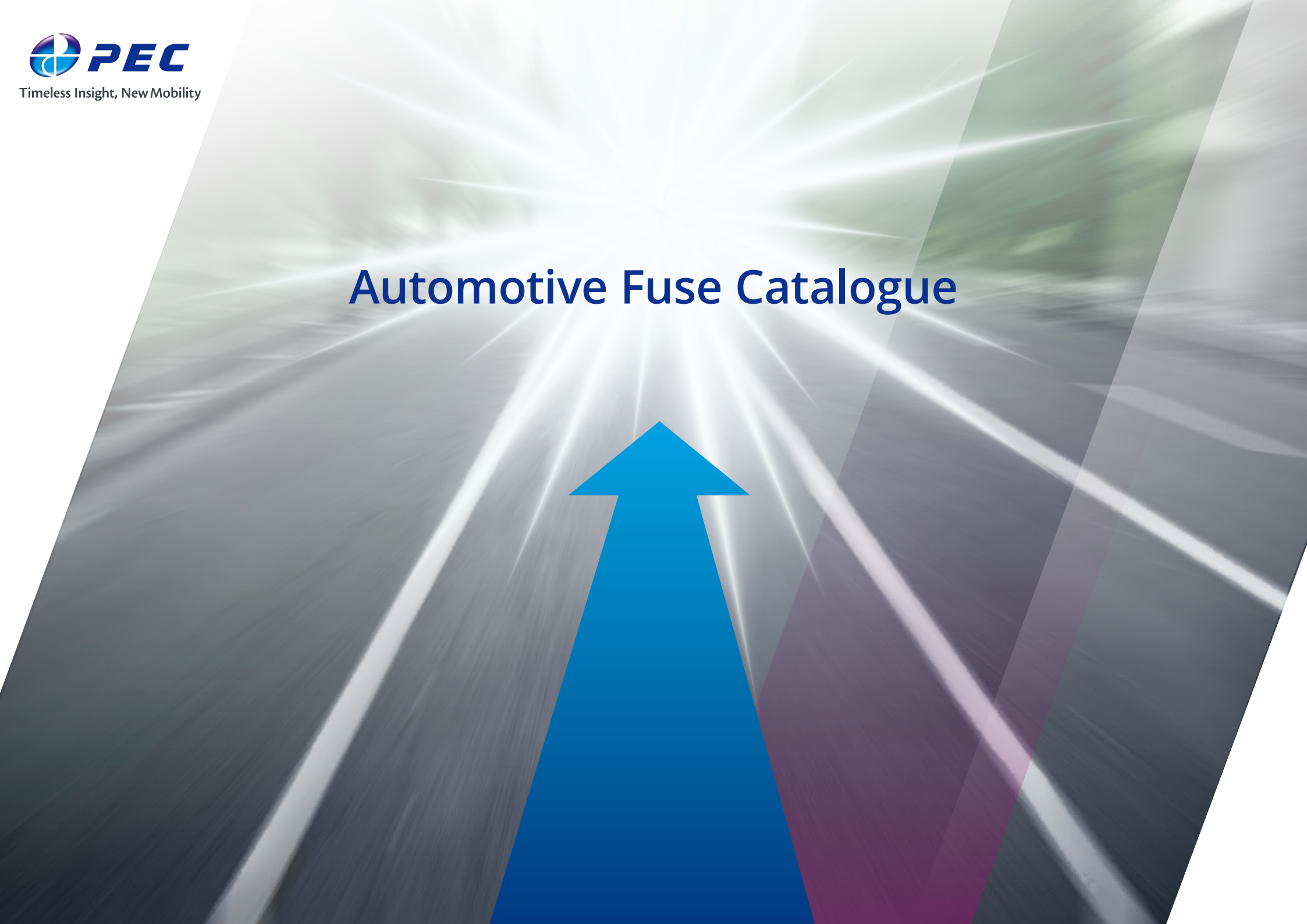
PEC

Timeless Insight, New Mobility

Automotive Fuse Catalogue



As a leading fuse maker, PEC will continue to deliver unrivaled quality and reliability through specialized technology.

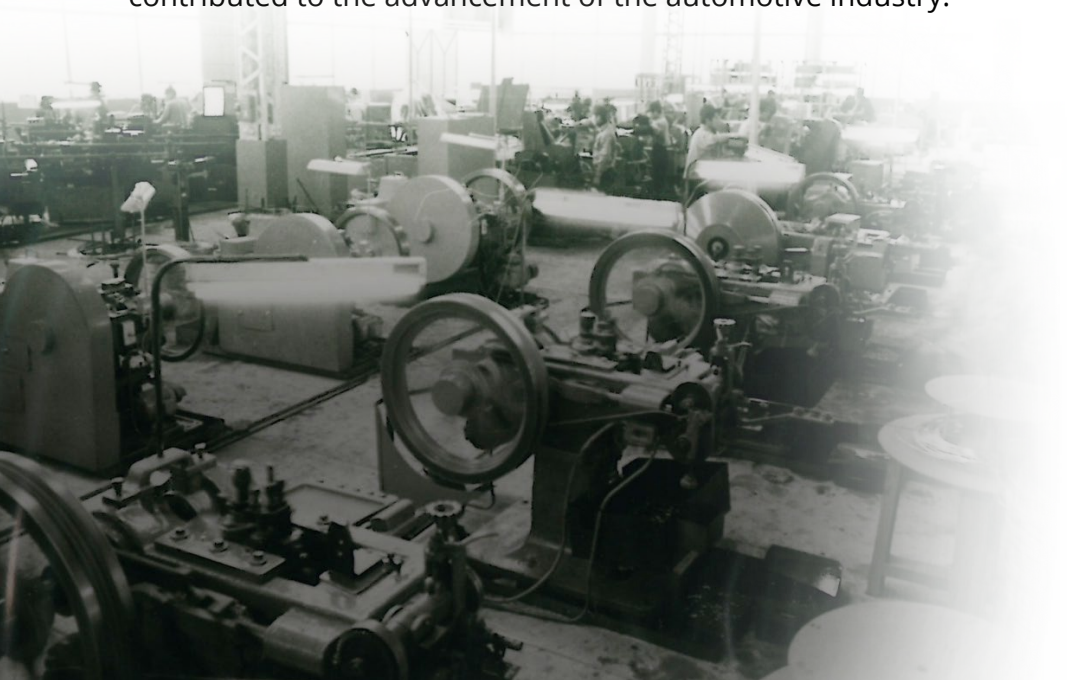
The competitive automotive industry continues to introduce new products and technologies toward the creation of a safer, more comfortable automotive society.
As one of the world's leading fuse makers,
Pacific Engineering Corporation (PEC) is fully committed to achieving this goal.
Fuses must be absolutely reliable as the last line of defense for electronic devices and electric wiring, which are increasingly being adopted in vehicles.
PEC will continue to deliver original, high-quality products by leveraging its accumulated expertise and rigorous quality control.
With an unwavering spirit, we will continue to pursue new challenges.

PEC
Timeless Insight, New Mobility

PEC
Timeless Insight, New Mobility

Meeting the demands of the prevailing times through technology and innovative thinking in step with developments in the automotive industry

Fuses are an indispensable part of automobiles.
The evolution in automobiles has propelled advances in fuses,
while the invention of new fuses has conversely
supported the development of new automobiles.
Since PEC entered the fuse market in 1970,
it has developed cutting-edge fuse products and
contributed to the advancement of the automotive industry.



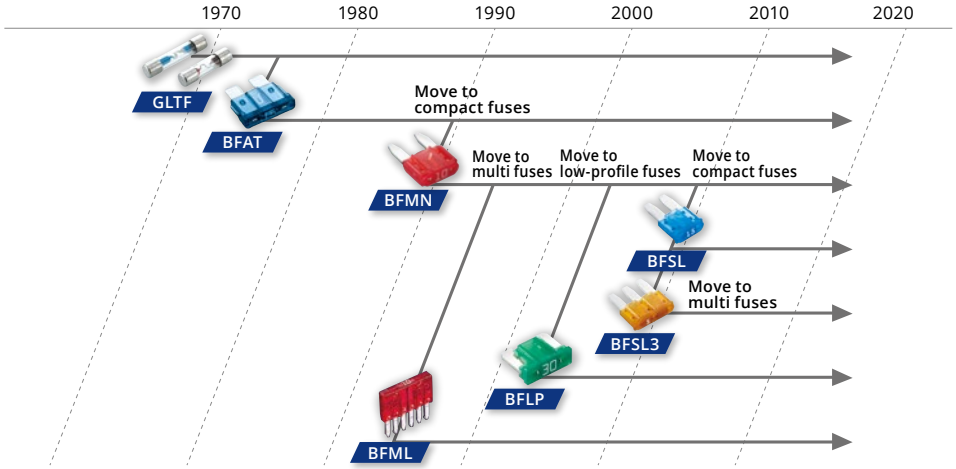
Blade Fuses

In 1960–70, automobiles were equipped with glass tube fuses, which were manufactured by hand at the time. PEC became the first company worldwide to successfully achieve automated mass production of such fuses in 1971, thus responding to the needs of various sectors including the automotive industry. Not long thereafter, in 1975, the company started production of blade fuses (auto fuses), which have become the most common type of automotive fuse in use today. Compared with glass tube fuses, blade fuses have a simpler structure and excel in terms of size (more compact), weight (lighter) and durability. PEC recognized the utility of blade fuses early on and has accumulated extensive manufacturing expertise for this product. Blade fuses have been successively adopted by automakers, leading to widespread usage. Prompted by automaker calls for products tailored to the growing complexity of automotive electronics and miniaturization of circuits, blade fuses went through a series of improvements that gave rise to multi fuses and more compact versions, and these are currently still utilized in a large number of automobiles.

BFAT

BFMN

Transformation of Blade Fuses



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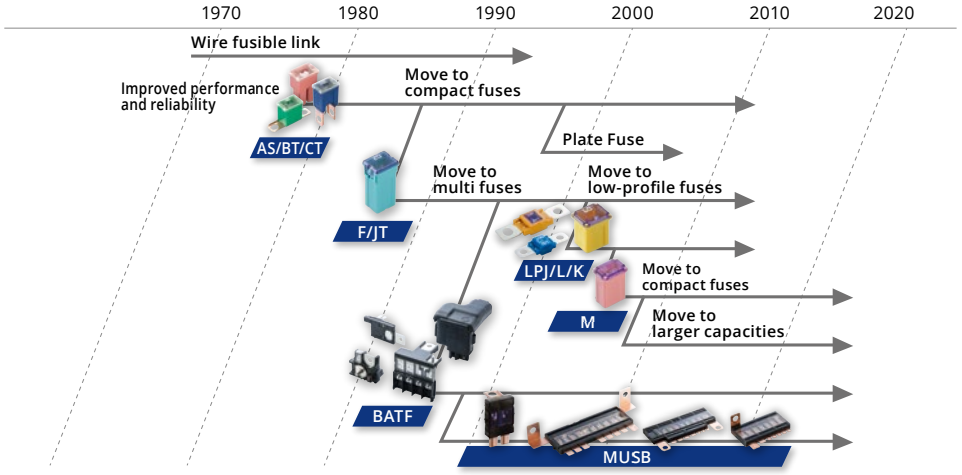
Slow blow fuses

Moving into the 1980s, automobiles continued to increasingly incorporate electronics, and the pursuit of enhanced driving comfort led to the introduction of various new functions such as power windows, automatic wipers and air conditioning. In conjunction with this trend, automobiles started featuring multiple motors. Auto fuses, which blow out immediately when their threshold capacity is exceeded, were unsuitable for motors because the latter generate a current that far exceeds their rated load when they are switched on. This meant a new type of fuse was needed. In response, PEC developed slow blow fuses that delayed the temperature rise accompanying high currents and therefore did not blow out immediately. The company started sales of slow blow fuses in 1982. The product was well received by the market and came to be used worldwide. From the 2000s, PEC expanded its product portfolio with multi slow blow fuses, which protect multiple circuits, to accommodate the growing complexity of electronic control systems used in automobiles.

SBFC-JT

SBFC-M

Transformation of Slow Blow Fuses

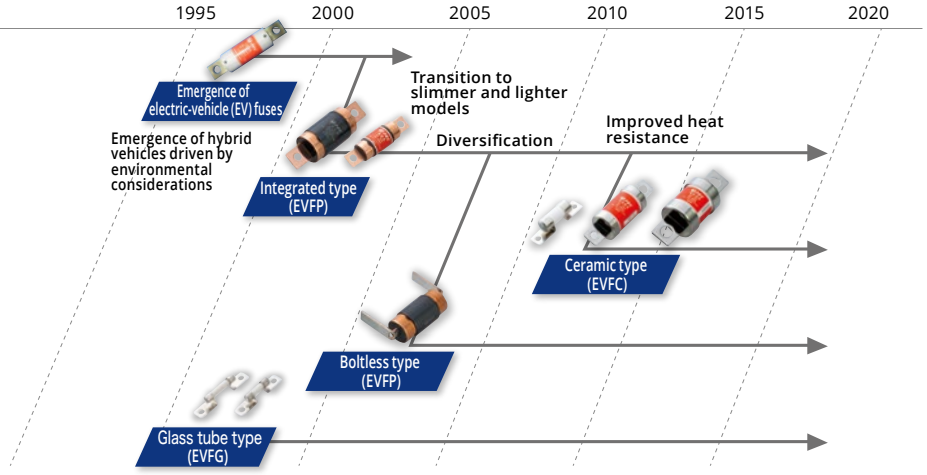


Electric vehicle fuses

From the late 1990s, automakers around the world started exploring the production of environmentally friendly vehicles. The most promising strategy at the time appeared to be the use of electricity as a power source for driving. Automakers thus ramped up development of hybrid vehicles, which combined conventional engines with electric motors, and electric vehicles (EVs). However, the resulting next-generation vehicles required an entirely new type of fuse. Electric-powered driving needs much higher voltages for on-board electronics, which conventional fuses could not withstand. In addition to blown fuses, another problem was that the high voltage could also give rise to an arc discharge phenomenon that would result in the destruction of circuits. To resolve these issues, PEC developed dedicated EV fuses for hybrid cars in 1997. The new fuses were adopted in the first hybrid vehicle that year and by various automakers later. To this day, they continue to be used by virtually all automakers around the world in a wide range of applications, and they have also been adopted in F1 and other racing vehicles.

EVFC

Transformation of High-voltage Fuses



Ampere Ratings and Housing Color

In fuses, the ampere rating and the type of fuse are indicated by the color of the fuse housing. Please refer to the diagram below for ampere ratings and housing colors.

