Technical Construction File

Tcf No: Applicant:	CE-WZ25061801-SO-LVD Wenzhou Solarc New Energy Technology Co., Ltd
Address:	No. 005 Yanhe West Road, Gaocun Village, Wenzhou Bridge Industrial Zone, Yueqing City, Wenzhou
Manufacturer:	Wenzhou Solarc New Energy Technology Co., Ltd
Address:	No. 005 Yanhe West Road, Gaocun Village, Wenzhou Bridge Industrial Zone, Yueqing City, Wenzhou
Product:	DC Molded Case Circuit Breaker
Model:	SCM3DC-800, SCM3DC-630, SCM3DC-400, SCM3DC-320
Test standard:	EN 60947-2:2017+A1:2020
Conclusion:	The products meet the above standards.
Edit Date:	2025-06-18
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ASSESSMENT REPORT

TCF

Reference No. .....: CE-WZ25061801-SO-LVD

Tested by(+ signature).....: Project Engineer, Melody Melody

Reviewed by(+ signature).....: Manager, Tracy Tracy

Date of issue .....: 2025-06-18

Client

Name .....: Wenzhou Solarc New Energy Technology Co., Ltd

Address .....: No. 005 Yanhe West Road, Gaocun Village, Wenzhou Bridge Industrial Zone, Yueqing City, Wenzhou

Test specification

Standard .....: EN 60947-2:2017+A1:2020

Test procedure .....: CE-LVD

Non-standard test method .....: N.A.

Test item description:

Manufacturer.....: Wenzhou Solarc New Energy Technology Co., Ltd

Factory.....: Wenzhou Solarc New Energy Technology Co., Ltd

Trademark .....: Refer to the nameplate

Model, Type reference .....: Refer to page 1

Rating(s) .....: refer to the nameplate.

General product information: The product is DC Molded Case Circuit Breaker.

Test Result: PASS.

The product meets the all the test requirements. The details are listed in the following documents.

EN 60947-2:2017+A1:2020			
Clause	Requirement + Test	Result - Remark	Verdict
1	**General**		-
1.1	Scope and object		P
	This part of IEC 60947 series applies to circuit-breakers,intended to be installed and operated by instructed or skilled persons,the main contacts of which are intended to be connected to circuits,the rated voltage of which does not exceed 1000Va.c.or 1500 V d.c.; it also contains additional requirements for integrally fused circuit-breakers.A		P
	Circuit-breakers rated above 1000 V a.c.but not exceeding 1500 V a.c.may also be tested to this standard.		P
	It applies whatever the rated currents,the method of construction or the proposed applications of the circuit-breakers may be.		P
	The requirements for circuit-breakers which are also intended to provide earth leakage protection are contained in Annex B.		P
	The additional requirements for circuit-breakers with electronic over-current protection are contained in Annex F.		P
	The additional requirements for circuit-breakers for IT systems are contained in Annex H.		P
	The requirements and test methods for electromagnetic compatibility of circuit-breakers are contained in Annex J.		P

	The requirements for circuit-breakers not fulfilling the requirements for over-current protection are contained in Annex L.		P
	The requirements for modular residual current devices (without integral current breaking device)are contained in Annex M.		P
	The requirements and test methods for electromagnetic compatibility of circuit-breaker auxiliaries are contained in Annex N.		P
	The requirements and test methods for d.c.circuit-breakers for use in photovoltaic(PV) applications are contained in Annex P.		N
	The requirements and test methods for circuit-breakers incorporating residual current protection with automatic reclosing functions are contained in Annex R.		P
	Supplementary requirements for circuit-breakers used as direct-on-line starters are given in IEC60947-4-1,applicable to low-voltage contactors and starters.		P
	The requirements for circuit-breakers for the protection of wiring installations in buildings and similar applications,and designed for use by uninstructed persons,are contained in IEC 60898.		P
	The requirements for circuit-breakers for equipment(for example electrical appliances)are contained in IEC 60934.		N
	For certain specific applications(for example traction,rolling mills,marine service, downstream of variable frequency drives,use in explosive atmospheres)particular or additional requirements may be necessary.A		N
	The object of this standard is to state:		P

	a)the characteristics of circuit-breakers;		P
	b)the conditions with which circuit-breakers shall comply with reference to: 1)operation and behaviour in normal service; 2)operation and behaviour in case of overload and operation and behaviour in case of short-circuit,including co-ordination in service (selectivity and back-up protection); 3)dielectric properties;		P
	c)tests intended for confirming that these conditions have been met and the methods to be adopted for these tests;		P
	d)information to be marked on or given with the apparatus.		P
1.2	Normative references		P
	The following documents,in whole or in part,are normatively referenced in this document and are indispensable for its application.For dated references,only the edition cited applies.For undated references,the latest edition of the referenced document (including any amendments)applies.		P
	IEC 60068-2-14,Environmental testing-Part 2-14:Tests-Test N:Change of temperature		P
	IEC 60068-2-30,Environmental testing-Part 2-30:Tests-Test Db:Damp heat,cyclic(12h +12 h cycle)		P
2	**Terms and definitions**		-
	For the purposes of this document,the following terms and definitions apply.		P
2.1	circuit-breaker		-

