



Panorama of the Low Voltage Apparatus Automatic moulded-case and air circuit-breakers

Power and productivity
for a better world™



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Circuit-breakers and Low Voltage Apparatus



ABB SACE is a synonym of quality and innovation in the Low Voltage sector, with products which, by integrating perfectly, adapt to the various service and installation requirements, thereby satisfying all plant needs, from the small user up to large industrial power distribution plants.

ABB SACE's offer of low voltage circuit-breakers makes products of high quality, reliability and precision available, which guarantee high performances in any conditions, safe-to-use products and, when needed, easy replacement of any faulty parts.

The SACE Emax series of air circuit-breakers, now enriched by the new X1 size, covers all user needs from 630 up to 6300A. Emax X1 is put forward as the best solution for all those applications where dimensions are an important determining





factor in selecting the circuit-breaker, without however necessarily having to do without high rated current values. Rated current up to 1600A, high rated short-time withstand current for selective circuit-breakers and, for the current-limiting version, a short-circuit breaking capacity of 150kA at 415VAC.

The family of SACE Tmax moulded-case circuit-breakers is divided into eight sizes (T1-T8) with rated uninterrupted currents from 160 to 3200A. Perfect integration among the sizes, higher performances in circuit-breakers of even smaller dimensions, and a standardised range of accessories which considerably simplifies selection of the apparatus.

Thanks to the new Tmax T8, the SACE Tmax family is completed so as to respond to all installation and protection requirements, even the most specific ones.

In conformity with the group's commitment and its care paid to protection of the environment, ABB SACE has always paid attention to achieving sustainable and environmentally friendly development objectives.

All the company production sites have obtained ISO 9001 quality certification, and the majority also have ISO 14001 certifications of their environmental management system. The ABB SACE facilities have also obtained certification for integrated management of its Quality, Environment and Safety systems in conformity with the ISO 9001 ISO 14001 OHSAS 18001 Standards. From the safety viewpoint, once again ABB SACE is a guarantee of conformity with the electrical safety standards, in respect of the international regulations. Our products undergo the most severe tests of conformity with the standards and the necessary type tests in the ABB laboratories, accredited by the most important national and international Organisations (SINAL, LOVAG/ ACAE, SEMCO, UL, and CSA).

Ethics and Social Responsibility

The International SA8000 standard (Social Accountability 8000) or System of Social Responsibility is the most widespread and recognised standard at international level whereby it is guaranteed that the company is socially accountable and, in particular, is committed to respecting the rules of work ethics and working conditions.

Based on the so-called "requirements for social accountability", the SA8000 Standard sanctions the ethics of the whole production cycle of a company with regard to child labour, no forced labour, personnel workplace safety and health, freedom of association and the right to collective bargaining, equal opportunities, no discrimination, disciplinary procedures, remuneration and working hours, relationships with suppliers and integration in the community where the company carries out its activities.

In 2004 ABB SACE decided to implement the management system for Social Responsibility according to the SA8000 Standard at the site in Frosinone, which had already certified the integrated QAS (Quality, Environment and Safety) management system in accordance with the ISO 9001, ISO 14001, OHSAS 18001 Standards.

The initiative comes within the more general framework of activities of the ABB Group Function Sustainability Affairs, committed to implementation and pursuit of ABB's sustainability objectives throughout the world.

During the process for implementation of the SA8000 Standard, all the personnel of the sites involved took part in a cycle of debating and training meetings; the suppliers called on to recognise and uphold the principles sanctioned by the SA8000 Standard and by ABB SACE's policy for Social Responsibility, were also involved.

Once again ABB is to the fore to offer you a better service.

Tmax moulded-case circuit-breakers for distribution

Common data

| | | |
|---|------|--------------|
| Voltages | | |
| Rated service voltage, Ue | [V] | 690* |
| Rated impulse withstand voltage, Uimp | [kV] | 8-12*** |
| Rated insulation voltage, Ui | [V] | 800...1000** |
| Test voltages at power frequency for 1 min. | [V] | 3000...3500 |
| Number of poles | | 3-4 |



| Type of circuit-breaker | | Tmax T1 1p | | Tmax T1 | | | Tmax T2 | | | |
|---|---------------------------------|---------------------|---------------|--------------|---------------------|----------|--------------|-------------------------|----------|--------------------|
| | | 160 | | B | C | N | N | S | H | L |
| Frame | | 160 | | 160 | | | 160 | | | |
| Rated ultimate short-circuit breaking capacity, Icu | | B | | B | C | N | N | S | H | L |
| (AC) 50-60 Hz 220/230 V | [kA] | 25 ⁽¹⁾ | | 25 | 40 | 50 | 65 | 85 | 100 | 120 |
| (AC) 50-60 Hz 380/415 V | [kA] | – | | 16 | 25 | 36 | 36 | 50 | 70 | 85 |
| (AC) 50-60 Hz 440 V | [kA] | – | | 10 | 15 | 22 | 30 | 45 | 55 | 75 |
| (AC) 50-60 Hz 500 V | [kA] | – | | 8 | 10 | 15 | 25 | 30 | 36 | 50 |
| (AC) 50-60 Hz 690 V | [kA] | – | | 3 | 4 | 6 | 6 | 7 | 8 | 10 |
| (DC) 250 V-2 poles in series | [kA] | 25 (at 125 V) | | 16 | 25 | 36 | 36 | 50 | 70 | 85 |
| (DC) 250 V-3 poles in series | [kA] | – | | 20 | 30 | 40 | 40 | 55 | 85 | 100 |
| (DC) 500 V-2 poles in series | [kA] | – | | – | – | – | – | – | – | – |
| (DC) 500 V-3 poles in series | [kA] | – | | 16 | 25 | 36 | 36 | 50 | 70 | 85 |
| (DC) 750 V-3 poles in series | [kA] | – | | – | – | – | – | – | – | – |
| Rated service short-circuit breaking capacity, Ics (at 415 V) | [%Icu] | 75% | | 100% | 75% | 75% | 100% | 100% | 100% | 75% ⁽³⁾ |
| Rated short-circuit making capacity, Icm (415 V) | [kA] | 52.5 (at 220/230 V) | | 32 | 52.5 | 75.6 | 75.6 | 105 | 154 | 187 |
| Opening time (415 V) | [ms] | 7 | | 7 | 6 | 5 | 3 | 3 | 3 | 3 |
| Rated short-time withstand current for 1 s, Icw | [kA] | | | | | | | | | |
| Category of use (IEC 60947-2, EN 60947-2) | | A | | A | | | | A | | |
| Isolation behaviour | | • | | • | | | | • | | |
| Reference Standard IEC 60947-2, EN 60947-2 | | • | | • | | | | • | | |
| Release: | | | | | | | | | | |
| thermomagnetic | T fixed, M fixed (10xIn) TMF | • | | – | | | | – | | |
| | T adj., M fixed (10xIn) TMD | – | | • | | | | • | | |
| | T adj., M adj. (5...10xIn) TMA | – | | – | | | | – | | |
| | T adj., M fixed (3xIn) TMG | – | | – | | | | • | | |
| | T adj., M adj. (2.5...5xIn) TMG | – | | – | | | | – | | |
| magnetic only | M adjustable (6...12xIn) MA | – | | – | | | | • (MF up to In 12.5 A) | | |
| electronic | PR221DS (I-LS/I) | – | | – | | | | • | | |
| | PR221MP/PR221GP | – | | – | | | | • | | |
| | PR222DS/P (LSI-LSIG) | – | | – | | | | – | | |
| | PR222 MP | – | | – | | | | – | | |
| | PR223DS/P | – | | – | | | | – | | |
| | PR223EF | – | | – | | | | – | | |
| | PR231/P (I-LS/I) | – | | – | | | | – | | |
| | PR232/P (LSI) | – | | – | | | | – | | |
| | PR331/P (LSIG) | – | | – | | | | – | | |
| | PR332/P (LI-LSI-LSIG-LSIRc) | – | | – | | | | – | | |
| Interchangeability | | | | | | | | | | |
| Versions | | F | | F | | | | F-P | | |
| Terminals | Fixed (F) | | FC Cu | | FC Cu-EF-FC CuAl-HR | | | F-FC Cu-FC CuAl-EF-ES-R | | |
| | Plug-in (P) | | – | | – | | | F-FC Cu-FC CuAl-EF-ES-R | | |
| | Withdrawable (W) | | – | | – | | | – | | |
| Fixing on DIN rail | | – | | DIN EN 50022 | | | DIN EN 50022 | | | |
| Mechanical life | [No. operations /hourly oper.] | 25000/240 | | 25000/240 | | | 25000/240 | | | |
| Electrical life (at 415 V) | [No. operations /hourly oper.] | 8000/120 | | 8000/120 | | | 8000/120 | | | |
| Basic fixed dimensions | L | [mm] | 25.4 (1 pole) | | 76/102 | | | 90/120 | | |
| | 3/4 poles | D | [mm] | 70 | | 70 | | 70 | | |
| | | H | [mm] | 130 | | 130 | | 130 | | |
| Weights | fixed | 3/4 poles | [kg] | 0.4 (1 pole) | | 0.9/1.2 | | 1.1/1.5 | | |
| | plug-in | 3/4 poles | [kg] | – | | – | | 1.5/1.9 | | |
| | Withdrawable | 3/4 poles | [kg] | – | | – | | – | | |