BF [Ampere Ratings - Housing Colors]

[1A-Black] [2A-Gray] [3A-Violet] [4A-Pink] [5A-Tan] [7.5A-Brown]

[10A-Red] [15A-Blue] [20A-Yellow] [25A-Natural] [30A-Green] [40A-Orange]

SBF [Ampere Ratings - Housing Colors]

[20A-Light Blue] [25A-White] [30A-Pink] [40A-Green] [50A-Red] [60A-Yellow]

[70A-Brown] [80A-Black] [100A-Blue] [120A-White] [140A-Maroon]

International Standards

International Standard Part

In Japan, standards for automotive fuses are deliberated on by the Fuse Subcommittee of the Society of Automotive Engineers of Japan, and are published in JASO standards. These standards then undergo a consultation process with representatives of various countries, and are harmonized internationally as ISO standards.

*Standard International Products

RoHS

The RoHS* Directive, an EU environmental regulation, prohibits from products specific substances such as lead and mercury, in order to reduce the environmental burden from the disposal of electric and electronic devices.

*Restriction of Hazardous Substances

UL Standard

The UL standard is the safety standard established by UL (Underwriters Laboratories Inc.), a U.S. non-profit organization. To meet the UL standard, electric products, parts, and materials must pass a safety test.

ELV

The ELV Directive, or end-of-life vehicle directive, is an EU set of environmental restrictions aimed at reducing the environmental burden of cars when they are being disposed of by reducing automotive waste and end-of-life vehicles. Under this regulation, automobile manufacturers are required to assume the costs for the recovery and recycling of car-related waste.

*End of Life Vehicle

Meeting the needs of hybrid and electric cars.

High Voltage automotive fuses for next generation vehicles

High Voltage Fuse

EVF

High Voltage Fuse

RoHS ELV

EVFP(ϕ30)

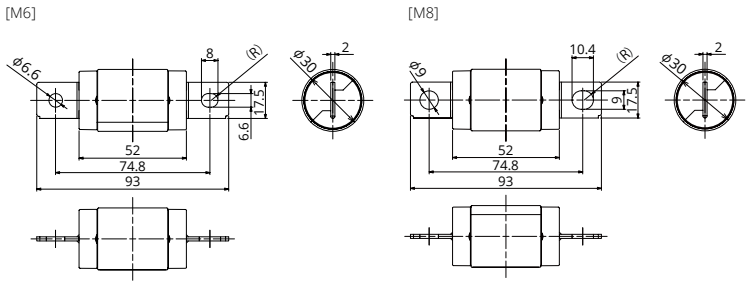
Lightweight and compact High Voltage automotive fuses with excellent vibration resistance properties

General Specification

Rated Voltage	DC500V
Breaking Capacity	16000A
Recommended Operating Temp.	-40°C~85°C*2
Standard	—
Country of Origin	Japan
Plating	—
Standard Packaging	80
Insertion Force	—
Pull-out Load	—
Recommended Torque	M6(6.0±1.0)N·m M8(12.0±1.0)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Bolt Size	Diameter	Resistance Value	Voltage Drop*1
150	2940	M6	ϕ30	0.52 mΩ	44 mV
175	2941			0.43 mΩ	44 mV
200	2942			0.37 mΩ	44 mV
225	2943			0.33 mΩ	43 mV
250	2944			0.31 mΩ	44 mV
300	2945			0.25 mΩ	46 mV
150	2950	M8		0.52 mΩ	44 mV
175	2951			0.43 mΩ	44 mV
200	2952			0.37 mΩ	44 mV
225	2953			0.33 mΩ	43 mV
250	2954			0.31 mΩ	44 mV
300	2955			0.25 mΩ	46 mV

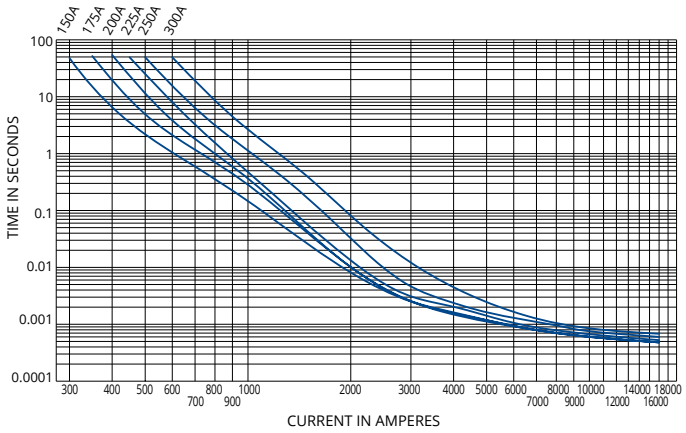
*1 Voltage drop: apply 50% of the rated current.
*In case a product other than the ones published in this document is desired, please contact us for details.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	4hrs.	—
200%	5sec.	100sec.
300%	0.5sec.	15sec.
500%	—	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



High Voltage Fuse

RoHS ELV

EVFP(ϕ38)

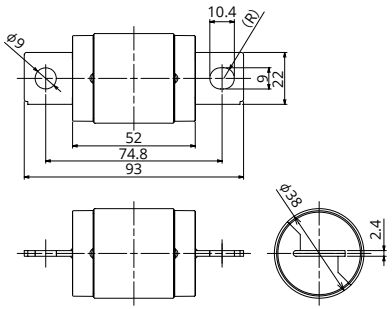
Lightweight and compact High Voltage automotive fuses with excellent vibration resistance properties

General Specification

Rated Voltage	DC500V
Breaking Capacity	30000A
Recommended Operating Temp.	-40°C～85°C*2
Standard	—
Country of Origin	Japan
Plating	—
Standard Packaging	40
Insertion Force	—
Pull-out Load	—
Recommended Torque	(12.0±1.0)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Bolt Size	Diameter	Resistance Value	Voltage Drop*1
350	2976	M8	ϕ38	0.24 mΩ	52 mV
400	2977			0.20 mΩ	52 mV
450	2978			0.17 mΩ	49 mV
500	2979			0.15 mΩ	48 mV

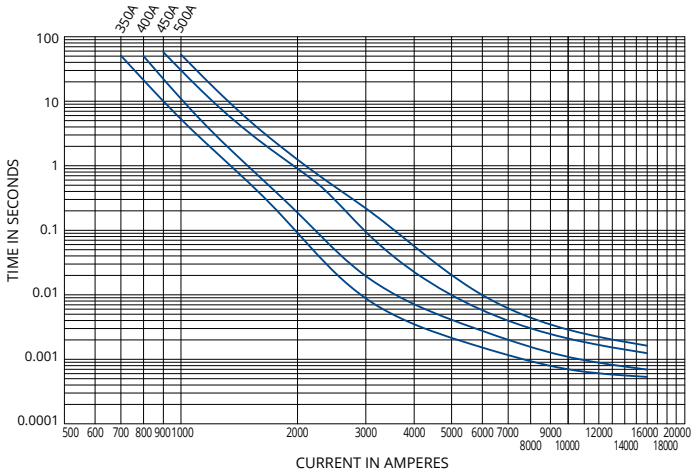
*1 Voltage drop:apply 50% of the rated current.
*In case a product other than the ones published in the document is desired, please contact us.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	4hrs.	—
200%	5sec.	100sec.
300%	0.5sec.	15sec.
500%	—	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



High Voltage Fuse

EVFP(ϕ38) Tin plating

RoHS ELV

PEC Timeless Insight, New Mobility

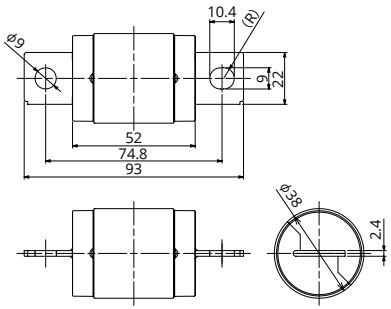
Lightweight and compact High Voltage automotive fuses with excellent vibration resistance properties

General Specification

Rated Voltage	DC500V
Breaking Capacity	30000A
Recommended Operating Temp.	-40°C～85°C*2
Standard	—
Country of Origin	Japan
Plating	Tin plating
Standard Packaging	40
Insertion Force	—
Pull-out Load	—
Recommended Torque	(12.0±1.0)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Bolt Size	Diameter	Resistance Value	Voltage Drop*1
350	2986	M8	ϕ38	0.24 mΩ	52 mV
400	2987			0.20 mΩ	52 mV
450	2988			0.17 mΩ	49 mV
500	2989			0.15 mΩ	48 mV

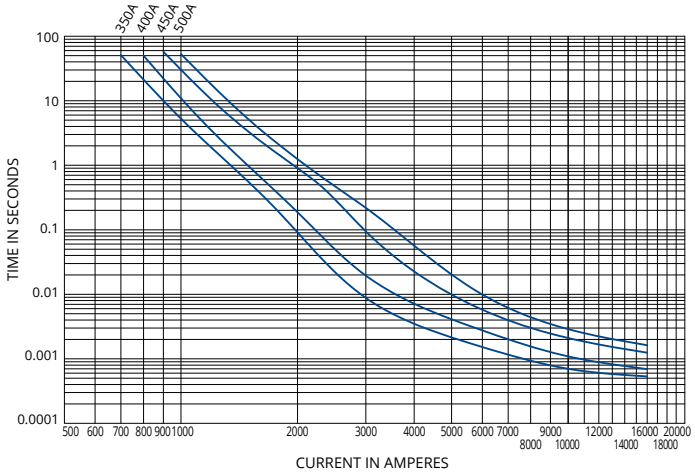
*1 Voltage drop:apply 50% of the rated current.
*In case a product other than the ones published in the document is desired, please contact us.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	4hrs.	—
200%	5sec.	100sec.
300%	0.5sec.	15sec.
500%	—	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



High Voltage Fuse

RoHS ELV

EVFP(38×64)

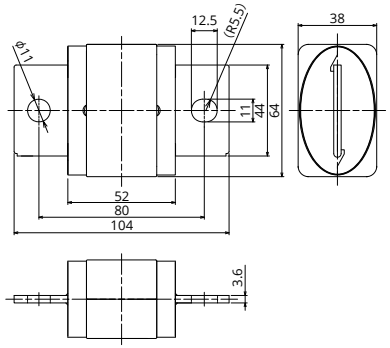
Lightweight and compact High Voltage automotive fuses with excellent vibration resistance properties

General Specification

Rated Voltage	DC500V
Breaking Capacity	30000A
Recommended Operating Temp.	-40°C～100°C*2
Standard	—
Country of Origin	Japan
Plating	Tin plating
Standard Packaging	32
Insertion Force	—
Pull-out Load	—
Recommended Torque	(16.0±1.0)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Bolt Size	Diameter	Resistance Value	Voltage Drop*1
600	2970	M8	—	0.14 mΩ	52 mV
700	2971			0.12 mΩ	50 mV
800	2972			0.10 mΩ	51 mV
900	2973			0.088 mΩ	53 mV
1000	2974			0.081 mΩ	51 mV

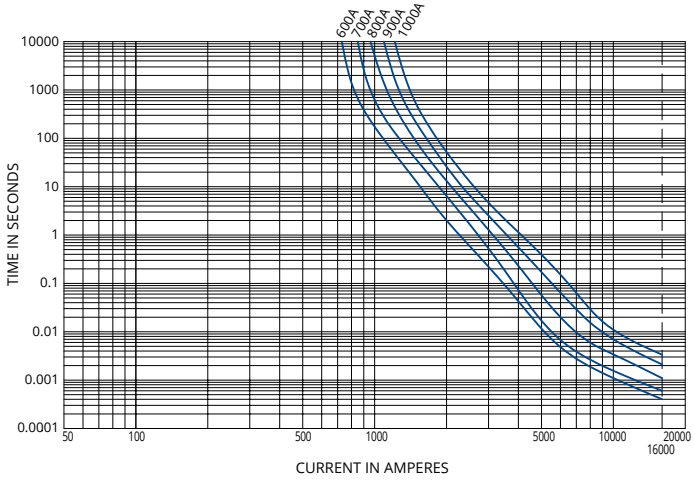
*1 Voltage drop:apply 50% of the rated current.
*In case a product other than the ones published in the document is desired, please contact us.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	4hrs.	—
200%	5sec.	100sec.
300%	0.5sec.	15sec.
500%	—	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



High Voltage Fuse

RoHS ELV

EVFC(ϕ6.7)

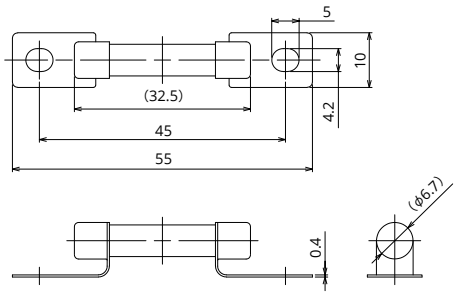
Fuses to protect auxiliary system circuits such as electric compressors and DC/DC converters

General Specification

Rated Voltage	DC450V
Breaking Capacity	2000A
Recommended Operating Temp.	-40°C～100°C*2
Standard	—
Country of Origin	China
Plating	Ni Plating
Standard Packaging	400
Insertion Force	—
Pull-out Load	—
Recommended Torque	(2.1±0.2)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Bolt Size	Diameter	Resistance Value	Voltage Drop
1	2704	M4	ϕ6.7	645.0 mΩ	710 mV
5	2705			43.0 mΩ	400 mV

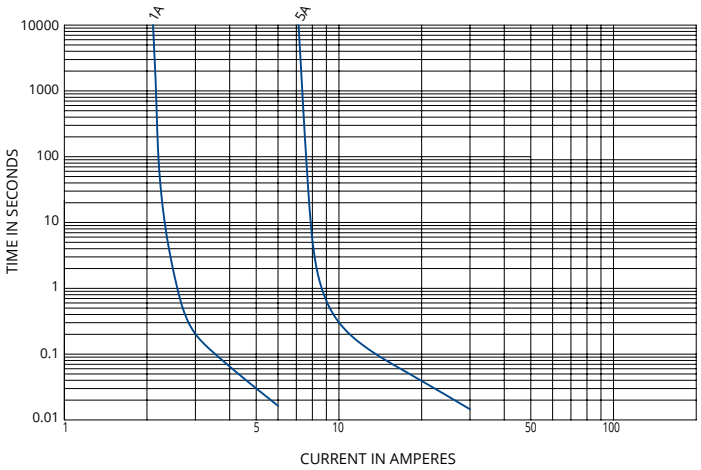
*In case a product other than the ones published in the document is desired, please contact us.
*This product is under development, so please contact us for the details.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	100hrs.	—
350%	—	0.5sec.
600%	—	0.2sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current CharacteristicChart



High Voltage Fuse

EVFC(ϕ10.3)

RoHS | ELV | UL standard

PEC
Timeless Insight, New Mobility

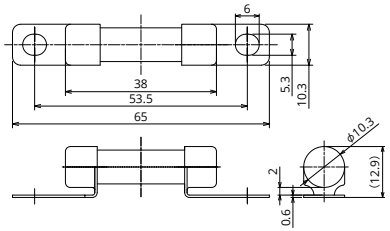
Fuses to protect auxiliary system circuits such as electric compressors and DC/DC converters

