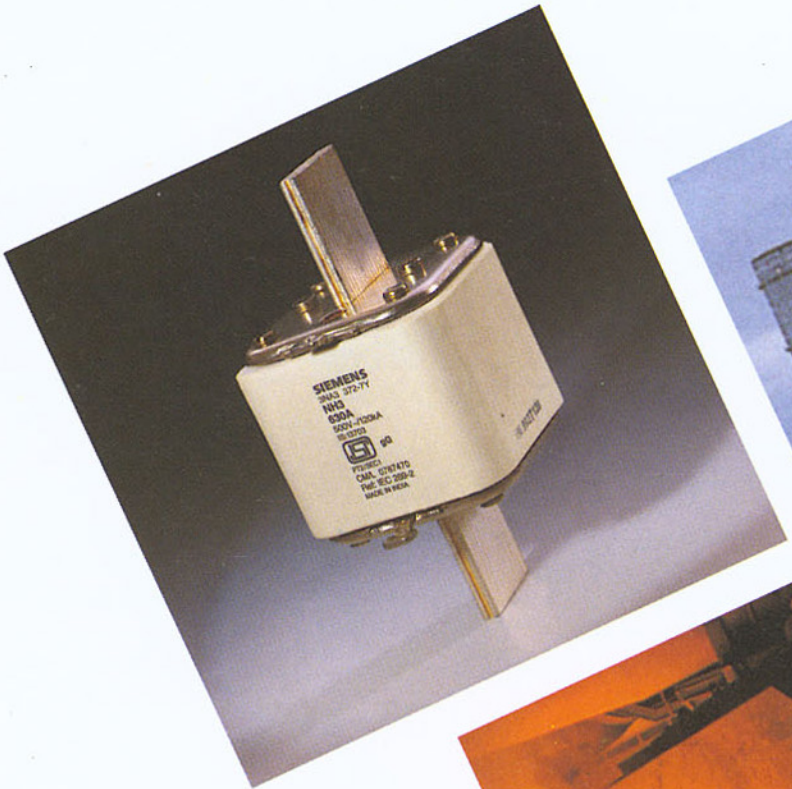
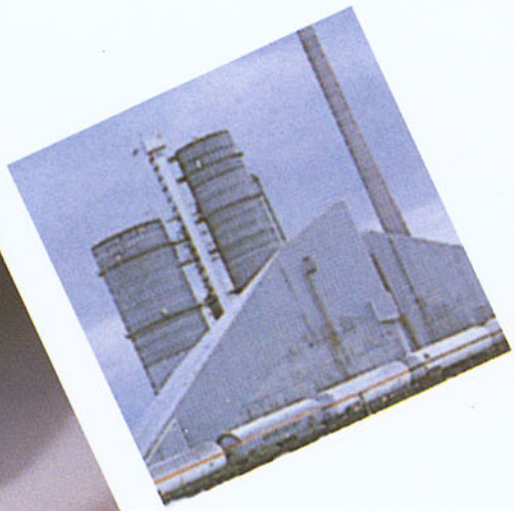
SIEMENS

HRC Fuse - Type 3NA3

The protection switchgear from Siemens

HRC 3NA3 CATALOGUE





Contents

* Include Accessories - Fuse Base, Fuse Puller & Isolating Link

Technical description
Low-Voltage fuses

Short data description
3NA3 LV HRC Fuses

Standards	IS 13703 Part 2 Section 1 (1993); IEC269-2-1
Dimensions	IS 13703; IEC 269
Operating class	gG
Rated voltage	AC 500V/DC 440V (DC 250V for size 00)
Rated current range	2 to 630A
Rated breaking capacity	AC 120kA / DC 100kA (50kA for size 00)
Mounting position	as desired but preferably vertical
Resistance to climate	-30°C to +50°C at 95% relative humidity

LV HRC Fuses

3NA3 LV HRC fuses are available in 5 different sizes from 2 to 630 A.

The main part of the LV HRC fuses is the fuse-element of high-grade copper. The important factors are the resistance value per meter, the material thickness and the dimensional accuracy. Three criteria decisive in the production of the fuse-elements are:

- Accurate cutting and punching
- Precise application of the solder deposit
- Accurate and concentric insertion of the fuse-element in the fuse body.

Where several fuse-elements are involved, these are fitted exactly parallel to each other in the fuse body. This ensures adequate cooling of the individual arcs. The precision of the parallel arrangement can be verified by observing the beads of molten metal after the fuse has switched off a short circuit. The fuse-element must not be too close to the wall of the fuse body as otherwise there is no protective layer of sand. If the arc were to touch the wall of the fuse body, the fuse might burst or blow.

The fuse-elements of 3NA3 fuses are of operating class gG and of copper. The use of silver-plated or pure silver fuse-elements is not required for physical reasons.

Oxidation, also called scaling of copper, which reduces the cross-section of the fuse-element, occurs only at a temperature of approx. 350 ^{0}C. In the time/current range within which a fuse operates, however, only temperatures of 180^{0}C to 240^{0}C are attained. Hence safe tripping is ensured with this fuse element.

Advantages

- Consistently high quality LV HRC fuses
- Least stresses to downstream equipments during short circuit due to lower let through current
- Low power losses resulting in high economy and minimal heating
- Safe and reliable breaking capacity from the smallest and dangerous overload current up to the largest short-circuit current
- Finely graded selectivity level for the optimal use of cable cross sections
- Reliable even after continuous operation over a long period
- High resistance to ageing thus avoiding unnecessary operational faults
- Constant characteristics even under different temperature conditions
- Wide range of practical accessories
- Approved in many countries of the world

Applications

Fuses are primarily used for the protection of cables and conductors against overload and short-circuit currents, and are also suitable for the protection of equipment and systems. Some of the important applications are:

- Due to high selectivity 3NA3 HRC fuses are used in radial and ring networks
- For back-up protection of MCBs
- For protection of motor circuits in which operational short-term overloads and short-circuits occur
- Short circuit protection for switching devices such as contactors and circuit-breakers

The field of application for fuses include industrial installations, power supply utilities, equipment manufacturers, switchboards and control panels.

