



FDw – FDwT MV Fuses – DIN Standard



FDwT with integrated temperature sensor allows a better protection in cubicles

Technical Characteristics

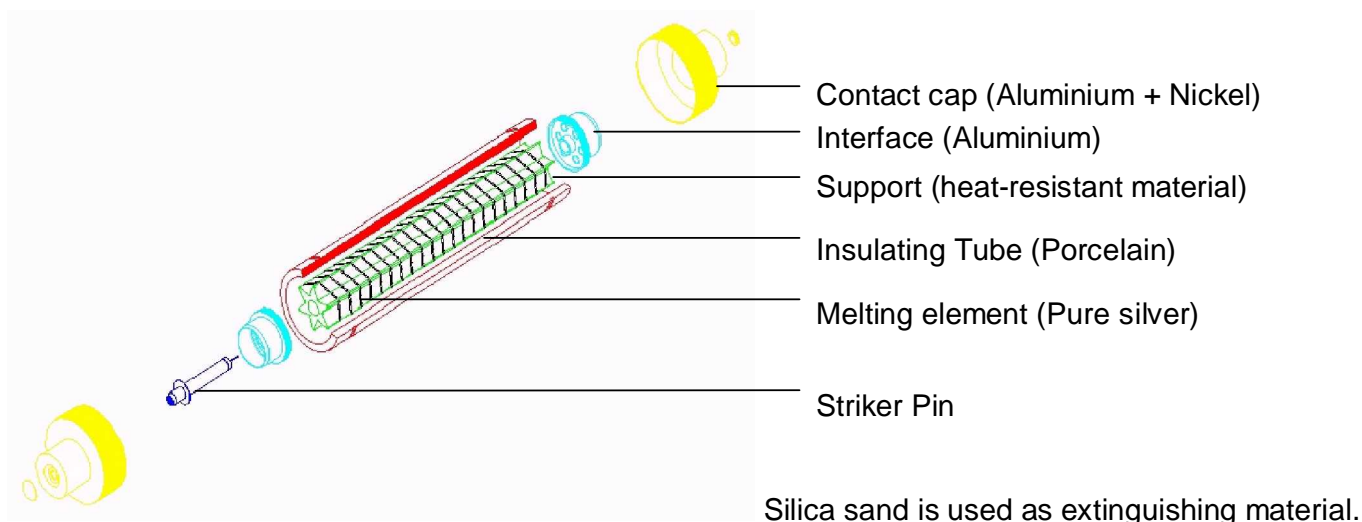
>> Technical description

Use of MV Fuses

Current limiting HV-fuses are generally used for the protection of transformers, capacitors and medium voltage motor. *FDw* fuses benefit our know-how and experience in the development and the production of Medium Voltage switchgear. The production is certified in accordance with ISO 9001 standard.

The whole *FDw* range meets the current standards IEC 60282-1, DIN 43625, as well as IEC 60787 for the protection of distribution transformers, IEC 60549 for the protection of capacitor banks and IEC 60644 for the protection of motor circuits.

Constitution



Back-up fuses : a good choice

FDw range belongs to the category of HV back-up fuses. These are a sure and efficient way to protect Medium Voltage installations. Back-up fuses have a current limiting effect with a cut out speed such that short circuit fault current is interrupted before reaching its peak value.

Switch-Fuse-Combination

All our *FDw Fuses* are equipped with a striker pin whose role by being released is to open the load switch break switch. This switch relieves the fuses in the switching work by interrupting the fault currents the back-up fuses can't break.

The switch-fuse combination provides a three-phase break from the melting of a simple fuse, thus offering an optimal protection for equipment and switchgear components.

The standard striker is released when all stripes of the fuse element have melted; while for fuses equipped with thermal function the striker pin can also be released in case of temperature rise of the fuse.

The Thermal Function: FDwT (=FDw equipped with the thermal function)

With this range, **AREVA T&D** offers fuses which are current limiting –protecting installations against the effects of important short-circuit currents – temperature limiting and fault current limiting as well, thanks to the thermal function.

The principle of this additional function consists in releasing the thermal striker in case of temperature rise incompatible with materials directly surrounding the fuse, even if the overload current is not sufficient to melt all silver stripes.

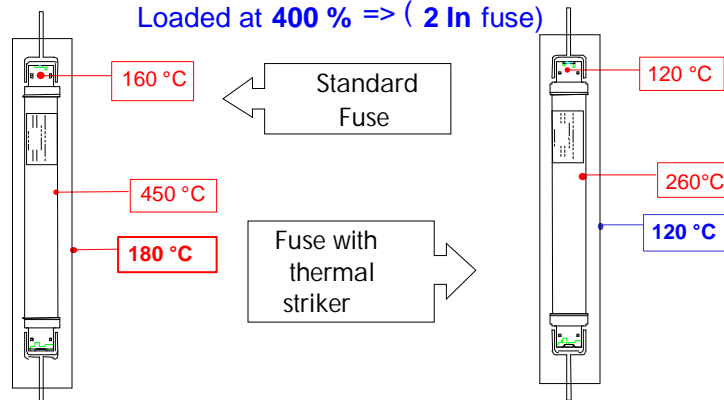
This option is available for ratings up to 125 A of our **FDw** Fuses range. Installing **FDwT** Fuses from AREVA T&D allows to better cover the requirements of IEC 62271-105 (ex-IEC 420).



