

Indoor Railway DC Fuses, WBT

Catalogue 1YMB622060-en



1. FEATURES

- High rupturing capacity
- Short circuit current limiting
- Low switching voltages
- R1, P1 fire-protection grade for the materials used – in accordance with PN-84/K-02500.

2. APPLICATIONS

The fuse-links for traction applications are used to protect traction substation and electric traction rolling stock equipment against the effects of overloads greater than $2 \times I_n$ and of short-circuits at voltages of 1.9 kV DC and 4 kV DC. For detailed applications of particular types of the products refer to Table 1.

3. CLIMATIC WORKING CONDITIONS

Fuse bases type PBWMI can be operated at indoor conditions at ambient temperatures of -5°C to $+50^{\circ}\text{C}$. Other parameters are presented below.

The fuse-links and fuse-boards can be operated at indoor conditions or, when enclosed in sealed boxes secured under the railway car, under the following environmental conditions:

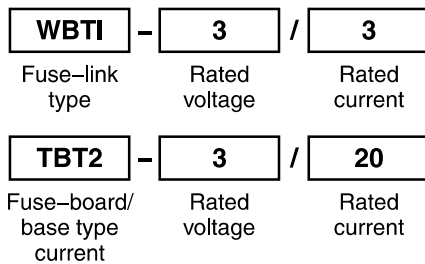
- at ambient temperatures of -30°C to $+50^{\circ}\text{C}$,
- at relative humidity of ambient air of 95% at a temperature of $+20^{\circ}\text{C}$.
- 1200 m altitude

Operating in other conditions requires approval from the manufacturer.

4. DESIGNATIONS, VERSIONS

4.1 Marking system

The marking system for particular fuse-link, fuse base or fuse-board has three alphanumeric sections as shown in the following diagram.



Note: A spring-loaded indicator for the WBTI-3, WBTG-3, WBTGI-3 fuse-links is available as an option. W-letter is to be added to the type symbol of a fuse-link if you would like to order a fuse-link fitted with an indicator.

e.g., WBTIW-3/20 – fuse-link fitted with an indicator
WBTI-3/20 – fuse-link without indicator.

5. CONSTRUCTION AND OPERATION

5.1 Construction and operation of fuse-links

A fuse-link consists of an insulation tube¹⁾ whose both ends are terminated with end caps. Fuse elements are made from specially profiled silver wire and are helically wound on a supporting element. Additional fusible element, made of resistive wire, is located inside the supporting element. The fuse interior is filled with arc extinguishing material whose chemical composition and granularity have been appropriately chosen. The fuse-link is sealed at its both ends. Fuse-links can be used with a proper type of fuse base (see tab.1).

The fuses limit the peak value of short circuit currents and, hence, protect circuits from adverse thermal and electromagnetic effects of the short-circuit.

5.2 Construction of fuse bases

Fuse-base types PBT or PBWMI consists of a steel beam fitted with a protective earthing terminal. There are two indoor support insulators mounted on the beam. Two sets of contacts are mounted on the upper side of each insulator. The set of contacts consist of contact spring, compression spring, and terminals.

5.3 Construction of fuse-boards

The fuse-boards are made of R1; P1 fire-protection grade acc. to PN-84/K-02500 insulation board carrying contact sets designed to fixed fuse-links. The contact set consists of contact spring, compression spring, and terminals.

The types TBT2-3/..., TBTS1-3/1, TBTG1A-3/15, and TBTG1-3/6 have terminal screws located under the panel.

The type TBTS2-3... has terminals made from flat bars fitted with terminal screws and located directly at the contacts.

The types TBT2-3/... and TBTS2-3... additionally have insulating barriers separating the poles and one of the poles is guarded by an additional external shield. Fuse-boards can be fitted with two shields.

The types TBTG3-3 and TBTG4-3 are designed for carrying replaceable fuse-links outside the operating circuits and therefore these are not fitted with terminals, barriers or shields.

6. TECHNICAL DATA

The general technical data of the fuse-links are presented in Table 3. The general technical data of the fuse-boards are presented in Table 4.

7. COMPLIANCE WITH STANDARDS

The fuse-links for traction applications meet the requirements specified in Table 2.

8. HOW TO ORDER

Order by specifying the following:

- product name,
- type symbol,
- rated voltage,
- rated current, and
- quantity.

All additional requirements, which are not listed in this Catalogue, should be agreed with the manufacturer

9. ORDER EXAMPLE

1. Type WBTI-3/30 fuse-link for traction applications for rated voltage 4 kV, rated current 20 A – 20 pcs.
2. Type TBT2-3/20 fuse-board for traction applications for rated voltage 4 kV, rated current 20 A – 20 pcs.
3. Type WBTIW-3/30 fuse-link for traction applications for rated voltage 4 kV, rated current 20 A, fitted with an operation indicator – 20 pcs.

¹⁾ The Types WBTI-3 and WBT1,5/40 are fitted with insulation tubes made of porcelain, while all other types are made of grade 3.3 borosilicate glass characterized by good thermal, mechanical and electrical parameters.

Table 1.

Fuse-link type	Fuse-base/board ¹ type	Applications
WBTI-3/3 to 20	PBWMI-6/20	Protection against the effects of short-circuits and overloads in the electric circuits of railway traction substation equipment .
WBTI-3/25 to 50	PBWMI-6/50	
WBTI-3/100	PBWMI-10/100-1	
WBTI-3/3 to 20	TBT2-3/20 TBT2-3/20 & 50 TBTS2-3/20 TBTS2-3/20 & 50	Protection against the effects of short-circuits and overloads in the electric circuits of traction vehicles, rail-coach space-heating equipment and electric locomotive.
WBTI-3/25 to 50	TBT2-3/50	
WBTG-3/3; 4; 6	TBTG1-3/6	Protection against the effects of short-circuits and overloads in electric single and multi-voltage circuits of rail-coach space-heating equipment .
WBTG-3/3-I	BTG-3/3-I	
WBTGI-3/10; 16; 20	TBTG1A-3/15	Protection against the effect of short-circuits and overloads in the electric single- and multi-voltage circuits of rail-coach space-heating equipment as well as other d.c. circuits at traction vehicles. Dimensions of these fuse-links meet the requirements of German Standards DIN 43625.
WBTS-3/0,6; 1	TBTS1-3/1	Protection against the effects of short-circuits and overloads in the voltage measurement circuits and special electric equipment in traction vehicles, if the nominal loads are lower than 1 A .
WBT-1,5/3; 15; 40	PBT-1,5/40	Protection against the effects of short-circuits and overloads in the electric circuits of traction substation equipment and vehicles operating at a rated voltage not higher than 1900 V DC
WBTS-3 WBTG-3 WBTGI-3	TBTG3-3/1; 6; 15 TBTG4-3/1; 3; 6; 15	A device for carrying replaceable parts in the form of types WBTS, WBTG, and WBTGI mounted outside electric circuits in electric locomotive.

