RUVA®

Product Profile 2020

PFC CAPACITOR

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NOTES

PFC Capacitors Profile

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Foreword

General

In recent years, people's demand for electric power is increasing, and people are more and more aware of the necessity of energy saving. So power factor correction (PFC) and harmonic filtering will be more and more widely used. Improve power quality, improve power factor, save costs and ensure fast return on investment.

Reactive power and PFC

The rational use of electrical energy calls for economical generation, transmission and distribution with little losses. That means restricting all factors in electrical networks that cause losses. One of these factors is lagging reactive power.

Each electric load (motor, choke, transformer, induction heating, arc welding, generator) working in magnetic field will produce different degrees of hysteresis, which is called inductance. This hysteresis of the induced load maintains current sensing (e.g., positive current) for a period of time, even if the negative voltage tries to reverse it. The phase shift between current and voltage remains unchanged, and the sign of current and voltage is opposite. During this period, negative power or energy is generated and fed back to the network. When the current and voltage have the same symbol again, the same amount of energy needs to establish a magnetic field in the inductive load. This anti-magnetic energy is called reactive power.

Due to the existence of these reactive power, the power factor cosφ is obviously less than 1. In the network, low power factor cosφ results in:

- Higher energy consumption and costs.
- Less power distributed via the network.
- Power loss in the network, higher transformer losses.
- Increased voltage drop in power distribution networks.

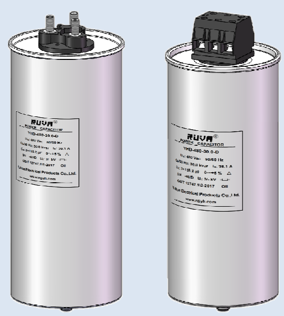
A solution to this problem is to compensate the generated lagging reactive power by leading reactive power at defined nodes. The necessary leading power is produced by capacitors parallel to the supply network, as close as possible to the inductive load.

Therefore, the automatic reactive power compensation system (detuning / conventional) is installed in larger loads, such as industrial machinery. The system consists of a set of capacitor units which can be connected and cut off, driven and switched by power factor.

Benefits of high power factor through PFC capacitors are:

- Fast return on investment through lower power costs. PFC reduces the reactive power in a system,so power consumption and power costs drop in proportion.
- Effective use of installation. An improved power factor means higher effective power for the same apparent power, electrical installation operates more economically.
- Improved voltage quality, reduced voltage drops.
- Optimum cable design. Cable cross-sections can be reduced with improvement of power factor because of less current.
- Reduced transmission losses. The transmission and switching devices carry less current, the losses caused by the leads’ resistance are reduced.

PFC capacitor series overviews

Parameter	YHC	YHD
Rated Voltage U_N	230 Vac～850 Vac	230 Vac～850 Vac
Power Q_N	5.0 kvar～40.0 kvar	3.0 kvar～40.0 kvar
Connection Method	1 Phase	3 Phase, △ connection
Losses -Dielectric Q_D -Total Q_T	＜0.2 W/kvar ＜0.5 W/kvar	＜0.2 W/kvar ＜0.5 W/kvar
Temperature Class	-40/D (-40/60 optional) Max. temp.: +55 ℃ Max. mean 24 h: +45 ℃ Max. mean 1 year: +35 ℃ Lowest temp.: -40 ℃	-40/D (-40/60 optional) Max. temp.: +55 ℃ Max. mean 24 h: +45 ℃ Max. mean 1 year: +35 ℃ Lowest temp.: -40 ℃
Max. Humidity H_{max}	95 %RH	95 %RH
Max. Altitude	2000 m	2000 m
Admissible Voltage Levels	1.1U_N： up to 8 h daily 1.15U_N： up to 30 min daily 1.2U_N： up to 5 min daily 1.3U_N： up to 1 min daily	1.1U_N： up to 8 h daily 1.15U_N： up to 30 min daily 1.2U_N： up to 5 min daily 1.3U_N： up to 1 min daily
Safety	Self-healing Overpressure disconnector	Self-healing Overpressure disconnector
Mean Life Expectancy t_{LD}	Up to 180 000 h（-40/C） Up to 120 000 h（-40/D）	Up to 180 000 h（-40/C） Up to 120 000 h（-40/D）
Case and Shape	Aluminum, cylindrical	Aluminum, cylindrical
Terminals Type	Bolt or cap terminals	Bolt or cap terminals
Impregnation	Polyurethane resin or oil	Polyurethane resin or oil
Discharge Method	Internal or external or without	Internal or external or without
Cooling	Natural or forced cooled	Natural or forced cooled
Standard	GB/T 12747.1-2017 (idt IEC 60831-1:2014) GB/T 12747.2-2017 (idt IEC 60831-2:2014)	GB/T 12747.1-2017 (idt IEC 60831-1:2014) GB/T 12747.2-2017 (idt IEC 60831-2:2014)
Product Picture		

YHC type PFC Capacitors

General, applications and features YHC

General

YHC series represents a new generation of single phase power factor correction capacitors. The expected service life of YHC is up to 180 000 hours, the inrush current capacity is increased to $300I_N$, and the can size is reduced, which makes YHC an ideal capacitor for industrial applications requiring high reliability.

YHC can be impregnated in two ways: polyurethane or oil. They all have self-healing characteristics and overpressure disconnector. The voltage range is 230 to 850V, the output is 5.0 to 40.0 kvar and two different terminal types, allowing the selection of custom capacitor types.

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Applications

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

Features

Structural features

- Metallized polypropylene with high performance and lower weight.
- Cylindrical extruded aluminum case, compact integrated structure.
- Optional dry filled, good anti-vibration performance and no leakage.
- Optional oil filled, less weight and better heat dissipation performance.
- Tightly sealed, good environment adaptability.

Electrical features

- Long life expectancy up to 120 000 hours at temperature class -40/D.
- Low dissipation factor, high pulse current withstand capability.
- Good self-healing and voltage withstand, high long term stability.

Safety measures

- Self-healing property.
- Overpressure disconnector.
- Dust cover, or shock hazard protected terminals.

