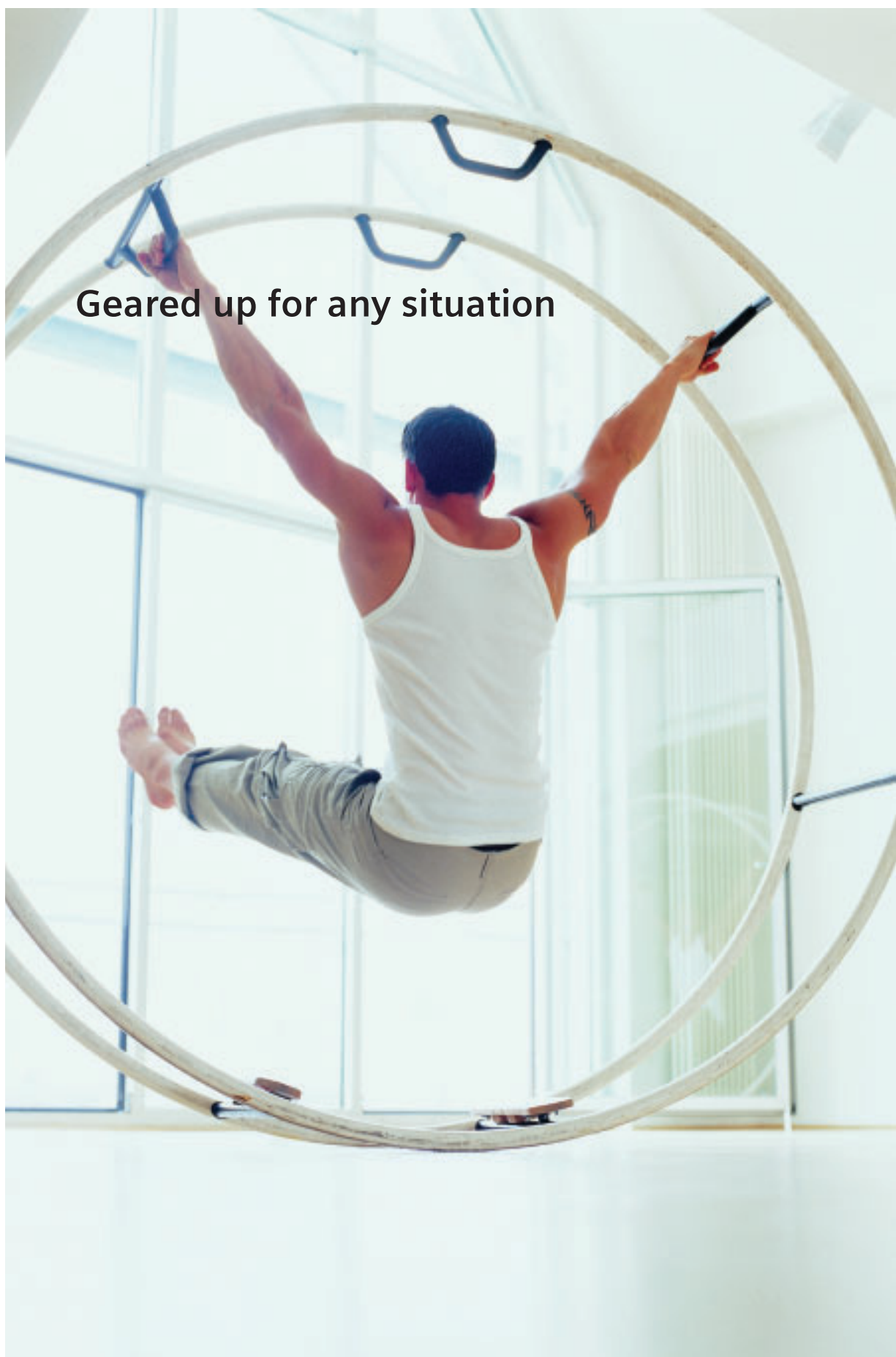




Geared up for any situation



## Fuses HRC

Answers for industry.

**SIEMENS**

# Introduction

## Short data description : 3NA7 LV HRC Fuses

Standards	IS 13703 Part 2 Section 1(1993); IEC 269
Dimensions	IS 13703; IEC 269
Operating class	gG
Rated Voltage	AC 500V / DC 440V upto 630A (DC 250V for size 00)
	AC 690V/DC 440V (DC 250V for size 00)
Rated Current Range	2 to 800A: (500 Vac) 800A@415V.
	40 to 500 A (690 Vac)
Rated Breaking Capacity	AC 120kA / DC 25kA
Mounting position	as desired but preferably vertical
Resistance to climate	-30° C to +50° C at 95% relative humidity

### LV HRC Fuses

During installations, when the conventional HRC Fuses are mounted on the fuse bases or Switch Disconnecter Fuse Units in panels as in Fuse Rails above certain height, it is very difficult to identify the status of the fuse link whether healthy or blown. This necessitates requirement of additional front indication.

The combination indicator Fuse has two indicators as against one indicator in conventional fuses. One indicator is on top cover plate similar to conventional fuses and other indicator is at the centre of the ceramic body of the fuse link. This helps in clear identification of status of fuse even from front side.

3NA7 LV HRC Fuses are available in 5 different sizes from 2 to 800A. 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.

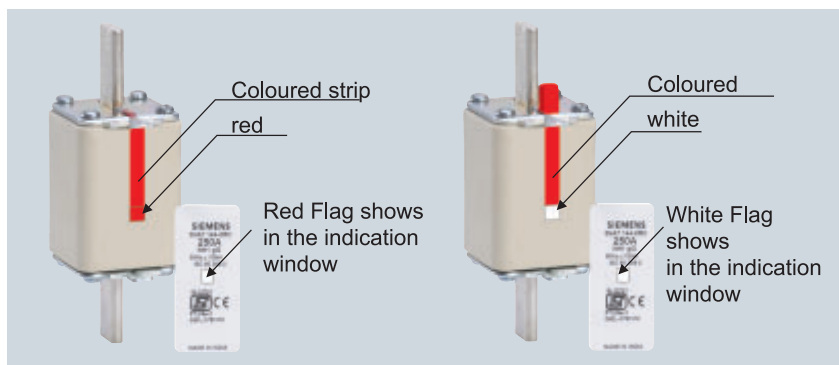
Where several fuse elements are involved, these are fitted exactly parallel to each other in the fuse body. This ensures adequate cooling of the individual arcs. The precision of the parallel arrangement can be verified by observing the beads of molten metal after the fuse has switched off a short circuit. 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 3 NA7 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 scalling of copper, which reduces the cross-section of the fuse-element, occurs only at a temperature of approx. 350° C. In the time/current range within which a fuse operates, however, only temperatures of 180° C to 240° C are attained. Hence safe tripping is ensured with this fuse element.

### Advantages

- Consistently high quality LVHRC 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 upto the largest short-circuit current.
- Finely graded selectivity level for the optimum use of cable cross sections
- High resistance to ageing thus avoids unnecessary operational faults
- Constant characteristics even under different temperature conditions



## 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 3NA7 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.

## 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,  $\pm 5\%$  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 at least 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 manufacturer, for which Siemens fuses is known for.

This strong current limiting property of 3NA7 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

Siemens fuse links of the operating

class gG completely conform with the supplementary part of the standard IEC 269, the condition being:

"Disconnection with  $I_2 = 1.45 \times I_N$  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

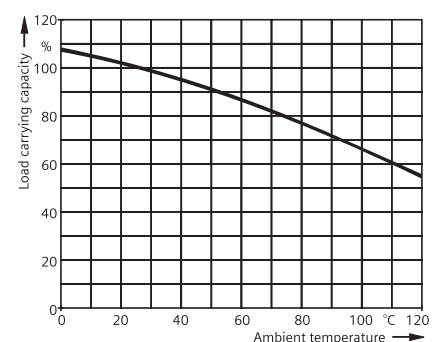
The economy of a fuse depends considerably on the rated watt loss. This should be kept as low as possible by minimal self-heating capability. In order to achieve a low watt loss, the fuse element should be as thick as possible, however to ensure a high rated breaking capacity, a thin fuse element that 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  $20^\circ\text{C} \pm 5\%$ . 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  $50^\circ\text{C}$ , a LV HRC fuse link should be loaded with only 90% of the rated current. The short-circuit behaviour is not affected by a high ambient temperature.








