Moulded Case Circuit Breakers
designed for global applications

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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.

**FD160**
Rated at 160A, the FD160 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 FD160 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 FD160 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™ 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 transparent trip unit door.

**Electromechanical devices**

Devices available in a current range of 16 to 1250A 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\(^1\). 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 adjustable 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.

\(^1\) Only applicable for the FE frame type.
Electronic devices SMR2
Designed to provide a flexible solution for all protection scenarios, the standard device provides an extensive set of protection features as:
- Long Time Protection adjustable from 0.4 to 1 x In.
- A choice of up to five Long Time Delay Bands.
- Short Time protection adjustable from 2 to 12 x In.
- A choice of up to five Short Time Delay Bands with a set of optional I^2T bands.
- Instantaneous Short Circuit Protection adjustable from 2 to 13 x In.
- Zone selective interlock on ST and GF functions (When a GF module is added)
- A Battery that supplies the Thermal Memory function.

An SMR2 can be equipped with unique Field mountable Plug-in modules that extend the Trip Units functionality to include:
- Modbus Communication
- Ground Fault Protection (GF)
- A two Channel Load Shedding Option.
- Trip Reason Indication module (LT, ST & I)
- Current measurement by Ammeter

An external Contact/Communication module allows the user to monitor the SMR2 via Modbus rtu communication or by using the available 1A relay contacts.

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, separate sensors and relays are available, or an integrated ground fault protection can be used.
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 mm².

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 mm² 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. Selective Fault Indication is possible by using one or a combination of the two Bell Alarm contact types.

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

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. The Record Plus line offers five different electrical operators each tailored to the characteristics of a specific frame size. Four of these devices (one for each frame size) can be mounted in the field. An additional Hi speed factory fitted operator is available for the FK frame size.

Common to each of these devices is that they can be used in a simple 3 wire connection scheme that can be extended to include a more complex functionality.

All Electrical Operators have a user interface that includes a CLEAR and ACCURATE ON, OFF and TRIPPED indication and offer the option to operate locally (Manual) or remotely (Auto).

All devices can be padlocked or keylocked 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 mm².
**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 FD160 frame has box clamps suitable 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 safely. Additionally, frame specific accessories as the IPXXB terminal cover for the FD160 and the widened and elongated terminal shield for the FG frame are available.
**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 include 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**

A simple, hand operated draw-out system is available for the FE, FG and FK frame sizes. The draw-out system enables Record Plus™ breakers with rating from 3A to 1600A to be configured as devices that can be fully insulated from the power supply and installation. Each device has three positions inserted and connected, test and isolated, and withdrawn.

A design modelled on our ACB constructions and incorporating a standard plug-in base encapsulated it in a sturdy metal cradle. The devices have a protection degree of IP40 in withdrawn or inserted position and offer a major step forward in MCCB draw-out construction.

A system offering a host of features as:

- Use behind door.
- Trip functionality on insertion and withdrawal.
- With MCCB style test position.
- Easily accessible earthing point.
- Through door version allowing accessibility of all draw-out and/or breaker functions from the door front.
- A locking option for multiple padlocks and/or multiple key locks.
- Multiple carriage indication switches for each position.
- Optional ACB style TEST position.

**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 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.