Technical data and limit values YHC

No.	Items		Technical data or limit values
1	Rated Voltage	U_N	230 Vac～850 Vac
2	Rated frequency	f_N	50 or 60 Hz
3	Power	Q_N	5 kvar～40 kvar
4	Connection Method		1 phase
5	Capacitance tolerance		-5%～+10% or ±10%，0%～+5% or ±5%
6	Overvoltage	U_{max}	1.1U_N： up to 8 h daily 1.15U_N： up to 30 min daily 1.2U_N： up to 5 min daily 1.3U_N： up to 1 min daily
7	Overcurrent	I_{max}	Up to 1.3～2.0I_N (Including combined effects of harmonics, overvoltage and capacitance tolerance)
8	Inrush Current	I_S	Up to 300I_N
9	Number of switching operations		Max. 10 000 switchings per year
10	Losses -Dielectric -Total	Q_D Q_T	＜0.2 W/kvar ＜0.5 W/kvar
11	Test voltage between terminals		2.15 U_N, 2 s
12	Test voltage between terminals and case		U_N≤500 Vac: 3600 Vac 2 s U_N＞500 Vac: 2.4U_N+2400 Vac 2 s
13	Ambient Temperature		Temperature class: -40/D Max. temp.: +55 ℃ Max. mean 24 h: +45 ℃ Max. mean 1 year: +35 ℃ Lowest temp.: -40 ℃
14	Humidity		Max. 95 %RH
15	Altitude		Max. 2000 m
16	Cooling		Natural or forced cooled
17	Mean Life Expectancy	t_{LD}	Up to 180 000 h（-40/C） Up to 120 000 h（-40/D）
18	Safety		Self-healing, overpressure disconnector, and maximum allowed fault current 10 000 A
19	Dielectric		Polypropylene film
20	Case		Extruded cylindrical aluminum can
21	Terminals		Bolt or cap terminals
22	Impregnation		Polyurethane or oil
23	Mounting position		Indoors, vertically upright
24	Mounting and grounding		Threaded M12 or M16 stud on bottom of case
25	Discharge device		Optional internal discharge resistors or external discharge module or without discharge device
26	Standard		GB/T 12747.1-2017 (idt IEC 60831-1:2014) GB/T 12747.2-2017 (idt IEC 60831-2:2014)

Part number YHC

The 14 digits part number is formed as follow:

Series Code
YHC type

Rated Capacitance
300×10⁶ pF = 300 μF

Internal Distinguishing Code
01 to 99 for different design

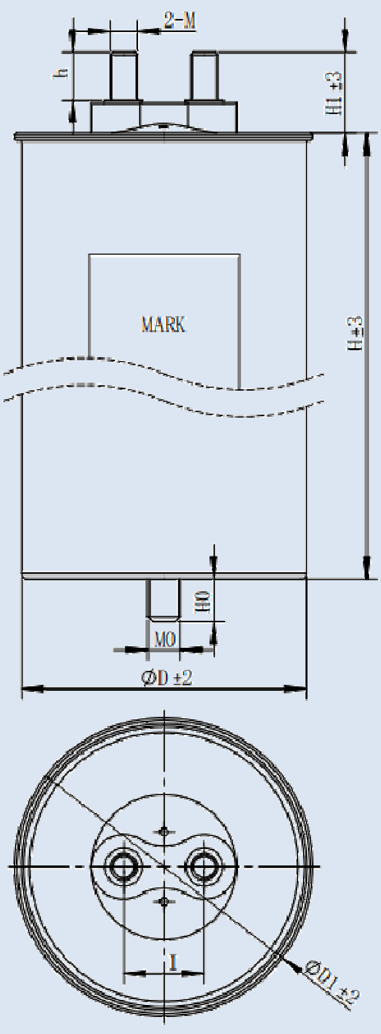
Y	H	C	4	8	1	3	0	0	6	J	1	0	1

Rated Voltage
48×10^{1}=480 Vac

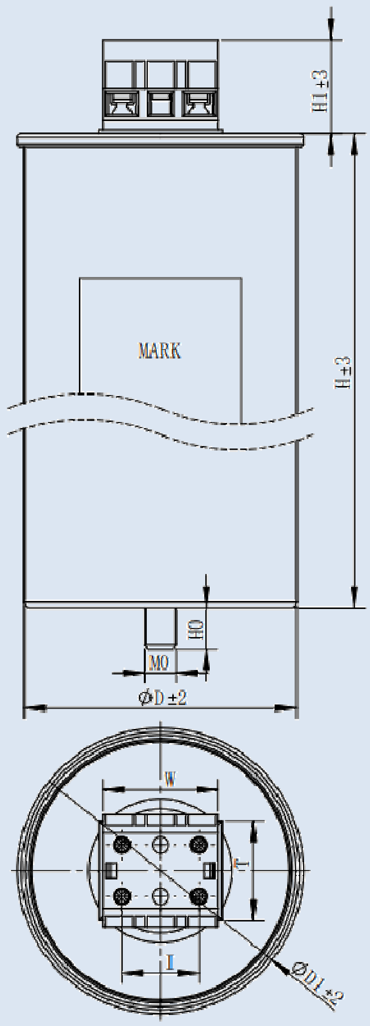
Capacitance Tolerance
J: ±5 % or 0 %～+5 %
K: ±10 % or -5 %～+10 %

Terminals Type
0: cap terminals
1: bolt terminals

Outline drawing YHC



D	D1	M0×H0	A			B		
			M×h	H1	I	W×T	H1	I
76	81	M12×16	M6×15	27	30	45×44	36	30
			M8×17	29				
86	91	M12×16	M8×17	29	30	45×44	36	30
			M10×18	30				
96	101	M12×16	M8×17	29	30	45×44	36	30
			M10×18	30				
106	111	M12×16	M8×17	29	30	45×44	36	30
		M16×25	M10×18	30				
116	121	M12×16	M8×17	29	30	45×44	36	30
		M16×25	M10×18	30				
126	131	M12×16	M8×17	29	30	45×44	36	30
		M16×25	M10×18	30				
136	141	M12×16	M10×18	30	30	45×44	36	30
		M16×25						



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Specification and dimension table YHC

U_N=400 Vac（380/280/230 Vac）

C_N μF	Q_N/50 Hz kvar	Dimensions D mm	H mm	I_N A	Weight kg	Part No.
80.0	4.0	76	150	10.1	0.7	YHC4018005****
100.0	5.0	76	170	12.6	0.8	YHC4011006****
150.0	7.5	86	180	18.8	1.1	YHC4011506****
150.0	7.5	96	150	18.8	1.2	YHC4011506****
200.0	10.1	86	215	25.1	1.4	YHC4012006****
200.0	10.1	96	180	25.1	1.4	YHC4012006****
250.0	12.6	96	215	31.4	1.7	YHC4012506****
250.0	12.6	106	180	31.4	1.7	YHC4012506****
300.0	15.1	106	215	37.7	2.1	YHC4013006****
300.0	15.1	116	180	37.7	2.1	YHC4013006****
350.0	17.6	106	230	44.0	2.2	YHC4013506****
350.0	17.6	116	200	44.0	2.3	YHC4013506****
430.0	21.6	116	230	54.0	2.6	YHC4014306****
550.0	27.6	116	275	69.1	3.2	YHC4015506****

