AUTOMATIC DE-TUNED POWER FACTOR CORRECTION SYSTEMS

Optimised, thermal design

De-tuned version

Low loss

Long service life

Optimised filter design
- Precise filter circuit frequency matching
- High quality reactors
- Temperature protection in the event of overload
- Filter circuit reactors with high linearity and low loss

Long service life
- Generous space- / power-ratio
- Generously dimensioned cooling system
- High quality capacitors and filter circuit reactors with 100% duty cycle

High operational reliability
- Capacitors with fivefold safety
- PFC controller with 8-way alarm message
- Optimised thermal design
- Exclusive use of quality components

Areas of application

- Automatic power factor correction with reactors
- For use in mains supply with harmonics distortion
- Converter power (non-linear loads) > 15% of the connection power
- Total harmonic distortion of THD-U > 3%
- To preveant cases of resonance
- Harmonics filtering and improvement of power quality
- Reduction in reactive energy costs and PFC penalties

Device overview and technical data

De-tuned power factor correction				
Technical data				
Standards	DIN, VDE 0660 part 500, EN 60439-1 and EN 60831-1/2			
Design in accordance with	DIN EN 60439 part 1, partial type-approved combination			
Construction type	Sheet steel cabinet for versions KB and ES, module for version MO			
Dynamic PFC controller	Prophi® per datasheet or selection table			
Power capacitors	High quality, self-healing, polypropylene 3-phase capacitors using dry technology			
Filter circuit reactors	Low-loss 3-phase reactors with high linearity, 7%, 14% (other ratings on request), with 100% duty cycle			
Contactors	Specific capacitor contactors			
Capacitor protection	HRC fuses, 3-phase, per capacitor stage			
Nominal voltage	400 V, 50 Hz (other voltages on request)			
Control voltage	230 V, 50 Hz (other voltages on request)			
Output range	10 – 600 kvar (alternative staging, outputs on request)			
Capacitor nominal voltage	440 V with 5.67 – 7% (detuned), 525 V with 14% (detuned)			
Voltage withstand capability of capacitors	At p = 5.67 – 7%	440 V	At p = 14%	525 V
	8 h daily	484 V		577 V
	30 min daily	506 V		604 V
	5 min	528 V		630 V
	1 min	572 V		682 V
Power dissipation	Capacitors < 0.5 W/kvar, systems 4 – 7 W/kvar			
System design	**Permissible harmonics currents**		**Harmonics voltage**	
	I 250 Hz	I 350 Hz	U 250 Hz	U 350 Hz
FK 5.67	0.565 IN	0.186 IN	5%	5%
FK 7	0.31 IN	0.134 IN	5%	5%
FK 14	0.086 IN	0.051 IN	5%	5%
Switching cycles capacitor contactors	max. 100,000 switching cycles			
Current transformer connection	.../1 A, .../5 A			
Control ratio	See overview of variants			
Discharging	With discharge resistors per EN 60831-1/2			
Maximum altitude	Up to 2,000 m above sea level			
Ambient temperature	35 °C per DIN EN 60439 part 1 (temperature class of the capacitors should be assured with adequate ventilation/cooling at the place of installation!)			
Protection class	Cabinet version = IP32 / Slide-in module = IP00			
Type of cooling	Forced ventilation (except slide-in modules)			
Colour	Grey, RAL 7035 (other colours on request)			
Noise emission (FK)	< 60 dB with closed systems at 1 m distance			
Connection cross-section and fuse	See technical annex			

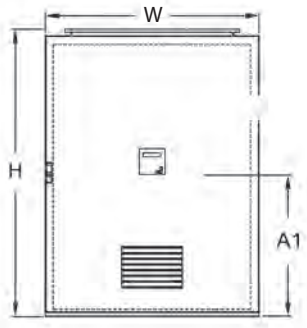
The following reactors can be used in mains supply with ripple control systems:		
Ripple control frequency	**De-tuning factor**	**Filter series resonant frequency**
< 168 Hz	p = 14%	fr = 134 Hz
168 – 183 Hz	p = 14 / 5.67%	fr = 134 / 210 Hz
> = 216.67	p = 8%	fr = 177 Hz
> 228 Hz	p = 7%	fr = 189 Hz
> 350 Hz	p = 5.67%	fr = 210 Hz

