



उत्पाद मैनुअल
निम्न - वोल्टेज स्विचगियर और नियंत्रण
भाग 2 परिपथ - वियोजक
आई एस/आई इ सी 60947 (भाग 2) : 2016 के अनुसार

PRODUCT MANUAL
Low-Voltage Switchgear and Controlgear
Part 2 Circuit Breakers
According to IS/IEC 60947 (Part 2): 2016

विभिन्न उत्पादों के लिए भारतीय मानक ब्यूरो) अनुरूपता मूल्यांकन (विनियम, 2018 की योजना -I के तहत प्रमाणन के संचालन में एकरूपता और पारदर्शिता के लिए इस उत्पाद मैनुअल का उपयोग सभी क्षेत्रीय / शाखा कार्यालयों और लाइसेंसधारियों द्वारा संदर्भ सामग्री के रूप में किया जाएगा। दस्तावेज का उपयोग बीआईएस प्रमाणन प्राप्त करने के इच्छुक संभावित आवेदकों द्वारा भी किया जा सकता है।

This Product Manual shall be used as reference material by all Regional/Branch Offices & licensees to ensure uniformity of practice and transparency in operation of certification under Scheme-I of Bureau of Indian Standards (Conformity Assessment) Regulations, 2018 for various products. The document may also be used by prospective applicants desirous of obtaining BIS certification.

1.	मानक संख्या IS No.	:	IS/IEC 60947 (Part 2): 2016
	शीर्षक Title	:	Low-Voltage Switchgear and Controlgear Part 2 Circuit Breakers
	संशोधनों की संख्या No. of amendments	:	1
2.	मानकीकरण / मनकीकरण में बदलाव के लिये अतिरिक्त दिशा निर्देश Additional Guidelines for GoL / CSoL	:	Please refer <u>Annex - A</u>
3.	समूहीकरण दिशानिर्देश Grouping Guidelines	:	Please refer <u>Annex – B</u>

4.	तकनीकी फाइल के अंतर्वस्तु Technical File Contents	:	Please refer <u>Annex – C</u>
5.	लेबलिंग और चिह्नांकन आवश्यकताएँ Labelling and Marking Requirements	:	Please refer <u>Annex – D</u>
6.	लाइसेंस का दायरा Scope of the Licence		As per below table
Licence is granted to use Standard Mark as per IS/IEC 60947 (Part 2): 2016 with the following scope:”			
Name of the product:		Low-Voltage Switchgear and Controlgear Part 2 Circuit Breakers	
Model(s)			
No. of Poles (Cl. 4.2)		One Pole Two Pole Three Pole Four Pole	
Type of Supply (Cl. 4.2)		Single Phase ac Three phase ac Direct Current	
Rated Voltages (V): (Cl. 4.3.2)		Rated operational voltage (U_e) Rated insulation voltage (U_i) Rated impulse withstand voltage (U_{imp})	
Rated Currents (A): (Cl. 4.3.3)		Rated current (I_n) Conventional free air thermal current (I_{th}) Conventional enclosed thermal current (I_{the})	
Rated Frequency (Hz): (Cl. 4.3.4)			
Rated Duty: (Cl. 4.3.5)		Eight hour duty / Uninterrupted duty	
Short-circuit characteristics (Cl. 4.3.6)		Rated short-circuit making capacity (I_{cm}) Rated ultimate short-circuit breaking capacity (I_{cu}) Rated service short-circuit breaking capacity (I_{cs}) Rated short-time withstand current (I_{cw})	
Selectivity category: (Cl. 4.4)		Selectivity Category A Selectivity Category B	
Interrupting Medium (Cl. 3.2)		Air-break Vacuum break Gas-break	