## Selection & Ordering Data

### LV HRC fuses : 500V AC

#### LV HRC fuse links

- According to IEC 60269/IS 13703
- Rated voltage: 500 V AC / 415 VAC for 800 A
- Rated voltage (DC): 440 V DC, upto 630A (250 V for size 000/00)
- Utilization Category gG
- Rated breaking capacity : 120 kA (AC), 25 kA (DC)

	Size	Rating A	Order No.	Std. Pkg. (Nos.)	Weight per unit kg	Replaces 3NA3 Type
 	000	2	3NA7 802-0RC	5/10	0.125	3NA3 802-7Y
		4	3NA7 804-0RC			3NA3 804-7Y
		6	3NA7 801-0RC			3NA3 801-7Y
		10	3NA7 803-0RC			3NA3 803-7Y
	000	16	3NA7 805-0RC	5/10	0.125	3NA3 805-7Y
		20	3NA7 807-0RC			3NA3 807-7Y
		25	3NA7 810-0RC			3NA3 810-7Y
		32	3NA7 812-0RC			3NA3 812-7Y
	000	40	3NA7 817-0RC	5/10	0.125	3NA3 817-7Y
		50	3NA7 820-0RC			3NA3 820-7Y
	000	63	3NA7 822-0RC	5/10	0.125	3NA3 822-7Y
		80	3NA7 824-0RC			3NA3 824-7Y
 	1	100	3NA7 130-0RC	1/10	0.270	3NA3 130-7Y
		125	3NA7 132-0RC			3NA3 132-7Y
		160	3NA7 136-0RC			3NA3 136-7Y
		200	3NA7 140-0RC		1/10	3NA3 140-7Y
		224	3NA7 142-0RC			3NA3 142-7Y
		250	3NA7 144-0RC			3NA3 144-7Y
	2	200	3NA7 240-0RC	1/10	0.475	—
		250	3NA7 244-0RC			—
	2	315	3NA7 252-0RC	1/10	0.670	3NA3 252-7Y
		400	3NA7 260-0RC			3NA3 260-7Y
	3	315	3NA3 352-0RC	1/5	1.040	3NA3 352-7Y
		400	3NA3 360-0RC			3NA3 360-7Y
		500	3NA3 365-0RC			3NA3 365-7Y
		630	3NA3 372-0RC			3NA3 372-7Y
		*800	3NA3 375-4RC			—



\* 800A fuses - Rated Voltage at 415V AC.

## Selection & Ordering Data

### LV HRC fuses : 690V AC

#### LV HRC fuse links

- According to IEC 60269/IS 13703
- Rated voltage: 690 V AC
- Rated voltage (DC): 440 V DC, (250 V for size 00)
- Utilization Catagory gG
- Rated short circuit breaking capacity : 120 kA (AC), 25 kA (DC)

	Size	Rating A	Order No.	Std. Pkg. (Nos.)	Weight per unit kg
	00	40	3NA7 817-6RC	5/10	0.190
		50	3NA7 820-6RC		
		63	3NA7 822-6RC		
		80	3NA7 824-6RC		
		100	3NA7 830-6RC		
	1	125	3NA7 132-6RC	1/10	0.270
		160	3NA7 136-6RC		0.270
		200	3NA7 140-6RC		0.450
	2	250	3NA7 244-6RC	1/10	0.670
		315	3NA7 252-6RC		
	3	400	3NA3 360-6RC	1/5	1.040
		425	3NA3 362-6RC		
		500	3NA3 365-6RC		





## Selection & Ordering Data

### 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

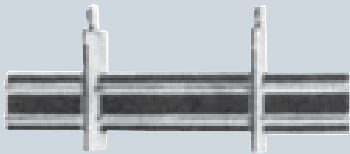
		Conductor - cross section upto mm <sup>2</sup>	Order No.	Std. Pkg. (Nos.)	Weight per unit kg
	<ul style="list-style-type: none"> <li>• Size 00 Rated current 160 A (Suitable for fuselink of size 000/00) Single pole</li> </ul>				
	With screw in connection	95	3NH3 030	1/10	0.145
	With plug-in connection	6 to 70	3NH3 032	1/10	0.145
	<ul style="list-style-type: none"> <li>• Size 1 Rated current 250 A</li> </ul>				
	Single pole With screw in connection	150	3NH3 230	1/5	0.390
	<ul style="list-style-type: none"> <li>• Size 2 Rated current 400 A</li> </ul>				
	Single pole With screw in connection	300	3NH3 330	1/5	0.420
	<ul style="list-style-type: none"> <li>• Size 3 Rated current 630 A</li> </ul>				
	Single pole With screw in connection	2x40x5	3NH3 430	1/5	0.680
	<ul style="list-style-type: none"> <li>• Size 3 Rated current 800 A</li> </ul>				
	Single pole With screw in connection	2x40x5	3NH3 430-4RC	1/5	0.720

## Selection & Ordering Data

### 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. (Nos.)	Std. Pkg. per unit (Kg)	Weight
	160	3NG1 000	1	0.075
	250	3NG1 250	1	0.175
	400	3NG1 300	1	0.260
	630	3NG1 400	1	0.280

