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Power Quality Solution

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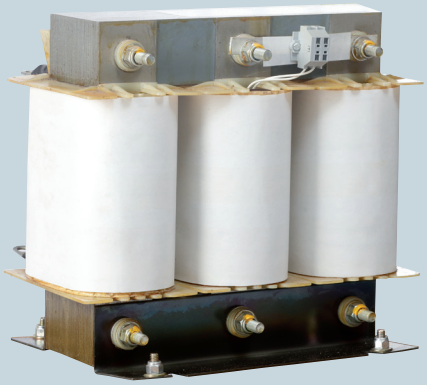
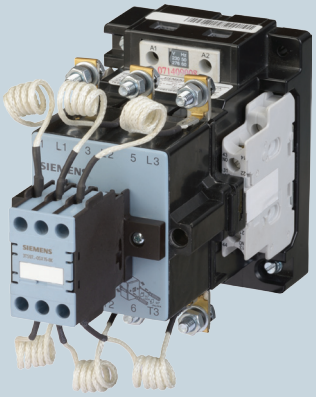
Index

4RB LV Capacitors



4KA Detuned Reactors

7UG0 APFC controller



3TS Capacitor Duty Contactor

Introduction:

For electricity consumer lagging reactive power generated from inductive loads is one of the major causes of power and financial losses i.e. poor power factor (non-unity). Incorporating power factor correction devices in the network helps in generating leading reactive power to compensate lagging reactive power. This techniques help consumer to achieved power factor (cos Ø) close to unity. Fig 1

The necessary leading power can be produced by LV capacitor connected in parallel to the supply network close to the lagging power source (Like Induction motors, MCC panels etc)

The capacitors connect can be fixed type for given fixed lagging pf of the system at a point in power system or variable in steps for a changing connected load. Fig 2

Advantages of power factor corrections:

- Reduction of reactive power in system
- Low cost of energy levied at better pf
- Improved voltage quality
- Reduced voltage drops
- Optimum cable design
- Reduced transmission losses

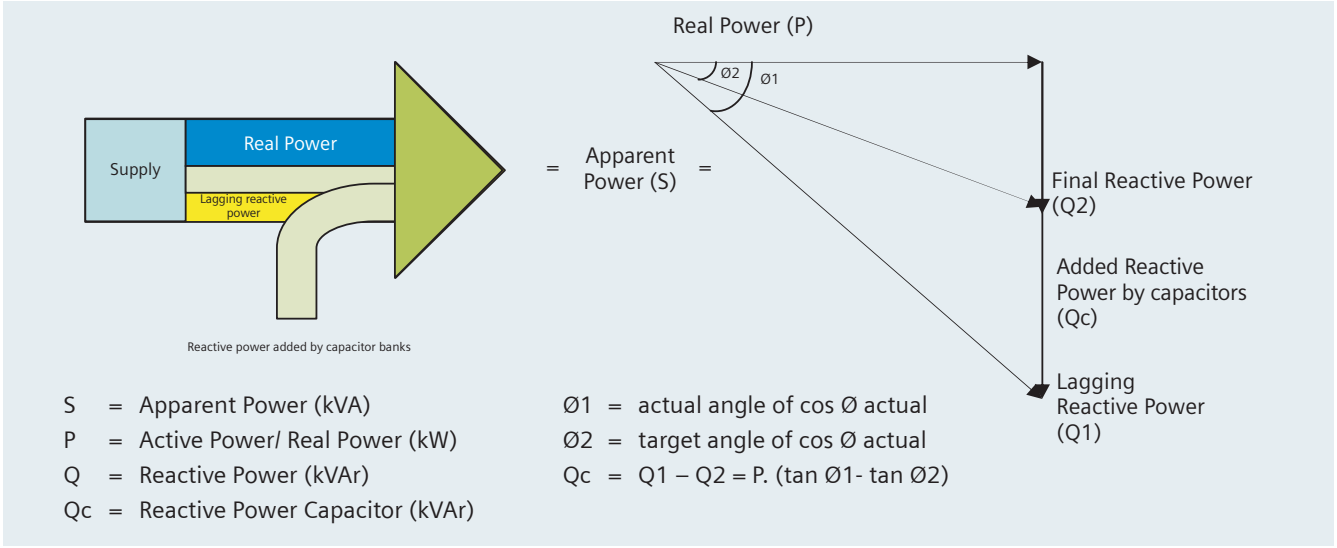
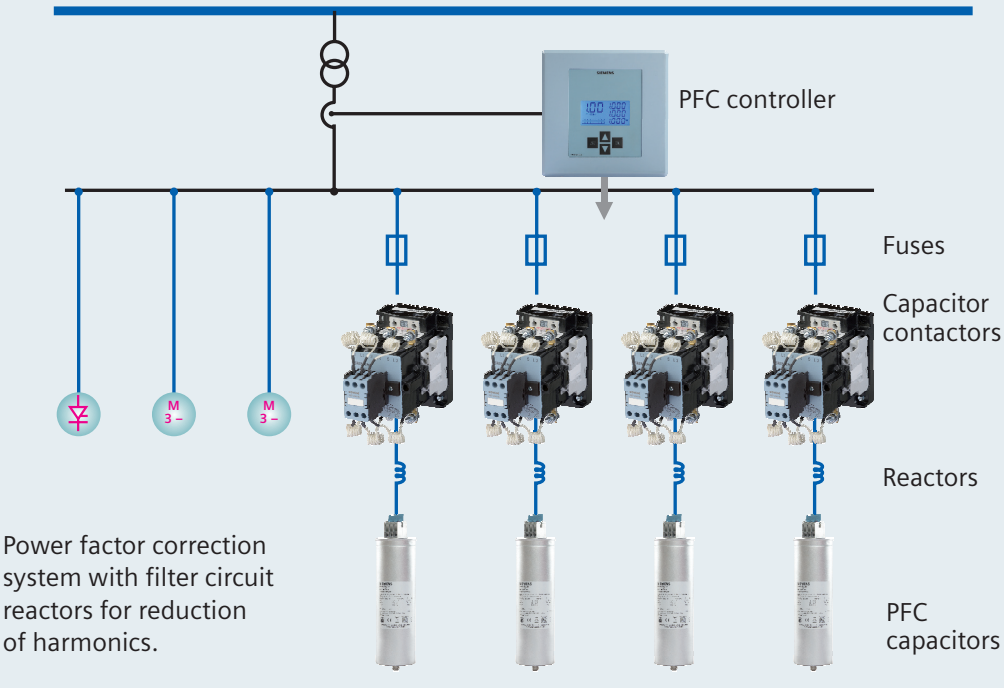


Fig 1

Typical power factor correction circuit diagram



Power factor correction system with filter circuit reactors for reduction of harmonics.

SIECAP™ LV Capacitors

Capacitor

SIEMENS SIECAP™ range of capacitor can withstand high inrush currents caused while individual switching operation (>100IR) as well while connected in parallel, i.e. as banks when the inrush current is increased to ≥150 · IR. The high inrush is because of the charging current comes from the power line as well as from other capacitors connected in parallel in the bank.

SIEMENS capacitor range broadly classified in two variants:

SIECAP™ ND
[Normal Duty]

SIECAP™ SHD
[Super Heavy Duty]

SIECAP™ range of capacitor is based MPP technology [Metalized of Zinc Al alloy over Polypropelyne dielectric] of film making with an impregnation of semi-dry biodegradable soft resin.

Special film-cutting technique (optimized combination of wavy and smooth cuts) & heavy edge and produces a maximum effective surface for the metal spraying or contacting process, Fig 3.

SIECAP™ capacitors are most compact and light in weight

Wavy cut design

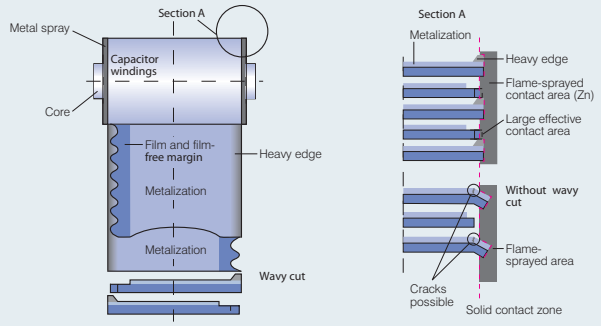
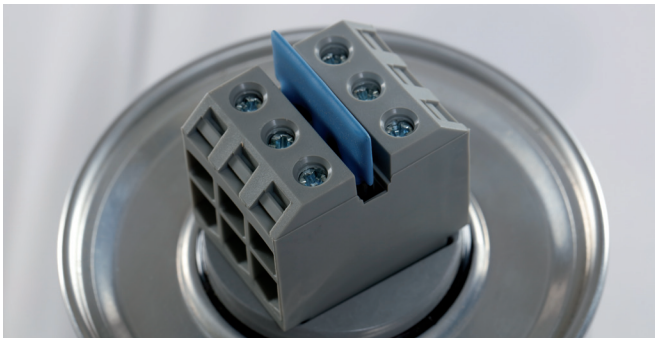
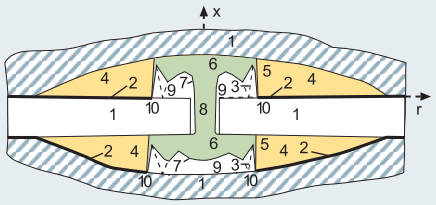


Fig 3



Self-healing properties

Self-healing



1 Dielectric
2 Metalized electrodes
3 Material displacing shock wave
4 Air gap with metal vapor
5,6 Plasma zone
7 Boundary layer between gas phase dielectric and plasma
8 Breakdown channel
9 Gas phase dielectric
10 Zone of displaced metalization and dielectric (isolating region)

Fig 4

In case of electrical overload the dielectric in the breakdown channel is broken down into highly compressed plasma that explodes out of the breakdown channel and pushes the dielectric layers apart. The discharge continues within the spreading plasma via the metal layers so that the metal surrounding the faulty area is completely burnt out. This produces perfect isolation of the faulty area within microseconds. The self-healing process results in negligible capacitance loss less than 100 pF per event. The capacitor remains fully functional during the entire process, Fig 4

Overpressure disconnector

Overpressure disconnector

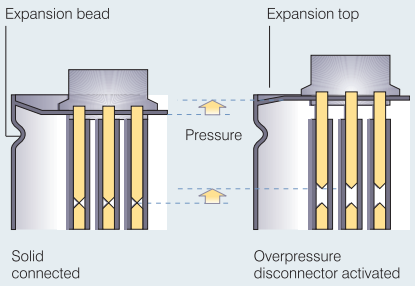


Fig 5

At the end of the capacitor's service life or when a high pressure forms inside the can, the overpressure disconnector is activated. The specially designed cover with an expansion bead moves upwards. Expansion beyond a certain degree will separate the wires and disconnect the capacitor safely from the line. The disconnector is separated at its breakpoint (small notch) and the flow of current to the capacitor windings is interrupted. Fig 5

Sigut terminals

SIECAP™ range of capacitor comes with SIGUT terminal strip with electric shock protection (IP2X),

These terminal provides figure touch protection for users

These as well ensures reliable connection

Overview

Low Voltage 3 phase Power Capacitors - SIECAP™ ND

As per IEC 60831–1/2 Edition 3.0 (2014), IS 13340–1/2

SIECAP™ ND capacitors is a series of MPP Metalized polypropylene) capacitors which have been used for PFC applications

The power range varies from 0.5 to 30.0 kVar for a three-phase capacitor design

The SIECAP™ ND capacitor is especially intended for power factor correction in industrial and commercial 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

Key Features

- Compact design in cylindrical aluminum can with stud
- Stacked winding
- MPP technology
- Voltage range 415 ... 480 V
- Output range 0.5 ... 30 kvar

Electrical

- Up to 30 kvar per case for three-phase applications
- Long life expectancy of up to 100 000 hours
- High pulse current withstand capability (up to 200 · IR)

Mechanical and maintenance

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

Safety

- Self-healing
- Overpressure disconnector
- Fast On & Shock hazard protected SIGUT- terminals

Technical specifications

Standards		IEC 60831–1/2 Edition 3.0 (2014), IS 13340–1/2 (2012)
Overvoltage	Vmax	VR +10% (up to 8 h daily) VR +15% (up to 30 min. daily) VR +20% (up to 5 min. daily) VR +30% (up to 1 min. daily)
Overcurrent	I max	Up to 1.3 ...1.5 • IR (A) (including combined effects of harmonics, overvoltages and capacitance tolerance) depending on the individual type
Inrush current	Is	≤ 200 IR (A)
Losses • Dielectric • Total [1]		 0.2 W/ kVar 0.5 W/ kVar
Rated frequency	f	50 / 60 Hz
Capacitance tolerance		–5 % / +10 %
Test voltage, terminal / terminal	V_{TT}	2.15 * V_N VAC / 50 Hz, 2s
Test voltage, terminal / case	V_{TC}	3600 VAC / 50 Hz, 2 s
Mean life expectancy	$T_{Ld(Co)}$	Upto 100 000 hours (temperature class –25/D)
Ambient temperature		Class -25/D: Max. short time: + 55°C, max. mean 24h: +45°C; max mean 1 year: +35°C; lowest temperature: - 25°C
Cooling		Natural or Forced air cooling
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
Discharge module		Discharge module included
Case		Extruded aluminium cane
Enclosure		IP00 for plastic top – 1 to 5.5 kvar, indoor mounting IP20 for metal top – 5 to 30 kvar, indoor mounting
Dielectric		Polypropylene film
Impregnation		Biodegradable soft resin, semi-dry
Terminals		SIGUT screw terminals, max current 50 A, max. 16 mm2 cable cross-section or Fast-On terminals
Number of switching operations		5000 switching's per year

