

### R.6 - Automatic capacitor banks with detuned filters, static system

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#### **FRE**

Capacitor banks with detuned filters with thyristors..... 13

#### **PLUS FRE**

Capacitor banks with detuned filters with thyristors..... 15

#### **PLUS FRE f-f**

Capacitor banks with detuned filters with thyristors..... 17

# FRE

Capacitor banks with detuned filters with thyristors



## Description

The **FRE** Series capacitor banks with detuned filters have been designed for power compensation purposes in networks with fluctuating load levels, a high content of harmonics and where there is a risk of resonance.

Power variations are relatively quick (in milliseconds) so that the switching operations can be carried out by thyristors, which are connected to a voltage control plate; the capacitor is connected and disconnected with a zero voltage difference. This system avoids transients in the connection and disconnection of steps, with an immediate response to load fluctuations.

## Application

The most common application is with individual loads or in installations where a quick compensation response is needed (for ex., welding units, motors for lifting units, lifts, etc.) and where there is a high content of harmonics in the network.

## Features

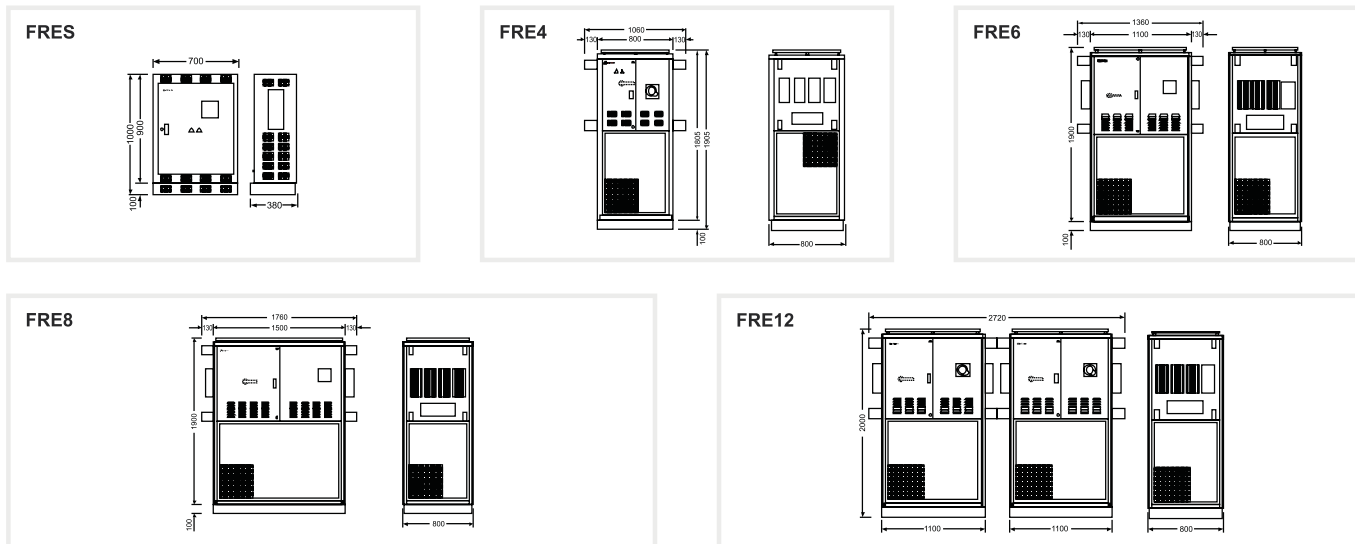
Features		
Operating voltage		230, 400 V (for other voltages, please ask)
Support voltage (400 V)		440 V
Capacity tolerance		± 10%
