GE Consumer & Industrial
Power Protection

WORLDWIDE PARTNER

Record Plus

Moulded Case Circuit Breakers
Selective & Current Limiting

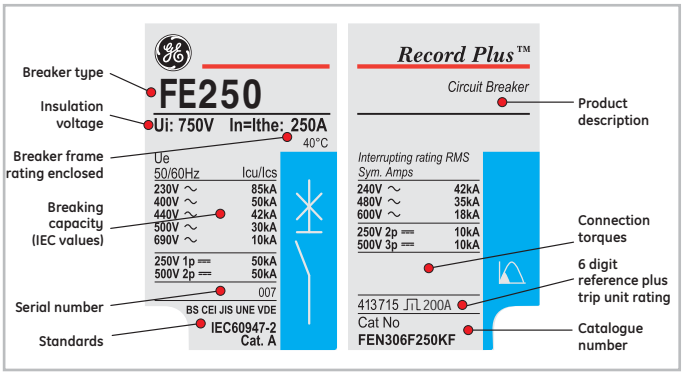
GE imagination at work

Circuit Breaker type		FD160		FD63/160						FE160		
Denomination		N	H	C	E	S	N	H	L	N	H	L
EN 60947-2 standard												
Poles	Number of	1		3,4			2[1],3,4			3,4		
Rated insulation voltage	Ui (Volts)	750		500	750	750	750			750		
Rated impulse withstand voltage	Uimp (Kilovolt)	3		6	8	8	8			8		
Rated operational voltage Ue	Volts AC	240		500	690	690	690			690		
	Volts DC	250		-	-	500	500			500		
Line protection device												
Category of use		A		A			A			A		
Suitable for use as a isolator	Positive ON & OFF	yes		yes			yes			yes		
Rated current Ith = Ie	A at 40°C	63 or 160		63 or 160			63 or 160			160		
Ultimate breaking capacity Icu [kA]	230/240V AC	25	50	25	40	50	85	100	200	85	100	200
	400/415V AC	-	-	18	25	36	50	80	150	50	80	150
	440V AC	-	-	12	14	25	30	65	130[4]	42	65	130
	500V AC	-	-	10	12	18	22	36	50[4]	30	50	100
	690V AC	-	-	-	4.5	6	8	10	12	10	22	75
	250V DC Single pole	-	50	-	-	25	40	65	100	50	85	100
	500V DC Two pole	-	-	-	-	25	40	65[2]	100[2]	50	85[2]	100[2]
Service breaking capacity Ics (%Icu)	≤ 500V	100%	100%	100%	75%	100%	100%	100%	100%	100%	100%	100%
	690V AC	-	-	-	75%	75%	50%	50%	35%	100%	75%	25%
Single phase breaking capacity I_{IT} [kA]	230V AC	25	50	16	25	30	50	80	150	50	80	150
	400/415V AC	-	-	-	4.5	6	8	10	12	15	22	36
Endurance (CO operations)	Mechanical	10000		10000			25000			40000		
	Electrical at In	5000		5000			10000			20000		
	Electrical at In/2	10000		10000			20000			30000		
Endurance (On-Tripped operations)	Mechanical	4000		4000			10000			16000		
Trip Units	Interchangeable	no		no			no			yes		
	Thermal magnetic line	LTM								LTM		
	Thermal magnetic generator						GTM			GTM		
	Thermal magnetic selective						LTMD			LTMD		
	Magnetic only						Mag Break™			Mag Break™		
	Electronic selective									SMR1		
	Electronic enhanced											
Circuit Breaker type and denomination		FD160Y		FD 63Y			FD160Y			FE160Y		
EN 60947-3 standard												
Non Automatic breaker (Switch)												
Rated current In (class AC23)	220V AC to 690V AC	160		63			160			160		
Rated making capacity	Icm (kA peak)	2.8		1.7			2.8			4.9		
Short-term withstand current Icw [kA]	Icw eff. 1 second	2		1.2			2			3		
	Icw eff. 3 seconds	2		1.2			2			3		
Circuit Breaker type							FD63/160			FE160		
Denomination							N	H	L	N	H	L
EN 60947-4 standard												
Use in motor circuits												
Rated current Ith	A at 65°C						FD50-50 FD160-100			150		
Endurance (CO operations)	Mechanical						25000			40000		
	Electrical at In class AC23						10000			20000		
	Operations per hour						120			120		
Protection	Short-circuit only (sep. overload device)						Mag Break™			Mag Break™		
	Overload class 10 and short-circuit									SMR1		
	Max In (A) class 10						FD63-50 FD160-100			150		
	Max In (A) class 30						FD63-50 FD160-80			150		
	Earth fault unit (differential)						Optional FDQ type			Optional FEQ type		
Circuit Breaker / Switch type		FD63/160 all types								FE160 all types		
NEMA AB1 standard												
3ph. interruption ratings [kA]	240V AC	-	-	-	-	50	65	100	-	100	150	200
	480V AC	-	-	-	-	25	36	50	-	50	65	130
	600V AC	-	-	-	-	6	8	10	-	25	36	42
Installation												
Mounting	On symmetrical DIN Rail	yes		yes			yes			no		
	Fixed	yes		yes			yes			yes		
	Plug in	no		yes			yes			yes		
	Draw out	no		no			no			yes		
Connection	Front	yes		yes			yes			yes		
	Rear	no		no			yes			yes		
Dimensions [w x h x d] mm	3 pole, fixed front connection	27 x 130 x 85		81 x 130 x 85			81 x 130 x 85			105 x 170 x 95		
	4 pole, fixed front connection	for single pole		108 x 130 x 85			108 x 130 x 85			140 x 170 x 95		
Weights [kg]	3 pole, fixed front connection	0.4		0.9			0.9			1.5		
	4 pole, fixed front connection	for single pole		1.3			1.3			2.0		

(1) N type only. (3) Use 2 poles.
(2) Use 3 poles. (4) 160A rating only; derate to 65kA at 440V and 36kA at 500V.

	FE250			FG400			FG630			FK800			FK1250			FK1600	
V	N	H	L	N	H	L	N	H	L	N	H	L	N	H	L	N	H
	3,4			3,4			3,4			3,4			3,4			3,4	
690	750			750			750			1000			1000			1000	
8	8			8			8			8			8			8	
500	690			690			690			690			690			690	
440	500			-			-			500			500			500	
	A			B(5)			B(5)			B			B			B	
	yes			yes			yes			yes			yes			yes	
	250			400			630			800			1250			1600	
65	85	100	200	85	100	200	85	100	200	85	100	170	85	100	170	85	100
36	50	80	150	50	80	150	50	80	150	50	80	100	50	80	100	50	80
25	42	65	130	42	65	130	42	65	130	42	65	80	42	65	80	42	65
18	30	50	100	30	50	100	30	50	100	36	42	50	36	42	50	36	42
-	10	15	22	10	22	75(7)	10	22	40(7)	20	25	30	20	25	30	20	25
25	50	85	100							50(3)	60(3)	80(3)	50(3)	60(3)	80(3)	-	-
-	50	85(2)	100(2)							36(2)	50(2)	60(2)	36(2)	50(2)	60(2)	-	-
100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	75%	50%	100%	75%	50%	100%	75%
-	100%	75%	50%	100%	45%	25%	100%	45%	25%	100%	75%	50%	100%	75%	50%	100%	75%
36	50	80	150	50	80	150	50	80	150	50	80	100	50	80	100	50	80
-	10	15	22	10	(6)	(6)	10	(6)	(6)	20	25	30	20	25	30	20	25
10000	25000			20000			20000			10000			10000			10000	
5000	10000			7500			5000			4000			3000			2000	
10000	20000			15000			10000			8000			6000			4000	
4000	10000			8000			8000			4000			3000			2000	
no	yes			yes			yes			no			no			no	
LTM										LTM			LTM				
	GTM																
	LTMD																
	Mag Break™			Mag Break™													
	SMR1			SMR1									SMR1e				
				SMR2									SMR 1s & g				
	FE250Y			FG400Y			FG630Y			FK800Y			FK1250Y			FK1600Y	
	250			400			630			800			1250			1600	
	6.4			8.5			11.3			14.1			21.2			28.3	
	4			5			6.5			10			15			20	
	4			5			6.5			10			15			20	
	FE250			FG400			FG630			FK800			FK1250			FK1600	
	N	H	L	N	H	L	N	H	L	N	H	L	N	H	L	N	H
	225			350			500			720			1000				
	25000			20000			20000			10000			10000				
	10000			7500			5000			4000			3000				
	120			120			60			60			60				
	Mag Break™			Mag Break™			Mag Break™			Mag Break™			Mag Break™				
	SMR1			SMR1 or SMR2			SMR1 or SMR2										
	225			350			500			720			1000				
	225			350			500			720			1000				
	Optional FEQ type			Optional FGQ type			Optional FGQ type										
	FE250 all types			FG400 all types			FG630 all types			FK800 all types			FK1250 all types			FK1600 all types	
65	100	150	200	100	150	200	100	150	200	85	-	-	85	-	-	85	-
36	50	65	130	50	65	130	50	65	130	42	-	-	42	-	-	42	-
22	25	36	42	25	36	42	25	36	42	25	-	-	25	-	-	25	-
	no			no			no			no			no			no	
	yes			yes			yes			yes			yes			yes	
	yes			yes			yes			no			no			no	
	yes			yes			yes			yes			yes			yes	
	yes			yes			yes			yes			yes			yes	
	yes			yes			yes			yes			yes			yes	
	105 x 170 x 95			140 x 265 x 115			140 x 265 x 115			210 x 320 x 160			210 x 320 x 160			210 x 320 x 160	
	140 x 170 x 95			185 x 265 x 115			185 x 265 x 115			280 x 320 x 160			280 x 320 x 160			280 x 320 x 160	
	1.6			4.5			4.5			12.2			18.0			18.0	
	2.1			6.0			6.0			15.1			23.4			23.4	

(5) 350 and 500A executions only
(6) Please contact us.
(7) On use of FG400 and FG630L type at 690V, one long and widened terminal shield is required.



Certification

The ***Record Plus™*** line of circuit breakers has been designed to comply with the following standards:

EN 60947 Low-voltage switchgear and controlgear

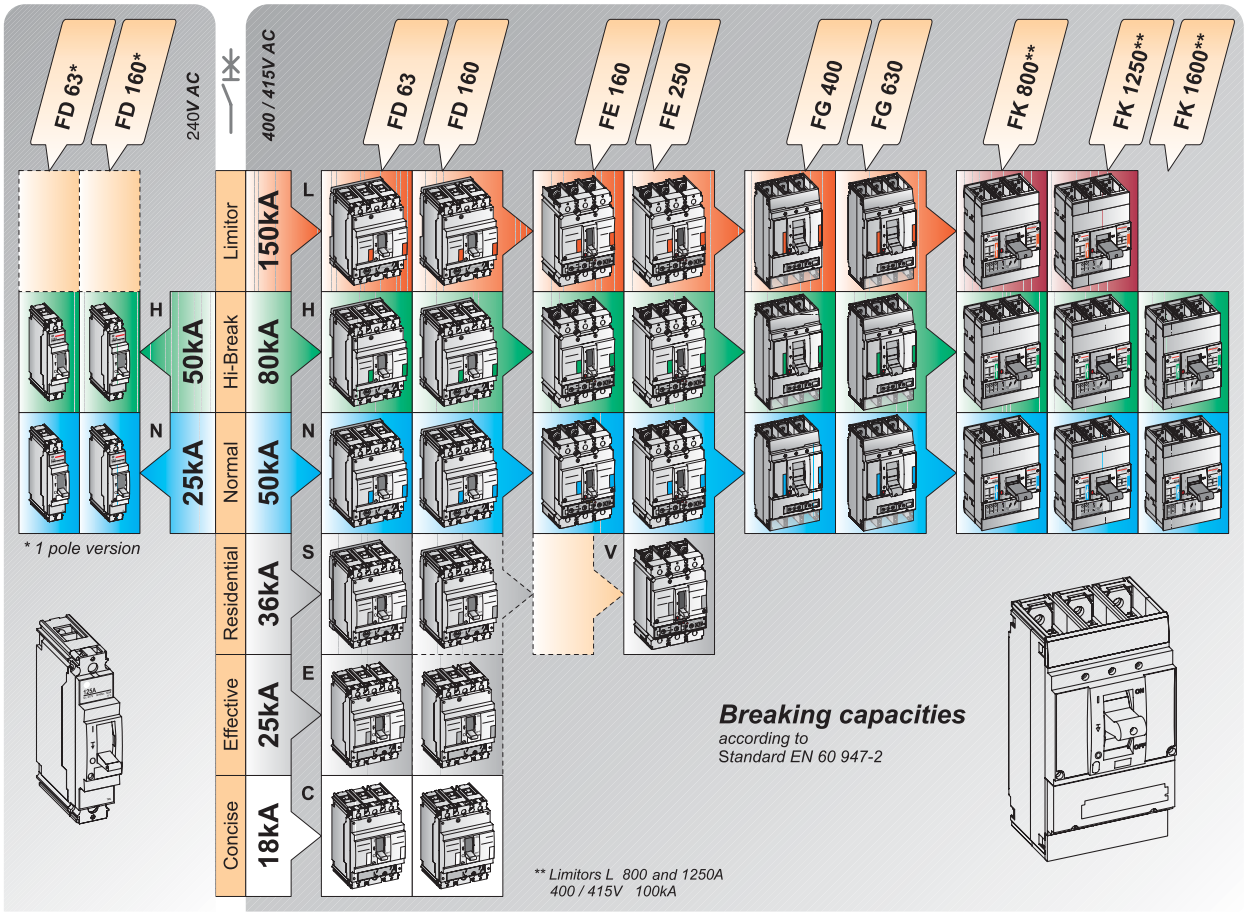
EN 60947-1: General rules
EN 60947-2: Circuit-breakers
EN 60947-3: Switches, disconnectors, switch-disconnectors and fuse-combination units
EN 60947-4-1: Contactors and motor-starters
Section One: Electromechanical contactors and motorstarters
EN 60947-5-1: Control circuit devices and switching elements
Section One: Electromechanical control circuit devices

The compliance has been verified by two testing authorities: LOVAG and KEMA (appropriate certificates are available on request)

Meeting the international standards. The requirements are met of **BS, VDE, UTE, KEMA, CEI**. Record Plus breakers have been tested in acordance with the NEMA standards

For the Record Plus product certificates are available from the following regulatory bodies:
Germanische Lloyds - RINA
Lloyds Register of Shipping - CCC (China)
Further tests are being undertaken to meet the requirements of the following regulatory bodies:
Bureau Veritas - Det Norske Veritas

Please contact us to check the availability of individual certificates.



A new line of breakers
designed for global applications

Record Plus

The ***Record Plus***™ family of circuit breakers has been developed as a line of aesthetically and technically coordinated protection devices for low voltage distribution and control applications.
The circuit breakers are available in four sizes, each of which is tailored to the individual requirements associated with its application.
The line offers a current range running from 3A to 1600A in single, 3 and 4 pole ratings. Numerous versions as fixed, plug in and draw out are available and the line is completed with a full range of accessories.

FD63/160

Rated at 160A, the FD63/160 frame size is designed for use in both a DIN-rail environment with modular equipment and in industrial applications. It is supplied with IPXXB terminals suitable for direct connection of one or two conductors totalling up to 95 mm^2 and is available as a thermal-magnetic breaker, a moulded case switch, and as a magnetic-only motor circuit protector.
The FD63/160 bridges the gap between residential miniature circuit breakers and industrial moulded case circuit breakers.

FE160 and FE250

Rated at 160 and 250A, the FE frame sizes are designed for side-by-side mounting with FD63/160 types in panels. FE sizes are equipped with an easily accessible busbar connection and can also be supplied with cable lugs for use with copper or aluminum conductors. The design allows the use of interchangeable thermal-magnetic, magnetic-only, and electronic trip units.

A complete line of
selective & current limiting breakers

FG400 and FG 630
Rated at 400 and 630A, the FG frame size includes all of the advanced features of the FD and FE frame sizes.
The FG connection area features easy-to-access busbar connections. Cable lugs for use with single or multiple copper or aluminum conductors are optionally available. The breaker is designed for use with interchangeable electronic units that can be easily adapted to multiple levels of protection.

FK 800, 1250 and 1600
Rated at 800,1250 and 1600A, the FK frame sizes are designed for use with the FG400 and 630 frame sizes. The design uses electronic trips units available in a number of performance ranges and allowing a wide variety of setting options and groundfault protection. If needed thermal-magnetic and magnetic only trip units are also available.
The FK connection area features easy-to-access busbar connections or cable lugs for use with single or multiple copper or aluminum conductors.

Record Plus

Record Plus™ circuit breakers are designed to protect, isolate and switch circuits in low voltage distribution networks. Circuit protection is provided by a combination of the devices unique current limiting properties and integrated protection devices commonly referred to as trip units.

The trip units are designed to protect circuits and/or the equipment connected to these circuits and exist as electromechanical or electronic devices. Numerous electromechanical types are available as thermal magnetic devices with overload and short-circuit protection or magnetic-only types providing short-circuit protection. Electronic devices offering wide setting ranges and a more sophisticated level of protection are available in several versions. Each trip unit has a setting area finished with a sealable transparant trip unit door.

Electromechanical devices

Devices available in a current range of 16 to 1250A(1) as single, two, three or four pole devices. The electromechanical trip units exist as thermal magnetic, magnetic-only and generator protection models. The high-performance thermal magnetic trip units exist as selective and non-selective versions and are equipped with a fault indicator that distinguishes between overload and short-circuit events in accordance with HD 384. This patented safety feature allows users to reduce downtime by resetting the breaker directly after an overload event.

Electronic devices SMR1

The ***Record Plus™*** FE, FG and FK sizes can be equipped with rigorously designed and tested interchangeable electronic trip units available in three and four pole units in currents ranging from 25 to 1600A.

The SMR1 and SMR2 types offer ajustable overload and selective short-circuit protection. The SMR1 range is designed for simplicity and includes numerous exciting features such as an overload signalling option, a built-in temperature sensor and rating plugs suitable for both line and motor protection.

(1) For 400 and 630A types, please contact us.

Protection with
flexible & interchangeable trip units

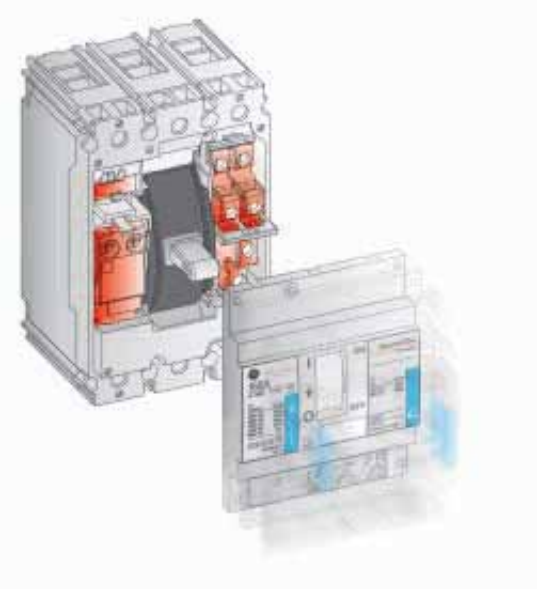
Personnel protection

A line of three and four pole add-on residual current devices are available as side or bottom mounted units with ratings up to 630A and sensitivities of 30mA to 10A.
The devices slide on to the breaker easily and are fixed by simply tightening the main electrical connections. Designed to meet the latest standards, they each have a mechanical and electrical test option and share a common cut out.
A de-electric disconnect plug unit and setting areas with transparent, tamper-free cover are standard for the whole line.
For ratings above 630A, seperate sensors and relays are available, or an integrated ground fault protection can be used.

Electronic devices SMR2

The SMR2 has been designed to provide a flexible solution for all protection scenarios.
The device is available in two versions, each allowing the user to conveniently tailor his protection to meet individual circuit requirements.
The available options include adjustable overload pickup values, overload trip time characteristics, short time pickup circuit values, short time delay circuit trip times and energy values.
The trip unit can be equipped with a ground fault protection and is also available with a load shedding option.

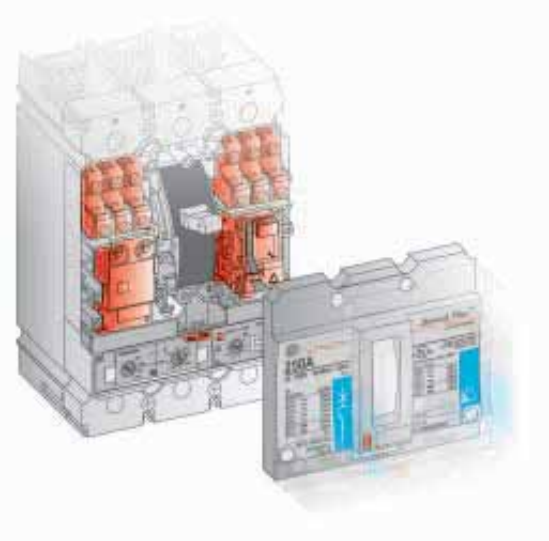
Common accessories
safe & easy to mount



Safe and easy to mount

The internal accessories are designed for safe and easy mounting. The breaker trips upon cover removal and remains tripped until the cover is replaced. Cover removal provides access to a specifically designed, isolated compartment into which the accessories can be mounted easily and safely in conveniently marked areas.

The advanced design includes routing channels for external wiring that allows access to internal terminals, making it easier to connect accessories. Particular attention has been paid to the design of these terminals that allow the connection of wiring from 0.5 to 2.5 mm^2.

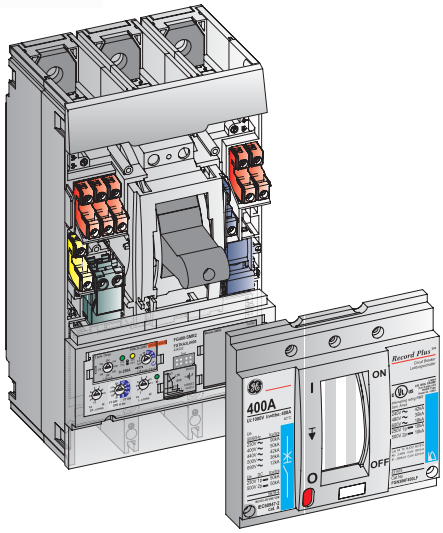


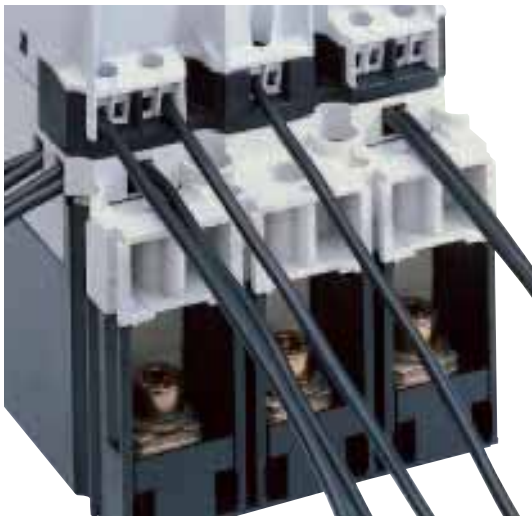
Common and adaptable

The same internal accessories are used in the FD, FE and FG frame sizes. The mounting system and wiring access methodology remains the same: simple and effective.

The FK frame has equivalent accessories and the same connection options.

For plug-in and draw-out breakers 6, 8 and 10 pole plug/socket combinations are available. These are equipped with wiring that can be led through specific openings in the breaker rear.





Mounting

Internal accessories can be easily clicked into conveniently marked areas in the isolated compartment.
Clearly marked indication of the accessory position and a mechanical interchange prevention system assure an error-proof and solid mounting of the accessory.

Wiring

External wiring is routed through the top or the side of the breaker lid through break out openings.
The wiring can then be connected to the accessory terminals. These cage terminals allow for cross sections from 0.75 to 2.5 mm^2 and even allow the connection of two wires.
All contact points are coded in accordance with the EN 60947 standard thus allowing for universal wiring diagrams.

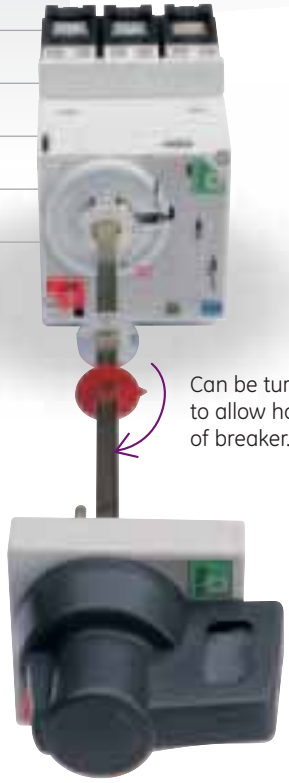
Auxiliary and Bell Alarm contacts

The internal accessories are common to ***Record Plus™*** FD, FE and FG circuit breakers. They offer a unique, patented, auxiliary contact block with normally open and normally closed contacts which are suitable for use in high current and high fidelity applications. A selective Bell Alarm contact featuring complementary contacts is also available.

Releases

The shunt and undervoltage releases are a totally new design combining the best in electromechanical and electronic engineering. Most releases are common for AC and DC voltages and are available in a wide voltage range. They combine low power consumption, a kiss-free, lock-out design and the ease of use common to all ***Record Plus™*** internal accessories.

Wide range of
electrical & mechanical operators



Can be turned 90°
to allow horizontal mounting
of breaker.

Easy-to-mount rotary handles

Fitted onto the breaker front the device allows the vertical handle movement to be changed into a rotary operation with the OFF position at 3 o'clock and the OFF position at 6 o'clock. An accurate position indication of the three breaker positions ON-OFF and TRIPPED is provided by a totally new internal design that also allows the user to install one or two early closing and late opening contact blocks which are the same as the standard internal accessory types.

Easy to install

The handles are available as a breaker mounted device, a type that can be mounted through a door or a panel and a version where the operator is mounted on the door or panel front.
The door and/or panel mounted units are equipped with (bypassable) interlocks to prevent the door from opening or the panel being removed whilst the breaker is ON. The door/panel mounted operators use a drilling common across the line.
Each breaker size and breaking capacity rating has its own escutcheon and handle that can be equipped with padlocks and/or a keylock.

Safe to operate

Locking/Interlocking devices

To allow users to safely work on the installations or installation segments protected by the ***Record Plus***™ moulded case circuit breakers it is possible to padlock the devices in their OFF position. A padlocking facility can be attached to the breaker front allowing the breaker to be equipped with up to three padlocks of 5 to 8 mm.

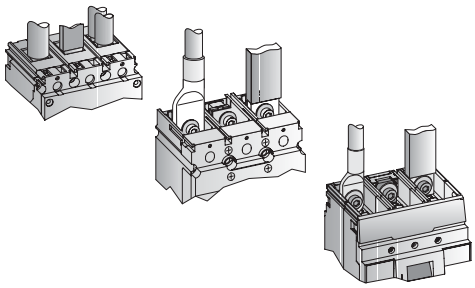
A second type (depicted in the photo) is only firmly attached to the breaker when it is padlocked and can be removed for use on another breaker when not in use. Key locking devices allow the creation of multiple key interlocking configurations. A walking beam system is available for interlocking two or three breakers. The system can be upgraded to a fully automatic power transfer system.

Easy to operate

Electrical operators

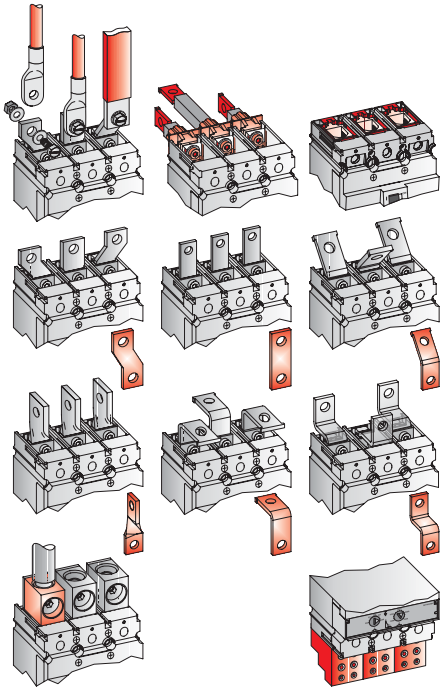
Front mounted devices that allow electrical operation of the breaker on which the device is mounted. Common to all electrical operators is a closing speed lower than 80 milliseconds, the same three wire electrical scheme and a clear and accurate ON, OFF and TRIPPED indication in the devices front face. Each device has two operational positions electrical or manual and can be padlocked or key-locked in OFF position. Easy connection is achieved by locating the terminals in the immediate vicinity of those of the internal accessories and by using terminals with a connection capacity of 0.5 to 2.5 mm^2.

Versatile installation options



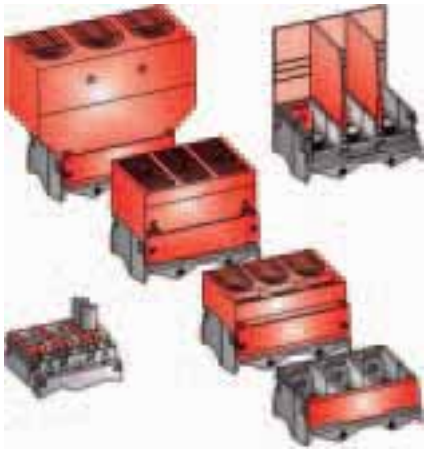
Standard connection options

The breakers are equipped with front access terminals designed to allow the user to quickly and easily connect standard conductors. The FD63/160 frame has box clamps suited for one or two cable cores or busbars while the FE, FG and FK frame sizes are configured to allow for easy busbar connection.



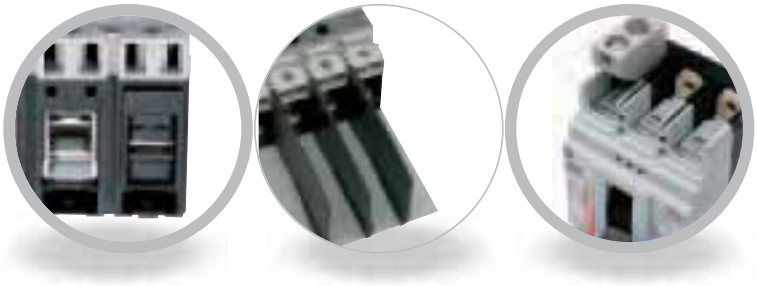
Configurable connection options

A wide range of alternatives are available in kit form with rear and angular connectors, spreaders, customised ring terminal connectors and extenders. Single and multiple box clamps can be directly fitted to the breaker terminals or in combination with extenders and spreaders. This flexibility allows the user to adapt ***Record Plus***™ circuit breakers to almost all standard connection configurations while at the same time allowing for the use of over-dimensioned and/or multiple conductors.



Terminal shields

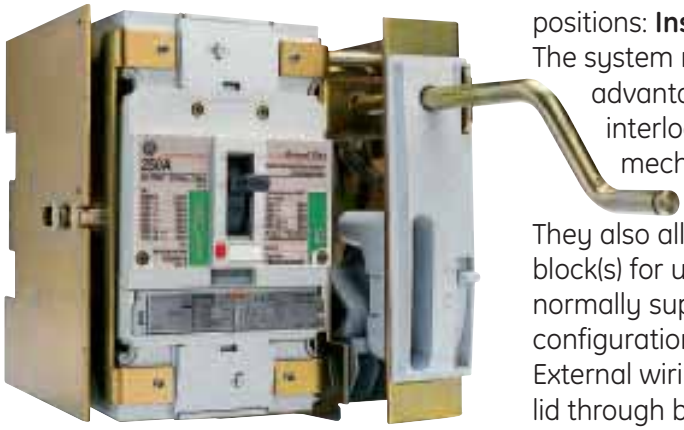
Each breaker can be fitted with tamper resistant, short or long, terminal shields that allow a IP30 finishing of the product. Backplates and phase separators complete this line and consistently enable the user to connect the products in a safe manner. Specific applications, extra accessories are available for some breaker sizes like the FD160 with its IPXXB terminal covers and the FG frame with its widened long terminal shield.



Plug-in systems

Plug-in mounting systems are available for current ratings through 630A in both kit and assembled options. The plug-in system consists of a single-piece moulded base in an IPXXB configuration. The mounting system features a safety interlock which ensures that the breaker is mechanically tripped before it is fully withdrawn or re-inserted in the ON position.

An optional set of plug-in terminal block(s) are available for use with internal accessory connections. Plug-in mounting bases are normally supplied with exactly the same front access terminal configuration as the standard fixed breaker. This allows the use of the same wide range of connection accessories that are available in kit form on the fixed version. These includs rear and angular connectors, spreaders, customised ring terminal connectors and extenders. Internal accessories can be easily clicked into conveniently marked areas in the isolated compartment. Clearly marked indication of the accessory position and a mechanical interchange prevention system assures an error-proof and solid mounting of the accessory.



Draw-out system

Simple, hand-operated draw-out mechanisms are available for breakers up to 1600A. The draw-out system enables ***Record Plus***™ breakers to be configured as fully isolated devices with three positions: **Inserted, Test & Isolated, Remove**

The system makes use of the plug-in base and offers all the advantages of these IPXXB devices such as the safety interlock system which makes sure that the breaker is mechanically tripped before it is fully withdrawn or re-inserted in the "on" position.

They also allow the use of the same optional set of plug-in terminal block(s) for use with internal accessory connections and are normally supplied with exactly the same front access terminal configuration as the standard fixed breaker.

External wiring is routed through the top or the side of the breaker lid through break out openings. All contact points are coded in accordance with the EN 60947 standard thus allowing for universal wiring diagrams.

Connectivity

The installation of a breaker is much easier and more cost effective when the mounting and connecting of the breaker can be reduced to a few simple, automateable tasks. Based on these principles GE Power Controls have devised a unique system that allows the user to mount and connect the breaker before installation.

An adaptor plate, specifically designed for the ***Record Plus***™ breaker line and incorporating all the connection hardware, is fitted to the breaker using 5 to 6 simple screws. Once mounted the adaptor is then simply plugged onto a three or four pole busbar system already installed in the equipment.

Record Plus

Using world class design and development tools like Six Sigma, Computer Simulation and Lean Manufacturing, ***Record Plus™*** is intended to meet and exceed the most stringent quality and safety standards. At GE we are proud to offer a product that will offer years of reliable and dependable protection.

GE Power Controls' name is synonymous with a broad range of products designed to meet our customer's changing and competitive environment. Our drive to exceed our customer's expectations is the foundation for continual renewal of our commitment to provide innovative low voltage solutions.

The new ElfaPlus, ***Record Plus™***, M-Pact and Surion breaker and starter lines offer a full line of hi-performance protection devices. The four lines are designed to be aesthetically and technically compatible and suited for a wide range of applications. They provide a fully co-ordinated approach to circuit and device protection for domestic, commercial or industrial usage.

GE Power Controls' new lines meet the latest technical standards and regulations and have been certified by authorities as Lovag, the KEMA and Lloyd's. The components in these lines have been designed to be an integral part of a solution. A complete low voltage distribution and control range including components, accessories and the distribution and controls equipment they go into.

Full solution for
low voltage distribution

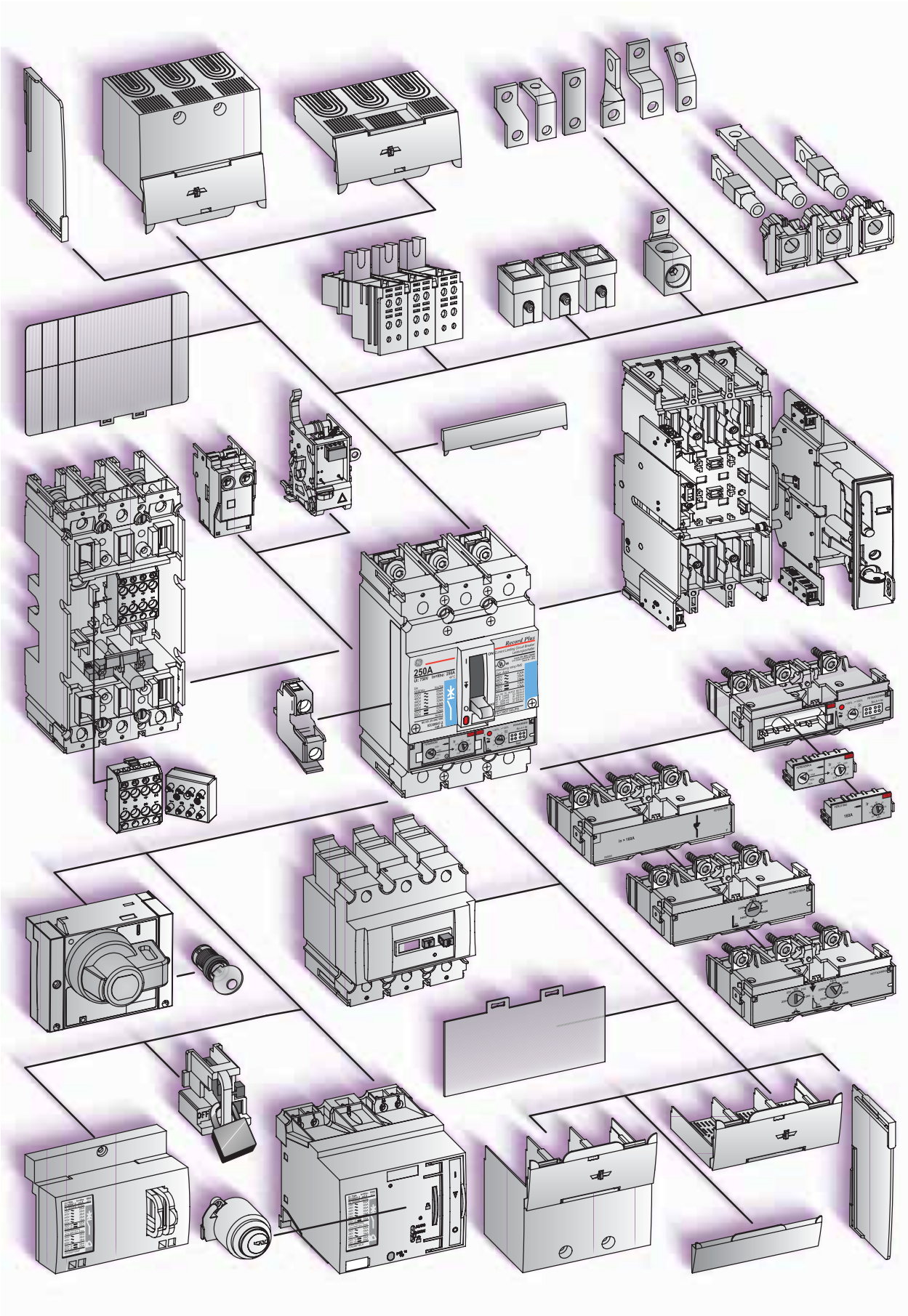
Application Software

The new HD 384 and R064-03 standards require that the design of a low voltage distribution system includes the determination of all perspective short-circuit and fault currents levels. GE Power Controls have developed a windows based software package to do this: Procera Plus offers a multi standard and multi lingual software package to accompany our new product line.

Implementation Software

Two ranges of software are designed to allow a user to select the correct protection devices, the associated components needed to install it, and a distribution system in which they can be installed.
The software can be linked with Procera and automatically produces drawings and ordering details.

Record Plus



How to order a standard breaker

To determine the basic breaker, the required current rating, the short circuit breaking capacity and the number of switched and protected poles must be defined. This information can be found on page 2 and 3 of this catalogue and is repeated in short-form within the ordering code part of each breaker size.

After selecting the basic device the circuit protection element or trip unit needs to be defined. These are available in numerous types, each of which is described briefly in the ordering code part of each breaker size, whilst a full functional description can be found in the relative section B of this catalogue.

With the above mentioned information the correct code for the required moulded case circuit breaker can be found in the order code pages. Here the selected product is a version suited for fixed mounting and front access connection.

Internal accessories
Common internal acessories are available from the FD63/160 frame size till the FG400/630 frame size. Taking into account the maximum breaker content the ordering procedure just requires a correct code selection.
The FK800, 1250 and 1600 types have equivalent accesories.

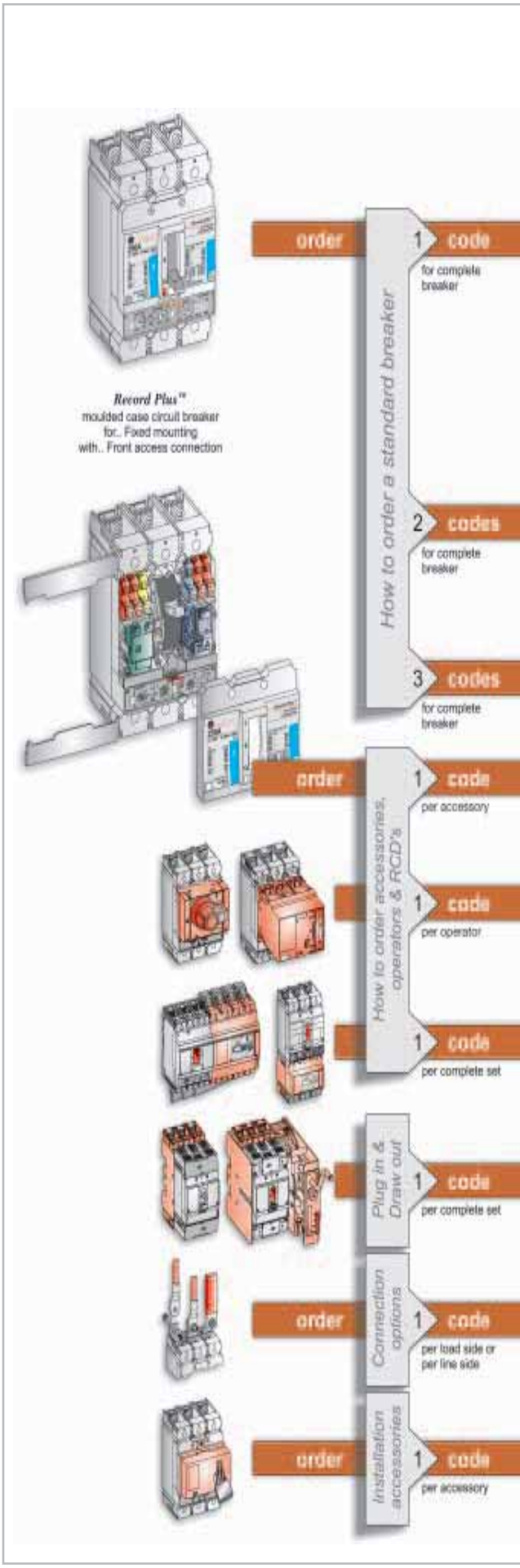
Operators
The breakers are normally supplied with an elongated toggle operator. Other operators, as rotary handles and electrical operators, can be ordered seperately.

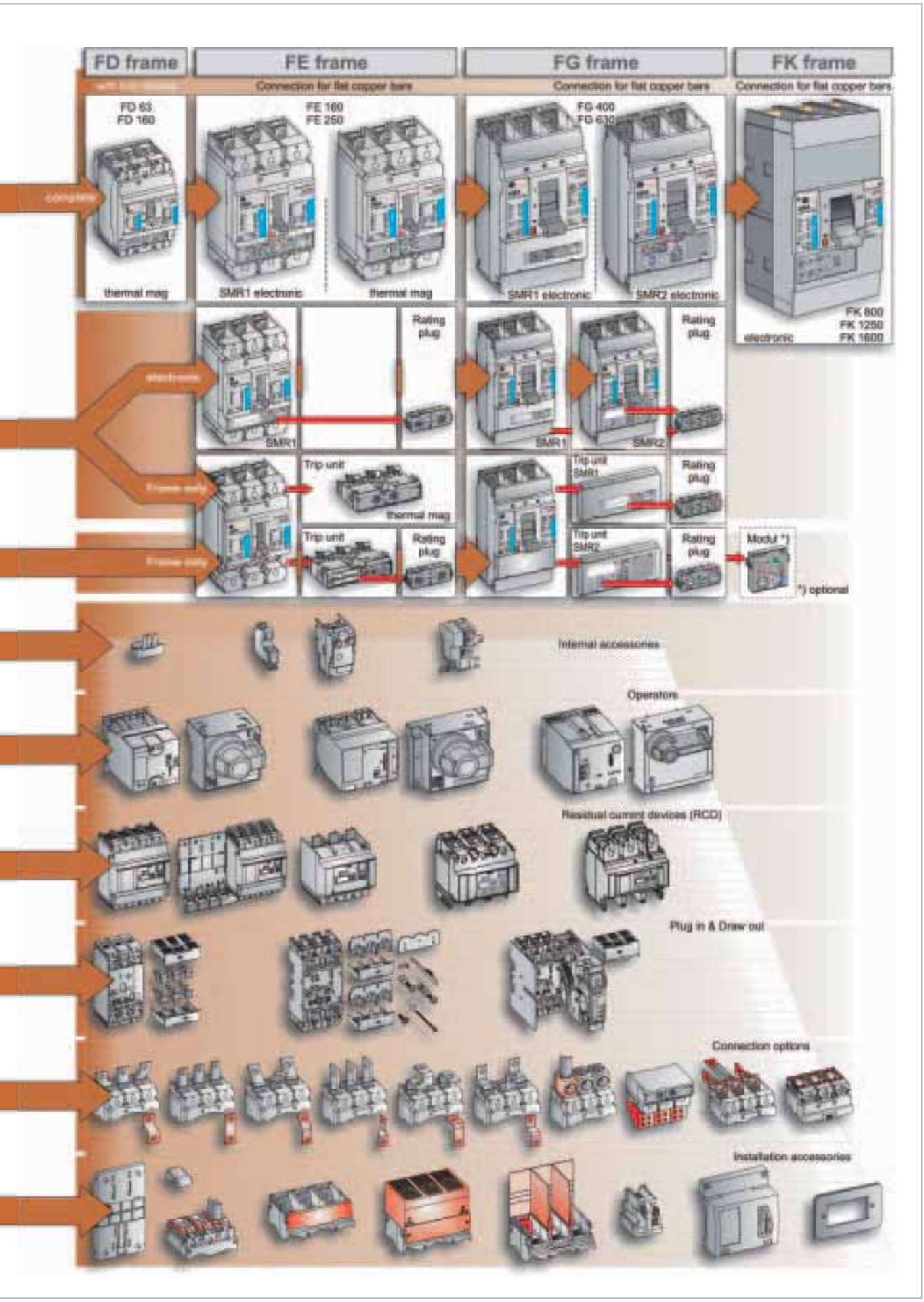
Residual Current devices (RCD)
Available as add-on devices for side mounting (FD63/160) or mounting below the trip unit area of the breaker (FD63/160, FE 160/250 and FG400/630). For breakers large than 630A seperate RCD relays and sensors are available.
On the FK800, FK1250 and FK1600 an integrated ground fault device can be used.

Breakers in Plug-in or Draw-out version
A breaker in fixed rating can easily be converted to a breaker in plug-in or draw-out rating. The plug-in device is supplied in two parts, one set for mounting on the breaker and one multipole base. The draw-out unit is ordered as one complete conversion kit for the required breaker. On ordering plug-in or draw-out breakers with accessories, please take into account that the auxiliary wiring also needs to be executed as such (6, 8 or 10 pole socket system required).

Connection options
If the standard connection options do not meet the requirements a wide variety of others is available.
The connection options are supplied in kit form for mounting on one side (load or line) of a breaker and can be used for the fixed, plug-in or draw-out version of the breaker.

Installation accessories
Additional requirements, as to the protection degree of the connection area, the locking or padlocking of the breaker and finishing of cut-outs for operators can be met by the use of these parts.




FD frame
FE frame
FG frame
FK frame
Connection for flat copper bars
Connection for flat copper bars
Connection for flat copper bars
FD 63
FD 160
FE 160
FE 250
FG 400
FG 630
thermal mag
SMR1 electronic
thermal mag
SMR1 electronic
SMR2 electronic
FK 800
FK 1250
FK 1600
electronic
Rating plug
SMR1
Rating plug
SMR1
SMR2
Trip unit
thermal mag
Trip unit SMR1
Rating plug
Trip unit
Rating plug
Trip unit SMR2
Rating plug
Modul *)
*) optional
Internal accessories
Operators
Residual current devices (RCD)
Plug in & Draw out
Connection options
Installation accessories

LTM
Line thermal magnetic protection
LTMD
Selective thermal magnetic protection
GTM
Generator thermal magnetic protection
Mag Break™
Magnetic Only protection
Y
Non Automatic or switch (not mentioned in tables)

FD frame

Breaking capacities

2, 3 and 4 pole types

Icu 400/415V AC in kA eff.

Type	C	E	S	N	H	L
FD63	18	25	36	50	80	150
FD160	18	25	36	50	80	150

Single pole types

Icu 230/240V AC in kA eff.

N	H
25	50

Protection

Trip Unit	Rated Current (A)	LTM	LTMD	GTM	Mag Break™
FD63 (2,3 & 4 pole)	3				N,H
	7				N,H
	12.5				N,H
	16	C,E	S,N,H		
	20	C,E	S,N,H		N,H,L
	25	C,E	S,N,H,L	N,H	
	30				N,H,L
	32	C,E	S,N,H,L	N,H	
	40	C,E	S,N,H,L	N,H	
	50	C,E	S,N,H,L	N,H	N,H,L
	63	C,E	S,N,H,L	N,H	
FD160 (2,3 & 4 pole)	80	C,E	S,N,H,L	N,H	N,H,L
	100	C,E	S,N,H,L	N,H	N,H,L
	125	C,E	S,N,H,L	N,H	
	160	C,E	S,N,H,L	N,H	

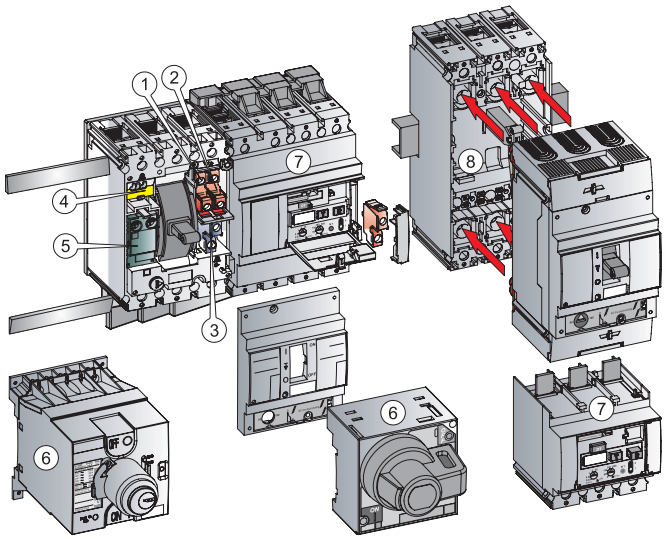
Number of poles/ protected poles (trips)				
2 pole 2 trips		N		
3 pole 3 trips	C,E	S,N,H,L	N,H	N,H,L
4 pole 3 trips		N,H,L	N,H	N,H,L
4 pole 4 trips	C,E	S,N,H,L	N,H	
4 pole 3.5 trips (N=50%)(2)		N,H,L	N,H	

Trip Unit	Rated Current (A)	LTM
FD160 (single pole)	16	N,H
	20	N,H
	25	N,H
	32	N,H
	40	N,H
	50	N,H
	63	N,H
	80	N,H
	100	N,H
	125	N,H
	160	N,H

Number of poles/ protected poles (trips)	
1 pole 1 trip	N,H

Accessories

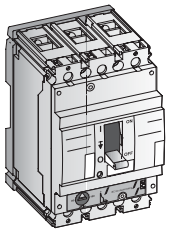
① Auxiliary contact left mounted (NO or NC)
② Auxiliary contact right mounted (NO or NC)
③ Bell Alarm trip unit (NO or NC)
④ Bell Alarm mechanism (CO)(1)
⑤ Shunt or Undervoltage release
⑥ Operators
Rotary Handle
Electrical Operator
⑦ RCD, side or bottom mounted(1)
(Insert indicates Bell alarm contact mounting)
⑧ Plug in system(1)



(1) Not applicable for some FDC and FDE types.
(2) Rated current ≥ 63A

FD63/160 - Complete circuit breaker

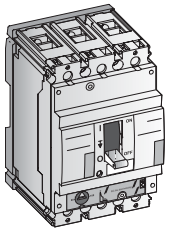
Line Thermal Magnetic LTM (fixed settings)



18 kA FDC

In (A)	3 pole 3 trips Cat. no.	Ref. no.	4 pole 4 trips[1] Cat. no.	Ref. no.
16	FDC35TE016ED	**433907**	FDC45TE016ED	**433948**
20	FDC35TE020ED	**433911**	FDC45TE020ED	**433949**
25	FDC35TE025ED	**433914**	FDC45TE025ED	**433950**
32	FDC35TE032ED	**433918**	FDC45TE032ED	**433951**
40	FDC35TE040ED	**436117**	FDC45TE040ED	**433952**
50	FDC35TE050ED	**436118**	FDC45TE050ED	**433953**
63	FDC35TE063ED	**436133**	FDC45TE063ED	**433954**
80	FDC35TE080GD	**436143**	FDC45TE080GD	**436145**
100	FDC35TE100GD	**436144**	FDC45TE100GD	**436146**
125	FDC35TE125GD	**433924**	FDC45TE125GD	**436147**
160	FDC35TE160GD	**433925**	FDC45TE160GD	**436148**

One code covers: A standard, fixed front connection breaker with:
DIN-Rail mounting kit + Breaker finishing covers + Fixation hardware.

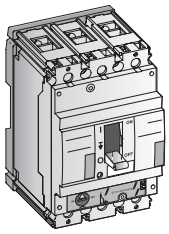


25kA FDE

In (A)	3 pole 3 trips Cat. no.	Ref. no.	4 pole 4 trips[1] Cat. no.	Ref. no.
16	FDE36TE016ED	**433649**	FDE46TE016ED	**433697**
20	FDE36TE020ED	**433651**	FDE46TE020ED	**433699**
25	FDE36TE025ED	**433653**	FDE46TE025ED	**433701**
32	FDE36TE032ED	**433655**	FDE46TE032ED	**433703**
40	FDE36TE040ED	**433657**	FDE46TE040ED	**433705**
50	FDE36TE050ED	**433659**	FDE46TE050ED	**433707**
63	FDE36TE063ED	**433661**	FDE46TE063ED	**433709**
80	FDE36TE080GD	**433663**	FDE46TE080GD	**433711**
100	FDE36TE100GD	**433665**	FDE46TE100GD	**433713**
125	FDE36TE125GD	**433667**	FDE46TE125GD	**433715**
160	FDE36TE160GD	**433669**	FDE46TE160GD	**433717**

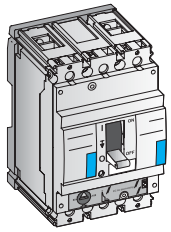
One code covers: A standard, fixed front connection breaker with:
DIN-Rail mounting kit + Breaker finishing covers + Fixation hardware.

Selective Thermal Magnetic LTMD (settable thermals)



36 kA FDS

In (A)	3 pole 3 trips Cat. no.	Ref. no.	4 pole 4 trips[1] Cat. no.	Ref. no.
16	FDS35TD016ED	**430161**	FDS45TD016ED	**430224**
20	FDS35TD020ED	**430163**	FDS45TD020ED	**430226**
25	FDS35TD025ED	**430165**	FDS45TD025ED	**430228**
32	FDS35TD032ED	**430167**	FDS45TD032ED	**430230**
40	FDS35TD040ED	**430169**	FDS45TD040ED	**430232**
50	FDS35TD050ED	**430178**	FDS45TD050ED	**430241**
63	FDS35TD063ED	**432952**	FDS45TD063ED	**432964**
80	FDS35TD080GD	**432955**	FDS45TD080GD	**432967**
100	FDS35TD100GD	**432958**	FDS45TD100GD	**432970**
125	FDS35TD125GD	**432961**	FDS45TD125GD	**432973**
160	FDS35TD160GD	**433602**	FDS45TD160GD	**433604**

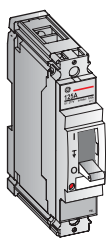


50kA FDN

In (A)	2 pole 2 trips Cat. no.	Ref. no.
16	FDN66TD016ED	**430143**
20	FDN66TD020ED	**430144**
25	FDN66TD025ED	**430145**
32	FDN66TD032ED	**430146**
40	FDN66TD040ED	**430147**
50	FDN66TD050ED	**430148**
63	FDN66TD063ED	**430149**
80	FDN66TD080GD	**430794**
100	FDN66TD100GD	**430797**
125	FDN66TD125GD	**430800**
160	FDN66TD160GD	**433599**

One code covers: A standard fixed front connection breaker + DIN-Rail mounting kit + Toggle elongator +
Breaker finishing covers + Fixation hardware

Line Thermal Magnetic LTM (fixed settings)



240V 25kA FDN

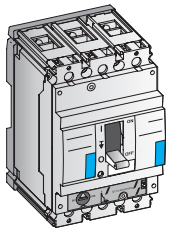
In (A)	1 pole 1 trip[2] Cat. no.	Ref. no.
16	FDN13TF016EF	**433316**
20	FDN13TF020EF	**433322**
25	FDN13TF025EF	**433328**
32	FDN13TF032EF	**433334**
40	FDN13TF040EF	**433340**
50	FDN13TF050EF	**433346**
63	FDN13TF063EF	**433352**
80	FDN13TF080GF	**433519**
100	FDN13TF100GF	**433522**
125	FDN13TF125GF	**433525**
160	FDN13TF160GF	**433527**

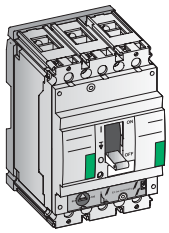
240V 50kA FDH

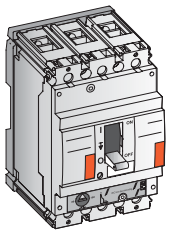
In (A)	1 pole 1 trip[2] Cat. no.	Ref. no.
16	FDH13TF016EF	**433246**
20	FDH13TF020EF	**433255**
25	FDH13TF025EF	**433262**
32	FDH13TF032EF	**433268**
40	FDH13TF040EF	**433274**
50	FDH13TF050EF	**433280**
63	FDH13TF063EF	**433286**
80	FDH13TF080GF	**433292**
100	FDH13TF100GF	**433298**
125	FDH13TF125GF	**433304**
160	FDH13TF160GF	**433310**

(1) Neutral on the left. If neutral on the right is needed, please contact us.
(2) Fixation hardware not suitable for mounting of one individual single pole breaker (see page A.10)

FD63/160 - Complete circuit breaker



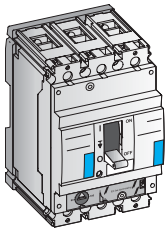


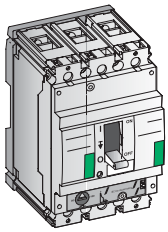


Generator Thermal Magnetic GTM (settable thermals)

	In (A)	3 pole 3 trips Cat. no.	3 pole 3 trips Ref. no.	4 pole 3 trips[1] Cat. no.	4 pole 3 trips[1] Ref. no.	4 pole 4 trips[1] Cat. no.	4 pole 4 trips[1] Ref. no.	4 pole 3.5 trips (N=50%)[1] Cat. no.	4 pole 3.5 trips (N=50%)[1] Ref. no.
50kA FDN	16	FDN36TD016ED	**430100**	FDN436TD016ED	**430117**	FDN46TD016ED	**430131**	-	-
	20	FDN36TD020ED	**430101**	FDN436TD020ED	**430118**	FDN46TD020ED	**430132**	-	-
	25	FDN36TD025ED	**430102**	FDN436TD025ED	**430119**	FDN46TD025ED	**430133**	-	-
	32	FDN36TD032ED	**430103**	FDN436TD032ED	**430120**	FDN46TD032ED	**430134**	-	-
	40	FDN36TD040ED	**430104**	FDN436TD040ED	**430121**	FDN46TD040ED	**430135**	-	-
	50	FDN36TD050ED	**430105**	FDN436TD050ED	**430122**	FDN46TD050ED	**430136**	-	-
	63	FDN36TD063ED	**430106**	FDN436TD063ED	**430123**	FDN46TD063ED	**430137**	FDN456TD063ED	**430129**
	80	FDN36TD080GD	**430630**	FDN436TD080GD	**430688**	FDN46TD080GD	**430752**	FDN456TD080GD	**430718**
	100	FDN36TD100GD	**430633**	FDN436TD100GD	**430691**	FDN46TD100GD	**430755**	FDN456TD100GD	**430721**
	125	FDN36TD125GD	**430636**	FDN436TD125GD	**430694**	FDN46TD125GD	**430758**	FDN456TD125GD	**430724**
	160	FDN36TD160GD	**433572**	FDN436TD160GD	**433578**	FDN46TD160GD	**433590**	FDN456TD160GD	**433584**
80kA FDH	16	FDH36TD016ED	**430020**	FDH436TD016ED	**430037**	FDH46TD016ED	**430051**	-	-
	20	FDH36TD020ED	**430021**	FDH436TD020ED	**430038**	FDH46TD020ED	**430052**	-	-
	25	FDH36TD025ED	**430022**	FDH436TD025ED	**430039**	FDH46TD025ED	**430053**	-	-
	32	FDH36TD032ED	**430023**	FDH436TD032ED	**430040**	FDH46TD032ED	**430054**	-	-
	40	FDH36TD040ED	**430024**	FDH436TD040ED	**430041**	FDH46TD040ED	**430055**	-	-
	50	FDH36TD050ED	**430025**	FDH436TD050ED	**430042**	FDH46TD050ED	**430056**	-	-
	63	FDH36TD063ED	**430026**	FDH436TD063ED	**430043**	FDH46TD063ED	**430057**	FDH456TD063ED	**430049**
	80	FDH36TD080GD	**430338**	FDH436TD080GD	**430396**	FDH46TD080GD	**430460**	FDH456TD080GD	**430426**
	100	FDH36TD100GD	**430341**	FDH436TD100GD	**430399**	FDH46TD100GD	**430463**	FDH456TD100GD	**430429**
	125	FDH36TD125GD	**430344**	FDH436TD125GD	**430402**	FDH46TD125GD	**430466**	FDH456TD125GD	**430432**
	160	FDH36TD160GD	**435821**	FDH436TD160GD	**435827**	FDH46TD160GD	**435839**	FDH456TD160GD	**435833**
150kA FDL	25	FDL36TD025ED	**430070**	FDL436TD025ED	**430082**	FDL46TD025ED	**430090**	-	-
	32	FDL36TD032ED	**430071**	FDL436TD032ED	**430083**	FDL46TD032ED	**430091**	-	-
	40	FDL36TD040ED	**430072**	FDL436TD040ED	**430084**	FDL46TD040ED	**430092**	-	-
	50	FDL36TD050ED	**430073**	FDL436TD050ED	**430085**	FDL46TD050ED	**430093**	-	-
	63	FDL36TD063ED	**430074**	FDL436TD063ED	**430086**	FDL46TD063ED	**430094**	FDL456TD063ED	**430087**
	80	FDL36TD080GD	**430518**	FDL436TD080GD	**430557**	FDL46TD080GD	**430591**	FDL456TD080GD	**430568**
	100	FDL36TD100GD	**430521**	FDL436TD100GD	**430560**	FDL46TD100GD	**430594**	FDL456TD100GD	**430571**
	125	FDL36TD125GD	**430524**	FDL436TD125GD	**430563**	FDL46TD125GD	**430597**	FDL456TD125GD	**430574**
	160	FDL36TD160GD	**435845**	FDL436TD160GD	**435848**	FDL46TD160GD	**435854**	FDL456TD160GD	**435851**

One code covers: A standard fixed front connection breaker + DIN-Rail mounting kit + Toggle elongator + Breaker finishing covers + Fixation hardware





Generator Thermal Magnetic GTM (settable thermals)

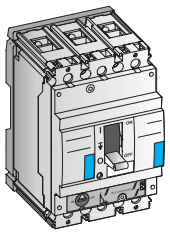
	In (A)	3 pole 3 trips Cat. no.	3 pole 3 trips Ref. no.	4 pole 3 trips[1] Cat. no.	4 pole 3 trips[1] Ref. no.	4 pole 4 trips[1] Cat. no.	4 pole 4 trips[1] Ref. no.	4 pole 3.5 trips (N=50%)[1] Cat. no.	4 pole 3.5 trips (N=50%)[1] Ref. no.
50 kA FDN	25	FDN36TG025ED	**430107**	FDN436TG025ED	**430124**	FDN46TG025ED	**430138**	-	-
	32	FDN36TG032ED	**430108**	FDN436TG032ED	**430125**	FDN46TG032ED	**430139**	-	-
	40	FDN36TG040ED	**430109**	FDN436TG040ED	**430126**	FDN46TG040ED	**430140**	-	-
	50	FDN36TG050ED	**430110**	FDN436TG050ED	**430127**	FDN46TG050ED	**430141**	-	-
	63	FDN36TG063ED	**430111**	FDN436TG063ED	**430128**	FDN46TG063ED	**430142**	FDN456TG063ED	**430130**
	80	FDN36TG080GD	**430649**	FDN436TG080GD	**430707**	FDN46TG080GD	**430771**	FDN456TG080GD	**430729**
	100	FDN36TG100GD	**430652**	FDN436TG100GD	**430710**	FDN46TG100GD	**430774**	FDN456TG100GD	**430732**
	125	FDN36TG125GD	**430655**	FDN436TG125GD	**430713**	FDN46TG125GD	**430777**	FDN456TG125GD	**430735**
	160	FDN36TG160GD	**433575**	FDN436TG160GD	**433581**	FDN46TG160GD	**433593**	FDN456TG160GD	**433587**
80kA FDH	25	FDH36TG025ED	**430027**	FDH436TG025ED	**430044**	FDH46TG025ED	**430058**	-	-
	32	FDH36TG032ED	**430028**	FDH436TG032ED	**430045**	FDH46TG032ED	**430059**	-	-
	40	FDH36TG040ED	**430029**	FDH436TG040ED	**430046**	FDH46TG040ED	**430060**	-	-
	50	FDH36TG050ED	**430030**	FDH436TG050ED	**430047**	FDH46TG050ED	**430061**	-	-
	63	FDH36TG063ED	**430031**	FDH436TG063ED	**430048**	FDH46TG063ED	**430062**	FDH456TG063ED	**430050**
	80	FDH36TG080GD	**430357**	FDH436TG080GD	**430415**	FDH46TG080GD	**430479**	FDH456TG080GD	**430437**
	100	FDH36TG100GD	**430360**	FDH436TG100GD	**430418**	FDH46TG100GD	**430482**	FDH456TG100GD	**430440**
	125	FDH36TG125GD	**430363**	FDH436TG125GD	**430421**	FDH46TG125GD	**430485**	FDH456TG125GD	**430443**
	160	FDH36TG160GD	**435824**	FDH436TG160GD	**435830**	FDH46TG160GD	**435842**	FDH456TG160GD	**435836**

One code covers: A standard fixed front connection breaker + DIN-Rail mounting kit + Toggle elongator + Breaker finishing covers + Fixation hardware

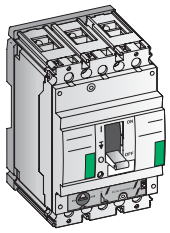
(1) Neutral on the left. If neutral on the right is needed, please contact us.

FD63/160 - Complete circuit breaker

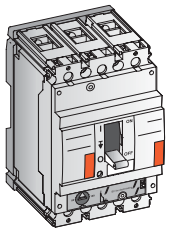
Motor Protection (Mag Break™) Magnetic Only Breakers



	In (A)	3 pole Cat. no.	3 pole Ref. no.	4 pole(1) Cat. no.	4 pole(1) Ref. no.	Cat. no.	Ref. no.	Cat. no.	Ref. no.
50kA FDN	3	FDN36MC003ED	**436409**	FDN436MC003ED	**436411**				
	7	FDN36MC007ED	**430095**	FDN436MC007ED	**430112**				
	12.5	FDN36MC012ED	**430096**	FDN436MC012ED	**430113**				
	20	FDN36MC020ED	**430097**	FDN436MC020ED	**430114**				
	30	FDN36MC030ED	**430098**	FDN436MC030ED	**430115**				
	50	FDN36MC050ED	**430099**	FDN436MC050ED	**430116**				
	80	FDN36MC080GD	**430610**	FDN436MC080GD	**430668**				
	100	FDN36MC100GD	**430613**	FDN436MC100GD	**430671**				



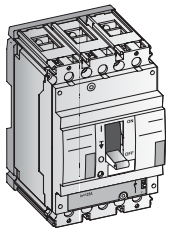
80kA FDH	3	FDH36MC003ED	**436396**	FDH436MC003ED	**436398**				
	7	FDH36MC007ED	**430015**	FDH436MC007ED	**430032**				
	12.5	FDH36MC012ED	**430016**	FDH436MC012ED	**430033**				
	20	FDH36MC020ED	**430017**	FDH436MC020ED	**430034**				
	30	FDH36MC030ED	**430018**	FDH436MC030ED	**430035**				
	50	FDH36MC050ED	**430019**	FDH436MC050ED	**430036**				
	80	FDH36MC080GD	**430318**	FDH436MC080GD	**430376**				
	100	FDH36MC100GD	**430321**	FDH436MC100GD	**430379**				



150kA FDL	20	FDL36MC020ED	**430065**	FDL436MC020ED	**430077**				
	30	FDL36MC030ED	**430066**	FDL436MC030ED	**430078**				
	50	FDL36MC050ED	**430067**	FDL436MC050ED	**430079**				
	80	FDL36MC080GD	**430498**	FDL436MC080GD	**430537**				
	100	FDL36MC100GD	**430501**	FDL436MC100GD	**430540**				

One code covers: A standard fixed front connection breaker + DIN-Rail mounting kit + Toggle elongator + Breaker finishing covers + Fixation hardware + IPXXB covers (Finger protection on connection clamps)

Complete Non-Automatic Circuit Breaker (Switch)

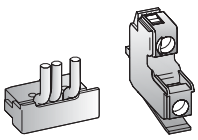


	In (A)	3 pole Cat. no.	3 pole Ref. no.	4 pole(1) Cat. no.	4 pole(1) Ref. no.
FDY	63	FDY306D063ED	**430150**	FDY406D063ED	**430151**
	160	FDY306D160GD	**430805**	FDY406D160GD	**430810**

One code covers: A standard fixed front connection breaker + DIN-Rail mounting kit + Toggle elongator + Breaker finishing covers + Fixation hardware

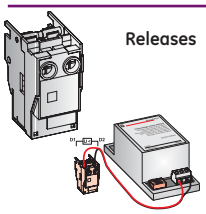
(1) Neutral on the left. If neutral on the right is needed, please contact us.

FD - Internal accessories



Contacts

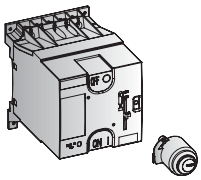
	Normally open		Normally closed		Changeover	
	Cat. no.	Ref. no.	Cat. no.	Ref. no.	Cat. no.	Ref. no.
Aux. switch right mounted	FAS10R	**430837**	FAS01R	**430831**	-	-
Aux. switch left mounted	FAS10L	**430834**	FAS01L	**430828**	-	-
Bell alarm trip unit	FABAT10	**430818**	FABAT01	**430815**	-	-
Bell alarm RCD device	FABAT10	**430818**	FABAT01	**430815**	-	-
Bell alarm mechanism[1]	-	-	-	-	FDBAM11	**430880**



Releases

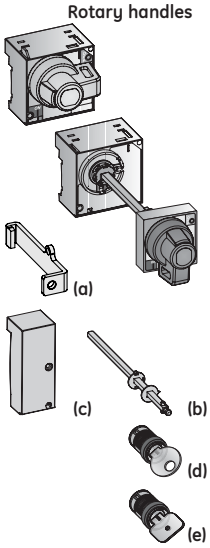
	Shunt		Undervoltage		Delayed undervoltage	
12V AC/DC	FASHTB	**430840**	FAUVRB	**440018**		
24V AC/DC	FASHTD	**430843**	FAUVRD	**430861**	-	-
48V AC/DC	FASHTF	**430846**	FAUVRF	**430864**	-	-
60V AC/DC	FASHTH	**435118**	FAUVRH	**435120**	-	-
110 AC/DC	FASHTJ	**430849**	FAUVRJ	**430867**	-	-
220/240V AC/DC	FASHTN	**430852**	FAUVRN	**430870**	FAUVDN	**430858**
400/415V AC	FASHTU	**430855**	FAUVR8	**436472**	-	-
440/480V AC	-	-	FAUVRU	**430873**	-	-

FD - Operators



Electrical operators

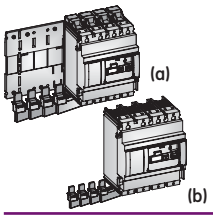
24V AC/DC	FDEMFD	**430926**
48V AC/DC	FDEMFF	**430929**
60V AC/DC	FDEMFH	**430932**
110V AC/DC	FDEMFJ	**430935**
220/250V AC/DC	FDEMFN	**430938**
400/440V AC	FDEMF8	**430920**
Keylock for operator Ronis[2]	FD1BRE	**430877**
Keylock for operator Profalux[2]	FD1BPE	**430876**



Rotary handles

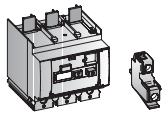
		Direct on device		Rotary handle for use through door or cover plate[3]		Panel or door mounted	
Grey		FDNRF/5	**436478**	FDNRC/5	**436474**	-	-
Red		FDNRFV/5	**436479**	FDNRCV/5	**436475**	-	-
Grey + Early closing Aux. Switches 2xNO[4]		-	-	FDNRY/5	**436487**	-	-
Red + Early closing Aux. Switches 2xNO[4]		-	-	FDNRYV/5	**436488**	-	-
Grey		-	-	-	-	FDNRD/5	**436476**
Red		-	-	-	-	FDNRDV/5	**436477**
Grey + Early closing Aux. Switches 2xNO[4]		-	-	-	-	FDNRZ/5	**436489**
Red + Early closing Aux. Switches 2xNO[4]		-	-	-	-	FDNRZV/5	**436490**
Accessories							
Flex operator adaptor push to trip, set of 2 pcs.	(a)	FDNFT	**430968**	Only for use with panel or door mounted type			
Extension shaft kit (max. 600 mm)	(b)	FDNRE	**430986**	Only for use with panel or door mounted type			
Side-by-side installation adapter kit	(c)	FDNR4	**430971**	Not for use with panel or door mounted type			
Ronis keylock 1104B nr. BC 1027[2]	(d)	FA1BR1	**430088**				
Ronis keylock 1104B nr. BC 1053[2]	(d)	FA1BR2	**430089**				
Ronis keylock 1104B nr. BC 2932[2]	(d)	FA1BR3	**430504**				
Ronis keylock 1104B nr. BC 2911[2]	(d)	FA1BR4	**430505**				
Ronis keylock 1104B nr. BC 2936[2]	(d)	FA1BR5	**430506**				
Ronis keylock 1104B nr. BC 2940[2]	(d)	FA1BR6	**430507**				
Ronis lock with random key[2]	(d)	FA1BRH	**430068**				
Profalux lock with random key[2]	(e)	FA1BPH	**430813**				

FD - Residual current devices



RCD side mounted[5]

		Standard	3 pole		4 pole	
Voltage 220/440V AC	(a)		FDQDS3M	**431013**	FDQDS4M	**431022**
Voltage 400/690V AC	(a)		FDQDS3H	**433542**	FDQDS4H	**433548**
One code covers an RCD with: DIN-Rail mounting kit & multidirectional supply kit						
Side connected only						
Voltage 220/440V AC	(b)		FDQDI3M	**433388**	FDQDI4M	**433397**
One code covers an RCD with: DIN-Rail mounting kit and interconnection kit.						



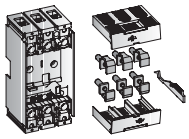
RCD bottom mounted[5] (below trip unit area)

Voltage 220/440V AC	FDQDB3M	**433370**	FDQDB4M	**433379**
Voltage 400/690V AC	FDQDB3H	**433364**	FDQDB4H	**433373**
	Normally open		**Normally closed**	
Bell Alarm RCD device	FABAT10	**430818**	FABAT 01	**430815**
One code covers an RCD with: Sealable connection cover (cut-out adaptor FDUF)				

(1) Not for all FDC and FDE types
(2) Key included
(3) Add door flange FDFH to allow use of the door interlock options
(4) On request 1xNO/1xNC is available.
(5) Not possible on FDC and FDE types with TF and TC trip unit. 100/200V AC rating available on request

FD - Plug-in system[1]

Main system complete

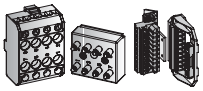


Fixed Mobile

	3 pole		4 pole	
	Cat. no.	Ref. no.	Cat. no.	Ref. no.
Complete set for breaker	FDDDF3	**430893**	FDDDF4	**430896**
Fixed part for breaker	FDDFF3	**430899**	FDDFF4	**430902**
Mobile part for breaker	FDDMP3	**430905**	FDDMP4	**430908**
Fixed part for breaker & RCD	FDDFQ3	**433489**	FDDFQ4	**433492**
Mobile part for breaker & RCD	FDDMP3	**430905**	FDDMP4	**430908**

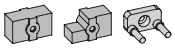
Complete set: Fixed and mobile part with connection and fixation hardware
Fixed part: Fixed base with connection and fixation and hardware
Mobile part: Mechanism trip device, terminal shields and set of 3 or 4 pole plugs

Auxiliary disconnects secondary wiring[2]



Complete set 8 pole	FAPFM	**430824**	
Fixed part 8 pole	FAPF8	**430823**	
Mobile part 8 pole	FAPM8	**430826**	
Plug and socket 10 pole	FAPPS	**430827**	

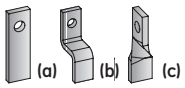
Insertion prevention kit



Insertion prevention kit (of ....wrong A rating)	FAPIP	**430825**

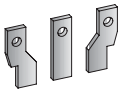
FD - Connections: Optional[4]

Extenders



		3 pole		4 pole	
Standard flat type	(a)	FDBES3	**430887**	FDBES4	**430888**
Heightened type	(b)	FDBEH3	**430885**	FDBEH4	**430886**
Twisted 90°	(c)	FDBEA3	**430883**	FDBEA4	**430884**

Spreader flat

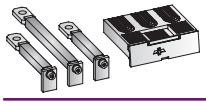


Pole spacing 35 mm		FDBSS3	**430891**	FDBSS4	**430892**

External box clamps

Cable Cu/Al 95 mm^2 [3]		FDTCA1316	**433400**	FDTCA1416	**433401**

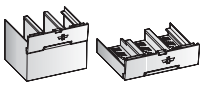
Rear connections



Set 3 pole (2 short, 1 long)		FDBRC3	**430889**	-	-
Set 4 pole (2 short, 2 long)		-	**-**	FDBRC4	**430890**
Spares, set of 2 short types		FDBRCS2	**433358**	-	-
Spares, set of 2 long types		FDBRCL2	**433357**	-	-

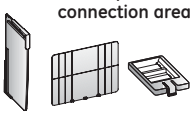
FD - Installation accessories

Terminal shields (with finishing covers)



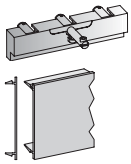
	3 pole		4 pole	
Long, set of 2 pcs.	FDJL3	**430951**	FDJL4	**430954**
Short, set of 2 pcs.	FDJS3	**430960**	FDJS4	**430963**

Specific to connection area



Phase separators, set of 12 pcs.	FDJP	**430957**		
Backplate set of 2 pcs. (3 or 4 pole)	FDJB	**430945**		
Finger protection IPXXB (set of 12 pcs)[5]	FDJK	**430069**		

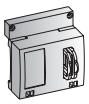
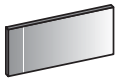
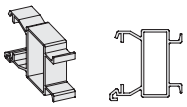
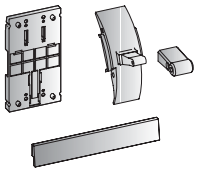
Covers



Cutout adaptor, Breaker + Trip unit	FDUF3	**430830**	FDUF4	**430832**
Cutout filler for cover plate (64 mm), length of 1.2 m	FBF6	**883970**	-	-

(1) Plug-in system max. 125A.
(2) Only necessary when internal accessories or an electrical operator are used.
(3) External box clamps are always delivered with standard extender
(4) Set for equipping the line OR load side of breaker.
(5) Supplied with mag. break types.

FD - Installation accessories *(continued)*

		Cat. no.	Ref. no.	Cat. no.	Ref. no.
Padlocking devices for toggle operator[1]  	Padlocking removable	FD1PR	**430879**		
	Padlocking fixed	FD1PF	**430878**		
Circuit indication/coding 	Set of 20 blank labels	FAC	**430821**		
Heightning set for Redline/ElfaPlus MCB's 	Length = (18 mod. of 18 mm) 354 mm	FDKE	**617947**		
Mounting kit for individual single pole breaker	Set of 50 pcs.	FDKM1	**436720**		
		3 pole		**4 pole**	
Door Flanges 	Breaker front face and RCD	FDFF3	**430941**	FDFF4	**430942**
	Rotary handle (through cover plate model)	FDFH	**430829**	-	-
	Electrical operator	FDFE	**432010**	-	-
Spare parts 	DIN-rail adaptor kit[2]	FDKD3	**430966**	FDKD4	**430967**
	Finishing covers, set of 2 pcs.[2]	FDUA3	**431025**	FDUA4	**431026**
	Spare toggle (set of 5 pieces)	FDUT	**433539**	-	-

(1) Padlocks not included
(2) Supplied with breakers, not with all FDC and FDE types

Notes

LTM
Line thermal magnetic protection
LTMD
Selective thermal magnetic protection
GTM
Generator thermal magnetic protection
Mag Break™
Magnetic Only protection
SMR1
Selective electronic trip unit
Y
Non Automatic or switch (not mentioned in tables)

FE Frame

Breaking capacities

Icu 400/415V AC in kA eff.

Type	V	N	H	L
FE160		50	80	150
FE250	36	50	80	150

Protection

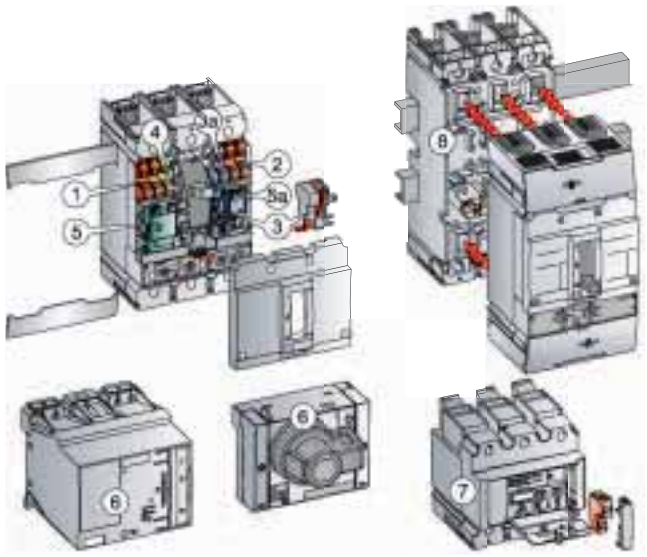
Trip Unit	Rated Current (A)	LTM	LTMD	GTM	Mag BreakTM	SMR1
	3				N, H, L	
	7				N, H, L	
	12.5				N, H, L	
	20				N, H, L	
	25	N, H, L				N, H, L
	30				N, H, L	
	32	N, H, L				
FE160	40	N, H, L				
	50	N, H, L			N, H, L	
	63	N, H, L				N, H, L
	80	N, H, L			N, H, L	
	100	N, H, L	N, H, L	N, H, L	N, H, L	
	125	N, H, L	N, H, L	N, H, L	N, H, L	N, H, L
	160	N, H, L	N, H, L	N, H, L	N, H, L	N, H, L
	125		N, H, L			N, H, L
FE250	160	V	N, H, L	N, H, L	N, H, L	N, H, L
	200	V	N, H, L	N, H, L	N, H, L	
	250	V	N, H, L	N, H, L	N, H, L	N, H, L

Number of poles/ protected poles (trips)					
3 pole 3 trips	V, N, H, L	N, H, L	N, H	N, H, L	N, H, L
4 pole 3 trips	N, H, L	N, H, L	N, H	N, H, L	N, H, L
4 pole 4 trips	V, N, H, L	N, H, L	N, H		N, H, L
4 pole 3.5 trips (N=50%)(1)	N, H, L	N, H, L	N, H		N, H, L

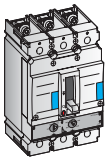
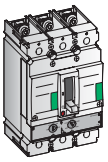
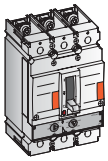
(1) Rated current ≥ 63A

Accessories (main types)

① Auxiliary contact left mounted (NO or NC) 1 or 2pcs.
② Auxiliary contact right mounted (NO or NC) 1 or 2pcs.
③ Bell Alarm thermal magnetic trip unit (NO or NC)
③a Bell Alarm electronic trip unit (NO or NC)
④ Bell Alarm mechanism (NO or NC)
⑤ Shunt or Undervoltage release
⑤a Actuator for electronic trip unit.
⑥ Operators
Rotary handle
Electrical operator
⑦ Bottom mounted RCD (below trip unit)
(Insert indicates Bell alarm contact mounting)
⑧ Plug-in or draw-out system



FE160 - Complete circuit breaker

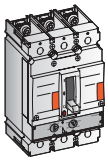




Line Thermal Magnetic LTM (adjustable settings)

	In (A)	3 pole 3 trips Cat. no.	Ref. no.	4 pole 3 trips[1] Cat. no.	Ref. no.	4 pole 4 trips[1] Cat. no.	Ref. no.	4 pole 3.5 trips (N=50%)[1] Cat. no.	Ref. no.
50 kA FEN	25	FEN36TA025JF	**435103**	FEN436TA025JF	**435178**	FEN46TA025JF	**435214**	-	-
	32	FEN36TA032JF	**435106**	FEN436TA032JF	**435181**	FEN46TA032JF	**435217**	-	-
	40	FEN36TA040JF	**435109**	FEN436TA040JF	**435184**	FEN46TA040JF	**435220**	-	-
	50	FEN36TA050JF	**435112**	FEN436TA050JF	**435187**	FEN46TA050JF	**435223**	-	-
	63	FEN36TA063JF	**435115**	FEN436TA063JF	**435190**	FEN46TA063JF	**435226**	FEN456TA063JF	**435202**
	80	FEN36TA080JF	**431751**	FEN436TA080JF	**431838**	FEN46TA080JF	**431949**	FEN456TA080JF	**431886**
	100	FEN36TA100JF	**431757**	FEN436TA100JF	**431844**	FEN46TA100JF	**431955**	FEN456TA100JF	**431892**
	125	FEN36TA125JF	**431763**	FEN436TA125JF	**431850**	FEN46TA125JF	**431961**	FEN456TA125JF	**431898**
	160	FEN36TA160JF	**431769**	FEN436TA160JF	**431856**	FEN46TA160JF	**431967**	FEN456TA160JF	**431904**
80 kA FEH	25	FEH36TA025JF	**434772**	FEH436TA025JF	**434847**	FEH46TA025JF	**434883**	-	-
	32	FEH36TA032JF	**434775**	FEH436TA032JF	**434850**	FEH46TA032JF	**434886**	-	-
	40	FEH36TA040JF	**434778**	FEH436TA040JF	**434853**	FEH46TA040JF	**434889**	-	-
	50	FEH36TA050JF	**434781**	FEH436TA050JF	**434856**	FEH46TA050JF	**434892**	-	-
	63	FEH36TA063JF	**434784**	FEH436TA063JF	**434859**	FEH46TA063JF	**434895**	FEH456TA063JF	**434871**
	80	FEH36TA080JF	**431165**	FEH436TA080JF	**431252**	FEH46TA080JF	**431363**	FEH456TA080JF	**431300**
	100	FEH36TA100JF	**431171**	FEH436TA100JF	**431258**	FEH46TA100JF	**431369**	FEH456TA100JF	**431306**
	125	FEH36TA125JF	**431177**	FEH436TA125JF	**431264**	FEH46TA125JF	**431375**	FEH456TA125JF	**431312**
	160	FEH36TA160JF	**431183**	FEH436TA160JF	**431270**	FEH46TA160JF	**431381**	FEH456TA160JF	**431318**
150 kA FEL	25	FEL36TA025JF	**434970**	FEL436TA025JF	**435013**	FEL46TA025JF	**435049**	-	-
	32	FEL36TA032JF	**434973**	FEL436TA032JF	**435016**	FEL46TA032JF	**435052**	-	-
	40	FEL36TA040JF	**434976**	FEL436TA040JF	**435019**	FEL46TA040JF	**435055**	-	-
	50	FEL36TA050JF	**434979**	FEL436TA050JF	**435022**	FEL46TA050JF	**435058**	-	-
	63	FEL36TA063JF	**434982**	FEL436TA063JF	**435025**	FEL46TA063JF	**435061**	FEL456TA063JF	**435037**
	80	FEL36TA080JF	**431458**	FEL436TA080JF	**431545**	FEL46TA080JF	**431656**	FEL456TA080JF	**431593**
	100	FEL36TA100JF	**431464**	FEL436TA100JF	**431551**	FEL46TA100JF	**431662**	FEL456TA100JF	**431599**
	125	FEL36TA125JF	**431470**	FEL436TA125JF	**431557**	FEL46TA125JF	**431668**	FEL456TA125JF	**431605**
	160	FEL36TA160JF	**431476**	FEL436TA160JF	**431563**	FEL46TA160JF	**431674**	FEL456TA160JF	**431611**

One code covers: A standard fixed front connection breaker + Toggle elongator + Breaker finishing covers + Fixation hardware



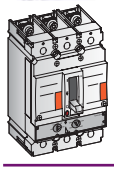


Selective Thermal Magnetic LTMD (adjustable settings)

	In (A)	3 pole 3 trips Cat. no.	Ref. no.	4 pole 3 trips[1] Cat. no.	Ref. no.	4 pole 4 trips[1] Cat. no.	Ref. no.	4 pole 3.5 trips (N=50%)[1] Cat. no.	Ref. no.
50 kA FEN	100	FEN36TD100JF	**432945**	FEN436TD100JF	**432994**	FEN46TD100JF	**433061**	FEN456TD100JF	**433028**
	125	FEN36TD125JF	**432953**	FEN436TD125JF	**433001**	FEN46TD125JF	**433067**	FEN456TD125JF	**433034**
	160	FEN36TD160JF	**432971**	FEN436TD160JF	**433007**	FEN46TD160JF	**433073**	FEN456TD160JF	**433040**
80 kA FEH	100	FEH36TD100JF	**431007**	FEH436TD100JF	**432198**	FEH46TD100JF	**432287**	FEH456TD100JF	**432242**
	125	FEH36TD125JF	**431021**	FEH436TD125JF	**432205**	FEH46TD125JF	**432296**	FEH456TD125JF	**432250**
	160	FEH36TD160JF	**431965**	FEH436TD160JF	**432214**	FEH46TD160JF	**432303**	FEH456TD160JF	**432259**
150 kA FEL	100	FEL36TD100JF	**432332**	FEL436TD100JF	**432374**	FEL46TD100JF	**432907**	FEL456TD100JF	**432699**
	125	FEL36TD125JF	**432341**	FEL436TD125JF	**432573**	FEL46TD125JF	**432921**	FEL456TD125JF	**432747**
	160	FEL36TD160JF	**432349**	FEL436TD160JF	**432585**	FEL46TD160JF	**432927**	FEL456TD160JF	**432834**

One code covers: A standard fixed front connection breaker + Toggle elongator + Breaker finishing covers + Fixation hardware





Generator Thermal Magnetic GTM

	In (A)	3 pole 3 trips Cat. no.	Ref. no.	4 pole 3 trips[1] Cat. no.	Ref. no.	4 pole 4 trips[1] Cat. no.	Ref. no.	4 pole 3.5 trips (N=50%)[1] Cat. no.	Ref. no.
50 kA FEN	100	FEN36TG100JF	**435139**	FEN436TG100JF	**436014**	FEN46TG100JF	**435250**	FEN456TG100JF	**436020**
	125	FEN36TG125JF	**435142**	FEN436TG125JF	**436015**	FEN46TG125JF	**435253**	FEN456TG125JF	**436021**
	160	FEN36TG160JF	**435148**	FEN436TG160JF	**436016**	FEN46TG160JF	**435259**	FEN456TG160JF	**436022**
80 kA FEH	100	FEH36TG100JF	**434808**	FEH436TG100JF	**435902**	FEH46TG100JF	**434919**	FEH456TG100JF	**436026**
	125	FEH36TG125JF	**434811**	FEH436TG125JF	**435903**	FEH46TG125JF	**434922**	FEH456TG125JF	**436027**
	160	FEH36TG160JF	**434817**	FEH436TG160JF	**435904**	FEH46TG160JF	**434928**	FEH456TG160JF	**436028**
150 kA FEL	100	FEL36TG100JF	**435923**	FEL436TG100JF	**435944**	FEL46TG100JF	**435992**	FEL456TG100JF	**435962**
	125	FEL36TG125JF	**435926**	FEL436TG125JF	**435947**	FEL46TG125JF	**435995**	FEL456TG125JF	**435965**
	160	FEL36TG160JF	**435932**	FEL436TG160JF	**435950**	FEL46TG160JF	**436002**	FEL456TG160JF	**435968**

One code covers: A standard fixed front connection breaker + Toggle elongator + Breaker finishing covers + Fixation hardware

(1) Neutral on the left. If neutral on the right is needed, please contact us.

FE160 - Complete circuit breaker

Motor protection (Mag Break™) Magnetic Only Breaker[2]

		3 pole 3 trips		4 pole 3 trips[1]					
	In (A)	Cat. no.	Ref. no.	Cat. no.	Ref. no.	Cat. no.	Ref. no.	Cat. no.	Ref. no.
50kA FEN	3	FEN36MC003JF	436365	-	-				
	7	FEN36MC007JF	435073	-	-				
	12.5	FEN36MC012JF	435076	-	-				
	20	FEN36MC020JF	435079	-	-				
	30	FEN36MC030JF	435082	-	-				
	50	FEN36MC050JF	435085	FEN436MC050JF	435160				
	80	FEN36MC080JF	435899	-	-				
	100	FEN36MC100JF	435088	FEN436MC100JF	435163				
	125	FEN36MC125JF	436335	FEN436MC125JF	436356				
	160	FEN36MC160JF	435094	FEN436MC160JF	435169				
80kA FEH	3	FEH36MC003JF	436361	-	-				
	7	FEH36MC007JF	434742	-	-				
	12.5	FEH36MC012JF	434745	-	-				
	20	FEH36MC020JF	434748	-	-				
	30	FEH36MC030JF	434751	-	-				
	50	FEH36MC050JF	434754	FEH436MC050JF	434829				
	80	FEH36MC080JF	435893	-	-				
	100	FEH36MC100JF	434757	FEH436MC100JF	434832				
	125	FEH36MC125JF	436327	FEH436MC125JF	436329				
	160	FEH36MC160JF	434763	FEH436MC160JF	434838				
150kA FEL	3	FEL36MC003JF	436363	-	-				
	7	FEL36MC007JF	434940	-	-				
	12.5	FEL36MC012JF	434943	-	-				
	20	FEL36MC020JF	434946	-	-				
	30	FEL36MC030JF	434949	-	-				
	50	FEL36MC050JF	434952	FEL436MC050JF	434994				
	80	FEL36MC080JF	435896	-	-				
	100	FEL36MC100JF	434955	FEL436MC100JF	434997				
	125	FEL36MC125JF	436331	FEL436MC125JF	436333				
	160	FEL36MC160JF	434961	FEL436MC160JF	435004				

One code covers: A standard fixed front connection breaker + Toggle elongator + Breaker finishing covers + Fixation hardware

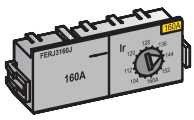
Selective Electronic Trip Unit (SMR1) without Rating Plug

	In (A)	3 pole		4 pole[1]	
50 kA FEN	25	FEN36AA025JBF	435881	FEN46AA025JBF	435887
	63	FEN36AA063JEF	435884	FEN46AA063JEF	435890
	125	FEN36AA125JGF	431698	FEN46AA125JGF	431787
	160	FEN36AA160JJF	431703	FEN46AA160JJF	431790
80 kA FEH	25	FEH36AA025JBF	435857	FEH46AA025JBF	435863
	63	FEH36AA063JEF	435860	FEH46AA063JEF	435866
	125	FEH36AA125JGF	431112	FEH46AA125JGF	431201
	160	FEH36AA160JJF	431117	FEH46AA160JJF	431204
150 kA FEL	25	FEL36AA025JBF	435869	FEL46AA025JBF	435875
	63	FEL36AA063JEF	435872	FEL46AA063JEF	435878
	125	FEL36AA125JGF	431405	FEL46AA125JGF	431494
	160	FEL36AA160JJF	431410	FEL46AA160JJF	431497

One code covers: A standard fixed front connection breaker + Toggle elongator + Breaker finishing covers + Fixation hardware

Ir 0.625: 1xIn

Adjustable Rating Plugs for Trip Units SMR1

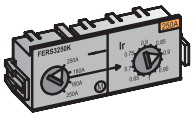


	In (A)	3 pole 3 trips		4 pole 3 trips[1]		4 pole 4 trips[1]		4 pole 3.5 trips (N=50%)[1]	
25A	16	FERJ3B0016	432174	FERJ43B0016	432210	FERJ4B0016	432276	-	-
	25	FERJ3B0025	432177	FERJ43B0025	432213	FERJ4B0025	432279	-	-
63A	40	FERJ3E0040	432180	FERJ43E0040	432216	FERJ4E0040	432282	-	-
	63	FERJ3E0063	432183	FERJ43E0063	432219	FERJ4E0063	432285	FERJ45E0063	432249
125A	80	FERJ3G0080	432186	FERJ43G0080	432222	FERJ4G0080	432288	FERJ45G0080	432252
	125	FERJ3G0125	432192	FERJ43G0125	432228	FERJ4G0125	432294	FERJ45G0125	432258
160A	100	FERJ3J0100	432189	FERJ43J0100	432225	FERJ4J0100	432291	FERJ45J0100	432255
	160	FERJ3J0160	432195	FERJ43J0160	432231	FERJ4J0160	432297	FERJ45J0160	432261

(1) Neutral on the left. If neutral on the right is needed, please contact us.
(2) All 3 and 7Amp FE size magnetic only breaker types have a breaking capacity at 690 Volt of 10kA.

FE160 - Complete circuit breaker

Ir 0.4: 1xIn



Switchable Rating Plugs for Trip Units SMR1

	In (A)	3 pole 3 trips Cat. no.	3 pole 3 trips Ref. no.	4 pole 3 trips[1] Cat. no.	4 pole 3 trips[1] Ref. no.	4 pole 4 trips[1] Cat. no.	4 pole 4 trips[1] Ref. no.	4 pole 3.5 trips (N=50%)[1] Cat. no.	4 pole 3.5 trips (N=50%)[1] Ref. no.
25A	25	FERS3B0025	**432312**	FERS43B0025	**432330**	FERS4B0025	**432363**	-	-
63A	63	FERS3E0063	**432315**	FERS43E0063	**432333**	FERS4E0063	**432366**	FERS45E0063	**432348**
125A	125	FERS3G0125	**432318**	FERS43G0125	**432336**	FERS4G0125	**432369**	FERS45G0125	**432351**
160A	160	FERS3J0160	**432321**	FERS43J0160	**432339**	FERS4J0160	**432372**	FERS45J0160	**432354**

Selective Electronic Trip Unit (SMR1) with Switchable Rating Plug

	In (A)	3 pole 3 trips Cat. no.	3 pole 3 trips Ref. no.	4 pole 3 trips[1] Cat. no.	4 pole 3 trips[1] Ref. no.	4 pole 4 trips[1] Cat. no.	4 pole 4 trips[1] Ref. no.	4 pole 3.5 trips (N=50%)[1] Cat. no.	4 pole 3.5 trips (N=50%)[1] Ref. no.
50 kA FEN	125	FEN36SA125JGF	**431724**	FEN436SA125JGF	**431811**	FEN46SA125JGF	**431922**	FEN456SA125JGF	**431871**
	160	FEN36SA160JJF	**431727**	FEN436SA160JJF	**431814**	FEN46SA160JJF	**431925**	FEN456SA160JJF	**431874**

80 kA FEH	125	FEH36SA125JGF	**431138**	FEH436SA125JGF	**431225**	FEH46SA125JGF	**431336**	FEH456SA125JGF	**431285**
	160	FEH36SA160JJF	**431141**	FEH436SA160JJF	**431228**	FEH46SA160JJF	**431339**	FEH456SA160JJF	**431288**

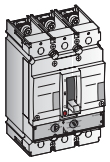
150 kA FEL	125	FEL36SA125JGF	**431431**	FEL436SA125JGF	**431518**	FEL46SA125JGF	**431629**	FEL456SA125JGF	**431578**
	160	FEL36SA160JJF	**431434**	FEL436SA160JJF	**431521**	FEL46SA160JJF	**431632**	FEL456SA160JJF	**431581**
	One code covers: A standard fixed front connection breaker + Toggle elongator + Breaker finishing covers + Fixation hardware								

Complete Non-Automatic Circuit Breaker (Switch)

	In (A)	3 pole Cat. no.	3 pole Ref. no.	4 pole[1] Cat. no.	4 pole[1] Ref. no.
FEY	160	FEY306D160JF	**431988**	FEY406D160JF	**431994**
	One code covers: A standard fixed front connection breaker + Toggle elongator + Breaker finishing covers + Fixation hardware				

(1) Neutral on the left. If neutral on the right is needed, please contact us

FE250 - Complete circuit breaker



Line Thermal Magnetic LTM (adjustable settings)

	In (A)	3 pole 3 trips Cat. no.	Ref. no.	4 pole 4 trips[1] Cat. no.	Ref. no.
36 kA FEV	125	FEV36TA125KF	**432416**	FEV46TA125KF	**431082**
	160	FEV36TA160KF	**436798**	FEV46TA160KF	**436817**
	200	FEV36TA200KF	**431058**	FEV46TA200KF	**431094**
	250	FEV36TA250KF	**431061**	FEV46TA250KF	**431097**

One code covers: A standard fixed front connection breaker + Fixation hardware

Selective Thermal Magnetic LTMD (adjustable settings)

	In (A)	3 pole 3 trips		4 pole 3 trips[1]		4 pole 4 trips[1]		4 pole 3.5 trips (N=50%)[1]	
50 kA FEN	125	FEN36TD125KF	**432962**	FEN436TD125KF	**433004**	FEN46TD125KF	**433070**	FEN456TD125KF	**433037**
	160	FEN36TD160KF	**432976**	FEN436TD160KF	**433010**	FEN46TD160KF	**433076**	FEN456TD160KF	**433043**
	200	FEN36TD200KF	**432979**	FEN436TD200KF	**433013**	FEN46TD200KF	**433079**	FEN456TD200KF	**433046**
	250	FEN36TD250KF	**432982**	FEN436TD250KF	**433016**	FEN46TD250KF	**433082**	FEN456TD250KF	**433049**

80 kA FEH	125	FEH36TD125KF	**431393**	FEH436TD125KF	**432209**	FEH46TD125KF	**432300**	FEH456TD125KF	**432254**
	160	FEH36TD160KF	**431980**	FEH436TD160KF	**432218**	FEH46TD160KF	**432307**	FEH456TD160KF	**432263**
	200	FEH36TD200KF	**432076**	FEH436TD200KF	**432223**	FEH46TD200KF	**432311**	FEH456TD200KF	**432266**
	250	FEH36TD250KF	**432096**	FEH436TD250KF	**432227**	FEH46TD250KF	**432316**	FEH456TD250KF	**432269**

150 kA FEL	125	FEL36TD125KF	**432344**	FEL436TD125KF	**432576**	FEL46TD125KF	**432924**	FEL456TD125KF	**432780**
	160	FEL36TD160KF	**432353**	FEL436TD160KF	**432588**	FEL46TD160KF	**432930**	FEL456TD160KF	**432843**
	200	FEL36TD200KF	**432357**	FEL436TD200KF	**432618**	FEL46TD200KF	**432933**	FEL456TD200KF	**432868**
	250	FEL36TD250KF	**432361**	FEL436TD250KF	**432621**	FEL46TD250KF	**432936**	FEL456TD250KF	**432871**

One code covers: A standard fixed front connection breaker + Toggle elongator + Breaker finishing covers + Fixation hardware

Generator Thermal Magnetic GTM

	In (A)	3 pole 3 trips		4 pole 3 trips[1]		4 pole 4 trips[1]		4 pole 3.5 trips (N=50%)[1]	
50kA FEN	160	FEN36TG160KF	**435151**	FEN436TG160KF	**436017**	FEN46TG160KF	**435262**	FEN456TG160KF	**436023**
	200	FEN36TG200KF	**435154**	FEN436TG200KF	**436018**	FEN46TG200KF	**435265**	FEN456TG200KF	**436024**
	250	FEN36TG250KF	**435157**	FEN436TG250KF	**436019**	FEN46TG250KF	**435268**	FEN456TG250KF	**436025**

80kA FEH	160	FEH36TG160KF	**434820**	FEH436TG160KF	**435905**	FEH46TG160KF	**434931**	FEH456TG160KF	**435908**
	200	FEH36TG200KF	**434823**	FEH436TG200KF	**435906**	FEH46TG200KF	**434934**	FEH456TG200KF	**435909**
	250	FEH36TG250KF	**434826**	FEH436TG250KF	**435907**	FEH46TG250KF	**434937**	FEH456TG250KF	**435910**

150kA FEL	160	FEL36TG160KF	**435935**	FEL436TG160KF	**435953**	FEL46TG160KF	**436005**	FEL456TG160KF	**435971**
	200	FEL36TG200KF	**435938**	FEL436TG200KF	**435956**	FEL46TG200KF	**436008**	FEL456TG200KF	**435974**
	250	FEL36TG250KF	**435941**	FEL436TG250KF	**435959**	FEL46TG250KF	**436011**	FEL456TG250KF	**435977**

One code covers: A standard fixed front connection breaker + Toggle elongator + Breaker finishing covers + Fixation hardware

Motor protection (Mag Break™) Magnetic Only Breaker

	In (A)	3 pole 3 trips		4 pole 3 trips[1]	
50kA FEN	160	FEN36MC160KF	**435097**	FEN436MC160KF	**435172**
	200	FEN36MC200KF	**436764**	FEN436MC200KF	**436765**
	250	FEN36MC250KF	**435100**	FEN436MC250KF	**435175**

80kA FEH	160	FEH36MC160KF	**434766**	FEH436MC160KF	**434841**
	200	FEH36MC200KF	**436754**	FEH436MC200KF	**436755**
	250	FEH36MC250KF	**434769**	FEH436MC250KF	**434844**

150kA FEL	160	FEL36MC160KF	**434964**	FEL436MC160KF	**435007**
	200	FEL36MC200KF	**436756**	FEL436MC200KF	**436763**
	250	FEL36MC250KF	**434967**	FEL436MC250KF	**435010**

One code covers: A standard fixed front connection breaker + Toggle elongator + Breaker finishing covers + Fixation hardware

(1) Neutral on the left. If neutral on the right is needed, please contact us.

