







High Voltage Power Capacitor-NH Type
High Voltage Power Capacitor-SH Type
Low Voltage Power Capacitor-SH Type
Special Capacitor
Motor Capacitor





The Symbol 'Samwha' Means 'Toward Better Future.'

The inner circle denotes the spirit of the state of the art technology development of Samwha and the outer circle shows the will of Samwha to extend toward the world.

300 100 150 460y

Affiliated Companies

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The History of the Company

1956.	Ohan Industry, Inc. was Established in August
1963.	The Company Name was Changed into Samwha Electrical Industry, Inc. in October The Production of High and Low voltage Power Capacitor was Begun First in Korea
1964.	The Production of Motor Capacitor was Begun First in Korea in April
1968.	The Trade Name was Changed into Samwha Capacitor Industry, Inc. in August
1970.	The KS Mark for low Voltage Power Capacitor was Obtained First in Korea (C 4801 No.423) in January
1976.	The Stocks of the Company was Publicly Offered and the Company was Listed in June
1977.	The KS Mark for High and Extra High Voltage Power Capacitor was Obtained First in Korea (C4802 No. 1524) in January
1979.	The KS Mark for Motor Capacitor (C4805 No.1827) was Obtained in September
1984.	The Factory was Moved from Seongsoo-dong, Seoul to Yongin in Kyonggido in December
1985.	The Production of the Multilayer Ceramic Capacitor was Begun in July
1986.	he Certifications of the Disk Ceramic capacitor(DCC) were Obtained from UL(E97754) and CSA(LR60366) The Certification of the Film Motor Capacitor was Obtained from UL(106435) in October
1987.	The Institute was Established in Yongin in February
1987.	The Certification of the Microwave Oven Capacitor was Obtained from TUV(R76500) in July
1992.	The Production of PTC Thermistor was Begun in February
1999.	ISO 9002 for Quality Control System was Obtained in October (KS A 3002-1992/ISO 9002-1987)
2002.	ISO 9001 for Quality Control System was Obtained in July (KS A 9001-2001)
2004.	ISO 14001 for Environment Management System was Obtained in October (KS A 14001-2001)



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Main Products

Film Capacitor
 High Voltage Power Capacitor-NH Type
 High Voltage Power Capacitor-SH Type
 Pulse Power Capacitor
 High Voltage Power Capacitor with
 Internally Fused

Low Frequency Induction Furnace Capacitor Water Cooling Capacitor Surge Absorbing Capacitor Grounding Capacitor High and low Voltage capacitor Bank Automatic Power Factor Control Capacitor Bank A.C. Harmonic Filter Motor Capacitor Microwave Oven Capacitor

- 2. Disk Ceramic Capacitor(DCC)
- 3, EMI Filter
- 4. Multilayer Ceramic Capacitor
- 5. PTC Thermistors

1	High Voltage Power Capacitor-NH Type Extra High Voltage Single Phase Capacitor, High Voltage Single Phase Capacitor,	6
	High Voltage 3 Phase and NCS Built-In Capacitor, Extra High Voltage Capacitor Bank, High Voltage Capacitor Bank, NVS Capacitor Protector	
2	High Voltage Power Capacitor-SH Type Protector Built-In Type, Protector Built-In and Protection Contact Attached Type	20
3	Low Voltage Power Capacitor-SH Type	23
4	Special Capacitor A.C. Harmonic Filter, High Voltage Power Capacitor with Internally Fused, Low Frequency Induction Furnace Capacitor, Water Cooling Capacitor, Surge Absorbing Capacitor, Grounding Capacitor, Pulse Power Capacitor	30
5	Motor Capacitor QMC/AMC Series, RMES Series, H. V. Capacitor	46
6	Appendix Capacity Calculation Table, Treatment of Capacitor, Examination of Capacitor, Capacitor Order Form	55









Specification

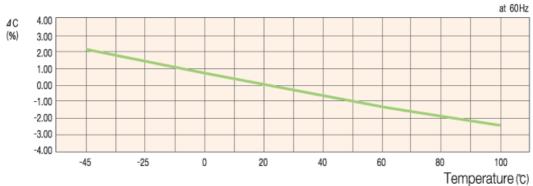
- Installation Place: Indoors and outdoors
- Ambient Temperature for use : -20°C ~ +40°C (below average 35°C for 24 hours, below average 25°C for 1 year)

- Performance

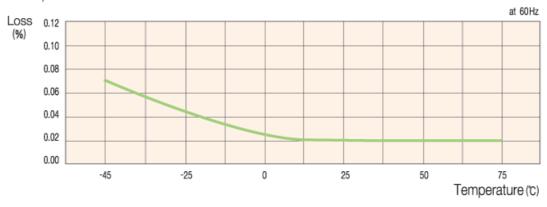
1 0110111101100	
Allowable Capacity Tolerance	-5% ~ +10% (at 20°c), unbalanced ratio between phases below 108%
Maximum Use Voltage	Less than 110% of rated voltage: within 12 hours among 24 hours Less than 115% of rated voltage: within 30 minutes among 24 hours Less than 120% of rated voltage: within 5 minutes Less than 130% of rated voltage: within 1 minute
Maximum Use Current	Transient current 130% of rated current allowed.
Withstand Voltage	There shall be no abnormalities after 10 seconds of 2,15 times of rated voltage between terminals
Insulation Level	3A 16/45, 6A 22/60, 10A 28/90, 20A 50/150k
Loss	Less than 0.35% (rated voltage, 20°C)
Temperature Rise	Less than 30 deg (rated voltage, 35°c)
Oil Leakage	No oil leakage when heat is applied to all parts of capacitor until the temperature reaches 70°C
Discharge	Only in case of products with discharging ability, the residual voltage shall be less than 50V within 5 minutes
Painting Color	Munsell no, 5Y 7/1
Reference Standard	IEC 60871-1(1997)
Series Reactor	L=6% can be applied



• Feature of Temperature Versus Capacity

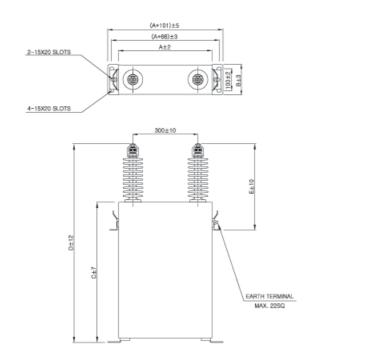


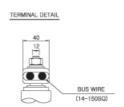
• Feature of Temperature Versus Loss





Diagram







Ratings and Dimensions

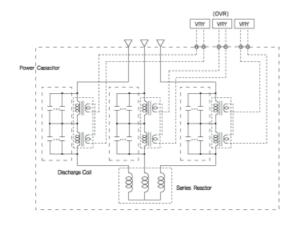
Line Voltage	Rated Voltage	Frequency	Capacity	Rated Current	Type		Dir	nension (m	nm]		Approximately																					
[kV]	V] [kV] [Hz]	[Hz]	[Hz]	[kvar]	[A]	Турс	Α	В	С	D	Е	Weight [kg]																				
					50	7,6	TAF-T235050S06R	430	135	230	500	400	21																			
											50	3,8	TAF-T235050S13R	400	100	200	300	400	21													
			66,7	10,1	TAF-T235067S06R	430	135	260	530	400	24																					
						00,7	5.1	TAF-T235067S13R	450	133	200	330	400	24																		
			83.4	12,6	TAF-T235083S06R	430	135	300	570	400	27																					
																			03,4	6,3	TAF-T235083S13R	430	133	300	370	400	21					
	6,6			6,6 50 (13,2)	-,-		50	50	50	100	15,2	TAF-T235100S06R	430	135	340	610	400	30														
22,9		50	50							50	50	50	100	7,6	TAF-T235100S13R	450	155	340	010	400	30											
	(13,2)																		134	20,2	TAF-T235134\$06R	430	135	420	690	400	36					
																					104	10,1	TAF-T235134S13R	430	133	420	090	400	30			
				167	25,3	TAF-T235167S06R	430	135	480	750	400	41																				
																					107	12,6	TAF-T235167S13R	430	133	400	750	400	41			
				209	31,7	TAF-T235209S06R	430	135	570	840	450	49																				
																									209	15,8	TAF-T235209S13R	430	133	5/0	040	450
					250	37,9	TAF-T235250S06R	430	135	660	930	490	56																			
														200	18,9	TAF-T235250S13R	430	100	000	930	430	30										

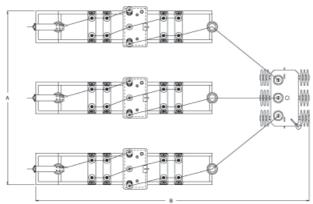
- ▶ Please confirm the ratings and dimensions of the products printed in this caue prior to ordering because they may be altered.
 - Notes) 1. In case of when line voltage is 22kV, production of each size is possible with the same dimensions.
 - 2. In case when more than 2capacitors are installed in parallel, please give intervals more than 90mm in between the capacitors. Also, in case when they are used in cubicles, the exterior case shall be well ventilated so that the maximum temperature of the capacitor case in summer shall be less than 65% (less than 60% of daily average) in summer.
 - 3. The case is made so that it expands about 15mm on each side. In case when the side expands more than 30mm, stop the power supply and check the cause.

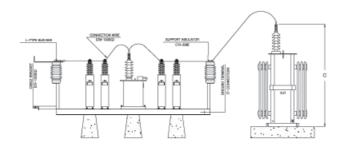


Cooperation for the Protection of Extra High Voltage Capacitor Bank

Voltage Deviation Protection Method







This method is usually employed for extra high voltage high capacity facilities based on the principle that Vry is driven by detecting unbalanced voltage from second winding discharge coil at each phase.

The failure of only 1 element within the capacitor can enable the detection of failure voltage so that safe bank operation is possible.

Detected failure voltage in case of the failure of element of the capacitor is as following:

$$V_{RY} = \frac{3V_C}{3P(S-1)+2}$$

Vc : Secondary Rated Voltage of Discharging Coil

P : Number of Parallel Units Per Phase

S : Number of Series Circuits Per Unit Capacitor



Bank Ratings and Dimensions

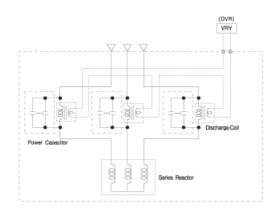
Line Voltage	Frequency	' ' Composition of unit Capacitor		Series Reactor			
[kV]	[Hz]	[kvar]	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Α	В	С	L=6[%]
		500	83,4kvar × 6EA	3445	4020	1400	30kvar
		1000	167kvar × 6EA	3445	4040	1500	60kvar
	50	1500	250kvar × 6EA	3445	4090	1600	90kvar
22.9		2000	167kvar × 12EA	3445	4610	1720	120kvar
22.0		2500	209kvar × 12EA	3445	4720	1720	150kvar
		3000	250kvar × 12EA	3445	4720	1720	180kvar
		4000	167kvar × 24EA	3445	5920	1720	240kvar
		5000	278kvar × 18EA	3445	5500	1800	300kvar

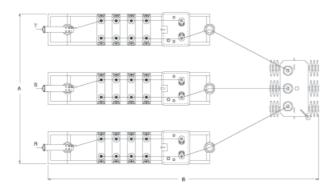
▶ Please confirm the ratings and dimensions of the products printed in this caue prior to ordering because they may be altered.

Cooperation for the Protection of Extra High Voltage Capacitor Bank



Open Delta Protection Method





This method is usually employed for relatively small capacity facilities among Extra High Voltage Capacitor facilities based on the principle that Vry is driven by detecting imbalance voltage in case of Capacitor failure when Secondary of discharging coil of each phase is connected with OPEN DELTA.

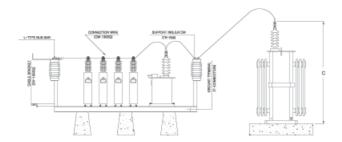
Although the operation is the same with the Voltage Differential Method, you have to find the phase on which the failure occurs for yourself when the protection relay operated.

$$V_{RY} = \frac{3Vc}{3P(S-1)+1}$$

Vc : Secondary Rated Voltage of Discharging Coil

P : Number of Parallel Units Per Phase

S : Number of Series Circuits Per Unit Ccapacitor



Bank Ratings and Dimensions

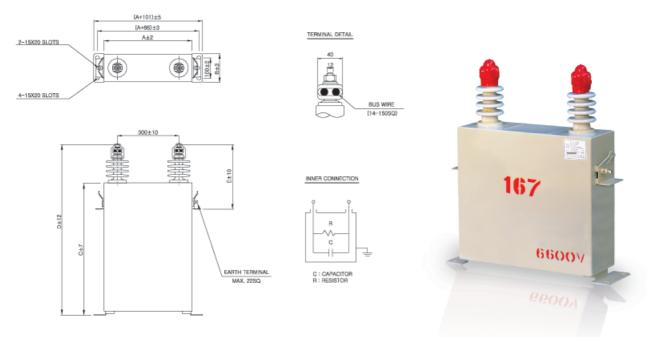
Line Voltage	Frequency	Rated Capacity Composition of Unit Capacitor Dimension [mm]					Series Reactor
[kV]	[Hz]	[kvar]		Α	В	С	L=6[%]
		500	167kvar× 3EA	3205	3290	1400	30kvar
		1000	167kvar× 6EA	3205	3830	1500	60kvar
22,9	22,9 50	1500	250kvar× 6EA	3205	3880	1600	90kvar
		2000	167kvar×12EA	3205	4400	1720	120kvar
		2500	209kvar×12EA	3205	4510	1720	150kvar

▶ Please confirm the ratings and dimensions of the products printed in this caue prior to ordering because they may be altered.



High Voltage Single Phase Power Capacitor

■ Diagram (3300, 6600V 50 ~ 250kvar)



Ratings and Dimensions

Line Voltage	Rated Voltage	Frequency	Capacity	Rated Current	d Current Type Dimension [mm]		Approximately																							
[kV]	[kV]	[Hz]	[kvar]	[A]	Туре	Α	В	С	D	Е	Weight [kg]																			
									50	26,3	TAF-T35050S1R	430	115	240	425	315	21													
							30	13,2	TAF-T65050S3R	450	110	240	420	313	21															
			66,7	35,1	TAF-T35067S1R	430	115	280	465	315	24																			
			00,7	17.6	TAF-T65067S3R	450	113	200	400	313	24																			
			83,4	43,9	TAF-T35083S1R	430	30 115	330	515	315	27																			
																					03,4	21,9	TAF-T65083S3R	400	110	330	313	313	21	
		1.9 50	50	100	52,6	TAF-T35100S1R	430	115	380	565	315	31																		
3,3	1,9			50	50	50	50	50	50	50	50	50	50	100	26,3	TAF-T65100S3R	450	113	300	303	313	31								
(6,6)	(3,8)										50	30	50	50	50	00	00	00	00	00		134	70,2	TAF-T35134S1R	430	115	470	655	315	37
																								104	35,1	TAF-T65134S3R	450	113	470	000
												167	87,7	TAF-T35167S1R	430	145	450	635	315	42										
																												167	43,9	TAF-T65167S3R
			200	105,3	TAF-T35200S1R	430	1/15	520	705	265	48																			
												200	52,6	TAF-T65200S3R	430	145	520	705	365	40										
														250	131,6	TAF-T35250S1R	520	170	460	645	315	59								
			200	65,8	TAF-T65250S3R	530	170	400	040	010	55																			

- ▶ Please confirm the ratings and dimensions of the products printed in this caue prior to ordering because they may be altered.
 - Notes) 1. In case when more than 2 capacitors are installed in parallel, please give intervals more than 90mm in between the capacitors.

 Also, in case when they are used in cubicles, the exterior case shall be well ventilated so that the maximum temperature of the capacitor case in summer shall be less than 65°c (less than 60°c daily average) in summer.
 - 2. The case is made so that it expands about 15mm on each side.

 In case when the side expands more than 30mm, stop the power supply and check the cause.





Specification

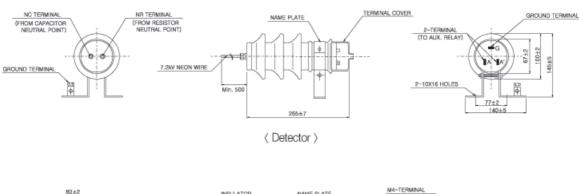
Detector

Ambient Temperature	-20℃ ~ +40℃
Line Voltage	3,3kV / 6,6kV
Insulation Level	6A
Frequency	50Hz / 60Hz
Rated Current	2mA
Minimum Operating Voltage	AC 250V
Contact Rated	1a contact AC / DC 100V 0,1A 10W
Withstanding Voltage	A, A' Between batch terminal NC, NR Between batch terminal AC 22kV A, A' Between batch terminal Ground AC 2kV

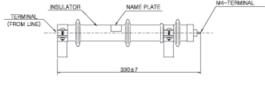
◆ Resistor

Type Item		RS-06	RW-06
Appli	cation	Single Star	Double Star
Rated	Continuous	3800V	1900V
voltage	1min.	7600V	3800V
Resistar	nce Value	6M. <i>Q</i> ±3%	2M ϱ ±3%
		Continuous	Operation
Po	wer	3 Phase 3,3kV : 1,8W	3 Phase 3,3kV : 1,8W
Consu	mption	3 Phase 6,6kV : 7,2W	3 Phase 6,6kV : 7,2W
		3 Phase	

Diagram









(Resistor (RS/RW - 06))

Features

- Power supply for manipulation is not needed. Neutral voltage occurring when the element within the capacitor fails makes the coil excitation which results in the operation of the relay.
- The error of the operation of ground relay does not occur. Neutral is not on ground, but it is earthed from earth by the resistor.
- 3. Movement error against Harmonics Inrush Current does not occur.

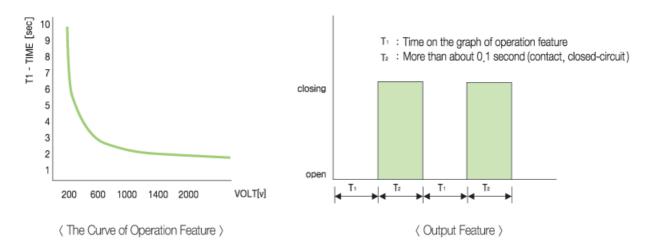
 Since it employs voltage detection method, the influence from inrush current or harmonics current does not reach.
- 4. It has high withstand voltage ability,
- 5, It has high reliability,
- 6. It can be applied both indoors and outdoors.
- 7. It is economical.

