

Technical Construction File

EN IEC 60947-1:2021, EN IEC 60947-4-1:2019

**Low-voltage switchgear and controlgear - -- Part 1: General rules Part 4-1:
Contactors and motor-starters - Electromechanical contactors and motor-starters**

TCF Reference No.....	: TLZJ23090150296	
Prepared by (+ signature):	Stephen Zhang / Testing Engineer	
Approved by (+ signature):	Cosco Yu / Technical Manager	
Date of issue.....	: September 6, 2023	
The third party.....	: Shanghai Global Testing Services Co., Ltd.	
Address.....	: Floor 2nd, Building D-1, No. 128, Shenfu Road, Minhang District, Shanghai, China.	
Reviewing procedure	: CE	
Applicant's name.....	: Zhejiang Changcheng Trading Co., Ltd.	
Address.....	: DianHou Village, Liushi Town, Yueqing City, Zhejiang, China	
Manufacturer's name.....	: Changcheng Electrical Group Zhejiang Technology Co., Ltd.	
Address.....	: DianHou Village, Liushi Town, Yueqing City, Zhejiang, China	
Factory's name.....	: Same as manufacturer	
Address.....	: Same as manufacturer	
TCF specification:		
Standard.....	: <input checked="" type="checkbox"/> EN IEC 60947-1:2021, EN IEC 60947-4-1:2019	
Non-standard TCF method.....	: N/A	
Review item description.....	: MAGNETIC STARTER	
Trade Mark.....	: /	
Model/Type reference.....	: LE1-09,LE1-12,LE1-18,LE1-25,LE1-32,LE1-40,LE1-50,LE1-65,LE1-80,LE1-95	
Ratings (for the Electrical Equipment)	: /	

Review item particulars (for the Electrical Equipment)..... :	
Classification of installation and use..... :	Stationary
Supply Connection..... :	Terminal
Electrical safety class..... :	/
IP number..... :	/
Switch..... :	Yes
Thermostat..... :	No
Thermal cut-out..... :	No
Electronic circuit..... :	\
Timer..... :	No
Heating elements..... :	No
Motor..... :	No
Low voltage motor..... :	No
Accessories provided..... :	Yes
Portable appliance..... :	No
Attachment type..... :	No
Possible review case verdicts:	
-review case does not apply to the test object..... :	N/A
- review object does meet the requirement..... :	P(Pass)
- review object does not meet the requirement..... :	F(Fail)
Reviewing :	
Date of receipt of review item..... :	September 1, 2023
Date (s) of performance of reviews..... :	September 1, 2023 to September 6, 2023
General remarks:	
<p>The review results presented in this report relate only to the object reviewed. This report shall not be reproduced, except in full, without the written approval of the Issuing the third party "(see Enclosure #)" refers to additional information appended to the report. "(see appended table)" refers to a table appended to the report.</p> <p>Throughout this report a comma (point) is used as the decimal separator.</p>	

General product information:

Magnetic starter
Review condition:
Temperature: 25°C
Relative humidity: 60%
The review sample was a pre-production sample.

Copy of marking plate and summary of review results (information/comments):

Magnetic starter
Model:
LE1-12

Changcheng Electrical Group Zhejiang Technology
Co., Ltd.

Summary of reviewing:

-The reviewed sample is found to comply with EN IEC 60947-1:2021, EN IEC 60947-4-1:2019.

General notes on tests:

This review report include the following page(s):

National deviation of EU have been considered.

Annex I: Photo Documentation, 2 page(s).

EN IEC 60947-1			
3	Classification		P
	This clause is intended to list the characteristics of an equipment on which information may be given by the manufacturer and which may not necessarily have to be verified by testing.		P
4	Characteristics of circuit-breakers		P
4.1	Summary of characteristics		P
	The characteristics of an equipment shall be stated in the relevant product standard in respect of the following, where applicable:		P
4.2	Type of circuit-breaker		P
	The product standard shall state the following, where applicable:		P
	– kind of equipment: e.g. contactor, circuit-breaker, etc.;		P
	– number of poles;		P
	– kind of current;		P
	– interrupting medium;		P
	– operating conditions (method of operation, method of control, etc.).		P
4.3	Rated and limiting values of the main circuit		P
	Ratings are assigned by the manufacturer. They shall be stated in accordance with 4.3.1 to 4.3.6 as required by the relevant product standard, but it is not necessary to establish all the ratings listed.		P
4.3.1	Rated voltages		P
4.3.1.1	Rated operational voltage (U_e)		P
4.3.1.2	Rated insulation voltage (U_i)		P
4.3.1.3	Rated impulse withstand voltage (U_{imp})		P
	The peak value of an impulse voltage of prescribed form and polarity which the equipment is capable of withstanding without failure under specified conditions of test and to which the values of the clearances are referred.		P
4.3.2	Currents		P
4.3.2.1	Conventional free air thermal current (I_{th})		P
	The conventional free air thermal current is the maximum value of test current to be used for temperature-rise tests of unenclosed equipment in free air (see 8.3.3.3).		P
4.3.2.2	Conventional enclosed thermal current (I_{the})		P

4.3.2.3	Rated operational current (Ie) or rated operational power		P
4.3.2.4	Rated uninterrupted current (Iu)		P
4.3.3	Rated frequency		P
4.3.4	Rated duties		P
4.3.4.1	Eight-hour duty		N
	A duty in which the main contacts of an equipment remain closed, whilst carrying a steady current long enough for the equipment to reach thermal equilibrium but not for more than eight hours without interruption.		N
4.3.4.2	Uninterrupted duty		P
	A duty without any off-load period in which the main contacts of an equipment remain closed, whilst carrying a steady current without interruption for periods of more than eight hours (weeks, months, or even years).		P
4.3.4.3	Intermittent periodic duty or intermittent duty		P
	A duty with on-load periods, in which the main contacts of an equipment remain closed, having a definite relation to off-load periods, both periods being too short to allow the equipment to reach thermal equilibrium.		P
	Intermittent duty is characterized by the value of the current, the duration of the current flow and by the on-load factor which is the ratio of the in-service period to the entire period, often expressed as a percentage.		P
	Standardized values of the on-load factor are 15 %, 25 %, 40 % and 60 %.		P
4.3.4.4	Temporary duty		N
	Duty in which the main contacts of an equipment remain closed for periods insufficient to allow the equipment to reach thermal equilibrium, the unload periods being separated by off-load periods of sufficient duration to restore equality of temperature with the cooling medium.		N
4.3.4.5	Periodic duty		P
	A type of duty in which operation, whether at constant or variable load, is regularly repeated.		P
4.3.5	Normal load and overload characteristics		P
	This subclause gives general requirements concerning ratings under normal load and overload conditions.	According with requirement of standard	P
4.3.5.1	Ability to withstand motor switching overload currents		P

	An equipment intended for switching motors shall be capable of withstanding the thermal stresses due to starting and accelerating a motor to normal speed and due to operating overloads.		P
4.3.5.2	Rated making capacity		P
4.3.5.3	Rated breaking capacity		P
	The rated breaking capacity of all equipment is a value of current, stated by the manufacturer, which the equipment can satisfactorily break, under specified breaking conditions.		P
4.3.6	Short-circuit characteristics		P
4.3.6.1	Rated short-time withstand current (I_{cw})		P
4.3.6.2	Rated short-circuit making capacity (I_{cm})		P
4.3.6.3	Rated short-circuit breaking capacity (I_{cn})		P
4.3.6.4	Rated conditional short-circuit current		P
4.4	Utilization categories		P
	The utilization category of an equipment defines the intended application and shall be specified in the relevant product standard; it is characterized by one or more of the following service conditions: Examples of utilization categories for low-voltage switchgear and controlgear are given in Annex A.		P
4.5	Control circuits		P
4.5.1	Electrical control circuits		P
	– kind of current;		P
	– rated frequency if a.c.;		P
	– rated control circuit voltage U_c (nature, and frequency if a.c.);		P
	– rated control supply voltage U_s (nature, and frequency if a.c.), where applicable.		P
4.5.2	Air-supply control circuits (pneumatic or electro-pneumatic)		N
4.6	Auxiliary circuits		P
	The characteristics of auxiliary contacts and switches shall comply with the requirements of the above standard.		P
4.7	Releases		N
	The following characteristics of relays and releases shall be stated in the relevant product standard,		N
4.8	Integral fuses (integrally fused circuit-breakers)		N
4.9	Switching overvoltages		P
	The manufacturer shall specify the maximum value of switching overvoltages caused by the operation of the switching device, when required by the product standard.	According with requirement of standard	P