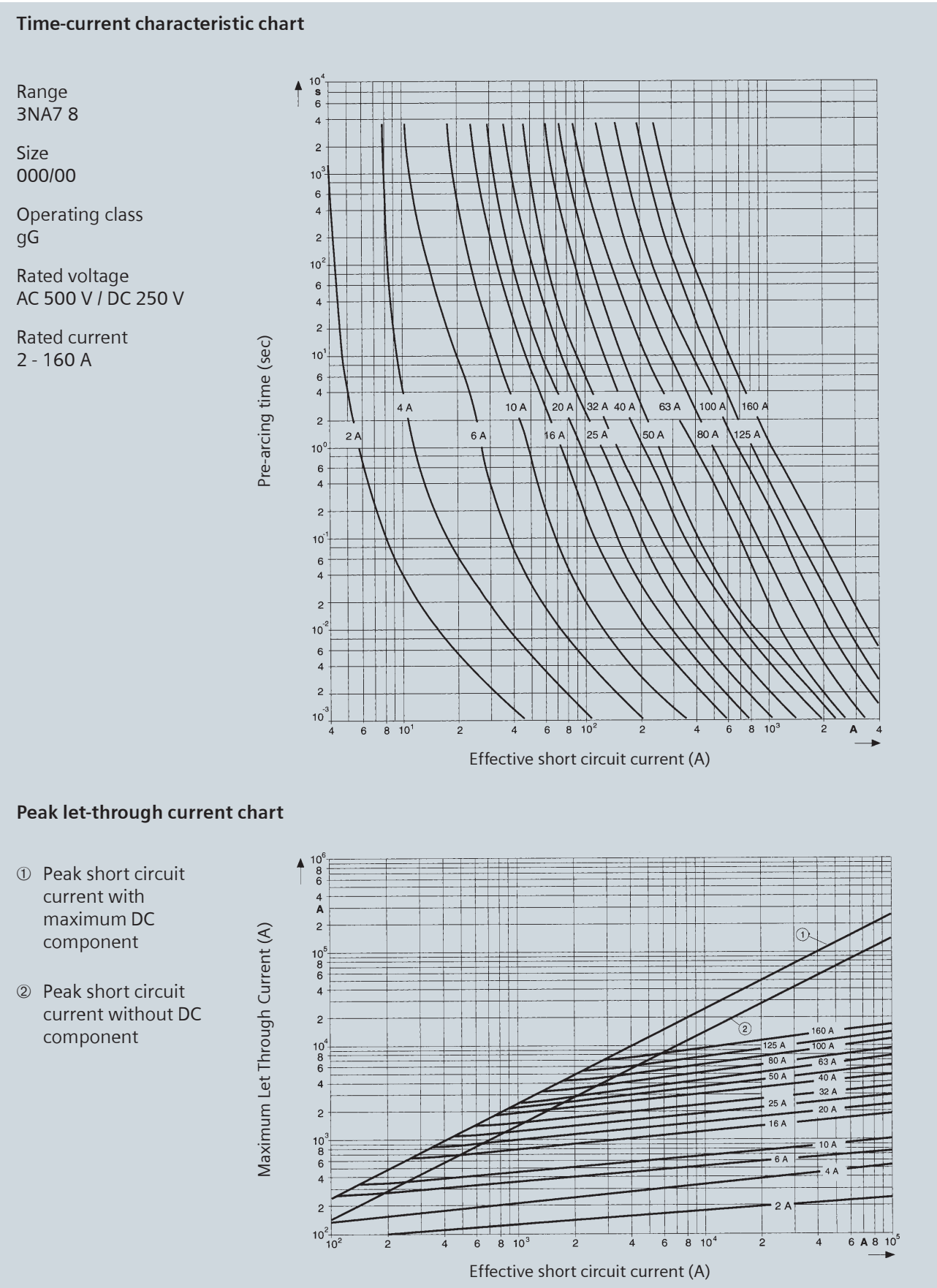
### Fuse Pullers

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 dropping out the puller. The fuse link can be released by merely pressing the push button provided on a fuse puller.

		Order No. Unit	Std. Pkg. (Nos.)	Weight per unit (Kg)
	Fuse Puller	3NX1 010	1	0.205
		3NX 1 011	1	0.560
	<b>Fuse Puller</b> Type 3NX1 010, 3NX1 011 suitable for all sizes of fuse links and isolating links.			
3NX1 011				

# Characteristic Curves

## LV HRC Fuse Links





# Characteristic Curves

## LV HRC Fuse Links

Time-current characteristic chart

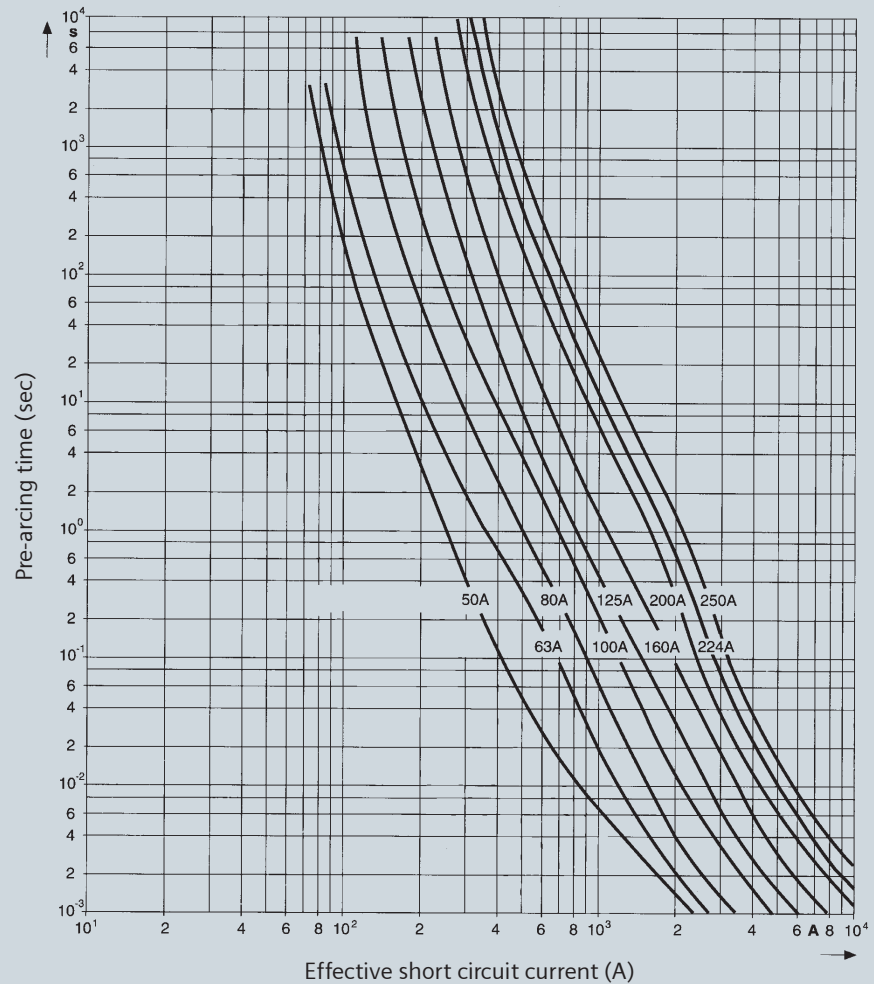
Range  
3NA7 1

Size  
1

Operating class  
gG

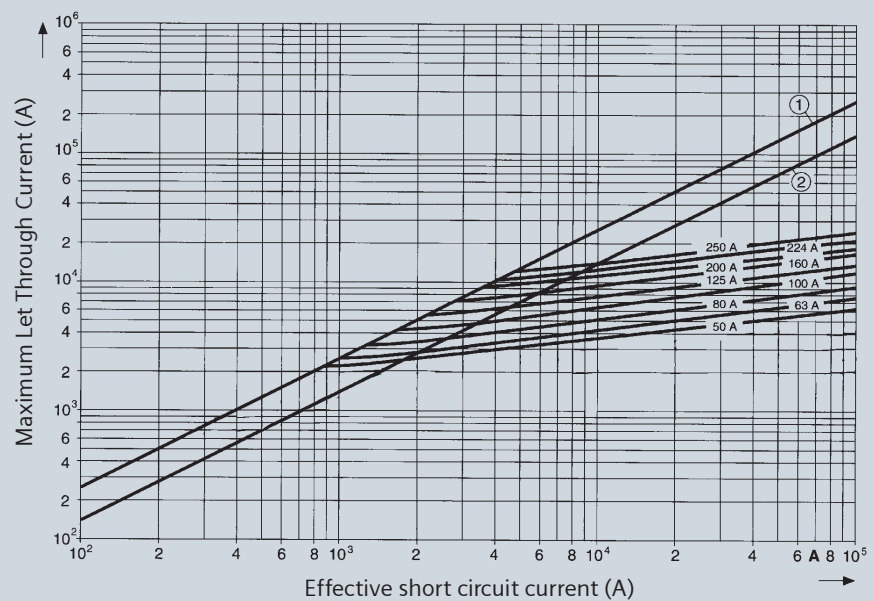
Rated voltage  
AC 500 V / DC 440 V

Rated current  
50 - 250 A



Peak let-through current chart

- ① Peak short circuit current with maximum DC component
- ② Peak short circuit current without DC component