	a mechanical switching device,capable of making,carrying and breaking currents under normal circuit conditions and also making,carrying for a specified time and breaking currents under specified abnormal circuit conditions such as those of short-circuit		P
2.1.1	frame size		P
	a term designating a group of circuit-breakers,the external physical dimensions of which are common to a range of current ratings.		P
	Note 1 to entry:Frame size is expressed in amperes corresponding to the highest current rating of the group.		P
	Note 2 to entry: Within a frame size,the width may vary according to the number of poles.		P
	Note 3 to entry:This definition does not imply dimensional standardization.		P
2.1.2	construction break		P
	a significant difference in construction between circuit-breakers of a given frame size, requiring additional type testing		P
2.2	integrally fused circuit-breaker		P
	a combination,in a single device,of a circuit-breaker and fuses,one fuse being placed in series with each pole of the circuit-breaker intended to be connected to a phase conductor		P
2.3	current-limiting circuit-breaker		P
	circuit-breaker that,within a specified range of current,prevents the let-through current reaching the prospective peak value and which limits the let-through energy(I^2t)to a value less than the let-through energy of a half-cycle wave of the symmetrical prospective current		P
2.4	plug-in circuit-breaker		P
	a circuit-breaker which,in addition to its interrupting contacts,has a set of contacts which enable the circuit-breaker to be removed		P
2.5	withdrawable circuit-breaker		P

	circuit-breaker which,in addition to its interrupting contacts,has a set of isolating contacts which enable the circuit-breaker to be withdrawn from the main circuit,and,in the disconnected position,to achieve an isolating distance in accordance with specified requirements		-
2.6	moulded-case circuit-breaker		P
	a circuit-breaker having a supporting housing of moulded insulating material forming an integral part of the circuit-breaker		P
2.7	air circuit-breaker		P
	a circuit-breaker in which the contacts open and close in air at atmospheric pressure		P
2.8	vacuum circuit-breaker		P
	a circuit-breaker in which the contacts open and close within a highly evacuated envelope		P
2.9	gas circuit-breaker		P
	a circuit-breaker in which the contacts open and close in a gas other than air at atmospheric or higher pressure		P
2.10	making-current release		P
	a release which permits a circuit-breaker to open,without any intentional time-delay,during a closing operation,if the making current exceeds a predetermined value,and which is rendered inoperative when the circuit-breaker is in the closed position		P
2.11	short-circuit release		N
	an over-current release intended for protection against short circuits		P
2.12	short-time delay short-circuit release		P
	an over-current release intended to operate at the end of the short-time delay		P
2.13	alarm switch		P
	an auxiliary switch which operates only upon the tripping of the circuit-breaker with which it is associated		P

2.14	circuit-breaker with lock-out device preventing closing		P
	a circuit-breaker in which each of the moving contacts is prevented from closing sufficiently to be capable of passing current if the closing command s initiated while specified conditions remain established		P
2.15	short-circuit breaking (or making)capacity		P
	a breaking (or making)capacity for which the prescribed conditions include a short circuit		P
2.15.1	ultimate short-circuit breaking capacity		P
	a breaking capacity for which the prescribed conditions according to a specified test sequence do not include the capability of the circuit-breaker to carry its rated current continuously		P
2.15.2	service short-circuit breaking capacity		P
	a breaking capacity for which the prescribed conditions according to a specified test sequence include the capability of the circuit-breaker to carry its rated current continuously		P
2.16	opening time		P
	interval of time between the specified instant of initiation of the opening operation and the instant when the arcing contacts have separated in all poles		P
2.17	over-current protective co-ordination		P
2.17.1	over-current selectivity		N
	co-ordination of the operating characteristics of two or more over-current protective devices such that,on the incidence of over-currents within stated limits,the device intended to operate within these limits does so,while the other(s)does (do)not		N
2.17.2	total selectivity		P

	over-current selectivity where,in the presence of two over-current protective devices in series,the protective device on the load side effects the protection without causing the other protective device to operate		P
2.17.3	partial selectivity		P
	over-current selectivity where,in the presence of two over-current protective devices in series,the protective device on the load side effects the protection up to a given level of over- current,without causing the other protective device to operate		P
2.17.4	selectivity limit current		P
	current co-ordinate of the intersection between the total time-current characteristic of the protective device on the load side and the pre-arcing(for fuses),or tripping(for circuit-breakers)time-current characteristic of the other protective device		P
2.17.5	take-over current		P
	current co-ordinate of the intersection between the maximum break time current characteristics of two over-current protective devices in series		N
2.18	I2t characteristic of a circuit-breaker		N
	information(usually a curve)giving the maximum values of /2t related to break time as a function of prospective current (r.m.s.symmetrical for a.c.)up to the maximum prospective current corresponding to the rated short-circuit breaking capacity and associated voltage		N
2.19	resetting time		N
	time elapsed between a circuit-breaker tripping due to an overcurrent and subsequently reaching a condition where it can be reclosed		P
2.20	rated instantaneous short-circuit current setting		P
	rated value of the current causing the operation of a release without any intentional time-delay		P