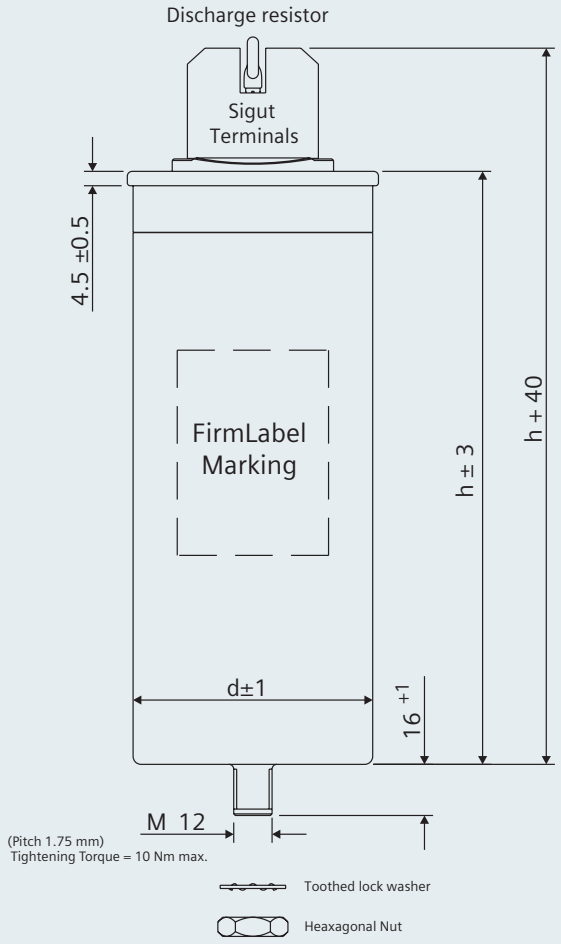
1) Without discharge resistor

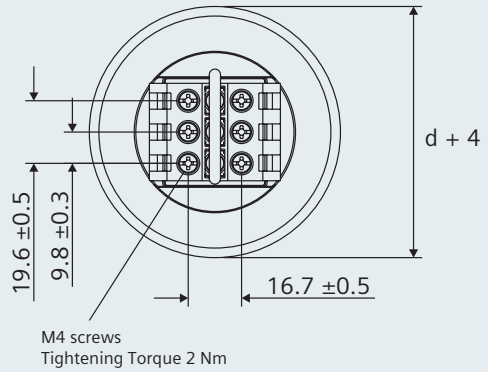
Ordering details

50 Hz Output in kVar	60 Hz Output in kVar	Capacity in uF 3 x	Terminal Type	Dimensions D * H mm Ø	Order No	PU Unit (s)	MOQ Unit (s)	Weight per PU Kg approx
Rated Voltage 440 V AC								
0.9	1.1	4.9	B	53 x 117	**4RB2008-3EE50-8K**	1	12	0.44
1	1.2	5.5	B	53 x 117	**4RB2010-3EE50-8K**	1	12	0.44
1.2	1.4	6.6	B	53 x 117	**4RB2012-3EE50-8K**	1	12	0.44
1.2	1.4	6.6	B	53 x 117	**4RB2012-3EE50-8K**	1	12	0.44
2.1	2.5	11.5	B	53 x 117	**4RB2021-3EE50-8K**	1	12	0.44
2.5	3	13.7	B	63.5 x 129	**4RB2025-3EE50-8K**	1	12	0.66
3	3.6	16.4	B	63.5 x 129	**4RB2030-3EE50-8K**	1	12	0.66
4.2	5	23	B	63.5 x 129	**4RB2042-3EE50-8K**	1	12	0.66
5	6	27.4	B	63.5 x 152	**4RB2050-3EE50-8K**	1	12	0.66
6	7.2	32.9	A	75x 195	**4RB2060-3EE50-8K**	1	6	1.32
7	8.4	38.4	A	75 x 195	**4RB2070-3EE50-8K**	1	6	1.32
7.5	9	41.1	A	75 x 195	**4RB2075-3EE50-8K**	1	6	1.32
8.3	10	45.5	A	75 x 195	**4RB2083-3EE50-8K**	1	6	1.32
9	10.8	49.3	A	75 x 195	**4RB2090-3EE50-8K**	1	6	1.32
10	12	54.8	A	85 x 195	**4RB2100-3EE50-8K**	1	4	1.65
12.5	15	68.5	A	85 x 270	**4RB2125-3EE50-8K**	1	4	1.98
15	18	82.2	A	85 x 270	**4RB2150-3EE50-8K**	1	4	1.98
16.7	20	91.5	A	85 x 348	**4RB2167-3EE50-8K**	1	4	2.64
20	24	109.6	A	85 x 348	**4RB2200-3EE50-8K**	1	4	2.64
20.8	25	114	A	85 x 348	**4RB2208-3EE50-8K**	1	4	2.64
25	30	137	A	90 x 348	**4RB2250-3EE50-8K**	1	4	2.75
28	–	153.4	A	90 x 348	**4RB2280-3EE50-8K**	1	4	2.75
30	–	164.4	A	90 x 348	**4RB2300-3EE50-8K**	1	4	2.75
Rated Voltage 480 V AC								
1	1.2	4.6	B	53 x 117	**4RB2010-3EJ50-8K**	1	12	0.44
1.5	1.8	6.9	B	63.5 x 129	**4RB2015-3EJ50-8K**	1	12	0.66
2	2.4	9.2	B	63.5 x 129	**4RB2020-3EJ50-8K**	1	12	0.66
2.5	3	11.5	B	63.5 x 129	**4RB2025-3EJ50-8K**	1	12	0.66
4.2	5	19.3	B	63.5 x 152	**4RB2042-3EJ50-8K**	1	12	0.66
5	6	23	A	75 x 195	**4RB2050-3EJ50-8K**	1	12	1.32
5.5	6.6	25.3	B	63.5 x 188	**4RB2055-3EJ50-8K**	1	12	0.66
8.3	10	38.2	A	75 x 270	**4RB2083-3EJ50-8K**	1	6	1.54
10.4	12.5	47.9	A	85 x 270	**4RB2104-3EJ50-8K**	1	4	1.98
11.1	13.3	51.1	A	85 x 270	**4RB2111-3EJ50-8K**	1	4	1.98
12.5	15	57.6	A	85 x 348	**4RB2125-3EJ50-8K**	1	4	2.64
13.8	16.6	63.5	A	85 x 270	**4RB2138-3EJ50-8K**	1	4	1.98
15	18	69.1	A	85 x 348	**4RB2150-3EJ50-8K**	1	4	2.64
16.7	20	76.9	A	85 x 348	**4RB2167-3EJ50-8K**	1	4	2.64
20.8	25	95.8	A	85 x 348	**4RB2208-3EJ50-8K**	1	4	2.64
25	30	115.1	A	90 x 348	**4RB2250-3EJ50-8K**	1	4	2.75
27.7	–	127.5	A	90 x 348	**4RB2277-3EJ50-8K**	1	4	2.75
30	–	138.1	A	90 x 348	**4RB2300-3EJ50-8K**	1	4	2.75

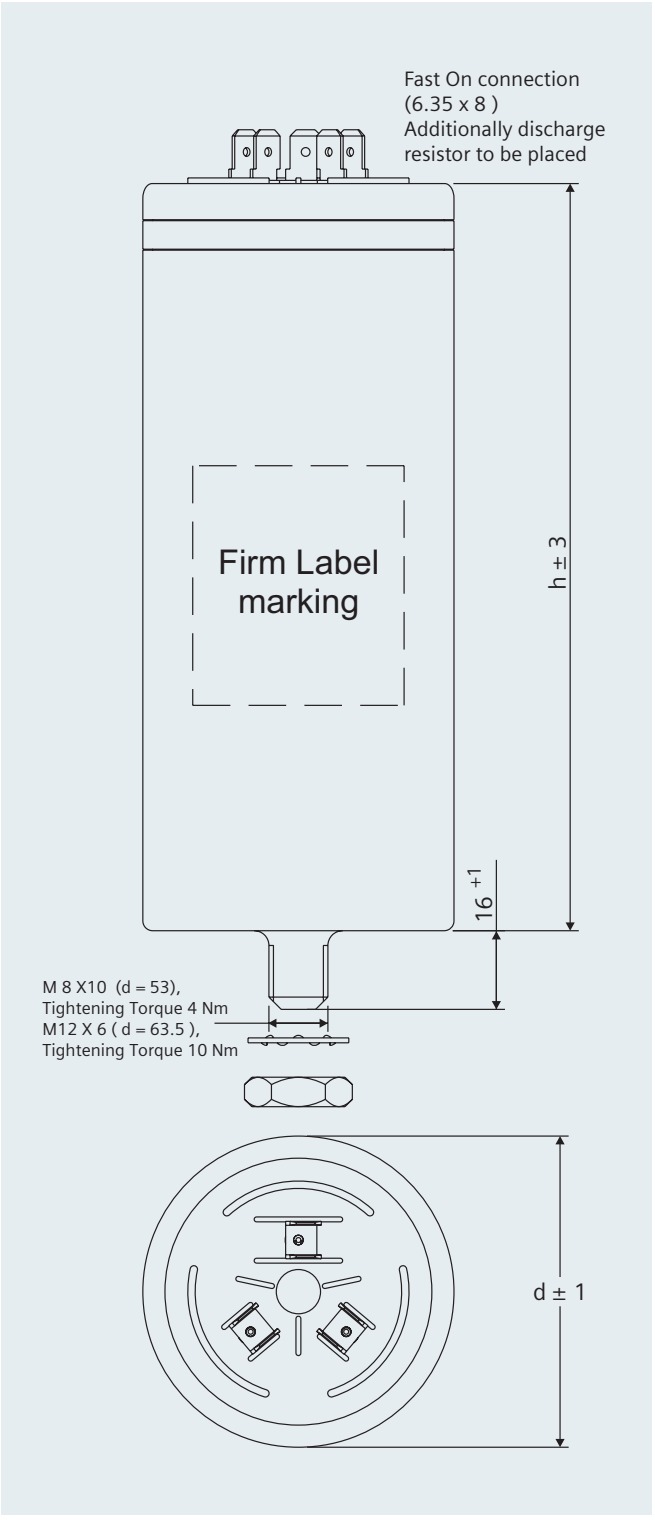
Dimension drawings

Terminal Type A





Terminal Type B



Overview

Low Voltage 3 Phase Power Capacitors SIECAP™ SHD

IEC 60831–1/2 Edition 3.0 (2014), IS 13340–1/2 (2012)

SIECAP™ SHD capacitors is a series of MPP Metalized polypropylene) capacitors which have been used for PFC applications

These are designed for commercial, heavy and light industrial application

The power range varies from 1 to 33.0 kvar for a three-phase capacitor desing

The SIECAP™SHD capacitor is especially intended for power factor correction in industrial and commercial applications

Especially designed to meet Heavy duty requirements The capacitors are manufactured using metalized polypropy lene 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
- Heavy Industries
- Most compact desing in cylindrical aluminum can with stud
- Stacked winding
- MPP technology
- Voltage range 415 ... 690 V
- Output range 1 ... 33 kvar
- Super heavy duty

Electrical

- Up to 33 kvar per case for three-phase applications
- Long life expectancy of up to 200 000 hours
- High pulse current withstand capability (up to 500 · IR)

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

Technical specifications

Standards		IEC 60831–1/2 Edition 3.0 (2014), IS 13340–1/2 (2012)
Overvoltage	Vmax	VR +10% (up to 8 h daily) VR +15% (up to 30 min. daily) VR +20% (up to 5 min. daily) VR +30% (up to 1 min. daily)
Overcurrent	I max	Up to 1.6 ...2.0 • I_R (A) (including combined effects of harmonics, overvoltages and capacitance tolerance) depending on the individual type
Inrush current	Is	≤ 500 I_R (A)
Losses • Dielectric • Total [1]		 0.2 W/ kVar 0.45 W/ kVar
Rated frequency	f	50 / 60 Hz
Capacitance tolerance		–5 % / +5 %
Test voltage, terminal / terminal	V_{TT}	2.15 * V_N VAC / 50 Hz, 2s
Test voltage, terminal / case	V_{TC}	3600 VAC / 50 Hz, 2 s upto V_N = 525 VAC 6000 VAC / 50 Hz, 2 s above V_N = 525 VAC
Mean life expectancy	$T_{Ld(Co)}$	Upto 200 000 hours (temperature class –40/D)
Ambient temperature		Class -40/60: Max. short time: + 60°C, max. mean 24h: +45°C; max mean 1 year: +35°C; lowest temperature: - 40°C
Cooling		Natural or Forced air cooling
Humidity	H_{rel}	max. 95 %
Altitude		max. 4000 m above sea level
Mounting position		Upright / horizontal
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
Discharge module		Discharge module included
Case		Extruded aluminium cane
Enclosure		IP00 for plastic top – 1 to 4 kvar, indoor mounting IP20 for metal top – 5 to 30 kvar, indoor mounting
Dielectric		Polypropylene film
Impregnation		Biodegradable soft resin, semi-dry
Terminals		SIGUT screw terminals, max current 80 A, max. 25 mm2 cable cross-section or Fast-On terminals
Number of switching operations		15000 switching's per year