* 240 V for T1 1p
 ** 500 V for T1 1p
 *** only for T8

⁽¹⁾ Settings In=16 and In=20 with Icu =16 kA @ 220/230 V
⁽²⁾ Version with Icu =35 kA certified at 36 kA
⁽³⁾ 70 kA

⁽⁴⁾ 27 kA

Tmax moulded-case circuit-breakers for specific applications

| | | | Tmax T1 | Tmax T2 | Tmax T3 |
|-------------------------|---|------|---------|-------------|---------|
| Current-limiting | | | | | |
| | | | | T2L | |
| Poles | | | - | 3-4 | - |
| Frame | | | - | 160 | - |
| Ue | | [V] | - | 690 | - |
| Icu @ 380/415 V | | [kA] | - | 85 | - |
| Icu @ 440 V | | [kA] | - | 75 | - |
| Icu @ 690 V | | [kA] | - | 10 | - |
| Ics/Icu | | [%] | - | 75% (70 kA) | - |
| Dimensions | L | [mm] | - | 90/120 | - |
| | D | [mm] | - | 70 | - |
| | H | [mm] | - | 130 | - |

Advanced zone selectivity

| | | | | | |
|-----------------------|---------------|------|---|---|---|
| Poles | | [No] | - | - | - |
| Frame | | | - | - | - |
| Ue | (AC) 50-60 Hz | [V] | - | - | - |
| EFDZ Zone selectivity | | | - | - | - |
| ZS Zone selectivity | | | - | - | - |

Motor protection

| | | | | | |
|-----------------------|------------------------|-----|---|-------------------|-----------|
| | | | | T2 | T3 |
| Poles | | | - | 3 | 3 |
| Frame | | | - | 160 | 250 |
| Ue | | [V] | - | 690 | 690 |
| Magnetic only release | M fixed | | - | • (up to In 12.5) | - |
| Magnetic only release | M adjustable | | - | • (from In 20) | • |
| Electronic release | PR221MP | | - | • | - |
| Electronic release | PR221DS-I, IEC 60947-2 | | - | • | - |
| Electronic release | PR222MP, IEC 60947-4-1 | | - | - | - |
| Electronic release | PR231/P-I, IEC 60947-2 | | - | - | - |

Cbs for use up to 1150 V AC and 1000 V DC

| | | | | | |
|-----------------|-------------------|------|---|---|---|
| Poles | | | - | - | - |
| Frame | | | - | - | - |
| Icu @ 1000 V AC | | [kA] | - | - | - |
| Icu @ 1150 V AC | | [kA] | - | - | - |
| Icu @ 1000 V DC | 4 poles in series | [kA] | - | - | - |

Disconnectors according to IEC 60947-3 Standard

| | | | | | |
|---------|---------------|------|------------|----------|------------|
| | | | T1D | - | T3D |
| Poles | | | 3-4 | - | 3-4 |
| Frame | | | 160 | - | 250 |
| Ie AC23 | | [A] | 125 | - | 200 |
| Ue | (AC) 50-60 Hz | [V] | 690 | - | 690 |
| | (DC) | | 500 | - | 500 |
| Uimp | | [kV] | 8 | - | 8 |
| Ui | | [V] | 800 | - | 800 |
| Icm | | [kA] | 2.8 | - | 5.3 |
| Icw | | [kA] | 2 | - | 3.6 |

UL/CSA (UL 489 and CSA C22.2)

| | | | | | |
|---|--|------|-----------|-----------|-----------|
| | | | T1 | T2 | T3 |
| Poles | | | 1-3-4 | 3-4 | 3-4 |
| Frame | | | 100 | 100 | 225 |
| Maximum Ampere Interrupting Capacity \cong 480 V | | [kA] | 22 | 35-65 | 25-35 |
| Maximum Ampere Interrupting Capacity \cong 600 V/347 V AC | | [kA] | 10 | - | 10 |
| Maximum Ampere Interrupting Capacity \cong 600 V | | [kA] | - | - | - |
| Thermal-magnetic trip unit | | | • | • | • |
| Magnetic only | | | - | • | • |
| Microprocessor based trip unit | | | - | • | - |
| MCCB | | | • | • | • |
| MCP | | | - | • | • |
| MCS | | | • | - | • |

| Tmax T4 | Tmax T5 | Tmax T6 | Tmax T7 | Tmax T8 |
|------------|------------|--------------|----------------------------------|---------|
| T4V | T5V | T6L | T7V | |
| 3-4 | 3-4 | 3-4 | 3-4 | - |
| 250/320 | 400/630 | 630/800/1000 | 800/1000/1250 | - |
| 690 | 690 | 690 | 690 | - |
| 200 | 200 | 100 | 150 | - |
| 180 | 180 | 80 | 130 | - |
| 80 | 80 | 30 | 60 | - |
| 100% | 100% | 75% | 100% | - |
| 105/140 | 140/184 | 210/280 | 210/280 | - |
| 103.5 | 103.5 | 103.5 | 154 (manual) / 178 (motorizable) | - |
| 205 | 205 | 268 | 268 | - |

| T4 | T5 | T6 | T7 | |
|---------|---------|--------------|--------------------|---|
| 3-4 | 3-4 | 3-4 | 3-4 | - |
| 250/320 | 400/630 | 630/800/1000 | 800/1000/1250/1600 | - |
| 690 | 690 | 690 | 690 | - |
| • | • | • | - | - |
| - | - | - | • | - |

| T4 | T5 | T6 | T7 | |
|---------|---------|-----|---------------|---|
| 3 | 3 | 3 | 3 | - |
| 250-320 | 400-630 | 800 | 800/1000/1250 | - |
| 690 | 690 | 690 | - | - |
| - | - | - | - | - |
| • | - | - | - | - |
| - | - | - | - | - |
| • | • | • | - | - |
| • | • | • | - | - |
| - | - | - | • | - |

| T4 | T5 | T6 | | |
|-----|---------|---------|---|---|
| 3-4 | 3-4 | 3-4 | - | - |
| 250 | 400-630 | 630-800 | - | - |
| 20 | 20 | 12 | - | - |
| 12 | 12 | - | - | - |
| 40 | 40 | 40 | - | - |

| T4D | T5D | T6D | T7D | T8 |
|-----|---------|--------------|----------------|----------------|
| 3-4 | 3-4 | 3-4 | 3-4 | 3-4 |
| 320 | 400/630 | 630-800-1000 | 1000/1250/1600 | 2000/2500/3200 |
| 320 | 400/630 | 630-800-1000 | 1000/1250/1600 | 2000/2500/3200 |
| 690 | 690 | 690 | 690 | 690 |
| 750 | 750 | 750 | 750 | - |
| 8 | 8 | 8 | 8 | 12 |
| 800 | 800 | 1000 | 1000 | 1000 |
| 5.3 | 11 | 30 | 52.5 | - |
| 3.6 | 6 | 15 | 20 | 40 |

| T4 | T5 | T6 | T7 | T8 |
|--------|---------|--------|-----------|---------------------|
| 3-4 | 3-4 | 3-4 | 3-4 | 3-4 |
| 250 | 400-600 | 800 | 1000-1200 | 1600-2000-2500-3000 |
| 25-150 | 25-150 | 35-100 | 50-100 | 125 |
| - | - | - | - | - |
| 18-100 | 18-100 | 20-42 | 25-65 | 100 |
| • | • | • | - | - |
| - | - | - | - | - |
| • | • | • | • | • |
| • | • | • | - | - |
| • | • | • | • | • |

Main release characteristics






Combination of release - circuit-breaker

| | | T1 | T2 | T3 | T4 | T5 | T6 | T7 | T8 |
|----------------|--------------|-----|-----|-----|---------|---------|--------------|----------|----------------|
| Thermomagnetic | In | 160 | 160 | 250 | 250/320 | 400/630 | 630/800/1000 | 800/1600 | 2000/2500/3200 |
| | Version | F | F-P | F-P | F-P-W | F-P-W | F-W | F-W | F |
| | MF | - | - | - | - | - | - | - | - |
| | MA | - | • | • | • | - | - | - | - |
| | TMF | •* | - | - | - | - | - | - | - |
| | TMD | • | • | • | • | - | - | - | - |
| | TMG | - | • | • | - | • | - | - | - |
| TMA | - | - | - | • | - | - | • | - | |
| Electronic | PR221DS | - | • | - | • | • | • | - | - |
| | PR221GP | - | • | - | - | - | - | - | - |
| | PR221MP | - | • | - | - | - | - | - | - |
| | PR222/P- /PD | - | - | - | • | • | • | - | - |
| | PR222 MP | - | - | - | • | • | • | - | - |
| | PR223DS | - | - | - | • | • | • | - | - |
| | PR223EF | - | - | - | • | • | • | - | - |
| | PR231/P | - | - | - | - | - | - | • | - |
| | PR232/P | - | - | - | - | - | - | • | •** |
| | PR331/P | - | - | - | - | - | - | • | • |
| PR332/P | - | - | - | - | - | - | • | • | |