It is economical and uses smaller area than with the existing method which applies the second discharging coil,



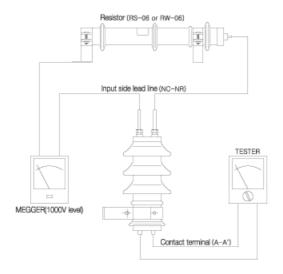
Neutral Voltage Detection Method(Neutral Voltage Sensor)

Characteristics



Applied Voltage	Output	Contact
(Failure Voltage)	Open Circuit Time(T1)	Closed Circuit Time(T2)
AC 250V ±10%	Infinite	N/A
AC 350V ±10%	9 ~ 15sec,	0,1sec, more than
AC 650V ±10%	2 ~ 5sec,	0,1sec, more than
AC 950V ±10%	1 ~ 3sec.	0,1sec, more than

If the element of the capacitor reaches the point of insulation destruction in the process of capacitor bank operation, the neutral voltage detector(NVS) begins its operation. The breaker for capacitor bank is tripped by the first pulse output first and the capacitor bank is separated from the power supply and at the same time the neutral voltage is also nullified. Therefore, the pulse output disappears at the operation of trip of the breaker, if the trip does not occur by the first pulse, the trip order continues until the breaker is tripped,



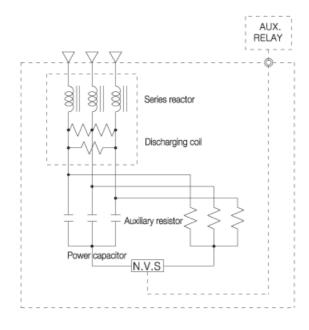
Test of Operation

After 1 copy of resistor(RS-06 or RW-06) is attached on one side of NC-NR lead line at the input of the detector, confirm the operation of A-A' terminal after applying the voltage with 1000V grade MEGGER resistance tester,





Composition of the Circuit



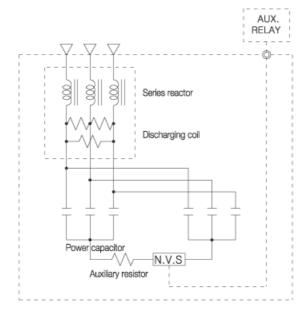
1. Single Star Method

This is a method of tripping the breaker by detecting neutral voltage differential against the symmetrical (Y-type connected) resistor after connecting 3 Capacitor in Y-type.

The detected voltage of NVS may be altered according to the number of inner series Capacitor, So it is determined at the time of system design.



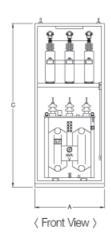
This is a method which detects the differential between neutrals of capacitors connected, of which the principle is same with that of Single Star Method,

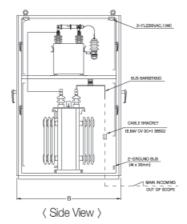


Although the contact capacity of NVS is AC, DC 100V
0.1A, the current from trip coil is usually about 5A, NVS
contact shall be protected by auxiliary relay.

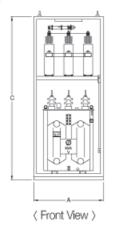
High Voltage Power Capacitor-NH Type Cubicle Type

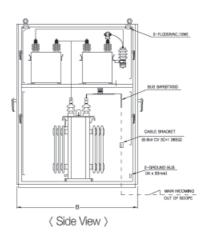
Single Star Method





Double Star Method





Bank Ratings and Dimensions

Line Voltage	Frequency	Rated Capacity	Composition of Unit Capacitor		imension (mm]	Series Reactor
[kV]	[Hz]	[kvar]		Α	В	С	L=6[%]
		150	50kvar ×3EA	900	1200	2050	9kvar
		200	66,7kvar ×3EA	900	1200	2050	12kvar
		250	83,4kvar ×3EA	900	1200	2050	15kvar
		300	100kvar ×3EA	900	1200	2050	18kvar
		400	134kvar ×3EA	900	1200	2250	24kvar
6.6	50	500	167kvar ×3EA	900	1200	2250	30kvar
		600	200kvar ×3EA	1000	1200	2450	36kvar
		750	250kvar ×3EA	1000	1200	2450	45kvar
		1000	167kvar ×6EA	1000	2000	2450	60kvar
		1200	200kvar ×6EA	1000	2000	2450	72kvar
		1500	250kvar ×6EA	1300	2000	2450	90kvar

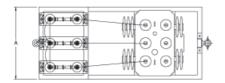
Notes) 1. Each bank can control power factor by automatic power factor controller.

- 2. Bank can be ordered with the breaker(VCB), switch(VCS) and protecting relay as a bundle.
- Please consult us prior to production so that the dimensions, composition and supply extent of each bank is appropriate to the feature of the load and the condition of the site,
- ▶ Please confirm the ratings and dimensions of the products printed in this caue prior to ordering because they may be altered,

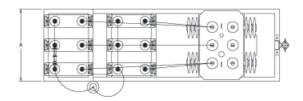
Open Rack Capacitor

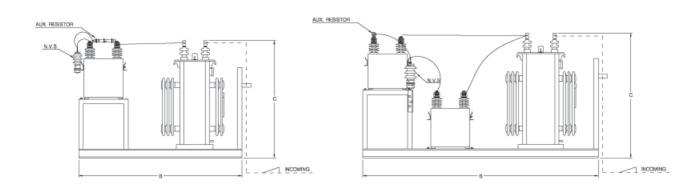


Single Star Method



Double Star Method





Bank Ratings and Dimensions

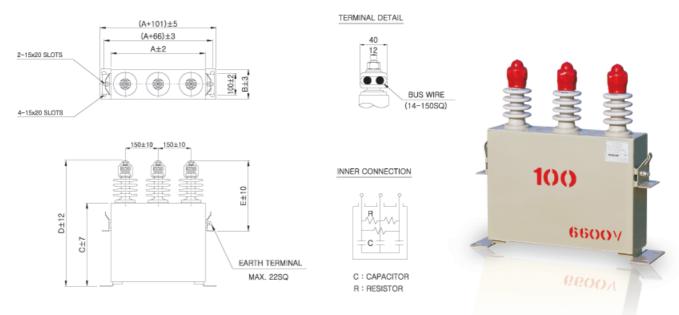
Line Voltage	Frequency	Rated Capacity	Composition of Unit Capacitor		Dimension (mm]	Series Reactor		
[kV]	[Hz]	[kvar]		Α	В	С	L=6[%]		
		150	50kvar ×3EA	800	1500	1020	9kvar		
		200	66,7kvar ×3EA	800	1700	1130	12kvar		
		250	83,4kvar ×3EA	800	1700	1130	15kvar		
		300	100kvar ×3EA	800	1700	1130	18kvar		
				400	134kvar ×3EA	800	1800	1250	24kvar
6.6	50	500	167kvar ×3EA	800	1800	1300	30kvar		
		600	200kvar ×3EA	800	1800	1300	36kvar		
		750	250kvar ×3EA	800	2000	1300	45kvar		
		1000	167kvar ×6EA	800	2600	1380	60kvar		
		1200	200kvar ×6EA	800	2600	1380	72kvar		
		1500	250kvar ×6EA	800	2800	1450	90kvar		

▶ Please confirm the ratings and dimensions of the products printed in this caue prior to ordering because they may be altered.



High Voltage 3 Phase Capacitor

Diagram (3300, 6600V 10 ~ 100kvar)



Ratings and Dimensions

Line Voltage	Rated Voltage	Frequency	Capacity	Rated Current	Туре		Dir	mension (m	nm]		Approximate
[kV]	[kV]	[Hz]	[kvar]	[A]	Туро	Α	В	С	D	Е	Weight [kg]
			10	1,75	TAF-T35010R	430	115	210	395	315	21
			10	0,87	TAF-T65010R	450	113	210	393	313	21
			15	2,62	TAF-T35015R	430	115	210	395	315	21
			15	1,31	TAF-T65015R	400	113	210	333	515	21
			20	3,50	TAF-T35020R	430	115	210	395	315	21
			20	1,75	TAF-T65020R	400	110	210	333	313	21
			25	4,37	TAF-T35025R	430	115	210	395	315	21
3,3	3,3	50	20	2,19	TAF-T65025R	400	110	210	000	010	21
(6,6)	(6,6)	00	30	5,25	TAF-T35030R	430	115	210	395	315	21
			00	2,62	TAF-T65030R	400	110	210	000	010	21
			50	8,75	TAF-T35050R	430	115	240	425	315	22
			00	4.40	TAF-T65050R	400	110	240	420	010	22
			75	13,10	TAF-T35075R	430	115	310	495	315	27
			7.0	6,60	TAF-T65075R	400	110	010	455	010	21
			100	17,50	TAF-T35100R	430	115	390	575	315	33
			100	8.70	TAF-T65100R	400	110	530	0/0	010	30

▶ Please confirm the ratings and dimensions of the products printed in this caue prior to ordering because they may be altered.

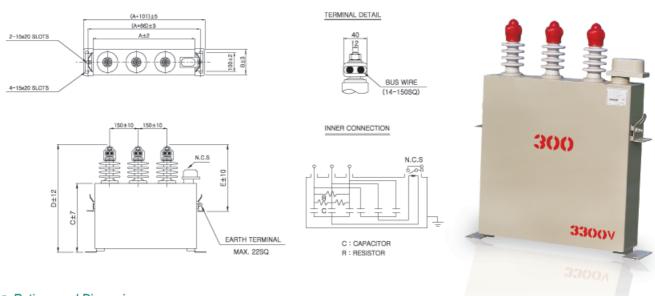
- Notes) 1. In case when more than 2 capacitors are installed in parallel, please give intervals more than 90mm in between the capacitors.

 Also, in case when they are used in cubicles, the exterior case shall be well ventilated so that the maximum temperature of the capacitor case in summer shall be less than 60°C (less than 60°C of daily average) in summer.
 - The case is made so that it expands about 15mm on each side.In case when the side expands more than 30mm, cut the power supply and check the cause.
 - 3. For the switch, use a breaker dedicated only to capacitor.

High Voltage 3 Phase Copacitor with NCS



■ Diagram (3300, 6600V 150 ~ 500kvar)



Ratings and Dimensions

Line Voltage	Rated Voltage	Frequency	Capacity	Rated Current	Туре		Dir	nension (m	nm]		Approximate
[kV]	[kV]	[Hz]	[kvar]	[A]	1,900	Α	В	С	D	Е	Weight [kg]
			150	26,2	TAF-T35150R	530	135	390	575	315	44
			100	13,1	TAF-T65150R	300	100	000	5/5	010	44
			200	35.0	TAF-T35200R	530	135	480	665	315	53
			200	17,5	TAF-T65200R	330	133	400	000	313	55
			250	43,7	TAF-T35250R	530	135	560	745	365	60
3,3	3,3	50	250	21,9	TAF-T65250R	550	133	300	740	300	00
(6,6)	(6,6)	50	300	52,5	TAF-T35300R	530	170	530	715	365	69
			300	26,2	TAF-T65300R	330	170	330	715	303	09
			400	70.0	TAF-T35400R	530	170	660	845	405	82
			400	35,0	TAF-T65400R	330	170	000	040	400	02
			500	87.5	TAF-T35500R	530	170	840	1025	405	104
			300	43,7	TAF-T65500R	330	170	040	1020	400	104

▶ Please confirm the ratings and dimensions of the products printed in this caue prior to ordering because they may be altered.

Notes) 1. In case when more than 2 capacitors are installed in parallel, please give intervals more than 90mm for 150-200kvar and 90mm for 250-500kvar in between the capacitors.

Also, in case when they are used in cubicles, the exterior case shall be well ventilated so that the maximum temperature of the condenser case in summer shall be less than 65°C (less than 60°C of daily average) in summer.

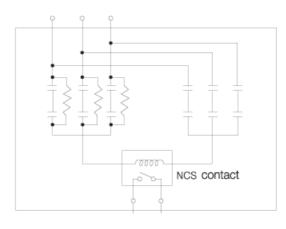
- 2. The case is made so that it expands about 15mm on each side.

 In case when the side expands more than 30mm, cut the power supply and check the cause.
- 3. For the switch, use a breaker dedicated to capacitor.

Explanation of NCS Terms (NCS : Neutral Current Sensor)

The principle of NCS is that, as can be seen in the picture, the inner element of capacitor is connected in Y-Y type and the current detection coil is inserted between the neutrals, when failure occurs within the capacitor, this coil is excited and the neutral is operation.

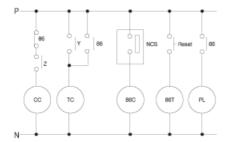
The neutral operation speedily and correctly when the element in the capacitor is destructed. Using this operation, the load power supply is shut or the switch is open.



(Diagram of Inner Connection)

NCS Contact

- 1) When a breaker or a switch is dedicated to capacitor circuit, the breaker or switch shall have the capacity of current shut off more than 3 times of the rated current of the capacitor.
- 2) Since the current capacity of the contact is DC 100V 0.1A, the consumption power of the coil of the auxiliary relay shall be less than 10VA.
- When the contact is used for the control circuit with DC 100V, NCS contact is open/shut at 120Hz, therefore, AC100V coil rated Latched Relay must be used.



86C, 86T: Latched Relay for AC

Y : Trip Contact by Other Conditions TC : Trip Coil of the Breaker or the Switch

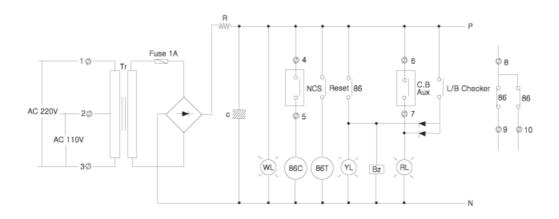
Z : Input Signal Contact

CC : Input Coil of the Breaker of the Switch

 In case when it is used for the control circuit which does not have DC power supply, please purchase and use NCS Control Box in which DC power supply is built,

NCS Control Box(Inner Circuit Diagram)

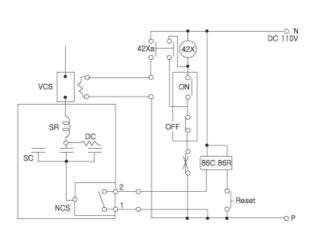
- Product Name: NCS Control Box
- Spec: Input AC 110/220V, 60Hz
- Output Contact: AC 220V, 15A
DC 110V, 2,4A

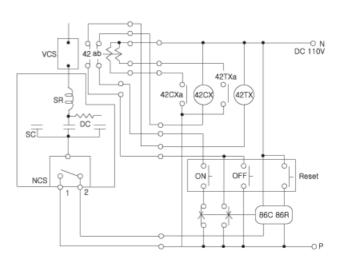


• Diagram of Connection According to the Open/Shut Excitation Method of the Breaker

1. Continuous Excitation Method

2. Instantaneous Excitation Method





2

High Voltage Power Capacitor-SH Type

This product is a High Voltage Power SH capacitor with a safety device built-in. For High Voltage Power SH capacitor use polypropylene film which has excellent insulation ability as dielectric and metalized film which has self healing ability over special paper which has excellent withstand voltage ability and oil impregnation to compose electrode and at the same time it is composed of environment friendly new insulation oil which exhibits enough self healing ability.

The characteristics of High Voltage Power SH capacitor is small size and low loss due to the feature of polypropylene film and has high insulation ability by the effect of destruction of defect part of dielectric thanks to the self healing ability of metalized electrode. It also secures higher stability owing to the current limit effect due to the metalized electrode resistance even in failure.

change[%]

₽

• Excellence of High Voltage Power SH(Self Healing) Capacitor

- 1, Low loss reduces the expense of operation,
- The temperature of self heat is low. Low loss reduces the temperature of self heat. Therefore

Low loss reduces the temperature of self heat. Therefore, it can be used until when the ambient temperature reaches 50°C. It can be easily used within cubicle or small electricity room.

3. It has high insulation reliability.

It used special metalized paper as electrode and its dielectric consists of only polypropylene film, which shows excellent electric feature and self healing ability. It can also endure high level of corona generated voltage, the cause of insulation destruction

4. It has built-in protector.

It has built-in protector of excellent shut off ability and therefore, so that even when inner destruction of capacitor occurs, the capacitor can be freed from power supply to prevent second disaster.

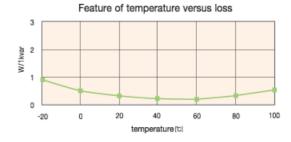
Also, high capacity capacitor, bigger than 150kvar, has protection contact attached. When inner protector is operated within capacitor, alarm can be invoked or the switch can be open easily using the contact signal.