1) Without discharge resistor

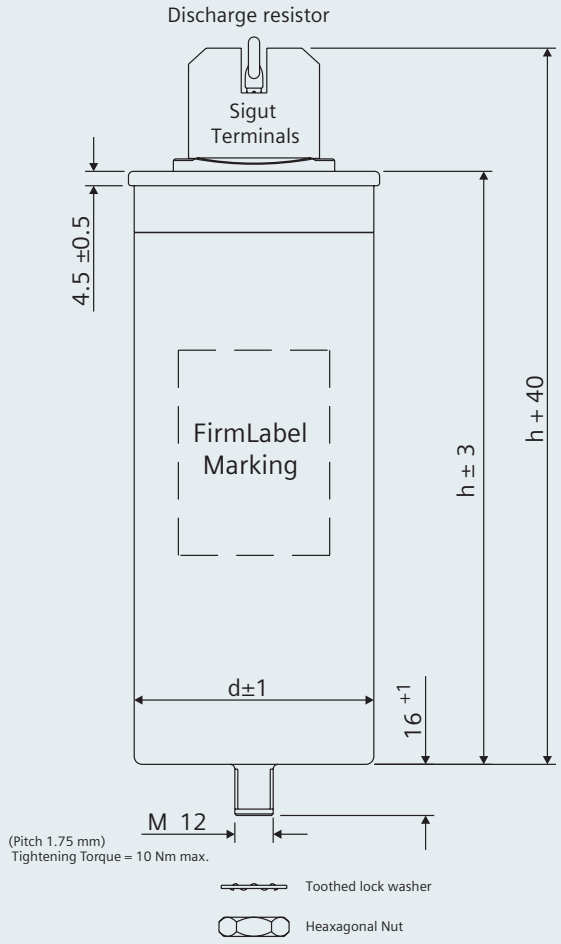
Ordering details

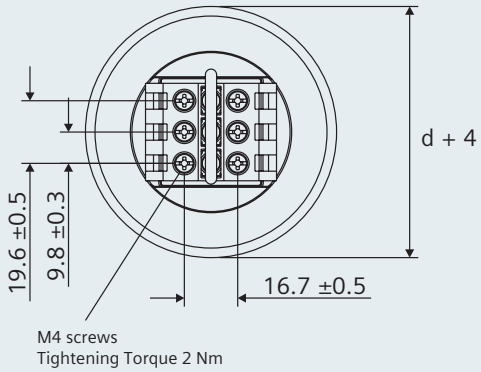
50 Hz Output in kVar	60 Hz Output in kVar	Capacity in uF 3 x	Terminal Type	Dimensions D * H mm Ø	Order No	PU Unit (s)	MOQ Unit (s)	Weight per PU Kg approx
Rated Voltage 415 V AC								
5	6	30.8	A	75 x 164	**4RB1050-3EB50-8K**	1	4	0.95
6.3	7.6	38.8	A	75 x 164	**4RB1063-3EB50-8K**	1	4	0.95
7.5	9	46.2	A	75 x 200	**4RB1075-3EB50-8K**	1	4	1.16
10.4	12.5	64.1	A	75 x 200	**4RB1104-3EB50-8K**	1	4	1.16
12.5	15	77	A	85 x 200	**4RB1125-3EB50-8K**	1	4	1.48
15	18	92.4	A	85 x 200	**4RB1150-3EB50-8K**	1	4	1.48
20	24	123.2	B	100 x 207	**4RB1200-3EB50-8K**	1	4	2.13
25	30	154	B	116 x 192	**4RB1250-3EB50-8K**	1	4	2.65
28.1	-	173.1	B	116 x 207	**4RB1281-3EB50-8K**	1	4	2.86
30	-	184.8	B	116 x 207	**4RB1300-3EB50-8K**	1	4	2.86
33	-	203.3	B	116 x 224	**4RB1330-3EB50-8K**	1	4	3.09
Rated Voltage 440 V AC								
1	1.2	5.5	E	53 x 117	**4RB1010-3EE50-8K**	1	4	0.44
2	2.4	11	E	53 x 129	**4RB1020-3EE50-8K**	1	4	0.44
3	3.6	16.4	E	53 x 129	**4RB1030-3EE50-8K**	1	4	0.44
4	4.8	21.9	E	63.5 x 152	**4RB1040-3EE50-8K**	1	4	0.66
5	6	27.4	A	75 x 164	**4RB1050-3EE50-8K**	1	4	0.95
7.5	9	41.1	A	75 x 200	**4RB1075-3EE50-8K**	1	4	1.16
10	12	54.8	A	75 x 200	**4RB1100-3EE50-8K**	1	4	1.16
10.4	12.5	57	A	85 x 200	**4RB1104-3EE50-8K**	1	4	1.48
12.5	15	68.5	A	85 x 200	**4RB1125-3EE50-8K**	1	4	1.48
15	18	82.2	A	85 x 218	**4RB1150-3EE50-8K**	1	4	1.62
16.7	20	91.5	B	100 x 207	**4RB1167-3EE50-8K**	1	4	2.13
20	24	109.6	B	100 x 207	**4RB1200-3EE50-8K**	1	4	2.13
25	30	137	B	116 x 192	**4RB1250-3EE50-8K**	1	4	2.65
28.1	-	154	B	116 x 207	**4RB1281-3EE50-8K**	1	4	2.86
30	-	164.4	B	125 x 192	**4RB1300-3EE50-8K**	1	4	3.09
33.1	-	181.4	B	116 x 224	**4RB1331-3EE50-8K**	1	4	3.09
Rated Voltage 480 V AC								
5	6	23	A	75 x 164	**4RB1050-3EJ50-8K**	1	4	0.95
6.3	7.6	29	A	75 x 164	**4RB1063-3EJ50-8K**	1	4	0.95
8.3	10	38.2	A	75 x 200	**4RB1083-3EJ50-8K**	1	4	1.16
10.4	12.5	47.9	A	75 x 200	**4RB1104-3EJ50-8K**	1	4	1.16
11	13.2	50.7	A	85 x 200	**4RB1111-3EJ50-8K**	1	4	1.48
12.5	15	57.6	A	85 x 200	**4RB1125-3EJ50-8K**	1	4	1.48
13.8	16.6	63.5	A	85 x 200	**4RB1138-3EJ50-8K**	1	4	1.48
15	18	69.1	B	100 x 207	**4RB1150-3EJ50-8K**	1	4	2.13
16.7	20	76.9	B	100 x 207	**4RB1167-3EJ50-8K**	1	4	2.13
18.7	22.4	86.1	B	100 x 207	**4RB1187-3EJ50-8K**	1	4	2.13
20	24	92.1	B	100 x 207	**4RB1200-3EJ50-8K**	1	4	2.13
22	26.4	101.3	B	116 x 207	**4RB1220-3EJ50-8K**	1	4	2.86
25	30	115.1	B	116 x 192	**4RB1250-3EJ50-8K**	1	4	2.65
28.1	-	129.4	B	116 x 207	**4RB1281-3EJ50-8K**	1	4	2.86
30	-	138.1	B	125 x 192	**4RB1300-3EJ50-8K**	1	4	3.09
31	-	142.7	B	116 x 224	**4RB1310-3EJ50-8K**	1	4	3.09
33	-	152	B	116 x 224	**4RB1330-3EJ50-8K**		4	3.09

50 Hz Output in kVar	60 Hz Output in kVar	Capacity in uF 3 x	Terminal Type	Dimensions D * H mm Ø	Order No	PU Unit (s)	MOQ Unit (s)	Weight per PU Kg approx
Rated Voltage 525 V AC								
5	6	19.2	A	75 x 164	**4RB1050-3FC50-8K**	1	6	0.95
6.3	7.6	24.2	A	75 x 164	**4RB1063-3FC50-8K**	1	6	0.95
8.3	10	31.9	A	75 x 200	**4RB1083-3FC50-8K**	1	6	1.16
10.4	12.5	40	A	85 x 185	**4RB1104-3FC50-8K**	1	9	1.37
12.5	15	48.1	A	85 x 200	**4RB1125-3FC50-8K**	1	9	1.48
13.2	15.8	50.8	A	85 x 200	**4RB1132-3FC50-8K**	1	9	1.48
15	18	57.7	A	85 x 218	**4RB1150-3FC50-8K**	1	4	1.62
16.7	20	64.3	B	100 x 207	**4RB1167-3FC50-8K**	1	6	2.13
20	24	77	B	100 x 224	**4RB1200-3FC50-8K**	1	4	2.3
25	30	96.2	B	116 x 207	**4RB1250-3FC50-8K**	1	4	2.86
26.5	31.8	102	B	116 x 207	**4RB1265-3FC50-8K**	1	4	2.86
30	-	115.5	B	125 x 207	**4RB1300-3FC50-8K**	1	4	3.1
33.1	-	127.4	B	136 x 192	**4RB1331-3FC50-8K**	1	4	3.65
Rated Voltage 690 V AC								
5.3	6.4	11.8	C	75 x 185	**4RB1053-3GK50-8K**	1	6	1.16
6.9	8.3	15.4	C	75 x 200	**4RB1068-3GK50-8K**	1	6	1.16
10.4	12.5	23.2	C	75 x 200	**4RB1104-3GK50-8K**	1	6	1.16
12.5	15	27.9	C	85 x 200	**4RB1125-3GK50-8K**	1	9	1.48
14.6	17.5	32.5	D	100 x 207	**4RB1146-3GK50-8K**	1	6	2.13
20	24	44.6	D	100 x 207	**4RB1200-3GK50-8K**	1	6	2.13
25	30	55.7	D	116 x 192	**4RB1250-3GK50-8K**	1	4	2.65