5	Product information		
5.1	Nature of the information		P
	The following information shall be given by the manufacturer, when required by the relevant product standard	Changcheng Electrical Group Zhejiang Technology Co., Ltd.	P
5.2	Marking		P
	All relevant information, as detailed in 5.1, which is to be marked on the equipment, shall be specified in the relevant product standard.	According with requirement of standard	P
	Markings shall be indelible and easily legible.		P
	Marking of the manufacturer's name or trademark and type designation or serial number is mandatory on the equipment and preferably on the nameplate, if any, in order to permit the complete data to be obtained from the manufacturer.	See nameplate	P
5.3	Instructions for installation, operation and maintenance	Have these information	P
	The manufacturer shall specify in his documents or catalogues the conditions for installation, operation and maintenance, if any, of the equipment during operation and after a fault.		P
6	Normal service, mounting and transport conditions		P
6.1	Normal service conditions		P
	Equipment complying with this standard shall be capable of operating under the following standard conditions:		P
6.1.1	Ambient air temperature		P
	The ambient air temperature does not exceed +40 °C and its average over a period of 24 h does not exceed +35 °C.		P
	The lower limit of the ambient air temperature is – 5 °C.		P
	Ambient air temperature is that existing in the vicinity of the equipment if supplied without enclosure, or in the vicinity of the enclosure if supplied with an enclosure.		P
6.1.2	Altitude		P
	The altitude of the site of installation does not exceed 2 000 m.		P
6.1.3	Atmospheric conditions		P
6.1.3.1	Humidity		

	The relative humidity of the air does not exceed 50 % at a maximum temperature of +40 °C. Higher relative humidities may be permitted at lower temperatures, e.g. 90 % at +20 °C. Special measures may be necessary in cases of occasional condensation due to variations in temperature.		P
6.1.3.2	Pollution degree		P
	The pollution degree (see 2.5.58) refers to the environmental conditions for which the equipment is intended.		P
6.1.4	Shock and vibration		P
	Standard conditions of shock and vibration to which the equipment can be submitted are under consideration.		P
6.2	Conditions during transport and storage		P
	A special agreement shall be made between user and manufacturer if the conditions during transport and storage, e.g. temperature and humidity, differ from those defined in 6.1, except that, unless otherwise specified, the following temperature range applies during transport and storage: between -25 °C and +55 °C and, for short periods not exceeding 24 h, up to +70 °C.		P
	Equipment subjected to these extreme temperatures without being operated shall not undergo any irreversible damage and shall then operate normally under the specified conditions.		P
6.3	Mounting		P
	The equipment shall be mounted in accordance with the manufacturer's instructions.	See the manufacturer's instructions	P
7	Constructional and performance requirements		P
7.1	Constructional requirements		P
	The equipment with its enclosure, if any, whether integral or not, shall be designed and constructed to withstand the stresses occurring during installation and normal use and, in addition, shall provide a specified degree of resistance to abnormal heat and fire.		P
7.1.1	Materials		P
	The suitability of materials used is verified by making tests:		P
	a) on the equipment; or		P
	b) on sections taken from the equipment; or		N
	c) on samples of identical material having representative cross-section.		N
	The suitability shall be determined with respect to resistance to abnormal heat and fire		P
7.1.1.1	Resistance to abnormal heat and fire		P

	Parts of insulating materials which might be exposed to thermal stresses due to electrical effects, and the deterioration of which might impair the safety of the equipment, shall not be adversely affected by abnormal heat and by fire.		P
	Parts of insulating materials necessary to retain current-carrying parts in position shall conform to the glow-wire tests of 8.2.1.1.1 at a test temperature of 850 °C or 960 °C according to the expected fire hazard.		P
	Parts of insulating materials other than those specified in the previous paragraph shall conform to the requirements of the glow-wire test of 8.2.1.1.1 at a temperature of 650 °C.		P
	When tests on materials are used, they shall be made according to the tests for flammability classification, hot wire ignition and, where applicable, arc ignition, as specified in 8.2.1.1.2.		N
7.1.2	Current-carrying parts and their connections		P
	Current-carrying parts shall have the necessary mechanical strength and current-carrying capacity for their intended use.		P
	For electrical connections, no contact pressure shall be transmitted through insulating material other than ceramic or other material with characteristics not less suitable, unless there is sufficient resiliency in the metallic parts to compensate for any possible shrinkage or yielding of the insulation material		P
7.1.3	Clearances and creepage distances		P
	For equipment tested according to 8.3.3.4 of this standard, minimum values are given in Tables 13 and 15.	According with requirement of standard	P
	In the other cases, guidance for minimum values is given in the relevant product standard.		P
7.1.4	Actuator		N
7.1.4.1	Insulation		N
	The actuator of the equipment shall be insulated from the live parts for the rated insulation voltage and, if applicable, the rated impulse withstand voltage.		
7.1.4.2	Direction of movement		N
	The direction of operation for actuators of devices shall normally conform to IEC 60447. Where devices cannot conform to these requirements, e.g. due to special applications or alternative mounting positions, they shall be clearly marked such that there is no doubt as to the "I" and "O" positions and the direction of operation.		N
7.1.5	Indication of the contact position		P

7.1.5.1	Indicating means		P
	When an equipment is provided with means for indicating the closed and open positions, these positions shall be unambiguous and clearly indicated. This is done by means of a position indicating device (see 2.3.18).		P
	If symbols are used, they shall indicate the closed and open positions respectively, in accordance with IEC 60417-2:		P
	For equipment operated by means of two push-buttons, only the push-button designated for the opening operation shall be red or marked with the symbol "O".		P
	Red colour shall not be used for any other push-button.		P
	The colours of other push-buttons, illuminated push-buttons and indicator lights shall be in accordance with IEC 60073.		P
7.1.5.2	Indication by the actuator		P
7.1.6	Additional requirements for equipment suitable for isolation		P
	The effectiveness of each of the means of indication provided on the equipment and its mechanical strength shall be verified in accordance with 8.2.5.	Pass muster	P
7.1.6.2	Supplementary requirements for equipment with provision for electrical interlocking with contactors or circuit-breakers	Supplementary have be provided	P
	If equipment suitable for isolation is provided with an auxiliary switch for the purpose of electrical interlocking with contactor(s) or circuit-breaker(s) and intended to be used in motor circuits, the following requirements shall apply unless the equipment is rated for AC-23 utilization category		P
	The time interval between the opening of the contacts of the auxiliary switch and the contacts of the main poles shall be sufficient to ensure that the associated contactor or circuit-breaker interrupts the current before the main poles of the equipment open		P
	During the closing operation the contacts of the auxiliary switch shall close after or simultaneously with the contacts of the main poles		P
7.1.6.3	Supplementary requirements for equipment provided with means for padlocking the open position		P

	The locking means shall be designed in such a way that it cannot be removed with the appropriate padlock(s) installed. When the equipment is locked by even of a single padlock, it shall not be possible by operating the actuator, to reduce the clearance between open contacts to the extent that it no longer complies with the requirements of 7.2.3.1b)		P
	Alternatively, the design may provide padlockable means to prevent access to the actuator.		P
7.1.7	Terminals		P
7.1.7.1	Constructional requirements		P
	All parts of terminals which maintain contact and carry current shall be of metal having adequate mechanical strength.		P
	Terminal connections shall be such that the conductors may be connected by means of screws, springs or other equivalent means so as to ensure that the necessary contact pressure is maintained.		P
	Terminals shall be so constructed that the conductors can be clamped between suitable surfaces without any significant damage either to conductors or terminals.		P
	Terminals shall not allow the conductors to be displaced or be displaced themselves in a manner detrimental to the operation of equipment and the insulation voltage shall not be reduced below the rated values.		P
	If required by the application, terminals and conductors may be connected by means of cable lugs for copper conductors only.		N
7.1.7.2	Connecting capacity		P
7.1.7.3	Connection		
	Terminals for connection to external conductors shall be readily accessible during installation		P
	Clamping screws and nuts shall not serve to fix any other component although they may hold the terminals in place or prevent them from turning		P
7.1.7.4	Terminal identification and marking	See the sample	
	Terminals shall be clearly and permanently identified in accordance with IEC 60445 and Annex L, unless superseded by the requirements of the relevant product standard		P
	Terminals intended exclusively for the neutral conductor shall be identified by the letter "N", in accordance with IEC 60445	"N"	P
	The protective earth terminal shall be identified in accordance with 7.1.9.3		N
	Additional requirements for equipment provided with a neutral pole		P

7.1.8	Additional requirements for equipment provided with a neutral pole		P
	When an equipment is provided with a pole intended only for connecting the neutral, this pole shall be clearly identified to that effect by the letter N	"N "clearly identified	P
	A switched neutral pole shall break not before and shall make not after the other poles		P
	For equipment having a value of conventional thermal current (free air or enclosed, see 4.3.2.1 and 4.3.2.2) not exceeding 63 A, this value shall be identical for all poles		N
	For higher conventional thermal current values, the neutral pole may have a value of conventional thermal current different from that of the other poles, but not less than half that value or 63 A, whichever is the higher		N
7.1.9	Provisions for protective earthing		N
7.1.9.1	Constructional requirements		N
	The exposed conductive parts other than those which cannot constitute a danger shall be electrically interconnected and connected to a protective earth terminal for connection to an earth electrode or to an external protective conductor		N
	This requirement can be met by the normal structural parts providing adequate electrical continuity and applies whether the equipment is used on its own or incorporated in an assembly		N
7.1.9.2	Protective earth terminal		N
	The protective earth terminal shall be readily accessible and so placed that the connection of the equipment to the earth electrode or to the protective conductor is maintained when the cover or any other removable part is removed		N
	The protective earth terminal shall be suitably protected against corrosion		N
	The protective earth terminal shall have no other function, except when it is intended to be connected to a PEN conductor		N
7.1.9.3	Protective earth terminal marking and identification		N
7.1.10	Enclosures for equipment		P
7.1.10.1	Design		P
	The enclosure shall be so designed that, when it is opened and other protective means, if any, are removed, all parts requiring access for installation and maintenance, as prescribed by the manufacturer , are readily accessible		P