	Any other variety (as per declaration of firm)
Method of installation (Cl. 3.7)	Fixed Plug-in Withdrawable Any other variety (as per declaration of firm)
Method of controlling the operating mechanism (Operation) (Cl. 3.4)	Dependent manual Independent manual Dependent power Independent Power Stored Energy
Design / Construction Type (Cl. 3.3)	Open construction Moulded case Any other variety (as per declaration of firm)
Suitability for isolation (Cl. 3.5)	Suitable for isolation Not suitable for isolation
Provision for maintenance (Cl. 3.6)	Maintainable Non-maintainable
Type of Releases (Cl. 4.7)	shunt releas over-current release instantaneous definite time delay inverse time delay - independent of previous load - dependent on previous load undervoltage release (for opening) closing releases other releases
Pollution Degree (Cl. 6)	Pollution Degree 1 Pollution Degree 2 Pollution Degree 3 Pollution Degree 4
Control Circuit, if applicable: (Cl. 4.5)	- Electrically or electronically controlled circuits - Air-supply control circuits (pneumatic or electro-pneumatic)
Auxiliary Circuit, if applicable: (Cl. 4.6)	
Integral fuses (Cl. 4.8)	With / without integrally fused circuit-breakers
Degree of Protection (Cl. 3.8)	(To be declared by the firm)
Electromagnetic Compatibility (EMC) (Cl. 7.3)	Tested for Environment A / Tested for Environment B / Not tested

Additional Features *	
Co-ordination between a circuit-breaker and another short-circuit protective device associated in the same circuit (Annex – A)	
Circuit-breakers incorporating residual current protection (Annex – B)	
Intended for connection of Aluminium Conductors (Annex – D)	Suitable and tested for Connection of Aluminium conductors / Not tested for Connection of Aluminium conductors
Circuit-breakers with electronic over-current protection (Annex – F)	
Modular residual current devices (without integral current breaking device) (Annex – M)	
Instantaneous trip circuit-breakers (ICB) (Annex – O)	
Use in Photovoltaic (PV) DC applications (Annex – P)	Suitable and tested for Use in (PV) DC applications / Not tested for Use in (PV) DC applications
Circuit-breakers incorporating residual current protection with automatic re-closing functions (Annex – R)	

* - The additional features shall be mentioned in the scope of licence document as per the declaration submitted by the manufacturer.

ANNEX - A
Additional Guidelines for GoL / CSoL

1. To ensure uniform operation of certification process, the following guidelines in addition to CMD Guidelines on GoL / CSoL as per the conformity assessment Scheme – X of Schedule – II of the BIS (Conformity Assessment) Regulations, 2018 placed below shall be followed:

For GoL:

- i. The scope of the licence shall be restricted to the applicable test (with / without EMC test as per Annex J (or) Special test as per Cl. 8.5, etc) that were carried out on the representative samples of the CBs as per the grouping guidelines as per Annex - B. However, it shall be ensured that all the requirements of the standard and all applicable tests as declared by the manufacturer have been reported in the test report.

For eg(s):

- (i) In case the CBs are not tested for the requirements of Annex – J i.e. Electromagnetic compatibility (EMC), the scope granted to the manufacturer shall clearly mention – ‘Not tested for EMC requirement’.
 - (ii) In case if special tests are carried out based on the declaration of the manufacturer, the same has to be incorporated in the applicable models.
- ii. The licence document shall contain the following technical data for each of the model as enclosed at Annex – A.1.

For CSoL:

- i. The manufacturer shall submit the technical file for the model(s) for which the manufacturer intends to get the CSoL as specified in Annex C, covering all aspects, including compliance report of product having complete test report issued by third party laboratory(ies). The manufacturer shall also submit a declaration whether the product category applied for inclusion falls under the same group for which the manufacturer is already having licence or the product category is a new group as per the grouping guidelines (Annex – B). The technical file and documents submitted by the manufacturer shall be reviewed by the BOs and the following process has to be followed:

- a) If the model / variety applied for CSoL falls under the existing group and does not require any additional manufacturing and testing infrastructure, CSoL may be done based on desk audit for which the manufacturer has applied for CSoL.
 - b) If the model / variety applied for CSoL falls under different group, visit shall be carried out to verify the manufacturing process and necessary processes required for manufacturing such products. After satisfactory verification, CSoL may be processed.

For eg:

- (i) In case the manufacturer is having a licence for CBs (Moulded case and current upto 630A) and applies for inclusion of Air CBs (withdrawable / non-withdrawable Moulded case and current above 630A), an inspection visit shall be carried out at the manufacturer premise to verify the manufacturing process and necessary processes required for manufacturing such products.