General Specification

Rated Voltage	DC500V
Breaking Capacity	20000A
Recommended Operating Temp.	-40°C~100°C*2
Standard	—
Country of Origin	Japan
Plating	Tin plating
Standard Packaging	240
Insertion Force	—
Pull-out Load	—
Recommended Torque	(4.5±1.0)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Bolt Size	Diameter	Resistance Value	Voltage Drop*1
15	2789	M5	ϕ10.3	14.3 mΩ	107 mV
20	2790			10.6 mΩ	112 mV
30	2791			3.4 mΩ	55 mV
40	2792			2.2 mΩ	50 mV
50	2683			1.7 mΩ	47 mV

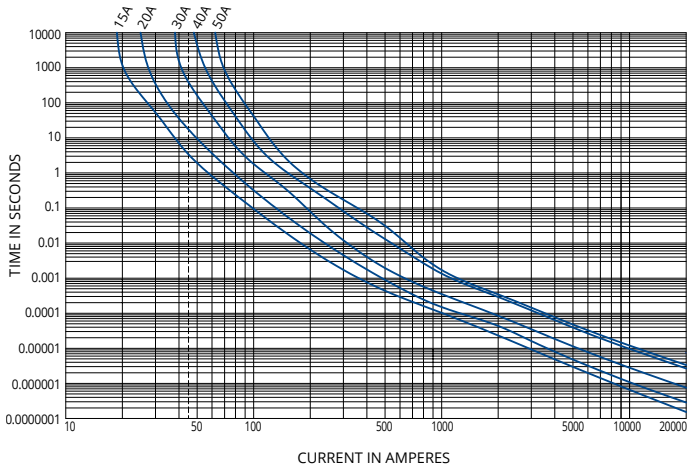
*1 Voltage drop: apply 50% of the rated current.
*In case a product other than the ones published in the document is desired, please contact us.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	4hrs.	—
135%	300sec.	3600sec.
200%	5sec.	100sec.
300%	0.5sec.	15sec.
500%	—	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



High Voltage Fuse

EVFC(ϕ20)

RoHS | ELV | UL standard

PEC
Timeless Insight, New Mobility

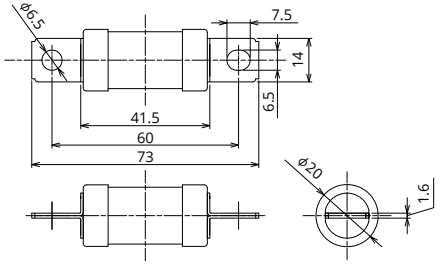
High Voltage automotive fuses with excellent durability properties

General Specification

Rated Voltage	DC500V
Breaking Capacity	20000A
Recommended Operating Temp.	-40°C～125°C*2
Standard	—
Country of Origin	Japan
Plating	Tin plating
Standard Packaging	140
Insertion Force	—
Pull-out Load	—
Recommended Torque	(9.0±1.0)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Bolt Size	Diameter	Resistance Value	Voltage Drop*1
60	2801	M6	ϕ20	1.4 mΩ	48 mV
70	2802			1.2 mΩ	49 mV
80	2803			1.1 mΩ	49 mV
100	2804			0.9 mΩ	51 mV
125	2805			0.7 mΩ	51 mV

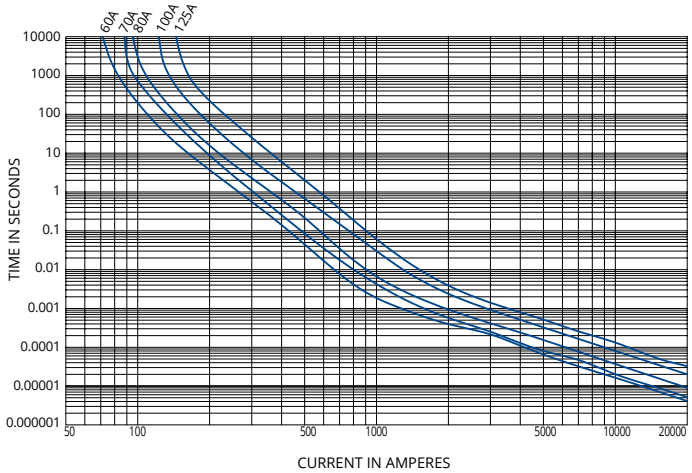
*1 Voltage drop:apply 50% of the rated current.
*In case product other than the ones published in this document is desired, please contact us for details.

Time-Current Characteristic

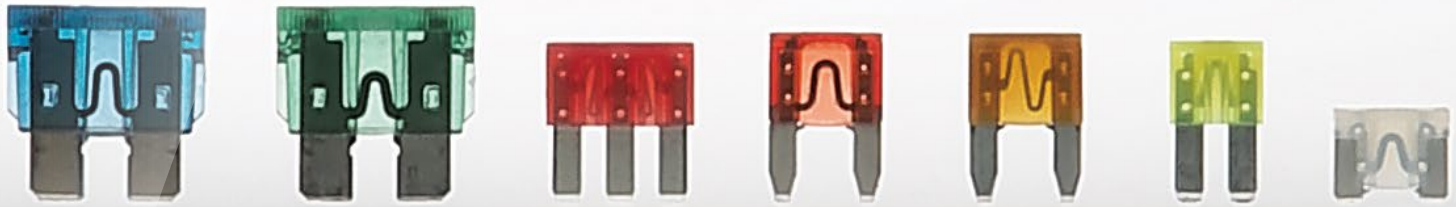
% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	4hrs.	—
135%	150sec.	3600sec.
150%	20sec.	1000sec.
200%	8sec.	150sec.
300%	1sec.	15sec.
500%	0.05sec.	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



Automotive fuses that are most used
by the automotive manufacturers in the world



Blade Fuse

BF

BFSL

International Standard Part | RoHS | ELV

PEC
Timeless Insight, New Mobility

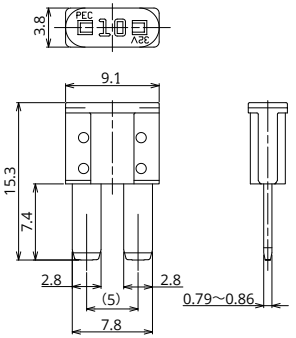
This state-of-the-art blade fuse was realized by reducing the width of the BFMN to offer space reduction

General Specification

Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	ISO8820-12
Country of Origin	Japan
Plating	Ag Plating
Standard Packaging	18,000
Insertion Force	—
Pull-out Load	—
Recommended Torque	—

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
3	1168	Violet	32.3 mΩ	131 mV
4	1169	Pink	23.1 mΩ	121 mV
5	1173	Tan	17.7 mΩ	122 mV
7.5	1174	Brown	11.0 mΩ	109 mV
10	1175	Red	7.9 mΩ	111 mV
15	1176	Blue	5.1 mΩ	110 mV
20	1177	Yellow	3.6 mΩ	103 mV
25	1178	Natural	2.8 mΩ	97 mV
30	1179	Green	2.2 mΩ	96 mV

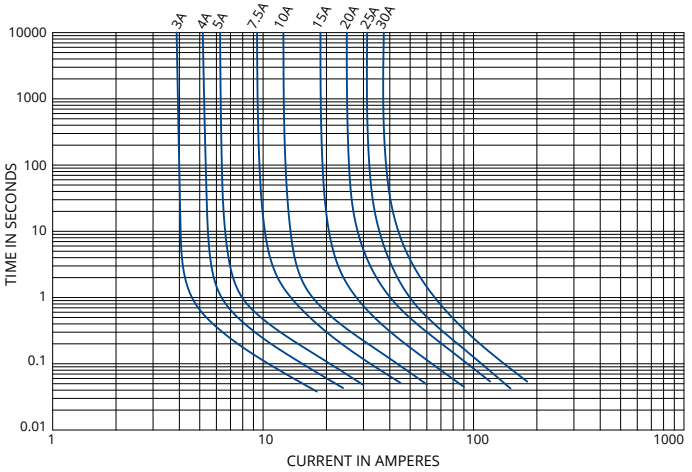
※1 Voltage drop: apply 100% of the rated current.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	100hrs.	—
135%	0.75sec.	120sec.
160%	0.25sec.	50sec.
200%	0.15sec.	5sec.
350%	0.04sec.	0.5sec.
600%	0.02sec.	0.1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



Blade Fuse

BFSL-3

International Standard Part | RoHS | ELV

PEC
Timeless Insight, New Mobility

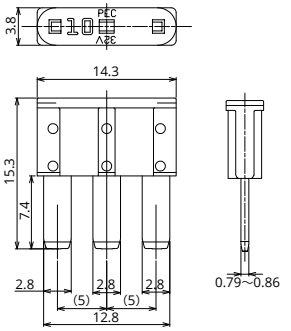
BFSL-3 is a multi terminal state-of-the-art blade fuse

General Specification

Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	ISO8820-13
Country of Origin	Japan
Plating	Ag Plating
Standard Packaging	10,000
Insertion Force	—
Pull-out Load	—
Recommended Torque	—

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
5	1183	Tan	16.7 mΩ	127 mV
7.5	1184	Brown	10.5 mΩ	112 mV
10	1185	Red	7.9 mΩ	114 mV
15	1186	Blue	5.0 mΩ	120 mV

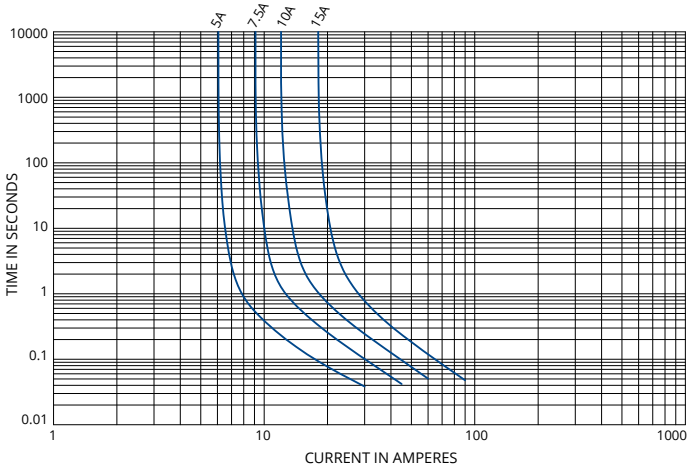
※1 Voltage drop: apply 100% of the rated current.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	100hrs.	—
135%	0.75sec.	120sec.
160%	0.25sec.	50sec.
200%	0.15sec.	5sec.
350%	0.04sec.	0.5sec.
600%	0.02sec.	0.1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



BFLP

International Standard Part | RoHS | ELV

PEC
Timeless Insight, New Mobility

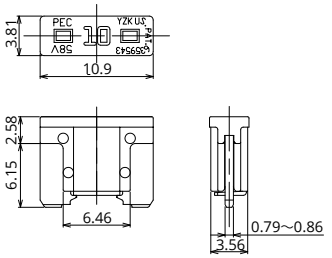
BFLP is a lower-cost and more compact BFMN

General Specification

Rated Voltage	DC58V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	ISO8820-9
Country of Origin	Japan/Mexico
Plating	Ag Plating
Standard Packaging	20,000
Insertion Force	—
Pull-out Load	—
Recommended Torque	—

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
2	1190	Gray	46.9 mΩ	126 mV
3	1191	Violet	30.4 mΩ	153 mV
4	1192	Pink	20.4 mΩ	111 mV
5	1193	Tan	16.5 mΩ	121 mV
7.5	1194	Brown	10.1 mΩ	107 mV
10	1195	Red	7.4 mΩ	104 mV
13	BB37	Pale orange	5.5 mΩ	117 mV
15	1196	Blue	4.6 mΩ	94 mV
17	BB38	Light blue	4.0 mΩ	106 mV
20	1197	Yellow	3.2 mΩ	91 mV
25	1198	Natural	2.5 mΩ	89 mV
30	1199	Green	1.9 mΩ	83 mV

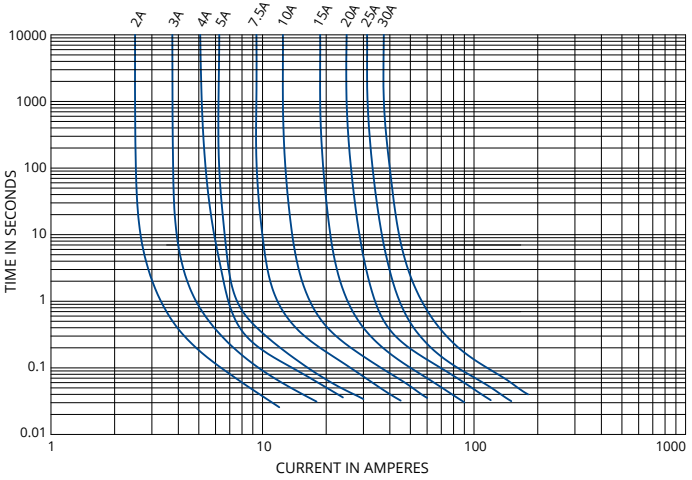
※1 Voltage drop: apply 100% of the rated current.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	100hrs.	—
135%	0.75sec.	600sec.
160%	0.25sec.	50sec.
200%	0.15sec.	5sec.
350%	0.04sec.	0.5sec.
600%	0.02sec.	0.1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



Blade Fuse

BFMN

International Standard Part | RoHS | ELV | UL standard

PEC
Timeless Insight, New Mobility

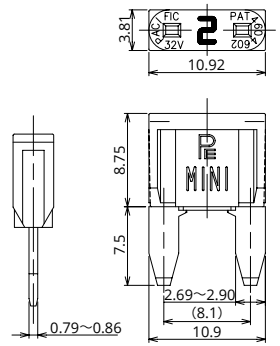
BFMN is a lower-cost and more compact BFAT

General Specification

Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	ISO8820-3
Country of Origin	Japan
Plating	Ag Plating
Standard Packaging	10,000
Insertion Force	—
Pull-out Load	—
Recommended Torque	—

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
1	1281	Black	123.5 mΩ	175 mV
2	1202	Gray	48.8 mΩ	149 mV
3	1203	Violet	29.7 mΩ	140 mV
4	1204	Pink	23.5 mΩ	142 mV
5	1205	Tan	16.6 mΩ	121 mV
7.5	1207	Brown	11.1 mΩ	131 mV
10	1210	Red	7.8 mΩ	115 mV
15	1215	Blue	4.9 mΩ	113 mV
20	1220	Yellow	3.5 mΩ	107 mV
25	1225	Natural	2.5 mΩ	99 mV
30	1230	Green	2.0 mΩ	95 mV