FE250 - Complete circuit breaker

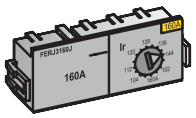


Selective Electronic Trip Unit (SMR1) without Rating Plug

	In (A)	3 pole Cat. no.	3 pole Ref. no.	4 pole[1] Cat. no.	4 pole[1] Ref. no.	Cat. no.	Ref. no.	Cat. no.	Ref. no.
50 kA FEN	125	FEN36AA125KGF	431920	FEN46AA125KGF	431938				
	160	FEN36AA160KJF	431706	FEN46AA160KJF	431793				
	250	FEN36AA250KKF	431709	FEN46AA250KKF	431796				
80 kA FEH	125	FEH36AA125KGF	431116	FEH46AA125KGF	431824				
	160	FEH36AA160KJF	431120	FEH46AA160KJF	431207				
	250	FEH36AA250KKF	431123	FEH46AA250KKF	431210				
150 kA FEL	125	FEL36AA125KGF	431836	FEL46AA125KGF	431890				
	160	FEL36AA160KJF	431413	FEL46AA160KJF	431500				
	250	FEL36AA250KKF	431416	FEL46AA250KKF	431503				

One code covers: A standard fixed front connection breaker + Toggle elongator + Breaker finishing covers + Fixation hardware

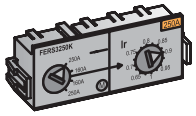
Ir 0.625: 1xIn



Adjustable Rating Plugs for Trip Units SMR1

	In (A)	3 pole 3 trips		4 pole 3 trips[1]		4 pole 4 trips[1]		4 pole 3.5 trips (N=50%)[1]	
125A	80	FERJ3G0080	432186	FERJ43G0080	432222	FERJ4G0080	432288	FERJ45G0080	432252
	125	FERJ3G0125	432192	FERJ43G0125	432228	FERJ4G0125	432294	FERJ45G0125	432258
160A	100	FERJ3J0100	432189	FERJ43J0100	432225	FERJ4J0100	432291	FERJ45J0100	432255
	160	FERJ3J0160	432195	FERJ43J0160	432231	FERJ4J0160	432297	FERJ45J0160	432261
250A	160	FERJ3K0160	432204	FERJ43K0160	432240	FERJ4K0160	432306	FERJ45K0160	432270
	250	FERJ3K0250	432207	FERJ43K0250	432243	FERJ4K0250	432309	FERJ45K0250	432273

Ir 0.4: 1xIn



Switchable Rating Plugs for Trip Units SMR1

	In (A)	3 pole 3 trips		4 pole 3 trips[1]		4 pole 4 trips[1]		4 pole 3.5 trips (N=50%)[1]	
125A	125	FERS3G0125	432318	FERS43G0125	432336	FERS4G0125	432369	FERS45G0125	432351
160A	160	FERS3J0160	432321	FERS43J0160	432339	FERS4J0160	432372	FERS45J0160	432354
250A	250	FERS3K0250	432327	FERS43K0250	432345	FERS4K0250	432378	FERS45K0250	432360



Selective Electronic Trip Unit (SMR1) with Switchable Rating Plug

	In (A)	3 pole 3 trips		4 pole 3 trips[1]		4 pole 4 trips[1]		4 pole 3.5 trips (N=50%)[1]	
50 kA FEN	160	FEN36SA160KJF	431730	FEN436SA160KJF	431817	FEN46SA160KJF	431928	FEN456SA160KJF	431877
	250	FEN36SA250KKF	431733	FEN436SA250KKF	431820	FEN46SA250KKF	431931	FEN456SA250KKF	431880
80 kA FEH	160	FEH36SA160KJF	431144	FEH436SA160KJF	431231	FEH46SA160KJF	431342	FEH456SA160KJF	431291
	250	FEH36SA250KKF	431147	FEH436SA250KKF	431234	FEH46SA250KKF	431345	FEH456SA250KKF	431294
150 kA FEL	160	FEL36SA160KJF	431437	FEL436SA160KJF	431524	FEL46SA160KJF	431635	FEL456SA160KJF	431584
	250	FEL36SA250KKF	431440	FEL436SA250KKF	431527	FEL46SA250KKF	431638	FEL456SA250KKF	431587

One code covers: A standard fixed front connection breaker + Toggle elongator + Breaker finishing covers + Fixation hardware

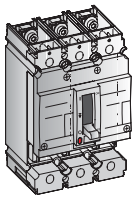
Complete Non-Automatic Circuit Breaker (Switch)

	In (A)	3 pole		4 pole[1]	
FEY	250	FEY306D250KF	431991	FEY406D250KF	431997

One code covers: A standard fixed front connection breaker + Toggle elongator + Breaker finishing covers + Fixation hardware

(1) Neutral on the left. If neutral on the right is needed, please contact us

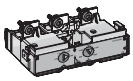
FE160 - Circuit breaker in components



Breaker frames: Without trip unit

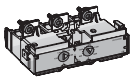
	In (A)	3 pole Cat. no.	3 pole Ref. no.	4 pole Cat. no.	4 pole Ref. no.	Cat. no.	Ref. no.	Cat. no.	Ref. no.
50kA FEN	160	FEN306F160JF	431712	FEN406F160JF	431799				
80kA FEH	160	FEH306F160JF	431126	FEH406F160JF	431213				
150kA FEL	160	FEL306F160JF	431419	FEL406F160JF	431506				

One code covers: A standard fixed front connection breaker + Toggle elongator + Breaker finishing covers + Fixation hardware



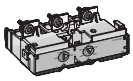
Trip units: Line Thermal Magnetic (adjustable settings)

	In (A)	3 pole 3 trips		4 pole 3 trips(1)		4 pole 4 trips(1)		4 pole 3.5 trips (N=50%)(1)	
LTM	25	FETTA3J0025	432546	FETTA43J0025	432391	FETTA4J0025	432636	-	-
	32	FETTA3J0032	432549	FETTA43J0032	432394	FETTA4J0032	432639	-	-
	40	FETTA3J0040	432552	FETTA43J0040	432397	FETTA4J0040	432642	-	-
	50	FETTA3J0050	432555	FETTA43J0050	432400	FETTA4J0050	432645	-	-
	63	FETTA3J0063	432558	FETTA43J0063	432403	FETTA4J0063	432648	FETTA45J0063	432603
	80	FETTA3J0080	432561	FETTA43J0080	432406	FETTA4J0080	432651	FETTA45J0080	432606
	100	FETTA3J0100	432564	FETTA43J0100	432409	FETTA4J0100	432654	FETTA45J0100	432609
	125	FETTA3J0125	432567	FETTA43J0125	432412	FETTA4J0125	432657	FETTA45J0125	432612
	160	FETTA3J0160	432570	FETTA43J0160	432582	FETTA4J0160	432660	FETTA45J0160	432615



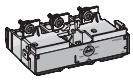
Trip units: Selective Thermal Magnetic (adjustable settings)

	In (A)	3 pole 3 trips		4 pole 3 trips(1)		4 pole 4 trips(1)		4 pole 3.5 trips (N=50%)(1)	
LTMD	100	FETTD3J0100	433159	FETTD43J0100	433201	FETTD4J0100	433269	FETTD45J0100	433231
	125	FETTD3J0125	433164	FETTD43J0125	433204	FETTD4J0125	433272	FETTD45J0125	433234
	160	FETTD3J0160	433168	FETTD43J0160	433207	FETTD4J0160	433275	FETTD45J0160	433239



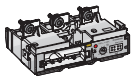
Trip units: Generator Thermal Magnetic

	In (A)	3 pole 3 trips		4 pole 3 trips(1)		4 pole 4 trips(1)		4 pole 3.5 trips (N=50%)(1)	
GTM	100	FETTG3J0100	433296	FETTG43J0100	433311	FETTG4J0100	433332	FETTG45J0100	433326
	125	FETTG3J0125	432693	FETTG43J0125	432717	FETTG4J0125	432774	FETTG45J0125	432741
	160	FETTG3J0160	432696	FETTG43J0160	432720	FETTG4J0160	432777	FETTG45J0160	432744



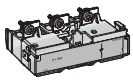
Trip units: Mag Break™, Magnetic only type for motor protection

	In (A)	3 pole 3 trips		4 pole 3 trips(1)	
MC	12.5	FETMC3J0012	432495	-	-
	20	FETMC3J0020	432498	-	-
	30	FETMC3J0030	434736	-	-
	50	FETMC3J0050	432501	FETMC43J0050	432528
	80	FETMC3J0080	436078	-	-
	100	FETMC3J0100	432504	FETMC43J0100	432531
	125	FETMC3J0125	436358	FETMC43J0125	436359
	160	FETMC3J0160	432510	FETMC43J0160	432537



Trip units: Selective Electronic type without Rating Plug

	In (A)	3 pole		4 pole(1)	
SMR1	25	FETAA3J0025	432414	FETAA4J0025	432432
	63	FETAA3J0063	432417	FETAA4J0063	432435
	125	FETAA3J0125	432420	FETAA4J0125	432438
	160	FETAA3J0160	432423	FETAA4J0160	432441

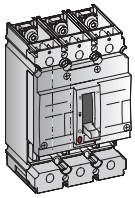


Trip units: Dummy for non Automatic Circuit Breaker (Switch)

	In (A)	3 pole		4 pole(1)	
Y	160	FETD30J0160	432480	FETD40J0160	432486

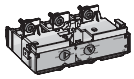
(1) Neutral on the left. If neutral on the right is needed, please contact us

FE250 - Circuit breaker in components



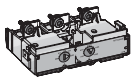
Breaker frames: Without trip unit

		3 pole		4 pole					
50kA FEN	In (A)	Cat. no.	Ref. no.	Cat. no.	Ref. no.	Cat. no.	Ref. no.	Cat. no.	Ref. no.
	250	FEN306F250KF	**431715**	FEN406F250KF	**431802**				
80kA FEH	250	FEH306F250KF	**431129**	FEH406F250KF	**431216**				
150kA FEL	250	FEL306F250KF	**431422**	FEL406F250KF	**431509**				
	One code covers: A standard fixed front connection breaker + Toggle elongator + Breaker finishing covers + Fixation hardware								



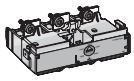
Trip units: Selective Thermal Magnetic (adjustable settings)

	In (A)	3 pole 3 trips		4 pole 3 trips[1]		4 pole 4 trips[1]		4 pole 3.5 trips (N=50%)[1]	
LTMD	125	FETTD3K0125	**433182**	FETTD43K0125	**433216**	FETTD4K0125	**433284**	FETTD45K0125	**433252**
	160	FETTD3K0160	**433186**	FETTD43K0160	**433219**	FETTD4K0160	**433287**	FETTD45K0160	**433257**
	200	FETTD3K0200	**433191**	FETTD43K0200	**433222**	FETTD4K0200	**433290**	FETTD45K0200	**433260**
	250	FETTD3K0250	**433195**	FETTD43K0250	**433225**	FETTD4K0250	**433293**	FETTD45K0250	**433263**



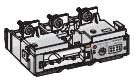
Trip units: Generator Thermal Magnetic

	In (A)	3 pole 3 trips		4 pole 3 trips[1]		4 pole 4 trips[1]		4 pole 3.5 trips (N=50%)[1]	
GTM	160	FETTG3K0160	**432705**	FETTG43K0160	**432729**	FETTG4K0160	**432786**	FETTG45K0160	**432753**
	200	FETTG3K0200	**432708**	FETTG43K0200	**432732**	FETTG4K0200	**432789**	FETTG45K0200	**432756**
	250	FETTG3K0250	**432711**	FETTG43K0250	**432735**	FETTG4K0250	**432792**	FETTG45K0250	**432759**



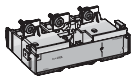
Trip units: Mag Break™, Magnetic only type for motor protection

	In (A)	3 pole 3 trips		4 pole 3 trips[1]	
MC	160	FETMC3K0160	**432513**	FETMC43K0160	**432540**
	200	FETMC3K0200	**436778**	FETMC43K0200	**436779**
	250	FETMC3K0250	**432516**	FETMC43K0250	**432543**



Trip units: Selective Electronic type without Rating Plug

	In (A)	3 pole		4 pole[1]	
SMR1	125	FETAA3K0125	**432004**	FETAA4K0125	**432007**
	160	FETAA3K0160	**432426**	FETAA4K0160	**432444**
	250	FETAA3K0250	**432429**	FETAA4K0250	**432447**



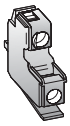
Trip units: Dummy for non Automatic Circuit Breaker (Switch)

	In (A)	3 pole		4 pole[1]	
Y	250	FETD30K0250	**432483**	FETD40K0250	**432489**

(1) Neutral on the left. If neutral on the right is needed, please contact us.

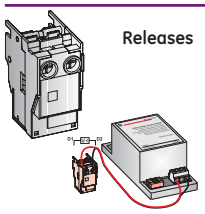
FE - Internal accessories

Contacts



	Normally open		Normally closed			
	Cat. no.	Ref. no.	Cat. no.	Ref. no.	Cat. no.	Ref. no.
Aux. switch right mounted	FAS10R	**430837**	FAS01R	**430831**		
Aux. switch left mounted	FAS10L	**430834**	FAS01L	**430828**		
Bell alarm electronic trip unit	FABAT10	**430818**	FABAT01	**430815**		
Bell alarm thermal magnetic trip unit	FEBAT10	**430970**	FEBAT01	**430969**		
Bell alarm mechanism	FABAM10	**432003**	FABAM01	**432000**		
Bell alarm RCD device	FABAT10	**430818**	FABAT01	**430815**		

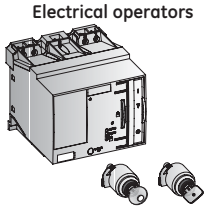
Releases



	Shunt		Undervoltage		Delayed undervoltage	
12V AC/DC	FASHTB	**430840**	FAUVRB	**440018**	-	-
24V AC/DC	FASHTD	**430843**	FAUVRD	**430861**	-	-
48V AC/DC	FASHTF	**430846**	FAUVRF	**430864**	-	-
60V AC/DC	FASHTH	**435118**	FAUVRH	**435120**	-	-
110 AC/DC	FASHTJ	**430849**	FAUVRJ	**430867**	-	-
220/240V AC/DC	FASHTN	**430852**	FAUVRN	**430870**	FAUVDN	**430858**
400/415V AC	FASHTU	**430855**	FAUVR8	**436472**	-	-
440/480V AC	-	-	FAUVRU	**430873**	-	-

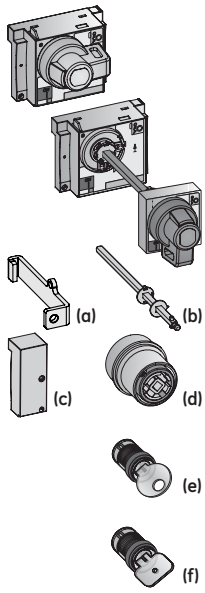
FE - Operators

Electrical operators



24V AC/DC	FEEMFD	**432052**
48V AC/DC	FEEMFF	**432055**
60V AC/DC	FEEMFH	**432058**
110/130V AC/DC	FEEMFJ	**432061**
220/250V AC/DC	FEEMFN	**432064**
400/440V AC	FEEMF8	**435812**
Keylock for electr. operator Ronis[1]	FE1BRE	**432012**
Keylock for electr. operator Profalux[1]	FE1BPE	**432011**

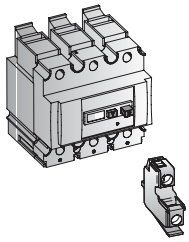
Rotary handles



	Direct on device		Rotary handle through door or cover plate[2]		Panel or door mounted	
Grey	FENRF/5	**436495**	FENRC/5	**436491**	-	-
Red	FENRFV/5	**436496**	FENRCV/5	**436492**	-	-
Grey + Early closing Aux. Switches 2xNO[4]	-	-	FENRY/5	**436500**	-	-
Red + Early closing Aux. Switches 2xNO[4]	-	-	FENRYV/5	**436501**	-	-
Grey	-	-	-	-	FENRD/5	**436493**
Red	-	-	-	-	FENRDV/5	**436494**
Grey + Early closing Aux. Switches 2xNO[4]	-	-	-	-	FENRZ/5	**436502**
Red + Early closing Aux. Switches 2xNO[4]	-	-	-	-	FENRZV/5	**436503**
Accessories						
Flex oper. adaptor push to trip, set of 2 pcs. (a)	FENFT	**433531**	Only for use with panel or door mounted type			
Extension shaft kit (max. 600 mm) (b)	FDNRE	**430986**	Only for use with panel or door mounted type			
Side-by-side installation adapter kit (c)	FENR4	**432099**	Not for use with panel or door mounted type			
Adaptor for drawout (d)	FENRW	**432120**				
Ronis keylock 1104B nr. BC 1027[1] (e)	FA1BR1	**430088**				
Ronis keylock 1104B nr. BC 1053[1] (e)	FA1BR2	**430089**				
Ronis keylock 1104B nr. BC 2932[1] (e)	FA1BR3	**430504**				
Ronis keylock 1104B nr. BC 2911[1] (e)	FA1BR4	**430505**				
Ronis keylock 1104B nr. BC 2936[1] (e)	FA1BR5	**430506**				
Ronis keylock 1104B nr. BC 2940[1] (e)	FA1BR6	**430507**				
Ronis lock with random key[1] (e)	FA1BRH	**430068**				
Profalux lock with random key[1] (f)	FA1BPH	**430813**				

FE - Residual current devices

RCD bottom mounted [4]



	3 pole		4 pole	
160A Voltage 220/440V AC	FEQDB3MJ	**432138**	FEQDB4MJ	**432150**
160A Voltage 400/690V AC	FEQDB3HJ	**432132**	FEQDB4HJ	**432144**
250A Voltage 220/440V AC	FEQDB3MK	**432141**	FEQDB4MK	**432153**
250A Voltage 400/690V AC	FEQDB3HK	**432135**	FEQDB4HK	**432147**

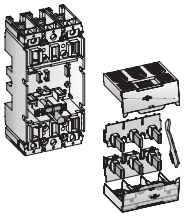
	Normally open		Normally closed	
Bell Alarm RCD device	FABAT10	**430818**	FABAT 01	**430815**

One code covers an RCD with: Fixation hardware + Sealable interconnection cover

(1) Key included
(2) Add door flange FDFH for door lock options
(3) On request 1xNO/1xNC is available.
(4) 100/200V AC execution available on request.

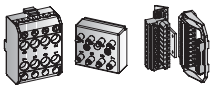
FE - Plug-in system

Main system



		3 pole		4 pole	
		Cat. no.	Ref. no.	Cat. no.	Ref. no.
Complete set for breaker		FEDDF3	**432034**	FEDDF4	**432037**
Fixed part for breaker		FEDFF3	**432040**	FEDFF4	**432043**
Mobile part for breaker		FEDMP3	**432046**	FEDMP4	**432049**
Fixed part for breaker & RCD		FEDFQ3	**430987**	FEDFQ4	**431842**
Mobile part for breaker & RCD		FEDMP3	**432046**	FEDMP4	**432049**
Complete set: Fixed and mobile part with connection and fixation hardware					
Fixed part: Fixed base with connection and fixation hardware					
Mobile part: Mechanism trip device, terminal shields and set of plugs					

Auxiliary disconnects (Secondary wiring)



Complete set 8pole		FAPFM	**430824**
Fixed part 8 pole		FAPF8	**430823**
Mobile part 8 pole		FAPM8	**430826**
Plug and socket 10 pole		FAPPS	**430827**

Insertion prevention kit

Insertion prevention kit (of ....wrong A rating)		FAPIP	**430825**

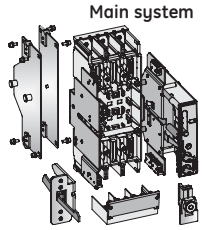
Spares

Set of nutplates and connection bolts (For connection of bases used as spare)		FEJN3	**436467**

		4 pole	
		Cat. no.	Ref. no.
Set of nutplates and connection bolts (For connection of bases used as spare)		FEJN4	**436468**

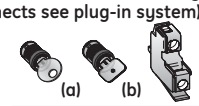
FE - Drawout system

Main system



		3 pole		4 pole	
				Cat. no.	Ref. no.
Complete set		FEWS3	**432168**	FEWS4	**432171**
One code covers the fixed and withdrawable part of the draw-out system, with plug-in base, mounting accessories and fixation hardware					

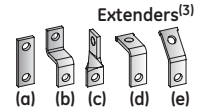
Accessories (for auxiliary disconnects see plug-in system)



Keylock in draw-out position Ronis[1]	(a)	FE1BRW	**432188**
Keylock in draw-out pos. Profalux[1]	(b)	FE1BPW	**432184**
Position indication contact NO		FAS01D	**436309**
Position indication contact NC		FAS10D	**436310**

FE - Connections: Optional

Extenders[3]

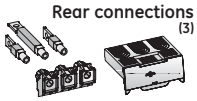


		3 pole		4 pole	
				Cat. no.	Ref. no.
Standard flat type	(a)	FEBES3	**432026**	FEBES4	**432027**
Heightened type	(b)	FEBEH3	**432024**	FEBEH4	**432025**
Twisted 90°	(c)	FEBEA3	**432022**	FEBEA4	**432023**
Angled 45°	(d)	FEBE43	**432018**	FEBE44	**432019**
Angled 90°	(e)	FEBE93	**432020**	FEBE94	**432021**

Spreader flat[3]

Pole spacing 45mm	FEBSS3	**432032**	FEBSS4	**432033**

Rear connections[3]



Set 3 pole (2 short, 1 long)	FEBRC3	**432028**	-	-
Set 4 pole (2 short, 2 long)	-	-	FEBRC4	**432029**
Set 3 pole (3 short)	FEBRCS3	**432190**	-	-
Set 4 pole (4 short)	-	-	FEBRCS4	**432191**

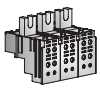
Internal box clamps[3]

	2.5 - 95mm²		16 - 150mm²	
Box Clamp Cu/Al, set 3 pole	FETCA1316	**432156**	FETCA1320	**432157**
Box Clamp Cu/Al, set 4 pole	FETCA1416	**432158**	FETCA1420	**432159**

External box clamps[3]

	70 - 185mm²	
Box Clamp Cu/Al, set 3 pole[2]	FETCA1323	**432160**
Box Clamp Cu/Al, set 4 pole[2]	FETCA1423	**432161**

External connectors[3]

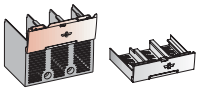


	6 copper cable cores 25mm² or 35 mm²	
Set 3 pole	FETCA630A	**880954**
Set 4 pole	FETCA640A	**880955**

(1) Key included
(2) External box clamps are always delivered with standard extender
(3) Set for equipping the line OR load side of breaker.

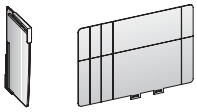
FE - Installation accessories

Terminal shields (with finishing covers)



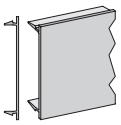
		3 pole		4 pole	
		Cat. no.	Ref. no.	Cat. no.	Ref. no.
Long, set of 2 pcs.		FEJL3	**432079**	FEJL4	**432082**
Short, set of 2 pcs.		FEJS3	**432088**	FEJS4	**432091**

Specific to connection area



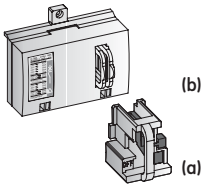
Phase separators, set of 12 pcs	FEJP	**432085**	
Backplate set of 2 pcs (3 or 4 pole)	FEJB	**432073**	

Covers



Cutout filler for cover plate (64 mm), length of 1.2 m	FBF6	**883970**	

Padlocking devices for toggle operator[1]

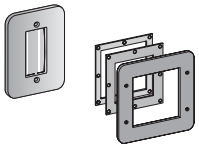


Padlocking removable	(a)	FD1PR	**430879**		
Padlocking fixed	(b)	FE1PF	**432017**		

Circuit indication/coding

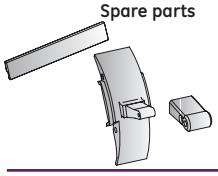
Set of 20 blank labels	FAC	**430821**	

Door flanges



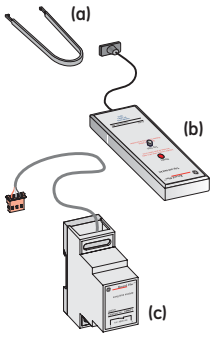
	3 pole		4 pole	
Breaker front face	FEFF3	**432067**	FEFF4	**432068**
RCD unit front face for 3 and 4 pole	FDFF3	**430941**		
Front face toggle area	FEFT	**432071**		
Rotary handle (through cover plate model)	FDFH	**430829**		
Motor operator	FEFE	**430943**		

Spare parts



	3 pole		4 pole	
Finishing covers, set of 2 pcs.[2]	FEUA3	**432162**	FEUA4	**432163**
Spare toggle (set of 5 pieces)	FEUT	**433540**		

FE - Accessories electronic trip units



		3 pole	
Rating plug tool	(a)	FAR	**433500**
Battery test device	(b)	FAT	**431402**
Longtime module	(c)	FAMLT1	**433376**

(1) Padlocks not included
(2) Supplied with breakers, not with FEV type.

Notes

LTM[1]
Line thermal magnetic protection
SMR1
Selective electronic protection.
SMR2
Modular electronic protection with enhanced functionality
Mag Break™
Magnetic Only protection
Y
Non Automatic or switch
(not mentioned in tables)

(1) Consult us for availability

FG Frame

Breaking capacities

Icu 400/415V AC in kA eff.

Type	N	H	L
FG400	50	80	150
FG630	50	80	150

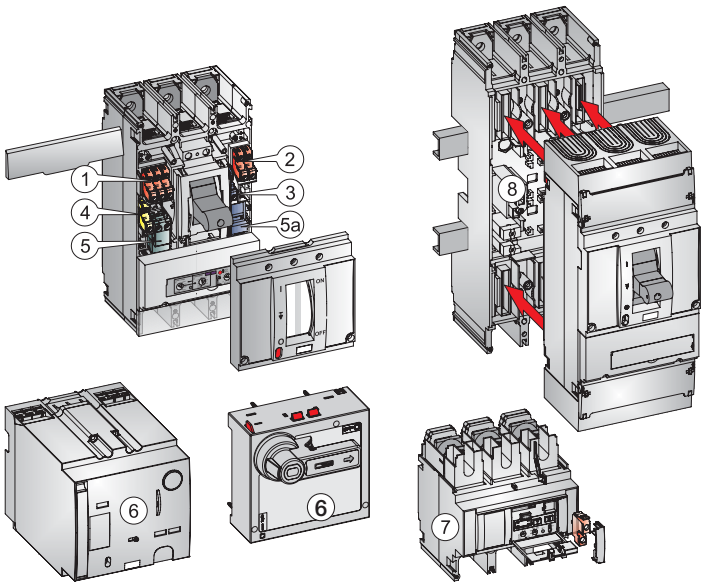
Protection

Trip Unit	Rated Current (A)	SMR1	SMR2	Mag Break™
	A			
FG400	250	N, H, L	N, H, L	N, H, L
	350	N, H, L	N, H, L	N, H, L
	400	N, H, L	N, H, L	-
FG630	400	N, H, L	N, H, L	-
	500	N, H, L	N, H, L	N, H, L
	630	N, H, L	N, H, L	-

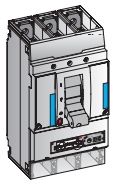
Number of poles / protected poles (trips)			
3 pole 3 trips	N, H, L	N, H, L	N, H, L
4 pole 3 trips	N, H, L	N, H, L	N, H, L
4 pole 4 trips	N, H, L	N, H, L	
4 pole 3.5 trips (N=50%)	N, H, L	N, H, L	

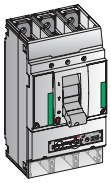
Accessories (main types)

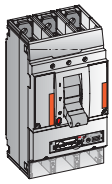
① Auxiliary contact left mounted (NO or NC) 1, 2 or 3pcs.
② Auxiliary contact right mounted (NO or NC) 1 or 2pcs.
③ Bell Alarm thermal magnetic trip unit (NO or NC)
③a Bell Alarm electronic trip unit (NO or NC)
④ Bell Alarm mechanism (NO or NC)
⑤ Shunt or Undervoltage release
⑤a Actuator for electronic trip unit.
⑥ Operators
Rotary handle
Electrical operator
⑦ Bottom mounted RCD (below trip unit)
(Insert indicates Bell alarm contact mounting)
Bottom mounted version is also available.
⑧ Plug in or draw out system



FG400 - Complete circuit breaker





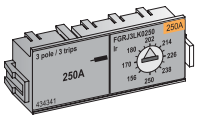


Selective Electronic Trip Unit (SMR1) without Rating Plug

	In (A)	3 pole Cat. no.	3 pole Ref. no.	4 pole[1] Cat. no.	4 pole[1] Ref. no.	Cat. no.	Ref. no.	Cat. no.	Ref. no.
50kA FGN	250	FGN36AA250LKF	**434248**	FGN46AA250LKF	**434253**				
	400	FGN36AA400LLF	**431455**	FGN46AA400LLF	**431536**				
80kA FGH	250	FGH36AA250LKF	**434232**	FGH46AA250LKF	**434237**				
	400	FGH36AA400LLF	**431032**	FGH46AA400LLF	**431106**				
150kA FGL	250	FGL36AA250LKF	**434240**	FGL46AA250LKF	**434245**				
	400	FGL36AA400LLF	**431246**	FGL46AA400LLF	**431330**				

One code covers: A standard fixed front connection breaker + Assembled trip unit + Toggle Elongator + Breaker finishing covers + Fixation hardware

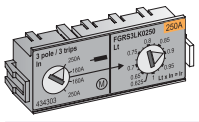
Type line 0.625 - 1 x In



Adjustable Rating Plugs for Trip Units SMR1

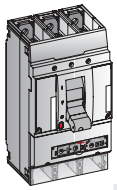
	In (A)	3 pole 3 trips		4 pole 3 trips[1]		4 pole 4 trips[1]		4 pole 3.5 trips (N=50%)[1]	
250A	160	FGRJ3LK0160	**434337**	FGRJ43LK0160	**434345**	FGRJ4LK0160	**434361**	FGRJ45LK0160	**434353**
	250	FGRJ3LK0250	**434341**	FGRJ43LK0250	**434349**	FGRJ4LK0250	**434365**	FGRJ45LK0250	**434357**
400A	250	FGRJ3LL0250	**435343**	FGRJ43LL0250	**435356**	FGRJ4LL0250	**435397**	FGRJ45LL0250	**435367**
	400	FGRJ3LL0400	**433151**	FGRJ43LL0400	**433163**	FGRJ4LL0400	**433187**	FGRJ45LL0400	**433175**

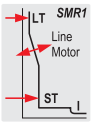
Type line/Motor 0.4 - 1 x In



Switchable Rating Plugs for Trip Units SMR1

	In (A)	3 pole 3 trips		4 pole 3 trips[1]		4 pole 4 trips[1]		4 pole 3.5 trips (N=50%)[1]	
250A	250	FGRS3LK0250	**434303**	FGRS43LK0250	**434307**	FGRS4LK0250	**434315**	FGRS45LK0250	**434311**
400A	400	FGRS3LL0400	**435435**	FGRS43LL0400	**434516**	FGRS4LL0400	**434537**	FGRS45LL0400	**434525**

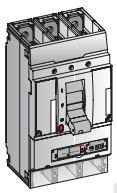


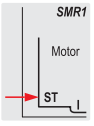


Selective Electronic Trip Unit (SMR1) with switchable Rating Plug

	In (A)	3 pole 3 trips		4 pole 3 trips[1]		4 pole 4 trips[1]		4 pole 3.5 trips (N=50%)[1]	
50kA FGN	250	FGN36SA250LKF	**434249**	FGN436SA250LKF	**434251**	FGN46SA250LKF	**434254**	FGN456SA250LKF	**434252**
	400	FGN36SA400LLF	**434489**	FGN436SA400LLF	**435277**	FGN46SA400LLF	**435280**	FGN456SA400LLF	**434504**
80kA FGH	250	FGH36SA250LKF	**434233**	FGH436SA250LKF	**434235**	FGH46SA250LKF	**434238**	FGH456SA250LKF	**434236**
	400	FGH36SA400LLF	**434399**	FGH436SA400LLF	**434408**	FGH46SA400LLF	**434426**	FGH456SA400LLF	**434414**
150kA FGL	250	FGL36SA250LKF	**434241**	FGL436SA250LKF	**434243**	FGL46SA250LKF	**434246**	FGL456SA250LKF	**434244**
	400	FGL36SA400LLF	**434444**	FGL436SA400LLF	**434453**	FGL46SA400LLF	**434474**	FGL456SA400LLF	**434462**

One code covers: A standard fixed front connection breaker + Assembled trip unit + Toggle elongator + Rating plug + Breaker finishing covers + Fixation hardware





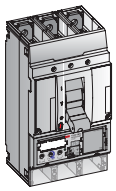
Selective Electronic Trip Unit (SMR1) with Rating Plug, without Overload (LT) protection

	In (A)	3 pole 3 trips		4 pole 3 trips[1]	
50kA FGN	400	FGN36BM400LLF	**434687**	FGN436BM400LLF	**434693**
80kA FGH	400	FGH36BM400LLF	**434663**	FGH436BM400LLF	**434669**
150kA FGL	400	FGL36BM400LLF	**434675**	FGL436BM400LLF	**434681**

One code covers: A standard fixed front connection breaker + Assembled trip unit + Toggle elongator + Rating plug + Breaker finishing covers + Fixation hardware

(1) Neutral on the left. If neutral on the right is needed, please contact us.
(2) Specifically configured for use with switchable rating plug only.

FG400 - Complete circuit breaker

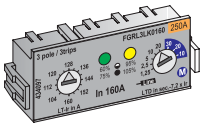


Modular Electronic Trip Unit (SMR2) without Rating Plug

	In (A)	3 pole Cat. no.	3 pole Ref. no.	4 pole[1] Cat. no.	4 pole[1] Ref. no.				
50kA FGN	250	FGN36KA250LKF	**434073**	FGN46KA250LKF	**436159**				
	350[2]	FGN36KA350LLF	**434483**	FGN46KA350LLF	**434510**				
	400	FGN36KA400LLF	**436156**	FGN46KA400LLF	**436160**				
80kA FGH	250	FGH36KA250LKF	**436150**	FGH46KA250LKF	**434041**				
	350[2]	FGH36KA350LLF	**434393**	FGH46KA350LLF	**434420**				
	400	FGH36KA400LLF	**436151**	FGH46KA400LLF	**434042**				
150kA FGL	250	FGL36KA250LKF	**434049**	FGL46KA250LKF	**436153**				
	350[2]	FGL36KA350LLF	**434438**	FGL46KA350LLF	**434468**				
	400	FGL36KA400LLF	**434050**	FGL46KA400LLF	**436154**				

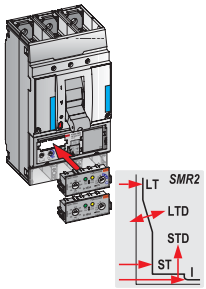
One code covers: A standard fixed front connection breaker + Assembled trip unit + Toggle Elongator + Fillller for extension module and battery socket + Breaker finishing covers + Fixation hardware

LT: Ir = 0.625-1 x In
LTD: Line & Motor; 8 options



Adjustable LT & LTD settable Rating Plugs for Trip Units SMR2

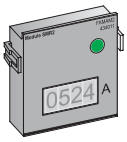
	In (A)	3 pole 3 trips		4 pole 3 trips[1]		4 pole 4 trips[1]		4 pole 3.5 trips (N=50%)[1]	
250A	160	FGRL3LK0160	**436162**	FGRL43LK0160	**434101**	FGRL4LK0160	**434109**	FGRL45LK0160	**434105**
	250	FGRL3LK0250	**434098**	FGRL43LK0250	**436177**	FGRL4LK0250	**436181**	FGRL45LK0250	**434106**
400A	250	FGRL3LL0250	**435399**	FGRL43LL0250	**435410**	FGRL4LL0250	**435433**	FGRL45LL0250	**434495**
	400	FGRL3LL0400	**434099**	FGRL43LL0400	**436178**	FGRL4LL0400	**434111**	FGRL45LL0400	**434107**
350[2]	350[2]	FGRL3LL0350	**435400**	FGRL43LL0350	**435412**	FGRL4LL0350	**435302**	FGRL45LL0350	**435266**

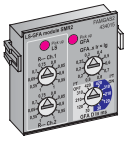


Modular Electronic Trip Unit (SMR2) with two adjustable Rating Plugs, setting 0.4 - 1 x In

	In (A)	3 pole 3 trips		4 pole 3 trips[1]		4 pole 4 trips[1]		4 pole 3.5 trips (N=50%)[1]	
50kA FGN	400	FGN36VA400LLF	**435140**	FGN436VA400LLF	**435152**	FGN46VA400LLF	**435170**	FGN456VA400LLF	**435164**
80kA FGH	400	FGH36VA400LLF	**434953**	FGH436VA400LLF	**434960**	FGH46VA400LLF	**434983**	FGH456VA400LLF	**434971**
150kA FGL	400	FGL36VA400LLF	**435065**	FGL436VA400LLF	**435077**	FGL46VA400LLF	**435128**	FGL456VA400LLF	**435095**

One code covers: A standard fixed front connection breaker + Assembled trip unit + Toggle elongator +Two rating plugs + Fillller for extension module and battery socket + Breaker finishing covers + Fixation hardware

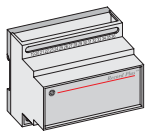




Extension modules for the SMR2 Electronic trip unit *Plug in types replacing the filler module (1 pc max.)*

Ammeter with 4 digit LCD display	FAMAM2	**436183**
Groundfault alarm + Modbus communication (RTu)	FAMGAM2	**436185**
Groundfault alarm + 2 channel load shedding device	FAMGAS2	**436186**
Groundfault alarm + Fault type indicators	FAMGAT2	**436187**
Groundfault protection + Modbus communication (RTu)	FAMGFM2	**436188**
Groundfault protection + 2 channel load shedding device	FAMGFS2	**436189**
Groundfault protection + Fault type indicators	FAMGFT2	**436190**
2 channel load shedding device + Modbus communication (RTu)	FAMSM2	**436192**
2 channel load shedding device + Fault type indicators	FAMST2	**436197**
Fault type indicators + Modbus communication (RTu)	FAMMT2	**436191**
Spare filler module	FAMB2	**434448**

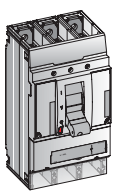
One code covers: A plug in module and where needed connection hardware



Other Modules

External communication and contact module (4 contacts, 1A/400V)[3]	FAMECM	**434013**

One code covers: Module and connection hardware



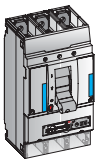
Non-Automatic Circuit Breaker (Switch)

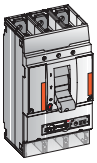
	In (A)	3 pole		4 pole[1]	
FGY	400	FGY306D400LF	**431659**	FGY406D400LF	**431671**

One code covers: A standard fixed front connection breaker + Assembled trip unit + Toggle elongator + Breaker finishing covers + Fixation hardware

(1) Neutral on the left. If neutral on the right is needed, please contact us.
(2) Specifically configured for Motor Protection
(3) Is needed for Modbus communication (1 per breaker).

FG630 - Complete circuit breaker

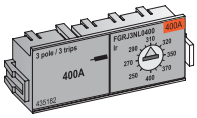




Selective Electronic Trip Unit (SMR1) without Rating Plug

	In (A)	3 pole Cat. no.	3 pole Ref. no.	4 pole[1] Cat. no.	4 pole[1] Ref. no.				
50kA FGN	400	FGN36AA400NLF	**434561**	FGN46AA400NLF	**434636**				
	500[2] ■	FGN36AA500NNF	**434812**	FGN46AA500NNF	**434866**				
	630	FGN36AA630NNF	**431461**	FGN46AA630NNF	**431539**				
80kA FGH	400	FGH36AA400NLF	**433142**	FGH46AA400NLF	**434432**				
	500[2] ■	FGH36AA500NNF	**434600**	FGH46AA500NNF	**434630**				
	630	FGH36AA630NNF	**431038**	FGH46AA630NNF	**431132**				
150kA FGL	400	FGL36AA400NLF	**434459**	FGL46AA400NLF	**434534**				
	500[2] ■	FGL36AA500NNF	**434645**	FGL46AA500NNF	**434770**				
	630	FGL36AA630NNF	**431249**	FGL46AA630NNF	**431333**				
	One code covers: A standard fixed front connection breaker + Assembled trip unit + Toggle Elongator + Breaker finishing covers + Fixation hardware								

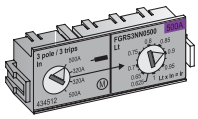
Type line 0.625 - 1 x In



Adjustable Rating Plugs for Trip Units SMR1

	In (A)	3 pole 3 trips		4 pole 3 trips[1]		4 pole 4 trips[1]		4 pole 3.5 trips (N=50%)[1]	
400A	250	FGRJ3NL0250	**433148**	FGRJ43NL0250	**433160**	FGRJ4NL0250	**433184**	FGRJ45NL0250	**433172**
	400	FGRJ3NL0400	**435182**	FGRJ43NL0400	**435188**	FGRJ4NL0400	**435200**	FGRJ45NL0400	**435194**
630A	400	FGRJ3NN0400	**433154**	FGRJ43NN0400	**433166**	FGRJ4NN0400	**433190**	FGRJ45NN0400	**433178**
	630	FGRJ3NN0630	**433157**	FGRJ43NN0630	**433169**	FGRJ4NN0630	**433193**	FGRJ45NN0630	**433181**

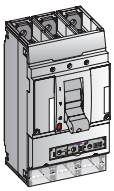
Type line/Motor 0.4 - 1 x In



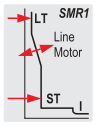
Switchable Rating Plugs for Trip Units SMR1

	In (A)	3 pole 3 trips		4 pole 3 trips[1]		4 pole 4 trips[1]		4 pole 3.5 trips (N=50%)[1]	
400A	400	FGRS3NL0400	**433235**	FGRS43NL0400	**433241**	FGRS4NL0400	**433253**	FGRS45NL0400	**433247**
500[2] ■	500	FGRS3NN0500	**434512**	FGRS43NN0500	**434521**	FGRS4NN0500	**434542**	FGRS45NN0500	**434530**

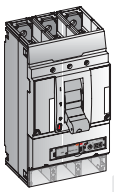
Selective Electronic Trip Unit (SMR1) with switchable Rating Plug



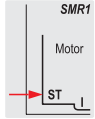
	In (A)	3 pole 3 trips		4 pole 3 trips[1]		4 pole 4 trips[1]		4 pole 3.5 trips (N=50%)[1]	
50kA FGN	400	FGN36SA400NLF	**431530**	FGN436SA400NLF	**431596**	FGN46SA400NLF	**431650**	FGN456SA400NLF	**431626**
	500 ■	FGN36SA500NNF	**434835**	FGN436SA500NNF	**434848**	FGN46SA500NNF	**434884**	FGN456SA500NNF	**434860**
80kA FGH	400	FGH36SA400NLF	**431091**	FGH436SA400NLF	**431168**	FGH46SA400NLF	**431240**	FGH456SA400NLF	**431198**
	500 ■	FGH36SA500NNF	**434612**	FGH436SA500NNF	**434621**	FGH46SA500NNF	**434642**	FGH456SA500NNF	**434627**
150kA FGL	400	FGL36SA400NLF	**431309**	FGL436SA400NLF	**431372**	FGL46SA400NLF	**431449**	FGL456SA400NLF	**431425**
	500 ■	FGL36SA500NNF	**434657**	FGL436SA500NNF	**434758**	FGL46SA500NNF	**434806**	FGL456SA500NNF	**434764**
	One code covers: A standard fixed front connection breaker + Assembled trip unit + Toggle elongator + Rating plug + Breaker finishing covers + Fixation hardware								



Selective Electronic Trip Unit (SMR1) with Rating Plug, without Overload (LT) protection (Motor)

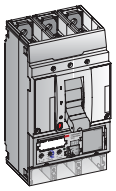


	In (A)	3 pole 3 trips		4 pole 3 trips[1]	
50kA FGN	500	FGN36BM500NNF	**434690**	FGN436BM500NNF	**434696**
80kA FGH	500	FGH36BM500NNF	**434666**	FGH436BM500NNF	**434672**
150kA FGL	500	FGL36BM500NNF	**434678**	FGL436BM500NNF	**434684**
	One code covers: A standard fixed front connection breaker + Assembled trip unit + Toggle elongator + Rating plug + Breaker finishing covers + Fixation hardware				



(1) Neutral on the left. If neutral on the right is needed, please contact us.
(2) Specifically configured for use with Switchable Rating Plug only.

FG630 - Complete circuit breaker

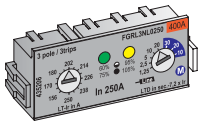


Modular Electronic Trip Unit (SMR2) without Rating Plug

	In (A)	3 pole Cat. no.	3 pole Ref. no.	4 pole[1] Cat. no.	4 pole[1] Ref. no.				
50kA FGN	400	FGN36KA400NLF	**436157**	FGN46KA400NLF	**436161**				
	500[2] ■	FGN36KA500NNF	**434824**	FGN46KA500NNF	**434872**				
	630	FGN36KA630NNF	**436158**	FGN46KA630NNF	**434092**				
80kA FGH	400	FGH36KA400NLF	**436152**	FGH46KA400NLF	**434043**				
	500[2] ■	FGH36KA500NNF	**434606**	FGH46KA500NNF	**434633**				
	630	FGH36KA630NNF	**434028**	FGH46KA630NNF	**434044**				
150kA FGL	400	FGL36KA400NLF	**434051**	FGL46KA400NLF	**436155**				
	500[2] ■	FGL36KA500NNF	**434651**	FGL46KA500NNF	**434782**				
	630	FGL36KA630NNF	**434052**	FGL46KA630NNF	**434068**				

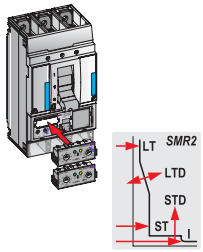
One code covers: A standard fixed front connection breaker + Assembled trip unit + Toggle Elongator + Fillller for extension module and battery socket + Breaker finishing covers + Fixation hardware

LT: Ir = 0.625-1 x In
LTD: Line & Motor; 8 options



Adjustable LT & LTD settable Rating Plugs for Trip Units SMR2

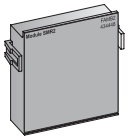
	In (A)	3 pole 3 trips		4 pole 3 trips[1]		4 pole 4 trips[1]		4 pole 3.5 trips (N=50%)[1]	
400A	250	FGRL3NL0250	**435206**	FGRL43NL0250	**435218**	FGRL4NL0250	**435254**	FGRL45NL0250	**435230**
	400	FGRL3NL0400	**435212**	FGRL43NL0400	**435224**	FGRL4NL0400	**435260**	FGRL45NL0400	**435236**
630A	400	FGRL3NN0400	**434471**	FGRL43NN0400	**435419**	FGRL4NN0400	**434501**	FGRL45NN0400	**434497**
	630	FGRL3NN0630	**434100**	FGRL43NN0630	**436179**	FGRL4NN0630	**434112**	FGRL45NN0630	**436180**
500[2] ■	500[2]	FGRL3NN0500	**434473**	FGRL43NN0500	**435427**	FGRL4NN0500	**435309**	FGRL45NN0500	**435272**

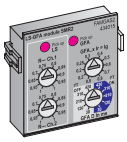


Modular ElectronicTrip Unit (SMR2) with two Adjustable Rating Plugs, setting 0.4 - 1 x In

	In (A)	3 pole 3 trips		4 pole 3 trips[1]		4 pole 4 trips[1]		4 pole 3.5 trips (N=50%)[1]	
50kA FGN	630	FGN36VA630NNF	**435146**	FGN436VA630NNF	**435158**	FGN46VA630NNF	**435176**	FGN456VA630NNF	**435167**
80kA FGH	630	FGH36VA630NNF	**434958**	FGH436VA630NNF	**434965**	FGH46VA630NNF	**435003**	FGH456VA630NNF	**434977**
150kA FGL	630	FGL36VA630NNF	**435071**	FGL436VA630NNF	**435091**	FGL46VA630NNF	**435134**	FGL456VA630NNF	**435122**

One code covers: A standard fixed front connection breaker + Assembled trip unit + Toggle elongator + Two rating plugs + Fillller for extension module and battery socket + Breaker finishing covers + Fixation hardware

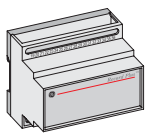




Extension modules for the SMR2 Electronic trip unit *Plug in types replacing the filler module (1 pc max.)*

Ammeter with 4 digit LCD display	FAMAM2	**436183**
Groundfault alarm + Modbus communication	FAMGAM2	**436185**
Groundfault alarm + 2 channel load shedding device	FAMGAS2	**436186**
Groundfault alarm + Fault type indicators	FAMGAT2	**436187**
Groundfault protection + Modbus communication	FAMGFM2	**436188**
Groundfault protection + 2 channel load shedding device	FAMGFS2	**436189**
Groundfault protection + Fault type indicators	FAMGFT2	**436190**
2 channel load shedding device + Modbus communication	FAMSM2	**436192**
2 channel load shedding device + Fault type indicators	FAMST2	**436197**
Fault type indicators + Modbus communication	FAMMT2	**436191**
Spare filler module	FAMB2	**434448**

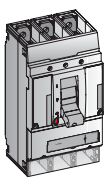
One code covers: A plug in module and where needed connection hardware



Other Modules

External communication and contact module (4 contacts, 1 A/400V)[3]	FAMECM	**434013**

One code covers: Module and connection hardware



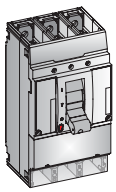
Non-Automatic Circuit Breaker (Switch)

	In (A)	3 pole		4 pole[1]	
FGY	630	FGY306D630NF	**431665**	FGY406D630NF	**431687**

One code covers: A standard fixed front connection breaker + Assembled trip unit + Toggle elongator + Breaker finishing covers + Fixation hardware

(1) Neutral on the left. If neutral on the right is needed, please contact us.
(2) Specifically configured for Motor Protection.
(3) Is needed for Modbus communication (1 per breaker).

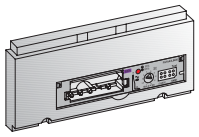
FG400 - Circuit breaker in components



Breaker frame without Trip Unit

	In (A)	3 pole Cat. no.	3 pole Ref. no.	4 pole[1] Cat. no.	4 pole[1] Ref. no.	Cat. no.	Ref. no.	Cat. no.	Ref. no.
50kA FGN	250	FGN306F250LF	434247	FGN406F250LF	434250				
	400	FGN306F400LF	431473	FGN406F400LF	431548				
80kA FGH	250	FGH306F250LF	434231	FGH406F250LF	434234				
	400	FGH306F400LF	431050	FGH406F400LF	431150				
150kA FGL	250	FGL306F250LF	434239	FGL406F250LF	434242				
	400	FGL306F400LF	431261	FGL406F400LF	431351				

One code covers: A standard fixed front connection breaker with current sensors + Toggle Elongator + Breaker finishing covers + Fixation hardware

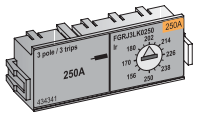


Selective Electronic Trip Unit (SMR1) without Rating Plug

	In (A)	3 pole Cat. no.	3 pole Ref. no.	4 pole[1] Cat. no.	4 pole[1] Ref. no.
SMR1	250	FGTAA3L0250	434319	FGTAA4L0250	434323
	400	FGTAA3L0400	431718	FGTAA4L0400	431742

Long time protection	Adj. Ir= 0.4 - 1 x In
Two long time delay bands (with choice of protection mode)	Line, no phase loss protection Motor with phase loss protection
Short time protection	Adj. 2 - 13 x Ir (current dependant delay)[2]
Instantaneous protection	Fixed 14 x Is[2]

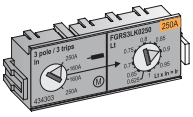
Type line 0.625 - 1 x In



Adjustable Rating Plugs for Trip Units SMR1

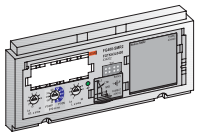
	In (A)	3 pole 3 trips		4 pole 3 trips[1]		4 pole 4 trips[1]		4 pole 3.5 trips (N=50%)[1]	
250A	160	FGRJ3LK0160	434337	FGRJ43LK0160	434345	FGRJ4LK0160	434361	FGRJ45LK0160	434353
	250	FGRJ3LK0250	434341	FGRJ43LK0250	434349	FGRJ4LK0250	434365	FGRJ45LK0250	434357
400A	250	FGRJ3LL0250	435343	FGRJ43LL0250	435356	FGRJ4LL0250	435397	FGRJ45LL0250	435367
	400	FGRJ3LL0400	433151	FGRJ43LL0400	433163	FGRJ4LL0400	433187	FGRJ45LL0400	433175

Type line/Motor 0.4 - 1 x In



Switchable Rating Plugs for Trip Units SMR1

	In (A)	3 pole 3 trips		4 pole 3 trips[1]		4 pole 4 trips[1]		4 pole 3.5 trips (N=50%)[1]	
250A	250	FGRS3LK0250	434303	FGRS43LK0250	434307	FGRS4LK0250	434315	FGRS45LK0250	434311
400	350	FGRS3LL0400	435435	FGRS43LL0400	434516	FGRS4LL0400	434537	FGRS45LL0400	434525

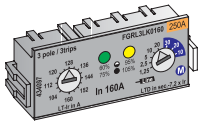


Modular Electronic Trip Unit (SMR2) without Rating Plug

	In (A)	3 pole Cat. no.	3 pole Ref. no.	4 pole[1] Cat. no.	4 pole[1] Ref. no.
SMR2	250	FGTKA3L0250	434201	FGTKA4L0250	434205
	350[3] ■	FGTKA3L0350	434902	FGTKA4L0350	434908
	400[2]	FGTKA3L0400	434202	FGTKA4L0400	434261

4 for line, no phase loss protection	Adj. Ir= 0.4 - 1 x In
Six long time delay bands	4 for line, no phase loss protection 2 for motor, with phase loss protection[2]
Short time protection	Adj. 1.5-12 x Ir[2]
Switchable to I^2t curve	
Five short time delay bands	From 40 to 410 milliseconds
Instantaneous protection	Adj. 2-13 x Is[2]

LT: Ir = 0.625-1 x In
LTD: Line & Motor; 8 options

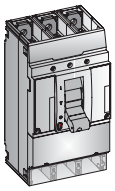


Adjustable LT & LTD settable Rating Plugs for Trip Units SMR2

	In (A)	3 pole 3 trips		4 pole 3 trips[1]		4 pole 4 trips[1]		4 pole 3.5 trips (N=50%)[1]	
250A	160	FGRL3LK0160	436162	FGRL43LK0160	434101	FGRL4LK0160	434109	FGRL45LK0160	434105
	250	FGRL3LK0250	434098	FGRL43LK0250	436177	FGRL4LK0250	436181	FGRL45LK0250	434106
400A	250	FGRL3LL0250	435399	FGRL43LL0250	435410	FGRL4LL0250	435433	FGRL45LL0250	434495
	400	FGRL3LL0400	434099	FGRL43LL0400	436178	FGRL4LL0400	434111	FGRL45LL0400	434107
350A[3] ■	350	FGRL3LL0350	435400	FGRL43LL0350	435412	FGRL4LL0350	435302	FGRL45LL0350	435266

(1) Neutral on the left. If neutral on the right is needed, please contact us.
(2) 400A trip unit limited to 5 LTD band settings(SMR2), a maximum ST setting of 10 x Ir and a maximum instantaneous setting of 11 x Is.
(3) Specifically configured for Motor Protection

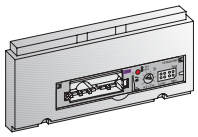
FG630 - Circuit breaker in components



Breaker frame without Trip Unit

	In (A)	3 pole Cat. no.	3 pole Ref. no.	4 pole[1] Cat. no.	4 pole[1] Ref. no.				
50kA FGN	400	FGN306F400NF	431488	FGN406F400NF	431554				
	630	FGN306F630NF	431491	FGN406F630NF	431560				
80kA FGH	400	FGH306F400NF	431067	FGH406F400NF	431153				
	630	FGH306F630NF	431073	FGH406F630NF	431156				
150kA FGL	400	FGL306F400NF	431267	FGL406F400NF	431354				
	630	FGL306F630NF	431282	FGL406F630NF	431357				

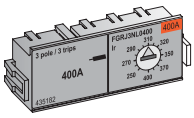
One code covers: A standard fixed front connection breaker with current sensors + Toggle Elongator + Breaker finishing covers + Fixation hardware



Selective Electronic Trip Unit (SMR1) without Rating Plug

	In (A)	3 pole Cat. no.	3 pole Ref. no.	4 pole[1] Cat. no.	4 pole[1] Ref. no.		
SMR1	400	FGTAA3N0400	431721	FGTAA4N0400	431745	Long time protection Two long time delay bands (with choice of protection mode) Short time protection Instantaneous protection	Adj. Ir= 0.4 - 1 x In Line, no phase loss protection Motor with phase loss protection Adj. 2 - 13 x Ir (current dependant delay)[2] Fixed 14 x Is[2]
	500[3]	FGTAA3N0500	434893	FGTAA4N0500	434899		
	630	FGTAA3N0630	431736	FGTAA4N0630	431748		

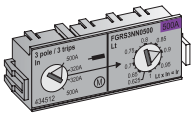
Type line 0.625 - 1 x In



Adjustable Rating Plugs for Trip Units SMR1

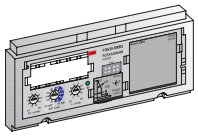
	In (A)	3 pole 3 trips		4 pole[1]		4 pole 4 trips[1]		4 pole 3.5 trips (N=50%)[1]	
400A	250	FGRJ3NL0250	433148	FGRJ43NL0250	433160	FGRJ4NL0250	433184	FGRJ45NL0250	433172
	400	FGRJ3NL0400	435182	FGRJ43NL0400	435188	FGRJ4NL0400	435200	FGRJ45NL0400	435194
630A	400	FGRJ3NN0400	433154	FGRJ43NN0400	433166	FGRJ4NN0400	433190	FGRJ45NN0400	433178
	630	FGRJ3NN0630	433157	FGRJ43NN0630	433169	FGRJ4NN0630	433193	FGRJ45NN0630	433181

Type line/Motor 0.4 - 1 x In



Switchable Rating Plugs for Trip Units SMR1

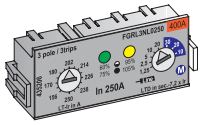
	In (A)	3 pole 3 trips		4 pole[1]		4 pole 4 trips[1]		4 pole 3.5 trips (N=50%)[1]	
400A	400	FGRS3NL0400	433235	FGRS43NL0400	433241	FGRS4NL0400	433253	FGRS45NL0400	433247
500[3]	500	FGRS3NN0500	434512	FGRS43NN0500	434521	FGRS4NN0500	434542	FGRS45NN0500	434530



Modular Electronic Trip Unit (SMR2) without Rating Plug

	In (A)	3 pole Cat. no.	3 pole Ref. no.	4 pole 3 trips[1] Cat. no.	4 pole 3 trips[1] Ref. no.		
SMR2	400	FGTKA3N0400	434203	FGTKA4N0400	434263	4 for line, no phase loss protection Six long time delay bands Short time protection Switchable to I^2t curve Five short time delay bands Instantaneous protection	Adj. Ir= 0.4 - 1 x In 4 for line, no phase loss protection 2 for motor, with phase loss protection[2] Adj. 1.5-12 x Ir[2] From 40 to 410 milliseconds Adj. 2-13 x Is[2]
	500[3]	FGTKA3N0500	434905	FGTKA4N0500	434911		
	630[2]	FGTKA3N0630	434204	FGTKA4N0630	434265		

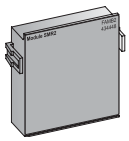
LT: Ir = 0.625-1 x In
LTD: Line & Motor; 8 options

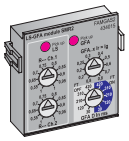


Adjustable LT & LTD settable Rating Plugs for Trip Units SMR2

	In (A)	3 pole 3 trips		4 pole 4 trips[1]		4 pole 4 trips[1]		4 pole 3.5 trips (N=50%)[1]	
400A	250	FGRL3NL0250	435206	FGRL43NL0250	435218	FGRL4NL0250	435254	FGRL45NL0250	435230
	400	FGRL3NL0400	435212	FGRL43NL0400	435224	FGRL4NL0400	435260	FGRL45NL0400	435236
630A	400	FGRL3NN0400	434471	FGRL43NN0400	435419	FGRL4NN0400	434501	FGRL45NN0400	434497
	630	FGRL3NN0630	434100	FGRL43NN0630	436179	FGRL4NN0630	434112	FGRL45NN0630	436180
500[3]	500	FGRL3NN0500	434473	FGRL43NN0500	435427	FGRL4NN0500	435309	FGRL45NN0500	435272

Extension modules for the SMR2 Electronic trip unit





Plug in types replacing the filler module (1 pc max.)

SMR2	Ammeter with 4 digit LCD display	FAMAM2	436183
	Groundfault alarm + Modbus communication	FAMGAM2	436185
	Groundfault alarm + 2 channel load shedding device	FAMGAS2	436186
	Groundfault alarm + Fault type indicators	FAMGAT2	436187
	Groundfault protection + Modbus communication	FAMGFM2	436188
	Groundfault protection + 2 channel load shedding device	FAMGFS2	436189
	Groundfault protection + Fault type indicators	FAMGFT2	436190
	2 channel load shedding device + Modbus communication	FAMSM2	436192
	2 channel load shedding device + Fault type indicators	FAMST2	436197
	Fault type indicators + Modbus communication	FAMMT2	436191
	Spare filler module	FAMB2	434448

One code covers: A plug in module and where needed connection hardware

Other Modules

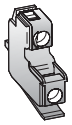
SMR2	External communication and contact module (4 contacts, 1A/400V)[4]	FAMECM	434013

One code covers: Module and connection hardware

(1) Neutral on the left. If neutral on the right is needed, please contact us.
(2) 630A trip unit limited to 5 LTD band settings(SMR2), a maximum ST setting of 10 x Ir and a maximum instantaneous setting of 11 x Is.
(3) Specifically configured for Motor Protection
(4) Is needed for Modbus communication (1 per breaker).

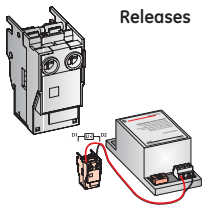
FG - Internal accessories

Contacts



	Normally open		Normally closed			
	Cat. no.	Ref. no.	Cat. no.	Ref. no.	Cat. no.	Ref. no.
Aux. switch right mounted	FAS10R	**430837**	FAS01R	**430831**		
Aux. switch left mounted	FAS10L	**430834**	FAS01L	**430828**		
Bell alarm electronic trip unit	FABAT10	**430818**	FABAT01	**430815**		
Bell alarm mechanism	FABAM10	**432003**	FABAM01	**432000**		
Bell alarm RCD device	FABAT10	**430818**	FABAT01	**430815**		

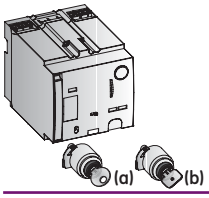
Releases



	Shunt		Undervoltage		Delayed undervoltage	
12V AC/DC	FASHTB	**430840**	FAUVRB	**440018**	-	-
24V AC/DC	FASHTD	**430843**	FAUVRD	**430861**	-	-
48V AC/DC	FASHTF	**430846**	FAUVRF	**430864**	-	-
60V AC/DC	FASHTH	**435118**	FAUVRH	**435120**	-	-
110 AC/DC	FASHTJ	**430849**	FAUVRJ	**430867**	-	-
220/240V AC/DC	FASHTN	**430852**	FAUVRN	**430870**	FAUVDN	**430858**
400/415V AC	FASHTU	**430855**	FAUVR8	**436472**	-	-
440/480V AC	-	-	FAUVRU	**430873**	-	-

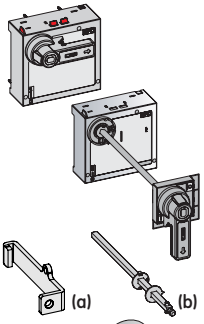
FG - Operators

Electrical operators

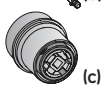


24V AC/DC	FGEMFD	**432817**
48V AC/DC	FGEMFF	**432820**
60V AC/DC	FGEMFH	**432823**
110/127V AC/DC	FGEMFJ	**432826**
220/250V AC/DC	FGEMFN	**432829**
400/440V AC	FGEMF8	**432811**
Keylock for electr. operator Ronis[1] (a)	FG1BRE	**431404**
Keylock for electr. operator Profalux[1] (b)	FG1BPE	**431403**

Rotary handles



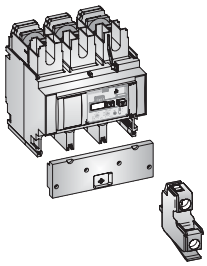
	Direct on device		Rotary handle through door or cover plate[2]		Panel or door mounted	
Grey	FGNRF/5	**436509**	FGNRC/5	**436504**	-	-
Red	FGNRFV/5	**436510**	FGNRCV/5	**436505**	-	-
Grey + Early closing Aux. Switches 2xNO[4]	-	-	FGNRY/5	**436513**	-	-
Red + Early closing Aux. Switches 2xNO[4]	-	-	FGNRYV/5	**436514**	-	-
Grey	-	-	-	-	FGNRD/5	**436506**
Red	-	-	-	-	FGNRDV/5	**436507**
Grey + Early closing Aux. Switches 2xNO[4]	-	-	-	-	FGNRZ/5	**436515**
Red + Early closing Aux. Switches 2xNO[4]	-	-	-	-	FGNRZV/5	**436516**



Accessories				
Flex operator adaptor push to trip (a)	FGNFT	**432867**	Only for use with panel or door mounted type	
Extension shaft kit (max. 600 mm) (b)	FGNRE	**434735**	Only for use with panel or door mounted type	
Adaptor for drawout (c)	FGNRW	**433892**		
Ronis keylock 1104B nr. BC 1027[1] (d)	FA1BR1	**430088**		
Ronis keylock 1104B nr. BC 1053[1] (d)	FA1BR2	**430089**		
Ronis keylock 1104B nr. BC 2932[1] (d)	FA1BR3	**430504**		
Ronis keylock 1104B nr. BC 2911[1] (d)	FA1BR4	**430505**		
Ronis keylock 1104B nr. BC 2936[1] (d)	FA1BR5	**430506**		
Ronis keylock 1104B nr. BC 2940[1] (d)	FA1BR6	**430507**		
Ronis lock with random key[1] (d)	FA1BRH	**430068**		
Profalux lock with random key[1] (e)	FA1BPH	**430813**		

FG - Residual current devices

RCD bottom mounted [4]



	3 pole		4 pole	
400/630A Voltage 200/440V AC	FGQDB3M	**430860**	FGQDB4M	**430869**
400/630A Voltage 400/690V AC	FGQDB3H	**430856**	FGQDB4H	**430865**

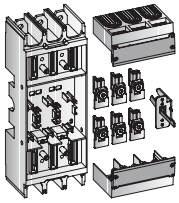
	Normally open		Normally closed	
Bell Alarm RCD device	FABAT10	**430818**	FABAT 01	**430815**

One code covers an RCD with: Fixation hardware + Sealable interconnection cover

(1) Key included
(2) Add door flange FGFH for door lock options
(3) On request 1xNO/1xNC is available.
(4) 100/200V AC execution available on request.

FG - Plug-in system

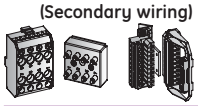
Main system



	3 pole		4 pole	
	Cat. no.	Ref. no.	Cat. no.	Ref. no.
Complete set for breaker	FGDDF3	**430944**	FGDDF4	**431064**
Fixed part for breaker	FGDFF3	**431983**	FGDFF4	**431986**
Mobile part for breaker	FGDMP3	**432796**	FGDMP4	**432799**

Complete set: Fixed and mobile part with connection and fixation hardware
Fixed part: Fixed base with connection and fixation and hardware
Mobile part: Mechanism trip device, terminal shields and set of 3 or 4 pole plugs

Auxiliary disconnects (Secondary wiring)



Complete set 8 pole	FAPFM	**430824**
Fixed part 8 pole	FAPF8	**430823**
Mobile part 8 pole	FAPM8	**430826**
Plug and socket 10 pole (side mounted)	FAPPS	**430827**

Insertion prevention kit

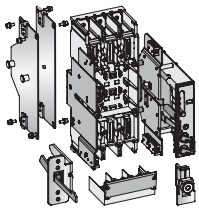
Insertion prevention kit (of ...wrong A rating)	FAPIP	**430825**

Spares

Set of nutplates and connection bolts (For connection of bases used as spare)	FGJN3	**436469**

FG - Drawout system

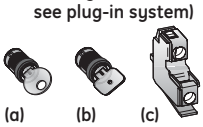
Main system



	3 pole		4 pole	
Complete set	FGWS3	**432910**	FGWS4	**432913**

One code covers the fixed and withdrawable part of the draw-out system, with plug-in base, mounting accessories and fixation hardware.

Accessories (for auxiliary disconnects see plug-in system)



(a) (b) (c)

Keylock in draw-out position Ronis[1]	(a)	FG1BRW	**433407**
Keylock in draw-out position Profalux[1]	(b)	FG1BPW	**433406**
Position indication contact NO	(c)	FAS01D	**436309**
Position indication contact NC	(c)	FAS10D	**436310**

FG - Connections: optional

Extenders[2]

(a) (b) (c)

		3 pole		4 pole	
Standard flat type	(a)	FGBES3	**431696**	FGBES4	**431697**
Heightened type	(b)	FGBEH3	**431691**	FGBEH4	**431695**
Twisted 90° c	(c)	FGBEA3	**431686**	FGBEA4	**431690**

Spreader flat[2]

Pole spacing 70mm	FGBSS3	**431981**

FGBSS4	**431982**	

Rear connections[2]

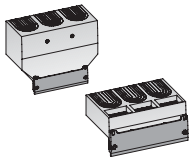
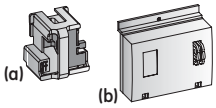
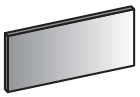
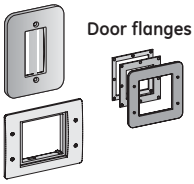
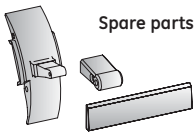
Set 3 pole (2 short, 1 long)	FGBRC3	**431701**	FGBRC4	**431702**
Set 4 pole (2 short, 2 long)				
Set 3 pole (3 short)	FGBRCS3	**432193**	FGBRCS4	**432194**
Set 4 pole (4 short)				

Internal box clamps[2]

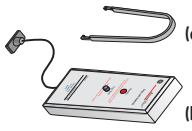
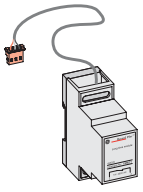
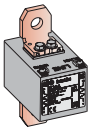
	One cable 240 mm² or two cables 95 mm²		Two cables 1x300 mm² & 1x240 mm²	
Box Clamp Cu/Al, set 3 pole	FGTCA1327	**435107**	FGTCA230B	**433412**
Box Clamp Cu/Al, set 4 pole	FGTCA1427	**435116**	FGTCA240B	**433413**

(1) Key included
(2) Set for equipping the line OR load side of breaker.

FG - Installation accessories

		3 pole		4 pole	
		Cat. no.	Ref. no.	Cat. no.	Ref. no.
Terminal shields (with finishing covers) 	Long and widened type for spreaders and 690V applications, set of 2 pcs	FGJW3	**432861**	FGJW4	**432864**
	Medium, set of 2 pcs.	FGJM3	**432846**	FGJM4	**432849**
	Short, set of 2 pcs.	FGJS3	**432855**	FGJS4	**432858**
Specific to connection area 	Phase separators, set of 12 pcs	FGJP	**432852**		
	Backplate (3 or 4pole), set of 2 pcs.	FGJB	**432840**		
Padlocking devices for toggle operator(1)  (a) (b)	Padlocking removable (a)	FG1PR	**431409**		
	Padlocking fixed (b)	FG1PF	**431408**		
Circuit indication / coding 	Set of 20 blank labels	FAC	**430821**		
		3 pole			
Door flanges 	RCD unit front face for 3 and 4 pole	FDFF3	**430941**		
	Front face toggle area	FGFT	**432836**		
	Rotary handle (through cover plate model)	FGFH	**430545**		
	Motor operator	FGFE	**430544**		
		3 pole		4 pole	
Spare parts 	Finishing covers, set of 2 pcs.	FGUA3	**432908**	FGUA4	**432909**
	Spare toggle (set of 5 pieces)	FGUT	**433541**		

FG - Accessories electronic trip units SMR1 and SMR2

		3 pole			
 (a) (b)	Rating plug tool (SMR1 & 2) (a)	FAR	**433500**		
	Battery test device (SMR1 & 2) (b)	FAT	**431402**		
 (c)	Long time module (SMR1 only) (c)	FAMLT1	**433376**		
 (d)	Ground Fault SMR2 Sensor 250A (d)	FGGS0250	**431870**		
	Ground Fault SMR2 Sensor 400A (d)	FGGS0400	**432838**		
	Ground Fault SMR2 Sensor 630A (d)	FGGS0630	**432839**		

(1) Padlocks not included

LTM
Line thermal magnetic protection
SMR1e
Selective electronic protection.
SMR1s
Selective electronic protection with enhanced functionality
SMR1g
Selective electronic protection with enhanced functionality and ground fault
Mag Break™
Magnetic only breaker for motor protection
Y
Non Automatic or switch (not mentioned in tables)

FK Frame

Breaking capacities

Icu 400/415V AC in kA eff.

Type	N	H	L
FK800	50	80	100
FK1250	50	80	100
FK1600	50	80	

Protection

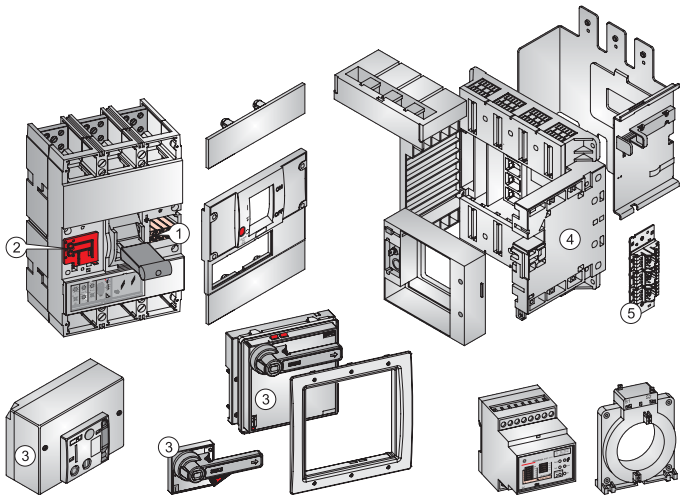
Trip Unit	Rated Current (A)	LTM	Mag Break™	SMR1e(1)	SMR1s(1)	SMR1g(1)
FK800	630	N, H, L				
	800	N, H, L	N, H, L	N, H, L	N, H	N, H
FK1250	1000	N, H, L		N, H, L	N, H	N, H
	1250	N, H, L	N, H, L	N, H, L	N, H	N, H
FK1600	1600			N, H	N, H	N, H

Number of poles / protected poles (trips)					
3 pole 3 trips	N, H, L	N, H, L	N, H, L	N, H	N, H
4 pole 3 trips	N, H, L	N, H, L	N, H, L	N, H	N, H
4 pole 4 trips(1)			N, H, L	N, H	N, H

(1) Switchable, 0%, 50% or 100% neutral protection

Accessories (main types)

① A maximum of one Bell Alarm contact AND 3 aux. contacts (all of CO type)
② Shunt or Undervoltage release
③ Operators
  Rotary handle
  OR
  Electrical operator
④ Draw out system
⑤ Connectors for auxiliary wiring
⑥ RCD with separate sensor



FK800 - Complete circuit breaker

Selective Electronic Trip Unit type SMR1e

	In (A)	3 pole 3 trips Cat. no.	Ref. no.	4 pole[1] N selectable 0-50-100% Cat. no.	Ref. no.
50kA FKN	800	FKN36NE800PPF	435393	FKN46NE800PPF	435447
80kA FKH	800	FKH36NE800PPF	435285	FKH46NE800PPF	435339
100kA FKL	800	FKL36NE800PPF	435390	FKL46NE800PPF	435282

One code covers: A standard fixed front connection breaker + Assembled trip unit + Toggle Elongator + Breaker finishing covers + Fixation hardware

Enhanced Selective Electronic Trip Unit type SMR1s

	In (A)	3 pole 3 trips		4 pole[1] N selectable 0-50-100%	
50kA FKN	800	FKN36NS800PPF	435429	FKN46NS800PPF	435483
80kA FKH	800	FKH36NS800PPF	435321	FKH46NS800PPF	435375

One code covers: A standard fixed front connection breaker + Assembled trip unit + Toggle Elongator + Breaker finishing covers + Fixation hardware

Enhanced Selective Electronic Trip Unit type SMR1g (= s + ground fault)

	In (A)	3 pole 3 trips		4 pole[1] N selectable 0-50-100%	
50kA FKN	800	FKN36NG800PPF	435411	FKN46NG800PPF	435465
80kA FKH	800	FKH36NG800PPF	435303	FKH46NG800PPF	435357

One code covers: A standard fixed front connection breaker + Assembled trip unit + Toggle Elongator + Breaker finishing covers + Fixation hardware

Line Thermal magnetic trip unit LTM (adjustable settings)

	In (A)	3 pole 3 trips		4 pole 3 trips[2]	
50kA FKN	630	FKN36NT630PF	435444	FKN436NT630PF	435408
	800	FKN36NT800PF	435336	FKN436NT800PF	435300
80kA FKH	630	FKH36NT630PF	435426	FKH436NT630PF	435462
	800	FKH36NT800PF	435318	FKH436NT800PF	435354
100kA FKL	630	FKL36NT630PF	435480	FKL436NT630PF	435534
	800	FKL36NT800PF	435372	FKL436NT800PF	435535

One code covers: A standard fixed front connection breaker + Assembled trip unit + Toggle Elongator + Breaker finishing covers + Fixation hardware

Motor Protection (Mag Break™) Magnetic Only Breaker

	In (A)	3 pole 3 trips		4 pole 3 trips[2]	
50kA FKN	800	FKN36NM800PF	435537	FKN436NM800PF	435541
80kA FKH	800	FKH36NM800PF	435538	FKH436NM800PF	435542
100kA FKL	800	FKL36NM800PF	435539	FKL436NM800PF	435543

One code covers: A standard fixed front connection breaker + Assembled trip unit + Toggle Elongator + Breaker finishing covers + Fixation hardware

(1) Switchable 0%, 50% or 100% neutral protection, neutral on left.
(2) Neutral on left

FK1250 - Complete circuit breaker

Selective Electronic Trip Unit type SMR1e

	In (A)	3 pole 3 trips Cat. no.	Ref. no.	4 pole[1] N selectable 0-50-100% Cat. no.	Ref. no.
50kA FKN	1000	FKN36NE100SQF	435396	FFKN46NE100SQF	435450
	1250	FKN36NE125SSF	435384	FKN46NE125SSF	435438
80kA FKH	1000	FKH36NE100SQF	435288	FKH46NE100SQF	435342
	1250	FKH36NE125SSF	435276	FKH46NE125SSF	435330
100kA FKL	1000	FKL36NE100SQF	435545	FKL46NE100SQF	435547
	1250	FKL36NE125SSF	435546	FKL46NE125SSF	435549

One code covers: A standard fixed front connection breaker + Assembled trip unit + Toggle Elongator + Breaker finishing covers + Fixation hardware

Enhanced Selective Electronic Trip Unit type SMR1s

	In (A)	3 pole 3 trips Cat. no.	Ref. no.	4 pole[1] N selectable 0-50-100% Cat. no.	Ref. no.
50kA FKN	1000	FKN36NS100SQF	435432	FKN46NS100SQF	435486
	1250	FKN36NS125SSF	435420	FKN46NS125SSF	435474
80kA FKH	1000	FKH36NS100SQF	435324	FKH46NS100SQF	435378
	1250	FKH36NS125SSF	435312	FKH46NS125SSF	435366

One code covers: A standard fixed front connection breaker + Assembled trip unit + Toggle Elongator + Breaker finishing covers + Fixation hardware

Enhanced Selective Electronic Trip Unit type SMR1g (= s + ground fault)

	In (A)	3 pole 3 trips Cat. no.	Ref. no.	4 pole[1] N selectable 0-50-100% Cat. no.	Ref. no.
50kA FKN	1000	FKN36NG100SQF	435414	FKN46NG100SQF	435468
	1250	FKN36NG125SSF	435402	FKN46NG125SSF	435456
80kA FKH	1000	FKH36NG100SQF	435306	FKH46NG100SQF	435360
	1250	FKH36NG125SSF	435294	FKH46NG125SSF	435348

One code covers: A standard fixed front connection breaker + Assembled trip unit + Toggle Elongator + Breaker finishing covers + Fixation hardware

Line Thermal magnetic trip unit LTM (adjustable settings)

	In (A)	3 pole 3 trips Cat. no.	Ref. no.	4 pole 3 trips[2] Cat. no.	Ref. no.
50kA FKN	1000	FKN36NT100SF	435550	FKN436NT100SF	435562
	1250	FKN36NT125SF	435551	FKN436NT125SF	435563
80kA FKH	1000	FKH36NT100SF	435553	FKH436NT100SF	435565
	1250	FKH36NT125SF	435554	FKH436NT125SF	435566
100kA FKL	1000	FKL36NT100SF	435555	FKL436NT100SF	435567
	1250	FKL36NT125SF	435557	FKL436NT125SF	435569

One code covers: A standard fixed front connection breaker + Assembled trip unit + Toggle Elongator + Breaker finishing covers + Fixation hardware

Motor Protection (Mag Break™) Magnetic Only Breaker

	In (A)	3 pole 3 trips Cat. no.	Ref. no.	4 pole 3 trips[2] Cat. no.	Ref. no.
50kA FKN	1250	FKN36NM125SF	435558	FKN436NM125SF	435570
80kA FKH	1250	FKH36NM125SF	435559	FKH436NM125SF	435571
100kA FKL	1250	FKL36NM125SF	435561	FKL436NM125SF	435573

One code covers: A standard fixed front connection breaker + Assembled dummy trip unit + Toggle elongator + Breaker finishing covers + Fixation hardware

(1) Switchable 0%, 50% or 100% neutral protection, neutral on left.
(2) Neutral on left

FK1600 - Complete circuit breaker

Selective Electronic Trip Unit type SMR1e

	In (A)	3 pole 3 trips Cat. no.	Ref. no.	4 pole(1) N selectable 0-50-100% Cat. no.	Ref. no.
50kA FKN	1600	FKN36NE160TTF	**435387**	FKN46NE160TTF	**435441**
80kA FKH	1600	FKH36NE160TTF	**435279**	FKH46NE160TTF	**435333**

One code covers: A standard fixed front connection breaker + Assembled trip unit + Toggle Elongator + Breaker finishing covers + Fixation hardware

Enhanced Selective Electronic Trip Unit type SMR1s

	In (A)	3 pole 3 trips Cat. no.	Ref. no.	4 pole(1) N selectable 0-50-100% Cat. no.	Ref. no.
50kA FKN	1600	FKN36NS160TTF	**435423**	FKN46NS160TTF	**435477**
80kA FKH	1600	FKH36NS160TTF	**435315**	FKH46NS160TTF	**435369**

One code covers: A standard fixed front connection breaker + Assembled trip unit + Toggle Elongator + Breaker finishing covers + Fixation hardware

Enhanced Selective Electronic Trip Unit type SMR1g (= s + ground fault)

	In (A)	3 pole 3 trips Cat. no.	Ref. no.	4 pole(1) N selectable 0-50-100% Cat. no.	Ref. no.
50kA FKN	1600	FKN36NG160TTF	**435405**	FKN46NG160TTF	**435459**
80kA FKH	1600	FKH36NG160TTF	**435297**	FKH46NG160TTF	**435351**

One code covers: A standard fixed front connection breaker + Assembled trip unit + Toggle Elongator + Breaker finishing covers + Fixation hardware

FKY- Non-Automatic circuit breaker (Switch)

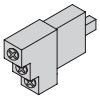
	In (A)	3 pole Cat. no.	Ref. no.	4 pole(2) Cat. no.	Ref. no.
FKY	800	FKY306DN800PF	**435495**	FKY406DN800PF	**435504**
	1000	FKY306DN100SF	**435381**	FKY406DN100SF	**435273**
	1250	FKY306DN125SF	**435489**	FKY406DN125SF	**435498**
	1600	FKY306DN160TF	**435492**	FKY406DN160TF	**435501**

One code covers: A standard fixed front connection breaker + Assembled dummy trip unit + Toggle elongator + Breaker finishing covers + Fixation hardware

(1) Switchable 0%, 50% or 100% neutral protection, neutral on left.
(2) Neutral on left

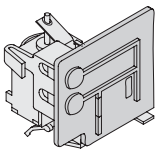
FK - Internal accessories

Contacts



	Changeover					
	Cat. no.	Ref. no.	Cat. no.	Ref. no.	Cat. no.	Ref. no.
Aux. switch right mounted CO	FNS11R	**436401**				
Bell alarm contact right mounted CO	FNBA11R	**435761**				

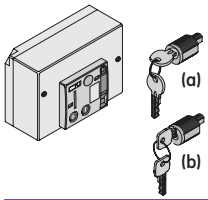
Releases



	Shunt		Undervoltage		Delayed undervoltage	
24V AC/DC	FNSHTD	**435693**	-	-	-	-
24 V AC	-	-	FNUVR1	**435698**	-	-
24 V DC	-	-	FNUVRD	**435701**	-	-
48 V AC/DC	FNSHTF	**435694**	-	-	-	-
48V /DC	-	-	FNUVRF	**435702**	-	-
110/130V AC/DC	FNSHTJ	**435695**	-	-	-	-
230V AC	-	-	FNUVR6	**435699**	-	-
220/240V AC - 220/2450V DC	FNSHTN	**435696**	-	-	-	-
400V AC	-	-	FNUVR8	**435700**	-	-
380/440V AC/DC	FNSHT8	**435692**	-	-	-	-
230V AC	-	-	-	-	FNUVD6	**435697**

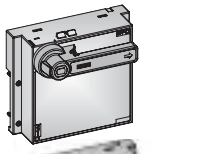
FK - Operators

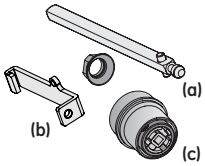
Electrical operators



24V AC/DC		FNEMFD	**435683**			
48V AC/DC		FNEMFF	**435680**			
110V AC		FNEMF3	**435686**			
110V DC		FNEMFJ	**436457**			
230V AC		FNEMF6	**435689**			
250V DC		FNEMFN	**436456**			
Keylock for electr. operator Ronis[1]	(a)	FN1BRE	**435679**			
Keylock for electr. operator Profalux[1]	(b)	FN1BPE	**435678**			

Rotary handles



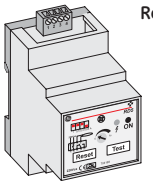


	Direct on device		Rotary handle through door or cover plate[2]		Panel or door mounted	
Grey	FNNRF/5	**436522**	FNNRC/5	**436517**	-	-
Red	FNNRFV/5	**436524**	FNNRCV/5	**436518**	-	-
Grey + Early closing aux. switches 2xNO[3]	-	-	FNNRY/5	**436527**	-	-
Red + Early closing aux. switches 2xNO[3]	-	-	FNNRYV/5	**436528**	-	-
Grey	-	-	-	-	FNNRD/5	**436519**
Red	-	-	-	-	FNNRDV/5	**436520**
Grey + Early closing aux. switches 2xNO[3]	-	-	-	-	FNNRZ/5	**436530**
Red + Early closing aux. switches 2xNO[3]	-	-	-	-	FNNRZV/5	**436531**

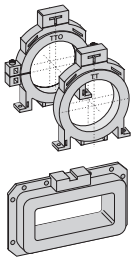
Accessories				
Extension shaft kit (max. 600 mm)	(a)	FNNRE	**435738**	Only for use with panel or door mounted type
Flex operator adaptor push to trip	(b)	FGNFT	**432867**	Only for use with panel or door mounted type
Adaptor for drawout	(c)	FNNRW	**435745**	
Ronis keylock 1104B nr. BC 1027[1]	(d)	FA1BR1	**430088**	
Ronis keylock 1104B nr. BC 1053[1]	(d)	FA1BR2	**430089**	
Ronis keylock 1104B nr. BC 2932[1]	(d)	FA1BR3	**430504**	
Ronis keylock 1104B nr. BC 2911[1]	(d)	FA1BR4	**430505**	
Ronis keylock 1104B nr. BC 2936[1]	(d)	FA1BR5	**430506**	
Ronis keylock 1104B nr. BC 2940[1]	(d)	FA1BR6	**430507**	
Ronis lock with random key[1]	(d)	FA1BRH	**430068**	
Profalux lock with random key[1]	(e)	FA1BPH	**430813**	

(1) Key included
(2) Add door flange FGFH for door lock options
(3) On request 1xNO/1xNC is available.

FK - Residual current devices

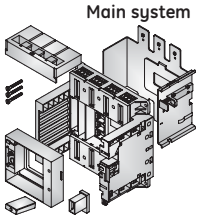


Relay	IΔ n	Operating voltage	Settable delay	Nr. of modules	Cat. no.	Ref. no.	Pack.
RD5	0.03 ... 1A	110V AC	0 - 1 s	3	RD5 110	**704175**	1
	0.03 ... 1A	220V AC	0 - 1 s	3	RD5 220	**704169**	1
	0.03 ... 1A	380V AC	0 - 1 s	3	RD5 380	**704176**	1
RD6	0.2 ... 5A	110V AC	0.5 - 5 s	3	RD6 110	**704178**	1
	0.2 ... 5A	220V AC	0.5 - 5 s	3	RD6 220	**704177**	1
	0.2 ... 5A	380V AC	0.5 - 5 s	3	RD6 380	**704179**	1
RD1D	0.01 ... 5A	110V AC	0 - 3 s	3	RD1D 110	**872225**	1
	0.01 ... 5A	220/230V AC	0 - 3 s	3	RD1D 220	**872224**	1
	0.01 ... 5A	380/400V AC	0 - 3 s	3	RD1D 380	**872226**	1



Sensor			
Round Internal diameter Ø 35mm	TT 35	**560091**	1
Round Internal diameter Ø 60mm	TT 60	**560092**	1
Round Internal diameter Ø 80mm	TT 80	**560093**	1
Round Internal diameter Ø 110mm	TT110	**560094**	1
Round Internal diameter Ø 160mm	TT160	**560095**	1
Round Internal diameter Ø 210mm	TT 210	**560096**	1
Round Internal diameter Ø 22mm Din Rail type	TTD 22	**560090**	1
Round; splittable Internal diameter Ø 110mm	TTO 110	**560097**	1
Round; splittable Internal diameter Ø 210mm	TTO 210	**560098**	1
Rectangular opening70 x 175mm	BTR 175	**704154**	1
Rectangular opening115 x 305mm	BTR 305	**704155**	1
Rectangular opening130 x 350mm	BTR 350	**704156**	1

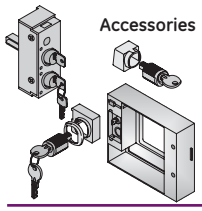
FK - Drawout system



Main system	3 pole		4 pole	
Model with front connection				
Complete set for FK800	FNWS3WP	**433434**	FNWS4WP	**436481**
Complete set for FK1250 & FK1600	FNWS3WT	**436482**	FNWS4WT	**433442**
Model with rear connection				
Complete set for FK800	FNWS3AP	**433436**	FNWS4AP	**433440**
Complete set for FK1250 & FK1600	FNWS3AT	**435757**	FNWS4AT	**435759**

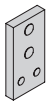
One code covers the fixed and withdrawable part of the draw-out system, with plug-in base, mounting accessories and fixation hardware.

Auxiliary disconnects (Secondary wiring)			
Complete set 6 pole	FNPFM	**435758**	

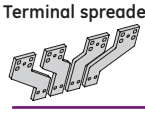


Accessories			
Keylock in chasis pos. 1 Ronis 1104A[1]	FN1BRW1	**435575**	
Keylock in chasis pos. 2 Ronis 1104A[1]	FN1BRW2	**435577**	
Position indication contact CO	FNS11L	**435760**	
Doorflange specific for drawout type	FNFW	**435578**	
Keylock in doorflange pos. 1 Ronis 1104A[1]	FN1BRY1	**433415**	
Keylock in doorflange pos. 2 Ronis 1104A[1]	FN1BRY2	**435574**	

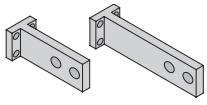
FK - Connections: optional



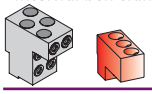
Terminal extenders[2]	3 pcs		4 pcs	
Flat FK800 - FK1250	FNBES3P	**435706**	FNBES4P	**435707**
Flat FK1250 -FK 1600	FNBES3R	**433420**	FNBES4R	**433422**



Terminal spreader flat[2]				
Flat FK800 - FK1250	FNBSS3P	**435708**	FNBSS4P	**435711**
Flat FK1250 -FK 1600	FNBSS3R	**435710**	FNBSS4R	**435712**



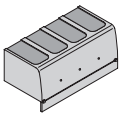
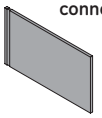
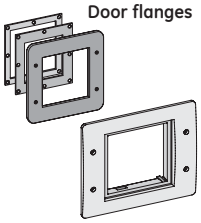
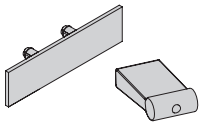
Rear connections[2]				
Set 3 pole (2 short, 1 long)	FNBRC3	**433423**	-	-
Set 4 pole (2 short, 2 long)	-	-	FNBRC4	**433425**
Set 3 pole (3 short)	FNBRCS3	**433426**	-	-
Set 4 pole (4 short)	-	-	FNBRCS4	**433427**



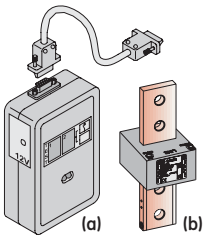
Internal box clamps[2]				
Box Clamp Cu/Al, for 3 x 70-240 sq.mm.	FNTCA3327	**436316**	FNTCA3427	**436651**
Box Clamp Cu/Al, for 4 x 70-240 sq.mm.	FNTCA4327	**433438**	FNTCA4427	**433439**

(1) Key included
(2) Set for equipping the line OR load side of breaker.

