

Cable current ratings

Conventional rated thermal current (A)	Copper conductor section				
	Cable		Busbars		
	No.	Section (mm ²)	No.	Dimensions (mm)	
8 A	1	1			
12 A	1	1.5			
20 A	1	2.5			
25 A	1	4.0			
32 A	1	6.0			
50 A	1	10			
65 A	1	16			
85 A	1	25			
115 A	1	35			
150 A	1	50			
175 A	1	70			
225 A	1	95			
250 A	1	120			
275 A	1	150			
350 A	1	185			
400 A	1	240			
500 A	2	x 150	2	x	30 x 5
630 A	2	x 185	2	x	40 x 5
800 A	2	x 240	2	x	50 x 5
1000 A			2	x	60 x 5
1250 A			2	x	100 x 5
1600 A			3	x	100x 5

Current rating of non-insulated flat busbar

A correction factor complying with DIN 43671 can be determined for **flat busbars** using the table below. The factor is dependant on the relevant ambient temperature. This correction factor should be taken into account when conditions change and loading is continuous.

air temp	busbar temperature											
	50°C	55°C	60°C	65°C	70°C	75°C	80°C	85°C	90°C	100°C	110°C	120°C
	correction factor k_2											
20°C	1.00	1.15	1.20	1.25	1.35	1.42	1.48	1.55	1.62	1.70	1.80	1.90
25°C	0.95	1.05	1.1	1.20	1.25	1.35	1.40	1.45	1.55	1.65	1.75	1.85
30°C	0.80	0.92	1.0	1.10	1.15	1.25	1.32	1.40	1.45	1.55	1.70	1.80
35°C	0.70	0.80	0.90	1.00	1.10	1.15	1.25	1.30	1.40	1.50	1.60	1.70
40°C	0.55	0.66	0.80	0.90	1.00	1.10	1.15	1.25	1.30	1.45	1.55	1.65
45°C	0.40	0.52	0.65	0.75	0.90	0.95	1.05	1.15	1.25	1.35	1.50	1.60
50°C	0.30	0.35	0.50	0.65	0.80	0.90	1.00	1.05	1.15	1.30	1.40	1.55
55°C	–	–	0.35	0.55	0.65	0.75	0.90	0.95	1.05	1.20	1.35	1.45
60°C	–	–	–	0.30	0.50	0.65	0.75	0.85	0.95	1.10	1.25	1.40

30 x 10 busbar can under normal operating conditions be loaded with 630A. A correction factor k_2 of 1.30 for example is required if a load of 800A is applied. This diagram demonstrates that the busbar heats up to 85°C if this correction factor and an air temperature of 35°C apply.

Degree of protection (IP--) IEC529

1st numeral digit. Protection against contact + penetration of solid bodies		2nd numeral digit Protection against penetration of liquids	
0	No protection	0	No protection
1	Protection against solid objects more than 50mm	1	Protection against vertical drops of water
2	Protection against solid objects more than 12mm	2	Protection against drops of water falling up to 15°
3	Protection against solid objects more than 2.5mm	3	Protection against spraying water
4	Protection against solid objects more than 1.0mm	4	Protection against splashing water
5	Protection against dust (limited ingress)	5	Protection against water jets
6	Total protection against dust (dust-tight)	6	Protection against heavy seas
		7	Protection against the effects of immersion

Inductive proximity switches

Namur version *namur-DIN 19234 (2 wire)*

Two wire non-amplified DC sensors contain only the oscillator and are adapted to control an electronic amplified threshold circuit. Only a few components are required, guaranteeing maximum operational safety and reliability. The sensor is not susceptible to inductive or capacitive irradiations into the amplifier.

Ideally suited for explosion proof applications connected intrinsically safe amplifiers.

Nominal voltage: 8 VDC (7.7 ÷ 9 V) - Load resistant 1 kΩ
 Output current: Presence of metal ≤ 1 mA
 Absence of metal ≤ 3 mA

DC version *direct voltage (3 wire)*

Amplified Dc sensors containing an output amplifier. In addition to the oscillator they are supplied with functions NO or NC in NPN or PNP. As standard this version if sensor is protected against short circuit and against polarity and peaks created by the disconnection of inductive loads.

AC version *alternative voltage (2 wire)*

Two wire amplified AC sensors containing a thyristor output amplifier, in addition to the oscillator the load (i.e. relay) is connected in series. Due to this system attention must be paid (particularly in the low voltage range) if electronic controls have high resistance inputs, as there is a residual current flow even when in the open state. All AC sensors protected against overvoltage created by the power supply.

Capacitive proximity switches

Capacitive sensors

These are electronic transducers which give output signals when any material (wood, marble, metals, glass, coffee, fodder, etc.) affects their sensing part without necessarily entering in contact with them. They have high resistance to knocks and vibrations and can operate in severe ambient conditions since they are completely static. The devices can be supplied with a rapid or delayed intervention.

Reduction factors

<i>inductive sensors</i>		<i>capacitive sensors</i>	
Aq37	1	Metals	c.a.1
Stainless steel	0.85	Water	c.a.1
Brass, bronze	0.55	Plastic	c.a.0.5
Aluminium	0.45	Glass	c.a.0.5
Copper	0.40	Wood	c.a.0.4

Conversion tables

Length	from:	to	meter	foot	inch
	1 meter (m)		1	3.281	39.37
	1 inch (in / ")		0.0254	0.08378	1
	1 foot (ft / ')		0.3048	1	12
Weight	from:	to	kg	lb	oz
	1 kilogram (kg)		1	2.205	35.27
	1 pound (1b)		0.454	1	16
	1 ounce (oz)		0.028	0.0625	1
Pressure	from:	to	n/m ²	bar	PSI
	1 n/m ² or pascal		1	0.00001	0.000145
	1 bar		100000	1	14.504
	1 PSI		6849.76	0.0689476	1