Automatic de-tuned power factor correction (Harmonics filter), compact design

Main features

- APFC in the steel cabinet
- For wall mounting
- Nominal voltage: 400 V, 3-phase, 50 Hz
- Reactors: 7% and 14%
- Protection class: IP32
- Ventilation: From 31 kvar with fan in the cabinet door for forced cooling
- With discharge resistors
- With power factor controller Prophi® 6R

Dimension diagrams



KB6825 (dimensions in mm):

W = 600, H = 800, D = 250, A1 = 410

KB6123 (dimensions in mm):

W = 600, H = 1,200, D = 300, A1 = 655

Technical data

7% de-tuned in accordance with series resonant frequency 189 Hz						
Nominal output kvar	Stage power kvar	Control ratio	Type	Design	Weight in kg	Item no.
15	5/10	1:2	JF440/15ER3KB6825FK7	KB6825	112	**50.52.020**
20	5/5/10	1:1:2	JF440/20ER4KB6825FK7	KB6825	113	**50.52.040**
25	5/10/10	1:2:2	JF440/25ER5KB6825FK7	KB6825	116	**50.52.080**
31	6.25/12.5/12.5	1:2:2	JF440/31/ER5KB6825FK7	KB6825	118	**50.52.110**
35	5/10/20	1:2:4	JF440/35ER7KB6825FK7	KB6825	122	**50.52.150**
43.75	6.25/12.5/25	1:2:4	JF440/43.75ER7KB6825FK7	KB6825	138	**50.52.180**
50	10/20/20	1:2:2	JF440/50ER5KB6825FK7	KB6825	142	**50.52.210**
60	10/20/30	1:2:3	JF440/60ER6KB6123FK7	KB6123	158	**50.52.225**
75	12.5/25/37.5	1:2:3	JF440/75ER6KB6123FK7	KB6123	167	**50.52.240**

Other rated voltages, frequencies, outputs, reactors, mechanical configurations or variants with circuit breakers on request.

14% de-tuned in accordance with series resonant frequency 134 Hz						
Nominal output kvar	Stage power kvar	Control ratio	Type	Design	Weight in kg	Item no.
15	5/10	1:2	JF525/15ER3KB6825FK14	KB6825	123	**50.52.520**
20	5/5/10	1:1:2	JF525/20ER4KB6825FK14	KB6825	124	**50.52.540**
25	5/10/10	1:2:2	JF525/25ER5KB6825FK14	KB6825	128	**50.52.580**
31	6.25/12.5/12.5	1:2:2	JF525/31/ER5KB6825FK14	KB6825	130	**50.52.610**
35	5/10/20	1:2:4	JF525/35ER7KB6825FK14	KB6825	134	**50.52.650**
43.75	6.25/12.5/25	1:2:4	JF525/43.75ER7KB6825FK14	KB6825	152	**50.52.680**
50	10/20/20	1:2:2	JF525/50ER5KB6825FK14	KB6825	173	**50.52.710**
60	10/20/30	1:2:3	JF525/60ER6KB6123FK14	KB6123	184	**50.52.725**
75	12.5/25/37.5	1:2:3	JF525/75ER6KB6123FK14	KB6123	195	**50.52.729**

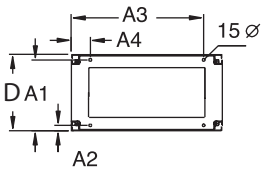
Other rated voltages, frequencies, outputs, reactors, mechanical configurations or variants with circuit breakers on request.

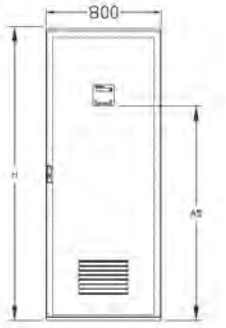
7% de-tuned power factor correction (harmonics filter), extractable design ES8206 FK7

Main features

- APFC in steel cabinet (free-standing mounting)
- Nominal voltage: 400 V, 3-phase, 50 Hz
- Reactor: 7% (189 Hz series resonant frequency)
- Protection class: IP32
- Ventilation: From 120 kvar with fan in the cabinet door for forced cooling
- With power factor controller Prophi® 6R/12R

Dimension diagrams





ES8206 (dimensions in mm):
H = 2.020, W = 800 or 1.600, D = 600
A1 = 537, A2 = 63, A3 = 737, A4 = 62, A5 = 1,480

Technical data

Nominal output kvar	Stage power kvar	Control ratio	Type	Width in mm	Weight in kg	Item no.
60	10/20/30	1:2:3...	JF440/60ER6ES8206FK7**	800	278	**50.89.040**
75	12.5/12.5/25...	1:1:2...	JF440/75ER6ES8206FK7**	800	278	**50.89.080**
100	25/25/50	1:1:2	JF440/100ER4ES8206FK7**	800	288	**50.89.120**
100	12.5/12.5/25/50	1:1:2:4	JF440/100ER8ES8206FK7**	800	288	**50.89.200**
120	20/20/40/40	1:1:2:2	JF440/120ER6ES8206FK7**	800	340	**50.89.320**
150	25/25/50/50	1:1:2:2	JF440/150ER6ES8206FK7**	800	344	**50.89.400**
175	25/50/50/50	1:2:2:2	JF440/175ER7ES8206FK7**	800	367	**50.89.440**
200	50...	1:1:1...	JF440/200ER4ES8206FK7**	800	314	**50.89.480**
200	25/25/50...	1:1:2...	JF440/200ER8ES8206FK7**	800	314	**50.89.520**
200	12.5/12.5/25/50...	1:1:2:4..	JF440/200ER16ES8206FK7**	800	314	**50.89.560**
250	50...	1:1:1...	JF440/250/ER5ES8206FK7**	800	437	**50.89.600**
250	25/25/50...	1:1:2...	JF440/250ER10ES8206FK7**	800	437	**50.89.640**
300	50...	1:1:1...	JF440/300ER6ES8206FK7**	800	487	**50.89.685**
300	25/25/50...	1:1:2...	JF440/300ER12ES8206FK7***	800	498	**50.89.687**
350	50...	1:1:1...	JF440/350ER7ES8206FK7-1S***	800	520	**50.89.720**
350	50...	1:1:1...	JF440/350ER7ES8206FK7***	1,600	352/347	**50.89.722**
400	50...	1:1:1...	JF440/400ER8ES8206FK7-1S***	800	570	**50.89.744**
400	50...	1:1.1...	JF440/400ER8ES8206FK7***	1,600	2x370	**50.89.740**
450	50...	1:1:1...	JF440/450ER9ES8206FK7***	1,600	437/347	**50.89.770**
500	50...	1:1:1...	JF440/500ER10ES8206FK7***	1,600	479/359	**50.89.800**
550	50...	1:1:1...	JF440/550ER11ES8206FK7***	1,600	2x431	**50.89.805**
600	50...	1:1:1...	JF440/600ER12ES8206FK7***	1,600	2x481	**50.89.820**
Accessories						
100 mm high socket for easy supply cable connection		SO 100 / 800 / 600			5	**50.00.150**
200 mm high socket for easy supply cable connection		SO 200 / 800 / 600			10	**50.00.151**

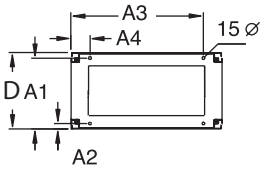
Other rated voltages, frequencies, outputs, reactors, mechanical configurations or variants with circuit breakers on request.
** With Prophi® 6R, *** With Prophi® 12R

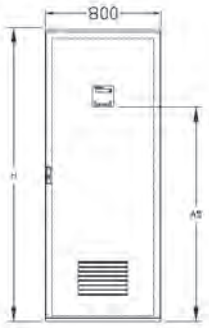
14% de-tuned power factor correction (harmonics filter), extractable design ES8206 FK14

Main features

- APFC in steel cabinet (free-standing mounting)
- Nominal voltage: 400 V, 3-phase, 50 Hz
- Reactors: 14% (134 Hz series resonant frequency)
- Protection class: IP32
- Ventilation: From 120 kvar with fan in the cabinet door for forced cooling
- With power factor controller Prophi® 6R/12R

Dimension diagrams





ES8206 (dimensions in mm):

H = 2.020, W = 800 or 1.600, D = 600

A1 = 537, A2 = 63, A3 = 737, A4 = 62, A5 = 1,480

Technical data

Nominal output kvar	Stage power kvar	Control ratio	Type	Width in mm	Weight in kg	Item no.
60	10/20/30	1:2:3	JF525/60ER6ES8206FK14**	800	317	**50.93.040**
75	12.5/12.5/25/25	1:1:2:2	JF525/75ER6ES8206FK14**	800	318	**50.93.080**
100	25/25/50	1:1:2	JF525/100ER4ES8206FK14**	800	368	**50.93.120**
100	12.5/12.5/25/50	1:1:2:4	JF525/100ER8ES8206FK14**	800	380	**50.93.200**
120	20/20/40/40	1:1:2:2	JF525/120ER6ES8206FK14**	800	379	**50.93.320**
150	25/25/50/50	1:1:2:2	JF525/150ER6ES8206FK14**	800	375	**50.93.400**
175	25/50/50/50	1:2:2:2	JF525/175ER7ES8206FK14**	800	407	**50.93.440**
200	50	1:1:1:1	JF525/200ER4ES8206FK14**	800	420	**50.93.480**
200	25/25/50...	1:1:2...	JF525/200ER8ES8206FK14**	800	421	**50.93.520**
200	12.5/12.5/25/50...	1:1:2:4...	JF525/200ER16ES8206FK14**	800	371	**50.93.560**
250	50	1:1:1...	JF525/250/ER5ES8206FK14**	800	478	**50.93.600**
250	25/25/50...	1:1:2...	JF525/250ER10ES8206FK14**	800	490	**50.93.640**
300	50	1:1:1...	JF525/300ER6ES8206FK14**	800	500	**50.93.685**
300	25/25/50...	1:1:2...	JF525/300ER12ES8206FK14***	800	500	**50.93.690**
350	50...	1:1:1...	JF525/350ER7ES8206FK14-1S***	800	550	**50.93.720**
350	50...	1:1:1...	JF525/350ER7ES8206FK14***	1,600	424/365	**50.93.722**
400	50...	1:1:1...	JF525/400ER8ES8206FK14-S***	800	600	**50.93.740**
400	50...	1:1:1...	JF525/400ER8ES8206FK14***	1,600	2x424	**50.93.742**
450	50...	1:1:1...	JF525/450ER9ES8206FK14***	1,600	2x478	**50.93.770**
500	50...	1:1:1...	JF525/500ER10ES8206FK14***	1,600	500/420	**50.93.800**
550	50...	1:1:1...	JF525/550ER11ES8206FK14***	1,600	500/478	**50.93.805**
600	50...	1:1:1...	JF525/600ER12ES8206FK14***	1,600	500/500	**50.93.920**
Accessories						
100 mm high socket for easy supply cable connection		SO 100 / 800 / 600			5	**50.00.150**
200 mm high socket for easy supply cable connection		SO 200 / 800 / 600			10	**50.00.151**

