INTERNATIONAL STANDARD

ISO 10924-4

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Road vehicles — Circuit breakers —

Part 4: Medium circuit breakers with tabs (Blade type), Form CB15

Véhicules routiers — Coupe-circuits —

Partie 4: Coupe-circuits moyens à languettes (de type lame), forme CB15

Reference number
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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Contents

Page

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 10924-4 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electrical and electronic equipment*.

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

— *Part 1: Definitions and general test requirements*

— *Part 4: Medium circuit breakers with tabs (Blade type), Form CB15*

The following part is under preparation:

— *Part 2: User's guide*

The following parts are planned:

— *Part 3: Miniature circuit breakers with tabs (Blade type), Form CB11*

— *Part 5: High current circuit breakers with tabs (Blade type), Form CB29*

— *Part 6: Circuit breakers with bolt-in contacts*

Road vehicles — Circuit breakers —

Part 4:
Medium circuit breakers with tabs (Blade type), Form CB15

1 Scope

This part of ISO 10924 specifies medium circuit breakers with tabs (Blade type), Form CB15, for use in road vehicles. It establishes, for this circuit breaker form, 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 14 V or 28 V, a current rating of no greater than 40 A and a breaking capacity of 2 000 A, intended for use in road vehicles with a nominal voltage of 12 V or 24 V.

Circuit breakers differ in terms of dimensions and functions, e.g. electrically reset, automatic reset, manual reset and switchable.

NOTE This type of circuit breaker is intended to be used in applications such as medium fuse-links in accordance with ISO 8820-3. While the tab dimensions and current ratings can be the same, there might be differences in performance, which it is advisable that the user of these products take into consideration.

2 Normative references

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

ISO 6722, *Road vehicles — 60 V and 600 V single-core cables — Dimensions, test methods and 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 10924-1, *Road vehicles — Circuit breakers — Part 1: Definitions and general test requirements*

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 Table 1 and ISO 10924-1.

Table 1 — Colour code

Rated current I_R A	**Colour code**
5	Tan/light brown
7,5	Brown
10	Red
15	Blue
20	Yellow
25	White
30	Green
35	Dark green
40	Orange

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 criteria below 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 Type C, as shown in ISO 8820-3. The connection resistance shall be no greater than 0,8 mΩ in order to ensure the proper function of the test fixture.

— The ambient temperature range for circuit breakers in accordance with this part of ISO 10924 shall be between −40 °C and +85 °C, in accordance with code G in ISO 16750-4.

5.1.2 Test sequence plan

The test sequence plan is shown in Table 2.

Table 2 — Test sequence plan

No.	Test			Clause/subclause of this part of ISO 10924	Sample groups[a]						
					1	2	3	4	5	6	7
1	Dimensions and designation			6	X[b]	X	X	—[c]	—	—	—
2	Marking, labelling and colour coding			4	X	X	X	X	X	X	X
3	Operating time-rating $2I_R$			5.5	X	X	X	X	X	X	X
4	Current steps			5.6	—	—	—	—	X	—	—
5	Voltage drop			5.2	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	—	—	—	—	—	—
13	Breaking capacity			5.9	—	X	—	—	—	—	—
14	Endurance			5.11	—	—	X	X	—	X	—
15	Operating time-rating	$0{,}7I_R$		5.5	—	X	X	—	—	—	X
		$1{,}1I_R$			—	—	—	X	—	X	X
		$1{,}35I_R$			—	—	—	X	—	X	X
		$1{,}6I_R$			—	—	—	—	—	—	X
		$2{,}0I_R$			—	X	X	X	X	X	X
		$3{,}5I_R$			—	—	—	—	—	—	X
		$6{,}0I_R$			—	X	—	X	—	X	X
16	Voltage drop			5.2	—	X	X	X	X	X	X
17	Maximum housing temperature			5.3	—	—	—	X	—	—	—
18	Dielectric strength			5.12	X	X	X	X	X	X	—
19	Strength of terminals			5.10	X	X	X	X	X	X	X
20	Marking, labelling and colour coding			4	X	X	X	X	X	X	X

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

[b] "X" indicates the test is required.

[c] "—" indicates the test is not required.