FK - Installation Accessories

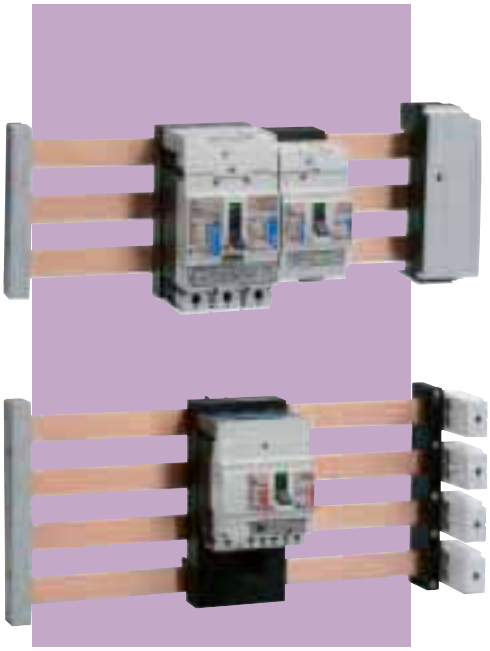
		3 pole		4 pole	
		Cat. no.	Ref. no.	Cat. no.	Ref. no.
Terminal shields (with finishing covers)					
	Long, set of 2 pcs.	FNJL3	**435716**	FNJL4	**435719**
Specific to connection area					
	Phase separators, set of 12 pcs	FNJP	**435722**		
Padlocking devices for toggle operator(1)					
	Padlocking removable	FN1PR	**433417**		
Circuit indication / coding					
	Set of 20 blank labels	FAC	**430821**		
Door flanges					
	Front face toggle area	FNFT	**435715**		
	Rotary handle (through cover plate model)	FNFH	**435714**		
	Motor operator	FNFE	**435713**		
	Rotary handle through cover model on drawout breaker	FNFHW	**436590**		
Spare parts					
	Finishing covers (set of 2 pieces)	FNUA3	**435762**	FNUA4	**435763**
	Spare toggle (set of 5 pieces)	FNUT	**435764**		

FK - Accessories electronic trip units

 (a) (b)	Battery test device	(a)	FNT	**435704**	
	Sensor 800A for Ground fault device	(b)	FNGS0800	**433419**	
	Sensor 1000A for Ground fault device	(b)	FNGS1000	**433421**	
	Sensor 1250A for Ground fault device	(b)	FNGS1250	**435709**	
	Sensor 1600A for Ground fault device	(b)	FNGS1600	**436471**	

(1) Padlocks not included

Notes



Standards

EN 60439-1
VDE 0660 Teil 500

Connectivity

Record Plus™ Breaker types

Adaptor type	Breaker types				
FBAD	FDE 160A	FDS 160A	FDN 160A	FDH 160A	FDL 160A
FBAE		FEV 160/250A	FEN 160/250A	FEH 160/250A	FEL 160/250A

Icu (kA) at 400/415V AC					
	25	36	50	80	150

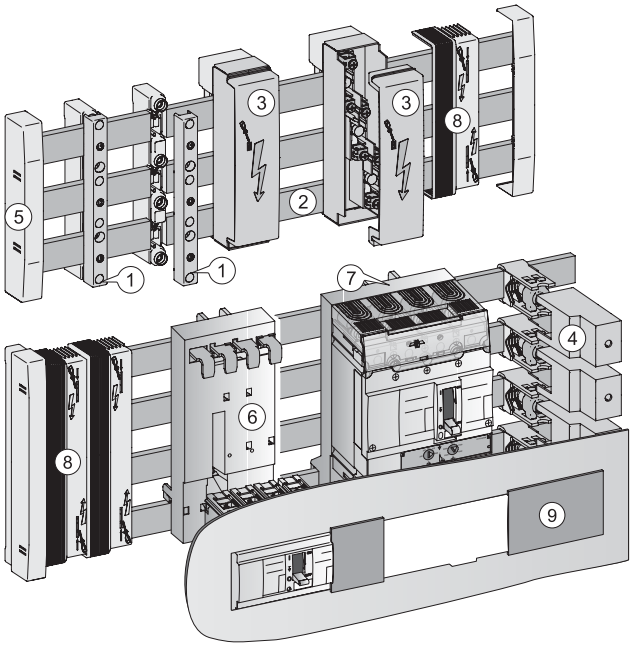
Busbar types and Ratings

Busbar Size	In in A	Icw (kA) at 400/415V AC 1 second rating(1)		
20 x 5	**250A**	16.7	to	19.9
20 x 10	**450A**	17.6	to	23.8
30 x 5	**400A**	22.4	to	27.6
30 x 10	**630A**	23.3	to	30

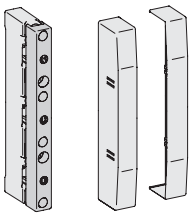
Short-circuit rating of the full system with mounted breakers = The indicated breaking capacity (Icu) of ***Record Plus™*** MCCB's

(1) Depending on support spacing (see page C.16)

① Busbar support
② Busbars (not part of offering)
③ Connection set
④ Lateral connection set
⑤ Support cover
⑥ Adaptor FD
⑦ Adaptor FE
⑧ Busbar covers
⑨ Trim/Cover plate filler

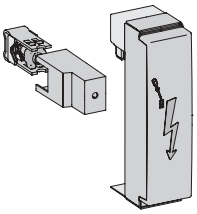


Connectivity system with 60mm spacing; three and four pole



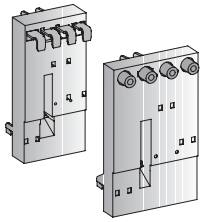
Busbar supports

	3 pole		4 pole	
	Cat. no.	Ref. no.	Cat. no.	Ref. no.
Set of left and right	FBB3S	**433458**	FBB4S	**433464**
Endplate covers, pair of	FBB3E	**433455**	FBB4E	**433461**



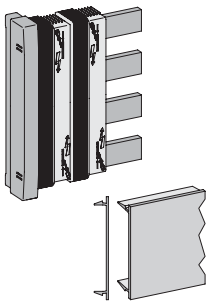
Connections

	Incoming from side		Incoming from front	
1 pole for lateral bar, flexible bar or cable connection Cu/Al 35-240 mm^2 for busbar section 5 mm	FBTS1L12	**433468**	-	-
1 pole for lateral bar, flexible bar or cable connection Cu/Al 35-300 mm^2 for busbar section 10 mm	FBTS10L12	**433474**	-	-
3 pole set for conductors 1.5 to 70mm^2	-	-	FBTF3L12	**433456**
4 pole set for conductors 1.5 to 70mm^2	-	-	FBTF4L12	**433497**



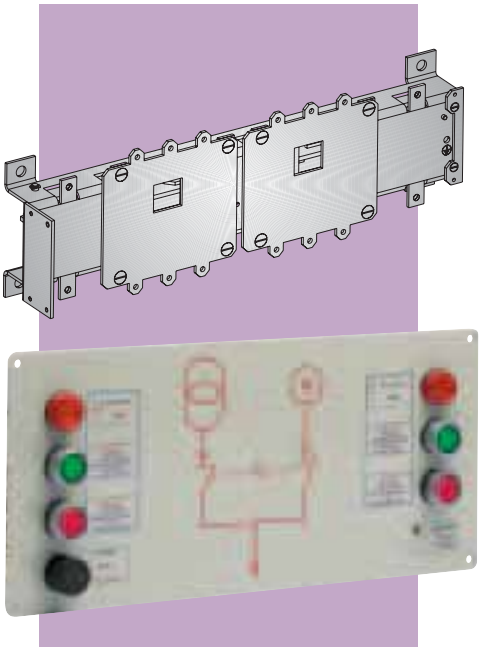
Adaptors

	3 pole		4 pole	
FD frame 160A	FBAD3	**433443**	FBAD4	**433446**
FE frame 250A	FBAE3	**433449**	FBAE4	**433452**



Installation

Busbar cover adjustable 3pole	FBCI3	**433377**
Busbar cover adjustable 4pole	FBCI4	**433444**
Filler for cover plate cut out of 64mm l=1.2m	FBF6	**883970**



Changeover devices

Available short-circuit rating at 415V AC in kA

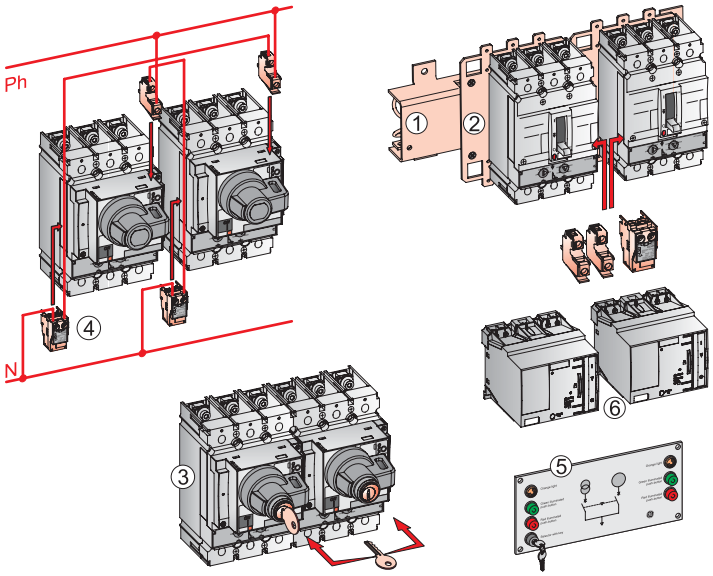
Device	Y	N	H	L
FE 160	3	50	80	150
FE 250	4.5	50	80	150
FG 400	6	50	80	150
FG 630	8	50	80	150
FK 800	10	50	80	100
FK1250	15	50	80	100
FK1600	20	50	80	

Available trip units, number of poles and trips (protected poles)

Device	Y	LTMD(1)	GTM(1)	SMR types	Mag Break
FE 160	Y	N,H,L	N,H	N,H,L	N,H,L
FE 250	Y	N,H,L	N,H	N,H,L	N,H,L
FG 400	Y	N,H,L		N,H,L	N,H,L
FG 630	Y			N,H,L	N,H,L
FK 800	Y	N,H,L		N,H,L	N,H,L
FK1250	Y	N,H,L		N,H,L	N,H,L
FK1600	Y			N,H	
3 pole 3 trips	Y(2)	N,H,L	N,H	N,H,L	N,H,L
4 pole 4 trips	Y(2)	N,H,L	N,H	N,H,L	
4 pole 3 trips		N,H,L	N,H	N,H,L	N,H,L
4 pole 3.5 trips (N=50%)(3)		N,H,L	N,H	N,H,L	

(1) FG & FK type LTM only (2) 3 or 4 pole without trips (3) Rated current > 63 A

LTM
Line thermal magnetic protection
LTMD
Selective thermal magnetic protection
GTM
Generator thermal magnetic protection
SMR types
Selective/Modular electronic trip units
Mag Break™
Magnetic Only protection
Y
Non Automatic or switch (not mentioned in tables)



Available device combinations

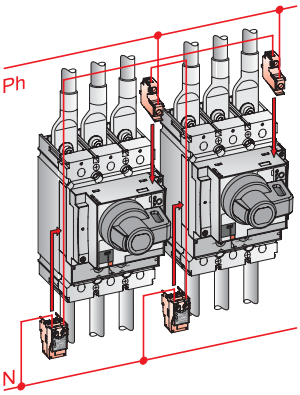
Main device N		Secundary device R	
FE 160	10 - 160A	FE 160	10 - 160A
FE 250	80 - 250A	FE 250	80 - 250A
FG 400	100 - 400A	FE 160	10 - 160A
FG 630	160 - 630A	FE 250	80 - 250A
FG 400	100 - 400A	FG 400	100 - 400A
FG 630	160 - 630A	FG 630	160 - 630A
FK 800	320 - 800A	FG 400	100 - 400A
FG 1250	400 - 1250A	FG 630	160 - 630A
FG 1600	640 - 1600A		
FK 800	320 - 800A	FK 800	320 - 800A
FG 1250	400 - 1250A	FG 1250	400 - 1250A
FG 1600	640 - 1600A	FG 1600	640 - 1600A

① Mechanical interlock for two breakers
② Breaker mounting plates
③ Mechanical interlock with lock in rotary handles
④ Electrical interlock with UVR and SHT release
⑤ Controller for automatic changeover suitable for two breakers
⑥ Electrical operators

Technical features ● pg. C.18

Changeover systems

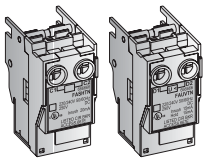
Electrical interlocking of two breakers



System with early action contacts in rotary handle and coils in both breakers[1]

Main Device N (left) FE160/250	Main Device N (left) FG400/630	Main Device N (left) FK800/1600	Secondary Device R (right) FE160/250	Secondary Device R (right) FG400/630	Secondary Device R (right) FK800/1600	Required main components (Listed protection devices are breakers or switches; order codes can be found on : FE 160: page A.13, FE 250 : page A.16, FG 400: page A.25, FG 630 : page A.27, FK 800: page A.35, FK1250 : page A.36, FK1600: page A.37)	Can be combined with Option 1 or 2 Cat. no.	Ref. no.	Qty
x			x			Rotary handle, grey, through door or panel type FE with 1 NO and 1 NC contact	FENRX/5	**436499**	2
						Shunt release in mains device	F- - - - - -	**4 - - - -**	1
						Undervoltage release in secondary device	F- - - - - -	**4 - - - -**	1
	x			x		Rotary handle, grey, through door or panel type FG with 1 NO and 1 NC contact	FGNRX/5	**436512**	2
						Shunt release in mains device	F- - - - - -	**4 - - - -**	1
						Undervoltage release in secondary device	F- - - - - -	**4 - - - -**	1
	x			x		Rotary handle, grey, through door or panel type FG with 1 NO and 1 NC contact	FGNRX/5	**436512**	1
						Rotary handle, grey, through door or panel type FE with 1 NO and 1 NC contact	FENRX/5	**436499**	1
						Shunt release in mains device	F- - - - - -	**4 - - - -**	1
						Undervoltage release in secondary device	F- - - - - -	**4 - - - -**	1
		x			x	Rotary handle, grey, through door or panel type FK with 1 NO and 1 NC contact	FNNRX/5	**436526**	2
						Shunt release in mains device	F- - - - - -	**4 - - - -**	1
						Undervoltage release in secondary device	F- - - - - -	**4 - - - -**	1
		x			x	Rotary handle, grey, through door or panel type FK with 1 NO and 1 NC contact	FNNRX/5	**436526**	1
						Rotary handle, grey, through door or panel type FG with 1 NO and 1 NC contact	FGNRX/5	**436512**	1
						Shunt release in mains device	F- - - - - -	**4 - - - -**	1
						Undervoltage release in secondary device	F- - - - - -	**4 - - - -**	1

(1) Also available for three breakers



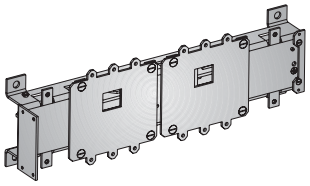
Shunt release for breaker/switch

	FE & FG type		FK type	
24V AC/DC	FASHTD	**430843**	FNSHTD	**435693**
110/130V AC/DC	FASHTJ	**430849**	FNSHTJ	**435695**
220/240V AC 250V DC	FASHTN	**430852**	FNSHTN	**435696**

Undervoltage release for breaker/switch

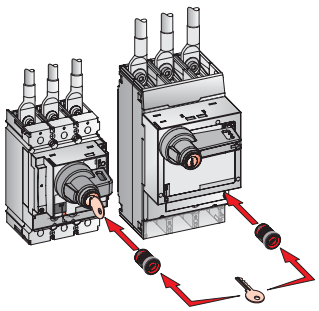
	FE & FG type		FK type	
24V AC/DC	FAUVRD	**430861**	-	-
24V AC	-	-	FNUVR1	**435698**
24V DC	-	-	FNUVRD	**435701**
110/130V AC/DC	FAUVRJ	**430867**	FNUVRJ	**437018**
220/240V AC 250V DC	FAUVRN	**430870**	-	-
230V AC	-	-	FNUVR6	**435699**

Mechanical interlocking of two breakers



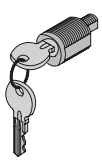
System with walking beam

Main Device N (left) FE160/250	Main Device N (left) FG400/630	Main Device N (left) FK800/1600	Secondary Device R (right) FE160/250	Secondary Device R (right) FG400/630	Secondary Device R (right) FK800/1600	Required components: Listed protection devices are breakers or switches; order codes can be found on : FE 160: page A.13; FE 250 : page A.16; FG 400: page A.25; FG 630 : page A.27; FK 800: page A.35; FK1250 : page A.36; FK1600: page A.37	Option 1 Cat. no.	Ref. no.	Qty
x			x			Mechanical interlock 2 FE frame breakers	FE1I2	**437001**	1
	x			x		Mechanical interlock 2 FG frame breakers	FG1I2	**437005**	1
	x		x			Mechanical interlock 1 FG & 1 FE frame breakers	FG1I4	**437009**	1
		x			x	Mechanical interlock 2 FK frame breakers	FN1I2F	**433416**	1
		x		x		Mechanical interlock 1 FK & 1 FG frame breaker	FN1I4F	**437016**	1



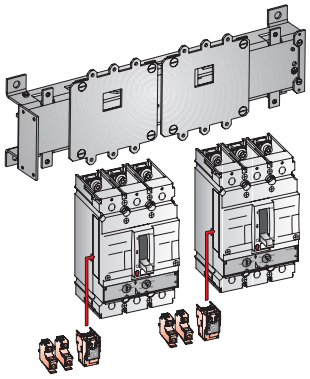
System with rotary handles, 1 key and two locks (Ronis 1104)[1]

Main Device N (left) FE160/250	Main Device N (left) FG400/630	Main Device N (left) FK800/1600	Secondary Device R (right) FE160/250	Secondary Device R (right) FG400/630	Secondary Device R (right) FK800/1600	Required components: Listed protection devices are breakers or switches; order codes can be found on : FE 160: page A.13; FE 250 : page A.16; FG 400: page A.25; FG 630 : page A.27; FK 800: page A.35; FK1250 : page A.36; FK1600: page A.37	Option 2 Cat. no.	Ref. no.	Qty
x			x			Rotary handle, grey, through door or panel type FE	FENRC	**432102**	2
						Ronis keylock	FA1BR --	**430 - - -**	2
	x			x		Rotary handle, grey, through door or panel type FG	FGNRC	**432873**	1
						Ronis keylock	FA1BR --	**430 - - -**	2
	x		x			Rotary handle, grey, through door or panel type FE	FENRC	**432102**	1
						Rotary handle, grey, through door or panel type FG	FGNRC	**432873**	1
						Ronis keylock	FA1BR --	**430 - - -**	2
		x			x	Rotary handle, grey, through door or panel type FK	FNNRC	**435726**	1
						Ronis keylock	FA1BR --	**430 - - -**	2
		x		x		Rotary handle, grey, through door or panel type FK	FNNRC	**435726**	1
						Rotary handle, grey, through door or panel type FG	FGNRC	**432873**	1
						Ronis keylock	FA1BR --	**430 - - -**	2



Keylocks type Ronis 1104 with key			
Ronis keylock 1104B nr. BC 1027	FA1BR1	**430088**	One type only
Ronis keylock 1104B nr. BC 1053	FA1BR2	**430089**	
Ronis keylock 1104B nr. BC 2932	FA1BR3	**430504**	
Ronis keylock 1104B nr. BC 2911	FA1BR4	**430505**	
Ronis keylock 1104B nr. BC 2936	FA1BR5	**430506**	
Ronis keylock 1104B nr. BC 2940	FA1BR6	**430507**	

Complete automatic changeover sets

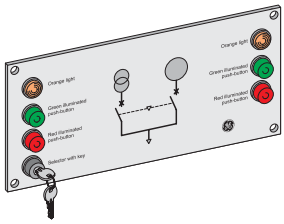


Two power supplies, ONLY one of which is allowed to supply the network

Main Device N (left) FE160/250	Main Device N (left) FG400/630	Main Device N (left) FK800/1600	Secondary Device R (right) FE160/250	Secondary Device R (right) FG400/630	Secondary Device R (right) FK800/1600		Required main components Listed protection devices are breakers or switches order codes can be found on : FE 160: page A.13 FE 250 : page A.16 FG 400: page A.25 FG 630 : page A.27 FK 800: page A.35 FK1250 : page A.36 FK1600: page A.37	Cat. no.	Ref. no.	Qty
x			x			Option 1	System 110V 50/60Hz with all necessary breaker accessories for two FE frames - WITHOUT CONTROLLER	FEEO1J	**437000**	1
							System 220V 50/60Hz with all necessary breaker accessories for two FE frames - WITHOUT CONTROLLER	FEEO1N	**437003**	1
							Controller type E or E plus	FAEC --	**87- - - -**	1
	x			x		Option 2	System 110V 50/60Hz with all necessary breaker accessories for two FG frames - WITHOUT CONTROLLER	FGEO2J	**437004**	1
							System 220V 50/60Hz with all necessary breaker accessories for two FG frames - WITHOUT CONTROLLER	FGEO2N	**437007**	1
							Controller type E or E plus	FAEC --	**87- - - -**	1
	x		x			Option 3	System 110V 50/60Hz with all necessary breaker accessories for 1 FG + 1 FE frame - WITHOUT CONTROLLER	FGEO3J	**437008**	1
							System 220V 50/60Hz with all necessary breaker accessories for 1 FG + 1 FE frame - WITHOUT CONTROLLER	FGEO3N	**437010**	1
							Controller type E or E plus	FAEC --	**87- - - -**	1
		x			x	Option 4	System 110V 50/60Hz with all necessary breaker accessories for two FK frames - WITHOUT CONTROLLER	FKEO4J	**437011**	1
							System 220V 50/60Hz with all necessary breaker accessories for two FK frames - WITHOUT CONTROLLER	FKEO4N	**437014**	1
							Controller type E or E plus	FAEC --	**87- - - -**	1
	x			x		Option 5	System 110V 50/60Hz with all necessary breaker accessories for 1 FK + 1 FG frame - WITHOUT CONTROLLER	FKEO5J	**437015**	1
							System 220V 50/60Hz with all necessary breaker accessories for 1 FK + 1 FG frame - WITHOUT CONTROLLER	FKEO5N	**437017**	1
							Controller type E or E plus	FAEC --	**87- - - -**	1

Allowed combinations

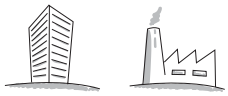
OFF	OFF
ON	OFF
OFF	ON



Required controller type E model[1]		
Controller 110/127V 50/60 cycles FE-FG frame	FAECA3	**436453**
Controller 110/127V 50/60 cycles combinations with FK frame	FNECA3	**436452**
Controller 220/240V 50/60 cycles FE-FG frame	FAECA6	**872240**
Controller 220/240V 50/60 cycles combinations with FK frame	FNECA6	**436451**
Required controller type E Plus model[1]		
Controller 110/127V 50/60 cycles FE-FG frame	FAECE3	**872141**
Controller 110/127V 50/60 cycles combinations with FK frame	FNECE3	**436450**
Controller 220/240V 50/60 cycles FE-FG frame	FAECE6	**872140**
Controller 220/240V 50/60 cycles combinations with FK frame	FNECE6	**436449**
E model with voltage monitoring[1]		
Add indicated code to controller cat nr. and add extra ref.nr.	- - - - - M	**872052**

(1) This are the reference numbers for the controler in english version. For other languages, consult us.

Applications



Residual current devices with separate sensors

RD5, RD6 and RD1D

Function

RCD Relay

The relay part of the RCD device is a DIN-rail mounted device containing the electronics and the setting area. On receipt of a signal from the sensor two contacts are operated.

Sensor

Placed around the phase and neutral current paths it detects the vectorial sum of the current in the circuit. When this sum is no longer zero, a signal is sent to the connected RCD relay.

The connection between the relay and the sensor should be as short as possible, the maximum circuit resistance may not exceed 30 Ohm.

If the lead length is longer than 5 meters and/or the sensitivity is adjusted to values < 0.5A the use of screened cables and earthed screening is recommended.

The same recommendation applies in cases where the sensor is installed in an environment where strong magnetic fields occur.

For high nominal currents or high sensitivities the cables must be centered within the sensor.

The use of an oversized sensor and/or reduced cable cross sections not centraly passing within the sensor could result in inaccurate readings.

Characteristics

RCD Relay

- Complies with EN 50082 & EN 60730
- For sinusoidal and pulsating earth leakages
- Test button and reset (memory clean) button
- Permanent working signal (green) and tripping signal (red) by means of LED
- Adjustable time delay (except 30mA) by means of potentiometer
- Two output contacts, one potential free
- Automatic test feature of the combination relay/sensor is provided
- On disconnection of the sensor, the relay trips
- Plug-in terminal block
- Width: 3 modules of 18 mm
- For installation in modular enclosures, DIN-rail mounted

Sensor

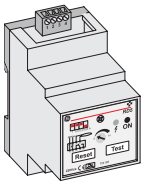
- Accuracy: 3/10,000 of the phase current (TTO type 1/10,000)
- Frequency: from 4 to 400Hz
- Sealable cover terminals
- For use with the relay types RD1D, RD5 and RD6 as described here. Also applicable for use with the reconnection relay RRC1 and RRC2 (see seperate publications)

Dimensions ● pg G.33

	RD5	RD6	RD1D
Operating voltage	110; 220; 380/400V 50/60Hz ±15%	110; 220; 380/400V 50/60Hz ±15%	110; 220; 380/400V 50/60Hz ±15%
Power consumption	2.5VA	2.5VA	2.5VA
Sensitivity settings	0.03 ; 0.3 ; 0.5 ; 1A	0.2 ; 0.5 ; 2 ; 5A	0.01 - 5A in steps of 10mA
Setting method	Dipswitches	Dipswitches	Digital with LCD display
Frequency	50/60Hz	50/60Hz	50/60Hz
Time delay adjustment (1)	0 - 1 second	0.5 - 5 seconds	0 - 3 seconds in steps of 50ms
Tripping time 30mA type	1x IdN<50ms - 5 x Idn<35ms	1x IdN<50ms - 5 x Idn<35ms	1x IdN<50ms - 5 x Idn<35ms
Tripping threshold	75% of set sensitivity value	75% of set sensitivity value	75% of set sensitivity value
Pre Alarm at 50% setting	----	----	Contact settable at 50% Idn
Contact ratings	5A / 230V	5A / 230	5A / 230V
Operating temperature	- 20 to + 50°C	- 20 to + 50°C	- 20 to + 50°C
Terminal capacity	2.5 mm^2; plug in terminal box	2.5 mm^2; plug in terminal box	2.5 mm^2; plug in terminal box

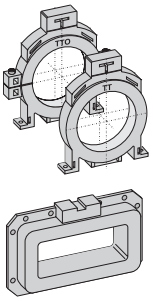
(1) Time setting ALWAYS disabled when 30mA setting is chosen.

RD range differential relay



	IΔn	Operating voltage	Settable delay	Nr. of modules	Cat. no.	Ref. no.	Pack.
RD5	0.03 ... 1A	110V AC	0 - 1 s	3	RD5 110	**704175**	1
	0.03 ... 1A	220/230V AC	0 - 1 s	3	RD5 220	**704169**	1
	0.03 ... 1A	380/400V AC	0 - 1 s	3	RD5 380	**704176**	1
RD6	0.2 ... 5A	110V AC	0.5 - 5 s	3	RD6 110	**704178**	1
	0.2 ... 5A	220/230V AC	0.5 - 5 s	3	RD6 220	**704177**	1
	0.2 ... 5A	380/400V AC	0.5 - 5 s	3	RD6 380	**704179**	1
RD1D	0.01 ... 5A	110V AC	0 - 3 s	3	RD1D 110	**872225**	1
	0.01 ... 5A	220/230V AC	0 - 3 s	3	RD1D 220	**872224**	1
	0.01 ... 5A	380/400V AC	0 - 3 s	3	RD1D 380	**872226**	1

Sensor

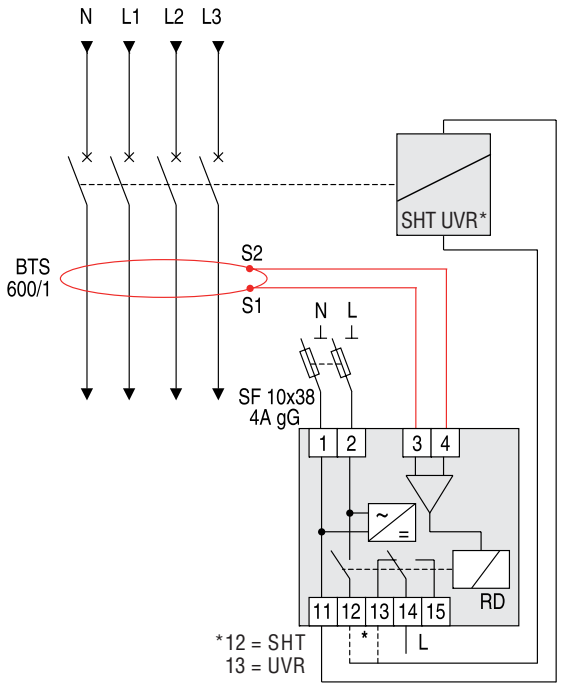


Closed model; internal diameter 22mm , suitable for DIN rail mounting	TTD 22	**560090**	1
Closed model; internal diameter 35mm	TT 35	**560091**	1
Closed model; internal diameter 60mm	TT 60	**560092**	1
Closed model; internal diameter 80mm	TT 80	**560093**	1
Closed model; internal diameter 110mm	TT110	**560094**	1
Closed model; internal diameter 160mm	TT160	**560095**	1
Closed model; internal diameter 210mm	TT 210	**560096**	1
Open/splittable model; internal diameter 110 mm	TTO 110	**560097**	1
Open/splittable model; internal diameter 210 mm	TTO 210	**560098**	1
Closed rectangular model opening 75 x 105mm	BTR 175	**704154**	1
Closed rectangular model opening 115 x 305mm	BTR 305	**704155**	1
Closed rectangular model opening 130 x 350mm	BTR 350	**704156**	1

Accessories

Through Panel/Door mounting kit for relay with DIN -rail, mounting hardware and doorflange.	RDFR	**872227**	1

Wiring Diagram



Just rel

Thermal Magnetic Trip Units

FD frame

Record Plus™ circuit breakers are designed to isolate and switch low voltage distribution circuits and to protect the conductors, equipment and devices included in these circuits.
The FD frame size is designed to use electro-mechanical trip units. These are typical thermal magnetic devices which offer an overload (thermal) and short-circuit protection (magnetic).
The breaker can also be equipped with a Mag Break™ magnetic-only trip unit that offers short-circuit protection.

The trip units have been designed with the user in mind. The trip unit ratings are always indicated in amperes. To prevent unauthorized manipulation of the breaker settings each trip unit comes with a transparent, tamper-free (sealable) cover.
All units come as 3 and 4 pole devices (2p on request) and are available in a number of application-defined subvariants.

The trip unit is an integrated part of the breaker and is not interchangeable. The following versions are available:

LTM (line protection thermal magnetic)
(FD...TF sub type)
Available in the Concise (FD63/160C) and Effective breaker type (FD63/160E).
Has no thermal setting option and a magnetic release set at 10 x In.(1)
Designed for the protection of generic loads.

LTM (line protection thermal magnetic)
(FD..TC & TE sub type)
Available in the Concise (FD63/160C) and Effective breaker type (FD63/160E).
Has a thermal settingof 0.8 to 1 times and a magnetic release set at 10(1) x the selected rating. Designed for the protection of generic loads.

LTMD (line thermal magnetic, selective)
(FD..TD sub type)
Available in the FD63/160S, N, H and L breaker types.
A trip unit offering selectivity with downstream devices as the ElfaPlus MCBs and Surion motor starter. Has a thermal setting of 0.8 to 1 times, and a magnetic release set at 10(1) x the selected rating.
Designed for the selective protection of generic loads.

GTM (generator thermal magnetic)
(FD..TG sub type)
Available in the FD63/160N and H breaker types
Suitable for generator protection and / or long cable runs where a low magnetic threshold is required. Has a thermal setting of 0.8 to 1 times, and a magnetic release set at 4 or 5 times the selected rating.

(1) 160A type 8x

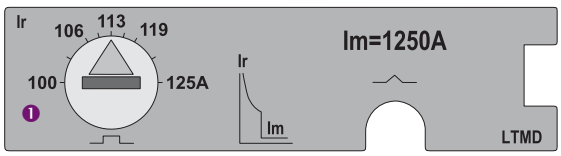
Mag Break™ (magnetic only)
(FD..MO sub type)
Available in the FD63/160N, H and L breaker types.
A trip unit designed to offer short-circuit protection only and specifically suited for motor protection in coordination with a contactor and a thermal relay (EN 60947-4).
Has a settable magnetic threshold of 10 to 15 x In.

Y (non automatic - switch disconnector)
A device available in a 63A and 160A variant.
Has no protection elements.
Designed as switch disconnector

FD63/160 breakers - trip unit overview

FD frame						Trip unit overview							
						In	Thermal setting Ir pick-up band 1.05 ÷ 1.3 Ir		Magnetic setting Im pick-up band ± 20% Im		Neutral protection		
Type	Sub-type	Applicable for breaker types				[A]	min [A]	max [A]		fix [A]	4P4T	4P 3.5T	4P3T
LTM	F.D	C	E			16	Ir = In	16	10 x In	160	=Ir		
						20		20		200	=Ir		
						25		25		250	=Ir		
						32		32		320	=Ir		
						40		40		400	=Ir		
						50		50		500	=Ir		
						63		63		630	=Ir		
						80		80		800	=Ir		
						100		100		1000	=Ir		
						125		125		1250	=Ir		
						160		160	8 x In	1280	=Ir		
LTM	C.D E.D.	C	E			16	Ir = 0.8÷1In	12.8	16	10 x In	160	=Ir	
						20		16	20		200	=Ir	
						25		20	25		250	=Ir	
						32		25.6	32		320	=Ir	
						40		32	40		400	=Ir	
						50		40	50		500	=Ir	
						63		50.4	63		630	=Ir	
						80		64	80		800	=Ir	
						100		80	100		1000	=Ir	
						125		100	125		1250	=Ir	
						160		128	160	8 x In	1280	=Ir	
LTMD	D.D	S	N	H	L	16	Ir = 0.8÷1In	12.8	16	10 x In	160	=Ir	not protected (1)
						20		16	20		200	=Ir	
						25		20	25		250	=Ir	
						32		25.6	32		320	=Ir	
						40		32	40		400	=Ir	
						50		40	50		500	=Ir	
						63		50.4	63		630	=Ir	=Ir/2(1)
						80		64	80		800	=Ir	=Ir/2(1)
						100		80	100		1000	=Ir	=Ir/2(1)
						125		100	125		1250	=Ir	=Ir/2(1)
						160		128	160	8 x In	1280	=Ir	=Ir/2(1)
GTM	G.D		N	H		25	Ir = 0.8÷1In	20	25	5 x In	125	=Ir	not protected
						32		25.6	32		160	=Ir	
						40		32	40		160	=Ir	
						50		40	50		200	=Ir	
						63		50.4	63		252	=Ir	
						80		64	80	4 x In	320	=Ir	=Ir/2
						100		80	100		400	=Ir	=Ir/2
						125		100	125		500	=Ir	=Ir/2
						160		128	160		640	=Ir	=Ir/2
Mag. Break™			N	H	L	3	No protection			Adjust-able 10÷15In	35	52.5	not protected
						7					70	105	
						12.5					125	187.5	
						20					200	300	
						30					300	450	
						50					500	750	
						80					800	1200	
						100					1000	1500	
Y		Y				63	No protection						
						160							

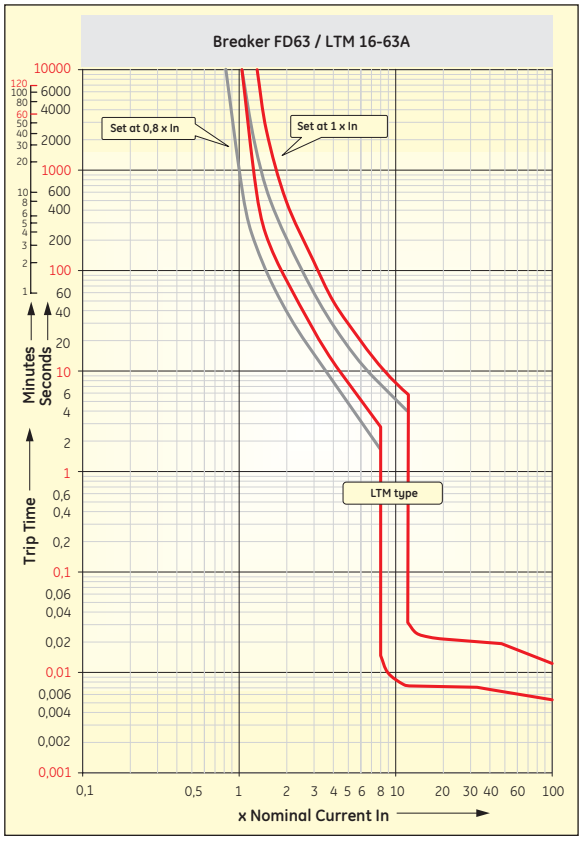
(1) Not available in S type

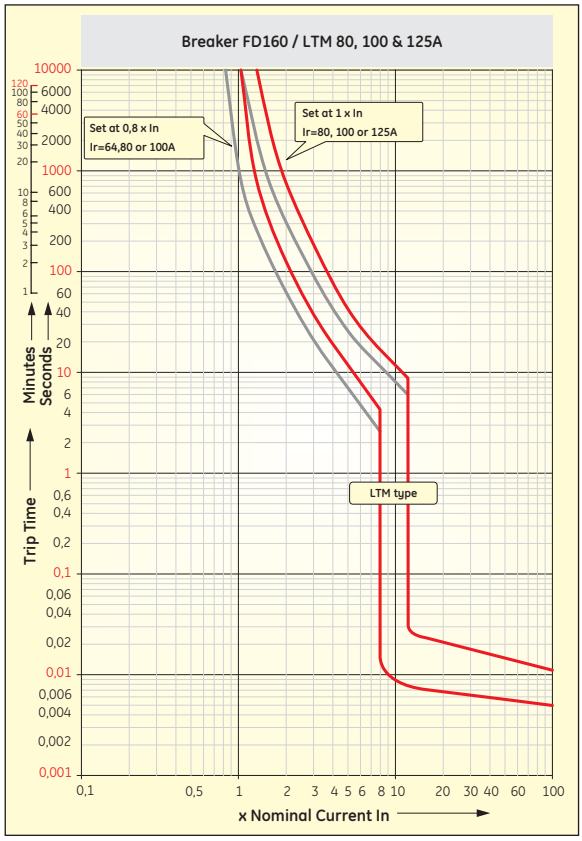


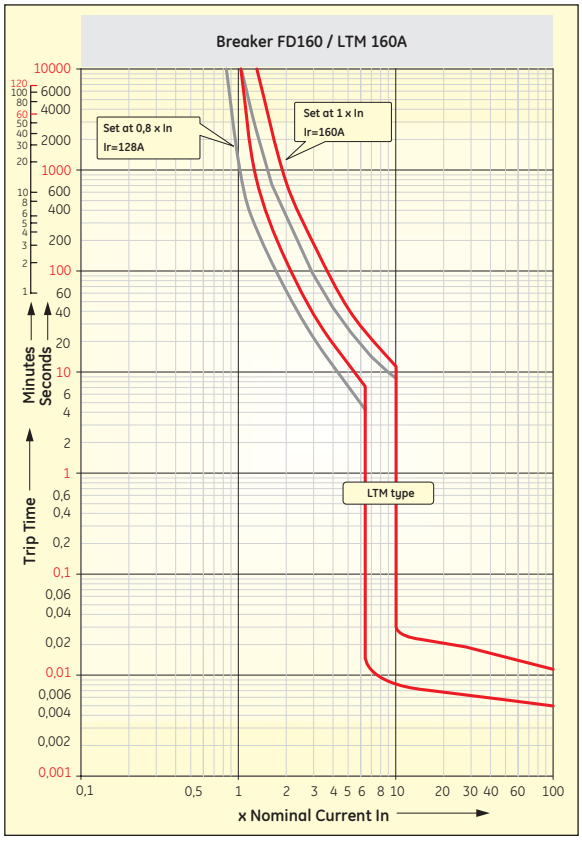
Depicted is the LTMD type

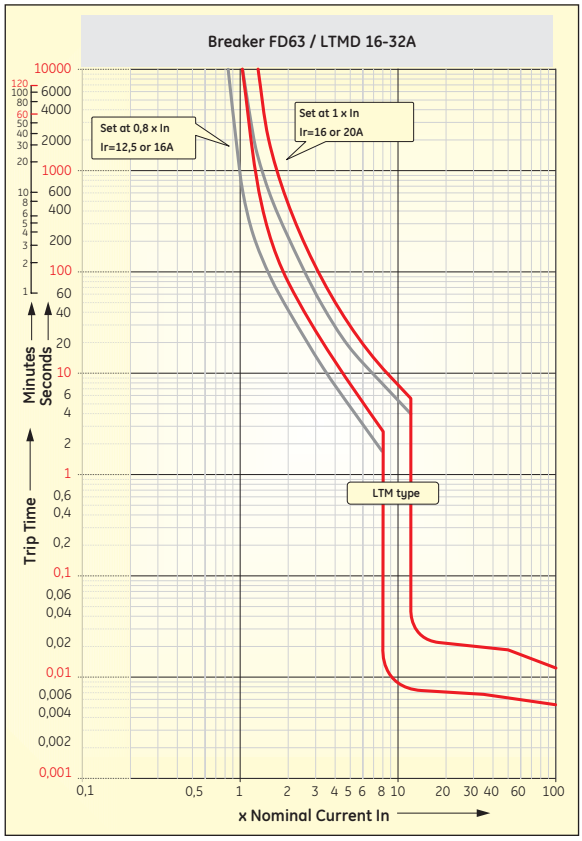
Time Current Curves

FD frame



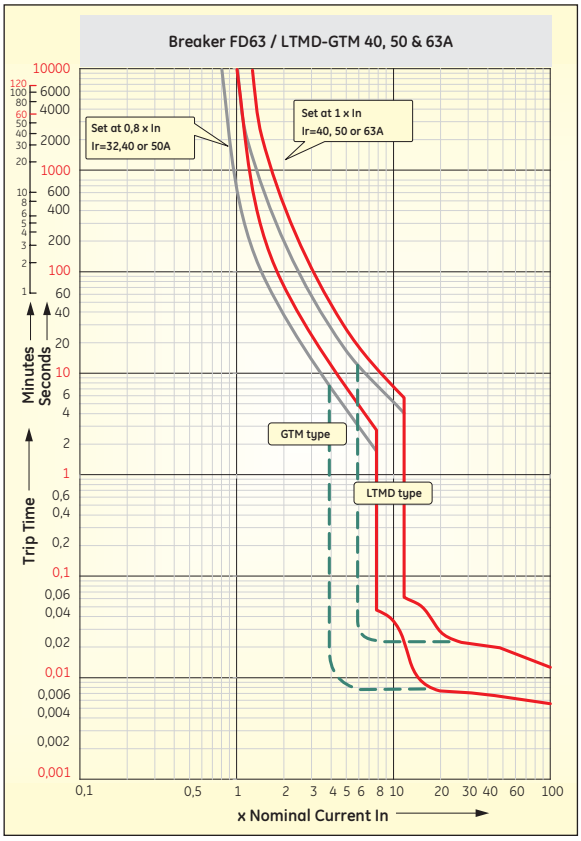


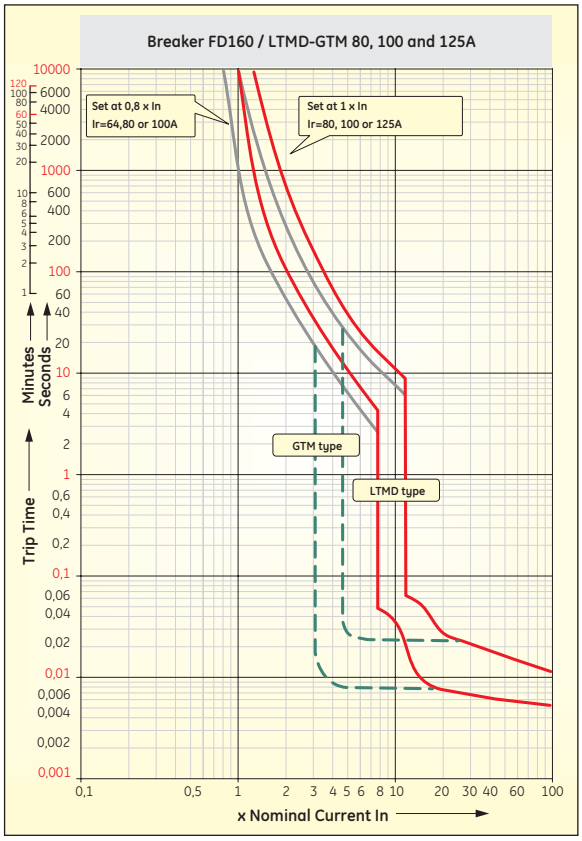


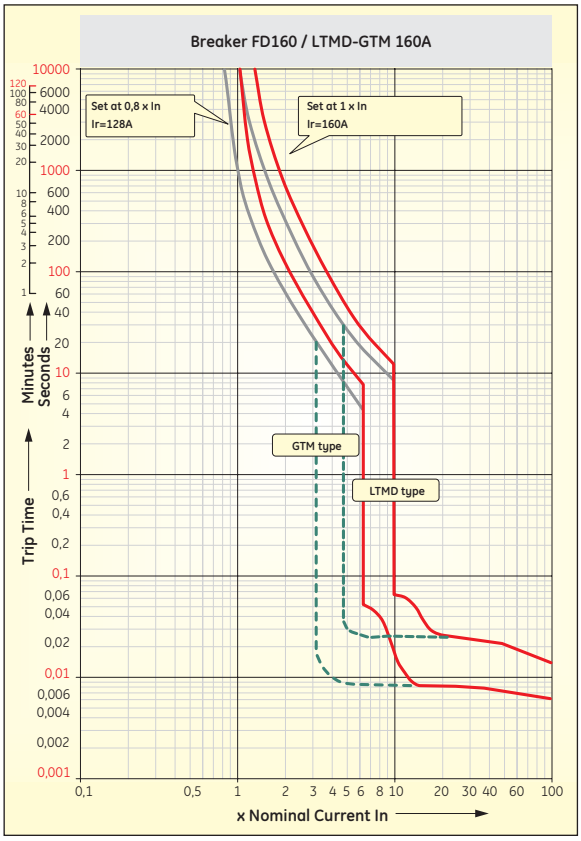


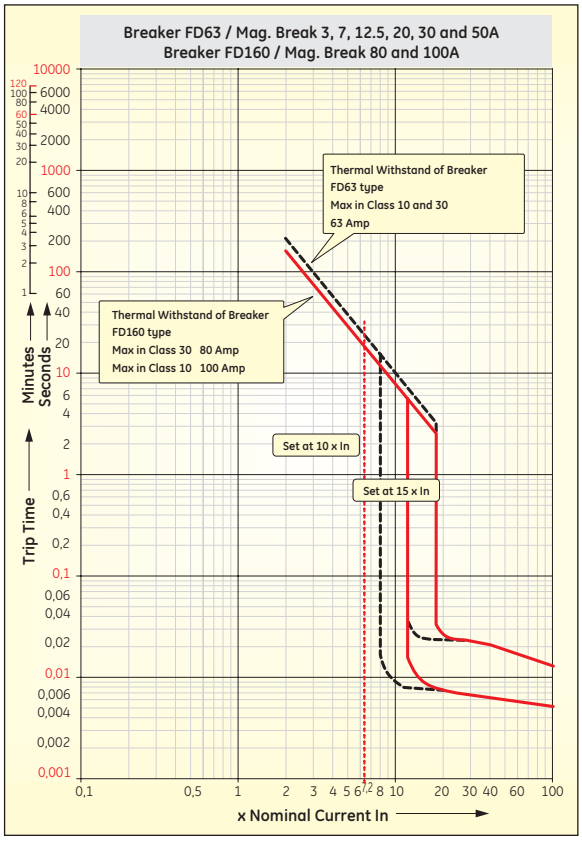
Time current curves are depicted in cold state.
For the types with fixed thermal settings (FD..TF) the 'set at 1x in' curves appply

Time Current Curves









Time current curves are depicted in cold state.
For the types with fixed thermal settings (FD..TF) the 'set at 1x in' curves appply

Thermal Magnetic Trip Units

FE frame

The breaker is built up of a frame and an inter-changeable trip unit. The interchangeability also includes the electronic trip unit and the non-automatic switch variant. The FE frame size trip units are designed to distinguish between an overload or short-circuit and are equipped with indicating flags. This patented GE system saves down time by enabling the user to identify an overload fault and, in accordance with the HD 384 standards to immediately reclose after an overload event. Each trip unit is equipped with an interchange prevention interlock that does not allow one to incorrectly place a 200 or 250A trip unit in a 160A frame size.

The following versions are available:

LTM (line thermal magnetic protection)
(FE...TA sub type)
Available in the FE160N, H & L and the FE250V, N, H & L breaker types.
Has a thermal setting of 0.8 to 1 and a magnetic setting of 5 to 10 times the selected rating.
Designed for the for protection of generic loads.

LTMD (Selective thermal magnetic protection)
(FE...TD sub type)
Available in the FE160N, H & L and FE250N, H & L breaker types.
A trip unit that offers selectivity with downstream devices as the Elfa Plus, FD63/160 range and the Surion motor starter.
Designed for the protection fo generic loads.

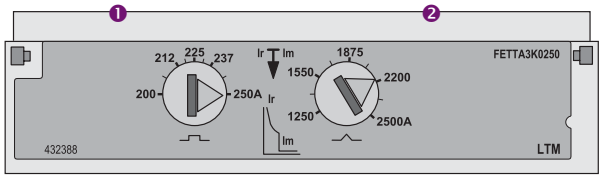
GTM (generator thermal magnetic)
(FE...TG sub type)
Available in the FE160N, H & L and FE250N, H & L breaker types.
Has a thermal setting of 0.8 to 1and a magnetic setting of 3 to 5 times the selected rating.
Suitable for generator protection and / or long cable runs where a low magnetic threshold is required.

Mag Break™ (magnetic only)
(FE...MO sub type)
Available in the FE160N, H & L FE250N, H & L breaker types.
A trip unit designed to offer short-circuit protection only and specifically suited for motor protection in coordination with a contactor and a thermal relay (EN 60947-4).
Has a settable magnetic threshold of 10 to 15 x In.

Y (non automatic - switch disconnector)
A 'dummy 'trip unit available in a 160A and 250A variant.
Has no protection elements.
Designed as switch disconnector.

FE160 and FE250 breakers - trip unit overview (electromechanical)

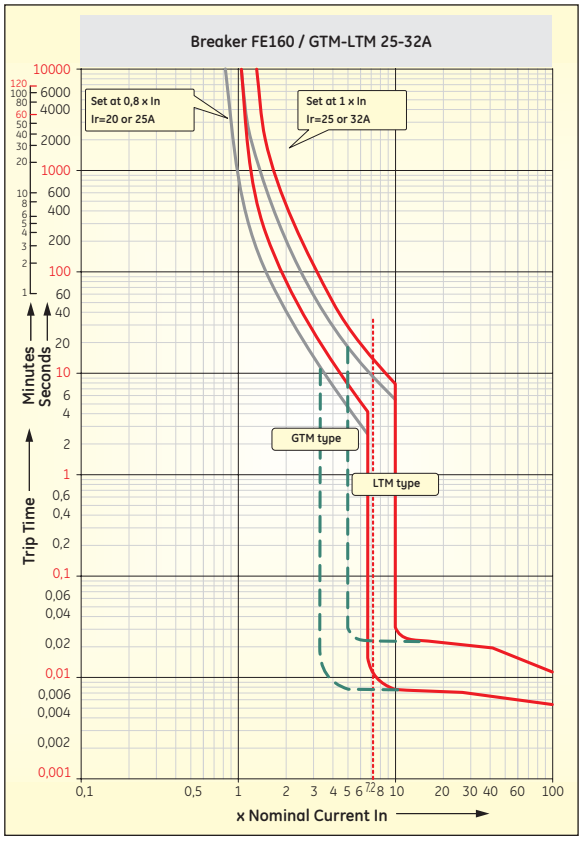
FE frame						Electro-mechanical trip unit overview								
						In	Thermal Ir pick-up band 1.05 ÷ 1.3 Ir			Magnetic Im pick-up band ± 20% Im			Neutral protection		
Type	Sub-type	Applicable for breaker types				[A]		min [A]	max [A]		min [A]	max [A]	4P4T	4P 3.5T	4P3T
LTM	A.E	N	H	L	FE160	25		20	25			200	=Ir		not protected
						32		26	32			256	=Ir		
						40		32	40	Fixed		320	=Ir		
						50		40	50	8 x In		400	=Ir		
						63	adjustable	50	63			504	=Ir	=Ir/2	
						80	0.8÷1xIn	64	80		400	800	=Ir	=Ir/2	
						100		80	100	adjustable	500	1000	=Ir	=Ir/2	
						125		100	125	5÷10 In	625	1250	=Ir	=Ir/2	
						160		128	160		800	1600	=Ir	=Ir/2	
LTMD	D.E	N	H	L	FE160	100		80	100		500	1000	=Ir		not protected
						125	adjustable	100	125	adjustable	625	1250	=Ir		
						160	0.8÷1xIn	128	160	5÷10 In	800	1600	=Ir		
					FE250	125		100	125		625	1250	=Ir	=Ir/2	
						160	adjustable	128	160	adjustable	800	1600	=Ir	=Ir/2	
						200	0.8÷1xIn	160	200	5÷10 In	1000	2000	=Ir	=Ir/2	
						250		200	250		1250	2500	=Ir	=Ir/2	
GTM	G.E	N	H		FE160	40		32	40			160	=Ir		
						50		40	50	Fixed		200	=Ir		
						63	adjustable	50	63	4 x In		252	=Ir	=Ir/2	
						100	0.8÷1xIn	80	100			400	=Ir	=Ir/2	
						125		100	125		375	625	=Ir	=Ir/2	
						160		128	160		480	800	=Ir	=Ir/2	
					FE250	125		100	125	adjustable	375	625	=Ir	=Ir/2	
						160	adjustable	128	160	3-5 In	480	800	=Ir	=Ir/2	
						200	0.8÷1xIn	160	200		600	1000	=Ir	=Ir/2	
						250		200	250		750	1250	=Ir	=Ir/2	
Mag. Break™		N	H	L	FE160	3,5	No protection				24,5	52,5			not protected
						7				adjustable	49	105			
						12,5				7÷15In	87,5	188			
						20					140	300			
						30					210	450			
						50					500	750			
						80					800	1200			
						100				adjustable	1000	1500			
						125				10÷15In	1250	1875			
					FE250	160					1600	2400			
						160					1600	2400			
						200					2000	3000			
						250					2500	3750			
Y		Y			FE160	160	No protection								
					FE250	250									

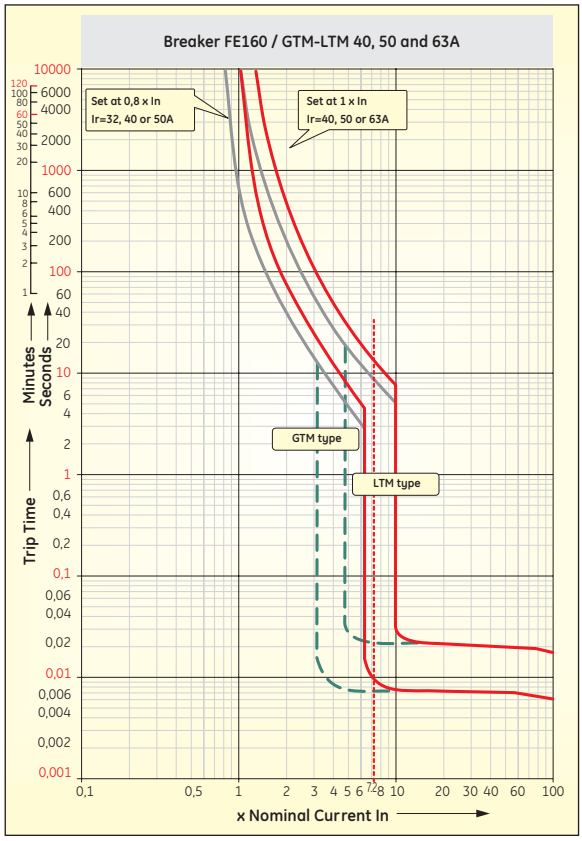


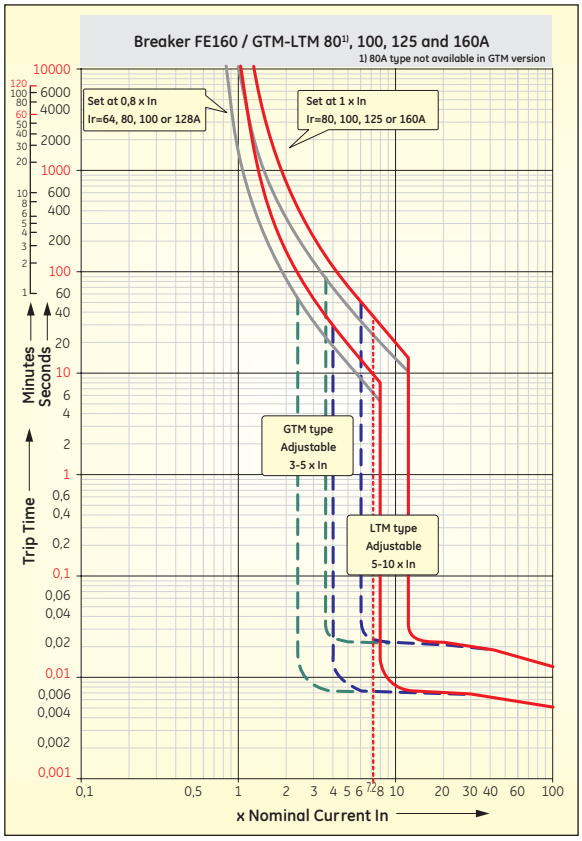
Depicted is the LTMD type

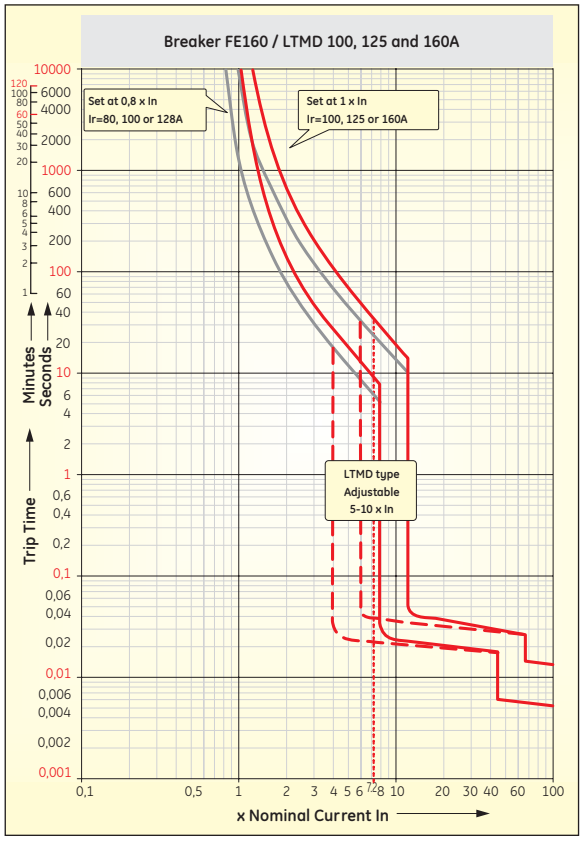
Time Current Curves

FE frame



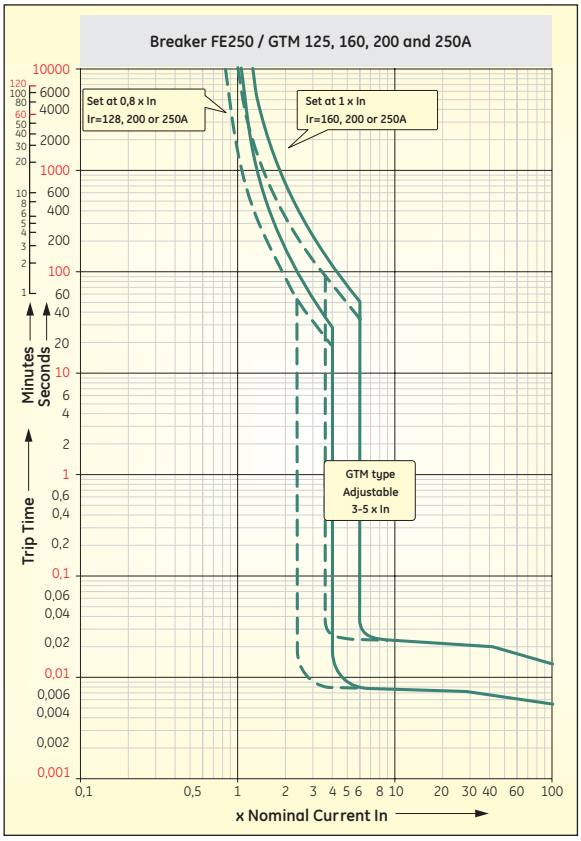


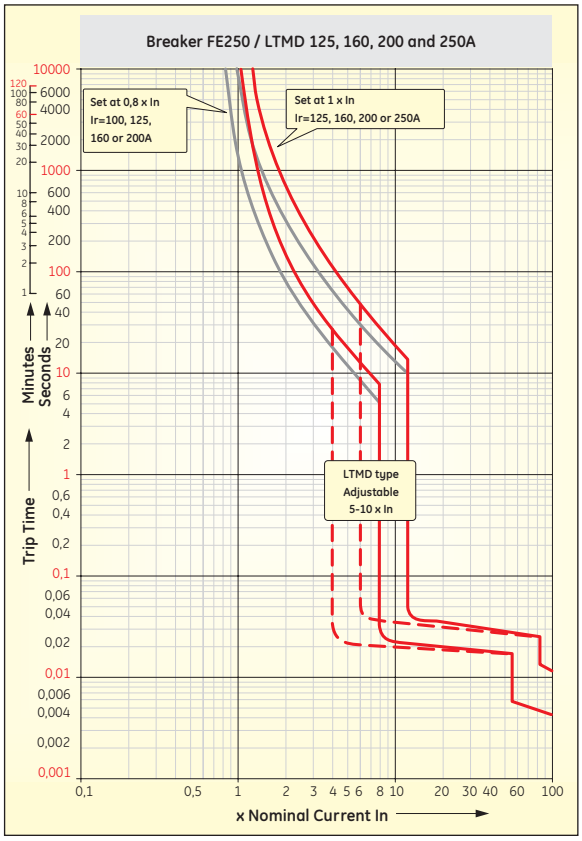


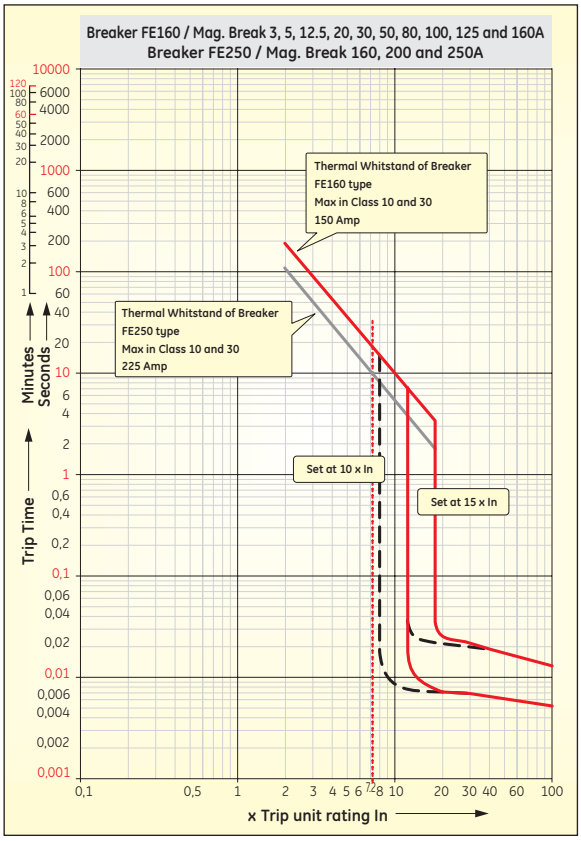


Time current curves are depicted in cold state.

Time Current Curves







Time current curves are depicted in cold state.

Electronic Trip Units

SMR range

Electronic trip units that offer sophisticated protective functions and wide setting bands are standard protection devices for the FG400, FG630, FK800, FK1250 and FK1600 frame sizes. The FE frame can be equipped with interchangeable trip units offering a choice of the electronic or the electro-mechanical device. Each electronic device has been designed with the abnormalities of modern low voltage distribution circuits in mind and has been rigorously tested to cope with harmonic currents, electromagnetic fields, inrush currents and spikes, thus preventing phenomanae as incorrect current measurement and nuisance tripping. The devices exist in a number of performance tiers, the SMR1 device for the FE and FG frame sizes, the SMR 2 for the FG frame size and the SMR1e, 1s and 1g types for the FK frame size.

SMR1

The SMR1 trip unit type is available for all FE and FG frame sizes. The device has two basic protective functions. The first is a **L**ong **T**ime or overload protection with two time bands designed to match motor or cable characteristics and a user defineable setting range. When set to motor protection mode a phase loss protection is initiated that will trip the breaker when the difference in current between one phase line and the average of all three phase drops below 20% .

The second device, the **S**hort **T**ime protection, offers protection against short-circuits and is settable from 2 to 13 (1) x the adjusted LT protection.

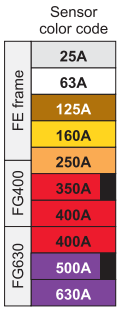
This easy-to-adjust trip unit is equipped with a LT pre-alarm device made up of a LED indicator on the trip unit front face and an electronic contact.

Before the breaker trip is initialized the LED will at first start to blink (at about 0.95 x Ir). When the current flowing through the breaker reaches about 1.05 x Ir and a trip is imminent , the LED stops blinking, remains on and an electronic contact closes, this just before the circuit breaker trips and power is disconnected. This electronic signal can be linked to an external LT module that transforms the electronic signal into one that allows the operation of an external relay.

(The LT module is a modular DIN-rail device).

All SMR 1 trip units have a built-in temperature sensor that trips the breaker at temperatures above 90°C. It thus prevents the breaker and electrical components in its immediate vicinity from overheating.

Each SMR1 trip unit comes with a transparent, tamper-free (sealable) cover, this to prevent unauthorized manipulation of the breaker settings. In the FE frame size they are supplied in a single housing including current sensors that can fully displace the alternative electromechanical device while the FG type is supplied as an electronic pouch (current sensors supplied with the breaker).



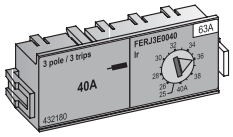
The SMR 1 uses rating plugs that allow the user flexibility to make a last minute choice in the required current rating, protected poles or protection band. These exist in two variants, adjustable and switchable. In order to prevent an insertion of a rating plug into the incorrect trip unit (number of poles and current rating) a mechanical interlock and color coding system are present.

The device is supplied with an electronic actuator coil that fits into a pocket in the breaker housing and is then connected to the trip unit. Without mounted and connected actuator coil the breaker will not function. However, in order to verify a correct operation of the combination a simple test device is available to test the assembly.

We strongly recommend the use of this test device.

Adjustable rating plug

Specifically designed for line protection with a setting range of 0.625 to 1 x the plug rating over 16 setpoints. The settings on the devices are in current values and thus allow for ease of setting.

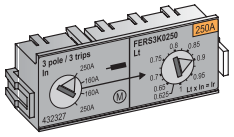


Each trip unit size can be equipped with one of two available adjustable rating plugs types. For 4 pole trip units the rating plugs exist in 3 and 4pole protected versions with a choice in neutral rating between 50 or 100% of the phase value.

Switchable rating plug

Allows for a choice of line or class 10 motor protection(2). The device has two setting knobs: one for the desired rating and band selection and one for the definite current setting.

The current setting is in multiples of the selected rating and has a range of 0.4 to 1 x the trip unit size over 32 setpoints. Each trip unit size has one switchable rating plug. For 4 pole trip units the rating plugs exist in 3 and 4 pole protected versions with a choice in neutral rating between 50 or 100% of the phase value.



(1) Some FG types have a smaller ST setting range.
(2) according to IEC EN 60947-4.1

FE160 and FE250 breakers SMR1 types

Trip units are available in 10 different versions depending on the frame rating and the network frequency.
FE 160 frame size 50/60 Hz 25, 63, 125 and 160A
FE250 frame size 50/60Hz 125, 160 and 250A
400 cycle variants (available on request)
FE160 - 125 and 160A, FE 250 - 250A
The trip units must be equipped with a rating plug that establishes the rated current of the protective device and its setting. A colour code and a mechanical interlock prevent incorrect combinations of electronic trip units and rating plugs. The 50/60Hz and 400Hz variants use the same rating plug. When NO rating plug is installed in the breaker, all protective functions remain operational. This at a reduced current rating. (15 -20 % of the chosen trip unit rating).
For applications where a overload protection is NOT needed a version with disabled LT protection is available.

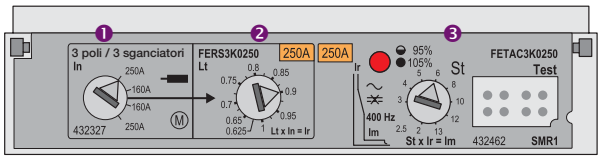
FE 160 & FE 250 Breakers - Electronic Trip Unit Overview

FE frame					Electronic trip unit overview								
					In*	LT			ST			Neutral protection	
						pick-up band 1.05÷1.2 Ir			pick-up band ± 20% Im				
					[A]	Ir setting	min [A]	max [A]	Im setting	min [A]	max [A]	4P4R	4P 3.5T	4P3R
SMR1 + adjustable rating plug	N	H	L	FE160	16	0.625-1xIn 16 steps line protection	10	16	2-13xIr 10 steps	20	208	=Ir		not protected
					25		16	25		32	325	=Ir		
					40		25	40		50	520	=Ir		
					63		40	63		79	819	=Ir	=Ir/2	
					80		50	80		101	1040	=Ir	=Ir/2	
					125		80	125		160	1625	=Ir	=Ir/2	
					100		63	100		126	1300	=Ir	=Ir/2	
					160		100	160		200	2080	=Ir	=Ir/2	
				FE250	80	0.625-1xIn 16 steps line protection	50	80	2-13xIr 10 steps	79	819	=Ir	=Ir/2	
					125		63	125		126	1625	=Ir	=Ir/2	
					100		80	100		160	1300	=Ir	=Ir/2	
					160		100	160		200	2080	=Ir	=Ir/2	
					160		100	160		200	2080	=Ir	=Ir/2	
					250		160	250		320	3250	=Ir	=Ir/2	
SMR1 + switchable rating plug	N	H	L	FE160	25	0.4-1xIn 32 steps line/mot. protection	10	25	2-13xIr 10 steps	20	325	=Ir		not protected
					63		25	63		50	819	=Ir	=Ir/2	
					125		50	125		100	1625	=Ir	=Ir/2	
					160		64	160		128	2080	=Ir	=Ir/2	
				FE250	125	0.4-1xIn 32 steps line/ mot. prot.	50 ❶	125 ❷	2-13xIr 10 steps	100	1625	=Ir	=Ir/2	
					160		64	160		128 ❸	2080	=Ir	=Ir/2	
					250		100	250		200	3250	=Ir	=Ir/2	

* Colour code indicates which rating plug can be applied where

On switching to Motor Protection a phase loss protection is initiated. **Do not use for line protection.**

Band timings	1.5 x Ir	7.2 x Ir
Line protection	65 - 95 sec	2.0 - 3.0 sec
Motor protection	200 - 300 sec	6.4 - 9.6 sec



How to set the device
The defined rating plug defines the long time (LT) setting range and the manner of its adjustment.

LT setting with adjustable rating plug
One knob with 16 positions allows the user a current setting (Ir) between 0.625 and 1 times the chosen rating. (values in A)

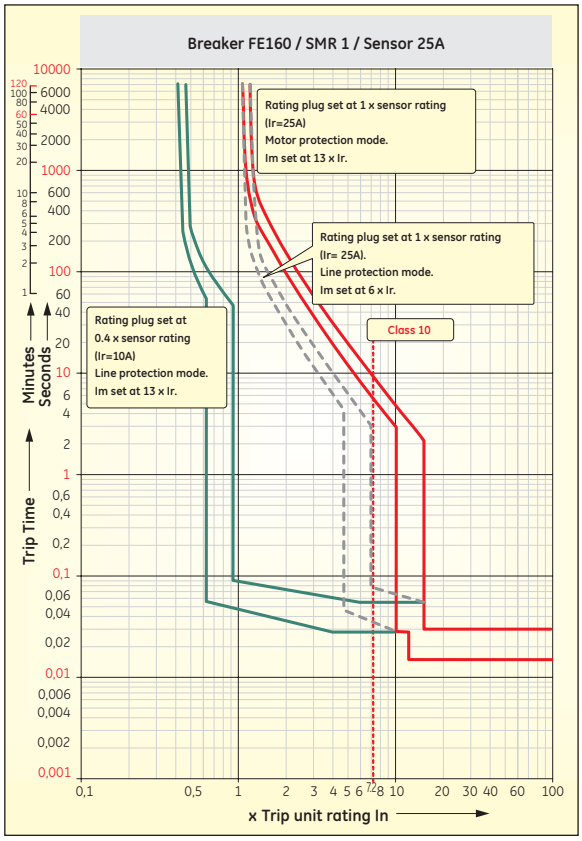
LT setting with switchable rating plug
One knob to set the protection band (line class 5 or motor class 10) and the rated current value (2 current value settings of 0.625 and 1 x the trip unit rating) - in sketch trip unit rating **250A** settings **160A or 250A**.
A second knob with 16 positions allows the user to set the current (Ir in multipliers of chosen rating).
The combination of these two knobs allows a setting range of 0.4 to 1 x the trip unit rating with 32 setpoints.

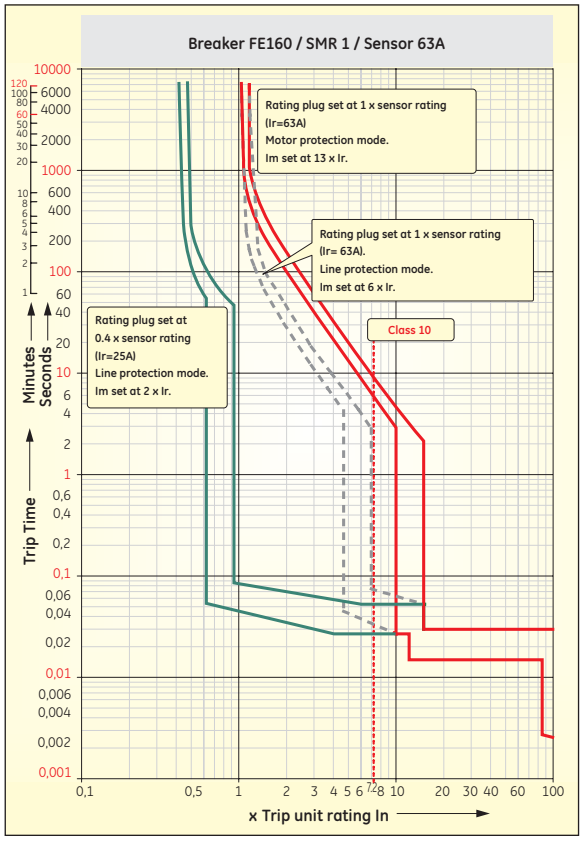
ST or Im setting
Is set in multiples of the LT current setting and has a setting of 2 to 13 x this value with 10 setpoints.

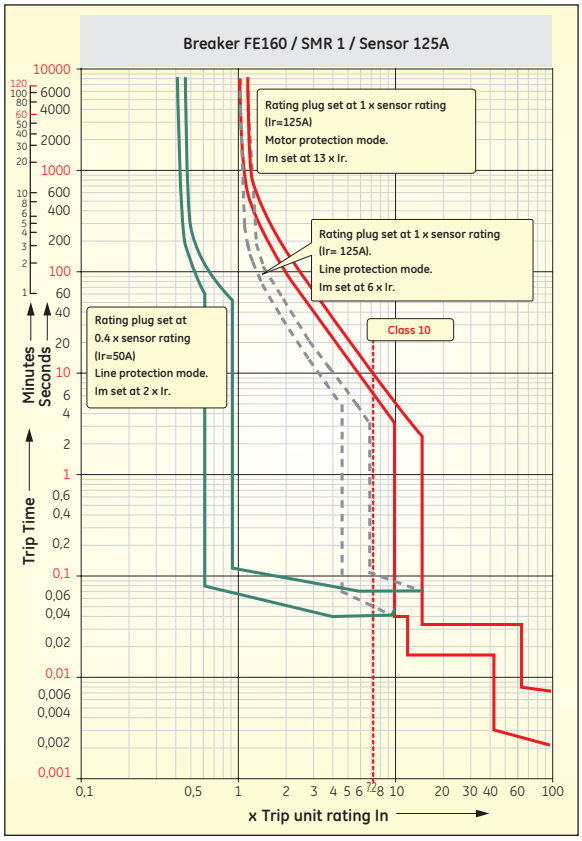
Example
A line protection device; required overload or **LT** setting 120A, short-circuit or **ST** setting 8 x the LT setting.
SMR1 of 250A + switchable rating plug of 250A.
LT setting .....knob 1 set to line and 160A
.....knob 2 set at 0.75 (0.75 x 160 = 120A)
ST setting.....knob 3 set a 8 x (= 8 x 120)
SMR1 of 250A + adjustable rating plug of 160A.
LT setting .....knob 2 set at 120 (value on scale)
ST setting.....knob 3 set at 8 x (= 8 x 120)

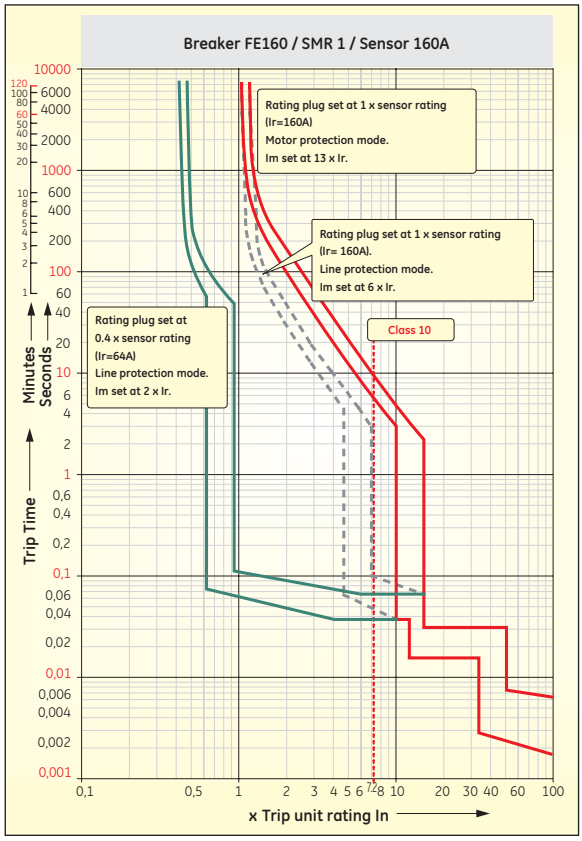
Time Current Curves

FE160 and FE250 breakers
SMR1 types

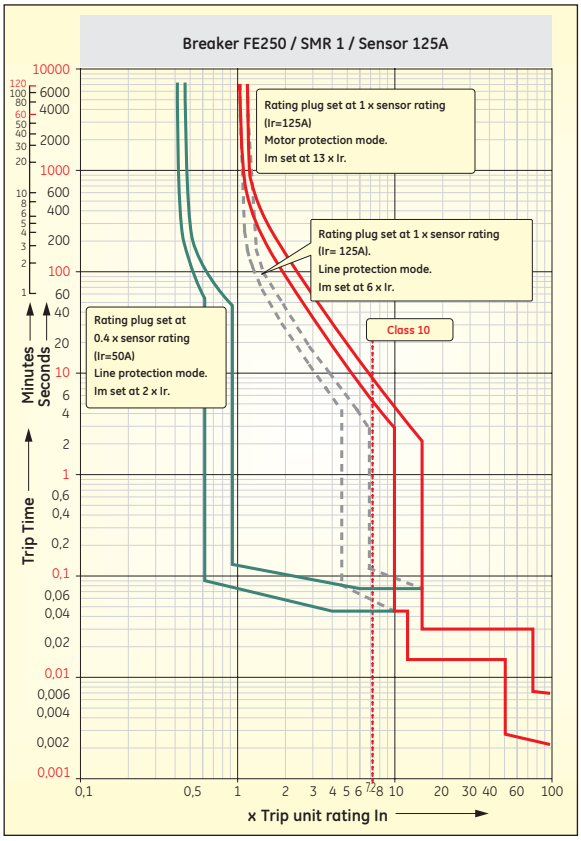


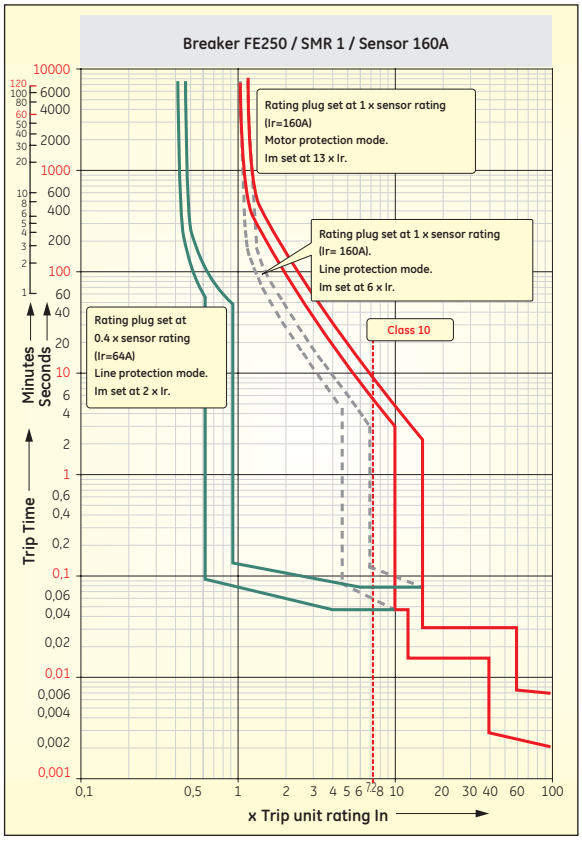


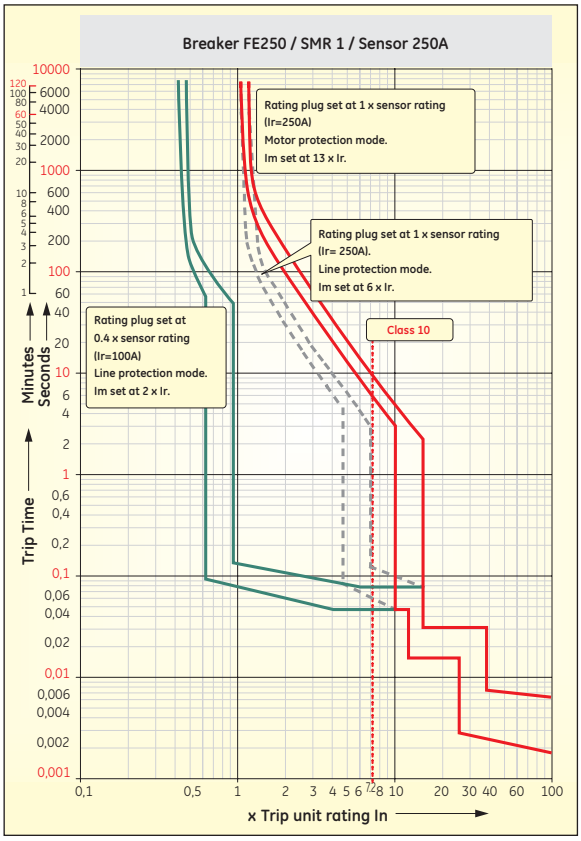




Time Current Curves



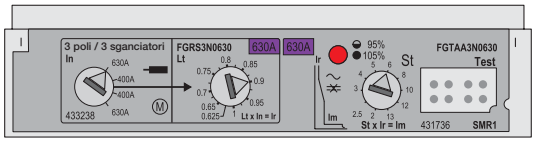




Electronic Trip Units

FG400 and FG630 breakers
SMR1 types

Trip units are available in 6 different versions depending on the frame rating and the network frequency.
FE400 frame size 50/60 Hz 250, 350 and 400A
FE630 frame size 50/60Hz 400, 500 and 630A
400 cycle variants (available on request)
FG400 - 400A, FG 630 - 630A
The trip units must be equipped with a rating plug that establishes the rated current of the protective device and its setting. A colour code and a mechanical interlock prevent incorrect combinations of electronic trip units and rating plugs. The 50/60Hz and 400Hz variants use the same rating plug.
For special applications a version with disabled LT or overload protection is available complete with a specific rating plug.



Band timings	1.5 x Ir	7.2 x Ir
Line protection	65 - 95 sec	2.0 - 3.0 sec
Motor protection	200 - 300 sec	6.4 - 9.6 sec

How to set the device
The rating plug defines the long time (LT) setting range and the manner of its adjustment.

LT setting with adjustable rating plug
One knob with 16 positions allows the user a current setting (Ir) between 0.625 and 1 times the chosen rating (values in A)

LT setting with switchable rating plug:
One knob to set the protection band (line class 2.5 or motor class 10) and the rated current value (2 current value settings of 0.625 and 1 x the trip unit rating - in sketch trip unit rating **400A** settings **250A or 400A**).
A second knob with 16 positions allows the user to set the current (Ir in multipliers of chosen rating).
The combination of these two knobs allows a setting range of 0.4 to 1 x the trip unit rating with 32 setpoints.

ST or Im setting
Is set in multiples of the LT current setting and has a setting of 2 to 13x this values with 10 setpoints.
The ST setting is limited to 10x on the FG00 400A trip unit and FG630 630Amp trip unit.

Example
A line protection device; required overload or **LT** setting 280A, short-circuit or **ST** setting 6 x the LT setting.
SMR1 of 400A +switchable rating plug of 400A.
LT setting .....knob 1 set to line and 315A
.....knob 2 set at 0.9 (0.9 x 315)
ST setting .....knob 3 set a 6 x (=6 x 280)
SMR1 of 400A +adjustable rating plug of 315A.
LT setting .....knob 1 set at 280
ST setting .....knob 3 set a 6 x (=6 x 280)

FG400 & FG630 Breakers - Electronic trip units type SMR1

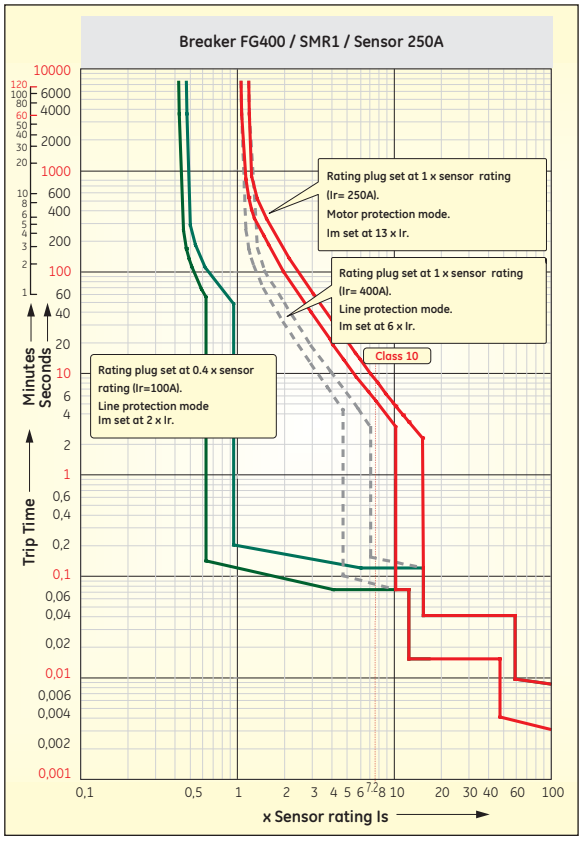
FG frame					Electronic trip unit overview									
					In*	LT pick-up band 1.05÷1.2 Ir			ST pick-up band ± 20% Im			Neutral protection		
					[A]	Ir setting	min [A]	max [A]	Im setting	min [A]	max [A]	4P4T	4P 3TN	4P3T
SMR1 + adjustable rating plug	N	H	L	FG400	160	0.625-1 xIn 16 steps line prot.	100	160	2-13xIr 10 steps	200	2080	=Ir	=Ir/2	not protected
					250		160	250		320	3250	=Ir	=Ir/2	
					160		160	250		320	3250	=Ir	=Ir/2	
					400		250	400		500	5200	=Ir	=Ir/2	
				FG630	400		250	400		500	5200	=Ir	=Ir/2	
					630		400	630	2-10 Ir	800	6300	=Ir	=Ir/2	
SMR1 + switchable rating plug	N	H	L	FG400	250	0.4-1xIn 32 steps line/mot. prot.	100	250	2-13 Ir 10 steps	200	3250	=Ir	=Ir/2	not protected
					400A		160	400		320	3250	=Ir	=Ir/2	
				FG630	400		160	400		320	5200	=Ir	=Ir/2	
					500		250	500		500	6500	=Ir	=Ir/2	

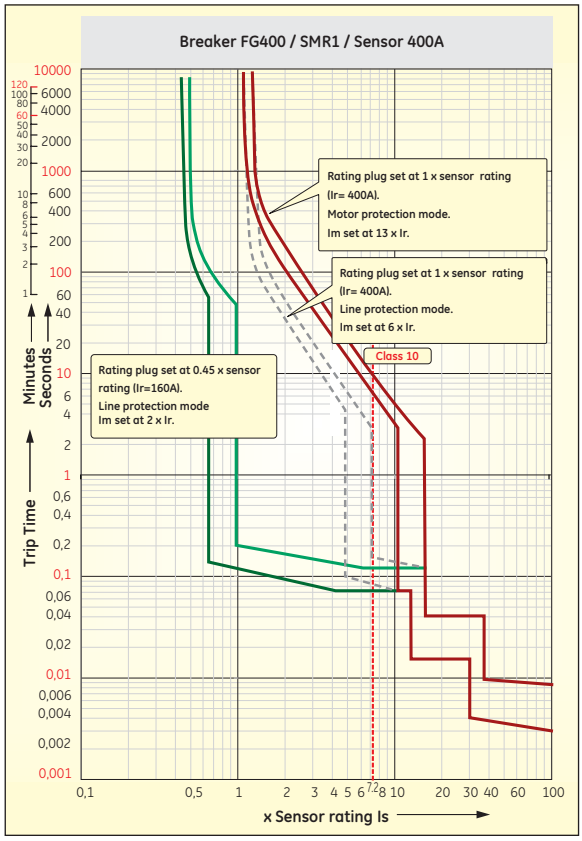
* Colour code indicates which rating plug can be applied where

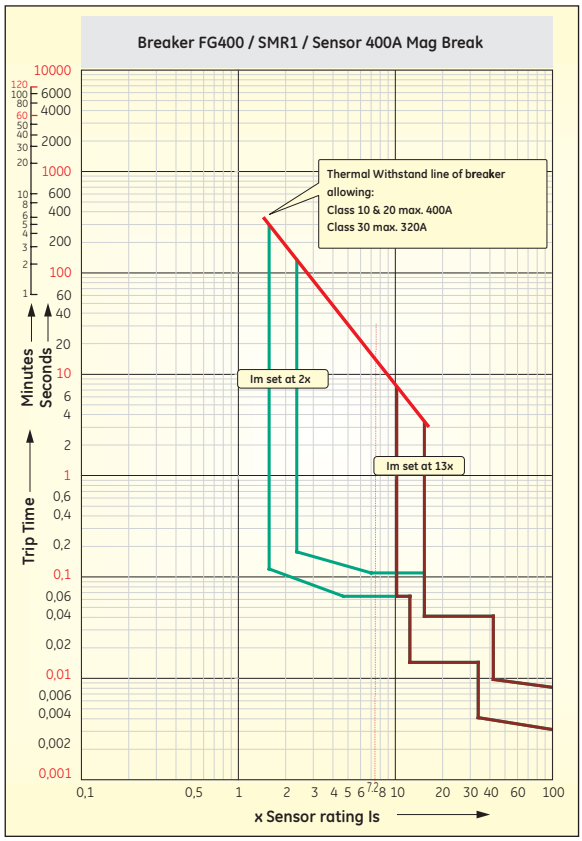
Notes

Time Current Curves

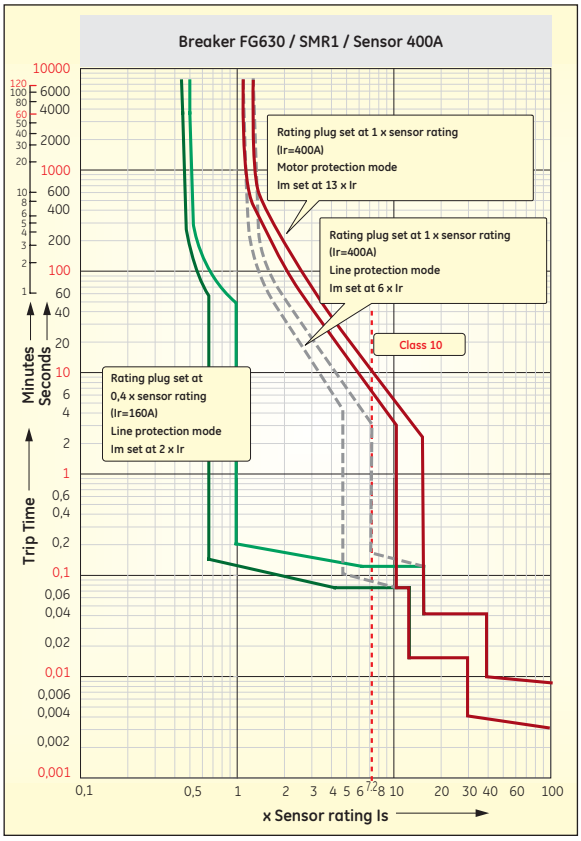
FG400 and FG630 breakers
SMR1 types

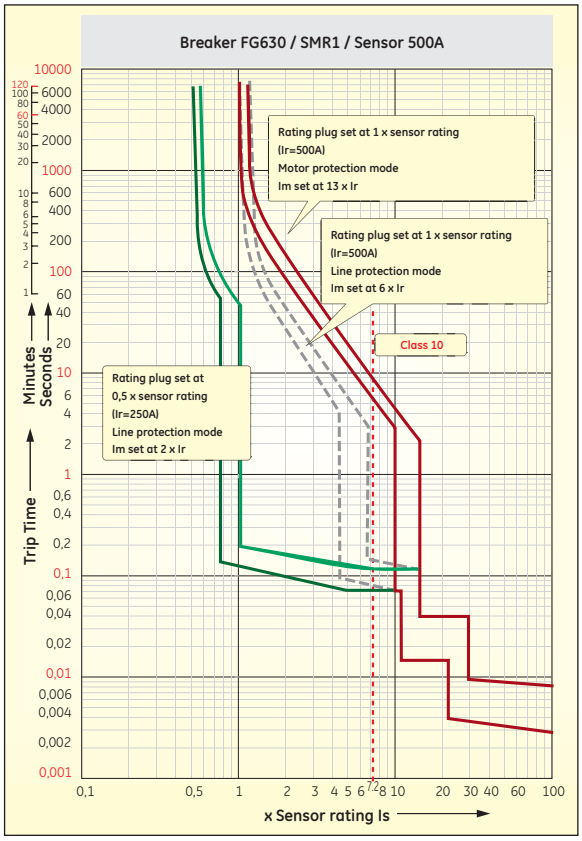


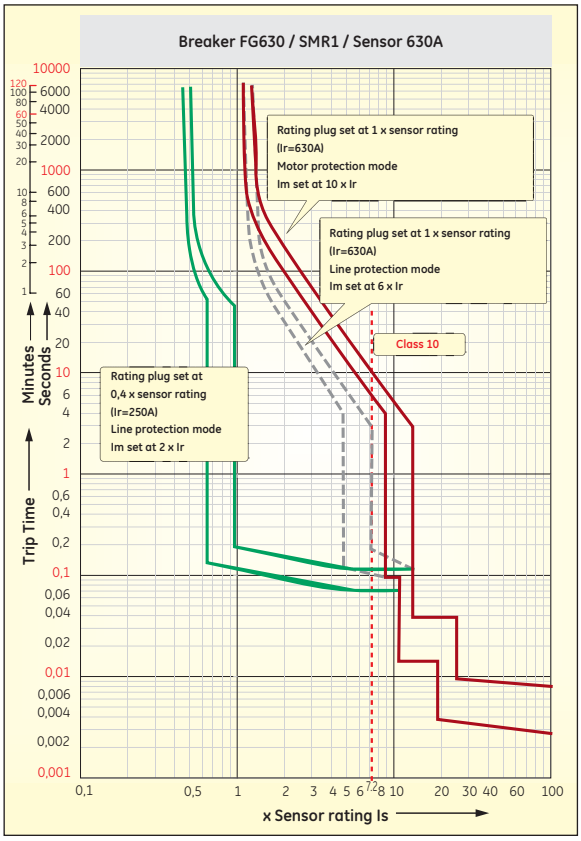


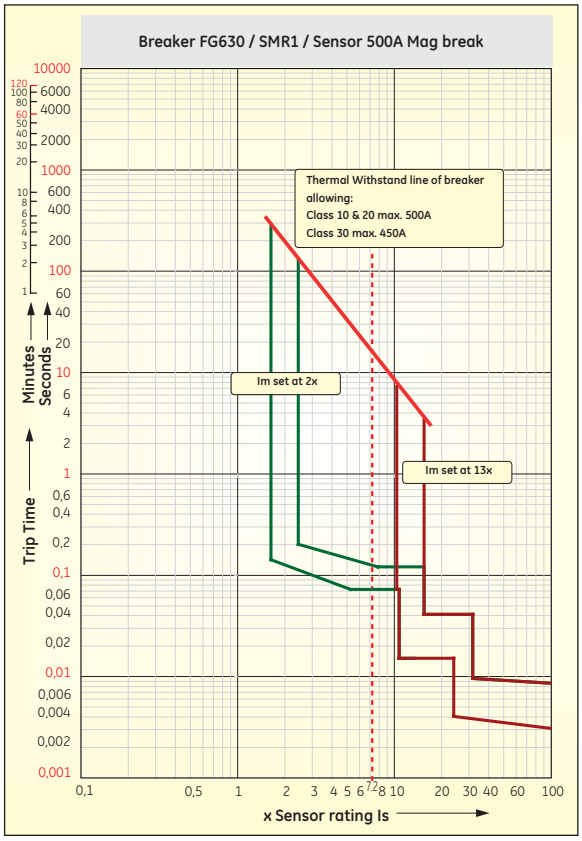


Time Current Curves









Electronic Trip Units

SMR2 range

The SMR2 is an electronic trip unit offering a fixed set of sophisticated protective functions that can be extended at will by the addition of seperately available modules. Designed for use with the FG400 and FG630 frame sizes the device has a fixed set of 3 protective functions allowing a selective and fully adjustable protection against Overloads (**LT**) and short-circuits (**ST** and **I**).
Both the **LT** and **ST** protection can be set to different time settings or bands (**LTD** and **STD**) whilst the ST device can be switched to a energy protection mode (I^2t).
The SMR2 uses rating plugs that give the user the flexibility to make a last minute choice in the required current rating, protected poles or protection band.

Overload protection LT (long time)
The **L**ong **T**ime or overload protection is adjustable from 0.4 (0.64(1)) to 1 x the chosen sensor ratings in 16 (32(1)) steps. The user can also define one of 6 time bands (**LTD**) each designed to match specific loads, motor or cable characteristics. Of these 6 time band settings, 4 have time bands for line applications and 2 are dedicated to motor protection (for time band classes see EN 60 947-4.1). When set to motor protection mode, a phase loss protection is initiated that will trip the breaker when the difference in current between one phase current and the other phases exceeds 80% for more than two seconds.

This easy-to-adjust trip unit is equipped with a LT load indicator device that operates by means of two LED indicators located on the trip unit front face. If the load reaches a 60% of the set Ir value, a **green LED** will start to blink (3 flashes a second). When the load reaches 75% of Ir it will stop blinking and remain on. The second **orange LED** will start to blink at 95% of the Ir value. It will remain on when the load reaches 105% of Ir and a trip is imminent.

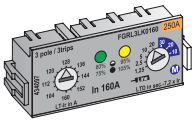
All SMR2 trip units have a built-in temperature sensor that trips the breaker at temperatures above 90°C. It thus prevents the breaker and electrical components in its immediate vicinity from overheating. The SMR2 is also equipped with a so called thermal memory device. This memory tracks overheating even after the device has tripped and prevents the breaker from being switched whilst its environment is still at a too high temperature.

Short-circuit Protection ST (short time)
Offerering a selective protection against low value short-circuits the **S**hort **T**ime protection is settable from 1.5 to 12(2) x the adjusted LT protection (Ir). The device can be set to five time setting bands (**STD**), this allowing selectivity between different breaker sizes.
The **STD** device can be set to an 'energy curve mode'. This mode changes the fixed delay and reaction time value of the device, when the set current level is reached, into a reaction time that depends on the energy flowing in the circuit.

Short-circuit Protection I (instantaneous)
Offerering a protection against short-circuits the Instantaneous protection is settable from 2 to 13(3) x the chosen sensor rating. The **I** device has no time delay band so that the breaker immediately trips when the set threshold is reached.

Each SMR2 trip unit comes with a transparent, tamper-free (sealable) cover, this to prevent unauthorized manipulation of the breaker settings. They are supplied as a simple to mount, plug-in electronic pouch (current sensors supplied with the breaker). The device is supplied with an actuator with flux shifter that fits into a pocket in the breaker housing and is then connected to the trip unit. Without a mounted and connected actuator coil the breaker will not function. In order to verify a correct operation of the combination a simple device is available to test the assembly.
We strongly recommend the use of this test device.

Adjustable rating plug
An SMR2 rating plug has two setting knobs. The first is used for the setting of the overload current device (LT) and has a setting range of 0.625 to 1 x the chosen rating over 16 setpoints. The settings on the devices are in current values thus avoiding the use of complicated multipliers. The second knob is used to set the time delay band of the overload protection (LTD) and has 6 possible time settings.



Each trip unit size can be equipped with one of two available adjustable rating plug types.
There is a version of the trip unit without rating plug and one in which the two rating plug types are included. For 4pole trip units the rating plugs exist in 3 and 4pole protected versions with a choice in neutral rating between 50 or 100% of the phase value.

(1) '(1) Normaly supplied with two rating plugs, each with a setting range of 0.64-1.
(2) Some types limited to 10 x
(3) Some types limited to 11 x

FG400 and FG630 breakers SMR2 types

Each SMR 2 device has three plug in elements of which at least two are needed to allow the device to work properly.
1) A rating plug is plugged into the jack at the top left of the device. Without rating plug the SMR2 device will not provide any circuit protection and the breaker will trip immediatley.
2) A battery module (supplied with trip unit) needs to placed in the appropiate module this to power the thermal memory within the trip unit when the breaker has tripped. If not installed the thermal memory function is disabled. The battery module also enhances the functionality of the Trip Reason Indicator Module.
3) An Extension module providing extra functionality and/or features. A standard SMR2 is supplied with a blank non function module.
A 24V DC auxiliary supply can be connected to the trip unit via the contact module . This enabling all modules to be used to their full capacity and allowing the use of the ZSI function (if installed in the trip unit).

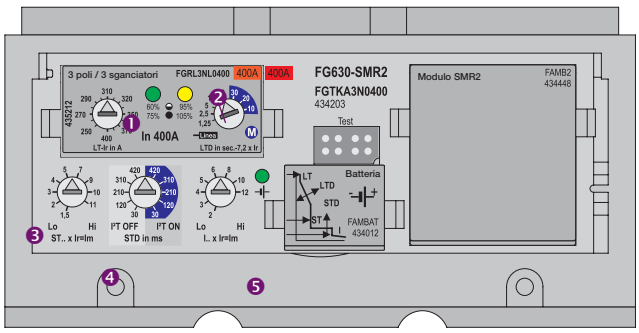
FG400 & FG 630 Breakers - Electronic trip units type SMR2

FG frame					Electronic trip unit overview												
					In	LT			ST			I			Neutral protection		
						pick-up band 1.05÷1.2 Ir			pick-up band ± 20% Ist			pick-up band ± 10% In					
					[A]	Ir setting	min [A]	max [A]	Ist setting	min [A]	max [A]	Im setting	min [A]	max [A]	4P4T	4P 3TN	4P3T
SMR2 + adjustable rating plug	N	H	L	FG400	160	0.4-1 In 32 steps utlising two rating plugs	100	160	❸ 1.5-12 Ir 10 steps	150	1920	❺ 2-13 Is 10 steps	500	3250	=Ir	=Ir/2	not protected
					250		160	250		240	3000		700	4550	=Ir	=Ir/2	
					250		160	250		240	3000				=Ir	=Ir/2	
					350		250	350		500	3500				=Ir	=Ir/2	
					400		250	400	1.5-10 Ir 10 steps	375	4000	2-11 Is 10 steps	750	4400	=Ir	=Ir/2	
				FG630	400		250	400	1.5-12 Ir 10 steps	375	4800	2-13 Is 10 steps	1000	6500	=Ir	=Ir/2	
					500		400	500		600	6000				=Ir	=Ir/2	
					630		400 ❶	630	1.5-10 Ir 10 steps	600	6300	2-11 Is 10 steps	1260	6930	=Ir	=Ir/2	

LTD, Line no phase loss			STD Standard		
Setting[1]	min [sec.]	max [sec.]	Setting	min [msec.]	max [msec.]
1.25	1	1.5	0.04	0.036	0.07
2.5	1.5	3	0.12	0.108	0.16
5	3	5	0.21	0.190	0.26
10	6 ❷	10	0.31	0.280	0.37
LTD, Motor with phase loss protection[1]			0.42	0.380 ❹	0.49
				-OR- I^2T	
20	10	14		(see trip curves)	
30	14 ❷	20			

(1) Timing applies at 7.2 x the set current value. (I.)

SMR2 front view
Indicating the location of the settings, the battery, rating plug and extension modules. The in/out put terminals are located within the trip unit pouch just below the battery modules and can be accessed by removing a break away cover.



FG400 and FG630 breakers
SMR2 types (continued)

Modules
Each SMR2 device can be equipped with two plug-in elements, a rating plug and an extension module. The extension modules are simple plug-in devices that allow the user to enhance the SMR2 as a protective device or to add in extra functional features. There is a single function module available with Ammeter and a range of functional modules each adding two functions to the device. this allows an SMR 2 to be equipped with:

Ground fault Protection
Ground fault alarm
Load shedding across two channels
Trip Reason indicators
Communication (modbus RTu)
Each module has a low level electronic output that can be channeled through the communication bus (when present) or in some cases trigger a 1A/250 Volt change-over contact placed in an external contact module containing four contacts (type FAECM2).

Ground fault protection
Designed for protection against indirect contact, the ground fault device measures the vectorial sum of the three phase currents and, if present, that of the neutral conductor. If the sum of these values exceeds the set current thresholds for a period of time greater than the set time delay, the breaker is tripped.
The **G**round **F**ault protection option is adjustable from 0.2 to 1 x the chosen sensor ratings in 9 steps. The user can also define one of 5 delay time bands (**GFD**) designed to allow selectivity between different sensor ratings.
The **GFD** device can be set to an 'energy curve mode'. This mode changes the fixed delay and reaction time value of the device, when the set current level is reached, into a reaction time that depends on the energy flowing in the circuit.
A breaker trip due to a ground fault event can be channeled through the communication output (when present) or be wired out to the contact module. (type ECM)

Ground fault alarm
The **G**round **F**ault **A**larm option offers the same functionality as the Ground Fault protection, here however **ONLY** an alarm signal is given and the breaker is **NOT TRIPPED**. It is adjustable from 0.2 to 0.8 x the chosen sensor ratings in 12 steps. The user can also define one of 5 delay time bands (**GFD**).
The **GFD** device can be set to an 'energy curve mode'. This changes the fixed delay and reaction time value of the device, when the set current level is reached, into a reaction time that depends on the energy flowing in the circuit.

A 100mA/240Volt NC contact is included in the module and can wired out through the 12 pole breaker connector plug on the breaker.

Load shedding device
The Load Shedding device (**R**) is designed to allow the user to switch off non priority loads before the **LT** function trips the breaker due to an overload. It measures the current within the circuit and provides a signal if the current measured in the three phases exceeds the set current values. The device has two channels, both adjustable from 0.55 to 1 x the set **LT** protection value (Ir).
Each channel is equiipped with a time delay directly proportional to that of the **LTD** setting. Chanel 1 is set to a time delay equal to **LTD**/2 and channel two is set to a time delay of **LTD**/4. If the current drops below the set thresholds the signal is reset. The reset signal being given in a time proportional with the chosen LTD curve.
A signal due to a load shedding event can be channeled through the communication output (when present) or be wired out to the contact module. (type ECM)

Trip Reason Indicators
In order to indicate the reason of a breaker trip a set of tptal of three LED's are provided on the trip unit front face. One indicating a trip due to the **LT** device, one indicating a trip due to the **ST** device and one for the **I** device.
Without auxilliary power, the use of the trip reason button is necessary to light up the appropiate **LED**.
With auxilliary power the use of the trip reason push button is unnecessary.
The three trip signals can be channeled through the communication output (when present) or be wired out as an overload (LT) or short circuit signal (ST & I) to the contact module (type FAECM)

Communication
When the communication option is added to the SMR2 trip unit the following data can be viewed:
- The position of the switches on all installed devices, thus providing the settings of the breaker.
- Signals indicating on which of the installed protection devices the breaker has tripped.
- Load shedding orders.
- Zone selective interlock occurrences.

For each breaker with Modbus rtu the use of a internal communication module AND and external contact module type FAECM2 (see page b.28) is required.
A 24V DC auxiliary supply is needed that supplies the system through the external contact module.

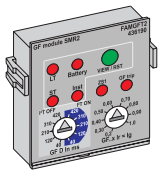
Zone Selective Interlock
A device that allows the user to achieve selectivity combined with the fastest possible fault reaction time. When the **ZSI** is active the SMR2 trip unit will always trip the breaker as quickly as possible, ignoring the time delays set by means of the **STD** or **GFD** devices. However, when a **ZSI** signal is received from a down-stream breaker equipped with an SMR2, the **STD** or **GFD** of the upstream SMR2 device revert to wherever the adjustment is set.

With standard cables the distance between breakers is a maximum of 30 meters. The use of shielded cables allows the distance between breakers to be increased to 1 km. A maximum of five SMR2 trip units can be linked in this manner.

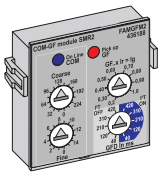
The ZSI option requires a 24VDC auxiliary supply. One FAECM2 module connected with one of the breakers in the ZSI loop can be used. The FAECM2 needs then connected to an auxiliary supply of 24V DC.
When the breaker is equipped with a "COM" option the ZSI status signal is also available on the communication output.

Ammeter
Provides the user with thecurrent running in one of the breaker phases. The device has an accuracy of 10% and normally indicates the current in the highest loaded phase. Use of the push buttons on the module front t allows the user to select an indiaction of the current in one of the other phases or neutral (if present). After a set delay of 10 seconds the device reverts to its standard indication setting.

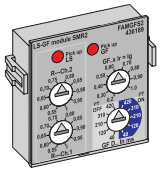
Each SMR 2 device has three plug in elements of which two are needed to allow the device to work properly. A rating plug is needed and is plugged into the jack at the top left of the device. Without rating plug the SMR2 device will not provide any circuit protection and the breaker will trip immediatley.
A battery needs to placed in the appropiate module, this to power the thermal memory within the trip unit, if not installed this function will be disabled.



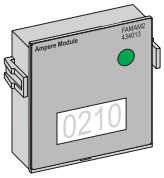
Module FAMGFT2
A combination of the Ground Fault protection and the Trip Reason indi-cators.



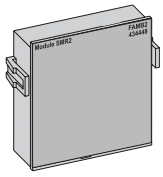
Module FAMGFM2
A combination of the Ground Fault protection and the communication option.



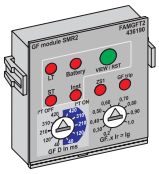
Module FAMGFS2
A combination of the Ground Fault protection and the load shedding device.



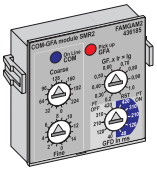
Module FAMAM2
An Ammeter.



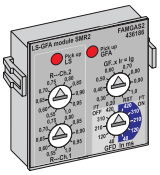
Module FAMB2
Spare filler module.



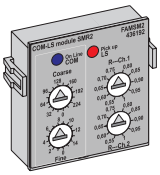
Module FAMGAT2
A combination of the Ground Fault Alarm function and the Trip Reason Indicators.



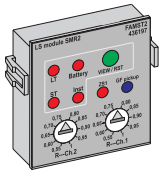
Module FAMGAM2
A combination of the Ground Fault alarm function and the communication option.



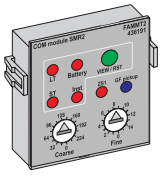
Module FAMGAS2
A combination of the Ground Fault alarm option and the load shedding device.



Module FAMSM2
A combination of the load shedding device and the communication option.