2.21	overload current setting		P
	current setting of an adjustable overload release		P
2.22	programmable logic controller		P
	digitally operating electronic system,designed for use in an industrial environment,which uses a programmable memory for the internal storage of user-oriented instructions for implementing specific functions such as logic,sequencing,timing,counting and arithmetic,to control,through digital or analogue inputs and outputs,various types of machines or processes.Both the PLC and its associated peripherals are designed so that they can be easily integrated into an industrial control system and easily used in all their intended functions		P
2.23	closing release closing coil		P
	release,energized by a source of voltage,which triggers the closing of the circuit-breaker		P
3	**Classification**		-
3.1	According to their selectivity category,A or B(see 4.4)		P
3.2	According to the interrupting medium,for example:		P
	— air-break;		P
	- vacuum break;		P
	-gas-break		P
3.3	According to the design,for example:		P
	- open construction;		P
	- moulded case.		P
3.4	According to the method of controlling the operating mechanism,viz:		P
	- dependent manual operation;		P
	- independent manual operation;		P
	- dependent power operation;		P
	- independent power operation;		P
	- stored energy operation.		P
3.5	According to the suitability for isolation:		P

	- suitable for isolation;		P
	- not suitable for isolation.		P
3.6	According to the provision for maintenance:		P
	- maintainable;		P
	- non-maintainable.		P
3.7	According to the method of installation,for example:		P
	- fixed;		P
	- plug-in;		P
	- withdrawable.		P
3.8	According to the degree of protection provided by the enclosure(see 7.1.12 of IEC 60947-1:2007)		P
4	**Characteristics of circuit-breakers**		P
4.1	Summary of characteristics		P
	The characteristics of a circuit-breaker shall be stated in terms of the following,as applicable:		P
	- type of circuit-breaker (4.2);		P
	- rated and limiting values of the main circuit (4.3);		P
	- selectivity categories (4.4);		P
	- control circuits (4.5);		P
	- auxiliary circuits (4.6);		P
	- releases (4.7);		P
	- integral fuses (integrally fused circuit-breakers)(4.8).		P
4.2	Type of circuit-breaker		N
	The following shall be stated:		P
	- number of poles;		P
	- kind of current (a.c.or d.c.)and,in the case of a.c.,number of phases and rated frequency.		P
4.3	Rated and limiting values of the main circuit		P
4.3.1	General		P

	The rated values established for a circuit-breaker shall be stated in accordance with 4.3.2 to 4.4,but it is not necessary to establish all the rated values listed.		P
4.3.2	Rated voltages		N
4.3.2.1	Rated operational voltage (Ue)		N
	Subclause 4.3.1.1 of IEC60947-1:2007 applies with the following amplification:		P
	- Circuit-breakers covered by item a)of Note 2(of IEC 60947-1:2007)		P
	Ue is generally stated as the voltage between phases.		P
4.3.2.2	Rated insulation voltage (Ui)		P
	Subclause 4.3.1.2 of IEC 60947-1:2007 applies.		P
4.3.2.3	Rated impulse withstand voltage (Uimp)		P
	Subclause 4.3.1.3 of IEC 60947-1:2007 applies.		P
4.3.3	Currents		P
4.3.3.1	Conventional free-air thermal current (Ith)		P
	Subclause 4.3.2.1 of IEC 60947-1:2007 applies.		P
4.3.3.2	Conventional enclosed thermal current (the)		P
	Subclause 4.3.2.2 of IEC 60947-1:2007 applies		N
4.3.3.3	Rated current (In)		N
	For circuit-breakers,the rated current is the rated uninterrupted current(lu)(see 4.3.2.4 of IEC 60947-1:2007)and is equal to the conventional free-air thermal current(lth).		P
4.3.3.4	Current rating for four-pole circuit-breakers		P
	Subclause 7.1.9 of IEC 60947-1:2007 applies.		P
4.3.4	Rated frequency		P
	Subclause 4.3.3 of IEC 60947-1:2007 applies.		P
4.3.5	Rated duty		P