* only available for T1 1p

** dedicated version only for T8

Electronic releases

| | PR221DS | PR221GP | PR221MP | PR222DS/P-DS/PD | PR222MP |
|------------------------------|---|---|--|---|---|
| |  |  |  |  |  |
| Protections available | LSI/I | LSI | LI | LSI-LSIG | LIRU |
| Compatible circuit-breakers | T2-T4-T5-T6 | T2 | T2 | T4-T5-T6 | T4-T5-T6 |
| Applications | Distribution/Motor protection | Generator protection | Motor protection | Distribution | Motor protection |




Basic protections

| | PR221DS | PR221GP | PR221MP | PR222DS/P-DS/PD | PR222MP |
|----|---|---|---|---|---|
| L | (DS) I1=0.4-1 In (DS) t1=3-12 s (t1=3-6 s T2) t=k/I2 | (DS) I1=0.4-1 In (DS) t1=0.7-5.5 s t=k/I2 | (DS) I1=0.65-1 In (DS) t1=2.77-11.1 s t=k/I2 | (DS) (E) I1=0.4-1 In (DS) (E) t1=3-18 s t=k/I2 | (DS) (E) I1=0.4-1 In (DS) (E) t1=3-18 s t=k/I2 |
| S | (DS) I2=1-10 In (DS) t2=0.1-0.25 s t=k/I2 | (DS) I2=1-2.5 In (DS) t2=0.07-0.75 s t=k/I2 or t=k | - | (DS) (E) I2=0.6-10 In (DS) (E) t2=0.05-0.5 s t=k/I2 or t=k | - |
| I | (DS) I3=1-10 In t3=instantaneous | (DS) I3=4 I2-Fixed t3=instantaneous t=k | (DS) I3=2.5-17.5 In t3=instantaneous t=k | (DS) (E) I3=1.5-12 In t3=instantaneous t=k | (DS) (E) I3=6-13 In t3=instantaneous t=k |
| G | - | - | - | (DS) (E) I4=0.2-1 In (DS) (E) t1=0.1-0.8 s t=k/I2 | - |
| Rc | RC221 (T2)-RC222 (T2-T4-T5) RC223 (T4)-RCQ SACE (T6) | RC221-RC222 | RC221-RC222 | RC222 (T4-T5)-RC223 (T4) RCQ SACE (T6) | RC222 (T4-T5)-RC223 (T4) RCQ SACE (T6) |
| OT | - | - | - | - | - |
| U | - | - | - | - | (DS) (E) I6=0.4 I1 (DS) (E) t6=1-10 s |



Advanced protections

| | | | | | |
|---------------|---|---|---|---|---|
| UV | - | - | - | - | - |
| OV | - | - | - | - | - |
| RV | - | - | - | - | - |
| RP | - | - | - | - | - |
| UF | - | - | - | - | - |
| OF | - | - | - | - | - |
| S2 | - | - | - | - | (DS) (E) I5=3-10 I1 (DS) (E) t5=1-10 s |
| Communication | - | - | - | Dialogue unit integrated with protocol Modbus-PR021/K remote signalling only on DS/PD | PR021/K remote signalling |
| Measurements | - | - | - | Basic-with PR010T or BT030 for DS/P standard for DS/PD | Basic-with PR010T |
| NOTES | - | - | Motor protection with powers up to 55kW | Setting (E) with PR010T or with BT030-Interface front of panel HMI030 on PD version | Setting (E) with PR010T |

Thermomagnetic releases


| | MF | MA | TMF | TMD | TMG | TMA |
|-------------------------------------|---|-----------------|--------------|--|---|---|
| | | | |  |  |  |
| Compatible circuit-breakers: | T2 | T2-T3-T4 | T1_1p | T1-T2-T3-T4 | T2-T3-T5 | T4-T5-T6 |
| Applications | Motor protection | | Distribution | Distribution | Generator protection | Distribution |
| Basic protections | | | | | | |
| L | - | | I1=In | (M) I1=0.7-1 In | (M) I1=0.7-1 In | (M) I1=0.7-1 In |
| I | (M) I3=13 In (M) I3=(6-12 In T2 T3) (6-14 In T4) | | I3=10 In | (M) I3=10 In | (M) I3=3 In (I3=2.5-5 In T5) | (M) I3=5-10 In |
| Rc | RC221 (T2-T3) RC222/RC223 (T4) | | RC221 | RC221 (T1-T2-T3)-RC222 (T1-T2-T3-T4-RC223 (T3-T4) | RC221 (T2-T3)-RC222 (T2-T3-T5)-RC223 (T3) | RC222 (T4-T5)-RC223 (T4) RCQ (T6) |

KEY


| | | | |
|--|--|---|--|
| L-Protection against overload S-Selective protection against short-circuit I- Instantaneous protection against short-circuit G-Protection against earth faults Rc-Protection against residual current OT-Protection against overtemperature U-Protection against phase unbalance UV-Undervoltage protection | OV-Overvoltage protection RV-Protection against residual voltage RP-Protection against reverse active power UF-Protection against under frequency OF-Protection against over frequency S2-Selective protection against short-circuit D-Protection against directional short-circuit R-Protection against rotor blocking | PR021K-Signalling unit (M)-Manual setting (DS)-Setting with Dip Switch (E)-Electronic setting with external apparatus (BT030 or PR010T) or remotely with communication (ME)-Manual electronic setting on front of panel RC_ _-External residual current release for moulded-case circuit-breakers RCQ SACE-Panel residual current with toroid and opening coil | Advanced Measurements Currents (phase, Neutral, Earth) Phase voltages (phase-phase, phase-neutral, residual) Power (Active, Reactive, Apparent) Power factor Frequency and Peak Factor Energy (Active, Reactive, Apparent) |
| t=k relation t=f(I) |  | PR010T-Test and Configuration Unit PR_ _-D-M-Communication module mod-bus PR_ _-V Measurement module BT030-Wireless communication unit | Version F- Fixed P- Plug-in W- Withdrawable |
| t=k/I2 relation t=f(I) |  | | |

| PR223DS | PR223EF | PR231/P | PR232/P | PR331/P | PR332/P |
|---|---|---|---|---|--|
|  |  |  |  |  |  |
| LSIG | LSIG | LS/I-I | LSI-LSIG | LI-LSI-LSIG | LSIG |
| T4-T5-T6 | T4-T5-T6 | T7 | T7 | T7-X1-T8 | T7-X1-T8 |
| Distribution | Zone selectivity | Distribution | Distribution | Distribution | Distribution |
| (E) I1=0.4-1 In (E) t1=3-18 s t=k/I2 | (E) I1=0.18-1 In (E) t1=3-18 s | (DS) I1=0.4-1 In (DS) t1=3-12 s t=k/I2 | (DS) (E) I1=0.4-1 In (DS) (E) t1=3-18 s t=k/I2 | (DS) (E) I1=0.4-1 In (DS) (E) t1=3-144 s t=k/I2 | (ME) (E) I1=0.4-1 In (ME) (E) t1=3-144 s t=k/I2 |
| (E) I2=0.6-10 In (E) t2=0.05-0.5 s t=k/I2 or t=k | (E) I2=0.6-10 In (E) t2=0.05-0.5 s t=k/I2 or t=k | (DS) I2=1-10 In (DS) t2=0.1-0.25 s t=k/I2 | (DS) (E) I2=0.6-10 In (DS) (E) t2=0.1-0.8 s t=k/I2 or t=k | (DS) (E) I2=0.6-10 In (DS) (E) t2=0.1-0.8 s t=k/I2 or t=k | (ME) (E) I2=0.6-10 In (ME) (E) t2=0.05-0.8 s t=k/I2 or t=k |
| (E) I3=1.5-12 In t3=instantaneous t=k | (E) I3=1.5-12 In t3=instantaneous t=k | (DS) I3=1-10 In t3=instantaneous t=k | (DS) (E) I3=1.5-12 In t3=instantaneous t=k | (DS) (E) I3=1.5-15 In t3=instantaneous t=k | (ME) (E) I3=1.5-15 In t3=instantaneous t=k |
| (E) I4=0.2-1 In (E) t4=0.1-0.8 s t=k/I2 | (E) I4=0.2-1 In (E) t4=0.1-0.8 s t=k/I2 | - | - | (DS) (E) I4=0.2-1 In (DS) (E) t4=0.1-0.8 s t=k/I2 or t=k | (ME) (E) I4=0.2-1 In (ME) (E) t4=0.1-0.8 s t=k/I2 or t=k |
| RC222 (T4-T5)-RC223 (T4) RCQ SACE (T6) | RC222 (T4-T5)-RC223 (T4) RCQ SACE (T6) | RCQ SACE | RCQ SACE | RCQ SACE | (ME) (E) IA=3-30 A (ME) (E) tA=0.06-0.8 s t=k T=85° C t=instantaneous t=k |
| - | - | - | - | - | (ME) (E) I6=0.02-0.9 I1 (ME) (E) t6=0.5-60 s t=k |
| - | - | - | - | - | (ME) (E) U8=0.5-0.95 Un (ME) (E) t8=0.1-5 s t=k (ME) (E) U9=1.05-1.2 Un (ME) (E) t9=0.1-5 s t=k (ME) (E) U10=0.1-0.4 Un (ME) (E) t10=0.5-30 s t=k (ME) (E) P11=-0.3/-0.1 Pn (ME) (E) t11=0.5-25 s t=k (ME) (E) f12=0.90-0.99 fn (ME) (E) t12=0.5-3 s t=k (ME) (E) f13=1.01-1.10 fn (ME) (E) t13=0.5-3 s t=k |
| Dialogue unit available with Modbus protocol -PR021/K remote signalling | Dialogue unit available with Modbus protocol - PR021/K remote signalling | - | - | PR021/K remote signalling | With PR330/D-M -protocol Modbus- BT030 communication wireless -PR021/K remote signalling |
| advanced with VM210 | advanced with VM210 | - | Basic-with PR010T or BT030 | Basic-BT030 | Basic included as standard-advanced with PR330/V |
| Setting (E) with PR010T or with BT030-HMI030 Interface front of panel | Setting (E) with PR010T or with BT030-Protection EF ultra-rapid trip- HMI030 Interface front of panel | - | Setting (E) with PR010T or with BT030 | Setting (E) with PR010T or with BT030-Interface front of panel HMI030 | Adv. Prot. PR330V-Setting (E) with PR010T or with BT030-Interface front of panel HMI030 |