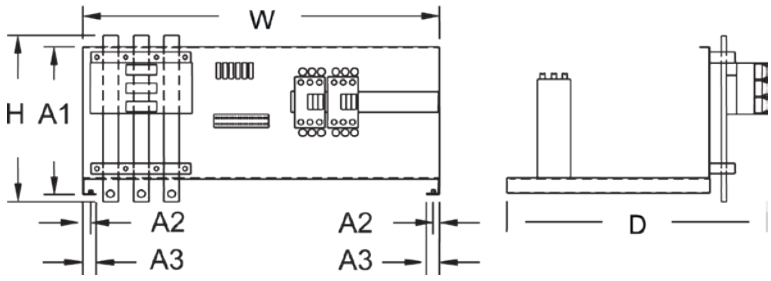
Other rated voltages, frequencies, outputs, reactors, mechanical configurations or variants with circuit breakers on request.
** With Prophi® 6R, *** With Prophi® 12R

De-tuned capacitor modules, extractable design

Main features

- Ready-to-install, de-tuned PFC slide-in modules
- Completely mounted and wired with capacitors, reactors, contactors and HRC-fuses
- For slide-in installation in existing PFC or switchgear cabinets
- Nominal voltage: 400 V, 3-phase, 50 Hz
- Reactors: 7% (189 Hz) and 14% (134 Hz)
- Protection class: IP32
- Ventilation: Natural (care must be taken to ensure sufficient ventilation)
- With discharge resistors