	The rated duties considered as normal are:		P
	- the eight-hour duty (see 4.3.4.1 of IEC60947-1:2007),		P
	- the uninterrupted duty(see 4.3.4.2 of IEC 60947-1:2007).		P
4.3.6	Short-circuit characteristics		P
4.3.6.1	Rated short-circuit making capacity(Icm)		P
	The rated short-circuit making capacity of a circuit-breaker is the value of short-circuit making capacity assigned to that circuit-breaker by the manufacturer for the rated operational voltage at rated frequency and at a specified power factor for a.c.,or time constant for d.c.It is expressed as the maximum prospective peak current.		P
	For a.c.the rated short-circuit making capacity of a circuit-breaker shall be not less than its rated ultimate short-circuit breaking capacity,multiplied by the factor n of Table 2(see 4.3.6.3).		P
	For d.c.,the rated short-circuit making capacity of a circuit-breaker shall be not less than its rated ultimate short-circuit breaking capacity.		P
	A rated short-circuit making capacity implies that the circuit-breaker shall be able to make the current corresponding to that rated capacity at the appropriate applied voltage related to the rated operational voltage.		P
4.3.6.2	Rated short-circuit breaking capacities		P
4.3.6.2.1	General		P
	The rated short-circuit breaking capacities of a circuit-breaker are the values of short-circuit breaking capacity assigned to that circuit-breaker by the manufacturer for the rated operational voltage,under specified conditions.		P

	A rated short-circuit breaking capacity requires that the circuit-breaker shall be able to break any value of short-circuit current up to and including the value corresponding to the rated capacity at a power-frequency recovery voltage corresponding to the prescribed test voltage values and:		P
	- for a.c.,at any power factor not less than that of Table 11(see 8.3.2.2.4);		P
	- for d.c.,with any time constant not greater than that of Table 11(see 8.3.2.2.5).		P
	For power-frequency recovery voltages in excess of the prescribed test voltage values (see 8.3.2.2.6),no short-circuit breaking capacity is guaranteed.		P
	For a.c.,the circuit-breaker shall be capable of breaking a prospective current corresponding to its rated short-circuit breaking capacity and the related power factor given in Table 11, irrespective of the value of the inherent d.c.component,on the assumption that the a.c. component is constant.		P
	The rated short-circuit breaking capacities are stated as:		P
	- rated ultimate short-circuit breaking capacity;		P
	- rated service short-circuit breaking capacity.		P
4.3.6.2.2	Rated ultimate short-circuit breaking capacity(Icu)		P
	The rated ultimate short-circuit breaking capacity of a circuit-breaker is the value of ultimate short-circuit breaking capacity(see 2.15.1)assigned to that circuit-breaker by the manufacturer for the corresponding rated operational voltage,under the conditions specified in 8.3.5.It is expressed as the value of the prospective breaking current,in kA(r.m.s.value of the a.c.component in the case of a.c.).		P
4.3.6.2.3	Rated service short-circuit breaking capacity(Ics)		P

	The rated service short-circuit breaking capacity of a circuit-breaker is the value of service short-circuit breaking capacity(see 2.15.2)assigned to that circuit-breaker by the manufacturer for the corresponding rated operational voltage,under the conditions specified in 8.3.4.It is expressed as a value of prospective breaking current,in kA,or as a%of /cu (for example /cs=25%/cu).		P
4.3.6.3	Standard relationship between short-circuit making and breaking capacities and related power factor,for a.c.circuit-breakers		N
	The standard relationship between short-circuit breaking capacity and short-circuit making capacity is given in Table 2.		P
	Table 2 – Ratio *n* between short-circuit making capacity and short-circuit breaking capacity and related power factor (for a.c. circuit-breakers) Short-circuit breaking capacity kA r.m.s. / Power factor / Minimum value required for $n = \frac{\text{short - circuit making capacity}}{\text{short - circuit breaking capacity}}$ $I \le 1{,}5$ / 0,95 / 1,41 $1{,}5 < I \le 3$ / 0,9 / 1,42 $3 < I \le 4{,}5$ / 0,8 / 1,47 $4{,}5 < I \le 6$ / 0,7 / 1,53 $6 < I \le 10$ / 0,5 / 1,7 $10 < I \le 20$ / 0,3 / 2,0 $20 < I \le 50$ / 0,25 / 2,1 $50 < I$ / 0,2 / 2,2		P
	The rated short-circuit making and breaking capacities are only valid when the circuit-breaker is operated in accordance with the requirements of 7.2.1.1 and 7.2.1.2.		P
	For special requirements,the manufacturer may assign a value of rated short-circuit making capacity higher than that required by Table 2.Tests to verify these rated values shall be the subject of agreement between manufacturer and user.		P
4.3.6.4	Rated short-time withstand current(Icw)		N
	The rated short-time withstand current of a circuit-breaker is the value of short-time withstand current assigned to that circuit-breaker by the manufacturer under the test conditions specified in 8.3.6.3.		P

