

ISO/TC 22/SC 32

Secretariat: JISC

Voting begins  
on: 2015-10-16

Voting terminates  
on: 2015-12-16

---

---

## Road vehicles — Circuit breakers —

### Part 1: Definitions and general test requirements

*Véhicules routiers — Coupe-circuits —*

*Partie 1: Définitions et exigences d'essais générales*

**ITeH STANDARD PREVIEW**  
(standards.iteh.ai)  
Full standard:  
<https://standards.iteh.ai/catalog/standards/sis/10924-1-2016>  
d915-49af-a2fa-13c85a48157d/iso-10924-1-2016

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.



Reference number  
ISO/FDIS 10924-1:2015(E)

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**  
Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/d1c94302-d915-49af-a2fa-13c85a48157d/iso-10924-1-2016>



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2015, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Ch. de Blandonnet 8 • CP 401  
CH-1214 Vernier, Geneva, Switzerland  
Tel. +41 22 749 01 11  
Fax +41 22 749 09 47  
copyright@iso.org  
www.iso.org

# Contents

	Page
Foreword .....	v
<b>1 Scope .....</b>	<b>1</b>
<b>2 Normative references .....</b>	<b>1</b>
<b>3 Terms and definitions .....</b>	<b>1</b>
<b>4 Marking, labelling and colour coding .....</b>	<b>5</b>
<b>5 Tests and requirements .....</b>	<b>5</b>
5.1 General .....	5
5.1.1 General test conditions .....	5
5.1.2 General performance requirements .....	6
5.2 Voltage drop .....	6
5.2.1 Purpose .....	6
5.2.2 Test .....	6
5.2.3 Requirement .....	6
5.3 Maximum housing temperature .....	6
5.3.1 Purpose .....	6
5.3.2 Test .....	6
5.3.3 Requirement .....	6
5.4 Environmental conditions .....	7
5.4.1 Purpose .....	7
5.4.2 Mechanical loads .....	7
5.4.3 Climatic loads .....	7
5.4.4 Chemical loads .....	7
5.5 Operating time rating .....	7
5.5.1 Purpose .....	7
5.5.2 Test .....	8
5.5.3 Requirement .....	8
5.6 Current steps .....	8
5.6.1 Purpose .....	8
5.6.2 Test .....	8
5.6.3 Requirement .....	8
5.7 No current trip and reset temperature .....	8
5.7.1 Purpose .....	8
5.7.2 Test .....	8
5.7.3 Requirement .....	9
5.8 Absolute breaking capacity .....	9
5.8.1 Purpose .....	9
5.8.2 Test .....	9
5.8.3 Requirement .....	9
5.9 Breaking capacity .....	9
5.9.1 Purpose .....	9
5.9.2 Test .....	10
5.9.3 Requirement .....	10
5.10 Strength of terminals .....	10
5.10.1 Purpose .....	10
5.10.2 Test .....	11
5.10.3 Requirement .....	11
5.11 Endurance .....	11
5.11.1 Purpose .....	11
5.11.2 Test .....	11
5.11.3 Requirement .....	11
5.12 Dielectric strength .....	12
5.12.1 Purpose .....	12
5.12.2 Test .....	12

5.12.3 Requirement.....	12
<b>Annex A</b> (informative) <b>Cycling profiles</b> .....	<b>13</b>
<b>Annex B</b> (informative) <b>Test circuit</b> .....	<b>15</b>

**iTeh STANDARD PREVIEW**  
(standards.iteh.ai)  
Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/d1c94302-d915-49af-a2fa-13c85a48157d/iso-10924-1-2016>

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword, Supplementary information](#).

The committee responsible for this document is ISO/TC 22, *Road vehicles*, Subcommittee SC 32, *Electrical and electronic components and general system aspects*.

This second edition cancels and replaces the first edition (ISO 10924-1:2009), which has been technically revised.

ISO 10924 consists of the following parts, under the general title *Road vehicles — Circuit breakers*:

- *Part 1: Definitions and general test requirements*
- *Part 2: User's guide*
- *Part 3: Miniature circuit breakers with tabs (Blade type), Form CB11*
- *Part 4: Medium circuit breakers with tabs (Blade type), Form CB 15*
- *Part 5: Circuit breakers with rated voltage of 450 V*

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/d1c94302-d915-49af-a2fa-13c85a48157d/iso-10924-1-2016>

# Road vehicles — Circuit breakers —

## Part 1: Definitions and general test requirements

### 1 Scope

This part of ISO 10924 defines terms and specifies general test requirements for circuit breakers for use in road vehicles with a nominal voltage of 12 V d.c., 24 V d.c, 48 V d.c. and 450 V d.c.

This part of ISO 10924 is intended to be used in conjunction with other parts of ISO 10924. The numbering of its clauses corresponds to that of this part of ISO 10924 whose requirements are applicable, except where modified by requirements particular to this part of ISO 10924.

This part of ISO 10924 is not applicable to circuit breaker holders (electrical centres or fuse-holders) used in vehicles.

### 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6722-1, *Road vehicles — 60 V and 600 V single-core cables — Part 1: Dimensions, test methods and requirements for copper conductor cables*

ISO 8820-1, *Road vehicles — Fuse-links — Part 1: Definitions and general test requirements*

ISO 8820-3, *Road vehicles — Fuse-links — Part 3: Fuse-links with tabs (blade type) Type C (medium), Type E (high current) and Type F (miniature)*

ISO 16750-1, *Road vehicles — Environmental conditions and testing for electrical and electronic equipment — Part 1: General*

ISO 16750-3, *Road vehicles — Environmental conditions and testing for electrical and electronic equipment — Part 3: Mechanical loads*

ISO 16750-4, *Road vehicles — Environmental conditions and testing for electrical and electronic equipment — Part 4: Climatic loads*

ISO 16750-5, *Road vehicles — Environmental conditions and testing for electrical and electronic equipment — Part 5: Chemical loads*

IEC 60068-2-70; *Environmental testing — Part 2: Tests — Test Xb: Abrasion of markings and letterings caused by rubbing of fingers and hands*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 16750-1, ISO 8820-1 and the following apply.