Representation of a transformer protection **with thermal fuse**

Fuse FDw 24 kV 63A / Transformer 1000 kVA

Loaded at 400 % => (2 In fuse)

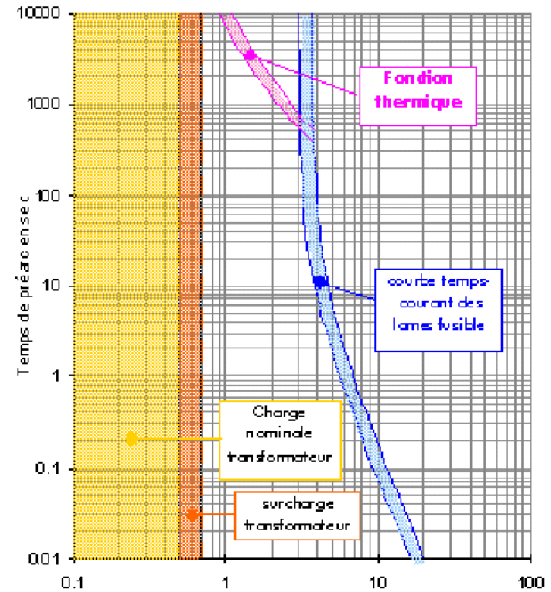


With an increasing use of compact Ring-Main Units, fuses are more and more fitted in confined spaces, where temperature rises can reach inadmissible values. Then the temperature limiter is essential for the protection of the fuse themselves, and their surroundings, often made of organic materials.

This function can be compared with that of an overload protection, controlling the fuse body temperature.

This comparison allows us to superpose on the present time-current characteristics with the equivalent one of an overload protection, and which corresponds to operating thermal striker.

The occurrence of this function in our *FDw*-fuses don't change their characteristics : The function of the fuses, their breaking capacity and cut out speed, as well as their dimension, stay the same. So the replacement of a standard fuses set by a *FDwT* set is possible.



Protection of Distribution Transformers

The choice of a fuse for the protection of a distribution transformer must be made according to recommendations of IEC 282-1. When the fuse is fitted in a original type tested equipment, the manufacturer of the cubicle is responsible for the selection of the fuse calibre.

However, we propose for information a selection chart covering the majority of distribution applications:

Service Voltage in kV		6/6.6	10/11	15	20/22	30/33
		FDw 7.2	FDw 12	FDw 17.5	FDw 24	FDw 36
Transformer Power in kVA	25	6.3	6.3	(6.3)	(6.3)	(6.3)
	50	10	6.3	6.3	6.3	(6.3)
	63	16	10	6.3	6.3	(6.3)
	80	16	10	10	6.3	(6.3)
	100	16 - 25	16	10	6.3 - 10	6.3
	125	25	16	16	10	6.3 - 10
	160	31.5	25	16	10 - 16	6.3 - 10
	200	31.5 - 40	25	16	16	10 - 16
	250	40 - 50	31.5	25	16	10 - 16
	315	50 - 63	31.5 - 40	25 - 31.5	25	16 - 25
	400	63 - 80	40 - 50	31.5	25	16 - 25
	500	80 - 100	50 - 63	31.5 - 40	31.5	25
	630	100 - 125	63 - 80	40 - 50	31.5 - 40	25 - 31.5
	800	125 - 160	80 - 100	50 - 63	40 - 63	31.5 - 40
	1000	160	100 - 125	63	50 - 63	31.5 - 40
	1250	200	125	80	63	40
1600	250	125	100	80	50	
2000	250*	160*	125	100		
2500				100		

The ratings are given for transformers without overload, the fuses being mounted in switchboards with an ambient temperature of 20°C
 Values in brackets indicate that the fuse must be used in conjunction with a load break switch.
 Values in italics are for FD3M version, diameter 88mm and length 442mm, resin tube
 For values with an asterisk (*), the transformer load must not exceed 90%.

For selecting more precisely the rating, follow this method

Choosing the fuse rating for distribution transformers

◆ Conditions to meet

1) The minimum envelope of the time/current characteristic of the fuse to choose must pass to the right of the point A defining the current at the energisation of the transformer.

- Point A is given by the intersection of the 0.1s horizontal line and the vertical line corresponding to 12 times the transformer's rated current.
- The 0.1s horizontal line cuts the time/rated current characteristic of the chosen fuse at point C, whose abscissa gives us the current I(C).

First condition: $0.8 \times I(C) > I(A)$.

2) When the transformer is in a three-phase short circuit on the LV side, the current on the HV side must be greater than the minimum breaking current I3.

$$\text{Transfo } I \times \frac{100}{U_{cc}} > \text{mini fuse } I3$$

3) In order to avoid ageing the chosen fuse rating must be more than 1.3 times the maximum current in the transformer (including overload if any)