	For a.c.,the value of this current is the r.m.s.value of the a.c.component of the prospective short-circuit current,assumed constant during the short-time delay.		P
	The short-time delay associated with the rated short-time withstand current shall be at least 0,05 s,preferred values being as follows:		P
	0,05s-0,1s-0,25s-0,5s-1s		P
	The rated short-time withstand current shall be not less than the appropriate values shown in Table 3.		P
	Table 3 – Minimum values of rated short-time withstand current Rated current I_n A | Rated short-time withstand current I_{cw} – Minimum values kA $I_n \leq 2\,500$ | 12 I_n or 5 kA, whichever is the greater $I_n > 2\,500$ | 30 kA		P
4.4	Selectivity categories		P
	Circuit-breakers according to this standard are divided into two selectivity categories:		P
	- Selectivity category B comprises circuit-breakers providing selectivity by having a short- time withstand current rating and an associated short-time delay according to 4.3.6.4. Selectivity of circuit-breakers of selectivity category B is not necessarily ensured up to the ultimate short-circuit breaking capacity(e.g.in the case of operation of an instantaneous release)but at least up to the value specified in Table 3.		P
	- Selectivity category A comprises all other circuit-breakers. These circuit-breakers may provide selectivity under short-circuit conditions by other means.		N
	A circuit-breaker of selectivity category A may have an intentional short-time delay with a short-time withstand current less than that according to 4.3.6.4.In that case,the tests include test sequence IV(see 8.3.6)at the assigned short-time withstand current.		P

	Attention is drawn to the differences of the tests applying to the two selectivity categories (see Table 9 and 8.3.4,8.3.5,8.3.6 and 8.3.8).		P
4.5	Control circuits		P
4.5.1	Electrical control circuits		P
	Subclause 4.5.1 of IEC 60947-1:2007/AMD1:2010/AMD2:2014 applies,with the following addition:		P
	If the rated control supply voltage is different from that of the main circuit,it is recommended that its value be chosen from Table 5.		P
	Table 5 – Preferred values of the rated control supply voltage, if different from that of the main circuit Direct current V: 24 – 48 – 110 – 125 – 220 – 250 Single-phase alternating current V: 24 – 48 – 110 – 127 – 220 – 230		P
4.5.2	Air-supply control circuits(pneumatic or electro-pneumatic)		P
	Subclause 4.5.2 of IEC 60947-1:2007 applies.		P
4.6	Auxiliary circuits		P
	Subclause 4.6 of IEC60947-1:2007 applies.		P
4.7	Releases		N
4.7.1	Types		N
	For the purpose of this standard,the following types of releases are considered: 1)shunt release;		P
	2)over-current release: a)instantaneous; b)definite time delay; c)inverse time delay: - independent of previous load; - dependent on previous load (for example thermal type release).		P
	3)undervoltage release (for opening); 4)closing release;A 5)other releases.		P
4.7.2	Characteristics		N
	The following characteristics shall be considered:		P

	1)shunt release and undervoltage release(for opening),and closing release:A		P
	- rated control circuit voltage(Uc); - kind of current; - rated frequency,if a.c.		P
	2)over-current release:		P
	- rated current (In); - kind of current; - rated frequency,if a.c.; -current setting(or range of settings); - time setting (or range of settings)if applicable.		P
	The rated current of an over-current release is the value of current(r.m.s.if a.c.) corresponding to the maximum current setting which it shall be capable of carrying under the test conditions specified in 8.3.2.5,without the temperature-rise exceeding the values specified in Table 7.		P
4.7.3	Current setting of over-current releases		P
	For circuit-breakers fitted with adjustable releases (see Note 2 to 4.7.1,item 2)),the current setting(or range of current-settings,as applicable)shall be marked or displayed on the release or on its scale.The marking or display may be either directly in amperes or as a multiple of the current value.Means shall be available from the manufacturer to read the display regardless of the status of the circuit-breaker.		P
	For circuit-breakers fitted with non-adjustable releases,the marking may be on the circuit- breaker.If the operating characteristics of the overload release comply with the requirements of Table 6,it will be sufficient to mark the circuit-breaker with its rated current (In).		P

	In the case of indirect releases operated by current transformers,the marking may refer either to the primary current of the current transformer through which they are supplied,or to the current setting of the overload release.In either case,the ratio of the current transformer shall be stated.		P
	Unless otherwise specified		P
	-the operating value of overload releases other than those of the thermal type is independent of the ambient air temperature within the limits of-5 ℃ to+40℃; - for releases of the thermal type,the values stated are for a reference temperature of +30 ℃ ± 2 ℃ .The manufacturer shall be prepared to state the influence of variations in the ambient air temperature (see 7.2.1.2.4,item b)).		P
4.7.4	Tripping time setting of over-current releases		P
	The tripping timeshall be stated as follows,depending on the type of over-current release: 1)Definite time-delay over-current releases		P
	The time-delay of such releases is independent of the over-current.The tripping time setting shall be stated as the duration in seconds of the opening time of the circuit- breaker,if the time-delay is not adjustable,or the extreme values of the opening time,if the time-delay is adjustable.		P
	2)Inverse time-delay over-current releases		P
	The time-delay of such releases is dependent on the over-current.		N

