

# Power Factor Correction Systems

Power Factor Correction Systems



## LSFC Power Factor Correction Systems

Ready to connect, automatic Power Factor Correction Systems in sheet steel cabinets for floor installation. Suitable for networks without harmonic distortion.

- Power Range: 100 to 500 kvar
- Modular construction in freestanding sheet steel cabinet
- Ready for connection
- Fully automatic and intelligent Power Factor Control Relay
- Power Factor Correction Capacitors LKT dry-type with four safety features

### Application Recommendations

Power Factor Correction Systems, type LSFC are suitable for compensation in networks without harmonic distortion.

**Attention:** Even low harmonic levels can be amplified by network resonances. For Power Factor Correction Systems with a power >150 kvar this effect will amplify even more. This is because the PFC-System, together with the transformer, generates resonance frequencies in the network, which are within the range of the low frequency, energy-intensive harmonics. High harmonic levels can overload or damage all electrical devices and machines in the network.

Today, networks without harmonic distortion are quite rare. Therefore we generally recommend installing fixed capacitors with Harmonic Filter Reactors (page 115 ff.).

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### Power Range

Power Factor Correction System in sheet steel cabinet:

- 100 to 500 kvar

### Construction

The ready-for-connection Power Factor Correction System consists of pre-assembled capacitor-reactor modules type C64C... and the suitable sheet steel cabinet.

The cabinet contains:

- Self-healing LKT type power capacitors with low loss self-healing dielectric made from segmented metallised polypropylene film. Filled with a PCB-free filler. With discharge resistors, as per EN 60831-1 and -2 as well as IEC 60831-1 and -2
- Capacitor Switching Contactors with leading transition contact for damping of current peaks
- Fuse links, 3-pole, size NH00
- Control terminal strip with control fuse and thermal trip contact for safety shutdown
- Intelligent Power Factor Control Relay of the PQC series

### Application / Installation

The place of installation must comply with the requirements of the ingress protection and ambient temperature concerned.

### Regulations

For installation and connection of Power Factor Correction Capacitors in Germany the following regulations must be complied with: VDE 0100, VDE 0105, VDE 0560 Part 46 and VDE 0106 Part 100 (German Association of Electrical Engineers). In other countries the equivalent local regulations must be followed.

### Connection

The power supply cable and the current transformer cable enter the bottom of the cabinet through a sliding gland plate and a cable clamp rail, the power supply being connected to the busbar system and the current transformer cable to the terminal strip provided.

### System Expansion

An extension of the system is possible by adding LSFCZ extension units. This extension unit will be integrated in the existing control circuit via the control cable (supplied with the extension unit).

### Technical Data

<b>Design</b>	Sheet steel cabinet with door right hinged
<b>Rated voltage</b>	400 V / 50 Hz
<b>Rated voltage of capacitors</b>	440 V / 50 Hz
<b>Ambient temperature</b>	-5 °C to +40 °C
<b>Humidity</b>	Max. 90 %, no condensation
<b>Cabinet colour</b>	RAL 7035
<b>Standards</b>	EN 60831-1 and -2 IEC 60831-1 and -2 EN 61921 IEC 61921 EN 61439-1 and -2 IEC 61439-1 and 2

### Important Notes

The presence of inductive and capacitive reactances in the low voltage network means that the harmonics generated there, together with those fed in from the medium voltage network, can be amplified many times over due to resonance. Particularly in industrial networks with loads that generate harmonics, the use of conventional power factor correction systems without Harmonic Filter Reactors is not advisable. Instead, detuned systems should be installed. See the LSFC-P series of Power Factor Correction Systems.

For further information on power factor correction and harmonics please refer to our "Manual of Power Factor Correction".

FRAKO systems are designed for connecting 5 core cables. If a 4-core cable is used, a jumper must be fitted to connect PE and N, or a control transformer must be installed.

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Article- No.	Type	Rated power	Stage power	Switching sequence	Dimensions			Weight approx. [kg]	Protection IP
		[kvar]	[kvar]		Width [mm]	Height [mm]	Depth [mm]		

**Power Factor Correction Systems in sheet steel cabinets (width = 600 mm), rated mains voltage: 400 V / 50 Hz**

**Type series: LSFC**

34-22773	LSFC 100-12,5-211-400-64-620	100	12.5	1:1:2:4	600	2000	400	120.5	30
34-22774	LSFC 100-25-21-400-64-620	100	25	1:1:2	600	2000	400	116	30
34-22775	LSFC 125-12,5-221-400-64-620	125	12.5	1:1:2:2:4	600	2000	400	136	30
34-22776	LSFC 125-25-12-400-64-620	125	25	1:2:2	600	2000	400	132	30
34-22777	LSFC 150-12,5-212-400-64-620	150	12.5	1:1:2:4:4	600	2000	400	137	30
34-22778	LSFC 150-25-22-400-64-620	150	25	1:1:2:2	600	2000	400	135	30
34-22779	LSFC 150-25-6-400-64-620	150	25	1:1:1:1:1:1	600	2000	400	136	30
34-22780	LSFC 175-12,5-11A2-400-64-620	175	12.5	1:2:3:4:4	600	2000	400	139	30
34-22781	LSFC 175-25-13-400-64-620	175	25	1:2:2:2	600	2000	400	138	30
34-22782	LSFC 200-12,5-213-400-64-620	200	12.5	1:1:2:4:4:4	600	2000	400	141	30
34-22783	LSFC 200-25-23-400-64-620	200	25	1:1:2:2:2	600	2000	400	143	30
34-22784	LSFC 200-25-8-400-64-650	200	25	1:1:1:1:1:1:1:1	600	2000	400	149	30
34-22785	LSFC 225-12,5-223-400-64-650	225	12.5	1:1:2:2:4:4:4	600	2000	400	156	30
34-22786	LSFC 225-25-14-400-64-620	225	25	1:2:2:2:2	600	2000	400	152	30
34-22787	LSFC 225-25-9-400-64-650	225	25	1:1:2:4:4:4:4	600	2000	400	154	30
34-22788	LSFC 250-12,5-214-400-64-650	250	12.5	1:1:2:4:4:4:4	600	2000	400	158	30
34-22789	LSFC 250-25-24-400-64-620	250	25	1:1:2:2:2:2	600	2000	400	157	30
34-22790	LSFC 250-25-0-400-64-650	250	25	1:1:1:1:1:1:1:1:1:1	600	2000	400	159	30
34-22791	LSFC 250-50-5-400-64-620	250	50	1:1:1:1:1	600	2100	400	156	30
34-22792	LSFC 275-25-15-400-64-620	275	25	1:2:2:2:2:2	600	2000	400	166	30
34-22793	LSFC 300-12,5-215-400-64-650	300	12.5	1:1:2:4:4:4:4:4	600	2000	400	166	30
34-22794	LSFC 300-25-25-400-64-650	300	25	1:1:2:2:2:2:2	600	2000	400	163	30
34-22795	LSFC 300-25-0-400-64-650	300	25	1:1:1:1:1:1:1:1:1:1:1	600	2000	400	236	30
34-22796	LSFC 300-50-6-400-64-620	300	50	1:1:1:1:1:1	600	2000	400	164	30
34-22797	LSFC 325-25-16-400-64-650	325	25	1:2:2:2:2:2:2	600	2000	400	174	20
34-22798	LSFC 350-25-26-400-64-650	350	25	1:1:2:2:2:2:2:2	600	2000	400	183	20
34-22799	LSFC 350-50-7-400-64-650	350	50	1:1:1:1:1:1:1	600	2000	400	181	20
34-22800	LSFC 375-25-17-400-64-650	375	25	1:2:2:2:2:2:2:2	600	2000	400	190	20
34-22801	LSFC 400-25-27-400-64-650	400	25	1:1:2:2:2:2:2:2:2	600	2000	400	188	20
34-22802	LSFC 400-50-8-400-64-650	400	50	1:1:1:1:1:1:1:1:1	600	2000	400	173	20

**Power Factor Correction Systems, extension units in sheet steel cabinets (width = 600 mm), rated mains voltage: 400 V / 50 Hz**

**Type series: LSFCZ**

34-16235	LSFCZ 100-50-2-400-64	100	50	1:1	600	2000	400	137	30
34-16236	LSFCZ 150-50-3-400-64	150	50	1:1:1	600	2000	400	125	30
34-16237	LSFCZ 200-50-4-400-64	200	50	1:1:1:1	600	2000	400	142	30
34-16238	LSFCZ 250-50-5-400-64	250	50	1:1:1:1:1	600	2000	400	157	30
34-16239	LSFCZ 300-50-6-400-64	300	50	1:1:1:1:1:1	600	2000	400	180	30
34-16240	LSFCZ 350-50-7-400-64	350	50	1:1:1:1:1:1:1	600	2000	400	183	20
34-16241	LSFCZ 400-50-8-400-64	400	50	1:1:1:1:1:1:1:1	600	2000	400	185	20

Other rated voltages, frequencies and power ratings on request.

Recommended supply lead cross sections: please refer to the technical annex (page 137 ff.).

Systems > 300 kvar with internal roof vent

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## Options and accessories for Power Factor Correction Systems type LSFC 400 V, 50 Hz

### Options, mounted and wired ready for operation

Article-No.	Type	Description	for System type
S34-5540	-650- (instead of -620)	Power Factor Control Relay PQC-12/1 instead of PQC-6/1	all
S34-5519	-66- (instead of -64-)	FRAKO LSFC-66 WxHxD: 600x2000x600 mm (without floor standing base and roof)	LSFC-64
S34-5528	-66- (instead of -84-)	FRAKO LSFC-66 WxHxD: 600x2000x600 mm (without floor standing base and roof)	LSFC-84
S34-5503	-84- (instead of -64-)	FRAKO LSFC-84 WxHxD: 800x2000x400 mm (without floor standing base and roof)	LSFC-64
S34-5524	-85- (instead of -84-)	FRAKO LSFC-85 WxHxD: 800x2000x500 mm (without floor standing base and roof)	LSFC-84
S34-5517	-86- (instead of -84/85-)	FRAKO LSFC-86 WxHxD: 800x2000x600 mm (without floor standing base and roof)	LSFC-84/-85
S34-5554	-119- (instead of -64-)	Rittal VX 8604, WxHxD: 600x2000x400 mm (without floor standing base and roof)	LSFC-64
S34-5555	-118- (instead of -84/85-)	Rittal VX 8606 WxHxD: 600x2000x600 mm (without floor standing base and roof)	LSFC-84/-85
S34-5556	-117- (instead of -84-)	Rittal VX 8804, WxHxD: 800x2000x400 mm (without floor standing base and roof)	LSFC-84
S34-5557	-116- (instead of -85-)	Rittal VX 8805, WxHxD: 800x2000x500 mm (without floor standing base and roof)	LSFC-85
S34-5558	-115- (instead of -84-)	Rittal VX 8806, WxHxD: 800x2000x600 mm (without floor standing base and roof)	LSFC-84
S34-5559	-115- (instead of -85-)	Rittal VX 8806, WxHxD: 800x2000x600 mm (without floor standing base and roof)	LSFC-85
S34-5509	-Li	Cabinet door with door left hinged	all type FRAKO LSFC
S34-5510	-Li	Cabinet door with door left hinged	all type Rittal VX
S34-5023	-S60	Pivoting lever closure for mounting a semiprofile cylinder	all
S34-0060	-SO (+ Description)	Special painting outside (RAL-Scale)	all
S34-0010	-S1	Cable entry through the cabinet roof with connection on top	up to 400 kvar/cabinet
S34-5512	-54	Ingress protection IP54	≤ 300 kvar/cabinet
S34-5513	-54	Ingress protection IP54	> 300 ≤ 400 kvar/cabinet
S34-0054	-S80	Ingress protection IPX1 with dust cover roof W x H x D: 520 x 300 x 50 mm; RAL 7035	all FRAKO LSFC
S34-5523	-S572	Ingress protection IP41, roof vent installation on cabinet instead of a roof vent installation in cabinet	≤ 400 kvar/cabinet
S34-5511	-S131	Fuse switch disconnecter instead of fuse base per 50 kvar	all
S34-5514	-SLTA	Fuse switch disconnecter in cable entry compartment	≤ 200 kvar/cabinet
S34-5515	-SLTA	Fuse switch disconnecter in cable entry compartment	≤ 300 kvar/cabinet
S34-0109	-LSA	Switch disconnecter* three-pole, 400 A in cable entry compartment, for cabinet width 600 mm	≤ 200 kvar/cabinet
S34-0108	-LSA	Switch disconnecter* three-pole, 400 A in cable entry compartment, for cabinet width 800 mm	≤ 200 kvar/cabinet
S34-0107	-LSA	Switch disconnecter* three-pole, 630 A in cable entry compartment, for cabinet width 600 mm	≤ 300 kvar/cabinet
S34-0106	-LSA	Switch disconnecter* three-pole, 630 A in cable entry compartment, for cabinet width 800 mm	≤ 300 kvar/cabinet
S34-0039	-S56	Control switch (On/Off) fitted and connected (requirement for power factor correction systems installed in Switzerland)	all