# Characteristic Curves

## LV HRC Fuse Links

Time-current characteristic chart

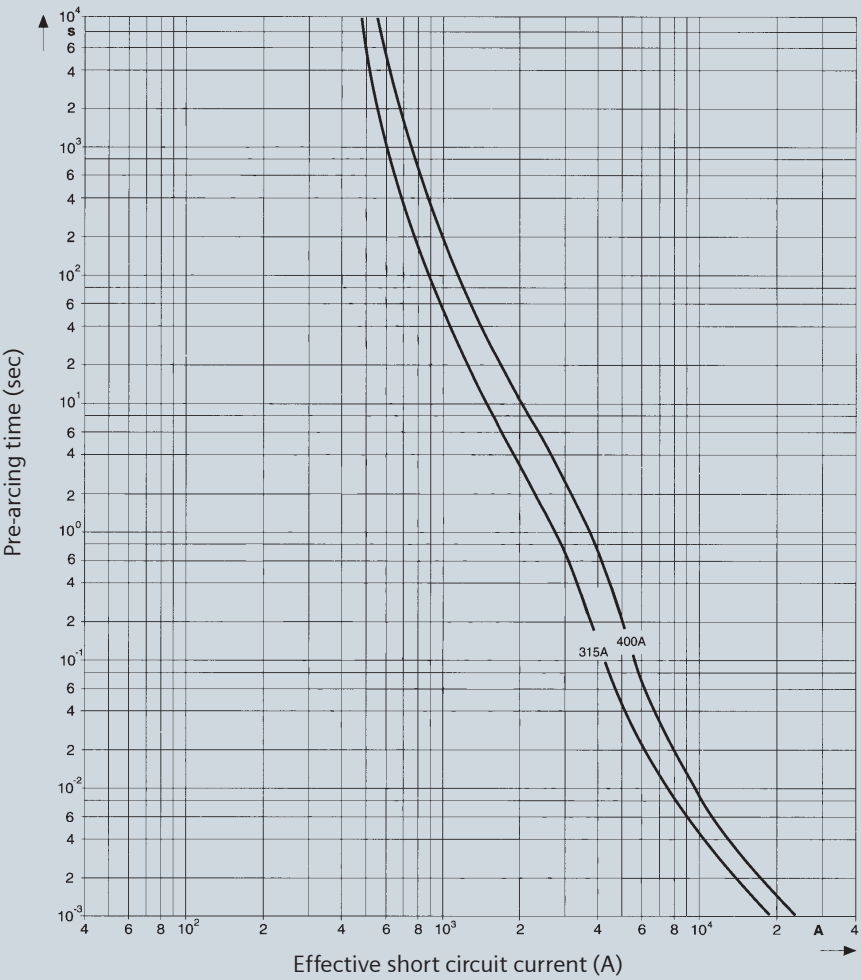
Range  
3NA7 2

Size  
2

Operating class  
gG

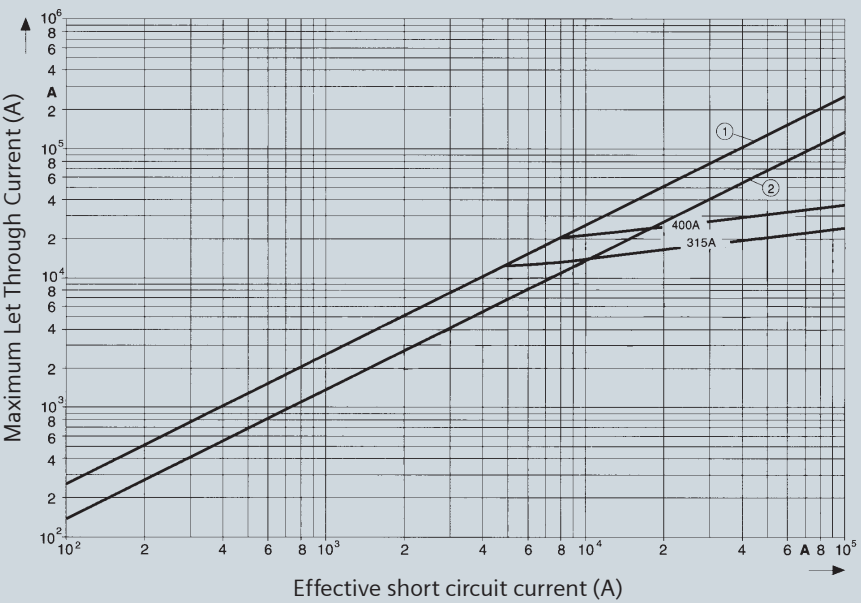
Rated voltage  
AC 500 V / DC 440 V

Rated current  
315 - 400 A



Peak let-through current chart

- ① Peak short circuit current with maximum DC component
- ② Peak short circuit current without DC component