	The time/current characteristics shall be given in the form of curves supplied by the manufacturer.These shallindicate how the opening time,starting from the cold state, varies with current within the range of operation of the release.The manufacturer shall indicate,by suitable means,the tolerances applicable to these curves.		N
	These curves shall be given for each extreme value of the current setting and,if the time setting for a given current setting is adjustable,it is recommended that they be given in addition for each extreme value of the time setting.		P
	It is recommended that the current be plotted as abscissa and the time as ordinate,using logarithmic scales.Furthermore,in order to facilitate the study of co-ordination of different types of over-current protection,it is recommended that the current be plotted as multiples of the setting current and the time in seconds on the standard graph sheets detailed in 5.6.1 of IEC 60269-1:2006.		N
4.8	Integral fuses (integrally fused circuit-breakers)		P
	Subclause 4.8 of IEC 60947-1:2007/AMD1:2010 applies. The manufacturershall provide the necessary information.		P
5	**Product information**		-
5.1	Nature of the information		P
	Subclause 5.1 of IEC 60947-1:2007 applies,as far as appropriate for a particular design.		P
	In addition the manufacturer shall make available,upon request,information concerning typical power losses for the various frame sizes(see 2.1.1).See Annex G.		P
5.2	Marking		P

	Each circuit-breaker shall be marked in a durable manner;data to be provided and corresponding locations are indicated in Table 13.		P
	Table 13 – Product information Item | Information | Marking location 1.1 | rated current (I_n) | Visible		P
	Item | Information | Marking location 1.2 | suitability for isolation, if applicable, with the symbol (IEC 60617-S00288:2001-07 combined with IEC 60617-S00219:2001-07) | Visible 1.3 | indication of the open and closed position with O (IEC 60417-5008;2002-10) and I (IEC 60417-5007;2002-10) respectively, if symbols are used (see 7.1.6.1 of IEC 60947-1:2007) | Visible 2.1 | manufacturer's name or trade mark | Marked 2.2 | type designation or catalogue reference | Marked 2.3 | IEC 60947-2, if the manufacturer claims compliance with the standard | Marked 2.4 | selectivity category A or B | Marked 2.5 | rated operational voltage(s) U_e (see 4.3.2.1 and, where applicable, Annex H) | Marked 2.6 | unsuitability for IT systems, if applicable, with the symbol (IEC 60417-6363:2016-07) | Marked 2.7 | rated impulse withstand voltage (U_{imp}) | Marked 2.8 | value (or range) of the rated frequency, and/or the indication "d.c." (or the symbol ⎓ (IEC 60417-5031:2002-10)) | Marked 2.9 | rated service short-circuit breaking capacity (I_{cs}) at the corresponding rated voltage (U_e) | Marked 2.10 | rated ultimate short-circuit breaking capacity (I_{cu}) at the corresponding rated voltage (U_e) | Marked 2.11 | rated short-time withstand current (I_{cw}), and associated short-time delay, for selectivity category B | Marked 2.12 | range of the current setting (I_r) of the adjustable overload release | Marked [a]		P
	2.13 | range of the rated instantaneous short-circuit current setting (I_i), for adjustable releases | Marked [a] 2.14 | reference temperature for non-compensated thermal releases, if different from 30 °C | Marked 2.15 | terminals identification, according to 7.1.8.4 of IEC 60947-1:2007 | Marked 2.16 | line and load terminals, if applicable | Marked 2.17 | neutral pole terminals, if applicable, by the letter N | Marked 2.18 | protective earth terminal, where applicable, by the symbol (IEC 60417-5019:2006-08) (see 7.1.10.3 of IEC 60947-1:2007) | Marked 3.1 | rated short-circuit making capacity (I_{cm}), if higher than that specified in 4.3.6.1 | Literature 3.2 | rated insulation voltage (U_i), if higher than the maximum rated operational voltage | Literature 3.3 | pollution degree if other than 3 | Literature 3.4 | conventional enclosed thermal current (I_{the}) if different from the rated current | Literature 3.5 | IP code, where applicable (see Annex C of IEC 60947-1:2007/AMD1:2010) | Literature 3.6 | minimum enclosure size and ventilation data (if any) to which marked ratings apply | Literature 3.7 | details of minimum distance between circuit-breaker and earthed metal parts for circuit-breakers intended for use without enclosures | Literature 3.8 | suitability for environment A or environment B per Annex J, as applicable | Literature 3.9 | RMS sensing, if applicable, in accordance with F.4.1.1 | Literature 3.10 | minimum cable cross-section, if different from Table 9 of IEC 60947-1:2007, for ratings ≤ 20 A according to rated ultimate short-circuit breaking capacity I_{cu} | Literature 3.11 | values of tightening torque for the circuit-breaker terminals | Literature 3.12 | current derating for terminals and connections, if applicable | Literature 4.1 | for closing releases (see 2.23) and/or motor-operators, rated control circuit voltage, kind of current and rated frequency for a.c. | Aux 4.2 | rated control circuit voltage of the shunt release and/or of the under-voltage release (or of the no-voltage release), kind of current and rated frequency for a.c. | Aux 4.3 | rated current of indirect over-current releases | Aux		P
	Item | Information | Marking location 4.4 | number and type of auxiliary contacts, rated operational currents at the rated operational voltages, and rated frequency for a.c. | Aux **Key** Visible:visible from the front when the circuit-breaker is installed as in service and the actuator is accessible Marked:marked on the circuit-breaker Literature:provided in the manufacturer's literature Aux:marked on the auxiliaries or on the circuit-breaker, if marking space is sufficient; additionally, data shall be made available in the manufacturer's literature [a] Where applicable, I_r and I_i ranges may be displayed instead of being marked on the circuit-breaker.		P
5.3	Instructions for installation,operation and maintenance		P
	Subclause 5.3 of IEC 60947-1:2007/AMD2:2014 applies with the following addition:		N
	Additional information for the decommissioning and dismantling of the circuit-breaker shall be provided to the user in the case of a foreseeable hazardous condition,for example due to stored energy or hazardous substances.A		P