**3.1 absolute breaking capacity**  
value of prospective breaking current that a circuit breaker is capable of breaking at least once at  $U_{Smax}$  under prescribed conditions of use and behaviour

**3.2 breaking capacity**  
 $I_B$   
value of prospective breaking current a circuit breaker is capable of breaking several times at  $U_{Smax}$  under prescribed conditions of use and behaviour

**3.3 circuit breaker**  
overcurrent protection device that mechanically interrupts the circuit reversibly, responsive to electric current

Note 1 to entry: The test fixture for the circuit breaker may be identical to the test fixture as described in the appropriate part of ISO 8820; however, some circuit breaker designs do not require a separate test fixture as the cables are directly connected to the circuit breaker terminals.

### 3.4 Circuit breaker components

**3.4.1 housing**  
electrically non-conductive mechanical support for conductive and non-conductive parts of the *circuit breaker* (3.3)

**3.4.2 terminal**  
part of the *circuit breaker* (3.3) which makes the electrical connection in the electrical circuit

**3.4.3 time delayed element**  
active part that acts depending on the current and causes the reversible interruption of the circuit in the case of an overcurrent

### 3.5 Circuit breaker features

**3.5.1 reset mechanism**  
provides a user interface in a manual reset *circuit breaker* (3.3) for resetting the device after an overcurrent condition

**3.5.2 snap-action mechanism**  
ensures that the contact closing speed by mechanical reset is independent of the speed of operation of the *reset mechanism* (3.5.1)

**3.5.3 switching mechanism**  
provides the ability to switch off the *circuit breaker* (3.3) by mechanical means

**3.5.4 trip mechanism**  
comprises a time delayed actuator and mechanical components

**3.5.4.1 cycling trip free**  
circuit breaker mechanism that cycles to open and close the contact(s) repeatedly if the actuator is maintained in the "ON" position in case of overcurrent



**3.5.4.2****fully trip free**

circuit breaker mechanism that will cause the moving contact(s) to open and remain open, even if the actuator is maintained in the "ON" position in case of overcurrent

**3.5.5****trip free mechanism**

prevents the *switching mechanism* (3.5.3) from being defeated by forcibly holding the actuator "ON" position, i.e. cannot be held closed against an overload

**3.6 Circuit breaker types****3.6.1****type I – automatic reset**

provides the reversal of an overcurrent condition after a cool-down period without any manual activity required by a user

**3.6.2****type II – electrically reset**

has a secondary heating circuit which, after an overcurrent condition occurs, creates heat internally upon the *time delayed element* (3.4.3) of the *circuit breaker* (3.3) to keep it from reversing as long as electrical system voltage and a small current flow ( $<1,0$  A) is available, reset function is accomplished by removing all electrical power supplied to the circuit breaker until the internal thermal element cools down and returns to its conductive position

**3.6.3****type III – manual reset**

contains a *reset mechanism* (3.5.1) that the user is required to operate manually for reversal of a circuit interruption

**3.6.4****type IV – switchable**

mechanism capable of being switched off manually for user testing or maintenance

**3.7****dielectric strength**

strength measured between specified measuring points, as shown in the appropriate parts of ISO 10924, at a specified voltage without flash-over

**3.8****nominal voltage**

$U_N$

voltage value used to describe the electrical system of a vehicle

[SOURCE: ISO 16750-1:2006, 3.1]

**3.9****operating time**

time between the application of an over current and the moment when the current drops below a value as specified in the appropriate part of ISO 8820

[SOURCE: ISO 8820-1:2014, 3.7]

**3.10****operating time rating**

*operating time* (3.9), as a function of the current under defined test conditions

[SOURCE: ISO 8820-1:2014, 3.8]

**3.11  
prospective current**

$I_P$   
current, which would flow in a circuit, if the *circuit breaker* (3.3) would be replaced by a conductor with negligible impedance

Note 1 to entry: See [Figure B.1](#).

**3.12  
rated current**

$I_R$   
current used for identifying the *circuit breaker* (3.3), according to specified tests

Note 1 to entry: The continuous current can be lower than the rated current.

**3.13  
rated voltage**

$U_R$   
maximum supply voltage for which the fuse-link is designed

[SOURCE: ISO 8820-1:2014, 3.10]

**3.14  
rerating factor**

correction factor of *rated current* (3.14) that consider fluctuations in ambient temperature

**3.15  
resetting time**

time elapsed between a *circuit breaker* (3.3) tripping due to an over current and subsequently reaching the ability of the circuit breaker to be reset

**3.16  
selectivity**

primary interruption of the *circuit breaker* (3.3) placed closest to faulty section

**3.17  
supply voltage maximum**

$U_{Smax}$   
highest supply voltage in the specified supply voltage range of the DUT performing class A

[SOURCE: ISO 16750-1:2006, 3.4]

**3.18  
time constant**

time required for a physical quantity to rise from 0 to  $1 - 1/e$  (that is 63,2 %) of its final steady value when it varies with time,  $t$ , as  $1 - 1^{-kt}$

Note 1 to entry: The continuous current is lower than the *rated current* (3.14).

[SOURCE: ISO 8820-1:2014, 3.13]

**3.19  
test voltage**

voltage(s) applied to the DUT during a test

[SOURCE: ISO 16750-1:2006, 3.7]