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 in Table 3 does not necessarily indicate the size of cable to be used in the vehicle application.

Table 3 — Test cable sizes

Rated current I_R A	**Conductor cross-sectional area**[a] mm^2	**Length** mm
5	0,5	500 ± 50
7,5	0,75	
10	1,0	
15	1,5	
20	2,5	
25	2,5	
30	4,0	
35	6,0	
40	6,0	

[a] Conductor material in accordance with ISO 6722.

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 0,7I_R, as shown in ISO 8820-3.

5.2.3 Requirements

The requirements of Table 4 shall apply.

Table 4 — Voltage drop

Rated current I_R A	Voltage drop U_D mV									
	Category[a]									
	A	B	C	D	E	F	G	H	J	K
5	300	[b]			200	205		260		205
7,5	200	150			[b]	190		250		190
10	150	150			[b]	180		235		180
15	150	150			150	160		215		160
20	150	130			150	135		190		135
25	150	130			[b]	115		170		115
30	150	120			150	110		160		110
35	150	120			[b]	[b]		[b]		[b]
40	150	120			[b]	[b]		[b]		[b]

[a] See Clause 6 for definition.

[b] Not required.

5.3 Maximum housing temperature

The requirements of Table 2 and the tests specified in ISO 10924-1 shall apply.

5.4 Environmental conditions

The tests specified in ISO 10924-1 shall apply.

5.5 Operating time-rating

5.5.1 Purpose

See ISO 10924-1.

5.5.2 Tests

The tests specified in ISO 10924-1 shall apply.

5.5.3 Requirements

The requirements of Table 5 shall apply.

Table 5 — Operating times

Test current A	Operating times									
	Category									
	A		B, C, D		E		F, G, H, J		K	
	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
$0{,}7I_R$	3 600	∞	3 600	∞	3 600	∞	3 600	∞	3 600	∞
I_R	[a]	[a]	[a]	[a]	[a]	[a]	1 800	∞	1 800	∞
$1{,}1I_R$	18	450	7	∞	20	∞	600	∞	10	∞
$1{,}35I_R$	8	90	3,0	120	10	∞	60	500	3	600
$1{,}6I_R$	5,0	50	2	50	5	200	5	300	2	120
$2I_R$	3	20	1	12	3	50	5	30	1	40
$3{,}5I_R$	0,9	5,5	0,35	2,6	1,5	12	1,5	4	0,35	6
$6I_R$[b]	0,4	1,9	0,13	0,8	1	7,5	0,3	2	0,13	2

[a] Not required.

[b] If the rated breaking capacity is lower than the test current, the value of the rated breaking capacity is valid.

5.6 Current steps

The test and requirements specified in ISO 10924-1 shall apply.

5.7 No current trip and reset temperature

The test and requirements specified in ISO 10924-1 shall apply.

5.8 Absolute breaking capacity

5.8.1 Tests

The tests specified in ISO 10924-1 shall apply. The circuit breakers shall be tested at 2 000 A.

5.8.2 Requirements

The requirements specified in ISO 10924-1 shall apply.

5.9 Breaking capacity

5.9.1 Tests

The tests specified in ISO 10924-1 shall apply. Circuit breakers in accordance with this part of ISO 10924 shall be tested to the values specified in Table 6, for a nominal voltage, U_N, of 12 V or 24 V.

Table 6 — Breaking capacity

Rated current I_R A	Breaking capacity A	
	$U_N = 12$ V	$U_N = 24$ V
$5 \leqslant I_R \leqslant 10$	150	100
$10 < I_R \leqslant 15$	225	150
$15 < I_R \leqslant 20$	300	200
$20 < I_R \leqslant 30$	450	300
$30 < I_R \leqslant 40$	600	400

5.9.2 Requirements

The requirements of Table 2 and the tests specified in ISO 10924-1 shall apply.

5.10 Strength of terminals

The test and requirements specified in ISO 8820-3 for Type C (medium) fuse-links shall apply.

5.11 Endurance

5.11.1 Tests

The tests and cycling profiles specified in ISO 10924-1 shall apply; the minimum number of cycles is specified in Table 7.