	Sufficient space shall be provided inside the enclosure for the accommodation of external conductors from their point of entry into the enclosure to the terminals to ensure adequate connection	Sufficient space have be provided inside the enclosure	P
	The fixed parts of a metal enclosure shall be electrically connected to the other exposed conductive parts of the equipment and connected to a terminal which enables them to be earthed or connected to a protective conductor		N
	Under no circumstances shall a removable metal part of the enclosure be insulated from the part carrying the earth terminal when the removable part is in place		P
	The removable parts of the enclosure shall be firmly secured to the fixed parts by a device so that they cannot be accidentally loosened or detached owing to the effects of operation of the equipment or vibrations		P
	When an enclosure is so designed as to allow the covers to be opened without the use of tools, means shall be provided to prevent loss of the fastening devices		N
	An integral enclosure is considered to be a non-removable part		P
	If the enclosure is used for mounting push-buttons, removal of buttons should be from the inside of the enclosure. Removal from the outside shall only be by use of a tool intended for this purpose		P
7.1.10.2	Insulation		P
	If, in order to prevent accidental contact between a metallic enclosure and live parts, the enclosure is partly or completely lined with insulating material, then this lining shall be securely fixed to the enclosure	Securely fixed to the enclosure	P
7.1.11	Degrees of protection of enclosed equipment		P
7.1.12	Conduit pull-out, torque and bending with metallic conduits		N
	Polymeric enclosures of equipment, whether integral or not, provided with threaded conduit entries, intended for the connection of extra heavy duty, rigid threaded metal conduits complying with IEC 60981, shall withstand the stresses occurring during its installation such as pull-out, torque, bending.		N
7.2	Performance requirements		P
	The following requirements apply to clean new equipment unless otherwise stated in the relevant product standard.		P

7.2.1	Operating conditions		P
7.2.1.1	General		P
7.2.1.2	Limits of operation of power operated equipment	According with the requirement	P
7.2.1.3	Limits of operation of under-voltage relays and releases		N
7.2.1.4	Limits of operation of shunt releases		N
7.2.1.5	Limits of operation of current operated relays and releases		N
7.2.2	Temperature-rise		P
7.2.2.1	Terminals		P
7.2.2.2	Accessible parts		P
7.2.2.3	Ambient air temperature		P
7.2.2.4	Main circuit		P
7.2.2.5	Control circuits		P
7.2.2.6	Windings of coils and electromagnets		N
7.2.2.7	Auxiliary circuits		P
7.2.2.8	Other parts		P
7.2.3	Dielectric properties	No breakdown or flashover	P
7.2.3.1	Impulse withstand voltage		P
7.2.3.2	Power-frequency withstand voltage of the main, auxiliary and control circuits		P
7.2.3.3	Clearances		P
7.2.3.4	Creepage distances		P
7.2.3.5	Solid insulation		P
7.2.3.6	Spacing between separate circuits		P
7.2.4	Ability to make, carry and break currents under no-load,		P
7.2.4.1	Making and breaking capacities		P
7.2.4.2	Operational performance		P
7.2.4.3	Durability		N
7.2.4.3.1	Mechanical durability		N
7.2.4.3.2	Electrical durability		N
7.2.5	Ability to make, carry and break short-circuit currents	According with the requirement of standard	P
7.2.6	Switching overvoltages		P
7.2.7	Leakage currents of equipment suitable for isolation		P
7.3	Electromagnetic compatibility (EMC)		N

7.3.1	For products falling within the scope of this standard, two sets of environmental conditions are considered and are referred to as a) environment A; b) environment B.		N
7.3.2	Immunity		N
7.3.2.1	Equipment not incorporating electronic circuits		N
	Equipment not incorporating electronic circuits is not sensitive to electromagnetic disturbances in normal service conditions, and therefore no immunity tests are required.		N
7.3.2.2	Equipment incorporating electronic circuits		N
7.3.3	Emission		N
7.3.3.1	Equipment not incorporating electronic circuits		N
7.3.3.2	Equipment incorporating electronic circuits		N
7.3.3.2.1	Limits for high-frequency emissions		N
7.3.3.2.2	Limits for low-frequency emissions		N
8	Type tests		P
	Type tests are intended to verify compliance of the design of a given equipment with this standard, where applicable, and the relevant product standard.	According with requirement of standard	P
8.1.3	Routine tests		N
8.1.4	Sampling tests		N
	If engineering and statistical analysis show that routine tests (on each product) are not required, sampling tests may be made instead, if so stated in the relevant product standard.		N
	The tests may comprise a) functional tests; b) dielectric tests.		N
8.2	Compliance with constructional requirements		P
	The verification of compliance with the constructional requirements stated in 7.1 concerns, for example		P
	– the materials;		P
	– the equipment;		P
	– the degrees of protection of enclosed equipment;	See nameplate	P
	– the mechanical properties of terminals;		P
	– the actuator;		N
	– the position indicating device (see 2.3.18).		P
8.2.1	Materials		P

8.2.1.1	Test of resistance to abnormal heat and fire	May resist to abnormal heat and fire	P
8.2.1.1.1	Glow-wire test (on equipment)		P
	The glow-wire test shall be made according to clauses 4 to 10 of IEC 60695-2-10 and IEC 60695-2-11 under the conditions specified in 7.1.1.1.		P
8.2.1.1.2	Flammability, hot wire ignition and arc ignition tests (on materials)		N
8.2.2	Equipment		P
8.2.3	Enclosures for equipment		P
8.2.3	Enclosures for equipment see Annex C.		P
8.2.4	Mechanical properties of terminals		P
	This subclause does not apply to aluminium terminals nor to terminals for connection of aluminium conductors.	No aluminium conductors nor aluminium terminals	P
8.2.4.1	General conditions for tests		P
	Unless otherwise stated by the manufacturer, each test shall be made on terminals in a clean and new condition.		P
8.2.4.2	Tests of mechanical strength of terminals		P
	Tests shall be made with the appropriate type of conductor having the maximum cross-sectional area.		P
	The conductor shall be connected and disconnected five times.		P
	For screw-type terminals, the tightening torque shall be in accordance with Table 4 or 110 % of the torque specified by the manufacturer, whichever is the greater.		P
8.2.4.3	Testing for damage to and accidental loosening of conductors (flexion test)		P
	The test applies to terminals for the connection of unprepared round copper conductors, of number, cross-section and type (flexible and/or rigid (stranded and/or solid)), specified by the manufacturer.		P
	Terminals intended for connection of both flexible or rigid (solid and/or stranded) conductors simultaneously shall be tested as stated in c) above		P
	During the test, the conductor shall neither slip out of the terminal nor break near the clamping unit.		P
	Immediately after the flexion test, each conductor under test shall be submitted in the test equipment to the test of 8.2.4.4 (pull-out test).		N
8.2.4.4	Pull-out test		N
8.2.4.4.1	Round copper conductors		N

	The force shall be applied without jerks for 1 min.		N
	During the test, the conductor shall neither slip out of the terminal nor break near the clamping unit.		N
8.2.4.4.2	Flat copper conductors		N
	A suitable length of conductor shall be secured in the terminal and the pulling force given in Table 6 applied without jerks for 1 min in a direction opposite to that of the insertion of the conductor.		N
	During the test, the conductor shall neither slip out of the terminal nor break near the clamping unit.		N
8.2.4.5	Test for insertability of unprepared round copper conductors having the maximum specified cross-section		P
8.2.4.5.1	Test procedure		P
	The measuring section of the gauge shall be able to penetrate freely into the terminal aperture to the full depth of the terminal (see also note to Table 7).	According with requirement of standard	P
8.2.4.5.2	Construction of gauges		P
	Details of dimensions a and b and their permissible deviations are shown in Table 7. The measuring section of the gauge shall be made from gauge steel.	See instruction	P
8.2.4.6	Tests for insertability of flat conductors with rectangular cross-section		N
	Under consideration.		N
8.2.5	Verification of the effectiveness of indication of the main contact position of equipment suitable for isolation		P
	To verify the effectiveness of the indication of the main contact position as required by 7.1.6, all means of indication of contact position shall continue to function correctly after the operational performance type tests, and special durability tests if performed.		P
8.2.5.1	Condition of equipment for the tests		P
	The condition of the equipment for the tests shall be stated in the relevant product standard.	According with requirement of standard	P
8.2.5.2	Method of test		P
8.2.5.3	Condition of equipment during and after test		P
8.2.5.3.1	Dependent and independent manual operation		P
	After the test, when the test force is no longer applied, the actuator being left free, the open position shall not be indicated by any of the means provided and the equipment shall not show any damage such as to impair its normal operation.		P
8.2.5.3.2	Dependent and independent power operation		N