Annex – A.1
Scope of Licence document

Name of the product:	Low-Voltage Switchgear and Controlgear Part 2 Circuit Breakers	
Model(s)	XXXXXXXX -(Lead / Test model) XXXX XXXX XXXX XXXX XXXX XXXX	
No. of Poles		
Type of Supply		
Rated Voltages (V)	Rated operational voltage (Ue)	
	Rated insulation voltage (Ui)	
	Rated impulse withstand voltage (Uimp)	
Rated Currents (A)	Rated current (In)	
	Conventional free air thermal current (Ith)	
	Conventional enclosed thermal current (Ithe)	
Rated Frequency (Hz): (Cl. 4.3.4)		
Rated Duty: (Cl. 4.3.5)		
Short-circuit characteristics (Cl. 4.3.6)	Rated short-circuit making capacity (Icm)	
	Rated ultimate short-circuit breaking capacity (Icu)	
	Rated service short-circuit breaking capacity (Ics)	
	Rated short-time withstand current (Icw)	
Selectivity category: (Cl. 4.4)		
Interrupting Medium (Cl. 3.2)		
Method of installation (Cl. 3.7)		
Method of controlling the operating mechanism (Operation) (Cl. 3.4)		
Design / Construction Type (Cl. 3.3)		
Suitability for isolation (Cl. 3.5)		
Provision for maintenance (Cl. 3.6)		
Type of Releases (Cl. 4.7)		

Pollution Degree (Cl. 6)	
Control Circuit, if applicable: (Cl. 4.5)	
Auxiliary Circuit, if applicable: (Cl. 4.6)	
Integral fuses (Cl. 4.8)	
Degree of Protection (Cl. 3.8)	
Electromagnetic Compatibility (EMC) (Cl. 7.3)	
Additional Features *	
(Only applicable features which are tested is to be included)	
Co-ordination between a circuit-breaker and another short-circuit protective device associated in the same circuit (Annex – A)	
Circuit-breakers incorporating residual current protection (Annex – B)	
Intended for connection of Aluminium Conductors (Annex – D)	
Circuit-breakers with electronic over-current protection (Annex – F)	
Modular residual current devices (without integral current breaking device) (Annex – M)	
Instantaneous trip circuit-breakers (ICB) (Annex – O)	
Use in Photovoltaic (PV) DC applications (Annex – P)	
Circuit-breakers incorporating residual current protection with automatic re-closing functions (Annex – R)	
Co-ordination between a circuit-breaker and another short-circuit protective device associated in the same circuit (Annex – A)	

ANNEX – B **Grouping Guidelines**

- a) For considering Grant of licence / Change in scope of licence the manufacturer shall submit the technical file including the test reports(s) / certificates(s) etc. for each of the variety of particular type designation(s) or model(s) as specified in the Scope of Licence (as given in Sl. 6 above) based on product grouping as per Gazette Notification F. No. 8(1)/2018-HEI-Part (1) dated 09th May 2023 given below:

1. Product Series of circuit-breaker(s)

1.1 A group of circuit breakers having a common frame size¹ used for a range of current ratings with a unique combination of feature(s) under classification mention in Table at Annexure-I subjected to allowable construction break².

1.2 For each product series type test report, a circuit breaker with maximum current rating and maximum features satisfying all operational performance criteria shall be tested. The test and number of sample(s) must be in accordance with the clause 8.3, Table 9, 9a and Table 10 of IS/IEC 60947-2: 2016.

1.3 Type tests are grouped together in a number of sequences, the test shall be done as per sequence and applicability defined in clause 8.3 and Table 9 of IS/IEC 60947-2:2016.

Note- 1) For each sequence, tests shall be made in the order listed unless otherwise specified in the IS/IEC 60947-2:2016.

2) Spares, accessories and sub-assemblies are integral part of product series. They shall be tested as far as possible with the equipment. (Spares and sub-assemblies being the integral part of the device, separate testing is not envisaged; Accessories may please be used while testing. Any one of the representative test voltages can be used for accessory).

¹ **Frame size (as per clause 2.1.1 of IS/IEC 60947-2:2016)** - a term designating a group of circuit-breakers, the external physical dimensions of which are common to a range of current ratings.

Note 1 to entry: Frame size is expressed in amperes corresponding to the highest current rating of the group.

Note 2 to entry: Within a frame size, the width OR height may vary according to the number of poles OR types of termination e.g. spreader links, prepared conductors, unprepared conductors, phase separators.

Note 3 to entry: This definition does not imply dimensional standardization.

² **Construction Break (as per clause 2.2.1 of IS/IEC 60947-2:2016)**- a significant difference in construction between circuit-breakers of a given frame size, requiring additional type testing.