¹⁾ The specified fuse-boards and fuse-bases will operate with fuse-links selected acc. Table 1. Other configurations should be agreed with the manufacturer.

Table 2.

Product Type	Compliance with Standards
WBTI-3/3 to 100	PN-69/E-06120 in scope of environmental requirements and vibration and shock resistance. General Requirements acc. BN-70/3086-14 IEC Publ. 77 of 1968 as well as UIC 552V Sheets, VII edition
WBTG-3/3 to 6 WBTG-3/3-I	PN-69/E-06120 in scope of environmental requirements and vibration and shock resistance. General Requirements acc. BN-70/3086-14 IEC Publ. 77 of 1968 as well as UIC 552 Sheets of 1993
WBTGI-3/10 to 20	PN-69/E-06120 in scope of environmental requirements and vibration and shock resistance. DIN 43625 in scope of dimensional requirements General Requirements acc. BN-70/3086-14 IEC Publ. 77 of 1968 as well as UIC 552V Sheets, VII edition
WBTS-3/0,6; 1	PN-69/E-06120 in scope of environmental requirements and vibration and shock resistance. General Requirements acc. BN-70/3086-14 IEC Publ. 77 of 1968
WBT-1,5/3; 15; 40 PBT-1,5/40	WTO-67/ZPM Technical Requirements and AE/A10-15004

The fuse-boards for traction applications meet the requirements of the following Standards:
PN-69/E-06120 and BN-70/3086-14 and IEC Publ. 77 of 1968 in the scope specified above.

Table 3. General technical data of fuse-links for traction applications

Fuse-link Type	Rated Voltage	Rated Current		Switching Overvolt.	Rated Breaking Current	Weight	Resistance		Fuse-base type		
		acc. BN-70 3086-14	acc. UIC-552				Min.	Max.			
		I _n	I _n							U _m	I _{ws}
U _n	I _n	I _n	U _m	I _{ws}	kg	mΩ	mΩ				
	kV DC	A DC	A DC	kV	kA						
WBTI-3/3	3.750 ¹	3	3,5	<12	31.5	1.5	516.6	631.4	PBWTI-6/20		
WBTI-3/6		6	7				189	231	TBT2-3/20		
WBTI-3/10		10	10				130.5	159.5	TBT2-3/20&50		
WBTI-3/16		16	16				64.8	79.2	TBTS2-3/20		
WBTI-3/20		20	20				41.4	50.6	TBTS2-3/20&50		
WBTI-3/25		25	25			33.3	40.7	2.3	28.8	35.2	PBWTI-6/50
WBTI-3/32		32	32			20.7	25.3		TBT2-3/50		
WBTI-3/40		40	36			15.8	19.25		TBTS2-3/20&50		
WBTI-3/50		50	48			8.73	10.67	4.6			PBWTI-10/100-1
WBTI-3/100		100	-								
WBTGI-3/10	3.750	10	10	<12	31.5	0.65	137.7	168.3	TBTG1A-3/15		
WBTGI-3/16		16	16				69.3	84.7			
WBTGI-3/20		20	20				45.1	55.3			
WBTG-3/3-I	4	3	3	<12	40	0.13	569.7	696.3	BTG-3/3-I ²		
WBTG-3/3	4	3	3	<12	40	0.22	569.7	696.3	TBTG1-3/6		
WBTG-3/4		3,5	4				459	561			
WBTG-3/6		6	6				300.6	367.4			
WBTS-3/0.6	4	0.6	-	<12	40	0.08	42(Ω)	51.3(Ω)	TBTS1-3/1		
WBTS-3/1		1	-				1710	2090			
WBT-1,5/3	1.9	3	-	<6	50	0.5	234	316	PBT-1,5/40		
WBT-1,5/15		15	-				28.2	38.2			
WBT-1,5/40		40	-				11.3	15.3			

*) Minimum breaking current I_{min} = 1.6 x I_n (description on page 10)

1) While testing the breaking capacity satisfactory results were found for the short circuits range at a recovery voltage of 4000 V DC and for the overload currents at a recovery voltage of 3800–4000 V DC various values for particular fuse-links were obtained.

2) This is a fuse housing for fuse-links for traction applications manufactured at ABB Factory at Przasnysz.

The resistance are to be measured by a electrical bridge method or technical method using measuring instrument with accuracy class not worse than 0.5% at an ambient temperature of t = 20°C ±2°C.

Table 4. General technical data of fuse-boards

Fuse-board type	Rated voltage	Rated current	Rated test voltage at 50 Hz	Number of poles	Weight	Fuse-link type
	U _n	I _n	U _{ni}			
	kV=	A=	kV			
PBWTI-6/20	7,2	20	35 ¹⁾	1	4,9	WBTI-3/3: 20
PBWTI-6/50		40			5	WBTI-3/25: 50
PBWTI-10/100-1		100			5,6	WBTI-3/100
TBT2-3/20	4	20	10	2	5,5	WBTI-3/3: 20 (2 pcs)
TBT2-3/20 & 50 ²⁾		20 & 50			5,65	WBTI-3/3: 20 (1 pcs) WBTI-3/25: 50 (1 pcs)
TBT2-3/50		50			5,8	WBTI-3/25: 50 (2 pcs)
TBTS2-3/20		20		7,0	WBTI-3/3: 20 (2 pcs)	
TBTS2-3/20 & 50		20 & 50		7,3	WBTI-3/3: 20 (1 pcs) WBTI-3/25: 50 (1 pcs)	
TBTG1A-3/15		20			1,15	WBTGI-3/10; 16; 20
TBTG1-3/6		6		0,85	WBTG-3/3; 4; 6	
TBTG3-3/1; 6; 15	—	—	—	3	1,8	WBTS-3/1 WBTG-3/3; 4; 6 WBTGI-3/10; 16; 20
TBTG4-3/1; 3; 6; 15	—	—	—	4	2,6	WBTS-3/1 WBTG-3/3; 4; 6 WBTGI-3/10; 16; 20
TBTS1-3/1	4	1	10	1	0,35	WBTS-3/0,6; 1
PBT-1,5/40	1,9	40	27 ¹⁾ 35 ³⁾	1	3,6	WBT-1,5/3 WBT-1,5/15 WBT-1,5/40

Note: Due to the introduction of improvements, the right is reserved to modify the products.