	During and after the test, the open position shall not be indicated by any of the means provided and the equipment shall not show any damage such as to impair its normal operation.		N
	When the equipment is provided with means for locking in the open position, it shall not be possible to lock the equipment during the test.		N
8.2.6	Vacant		N
8.2.7	Conduit pull-out test, torque test and bending test with metallic conduits	No this metallic conduits	N
	The tests shall be made in the sequence 8.2.7.1, 8.2.7.2 and 8.2.7.3.		N
8.2.7.1	Pull-out test		N
	After the test, the displacement of the conduit in relation with the entry shall be less than one thread depth and there shall be no evidence of damage impairing further use of the enclosure.		N
8.2.7.2	Bending test		N
	When the bending moment results in a deflection of the conduit of 25 mm per 300 mm length, or the bending moment has reached the value given in Table 21, the moment is maintained for 1 min. The test is then repeated in a perpendicular direction.		N
	After the test there shall be no evidence of damage impairing further use of the enclosure.		N
8.2.7.3	Torque test		N
	For enclosures provided with a single conduit connection up to and including 16 H, the tightening torque is reduced to 25 N · m.		N
	After the test, it shall be possible to unscrew the conduit and there shall be no evidence of damage impairing further use of the enclosure.		N
8.3	Performance		P
8.3.1	Test sequences		P
	Where applicable, the relevant product standard shall specify the test sequences to which the equipment is to be submitted.	According with requirement of standard	P
8.3.2	General test conditions		P
8.3.2.1	General requirements		P
8.3.2.2	Test quantities	According with requirement of standard	P
8.3.2.2.1	Values of test quantities		P
	All the tests shall be made with the values of test quantities corresponding to the ratings assigned by the manufacturer, in accordance with the relevant tables and data of the relevant product standard.		P

8.3.2.2.2	Tolerances on test quantities		P
	The test recorded in the test report shall be within the tolerances given in Table 8, unless otherwise specified in the relevant subclauses. However, with the agreement of the manufacturer, the tests may be made under more severe conditions than those specified.	According with requirement of standard	P
8.3.2.2.3	Recovery voltage		N
	a) Power-frequency recovery voltage		N
	b) Transient recovery voltage		N
8.3.2.3	Evaluation of test results		N
	Behaviour of the equipment during the tests and its condition after the tests shall be specified in the relevant product standard. For short-circuit tests, see also 8.3.4.1.7 and 8.3.4.1.9.		N
8.3.2.4	Test reports		P
8.3.3	Performance under no-load, normal load and overload conditions		P
8.3.3.1	Operation		P
	Tests shall be made to verify that the equipment operates correctly according to the requirements of 7.2.1.1.		P
8.3.3.2	Operating limits		P
8.3.3.2.1	Power operated equipment		P
	It shall be verified that the equipment opens and closes correctly within the limiting values of the control quantities, such as voltage, current, air pressure and temperatures, specified in the relevant product standard. Tests are made with no current flowing through the main circuit, unless otherwise specified.		P
8.3.3.2.2	Relays and releases		N
8.3.3.3	Temperature-rise		P
8.3.3.3.1	Ambient air temperature		P
	During the tests, the ambient air temperature shall be between +10 °C and +40 °C and shall not vary by more than 10 K		P
8.3.3.3.2	Measurement of the temperature of parts		P
8.3.3.3.3	Temperature-rise of a part		P
8.3.3.3.4	Temperature-rise of the main circuit		P
8.3.3.3.5	Temperature-rise of control circuits		P
8.3.3.3.6	Temperature-rise of coils of electromagnets		N
8.3.3.3.7	Temperature-rise of auxiliary circuits		P
8.3.3.4	Dielectric properties		P

8.3.3.4.1	Type tests		P
	1) General conditions for withstand voltage tests		P
	The equipment to be tested shall comply with the general requirements of 8.3.2.1.		P
	2) Verification of impulse withstand voltage		P
	3) Power-frequency withstand verification of solid insulation		P
	4) Power-frequency withstand verification after switching and short-circuit tests		P
	5) Vacant		N
	6) Verification of d.c. withstand voltage Under consideration.		N
	7) Verification of creepage distances		P
	8) Verification of leakage current of equipment suitable for isolation		P
8.3.3.4.2	Routine tests		N
8.3.3.4.3	Sampling tests for verification of clearances		N
8.3.3.4.4	Tests for equipment with protective separation		P
	Tests for equipment with protective separation are given in Annex N.		P
8.3.3.5	Making and breaking capacities		P
8.3.3.5.1	General test conditions		P
	Tests for verification of making and breaking capacities shall be made according to the general test requirements stated in 8.3.2.		P
8.3.3.5.2	Test circuit		P
8.3.3.5.3	Characteristics of transient recovery voltage		N
8.3.3.5.4	Vacant		N
8.3.3.5.5	Test procedure for making and breaking capacities		P
	The number of operations, the "on" and "off" times and the ambient conditions shall be stated in the relevant product standard.	According with requirement of relevant standard	P
8.3.3.5.6	Behaviour of the equipment during and after making and breaking capacity tests		P
	The criteria for acceptance during and after the tests shall be stated in the relevant product standard.		P
8.3.3.6	Operational performance capability		P
	Detailed test conditions shall be stated in the relevant product standard.		P
8.3.3.7	Durability		N

	Durability tests are intended to verify the number of operating cycles that an equipment is likely to be capable of performing without repair or replacement of parts.		N
8.3.3.7.1	Mechanical durability		N
8.3.3.7.2	Electrical durability		N
	Evaluation of test results shall be defined in the relevant product standard.		N
8.3.4	Performance under short-circuit conditions		P
8.3.4.1	General conditions for short-circuit tests		P
8.3.4.1.1	General requirements		P
	Additional test conditions may be specified in the relevant product standard.		P
8.3.4.1.2	Test circuit		P
8.3.4.1.3	Power-factor of the test circuit		N
	For a.c., the power-factor of each phase of the test circuit should be determined according to an established method which shall be stated in the test report.		N
8.3.4.1.4	Time-constant of the test circuit		N
	For d.c., the time-constant of the test circuit may be determined according to the method given in Annex F, clause F.2.		N
8.3.4.1.5	Calibration of the test circuit		N
	The calibration of the test circuit is carried out by placing temporary connections B of negligible impedance as close as reasonably possible to the terminals provided for connecting the equipment under test.		N
8.3.4.1.6	Test procedure		P
	Tests for the performance under short-circuit conditions shall be made according to the requirements of the relevant product standard.		P
8.3.4.1.7	Behaviour of the equipment during short-circuit making and breaking tests		P
	There shall be neither arcing nor flashover between poles, or between poles and frame, and no melting of the fusible element F in the leakage detection circuit (see 8.3.4.1.2).		P
8.3.4.1.8	Interpretation of records		P
8.3.4.1.9	Condition of the equipment after the tests		P
8.3.4.2	Short-circuit making and breaking capacities		P

8.3.4.3	Verification of the ability to carry the rated short-time withstand current		P
	The test shall be made with the equipment in the closed position, at a prospective current equal to the rated short-time withstand current and the corresponding operational voltage under the general conditions of 8.3.4.1.		P
8.3.4.4	Co-ordination with short-circuit protective devices and rated conditional shortcircuit current		P
	Test conditions and procedures, where applicable, shall be stated in the relevant product standard.		P
8.4	Tests for EMC		N