Example: Three-phase transformer

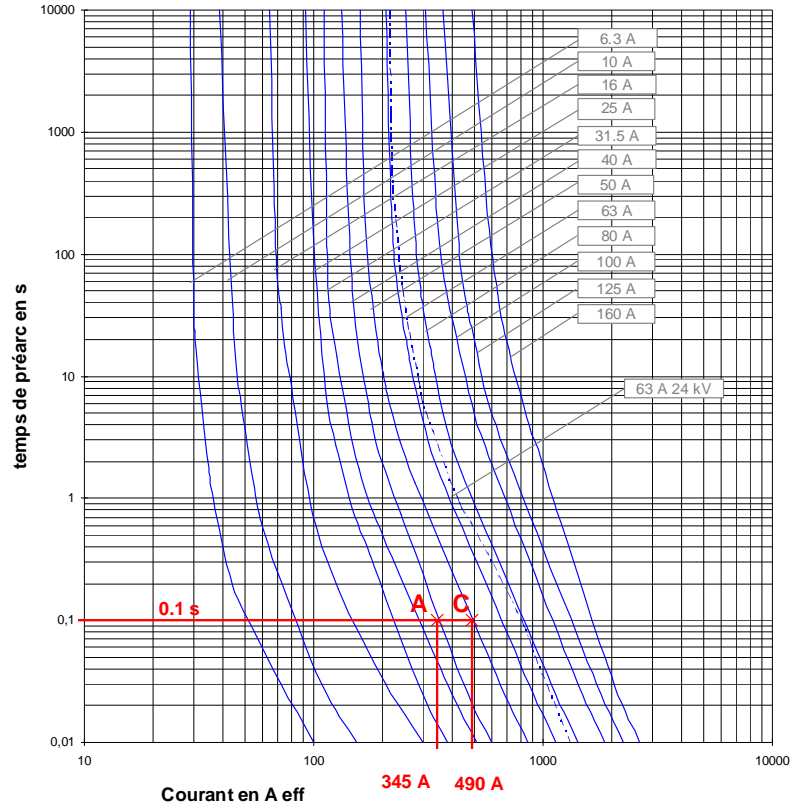
§ Rated power $S_n = 1,000 \text{ kVA}$.

§ Overload authorised = 10% - ambient temperature $< 40^\circ\text{C}$.

§ Primary voltage $U_1 = 20 \text{ kV}$ & $U_{cc} = 5\%$

§ Primary Current = $\frac{1000}{20 \sqrt{3}} = 28,86 \text{ A}$

§ Point A : Inrush current = 12 times the rated current : $12 \times 28.86 = 345.6 \text{ A}$



• **1st condition :** $0,8 \times I(C) > I(A)$

- Draw a horizontal line at 0.1s.
- Draw a vertical line at $I = 345 \text{ A}$.
- The intersection of these two straight lines gives point A.
- The rating immediately higher is 50A, which gives point C

$$0,8 I(C) = 0,8 \times 490 \text{ A} = 392 \text{ A} > I(A) = 345 \text{ A}$$

• **2nd condition :**

The I3 value of the 50A fuse is 250A (see table)

The short circuit current is $28,8 \times 100/5 = 576 \text{ A}$

Therefore the second condition is validated as $576 \text{ A} > 250 \text{ A}$

• **3rd condition :**

1.3 x overload current is $1.3 \times 1.1 \times 28.9 = 41.1 \text{ A}$

compared to the rated fuse current : 50A .

The 3rd condition is validated as $50 \text{ A} > 41 \text{ A}$

The chosen rating of 50A meets the 3 conditions detailed above.



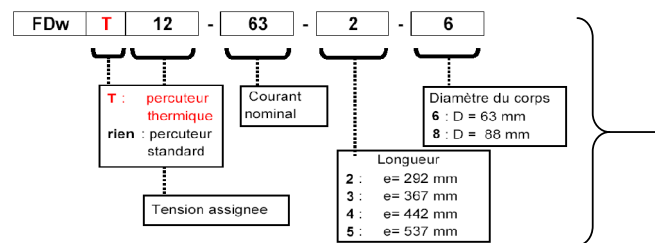
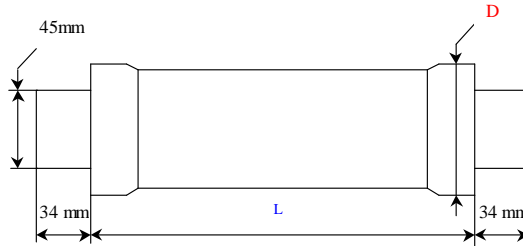
Protection of Capacitor Banks:

For the protection of capacitors, high frequency transient currents and the occurrence of high-ranking harmonics must be taken into account.

Two simple rules can be remembered:

- Rating of the fuse > 1.7 to 1.8 times the capacitive current of the bank
- Nominal voltage of a fuse > 1.1 times the nominal voltage of the bank

These rules are useful for single capacitor banks. In other case, please contact us.