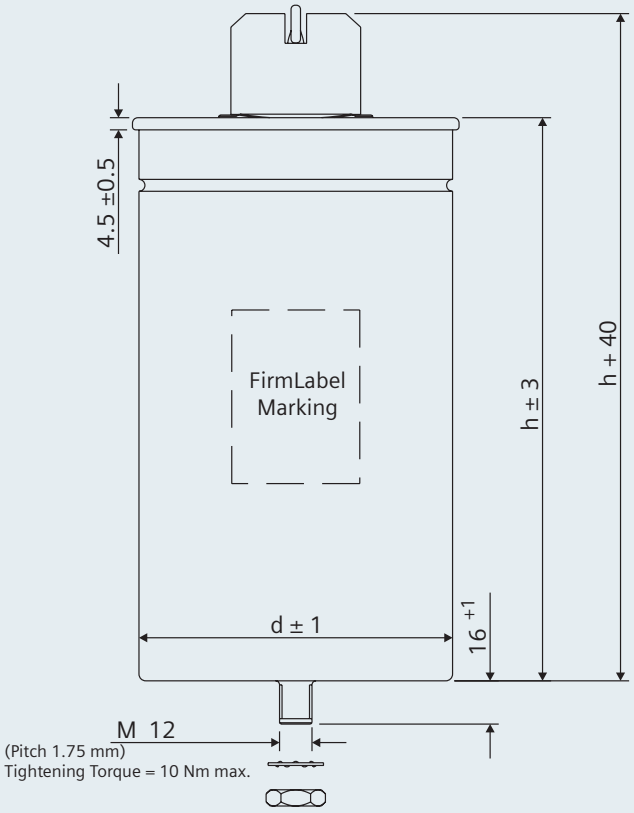
Dimension drawings

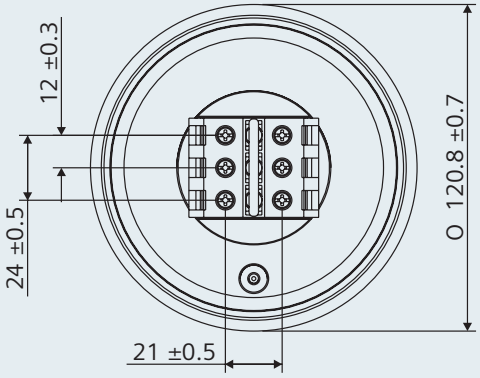
Terminal Type A



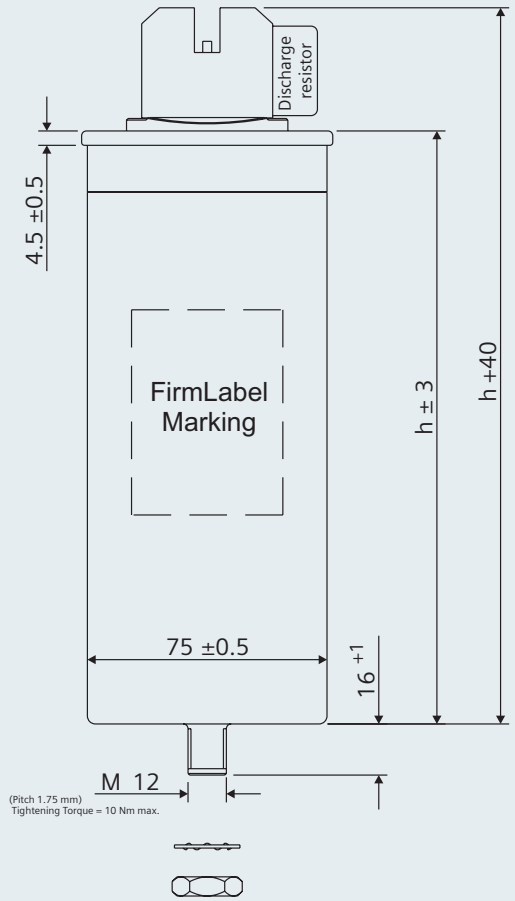


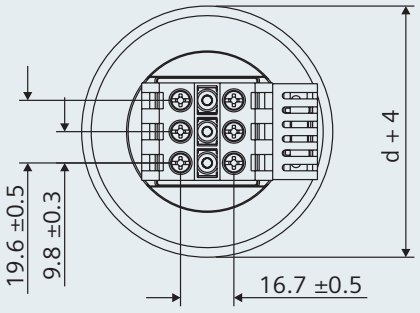
Terminal Type B



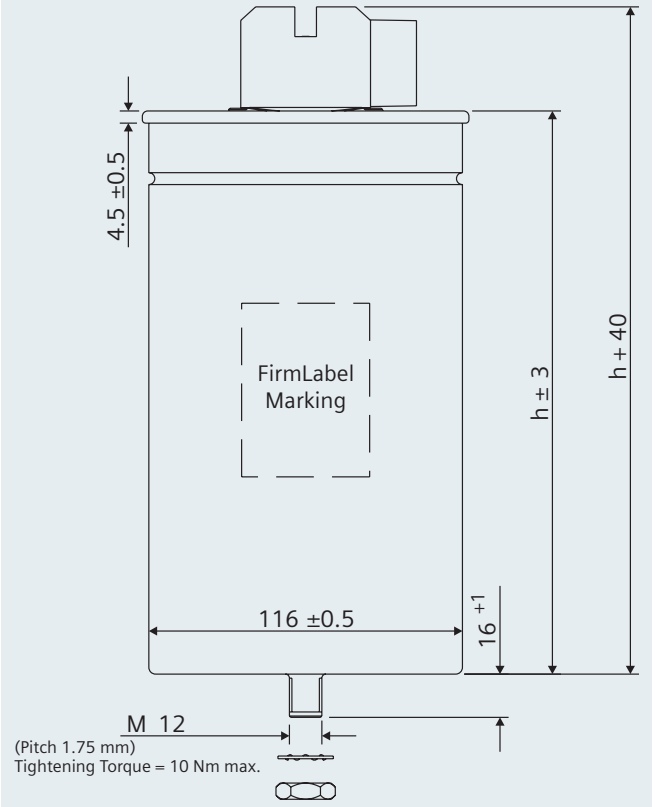


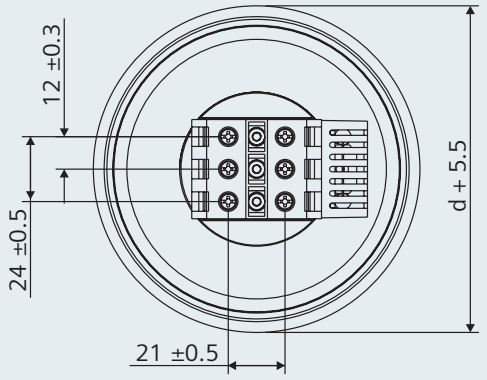
Terminal Type C



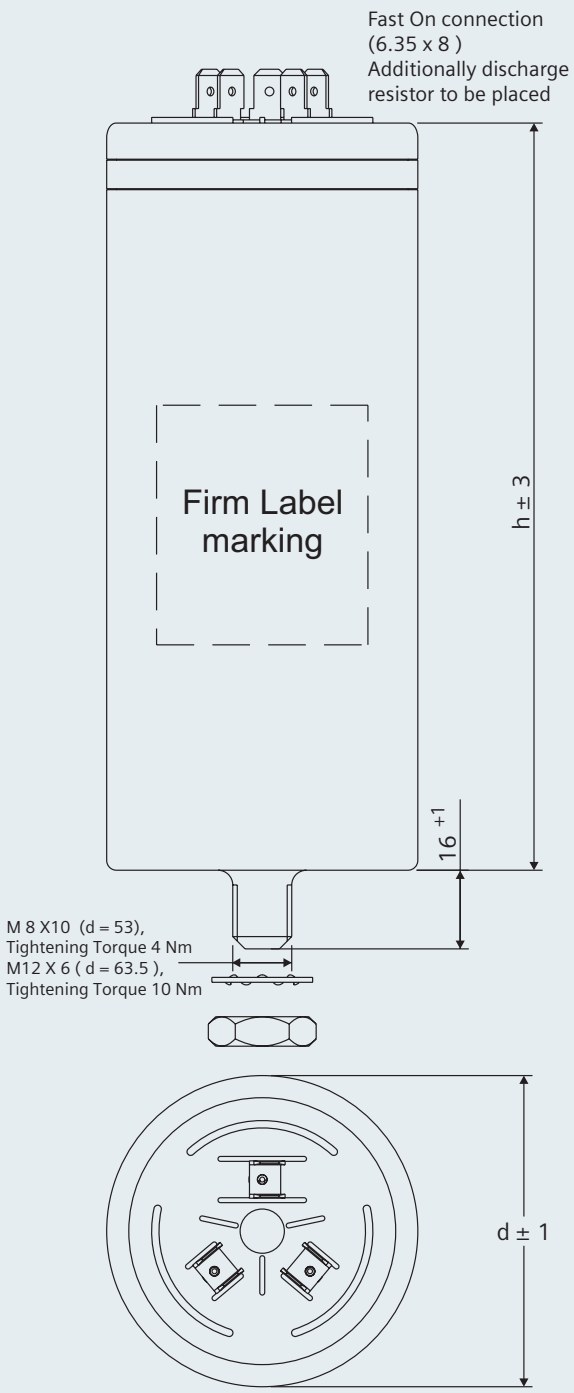


Terminal Type D





Terminal Type E



Detuned reactor

Overview

In past few years the use of power electronics equipment's like drives, SMPS, UPS etc has increased tremendously. These devices distort the pure sinusoidal waveform of power supply. These distortions can be called as harmonics. When a capacitor is used for power factor correction, it might create a resonating circuit with the feeding transformer. The resonance frequency is generally from 250Hz to 500Hz, that means 5th to 7th harmonics. This resonance is undesired condition and it might lead to

- Overloading of capacitors- reduce the life of capacitor
- Overloading of transformer, cables and other switchgear elements in the circuit- reduces life of all components
- Voltage distortion
- Increased power losses
- Nuisance tripping of protection equipment

This resonance can be avoided by putting a detuned reactor in series with the capacitor. The reactor shall be such that the tuning frequency with capacitor shall be less than the dominant harmonics. This combination of power factor correction capacitor and detuned reactors behaves inductively to frequencies above tuning frequency. Thus provide high impedance path to harmonics present in the system.

Detuning factor

Detuning factor can be defined by following formula:-

$$\frac{X_L}{X_C} * 100 = p\%$$

Where

X_L = Inductive reactance

X_C = Capacitive reactance

p = detuning factor in percentage

Tuning frequency of LC filtercan be calculated by below formula:-

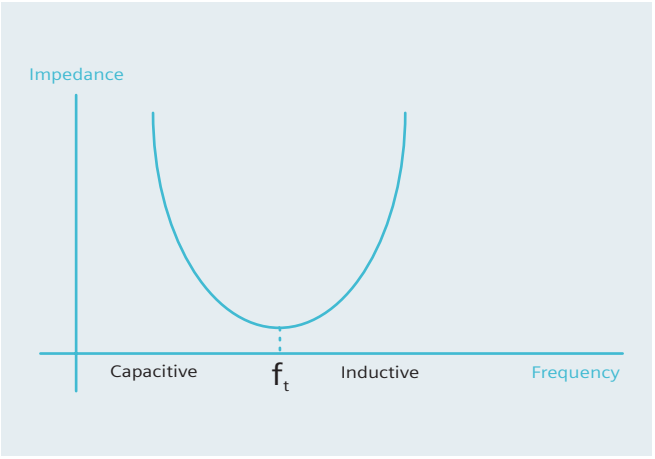
$$f_t = \frac{f_s}{\sqrt{\frac{p}{100}}}$$

Where

f_t = tuning frequency

f_s = supply frequency

p = detuning factor in percentage



This combination of detuned LC filter will act capacitive for frequency below ft and inductive for frequency above ft. Thus for base frequency of 50 or 60Hz this detune filter will act as capacitive and improves the power factor. This LC detuned filter is selected such that the tuning frequency is much less than the dominant harmonic frequency. Thus harmonics always seeshigher impedance and the condition of resonance with feeding transformeris avoided.

For example if the dominant harmonics is 5th harmonic and base frequency is 50Hz, a 7% detuned reactor shall be selected. The tuning frequency of this filter will be

$$f_t = \frac{f_s}{\sqrt{\frac{p}{100}}}$$

$$f_t = \frac{50}{\sqrt{\frac{7}{100}}} => 189 \text{ Hz}$$

189Hz, the tuning frequency in this case is lesser then 250Hz, the harmonic frequency. Hence there will not be a situation of resonance between the feeding transformer and capacitor.

Technical Specifications

7% Cu Reactor										
Technical Data										
De-tuning factor	%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Effective filter output QC	kVAr	5	10	12.5	15	20	25	50	75	100
Rated voltage VR	V	440								
Rated frequency	Hz	50								
Ambient temperature / Insulation class:		40 °C/H								
Capacitance C delta	µF	76.5	172	191	229.5	306	382.5	765	1147	1530
Inductivity L	mH	3 X 9.28	3 X 4.64	3 X 3.71	3 X 3.1	3 X 2.32	3 X 1.86	3 X 0.93	3 X 0.62	3 X 0.46
Linear up to	A	11.4	22.7	28.4	34	45.4	57	113.5	170.3	227
Effective current Irms	A	7.45	14.9	18.61	22.34	29.78	37.2	74.45	111.7	148.9
Temperature protection (NC)		yes								
Total losses P D	W	45	75	80	90	100	120	210	275	350
Total weight	kg	7	9	10	15	16	17	26	42	50
Connection										
Line		1U1-1V1-1W1								
Capacitors		1U2-1V2-1W2								
Temperature control:		1-2								
Dimension										
Length	mm	175	175	175	225	225	225	260	300	310
Height	mm	158	160	160	230	205	205	240	270	270
Width	mm	100	125	125	145	155	155	215	180	205

14%, Cu reactors										
Technical Data										
De-tuning factor	%	14%	14%	14%	14%	14%	14%	14%	14%	14%
Effective filter output QC	kVAr	5	10	12.5	15	20	25	50	75	100
Rated voltage VR	V	440								
Rated frequency	Hz	50								
Ambient temperature / Insulation class:		40 °C/H								
Capacitance C delta	µF	70.7	141.5	176.8	212.2	282.9	356.7	707.4	1061	1061
Inductivity L	mH	3 X 20.06	3 X 10.03	3 X 8.03	3 X 6.69	3 X 5.02	3 X 4.01	3 X 2.01	3 X 1.34	3 X 1
Linear up to	A	9.38	18.76	23.45	28.15	37.53	46.91	93.82	140.7	187.6
Effective current Irms	A	7.01	14.03	17.53	21.04	28.05	35.07	70.13	105.2	140.3
Temperature protection (NC)		yes								
Total losses P D	W	80	105	120	150	180	210	270	375	500
Total weight	kg	9	15	16	18	26	27	45	75	84
Connection										
Line		1U1-1V1-1W1								
Capacitors		1U2-1V2-1W2								
Temperature control:		1-2								
Dimension										
Length	mm	175	225	225	225	260	260	310	378	378
Height	mm	156	205	205	205	232	240	270	300	300
Width	mm	125	150	155	155	210	208	204	225	225

Technical Specifications

5.67%, Cu reactors										
Technical Data										
De-tuning factor	%	5.67%	5.67%	5.67%	5.67%	5.67%	5.67%	5.67%	5.67%	5.67%
Effective filter output QC	kVAr	5	10	12.5	15	20	25	50	75	100
Rated voltage VR	V	440								
Rated frequency	Hz	50								
Ambient temperature / Insulation class:		40 °C/H		5.67%						
Capacitance C delta	µF	77.6	155.2	191	232.8	310.4	387.9	775.9	1164	1552
Inductivity L	mH	3 X 7.41	3 X 3.7	3 X 2.96	3 X 2.47	3 X 1.85	3 X 1.48	3 X 0.74	3 X 0.49	3 X 0.37
Linear up to	A	13.65	27.3	34.12	40.94	54.59	68.23	136.5	204.7	272.9
Effective current Irms	A	8.37	16.74	20.93	25.11	33.48	41.85	83.71	125.6	167.4
Temperature protection (NC)		yes								
Total losses P D	W	45	75	80	90	100	120	210	275	350
Total weight	kg	7	9	10	15	16	17	26	42	50
Connection										
Line		1U1-1V1-1W1								
Capacitors		1U2-1V2-1W2								
Temperature control:		1-2								
Dimension										
Length	mm	175	175	190	225	225	225	260	310	330
Height	mm	158	160	160	230	205	205	240	270	270
Width	mm	95	124	124	145	155	155	208	180	180

7%, Al reactors										
Technical Data										
De-tuning factor	%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Effective filter output QC	kVAr	5	10	12.5	15	20	25	50	75	100
Rated voltage VR	V	440								
Rated frequency	Hz	50								
Ambient temperature / Insulation class:		40 °C/H								
Capacitance C delta	µF	76.5	172	191	229.5	306	382.5	765	1147	1530
Inductivity L	mH	3 X 9.28	3 X 4.64	3 X 3.71	3 X 3.1	3 X 2.32	3 X 1.86	3 X 0.93	3 X 0.62	3 X 0.46
Linear up to	A	11.4	22.7	28.4	34	45.4	57	113.5	170.3	227
Effective current Irms	A	7.45	14.9	18.61	22.34	29.78	37.2	74.45	111.7	148.9
Temperature protection (NC)		yes								
Total losses P D	W	50	83	85	100	110	130	240	285	380
Total weight	kg	7	9	10	15	16	17	26	42	50
Connection										
Line		1U1-1V1-1W1								
Capacitors		1U2-1V2-1W2								
Temperature control:		1-2								
Dimension										
Length	mm	175	175	175	225	225	225	275	310	335
Height	mm	158	160	160	230	205	205	238	270	270
Width	mm	100	125	125	155	175	175	230	180	185

Technical Specifications

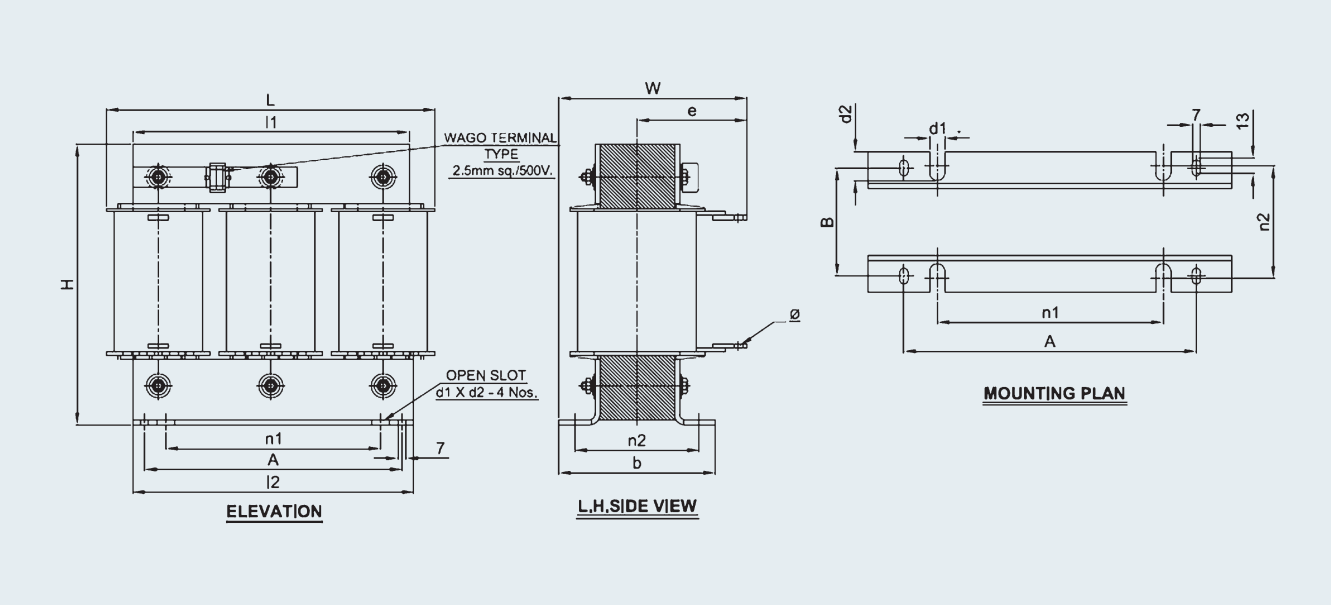
14%, Al reactors								
Technical Data								
De-tuning factor	%	14%	14%	14%	14%	14%	14%	14%
Effective filter output QC	kVAr	5	10	12.5	15	20	25	50
Rated voltage VR	V	440						
Rated frequency	Hz	50						
Ambient temperature / Insulation class:		40 °C/H						
Capacitance C delta	µF	70.7	176.8	176.8	212.2	282.9	353.7	707.4
Inductivity L	mH	3 X 20.06	3 X 10.03	3 X 8.03	3 X 6.69	3 X 5.02	3 X 4.01	3 X 2.01
Linear up to	A	9.38	18.76	23.45	28.15	37.53	46.91	93.82
Effective current Irms	A	7.01	14.03	17.53	21.04	28.05	35.07	70.13
Temperature protection (NC)		yes						
Total losses P D	W	80	105	120	150	200	210	380
Total weight	kg	9	15	16	18	25	28	42
Connection								
Line		1U1-1V1-1W1						
Capacitors		1U2-1V2-1W2						
Temperature control:		1-2						
Dimension								
Length	mm	175	225	225	225	285	285	335
Height	mm	156	205	205	205	210	230	270
Width	mm	125	150	155	155	188	188	190