Unit composed of		<ul style="list-style-type: none"> <li>• CF Capacitor</li> <li>• Static switching unit on each step, composed of static contactors (thyristors)</li> <li>• Individual protection of each step with fuses with high rupture power (HRP). NH-00 Series.</li> <li>• Two-pole protection circuit-breaker for capacitor bank and regulator operations.</li> <li>• Power factor regulator of the <b>computer 8df</b> series.</li> <li>• Heat removal radiators</li> <li>• Built-in thermostat on the radiator for the disconnection of each step in case of high temperatures (90 °C)</li> <li>• Detuned filters tuned at 189 Hz for the protection against harmonics present in the network and to avoid the problems of resonance with fifth or higher order harmonics.</li> </ul>
Add-ons		<ul style="list-style-type: none"> <li>• Manual capacitor bank header switch</li> <li>• Automatic capacitor bank header switch</li> <li>• Automatic switch + Earth leakage protection at the capacitor bank's header</li> <li>• Forced ventilation unit + thermostat</li> <li>• Polycarbonate plate to protect against direct contacts</li> <li>• Auto-transformer 400/230 V</li> </ul>
Insulation level		3 / 15 kV
Discharge resistance		75 V / 3 minutes
Overload		1.3 times the rated current permanently
Overvoltage		<ul style="list-style-type: none"> <li>• 10 % 8 over 24 hours</li> <li>• 15 % up to 15 minutes over 24 hours</li> <li>• 20 % up to 5 minutes over 24 hours</li> <li>• 30 % up to 1 minutes over 24 hours</li> </ul>
Contacting operating voltage		230 V
Ambient conditions		
Class D temperature	Daily mean	45 °C
	Annual mean	35 °C
	Maximum	50 °C
	Minimum	-25 °C
Humidity		80% RH
Altitude		2,000 m
Construction features		
Degree of protection		IP 21
Colour		RAL 7035: Grey / RAL 3005: Maroon
Assembly conditions		
Type of assembly		Vertical
Ventilation		Natural or forced, depending on the option
Distance between capacitors		Minimum, 2 cm
Standards		
CEI 60831-1, CEI 70/7, UNE 20827, UNE 20010, BS 1650, VDE 560		