¾ 10~100kvar : Protector built-in

150~500kvar : Protector built-in and protection contact attached

(pressure type)

Feature of temperature versus rate of capacity change 20 15 10 5 0 -5 -10 -15 -20 0 20 40 60 80 100



Specification

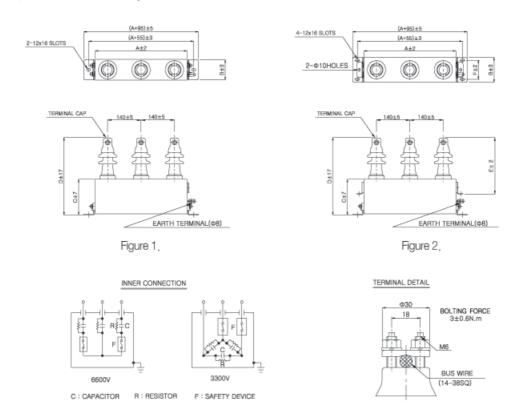
- Installation Place : Indoors and outdoors
- Ambient Temperature for use: -20°c ~ +40°c (below 35°c average for 24 hours, below 25°c average for 1 year)
- Performance

Allowable Capacity Tolerance	-5% ~ +10% (at 20°C), the rate of maximum to minimum between arbitrary 2 terminals shall be less than 1,08
Insulation Resistance	More than 1000 M. petween batch terminal and case (below 20℃)
Maximum Use Voltage	Below 110% of rated voltage (within 12 hours among 24 hours)
Maximum Use Current Transient Current	130% of rated current allowed in case when harmonics is contained
Insulation Level	3300V rate 3A, 6600V rate 6A
Loss	Less than 0.1% (rated voltage, 20°c)
Temperature Rise	Less than 20 deg (rated voltage, 35°C)
Oil Leakage	No oil leakage when heat is applied to all parts of capacitor until the temperature reaches 70°C
Discharge	Only in case of products with discharging ability, the residual voltage shall be less than 50V within 5 minutes
Painting Color	Munsell no, 5Y 7/1
Reference Standard	KS C 4802
Series Reactor	L=6% can be applied





Diagram (3300, 6600V 10 ~ 100kvar)



Ratings and Dimensions (3300, 6600V 10 ~ 100kvar)

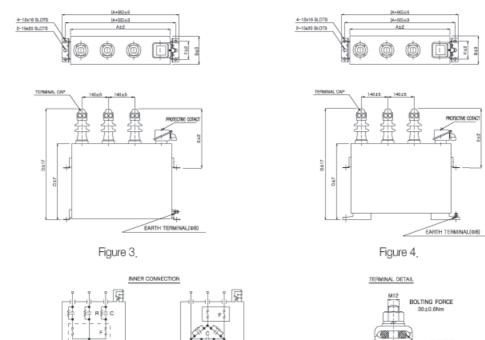
Line Voltage	Rated Voltage	Frequency	Capacity	Rated Current			Dimensio	n [mm]			Approximate	Figure
[kV]	[kV]	[Hz]	[kvar]	[A]	Α	В	С	D	Е	F	Weight [kg]	riguro
			10	1,75	385	87	150	325	-	-	10	
			15	2,62	385	87	150	325	-	-	10	-1
			20	3,50	385	87	170	345	-	-	11	'
3,3	3,3	50	25	4,37	385	87	190	365	-	-	11	
0,0	0,0	50	30	5,25	385	105	190	375	255	80	14	
			50	8,75	385	105	270	445	255	80	18	2
			75	13,10	385	105	335	510	255	80	22	2
			100	17,50	385	105	425	600	255	80	27	
			10	0,88	385	87	150	325	-	-	10	
			15	1,31	385	87	150	325	-	-	10	
			20	1,75	385	87	150	325	-	-	10	1
6,6	6,6	50	25	2,19	385	87	150	345	-	-	11	
0,0	0,0	00	30	2,62	385	87	170	365	-	-	11	
			50	4,37	385	105	200	415	255	80	16	
			75	6,56	385	105	270	485	255	80	20	2
			100	8,45	385	105	310	565	255	80	25	

▶ Please confirm the ratings and dimensions of the products printed in this caue prior to ordering because they may be altered.



Protector Built-In and Protection Contact Attached Type

Diagram (3300, 6600V 150 ~ 500 kvar)



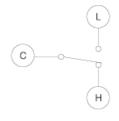
F : SAFETY DEVICE

Ratings and Dimensions (3300, 6600V 150 ~ 500kvar)

C : CAPACITOR

Line Voltage	Rated Voltage		Capacity	Rated Current			Dimensio	on [mm]			Approximate	Figure
[kV]	[kV]	[Hz]	[kvar]	[A]	Α	В	С	D	Е	F	Weight [kg]	1 19010
			150	26,2	530	135	405	590	315	95	45	3
3,3	3,3	50	200	35	530	175	405	590	315	95	55	3
0,0	0,0	30	250	43.7	630	175	650	620	315	90	66	4
			300	52,5	630	195	650	620	315	90	72	4
			150	13.1	530	120	405	590	315	95	40	3
6,6	6,6	50	200	17.5	530	150	405	590	315	95	48	3
			250	21,9	630	150	435	620	315	90	57	4
			300	26,2	630	175	435	620	315	90	66	4

▶ Please confirm the ratings and dimensions of the products printed in this caue prior to ordering because they may be altered.



Brea	ık-Down	©-L ON	C - H off
	AC 250V	1.0A	1.0A
Contact Capacity	AC 125V	3.0A	2.0A
out at a	DC 100V	0.1A	0.05A

R : RESISTOR

Pressure Rise Detection Switch Contact

This shall be used with the contact of pressure rise detection switch connected to the trip circuit of the breaker or the switch.



Low voltage capacitor is a product which has SH(Self Healing) ability using Polypropylene film which has excellent low loss electric ability as dielectric and metalized film. Being developed and produced since the beginning of 80' by our company, the product also has a built-in protector which secures stability and its reliability was demonstrated.

Specification

- Installation Place : Indoors
- Ambient Temperature for Use: -25° ~ +45° (below 35° average for 24 hours, below 25° average for 1 year)
- Performance

Allowable Capacity Tolerance	-5% to +10% for units and banks up to 100kvar (at 20°c), below 108% of imbalance between phase -5% to +5% for units and banks above 100kvar (at 20°c), below 108% of imbalance between phase
Maximum Use Voltage	Below 110% of rated voltage: within 8 hours among 24 hours Below 115% of rated voltage: within 30 minutes among 24 hours Below 120% of rated voltage (less than 2 times of 5 min, per month) Below 130% of rated voltage (less than 2 times of 1 min, per month)
Maximum Use Current	Transient current 130% of rated current allowed
Withstand Voltage	There shall be no abnormalities after 10 seconds of 2,15 times of rated voltage between mutual demagnetizers
Insulation Level	The voltage to be applied is $2U_N + 2kV$ or $3kV$, whichever is the higher, for 10 s
Loss	Less than 0.15% (rated voltage, 20°c)
Oil Leakage	No oil leakage when it is left in constant temperature tub for 2 hours at $65\pm3^\circ\!c$
Discharge	Only in case of products with discharging ability, the residual voltage shall be less than 75V within 5 minutes
Painting Color	Munsell no, 5Y 7/1
Reference Standard	IEC 60831
Series Reactor	L=6% can be applied
Safety	A protector is applied so that the power is shut speedily and correctly in case of failure in the capacitor due to old use or overload.

Ratings and Dimensions of 220V 50Hz Single Phase/3 Phase Capacitor

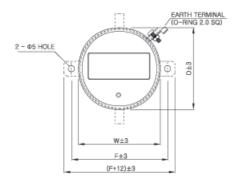
T	ype	Cap	acity	Curre	ent[A]				Dimension	n[mm]			F
Cinala Dhaga	2 Dhana	[Davori	Cinala Disasa	2 Dhone	- /	4	[В	W	F	D	Figure
Single Phase	3 Phase	[μF]	[kvar]	Single Phase	3 Phase	(Single Phase)	3 Phase	(Single Phase)	3 Phase	٧٧	Г	D	
QMM-2010S	QMM-2010T	10	0,2	0.7	0.4	(65)	65	(85)	85	63	77	63	
QMM-2015S	QMM-2015T	15	0,2	1.0	0,6	(65)	65	(85)	85	63	77	63	
QMM-2020S	QMM-2020T	20	0,3	1.4	0,8	(65)	65	(85)	85	63	77	63	
QMM-2030S	QMM-2030T	30	0,5	2,1	1,2	(65)	110	(85)	130	63	77	63	1
QMM-2040S	QMM-2040T	40	0.6	2,8	1.6	(65)	110	(85)	130	63	77	63	1
QMM-2050S	QMM-2050T	50	0.8	3.5	2,0	(110)	110	(130)	130	63	77	63	
QMM-2075S	QMM-2075T	75	1,1	5,2	3,0	(110)	110	(130)	130	63	77	63	
QMM-2100S	QMM-2100T	100	1,5	6,9	4.0	(110)	135	(155)	135	63	77	63	
SMS-	2150ST	150	2,3	10,4	6,0	10)5	12	25	170	190	60	
SMS-	2175ST	175	2,7	12,1	7.0	10)5	12	25	170	190	60	
SMS-	2200ST	200	3.0	13.8	8,0	10)5	12	25	170	190	60	
SMS-	2250ST	250	3.8	17.3	10.0	11	5	13	35	170	190	60	
SMS-	2300ST	300	4.6	20.7	12.0	13	50	15	50	170	190	60	2
SMS-	2400ST	400	6,1	27.6	16.0	15	55	17	75	170	190	60	
SMS-	2500ST	500	7.6	34,6	20,0	17	75	19	95	170	190	60	
SMS-	2600ST	600	9.1	41,5	23.9	20)5	22	25	170	190	60	
SMS-	2700ST	700	10,6	48,4	27.9	25	55	27	75	170	190	60	
SMS-	2750ST	750	11.4	51,8	29.9	25	55	27	75	170	190	60	



T	ype	Cap	acity	Curre	ent[A]		Dimension	n[mm]			
Cinala Dhana	2 Dhann	[la corl	Cinala Dhana	3 Phase	Α	В	W	Е	D	Figure
Single Phase	3 Phase	[µF]	[kvar]	Single Phase	3 Priase	(Single Phase) 3 Phase	(Single Phase) 3 Phase	VV	Г	U	
SMB-2800S	SMB-2800T	800	12,2	55,3	31,9	170	235	200	170	120	
SMB-2900S	SMB-2900T	900	13.7	62,2	35.9	170	235	200	170	120	3
SMB-21000S	SMB-21000T	1000	15,2	69.1	39.9	180	245	200	170	120	
SMS-2	5010KST	657.7	10	45.5	26.2	255	275	170	190	60	2
SMB-25015KS	SMB-25015KT	986,5	15	68,2	39.4	180	245	200	170	120	
SMB-25020KS	SMB-25020KT	1315.3	20	90.9	52,5	220	285	200	170	120	
SMB-25025KS	SMB-25025KT	1644,2	25	113,6	65,6	280	345	200	170	120	3
SMB-25030KS	SMB-25030KT	1973.0	30	136.4	78.7	300	365	200	170	120	
SMB-25040KS	SMB-25040KT	2630,7	40	181,8	105.0	380	445	200	170	120	
SMF-25050KS	SMF-25050KT	3288.3	50	227.3	131.2	280	355	343	409	153	4(M12)



Diagram



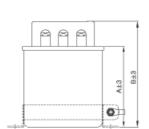
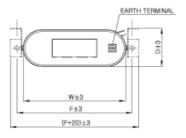
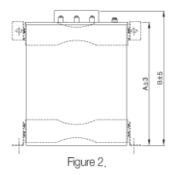
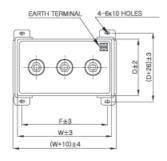


Figure 1,







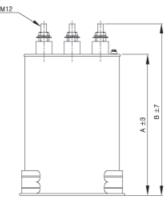
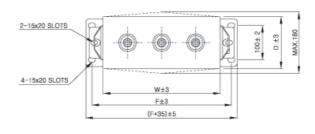


Figure 3,



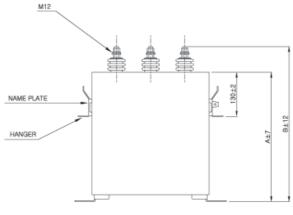


Figure 4,



• Ratings and Dimensions of 380V 50Hz Single Phase/3 Phase Capacitor

Т	ype	Cap	acity	Curre	ent[A])imensior	n[mm]			Eiguro
Cinala Dhana	2 Dhoop	[De coul	Cinala Diseas	2 Dhasa	1	4	E	3	W	F	D	Figure
Single Phase	3 Phase	[µF]	[kvar]	Single Phase	3 Phase	(Single Phase)	3 Phase	(Single Phase)	3 Phase	VV	r	U	
QMM-3010S	QMM-3010T	10	0,5	1,2	0.7	(65)	65	(85)	85	63	77	63	
QMM-3015S	QMM-3015T	15	0.7	1,8	1.0	(65)	110	(85)	130	63	77	63	
QMM-3020S	QMM-3020T	20	0.9	2,4	1,4	(65)	110	(85)	130	63	77	63	
QMM-3025S	QMM-3025T	25	1.1	3.0	1.7	(110)	110	(130)	130	63	77	63	1
QMM-3030S	QMM-3030T	30	1,4	3.6	2,1	(110)	110	(130)	130	63	77	63	
QMM-3040S	QMM-3040T	40	1,8	4.8	2,8	(110)	110	(130)	130	63	77	63	
QMM-3050S	QMM-3050T	50	2,3	6,0	3.4	(110)	135	(130)	155	63	77	63	
SMS-	3075ST	75	3.4	9.0	5,2	10)5	12	5	170	190	60	
SMS-	3100ST	100	4,5	11,9	6,9	10)5	12	5	170	190	60	
SMS-	3150ST	150	6,8	17.9	10.3	13	30	15	0	170	190	60	
SMS-	3200ST	200	9.1	23.9	13,8	15	55	17	5	170	190	60	2
SMS-	3250ST	250	11.3	29,8	17.2	17	75	19	5	170	190	60	
SMS-	3300ST	300	13.6	35,8	20,7	20)5	22	5	170	190	60	
SMS-	3400ST	400	18.1	47.8	27.6	25	55	27	5	170	190	60	
SMB-3500S	SMB-3500T	500	22,7	59.7	34,5	18	30	24	5	200	170	120	3(M12)
SMS-3	5010KST	220,4	10	26,3	15,2	15	55	17	5	170	190	60	2
SMS-3	5015KST	330.7	15	39.5	22,8	20)5	22	5	170	190	60	2
SMB-35020KS	SMB-35020KT	440.9	20	52,6	30.4	17	0	23	35	200	170	120	
SMB-35025KS	SMB-35025KT	551,1	25	65,8	38.0	18	0	24	15	200	170	120	
SMB-35030KS	SMB-35030KT	661.3	30	78,9	45.6	22	0	28	35	200	170	120	3(M12)
SMB-35040KS	SMB-35040KT	881,7	40	105.3	60,8	28	0	34	1 5	200	170	120	
SMB-35050KS	SMB-35050KT	1102,2	50	131,6	76,0	34	0	40)5	200	170	120	
SMF-35075KS	SMF-35075KT	1653,3	75	197.4	114.0	30	0	37	75	343	409	153	
SMF-35100KS	SMF-35100KT	2204,4	100	263,2	151,9	32	0	39)5	343	409	153	4(M12)
SMF-35150KS	SMF-35150KT	3306,5	150	394.7	227,9	44	0	51	15	343	409	153	

• Ratings and Dimensions of 400V 50Hz Single Phase/3 Phase Capacitor

T	ype	Cap	acity	Curre	ent[A]			D	imensior	n[mm]			
Cinala Dhasa	O Dhana	f	De coul	Cinala Dhana	0 Dhana	1	4	E	3	147	F		Figure
Single Phase	3 Phase	[µF]	[kvar]	Single Phase	3 Phase	(Single Phase)	3 Phase	(Single Phase)	3 Phase	W	F	D	
QMM-4010S	QMM-4010T	10	0,5	1.3	0.7	(65)	110	(85)	130	63	77	63	
QMM-4015S	QMM-4015T	15	0,8	1,9	1,1	(65)	110	(85)	130	63	77	63	
QMM-4020S	QMM-4020T	20	1.0	2,5	1,5	(110)	110	(130)	130	63	77	63	1
QMM-4025S	QMM-4025T	25	1,3	3,1	1,8	(110)	135	(130)	155	63	77	63	1
QMM-4030S	QMM-4030T	30	1,5	3.8	2,2	(110)	135	(130)	155	63	77	63	
QMM-4040S	QMM-4040T	40	2,0	5,0	2,9	(110)	135	(130)	155	63	77	63	
SMS-	4050ST	50	2,5	6,3	3.6	10)5	12	5	170	190	60	
SMS-	4075ST	75	3,8	9.4	5,4	10)5	12	5	170	190	60	
SMS-	4100ST	100	5.0	12,6	7.3	13	60	15	0	170	190	60	
SMS-	4150ST	150	7,5	18,8	10,9	15	55	17	5	170	190	60	2
SMS-	4200ST	200	10.1	25,1	14,5	17	75	19	5	170	190	60	
SMS-	4250ST	250	12,6	31,4	18,1	20)5	22	5	170	190	60	
SMS-	4300ST	300	15.1	37.7	21,8	25	55	27	5	170	190	60	
SMB-4400S	SMB-4400T	400	20,1	50,3	29,0	18	0	24	5	200	170	120	3(M12)
SMB-4500S	SMB-4500T	500	25.1	62,8	36.3	22	0	28	5	200	170	120	J(M12)
SMS-4	5010KST	198,9	10	25,0	14,4	15	55	17	5	170	190	60	2
SMS-4	5015KST	298,4	15	37.5	21,7	20)5	22	5	170	190	60	2
SMB-45020KS	SMB-45020KT	397,9	20	50,0	28,9	18	0	24	5	200	170	120	
SMB-45025KS	SMB-45025KT	497.4	25	62,5	36,1	22	0	28	5	200	170	120	
SMB-45030KS	SMB-45030KT	596,8	30	75,0	43,3	24	0	30	15	200	170	120	3(M12)
SMB-45040KS	SMB-45040KT	795,8	40	100,0	57.7	30	0	36	5	200	170	120	
SMB-45050KS	SMB-45050KT	994.7	50	125.0	72,2	36	0	42	5	200	170	120	
SMF-45075KS	SMF-45075KT	1492,1	75	187.5	108.3	32	0	39	5	343	409	153	
SMF-45100KS	SMF-45100KT	1989.4	100	250,0	144,3	34	0	41	5	343	409	153	4(M12)
SMF-45150KS	SMF-45150KT	2984,2	150	375.0	216,5	48	0	55	5	343	409	153	



			n[mm]	imensior	D			ent[A]	Curre	acity	Cap	pe	Ty
Figure	D	F	W	3	Е		A	3 Phase	Single Phase	[kvar]	[µF]	3 Phase	Single Phase
		'	**	3 Phase	(Single Phase)	3 Phase	(Single Phase)	0111000	aligio i riaso	[ivvon]	[/~:]	0111000	Oiligio i riado
	63	77	63	130	(85)	110	(65)	0,8	1.3	0.5	10	QMM-4010T	QMM-4010S
	63	77	63	130	(85)	110	(65)	1.1	2.0	0.8	15	QMM-4015T	QMM-4015S
1	63	77	63	130	(130)	110	(110)	1,5	2,6	1,1	20	QMM-4020T	QMM-4020S
1	63	77	63	155	(130)	135	(110)	1.9	3.3	1.4	25	QMM-4025T	QMM-4025S
	63	77	63	155	(130)	135	(110)	2,3	3.9	1,6	30	QMM-4030T	QMM-4030S
	63	77	63	155	(130)	135	(110)	3.0	5,2	2,2	40	QMM-4040T	QMM-4040S
	60	190	170	5	12	5	10	3,8	6,5	2,7	50	1050ST	SMS-
	60	190	170	5	12	5	10	5,6	9,8	4.1	75	1075ST	SMS-4
	60	190	170	0	15	0	13	7,5	13.0	5.4	100	1100ST	SMS-
2	60	190	170	5	17	5	15	11.3	19,6	8.1	150	150ST	SMS-
	60	190	170	5	19	5	17	15,1	26,1	10,8	200	1200ST	SMS-
	60	190	170	5	22	5	20	18,8	32,6	13.5	250	1250ST	SMS-
	60	190	170	5	27	5	25	22,6	39.1	16,2	300	1300ST	SMS-
2(1112)	120	170	200	5	24	0	18	30,1	52,2	21,6	400	SMB-4400T	SMB-4400S
3(M12)	120	170	200	5	28	0	22	37.6	65,2	27,1	500	SMB-4500T	SMB-4500S
2	60	190	170	5	22	5	20	13.9	24.1	10	184,8	010KST	SMS-45
	60	190	170	5	27	5	25	20,9	36,1	15	277,2	015KST	SMS-45
	120	170	200	5	24)	18	27,8	48,2	20	369,6	SMB-45020KT	SMB-45020KS
	120	170	200	15	28)	22	34,8	60,2	25	462,1	SMB-45025KT	SMB-45025KS
3(M12)	120	170	200	15	30)	24	41.7	72,3	30	554,5	SMB-45030KT	SMB-45030KS
	120	170	200	5	34)	28	55,6	96.4	40	739,3	SMB-45040KT	SMB-45040KS
	120	170	200	15	40)	34	69,6	120,5	50	924,1	SMB-45050KT	SMB-45050KS
	153	409	343	5	39)	32	104,3	180,7	75	1386,2	SMF-45075KT	SMF-45075KS
4(M12)	153	409	343	5	43)	36	139.1	241.0	100	1848,2	SMF-45100KT	SMF-45100KS
	153	409	343		55)	48	208.7	361.4	150	2772,3	SMF-45150KT	SMF-45150KS