2. List of allowable construction breaks (as per clause 7.1.6 of IS/IEC 60947-2:2016)

2.1 Circuit-breakers of a given frame size are considered to have a construction break, if any one of the following features are not the same:

- i. material, finish and dimensions of internal current-carrying parts, admitting, however, the variations listed in a), b), c), f) and g) below;
- ii. size, material, configuration and method of attachment of the main contacts;
- iii. any integral manual operating mechanism, its materials and physical characteristics;
- iv. moulding and insulating materials;
- v. the principle of operation, materials and construction of the arc extinction device;
- vi. the principle of operation, materials and construction of the arc extinction device;
- vii. the basic design of the over-current tripping devices, admitting, however, the variations detailed in a), b) and c) below

Variations in the following do not constitute a construction break:

- 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) addition / deletion / types of communication ports OR visual display OR visual indications OR setting means (touch Vs dip switch Vs membrane soft key pad) in electronic trip units, which has no impact on the required performance, in particular the tripping function;
- j) electronic trip unit hardware, due to omitted components on identical printed circuit board layout (e.g. rotary knobs, display, etc.).

Annexure-I**Table A. Classification of Circuit Breaker (physical and operational parameter)**

Sl. No.	Classification based on	Types of Circuit Breaker
1.	Classification as per Clause 3	
2.	Selectivity	a) Category type, A; b) Category type, B
3.	Interrupting Medium	a) Air-break; b) Vacuum break; c) Gas-break
4.	Method of installation	a) Fixed; b) Plug-in; c) Withdrawable.
5.	By controlling the operating mechanism (Operation)	a) Dependent manual; b) Independent manual; c) Dependent power; d) Independent Power; e) Stored Energy
6.	Design / Construction Type	a) Open construction; b) Moulded case
7.	Suitability for isolation	a) Suitable; b) Not suitable
8.	Provision for maintenance	a) Maintainable; b) Non-maintainable
	Operational Characteristic	
9.	Type of Supply	a) 1 Phase AC; b) 3 phase AC; c) Direct Current
10.	Number of Pole	a) One Pole; b) Two Pole; c) Three Pole; d) Four Pole
	Additional Features	
11.	Release type	a) Thermal, b) Electromagnetic, c) Electronic, etc.
12.	Degree of protection	With maximum Ingress Protection code/rating ³

For Example

Product Series 1- Air-break Type- Fixed installation -Dependent manual operation - Open construction- Selectivity Type A, suitable for isolation; maintainable, IP68D - having a common frame size for a range of current ratings subjected to allowable construction break.

³ Degree of protection provided by the enclosure as per 7.1.12 and Annex C of IEC 60947-1:2007

Product Series 2- Air-break Type- Fixed installation -Dependent manual operation - Open construction- Selectivity Type A, not suitable for isolation; maintainable, IP68D having a common frame size for a range of current ratings with to allowable construction break.

Annex – A.1**Table. Circuit breaker can be added under the scope of license without additional type testing. (vice versa condition is not applicable)**

Case	Circuit Breaker Type	Condition
A	circuit breaker not-suitable for isolation	if product series is tested for circuit breaker suitable for isolation.
B	circuit breaker with trip releases having different features/settings	if product series is tested, with trip releases with maximum or higher settings, then all other variants will be covered
C	Fixed, plug in, withdrawable circuit breaker	If product series is tested, with highest complexity will cover the lower complexity breaker, i.e.- a) if withdrawable breaker is tested it will cover plug in and fixed variants. b) if plug in breaker is tested it will cover fixed variants
D	One, two, three and four poles	If the higher Pole Combination device is tested, then lower Pole Combination will be covered subject to identical pole designs. e.g. 4 Pole or 3P+N testing covered 3 Pole Circuit breaker test, 2 Pole testing covered 1 Pole test.
E	Circuit breaker with different types of releases (Shunt, UV, Closing etc.)	If a product series is tested with a representative release(s), it will cover the other variants. However, declaration to be provided for all such releases by Manufacturer.
F	Circuit breaker with Multiple Ue rated voltage ratings	If product is tested for highest Ue all range of operational voltages are covered
G	Multiple Short Circuit Breaking capacity (at same Ue)	Highest Breaking capacity if tested, lower breaking capacity are covered