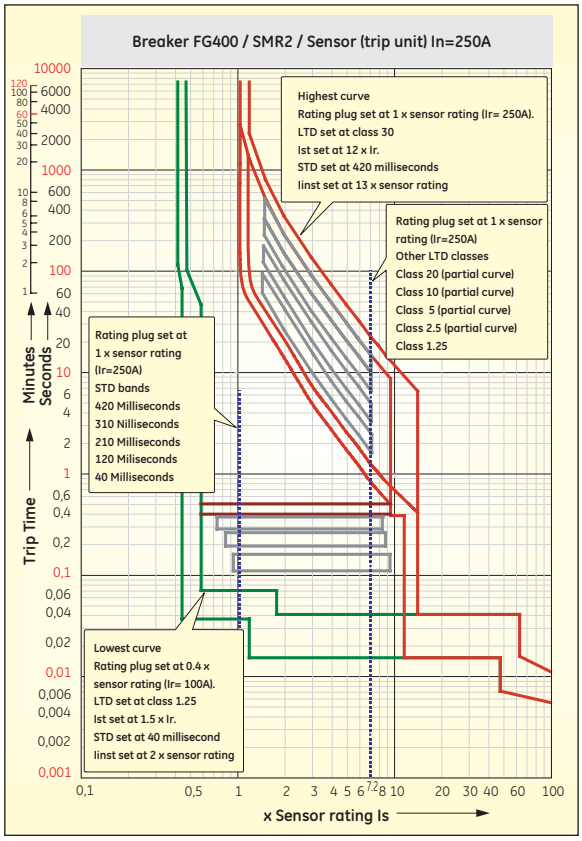
Module FAMST2
A combination of the load shedding device and the Trip Reason Indicators.

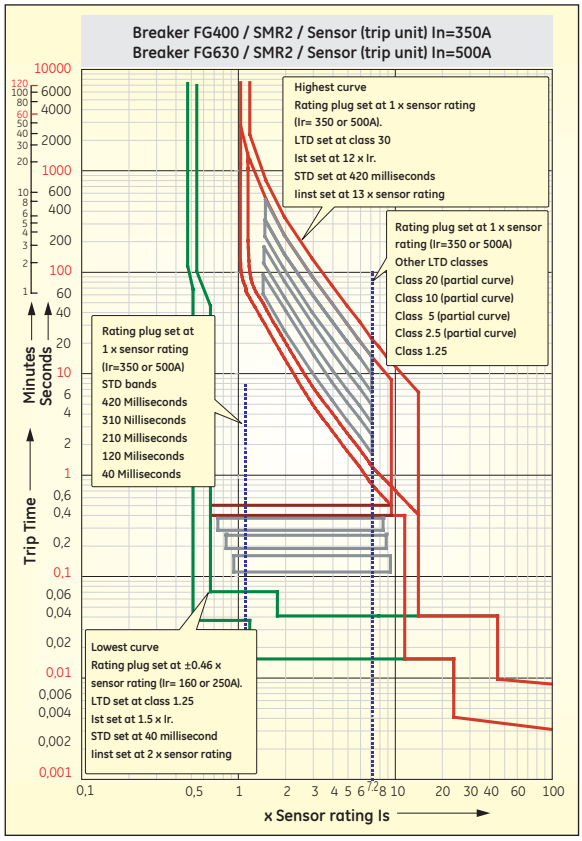


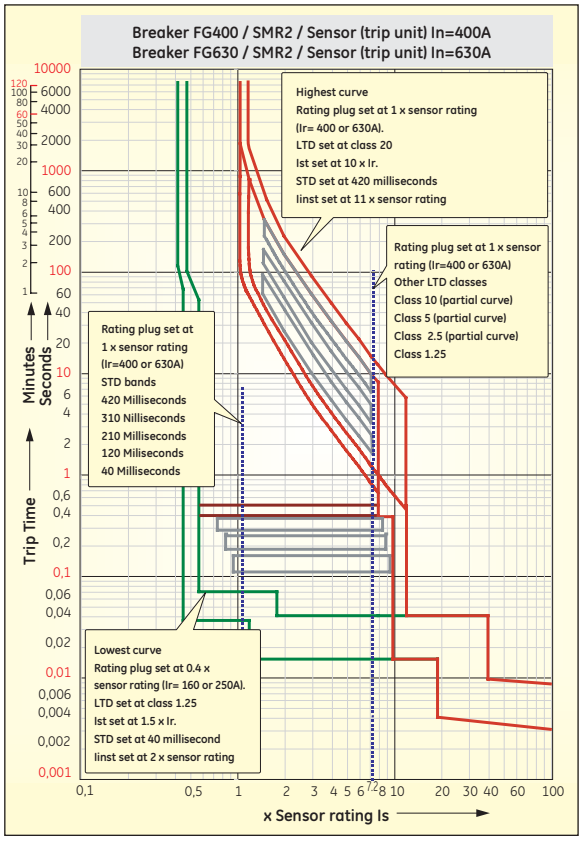
Module FAMMT2
A combination of the comunication option and the Trip Reason Indicators.

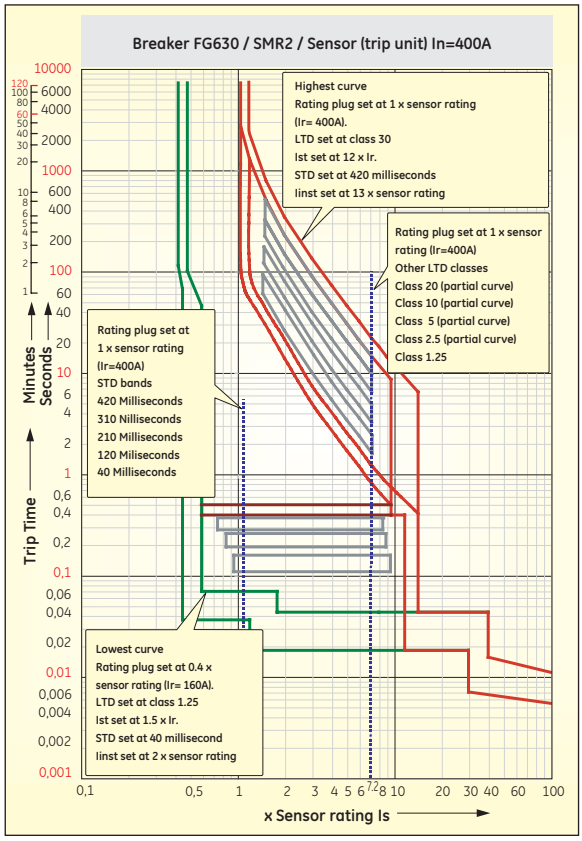
Time Current Curves

FG400 and FG630 breakers SMR2 types

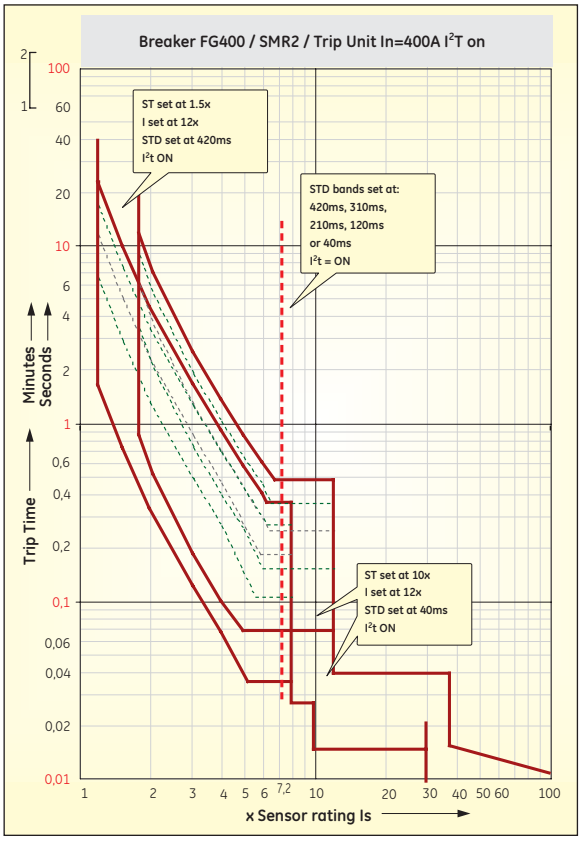


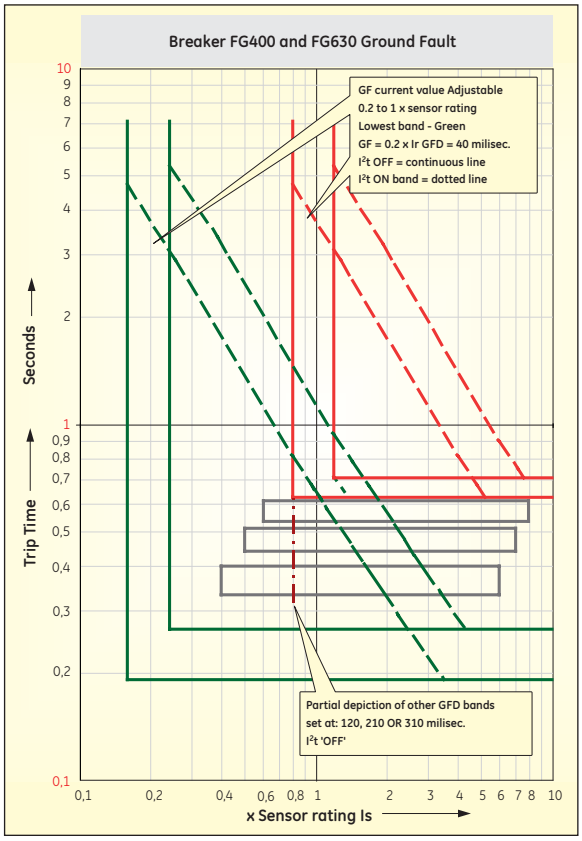


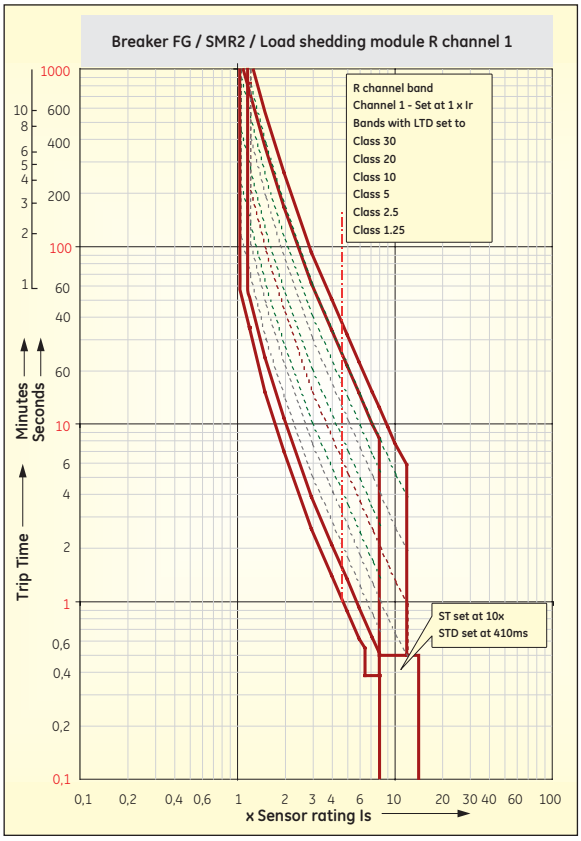


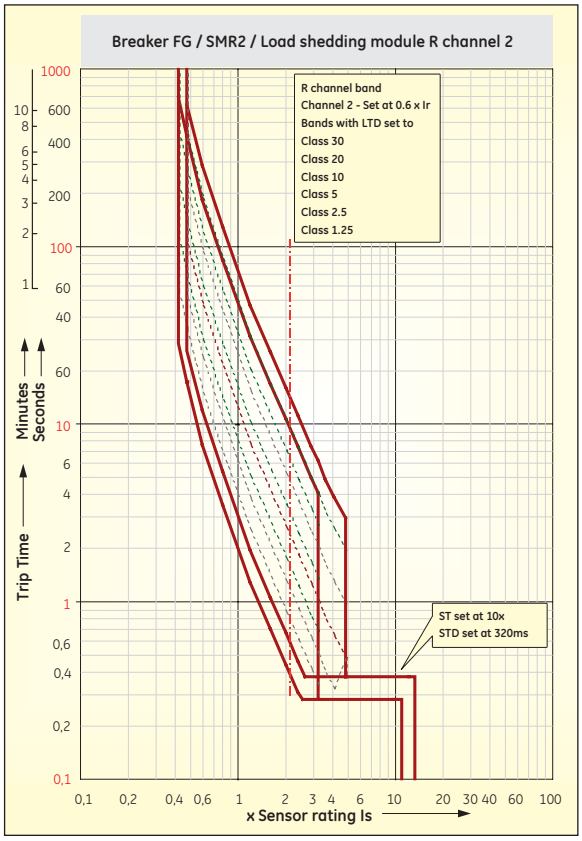


Time Current Curves









Electronic trip units

FK frame

SMR1 range
SMR1e, s and g types are designed to allow the user to conveniently tailor his protection to meet individual circuit requirements. The available options include adjustable overload pickup values, overload trip time characteristics, short time pickup circuit values, short time delay circuit trip times and energy values. The trip unit can be equipped with a ground-fault protection and provides a flexible solution to all protection scenarios.

This easy-to-use trip unit with overload and selective short-circuit protection is equippeed with an overload signalling option and has a built-in temperature sensor to prevent the breaker and electrical components in its immediate vicinity from overheating. The 4 pole units are equipped with a switchable neutral protection option, allowing the user to set the neutral at 0, 50 or 100% of the phase ratings.

Overload protection LT (long time)
The **L**ong **T**ime or overload protection is adjustable from 0.4 to 1 x the chosed sensor ratings in 8 steps. The SMR1e has a fixed time band of 5seconds at 7.2 x Ir whilst the SMR1s and g variants have a choice of 5 time bands (**LTD**) each designed to match specific load characteristics. (For time band classes see EN 60 947-4.1).
All devices are equipped with three LED's for signalling purposes.
A green LED that indicates that the trip unit is powered up and is measuring and operating correctly. (30% of chosen sensor rating).
A yellow LED that will astart to blink at 95% of the set Ir current (3 flashes a second) when the current level reaches 105% of the Ir setting and a trip is imminent the LED will light up constantly.
An over temperature in the trip unit is clearly indicated on the breaker front face. On the SMR1s and G variants a over temperature will trip the breaker.

Short-circuit Protection ST (short time)
Offerering a selective protection against low value short-circuits the **S**hort **T**ime protection is settable from 1.5 to 10 x the adjusted LT protection (Ir).
The SMR1e has a fixed time band of 50 milliseconds, a setting that provides discrimination with downstream FG devices.
Tthe SMR1s and g variants have a choice of four time setting bands (**STD**), designed to allow selectivity between different breaker sizes. Here the **STD** device can be set to an 'energy curve mode' that changes the reaction of the device from a fixed delay and reaction time value when the set current level is reached to a reaction time that depends on the energy flowing in the circuit.

Ground fault protection
Designed for protection against indirect contact the ground fault device measures the vectorial sum of the three phase currents and, if present, that of the neutral conductor. If the sum of these values exceeds the set current thresholds for a period of time greater than the set time delay, the breaker is tripped.
The **G**round **F**ault protection option is adjustable from 0.1 to 1 x the chosed sensor ratings in 4 steps. The user can also define one of 4 delay time bands (**GFD**) designed to allow selectivity between different sensor ratings. The groundfault device is available in the SMR1g trip unit type.

Short-circuit Protection I (instantaneous)
Offerering a protection against short-circuits the Instantaneous protection is set at a fixed value depending on the chosen frame/ contact size. The **I** device has no time delay band so that the breaker trips as immediatley when the set threshold is reached. The fixed instanatneous (**I**) is set at a current value allows discrimination between different frame sizes and at a level that limits the current and thermal stress in the protected circuit

Zone Selective Interlock
A device that allows the user to achieve selectivity combined with the fastesrt possible fault reaction time. With connected ZSI the SMR1s and SMR1g trip unit will always trip the breaker as quickly as possible, ignoring the time delays set by means of the **STD** or **GFD** devices. However when a **ZSI** signal is recieved from a downstream breaker equipped with an SMR1a, 1g and 2 the **STD** or **GFD** of the upstream device reverts to wherever the adjustment is set. The Ground Fault and Short Time Zone Selective Interlock signals are shared on one in/out put .
The device only works when auxiliary power is present and operates up to a distance between breakers of 1 kilometer. The use of shielded cable is required. A maximum of five SMR 1s, g or SMR2 trip units can be linked in this manner. (not available in the SMR1e)

Use and Testing

Each SMR1e, s or g trip unit comes with a transparent, tamper-free (sealable) cover, this to prevent unauthorized manipulation of the breaker settings. The device is supplied with an electronic actuator coil that fits into a pocket in the breaker housing and is then connected to the trip unit. In order to verify a correct operation of the combination a simple test device is available to test the assembly.

We strongly recommend the use of this test device.

Connection of trip unit

Each SMR1 s or g trip unit has a connector located on the right side of the breaker. This connector is normally hidden behind a break-away cover and is required to connect the following:

Auxiliary power supply (24V DC), ZSI in and out, long time pre-alarm signal, connection of external CT for 4 pole groundfault on three pole breakers.

FK800, FK1250 and FK1600 breakers - Electronic trip unit overview

FK frame					Electronic trip unit overview									
					In	LT pick-up band 1.05÷1.3 Ir			ST pick-up band ± 20% Im			Neutral protection Switchable type		
					[A]	Ir setting	min [A]	max [A]	Im setting	min [A]	max [A]	4P4T	4P 3TN	4P3T
SMR 1e	N	H	L	FK800	800	0.4 x1 In in 8 steps	320	800	1.5-10 Ir in 8 steps	480	8000	=Ir	=Ir/2	not protected
				FK1250	1000		400	1000		600	6000	=Ir	=Ir/2	
					1250		500	1250		750	12500	=Ir	=Ir/2	
				FK1600	1600		640	1600		960	16000	=Ir	=Ir/2	
					In	LT pick-up band 1.05÷1.3 Ir			ST pick-up band ± 20% Im			Neutral protection Switchable type		
					[A]	Ir setting	min [A]	max [A]	Im setting	min [A]	max [A]	4P4T	4P 3TN	4P3T
SMR 1s	N	H		FK800	800	0.4 x1 In in 8 steps	320	800	1.5-10 Ir in 8 steps	480	8000	=Ir	=Ir/2	not protected
				FK1250	1000		400	1000		600	6000	=Ir	=Ir/2	
					1250		500	1250		750	12500	=Ir	=Ir/2	
				FK1600	1600		640	1600		960	16000	=Ir	=Ir/2	
						LTD(1)			STD(2)					
						Setting	min [sec.]	max [sec.]	Setting	min [msec.]	max [msec.]			
						10	8	12	0.1	0.095	0.17			
						20	16	24	0.2	0.175	0.29			
						30	24	36	0.3	0.255	0.41			
					In	LT pick-up band 1.05÷1.3 Ir			ST pick-up band ± 20% Im			Neutral protection Switchable type		
					[A]	Ir setting	min [A]	max [A]	Im setting	min [A]	max [A]	4P4T	4P 3TN	4P3T
SMR 1g*	N	H		FK800	800	0.4 x1 In in 8 steps ❶	320	800	1.5-10 Ir in 8 steps ❸	480	8000	=Ir	=Ir/2	not protected
				FK1250	1000		400	1000		600	6000	=Ir	=Ir/2	
					1250		500	1250		750	12500	=Ir	=Ir/2	
				FK1600	1600		640	1600		960	16000	=Ir	=Ir/2	
						LTD(1)			STD(2)					
						Setting	min [sec.]	max [sec.]	Setting	min [msec.]	max [msec.]			
						5	4	6	0	0.015	0.05			
						10 ❷	8	12	0.1 ❹	0.095	0.17			
						20	16	24	0.2	0.175	0.29			
						30	24	36	0.3	0.255	0.41			
						GF pick-up band ± 20% Im			GFD(2)					
						Ig setting	min [sec.]	max [sec.]	Setting	min [msec.]	max [msec.]			
						❺ 0.1 x1 In in 4 steps	80	1000	0.1	0.095	0.17			
							100	1250	0.2	0.175 ❻	0.29			
							128	1600	0.3	0.255	0.41			

(1) At 7.2 x Ir : Min. is minimum settable delay: Max: Is maximum total tripping time.
(2) At set value : Min. is minimum settable delay: Max: Is maximum total tripping time.

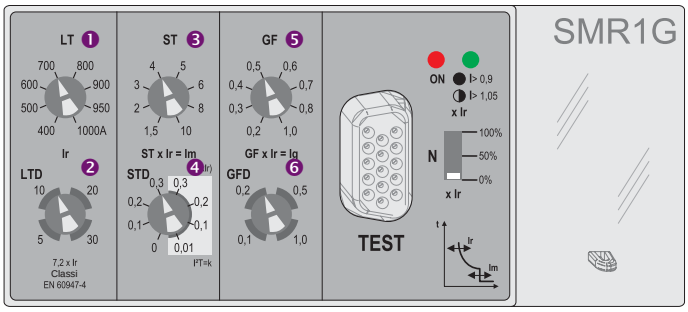
Trip units are available in 4 ratings and 3 different versions depending on the frame rating and the chosen functionality.

FK800 frame size
800A, SMR 1e, s or g

FK1250 frame size
1000 and 1250A,SMR 1e, s or g

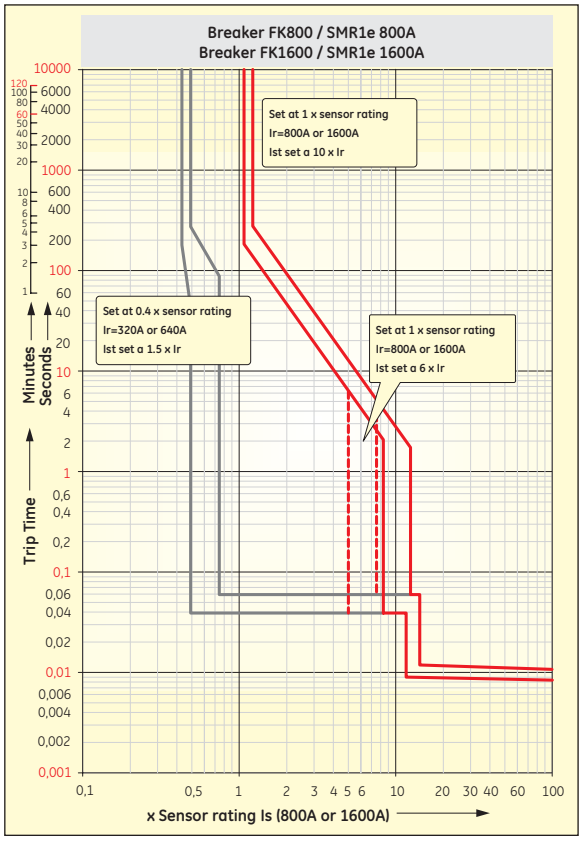
FK1600 frame size
1600A,SMR 1e, s or g

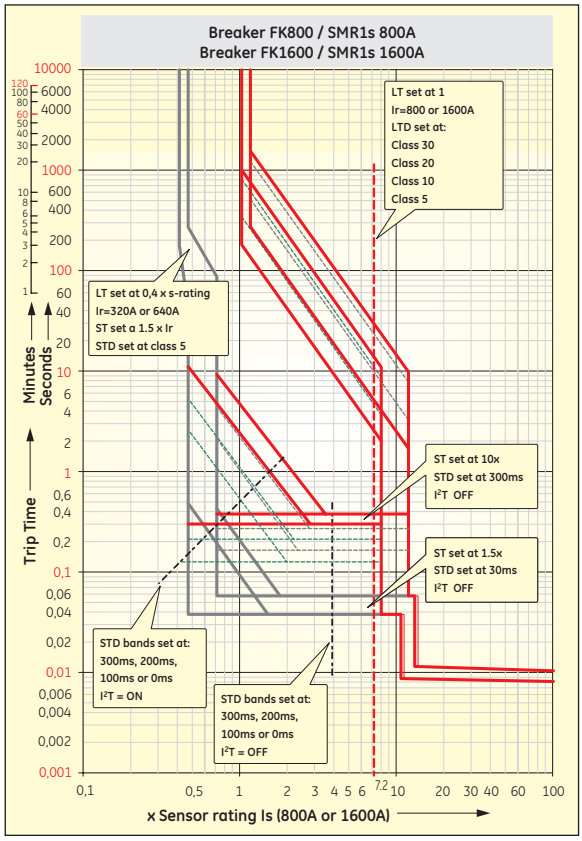
The trip units are an integral part of the breaker and are NON inter-changeable.

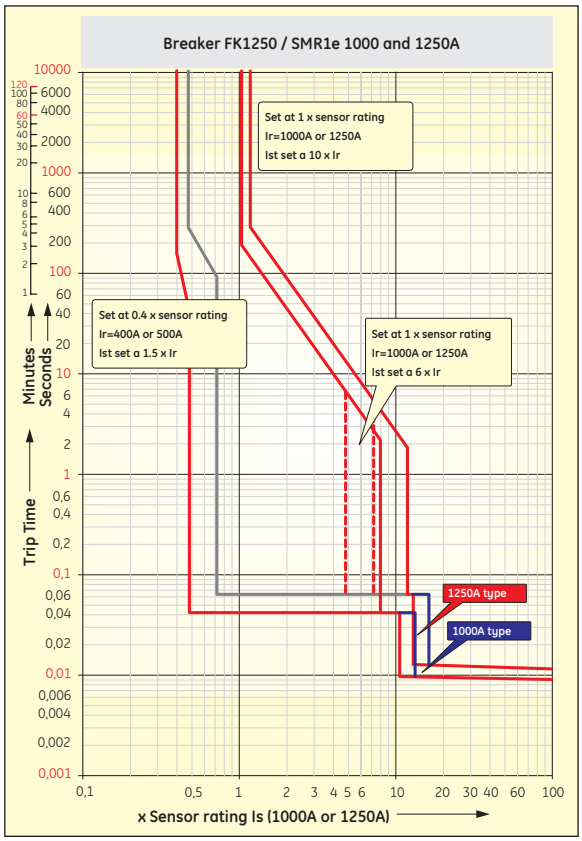


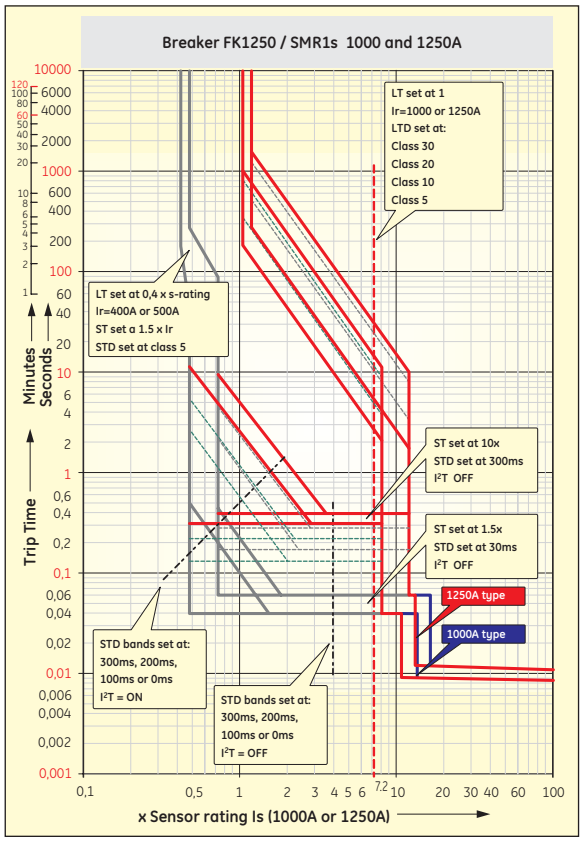
Time Current Curves

FK frame

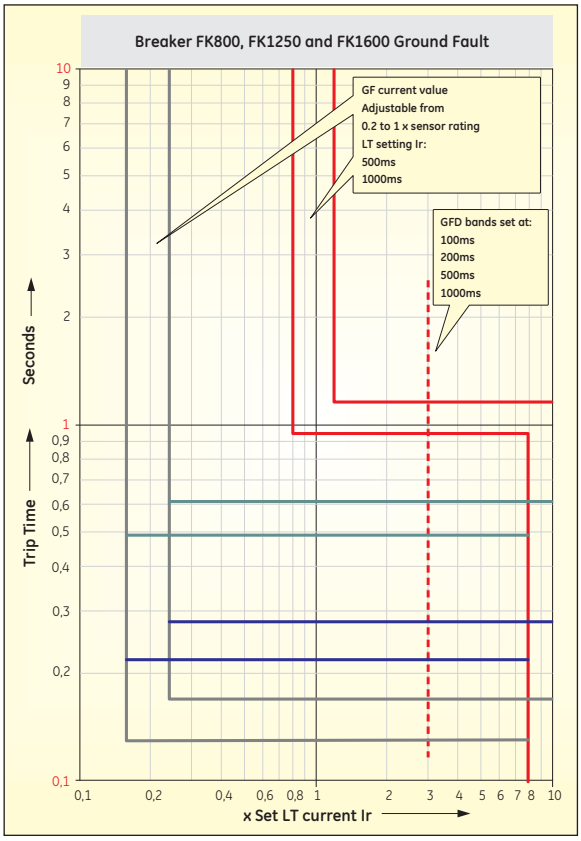


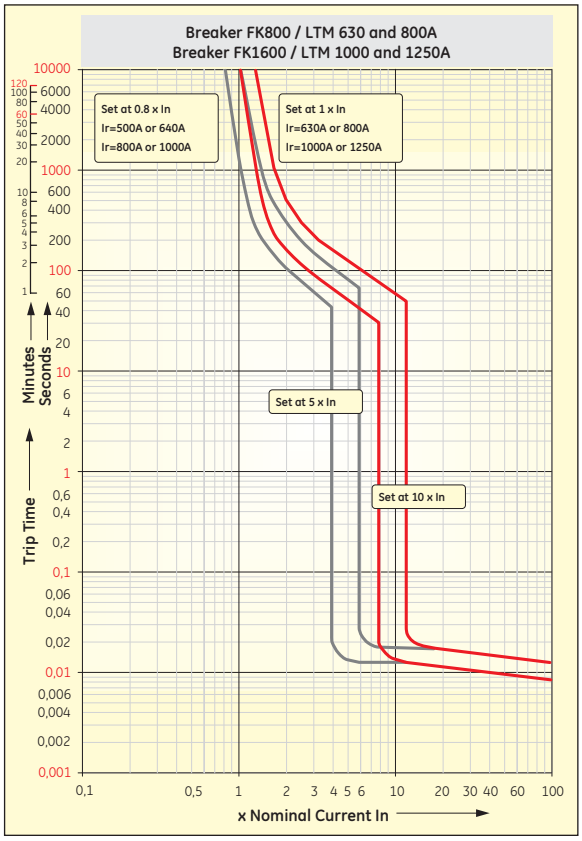


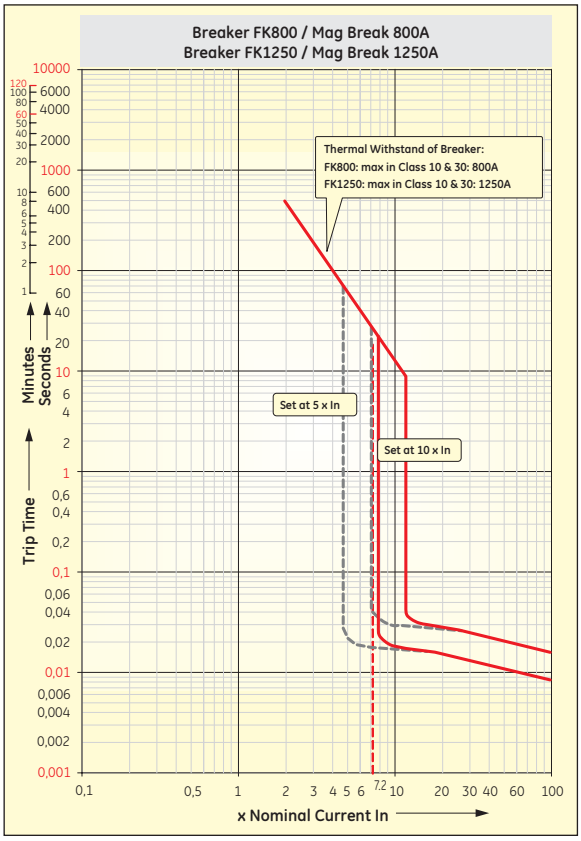




Time Current Curves







Electronic Trip Units

Accessories for SMR1 and SMR2 types

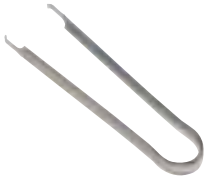
Long time module SMR1 (FAMLT)(1)

This external DIN-rail mounted device with modular dimensions is directly connected to the SMR1electronic trip unit.
The device is equipped with a NC 1A/400V AC contact that opens to a signal which indicates that a LT trip will shortly be initiated by the SMR1.
The SMR1 emits this before a trip action is initiated. When set to motor protection this occurs 0.5 seconds before the tripping event and at 0.05 seconds when set to line protection. Contact is reset when breaker trips.

Test kit SMR1 & SMR2 (FAT) and SMR1e,s,g (FNT)

Designed to test the actuator trip unit combinations the device is plugged into the test jack on the trip unit front face. Just remove the test jack cover, insert and plug in the test device.
Releasing the push button on the tester FAT front should now initiate a trip event. The tester requires a 9V battery and is also equipped with a battery status indicator.
FNT initiates a trip event when the push buttom is depressed more than two seconds. It requires an external 9V supply.

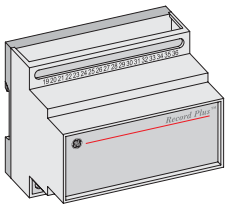
Rating plug tool SMR1 & SMR 2 (FAR)



A rating plug can be removed by using two small screwdrivers.
In case of repeated removal the ***Record Plus™*** rating plug removal tool is advised to enhance the ease and safety of this operation.

(1) Use of an RC suppressor is recommended.
(See Controls and Automation catalogue)

Communication & contact module SMR2 (FAMECM)



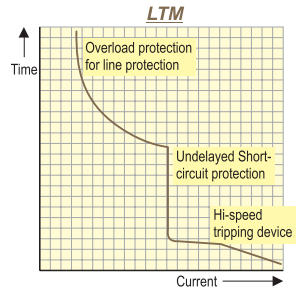
This external DIN-rail mounted device with modular dimensions is directly connected to the SMR2 electronic trip unit.
It is a multi functional unit acting as an interface between the breaker and the communication network.
To use the communication option the FAMECM module requires an auxiliary supply of 24V DC.

The device is also equipped with four NC 1A/400V AC contacts that can provide the following outputs:
- Breaker trip reason
  (Overload (LT) **OR** Short Circuit (ST/I)
- Load shedding device contacts.
  Channel 1 **AND** Channel 2

Trip units

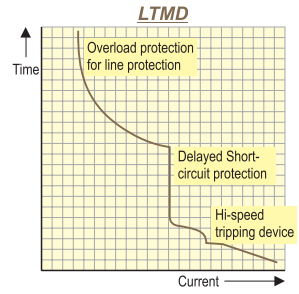
Overview of available types

LTM - Line thermal magnetic



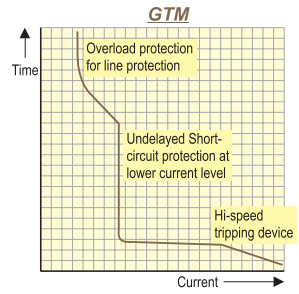
This trip unit offers overload and short-circuit protection.
The overload protection is adjustable from 0.8 to 1 x the chosen rating whilst the short-circuit protection is set at 10 x the chosen rating (FD frame) or adjustable from 5 to 10 x the chosen rating (FE and FK frame).
The unit is designed to protect the lines and/of loads present in standard circuits.

LTMD - Line thermal magnetic, selective type



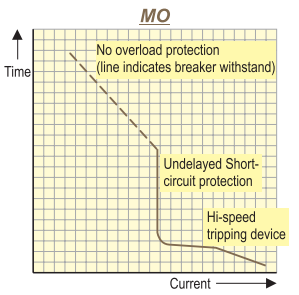
This trip unit offers overload and short-circuit protection.
The overload protection is adjustable from 0.8 to 1 x the chosen rating whilst the short-circuit protection is set at 10 x the chosen rating (FD frame) or adjustable from 5 to 10 x the chosen rating (FE frame).
The unit is designed to offer discrimination with downstream protection devices. It also protects the lines and/of loads present in standard circuits.

GTM - Line thermal magnetic



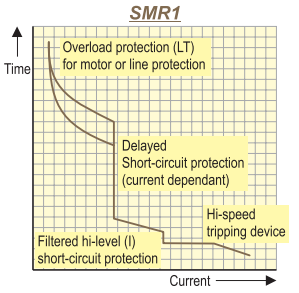
A trip unit de signed to offer overload and short-circuit protection.
The overload protection is adjustable from 0.8 to 1 x the chosen rating whilst the short-circuit protection is set at about 4 x the chosen rating (FD frame) or adjustable from 2.5 to 5 x the chosen rating (FE frame).
Due to its low short-circuit current setting the unit can be used to protect long cable runs or to provide generator protection.

MO - Magnetic Only



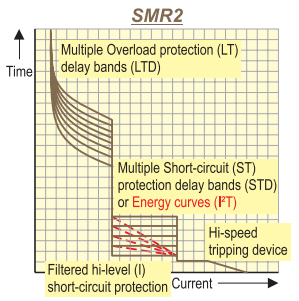
This trip unit offers short-circuit protection only, the device is adjustable from 10 to 15 x the chosen rating.
In order to prevent the protection device (Circuit Breaker) from overheating, the current of the circuit that it protects, needs to be limited. (see dotted line)
The unit is primarily designed to be used with thermal relays in motor protection circuits.

SMR1 (e)- Selective Electronic Protection[2]



A trip unit designed to offer a overload (LT) and short-circuit protection (ST). The overload protection is adjustable from 0.4 to 1 x the chosen rating and has two protection bands (LTD), one for line protection and one for motor protection (class 10)[1]. To ensure full discrimination the short-circuit protection has a current dependant fixed time setting that varies per frame size.
The device is adjustable from 2 to 13* x the set LT current value.
The unit is designed to protect all circuit types and to offer a high level of discrimination with downstream devices.

SMR2 (1s & 1g) - Enhanced Electronic Protection[2]



A trip unit designed to offer a overload (LT) and short-circuit protection (ST). The overload protection is adjustable from 0.4 to 1 x the chosen rating and has multiple protection bands (LTD). The short-circuit protection (ST) is adjustable from 2 to 13 x the set LT value and has multiple protection bands (STD). The short-circuit protection can also be set to an energy mode. The unit is designed to protect all circuit types and to offer a high level of discrimination with downstream devices. Different modules allow the user to expand the device including groundfault, load shedding and communications etc.

(1) Not available on FK frame execution.
(2) Text applicable for SMR1/2. For SMR1e, SMR1s and g see relevant section.

Just rel

Internal accessories

Auxiliary contacts

FE & FG frame

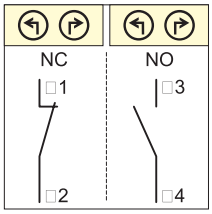
Auxiliary contact blocks are coveniently fitted into an auxiliary-device compartment, accessible by removing the breaker cover. This fully insulated compartment has several pouches, a number of which are reserved for contact blocks. To allow for a logical and traceable schematics each contact block has a pre-defined position within the auxiliary device compartment indicated by a symbol printed both on the breaker case and on the auxiliary device itself.
External wiring can be brought into the accessory compartment through - specifically designed and positioned - break-out openings in the breaker lid or can go through channels in the breaker rear. Once this is done the wiring can be stripped and easily connected to the box terminals on the internal accessories. These terminals are designed to connect wiring up to 2.5 mm^2.
To identify the correct mounting position within the accessory compartment symbols are moulded into the breaker and contact housing.
For Auxiliary switches suited for mounting on the right ⓟ and on the left ⓛ.
For Bell Alarm switches; Mechanism operated types Ⓜ
Trip unit operated types 🔔.

Depending on the the breaker functionality,
9 different kinds of contacts are available, all meeting the EN 60947-5-1 and UL standards. The maximum number and type of contacts that can be fitted depends on the frame size (FD, FE, FG).
Please take in to account that when the device is not linked or mounted to the breaker, it functions in the opposite manner. (NO mounted in breaker is NC when not mounted in breaker).
This does not apply to the contcats blocks used in the chassis of the drawout version.

The contact numbering of each device is indicated in the shematics next to each photo. **eg. 5 or 6**
The intermediate cover of the breaker has a separate set of codes that indicate the number of the device when it is mounted in the breaker. **eg. 1 or 2** +
The combination of these two codes provides a standardized coding system of each connection point(1). **eg. 15 or 26**

FAS/CA (open - closed indication)
They indicate the breaker contact status (open/closed).
The contact is mounted in a simple click-in block and is available in 4 different versions:
- **FAS10L** auxiliary contact left mounted NO
- **FAS01R** auxiliary contact right mounted NC
- **FAS10L** auxiliary contact left mounted NO
- **FAS01R** auxiliary contact right mounted NC

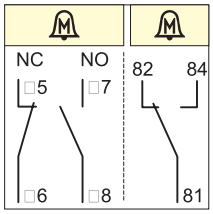
To indicate the breaker position in the drawout chassis (see page C.23 and C.24) similar contact blocks are used, available in two versions:
- **FAS10D** auxiliary contact NO
- **FAS01D** auxiliary contact NC



BAM/CDM (Bell alarm mechanism)
Indicates that the breaker has tripped due to one of the following causes:
- the trip unit has operated (overload or short circuit)
- an RCD operation (earth fault)
- the push-to-trip button on the breaker front has been pressed
- a shunt or undervoltage release operation

The contact is a simple click-in block and can only be placed in the BAM position inside the accessory compartment indicated by the symbol Ⓜ. By using a combination of the BAM and BA contacts it is possible to discriminate between the kind of fault the breaker has reacted to.

3 versions of bell alarm mechanisms are available:
- **FABAM10** bell alarm mechanism NO for FE and FG frame
- **FABAM01** bell alarm mechanism NC for FE and FG frame
- **FABAM11** bell alarm mechanism (change over) only for FD frame
  (Is delivered with 0.75 mm^2 cables of 60 cm length).



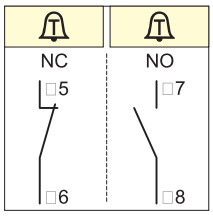
(1) See wiring diagram section for complete overview.

BAT/CD (Bell alarm trip unit)
Indicates that the breaker has tripped due to one of the following cases:
- the trip unit has operated (overload or short circuit)
- an RCD operation (earth fault)

The contact is a simple click-in block and can only be placed in the BAT position inside the accessory compartment (indicated by the symbol 🔔). By using a combination of the BAM and BAT contacts it is possible to discriminate between the kind of fault the breaker has reacted to.

4 versions are available:
for general use:
- **FABAT10** bell alarm trip NO
- **FABAT01** bell alarm trip NC

for use in FE frame thermal magnetic and magnetic only types:
- **FEBAT10** bell alarm trip NO
- **FEBAT01** bell alarm trip NC



Performance

The contacts offer a combination of a high thermal current rating and can be used down to typical PLC operating levels of 12V 5 mA, AC/DC. The contacts are self-reansing and offer a life span equivalent to or exceeding that of the breakers. The values mentioned here have been determined in accordance with the EN 60947-5-1 standard.

	AC [A]				DC [A]			
	FAS (no/nc)	BAT (no/nc)	BAM (co)	BAM (no/nc)	FAS (no/co)	BAT (no/nc)	BAM (co)	BAM (no/nc)
≤ 24V	10	10	10	10	2.5	2.5	4	2.5
48V	10	10	10	10	1.4	1.4	0.5	1.4
60V	10	10	10	10	1	1	0.3	1
110V	6	6	6	6	0.55	0.55	0.2	0.55
220V	3	3	3	3	0.27	0.27	0.1	0.27
380V	2	2	2	2	0.2	0.2	-	0.2
500V	1.5	1.5	-	1.5	-	-	-	-
600V	1.2	1.2	-	1.2	-	-	-	-

FK frame

Optimized for use in the larger FK frame size mounting and connecting takes place in the same manner as in the FD, FE and FG frame sizes. The contact blocks are of the change over type (form C) and are available in easy to mount click in devices with a bell alarm contact or auxiliary switch. A maximum of three auxiliary swiches and one bell alarm contact can be mounted. To indicate the breaker position in the drawout chassis (see page C.23 and C.24) a similar contact block is used.)

The contact numbering of each device is indicated in the shematics next to each photo. **eg. 5 or 6**

The intermediate cover of the breaker has a separate set of codes that indicate the number of the device when it is mounted in the breaker. **eg. 1 or 2**

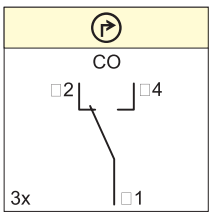
+

The combination of these two codes provides a standardized coding system of each connection point. **eg. 15 or 26**

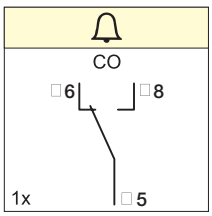
FAS/CA (open - closed)
They indicate the breaker contact status (open/closed). The contacts are mounted in a simple click-in block, of which a maximum of three fit into the auxiliary device compartment (right side).

(Bell alarm)
A contact that indicates that the breaker has tripped. The contact is mounted in a simple click-in block and fits into the auxiliary device compartment (right side).

FNS11R Auxiliary contact right mounted CO **BA/CD**



FNBA11R Bell Alarm contact right mounted CO



Performance

The values mentioned here have been determined in accordance with the EN 60947-5-1 standard and apply for inductive loads.

	AC [A]		DC [A]	
	FAS (co)	BA (co)	FAS (co)	BA (co)
≤ 24V	10	10	2	2
48V	6	6	1.5	1.5
60V	6	6	1	1
110V	4	4	0.5	0.5
220V	3	3	0.25	0.25
400V	1.5	1.5	-	-

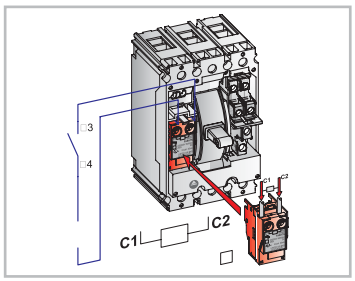
Internal Accessories

Releases

Shunt and undervoltage releases can be fitted easily and quickly in a specifically designed accessory compartment which is accessible by removing the breaker lid. This fully insulated compartment has several pouches one of which is reserved for a shunt or undervoltage release indicated by a symbol printed in the breaker case and on the auxiliary device itself. External wiring can be brought into the accessory compartment through - specifically designed and positioned - break out openings in the breaker lid, or can go through channels in the breaker rear.
Once this is done the wiring can be stripped and easily connected to the box terminals on the internal accessories. These terminals are designed to connect wiring up to 2.5 mm^2.
The devices are designed to trip the breaker when its contacts are closed and the handle indicates the "On" position. When the breaker contacts are open and the breaker handle indicates "Off" or "Trip" activating the releases will have no effect.(1)

FE & FG frame

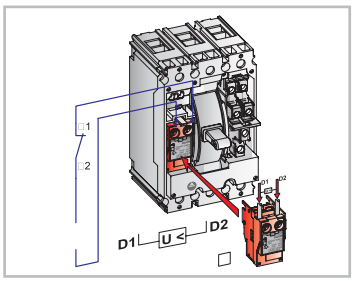
Shunt release (SHT/EA)



The ***Record Plus™*** shunt and undervoltage releases are common for all frame sizes up to 630A and all offer a unique combination of low power consumption and a kiss-free, lock out operation. Most types are common for equivalent AC and DC ratings and all are available in a wide range of voltages. When the breaker is in the "ON" position and the shunt trip is activated the breaker will trip and its contacts will open. The device can be constantly activated at its nominal voltage allowing it to be used as a lock out coil. The connection clamps are marked C1 and C2. Switches, relay contacts and push buttons can be used to operate the shunt release. The use of illuminated push buttons is limited by the power that these lamps require to operate and the value that the shunt release requires to trip. Here the maximum total consumption of the lamps may not exceed 2mA.

Voltage operational band	0.7 - 1.1 Un
Minimum pulse duration	10 msec
Total intervention time	≤ 50 msec

Undervoltage releases (UVR/MV)



When the breaker is in the "ON" position and the undervoltage release is deactivated the breaker will trip and its contacts will open. In de-energized status the device prevents the breaker contacts from moving and is suitable for use as a lock-out coil. The connection clamps are marked D1 and D2. De-energization of the device or a drop in its supply voltage to a value below the mentioned lower voltage limit will activate the device. To prevent voltage-dip-driven nuisance tripping an undervoltage release with time delay is available. An external DIN-rail mountable box contains a time delay unit with settable timings and is linked up with a DC UV undervoltage release. This version is only available for an AC voltage of 230/240V.

Voltage operation band (all types)	
deactivates between	0.35 - 0.7 Un
activates between	0.85 - 1.1 Un
minimum reaction time	10 msec
total intervention time (undelayed type)	≤ 50 msec
delayed version (extra delay)	settable 100 to 250 msec

Shunt release - Performance

Voltage rating	Current consumption mA		Power consumption mW/mVA	
	inrush	hold	inrush	hold
12V dc	200	200	2.4	2.4
24V ac/dc	150	150	3.6	3.6
48V ac/dc	60	60	2.88	2.88
110/130V ac/dc	40	40	4.8	4.8
220/240V ac 250V dc	20	20	4.6	4.6
440/440V ac	15	15	6.6	6.6
480V ac	15	15	7.2	7.2

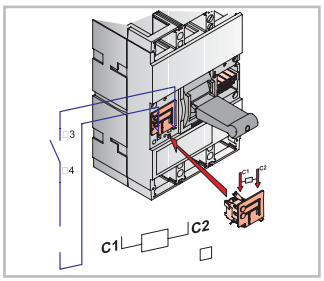
Undervoltage releases - Performance

Voltage rating	Current consumption mA		Power consumption mW/mVA	
	inrush	hold	inrush	hold
24V ac/dc	50	50	1.2	1.2
48V ac/dc	20	20	0.96	0.96
110/130V ac/dc	15	15	1.8	1.8
220/240V ac 250V dc	15	15	3.45	3.45
440/440V ac	15	15	6.6	6.6
480V ac	15	15	7.2	7.2

(1) Not applicable for FK Frame undervoltage release.

FK frame

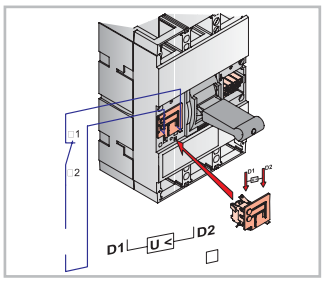
Shunt release (SHT/EA)



When the breaker is in the "ON" postion and the shunt trip is activated the breaker will trip and its contacts will open. The device can be constantly activated at its nominal voltage allowing it to be used as a lock out coil.
The connection clamps are marked C1 and C2.
Switches, relay contacts and push buttons are used to operate the shunt release.

Voltage operational band	0.7 - 1.1 Un
Minimum pulse duration	10 msec
Total intervention time	≤ 50 msec

Undervoltage releases (UVR/MV)



When the breaker is in the "ON" position and the undervoltage release is deactivated the breaker will trip and its contacts will open. In de-energized status the device prevents the breaker contacts from moving and is suitable for use as a lock-out coil. The connection clamps are marked D1 and D2. De-energization of the device or a drop in its supply voltage to a value below the mentioned lower voltage limit will activate the device. To prevent voltage-dip-driven nuisance tripping an undervoltage release with time delay is available. An external DIN-rail mountable box contains a time delay unit with settable timings and is linked up with a DC UV undervoltage release. This version is only available for an AC voltage of 230/240V.

voltage operation band (all types)	
deactivates between	0.35 - 0.7 Un
activates between	0.85 - 1.1 Un
minimum reaction time	10 msec
total intervention time (undelayed type)	≤ 50 msec
delayed version (extra delay)	settable 100 to 250 msec

Shunt release - Performance

Voltage rating	Current consumption mA		Power consumption mW/mVA	
	inrush	hold	inrush	hold
24V ac/dc	12.5	1.3	300	30
48V ac/dc	6.3	0.6	300	30
110/130V ac/dc	2.3	0.2	300	30
220/240V ac 250V dc	1.2	0.1	300	30
380-400V ac	0.8	0.1	300	30

Undervoltage releases - Performance

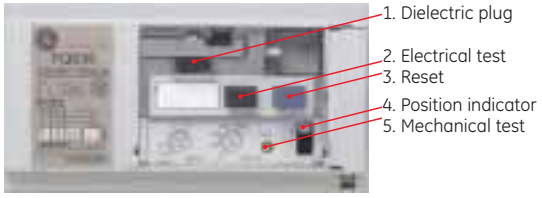
Voltage rating	Current consumption mA		Power consumption mW/mVA	
	inrush	hold	inrush	hold
24V dc	1.3	0.13	30	3
24V ac	1.3	0.13	30	3
48V dc	0.6	0.06	30	3
110-127V ac	0.2	0.02	30	3
230V ac	0.1	0.01	30	3
400-415V ac	0.1	0.01	30	3

External accessories

Residual current devices

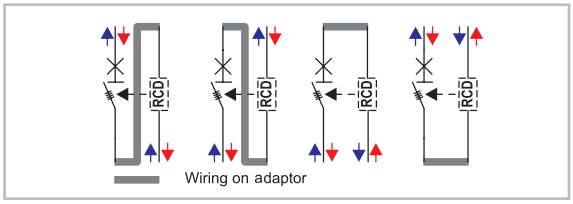
A ***Record Plus™*** circuit breaker can offer protection against earth leakage currents by using an add-on residual current device (RCD). A line of three and four pole completely integrated add-on devices are available as side mounted models (FD frame size) or as units that are fitted below the trip unit of the breaker (FD, FE and FG frame sizes). In all cases the RCD unit interfaces directly with the circuit breaker without the use of any secondary wiring or connections.
Each RCD has a sensor placed around the phase and neutral current paths that detects the vectorial sum of the phase and neutral currents. When this sum is no longer zero it is assumed that current is flowing to earth (residual current). If this value exceeds the threshold set on the RCD the breaker connected to the device is tripped.
The RCD unit´s electrical power is supplied by the line voltage of the breaker it is linked to. By use of a multi-phase bridge the design still works when one phase and the neutral is present. A pouch on the RCD allows one to place one BAT contact NO or NC which allows a remote signal on earth faults.
A ***Record Plus™*** breaker and an RCD combination can be connected like any stand-alone breaker and are available as fixed or plug-in devices. The mains connection interface of the RCD is an exact replica of the breaker connection area, thus allowing the use of all standard breaker terminals.

Designed to meet the latest IEC 947 (industrial), IEC 1009 (residential) and the IEC 755 standards, ***Record Plus™*** RCDs are available in a version suited for side or bottom mounting as three and four pole units. The tamper free setting area illustrated below is common for the whole line and includes a mechanical and an electrical test option.



The mechanical test button tests the mechanical operation of the breaker and RCD unit without power, whereas the electrical option tests both the electrical and mechanical operation of the device. In order to allow for a dielectric test of the breaker and RCD combination without damaging the electronics, a so called "dielectric disconnect plug unit" is placed within the setting area. All devices have a setting area with a standard front cut-out of 45 mm. The device has numerous current and time settings and an override blocking the time settings when set to 30mA. The devices are class A , surge resistant (500A 8/20 mircoseconds) and are finished with a transparent, tamper-free cover.

The FD-frame RCD is available in two versions: for mounting on the right hand side of the breaker or for mounting below the trip unit of the breaker. The side mounted type is available in two versions. The first one comes with a multifunctional DIN-rail mounting kit including a connection kit to link up the breaker and the RCD. The connection kit allows the user to feed the breaker and RCD assembly from a multitude of directions while placing the RCD up- or downstream.
The second version of the side-mounted RCD is designed for screw mounting and comes with a simplified connection set (see sketch). Both side mounted devices are designed to accommodate a
45 or 64 mm cover plate cut-out. This allows usage in an environment with other DIN-modular devices or with other breakers.



The screw mounted type that only allows for two connection options is depicted on the right.

The FE- and FG-frame RCD units are designed to be mounted directly below the breaker trip unit area, thus forming an integrated circuit breaker plus RCD device. All 'bottom' mounted devices are available as three and four pole units and have a setting area that is common for the whole line.

Programme overview

	FDQI or S	FDQ(1)	FEQ(1)	FEQ(1)	FGQ(1)
	FD frame side mounted	FD frame mounted below breaker(1)	FE frame mounted below breaker(1)	FE frame mounted below breaker(1)	FG frame mounted below breaker(1)
In (A)	160	160	160	250	400/630
Number of poles	3-4	3-4	3-4	3-4	3-4
Delay at 2 Idn [msec]	Inst-60-150-300-600	Inst-60-150-300-600	Inst-60-150-300-600	Inst-60-150-300-600	Inst-60-150-300-600
Total tripping time at 2 x Idn [msec]	40-100-190-340-640	40-100-190-340-640	40-100-190-340-640	40-100-190-340-640	40-100-190-340-640
Available voltages (AC..50/60Hz)	220-440V / 440-690V	220-440V / 440-690V	220-440V / 440-690V	220-440V / 440-690V	220-440V / 440-690V
Idn setting [A]	0.03 - 0.3 - 1 - 3 - 10	0.03 - 0.3 - 1 - 3 - 10	0.03 - 0.3 - 1 - 3 - 10	0.03 - 0.3 - 1 - 3 - 10	0.03 - 0.3 - 1 - 3 - 10

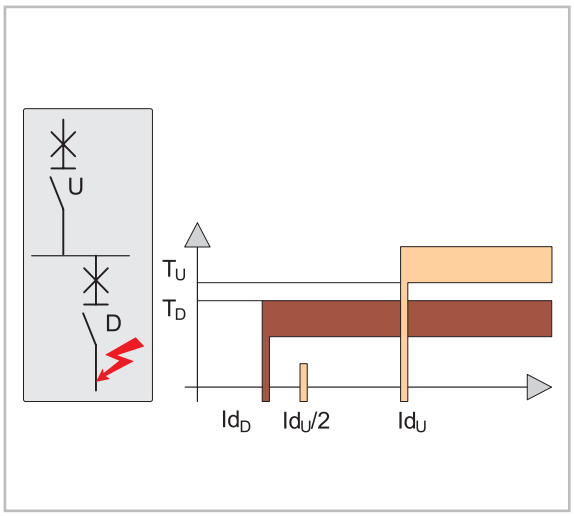
(1) Must be linked to the trip unit side of the breaker

Selectivity

To assure selectivity/discrimination between two residual current devices the following rules are applicable.

$Id_U > 2 \times Id_D$
Where Id_U is the threshold of the upstream device and Id_D that of the downstream one.

$Tr_U > To_D$
Where Tr_U is the reaction time of the upstream device and To_D is the total opening time of the downstream device.
The table included here indicates where selectivity/discrimination can be achieved and takes into account the threshold and time settings of the devices.



Selectivity overview

outgoing / incoming	Idn (mA)	Elfa Plus"S"		F-Q RCD 60 ms			F-Q RCD 150 ms			F-Q RCD 300 ms			F-Q RCD 600 ms		
		300	1000	300	1000	3000	300	1000	3000	300	1000	3000	300	1000	3000
ElfaPlus	30	T	T	T	T	T	T	T	T	T	T	T	T	T	T
Inst. Type	300		T		T	T	T	T	T		T	T		T	T
	1000					T			T			T			T
ElfaPlus	30						T	T	T	T	T	T	T	T	T
"S" type	300							T	T		T	T		T	T
	1000								T			T			T
FD-Q RCD	30		T		T	T	T	T	T	T	T	T	T	T	T
set at inst.	300					T		T	T		T	T		T	T
	1000								T			T			T
FD-Q RCD	30						T	T	T	T	T	T	T	T	T
set at :	300							T	T		T	T		T	T
60 msec.	1000								T			T			T
	3000														
FD-Q RCD	30									T	T	T	T	T	T
set at :	300										T	T		T	T
150 msec.	1000											T			T
	3000														
FD-Q RCD	30												T	T	T
set at :	300													T	T
300 msec.	1000														T
	3000														

T = Total (or Full) selectivity

External accessories

Rotary handles

The ***Record Plus***™ rotary handle is specifically designed to allow the user to change the linear motion of the breaker to a rotation over a 90 degree angle. This can be accomplished by simply adding an adaption box to the breaker front.
The design is universal for the whole breaker line and has the OFF position placed at
3 o'clock and the ON position at 6 o'clock. The third breaker position "TRIP" is located between the ON and the OFF position.
The design has room for two early closing and late opening contact blocks that, in order to save installation time, are delivered pre-mounted and pre-wired with a specific rotary-handle device.
Each ***Record Plus***™ rotary handle is designed to allow the user to place one to three 5 to 8 mm padlocks to lock the breaker in the "OFF" position.

Record Plus™ rotary handle mounted directly on the breaker front

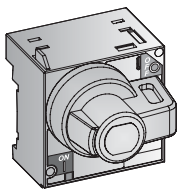
A specifically designed adaptor box with a handle is directly installed onto the breaker front. It is available in grey for normal applications and in a yellow/red execution for machine tool applications.

Rotary handle for use through door or cover plate

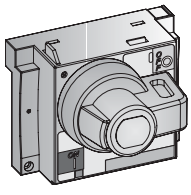
Uniquely designed to allow the breaker to be placed behind a door or cover plate with the handle protruding through the door. The rotary handle features a door-opening or cover-plate-removal prevention, interlock in the ON position and a mechanism that automatically trips the breaker if the door or cover plate is not present (a bypass is available). The rotary handle is available in grey for normal applications and in a yellow/red execution for machine-tool applications.

A special version is available with two normally open auxiliary contacts (FABAM10) that are pre-mounted and pre-wired with leads of 0.75 mm^2 and a length of 60 cm. The use of a through door rotary handle door flange is recommended.

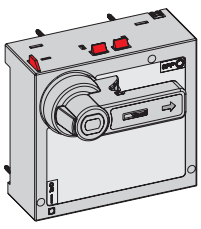
An extra Ronis or Profalux key lock can be clicked into the handle front, thus allowing one to lock the breaker in the same manner as the padlocking device.
The Ronis key locks are available in a number of versions:
- A version where each lock has a different key number
- A version where the user can choose one of six keys for several locks



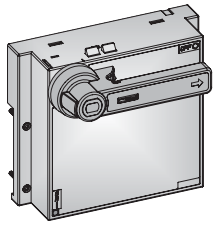
FD 63/160



FE 160/250



FG 400/630



FK 800-1600

Rotary handle for panel or hinged door mounting

A handle and escutcheon is mounted on the door or panel front and connected to the breaker by an elongation shaft that goes into an adaptor box directly installed onto the breaker front. The design allows for a total depth of up to 350 mm (from the back of the breaker mounted behind the door or panel and the door front).
The handle is available in grey for normal applications and in a yellow/red execution for machine-tool applications. Interlocks that prevent the opening of the door while the breaker is "ON" (are standard). For override operation see red indicators on euchenon front.

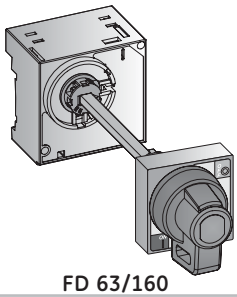
All ***Record Plus***™ rotary handles have the same standard "single hole" front door drilling and are specifically designed to tackle mounting issues as "shaft droop" and tolerance in user drillings.

Available in grey or in yellow/red the device is supplied with an adaptor box for installation on the breaker front, a mounting position definer, a shaft, a handle with escutcheon for door or panel mounting and all necessary fixation hardware.

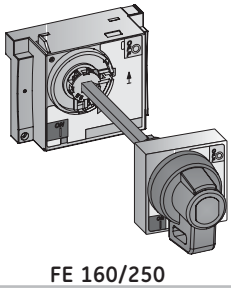
A special version is available equipped with two normally open auxiliary contacts (FABAM10) that are pre-mounted and pre-wired with leads of 0.75 mm^2 and a length of 60 cm.

An extra Ronis or Profalux key lock can be clicked into the handle front, thus allowing one to lock the breaker in the same manner as the padlocking device.
The Ronis key locks are available in a number of versions:
- A version where each lock has a different key number
- A version where the user can choose one of six keys for several locks

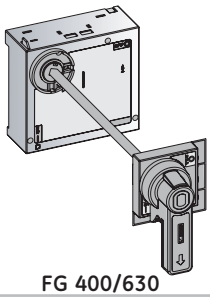
A number of accessories are available to allow for specific applications of the device:
- To operate the push to trip from the door front an accessory allowing for a Bowden cable can be fitted to the rotary handle adaptor (flex operator push to trip)
- An adaptor to allow the use of the device with a drawout construction on the FE, FG,and FK frame sizes
- A "long shaft set" allowing for larger mounting depths than 350 mm (max. 600 mm)



FD 63/160



FE 160/250



FG 400/630

FK 800-1600

External accessories

Rotary handles - accessories

Extension shaft set

- The "long shaft set" allows the user to install a breaker with a door or panel mounted rotary handle up to a depth of 600 mm, measured from the back of the breaker to the front of the door
- The set includes a shaft and a shaft droop prevention adapter
- Available for all frames

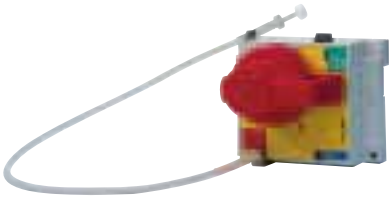
Keylock

- Mounted onto the direct or behind-door rotary handle, the key lock locks the operator in the OFF position
- The key can not be operated when the lock is opened: the key is not removable when the breaker is in the ON position
- The Ronis key lock type is available with different key numbers or with a choice of 6 specifically allocated key numbers
- The same key can be used for a number of different key locks on a number of different breakers
- The specific order code assures that the key fits every lock with the same code, even if ordered at a later date.
- Available for all frame sizes

Side-by-side installation adapter boxes

- A set of covers that bridge the gap between breakers with rotary handles on use through cover plate
- Provides an aesthetically pleasing finish to the breaker fronts
- Available for FD and FE frame sizes.

Flex operator push to trip (Bowden cable)



- For the door/panel-mounted rotary handle accessory
- Allows the operation of the push-to-trip button from the door front by use of a bowden cable (cable NOT supplied).
- Available for FD, FE and FG frame sizes.

Drawout adaptor

- For use with the door/panel mounted rotary handle with the standard or long shaft.
- The device allows for the difference in breaker position in the drawout device (depth difference, withdrawn and plugged in)
- The telescopic construction allows one to close the door or panel with the breaker in the withdrawn position
- Available for FE, FG and FK frame sizes.

Auxiliary contacts

- Special rotary handle versions can be provided with two FABAM NO contacts. These close before the main contacts close and open after the main contacts open
- The contacts come pre-installed in the rotary handle and have 2 cables 0.75 mm^2, 60 cm long
- Available for FD, FE, FG and FK frame sizes.

Notes

External accessories

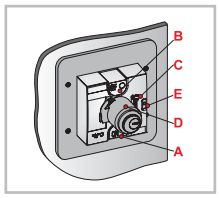
Electrical operators

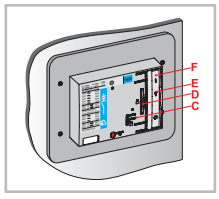
In order to allow a ***Record Plus™*** circuit breaker to be operated electrically, front mounted electrical drives are available. These drives are designed for easy mounting onto the breaker front and offer operating times of 75 milliseconds or lower.
A specifically designed electrical operator is available for each frame size (FD, FE, FG or FK) each of which has the same specific technical design features.
A ***Record Plus™*** motor operator has three positions "OFF", TRIP" and "ON", a three-wire connection scheme and is designed to be fast: **all drives close within 75 milliseconds**.

An operating panel placed on the drive front allows one to choose between two operational positions
- **electrical or manual**.
The panel includes a padlocking or key-locking device in OFF position, the position indicators and a manual operator.
The devices are connected by means of IPXXB box terminals accessible from the breaker front and located in the immediate vicinity of the terminals of the internal accessories. The box terminals allow for wiring with a cross section of 0.5 to 2.5 mm^2.

Operation

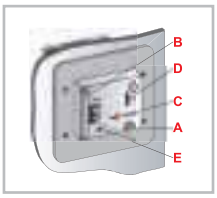
FD and FE frame
The ***Record Plus™*** FD and FE frame drives are designed with the same front cut-out in the door or panel and total breaker depth, thus allowing a side by side use of the devices. The drives have a front escutcheon housing with all the necessary operators, indicators and locking features:

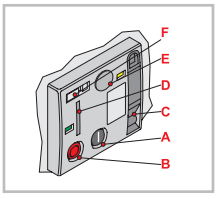




Ⓐ ON push-button
Ⓑ OFF push-button
Ⓒ Manual / Automatic switch
Ⓓ Padlocking device
Ⓔ Position indicator "OFF"--"TRIP"---"ON"
Ⓕ Local operating handle

FG and FK frame
The ***Record Plus™*** FG and FK frame drives have a front escutcheon housing with all the necessary operators, indicators and locking features:





Ⓐ ON push-button
Ⓑ OFF push-button
Ⓒ Charging handle
Ⓓ Padlocking rack
Ⓔ Room for cylinderlock
Ⓕ Manual / Automatic switch

Mounting and Connection

Each drive comes fully mounted and only requires to be screwed onto the front of the breaker after removing the standard handle elongator.(1)
The connections are easily accessible and are placed within the immediate vicinity of the accessory wiring outlets. This allows for easy interconnection with other internal accessories.

(1) On the FG and FK frame sizes the lid needs to be removed

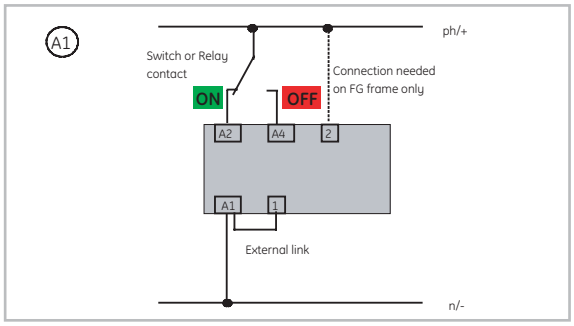
Specifications

Operating times	FD63 & FD160	FE160 & FE250	FG400 & FG630	FK800, FK1250 & FK1600
"On" - pulse received, breaker ON - by drive	50 millisec.	100 millisec.	50 millisec.	50 millisec.
"Off" - pulse received, breaker OFF- by drive	50 millisec.	100 millisec.	8 seconds	12 seconds
"Off" - pulse received, breaker OFF- by SHT/UVR release	50 millisec.	50 millisec.	50 millisec.	50 millisec.
"Reset" - Time between "OFF" and subsequent "ON" pulse	80 millisec.	80 millisec.	8 seconds	12 seconds
Power consumption and required ratings				
Short time pulse power "OFF"	700VA / W	700VA / W	500VA / W	500VA / W
Constant power required when in "OFF" position	0	0	0	0
Short time pulse power "ON"	700VA / W	700VA / W	500VA / W	500VA / W
Constant power required when in "ON" position	0	0		
Required transformer rating VA (AC use only)	300VA(1)	300VA(1)	300VA	300VA
Required Push button/Contact rating (A)				
AC12 24V AC	-	-	6	6
AC12 230V AC	2	2	2	2
AC15 24V AC	4	4	4	4
AC15 230V AC	1	1	1	1
DC12 24V DC	-	-	10	10
DC12 220V DC	4	4	4	4
DC14 24V DC	4	4	4	4
DC14 220V DC	1	1	1	1
Life Span				
Mechanical endurance	10000	10000	5000	5000
Operations per hour	120	120	60	30

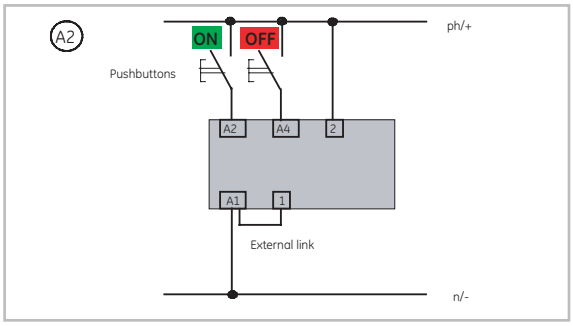
(1) 24V rating requires a 630VA transformer

Schematics FD, FE & FG frame Electrical Operator

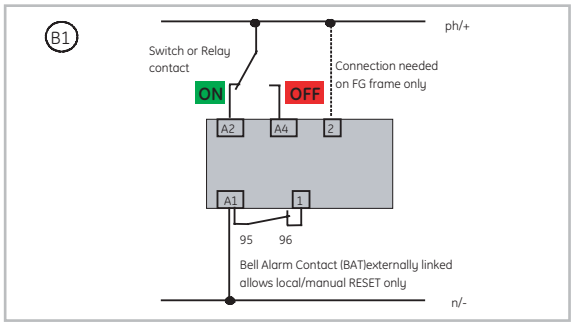
Scheme A1
Suitable for Non Automatic breakers (switch)
Control circuit operated with a relay contact or a switch.



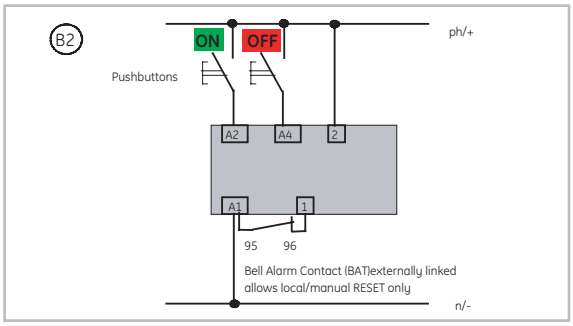
Scheme A2
Suitable for Non Automatic breakers (switch)
Control circuit operated with push buttons



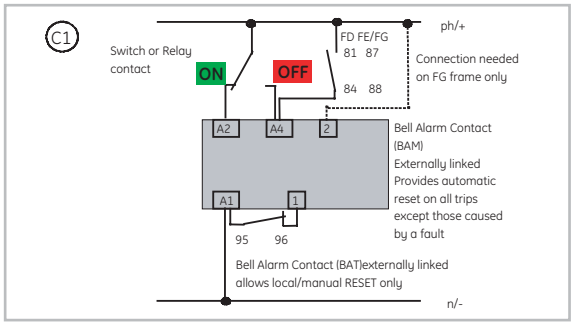
Scheme B1
Suitable for standard circuit breakers without Shunt or Undervoltage release
Control circuit operated with a relay contact or a switch.
After a fault the breaker goes into 'tripped position'.
The BAT/CD contact then prevents further electrical operation.
The breaker MUST be reset locally by hand.



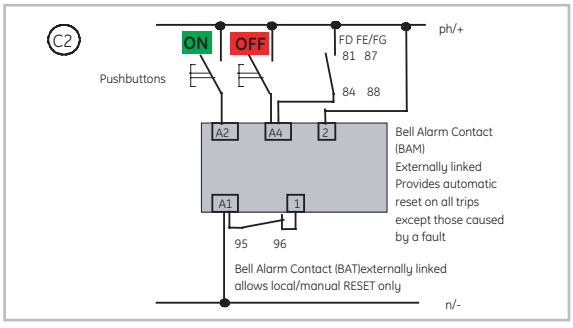
Scheme B2
Suitable for standard circuit breakers without Shunt or Undervoltage release
Control circuit operated with push buttons
After a fault the breaker goes into 'tripped position'.
The BAT/CD conatct then prevents further electrical operation.
The breaker MUST be reset locally by hand.



Scheme C1
Suitable for standard circuit breakers with Shunt or Undervoltage release
Control circuit operated with a relay contact or a switch.
After a fault the breaker goes into 'tripped position'.
The BAT/CD contact then prevents further electrical operation.
The breaker MUST be reset locally by hand.
If tripped by 'other means' an automatic reset is initiated.

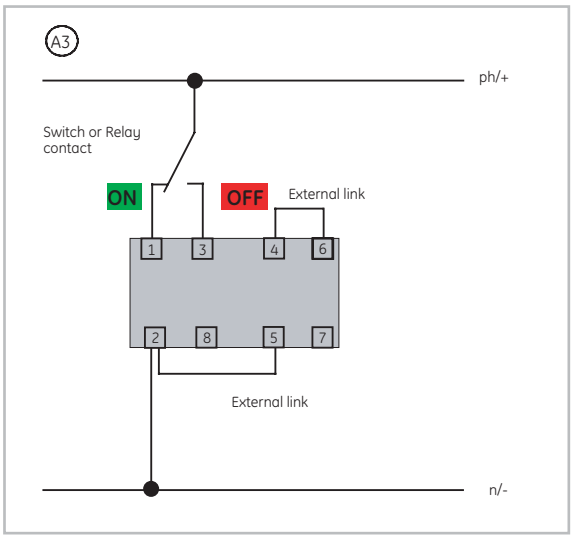


Scheme C2
Suitable for standard circuit breakers with Shunt or Undervoltage release
Control circuit operated with push buttons
After a fault the breaker goes into 'tripped position'.
The BAT/CD contact then prevents further electrical operation.
The breaker MUST be reset locally by hand.
If tripped by 'other means' an automatic reset is initiated.

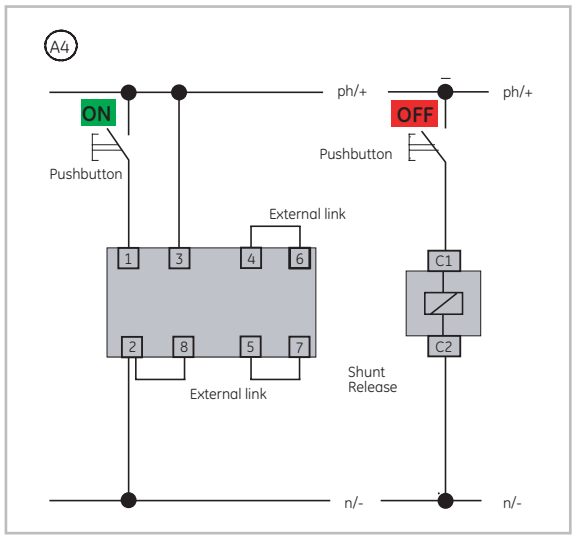


Schematics FK frame Electrical Operator

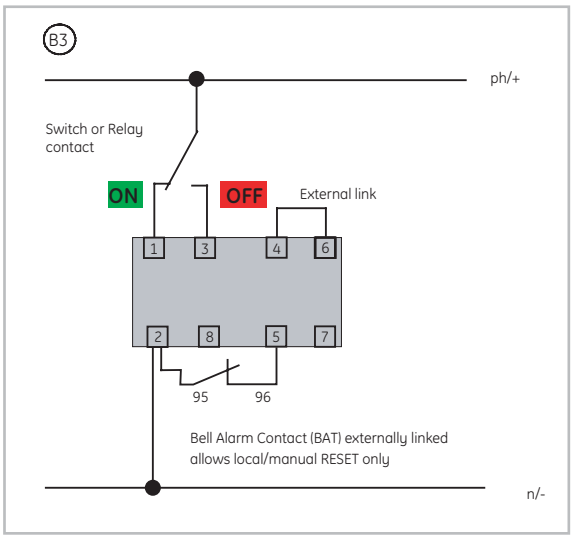
Scheme A3
Suitable for Non Automatic breakers (switch)
Control circuit operated with a relay contact or a switch.



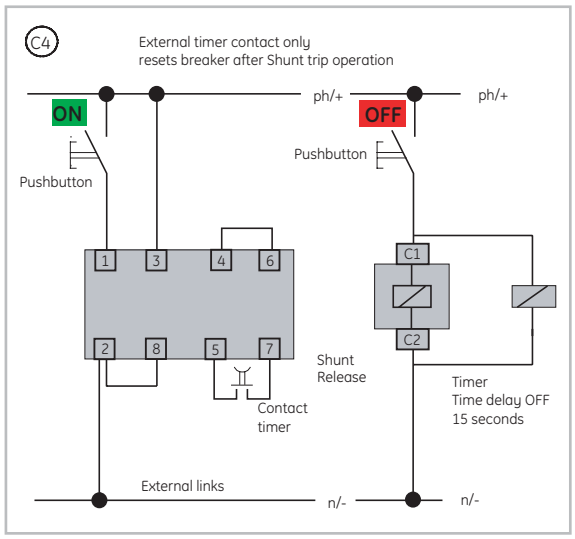
Scheme A4
Suitable for Non Automatic breakers (switch)
Control circuit operated with push buttons
The use of a shunt trip is mandatory.



Scheme B3
Suitable for standard circuit breakers without Shunt or Undervoltage release
Control circuit operated with a relay contact or a switch.
After a fault the breaker goes into 'tripped position' .
The BAT/CD contact then prevents further electrical operation.
The breaker MUST be reset locally by hand.



Scheme C4
Suitable for standard circuit breakers with Shunt release
Control circuit operated with push buttons.
After a shunt trip OFF signal the breaker goes into 'tripped position' and is reset automatically.
On all other trip events the breaker MUST be reset locally by hand.



External accessories

Connectivity - 60 mm system

three and four pole

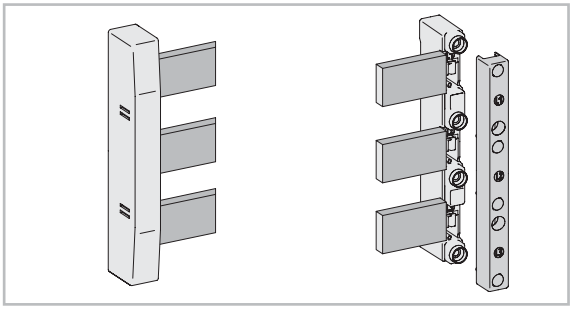
Record Plus™ circuit breakers have been designed to be installed easily and quickly with conventional means. The devices can be screw mounted to a mounting plate or clicked to a symmectrical DIN rail and connected with busbars, cables, flex-bars and ring terminals in a multitude of configurarations. However, if mounting and connecting the breaker can be cut down to a few simple, automateable tasks, installation can become easier and more cost effective.

Based on these principles GE Power Controls have devised a unique system that allows the user to mount and connect the breaker before the installation. An adaptor device, specifically designed for the ***Record Plus™*** breaker line and incorperating all the connection hardware, is fitted to the breaker using five to six simple screws. Once mounted the adaptor is then simply plugged on to a three or four pole busbar system already installed in the switchboard.

Busbar system

The heart of the system is formed by a busbar system based on the 60 mm standard for bar spacing. It is made up of one of two different sets of three or four pole supports, designed to allow the use of the following copper bar dimensions.

20 x 5 mm; recommended for 250A
20 x 10 mm; recommended for 400A
30 x 5 mm; recommended for 400A
30 x 10 mm; recommended for 630A



As standard the busbar supports are delivered prepared to receive busbar of cross section 30 x 5 mm, but they can easily be adapted to each other dimension mentioned by an integrated spacing element.

By varying the distance between the supports it is possible to build a three or four pole busbar system with the following short circuit ratings:

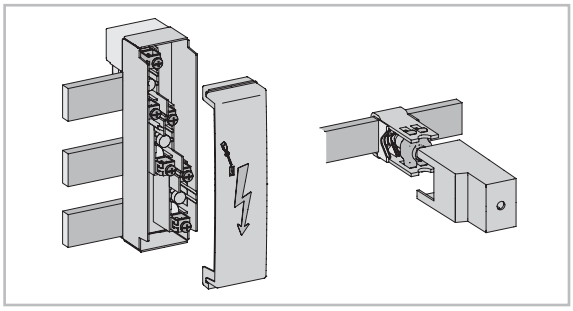
Busbar system

Support spacing	Busbar size (mm)	Peak withstand Ipk (kA)	Thermal withstand Icw (kA eff) 1 sec.
200 mm	20 x 5	46	21.9
	20 x 10	50	23.8
	30 x 5	58	27.6
300 mm	30 x 10	63	30.0
	20 x 5	40	19.0
	20 x 10	43	20.5
	30 x 5	52	24.8
400 mm	30 x 10	56	26.7
	20 x 5	35	16.7
	20 x 10	37	17.6
	30 x 5	47	22.4
	30 x 10	49	23.3

Mains connection

The system can be connected from the side or front. The front connection kit makes use of connection modules with connection lugs that are directly plugged on to the busbars. This module comes as a three and four pole unit and allows the connection of conductors from 1.5 to 70 mm^2.

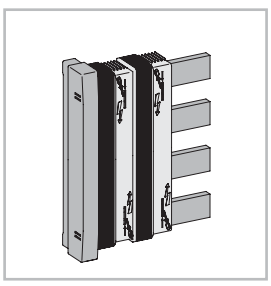
The side connection kit is made up of single pole connectors with terminal covers that allow for the connection of Cu conductors with a cross section of 25 to 300 mm^2.

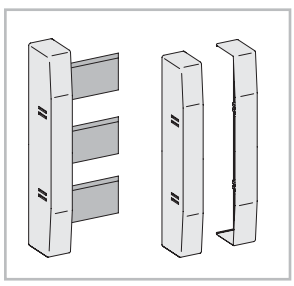


Busbar finishing

Insulating covers are available to protect the user from inadvertent direct contact with the busbar system. These elements have a standard width of 50mm and can be coupled laterally offering variable width in order to cover the busbar not yet covered by breakers or feeding modules.

Endplate covers can be mounted to the busbar supports in order to provide complete protection against inadvertent contact to a busbar from the side.

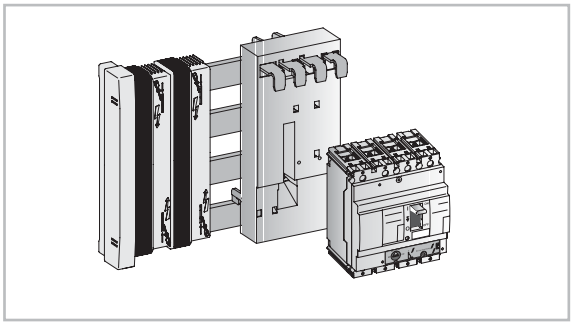




The system

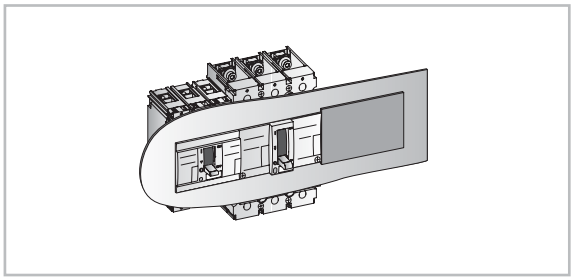
For the ***Record Plus™*** FD and FE frame adaptors exist rated at 160A (FD) and 250A (FE) and in a 3 and 4 pole version. Designed to allow the use of the breaker at its full rated breaking capacity of 150kA at 415V each unit is equipped with a plug/hang on connection system allowing one to place it on the busbar system in one simple operation.
The adaptors have been tested to meet the most stringent requirements and are equipped with a mechanism allowing them to be removed as they were mounted.
Each adaptor is supplied with the necessary fixation hardware and a terminal shield to cover the connection between the breaker and the adaptor.
The breaker is mounted and connected to the adaptor by using two pre-tapped fixation points located at its lower end while its main terminals are used to connect and fix it at the upper end of the adaptor.

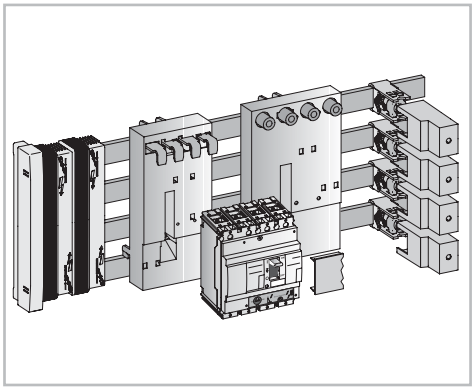
Adaptor
The breaker and adaptor mounting is simple and easy. The length of the 4 pole adaptor also allows the use of a bottom mounted RCD.



System
Each breaker is fixed on the adapter by means of two pretapped screws at the bottom and its main terminals at the top.
The breaker and adaptor combination is now quite simply plug/hung on to the busbars, connecting and fixing the breaker in one simple operation.
To allow for a flush-front finishing the adaptors have been designed to adapt to the difference in breaker depth and can be used with the standard FD and FE frame sizes (FD type without DIN-rail adaptor).
The system can be finished with a cover/trim plate that can be found in the GE Power Controls enclosure/ systems catalogue.

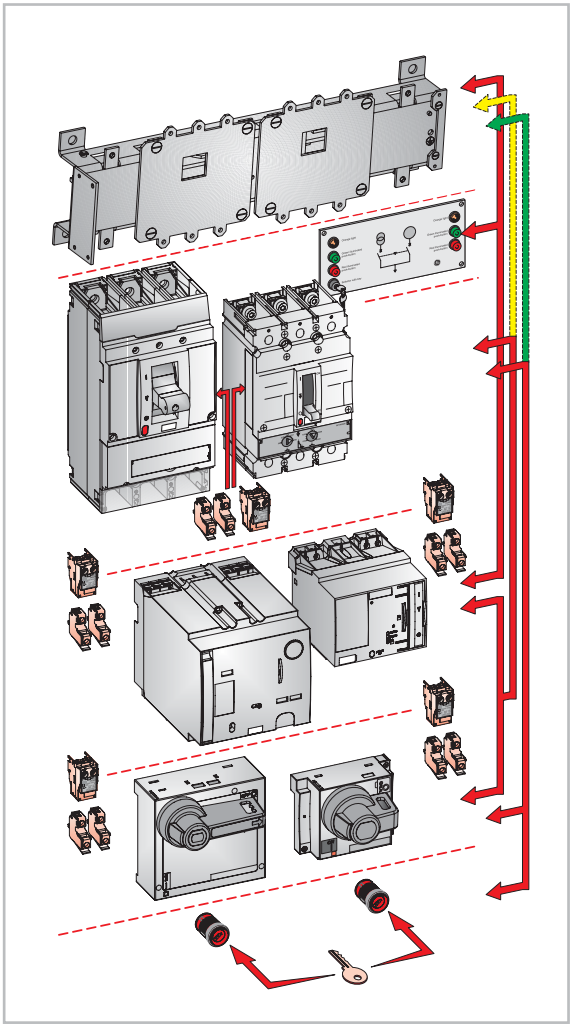
Finishing
The system can be finished with a cover/trim plate that can be found in the GE Power Controls enclosure/systems catalogue. To allow for a standard cut-out within the cover/trim plate a filler piece is available in lengths of of 1.2 m. This filler plate is adapted to the ***Record Plus™*** standard front cut-out of 64 mm.





External accessories

Changeover/Power transfer systems

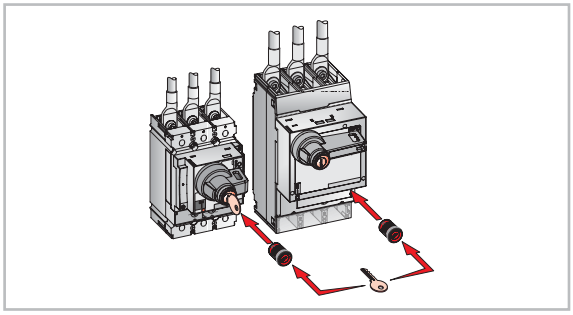


Mechanical interlocking

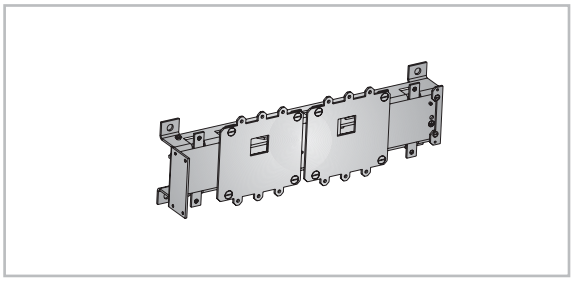
Record Plus™ circuit breaker are designed for use with a number of mechanical interlock systems suitable for use with thermal magnetic, magnetic only, non automatic and electronic circuit breakers. Each system only permits one of the two interlocked devices to be switched to the 'on' position.

Two systems are available

Mechanical interlocking by equipping both devices with a rotary handle and cylinderlocks with the same key number. (2 locks one key)



The use of an interlock unit mounted behind the two devices, here the breakers are fitted on to pre-assembled adapter plates that allow the breaker to infterface with the interlock unit.

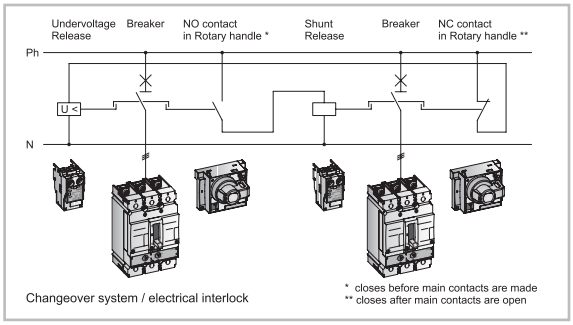


Mechanical interlocking is possible for the following breaker types and combinations

Two 3 or 4 pole FE frames (10- 250A).
Two 3 or 4 pole FG frames (100- 630A).
Two 3 or 4 pole FK frames (320-1600A).
One 3 or 4 pole FG frames (100- 630A)
&
One 3 or 4 pole FE frames (10- 250A).
One 3 or 4 pole FK frames (320-1600A)
&
One 3 or 4 pole FG frames (100- 630A).

Electrical interlocking

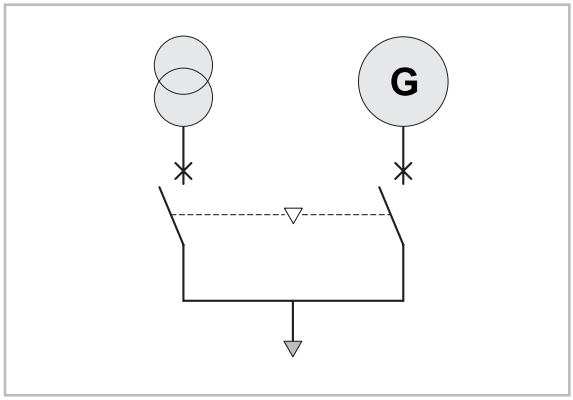
Two devices can be electrically interlocked by using a combination of shunt and/or undervoltage releases with auxiliary contacts of the early closing and breaking type. The ***Record Plus***™ undervoltage and shunt release are designed to allow their use as interlocking devices and use a twin coil actuator design. Rotary handle mechanisms are available with early closing and breaking auxiliary contacts.



Automatic changeover

To assure the continuity of electrical supply within a low voltage installation it is desirable that on a failure of the mains voltage supply a secondary power source takes over. An automatic changeover device transfers the power supply from the main power source to a secondary supply when a voltage monitoring device detects a failure in the mains voltage.

The GEPC devices are available in several versions each tailored to the specific needs of the user and the design of the installation.



Based on the differences in the configuration of the power supply, complete systems are available for two or three power sources(1). A two breaker system allows for a power transfer between a transformer and a generator set (or two transformers).

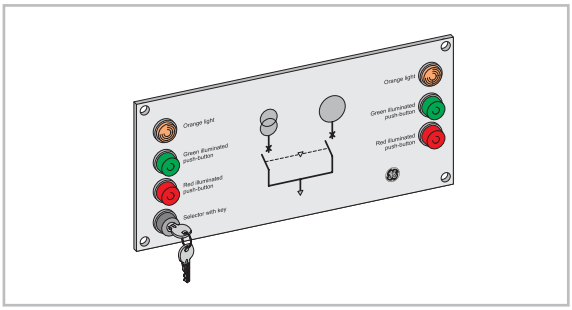
Controllers

Controllers are available for change over systems with two breakers allowing for a number of power supply configurations. Each controller has a manual, automatic and locked position, a generator start up routine and a full set of pilot lights indicating the status of the system.

Two basic controllers available:

E model
Is available for change over systems with two devices. On a mains supply failure the mains device is disconnected and the secondary device switched on. When the mains supply returns, the controller keeps the secondary supply on line for a preset time of 10 seconds. It then opens the secondary breaker and closes the mains breaker. An emergency STOP order can be inputted on the terminals that will switch both the mains and secondary device to be switched OFF.

E plus model
Is available for changeovers with two devices. In addition to the standard E model features it allows for:
- A generator start up command.
- An adjustable time delay on the generator start command initiation.
- Two connections allowing the input of a signal indicating that the supply of the generator set has reached it's nominal voltage. Only then will the mains device be disconnected and the secondary device switched on.
- An adjustable transfer and retransfer time between the different power supplies.
- Allows for the connection and disconnection of non priority loads when switching to the secondary supply.
- Built in communication.
- A terminal that allows the input of a start order of the generator set independent of the mains supply status. Here a change over cycle is initiated transferring from main to secondary supply.
- Adjustable cool down time of generator set.



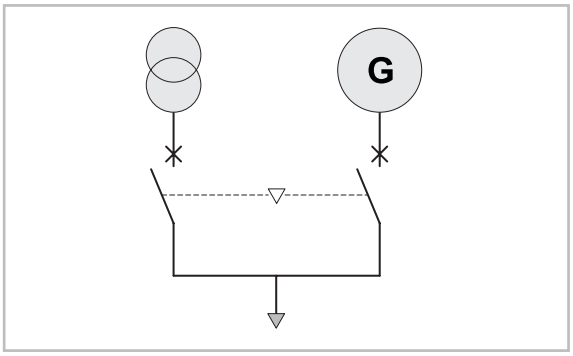
Controllers, performance

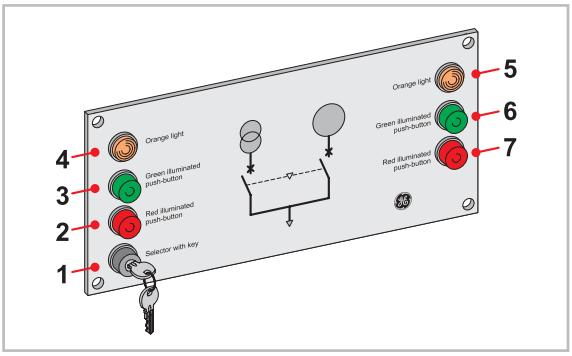
	E model	E plus model
Number of devices	2	2
Positions	Aut.- Man.- locked	Aut.- Man.- locked
Operating voltage	110 or 230V AC	110 or 230V AC
Power consumption	18VA	18VA
Mains voltage monitoring(1)	Optional	Optional
Time delay on generator set start signal	No	Adjustable 0.1 to 60 sec.
Time delay on transfer command after mains return	Fixed 10 sec.	Adjustable 0.1 to 15 min.
Remote order stop	included	included
Remote transfer order	No	included
Remote retention of secondary supply order	No	included
Non priority load switching	No	included
Cool down time gen. Set.		Adjustable 0.1 to 60 min.
Communication		RS232 / RS485

(1) Optionally, a built-in net and/or generator voltage monitor can be delivered with the controler

Automatic system with two devices

The system consists of two electrically operated ***Record Plus™*** moulded case circuit breakers equipped with a walking beam mechanical interlock and a controller that can be mounted in the front of the door or cover in which the breakers are installed.





Controller modes

A key operated switch (1) allows the selection of four different operational modes:

LOCKED	- all breakers remain in the position attained before this mode was initiated - The push buttons are disabled. - All automatic transfer functions are non functional.
MANUAL **E model**	- Taking the conditions normally applied to a transfer operation into account, the push buttons allow operation of the breakers. - Pressing the generator 'ON' push button will only result in an operation of the breaker if the mains breaker is open and the generator is on line. (voltage present)
E plus model	*On use of the E plus controller, pressing the generator 'ON' push button will give the generator an order to start. If second voltage is available an automatic transfer will be initiated from mains to generator supply. This operation can be cancelled by depressing the generator 'OFF' or mains 'ON' push button.*
E model	- Pressing the mains 'ON' push button will only result in an operation of the breaker if the generator breaker is open and the mains is on line. (voltage present)
E plus model	*On use of the E plus controller, pressing the mains 'ON' push button will initiate a automatic transfer from generator to mains supply. This operation can be cancelled by depressing the mains 'OFF' or generator 'ON' push button. If the mains voltage is not present, the cycle will not be carried out.*

AUTOMATIC	Depressing the push buttons that operate the breaker in the manual mode have no effect. ***Mains supply fails***
E model and *E plus model*	The system remains in its standby mode in which the mains breaker is 'ON' and the secondary supply breaker (generator) is 'OFF'. As soon as a signal is received that the secondary supply voltage is available the mains breaker is opened and the secondary supply breaker closed. If the secondary supply breaker does not close on the first command, two further closing orders will be given. If the breaker is still unable to close a fault is indicated.
E plus model	*Issues a start command to the secondary supply. This can be delayed up until 60 seconds after mains failure.*
	Mains supply returns
E model	The system remains in its secondary mode. The secondary breaker (generator) is 'ON' and the mains supply breaker is 'OFF' for a period of 10 seconds. This delay is re-instated if the mains supply fails within this time frame. After this delay the secondary supply breaker is opened and the mains breaker closed. If the mains breaker does not close on the first command, two further closing orders will be given. If the breaker is still unable to close a fault is indicated.
E plus model	*Basic operation is the same. However the 10 second delay is upgraded to one that is adjustable from 0 to 15 minutes.*

Pilot lights

ORANGE (4)	Mains voltage present.
ORANGE (5)	Secondary supply voltage available.

Push-buttons with pilot lights

GREEN (3)	Constantly on: Mains breaker is 'OFF' Blinking: Transfer to secondary supply underway **-OR-** Fault detected on closing mains breaker When the key selector switch is in it's manual position the push-button allows one to switch the mains breaker 'OFF'
GREEN (6)	Constantly on: Secondary supply breaker is 'OFF' Blinking: Transfer to mains supply underway **-OR-** Fault detected on closing Secondary supply breaker When the key selector switch is in it's manual position the push-button allows one to switch the Secondary supply breaker 'OFF'
RED (2)	Constantly on: Mains breaker is 'ON'. Blinking: Mains breaker has tripped due to an overcurrent. (fault mode) When the key selector switch is in it's manual position the push-button allows one to switch the mains breaker 'ON'
RED (7)	Constantly on: Secondary supply breaker is 'OF'. Blinking: Secondary supply breaker has tripped due to an overcurrent. (fault mode) When the key selector switch is in it's manual position the push-button allows one to switch the Secondary supply breaker 'ON'

E plus model extra functionality

- Extra green pilot light indicates that the PLC is on line and functioning well.
- Remote retention of secondary supply
  Used to prevent unwanted power transfers and to prevent these occurring a to high a frequency.
  A specific potential free contact is dedicated to this function.
- Transfer to secondary supply option
  Used to start and keep the secondary supply on line independent of the presence of the mains voltage.
  A specific potential free contact is dedicated to this function.
- Switching on Non Priority loads
  If the secondary supply cannot cope with the full load of the installation it is necessary that certain 'NON priority loads are deactivated when the installation is supplied by the secondary source.
  However,after some time some NON priority loads could become 'Priority loads'.
  A potencial free contact is used to activate again these loads
- Voltage monitoring relays
  4 terminals are supplied that allow the connection of a contact indicating that the chosen supply is available and meets the standards set by the relay.

System performance

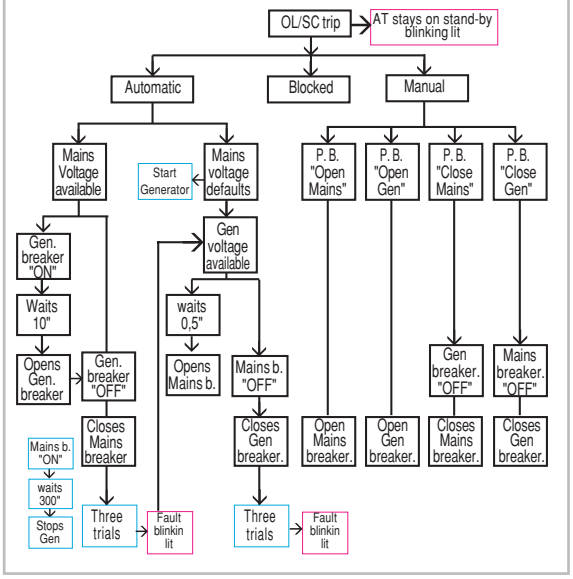
Breaker operation

Operating times (minimum)	FE frame	FG frame	FK frame
Opening (trip)	75 ms.	50 ms.	50 ms.
Closing (ON)	75 ms.	50 ms.	50 ms.
Reset plus OFF	2 sec.	5 sec.	12 sec.

Changeover operation

Operating times (minimum)
The sum of the operating times of the chosen breaker combination plus the time values of the controller.