U_N=480 Vac（460/450/440/400/380 Vac）

C_N μF	Q_N/50 Hz kvar	Dimensions D mm	H mm	I_N A	Weight kg	Part No.
69.1	5.0	76	150	10.4	0.7	YHC4816915****
100.0	7.2	86	160	15.1	1.0	YHC4811006****
100.0	7.2	76	200	15.1	1.0	YHC4811006****
138.2	10.0	96	170	20.8	1.3	YHC4811386****
138.2	10.0	86	200	20.8	1.3	YHC4811386****
150.0	10.9	96	180	22.6	1.4	YHC4811506****
150.0	10.9	86	215	22.6	1.4	YHC4811506****
172.7	12.5	96	200	26.0	1.6	YHC4811736****
172.7	12.5	106	170	26.0	1.6	YHC4811736****
200	14.5	96	215	30.2	1.7	YHC4812006****
250.0	18.1	106	215	37.7	2.1	YHC4812506****
276.3	20.0	106	230	41.7	2.2	YHC4812766****
300.0	21.7	106	245	45.2	2.4	YHC4813006****
300.0	21.7	116	215	45.2	2.5	YHC4813506****
350.0	25.3	116	245	52.8	2.8	YHC4814156****
414.5	30.0	116	275	62.5	3.2	YHC4814156****

Specification and dimension table YHC

U_N=530 Vac（525/500/480/460 Vac）

C_N µF	Q_N/50 Hz kvar	Dimensions D mm	Dimensions H mm	I_N A	Weight kg	Part No.
56.7	5.0	76	170	9.4	0.8	YHC5315675****
100.0	8.8	76	230	16.7	1.1	YHC5311006****
100.0	8.8	86	200	16.7	1.3	YHC5311006****
113.3	10.0	86	200	18.9	1.3	YHC5311136****
113.3	10.0	96	170	18.9	1.3	YHC5311136****
150.0	13.2	86	260	25.0	1.6	YHC5311506****
150.0	13.2	96	200	25.0	1.6	YHC5311506****
170.0	15.0	96	230	28.3	1.8	YHC5311706****
170.0	15.0	106	190	28.3	1.8	YHC5311706****
200.0	17.6	96	260	33.3	2.1	YHC5312006****
200.0	17.6	106	230	33.3	2.2	YHC5312006****
226.6	20.0	96	275	37.7	2.2	YHC5312276****
250.0	22.1	106	260	41.6	2.5	YHC5312506****
283.3	25.0	106	275	47.2	2.6	YHC5312836****
300.0	26.5	116	260	50.0	3.0	YHC5313006****
340.0	30.0	116	275	56.6	3.2	YHC5313406****

U_N=600 Vac（530/525/500 Vac）

C_N µF	Q_N/50 Hz kvar	Dimensions D mm	Dimensions H mm	I_N A	Weight kg	Part No.
35.0	4.0	86	130	6.6	0.8	YHC6913505****
44.2	5.0	76	170	8.3	0.8	YHC6914425****
55.0	6.2	76	200	10.4	1.0	YHC6915505****
55.0	6.2	86	170	10.4	1.1	YHC6915505****
88.4	10.0	86	230	16.7	1.5	YHC6918845****
88.4	10.0	96	190	16.7	1.5	YHC6918845****
100.0	11.3	86	260	18.8	1.6	YHC6911006****
100.0	11.3	96	200	18.8	1.6	YHC6911006****
132.6	15.0	96	260	25.0	2.1	YHC6911336****
150.0	17.0	96	275	28.3	2.2	YHC6911506****
150.0	17.0	106	230	28.3	2.2	YHC6911506****
176.8	20.0	106	260	33.3	2.5	YHC6911776****
200.0	22.6	116	260	37.7	3.0	YHC6912006****
221.1	25.0	116	275	41.7	3.2	YHC6912216****

Specification and dimension table YHC

U_N=690 Vac（600/530/525 Vac）

C_N μF	Q_N/50 Hz kvar	Dimensions D mm	H mm	I_N A	Weight kg	Part No.
20.0	3.0	76	140	4.3	0.7	YHC6912005****
25.0	3.7	76	150	5.4	0.7	YHC6912505****
25.0	3.7	86	130	5.4	0.8	YHC6913345****
33.4	5.0	76	170	7.2	0.8	YHC6913345****
33.4	5.0	86	150	7.2	0.9	YHC6913345****
50.0	7.5	86	200	10.8	1.3	YHC6915005****
50.0	7.5	96	170	10.8	1.3	YHC6915005****
66.9	10.0	86	230	14.5	1.5	YHC6916695****
66.9	10.0	96	200	14.5	1.6	YHC6916695****
100.0	15.0	96	260	21.7	2.1	YHC6911006****
100.0	15.0	106	230	21.7	2.2	YHC6911006****
133.7	20.0	106	275	29.0	2.6	YHC6911386****
150.0	22.4	116	260	32.5	3.0	YHC6911506****

YHD type PFC Capacitors

General, applications and features YHD

General

YHD series represents a new generation of three phase power factor correction capacitors. The expected service life of YHC is up to 180 000 hours, the inrush current capacity is increased to $300I_N$, and the can size is reduced, which makes YHC an ideal capacitor for industrial applications requiring high reliability.

YHD can be impregnated in two ways: polyurethane or oil. They all have self-healing characteristics and overpressure disconnector. The voltage range is 230 to 850V, the output is 3.0 to 40.0 kvar and two different terminal types, allowing the selection of custom capacitor types.

A B

Applications

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

Features

Structural features

- Metallized polypropylene with high performance and lower weight.
- Cylindrical extruded aluminum case, compact integrated structure.
- Optional dry filled, good anti-vibration performance and no leakage.
- Optional oil filled, less weight and better heat dissipation performance.
- Tightly sealed, good environment adaptability.

Electrical features

- Long life expectancy up to 120 000 hours at temperature class -40/D.
- Low dissipation factor, high pulse current withstand capability.
- Good self-healing and voltage withstand, high long term stability.

Safety measures

- Self-healing property.
- Overpressure disconnector.
- Dust cover, or shock hazard protected terminals.