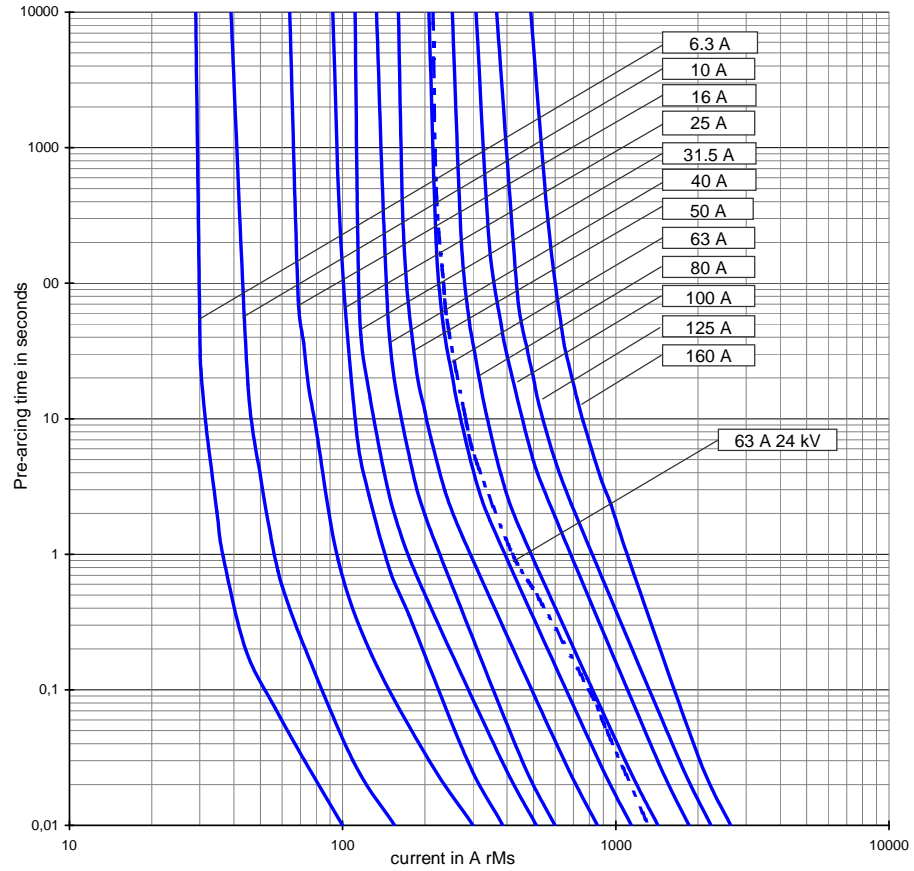
Range and electrical characteristics

Rated Voltage		Rated Current		Dimension		Rated Breaking Current		Minimum Breaking Current		Cold Resistance		Power Loss when hot		Max observed over-voltage		I ² t		REFERENCE
Un	In	L	D	I1	I3	R cold	at In	at 0.7In	kV	A ² s	A ² s	kg						
kV	A	mm	mm	kA	A	m Ohm	W	W					min. pre-arc value	Max total value				
7.2	6.3	292	63	63	28	147.32	6	3	18	60	1000	1.9			FDw(T)7.2-6-2-6			
	10				45	80.35	9	4	18	100	1500		FDw(T)7.2-10-2-6					
	16				64	44.3	12.8	5.9	18	600	3400		FDw(T)7.2-16-2-6					
	25				100	27.58	21	9	17	1000	5500		FDw(T)7.2-25-2-6					
	31.5				126	20.69	25	11	17	1200	10000		FDw(T)7.2-32-2-6					
	40				160	16.24	33	14	17	2000	12000		FDw(T)7.2-40-2-6					
	50				200	11.37	37	16	17	4000	22000		FDw(T)7.2-50-2-6					
	63				252	8.53	46	19	17	8000	42000		FDw(T)7.2-63-2-6					
	80				320	6.82	63	26	17	12000	120000		FDw(T)7.2-80-2-6					
	100				400	4.75	70	28	17	15000	220000		FDw(T)7.2-100-2-6					
7.2	6.3	442	63	63	28	166.6	7	3	21	60	1000	2.9			FDw(T)7.2-6-4-6			
	10				45	90.87	10	5	21	100	1500		FDw(T)7.2-10-4-6					
	16				64	46.79	14	6	21	600	3400		FDw(T)7.2-16-4-6					
	25				100	31.19	23	10	20	1000	5500		FDw(T)7.2-25-4-6					
	31.5				126	23.4	29	13	20	1200	10000		FDw(T)7.2-32-4-6					
	40				160	18.37	38	16	20	2000	12000		FDw(T)7.2-40-4-6					
	50				200	12.86	41	18	20	4000	22000		FDw(T)7.2-50-4-6					
	63				252	9.64	50	22	20	8000	42000		FDw(T)7.2-63-4-6					
	80				320	7.72	69	29	20	12000	120000		FDw(T)7.2-80-4-6					
	100				400	5.37	76	31	20	15000	220000		FDw(T)7.2-100-4-6					
125	500	4.62	107	42	20	22000	450000	FDw(T)7.2-125-4-8										
160	640	3.6	146	56	20	35000	530000	FDw 7.2-160-4-8										
7.2	6.3	292	63	31.5	31.5	244.88	11	5	30	60	1000	1.9			FDw(T)7.2-6-2-6			
	10				45	133.56	15	7	30	100	1500		FDw(T)12-10-2-6					
	16				64	73.6	22.4	9	30	600	3400		FDw(T)12-16-2-6					
	25				100	45.85	37	16	27	1000	5500		FDw(T)12-25-2-6					
	31.5				126	34.39	46	19	27	1200	10000		FDw(T)12-32-2-6					
	40				160	27	62	25	27	2000	12000		FDw(T)12-40-2-6					
	50				200	18.9	70	28	27	4000	22000		FDw(T)12-50-2-6					
	63				252	14.18	87	34	27	8000	42000		FDw(T)12-63-2-6					
	80				320	8.65	81	33	25	12000	120000		FDw(T)12-80-2-8					
	100				400	6.55	100	40	25	15000	220000		FDw(T)12-100-2-8					
125	500	5.46	147	54	25	22000	450000	FDw(T)12-125-2-8										
7.2	6.3	442	63	31.5	31.5	244.9	11	5	30	60	1000	2.9			FDw(T)12-6-4-6			
	10				45	133.6	15	7	30	100	1500		FDw(T)12-10-4-6					
	16				64	73.9	21.8	10	30	600	3400		FDw(T)12-16-4-6					
	25				100	45.9	35	16	27	1000	5500		FDw(T)12-25-4-6					
	31.5				126	34.4	43	19	27	1200	10000		FDw(T)12-32-4-6					
	40				160	27	57	24.5	27	2000	12000		FDw(T)12-40-4-6					
	50				200	18.9	63	27	27	4000	22000		FDw(T)12-50-4-6					
	63				252	14.2	78	33	27	8000	42000		FDw(T)12-63-4-6					
	80				320	9.4	83	35	25	12000	120000		FDw(T)12-80-4-8					
	100				400	6.55	91	38	25	15000	220000		FDw(T)12-100-4-8					
125	500	5.46	130	52	25	22000	450000	FDw(T)12-125-4-8										
160	640	4.07	170	66	25	35000	530000	FDw 12-160-4-8										