Rated motor current conversion table

Rated power		3-phase 4-pole 50 - 60 hz					Single phase	
kW	Hp	400V A	415V A	440V A	500V A	660V A	220V A	240V A
0.37	0.5	0.9	0.9	0.9	0.8	0.6	3.9	3.6
0.55	0.75	1.4	1.4	1.3	1.1	0.9	5.2	4.8
0.75	1	1.9	1.8	1.7	1.5	1.1	6.6	6.1
1.1	1.5	2.5	2.4	2.3	2	1.5	9.6	8.8
1.5	2	3.5	3.3	3	2.7	2	12.7	11.7
2.2	3	4.8	4.7	4.4	3.8	3	18.6	17.1
4	5.5	8.1	8	7.5	6.5	5	32	29
5.5	7.5	11.1	11	10	9	6.7	42.2	38.7
7.5	10	14.7	14.3	13.5	12	9	54.4	50
10	13.5	19.5	19	18	15.6	12	–	–
11	15	20.9	20.5	19.5	17	13	75	–
15	20	28.5	28	26.5	23	17.5		
18.5	25	35.1	34	32	28	21.3		
22	30	42	40	38	33.5	25.4		
30	40	56	54	51	45	34		
37	50	68.4	66	62	55	42		
45	60	81	78	73	65	49		
55	75	99	95	90	79	60		
75	100	132	128	121	106	81		
90	125	162	157	148	130	99		
110	150	195	188	177	156	118		
132	180	233	225	212	187	142		
160	220	285	276	260	229	174		
200	270	353	341	321	283	214		
220	300	389	375	353	311	236		
250	340	442	426	402	353	268		
315	430	551	530	500	440	334		
355	480	617	595	560	490	374		
375	500	660	630	585	530	395		
425	580	742	715	675	594	450		

Star-delta ratings calculated at full load current x 0.58

Contactors utilisation categories (IEC 60947-4-1)

Category AC-1	All AC loads with a power factor ≥ 0.95 – heating, distribution
Category AC-2	Starting, plugging and inching of slip ring motors – starting ± 2.5 times rated motor current – stopping \leq mains supply voltage
Category AC-3	Starting and stopping squirrel cage motors – closing and opening at ± 7 times rated motor current – stopping the voltage is at $\pm 20\%$ of mains supply voltage – light breaking
Plugging and inching of squirrel cage	– closing and opening at ± 7 times rated motor current – severe breaking

Type 2 co-ordination tables

80kA 400V (IEC/EN60947-4-1), Direct-on-line starters with fuses

Motor		Fuse rating					
Rated output (kW)	Rated current (A)	Fuse switch type	gG	aM	Contactor	Thermal overload	Current range (A)
0.37	1.1	3631 3003	6	4	BF09A	RF380160	1-1.6
0.55	1.5	3631 3003	10	4	BF09A	RF380160	1-1.6
0.75	1.9	3631 3003	10	4	BF09A	RF380250	1.6-2.5
1.1	2.7	3631 3003	16	6	BF09A	RF380400	2.5-4
1.5	3.6	3631 3003	16	10	BF09A	RF380400	2.5-4
2.2	4.9	3631 3003	25	10	BF09A	RF380650	4-6.5
3.0	6.5	3631 3003	32	16	BF12A	RF381000	6.3-10
4.0	8.5	3631 3003	32	20	BF16A	RF381000	6.3-10
5.5	11.5	3831 3011	50	25	BF25A	RF381400	9-14
7.5	15.5	3831 3011	63	32	BF32A	RF381800	13-18
11.0	22	3831 3011	80	40	BF32A	RF382500	20-25
15.0	29	3831 3011	100	63	BF50	RF95333	20-22
18.5	35	3831 3011	125	80	BF50	RF95342	28-32
22	41	3831 3024	160	100	BF65	RF95350	35-50
30	55	3831 3024	200	100	BF95	RF95365	46-65
37	66	3831 3024	200	125	BF95	RF95382	60-82
45	80	3831 3024	250	160	B145	RF200100	60-100
55	97	3831 3039	315	200	B180	RF200100	90-150
75	132	3831 3039	400	250	B250	RF200150	120-200
90	160	3831 3039	400	315	B250	RF420250	150-250
110	195	3831 3039	400	355	B310	RF420250	150-250
132	230	3811 3063	630	400	B400	RF420250	150-250
160	280	3811 3063	630	500	B400	RF420300	180-300
200	350	3811 3063	630	630	B500	RF420400	250-420

80kA 400V, Star-Delta starters with fuses

Motor		Fuse rating						
Rated output (kW)	Rated current (A)	Fuse switch type	gG	aM	Line	Delta	Star	Current range (A)
4.0	8.6	3631 3003	20	10	BF9A	BF9A	BF9A	
5.5	11.5	3631 3003	25	16	BF12A	BF12A	BF9A	
7.5	15.2	3631 3003	32	20	BF16A	BF16A	BF9A	6.3-10
11.0	22	3631 3005	40	25	BF25A	BF25A	BF9A	9-14
15.0	29	3631 3005	50	32	BF25A	BF25A	BF12A	13-18
18.5	35	3638 3011	63	40	BF25A	BF25A	BF18A	17-23
22	41	3638 3011	80	50	BF32A	BF32A	BF18A	24-32
30	55	3638 3011	100	63	BF38A	BF38A	BF25A	32-38
37	66	3638 3011	125	80	BF50	BF50	BF32A	35-50
45	80	3638 3011	125	100	BF65	BF65	BF32A	35-50
55	97	3831 3024	160	125	BF80	BF80	BF38A	46-65
75	132	3831 3024	200	160	BF80	BF80	BF50	60-100
90	160	3831 3024	250	200	B115	B115	BF65	90-150
110	195	3831 3024	250	200	B115	B115	BF65	120-200
132	230	3831 3039	315	250	B145	B145	BF80	120-200
160	280	3831 3039	400	315	B180	B180	B115	120-200
250	430	3811 3063	500	500	B250	B250	B145	150-250
295	540	3811 3063	630	630	B310	B310	B180	240-400

50 kA 400V, between SM circuit breakers and contactors series BG and BF

P (kW)	I _e (A)	Current adjustment range (A)	Circuit breaker	Contactor
<0.6	-	0.1 - 0.16	SM1B00	BG6...
0.06	-	0.16 - 0.25	SM1B04	BG6...
0.09	-	0.25 - 0.4	SM1B08	BG6...
0.12	-	0.4 - 0.63	SM1B12	BG6...
0.25	0.85	0.63 - 1	SM1B16	BG6...
0.55	1.4	1 - 1.6	SM1B20	BG6...
0.75	1.9	1.6 - 2.5	SM1B24	BG6...
1.5	3.5	2.5 - 4	SM1B28	BG6...
2.2	4.8	4 - 6.5	SM1B32	BG6...
4	8	6.3 - 10	SM1B36	BG9.../BF9...
5.5	11	9 - 14	SM1A40	BF12...
7.5	15	13 - 18	SM1A44	BF16...
11	21	20 - 25	SM1A52	BF25...
15	29	22 - 32	SM1A54	BF32...
18.5	35	28 - 40	SM2A68	BF40...
22	41	40 - 50	SM2A76	BF50...
30	55	45 - 63	SM3A84	BF65...
37	67	57 - 75	SM3A88	BF80...
45	80	80 - 100	SM3A96	BF95...