6	**Normal service,mounting and transport conditions**		P
	Clause 6 of IEC 60947-1:2007/AMD2:2014 applies with the following addition: Pollution degree(see 6.1.3.2 of IEC 60947-1:2007).		P
	Unless otherwise stated by the manufacturer,a circuit-breaker is intended for installation under environmental conditions of pollution degree 3.		P
7	**Constructional and performance requirements**		P
7.1	Constructional requirements		P
7.1.1	General		P
	Subclause 7.1 of IEC 60947-1:2007/AMD1:2010/AMD2:2014 applies with the following modifications:		P
	The requirements of 7.1.2 of IEC 60947-1:2007/AMD1:2010/AMD2:2014 do not apply to parts with a mass lower than 2g (insignificant mass,in accordance with 3.14 of IEC 60695-2-11:2014).For products containing a plurality of small parts,the total mass of non-tested parts located in close proximity to each other shall not exceed 10 g.Proximity shall be based on engineering judgment that takes into consideration the risk of propagation of fire.		P
	Where,in 7.1.2.2 of IEC 60947-1:2007/AMD1:2010/AMD2:2014,the test temperature is to be specified,the value required by this document for the parts necessary to retain in position current-carrying parts is:		P
	- 960℃ for the main circuit; - 850℃ for the other circuits.A		P
7.1.2	Withdrawable circuit-breakers		P

	In the disconnected position,the isolating contacts of the main circuit and,where applicable, auxiliary circuits of withdrawable circuit-breakers shall have isolating distances which comply with the requirements specified for the isolating function,taking account of manufacturing tolerances and changes in dimensions due to wear.		P
	The withdrawable mechanism shall be fitted with a reliable indicating device which indicates unambiguously the positions of the isolating contacts.		P
	The withdrawable mechanism shall be fitted with interlocks which only permit the isolating contacts to be separated or reclosed when the main contacts of the circuit-breaker are open.		
	In addition,the withdrawable mechanism shall be fitted with interlocks which only permit the main contacts to be closed		N
	- when the isolating contacts are fully closed,or - when the specified isolating distance is achieved between the fixed and moving parts of the isolating contacts (disconnected position).		P
	When the circuit-breaker is in the disconnected position,means shall be provided to ensure that the specified isolating distances between the isolating contacts cannot be inadvertently reduced.		P
7.1.3	Additional requirements for circuit-breakers suitable for isolation		P
	For additional requirements concerning performance,see 7.2.7.		P
	Subclause 7.1.7 of IEC60947-1:2007/AMD1:2010 applies with the following addition: If the tripped position is not the indicated open position,it should be clearly identified.		P
7.1.4	Clearances and creepage distances		N