Functional diagram
In 3 ATS the diagram is adapted to selected type

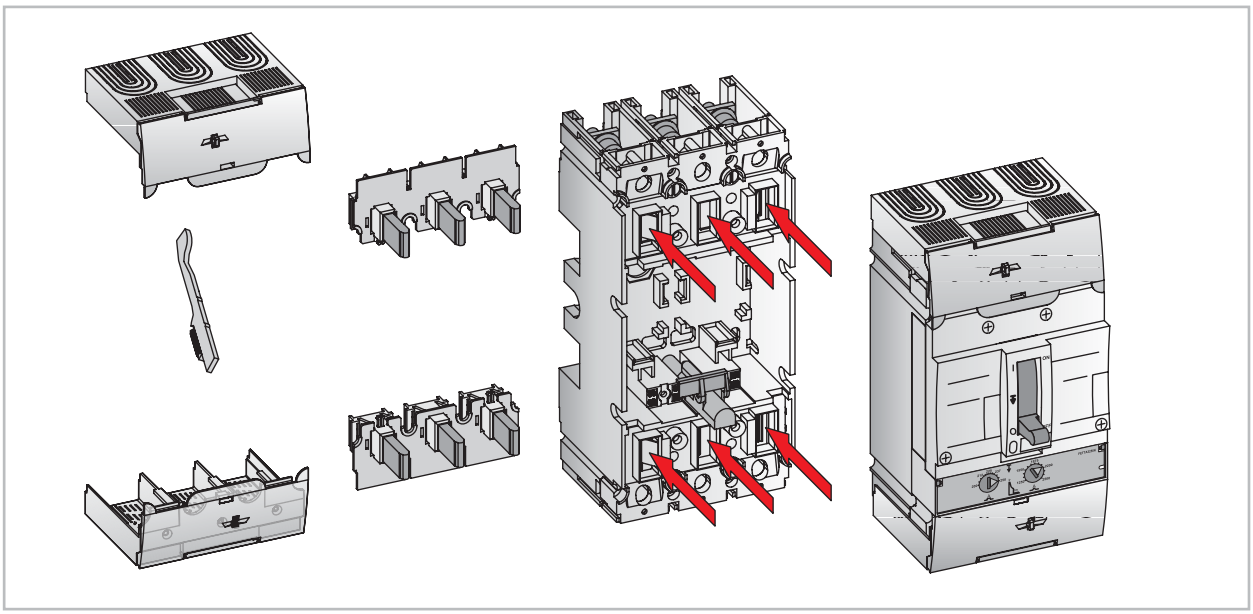


Versions

Plug-in

The ***Record Plus™*** plug-in version allows quick, safe and easy interchange of breakers. It is made up of a "standard" fixed-front-connection breaker, a set of plugs, a trip mechanism fitted to the breaker and a monoblock base into which the breaker is plugged.
When the breaker is removed from the plug-in base it trips automatically (main contacts open) before the plug-in contacts in the base are disconnected.
The breaker can be operated (closed and opened) when removed from the plug-in base. On attempted insertion of a breaker in the "On" position into the plug-in base, the ***Record Plus™*** breaker trips before the plug-in contacts in the base are connected.
The ***Record Plus™*** plug in version is available for:
FD frame sizes FD63/160 (maximum 125Amps)
FE frame sizes FE160/250 (maximum 250Amps)
FG frame sizes FG400/FG630 (maximum 630Amps)

FD and FE frame sizes equipped with "bottom mounted RCD unit" can also be transformed into the plug-in version. The mobile part of the plug-in version remains the same (plugs and trip mechanism do not change). The fixed plug-in base is of a different, elongated type and has a seperate catalogue number.



Mobile part

The mobile part that is fitted to the breaker is made up of a multi-pole set of plugs that displace the standard front connection. It also includes a trip interlock, that, when mounted, trips the breaker on its removal from the base and prevents re-insertion into the base when the breaker is on.
The mobile part is supplied with tamper free short terminal shields.

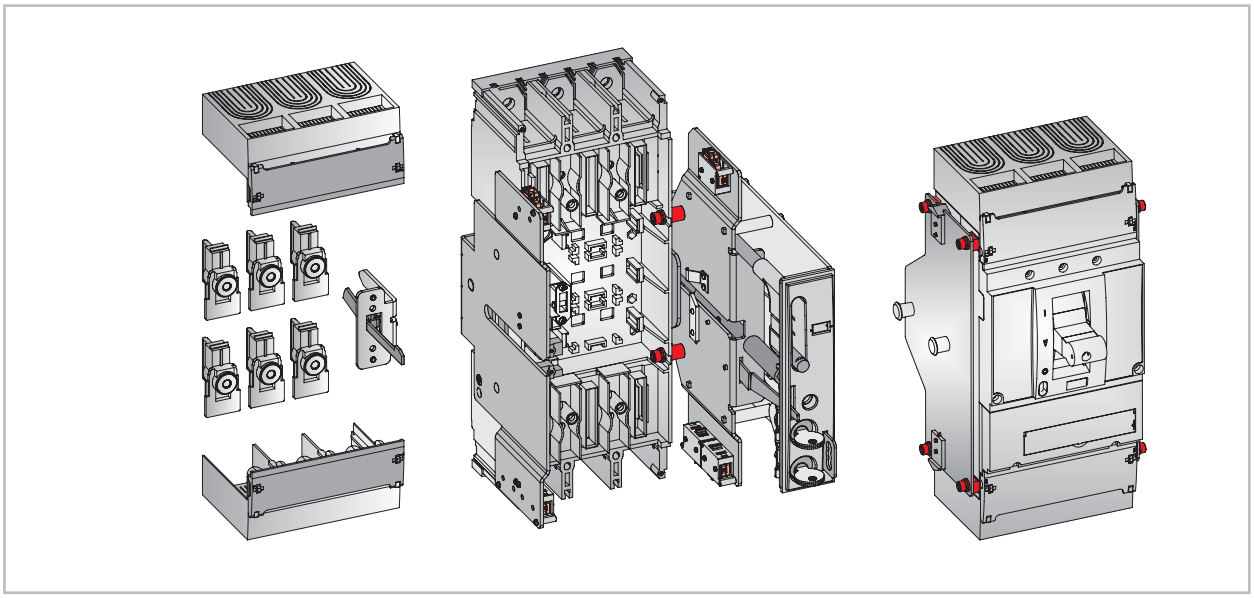
Monoblock base

The monoblock base can be mounted to a backplate or on profiles and offers IPXXB protection for front access. (FD - IP20, FE and FG - IP40).
It is designed to have exactly the same connection profile as the breaker it goes with, thus allowing the installation of all terminal shields and terminals that the standard breaker offers. These include rear and angular connectors, spreaders, customized ring terminal connectors and extenders.

Drawout

A drawout version allows one to visibly and positively disconnect the mains supply from the installation. Like on the plug-in device, interchanging breakers quickly, safely and effectively is one of the key features of ***Record Plus™*** drawout. It is made up of a breaker ("standard" fixed front connection version), a set of plugs and a trip mechanism that are fitted to the breaker, a monoblock base into which the breaker is plugged and a metal support cradle.

The cradle allows for placing the breaker in one of three positions:
Connected: Main and auxiliary contacts are fully connected to the base
Test/Disconnected: Main contacts are disconnected. Auxiliaries can be connected or disconnected. This allows for a complete test of the secondary wiring/functionality without having the mains connected.
Remove: Main and auxiliary contacts are fully disconnected from the metal support cradle and the plug-in base, the breaker can be removed.



Mobile part

The mobile part that is fitted to the breaker is made up of a multi-pole set of plugs that displace the standard front connection. It also includes a trip interlock, that, when mounted, trips the breaker on its removal from the base and prevents re-insertion into the base when the breaker is on. The kit includes a sliding mechanism linking the breaker to its cradle. As with the plug-in version tamper-free short terminal shields are included in the kit.

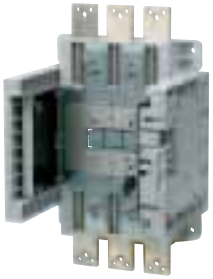
Cradle with monoblock base
The cradle and monoblock base combination can be mounted to a backplate or on profiles and offers IPXXB protection for access from the front of the cradle. It is designed to offer the same connection options as the standard fixed front connection circuit breaker.

Remark: See following page for details on interlocks and cradle execution.

FE and FG frames sizes

The cradle is of a sturdy metal construction and is supplied with an integrated standard plug-in base. All standard terminal shields, terminals, the available accessories for the standard fixed front connection breaker, can be implemented. These include rear and angular connectors, spreaders, customized ring terminal connectors and extenders.

FK frames sizes



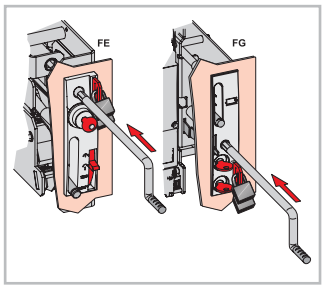
The cradle and monoblock base are combined to form one integral moulded part. The unit is available with a front or rear connection facility that allows the use of connection clamps available as accessories for the standard fixed front connection breaker.

Versions

Drawout, cradle types

FE and FG frame

In the drawout version the ***Record Plus™*** FE and FG frame breakers use the standard plug-in base encapsulated in a metal cradle. The metal cradle has a escutcheon that protrudes through a door or panel.



The escutcheon is designed as an operation- and indicator-panel and includes the following elements:

- A slot for handle insertion. This to withdraw the breaker by rotating it anti-clockwise, and clockwise to re-insert it into the cradle.
- A locking facility for 3 padlocks of 5 to 8mm (locking in Disconnected/Test position only)
- Room to place a Ronis keylock (E frame 1, G frame 2) (locking in Disconnected/Test position)
- A storage facility for the drawout handle
- A position indicator: Inserted, Disconnected/Test and Withdrawn

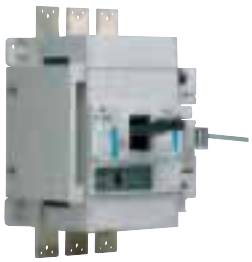
The cradle has space to mount two specifically designed auxiliary contacts blocks type FAS10D or FAS01D per position Disconnected/Test and Withdrawn.

When the drawout is mounted behind a panel or door, the design allows the breaker operators and the drawout escutcheon to be accesible from the panel or door front, three executions are possible:

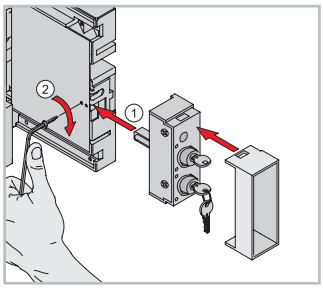
- Breaker is operated by elongated toggle (standard, included in drawout system)
- Breaker with electrical operator (door flange to be ordered seperately)
- Breaker is operated by a rotary handle type through door or cover. (door flange to be ordered seperately)

- Breaker is operated by a rotary handle on hinged door or panel. (telescopic shaft needs to be ordered seperately)

FK frame



The FK breaker frame size drawout system has a cradle and monoblock base combined to form one integral moulded part. The design has a escutcheon that protrudes through a door or panel.



The escutcheon is designed as an operation and indicator panel and includes the following elements:

- A slot for handle insertion. This to withdraw the breaker by rotating it anti-clockwise, and clockwise to re-insert the breaker into the cradle.
- A locking facility for 3 padlocks of 5 to 8 mm (locking in drawout position only)
- An escutcheon adaptor is available with space for one or two Ronis keylocks. (locking in drawout position)
- A position indicator: Inserted, Withdrawn and Test

The cradle permits the mounting of three auxiliary contacts, one per position: Inserted, Withdrawn and Test.

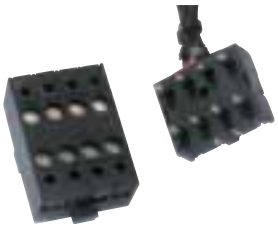
When the drawout is mounted behind a panel or door, the design allows the breaker operators and the drawout escutcheon to be accesible from the panel or door front, three executions are possible:

- Breaker is operated by elongated toggle (door flange to be ordered seperately)
- Breaker with electrical operator (door flange to be ordered seperately)
- Breaker is operated by a rotary handle type through door or cover. (door flange to be ordered seperately)
- Breaker is operated by a rotary handle on hinged door or panel. (telescopic shaft needs to be ordered separately)

Plug-in and Drawout versions Accessories

Auxiliary disconnect plugs and sockets(1)

FD, FE and FG frame - 8 pole type(1)



A set made up of a plug screwed to the breaker back (mobile part) and a socket that clicks into the plug-in base (fixed part). The socket comes with connected colour coded wiring which allows for an easy identification of the connection points.The wiring can be passed through specifically designed channels that lead from the breaker rear into the accesory compartment. The socket part can be wired out from the base with wiring up to 2.5 mm^2 (front access). Each unit has a total of 8 poles. The number of connectors that can be used per breaker frame size is as follows:

Frame size	FD63/160	FE160/250	FG400/630
Nos of units	1	2	3
Pin Codes (per connector)	1 - 8	1 - 8	1 - 8
Connector coding[2]	X	X & Y	X, Y & Z

FD, FE and FG frame - 10 pole type(1)

A set made up of a socket that can be attached to the plug-in base or a drawout cradle and a plug with wiring that is connected to the accessories.
The set is used to allow for a test position on a drawout breaker of the FE and FG frame sizes and as a supplementary connector for internal accessories on the FD and FE frame sizes.
Each plug and socket has a total of 10 poles.
The plug is fitted with supple wire, cross section 0.75 mm^2, length 60 cm. Maximum mounting per breaker size is:

Frame size	FD63/160	FE160/250	FG400/630
Nos of units	2	2	2
Pin Codes (per connector)	1 - 10	1 - 10	1 - 10
Connector coding	EL & ER	EL & ER	EL & ER

(1) In order to ensure a consistant and traceable wiring diagram of all internal accessories in each frame sizes a standard scheme is included in the wiring diagram chapter F of this catalogue. (use is optional)

FK frame - 6 pole type(1)

A 6 pole plug and socket system is available and is used to allow the auxiliary circuits to be connected and disconnected in the same manner as the poles. The plug sits on the back of the breaker and the socket clicks into the base.

On withdrawing and inserting the breaker the 6 pole plug and socket system only disconnects and connnects once the test position has been reached. This allowing for a test position without a seperate plug and socket. The FK socket part can be wired out from the base with wiring up to 1.5 mm^2 (front access).

Frame size	FK800/1600 3p	FK800/1600 4p
Nos of units	4	5
Pin Codes (per connector)	1 - 6	1 - 6
Connector coding[3]	X, Y, Z & A	X, Y, Z, A & B

Rating interchange prevention system

When a number of plug-in or withdrawable breakers (same frame different ratings) are installed in the same panel, it becomes necessary to determine which rating fits into which plug-in base. This to prevent overload in the cables/conductors connected to the base, the size of which are determined by the breaker trip unit value or setting.
A specifically designed ***Record Plus™*** accessory prevents misinsertion of a wrongly configured breaker/trip-unit combination in the base.

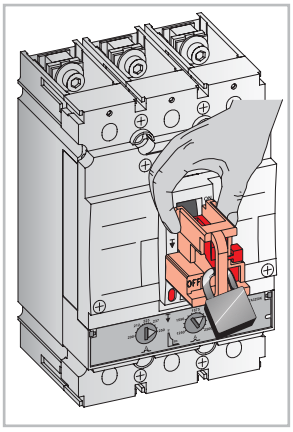
The accessory consists of two parts (one code per breaker), one fixed on the base, the other on the rear of breaker. Depending on the placing of the red part in the plug-in base and the pin the user breaks out on the white part, up to 4 breakers can be equipped with this mutual rejection feature.

Installation

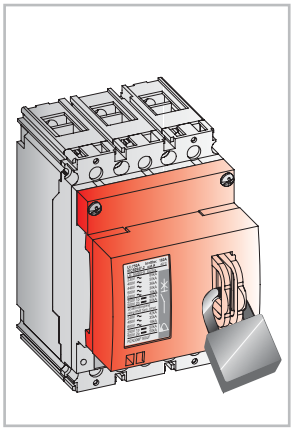
Padlocking device for toggle handle

To allow users to safely work on installations or installation segments protected by the ***Record Plus™*** moulded case circuit breakers it is possible to padlock the devices in their OFF position.

This ensures a complete and safe isolation of the installation or installation segment from the power supply. Two different padlocking devices are available.



The ***Record Plus™*** removable padlock is firmly attached to the breaker when it is padlocked and can be removed for use on another breaker when not in use. This accessory can be used with up to 3 padlocks of 5 to 8 mm. It is available in three different versions: one for the ***Record Plus™*** FD and FE frame, one for the FG frame and a third for the FK frame.



A padlocking facility that is screwed on to the breaker front and normally remains mounted. This device allows the breaker to be locked in the OFF position with up to three padlocks of 5 to 8 mm. The device also covers the push to trip knob.
It is available in three different versions for the ***Record Plus™*** FD, FE and FG frame.

Keylocking devices

Record Plus™ moulded case circuit breakers can also be locked in their OFF position by the use of a Keylock. This to allow users to work on installations or installation segments or to interlock one or more breakers. Keylocks are available for all Rotary handle devices, electrical operators and draw-out systems.

Pad- and Keylocking options, applicable for Record Plus Breakers

Overview	Frame size	Padlock		Standard Ronis key lock	Specifically numbered Ronis key lock	Profalux key lock
		Fixed	Removable			
Toggle operator Breaker locked in "OFF" position	FD Frame	A(1)	A			
	FE Frame	A(1)	A			
	FG Frame	A(1)	A			
	FK Frame	A(1)	A			
Directly mounted rotary handle Breaker locked in "OFF" position	FD Frame	S(1)		A	A	A
	FE Frame	S(1)		A	A	A
	FG Frame	S(1)		A	A	A
	FK Frame	S(1)		A	A	A
Through panel or door type of rotary handle Breaker locked in "OFF" position	FD Frame	S(1)		A	A	A
	FE Frame	S(1)		A	A	A
	FG Frame	S(1)		A	A	A
	FK Frame	S(1)		A	A	A
Panel or door mounted rotary handle Breaker locked in "OFF" position	FD Frame	S(1)		A	A	A
	FE Frame	S(1)		A	A	A
	FG Frame	S(1)		A	A	A
	FK Frame	S(1)		A	A	A
Electrical drive Breaker locked in "OFF" position	FD Frame	S		A		A
	FE Frame	S		A		A
	FG Frame	S		A		A
	FK Frame	S		A		A
Drawout version Locked in Disconnected/Test (2) OR drawout position	FE Frame	S		A		A
	FG Frame	S		A		A
	FK Frame	S		A		A

S= standard feature, A = accessory needed, empty box = not foreseen
(1) the explicitly removing of a plastic part directly beneath the handle operator allows one to padlock or keylock in ON position. (Special applications)
(2) FE and FG; Disconnected/test; FK Drawout position.

Door flanges

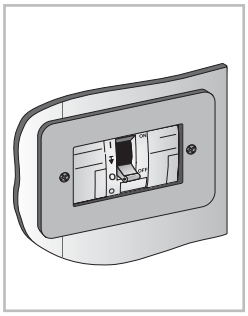
In order to provide an IP40 protection degree of the breaker when mounted through a door or cover plate door flanges are used. A door flange also improves the aesthetics of the cutout in the door and allows for higher tolerances within the cutout.

The devices are available for cutouts with the toggle area, breaker front face, motor drive front face or on RCD operating panels. A second type of flange is used for rotary handles through door/cover allowing interlocks on the device to function correctly.

For ***Record Plus™*** breakers installed through doors, cover plates or panels the following door flanges are available:

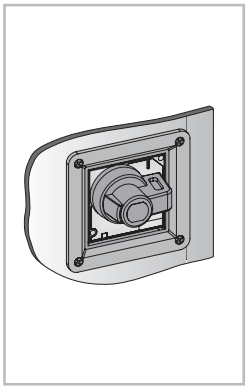
Toggle area
Fixation via front with 2 or 4 screws, universal for 3 and 4 pole breakers.

	Type
FE frame	**FEFT**
FG frame	**FGFT**
FK frame	**FNFT**



Front face
Fixation via front with 4 screws, available for 3 and 4 pole breakers

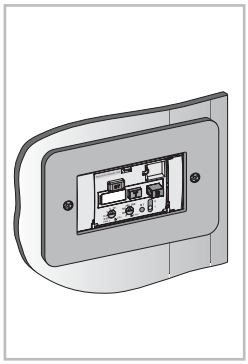
	Type
FD frame 3p	**FDFF3**
FD frame 4p	**FDFF4**
FE frame 3p	**FEFF3**
FE frame 4p	**FEFF4**



Rotary handle (1)
Fixation via front with 4 screws; is required to allow use of the door lock in ON position with the through door/panel rotary handle type. Is available for:

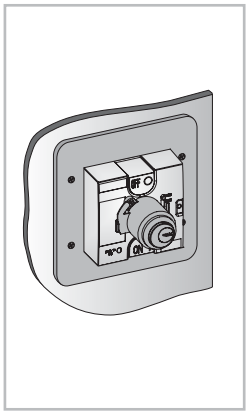
	Type
FD & FE frame	**FDFH**
FG frame	**FGFH**
FK frame	**FNFH**

(1) Customized, variable depth version available for drawout types.



RCD bottom mounted type
(universal for FD, FE and FG)
Fixation via front with 4 screws

	Type
FD frame 3p	**FDFF3**
FD frame 4p	**FDFF4**
FE frame 3p	**FDFF3**
FE frame 4p	**FDFF3**
FG frame 3p	**FDFF3**
FG frame 4p	**FDFF3**



Electrical operator
Fixation via front with 4 screws. On the FE, FG and FK breaker types the flange can be used with the drawout system.
Available for:

	Type
FD frame	**FDFE**
FE frame	**FEFE**
FG frame	**FGFE**
FK frame	**FNFE**

Installation

Terminal shields

Terminal shields are installed on the incoming or outgoing side of the breaker thus achieving a heightened protection degree, independent of the type of connection used. For fixed breakers with rear connnection or the plug-in or withdrawble versions of the ***Record Plus™*** breaker the installion of short terminal shields is mandatory and they are normally supplied as part of the kit.

Record Plus™ terminal shields are equipped with a tamper free sealing facility and come in sets of two. They are available in a short or a long version and have been designed for use on the standard fixed front connection breaker or on the base used for plug in breakers.
Each terminal shield is equipped with easy to remove breakouts to facilitate the connection of the breaker.

Short type(1)
For use with internal box clamps and rear connection.

Long type(2)

Short terminal shields

	FD	FE	FG	FK
With two terminal shields mounted, Breaker heighth is increased by: (mm)	20	30	60	40

(1) The FK short type is only supplied with rear connection kit.

Long terminal shields

	FD	FE	FG(2)	FK
With two terminal shields mounted, Breaker heighth is increased by: (mm)	97	122	83	160

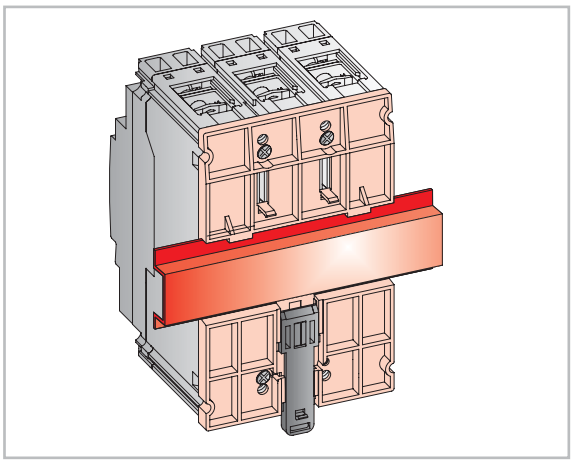
(2) The FG type is of medium length. Special long and widened version available on request.

Finger protection caps
Available only for the D frame box terminals, the caps prevent inadvertent contact with the connection terminals, thus providing the terminal and breaker with an IPXXB protection.
Finger protection caps come as standard with the magnetic only circuit breakers but they are also available in a set containing 12 pieces.

FD frame adaptors

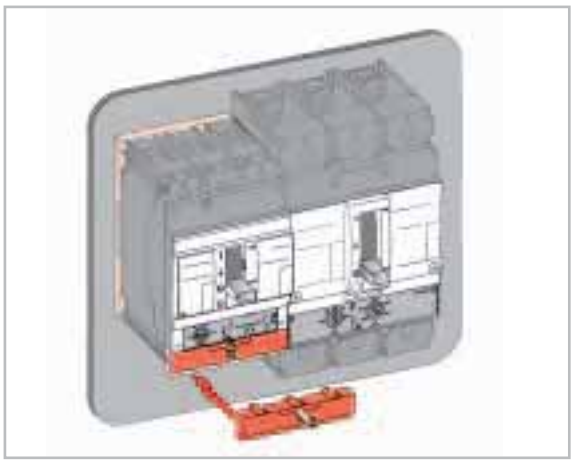
DIN-rail mounting

All ***Record Plus™*** FD frame breakers can be installed on a (symmetric) DIN profile (EN50022) by using an adaptor. The DIN-rail adaptor is normally supplied with most breaker types but can also be purchased seperately.



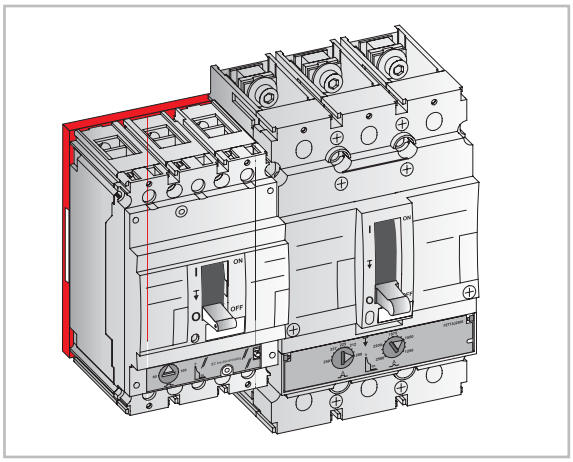
Adaptor - Cut-out filler

To use the cut-out with the breaker face and trip unit just apply the 'cut-out adaptor' to the D frame trip unit. This sealable cover matches the cut-out perfectly and offers an aestheticly pleasing blending of both breaker fronts.



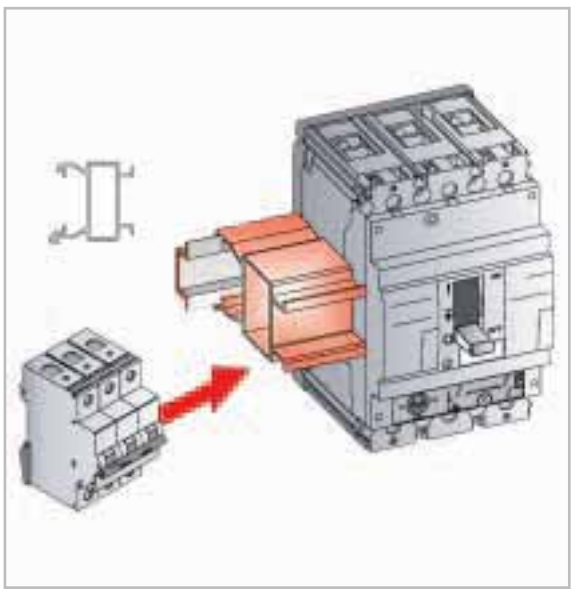
Side by side mounting with FE frame breakers

The FD frame DIN-rail adaptor has a second application: when mounted with its DIN-rail mounting feature facing the breaker rear it serves as a heightner. This change in depth of the D frame allows side by side mounting with E frames. When reversed the adaptor turns into a heightner that lifts the D frame, and all its cut-outs up to the E frame level. The 64 mm cut-out of the D and E frame now match up fully in height and depth.



Adapator - Side by side mounting with ElfaPlus MCB's

The FD frame has a 45 mm cut-out allowing it's use next to Elfa Plus MCB's and other modular devices. To bridge the diffference in depth between the FD frame and the modular devices a special heightning kit is available in a standard length of 354 mm.



Installation

Finishing covers

FD frame

For the ***Record Plus™*** FDS, FDN, FDH and FDL types the finishing covers are standard. By adding both these covers and the finger protection caps the breaker has a protection degree of IP40.

FE, FG and FK frame

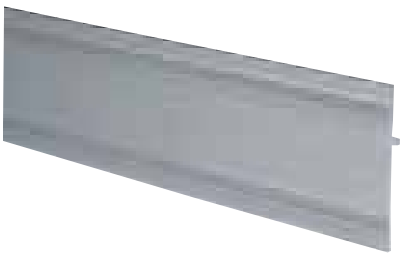
All ***Record Plus™*** FE, FG and FK frame breakers come complete with finishing covers (for 3 or 4 pole versions). However, these covers are also available as seperate items.

Circuit identification label

Located just under the toggle of every ***Record Plus™*** circuit breaker there is an area allocated specifically to click in a circuit identification lable.
A set contains 20 units that are common for all frame sizes.

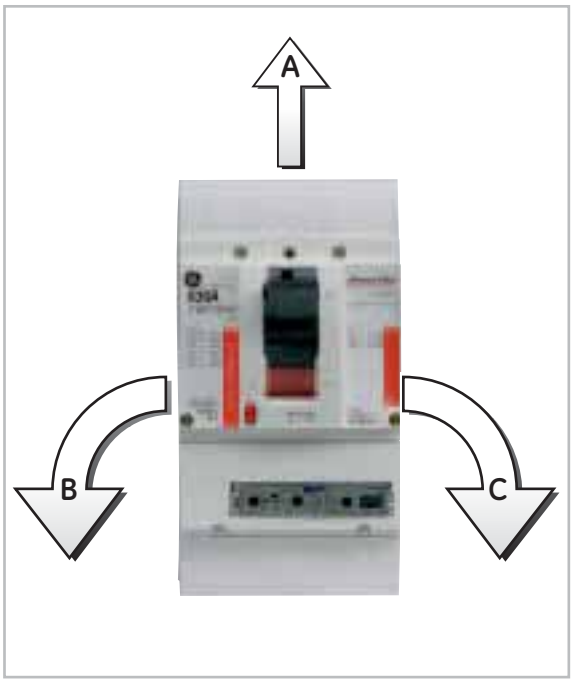
Cut-out filler plate

The FD & FE frame sizes are designed for side by side mounting.The cut-out suited for use with both breaker types has a standard dimension of 64 mm. In order to fill in empty or reserve space in the trim/cover plate,a cut-out filler plate is available in a standardized length of 1.2 meters.



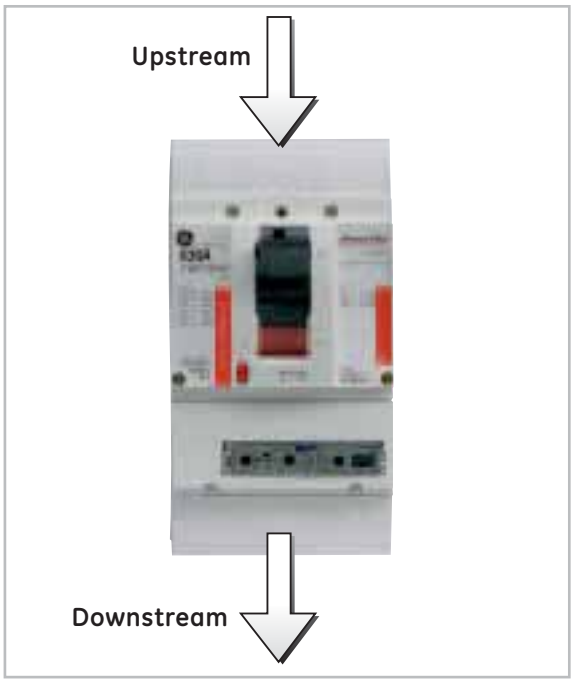
Mounting positions

Allowed mounting position per frame size



Breaker	Version	A	B	C
FD63/160	DIN rail	X	X	X
	Fix	X	X	X
	Plug in	X	X	X
FE160 / FE250	Fix	X	X	X
	Plug in	X	X	X
	Draw out	X	X	X
FG400 / FG630	Fix	X	X	X
	Plug in	X	X	X
	Draw out	X	X	X
FK800 / FK1600	Fix	X	X	X
	Draw out	X	X	X

Breaker supply



Phase/phase voltage Un (AC/ DC)	Supply side is :	FD63/160 C, E, S	FD63/160 N, H, L	FE160 FE250	FG400 FG630	FK800 FK1600
220/240V	Upstream	A	A	A	A	A
	Downstream	A	A	A	A	A
< 500 V	Upstream	A	A	A	A	A
	Downstream	A	A	A	A	A
≥ 500V	Upstream	P	P	P	P	P
	Downstream	P	PB(1)	PB	N(2)	P

A= Allowed
N= Not allowed
P= Use of phase separators is obligatory.
PB= Use of phase separators and backplate is obligatory.

(1) The use of the top cavity in the box terminal is mandatory.
(2) H & L versions only

Connections

Standard connection terminals

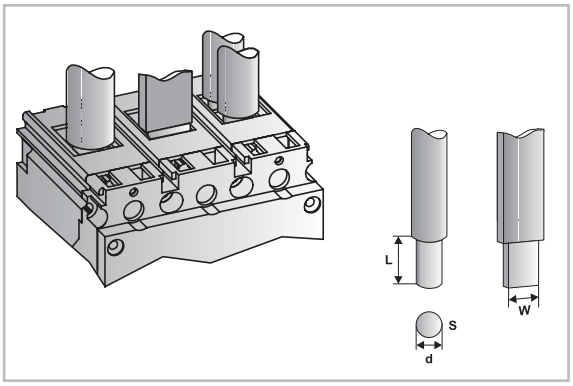
The ***Record Plus™*** connection facilities have been designed with the user in mind.
Easy access to the area where the conductor must be placed, their generous dimensions and their inherent stability assure an easy connection.
Each of the standard connection options described here applies to the fixed breaker, its plug in or drawout base and the RCD associated with the frame size.

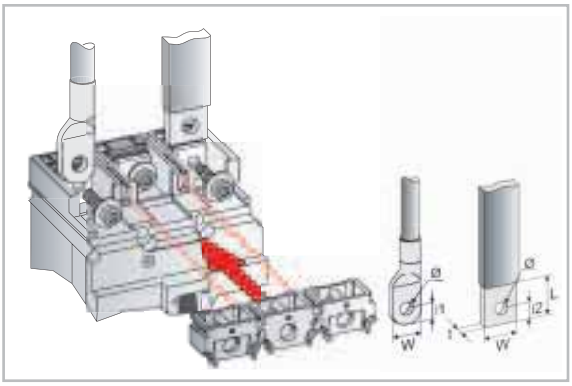
FD frame

The FD frame is equipped with box clamps allowing the direct connection of one or two cables. The clamps can also be used with flat bars up to a width of 12 mm. All 'non standard' connection terminals as extenders, rear connections etc. are directly connected to these standard terminals. The breaker is always supplied with the clamps fully open, and they are equipped with a mechanism that prevents them from inadvertently closing whilst connecting.

FE frame

The FE frame size has a connection area specifically designed for the connection of busbars and/or cable lugs. The connection area is designed to allow for maximum access to the front of the terminal. Standard busbar sizes and cable lugs can be accommodated without accessories.
The connection pads have through holes and are supported by a simple slide-in fully insulated part that contains one steel nut per connection point. The connection bolts have an internal allen key profile allowing for ease of use in the relatively confined area just above the connection strap.
'Non-standard' connections as extenders are directly fitted onto the standard terminals. In other cases - like rear connections - the slide-in part is completely replaced.





FD frame box terminals

	FD
1 cable S min/max [mm²] in top cavity Cu(1)	2.5 - 95(2)
2 cables S min/max [mm²] in 2 cavities Cu(2)	2.5 - 35 + 4 - 35
Strippable length L [mm]	17.5
W max [mm]	12
Torque (Allen key in breaker) (Nm max.)	8

(1) For aluminium conductors use external box clamps.
(2) For lower terminal cavity 4 - 70 mm².
(3) On the FDC and FDE type the top cavity cannot be used. Total connection capacity for the FDC and FDE type is thus 1 cable of 2.5 -95 mm² in lower cavity.

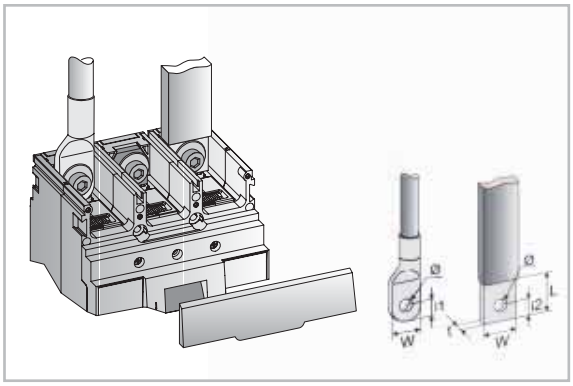
FE frame with removeable cover

	FE
W max [mm]	25
t max [mm]	5
i1 max [mm]	11.5
i2 max [mm]	9.8
Ø max [mm]	9.5
L Distance to insulation (min.)	25
Torque (Allen key in breaker) (Nm max.)	25

W = Width of bar or ring terminal / lug
t = Thickness of bar or lug
Ø = Hole diameter

FG frame

The FG frame size has a connection area specifically designed for the connection of busbars and/or box clamps. The connection area is designed to allow for maximum access to the front of the terminal. The connection pads have through holes without screw thread and are supported by a simple slide-in fully insulated part that contains one steel nut per connection point. The connection bolts have an internal allen key profile allowing for ease of use in the relatively confined area just above the connection strap.
'Non-standard' connections as extenders are directly fitted onto the standard terminals. In other cases - like rear connections - the slide-in part is completely replaced.



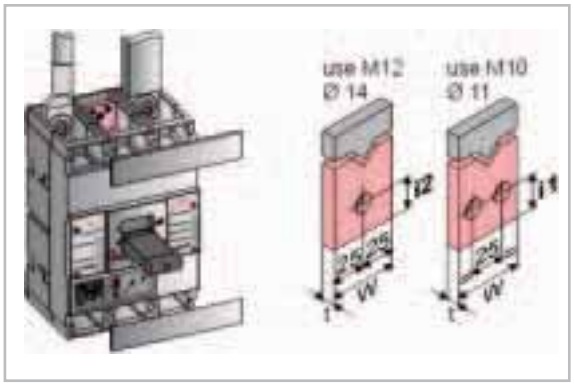
FG frame with removeable cover

	FG
W max [mm]	32
t max [mm]	12
i1 max [mm]	19
i2 max [mm]	17.5
Ø max [mm]	11
L Distance to insulation (min.)	33
Torque (Allen key in breaker) (Nm max.)	42

W = Width of bar or ring terminal / lug
t = Thickness of bar or lug
Ø = Hole diameter

FK frame

The FK frame has a connection area specifically designed for the connection of busbars. For the FK800 and FK1250 sizes the standard connection pads offer a choice of the use of 2 M10 or 1 M12 bolt. The FK 1600 type can use the same connection facility, but the use of specifically designed extended connection pads is advised.
The estended connections allow the use of 2 M12 bolts.
All 'non standard' connection options are fitted to the standard connection pads.



FK frame with removeable cover

	FK
W max [mm]	50
t max [mm]	20
i1 max using 2 x M10 [mm]	32
i2 max using 1 x M12 [mm]	23
Ø max [mm]	2 x 11 or 1 x 14
Torque (Allen key in breaker) (Nm max. M10)	42
Torque (Allen key in breaker) (Nm max. M12)	48

W = Width of bar or ring terminal / lug
t = Thickness of bar or lug
Ø = Hole diameter

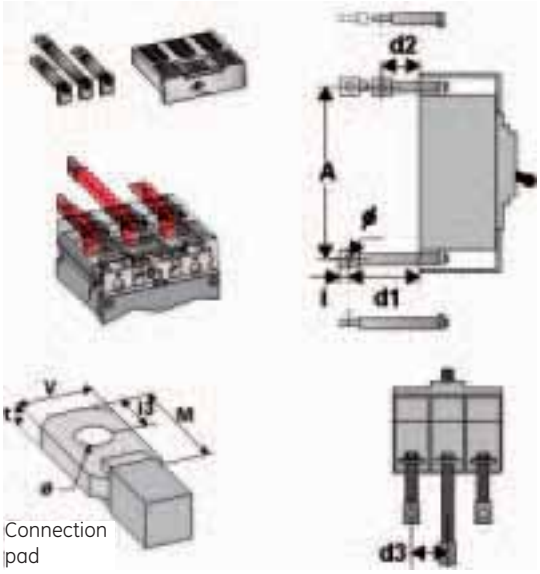
Connections

Rear connection facilities

A rear connection kit changes the standard connnection configuration of a fixed, plug-in or drawout breaker from front to rear access. Delivered as a multi-pole set they allow an easy and quick change in configuration of the standard fixed-front connection breaker to a model where the connection is accessible from the rear. Each kit is supplied with a short terminal shield to warrant a IPXXB protection from the breaker front.

FD frame

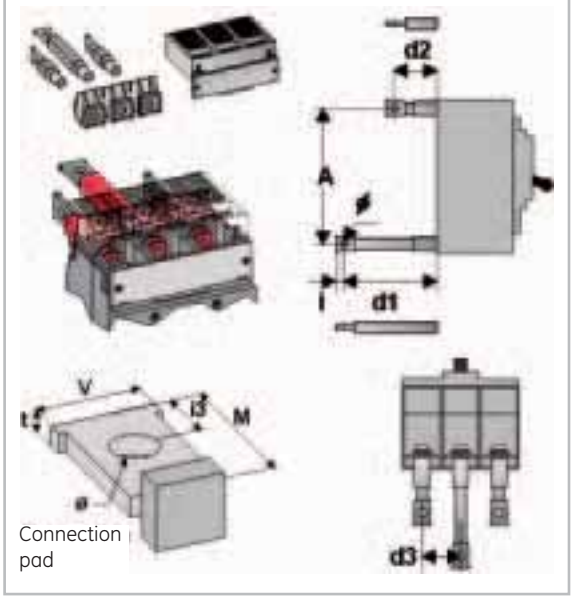
Available as a three or four pole set allowing for the configuration of one side of the breaker. The kits are made up of single pole connectors that are fitted to the standard cage terminal (top cavity). The rear connections are configured for use with busbars and can be rotated at a ninety degree angle to allow for different incoming busbar configurations. The connectors can be used with standard external box clamps, with or without phase barriers, and are supplied with a short terminal shield.



Connection pad

FE frame

Before a ***Record Plus™*** FE frame size can be configured as a rear connected device, the front connection insulation part (nut plate) must be removed. The rear connection kit that consists of a multi-pole kit held in a rear connection support plate can then be simply slid into the room just vacated by the front connection part (nut plate). Available as a three or four pole set, it allows for the configuration of one side of the breaker. The rear connections are configured for use with busbars and can be rotated at a forty five or ninety degree angle to allow for different incoming busbar configurations. The connectors can be used with standard internal box clamps, with or without phase barriers, and are supplied with a short terminal shield.



Connection pad

FD frame rear connection

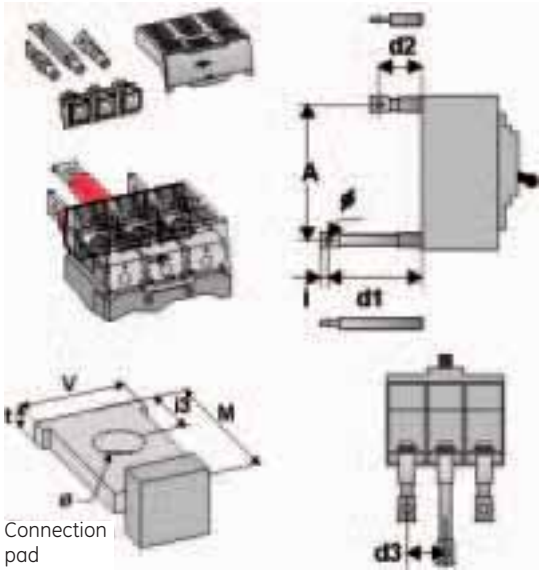
	FD
A = vertical distance between connections	150
d1 = breaker depth with long rear connections	90
d2 = breaker depth with short rear connections	45
d3 = pole spacing	27
V [mm]	14
t [mm]	4
i3 [mm]	10
M [mm]	22
Ø hole max [mm]	7
Torque (Allen key in breaker) (Nm max.)	8
Torque of connection bolt M6 (Nm max).	8

FE frame rear connection

	FE
A = vertical distance between connections	140
d1 = breaker depth with long rear connections	98
d2 = breaker depth with short rear connections	48
d3 = pole spacing	35
V [mm]	17.4
t [mm]	4
i3 [mm]	13
M [mm]	30
Ø hole max [mm]	9
Torque (Allen key in breaker) (Nm max.)	25
Torque of connection bolt M8 (Nm max).	25

FG frame

Before a ***Record Plus™*** FG frame can be configured as a rear connected device, the front connection isolation part (nut plate) must be removed. The rear connection kit that consists of a multi-pole kit held in a rear connection support plate can then be simply slid into the room just vacated by the front connection part. Available as a three or four pole set, it allows for the configuration of one side of the breaker. The rear connections are configured for use with busbars and can be rotated at a ninety degree angle to allow for different incoming busbar configurations. The connectors can be used with or without phase barriers, and are supplied with a short terminal shield.



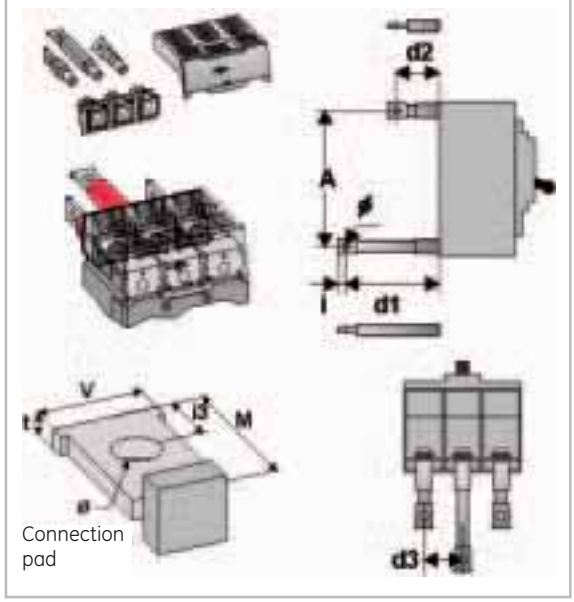
Connection pad

FG frame rear connection

	FG
A = vertical distance between connections	229
d1 = breaker depth with long rear connections	115
d2 = breaker depth with short rear connections	50
d3 = pole spacing	45
V [mm]	30
t [mm]	8
i3 [mm]	15
M [mm]	35
Ø hole max [mm]	13
Torque (Allen key in breaker) (Nm max.)	42
Torque of connection bolt M12 (Nm max).	42

FK frame

Available as a three or four pole set allowing for the configuration of the load or line side of the breaker. The kits are made up of single pole connectors that are screwed to the underside of the standard connection pad. The rear connections are configured for use with busbars and allow for different incoming busbar configurations with a option of rotating them at a ninety degree angle for edgewise busbar connection. The connectors can be used with or without phase barriers, and are supplied with a short terminal shield.



Connection pad

FK frame rear connection

	FK
A = vertical distance between connections	273
d1 = breaker depth with long rear connections	163
d2 = breaker depth with short rear connections	98
d3 = pole spacing	70
V [mm]	40
i4 [mm]	15
i5 [mm]	47
M [mm]	115/180
Ø hole max [mm]	2 x 14
Torque (Allen key in breaker) (Nm max.)	14
Torque of connection bolt M12 (Nm max).	48

Connections

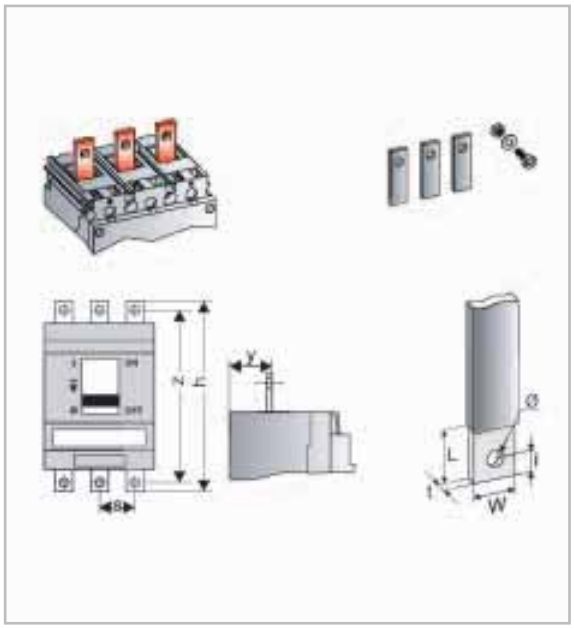
Optional connection terminals

To allow for the different connection options in the different applications of the ***Record Plus™*** circuit breaker a large variety of different connection lugs, terminals and multiple connectors are available. These are available as a three or four pole set allowing for the configuration of one side of the breaker. The kits are made up of single pole connectors that are fitted to the standard breaker terminal. The connectors are supplied with all the necesssary connection and fixation hardware.

Extender
Extends the standard connection point to the exterior of the breaker body. ***Record Plus™*** extenders are normally used when the busbars and cables that are needed to connect the breaker exceed the possibilities of the standard connection facility or when the use of external box clamps is required.

FD frame & FE frame

The single pole connectors that are fitted to the standard terminal. (FD frame top cavity of box clamp).
The connectors can be used with standard external box clamps, with or without phase barriers.(1)



FD & FE extenders

	FD	FE
h = heigth dimension of breaker with extenders at its top AND bottom.	190	230
z [mm]	170	212
s [mm]	27	35
y max [mm]	28.5	25.5
W max [mm]	14	20
t max [mm]	5	8
L max [mm]	16	18
Ø hole max [mm]	7	9
Torque (Allen key in breaker) (Nm max.)	8	25
Torque of connection bolt (Nm max).	8	25

(1) Use is recommended

FG frame & FK frame

The single pole connectors that are fitted to the standard terminal.
The connectors can be used with standard external box clamps, with or without phase barriers.(1)

FG & FK extenders

	FG	FK
h = heigth dimension of breaker with extenders at its top AND bottom.	354	452
z [mm]	314	408
s [mm]	52.5	100
y max [mm]	29.5	56
W max [mm]	30	50
t max [mm]	12	20(10)(3)
L max [mm]	32	-
Ø hole max [mm]	13	2 x 11 or 1 x 13
Torque (Allen key in breaker) (Nm max.)	42	M10-42 M12-48
Torque of connection bolt (Nm max).	42	M10-42 M12-48

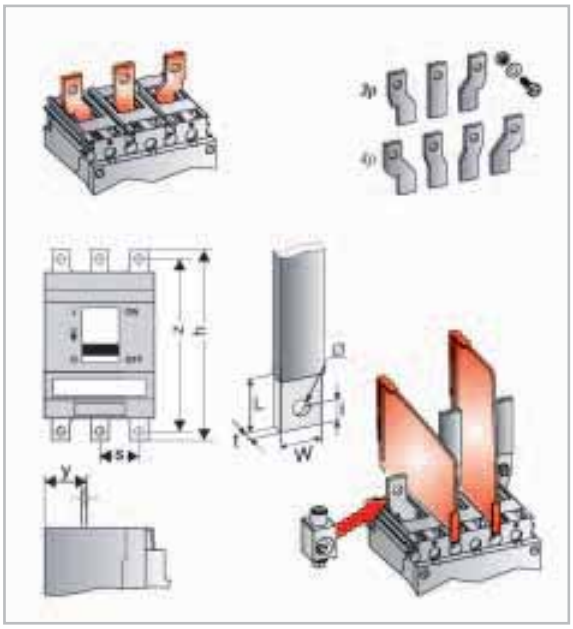
(1) Use is recommended
(2) Two holes in each connection pad.
(3) 1600A, parallel 10mm bus.

Spreaders

Increase the pole spacing of the breaker they are used to extend the standard connection points to the exterior of the breaker body. ***Record Plus***™ spreaders are normally used when the busbars and cables that are needed to connect the breaker exceed the possibilities of the standard connection facility or when external lugs are needed. Available for:

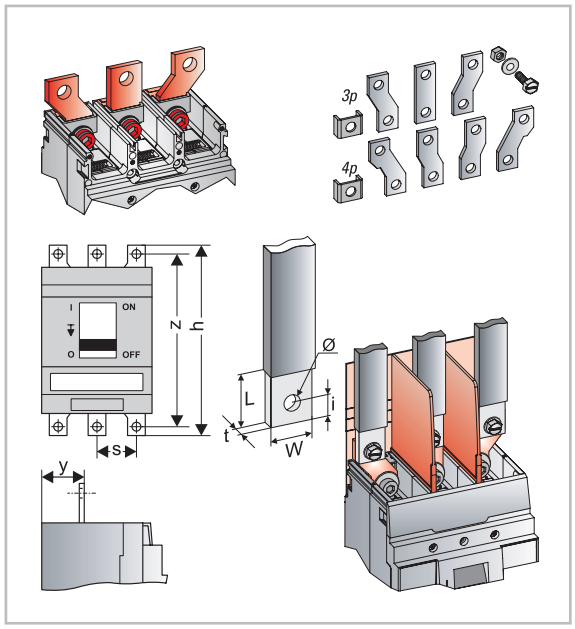
FD frame & FE frame

The single pole connectors that are fitted to the standard terminal. (FD frame top cavity of box clamp).
The connectors can be used with standard external lugs, with or without phase barriers.(1)



FG frame & FK frame

The single pole connectors that are fitted to the standard terminal.
The connectors can be used with standard external lugs, with or without phase barriers.(1)



FD & FE spreaders

	FD	FE
h = heigth dimension of breaker with extenders at its top AND bottom.	190	230
z [mm]	170	212
s [mm]	27	35
y max [mm]	18.5	25.5
W max [mm]	14	18
t max [mm]	5	8
L max [mm]	16	18
Ø hole max [mm]	7	9
Torque (Allen key in breaker) (Nm max.)	8	25
Torque of connection bolt (Nm max).	8	25

(1) Use is recommended

FG & FK spreaders

	FG	FK
h = heigth dimension of breaker with extenders at its top AND bottom.	354	452
z [mm]	314	408
s [mm]	52.5	100
y max [mm]	29.5	56
W max [mm]	30	50
t max [mm]	12	20(10)(3)
L max [mm]	32	-
Ø hole max [mm]	13	2 x 11 or 1 x 13
Torque (Allen key in breaker) (Nm max.)	42	M10-42 M12-48
Torque of connection bolt (Nm max).	42	M10-42 M12-48

(1) Use is recommended
(3) 1600A, parallel 10mm bus.

Connections

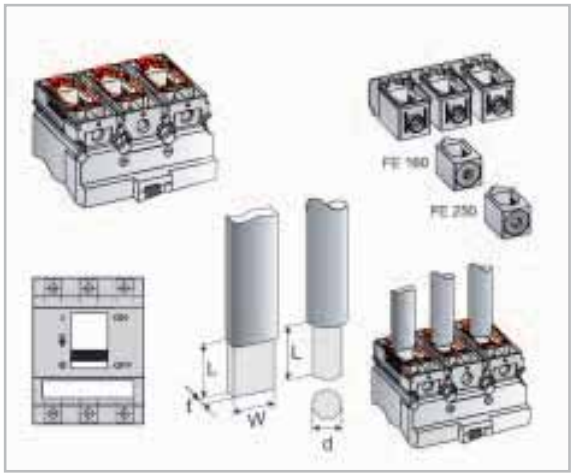
Optional connection - box clamps

Record Plus™ breakers are designed to save space and time in mounting when compared to conventional switch gear. To achieve the same savings in the connecting process the ***Record Plus™*** line includes a series of lugs meeting the newest and highest standards in ease of connection and durability.
The terminals are suitable for conductors of copper and aluminium and meet both the newest version of the EN 60497 standards and the relevant UL486a and b regulations.

Internal box clamps
Fit onto the breaker without changing its profile or external dimensions. Available as a three or four pole set allowing the line or load side of the breaker to be equipped. The set consists of multi-pole units that displace the standard connection configuration. The sets can also be used on the plug in / drawout base and RCD units.
All clamps are suitable for copper and aluminium conductors.

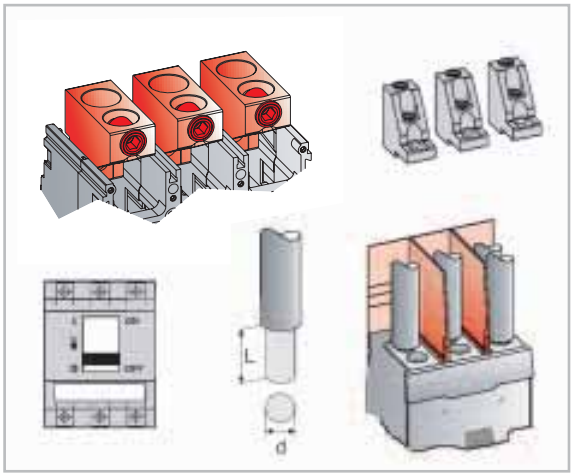
FE frame (FE160 & FE250)

The set consists of basic 3 or 4 pole pole units that displace the standard connection configuration (FE frame nut plate). The internal box clamps are used in the same way on the plug in / drawout base and RCD units. All types can also be mounted to extenders, spreaders or rear connection pads.



FG frame & FK frame

The set consists of basic single pole units that displace are mounted above the standard connection pad (FG and FK frame). Each box terminal allows the connection of two to four cable cores per item. The internal lugs are used in the same way on the plug in / drawout base and RCD units. All types can also be mounted to extenders, spreaders or rear connection pads and can be used with or without phase barriers.



FE internal box clamps

	FE160	FE250
h = heigth dimension of breaker with box clamps mounted at top and bottom.	the same as breaker	
L max [mm]	18	18
d max [mm]	16	17.5(1)
S max [mm²]	2.5 - 95	16 - 150
L = distance to insulation (min.)	21	25
Torque (Allen key on clamp) (Nm max.)	30	30

(1) Most standard 185 mm² cable sections will also fit into this lug (hole diameter 17.5 mm)

FG & FK internal box clamps

	FG	FK(2)	FK(3)
h = heigth dimension of breaker with box clamps mounted at top and bottom.	333	381	354
S max [mm²]	25 - 240 for L1 50 - 300 for L2	240	240
Hole L1 = distance to insulation L (min.)	22	-	-
Hole L2 = distance to insulation L (min.)	40	-	-
Distance to insulation L (min.)	-	27.5	36
Torque (Nm max.)	31(L_1) 42(L_2)	31	31

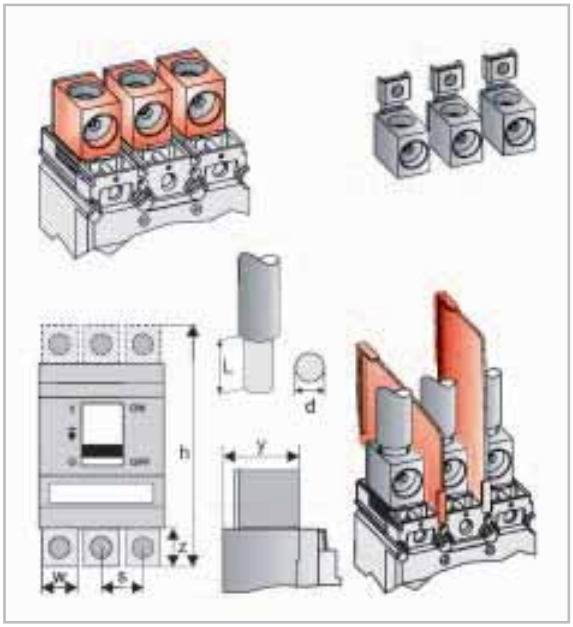
(2) Terminal for 3 cables
(3) Terminal for 4 cables

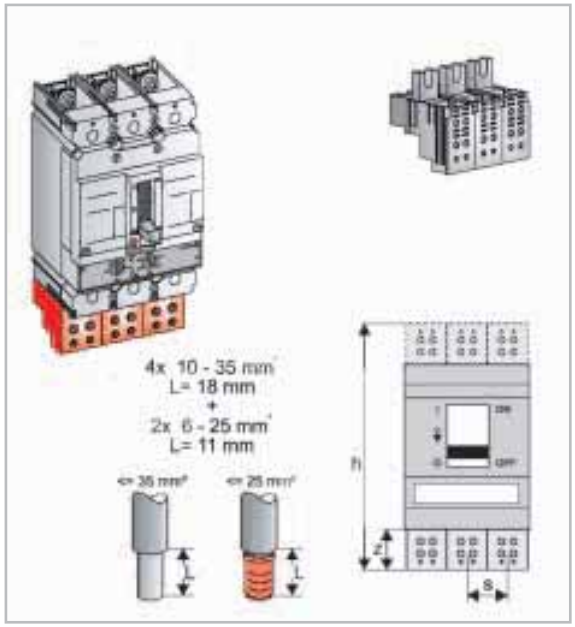
External box clamps

To accomodate for larger cross sections ***Record Plus***™ clamps can be used in combination with extenders and/or spreaders. They are available as a three or four pole set allowing the line or load side of the breaker to be equipped. Each set consists of basic single pole units with phase seperators.

FE frame distribution terminal

Specifically designed to allow the use of the ***Record Plus***™ FE frame as a mains device with cables distributing the load over multiple outgoing circuits (or lines of multiple outgoing circuits). The lugs are available as a three or four pole set allowing the line or load side of the breaker to be equipped. The sets consist of a number of fully isolated single pole units that can be assembled into a multipole distribution block before they are mounted on the breaker. Each lug allows for a maximum of four 6-25 mm^2 or two 10-35 mm^2 copper conductors.





FD & FE external box clamps

	FD	FE
h = heigth dimension of breaker with box clamps mounted at top and bottom.	190	270
z [mm]	30	50
s [mm]	27	35
w [mm]	18.5	30
y [mm]	50	55.5
S max [mm^2]	4 - 95	70 - 185
L = distance to insulation (min.)	20	20
Torque (Allen key in breaker) (Nm max.)	8	25
Torque on connection bolt (Nm max.)	17	25

FE distribution terminal

	FE
h = heigth dimension of breaker with box clamps mounted at top and bottom.	250
z [mm]	60
s max [mm]	35
Torque (Allen key in breaker) (Nm max.)	25
L = distance to insulation (min.) - 35 mm^2	18
L = distance to insulation (min.) - 25 mm^2	11
Torque on connection bolt (Nm max.) - 35 mm^2	6
Torque on connection bolt (Nm max.) - 25 mm^2	3

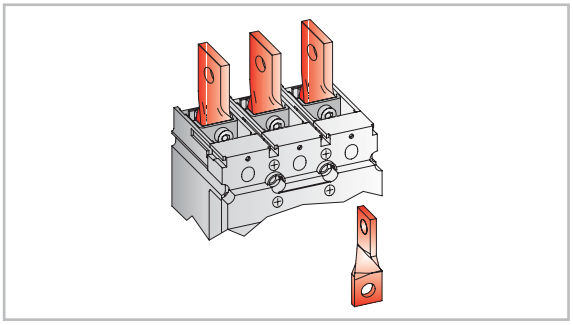
Connections

Optional connection terminals - extender variants

The ***Record Plus™*** circuit breaker can be equiped with several variants of the standard extender design. These are available as a three or four pole set allowing for the configuration of one side of the breaker. The kits are made up of single pole connectors that are fitted to the standard breaker terminal. The connectors are supplied with all the necesssary connection and fixation hardware.

Extender twisted

The twisted version extends the standard connection point to the exterior of the breaker body and 'twists' the connection area from horizontal to vertical. It is normally used when the connecting busbars are turned 90 degrees and with ring terminals.

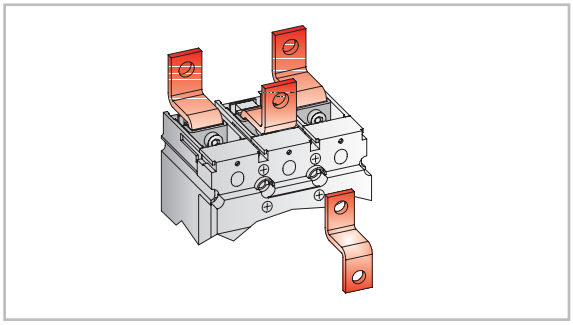


Twisted extenders

	FD	FE	FG
h = heigth dimension of breaker with extenders at its top AND bottom.	190	230	354
Ø hole max [mm]	7	9	13
Torque (Allen key in breaker) (Nm max.)	8	25	42

Extender heightened

Extends the standard connection points to the exterior of the breaker body and places them at different heights. ***Record Plus™*** extenders are normally used when the busbars and cables that are needed to connect the breaker exceed the possibilities of the standard connection facility, when external lugs are needed or to interconnect several breakers on the incoming side.

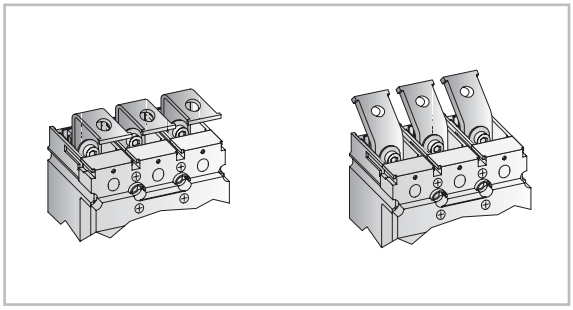


Heightened extenders

	FD	FE
h = heigth dimension of breaker with extenders at its top AND bottom.	190	230
Ø hole max [mm]	7	9
Torque (Allen key in breaker) (Nm max.)	8	25

Extender angled

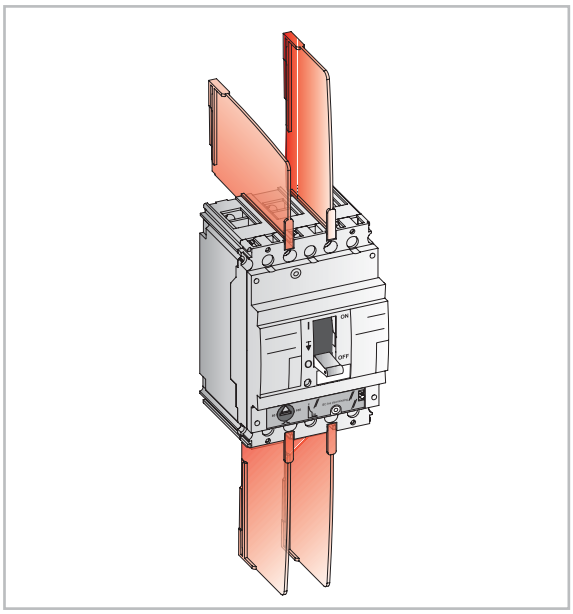
Two more extender variants exist for the FE frame type only with a connection area set at forty five or ninety degrees. The hole dimensions and reqiuired torques are the same as those required for the heightened extenders.



Phase separators and Back plates

Phase separators

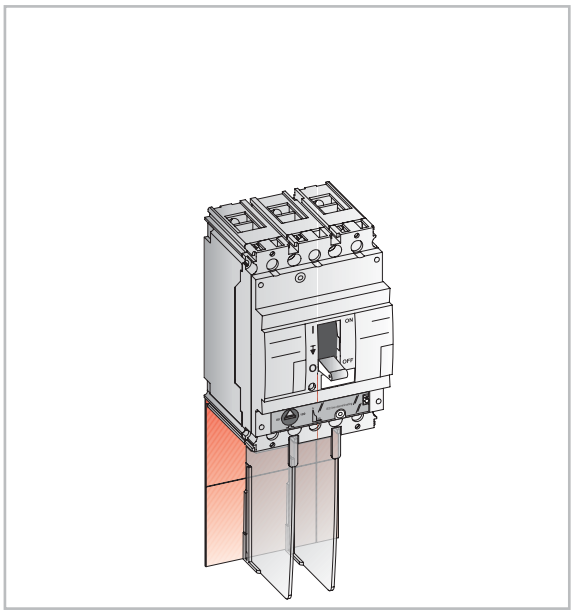
Depending on the rated voltage and the type of connector, the use of phase separators is preferable and in some cases mandatory.
Record Plus™ phase seperators are simply slid into slots in the breaker housing. To allow for an easy installation of the connectors they are made of flexible material. They can be mounted in two ways, to allow for front and rear connection.
They ensure a correct dielectric separation of the different connection terminals.
For the ***Record Plus™*** FD, FE, FG and FK frame, phase separators are available in one set containing 12 pieces.



Back plates

Back plates are always used in association with phase separators. Normally used at voltages above 500V they prevent breaker venting from leading to dielectric issues. They also can be used when externally mounted connectors no longer meet the required clearance distances to a metal back plate.

A back plate suitable for 3 and 4 pole breakers is available. The required size is easily achieved by breaking off parts along a pre-cut line.



Just rel

Circuit Breaker type		FD160		FD63/160						FE160		
Denomination		N	H	C	E	S	N	H	L	N	H	L
EN 60947-2 standard												
Poles	Number of	1		3,4			2[1],3,4			3,4		
Rated insulation voltage	Ui (Volts)	750		500	750	750	750			750		
Rated impulse withstand voltage	Uimp (Kilovolt)	3		6	8	8	8			8		
Rated operational voltage Ue	Volts AC	240		500	690	690	690			690		
	Volts DC	250		-	-	500	500			500		
Line protection device												
Category of use		A		A			A			A		
Suitable for use as a isolator	Positive ON & OFF	yes		yes			yes			yes		
Rated current Ith = Ie	A at 40°C	63 or 160		63 or 160			63 or 160			160		
Ultimate breaking capacity Icu [kA]	230/240V AC	25	50	25	40	50	85	100	200	85	100	200
	400/415V AC	-	-	18	25	36	50	80	150	50	80	150
	440V AC	-	-	12	14	25	30	65	130[4]	42	65	130
	500V AC	-	-	10	12	18	22	36	50[4]	30	50	100
	690V AC	-	-	-	4.5	6	8	10	12	10	22	75
	250V DC Single pole	-	50	-	-	25	40	65	100	50	85	100
	500V DC Two pole	-	-	-	-	25	40	65[2]	100[2]	50	85[2]	100[2]
Service breaking capacity Ics (%Icu)	≤ 500V	100%	100%	100%	75%	100%	100%	100%	100%	100%	100%	100%
	690V AC	-	-	-	75%	75%	50%	50%	35%	100%	75%	25%
Single phase breaking capacity I_{IT} [kA]	230V AC	25	50	16	25	30	50	80	150	50	80	150
	400/415V AC	-	-	-	4.5	6	8	10	12	15	22	36
Endurance (CO operations)	Mechanical	10000		10000			25000			40000		
	Electrical at In	5000		5000			10000			20000		
	Electrical at In/2	10000		10000			20000			30000		
Endurance (On-Tripped operations)	Mechanical	4000		4000			10000			16000		
Trip Units	Interchangeable	no		no			no			yes		
	Thermal magnetic line	LTM								LTM		
	Thermal magnetic generator						GTM			GTM		
	Thermal magnetic selective						LTMD			LTMD		
	Magnetic only						Mag Break™			Mag Break™		
	Electronic selective									SMR1		
	Electronic enhanced											
Circuit Breaker type and denomination		FD160Y		FD 63Y			FD160Y			FE160Y		
EN 60947-3 standard												
Non Automatic breaker (Switch)												
Rated current In (class AC23)	220V AC to 690V AC	160		63			160			160		
Rated making capacity	Icm (kA peak)	2.8		1.7			2.8			4.9		
Short-term withstand current Icw [kA]	Icw eff. 1 second	2		1.2			2			3		
	Icw eff. 3 seconds	2		1.2			2			3		
Circuit Breaker type							FD63/160			FE160		
Denomination							N	H	L	N	H	L
EN 60947-4 standard												
Use in motor circuits												
Rated current Ith	A at 65°C						FD50-50 FD160-100			150		
Endurance (CO operations)	Mechanical						25000			40000		
	Electrical at In class AC23						10000			20000		
	Operations per hour						120			120		
Protection	Short-circuit only (sep. overload device)						Mag Break™			Mag Break™		
	Overload class 10 and short-circuit									SMR1		
	Max In (A) class 10						FD63-50 FD160-100			150		
	Max In (A) class 30						FD63-50 FD160-80			150		
	Earth fault unit (differential)						Optional FDQ type			Optional FEQ type		
Circuit Breaker / Switch type		FD63/160 all types								FE160 all types		
NEMA AB1 standard												
3ph. interruption ratings [kA]	240V AC	-	-	-	-	50	65	100	-	100	150	200
	480V AC	-	-	-	-	25	36	50	-	50	65	130
	600V AC	-	-	-	-	6	8	10	-	25	36	42
Installation												
Mounting	On symmetrical DIN Rail	yes		yes			yes			no		
	Fixed	yes		yes			yes			yes		
	Plug in	no		yes			yes			yes		
	Draw out	no		no			no			yes		
Connection	Front	yes		yes			yes			yes		
	Rear	no		no			yes			yes		
Dimensions [w x h x d] mm	3 pole, fixed front connection	27 x 130 x 85		81 x 130 x 85			81 x 130 x 85			105 x 170 x 95		
	4 pole, fixed front connection	for single pole		108 x 130 x 85			108 x 130 x 85			140 x 170 x 95		
Weights [kg]	3 pole, fixed front connection	0.4		0.9			0.9			1.5		
	4 pole, fixed front connection	for single pole		1.3			1.3			2.0		

(1) N type only. (3) Use 2 poles.
(2) Use 3 poles. (4) 160A rating only; derate to 65kA at 440V and 36kA at 500V.

	FE250			FG400			FG630			FK800			FK1250			FK1600	
V	N	H	L	N	H	L	N	H	L	N	H	L	N	H	L	N	H
	3,4			3,4			3,4			3,4			3,4			3,4	
690	750			750			750			1000			1000			1000	
8	8			8			8			8			8			8	
500	690			690			690			690			690			690	
440	500			-			-			500			500			500	
	A			B[5]			B[5]			B			B			B	
	yes			yes			yes			yes			yes			yes	
	250			400			630			800			1250			1600	
65	85	100	200	85	100	200	85	100	200	85	100	170	85	100	170	85	100
36	50	80	150	50	80	150	50	80	150	50	80	100	50	80	100	50	80
25	42	65	130	42	65	130	42	65	130	42	65	80	42	65	80	42	65
18	30	50	100	30	50	100	30	50	100	36	42	50	36	42	50	36	42
-	10	15	22	10	22	75[7]	10	22	40[7]	20	25	30	20	25	30	20	25
25	50	85	100							50[3]	60[3]	80[3]	50[3]	60[3]	80[3]	-	-
-	50	85[2]	100[2]							36[2]	50[2]	60[2]	36[2]	50[2]	60[2]	-	-
100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	75%	50%	100%	75%	50%	100%	75%
-	100%	75%	50%	100%	45%	25%	100%	45%	25%	100%	75%	50%	100%	75%	50%	100%	75%
36	50	80	150	50	80	150	50	80	150	50	80	100	50	80	100	50	80
-	10	15	22	10	(6)	(6)	10	(6)	(6)	20	25	30	20	25	30	20	25
10000	25000			20000			20000			10000			10000			10000	
5000	10000			7500			5000			4000			3000			2000	
10000	20000			15000			10000			8000			6000			4000	
4000	10000			8000			8000			4000			3000			2000	
no	yes			yes			yes			no			no			no	
LTM										LTM			LTM				
	GTM																
	LTMD																
	Mag Break™			Mag Break™													
	SMR1			SMR1									SMR1e				
				SMR2									SMR 1s & g				
	FE250Y			FG400Y			FG630Y			FK800Y			FK1250Y			FK1600Y	
	250			400			630			800			1250			1600	
	6.4			8.5			11.3			14.1			21.2			28.3	
	4			5			6.5			10			15			20	
	4			5			6.5			10			15			20	
	FE250			FG400			FG630			FK800			FK1250			FK1600	
	N	H	L	N	H	L	N	H	L	N	H	L	N	H	L	N	H
	225			350			500			720			1000				
	25000			20000			20000			10000			10000				
	10000			7500			5000			4000			3000				
	120			120			60			60			60				
	Mag Break™			Mag Break™			Mag Break™			Mag Break™			Mag Break™				
	SMR1			SMR1 or SMR2			SMR1 or SMR2										
	225			350			500			720			1000				
	225			350			500			720			1000				
	Optional FEQ type			Optional FGQ type			Optional FGQ type										
	FE250 all types			FG400 all types			FG630 all types			FK800 all types			FK1250 all types			FK1600 all types	
65	100	150	200	100	150	200	100	150	200	85	-	-	85	-	-	85	-
36	50	65	130	50	65	130	50	65	130	42	-	-	42	-	-	42	-
22	25	36	42	25	36	42	25	36	42	25	-	-	25	-	-	25	-
	no			no			no			no			no			no	
	yes			yes			yes			yes			yes			yes	
	yes			yes			yes			no			no			no	
	yes			yes			yes			yes			yes			yes	
	yes			yes			yes			yes			yes			yes	
	yes			yes			yes			yes			yes			yes	
	105 x 170 x 95			140 x 265 x 115			140 x 265 x 115			210 x 320 x 160			210 x 320 x 160			210 x 320 x 160	
	140 x 170 x 95			185 x 265 x 115			185 x 265 x 115			280 x 320 x 160			280 x 320 x 160			280 x 320 x 160	
	1.6			4.5			4.5			12.2			18.0			18.0	
	2.1			6.0			6.0			15.1			23.4			23.4	

(5) 350 and 500A executions only
(6) Please contact us.
(7) On use of FG400 and FG630L type at 690V, one long and widened terminal shield is required.

Power dissipation

Standards

The standard for low voltage equipment is defined in the EN 60439-1, the EN 50298 and the IEC 60890. These provide a theoretical method to calculate the temperature rise within an enclosure. The main element in these calculations is the power dissipation of the equipment installed. By totalizing this value for all the installed devices, connections, cables and busbars it is possible to calculate the temperature rise within the enclosure. Here, for normal applications a temperature rise within the enclosure of 50 Kelvin is assumed.
The absolute value of this temperature may not exceed 70°C (the sum of the ambient temperature in Celsius and the temperature rise in Kelvin).

Use

An enclosure manufacturer can provide the exact data on the allowable power dissipation within a certain enclosure. The values depend on the enclosure type, the ventilation it offers and on where the components are located within this enclosure. The example here is based on the GE Modula 630 enclosure type. The table indicates the temperature rise within a certain enclosure dimension. This at the top and middle of the enclosure in function of the installed heat dissipation (products) in Watt.

Mounted on wall - Temperature rise [Kelvin]

DISSIPATION	500x500		500x750		750x500		750x750		750x1000		750x1250		1000x500		1000x750		1000x1000		1000x1250		1250x750		1250x1000	
(Watt)	Middle	Top	Middle	Top	Middle	Top	Middle	Top	Middle	Top	Middle	Top	Middle	Top	Middle	Top	Middle	Top	Middle	Top	Middle	Top	Middle	Top
10	4	5	4	4	4	5																		
20	8	9	7	7	6	8	5	6	4	5			5	7										
30	11	13																						
40	13	16	11	13	11	14	9	11	7	9	6	7	9	13	7	9	5	7	5	6	5	8		
50	16	19																						
60	19	22	16	18	16	19	12	16	10	12	8	10	12	18	10	13	7	10	6	8	8	11	6	8
70	21	25																						
80	23	28	20	23	20	24	15	20	12	16	10	12	16	22	12	16								
90	26	31																						
100	28	33	24	27	23	29	18	23	15	19	12	14	19	27	14	19	11	14	9	12	11	16	9	13
120	32	38	28	31	27	33	21	27					22	31	17	23								
140	37	44	31	35	31	38	24	31	19	24	15	19	25	35	19	26	15	19	12	16	15	21	12	16
160	41	48	35	39	34	42	27	34					27	39	21	28								
180	45	53	38	43	38	46	29	38	24	30	19	23	30	43	23	31	18	23	15	19	18	25	15	20
200	49	58	42	47	41	51	32	41					33	47	25	34								
220	53	63	45	51	44	55	34	44	28	35	22	27	35	50	27	37	21	27	18	23	21	30	18	24
240			48	55	47	58	37	47					38	54	29	39								
260			52	58	51	62	39	51	32	40	25	31	40	58	31	42	24	31	20	26	24	34	20	27
280							42	54					43	61	33	45								
300							44	57	36	45	28	35	45	65	35	47	27	35	23	29	27	38	23	30
350							50	64	40	51	32	40	51	73	40	53	30	39	26	33	31	43	25	34
400									45	57	36	44			44	59	34	44	29	37	34	48	28	38
450									49	62	39	48			48	65	37	48	32	40	38	53	31	42
500											43	53			53	71	40	53	34	44	41	58	34	46
550											46	57					44	57	37	47	45	63	37	49
600											49	61					47	61	40	51	48	67	39	53
650											53	65					50	65	42	54	51	72	42	57
700																			45	57			45	60
750																			48	61			47	63
800																			50	64			50	67

Record Plus™ Power dissipation

The power dissipation tables included here indicate the DC resistance of the ***Record Plus™*** breakers in cold condition.The power dissipation per pole can be calculated with this value and the average current flowing within the circuit (formula I^2R).

The tables indicate the Watt loss per pole based on the maximum current load of the breaker. To calculate the total Watt loss for a three or four pole breaker these values are multiplied by three.*

* for circuits with a high 3rd harmonic content, please contact us

Power Dissipation - FD63 frame

		Thermal magn. type (LTM, LTMD, GTM)							Mag Break™ (MO)						Switch (Y)
	In (A)[1]	16	20	25	32	40	50	63	3	7	12.5	20	30	50	63
Fixed version	R in mΩ per pole	11.00	5.70	4.00	2.90	2.90	2.25	1.60	110.00	55.00	17.85	10.65	4.75	3.00	0.40
	Dissipation Watt single pole	2.82	2.28	2.50	2.97	4.64	5.63	6.35	0.99	2.70	2.79	4.26	4.28	7.50	1.59
	Dissipation Watt three poles	8.45	6.84	7.50	8.91	13.92	16.88	19.05	2.97	8.09	8.37	12.78	12.83	22.50	4.76
Plug-in version	R in mΩ per pole	11.07	5.77	4.07	2.97	2.97	2.32	1.67	110.07	55.07	17.92	10.72	4.82	3.07	0.47
	Dissipation Watt single pole	0.28	0.44	0.69	0.75	1.17	1.83	2.91	0.99	2.70	2.80	0.31	0.47	1.31	1.87
	Dissipation Watt three poles	0.84	1.32	2.06	2.25	3.52	5.50	8.73	2.97	8.10	8.40	0.94	1.42	3.94	5.60
Fixed version with RCD	R in mΩ per pole	11.08	5.78	4.08	2.98	2.98	2.33	1.68	110.08	55.08	17.93	10.73	4.83	3.08	0.48
	Dissipation Watt single pole	0.29	0.45	0.70	0.76	1.19	1.87	2.96	0.99	2.70	2.80	0.33	0.50	1.39	1.91
	Dissipation Watt three poles	0.86	1.34	2.10	2.29	3.58	5.60	8.89	2.97	8.10	8.40	1.00	1.50	4.18	5.72
Plug-in version with RCD	R in mΩ per pole	11.15	5.85	4.15	3.05	3.05	2.40	1.75	110.15	55.15	18.00	10.80	4.90	3.15	0.55
	Dissipation Watt single pole	0.31	0.49	0.76	0.83	1.30	2.03	3.23	0.99	2.70	2.81	0.36	0.54	1.51	2.18
	Dissipation Watt three poles	0.94	1.46	2.29	2.50	3.90	6.10	9.68	2.97	8.11	8.44	1.09	1.63	4.54	6.55

Power Dissipation - FD160 frame

		Thermal magn. type (LTM, LTMD, GTM)						Mag Break™ (MO)			Switch (Y)
	In (A)			80	100	125	160		80	100	160
Fixed version	R in mΩ per pole			0.95	0.70	0.40	0.40		0.45	0.45	0.40
	Dissipation Watt single pole			6.08	7.00	6.25	10.24		2.88	4.50	10.24
	Dissipation Watt three poles			18.24	21.00	18.75	30.72		8.64	13.50	30.72
Plug-in version	R in mΩ per pole			1.02	0.77	0.47	0.47		0.52	0.52	0.47
	Dissipation Watt single pole			6.53	7.70	7.34	12.03		3.33	5.20	12.03
	Dissipation Watt three poles			19.58	23.10	22.03	36.10		9.98	15.60	24.06
Fixed version with RCD	R in mΩ per pole			1.03	0.78	0.48	0.48		0.53	0.53	0.48
	Dissipation Watt single pole			6.59	7.80	7.50	12.29		3.39	5.30	12.29
	Dissipation Watt three poles			19.78	23.40	22.50	36.86		10.18	15.90	36.86
Plug-in version with RCD	R in mΩ per pole			1.10	0.85	0.55	0.55		0.60	0.60	0.55
	Dissipation Watt single pole			7.04	8.50	8.59	14.08		3.84	6.00	14.08
	Dissipation Watt three poles			21.12	25.50	25.78	42.24		11.52	18.00	42.24

Power Dissipation - FE160 frame

		Thermal magn. type (LTMD, GTM)									Switch (Y)
	In (A)	25	32	40	50	63	80	100	125	160	160
Fixed version	R in mΩ per pole	6.30	2.80	2.80	2.05	1.80	1.20	0.70	0.63	0.48	0.30
	Dissipation Watt single pole	3.94	2.87	4.48	5.13	7.14	7.68	7.00	9.84	12.29	7.68
	Dissipation Watt three poles	11.81	8.60	13.44	15.38	21.43	23.04	21.00	29.53	36.86	23.04
Plug-in version	R in mΩ per pole	6.36	2.86	2.86	2.11	1.86	1.26	0.76	0.69	0.54	0.36
	Dissipation Watt single pole	3.98	2.93	4.58	5.28	7.38	8.06	7.60	10.78	13.82	5.63
	Dissipation Watt three poles	11.93	8.79	13.73	15.83	22.15	24.19	22.80	32.34	41.47	11.25
Fixed version with RCD	R in mΩ per pole	6.37	2.87	2.87	2.12	1.87	1.27	0.77	0.70	0.55	0.38
	Dissipation Watt single pole	3.98	2.94	4.59	5.30	7.42	8.13	7.70	10.94	14.08	5.94
	Dissipation Watt three poles	11.94	8.82	13.78	15.90	22.27	24.38	23.10	32.81	42.24	17.81
Plug-in version with RCD	R in mΩ per pole	6.43	2.93	2.93	2.18	1.93	1.33	0.83	0.76	0.61	0.44
	Dissipation Watt single pole	4.02	3.00	4.69	5.45	7.66	8.51	8.30	11.88	15.62	11.56
	Dissipation Watt three poles	12.06	9.00	14.06	16.35	22.98	25.54	24.90	35.63	46.85	33.79

		Mag Break™ (MO)										FE160 frame electronic type (SMR1)			
	In (A)[1]	3	7	12.5	20	30	50	80	100	125	160	25	63	125	160
Fixed version	R in mΩ per pole	410.00	110.00	13.30	13.30	3.60	1.70	0.60	0.60	0.32	0.32	0.35	0.35	0.35	0.35
	Dissipation Watt single pole	5.02	5.39	2.08	5.32	3.24	4.25	3.84	6.00	3.84	3.84	0.22	1.39	5.47	8.96
	Dissipation Watt three poles	15.07	16.17	7.27	15.96	11.34	12.75	11.52	18.00	11.52	11.52	0.66	4.17	16.41	26.88
Plug-in version	R in mΩ per pole	410.06	110.06	13.36	13.36	3.66	1.76	0.66	0.66	0.38	0.38	0.41	0.41	0.41	0.41
	Dissipation Watt single pole	5.02	5.39	2.09	5.34	3.29	4.40	4.22	6.60	5.94	9.73	0.26	1.63	6.41	10.50
	Dissipation Watt three poles	15.07	16.18	6.26	16.03	9.88	13.20	12.67	19.80	17.81	29.18	0.77	4.88	19.22	31.49
Fixed version with RCD	R in mΩ per pole	410.07	110.07	13.37	13.37	3.67	1.77	0.67	0.67	0.39	0.39	0.42	0.42	0.42	0.42
	Dissipation Watt single pole	5.02	5.39	2.09	5.35	3.30	4.43	4.29	6.70	6.09	9.98	0.26	1.67	6.56	10.75
	Dissipation Watt three poles	15.07	16.18	6.27	16.04	9.91	13.28	12.86	20.10	18.28	29.95	0.79	5.00	19.69	32.26
Plug-in version with RCD	R in mΩ per pole	410.13	110.13	13.43	13.43	3.73	1.83	0.73	0.73	0.45	0.45	0.48	0.48	0.48	0.48
	Dissipation Watt single pole	5.02	5.40	2.10	5.37	3.36	4.58	4.67	7.30	7.03	11.52	0.30	1.91	7.50	12.29
	Dissipation Watt three poles	15.07	16.19	6.30	16.12	10.07	13.73	14.02	21.90	14.02	14.02	0.90	5.72	22.50	36.86

(1) All 3A magnetic only ratings can be used at 3.5A

Power Dissipation - FE250 frame

		Thermal magn. type (LTMD, GTM)						Switch (Y)
	In (A)	80	100	125	160	200	250	250
Fixed version	R in mΩ per pole	1.10	0.60	0.55	0.40	0.33	0.24	0.20
	Dissipation Watt single pole	7.04	6.00	8.59	10.24	13.20	15.00	12.50
	Dissipation Watt three poles	21.12	18.00	25.78	30.72	39.60	45.00	37.50
Plug-in version	R in mΩ per pole	1.16	0.66	0.61	0.46	0.39	0.30	0.26
	Dissipation Watt single pole	7.42	6.60	9.53	11.78	15.60	18.75	16.25
	Dissipation Watt three poles	22.27	19.80	28.59	35.33	46.80	56.25	48.75
Fixed version with RCD	R in mΩ per pole	1.17	0.67	0.62	0.47	0.40	0.31	0.27
	Dissipation Watt single pole	7.49	6.70	9.69	12.03	16.00	19.38	16.88
	Dissipation Watt three poles	22.46	20.10	29.06	36.10	48.00	58.13	50.63
Plug-in version with RCD	R in mΩ per pole	1.23	0.73	0.68	0.53	0.46	0.37	0.33
	Dissipation Watt single pole	7.87	7.30	10.63	13.57	18.40	23.13	20.63
	Dissipation Watt three poles	23.62	21.90	31.88	40.70	55.20	69.38	61.88

		Mag Break™(MO)			FE250 frame Electronic type (SMR1)		
	In (A)	160	200	250	125	160	250
Fixed version	R in mΩ per pole	0.33	0.24	0.20	0.20	0.20	0.20
	Dissipation Watt single pole	8.45	2.40	15.00	3.13	5.12	12.50
	Dissipation Watt three poles	25.34	7.20	45.00	9.38	15.36	37.50
Plug-in version	R in mΩ per pole	0.39	0.30	0.30	0.26	0.26	0.26
	Dissipation Watt single pole	9.98	3.00	18.75	4.06	6.66	16.25
	Dissipation Watt three poles	29.95	9.00	56.25	12.19	19.97	48.75
Fixed version with RCD	R in mΩ per pole	0.40	0.31	0.31	0.27	0.27	0.27
	Dissipation Watt single pole	10.24	3.10	19.38	4.22	6.91	16.88
	Dissipation Watt three poles	30.72	9.30	58.13	12.66	20.74	50.63
Plug-in version with RCD	R in mΩ per pole	0.46	0.37	0.37	0.33	0.33	0.33
	Dissipation Watt single pole	11.78	3.70	23.13	5.16	8.45	20.63
	Dissipation Watt three poles	35.33	11.10	69.38	15.47	25.34	61.88

Power Dissipation - FG400 & FG 630 frame

		FG400/630 frame electronic type (SMR1 & 2)					Mag Break™(MO)		Switch (Y)	
	In (A)	250	350	400	500	630	350	500	400	630
Fixed version	R in mΩ per pole	0.11	0.11	0.11	0.10	0.10	0.11	0.10	0.11	0.10
	Dissipation Watt single pole	6.88	13.48	17.60	25.00	39.69	13.48	23.75	17.60	39.69
	Dissipation Watt three poles	20.63	40.43	52.80	75.00	119.07	40.43	71.25	52.80	119.07
Plug-in/Draw-out version	R in mΩ per pole	0.13	0.13	0.13	0.12	0.12	0.13	0.12	0.13	0.12
	Dissipation Watt single pole	8.13	15.93	20.80	30.00	47.63	15.93	30.00	20.80	47.63
	Dissipation Watt three poles	24.38	74.78	62.40	90.00	142.88	47.78	90.00	62.40	142.88
Fixed version with RCD	R in mΩ per pole	0.16	0.16	0.16	0.15	0.15	0.16	0.15	0.16	0.15
	Dissipation Watt single pole	10.00	19.60	25.60	37.50	59.54	19.60	37.50	25.60	59.54
	Dissipation Watt three poles	30.00	58.80	76.80	112.50	178.61	58.80	112.50	76.80	178.61
Plug-in/Draw-out version with RCD	R in mΩ per pole	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
	Dissipation Watt single pole	10.00	20.21	26.40	41.25	65.49	20.21	41.25	26.40	65.49
	Dissipation Watt three poles	30.00	60.64	79.20	123.75	196.47	60.64	123.75	79.20	196.47

Power Dissipation - FK800, FK1250 & FK1600 frame

		Thermal magn. type (LTM)				Mag Break™(MO)		Switch (Y)		
	In (A)	630	800	1000	1250	800	1250	800	1250	1600
Fixed version	R in mΩ per pole	0.04	0.04	0.04	0.04	0.02	0.02	0.02	0.02	0.01
	Dissipation Watt single pole	15.88	25.60	35.00	54.69	12.80	23.44	12.80	31.25	25.60
	Dissipation Watt three poles	47.63	76.80	105.00	164.06	38.40	70.31	38.40	93.75	76.80
Draw-out version	R in mΩ per pole	0.07	0.07	0.07	0.07	0.05	0.05	0.05	0.05	0.04
	Dissipation Watt single pole	27.78	44.80	65.00	101.56	32.00	70.31	32.00	78.13	102.40
	Dissipation Watt three poles	83.35	134.40	195.00	304.69	96.00	210.94	96.00	234.38	307.20

		FK800,1250-1600 frame electronic type (SMR1e, s & g)			
	In (A)	800	1000	1250	1600
Fixed version	R in mΩ per pole	0.04	0.04	0.04	0.03
	Dissipation Watt single pole	25.60	35.00	54.69	76.80
	Dissipation Watt three poles	76.80	105.00	164.06	230.40
Draw-out version	R in mΩ per pole	0.07	0.07	0.07	0.06
	Dissipation Watt single pole	25.60	35.00	54.69	76.80
	Dissipation Watt three poles	76.80	105.00	164.06	230.40

Notes

Derating

Thermal magnetic trip units

The ambient temperature in the direct vicinity of a protective device has an influence on its current carrying properties.

The ***Record Plus™*** breakers with thermal magnetic and magnetic only protection units as the MO, LTM and LTMD types can be used at currents and temperatures as indicated in the table.

Maximum permissable current at an ambient temperature of

		Fixed breaker							Plug in or drawout breaker						
Type	In (A)	40°C	45°C	50°C	55°C	60°C	65°C	70°C	40°C	45°C	50°C	55°C	60°C	65°C	70°C
FD63, FD160, FE160 & FE250	16	16.0	15.5	15.0	14.6	14.1	13.6	13.1	15.0	14.6	14.1	13.7	13.2	12.8	12.3
	25	25.0	24.3	23.5	22.8	22.0	21.3	20.5	23.5	22.8	22.1	21.4	20.7	20.0	19.3
	32	32.0	31.0	30.1	29.1	28.2	27.2	26.2	30.1	29.2	28.3	27.4	26.5	25.6	24.7
	40	40.0	38.8	37.6	36.4	35.2	34.0	32.8	37.6	36.5	35.3	34.2	33.1	32.0	30.8
	50	50.0	48.5	47.0	45.5	44.0	42.5	41.0	47.0	45.6	44.2	42.8	41.4	40.0	38.5
	63	63.0	61.1	59.2	57.3	55.4	53.6	51.7	59.2	57.4	55.7	53.9	52.1	50.3	48.6
	80	80.0	77.6	75.2	72.8	70.4	68.0	65.6	75.2	72.9	70.7	68.4	66.2	63.9	61.7
	100	100	97.0	94.0	91.0	88.0	85.0	82.0	94.0	91.2	88.4	85.5	82.7	79.9	77.1
FD160	125	125	121	118	114	110	106	103	118	114	110	107	103	100	96
	160	160	155	150	146	141	136	131							
FE160 & FE250	125	125	121	118	114	110	106	103	118	114	110	107	103	100	96
	160	160	155	150	146	141	136	131	150	146	141	137	132	128	123
	200	200	194	188	182	176	170	164	188	182	177	171	165	160	154
	250	250	243	235	228	220	213	205	235	228	221	214	207	200	193
FK800 & FK1250	630	630	611	592	573	554	536	517	630	611	563	545	527	509	491
	800	800	776	752	728	704	680	656	800	760	714	692	669	646	623
	1000	1000	970	940	910	880	850	820	1000	950	893	865	836	808	779
	1250	1250	1213	1175	1138	1100	1063	1025	1250	1188	1116	1081	1045	1009	974
FD63 & FD160 FE160 & FE250 with RCD	16	16.0	15.5	15.0	14.6	14.1	13.6	13.1	15.0	14.6	14.1	13.7	13.2	12.8	12.3
	25	25.0	24.3	23.5	22.8	22.0	21.3	20.5	23.5	22.8	22.1	21.4	20.7	20.0	19.3
	32	32.0	31.0	30.1	29.1	28.2	27.2	26.2	30.1	29.2	28.3	27.4	26.5	25.6	24.7
	40	40.0	38.8	37.6	36.4	35.2	34.0	32.8	37.6	36.5	35.3	34.2	33.1	32.0	30.8
	50	50.0	48.5	47.0	45.5	44.0	42.5	41.0	47.0	45.6	44.2	42.8	41.4	40.0	38.5
	63	63.0	61.1	59.2	57.3	55.4	53.6	51.7	59.2	57.4	55.7	53.9	52.1	50.3	48.6
	80	80.0	77.6	75.2	72.8	70.4	68.0	65.6	75.2	72.9	70.7	68.4	66.2	63.9	61.7
	100	100	97.0	94.0	91.0	88.0	85.0	82.0	94.0	91.2	88.4	85.5	82.7	79.9	77.1
FD160 with RCD	125	119	115	110	108	97	101	97	110	107	104	101	97	94	91
	160	152	147	141	138	125	129	125	141	137	133	129	124	120	116
FE160 & FE250 with RCD	125	125	121	118	114	110	106	103	118	114	110	107	103	100	96
	160	152	147	141	138	125	129	125	141	137	133	129	124	120	116
	200	190	184	177	173	156	162	156	177	171	166	161	156	150	145
	250	238	230	221	216	195	202	195	221	214	208	201	194	188	181

Derating

Electronic trip units

Electronic trip units are less sensitive to fluctuations in ambient temperature than thermal magnetic trip units. However, to prevent the device and its environment from exceeding their design values, certain limits must be taken into account. The table indicates the maximum values to which the LT or overload protection of the electronic trip unit of the ***Record Plus***™ breaker can be set. This at ambient temperatures from 40 to 70°C.

Maximum permissable current at an ambient temperature of

		Fixed breaker							Plug in or drawout breaker						
Type	**Is[1](A)**	**40°C**	**45°C**	**50°C**	**55°C**	**60°C**	**65°C**	**70°C**	**40°C**	**45°C**	**50°C**	**55°C**	**60°C**	**65°C**	**70°C**
FE160	**25**	25	25	25	25	25	25	25	25	25	25	25	25	25	25
	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
	160	160	160	160	156	152	148	144	160	156	152	148	144	140	136
FE250	**125**	125	125	125	125	125	125	125	125	125	125	125	125	125	125
	160	160	160	160	160	160	160	160	160	156	152	148	144	140	136
	250	250	250	250	244	238	231	225	250	244	238	231	225	219	213
FG400	**250**	250	250	250	250	250	250	250	250	250	250	250	250	250	250
	350	350	350	350	350	350	350	350	350	350	350	350	350	350	340
	400	400	400	400	390	380	370	360	400	390	380	370	360	350	340
FG630	**400**	400	400	400	400	400	400	400	400	400	400	400	400	400	400
	500	500	500	500	500	500	500	500	500	500	500	500	500	500	481
	630	630	614	599	583	567	551	536	583	568	554	539	524	510	481
FK800	**800**	800	800	760	760	760	680	-	760	741	722	703	722	646	-
FK1250	**1000**	1000	1000	950	950	900	850	-	950	950	903	879	855	808	-
	1250	1250	1250	1188	1188	1125	1000	-	1188	1158	1128	1098	1069	950	-
FK1600	**1600**	1600	1600	1520	1440	1408	1280	-	1600	1536	1444	1408	1368	1216	-
FE160 with RCD	**25**	25	25	25	25	25	25	25	25	25	25	25	25	25	25
	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	125	125	125	125	125	125	125	125	125	125	125	125	125	125	106
	160	160	156	152	148	144	141	137	152	148	144	141	137	133	129
FE250 with RCD	**125**	125	125	125	125	125	125	125	125	125	125	125	125	125	125
	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160
	250	250	244	238	244	238	231	225	238	232	226	220	214	208	202
FG400 with RCD	**250**	250	250	250	250	250	250	250	250	250	250	250	250	250	250
	350	350	350	350	341	333	324	315	350	351	342	333	324	315	306
	400	400	370	360	350	340	330	320	360	351	342	333	324	315	306
FG630 with RCD	**400**	400	400	400	400	400	400	400	400	400	400	400	400	400	400
	500	500	500	500	500	500	500	488	500	500	494	481	468	455	442
	630	630	567	551	536	520	504	488	520	507	494	481	468	455	442

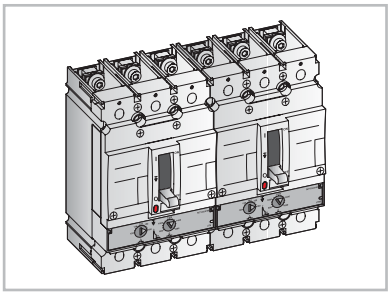
(1) Is = Sensor rating

Clearances

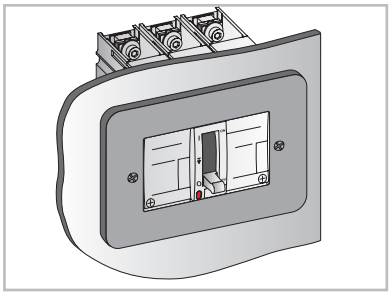
Minimum distances

A modern circuit breaker is designed to interrupt high short-circuit currents in a very limited time frame. In doing so the breaker vents gas and and a limited amount of conductive fragments.

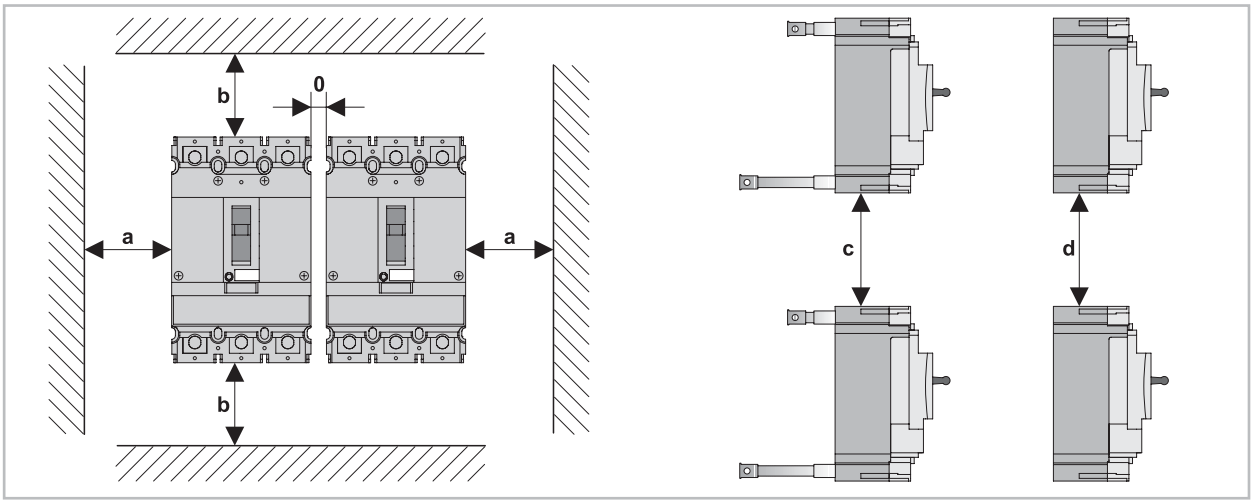
The ***Record Plus™*** circuit breaker has been designed to limit the venting phenomanae to a minimum. However, it is necessary to take the following minimum distances into account:



Minimum Distance between two side by side mounted ***Record Plus™*** Breakers = 0 mm



Minimum Distance to a front panel from a ***Record Plus™*** Breakers = 0 mm
Protection degree on breaker front = IP40



Minimum Distances

Type			Distances in mm a	b	c	d
FD63 & FD/160	To painted metal, non conductive materials and isolated conductors.		0	15		
	To unpainted metal	Voltage ≤ 480V	3	35		
		Voltage < 600V[1]	5	(2)		
		Voltage = 690V[1]	15	(2)		
	To breaker housing				35	35
	To conductors potruding from breaker				35	35
FE160 & FE250	To painted metal, non conductive materials and isolated conductors.		0	20		
	To unpainted metal	Voltage ≤ 480V	5	35		
		Voltage < 600V[1]	10	(2)		
		Voltage = 690V[1]	20	(2)		
	To breaker housing				35	35
	To conductors potruding from breaker				35	35
FG400 & FG630	To painted metal, non conductive materials and isolated conductors.		0	30		
	To unpainted metal	Voltage ≤ 480V	5	60		
		Voltage < 600V[1]	10	(2)		
		Voltage = 690V[3]	20	(2)		
	To breaker housing				60	60
	To conductors potruding from breaker				60	60
FK800, FK 800 & FK1600	To painted metal, non conductive materials and isolated conductors.		0	40		
	To unpainted metal	Voltage ≤ 480V	15	80		
		Voltage < 600V	20	80		
		Voltage = 690V	30	80		
	To breaker housing				140	140
	To conductors potruding from breaker				140	140

(1) The use of phase seperators and back plates is obligatory.
(2) Size determined by phase seperators.
(3) At 690Volts the FG400L & FG630L must have the power supply connected to the breaker ON side (Line). In this application the use of the widened terminal shield is compulsory.

Individual mounting of Record Plus™ in enclosures

Record Plus™ breakers can be placed in enclosures for use as individually wall mounted feeder units. In order to ensure a reliable and practical solution each of the combinations mentioned here have been defined by strenous testing. Here the properties of all components, and their use as a combination have been taken into account. For all other application of the ***Record Plus™*** in individually mounted enclosures, please contact us.

