NH (H.R.C) FUSES


FEDERAL
TS 86 EN 60269
gI/gG
NH1-FB
200 A
- 500 V / 120kA
CE :/ 03
MADE IN TÜRKİYE

NH (H.R.C) Fuses

NHC00-FB
6A...100A

NH00-FB
6A...160A

NHG00-FB
25A...125A

NH0-FB
25A...160A

NH1-FB
50A...250A

NHG1-FB
100A...250A

NH2-FB
80A...400A

NHG2-FB
200A...400A

NH3-FB
250A...6300A

NHG3-FB
315A...630A

NH Fuse Base

BMC
NH00-FA

BMC
NH0-FA

BMC
NH1-FA

BMC
NH2-FA

BMC
NH3-FA

STEATIT
NH00-FA

STEATIT
NH1-FA

STEATIT
NH2-FA

STEATIT
NH3-FA

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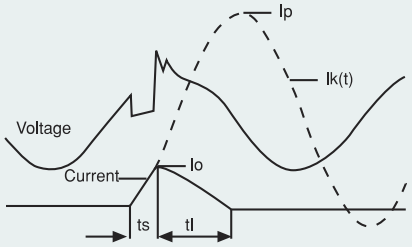
CE

Assembly Position : Free
Altitude : 2000 m (max)
Relative Humidity : %50 (40°C) , %90 (20°C)
Ambient Temperature : between -5°C and +40°C

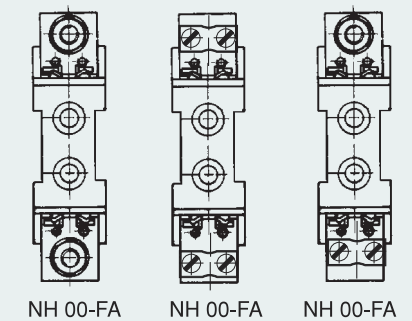
Fuse is a protective device and it breaks current when the wire inside melts and protects its circuit against over current risks. Federal NH fuse and fuse base are manufactured in accordance with CE. Federal NH fuses are manufactured of steatite material and capable of breaking short circuit currents up to 120 kArms. Federal Electric NH fuses with rated voltages up to
500V AC and 440V DC and rated currents up to 630A protect several devices and facilities such as transformer, cable, switch panel against overloading and short circuit safely.
Current-time characteristics of fuses are seen in Figure-6. These curves indicate opening duration (t) of the fuse depending on the load current. As current increases, fuse's opening duration decreases. Federal NH fuse have delayed characteristics. They are resistant to progress currents of asynchronous motors. They provide good protection against short circuits and over currents and open the circuit without delay.
"gL/gG" mark means line protection and NH fuses in this class are especially used for protection of cables and conductors.



Io : Passing current
Ik(t) : Expected short circuit current
Ip : Peak value of short circuit current
ts : Melting duration
tl : Extinction duration

Fig - 1 Current and Voltage Changes Graphic at Breaking of Leakage Current by Fuse.

Order code	Size	Pertinax dimensions (mm) (mm) h x w
8CB-A0000-0000	1	116 x 227
8CB-A0000-0000	2	116 x 227
8CB-A0000-0000	3	116 x 227



NH 00-FA NH 0-FA **Fig - 2a**
NH 00-FA NH 0-FA **Fig - 2b**
NH 00-FA NH 0-FA **Fig - 2c**

As it can also be seen in the current-time curve, fuses operate at 1.6 times more of the nominal current and open the circuit within 5 seconds at a current of 5 x In. Melting wires used in NH fuses are manufactured in various types and forms depending on size of the fuse current. Same-sized cells (thin wires to melt) have been formed on melting wires. In case of overload and short circuit, melting partial arcs shall form at several points throughout the wire. Such a melting shall break the short circuit currents and temperature shall be dispersed throughout the whole fuse.
Outer body of the fuses should be resistant to high pressure and temperature caused by broken current. Because, the fuse wire needs to melt in order to break the current; that is, it should form a heat energy on resistance of the fuse wire of the current to be broken. In case of melting temperature sized by the fuse wire is exceeded with this heat energy produced by the current to be broken during ts melting duration, current continues to flow through liquefied metal and metal steam. Current is in an arc form at this final stage of breaking operation (Figure-1). This arc causes increase in pressure and temperature in the fuse body during tl extinction duration. The fuse body needs to resist these two impacts. Damage to the fuse by heat amounts produced by these currents on the fuse resistance, where it is not certain whether fuse wire shall melt or not or where they shall flow for a long time even in case of melting, may be avoided by manufacturing the fuse body of materials resistant to high temperatures.
Material used in Federal NH fuse is steatite material with high resistance to shock heats and dynamic forces. Contact knives of Federal fuses are made of special brass or copper material and coated with silver. Silver contacts with air and gets sulfured and dark in time. However, this is not important. Because, silver sulfur gets into conductive condition with the heat produced by the current passing through the circuit.

