Power Quality Solution Key Components

Power Factor Correction

The rational use of electrical energy calls for economical generation, transmission and distribution with little losses. Static capacitive compensation devices reduce the lagging reactive power component transmitted over the network. If grid conditions change, the required power can be matched in steps by adding or taking out single power capacitors (automatic PFC) for compensation.

Benefits of power factor correction

The awareness of power quality is increasing, power factor correction (PFC) and harmonic filtering will be implemented on a growing scale. Enhancing power quality – improvement of power factor – saves costs and ensures a fast return on investment.

Power quality products

Power quality solutions offer all key components for an effective PFC system from a single source. This includes power factor controllers, multi measuring interfaces, capacitor contractors, thyristor modules for dynamic PFC and discharge reactors.

Highlights

- Complete product portfolio for simple and complex power quality solutions
- Self healing capacitors for maximum safety and reliability for long life expectancy
- Improved voltage quality for effective and economic use of installation ensure fast return on investment

Answers for infrastructure.

SIEMENS

Power Capacitors

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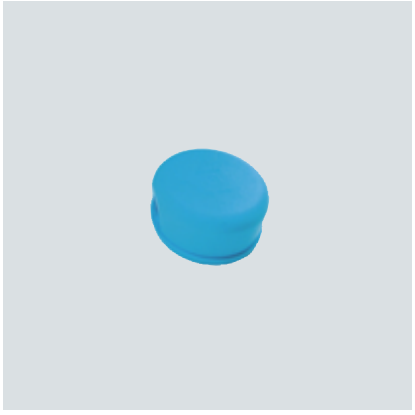
Power Capacitor PhaseCap Compact → Page 16

Power Capacitor PhiCap → Page 22

Power Capacitor MKV → Page 32

Accessories



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Power Components

Power factor controllers → Page 37

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Accessories

Discharge Reactor → Page 54

Power Capacitors

Product overview

Overview

Devices		Page	Standards	Used in		
				Non-residential buildings	Residential buildings	Industry
	**Power Capacitors PhaseCap 3-phase , IP20** (MKK AC Technology, gas Impregnation)	6	IEC 60831-1+/2, EN 60831-1+2, UL 810 5th edition	✓	--	✓
	Power Capacitors PhaseCap 1-phase, IP20 (MKK AC Technology, gas Impregnation)	6	IEC 60831-1+/2, EN 60831-1+2, UL 810 5th edition	✓	--	✓
	**Power Capacitors PhaseCap Heavy Duty 3-phase, IP20** (MKK AC Technology, gas Impregnation)	12	IEC 60831-1+2, EN 60831-1+2, UL 810 5th edition	✓	--	✓
	**Power Capacitors PhaseCap Compact 3-phase , IP20** (MKK AC Technology, soft resin Impregnation)	16	IEC 60831-1+2, EN 60831-1+2	✓	--	✓
	**Power Capacitors PhiCap 3-phase** (MKK AC Technology, soft resin Impregnation)	22	IEC 60831-1+2, IS: 13340/41	✓	--	✓
	Power Capacitors PhiCap 1-phase (MKK AC Technology, soft resin Impregnation)	22	IEC 60831-1+2, IS: 13340/41	✓	--	✓
	**Power Capacitors MKV 3-phase** Paperpolyprophylene film technology, oil Impregnation	32	IEC 60831-1+2	✓	--	✓

Power Capacitors

Power Capacitors PhaseCap 3-phase, IP20
Power Capacitors PhaseCap 1-phase, IP20

Overview

PhaseCap capacitors in cylindrical aluminum cases have been designed for power factor correction in low-voltage applications.

Loads like motors and transformers consume active power as well as reactive power.

Generators, supply cables and other electrical distribution equipment, in turn, should be relieved of reactive power.

The MKK (metalized plastic compact) AC series is intended to increase packing density per bank and cut component costs.

Improved thermal response and simplified installation are advantages of the cylindrical aluminum case.

Applications

- Automatic PFC equipment, capacitor banks
- Individual fixed PFC (e.g. motors, transformers, lighting)
- Group fixed PFC
- Tuned and detuned capacitor banks
- Filter applications
- Dynamic PFC

Benefits

- Compact design in cylindrical aluminum can with stud
- Concentric winding
- MKK-technology with wavy cut and heavy edge
- Voltage range 230 V … 800 V
- Output range 5.0 kvar … 36 kvar

Electrical

- Longlife expectancy
- High pulse current withstand capability

Mechanical and maintenance

- Reduced mounting costs
- Maintenance-free
- Highest packing density thanks to compact dimensions

Safety

- Self-healing
- Overpressure disconnector
- Shock hazard protected terminals
- Longterm approved
- cUL approval for B25667; for B25668 up to 690 V
- Ceramic discharge resistor pre-mounted

Environmental

- Dry design, inert gas
- No oil leakage

Technical specifications

		PhaseCap 3 ph	PhaseCap 1 ph
Standards		IEC 60831-1+/2, EN 60831-1+2, UL 810 5th edition	
Overvoltage	V_{max}	V_R + 10 % (up to 8 h daily) / V_R + 15 % (up to 30 min daily) / V_R + 20 % (up to 5 min daily) / V_R + 30 % (up to 1 min daily)	
Overcurrent	I_{max}	up to 1.3 · I_R (up to 1.5 · I_R including combined effects of harmonics, overvoltages and capacitance tolerance)	
Inrush current	I_s	up to 200 · I_R	
Losses			
• Dielectric		< 0.2 W/kvar	
• Total[1)]		< 0.45 W/kvar	
Rated frequency	f	50 / 60 Hz	
Capacitance tolerance		–5 % / +10 %	
Test voltage, terminal / terminal	V_{TT}	2.15 · V_{R1}, AC, 10 s	
Test voltage, terminal / case	V_{TC}	up to V_R ≤ 660 V: 3000 V AC, 10 s; above V_R = 660 V: 6000 V AC, 10 s	
Mean life expectancy	$t_{LD(Co)}$	up to 115000 h	
Ambient temperature		–40/D; max. temp. 55 °C; max. mean 24 h = 45 °C; max. mean 1 year = 35 °C; lowest temperature = –40 °C	
Cooling		natural or forced	
Humidity	H_{rel}	max. 95 %	
Altitude		max. 4000 m above sea level	
Mounting position		upright / horizontal	
Mounting and grounding		threaded M12 stud on bottom of case	
Safety		dry technology, overpressure disconnector, self-healing, maximum allowed fault current 10000 A in accordance with UL 810 standard	
Discharge module		ceramic discharge module pre-mounted, discharge time ≤ 75 V in 60 s; ≤ 75 V in 90 s for types marked with [1)] in the ordering code table 1/8ff.	
Case		extruded aluminum can	
Enclosure		IP20, indoor mounting (optionally with terminal cap for IP54)	
Dielectric		polypropylene film	
Impregnation		inert gas, Nitrogen (N_2)	
Terminals		SIGUT terminal strip with electric shock protection (IP20), (VDE 0106 part 100), max. 16 mm² cable cross-section, max. current 50 A	
Certification		cUL file # E238746	
Number of switching operations		max. 5000 switchings per year according to IEC 60831-1+/2	

1) Without discharge resistor.

Power Capacitors

Power Capacitors PhaseCap 3-phase, IP20

Selection and ordering data (Dated 10/2010)

50 Hz Output in kVAr	60 Hz Output in kVAr	Capacity in µF 3 x	Dimensions D * H mm ∅	Order No.	PU Unit(s)	PS*/ P. unit Unit(s)	PG	Weight per PU approx. kg
Rated voltage 230 V								
5.0	6.0	100	116 x 164	**4RB5 050-3CD50**	1	6	155	1.300
7.5	9.0	150	116 x 164	**4RB5 075-3CD50**	1	6	155	1.300
10.4	12.5	209	116 x 164	**4RB5 104-3CD50**	1	6	155	1.500
12.5[1)]	15.0	251	116 x 200	**4RB5 125-3CD50**	1	4	155	1.700
Rated voltage 400 V								
5.0	6.0	32	116 x 164	**4RB5 050-3EA50**	1	6	155	1.100
7.5	9.0	50	116 x 164	**4RB5 075-3EA50**	1	6	155	1.200
10.0	12.0	64	116 x 164	**4RB5 100-3EA50**	1	6	155	1.200
12.5	15.0	83	116 x 164	**4RB5 125-3EA50**	1	6	155	1.100
15.0	18.0	100	116 x 164	**4RB5 150-3EA50**	1	6	155	1.300
20.0	24.0	133	116 x 164	**4RB5 200-3EA50**	1	6	155	1.500
25.0	--	165	116 x 200	**4RB5 250-3EA50**	1	4	155	1.800
Rated voltage 415 V								
5.0	6.0	32	116 x 164	**4RB5 050-3EB50**	1	6	155	1.100
6.3	7.5	39	116 x 164	**4RB5 063-3EB50**	1	6	155	1.200
10.4	12.5	64	116 x 164	**4RB5 104-3EB50**	1	6	155	1.200
12.5	15.0	77	116 x 164	**4RB5 125-3EB50**	1	6	155	1.300
15.0	18.0	93	116 x 164	**4RB5 150-3EB50**	1	6	155	1.400
16.7	20.0	103	116 x 164	**4RB5 167-3EB50**	1	6	155	1.500
20.8	25.0[2)]	128	116 x 200	**4RB5 208-3EB50**	1	4	155	1.700
25.0[3)]	--	154	136 x 200	**4RB5 250-3EB50**	1	4	155	2.100
Rated voltage 440 V								
5.0	6.0	27	116 x 164	**4RB5 050-3EE50**	1	6	155	1.200
7.5	9.0	41	116 x 164	**4RB5 075-3EE50**	1	6	155	1.200
10.4	12.5	57	116 x 164	**4RB5 104-3EE50**	1	6	155	1.300
12.5	15.0	69	116 x 164	**4RB5 125-3EE50**	1	6	155	1.400
14.2	17.0	77	116 x 164	**4RB5 142-3EE50**	1	6	155	1.300
15.0	18.0	83	116 x 164	**4RB5 150-3EE50**	1	6	155	1.400
16.7	20.0	92	116 x 200	**4RB5 167-3EE50**	1	4	155	1.800
18.8	22.6	103	116 x 164	**4RB5 188-3EE50**	1	6	155	1.500
20.0	24.0	111	116 x 200	**4RB5 200-3EE50**	1	4	155	1.700
25.0	30.0	137	136 x 200	**4RB5 250-3EE50**	1	4	155	2.000
28.1[3)]	--	154	136 x 200	**4RB5 281-3EE50**	1	4	155	2.100
28.1[3)]	--	154	136 x 200	**4RB5 281-3EE51**	1	4	155	2.100
30.0[1)4)]	--	164	136 x 200	**4RB5 300-3EE50**	1	4	155	2.400
33.0[1)3)]	--	181	136 x 200	**4RB5 330-3EE50**	1	4	155	2.500
Rated voltage 480 V								
6.3	7.5	29	116 x 164	**4RB5 063-3EJ50**	1	6	155	1.200
8.3	10.0	39	116 x 164	**4RB5 083-3EJ50**	1	6	155	1.200
10.4	12.5	48	116 x 164	**4RB5 104-3EJ50**	1	6	155	1.300
12.5	15.0	58	116 x 164	**4RB5 125-3EJ50**	1	6	155	1.500
15.0	18.0	69	116 x 164	**4RB5 150-3EJ50**	1	6	155	1.400
16.7	20.0	77	116 x 200	**4RB5 167-3EJ50**	1	4	155	1.800
20.0	24.0	92	116 x 200	**4RB5 200-3EJ50**	1	4	155	1.800
25.0	30.0	115	136 x 200	**4RB5 250-3EJ50**	1	4	155	2.200
30.0[3)4)]	--	138	136 x 200	**4RB5 300-3EJ50**	1	4	155	2.400

Types for voltages 220 V, 240 V, 600 V, 660 V and other kvar-outputs are available upon request.

[1)] Discharge time ≤ 75 V in 90 s.

[2)] Temperature class deviation -40/B max. 45 °C.

[3)] Usefull life up to 100 000 h.

[4)] Temperature class deviation -40/C max. 50 °C.

* You can order this quantity or a multiple thereof.

	50 Hz	60 Hz	Capacity	Dimensions	Order No.	PU	PS*/ P. unit	PG	Weight per PU approx.
	Output in kVAr	Output in kVAr	in µF 3 x	D * H mm ∅		Unit(s)	Unit(s)		kg
	**Rated voltage 525 V**								
	8.3	10.0	32	116 x 164	**4RB5 083-3FC50**	1	6	155	1.100
	10.0	12.0	39	116 x 164	**4RB5 100-3FC50**	1	6	155	1.200
	12.5	15.0	48	116 x 164	**4RB5 125-3FC50**	1	6	155	1.300
	15.0	18.0	58	116 x 164	**4RB5 150-3FC50**	1	6	155	1.500
	16.7	20.0	64	116 x 164	**4RB5 167-3FC50**	1	6	155	1.600
	20.0	24.0	77	116 x 200	**4RB5 200-3FC50**	1	4	155	1.800
	25.0	--	96	136 x 200	**4RB5 250-3FC50**	1	4	155	2.300
	30.0[1)2)]	--	115	136 x 200	**4RB5 300-3FC50**	1	4	155	2.400
	Rated voltage 570 V								
	27.5	33.0	90	136 x 200	**4RB5 275-3FH50**	1	4	155	2.500
	Rated voltage 690 V								
	5.0	6.0	11	116 x 164	**4RB5 050-3GK50**	1	6	155	1.300
	7.5	9.0	17	116 x 164	**4RB5 075-3GK50**	1	6	155	1.300
	10.0	12.0	23	116 x 164	**4RB5 100-3GK50**	1	6	155	1.400
	12.5	15.0	28	116 x 164	**4RB5 125-3GK50**	1	6	155	1.500
	15.0	18.0	34	116 x 164	**4RB5 150-3GK50**	1	6	155	1.500
	20.8	25.0	47	136 x 200	**4RB5 208-3GK50**	1	4	155	2.000
	25.0	30.0	56	136 x 200	**4RB5 250-3GK50**	1	4	155	2.200
	Rated voltage 765 V								
	30.0	36.0	55	136 x 200	**4RB5 300-3HG50**	1	4	155	2.400
	**Rated voltage 800 V**								
	5.0	6.0	8	116 x 164	**4RB5 050-3JA50**	1	6	155	1.200
	7.5	9.0	12	116 x 164	**4RB5 075-3JA50**	1	6	155	1.300
	10.0	12.0	17	116 x 164	**4RB5 100-3JA50**	1	6	155	1.300
	12.5	15.0	21	116 x 164	**4RB5 125-3JA50**	1	6	155	1.400
	15.0	18.0	25	116 x 164	**4RB5 150-3JA50**	1	6	155	1.500
	20.0	24.0	33	136 x 200	**4RB5 200-3JA50**	1	4	155	2.000
	25.0	30.0	41	136 x 200	**4RB5 250-3JA50**	1	4	155	2.300
	28.0	33.0	46	136 x 200	**4RB5 280-3JA50**	1	4	155	2.400

Types for voltages 220 V, 240 V, 600 V, 660 V and other kvar-outputs are available upon request.

1) Discharge time ≤ 75 V in 90 s.

2) Temperature class deviation -40/C max. 50 °C.

* You can order this quantity or a multiple thereof.

Power Capacitors

Power Capacitors PhaseCap 1-phase, IP20

Selection and ordering data (Dated 10/2010)

	50 Hz	60 Hz	Capacity	Dimensions	Order No.	PU	PS*/ P. unit	PG	Weight per PU approx.
	Output in kVAr	Output in kVAr	in µF 1 x	D * H mm ∅		Unit(s)	Unit(s)		kg
	**Rated voltage 230 V**								
	5.2	6.2	313	116 x 164	**4RB5 052-1CD50**	1	6	155	1.100
	6.6	7.9	397	116 x 164	**4RB5 066-1CD50**	1	6	155	1.400
	7.5	9.0	457	116 x 164	**4RB5 075-1CD50**	1	6	155	1.300
	8.3	10.0	502	116 x 164	**4RB5 083-1CD50**	1	6	155	1.300
	9.1	--	548	116 x 164	**4RB5 091-1CD50**	1	6	155	1.400
	10.0	--	607	116 x 164	**4RB5 100-1CD50**	1	6	155	1.400
	Rated voltage 400 V								
	10.4	12.5	207	116 x 164	**4RB5 104-1EA50**	1	6	155	1.200
	12.5	15.0	249	116 x 164	**4RB5 125-1EA50**	1	6	155	1.300
	Rated voltage 440 V								
	6.9	8.3	116	116 x 164	**4RB5 068-1EE50**	1	6	155	1.300
	8.3	10.0	144	116 x 164	**4RB5 083-1EE50**	1	6	155	1.500
	**Rated voltage 525 V**								
	10.0	12.0	116	116 x 164	**4RB5 100-1FC50**	1	6	155	1.500
	12.5	15.0	144	116 x 164	**4RB5 125-1FC50**	1	6	155	1.500
	15.0	18.0	173	116 x 200	**4RB5 150-1FC50**	1	4	155	1.700
	18.6	22.3	215	136 x 200	**4RB5 186-1FC50**	1	4	155	2.000

Accessories

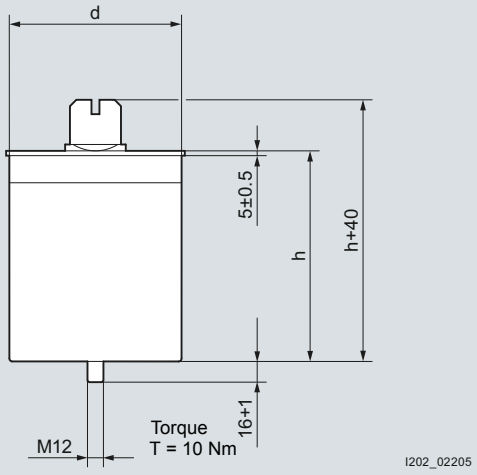
	Cable gland	Dimensions	Order No.	PU	PS*/ P. unit	PG	Weight per PU approx.
	Size	D*H mm ∅		Unit(s)	Unit(s)		kg
	**Plastic protection cover**	Can size					
	PG 13.5	116 x 164	**4RB9 313-0BA00**	1	1	155	0.1000
	PG16	116 x 200	**4RB9 316-0CA00**	1	1	155	0.1000
	PG 21	136 x 200	**4RB9 321-0CA00**	1	1	155	0.1100
	**Plastic protection casing**						
		116 x 164	**4RB9 300-0BA00**	1	1	155	0.1500
		116 x 200 / 136 x 200	**4RB9 300-0CA00**	1	1	155	0.1800

* You can order this quantity or a multiple thereof.