VMS, thermoplastic box IP65 with transparent cover.
The use of short or long terminal covers for the breaker is mandatory.

Breaker and terminal covers always have to be ordered separately.
Short-circuit rating: 20kA, 440 V

VMS, thermoplastic housing IP65 with opaque cover

Record Plus Breaker[1] In (A)	Breaker type	Rotary handle type	Housing		
			Size	Type	Ref. nr.
125A	FD125 with and without RCD	FDNRC	440 x 320 x 254	VMS43 + extension frame	**855085**
160A	FE160	FENRC	440 x 320 x 254	VMS43 + extension frame	**855087**
160A	FE160 with RCD	FENRC	640 x 320 x 254	VMS63 + extension frame	**855088**
250A	FE250	FENRC	440 x 320 x 254	VMS43 + extension frame	**855087**
250A	FE250 with RCD	FENRC	640 x 320 x 254	VMS63 + extension frame	**855088**
400A	FG400 or FG 630	FGNRC	(2)	(2)	**(2)**
630A	FG400 or FG630 with RCD	FGNRC	(2)	(2)	**(2)**

PolySafe, glass fibre reinforced Polyester, cabinet IP65 with door.
When using ***Record Plus™*** Breaker in polyester cabinets for outdoor use we recommend encapsulating the breaker in a VMS box.
Breaker, terminal covers and mounting plate for the external housing have to be ordered separately.
Short-circuit rating: 20kA, 440 V[3]

PolySafe, glass fibre reinforced polyester cabinet IP65

Record Plus Breaker[1] In (A)	Breaker type	Internal housing VMS		External housing Polysafe	
		Size	Ref. nr.	Size	Ref. nr.
125A	FD125 w/out RCD	440 x 320 x 254	**855085[3]**	750 x 500 x 320	**883008**
160A	FE160 w/out RCD	640 x 320 x 254	**855087 / 855088[3]**	750 x 500 x 320	**883008**
250A	FE250 w/out RCD	640 x 320 x 254	**855087 / 855088[3]**	750 x 500 x 320	**883008**
400A	FG400 or FG 630	FGNRC	**(2)**	(2)	**(2)**
630A	FG400 or FG630 with RCD	FGNRC	**(2)**	(2)	**(2)**

(1) Ambient temperature max. 30 degrees centigrade.
(2) Please contact us.
(3)The use of short or long terminal covers on the breaker is mandatory

Current limitation

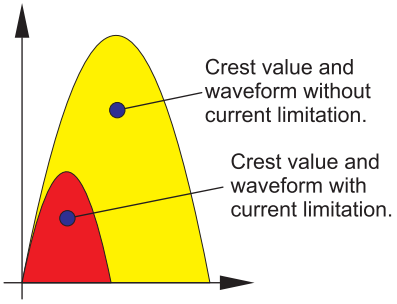
A short-circuit is an overcurrent with a value only limited by the impedance of the fault circuit itself. This impedance is determined by a number of factors the main ones of which are the available power that a network can supply and the impedance of the conductors within the fault circuit.

In modern hi-power electrical distribution networks very high prospective fault levels of 100kA or more can occur. High prospective short-circuit current values can cause issues in a number of areas:

Electrodynamic forces
These are proportional to the square of the crest current value
The electrodynamical forces due to the crest current value can seriously damage equipment as busbar systems and their supports, downstream switchgear etc.
Current limiting devices limit the crest value of the short-circuit current and thus reduce theses forces.

Magnetic fields
A high level short-circuit produces magnetic fields that prevent electrical equipment as meters and computers from operating correctly.

Thermal stress (heat)
Thermal stress is proportional to the square of the effective current value.
The thermal stress limit of cable isolation, busbar supports and other electrical equipment can be expressed as an A^2S value. This electrical energy value must be kept within certain pre-defined limits to prevent overheating.
To avoid or to limit the effects of these issues the use of current limiting devices is advisable.



Effect of a current limiting device on a short-circuit in an AC network.

Thermal stress in Electrical conductors
Cable have thermal stress limits normaly expressed in a A^2S value that depend on the cable´s cross section and its isolation. It is limited to prevent the cable isolation from exceeding its temperature limits, the maximum values being specified in the HD 384.4.4.42 and HD 384.5.5.4 standards and paragraphs.The standards define the use of the formula:

$$K^2 \times S^2$$

K; factor provided in the standard; depends on the material that the conductor is made of and it's insulation
S; cross section of the conductor

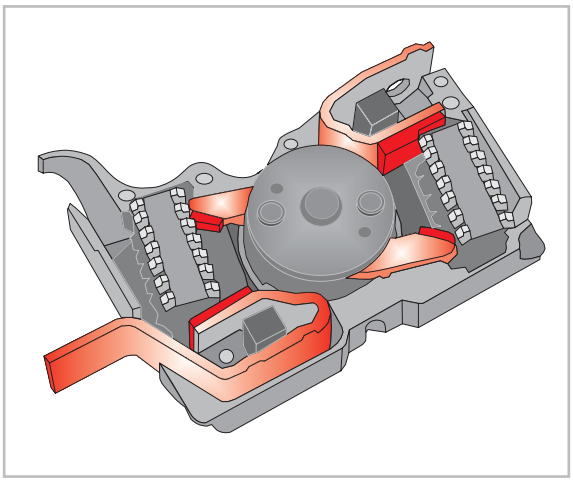
K factors acording to HD 384

Insulation	Cu	Al
70°C PVC ≤ 300 sq.mm	115	76
70°C PVC > 300 sq.mm	103	68
90°C XLPE or EPR	143	94
85°C rubber	134	89

Maximum permissable thermal stress in conductors

Insulation	Core Material	S in mm²	Thermal Stress Values											
			1.5	2.5	4	6	10	16	25	35	50	70	95	120
			A^2S x10^4	A^2S x10^4	A^2S x10^5	A^2S x10^5	A^2S x10^5	A^2S x10^6	A^2S x10^6	A^2S x10^7	A^2S x10^7	A^2S x10^7	A^2S x10^7	A^2S x10^7
70°C PVC	Copper		2.98	8.27	2.12	4.76	13.23	3.39	8.27	1.62	3.31	6.48	11.94	19.04
	Aluminium		1.30	3.61	0.92	2.08	5.78	1.48	3.61	0.71	1.44	2.83	5.21	8.32
90°C XLPE or EPR	Copper		4.60	12.78	3.27	7.36	20.45	5.23	12.78	2.51	5.11	10.02	18.46	29.45
	Aluminium		1.99	5.52	1.41	3.18	8.84	2.26	5.52	1.08	2.21	4.33	7.97	12.72
85°C rubber	Copper		4.04	11.22	2.87	6.46	17.96	4.60	11.22	2.20	4.49	8.80	16.21	25.86
	Aluminium		1.78	4.95	1.27	2.85	7.92	2.03	4.95	0.97	1.98	3.88	7.15	11.41

Record Plus™ MCCB's revolutionary design is equipped with dual contacts placed in a rotary configuration that enables the device to provide the highest available interruption ratings in the smallest possible size. When the breaker reacts it does so with more than twice the speed and force of conventional breakers, thus providing excellent current limitation. This results in low peak current and energy values in the circuit and leads to lower electro-dynamic forces and thermal stress values in the protected electrical conductors, downstream protection devices and equipment.

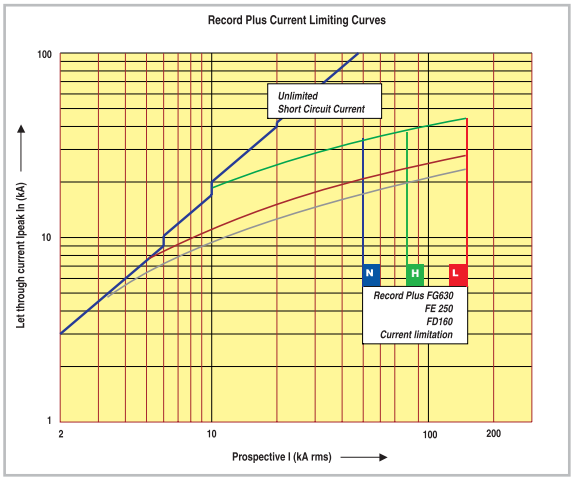


However, in some cases it is still necessary to check if the electrical conductors are protected correctly. This can be verified by taking the cable stress limits published on the previous page and comparing them with the let-through energy values found in the graphs.

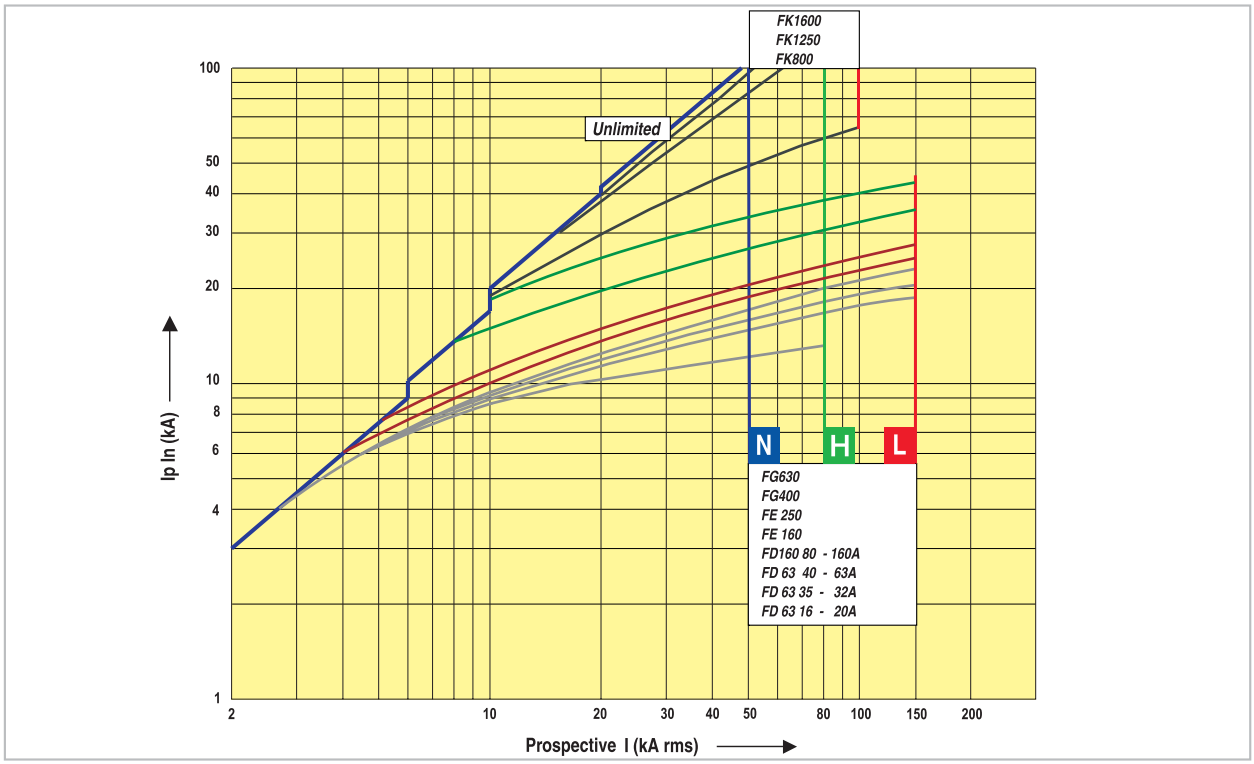
The limitation of electrodynamic forces and thermal stress by using back-up protection

Protection devices placed downstream from a protective device as a ***Record Plus***™ breaker must be able to withstand the thermal and electrodynamic effects that occur at its point of installation. Placing current limiting devices upstream limits these values and can allow the use of smaller and more economical devices than is possible without the use of current limitation.

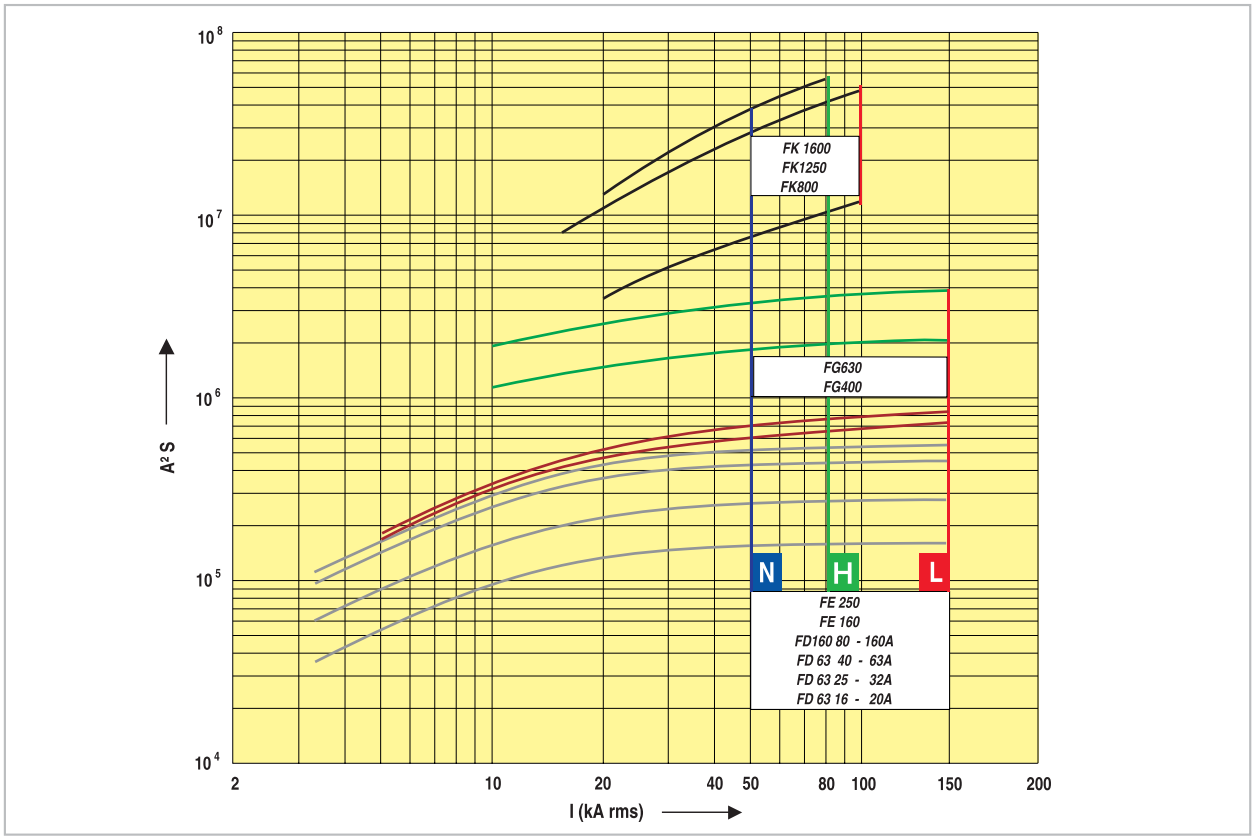
Back-up protection with ***Record Plus***™ is described in the application data section of this catalogue.



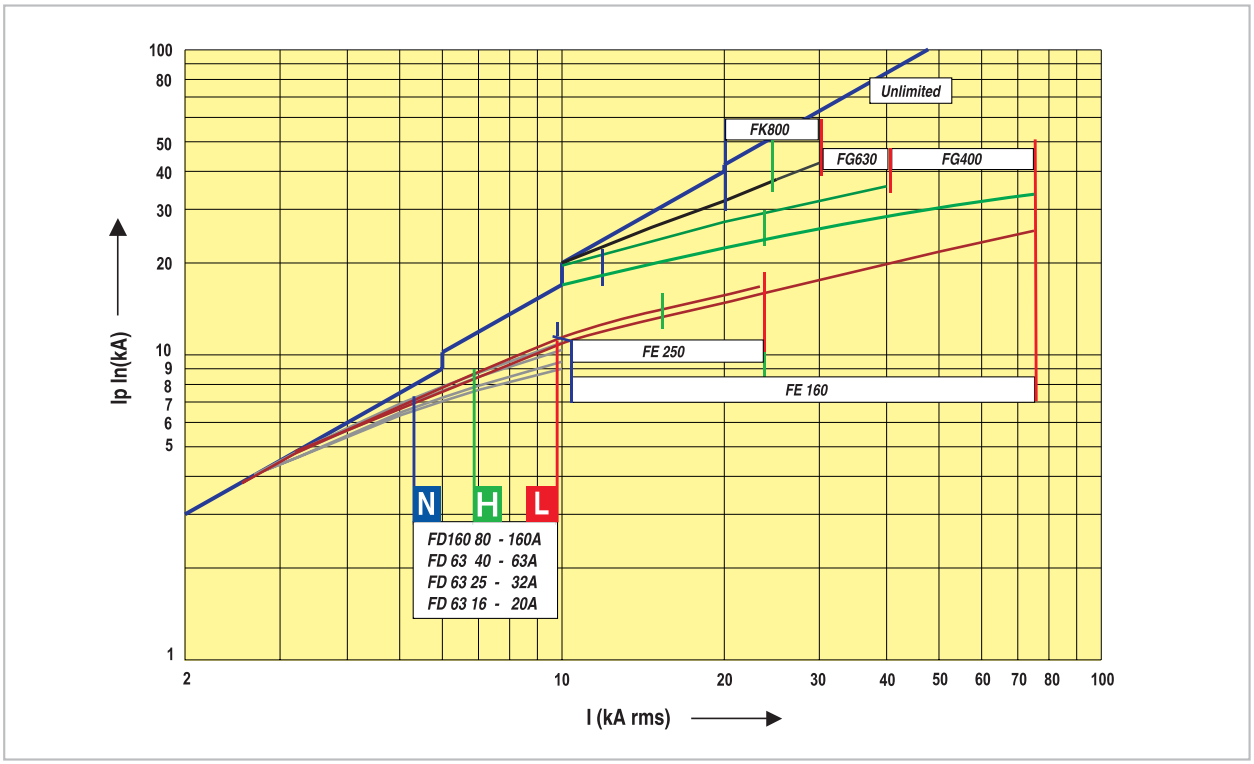
Current limitation data at 400/415V



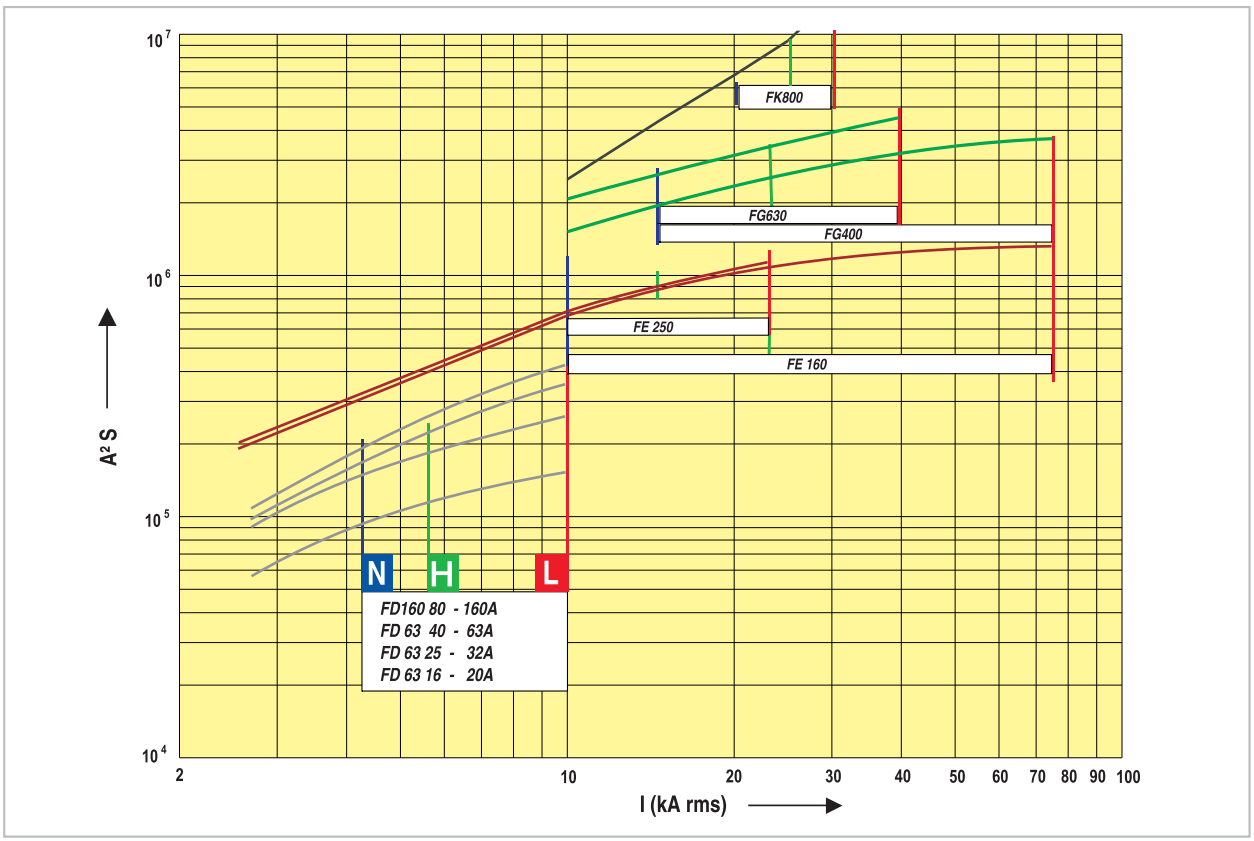
Thermal stress (Energy) Limitation data at 400/415V



Current limitation data at 690V



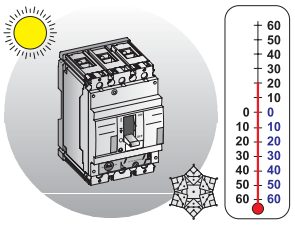
Thermal stress (Energy) Limitation data at 690V



Environmental considerations

Ambient temperature

Record Plus™ breakers are designed to operate normally at temperatures of - 20 degrees to + 70°C. Above 40°C derating factors must be applied for two basic reasons:
- To prevent the materials used to construct the device from reaching temperatures that have an adverse effect on their mechanical and/or electrical properties.
- When the breakers is equipped with a thermal magnetic protection device the bimetal in the device will react to the heat generated by the current flowing through the device.Typical for this kind of device is that its reaction time speeds up at higher ambient temperatures.

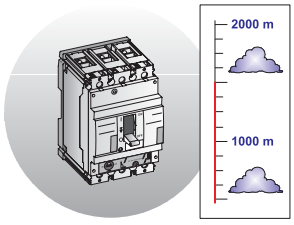


To achieve the same reaction time on a set current value it becomes necessary to derate.
The time current curves published in this catalogue are always valid for operating tempera-tures between 10 and 40°C.

Storage temperature

A ***Record Plus™*** breaker is able to withstand non-operational storage temperature ranges of - 40 to + 85°C.

Influence of altitude

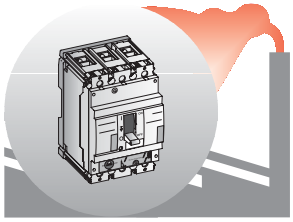


Up to altitudes of 2000 m above sea level no derating of breaker current or rated voltage is apllicable. For altitudes above 2000 m the following factors apply:

Altitude

Altitude (meters)	3000m	4000m	5000m
Ue max. (Volts)	550V	480V	420V
Max. Thermal current at 40 degrees C	0.98 x In	0.93 x In	0.9 x In

Other atmospheric conditions



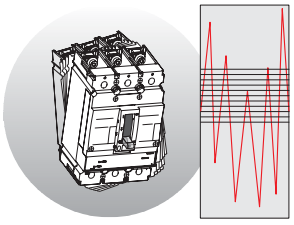
The breaker is designed to operate at the temperatures and relative humidities defined in the EN 60947 clause 6.1.3.1. It also meets the following standards:

IEC 68-2-1	Cold
IEC 68-2-2	Dry heat
IEC 68-2-11	Salt
IEC 68-2-14	Change of temperature
IEC 68-2-27	Shock test
IEC 68-2-29	Bump
IEC 68-2-30	Damp heat cyclic
IEC 68-2-31	Drop
MIL810F	Humidity

Shock & vibration

The ***Record Plus™*** line has been designed to withstand shock and vibration to the following standards:
IEC 68-2-6
Lloyd´s Register of Shippping
Bureau Veritas
JIS 8370
More specifically: ***Record Plus™*** passed the following electro-mechanical tests:

Functions normally while being subjected to 30 minutes of random vibration with a power spectral density of 0.29g^2/Hz in the range of 5Hz to 500Hz (3dB corner points, +-20dB/decade rolloff), this over three axes.



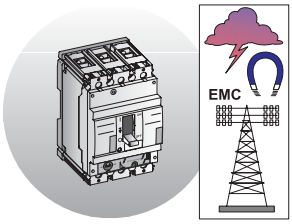
Functions normally while being subjected to sinusoidal vibration of 5g Peak from 10Hz to 500Hz using 30 minute sweeps with additional 30 minute dwells at the three greatest resonance points in this frequency range, this over three axes.

The product is shock resisitant and can withstand the following impacts in any possible orientation:
20g, 6ms, 10g, 11ms

Electromagnetic compatibility

Meets the most stringent requirement of the EN 60947-2 and IEC 1000-4. The breaker and electronic trip unit have passed the following tests.

Harmonics, current dips , interruptions and power frequency variations.
EN 60947-2 Annex F, Sub-clause F4.1 through 3
All requirements of non-sinusoidal currents resulting from harmonics are met i.e :



- Wave form consisting of a fundamental component + 3rd harmonic component at 50 and 60Hz
- Wave form consisting of a fundamental component + a 5th harmonic component at 50 and 60Hz
- Composite wave form with a fundumental component + 3rd ,5th & 7th and a harmonic at 50 and 60Hz
- All current dips and current interruptions are met.
- Frequency variation test from 45Hz to 65Hz in 1Hz steps (required 50Hz to 60Hz in 1Hz steps)

Electrostatic discharge
EN 70947 Annex F, Sub-clause F6 and the IEC 1000-4-2 (basic standard)
- Passed level 4 air discharge 15kV

Radiated, radio frequency, electromagnetic field immunity test
EN 60947-2 Annex F, Sub-clause F7 and the IEC 1000-4-3 (basic standard)
- Passed higher than level 4.....field strength 30V/m

Electrical fast transient/burst
EN 60947-2 Annex F, Sub-clause F5 and the IEC 1000-4-4 (basic standard)
- Passed level 4 burst peak voltage 4kV

Surge immunity test
EN 60947-2 Annex F, Sub-clause F5 and the IEC 1000-4-5 (basic standard)
- Passed level 4 Voltage 1.2µs/50µs 6kV; current 8µs/20µs 3kA

Dry heat test
EN 60947-2 Annex F, Sub-clause F8
- Passed all test requirements

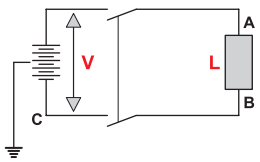
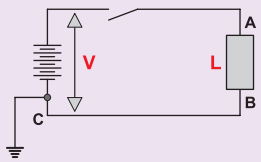
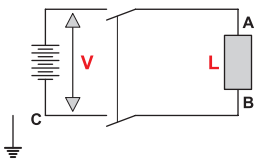
Thermal shock test
EN 60947-2 Annex F, Sub-clause F9
- No nuisance tripping within the 28-day temperature cycles

Use in DC networks

In both AC and DC networks protective devices are required to interrupt the prospective short-circuit current at the point where the device is installed. For circuit breakers as the ***Record Plus™*** this value is called the interuption or breaking capacity (Icu or Ics), a value dependent not only on the prospective fault current value but also on the system voltage rating. For DC networks the situation is basically the same as for AC networks.

However, the system voltage generally plays a greater role (is more difficult to interrupt) while the network defines how many poles need to participate in the interruption.
The drawing below indicates the three possible DC networks with the "worst" short-circuit for each of them, the number of poles that must particpate in the breaking operation and the voltage level that needs to be interrupted.

Use in DC networks

Network Type	Center point connected to earth (A)	One pole connected to earth (B)	Insulated from earth (C)(1)
Electrical schemes			
Maximum short-circuit current (Icc max)	short-circuit A-B	short-circuit A-B or A-C	short-circuit A-B
Minimum poles needed	2 (one on each polarity)	1 (unearthed polarity)	2 (one on each pole)
Breaking capacity on each pole	Icc max at V/2	Icc max at V	Icc max at V

(1) When a pole is grounded due to a first fault nothing happens, on a second fault the network behaves like a system with "one polarity connected to ground"

Record Plus™ FD, FE, FG and FK line breakers can be used in DC networks with standard thermal magnetic trip units.
For ***Record Plus™*** FG line breakers, please contact us.
The nominal current rating of the device does not vary in AC or DC applications. The setting of the short-circuit or magnetic device needs to be multiplied by 1.2 to determine its threshold in a DC network.
The table indicates the nominal current, the breaking capacity (Icu=Ics) and the number of poles needed to participate in the interruption.

Example
Rated voltage 500 V DC; Rated current 200 A Icc max 50 kA
network A : center point connected to grond
FE250N 3x 250 - 1pole for each polarity
network B : one pole connected to ground
FE250N 3x 250 - 2poles on unearthed polarity.
network C : insulated network
FE250N 3 x 250 - 1 pole on each polarity

Use in DC networks with standard thermal magnetic trip units

Breaker	Rated current	110 V DC	250 V DC	440 V DC	500 V DC	Thermal threshold	Magnetic threshold
FD 63S	16÷ 63	25 (1p)	25 (1p)	25 (2p)	-	= AC	1.2
FD 63N	16÷ 63	40 (1p)	40 (1p)	40 (2p)	40 (2p)	= AC	1.2
FD 63H	16÷ 63	65 (1p)	65 (1p)	65 (2p)	65 (3p)	= AC	1.2
FD 63L	16÷ 63	100 (1p)	100 (1p)	100 (3p)	100 (3p)	= AC	1.2
FD160S	64÷160	25 (1p)	25 (1p)	25 (3p)	-	= AC	1.2
FD160N	64÷640	40 (1p)	40 (1p)	40 (2p)	40 (2p)	= AC	1.2
FD160H	64÷640	65 (1p)	65 (1p)	65 (2p)	65 (3p)	= AC	1.2
FD160L	64÷640	100 (1p)	100 (1p)	100 (3p)	100 (3p)	= AC	1.2
FE160N	25÷160	50 (1p)	50 (1p)	50 (2p)	50 (2p)	= AC	1.2
FE160H	25÷160	85 (1p)	85 (1p)	85 (2p)	85 (3p)	= AC	1.2
FE160L	25÷160	100 (1p)	100 (1p)	100 (3p)	100 (3p)	= AC	1.2
FE250V	125÷250	25 (1p)	25 (1p)	25 (2p)	-	= AC	1.2
FE250N	125÷250	50 (1p)	50 (1p)	50 (2p)	50 (2p)	= AC	1.2
FE250H	125÷250	85 (1p)	85 (1p)	85 (2p)	85 (3p)	= AC	1.2
FE250L	125÷250	100 (1p)	100 (1p)	100 (3p)	100 (3p)	= AC	1.2
FG400N							
FG400H							
FG400L							
FK800N	500÷800	50 (1p)	50 (2p)	36 (3p)	36 (3p)	= AC	1.2
FK800H	500÷800	60 (1p)	60 (2p)	60 (3p)	60 (3p)	= AC	1.2
FK800L	500÷800	80 (1p)	80 (2p)	80 (3p)	80 (3p)	= AC	1.2
FK1250N	640÷1250	50 (1p)	50 (2p)	36 (3p)	36 (3p)	= AC	1.2
FK1250N	640÷1250	60 (1p)	60 (2p)	60 (3p)	60 (3p)	= AC	1.2
FK1250L	640÷1250	80 (1p)	80 (2p)	80 (3p)	80 (3p)	= AC	1.2

Use at frequencies other than 50/60 cycles

Performance characteristics of protective devices used in electrical distribution networks or systems vary according to the network's rated frequency.
The ***Record Plus™*** family of circuit breakers is designed to offer their best performance at 50/60 Hz network.

The breakers can be used at 16 2/3 (applications in rail transport) and 400hz (aviation) if the following is taken into account:
a) The rated breaking capacity is decreased [(1)]
b) The device trip unit settings are modified
Here the correct setting of the trip unit is vital to ensure that the circuit breaker performs well in the electrical distribution network.

Thermal magnetic trip units

Record Plus™ breakers and their trip units can be used at 16 2/3 Hz and 400 Hz provided that the trip units are set accordingly.The table indicates the coefficients to be applied for 16 2/3 Hz and 400 Hz applications.

Kt (for thermal)
Km (for magnetic)

The current values for each environment can be calculated by multiplying the values set on the breaker by the coefiicients mentioned in the tables.

Electronic (SMR1) trip units

The breakers and their trip units can be used at 400 Hz (aircraft) provided that the trip units are set accordingly.
The table indicates the coefficients to be applied for 16 2/3 Hz and 400 Hz applications.

Kt (for LT)
Km (for ST)

The current values for each environment can be calculated by multiplying the values set on the breaker by the coefiicients mentioned in the tables.

Use in networks with a frequency of 16 2/3 and 400 cycles

Breaker	Rated current	Trip Unit type	Thermal or LT settings		Magnetic or ST settings	
			Kt_{16} (16 2/3Hz)	Kt_{400} (400 Hz)	Km_{16} (16 2/3Hz)	Km_{400} (400 Hz)
FD63N, H or L	8÷63	LTMD, GTM or MO	1	0.95	0.8	1.6
FD160N, H or L	64÷160	LTMD, GTM or MO	1	0.9	0.8	1.6
FE160N, H or L	8÷63	LTM, LTMD, GTM or MO	1	0.95	0.8	1.6
FE160N, H or L	64÷160	LTM, LTMD, GTM or MO	1	0.9	0.8	1.6
FE250N, H or L	80÷250	LTMD, GTM or MO	1	0.9	0.8	1.6
FE160N, H or L	10÷125	SMR1	1	1	1	1
FE160N, H or L	160	SMR1	1	0.9	1	1
FE250N, H or L	40÷125	SMR1	1	1	1	1
FE250N, H or L	64÷250	SMR1	1	0.9	1	1
FG400N, H or L	100÷400	SMR1	1	0.8	1	1
FG630N, H or L	160÷630	SMR1	1	0.8	1	1
FK800N, H or L	320÷800	LTM	1	0.6	1	1
FK1250N, H or L	400÷1250	LTM	1	0.6	1	1

Example
A FE160N with LTMD 160A trip unit in a 400 Hz network:
(from the table Kt_{400} = 0.9 / Km_{400} = 1.6)
If Ir is set at 160A and Im set at 1200A the real thermal threshold is 160 x 0.9 = 144A at 40°
Thus the current in the circuit may not exceed this value
Im = 1200 ≥
the real magnetic threshold is 1120 x 1.6 = 1920A

(1) Please consult us.

Just rel

Notes

Introduction

A protection device like the ***Record Plus™*** circuit breaker is used in a wide variety of environments to protect conductors, equipment and devices in low voltage distribution circuits. To use this product to its full potential it is necessary to verify that it functions correctly in the environment in which it is used and that it meets the Electrotechnical requirements of the circuit it protects.

Environment
Record Plus™ breakers function well in almost any industrial environment. The EN 60947-2 defines the main aspects of what is meant by "industrial environment":
Temperature:
Relative humidity:
Altitude:
Pollution:
Network harmonic content:
Shock and vibration resistance:
For conditions other than the above mentioned please refer to page D.16 in which the effects of the environment are defined.

Maximum short-circuit current
Protective devices as the ***Record Plus™*** circuit breaker must be able to interrupt the maximum short-circuit current at the point where they are installed.
The interruption ratings of these breakers (breaking capacity) can be found elsewhere in this catalog.

Design current of a circuit
The equipment and devices in an electrical circuit determines it's current load. The electrical conductor cross sections that can be used in the circuit are determined by a number of factors i.e.

- The design current of the circuit (I_B).
- Conductor type and it's insulation. (current capacity = I_Z)
- Installation method.
- Temperature.
- Number of conductors mounted in each others vicinity.

The resulting combinations of current load and electrical conductor cross sections are beyond the scope of this catalogue, however a number of frequently used values are:

Conductor cross section	10mm²	25mm²	50mm²	70mm²	95mm²
I_B with Cu conductors in A	50	90	130	170	210
I_B with AL conductors in A	35	70	100	130	160

The breaker settings
The main breaker settings are :
- Overload protection or LT setting ... **Ir**
- Magnetic or ST setting .... **Im**

Ir setting
The HD 384 (IEC 364) installation regulations state that the Ir value is determined by use of the following two formulae:

$$I_B < Ir \leq I_Z$$
$$It \leq 1.45 \times I_Z$$

Terminology
I_B = Circuit design current
Ir = Current set on breaker
I_Z = Current carrying capacity of electrical conductor
I_t = Tripping current of the protection device
(***Record Plus™*** MCCB $I_t \leq 1.3 \times Ir$)

Use of the above mentioned formulae and the ***Record Plus™*** characteristics give the following results:
Breaker setting $Ir \leq I_Z$ ($I_t \leq 1.3 \times I_Z$)
In practice **Ir** is generally set at a value equal to I_Z.

Im setting - protected equipment
The magnetic or ST setting of a breaker (Im) is primarily defined by the characteristics of the equipment and devices in the circuit.
The ***Record Plus™*** device is equipped with trip units that react to fault currents when needed but are specifically designed not to react to most inrush-current profiles.
The details included in this section on devices as LV/LV transformers and the time current curves of the breaker published elsewhere in this catalogue allow a definition of the **Im** value.

Im setting - protected lines
On a short-circuit event the total circuit impedance determines the highest and the lowest current that can flow in the circuit. It is necessary not only to verify if the protective device can interrupt the maximum short-circuit value but also if the device protecting the circuit reacts and disconnects in time at the lowest possible short-circuit value.
Due to the fact that a major part of the circuit impedance is formed by electrical conductors like cables, busbar systems etc. within the circuit, this requirement has a limiting effect on the length of the conductors used in the circuit.

There are two conditions that have to be met:
a) The weakest short-circuit current must be disconnected before the electrical conductors exceed their temperature limits.
b) A current to earth (fault current) must be disconnected before inadvertent contact to normally non-conductive parts causes injury.
Please refer to the pages E.6 and E.13 for more details.

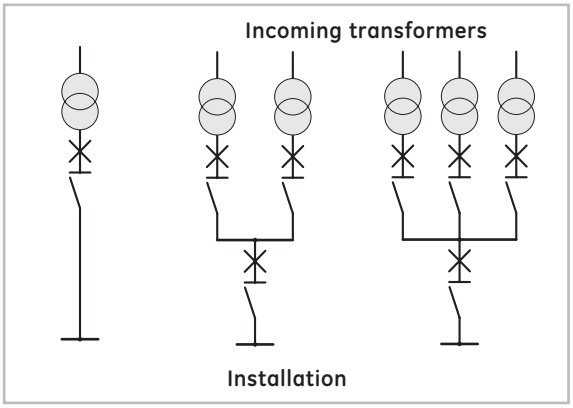
Protection against short-circuits

Maximum short-circuit ratings

Protective devices as the ***Record Plus***™ circuit breaker must be able to interrupt the maximum short-circuit current at the point where they are installed.
The interruption ratings of these breakers (breaking capacity) can be found elsewhere in this catalogue.
For the calculation of the short-circuit current at the point where the breaker is installed a pan-European document is now available in the form of the R064-003.The values published here are based on this document.

Power supply

The values mentioned in table indicate the effective values of the highest three phase short-circuit current that is available at the connection terminals of the incoming transformer(s).



Formulas

Medium voltage impedance

$$Z_Q = \frac{(m\ Uo\ sqrt\ 3)^2}{Sk_Q}\ mOhm$$

MV/LV transformer impedance

$$Z_r = \frac{(m\ Uo\ sqrt\ 3)^2}{S_rT} \times \frac{U_{kr}}{100\%}\ mOhm$$

Maximum short-circuit calculation

$$Ik_{3max} = \frac{(cmax * m * Uo\ sqrt\ 3)^2}{Sqrt\ (R^2 + X^2)}\ kA$$

Calculated maximum short-circuit values (3 phase 400V network)

MV/LV Transformer(s)		Medium Voltage power SK_Q in MvA					
S_rT	U_{kr} %	100	150	200	300	400	500
		Maximum short-circuit Values in kA (Ik_{3max})					
100	4	3.5	3.6	3.6	3.6	3.6	3.6
160	4	5.6	5.7	5.7	5.7	5.7	5.8
250	4	8.5	8.7	8.8	8.9	8.9	9.0
315	4	10.6	10.9	11.0	11.1	11.2	11.2
400	4	13.2	13.6	13.8	14.0	14.2	14.2
500	4	16.2	16.8	17.1	17.4	17.6	17.7
630	4	19.8	20.7	21.2	21.7	22.0	22.2
630	5	16.3	16.9	17.2	17.6	17.7	17.8
630	6	13.8	14.3	14.5	14.7	14.8	14.9
800	6	17.1	17.8	18.2	18.5	18.7	18.8
1000	6	20.8	21.8	22.3	22.9	23.2	23.4
1250	6	25.1	26.6	27.4	28.3	28.7	29.0
1600	6	30.6	32.9	34.2	35.6	36.3	36.8
2000	6	36.4	39.7	41.6	43.6	44.7	45.4
2500	6	42.9	47.5	50.2	53.2	54.8	55.9
2 x 400	4	24.2	25.7	26.4	27.2	27.7	27.9
2 x 500	4	29.1	31.2	32.3	33.5	34.2	34.6
2 x 630	4	34.9	37.9	39.6	41.4	42.4	43.0
2 x 630	5	29.3	31.4	32.5	33.8	34.4	34.8
2 x 630	6	25.3	26.8	27.6	28.5	29.0	29.3
2 x 800	6	30.6	32.9	34.2	35.6	36.3	36.8
2 x 1000	6	36.4	39.7	41.6	43.6	44.7	45.4
2 x 1250	6	42.9	47.5	50.2	53.2	54.8	55.9
2 x 1600	6	50.7	57.3	61.3	65.9	68.4	70.0
2 x 2000	6	58.3	67.3	72.8	79.4	83.1	85.5
2 x 2500	6	66.3	78.1	85.7	94.9	100.3	103.9
3 x 400	4	33.6	36.4	37.9	39.6	40.5	41.1
3 x 500	4	39.7	43.7	45.9	48.5	49.8	50.7
3 x 630	4	46.8	52.3	55.6	59.4	61.4	62.7
3 x 630	5	40.0	43.9	46.2	48.8	50.2	51.0
3 x 630	6	34.9	37.9	39.6	41.4	42.4	43.0
3 x 800	6	41.6	46.0	48.5	51.3	52.8	53.8
3 x 1000	6	48.6	54.6	58.2	62.3	64.6	66.0
3 x 1250	6	56.1	64.3	69.3	75.3	78.6	80.8
3 x 1600	6	64.8	76.1	83.3	91.9	97.0	100.3
3 x 2000	6	72.9	87.5	97.2	109.2	116.4	121.2
3 x 2500	6	81.0	99.4	112.1	128.6	138.7	145.6

Terminology

Sk_Q	= short-circuit power of the medium/high voltage network
S_{rT}	= power rating of the MV/LV transformer
U_{kr}	= short-circuit voltage in %, according to HD 398
m	= no load factor; 1.05 assumed
Cmax.	= voltage factor; 1.05 assumed
Uo	= phase to neutral voltage
Ik_{3max}	= maximum 3 phase short-circuit current
X	= total reactance
X_Q	= 0.995 x Z_Q
X_T	= 0.95 x Z_T
R	= total resistance
R_Q	= 0.1 x X_Q*
R_T	= 0.31 x Z_T

* See IEC 909

Influence of cable runs

It is possible to calculate short-circuit values within circuits by determining the impedance, reactance and resistance of the power supply and by adding those of cable runs. These values are used here to calculate the maximum short-circuit levels at the end of a defined cable run.

Values used
Specific resistance of copper and aluminum at 20°C

ρ_0 = 18.51 mΩ mm^2/m. for copper cores
29.41 mΩ mm^2/m. for aluminum cores

Reactance of multicore cables λ 0.08 mΩ /m.

Examples
$Ik_{3\ max.}$ at cable run start 50kA
54 meters of 185 mm^2 cable
$Ik_{3\ max.}$ at cable run end 22kA

$Ik_{3\ max.}$ at cable run start 120kA
12 meters of 185 mm^2 cable
$Ik_{3\ max.}$ at cable run end 80kA

Short-circuit values within circuits

$Ik_{3\ max.}$ without cable run	$IK_{3\ max}$ in kA at point where *Record Plus*™ MCCB is to be installed (This value must be ≤ Icu or Ics)									
145	80	65	50	30	25	22	20	15	10	6
140	80	65	50	30	25	22	20	15	10	6
130	80	65	50	30	25	22	20	15	10	6
120	80	65	50	30	25	22	20	15	10	6
110	80	65	50	30	25	22	20	15	10	6
100	65	65	50	30	25	22	20	15	10	6
90	65	65	50	30	25	22	20	15	10	6
80	65	50	50	30	22	20	20	15	10	6
70	65	50	50	25	22	20	20	15	10	6
60	50	50	50	25	22	20	20	15	10	6
50	50	36	30	22	20	20	20	15	10	6
45	50	36	30	22	20	20	20	15	10	6
40	36	36	30	20	20	20	15	15	10	6
35	30	30	25	20	20	15	15	15	10	6
30	30	25	22	20	20	15	15	15	10	6
25	22	22	20	15	15	15	15	10	10	6
20	-	-	-	15	15	15	15	10	10	6
15	-	-	-	-	-	10	10	10	10	6
10	-	-	-	-	-	-	-	-	6	6

Cable cross section Cu mm^2	AL mm^2	Required minimum length in meters of cable run of the mentioned cross section to achieve the $Ik_{3\ max}$ mentioned above									
1.5		0.5	0.5	0.5	1	1	1	1	1.5	2	3.5
2.5	**4**	0.5	0.5	0.5	1	1.5	1.5	1.5	2	3.5	5.5
4	**6**	0.5	0.5	1	1.5	2	2.5	2.5	4	5	9
6	**10**	1	1	1.5	2.5	3	3.5	3.5	5	8	13
10	**16**	1	2	2	4	5	5.5	6	8	13	21
16	**25**	1.5	2.5	3.5	6	8	9	10	13	20	35
25	**35**	2.5	4	5	9	12	13	15	20	32	55
35	**50**	3	4	7	13	16	18	20	28	42	70
50	**70**	4	6	9	18	22	25	29	39	60	100
70	**95**	6	8	12	24	30	35	40	55	85	135
2 x 35	**2 x 50**	6	8	13	25	32	36	40	55	85	140
95	**150**	7	11	16	32	39	46	51	70	110	180
2 x 50	**2 x 70**	8	12	18	35	44	52	58	80	120	200
120	**185**	9	13	19	38	48	55	62	85	130	220
150	**240**	10	15	23	46	58	66	75	100	155	255
2 x 70	**2 x 95**	11	16	24	50	60	70	80	110	170	270
185		12	18	27	54	65	76	84	116	180	300
240		14	21	32	32	78	88	98	135	210	340
2 x 95	**2 x150**	14	21	32	65	80	95	105	140	220	360
300		16	24	35	70	85	100	110	150	230	380
2 x120	**2 x185**	17	27	42	80	95	110	125	170	260	430
2 x150		20	30	48	91	115	135	150	200	310	510
3 x 95	**3 x150**	21	33	51	95	120	140	155	210	320	540
2 x185		23	35	53	105	130	155	170	235	360	590
3 x120		25	38	57	115	145	165	185	255	390	645
2 x240		28	41	62	125	155	180	200	270	410	675
3 x150	**3 x240**	30	45	68	140	170	200	220	300	460	765
3 x185		35	53	79	160	195	230	255	350	530	880
3 x240		41	80	125	185	230	265	295	410	620	

Protection against short-circuits

Weakest short-circuit current

It is necessary to verify that the permissible thermal stress in conductors is not exceeded at the maximum short-circuit level and at the weakest short-circuit level. Verification on the maximum short-circuit level is described on page E.4 of this catalogue. For the weakest short-circuit value it is necessary to verify that the protective devices as the ***Record Plus™*** circuit breaker trips before the conductors reach the mentioned limits. On using circuit breakers it is generally sufficient to check if the weakest short-circuit current trips the short-circuit protective element of the device.

Permissible thermal stress in conductors
For insulated conductors and cables this is defined by the formula:

$$\frac{t \leq K^2 S^2}{Ik^2}$$

Terminology
t = the short-circuit time in seconds
k = a factor determined by the conductor in accordance with HD384-5-54
Ik = the weakest short-circuit current in A
S = the conductor cross section in mm^2

The table included here indicates the factor k for conductors with different insulation materials and the calculated energy values for the conductor cross sections.

Weakest short-circuit current calculations
For the most commonly applied network configuration, 3 phase with neutral, the weakest short-circuit is the Phase to Neutral value.
The network configuration determines the value of this current. Cases where the Phase to Earth or two Phase value is the weakest are also commonplace.
Basically, the weakest short-circuit current is determined by the highest impedance loop in the circuit that the breaker is protecting.
Due to the simple fact that the impedance of this loop is mainly determined by the conductors included in the circuit, their maximum length is limited. An approximation of the effect of the conductor or cable length on the weakest short-circuit is possible by using the following formula:

$$Ikmin = 0.8 \times \frac{Cmin \times Uo}{Sqrt(R^2 + X^2)} \times k1 \times k2 \times k3 \text{ Amp}$$

Maximum thermal stress in isolated conductors (x 10^3) and k factors accordance with HD 384-5-54.

Insulation material K factor Copper conductors S in mm^2	Rubber 134	PVC 115	XLPE 143	EPR 143
	Maximum thermal stress x 10^3			
1.5	40	30	46	46
2.5	112	83	128	128
4	287	212	327	327
6	646	476	736	736
10	1796	1323	2045	2045
16	4597	3386	5235	5235
25	11223	8266	12781	12781
35	21996	16201	25050	25050
50	44890	33063	51123	51123
70	87984	64803	100200	100200
95	162053	119356	184552	184552
120	258566	190440	294466	294466
185	614544	452626	699867	699867
240	1034266	761760	1177862	1177862
300	1616040	1190250	1840410	1840410

Insulation material K factor Alumin. conductors S in mm^2	Rubber 89	PVC 76	XLPE 94	EPR 94
	Maximum thermal stress x 10^3			
4	127	92	141	141
6	285	208	318	318
10	792	578	884	884
16	2028	1479	2262	2262
25	4951	3610	5523	5523
35	9703	7076	10824	10824
50	19803	14440	22090	22090
70	38813	28302	43296	43296
95	71487	52128	79745	79745
120	114062	83174	127238	127238
185	271096	197684	302412	302412
240	456250	332698	508954	508954
300	712890	519840	795240	795240

Terminology
Ikmin = Weakest short-circuit current
0.8 = Assumed factor for the impedance of the upstream network
Cmin = Voltage factor; 0.95 assumed
Uo = Phase to neutral voltage
X = Reactance of the conductors or cables in the circuit reactance of multi core cables X in mΩ/m 0.08
R = Resistance of the conductors or cables in the circuit based on the following basic data:
23.69 mΩ mm^2/m. for copper cores*
37.64 mΩ mm^2/m. for aluminum cores*
The values are in accordance with the Cenelec R064-003 document for calculating the weakest short-circuit current with circuit breakers (warme state value)
k1, k2 k3 = Correction factors, see next page

* = 1.28 x 18.51 and 1.28 x 29.41.

Maximum conductor length

To meet the requirements the short-circuit device of the circuit breaker (Im) must react to the weakest short-circuit current. The table indicates the maximum cable length where this condition is still met.
The tolerances on the settings of the short-circuit device in the breaker are taken into account (factor included in calculations of 1.2).

Correction factors k
For a 3 phase circuit with no neutral and a voltage of 400V between phases:

k1 = 1.74

For a single phase circuit with neutral and a voltage of 230V between phase and neutral:

k1 = 1.00

For a 3 phase circuit with neutral, a voltage of 400V between phase and a neutral with 0.5 x the phase cross section:

k1 = 0.67

For a number of multi-core cables in parallel

k2 for 2 cores = 2.00
k2 for 3 cores = 2.65

For multicore cables with conductors made of aluminum:

Cu conductor Cross section S in mm^2	k3
= 4 ≤ 50	0.63
70	0.64
95	0.65
120	0.66
150	0.67
185	0.69
240	0.72
300	0.76

Maximum cable length in meters in a 3 phase + neutral network (U_0=230V) Based on multicore cables with an EPR/XLPE insulation (worst case)

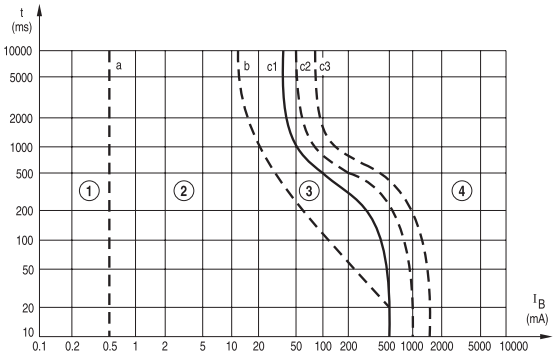
Cu conductor Cross section S in mm^2	short-circuit setting of *Record Plus™* device in Amps											
	50	75	100	125	150	200	250	300	350	400	450	500
1.5	92	61	46	37	31	23						
2.5	154	102	77	61	51	38	31	26	22	19	17	15
4	246	164	123	98	82	61	49	41	35	31	27	25
6	246	246	184	148	123	92	74	61	53	46	41	37
10		246	307	246	205	154	123	102	88	77	68	61
16				393	327	246	196	164	140	123	109	98
25				393	511	383	306	255	219	191	170	153
35						534	427	356	305	267	237	214
50						534	606	505	433	379	337	303
70								698	598	524	465	419
95								698	795	695	618	556
120										855	760	684
150										855	914	823
185											914	965

Cu conductor Cross section S in mm^2	short-circuit setting of *Record Plus™* device in Amps											
	600	700	800	900	1000	1250	1500	1750	2000	2500	3000	3500
2.5	13											
4	20	18	15	14								
6	31	26	23	20	18	15	12					
10	51	44	38	34	31	25	20	18	15	12		
16	82	70	61	55	49	39	33	28	25	20	16	14
25	128	109	96	85	77	61	51	44	38	31	26	22
35	178	153	134	119	107	85	71	61	53	43	36	31
50	253	217	189	168	152	121	101	87	76	61	51	43
70	349	299	262	233	209	168	140	120	105	84	70	60
95	464	397	348	309	278	222	185	159	139	111	93	79
120	570	488	427	380	342	274	228	195	171	137	114	98
150	686	588	514	457	411	329	274	235	206	165	137	118
185	804	689	603	536	482	386	322	276	241	193	161	138
240	955	819	717	637	573	459	382	328	287	229	191	164
300		926	810	720	648	518	432	370	324	259	216	185

Cu conductor Cross section S in mm^2	short-circuit setting of *Record Plus™* device in Amps											
	4000	4500	5000	5500	6000	6500	7000	7500	8000	9000	10000	12000
16	12											
25	19	17										
35	27	24	21	19	18							
50	38	34	30	28	25	23	22	20				
70	52	47	42	38	35	32	30	28	26	23		
95	70	62	56	51	46	43	40	37	35	31	28	23
150	85	76	68	62	57	53	49	46	43	38	34	28
185	103	91	82	75	69	63	59	55	51	46	41	34
185	121	107	96	88	80	74	69	64	60	54	48	40
240	143	127	115	104	96	88	82	76	72	64	57	48
300	162	144	130	118	108	100	93	86	81	72	65	54

Personnel protection

If, in low voltage installations, a person makes contact with two or more conductive materials/ surfaces with a different electrical potential he or she will risk a potentially dangerous electrical shock.
This results in an electrical current flowing through the persons body, the effects of which are indicated in figure 1 and the accompanying text.
(source IEC 60479-1)



Zone	Physiological effects
1	Usually has no reactions or effects.
2	Usually has no harmful effects.
3	Usually, no organic damage is expected. Here the likelihood is present of muscular contractions and difficulty in breathing. Reversible disturbances in the formation and conductance of impulses in the heart, including arterial fibrillation and transient cardiac arrest without ventricular fibrillation are possible. These effects increase with current magnitude and time.
4	In addition to he effects of Zone 3, the probability of ventricular fibrillation increases from 5% (curve c2) , to about 50% (curve c3) and beyond 50% above curve c3. Increasing with magnitude and time are pathophysiological effects as cardiac and breathing arrest, whilst heavy burns are possible.

If, in a low voltage installation, a person comes into contact with an earthed part that has accidentally been connected to a live conductor, he or she will risk a potentially dangerous electrical shock.
The level of voltage over the contact, and the length of time that the person has to endure this contact can be dangerous. This so called 'Touch Voltage' must be limited to values that a human being can endure without physiological damage.
The environment in which the fault occurs, dry or humid, also plays a role in defining 'touch voltage' values.
The IEC 60479-1 standard defines numerous touch voltages or UL values.

50V AC.....In a dry environment
25V AC.....In a humid environment

The IEC 60479-1 defines that this so called 'Touch Voltage' must be disconnected within 5 seconds.
Based on the environment and the associated 'Touch Voltage' maximum disconnect times are also specified for a range of higher voltage value.

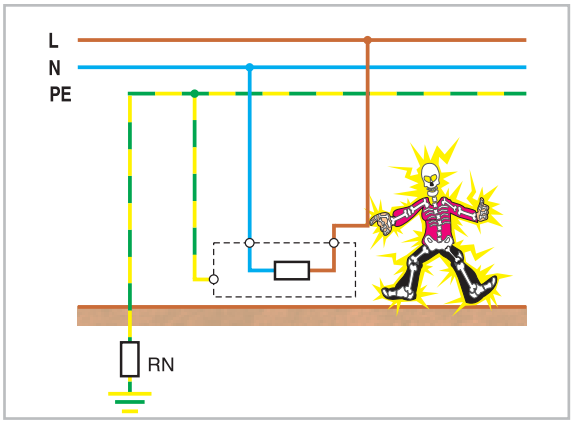
Maximum Disconnect times and touch Voltages

Measured Voltage U in Volts	Touch Voltage UL= 50V Maximum Disconnect time (s)	
	AC Voltage	DC Network
<50	5	5
50	5	5
75	0.6	5
90	0.45	5
120	0.34	5
150	0.27	1
220	0.17	0.4
280	0.12	0.3
350	0.08	0.2
500	0.04	0.1

The term Personnel protection, as used here, entails the prevention of, or limitation of the effects of electrical shocks that occur during one of two possible contact scenario's, direct and indirect.

Direct contact

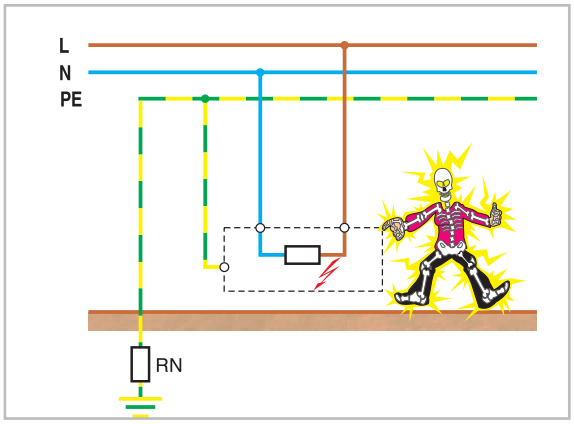
Caused by an accident in which a person comes into contact with a live electrical conductor and a second conductive part. Here the person in question becomes a part of the electrical circuit, the current in which is determined by the resistance of the earth and that of the human body.



How to protect against?
The following methods can be used (source HD384)
- The use of very low voltage systems as:
  SELV (safe, extra low voltage), PELV (protective extra low voltage) and
  FELV (functional extra low voltage)
- Appropriate conductor insulation.
- The use of mechanical barriers or that of enclosures with the appropriate protection degree. (IP-)
- Take the defined safety distances into account when installing
- The use of complementary protection, RCD's with a sensitivity ≤ 30mA

Indirect contact

Caused when person comes into contact with an earthed part that has accidentally been connected to a live conductor. The level of voltage over the contact, and the length of time that the person has to endure this contact can be dangerous. This so called 'Touch Voltage' must be limited to values that a human being can endure without physiological damage.



How to protect against?
The following concepts can be applied (source HD384)
- The use of very low voltage systems as:
  SELV (safe, extra low voltage), PELV (protective extra low voltage) and
  FELV (functional extra low voltage)
- Automatic disconnection of the power supply to the installation, or a part thereof.
- The use of materials that provide total insulation (class II)

- The use of a non conductive environment, i.e. All exposed conductive parts cannot be accessed or touched in normal operational conditions.
  Here the use of protective conductors is prohibited, whilst floor and walls must have a certain insulation resistance. (Un<500V AC,
  50 kOhm; Un >= 500V AC, 100 kOhm.)
- The use of equipotential bonding or links. These to avoid potential differences between normally non-conductive materials/surfaces. These may not be connected to earth.

- The use of LV/LV transformers with insulating properties.

Record Plus™ circuit breakers, used to protect against direct, or indirect contact

As moulded case circuit breakers, ***Record Plus™*** have properties that automatically forfill a number of the requirements concerning direct and indirect contact. When installed correctly, with the appropriate cover/trim/front plates the device itself offers a high protection degree of up to IP40 whilst the moulded case housing construction ensures a class II protection.

Direct contact
They can be equipped with RCD's of 30mA that are required as a complementary protection.

Indirect contact
Ideally suited to be used as a device to allow automatic disconnection of the supply of a part or a full installation. This making use of one of three available protection devices.

- A short-circuit protection that can be set over a wide range and normally can be set to detect most earth fault currents.
- An optional RCD device that can detect earth fault currents down to extremely low levels.
- The larger frame size can be equipped with a ground fault protection device that can be set to detect medium to low earth fault currents.

Protection against indirect contact by automatic disconnection of the power supply

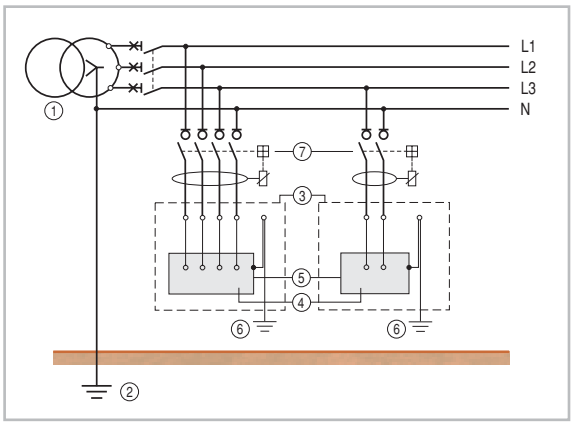
Use of the automatic disconnection of the power supply concept requires that a number of elements is taken into account in a coordinated manner, i.e.:

- **The characteristics of the network (earthing system - TT, IT, TN as described).**
- **The properties of the protective conductors.**
- **The tripping threshold and disconnect time of the protective device.**
- **The properties of the environment.**

This to ensure that the touch voltage does not exceed the values of UL = 50V AC in a dry environment and UL = 25V AC in a humid environment and that higher voltages are disconnected within the perscribed maximum disconnect time.

TT system characteristics

One point of the power supply is connected to earth whilst all conductive parts in the installation are connected to electrically independent earth electrodes.



① Power supply.
② Power supply earthing (R_N)
③ Low voltage installation, consumer portion.
④ Equipment present in installation.
⑤ Exposed conductive parts/surfaces.
⑥ Installation earthing. (R_A)
⑦ Optional RCD device.

If a fault to earth or insulation fault occurs, a circuit comes into being, in which the current runs through the live conductor that has caused the fault and the two earth electrodes RA and RB. On indirect contact the touch voltage UL is directly dependant on the value of the local earth electrode RA and the resistance of the protective conductor by which it is connected.
The following formula is valid:

$$R_A \times I_A \leq U_L$$

R_A = Resistance of local electrode and it's connecting protective conductor.
I_A = With circuit breakers the short-circuit protective element of the device (magnetic operating threshold of the protective device)

Due to the very low values of R_A required by the application of this rule the use of RCD's (see table below) is widespread, and mandatory in several European countries. (I_A is then replaced by the I_dn of the RCD)

Touch Voltage UL	Examples of R_A value based on				
	I_A = 200A	I_A = 500A	I_dn 300mA	I_dn 1A	I_dn 3A
25V	0.125Ω	0.05Ω	83Ω	25Ω	8Ω
50V	0.25Ω	0.01Ω	167Ω	50Ω	17Ω

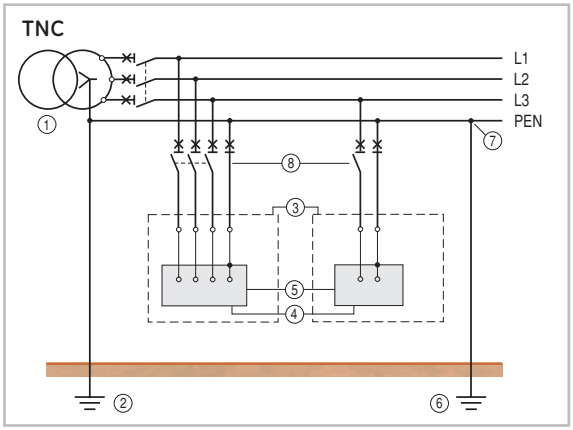
TN system characteristics

One or more points of the power supply are connected to earth whilst all conductive parts in the installation are electrically connected to this point by protective conductors. (PE or PEN conductors). The system exits in three main variants:

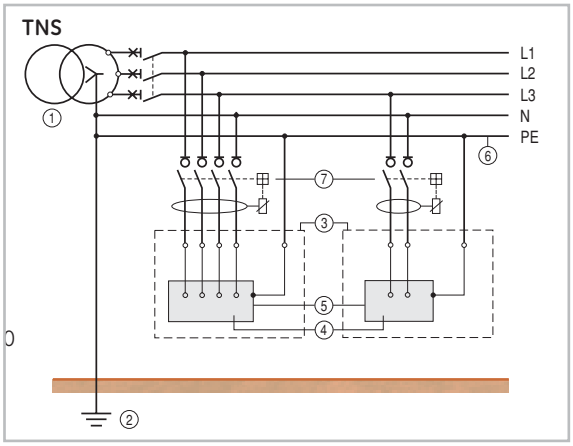
TNC The neutral and protective conductor are combined. (PEN)

TNS The neutral(N) and protective conductor (PE) are separate.

TNCS The supply is configured as a TNC, the system changes to a TNS system at a pre-defined point in the LV installation.



① Power supply.
② Power supply earthing.
③ Low voltage installation, consumer portion.
④ Equipment present in installation.
⑤ Exposed conductive parts/surfaces.
⑥ Additional supply earthing.
⑦ Protective conductor combined with the neutral.
⑧ Protective device.



① Power supply.
② Power supply earthing.
③ Low voltage installation, consumer portion.
④ Equipment present in installation.
⑤ Exposed conductive parts/surfaces.
⑥ Protective conductor.
⑦ Protective device.

Remark : a TNCS system is not depicted

If a fault to earth or insulation fault occurs, a circuit comes into being, in which the current runs through the live conductor that has caused the fault and the protective conductor (PE or PEN). The fault circuit has a voltage equal to the phase to earth voltage U_0 of the system.
On indirect contact the touch voltage U_L is not exceeded if the following conditions are met

$$Z_s \times I_A \leq U_0$$

Z_S = Impedance of the fault circuit.
I_A = The operating threshold of the protective device, that warranties a total disconnection time dependant on the phase to earth system voltage. (see table insert)
U_0 = The phase to earth voltage of the system.

If the Z_S value reaches high values due to long cable runs the use of RCD's is allowed. (I_A is then replaced by the I_dn of the RCD).

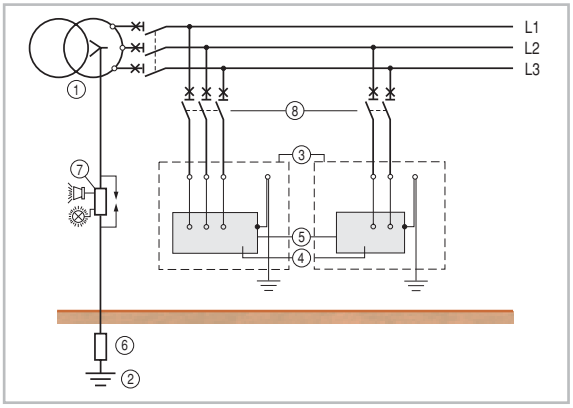
A second option is the use of a ground fault device.
In all cases the Interruption of the protective conductor is prohibited.

The following disconnection times are mandatory:

Network voltage Phase-Neutral U_0	Maximum disconnecting time (AC system)
127V	0.8 sec.
230V	0.4 sec.
400V	0.2 sec.
> 400V	0.1 sec.

IT system characteristics

The supply is isolated from earth or connected to earth by means of an impedance of a relatively high value. The conductive parts in the installation are connected to earth electrodes.



① Power supply.
② Power supply earthing.
③ Low voltage installation, consumer portion.
④ Equipment present in installation.
⑤ Exposed conductive parts/surfaces.
⑥ Impedance for insulation from earth.
⑦ Insulation monitoring device + surge protection
⑧ Protective device.

On the first fault to earth or insulation fault in an IT system, the protective device does not need to react. Here no fault circuit to earth exists and no potentially dangerous contact can occur.
However, depending on the location of the fault to earth the first fault modifies the system from an isolated IT into a non isolated TN or TT system.
To indicate that the IT system is no longer functional the use of insulation monitoring devices providing a visual and sonorous alarm of the event is necessary.
With the first fault still existing, a second fault to earth must cause an automatic disconnection of the supply that **must** meet the conditions and formulae set out for TT **and** TN systems indicated here.
The possible distribution of a neutral within the system does modify the allowed disconnection times as indicated in the table below.

Network voltage Phase-Neutral U_0 / Phase-Phase U_n	Maximum disconnecting time (AC system)	
	No neutral distributed	Neutral distributed
127/230V	0.8 sec.	5 sec.
230/400V	0.4 sec.	0.8 sec.
400/690V	0.2 sec.	0.4 sec.

Remark
On a second insulation fault the protective device can be required to interrupt the full fault current in a circuit with a voltage equal to the phase to phase value Un. The requirements for interrupting this single phase fault are now included in the EN 60947-2 (appendix H). Needless to say that the ***Record Plus™*** breaker meet these requirements, the exact single phase or I_{cu} values are mentioned in the tables covering the technical data of the breaker.

Required calculations in TN and IT networks

In both the IT and TN network configuration it is necessary to verify that the protective device will interrupt the circuit within the defined disconnection time. Here the worst case scenario needs to be taken into account and the weakest possible current flowing in the circuit, on a insulation or earth fault must be defined (The fault current If).

Here it is also necessary to establish that the protective device will disconnect within the time limits defined for the different phase to phase and phase to neutral network voltages, at this current level (Id). To determine the fault current, the voltage of the circuit and it's impedance must be known. The circuit impedance being that of the upstream installation and that of the live and protective conductor.

Use of Record Plus™ breakers in this application

Circuit breakers of the ***Record Plus™*** type disconnect within 0.1 seconds on their magnetic threshold (Im on the electromechanical device) and within 0.2 seconds on their ST device (Im on the SMR1 electronic device*). To assure a disconnection that meets the requirements the circuit fault current Id must be higher than the Im value.
With the Im value and the system voltage it is now possible to calculate the maximum ZS value of the fault circuit. This is mainly made up of the electrical conductors in the circuit, therefore these calculations result in a maximum cable run length.

Formula for calculating the cable run length.

$$L_{max} = 0.8 \times \frac{Cmin \times \alpha \times Uo}{\{2 \times [= \sqrt{(R^2 + X^2)}]\} \times (Im \times kt)} \times k1 \times k2 \times k3 \text{ meters}$$

Terminology

L_{max} = Maximum cable run length
0.8 = Assumed factor for the impedance of the upstream network.
Cmin. = Voltage factor; 0.95 assumed
α = Coefficient depending on earthing system
TN = 1 **IT** no neutral = 0.86 **IT** with neutral = 0.5
Uo = Phase to neutral voltage
X = Reactance of the conductors or cables in the circuit. Reactance of multi core cables λ mΩ /m. 0.08
R = Resistance of the conductors or cables in the circuit. *based on the following basic data:*
ρ_1 = 23.69 mΩ mm^2/m. for copper cores.*
37.64 mΩ mm^2/m. for aluminum cores.*
Im x kt = Magnetic or ST setting of breaker (Im) x plus tolerance factor (kt[=1.2])
k1-3 = Correction factor (see page with cable run calculations) These being the values in accordance with the Cenelec R064-003 document for calculating the weakest short-circuit current with circuit breakers (worst case assumed)

* = 1.28 x 18.51 and 1.28 x 29.41.

Cable run length calculations device

To meet the requirements the short-circuit device (**Im**) of the circuit breaker must react to a current equal or lower than the fault current (**If**).
The table indicates the maximum cable lengths where this condition is still met. This taking into account the tolerances on the settings of the short-circuit device in the breaker. (see factor kt [=1.2])

Correction factors α

For TN networks and IT networks with different voltages and with or without distributed neutral.

TN network Uo/Un	Neutral distributed	
	Yes α	No α
127 /230V AC	0.55	1.00
230/400V AC	1.00	1.74
400/690V AC	1.74	3.00

IT network Uo/Un	Neutral distributed	
	Yes α	No α
127 /230V AC	0.28	0.49
230/400V AC	0.50	0.86
400/690V AC	0.87	1.48

Correction factor k1

For a 3 phase circuit with a voltage of 400V between phases and a protective conductor with a cross section smaller than the phase value.

$S_{ph}/S_{pe\ or\ pen}$	k1
1.00	1.00
0.67	0.75
0.50	0.67
0.33	0.50

Correction factor k2

For a number multi core cables in parallel

k2 2 = 2.00
k2 3 = 2.65

Correction factor k3

For multicore cables with conductors made of aluminium.

AL conductor cross section S in mm²	k3
= 4 ≤ 50	0.63
70	0.64
95	0.65
120	0.66
150	0.67
185	0.69
240	0.72
300	0.76

Maximum cable length in meters in a 3 phase TN system (U_0=230V). For IT system see text, calculations based on muticore cables. (worst case)

Cu conductor	short-circuit setting of *Record Plus™* device in Amps											
Cross section S in mm²	50	75	100	125	150	200	250	300	350	400	450	500
1.5	92	61	46	37	31	23						
2.5	154	102	77	61	51	38	31	26	22	19	17	15
4	246	164	123	98	82	61	49	41	35	31	27	25
6	246	246	184	148	123	92	74	61	53	46	41	37
10		246	307	246	205	154	123	102	88	77	68	61
16				393	327	246	196	164	140	123	109	98
25				393	511	383	306	255	219	191	170	153
35						534	427	356	305	267	237	214
50						534	606	505	433	379	337	303
70								698	598	524	465	419
95								698	795	695	618	556
120										855	760	684
150										855	914	823
185											914	965

Cu conductor	short-circuit setting of *Record Plus™* device in Amps											
Cross section S in mm²	600	700	800	900	1000	1250	1500	1750	2000	2500	3000	3500
2.5	13											
4	20	18	15	14								
6	31	26	23	20	18	15	12					
10	51	44	38	34	31	25	20	18	15	12		
16	82	70	61	55	49	39	33	28	25	20	16	14
25	128	109	96	85	77	61	51	44	38	31	26	22
35	178	153	134	119	107	85	71	61	53	43	36	31
50	253	217	189	168	152	121	101	87	76	61	51	43
70	349	299	262	233	209	168	140	120	105	84	70	60
95	464	397	348	309	278	222	185	159	139	111	93	79
120	570	488	427	380	342	274	228	195	171	137	114	98
150	686	588	514	457	411	329	274	235	206	165	137	118
185	804	689	603	536	482	386	322	276	241	193	161	138
240	955	819	717	637	573	459	382	328	287	229	191	164
300		926	810	720	648	518	432	370	324	259	216	185

Cu conductor	short-circuit setting of *Record Plus™* device in Amps											
Cross section S in mm²	4000	4500	5000	5500	6000	6500	7000	7500	8000	9000	10000	12000
16	12											
25	19	17										
35	27	24	21	19	18							
50	38	34	30	28	25	23	22	20				
70	52	47	42	38	35	32	30	28	26	23		
95	70	62	56	51	46	43	40	37	35	31	28	23
150	85	76	68	62	57	53	49	46	43	38	34	28
185	103	91	82	75	69	63	59	55	51	46	41	34
185	121	107	96	88	80	74	69	64	60	54	48	40
240	143	127	115	104	96	88	82	76	72	64	57	48
300	162	144	130	118	108	100	93	86	81	72	65	54

Selectivity/Discrimination

Fig. 1 depicts a typical distribution network. Here outgoing circuits are designed for the current load and the characteristics of the equipment within the circuit. Outgoing circuits that protect a certain area are placed together in panels or form groups within panels. Typically this group of circuits is protected by a second, similar device, the characteristics of which are determined in the same manner. This system can be extended to a multiple level distribution network.
In case of a fault it is necessary that the device nearest to the fault reacts while all others remain closed.
This capability is called discrimination (UK) or selectivity (USA and Europe). If this requirement is not met, a fault (F) in one arm of the distribution system will cause a number of upstream protection devices wired in series to trip. Thus a minor fault in a socket outlet of a circuit can cause whole floors, buildings or building complexes to be cut off from the power supply.

Record Plus™ breakers are specifically designed to discriminate. By introducing ***Record Plus™***. GE sets a new standard in circuit breakers by offering total selectivity for all normally proportioned distribution systems.

EN 60947-2 amendment 1, app. A defines under "Coordination" that discrimination/selectivity may be partial up to a pre-defined current limit (Is). Discrimination is considered total when the current limit is equal to the rated short-circuit breaking capacity (Icu or Ics) of the downstream device. Discrimination/Selectivity is determined by comparing the time it takes an upstream device to react at a specific current value and - again - comparing this to the time it takes a downstream device to clear the fault at the same current level. (see Fig. 2) The comparison of these two time spans can be used to define whether discrimination is present or not.
We have simplified this comparison by applying a multiplication factor between downstream and upstream devices. With the values indicated in the table we can guarantee discrimination.
(see page E.15)

3D discrimination

Record Plus™ downstream-protection-device breakers limit the energy and current in the protected circuit in a limited time frame. The use of relatively minor time delays in the short-circuit protection of the upstream breaker, allows the ***Record Plus™*** line of circuit breakers to achieve total discrimination. Fig. 3 depicts this comparison technique. In this graph the Grey area indicates the time and current values the downstream breaker allows to flow in the circuit. The coloured area depicts the current- and energy-reaction level of the upstream device within a certain set time frame.

Fig. 1

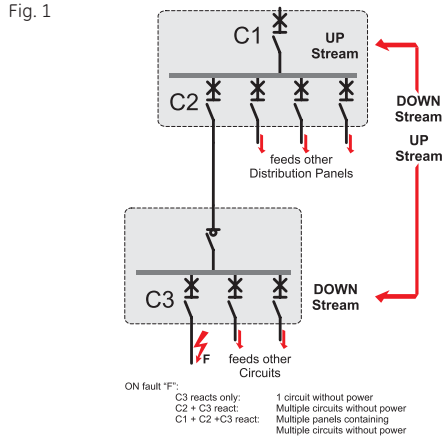


Fig. 2

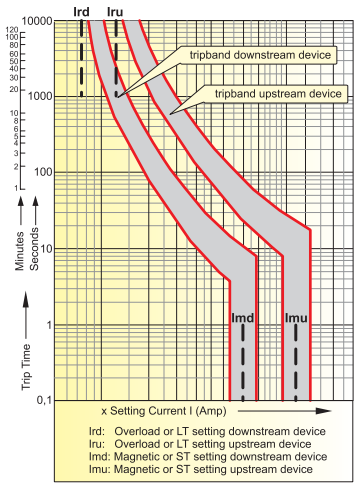
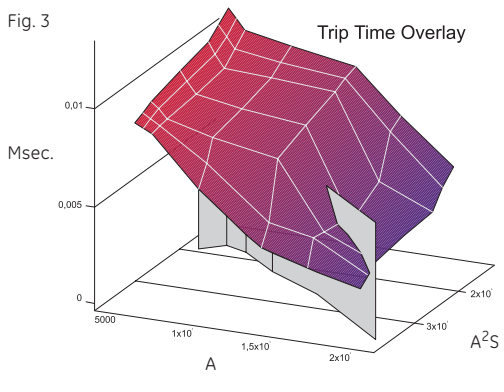


Fig. 3



How to determine discrimination/selectivity with Record Plus™ (and associated devices)

Table D1 to D5 (page E.16-E.19) indicate the discrimination levels that can be achieved with ***Record Plus™*** and associated devices. Where discrimination is partial the selectivity limits in kA (Is) are mentioned in kA.
Where a "T" is found in the tables, this indicates total discrimination up to the highest breaking capacity of the devices.
These discrimination/selectivity limits are only valid if the ratio between the current settings, ratings or time settings of the upstream and downstream breaker are equal or higher than the factor indicated here.

Selectivity/Discrimination

Downstream device		Upstream device		
		Record Plus™ MCCB		
		LTM or LTMD	SMR1, 1e, 1s or 1g	SMR2
Redline & Hti MCB	B, C & D curve	**Ir** factor 1.6 **Im** factor 2	**Ir** factor 2 **Ist** factor 1.5	**Ir** factor * 1.6 **Ist** factor 1.5
Surion Manual Motor Starter	Thermal mag or Mag. Only	**Ir** factor 3 **Im** factor 3	**Ir** factor 2 **Ist** factor 1.5	**Ir** factor * 1.6 **Ist** factor 1.5
***Record Plus™* MCCB**	LTM or LTMD	**Ir** factor 1.6 **Im** factor 1.5	**Ir** factor 2 **Ist** factor 1.5	**Ir** factor * 1.6 **Ist** factor 1.5
	SMR1	**Ir** factor 1.6 **Im** factor 1.5	**Ir** factor 1.6 **Ist** factor 1.5	**Ir** factor * 1.6 **Ist** factor 1.5
			SMR1, 1e, 1s or 1g	**SMR2**
***Record Plus™* MCCB**	SMR1s SMR2		**Ir** factor 1.6 **LTD** set at one class higher **Ist** factor 1.5 **STD** Set at one band higher	**Ir** factor 1.6 **LTD** set at one class higher **IIst** factor 1.5 **STD** Set at one band higher Inst. factor 1.5 **A^2S** Set at one band higher
			Mpact ACB	
			MPRO 17	**MPRO 20, 30 & 40**
***Record Plus™* MCCB**	SMR1		**Ir** factor 1.6 **Ist** factor 1.5 **STD** timing 0.2	**Ir** factor 1.6 **LTD** Class 20 **Ist** factor 1.5 **STD** timing 0.2 **A^2S** band 0.1
***Record Plus™* MCCB**	SMR1s SMR2		**Ir** factor 1.6 **Ist** facto 1.5 **STD** Set at one band higher	**Ir** factor 1.6 **LTD** set at one class higher **Ist** factor 1.5 **STD** Set at one band higher **A^2S** Set at one band higher

* LTD set at class 20

Terminology		
LTM	**Thermal magnetic Trip Unit**	
	Ir = Overload setting	**Im** = Magnetic setting
LTMD	**Selective Thermal magnetic Trip Unit**	
	Ir = Overload setting	**Im** = Magnetic setting
Mag. Break™	**Magnetic Only Trip Unit**	
	Im = Magnetic setting	
SMR1 & SMR1e	**Selective Electronic Trip unit**	
	Ir = Setting on **LT** device	**Ist** = Setting on **ST** device
SMR1s,g and SMR2	**Enhanced Electronic Trip unit**	
MPRO 17, 20, 30 & 40	**Mpact Electronic Trip Units**	
	Ir = Setting on **LT** device	**Ist** = Setting on **ST** device
	LTD class, time setting at 7.2 x Ir	**STD** Delay setting on ST device
		A^2S Cropped short time device delay setting
		Inst. = Setting on I (**Instantaneous**) device

Table D1 - Selectivity/Discrimination

Upstream / Downstream	In (A)	Record Plus™ type																				
		FD160E							FD160S							FD160N, H & L						
		40	50	63	80	100	125	160	40	50	63	80	100	125	160	40	50	63	80	100	125	160
		Selectivity limit in kA																				
Redline	**≤16**	0.6	2.5	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
G60 & DM60	**20**	0.6	2.5	3	T	T	T	T	3.5	T	T	T	T	T	T	3.5	T	T	T	T	T	T
	25	-	0.8	1.2	T	T	T	T	1.6	3.5	T	T	T	T	T	1.6	3.5	T	T	T	T	T
C45 & C60	**32**	-	-	1.2	3	T	T	T	-	-	T	T	T	T	T	-	-	T	T	T	T	T
	40	-	-	-	3	4	T	T	-	-	-	T	T	T	T	-	-	T	T	T	T	T
	50	-	-	-	1.2	1.5	T	T	-	-	-	3.5	T	T	T	-	-	-	3.5	T	T	T
	63	-	-	-	-	1.5	2	T	-	-	-	-	T	T	T	-	-	-	-	T	T	T
G100 & DM100	**≤16**	0.6	2.5	6	6	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	20	0.6	2.5	2.5	6	8	T	T	3.5	T	T	T	T	T	T	3.5	T	T	T	T	T	T
	25	-	0.8	1.2	6	6	T	T	1.6	3.5	T	T	T	T	T	1.6	3.5	T	T	T	T	T
	32	-	-	1.2	3	6	8	T	-	-	6	6	T	T	T	-	2.5	T	T	T	T	T
	40	-	-	-	3	4	6	6	-	-	-	6	T	T	T	-	-	T	T	T	T	T
	50	-	-	-	1.2	1.5	6	6	-	-	-	3.5	8	T	T	-	-	-	3.5	T	T	T
	63	-	-	-	-	1.5	2	2	-	-	-	-	8	T	T	-	-	-	-	8	T	T
GT25 B/C curve	**≤16**	0.6	2.5	6	6	10	T	T	10	10	T	T	T	T	T	10	10	T	T	T	T	T
	20	0.6	2.5	3	6	8	T	T	3.5	10	T	T	T	T	T	3.5	10	T	T	T	T	T
	25	-	0.8	1.2	6	6	10	T	1.6	3.5	15	15	T	T	T	1.6	3.5	15	15	T	T	T
	32	-	-	1.2	3	6	8	10	-	-	6	6	10	T	T	-	-	10	10	T	T	T
	40	-	-	-	3	4	6	6	-	-	-	6	10	T	T	-	-	10	10	15	T	T
	50	-	-	-	1.2	1.5	6	6	-	-	-	3.5	8	10	T	-	-	-	3.5	10	T	T
	63	-	-	-	-	1.5	2	2	-	-	-	-	8	10	T	-	-	-	-	8	T	T
Hti - B/C curve	**80**	-	-	-	-	-	1.9	1.9	-	-	-	-	-	2.5	2.5	-	-	-	-	-	2.5	2.5
	100	-	-	-	-	-	-	1.9	-	-	-	-	-	-	2.5	-	-	-	-	-	-	2.5
S90 - C curve	**≤32**	0.6	0.8	0.9	1.2	1.5	1.9	1.9	0.8	1	1.2	15	15	15	15	0.8	1	1.2	15	15	15	15
	40	-	-	0.9	1.2	1.5	1.9	1.9	-	-	1.2	15	15	15	15	-	-	1.2	15	15	15	15
	50	-	-	-	1.2	1.5	1.9	1.9	-	-	-	15	15	15	15	-	-	-	15	15	15	15
	63	-	-	-	-	1.5	1.9	1.9	-	-	-	-	15	15	15	-	-	-	-	15	15	15
	80	-	-	-	-	-	1.9	1.9	-	-	-	-	-	15	15	-	-	-	-	-	15	15
	100	-	-	-	-	-	-	1.9	-	-	-	-	-	-	15	-	-	-	-	-	-	15
Surion	**≤20**	0.6	2.5	6	6	10	T	T	10	10	T	T	T	T	T	T	T	T	T	T	T	T
GPS1BS & GPS1MS	**25**	0.6	1	1.2	6	6	10	T	1.6	3.5	15	15	T	T	T	1.6	3.5	T	T	T	T	T
GPS2BS & GPS2MS	**32**	-	1	1.2	3	6	8	10	-	-	6	6	10	T	T	-	2.5	T	T	T	T	T
	40	-	-	1.2	3	4	6	6	-	-	-	6	10	T	T	-	-	T	T	T	T	T
	50	-	-	-	1.2	1.6	6	6	-	-	-	3.5	8	10	T	-	-	-	3.5	T	T	T
	63	-	-	-	-	1.6	2	2	-	-	-	-	8	10	T	-	-	-	-	8	T	T
Surion	**≤20**	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
GPS1BH & GPS1MH	**25**	-	2.5	15	15	T	T	T	-	3.5	15	15	T	T	T	-	3.5	15	15	T	T	T
GPS2BH & GPS2MH	**32**	-	-	6	6	8	10	T	-	-	6	15	10	T	T	-	-	6	15	10	T	T
	40	-	-	-	6	8	10	T	-	-	-	6	10	T	T	-	-	-	6	10	T	T
	50	-	-	-	-	6	8	T	-	-	-	-	8	10	T	-	-	-	-	8	10	T
	63	-	-	-	-	-	8	T	-	-	-	-	-	10	T	-	-	-	-	-	10	T
Record Plus™	**≤25**	0.4	0.5	0.6	0.8	1	1.3	1.3	0.6	0.8	0.9	1.2	1.5	3.5	3,5	0.6	0.8	0.9	1.2	1.5	3.5	3.5
FD160E	**32**	-	0.5	0.6	0.8	1	1.3	1.3	-	0.8	0.9	1.2	1.5	3.5	3.5	-	0.8	0.9	1.2	1.5	3.5	3.5
	40	-	-	0.6	0.8	1	1.3	1.3	-	-	0.9	1.2	1.5	3.5	3.5	-	-	0.9	1.2	1.5	3.5	3.5
	50	-	-	-	0.8	1	1.3	1.3	-	-	-	1.2	1.5	3.5	3.5	-	-	-	1.2	1.5	3.5	3.5
	63	-	-	-	-	1	1.3	1.3	-	-	-	-	1.5	3.5	3.5	-	-	-	-	1.5	3.5	3.5
	80	-	-	-	-	-	-	1.3	-	-	-	-	-	-	3.5	-	-	-	-	-	-	3.5

* T = Total: selective unil the lowest Icu value of the two devices placed in series.

Table D2 - Selectivity/Discrimination

Upstream / Downstream	In (A)	*Record Plus™* type																
		FE160N, H & L - LTM					FE160N, H & L - LTMD			FE160N, H & L - SMR1			FE250N, H & L - LTMD			FE250N, H & L - SMR1		
		Selectivity limit in kA																
		63	80	100	125	160	100	125	160	63	125	160	125	160	200&250	125	160	250
Redline	≤20	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
G60 & DM60	25	1.2	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	32	1.2	3	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
C45 & C60	40	-	3	4	T	T	T	T	T	-	T	T	T	T	T	T	T	T
	50	-	1.2	1.5	T	T	T	T	T	-	T	T	T	T	T	T	T	T
	63	-	-	1.5	2	T	-	T	T	-	T	T	T	T	T	T	T	T
G100 & DM100	≤16	6	6	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	20	2.5	6	8	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	25	1.2	6	6	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	32	1.2	3	6	8	T	T	T	T	T	T	T	T	T	T	T	T	T
	40	-	3	4	6	6	T	T	T	T	T	T	T	T	T	T	T	T
	50	-	1.2	1.5	6	6	T	T	T	-	T	T	T	T	T	T	T	T
	63	-	-	1.5	2	2	-	T	T	-	T	T	T	T	T	T	T	T
GT25 B/C curve	≤16	6	6	10	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	20	2.5	6	8	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	25	1.2	6	6	10	T	T	T	T	T	T	T	T	T	T	T	T	T
	32	1.2	3	6	8	10	T	T	T	T	T	T	T	T	T	T	T	T
	40	-	3	4	6	6	T	T	T	T	T	T	T	T	T	T	T	T
	50	-	1.2	1.5	6	6	T	T	T	-	T	T	T	T	T	T	T	T
	63	-	-	1.5	2	2	-	T	T	-	T	T	T	T	T	T	T	T
Hti - B/C curve	80	-	-	-	1	2	-	T	T	-	T	T	-	T	T	-	T	T
	100	-	-	-	-	2	-	-	T	-	-	T	-	T	T	-	T	T
	125	-	-	-	-	-	-	-	T	-	-	T	-	-	T	-	-	T
S90 - C curve	≤32	0.6	0.8	0.95	1.2	1.5	T	T	T	T	T	T	T	T	T	T	T	T
	40	-	-	0.9	1.2	1.5	T	T	T	T	T	T	T	T	T	T	T	T
	50	-	-	-	1.2	1.5	T	T	T	-	T	T	T	T	T	T	T	T
	63	-	-	-	-	1.5	-	T	T	-	T	T	T	T	T	T	T	T
	80	-	-	-	-	1.5	-	T	T	-	T	T	-	T	T	-	T	T
	100	-	-	-	-	-	-	-	T	-	-	T	-	T	T	-	T	T
Surion	≤20	0.6	3	6	6	10	T	T	T	T	T	T	T	T	T	T	T	T
GPS1BS & GPS1MS	25	0.6	3	6	6	10	T	T	T	T	T	T	T	T	T	T	T	T
GPS2BS & GPS2MS	32	0.6	3	3	6	8	T	T	T	T	T	T	T	T	T	T	T	T
	40	0.6	1	1	6	6	T	T	T	T	T	T	T	T	T	T	T	T
	50	-	1	1	3	6	T	T	T	-	T	T	T	T	T	T	T	T
	63	-	-	1	3	4	-	T	T	-	T	T	T	T	T	T	T	T
Surion	≤20	0.6	2.5	6	6	10	T	T	T	T	T	T	T	T	T	T	T	T
GPS1BH & GPS1MH	25	0.6	2.5	6	6	10	T	T	T	T	T	T	T	T	T	T	T	T
GPS2BH & GPS2MH	32	0.6	2.5	3	6	8	T	T	T	T	T	T	T	T	T	T	T	T
	40	0.6	1	1.2	6	6	T	T	T	T	T	T	T	T	T	T	T	T
	50	-	1	1.2	2.5	6	T	T	T	-	T	T	T	T	T	T	T	T
	63	-	-	1.2	2.5	6	-	T	T	-	T	T	T	T	T	T	T	T
Record Plus™	≤40	0.6	1	1	1	2	T	T	T	T	T	T	T	T	T	T	T	T
FD160E	50	-	1	1	1	2	T	T	T	-	T	T	T	T	T	T	T	T
	63	-	-	1	1	2	T	T	T	-	T	T	T	T	T	T	T	T
	80	-	-	-	1	2	-	T	T	-	T	T	T	T	T	T	T	T
	100	-	-	-	-	2	-	-	T	-	-	T	-	T	T	-	T	T
	125	-	-	-	-	-	-	-	T	-	-	T	-	-	T	-	-	T
	160	-	-	-	-	-	-	-	-	-	-	-	-	-	T	-	-	T
Record Plus™	≤40	0.63	0.8	1	1.25	1.6	30	30	30	36	36	36	42	42	42	50	50	50
FD160S	50	-	0.8	1	1.25	1.6	30	30	30	-	36	36	42	42	42	50	50	50
FD160N	63	-	-	1	1.25	1.6	30	30	30	-	36	36	42	42	42	50	50	50
FD160H	80	-	-	-	1.25	1.6	-	30	30	-	36	36	42	42	42	50	50	50
FD160L	100	-	-	-	-	1.6	-	-	30	-	-	36	-	42	42	-	50	50
	125	-	-	-	-	-	-	-	-	-	-	-	-	-	42	-	-	50
	160	-	-	-	-	-	-	-	-	-	-	-	-	-	42	-	-	50
Record Plus™	≤40	0.6	0.8	1	1.25	1.6	30	30	30	36	36	36	42	42	42	50	50	50
FE160N LTM	50	-	0.8	1	1.25	1.6	30	30	30	-	36	36	42	42	42	50	50	50
FE160H LTM	63	-	-	1	1.25	1.6	30	30	30	-	36	36	42	42	42	50	50	50
FE160L LTM	80	-	-	-	1.25	1.6	-	30	30	-	36	36	42	42	42	-	50	50
	100	-	-	-	-	1.6	-	-	30	-	-	36	-	42	42	-	50	50
	125	-	-	-	-	-	-	-	-	-	-	36	-	-	42	-	-	50

* T = Total: selective unil the lowest Icu value of the two devices placed in series.

Table D3 - Selectivity/Discrimination

Upstream / Downstream	In (A)	Record Plus™ type														
		FE160N,H&L - SMR1			FE250N,H&L - LTMD			FE250N,H&L - SMR1			FG400/630N, H&L - SMR1 & SMR2(1)					
		63	125	160	125	160	200&250	125	160	250	400/250	400/350	400/400	630/400	630/500	630/630
		Selectivity limit in kA														
Redline																
G60 B/C curve	≤40	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
G100 B/C curve	50	-	T	T	T	T	T	T	T	T	T	T	T	T	T	T
GT25 B/C curve	63	-	T	T	-	T	T	-	T	T	T	T	T	T	T	T
Hti - B/C curve	≤80	-	-	T	-	T	T	-	T	T	T	T	T	T	T	T
	100	-	-	T	-	T	T	-	T	T	T	T	T	T	T	T
	125	-	-	-	-	-	T	-	-	T	T	T	T	T	T	T
S90 - C curve	≤40	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	50	-	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	63	-	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	80	-	-	T	-	T	T	-	T	T	T	T	T	T	T	T
	100	-	-	-	-	-	T	-	-	T	T	T	T	T	T	T
Surion	≤40	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
GPS1BS & GPS1MS	50	-	T	T	T	T	T	T	T	T	T	T	T	T	T	T
GPS2BS & GPS2MS	63	-	T	T	T	T	T	T	T	T	T	T	T	T	T	T
GPS1BH & GPS1MH	≤40	-	T	T	T	T	T	T	T	T	T	T	T	T	T	T
GPS2BH & GPS2MH	50	-	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	63	-	T	T	T	T	T	T	T	T	T	T	T	T	T	T
Record Plus™	≤32	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
FD160E	40	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
FD160S	50	-	T	T	T	T	T	T	T	T	T	T	T	T	T	T
LTM	63	-	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	80	-	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	100	-	-	T	-	T	T	-	T	T	T	T	T	T	T	T
	125	-	-	-	-	-	T	-	-	T	T	T	T	T	T	T
	160	-	-	-	-	-	T	-	-	T	T	T	T	T	T	T
Record Plus™	≤32	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
FD160 N, H & L	40	36	36	36	42	42	42	50	50	50	T	T	T	T	T	T
LTMD & MO	50	-	36	36	42	42	42	50	50	50	T	T	T	T	T	T
	63	-	36	36	42	42	42	50	50	50	T	T	T	T	T	T
	80	-	36	36	42	42	42	50	50	50	T	T	T	T	T	T
	100	-	-	36	-	42	42	-	50	50	T	T	T	T	T	T
	125	-	-	-	-	-	42	-	-	50	T	T	T	T	T	T
	160	-	-	-	-	-	42	-	-	50	T	T	T	T	T	T
Record Plus™	≤32	36	36	36	42	42	42	50	50	50	T	T	T	T	T	T
FE160 N, H & L	40	36	36	36	42	42	42	50	50	50	T	T	T	T	T	T
LTM & MO	50	-	36	36	42	42	42	50	50	50	T	T	T	T	T	T
	63	-	36	36	42	42	42	50	50	50	T	T	T	T	T	T
	80	-	36	36	-	42	42	-	50	50	T	T	T	T	T	T
	100	-	-	36	-	42	42	-	50	50	T	T	T	T	T	T
	125	-	-	-	-	-	42	-	-	50	-	T	T	T	T	T
	160	-	-	-	-	-	42	-	-	50	-	T	T	T	T	T
Record Plus™	≤32	0.8	1.8	2.2	1.3	1.6	2.5	1.8	2.2	3.5	T	T	T	T	T	T
FE160 N, H & L	40	0.8	1.8	2.2	1.3	1.6	2.5	1.8	2.2	3.5	T	T	T	T	T	T
LTMD	50	-	1.8	2.2	-	1.6	2.5	-	2.2	3.5	T	T	T	T	T	T
SMR1	63	-	1.8	2.2	-	1.6	2.5	-	2.2	3.5	T	T	T	T	T	T
	80	-	-	2.2	-	1.6	2.5	-	2.2	3.5	T	T	T	T	T	T
	100	-	-	2.2	-	1.6	2.5	-	2.2	3.5	T	T	T	T	T	T
	125	-	-	-	-	-	2.5	-	-	3.5	T	T	T	T	T	T
	160	-	-	-	-	-	2.5	-	-	3.5	T	T	T	T	T	T
Record Plus™	125	-	-	-	-	-	2.5	-	-	3.5	15	15	15	T	T	T
FE250 N, H & L	160	-	-	-	-	-	-	-	-	-	-	15	15	T	T	T
LTMD	200	-	-	-	-	-	-	-	-	-	-	15	15	T	T	T
SMR1	250	-	-	-	-	-	-	-	-	-	-	15	15	T	T	T
Record Plus™	250	-	-	-	-	-	-	-	-	-	-	-	-	6	6	6
FG400 N, H & L	350	-	-	-	-	-	-	-	-	-	-	-	-	-	6	6
SMR1	400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6

* T = Total: selective unil the lowest Icu value of the two devices placed in series.
(1) ...../..... = Contact rating/Sensor rating

Table D4 - Selectivity/Discrimination

Upstream / Downstream	In (A)	*Record Plus™* type						
		FK800N&H SMR1	FK800L SMR1	FK1250N&H SMR1		FK1250L SMR1		FK1600N&H SMR
		800	800	1000	1250	1000	1250	1600
		Selectivity limit in kA						
Redline								
G60/100/GT25	All	T	T	T	T	T	T	T
Surion								
GPS	All	T	T	T	T	T	T	T
Hti	All	T	T	T	T	T	T	T
S90	All	T	T	T	T	T	T	T
Record Plus™								
FD160 E, S, N, H & L	All	T	T	T	T	T	T	T
FE160N, H and L	All	T	T	T	T	T	T	T
FE250 N, H & L	All	T	T	T	T	T	T	T
FG400 N, H & L	All	T	T	T	T	T	T	T
FG630N, H & L	All	25	25	T	T	T	T	T
FK800 N, H & L	All	-	-	15	15	15	15	25
FK1250 N, H & L	All	-	-	-	-	-	-	25

* T = Total: selective until the Icu of the downstream device OR the Icu of the upstream device

Table D5 - Selectivity/Discrimination

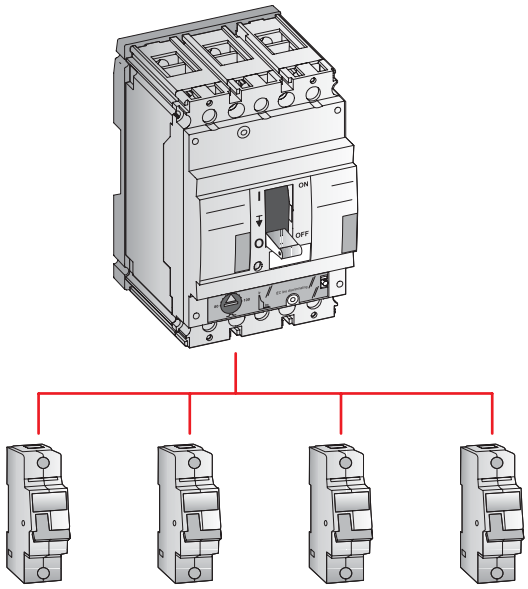
Upstream / Downstream	In (A)	M Pact ACB type													
		Frame1 N and H type							Frame2 N and H type						
		400	800	1000	1250	1600	2000	2500	1000	1250	1600	2000	2500	3200	4000
		Selectivity limit in kA													
Redline															
G60/100/GT25	All	T	T	T	T	T	T	T	T	T	T	T	T	T	T
Surion															
GPS	All	T	T	T	T	T	T	T	T	T	T	T	T	T	T
Hti	All	T	T	T	T	T	T	T	T	T	T	T	T	T	T
S90		T	T	T	T	T	T	T	T	T	T	T	T	T	T
Record Plus™															
FD160 E, S, N, H & L	All	T	T	T	T	T	T	T	T	T	T	T	T	T	T
FE160 N, H & L	All	T	T	T	T	T	T	T	T	T	T	T	T	T	T
FE250 N, H & L	All	T	T	T	T	T	T	T	T	T	T	T	T	T	T
FG400 N, H & L	250	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	350	-	T	T	T	T	T	T	T	T	T	T	T	T	T
	400	-	T	T	T	T	T	T	T	T	T	T	T	T	T
FG630 N, H & L	400	-	T	T	T	T	T	T	T	T	T	T	T	T	T
	500	-	-	T	T	T	T	T	T	T	T	T	T	T	T
	630	-	-	T	T	T	T	T	T	T	T	T	T	T	T
FK800 N, H & L	All	-	-	-	T	T	T	T	T	T	T	T	T	T	T
FK1250 N, H & L	1000	-	-	-	-	T	T	T	-	T	T	T	T	T	T
	1250	-	-	-	-	-	T	T	-	-	T	T	T	T	T
FK1600 N and H	1600	-	-	-	-	-	T	T	-	-	-	T	T	T	T
Mpact ACB	400	-	T	T	T	T	T	T	T	T	T	T	T	T	T
Frame 1	800	-	-	-	T	T	T	T	-	T	T	T	T	T	T
Frame 2	1000	-	-	-	-	T	T	T	-	-	T	T	T	T	T
	1250	-	-	-	-	-	T	T	-	-	-	T	T	T	T
	1600	-	-	-	-	-	-	T	-	-	-	-	T	T	T
	2000	-	-	-	-	-	-	T	-	-	-	-	-	T	T
	2500	-	-	-	-	-	-	-	-	-	-	-	-	-	T

* T = Total: selective until the Icu of the downstream device OR the Icu of the upstream device

Back-up protection

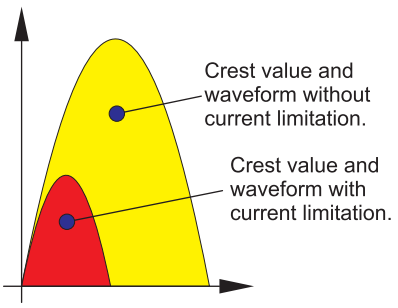
One of the operational requirements for a protective device is that its rated short-circuit breaking capacity Icu or Ics is either equal or greater than the prospective short-circuit current at the point where it is installed. EN 60384 defines one exception to this in clause 434:

The upstream device must posses the necessary rated short-circuit breaking capacity at its point of installation. The upstream device must coordinate with the downstream device in a manner that will limit the energy and short-circuit values to levels that the downstream device can handle.