### FRE

Capacitor banks with detuned filters with thyristors



#### Dimensions



#### References

kvar	Composition	Switch (A)	Cable section (mm <sup>2</sup> )	Weight (kg)	Dimensions (mm) width x height x depth	Type	Code
440 400							
17,5 14	( 2,5 + 5 + 10 )	63	6	105	700 x 1000 x 380	FRES-17.5-440	R6H450
25 21	( 5 + ( 2 X 10 ) )	63	10	120	700 x 1000 x 380	FRES-25-440	R6H455
27,5 23	( 2,5 + 5 + ( 2 x 10 ) )	125	16	130	700 x 1000 x 380	FRES-27.5-440	R6H460
35 29	( 5 + ( 3 X 10 ) )	125	16	140	700 x 1000 x 380	FRES-35-440	R6H465
37,5 31	( 7,5 + ( 2 X 15 ) )	125	25	150	700 x 1000 x 380	FRES-37.5-440	R6H470
45 37	( 3 x 15 )	125	25	175	700 x 1000 x 380	FRES-45-440	R6H475
60 50	( 4 x 15 )	200	35	200	700 x 1000 x 380	FRES-60-440	R6H480
75 62	( 4 x 18.75 )	200	50	215	700 x 1000 x 380	FRES-75-440	R6H485
87,5 72	( 12,5 + 25 + 50 )	200	50	300	800 x 1900 x 800	FRE4-87.5-440	R6E416
100 83	( 25 + 25 + 50 )	250	95	325	800 x 1900 x 800	FRE4-100-440	R6E420
125 103	( 25 + 50 + 50 )	400	95	345	800 x 1900 x 800	FRE4-125-440	R6E422
150 125	( 25 + 25 + 50 + 50 )	400	95	355	800 x 1900 x 800	FRE4-150-440	R6E423
175 145	( 25 + 50 + 100 )	400	120	365	800 x 1900 x 800	FRE4-175-440	R6E425
200 165	( 50 + 50 + 100 )	400	150	380	800 x 1900 x 800	FRE4-200-440	R6E428
250 207	( 50 + ( 2 x 100 ) )	630	185	390	800 x 1900 x 800	FRE4-250-440	R6E429
300 248	( 50 + 50 + ( 2 x 100 ) )	630	240	410	800 x 1900 x 800	FRE4-300-440	R6E430
350 289	( 50 + ( 3 x 100 ) )	800	240	430	800 x 1900 x 800	FRE4-350-440	R6E432
400 331	( 4 x 100 )	800	240	460	800 x 1900 x 800	FRE4-400-440	R6E434
400 331	( 50 + 50 + ( 3 x 100 ) )	800	2x185	550	1100 x 2000 x 800	FRE6-400-440	R6J425
450 372	( 50 + ( 4 x 100 ) )	1000	2x185	587	1100 x 2000 x 800	FRE6-450-440	R6J430
500 413	( 5 x 100 )	1000	2x240	621	1100 x 2000 x 800	FRE6-500-440	R6J435
550 455	( 50 + ( 5 x 100 ) )	1250	2x240	658	1100 x 2000 x 800	FRE6-550-440	R6J440
600 496	( 6 x 100 )	1250	2x240	685	1100 x 2000 x 800	FRE6-600-440	R6J445
600 496	( 50 + 50 + ( 5 x 100 ) )	1250	2x240	820	1500 x 2000 x 800	FRE8-600-440	R6K436
650 537	( 50 + ( 6 x 100 ) )	1600	3x150	865	1500 x 2000 x 800	FRE8-650-440	R6K438
700 579	( 7 x 100 )	1600	3x150	910	1500 x 2000 x 800	FRE8-700-440	R6K440
750 620	( 50 + ( 7 x 100 ) )	1600	3x185	955	1500 x 2000 x 800	FRE8-750-440	R6K442
800 661	( 8 x 100 )	1600	3x185	1000	1500 x 2000 x 800	FRE8-800-440	R6K444
800 661	( 50 + 50 + ( 7 x 100 ) )	1000 / 630	2x240/ 240	1100	2200 x 2000 x 800	FRE12-800-440	R6L425
850 702	( 50 + ( 8 x 100 ) )	1250 / 630	2x240/ 240	1137	2200 x 2000 x 800	FRE12-850-440	R6L430
900 744	( 9 x 100 )	1250 / 630	2x240/ 240	1174	2200 x 2000 x 800	FRE12-900-440	R6L435
950 785	( 50 + ( 9 x 100 ) )	1250 / 800	2x240/ 2x185	1211	2200 x 2000 x 800	FRE12-950-440	R6L440
1000 826	( 10 x 100 )	1250 / 800	2x240/ 2x185	1248	2200 x 2000 x 800	FRE12-1000-440	R6L445
1050 868	( 50 + ( 10 x 100 ) )	1250 / 1000	2x240/ 2x240	1285	2200 x 2000 x 800	FRE12-1050-440	R6L450
1100 909	( 11 x 100 )	1250 / 1000	2x240/ 2x240	1322	2200 x 2000 x 800	FRE12-1100-440	R6L455
1150 950	( 50 + ( 11 x 100 ) )	2 X 1250	2x240/ 2x240	1359	2200 x 2000 x 800	FRE12-1150-440	R6L460
1200 992	( 12 x 100 )	2 X 1250	2x240/ 2x240	1389	2200 x 2000 x 800	FRE12-1200-440	R6L465