5.67%, Al reactors										
Technical Data										
De-tuning factor	%	5.67%	5.67%	5.67%	5.67%	5.67%	5.67%	5.67%	5.67%	5.67%
Effective filter output QC	kVAr	5	10	12.5	15	20	25	50	75	100
Rated voltage VR	V	440								
Rated frequency	Hz	50								
Ambient temperature / Insulation class:		40 °C/H								
Capacitance C delta	µF	77.6	155.2	194	232.8	310.4	387.9	775.9	1164	1552
Inductivity L	mH	3 X 7.41	3 X 3.7	3 X 2.96	3 X 2.47	3 X 1.85	3 X 1.48	3 X 0.74	3 X 0.49	3 X 0.37
Linear up to	A	13.65	27.3	34.12	40.94	54.59	68.23	136.5	204.7	272.9
Effective current Irms	A	8.37	16.74	20.93	25.11	33.48	41.85	83.71	125.6	167.4
Temperature protection (NC)		yes								
Total losses P D	W	55	85	88	105	115	135	250	290	390
Total weight	kg	8	10	11	16	18	20	27	43	51
Connection										
Line		1U1-1V1-1W1								
Capacitors		1U2-1V2-1W2								
Temperature control:		1-2								
Dimension										
Length	mm	175	190	175	225	225	240	275	310	310
Height	mm	158	160	158	230	205	205	238	270	270
Width	mm	100	125	125	155	175	175	230	180	210

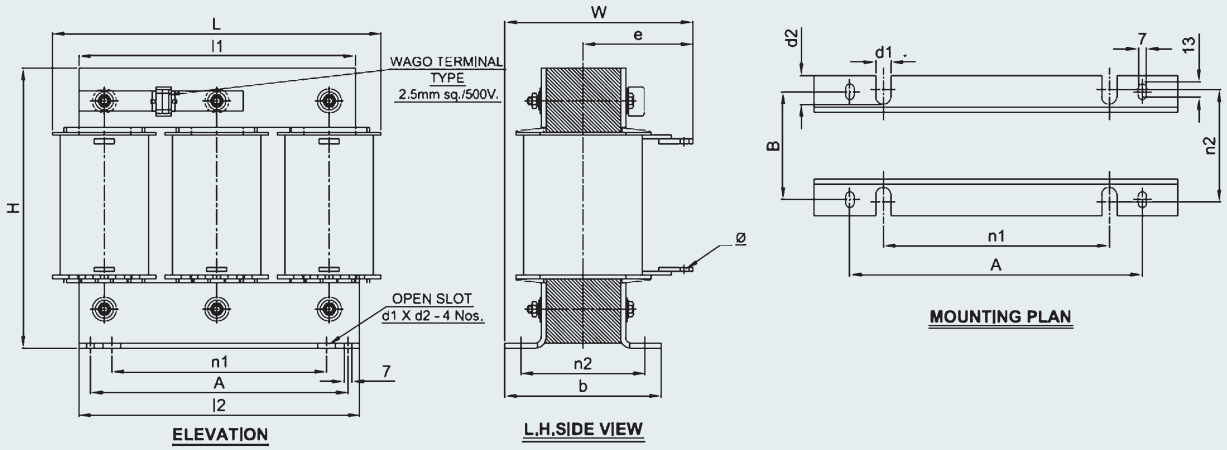
Ordering Information

Bank Size	Type	Detuning Factor	Voltage	Material
5kVAr	4KA1220-1AA01-0AA0	7%	440V AC	Cu
10kVAr	4KA1220-3AA01-0AA0	7%	440V AC	Cu
12.5kVAr	4KA1220-4AA01-0AA0	7%	440V AC	Cu
15kVAr	4KA1220-5AA01-0AA0	7%	440V AC	Cu
20kVAr	4KA1220-6AA01-0AA0	7%	440V AC	Cu
25kVAr	4KA1220-7AA01-0AA0	7%	440V AC	Cu
50kVAr	4KA1220-2BA01-0AA0	7%	440V AC	Cu
75kVAr	4KA1220-3BA03-0AA0	7%	440V AC	Cu
100kVAr	4KA1220-4BA03-0AA0	7%	440V AC	Cu
5kVAr	4KA1220-1AB01-0AA0	14%	440V AC	Cu
10kVAr	4KA1220-3AB01-0AA0	14%	440V AC	Cu
12.5kVAr	4KA1220-4AB01-0AA0	14%	440V AC	Cu
15kVAr	4KA1220-5AB01-0AA0	14%	440V AC	Cu
20kVAr	4KA1220-6AB01-0AA0	14%	440V AC	Cu
25kVAr	4KA1220-7AB01-0AA0	14%	440V AC	Cu
50kVAr	4KA1220-2BB01-0AA0	14%	440V AC	Cu
75kVAr	4KA1220-3BB03-0AA0	14%	440V AC	Cu
100kVAr	4KA1220-4BB03-0AA0	14%	440V AC	Cu
5kVAr	4KA1220-1AC01-0AA0	5.67%	440V AC	Cu
10kVAr	4KA1220-3AC01-0AA0	5.67%	440V AC	Cu
12.5kVAr	4KA1220-4AC01-0AA0	5.67%	440V AC	Cu
15kVAr	4KA1220-5AC01-0AA0	5.67%	440V AC	Cu
20kVAr	4KA1220-6AC01-0AA0	5.67%	440V AC	Cu
25kVAr	4KA1220-7AC01-0AA0	5.67%	440V AC	Cu
50kVAr	4KA1220-2BC01-0AA0	5.67%	440V AC	Cu
75kVAr	4KA1220-3BC03-0AA0	5.67%	440V AC	Cu
100kVAr	4KA1220-4BC03-0AA0	5.67%	440V AC	Cu
5kVAr	4KA1420-1AA01-0AA0	7%	440V AC	Al
10kVAr	4KA1420-3AA01-0AA0	7%	440V AC	Al
12.5kVAr	4KA1420-4AA01-0AA0	7%	440V AC	Al
15kVAr	4KA1420-5AA01-0AA0	7%	440V AC	Al
20kVAr	4KA1420-6AA01-0AA0	7%	440V AC	Al
25kVAr	4KA1420-7AA01-0AA0	7%	440V AC	Al
50kVAr	4KA1420-2BA01-0AA0	7%	440V AC	Al
75kVAr	4KA1420-3BA03-0AA0	7%	440V AC	Al
100kVAr	4KA1420-4BA03-0AA0	7%	440V AC	Al
5kVAr	4KA1420-1AB01-0AA0	14%	440V AC	Al
10kVAr	4KA1420-3AB01-0AA0	14%	440V AC	Al
12.5kVAr	4KA1420-4AB01-0AA0	14%	440V AC	Al
15kVAr	4KA1420-5AB01-0AA0	14%	440V AC	Al
20kVAr	4KA1420-6AB01-0AA0	14%	440V AC	Al
25kVAr	4KA1420-7AB01-0AA0	14%	440V AC	Al
50kVAr	4KA1420-2BB01-0AA0	14%	440V AC	Al
5kVAr	4KA1420-1AC01-0AA0	5.67%	440V AC	Al
10kVAr	4KA1420-3AC01-0AA0	5.67%	440V AC	Al
12.5kVAr	4KA1420-4AC01-0AA0	5.67%	440V AC	Al
15kVAr	4KA1420-5AC01-0AA0	5.67%	440V AC	Al
20kVAr	4KA1420-6AC01-0AA0	5.67%	440V AC	Al
25kVAr	4KA1420-7AC01-0AA0	5.67%	440V AC	Al
50kVAr	4KA1420-2BC01-0AA0	5.67%	440V AC	Al
75kVAr	4KA1420-3BC03-0AA0	5.67%	440V AC	Al
100kVAr	4KA1420-4BC03-0AA0	5.67%	440V AC	Al

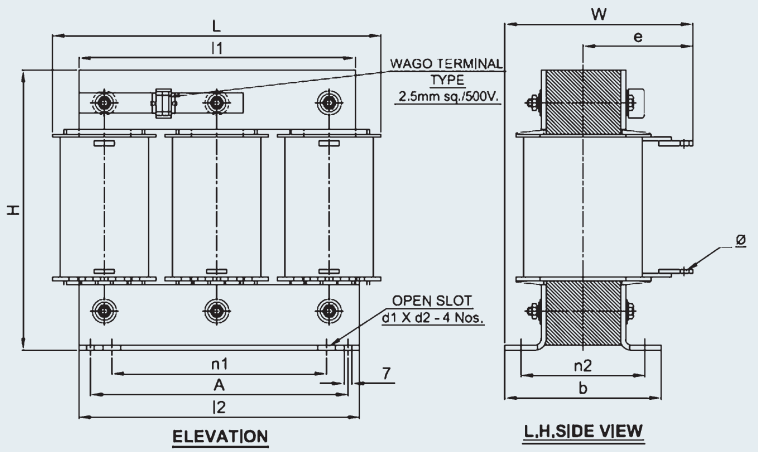
Dimension drawing



7% Cu detuned reactor (all dimensions in mm)															
kVAr	Type	L	H	W	l1	l2	n1	n2	b	e	d1	d2	A	B	Ø
5	**4KA1220-1AA01-0AA0**	175	158	100	150	150	100	62	78	62	10.8	15.5	125	58	6.5
10	**4KA1220-3AA01-0AA0**	175	160	125	150	150	100	83	98	76	10.8	15.5	125	58	6.5
12.5	**4KA1220-4AA01-0AA0**	175	160	125	150	150	100	83	98	76	10.8	15.5	125	58	6.5
15	**4KA1220-5AA01-0AA0**	225	230	145	190	190	150	73	90	97	10.8	15.5	175	71.5	8.5
20	**4KA1220-6AA01-0AA0**	225	205	155	190	190	150	98	112	100	10.8	15.5	175	95	8.5
25	**4KA1220-7AA01-0AA0**	225	205	155	190	190	150	98	112	100	10.8	15.5	175	95	8.5
50	**4KA1220-2BA01-0AA0**	260	240	215	220	220	150	168	185	118	10.8	15.5	175	165	8.5
75	**4KA1220-3BA03-0AA0**	300	270	180	250	250	150	136.5	150	97	10.8	15.5	175	132	10.5
100	**4KA1220-4BA03-0AA0**	310	270	205	265	265	150	162.5	178	110	10.8	15.5	175	159	10.5
7% Al detuned reactor (all dimensions in mm)															
kVAr	Type	L	H	W	l1	l2	n1	n2	b	e	d1	d2	A	B	Ø
5	**4KA1420-1AA01-0AA0**	175	158	100	150	150	100	61.5	78	62	10.8	15.5	125	58	6.5
10	**4KA1420-3AA01-0AA0**	175	160	125	150	150	100	82.5	98	76	10.8	15.5	125	58	6.5
12.5	**4KA1420-4AA01-0AA0**	175	160	125	150	150	100	82.5	98	76	10.8	15.5	125	78	6.5
15	**4KA1420-5AA01-0AA0**	225	230	155	190	190	150	73	90	105	10.8	15.5	175	71.5	8.5
20	**4KA1420-6AA01-0AA0**	225	205	175	190	190	150	97.8	112	115	10.8	15.5	175	95	8.5
25	**4KA1420-7AA01-0AA0**	225	205	175	190	190	150	97.8	112	115	10.8	15.5	175	95	8.5
50	**4KA1420-2BA01-0AA0**	275	238	230	235	235	150	168	185	135	10.8	15.5	175	165	8.5
75	**4KA1420-3BA03-0AA0**	310	270	180	265	265	150	135	150	99	10.8	15.5	175	132	10.5
100	**4KA1420-4BA03-0AA0**	335	270	185	285	285	150	136.5	150	97	10.8	15.5	175	132	10.5



14% Cu detuned reactor (all dimensions in mm)															
kVAr	Type	L	H	W	l1	l2	n1	n2	b	e	d1	d2	A	B	Ø
5	**4KA1220-1AB01-0AA0**	175	156	125	150	150	100	84	100	76	10.8	15.5	125	81	6.5
10	**4KA1220-3AB01-0AA0**	225	205	150	190	190	150	97.5	112	96	10.8	15.5	175	95	6.5
12.5	**4KA1220-4AB01-0AA0**	225	205	155	190	190	150	98	112	100	10.8	15.5	175	95	8.5
15	**4KA1220-5AB01-0AA0**	225	205	155	190	190	150	97.5	112	100	10.8	15.5	175	95	8.5
20	**4KA1220-6AB01-0AA0**	260	232	210	220	220	150	168	185	120	10.8	15.5	175	165	8.5
25	**4KA1220-7AB01-0AA0**	260	240	208	220	220	150	168	185	116	10.8	15.5	175	165	8.5
50	**4KA1220-2BB01-0AA0**	310	270	204	265	265	150	135	150	120	10.8	15.5	175	132	8.5
75	**4KA1220-3BB03-0AA0**	378	300	225	330	330	150	170	190	122	10.5	15.5	175	170	10.5
100	**4KA1220-4BB03-0AA0**	378	300	225	330	330	150	170	190	122	10.5	15.5	175	170	10.5
14% Al detuned reactor (all dimensions in mm)															
kVAr	Type	L	H	W	l1	l2	n1	n2	b	e	d1	d2	A	B	Ø
5	**4KA1420-1AB01-0AA0**	175	156	125	150	150	100	84	100	76	10.8	15.5	125	81	6.5
10	**4KA1420-3AB01-0AA0**	225	205	150	190	190	150	97.5	112	96	10.8	15.5	175	95	6.5
12.5	**4KA1420-4AB01-0AA0**	225	205	155	190	190	150	98	112	100	10.8	15.5	175	95	8.5
15	**4KA1420-5AB01-0AA0**	225	205	155	190	190	150	97.5	112	100	10.8	15.5	175	95	8.5
20	**4KA1420-6AB01-0AA0**	285	210	188	235	235	150	168	185	92	10.8	15.5	175	165	8.5
25	**4KA1420-7AB01-0AA0**	285	230	188	235	235	150	165	185	95	10.8	15.5	175	168	8.5
50	**4KA1420-2BB01-0AA0**	335	270	190	285	285	150	136	150	99	10.8	15.5	175	132	10.5