• Ratings and Dimensions of 440V 50Hz Single Phase/3 Phase Capacitor

Ty	Cap	acity	Curre	ent[A]	Dimension[mm]									
Cinala Dhana	2 Dhana	[Il a soul	Cools Dhass	O Dhasa	1	4	E	3	W	F	D	Figure	
Single Phase	3 Phase	$[\mu F]$	[kvar]	Single Phase	3 Phase	(Single Phase)	3 Phase	(Single Phase)	3 Phase	VV	Г	D		
QMM-4010S	QMM-4010T	10	0,6	1.4	0,8	(65)	110	(85)	130	63	77	63		
QMM-4015S	QMM-4015T	15	0,9	2,1	1,2	(65)	110	(85)	130	63	77	63		
QMM-4020S	QMM-4020T	20	1.2	2,8	1,6	(110)	110	(130)	130	63	77	63	1	
QMM-4025S	QMM-4025T	25	1,5	3,5	2,0	(110)	135	(130)	155	63	77	63	1	
QMM-4030S	QMM-4030T	30	1.8	4.1	2,4	(110)	135	(130)	155	63	77	63		
QMM-4040S	QMM-4040T	40	2,4	5,5	3,2	(110)	135	(130)	155	63	77	63		
SMS-	4050ST	50	3.0	6,9	4.0	10)5	12	5	170	190	60		
SMS-	4075ST	75	4.6	10.4	6,0	10)5	12	5	170	190	60		
SMS-	4100ST	100	6.1	13.8	8,0	13	50	15	0	170	190	60		
SMS-	SMS-4150ST		9,1	20,7	12,0	15	55	17	5	170	190	60	0	
SMS-4200ST		200	12,2	27.6	16,0	17	75	19	5	170	190	60		
SMS-	SMS-4250ST		15,2	34,6	20,0	20)5	22	5	170	190	60		
SMS-	4300ST	300	18,2	41.5	23.9	25	55	27	5	170	190	60		
SMB-4400S	SMB-4400T	400	24,3	55,3	31,9	18	30	24	5	200	170	120	3(M12)	
SMB-4500S	SMB-4500T	500	30.4	69.1	39.9	22	20	285		200	170	120	J(M112)	
SMS-4	5010KST	164,4	10	22,7	13,1	20)5	22	5	170	190	60	2	
SMS-4	5015KST	246,6	15	34.1	19.7	20)5	22	5	170	190	60	- 2	
SMB-45020KS	SMB-45020KT	328,8	20	45.5	26,2	16	0	22	25	200	170	120		
SMB-45025KS	SMB-45025KT	411.0	25	56,8	32,8	18	0	24	5	200	170	120		
SMB-45030KS	SMB-45030KT	493,2	30	68,2	39.4	22	0	28	35	200	170	120	3(M12)	
SMB-45040KS	SMB-45040KT	657.7	40	90.9	52,5	28	0	34	5	200	170	120		
SMB-45050KS	SMB-45050KT	822,1	50	113,6	65,6	32	0	38	35	200	170	120		
SMF-45075KS	SMF-45075KT	1233.1	75	170,5	98.4	28	0	35	55	343	409	153		
SMF-45100KS	SMF-45100KT	1644,2	100	227.3	131.2	32	0	39	15	343	409	153	4(M12)	
SMF-45150KS	SMF-45150KT	2466,2	150	340.9	196,8	43	0	50)5	343	409	153		

[▶] Please confirm the ratings and dimensions of the products printed in this caue prior to ordering because they may be altered.

Low Voltage Power Capacitor-SH Type Automatic Power Factor Control Capacitor Bank

Specification

1. Installation Place: Both indoors and outdoors

2. Ambient Temperature for Use: -20°C ~ +40°C (below 35°C average for 24 hours)

Altitude: Less than 1000m
 Painting Color: Munsell No, 5Y 7/1

Effects of Installation

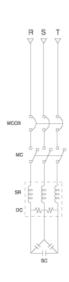
Reduced loss from the reduced current of transformer, enhanced efficiency of current in line due to reduced current and additional installation thanks to surplus transformer.

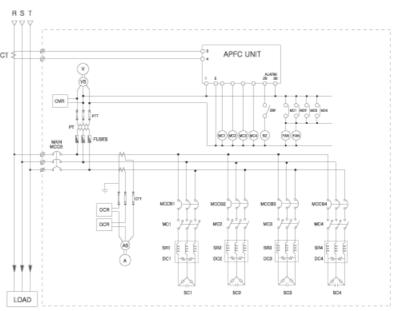
High capacity collective installation enables low installation expense per kvar compared with individual installation at terminal, Concentrative care is possible since series reactor, discharging coil, MCCB, MC, and etc can be installed in one box. Since series reactor is installed the front of capacitor, inrush current is prevented, resulting in safe use. Automatic control is easy and high power factor can be kept constantly.

Composition of Circuit

1, Individual Power Factor Correction Method

2. Automatic Power Factor Correction Method





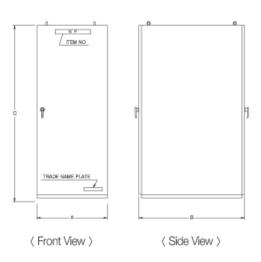
SC: Capacitor SR: Series Reactor DC: Discharge Coil APFC: Automatic Power Factor Controller MCCB: Molded Case Circuit Breaker

M C : Magnetic Contactor

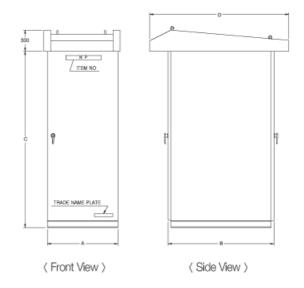
Low Voltage Power Capacitor-SH Type Cubicle Type

Diagram

1, For Indoor Use



2, For Outdoor Use



Ratings and Dimensions of the Bank

Line Voltage	,		Composition of	Dir	mension (m	nm]	Series Reactor	Remarks
[V]	[Hz]	[kvar]	Unit Capacitor	Α	В	С	(including discharging coil)	1101110110
		40	20kvar ×2EA	600	1000	1600	1,2kvar ×2EA	
		50	25kvar ×2EA	600	1000	1600	1,5kvar ×2EA	
		60	30kvar ×2EA	600	1000	1600	1,8kvar ×2EA	1. For outdoor
220	50	75	25kvar ×3EA	600	1000	2100	1,5kvar ×3EA	product, the
220	30	90	30kvar ×3EA	600	1000	2100	1,8kvar ×3EA	dimension of A and B are same, but the
		100	50kvar ×2EA	600	1100	1600	3kvar ×2EA	dimension of C is
		150	50kvar ×3EA	600	1100	2100	3kvar ×3EA	350mm higher,
		200	50kvar ×4EA	1200	1100	1600	3kvar ×4EA	2. For outdoor
		50	50kvar ×1EA	600	1000	1600	3kvar ×1EA	product, the
		75	75kvar ×1EA	600	1000	1600	4,5kvar ×1EA	dimension of D is
380		100	50kvar ×2EA	600	1100	1600	3kvar ×2EA	B+550
~	50	150	50kvar ×3EA	600	1100	2100	3kvar ×3EA	3, Series reactor : Dry
440	00	200	50kvar ×4EA	1200	1100	1600	3kvar ×4EA	Type
		250	50kvar ×5EA	1200	1100	2100	3kvar ×5EA	
		300	50kvar ×6EA	1200	1100	2100	3kvar ×6EA	
		400	50kvar ×8EA	1200	1100	1600	3kvar ×8EA	

Notes) 1. Each bank can control power factor with automatic power factor controller.

- 2. Breaker(MCCB), contact(MC) and protecting relay can be assembled and supplied in bundle.
- 3. Please consult us prior to production so that the dimensions, composition and supply extent of each bank is appropriate to the feature of the load and the condition of the site.
- ▶ Please confirm the ratings and dimensions of the products printed in this caue prior to ordering because they may be altered.

Due to rapid increase of devices using Thyristor the generator of harmonics recently, accidents and incidents in electricity has been increased and became the cause of problems in the operation.

Therefore, the application of filter facilities is unavoidable to prevent the extension of harmonics in the system and prevent accidents by absorbing the harmonics and rationalize the use of electricity.

• What is Harmonics?

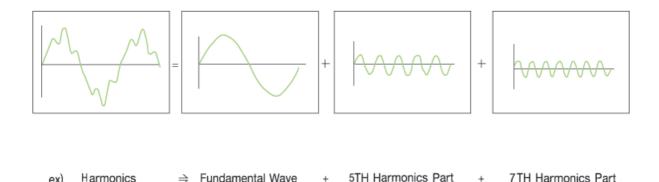
Cyclic distortion wave is expressed as the sum of sine wave(50Hz), the integral number frequency and major sine wave, integral number(50Hz) frequency,

This integral number frequency is called harmonic wave and according to the change of amplitude and phase, wave form is changed resulting in synthetic distortion.

Combined distortion wave is manifested in distorted sine wave form, This form can be analyzed into one fundamental wave(50Hz) which has random cycle and major sine wave which has integral number frequency or subharmonic frequency.

These sine wave less fundamental frequency are called harmonic and if the frequency of it is higher than the fundamental frequency, it is called harmonics and if the frequency of it is lower, it is called fractional harmonic wave or subharmonic.

For example, an distorted wave form comprising sine wave type(50Hz) and 5th(250Hz) and 7th(350Hz) wave form is analyzed as following:



The Generator of Harmonics

- Thyristor controller

ex)

- Speed controller
- Low speed starter
- Power factor compensator
- Rectifier
- Arc furnace
- Transformer, Reactor
- Non-linear loads such as rotating devices change the wave form of the current which generates harmonics,

Process of Harmonic Filter Engineering

- Collecting data(system condition, harmonics spectrum, THD limit)
- Drawing system impedance map
- Calculating harmonics impedance and determining filtering order
- Harmonic flow calculation
- Simulation
- Checking abnormal resonance in the system and the possibility of harmonics extension
- Designing Switcher PNL, Structure
- Testing the operation after installation
- Test report

Disturbance by Harmonics

Harmonics generated in the system does not stay at the system, but goes into the entire system of electricity and gives fatal influence on other electric facilities,

- Overheating and loss of transformer
- Influx of over current of capacitor and noise
- Instability of control system
- Change of voltage
- Overload of rotator
- Error in the movement of circuit breaker
- Impediment in communication and interfering OA functions
- Heavy current in neutral and low voltage between phase and earthing

What is Harmonic Filter?

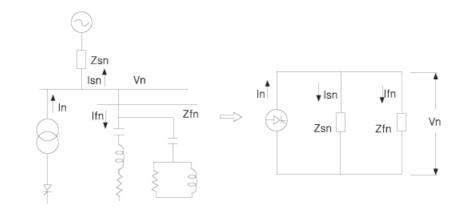
Harmonic filter is a device which represses and absorbs the outflow of harmonics generated in the electricity system, It consists of resistor, reactor and capacitor,

Basic harmonic filter consists of lower order(5-13th order) single shunt filter which is synchronized with the harmonics current generated. For other higher order frequency, higher order filter shall be installed, if necessary.

Effects of Harmonic Filter

- Improvement of power factor(invalid power in the electricity system is removed, resulting in the improvement of economics)
- Absorption and removal of harmonics
- Resolving the problem of resonance between inductive and capacitive in the system.
- Keeping the performance and lifetime of the facility high by keeping normal voltage

The effects of contained harmonics current by filter can be expressed as following:



$$Vn = \frac{Zfn \cdot Zsn}{Zfn + Zsn} \cdot In = \frac{In}{Yfn + Ysn}$$

$$\operatorname{Isn} = \frac{\operatorname{Zfn}}{\operatorname{Zfn} + \operatorname{Zsn}} \cdot \operatorname{In} = \frac{\operatorname{Ysn}}{\operatorname{Yfn} + \operatorname{Ysn}} \cdot \operatorname{In} \quad , \quad \operatorname{Ifn} = \frac{\operatorname{Zsn}}{\operatorname{Zfn} + \operatorname{Zsn}} \cdot \operatorname{In} = \frac{\operatorname{Yfn}}{\operatorname{Yfn} + \operatorname{Ysn}} \cdot \operatorname{In}$$

In : Generated Harmonic Current Zfn : Harmonics Impedance in Filter Facility

1fn : Harmonic Current Incoming Into Filter Facility Zsn : Harmonics Impedance in the Power Supply Circuit

1sn: Harmonics Current Outgoing Into Power Supply Circuit Vn: Harmonics Voltage in Bus



• Korea Electric Power Corporation Standard of Allowable Harmonics

Systemic Voltage	Less Than 66kV	More Than 154kV
Vthd[%]	3%	1.5%

• Current Distortion Limits for General Distribution Systems (IEEE Std 519-1992)

Ma	Maximum Harmonic Current Distortion in Percent of I									
Indi	Individual Harmonic Order (Odd Harmonics)									
	Isc/IL	⟨11	11≤h⟨17	17≤h⟨23	23≤h⟨35	35≤h	TDD			
	⟨20*	4.0	2.0	1.5	0.6	0.3	5.0			
	20 (50	7.0	3,5	2,5	1.0	0,5	8,0			
	50 < 100	10,0	4.5	4.0	1,5	0,7	12,0			
	100 (1000	12.0	5.5	5.0	2.0	1.0	15.0			
	>1000	15.0	7.0	6.0	2,5	1.4	20,0			
Eve	en harmonics are l	imited to 25%	of the odd harmo	onic limits above						
	rent distortions th					l,				
* Al	l power generation	n equipment is	limited to these	alues of current	distortion regard	dless of actual Is	c/l.			
whe	* All power generation equipment is limited to these values of current distortion regardless of actual lsc/l. where									
Isc	= maximum short	circuit current	at PCC							
	= maximum dema		ul/f alama and al fu		and at DOO					

Voltage Distortion Limits (IEEE Std 519-1992)

Bus Voltage at PCC	Individual Voltage Distortion [%]	Total Voltage Distortion THD [%]
69kV and below	3,00	5,00
69,001kV through 161kV	1,50	2,50
161,001kV and above	1,00	1.50

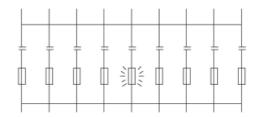


This product was specially developed by our company with our own technology to apply to phase modifying equipment of super high voltage power line which requires high reliability and transformer facilities which requires special level of safety by connecting with NVS, the bank protection system, voltage differential method, open delta method and current detection method.

High Reliability of Capacitor

Usually capacitor bank consists of several capacitor units.

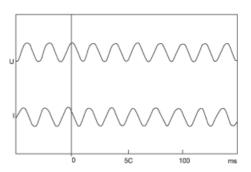
Desirable protection method is to separate and insulate the proper unit capacitor or the minimum element in the unit capacitor from power supply to minimize the influence of failure in bank operation.



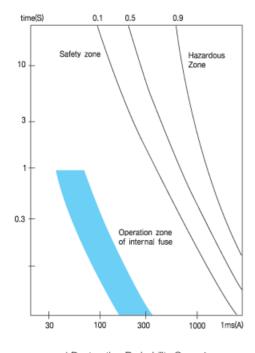
Speedy Separation of Failed Element

Fuse built in capacitor is made of specially designed metal material which enables it to move at the same time with insulation destruction of dielectric

Failure element current in failure is changed according to the number of parallel circuits and usually becomes $15 \sim 20$ times of rated current which makes the fuse move within several cycles after failure,



(Diagram of Time Feature in Fuse Movement)



〈 Destruction Probability Curve 〉 (NEMA Regulations)

Prevention of Case Destruction

Usually, case destruction is due to the rise of resolution gas pressure resulting from inner arc generation in case of capacitor failure.

Fuse built in capacitor is a capacitor which minimizes the impact of failure by connecting fuses with each element within unit capacitor and separating the relevant element, as can be seen in the picture above.

It is a world wide trend to use ignitable non PCB insulation oil due to the problem of pollution. Therefore it is an urgent task to secure safety to prevent big accidents.