TEKNOMEGA top busbar support fault level chart

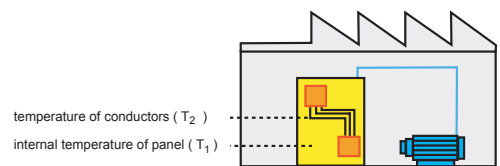
Top 1010 (Top 2/5TN)		(1 x 5mm bar per phase)																			
icc kA pk		74				110				143				165				187			
icc kA eff. 1 s		35				50				65				75				85			
D =		75	100	125	150	75	100	125	150	75	100	125	150	75	100	125	150	75	100	125	150
E	30 x 5	200	230	260	-	135	155	175	-	-	-	-	-	-	-	-	-	-	-	-	-
	40 x 5	230	265	300	-	155	180	200	-	-	-	-	-	-	-	-	-	-	-	-	-
	50 x 5	260	300	335	-	175	200	225	-	130	155	170	-	-	-	-	-	-	-	-	-
	60 x 5	290	335	375	-	195	225	250	-	150	170	195	-	-	-	-	-	-	-	-	-
Top 1010 (Top 2/5TN)		(2 x 5mm bars per phase)																			
E	30 x 5	170	175	175	-	115	115	115	-	-	-	-	-	-	-	-	-	-	-	-	-
	40 x 5	210	220	220	-	140	145	150	-	100	100	100	-	-	-	-	-	-	-	-	-
	50 x 5	250	260	270	-	165	175	180	-	125	135	135	-	-	-	-	-	-	-	-	-
	60 x 5	295	310	325	-	195	205	215	-	150	160	165	-	-	-	-	-	-	-	-	-
Top 1030 (Top 1/10TN)		(1 x 10mm bar per phase)																			
E	30 x 10	400	460	520	550	265	310	350	360	205	240	260	290	170	180	190	190	-	-	-	-
	40 x 10	460	530	600	640	310	360	400	420	240	275	310	330	170	210	225	225	-	-	-	-
	50 x 10	520	560	670	690	350	400	450	475	265	310	345	370	175	220	265	270	-	-	-	-
	60 x 10	525	560	750	810	390	450	505	520	295	345	390	410	180	235	275	300	-	-	-	-
	80 x 10	525	560	850	890	440	495	505	600	295	360	410	470	190	240	285	315	-	-	-	-
	100 x 10	525	560	955	1030	440	495	505	660	295	375	425	480	205	250	305	350	-	-	-	-
	120 x 10	525	560	1030	1080	440	495	505	720	295	375	425	480	215	265	315	360	-	-	-	-
Top 1040 (Top 2/10TN)		(2 x 10mm bars per phase)																			
E	30 x 10	380	400	425	425	255	275	280	285	190	215	220	220	170	180	190	190	130	155	165	165
	40 x 10	460	480	500	510	310	330	340	350	220	250	260	270	170	210	225	225	130	170	200	205
	50 x 10	510	525	540	570	350	380	390	410	235	290	305	315	175	220	265	270	135	175	215	240
	60 x 10	510	530	545	630	385	440	460	480	245	310	350	370	180	235	275	300	140	180	220	260
	80 x 10	510	530	545	630	395	450	495	495	255	325	375	420	190	240	285	315	150	190	230	270
	100 x 10	520	535	555	640	410	470	495	505	275	335	385	425	205	250	305	350	160	200	230	280
	120 x 10	520	535	560	650	435	490	495	505	285	345	390	435	215	265	315	360	160	200	230	280
Top 1050 (Top 3/10TN)		(3 x 10mm bars per phase)																			
E	30 x 10	490	505	505	505	330	335	340	340	250	260	260	260	220	225	225	225	190	200	200	200
	40 x 10	580	610	615	615	385	410	410	410	300	310	315	315	260	270	275	275	230	240	240	240
	50 x 10	585	700	715	715	450	465	470	480	345	360	370	370	300	315	320	320	245	275	280	280
	60 x 10	780	810	840	850	500	510	520	535	400	420	435	440	325	365	375	380	255	315	330	335
	80 x 10	900	950	975	1000	500	510	525	535	410	470	495	500	335	385	430	455	260	320	360	400
	100 x 10	1200	1200	1200	1200	505	515	525	535	420	480	495	500	350	395	440	480	275	330	375	410
	120 x 10	1200	1200	1200	1200	505	515	525	535	435	485	495	500	360	405	445	480	285	340	380	415

Δ T (°K) calculation

eg.
 T_1 (internal panel temperature) 50°C
 T_2 (temperature of conductor) 100°C

temperature rise of conductor = $T_2 - T_1 = \Delta T$ (°K)

eg. T_2 (100°C) - T_1 (50°C) = select from 50°K



WÖHNER busbar support fault level chart							
icc kA pk		42	52.7	63	73.5	84	94.5
icc kA eff. 1 s		20	25	30	35	40	45
01485/01495/01356		D = 60 (MM)					
E	20 X 5	400	250	-	-	-	-
	30 x 5	600	350	250	-	-	-
	20 x 10	470	300	-	-	-	-
	30 x 10	650	600	450	300	250	-
01231 ("H" Profile)		D = 60 (MM)					
	"H" Profile	1100	1000	770	700	550	-
01479		D = 100 (MM)					
E	30 X 10	600	400	-	-	-	-
	40 x 10	600	500	-	-	-	-
	50 x 10	600	500	-	-	-	-
	60 x 10	650	600	600	-	-	-
01230		D = 185 (MM)					
E	60 X 10	600	600	500	-	-	-
	80 x 10	600	600	500	-	-	-
	100 x 10	600	600	500	-	-	-
	120 x 10	600	600	500	-	-	-
		"H" Profile	600	600	600	600	600

charts and tables

SOCOMEK SBC ER busbar support fault levels

D = Distance between busbar centres
E = Distance between support centres

5025 5105 (1 x 5mm bar per phase)

lcc kA pk	74				110				143				165				187				
lcc kA eff. 1 s	35				50				65				75				85				
D =	75	100	125	150	75	100	125	150	75	100	125	150	75	100	125	150	75	100	125	150	
E	30 x 5	225	275	300	325	160	175	200	225	120	140	160	175	105	120	135	150	-	-	-	-
	40 x 5	275	300	350	375	175	200	225	250	145	165	175	200	125	140	160	175	-	-	-	-
	50 x 5	300	350	400	425	200	225	250	275	160	175	200	225	140	160	175	175	-	-	-	-
	60 x 5	350	400	425	475	225	250	275	300	175	200	225	225	155	175	175	200	-	-	-	-
	80 x 5	400	450	500	550	250	300	325	375	200	225	250	275	175	200	225	250	-	-	-	-