5.67% Cu detuned reactor (all dimensions in mm)															
kVAr	Type	L	H	W	l1	l2	n1	n2	b	e	d1	d2	A	B	Ø
5	**4KA1220-1AC01-0AA0**	175	158	95	150	150	100	56	73	60	10.8	15.5	125	56	6.5
10	**4KA1220-3AC01-0AA0**	175	160	124	150	150	100	78	95	75	10.8	15.5	125	78	6.5
12.5	**4KA1220-4AC01-0AA0**	190	160	124	165	165	60	80	98	75	10.8	15.5	85	80	6.5
15	**4KA1220-5AC01-0AA0**	225	230	145	190	190	150	73	90	97	10.8	15.5	175	71.5	8.5
20	**4KA1220-6AC01-0AA0**	225	205	155	190	190	150	95	112	100	10.8	15.5	175	95	8.5
25	**4KA1220-7AC01-0AA0**	225	205	155	190	190	150	95	112	100	10.8	15.5	175	95	8.5
50	**4KA1220-2BC01-0AA0**	260	240	208	220	220	150	165	185	116	10.8	15.5	175	165	8.5
75	**4KA1220-3BC03-0AA0**	310	270	180	265	265	150	132	150	97	10.8	15.5	175	132	10.5
100	**4KA1220-4BC03-0AA0**	330	270	180	285	285	150	132	155	97	10.8	15.5	175	132	10.5
5.67% Al detuned reactor (all dimensions in mm)															
kVAr	Type	L	H	W	l1	l2	n1	n2	b	e	d1	d2	A	B	Ø
5	**4KA1420-1AC01-0AA0**	175	158	100	150	150	100	61.5	78	62	10.8	15.5	125	58	6.5
10	**4KA1420-3AC01-0AA0**	190	160	125	165	165	60	78	98	76	10.8	15.5	85	76	6.5
12.5	**4KA1420-4AC01-0AA0**	175	160	125	150	150	100	82.5	98	76	10.8	15.5	125	78	6.5
15	**4KA1420-5AC01-0AA0**	225	230	155	190	190	150	73	90	105	10.8	15.5	175	71.5	8.5
20	**4KA1420-6AC01-0AA0**	225	205	175	190	190	150	97.8	112	115	10.8	15.5	175	95	8.5
25	**4KA1420-7AC01-0AA0**	240	205	175	205	205	150	98	112	115	10.8	15.5	175	95	8.5
50	**4KA1420-2BC01-0AA0**	275	238	230	235	235	150	168	185	135	10.8	15.5	175	165	8.5
75	**4KA1420-3BC03-0AA0**	310	270	180	265	265	150	135	150	99	10.8	15.5	175	132	10.5
100	**4KA1420-4BC03-0AA0**	310	270	210	265	265	150	160	175	110	10.8	15.5	175	160	10.5

Smart. Easy. Reliable.

Automatic Power Factor Controller Relay 7UG05 for optimized power need.

7UG05 Automatic power factor correction relay

- Controls the required Power factor
- Manage capacitor bank switching
- Monitors power quality
- Communication capable
- Common relay for three CT and Single CT connection

Overview

7UG0572-1GT21

- Intelligent 12 stage relay controls
- Confirms to IEC 60947-5-1, carry CE and RoHS Compliant
- 4 digit 7 segment LED display
- Universal control supply – optimizing the no of variants
- Automatic / Linear / rotational switching of banks
- Power factor settable-0.8 lag -- 0.8 Lead
- Selectable 1A /5A current input

7UG0572-1GT20

- Intelligent 12 stage relay controls
- Confirms to IEC 60947-5-1, carry CE and RoHS Compliant
- Dual colour Backlight LCD display
- Universal control supply – optimizing the no of variants
- Automatic / Linear / rotational switching of banks
- Power factor settable-0.8 lag – 0.8 Lead
- Selectable 1A /5A current input
- Measurement and display of key parameters viz: Voltage, Current, Power factor, THDI etc
- RS485 Communication MODBUS RTU Protocol

7UG0571-1FT20

- Intelligent 08 stage relay controls
- Confirms to IEC 60947-5-1, carry CE and RoHS Compliant
- Dual colour Backlight LCD display
- Universal control supply – optimizing the no of variants
- Automatic / Linear / rotational switching of banks
- Power factor settable-0.8 lag -- 0.8 Lead
- Selectable 1A /5A current input
- Measurement and display of key parameters viz: Voltage, Current, Power factor, THDI etc
- RS485 Communication MODBUS RTU Protocol

APFC relay: Technical data

		
Type	**7UG0571-1FT20 (8 step) / 7UG0572-1GT20 (12 step)**	**7UG0572-1GT21**
Display	LCD with dual color backlight 3 line 4 digit & Programable Scrolling (Auto / Manual / Default) to show electrical parameters	4 digit 7 segment LED (No display scrolling, only PF is displyed)
INPUT		
Rated operational voltage [Ue]	415V	
Rated Insulation Voltage [Ui]	600V	
Rated Impulse Withstand Voltage [Uimp]	6kV	
Overvoltage category	III	
Control supply AC	90 to 250 VAC	
Power consumption	15VA	
Frequency HZ	50/60Hz	
Mains		
L-N AC	30 to 250 VAC	
L-L AC	50 to 440 VAC	
Current AC	5A AC	
Frequency HZ	50/60Hz	
Digital input	Yes	NA
Wiring input	3P 4W / 3P 3W / 2P 2W / 1P 2W	
Environment condition		
Temperature (operating)	0°C to +60°C	
Temperature (storage)	-20°C to +60°C	
Humidity	0 % to 95 %, without moisture condensation	
Pollution Degree	PCB: 2 Product: 3	
IP Protection	IP20	
Accuracy		
Voltage	± 0.5% of full range	NA
Current	± 0.5% of full range	NA
Power factor	± 0.01	
Frequency	± 0.1% of full range	NA
Power (KW, KVA, KVAr)	± 1% of full range	NA
Energy (KWh, KVAh, KVArh)	± 1% of full range	NA
Resolution		
Energy (kWh)	0.01k, 0.1k, 1k, 0.01M, 0.1M, 1M	NA
Power factor	For average PF: 0.01 For phase PF: 0.001	0.001
Voltage, current & power	Auto	NA
Measurement parameters		
Power factor	√	√
True RMS voltage	√	x
Current	√	x
Frequency	√	x
Power (KW, KVA, KVAr)	√	x
Energy (KWh, KVArh)	√	x
Temperature	√	x

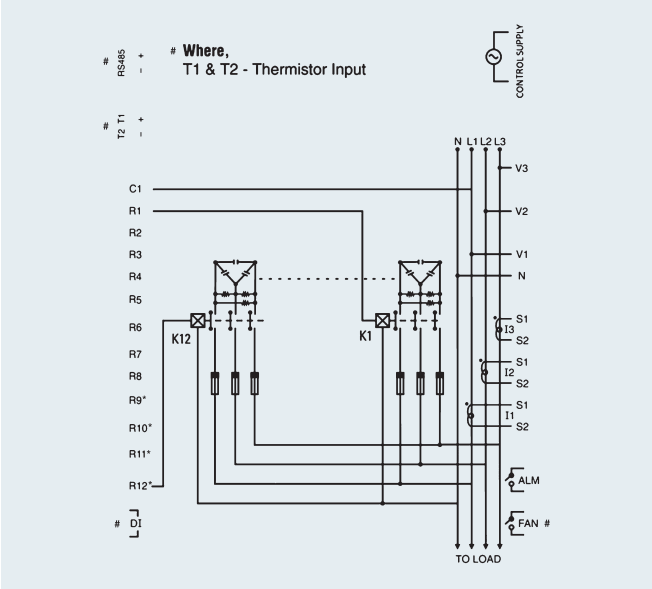
Setting		
Power factor (settable)	0.8 lag --- 0.8 Lead	
Reconnection time (sec)	Reconnection time is same as discharge time	
Step switching time (sec)	1 - 999 (Default is 5 sec)	
Discharge time (sec)	1 - 9999 (Default is 180 sec)	
No voltage release	Instantaneous** (Voltage failure) 90 sec (Voltage restoration)	
Control sensitivity	55 -- 100%	
Switching	Automatic / Linear / rotational	
Control	Automatic / Manual	
CT (programable)	Pri: 1A / 5A upto 9999A Sec: 1A/ 5A	
CT Burden	20 mohms	
PT (programable)	Pri: 100 V - 500KV Sec: 100 V - 500V	NA
Alarm Indication		
% THDI	20 -100% / OFF	NA
Over Voltage AC	(L-N) 50 - 277V (L-L) 85 - 480V	
Under Voltage AC	(L-N) 50 - 240V (L-L) 85 - 415V	
No Voltage	ON / OFF	
Over compensate	ON / OFF	
Under compensate	ON / OFF	
CT Polarity error	ON / OFF	
Step error	20 -- 80% or OFF	
Over Temperature	0--100°C, ON /OFF	NA
Current absent indication	NA	CURR
Fan setting	ON/OFF	NA
Test mode Facility	YES	
Display		
% THDI	20 - 100%	NA for LED variant
Harmonics Resolutions	Upto 31st Harmonics	NA for LED variant
Active Power	4 digit	NA for LED variant
Reactive Power	4 digit	NA for LED variant
Apparent Power	4 digit	NA for LED variant
Voltage	100V - 500kV	NA for LED variant
Current	1 - 9999A	NA for LED variant
Temperature	0 - 100°C	NA for LED variant
Frequency	45 - 65 Hz	NA for LED variant
Power factor	-1.00 to 1.00	
Mechanical		
Mounting	Panel	
Dimension(WxHxD)	144 X 144 X 50 MM	
Net weight	635gms (Final packing with accessories)	610gms (Final packing with accessories)
Termination for Control supply, Measuring circuit, output relays		
Conductor cross section (solid) sq.mm.	1x (0.75 to 2.5) 2x 0.5 to 2x 1.5	1 x (0.75 to 2.5) 2x 0.5 to 2x 1.5
Conductor cross section (stranded with end sleeve) sq.mm.	1 x (0.5 to 2.5) 2x (0.5 to 1.5)	1 x (0.5 to 2.5) 2x (0.5 to 1.5)
Tightening torque	0.5 Nm	0.5 Nm
Termination for RS485, T1, T2		
Conductor cross section (solid / stranded)	1x 0.5	1x 0.5
Tightening torque	0.4 Nm	0.4 Nm
Output		
Relay Contacts	NO, one common point max fuse 6A	
Ie (AC12 @ 250VAC)	5A* @ 250VAC	
Ie (AC15 @ 250VAC)	1A @ 250VAC	
Password protection	YES	
Communication	RS 485 & Modbus-RTU communication	NA
Standards	IEC 60947-5-1	
Markings	CE & RoHS	

* 5A rating is for each relay contact. If multiple relays are getting switched simultaneously, relay rating will be derated to 1.2A @ 250V
** Response time is 3-5 sec

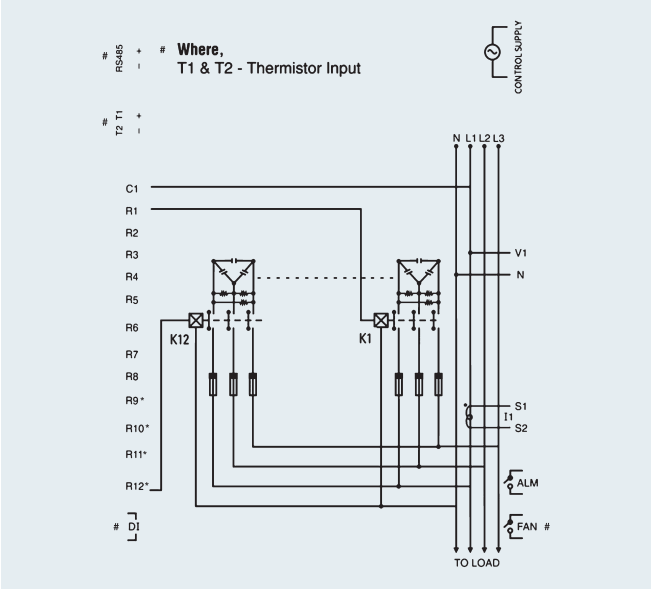
Dimensions and wiring diagram

Wiring Diagram

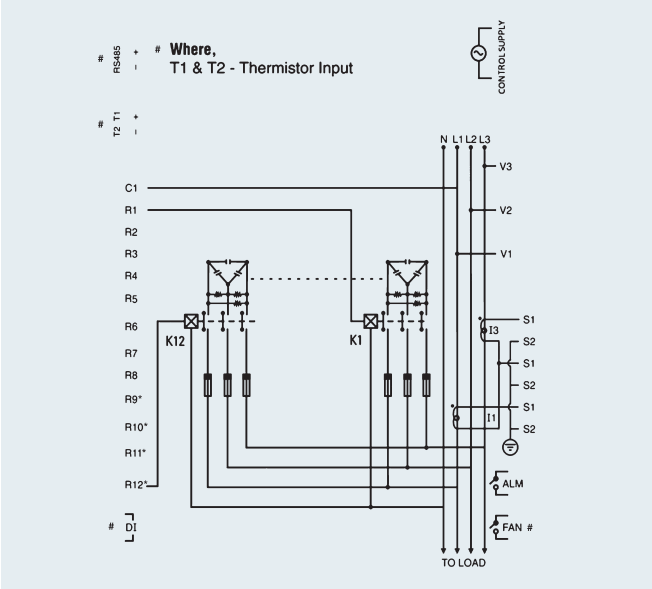
3 Phase - 4 Wire



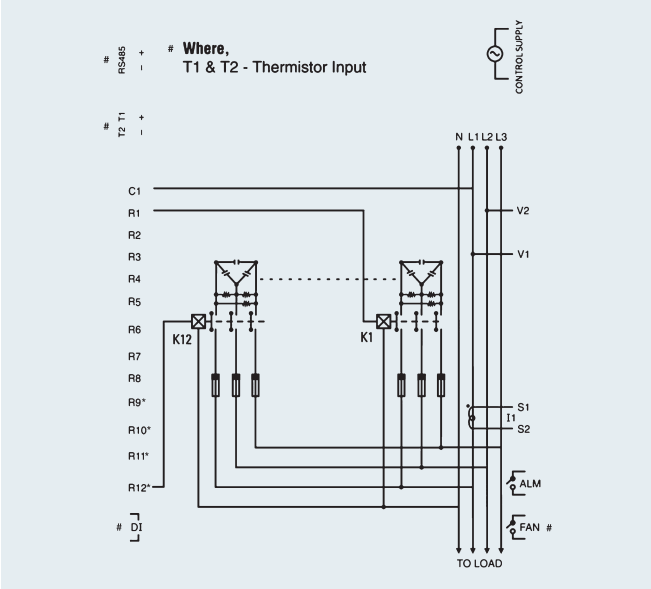
1 Phase - 2 Wire



3 Phase - 3 Wire



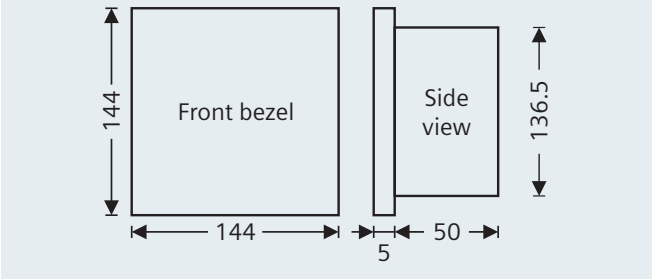
2 Phase - 2 Wire



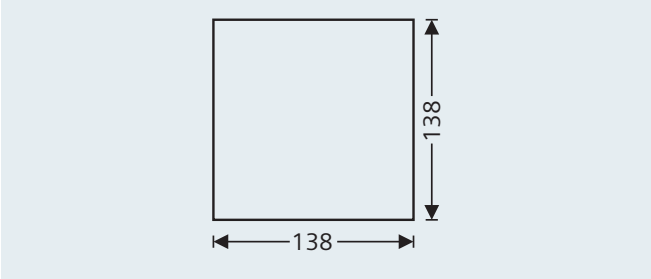
Note: • For N/W selection 2P2W voltage (V_{LL}) applied between V1 & V2 and connect CT for I1 (Do not use V3, N, I2 & I3 terminal)
• For N/W selection 1P2W voltage (V_{LN}) applied between V1 & N and connect CT for I1 (Do not use V2, V3, I2 & I3 terminal)
Only available in 7UG0571-1FT20 & 7UG0572-1GT20 variants * Not applicable for 7UG0571-1FT20

Dimensional Drawing (mm)

Outline Dimension (in mm)



Panel Cutout (in mm)



3TS Capacitor duty contactors

Overview:

For more than 125 years, Siemens has been developing and manufacturing industrial control products. We offer a wide product range which caters to fulfill the demand of our esteemed customers with satisfactory performance level and improved reliability. The new range of capacitor duty contactor has been launched to provide a reliable and economical solution for capacitor switching applications.