Use of current limitation

Installing an upstream device that limits the prospective short-circuit values will enable the user to place a downstream device with a lower breaking capacity. The coordination between the two devices allows excellent breaking capacity at a low cost.



Effect of a current limiting device on a short-circuit in an AC network.

Record Plus™

The ***Record Plus™*** rotating dual contact configuration limits the energy and current values of prospective faults to extremely low values. This key design feature allows the use of cost-effective downstream devices while maintaining overall system protection.
Back-up protection is inherently „unselective" or „non-discriminating". That means that the upstream device must react first in order to protect the downstream device. However, the ***Record Plus™*** devices are so current limiting that the current and energy values present in the circuit do not trip the upstream breaker. Please refer to the details on „Selectivity Plus" for a description of this technique.

The tables B1 and B2 are in complete accordance with the EN 60947-2 requirements and have been verified through experiment where necessary. They provide data for the ***Record Plus™*** breaker and the other GE Power Controls/Industrial Systems product lines. The values are only applicable for the devices mentioned.

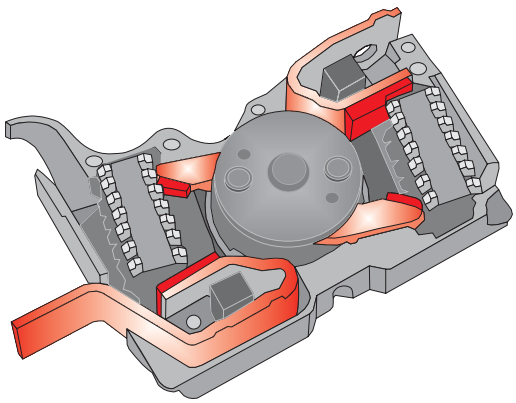


Table B1 - Back-up protection at 230/240V

Upstream / Downstream	Icu / In (A)	Record Plus™ type																									
		FD63/160E	FD63/160S	FD63/160N	FD63/160H	FD63/160L	FE160N	FE160H	FE160L	FE250N	FE250H	FE250L	FG400N	FG400H	FG400L	FG630N	FG630H	FG630L	FK800N	FK800H	FK800L	FK1250N	FK1250H	FK1250L	FK1600N	FK1600H
		36	50	85	100	200	85	100	200	85	100	200	85	100	200	85	100	200	80	100	170	80	100	170	80	100
		Icu of the combination in kA																									
Redline																											
C30	**3**	4.5	6	8	10	12	8	10	12	4.5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C60 & DME60	**6**	10	12	15	18	22	15	18	22	10	12	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
G60 & DM60	**6**	22	25	36	85	85	36	85	85	36	50	50	16	16	16	14	14	14	-	-	-	-	-	-	-	-	-
G100 & DM100	**10**	30	36	50	100	100	50	100	100	50	65	65	22	22	22	16	16	16	-	-	-	-	-	-	-	-	-
GT25 ≤25A	**25**	36	50	85	100	100	85	100	100	85	85	85	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GT25 32 & 40A	**20**	30	36	65	100	100	65	100	100	65	85	85	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GT25 50 & 63A	**15**	25	30	50	100	100	50	100	100	50	65	65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hti	**15**	25	30	50	100	100	50	100	100	50	65	65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S90	**25**	36	50	85	100	100	85	100	100	85	85	85	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surion																											
GPS1A ≤16A	**100**	-	-	-	-	150	-	-	150	-	-	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GPS1A >16A	**50**	-	-	85	100	150	-	100	150	-	100	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GPS1HA all	**100**	-	-	-	-	150	-	-	150	-	-	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GPS2A ≤16A	**100**	-	-	-	-	150	-	-	150	-	-	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GPS2A >16A	**50**	-	-	85	100	150	-	100	150	-	100	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GPS2HA all	**100**	-	-	-	-	150	-	-	150	-	-	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Record Plus™																											
FD160E	**36**	-	50	65	85	100	65	85	100	65	85	100	65	85	100	65	85	100	-	-	-	-	-	-	-	-	-
FD160S	**50**	-	-	-	85	100	-	85	100	-	85	100	-	85	100	-	85	100	-	-	-	-	-	-	-	-	-
FD160N	**85**	-	-	-	100	200	-	100	200	-	100	200	-	100	200	-	100	200	80	100	150	80	100	150	80	100	150
FD160H	**100**	-	-	-	-	200	-	-	200	-	-	200	-	-	200	-	-	200	-	100	150	-	100	150	-	100	150
FE160N	**85**	-	-	-	-	-	-	100	200	-	100	200	-	100	200	-	100	200	80	100	150	80	100	150	80	100	150
FE160H	**100**	-	-	-	-	-	-	-	200	-	-	200	-	-	200	-	-	200	-	100	150	-	100	150	-	100	150
FE250N	**85**	-	-	-	-	-	-	-	-	-	100	200	-	100	200	-	100	200	80	100	150	80	100	150	80	100	150
FE250H	**100**	-	-	-	-	-	-	-	-	-	-	200	-	-	200	-	-	200	-	100	150	-	100	150	-	100	150
FG400N	**85**	-	-	-	-	-	-	-	-	-	-	-	-	100	200	-	100	200	80	100	150	80	100	150	80	100	150
FG400H	**100**	-	-	-	-	-	-	-	-	-	-	-	-	-	200	-	-	200	-	100	150	-	100	150	-	100	150
FG630N	**85**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	200	80	100	150	80	100	150	80	100	150
FG630H	**100**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200	-	100	150	-	100	150	-	100	150
FK800N	**80**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80	100	150	80	100	150	80	100	150
FK800H	**100**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	170	-	100	170	-	100	170
FK1250N	**80**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80	100	170	80	100	170	80	100	170
FK1250H	**100**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	170	-	100	170	-	100	170

Table B2 - Back-up protection at 400/415V

Upstream / Downstream	Icu / In (A)	Record Plus™ type																									
		FD63/160E	FD63/160S	FD63/160N	FD63/160H	FD63/160L	FE160N	FE160H	FE160L	FE250N	FE250H	FE250L	FG400N	FG400H	FG400L	FG630N	FG630H	FG630L	FK800N	FK800H	FK800L	FK1250N	FK1250H	FK1250L	FK1600N	FK1600H
		25	30	50	80	150	50	80	150	50	80	150	50	80	150	50	80	150	50	80	100	50	80	100	50	80
		Icu of the combination in kA																									
Redline																											
G60 & DM60	**6**	15	22	30	36	40	30	36	40	22	30	36	12	12	12	10	10	10	-	-	-	-	-	-	-	-	-
G100 & DM100	**10**	15	25	36	40	50	36	40	50	25	36	40	22	22	22	16	16	16	-	-	-	-	-	-	-	-	-
GT25 ≤25A	**25**	-	30	40	50	65	40	50	65	30	40	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GT25 32 & 40A	**20**	-	30	36	40	50	36	40	50	30	36	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GT25 50 & 63A	**15**	-	25	36	40	50	36	40	50	25	36	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hti	**10**	15	25	36	40	50	36	40	50	25	36	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S90	**15**	-	25	36	40	50	36	40	50	25	36	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surion																											
GPS1A ≤10A	**100**	-	-	-	-	150	-	-	150	-	-	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GPS1A 12.5A	**50**	-	-	-	80	150	-	80	150	-	80	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GPS1A ≥16A	**25**	-	-	40	50	65	40	50	65	40	50	65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GPS1HA ≤12.5A	**100**	-	-	-	-	150	-	-	150	-	-	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GPS1HA >12.5A	**50**	-	-	-	80	150	-	80	150	-	80	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GPS2A 10A	**100**	-	-	-	-	150	-	-	150	-	-	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GPS2A > 10A	**25**	-	-	40	50	65	40	50	65	40	50	65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GPS2HA 10A	**100**	-	-	-	-	150	-	-	150	-	-	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GPS2HA > 10A	**50**	-	-	-	80	150	-	80	150	-	80	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Record Plus™																											
FD160E	**25**	-	30	36	42	50	36	42	50	36	42	50	36	42	50	36	42	50	-	-	-	-	-	-	-	-	-
FD160S	**36**	-	-	42	50	65	42	50	65	42	50	65	42	50	65	42	50	65	-	-	-	-	-	-	-	-	-
FD160N	**50**	-	-	-	80	150	-	80	150	-	80	150	-	80	150	-	80	150	-	80	100	-	80	100	-	80	100
FD160H	**80**	-	-	-	-	150	-	-	150	-	-	150	-	-	150	-	-	150	-	-	100	-	-	100	-	-	100
FE160N	**50**	-	-	-	-	-	-	80	150	-	80	150	-	80	150	-	80	150	-	80	100	-	80	100	-	80	100
FE160H	**80**	-	-	-	-	-	-	-	150	-	-	150	-	-	150	-	-	150	-	-	100	-	-	100	-	-	100
FE250N	**50**	-	-	-	-	-	-	-	-	-	80	150	-	80	150	-	80	150	-	80	100	-	80	100	-	80	100
FE250H	**80**	-	-	-	-	-	-	-	-	-	-	150	-	-	150	-	-	150	-	-	100	-	-	100	-	-	100
FG400N	**50**	-	-	-	-	-	-	-	-	-	-	-	-	80	150	-	80	150	-	80	100	-	80	100	-	80	100
FG400H	**80**	-	-	-	-	-	-	-	-	-	-	-	-	-	150	-	-	150	-	-	100	-	-	100	-	-	100
FG630N	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80	150	-	80	100	-	80	100	-	80	100
FG630H	**80**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	150	-	-	100	-	-	100	-	-	100
FK800N	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80	100	-	80	100	-	80	100
FK800H	**80**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	-	100	-	-	100
FK1250N	**50**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80	100	-	80	100	-	80	100
FK1250H	**80**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	-	100	-	-	100

Application guide
Selectivity Plus

Back-up protection requires an upstream device to open in order to protect the downstream device(s) before the downstream devices can be damaged. For continuity of service it is desirable that the upstream device remains closed and that only the downstream device closest to the fault reacts.
The ***Record Plus™*** family of breakers resolves this paradox: the breakers are so current limiting that let-through energy and current are not sufficient to operate the upstream breaker.
The result discrimination to current levels that are higher than the rated short-circuit breaking capacity of the downstream breaker.
Tables DB1 to DB5 provide the data for the ***Record Plus™*** breaker line used in combination with the ElfaPlus, Surion and MPact protection devices. The values in the table are in kA and indicate the results of the Selectivity Plus technique.
Before the slash the discrimination limit in kA, after the slash the back-up protection value at 400V in kA (e.g. 50/80).

Table DB1 - Selectivity Plus

Upstream / Downstream	In (A)	*Record Plus™* type														
		FD160N - LTMD					FD160H - LTMD					FD160L - LTMD				
		63	80	100	125	160	63	80	100	125	160	63	80	100	125	160
		Selectivity limit in kA / Maximum Icu of combination at 400/415V ac														
Redline	**≤20**	16/16	16/16	16/16	16/16	16/16	22/22	22/22	22/22	22/22	22/22	25/25	25/25	25/25	25/25	25/25
G30 B/C curve	**25**	15/16	15/16	16/16	16/16	16/16	15/22	15/22	22/22	22/22	22/22	15/25	15/25	25/25	25/25	25/25
	32	10/16	10/16	16/16	16/16	16/16	10/22	10/22	22/22	22/22	22/22	10/25	10/25	25/25	25/25	25/25
	40	-	10/16	15/16	16/16	16/16	-	10/22	22/22	22/22	22/22	-	10/25	15/25	25/25	25/25
	50	-	-	10/16	16/16	16/16	-	-	22/22	22/22	22/22	-	-	10/25	22/25	22/25
	63	-	-	-	16/16	16/16	-	-	-	22/22	22/22	-	-	-	22/25	22/25
G60 B/C curve	**≤20**	25/25	25/25	25/25	25/25	25/25	30/30	30/30	30/30	30/30	30/30	36/36	36/36	36/36	36/36	36/36
	25	15/25	15/25	25/25	25/25	25/25	15/30	30/30	30/30	30/30	30/30	22/36	30/36	30/36	30/36	30/36
	32	10/25	10/25	25/25	25/25	25/25	10/30	30/30	30/30	30/30	30/30	16/36	25/36	25/36	25/36	25/36
	40	-	10/25	15/25	25/25	25/25	-	22/30	30/30	30/30	30/30	-	22/36	25/36	25/36	25/36
	50	-	-	10/25	22/25	22/25	-	-	22/30	22/30	22/30	-	-	22/36	22/36	22/36
	63	-	-	-	22/25	22/25	-	-	-	22/30	22/30	-	-	-	22/36	22/36
G100 B/C curve	**≤20**	25/30	30/30	30/30	30/30	30/30	30/36	36/36	36/36	36/36	36/36	36/42	36/42	36/42	36/42	36/42
	25	15/30	15/30	30/30	30/30	30/30	15/36	15/36	30/36	30/36	30/36	15/42	15/42	30/42	30/42	30/42
	32	10/30	10/30	30/30	30/30	30/30	10/36	10/36	25/36	25/36	25/36	10/42	10/42	25/42	25/42	25/42
	40	-	10/30	15/30	25/30	25/30	-	10/36	15/36	25/36	25/36	-	10/42	15/42	25/42	25/42
	50	-	-	10/30	22/30	22/30	-	-	10/36	22/36	22/36	-	-	10/42	22/42	22/42
	63	-	-	-	22/30	22/30	-	-	-	22/36	22/36	-	-	-	22/42	22/42
GT25 B/C curve	**≤20**	30/36	36/36	36/36	36/36	36/36	30/42	36/42	36/42	36/42	36/42	36/50	36/50	36/50	36/50	36/50
	25	15/36	15/36	30/36	30/36	30/36	15/42	15/42	30/42	30/42	30/42	15/50	15/50	30/50	30/50	30/50
	32	10/36	10/36	30/36	30/36	30/36	10/42	10/42	30/42	30/42	30/42	10/50	10/50	30/50	30/50	30/50
	40	-	10/36	15/36	25/36	25/36	-	10/42	15/42	25/42	25/42	-	10/50	15/50	25/50	25/50
	50	-	-	10/36	22/36	22/36	-	-	10/42	22/42	22/42	-	-	10/50	22/50	22/50
	63	-	-	-	22/36	22/36	-	-	-	22/42	22/42	-	-	-	22/50	22/50
Surion	**≤10**	50/50	50/50	50/50	50/50	50/50	80/80	80/80	80/80	80/80	80/80	150/150	150/150	150/150	150/150	150/150
GPS1BA	**12.5**	36/36	36/36	36/36	36/36	36/36	42/42	42/42	42/42	42/42	42/42	50/50	50/50	50/50	50/50	50/50
GPS1MA	**16/20**	36/36	36/36	36/36	36/36	36/36	42/42	42/42	42/42	42/42	42/42	50/50	50/50	50/50	50/50	50/50
GPS2BA	**25/32**	36/36	36/36	36/36	36/36	36/36	42/42	42/42	42/42	42/42	42/42	50/50	50/50	50/50	50/50	50/50
GPS2MA	**40**	-	36/36	36/36	36/36	36/36	-	42/42	42/42	42/42	42/42	-	50/50	50/50	50/50	50/50
	50/63	-	-	36/36	36/36	36/36	-	-	42/42	42/42	42/42	-	-	50/50	50/50	50/50
GPS1BH	**≤10**	50/50	50/50	50/50	50/50	50/50	80/80	80/80	80/80	80/80	80/80	150/150	150/150	150/150	150/150	150/150
GPS1MH	**12.5**	50/50	50/50	50/50	50/50	50/50	80/80	80/80	80/80	80/80	80/80	150/150	150/150	150/150	150/150	150/150
GPS2BH	**16/20**	50/50	50/50	50/50	50/50	50/50	80/80	80/80	80/80	80/80	80/80	150/150	150/150	150/150	150/150	150/150
GPS2MH	**25/32**	50/50	50/50	50/50	50/50	50/50	80/80	80/80	80/80	80/80	80/80	150/150	150/150	150/150	150/150	150/150
	50/63	-	-	50/50	50/50	50/50	-	-	80/80	80/80	80/80	-	-	150/150	150/150	150/150

Table DB1a - Selectivity Plus

Upstream / Downstream	In (A)	*Record Plus™* type														
		FD160N - LMLD					FD160H - LMLD					FD160L - LMLD				
		63	80	100	125	160	63	80	100	125	160	63	80	100	125	160
		Selectivity limit in kA / Maximum Icu of combination at 230/240V AC														
C30 B/C curve	≤20A	8/8	8/8	8/8	8/8	8/8	10/10	10/10	10/10	10/10	10/10	12/12	12/12	12/12	12/12	12/12
	25A	8/8	8/8	8/8	8/8	8/8	10/10	10/10	10/10	10/10	10/10	12/12	12/12	12/12	12/12	12/12
	32A	6/6	8/8	8/8	8/8	8/8	8/8	10/10	10/10	10/10	10/10	10/10	12/12	12/12	12/12	12/12
	40A	-	8/8	8/8	8/8	8/8	-	10/10	10/10	10/10	10/10	-	12/12	12/12	12/12	12/12
C60 B/C curve & DME60	≤20A	12/12	12/12	12/12	12/12	12/12	15/15	15/15	15/15	15/15	15/15	18/18	18/18	18/18	18/18	18/18
	25A	12/12	12/12	12/12	12/12	12/12	15/15	15/15	15/15	15/15	15/15	18/18	18/18	18/18	18/18	18/18
	32A	10/10	12/12	12/12	12/12	12/12	12/12	15/15	15/15	15/15	15/15	15/15	18/18	18/18	18/18	18/18
	40A	-	12/12	12/12	12/12	12/12	-	15/15	15/15	15/15	15/15	-	15/18	18/18	18/18	18/18

Table DB2 - Selectivity Plus

Upstream / Downstream	In (A)	Record Plus™ type																		
		FE160N-LTMD/SMR1			FE160H-LTMD/SMR1			FE160L-LTMD/SMR1			FE250N-LTMD/SMR1			FE250H-LTMD/SMR1			FE250L-LTMD/SMR1		
		100	125	160	100	125	160	100	125	160	125	160/200	250	125	160/200	250	125	160/200	250
		Selectivity limit in kA / Maximum Icu of combination at 400/415V ac																		
Redline	**≤20**	16/16	16/16	16/16	22/22	22/22	22/22	25/25	25/25	25/25	16/16	16/16	16/16	22/22	22/22	22/22	25/25	25/25	25/25
G30 B/C curve	**25**	16/16	16/16	16/16	22/22	22/22	22/22	25/25	25/25	25/25	16/16	16/16	16/16	22/22	22/22	22/22	25/25	25/25	25/25
	32	16/16	16/16	16/16	22/22	22/22	22/22	25/25	25/25	25/25	16/16	16/16	16/16	22/22	22/22	22/22	25/25	25/25	25/25
	40	16/16	16/16	16/16	22/22	22/22	22/22	25/25	25/25	25/25	16/16	16/16	16/16	22/22	22/22	22/22	25/25	25/25	25/25
	50	16/16	16/16	16/16	22/22	22/22	22/22	25/25	25/25	25/25	16/16	16/16	16/16	22/22	22/22	22/22	25/25	25/25	25/25
	63	-	16/16	16/16	-	22/22	22/22	-	25/25	25/25	16/16	16/16	16/16	22/22	22/22	22/22	25/25	25/25	25/25
G60 B/C curve	**≤20**	30/30	30/30	30/30	36/36	36/36	36/36	40/40	40/40	40/40	22/22	22/22	22/22	30/30	30/30	30/30	36/36	36/36	36/36
	25	30/30	30/30	30/30	36/36	36/36	36/36	40/40	40/40	40/40	22/22	22/22	22/22	30/30	30/30	30/30	36/36	36/36	36/36
	32	30/30	30/30	30/30	36/36	36/36	36/36	40/40	40/40	40/40	22/22	22/22	22/22	30/30	30/30	30/30	36/36	36/36	36/36
	40	30/30	30/30	30/30	36/36	36/36	36/36	40/40	40/40	40/40	22/22	22/22	22/22	30/30	30/30	30/30	36/36	36/36	36/36
	50	30/30	30/30	30/30	36/36	36/36	36/36	40/40	40/40	40/40	22/22	22/22	22/22	30/30	30/30	30/30	36/36	36/36	36/36
	63	-	30/30	30/30	-	36/36	36/36	-	40/40	40/40	22/22	22/22	22/22	30/30	30/30	30/30	36/36	36/36	36/36
G100 B/C curve	**≤20**	36/36	36/36	36/36	40/40	40/40	40/40	50/50	50/50	50/50	25/25	25/25	25/25	36/36	36/36	36/36	40/40	40/40	40/40
	25	36/36	36/36	36/36	40/40	40/40	40/40	50/50	50/50	50/50	25/25	25/25	25/25	36/36	36/36	36/36	40/40	40/40	40/40
	32	36/36	36/36	36/36	40/40	40/40	40/40	50/50	50/50	50/50	25/25	25/25	25/25	36/36	36/36	36/36	40/40	40/40	40/40
	40	36/36	36/36	36/36	40/40	40/40	40/40	50/50	50/50	50/50	25/25	25/25	25/25	36/36	36/36	36/36	40/40	40/40	40/40
	50	36/36	36/36	36/36	40/40	40/40	40/40	50/50	50/50	50/50	25/25	25/25	25/25	36/36	36/36	36/36	40/40	40/40	40/40
	63	-	36/36	36/36	-	40/40	40/40	-	50/50	50/50	25/25	25/25	25/25	36/36	36/36	36/36	40/40	40/40	40/40
GT25 B/C curve	**≤20**	40/40	40/40	40/40	50/50	50/50	50/50	65/65	65/65	65/65	30/30	30/30	30/30	40/40	40/40	40/40	40/40	40/40	40/40
	25	40/40	40/40	40/40	50/50	50/50	50/50	65/65	65/65	65/65	30/30	30/30	30/30	40/40	40/40	40/40	40/40	40/40	40/40
	32	36/36	36/36	36/36	40/40	40/40	40/40	50/50	50/50	50/50	30/30	30/30	30/30	36/36	36/36	36/36	40/40	40/40	40/40
	40	36/36	36/36	36/36	40/40	40/40	40/40	50/50	50/50	50/50	30/30	30/30	30/30	36/36	36/36	36/36	40/40	40/40	40/40
	50	36/36	36/36	36/36	40/40	40/40	40/40	50/50	50/50	50/50	25/25	25/25	25/25	36/36	36/36	36/36	40/40	40/40	40/40
	63	-	36/36	36/36	-	40/40	40/40	-	50/50	50/50	25/25	25/25	25/25	36/36	36/36	36/36	40/40	40/40	40/40
Surion	**≤10**	50/50	50/50	50/50	80/80	80/80	80/80	150/150	150/150	150/150	50/50	50/50	50/50	80/80	80/80	80/80	150/150	150/150	150/150
GPS1BA	**12.5**	36/36	36/36	36/36	42/42	42/42	42/42	50/50	50/50	50/50	36/36	36/36	36/36	42/42	42/42	42/42	50/50	50/50	50/50
GPS1MA	**16/20**	36/36	36/36	36/36	42/42	42/42	42/42	50/50	50/50	50/50	36/36	36/36	36/36	42/42	42/42	42/42	50/50	50/50	50/50
GPS2BA	**25/32**	36/36	36/36	36/36	42/42	42/42	42/42	50/50	50/50	50/50	36/36	36/36	36/36	42/42	42/42	42/42	50/50	50/50	50/50
GPS2MA	**40**	36/36	36/36	36/36	42/42	42/42	42/42	50/50	50/50	50/50	36/36	36/36	36/36	42/42	42/42	42/42	50/50	50/50	50/50
	50/63	-	36/36	36/36	-	42/42	42/42	-	50/50	50/50	-	36/36	36/36	-	42/42	42/42	-	50/50	50/50
GPS1BH	**≤10**	50/50	50/50	50/50	80/80	80/80	80/80	150/150	150/150	150/150	50/50	50/50	50/50	80/80	80/80	80/80	150/150	150/150	150/150
GPS1MH	**12.5**	50/50	50/50	50/50	80/80	80/80	80/80	150/150	150/150	150/150	50/50	50/50	50/50	80/80	80/80	80/80	150/150	150/150	150/150
GPS2BH	**16/20**	50/50	50/50	50/50	80/80	80/80	80/80	150/150	150/150	150/150	50/50	50/50	50/50	80/80	80/80	80/80	150/150	150/150	150/150
GPS2MH	**25/32**	50/50	50/50	50/50	80/80	80/80	80/80	150/150	150/150	150/150	50/50	50/50	50/50	80/80	80/80	80/80	150/150	150/150	150/150
	40	50/50	50/50	50/50	80/80	80/80	80/80	150/150	150/150	150/150	50/50	50/50	50/50	80/80	80/80	80/80	150/150	150/150	150/150
	50/63	-	50/50	50/50	-	80/80	80/80	-	150/150	150/150	-	50/50	50/50	-	80/80	80/80	-	150/150	150/150

Table DB2a - Selectivity Plus

Upstream / Downstream	In (A)	Record Plus™ type																	
		FE160N - LMLD/SMR1			FE160H - LTMD/SMR1			FE160L - LTMD/SMR1			FE250N - LTMD/SMR1			FE250H - LTMD/SMR1			FE250L - LTMD/SMR1		
		100	125	160	100	125	160	100	125	160	125	160/200	250	125	160/200	250			
		Selectivity limit in kA / Maximum Icu of combination at 230/240V AC																	
C30 B/C curve	≤20A	8/8	8/8	8/8	10/10	10/10	10/10	12/12	12/12	12/12	8/8	8/8	8/8	10/10	10/10	10/10	12/12	12/12	12/12
	25A	8/8	8/8	8/8	10/10	10/10	10/10	12/12	12/12	12/12	8/8	8/8	8/8	10/10	10/10	10/10	12/12	12/12	12/12
	32A	8/8	8/8	8/8	10/10	10/10	10/10	12/12	12/12	12/12	8/8	8/8	8/8	10/10	10/10	10/10	12/12	12/12	12/12
	40A	8/8	8/8	8/8	10/10	10/10	10/10	12/12	12/12	12/12	8/8	8/8	8/8	10/10	10/10	10/10	12/12	12/12	12/12
C60 B/C curve & DME60	≤20A	15/15	15/15	15/15	18/18	18/18	18/18	22/22	22/22	22/22	10/10	10/10	10/10	12/12	12/12	12/12	15/15	15/15	15/15
	25A	15/15	15/15	15/15	18/18	18/18	18/18	22/22	22/22	22/22	10/10	10/10	10/10	12/12	12/12	12/12	15/15	15/15	15/15
	32A	15/15	15/15	15/15	18/18	18/18	18/18	22/22	22/22	22/22	10/10	10/10	10/10	12/12	12/12	12/12	15/15	15/15	15/15
	40A	15/15	15/15	15/15	18/18	18/18	18/18	22/22	22/22	22/22	10/10	10/10	10/10	12/12	12/12	12/12	15/15	15/15	15/15

Table DB3 - Selectivity Plus

Upstream / In (A) / Downstream	Record Plus™ type															
	FE160H-LTMD		FE160L-LTMD		FE160H-SMR1		FE160L-SMR1		FE250H-LTMD		FE250L-LTMD		FE250H-SMR1		FE250L-SMR1	
	125	160	125	160	125	160	125	160	160/200	250	160/200	250	160	250	160	250
	Selectivity limit in kA / Maximum Icu of combination															
Record Plus™																
FD 63S LTMD	30/42	30/42	30/50	30/50	36/42	36/42	36/50	36/50	42/42	42/42	42/50	42/50	42/42	42/42	50/50	50/50
FD 63N LTMD	30/80	30/80	30/150	30/150	36/80	36/80	36/150	36/150	42/80	42/80	42/150	42/150	50/80	50/80	50/150	50/150
FD 63H LTMD	-	-	30/150	30/150	-	-	36/150	36/150	-	-	42/150	42/150	-	-	50/150	50/150
FD160S LTMD ≤80A	30/42	30/42	30/50	30/50	36/42	36/42	36/50	36/50	42/42	42/42	42/50	42/50	42/42	42/42	50/50	50/50
FD160N LTMD ≤80A	30/80	30/80	30/150	30/150	36/80	36/80	36/150	36/150	42/80	42/80	42/150	42/150	50/80	50/80	50/150	50/150
FD160H LTMD ≤80A	-	-	30/150	30/150	-	-	36/150	36/150	-	-	42/150	42/150	-	-	50/150	50/150
FE 160N LTM ≤80A	30/80	30/80	30/150	30/150	36/80	36/80	36/150	36/150	42/80	42/80	42/150	42/150	50/80	50/80	50/150	50/150
FE 160H LTM ≤80A	-	-	30/150	30/150	-	-	36/150	36/150	-	-	42/150	42/150	-	-	50/150	50/150

Table DB4 - Selectivity Plus

Upstream / In (A) / Downstream	Record Plus™ type											
	FG400H-SMR			FG400L-SMR			FG630H-SMR			FG630L-SMR		
	250	350	400	250	350	400	250	350	400	250	350	400
	Selectivity limit in kA / Maximum Icu of combination											
Record Plus™												
FD 63S LTMD	50/50	50/50	50/50	65/65	65/65	65/65	50/50	50/50	50/50	65/65	65/65	65/65
FD 63N LTMD	80/80	80/80	80/80	150/150	150/150	150/150	80/80	80/80	80/80	150/150	150/150	150/150
FD 63H LTMD	150/150	150/150	150/150	150/150	150/150	150/150	150/150	150/150	150/150	150/150	150/150	150/150
FD160S LTMD	50/50	50/50	50/50	65/65	65/65	65/65	50/50	50/50	50/50	65/65	65/65	65/65
FD160N LTMD	80/80	80/80	80/80	150/150	150/150	150/150	80/80	80/80	80/80	150/150	150/150	150/150
FD160H LTMD	-	150/150	150/150	-	150/150	150/150	-	150/150	150/150	-	150/150	150/150
FE 160N LTM &LTMD	80/80	80/80	80/80	150/150	150/150	150/150	80/80	80/80	80/80	150/150	150/150	150/150
FE 160H LTM & LTMD	-	150/150	150/150	-	150/150	150/150	-	150/150	150/150	-	150/150	150/150
FE 160N SMR1	80/80	80/80	80/80	150/150	150/150	150/150	80/80	80/80	80/80	150/150	150/150	150/150
FE 160H SMR1	-	150/150	150/150	-	150/150	150/150	-	150/150	150/150	-	150/150	150/150

Table DB5 - Selectivity Plus

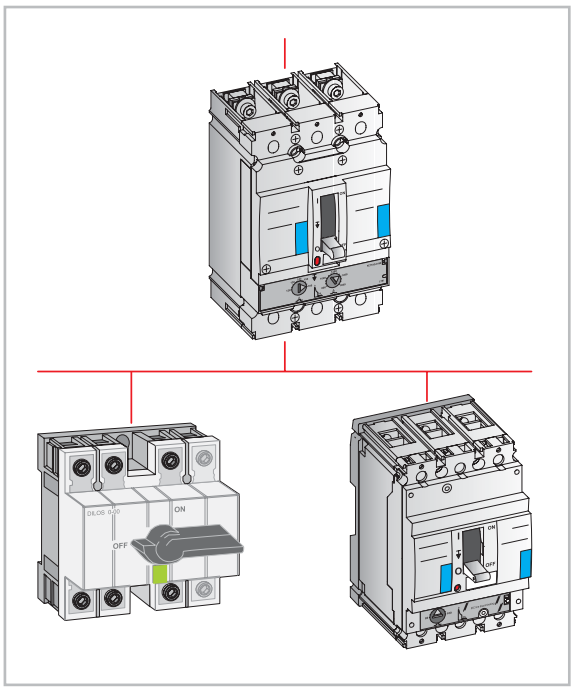
Upstream / In (A) / Downstream	Record Plus™ type						
	FK800H-SMR	FK800L-SMR	FK1250H-SMR		FK1250L-SMR		FK1600H-SMR
	800	800	1000	1250	1000	1250	1600
	Selectivity limit in kA / Maximum Icu of combination						
Record Plus™							
FD 63N LTMD	80/80	80/80	80/80	80/80	80/80	80/80	80/80
FD 63H LTMD	80/80	100/100	80/80	80/80	100/100	100/100	80/80
FE 160N LTMD-SMR1	80/80	80/80	80/80	80/80	80/80	80/80	80/80
FE 160H LTMD -SMR1	80/80	100/100	80/80	80/80	100/100	100/100	80/80
FE 250N LTMD -SMR1	80/80	80/80	80/80	80/80	80/80	80/80	80/80
FE 250H LTMD-SMR1	80/80	100/100	80/80	80/80	100/100	100/100	80/80
FG 400N SMR	80/80	80/80	80/80	80/80	80/80	80/80	80/80
FG 400H SMR	80/80	100/100	80/80	80/80	100/100	100/100	80/80
FG 630N SMR	80/80	80/80	80/80	80/80	80/80	80/80	80/80
FG 630H SMR	80/80	100/100	80/80	80/80	100/100	100/100	80/80

Coordination with loadbreak disconnect switches

Record Plus™ circuit breakers excel in their characteristics as current and energy limiting devices. This allows one to use lighter and more economical downstream busbar systems and switchgear.

A frequently used combination is that of a ***Record Plus™*** breaker, used as a protection and switching device in the mains switchboard, and a Dilos loadbreak switch, as an incomer, in a downstream, secondary switchboard. In this application the Dilos needs to be able to withstand the current and energy values on a short-circuit event, this taking the limiting effects of the upstream breaker into account.

The table indicates the maximum prospective short-circuit that the combination of an upstream ***Record Plus™*** and a downstream Dilos or ***Record Plus™*** in its switch disconnect variant (type **Y**) can withstand.



Protection of Switch Disconnectors (Dilos or Record Plus) with Record Plus circuit breakers - Valid for 400/415V AC

Upstream *Record Plus™* circuit breaker	Breaking capacity, Icu=Ics (kA eff.)	Downstream Dilos switch	Maximum allowable short-circuit (kA eff.) of combination	Downstream *Record Plus™* switch	Maximum allowable short-circuit (kA eff.) of combination
FD63/160S	36	Dilos 1 & 1H	18	FD63Y	36
		Dilos 2	18	FD160Y	36
FD63/160N	50	Dilos 1 & 1H	25	FD63Y	50
		Dilos 2	25	FD160Y	50
FD63/160H	80	Dilos 1 & 1H	30	FD63Y	80
		Dilos 2	30	FD160Y	80
FD63/160L	150	Dilos 1 & 1H	36	FD63Y	150
		Dilos 2	36	FD160Y	150
FE160N	50	Dilos 1 & 1H	25	FD63Y	50
		Dilos 2	25	FD160Y	50
FE160H	80	Dilos 1 & 1H	30	FD63Y	80
		Dilos 2	30	FD160Y	80
FE160L	150	Dilos 1 & 1H	36	FD63Y	150
		Dilos 2	36	FD160Y	150
FE250N	50	Dilos 3	50	FE250Y	50
FE250H	80	Dilos 3	80	FE250Y	80
FE250L	150	Dilos 3	150	FE250Y	150
FG400N	50	Dilos 4	50	FG400Y	50
FG400H	80	Dilos 4	80	FG400Y	80
FG400L	150	Dilos 4	150	FG400Y	150
FG630N	50	Dilos 4	50	FG630Y	50
FG630H	80	Dilos 4	80	FG630Y	80
FG630L	150	Dilos 4	150	FG630Y	150
FK800N	50	Dilos 6	50	FK800Y	50
FK800H	80	Dilos 6	80	FK800Y	80
FK1250N	50	Dilos 6	50	FK1250Y	50
FK1250H	80	Dilos 6	80	FK1250Y	80
FK1600N	50	Dilos 7	50	FK1600Y	50
FK1600H	80	Dilos 7	80	FK1600Y	80

Protection of motor circuits

General
In a circuit that provides power to a motor a number of protective and control devices are normally present. The combination of these devices must be coordinated to ensure the efficiency and an optimal protection of the motor. Here, the protection of such circuits strongly depends on the operational requirements, as the application for which the motor is used, the required starting frequency, the required service level and the applicable safety standards.

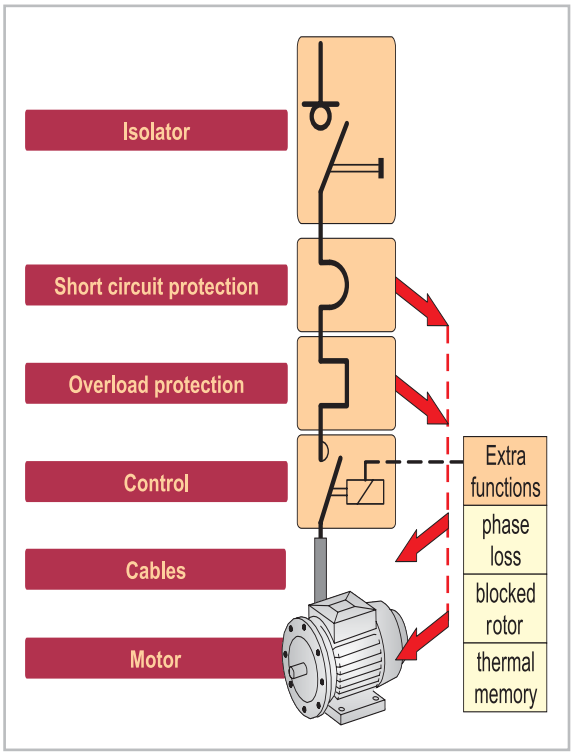
Protection of the electrical circuit
The motor circuit must provide the following functionality:

- Isolate the circuit from the network for maintenance.
- Protect against short-circuits in the equipment, the starter and the cables within the circuit.
- Protect against overloads in the equipment, the starter and the cables within the circuit.
- Protect against faults specific to the motor within it's application.

Control of the motor in question, this covering starting, stopping, speed control etc.

Standards
The requirements for circuits supplying a motor, in general called "motor starters", can be found in the IEC 60947-4-1. To define the components for isolation, overload and short-circuit protection the following elements must be defined:

- Depending on the type of electrical motor and it's operational requirements, four motor utilization categories have been defined. These have an impact on the characteristics of the control element within the circuit. These so called AC classes are depicted in the table on the right.
- The required trip curve class of the overload protection, this depending on the motor application, the classes 10A, 10, 20 and 30 are normally used, the requirements for which are indicated in the table.
- Isolation and safety during maintenance. Use of the ***Record Plus™*** breaker here provides an enhancement of the present standard requirement for **POSITIVE OFF** adding in a **POSITIVE ON** indication.



Category	Load type	Contactor usage
AC1	Non Inductive motors	Energization
AC2	Slip ring motors	Starting Switching off whilst running Regenerative breaking Inching
AC3	Squirrel-cage motors	Energization Switching off whilst running
AC4	Squirrel-cage motors (cos phi = 0.45 ≤ 100A) (cos phi = 0.35 > 100A)	Starting Switching off whilst running Regenerative breaking Plugging Inching

Trip class	Required tripping times at		
	1.2 x In	1.5 x In	7.2 x In
10A	t < 2 hours	t < 2 min.	2 ≤ t ≤ 10 sec.
10	t < 2 hours	t < 4 min.	4 ≤ t ≤ 10 sec.
20	t < 2 hours	t < 8 min.	6 ≤ t ≤ 20 sec.
30	t < 2 hours	t < 12 min.	9 ≤ t ≤ 30 sec.

Coordination
The standards require tests to define the coordination between the devices within the motor starter. Depending on the state of the components after the test two coordination classes 1 and 2 have been defined.

The unique properties of the ***Record Plus™*** breaker allow GE to offer solutions meeting the highest standards. For this reason all tables published here only refer to **coordination type 2**.

This entails that the GE equipment meets the following standards
- No or minor weldings of the contactors after testing; contact separation is simple and easy
- The switchgear and controlgear are fully operational after the tests indicated here.

Solutions with the *Record Plus™* breaker
Motor starters are compiled with a number of GE components. This is to offer the required functionality of the motor starter circuit and to allow a choice in the execution thereof.

Coordination type 2 test sequence

Motor current Ie (AC3)	Test with current " r "
Ie ≤ 16A	1 kA
16 < Ie ≤ 63A	3 kA
63 < Ie ≤ 125A	5 kA
125 < Ie ≤ 315A	10 kA
315 < Ie ≤ 630A	18 kA

- After this test the original characterstics of the contactor and thermal relay MUST remain unchanged.
- After this test the short-circuit protection must trip within 10 ms at a fault current ≥ 15 x In.

Short-circuit test

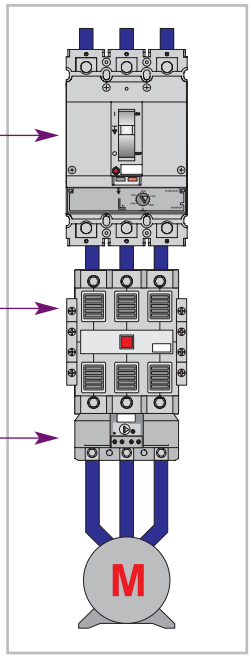
This value which is generally ≤ 50kA is used to check the coordination of the devices used in the motor starter circuit. For each combination with ***Record Plus™*** breakers this value is mentioned in the tables on pages E.28, 29, 30, 31, 32 and 33.
After a test with this current the following conditions must be met:
- No or minor weldings of the contactors after testing; contact separation is simple and easy
- The switchgear and controlgear are fully operational after the test.

Option 1

Magnetic only circuit breaker as the short-circuit protection device.

Contactor for control purposes.

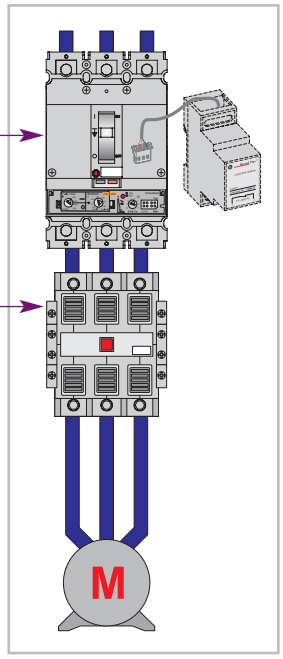
Separate thermal relay for class 10 or class 30 as overload protection.



Option 2

Electronic circuit breaker as the short-circuit and Overload protection device.

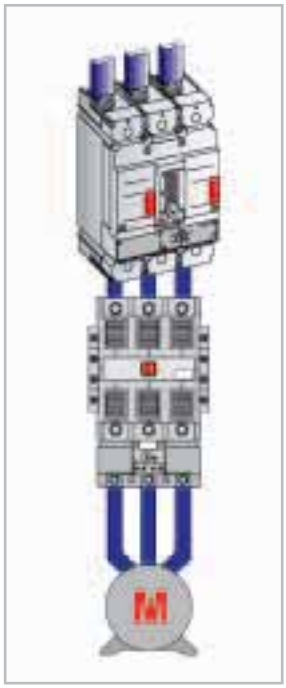
Contactor for control purposes.



After power is disconnected (circuit interruption after a fault) the breaker has no thermal memory function. This implies that after an overload, immediate breaker reset and re-energization of the circuit is possible.
In order to prevent this a Long time module can be utilized that closes a contact on an overload just before the breaker trips. This allowing the contactor in the circuit to be de-energized and a external thermal memory to be initialized, before the breaker trips.

The sketch here depicts the long time module as an optional add on in the circuit diagram. Here the breaker is the short-circuit protection device **AND** a backup overload protection. If the contactor fails to open on a long time module signal the breaker will trip.

Coordination type II - EN 60947-4 - Class 10 protection



Short-circuit Protection by means of Magnetic Only MCCB.
Overload Protection by means of a direct heated electromechanical thermal relay
Phase Loss protection (Thermal relay feature)
Control by GE contactor

Upstream *Record Plus*™ Breaker selection							
Type	N	H	L	Type	N	H	L
	Icc values in kA Ue=230V AC				Icc values in kA Ue=400/415V AC		
FD63/160	85	100	130	FD63/160	50	80	130
FE160/250	85	100	130	FE160/250	50	80	130
FG 400/630	85	100	130	FG 400/630	50	80	130
FK 800/1250	85	100	130	FK 800/1250	50	80	100

Selection of associated components[1]											
Motor		Breaker details			Contactor	Motor		Breaker details			Contactor
P(kw)	In	Type	Ie	Im	Type+O.R.	P(kw)	In	Type	Ie	Im	Type
0.37	2.0	FD63/FE160	3[2]	30	CL25+RT1J						
0.55	2.8	FD63/FE160	3[2]	36	CL25+RT1K						
0.75	3.5	FD63/FE160	3[2]	70	CL25+RT1K	0.75	2.0	FD63/FE160	3[2]	30	CL25+RT1J
1.1	5.0	FD63/FE160	7	70	CL03+RT12L	1.1	2.6	FD63/FE160	3[2]	33	CL25+RT1K
1.5	6.1	FD63/FE160	7	80	CL03+RT1M	1.5	3.6	FD63/FE160	7	70	CL03+RT1K
2.2	8.7	FD63/FE160	12.5[3]	125	CL06+RT2AN	2.2	5.0	FD63/FE160	7	80	CL03+RT12L
3	11.5	FD63/FE160	12.5[3]	150	CL06+RT2AN	3	6.6	FD63/FE160	7	86	CL03+RT1M
4	14.5	FD63/FE160	20[3]	200	CL06+RT2B	4	8.3	FD63/FE160	12.5[3]	125	CL06+RT2AN
5.5	20.0	FD63/FE160	20[3]	260	CL06-RT2C	5.5	11.5	FD63/FE160	12.5[3]	150	CL06+RT2AN
7.5	28	FD63/FE160	30[4]	364	CL06-RT2D	7.5	16.1	FD63/FE160	20[3]	200	CL06+RT2B
10	36	FD63/FE160	50	500	CL06+RT2E	10	21	FD63/FE160	30[4]	300	CL06-RT2C
11	39	FD63/FE160	50	507	CL06+RT2E	11	22	FD63/FE160	30[4]	300	CL06-RT2C
15	50	FD63/FE160	50	650	CL06+RT2G	15	30	FD63/FE160	30[4]	390	CL06-RT2D
18.5	64	FD/FE160	80[5]	832	CL09+RT2J	18.5	37	FD63/FE160	50	478	CL06+RT2E
22	75	FD/FE160	80[5]	975	CL09+RT2J	22	43	FD63/FE160	50	561	CL06+RT2G
25	85	FD/FE160	100	1020	CL09+RT2L	25	49	FD63/FE160	50	635	CL06+RT2G
30	100	FD160	100	1300	CL09+RT2M	30	58	FD/FE160	80[5]	800	CL09+RT2H
30	100	FE160	100	1300	CK75C+RT2M	37	72	FD/FE160	80[5]	934	CL09+RT2J
37	125	FE160	125	1625	CK85B+RT3E	45	86	FD160	100	1121	CL09+RT2L
45	150	FE160	160	1950	CK85B+RT3F	45	86	FE160	100	1121	CK75C+RT2L
55	180	FE250	250	2500	CK95B+RT3F	55	104	FE160	125	1346	CK85B+RT3E
75	250	FG400	250	3250	CK10B+RT4P	75	144	FE160	160	1869	CK85B+RT3F
90	312	FG400	400	4056	CK10B+RT5C	90	179	FE250	250	2500	CK95B+RT4N
110	360	FG400	400	4680	CK12B+RT5C	110	207	FE250	250	2691	CK10B+RT4P
132	430	FG630	500	5590	CK12B+RT5D	132	247	FG400	250	3214	CK10B+RT4R
160	520	FK800	800	6760	CK13B+RT5E	160	300	FG400	400	3900	CK10B+RT5C
200	630	FK800	800	6930	CK13B+RT5E	200	360	FG400	400	4680	CK12B+RT5C
-	-	-	-	-	-	220	400	FG630	500	5200	CK12B+RT5D
-	-	-	-	-	-	250	462	FG630	500	6004	CK12B+RT5D
-	-	-	-	-	-	300	560	FK800	800	6720	CK13B+RT5E
-	-	-	-	-	-	315	582	FK800	800	6985	CK13B+RT5C
-	-	-	-	-	-	335	619	FK800	800	6810	CK13B+RT5C

(1) The contactor has a breaking capacity that is sufficient to operate the specified motor up to the specified magnetic setting of the breaker
(2) The 3Amp device is designed to operate at a current level up to 3.5Amps
(3) FD63 type; contactor size can be reduced to CL04
(4) FD63 type; contactor size can be reduced to CL45
(5) FD160 type; contactor size can be reduced to CL08

Coordination type II - EN 60947-4 - Class 10 protection

Upstream *Record Plus*™ Breaker selection											
Type	N	H	L	Type	N	H	L	Type	N	H	L
	Icc values in kA Ue=440V AC				Icc values in kA Ue=500/525V AC				Icc values in kA Ue=690V AC		
FD63/160	30	50	80	FD63/160	-	36	50	FD63/160	-	6	Tests pending
FE160/250	42	65	130	FE160/250	-	50	80	FE160/250	-	22	
FG 400/630	42	65	130	FG 400/630	-	50	80	FG 400/630	-	22	
FK 800/1250	42	65	80	FK 800/1250	-	36	50	FK 800/1250	-	22	

Selection of associated components[1]																	
Motor		Breaker details			Contactor	Motor		Breaker details			Contactor	Motor		Breaker details			Contactor
P(kw)	In	Type	Ie	Im	Type+O.R.	P(kw)	In	Type	Ie	Im	Type+O.R.	P(kw)	In	Type	Ie	Im	Type+O.R.
0.8	1.9	FD63/FE160	3[2]	30	CL25+RT1J	0.8	1.5	FD63/FE160	3[2]	30	CL25+RT1H						
1.1	2.5	FD63/FE160	3[2]	30	CL25+RT1K	1.1	2.0	FD63/FE160	3[2]	30	CL25+RT1J	1.5	2.0	FD63/FE160	3[2]	30	CL25+RT1J
1.5	3.4	FD63/FE160	3[2]	70	CL25+RT1K	1.5	2.6	FD63/FE160	3[2]	40	CL25+RT1K	2.2	2.9	FD63/FE160	3[2]	38	CL25+RT1K
2.2	4.6	FD63/FE160	7	70	CL03+RT12L	2.2	3.8	FD63/FE160	7	70	CL03+RT12L	3	3.5	FD63/FE160	3[2]	70	CL25+RT1K
3	6.0	FD63/FE160	7	78	CL03+RT1M	3	5.0	FD63/FE160	7	70	CL03+RT1M	3.7	4.6	FD63/FE160	7	70	CL03+RT12L
4	7.6	FD63/FE160	12.5[3]	100	CL06+RT2AN	4	6.5	FD63/FE160	7	85	CL03+RT1M	4	5.0	FD63/FE160	7	70	CL03+RT12L
5.5	10.5	FD63/FE160	12.5[3]	136	CL03+RT2AN	5.5	9.0	FD63/FE160	12.5[3]	125	CL06+RT2AN	5.5	7.0	FD63/FE160	7	91	CL03+RT12M
7.5	14.6	FD63/FE160	20[3]	200	CL06+RT2B	7.5	12.0	FD63/FE160	12.5[3]	156	CL06+RT2BP	7.5	9.0	FD63/FE160	12.5[3]	125	CL07+RT2AN
10	18.8	FD63/FE160	20[3]	245	CL06+RT2B	10	15.0	FD63/FE160	20[3]	200	CL06+RT2B	11	12.5	FD63/FE160	12.5[3]	163	CL07+RT2BP
11	20	FD63/FE160	30[4]	300	CL06-RT2C	11	18.4	FD63/FE160	20[3]	300	CL06-RT2B	13	16.0	FD63/FE160	20[3]	208	CL07+RT2B
15	27	FD63/FE160	30[4]	355	CL06-RT2D	15	23	FD63/FE160	30[4]	300	CL06-RT2C	15	18.0	FD63/FE160	20[3]	234	CL07+RT2B
18.5	33	FD63/FE160	50	500	CL06+RT2E	18.5	29	FD63/FE160	30[4]	371	CL06-RT2D	18.5	23	FD63/FE160	30[4]	300	CL09+RT2C
22	39	FD63/FE160	50	510	CL06+RT2E	22	33	FD63/FE160	50	500	CL06+RT2E	22	25	FD63/FE160	30[4]	325	CL09+RT2D
25	44	FD63/FE160	50	578	CL06+RT2G	-	-	-	-	-	-	-	-	-	-	-	-
30	52	FD/FE160	80	680	CL09+RT2H	30	45	FD63/FE160	50	585	CL06+RT2G	30	35	FD63/FE160	50	500	CL09+RT2E
37	65	FD/FE160	80	849	CL09+RT2J	37	55	FD/FE160	80[5]	800	CL09+RT2J	37	42	FD63/FE160	50	546	CL09+RT2E
45	78	FD/FE160	80	1019	CL09+RT2J	45	65	FD/FE160	100	1000	CL09+RT2J	45	49	FD63/FE160	50	637	CL09+RT2G
55	86	FD160	100	1223	CL09+RT2L	55	80	FD160	100	1100	CL09+RT2S	55	60	FD/FE160	80[5]	800	CL09+RT2J
55	94	FE160	100	1223	CK75C+RT2L	55	80	FE160	100	1100	CK75C+RT2J	75	80	FD/FE160	80[5]	1040	CL09+R2TL
75	131	FE160	160	1699	CK85B+RT3E	75	110	FE160	125	1430	CK85B+RT3D	90	100	FD160	100	1300	CL09+R2TL
90	163	FE250	250	2500	CK95B+RT3F	90	130	FE160	160	1690	CK95B+RT3E	90	100	FE160	100	1300	CK85B+RT2M
110	188	FE250	250	2500	CK95B+RT4P	110	156	FE160	160	2028	CK95B+RT3F	110	120	FE160	125	1560	CK85B+RT3E
132	225	FE250	250	2922	CK95B+RT4R	132	190	FE250	250	2500	CK95B+RT4P	132	140	FE160	160	1820	CK95B+RT3F
160	300	FG400	400	3900	CK10B+RT5C	160	228	FE250	250	2964	CK95B+RT4R	160	175	FE250	250	2100	CK95B+RT4N
200	360	FG400	400	4680	CK12B+RT5C	200	281	FG400	400	3653	CK10B+RT5C	200	220	FE250	250	2860	CK10B+RT4R
220	400	FG630	500	5200	CK12B+RT5D	220	310	FG400	400	4030	CK10B+RT5C	220	240	FG400	250	3120	CK10B+RT4R
250	462	FG630	500	6004	CK12B+RT5D	-	-	-	-	-	-	250	270	FG400	400	3510	CK10B+RT5C
300	509	FK800	800	6619	CK13B+RT5E	-	-	-	-	-	-	-	-	-	-	-	-
315	529	FK800	800	6880	CK13B+RT5E	315	445	FG630	500	5785	CK12B+RT5D	-	-	-	-	-	-
335	563	FK800	800	6754	CK13B+RT5E	335	460	FG630	500	5980	CK12B+RT5D	335	335	FG400	400	4355	CK10B+RT5C
355	596	FK800	800	6560	CK13B+RT5E	355	500	FK800	800	6500	CK13B+RT5E	-	-	-	-	-	-
375	630	FK800	800	6930	CK13B+RT6A	375	530	FK800	800	6890	CK13B+RT5E	375	400	FG630	500	5200	CK12B+RT5D
-	-	-	-	-	-	400	570	FK800	800	6840	CK13B+RT5E	-	-	-	-	-	-
-	-	-	-	-	-	450	630	FK800	800	7560	CK13B+RT6A	450	480	FG630	500	6240	CK12B+RT5D
-	-	-	-	-	-	-	-	-	-	-	-	500	530	FK800	800	6360	CK13B+RT5E
-	-	-	-	-	-	-	-	-	-	-	-	560	580	FK800	800	6380	CK13B+RT5E

Coordination type II - EN 60947-4 - Class 10 protection (with SMR2 other classes possible)

Short-circuit and Overload protection by means of Electronic MCCB.
Phase Loss protection (in MCCB)
Overload backup protection, and overload alarm on use of LT module.
Control by GE contactor

Upstream *Record Plus*™ Breaker selection							
Type	N	H	L	Type	N	H	L
	Icc values in kA Ue=230V AC				Icc values in kA Ue=400/415V AC		
FE160/250	85	100	130	FE160/250	50	80	130
FG 400/630	85	100	130	FG 400/630	50	80	130

Selection of associated components[1]											
Motor		Breaker details			Contactor	Motor		Breaker details			Contactor
P(kw)	In	Type	Ie	Ist	Type	P(kw)	In	Type	Ie	Im	Type
3	11.5	**FE160**	25	150	**CL08**	-	-	**-**	-	-	**-**
4	14.5	**FE160**	25	189	**CL08**	-	-	**-**	-	-	**-**
5.5	20	**FE160**	25	260	**CL08**	5.5	11.5	**FE160**	25	150	**CL08**
7.5	28	**FE160**	63	364	**CL09**	7.5	16.1	**FE160**	25	200	**CL08**
10	36	**FE160**	63	468	**CL09**	10	21	**FE160**	25	300	**CL08**
11	39	**FE160**	63	507	**CL09**	11	22	**FE160**	25	300	**CL08**
15	50	**FE160**	63	650	**CL09**	15	30	**FE160**	63	390	**CL09**
18.5	64	**FE160**	125	832	**CK85B**	18.5	37	**FE160**	63	478	**CL09**
22	75	**FE160**	125	975	**CK85B**	22	43	**FE160**	63	561	**CL09**
25	85	**FE160**	125	1105	**CK85B**	25	49	**FE160**	63	635	**CL09**
30	100	**FE160**	125	1300	**CK85B**	30	58	**FE160**	63	800	**CL09**
37	125	**FE160**	160	1625	**CK95B**	37	72	**FE160**	125	934	**CK85B**
45	150	**FE160**	160	1950	**CK95B**	45	86	**FE160**	125	1121	**CK85B**
55	180	**FE250**	250	2340	**CK95B**	55	104	**FE160**	125	1346	**CK85B**
75	250	**FG400**	250	3000	**CK95B**	75	144	**FE160**	160	1869	**CK85B**
90	312	**FG400**	400	4056	**CK10C**	90	179	**FE250**	250	2500	**CK95B**
110	360	**FG400**	400	4680	**CK12B**	110	207	**FE250**	250	2691	**CK95B**
132	430	**FG630**	500	5590	**CK12B**	132	247	**FG400**	250	2967	**CK95B**
-	-	**-**	-	-	**-**	160	300	**FG400**	400	3900	**CK10C**
-	-	**-**	-	-	**-**	200	360	**FG400**	400	4680	**CK12B**
-	-	**-**	-	-	**-**	220	400	**FG630**	500	5200	**CK12B**
-	-	**-**	-	-	**-**	250	462	**FG630**	500	6004	**CK12B**

(1) The contactor has a breaking capacity that is sufficient to operate the specified motor up to the specified magnetic setting of the breaker

Coordination type II - EN 60947-4 - Class 10 protection (with SMR2 other classes possible)

Upstream *Record Plus*™ Breaker selection

Type	N	H	L
	Icc values in kA Ue=440V AC		
FE160/250	42	65	130
FG 400/630	50	65	130

Type	N	H	L
FE160/250	-	50	80
FG 400/630	-	50	80

Type	N	H	L
	Icc values in kA Ue=690V AC		
FE160/250	-	22	50
FG 400/630	-	22	50

Selection of associated components[1]

Motor		Breaker details			Contactor
P(kw)	In	Type	Ie	Im	Type
-	-	-	-	-	-
-	-	-	-	-	-
5.5	10.5	FE160	25	136	CL08
7.5	14.6	FE160	25	200	CL08
10	18.8	FE160	25	245	CL08
11	20	FE160	25	265	CL08
15	27	FE160	63	355	CL09
18.5	33	FE160	63	500	CL09
22	39	FE160	63	510	CL09
25	44	FE160	63	578	CL09
30	52	FE160	63	680	CL09
37	65	FE160	125	849	CK85B
45	78	FE160	125	1019	CK85B
55	94	FE160	125	1223	CK85B
75	131	FE160	160	1699	CK85B
90	163	FE250	250	2500	CK95B
110	188	FE250	250	2500	CK95B
132	225	FE250	250	2922	CK95B
160	300	FG400	400	3900	CK10C
200	360	FG400	400	4680	CK12B
220	400	FG630	500	5200	CK12B
250	462	FG630	500	6004	CK12B
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

Motor		Breaker details			Contactor
P(kw)	In	Type	Ie	Im	Type
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
7.5	12.0	FE160	25	156	CL09
10	15.0	FE160	25	200	CL09
11	18.4	FE160	25	300	CL09
15	23	FE160	25	300	CL09
18.5	29	FE160	63	371	CL10
22	33	FE160	63	423	CL10
-	-	-	-	-	-
30	45	FE160	63	585	CL10
37	55	FE160	63	800	CL10
-	-	-	-	-	-
55	80	FE160	125	1040	
75	110	FE160	125	1430	CK85B
90	130	FE160	160	1690	CK85B
110	156	FE160	160	2028	CK85B
132	190	FE250	250	2500	CK95B
160	228	FE250	250	2964	CK95B
200	281	FG400	400	3653	CK10C
220	310	FG400	400	4030	CK10C
-	-	-	-	-	-
-	-	-	-	-	-
315	445	FG630	500	5785	CK12B
335	460	FG630	500	5980	CK12B
355	500	FG630	500	6500	CK12B
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

Motor		Breaker details			Contactor
P(kw)	In	Type	Ie	Im	Type
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
10	11.5	FE160	25	150	CK85B
-	-	-	-	-	-
15	17.1	FE160	25	223	CK85B
18.5	20	FE160	25	260	CK85B
-	-	-	-	-	-
-	-	-	-	-	-
30	35	FE160	63	500	CK85B
37	42	FE160	63	546	CK85B
45	49	FE160	63	637	CK85B
55	60	FE160	63	800	CK85B
75	80	FE160	125	1040	CK85B
90	100	FE160	125	1300	CK85B
110	120	FE160	125	1560	CK85B
132	140	FE160	160	1820	CK85B
160	175	FE250	250	2275	CK10C
200	220	FE250	250	2860	CK10C
220	240	FG400	250	3120	CK10C
250	270	FG400	400	3510	CK10C
-	-	-	-	-	-
-	-	-	-	-	-
335	335	FG400	400	4355	CK10C
-	-	-	-	-	-
375	400	FG630	500	5200	CK12B
-	-	-	-	-	-
450	480	FG630	500	6240	CK12B

(1) The contactor has a breaking capacity that is sufficient to operate the specified motor up to the specified magnetic setting of the breaker

Coordination type II - EN 60947-4 - Class 20[3] protection

Short-circuit Protection by means of Magnetic Only MCCB.
Overload Protection by means of a electromechanical thermal relay.
Phase Loss protection (Thermal relay feature)
Control by GE contactor

Upstream *Record Plus*™ Breaker selection							
Type	N	H	L	Type	N	H	L
	Icc values in kA Ue=230V AC				Icc values in kA Ue=400/415V AC		
FD63/160	85	100	130	FD63/160	50	80	130
FE160/250	85	100	130	FE160/250	50	80	130
FG 400/630	85	100	130	FG 400/630	50	80	130
FK 800/1250	85	100	130	FK 800/1250	50	80	100

Selection of associated components[1]											
Motor		Breaker details			Contactor	Motor		Breaker details			Contactor
P(kw)	In	Type	Ie	Im	Type+O.R.	P(kw)	In	Type	Ie	Im	Type+O.R.
0.37	2.0	FD63/FE160	3[2]	35	CL25+RT12J						
0.55	2.8	FD63/FE160	3[2]	35	CL25+RT12K						
0.75	3.5	FD63/FE160	3[2]	46	CL25+RT12K	0.75	2.0	FD63/FE160	3[2]	35	CL25+RT12J
1.1	5.0	FD63/FE160	7	70	CL03+RT12L	1.1	2.6	FD63/FE160	3[2]	35	CL25+RT12K
1.5	6.1	FD63/FE160	7	80	CL03+RT12M	1.5	3.6	FD63/FE160	7	70	CL03+RT12K
2.2	8.7	FD63/FE160	12.5[4]	125	CL06+RT2AN	2.2	5.0	FD63/FE160	7	80	CL03+RT12L
3	11.5	FD63/FE160	12.5[4]	150	CL06+RT2AN	3	6.6	FD63/FE160	7	86	CL03+RT12M
4	14.5	FD63/FE160	20[4]	200	CL06+RT2B	4	8.3	FD63/FE160	12.5[4]	125	CL06+RT2AN
5.5	20.0	FD63/FE160	20[4]	260	CL06-RT2C	5.5	11.5	FD63/FE160	12.5[4]	150	CL06+RT2AN
7.5	28	FD63/FE160	30[5]	364	CL06-RT22D	7.5	16.1	FD63/FE160	20[4]	200	CL06+RT2B
10	36	FD63/FE160	50	500	CL06+RT22E	10	21	FD63/FE160	30[5]	300	CL06-RT2C
11	39	FD63/FE160	50	507	CL06+RT22E	11	22	FD63/FE160	30[5]	300	CL06-RT2C
15	50	FD63/FE160	50	650	CL06+RT22G	15	30	FD63/FE160	30[5]	390	CL06-RT22D
18.5	64	FD/FE160	80[6]	832	CL09+RT22J	18.5	37	FD63/FE160	50	478	CL06+RT22E
22	75	FD/FE160	80[6]	975	CL09+RT22J	22	43	FD63/FE160	50	561	CL06+RT22G
25	85	FD/FE160	100	1020	CL09+RT22L	25	49	FD63/FE160	50	635	CL06+RT22G
30	100	FD160	100	1300	CL09+RT22M	30	58	FD/FE160	80[6]	800	CL09+RT22H
30	100	FE160	100	1300	CK75C+RT22M	37	72	FD/FE160	80[6]	934	CL09+RT22J
37	125	FE160	125	1625	CK85B+RT32E	45	86	FD160	100	1121	CL09+RT22L
45	150	FE160	160	1950	CK85B+RT32F	45	86	FE160	100	1121	CK75C+RT22L
55	180	FE250	250	2500	CK95B+RT32F	55	104	FE160	125	1346	CK85B+RT32E
75	250	FG400	250	3250	CK10B+RT5LB	75	144	FE160	160	1869	CK85B+RT32F
90	312	FG400	400	4056	CK10B+RT5LB	90	179	FE250	250	2500	CK95B+RT32F
110	360	FG400	400	4680	CK12B+RT5LC	110	207	FE250	250	2691	CK10B+RT5LB
132	430	FG630	500	5590	CK12B+RT5LD	132	247	FG400	250	3214	CK10B+RT5LB
160	520	FK800	800	6760	CK13B+RT5LE	160	300	FG400	400	3900	CK10B+RT5LB
200	630	FK800	800	6930	CK13B+RT5LE	200	360	FG400	400	4680	CK12B+RT52LC
-	-	-	-	-	-	220	400	FG630	500	5200	CK12B+RT52LD
-	-	-	-	-	-	250	462	FG630	500	6004	CK12B+RT52LD
-	-	-	-	-	-	300	560	FK800	800	6720	CK13B+RT5LE
-	-	-	-	-	-	315	582	FK800	800	6985	CK13B+RT5LE
-	-	-	-	-	-	335	619	FK800	800	6810	CK13B+RT5LE

(1) The contactor has a breaking capacity that is sufficient to operate the specified motor up to the specified magnetic setting of the breaker.
(2) The 3Amp device is designed to operate at a current level up to 3.5Amps.
(3) Class 30 on request.
(4) FD63 type; contactor size can be reduced to CL04
(5) FD63 type; contactor size can be reduced to CL45
(6) FD160 type; contactor size can be reduced to CL08

Coordination type II - EN 60947-4 - Class 20[3] protection

Upstream *Record Plus*™ Breaker selection												
Type	N	H	L	Type	N	H	L	Type	N	H	L
	Icc values in kA Ue=440V AC				Icc values in kA Ue=500/525V AC				Icc values in kA Ue=690V AC		
FD63/160	30	50	80	FD63/160	-	36	50	FD63/160	-	6	10
FE160/250	42	65	130	FE160/250	-	50	80	FE160/250	-	22	50
FG 400/630	42	65	130	FG 400/630	-	50	80	FG 400/630	-	22	50
FK 800/1250	42	65	80	FK 800/1250	-	36	50	FK 800/1250	-	22	30

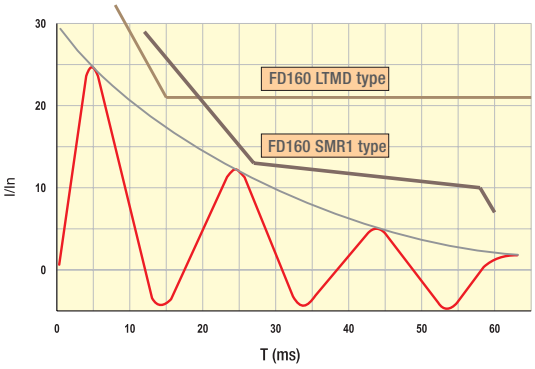
Selection of associated components[1]																	
Motor		Breaker details			Contactor	Motor		Breaker details			Contactor	Motor		Breaker details			Contactor
P(kw)	In	Type	Ie	Im	Type+O.R.	P(kw)	In	Type	Ie	Im	Type+O.R.	P(kw)	In	Type	Ie	Im	Type+O.R.
0.75	1.9	FD63/FE160	3[2]	30	CL25+RT12J	0.75	1.5	FD63/FE160	3[2]	30	CL25+RT12H						
1.1	2.5	FD63/FE160	3[2]	30	CL25+RT12K	1.1	2.0	FD63/FE160	3[2]	30	CL25+RT12J						
1.5	3.4	FD63/FE160	3[2]	70	CL25+RT12K	1.5	2.6	FD63/FE160	3[2]	40	CL25+RT12K	1.5	2.0	FD63/FE160	3[2]	30	CL25+RT12J
2.2	4.6	FD63/FE160	7	70	CL03+RT12L	2.2	3.8	FD63/FE160	7	70	CL03+RT12L	2.2	2.9	FD63/FE160	3[2]	38	CL25+RT12K
3	6.0	FD63/FE160	7	78	CL03+RT12M	3	5.0	FD63/FE160	7	70	CL03+RT12M	3	3.5	FD63/FE160	3[2]	46	CL25+RT12K
4	7.6	FD63/FE160	12.5[4]	100	CL06+RT2AN	4	6.5	FD63/FE160	7	85	CL03+RT12M	3.7	4.6	FD63/FE160	7	70	CL03+RT12L
5.5	10.5	FD63/FE160	12.5[4]	136	CL06+RT2AN	5.5	9.0	FD63/FE160	12.5[4]	125	CL06+RT2AN	4	5.0	FD63/FE160	7	70	CL03+RT12L
7.5	14.6	FD63/FE160	20[4]	200	CL06+RT2B	7.5	12.0	FD63/FE160	12.5[4]	156	CL06+RT2BP	5.5	7.0	FD63/FE160	7	91	CL03+RT12M
10	18.8	FD63/FE160	20[4]	245	CL06+RT2B	10	15.0	FD63/FE160	20[4]	200	CL06+RT2B	7.5	9.0	FD63/FE160	12.5[4]	125	CL07+RT2AN
11	20	FD63/FE160	30[5]	300	CL06-RT2C	11	18.4	FD63/FE160	20[4]	300	CL06-RT2B	11	12.5	FD63/FE160	12.5[4]	163	CL07+RT2BP
15	27	FD63/FE160	30[5]	355	CL06-RT22D	15	23	FD63/FE160	30[5]	300	CL06-RT2C	13	16.0	FD63/FE160	20[4]	208	CL07+RT2B
18.5	33	FD63/FE160	50	500	CL06+RT22E	18.5	29	FD63/FE160	30[5]	371	CL06-RT22D	15	18.0	FD63/FE160	20[4]	234	CL07+RT2B
22	39	FD63/FE160	50	510	CL06+RT22E	22	33	FD63/FE160	50	500	CL06+RT22E	18.5	23	FD63/FE160	30[5]	300	CL09+RT2C
25	44	FD63/FE160	50	578	CL06+RT22G	-	-	-	-	-	-	22	25	FD63/FE160	30[5]	325	CL09+RT22D
30	52	FD/FE160	80[6]	680	CL09+RT22H	30	45	FD63/FE160	50	585	CL06+RT22G	-	-	-	-	-	-
37	65	FD/FE160	80[6]	849	CL09+RT22J	37	55	FD/FE160	80[6]	800	CL09+RT22J	30	35	FD63/FE160	50	500	CL09+RT22E
45	78	FD/FE160	80	1019	CL09+RT22J	45	65	FD/FE160	100	1000	CL09+RT22J	37	42	FD63/FE160	50	546	CL09+RT22F
55	94	FD160	100	1223	CL09+RT22L	55	80	FD160	100	1000	CL09+RT22J	45	49	FD63/FE160	50	637	CL09+RT22G
55	94	FE160	100	1223	CK75C+RT22L	55	80	FE160	100	1100	CK75C+RT22J	55	60	FD/FE160	80[6]	800	CL09+RT22J
75	131	FE160	160	1699	CK85B+RT32E	75	110	FE160	125	1430	CK85B+RT32D	75	80	FD/FE160	80[6]	1040	CL09+R2T2L
90	163	FE250	250	2500	CK95B+RT32F	90	130	FE160	160	1690	CK95B+RT32E	90	100	FD/FE160	100	1300	CK85B+RT22M
110	188	FE250	250	2500	CK95B+RT5LB	110	156	FE160	160	2028	CK95B+RT32F	110	120	FE160	125	1560	CK85B+RT32E
132	225	FE250	250	2922	CK95B+RT5LB	132	190	FE250	250	2500	CK95B+RT5LB	132	140	FE160	160	1820	CK95B+RT32F
160	300	FG400	400	3900	CK10B+RT5LC	160	228	FE250	250	2964	CK95B+RT5LB	160	175	FE250	250	2100	CK95B+RT32F
200	360	FG400	400	4680	CK12B+RT5LD	200	281	FG400	400	3653	CK10B+RT5LC	200	220	FE250	250	2860	CK10B+RT5LB
220	400	FG630	500	5200	CK12B+RT5LD	220	310	FG400	400	4030	CK10B+RT5LC	220	240	FG400	250	3120	CK10B+RT5LB
250	462	FG630	500	6004	CK12B+RT5LD	-	-	-	-	-	-	250	270	FG400	400	3510	CK10B+RT5LC
300	509	FK800	800	6619	CK13B+RT5LE	-	-	-	-	-	-	-	-	-	-	-	-
315	529	FK800	800	6880	CK13B+RT5LE	315	445	FG630	500	5785	CK12B+RT5LD	-	-	-	-	-	-
335	563	FK800	800	6754	CK13B+RT5LE	335	460	FG630	500	5980	CK12B+RT5LD	335	335	FG400	400	4355	CK10B+RT5LC
355	596	FK800	800	6560	CK13B+RT5LE	355	500	FK800	800	6500	CK13B+RT5LE	-	-	-	-	-	-
375	630	FK800	800	6930	CK13B+RT5LE	375	530	FK800	800	6890	CK13B+RT5LE	375	400	FG630	500	5200	CK12B+RT5LD
-	-	-	-	-	-	400	570	FK800	800	6840	CK13B+RT5LE	-	-	-	-	-	-
-	-	-	-	-	-	450	630	FK800	800	7560	CK13B+RT5LE	450	480	FG630	500	6240	CK12B+RT5LD
-	-	-	-	-	-	-	-	-	-	-	-	500	530	FK800	800	6360	CK13B+RT5LE
-	-	-	-	-	-	-	-	-	-	-	-	560	580	FK800	800	6380	CK13B+RT5LE

Protection of LV/LV transformers

Transformers generally produce a very high inrush current. The crest value of the first half cycle may reach values of 15 to 25 times the effective rated current.
For a protective device capable of protecting these units this must be taken into account. Manufacturers data and tests have indicated that a protective device feeding a transformer must be capable of carrying the following current values without tripping (see graph insert).

Transformer value	Maximum crest inrush values		
	1st period 5 ms	2nd period 25 ms.	after 3 periods 45 ms.
< 50 kVA	25 x In	12 x In	5 x In
≥ 50 kVA	15 x In	8 x In	3.5 x In

Record Plus™ circuit breakers have been designed to cope with this kind of phenomenae. The adjacent table indicates the types to select, based on the breaker characteristics, the transformer ratings and the above mentioned inrush current prognoses.



Protection of LV/LV transformers with Record Plus circuit breakers

Transformer ratings						Record Plus breaker choice		
1ph 230V		3ph 230V 1ph 400V		3ph 400V		Type	Trip unit type & rating	Ist *
kVA	In	kVA	In	kVA	In			
2.5	10	4	10	6.3	9	FD160N,FD160H or L	LTMD-25	250
4	11	5	12	8	12	FD160N,FD160H or L	LTMD-25	250
5	17	6.3	16	10	14	FD160N,FD160H or L	LTMD-32	320
		8	20	12.5	18	FD160N,FD160H or L	LTMD-32	320
6.3	27	10	24	16	23	FD160N,FD160H or L	LTMD-40	400
8	34	12.5	30	20	28	FD160N,FD160H or L	LTMD-50	500
10	42	16	39	25	35	FD160N,FD160H or L	LTMD-63	630
12.5	53	20	49	31.5	44	FD160N,FD160H or L	LTMD-80	800
		25	61	40	56	FD160N,FD160H or L	LTMD-100	1000
16	68			50	70	FD160N,FD160H or L	LTMD-125	1250
20	84	31.5	77			FD160N,FD160H or L	LTMD-125	1250
		40	98	63	89	FE160N, H or L	SMR1-125	
25	105	50	122	80	113	FE160N, H or L	SMR1-125	
31.5	133	63	154	100	141	FE160N, H or L	SMR1-160	
40	169	80	195	125	176	FE250N, H or L	SMR1-250	
50	211	100	244	160	225	FE250N, H or L	SMR1-250	
63	266	125	305	200	287	FG400N, H or L	SMR1-350	
80	338	160	390	250	352	FG400N, H or L	SMR1-350	
100	422			315	444	FG630N, H or L	SMR1-500	
125	528			400	563	FG630N, H or L	SMR1-630	
160	675			500	704	FK800N or H	SMR- 800	
				630	887	FK1250N or H	SMR-1000	
				800	1126	FK1250N or H	SMR-1250	
				1000	1408	FK1600N or H	SMR-1600	

* Magnetic threshold of breaker

Protection of capacitor banks
(power factor improvement units)

For circuit breakers and particularly for the ***Record Plus™*** device, designed to offer high making and breaking capacities under adverse conditions, the switching of capacitor banks has little to no effect on the breaker, its characteristics as a protective device, or on its lifespan.

However, the current flowing in the circuit can trip a circuit breaker and a capacitor load displays certain anomalies. In a circuit with capacitors the maximum current flow in the circuit cannot be assumed to be the calculated capacitor current only. The effective value must be increased due to harmonic content (a factor normally taken as 30%) and an allowance for the tolerances in the capacitance of the unit itself. (10% assumed).

In order to protect these devices without running into regular nuisance tripping due to overloads please refer to the adjacent table in which the correct ***Record Plus™*** breaker is specified to protect and switch the indicated capacitor banks at several different voltages.

Un = 230V (phase to phase voltage)

Capacitor rating (kVAr)	*Record Plus* breaker	Ir setting (min)
5	FD160N, FD160H or L	18 A
7.5	FD160N, FD160H or L	27 A
10	FD160N, FD160H or L	36 A
12.5	FD160N, FD160H or L	45 A
15	FD160N, FD160H or L	54 A
20	FD160N, FD160H or L	72 A
25	FD160N, FD160H or L	90 A
30	FD160N, FD160H or L	108 A
35	FD160N or FE160N, H or L	126 A
40	FE160N, H or L	144 A
45	FE250N, H or L	162 A
50	FE250N, H or L	179 A
60	FE250N, H or L	215 A
75	FG400N, H or L	269 A
90	FG400N, H or L	323 A
100	FG400N, H or L	359 A
120	FG630N, H or L	431 A
150	FG630N, H or L	538 A
180	FK800N or H	646 A

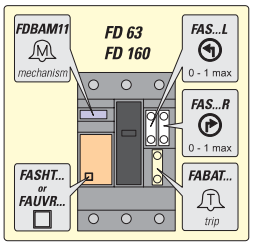
Un = 400V (phase to phase voltage)

Capacitor rating (kVAr)	*Record Plus* breaker	Ir setting (min)
10	FD160N, FD160H or L	21 A
15	FD160N, FD160H or L	31 A
20	FD160N, FD160H or L	41 A
25	FD160N, FD160H or L	52 A
30	FD160N, FD160H or L	62 A
35	FD160N, FD160H or L	72 A
40	FD160N, FD160H or L	83 A
45	FD160N, FD160H or L	93 A
50	FD160N, FD160H or L	103 A
60	FD160N, FD160H or L	124 A
70	FD160N or FE160N, H or L	144 A
80	FE250,N,H or L	165 A
90	FE250N, H or L	186 A
100	FE250N, H or L	206 A
120	FE250N, H or L	248 A
140	FG400N, H or L	289 A
160	FG400N, H or L	330 A
180	FG400N, H or L	372 A
200	FG630N, H or L	413 A
250	FG630N, H or L	516 A
300	FG630N, H or L	619 A
350	FK800N or H	722 A

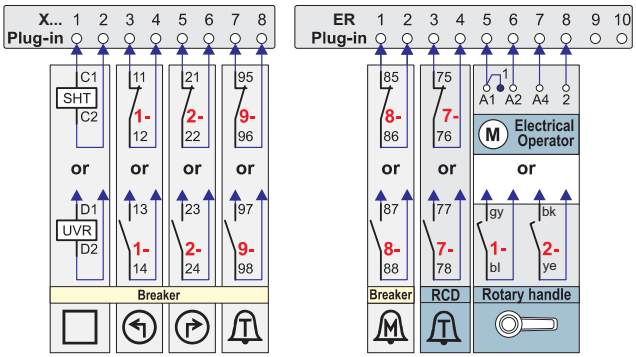
Just rel

Recommended wiring diagrams

FD frame, plug in device (8 & 10 pole connectors)

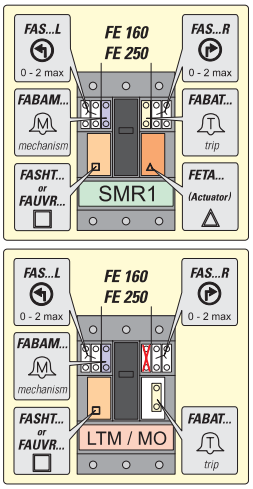


Recommended connection scheme on **Plug-in**

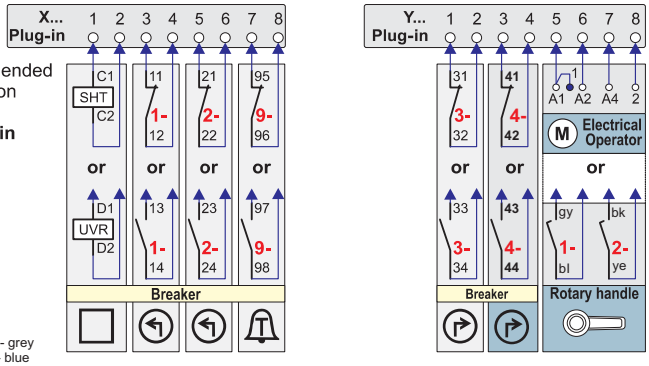


gy - grey
bl - blue
bk - black
ye - yellow

FE frame, plug in device (8 pole connectors)

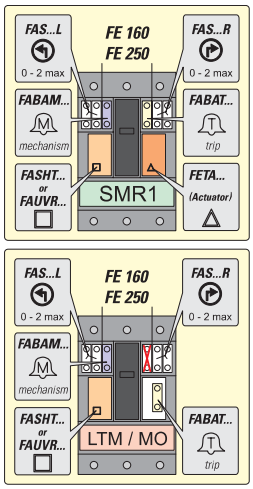


Recommended connection scheme on **Plug-in**

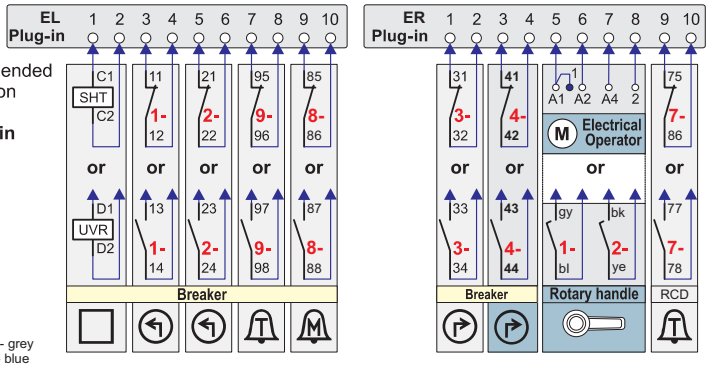


gy - grey
bl - blue
bk - black
ye - yellow

FE frame, plug in device (10 pole connectors)

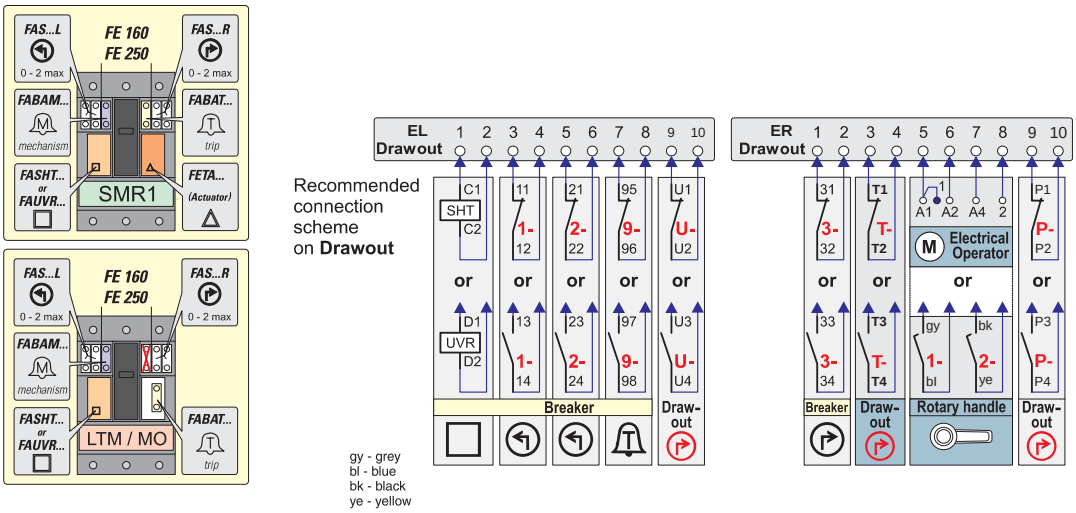


Recommended connection scheme on **Plug-in**

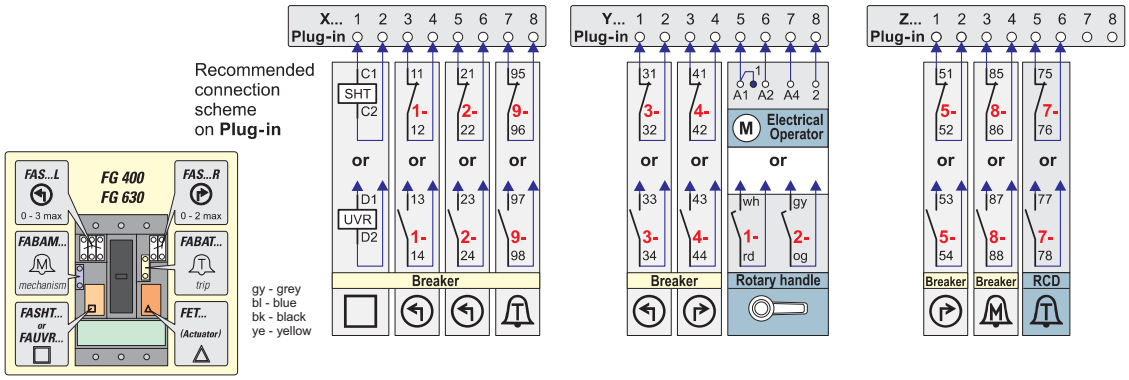


gy - grey
bl - blue
bk - black
ye - yellow

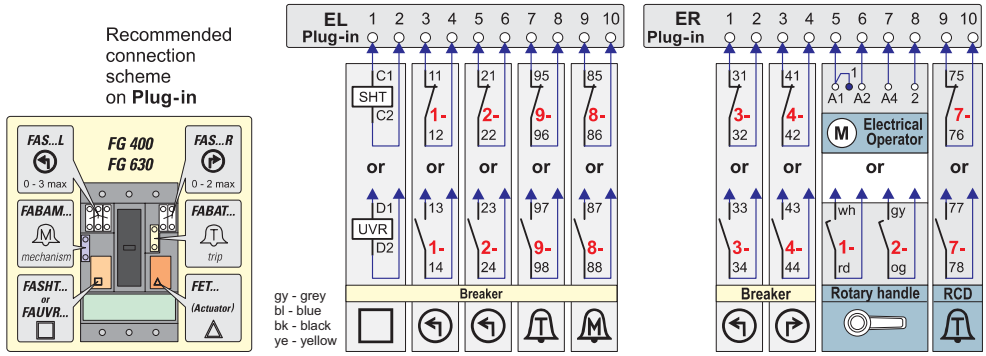
FE frame, draw out device (10 pole connectors)



FG frame, plug in device (8 pole connectors)

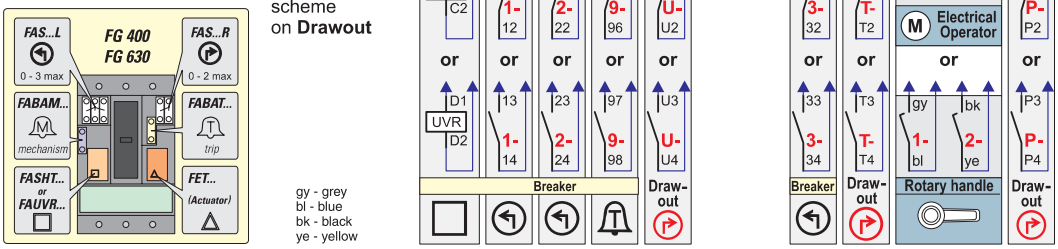


FG frame, plug in device (10 pole connectors)

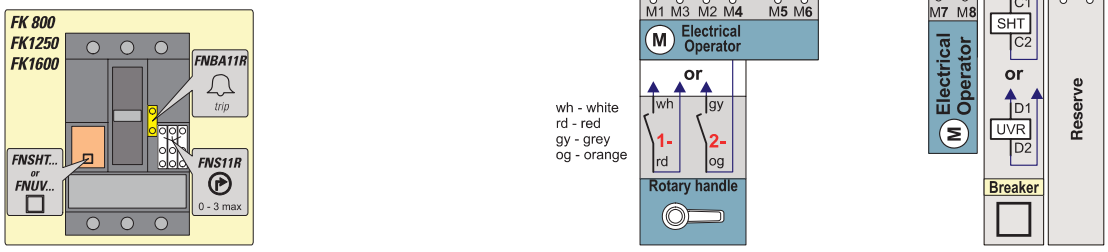


Recommended Wiring diagrams

FG frame, draw out device (10 pole connectors)

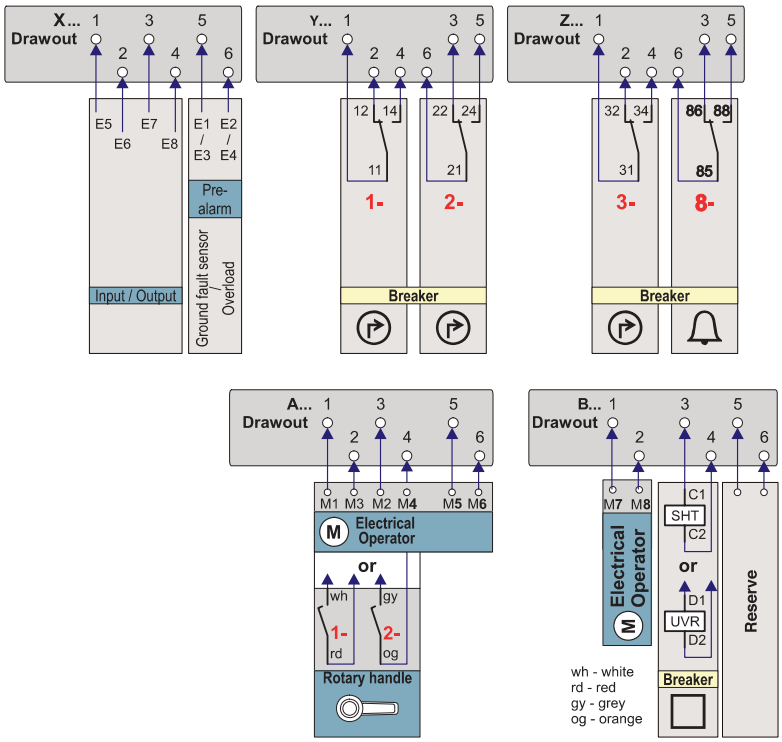


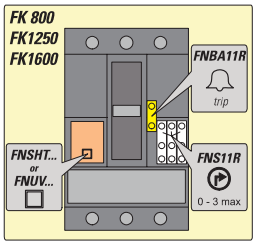
FK frame 3 pole, draw out device (6 pole connectors)



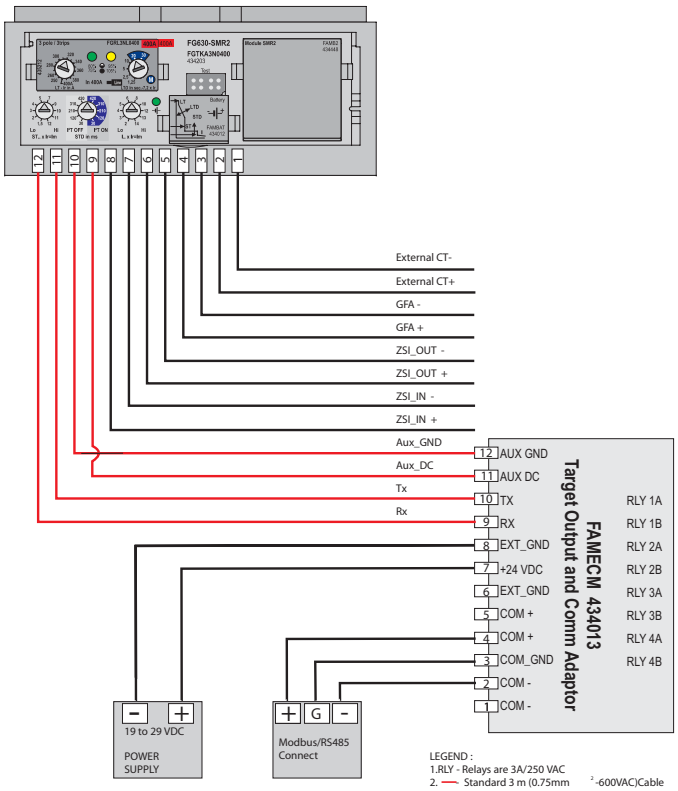
FK frame 4 pole, draw out device (6 pole connectors)

Recommended connection scheme on **Drawout**





FG frame, SMR 2 trip unit connection



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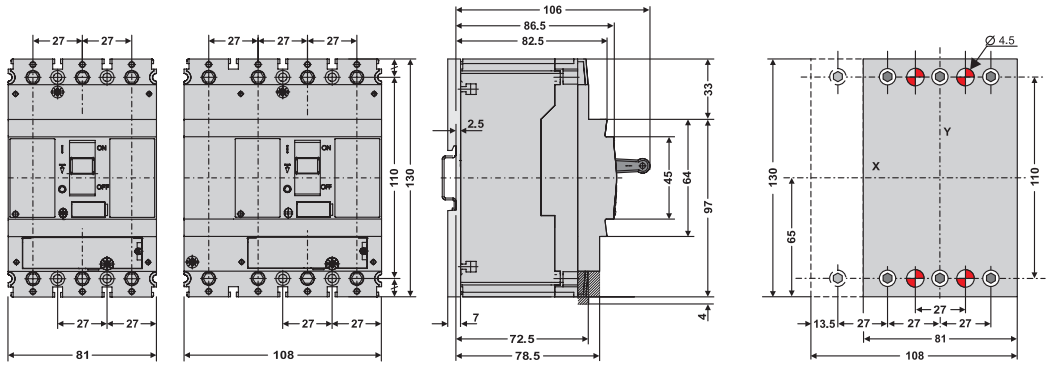
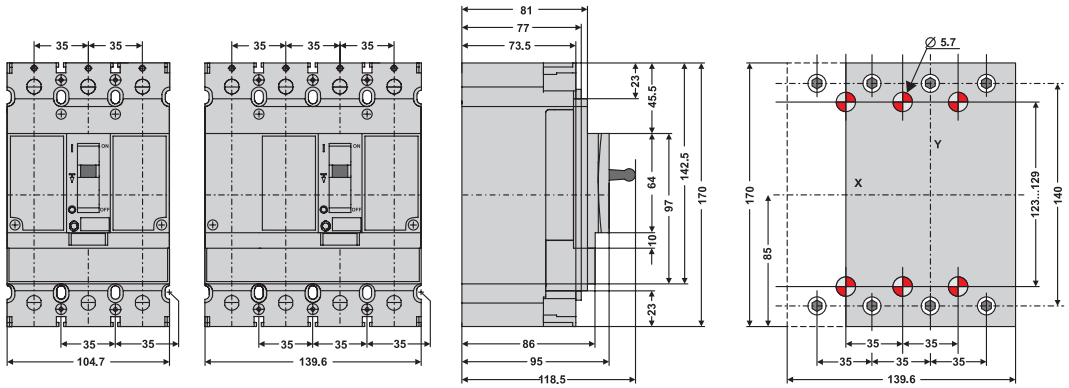
Dimensional Drawings

Breakers - FD63/160 fixed, front connected

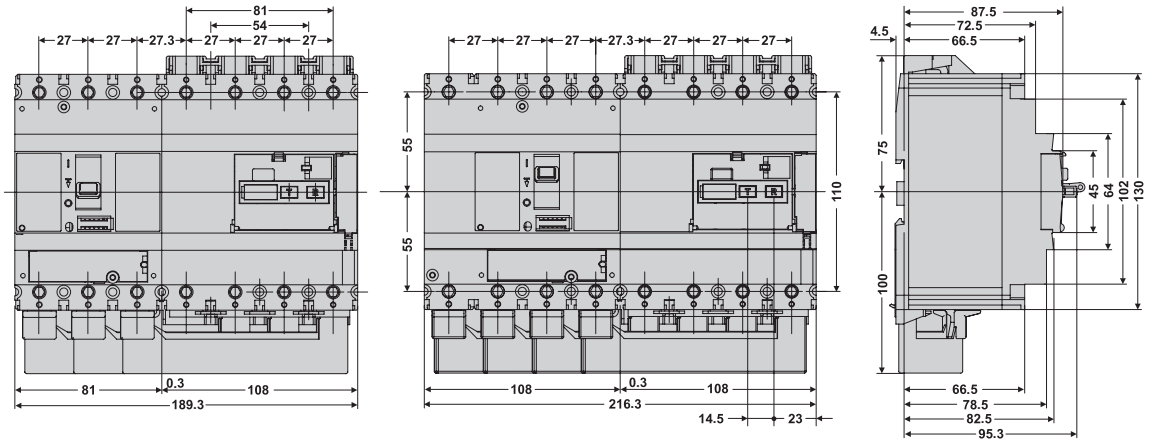


Breakers - FE160 and FE250 fixed, front connected

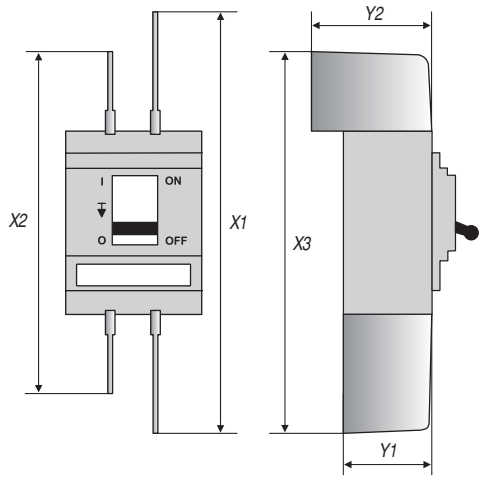


Dimensional Drawings

RCD side mounted - FD63/160



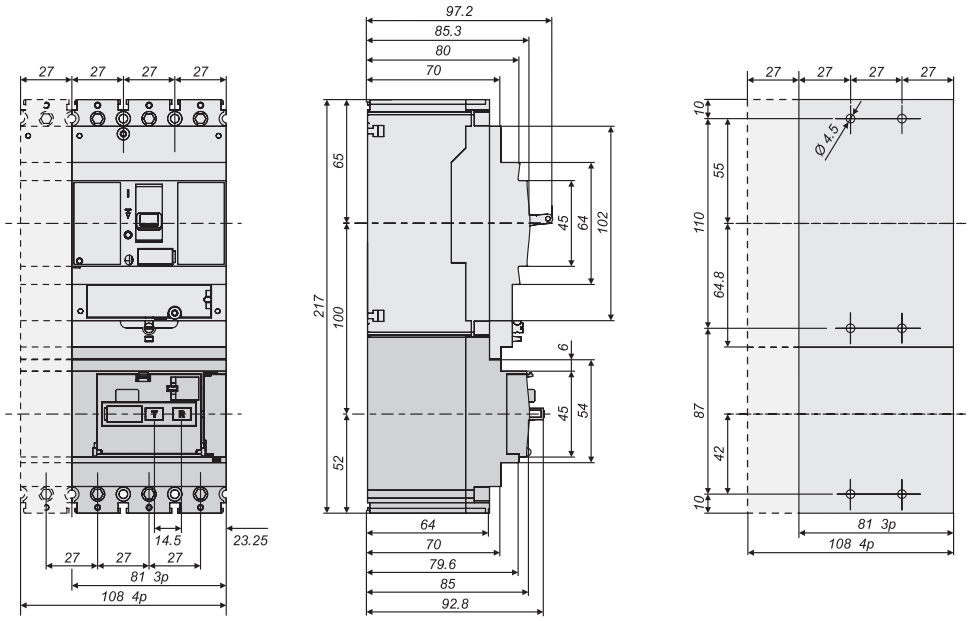
Breakers with phase separator - FD and FE frames



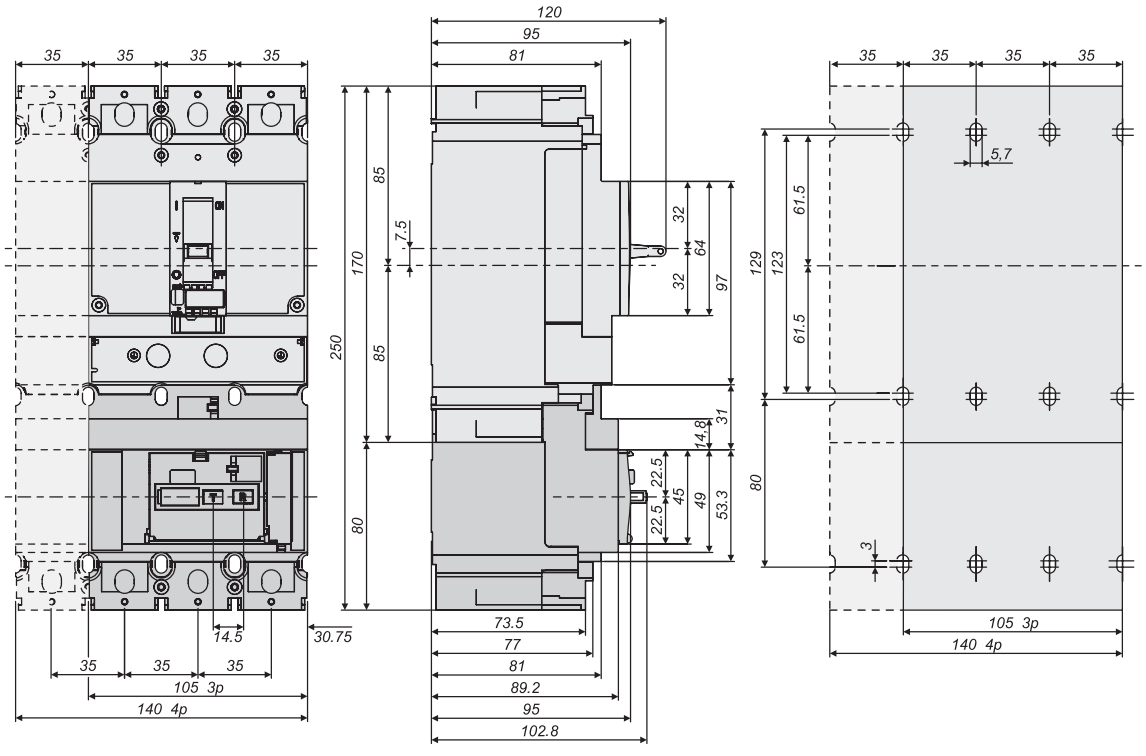
Dimensions	FD63 FD160	FE160 FE250
X1	330	410
X2	245	304
X3	287,5	357
Y1	63	72,5
Y2	105,5	126