# PLUS FRE

Capacitor banks with detuned filters with thyristors



## Description

Intelligent state-of-the-art capacitor banks, capable of measuring the three installation phases and compensating the total power factor consumption accurately and in real time.

The **PLUS FRE** series includes detuned filters tuned at 189 Hz to avoid the resonance phenomena in 5th or higher order harmonics. Units for other harmonics orders are manufactured on demand.

Including **CIRCUTOR**'s measurement technology, effectively creating a compensation + measurement unit. As a power quality analyzer, it displays any electrical parameter of the network in real time and records it in its memory, with maximum and minimum values, date and hour.

## Application

The most common application is with individual loads or in installations where a quick compensation response is needed (for ex., welding units, motors for lifting units, lifts, etc.) and where there is a high content of harmonics in the network.

## Features

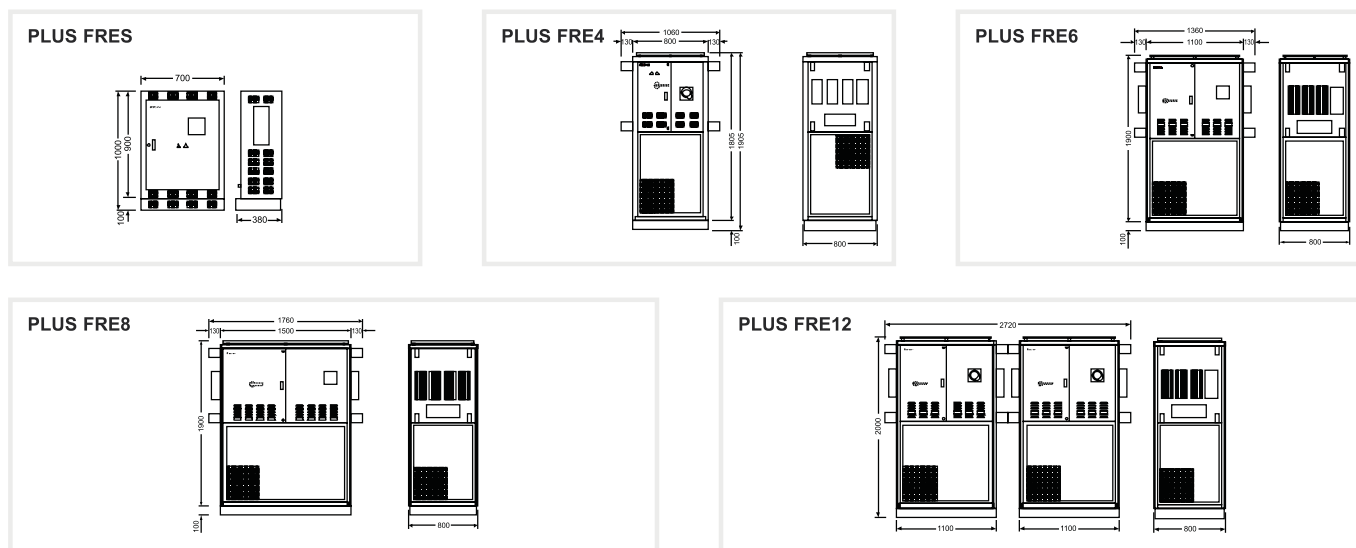
Features		
Operating voltage	230, 400 V (for other voltages, please ask)	
Support voltage (400 V)	440 V	
Capacity tolerance	± 10%	
Unit composed of	<ul style="list-style-type: none"> <li>• CF Capacitor</li> <li>• Static switching unit on each step, composed of static contactors (thyristors)</li> <li>• Individual protection of each step with fuses with high rupture power (HRP). NH-00 Series.</li> <li>• Two-pole protection circuit-breaker for capacitor bank and regulator operations.</li> <li>• Power factor regulator of the <b>computer Plus</b> series, three-phase measurement and power analyzer functions</li> <li>• Heat removal radiators</li> <li>• Built-in thermostat on the radiator for the disconnection of each step in case of high temperatures (90 °C)</li> <li>• Detuned filters tuned at 189 Hz for the protection against harmonics present in the network and to avoid the problems of resonance with fifth or higher order harmonics.</li> </ul>	
Add-ons	<ul style="list-style-type: none"> <li>• Manual capacitor bank header switch</li> <li>• Automatic capacitor bank header switch</li> <li>• Automatic switch + Earth leakage protection at the capacitor bank's header</li> <li>• Forced ventilation unit + thermostat</li> <li>• Polycarbonate plate to protect against direct contacts</li> <li>• Auto-transformer 400/230 V</li> </ul>	
Insulation level	3 / 15 kV	
Discharge resistance	75 V / 3 minutes	
Overload	1.3 times the rated current permanently	
Overvoltage	<ul style="list-style-type: none"> <li>• 10 % 8 over 24 hours</li> <li>• 15 % up to 15 minutes over 24 hours</li> <li>• 20 % up to 5 minutes over 24 hours</li> <li>• 30 % up to 1 minutes over 24 hours</li> </ul>	
Contacting operating voltage	230 V	
Ambient conditions		
Class D temperature	Daily mean	45 °C
	Annual mean	35 °C
	Maximum	50 °C
	Minimum	-25 °C
Humidity		80% RH
Altitude		2,000 m
Construction features		
Degree of protection		IP 21
Colour		RAL 7035 Grey RAL 3005 Maroon
Assembly conditions		
Type of assembly		Vertical
Ventilation		Natural or forced, depending on the option
Distance between capacitors		Minimum, 2 cm
Standards		
		CEI 60831-1, CEI 70/7, UNE 20827, UNE 20010, BS 1650, VDE 560