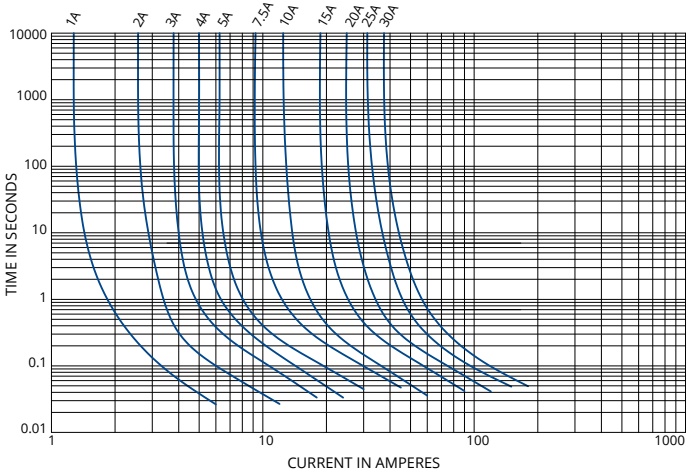
※1 Voltage drop: apply 100% of the rated current.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	100hrs.	—
135%	0.75sec.	600sec.
160%	0.25sec.	50sec.
200%	0.15sec.	5sec.
350%	0.04sec.	0.5sec.
600%	0.02sec.	0.1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



BFMN-S

International Standard Part | RoHS | ELV

PEC
Timeless Insight, New Mobility

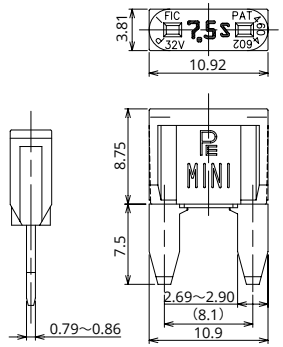
The BFMN-S is a blade fuse with the housing at the same level of UL standard V-0

General Specification

Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	ISO8820-3
Country of Origin	Japan
Plating	Ag Plating
Standard Packaging	10,000
Insertion Force	—
Pull-out Load	—
Recommended Torque	—

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
5	1271	Tan	16.9 mΩ	121 mV
7.5	1272	Brown	11.1 mΩ	131 mV
10	1273	Red	7.9 mΩ	109 mV
15	1274	Blue	4.9 mΩ	110 mV

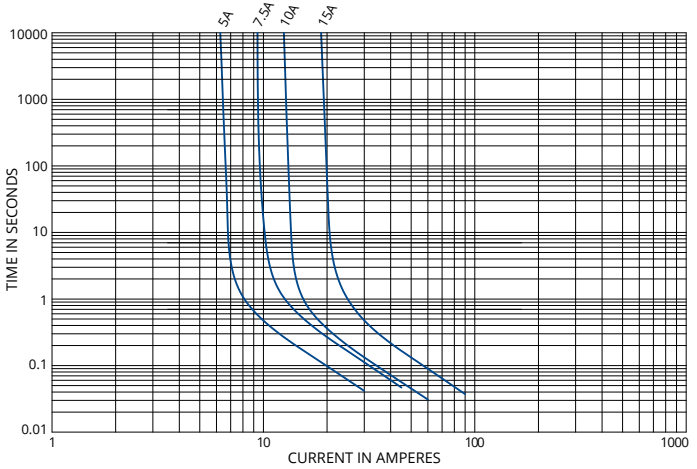
※1 Voltage drop: apply 100% of the rated current.

Time-Current Characteristic

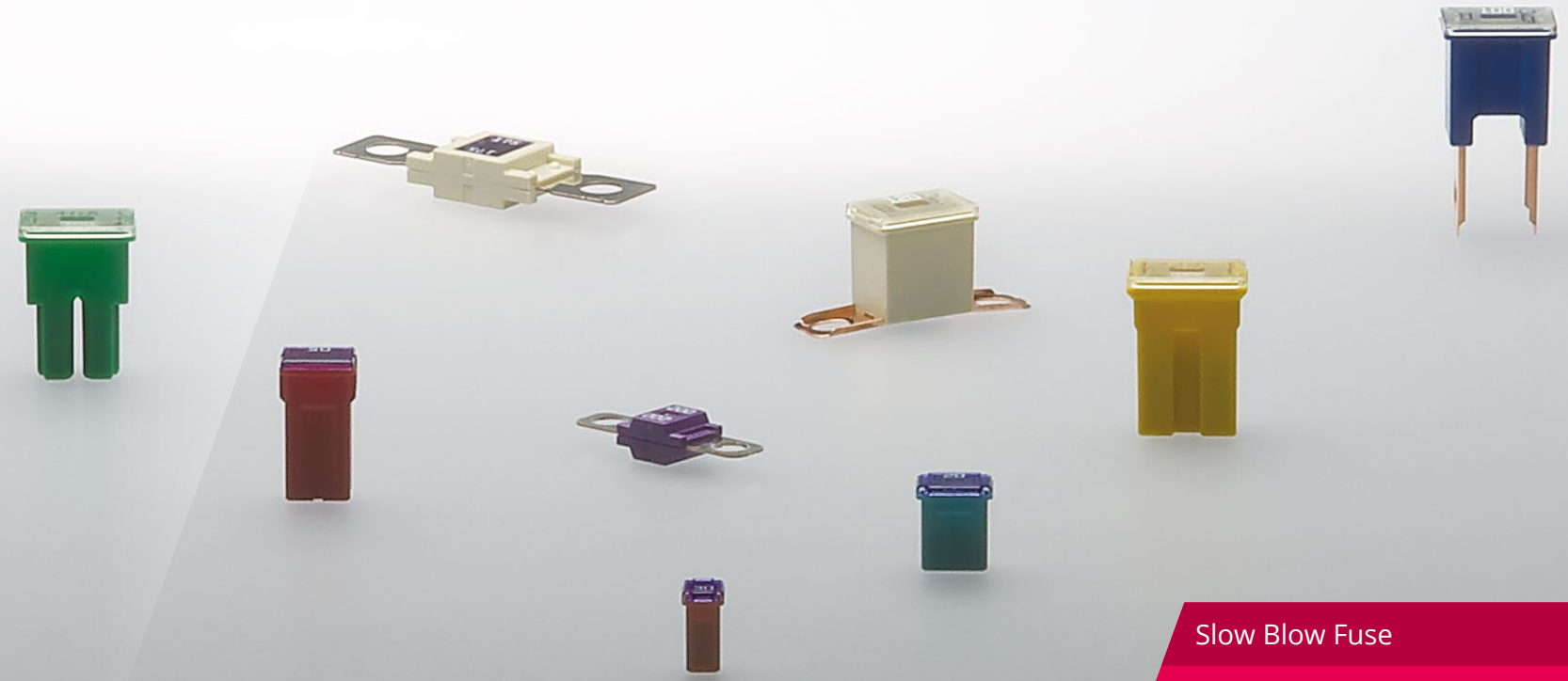
% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	100hrs.	—
135%	0.75sec.	600sec.
160%	0.25sec.	50sec.
200%	0.15sec.	5sec.
350%	0.04sec.	0.5sec.
600%	0.02sec.	0.1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



The safety and reliability of the fuses have dramatically increased and therefore their demand has expanded



Slow Blow Fuse

SBF

Slow Blow Fuse

SBFC-MS

RoHS ELV

PEC
Timeless Insight, New Mobility

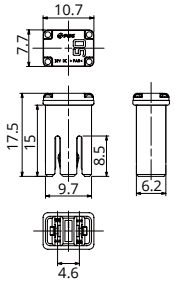
High-amperage SBFC-M

General Specification

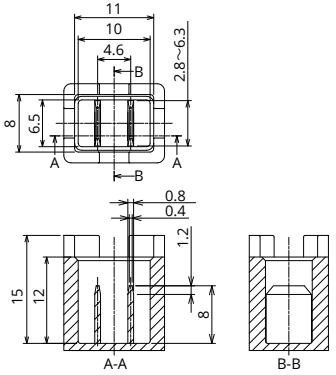
Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	—
Country of Origin	Japan
Plating	Tin plating
Standard Packaging	4,000
Insertion Force	44.1N
Pull-out Load	4N~24.5N
Recommended Torque	—

*2 Please contact us for the details of operating temperature.

Dimensions



Cavity



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
15	3125	Gray	5.3 mΩ	94 mV
20	3145	Light Blue	3.9 mΩ	93 mV
25	3155	White	3.2 mΩ	93 mV
30	3165	Pink	2.2 mΩ	80 mV
40	3175	Green	1.6 mΩ	76 mV
50	3185	Red	1.3 mΩ	84 mV
60	3195	Yellow	1.1 mΩ	71 mV

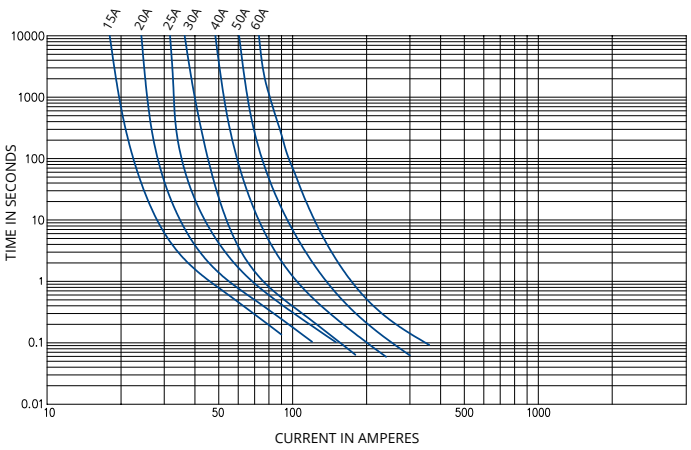
*1 Voltage drop: apply 100% of the rated current.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	100hrs.	—
135%	60sec.	1800sec.
200%	2sec.	60sec.
350%	0.2sec.	7sec.
600%	0.04sec.	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



Slow Blow Fuse

RoHS ELV

SBFC-M

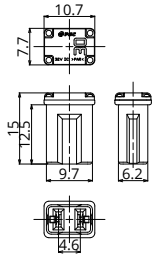
The SBFC-M is a more compact and more lightweight SBFC-LPJ fuse.
It is the world's smallest and lightest SBF

General Specification

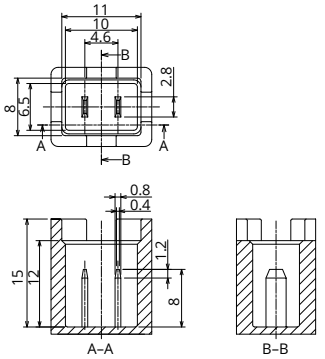
Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	JASO D612-4
Country of Origin	Japan/Mexico
Plating	Sn Plating
Standard Packaging	4,000
Insertion Force	44.1N
Pull-out Load	4N~24.5N
Recommended Torque	—

*2 Please contact us for the details of operating temperature.

Dimensions



Cavity



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
15	3113	Gray	5.3 mΩ	97 mV
20	3123	Light Blue	4.0 mΩ	94 mV
25	3173	White	3.1 mΩ	93 mV
30	3133	Pink	2.6 mΩ	92 mV
40	3143	Green	2.1 mΩ	98 mV

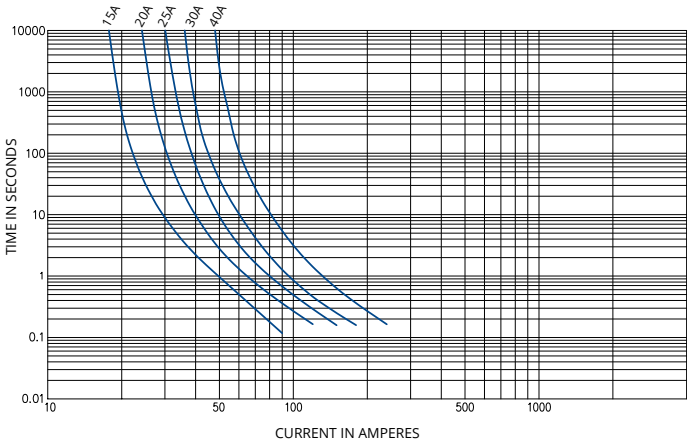
*1 Voltage drop: apply 100% of the rated current.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	100hrs.	—
135%	60sec.	1800sec.
200%	5sec.	60sec.
350%	0.2sec.	7sec.
600%	0.04sec.	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



SBF

Slow Blow Fuse

SBFC-LPJ

International Standard Part | RoHS | ELV

PEC
Timeless Insight, New Mobility

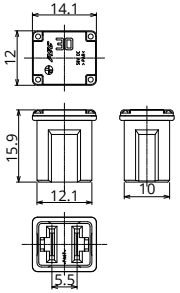
The SBFC-LPJ is a more compact and more lightweight SBFC-JT

General Specification

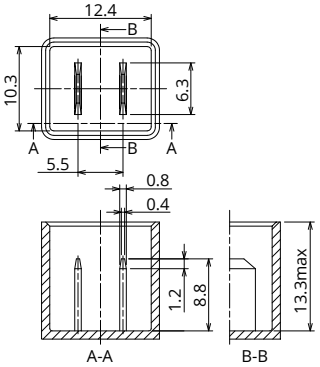
Rated Voltage	DC58V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	ISO8820-4
Country of Origin	Japan/Mexico
Plating	—
Standard Packaging	2,000
Insertion Force	44.1N
Pull-out Load	9.8N~24.5N
Recommended Torque	—

*2 Please contact us for the details of operating temperature.

Dimensions



Cavity



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
20	3422	Light Blue	4.3 mΩ	103 mV
25	3472	White	3.5 mΩ	106 mV
30	3432	Pink	3.0 mΩ	103 mV
40	3442	Green	1.9 mΩ	92 mV
50	3452	Red	1.5 mΩ	92 mV
60	3462	Yellow	1.2 mΩ	93 mV

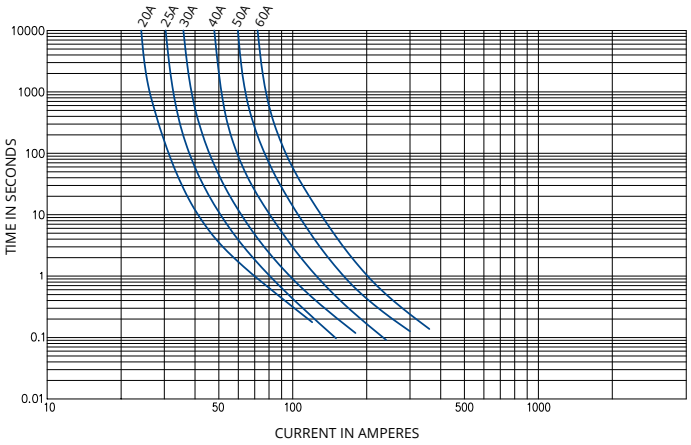
*1 Voltage drop: apply 100% of the rated current.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	100hrs.	—
135%	60sec.	1800sec.
200%	5sec.	60sec.
350%	0.2sec.	7sec.
600%	0.04sec.	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



Slow Blow Fuse

SBFC-JT

International Standard Part | RoHS | ELV

PEC
Timeless Insight, New Mobility

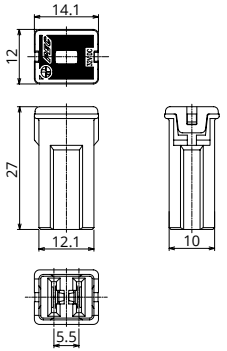
Low-amperage plug-in type fuse

General Specification

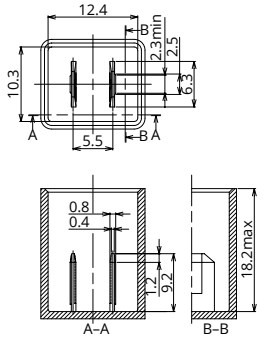
Rated Voltage	DC32V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	ISO8820-4
Country of Origin	Mexico
Plating	—
Standard Packaging	3,000
Insertion Force	44.1N
Pull-out Load	9.8N~24.5N
Recommended Torque	—

*2 Please contact us for the details of operating temperature.