# Characteristic Curves

## LV HRC Fuse Links

Time-current characteristic chart

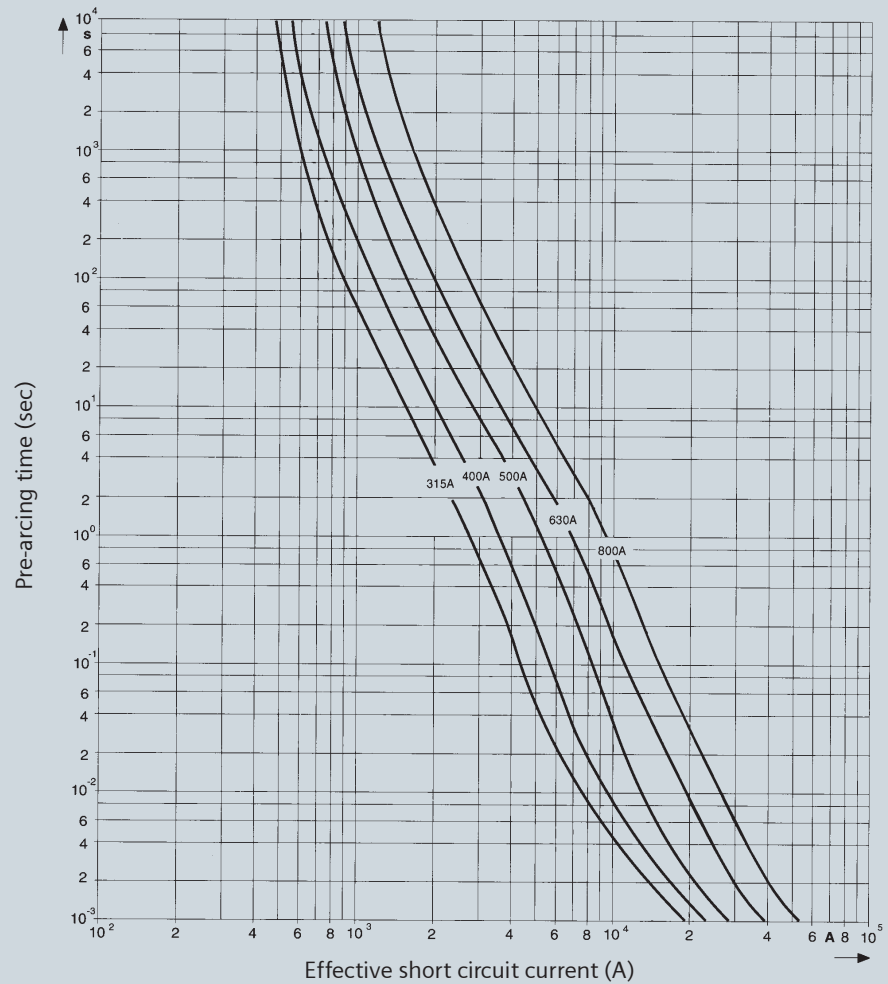
Range  
3NA3 3

Size  
3

Operating class  
gG

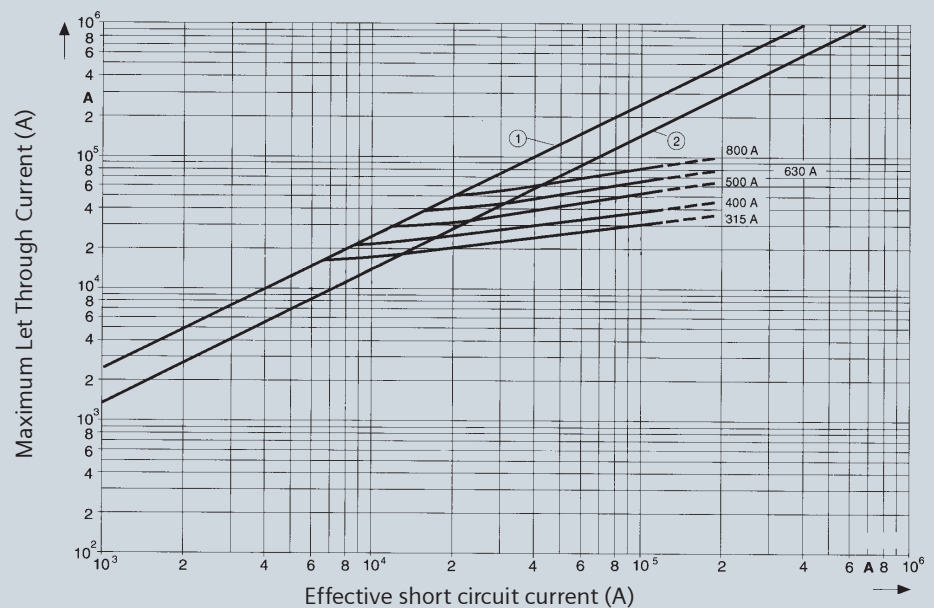
Rated voltage  
AC 500 V / DC440 V

Rated current  
315 - 800 A



Peak let-through current chart

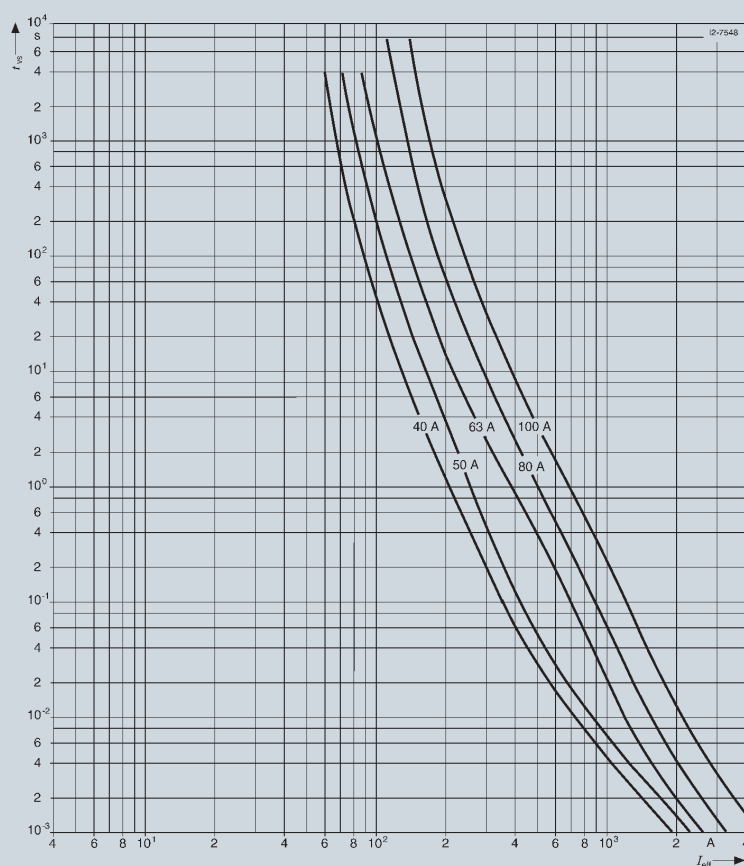
- ① Peak short circuit current with maximum DC component
- ② Peak short circuit current without DC component



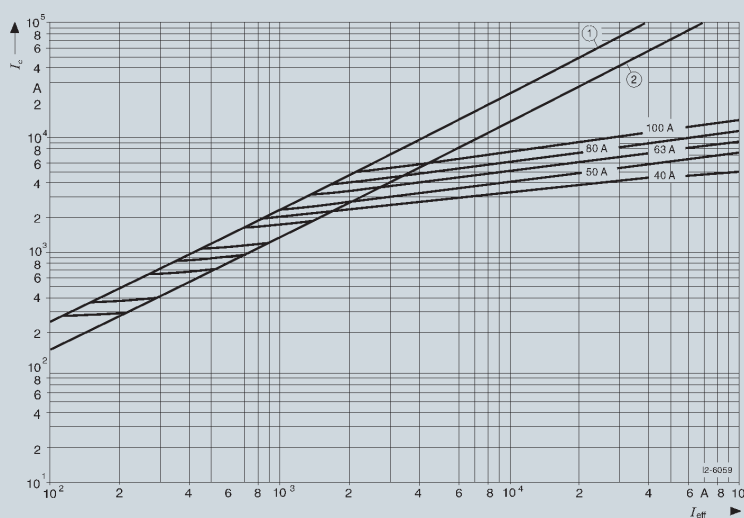
# Characteristic Curves

**Series** : 3NA7 8...-6  
**Size** : 00  
**Operational class** : gG  
**Rated Voltage** : 690 V AC/250 V DC  
**Rated current** : 40... 100A

Time / current characteristics curves diagram



Current limitation diagram

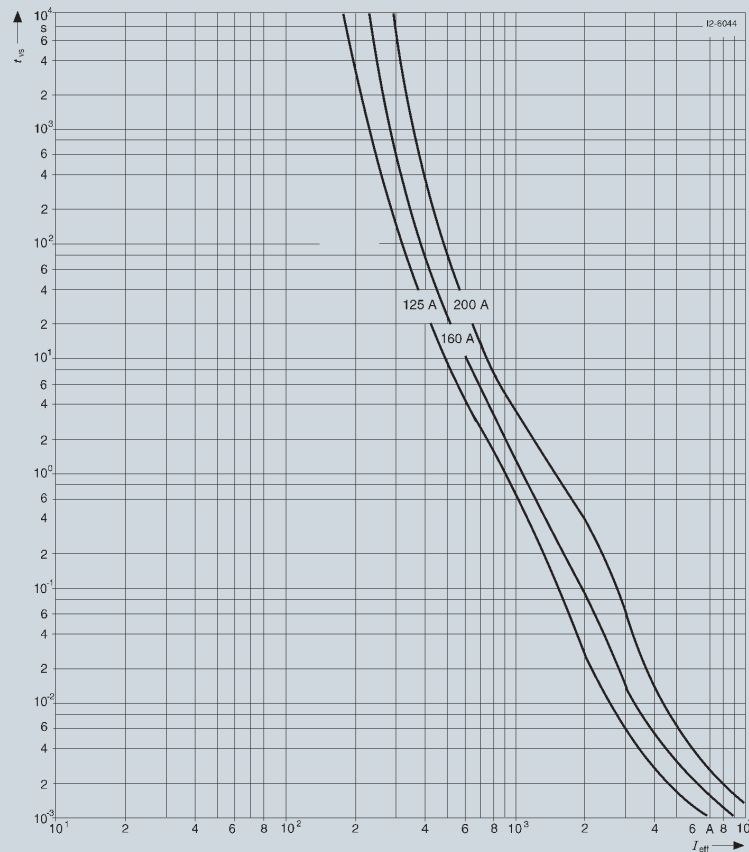


- ① Peak short circuit current with maximum DC component
- ② Peak short circuit current without DC component

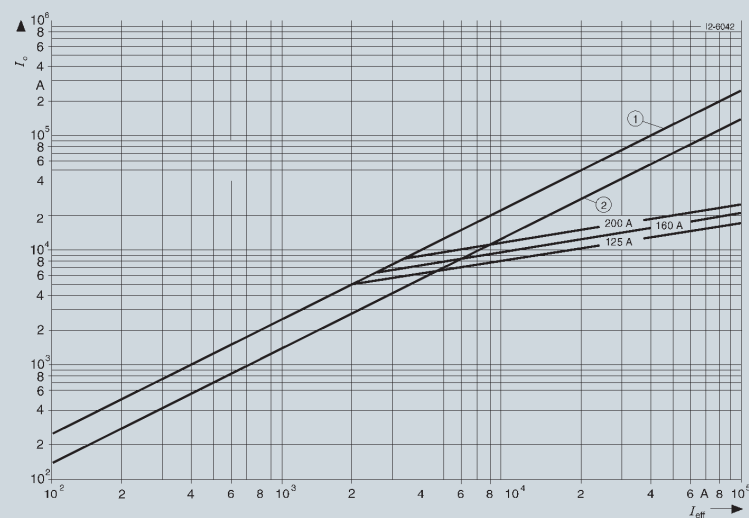
# Characteristic Curves

**Series** : 3NA7 1..-6  
**Size** : 1  
**Operational class** : gG  
**Rated Voltage** : 690 V AC/440 V DC  
**Rated current** : 125... 200A