Fuse built-in type capacitor gives no danger such as case destruction since it separates failed element speedily from the circuit and prevents gas pressure expansion due to arching with design that capacitor destruction probability curve stays in safety zone under NEMA regulations,

High Voltage Power Capacitor with Internally Fused

Performance

- Related Standard : IEC 593 (Internal fuse and internal overpressure

disconnectors for shunt capacitor)

For general test regulations, IEC 6087-1 is

applied.

- Allowable Current : It shall endure 1,43 times of rated current.

- Fuse Durability : It shall endure inrush current in opening and

closing. Normal elements shall endure the discharged current from failed element. After fuse movement between both side of element it shall endure the rated voltage and surge

voltage,

- Discharge Test : After rated voltage x 1,7 (VDC) charged, let the

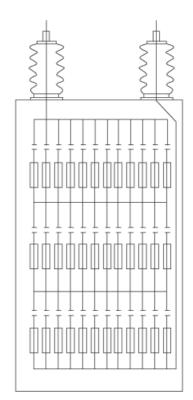
impedance in the discharging closed circuits reach near 0 to discharge rapidly. There shall be no more than 1 wire broken amongn

demagnetizers,

- Fuse Movement Test : Induce the first movement of fuse at 0,9 times of

rated voltage and increase the voltage and induce second movement of fuse within 2,2 times of rated voltage. When the case is

opened, the fuse shall endure 3,5 times of rated voltage for 10 seconds,

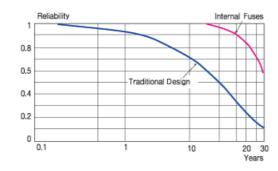


〈 Diagram of Inner Circuit of Power Capacitor with Internally Fused〉

■ Lifetime of Capacitor

When the voltage increase of the element connected in parallel does not give influence after the movement of fuse built-in, the number of series and parallel circuits shall be calculated.

Also, special material is used for fuse so that the loss generated from the material can be disregarded,



Comparison of reliability Between Fuse Built-In Capacitor and General Capacitor > The basic concept of fuse built-in capacitor is that big-unit capacitor. Capacitor is divided into small capacity for individual protection for segment units to increase reliability.

The picture on the left shows the comparison between bank by existing unit capacitor and bank by fuse built-in unit capacitor.

Low Frequency Induction Furnace Capacitor



This product was developed by our company in 1977 with the purpose of rationalizing power supply by improving heating efficiency and power factor of low frequency induction furnace. This product uses polypropylene film and aluminum thin film or metalized film which has excellent voltage resistance and contains specially produced composite oil, resulting in high reliability.

Specification

- Installation Place : Indoors
- Ambient Temperature for use : -20°C ~ + 40°C (below 35°C average for 24 hours)
- Performance

Allowable Capacity Tolerance	-5% ~ +15% (at 20℃)
Insulation Resistance	More than 1000 M.
Withstand Voltage	There shall be no abnormalities after 10 seconds of 2,0 times of rated voltage between mutual terminals
Insulation Level	The voltage to be applied is $2U_N + 2kV$ or $3kV$, whichever is the higher, for 10 s
Max, Voltage for Use	Less than 105% of rated voltage: within 12 hours among 24 hours
Max, Current for Use	Less than 120% of rated capacity (less than 60 Hz), 115% of rated capacity (more than 60Hz)
Loss	Less than 0.35% (rated voltage, 20°C)
Oil Leakage	No oil leakage when it is left in constant temperature tub for 2 hours at 65±3°c
Temperature Rise	Less than 30 deg. (at rated voltage, 30°C)
Painting Color	Munsell no, 5Y 7/1

Diagram

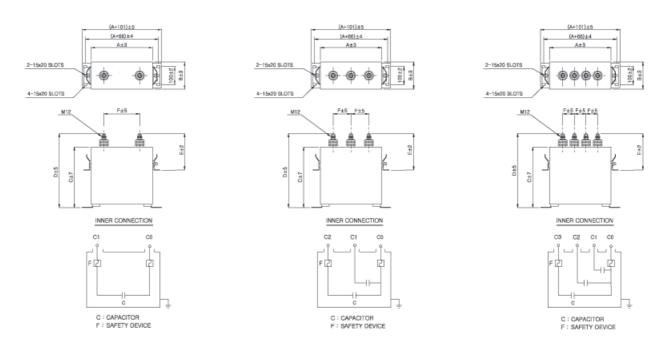


Figure 1, Figure 2, Figure 3,



Ratings and Dimensions

Capacity	Voltage	Phase	Freguency	Rated Capacity	Type		Figure					
[kvar]	[V]	1 11000	[Hz]	[kvar]	. 100	Α	В	С	D	Е	F	1 igaio
50	630	1	50	50	SMFL-66050KS	343	153	280	355	205	200	1
	440	1	50	11,1+22,2+66,7	SMFL-46100KS	343	153	390	465	205	65	3
100	600	1	50	50+50	SMFL-66100KS	630	135	380	455	205	100	2
	630	1	50	100	SMFL-66100KS	343	153	380	455	205	200	1
	800	1	50	100	SMFL-86100KS	343	153	470	545	205	200	1
150	600	1	50	50+100	SMFL-66150KS	630	135	500	575	205	100	2
100	800	1	50	150	SMFL-86150KS	343	153	640	715	295	200	1
	600	1	50	200	SMFL-66200KS	343	153	660	735	255	200	1
	750	1	50	25+40+135	SMFL-76200KS	343	153	580	655	255	65	3
200	1000	1	50	30+60+110	TAFL-106200KS	343	153	840	915	295	65	3
200	1000	1	50	100+100	TAFL-106200KS	530	135	610	685	295	100	2
	1200	1	50	25+25+150	TAFL-126200KS	530	170	480	555	205	65	3
	1200	1	50	50+50+100	TAFL-126200KS	530	170	480	555	205	65	3

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Special Capacitor Water Cooling Capacitor

This product is specially designed to accommodate high capacity to be easily used for matching circuit of high frequency induction furnace device,

For dielectric, polypropylene film and capacitor paper was used together and aluminium foil electrode of non induction method was used. For insulating oil, non PCB dielectric was impregnation resulting in stable and excellent feature. For cooling method, it was designed that cooling water can absorb the heat generated from the inner dielectric loss.

To make matching circuit easy when inductive load is changed, capacity was divided into proper capacity and lead bushing was treated.

The material of case is non magnetic aluminum to minimize induction loss due to high frequency electric field. The loss of capacitor itself is about 0,1%,

Water temperature rise is less than 4 deg, for maximum unit capacitor capacity (quantity 5 l/min.),

Allowable load power is 1,05 times of rated voltage(within 1 hour among 24 hours) and maximum allowable current is 1,35 times of rated current,

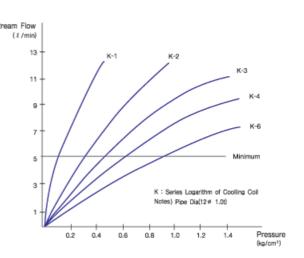
High frequency water cooling capacitor does not contain discharging resistor since they are connected to high capacity coil circuit in parallel,

When capacitor is input into circuit again, the allowable limit of residual voltage in capacitor is DC voltage which is within 10% of rated voltage and knut tightening strength at terminal is less than 200kg \cdot cm.



Rate and Performance

Installation Place	Only indoors
Temperature of Cooling Water	Cooling water exit temperature less than 45°C
Ambient Temperature	More than 0°C
Allowable Capacity Tolerance	Within ± 10% of rated capacity
Withstand Voltage	2,15 times of rated voltage, 10 seconds
Flux of Cooling Water	More than 5 i per minute
Pressure of Cooling Water	Less than 10 kg/cm²
Safety Device	Thermostat contact capacity (250VAC, 7,5A)
Case	Aluminium non painted product



(Head Loss and Cooling Water Quantity Curve)

Cautions in Use

Since the outer case of capacitor is unilateral electrode, please be sure to use insulation rack in installation. When more than 2 capacitors are installed in parallel, the interval between side and side shall be more than 35mm. The flow quantity of cooling water shall be more than 5i/min.

In case when capacitor is kept at subzero temperature, remove the water entirely from copper pipe,

Special Capacitor Water Cooling Capacitor

Diagram

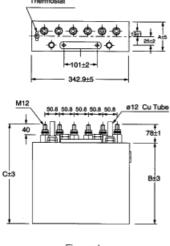
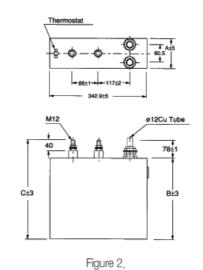
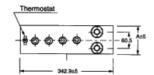


Figure 1.





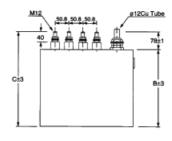


Figure 3,

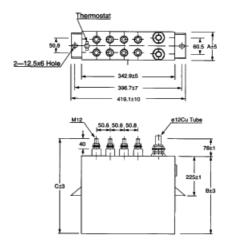


Figure 4.

Ratings and Dimensions

Frequency	Rated Voltage	Rated Capacity	Total		μ F Per Section						Din	nension (n	nm]	Figure	
[Hz]	[VAC]	[kvar]	[μF]	1	2	3	4	5	6	7	8	Α	В	С	riguie
960	800	450	117	5	8	16	44	44	-	-	-	136,7	330,2	398,2	1
960	1000	480	80	13	13	27	27	-	-	-	-	104,6	330,2	398,2	3
1000	1250	750	76	3	3	3	3	13	13	19	19	104,6	360,2	428.0	4
1200	1250	1200	102	-	-	17	17	17	17	17	17	104.6	330,2	398,2	-4
2000	1250	300	15	7.6	7.6	-	-	-	-	-	-	136,7	200.0	368,0	2
3000	400	300	100	7	13	27	53	-	-	-	-	104,6	200,0	268,0	3
3000	800	1000	84	21	21	21	21	-	-	-	-	104,6	330,2	398,2	3
3000	1250	1200	40	3	3	3	3	7	7	7	7	104,6	330,2	398,2	4
3000	1250	1200	40	2	2	2	2	6	6	10	10	104.6	330,2	398,2	-4

▶ Please confirm the ratings and dimensions of the products printed in this caue prior to ordering because they may be altered.

Special Capacitor Surge Absorbing Capacitor

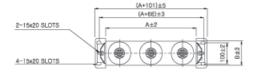
This product was developed by our company in 1976 to absorb and reduce surge which may be generated when the breaker is open or closed and lightning surge which may be delivered by connecting transmission line and ground, Its dielectric is polypropylene film which has excellent withstand voltage and good quality capacitor paper and it also contains specially produced composite oil, In 1986, new C-R type Capacitor into which series resistance was inserted was developed to improve electric feature,

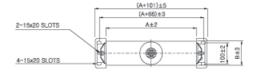
Specification

- Installation Place: Both indoors and outdoors
- Ambient Temperature for Use: -20°c ~ +40°c (below 35°c average for 24 hours, below 25°c average for 1 year)
- Performance

Allowable Capacity Tolerance	-5% -	~ +15% (at 20℃), less th	nan 108% of unbalance	d ratio between phases		
Max, Voltage for Use	Less t Less t	Less than 110% of rated voltage: within 12 hours among 24 hours Less than 115% of rated voltage: within 30 minutes among 24 hours Less than 120% of rated voltage: within 5 minutes Less than 130% of rated voltage: within 1 minutes Less than 182% of rated voltage: within 2 seconds				
Max, Current for Use	Trans	ient current 130% of rat	ed current allowed			
Withstand Voltage	Betw	een terminals on line and Line Voltage 3300V 6600V 11000V 22000V		al line and case Circuit Vo Voltage 45kVDC (10sec.) 60kVDC (10sec.) 90kVDC (10sec.) 150kVDC (10sec.)	tage	
Loss	Less	than 0,5% (rated voltage	e, 20°c), for C-R type, le	ss than 0,6 %		
Temperature Rise	Less	than 10 deg. (at rated v	oltage, 35°c)			
Oil Leakage	No oi	No oil leakage when all parts of Capacitor is heated until it reaches 70 $^\circ\!\mathrm{C}$				
Painting Color	Muns	Munsell no, 5Y 7/1				
Reference Standard	JEM :	1362 (1999)				

Diagram





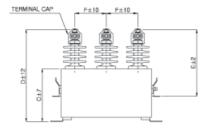


Figure 1,

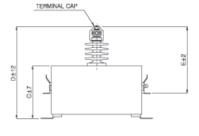
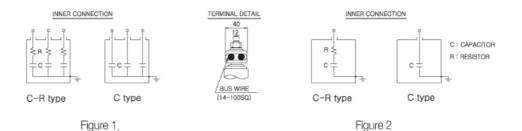


Figure 2,

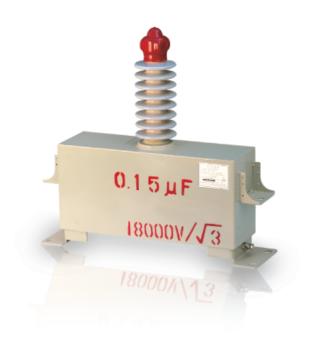
Special Capacitor Surge Absorbing Capacitor



Ratings and Dimensions

Rated Voltage	Rated Capacity	Type			Dimer	nsion [mm]			Figure
[VAC]	rated dapasity	Турс	Α	В	С	D	Е	F	rigare
3300 / √3	0,5µF × 3	THF-T3015T	430	115	270	455	315	150	
3300 / √3	0.05μF × 3	THF-T30015TCR	430	115	250	435	315	150	
3300 / √3	$0.1\mu F \times 3$	THF-T3003TCR	430	115	220	405	315	150	
3300/~3	$0.8\mu F \times 3$	THF-T3024T	430	115	270	455	315	150	
6600 / √3	0.05μF × 3	THF-T60015TCR	430	115	220	405	315	150	1
6600 / √3	$0.1\mu F \times 3$	THF-T6003TCR	430	115	250	435	315	150	
6600/~3	$0.1\mu F \times 3$	THF-T6003T	430	115	250	435	315	150	
13200 / √3	$0.2\mu F \times 3$	THF-T13006T	630	135	340	610	400	225	
13800 / √3	$0.1\mu F \times 3$	THF-T13003TCR	630	135	390	620	400	225	
22900 / √3	0.1μF	TBF-T23001SCR	430	135	240	510	400	-	
13800 / √3	0.3μF	THF-T13003S	430	135	340	570	360	-	2
24000 / √3	0,2μF	THF-T24002S	430	135	340	610	400	-	2
24000 / √3	0.4µF	THF-T24004S	530	135	450	720	400	-	

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Principle and Application

To explain the effect of surge absorbing capacitor, the rotator is expressed as intensive equivalent resistance R as in the figure A. In parallel with this, on the circuit to which the protecting Capacitor is connected, $V_0 = E_0H(t)$ travelling wave invaded from line of surge impedance Z. Then, when terminal voltage of R and C is V_0 , the current I_0 at P point is

$$Ip = C \frac{dV_c}{dt} + \frac{1}{R} V_c = \frac{1}{Z} (2V_o - V_o)$$

To rearrange this expression $\frac{d}{dt}$ = P, V_o = EoH (t) it is

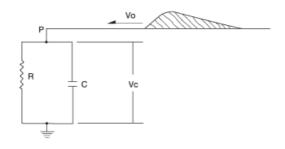
$$PV_c + \left(\frac{R+Z}{CRZ}\right)V_c = \frac{2E\circ}{CZ}H(t)$$

$$\frac{R+Z}{CRZ} = \alpha$$
 it is

$$V_{\rm c} = \frac{2 E \circ}{CZ} \times \frac{1}{P + \alpha} \; H(t) = \frac{2 E \circ}{\alpha \; CZ} (1 \text{-e}^{-\alpha t}) \; H(t)$$

When Z and R is constant and C is changed, the terminal voltage of the rotator Vc is as in the figure B, From this, it can be seen that the wave height value is reduced according to the value of C or R. When $R = \infty$ and C = 0.3 μF , the terminal voltage of the rotator is reduced to 1/2 of invasion wave, which shows the effects of surge absorbing capacitor.





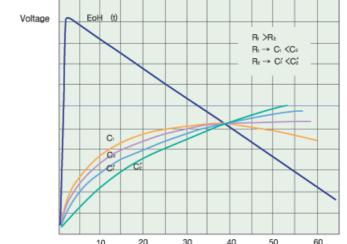


Figure B.

Time (µs)



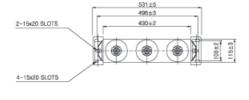
This product was developed by our company in 1975 to improve capacity between distribution line and earth by connecting the 2nd winding distribution line of insulation transformer and earth. It uses polypropylene film which has excellent insulation ability and good quality capacitor paper as dielectric and contains specially produced composite oil to improve electric feature.

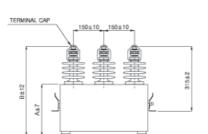
Specification

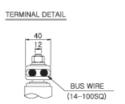
- Installation Place: Both indoors and outdoors
- Ambient Temperature for Use: -20℃ ~ +40℃ (below 35℃ average for 24 hours, below 25℃ average for 1 year)
- Performance

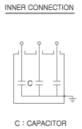
Allowable Capacity Tolerance	-5% ~ +15% (at 20℃), less tha	an 108% of imbalance r	atio between phase			
Max, Voltage for Use	Less than 110% of rated voltage: within 12 hours among 24 hours Less than 115% of rated voltage: within 30 minutes among 24 hours Less than 120% of rated voltage: within 5 minutes Less than 130% of rated voltage: within 1 minute Less than 182% of rated voltage: within 2 seconds					
Max, Current for Use	Transient current 130% of rate	d current allowed				
Withstand Voltage	Between terminals on line and between batch line terminal and case Line Voltage 3300V 10kVAC (1min.) 6600V 16kVAC (1min.) 45kVDC (10sec.)					
Loss	Less than 0,35% (rated voltage	e, 20°C)				
Temperature Rise	Less than 25 deg, (at rated vol	tage, 35°C)				
Oil Leakage	No oil leakage when all parts o	No oil leakage when all parts of Condenser is heated until it reaches 70 ℃				
Painting Color	Munsell no, 5Y 7/1					
Reference Standard	JEM 1362 (1999)					

Diagram









Ratings and Dimensions

Line Voltage	Rated Capacity	Туре	Dimensi	on [mm]
[V]	[kvar]	Турс	A	В
3300	10	TBF-T36010Y	490	675
6600	10	TBF-T66010Y	290	475

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Principle and Application

In 3 phase circuit, for 1 line grounding, grounding current is calculated with the expression below.