Dimensions



Cavity



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
20	3424	Light Blue	4.8 mΩ	113 mV
25	3474	White	3.7 mΩ	105 mV
30	3434	Pink	3.1 mΩ	106 mV
40	3444	Green	2.0 mΩ	92 mV
50	3454	Red	1.7 mΩ	92 mV
60	3464	Yellow	1.2 mΩ	93 mV

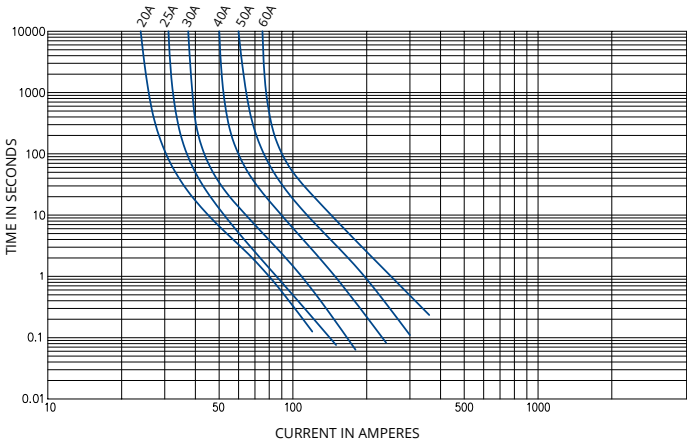
*1 Voltage drop: apply 100% of the rated current.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	100hrs.	—
135%	60sec.	1800sec.
200%	5sec.	60sec.
350%	0.2sec.	7sec.
600%	0.04sec.	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



Slow Blow Fuse

RoHS ELV

SBFC-ET

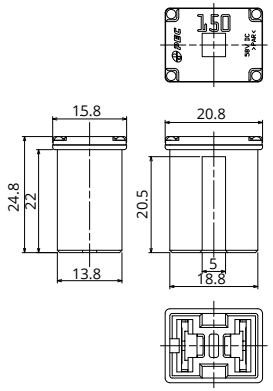
High-amperage plug-in type fuse

General Specification

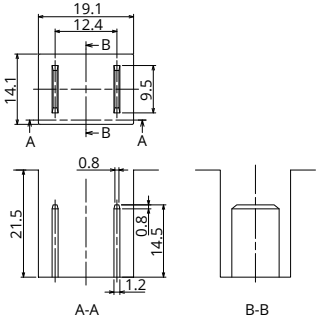
Rated Voltage	DC58V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	—
Country of Origin	Japan
Plating	Tin plating
Standard Packaging	500
Insertion Force	44.1N
Pull-out Load	9.8N~24.5N
Recommended Torque	—

*2 Please contact us for the details of operating temperature.

Dimensions



Cavity



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
50	3340	Red	1.2 mΩ	84 mV
60	3350	Yellow	1.0 mΩ	91 mV
70	3360	Brown	0.9 mΩ	84 mV
80	3370	Black	0.9 mΩ	84 mV
100	3380	Blue	0.7 mΩ	86 mV
125	3390	Pink	0.6 mΩ	98 mV
150	3400	Gray	0.5 mΩ	107 mV

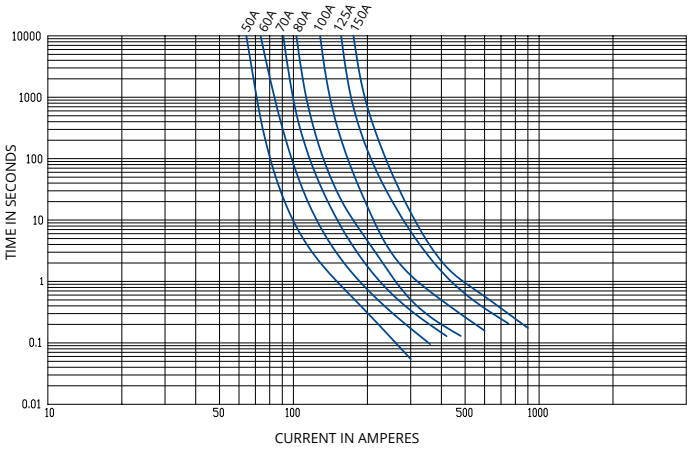
*1 Voltage drop:apply 100% of the rated current. (125A-150A: at 75% of the rated current)

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
110%	4hrs.	—
150%	30sec.	3600sec.
200%	5sec.	100sec.
350%	0.2sec.	7sec.
600%	0.04sec.	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



Slow Blow Fuse

SBFW-L M5

International Standard Part | RoHS | ELV

PEC
Timeless Insight, New Mobility

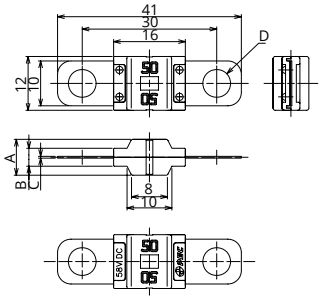
M5 bolt type

General Specification

Rated Voltage	DC58V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	ISO8820-5*3
Country of Origin	Japan
Plating	Sn Plating
Standard Packaging	2,000
Insertion Force	—
Pull-out Load	—
Recommended Torque	(4.5±1.0)N·m

*2 Please contact us for the details of operating temperature.
*3 Except for the breaking capacity

Dimensions



CURRENT RATING		DIMENSION		
		A	B	C
30A~80A	M5 TYPE	8	4	0.4
100A~200A	M5 TYPE	8.24	4.24	0.64

Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
30	3139	Orange	2.1 mΩ	86 mV
40	3149	Green	1.4 mΩ	77 mV
50	3159	Red	1.2 mΩ	73 mV
60	3169	Yellow	0.9 mΩ	71 mV
70	3179	Brown	0.7 mΩ	66 mV
80	3189	White	0.5 mΩ	51 mV
100	3107	Blue	0.4 mΩ	58 mV
125	3117	Pink	0.4 mΩ	59 mV

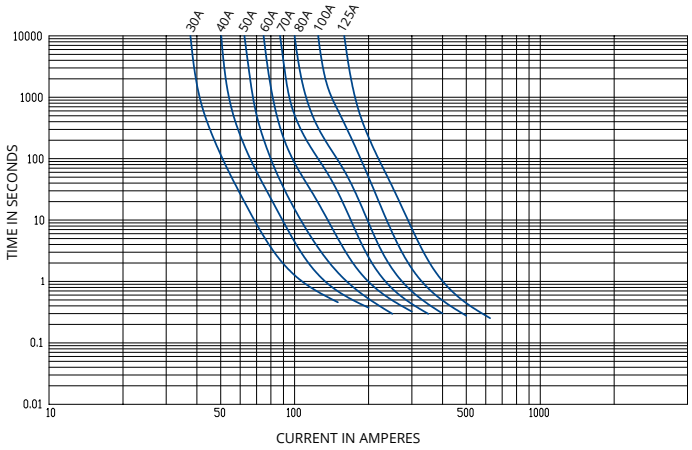
*1 Voltage drop: apply 100% of the rated current.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
100%	100hrs.	—
110%	4hrs.	—
150%	90sec.	3600sec.
200%	3sec.	100sec.
300%	0.3sec.	3sec.
500%	0.1sec.	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



SBFW-L M6

International Standard Part | RoHS | ELV

PEC
Timeless Insight, New Mobility

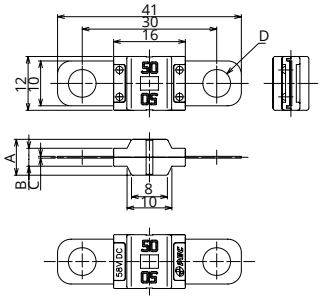
M6 bolt type

General Specification

Rated Voltage	DC58V
Breaking Capacity	1000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	ISO8820-5*3
Country of Origin	Japan
Plating	Sn Plating
Standard Packaging	2,000
Insertion Force	—
Pull-out Load	—
Recommended Torque	(6.0±1.0)N·m

*2 Please contact us for the details of operating temperature.
*3 Except for the breaking capacity

Dimensions



CURRENT RATING		DIMENSION		
		A	B	C
30A~80A	M6 TYPE	8	4	0.4
100A~200A	M6 TYPE	8.24	4.24	0.64

Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
30	3338	Orange	2.1 mΩ	86 mV
40	3348	Green	1.4 mΩ	77 mV
50	3358	Red	1.2 mΩ	73 mV
60	3368	Yellow	0.9 mΩ	71 mV
70	3378	Brown	0.7 mΩ	66 mV
80	3388	White	0.5 mΩ	51 mV
100	3319	Blue	0.4 mΩ	58 mV
125	3329	Pink	0.4 mΩ	59 mV
150	3108	Gray	0.4 mΩ	50 mV
175	3118	Tan	0.3 mΩ	51 mV
200	3128	Violet	0.3 mΩ	52 mV

*1 Voltage drop: apply 100% of the rated current (150A-200A: at 75% of the rated current).

Time-Current Characteristic [30A~125A]

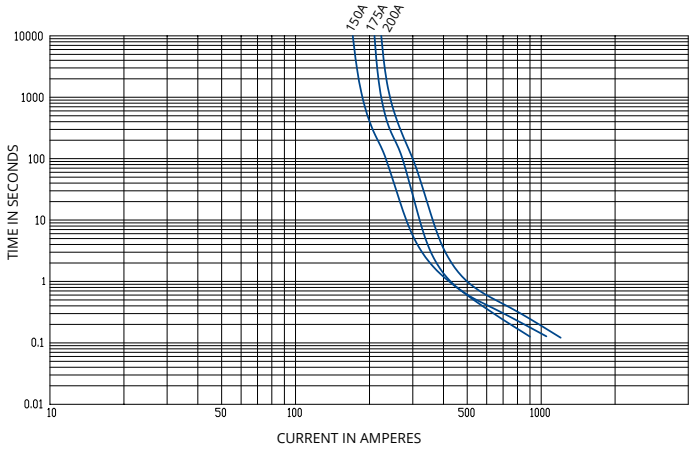
% of Ampere Rating(A)	Operating Time	
	Min	Max
100%	100hrs.	—
110%	4hrs.	—
150%	90sec.	3600sec.
200%	3sec.	100sec.
300%	0.3sec.	3sec.
500%	0.1sec.	1sec.

Time-Current Characteristic [150A~200A]

% of Ampere Rating(A)	Operating Time	
	Min	Max
75%	100hrs.	—
200%	1sec.	15sec.
350%	0.3sec.	5sec.
600%	0.1sec.	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



*Please refer to the blowing characteristic graph of the 30A to 125A fuses on page SBFW-L M5.

Slow Blow Fuse

SBFW-K

International Standard Part | RoHS | ELV

PEC
Timeless Insight, New Mobility

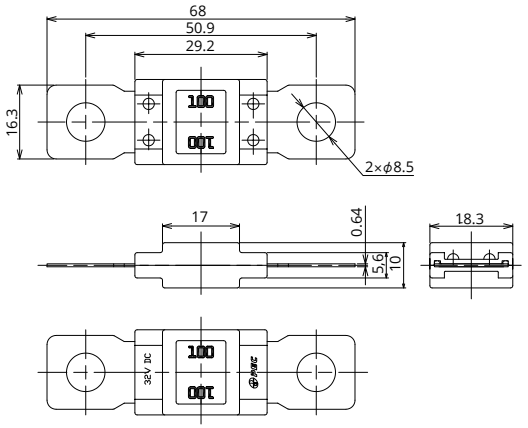
High-amperage bolt type fuse

General Specification

Rated Voltage	DC32V
Breaking Capacity	2000A
Recommended Operating Temp.	-40°C~120°C*2
Standard	ISO8820-5
Country of Origin	Mexico
Plating	Sn Plating
Standard Packaging	1,200
Insertion Force	—
Pull-out Load	—
Recommended Torque	(12.0±1.0)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
80	3102	Red	0.7 mΩ	85 mV
100	3112	Yellow	0.6 mΩ	83 mV
125	3122	Green	0.4 mΩ	82 mV
150	3132	Orange	0.4 mΩ	89 mV
175	3142	White	0.3 mΩ	91 mV
200	3152	Blue	0.3 mΩ	95 mV
225	3162	Tan	0.3 mΩ	97 mV
250	3172	Pink	0.2 mΩ	100 mV
300	3182	Gray	0.2 mΩ	63 mV
350	3134	Dark Green	0.2 mΩ	50 mV
400	3144	Violet	0.2 mΩ	52 mV
450	3154	Dark Yellow	0.1 mΩ	56 mV
500	3164	Brown	0.1 mΩ	63 mV

*1 Voltage drop: apply 100% of the rated current (300A-500A: at 75% of the rated current).

Time-Current Characteristic [80A~250A]

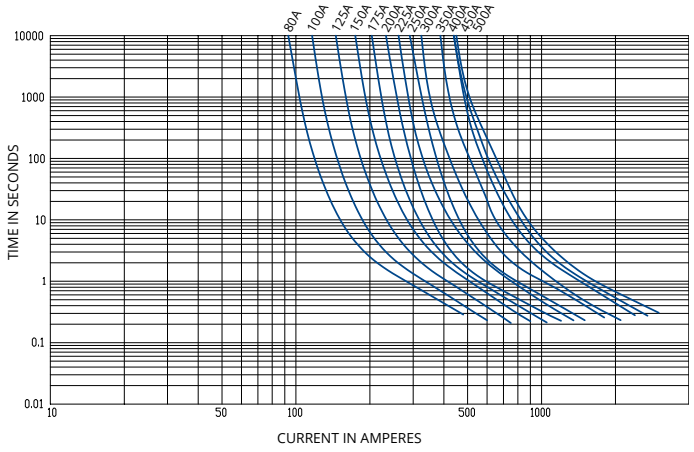
% of Ampere Rating(A)	Operating Time	
	Min	Max
100%	4hrs.	—
135%	120sec.	1800sec.
200%	1sec.	15sec.
350%	0.3sec.	5sec.
600%	0.1sec.	1sec.
500%	0.1sec.	1sec.