Quality assurance with LV HRC fuse links

The foundation for the stipulated high quality is laid as early as the stages of product development, planning of the means of production, as well as the selection of materials and their procurement. During production, there are certain major inspection stages:

- Material and parts receiving inspection
- Assembly inspection
- Final inspection

Quality assurance with LV HRC fuse links

(Continuation)

Material and parts receiving inspection

Particular attention is paid to maintain the specification and dimensional accuracy of the fuse-element, which is the main part of a fuse link. For example, the thickness of the copper strip is within a tolerance of a few thousandths of a millimeter, to ensure high discrimination. The fuse bodies are subjected to a bursting test to determine their strength. Even the sand used has a certain grain size, and are chemically pure which leads to reliable operation of the LV HRC fuse links even at high short-circuit currents up to 120 kA.

Assembly inspection

The copper strip is necked by punching under electronic control to form the narrow sections. The solder deposit is then applied to the fuse-elements by a special proven process. The location and quality of the solder deposit are thoroughly checked since they are mainly responsible for the overload and characteristic stability. The fuse-elements are fitted on fully mechanized and electronically controlled assembly lines, which are of modular design. A reference/actual value comparison is made at numerous checkpoints. The electronic test units integrated in the individual modules check every assembly step, including the quality of the sand filling, the internal resistance of the fuse link and the position of the contact pieces. The mechanical insertion of the fuse-element assembly ensures that its position in the ceramic insulating body is exactly concentric. Finally, every fuse-link is inspected visually for satisfactory appearance.

Final inspection

The final inspection is performed according to statistical measures. The aim is to determine whether the originally stipulated design properties have been satisfied. These include not only meeting the relevant specifications, outlined in standards but also the requirements likely to be encountered under severe conditions in practice.

Selectivity

In an installation, as a rule, several fuses are connected in series. Selectivity ensures that in an emergency, only the plant in the faulty circuit is disconnected, and not the entire operation. Siemens fuses with operating class gG for a rated voltage up to ~230V are mutually selective in the ratio 1:1.25, i.e. from rated current type to rated current type. This is due to the much lower tolerance range, ±5% of the time/current characteristics curve. The standard requires a ratio limit of 1:1.6, which our fuses clearly exceed. The cable sizes due to the smaller rated currents can also be reduced.

Breaking capacity

The fuses distinguish themselves with their high rated breaking capacity of atleast 120kA which is achieved through:

– Fuse element design and manufacturing process

– Precise positioning of fuse element inside the fuse body

– Chemical purity, grain size and density of the quartz sand

– Resistance to pressure and temperature change on the ceramic fuse body

The basic requirements and circuit data for the testing, i.e. voltage, load factor, switching angle etc. are detailed in the international (IEC 269) standards and Indian standard IS 13703.

Current limitation

Along with a reliable rated breaking capacity the current limiting effect i.e. let through current of fuse links can have a significant influence on the economy of an installation.

During the interruption of a short-circuit by a fuse, the short-circuit current also flows through the upstream fuses. The short-circuit current is limited by the network impedance.

By the simultaneous melting of all narrow parts of the fuse element partial electrical arcs lying in series assure quick breaking with greater current limitation. The current limitation is therefore, influenced substantially by the quality of manufacture, for which Siemens fuses is known for.

This strong current limiting property of 3NA3 protects the system for excessive loads everytime.

Co-ordination for cable and line protection

To ensure co-ordination of fuses with regard to cable and line protection during overload, according to DIN 0100 part 430, the following conditions apply:

(1) $I_B \leq I_N \leq I_z$ (Nominal current range)

(2) $I_2 \leq 1.45 \times I_N$ (Tripping range)

I_B: Operating current of the circuit

I_N: Nominal current of selected protective device

I_Z: Permissible current loading capacity at given operating conditions for the cable or line

I_2: Tripping current of the protective device under determined conditions (large test current)

The factor 1.45 is an internationally accepted compromise between utilisation and level of protection for a conductor, when considering the disconnection limits and the possible protective device (e.g. fuses).

Co-ordination for cable and line protection

(Continuation)

Siemens fuse links of the operating class gG completely conform with the supplementary parts of the standard IEC 269, the condition being:

"Disconnection with I_2 = 1.45 x I_N for the conventional continuous test under the particular test requirements according to the named supplementary part of standard IEC 269."

A direct co-ordination is therefore possible.

Rated watt loss

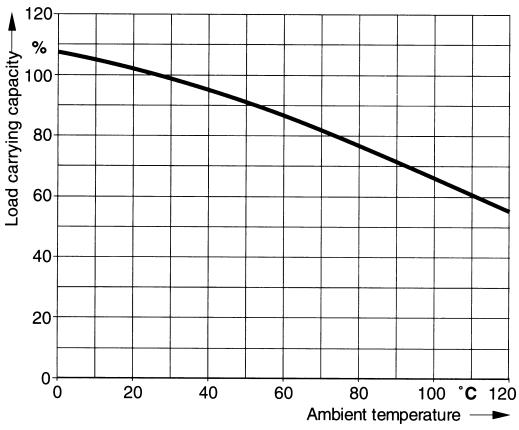
The economy of a fuse depends considerably on the rated watt loss. This should be kept as low as possible by minimal self-heating capability. In order to achieve a low watt loss, the fuse element should be as thick as possible, however to ensure a high rated breaking capacity, a thin fuse element that ensures safe arc quenching is required. Siemens fuses when considering their high breaking capacity, have their rated power losses kept as low as possible.

These values lie far below the limits specified in the standards. That means minimal heating, reliable breaking capacity and high economy.

Load carrying capacity at higher ambient temperatures

Test rig according to IEC 269

According to IEC 269, the shape of the time/current characteristic of LV HRC fuse links is referred to an ambient temperature of 20 °C ±5% °C. When being used at a higher ambient temperature (see diagram), a lower load carrying capacity should be anticipated. For example, at an ambient temperature of 50 °C, a LV HRC fuse link should be loaded with only 90% of the rated current. The short-circuit behaviour is not affected by a higher ambient temperature.