5025 5105 (2 x 5mm bars per phase)

E	30 x 5	200	200	200	200	135	140	140	140	105	105	105	105	90	90	90	90	-	-	-	-
	40 x 5	250	250	250	250	165	175	175	175	125	135	135	135	110	115	115	115	-	-	-	-
	50 x 5	275	300	300	300	175	200	200	200	150	160	160	160	130	135	140	140	-	-	-	-
	60 x 5	325	350	350	350	225	225	225	250	170	175	175	175	150	155	165	165	-	-	-	-
	80 x 5	400	425	450	475	250	275	300	300	200	225	225	225	175	175	200	200	-	-	-	-

5025 5110 (1 x 10mm bar per phase)

E	30 x 10	475	550	600	675	300	350	400	450	225	275	300	350	200	225	275	300	175	200	225	250
	40 x 10	550	625	700	775	375	425	475	525	275	325	350	400	225	275	300	350	175	225	275	300
	50 x 10	625	735	800	875	425	475	525	575	300	350	400	450	225	300	350	375	175	225	275	325
	60 x 10	700	800	875	950	475	550	600	650	325	400	450	475	225	300	375	425	175	225	300	350
	80 x 10	825	925	1000	1000	550	625	675	750	325	425	525	575	250	325	375	450	200	250	300	350
	100 x 10	950	1000	1000	1000	600	700	775	850	350	450	525	625	275	325	400	475	200	250	300	350
	120 x 10	1000	1000	1000	1000	650	800	875	925	375	475	550	650	275	350	400	475	225	275	325	375

5025 5110 (2 x 10mm bars per phase)

E	30 x 10	450	475	500	500	300	350	400	450	225	250	250	250	200	200	225	225	175	175	175	200
	40 x 10	475	575	600	600	375	425	475	525	275	300	300	300	225	250	250	275	175	225	225	225
	50 x 10	500	650	700	725	425	475	525	575	300	325	350	350	220	300	300	300	175	225	275	275
	60 x 10	500	675	775	825	450	525	575	625	300	375	400	400	225	300	350	350	175	225	300	300
	80 x 10	550	700	850	1000	555	625	675	750	325	425	500	500	250	325	375	425	175	250	300	350
	100 x 10	675	725	875	1000	600	700	775	850	350	450	525	600	250	325	400	475	200	250	300	350
	120 x 10	625	750	900	1000	650	800	875	925	375	450	550	650	275	350	400	475	225	275	325	375

SBC 10 busbar support fault level chart

lcc kA pk	52.5	73.5	110	143	
lcc kA eff. 1 s	25	35	50	65	
D = (MM)	65	65	65	65	
E	30 x 10	575	400	275	200
	40 x 10	675	475	325	250
	50 x 10	775	550	350	250
	60 x 10	850	600	400	250
	80 x 10	1000	725	450	250

SBP 44 4 pole angled busbar support fault level chart

lcc kA pk	20	30	47.5	63	
lcc kA eff. 1 s	10	15	22.5	30	
D = (MM)	50	50	50	50	
E	15 x 5	-	-	-	
	20 x 5	725	650	375	200
	30 x 5	975	900	350	200
	20 x 10	1000	925	375	200
	30 x 10	1000	900	350	200

SBE 44 4 pole stair type busbar support fault level chart

lcc kA pk	20	30	47.3	63	
lcc kA eff. 1 s	10	15	22.5	30	
D = (MM)	36	36	36	36	
E	15 x 5	600	400	200	115
	20 x 5	800	475	200	110
	30 x 5	1000	450	175	100
	20 x 10	-	-	-	-
	30 x 10	-	-	-	-

Individual motor compensation

Capacitor rating in kVAR							To improve power factor to 0.95 or better at all loads						
motor kW	2 pole 3000rpm	4 pole 1500rpm	6 pole 1000rpm	8 pole 750rpm	10 pole 600rpm	12 pole 500rpm							
1.5	0.5	1	1	1.5	1.5	1.5							
2.2	0.75	1	1	1.5	1.5	1.5							
4	1.0	1.5	2	2.5	3	3							
5.5	1.5	2	3	3.5	4	4							
7.5	2.5	3	3.5	4	5	5							
11	4	4	4.5	6	6	6							
15	5	5	6	8	8	10							
18.5	6	6	7	8	10	12							
22	7	8	9	10	12	14							
30	9	10	11	14	14	16							
37	12	12	14	16	18	18							
45	14	14	15	18	20	22							
55	15	16	18	20	22	26							
63	16	18	20	22	24	28							
75	20	22	24	26	28	32							
90	25	26	30	32	35	30							
110	28	30	32	35	38	45							
132	30	32	326	38	45	60							

charts and tables

Calculating capacitor size requirements

It is imperative that correct capacitor sizes be selected when calculating capacitor requirements. In the case of group compensation it is recommended that the first capacitor step be equal to half the value of the following steps, to allow a smooth overall more finely tuned correction system.

Table 2 below will assist in calculating capacitor values required in specific applications. Prior knowledge of the following is required:

- a) Power factor before applying capacitors (left column)
- b) Required power factor after applying capacitors (top row)
- c) Total consumption in kW (per kW)

The correct capacitor size can then be calculated by crossing the horizontal and vertical values of table 2.