Main release characteristics

| Residual current releases | | RC221 | RC222 | | RC223 |
|--|--|----------------------|--|--|--|
| Sizes | | T1-T2-T3 | T1-T2-T3 | T4 and T5 | T3 and T4 |
|  | Version | 3/4 Poles F | 3/4 Poles-F, P, W- | 4 Poles-F, P, W - | T3 4 Poles F, T4 250 4 Poles-F,P,W - |
| | Type | shape "L" | shape "L" | Underneath | Underneath |
| | Technology | With microprocessor | With microprocessor | With microprocessor | With microprocessor |
| | Action | Solenoid | Solenoid | Solenoid | Solenoid |
| | Primary operating voltage [V] | 85...500 | 85...500 | 85...500 | 110...500 |
| | Frequency of operation [Hz] | 45...66 | 45...66 | 45...66 | 45...66 |
| | Self-supply | • | • | • | • |
| | Field of test operation [V] | 85...500 | 85...500 | 85...500 | 110...500 |
| | Rated service current [A] | up to 250 A | up to 250 A | up to 500 A | up to 500 A |
| | Adjustable trip thresholds [A] | 0.03-0.1-0.3-0.5-1-3 | 0.03- 0.05-0.1-0.3-0.5-1-3-5 -10 | 0.03- 0.05-0.1-0.3-0.5-1-3-5 -10 | 0.003-0.05-0.1-0.3-0.5-1 |
| | Adjustable trip times [s] | instantaneous | instantaneous 0.1- 0.2- 0.3- 0.5- -2- 3 | instantaneous 0.1- 0.2- 0.3- 0.5- -2- 3 | instantaneous 0.1- 0.2- 0.3- 0.5- -2- 3 |
| | Tolerance over trip times | | ± 20% | ± 20% | ± 20% |
| | Absorbed power | < 8 W at 400 V AC | < 10 W at 400 V AC | < 10 W at 400 V AC | < 10 W at 400 V AC |
| | Local trip indication | • | • | • | • |
| | OS with changeover contact for trip signalling | • | • | • | • |
| | Input for remote opening | - | • | • | • |
| | NO contact for signalling pre-alarm | - | • | • | • |
| | NO contact for signalling alarm | - | • | • | • |
| | Indication of pre-alarm from 25% I _{Δn} (tolerance ± 3%) | - | • | • | • |
| | Indication of alarm timing at 75% I _{Δn} (tolerance ± 3%) | - | • | • | • |
| | Type A for pulsating alternating current, AC direct current | • | • | • | • |
| | Type AE with remote release | - | • | • | • |
| | Type B for pulsating current and direct current | - | - | - | • |
| | Type S selective | - | • | • | • |
| | Button for insulation test | • | • | • | • |
| | Power supply from the top and bottom | • | • | • | • |
| | Assembly with three-pole circuit-breakers | • | • | - | - |
| | Assembly with four-pole circuit-breakers | • | • | • | • |
| | Conversion Kit of cb with residual current from fixed to plug-in | - | • | • | • |

RCQ SACE

| | | |
|--|---|--|
|  | Characteristics | All 3/4 poles |
| | Power supply voltage AC [V]/DC [V] | 80...500/48...125 |
| | Frequency of operation [Hz] | 45...66 |
| | Inrush power consumption | 100 [VA]/100 [W] |
| | Service power consumption | 6 [VA]/6 [W] |
| | Adjustment of trip threshold | |
| | 1st range of Adjustments [A] | 0.03-0.05-0.1-0.3-0.5 |
| | 2nd range of Adjustments [A] | 1- 3-5-10-30 |
| | Adjustment of trip times I _{Δn} [s] | instantaneous-0.1-0.2-0.3-0.5-0.7-1-2-3-5 |
| | Adjustment of pre-alarm threshold [%] x I _{Δn} | 25...75% x I _{Δn} |
| | Range of use of closed transformers | |
| | Toroidal transformer Ø 60 [mm] [A] | 0.03...30 |
| | Toroidal transformer Ø 110 [mm] [A] | 0.03...30 |
| | Toroidal transformer Ø 185 [mm] [A] | 0.1...30 |
| | Range of use of openable transformers | |
| | Toroidal transformer Ø 60 [mm] [A] | 0.03...30 |
| | Toroidal transformer Ø 110 [mm] [A] | 0.03...30 |
| | Toroidal transformer Ø 185 [mm] [A] | 0.1...30 |
| | Pre-threshold pre-alarm indication | Yellow flashing LED 1 changeover contact N.O. 6A-250 V AC 50/60 Hz |
| | Signalling of residual relay trip | Magnetic indication and two changeover contacts (N.O. N.C. ; N.O.), 6A-250 V AC 50/60 Hz |
| | Remote opening control | N.O. contact Trip time 15 ms |
| | Connection to the toroidal transformer | By means of 4 twisted conductors. Maximum length: 5 m |
| | Dimensions L x H x D [mm] | 96 x 96 x 131,5 |
| | Drilling for assembly on door [mm] | 92 x 92 |
| | Degree of protection on the front | IP41 |
| | Degree of protection on the rear | IP30 |

Communication/Signalling/M Measurement

PR330/D-M



PR330/D-M

The PR330/D-M communication module is the solution for connecting the ABB moulded-case circuit-breakers to a Modbus network, for supervision and remote control of the circuit-breaker

SACE PR021/K



PR021/K

The SACE PR021/K is able to convert the digital signals provided by the PR222DS/PD, PR223DS, PR223EF, PR331, PR332, PR333 protection units into electric signals by means of normally open electrical contacts, and allow remote signalling of alarms and release trips.

VM210



The VM210 accessory, combined with the protection devices, provides different measurements of the electrical values of the plant. It is able to provide measurements relative to a maximum of 5 electronic releases. The connection distance between the module and the release is a maximum of 15 metres; for distances greater than 1 metre, it is necessary to use a shielded multi-pole connection cable.

HMI030



Can be used with all the protection releases fitted with dialogue, is designed to be installed on the front of the panel. It consists of a graphic display where all the measurements and alarms/events of the release are displayed. Thanks to its high precision, the device can replace traditional multi-meters without the need of current/voltage transformers. The HMI030 is connected directly to the protection release by means of a serial line and requires a 24 V DC power supply.

PR330/V



PR330/V

The internal PR330/V module can be added to the trip unit and allow the phase and neutral voltages to be measured and processed, transferring these data to the protection release itself, so that a series of protection functions and measurements can be implemented.

BT030



BT030

The BT030 is an device to be connected to the Test connector of PR222DS, PR223DS, PR223EF, PR232/P, PR331/Pand PR332/P. It allows Bluetooth communication between the protection release and a hand-held PC or a laptop with a Bluetooth port. T

PR010/T



The unit SACE PR010/T is an instrument able to carry out the Test, programming and parameter reading functions for the protection units which equip the circuit-breakers. For T4, T5, T6 and T7, the test, programming and parameter reading functions are available. It is possible to store the results of primary interest regarding the tests inside the unit itself and to send them to the PC. In both automatic and manual mode, the SACE PR010/T unit is able to test: – protection functions L, S, I, G – protection functions L, R, I, U (for PR222MP) – monitoring of correct operation of the microprocessor.