LV HRC Fuses

LV HRC fuse links

- According to IEC 269/IS 13703
- Rated voltage: AC 500 V/DC 440 V
- Exception: Size 00 with DC 250 V
- Operating class gG
- Finely graded selectivity
- Rated breaking capacity (AC): 120 kA

Size	Rating A	Order No.	Std. Pkg. (Nos.)	Weight per unit. Kg.	Replaces 3NA1 type
00c	2 [1])	3NA3 8027Y	3/9	0.130	3NA1 008
	4 [1])	3NA3 8047Y			3NA1 009
	6 [1])	3NA3 8017Y			3NA1 011
	10 [1])	3NA3 8037Y			3NA1 012
00c	16 [1])	3NA3 8057Y	3/9	0.130	3NA1 013
	20 [1])	3NA3 8077Y			3NA1 014
	25 [1])	3NA3 8107Y			3NA1 015
	32 [1])	3NA3 8127Y			3NA1 001
00c	50 [1])	3NA3 8207Y	3/9	0.130	3NA1 017
	63 [1])	3NA3 8227Y			3NA1 018
	80 [1])	3NA3 8247Y			3NA1 020
	100[1])	3NA3 8307Y			3NA1 021
00	125[2])	3NA3 8327Y	3/9	0.220	3NA1 010
	160[2])	3NA3 8367Y			–

➤ For dimension drawings, see page 15.

[1]) With reduced dimensions according to IEC 269; width: 21 mm.

[2]) This design is manufactured according to IEC 269 and meets the operating class gG for cable and conductor protection.

LV HRC Fuses

LV HRC fuse links (Continuation)

Size	Rating A	Order No.	Std. Pkg. (Nos.)	Weight per unit kg	Replaces 3NA1 type
1	32	–	–	–	3NA1 201
	50	3NA3 1207Y	1/10	0.300	3NA1 217
	63	3NA3 1227Y			3NA1 218
	80	3NA3 1247Y			3NA1 220
1	100	3NA3 1307Y	1/10	0.300	3NA1 221
	125	3NA3 1327Y			3NA1 222
	160	3NA3 1367Y			3NA1 224
1	200	3NA3 1407Y	1/10	0.440	3NA1 225
	224	–	–	–	3NA1 226
	250	3NA3 1447Y			3NA1 227
2	315	3NA3 2527Y	1/10	0.650	3NA1 330
	355	–	–	–	3NA1 331
	400	3NA3 2607Y			3NA1 332
3	315	3NA3 3527Y	1/10	0.650	–
	400	3NA3 3607Y			–
	425	–	–	–	3NA1 433
	500	3NA3 3657Y	1/10	1.000	3NA1 434
	630	3NA3 3727Y			3NA1 436

➤ For dimension drawings, see page 15.

Note: The new 3NA3 fuses can also be fitted in the fuse bases of 3NA1.

LV HRC Fuse Bases

Fuse bases are available in four different ratings corresponding to different sizes of fuse links. They consist of an insulated base on which lyra contacts are fixed. Fuse links can be removed under live conditions. The fuse bases can be supplied either with screw terminals or plug in terminal connection.

The fuse bases are manufactured in accordance with IEC 269 & IS 13703

Rated voltage : AC 690 V/DC 440V

Special Characteristics :

- Low contact resistance due to silver plated lyra contacts
- Easy handling due to special shape of lyra contacts
- Constant contact pressure ensures reliable current conduction

	Conductor - cross section upto mm²	Order No.	Std. Pkg. (Nos.)	Weight per unit kg
• Size 00 Rated current 160 A (Suitable for fuselink of size 00c/00) Single pole				
With screw in connection	95	3NH3 030	1	0.235
With plug-in connection	6 to 70	3NH3 032	1	0.266

➤ For dimensional drawings, see pages 16 & 17.

LV HRC Fuse Bases

(Continuation)

	Conductor - cross section upto mm²	Order No.	Std. Pkg. (Nos.)	Weight per unit kg
 • Size 1 Rated current 250 A Single pole With screw in connection	150	3NH3 230	1	0.789
 • Size 2 Rated current 400 A Single pole With screw in connection	300	3NH3 330	1	0.843
 • Size 3 Rated current 630 A Single pole With screw in connection	2x40x5	3NH3 430	1	1.100

➤ For dimensional drawings, see pages 16 & 17.

Isolating Links

Together with fuse bases, these isolating links can effectively be used to serve as removable links in feeders instead of isolators.

These are made of silver plated copper alloy in one piece and are similar in construction to the ribbed contact knife of the fuse link.

Rating	Order No. Unit	Std. Pkg. (Nos.)	Weight per unit (Kg)
160	3NG1 000	1	0.075
250	3NG1 250	1	0.175
400	3NG1 300	1	0.260
630	3NG1 400	1	0.280

Fuse Pullers

Fuse puller with special insulated handle makes it possible to change fuses even under live conditions (on load). A mechanical lock provided on the fuse puller prevents the fuse link from drapping out the puller. The fuse link can be released by merely pressing the push button provided on a fuse puller.

3NX1 010

	Order No. Unit	Std. Pkg. (Nos.)	Weight per unit (Kg)
Fuse Puller	3NX1 010	1	0.205
	3NX 1 011	1	0.560

3NX1 011

Fuse Puller
Type 3NX1 010, 3NX1 011 suitable for all sizes of fuse links and isolating links.

➤ For dimensional drawings, see pages 17 & 18.

