GLOBAL SOLUTION IN ENERGY MANAGEMENT

DSHM

DSHI

PRODUCT APPLICATION GUIDE

Your Solution in

POWER FACTOR CORRECTION and POWER QUALITY CORRECTION

LISTED

ISO 9001 (2000)

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Application and Installation of Power Factor Correction Capacitors

The new generation of low voltage capacitors

Nokian Capacitors has manufactured self healing dry typed low voltage capacitors since 1980. Today Nokian Capacitors manufactures low voltage units having rated voltages from 200V to 1000V for both frequencies 50Hz and 60Hz. For example, they can have the following applications:

- Delta or star connected 3-phase units to be used for power factor correction in all kind of capacitor banks including detuned and tuned filters
- 1-phase units to be used e.g. in heating installations
- Capacitors units for special applications (trains etc.)

In the design and manufacturing of the new cool type capacitor unit (L- and N-Series) the latest knowledge in raw materials and processing has been utilised. While choosing raw materials and manufacturing processes the quality of the end product has been the first priority. As a proof of our continuous commitment to quality, Nokian Capacitors was awarded the Quality Certificate ISO 9001 in December 1993 which is followed-up with twice yearly audits. Capacitor units have been type tested according to IEC 831-1 and IEC 831-2 and they have CE-conformity marking and UL and CSA approval.

Because the high temperature of the plastic insulation material is know to lead to its premature ageing, one of the main targets in the design of the new cool type capacitor unit was to find a construction having a low temperature rise which has been reached by the following means:

EXCLUSIVE HEAT TRANSFER PACKAGE:

A - Losses of the elements have been minimised using by mean of winding design and using short solid copper terminals.

B - Losses of the wiring have been minimised using solid copper bus bars and thick copper wires with low current density for internal connection in the capacitor unit.

C - Elements assembled in the steel container using a spacer to separate elements from each other.

D - The split design of the container allows much better cooling due to 40% increase in the cooling surface.

Safety has been also an important guideline in the design the main safety features being:

E- The capacitor is completely encased in the steel container.

F- The capacitor unit has been provided with two level protection comprised of individually fused elements and non-flammable filling around the elements in larger capacitor units which displaces oxygen and absorbs energy in failure situations.

G- Over 10 coolling surfaces.

The new arrangement of the terminals allows easy connection and the design of the discharge resistors (discharge time to 50V is less than 60 sec.) allows the capacitor units to be easily used in automatically controlled capacitor banks.

LOW VOLTAGE POWER CAPACITORS:

Low voltage power capacitors are manufactured by using the latest methods. Capacitor elements of metallized polypropylene film are self-healing and dry without impregnation liquid. Each capacitor element is individually protected with patented internal protection.

Capacitors have low losses, and are constructed to be light in weight. The low voltage power capacitors comply with most national and international standards.

CONSTRUCTION

The DSHI capacitor consists of a number of low loss capacitor cells connected to provide the required three phase output. These cells are wound from metallized polypropylene film. After winding, the cell ends are zinc sprayed to provide the best electrical contact between the turns of the winding, and connection wires are soldered to the zinc end surfaces. The winding is then placed in a thermoplastic resin case which is filled with a polyurethane resin and allowed to harden. The finished cells are wired for the required three phase output and assembled in a steel enclosure.

HOUSING

All capacitor units are supplied in a powder epoxy painted steel case. Solderless terminal connectors and discharge resistors are enclosed in an indoor/outdoor terminal compartment.

Because DSHI Serie capacitors contain no liquid there is no danger of a spill in the unlikely event of a rupture.

FEATURES

ENVIRONMENTALLY SAFE

Although the elements used in the DSHI capacitor are treated with silicon oil there is no free liquid. Hence in the extremely unlikely event of an element rupture there is no risk of leaks of pollution.

SELF-PROTECTING

Extensive testing on DSHI capacitors with elements purposely short circuited by driving a nail through the element case has shown that the impedance of the lead connections and the element itself will limit the fault current to value within the self-healing capabilities of the elements. The energy discharged into the puncture causes the very thin layer of metal deposited on the polypropylene film to vaporize around the area of the fault creating an open circuit and clearing the fault (See Figure 1). This self-healing action is completed in ten micro seconds. The capacitors are also protected by an internal fuse element within the cell (See Figure 2). This combination of self-healing action and internal fusing eliminates the need for additional fuses to protect the capacitor cells. NEC article 460-8B, however, may dictate the need for external overcurrent protection to protect the conductors leading to the capacitors.