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Article-No.	Type	Description	for System type
S34-5535	-S19	Control phase + N via a protective motor switch (option for France)	all
S34-5536	-S119	Control transformer set 500 VA incl. primary and secondary fuses	≤ 500 kvar
S34-5526	-S119	Control transformer set 800 VA incl. primary and secondary fuses	> 500 ≤ 900 kvar
S34-5069	-S53	3 ammeter incl. current transformer	all
S34-5073	-SO (+ Description)	Voltage meter with switch	all
S34-5077	-SO (+ Description)	kvar-Meter incl. current transformer; measuring range up to 300 kvar, 400 V	all
S34-5057	-SO (+ Description)	Measuring transducer 4-20 mA for power factor	all
S34-0040	-S66	Summation current transformer 5+5/5A	all
S34-0081	-S66	Summation current transformer 5+5+5/5A	all
S34-5049	-S145	Switch cabinet lighting with power outlet and position switch	all

\*) Switch disconnecter can be operated from the outside

## Accessories

Article-No.	Type	Description	Dimensions (W x D) in mm	for System type
34-80090	KR-LSFC-64-100	Floor standing base (h = 100 mm)	600 x 400	LSFC-64
34-80175	KR-LSFC-64-200	Floor standing base (h = 200 mm)	600 x 400	LSFC-64
34-80122	KR-LSFC-66-100	Floor standing base (h = 100 mm)	600 x 600	LSFC-66
34-80125	KR-LSFC-66-200	Floor standing base (h = 200 mm)	600 x 600	LSFC-66
34-80091	KR-LSFC-84-100	Floor standing base (h = 100 mm)	800 x 400	LSFC-84
34-80113	KR-LSFC-84-200	Floor standing base (h = 200 mm)	800 x 400	LSFC-84
34-80079	KR-LSFC-85-100	Floor standing base (h = 100 mm)	800 x 500	LSFC-85
34-80075	KR-LSFC-85-200	Floor standing base (h = 200 mm)	800 x 500	LSFC-85
34-80092	KR-LSFC-86-100	Floor standing base (h = 100 mm)	800 x 600	LSFC-86
34-80112	KR-LSFC-86-200	Floor standing base (h = 200 mm)	800 x 600	LSFC-86

Other options and accessories on request.