Technical data and limit values YHD

No.	Items		Technical data or limit values
1	Rated Voltage	U_N	230 Vac～850 Vac
2	Rated frequency	f_N	50 or 60 Hz
3	Power	Q_N	3 kvar～40 kvar
4	Connection Method		Three phase, delta (△) connection
5	Capacitance tolerance		-5%～+10% or ±10%，0%～+5% or ±5%
6	Overvoltage	U_{max}	1.1U_N：up to 8 h daily 1.15U_N：up to 30 min daily 1.2U_N：up to 5 min daily 1.3U_N：up to 1 min daily
7	Overcurrent	I_{max}	Up to 1.3～2.0I_N (Including combined effects of harmonics, overvoltage and capacitance tolerance)
8	Inrush Current	I_S	Up to 300I_N
9	Number of switching operations		Max. 10 000 switchings per year
10	Losses -Dielectric	Q_D	＜0.2 W/kvar
	-Total	Q_T	＜0.5 W/kvar
11	Test voltage between terminals		2.15 U_N, 2 s
12	Test voltage between terminals and case		U_N≤500 Vac: 3600 Vac 2 s U_N＞500 Vac: 2.4U_N+2400 Vac 2 s
13	Ambient Temperature		Temperature class: -40/D Max. temp.: +55 ℃ Max. mean 24 h: +45 ℃ Max. mean 1 year: +35 ℃ Lowest temp.: -40 ℃
14	Humidity		Max. 95 %RH
15	Altitude		Max. 2000 m
16	Cooling		Natural or forced cooled
17	Mean Life Expectancy	t_{LD}	Up to 180 000 h（-40/C） Up to 120 000 h（-40/D）
18	Safety		Self-healing, overpressure disconnector, and maximum allowed fault current 10 000 A
19	Dielectric		Polypropylene film
20	Case		Extruded cylindrical aluminum can
21	Terminals		Bolt or cap terminals
22	Impregnation		Polyurethane or oil
23	Mounting position		Indoors, vertically upright
24	Mounting and grounding		Threaded M12 or M16 stud on bottom of case
25	Discharge device		Optional internal discharge resistors or external discharge module or without discharge device
26	Standard		GB/T 12747.1-2017 (idt IEC 60831-1:2014) GB/T 12747.2-2017 (idt IEC 60831-2:2014)

Part number YHC

The 14 digits part number is formed as follow:

Series Code
YHD type

Rated Phase Capacitance
100×10⁶ pF = 100 μF

Internal Distinguishing Code
01 to 99 for different design

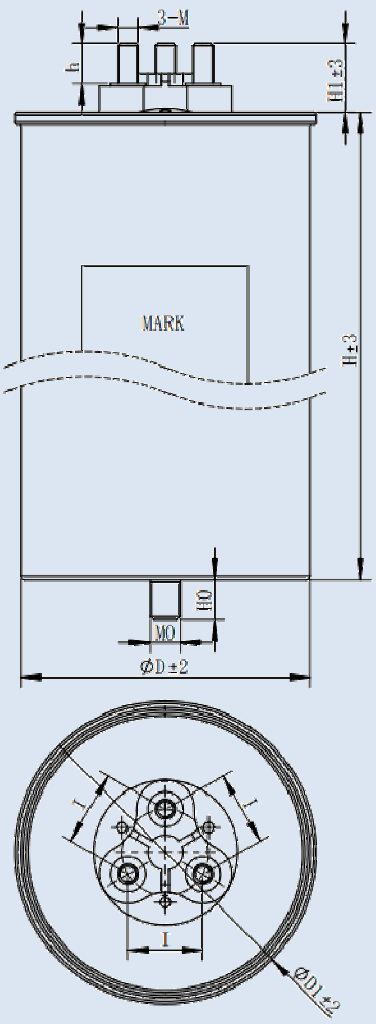
Y	H	D	4	8	1	1	0	0	6	J	0	0	1

Rated Voltage
48×10¹=480 Vac

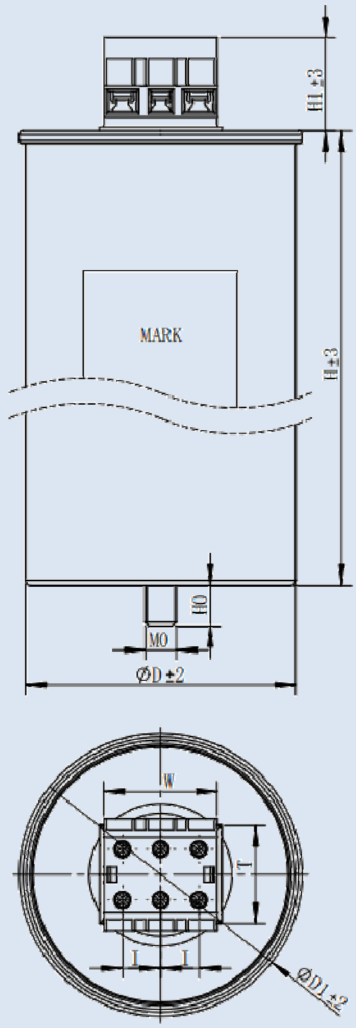
Capacitance Tolerance
J: ±5 % or 0 %～+5 %
K: ±10 % or -5 %～+10 %

Terminals Type
0: cap terminals
1: bolt terminals

Outline drawing YHD



D	D1	M0×H0	A: M×h	A: H1	A: I	B: W×T	B: H1	B: I
76	81	M12×16	M6×15	27	30	45×44	36	15
			M8×17	29				
86	91	M12×16	M8×17	29	30	45×44	36	15
			M10×18	30				
96	101	M12×16	M8×17	29	30	45×44	36	15
			M10×18	30				
106	111	M12×16	M8×17	29	35	45×44	36	15
		M16×25	M10×18	30				
116	121	M12×16	M8×17	29	35	45×44	36	15
		M16×25	M10×18	30				
126	131	M12×16	M8×17	29	35	45×44	36	15
		M16×25	M10×18	30				
136	141	M12×16	M8×17	29	35	45×44	36	15
		M16×25	M10×18	30				



A

B

Specification and dimension table YHD

U_N=400 Vac（380/280/230 Vac）

C_N μF	Q_N/50 Hz kvar	Dimensions D mm	Dimensions H mm	I_N A	Weight kg	Part No.
3×33.2	5.0	76	170	7.2	0.8	YHD4013325****
3×50.0	7.5	76	230	10.9	1.1	YHD4015005****
3×66.3	10.0	86	215	14.4	1.4	YHD4016635****
3×80.0	12.1	86	245	17.4	1.6	YHD4018005****
3×80.0	12.1	96	215	17.4	1.7	YHD4018005****
3×100.0	15.1	96	245	21.8	1.9	YHD4011006****
3×100.0	15.1	106	215	21.8	2.1	YHD4011006****
3×132.6	20.0	116	230	28.9	2.6	YHD4011336****
3×150.0	22.6	106	275	32.6	2.6	YHD4011506****
3×150.0	22.6	116	245	32.6	2.8	YHD4011506****
3×185.0	27.9	116	275	40.3	3.2	YHD4011856****

