INTERNATIONAL STANDARD

ISO 10924-4

Second edition
2015-08-01

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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Foreword

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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).

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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, *Electric and electronic components and general system aspects*.

This second edition cancels and replaces the first edition (ISO 10924-4:2009), 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 CB15*

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

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 d.c. or 28 V d.c. or 58 V d.c., 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 d.c. or 24 V d.c. or 48 V d.c.

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 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 8820-3, *Road vehicles — Fuse links — Part 3: Fuse links with tabs (Blade type)*

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 ISO 10924-1 and Table 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 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 Type C as shown in ISO 8820-3. The connection resistance shall be 0,8 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 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
1	Dimensions	6	X	X	X	--	--	--	--
2	Marking, labelling and colour coding	4	X	X	X	X	X	X	X
3	Operating time rating 2,0 I_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	--	--	--	--

-- - Not required.

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

Table 2 *(continued)*

No.	Test		Clause	Sample groups[a]						
				1	2	3	4	5	6	7
9	Environmental conditions	Climatic loads	5.4	--	--	--	X	--	--	--
10		Chemical loads		--	--	--	--	X	--	--
11		Mechanical loads – Vibration		--	--	--	--	--	X	--
		Mechanical loads – Shock		--	--	--	--	--	X	--
		Mechanical loads – 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	0,7 I_R	5.5	--	X	X	--	--	--	X
		1,1 I_R		--	--	--	X	--	X	X
		1,35 I_R		--	--	--	X	--	X	X
		1,6 I_R		--	--	--	--	--	--	X
		2,0 I_R		--	X	X	X	X	X	X
		3,5 I_R		--	--	--	--	--	--	X
		6,0 I_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

-- - Not required.

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

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.

Table 3 — Test cable sizes

Rated current I_R A	Conductor cross-sectional area[a] mm²	Length mm
5	0,50	500 ± 50
7,5	0,75	
10	1,0	
15	1,5	
20	2,5	
25		
30	4,0	
35	6,0	
40		

[a] Conductor material according to ISO 6722-1.

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

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 mV									
	Category									
	A	B	C	D	E	F	G	H	J	K
5	300	--			200	205		260		205
7,5	200	150			--	190		250		190
10	150					180		235		180
15					150	160		215		160
20		130				135		190		135
25					--	115		170		115
30		120			150	110		160		110
35		--			--	--		--		--
40		120			--	--		--		--

-- - Not required.

5.3 Maximum housing temperature

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

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													
	Category													
	A				B C D				E		F G H J		K	
	Fast[a]		Standard		Fast		Standard		Standard		Standard		Standard	
	min	max	min	max	min	max	min	max	min	max	min	max	min	max
0,7 I_R	3 600	∞	--	--	3 600	∞	--	--	3 600	∞	3 600	∞	3 600	∞
I_R	30	∞	3 600	∞	10	∞	3 600	∞	30	∞	1 800	∞	1 800	∞
1,1 I_R	18	450	200	∞	7	∞	40	3 600	20	∞	600	∞	10	∞
1,35 I_R	8	90	60	∞	3,0	120	12	1 800	10	∞	60	500	3	600
1,6 I_R	5,0	50	12	1 800	2	50	6,0	170	5	200	5	300	2	120
2 I_R	3	20	9	100	1	12	3,0	40	3	50	5	30	1	40
3,5 I_R	0,9	5,5	2,5	10	0,35	2,6	0,8	6,0	1,5	12	1,5	4	0,35	6
6 I_R[b]	0,4	1,9	0,8	3,5	0,13	0,8	0,2	1	1	7,5	0,3	2	0,13	2

-- - Not required.

[a] Operating time rating similar to fuse type.

[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 of ISO 10924-1 shall apply.

5.7 No current trip and reset temperature

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

5.8 Absolute breaking capacity

5.8.1 Purpose

See ISO 10924-1.

5.8.2 Tests

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

5.8.3 Requirements

The requirements as in ISO 10924-1 shall apply.

5.9 Breaking capacity

5.9.1 Purpose

See ISO 10924-1.

5.9.2 Tests

The tests given in ISO 10924-1 shall apply; the circuit breakers according to Table 2 shall be tested to the values given in Table 6.

Table 6 — Breaking capacity

Current rating	Nominal voltage U_N		
	12 V	24 V	48 V
≥5 A to ≤10A	150 A	100 A	75 A
>10 A to ≤15 A	225 A	150 A	100 A
>15 A to ≤20 A	300 A	200 A	135 A
>20 A to ≤30 A	450 A	300 A	200 A
>30 A to ≤40 A	600 A	400 A	300 A

5.9.3 Requirements

The requirements as given in ISO 10924-1 and in Table 2 of this part of ISO 10924 shall apply.

5.10 Strength of terminals

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

5.11 Endurance

5.11.1 Purpose

See ISO 10924-1.

5.11.2 Tests

The tests and cycling profiles as given in ISO 10924-1 shall apply; the minimum number of cycles is shown in Table 7. The duration of one cycle shall be 60 s to 100 s. The test current shall be applied for at least 1 s.

Table 7 — Endurance

Function	Type	Test current	Cycles									
			Category									
			A	B	C	D	E	F	G	H	J	K
Automatic reset	I	4,0 I_R	--	--	--	≥50[a]	--	≥50[a]	--	--	--	--
Electrically reset	II	4,0 I_R	--	--	--	--	30 + 30[b]		30 + 30[b]	--	--	--
Manual reset	III	2,0 I_R	1 000	--	300	--	--	--	[d]	1 000	--	500
		4,0 I_R	100	--	100	--	--	--	--	100	--	100
Switchable	IV	1,0 I_R	6 000[c]	500	--	--	--	--	--	--	6 000	--

-- - Not required.

[a] Circuit breakers shall be cycled for at least 30 minutes or the time needed to achieve the minimum number 50 cycles. Following the 30 minutes of cycling a voltage drop test shall be performed. After the voltage drop test the circuit breaker shall be cycled for additional 4 h. It shall be acceptable, if the results of the endurance test are such, that the device is rendered inoperable, but is otherwise still in compliance with the appropriate part of ISO 10924.

[b] After the first 30 cycles the circuit breaker shall be allowed to cool down to reclose the circuit and then the test shall be continued for another 30 cycles, see ISO 10924-1.

[c] U_N = 48 V, 500 cycles.

5.11.3 Requirements

See ISO 10924-1.

5.12 Dielectric strength

5.12.1 Purpose

See ISO 10924-1.

5.12.2 Tests

The circuit breaker shall be measured in OFF-position at points A and B as shown in ISO 8820-3. The test voltage amounts to (500 ± 10) V, for $\left(60^{+6}_{0}\right)$ s.

5.12.3 Requirement

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

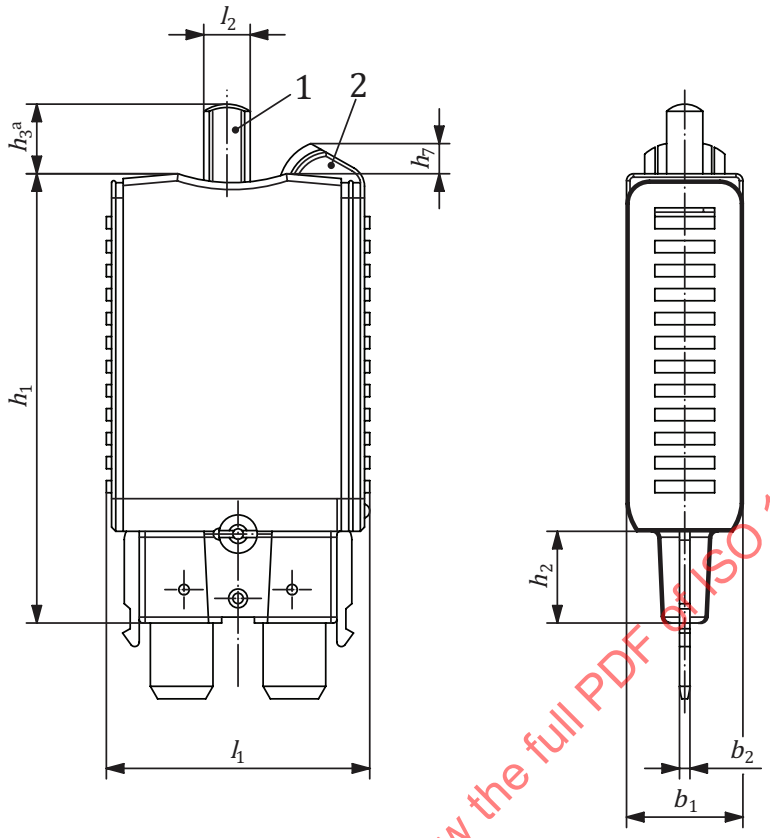
6 Dimensions and designation example

6.1 Dimensions

See Table 8. For all not specified tab dimensions ISO 8820-3, Type C (medium fuse-links) shall apply.

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

6.1.1 Category A



Key

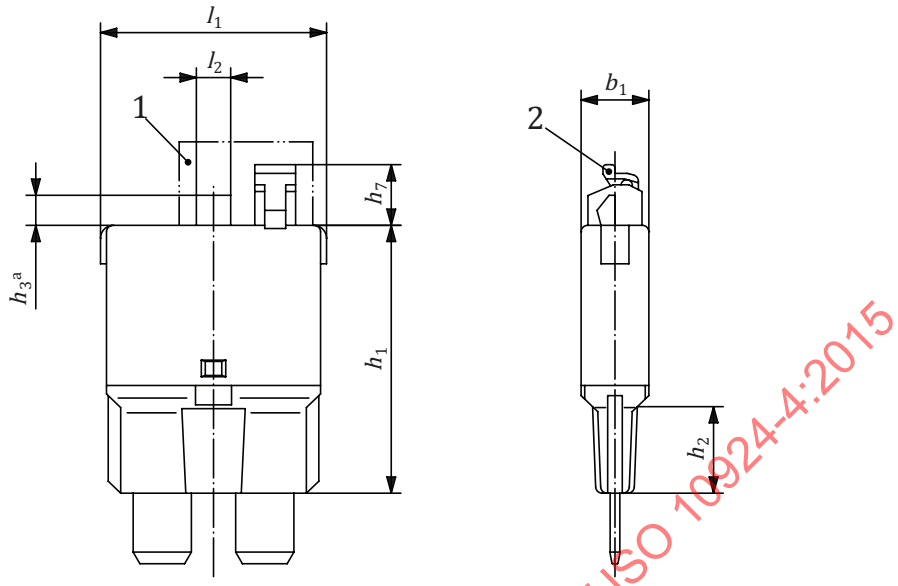
1 please leave space for button

2 direction for movement of switchable lever

a up equal to off – position, down equal to on – position

Figure 1 — Circuit breaker — Category A

6.1.2 Category B



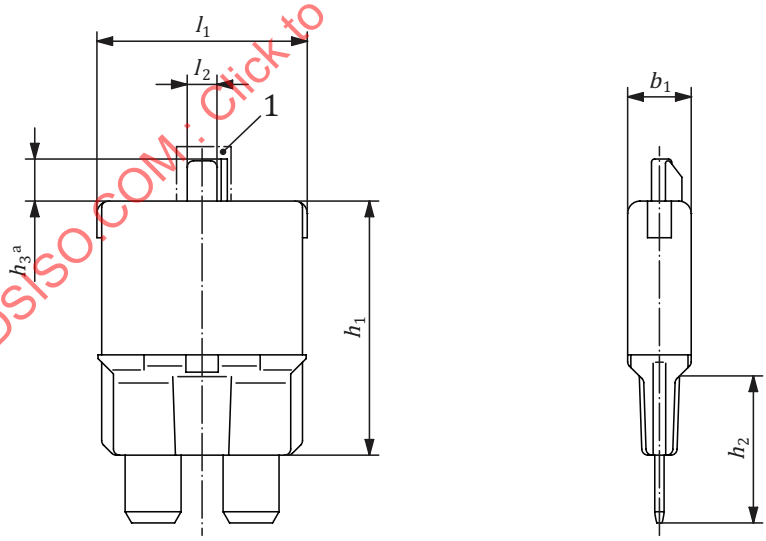
Key

1 please leave space for button

2 direction for movement of switchable lever

Figure 2 — Circuit breaker — Category B

6.1.3 Category C



Key

1 please leave space for button

Figure 3 — Circuit breaker — Category C

6.1.4 Category D

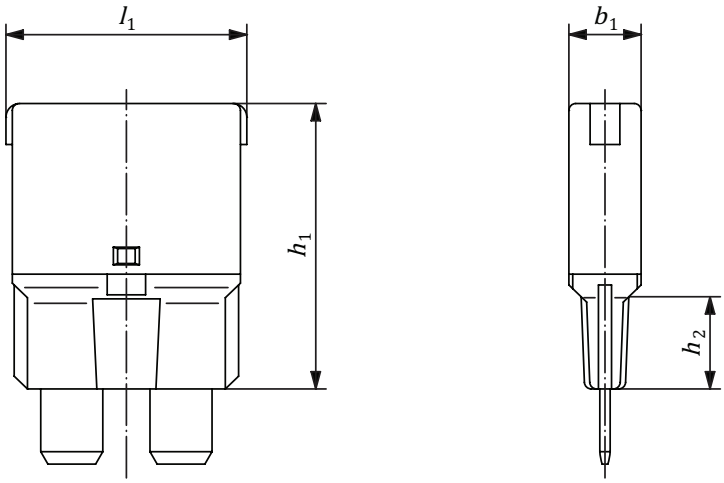


Figure 4 — Circuit breaker — Category D

6.1.5 Category E

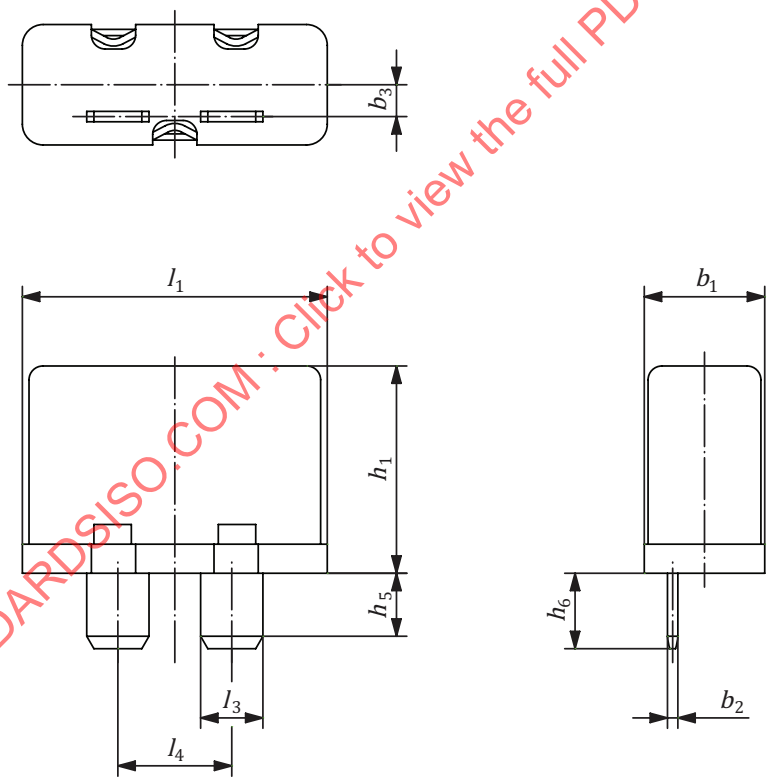


Figure 5 — Circuit breaker — Category E

6.1.6 Category F and G