1) AC contact-to-contact insulation test voltage.

2) One pole is designed for fixing the type WBTI-3/3 to 20 fuse-link and the second one for WBTI-3/25 to 50 fuse-link.

3) AC earth insulation test voltage.

10. APPENDICES

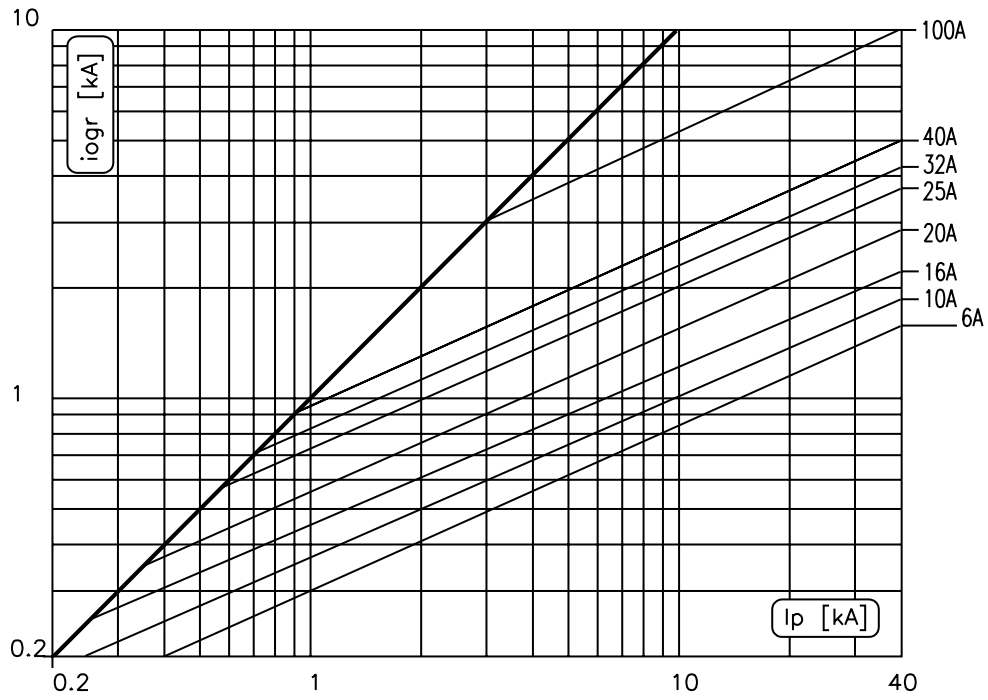


Fig. 1 Cut-off current characteristics for fuse-link types WBTI-3 ...

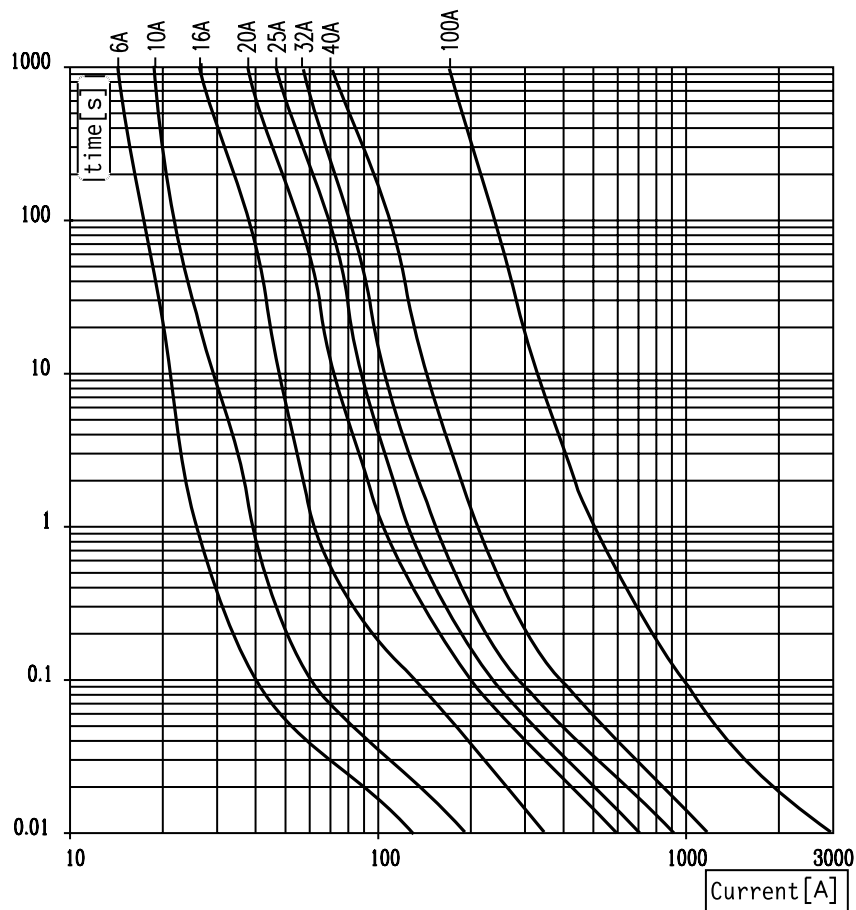


Fig. 2 Time-current characteristics for fuse-link types WBTI-3 ...

Current value deviations for any average pre-arcing period value as read from the diagram are presented within $\pm 20\%$.

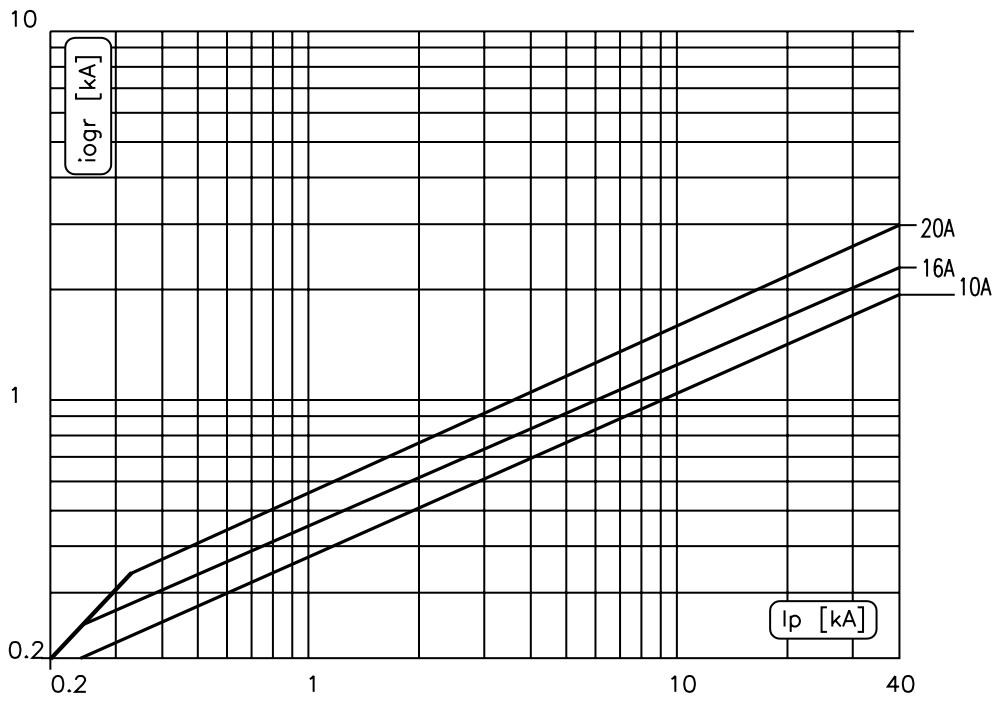


Fig. 3 Cut-off current characteristics fuse-link types WBTGI-3 ...

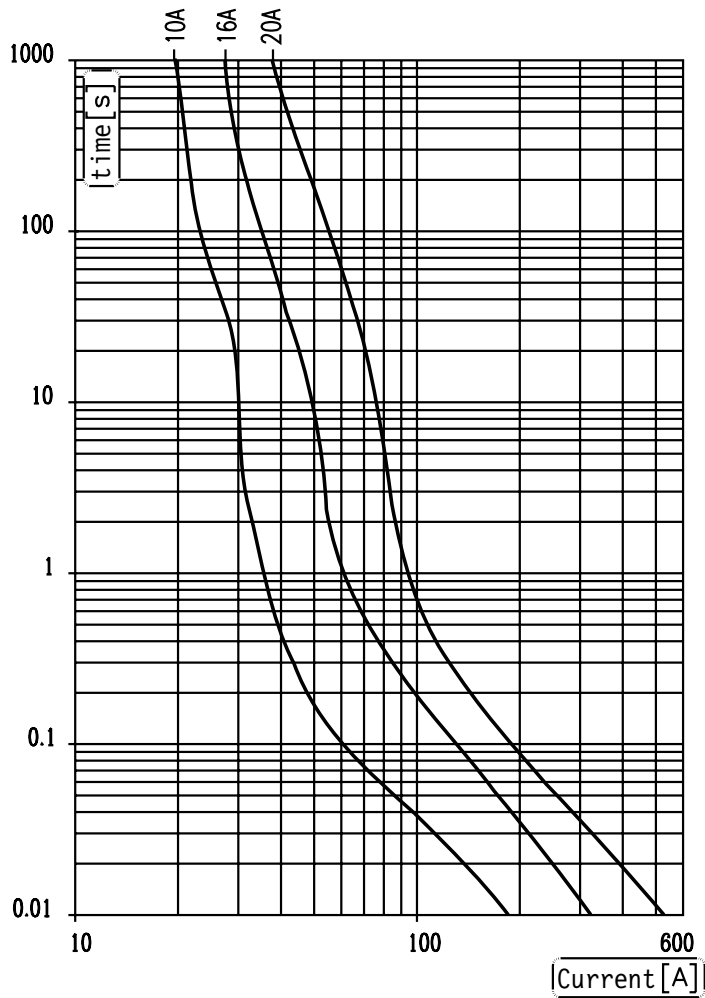


Fig. 4 Time-current characteristics for the fuse-link types WBTGI-3 ...
Current value deviations for any average pre-arcing period value as read from the diagram are presented within $\pm 20\%$.

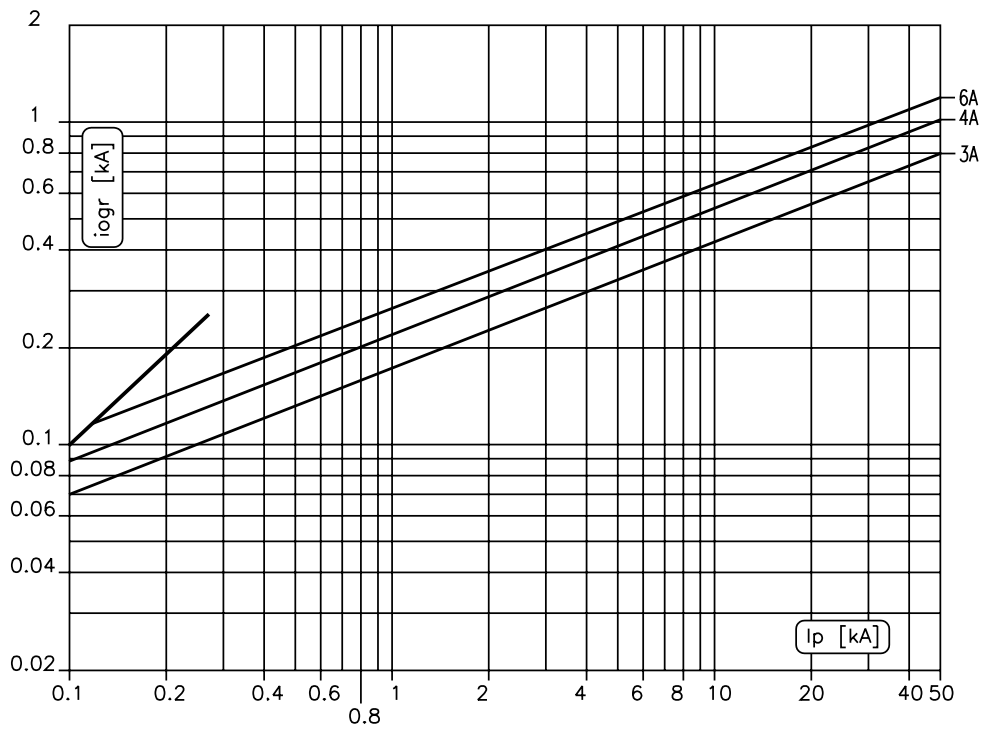


Fig. 5 Cut-off current characteristics for fuse-link types WBTG-3/3; 4; 6 ... and WBTG-3/3-I