TEMPERATURE

The DSHI capacitor is designed to operate over an ambient temperature range of -40 degrees C to +50 degrees C.

OVERVOLTAGE

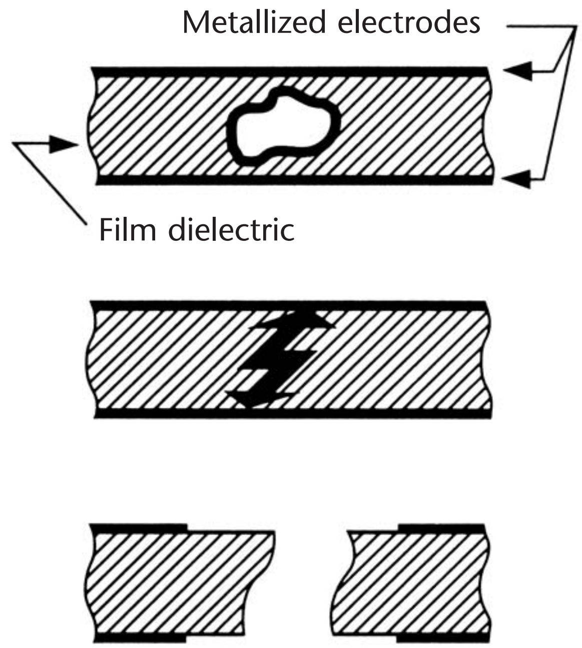
All DSHI capacitors are suitable for continuous operation at 110 percent of the nameplate voltage (RMS including harmonics).

OVERCURRENT

All DSHI capacitors are suitable for continuous operation at 135 percent of the rated nameplate current (including harmonics).

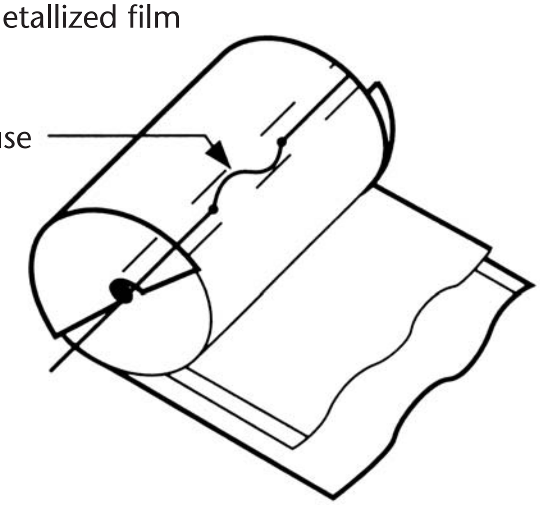
DISCHARGE RESISTORS

All power capacitors are equipped with discharge resistors to discharge the capacitor when de-energized. For 600 volts and below, the residual voltage is reduced to 50 volts or less within one minute of de-energization. For units above 600 volts, the residual voltage is reduced to 50 volts or less within 5 minutes.



Self-healing

Figure 1



Metallized polypropylene film

Figure 2

DSHI Low Voltage Capacitors Units

Type DSHI capacitors consist of dry self-protecting metallized internally fused cells assembled in an epoxy painted steel enclosure. Solderless terminal connectors and discharge resistors are enclosed in an indoor/outdoor terminal compartment.

DSHI SERIE

FEATURES

- Dry self-healing metallized polypropylene cells
- Internally protected cells
- Discharge resistors
- NEMA 1, 12, & 3R enclosures available
- Optional fuses (200 KA interrupting capacity) and blown fuse indicating lights
- UL Listed and CSA Approved

RATINGS

240 V	5-50 kVAR
480 V	2-100 kVAR
600 V	3-100 kVAR
660 V	3-100 kVAR (750V CONSTRUCTION)

MOUNTING & CONNECTION

Type DSHI units can be mounted in an upright position using the integral floor mounting brackets. Wall mounting can be accomplished by using the optional wall mounting brackets. Connections can be made from either end to the enclosed solderless terminal connectors.

EXTERNAL FUSING

The combination of the self-healing action and internal fusing eliminates the need for additional fuses to protect the capacitor cells. NEC article 460-8B, however, may dictate the need for external overcurrent protection to protect the conductors leading to the capacitors.