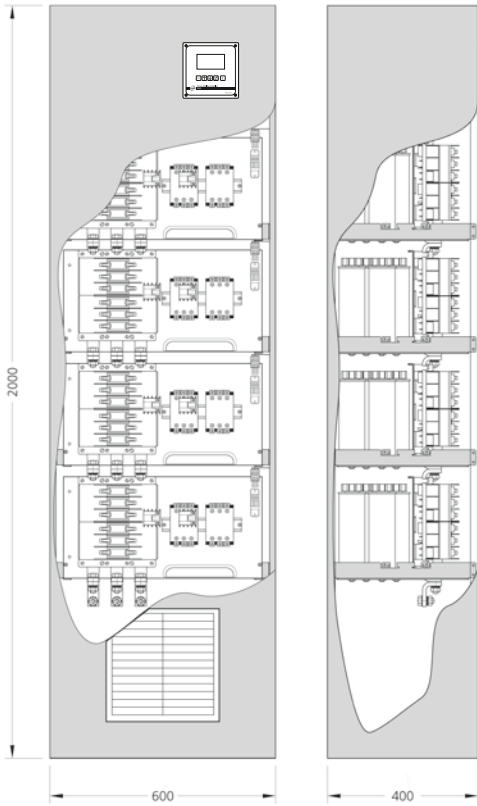
For dimensional drawings please see next page.

## Dimensions

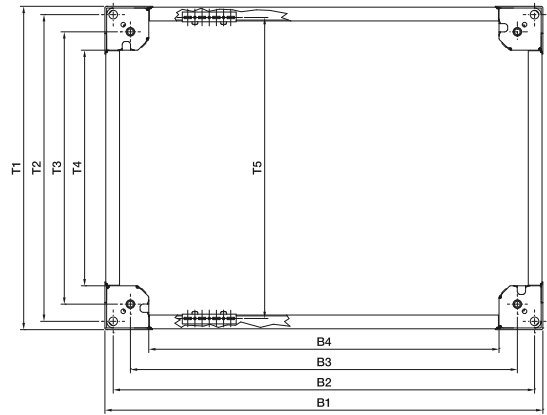
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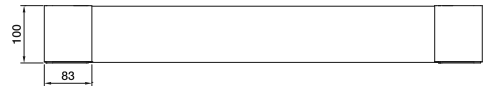
## Base/plinth system VX



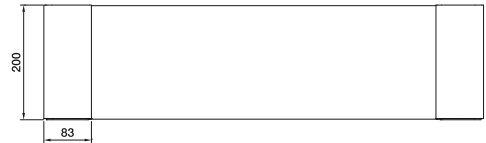
Dimensional drawing LSFC (100 bis 400 kvar)



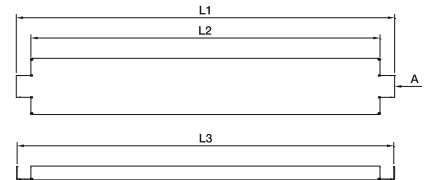
Dimensional drawing base/plinth 100 mm high



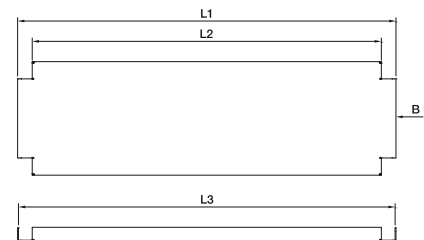
Dimensional drawing base/plinth 200 mm high



Base/plinth trim panels, solid, 100 mm high, front view



Base/plinth trim panels, solid, 200 mm high, front view



### Description of the hole pattern

B1/T1 = outer dimensions

B2/T2 = for screwing with the corner piece of the cabinet (from below)

B3/T3 = for screwing to the cabinet bottom with a captive nut (from below or above)

For fixing to the floor, drill holes B2-B4/T2-T3 can be used.

For enclosure width or depth mm	Width dimensions mm				Length dimensions mm			Depth dimensions mm				
	B1	B2	B3	B4	L1	L2	L3	T1	T2	T3	T4	T5 <sup>1)</sup>
400	366	335	275	211	260	209	257	364	335	275	211	325
500	466	435	375	311	360	309	357	464	435	375	311	425
600	566	535	475	411	460	409	457	564	535	475	411	525
800	766	735	675	611	660	609	657	764	735	675	611	725

<sup>1)</sup> T5 = Distance between system punchings including base/plinth installation bracket

All dimensions in mm