### PLUS FRE

Capacitor banks with detuned filters with thyristors



#### Dimensions



#### References

kvar	Composition	Switch (A)	Cable section (mm <sup>2</sup> )	Weight (kg)	Dimensions (mm) width x height x depth	Type	Code
440	400						
17,5	14 (2,5 + 5 + 10)	63	6	105	700 x 1000 x 380	PLUS FRES-17.5-440	R6G450
25	21 (5 + (2 X 10))	63	10	120	700 x 1000 x 380	PLUS FRES-25-440	R6G455
27,5	23 (2,5 + 5 + (2 x 10))	125	16	130	700 x 1000 x 380	PLUS FRES-27.5-440	R6G460
35	29 (5 + (3 X 10))	125	16	140	700 x 1000 x 380	PLUS FRES-35-440	R6G465
37,5	31 (7,5 + (2 X 15))	125	25	150	700 x 1000 x 380	PLUS FRES-37.5-440	R6G470
45	37 (3 x 15)	125	25	175	700 x 1000 x 380	PLUS FRES-45-440	R6G475
60	50 (4 x 15)	200	35	200	700 x 1000 x 380	PLUS FRES-60-440	R6G480
75	62 (4 x 18.75)	200	50	215	700 x 1000 x 380	PLUS FRES-75-440	R6G485
87,5	72 (12,5 + 25 + 50)	200	50	300	800 x 1900 x 800	PLUS FRE4-87.5-440	R6B416
100	83 (25 + 25 + 50)	250	95	325	800 x 1900 x 800	PLUS FRE4-100-440	R6B420
125	103 (25 + 50 + 50)	400	95	345	800 x 1900 x 800	PLUS FRE4-125-440	R6B422
150	125 (25 + 25 + 50 + 50)	400	95	355	800 x 1900 x 800	PLUS FRE4-150-440	R6B423
175	145 (25 + 50 + 100)	400	120	365	800 x 1900 x 800	PLUS FRE4-175-440	R6B425
200	165 (50 + 50 + 100)	400	150	380	800 x 1900 x 800	PLUS FRE4-200-440	R6B428
250	207 (50 + (2 x 100))	630	185	390	800 x 1900 x 800	PLUS FRE4-250-440	R6B429
300	248 (50 + 50 + (2 x 100))	630	240	410	800 x 1900 x 800	PLUS FRE4-300-440	R6B430
350	289 (50 + (3 x 100))	800	240	430	800 x 1900 x 800	PLUS FRE4-350-440	R6B432
400	331 (4 x 100)	800	240	460	800 x 1900 x 800	PLUS FRE4-400-440	R6B434
400	331 (50 + 50 + (3 x 100))	800	2x185	550	1100 x 2000 x 800	PLUS FRE6-400-440	R68425
450	372 (50 + (4 x 100))	1000	2x185	587	1100 x 2000 x 800	PLUS FRE6-450-440	R68430
500	413 (5 x 100)	1000	2x240	621	1100 x 2000 x 800	PLUS FRE6-500-440	R68435
550	455 (50 + (5 x 100))	1250	2x240	658	1100 x 2000 x 800	PLUS FRE6-550-440	R68440
600	496 (6 x 100)	1250	2x240	685	1100 x 2000 x 800	PLUS FRE6-600-440	R68445
600	496 (50 + 50 + (5 x 100))	1250	2x240	820	1500 x 2000 x 800	PLUS FRE8-600-440	R66436
650	537 (50 + (6 x 100))	1600	3x150	865	1500 x 2000 x 800	PLUS FRE8-650-440	R66438
700	579 (7 x 100)	1600	3x150	910	1500 x 2000 x 800	PLUS FRE8-700-440	R66440
750	620 (50 + (7 x 100))	1600	3x185	955	1500 x 2000 x 800	PLUS FRE8-750-440	R66442
800	661 (8 x 100)	1600	3x185	1000	1500 x 2000 x 800	PLUS FRE8-800-440	R66444
800	661 (50 + 50 + (7 x 100))	1000 / 630	2x240/ 240	1100	2200 x 2000 x 800	PLUS FRE12-800-440	R67425
850	702 (50 + (8 x 100))	1250 / 630	2x240/ 240	1137	2200 x 2000 x 800	PLUS FRE12-850-440	R67430
900	744 (9 x 100)	1250 / 630	2x240/ 240	1174	2200 x 2000 x 800	PLUS FRE12-900-440	R67435
950	785 (50 + (9 x 100))	1250 / 800	2x240/ 2x185	1211	2200 x 2000 x 800	PLUS FRE12-950-440	R67440
1000	826 (10 x 100)	1250 / 800	2x240/ 2x185	1248	2200 x 2000 x 800	PLUS FRE12-1000-440	R67445
1050	868 (50 + (10 x 100))	1250 / 1000	2x240/ 2x240	1285	2200 x 2000 x 800	PLUS FRE12-1050-440	R67450
1100	909 (11 x 100)	1250 / 1000	2x240/ 2x240	1322	2200 x 2000 x 800	PLUS FRE12-1100-440	R67455
1150	950 (50 + (11 x 100))	2 X 1250	2x240/ 2x240	1359	2200 x 2000 x 800	PLUS FRE12-1150-440	R67460
1200	992 (12 x 100)	2 X 1250	2x240/ 2x240	1389	2200 x 2000 x 800	PLUS FRE12-1200-440	R67465