Power Capacitors PhaseCap 3-phase, IP20
Power Capacitors PhaseCap 1-phase, IP20

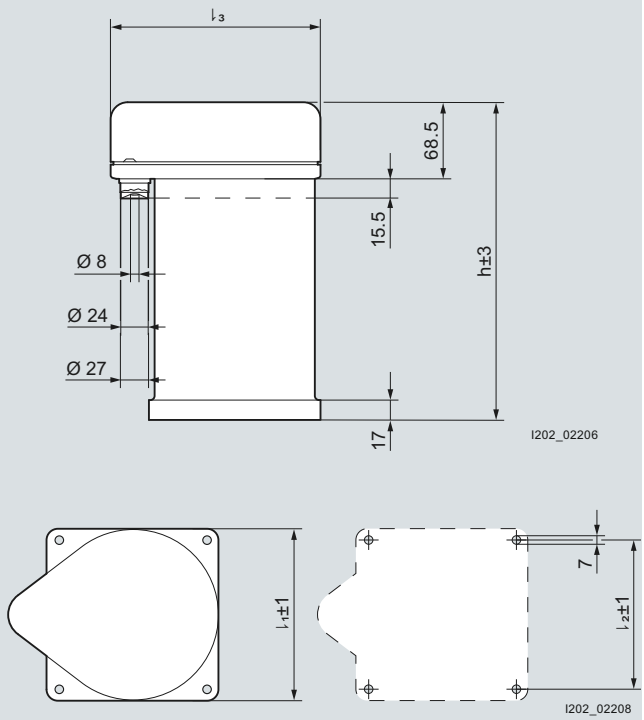
Dimensional drawings

Capacitor

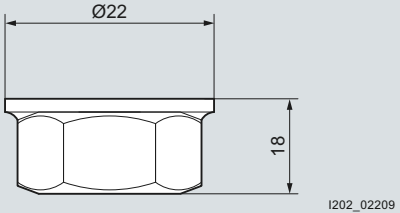


d_1 = 6 mm
Creepage distance 12.7 mm min.
Clearance 9.6 mm min.

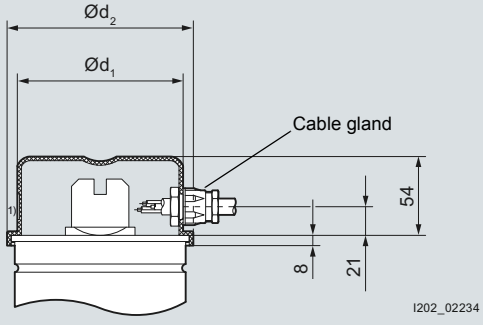
Protective case for capacitor



Mounting



Protective cover for terminal



1) Perforation for second cable gland

Power Capacitors

Power Capacitors PhaseCap Heavy Duty 3-phase, IP20

Overview

The PhaseCap HD series is a follow-on development of the MKK AC series, covering the power range above 40 through 60 kvar with just one capacitor in a cylindrical aluminum case.

The PhaseCap HD is especially intended for industrial applications with demands for long life, constant capacitance and high inrush current withstand capability up to 200 · I_R.

Such applications require typical power steps of 25 or 50 kvar switched by a PFC controller via each capacitor contactor.

This MKK AC series was developed to increase packing density per bank and cut component costs.

Applications

- Automatic PFC equipment, capacitor banks
- Individual fixed PFC (e.g. motors, transformers, lighting)
- Group fixed PFC
- Tuned and detuned capacitor banks
- Filter applications
- Dynamic PFC
- PFC systems with space constraints

Benefits

- Compact design in cylindrical aluminum can with stud
- Stacked winding
- MKK-technology with wavy cut and heavy edge
- Voltage range 400 V … 525 V
- Output range 40 kvar (50 Hz) … 60 kvar (60 Hz)

Electrical

- Low losses
- High pulse current withstand capability (up to 200 · I_R)

Mechanical and maintenance

- Reduced mounting costs
- Maintenance-free

Safety

- Self-healing
- Overpressure disconnector
- Shock hazard protected terminals
- Long-term approved

Environmental

- Dry design, inert gas
- No oil leakage

Technical specifications

		PhaseCap Heavy Duty 3-phase
Standards		IEC 60831-1+2, EN 60831-1+2, UL 810 5th edition
Overvoltage	V_{max}	V_R + 10 % (up to 8 h daily) / V_R + 15 % (up to 30 min daily) / V_R + 20 % (up to 5 min daily) / V_R + 30 % (up to 1 min daily)
Overcurrent	I_{max}	up to 1.3 · I_R (up to 1.5 · I_R including combined effects of harmonics, overvoltages and capacitance tolerance)
Inrush current	I_s	up to 200 · I_R
Losses		
• Dielectric		< 0.2 W/kvar
• Total[1)]		< 0.45 W/kvar
Rated frequency	f	50 / 60 Hz
Capacitance tolerance		–5 % / +10 %
Test voltage, terminal / terminal	V_{TT}	2.15 · V_{R1}, AC, 10 s
Test voltage, terminal / case	V_{TC}	up to $V_R \leq 660$ V: 3000 V AC, 10 s
Mean life expectancy	$t_{LD(Co)}$	up to 130000 h
Ambient temperature		–40/D; max. temp. 55 °C; max. mean 24 h = 45 °C; max. mean 1 year = 35 °C; lowest temperature = –25 °C
Cooling		natural or forced
Humidity	H_{rel}	max. 95 %
Altitude		max.4000 m above sea level
Mounting position		upright
Mounting and grounding		threaded M12 stud on bottom of case
Safety		dry technology, overpressure disconnector, self-healing, maximum allowed fault current 10000 A in accordance with UL 810 standard
Discharge resistors		discharge module included in delivery
Case		extruded aluminum can
Enclosure		IP20, indoor mounting
Dielectric		polypropylene film
Impregnation		inert gas, Nitrogen (N_2)
Terminals		SIGUT terminal strip with electric shock protection (IP20), (VDE 0106 part 100), max. 35 mm^2 cable cross-section, max. current 130 A
Number of switching operations		max. 5000 switchings per year according to IEC 60831-1+/2

1) Without discharge resistor.

Selection and ordering data (Dated 10/2010)

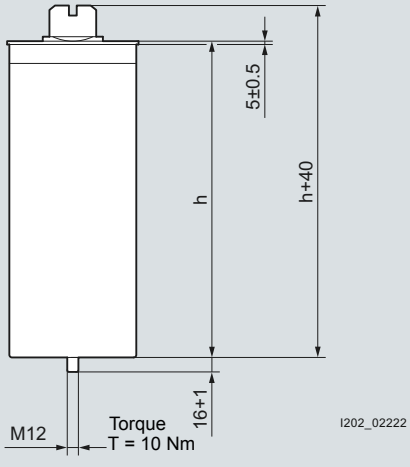
	50 Hz	60 Hz	Capacity	Dimensions	Order No.	PU	PS*/ P. unit	PG	Weight per PU approx.
	Output	Output	in µF	D * H					
	in kVAr	in kVAr	3 x	mm ∅		Unit(s)	Unit(s)		kg
	**Rated voltage 400 V**								
	40.0	48.0	265	136 x 317	**4RB6 400-3EA50**	1	2	155	4.400
	50.0	60.0	332	136 x 355	**4RB6 500-3EA50**	1	2	155	4.700
	(Suitable also for 415 V with 7.6 % higher output)								
	Rated voltage 440 V								
	40.0	48.0	219	136 x 317	**4RB6 400-3EE50**	1	2	155	4.400
	50.0	60.0[1)]	274	136 x 355	**4RB6 500-3EE50**	1	2	155	4.700
	56.0	--	307	136 x 355	**4RB6 560-3EE50**	1	2	155	4.700
	Rated voltage 525 V								
	40.0	48.0	154	136 x 355	**4RB6 400-3FC50**	1	2	155	4.700

[1)] Temperature class deviation -25/B max. 45 °C.

* You can order this quantity or a multiple thereof.

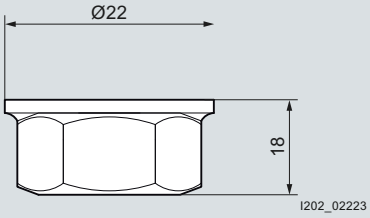
Dimensional drawings

Capacitor

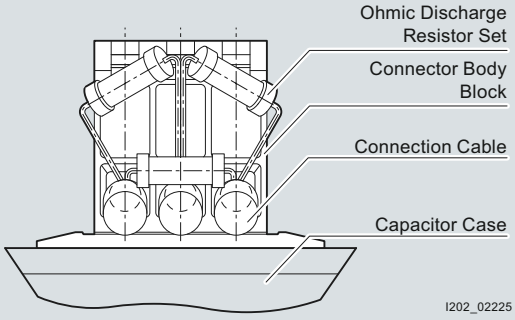


d_1 = 6 mm
Creepage distance 15 mm min.
Clearance 12 mm min.

Mounting



Discharge resistor set included in the extend of delivery



Power Capacitors

Power Capacitors PhaseCap Compact 3-phase, IP20

Overview

The new Power Capacitor PhaseCap Compact is based on the MKK technology known for many years from the successful Phase-Cap series with its unique concentric windings.

Using polypropylene as dielectric and semi-dry biodegradable resin as impregnation agent, the PhaseCap Compact offers higher inrush current capability (up to 300 · I_R) and over current capability (up to 2.0 · I_R) even compared to PhaseCap. With an output of up to 33 kvar at very small height it meets the dimensional requirements of panel builders. Its new enhanced terminals permit the connection of a broader variety of cables and cable sizes. Depending on the operating conditions PhaseCap Compact provides a life expectancy of up to 180000 hours more than any other capacitor in the LV DS power capacitor portfolio besides MKV.

Applications

- Automatic PFC equipment, capacitor banks
- Individual fixed PFC (e.g. motors, transformers, lighting)
- Group fixed PFC
- Tuned and detuned capacitor banks
- Filter applications
- Dynamic PFC

Benefits

- Compact design in cylindrical aluminum can with stud
- Concentric winding
- MKK-technology with wavy cut and heavy edge

Electrical features

- Very high life expectancy
- High inrush current capability (up to 300 · I_R)
- High overcurrent capability (up to 1.5 … 2.0 · I_R)

Mechanical and maintenance

- Reduced mounting costs
- Maintenance-free
- Compact dimensions
- Mounting position upright/horizontal

Safety

- Self healing
- Overpressure disconnector
- Shock hazard protected terminals
- Pre-mounted ceramic discharge resistor

Technical specifications

		PhaseCap Compact 3-phase
Standards		IEC 60831-1+2, EN 60831-1+2
Overvoltage	V_{max}	V_R + 10 % (up to 8 h daily) / V_R + 15 % (up to 30 min daily) / V_R + 20 % (up to 5 min daily) / V_R + 30 % (up to 1 min daily)
Overcurrent	I_{max}	up to 1.5 ... 2.0 · I_R (including combined effects of harmonics, overvoltages and capacitance tolerance) depending on th individual type
Inrush current	I_s	up to 300 · I_R
Losses		
• Dielectric		< 0.2 W/kvar
• Total[1)]		< 0.45 W/kvar
Rated frequency	f	50 / 60 Hz
Capacitance tolerance		–5 % / +10 %
Test voltage, terminal / terminal	V_{TT}	2.15 · V_{R1}, AC, 10 s
Test voltage, terminal / case	V_{TC}	up to $V_R \leq 660$ V: 3000 V AC, 10 s; above V_R = 6000 V AC, 10 s
Mean life expectancy	$t_{LD(Co)}$	up to 180000 h (temperature class -40/C) up to 130000 h (temperature class -40/D)
Ambient temperature		Temperature class -40/D: Max. short time 55 °C, max. mean 24 h = 45 °C; max. mean 1 year = 35 °C; lowest temperature = -40 °C Temperature class -40/C: Max. short time 50 °C, max. mean 24 h = 40 °C; max. mean 1 year = 30 °C; lowest temperature = -40 °C
Cooling		natural or forced
Humidity	H_{rel}	max. 95 %
Altitude		max.4000 m above sea level
Mounting position		upright / horizontal
Mounting and grounding		threaded bolt M12
Safety		self-healing, overpressure disconnector
Discharge resistors		ceramic discharge module pre-mounted ≤ 75 or less in 60 s
Case		extruded aluminum can with stud
Enclosure		IP20, indoor mounting (optionally with terminal cap for IP54)
Dielectric		polypropylene film
Impregnation		semi-dry biodegradable resin
Terminals		Terminal strip with electric shock protection (IP20), (VDE 0106 part 100), for current and connection cable details and the terminal type - capacitor type association please refer to the terminal drawings and the capacitor type list
Certification		n/a
Number of switching operations		max. 10000 switchings operations per year according to IEC 60831

1) Without discharge resistor.

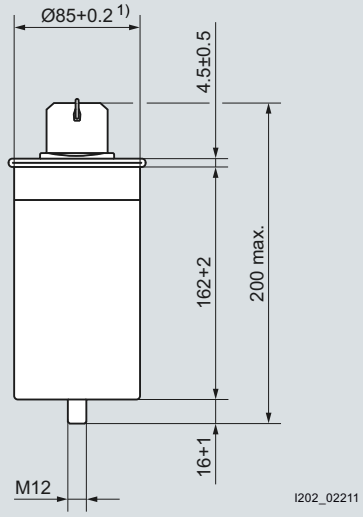
Selection and ordering data (Dated 10/2010)

50 Hz	60 Hz	Capacity	Terminal type	Dimen-sions	Order No.	PU	PS*/ P. unit	PG	Weight per PU approx.
Output in kVAr	Output in kVAr	in µF 1 x		D * H mm ∅		Unit(s)	Unit(s)		kg
Rated voltage 230 V									
5.0	6.0	100	A	85 x 200	**4RB4 050-3CD50**	1	9	155	1.200
7.5	9.0	150	B	100 x 200	**4RB4 075-3CD50**	1	6	155	1.700
10.0	12.0	201	B	116 x 200	**4RB4 100-3CD50**	1	4	155	2.200
12.5	15.0	251	B	116 x 200	**4RB4 125-3CD50**	1	4	155	2.200
Rated voltage 400 V									
5.0	6.0	33	A	85 x 125	**4RB4 050-3EA50**	1	9	155	0.700
7.5	9.0	50	A	85 x 162	**4RB4 075-3EA50**	1	9	155	1.000
10.0	12.0	66	A	85 x 162	**4RB4 100-3EA50**	1	9	155	1.000
12.5	15.0	83	B	100 x 162	**4RB4 125-3EA50**	1	6	155	1.400
15.0	18.0	99	B	100 x 162	**4RB4 150-3EA50**	1	6	155	1.400
20.0	24.0	133	B	100 x 200	**4RB4 200-3EA50**	1	6	155	2.200
25.0	--	166	B	116 x 200	**4RB4 250-3EA50**	1	4	155	2.200
Rated voltage 415 V									
5.0	6.0	32	A	85 x 125	**4RB4 050-3EB50**	1	9	155	0.700
6.2	7.4	38	A	85 x 162	**4RB4 062-3EB50**	1	9	155	1.000
10.4	12.5	64	B	100 x 162	**4RB4 104-3EB50**	1	6	155	1.400
12.5	15.0	77	B	100 x 200	**4RB4 125-3EB50**	1	6	155	1.700
15.0	18.0	93	B	100 x 200	**4RB4 150-3EB50**	1	6	155	2.200
20.8	25.0	128	B	116 x 200	**4RB4 208-3EB50**	1	4	155	2.200
25.0	--	154	C	136 x 200	**4RB4 250-3EB50**	1	2	155	3.200
Rated voltage 440 V									
5.0	6.0	27	A	85 x 125	**4RB4 050-3EE50**	1	9	155	0.800
7.5	9.0	41	A	85 x 162	**4RB4 075-3EE50**	1	9	155	1.000
10.4	12.5	57	B	100 x 162	**4RB4 104-3EE50**	1	6	155	1.400
12.5	15.0	69	B	100 x 162	**4RB4 125-3EE50**	1	6	155	1.400
15.0	18.0	82	B	100 x 200	**4RB4 150-3EE50**	1	6	155	1.700
16.7	20.0	92	B	100 x 200	**4RB4 167-3EE50**	1	6	155	2.200
20.0	24.0	110	B	116 x 200	**4RB4 200-3EE50**	1	4	155	2.200
25.0	30.0	137	B	116 x 200	**4RB4 250-3EE50**	1	4	155	2.200
28.1	--	154	C	136 x 200	**4RB4 281-3EE50**	1	2	155	3.200
30.0	--	164	C	136 x 200	**4RB4 300-3EE50**	1	2	155	3.200
33.0	--	181	C	136 x 200	**4RB4 330-3EE50**	1	2	155	3.200
Rated voltage 480 V									
6.3	7.5	29	A	85 x 162	**4RB4 063-3EJ50**	1	9	155	1.000
8.3	10.0	38	B	100 x 162	**4RB4 083-3EJ50**	1	6	155	1.400
10.4	12.5	48	B	100 x 200	**4RB4 104-3EJ50**	1	6	155	1.700
12.5	15.0	58	B	100 x 200	**4RB4 125-3EJ50**	1	6	155	1.700
15.0	18.0	69	B	100 x 200	**4RB4 150-3EJ50**	1	6	155	1.700
16.7	20.0	77	B	116 x 200	**4RB4 167-3EJ50**	1	4	155	2.200
20.0	24.0	92	B	100 x 200	**4RB4 200-3EJ50**	1	6	155	2.200
25.0	30.0	115	C	136 x 200	**4RB4 250-3EJ50**	1	2	155	3.200
28.0	33.6	129	C	136 x 200	**4RB4 280-3EJ50**	1	2	155	3.200
30.0	--	138	C	136 x 200	**4RB4 300-3EJ50**	1	2	155	3.200
Rated voltage 525 V									
8.3	10.0	32	B	100 x 162	**4RB4 083-3FC50**	1	6	155	1.700
10.0	12.0	38	B	100 x 162	**4RB4 100-3FC50**	1	6	155	1.700
12.5	15.0	48	B	100 x 200	**4RB4 125-3FC50**	1	6	155	1.700
15.0	18.0	58	B	100 x 200	**4RB4 150-3FC50**	1	6	155	2.200
16.7	20.0	64	B	116 x 200	**4RB4 167-3FC50**	1	4	155	2.200
20.0	24.0	77	B	116 x 200	**4RB4 200-3FC50**	1	4	155	2.200
25.0	--	96	C	136 x 200	**4RB4 250-3FC50**	1	2	155	3.200
30.0	--	115	C	136 x 200	**4RB4 230-3FC50**	1	2	155	3.200

* You can order this quantity or a multiple thereof.

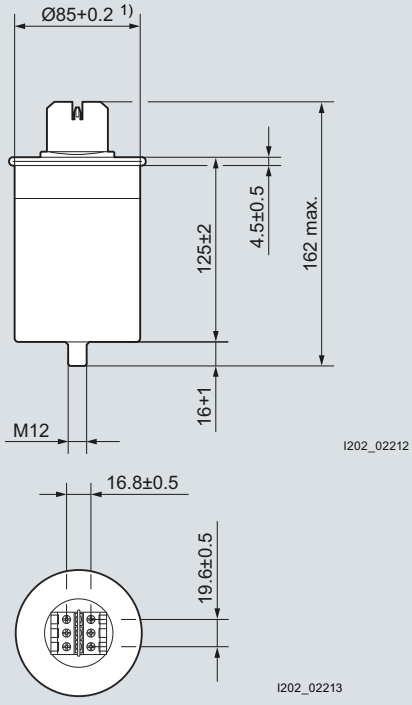
Dimensional drawings

Terminal type A, d x h = 85 x 162 mm, current up to 50 A
Terminal cross section 16 mm² (without cable end lug)



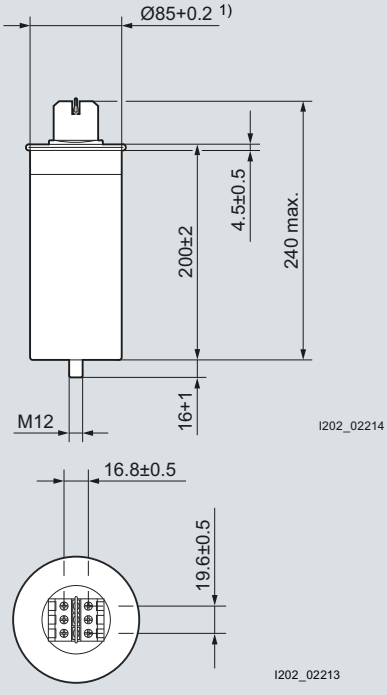
1) Seaming adds 4 mm in diameter

Terminal type A, d x h = 85 x 125 mm, current up to 50 A
Terminal cross section 16 mm² (without cable end lug)



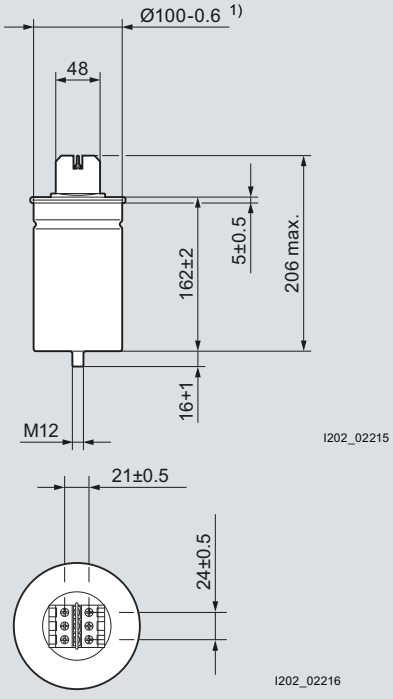
1) Seaming adds 4 mm in diameter

Terminal type A, d x h = 85 x 200 mm, current up to 50 A
Terminal cross section 16 mm² (without cable end lug)



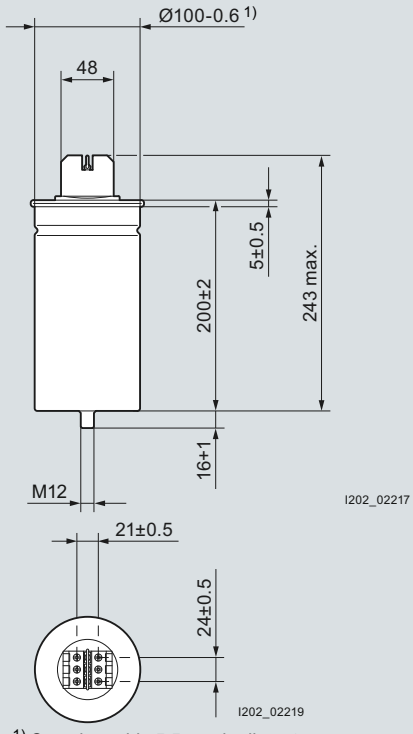
1) Seaming adds 4 mm in diameter

Terminal type B, d x h = 100 x 162 mm, current up to 60 A
Terminal cross section 25 mm² (without cable end lug)



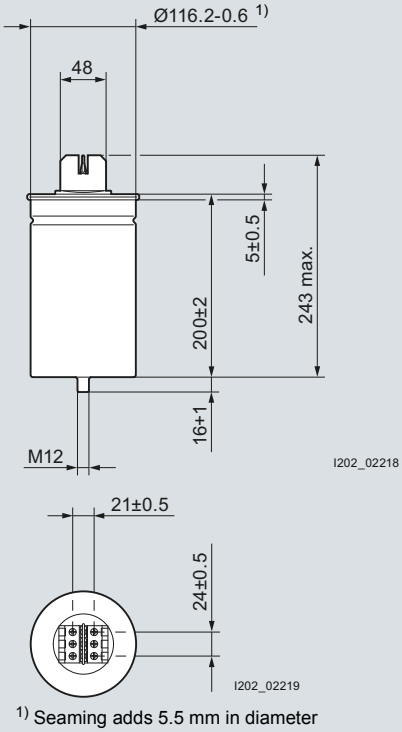
1) Seaming adds 5.5 mm in diameter

Terminal type B, d x h = 100 x 200 mm, current up to 60 A
Terminal cross section 25 mm^2 (without cable end lug)



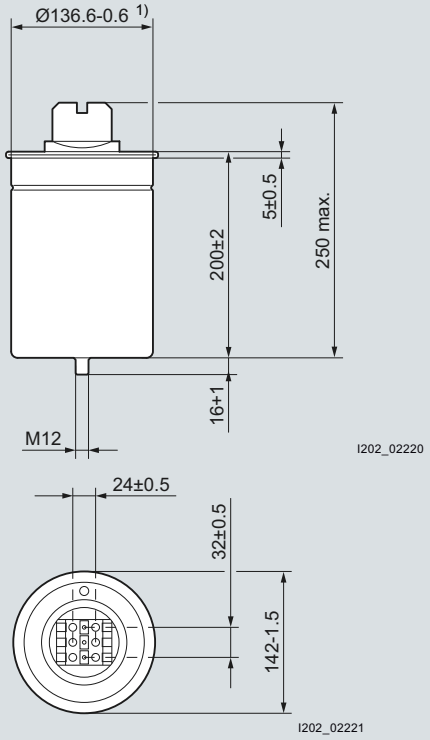
1) Seaming adds 5.5 mm in diameter

Terminal type B, d x h = 116 x 200 mm, current up to 60 A
Terminal cross section 25 mm^2 (without cable end lug)



1) Seaming adds 5.5 mm in diameter

Terminal type C, d x h = 136 x 200 mm, current up to 130 A
Terminal cross section 35 mm^2 (without cable end lug)



1) Seaming adds 5.5 mm in diameter

Power Capacitors

Power Capacitors PhiCap 3-phase
Power Capacitors PhiCap 1-phase

Overview

PhiCap capacitors are a tried and tested series of MKP (metalized polypropylene) capacitors which have been used for PFC applications for more than 15 years.

The power range varies from 0.5 to 30.0 kvar and 0.7 to 6.0 kvar per single capacitor can, depending on a three-phase or single-phase capacitor design.

The PhiCap capacitor is especially intended for power factor correction in industrial and semi-industrial applications.

The capacitors are manufactured using metalized polypropylene film as the dielectric and housed in a cylindrical aluminum case.

Applications

- Power Factor Correction (PFC)
- Automatic capacitor banks
- Fixed PFC applications, e.g. motor compensation
- Detuned PFC systems
- Dynamic PFC systems

Benefits

- Compact desing in cylindrical aluminum can with stud
- Stacked winding
- MKP technology
- Voltage range 230 … 525 V
- Output range 0.5 … 30 kvar

Electrical

- Up to 30 kvar per case for three-phase applications
- Up to 6 kvar per case for single-phase applications
- Long life expectancy of up to 100000 hours
- High pulse current withstand capability (up to 200 · I_R)

Mechanical and maintenance

- Reduced mounting costs, easy installation and connection
- Low weight and compact volume
- Maintenance-free

Safety

- Self-healing
- Overpressure disconnector
- Shock hazard protected SIGUT- terminal for capacitors rated higher than 1,5 kVar up to 240 V and 5,0 kVar above 240 V

Technical specifications

		PhiCap 3 ph	PhiCap 1 ph
Standards		IEC 60831-1+2, IS: 13340/41	
Overvoltage	V_{max}	V_R + 10 % (up to 8 h daily) / V_R + 15 % (up to 30 min daily) / V_R + 20 % (up to 5 min daily) / V_R + 30 % (up to 1 min daily)	
Overcurrent	I_{max}	up to 1.3 · I_R (up to 1.5 · I_R including combined effects of harmonics, overvoltages and capacitance)	
Inrush current	I_s	up to 200 · I_R	
Losses			
• Dielectric		< 0.2 W/kvar	
• Total[1)]		< 0.45 W/kvar	
Rated frequency	f	50 / 60 Hz	
Capacitance tolerance		–5 % / +10 %	
Test voltage, terminal / terminal	V_{TT}	2.15 · V_R, AC, 2 s	
Test voltage, terminal / case	V_{TC}	3000 V AC, 10 s	
Mean life expectancy	$t_{LD(Co)}$	up to 100000 h	
Ambient temperature		–25/D; max. temp. 55 °C; max. mean 24 h = 45 °C; max. mean 1 year = 35 °C; lowest temperature = –25 °C	
Cooling		natural or forced	
Humidity	H_{rel}	max. 95 %	
Altitude		max. 4000 m above sea level	
Mounting position		upright	
Mounting and grounding		threaded M12 (10 Nm) for case size diam. > 53 mm M8 (4 Nm) for case size diam. ≤ 53 mm	
Safety		Self-healing technology, overpressure disconnector, maximum allowed fault current 10000 A in accordance with UL 810 standard	
Discharge module		discharge module included; pre-mounted for B32344 series	
Case		extruded aluminum can	
Enclosure		IP20, indoor mounting	
Dielectric		polypropylene film	
Impregnation		biodegradable soft resin, semi-dry	
Terminals		SIGUT screw terminals, max current 60 A, max. 16 mm^2 cable cross-section or Fast-On terminals	
Number of switching operations		max. 5000 switchings per year according to IEC 60831-1+/2	

1) Without discharge resistor.

Power Capacitors

Power Capacitors PhiCap 3-phase

Selection and ordering data (Dated 10/2010)

50 Hz	60 Hz	Capacity	Terminal-type	Dimensions	Order No.	PU	PS*/ P. unit	PG	Weight per PU approx.
Output in kVAr	Output in kVAr	in µF 3 x		D * H mm ∅		Unit(s)	Unit(s)		kg
Rated voltage 220 V									
0.4	0.5	9	Fast-On	53 x 114	**4RB2 004-3CC50**	1	12	155	0.300
0.6	0.8	14	Fast-On	53 x 114	**4RB2 006-3CC50**	1	12	155	0.300
0.8	1.0	19	Fast-On	53 x 114	**4RB2 008-3CC50**	1	12	155	0.300
1.2	1.5	28	Fast-On	63.5 x 129	**4RB2 012-3CC50**	1	12	155	0.400
1.7	2.0	37	SIGUT	75 x 138	**4RB2 017-3CC50**	1	6	155	0.400
2.1	2.5	46	SIGUT	75 x 138	**4RB2021-3CC50**	1	6	155	0.400
4.2	5.0	92	SIGUT	75 x 198	**4RB2 042-3CC50**	1	6	155	0.600
6.3	7.5	137	SIGUT	85 x 198	**4RB2 063-3CC50**	1	4	155	0.800
8.3	10.0	183	SIGUT	85 x 273	**4RB2 083-3CC50**	1	4	155	1.200
10.4	12.5	229	SIGUT	85 x 273	**4RB2 104-3CC50**	1	4	155	1.500
12.5	15.0	274	SIGUT	85 x 348	**4RB2 125-3CC50**	1	4	155	1.500
Rated voltage 230 V									
0.5	0.6	10	Fast-On	53 x 114	**4RB2 005-3CD50**	1	6	155	0.300
0.7	0.9	15	Fast-On	53 x 114	**4RB2 007-3CD50**	1	12	155	0.300
1.0	1.2	20	Fast-On	63.5 x 129	**4RB2 010-3CD50**	1	12	155	0.300
1.5	1.8	30	Fast-On	63.5 x 129	**4RB2 015-3CD50**	1	12	155	0.400
2.0	2.4	42	SIGUT	75 x 138	**4RB2 020-3CD50**	1	6	155	0.400
2.5	3.0	50	SIGUT	75 x 138	**4RB2 025-3CD50**	1	6	155	0.400
5.0	6.0	100	SIGUT	85 x 198	**4RB2 050-3CD50**	1	6	155	0.600
7.5	9.0	150	SIGUT	85 x 198	**4RB2 075-3CD50**	1	4	155	0.800
10.0	12.0	200	SIGUT	85 x 273	**4RB2 100-3CD50**	1	4	155	1.200
12.5	15.0	250	SIGUT	85 x 348	**4RB2 125-3CD50**	1	4	155	1.500
15.0	--	300	SIGUT	85 x 348	**4RB2 150-3CD50**	1	4	155	1.600
Rated voltage 240 V									
2.1	2.5	38	SIGUT	75 x 138	**4RB2 021-3CE50**	1	6	155	0.400
2.5	3.0	46	SIGUT	75 x 138	**4RB2 025-3CE50**	1	6	155	0.400
4.2	5.0	77	SIGUT	75 x 160	**4RB2 042-3CE50**	1	6	155	0.600
6.3	7.5	115	SIGUT	75 x 198	**4RB2 063-3CE50**	1	6	155	0.600
6.9	8.3	127	SIGUT	85 x 198	**4RB2 068-3CE50**	1	4	155	0.900
8.3	10.0	154	SIGUT	85 x 198	**4RB2 083-3CE50**	1	4	155	0.900
10.4	12.5	192	SIGUT	85 x 273	**4RB2 104-3CE50**	1	4	155	1.200
12.5	15.0	230	SIGUT	85 x 273	**4RB2 125-3CE50**	1	4	155	1.200
13.9	--	256	SIGUT	85 x 348	**4RB2 140-3CE50**	1	4	155	1.200
Rated voltage 380 V									
0.8	1.0	6	Fast-On	53 x 114	**4RB2 008-3DJ50**	1	12	155	0.300
1.3	1.5	9	Fast-On	53 x 114	**4RB2 013-3DJ50**	1	12	155	0.300
1.7	2.0	13	Fast-On	63.5 x 129	**4RB2 017-3DJ50**	1	12	155	0.400
2.1	2.5	16	Fast-On	63.5 x 129	**4RB2 021-3DJ50**	1	12	155	0.400
4.2	5.0	31	Fast-On	63.5 x 129	**4RB2 042-3DJ50**	1	12	155	0.400
6.3	7.5	46	SIGUT	75 x 160	**4RB2 063-3DJ50**	1	6	155	0.500
8.3	10.0	61	SIGUT	75 x 160	**4RB2 083-3DJ50**	1	6	155	0.500
10.4	12.5	77	SIGUT	75 x 198	**4RB2 104-3DJ50**	1	6	155	0.600
12.5	15.0	92	SIGUT	85 x 198	**4RB2 125-3DJ50**	1	4	155	0.800
16.7	20.0	123	SIGUT	85 x 273	**4RB2 167-3DJ50**	1	4	155	1.200
20.8	25.0	153	SIGUT	85 x 273	**4RB2 208-3DJ50**	1	4	155	1.200
23.0	27.5	168	SIGUT	85 x 348	**4RB2 230-3DJ50**	1	4	155	1.500
25.0	30.0	184	SIGUT	85 x 348	**4RB2 250-3DJ50**	1	4	155	1.500

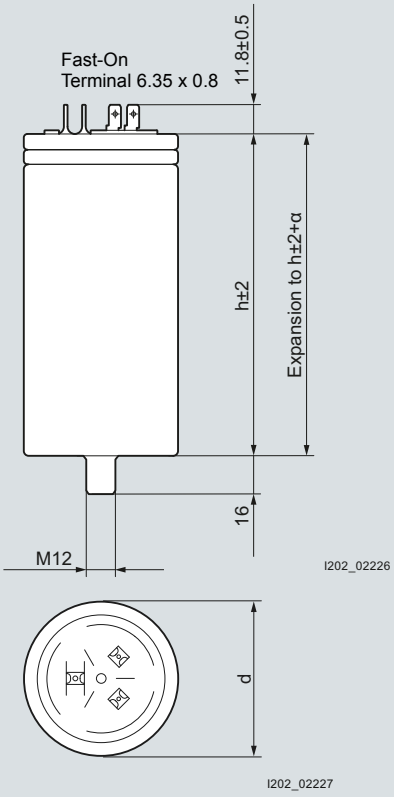
50 Hz	60 Hz	Capacity	Terminal-type	Dimensions	Order No.	PU	PS*/ P. unit	PG	Weight per PU approx.
Output	Output	in µF		D * H					
in kVAr	in kVAr	3 x		mm ∅		Unit(s)	Unit(s)		kg
Rated voltage 400 V									
1.0	1.2	7	Fast-On	53 x 114	**4RB2 010-3EA50**	1	12	155	0.300
1.5	1.8	10	Fast-On	53 x 114	**4RB2 015-3EA50**	1	12	155	0.300
2.0	2.4	13	Fast-On	63.5 x 129	**4RB2 020-3EA50**	1	12	155	0.400
2.5	3.0	17	Fast-On	63.5 x 129	**4RB2 025-3EA50**	1	12	155	0.400
5.0	6.0	33	Fast-On	63.5 x 129	**4RB2 050-3EA50**	1	12	155	0.400
6.3	7.5	42	SIGUT	75 x 160	**4RB2 063-3EA50**	1	6	155	0.500
7.5	9.0	50	SIGUT	75 x 160	**4RB2 075-3EA50**	1	6	155	0.500
8.3	10.0	55	SIGUT	75 x 160	**4RB2 083-3EA50**	1	6	155	0.500
10.0	12.0	67	SIGUT	75 x 198	**4RB2 100-3EA50**	1	6	155	0.600
12.5	15.0	83	SIGUT	85 x 198	**4RB2 125-3EA50**	1	4	155	0.800
15.0	18.0	100	SIGUT	85 x 198	**4RB2 150-3EA50**	1	4	155	0.800
16.7	20.0	111	SIGUT	85 x 198	**4RB2 167-3EA50**	1	4	155	0.800
20.0	24.0	133	SIGUT	85 x 273	**4RB2 200-3EA50**	1	4	155	1.100
25.0	--	166	SIGUT	85 x 273	**4RB2 250-3EA50**	1	4	155	1.500
Rated voltage 415 V									
1.0	1.2	6	Fast-On	53 x 114	**4RB2 010-3EB50**	1	12	155	0.300
1.5	1.8	9	Fast-On	53 x 114	**4RB2 015-3EB50**	1	12	155	0.300
2.0	2.4	13	Fast-On	53 x 114	**4RB2 020-3EB50**	1	12	155	0.400
2.5	3.0	16	Fast-On	63.5 x 129	**4RB2 025-3EB50**	1	12	155	0.400
5.0	6.0	31	Fast-On	63.5 x 154	**4RB2 050-3EB50**	1	12	155	0.400
6.3	7.5	39	SIGUT	75 x 160	**4RB2 063-3EB50**	1	6	155	0.500
7.5	9.0	46	SIGUT	75 x 198	**4RB2 075-3EB50**	1	6	155	0.600
10.0	12.0	62	SIGUT	75 x 198	**4RB2 100-3EB50**	1	6	155	0.600
12.5	15.0	77	SIGUT	85 x 198	**4RB2 125-3EB50**	1	4	155	0.800
15.0	18.0	93	SIGUT	85 x 273	**4RB2 150-3EB50**	1	4	155	1.200
20.0	24.0	123	SIGUT	85 x 273	**4RB2 200-3EB50**	1	4	155	1.200
25.0	--	154	SIGUT	85 x 348	**4RB2 250-3EB50**	1	4	155	1.500
Rated voltage 440 V									
0.9	1.0	5	Fast-On	53 x 114	**4RB2 008-3EE50**	1	12	155	0.300
1.0	1.2	6	Fast-On	53 x 114	**4RB2 010-3EE50**	1	12	155	0.300
1.2	1.5	7	Fast-On	53 x 114	**4RB2 012-3EE50**	1	12	155	0.300
1.5	1.8	8	Fast-On	53 x 114	**4RB2 015-3EE50**	1	12	155	0.300
2.1	2.5	12	Fast-On	53 x 114	**4RB2 021-3EE50**	1	12	155	0.400
2.5	3.0	14	Fast-On	63.5 x 129	**4RB2 025-3EE50**	1	12	155	0.300
4.2	5.0	23	Fast-On	63.5 x 129	**4RB2 042-3EE50**	1	12	155	0.400
5.0	6.0	28	Fast-On	63.5 x 154	**4RB2 050-3EE50**	1	12	155	0.500
6.3	7.5	34	SIGUT	75 x 160	**4RB2 063-3EE50**	1	6	155	0.500
7.5	9.0	41	SIGUT	75 x 160	**4RB2 075-3EE50**	1	6	155	0.500
8.3	10.0	46	SIGUT	75 x 198	**4RB2 083-3EE50**	1	6	155	0.600
10.0	12.0	55	SIGUT	75 x 198	**4RB2 100-3EE50**	1	6	155	0.600
10.4	12.5	57	SIGUT	85 x 198	**4RB2 104-3EE50**	1	6	155	0.600
12.5	15.0	69	SIGUT	85 x 198	**4RB2 125-3EE50**	1	4	155	0.800
15.0	18.0	82	SIGUT	85 x 273	**4RB2 150-3EE50**	1	4	155	1.200
16.7	20.0	92	SIGUT	85 x 273	**4RB2 167-3EE50**	1	4	155	1.200
20.8	25.0	114	SIGUT	85 x 273	**4RB2 208-3EE50**	1	4	155	1.200
25.0	30.0	138	SIGUT	85 x 348	**4RB2 250-3EE50**	1	4	155	1.500
28.0	--	154	SIGUT	85 x 348	**4RB2 280-3EE50**	1	4	155	1.500
30.0	--	165	SIGUT	85 x 348	**4RB2 230-3EE50**	1	4	155	1.600

* You can order this quantity or a multiple thereof.

50 Hz	60 Hz	Capacity	Terminal-type	Dimensions	Order No.	PU	PS*/ P. unit	PG	Weight per PU approx.
Output	Output	in µF		D * H					
in kVAr	in kVAr	3 x		mm ∅		Unit(s)	Unit(s)		kg
Rated voltage 480 V									
1.5	1.8	7	Fast-On	63.5 x 129	**4RB2 015-3EJ50**	1	12	155	0.400
2.0	2.4	9	Fast-On	63.5 x 129	**4RB2 020-3EJ50**	1	12	155	0.400
2.5	3.0	12	Fast-On	63.5 x 129	**4RB2 025-3EJ50**	1	12	155	0.400
4.2	5.0	19	Fast-On	63.5 x 154	**4RB2 042-3EJ51**	1	6	155	0.400
4.2	5.0	19	SIGUT	75 x 160	**4RB2 042-3EJ50**	1	6	155	0.500
5.0	6.0	23	SIGUT	75 x 160	**4RB2 050-3EJ50**	1	6	155	0.500
6.3	7.6	29	SIGUT	75 x 160	**4RB2 063-3EJ50**	1	6	155	0.500
7.5	9.0	35	SIGUT	75 x 198	**4RB2 075-3EJ50**	1	6	155	0.600
8.3	10.0	38	SIGUT	75 x 198	**4RB2 083-3EJ50**	1	6	155	0.600
10.4	12.5	48	SIGUT	85 x 198	**4RB2 104-3EJ50**	1	4	155	0.800
12.5	15.0	58	SIGUT	85 x 198	**4RB2 125-3EJ50**	1	4	155	0.800
15.0	18.0	69	SIGUT	85 x 273	**4RB2 150-3EJ50**	1	4	155	1.200
16.7	20.0	77	SIGUT	85 x 273	**4RB2 167-3EJ50**	1	4	155	1.200
20.8	25.0	96	SIGUT	85 x 273	**4RB2 208-3EJ50**	1	4	155	1.200
25.0	30.0	115	SIGUT	85 x 348	**4RB2 250-3EJ50**	1	4	155	1.500
30.0	--	138	SIGUT	85 x 348	**4RB2 300-3EJ50**	1	4	155	1.500
Rated voltage 525 V									
1.0	1.2	4	Fast-On	53 x 114	**4RB2 010-3FC50**	1	12	155	0.300
1.5	1.8	6	Fast-On	53 x 114	**4RB2 015-3FC50**	1	12	155	0.300
2.0	2.4	8	Fast-On	63.5 x 129	**4RB2 020-3FC50**	1	12	155	0.400
2.5	2.7	10	Fast-On	63.5 x 129	**4RB2 025-3FC50**	1	12	155	0.400
5.0	6.0	19	SIGUT	75 x 160	**4RB2 050-3FC50**	1	6	155	0.400
6.3	7.6	24	SIGUT	75 x 160	**4RB2 063-3FC50**	1	6	155	0.500
8.3	10.0	32	SIGUT	75 x 198	**4RB2 083-3FC50**	1	6	155	0.600
10.4	12.5	40	SIGUT	85 x 198	**4RB2 104-3FC50**	1	4	155	0.800
12.5	15.0	48	SIGUT	85 x 273	**4RB2 125-3FC50**	1	4	155	1.200
16.7	20.0	64	SIGUT	85 x 273	**4RB2 167-3FC50**	1	4	155	1.200
20.0	25.0	80	SIGUT	85 x 348	**4RB2 200-3FC50**	1	4	155	1.500
25.0	30.0	96	SIGUT	85 x 348	**4RB2 250-3FC50**	1	4	155	1.500
Rated voltage 600 V									
4.0	5.0	12	SIGUT	75 x 198	**4RB2 040-3GA50**	1	6	155	0.500
5.3	6.3	16	SIGUT	75 x 198	**4RB2 053-3GA50**	1	6	155	0.500
6.3	7.5	19	SIGUT	75 x 198	**4RB2 063-3GA50**	1	6	155	0.500
7.0	8.3	21	SIGUT	75 x 198	**4RB2 070-3GA50**	1	6	155	0.600
8.3	10.0	25	SIGUT	75 x 198	**4RB2 083-3GA50**	1	6	155	0.600
10.5	12.5	31	SIGUT	85 x 198	**4RB2 105-3GA50**	1	4	155	0.800
12.5	15.0	37	SIGUT	85 x 273	**4RB2 125-3GA50**	1	4	155	0.800
14.0	16.7	41	SIGUT	85 x 273	**4RB2 140-3GA50**	1	4	155	1.200
14.6	17.5	43	SIGUT	85 x 273	**4RB2 146-3GA50**	1	4	155	1.200
16.7	20.0	49	SIGUT	85 x 273	**4RB2 167-3GA50**	1	4	155	1.500
20.8	25.0	62	SIGUT	85 x 348	**4RB2 208-3GA50**	1	4	155	1.500
Rated voltage 660 V									
4.0	5.0	10	SIGUT	75 x 198	**4RB2 040-3GG50**	1	6	155	0.300
6.0	7.5	15	SIGUT	75 x 198	**4RB2 060-3GG50**	1	6	155	0.300
7.0	8.3	17	SIGUT	85 x 198	**4RB2 070-3GG50**	1	6	155	0.500
8.3	10.0	20	SIGUT	85 x 198	**4RB2 083-3GG50**	1	4	155	0.600
10.0	12.5	25	SIGUT	85 x 273	**4RB2 100-3GG50**	1	4	155	0.800
12.5	15.0	30	SIGUT	85 x 273	**4RB2 125-3GG50**	1	4	155	1.100
14.0	16.7	34	SIGUT	85 x 273	**4RB2 140-3GG50**	1	4	155	1.200
15.0	17.5	36	SIGUT	85 x 348	**4RB2 150-3GG50**	1	4	155	1.500
16.7	20.0	41	SIGUT	85 x 348	**4RB2 167-3GG50**	1	4	155	1.500

* You can order this quantity or a multiple thereof.

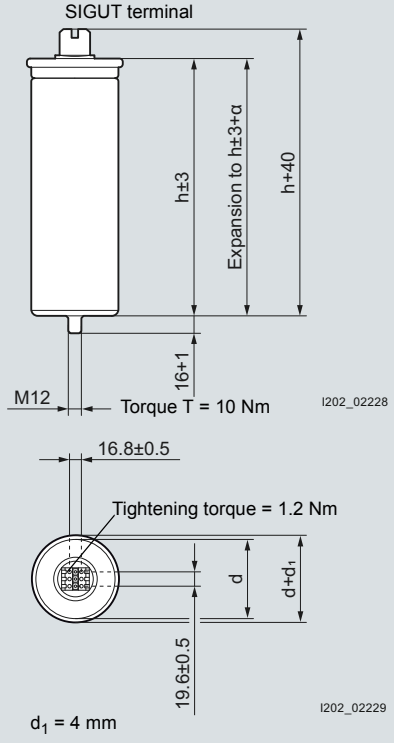
Dimensional drawings: three-phase capacitors



Creepage distance	10.5 mm (∅ 53) 10.0 mm (∅ 63.5)
Clearance	13.0 mm (∅ 53) 16.5 mm (∅ 63.5)
Diameter (∅)	53.0 mm 63.5 mm
Expansion α	max. 12 mm

Mounting

	M12 (∅ 63.5 mm)	M8 (∅ 53.0 mm)
Torque	T = 10 Nm	T = 4 Nm
Toothed washer	J12.5 DIN 6797	J8.0 DIN 6797
Hex nut	BM12 DIN 439	BM8 DIN 439



Creepage distance	9.6 mm
Clearance	12.7 mm
Diameter d (∅)	79.5 mm / 89.5 mm
Diameter d1 (∅)	75.0 mm / 85.0 mm
Expansion α	max. 13 mm

Mounting

	M12	M5
Torque	T = 10 Nm	T = 2.5 Nm
Toothed washer	J12.5 DIN 6797	
Hex nut	BM12 DIN 439	

Power Capacitors

Power Capacitors PhiCap 1-phase

Selection and ordering data (Dated 10/2010)