Time / current characteristics curves diagram



Current limitation diagram

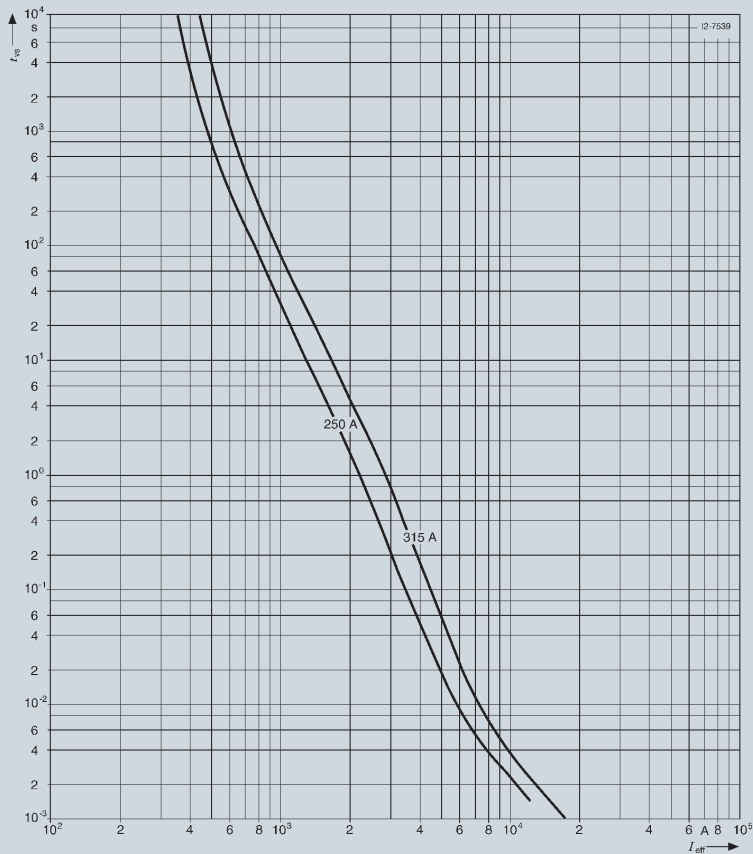


- ① Peak short circuit current with maximum DC component
- ② Peak short circuit current without DC component

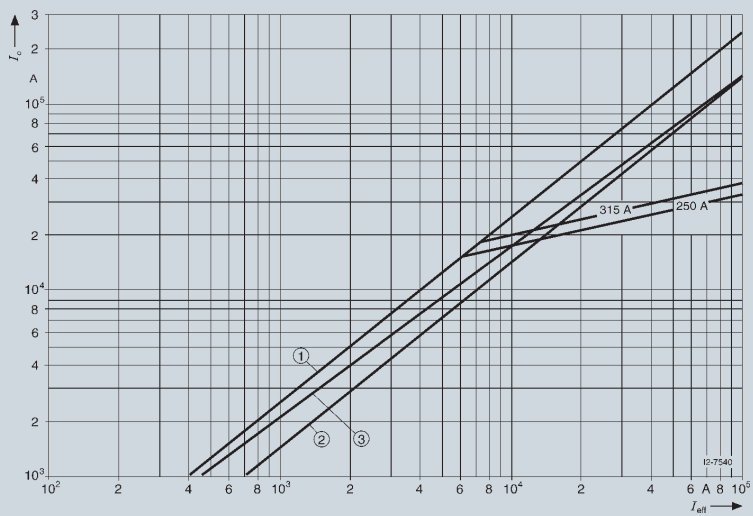
# Characteristic Curves

**Series** : 3NA7 2...-6  
**Size** : 2  
**Operational class** : gG  
**Rated Voltage** : 690 V AC/440 V DC  
**Rated current** : 250... 315A

Time / current characteristics curves diagram



Current limitation diagram



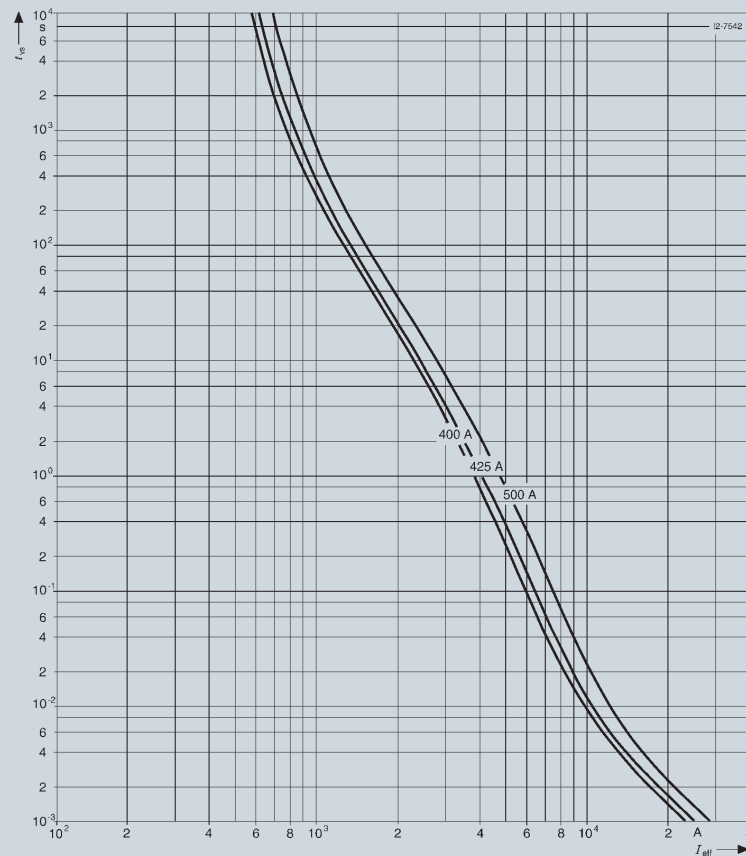
- ① Peak short circuit current with maximum DC component
- ② Peak short circuit current without DC component



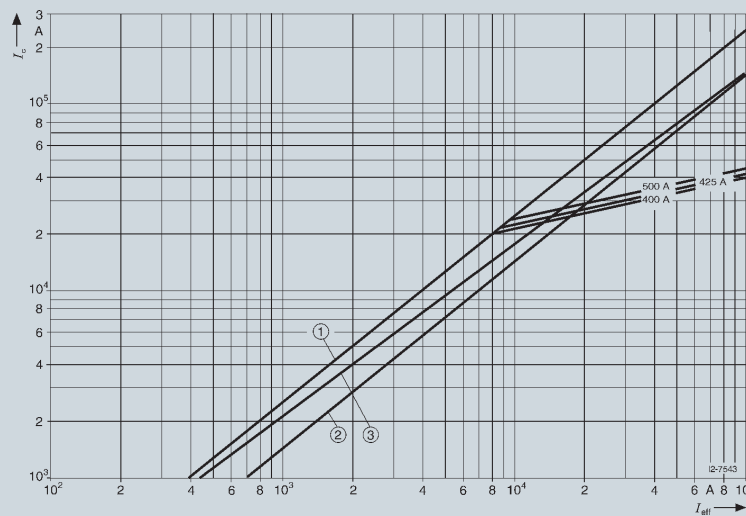
# Characteristic Curves

**Series** : 3NA3 3..-6  
**Size** : 3  
**Operational class** : gG  
**Rated Voltage** : 690 V AC/440 V DC  
**Rated current** : 400... 500A