Table 7 — Endurance

Function	Type	Test current	Minimum number of cycles									
			Category									
			A	B	C	D	E	F	G	H	J	K
Automatic reset	I	$4I_R$	a	a	a	50	a	50	a	a	a	a
Electrically reset	II	$4I_R$	a	a	a	a	30 + 30[b]		30 + 30[b]	a	a	a
Switchable	IV	I_R	6 000	500	a	a	a	a	a	a	1 000	a
Manual reset	III	$2I_R$	1 000	a	a	a	300	a	a	a	500	500
Manual reset	III	$4I_R$	100	100	100	a	a	a	a	a	100	100

[a] Not required.

[b] After the first 30 cycles, allow the circuit breaker to cool down to re-close the circuit and repeat the test for another 30 cycles (see ISO 10924-1).

5.11.2 Requirements

See ISO 10924-1.

5.12 Dielectric strength

5.12.1 Tests

The circuit breaker shall be measured in the “OFF” position at points A and B, as specified in ISO 8820-3. The test voltage amounts to (500 ± 10) V for (60 + 6) s.

5.12.2 Requirement

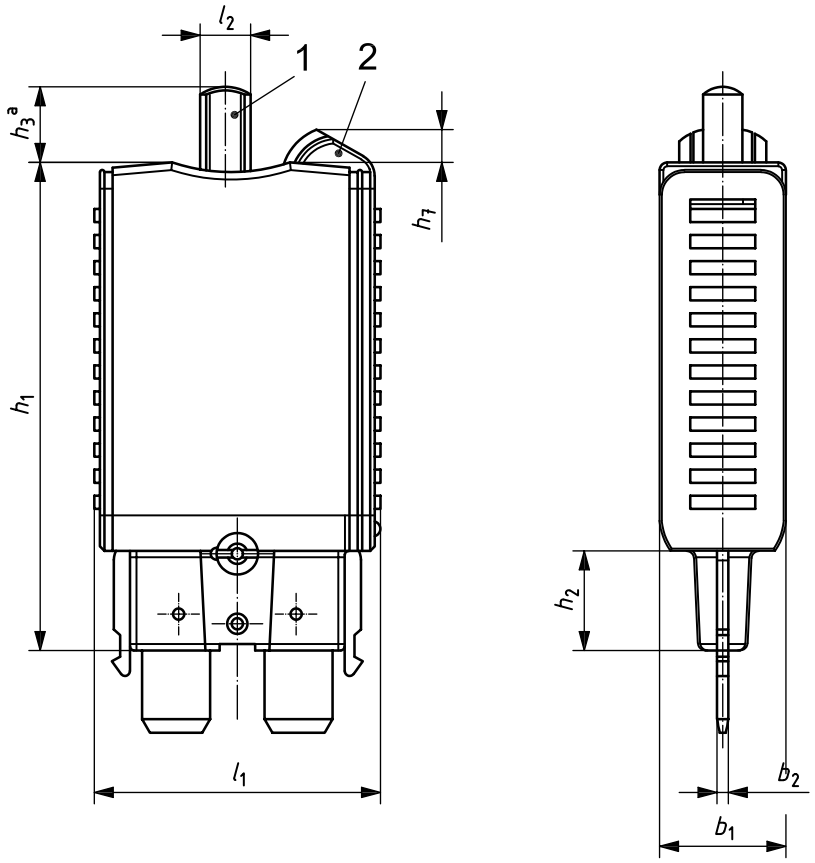
Flashover shall not occur and the leakage current shall not exceed 15 mA.

6 Dimensions and designation

6.1 Dimensions

See Table 8. For all non-specified tab dimensions, ISO 8820-3, Type C (medium fuse-links) shall apply.

All mounting dimensions specified in Figures 1 to 9 shall apply. Other dimensions may be defined by the supplier.



Dimensions are defined in Table 8.