U_N=480 Vac（460/450/440/400/380 Vac）

C_N μF	Q_N/50 Hz kvar	Dimensions D mm	Dimensions H mm	I_N A	Weight kg	Part No.
3×23.0	5.0	76	170	6.0	0.8	YHD4812305****
3×35.0	7.6	76	215	9.1	1.1	YHD4813505****
3×35.0	7.6	86	170	9.1	1.1	YHD4813505****
3×46.1	10.0	86	200	12.0	1.3	YHD4814615****
3×46.1	10.0	96	170	12.0	1.3	YHD4814615****
3×60.0	13.0	86	245	15.7	1.6	YHD4816005****
3×60.0	13.0	96	200	15.7	1.6	YHD4816005****
3×70.0	15.2	96	230	18.3	1.8	YHD4817005****
3×70.0	15.2	106	200	18.3	1.9	YHD4817005****
3×80.0	17.4	96	245	20.9	1.9	YHD4818005****
3×80.0	17.4	106	215	20.9	2.1	YHD4818005****
3×92.1	20.0	96	275	24.1	2.2	YHD4819215****
3×92.1	20.0	106	230	24.1	2.2	YHD4819215****
3×100.0	21.7	106	245	26.1	2.4	YHD4811006****
3×100.0	21.7	116	215	26.1	2.5	YHD4811006****
3×115.1	25.0	106	275	30.1	2.6	YHD4811156****
3×115.1	25.0	116	245	30.1	2.8	YHD4811156****
3×138.2	30.0	116	275	36.1	3.2	YHD4811386****

Specification and dimension table YHD

U_N=530 Vac（525/500/480/460 Vac）

C_N µF	Q_N/50 Hz kvar	Dimensions D mm	Dimensions H mm	I_N A	Weight kg	Part No.
3×12.0	3.2	76	140	3.5	0.7	YHD5311205****
3×19.0	5.0	76	170	5.5	0.8	YHD5311905****
3×27.0	7.1	86	170	7.8	1.1	YHD5312705****
3×35.0	9.3	86	200	10.1	1.3	YHD5313505****
3×37.8	10.0	86	230	10.9	1.5	YHD5313785****
3×50.0	13.2	86	260	14.4	1.6	YHD5315005****
3×56.7	15.0	96	230	16.4	1.8	YHD5315675****
3×75.6	20.0	96	275	21.8	2.2	YHD5317565****
3×85.0	22.5	106	260	24.5	2.5	YHD5318505****
3×94.4	25.0	106	275	27.2	2.6	YHD5319445****
3×100.0	26.5	116	260	28.8	3.0	YHD5311006****
3×113.3	30.0	116	275	32.7	3.2	YHD5311136****

U_N=600 Vac（530/525/500 Vac）

C_N µF	Q_N/50 Hz kvar	Dimensions D mm	Dimensions H mm	I_N A	Weight kg	Part No.
3×9.0	3.1	76	140	2.9	0.7	YHD6019004****
3×14.0	4.8	76	170	4.6	0.8	YHD6011405****
3×25.0	8.5	86	200	8.2	1.3	YHD6012505****
3×29.5	10.0	86	230	9.6	1.5	YHD6012955****
3×29.5	10.0	96	200	9.6	1.6	YHD6012955****
3×44.2	15.0	96	260	14.4	2.1	YHD6014425****
3×50.0	17.0	96	275	16.3	2.2	YHD6015005****
3×58.9	20.0	106	260	19.2	2.5	YHD6015895****
3×70.0	23.8	116	260	22.9	3.0	YHD6017005****
3×75.0	25.4	116	275	24.5	3.2	YHD6017505****

U_N=690 Vac（690/630/600 Vac）

C_N µF	Q_N/50 Hz kvar	Dimensions D mm	Dimensions H mm	I_N A	Weight kg	Part No.
3×6.7	3.0	76	140	2.5	0.7	YHD7016704****
3×10.0	4.5	76	170	3.8	0.8	YHD7011005****

Specification and dimension table YHD

3×16.7	7.5	86	200	6.3	1.3	YHD7011675****
3×16.7	7.5	96	170	6.3	1.3	YHD7011675****
3×22.0	9.9	86	230	8.3	1.5	YHD7012205****
3×22.0	9.9	96	200	8.3	1.6	YHD7012205****
3×35.0	15.7	96	260	13.1	2.1	YHD7013505****
3×35.0	15.7	106	230	13.1	2.2	YHD7013505****
3×44.6	20.0	106	275	16.7	2.6	YHD7014465****
3×50.0	22.4	116	260	18.8	3.0	YHD7015005****

Main technologies

Zinc/aluminium metallized polypropylene film with heavy edge

Polypropylene film has the advantages of high dielectric strength, low dielectric loss, good temperature and frequency characteristics. Therefore, low film thickness allowing significantly more compact dimensions and a lower weight, as well as high performance. Zinc/aluminum alloy metallization has good self-healing property and AC durability. The heavy edge technology produces a maximum effective surface for the metal spraying and enhance current impulse capability.

Sealed packaging and various filling technologies

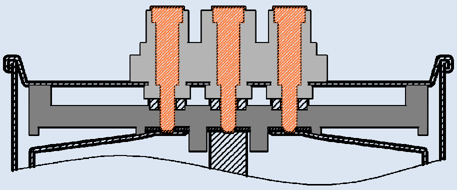
The winding elements are heated and dried for a defined period, and the filling materials are heated and dried under vacuum. In this way, air and moisture are extracted from the inner capacitor and filling materials, and oxidation of the electrodes as well as partial discharges are avoided. Afterwards, the capacitor elements are hermetically sealed in aluminum cases. This elaborate process ensures excellent capacitance stability and long useful life.

Self-healing property

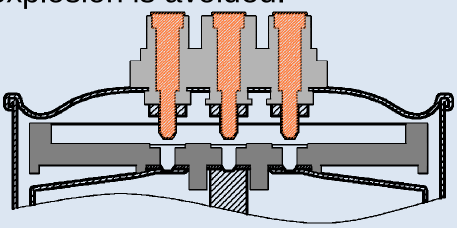
In the event of thermal or electrical overload, an electric breakdown occurs. The dielectric in the breakdown channel is broken down into highly compressed plasma that explodes out of the breakdown channel and pushes the dielectric layers apart. The discharge continues within the spreading plasma via 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. This property is called self-healing.

Overpressure disconnector

At the end of the capacitor's service life or when a high pressure forms inside the can, the overpressure disconnector is activated, the middle part of the specially designed shell cover bulges upward. When expansion beyond a certain degree, the bottom of the terminal is pulled out from the welding electrode of the explosion-proof module and disconnect the capacitor safely from the line. Without electrical connection, the internal pressure of the capacitor is no longer continuously rise, and the explosion is avoided.