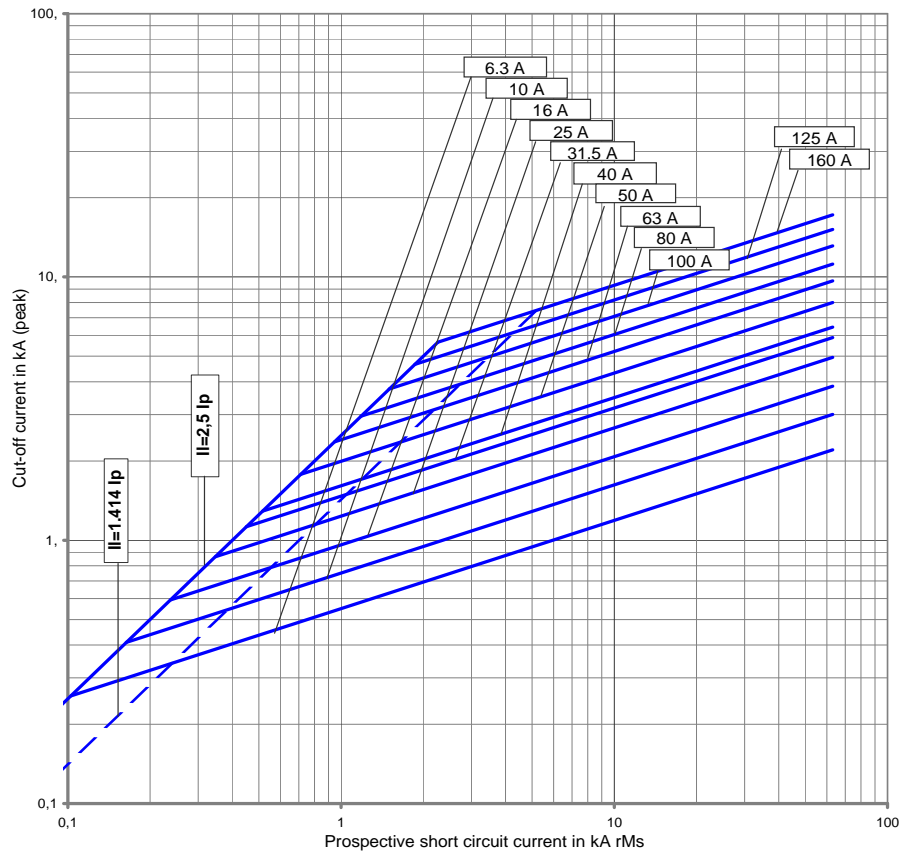
Range and electrical characteristics

Rated Voltage		Rated Current		Dimensions		Rated Breaking Current	Minimum Breaking Current	Cold Resistance	Power Loss when hot	Max observed Over-voltage	I ² t		Weight	
Un	In	L	D	I1	I3	R cold	at In	at 0.7In	kV	A ² s	A ² s	kg		
kV	A	mm	mm	kA	A	m Ohm	W	W					REFERENCE	
17.5	6.3	292	63	25	32	331.4	15.1	7	38	60	1 000	1.9	FDw(T)17.5-6-2-6	
	10				45	181.1	22	9.7	38	100	1 500		FDw(T)17.5-10-2-6	
	16				64	99.6	32	14	38	600	3 400		FDw(T)17.5-16-2-6	
	25				100	62.1	54	19.3	38	1 000	5 500		FDw(T)17.5-25-2-6	
	31.5				126	46.5	69	28	38	1 200	10 000		FDw(T)17.5-32-2-6	
	40				160	36.5	94.3	37	38	1 800	12 000		FDw(T)17.5-40-2-6	
	50				200	21.4	77	32	36	2 200	23 000		3.5	FDw(T)17.5-50-2-8
	88													
17.5	6.3	367	63	25	32	331.4	15	7	38	60	1 000	2.4	FDw(T)17.5-6-3-6	
	10				45	180.8	21.3	10	38	100	1 500		FDw(T)17.5-10-3-6	
	16				64	99.6	31	14	38	600	3 400		FDw(T)17.5-16-3-6	
	25				100	62.1	52	22	38	1 000	5 500		FDw(T)17.5-25-3-6	
	31.5				126	46.6	66	27	38	1 200	10 000		FDw(T)17.5-32-3-6	
	40				160	36.6	89	36	38	1 800	12 000		FDw(T)17.5-40-3-6	
	50				200	21.3	77	32	38	2 200	23 000		FDw(T)17.5-50-3-6	
	63				252	15.3	92	37	38	3 500	35 000		FDw(T)17.5-63-3-6	
	80				320	12.4	124	49	36	5 000	72 000		4.5	FDw(T)17.5-80-3-8
	100				400	9.5	158	60	36	15 000	220 000		4.5	FDw(T)17.5-100-3-8
	88													
17.5	6.3	442	63	31.5	32	301.0	13	6	45	60	1 000	2.9	FDw(T)17.5-6-4-6	
	10				46	164.2	19	9	45	100	1 500		FDw(T)17.5-10-4-6	
	16				64	90.5	27.3	12.3	45	600	3 400		FDw(T)17.5-16-4-6	
	25				100	56.4	45	20	40	1 000	5 500		FDw(T)17.5-25-4-6	
	31.5				126	42.3	56	24	40	1 200	10 000		FDw(T)17.5-32-4-6	