Quartz Sand:
Quartz sand, which has high purity and cleanness, no humidity and grain size of which is controlled strictly, is used as the extinction environment for the arc to be formed during current breaking operation. It is tried to have the sand, which is placed in the body via vibration, surround the current line completely and to reduce the air in the inner structure to the largest extent possible. Quartz sand, which gets a uniform structure via partial melting, helps both extinction of the arc and insulation of broken fuse wires by placing between broken fuse wires.

NH Fuse Base:
They are manufactured of steatite or BMC materials, depending on the need, in five different sizes. Joints of base are manufactured as with connectors or bolts in 00 and 0 sizes, depending on customer request; and manufactured in a way to allow bolted connection in other sizes. Spring contacts of NH fuse base, which are made of electrolytic copper, are reinforced with special steel springs, as well as their own tightening and springiness features. Tightening power of the contacts is higher than other fuse base in the market; If the fuse base are assembled side by side, insulation among phases can be increased with Pertinax separators, which are provided as accessories upon request. While NH fuse are mounted to base, attention should be paid to secure the fuse knives on the base. Otherwise, poor contact resistance shall cause heat and power loss and accordingly failures. Another important issue is that conductors with sections in accordance with the standards should be connected to the NH base.

Three separate model connection types have been developed to easily connect busbars or cables to Federal 00 and 0 size NH base.

Two-side bolted: For cable shoe, thing, multi-wire cables or busbars (Figure-2a).

Two-side bridge connector: For single stranded cables (Figure-2b).

One-side bolted, other side bridge connector: For single stranded cables and busbars (Figure-2c).

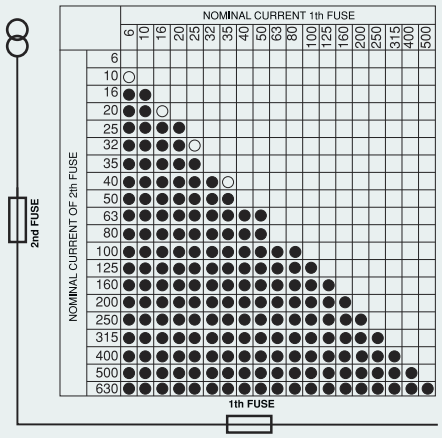
Steatit: It is used as NH fuse insulator in low voltage. It is a material resistant to high temperature. Steatit is a derivative of porcelain. With reflected of developing technology in quality of materials utilized in electrical industry, whereas normal porcelain materials are used in MV and LV bearers for insulating purposes; steatit materials are used in NH base, which has superior shock resistance and strength than porcelain materials.

BMC (Bulk Molding Compound): It is a polyester molding material, which looks like dough and which is reinforced with long fiber, and it is a composite material capable of being adjusted by changing rates of additives. BMC is in thermoset plastics class and bears similar characteristics with bakelite and melamine. However, it has significant superiorities when

considered in terms of process conditions as an end product. It is resistant to dynamic forces and thermal shocks.

Selective protection (selectivity):

It is the method of design to ensure elimination of a failure (fault), which occurs at any point of the network, by the protection element on that faulty operating element and to allow other sections of the system to continue operation. NH fuse, which have a nominal current difference of 60% according to “gL/gG” operating class, should open the circuit selectively in high short circuit currents. NH fuses should be chosen according to the table in Figure-3 in order to ensure selectivity.



○ three phase, selective at 380 V.
● three phase, selective at 500 V.