	Minimum values are given in Table 13 of IEC 60947-1:2007 and in Table 15 of IEC 60947-1:2007/AMD1:2010.		P
	For Uimp values exceeding the values given in Table 13 of IEC 60947-1:2007,clearances shall be obtained from Table F.2 of IEC 60664-1:2007.		P
7.1.5	Requirements for the safety of the operator		P
	There shall be no path or opening which allows incandescent particles to be discharged from the area of the manual operating means.		P
	Compliance is checked by the provisions of 8.3.2.6.1,item b).		P
7.1.6	List of construction breaks		P
	Circuit-breakers of a given frame size are considered to have a construction break(see 2.1.2) if any one of the following features are not the same:		N
	- material,finish and dimensions of internal current-carrying parts,admitting,however,the variations listed in a),b),c),f)and g)below;		P
	- size,material,configuration and method of attachment of the main contacts;		P
	- any integral manual operating mechanism,its materials and physical characteristics;		N
	- moulding and insulating materials;		P
	- the principle of operation,materials and construction of the arc extinction device;		P
	-the basic design of the over-current tripping devices,admitting,however,the variations detailed in a),b)and c)below.		P
	Variations in the following do not constitute a construction break:		N

	a)dimensions of terminals,provided that creepage and clearance distances are not reduced; b)in the case of thermal and magnetic releases those dimensions and materials of the release components,including flexible connections,which determine the current rating; c)secondary windings of current transformer operated releases; d)external operating means,additional to the integral operating means; e)type designation and/or purely aesthetic features (e.g.labels); f) in the case of the 2-pole and 4-pole variants,replacement of the trip unit in one pole by a link,to provide an unprotected neutral; g)creating a 2-pole breaker from a 3-pole breaker by removing the centre current path; h)difference in embedded software (firmware)in electronic trip units,which has no impact on the required performance,in particular the tripping function; i) electronic trip unit hardware,due to omitted components on identical printed circuit board layout(e.g.rotary knobs,display,etc.).		N
7.1.7	Additional requirements for circuit-breakers provided with a neutral pole		P
	Subclause 7.1.9 of IEC 60947-1:2007 applies with the following addition:		P
	If a pole with an appropriate making and breaking capacity is used as a neutral pole,then all poles,including the neutral pole,may operate substantially together.		P
7.1.8	Digital inputs and outputs for use with programmable logic controllers(PLCs)		P

	Annex S of IEC 60947-1:2007 applies.For the purposes of this standard,this requirement does not apply to digital inputs and outputs dedicated to devices other than PLCs.		P
7.2	Performance requirements		P
7.2.1	Operating conditions		P
7.2.1.1	Closing		P
7.2.1.1.1	General		P
	For a circuit-breaker to be closed safely on to the making current corresponding to its rated short-circuit making capacity,it is essential that it should be operated with the same speed and the same firmness as during the type test for proving the short-circuit making capacity.		P
7.2.1.1.2	Dependent manual closing		P
	For a circuit-breaker having a dependent manual closing mechanism,it is not possible to assign a short-circuit making capacity rating irrespective of the conditions of mechanical operation.		P
	Such a circuit-breaker should not be used in circuits having a prospective peak making current exceeding 10 kA.		P
	However,this does not apply in the case of a circuit-breaker having a dependent manual closing mechanism and incorporating an integral fast-acting opening release which causes the circuit-breaker to break safely,irrespective of the speed and firmness with which it is closed on to prospective peak currents exceeding 10 kA;in this case,a rated short-circuit making capacity can be assigned.		P
7.2.1.1.3	Independent manual closing		P
	A circuit-breaker having an independent manual closing mechanism can be assigned a short- circuit making capacity rating irrespective of the conditions of mechanical operation.		P
7.2.1.1.4	Dependent power closing		P

	The power-operated closing mechanism, including intermediate control relays where necessary,shall be capable of securing the closing of the circuit-breaker in any condition between no-load and its rated making capacity,when the supply voltage,measured during the closing operation,remains between the limits of 110%and 85%of the rated control supply voltage,and,when a.c.,at the rated frequency.		P
	At 110%of the rated control supply voltage,the closing operation performed on no-load shall not cause any damage to the circuit-breaker.		P
	At 85%of the rated control supply voltage,the closing operation shall be performed when the current established by the circuit-breaker is equal to its rated making capacity within the limits allowed by the operation of its relays or releases and,if a maximum time limit is stated for the closing operation,in a time not exceeding this maximum time limit.		P
7.2.1.1.5	Independent power closing		P
	A circuit-breaker having an independent power closing operation can be assigned a rated short-circuit making capacity irrespective of the conditions of power closing.		P
	Means for charging the operating mechanism,as well as the closing control components, shall be capable of operating in accordance with the manufacturer's specification.		P
7.2.1.1.6	Stored energy closing		P
	This type of closing mechanism shall be capable of ensuring closing of the circuit-breaker in any condition between no-load and its rated making capacity.		P
	When the stored energy is retained within the circuit-breaker,a device shall be provided which indicates when the storing mechanism is fully charged.		P

	Means for charging the operating mechanism,as well as the closing control components, shall be capable of operating when the auxiliary supply voltage is between 85%and 110%of the rated control supply voltage.		P
	It shall not be possible for the moving contacts to move from the open position unless the charge is sufficient for satisfactory completion of the closing operation.		N
	When the energy storing mechanism is manually operated,the direction of operation shall be indicated.		P
	This last requirement does not apply to circuit-breakers with an independent manual closing operation.		P

Photo of Product