	40				160	33.2	75	31	40	2 000	12 000		FDw17.5-40-4-6	
	50				200	23.2	83	34	40	4 000	22 000		FDw(T)17.5-50-4-6	
	63				252	17.4	104	42	40	8 000	42 000		FDw17.5-63-4-6	
	80				320	13.7	135	53	36	12 000	120 000		5.2	FDw(T)17.5-80-4-8
	100				400	9.6	151	59	36	15 000	220 000		5.2	FDw(T)17.5-100-4-8
	125				500	8	217		36	22 000	300 000		5.2	FDw(T)17.5-125-4-8
88														
17.5	100	537	88	31.5	400	9.6	151	59	36	15 000	220 000	6	FDw(T)17.5-100-5-8	
	125				500	8	217	85	36	22 000	300 000		6	FDw(T)17.5-125-5-8
24	6.3	442	63	25	32	499.9	23	11	60	60	1 000	2.9	FDw(T)24-6-4-6	
	10				50	272.7	33	15	60	100	1 500		FDw(T)24-10-4-6	
	16				80	150.2	49	21.3	60	600	3 400		FDw(T)24-16-4-6	
	25				125	93.6	84	34	55	1 000	5 500		FDw(T)24-25-4-6	
	31.5				158	70.2	107	42	55	1 200	10 000		FDw(T)24-32-4-6	
	40				200	55.1	145	56	55	2 000	12 000		FDw(T)24-40-4-6	
	50				250	32.5	130	50	55	4 000	22 000		FDw(T)24-50-4-6	
	63				315	23.3	155	59	55	8 000	88 000		FDw(T)24-63-4-6	
	80				360	17.5	185	71	50	12 000	120 000		5.2	FDw(T)24-80-4-8
	100				450	13.1	234	87	50	15 000	220 000		5.2	FDw(T)24-100-4-8
88														
24	80	537	88	25	360	17.5	185	71	50	12 000	120 000	6	FDw(T)24-80-5-8	
	100				450	13.1	234	87	50	15 000	220 000		6	FDw(T)24-100-5-8
36	6.3	537	63	20	38	764.5	36	16	90	60	1 000	3.3	FDw(T)36-6-5-6	
	10				60	417.0	53	23	90	100	1 500		FDw(T)36-10-5-6	
	16				96	214.7	74	31	85	600	3 400		FDw(T)36-16-5-6	
	25				150	128.8	124	49	80	1 000	5 500		FDw(T)36-25-5-6	
	31.5				173	91.1	140	57	80	1 200	10 000		FDw(T)36-32-5-6	
	40				220	65.9	162	65	80	2 000	12 000		6	FDw(T)36-40-5-8
	50				275	53.6	234	87	80	4 000	22 000		6	FDw(T)36-50-5-8
88														