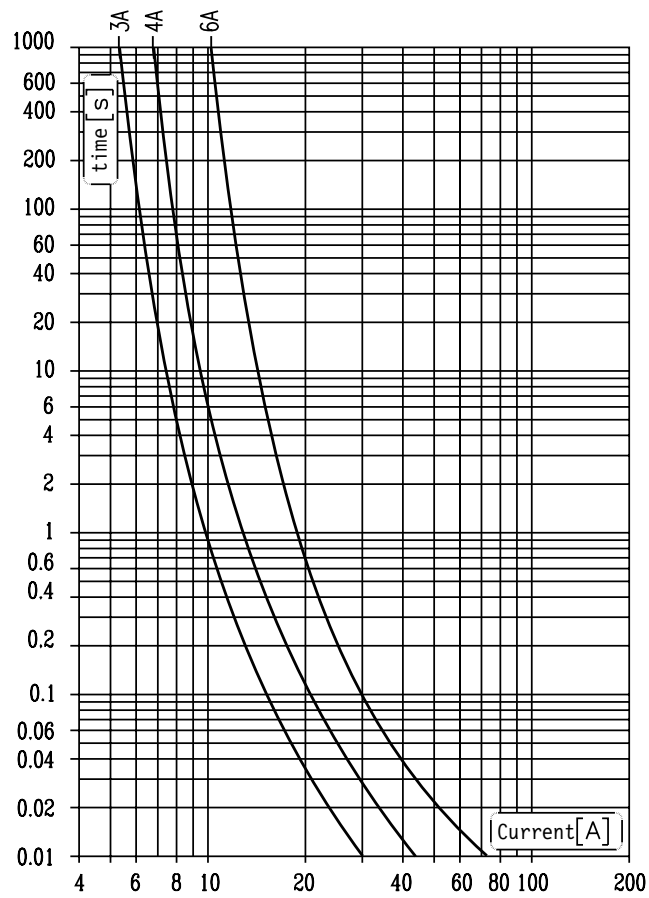


Fig. 6 Time-current characteristics for fuse-link types WBTG-3/3; 4; 6 ... and WBTG-3/3-I

Current value deviations for any average pre-arcing period value as read from the diagram are presented within $\pm 20\%$.

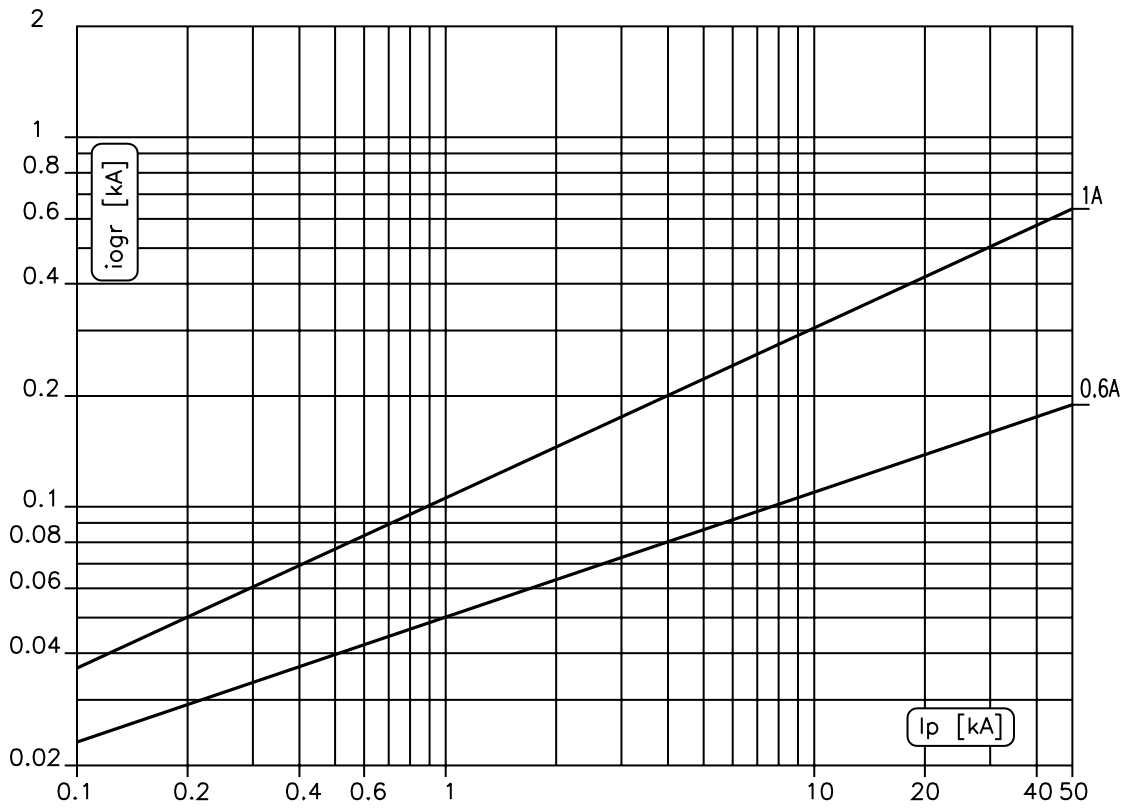


Fig. 7 Cut-off current characteristics for fuse-link types WBTS-3/0,6; 1

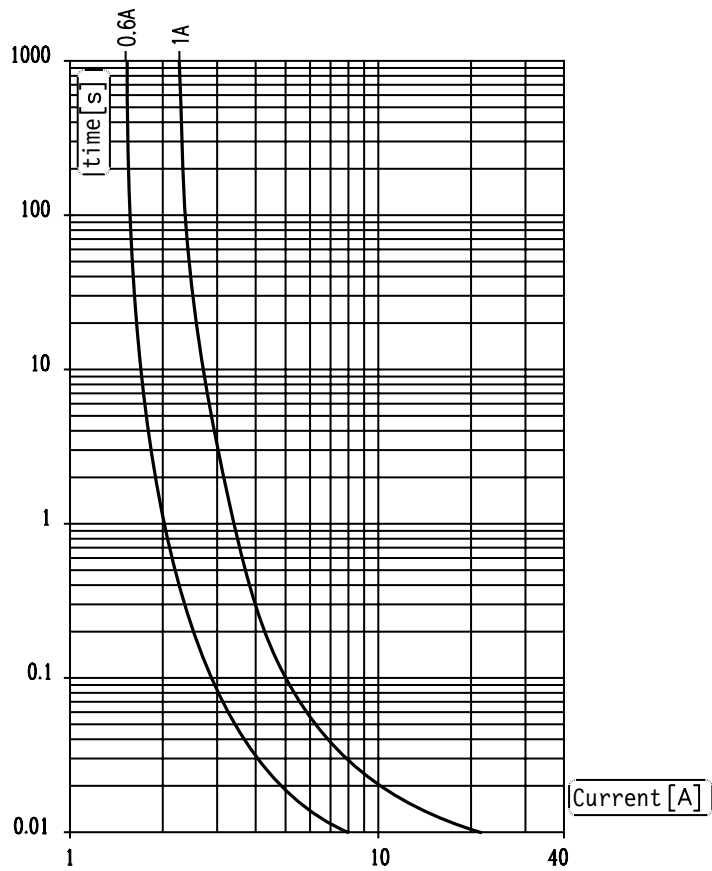


Fig. 8 Time-current characteristics for fuse-link types WBTS-3/0,6; 1

Current value deviations for any average pre-arcing period value as read from the diagram are presented within $\pm 20\%$.