Example:

1. Convert the plant load to kW (kVA x Power Factor = kW)
400 kVA x 0.70 PF = 280kW (useful power).
2. To correct a load of 400 kVA at 0.70 PF to 0.96. Follow the 0.70 value (in the left vertical column table 2) horizontally until below the 0.96 value (in the top horizontal row) the value is 0.729.
3. Capacitor required to correct from 0.70 to 0.96 (Power x Capacitor from table value)
280kW x 0.729 = 204.12 kVAr

Savings: 280kW at 0.70 PF = 400 kVA
280kW at 0.96 PF = 292 kVA

Reduction = 108 kVA (27% less of transformer load)

Table 2

PF load before applying capacitors	Target power factor												
	0.80	0.85	0.90	0.91	0.92	0.93	0.94	0.95	0.96	0.97	0.98	0.99	Unity
0.40	1.537	1.668	1.805	1.832	1.861	1.924	1.959	1.988	2.037	2.003	2.085	2.146	2.288
0.41	1.474	1.605	1.742	1.769	1.798	1.831	1.860	1.896	1.935	1.973	2.021	2.082	2.225
0.42	1.413	1.544	1.681	1.709	1.738	1.771	1.800	1.836	1.874	1.913	1.961	2.022	2.164
0.43	1.356	1.487	1.624	1.651	1.680	1.713	1.742	1.778	1.816	1.855	1.903	1.964	2.107
0.44	1.290	1.421	1.558	1.585	1.614	1.647	1.677	1.712	1.751	1.790	1.837	1.899	2.041
0.45	1.230	1.360	1.501	1.532	1.561	1.592	1.626	1.659	1.695	1.737	1.784	1.846	1.988
0.46	1.179	1.309	1.446	1.473	1.502	1.533	1.567	1.600	1.636	1.677	1.725	1.786	1.929
0.47	1.130	1.260	1.397	1.425	1.454	1.485	1.519	1.552	1.588	1.629	1.677	1.758	1.881
0.48	1.076	1.206	1.343	1.370	1.400	1.430	1.464	1.497	1.534	1.575	1.623	1.684	1.826
0.49	1.030	1.160	1.297	1.326	1.355	1.386	1.420	1.453	1.489	1.530	1.578	1.639	1.782
0.50	0.982	1.112	1.248	1.276	1.303	1.337	1.369	1.403	1.441	1.481	1.529	1.590	1.732
0.51	0.936	1.066	1.202	1.230	1.257	1.291	1.323	1.357	1.395	1.435	1.483	1.544	1.686
0.52	0.894	1.024	1.160	1.188	1.215	1.249	1.281	1.315	1.353	1.393	1.441	1.502	1.644
0.53	0.850	0.980	1.116	1.144	1.171	1.205	1.237	1.271	1.309	1.349	1.397	1.458	1.600
0.54	0.809	0.939	1.075	1.103	1.130	1.164	1.196	1.230	1.268	1.308	1.356	1.417	1.559
0.55	0.769	0.899	1.035	1.063	1.090	1.124	1.156	1.190	1.228	1.268	1.316	1.377	1.519
0.56	0.730	0.860	0.996	1.024	1.051	1.085	1.117	1.151	1.189	1.229	1.277	1.338	1.480
0.57	0.692	0.822	0.958	0.986	1.013	1.047	1.079	1.113	1.151	1.191	1.239	1.300	1.442
0.58	0.655	0.785	0.921	0.949	0.976	1.010	1.042	1.076	1.114	1.154	1.202	1.263	1.405
0.59	0.618	0.748	0.884	0.912	0.939	0.973	1.005	1.039	1.077	1.117	1.165	1.226	1.368
0.60	0.584	0.714	0.849	0.878	0.905	0.939	0.971	1.005	1.043	1.083	1.131	1.192	1.334
0.61	0.549	0.679	0.815	0.843	0.870	0.904	0.936	0.970	1.008	1.048	1.096	1.157	1.299
0.62	0.515	0.645	0.781	0.809	0.836	0.870	0.902	0.934	0.974	1.014	1.062	1.123	1.265
0.63	0.483	0.613	0.749	0.777	0.804	0.838	0.870	0.904	0.942	0.982	1.030	1.091	1.233
0.64	0.450	0.580	0.716	0.744	0.771	0.805	0.837	0.871	0.909	0.949	0.997	1.058	1.200
0.65	0.419	0.549	0.685	0.713	0.740	0.774	0.806	0.840	0.878	0.918	0.966	1.027	1.169
0.66	0.388	0.518	0.654	0.682	0.709	0.743	0.775	0.809	0.847	0.887	0.935	0.996	1.138
0.67	0.358	0.488	0.624	0.652	0.679	0.713	0.745	0.779	0.817	0.857	0.905	0.966	1.108
0.68	0.329	0.459	0.595	0.623	0.650	0.684	0.716	0.750	0.788	0.828	0.876	0.937	1.079
0.69	0.299	0.429	0.565	0.593	0.620	0.654	0.686	0.720	0.758	0.798	0.840	0.907	1.049
0.70	0.270	0.400	0.536	0.564	0.591	0.625	0.657	0.691	0.729	0.769	0.811	0.878	1.020
0.71	0.242	0.372	0.508	0.536	0.563	0.597	0.629	0.663	0.701	0.741	0.783	0.850	0.992
0.72	0.213	0.343	0.479	0.507	0.534	0.568	0.600	0.634	0.672	0.712	0.754	0.821	0.963
0.73	0.186	0.316	0.452	0.480	0.507	0.541	0.573	0.607	0.645	0.685	0.727	0.794	0.936
0.74	0.159	0.289	0.425	0.453	0.480	0.514	0.546	0.580	0.618	0.658	0.700	0.767	0.909
0.75	0.132	0.262	0.398	0.426	0.453	0.487	0.519	0.553	0.591	0.631	0.673	0.740	0.882
0.76	0.105	0.235	0.371	0.399	0.426	0.460	0.492	0.526	0.564	0.604	0.652	0.713	0.855
0.77	0.079	0.209	0.345	0.373	0.400	0.434	0.466	0.500	0.538	0.578	0.620	0.687	0.829
0.78	0.053	0.183	0.319	0.347	0.374	0.408	0.440	0.474	0.512	0.552	0.594	0.661	0.803
0.79	0.026	0.156	0.292	0.320	0.347	0.381	0.413	0.447	0.485	0.525	0.567	0.634	0.776
0.80	-	0.130	0.266	0.294	0.321	0.355	0.387	0.421	0.459	0.499	0.541	0.608	0.750
0.81	-	0.104	0.240	0.268	0.295	0.329	0.361	0.395	0.433	0.473	0.515	0.582	0.724
0.82	-	0.078	0.214	0.242	0.269	0.303	0.335	0.369	0.407	0.447	0.489	0.556	0.698
0.83	-	0.052	0.188	0.216	0.243	0.277	0.309	0.343	0.381	0.421	0.463	0.530	0.672
0.84	-	0.026	0.162	0.190	0.217	0.251	0.283	0.317	0.355	0.395	0.437	0.504	0.645
0.85	-	-	0.136	0.164	0.191	0.225	0.257	0.291	0.329	0.369	0.417	0.478	0.620
0.86	-	-	0.109	0.140	0.167	0.198	0.230	0.264	0.301	0.343	0.390	0.450	0.593
0.87	-	-	0.083	0.114	0.141	0.172	0.204	0.238	0.275	0.317	0.364	0.424	0.567
0.88	-	-	0.054	0.085	0.112	0.143	0.175	0.209	0.246	0.288	0.335	0.395	0.538
0.89	-	-	0.028	0.059	0.086	0.117	0.149	0.183	0.230	0.262	0.309	0.369	0.512
0.90	-	-	-	0.031	0.058	0.089	0.121	0.155	0.192	0.234	0.281	0.341	0.484
0.91	-	-	-	-	0.027	0.058	0.090	0.124	0.161	0.203	0.250	0.310	0.453
0.92	-	-	-	-	-	0.031	0.063	0.097	0.134	0.176	0.223	0.283	0.426
0.93	-	-	-	-	-	-	0.032	0.066	0.103	0.145	0.192	0.252	0.395