Emax air circuit-breakers for distribution

Common data

| | | | |
|---------------------------------|------|------|--------------------|
| Voltages | | | |
| Rated service voltage | Ue | [M] | 690 ~ |
| Rated insulation voltage | Ui | [M] | 1000 |
| Rated impulse withstand voltage | Uimp | [kV] | 12 |
| Service temperature | | [°C] | -25...+70 |
| Storage temperature | | [°C] | -40...+70 |
| Frequency | f | [Hz] | 50-60 |
| Number of poles | | | 3-4 |
| Version | | | Fixed-Withdrawable |



| | | | X1 | | | E1 | | |
|---|----------------|------------------------|------------------------|----------------------------------|---------|---------|---------|-------|
| Levels of performance | | | [A] | B | N | L | B | N |
| Currents: rated uninterrupted current (at 40 °C) | Iu | | [A] | 630 | 630 | 630 | 800 | 800 |
| | | | [A] | 800 | 800 | 800 | 1000 | 1000 |
| | | | [A] | 1000 | 1000 | 1000 | 1250 | 1250 |
| | | | [A] | 1250 | 1250 | 1250 | 1600 | 1600 |
| | | | [A] | 1600 | 1600 | - | - | - |
| Current carrying capacity of neutral pole for 4-pole cbs | | | [%Iu] | 100 | 100 | 100 | 100 | 100 |
| Rated ultimate short-circuit breaking capacity | Icu | 220/230/380/400/415 V~ | [kA] | 42 | 65 | 150 | 42 | 50 |
| | | 440 V~ | [kA] | 42 | 65 | 130 | 42 | 50 |
| | | 500/525 V~ | [kA] | 42 | 50 | 100 | 42 | 50 |
| | | 660/690 V~ | [kA] | 42 | 50 | 60 | 42 | 50 |
| Rated service short-circuit breaking capacity | Ics | 220/230/380/400/415 V~ | [kA] | 42 | 50 | 150 | 42 | 50 |
| | | 440 V~ | [kA] | 42 | 50 | 130 | 42 | 50 |
| | | 500/525 V~ | [kA] | 42 | 42 | 100 | 42 | 50 |
| | | 660/690 V~ | [kA] | 42 | 42 | 45 | 42 | 50 |
| Rated short/time withstand current | Icw | (1s) | [kA] | 42 | 42 | 15 | 42 | 50 |
| | | (3s) | [kA] | - | - | - | 36 | 36 |
| | | Icm | 220/230/380/400/415 V~ | [kA] | 88.2 | 143 | 330 | 88.2 |
| Rated making capacity in short-circuit (peak value) | | 440 V~ | [kA] | 88.2 | 143 | 286 | 88.2 | 105 |
| | | 500/525 V~ | [kA] | 88.2 | 121 | 220 | 88.2 | 105 |
| | | 660/690 V~ | [kA] | 88.2 | 121 | 132 | 88.2 | 105 |
| | | Category of use | CEI EN 60947-2 | | B | B | A | B |
| Isolation behaviour | CEI EN 60947-2 | | • | • | • | • | • | |
| Overcurrent protection | | | • | • | • | • | • | |
| Electronic releases for applications in AC | | | • | • | • | • | • | |
| Operating times | | | | | | | | |
| Closing time (max) | | | [ms] | 80 | 80 | 80 | 80 | 80 |
| Breaking time for I<Icw (max) ⁽¹⁾ | | | [ms] | 70 | 70 | 70 | 70 | 70 |
| Breaking time for I>Icw (max) | | | [ms] | 30 | 30 | 12 | 30 | 30 |
| Overall dimensions | | | | | | | | |
| Fixed: H =418 mm-D =302 mm | L (3/4 poles) | | [mm] | H=268 mm-D=181 mm-L(3/4)=210/280 | | | 296/386 | |
| Withdrawable: H =461 mm-D =396.5 mm | L (3/4 poles) | | [mm] | H=343 mm-D=254 mm-L(3/4)=284/354 | | | 324/414 | |
| Weights (circuit-breaker complete with releases and CT, accessories excluded) | | | | | | | | |
| Fixed 3/4 poles | | | [kg] | 11/14 | 11/14 | 11/14 | 45/54 | 45/54 |
| Withdrawable 3/4 poles (including the fixed part) | | | [kg] | 32/42.6 | 32/42.6 | 32/42.6 | 70/82 | 70/82 |

⁽¹⁾ without intentional delays ⁽²⁾ the performance at 600 V is 100 kA

| | | | X1 B | X1 N | X1 L | E1 B-N | | |
|---|-----------|-------------------------|------|------|------|--------|---------------|------|
| Rated uninterrupted current (at 40 °C) | Iu | [A] | 800 | 1250 | 1600 | 800 | 1000/ 1250 | 1600 |
| Mechanical life with regular ordinary maintenance | | [No. operations x 1000] | 12.5 | 12.5 | 12.5 | 25 | 25 | 25 |
| Frequency of operations | | [Operations/hour] | 60 | 60 | 60 | 60 | 60 | 60 |
| Electrical life | (440 V ~) | [No. operations x 1000] | 6 | 4 | 3 | 10 | 10 | 10 |
| | (690 V ~) | [No. operations x 1000] | 3 | 2 | 1 | 10 | 8 | 8 |
| Frequency of operations | | [Operations/hour] | 30 | 30 | 30 | 30 | 30 | 30 |



| | E2 | | | | E3 | | | | E4 | | | | E6 | |
|--|---------|-------|-------|-------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | B | N | S | L | N | S | H | V | L | S | H | V | H | V |
| | 1600 | 1000 | 800 | 1250 | 2500 | 1000 | 800 | 800 | 2000 | 4000 | 3200 | 3200 | 4000 | 3200 |
| | 2000 | 1250 | 1000 | 1600 | 3200 | 1250 | 1000 | 1250 | 2500 | - | 4000 | 4000 | 5000 | 4000 |
| | - | 1600 | 1250 | - | - | 1600 | 1250 | 1600 | - | - | - | - | 6300 | 5000 |
| | - | 2000 | 1600 | - | - | 2000 | 1600 | 2000 | - | - | - | - | - | 6300 |
| | - | - | 2000 | - | - | 2500 | 2000 | 2500 | - | - | - | - | - | - |
| | - | - | - | - | - | 3200 | 2500 | 3200 | - | - | - | - | - | - |
| | - | - | - | - | - | - | 3200 | - | - | - | - | - | - | - |
| | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 50 | 50 | 50 | 50 | 50 |
| | 42 | 65 | 85 | 130 | 65 | 75 | 100 | 130 | 130 | 75 | 100 | 150 | 100 | 150 |
| | 42 | 65 | 85 | 110 | 65 | 75 | 100 | 130 | 110 | 75 | 100 | 150 | 100 | 150 |
| | 42 | 55 | 65 | 85 | 65 | 75 | 85 | 100 | 85 | 75 | 100 | 130 | 100 | 130 |
| | 42 | 55 | 65 | 85 | 65 | 75 | 85 | 100 | 85 | 75 | 85 | 100 | 100 | 100 |
| | 42 | 65 | 85 | 130 | 65 | 75 | 85 | 100 | 130 | 75 | 100 | 125 | 100 | 125 |
| | 42 | 65 | 85 | 110 | 65 | 75 | 85 | 100 | 110 | 75 | 100 | 125 | 100 | 125 |
| | 42 | 55 | 65 | 65 | 65 | 75 | 85 | 85 | 65 | 75 | 100 | 130 | 100 | 100 |
| | 42 | 55 | 65 | 65 | 65 | 75 | 85 | 85 | 65 | 75 | 85 | 100 | 100 | 100 |
| | 42 | 55 | 65 | 10 | 65 | 75 | 75 | 85 | 15 | 75 | 100 | 100 | 100 | 100 |
| | 42 | 42 | 42 | - | 65 | 65 | 65 | 65 | - | 75 | 75 | 75 | 85 | 85 |
| | 88.2 | 143 | 187 | 286 | 143 | 165 | 220 | 286 | 286 | 165 | 220 | 330 | 220 | 330 |
| | 88.2 | 143 | 187 | 242 | 143 | 165 | 220 | 286 | 286 | 165 | 220 | 330 | 220 | 330 |
| | 88.2 | 121 | 143 | 187 | 143 | 165 | 187 | 220 | 187 | 165 | 220 | 286 | 220 | 286 |
| | 88.2 | 121 | 143 | 187 | 143 | 165 | 187 | 220 | 187 | 165 | 187 | 220 | 220 | 220 |
| | B | B | B | A | B | B | B | B | A | B | B | B | B | B |
| | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 |
| | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 |
| | 30 | 30 | 30 | 12 | 30 | 30 | 30 | 30 | 12 | 30 | 30 | 30 | 30 | 30 |
| | 296/386 | | | | 404/530 | | | | 566/656 | | | | 782/908 | |
| | 324/414 | | | | 432/558 | | | | 594/684 | | | | 810/936 | |
| | 50/61 | 50/61 | 50/61 | 52/63 | 66/80 | 66/80 | 66/80 | 66/80 | 72/83 | 97/117 | 97/117 | 97/117 | 140/160 | 140/160 |
| | 78/93 | 78/93 | 78/93 | 80/95 | 104/125 | 104/125 | 104/125 | 104/125 | 110/127 | 147/165 | 147/165 | 147/165 | 210/240 | 210/240 |

| | E2 B-N-S | | | | E2 L | | E3 N-S-H-V | | | | | | | E3 L | | E4 S-H-V | | E6 H-V | | | |
|--|----------|------|------|------|------|------|------------|------|------|------|------|------|------|------|------|----------|------|--------|------|------|------|
| | 800 | 1000 | 1600 | 2000 | 1250 | 1600 | 800 | 1000 | 1600 | 2000 | 2500 | 3200 | 3200 | 2000 | 2500 | 3200 | 4000 | 3200 | 4000 | 5000 | 6300 |
| | 25 | 25 | 25 | 25 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 15 | 15 | 15 | 15 | 12 | 12 | 12 | 12 |
| | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| | 15 | 15 | 12 | 10 | 4 | 3 | 12 | 12 | 10 | 9 | 8 | 6 | 6 | 2 | 1,8 | 7 | 5 | 5 | 4 | 3 | 2 |
| | 15 | 15 | 10 | 8 | 3 | 2 | 12 | 12 | 10 | 9 | 7 | 5 | 5 | 1,5 | 1,3 | 7 | 4 | 5 | 4 | 2 | 1,5 |
| | 30 | 30 | 30 | 30 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 10 | 10 | 10 | 10 | 10 | 10 |