# PLUS FRE f-f

Capacitor banks with detuned filters with thyristors



## Description

State-of-the-art intelligent capacitor banks that are capable of measuring the three installation phases and compensating the total power factor consumption of each phase in real time.

The **PLUS FRE f-f** series includes detuned filters tuned at 189 Hz to avoid the resonance phenomena in 5th or higher order harmonics. Units for other harmonics orders are manufactured on demand.

Including **CIRCUTOR's** measurement technology, effectively creating a compensation + measurement unit. As a power quality analyzer, it displays any electrical parameter of the network in real time and records it in its memory, with maximum and minimum values, date and hour.

## Application

The most common application is with individual loads or in installations where a quick compensation response is needed (for ex., welding units, motors for lifting units, lifts, etc.) and where there is a high content of harmonics in the network.

## Features

Features		
Operating voltage	230, 400 V (for other voltages, please ask)	
Support voltage	440 V	
Capacity tolerance	± 10%	
Unit composed of	<ul style="list-style-type: none"> <li>• CF Capacitor</li> <li>• Static switching unit on each step, composed of static contactors (thyristors)</li> <li>• Individual protection of each step with fuses with high rupture power (HRP). NH-00 Series.</li> <li>• Two-pole protection circuit-breaker for capacitor bank and regulator operations.</li> <li>• Power factor regulator of the <b>computer Plus</b> series, three-phase measurement and power analyzer functions</li> <li>• Heat removal radiators</li> <li>• Built-in thermostat on the radiator for the disconnection of each step in case of high temperatures (90 °C)</li> <li>• Detuned filters tuned at 189 Hz for the protection against harmonics present in the network and to avoid the problems of resonance with fifth or higher order harmonics.</li> </ul>	
Add-ons	<ul style="list-style-type: none"> <li>• Manual capacitor bank header switch</li> <li>• Automatic capacitor bank header switch</li> <li>• Automatic switch + Earth leakage protection at the capacitor bank's header</li> <li>• Forced ventilation unit + thermostat</li> <li>• Polycarbonate plate to protect against direct contacts</li> <li>• Auto-transformer 400/230 V</li> </ul>	
Insulation level	3 / 15 kV	
Discharge resistance	75 V / 3 minutes	
Overload	1.3 times the rated current permanently	
Overvoltage	<ul style="list-style-type: none"> <li>• 10 % 8 over 24 hours</li> <li>• 15 % up to 15 minutes over 24 hours</li> <li>• 20 % up to 5 minutes over 24 hours</li> <li>• 30 % up to 1 minutes over 24 hours</li> </ul>	
Contacting operating voltage	230 V	
Ambient conditions		
Class D temperature	Daily mean	45 °C
	Annual mean	35 °C
	Maximum	50 °C
	Minimum	-25 °C
Humidity		80% RH
Altitude		2,000 m
Construction features		
Degree of protection		IP 21
Colour		RAL 7035 Grey
		RAL 3005 Maroon
Assembly conditions		
Type of assembly		Vertical
Ventilation		Natural or forced, depending on the option
Distance between capacitors		Minimum, 2 cm
Standards		
		CEI 60831-1, CEI 70/7, UNE 20827, UNE 20010, BS 1650, VDE 560

