Fuses for Semiconductor Protection

CBP-SBX-JP SERIES FUSES

PRODUCT SPECIFICATION

IEC60269-4/EN60269-4 standard

SIZE	Rated Voltage	Operating Class	Rated Breaking Capacity
14	dc 1000V	EV/aR	1000Vdc@20kA

Product Series

- CBP-SBX-JP

General Description

The **CBVAC Protect CBP-SBX-JP** series are high-performance, bolt-down fuses designed for robust protection in high-power DC applications. With a 1000Vdc rating and a fast-acting aR operating class, these fuses are ideal for safeguarding sensitive power semiconductors, inverters, DC-DC converters, and battery systems in Electric Vehicles (EV) and Energy Storage Systems (ESS).

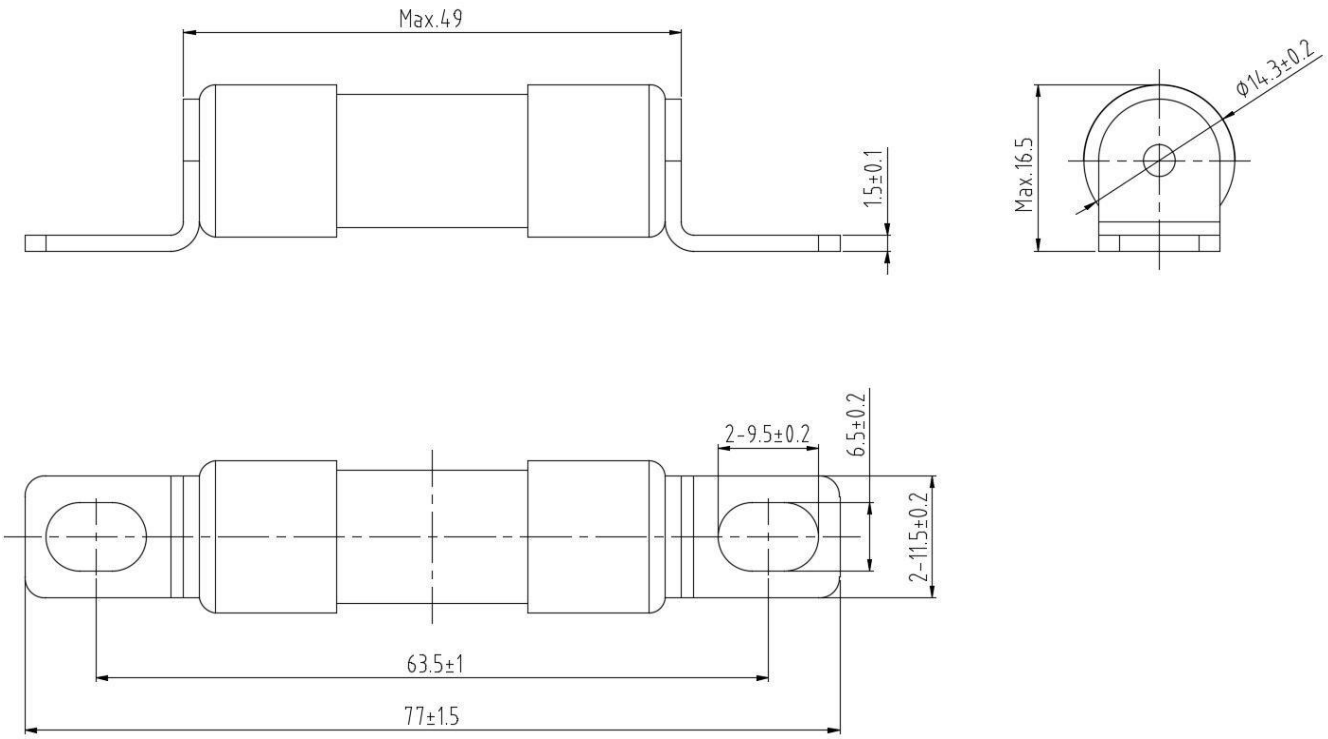
Features & Benefits

- **Secure Bolt-Down Mounting:** Ensures reliable, low-resistance connections suitable for high-vibration environments.
- **Excellent Electrical Performance:** Provides extremely fast-acting interruption of fault currents to protect critical power electronics.
- **High Voltage & Breaking Capacity:** Rated for **1000Vdc** with a **20kA** interrupting rating, ensuring safety in demanding high-power circuits.
- **Automotive Grade Quality:** The manufacturing process conforms to **IATF 16949** quality management system standards.
- **Compliant with Standards:** Designed and tested in accordance with **IEC 60269-4** and **EN 60269-4.**
- **Environmentally Compliant:** All materials and packaging are **RoHS compliant**.

Key Specifications

Parameter	Value
Body Diameter (mm)	14
Rated Voltage	1000 Vdc
Operating Class	aR (EV/Semiconductor Protection)
Rated Breaking Capacity	20 kA @ 1000Vdc

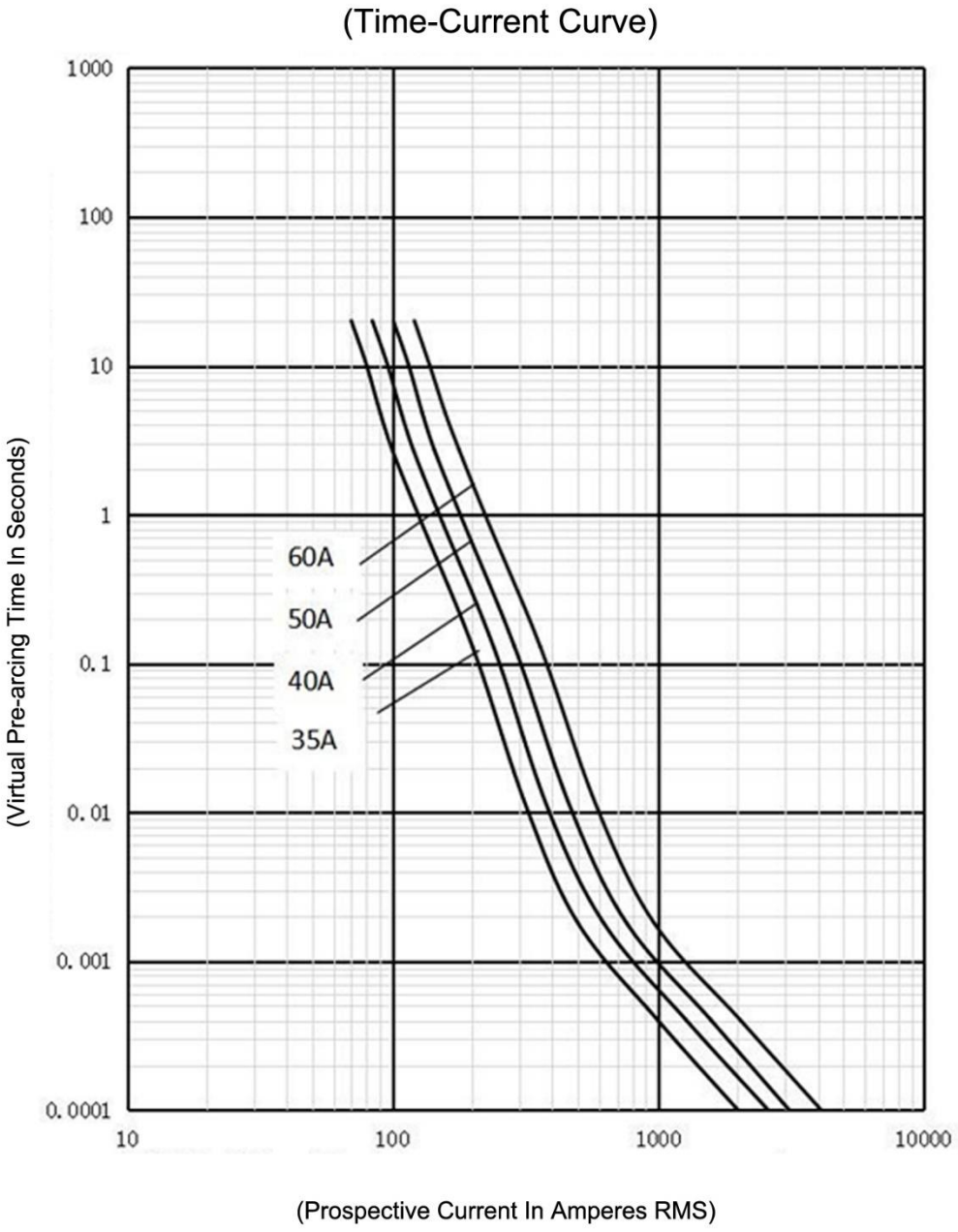
Physical Dimensions (mm)



Selection and ordering data

Rated Current (A)	Part Number	Power Loss (W, typ.)	Pre-arcing I²t (A²s)	Total Clearing I²t @ 1000V (A²s)	Weight (kg/pc)	Pack Qty.
35	**CBP-SBX-35JP**	7.4	420	2050	0. 029	12
40	**CBP-SBX-40JP**	8.5	630	3050	0. 029	12
50	**CBP-SBX-50JP**	9.4	1220	5400	0. 029	12
60	**CBP-SBX-60JP**	10.7	1480	7200	0. 029	12

Time-Current Characteristic Curve (TCC)



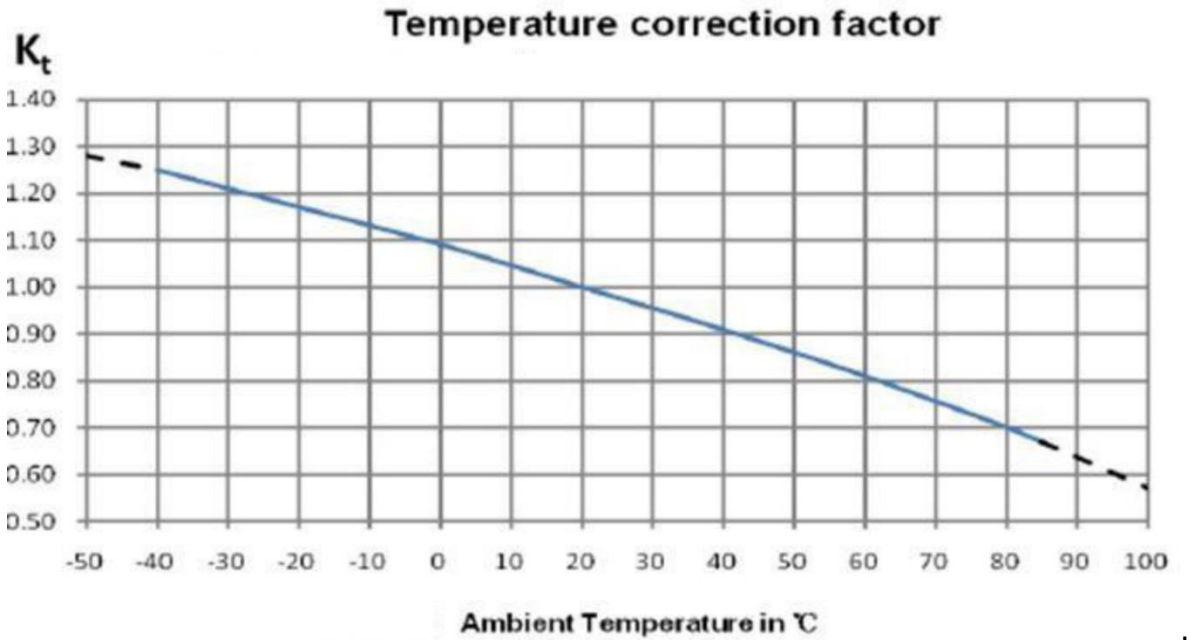
Fuse Current Rating Selection Formula

To ensure reliable performance and prevent nuisance tripping, the fuse's nominal current rating (I_n) must be properly selected based on the system's operating conditions. Use the following formula to calculate the required minimum fuse rating:.

$$I_n \geq \frac{I_{RMS} \times G}{K_t \times K_e \times K_v \times K_f \times K_a \times K_b}$$

Temperature Derating Factor (K_t)

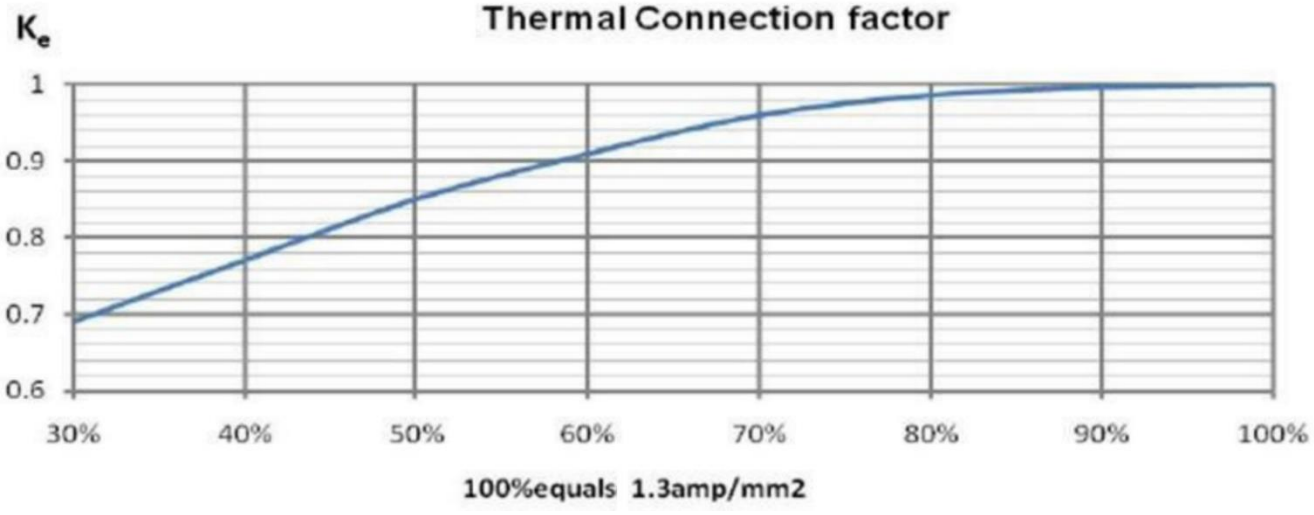
The fuse's current-carrying capacity is affected by the ambient operating temperature. Higher temperatures reduce the fuse's ability to dissipate heat. Use the curve below to find the appropriate K_t factor.



Thermal Connection Factor (K_e)

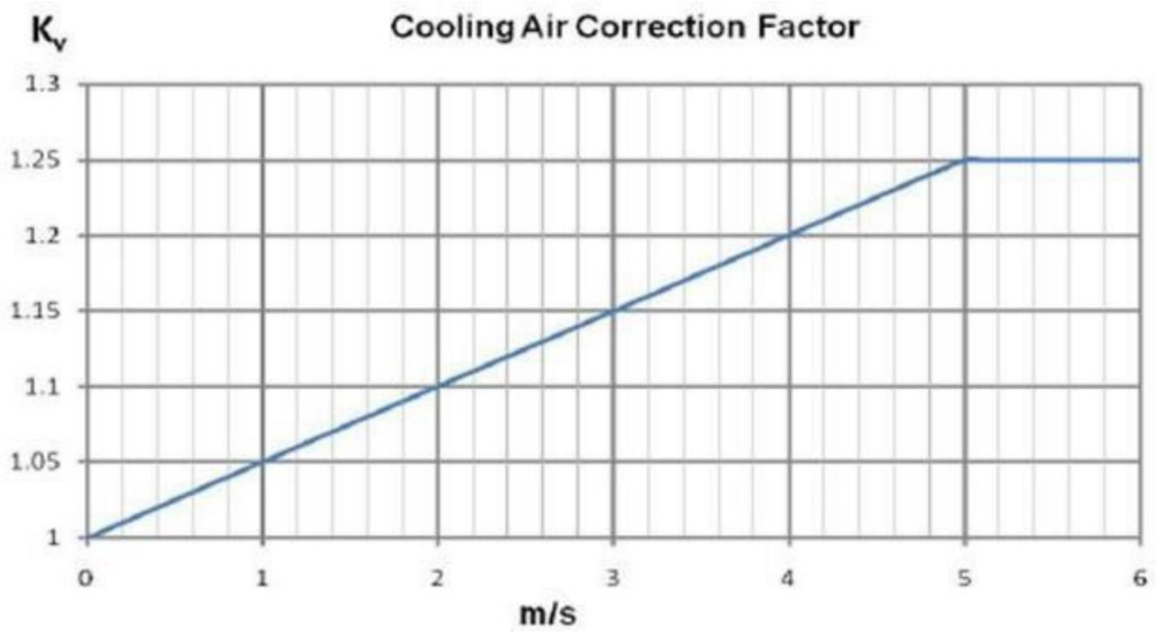
The size of connected busbars or cables impacts heat conduction away from the fuse. Use the curve below to determine the K_e factor based on the conductor's current density.

- 100% on the X-axis corresponds to a current density of 1.3 A/mm²



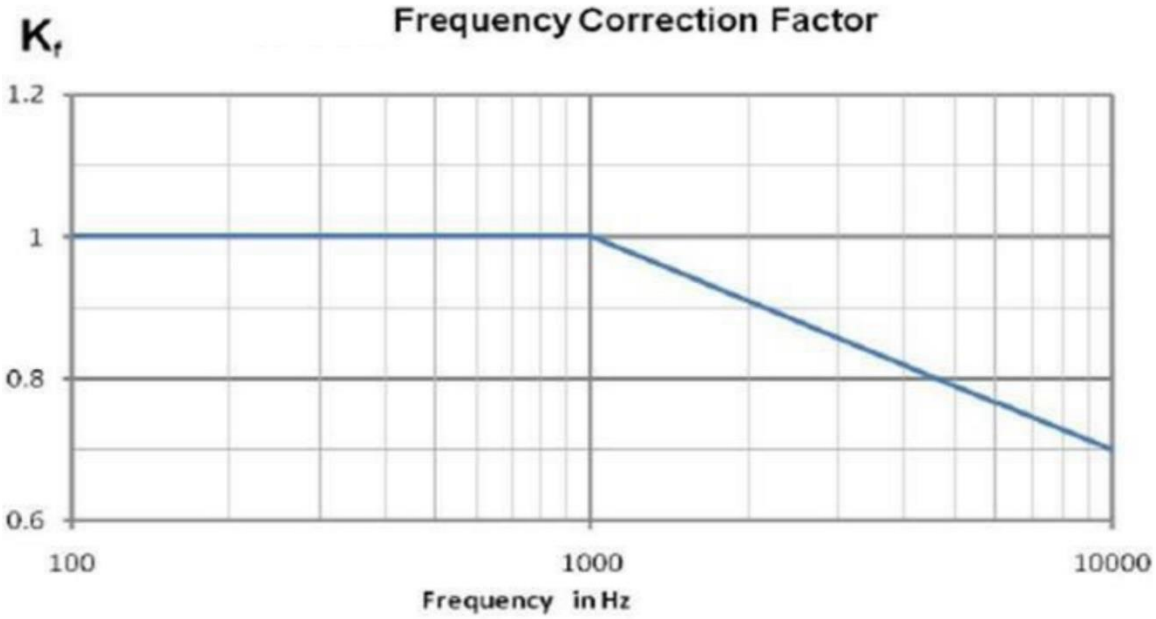
Forced Cooling Correction Factor (K_v)

Applying forced air cooling enhances thermal convection, allowing the fuse to carry more current. Use the curve below to determine the K_v factor.



Frequency Derating Factor (K_f)

For applications with high-frequency harmonics (above 1000 Hz skin effect increases the fuse's effective resistance and requires derating. Use the curve below to find the K_f factor.



Altitude Derating Factor (K_a)

The standard operating altitude is up to 2000 meters. Above this, thinner air reduces cooling effectiveness.

- **Derating:** Derate the fuse's current rating by 3% to 5% for every 1000 meters of elevation above 2000m.

- **Enclosed Applications:** If the fuse is in a sealed enclosure where the internal temperature remains high (e.g., >40°C) regardless of external altitude changes, this derating must be applied.
- **Insulation:** The impact of high altitude on insulation strength is a system-level consideration and does not require separate derating for the fuse itself, which acts as a conductor in normal operation.

Installation Environment Factor (K_b)

The enclosure type affects airflow and heat dissipation around the fuse.

- Open-type enclosure: **K_b = 1.0**
- Sealed enclosure: **K_b = 0.9 – 0.95**
- Installation in MSD (Manual Service Disconnect) with bolt fastening: **K_b = 0.8**
- Installation in MSD with plug-in connection: **K_b = 0.7**

Load Constant (G)

Consider the load type to prevent nuisance tripping from inrush currents.

- Purely resistive load (no inrush): **G = 1.0**
- Resistive load with moderate peak/inrush current: **G = 1.1 – 1.2**
- Highly capacitive or inductive loads with high peak inrush current: **G = 1.5 – 1.7**

Operating & Storage Conditions

No.	Parameter	Requirement / Value
1	**Electrical**	
	Max Operating Voltage	≤ 1000 Vdc
2	**Operating Environment**	
	Normal Ambient Temperature	-5°C to +40°C
	Allowed Full Operating Temperature	-40°C to +125°C
	Relative Humidity	5% to 95%
3	**Altitude**	
	Normal Operating Altitude	≤ 2000 m
	Maximum Allowed Altitude (with derating)	≤ 5500 m
	Atmospheric Pressure	61.6 kPa to 106.2 kPa
4	**Storage Environment**	
	Normal Storage Conditions	-5°C to +85°C, RH < 75%

	Allowed Storage Temperature	-40°C to +120°C
5	**Installation**	
	Recommended Installation Torque (M6 Bolt)	**6 ± 1 N·m**
6	**Contamination**	
	Pollution Degree	III

Note:
Operation outside the "Normal" conditions but within the "Allowed" range may require applying the derating factors outlined in this document. For applications with conditions exceeding these specifications, please contact Component Basics technical support for an application review.

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