50 Hz	60 Hz	Capacity	Terminal-type	Dimensions	Order No.	PU	PS*/ P. unit	PG	Weight per PU approx.
Output in kVAr	Output in kVAr	in µF 1 x		D * H mm ∅		Unit(s)	Unit(s)		kg
Rated voltage 220 V									
0.7	0.8	45	Fast-On	63.5 x 105	**4RB2 007-1CC50**	1	12	155	0.300
1.4	1.7	91	Fast-On	63.5 x 142	**4RB2 014-1CC50**	1	12	155	0.400
1.7	2.0	110	Fast-On	63.5 x 142	**4RB2 017-1CC50**	1	12	155	0.400
2.1	2.5	137	Fast-On	63.5 x 142	**4RB2 021-1CC50**	1	12	155	0.500
2.3	2.7	150	Fast-On	63.5 x 142	**4RB2 023-1CC50**	1	12	155	0.500
2.8	3.3	183	Fast-On	63.5 x 142	**4RB2 028-1CC50**	1	12	155	0.500
Rated voltage 230 V									
0.8	1.0	50	Fast-On	63.5 x 105	**4RB2 008-1CD50**	1	12	155	0.300
1.7	2.0	101	Fast-On	63.5 x 142	**4RB2 017-1CD50**	1	12	155	0.400
2.5	3.0	151	Fast-On	63.5 x 142	**4RB2 025-1CD50**	1	12	155	0.500
Rated voltage 380 V									
0.7	0.8	15	Fast-On	63.5 x 68	**4RB2 007-1DJ50**	1	12	155	0.300
1.4	1.7	31	Fast-On	63.5 x 68	**4RB2 014-1DJ50**	1	12	155	0.300
2.1	2.5	46	Fast-On	63.5 x 105	**4RB2 021-1DJ50**	1	12	155	0.400
2.8	3.3	62	Fast-On	63.5 x 105	**4RB2 028-1DJ50**	1	12	155	0.400
4.2	5.0	91	Fast-On	63.5 x 142	**4RB2042-1DJ50**	1	12	155	0.400
Rated voltage 400 V									
0.8	1.0	16	Fast-On	63.5 x 68	**4RB2 008-1EA50**	1	12	155	0.300
1.7	2.0	34	Fast-On	63.5 x 68	**4RB2 017-1EA50**	1	12	155	0.300
2.5	3.0	50	Fast-On	63.5 x 105	**4RB2 025-1EA50**	1	12	155	0.400
3.3	4.0	67	Fast-On	63.5 x 105	**4RB2 033-1EA50**	1	12	155	0.400
4.2	5.0	83	Fast-On	63.5 x 142	**4RB2 042-1EA50**	1	12	155	0.400
5.0	6.0	99	Fast-On	63.5 x 142	**4RB2 050-1EA50**	1	12	155	0.500
Rated voltage 415 V									
0.8	1.0	16	Fast-On	63.5 x 68	**4RB2 008-1EB50**	1	12	155	0.300
1.7	2.0	31	Fast-On	63.5 x 105	**4RB2 017-1EB50**	1	12	155	0.400
2.5	3.0	46	Fast-On	63.5 x 105	**4RB2 025-1EB50**	1	12	155	0.500
3.3	4.0	62	Fast-On	63.5 x 142	**4RB2 033-1EB50**	1	12	155	0.500
5.0	6.0	92	Fast-On	63.5 x 142	**4RB2 050-1EB50**	1	12	155	0.600
Rated voltage 440 V									
0.7	0.8	12	Fast-On	63.5 x 68	**4RB2 007-1EE50**	1	12	155	0.300
1.4	1.7	23	Fast-On	63.5 x 68	**4RB2014-1EE50**	1	12	155	0.300
2.1	2.5	35	Fast-On	63.5 x 105	**4RB2 021-1EE50**	1	12	155	0.400
2.8	3.3	46	Fast-On	63.5 x 105	**4RB2 028-1EE50**	1	12	155	0.400
3.3	4.0	55	Fast-On	63.5 x 142	**4RB2 033-1EE50**	1	12	155	0.500
4.2	5.0	69	Fast-On	63.5 x 142	**4RB2 042-1EE50**	1	12	155	0.500
5.0	6.0	82	Fast-On	63.5 x 142	**4RB2 050-1EE50**	1	12	155	0.600
Rated voltage 480 V									
0.7	0.8	1	Fast-On	63.5 x 105	**4RB2 007-1EJ50**	1	12	155	0.300
1.4	1.7	19	Fast-On	63.5 x 105	**4RB2 014-1EJ50**	1	12	155	0.300
2.1	2.5	29	Fast-On	63.5 x 105	**4RB2 021-1EJ50**	1	12	155	0.500
2.8	3.3	39	Fast-On	63.5 x 142	**4RB2 028-1EJ50**	1	12	155	0.500
4.2	5.0	58	Fast-On	63.5 x 142	**4RB2 042-1EJ50**	1	12	155	0.500

* You can order this quantity or a multiple thereof.

Power Capacitors PhiCap 1-phase and Accessories

Selection and ordering data (Dated 10/2010)

50 Hz	60 Hz	Capacity	Terminal-type	Dimensions	Order No.	PU	PS*/ P. unit	PG	Weight per PU approx.
Output in kVAr	Output in kVAr	in µF 1 x		D * H mm ∅		Unit(s)	Unit(s)		kg
Rated voltage 525 V									
1.4	1.7	16	Fast-On	63.5 x 105	**4RB2 014-1FC50**	1	12	155	0.300
2.8	3.3	31	Fast-On	63.5 x 142	**4RB2 028-1FC50**	1	12	155	0.500
3.3	4.0	38	Fast-On	63.5 x 142	**4RB2 033-1FC50**	1	12	155	0.600
4.2	5.0	49	Fast-On	63.5 x 142	**4RB2 042-1FC50**	1	12	155	0.700

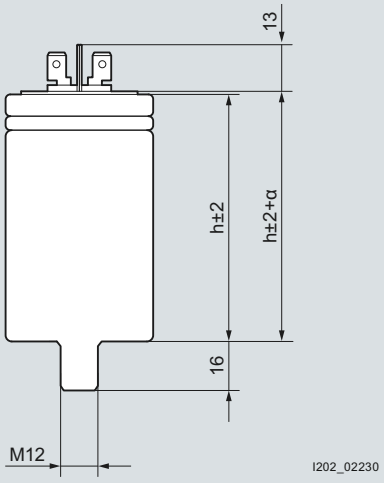
Accessories

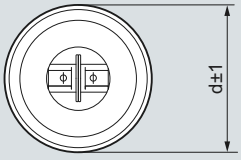
Cable gland	Dimensions	Order No.	PU	PS*/ P. unit	PG	Weight per PU approx.
Size	D*H mm ∅		Unit(s)	Unit(s)		kg
Plastic protection cover PhiCap						
	Can diameter					
PG 13.5	53[1)]	**4RB9 313-0AF00**	1	1	155	0.090
PG 16	64[1)]	**4RB9 316-0AG00**	1	1	155	0.100
PG 21	75	**4RB9 321-0AH00**	1	1	155	0.030
PG 21	85	**4RB9 321-0AJ00**	1	1	155	0.040

1) For diameter 53.0 and 63.5 mm, terminal covers with cable entry on top. For IP54 additional cable gland at cable entry required.

* You can order this quantity or a multiple thereof.

Dimensional drawings: single-phase capacitors



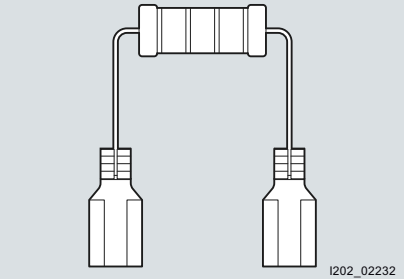


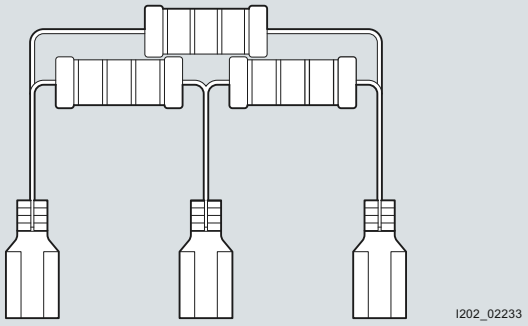
Creepage distance	10.0 mm
Clearance	16.5 mm
Diameter (∅)	63.5 mm
Expansion α	max. 12 mm

Mounting

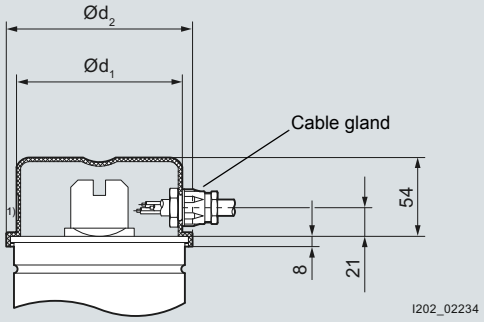
	M12
Torque	T = 10 Nm
Toothed washer	J12.5 DIN 6797
Hex nut	BM12 DIN 439

Discharge resistors





Protective cover for terminal, protection class / IP54



1) Perforation for second cable gland

∅ in mm	MLFB Code
53.0	4RB9313-0AF00*
63.5	4RB9316-0AG00*
75	4RB9321-0AH00
85	4RB9321-0AJ00

* For B32340- and B32343-series (diameter 53.0 and 63.5 mm), terminal covers with cable entry on top

For IP54 additional cable gland at cable entry required.

Power Capacitors

Power Capacitors MKV 3-phase

Overview

The winding element of the MKV capacitor consists of a dielectric of polypropylene film and an electrode of double-sided metalized paper.

This winding construction achieves low losses and a high pulse-current withstand capability. Oil is used for impregnation of the capacitor.

The oil impregnation (due to the paper film) enables good heat dissipation from the winding element to the aluminum can's surface, thus preventing hot spots in the winding element.

The capacitor is designed to cover ambient temperatures of up to 70 °C max

Applications

- Power Factor Correction to improve the power quality
  - Applications with high thermal loading
  - PFC systems dealing with high harmonic loads
- AC applications in industrial electronics, e.g. high dv/dt
- Tuned harmonic filter

Benefits

Electrical

- Long life expectancy (up to 300000 h)
- Maximum pulse current withstand capability (up to 500 · I_R)

Mechanical and maintenance

- Easy installation and connection
- Maintenance-free

Safety

- Self-healing
- Overpressure disconnector
- Shock hazard protected terminals

Technical specifications

		MKV 3 ph
Standards		IEC 60831-1+2
Overvoltage	V_{max}	V_R + 10 % (up to 8 h daily) / V_R + 15 % (up to 30 min daily) / V_R + 20 % (up to 5 min daily) / V_R + 30 % (up to 1 min daily)
Overcurrent	I_{max}	up to 3 · I_R depending on the exact capacitor type (including combined effects of harmonics, overvoltages and capacitance tolerance)
Inrush current	I_s	up to 500 · I_R
Losses		
• Dielectric		< 0.2 W/kvar
• Total[1)]		< 0.35 W/kvar
Rated frequency	f	50 / 60 Hz
Capacitance tolerance		–5 % / +10 %
Test voltage, terminal / terminal	V_{TT}	2.15 · V_{R1}, AC, 10 s
Test voltage, terminal / case	V_{TC}	up to V_R ≤ 500 V: 3000 V AC, 10 s, above V_R = 500 V: 4000 V AC, 10 s
Mean life expectancy	$t_{LD(Co)}$	up to 300000 h @ temperature class -40/D
Ambient temperature		up to 70 °C environmental temperature permanently[2)] Temperature class -40/D: max. mean 24 h = 45 °C; max. mean 1 year = 35 °C; lowest temperature = -40 °C
Cooling		natural or forced
Humidity	H_{rel}	max. 95 %
Altitude		max.4000 m above sea level
Mounting position		upright or horizontal
Mounting and grounding		threaded M12 stud on bottom of case
Safety		overpressure disconnector, self-healing
Discharge module		discharge module pre-mounted
Case		extruded aluminum can
Enclosure		IP20, indoor mounting (optionally with terminal cap for IP54)
Dielectric		polypropylene film with paper as electrode carrier
Impregnation		oil
Terminals		SIGUT terminal strip with electric shock protection (IP20), (VDE 0106 part 100), max. 16 mm^2 cable cross-section, max. current 50 A
Number of switching operations		max. 20000 switchings per year according to IEC 60831-1+/2 max. 50000 switchings per year according to IEC 60831-1+/2 in case standard PFC reactors are additionally applied

1) Without discharge resistor.

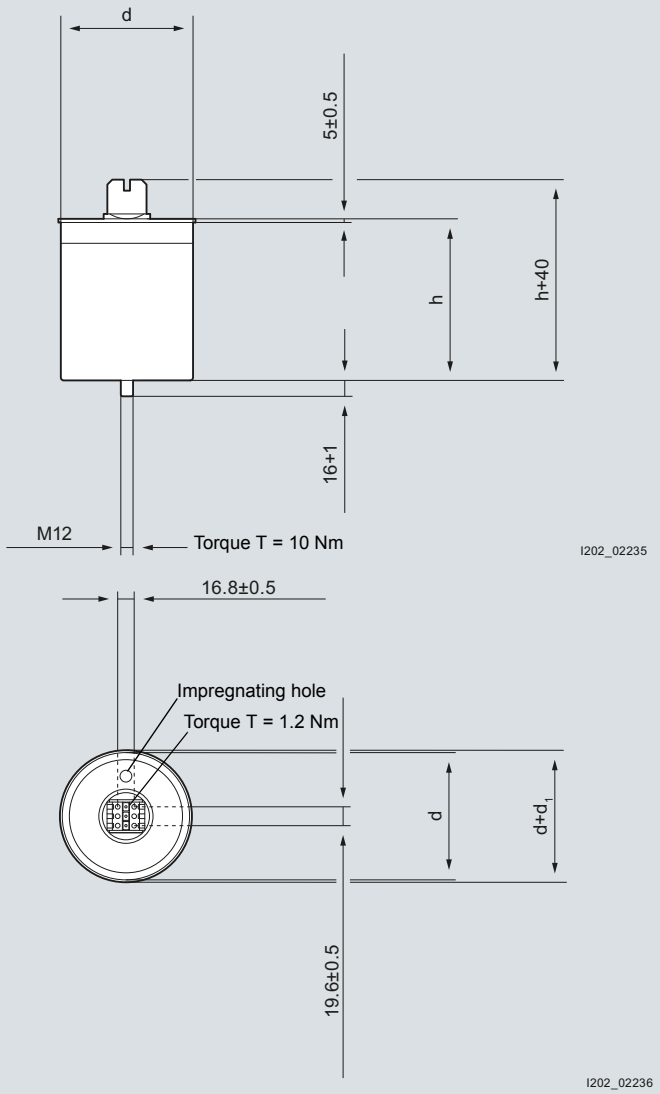
2) Inflicting an respective shorter life time.

Selection and ordering data (Dated 10/2010)

50 Hz	60 Hz	Capacity	Dimensions	Order No.	PU	PS*/ P. unit	PG	Weight per PU approx.
Output	Output	in µF	D * H					
in kVAr	in kVAr	3 x	mm ∅		Unit(s)	Unit(s)		kg
Rated voltage 400 V								
5.0	6.0	33	75 x 248	**4RB3 050-3EA50**	1	5	155	1.300
10.0	12.0	66	116 x 248	**4RB3 100-3EA50**	1	2	155	3.100
12.5	15.0	83	116 x 248	**4RB3 125-3EA50**	1	2	155	3.100
15.0	18.0	100	116 x 248	**4RB3 150-3EA50**	1	2	155	3.100
20.0	24.1	133	116 x 325	**4RB3 200-3EA50**	1	2	155	4.500
25.0	30.0	166	116 x 325	**4RB3 250-3EA50**	1	2	155	4.500
Rated voltage 440 V								
6.1	7.3	33	75 x 248	**4RB3 061-3EE50**	1	5	155	1.300
12.1	14.5	66	116 x 248	**4RB3 121-3EE50**	1	2	155	3.100
15.1	18.2	83	116 x 248	**4RB3 151-3EE50**	1	2	155	3.100
20.2	24.2	111	116 x 325	**4RB3 202-3EE50**	1	2	155	4.500
25.0	30.0	137	116 x 325	**4RB3 250-3EE50**	1	2	155	4.500
Rated voltage 480 V								
4.2	5.0	19	75 x 248	**4RB3 042-3EJ50**	1	2	155	1.300
10.4	12.5	48	116 x 248	**4RB3 104-3EJ50**	1	2	155	3.100
12.6	15.1	58	116 x 248	**4RB3 125-3EJ50**	1	2	155	3.100
15.0	18.0	69	116 x 248	**4RB3 150-3EJ50**	1	2	155	3.100
20.0	24.0	92	116 x 325	**4RB3 200-3EJ50**	1	2	155	4.500
25.0	30.0	115	116 x 325	**4RB3 250-3EJ50**	1	2	155	4.500
Rated voltage 525 V								
5.0	6.0	19	75 x 248	**4RB3 050-3FC50**	1	2	155	1.300
10.0	12.0	39	95 x 248	**4RB3 100-3FC50**	1	4	155	2.100
12.5	15.0	48	116 x 248	**4RB3 125-3FC50**	1	2	155	3.100
15.1	18.1	58	116 x 248	**4RB3 151-3FC50**	1	2	155	3.100
20.0	24.0	77	116 x 325	**4RB3 200-3FC50**	1	2	155	4.500
25.0	30.0	96	116 x 325	**4RB3 250-3FC50**	1	2	155	4.500
Rated voltage 600 V								
10.4	12.5	31	116 x 248	**4RB3 104-3GA50**	1	2	155	3.100
Rated voltage 690 V								
5.0	6.0	11	75 x 248	**4RB3 050-3GK50**	1	2	155	1.300
10.1	12.1	23	95 x 248	**4RB3 101-3GK50**	1	2	155	2.100
12.5	15.0	28	116 x 248	**4RB3 125-3GK50**	1	2	155	3.100
15.0	18.0	34	116 x 248	**4RB3 150-3GK50**	1	2	155	3.100
20.0	24.0	45	116 x 325	**4RB3 200-3GK50**	1	2	155	4.500
25.0	30.0	56	116 x 325	**4RB3250-3GK50**	1	2	155	4.500
Rated voltage 800 V								
5.0	6.0	8	75 x 248	**4RB3 050-3JA50**	1	2	155	1.300
10.0	12.0	17	116 x 248	**4RB3 100-3JA50**	1	2	155	3.100
12.7	15.2	21	116 x 248	**4RB3 127-3JA50**	1	2	155	3.100
15.0	18.0	25	116 x 248	**4RB3 150-3JA50**	1	2	155	3.100
16.9	20.3	28	116 x 325	**4RB3 168-3JA50**	1	2	155	4.500
20.0	24.0	33	116 x 325	**4RB3 200-3JA50**	1	2	155	4.500

* You can order this quantity or a multiple thereof.

Dimensional drawings



d_1 = 2 ... 6 mm (depending on the capacitor type; for details please refer to the data sheet)

Creepage distance 12.7 mm min.
Clearance 9.6 mm min.

Power Components

Product overview

Overview

Devices		Page	Field of application	Standards	Used in		
					Non-residential buildings	Residential buildings	Industry
	**Controllers**	37	• set up pf required power factor • controlling capacitor banks • monitoring power quality • communication in complex PFC systems	IEC 61010-1 EN 50082-1 IEC 61000-4-2 IEC 61000-4-4	✓	--	✓
	**Capacitor Contactors**	46	• switching of capacitor banks	IEC 60947/EN 60947 (VDE 0660)	✓	--	✓
	**Dynamic Components**	50	• ultra fast PFC, within 1ms reaction time • for welding robots and machines	SEN 60947-4-3	✓	--	✓
	Current limiting products	54	• protection of equipment • enhancing of mean life expectancy of PFC system	IEC 60831	✓	--	✓

Overview

Controllers for PFC are of major importance in the PFC system. They measure the actual power factor and connect or disconnect capacitor stages to achieve a specific desired value (cos φ).

The PF controller series BR604 (four stages) and BR6000 (six and twelve stages) offer highly intelligent control behavior and are very user-friendly thanks to menu-driven handling (plain language). Their multifunctional display greatly simplifies installation, handling and maintenance.

Different versions of the BR6000 series provide solutions to various applications:

- BR6000-R6 and BR6000-R12 for conventional applications with slowly changing loads (optionally with RS485 interface)
- BR6000-T6 and BR6000-T12 for dynamic PFC in applications with fast-changing loads
- BR6000-T6R6 for mixed PFC systems with both slowly and fast-changing loads (optionally with RS485 interface)
- BR7000 offers the next generation in PFC controllers and is a consequent follow-up developement of the well proven series BR6000. The main distinctive feature is the new 3-pases measuring system. Due to the 3-phases recording of voltage and curent the device allows a convenient usage as grid measuring device and power factor controller. Beside the functions of BR6000 series which are aboard, the new BR7000 provides also an integrated Help-button and ESCape-button for easier menu handling and programming. The usage of a fully graphic support display allows an additional oscilloscope-mode where the phases (half waves) of voltage and current can graphically be displayed.

PF controllers BR6000-F, S, T even allow coupling, for instance in cascading two systems with two inputs and a single coupling switch.

Cautions

Discharge time: Make sure that the discharge time set in controller matches the capacitor discharge time.

Number of switchings: Power capacitors according to standard IEC 60831 are designed for up to 5000 switching operations. Make sure that 5000 switching operations per year are not exceeded.

Controller hunting must be avoided at any case.

Accessories: adapter for PF controller BR6000

This adapter is used to align the PF controller BR6000 to grids without neutral conductor. To achieve this, input of the adapter is connected to the three phases of the grid, and the output is connected to the measuring voltage input of the controller.

The voltage at the measuring input must not exceed 525 V. At output "1/2 L1" half measuring voltage the L-N is disposable.

Accessories: USB to RS485 converter

USB to RS485 converter to connect the power factor controller BR6000 or other devices with Interface RS485 to a PC with USB interface. Connection of several devices at RS485 possible.

Benefits

- Display
  - Large and multifunctional LCD (2 x 16 characters)
  - Graphic and alphanumeric
  - LCD illumination[1)]
- Intelligent control
- Menu-driven handling (plain language)
- Self-optimizing control capability
- Recall function of recorded values
- Four-quadrant operation (e.g. stand-by generator
- Large measuring voltage range[1)]
- Powerful alarm output[1)]
- Display of numerous of system parameters
  - System voltage (V AC)
  - Reactive power (kvar)
  - Active power (kW)
  - Frequency[1)]
  - THD-V, THD-I*
  - Individual harmonics up to 19th[1)]
  - Monitoring of individual capacitor currents[1)]
  - Apparent power (kVA)
  - Apparent current (A)
  - Temperature (°C)[1)]
  - Real-time cos φ
  - Target cos φ
  - kvar value to target cos φ
- Alarm output[1)]
  - Insufficient compensation
  - Overcompensation
  - Undercurrent
  - Overcurrent
  - Overtemperature
  - Harmonics exceeded
  - Threshold value programmable
  - Internal error storage
  - Programming of 2nd signal relay random
- Recall recorded values
  - Number of contactor switching operations[1)]
  - Maximum voltage V (Vmax)
  - Maximum reactive power, Q (kvar)
  - Maximum value of harmonic[1)]
  - Maximum active power, P (kW)
  - Maximum apparent power, S (kVA)
  - Maximum temperature (°C)[1)]
  - Operation time of all capacitors[1)]
- Complete 2nd parameter set available[1)]
- Automatic initialization[1)]
- Dynamic PFC (transistor output)[1)]
  - Thyristor switching

[1)] Only for BR6000/BR7000 series.

Technical specifications

	BR604	BR6000-R6	BR6000-R6 110 V	BR6000-T6	BR6000-R12	BR6000-R12 110 V	BR6000-T12
Supply voltage	230 V AC		110 V AC	230 V AC		110 V AC	230 V AC
Measurement voltage range	= supply voltage: 230 V AC (L-N)	30 ... 300 V AC (i.e. 50 ... 525 V phase to phase)					
LCD illumination	no	yes					
Plain language	German/English	Czech / Dutch / English / French / German / Polish / Russian / Spanish / Portuguese					
Number of relay outputs	4	6		--	12		--
Number of transistor outputs	--	--		6	--		12
Alarm output	no	yes					
• Insuffient compensation	n/a	yes					
• Overcompensation	n/a	yes					
• Undercurrent	n/a	yes					
• Overcurrent	n/a	yes					
Switchover target cos φ 1/2	n/a	no					
Automatic initialization	n/a	yes					
Complete 2nd parameter set programmable / switchable	n/a	yes					
Test-run of complete PFC system	n/a	yes					
Interface	no						
Parameters displayed							
• System voltage	yes						
• Reactive power	yes						
• Active power	yes						
• Frequency	no	yes					
• THD-V, THD-I	no	yes					
• Individual harmonics up to 19th	no	yes					
• Monitoring of individual capacitor currents	no	yes					
• Apparent power	yes						
• Apparent current	yes						
• Temperature ° C / ° F	no	yes					
• Real time cos φ	yes						
• Target cos φ	yes						
• kvar value to target cos φ	yes						
Recall recorded values							
• Number of contactor switching operations	no	yes					
• Maximum voltage	yes						
• Maximum active power	yes						
• Maximum reactive power	yes						
• Maximum value of harmonic	no	yes					
• Maximum apparent power	yes						
• Maximum temperature (° C)	no	yes					
• Operation time of all capacitors	no	yes					
Switching and discharge time range	1 … 255 seconds	1 … 1200 seconds					
Number of control series	23 series preset	20 series preset and control series editor for free programming					
Weight	0.5 kg	1 kg					
Dimensions	100 x 100 x 40 mm	144 x 144 x 55 mm					
Suitable for dynamic PFC	no			yes	no		yes

	BR6000-R12/F	BR6000-R12/S485	BR6000-T6R6	BR6000-T6R6/S485	BR6000-T12/S485	BR7000-R15/S485
Supply voltage	230 V AC					
Measurement voltage range	30 ... 300 V AC (i.e. 50 ... 525 V phase to phase)					30 ... 440 V AC
LCD illumination	yes					
Plain language	Czech / Dutch / English / French / German / Polish / Russian / Spanish / Portuguese					English / German / Spanish / Russian / Turkish
Number of relay outputs	12		6		—	15
Number of transistor outputs	--		6		—	--
Alarm output	yes					
• Insuffient compensation	yes					
• Overcompensation	yes					
• Undercurrent	yes					
• Overcurrent	yes					
Switchover target cos φ 1/2	yes					
Automatic initialization	yes					
Complete 2nd parameter set programmable / switchable	yes					
Test-run of complete PFC system	yes					
Interface	no	R485	no	RS485		
Parameters displayed						
• System voltage	yes					
• Reactive power	yes					
• Active power	yes					
• Frequency	yes					
• THD-V, THD-I	yes					
• Individual harmonics up to 19th	yes					
• Monitoring of individual capacitor currents	yes					
• Apparent power	yes					
• Apparent current	yes					
• Temperature ° C / ° F	yes					
• Real time cos φ	yes					
• Target cos φ	yes					
• kvar value to target cos φ	yes					
Recall recorded values						
• Number of contactor switching operations	yes					
• Maximum voltage	yes					
• Maximum active power	yes					
• Maximum reactive power	yes					
• Maximum value of harmonic	yes					
• Maximum apparent power	yes					
• Maximum temperature (° C)	yes					
• Operation time of all capacitors	yes					
Switching and discharge time range	1 … 1200 seconds					
Number of control series	20 series preset and control series editor for free programming					
Weight	1 kg					
Dimensions	144 x 144 x 55 mm					144 x 144 x 60 mm
Suitable for dynamic PFC	no		yes			

	Adapter for PF controller BR6000
Design	compact form, all connections as screw type clamp
Mounting	snap on top hat rail
Technical data	
- Input voltage	grid without neutral max. 3 x 525 V
- Output voltage 1	L1-N
- Output voltage 2	1/2 L1-N (to use this output, a V-transformer ratio of 2 has to be programmed on the BR6000)
- Protection	necessary external according to cable cross-section
- Max. ambient temperature	-20 ... 55 °C
Dimensions	height 76 mm, width 45 mm, depth 110 mm

	USB to RS485 converter
Design	compact form in plastic casing
Dimensions	height 28 mm, width 66 mm, depth 66 mm
Weight	approx. 0.1 kg
Connection	RS485 four pole terminal with mating plug for 1:1-conncection with BR6000
Signals	A, B, GND
USB	USB-B standard bushing, one USB cable 1 m length included in delivery
Power supply	via USB-connection of the PC
Power consumption	auxiliary power approx. 40 mA, depending on number of connected devices and cable length
Compatibility	USB 2.0, downward compatible
Configuration	Plug and play
Ambient temperature	-10 … 60 °C
Storage temperature	-20 ... 75 °C

Selection and ordering data (Dated 10/2010)

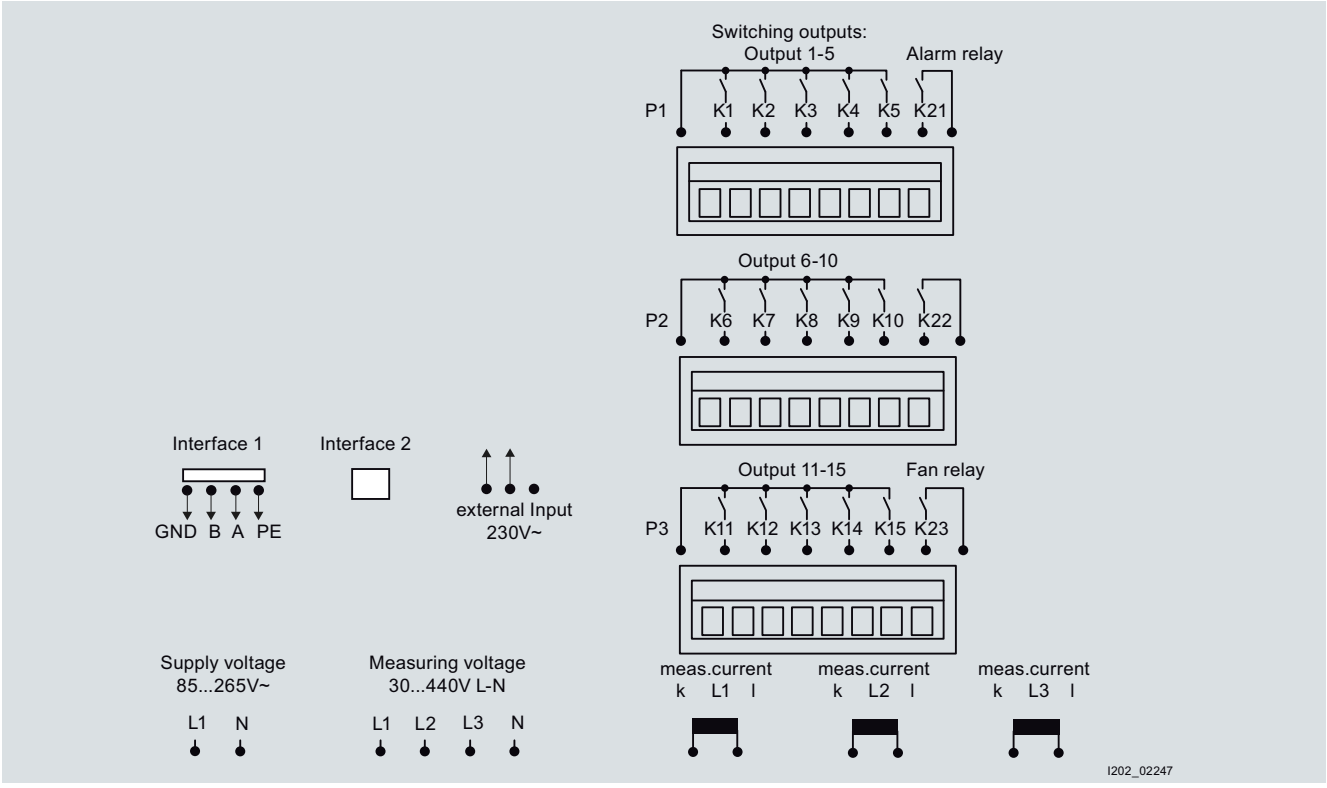
	Measurement voltage range	Dimensions	Order No.	PU	PS*/ P. unit	PG	Weight per PU approx.
		mm		Unit(s)	Unit(s)		kg
	**BR604-R4, 4 steps standard**						
	230 V AC (L-N)	100 x 100 x 40	**4RB9 504-1CD50**	1	1	155	0.500
	BR6000-R6, 6 steps standard						
	30 ... 300 V AC	144 x 144 x 55	**4RB9 506-1CD50**	1	1	155	1.000
	BR6000-R12, 12 steps standard						
	30 ... 300 V AC	144 x 144 x 55	**4RB9 512-1CD50**	1	1	155	1.000
	BR6000-R6, 6 steps standard -110V						
	30 ... 300 V AC	144 x 144 x 55	**4RB9 506-1BB50**	1	1	155	1.000
	BR6000-R12, 12 steps standard - 110V						
	30 ... 300 V AC	144 x 144 x 55	**4RB9 512-1BB50**	1	1	155	1.000
	BR6000-T6, 6 steps Dynamic						
	30 ... 300 V AC	144 x 144 x 55	**4RB9 506-2CD50**	1	1	155	1.000
	BR6000-T12, 12 steps Dynamic						
	30 ... 300 V AC	144 x 144 x 55	**4RB9 512-2CD50**	1	1	155	1.000
	BR6000-R12/F, with 2nd alarm relay						
	30 ... 300 V AC	144 x 144 x 55	**4RB9 512-3CD50**	1	1	155	1.000
	BR6000-R12/S485, 12 steps RS485+Software						
	30 ... 300 V AC	144 x 144 x 55	**4RB9 512-4CD50**	1	1	155	1.000
	BR6000-T12/RS485 - 12 steps dynamic - RS485+Software						
	30 ... 300 V AC	144 x 144 x 55	**4RB9 512-5CD50**	1	1	155	1.000
	BR6000-T6R6 - 6steps standard/ 6steps dynamic						
	30 ... 300 V AC	144 x 144 x 55	**4RB9 512-6CD50**	1	1	155	1.000
	BR6000-T6R6 - 6steps standard/ 6steps dynamic RS485+Software						
	30 ... 300 V AC	144 x 144 x 55	**4RB9 512-7CD50**	1	1	155	1.000
	BR7000-R15/S485, 15 steps RS 485+Software						
	30 ... 440 V AC	144 x 144 x 60	**4RB9 515-4CD50**	1	1	155	1.000

	Ambient temperature	Dimensions	Order No.	PU	PS*/ P. unit	PG	Weight per PU approx.
		mm		Unit(s)	Unit(s)		kg
	BR6000 Hut rail mounting adapter (set; 2pcs)						
	-20 ... 55 °C	76 x 45 x 110	**4RB9 500-1AA00**	1	1	155	0.200
	RS485 to USB adapterfor controller with Interface						
	-10 ... 60 °C	28 x 66 x 66	**4RB9 500-2AA00**	1	1	155	0.100

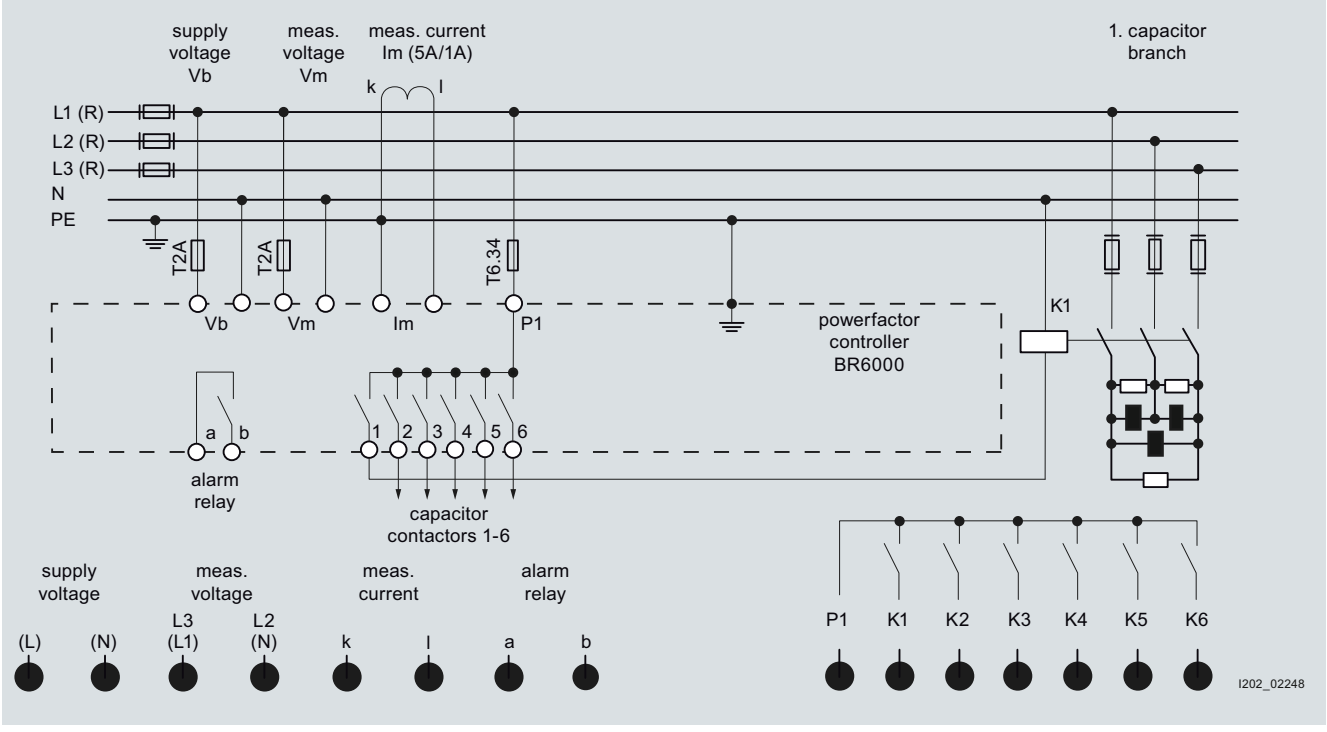
* You can order this quantity or a multiple thereof.