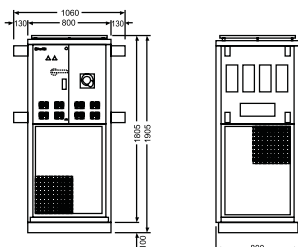
## PLUS FRE f-f

Capacitor banks with detuned filters with thyristors

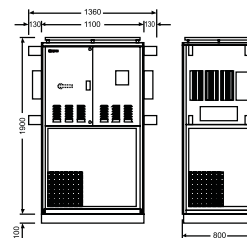


### Dimensions

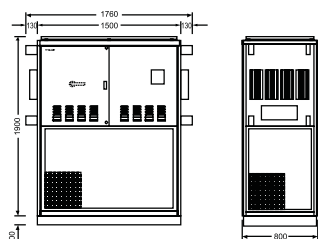
PLUS FREF4



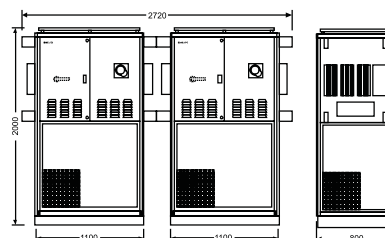
PLUS FREF6



PLUS FREF8



PLUS FREF12



### References

kvar	Composition	Switch (A)	Cable section (mm <sup>2</sup> )	Weight (kg)	Dimensions (mm) width x height x depth	Type	Code
440	400						
87,5	72 ( 12,5 + 25 + 50 )	200	50	300	800 x 1900 x 800	PLUS FREF4-87.5-440	R69000
100	83 ( 25 + 25 + 50 )	250	95	325	800 x 1900 x 800	PLUS FREF4-100-440	R69001
125	103 ( 25 + 50 + 50 )	400	95	345	800 x 1900 x 800	PLUS FREF4-125-440	R69002
150	125 ( 3 x 50 )	400	95	355	800 x 1900 x 800	PLUS FREF4-150-440	R69003
175	145 ( 25 + 50 + 100 )	400	120	365	800 x 1900 x 800	PLUS FREF4-175-440	R69004
200	165 ( 50 + 50 + 100 )	400	150	380	800 x 1900 x 800	PLUS FREF4-200-440	R69005
250	207 ( 50 + 100 + 100 )	630	185	390	800 x 1900 x 800	PLUS FREF4-250-440	R69006
300	248 ( 3 x 100 )	630	240	410	800 x 1900 x 800	PLUS FREF4-300-440	R69007
300	248 ( 50 + 50 + ( 2 x 100 ) )	630	240	430	1100 x 2000 x 800	PLUS FREF6-300-440	R69008
350	289 ( 50 + ( 3 x 100 ) )	630	240	445	1100 x 2000 x 800	PLUS FREF6-350-440	R69009
400	331 ( 4 x 100 )	800	240	460	1100 x 2000 x 800	PLUS FREF6-400-440	R69010
400	331 ( 50 + 50 + ( 3 x 100 ) )	800	240	550	1500 x 2000 x 800	PLUS FREF8-400-440	R69011
450	372 ( 50 + ( 4 x 100 ) )	1000	2x185	587	1500 x 2000 x 800	PLUS FREF8-450-440	R69012
500	413 ( 5 x 100 )	1000	2x240	621	1500 x 2000 x 800	PLUS FREF8-500-440	R69013
500	413 ( 50 + 50 + ( 4 x 100 ) )	1000	2x240	638	1500 x 2000 x 800	PLUS FREF8-500-440	R69014
550	455 ( 50 + ( 5 x 100 ) )	1250	2x240	658	1500 x 2000 x 800	PLUS FREF8-550-440	R69015
600	496 ( 6 x 100 )	1250	2x240	685	1500 x 2000 x 800	PLUS FREF8-600-440	R69016
600	496 ( 50 + 50 + ( 5 x 100 ) )	1000 / 200	240/95	870	2200 x 2000 x 800	PLUS FREF12-600-440	R69017
650	537 ( 50 + ( 6 x 100 ) )	1000 / 200	240/95	907	2200 x 2000 x 800	PLUS FREF12-650-440	R69018
700	579 ( 7 x 100 )	800 / 630	240/240	944	2200 x 2000 x 800	PLUS FREF12-700-440	R69019
750	620 ( 50 + ( 7 x 100 ) )	800 / 630	240/240	981	2200 x 2000 x 800	PLUS FREF12-750-440	R69020
800	661 ( 8 x 100 )	2 x 800	240/240	1016	2200 x 2000 x 800	PLUS FREF12-800-440	R69021