Fig - 3

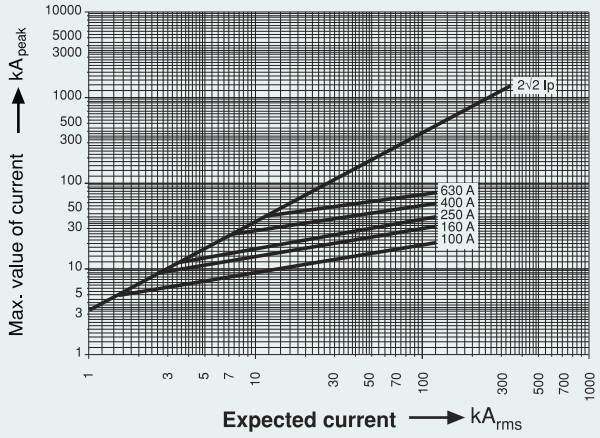


Fig - 4
Breaking current diagram

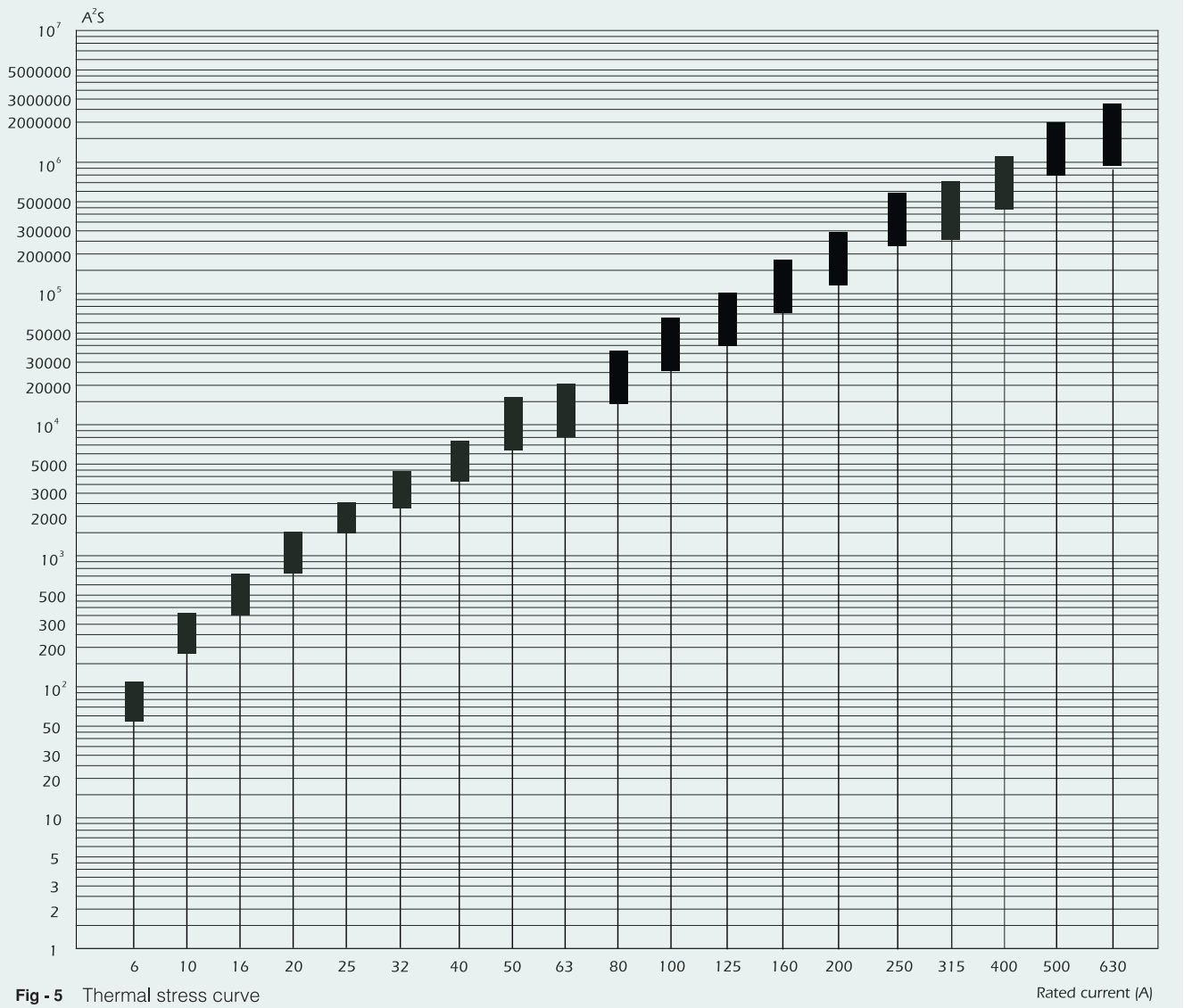


Fig - 5 Thermal stress curve

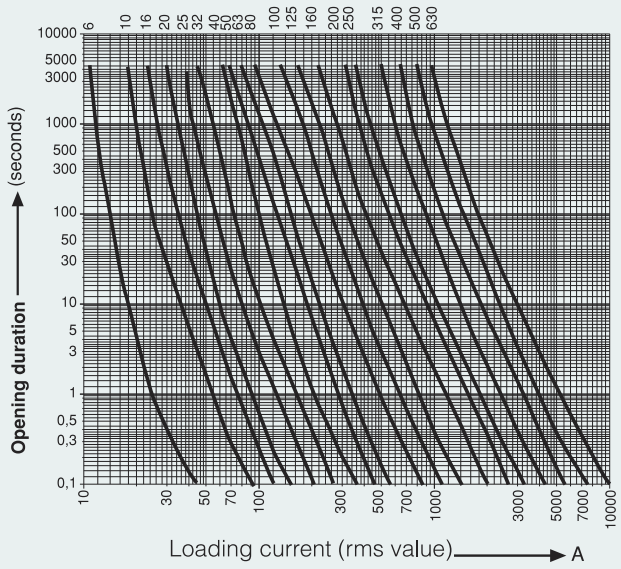


Fig-6:
Current-time characteristic of NH fuses "gL/gG"

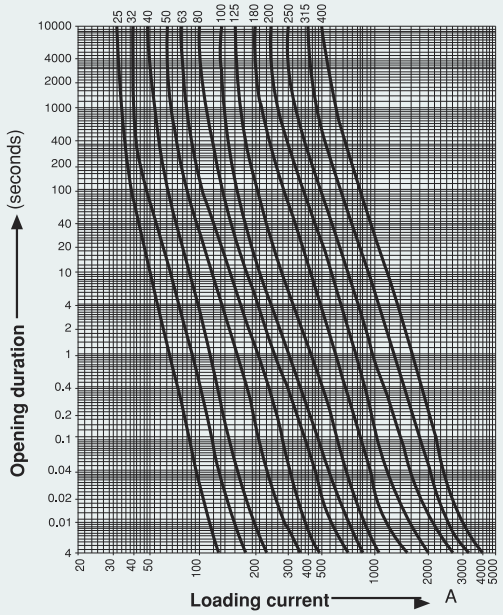


Fig-7:
Current-time characteristic of super flink NH fuses "gR"

Super Flink NH Fuse:

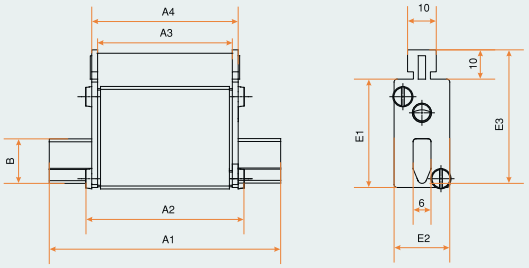
These are fuses used in protection against over current and short circuits of AC and DC power circuits, where power electronic elements such as diode, thyristor are present. The most important feature discriminating super flink fuses from NH type fuses is the material type of the melting wire used inside the NH fuse. Pure silver material is used as the melting wire in super flink fuses. As it can be seen in current-time characteristic curves of super flink fuses, temperature increase is higher than protection devices with operating class "gL/gG" (Figure-7). In this way, sensitive protection is provided at rated current or values close to rated current via super flink fuses.

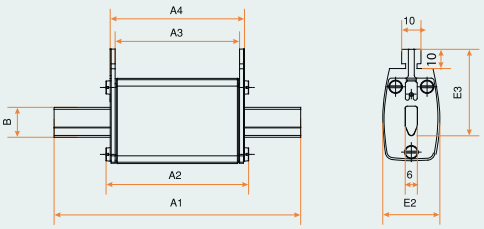
Operating characteristic : Super flink (fast)
Rated voltage : AC 500 V
Operating class : gR
Breaking capacity : 120 kA (rms)