Ig =
$$3j\omega$$
 CEa = $j\sqrt{3}$ E $\times 2\pi$ fC

Ig : Grounding Current [A] E : Line Voltage [V]

Ea: Phase Voltage [V] C: Equivalent Ground Capacitance (C = C₁ + C₂)

 I_{C_1} (Ground fault current I_g in figure A - charged current after zero phase current transformer (ZCT)) passes the zero phase current transformer. Therefore, ground fault current I_{g_1} passing ZCT can be calculated with the expression below

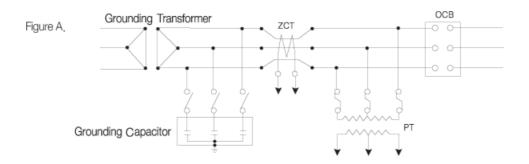
$$Ig_1 = \sqrt{3} E \times 2\pi \times f \times C_1$$

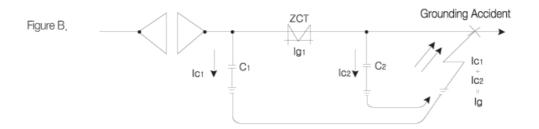
When the distance between transformer and ZCT is small, ground capacity in line is small and penetration ground fault current Ig_1 is not enough to move circuit breaker. Therefore, use capacitor for earthing to improve ground capacity in line.

For example, when E=3300V, $C = 0.5 \mu F$, and f = 60 Hz in figure B, ZCT penetration ground fault current is as following:

$$Ig_1 = \sqrt{3} \times 3300 \times 2\pi \times 60 \times 0.5 \times 10^{-6} = 1.08[A]$$

Since detecting current of grounding breaker is selected to be $0.1 \sim 0.8$ A, it is good to select the value of C, to be more than this value. (C, is equivalent to 1 phase and in case of C, = 0.5μ F, capacitor for grounding of 0.5μ F $\times 3$ is to be selected)





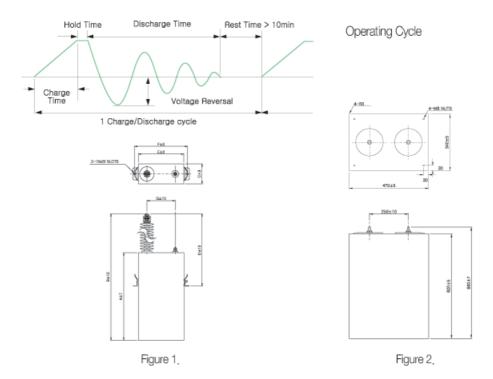
Special Capacitor Pulse Power Capacitor

Use

The use of this capacitor is wide in the area of power supply device for tests (IVG, ICG, Mark Generator, power supply for L-C resonance circuit and small scale power supply for fusion study) and power supply pulse power (state of the art medical instruments, rock destruction and pulse laser) and recently, households which use this capacitor have been rapidly increased.

Since high energy density capacitor for pulse power is the key part of aircrafts (fighter, artificial satellite and passenger airplane), electronic/electric heat chemical gun, high efficiency laser and high efficiency munitions such as radar, the supply of this product was difficult since the industrialized countries regulated the outflow of technology. But, recently our company mass produced the capacitor resulting in smooth supply of the product. In 1997, 11kVDC 150 µF 9kJ rated capacitor for energy storage was developed with our own technology and delivered them for power supply of simple composite test facility and its performance has been recognized.

Several capacitors were also installed at heavy electro mechanics manufacturers in Korea and are used for test facilities,



Pulse Power Low loss Capacitor

This product uses polypropylene film which has excellent withstand voltage and good quality capacitor paper as dielectric and contains refined impregnation oil, resulting in high reliability. To minimize inner inductance, it employs non inductive solder for reducing self inductance.

- Installation Place : Indoors
- Ambient Temperature for Use: -10°c ~ + 40°c (below 35°c average for 24 hours)
- Performance

Allowable Capacity Tolerance	-10% ~ +10% (at 20℃)
Insulation Resistance	More than 1000 M. petween batch terminal and case (below 20℃)
Loss	Less than 0,35% (at 20°c)
Withstand Voltage	Rated voltage x 1,2 times, for 60 seconds between terminal and case
Oil Leakage	No oil leakage when it is left in constant temperature tub for 3 hours at 80°c
Painting Color	Munsell no, 5Y 7/1
Self Inductance	Max, 150nH
Duty Cycle	Pause for more than 10 min, per charging/discharging
Voltage Reversal	20% ~ 90%

Ratings and Dimensions

Rated Voltage [kVDC]	Capacity [µF]	Joule [kJ]	Туре	А	В	Dim C	ension(r D	nm] E	F	G	Approximate Weight [kg]	Figure	Remarks
11	150	9,08	TAF-T11150S	810	995	160	315	370	424	228	70,7		
40	0.01	0.01	TAF-T40001S	190	375	115	315	430	496	300	20.8		Steel
40	11	8,80	TAF-T40011S	560	745	170	530	530	583	300	71.8	1	Case
100	0,5	2,50	TAF-T100001S	390	660	135	450	530	583	380	42,6		0000
100	1.0	5.00	TAF-T100001S	690	690	135	450	530	583	380	73.4		
25	0,3	0.09	TAE-25001S	-	-	-	-	-	-	-	6.7	2	Plastic
100	0,1	0,50	THE-100001S	-	-	-	-	-	-	-	7,5	2	Case

▶ Please confirm the ratings and dimensions of the products printed in this caue prior to ordering because they may be altered.

• High Energy Density Pulse Power Capacitor

With metalized polypropylene film made through metalized technology and good quality capacitor paper as dielectric, this product realized high energy density, high reliability and long lifetime,

- Installation Place : Indoors
- Ambient Temperature for Use: -10℃ ~ +40℃ (below 35℃ average for 24 hours)
- Performance

Allowable Capacity Tolerance	-10% ~ +10% (at 20°c)
Insulation Resistance	More than 1000 M. petween batch terminal and case (below 20℃)
Loss	Less than 0,35% (rated voltage, 20°C)
Withstand Voltage	Rated voltage x 1,2 times, for 60 seconds between terminal and case
Oil Leakage	No oil leakage when it is left in constant temperature tub for 3 hours at 80°c
Painting Color	Munsell no, 5Y 7/1
Self Inductance	Max, 150nH
Duty Cycle	Pause for more than 10 min, per charging/discharging
Voltage Reversal	20% ~ 90%
Lifetime	When voltage reversal is 20%, more than 2,000 times



Ratings and Dimension

Rated Voltage	Capacity	Energy Density	Type	Din	nension (n	nm]	Approximate	Figure
[kVDC]	[µF]	[kJ/kg]	Турс	Α	В	С	Weight [kg]	rigure
20	200	3,33	SDF-T20200S	620	660	340	120	3

▶ Please confirm the ratings and dimensions of the products printed in this caue prior to ordering because they may be altered.

Necessary Information in Ordering

- Capacity and allowable tolerance capacitor
- Rated voltage and voltage reversal (%)
- Required lifetime and 1 time charging/discharging cycle
- Charging time and hold time
- Maximum current (kA) in discharging and discharge time



Motor Capacitor

QMC / AMC Series are metallized polyproylene film capacitors these are designed primarily for use in motor run applications although they are also used in AC power supplies. The low dielectric losses, the inherent "self healing" propety, and the greatly increased microfarad per unit volume make these designs ideal where reliability and small size are essential.



Specification

Withstanding Voltage

Items	Test Voltage (RMS) VAC	Applying Time sec.
Between Terminals	Rated Voltage × 1,75	10
Between Terminals (tied together) and Case	Rated Voltage × 2 + 1000 (Minimum 2000)	10

Insulation Resistance : Between the collected terminals and the case, $2000M\Omega$ or greater (at 500VDC)

Dissipation Factor : 0,1% Max, at 60Hz, 20°C

Seal Ability : There shall be no oil leaks even if left 1 hour under a constant temperature of 85°C

Internal Protection : Pressure sensitive interrupter

Fault Current : 10000AFC

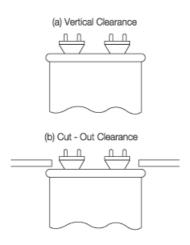
Reference Standard : EN 60252, KS C 4805, JIS C 4908

Mounting Considerations For The Pressure Sensitive Interrupter

The proper operation of the pressure sensitive interrupter requires that the cover be allowed to bulge without restraint.

If this expansion is restricted it may interfere with the pressure sensitive interrupter mechanism. The following should be considered when mounting capacitors containing the pressure sensitive interrupter.

There must be a clearance of at least 0.5 inches (12.7mm) between the tops of the terminals and / or the assembled wire connector and a plane perpendicular to the capacitor terminals, In addition, care should be taken to ensure that there still is adequate electrical clearance between the terminals and the overhead surface after pressure sensitive interrupter operation.

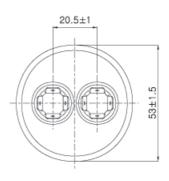


Motor Capacitor QMC/AMC Series

Dimensions of QMC

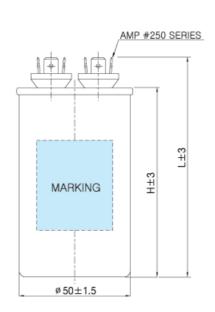
Voltage: 450VAC

No.	Capa,	Part No.	Case Dim,			
140,	[µ F]	Tarrio,	H[mm]	L[mm]		
1	3	QMC-45H030B	55	68		
2	5	QMC-45H050B	55	68		
3	7,5	QMC-45H075B	55	68		
4	10	QMC-45H100B	55	68		
5	12	QMC-45H120B	55	68		
6	15	QMC-45H150B	65	78		
7	20	QMC-45H200B	65	78		
8	25	QMC-45H250B	75	88		
9	30	QMC-45H300B	85	98		
10	35	QMC-45H350B	95	108		
11	40	QMC-45H400B	100	113		
12	45	QMC-45H450B	110	123		
13	50	QMC-45H500B	125	138		



Voltage: 370VAC

NO.	CAPA.	Part No.	Case	DIM.
140,	[µF]	TOILTYO,	H[mm]	L[mm]
1	3	QMC-37H030B	55	68
2	5	QMC-37H050B	55	68
3	7,5	QMC-37H075B	55	68
4	10	QMC-37H100B	55	68
5	12	QMC-37H120B	55	68
6	15	QMC-37H150B	55	68
7	20	QMC-37H200B	55	68
8	25	QMC-37H250B	75	88
9	30	QMC-37H300 B	75	88
10	35	QMC-37H350B	75	88
11	40	QMC-37H400B	85	98
12	45	QMC-37H450B	95	108
13	50	QMC-37H500B	95	108

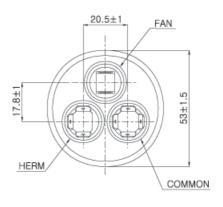


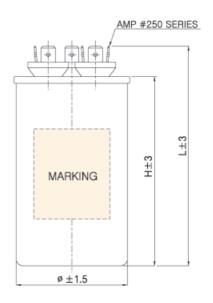
Motor Capacitor QMC/AMC Series

Dimensions of AMC

Voltage: 450V

Voltage	CAPA.	D		Case DIM	l
NO.	[µF]	Part No,	ø [mm]	H[mm]	L[mm]
1	0,7/15	AMC-45H007150B	50	65	78
2	1,0/15	AMC-45H010150B	50	65	78
3	1,5/15	AMC-45H015150B	50	65	78
4	1,8/15	AMC-45H018150B	50	65	78
5	2.0/15	AMC-45H020150B	50	65	78
6	2,5/15	AMC-45H025150B	50	65	78
7	3.0/15	AMC-45H030150B	50	65	78
8	3,5/15	AMC-45H035150B	50	65	78
9	4.0/15	AMC-45H040150B	50	65	78
10	4.5/15	AMC-45H045150B	50	65	78
11	5.0/15	AMC-45H050150B	50	65	78
12	5,5/15	AMC-45H055150B	50	65	78
13	6.0/15	AMC-45H060150B	50	75	88
14	6,5/15	AMC-45H065150B	50	75	88
15	7,0/15	AMC-45H070150B	50	75	88
16	7.5/15	AMC-45H075150B	50	75	88
17	8,0/15	AMC-45H080150B	50	75	88
18	8,5/15	AMC-45H085150B	50	75	88
19	9.0/15	AMC-45H090150B	50	75	88
20	9,5/15	AMC-45H095150B	50	75	88
21	10/15	AMC-45H100150B	50	75	88
22	11/15	AMC-45H110150B	50	75	88
23	12/15	AMC-45H120150B	50	85	98
24	13/15	AMC-45H130150B	50	85	98
25	14/15	AMC-45H140150B	50	85	98
26	15/15	AMC-45H150150B	50	85	98
27	0,7/20	AMC-45H007200B	50	75	88
28	1.0/20	AMC-45H010200B	50	75	88
29	1,5/20	AMC-45H015200B	50	75	88
30	1,8/20	AMC-45H018200B	50	75	88
31	2.0/20	AMC-45H020200B	50	75	88
32	2,5/20	AMC-45H025200B	50	75	88
33	3,0/20	AMC-45H030200B	50	75	88
34	3,5/20	AMC-45H035200B	50	75	88
35	4.0/20	AMC-45H040200B	50	75	88
36	4,5/20	AMC-45H045200B	50	75	88
37	5.0/20	AMC-45H050200B	50	75	88
38	5,5/20	AMC-45H055200B	50	75	88
39	6,0/20	AMC-45H060200B	50	75	88
40	6,5/20	AMC-45H065200B	50	75	88
41	7,0/20	AMC-45H070200B	50	85	98
42	7,5/20	AMC-45H075200B	50	85	98
43	8.0/20	AMC-45H080200B	50	85	98





Dimensions of AMC

Voltage: 450V

NO.	CAPA.	Part No.	(Case DIM		NO.	CAPA.	Part No.		Case DIM	l.
140,	[#F]	Fartivo,	ø [mm]	H[mm]	L[mm]	IVO,	[µ F]	Fait NO.	ø [mm]	H[mm]	L[mm]
44	8,5/20	AMC-45H085200B	50	85	98	87	4,0/30	AMC-45H040300B	50	95	108
45	9,0/20	AMC-45H090200B	50	85	98	88	4.5/30	AMC-45H045300B	50	95	108
46	9,5/20	AMC-45H095200 B	50	85	98	89	5,0/30	AMC-45H050300B	50	95	108
47	10/20	AMC-45H100200B	50	85	98	90	5,5/30	AMC-45H055300B	50	95	108
48	11/20	AMC-45H110200B	50	85	98	91	6,0/30	AMC-45H060300B	50	95	108
49	12/20	AMC-45H120200B	50	85	98	92	6,5/30	AMC-45H065300B	50	95	108
50	13/20	AMC-45H130200B	50	95	108	93	7.0/30	AMC-45H070300B	50	95	108
51	14/20	AMC-45H140200B	50	95	108	94	7.5/30	AMC-45H075300B	50	95	108
52	15/20	AMC-45H150200B	50	95	108	95	8,0/30	AMC-45H080300B	50	95	108
53	0.7/25	AMC-45H007250B	50	75	88	96	8,5/30	AMC-45H085300B	50	95	108
54	1,0/25	AMC-45H010250B	50	75	88	97	9.0/30	AMC-45H090300B	50	100	113
55	1,5/25	AMC-45H015250B	50	75	88	98	9,5/30	AMC-45H095300B	50	100	113
56	1,8/25	AMC-45H018250B	50	85	98	99	10/30	AMC-45H100300B	50	100	113
57	2,0/25	AMC-45H020250B	50	85	98	100	11/30	AMC-45H110300B	50	100	113
58	2,5/25	AMC-45H025250B	50	85	98	101	12/30	AMC-45H120300B	50	110	123
59	3,0/25	AMC-45H030250B	50	85	98	102	13/30	AMC-45H130300B	50	110	123
60	3,5/25	AMC-45H035250B	50	85	98	103	14/30	AMC-45H140300B	50	110	123
61	4,0/25	AMC-45H040250B	50	85	98	104	15/30	AMC-45H150300B	50	110	123
62	4.5/25	AMC-45H045250B	50	85	98	105	0.7/35	AMC-45H007350B	50	95	108
63	5,0/25	AMC-45H050250B	50	85	98	106	1,0/35	AMC-45H010350B	50	95	108
64	5,5/25	AMC-45H055250B	50	85	98	107	1,5/35	AMC-45H015350B	50	95	108
65	6,0/25	AMC-45H060250B	50	85	98	108	1.8/35	AMC-45H018350B	50	95	108
66	6,5/25	AMC-45H065250 B	50	85	98	109	2,0/35	AMC-45H020350B	50	95	108
67	7,0/25	AMC-45H070250B	50	85	98	110	2,5/35	AMC-45H025350B	50	95	108
68	7,5/25	AMC-45H075250B	50	85	98	111	3,0/35	AMC-45H030350B	50	95	108
69	8,0/25	AMC-45H080250B	50	95	108	112	3,5/35	AMC-45H035350B	50	95	108
70	8,5/25	AMC-45H085250 B	50	95	108	113	4,0/35	AMC-45H040350B	50	100	113
71	9.0/25	AMC-45H090250B	50	95	108	114	4.5/35	AMC-45H045350B	50	100	113
72	9,5/25	AMC-45H095250B	50	95	108	115	5,0/35	AMC-45H050350B	50	100	113
73	10/25	AMC-45H100250B	50	95	108	116	5,5/35	AMC-45H055350B	50	100	113
74	11/25	AMC-45H110250B	50	95	108	117	6.0/35	AMC-45H060350B	50	100	113
75	12/25	AMC-45H120250B	50	95	108	118	6,5/35	AMC-45H065350B	50	100	113
76	13/25	AMC-45H130250B	50	95	108	119	7,0/35	AMC-45H070350B	50	110	123
77	14/25	AMC-45H140250B	50	100	113	120	7.5/35	AMC-45H075350B	50	110	123
78	15/25	AMC-45H150250B	50	100	113	121	8,0/35	AMC-45H080350B	50	110	123
79	0,7/30	AMC-45H007300B	50	85	98	122	8,5/35	AMC-45H085350B	50	110	123
80	1.0/30	AMC-45H010300B	50	85	98	123	9.0/35	AMC-45H090350B	50	110	123
81	1,5/30	AMC-45H015300B	50	85	98	124	9,5/35	AMC-45H095350B	50	110	123
82	1,8/30	AMC-45H018300B	50	85	98	125	10/35	AMC-45H100350B	50	110	123
83	2.0/30	AMC-45H020300B	50	85	98	126	11/35	AMC-45H110350B	50	110	123
84	2,5/30	AMC-45H025300 B	50	85	98	127	12/35	AMC-45H120350B	50	110	123
85	3,0/30	AMC-45H030300B	50	95	108	128	13/35	AMC-45H130350B	50	125	138
86	3,5/30	AMC-45H035300B	50	95	108	129	14/35	AMC-45H140350B	50	125	138