LV HRC Fuse Links

Range
3NA3 8

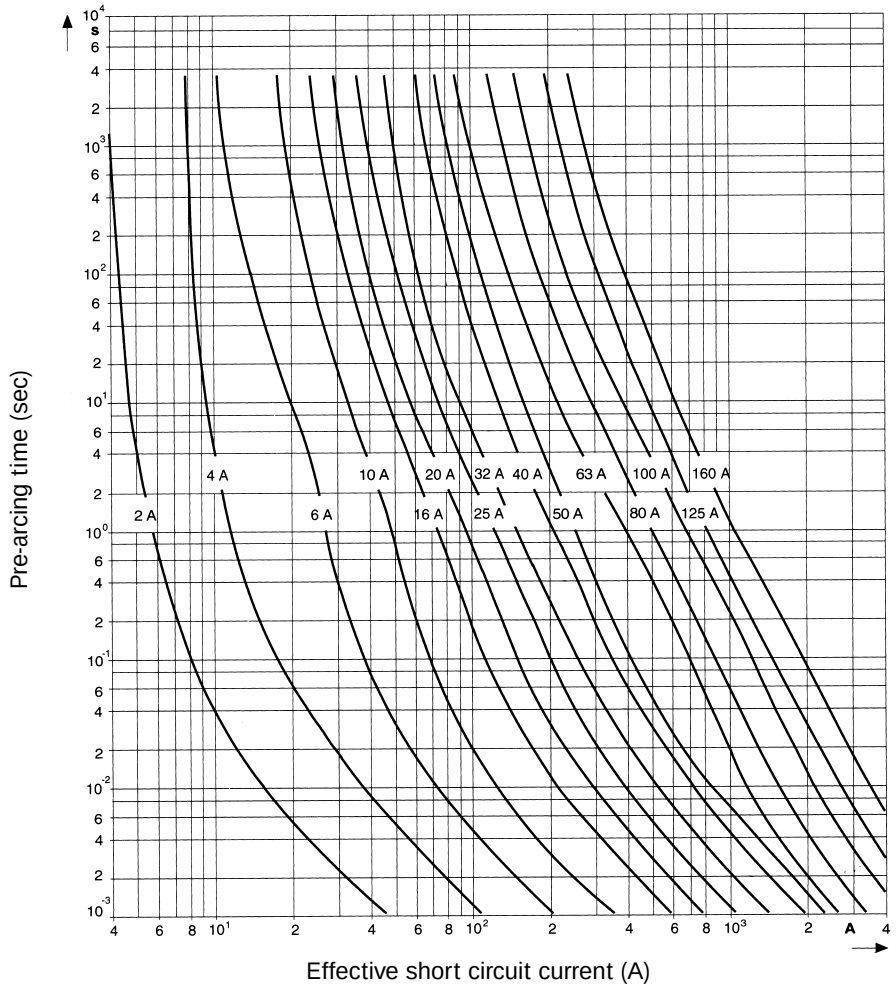
Size
00c/00

Operating class
gG

Rated voltage
AC 500 V / DC 250 V

Rated current
2 - 160 A

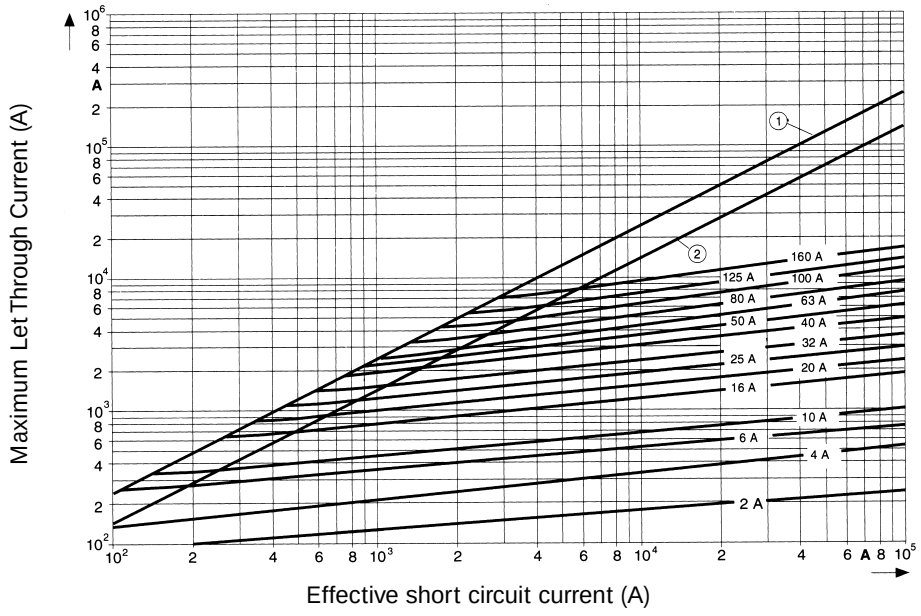
Time-current characteristic chart



Peak let-through current chart

① Peak short circuit current with maximum DC component

② Peak short circuit current without DC component



LV HRC Fuse Links

Range
3NA3 1

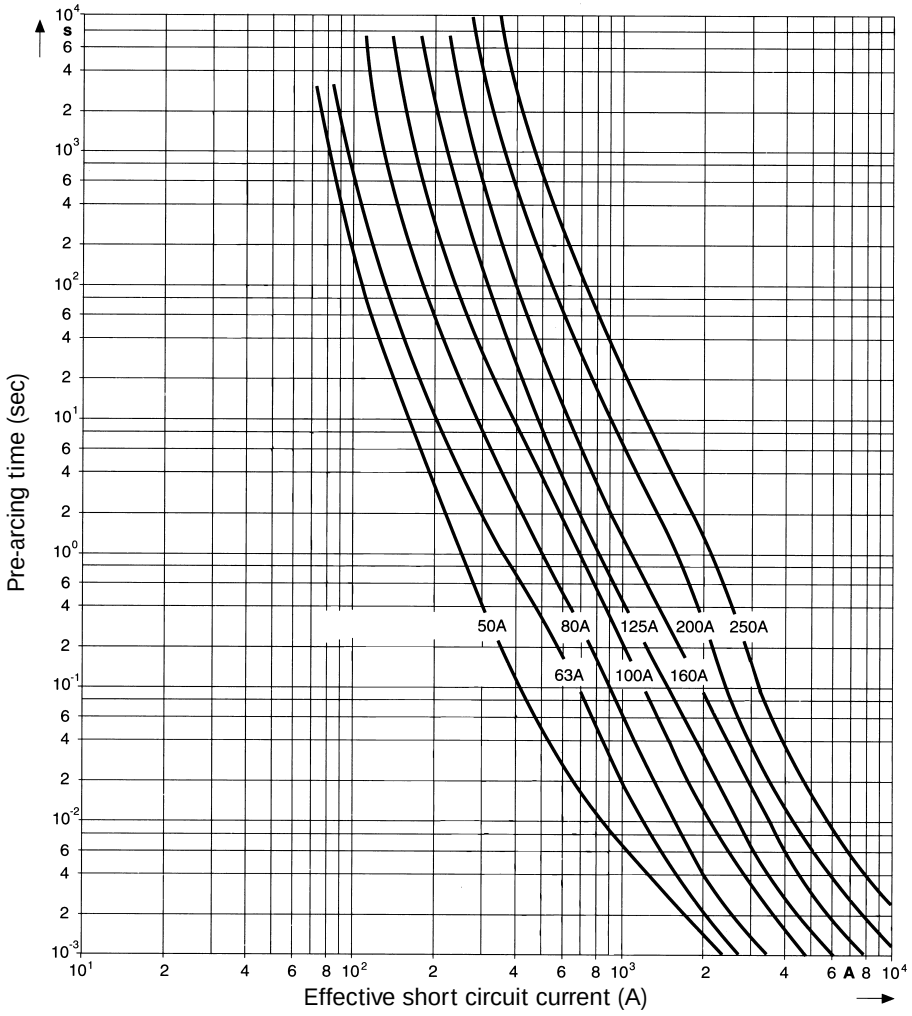
Size
1

Operating class
gG

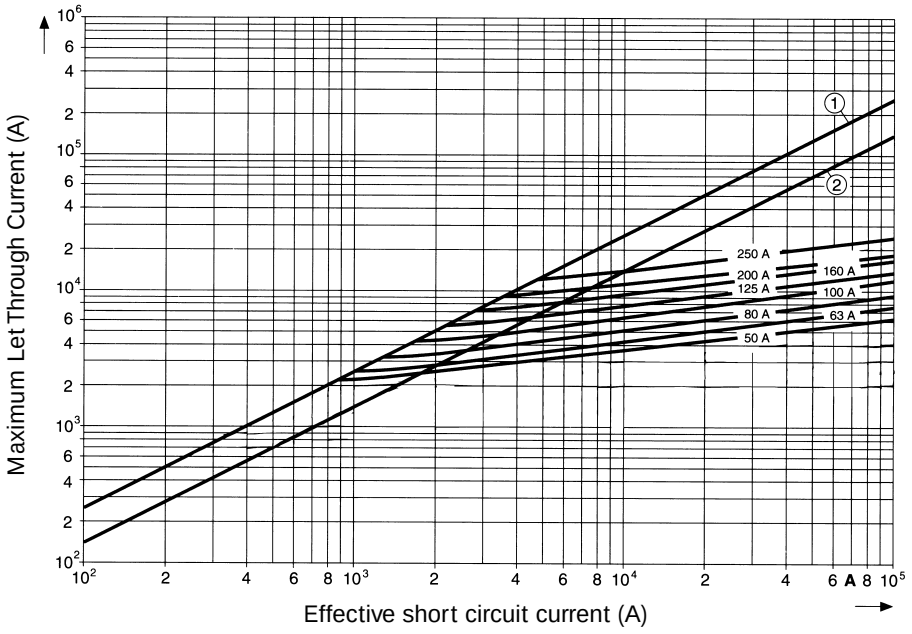
Rated voltage