Capacitor ratings at different voltages

	kVAr at				capacitance total (uF)	capacitance in delta (uF)	current in delta (A)				line current (A)			
	525V	440V	415V	400V			525V	440V	415V	400V	525V	440V	415V	400V
	10	9	8		164	82		8	7	7		13	12	12
	15	13	12		247	123		11	11	10		20	19	18
	20	18	17		329	164		15	14	14		26	25	24
	25	22	21		411	206		19	18	17		33	31	30
	30	27	25		493	247		23	21	21		39	37	36
	40	36	33		658	329		30	29	28		52	50	48
	45	40	37		740	370		34	32	31		59	56	54
	50	44	41		822	411		38	36	34		66	62	60
	60	53	50		987	493		45	43	41		79	74	72
	75	67	62		1234	617		57	54	52		98	93	89
	80	71	66		1316	658		61	57	55		105	99	95
	90	80	74		1480	740		68	64	62		118	111	107
	100	89	83		1645	822		76	71	69		131	124	119
	120	107	99		1974	987		91	86	83		157	149	143
	125	111	103		2056	1028		95	89	86		164	155	149
	150	133	124		2467	1234		114	107	103		197	186	179
	175	156	145		2879	1439		133	125	121		230	217	209
	180	160	149		2961	1480		136	129	124		236	223	215
	200	178	165		3290	1645		152	143	138		262	248	239
	210	187	174		3454	1727		159	150	145		276	260	251
	225	200	186		3701	1851		170	161	155		295	278	268
	240	214	198		3948	1974		182	171	165		315	297	286
	250	222	207		4112	2056		189	179	172		328	309	298
	270	240	223		4441	2221		205	193	186		354	334	322
	275	245	227		4524	2262		208	196	189		361	340	328
	300	267	248		4935	2467		227	214	207		394	371	358
	325	289	269		5346	2673		246	232	224		426	402	388
	330	294	273		5428	2714		250	236	227		433	408	394
	350	311	289		5757	2879		265	250	241		459	433	418
	360	320	298		5922	2961		273	257	248		472	446	429
	375	334	310		6169	3084		284	268	258		492	464	447
	400	356	331		6580	3290		303	286	275		525	495	477
	420	374	347		6909	3454		318	300	289		551	520	501
	425	378	351		6991	3496		322	304	293		558	526	507
	450	400	372		7402	3701		341	322	310		590	557	537
	475	423	393		7814	3907		360	339	327		623	588	567
	480	427	397		7896	3948		364	343	331		630	594	573
	500	445	413		8225	4112		379	357	344		656	619	596
	600	534	496		9870	4935		455	429	413		787	743	716
	700	623	579		11515	5757		530	500	482		919	866	835
10	7	6	6		116	58	6	5	5	5	11	9	9	8
20	14	12	12		231	116	13	11	10	10	22	18	17	17
30	21	19	17		347	173	19	16	15	15	33	28	26	25
40	28	25	23		462	231	25	21	20	19	44	37	35	34
50	35	31	29		578	289	32	27	25	24	55	46	43	42
60	42	37	35		693	347	38	32	30	29	66	55	52	50
70	49	44	41		809	404	44	37	35	34	77	65	61	59
80	56	50	46		924	462	51	43	40	39	88	74	70	67
90	63	56	52		1040	520	57	48	45	44	99	83	78	75
100	70	62	58		1155	578	63	53	50	48	110	92	87	84
120	84	75	70		1387	693	76	64	60	58	132	111	104	101
140	98	87	81		1618	809	89	74	70	68	154	129	122	117
160	112	100	93		1849	924	102	85	80	77	176	147	139	134
180	126	112	104		2080	1040	114	96	90	87	198	166	156	151
200	140	125	116		2311	1155	127	106	100	97	220	184	174	168
220	155	137	128		2542	1271	140	117	110	106	242	203	191	184
240	169	150	139		2773	1387	152	128	120	116	264	221	209	201
260	183	162	151		3004	1502	165	138	130	126	286	240	226	218
280	197	175	163		3235	1618	178	149	141	135	308	258	243	235
300	211	187	174		3466	1733	190	160	151	145	330	276	261	251
320	225	200	186		3697	1849	203	170	161	155	352	295	278	268
400	281	250	232		4622	2311	254	213	201	193	440	369	348	335

Standard rated capacitor voltage 440V or 525V

- Notes:**
1. "capacitance total" refers to total calculated capacitance of the delta connected capacitor at rated capacitor voltage
 2. "capacitance in delta" refers to calculated capacitance between any two terminals of delta wired capacitor
 3. "line current" refers to calculated current at terminals of delta capacitor
 4. calculated values may vary in practice due to tolerances allowed in manufacturing standards, as well as life span considerations and the effect of cables, discharge resistors, etc

Capacitor selection regarding harmonics

	Capacitor without reactor	Capacitor without reactor	Capacitor with reactor	Capacitor with reactor
	Standard type	H type	Standard class	Reinforced class
S.H	15%	15-25%	25-35%	35-50%
S.T	≤ 2%	≤ 3%	≤ 4%	≤ 6%
THDU	and	and	and	and
Measures	≤ 5%	≤ 10%	≤ 20%	≤ 40%
THDI				

- Notes:**
- S.H and S.T are given in kVA
 - S.H: weighted power in kVA of harmonic generators
 - S.T: power of the transformer HV/LV