Time / current characteristics curves diagram

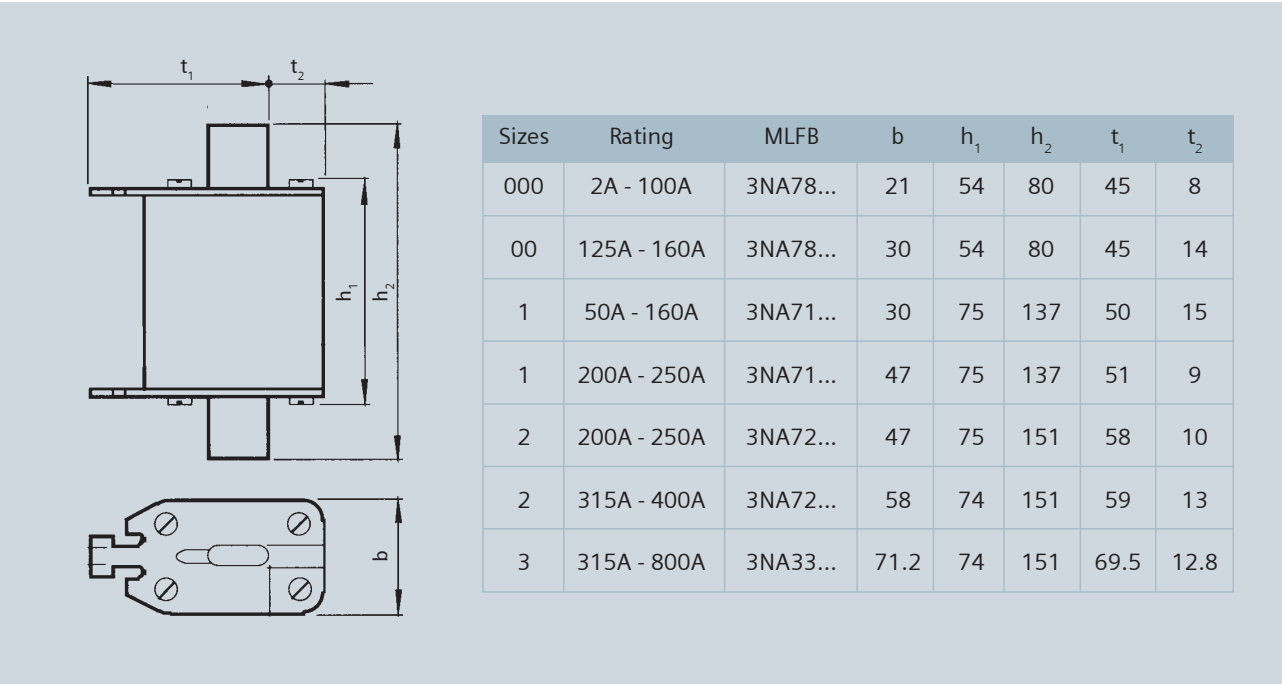


Current limitation diagram

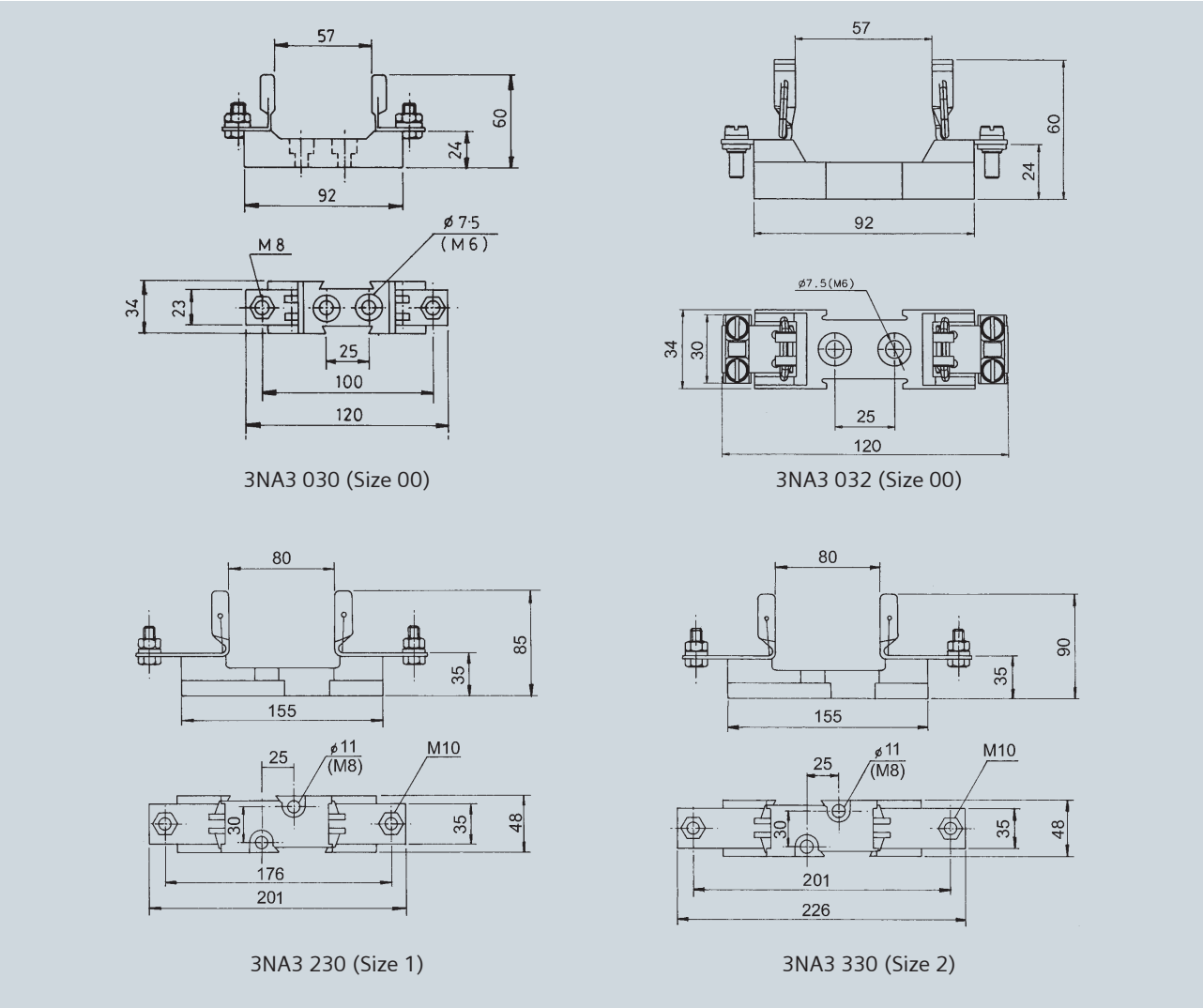


- ① Peak short circuit current with maximum DC component
- ② Peak short circuit current without DC component