AC 500 V / DC 440 V

Rated current
50 - 250 A

Time-current characteristic chart



Peak let-through current chart



① Peak short circuit current with maximum DC component

② Peak short circuit current without DC component

LV HRC Fuse Links

Range
3NA3 2

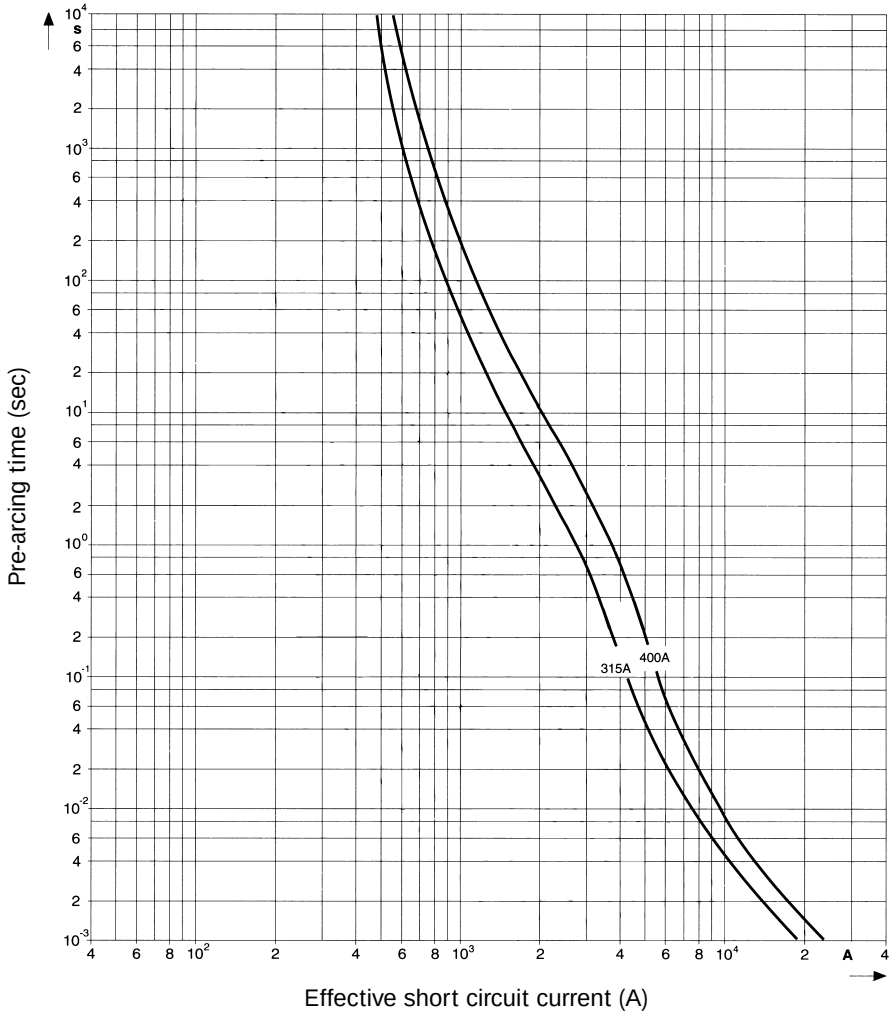
Size
2

Operating class
gG

Rated voltage
AC 500 V / DC 440 V

Rated current
315 - 400 A

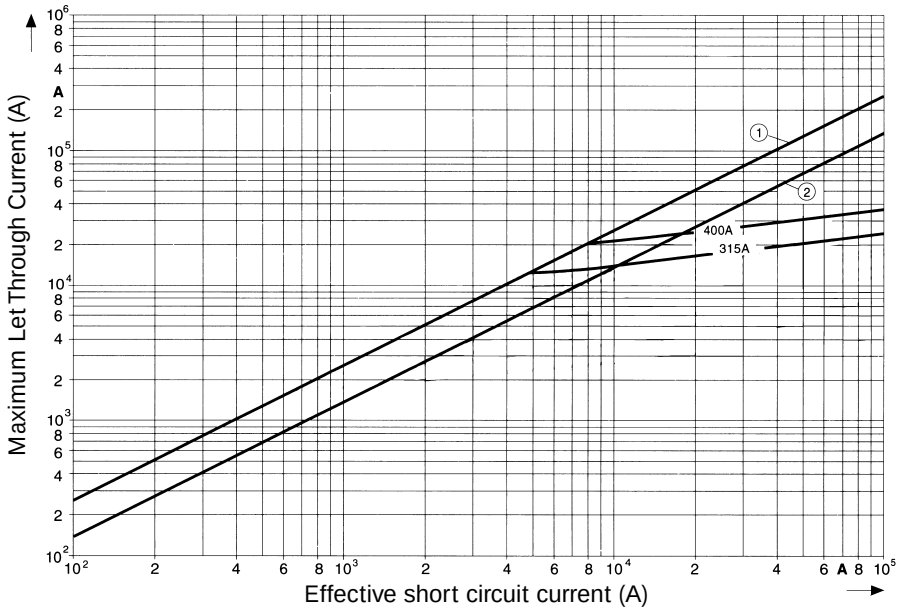
Time-current characteristic chart



Peak let-through current chart

① Peak short circuit current with maximum DC component