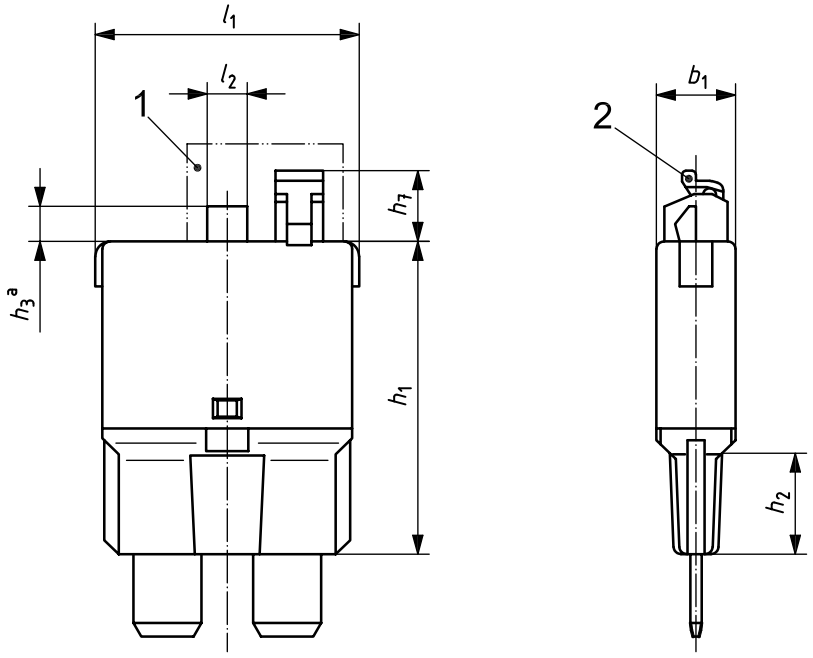
Key

1 space left for button

2 direction for movement of switchable lever

a “OFF” position is up; “ON” position is down.

Figure 1 — Circuit breaker - Category A



Dimensions are defined in Table 8.

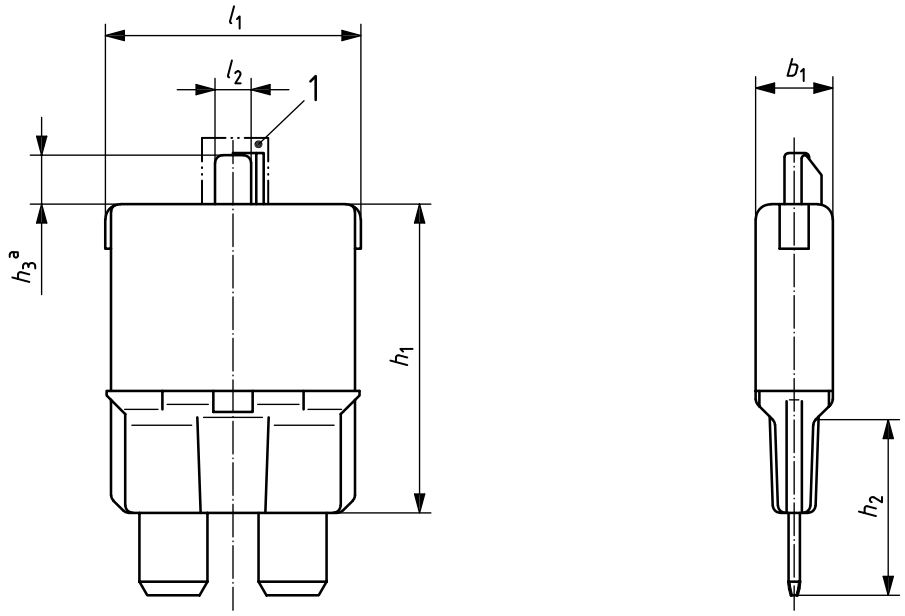
Key

1 space left for button

2 direction for movement of switchable lever

a "OFF" position is up; "ON" position is down.