Time-Current Characteristic [300A~500A]

% of Ampere Rating(A)	Operating Time	
	Min	Max
75%	4hrs.	—
200%	1sec.	15sec.
350%	0.5sec.	5sec.
600%	0.1sec.	1sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



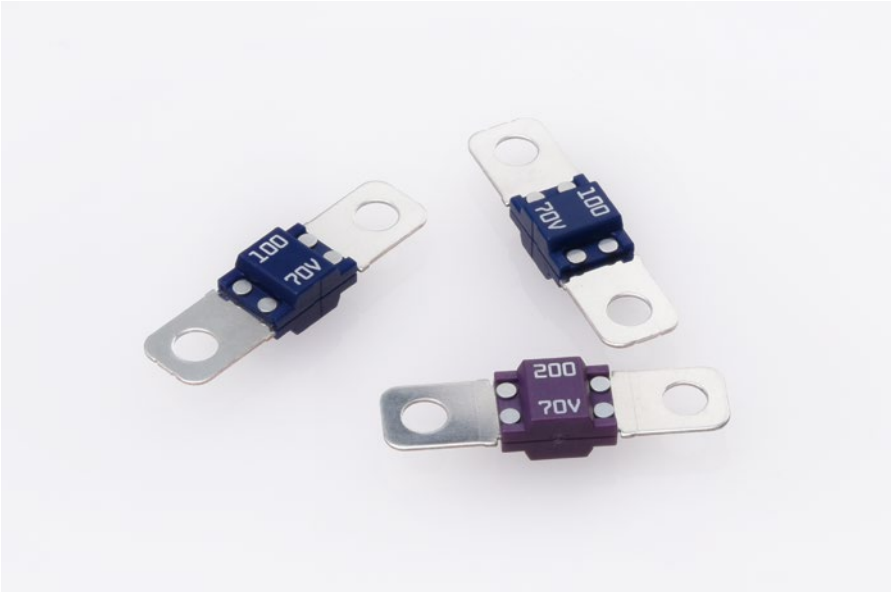
Slow Blow Fuse

SBFW-L48V-M6L

International Standard Part | RoHS | ELV

PEC
Timeless Insight, New Mobility

SBFW-L type for 48V system

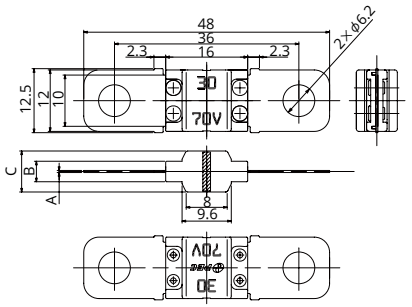


General Specification

Rated Voltage	DC70V
Breaking Capacity	2500A
Recommended Operating Temp.	-40°C～120°C*2
Standard	ISO20934
Country of Origin	Japan
Plating	Tin plating
Standard Packaging	2,000
Insertion Force	—
Pull-out Load	—
Recommended Torque	(9.0±1.0)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



CURRENT RATING	DIMENSION		
	A	B	C
30A~80A	0.4	4	8
100A~200A	0.64	4.24	8.24

Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
30	3005	Orange	2.6 mΩ	92 mV
40	3015	Green	1.6 mΩ	80 mV
50	3025	Red	1.2 mΩ	74 mV
60	3035	Yellow	0.9 mΩ	71 mV
70	3045	Brown	0.7 mΩ	66 mV
80	3055	White	0.5 mΩ	57 mV
100	3065	Blue	0.4 mΩ	64 mV
125	3075	Pink	0.4 mΩ	66 mV
150	3085	Gray	0.3 mΩ	65 mV
175	3095	Tan	0.2 mΩ	65 mV
200	3006	Violet	0.2 mΩ	71 mV

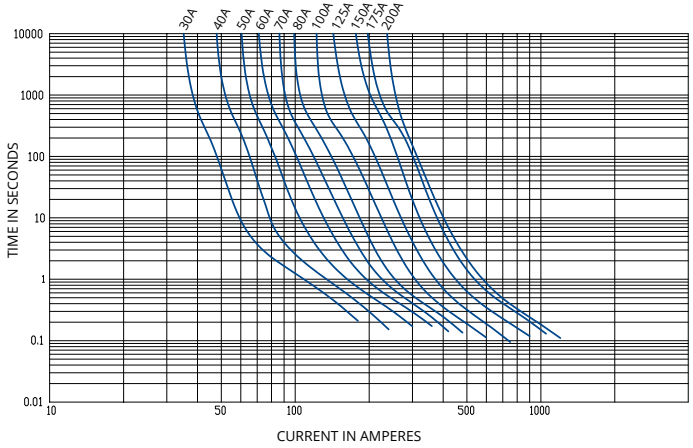
*1 Voltage drop: apply 100% of the rated current.

Time-Current Characteristic

% of Ampere Rating(A)	Operating Time	
	Min	Max
100%	100hrs.	—
135%	300sec.	3600sec.
150%	90sec.	500sec.
200%	1sec.	50sec.
300%	0.3sec.	4sec.
500%	0.1sec.	1sec.
600%	0.07sec.	0.7sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



Slow Blow Fuse

SBFW-K48V-M8

International Standard Part | RoHS | ELV

PEC
Timeless Insight, New Mobility

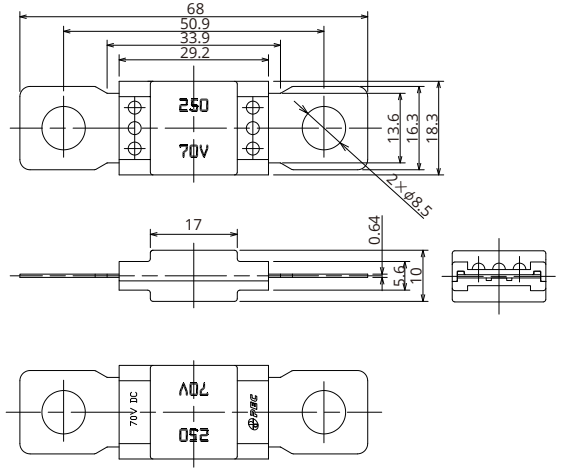
SBFW-K type for 48V system

General Specification

Rated Voltage	DC70V
Breaking Capacity	2500A
Recommended Operating Temp.	-40°C～120°C*2
Standard	ISO20934
Country of Origin	Japan
Plating	Tin plating
Standard Packaging	400
Insertion Force	—
Pull-out Load	—
Recommended Torque	(20.0±1.0)N·m

*2 Please contact us for the details of operating temperature.

Dimensions



Product Lineup

Ampere Rating(A)	Part Number	Housing Colors	Resistance Value	Voltage Drop*1
60	3090	Light Blue	1.0 mΩ	102 mV
80	3001	Red	0.8 mΩ	93 mV
100	3011	Yellow	0.6 mΩ	90 mV
125	3021	Green	0.4 mΩ	86 mV
150	3031	Orange	0.4 mΩ	86 mV
175	3041	White	0.3 mΩ	97 mV
200	3051	Blue	0.3 mΩ	101 mV
225	3061	Tan	0.2 mΩ	104 mV
250	3071	Pink	0.2 mΩ	110 mV
300	3091	Gray	0.2 mΩ	54 mV
350	3002	Dark Green	0.2 mΩ	61 mV
400	3012	Violet	0.1 mΩ	61 mV
450	3022	Dark Yellow	0.1 mΩ	70 mV
500	3032	Brown	0.1 mΩ	72 mV

*1 Voltage drop: apply 100% of the rated current (300A - 500A: at 75% of the rated currrent).

Time-Current Characteristic [80A~250A]

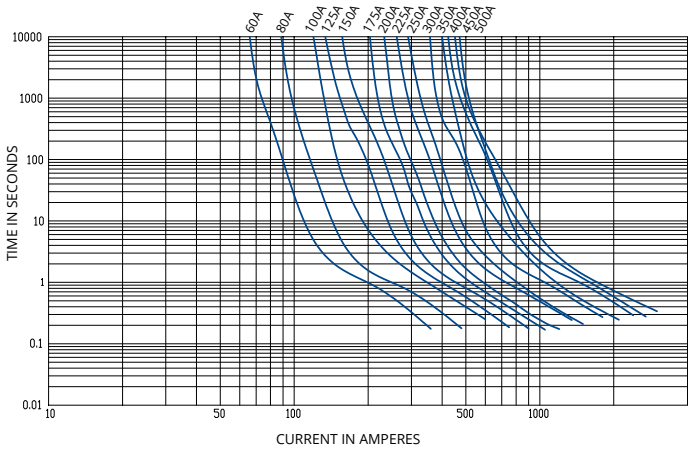
% of Ampere Rating(A)	Operating Time	
	Min	Max
100%	4hrs.	—
135%	120sec.	1800sec.
150%	20sec.	450sec.
200%	1sec.	15sec.
350%	0.3sec.	5sec.
600%	0.1sec.	1sec.

Time-Current Characteristic [300A~500A]

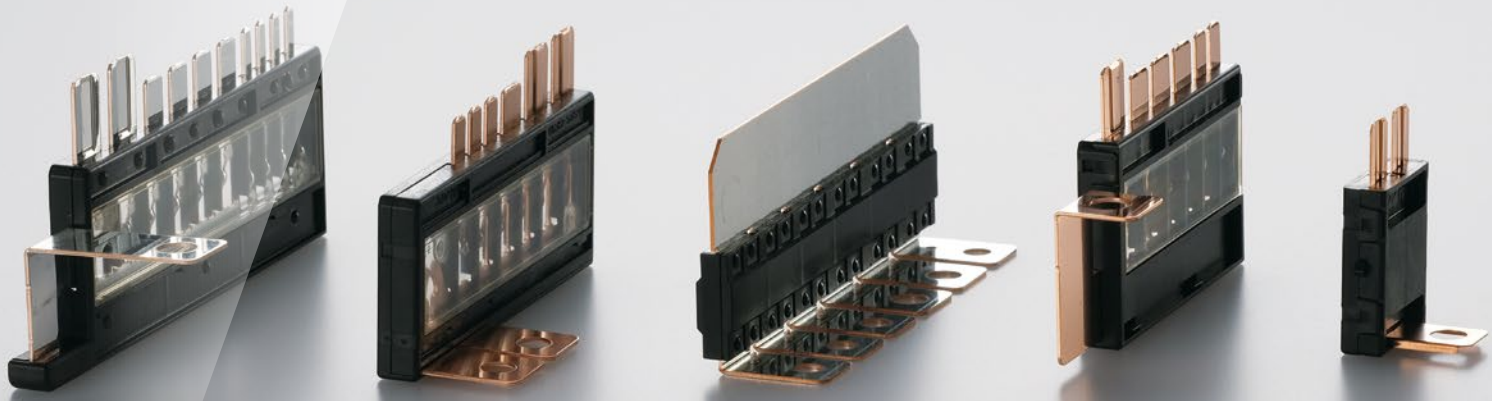
% of Ampere Rating(A)	Operating Time	
	Min	Max
75%	4hrs.	—
200%	1sec.	15sec.
350%	0.5sec.	5sec.

*The fuse characteristic may change depending on the conditions of use.

Time-Current Characteristic Chart



Meeting the needs of the diverse and complex automotive circuits.
PEC's Multi terminal Slow Blow Fuses with compact multi-circuits

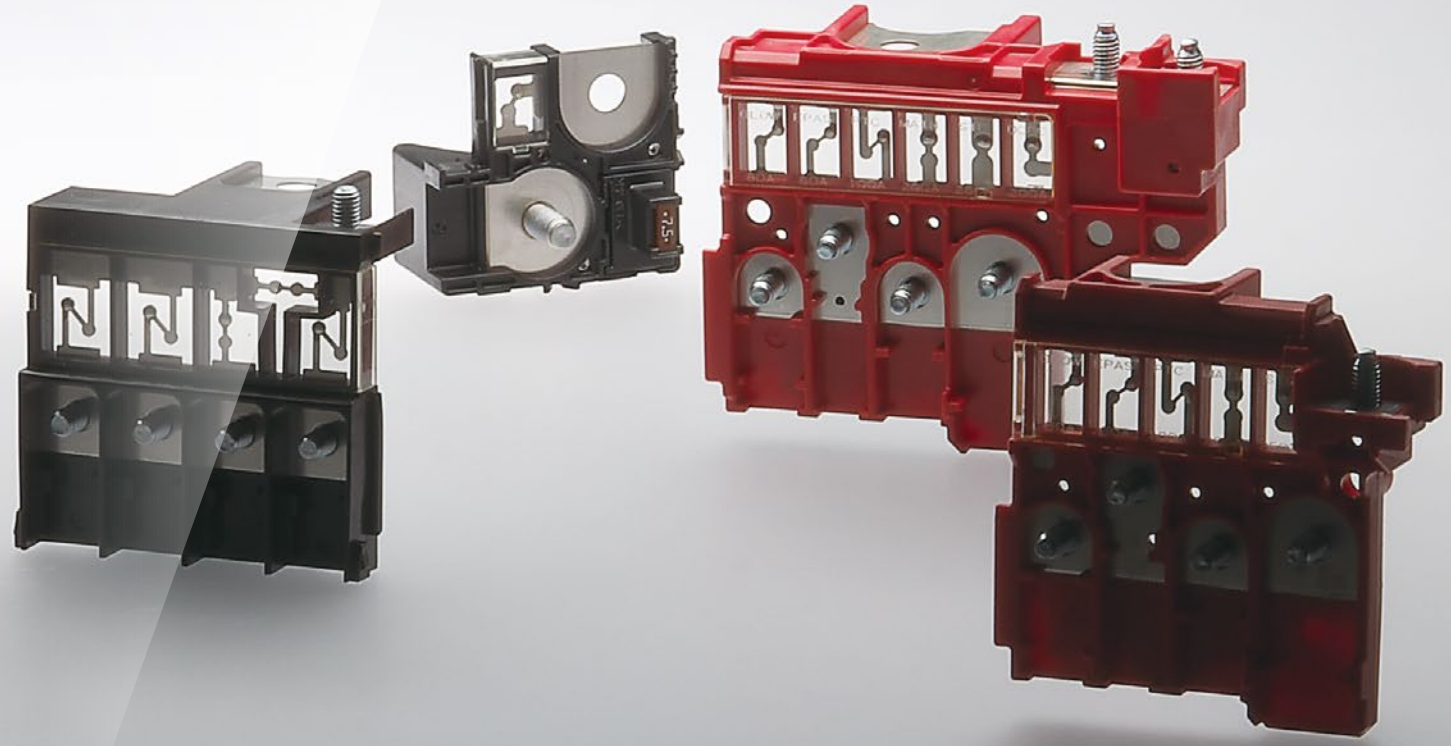


Multi Slow Blow Fuse

MUSB

Integration of multiple fuse circuits with the battery terminal

Possibility of direct attachment onto the battery, hence battery cable slimination



Battery Terminal Fuse

BATF

Fuse accessories which make the fuse mounting and replacement easy and safe

Accessories

Short Pins

BFMN-SP

RoHS ELV

For interrupting dark current
(Exclusive for BFMN)

Product information

Part Number	1240

BFLP-SP

RoHS ELV

For interrupting dark current
(Exclusive for BFLP)

Product information

Part Number	1151

Fuse Pullers

Essential product to easily extract
the BF at the time of replacement

Fuse Pullers No.7

RoHS ELV

Product information

Part Number	150920
Type of fuse	BFAT, BFMN

Fuse Pullers No.9

RoHS ELV

Product information

Part Number	150940
Type of fuse	BFMN, BFLP

PCV Valves which properly burn the blow-by gas reflux, resulting in decreased emissions of harmful UHC

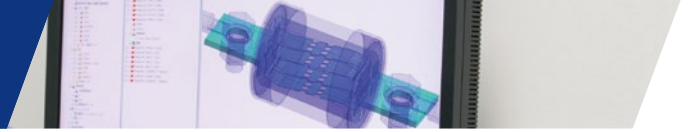
Accessor y

Other automotive parts

PCV Valve

Fuse Outline

What is a Fuse?