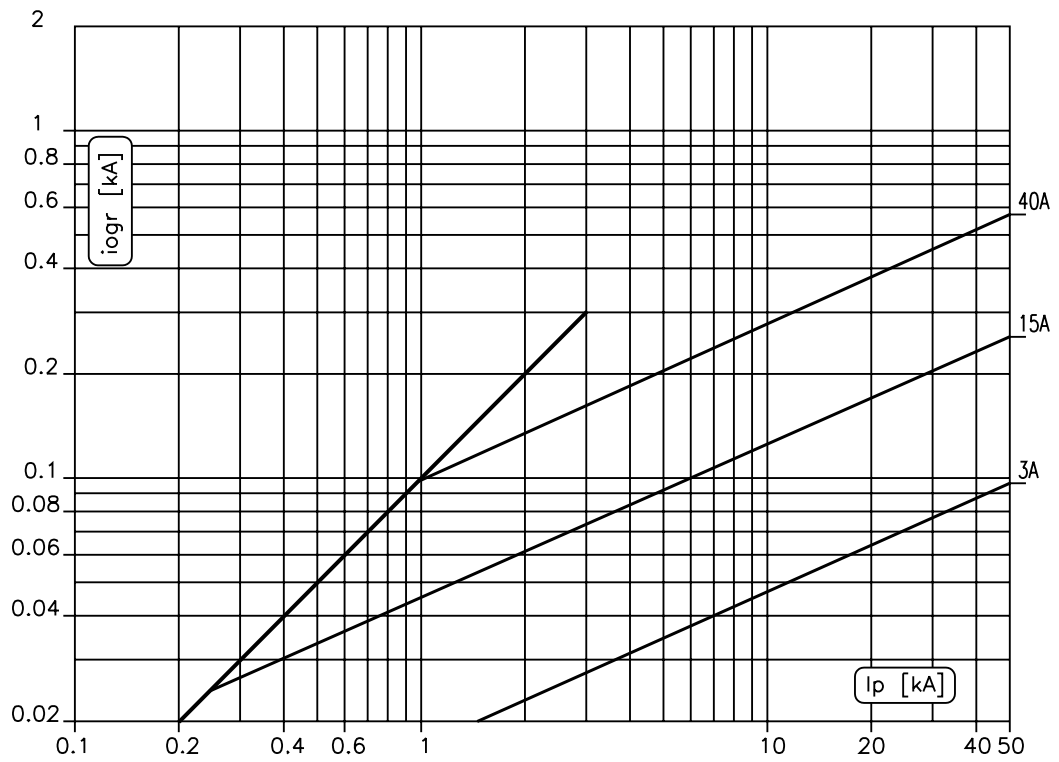


Fig. 9 Cut-off current characteristics for fuse-link types WBT-1,5/3; 15; 40

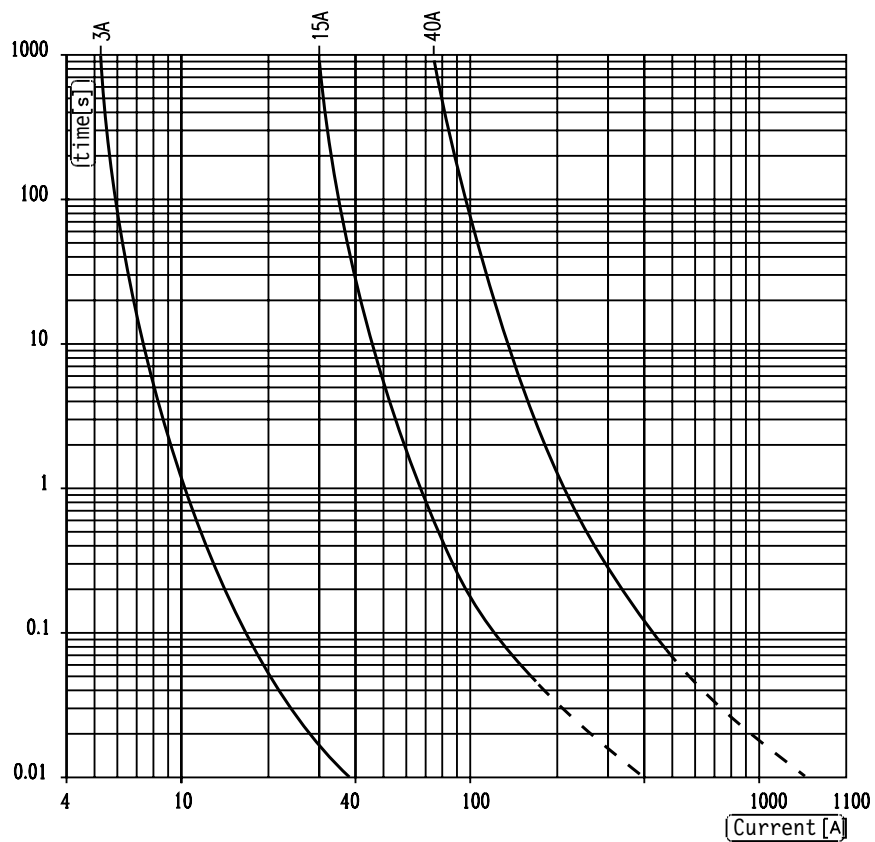


Fig. 10 Time-current characteristics for fuse-link types WBT-1,5/3; 15; 40
Current value deviations for any average pre-arcing period value as read from the diagram are presented within $\pm 20\%$.