Motor Capacitor QMC/AMC Series

Dimensions of AMC

Voltage: 450V

Voltage	: 450V										
NO.	CAPA.	Dort No.	(Case DIM	l.	NO	CAPA.	Dort No.	(Case DIM	1.
NO,	[#F]	Part No.	ø [mm]	H[mm]	L[mm]	NO.	[µF]	Part No.	ø [mm]	H[mm]	L[mm]
130	15/35	AMC-45H150350B	50	125	138	173	8,0/45	AMC-45H080450B	50	125	138
131	0,7/40	AMC-45H007400B	50	110	123	174	8,5/45	AMC-45H085450 B	50	125	138
132	1,0/40	AMC-45H010400B	50	110	123	175	9,0/45	AMC-45H090450 B	50	125	138
133	1,5/40	AMC-45H015400B	50	110	123	176	9,5/45	AMC-45H095450 B	50	125	138
134	1,8/40	AMC-45H018400B	50	110	123	177	10/45	AMC-45H100450B	50	125	138
135	2,0/40	AMC-45H020400B	50	110	123	178	11/45	AMC-45H110450B	50	125	138
136	2,5/40	AMC-45H025400B	50	110	123	179	12/45	AMC-45H120450B	63	95	108
137	3,0/40	AMC-45H030400B	50	110	123	180	13/45	AMC-45H130450B	63	95	108
138	3,5/40	AMC-45H035400B	50	110	123	181	14/45	AMC-45H140450B	63	95	108
139	4.0/40	AMC-45H040400B	50	110	123	182	15/45	AMC-45H150450B	63	95	108
140	4.5/40	AMC-45H045400B	50	110	123	183	0,7/50	AMC-45H007500B	50	125	138
141	5,0/40	AMC-45H050400B	50	110	123	184	1,0/50	AMC-45H010500B	50	125	138
142	5.5/40	AMC-45H055400B	50	110	123	185	1,5/50	AMC-45H015500B	50	125	138
143	6.0/40	AMC-45H060400B	50	110	123	186	1,8/50	AMC-45H018500B	50	125	138
144	6,5/40	AMC-45H065400B	50	110	123	187	2,0/50	AMC-45H020500 B	50	125	138
145	7.0/40	AMC-45H070400B	50	110	123	188	2,5/50	AMC-45H025500 B	50	125	138
146	7,5/40	AMC-45H075400B	50	110	123	189	3,0/50	AMC-45H030500B	50	125	138
147	8,0/40	AMC-45H080400B	50	125	138	190	3,5/50	AMC-45H035500 B	50	125	138
148	8.5/40	AMC-45H085400B	50	125	138	191	4.0/50	AMC-45H040500B	50	125	138
149	9.0/40	AMC-45H090400B	50	125	138	192	4,5/50	AMC-45H045500 B	50	125	138
150	9,5/40	AMC-45H095400B	50	125	138	193	5,0/50	AMC-45H050500 B	50	125	138
151	10/40	AMC-45H100400B	50	125	138	194	5.5/50	AMC-45H055500 B	50	125	138
152	11/40	AMC-45H110400B	50	125	138	195	6,0/50	AMC-45H060500 B	50	125	138
153	12/40	AMC-45H120400B	50	125	138	196	6,5/50	AMC-45H065500 B	50	125	138
154	13/40	AMC-45H130400B	50	125	138	197	7.0/50	AMC-45H070500B	63	95	108
155	14/40	AMC-45H140400B	50	125	138	198	7,5/50	AMC-45H075500B	63	95	108
156	15/40	AMC-45H150400B	50	125	138	199	8,0/50	AMC-45H080500 B	63	95	108
157	0.7/45	AMC-45H007450B	50	110	123	200	8,5/50	AMC-45H085500 B	63	95	108
158	1,0/45	AMC-45H010450B	50	110	123	201	9,0/50	AMC-45H090500B	63	95	108
159	1,5/45	AMC-45H015450B	50	110	123	202	9,5/50	AMC-45H095500 B	63	95	108
160	1.8/45	AMC-45H018450B	50	110	123	203	10/50	AMC-45H100500B	63	95	108
161	2,0/45	AMC-45H020450B	50	110	123	204	11/50	AMC-45H110500B	63	95	108
162	2,5/45	AMC-45H025450B	50	110	123	205	12/50	AMC-45H120500B	63	95	108
163	3.0/45	AMC-45H030450B	50	125	138	206	13/50	AMC-45H130500B	63	95	108
164	3,5/45	AMC-45H035450B	50	125	138	207	14/50	AMC-45H140500B	63	100	113
165	4.0/45	AMC-45H040450B	50	125	138	208	15/50	AMC-45H150500B	63	100	113
166	4.5/45	AMC-45H045450B	50	125	138						
167	5,0/45	AMC-45H050450B	50	125	138						
168	5,5/45	AMC-45H055450B	50	125	138						
169	6.0/45	AMC-45H060450B	50	125	138						

6,5/45

7,0/45

7,5/45

170

171

172

AMC-45H065450 B

AMC-45H070450B

AMC-45H075450B

125

125

125

50

50

50

138

138

138

Motor Capacitor RMES Series

The RMES Series capacitors are especially designed for prevents of case rupture, vent, fire with the inherent metallized technique dielectric materials, and it has high reliability as the role of the fuse of the metallized electrodes at the time that capacitors are exposed on over stress.

They are widely used in fluorescent lamp, air conditioners, office equipment, washing machine and other circuits,



Specification

Capacitance : See table

Rated Voltage : See table

Rated Frequency : 50Hz/60Hz

Capacitance Tolerance : -5% ~ +10%

Permissible Temperature : -25°c ~ +85°c

Withstanding Voltage

Items	Test Voltage (RMS) VAC	Applying Time sec.
Between Terminals	Rated Voltage × 1,75	10
Between Terminals (tied together) and Case	Rated Voltage × 2 + 1000 (Minimum 2000)	10

Insulation Resistance : Between the collected terminals and the case, $2000M_{\Omega}$ or greater (at 500Vdc)

Dissipation Factor : 0,10% Max, at 60Hz, 20℃

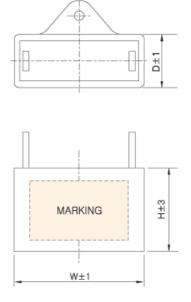
Reference Standard : EN 60252, KS C 4805, JIS C 4908

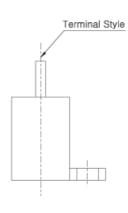
Motor Capacitor RMES Series

RMES Series

I TIVILO O	01100				
				RMES-45H	
NO.	CAPA,			370 / 400 / 450V	
	[μF]	PART NO.		Case [mm]	
		RMES	W	D	Н
1	0.5	45H005U	38	14	23
2	0,6	45H006U	38	14	23
3	0.7	45H007U	38	14	23
4	0,8	45H008U	38	14	23
5	0.9	45H009U	38	14	23
6	1.0	45H010 U	38	16	29
7	1.2	45H012U	38	16	29
8	1.5	45H015U	38	16	29
9	1.7	45H017U	38	16	29
10	2,0	45H020 U	38	16	29
11	2,5	45H025U	38	19	35
12	3.0	45H030 U	38	19	35
13	3,5	45H035U	38	19	35
14	4.0	45H040 U	38	24	37
15	4.5	45H045U	38	24	37
16	5.0	45H050 U	38	24	37
17	5,5	45H055U	38	26	42
18	6.0	45H060 U	38	26	42
19	6,5	45H065U	38	26	42
20	7.0	45H070 U	50	25	40
21	7.5	45H075U	50	25	40
22	8,0	45H080 U	50	25	40

 $\blacktriangleright \ \text{Note}: \ _ \leftarrow \text{Terminal sytle}$





Motor Capacitor H, V, Capacitor

The capacitors are designed primarily for voltage doubler circuits such as in microwave ovens and high voltage applications,

They have polypropylene paper dielectric system with inserted tap construction and non PCB's oil impregnated.



Specification

Capacitance : 0.60 ~ 1.20 µ F

Rated Voltage : 2100 VAC

Rated Frequence : 50Hz/60Hz

Capacitance Tolerance : ±3%

Dissipation Factor : 0,3% Max, (at 60Hz, 20°C)

Permissible Temperature

Withstanding Voltage

:-20 ~ +85°C

Between Terminals Mutually : Rated voltage x 4,3[Vdc], 10sec,

Between Terminals and Case : 8,0 [kVAC], 10sec.

Discharge Device : Voltage decreases to below 50V in one minute when disconnected from power source

Insulation Resistance : Min, $1000M_{\mathcal{Q}}$ between terminals and case

Seal Ability : Capacitor shall be capable of withstanding 85°C case temperature for 3hours without evidence of the

impregnant leakage

Capacitor Oil : Non PCB's oil

Applied Standard : EN 601270-1, EIA RS-479

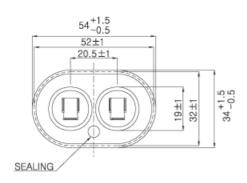
These capacitors are certified the ambient temperature up to +85°c form EN 601270-1

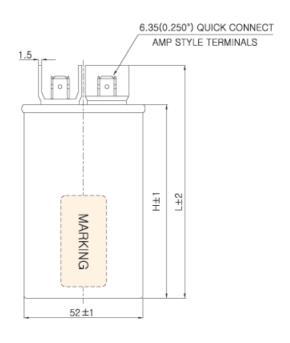
Motor Capacitor H. V. Capacitor

Dimensions of H.V.Capacitor

NO.	CAPA,	Part No.	CASI	E DIM,	NO.	CAPA,	Part No.	CASE	E DIM,
NO.	[μF]	Taitivo,	H[mm]	L[mm]	140.	$[\mu F]$	raitivo,	H[mm]	L[mm]
1	0,60	21CH604S060	60	77	32	0.91	21CH914S070	70	87
2	0,61	21CH614S060	60	77	33	0,92	21CH924S075	75	92
3	0,62	21CH624S060	60	77	34	0,93	21CH934S075	75	92
4	0,63	21CH634S060	60	77	35	0,94	21CH944S075	75	92
5	0,64	21CH644S060	60	77	36	0,95	21CH954S075	75	92
6	0,65	21CH654S060	60	77	37	0,96	21CH964S075	75	92
7	0,66	21CH664S060	60	77	38	0,97	21CH974S075	75	92
8	0,67	21CH674S060	60	77	39	0,98	21CH984S075	75	92
9	0,68	21CH684S060	60	77	40	0,99	21CH994S075	75	92
10	0,69	21CH694S060	60	77	41	1,00	21CH105S075	75	92
11	0.70	21CH704S060	60	77	42	1,01	21CH10AS075	75	92
12	0,71	21CH714S060	60	77	43	1,02	21CH10BS080	80	97
13	0,72	21CH724S060	60	77	44	1,03	21CH10CS080	80	97
14	0,73	21CH734S065	65	82	45	1,04	21CH10DS080	80	97
15	0.74	21CH744S065	65	82	46	1,05	21CH10ES080	80	97
16	0,75	21CH754S065	65	82	47	1,06	21CH10FS080	80	97
17	0,76	21CH764S065	65	82	48	1,07	21CH10GS080	80	97
18	0,77	21CH774S065	65	82	49	1,08	21CH10HS080	80	97
19	0.78	21CH784S065	65	82	50	1.09	21CH10IS080	80	97
20	0.79	21CH794S060	65	82	51	1,10	21CH115S080	80	97
21	0,80	21CH804S065	65	82	52	1,11	21CH10AS085	85	102
22	0,81	21CH814S065	65	82	53	1,12	21CH10BS085	85	102
23	0,82	21CH824S065	65	82	54	1,13	21CH10CS085	85	102
24	0,83	21CH834S070	70	87	55	1,14	21CH10DS085	85	102
25	0,84	21CH844S070	70	87	56	1,15	21CH10ES085	85	102
26	0.85	21CH854S070	70	87	57	1,16	21CH10FS085	85	102
27	0.86	21CH864S070	70	87	58	1,17	21CH10GS085	85	102
28	0,87	21CH874S070	70	87	59	1,18	21CH10HS085	85	102
29	0.88	21CH884S070	70	87	60	1.19	21CH10IS085	85	102
30	0,89	21CH894S070	70	87	61	1,20	21CH125S085	85	102
31	0,90	21CH904S070	70	87		.,25			

$ightharpoonup Note: \Box \leftarrow \text{Terminal sytle}$





Capacity Table

								Р	ower f	Factor	After I	mprov	ement	= 009	θ_2							
		1,00	0,99	0,98	0,97	0,96	0,95	0,94	0,93	0,92	0,91	0,90	0,89	0,88	0,87	0,86	0,85	0,84	0,83	0,82	0,81	0,80
	0.50	173	159	153	148	144	140	137	134	131	128	125	122	119	117	114	111	109	106	103	101	98
	0,51	169	154	148	144	140	136	132	129	126	123	120	118	115	112	109	107	104	102	99	96	94
	0,52	164	150	144	139	135	131	128	125	122	119	116	113	110	108	105	102	100	97	95	92	89
	0,53	160	146	140	135	131	127	124	121	117	114	112	109	106	103	101	98	95	93	90	88	85
	0,54	156	142	136	131	127	123	120	116	113	110	108	105	102	99	97	94	91	89	86	84	81
	0,55	152	138	132	127	123	119	116	112	109	106	104	101	98	95	93	90	87	85	82	80	77
	0,56	148	134	128	123	119	115	112	109	105	102	100	97	94	91	89	86	83	81	78	76	73
	0.57	144	130	124	119	115	111	108	105	102	99	96	93	90	88	85	82	80	77	74	72	69
	0.58	141	126	120	115	111	108	104	101	98	95	92	89	87	84	81	79	76	73	71	68	66
	0.59	137	123	117	112	108	104	101	97	94	91	89	96	83	80	78	75	72	70	67	65	62
	0,60	133	119	113	108	104	100	97	94	91	88	85	82	79	77	74	71	69	66	64	61	58
	0,61	130	116	110	105	101	97	94	90	87	84	82	79	76	73	71	68	65	63	60	58	55
	0,62	127	112	106	102	97	94	90	87	84	81	78	75	73	70	67	65	62	59	57	54	52
	0,63	123	109	103	98	94	90	87	84	81	78	75	72	69	67	64	61	59	56	54	51	48
	0.64	120	106	100	95	91	87	84	81	78	75	72	69	66	63	61	58	56	53	50	48	45
	0.65	117	103	97	92	88	84	81	77	74	71	69	66	63	60	58	55	52	50	47	45	42
	0,66	114	100	94	89	85	81	78	74	71	68	65	63	60	57	55	52	49	47	44	41	39
	0.67	111	97	91	86	82	78	75	71	68	65	62	60	57	54	52	49	46	44	41	38	36
	0,68	108	94	88	83	79	75	72	68	65	62	59	57	54	51	49	46	43	41	38	35	33
	0.69	105	91	85	80	76	72	69	65	62	59	57	54	51	48	46	43	40	38	35	33	30
-	0.70	102	88	82	77	73	69	66	63	59	56	54	51	48	45	43	40	37	35	32	30	27
	0.71	99	85	79	74	70	66	63	60	57	54	51	48	45	43	40	37	35	32	29	27	24
	0.72	96	82	76	71	67	64	60	57	54	51	48	45	42	40	37	34	32	29	27	24	2
	0.73	94	79	73	69	64	61	57	54	51	48	45	42	40	37	34	32	29	26	24	21	19
	0.74	91	77	71	66	62	58	55	51	48	45	43	40	37	34	32	29	26	24	21	19	16
	0.75	88	74	68	63	59	55	52	49	46	43	40	37	34	32	29	26	24	21	18	16	13
	0.76	86	71	65	60	56	53	49	46	43	40	37	34	32	29	26	24	21	18	16	13	1
	0.77	83	69	63	58	54	50	47	43	40	37	35	32	29	26	24	21	18	16	13	11	8
	0.78	80	66	60	55	51	47	44	41	38	35	32	29	26	24	21	18	16	13	10	8	5
	0.79	78	63	57	53	48	45	41	38	35	32	29	26	24	21	18	16	13	10	8	5	2,6
	0.80	75	61	55	50	46	42	39	36	32	29	27	24	21	18	16	13	10	8	5	2,6	
	0.81	72	58	52	47	43	40	36	33	30	27	24	21	18	16	13	10	8	5	2,6		
	0,82	70	56	50	45	41	37	34	30	27	24	21	19	16	13	11	8	5	2,6			
	0,83	67	53	47	42	38	34	31	28	25	22	19	16	13	11	8	5	2,6				
	0,84	65	50	44	40	35	32	28	25	22	19	16	13	11	8	5	2,6					
	0,85	62	48	42	37	33	29	26	23	19	16	14	11	8	5	2,7						
	0.86	59	45	39	24	30	26	23	20	17	14	11	8	5	2,6							
	0,87	57	42	36	32	28	24	20	17	14	11	8	6	2,7								
	0,88	54	40	34	29	25	21	18	15	11	8	6	2,8									
	0,89	51	37	31	26	22	18	15	12	9	6	2,8										
	0,90	48	34	28	23	19	16	12	9	6	2,8											
	0,91	46	31	25	21	16	13	9	6	3												
	0.92	43	28	22	18	13	10	6	3,1													
	0,93	40	25	19	14	10	7	3,2														
	0.94	36	22	16	11	7	3,4															
	0,95	33	19	13	8	3,7																
	0,96	29	15	9	4.1																	
	0.97	25	11	4.8																		
	0,98	20	6																			
	0,99	14																				



Selection of Capacitor

To select capacitor, consider the quality and after service of the product first,

Since the purpose of power capacitor is to use electricity efficiently by reducing reactive power, the loss of electricity shall be examined.