EN IEC 60947-4-1		
6.2	MARKING	-
	Data shall be preferably marked on the equipment:	-
	a – manufacturer’s name or trade mark	Changcheng Electrical Group Zhejiang Technology Co., Ltd.
	b – type designation or serial number	P
	c - number of this standard, if the manufacturer claims compliance	IEC 60947
	k - IP code, in case of an enclosed equipment	N
	Data shall be included on the nameplate, or on the equipment, or in the manufacturer's published literature:	P
	d – rated operational voltages	P
	e - utilization category and rated operational currents (or rated powers), at the rated operational voltages of the equipment	P
	f - either the value of the rated frequency/ies, or the indication d.c. (or symbol)	P
	g - rated duty with the indication of the class of intermittent duty, if any	P
	Associated values:	P
	h - rated marking and breaking capacities (these indications may be replaced, where applicable, by the indication of the utilization category, see table 7)	P
	Safety an installation:	P
	i – rated insulation voltage	P
	j – rated impulse withstand voltage	P
	l – pollution degree	P
	m – rated conditional short-circuit current and type of co-ordination of contactor or starter and type, current rating and characteristics of the associated SCPD:	P
	m – rated conditional short-circuit current of the combination starter or the protected starter	P
	n – switching overvoltages	P
	Control circuits	P
	The following information concerning control circuits shall be placed either on the coil or on the equipment:	P

	o – rated control circuit voltage (Uc), nature of current and rated frequency		P
	p - if necessary, nature of current, rated frequency and rated control supply voltages (Us)		P
	Air supply systems for starter or contactors operated by compressed air		P
	Q – rated supply systems of the compressed air and limits of variation of this pressure, if they are different from those specified in 8.2.1.2		N
	Auxiliary circuits:		-
	r – ratings of auxiliary circuits		N
	Overload relays and releases:		N
	s – characteristics according to 5.7		N
	Additional information for certain types of contactor and starter:		N
	Rheostatic starters:		N
	t – circuit diagram		N
	u – severity of start, see 5.3.5.5.1		N
	v – starting time, see 5.3.5.5.1		N
	Auto-transformer starters:		-
	w – rated starting voltage(s), i.e. voltage(s) at the tapping terminals		N
	Vacuum contactors and starters:		N
	x – maximum permissible altitude of the site of installation, if less than 2000 m		N
	EMC		-
	y – environment B or A: see 7.3.1 of part 1		P
	z – special requirements, if applicable, for example shielded or twisted conductors		P
	Sub clause 5.2 of part 1 applies to contactors, starters and overload relays with the following additions:		-
	Data under items d) to x in 6.1.2 shall be included on the nameplate or on the equipment or in the manufacturer's published literature:		P
	In case of electronically controlled electromagnets, information other than given in o) and p) of 6.1.2 may also be necessary: see 5.5 and annex E		P

	Data under items c) and k) in 6.1.2 shall preferably be marked on the equipment		P
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6.3	Instruction for installation, operation and maintenance		-
	The manufacture shall specify, in his documents or catalogues:		P
	- the conditions for installation, operation and maintenance, if any, of the equipment during operation and after a fault		P
	- the specify the measures to be taken with regard to EMC, if any,		N
	- equipment only suitable in environment A shall provided with the following notice		P
	- if necessary, the instructions for transport, installation and operation of the equipment shall indicate the measures that are particular importance for the proper and correct installation, commissioning and operation of the equipment.		P

	- manufacturer advice on the measures to be taken in the event of a short-circuit		P
	In case of protected starters (see 3.2.8), the manufacturer shall also provide the necessary mounting and wiring instruction		P

8.1	CONSTRUCTION		
8.1.1	Materials (see 7.1.1)		P
	Resistance to abnormal heat and fire (according to 7.1.1.1 of IEC 60947-1) of insulating current-carrying parts		P

7.10	Resistance to heat		
	CB sufficiently resistant to heat		P
9.14	Test of resistance to heat		
9.14.1	Test:		P
	- without removable covers..... 1 h (100 ± 2) °C		P
	- removable covers..... 1 h (70 ± 2) °C		P

	After the test no access to live parts, marking still legible		P
9.14.2	Ball pressure test for external parts of insulating material (parts retaining current-carrying parts and parts of the protective circuit in position) T = 125°C Ø of impression ≤ 2 mm		P
8.14.3	Ball pressure test for external parts of insulating material (parts not retaining current-carrying parts and parts of the protective circuit in position) T = (70 ± 2)°C or T = ___ °C = (40 ± 2)°C + max. temperature rise of sub-clause 8.8 Ø of impression ≤ 2 mm		P
8.11	Resistance to abnormal heat and to fire		-
	External parts of insulating material shall not ignite or spread fire under fault or overload conditions		P
9.15	Resistance to abnormal heat and to fire		-
	Glow wire test: No visible flame, no sustained glowing or flames and glowing extinguish within 30 s		P
	external parts retaining current-carrying parts and parts of the protective circuit in position..... (960 ± 15)°C		P
	all other external parts (650 ± 10)°C		P
8.12	Resistance to rusting		-
	Ferrous parts adequately protected against rusting		P
9.16	Test of resistance to rusting:		P
	- 10 min immersed in a cold chemical		P
			P
	No sign of rust		P

8.1.2	Current-carrying parts and their connection (see 7.1.2)		P
8.1.3	CLEARANCES AND CREEPAGE DISTANCES		P
	CLAUSE 7.1.3 OF IEC 60947 APPLIES		P
7.1.3	Clearances		P
	Rated impulse withstand voltage		P
	Creepage distances		P
	Pollution degree		—
	Comparative tracking index (V)		—

	Material group		—
	Rated insulation voltage U_i (V)		—
	Minimum creepage distances (mm)		—
	Measured creepage distances (mm)		P
	In case U_{imp} is not indicated		P
8.1.4	Actuator		P
	Sub-clause 7.1.4 of part 1 applies when the actuator is manually operated with the following addition:		—
	The operating handle of the manually operated switching device of combination starter shall be provided with means for padlocking it in the OFF position.		P
8.1.4.1	Insulation		P
8.1.4.2	Direction of movement		P
8.1.4.3	Mounting		P
	Actuators mounted on removable panels or opening doors are so designed that when the panels are replaced or doors closed the actuator will engage correctly with the associated mechanism		P
8.1.5	INDICATION OF CONTACT POSITION		-
8.1.5.1	Indication means, see 7.1.5.1 part 1 applies to manually operated starters		P
8.1.5.2	Indication by the actuator, see 7.1.5.1 part 1		P
8.1.6	Additional safety requirements for equipment suitable for isolation, see clause 7.1.6.1 part 1 applies and the additions marked with *)		-
7.1.6.1	Additional constructional requirements:		P
	- marking according to 5.2.		P
	- indication of the position of the contacts		P
	- construction of the actuating mechanism		P
	- minimum clearances across open contacts (see Table XIII, Part 1) (mm)		—
	- measured clearances (mm)		P
	- test U_{imp} across gap (kV)		P
	*) Devices provided with positions like trip position or stand-by positions which are not the indicated open position shall be clearly marked.		P

	*) An indicator having only one position of rest shall not be considered as appropriate to indicate the position of the main contact.		P
8.1.6.2	Supplementary requirements for equipment with provision for electrical interlocking with contactors or circuit-breakers:		-
	Auxiliary switch is rated according to IEC 60947-5-1 (unless the equipment is rated AC-23)		P
	Time interval between opening of the contacts of the auxiliary contact and the contacts of the main poles: =20 ms		—
	Measured time interval (ms)		P
	During the closing operation the contacts of the auxiliary switch closes after or simultaneously with the contacts of the main poles		P
8.1.6.3	Supplementary requirements for equipment provided with means for padlocking the open position:		P
	The locking means is so designed that it cannot be removed with the appropriate padlock(s) installed		p
	Test force F applied to the actuator in an attempt to operate to the closed position (N)		—
	Rated impulse withstand voltage (kV)		—
	Test Uimp on open main contacts at the test force		P
8.1.7	Terminals		-
7.1.7.1	All parts of terminals which maintain contact and carry current shall be of metal having adequate mechanical strength	(see 8.2.4 below)	P
	Terminal connections shall be such that necessary contact pressure is maintained	(see 8.2.4 below)	P
	Terminals shall be so constructed that the conductor is clamped between suitable surfaces without damage to the conductor and terminal	(see 8.2.4 below)	P
	Terminal shall not allow the conductor to be displaced or to be displaced themselves in a manner detrimental to the operator of equipment and the insulation voltage shall not be reduced below the rated value	(see 8.2.4 below)	P
	If required by application, terminals and conductors may be connected by means of cable lugs for copper conductors only		P
8.2.4	Mechanical properties of terminals		-

8.2.4.2	Mechanical strength of terminals		P
	maximum cross-sectional area of conductor (mm ²)		-
	diameter of thread (mm)		-
	torque (Nm)		-
	5 times on 2 separate clamping units		-
8.2.4.3	Testing for damage to and accidental loosening of conductor (flexion test)		-
	conductor of the smallest cross-sectional area (mm ²)		-
	number of conductor of the smallest cross section		-
	diameter of bushing hole (mm)		-
	height between the equipment and the platen (mm)		-
	mass at the conductor(s) (kg)		-
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.4	Pull-out test		P
	force (N)		
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Flexion test		P
	conductor of the largest cross-sectional area (mm ²)		-
	number of conductor of the largest cross-sectional		-
	diameter of bushing hole (mm)		-
	height between the equipment and the platen (mm)		-
	mass at the conductor(s) (kg)		-
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Pull-out test		P
	force (N)		-