Dimension diagrams



Dimensions in mm:
H = 330, W = 703, D = 533
A1 = 290, A2 = 14, A3 = 26.5

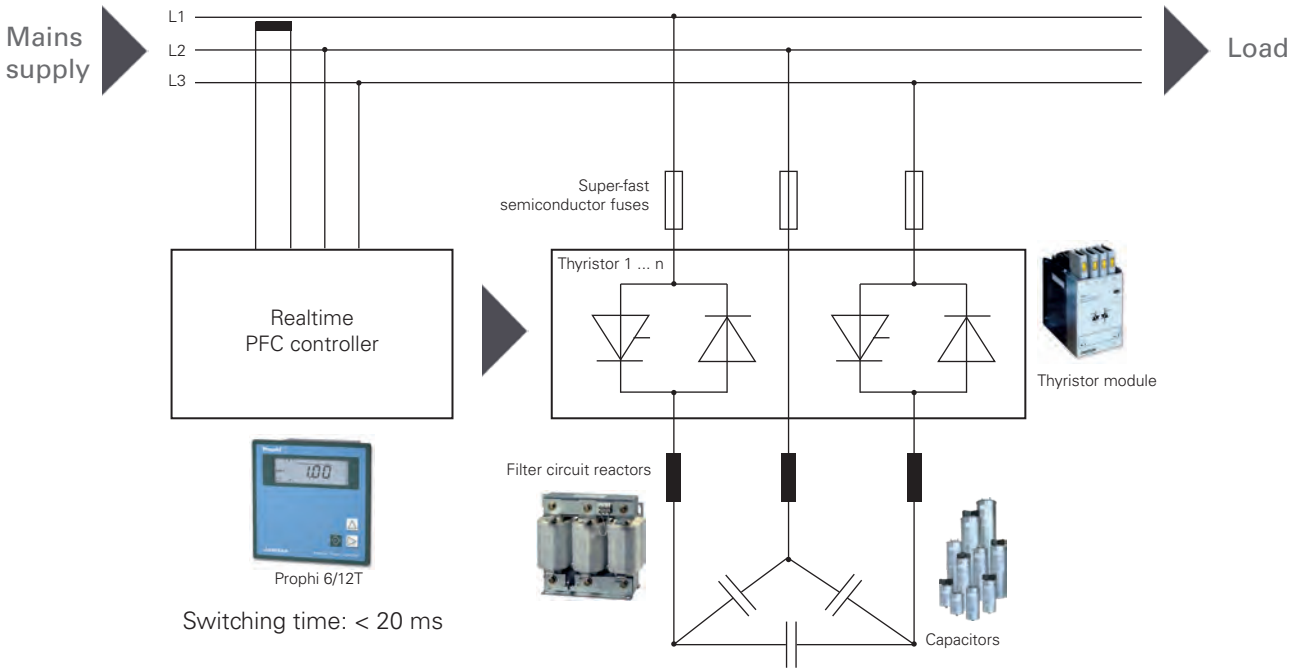
Technical data

7% de-tuned capacitor modules (189 Hz) MO86FK7 (width 800 mm, depth 600 mm)					
Nominal output kvar	Stage power kvar	Control ratio	Type	Weight in kg	Item no.
10	10		JF440/10EK1MO86FK7	24	**50.88.650**
12.5	12.5		JF440/12.5EK1MO86FK7	26	**50.88.680**
20	20		JF440/20EK1MO86FK7	33	**50.88.710**
25	25		JF440/25/EK1MO86FK7	33	**50.88.740**
40	40		JF440/40EK1MO86FK7	43	**50.88.770**
50	50		JF440/50EK1MO86FK7	45	**50.88.800**
20/2	10	1:1	JF440/20/2EK2MO86FK7	36	**50.88.801**
25/2	12.5	1:1	JF440/25/2EK2MO86FK7	38	**50.88.830**
30/2	10/20	1:2	JF440/30/2EK2MO86FK7	42	**50.88.860**
40/2	20	1:1	JF440/40/2EK2MO86FK7	55	**50.88.890**
40/3	10/10/20	1:1:2	JF440/40/3EK2MO86FK7	55	**50.88.891**
50/2	25	1:1	JF440/50/2EK2MO86FK7	56	**50.88.930**
75/2	25/50	1:2	JF440/75/2EK2MO86FK7	72	**50.88.932**
80/2	40	1:1	JF440/80/2EK2MO86FK7	72	**50.88.933**
100/2	50	1:1	JF440/100/2EK2MO86FK7	86	**50.88.931**

Other rated voltages, frequencies, outputs, reactors, mechanical configurations
(e.g. 500 mm switch cabinet depth) or variants with circuit breakers on request. Accessories, see page 273.

14% de-tuned capacitor modules (134 Hz) MO86FK14 (width 800 mm, depth 600 mm)					
Nominal output kvar	Stage power kvar	Control ratio	Type	Weight in kg	Item no.
10	10		JF525/10EK1MO86FK14	34	**50.92.650**
12.5	12.5		JF525/12.5EK1MO86FK14	35	**50.92.680**
20	20		JF525/20EK1MO86FK14	40	**50.92.710**
25	25		JF525/25EK1MO86FK14	40	**50.92.740**
40	40		JF525/40EK1MO86FK14	52	**50.92.770**
50	50		JF525/50EK1MO86FK14	54	**50.92.800**
20/2	10	1:1	JF525/20/2E2MO86FK14	53	**50.92.803**
25/2	12.5	1:1	JF525/25/2EK2MO86FK14	60	**50.92.804**
30/2	10/20	1:2	JF525/30/2EK2MO86FK14	45	**50.92.849**
40/2	20	1:1	JF525/40/2EK2MO86FK14	67	**50.92.850**
40/3	10/10/20	1:1:2	JF525/40/3EK3MO86FK14	72	**50.92.851**
50/2	25	1:1	JF525/50/2EK2MO86FK14	69	**50.92.890**
75/2	25/50	1:2	JF525/75/2EK2MO86FK14	78	**50.92.893**
80/2	40	1:1	JF525/80/2EK2MO86FK14	78	**50.92.896**
100/2	50	1:1	JF525/100/2EK2MO86FK14	92	**50.92.892**

Other rated voltages, frequencies, outputs, reactors, mechanical configurations or variants (e.g. 500 mm switch cabinet depth) with circuit breakers on request. Accessories, see page 273.


Mains supply
L1
L2
L3
Load
Super-fast semiconductor fuses
Thyristor 1 ... n
Realtime PFC controller
Thyristor module
Filter circuit reactors
Capacitors
Prophi 6/12T
Switching time: < 20 ms