Determination of Capacity

Capacitor having been selected, the next problem is how much quantity is needed.

To determine the necessary quantity, those questions below shall be replied.

- 1) How much full load power is being operated in kW?
- ② What is the present power factor($\cos \theta_1$)? In case of new factory, power factor of each load and load which can be changed shall be investigated.
- 3 Target power factor($\cos \theta_2$) shall be determined.

After investigation and determination of these items, necessary capacitor quantity can be calculated.

(Example) When load power is 1000 [kW], present power factor is 0,75 and target power factor is 0,95

1 To Use formula

 $\begin{aligned} &\operatorname{Qc} = \operatorname{P} \times \left(\frac{\sqrt{1-\cos^2\theta_1}}{\cos\theta_1} - \frac{\sqrt{1-\cos^2\theta_2}}{\cos\theta_2} \right) & \operatorname{Qc} & : \operatorname{Capacity} \left[\operatorname{kvar} \right] \\ &= \operatorname{P} \times \left(\tan\theta_1 - \tan\theta_2 \right) & \operatorname{cos}\theta_1 : \operatorname{Present} \operatorname{Power} \left[\operatorname{kW} \right] \\ &= \operatorname{P} \times \left(\tan \cdot \cos^{-1} \left(\cos\theta_1 \right) - \tan \cdot \cos^{-1} \left(\cos\theta_2 \right) \right) \ \, \text{$\%$ Using a Mechanic Calculator} \\ &= 1000 \times \left(\tan \cdot \cos^{-1} 0.75 - \tan \cdot \cos^{-1} 0.95 \right) \\ &= 553 \left[\operatorname{kvar} \right] \end{aligned}$

(2) To Use Capacity Table

The crossing point between before improvement power factor 0.75 and after improvement power factor 0.95 is 55%, therefore, $Qc = 1000 \times 0.55 = 550$ [kvar]

However, capacitors are produced under the standard of capacity (see rated voltage and rated quantity listed in the first part of this catalogue.) When single phase capacitor is installed, under 500kvar standard, 3 units of 167 kvar shall be installed and under 600kvar, 3 units of 200kvar. When 3 phase capacitor is installed, 2 units of 250kvar and under 600kvar, 2 units of 300kvar or 3 units of 200kvar shall be installed.

In case of capacity (more than 300kvar for high voltage and more than 50kvar for low voltage) capacitor in itself can not prevent harmonics and inrush current. Therefore, series reactor shall be installed and to secure perfect discharging performance, discharging coil shall be installed in addition.

For reference, the units to express capacity are kvar and μ F. The way for conversion between these two units are as following:

 $\begin{array}{lll} Q_{c} = 2 \times \pi \times f \times C \times V^{2} \times 10^{-9} \; [kvar] & C \; : \; Capacity [uF] \\ C = & \frac{Q_{c} \times 10^{9}}{2 \times \pi \times f \times V^{2}} \; [uF] & f \; : \; Frequency [Hz] \\ & V \; : \; Rated \; Voltage [V] \\ \end{array}$

π : Integer (3.141592654)

Low Voltage 3 Phase Induction Electric Motor

Output of E	lectric Motor			Capacitor	Installed		
Odipul of L	IECUIC IVIOLOI	22	0V	38	0V	44	VOV
[kW]	[HP]	[μF]	[kvar]	[μF]	[kvar]	[μF]	[kvar]
0.2	1/4	15	0,27	-	-	-	-
0.4	1/2	20	0,36	-	-	-	-
0,75	1	30	0,55	-	-	-	-
1.5	2	50	0,91	10	0,544	10	0,730
2,2	3	75	1,37	15	0.817	15	1.095
3,7	5	100	1,82	20	1,089	20	1,460
5.5	7.5	175	3,19	50	2,722	40	2,919
7,5	10	200	3,65	75	4.083	40	2,919
11	15	300	5,47	100	5,444	75	5,474
15	20	400	7,30	100	5.444	75	5.474
22	30	500	9,12	150	8,166	100	7,299
30	40	800	14,60	200	10,888	175	12,772
37	50	900	16,42	250	13,609	200	14,597

If some capacitors are already installed, then deduce the total of the quantity of the installed capacitors (kvar or μ F) from the total of reactive power [kvar] or capacitance [μ F] to know how much capacitor shall be installed.

High Voltage Electric Motor

Output of F	lectric Motor	otor Power Factor			Capacito	r Installed		
Odipat of E	icotrio iviotoi	Power Factor	0	.9	0.	95	0.9	98
[kW]	[HP]	%	[kvar]	[kvar]	[kvar]	[kvar]	[kvar]	[kvar]
37	50	80.0%	9,83	10	15,59	15	20,24	20
40		80.5%	10,11	10	16,33	15	21,36	20
50		81.5%	11,33	15	19,12	20	25,40	25
55	75	82.0%	11.75	15	20,31	20	27,22	25
60	80	82,5%	12,04	15	21,38	20	28,92	30
75	100	83.0%	14.08	15	25.75	25	35,17	30
100		84.0%	16,16	15	31.73	30	44.29	40
110	150	84,5%	16,34	20	33,46	30	47,28	50
125		85.0%	16,93	20	36,38	50	52,09	50
150	200	85.5%	18,34	20	41.68	50	60,53	50
200		86,0%	21,81	20	52,94	50	78,06	75
220	300	90.0%	0.00	0	34,24	30	61,88	50

Power factor of high voltage electric motors are different according to the type of electric motor. Therefore, it is desirable to install them so that power factor is more than 90% according to all the characteristics of electric motor being installed.

If some capacitors are already installed, then deduce the total of the quantity of the installed capacitors (kvar or μ F) from the total of reactive power [kvar] or capacitance [μ F] to know how much capacitor shall be installed.

Appendix Treatment of High Voltage Power Capacitor

Installation Place

Installation place shall be dry and well ventilated. Avoid the places such as where corrosive gases or dust are much or agitation occurs. Capacitor rack shall be installed on the base of concrete and tightened with bolt.

Ambient Temperature

Ambient temperature shall not exceed $-20\% \sim +40\%$ (average temperature per day shall be less than 35%)

Earthing

Earth of capacitor shall be grounded with No.1 type grounding construction (less than 10.0) and the square of earthing wire shall be more than 5.5 mm^2 .

Cooperation for Protection

When Y type connected capacitor unit capacitor is used, current transformer and OCR tap adjustment shall be done as in the table

Also, it is desirable to adjust the time lever of OCR to be 2 (move within 3 seconds). In case where series reactor is used, the strength of transient current of CT shall be 40 and without reactor 150

Electric Wire

Use twisted wire for connecting to capacitor,

The square of wire shall be more than 1,35 times of rated current of capacitor,

Wire Connection

To connect the wires, remove 30mm of the covering material from the wire and tighten them.

Torque in tightening shall be less than 250 kg-cm

Attachment of Amperemeter

It is desirable to attach amperemeter to capacitor circuit and distinguish the current of each phase using ampere select switch, If not so, defective phase due to current from harmonics or bad switch contact may not be found,

Capacity		3300V			6600V	
	Rated Current	CT Ratio	OCR tab	Rated current	CT Ratio	OCR tab
[kvar]	[A]	[A/A]	[A]	[A]	[A/A]	[A]
50	8.75	15/5	4	4.37	10/5	3
75	13,1	20/5	4	6,55	10/5	4
100	17.5	30/5	4	8.75	15/5	4
150	26,2	40/5	4	13,1	20/5	4
200	35,0	60/5	4	17,5	30/5	4
250	43.7	75/5	4	21.9	30/5	5
300	52,5	75/5	5	26,2	40/5	4
400	70,0	95/5	5	35,0	50/5	5
500	87.5	110/5	5	43.7	60/5	5

Opening/Closing of Capacitor Circuit

Capacitor has been produced with built-in discharge resistance so that when it is opened from the circuit, the residual voltage can be reduced to less than 50V within 5 min, If the switch is turn on again when the residual voltage is not discharged enough, DC voltage becomes double and can be the cause of damage to capacitor,

When it is turn on/off within short time (within 5 seconds), employment of discharging coil is desirable.

Transportation of Capacitor

To transport capacitor, use the handle attached.

Be sure not to grasp the bushing during the transportation.





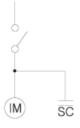
- 1) Ambient temperature shall not exceed -25°C ~ +45°C (average temperature per day shall be less than 35°C)
- Installation place shall be dry and well ventilated. Avoid the places such as where corrosive gases or dust are much or agitation occurs. Capacitor rack shall be installed on the base of concrete and tightened with bolt.
- 3) In case when used in collection, the interval between capacitors shall be more than 30mm for 220V 10 \sim 500 μ F, 40mm for 600 \sim 1000 μ F, 30mm for 380 \sim 480V 10kVA, 40 mm for 15 \sim 25kVA and 60 mm for 50kVA considering the rise of temperature for air circulation,

The outer box shall not sealed tightly and ambient temperature of the Capacitor shall be less than 40°c in summer.

- Use the handle attached to the body for transportation and be sure not to grasp the bushing.
- Use twisted wire for connecting to capacitor.
 The square of wire shall be more than 1.35 times of rated current of capacitor.
- Earth of capacitor shall be grounded with No.1 type grounding construction (less than 10.0)
- 7) Capacitor has been produced with built in discharge resistance so that when it is opened from the circuit, the residual voltage can be reduced to less than 75V within 3 min. If the switch is turn on again when the residual voltage is not discharged enough, DC voltage becomes double and can be the cause of damage to capacitor.

When it is turn on/off within short time (within 5 seconds), employment of discharging coil is desirable,

8) If the capacitor is connected in series to induction motor as in the picture below, select the capacity to be the same with non load exciting current when capacitor current ≤ IM, (to prevent voltage rise against magnetic excitation.)



Check Points

- Allowable over voltage is within 110% of rated voltage.
 Confirm of the equilibrium on each phase.
 Please be careful of circuit voltage rise in slight load at night.
 If over voltage is applied to capacitor continuously, kvar quantity is increased relative to 2 square voltage rise which results in the increase of loss and rise of temperature leading to shortening of lifetime.
- Confirm that current of capacitor is within 130% of rated current.
- 3) When more than 120% of rated current flows on capacitor, please check the current wave form with oscilloscope to know which harmonics current is the cause and install series reactor to contain harmonics.
- 4) The temperature of capacitor case is designed to be less than 65°C in mid summer (ambient temperature 45°C)
- 5) Always check the current and voltage of capacitor circuit (3 phase equilibrium) Cleaning of other bushing: more than once per 6 months (according to the state of contamination) Capacity and insulation resistance: measure once per year. But, for measurement of insulation resistance, confirm that DC mega measurement shall be more than 1000M. (per unit) between terminal and case.
- 6) Check the connection part of the electronic switch used in capacitor circuit once per year to a minimum. If the connection is not perfect, single phase operation or harmonics agitation voltage may be applied to the capacitor and it can lead to shortening of lifetime.
- Open the capacitor from the circuit when leading power factor in slight load at night,



Examination of Capacitor to Prevent Accidents

To contact capacitor terminal for examination, open the switch on the side of power supply and leave it for 5 minutes as it is until the residual voltage goes below 50 V. Then, use earth stick to discharge the residual voltage entirely and check the charging part,

- 1. The maximum allowable over voltage of capacitor is less than 110% of rated voltage(within 12 hours among 24 hours). Confirm that each phase is in equilibrium. Especially at night or lunch break, be careful to check the rise of circuit voltage. When over voltage is applied to capacitor, kvar is increased relative 2 square of the voltage rise resulting in excessive increase of temperature of capacitor, leading to short lifetime. Therefore, it is desirable to separate the capacitor from the circuit in slight load.
- 2. The maximum temperature of maximum temperature part of outer capacitor case is designed to be 40°C to 60°C. If this limit is exceeded, forced wind cooling shall be employed to reduce the ambient temperature.
- 3. Capacitor expands or contracts according to the change of temperature and the bend of case surface absorbs this expansion or contraction. In operation, case expands about 15mm on the side by the inner insulation oil. If the expansion is below 15 mm, it is normal, If the case expands about 15mm and abnormal function is suspicious, check the current, The current of each phase is within allowable limit of rated current and in 3 phase equilibrium, then capacitor is normal.
- 4. Always check the current of capacitor,
- 5. Check the contact part of breaker or switch used in capacitor circuit once per year. If the contact is bad, capacitor would be operated in single phase or abnormal noise may be heard due to bad connection. High frequency agitation voltage is applied to capacitor leading to notable shortening of lifetime.

Check Points of Capacitor

Points	Checks	Actions
Lockers of O'l and	Oil leakage at bushing	If oil leaks, change the capacitor. (Being left for a long time, it may be led to destruction of insulation)
Leakage of Oil and Damage	Oil leakage at case welding parts	If oil leaks, change the capacitor. (clean the part where oil leaks and check there after several days)
	Damage or rust on the side of outer case	Clean the damage and rust and treat for rust proofing,
Expansion of Case	Expansion on the side of case	Change the capacitor when it exceeds the standard expansion limit,
	Overheat due to bad connection of terminal parts	Tighten the terminal, (avoid the agitated place)
Temperature Rise Bad Connection	The limit of temperature rise of outer case when ambient temperature is 35°C is less than 30 deg. (for High Voltage)	Use ordinary thermometer for measurement, (avoid closed place) Investigate the cause of excessive temperature rise, (transient current or bad connection)
Insulation Resistance	Insulation resistance shall be more than 1,000 M $\!\mathcal{Q}$ between terminal batch and earth terminal,	Clean the bushing with dry dust cloth and measure the resistance, Change the one which is below the standard, For low voltage (500Vdc), for high voltage (1,000Vdc)

• Failure and Cause of Example Capacitor.

Point	Check	Action	
	Oil leakage at bushing	Excessive tightening of connection part at the terminal,	
Oil Leakage	Oil leakage at the welding part of case	Damage of case due to outer force. Corrosiveness of outer case, Grounding on the case from outer force, Abnormality within the capacitor.	
Distortion of the Outer Case	The expansion of case is more than the standard.	Excessively high ambient temperature. Inflow of harmonics current, Damage of case due to outer force, Abnormality within the capacitor.	
Abnormal Noise		Imperfect tightening of terminal. Influx of harmonics current. Excessive inrush current, Imperfect turning of the switch. Abnormality within the capacitor.	

Abnormal noise is usually not heard in ordinary use of capacitor. But many customers questioned about abnormal noise. This is guessed to occur due to electronic agitation and mutual resonance between capacitor case and inner components in case of rapid change of electricity quantity.

However, the abnormal noise does not give bad influence on capacitor but the influx of harmonics gives influence on capacitor. Therefore, in this case, investigate the current wave form of capacitor or check whether combined current is within the limit. If harmonics quantity is within the limit, you can continue to use the capacitor since there shall be no real problems.

Abnormal Smell	Overheat insulation oil, Improper quantity of insulation oil, Insufficient tightening of terminal, Abnormality within capacitor,	
Abnormal Temperature	Excessively high ambient temperature. Over voltage applied, Influx of harmonics current. Improper selection of capacitor. Abnormality within capacitor.	



• Initial Flowing of Electricity Into Capacitor Bank (Procedure)

4) 0 6				
, ,	 ♦ Check the main circuit, ♦ Check the connection auxiliary circuit by protection method, ♦ Is tightening proper at each part? ♦ How about insulation resistance at each place where insulation resistance is to be secured? ♦ Especially, was the connection direction of PT, CT (KL, kl) not changed? (It can cause the error of APFC or power factor meter) 			
Flouring Toot	Check the abnormality of system without flowing power in capacitor, Separate the main circuit from capacitor.			
	Exclude fuse such as VCB or open disconnector or separate capacitor incoming terminal. If a line is interlocked with CB auxiliary contact point dedicated to capacitor, it shall be opened or short circuited case by case. Prepare to trip capacitor according to the protection method, ex) OCR, NCS, NVS, Voltage differential method, or open delta method			
<	 Confirm that it is on and approve the trip signal according to the protection method. Confirm that CB has been tripped, and if not, find the cause and take actions for it. Confirm that CB has been tripped and record the quantity of signal and trip time. 			
	♦ Recover the circuit to the original state,			
	 ♦ Check the power factor meter with load. ♦ Calculate the expected power factor after the capacitor is on. ♦ Record the rated current and the expected power factor. ♦ Pay attention to power factor meter and amperemeter and turn CB on. ♦ Confirm that power factor and current show the expected values. ♦ If the value is over the expected one, find the cause and take actions for it. ♦ Attend for the first 60 min. after electricity flowing and watch the current and others. ♦ Record the current, power factor and temperature per 1 hour for initial 24 hours. (Especially, pay attention to abnormal noise) 			
<	♦ If possible, examine 5~6 times per day for the first week.			

1. General Information	 Name of Company Person in Charge Telephone No. Fax No. Address E-mail Address 	: (DEP.) : :	(Name)
2. Specification			
Z, Opcomount	1) Installation Form 2) Line Voltage 3) Rated Voltage 4) Rated Capacity 5) Frequency 6) No. of Phases 7) Quantity 8) Dimension 9) Color	: Unit Capacitor :	☐ Capacitor Bank [V] [V] [kvar] ☐ 50 [Hz] ☐ 3 Phase ☐ Bank [mm] [mm] [mm]
3. Installation Condition			
	Installation Place Installation Method Installation Area Ambient Temperature		☐ Outdoors☐ Rack☐ -() ~ + () [ĉ]
4. Protection Method			
	□ Voltage Differential	☐ Open Delta ☐ NVS	□ NCS □ Others
5. Attached Facilities	Series Reactor Discharging Device APFC	: %L =	% ☐ 13% ☐ Built-In Discharging Coil ☐ Others STEP

◆This specification is Samwha's standards.

Please do not hesitate to contact us if you have any further query.