**WBTI-3, WBTG-3, WBTGI-3, WBTG-3/3-I,
WBTS-3 and WBT-1,5 fuse-links
for traction applications**

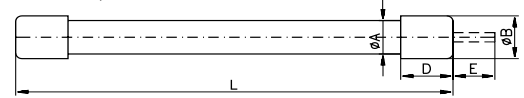
Fuse-link type	Dimensions [mm]						
	∅A	∅B	∅C	D	E	L	F
WBTI-3/3 to 20	55	62	66	50	~20	256± ²	-
WBTI-3/25 to 50	70	78	84			556± ²	-
WBTI-3/100						-	-
WBTGI-3/10 to 20	38	45	50	33	-	256± ²	-
WBTG-3/3-I	18	23	-	25	-	209± ²	-
WBTG-3/3 to 6	24	28	-	20	12	200± ²	-
WBTI-3/0.6; 1	18	23	-	25	-	145± ²	-
WBT-3/3;15	38	45	50	33	-	175± ²	-
WBTI-1,5/40	65		72		-	175± ²	60



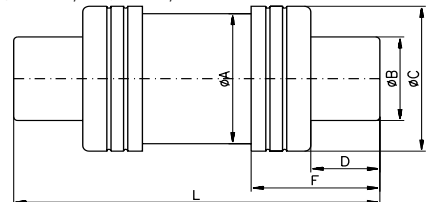
Type WBTI-3/... Fuse-links



Type WBTGI-3/...; WBT-1,5/3 ... Fuse-links



Type WBTG-3/3-6, WBTG-3/3-I, WBTS-3/... Fuse-links



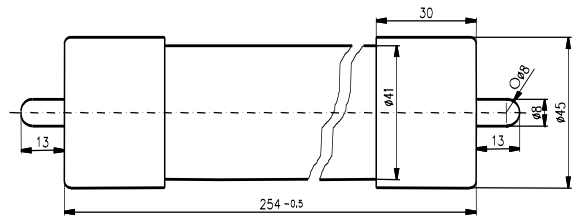
Type WBT-1,5/40 Fuse-links

BWT fuse-links for traction applications

DC fuse-links for railway applications, characterized by small dimensions, high rupturing capacity, current-limitation and low switching voltage. Type tested according to 'Specifiche Generali per la Fornitura di Valvole Fusibili A. T. per Circuiti C. C.' at Trenitalia (Italian Railways) testing station in Empoli/Italy.

Technical parameters:

Rated voltage	U_n	3 kV DC
Rated current	I_n	3.15; 16; 20 A
Switching voltage (max)	U_m	12 kV
Minimum breaking current	I_{min}	$1.6 \times I_n$
Maximum breaking current	I_{ws}	60 kA

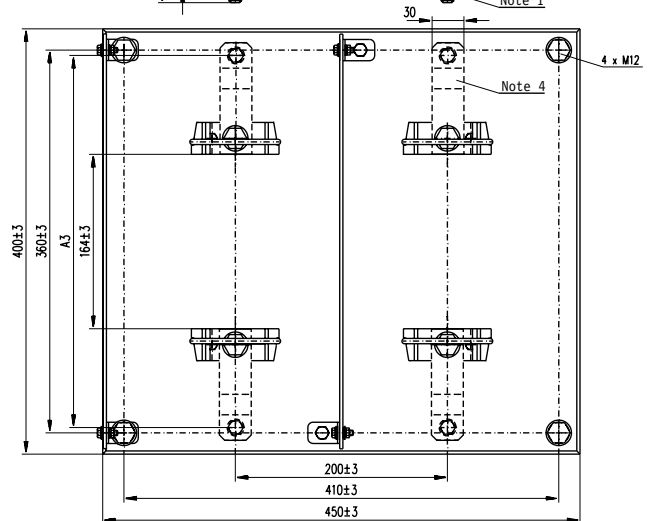
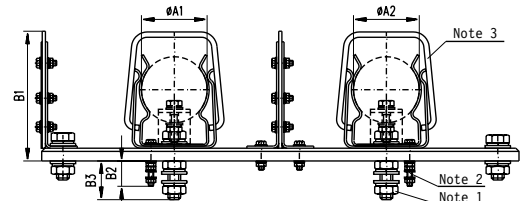


Type BWT fuse-links

**TBT2-3/...; TBT2-3/20&50; TBTS2-3/
20 and TBTS2-3/20&50 fuse-boards
for traction applications**

1. Connection screw, M12, for the board type TBT2-3/50 only.
2. Connection screw – M8 for the ∅D1 pole or M5 for the ∅D2 pole – for the board type TBT2-3/20 & 50 only.
3. Poles designed for the fuse-links type WBT-3/20-50 fitted with extra thimble terminals.
4. Flat connections employing a screw, M8 are fitted in the TBTS2-3/... only.

Connections: silver-plated brass
Contact Springs: silver-plated brass
Deviations of dimensions with no tolerance specified shall be within ±3%.

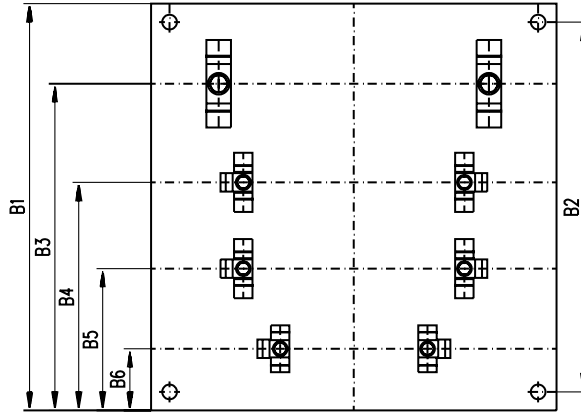
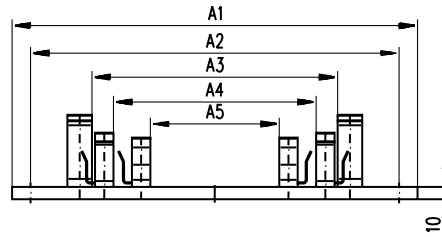


Fuse-board type	Dimensions [mm]					
	∅A1	∅A2	A3	B1	B2	B3
TBT2-3/20	62	62	-	136	30	-
TBT2-3/50	78	78	-	136	-	40
TBT2-3/20&50	78	62	-	138	40	40
TBTS2-3/20	62	62	295	138	-	-
TBTS2-3/20&50	62	78	295	138	-	-