② Peak short circuit current without DC component



LV HRC Fuse Links

Range
3NA3 3

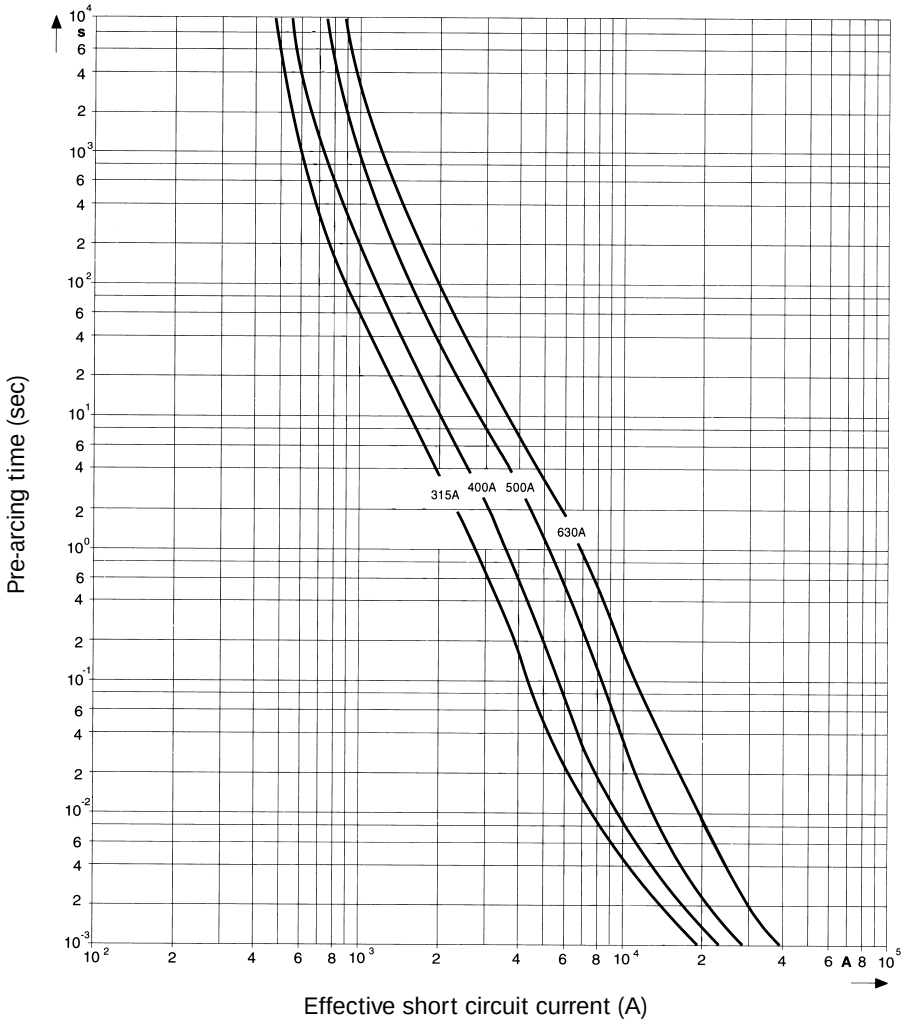
Size
3

Operating class
gG

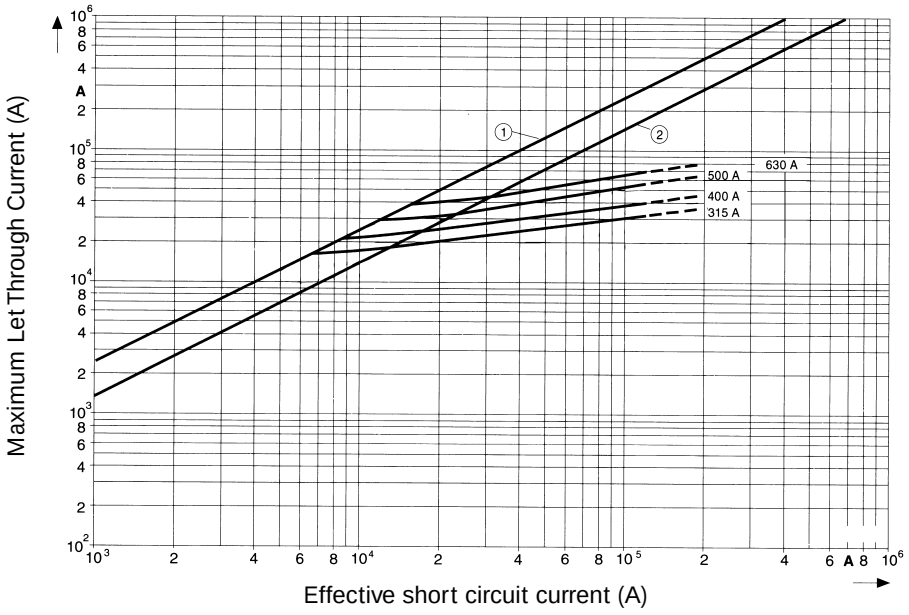
Rated voltage
AC 500 V / DC440 V

Rated current
315 - 630 A

Time-current characteristic chart



Peak let-through current chart



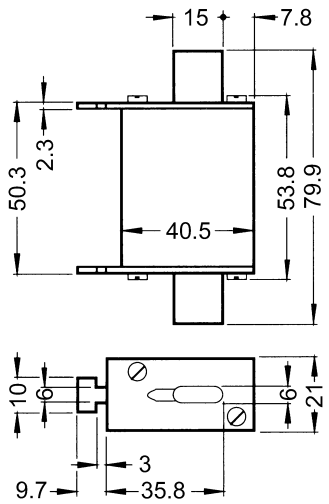
① Peak short circuit current with maximum DC component

② Peak short circuit current without DC component

Dimensions

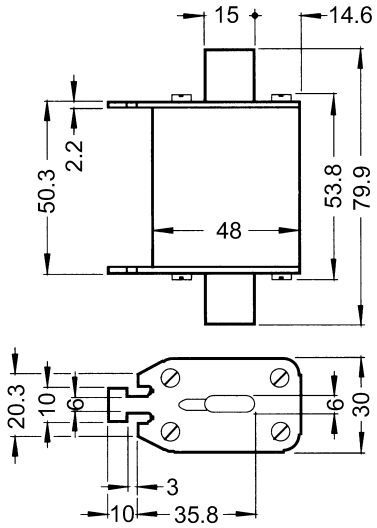