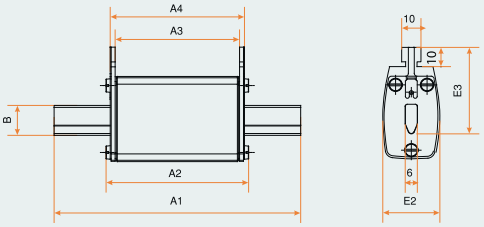
Order Codes of Super Flink Fuses:

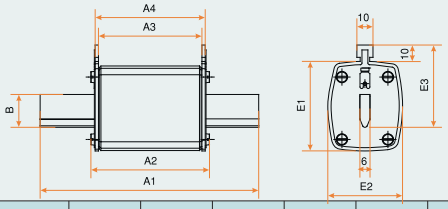
Type	Size	Rated current	I^2T Total	I^2T Melting	Order code
NHG00-FB	00	25 A	300	80	9CB-BH000-0025
NHG00-FB	00	32 A	450	130	9CB-BH000-0032
NHG00-FB	00	40 A	1000	260	9CB-BH000-0040
NHG00-FB	00	50 A	1500	400	9CB-BH000-0050
NHG00-FB	00	63 A	2300	620	9CB-BH000-0063
NHG00-FB	00	80 A	3400	900	9CB-BH000-0080
NHG00-FB	00	100 A	5700	1500	9CB-BH000-0100
NHG00-FB	00	125 A	10000	2700	9CB-BH000-0125
NHG00-FB	00	160 A	21000	6000	9CB-BH000-0160
NHG1-FB	1	100 A	6100	1600	9CD-BH000-0100
NHG1-FB	1	125 A	10000	2400	9CD-BH000-0125
NHG1-FB	1	160 A	20000	5100	9CD-BH000-0160
NHG1-FB	1	200 A	30000	7800	9CD-BH000-0200
NHG1-FB	1	250 A	52000	14000	9CD-BH000-0250
NHG2-FB	2	200 A	30000	7800	9CE-BH000-0200
NHG2-FB	2	250 A	52000	14000	9CE-BH000-0250
NHG2-FB	2	315 A	82000	20000	9CE-BH000-0315
NHG2-FB	2	400 A	160000	40000	9CE-BH000-0400
NHG3-FB	3	315 A	80000	20000	9CF-BH000-0315
NHG3-FB	3	400 A	160000	40000	9CF-BH000-0400
NHG3-FB	3	500 A	270000	70000	9CF-BH000-0500
NHG3-FB	3	630 A	360000	90000	9CF-BH000-0630