TBTG3-3/1; 6; 15 and TBTG4-3/1; 3; 6; 15 fuse-boards for traction applications

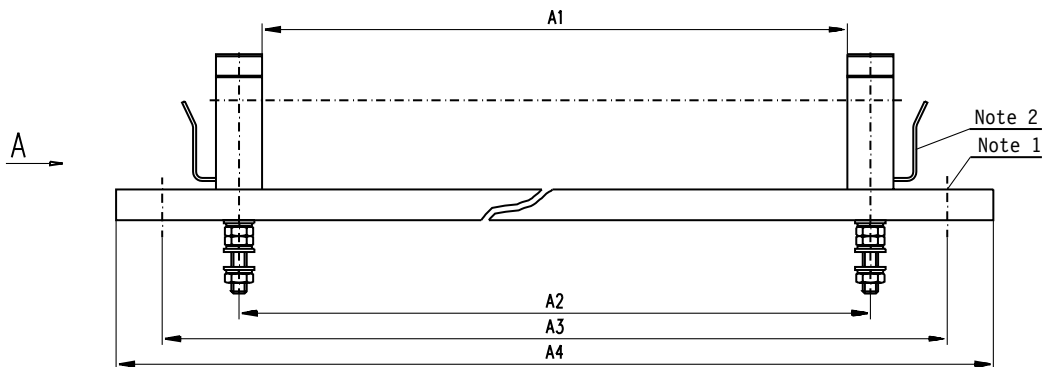
Notes:

1. Connections: silver-plated brass
2. Contact Springs: silver-plated brass
3. Deviations of dimensions with no tolerance specified shall be within $\pm 3\%$.



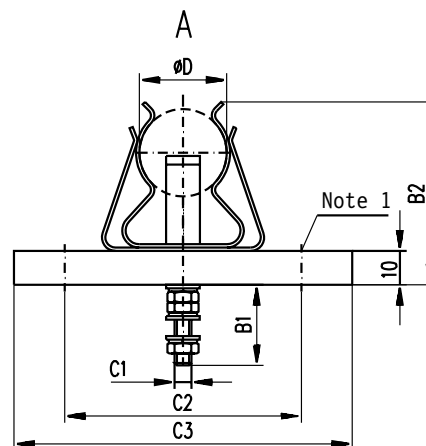
Fuse-board type	Dimensions [mm]											
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	
TBTG3-1,6,15	330	300	220±1	180±1	120	250	220	190	110	-	40	
TBT4-3/1,3,6,15	330	300	220±1	180±1	120	330	300	265	185	115	50	

TBTG1-3/6; TBTG1A-3/15; TBTS1-3/1 Fuse-boards for traction applications



1. The $\varnothing 10$ holes are to be used for installation
2. Fuse-link stops for the Type TBTG1-3/6 and TBTS1-3/1 Fuse-board are to be installed in the panels

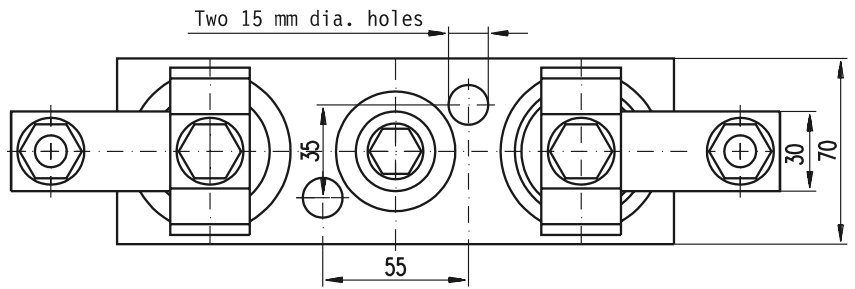
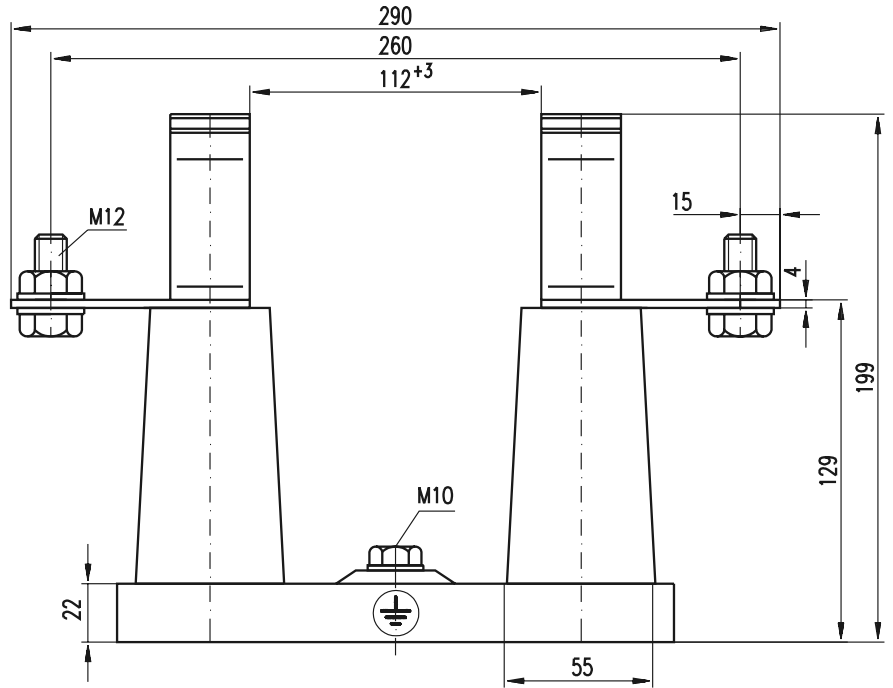
Connections: silver-plated brass
 Contact Springs: silver-plated brass
 Deviations of dimensions with no tolerance specified shall be within $\pm 3\%$.



Fuse-board type	Dimensions [mm]										
	A1	A2	A3	A4	B1	B2	C1	C2	C3	$\varnothing D$	
TBTG1-3/6	165±1.5	180±3	395±3	425	18	58±2	M5	70±2	100	28	
TBTG1A-3/15	205±1.5	225±3	440±3	470	25	71±2	M8	70±2	100	45	
TBTS1-3/1	105±1	120±3	394±3	425	20	60	M5	-	50	23	

Type PBT-1,5/40 Fuse-base for traction applications

Notes:
 Earthing Terminal; tinned steel.
 Connections: silver-plated brass
 Contact Springs: silver-plated brass
 Deviations of dimensions with no tolerance specified shall be within $\pm 3\%$.
 Note: Due to the introduction of improvements, the right is reserved to modify the products.



Note: Design and specifications are subject to change without notice.

ABB is working to continuous improve the products. Therefore we reserve the right to change design, dimension and data without prior notice.



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