ANNEX – C
Technical File

1. TECHNICAL FILE - Manufacturer shall maintain a Technical File for each model(s) manufactured by them as per BIS circular Ref: CMD-I/2:17:1 dated 02 June 2023 with subject ‘Guidelines for Grant of Licence (GoL) as per the conformity assessment Scheme – X of Schedule – II of BIS (Conformity Assessment) Regulations, 2018’.
2. In addition to the documents indicated in above circular, following documents are also to be submitted in the Technical File:
 - a) Declaration for variety(ies) applied for BIS licence. The declaration shall be in line with scope of licence specified in this Product Manual;
 - b) Technical data for each model(s) as per format specified in Annex C.1 (for guidance only);
 - c) Test Report / Certificate for Constructional and Performance requirements (Cl. 7 of IS 60947 (Part 2): 2016) for each model, wherever applicable.
 - d) Declaration with respect to special test and its compliance (Cl. 8.5 of the IS 60947 (Part 2): 2016) for each model, wherever applicable.
3. The technical File shall be maintained by the manufacturer till the End of Life of the model / variety(ies).

ANNEX C.1
Format for Technical Data

Name of the product:

Equipment Type:

Model No(s).:

Technical Description of the product:

Test item particulars:	
Rated Voltages	
- rated operational Voltage: U_e (V) :	
- rated insulation voltage: U_i (V) :	
- rated impulse withstand voltage: U_{imp} (kV) :	
- rated control circuit voltage, kind of current and frequency:	
- rated control circuit voltage, kind of current and frequency:	
- control circuit supply voltage, kind of current and frequency, if different from those of the control coil;	
Rated Currents	
- rated operational current: I_e (A) :	
- Rated uninterrupted current: I_u (A):	
- conventional free air thermal current: I_{th} (A) :	
- conventional enclosed thermal current: I_{the} (A) :	
- Rated short time withstand current (I_{cw}), along with duration, if any:	
-Rated short circuit making capacity (I_{cm}):	
-Rated short-circuit breaking capacity (I_{cn}):	
-Rated conditional short-circuit current (I_q (or) I_{cc}):	
-Type of Supply (1 Phase/ 2 Phase/ DC)	
-Rated Frequency (Hz):	
-Short-circuit protection device:	
-rated duty, with the indication of the class of intermittent duty, if any:	
Utilization Category:	
-Category A:	
-Category B:	
-Method of operation of manually operated equipment:	
-Method of locking:	
-Suitability for Isolation:	
-Degree of protection:	
-Pollution degree/ Material Group:	
-Number of Poles:	
-Number of positions of mains contact:	
-No. of break per pole:	
-Material of terminal:	
-Breaking arrangement for fused devices:	
-Control circuit	
-Auxiliary circuit	
-Co-ordination with short-circuit protective devices (SCPD):	
-Kind of protective device:	

Relays and releases	
-type of relay or release:	
-current setting or current setting range:	
-time/current characteristics:	
-influence of ambient air temperature:	
-extended functions as given in Annex T:	
-rated supply pressure of the air-pressure and limits of pressure variations (for air-pressure controlled equipment):	
-pole impedance of the switching device (Z):	
-material declaration as per Annex W:	
-length of insulation to be removed before insertion of the conductor into the terminal:	
For non-universal screwless terminals (if applicable)	
-“s” or "sol" for terminals declared for solid conductors:	
- "r" for terminals declared for solid and stranded conductors:	
- "f" for terminals declared for flexible conductors:	
In the case of equipment co-ordinated with short-circuit protective devices (SCPDs)	
-rated conditional short-circuit current	
-other types of co-ordination, specified solely in the relevant product standard	

ANNEX – D
Labelling and Marking Requirements

1. **Labelling and Marking Requirements-** Labelling and Marking of Circuit Breakers shall be as per Table 13 and Cl. 5.2 of IS/IEC 60947 (Part 2): 2016.
 - a) Each Circuit Breakers and its packaging shall be marked with the Standard Mark, as specified in Scheme –X in Schedule –II of the BIS (Conformity Assessment) Regulations, 2018. The Standard Mark shall carry the licence number in a visible manner as specified in the licence document.
 - b) In addition, details of BIS website shall be marked on the package as follows:
'For details of BIS certification please visit www.bis.gov.in.'
2. In case the CBs are not tested for the requirements of Annex – J i.e. Electromagnetic compatibility (EMC), the product / its packaging shall either be marked with the following on the CBs– 'Not tested for EMC requirement'.
3. In case CBs are tested and marked with multiple rated voltages and multiple I_{cs} and I_{cu} , the CBs shall be clearly marked with the voltage level at which the product has been tested:

