

# BS EN 60947-2 third edition 2003

## The background to BS EN 60947-2 third edition 2003 - Low-voltage switchgear and controlgear – Part 2 Circuit Breakers:

In 2003, the third edition of BS EN 60947 Part 2 came into force. This governs the Circuit Breaker elements of low voltage switchgear and control gear and the latest change involved the addition of two new annexes, M & N, to the existing standard.

For many of us it is difficult to understand the exact change process or to have a clear picture of which amendments have been made. Paul Galbraith, Schneider Electric's UK Manager for Standards and Certification and a member of numerous technical committees in UK and Europe, demystifies the process. He also explains the origins of this standard and the main differences between IEC 157-1 (the precursor of BS EN 60947-2) and IEC 947-2. The lists of affected LV switchgear and controlgear are provided and the relevant annexes are listed and defined.

### Introduction:

In the standardisation process there are basically three tiers;

International: International Electrotechnical Commission (IEC)

Regional; European Committee for Electrotechnical Standardization (CENELEC)

National: British Electrotechnical Commission (BEC) which is better known in the UK as British Standards Institution (BSI)

BSI is the independent national body responsible for preparing British Standards.

Basically, if an IEC standard is adopted with or without modification by CENELEC then the document would become a European Norm (EN). CENELEC would then distribute that EN to all member states of the European Union who would then have to adopt the EN and then have to withdraw any conflicting national standards by a time given by CENELEC. The UK National Committee BSI would then prefix the standard with BS and issue it.

One such standard is BS EN 60947-2 *Low-voltage switchgear and controlgear Part 2 Circuit-breakers*

BS EN 60947-2 started life as IEC Publication 157-1 LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR Part :1 Circuit-breakers

### CONTENTS

1. General
2. Definitions
3. Classifications
4. Characteristics of circuit-breakers
5. Marking
6. Standard conditions for operation in service
7. Standard conditions for construction
8. Tests
9. Additional requirements for integrally-fused circuit-breaker

Appendix A -- Determination of short circuit

Appendix B -- Information to be given by the user when conditions for operation in service differ from the standard

Appendix C -- Clearances and creepage distances for circuit-breakers.

Appendix D -- Co-ordination of circuit-breakers with separate fuses.

During the 1980's the concept of the IEC 947 series of standards evolved. This for the first time brought all products relating to low-voltage switchgear and controlgear under one generic standard.

IEC 947	Specification for low-voltage switchgear and controlgear.
IEC 947-1	General rules
IEC 947-2	Circuit-breakers
IEC 947-3	Switches, disconnectors, switch disconnectors and fused combination units
IEC 947-4	Contactors and motor starters
IEC 947-5-1	Control circuit devices - electromechanical
IEC 947-5-2	Proximity switches
IEC 947-6	Multiple function switching devices
IEC 947-7	Ancillary equipment

In 1989 IEC 157 was superseded by IEC 947-2. This was adopted as the European Norm EN 60947-2 in March 1991 and was published in the UK as British Standard BS EN 60947-2 in May 1992 with the withdrawal of the dual standard IEC 157/BS 4752 in September 1992. Since then IEC 947-2 has been re-issued in 1995 and further amended in 1997 and 2001.

BS EN 60947-2 LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR Part :1 Circuit-breakers

## CONTENTS

1. General
2. Definitions
3. Classifications
4. Characteristics of circuit-breakers
5. Product information
6. Normal service, mounting and transport conditions
7. Constructional and performance requirements
8. Tests

Annex A -- (normative) Co-ordination under short-circuit conditions between a circuit-breakers and another short-circuit protective device associated in the same circuit.

Annex B -- (normative) Circuit-breakers incorporating residual current protection

Annex C -- (normative) Individual pole short-circuit test sequence.

Annex D -- Vacant.

Annex E -- (informative) Items subject to agreement between the manufacturer and the user.

Annex F -- (normative) Additional tests for circuit-breakers with electronic over-current protection.

Annex G -- (normative) Power loss

Annex H -- (normative) Test sequence for circuit-breakers for IT systems.

Annex J -- (normative) Electromagnetic compatibility (EMC) - Requirements and test methods for circuit-breakers.

Annex K -- (informative) Glossary of symbols related to products covered by this standard.

Annex L -- (normative) Circuit-breakers not fulfilling the requirements for over-current protection.

The main differences between IEC 157-1 and IEC 947-2

IEC 157-1	IEC947-2	Comments
Breaking capacity P1 cycle	Ultimate breaking capacity $I_{cu}$	Equivalent characteristic
Breaking capacity P2 cycle	Service breaking capacity $I_{cs}$	The new $I_{cs}$ characteristic is compulsory and more rigorous than the P2 cycle of IEC 157-1, as its tests are followed (after breaking) by an operating check at $I_n$ .
Each test is performed on a new device (operation, endurance, overloads and breaking capacity)	Tests are conducted in sequence.	More severe because of the cumulative testing on one device, but closer to real conditions.
Verify (three poles loaded) at the two asymptotes: $I_{nd} = 1.05 I_r$ $I_d = 1.35 I_r (\leq 63A)$ Or $I_d = 1.25 I_r (> 63A)$	Verify (three poles loaded) at the two asymptotes: $I_{nd} = 1.05 I_r$ $I_d = 1.30 I_r$	Where: $T = 1h (\leq 63A)$ Or $T = 2h (> 63A)$
No other verification of overcurrent releases	Verification of tripping; Pole by pole (sequence 3,4,5); All poles loaded (sequence 2)	Better guarantee of operation of releases
Nothing	Definition of tests for isolation with the associated symbol	The circuit-breaker disconnect is recognised by installation standards to ensure the isolation function
Nothing	Voltage impulse withstand test. Characteristic $U_{imp}$	Allows insulation co-ordination throughout the installation.
Co-ordination only between fuse and circuit-breaker	Includes a co-ordination appendix	Takes into account two circuit-breakers in series
Nothing	Annex B: devoted to circuit-breakers fitted with residual current protection	Standardization of industrial residual current circuit-breakers
Nothing	Annex F: devoted to circuit-breakers fitted with electronic releases	Defines the additional tests specific to proper operation of electronic releases
Nothing	Annex G: devoted to measurement of power dissipation by circuit-breaker	Standardizes power dissipation measurement
Nothing	Annex H: describes the test sequence for circuit-breakers used on IT earthing systems	Guarantees users that a device can be installed in IT earthing systems without other verifications

Nothing	Annex J: describes the test sequence and requirements of electromagnetic compatibility (EMC) for circuit-breakers	Standardizes EMC requirements for circuit-breakers
Nothing	Annex K: Glossary of symbols	Centralise the symbols used in the standard
Nothing	Annex L: describes circuit-breakers not fulfilling the requirements for overcurrent protection	Standardization of industrial tripable circuit-breakers

IEC have just issued the third edition of IEC 60947-2 which now includes the following:

IEC 157-1	IEC947-2	Comments
Nothing	Annex M: describes modular residual current devices	Standardization of industrial modular residual current devices
Nothing	Annex N: describes the additional EMC requirements and test methods for circuit-breaker auxiliaries	Standardization EMC requirements circuit-breaker auxiliaries

These changes have now passed through the CENELEC process to BSI who have now adopted them without change. IEC rules dictate that when a standard has been amended twice then it has to be re-issued and as the IEC is the third issue BS EN 60947-2 : 2003 is also the third issue of this standard.

*As a responsible international manufacturer, Schneider Electric continues to comply with all relevant legislation and standards assuring its customers of our ongoing commitment at the highest level. Schneider Electric UK have many UK experts working in Standards and Regulations. This expertise is fully available to their customers to assist with designs or to help to better understand specific Regulations and Standards.*