Delta drives – brake resistor selection chart

Drive	Applicable motor (kW)	Full load torque Nm	Brake unit ea.	No	Price ea.	Resistor value		Brake resistor				Price ea.	Brake torque 10% ED	
						Watt	Ohms	Part no	Qty	Series	Parallel			
"EL" Series														
VFD002EL21A	230V	0.20	0.110	BUE-20015	1	580.00	200	250	BR200W250	1	-	-	368.00	32
VFD004EL21A		0.40	0.216	BUE-20015	1	580.00	200	250	BR200W250	1	-	-	368.00	170
VFD007EL21A		0.75	0.427	BUE-20015	1	580.00	200	150	BR200W150	1	-	-	368.00	140
VFD015EL21A		1.50	0.849	BUE-20015	1	580.00	300	100	BR300W100	1	-	-	490.00	107
VFD004EL43A	460V	0.40	0.216	BUE-40015	1	890.00	300	400	BR300W400	1	-	-	490.00	400
VFD007EL43A		0.75	0.427	BUE-40015	1	890.00	300	400	BR300W400	1	-	-	490.00	200
VFD015EL43A		1.50	0.849	BUE-40015	1	890.00	400	300	BR200W150	2	-	-	368.00	140
VFD022EL43A		2.20	1.262	BUE-40037	1	1420.00	600	200	BR300W400	2	-	-	490.00	150
VFD037EL43A		3.70	2.080	BUE-40037	1	1420.00	900	120	-	-	-	-	-	150
"E" Series														
VFD004E43A	460V	0.40	0.216	BUE-40015	1	890.00	300	400	BR300W400	1	-	-	490.00	400
VFD007E43A		0.75	0.427	BUE-40015	1	890.00	300	400	BR200W250	1	-	-	490.00	200
VFD015E43A		1.50	0.849	BUE-40015	1	890.00	400	300	BR200W150	2	-	-	368.00	140
VFD022E43A		2.20	1.262	BUE-40037	1	1420.00	600	200	BR300W400	2	-	-	490.00	140
VFD037E43A		3.70	2.080	-	-	-	750	140	-	-	-	-	-	125
VFD055E43A		5.50	3.111	-	-	-	1100	96	-	-	-	-	-	120
VFD075E43A		7.50	4.148	-	-	-	1500	69	-	-	-	-	-	125
VFD110E43A		11.00	6.186	-	-	-	2000	53	-	-	-	-	-	108
VFD015E43A		15.00	8.248	-	-	-	4800	32	BR1K2W008	4	-	-	1290.00	151
VFD185E43A		18.50	10.281	-	-	-	4800	32	BR1K2W008	4	-	-	1290.00	121
VFD220E43A	22.00	12.338	-	-	-	4800	32	BR1K2W008	4	-	-	1290.00	100	
"VL" Series														
VFD055VL43A	460V	5.5	3.111	-	-	-	1000	75	BR1K0W075	1	-	-	1610.00	125
VFD075VL43A		7.5	4.148	-	-	-	1500	43	BR1K5W043	1	-	-	1620.00	125
VFD110VL43A		11	6.186	-	-	-	1500	43	BR1K5W043	1	-	-	1620.00	125
VFD150VL43A		15	8.248	-	-	-	2000	32	BR1K0W016	2	2	-	1080.00	125
VFD185VL43A		18.5	10.281	-	-	-	3000	26	BR1K5W013	2	2	-	1620.00	125
VFD220VL43A		22	12.338	-	-	-	3000	26	BR1K5W013	2	2	-	1620.00	125
VFD300VL43A		30	16.497	BUE-4030	1	4580.00	3000	20.4	BR1K0W5PI	4	4	-	1620.00	125
VFD370VL43A		37	20.600	BUE-4045	1	4450.00	4800	15	BR1K2W015	4	2	2	1290.00	125
VFD450VL43A		45	24.475	BUE-4045	1	4450.00	6000	13	BR1K5W013	4	2	2	1620.00	125
"C2000" Series														
VFD040C43E	460V	4	2.7	-	-	-	1000	75	BR1K0W075	1	-	-	1610.00	10.2
VFD055C43E		5.5	3.7	-	-	-	1000	75	BR1K0W075	1	-	-	1610.00	10.2
VFD075C43E		7.5	5.1	-	-	-	1000	75	BR1K0W075	1	-	-	1610.00	10.2
VFD110C43E		11	7.5	-	-	-	1500	43	BR1K5W043	1	-	-	1620.00	17.6
VFD150C43E		15	10.2	-	-	-	2000	32	BR1K0W016	2	2	-	1080.00	24
VFD185C43E		18.5	12.2	-	-	-	2000	32	BR1K0W016	2	2	-	1080.00	24
VFD220C43E		22	14.9	-	-	-	3000	26	BR1K5W013	2	2	-	1620.00	29
VFD300C43E		30	20.3	-	-	-	4000	16	BR1K0W016	4	2	2	1080.00	47.5
VFD370C43A		37	25.1	BUE-4045	1	4450.00	4800	15	BR1K2W015	4	2	2	1290.00	50
VFD450C43A		45	30.5	BUE-4045	1	4450.00	6000	13	BR1K5W013	4	2	2	1620.00	59
VFD550C43A		55	37.2	BUE-4030	2	4580.00	7200	10	BR1K2W015	4	-	4	1290.00	76
VFD750C43A		75	50.8	BUE-4045	2	4450.00	9600	7.5	BR1K2W015	8	2	2	1290.00	100
VFD900C43A		90	60.9	BUE-4045	2	4450.00	12000	6.5	BR1K5W013	8	2	2	1620.00	117
VFD1100C43A		110	74.5	BUE-4110	1	13440.00	12000	6	BR1K2W015	10	2	5	1290.00	126
VFD1320C43A		132	89.4	BUE-4160	1	14080.00	18000	4	BR1K5W012	12	2	6	1620.00	190
VFD1600C43A	160	108.3	BUE-4160	1	16360.00	18000	4	BR1K5W012	12	2	6	1620.00	190	
"CP2000" Series														
VFD040C43E	460V	4	2.5	-	-	-	400	150	BR400W150	1	-	-	630.00	9
VFD055C43E		5.5	2.7	-	-	-	1000	75	BR1K0W075	1	-	-	1610.00	10.2
VFD075C43E		7.5	3.7	-	-	-	1000	75	BR1K0W075	1	-	-	1610.00	10.2
VFD110C43E		11	5.1	-	-	-	1000	75	BR1K0W075	1	-	-	1610.00	10.2
VFD150C43E		15	7.5	-	-	-	2000	32	BR1K5W043	1	-	-	1620.00	17.6
VFD185C43E		18.5	10.2	-	-	-	2000	32	BR1K0W016	2	2	-	1080.00	24
VFD220C43E		22	12.2	-	-	-	2000	32	BR1K0W017	2	2	-	1080.00	24
VFD300C43E		30	14.9	-	-	-	3000	26	BR1K5W013	2	2	-	1620.00	29
VFD370C43A		37	20.3	-	-	-	4000	16	BR1K0W016	4	2	2	1080.00	47.5
VFD450C43A		45	25.1	BUE-4045	1	4450.00	4800	15	BR1K2W015	4	2	2	1290.00	50
VFD550C43A		55	30.5	BUE-4045	1	4450.00	6000	13	BR1K5W013	4	2	2	1620.00	59
VFD750C43A		75	37.2	BUE-4030	2	4580.00	8000	10.2	BR1K0W5P1	4	4	-	1620.00	76
VFD900C43A		90	50.8	BUE-4045	2	4450.00	9600	7.5	BR1K1W015	4	2	2	1620.00	100
VFD1100C43A		110	60.9	BUE-4045	2	13440.00	12000	6.5	BR1K5W013	4	2	2	1620.00	117
VFD1320C43A		132	74.5	BUE-4110	1	14080.00	12000	6	BR1K5W013	4	2	2	1620.00	126
VFD1600C43A	160	89.4	BUE-4160	1	16360.00	18000	4	BR1K5W012	12	2	6	1620.00	190	