Emax air circuit-breakers for specific applications

| | | | X1 | E1 | E2 | | |
|---|--------|------|------------------|------------------|----|------------------|--|
| Circuit-breakers with full section neutral conductor | | | | | | | |
| Poles | [No] | | Standard version | Standard version | | Standard version | |
| Current carrying capacity of the neutral of 4p circuit-breakers | [% Iu] | | | | | | |
| Iu (40 °C) | [A] | | | | | | |
| Ue | [V~] | | | | | | |
| Icu (220...415 V) | [kA] | | | | | | |
| Ics (220...415 V) | [kA] | | | | | | |
| Icw (1s) | [kA] | | | | | | |
| | (3s) | [kA] | | | | | |

Switch-disconnectors

| | | | X1B/MS | E1B/MS | E1N/MS | E2B/MS | E2N/MS | E2S/MS |
|-------------------|------|------|----------------|--------------------|--------------------|-----------|---------------------|---------------------|
| Poles | [No] | | 3-4 | 3-4 | 3-4 | 3-4 | 3-4 | 3-4 |
| Iu (40 °C) | [A] | | 1000-1250-1600 | 800-1000-1250-1600 | 800-1000-1250-1600 | 1600-2000 | 1000-1250-1600-2000 | 1000-1250-1600-2000 |
| Ue | [V~] | | 690 | 690 | 690 | 690 | 690 | 690 |
| Icw (1s) | [kA] | | 42 | 42 | 50 | 42 | 55 | 65 |
| | (3s) | [kA] | | 36 | 36 | 42 | 42 | 42 |
| Icm (220...440 V) | [kA] | | 88.2 | 88.2 | 105 | 88.2 | 121 | 143 |

Circuit-breakers for applications up to 1150 V AC

| | | | X1B/E | | E2B/E | E2N/E |
|--------------|------|--|------------------------|--|-----------|----------------|
| Poles | [No] | | 3-4 | | 3-4 | 3-4 |
| Iu (40 °C) | [A] | | 630-800-1000-1250-1600 | | 1600-2000 | 1250-1600-2000 |
| Ue | [V~] | | 1000 | | 1150 | 1150 |
| Icu (1000 V) | [kA] | | 20 | | 20 | 30 |
| Ics (1000 V) | [kA] | | 20 | | 20 | 30 |
| Icw (1s) | [kA] | | 20 | | 20 | 30 |

Switch-disconnectors for applications up to 1150 V AC

| | | | X1B/E MS | | E2B/E MS | E2N/E MS |
|--------------|------|--|----------------|--|-----------|----------------|
| Poles | [No] | | 3-4 | | 3-4 | 3-4 |
| Iu (40 °C) | [A] | | 1000-1250-1600 | | 1600-2000 | 1250-1600-2000 |
| Ue | [V~] | | 1000 | | 1150 | 1150 |
| Icw (1s) | [kA] | | 20 | | 20 | 30 |
| Icm (1000 V) | [kA] | | 40 | | 40 | 63 |

Switch-disconnectors for applications up to 1000 V DC

| | | | | E1B/E MS | | E2N/E MS |
|-------------|----------|------|--|-----------------------|--|-----------------------|
| Poles | [No] | | | 3-4 | | 3-4 |
| Iu (40 °C) | [A] | | | 800-1250 | | 1250-1600-2000 |
| Ue | [V-] | | | 750 (3p) 1000 (4p) | | 750 (3p) 1000 (4p) |
| Icw (1s) | [kA] | | | 20 | | 25 |
| Icm (750 V) | [kA] | | | 42 | | 52.5 |
| | (1000 V) | [kA] | | 42 | | 52.5 |

Isolating truck

| | | | | E1 CS | | E2 CS |
|------------|-----|--|--|-------|--|-------|
| Iu (40 °C) | [A] | | | 1250 | | 2000 |

Earthing switch with making capacity

| | | | | E1 MTP | | E2 MTP |
|------------|-----|--|--|--------|--|--------|
| Iu (40 °C) | [A] | | | 1250 | | 2000 |

Earthing truck

| | | | | E1 MT | | E2 MT |
|------------|-----|--|--|-------|--|-------|
| Iu (40 °C) | [A] | | | 1250 | | 2000 |

(*) The performance at 1000 V is 50 kA

| E3 | | | E4 | | | E6 | | |
|--------------------------|-------------------------------|------------------------------|-----------|-----------|-----------|----------------|----------------|--|
| Standard version | | | E4S/f | E4H/f | | | E6H/f | |
| | | | 4 | 4 | | | 4 | |
| | | | 100 | 100 | | | 100 | |
| | | | 4000 | 3200-4000 | | | 4000-5000-6300 | |
| | | | 690 | 690 | | | 690 | |
| | | | 80 | 100 | | | 100 | |
| | | | 80 | 100 | | | 100 | |
| | | | 80 | 85 | | | 100 | |
| | | | 75 | 75 | | | 100 | |
| E3N/MS | E3S/MS | E3V/MS | E4S/MS | E4H/MS | E4H/f MS | E6H/MS | E6H/f MS | |
| 3-4 | 3-4 | 3-4 | 3-4 | 3-4 | 4 | 3-4 | 4 | |
| 2500-3200 | 1000-1250-1600-2000-2500-3200 | 800-1250-1600-2000-2500-3200 | 4000 | 3200-4000 | 3200-4000 | 4000-5000-6300 | 4000-5000-6300 | |
| 690 | 690 | 690 | 690 | 690 | 690 | 690 | 690 | |
| 65 | 75 | 85 | 75 | 100 | 85 | 100 | 100 | |
| 65 | 65 | 65 | 75 | 75 | 75 | 85 | 85 | |
| 143 | 165 | 187 | 165 | 220 | 187 | 220 | 220 | |
| E3H/E | | | E4H/E | | | E6H/E | | |
| 3-4 | | | 3-4 | | | 3-4 | | |
| 1250-1600-2000-2500-3200 | | | 3200-4000 | | | 4000-5000-6300 | | |
| 1150 | | | 1150 | | | 1150 | | |
| 30(*) | | | 65 | | | 65 | | |
| 30(*) | | | 65 | | | 65 | | |
| 30(*) | | | 65 | | | 65 | | |
| E3H/E MS | | | E4H/E MS | | | E6H/E MS | | |
| 3-4 | | | 3-4 | | | 3-4 | | |
| 1250-1600-2000-2500-3200 | | | 3200-4000 | | | 4000-5000-6300 | | |
| 1150 | | | 1150 | | | 1150 | | |
| 50 | | | 65 | | | 65 | | |
| 105 | | | 143 | | | 143 | | |
| E3H/E MS | | | E4H/E MS | | | E6H/E MS | | |
| 3-4 | | | 3-4 | | | 3-4 | | |
| 1250-1600-2000-2500-3200 | | | 3200-4000 | | | 4000-5000-6300 | | |
| 750 (3p) | | | 750 (3p) | | | 750 (3p) | | |
| 1000 (4p) | | | 1000 (4p) | | | 1000 (4p) | | |
| 40 | | | 65 | | | 65 | | |
| 105 | | | 143 | | | 143 | | |
| 105 | | | 143 | | | 143 | | |
| E3 CS | | | E4 CS | | | E6 CS | | |
| 3200 | | | 4000 | | | 6300 | | |
| E3 MTP | | | E4 MTP | | | E6 MTP | | |
| 3200 | | | 4000 | | | 6300 | | |
| E3 MT | | | E4 MT | | | E6 MT | | |
| 3200 | | | 4000 | | | 6300 | | |