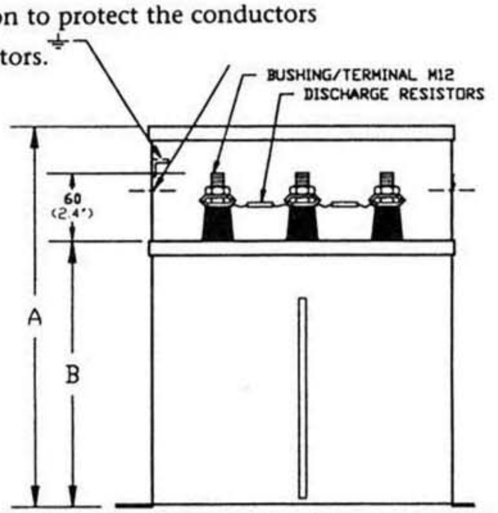


FIGURE 1

Fig. 1

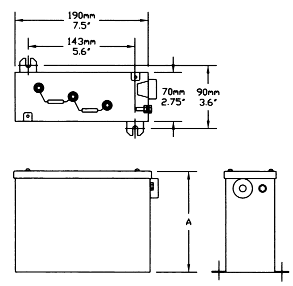


Fig. 2

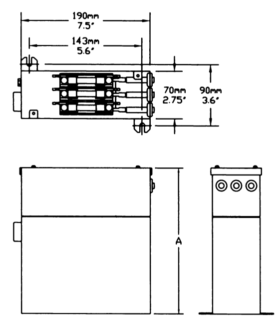


Fig. 3

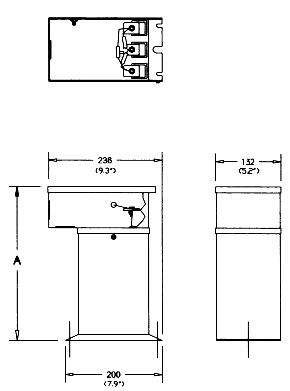


Fig. 4

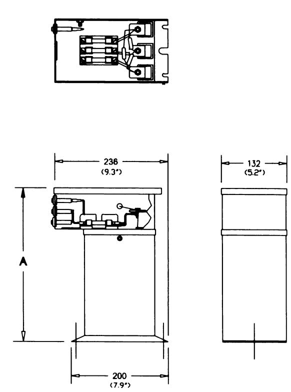


Fig. 5

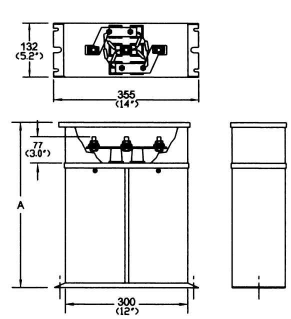
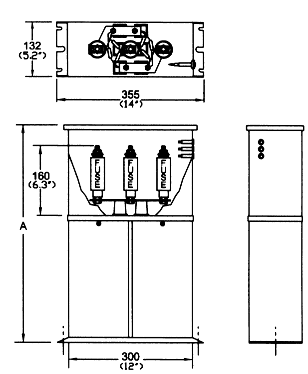