Dimensional drawings

PF controller BR6000



PF controller BR7000



Power Components

Multi Measuring Interface MMI6000

Overview

The MMI6000 is an external meter combining many devices in one. Combined with a PF controller BR6000 or BR6000-T (V4.0), the MMI6000 monitors the input lead of the PFC system. Both available versions

- standard version with a standard relay MMI6000R
- dynamic version with optocoupler MMI6000T

feature an interface RS485, allowing the processing of measured parameters via PC.

It allows direct recognition of dangerous network conditions and will switch off capacitor steps as long as the potential hazardous situation exists.

This means an additional protection for the capacitor as well as for the complete PFC system. As a standalone-device, the MMI6000 can also operated as a meter, a signal trigger or as a switch for a single PFC step.

Menu driven handling (plain language) in English and German.

Benefits

Applications

- MMI6000R / MMI6000T Coupling MMI6000 – BR6000-R via RS485 interface
  - Genuine monitoring of the particular capacitor currents offers additional protection for the whole PFC system.
- Coupling MMI6000 – BR6000-T via RS485 interface
  - All stages switched by TSM-thyristor switches monitored in real time for additional protection of switches and PFC system.
- MMI6000 – Modbus RTU
  - Usage as separate measuring device allows display of all network parameters and delivery via Modbus-RTU-protocol.
- MMI6000 – ASCII OUT
  - Measured values are provided in ASCII code via interface; usage also as a trigger relay.
- MMI6000T Dyna-I-trigger
  - Triggering of TSM-thyristor switches in real time, providing the switching within 1 ms.

- Compact dimensions
- Panel mounting instrument
- LCD-Display, English/German
- Indication of various parameters:
  - Voltage
  - Current
  - Power factor
  - Active power
  - Reactive power
  - Apparent power
  - Frequency
  - Temperature
  - Energy
- Storage of maximum values:
  - Voltage
  - Current
  - Active power
  - Reactive power
  - Apparent power
  - Temperature
  - Energy

Technical specifications

	Multi Measuring Interface (MMI6000)
Weight	0.5 kg
Case	panel mounting instrument 100 x 100 x 45 mm
Interface	RS485/4-pole terminal
Output capacity: - MMI6000-R - MMI6000-T	 250 V AC, 1,000 W 60 V DC, 150 mA
Display	graphical, 2 x 16 characters, illuminated
Supply and measuring voltage	230 V AC
Frequency	50 / 60 Hz
Power consumption	< 4 VA
Measurement current	X/5 A and X/1 A
Measuring temperature range	0 ... 100 °C
Ambient temperature range	-10 ... 55 °C
Storage temperature range	-20 ... 75 °C
Overvoltage class	II
Pollution degree	2
Humidity class	15 % ... 95 % without dew
Mounting position	Any
Protection class to IEC 60529	Front IP54, Rear IP20
Safety guidelines	IEC 61010-1 : 2001, EN 61010-1 : 2001
Sensitivity to interferences (industrial areas)	IEC 61000-4-2 : 8 kV, IEC 61000-4-4 : 4 kV

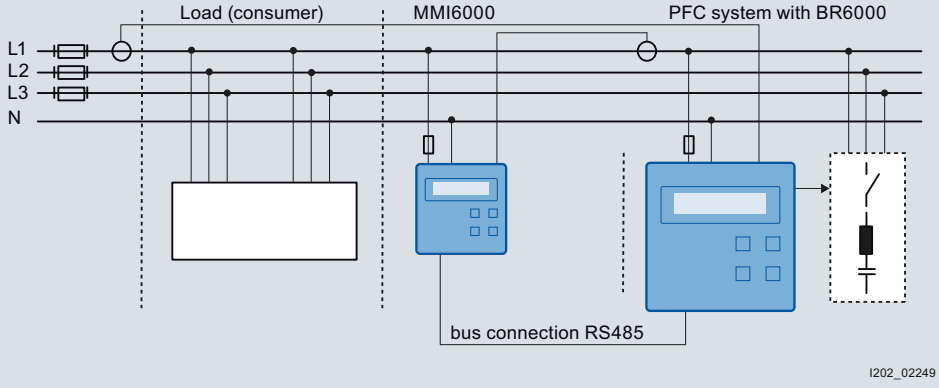
Selection and ordering data (Dated 10/2010)

	Ambient temperature	Dimensions	Order No.	PU	PS*/ P. unit	PG	Weight per PU approx.
		mm		Unit(s)	Unit(s)		kg
	**MMI6000-Relay Multi Measuring Interface**						
	-10 ... 55 °C	100 x 100 x 45	**4RB9 500-3CD50**	1	1	155	0.500
	MMI6000-Opto Multi Measuring Interface						
	-10 ... 55 °C	100 x 100 x 45	**4RB9 500-4CD50**	1	1	155	0.500

* You can order this quantity or a multiple thereof.

Dimensional drawings

MMI6000



Power Components

3RT16 Capacitor Contactors

Overview

AC operation

IEC 60947, EN 60947 (VDE 0660).

The contactors are suitable for use in any climate. They are finger-safe according to EN 50274.

The 3RT16 capacitor contactors are special versions of the size S00 to S3 SIRIUS contactors. The capacitors are precharged by means of the mounted leading NO contacts and resistors; only then do the main contacts close.

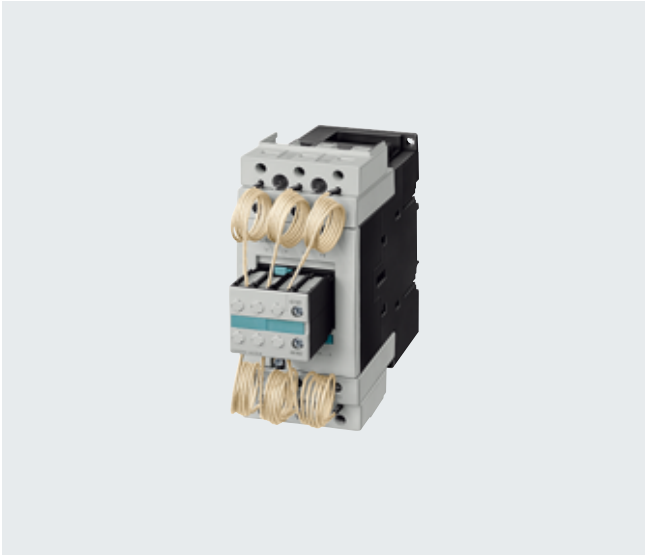
This prevents disturbances in the network and welding of the contactors.

Only discharged capacitors are permitted to be switched on with capacitor contactors.

The auxiliary switch block which is snapped onto the capacitor contactor contains the three leading NO contacts and in the case of S00 one standard NC contact and in the case of S0 and S3 one standard NO contact, which is unassigned. Size S00 also contains another unassigned NO contact in the basic unit.

In addition, a 2-pole auxiliary switch block can be mounted laterally on the 3RT16 47 capacitor contactors (2 NO, 2 NC or 1 NO + 1 NC versions); type 3RH19 21-1EA... The fitting of auxiliary switches for 3RT16 17 and 3RT16 27 is not expandable.

Benefits



- Excellent damping of inrush current
- Improved power quality (e.g. avoidance of voltage sags)
- Longer useful service life of main contacts of capacitor contactor
- Soft switching of capacitor and thus longer useful service life
- Enhanced mean life expectancy of PFC system
- Reduced ohmic losses
- Leading contacts with wiper function
- Tamper-proof and protected resistors
- Easy access for cable connection
- Voltage range: 400 … 690 V
- Output range: 12.5 … 50 kvar

Technical specifications

Contactors	Type		3RT16 17-.A..3	3RT16 27-.A..1	3RT16 47-.A..1
	Size		S00	S0	S3
All technical specifications not mentioned in the table below are identical to those of the 3RT10 17 contactors for size S00, to those of the 3RT10 26 contactors for size S0 and to those of the 3RT10 45 contactors for size S3.					
Capacitor rating at rated power (utilization category AC-6b)	230 V, 50/60 Hz	kvar	3 … 7.5	3.5 … 15	3.5 … 30
	400 V, 50/60 Hz	**kvar**	**5 … 12.5**	**6 … 25**	**5 … 50**
	525 V, 50/60 Hz	kvar	7.5 … 15	7.8 … 30	7.5 … 60
	690 V, 50/60 Hz	kvar	10 … 21	10 … 42	10 … 84
Auxiliary contacts mounted (unassigned)			1 NO + 1 NC	1 NO contact	
Auxiliary contacts mountable (lateral), not for sizes S00 and S0			--		2 NC + 2 NO or 1 NO + 1 NC
Magnetic coil operating range			0.8 … 1.1 x U_s		
Max. switching frequency		h^{-1}	180	100	
Electrical endurance		Operating cycles	> 250000	> 150000	> 100000
Ambient temperature		°C	60		
Standards			IEC 60947/EN 60947 (VDE 0660)		
Short-circuit protection			1.6 ... 2.2 x I_e		
Conductor cross-sections (1 or 2 conductors connectable)					
Main conductor			⏚ **Screw terminals**		
• Solid		mm^2	2 x (0.5 ... 1.5); 2 x (0.75 ... 2.5) Acc. to IEC 60947; Max. 2 x (1 ... 4)	2 x (1 ... 2.5); 2 x (2.5 ... 6) Acc. to IEC 60947; Max. 1 x 10[1)]	--
• Finely stranded with end sleeve		mm^2	2 x (0.5 ... 1.5); 2 x (0.75 ... 2.5)	2 x (1 ... 2.5); 2 x (2.5 ... 6)[1)]	--
• AWG cables					
- Solid		AWG	2 x (20 ... 16)	2 x (16 ... 12)	--
- Solid or stranded		AWG	2 x (18 ... 14)	2 x (14 ... 10)	--
- Stranded		AWG	1 x 12	1 x 8	--
• Terminal screws			M3	M4 (Pozidriv size 2)	--
- Tightening torque		Nm	0.8 ... 1.2	2 ... 2.5	--
		lb.in	7 ... 10.3	18 ... 22	--
	Main conductors: With box terminal				
Front clamping point connected 	• Finely stranded with end sleeve	mm^2	--		2.5 ... 35
	• Finely stranded without end sleeve	mm^2	--		4 ... 50
	• Solid	mm^2	--		2.5 ... 16
	• Stranded	mm^2	--		4 ... 70
	• Ribbon cable conductors (number x width x thickness)	mm	--		6 x 9 x 0.8
	• AWG cables, solid or stranded	AWG	--		10 ... 2/0
Rear clamping point connected 	• Finely stranded with end sleeve	mm^2	--		2.5 ... 50
	• Finely stranded without end sleeve	mm^2	--		10 ... 50
	• Solid	mm^2	--		2.5 ... 16
	• Stranded	mm^2	--		10 ... 70
	• Ribbon cable conductors (number x width x thickness)	mm	--		6 x 9 x 0.8
	• AWG cables, solid or stranded	AWG	--		10 ... 2/0

1) 3RV19 25-5AB feeder terminal for 16 mm^2.

Contactors	Type		3RT16 17-.A..3	3RT16 27-.A..1	3RT16 47-.A..1
	Size		S00	S0	S3
Both clamping points connected 	• Finely stranded with end sleeve	mm²	--		Max. 2 x 35
	• Finely stranded without end sleeve	mm²	--		Max. 2 x 35
	• Solid	mm²	--		Max. 2 x 16
	• Stranded	mm²	--		Max. 2 x 50
	• Ribbon cable conductors (number x width x thickness)	mm			2 x (6 x 9 x 0.8)
	• AWG cables, solid or stranded	AWG	--		2 x (10 ... 1/0)
	• Terminal screw		--		M6 (hex. socket, A/F 4)
	- Tightening torque	Nm lb.in	--		4 ... 6 36 ... 53
Connection for drilled copper bars[1]	Max. width	mm			10
Without box terminal with cable lugs[2] (1 or 2 conductors can be connected)	• Finely stranded with cable lug	mm²	--		10 ... 50[3]
	• Stranded with cable lug	mm²	--		10 ... 70[3]
	• AWG cables, solid or stranded	AWG	--		7 ... 1/0
	Auxiliary conductors:				
	• Solid	mm²	2 x (0.5 ... 1.5)[4] 2 x (0.75 ... 2.5)[4] acc. to IEC 60947; max. 2 x (1 ... 4)	2 x (0.5 ... 1.5)[4], 2 x (0.75 ... 2.5)[4] acc. to IEC 60947; max. 2 x (0.75 ... 4)	
	• Finely stranded with end sleeve	mm²	2 x (0.5 ... 1.5)[4], 2 x (0.75 ... 2.5)[4]		
	• AWG cables, solid or stranded	AWG	2 x (20 ... 16)[4], 2 x (18 ... 14)[4]; 1 x 12		
	• Terminal screw		M3		
	- Tightening torque	Nm lb.in	0.8 ... 1.2 7 ... 10.3		

1) If bars larger than 12 x 10 mm are connected, a 3RT19 46-4EA1 terminal cover is needed to comply with the phase clearance.

2) When connecting conductors which are larger than 25 mm², the 3RT19 46-4EA1 terminal cover must be used to keep the phase clearance.

3) Only with crimped cable lugs according to DIN 46234. Cable lug max. 20 mm wide.

4) If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in the range specified. If identical cross-sections are used, this restriction does not apply.

Selection an ordering data (Dated 10/2010)

AC operation Screw terminals

3RT16 17-1A.03

3RT16 27-1A.01

3RT16 47-1A.01

Utilization category AC-6b Switching of AC capacitors for an ambient temperature of 60 °C[1]				Auxiliary contacts, unassigne		Rated control supply voltage U_s[2]		Order No.	PU	PS*/ P. unit	PG	Weight per PU approx.
Capacitor rating at operational voltage 50/60 Hz				Version								
at 230 V	at 400 V	at 525 V	at 690 V									
kvar	kvar	kvar	kvar	NO	NC	V AC	Hz		Unit(s)	Unit(s)		kg
For screw and snap-on mounting onto TH 35 standard mounting rail												
Size S00												
3 … 7.5	5 … 12.5	7.5 … 15	10 … 21	1	1	24	50 /60	**3RT16 17-1AB03**	1	1	101	0.280
						110		**3RT16 17-1AF03**	1	1	101	0.280
						230		**3RT16 17-1AP03**	1	1	101	0.280
Size S0[3]												
3.5 … 15	6 … 25	7.8 … 30	10 … 42	1	--	24	50	**3RT16 27-1AB01**	1	1	101	0.440
						110		**3RT16 27-1AF01**	1	1	101	0.440
						230		**3RT16 27-1AP01**	1	1	101	0.440
Size S3												
3.5 … 30	5 … 50	7.5 … 60	10 … 84	1	--	24	50	**3RT16 47-1AB01**	1	1	101	2.040
						110		**3RT16 47-1AF01**	1	1	101	2.040
						230		**3RT16 47-1AP01**	1	1	101	2.040

1) For size S3: 55 °C.

2) Operating range: 0.85 ... 1.1 x U_s.

3) For conductor cross-sections > 6 mm^2 use 3RV19 25-5AB terminals (2 units).

* You can order this quantity or a multiple thereof.

Power Components

Dynamic Components

Overview

Conventional systems for power factor correction are used to optimize the power factor and reduce the level of harmonics in the grid. The usage of new technologies in modern industry has negative impacts on electric power quality of the main supply networks, e.g. frequent high load fluctuations and harmonic oscillation.