# Dimensions

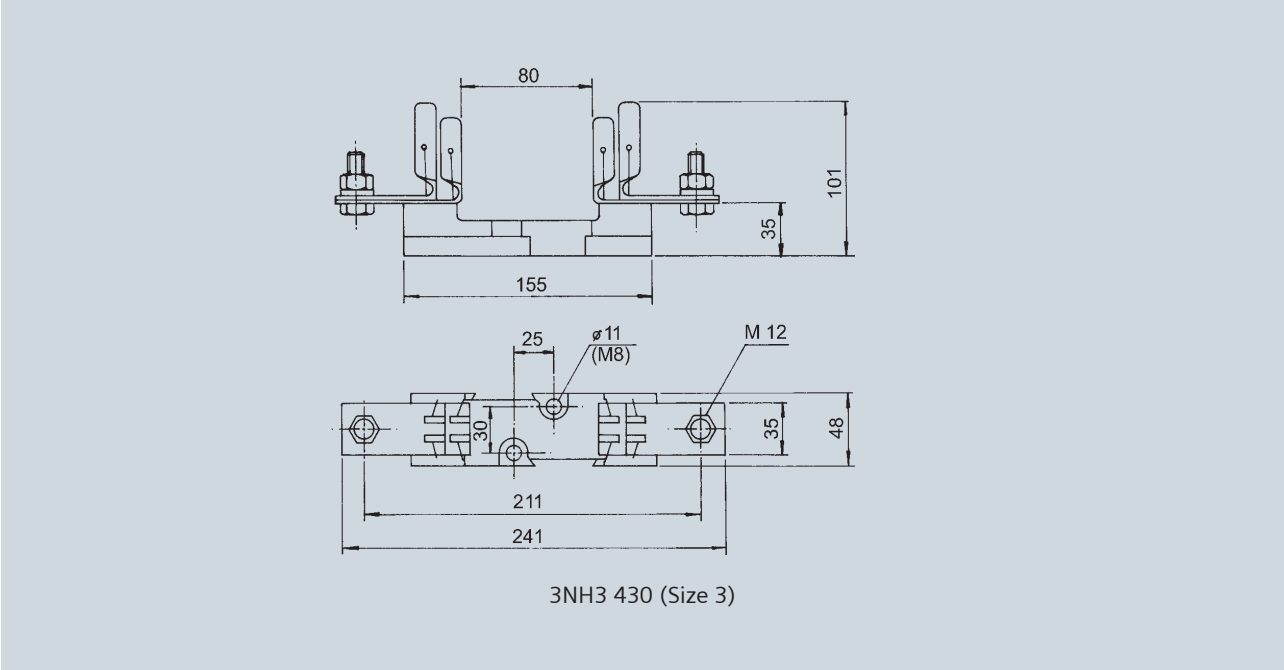


## 3NA3 Fuse Bases

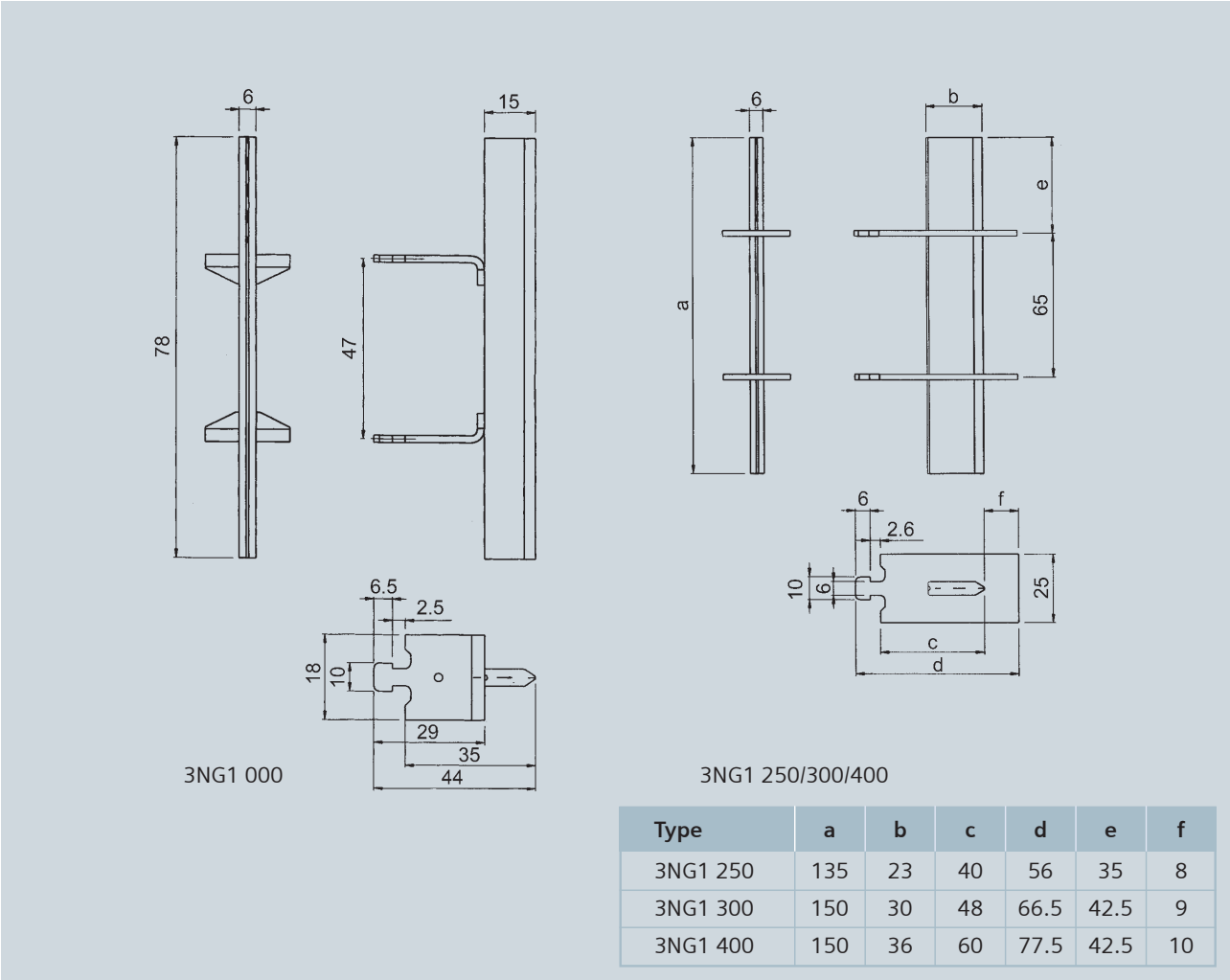


# Dimensions

## 3NA3 Fuse Bases (Continuation)

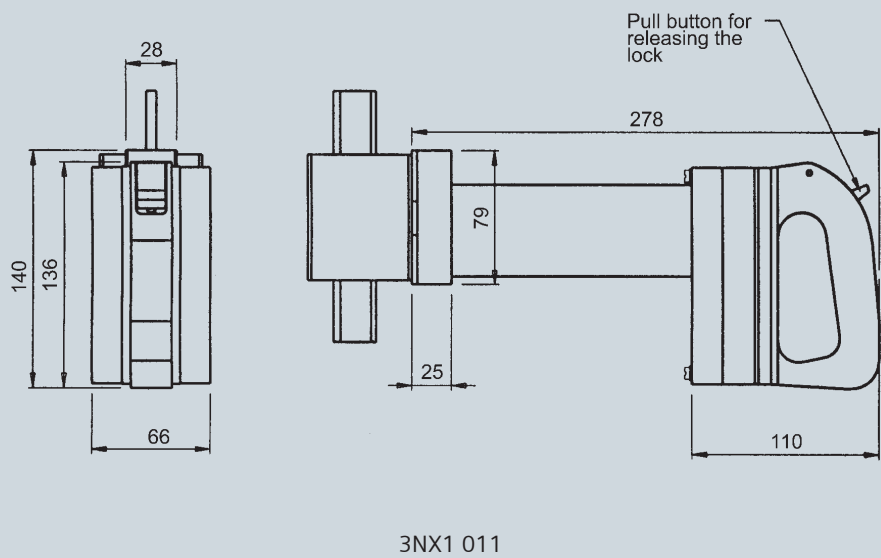
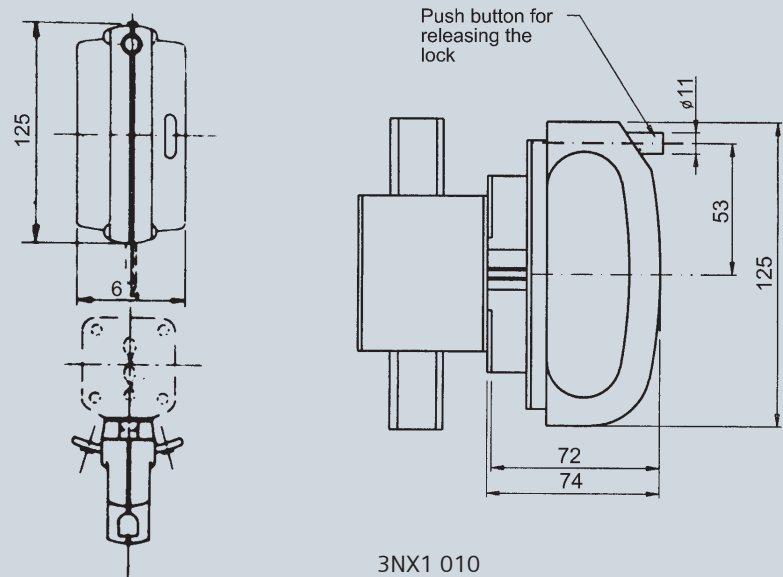


## Isolating Links



# Dimensions

## Insulated-handle fuse pullers



## Notes

# Your partners

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