Fig. 6



DSHI series							" A "	3 Fus.	3 lights	Nema				" A "
	1 kVAR	2 cat #	3 Style	*Weight* Lbs	kg	fig #	*Dimension* inch (mm)	4 Suffix	5 Suffix	6 1,12,3R	*Weight* Lbs	Lbs	fig #	*Dimension* inch (mm)
240 Volts.	**5**	**21357**	**ML1D**	19	8	3	9 (228)	**F**	**BFI**	**1**	21	9	4	9 (228)
	7,5	**21358**	**ML1D**	19	8	3	9 (228)	**F**	**BFI**	**1**	21	9	4	9 (228)
	10	**21359**	**FL1D**	21	9	3	12.8 (326)	**F**	**BFI**	**1**	23	10	4	12.8 (326)
	15	**21360**	**FL1D**	**22**	**10**	**3**	**12.8 (326)**	**F**	**BFI**	**1**	**24**	**11**	**4**	**12.8 (326)**
	20	**21361**	**FL2D**	**25**	**11**	**5**	**13.4 (340)**	**F**	**BFI**	**1**	**27**	**12**	**6**	**18.1 (460)**
	25	**21362**	**FL2D**	**27**	**12**	**5**	**13.4 (340)**	**F**	**BFI**	**1**	**29**	**13**	**6**	**18.1 (460)**
	30	**9947**	**FL2D**	27	12	5	13.4 (340)	**F**	**BFI**	**1**	29	13	6	18.1 (460)
	40	**9953**	**SL2D**	33	15	5	17.4 (440)	**F**	**BFI**	**1**	35	16	6	22.0 (560)
	50	**21687**	**AL2D**	36	16	5	21.0 (535)	**F**	**BFI**	**1**	38	17	6	25.8 (655)
480 Volts 3 phases	**3**	**22202**	**N3D**	6	3	1	7,5 (190)	**F**	**BFI**	**1**	8	4	2	10,3 (260)
	5	**21686**	**N3D**	6	3	1	7,5 (190)	**F**	**BFI**	**1**	8	4	2	10,3 (260)
	6	**22203**	**N3D**	6	3	1	7,5 (190)	**F**	**BFI**	**1**	8	4	2	10,3 (260)
	7,5	**21368**	**N3D**	7	3	1	7,5 (190)	**F**	**BFI**	**1**	9	4	2	10,3 (260)
	10	**21369**	**N3D**	7	3	1	7,5 (190)	**F**	**BFI**	**1**	9	4	2	10,3 (260)
	12,5	**31237**	**N3D**	8	4	1	7,5 (190)	**F**	**BFI**	**1**	10	5	2	10,3 (260)
	15	**21370**	**FL1D**	19	8	3	12.8 (326)	**F**	**BFI**	**1**	20	9	4	12.8 (326)
	17,5	**31238**	**FL1D**	19	8	3	12.8 (326)	**F**	**BFI**	**1**	20	9	4	12.8 (326)
	20	**21371**	**FL1D**	21	9	3	12.8 (326)	**F**	**BFI**	**1**	23	10	4	12.8 (326)
	25	**21372**	**FL1D**	23	10	3	12.8 (326)	**F**	**BFI**	**1**	25	11	4	12.8 (326)
	30	**21373**	**FL2D**	25	11	5	13.4 (340)	**F**	**BFI**	**1**	27	12	6	18.1 (460)
	35	**31239**	**FL2D**	24	11	5	13.4 (340)	**F**	**BFI**	**1**	26	12	6	18.1 (460)
	40	**21374**	**FL2D**	24	11	5	13.4 (340)	**F**	**BFI**	**1**	26	12	6	18.1 (460)
	45	**31240**	**FL2D**	29	13	5	13.4 (340)	**F**	**BFI**	**1**	31	14	6	18.1 (460)
	50	**21375**	**FL2D**	29	13	5	13.4 (340)	**F**	**BFI**	**1**	31	14	6	18.1 (460)
	60	**21376**	**SL2D**	31	14	5	17.4 (440)	**F**	**BFI**	**1**	33	15	6	22.0 (560)
	70	**22652**	**SL2D**	33	15	5	17.4 (440)	**F**	**BFI**	**1**	35	16	6	22.0 (560)
	75	**21377**	**SL2D**	33	15	5	17.4 (440)	**F**	**BFI**	**1**	35	16	6	22.0 (560)
	80	**22653**	**SL2D**	37	17	5	17.4 (440)	**F**	**BFI**	**1**	39	18	6	22.0 (560)
	90	**22654**	**AL2D**	42	19	5	21.0 (535)	**F**	**BFI**	**1**	44	20	6	25.8 (655)
	100	**21378**	**AL2D**	44	20	5	21.0 (535)	**F**	**BFI**	**1**	42	21	6	25.8 (655)
600 V. 110% En	**3**	**21555**	**N3D**	6	3	1	7,5 (190)	**F**	**BFI**	**1**	8	4	2	10,3 (260)
	6	**21556**	**N3D**	6	3	1	7,5 (190)	**F**	**BFI**	**1**	8	4	2	10,3 (260)
	7,5	**21363**	**N3D**	6	3	1	7,5 (190)	**F**	**BFI**	**1**	8	4	2	10,3 (260)
	10	**9932**	**N3D**	7	3	1	7,5 (190)	**F**	**BFI**	**1**	9	5	2	10,3 (260)
	12,5	**21364**	**FL1D**	16	8	3	12.8 (326)	**F**	**BFI**	**1**	18	9	4	12.8 (326)
	15	**9935**	**FL1D**	16	8	3	12.8 (326)	**F**	**BFI**	**1**	19	9	4	12.8 (326)
	20	**9938**	**FL1D**	17	9	3	12.8 (326)	**F**	**BFI**	**1**	19	10	4	12.8 (326)
	25	**9941**	**SL1D**	20	9	3	16.7 (425)	**F**	**BFI**	**1**	20	10	4	16.7 (425)
	30	**9944**	**SL1D**	21	10	3	16.7 (425)	**F**	**BFI**	**1**	23	11	4	16.7 (425)
	40	**9950**	**FL2D**	28	13	5	13.4 (340)	**F**	**BFI**	**1**	30	15	6	18.1 (461)
	50	**9956**	**SL2D**	33	15	5	17.4 (440)	**F**	**BFI**	**1**	35	17	6	22.0 (560)
	60	**9959**	**SL2D**	35	16	5	17.4 (440)	**F**	**BFI**	**1**	37	18	6	22.0 (560)
	75	**21365**	**AL2D**	37	17	5	21.0 (535)	**F**	**BFI**	**1**	39	19	6	25.8 (655)
	100	**21366**	**TL2D**	48	22	5	25.0 (635)	**F**	**BFI**	**1**	50	24	6	29.7 (755)
**** 660 V. 125% En**	**3**	**31248**	**ML1Y**	15	7	3	9,0 (228)	**F**	**BFI**	**1**	17	8	4	14,3 (363)
	6	**31249**	**ML1Y**	15	7	3	9,0 (228)	**F**	**BFI**	**1**	17	8	4	14,3 (363)
	7,5	**31250**	**ML1Y**	15	7	3	9,0 (228)	**F**	**BFI**	**1**	17	8	4	14,3 (363)
	10	**31251**	**ML1Y**	16	7	3	9,0 (228)	**F**	**BFI**	**1**	18	8	4	14,3 (363)
	12,5	**31252**	**FL1Y**	17	8	3	12.8 (326)	**F**	**BFI**	**1**	19	9	4	12,8 (326)
	15	**31253**	**FL1Y**	17	8	3	12.8 (326)	**F**	**BFI**	**1**	19	9	4	12,8 (326)
	20	**31254**	**SL1Y**	17	8	3	16,7 (423)	**F**	**BFI**	**1**	19	9	4	16,7 (423)
	25	**31256**	**SL1Y**	18	8	3	16,7 (423)	**F**	**BFI**	**1**	20	9	4	16,7 (423)
	30	**31257**	**FL2Y**	28	13	5	13.4 (340)	**F**	**BFI**	**1**	30	14	6	18 (461)
	40	**31258**	**SL2Y**	35	16	5	17.4 (440)	**F**	**BFI**	**1**	37	17	6	22 (558)
	50	**31259**	**SL2Y**	36	16	5	17.4 (440)	**F**	**BFI**	**1**	38	17	6	22 (558)
	60	**31260**	**AL2Y**	40	18	5	21.0 (535)	**F**	**BFI**	**1**	42	19	6	25.8 (655)
	75	**31261**	**TL2Y**	47	21	5	25.0 (635)	**F**	**BFI**	**1**	49	22	6	29.7 (755)
	100	**31255**	**RL2Y**	56	26	5	28.7 (730)	**F**	**BFI**	**1**	58	27	6	33,5 (851)