Solid connected



Overpressure disconnector activated

PFC Basic formulas

Apparent power $S=\sqrt{3}\cdot V\cdot I=\sqrt{(P^2+Q^2)}$, unit VA

Active power $P=S\cdot \cos\varphi$, Unit W

Reactive power $Q=S\cdot \sin\varphi$, Unit var

Power factor ($\cos\varphi$): $\cos\varphi=P/S$

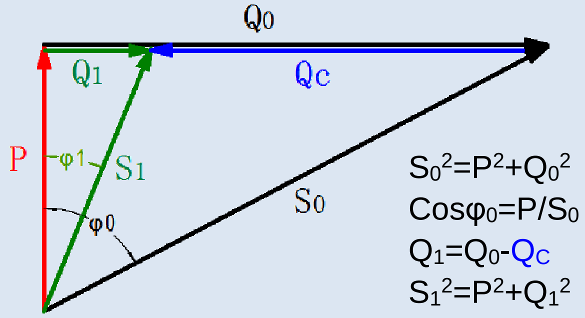
Capacitor reactive power:

$Q_C=V_C\cdot I_C=\omega\cdot C\cdot V_C^2=2\pi\cdot f\cdot C\cdot V_C^2$, Unit var

Reactive power needed from $\cos\varphi_0$ to $\cos\varphi_1$:

$Q_C=P\cdot(tg\varphi_0-tg\varphi_1)$

$=P\cdot(\sqrt{(1-\cos\varphi_0^2)}/\cos\varphi_0-\sqrt{(1-\cos\varphi_1^2)}/\cos\varphi_1)$, Unit var



$S_0^2=P^2+Q_0^2$

$\cos\varphi_0=P/S_0$

$Q_1=Q_0-Q_C$

$S_1^2=P^2+Q_1^2$

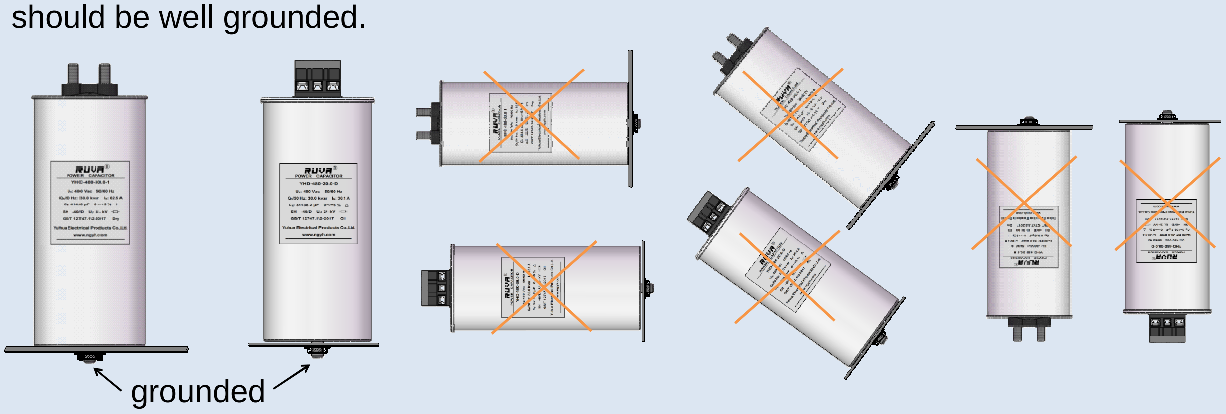
$\cos\varphi_1=P/S_1$

Shunt capacitors are used to compensate reactive power,which reduces reactive power Q and improves power factor. When real power of the load (P) and the power factor without power factor correction ($\cos\varphi_0$) are known, the reactive power of the capacitors (Q_C) required to increase the power factor to $\cos\varphi_1$ is $Q_C=P\times K$, the value of K is shown in the table below:

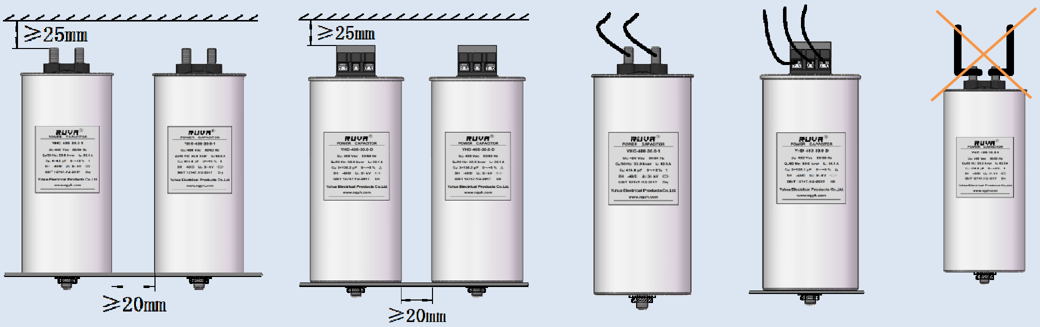
$\cos\varphi_0$	Required power factor $\cos\varphi_1$												
	0.70	0.75	0.80	0.82	0.84	0.86	0.88	0.90	0.92	0.94	0.96	0.98	1.00
0.50	0.71	0.85	0.98	1.03	1.09	1.14	1.19	1.25	1.31	1.37	1.44	1.53	1.73
0.52	0.62	0.76	0.89	0.94	1.00	1.05	1.10	1.16	1.22	1.28	1.35	1.44	1.64
0.54	0.54	0.68	0.81	0.86	0.91	0.97	1.02	1.07	1.13	1.20	1.27	1.36	1.56
0.56	0.46	0.60	0.73	0.78	0.83	0.89	0.94	1.00	1.05	1.12	1.19	1.28	1.48
0.58	0.38	0.52	0.65	0.71	0.76	0.81	0.86	0.92	0.98	1.04	1.11	1.20	1.40
0.60	0.31	0.45	0.58	0.64	0.69	0.74	0.79	0.85	0.91	0.97	1.04	1.13	1.33
0.62	0.25	0.38	0.52	0.57	0.62	0.67	0.73	0.78	0.84	0.90	0.97	1.06	1.27
0.64	0.18	0.32	0.45	0.50	0.55	0.61	0.66	0.72	0.77	0.84	0.91	1.00	1.20
0.66	0.12	0.26	0.39	0.44	0.49	0.55	0.60	0.65	0.71	0.78	0.85	0.94	1.14
0.68	0.06	0.20	0.33	0.38	0.43	0.49	0.54	0.59	0.65	0.72	0.79	0.88	1.08
0.70		0.14	0.27	0.32	0.37	0.43	0.48	0.54	0.59	0.66	0.73	0.82	1.02
0.72		0.08	0.21	0.27	0.32	0.37	0.42	0.48	0.54	0.60	0.67	0.76	0.96
0.74		0.03	0.16	0.21	0.26	0.32	0.37	0.42	0.48	0.55	0.62	0.71	0.91
0.76			0.11	0.16	0.21	0.26	0.32	0.37	0.43	0.49	0.56	0.65	0.86
0.78			0.05	0.10	0.16	0.21	0.26	0.32	0.38	0.44	0.51	0.60	0.80
0.80				0.05	0.10	0.16	0.21	0.27	0.32	0.39	0.46	0.55	0.75
0.82					0.05	0.11	0.16	0.21	0.27	0.34	0.41	0.50	0.70
0.84						0.05	0.11	0.16	0.22	0.28	0.35	0.44	0.65
0.86							0.05	0.11	0.17	0.23	0.30	0.39	0.59
0.88								0.06	0.11	0.18	0.25	0.34	0.54
0.90									0.06	0.12	0.19	0.28	0.48
0.92										0.06	0.13	0.22	0.43
0.94											0.07	0.16	0.36

Storage and installation requirements

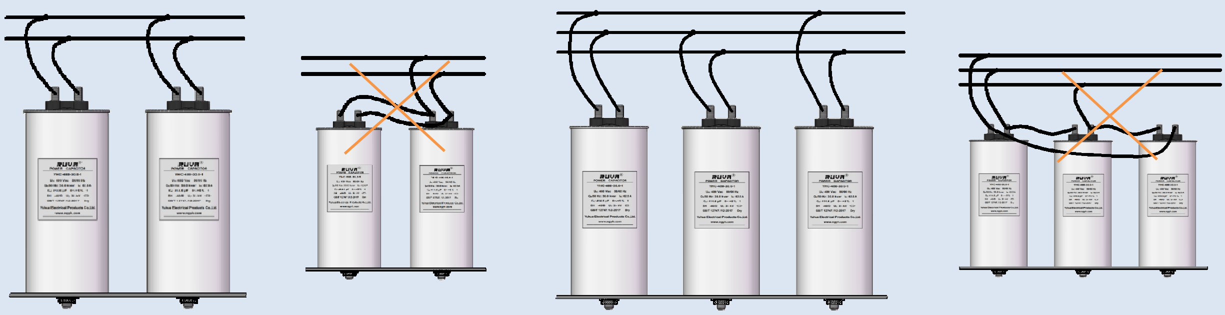
1. Do not store or install capacitors in corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present, and avoid dust accumulation near the terminals.
2. If there is a pit in the capacitance surface with a depth of more than 1 mm or other visible mechanical damage, or oil leakage, it shall not be used. In any case, resonance conditions must be avoided by appropriate application design.
3. The capacitor should be installed in a cool and ventilated place, avoid direct sunlight or close to other heating objects.
4. The capacitor must be mounted vertically with the terminals upwards. The bottom stud should be well grounded.

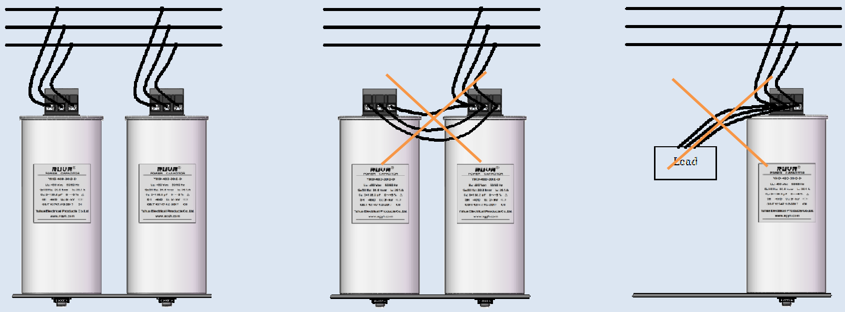


5. During installation, a gap of at least 20 mm should be left at the side of each product to facilitate the heat dissipation of the product. A gap of at least 25 mm should be left on the upper of the terminal too, and the connection cable shall be of flexible type and keep slack , do not use hard core cable, so as to ensure the explosion-proof function of the product and avoid mechanical stress on the terminals and feedthroughs.



6. When multiple capacitors are used in parallel, the current carrying capacity of terminals and wires should be considered. We recommended that each capacitor use independent lead wires, if you have any other connection way please contact us.





7. For the cap type design, recommend to using a slotted screwdriver to install the terminals. For the bolt type design, fix the bottom insulator before tightening the bolts. In addition, the torque should not exceed the specified value to avoid damage.
8. Installation & commissioning procedures:
   (1) Unpack Capacitor, do not hold it on the capacitor terminal when taking it out.
   (2) Check Physically, confirm that the product is complete without visible damage.
   (3) Fixed capacitors with the bottom thread bolt firmly, and avoid mechanical damage.
   (4) Ensure for correctness of supply voltage, frequency, temperature, etc.
   (5) Connect Capacitor right.
   (6) Switch on supply.
   (7) Check main supply voltage and current.
9. Before operating the capacitors (installation, disassemble, etc.), the capacitor must be fully discharged (discharge through resistance, and then short-circuit discharge and grounding). Even if some capacitors have Internal discharge resistance, they still need short-circuit discharge and grounding.

Operation and maintenance requirements

1. Must pay attention to the temperature category of the capacitor, the ambient air temperature shall not exceed the upper limit of the temperature category. Under forced cooling conditions higher ambient air temperature is possible, but should guarantee the capacitor shell temperature no more than maximum 65 ℃ normally.
2. The switching of a capacitor bank by a restrike-free circuit breaker usually causes a transient overvoltage, the first peak of which does not exceed 2√2 times the applied voltage for a maximum duration of 1/2 cycle, and the associated peak transient overcurrent may reach 300 times the rated current I_N. About 10 000 switching operations per year are acceptable under these conditions.
3. It is recommended to use HRC fuse or MCCBs for short circuit protection. Short circuit protection elements and connecting cables shall be able to withstand 1.5 times of rated current I_N continually. The rated current value of current limiting fuse should be 1.6 to 2.0 times of the normal current value of capacitor, and it is recommended to use thermal magnetic over current relays for overload protection.
4. If we indicate that it is equipped with internal or external discharge resistance, the default resistance value will discharge each unit in 3 min to 75 V or less from an initial peak voltage of √2 times the rated voltage U_N. If smaller discharge times and voltages are required, please inform us advance. A discharge device is not a substitute for

short-circuiting the capacitor terminals together and to earth before handling.

5. In case of voltage interruption, a sufficient discharge time has to be ensured，maximum permitted voltage is 10% of rated voltage before they are switched in again, this prevent phase-opposition and an electric impulse discharge with high inrush currents in the application which influences the capacitor's service life, and protects against electric shock.
6. Check tightness of the connections and terminals periodically, check short circuit protection fuses and the discharge resistance whether normal work. Clean the terminals periodically to avoid dust or other conductive garbage can cause a short-circuit.
7. Use a harmonic analyser or current clamp table or other on-line measuring tools of current, take current reading and compare with nominal current every six month. In case of current above the nominal current, must check the power supply and capacitors in time.
8. Resonance cases must be avoided by appropriate application design in any case. Maximum total RMS capacitor current (include fundamental and harmonic current) specified in technical data must not be exceeded.
9. All capacitors do not have an unlimited service life expectancy, this applies to self-healing type PFC capacitors too. The maximum service life expectancy may vary depending on the application the capacitor is used in, such as, ambient temperature, voltage, current, altitude and heat dissipation, etc.
10. Check the temperature of capacitors directly after operation for a longer period. In case of excessive temperature of individual capacitors, it is recommended to replace these capacitors, as this should be an indication for loss factor increase, which is a sign for reaching end of life.

Cautions

1. Rated current and maximum admissible overcurrent

The rated current (I_N) is the current resulting for rated voltage (U_N) and frequency (f_N), excluding transients. Maximum permitted r.m.s. current for each particular capacitor is specified in the data sheet. Continuously exceeding of the nominal current will lead to increased self-heating of the capacitor and reduce life time. The maximum admissible overcurrent (I_{max}) of $1.3I_N$ to GB/T 12747 standard is maintained or overachieved by all capacitors in this catalog. The figures for overcurrent allow for the combined effects of harmonics, overvoltage and capacitance tolerance.

2. Maximum admissible overvoltage

YHC and YHD type PFC capacitors are suitable for operation on overvoltage quoted by GB/T 12747. Overvoltage higher than $1.15U_N$ reduce life time of the capacitor and must not occur more than 200 times during life time of capacitor. Overvoltage above $1.3U_N$ must not occur at all, appropriate overvoltage protection (e.g. against lightning strikes) must be ensured.

3. Mean life expectancy

The mean life expectancy of power capacitors is mainly governed by the following factors: duration of overload, ambient temperature and the resulting case temperature, maximum r.m.s. current and the resulting case temperature, voltage value and duration.

The calculated life expectancy of the various series is stated for nominal operating conditions. If components are stressed less than the GB/T 12747 factors, longer useful life can be expected, and a correspondingly shorter one or increased failure rate if nominal parameters are exceeded.

4. Fuse protection

Power capacitors have to be protected against short circuits by fuses or thermal magnetic overcurrent relays. Slow-blow, low-voltage, high-breaking-capacity (HRC) fuses are preferable. The fuse rating should be 1.6 to 1.8 times the rated current of the capacitor. HRC fuses must not be used for switching. Resulting electric arcing can cause death! It may also cause capacitor failures, and result, worst case, in capacitor bursting and fire.

Magnetic short circuit relays should be set to between 9 and 12 times rated current to prevent them responding to high inrush currents. Maximum allowed fault current of 10 000 A must be ensured by the application design.

5. Switching of capacitors

When a capacitor is switched to an AC system, the result is a resonant circuit damped to a greater or lesser degree. In addition to the rated current, the capacitor accepts a transient current that is a multiple of its rated current (up to 200 times) . Fast switching, low-bounce contactors should be used, and have the switching capacity for capacitive currents stated by the producer. Special capacitor contactors with leading contacts that feature precharging resistors to damp inrush currents are recommended. As per GB/T 12747 standard, a maximum of 5000 switching operations per year is acceptable. Before considering a higher number of switching operations, please contact us.

6. Discharging

Capacitors must be discharged to a maximum of 10% of rated voltage before they are switched in again. This prevents an electric impulse discharge in the application, influences the capacitor's useful life in PFC systems, and protects against electric shock. The capacitor must be discharged to 75 V or less within 3 min. There must not be any switch, fuse or any other disconnecting device in the circuit between the power capacitor and the discharging device. In addition, should short discharge before handling!

7. Networks harmonics influence and control

Harmonics are produced in the operation of electric loads with a nonlinear voltage or current characteristic (e.g. rectifiers and inverters for drives, welding equipment and Uninterruptible power supplies). Harmonics are sinusoidal voltages and currents with higher frequencies of a multiple of the 50 or 60 Hz line frequency. In low-voltage three-phase systems the 5th and 7th harmonics are especially troublesome. To ensure the normal operation of the capacitors, we should not only to control the THD voltage, but also take measures to avoid resonance, to ensure that the maximum overcurrent as specified under technical data of each series must not be exceeded, otherwise resonance may cause very high overcurrents which can lead to capacitor failures, and worst case, to explosion and fire.

8. Terminals connection

Ensure firm fixing of terminals, fixing torque to be applied should not exceed the specified value. Avoid bending cable lugs, cables or other mechanical force on the terminals.

The connection cables to the capacitor should be designed for a current of at least 1.5 times the rated current so that no heat is conducted into the capacitor. Otherwise leakages may set the safety device out of operation. Maximum specified terminal current (please refer to technical data of specific series) must not be exceeded at any case.

If reactors are used in an application, the distance between reactor and capacitor must be great enough so that no heat of the reactors, which are operating at a much higher temperature level, is conducted via connection cable to the capacitors.

9. Grounding

The threaded bottom stud of the capacitor has to be used for grounding. If there are other metal conductors between the stud and the ground, the connection between them must be good conductivity.

10. Heat dissipation

Capacitors should be sited in cool and well ventilated locations away from other heat-radiating elements. Natural heat dissipation is generally sufficient for cooling purposes if enough air is able to flow to and away from them and the capacitors are spaced at least 20 mm apart. Otherwise, in a less well ventilated environment, forced cooling (fans) will be necessary, scaled so that the maximum admissible ambient temperature is not exceeded. Useful life of capacitors strongly depends on the operating temperature Exceeding maximum allowed temperature may causes capacitor damage or even more serious consequences even if in a short time.

Notes

1. Some parts of this manual contain statements about the applicability of our capacitors in certain applications. These statements are based on our understanding of the typical requirements of our products in the relevant application areas, and such statements cannot be considered as binding statements about the suitability of our products for specific customer applications. In general, we are either unfamiliar or not as familiar as the customer himself with the actual application. For these reasons, it is ultimately the responsibility of the customer to check and determine whether a product with the characteristics described in the product specification is suitable for use in a particular customer application.
2. In some cases, under the existing technical level, the possibility of failure before the end of normal service life cannot be completely ruled out even if the operation is carried out according to the regulations. In customer applications where operational safety requirements are extremely high, especially when a failure may endanger human life or health, proper design of the customer application or other measures taken by the customer, such as installing protective circuits or redundancy, must be used to ensure that no injury or damage occurs in the event of a failure.
3. We are constantly trying to improve our products, the products described in this manual may change. Therefore, we cannot guarantee that all products specified in this manual will always be available. We reserve the right to stop production and delivery of products. Please check to what extent the product description contained in this manual is still applicable before placing an order. If you have any questions or different requirements, you can contact us for confirmation.

NOTES

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