What is a Fuse?

It is said that Thomas Edison, the inventor of the light bulb, first put forth the idea of a fuse. Ever since, fuses have been widely used across a wide range of applications to ensure the safety of electric circuits and protect devices.

Electric circuits are connected to various devices through electric wiring and switches that receive electricity from a power source. Fuses are installed in series with the electric circuit on the upstream flow of electricity and are designed to immediately interrupt the circuit when exposed to overcurrent resulting from a short-circuit on the downstream flow. They are therefore critical components that protect the wiring and devices in an electric circuit from damage caused by fires and the like.

When exposed to overcurrent, a fuse's metal element, which is distinguished by a small cross-sectional area, reaches its melting point and subsequently blows. This effectively interrupts (protects) the circuit.

Fuses are classified into different types depending on their usage purpose and application. For example, there are fuses for high-voltage insulating structures, cylindrical fuses for applications that receive or distribute electricity, tube-type fuses used in residential electric appliances, surface-mount fuses for printed wiring boards, and automotive fuses.

Automotive Fuses

Even when confining the discussion to automotive fuses, these can still be divided in a wide range of types based on usage purpose. (Figure 1)

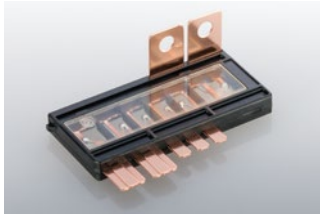
Among this large variety of automotive fuses, the type that has made most headway with standardization and is currently employed in vehicles all over the world is the blade fuse (BF). In recent years, the number of fuses installed per vehicle has increased in tandem with wider adoption of electric and digital systems in automobiles, an increase in the number of on-board devices, and a shift to increasingly compact fuses.

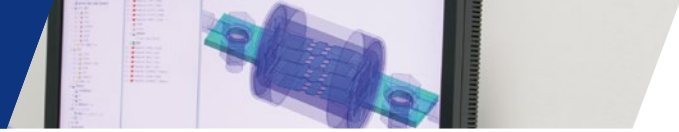
Figure 1: Automotive fuse types

BF (Quick blow type)

SBF (Slow blow type)

MUSB (Slow blow type)





Characteristics of Automotive Fuses

Automotive fuses differ in their application from other types due to their exposure to vibrations, ambient temperature and other factors, as well as in terms of precision and reliability. In other words, they are required to operate under much more demanding conditions. In addition, their size and weight are also important elements.

[Special Requirements for Automotive Fuses]

(1) Vibrations

Automobiles are exposed to vibrations under a wide range of conditions including when driving continuously on highways, when driving on poor or cobbled roads, or when idling. Automotive fuses must be able to withstand a vibration acceleration of 44.1m/s2 for automobiles and 196m/s2 for motorcycles, and guarantee performance even when exposed to resonance vibration from frequency changes.

(2) Ambient Temperature

Automobiles are expected to deliver problem-free driving performance both in the scorching heat of desert environments and in areas subjected to extreme cold. Moreover, because fuses are installed in the engine compartment and the passenger compartment, they are required to function within a broad temperature range of -40-120°C.

(3) Precision

Automobiles vary widely in weight depending on their fuel efficiency, and they tend to utilize extremely compact electric wiring to achieve a corresponding reduction in weight. For this reason, the actual current used in automotive electrical wiring is close to the allowable current capacity, and the time-current characteristics of fuses must be managed within this narrow range.

(4) Reliability

When a fuse malfunctions during driving, it immediately impairs the vehicle's ability to drive. If this occurs while driving on a highway or in similar circumstances, it can lead to serious accidents. In today's world, where vehicles have an average service life that exceeds over 10 years, fuses are required to deliver durability in the form of sustained functionality amid various changes in environment.

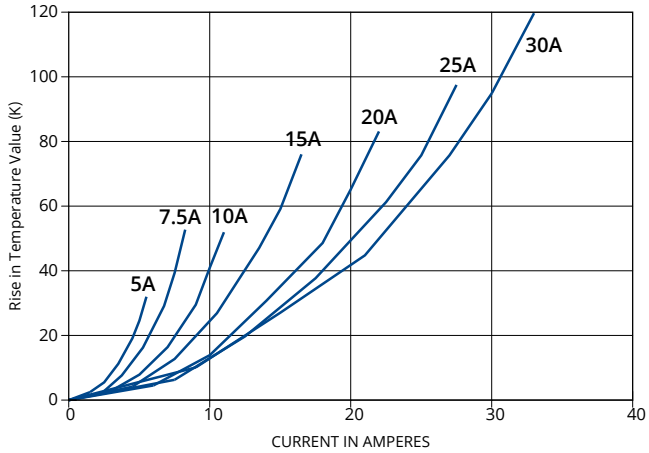
(5) Size and Weight

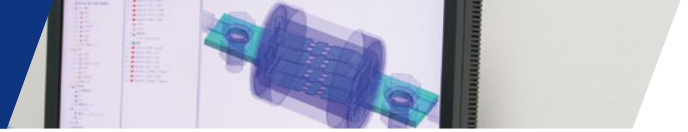
If we look at automobiles in the context of the CO_2 emission regulations specified in the Kyoto Protocol, we learn that the CO_2 emissions generated while driving are substantially higher than the ones generated when producing the parts, materials and vehicle itself or when disposing of a vehicle. Accordingly, vehicle weight reduction is an important factor for the automotive sector, and fuses are also expected to be compact and lightweight while at the same time guaranteeing performance.

Temperature Rises in Fuses

Fuses have a specific electric resistance value. When exposed to current, their temperature will rise depending on the load. (Figure 2) Test results for temperature rises can vary significantly based on the type of jig or fuse connection used, and fuse performance is therefore measured using a standard jig (i.e., specified by a relevant industry standard). Because measurements of temperature rise in the lab will be different from data obtained during actual driving, the general approach is to conduct a second evaluation based on reliability tests for each vehicle model. Fuses with connection terminals made out of heat-resistant copper alloy are able to withstand a temperature of up to 140°C. If we assume a temperature of 80°C inside the engine compartment, this means the fuses can handle a temperature increase of 60K.

Figure 2: Temperature rise





Time-current Characteristics of Fuses

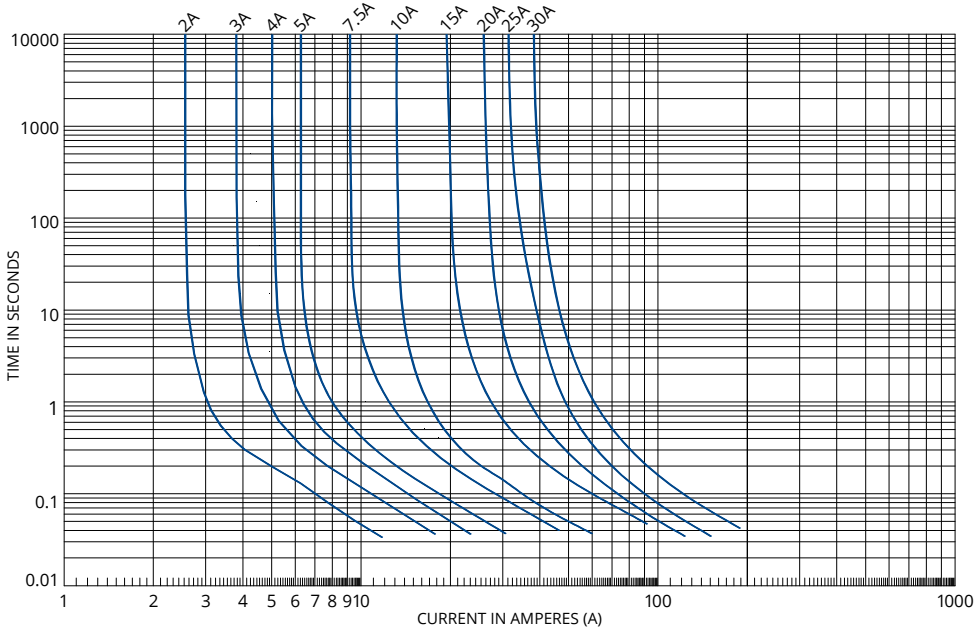
Time-current characteristics are the most important specifications of fuses.
Fuses are designed to only withstand continuous current that is equivalent to their rated current. When the current flowing through a fuse exceeds the rated current, the fuse must cut off the current within a predetermined time interval, thus ensuring the current flow is interrupted.
For this reason, the melting time of a fuse when exposed to overcurrent is specified by international and national standards for each type of fuse. In the case of BFMN fuses (Figure 3), which are the most common type in use today, the applicable standards are ISO 8820-3 (international), JASO D612 (Japan) and SAE J2077 (US). These standards specify uniform time-current characteristics, which are regarded as the international standard.
[Rated values (Table 1), time-current characteristics (Figure 4)]
Time-current standard values specify an upper threshold for the melting time to prevent an overcurrent from flowing continuously and resulting in fire or damage to connected electrical wiring and electric devices. This is the ultimate purpose of a fuse. At the same time, a lower threshold is specified to ensure the current is not interrupted during the initial rush at the start of the current flow, and thus ensure durability.
Time-current characteristics differ by fuse type. For example, motor circuits employ slow blow fuses (SBF) that feature a slow-blow mechanism to withstand the comparatively long current rush that is produced when a motor starts operating. It is common practice to use SBFs for circuits using motors of automatic wipers and power windows, and BFs for applications such as lamps.

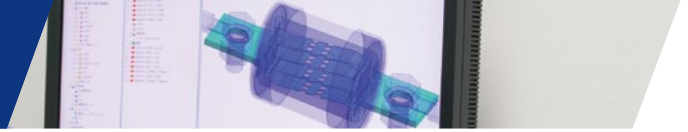
Figure 3: BFMN

Table 1: Rated time-current characteristics

% of Ampere Rating (A)	Operating Time
110%	100hrs.
135%	0.75~600sec.
160%	0.25~50sec.
200%	0.15~5sec.
350%	0.04~0.5sec.
600%	0.02~0.1sec.

Figure 4: Time-current characteristics



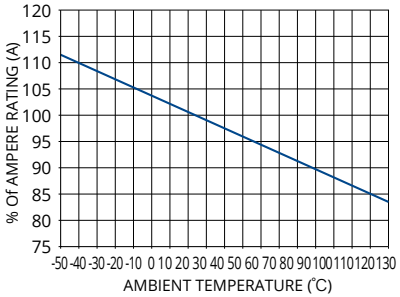


Fuses and Ambient Temperature

The metal element inside a fuse is designed to melt through Joule heat produced by overcurrent, thus interrupting the current flow in the circuit. Because the Joule heat (I^2Rt) required to melt the metal element differs based on the ambient temperature, the time at which the metal element in the fuse will reach its melting point will also vary. In other words, the actual capacity of a fuse will vary based on the ambient temperature.

The amount of change from the actual capacity is referred to as the temperature change rate. The temperature change rate differs based on the type of metal element used. For example, a 10A-rated BF with a zinc element has an actual capacity of 8.5A at an ambient temperature of 120°C, and the temperature change rate is -0.15%/°C (Figure 5). The corresponding rate is -0.075%/°C assuming a copper element and -0.14%/°C in the case of a copper-tin element.

Figure 5:
Fuse Temperature Change Rate

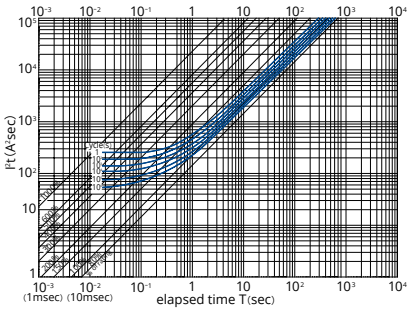


Durability of Fuses

The durability (i.e., service life) of a fuse depends on the load, current waveforms, ambient temperatures and other factors. If exposed to a consistent current frequency, the service life of a fuse (total usage count) can be easily determined from the I^2t characteristics diagram (Figure 6) organized by capacity.

Fuses need to have a capacity that exceeds the service life (total usage count) demanded by automakers. In the case of continuous current flow, they are recommended to be used with a rate load of 70% or below.