Accessories for Emax air circuit-breakers

Circuit-breaker version

| | Circuit-breakers | | | |
|--|---|--------------|-------|--------------|
| | Circuit-breakers with full section neutral | | | |
| | Circuit-breakers for applications up to 1150 V AC | | | |
| | X1 | | E1-E6 | |
| | Fixed | Withdrawable | Fixed | Withdrawable |
| Service releases | | | | |
| Shunt opening/closing release and second shunt opening release | • | • | • | • |
| SOR test unit | • | • | • | • |
| Undervoltage release | • | • | • | • |
| Delay device for undervoltage release | • | • | • | • |
| Remote control | | | | |
| Geared motor for automatic charging of the closing springs (M) | • | • | • | • |
| Electric signals | | | | |
| Electric signalling overcurrent release tripping | • | • | • | • |
| Electric signalling overcurrent release tripping with remote control | • | • | • | • |
| Electric signalling of circuit-breaker open/closed ⁽¹⁾ | • | • | • | • |
| Electric signalling of circuit-breaker open/closed, supplementary external | | | • | • |
| Electric signalling of circuit-breaker connected/racked-out/racked out for test | | ○ | | • |
| Signalling contact for closing springs charged | • | • | • | • |
| Signalling contact for the undervoltage release de-energised (C. Aux YU) | | | • | • |
| Signalling contact for "ready to close" | • | • | | |
| Accessories for electronic releases | | | | |
| Current transformer for the neutral conductor outside the circuit-breaker | • | • | • | • |
| Homopolar toroid for the earth earthing conductor of the mains supply (star centre of the transformer) | • | • | • | • |
| Homopolar toroid for residual current protection | • | ○ | • | • |
| Controls and locks | | | | |
| Mechanical operation counter | • | • | • | • |
| Lock in open position: key | • | • | • | • |
| Lock in open position: padlocks | • | • | • | • |
| Circuit-breaker lock in connected/racked-out/racked out for test position | | ● | | ● |
| Accessories for lock in racked-out/racked out for test position | | ● | | ● |
| Accessory for shutter padlock lock | | | | • |
| Mechanical lock on compartment door | • | • | • | • |
| Opening and closing pushbutton protection | • | • | • | • |
| IP54 door protection | • | • | • | • |
| Sliding contact locks | • | • | • | • |
| Interlock between circuit-breakers ⁽²⁾ | • | • | • | • |
| Automatic network-generator transfer unit | | | | |
| ATS021/ATS022 automatic network-generator transfer switch ⁽³⁾ | • | • | • | • |

KEY

- Optional accessory on circuit-breaker fixed or moving part
- Optional accessory on fixed part
- Optional accessory on moving part

⁽¹⁾ For the circuit-breaker the 4 auxiliary contacts for electric signalling of circuit-breaker open/closed are included in the normal supply

⁽²⁾ Incompatible with the versions with full section neutral E6/f


⁽³⁾ For E1-E6, incompatible with the range of circuit-breakers for applications up to 1150V AC. For X1, incompatible with the range of circuit-breakers for applications up to 1000V AC

Main characteristics of releases




Combination of release with circuit-breaker

| | X1 | E1 | E2 | E3 | E4 | E6 |
|------------|----------|----------|----------|----------|-----------|-----------|
| In | 630/1600 | 800/1600 | 800/2000 | 800/3200 | 3200/4000 | 3200/6300 |
| Version | F-W | F-W | F-W | F-W | F-W | F-W |
| Electronic | PR331/P | • | - | - | - | - |
| | PR332/P | • | - | - | - | - |
| | PR333/P | • | - | - | - | - |
| | PR121/P | - | • | • | • | • |
| | PR122/P | - | • | • | • | • |
| | PR123/P | - | • | • | • | • |

Electronic releases

| | PR331/P | PR332/P | PR333/P |
|--|---|--|---|
| |  |  |  |

| Electronic releases | LI-LSI-LSIG | LSIG | LSIG |
|-----------------------------|---|---|--|
| Compatible circuit-breakers | T7-X1 | T7-X1 | X1 |
| Applications | Distribution | Distribution | Distribution |
| Basic protections | | | |
| L | (DS) (E) I1=0.4-1 In (DS) (E) t1=3-144 s t=k/2 | (ME) (E) I1=0.4-1 In (ME) (E) t1=3-144 s t=k/2 | (ME) (E) I1=0,4-1 In (ME) (E) t1=3-144 s t=k/2 |
| S | (DS) (E) I2=0.6-10 In (DS) (E) t2=0.1-0.8 s t=k/2 or t=k | (ME) (E) I2=0.6-10 In (ME) (E) t2=0.05-0.8 s t=k/2 or t=k | (ME) (E) I2=0.6-10 In (ME) (E) t2=0.05-0.8 s t=k/2 or t=k |
| I | (DS) (E) I3=1.5-15 In t3= instantaneous t=k | (ME) (E) I3=1.5-15 In t3= instantaneous t=k | (ME) (E) I3=1.5-15 In t3= instantaneous t=k |
| G | (DS) (E) I4=0.2-1 In (DS) (E) t1=0.1-0.8 s t=k/2 or t=k | (ME) (E) I4=0.2-1 In (ME) (E) t4=0.1-0.8 s t=k/2 or t=k | (ME) (E) I4=0.2-1 In (ME) (E) t4=0.1-0.8 s t=k/2 or t=k |
| Rc | RCQ SACE - | (ME) (E) IΔ=3-30 A (ME) (E) tΔ=0.06-0.8 s t=k | (ME) (E) IΔ=3-30 A (ME) (E) tΔ=0.06-0.8 s t=k |
| OT | - | T=85 °C t= instantaneous t=k | T=85 °C t= instantaneous t=k |
| U | - | (ME) (E) I6=0.02-0.9 I1 (ME) (E) t6=0.5-60 s t=k | (ME) (E) I6=0.02-0.9 I1 (ME) (E) t6=0.5-60 s t=k |
| Advanced protections | | | |
| UV | - | (ME) (E) U8=0.5-0.95 Un (ME) (E) t8 =0.1-5 s t=k | (ME) (E) U8=0.5-0.95 Un (ME) (E) t8 =0.1-5 s t=k |
| OV | - | (ME) (E) U9=1.05-1.2 Un (ME) (E) t9 =0.1-5 s t=k | (ME) (E) U9=1.05-1.2 Un (ME) (E) t9 =0.1-5 s t=k |
| RV | - | (ME) (E) U10 =0.1-0.4 Un (ME) (E) t10 =0.5-30 s t=k | (ME) (E) U10 =0.1-0.4 Un (ME) (E) t10 =0.5-30 s t=k |
| RP | - | (ME) (E) P11 =-0.3/-0.1 Pn (ME) (E) t11 =0.5-25 s t=k | (ME) (E) P11 =-0.3/-0.1 Pn (ME) (E) t10 =0.5-25 s t=k |
| UF | - | (ME) (E) f12 =0.90-0.99 fn (ME) (E) t12 =0.5-3 s t=k | (ME) (E) f12 =0.90-0.99 fn (ME) (E) t10 =0.5-3 s t=k |
| OF | - | (ME) (E) f13 =1,01-1,10 fn (ME) (E) t13 =0.5-3 s t=k | (ME) (E) f13 =1.01-1.10 fn (ME) (E) t13 =0.5-3 s t=k |
| S2 | - | - | (ME) (E) I2=0.6-10 In (ME) (E) t2=0.05-0.8 s t=k |
| D | - | - | (ME) (E) I7=0.6-10 In t=k |
| R | - | - | (ME) (E) t7=0.2-0.8 s t=k |
| Communication | PR021/K remote signalling | With PR330/D-M - Modbus protocol- BT030 communication wireless -PR021/K remote signalling | With PR330/D-M as standard-Modbus protocol |
| Measurements | Basic-BT030 | Basic included as standard-advanced with PR330/V | advanced- harmonic analysis |
| NOTES | Setting (E) with PR010T or with BT030-Interface front of panel HMI030 | Adv. Prot. PR330V-Setting (E) with PR010T or with BT030-Interface front of panel HMI030 | - |