Capacitor Duty Contactor

Range:

- 7kVAr - 50kVAr

Features:

- Delatching operating principle
- SIGUT Termination technique
- Finger touch proof terminals $
- Compact Dimensions
- DIN / Screw mounting

Benefits:

- Reliable switching of capacitor banks
- Ease of wiring (can obviate use of lugs)
- Operator Safety
- Space saving
- Flexible mounting

Standards:

- IEC 60947-4-1

Approbations:

- CE marking

Operating Principle:

In Low Voltage industrial installations, capacitors are mainly used for reactive power correction (raising the power factor). When these capacitors are energized, overcurrents of high amplitude and high frequencies (3 to 15 kHz) occur during the transient period (~1 ms).

The amplitude of these current peaks, also known as "inrush current peaks", depends on the following factors:

- The network inductances.
- The transformer power and short-circuit voltage.
- Type of power factor correction: fixed or automatic.
- Harmonics present in the system.

The in-rush current of such high magnitudes is undesirable and it is likely to weld main contacts of any standard contactor. Therefore, contactor for capacitor bank switching must be designed to withstand:

- Permanent current that can reach 1.5 time the nominal current of capacitor bank.
- Short but high peak current on pole closing.

Hence, capacitor duty switching device requires careful selection. It is always recommended to use dedicated capacitor duty switching contactor for switching capacitor bank, which optimizes the switchgear cost & enhances the equipment life.

Siemens 3TS capacitor duty contactor works on mechanical delatching operating principle, which ensures reliable switching of capacitors as per AC-6b utilization category.

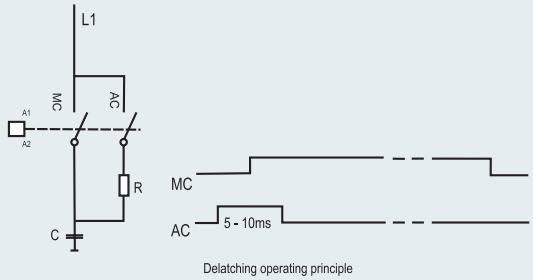
Delatching operating principle:

The front-mounted block mechanism of the 3TS capacitor duty contactors ensures:

- early making of the auxiliary contacts "AC" with respect to the main contacts "MC"
- automatic return to the open position of the auxiliary contacts after the main contacts are closed.

When the coil is energized, the early making auxiliary contacts connect the capacitor to the network via the set of 3 resistors. The damping resistors attenuate the first current peak and the second inrush current when the main contacts begin to make. Once the main contacts are in the closed position, the auxiliary contacts automatically break.

When the coil is de-energized, the main contacts break ensuring the breaking of the capacitive current. The contactor can then begin a new cycle.

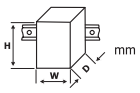


Delatching operating principle

AC = auxiliary contacts MC = main contacts

$ upto 25kVAr

Technical specifications:

							
Type		**3TS11**	**3TS12**	**3TS13**	**3TS14**	**3TS15**	**3TS17**
Size		1	2	3	3	3	4
Dimensions (H x D x W) *including auxiliary switches and connecting cables* • Screw-type terminals	 mm	H x D x W 115 x 125 x 45	H x D x W 115 x 136 x 45	H x D x W 120 x 148 x 55	H x D x W 120 x 148 x 55	H x D x W 120 x 148 x 55	H x D x W 117x177x90
General technical specifications							
Conformance to		IEC-60947-4-1					
Approvals		CE					
Degree of protection acc. to IEC 60529	IP	IP 20	IP 20	IP20 for Aux block IP00 contactor	IP20 for Aux block IP00 contactor	IP20 for Aux block IP00 contactor	IP 00
Storage temperature	°C	-25 to +55					
Operating temperature	°C	-25 to +40					
Altitude of site (without technical restrictions)	m	2000					
Type of mounting		DIN / Screw					Screw
Main Circuit							
Rated insulation voltage Ui	V	690					
Rated operational voltage Ue	V	415 / 440					
Rated operational Current Ie ***(Harmonic & Safety factor excluded)***	A	9.7	17.4	22.3	27.8	34.8	69.6
Impulse withstand voltage Uimp	kV	6					
Rated frequency	Hz	50					
Capacitor rating at rated power (utilization category AC-6b) 415/440 V, 50Hz	kVAr	7	12.5	16	20	25	50
Max. switching frequency	Cycles per hour	180					100
Coil operating range		0.85 to 1.1Us					
Auxiliary contacts mounted		1 NO	–				2 NO + 2NC
Auxiliary contacts mountable		1NO or 1NC					–
Short-circuit protection device for contactors With Fuse - Operational class gG - Type 1 co-ordination (3NA7)	A	20	32	50	50	63	125
Connecting characteristics							
Main conductors		**Screw terminals**					
Terminal screw size		M3.5	M4				M6
Screw head type		Slotted Cheese Head					Hex Head
Tightening torque Recommended	N-m	0.8 to 1.4	1 to 1.5	2.5 to 3			4 to 6
Conductor cross-section							
Solid	mm^2	1 x (1 to 2.5)	1 x (2.5 to 6)	1 x (1 to 16)			
Finely stranded with end sleeve	mm^2	1 x (0.75 to 2.5)	1 x (1.5 to 4)	1 x (1.5 to 16)			
Finely stranded	mm^2	-	-	1 x (1.5 to 16)			
Finely stranded with pin end connector	mm^2	1 x (0.75 to 2.5)	1 x (1.5 to 4)	1 x (1.5 to 16)			
Finely stranded with ring type lug	mm^2	–					1 x35, 2 x 16
Busbar (max width)	mm	–					12
Auxiliary conductors *(built-in auxiliary terminals + coil terminals)*		**Screw terminals**					
Screw head type		Slotted Cheese Head					
Tightening torque Recommended	N-m	0.8 to 1.4					
Conductor cross-section							
Solid	mm^2	2 x (0.5 to 1, 1 to 2.5), 1 x 4					
Finely stranded with end sleeve	mm^2	2 x (0.75 to 2.5)					
Finely stranded with pin end connector	mm^2	2 x (0.75 to 2.5)					

Selection and ordering data:

Capacitor duty contactor - 3TS

Capacitor kVAr 415V, 3ph, 50Hz	Built-in aux. contacts	Type@	Built-in aux. contacts	Type@	Std. pkg. (nos.)
7 kVAr	1 NO	**3TS1110-0A..5-8K†**			
12.5 kVAr	–	**3TS1200-0A..5-8K†**	1NO+1NC	**3TS1211-0A..5-8K**	**1**
16 kVAr	–	**3TS1300-0A..5-8K†**	1NO+1NC	**3TS1311-0A..5-8K**	**1**
20 kVAr	–	**3TS1400-0A..5-8K†**	1NO+1NC	**3TS1411-0A..5-8K**	**1**
25 kVAr	–	**3TS1500-0A..5-8K†**	1NO+1NC	**3TS1511-0A..5-8K**	**1**
50 kVAr	2 NO + 2 NC	**3TS1722-0A..5-8K**			

3RT26 Capacitor duty contactor

Capacitor kVAr 415V, 3ph, 50Hz	Coil voltage	Built-in aux. contacts	Type	Std. pkg. (nos.)
75 kVAr	24V, 50HZ	1NO + 1NC	**3RT2637-1AB03**	**1**
	110V, 50HZ		**3RT2637-1AF03**	
	230V, 50HZ		**3RT2637-1AP03**	
100 kVAr	24V, 50HZ	1NO + 1NC	**3RT2646-1AB03**	**1**
	110V, 50HZ		**3RT2646-1AF03**	
	230V, 50HZ		**3RT2646-1AP03**	

@ AC 50Hz coil code - Please enter coil codes from table below

	For 3TS contactors		
Code	F0	P0	R0
Coil voltage (V)	110	230	415

† Facility to add one contact block of 1NO / 1NC

Auxiliary contact blocks

For contactor	Description	Type	Std.pkg. (nos.)
3TS1110-3TS1500	1NO	■ **3TX4010-2A**	**10**
	1NC	■ **3TX4001-2A**	**10**

Spares for 3TS Contactors

Capacitor Duty

Spare coils

Contactor kVAr	Description	Type*	Std. pkg. (nos.)
7 kVAr	AC 50Hz coil	**3TY74030A..**	**1**
12.5 kVAr			
16 kVAr		**3TY74430A..**	**1**
20 kVAr			
25 kVAr			
50 kVAr		**3TY74630A..**	**1**

* For coil, refer below table

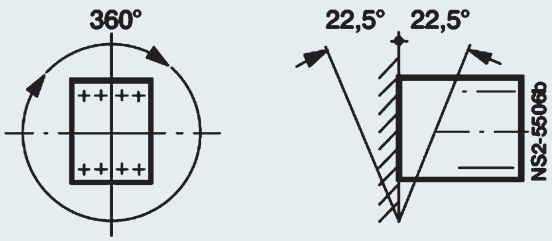
	For 3TS contactors		
Code	F0	P0	R0
Coil voltage (V)	110	230	415

Pre-charge resistor + Contact block kit

Contactor kVAr	Description	Type	Std. pkg. (nos.)
12.5 kVAr	Pre-charge resistor + early making contact block kit + main contacts kit	**3TS9762-0SX15-8K**	**1**
16 kVAr		**3TS9763-0SX15-8K**	**1**
20 kVAr		**3TS9764-0SX15-8K**	**1**
25 kVAr		**3TS9765-0SX15-8K**	**1**
50 kVAr		**3TS9767-0SX15-8K**	**1**

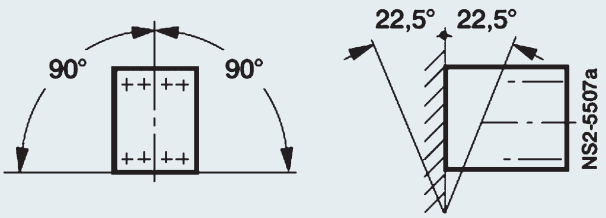
Note: Pre-charge resistor + early making contact block kit + main contacts should be replaced simultaneously

Mounting details:



Frame 1

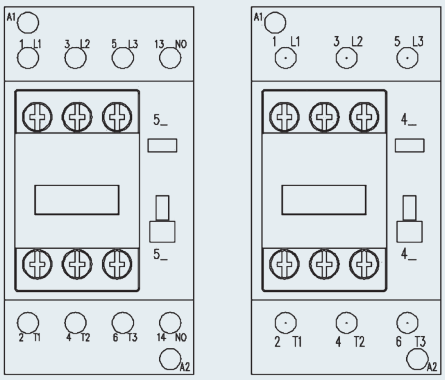
3TS11



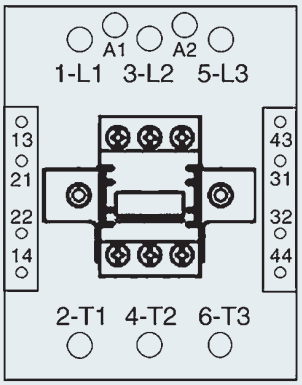
Frame 2, 3, 4

3TS12 / 13 / 14 / 15 / 17

Terminal drawing:

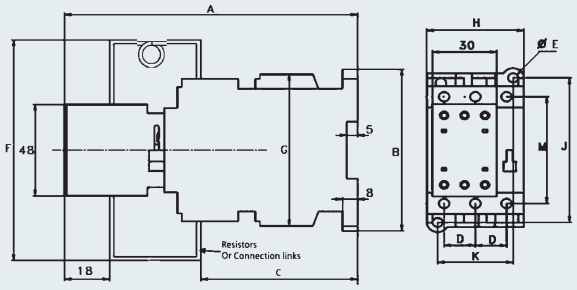


3TS11 3TS12/13/14/15

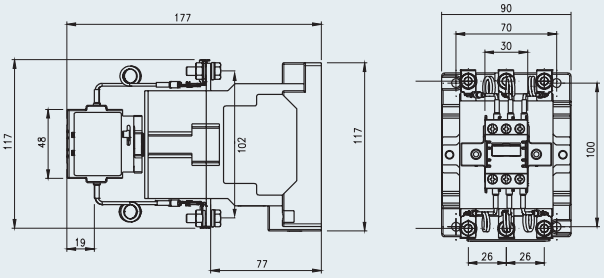


3TS17

Dimensional drawing:



Dimensional drawing : 7, 12.5, 16, 20, 25 kVAr
(3TS11/12/13/14/1500-0A..5-8K)



Dimensional drawing : 50kVAr (3TS1711-0A..5-8K)