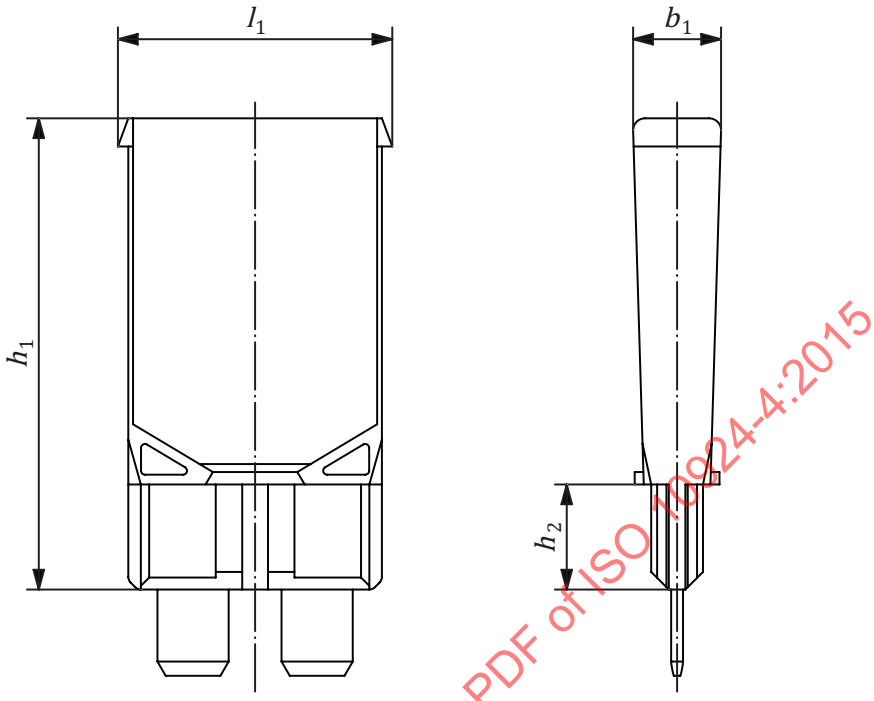


Figure 6 — Circuit breaker — Category F and G

6.1.7 Category H

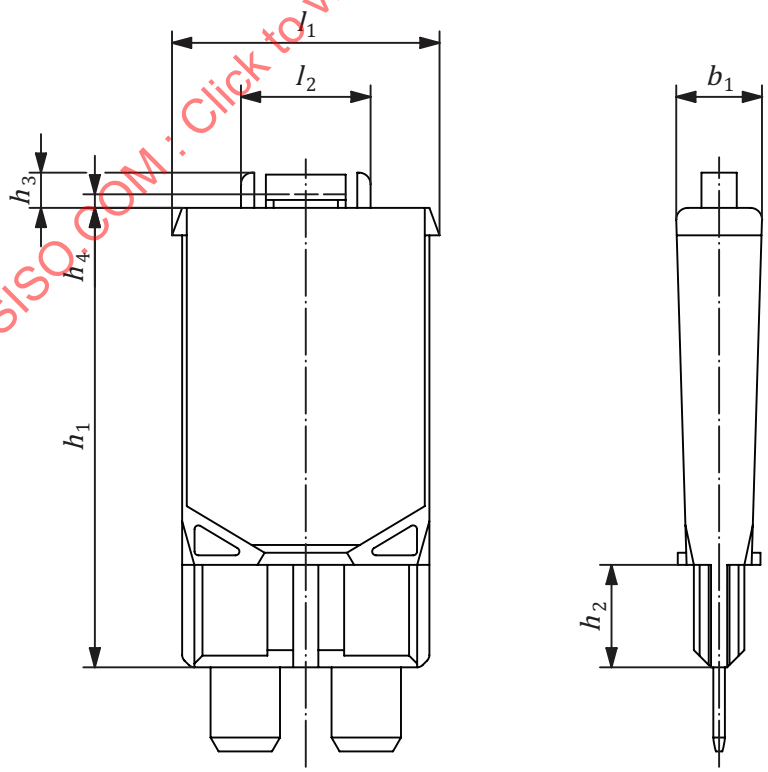


Figure 7 — Circuit breaker — Category H

6.1.8 Category J

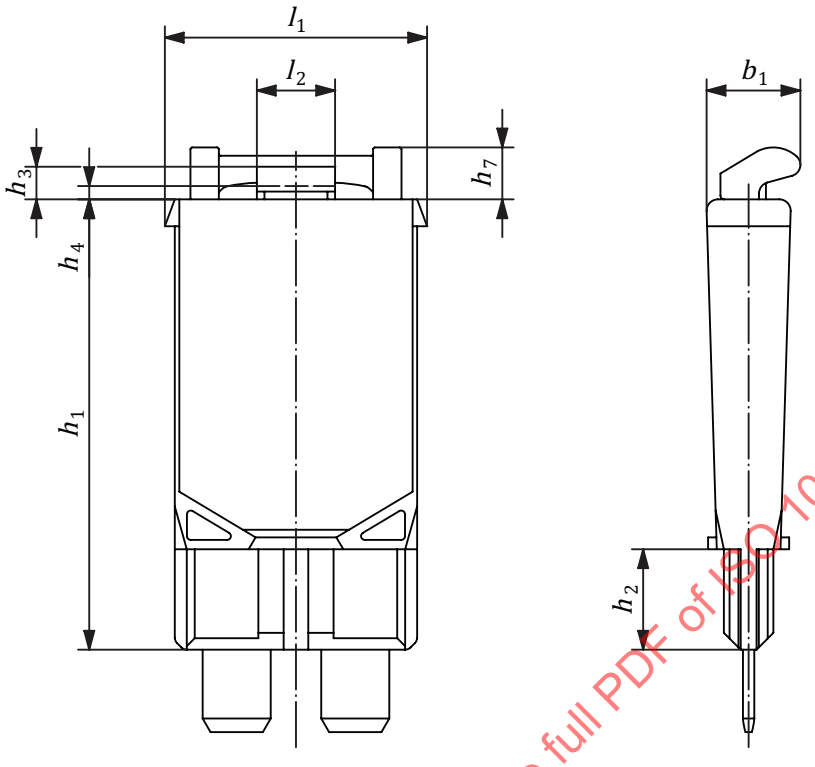


Figure 8 — Circuit breaker — Category J

6.1.9 Category K

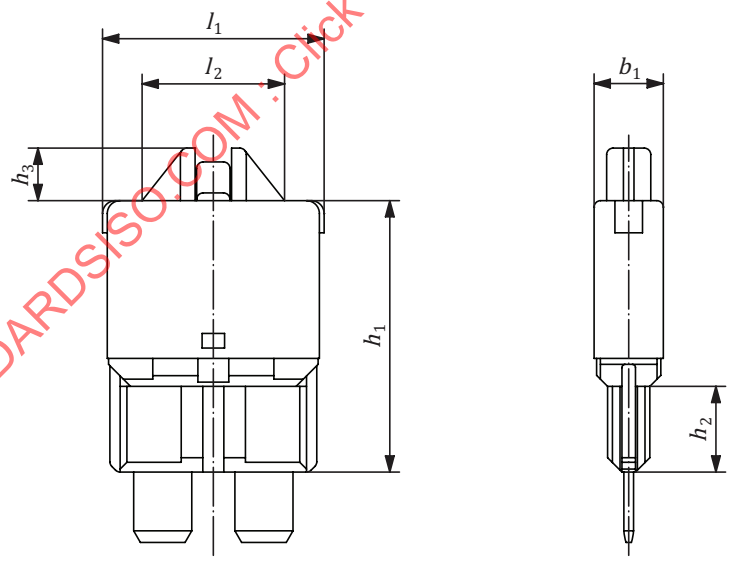


Figure 9 — Circuit breaker — Category K