| PR121/P | PR122/P | PR123/P |
|---|---|--|
|  |  |  |
| LI-LSI-LSIG | LI-LSI-LSIG | LI-LSI-LSIG |
| E1-E2-E3-E4-E6 | E1-E2-E3-E4-E6 | E1-E2-E3-E4-E6 |
| Distribution | Distribution | Distribution |
| (DS) (E) I1=0.4-1 In | (ME) (E) I1=0.4-1 In | (ME) (E) I1=0.4-1 In |
| (DS) (E) t1=3-144 s t=k/2 | (ME) (E) t1=3-144 s t=k/2 | (ME) (E) t1=3-144 s t=k/2 |
| (DS) (E) I2=1-10 In | (ME) (E) I2=0.6-10 In | (ME) (E) I2=0.6-10 In |
| (DS) (E) t2=0.1-0.8 s t=k | (ME) (E) t2=0.5-0.8 s t=k/2 or t=k | (ME) (E) t2=0.05-0.8 s t=k/2 or t=k |
| (DS) (E) I3=1.5-15 In | (ME) (E) I3=1.5-15 In | (ME) (E) I3=1.5-15 In |
| t3= instantaneous t=k | t3= instantaneous t=k | t3= instantaneous t=k |
| (DS) (E) I4=0.2-1 In | (ME) (E) I4=0.1-1 In | (ME) (E) I4=0.1-1 In |
| (DS) (E) t4=0.1-0.8 s t=k | (ME) (E) t4=0.1-1 s t=k/2 or t=k | (ME) (E) t4=0.1-1 s t=k/2 or t=k |
| - | (ME) (E) IΔ=3-20 A | (ME) (E) IΔ=3-30 A |
| - | (ME) (E) tΔ=0.06-0.8s t=k | (ME) (E) tΔ=0.06-0.8 s t=k |
| - | T=85° C | T=85° C |
| - | t=instantaneous t=k | t=instantaneous t=k |
| - | (ME) (E) I6=5...90% | (ME) (E) I6=5...90% |
| - | (ME) (E) t6=0.5-60 s t=k | (ME) (E) t6=0.5-60 s t=k |
| - | (ME) (E) U8=0.5-0.95 Un | (ME) (E) U8=0.5-0.95 Un |
| - | (ME) (E) t8 =0.1-5 s t=k | (ME) (E) t8 =0.1-5 s t=k |
| - | (ME) (E) U9=1.05-1.2 Un | (ME) (E) U9=1.05-1.2 Un |
| - | (ME) (E) t9 =0.1-5 s t=k | (ME) (E) t9 =0.1-5 s t=k |
| - | (ME) (E) U10 =0.1-0.4 Un | (ME) (E) U10 =0.1-0.4 Un |
| - | (ME) (E) t10 =0.5-30 s t=k | (ME) (E) t10 =0.5-30 s t=k |
| - | (ME) (E) P11 =-0.3/-0.1 Pn | (ME) (E) P11 =-0.3/-0.1 Pn |
| - | (ME) (E) t10 =0.5-25 s t=k | (ME) (E) t10 =0.5-25 s t=k |
| - | (ME) (E) f12 =0.90-0.99 fn | (ME) (E) f12 =0.90-0.99 fn |
| - | (ME) (E) t10 =0.5-3 s t=k | (ME) (E) t10 =0.5-3 s t=k |
| - | (ME) (E) f13 =1.01-1.10 fn | (ME) (E) f13 =1.01-1.10 fn |
| - | (ME) (E) t13 =0.5-3 s t=k | (ME) (E) t13 =0.5-3 s t=k |
| - | - | (ME) (E) I2=0.6-10 In |
| - | - | (ME) (E) t2=0.05-0.8 s t=k |
| - | - | (ME) (E) I7=0.6-10 In |
| - | - | (ME) (E) t7=0.2-0.8 s t=k |
| - | - | - |
| PR021K Alarm signalling | With PR120/ D-M | With PR120/ D-M |
| - | Basic: included as standard-advanced with Accessory PR120/V | advanced- harmonic analysis |
| - | Adv. prot. PR120V-Diff. with homopolar toroid- Sett. (E) with PR010T, BT030-USB, PR120/D-BT | Residual with homopolar toroid-Sett. (E) with PR010T, BT030-USB, PR120/D-BT |

KEY

L-Protection against overload
S-Selective protection against short-circuit
I-Instantaneous protection against short-circuit
G-Protection against earth faults
Rc-Protection against residual current
OT-Protection against overtemperature
U-Protection against phase unbalance
UV-Undervoltage protection

t=k relation t=f(I)



t=k/2 relation t=f(I)



OV-Overvoltage protection
RV-Protection against residual voltage
RP-Protection against active power reversal
UF-Protection against under frequency
OF-Protection against over frequency
S2-Selective protection against short-circuit
D-Protection against directional short-circuit
R-Protection against rotor block

PR010T-Test and configuration unit
PR_ _ D-M-Communication module mod-bus
PR_ _ V Measurement module
BT030-Wireless communication unit

PR021K-Signalling unit

(M)-Manual setting
(DS)-Setting with Dip Switch
(E)-Electronic setting with external apparatus (BT030 or PR010T) or remotely with communication
(ME)-Electronic manual setting on front of panel

RC_ _-External residual current release for moulded-case circuit-breakers
RCQ SACE-Panel residual current with toroid and opening coil


Basic Measurements
Phase, Neutral, Earth currents

Advanced Measurements
Currents (phase, Neutral, Earth)
Phase voltages (between phases, phase-neutral, residual)
Power (Active, Reactive, Apparent)
Power factor
Frequency and Peak Factor
Energy (Active, Reactive, Apparent)


Version
F- Fixed
P- Plug-in
W- Withdrawable

Main characteristics of releases


RCQ SACE

| | | | |
|---|---------------------------------------|--|---|
|  | Characteristics | | All 3/4 poles |
| | Power supply voltage | AC [V]/DC [V] | 80...500/48...125 |
| | Frequency of operation | [Hz] | 45...66 |
| | Absorbed power on inrush | | 100 [VA]/100 [W] |
| | Absorbed power running | | 6 [VA]/6 [W] |
| | Adjustment of trip threshold | | |
| | 1st range of Adjustments | [A] | 0.03-0.05-0.1-0.3-0.5 |
| | 2nd range of Adjustments | [A] | 1-3-5-10-30 |
| | Adjustment of trip times I Δ n | [s] | instantaneous-0.1-0.2-0.3-0.5-0.7-1-2-3 5 |
| | Adjustment of pre-alarm threshold | [%] x I Δ n | 25...75% x I Δ n |
| Range of use of closed transformers | | | |
| Toroidal transformer Ø 60 [mm] | [A] | 0.03...30 | |
| Toroidal transformer Ø 110 [mm] | [A] | 0.03...30 | |
| Toroidal transformer Ø 185 [mm] | [A] | 0.1...30 | |
| Range of use of openable transformers | | | |
| Toroidal transformer Ø 60 [mm] | [A] | 0.03...30 | |
| Toroidal transformer Ø 110 [mm] | [A] | 0.03...30 | |
| Toroidal transformer Ø 185 [mm] | [A] | 0.1...30 | |
| Pre-threshold pre-alarm indication | | Yellow flashing LED 1 changeover contact N.O. 6A-250 V AC 50/60 Hz | |
| Signalling of residual current release trip | | Magnetic indication and two changeover contacts (N.O. N.C. ; N.O.). 6A-250 V AC 50/60 Hz | |
| Remote opening control | | N.O. contact Trip time 15 ms | |
| Connection to the toroidal transformer | | By means of 4 twisted conductors. Maximum length: 5 m | |
| Dimensions L x H x D | [mm] | 96 x 96 x 131.5 | |
| Drilling for assembly on door | [mm] | 92 x 92 | |
| Degree of protection on the front | | IP41 | |
| Degree of protection on the rear | | IP30 | |

HOMOPOLAR TOROID FOR RESIDUAL CURRENT PROTECTION

| | |
|---|---|
|  | The PR332/P LSIrc, PR332/P LSIG (with PR330V) PR122/P LSIrc, PR122/P LSIG (with PR120/V) e PR123/P electronic trip units can be used with this accessory, which allows activation of the residual current protection. RC protection can be activated only when the dedicated rating plug for residual current protection and external toroidal transformer are present. |
|---|---|

HOMOPOLAR SENSOR

| | |
|---|---|
|  | Homopolar sensor for main power supply earthing conductor (star centre of the transformer). |
|---|---|

Communication/Signalling/Measurement

PR330/D-M - PR120/D-M



PR330/D-M



PR120/D-M

The PR330/D-M (for Tmax) and PR120/D-M (for Emax) communication modules are the solution for connection the ABB circuit-breakers to a Modbus network, for remote supervision and control of the circuit-breaker.

SACE PR021/K -PR120/K



PR021/K



PR120/K

The SACE PR021/K and PR120/K (only for PR122 and PR123) signalling units are able to convert the digital signals supplied by the PR331, PR332, PR333, PR121, PR122 and PR123 protection units into electric signals by means of normally open electrical contacts, it allows remote signalling of the release alarms and trips.

HMI030



This can be used with all the protection releases fitted with dialogue, it is designed to be installed on the front of the panel. It consists of a graphic display where all the measurements and the release alarms/events are displayed. Thanks to its high level of precision, the device can replace the traditional multi-meters without the need of current/voltage transformers. L'HMI030 is connected directly to the protection release by means of a serial line and requires a 24 V DC power supply.

PR330/V -PR120/V



PR330/V



PR120/V

The internal PR330/V (for PR332/P) and PR120/V (for PR122/P) modules can be added to the releases and allow the phase voltages and neutral to be measured and processed, transferring these data to the protection release itself, so that a series of protection and measurement functions can be implemented.

BT030 - PR120/D-BT



BT030



PR120/D-BT

The BT030 is a device to be connected to the Test connector of PR222DS, PR223DS, PR223EF, PR232/P, PR331/P and PR332/P. It allows Bluetooth communication between the protection release and a hand-held PC or a laptop with a Bluetooth port. The BT030 can also be used with Emax circuit-breakers equipped with PR121/P, PR122/P and PR123/P. For the PR122 and 123, the PR120/D-BT Bluetooth communication module is available, which can be inserted inside the release.

PR010/T



The SACE PR010/T unit is an instrument able to carry out the Test, programming and parameter reading functions for the protection units which equip the circuit-breakers.

Contact us

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