	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Flexion test		P
	conductor of the largest and smallest cross-sectional area (mm ²)		-
	number of conductor of the smallest cross sectional, number of conductor of the largest cross sectional		-
	diameter of bushing hole (mm)		-
	height between the equipment and the platen (mm)		-
	mass at the conductor(s) (kg)		-
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Pull-out test		P
	force (N)		-
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
7.1.7.2	Connecting capacity		P
	type of conductors		-
	minimum cross-sectional area of conductor (mm ²)		-
	maximum cross-sectional area of conductor (mm ²)		-
	number of conductors simultaneously connectable to the terminal		-
7.1.7.3	Connection		P
	terminals for connection to external conductors shall be readily accessible during installation		P
	clamping screws and nuts shall not serve to fix any other component		P
8.1.7.4	Terminal identification and marking,		P
8.1.7.4	Subclause 7.1.7.4 of part 1 applies with the additional requirements of annex A		P

	terminal intended exclusively for the neutral conductor		P
	protective earth terminal		P
	other terminals		P
8.1.8	Additional requirements for equipment provided with a neutral pole		-
	Subclause 7.1.8 of part 1 applies		P
	marking of neutral pole		P
	The switched neutral pole shall not break before and shall not make after the other poles		P
	Conventional thermal current of neutral pole		P
	If a pole having an appropriate short-circuit breaking and making capacity is used as a neutral pole, then all poles, including the neutral pole, may operate substantially together.		P
	Equipment having a value $I_{th} < 63$ A, this value shall be identical for all poles		P
	For $I_{th} > 63$ A, the neutral pole may have a value of I_{th} different from that of the other poles, but not less than the half that value or 63 A, whichever is the higher.		P
8.1.9	Provisions for protective earthing		-
	Subclause 7.1.9 of part 1 applies		P
7.1.9.1	The exposed conductive parts shall be electrically interconnected and connected to a protective earth terminal		P
7.1.9.2	The protective earth terminal shall be readily accessible		P
	The protective earth terminal shall be suitably protected against corrosion		P
	The electrical continuity between the exposed conductive parts of the protective earth terminal and the metal sheathing of connecting conductors		P
	The protective earth terminal shall have no other functions		P
7.1.9.3	Protective earth terminal marking and identification		P

8.1.10	Enclosure for equipment		-
7.1.10.1	Design		-
	Subclause 7.1.9 of part 1 applies with the follow additions		P
	Starting resistors mounted within an enclosure shall be so located or guarded that issuing heat is not detrimental to other apparatus and materials within the enclosure.		P
	For the specified case of combination starters, the cover or door shall be interlocked so that it cannot be opened without manually operated device being in open position.		P
	However, provision may be made to open the door or cover with the manually operated switching device in the ON position by use of a tool.		P
	The enclosure, when it is opened: all parts requiring access for installation and maintenance are readily accessible		P
	Sufficient space shall be provided inside the enclosure		P
	The fixed parts of a metal enclosure shall be electrically connected to the other exposed conductive parts of the equipment and connected to a terminal which enables them to be earthed or connected to a protective conductor		P
	Under no circumstances shall a removable metal part of the enclosure be insulated from the part carrying the earth terminal when the removable part is in place		P
	The removable parts of the enclosure shall be firmly secured to the fixed parts by a device such that they cannot be accidentally loosened or detached owing to the effects of operation of the equipment or vibrations		P

	When an enclosure is so designed as to allow the covers to be opened without the use of tools, means shall be provided to prevent loss of the fastening devices		P
7.1.10.2	Insulation		-
	If, in order to prevent accidental contact between a metallic enclosure and live parts, the enclosure is partly or completely lined with insulating material, then this lining shall be securely fixed to the enclosure		P
8.1.11	Degree of protection of enclosed contactors and starters		N
	Subclause 7.1.11 of part 1 applies		N
	Degree of protection :		N
	Test for first characteristic		N
	Test for first numeral :		—
			-
	Test for second numeral :		—

9.3.1.a	TEST SEQUENCE I		-
	- verification of temperature rise (Clause 9.3.3.3.)		P
	- verification of operation and operating limits (Clause 9.3.3.1 and 9.3.3.2)		P
	- verification of dielectric properties (Clause 9.3.3.4)		P
9.3.3.3	Temperature rise		P
	Subclause 8.3.3.3. of part 1 applies		-
	ambient temperature 10-40 °C		—
	Contactor		-
	test enclosure W x H x D (mm x mm x mm)		—
	material of enclosure		—
9.3.3.3.4	Main circuits, test conditions:		-
	Subclause 8.3.3.4 of part 1 applies with following addition		-
	loaded as stated in 8.2.2.4		-
	- setting of the maximum current setting.....		-
	- setting overload relay.....		-
	- conventional thermal current I _{th} (A)		—
	- conventional enclosed thermal current I _{the} (A) .:		—
	- cable/busbar cross-section (mm ²) / (mm)		—
	- temperature rise of main circuit terminals (K)	<	—
9.3.3.3.5	Control circuit, test conditions:		-
	Subclause 8.3.3.5. of part 1 applies with following addition		-
	The temperature rise shall be measures during the test of 9.3.3.3.4		-
	- conventional thermal current I _{th} (A) at their rated voltage.....		-
	- conventional enclosed thermal current I _{the} (A) .:		-
	- cable/busbar cross-section (mm ²) / (mm)		-
	- temperature rise of control circuit (K)	<	P
9.3.3.3.6	Coils and electromagnets circuit, test conditions:		-
	a) Uninterrupted and eight-hour duty windings (8.2.2.6.1)		P
	The temperature rise shall be measures during the test of 9.3.3.3.4		P
	- rated control supply voltage U _s (V)		—

	- class of insulating material		—
	- uninterrupted or eight-hour duty windings		P
	- temperature rise of control circuit terminals (K) . :		P
	b) Intermittent duty windings (8.2.2.6.2)		P
	- no current flowing though the main circuit		P
	- rated control supply voltage U_s (V)		—
	- class of insulating material		—
	- intermittent duty class.....		P
	- close open operating cycle.....		P
	- on-load factor.....		P
	- temperature rise of control circuit terminals (K) . :	<40	P
	c) temporary or periodic duty (8.2.2.6.3)		P
	- no current flowing though the main circuit		P
	- rated control supply voltage U_s (V)		—
	- class of insulating material		—
	- close open operating cycle.....		P
	- on-load time.....		P
	- temperature rise of control circuit terminals (K) . :		P
9.3.3.3.7	Auxiliary circuit, test conditions:		P
	Normally loaded with their maximum rated operational current at any convenient voltage		P
	The temperature rise shall be measures during the test of 9.3.3.3.4		P
	- conventional thermal current I_{th} (A).....		P
	- conventional enclosed thermal current I_{the} (A) . :		P
	- cable/busbar cross-section (mm ²) / (mm)		P
	- cable cross-section (mm ²)		—
	- temperature rise of auxiliary circuit terminals (K)		P
9.3.3.3.8	Starting resistors for rheostatic rotor starters test conditions:		P
	Normally loaded with their current value I_m		P
	Number of starts per hour.....		P
	Rated duty.....		P
	Starting characteristic		P
	- cable/busbar cross-section (mm ²) / (mm)		P
	- cable cross-section (mm ²)		P

	- temperature rise of starting resistor terminals (K)	See table 3 of part 1	P
	- temperature rise of starting resistor enclosure (K)	See table 3 of part 1	P
	- temperature rise of issuing air (K)	See table 3 of part 1	P
9.3.3.3.9	Auto-transformers for two-step auto-transformers starters		P
	Normally loaded with max. Starting current multiplied with $0,8 \times \frac{\text{starting voltage}}{U_e}$		P
	Number of starts per hour.....		P
	Rated duty.....		P
	Starting characteristic.....		P
	- cable/busbar cross-section (mm ²) / (mm)		P
	Temperature rise of:		P
	- windings (K)	See table 5 (+15 %)	P
	- operating means (K)	See table 3 of part 1	P
	- parts intended to be touched but not hand held (K)	See table 3 of part 1	P
	- parts which need not be touched during normal operation (K)	See table 3 of part 1	P

9.3.3	Performance under no load, normal load and overload conditions		-
9.3.3.1	Operation		-
	For starter only:		P
	reference ambient temperature(i.e. +20 °C :		P
	Rated full load current (A) :		P
	No tripping after 3 operations when stator has reached thermal equilibrium at minimum and maximum settings		P
	For overload relay with combined stop and reset actuating mechanism only		P
	With closed contactor, the resetting mechanism shall be operated and this shall cause the contactor drop out		P
	For overload relay with either a reset or separate stop and reset mechanism only		P
	With closed contactor and resetting mechanism in the reset position, the tripping mechanism shall be operated and the contactor shall have been caused to drop out		P

9.3.3.2	OPERATING LIMITS		-
9.3.3.2.1	Power-operated equipment:		P
8.2.1.2.1	Electromagnetic contactors and starters		P
	rated control supply voltage U_s (V)		—
	frequency (Hz)		—
	declared ambient temperature(>40 °C) for 100% U_s		P
	limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage U_s		P
	limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c.		P
	ambient temperature(-5 °C) for 100% U_s		P
	limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage U_s		P
	Limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c.		P
8.2.1.2.2	Contactors and starters with electronically controlled electromagnet		P
	Rated control supply voltage U_s (V)		—
	Frequency (Hz)		—
	Declared ambient temperature(>40 °C) for 100% U_s		P
	Limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage U_s		P
	Limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c.		P
	Ambient temperature(-5 °C) for 100% U_s		P
	Limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage U_s		P
	Limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c.		P
8.2.1.2.3	Electro-pneumatic contactors and starters		P
	Rated air supply pressure(Bar)		—