Cascading according to IEC 60947-2

MCCB x160, x250, h250, h400, h630, h1000, h1600

Cascading value in kA according to IEC 947-2. Network: 3 phases + neutral. 380~415 VAC.

Downstream Circuit Breaker										Upstream Circuit breaker																	
MCB's										MCCB's																	
Reference	MV	MJN	MN	NFN	HLF	NGN	NCN NDN	HMC HMD	NRN	HDA	HHA	HNA	HHB	HNB	HHG	HNG	HEG	HNC	HEC	HHD	HND	HED	HNE	HEE	HNF	HEF	
fault level IEC 60947 2	4,5 kA	6 kA	6 kA	10 kA	10 kA	10 kA	15 kA	15 kA	20 kA	18 kA	25 kA	40 kA	25 kA	40 kA	25 kA	50 kA	65 kA	50 kA	70 kA	25 kA	50 kA	50 kA	50 kA	50 kA	50 kA	50 kA	70 kA
	3 kA	4,5 kA	4,5 kA	6 kA	6 kA	6 kA	10 kA	15 kA	32-40A	50-63A	x160 TM	x160 TM	x250 TM	40 kA	40 kA	50 kA	h250 TM	h250 LSI	70 kA	h400 TM	50 kA	h630 LSI	h1000 LSI	50 kA	70 kA	h1600 LSI	
IEC 60898	Curve	B	C	C	C	C	B, C	C, D	C	std	std	std	std	std	std	std	std	std	std	std	std	std	std	std	std	std	
MV	4,5 kA	3 kA	-	-	10	10	15	15	20	15	5.4	5.4	5.2	5.2	5.8	5.8	5.8	5.1	5.1	-	-	-	-	-	-	-	
MJN	6 kA	4,5 kA	-	-	10	10	15	15	20	15	6	6	6	6	6	6	6	6	6	-	-	-	-	-	-	-	
MN	6 kA	4,5 kA	-	-	10	10	15	15	20	15	8	8	6.5	6.5	6	6	6	6.5	6.5	-	-	-	-	-	-	-	
NFN	10 kA	6 kA	-	-	-	-	15	15	20	15	18	20	14	14	10	10	10	14	14	13.6	13.6	10.1	10.1	-	-	-	
HLF	10 kA	10 kA	-	-	-	-	15	15	20	15	18	25	40	25	25	25	25	47	47	23	23	18.6	18.6	18	18	-	
NGN	10 kA	6 kA	-	-	-	-	15	15	20	15	18	18	14	14	10	10	10	14	14	13.6	13.6	10	10	-	-	-	
NCN	15 kA	10 kA	-	-	-	-	-	-	20	15	18	25	40	25	25	25	25	47	47	23	23	19	19	18	18	-	
NDN	15 kA	10 kA	-	-	-	-	-	-	20	15	18	25	40	25	25	25	25	47	47	23	23	19	19	18	18	-	
HMC	15 kA	15 kA	-	-	-	-	-	-	-	-	18	25	40	25	25	25	25	47	47	24	24	19	19	18	18	-	
HMD	15 kA	15 kA	-	-	-	-	-	-	-	-	18	25	40	25	25	25	25	47	47	24	24	19	19	18	18	-	
NRN	25 kA	-	-	-	-	-	-	-	-	-	18	25	40	25	50	50	65	50	70	25	25	50	58	44	28	28	
	20 kA	-	-	-	-	-	-	-	-	-	18	25	40	25	50	50	55	50	70	25	25	44	29	30	20	20	
	15 kA	-	-	-	-	-	-	-	-	-	18	25	40	25	25	25	25	47	47	25	25	33	19	18	18	-	
HDA	18 kA	-	-	-	-	-	-	-	-	18	25	40	25	40	25	40	40	50	40	25	25	34	24	25	18	18	
HHA	25 kA	-	-	-	-	-	-	-	-	-	25	40	25	40	25	50	65	50	70	25	25	50	55	45	28	28	
HNA	40 kA	-	-	-	-	-	-	-	-	-	-	40	25	40	25	50	65	50	70	25	25	50	50	70	50	50	
HNB	25 kA	-	-	-	-	-	-	-	-	-	-	25	40	25	50	65	50	70	25	25	25	50	55	45	28	28	
HNB	40 kA	-	-	-	-	-	-	-	-	-	-	-	40	25	50	65	50	70	25	25	50	50	70	50	50	50	
HHG	25 kA	-	-	-	-	-	-	-	-	-	-	25	40	25	50	65	50	70	25	25	25	50	55	45	28	28	
HNG	50 kA	-	-	-	-	-	-	-	-	-	-	-	25	40	50	65	50	70	25	25	50	50	70	50	70	70	
HEG	65 kA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	65	50	70	25	25	50	70	50	70	70	
HNC	50 kA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	65	50	70	25	25	50	70	50	70	70	
HEC	70 kA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	70	50	70	25	25	50	70	50	70	70	
HHD	25 kA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	70	50	25	25	50	55	45	28	28	
HND	50 kA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50	70	50	70	70	
HND	50 kA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50	70	50	70	70	
HED	70 kA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	70	70	50	70	70	
HNE	50 kA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50	70	50	70	70	
HEE	70 kA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50	70	50	70	70	
HNF	50 kA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50	70	50	70	70	
HEF	70 kA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50	70	50	70	70	