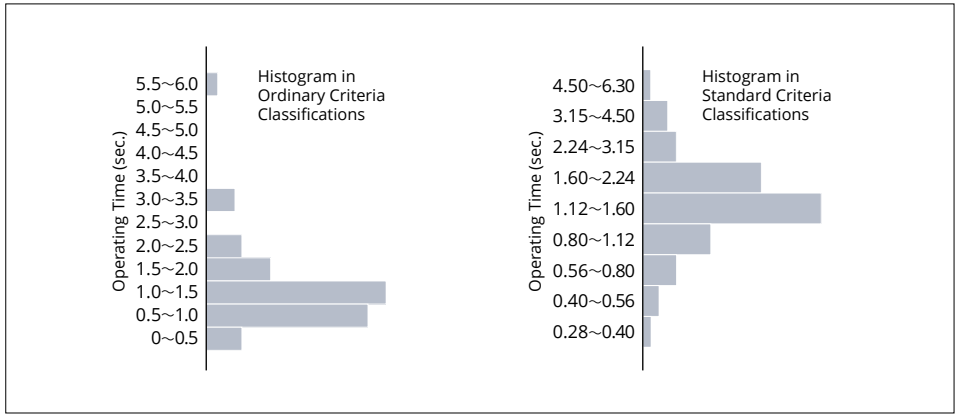
Figure 6:
I^2t characteristics diagram

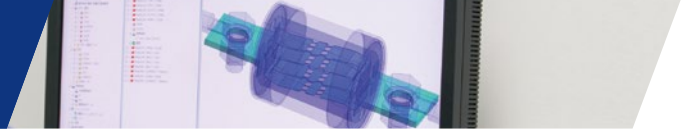


Fuse Precision

The melting time does not simply exhibit a direct proportional correlation with the actual current value, but rather is determined by the Joule heat (I^2Rt) generated by the passing current value. Accordingly, when verifying variations in the melting time or conducting quality guarantee tests such as frequency distribution and measuring actual current values, an error can occur in the form of a negative LCL time. By using a standard value (JIS Z8601) in statistical analysis, the variation in the skewed melting time returns to a normal distribution, enabling the use of general quality control management methods. (Figure 7)

Figure 7: Variation in melting time





Fuses and Electric Wiring

To ensure fuses conform with devices and connected electric wiring and thus protect related circuits, it is necessary to select electric wiring of a suitable size that can handle the fuse's rated current. (Figure 8)

(1) Load Current

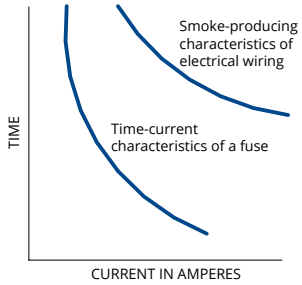
For blade fuses, Fuses should be selected in such a way as to ensure the load current does not exceed 70% of the rated current. When setting the load current value, the following factors should be considered.

— Is the load current continuous or pulsed?

— Is there a current surge when turning the switch on?

— Intermittent or continuous current?

Figure 8:
Time-current characteristics of a fuse and smoke-producing characteristics of electrical wiring



(2) Ambient temperature

A fuse's time-current characteristics are affected by ambient temperature, so the ambient temperature at the location where the fuse is installed must be considered. A fuse's rated current is calculated based on the ambient temperature and the rate of change in capacity (Figure 5).

(3) Fusing Current

The current at which the fuse should precisely blow is determined from a blowing standard.

(4) Maximum Circuit Resistance

To guarantee fuses' time-current characteristics, the maximum circuit resistance value is required while also taking into account the ambient temperature of the electric wiring.

(5) Selection of Smallest Wire Size

For the electric wiring size, select a size for which the resistance value after factoring in the wiring length is smaller than the maximum resistance value for the circuit. The correlation between a representative fuse's rated current and the electric wiring size and length is shown in Figure 2.

Table 2: Correlation between fuse rating, electric wiring size and electric wiring length

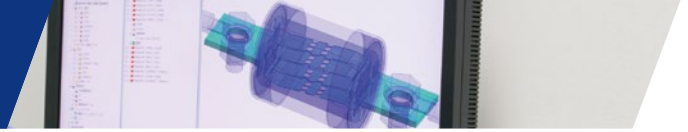
Fuse Ampere Rating (A)	Nominal Cross Sectional Area of Wires (mm^2)						
	0.3	0.5	0.85	1.25	2	3	5
3	37	—	—	—	—	—	—
4	38	43	—	—	—	—	—
5	22	34	—	—	—	—	—
7.5	15	23	36	—	—	—	—
10	11	17	27	39	—	—	—
15		11	18	26	43	—	—
20			13	19	32	—	—
25				15	25	40	—
30					21	34	—

* The figures in the middle of the table show the maximum length of the electric wiring (m).
* Values exceeding 50m are indicated with "–".
* Taken from JASO D610

Automotive Fuse Ratings

Fuses utilized in general home appliances are specified by the JIS standards, but automotive fuses are a specialized type of fuse covered by the JASO standards in Japan. The JASO standards for automotive fuses are the only public standard governing automotive fuses in Japan. JASO is part of the Society of Automotive Engineers of Japan, and its standards are deliberated by an automotive electronics subcommittee with members consisting of automakers, fuse users, fuse makers and third parties. As the only Japanese specialized fuse maker, PEC serves as the executive secretary of the subcommittee and contributes to the standardization work in that capacity.

The global standard for automotive fuses is ISO8820, which has been established under the international ISO standards. The fuse subcommittee works to support Japanese compliance with ISO standardization activities. PEC participates in international conferences as a Japanese representative member and deliberates international standards with representative members from other countries. The current Japanese standard is largely reconciled with the international one so the contents of JASO D612 and ISO 8820 are more or less the same.



Fuse Types

[Glass Tube Fuses]

Upon hearing the word fuse, many people first picture a glass tube fuse consisting of a glass tube that contains a metal element. Glass tubes were used as early as the 1910s to prevent accidents due to overcurrent during engine ignition. However, these fuses abruptly moved into the spotlight in the 1970s. Against the backdrop of air pollution problems linked to vehicle emissions, automakers developed engine control units (ECUs; microprocessor-based engine controllers) with the aim of maintaining engine performance and fuel efficiency while complying with emissions regulations. The development of ECUs triggered a sudden acceleration in the adoption of automotive electronic solutions. This in turn increased demand for fuses, which play a role in ensuring the safety of electric circuits and the protection of devices.

[Blade Fuses]

Blade fuses (auto fuses) were developed in 1975 and continue to be the mainstream fuse type utilized in vehicles today. Compared with glass tube fuses, blade fuses require only half the parts, their simplified structure is ideal for mass production, and they are smaller, lighter and more durable. Amid the shift toward electronics in the automotive sector, blade fuses were rapidly adopted by automakers around the world.

[Slow Blow Fuses]

The 1980s introduced a range of automotive electronic solutions aimed at enhancing passenger comfort, including power windows and automatic wipers. As a result, vehicles came to be equipped with a large number of motors. However, motors temporarily produce a large current that exceeds their rated capacity when they are switched on. Conventional auto fuses, which immediately blow when exposed to overcurrent, were therefore not appropriate for this type of application. Instead, automakers employed slow blow fuses, which are distinguished by a slow rise in temperature when exposed to high current and therefore do not blow immediately. PEC developed slow blow fuses in 1982 ahead of its competitors. Moving into the 2000s, automotive ECUs grew increasingly complex, resulting in the need for miniaturization of the circuit itself. The product that emerged to meet these needs was the multi slow blow fuse, which protected multiple circuits.

[EV Fuses]

From the mid-1990s, automakers started exploring the concept of environmentally friendly vehicles, giving rise to the EV fuse. Electric-powered vehicles require much higher currents than their gasoline counterparts. For this reason, conventional fuses would immediately blow and the high current would give rise to another problem in the form of the arc discharge phenomenon that could lead to destruction of circuits. The EV fuses developed by PEC in cooperation with Toyota Motor Corporation became the first products to resolve this problem, and have been adopted in the hybrid vehicles of a large number of automakers. They have also been installed in electric vehicles that have been developed to deliver additional environmental performance since the 2000s.

Company Profile

Company Profile

Involvement in Quality Control and Environmental Protection.

Our company, together with our various group offices have received an automotive industry quality management system standard, the IATF16949 certification. In addition, regarding the environmental protection, we are certified with the ISO14001. As the good corporate citizen that we are, we will continue striving to achieve both, product quality assurance and evironmental protection. We will ensure compliance to laws and regulations and ISO standards.

Quality First

IATF 16949 Certification

PEC Manufacturing (Thailand) Ltd.
January 2018 (IATF 16949:2016)

PEC de Mexico S.A. de C.V. (Guanajuato)
April 2018 (IATF 16949:2016)

Ogaki Factory, Ogaki West Factory certified in
September 2018 (IATF 16949:2016)

ISO 9000 Certification

Automotive parts Dept. and Air Conditioning parts Dept.
cerfied in May 1997(ISO 9001)
Electric parts Dept. (ISO 9002)

PEC of America Corp. certified in
December 1997 (ISO 9002)

PEC de Mexico S.A. de C.V. (Tijuana) certified in
October 2001 (ISO 9001:2009)

Pacific Engineeering Corporation certified in
May 2003 (ISO 9001:2000)

PEC Manufacturing (Thailand) Ltd. certified in
June 2003 (ISO 9001:2000)

PEC Manufacturing (Thailand) Ltd.certified in
February 2009 (ISO 9001:2008)

PEC de Mexico S.A. de C.V. (Tijuana) certified in
August 2010 (ISO 9001:2008)

Pacific Engineeering Corporation certified in
September 2010 (ISO 9001:2008)

PEC de Mexico S.A. de C.V. (Guanajuato) certified in
February 2016 (ISO 9001:2008)

PEC Manufacturing (Thailand) Ltd. certified in
January 2018 (ISO 9001:2015)

PEC de Mexico S.A. de C.V. (Guanajuato) certified in
April 2018 (ISO 9001:2015)

Pacific Engineeering Corporation certified in
September 2018 (ISO 9001:2015)

ISO/IEC 17025 Certification

Quality Assurance Dept. Testing sect certified in
October 2001 (ISO/IEC 17025)

Quality Assurance Dept. Testing sect certified in
December 2006 (ISO/IEC 17025:2005)

Create and earth-friendly environment

ISO 14001 Certification

The whole company certified in December 2001

Pacific Engineering Corporation certified in
November 2005 (ISO 14001:2004)

PEC Manufacturing(Thailand)Ltd. certified in
November 2010 (ISO 14001:2004)

Pacific Engineeering Corporation certified in
November 2016 (ISO 14001:2015)

PEC Manufacturing (Thailand) Ltd.certified in
November 2017 (ISO 14001:2015)

PEC
Timeless Insight, New Mobility

Network

Pacific Engineering Corporation established its manufacturing base in the city of Ogaki, known as the 「Capital of Water」. With a focus on the Pacifc rim region PEC supplies high-quality products to various regions in Japan. In addition, PEC offers a global service in line with the world's optimal procurement strategies through its production and sales activities out of its 3 poles: Japan, Mexico and Thailand.

Domestic Base

Head Quarter Factory	Hinoki-cho 450, Ogaki city, Gifu prefecture. TEL:0584-91-3131(Main)　FAX:0584-91-6102
Ogaki Factory	Kuzegawa-cho 7-5-8, Ogaki city, Gifu prefecture. TEL:0584-81-3131(Main)　FAX:0584-81-6102

Production centers abroad

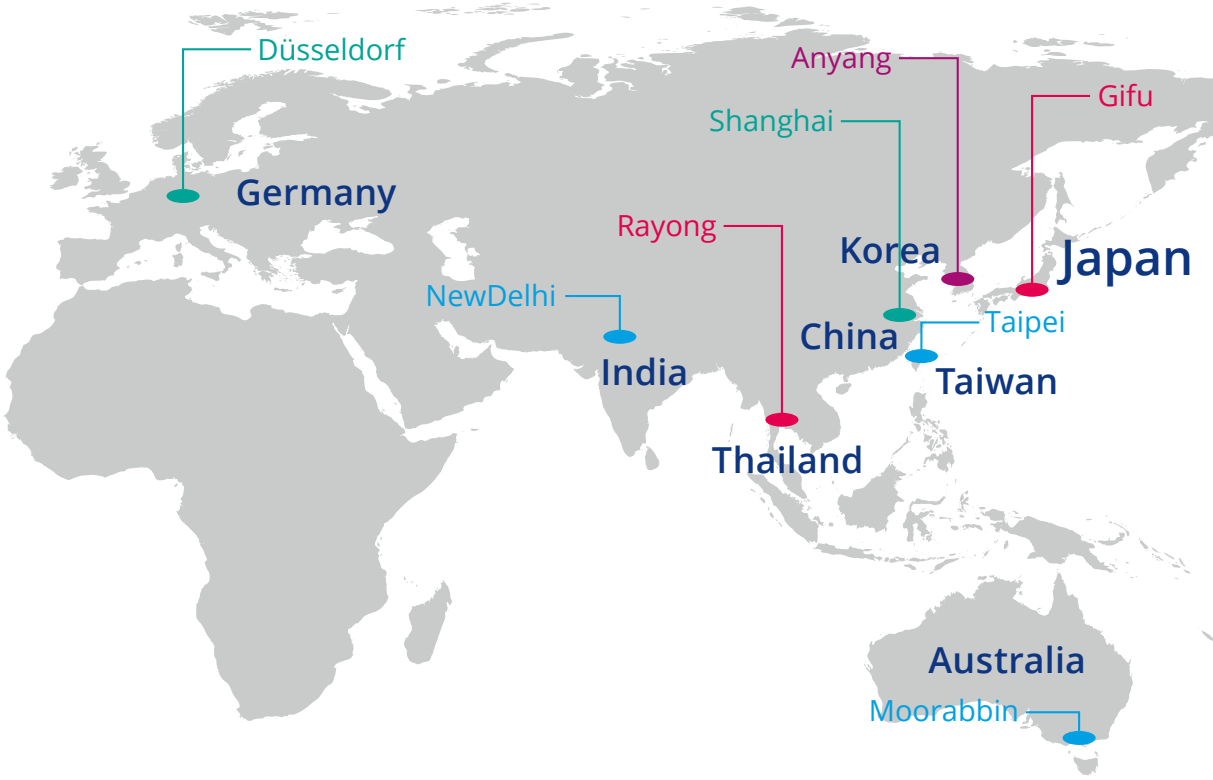
Mexico	PEC de México,S.A. de C.V. (Guanajuato)
Thailand	PEC Manufacturing (Thailand) Ltd.

Sales offices abroad

North America	PEC of America Corporation, Detroit Technical Office
China	PEC (Shanghai) Corporation
Germany	PEC (Europe) GmbH

Technical Support offices abroad

Korea	Pacific Engineering Coporation Korea Korea Technical Office.




PEC (Europe) GmbH


PEC Manufacturing (Thailand) Ltd.


PEC (Shanghai) Corporation


PEC Korea Technical Office.

PEC
Timeless Insight, New Mobility


Head Quarter Factory


Ogaki Factory


PEC de México,S.A. de C.V.
(Guanajuato)


PEC of America Corporation,
Detroit Technical Office

Copmany Overview

Official company name	Taiheyou Seiko Kabushiki Kaisha
Name in English	Pacific Engineering Corporation
Establishment	October 3rd, 1961
HQ address	Hinoki-cho 450, Ogaki city, Gifu prefecture, Japan, 503-0981 TEL 0584-91-3131 (Main) FAX 0584-91-6102
Business Overview	Automotive Fuse development and production Precision metal stamping, Tooling die manufacturing
Capital	JPY 98,400,000
Sales	JPY 26,500,000,000 (as of March 2025)
Employees	Domestic: 446 (as of March 2025) Worldwide: 1049 (as of March 2025)
Directors	President: Takahisa Ogawa

Timeless Insight, New Mobility

Pacific Engineering Corporation

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Ogaki Factory Kuzegawa-cho 7-5-8, Ogaki city, Gifu prefecture. TEL : 0584-81-3131(Main) FAX : 0584-81-6102
URL：http://www.pecj.co.jp *We can respond to your RFQ through our web page. For details consult our home page.

2025 Jun.