	Declared ambient temperature(>40 °C) for 100% of the rated air supply pressure(Bar)		P
	Limits of close satisfactorily at any value between 85% and 110% of rated air supply pressure(Bar)		P
	Limits of drop out and open fully are: 75% to 10% of rated air supply pressure(Bar)		P
	Ambient temperature(-5 °C) for 100% of the rated air supply pressure(Bar)		P
	Limits of close satisfactorily at any value between 85% and 110% of rated air supply pressure(Bar) :		P
	Limits of drop out and open fully are: 75% to 10% for the rated air supply pressure(Bar)		P
8.2.1.2.4	Capacitive drop out test		P
	A capacitor shall be inserted in series in the supply circuit U_s , the total length of the connecting conductors being = 3 m.		P
s	The capacitor is short-circuit by a switch of negligible impedance.		P
	The supply voltage shall then be adjusted to 110 % U_s		P
	The value of the capacitor shall be calculated: $C (nF) = 30 + 200000 / (f \times U_s)$		P
	Verification of the drop out of the contactor when the switch is operated to the open position.....		P
9.3.3.2.2	Relays and releases		-
8.2.1.3	Operation of under-voltage relays and releases		P
	type of under-voltage relay		P
	Rated control supply voltage(U).....		P
	Frequency (Hz).....		P
	Limits of drop out and fully open at slowly falling voltage are 70 % and 35 % of the rated voltage.....		P
	Prevent to close if supply voltage < 35 % of the rated voltage.....		P
	Limits of close satisfactorily at any value between 85 % and 110 %.....		P

8.2.1.4	Shunt-coil operated releases (shunt trip)		-
	Tripping of shunt release measured during the tripping operation between 70 % and 110 % of the rated control supply voltage and if a.c. at rated frequency.....:		P
8.2.1.5	Conditions for thermal and time-delay magnetic overload relays only:		P
8.2.1.5.1	Limits of operation of time-delay overload relays when all poles are energized		P
	type of time-delay overload relay		-
	trip class		-
	current setting		-
	ambient temperature (°C)		-
	test enclosure W x H x D (mm x mm x mm)		-
	cable/busbar cross-section (mm ²) / (mm)		-
	at A times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current		-
	when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current		-
	for class 10A overload relays energized at C times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current		-
	For class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time		-
	At D times the current setting, tripping shall occur within the tripping time (s) < Tp <, starting from the cold state; test current; tripping time Tp (s)		-
	ambient temperature: - 5 °C		P
	at A times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current		-
	when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current		-

	for class 10A overload relays energized at C times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current		-						
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time		-						
	at D times the current setting, tripping shall occur within the tripping time (s) < Tp <, starting from the cold state; test current; tripping time Tp (s)		-						
	ambient temperature: + 40 °C		-						
	at A times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current		-						
	when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current		-						
	for class 10A overload relays energized at C times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current		-						
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time		-						
	at D times the current setting, tripping shall occur within the tripping time (s) < Tp <, starting from the cold state; test current; tripping time Tp (s)		-						
	Limits of operation of three-pole thermal overload relays energized on two poles:		-						
	ambient temperature (°C)		-						
	the relay energized on three poles, at A times the current setting, tripping shall not occur in less than 2 h, starting from the cold state; test current :	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> </table>							-

								-
	when the value of the current flowing in two poles is increased to B times the current setting and the third pole deenergized, tripping shall occur in less than 2 h; current value; test current							-
								-
8.2.1.5.3	Limits of operation of instantaneous magnetic overload relays							P
	For all values of the current setting, instantaneous magnetic overload relays shall trip with an accuracy of $\pm 10\%$ of the value of the published current value corresponding to the current setting							P
	Magnetic settings.....:							P
	Accuracy $\pm 10\%$ of the value.....:							P
8.2.1.5.4	Limits of operation of automatic change over by under-current relays							P
	- for star-delta starters from star to delta, and - for auto-transformer starters from the starting to the ON position							P
	The lowest drop-out of an under-current relay shall be not greater than 1,5, times the actual current setting of the overload relay which is active in the starting or star connection.							P
	The under-current real shall be able to carry any value of current , from its lowest current setting to stalled current in the starting position or the star connection, for the tripping times determined by the overload relays at its highest current setting							P
9.3.3.4	Test of dielectric properties, impulse withstand voltage (Uimp indicated):							P
	- verification by measurement of clearances instead of testing							P
	- rated impulse withstand voltage (V)							—
	- test Uimp main circuits (kV)							P
	- test Uimp auxiliary circuits (kV)							P
	Test of dielectric properties, dielectric withstand voltage (Uimp not indicated):							-

	- rated insulation voltage (V)		—
	- main circuits, test voltage for 5 s (V)		P
	- control and auxiliary circuits, test voltage for 5-s (V)		P
	- circuits of equipment include devices such as motors, instruments ect, test voltage for 5 s (V) ...:		P
	Equipment suitable for isolation		P
	The leakage current shall be measured through each pole with the contacts in open position(< 0,5 mA)		P
9.3.1.B	TEST SEQUENCE II		-
	- verification of read making and breaking capacities, change-over ability and reversibility, where applicable (Clause 9.3.3.5.)		P
	- verification of conventional operational performance (Clause 9.3.3.6)		P
9.3.3.5	Making and breaking capacity		P
	Conditions, make operations only.....		P
	Type of product.....		P
	utilization category		—
	Control voltage 25 times at 110% and 25 times at 85% for AC-3 and AC-4		P
	rated operational voltage Ue (V)		—
	rated operational current Ie (A) or power (kW)		—
	- test voltage U/Ue = 1,05 (V)		—
	- test current I/Ie = _____ (A)		—
	- power factor/time constant		—
	- on-time (ms)		—
	- off-time (s)		—
	- number of make operations		P
	Behaviour and condition during and after the test:		P
	- no permanent arcing		P
	- no flash-over between poles		P
	- no blowing of the fusible element in the earth circuit		P
	- no welding of the contacts		P

	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		P
	Conditions, make/break operations only.....:		P
	Type of product.....:		P
	utilization category		-
	rated operational voltage U_e (V)		-
	rated operational current I_e (A) or power (kW)		-
	For starters incorporated two contactors, 2 contactor shall be used with the follow sequence: Close A – open A – close B – open B- off period		-
	- test voltage $U/U_e = 1,05$ (V)		—
	- test current $I/I_e = \underline{\hspace{1cm}}$ (A)		—
	- power factor/time constant		—
	- on-time (ms)		—
	- off-time (s)		—
	Characteristic of transient recovery voltage for AC-3 and AC-4 only:		P
	oscillatory frequency (kHz)		—
	Measured oscillatory frequency (kHz)		P
	Factory		P
	Behaviour and condition during and after the test:		P
	- no permanent arcing		P
	- no flash-over between poles		P
	- no blowing of the fusible element in the earth circuit		P
	- no welding of the contacts		P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		P
9.3.3.6	Operational performance capability:		P
	Type of product.....:		P
	utilization category		—
	rated operational voltage U_e (V)		—
	rated operational current I_e (A) or power (kW)		—
	Conditions, make/break operations:		P
	- test voltage $U/U_e = 1,05$ (V)		—

	- test current $I/I_e = (A)$		—
	- power factor/time constant		—
	- on-time (ms)		—
	- off-time (s)		—
	- number of make/break operations		P
	Characteristic of transient recovery voltage for AC- 3 and AC- 4 only:		P
	oscillatory frequency (kHz)		—
	Measured oscillatory frequency (kHz)		P
	Factor y		P
	Behaviour and condition during and after the test:		P
	- no permanent arcing		P
	- no flash-over between poles		P
	- no blowing of the fusible element in the earth circuit		P
	- no welding of the contacts		P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		P
8.3.3.4	Dielectric verification		P
	test voltage ($2 U_i$) for 1 min. (V)		P
	No flashover or breakdown		P
8.3.3.5	Leakage current equipment suitable for isolation		P
	test voltage ($1,1 U_e$) (V)		P
	Leakage current: $\leq 2 \text{ mA /pole}$		P
8.3.4	TEST SEQUENCE III		P
			P
	- Performance under short-circuit conditions (Clause 9.3.4)		P
			P
9.3.4	Performance under short-circuit conditions		P
	Contactors or starter and the associated SCPD, or combination or protected starter are subjected to tests 9.3.4.2.1 and 9.3.4.2.2.		P
	Maximum I_e and of maximum for AC-3 are covered		P
	Rated control supply voltage.....		P
9.3.4.2.1	Test at de prospective current "r":		P