Figure 2 — Circuit breaker - Category B



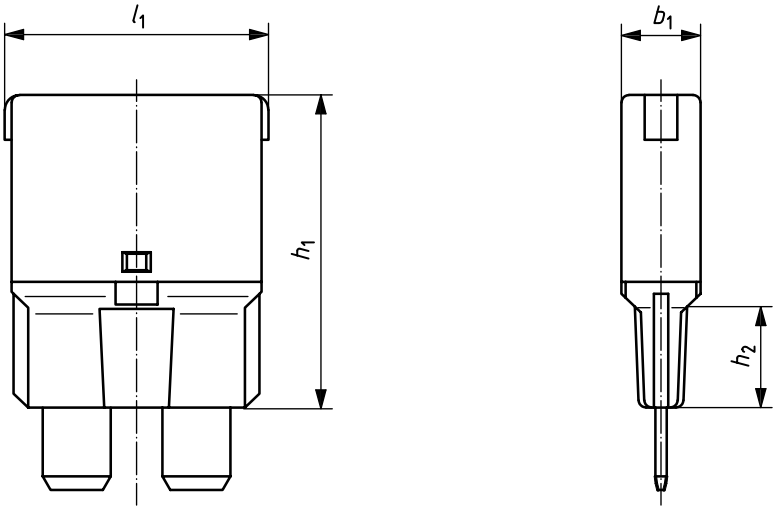
Dimensions are defined in Table 8.

Key

1 space left for button

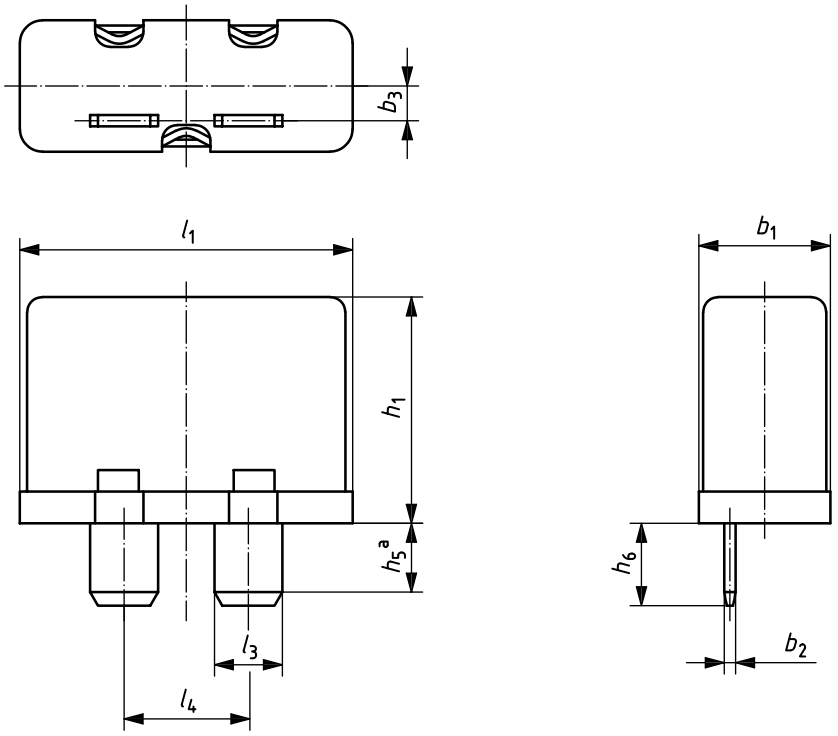
a "OFF" position is up; "ON" position is down.

Figure 3 — Circuit breaker - Category C



Dimensions are defined in Table 8.

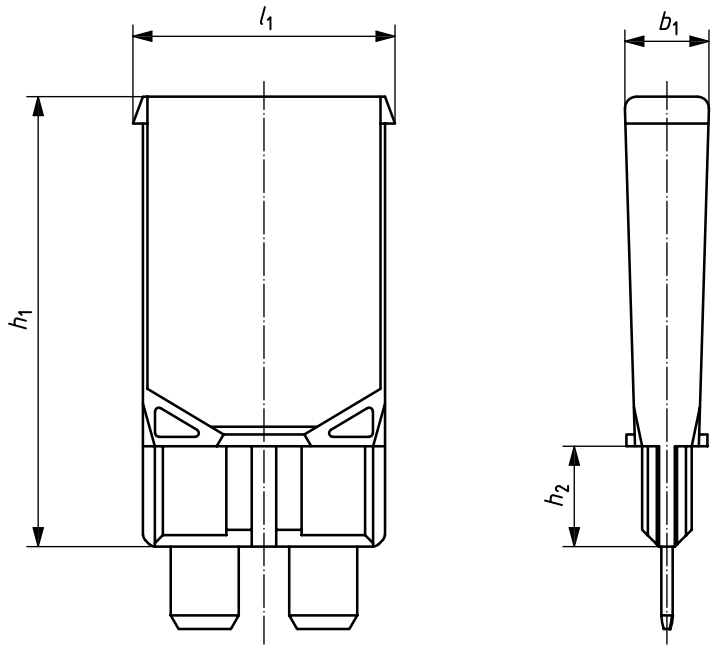
Figure 4 — Circuit breaker - Category D



Dimensions are defined in Table 8.