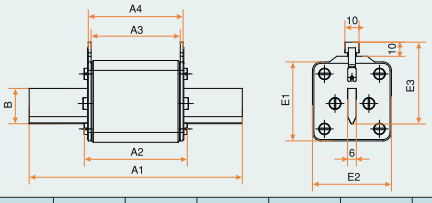
	Order code	Size	Rated Current (A)	Pcs / Box	kg. / Box	Dimensions (mm) a1	a2	a3	a4	b	e1	e2	e3
 NHC00-FB	9CA-BG000-0006	C00	6	10	1.305	78.5	54	45	49	15	36	21	45
	9CA-BG000-0010	C00	10	10	1.305								
	9CA-BG000-0016	C00	16	10	1.305								
	9CA-BG000-0020	C00	20	10	1.305								
	9CA-BG000-0025	C00	25	10	1.305								
	9CA-BG000-0032	C00	32	10	1.305								
	9CA-BG000-0040	C00	40	10	1.305								
	9CA-BG000-0050	C00	50	10	1.305								
	9CA-BG000-0063	C00	63	10	1.305								
	9CA-BG000-0080	C00	80	10	1.305								
	9CA-BG000-0100	C00	100	10	1.305								
 NH00-FB	9CB-BG000-0006	00	6	10	1.760	78.5	54	45	49	15	48	29.5	44.5
	9CB-BG000-0010	00	10	10	1.760								
	9CB-BG000-0016	00	16	10	1.760								
	9CB-BG000-0020	00	20	10	1.760								
	9CB-BG000-0025	00	25	10	1.760								
	9CB-BG000-0032	00	32	10	1.760								
	9CB-BG000-0035*	00	35	10	1.760								
	9CB-BG000-0040	00	40	10	1.760								
	9CB-BG000-0050	00	50	10	1.760								
	9CB-BG000-0063	00	63	10	1.760								
	9CB-BG000-0080	00	80	10	1.760								
	9CB-BG000-0100	00	100	10	1.760								
	9CB-BG000-0125	00	125	10	1.760								
	9CB-BG000-0160	00	160	10	1.760								
 NH0-FB	9CC-BG000-0025	0	25	5	1.225	125	71	62	66	15	48	29.5	44.5
	9CC-BG000-0032	0	32	5	1.225								
	9CC-BG000-0040	0	40	5	1.225								
	9CC-BG000-0050	0	50	5	1.225								
	9CC-BG000-0063	0	63	5	1.225								
	9CC-BG000-0080	0	80	5	1.225								
	9CC-BG000-0100	0	100	5	1.225								
	9CC-BG000-0125	0	125	5	1.225								
	9CC-BG000-0160	0	160	5	1.225								
 NH1-FB	9CD-BG000-0050*	1	50	3	1.300	135	71	62	68	20	54	45	51
	9CD-BG000-0063*	1	63	3	1.300								
	9CD-BG000-0080	1	80	3	1.300								
	9CD-BG000-0100	1	100	3	1.300								
	9CD-BG000-0125	1	125	3	1.300								
	9CD-BG000-0160	1	160	3	1.300								
	9CD-BG000-0200	1	200	3	1.300								
	9CD-BG000-0250	1	250	3	1.300								
 NH2-FB	9CE-BG000-0080*	2	80	3	2.005	150	73.5	62	68	25	60	57	58
	9CE-BG000-0100*	2	100	3	2.005								
	9CE-BG000-0125*	2	125	3	2.005								
	9CE-BG000-0160	2	160	3	2.005								
	9CE-BG000-0200	2	200	3	2.005								
	9CE-BG000-0250	2	250	3	2.005								
	9CE-BG000-0315	2	315	3	2.005								
	9CE-BG000-0400	2	400	3	2.005								
 NH3-FB	9CF-BG000-0250*	3	250	1	0.980	150	73.5	62	68	32	75	69	70
	9CF-BG000-0315	3	315	1	0.980								
	9CF-BG000-0400	3	400	1	0.980								
	9CF-BG000-0500	3	500	1	0.980								
	9CF-BG000-0630	3	630	1	0.980								

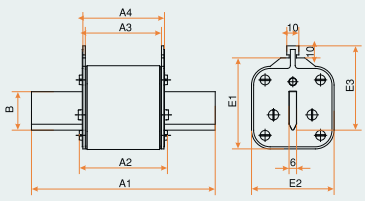












* Marked products are manufactured upon order.

BMC

Steatit

NH00-FA

Order code

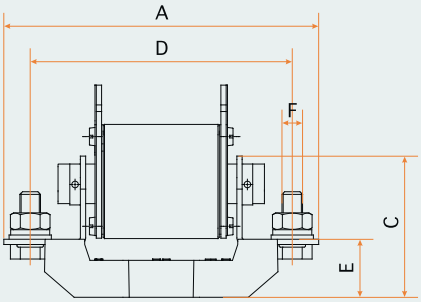
9CB-C0□00-0000 (BMC)
9CB-A0□00-0000 (Steatit)
□ C- with screw □ K- with clemens
□ X-with screw and clemens
Size : 00
Rated current : 160 A
Quantity / box : 5
Kg. / box : 0.795 (BMC)
1.060 (Steatit)

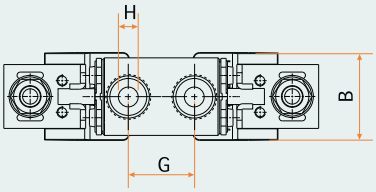
BMC

NH0-FA

Order code

9CC-C0□00-0000 (BMC)
□ C- with screw □ K- with clemens
□ X-with screw and clemens
Size : 0
Rated current : 160 A
Quantity / box : 5
Kg. / box : 1.020





Type	Dimension (mm)							
	A	B	C	D	E	F	G	H
NH00	120	32,5	54	101	23,5	M8	25	7,5
NH0	170	32	64,5	150	30,5	M8	25	7,5

BMC

Steatit

NH1-FA

Order code

9CD-C0C00-0000 (BMC)
9CD-A0C00-0000 (Steatit)
Size : 1
Rated current : 250 A
Quantity / box : 3
Kg. / box : 1.375 (BMC)
1.845 (Steatit)