Type	A	B	C	D	F	G	H	J	K	øE	M	Term Screw
3TS11	125	74	60	10	115	78	45	60	35	4.8	48	M3.5
3TS12	136	85	70	14.5	115	85	45	75	35	4.8	51	M4
3TS13..15	148	85	63	18	120	103	55	75	45	5	62.5	M4

Selection tables

Standard Values: Selection Tables for Cables, Cable Cross Sections and Fuses

Power kvar	Current A	Section mm²	Fuse A
Rated voltage 230 V, 60 Hz			
2.5	6.3	1.5	10
5.0	12.6	4.0	25
7.5	18.8	6.0	35
10.0	25.1	10.0	50
12.5	31.4	16.0	50
15.0	37.7	16.0	63
20.0	50.2	25.0	80
25.0	62.8	35.0	100
30.0	75.3	50.0	125
40.0	100.4	70.0	160
50.0	125.5	95.0	200
75.0	188.3	185.0	315
100.0	251.0	2× 120.0	400
125.0	–	–	–
150.0	–	–	–
175.0	–	–	–
200.0	–	–	–
Rated voltage 400 V, 50 Hz			
2.5	3.6	1.5	10
5.0	7.2	2.5	16
7.5	10.8	2.5	16
10.0	14.4	4.0	25
12.5	18.0	6.0	35
15.0	21.6	6.0	35
20.0	28.8	10.0	50
25.0	36.0	16.0	63
30.0	43.2	25.0	80
40.0	57.6	35.0	100
50.0	72.0	50.0	125
75.0	108.3	70.0	160
100.0	144.3	120.0	250
125.0	180.3	185.0	315
150.0	216.5	2× 95.0	350
175.0	252.6	2× 95.0	400
200.0	288.0	2× 120.0	500
Rated voltage 440 V, 60 Hz			
2.5	3.3	1.5	10
5.0	6.6	2.5	16
7.5	10.0	2.5	16
10.0	13.2	4.0	25
12.5	16.8	4.0	25
15.0	19.8	6.0	35
20.0	26.4	10.0	50
25.0	33.0	16.0	63
30.0	39.6	25.0	80
40.0	52.8	35.0	100
50.0	66.0	50.0	125
75.0	99.0	70.0	160
100.0	132.0	95.0	200
125.0	165.0	185.0	315
150.0	198.0	2× 95.0	350
175.0	231.0	2× 95.0	400
200.0	264.0	2× 120.0	500

The above mentioned values are guidelines for operation in normal conditions at ambient temperatures up to +35 °C.
Upgrade accordingly if conditions differ, e.g. temperature or hamonics differ. The internal wiring of a capacitor bank is sometimes possible with a smaller cross section. Various parameters such as temperature inside the cabinet, cable quality, maximum cable insulation temperature, single or multi core cable, cable length and laying system have to be considered for a proper selection. The local panelbuilder/installer is responsible for a proper selection of the cable sizes and fuses according to the valid regulations and standards in the specific country where the PFC panels are installed.

Standard Values: Selection Tables for Cables, Cable Cross Sections and Fuses

Power kvar	Current A	Section mm²	Fuse A
Rated voltage 480 V, 60 Hz			
2.5	3.0	1.5	10
5.0	6.0	2.5	16
7.5	9.0	2.5	16
10.0	12.0	4.0	25
12.5	18.0	6.0	35
15.0	21.0	6.0	35
20.0	24.0	10.0	50
25.0	30.0	10.0	50
30.0	36.0	16.0	63
40.0	48.0	25.0	80
50.0	60.0	35.0	100
75.0	90.0	70.0	160
100.0	120.0	95.0	200
125.0	150.0	120.0	250
150.0	180.0	185.0	315
175.0	210.0	2× 95.0	350
200.0	240.0	2× 95.0	400
Rated voltage 525 V, 50 Hz			
2.5	2.7	1.5	10
5.0	5.5	1.5	10
7.5	6.9	2.5	16
10.0	11.0	2.5	16
12.5	13.7	4.0	25
15.0	16.5	4.0	25
20.0	22.0	6.0	35
25.0	27.5	10.0	50
30.0	33.0	16.0	63
40.0	44.0	25.0	80
50.0	55.0	35.0	100
75.0	82.5	70.0	160
100.0	110.0	95.0	200
125.0	137.5	95.0	200
150.0	165.0	185.0	300
175.0	193.0	2× 95.0	350
200.0	220.0	2× 95.0	350
Rated voltage 690 V, 50 Hz			
2.5	2.1	1.5	10
5.0	4.2	1.5	10
7.5	6.3	1.5	10
10.0	8.4	2.5	16
12.5	10.5	2.5	16
15.0	12.6	4.0	25
20.0	16.7	4.0	25
25.0	20.9	6.0	35
30.0	25.1	10.0	50
40.0	33.5	16.0	63
50.0	41.8	25.0	80
75.0	62.8	50.0	125
100.0	83.7	70.0	160
125.0	105.0	70.0	160
150.0	126.0	95.0	200
175.0	146.0	120.0	250
200.0	167.0	128.5	315

The above mentioned values are guidelines for operation in normal conditions at ambient temperatures up to +35 °C.
Upgrade accordingly if conditions differ, e.g. temperature or hamonics differ. The internal wiring of a capacitor bank is sometimes possible with a smaller cross section. Various parameters such as temperature inside the cabinet, cable quality, maximum cable insulation temperature, single or multi core cable, cable length and laying system have to be considered for a proper selection. The local panelbuilder/installer is responsible for a proper selection of the cable sizes and fuses according to the valid regulations and standards in the specific country where the PFC panels are installed.

Calculation Table for Reactive Power Demand (Qc)

Current (ACTUAL) tan φ	cos φ	Achievable (TARGET) cos φ							Qc	TARGET cos φ = 0.96		
										cos φ ≤ 1		
										Qc = Pmot · F (0.96) = ... [kvar] 100 · 1.01 = 101.0 kvar		
		0.80	0.82	0.85	0.88	0.90	0.92	0.94		0.96	0.98	1.00
		Faktor F										
3.18	0.30	2.43	2.48	2.56	2.64	2.70	2.75	2.82		2.89	2.98	3.18
2.96	0.32	2.21	2.26	2.34	2.42	2.48	2.53	2.60		2.67	2.76	2.96
2.77	0.34	2.02	2.07	2.15	2.23	2.28	2.34	2.41		2.48	2.56	2.77
2.59	0.36	1.84	1.89	1.97	2.05	2.10	2.17	2.23		2.30	2.39	2.59
2.43	0.38	1.68	1.73	1.81	1.89	1.95	2.01	2.07		2.14	2.23	2.43
2.29	0.40	1.54	1.59	1.67	1.75	1.81	1.87	1.93		2.00	2.09	2.29
2.16	0.42	1.41	1.46	1.54	1.62	1.68	1.73	1.80		1.87	1.96	2.16
2.04	0.44	1.29	1.34	1.42	1.50	1.56	1.61	1.68		1.75	1.84	2.04
1.93	0.46	1.18	1.23	1.31	1.39	1.45	1.50	1.57		1.64	1.73	1.93
1.83	0.48	1.08	1.13	1.21	1.29	1.34	1.40	1.47		1.54	1.62	1.83
1.73	0.50	0.98	1.03	1.11	1.19	1.25	1.31	1.37		1.45	1.63	1.73
1.64	0.52	0.89	0.94	1.02	1.10	1.16	1.22	1.28		1.35	1.44	1.64
1.56	0.54	0.81	0.86	0.94	1.02	1.07	1.13	1.20		1.27	1.36	1.56
1.48	0.56	0.73	0.78	0.86	0.94	1.00	1.05	1.12		1.19	1.28	1.48
1.40	0.58	0.65	0.70	0.78	0.86	0.92	0.98	1.04		1.11	1.20	1.40
1.33	0.60	0.58	0.63	0.71	0.79	0.85	0.91	0.97		1.04	1.13	1.33
1.30	0.61	0.55	0.60	0.68	0.76	0.81	0.87	0.94		1.01	1.10	1.30
1.27	0.62	0.52	0.57	0.65	0.73	0.78	0.84	0.91		0.99	1.06	1.27
1.23	0.63	0.48	0.53	0.61	0.69	0.75	0.81	0.87		0.94	1.03	1.23
1.20	0.64	0.45	0.50	0.58	0.66	0.72	0.77	0.84		0.91	1.00	1.20
1.17	0.65	0.42	0.47	0.55	0.63	0.68	0.74	0.81		0.88	0.97	1.17
1.14	0.66	0.39	0.44	0.52	0.60	0.65	0.71	0.78		0.85	0.94	1.14
1.11	0.67	0.36	0.41	0.49	0.57	0.63	0.68	0.75		0.82	0.90	1.11
1.08	0.68	0.33	0.38	0.46	0.54	0.59	0.65	0.72		0.79	0.88	1.08
1.05	0.69	0.30	0.35	0.43	0.51	0.56	0.62	0.69		0.76	0.85	1.05
1.02	0.70	0.27	0.32	0.40	0.48	0.54	0.59	0.66		0.73	0.82	1.02
0.99	0.71	0.24	0.29	0.37	0.45	0.51	0.57	0.63		0.70	0.79	0.99
0.96	0.72	0.21	0.26	0.34	0.42	0.48	0.54	0.60		0.67	0.76	0.96
0.94	0.73	0.19	0.24	0.32	0.40	0.45	0.51	0.58		0.65	0.73	0.94
0.91	0.74	0.16	0.21	0.29	0.37	0.42	0.48	0.55		0.62	0.71	0.91
0.88	0.75	0.13	0.18	0.26	0.34	0.40	0.46	0.52		0.59	0.68	0.88
0.86	0.76	0.11	0.16	0.24	0.32	0.37	0.43	0.50		0.57	0.65	0.86
0.83	0.77	0.08	0.13	0.21	0.29	0.34	0.40	0.47		0.54	0.63	0.83
0.80	0.78	0.05	0.10	0.18	0.26	0.32	0.38	0.44		0.51	0.60	0.80
0.78	0.79	0.03	0.08	0.16	0.24	0.29	0.35	0.42		0.49	0.57	0.78
0.75	0.80		0.05	0.13	0.21	0.27	0.32	0.39		0.46	0.55	0.75
0.72	0.81			0.10	0.18	0.24	0.30	0.36		0.43	0.52	0.72
0.70	0.82			0.08	0.16	0.21	0.27	0.34		0.41	0.49	0.70
0.67	0.83			0.05	0.13	0.19	0.25	0.31		0.38	0.47	0.67
0.65	0.84			0.03	0.11	0.16	0.22	0.29		0.36	0.44	0.65
0.62	0.85				0.08	0.14	0.19	0.26		0.33	0.42	0.62
0.59	0.86				0.05	0.11	0.17	0.23		0.30	0.39	0.59
0.57	0.87					0.08	0.14	0.21		0.28	0.36	0.57
0.54	0.88					0.06	0.11	0.18		0.25	0.34	0.54
0.51	0.89					0.03	0.09	0.15		0.22	0.31	0.51
0.48	0.90						0.06	0.12		0.19	0.28	0.48
0.46	0.91						0.03	0.10		0.17	0.25	0.46
0.43	0.92							0.07		0.14	0.22	0.43
0.40	0.93							0.04		0.11	0.19	0.40
0.36	0.94									0.07	0.16	0.36
0.33	0.95										0.13	0.33

QC = PA · (tan φ1– tan φ2)
QC [kvar] = PA · F = active power [kW] · factor "F"
PA = S · cos φ = apparent power · cos φ
tan φ1 + φ2 according to cos φ values ref. table

Example:

Actual motor power	P = 100 kW
ACTUAL cos φ	0.61
TARGET cos φ	0.96
Factor F from table	1.01
Capacitor reactive power QC	
QC = 100 · 1.01 = 101.0 kvar	

Individual PFC for Motors

Approximate values (specified by the German Electricity Association VDEW) for fixed PFC of motors			
Motor nominal rating kW	Capacitor power rating (1500 r.p.m.*) kvar	Capacitor power rating (1000 r.p.m.*) kvar	Capacitor power rating (750 r.p.m.*) kvar
1 ... 1.9	0.5	0.5	0.6
2 ... 2.9	1	1.1	1.2
3 ... 3.9	1.5	1.6	1.7
4 ... 4.9	2	2.1	2.3
5 ... 5.9	2.5	2.6	2.9
6 ... 7.9	3	3.2	3.5
8 ... 10.9	4	4.2	4.6
11 ... 13.9	5	5.3	5.8
14 ... 17.9	6	6.3	6.9
18 ... 21.9	7.5	8.0	8.6
22 ... 29.9	10	10.5	11.5
30 ... 39.9	approx. 40% of the motor power		
40 and above	approx. 35% of the motor power		
*r.p.m.: revolutions per minute			

The capacitor output should be approx. 90% of the apparent power of the motor when idle.

This means a power factor of 0.9% at full load and 0.95 to 0.98 during idling. Important: The capacitor output must not be rated too high for individual compensated machines where the capacitor is directly connected with the motor clamp. This especially applies when the machine has a big oscillating weight and still continues to rotate after switching off.

The capacitor placed in parallel may act as generator for the motor which will cause serious overvoltages. The consequence could be heavy damage to the capacitor as well as to the motor.

Individual PFC for Transformers

Standard values for transformer power factor correction		
Rated apparent power of transformer	Rated capacitor power for oil immersed transformers	Rated capacitor power for cast resin transformers
kVA	kvar	kvar
10	1.0	1.5
20	2.0	1.7
50	4.0	2.0
75	5.0	2.5
100	5.0	2.5
160	7.0	4.0
200	7.5	5.0
250	8.0	7.5
315	10.0	8.0
400	12.5	8.5
500	15.0	10.0
630	17.5	12.5
800	20.0	15.0
1000	25.0	16.7
1250	30.0	20.0
1600	35.0	22.0
2000	40.0	25.0
2500	50.0	35.0
3150	60.0	50.0

For an exact calculation of the right capacitor value, following formula can be used:

$$Q_C = I_0\% \cdot \frac{AN}{100}$$

Q_c = needed capacitor (kvar)

I0% = magnetising current of the transformer (AS%)

AN = apparent rated power of the transformer in kVA

There are regional differences in the guidelines of power suppliers concerning the admissible size of capacitors directly connected with a transformer. Therefore a consultation with the respective power supplier is recommended before installation of a compensation bank. Modern transformers have laminations which only need low capacity to reverse the magnetism. In case the capacitor output is too high, stress increase may occur during idling.

Notes

Notes

Your partners

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