FDw 7.2 kV - 12 kV - 17.5 kV (e=442 mm) - 24 kV

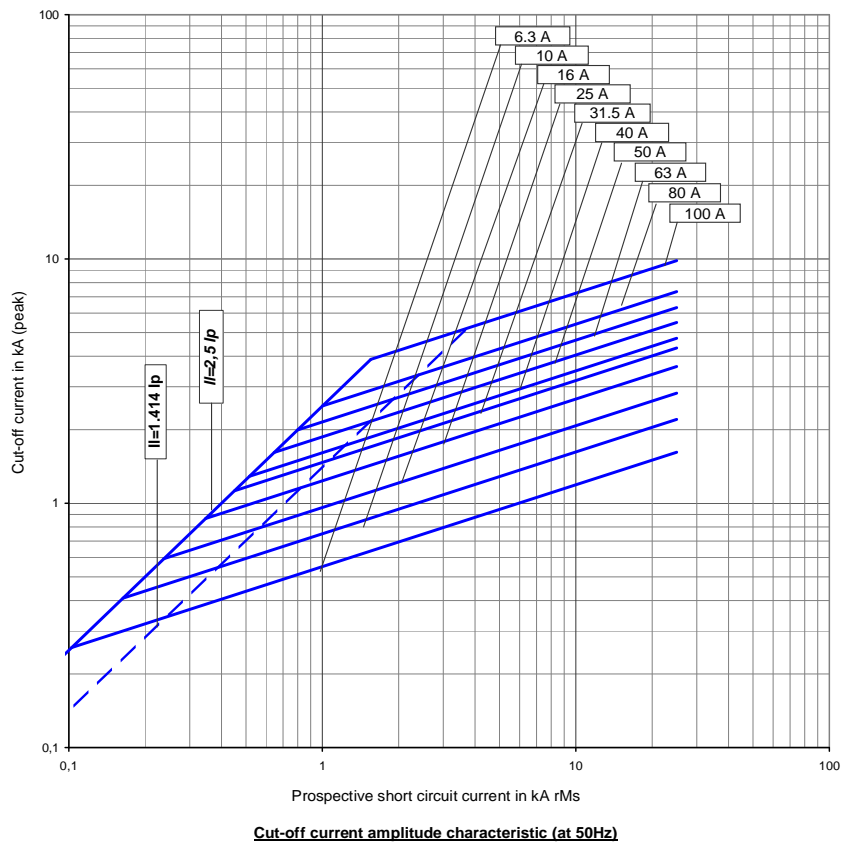
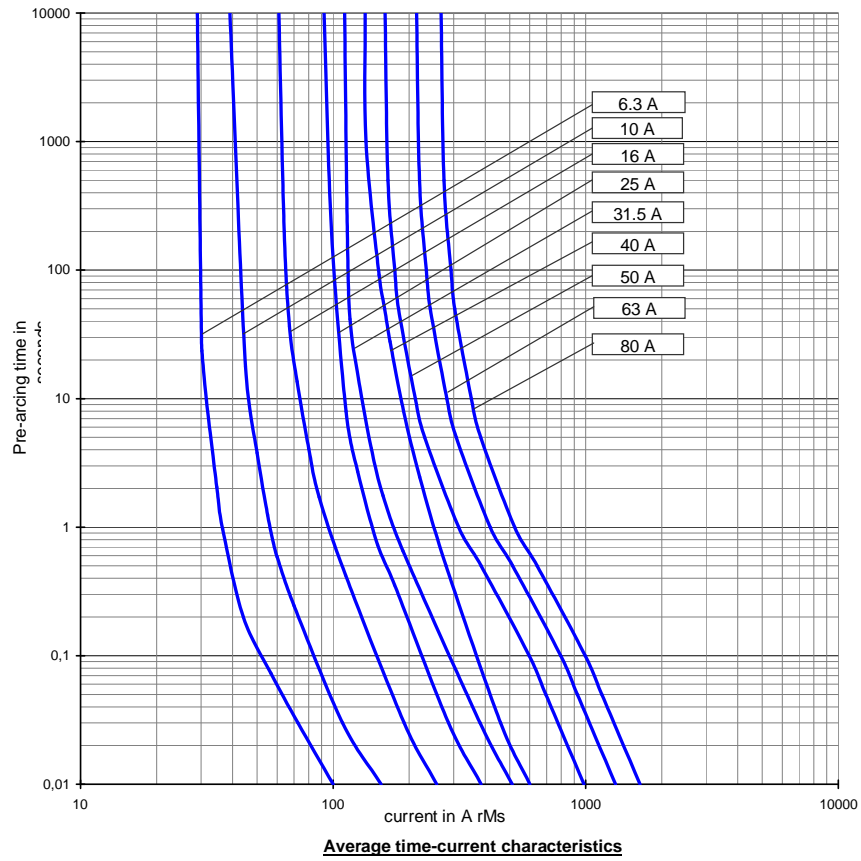