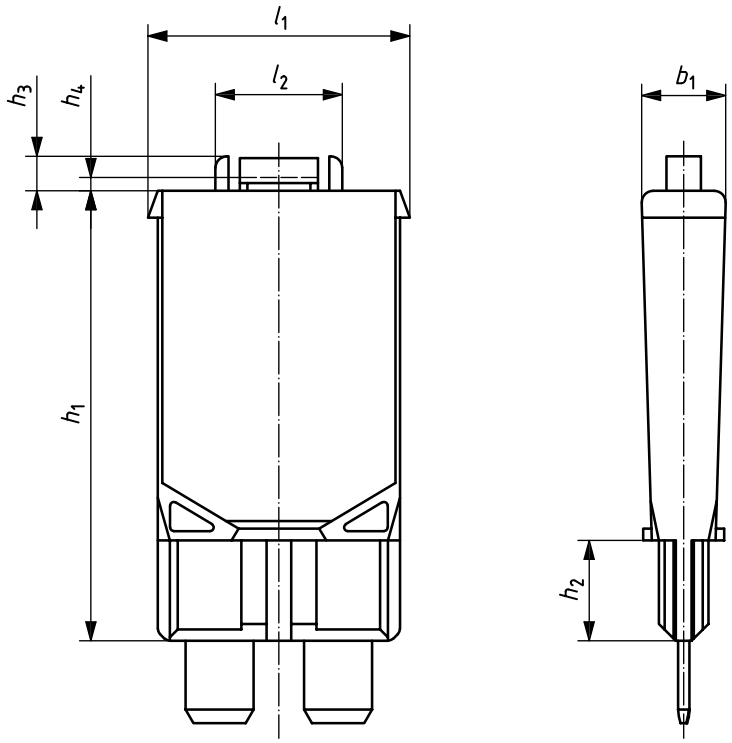
[a] h_5 is a non-tapered area.

Figure 5 — Circuit breaker - Category E



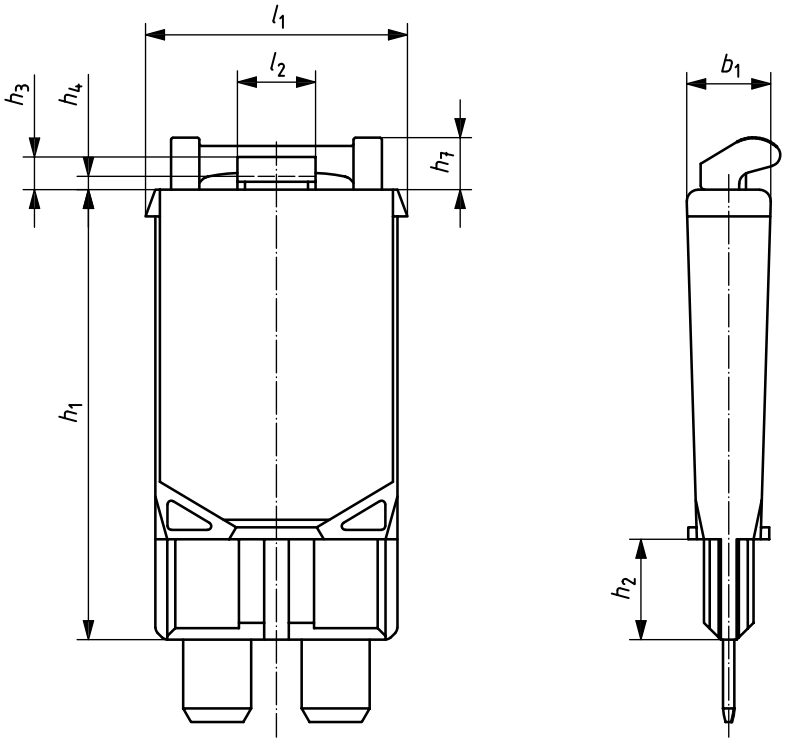
Dimensions are defined in Table 8.