Type of product.....:		P
Test circuit, figure 9, 19, 11, 12.....:		P
type of SCPD		—
ratings of SCPD, co-ordination type 1		—
ratings of SCPD, co-ordination type 2		—
rated operational current I_e (A) AC-3		—
prospective current "r" (kA) (table 12).....:		—
test voltage (V)		—
r.m.s. test current (A)		—
peak current (A)		—
power factor		P
1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2dt (kA ² s)		—
2. one breaking operation of SCPD by closing the contactor or starter on to the short-circuit		—
Behaviour of the equipment during the test		P
Both types of co-ordination (all devices):		P
A - the fault current has been successfully interrupted by the SCPD or the combination starter and the fuse or fusible element, or solid connection between the enclosure and supply shall not have melted		P
B - the door or cover of the enclosure has not been blown open and it is possible to open the door or cover		P
C - there is no damage to the conductors or terminals and the conductors have not been separated from the terminals		P
D - there is no cracking or breaking of an insulating base to the extent that the integrity of mounting of a live part is impaired		P
Both types of co-ordination (combination starters and protected starters only):		P
E - the circuit breaker or the switch is capable of being opened manually by its operating means		P

	F - neither end of the SCPD is completely separated from its mounting means to an exposed conductive part		P
	G - if a circuit breaker with rated ultimate short-circuit breaking capacity less than the rated conditional short-circuit current assigned to the combination or protected starter is employed, the circuit breaker shall be tested to trip:		P
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		P
	2) circuit breaker with overload relays or releases, at 250% of the rated current of the circuit breaker		P
	Type 1 co-ordination (all devices):		P
	H - there has been no discharge of parts beyond the enclosure. The starter may be inoperative after each operation		P
	Type 1 co-ordination (combination and protected starters only):		P
	I - dielectric verification test voltage (2 Ue) for 1 min (V) but not less than 1000V		—
	Type 2 co-ordination (all devices):		P
	J - no damage to the overload relay or other parts has occurred, except that welding of contactor or starter contacts is permitted, if they are easily separated without significant deformation		P
	K - the tripping of the overload relay shall be conform to the published tripping characteristics, before and after the test		P
	L - dielectric verification test voltage (2 Ue) for 5 sec but not less than 1000V		P
	Leakage current equipment suitable for isolation		P
	test voltage (1,1 Ue) (V)		P
	Leakage current: ≤ 2 mA /pole		P
8.3.4.2.2	Test at the rated conditional short-circuit current "Iq"		P
	Type of product.....		P
	Test circuit, figure 9, 19, 11, 12.....		P
	type of SCPD		—

	ratings of SCPD, co-ordination type 1		—
	ratings of SCPD, co-ordination type 2		—
	rated operational current I_e (A) AC-3		—
	prospective current "I _q " (kA)		—
	test voltage (V)		—
	r.m.s. test current (A)		—
	peak current (A)		—
	power factor		P
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2dt (A ² s)		—
	2. one breaking operation of SCPD by closing the contactor or starter on to the short-circuit		—
	3. one breaking operation of SCPD by closing the switching device on to the short-circuit		—
	Behaviour of the equipment during the test		P
	Both types of co-ordination (all devices):		P
	A - the fault current has been successfully interrupted by the SCPD or the combination starter and the fuse or fusible element, or solid connection between the enclosure and supply shall not have melted		P
	B - the door or cover of the enclosure has not been blown open and it is possible to open the door or cover		P
	C - there is no damage to the conductors or terminals and the conductors have not been separated from the terminals		P
	D - there is no cracking or breaking of an insulating base to the extent that the integrity of mounting of a live part is impaired		P
	Both types of co-ordination (combination starters and protected starters only):		P
	E - the circuit breaker or the switch is capable of being opened manually by its operating means		P

	F - neither end of the SCPD is completely separated from its mounting means to an exposed conductive part		P
	G - if a circuit breaker with rated ultimate short-circuit breaking capacity less than the rated conditional short-circuit current assigned to the combination or protected starter is employed, the circuit breaker shall be tested to trip:		P
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		P
	2) circuit breaker with overload relays or releases, at 250% of the rated current of the circuit breaker		P
	Type 1 co-ordination (all devices):		P
	H - there has been no discharge of parts beyond the enclosure. The starter may be inoperative after each operation		P
	Type 1 co-ordination (combination and protected starters only):		P
	I - dielectric verification test voltage (2 Ue) for 1 min (V) but not less than 1000V		—
	Type 2 co-ordination (all devices):		P
	J - no damage to the overload relay or other parts has occurred, except that welding of contactor or starter contacts is permitted, if they are easily separated without significant deformation		P
	K - the tripping of the overload relay shall be conform to the published tripping characteristics, before and after the test		P
	L - dielectric verification test voltage (2 Ue) for 5 s but not less than 1000V		P
	Leakage current equipment suitable for isolation		-
	test voltage (1,1 Ue) (V)		-
	Leakage current: ≤ 2 mA /pole		P
	TEST SEQUENCE IV		-

	- Verification of ability to withstand overload currents: Clause 9.3.5 (applicable for contactors only)	P
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8.3.5	Verification of ability to withstand overload currents	P
	Overload current withstand capability of contactors AC-3 and AC-4:	P
	ambient temperature (°C) :	—
	rated operational current Ie (A) max. AC-3 :	—
	test current (Ie) (A) :	—
	duration of test: 10 s :	—
	After the test, the contactor shall be substantially in the same condition as before the test (visual inspection)	P

	TEST SEQUENCE V	-
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	- Verification of mechanical properties of terminals: Clause 8.2.4 - Verification of degrees of protection of enclosed contactors and starters (see annex C of part 1	P
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8.2.4	Verification of mechanical properties of terminals	P
	See construction	P
Annex C	Verification of degrees of protection of enclosed contactors and starters	P
	See construction	P

	TEST SEQUENCE Annex B	-
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	- Mechanical durability B2 Single 8 test Double 3 test - Electrical durability B3	P
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Annex B2	Mechanical durability	-
	Single 8 test	P
	Double 3 test	P
Annex B3	Electrical durability	-
		P

	TEST SEQUENCE Annex F	-
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	Requirements for auxiliary contact linked with power contact (mirror contact)	-
		-

	TEST SEQUENCE EMC tests	N
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	Immunity	N
	Emission	N

- End of Test Report -

Type of equipment, model: **MAGNETIC STARTER,
LE1-12**

Details of:

View:

general

front

rear

right

left

top

bottom



Details of:

View:

general

front

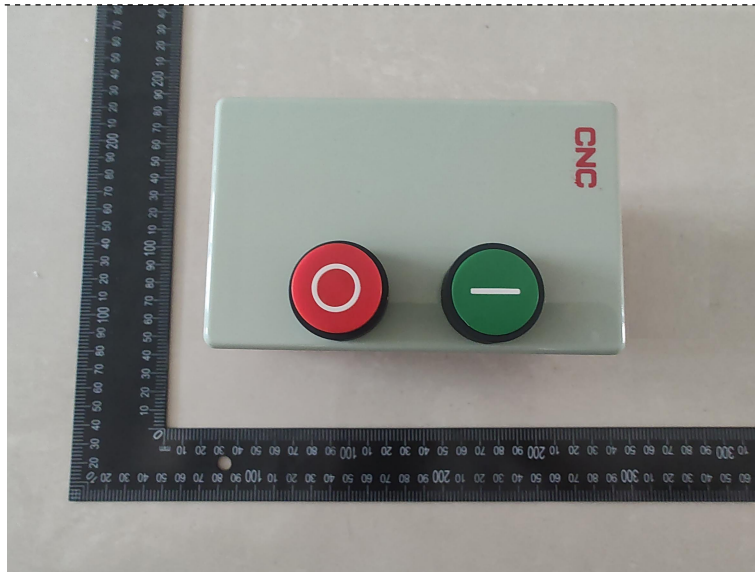
rear

right

left

top

bottom



Details of:

View:

general

front

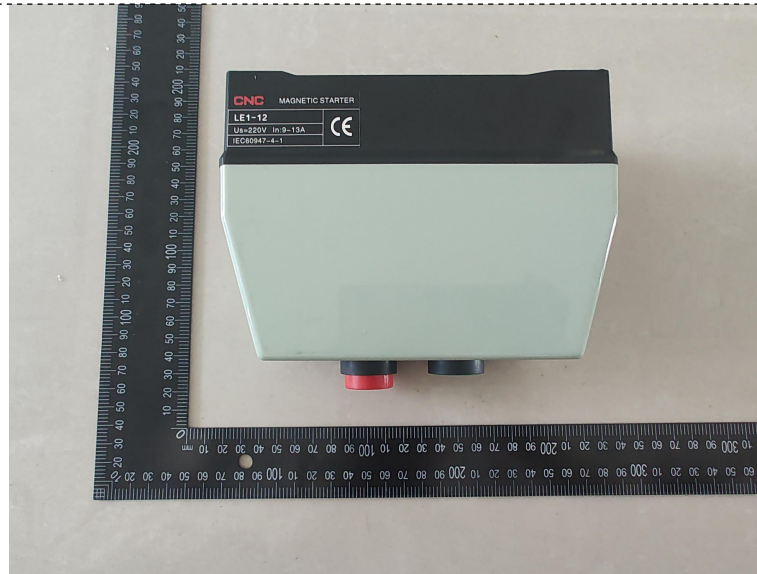
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top

bottom



- End of Annex I -