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Road vehicles — Circuit breakers —

Part 5:
Circuit breakers with tabs with rated voltage of 450 V

Véhicules routiers — Coupe-circuits —

Partie 5: Coupe circuit moyen à pattes avec une tension nominale de 9 450 V

Reference number
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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).

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).

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*.

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*

Road vehicles — Circuit breakers —

Part 5:
Circuit breakers with tabs with rated voltage of 450 V

1 Scope

This part of ISO 10924 specifies circuit breakers with rated voltage of 450 V for use in road vehicles. It establishes, for this circuit breaker type, the rated current, test procedures, performance requirements and dimensions.

This part of ISO 10924 is intended to be used in conjunction with ISO 10924-1 and with ISO 10924-2. The numbering of its clauses corresponds to that of ISO 10924-1 whose requirements are applicable, except where modified by requirements particular to this part of ISO 10924.

This part of ISO 10924 is applicable to circuit breakers with a rated voltage of 450 V d.c., a current rating of no greater than 200 A and a breaking capacity of 6 000 A.

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 10924–1, *Road vehicles — Circuit breakers — Part 1: Definitions and general test requirements*

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 8820–7, *Road vehicles — Fuse-links — Part 7: Fuse-links with tabs (Type G) with rated voltage of 450 V*

ISO 8820–8, *Road vehicles — Fuse-links — Part 8: Fuse-links with bolt-in contacts (Type H and J) with rated voltage of 450 V*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 10924-1 apply.

4 Marking, labelling and colour coding

See ISO 10924-1 and Table 1.

Table 1 — Colour code

Rated current, I_R A	Colour code
15	blue
20	yellow
25	white (natural)
30	green
40	orange
50	red
60	blue
70	brown
80	black
100	blue
120	white
150	orange
200	blue
250	pink
300	grey

5 Tests and requirements

5.1 General

5.1.1 General test conditions

In addition to carrying out the test procedures in accordance with ISO 10924-1, the following criteria shall apply.

— Tests shall be performed following the test sequences in Table 2.

— The test fixture for electrical tests shall be designed in accordance with ISO 8820-7 and ISO 8820-8. The connection resistance shall be 1 mΩ max. to ensure the proper function of the test fixture. The ambient temperature range for circuit breakers according to this part of ISO 10924 shall be −40 °C to 85 °C, Code G (according to ISO 16750-4).

5.1.2 Test sequence plan

Table 2 — Test sequence plan

No	Test	Clause	Sample groups[a]							
			1	2	3	4	5	6	7	8
1	Dimensions	Clause 6	X	—	—	—	—	—	—	—
2	Marking, labelling and colour coding	Clause 4	X	—	—	—	—	—	—	—
3	Operating time rating 2,0 I_R	5.5	X	X	X	X	X	X	X	X
4	Current steps	5.6	—	—	—	—	X	—	—	—

— Not required.

[a] Three circuit breakers for each rated current rating per sample group.

[b] 3 + 3 circuit breakers for each rated current rating, three circuit breakers with reversal voltage.

Table 2 *(continued)*

No	Test			Clause	Sample groups[a]							
					1	2	3	4	5	6	7	8
5	Voltage drop			5.2	X	X	X	X	X	X	X	X
6	Maximum housing temperature			5.3	—	—	—	X	—	—	—	—
7	No current trip and reset temperature			5.7	—	—	—	—	X	—	—	—
8	Strength of terminals			5.10	X	X	X	—	—	—	—	—
9	Environmental conditions	Climatic loads		5.4	—	—	—	X	—	—	—	—
10		Chemical loads			—	—	—	—	X	—	—	—
11		Mechanical loads	Vibration		—	—	—	—	—	X	—	—
			Shock		—	—	—	—	—	X	—	—
			Free Fall		—	—	—	—	—	X	—	—
12	Absolute breaking capacity			5.8	X[b]	—	—	—	—	—	—	—
13	Breaking capacity			5.9	—	X[b]	—	—	—	—	—	—
14	Endurance			5.11	—	—	X[b]	—	—	X	—	—
15	Pulse test			5.13	—	—	—	—	—	—	—	X
16	Operating time rating		1,0 I_R	5.5	—	X	X	—	—	—	X	X
			1,35 I_R		—	—	—	X	—	X	X	—
			1,5 I_R		—	—	—	—	—	—	X	—
			2,0 I_R		—	X	X	X	X	X	X	X
			4,0 I_R		—	—	—	—	—	—	X	—
			6,0 I_R		—	X	—	X	—	X	X	—
17	Voltage drop			5.2	—	X	X	X	X	X	X	X
18	Maximum housing temperature			5.3	—	—	—	X	—	—	—	—
19	Dielectric strength			5.12	X	X	X	X	X	X	—	X
20	Strength of terminals			5.10	X	X	X	X	X	X	X	X
20	Marking, labelling and colour coding			Clause 4	X	X	X	X	X	X	X	X

— Not required.

[a] Three circuit breakers for each rated current rating per sample group.

[b] 3 + 3 circuit breakers for each rated current rating, three circuit breakers with reversal voltage.

5.1.3 Test cable sizes

Test cable sizes shall be as given in Table 3. All tests for a particular circuit breaker rating shall be performed using the same cable size.

Test cable sizes are specified to allow comparative circuit breaker tests to be carried out. The cable size specified herein does not necessarily indicate the size of cable to be used in the vehicle application.

Only thick wall cables as specified in ISO 6722-1 shall be used for testing.

Table 3 — Test cable sizes

Rated current, I_R A	Conductor cross-sectional area[a] mm^2	Length mm
15	1,5	500 ± 50
20	2,5	
25	2,5	
30	4	
40	6	
50	10	
60	10	
70	16	
80	16	
100	16	
120	16	
150	25	
200	35	
250	50	
300	70	

[a] Conductor material according ISO 6722-1 for copper cables.

5.2 Voltage drop

5.2.1 Purpose

See ISO 10924-1.

5.2.2 Tests

The circuit breaker voltage drop shall be measured at points A and B across the circuit breaker tabs at 1,0 × I_R as shown in ISO 8820-7 and ISO 8820-8.

5.2.3 Requirements

The requirements given in Table 4 shall apply.

Table 4 — Voltage drop

Rated current, I_R A	Max. voltage drop, U_D V
15	0,200
20	0,200
25	0,175
30	0,175
40	0,150
50	0,150
60	0,125
70	0,125
80	0,100

Table 4 *(continued)*

Rated current, I_R A	**Max. voltage drop**, U_D V
100	0,100
120	0,095
150	0,090
200	0,080
250	0,075
300	0,070

5.3 Maximum housing temperature

The tests and requirements specified in ISO 10924-1 shall apply. The subsequent tests in Table 2 have to be passed.

5.4 Environmental conditions

The tests of ISO 10924-1 shall apply.

5.5 Operating time-rating

5.5.1 Purpose

See ISO 10924-1.

5.5.2 Tests

The test of ISO 10924-1 shall apply.

5.5.3 Requirements

The requirements given in Table 5 shall apply.

Table 5 — Operating times

Test current A	**Operating time** s	
	min	max
I_R	3 600	∞
1,35 I_R	100	1 800
1,50 I_R	50	400
2,00 I_R	10	100
4,00 I_R	0,5	30
6,00 I_R	0,05	1

— Not required.

NOTE The values given here are the total time values, including pre-arcing time and arcing time.

5.6 Current steps

The test and requirements of ISO 10924-1 shall apply.