Average time-current characteristics

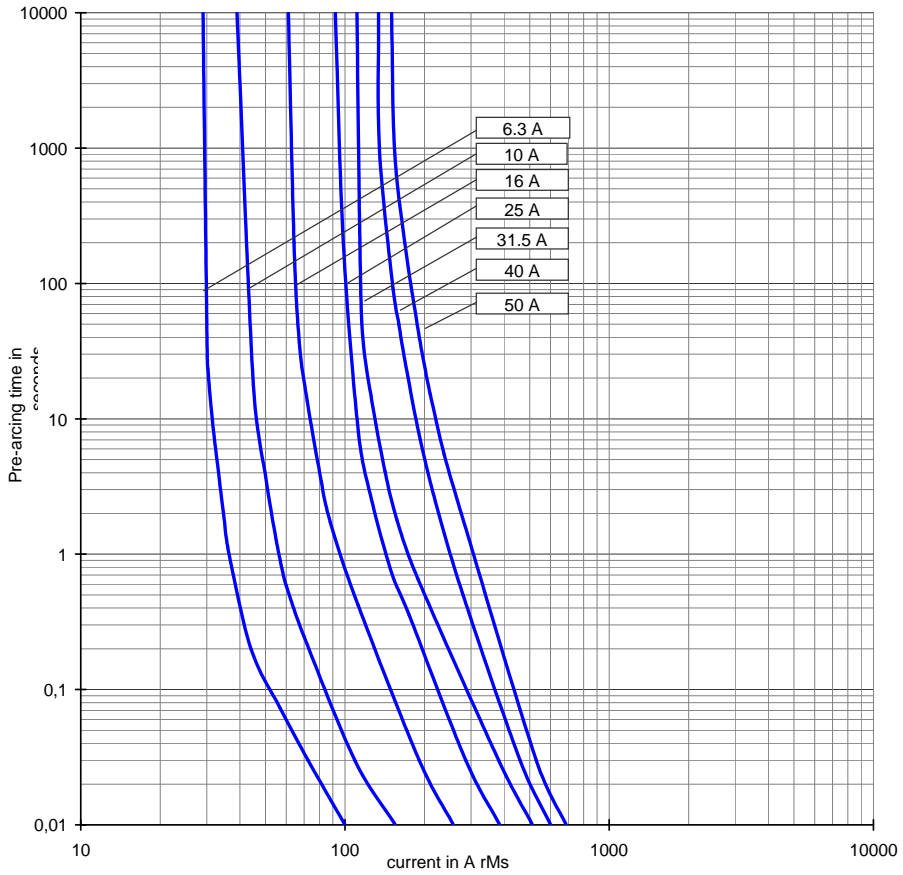


Cut-off current amplitude characteristic (at 50Hz)

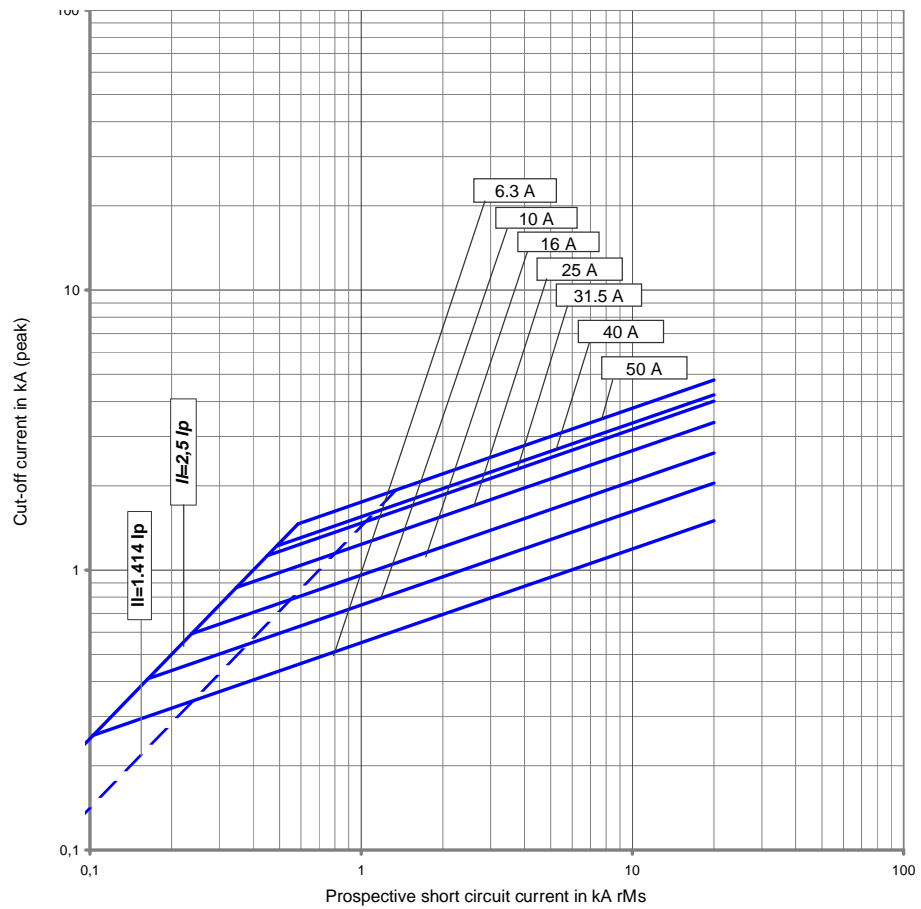
FDw 17.5 kV (e=292mm ou 367mm)



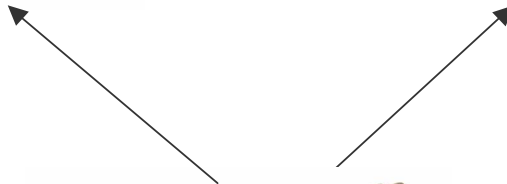
FDw 36 kV



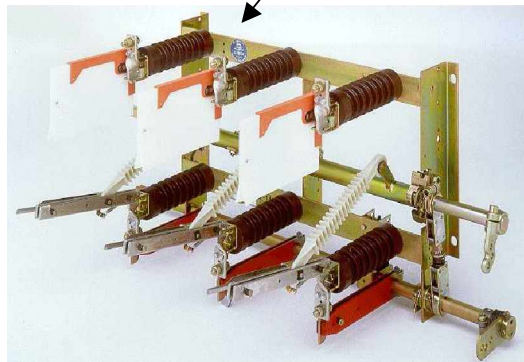
Average time-current characteristics



Cut-off current amplitude characteristic (at 50Hz)



***FDw* and *FDwT* fuses are able to protect all Medium Voltage installations which accept DIN fuses,**



We offer ***FDw*** and ***FDwT*** fuses by set of 3 according to the recommendations of IEC 282-1 and VDE 0670 standards on the replacement of Medium Voltage fuses in 3-phase networks :
The replacement of all 3 fuse links is recommended for a safe protection if one or two fuses have melted.