LV HRC fuse links

Size: 00c

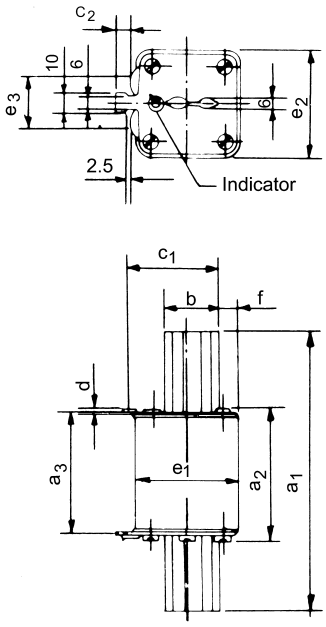


3NA3 8..

Size: 00



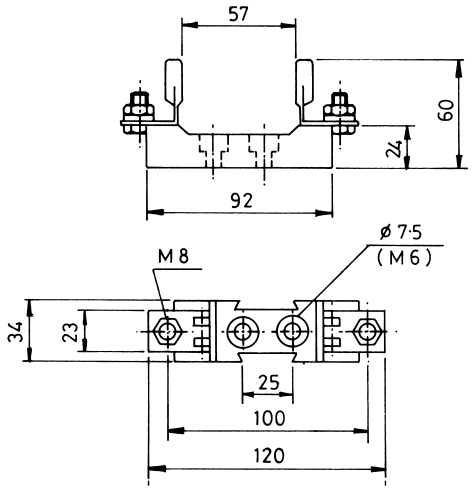
3NA3 8..



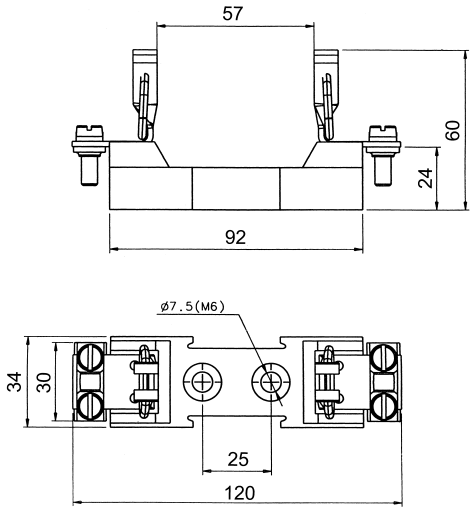
3NA3 1 2 & 3

Sizes	1	2	3
Type	3NA3 1	3NA3 2	3NA3 3
a1	135	150	150
a2	71.5	71.5	71.5
a3	65	65	65
b	21	30	36
c1	40	48	60
c2	9	9	9
d	3	3	3
e1	46	57	70
e2	46	57	70
e3	25	25	25
f	8.5	11.5	12

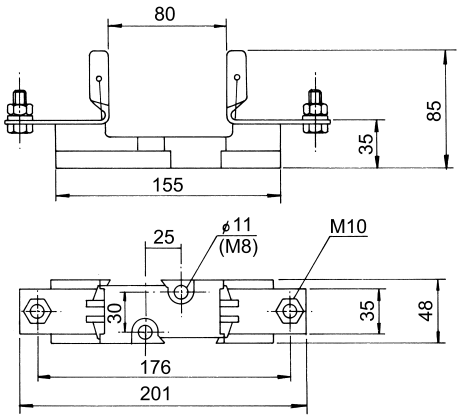
3NH3 Fuse Bases



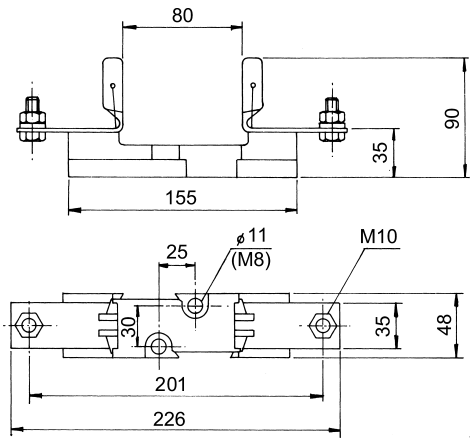
3NH3 030 (Size 00)



3NH3 032 (Size 00)