Excessive currents, increased losses and flickering will not only influence the supply capacity but will also have a significant impact on the operation of sensitive electronic devices.

The solution for this are dynamic power factor correction systems.

With the thyristor module series TSM-LC and TSM-HV, we provide the main component – "the electronic switch" – for dynamic power factor correction.

The TSM module series offers fast electronically controlled, self-observing thyristor switches for capacitive loads up to 200 kvar, that are capable to switch power capacitors within a few milliseconds nearly without a limitation to the number of switchings during the capacitor lifetime.

Applications

- Main supply networks with high load fluctuations for dynamic PFC systems
- Presses
- Welding machines
- Elevators
- Cranes
- Wind turbines

Benefits

- Easy installation: it can be used similar to a contactor
- All the intelligence needed is offered within the thyristor module itself
- Reaction time: 5 milliseconds only
- Permanent self-controlling of:
  - voltage parameter
  - phase sequence
  - capacitor output
- Display of
  - operation
  - faults
  - activation
- Voltage range: 400 V and 690 V
- Output range:
  - 400 V: 10, 25, 50, 100, 200 kvar
  - 690 V: 50 and 200 kvar

Technical specifications

	TSM-LC10	TSM-LC25	TSM-LC50	TSM-LC100	TSM-LC200	TSM-HV50	TSM-HV200
Rated voltage	380 … 400 V					690 V	
Max. grid voltage:	440 V					690 V	
- in conventional PFC systems (without reactors							
- in detuned PFC system (7 % detuning)	440 V (no upwards tolerance)					690 V	
- in detuned PFC system (14 % detuning)	400 V					690 V	
Frequency	50 / 60 Hz						
Maximum power / at nominal voltage	12.5 kvar	25 kvar	50 kvar	100 kvar	200 kvar	60 kvar	200 kvar
Power circuit	Direct connection 4 pole via terminal clamps (D = 6 mm^2 resp. 4 mm^2)	Direct connection 4 pole via busbar (cable lug 25 mm^2, D = 8 mm)		Direct connection 4 pole via busbar (cable lug 70 mm^2, D = 10 mm)	Direct connection 4 pole via busbar (cable lug 185 mm^2, D = 12 mm)	Direct connection 4 pole via busbar (cable lug 25 mm^2, D = 8 mm)	Direct connection 4 pole via busbar (cable lug)
Neutral required	no[1]			no	no[1]	yes[2]	no[1]
Aux. supply voltage required	no			230 V AC (needed for fan) via terminal clamp; automatically controlled cooling, over temperature switch off	230 V AC	230 V AC	no
Connection	from bottom				from top	from bottom	
Losses (PD in W)	2.0 x I (in A); at 400 V/12.5 kvar approx. 35 W (thermal)	2.0 x I (in A); typical 75 W (thermal)	2.0 x I (in A); typical 150 W (thermal)	2.0 x I (in A); typical 300 W (thermal)	2.0 x I (in A); at 400 V/200 kvar approx. 580 W (thermal)	3.0 x I (in A); at 690 V/50 kvar approx. 125 W (thermal)	2.0 x I (in A); at 690 V/200 kvar typical 350 W (thermal)
Recommended fuses "superfast"	3 x NH00 (AC 690 V) 35 A	3 x NH00 (AC 690 V) 63 A	3 x NH00 (AC 690 V) 125 A	3 x NH1 (AC 690 V) 250 A	3 x NH2 400 V/ 200 kvar approx. 580 W (thermal)	3 x NH00 (AC 690 V) 25 kvar: 63 A 50/60 kvar: 100 A	3 x NH2 (AC 690 V) 100 kvar: 160 A 200 kvar: 250 A
Dimensions in mm (w x h x d)	162 x 150 x 75	157 x 200 x 180		157 x 240 x 195	250 x 480 x 160	157 x 200 x 195	410 x 400 x 250
Weight	1.75 kg	4.8 kg		5.5 kg	11.5 kg	5 kg	17 kg
LED display per phase	2					1	6
Cascading	yes						
Ambient temperature	-10 °C ... 55 °C						
Discharge resistors EW-22 needed	1			1-2 in parallel	2-4 in parallel	standard resistor sufficient	
Current limitation reactor BD-100 needed[3]	2			For standard applications (without detuned filter reactors) a special current limitation reactor is mandatory. Further information upon request		not needed	only for systems with detuning-reactors

[1] For operation with three-phase capacitor or three single-phase capacitors.

[2] Only for operation with single-phase capacitors.

[3] For PFC systems without detuning reactors mandatory.

Power Components

Dynamic Power Components and Accessories

Selection and ordering data (Dated 10/2010)

	Rated voltage / Frequency	Maximum power / at nominal voltage	Dimensions	Order No.	PU	PS*/ P. unit	PG	Weight per PU approx.
	V / Hz	kvar	mm		Unit(s)	Unit(s)		kg
	TSM-LC10							
	400 / 50	10	162 x 150 x 75	**4RB9 710-0EA50**	1	1	155	1.750
	TSM-LC25							
	400 / 50	25	157 x 200 x 180	**4RB9 725-0EA50**	1	1	155	4.800
	TSM-LC50							
	400 / 50	50	157 x 200 x 180	**4RB9 750-0EA50**	1	1	155	4.800
	TSM-LC100							
	400 / 50	100	157 x 240 x 195	**4RB9 701-0EA50**	1	1	155	5.500
	TSM-LC200							
	400 / 50	200	250 x 480 x 160	**4RB9 702-0EA50**	1	1	155	11.500
	TSM-HV50							
	690 / 50	50	157 x 200 x 195	**4RB9 750-0GK50**	1	1	155	5.000
	TSM-HV200							
	690 / 50	200	410 x 400 x 250	**4RB9 702-0GK50**	1	1	155	17.000

Accessories (for TSM-LC modules)

		Order No.	PU	PS*/ P. unit	PG	Weight per PU approx.
			Unit(s)	Unit(s)		kg
	Discharge resistor EW22 (1/step)[1)]					
	at least 1 piece to be used for all types of TSM-LC if fast re-switching time is required. For higher rated steps please contact your local sales office.	**4RB9 810-0AA00**	1	1	155	0.300
	Current limitation reactor BD-100 (2/step)[2)]					
	Current limitation reactor BD-100 for PFC systems without detuning reactors to be used for 10 kvar, 25 kvar or 50 kvar step, two units per step required	**4RB9 830-0AA00**	1	1	155	2.000

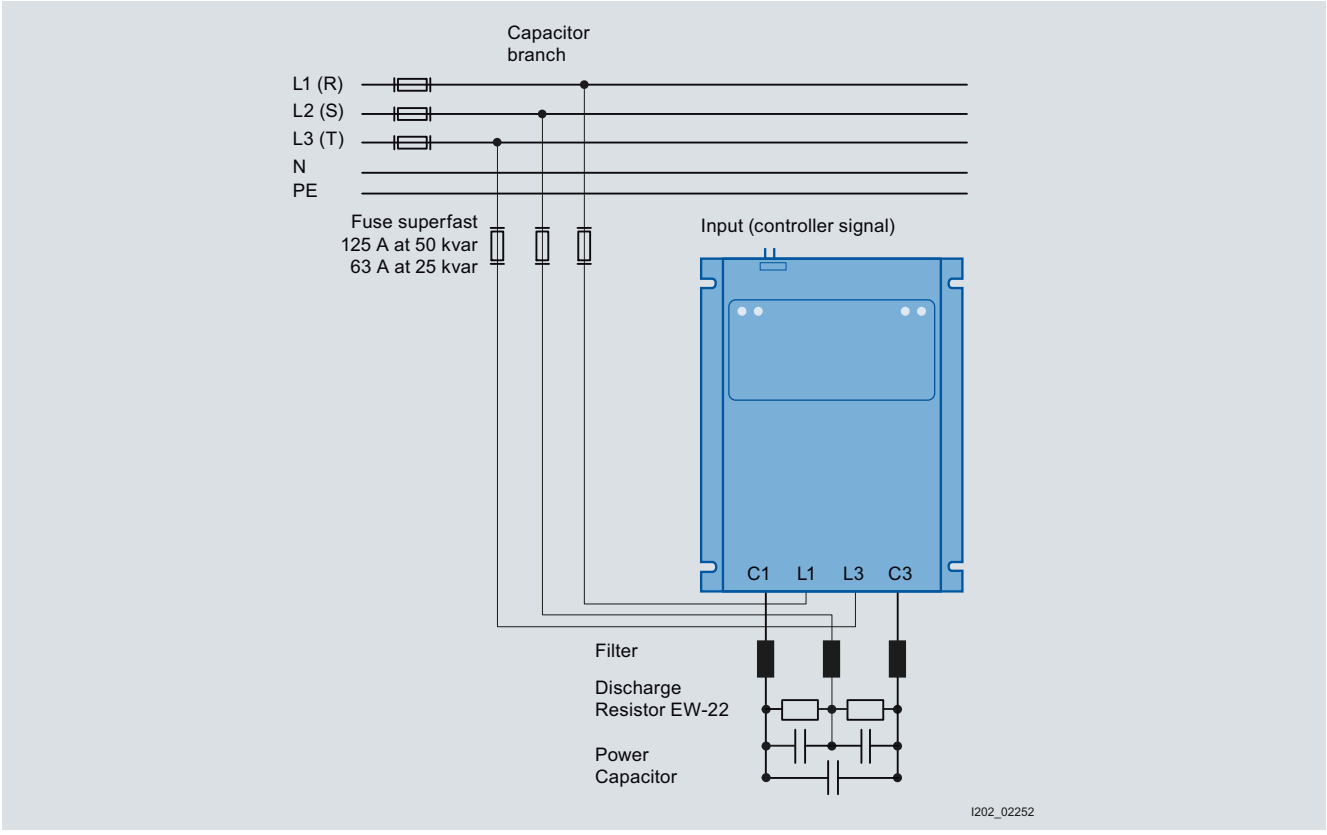
1) Consisting of two single resistors of 22 kΩ each.

2) Not suitable for TSM-LC100, TSM-LC200 and TSM-HV200.

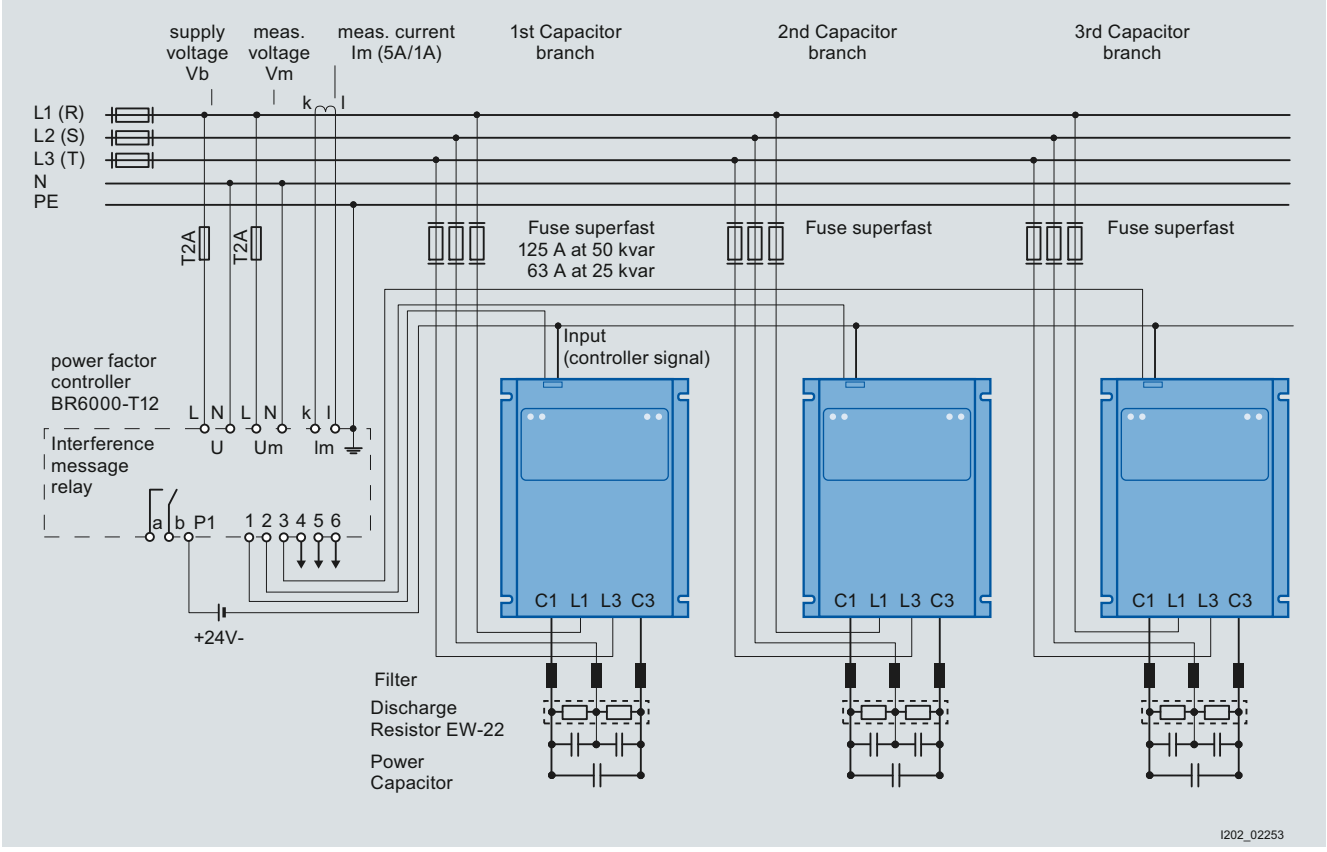
* You can order this quantity or a multiple thereof.

Dimensional drawings

Dynamic PFC network: one stage



Dynamic PFC network: multiple stages



Power Components

Accessories

Overview

The losses of discharge reactors are substantially lower than those of discharging resistors. They satisfy the requirement for permanently connected discharging device and for a discharge time of a few seconds. Fast discharging allows a fast reswitching in automatic PFC equipment. However, max. 5000 switching operations (according to IEC 60831) should not be exceeded.

Benefits

- Fast discharge for fast reconnection of capacitors
- Reduced losses
- Shockproof case for DIN rail mounting

Technical specifications

		Discharge reactor
Voltage	V_R	230 ... 525 V
Frequency	f	50 / 60 Hz
Internal configuration		2 windings in V arrangement
Resistance	R	4900 Ω
Discharge time	t	230 V up to 25 kvar < 10 s / up to 50 kvar < 20 s / up to 100 kvar < 40 s 400 … 525 V up to 25 kvar < 5 s / up to 50 kvar < 10 s / up to 100 kvar < 20 s
Power loss	P_{LOSS}	< 1.8 W
Free-wheeling current	I	< 4.5 mA
Accepted discharge number		1 x / (minute and 100 kvar)
Insulation class	R_{INS}	T40/B
Cable diameter	∅	0.75 … 2 x 2.5 mm^2
Terminals		fixing torque 0.5 Nm
Installation location		indoor
Ambient temperature		- 25 … 55 °C
Cooling		natural
Dimensions	h x w x d	90 x 45 x 59 mm
Weight		0.5 kg

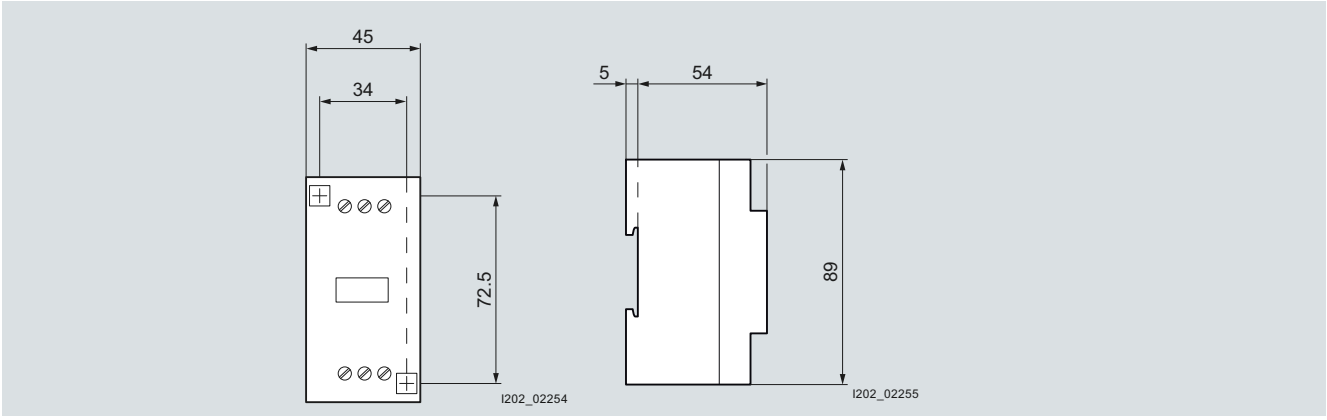
Selection and ordering data (Dated 10/2010)

	Ambient temperature	Dimensions	Order No.	PU	PS*/ P. unit	PG	Weight per PU approx.
		mm		Unit(s)	Unit(s)		kg
	**Discharge reactor**						
	-25 ... 55 °C	90 x 45 x 59	**4RB9 820-0AA00**	1	1	155	0.500

* You can order this quantity or a multiple thereof.

Dimensional drawings

Discharge Reactor



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