Figure 6 — Circuit breaker - Category F and G



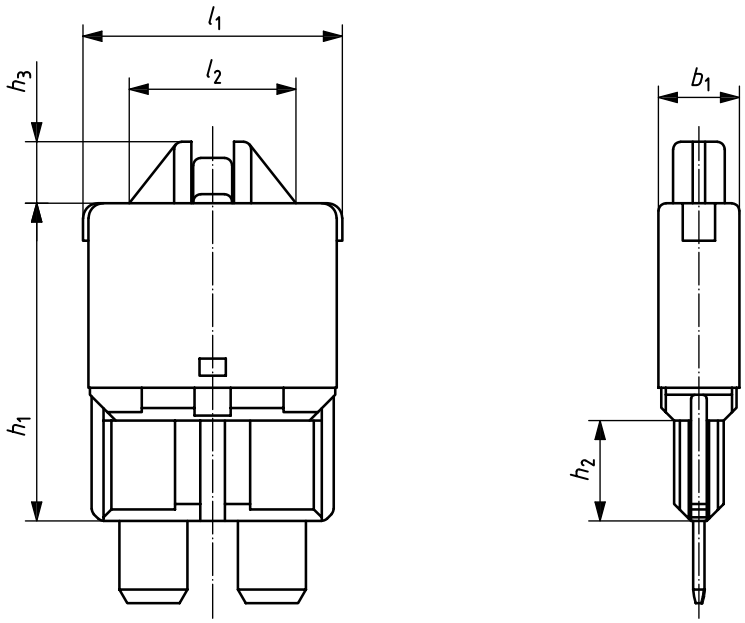
Dimensions are defined in Table 8.

Figure 7 — Circuit breaker - Category H



Dimensions are defined in Table 8.

Figure 8 — Circuit breaker - Category J



Dimensions are defined in Table 8.

Figure 9 — Circuit breaker - Category K

Table 8 — Dimensions

Dimensions in millimetres

Dimension	Category										Tolerances
	A	B	C	D	E	F	G	H	J	K	
b_1	9,5	6	6	6	9,9	6,7	6,7	6,7	7,3	6,4	±0,3
b_2	a	a	a	a	0,8	a	a	a	a	a	±0,03
b_3	a	a	a	a	2,5	a	a	a	a	a	±0,2
h_1	38	24	24	24	17,5	35,4	35,4	35,4	35,4	25,4	±0,4
h_2	7,6	7,5	7,5	7,5	a	7,9	7,9	7,9	7,9	7,9	±0,3
h_3	7,2	4,3	4,3	a	a	a	a	2,4	2,6	4,6	±0,3
h_4	a	a	a	a	a	a	a	1,1	1,1	a	±0,3
h_5	a	a	a	a	6,6	a	a	a	a	a	±0,4
h_6	a	a	a	a	7,6	a	a	a	a	a	±0,3
h_7	2,4	5,5	a	a	a	a	a	a	a	a	±0,3
l_1	22	20	20	20	25	20,4	20,4	20,4	20,4	20,6	±0,3
l_2	4	3,0	3,0	a	a	a	a	10,0	6,2	12,4	±0,2
l_3	a	a	a	a	5,2	a	a	a	a	a	±0,2
l_4	a	a	a	a	9,3	a	a	a	a	a	±0,3

[a] Not required.

6.2 Designation example

A circuit breaker in accordance with this part of ISO 10924 with form CB15, category B, and with a rated current of 10 A is designated as follows:

Circuit breaker ISO 10924 – CB15 – B – 10

Bibliography

[1] ISO 10924-2[1)], *Road vehicles — Circuit breakers — Part 2: User's guide*

[2] SAE J553, *Circuit Breakers*

1) Under preparation.

ICS 43.040.10

Price based on 14 pages