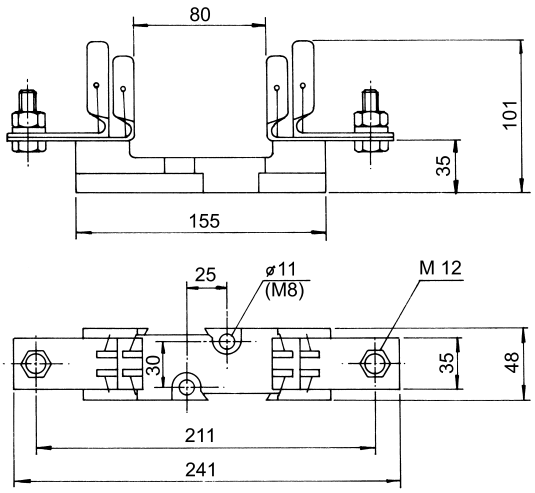
3NH3 230 (Size 1)



3NH3 330 (Size 2)

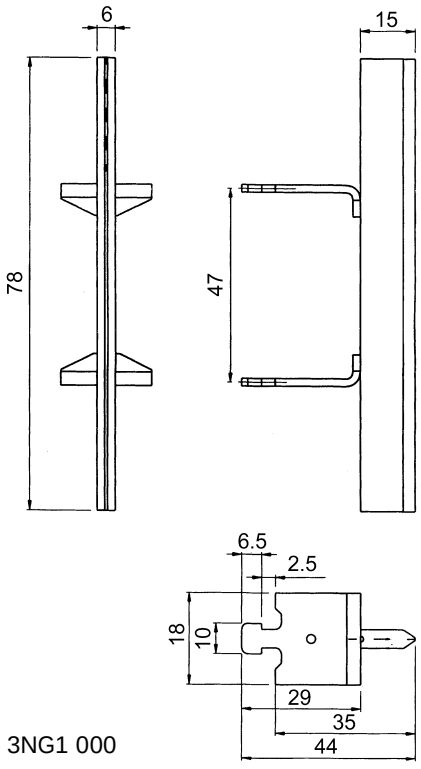
3NH3 Fuse Bases

(Continuation)

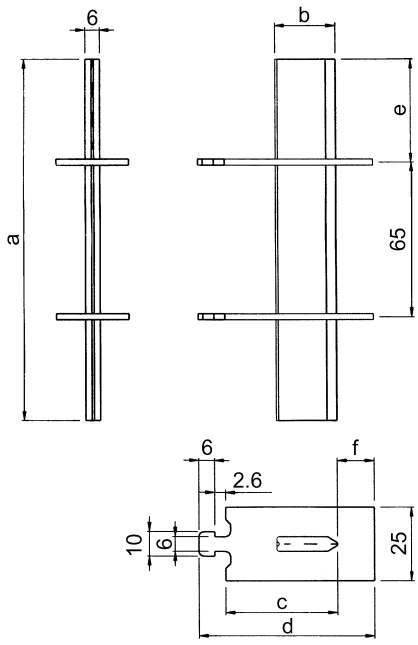


3NH3 430 (Size 3)

Isolating Links



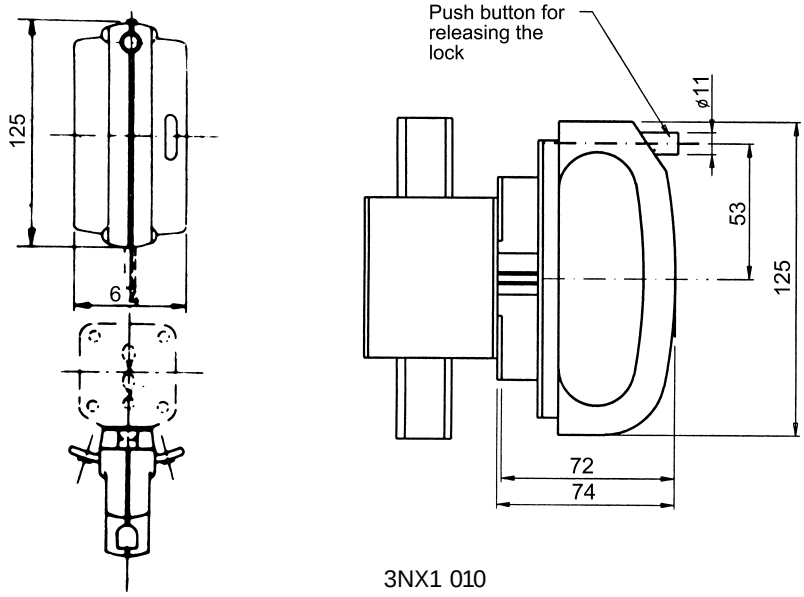
3NG1 000



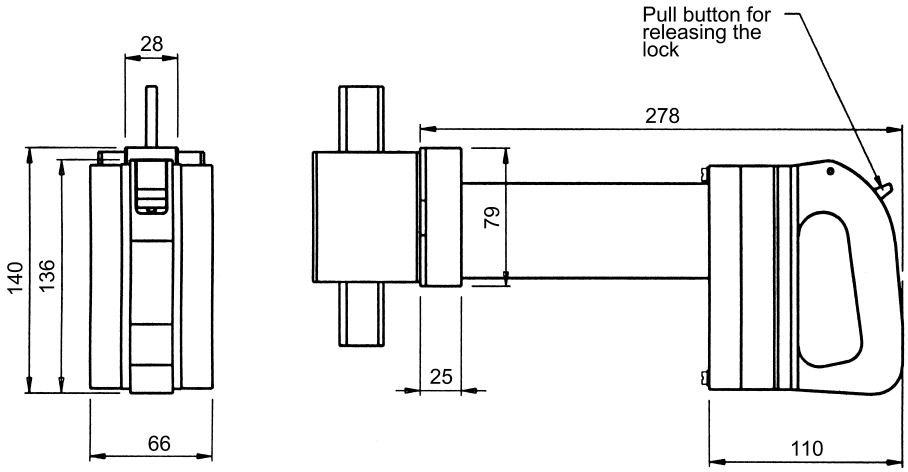
3NG1 250/300/400

Type	a	b	c	d	e	f
3NG1 250	135	23	40	56	35	8
3NG1 300	150	30	48	66.5	42.5	9
3NG1 400	150	36	60	77.5	42.5	10

Insulated-handle fuse pullers



3NX1 010



3NX1 011

Notes

Notes

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