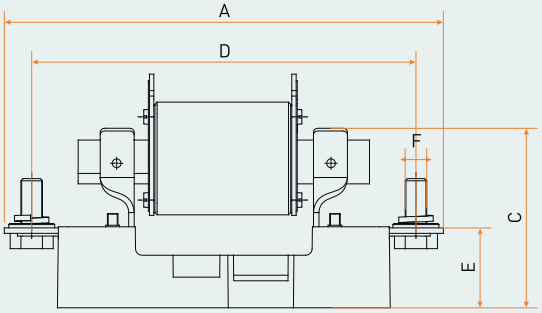
BMC

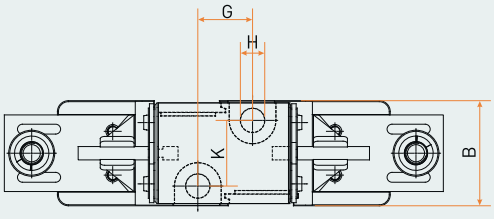
Steatit

NH2-FA

Order code

9CE-C0C00-0000 (BMC)
9CE-A0C00-0000 (Steatit)
Size : 2
Rated current : 400 A
Quantity / box: 3
Kg. / box : 1.740 (BMC)
1.950 (Steatit)





Type	Dimension (mm)								
	A	B	C	D	E	F	G	H	K
Nh1	200	47,5	82	175	35	M10	25	10,5	30
Nh2	225	47,5	88	200	35	M10	25	10,5	30
Nh3	240	47,5	99	210	37	M12	25	10,5	30

BMC

Steatit

NH3-FA

Order code

9CF-C0C00-0000 (BMC)
9CF-A0C00-0000 (Steatit)
Size : 3
Rated current : 630 A
Quantity / box: 3
Kg. / box : 2.280 (BMC)
2.750 (Steatit)

Power losses:
It is the power consumption on the NH fuse, which has reached stable temperature, while rated current passes through the circuit. When rated current passes through a fuse, temperature at joints of the NH fuse (for example 00 length and 160A) does not exceed 65K.
Power losses of Federal Electric NH fuses are below the values set by the standards. These values are shown comparatively in the table below in accordance with TS EN 60269 / IEC60269 / VDE 0636.

Size	Rated Current (A)	Maximum power loss values			
		TS EN 60269	IEC 60269	VDE 0636	Federal
00	6	12 W	12 W	7.5 W	1.7 W
00	10	12 W	12 W	7.5 W	2.0 W
00	16	12 W	12 W	7.5 W	2.2 W
00	25	12 W	12 W	7.5 W	2.7 W
00	32	12 W	12 W	7.5 W	3.5 W
00	40	12 W	12 W	7.5 W	4.2 W
00	50	12 W	12 W	7.5 W	4.5 W
00	63	12 W	12 W	7.5 W	5.8 W
00	80	12 W	12 W	7.5 W	6.6 W
00	100	12 W	12 W	7.5 W	8.5 W
00	125	12 W	12 W	7.5 W	10.0 W
00	160	12 W	12 W	—	12.0 W
0	25	16 W	16 W	16 W	3.4 W
0	32	16 W	16 W	16 W	4.0 W
0	40	16 W	16 W	16 W	5.0 W
0	50	16 W	16 W	16 W	5.7 W
0	63	16 W	16 W	16 W	7.2 W
0	80	16 W	16 W	16 W	7.5 W
0	100	16 W	16 W	16 W	8.5 W
0	125	16 W	16 W	16 W	10.0 W
0	160	16 W	16 W	16 W	14.0 W
1	80	23 W	23 W	23 W	7.5 W
1	100	23 W	23 W	23 W	9.0 W
1	125	23 W	23 W	23 W	10.0 W
1	160	23 W	23 W	23 W	13.0 W
1	200	23 W	23 W	23 W	17.5 W
1	250	23 W	23 W	23 W	23.0 W
2	160	34 W	34 W	34 W	12.0 W
2	200	34 W	34 W	34 W	17.5 W
2	250	34 W	34 W	34 W	20.3 W
2	315	34 W	34 W	34 W	25.0 W
2	400	34 W	34 W	34 W	30.0 W
3	315	48 W	48 W	48 W	25.0 W
3	400	48 W	48 W	48 W	31.0 W
3	500	48 W	48 W	48 W	35.0 W
3	630	48 W	48 W	48 W	42.0 W