Dimensional Drawings

RCD bottom mounted - FD63/160

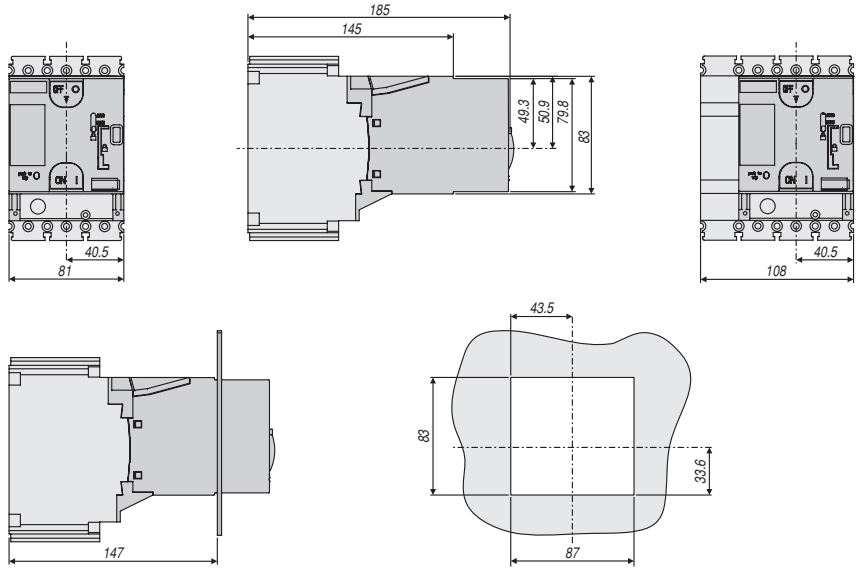


RCD bottom mounted - FE160 and FE250

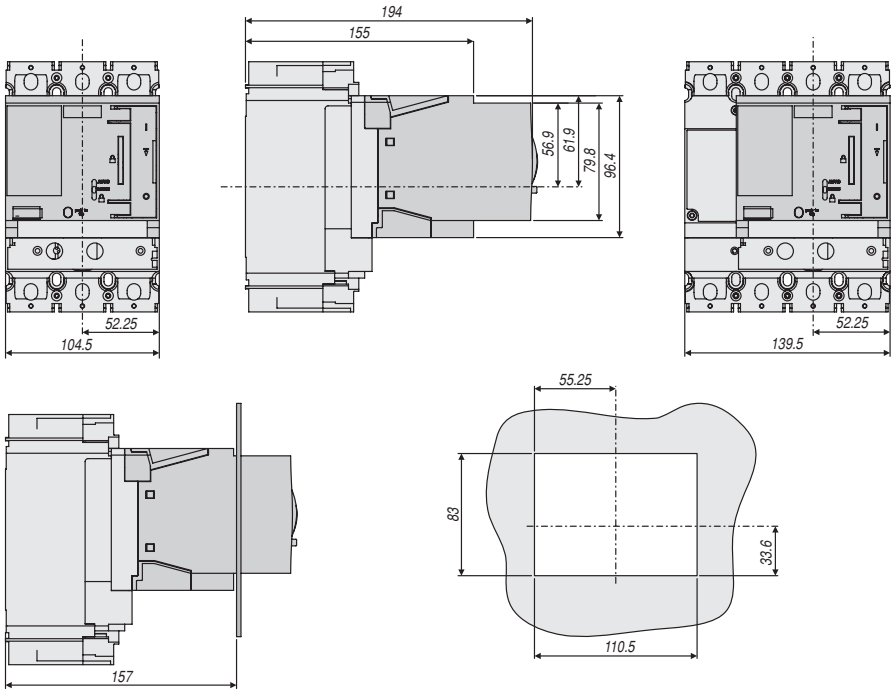


Dimensional Drawings

Breakers with electrical operator - FD63/160

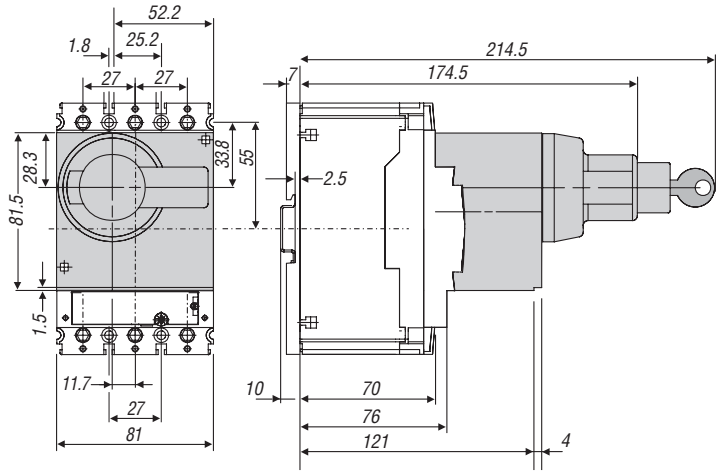


Breakers with electrical operator - FE160 and FE250

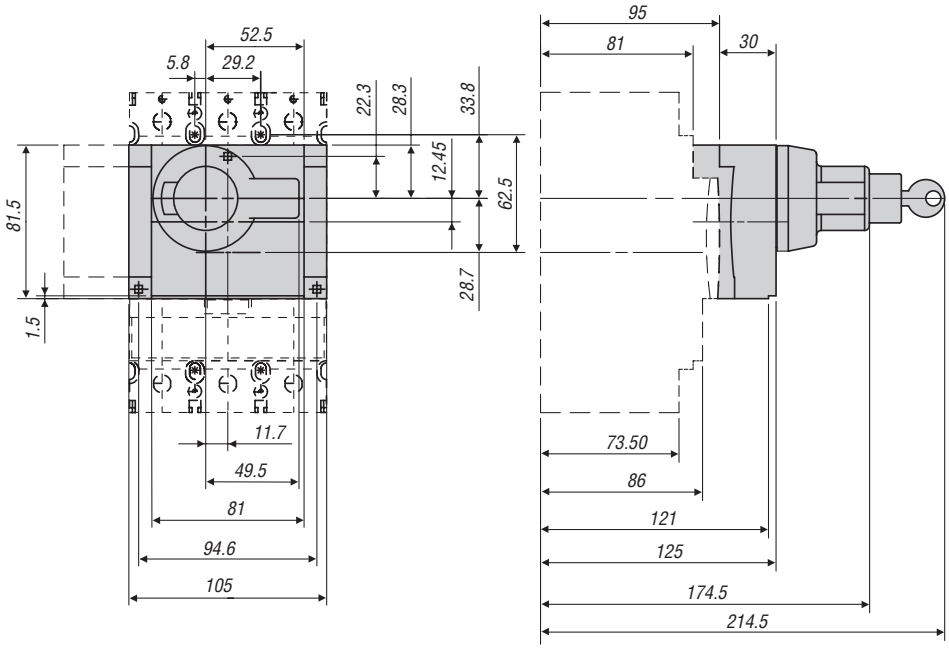


Dimensional Drawings

Rotary handle - Breaker and through panel mounted - FD63/160

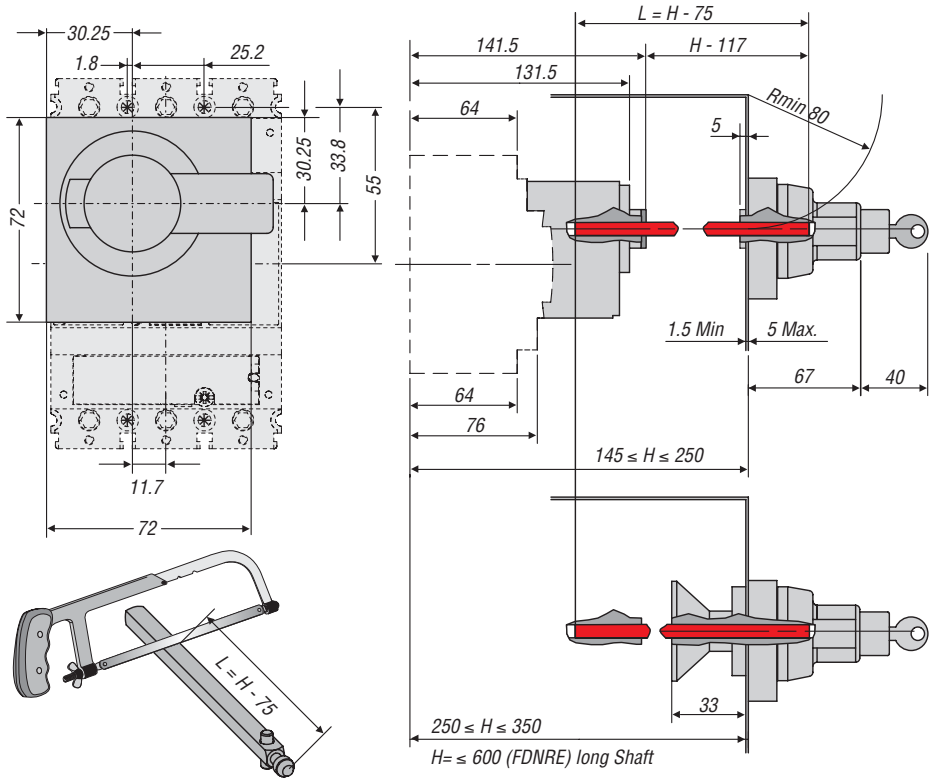


Rotary handle - Breaker and through panel mounted - FE160 and FE250

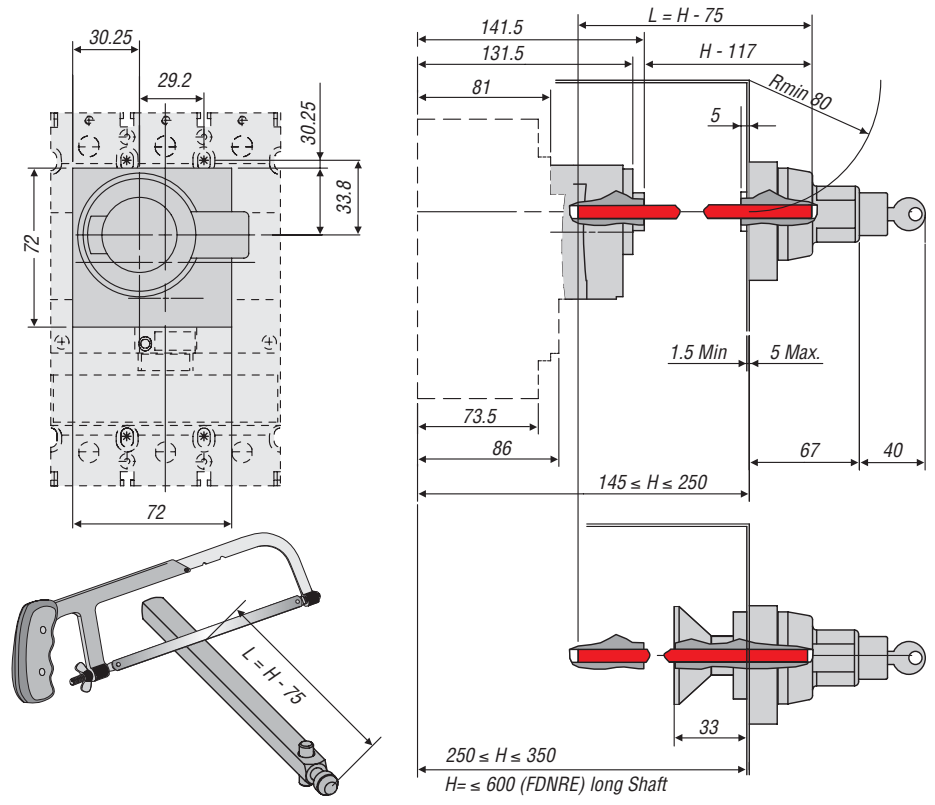


Dimensional Drawings

Rotary handle - Door mounted FD63/160

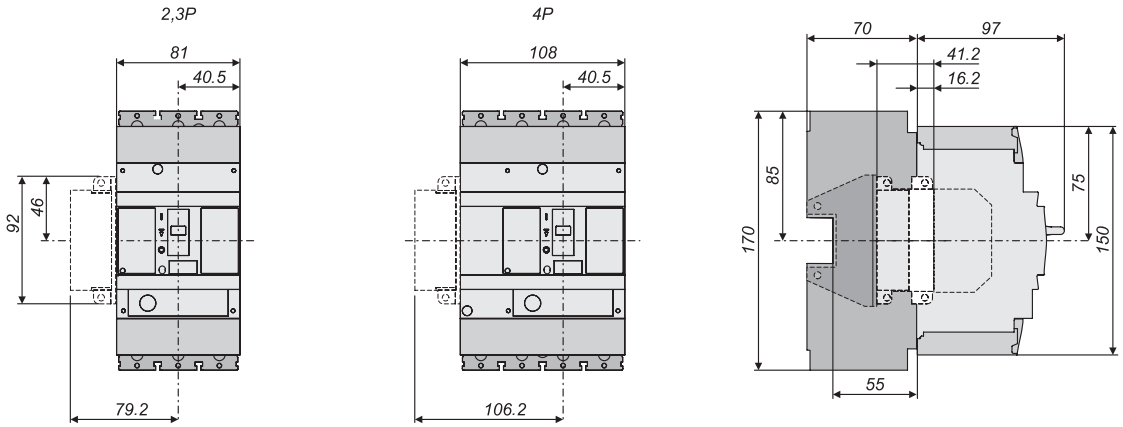


Rotary handle - Door mounted - FE 160 and FE250

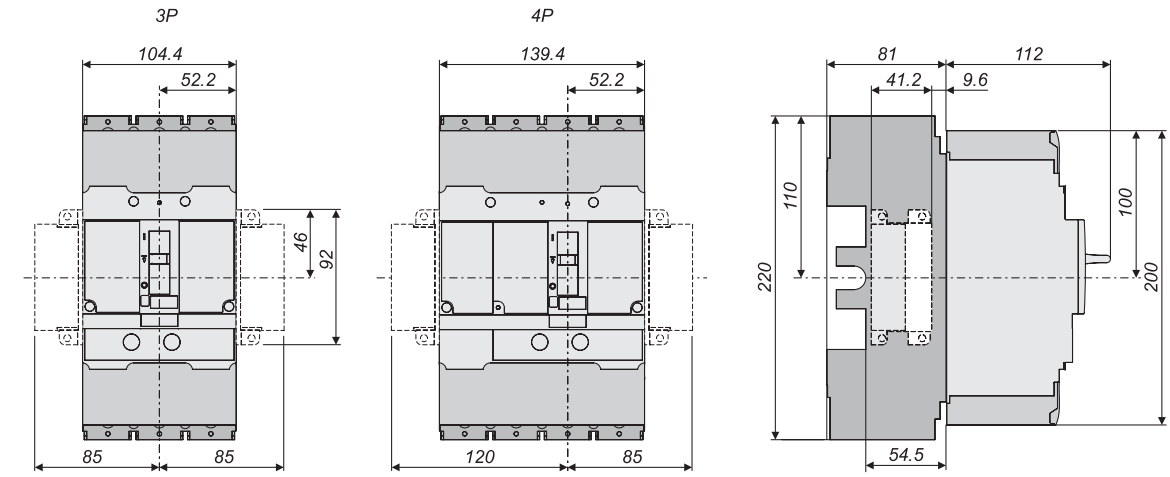


Dimensional Drawings

Plug-in version - FD63/160

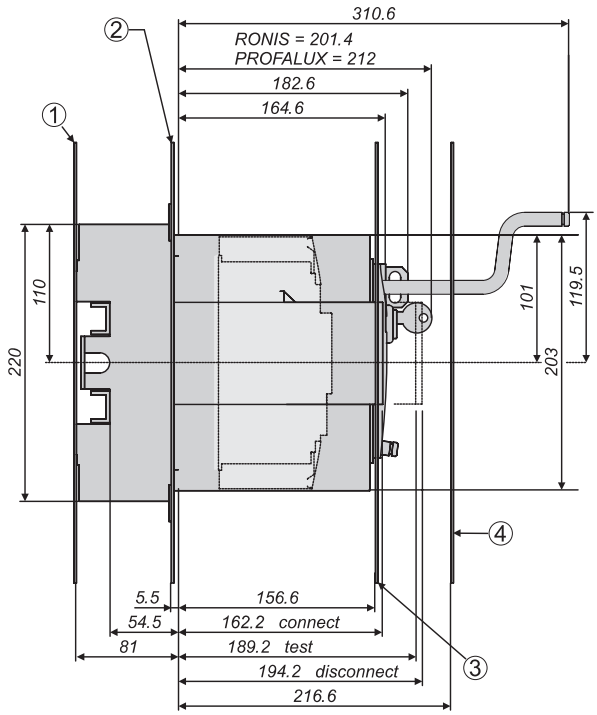


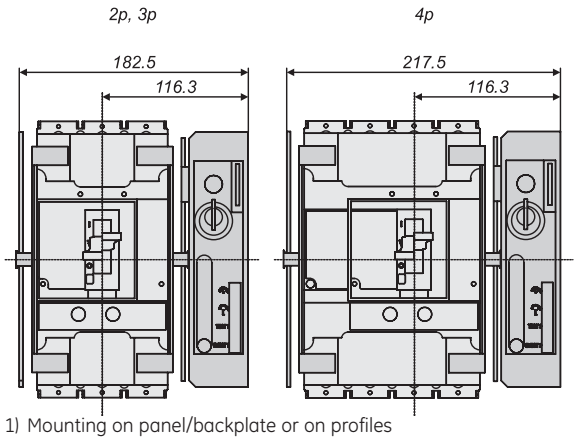
Plug-in version - FE160 and FE250



Dimensional Drawings

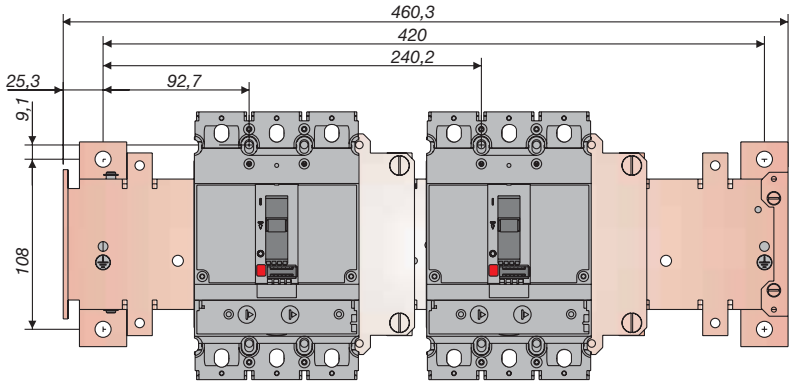
Drawout version - FE160 and FE250

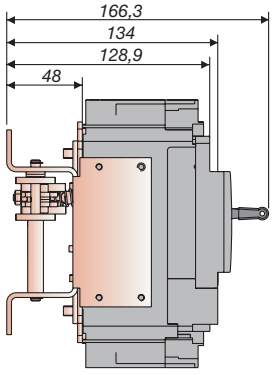




1) Mounting on panel/backplate or on profiles
2) Mounting through a front panel
(all electrical connection behind panel)
3) Mounting of device through door or panel
(parts for operating the drawout mechanism/breaker pass through the door or panel*)
*Here a door flange (model for rotary handle) can be used
4) Mounting of device behind door or panel
(all parts for operating the drawout mechanism/breaker behind the door or panel)

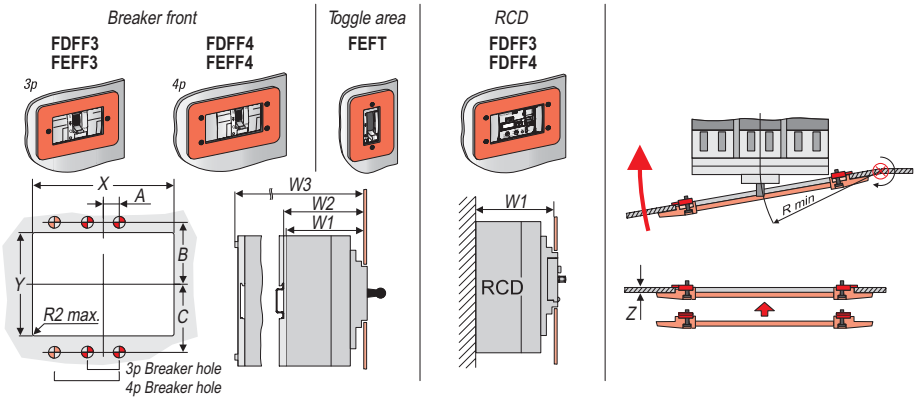
FE Frame, 2 pcs. mechanically interlocked





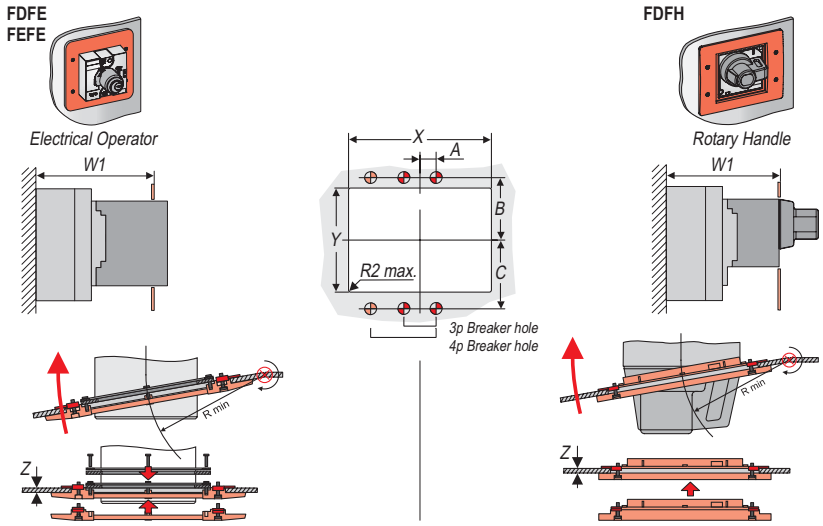
Dimensional Drawings

Door flanges - FD63/160, FE160 and FE250



Dimensions												
			A	B	C	Rmin	W1(max)	W2(max)	W3(max)	X	Y	Z
FDFF3	FD 63/160	3p	13,5	55	55	80	83,2	85,8	93,2	114	78	1...4
FDFF4	FD 63/160	4p	13,5	55	55	93,5	83,2	85,8	93,2	146	78	1...4
FEFF3	FE160/250	3p	17,5	55,5	70,5	91,75	89,2	-	-	138	97	1...4
FEFF4	FE160/250	4p	17,5	55,5	70,5	102,5	89,2	-	-	173	97	1...4
FEFT	FE 160/250	3p/4p	17,5	55,5	70,5	93,5	93,2	-	-	60	97	1...4
FDFF3 (RCD*)	FD63/160	3p	13,5	155	42	80	83,2	85,8	93,2	114	78	1...4
FDFF4 (RCD*)	FD63/160	4p	13,5	155	42	93,5	83,2	85,8	93,2	146	78	1...4
FDFF3 (RCD*)	FE160/250	3p/4p	18	182,1	42	80	89,2	-	-	114	78	1...4

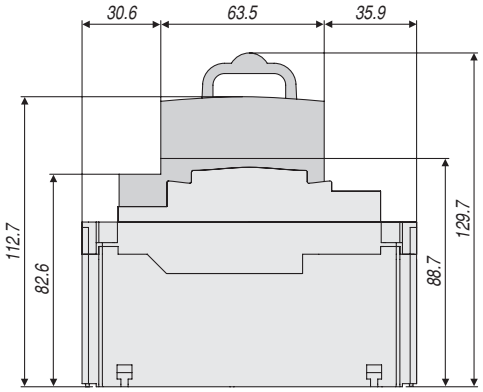
Door flanges - FD63/160, FE160 and FE250



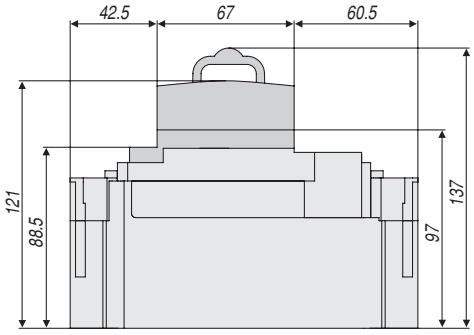
Dimensions									
3+4 pole versions		A	B	C	Rmin	W1(max)	X	Y	Z
FDFE	FD 63/160 Electr. Operator	13.5	49.5	64.5	80	141	148.5	124.5	1...4
FEFE	FE 160/250 Electr. Operator	17.5	46	80	100	170	172	124.5	1...4
FDFH	FD63/160 Rotary Handle	13.5	46,25	63.75	100	125	120	120	1...4
FEFH	FE 160/250 Rotary Handle	17.5	46.25	81.75	100	125	120	120	1...4

Dimensional Drawings

Padlock fixed - FD63/160

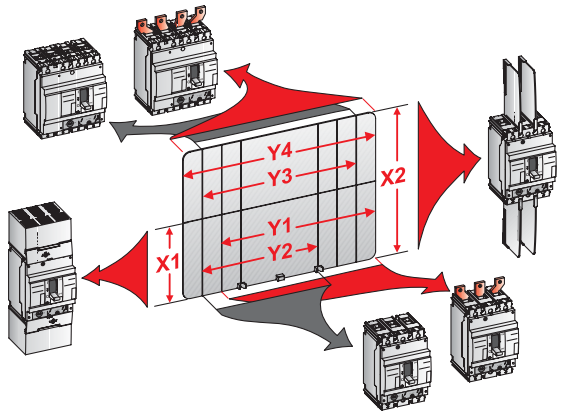


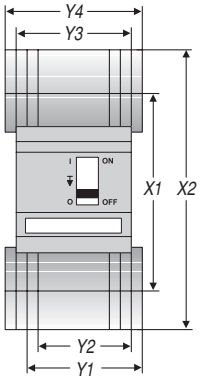
Padlock fixed - FE160 and FE250

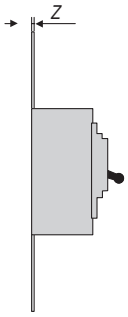


Dimensional Drawings

Backplate - FD63/160

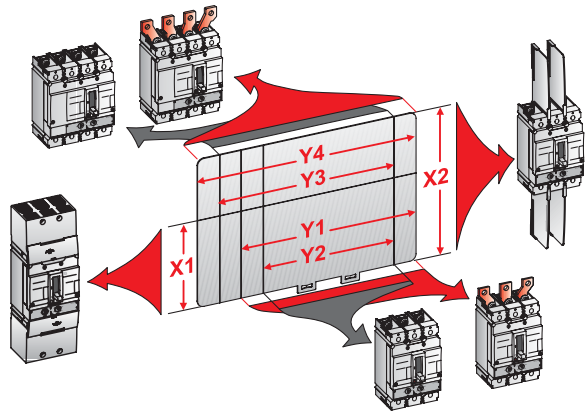


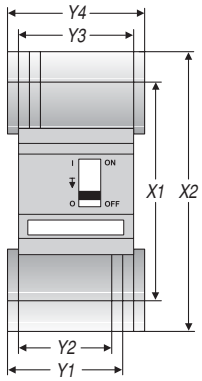


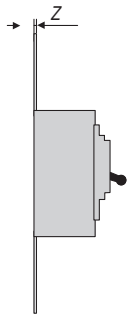


Dimensions	FD 63 FD 160
X1	230
X2	330
Y1	108
Y2	81
Y3	108
Y4	135
Z	1

Backplate - FE160 and FE250



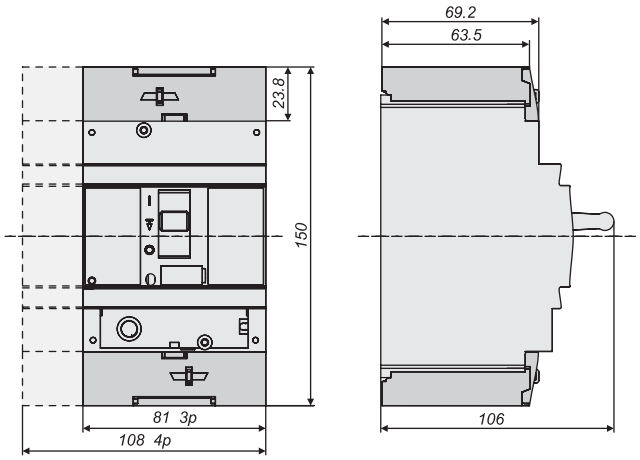




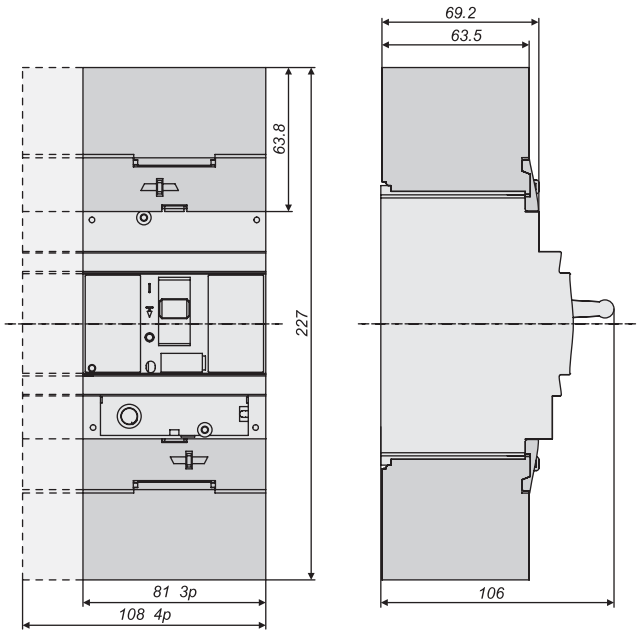
Dimensions	FE160 FE250
X1	310
X2	410
Y1	139.5
Y2	104.5
Y3	139.5
Y4	175
Z	1

Dimensional Drawings

Breaker with short terminal shields - FD63/160

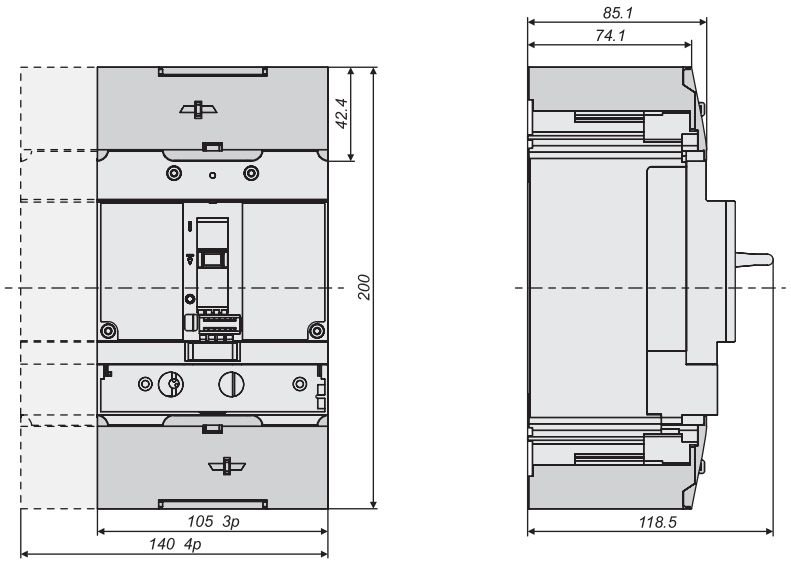


Breaker with long terminal shields - FD63/160

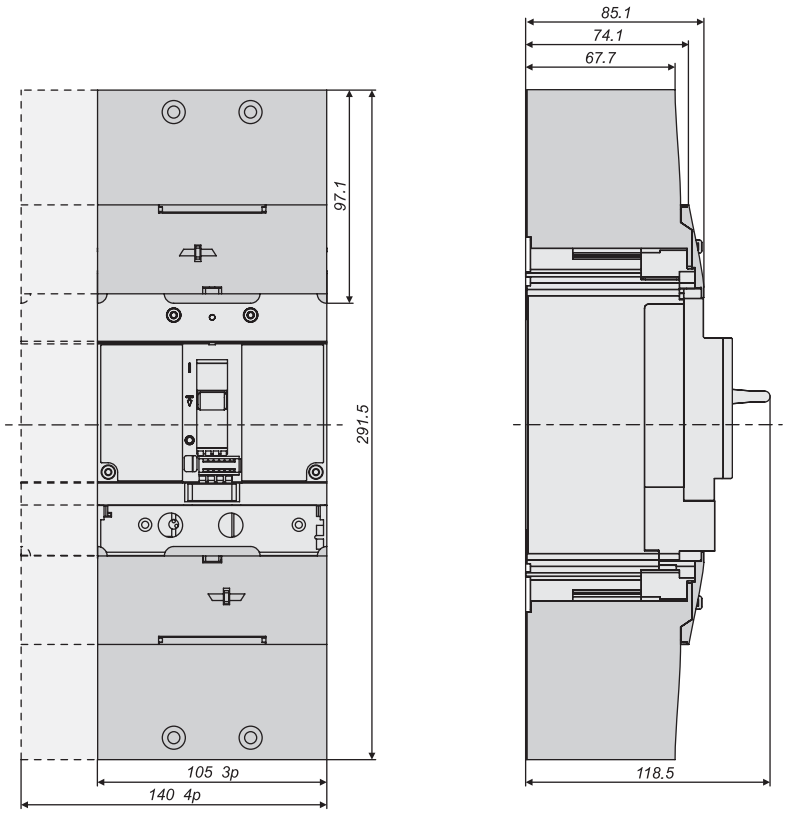


Dimensional Drawings

Breaker with short terminal shields - FE160 and FE250

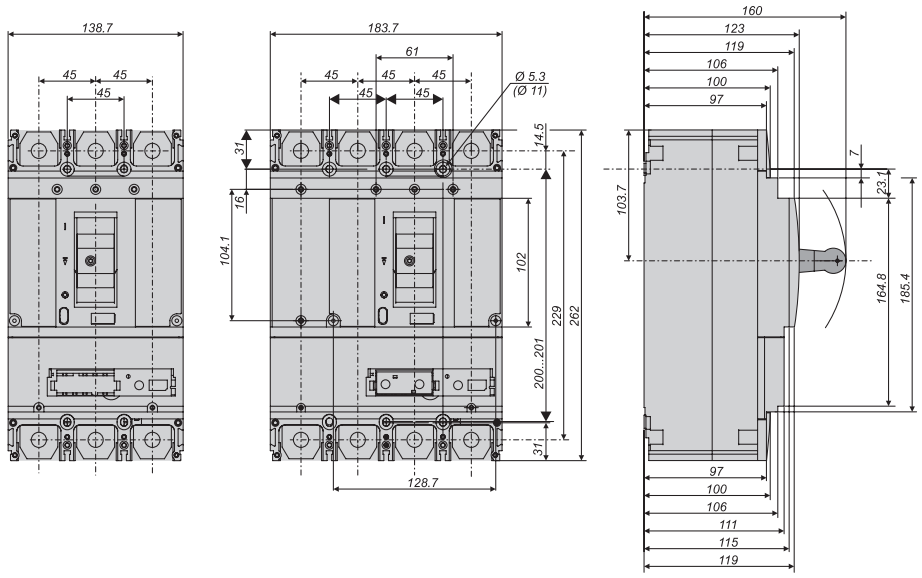


Breaker with long terminal shields - FE160 and FE250

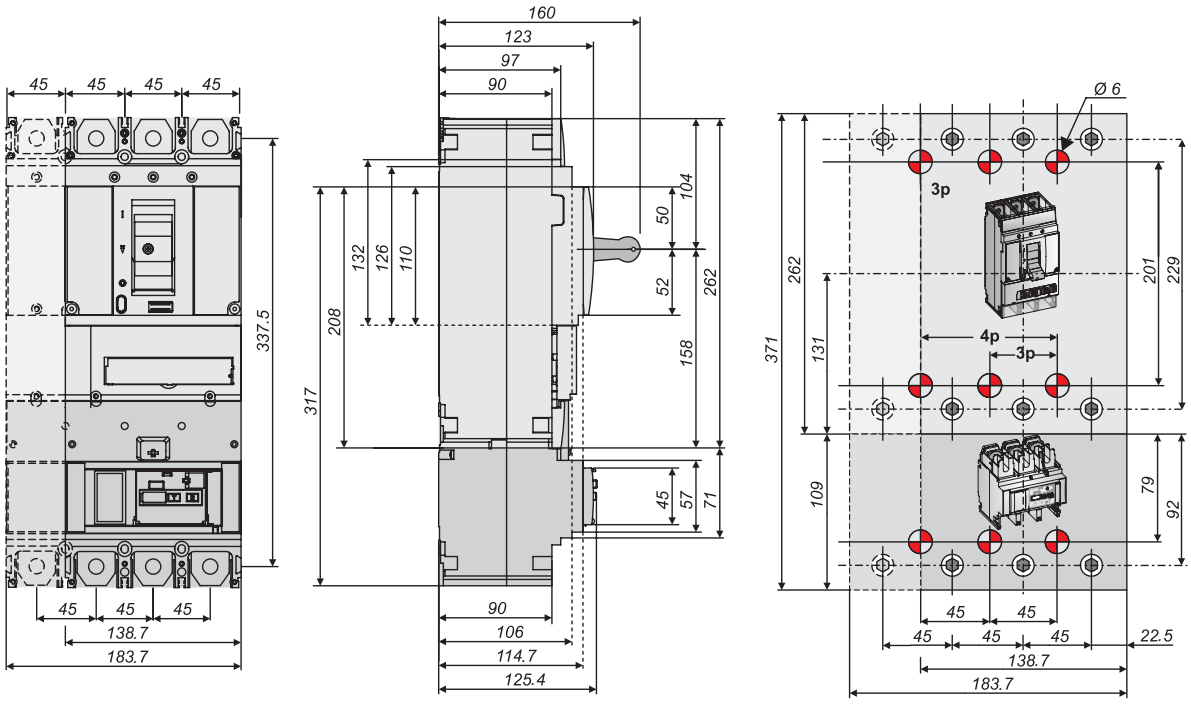


Dimensional Drawings

Breakers - FG400/630 fixed, front connected

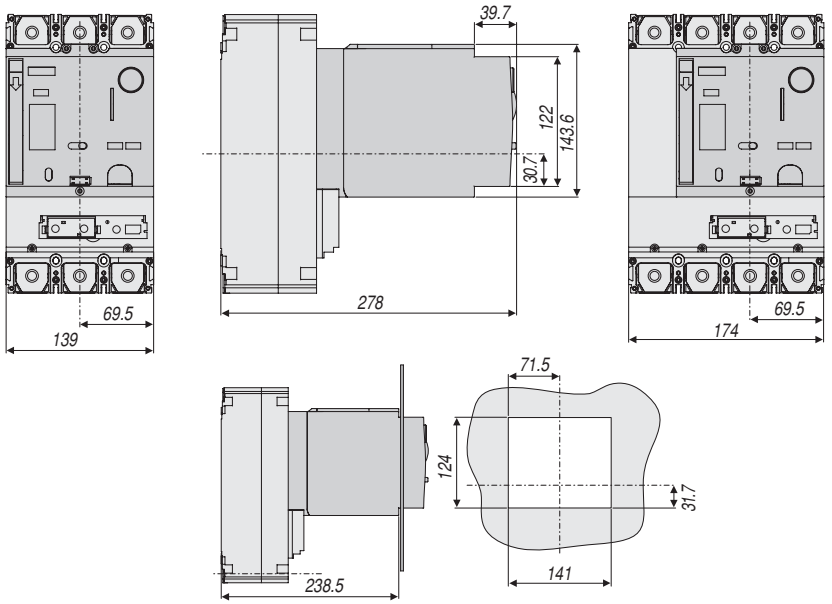


RCD bottom mounted - FG 400/630



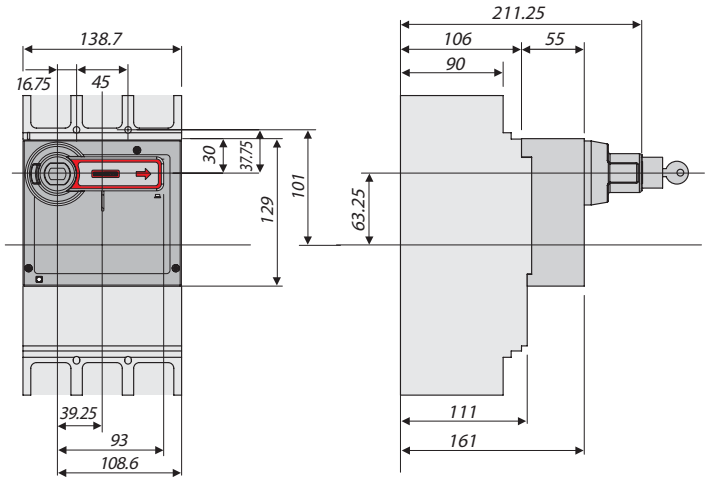
Dimensional Drawings

Breaker with electrical operator - FG400/630

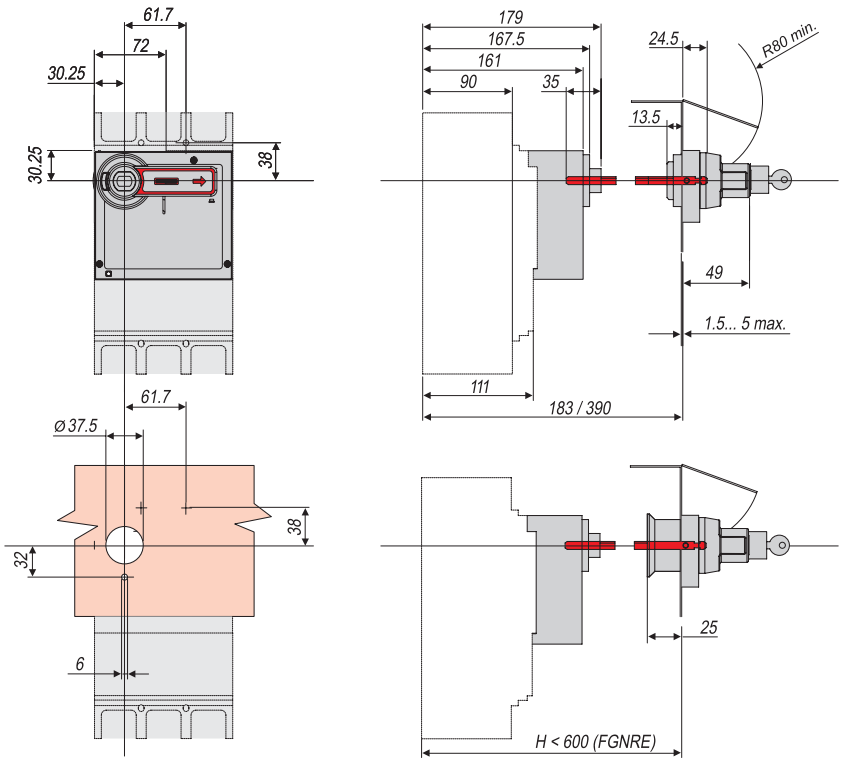


Dimensional Drawings

Rotary handle, breaker and through panel mounted - FG400/630

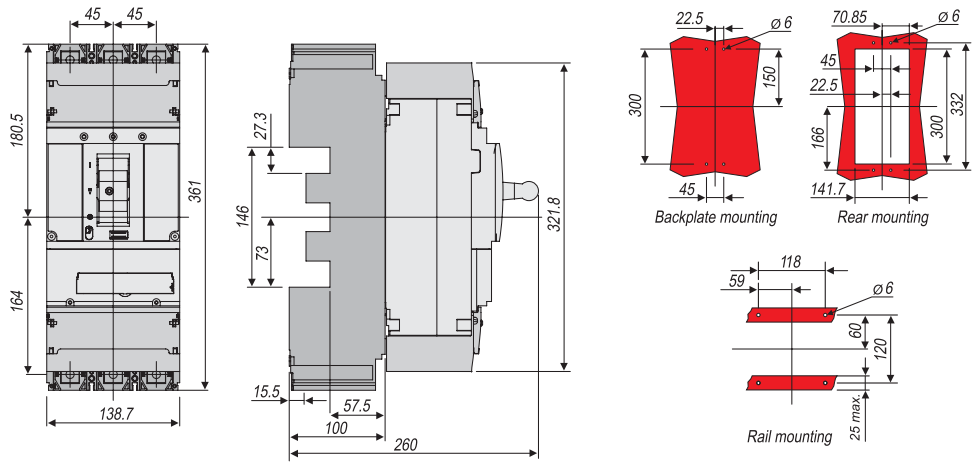


Rotary handle, door mounted - FG400/630

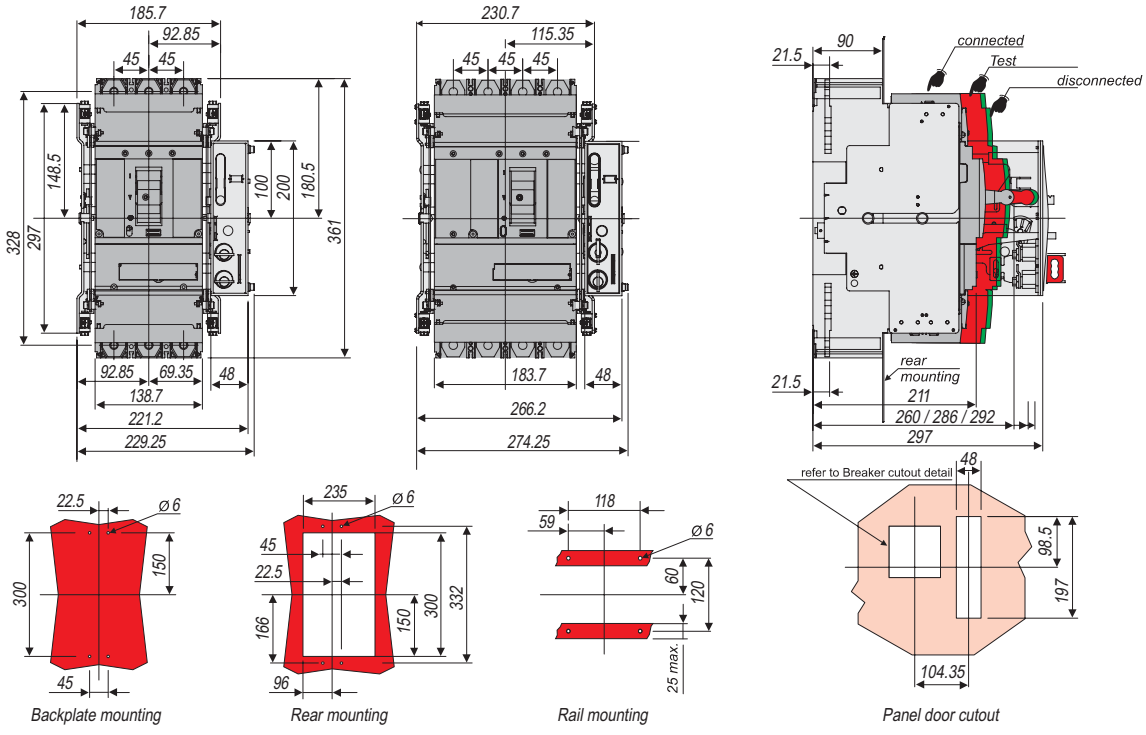


Dimensional Drawings

Plug-in version - FG400/630

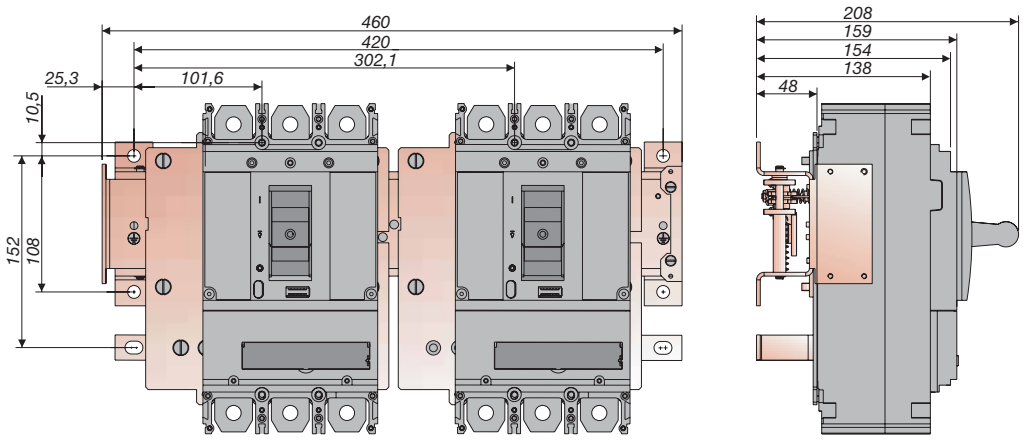


Drawout version - FG400/630

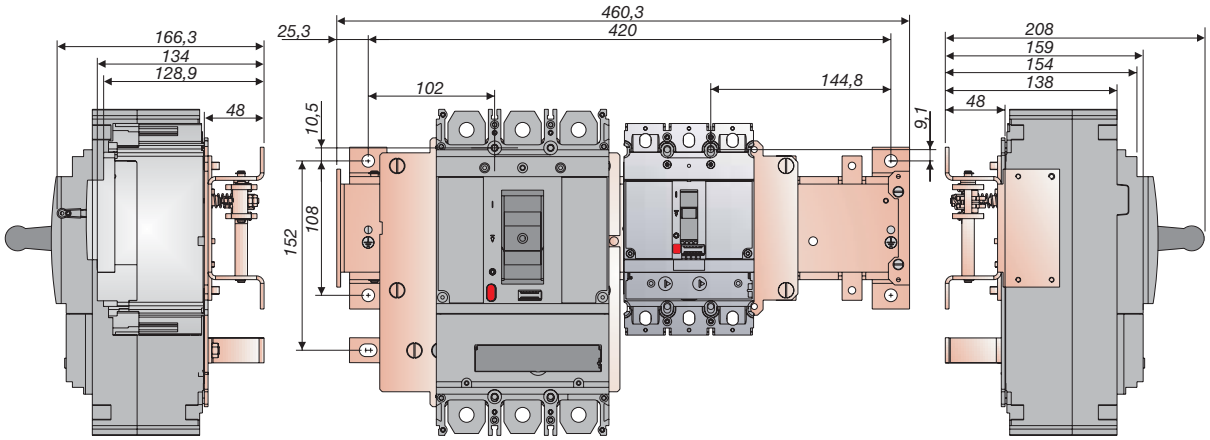


Dimensional Drawings

FG Frame, 2 pcs. mechanically interlocked

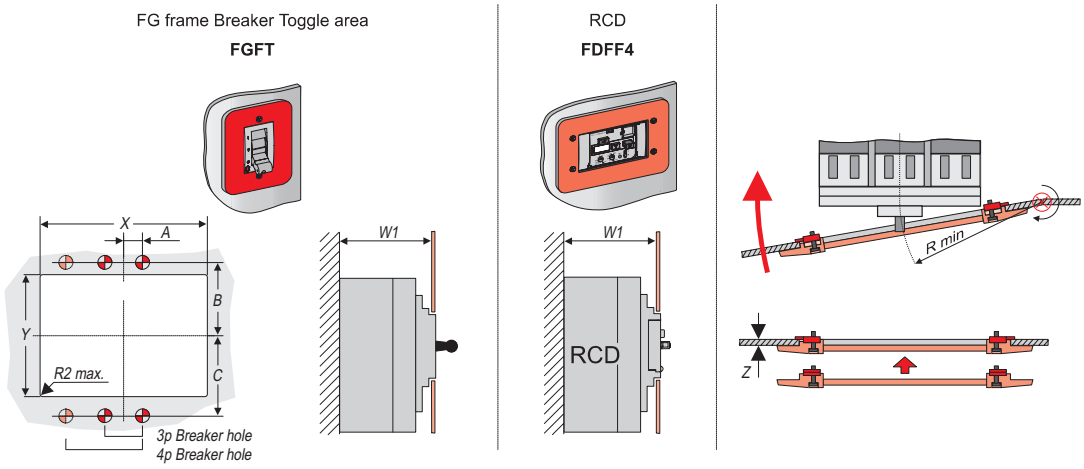


FG Frame and FE Frame. mechanically interlocked



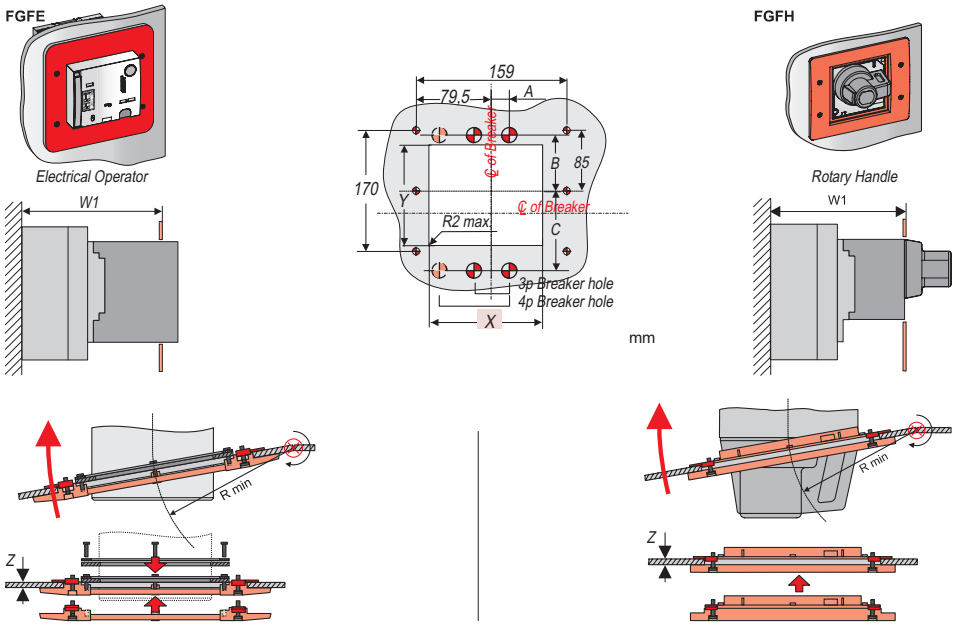
Dimensional Drawings

Door flanges - FG400/630



Dimensions										
			A	B	C	Rmin	W1(max)	X	Y	Z
FGFT	FG 400/630 Toggle	3p/4p	22.5	73	127	100	115	95	135	1...4
FDFF4	FG 400/630 RCD	3p/4p	22.5	297.5	68.5	93.5	115	146	78	1...4

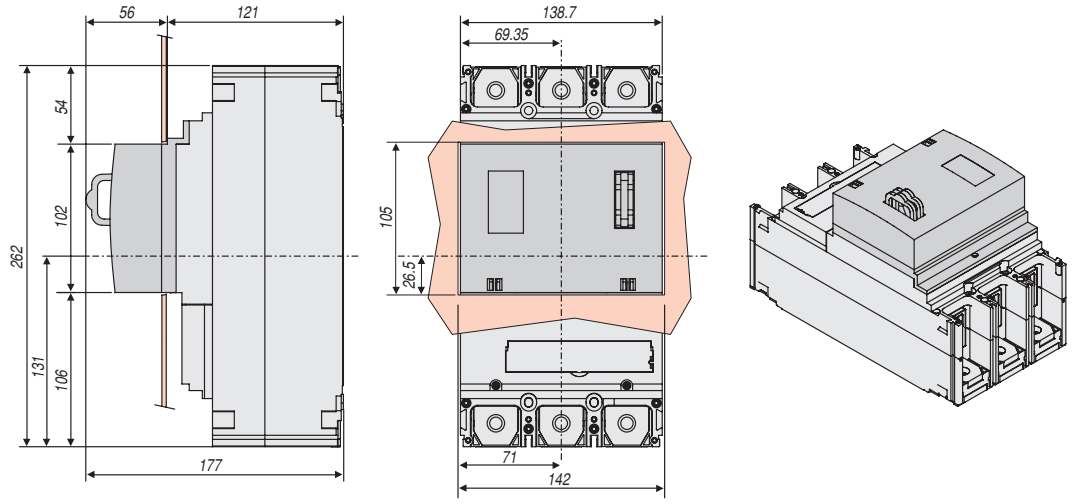
Door flanges - FG400/630



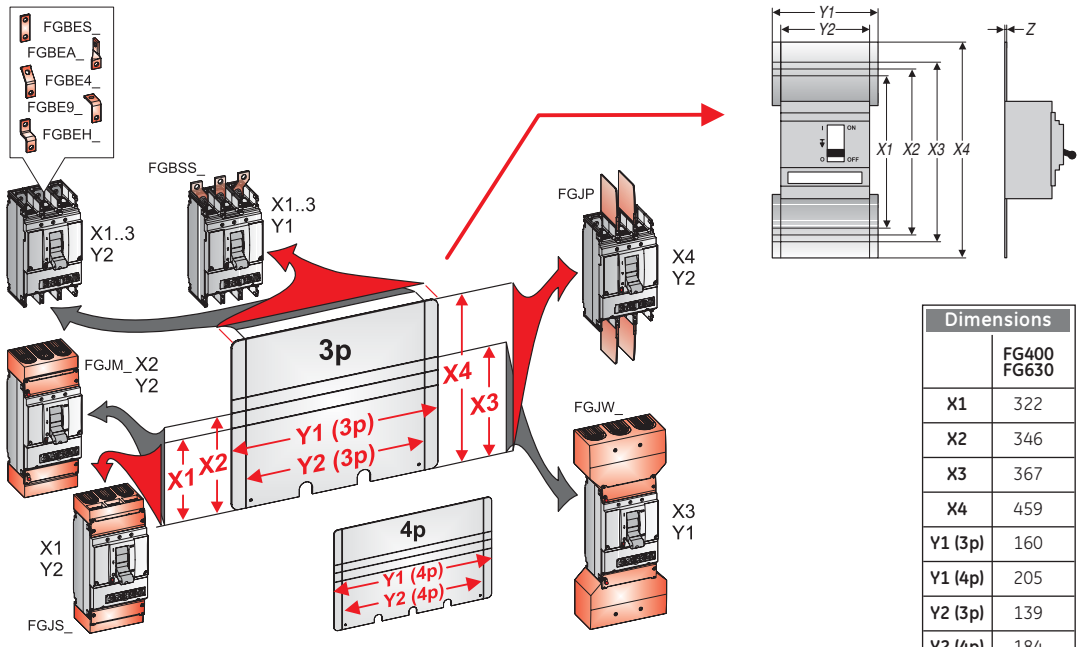
Dimensions									
3+4 pole versions		A	B	C	Rmin	W1(max)	X	Y	Z
FGFE	FG 400/630 Electr. Operator	70.5	85	145	100	238.5	41	126	1...4
FGFH	FG 400/630 Rotary Handle	22.5	72.5	129	115	161	191	181.5	1...4

Dimensional Drawings

Padlock fixed - FG400/630



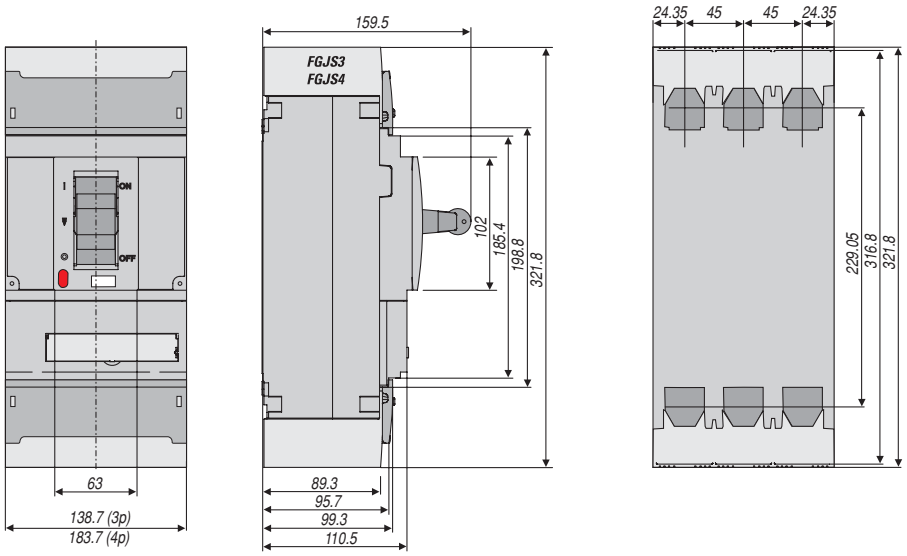
Backplate - FG400/630



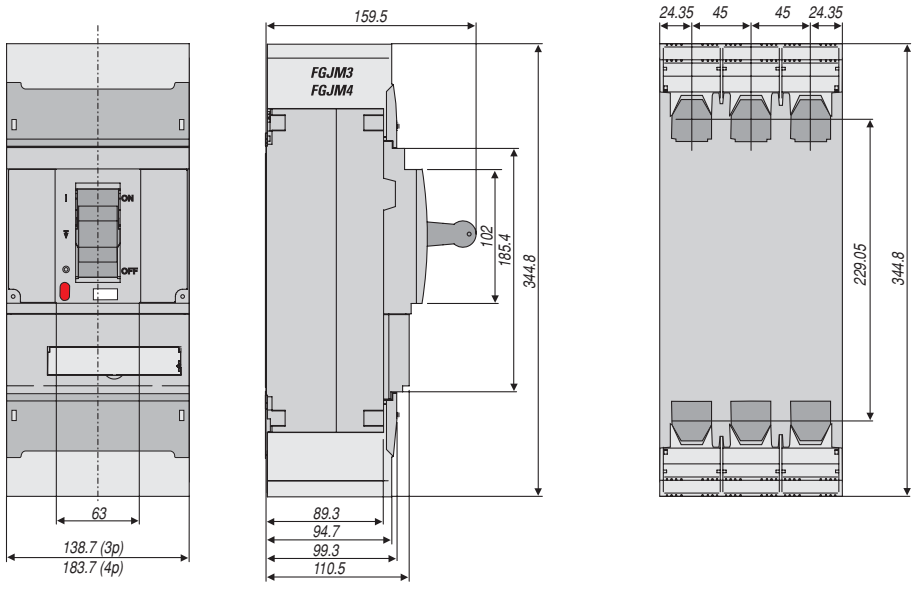
Dimensions	FG400 FG630
X1	322
X2	346
X3	367
X4	459
Y1 (3p)	160
Y1 (4p)	205
Y2 (3p)	139
Y2 (4p)	184
Z	1.5

Dimensional Drawings

Breaker with short terminal shields - FG400/630

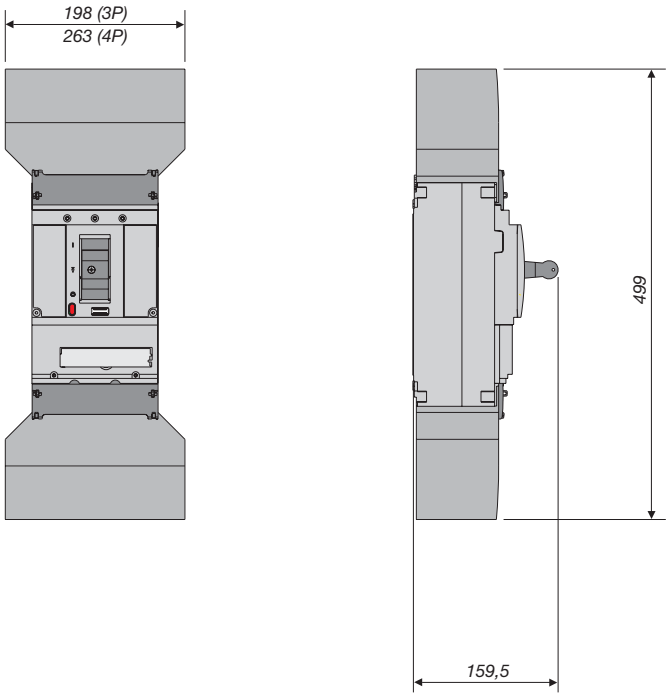


Breaker with medium terminal shields - FG400/630



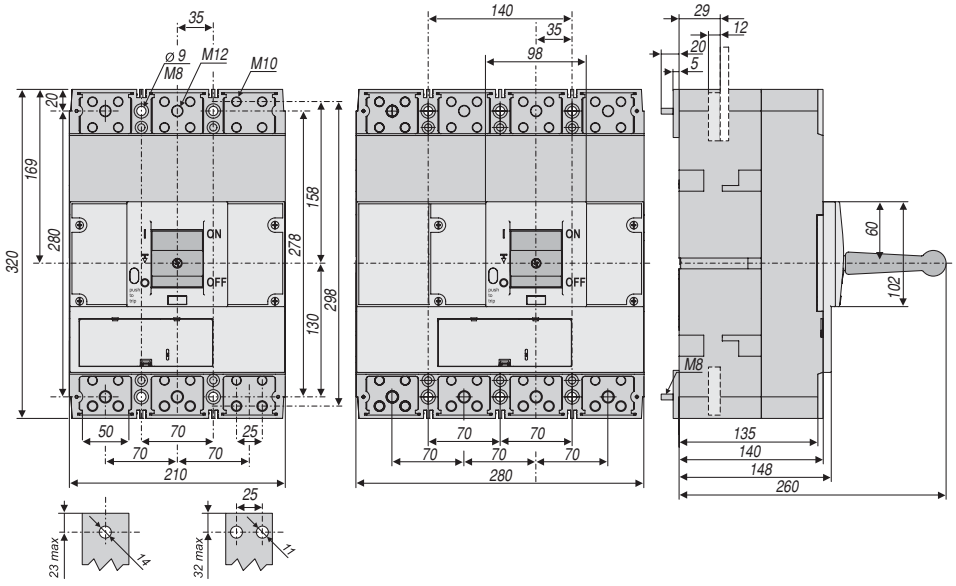
Dimensional Drawings

Breaker with long and wide terminal shields - FG400/630

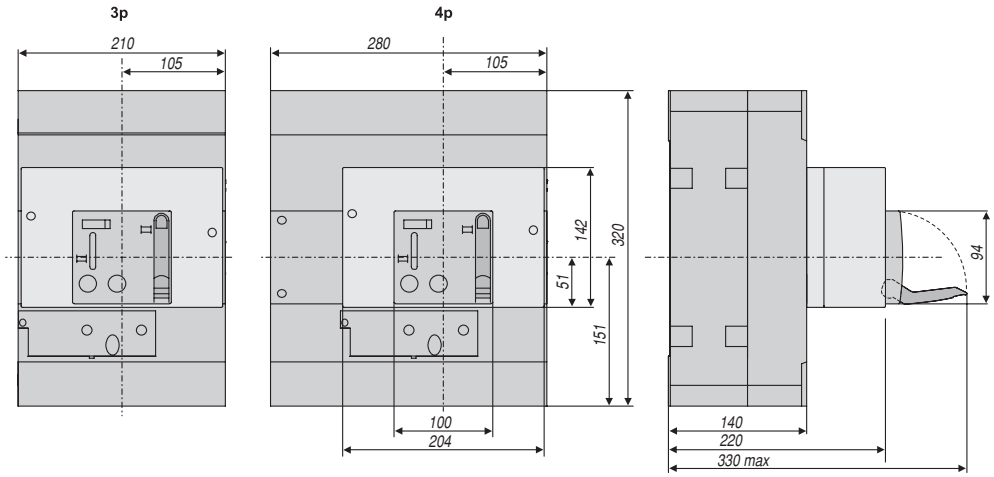


Dimensional Drawings

Breakers - FK800/1250/1600 fixed, front connected

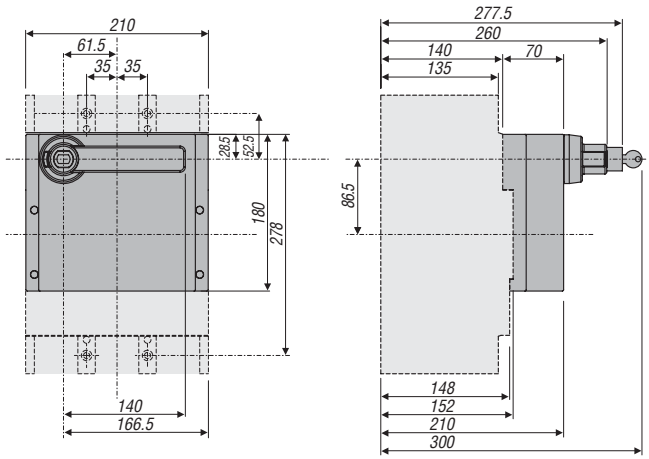


Breaker with electrical operator - FK800/1250/1600

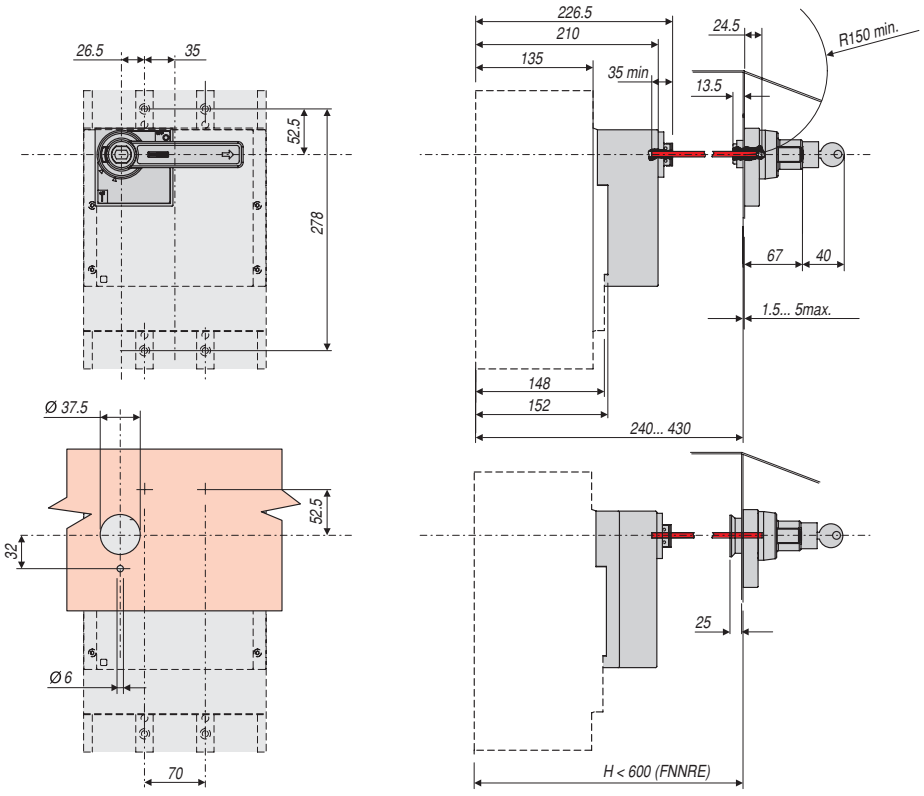


Dimensional Drawings

Rotary handle, door mounted - FK800/1250/1600

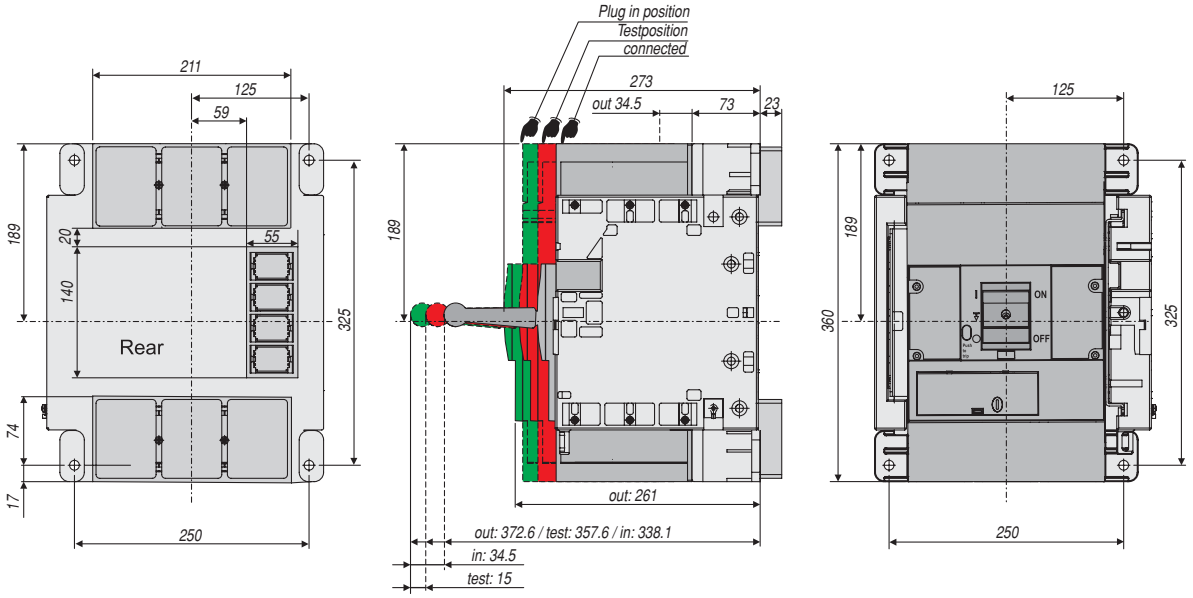


Rotary handle, breaker and through panel mounted - FK800/1250/1600

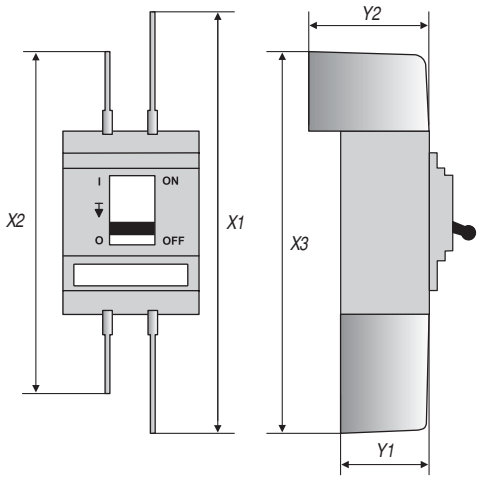


Dimensional Drawings

Drawout version - FK800/1250/1600



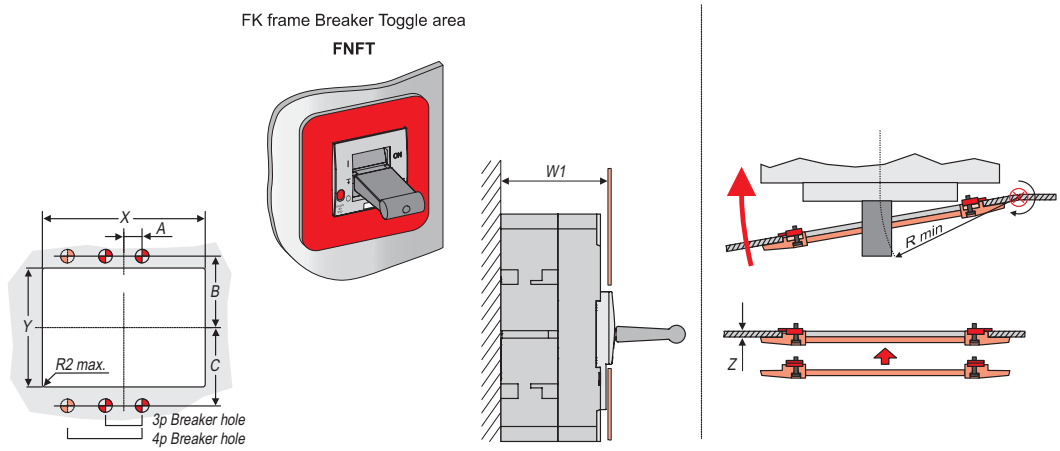
Breakers with phase separator - FG and FK frames



Dimensions	FG 400 FG 630	FK 800 FK 1250 FK 1600
X1	459	484
X2	-	-
X3	-	-
Y1	90	135
Y2	-	-

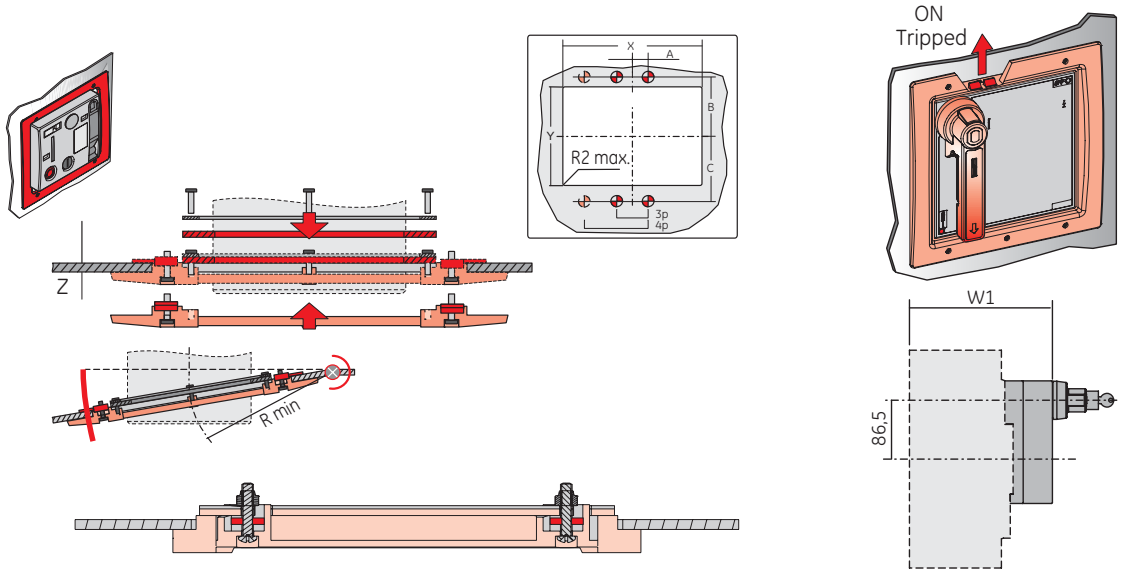
Dimensional Drawings

Door flanges - FK800/1250/1600



Dimensions										
			A	B	C	Rmin	W1(max)	X	Y	Z
FNFT	FK 800/1250/1600	3p/4p	35	130	150	120	153	101	104	1...4

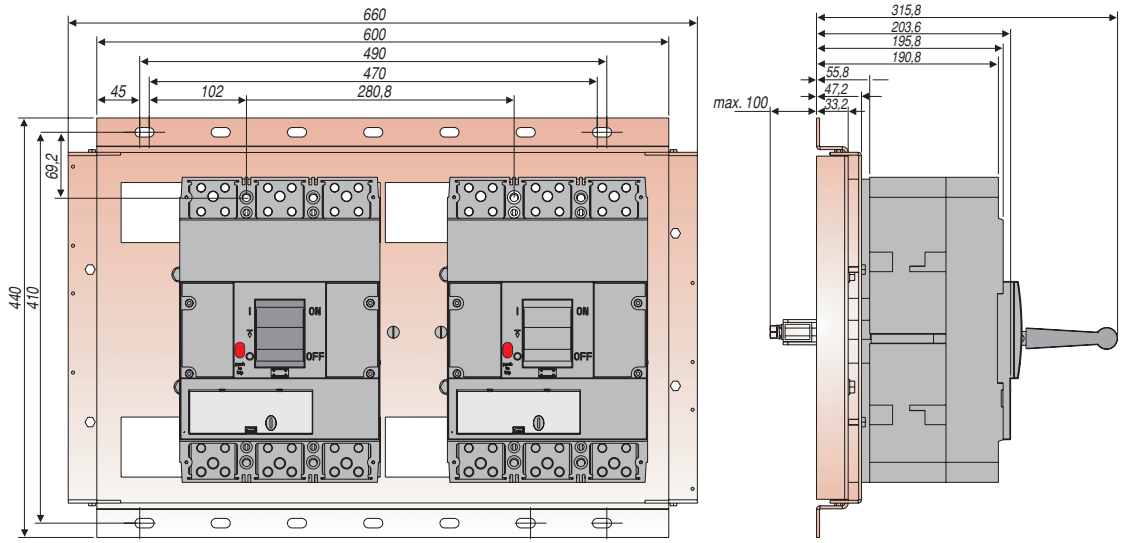
Door flanges - FK800/1250/1600



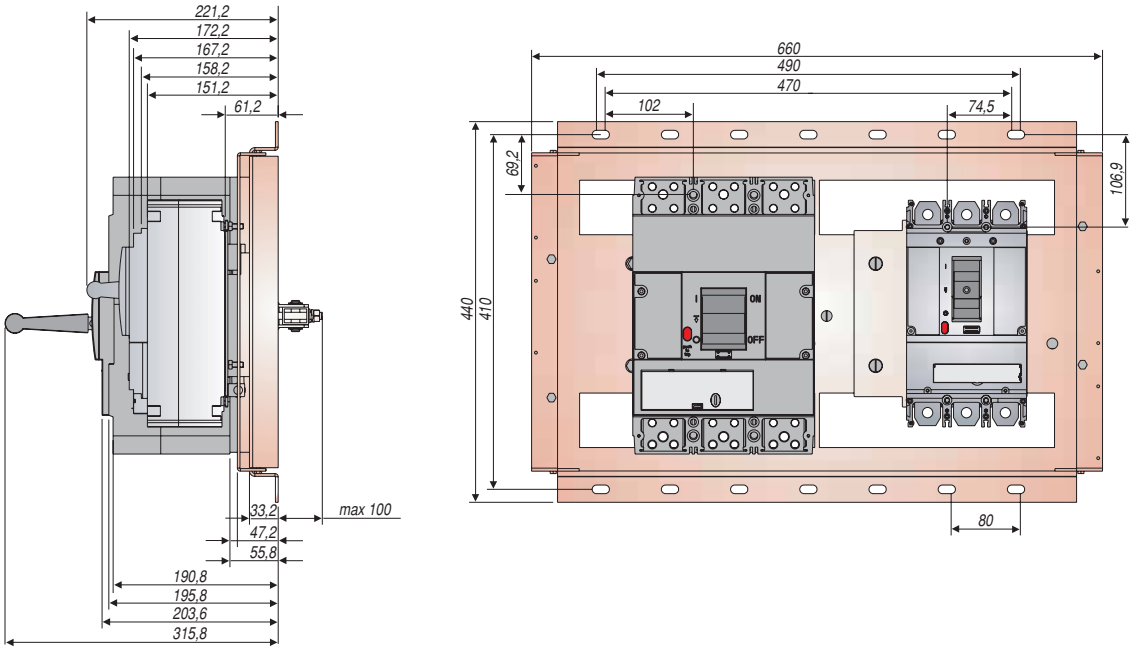
Dimensions									
3 + 4 pole versions		A	B	C	Rmin	W1(max)	X	Y	Z
FNFE	FK 800/1250/1600 Electr. operator	35	129	151	120	220	142	125	1...4
FNFH	FK 800/1250/1600 Rotary handle	35	114	163	190	210	232.5	232.5	1...4

Dimensional Drawings

FK Frame, 2 pcs. mechanically interlocked

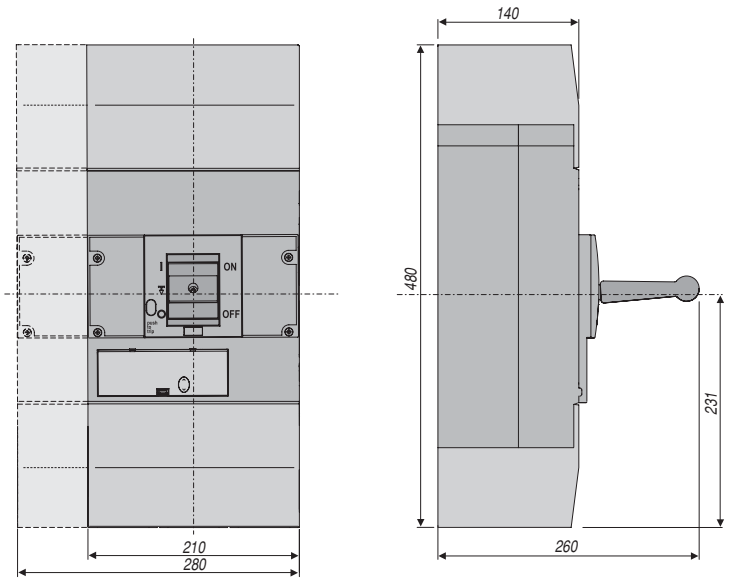


FK Frame and FG Frame. mechanically interlocked



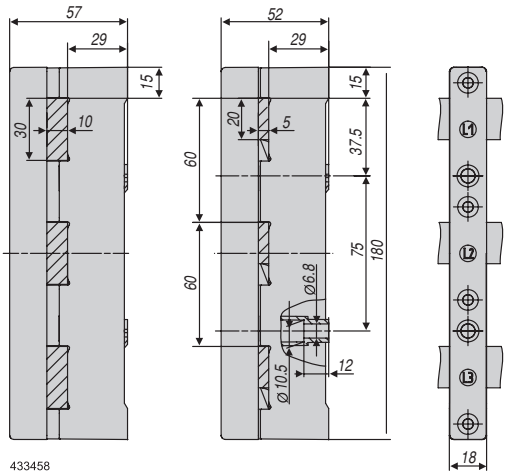
Dimensional Drawings

Breaker with long terminal shields - FK800/1250/1600

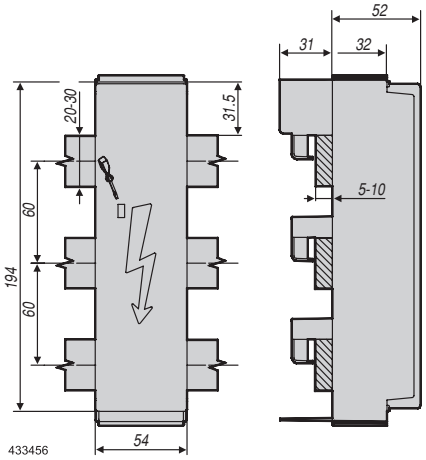


Dimensional Drawings

Connectivity 60 mm system - FD and FE frame 3 pole



433458
FBB3S



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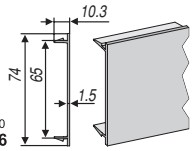
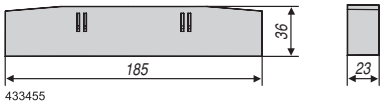


883970
FBF6



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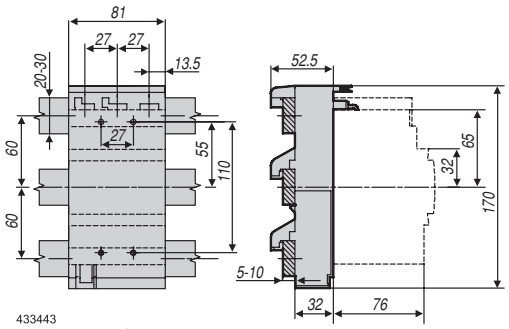
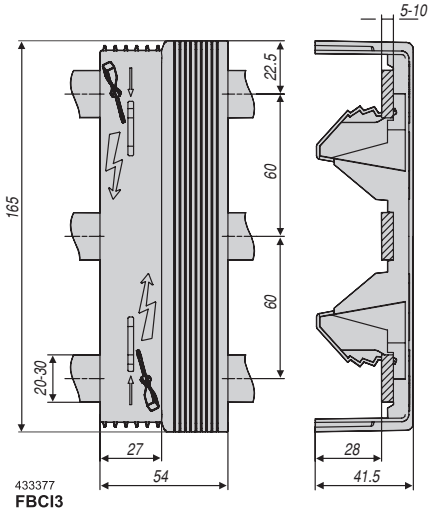
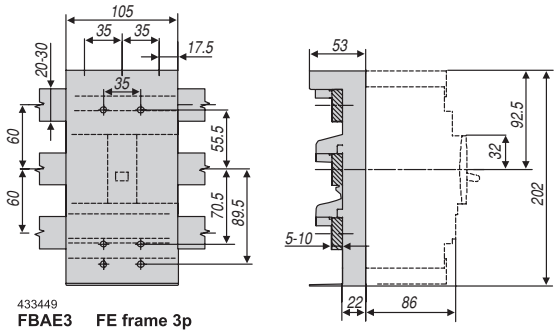


433443
FBAD3 **FD frame 3p**



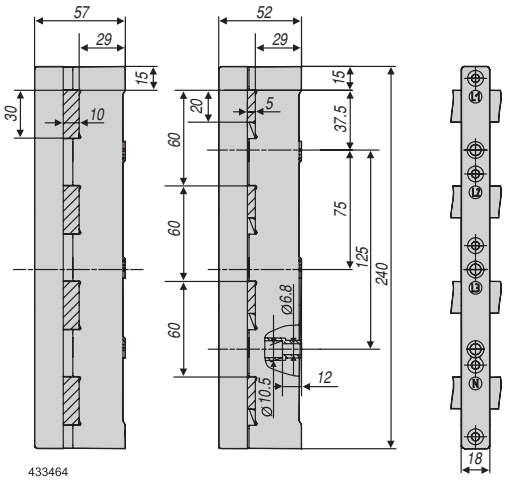
433377
FBCI3



433449
FBAE3 **FE frame 3p**

Dimensional Drawings

Connectivity 60 mm system - FD and FE frame 4 pole



433464
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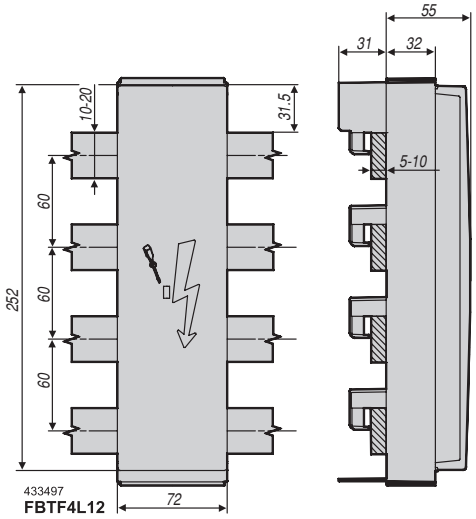
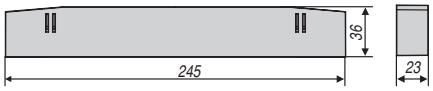


433497
FBTF4L12



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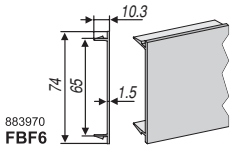

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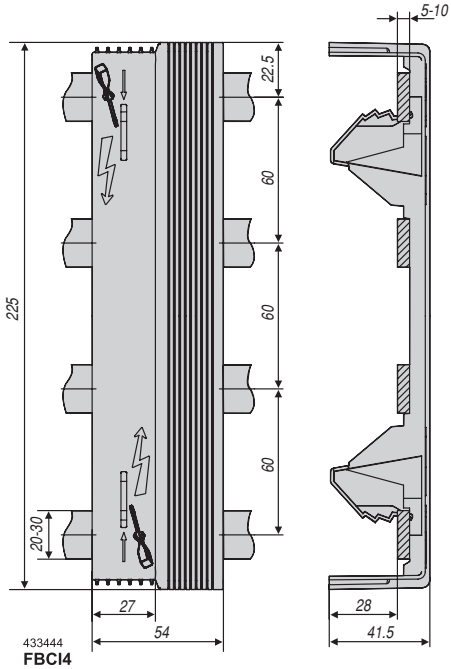

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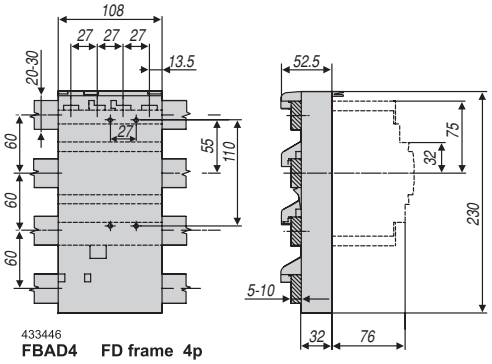
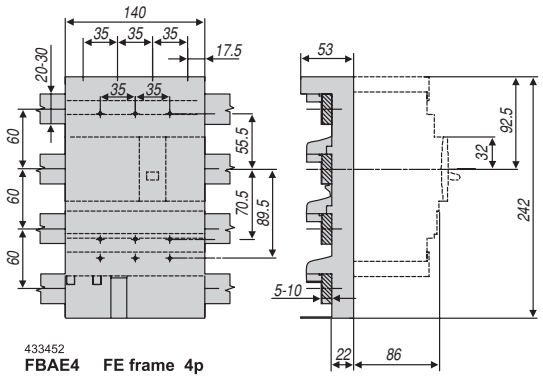


433446
FBAD4 FD frame 4p



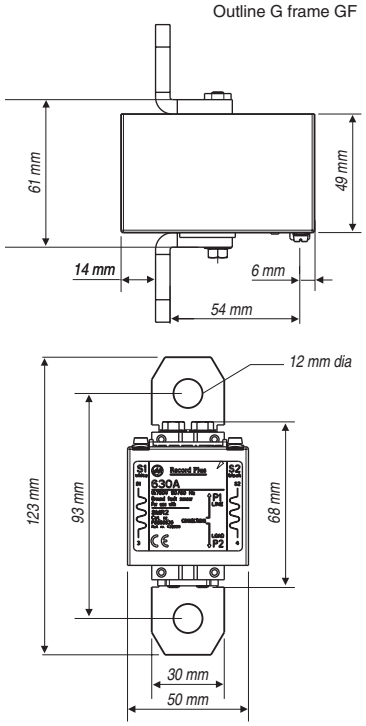
433452
FBAE4 FE frame 4p

Dimensional Drawings

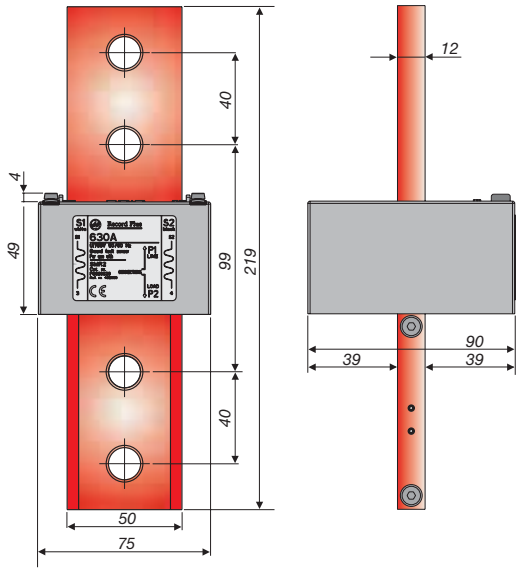
FG & FK frame, external groundfault sensors

FG type

Outline G frame GF

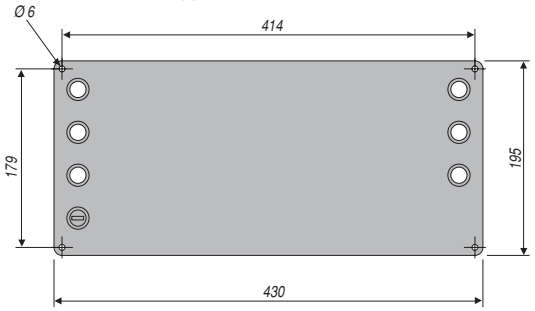


FK type

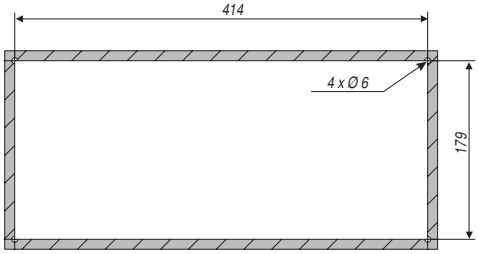


FE, FG & FK frame, Controller for changeover device

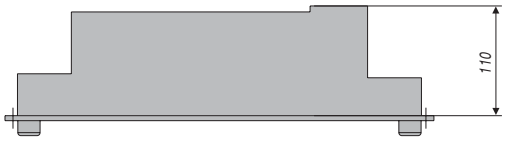
Controller type E and E Plus, front view



Cut-out for panel or door mounting



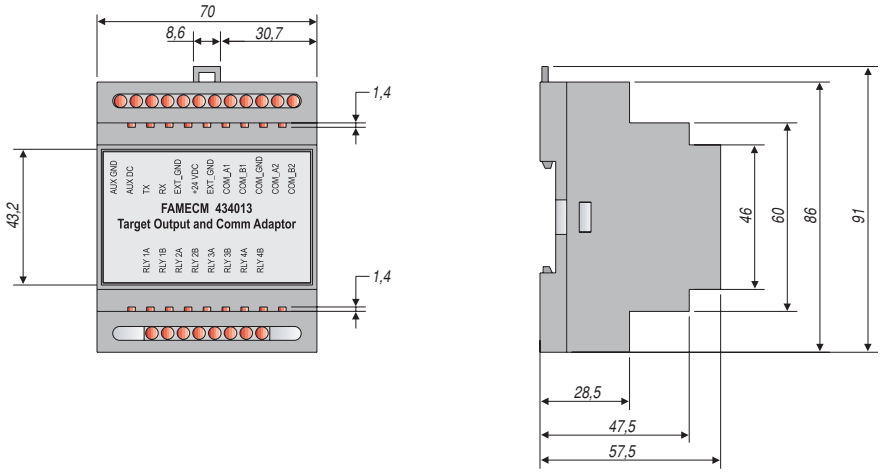
Controller type E, top view



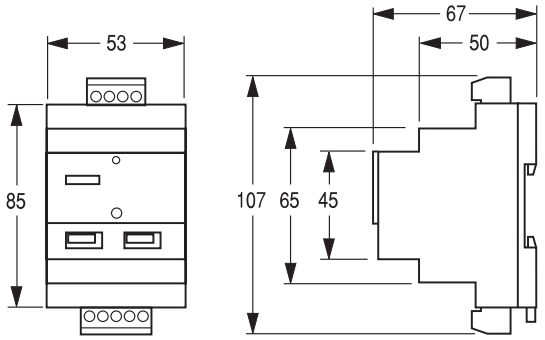
Controller type E Plus, top view

Dimensional Drawings

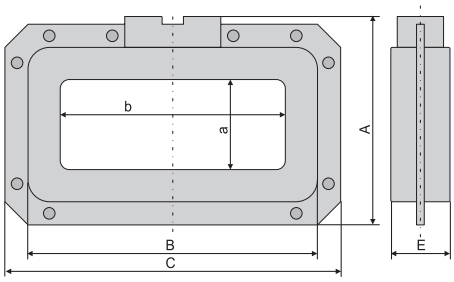
FG frame SMR2 Trip unit accessory; FACM module



Relay RD5 and RD6

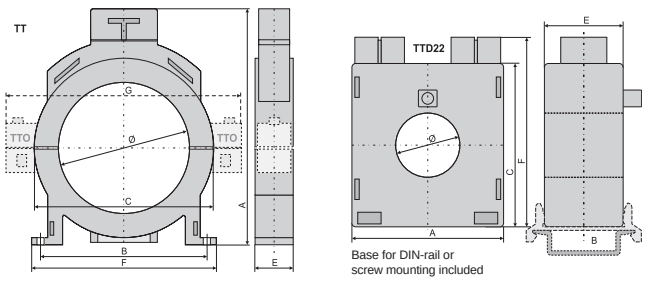


Rectangular sensor



Dimensions						
	a x b	H	h	E	e	d
BTR 175	70x175	162	85	261	46	225
BTR 305	115x305	226	116	402	55	360
BTR 350	150x350	271	140	460	55	415

Circular sensor



Dimensions							
	Ø	A	B	C	E	F	G
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TT35	35	118	90	78.5	27	104	
TT60	60	143	102	94.5	27	117	
TT80	80	163	110	114.5	27	125	
TT110	110	198	140	150.5	32	155	
TT160	160	248	181	200.5	32	197	
TT210	210	298	210	250.5	32	227	
TT0110	110	198	140	150.5	32	155	198
TT0210	210	298	210	250.5	32	227	296

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435857	FEH36AA025JBF	A.14
435860	FEH36AA063JEF	A.14
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435887	FEN46AA025JBF	A.14
435890	FEN46AA063JEF	A.14
435893	FEH36MC080JF	A.14
435896	FEL36MC080JF	A.14
435899	FEN36MC080JF	A.14
435902	FEH436TG100JF	A.13
435903	FEH436TG125JF	A.13
435904	FEH436TG160JF	A.13
435905	FEH436TG160KF	A.16
435906	FEH436TG200KF	A.16
435907	FEH436TG250KF	A.16
435908	FEH456TG160KF	A.16
435909	FEH456TG200KF	A.16
435910	FEH456TG250KF	A.16
435923	FEL36TG100JF	A.13
435926	FEL36TG125JF	A.13
435932	FEL36TG160JF	A.13
435935	FEL36TG160KF	A.16
435938	FEL36TG200KF	A.16
435941	FEL36TG250KF	A.16
435944	FEL436TG100JF	A.13
435947	FEL436TG125JF	A.13
435950	FEL436TG160JF	A.13
435953	FEL436TG160KF	A.16
435956	FEL436TG200KF	A.16
435959	FEL436TG250KF	A.16
435962	FEL456TG100JF	A.13
435965	FEL456TG125JF	A.13
435968	FEL456TG160JF	A.13
435971	FEL456TG160KF	A.16
435974	FEL456TG200KF	A.16
435977	FEL456TG250KF	A.16
435992	FEL46TG100JF	A.13
435995	FEL46TG125JF	A.13
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436002	FEL46TG160JF	A.13
436005	FEL46TG160KF	A.16
436008	FEL46TG200KF	A.16
436011	FEL46TG250KF	A.16
436014	FEN436TG100JF	A.13
436015	FEN436TG125JF	A.13
436016	FEN436TG160JF	A.13
436017	FEN436TG160KF	A.16
436018	FEN436TG200KF	A.16
436019	FEN436TG250KF	A.16
436020	FEN456TG100JF	A.13
436021	FEN456TG125JF	A.13
436022	FEN456TG160JF	A.13
436023	FEN456TG160KF	A.16
436024	FEN456TG200KF	A.16
436025	FEN456TG250KF	A.16
436026	FEH456TG100JF	A.13
436027	FEH456TG125JF	A.13
436028	FEH456TG160JF	A.13
436078	FETMC3J0080	A.18
436117	FDC35TE040ED	A.5
436118	FDC35TE050ED	A.5
436133	FDC35TE063ED	A.5
436143	FDC35TE080GD	A.5
436144	FDC35TE100GD	A.5
436145	FDC45TE080GD	A.5
436146	FDC45TE100GD	A.5
436147	FDC45TE125GD	A.5
436148	FDC45TE160GD	A.5
436150	FGH36KA250LKF	A.26
436151	FGH36KA400LLF	A.26
436152	FGH36KA400NLF	A.28
436153	FGL46KA250LKF	A.26
436154	FGL46KA400LLF	A.26
436155	FGL46KA400NLF	A.28
436156	FGN36KA400LLF	A.26
436157	FGN36KA400NLF	A.28
436158	FGN36KA630NNF	A.28
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436183	FAMAM2	A.26
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436309	FAS01D	A.21
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436316	FNTCA3327	A.39
436327	FEH36MC125JF	A.14
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436331	FEL36MC125JF	A.14
436333	FEL436MC125JF	A.14
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436356	FEN436MC125JF	A.14
436358	FETMC3J0125	A.18
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436361	FEH36MC003JF	A.14
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436365	FEN36MC003JF	A.14
436396	FDH36MC003ED	A.7
436398	FDH436MC003ED	A.7
436401	FNS11R	A.38
436409	FDN36MC003ED	A.7
436411	FDN436MC003ED	A.7
436449	FNECE6	A.47
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436456	FNEMFN	A.38
436457	FNEMFJ	A.38
436467	FEJN3	A.21
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436469	FGJN3	A.32
436470	FGJN4	A.32
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436472	FAUVR8	A.8
436474	FDNRC/5	A.8
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436487	FDNRY/5	A.8
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436491	FENRC/5	A.20
436492	FENRCV/5	A.20
436493	FENRD/5	A.20
436494	FENRDV/5	A.20
436495	FENRF/5	A.20
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436499	FENRX/5	A.45
436500	FENRY/5	A.20
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436502	FENRZ/5	A.20
436503	FENRZV/5	A.20
436504	FGNRC/5	A.31
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436514	FGNRYV/5	A.31
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436516	FGNRZV/5	A.31
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436518	FNNRCV/5	A.38
436519	FNNRD/5	A.38
436520	FNNRDV/5	A.38
436522	FNNRF/5	A.38
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436531	FNNRZV/5	A.38
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