***** 750 Volts construction***

Exemple / Model # : DSHI - 31255 - RL2Y - F - BFI - 1

Suffix = 1 2 3 4 5 6

DSHM Low Voltage Capacitor Bank

Comprised of Type DSHI units, the Type DSHM banks offer the same totally dry self-healing metallized polypropylene design with individually internally fuse protected capacitor elements with special heat transfer.

Each unit in the bank can be externally fused to protect the wiring to each unit. Optional blown fuse indicating lights are also available. All banks are UL Listed and CSA Approved, and are available in NEMA 1, 12, and 3R enclosures.

DSHM SERIES

FEATURES

- Dry self-healing metallized polypropylene cells
- Internally protected cells
- Discharge resistors
- NEMA 1, 12, & 3R enclosures available
- Optional fuses (200 KA interrupting capacity) and blown fuse indicating lights
- UL Listed and CSA Approved

RATINGS

240 V	60-300 kVAR
480 V	120-600 kVAR
600 V	120-600 kVAR

MOUNTING & CONNECTION

Type DSHI units can be mounted in an upright position using the integral floor mounting brackets. Wall mounting can be accomplished by using the optional wall mounting brackets. Connections can be made from either end to the enclosed solderless terminal connectors.

EXTERNAL FUSING

The combination of the self-healing action and internal fusing eliminates the need for additional fuses to protect the capacitor cells. NEC article 460-8B, however, may dictate the need for external overcurrent protection to protect the conductors leading to the capacitors.

Fig. 1

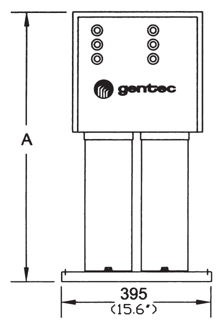


Fig. 2

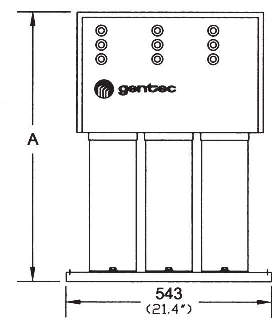


Fig. 3

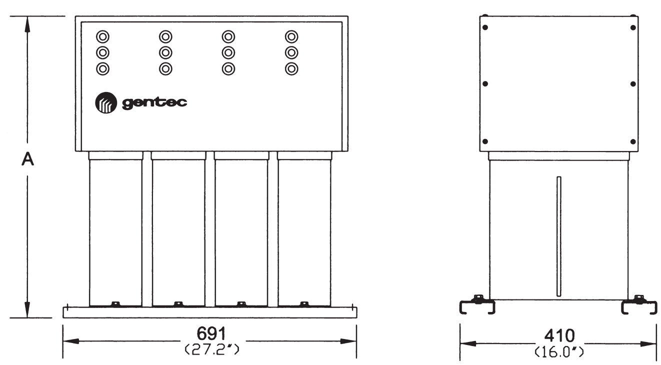
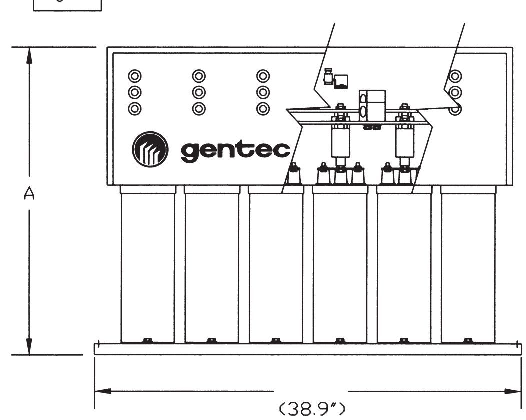


Fig. 4



	Model no..		option	option	Option	DIMENSION		Weight	
DSHM series		style	Type .. 1,12,3R	3 Fuses	3 Lights		" A "		
	kVAR	cat #	Suffixe	Suffixe	Suffixe	Suffixe	fig #	pouce (mm)	Lbs	kg
240 Volts	60	2-9947	FL2D	1	F	BFI	1	23.0 (583)	55	25
	80	2-9953	SL2D	1	F	BFI	1	26.9 (683)	68	31
	100	2-21687	AL2D	1	F	BFI	1	30.6 (778)	73	33
	120	3-9953	SL2D	1	F	BFI	2	26.9 (683)	109	49
	150	3-21687	AL2D	1	F	BFI	2	30.6 (778)	115	52
	200	4-21687	AL2D	1	F	BFI	3	30.6 (778)	187	85
	225	4-21687-2	AL2D	1	F	BFI	4	30.6 (778)	200	91
	250	5-21687	AL2D	1	F	BFI	4	30.6 (778)	218	99
	300	6-21687	AL2D	1	F	BFI	4	30.6 (778)	231	105
480 Volts	120	2-21376	SL2D	1	F	BFI	1	26.9 (683)	73	33
	125	2-21377-5	SL2D	1	F	BFI	1	26.9 (683)	73	33
	130	2-22652-6	SL2D	1	F	BFI	1	26.9 (683)	73	33
	140	2-22652	SL2D	1	F	BFI	1	26.9 (683)	74	34
	150	2-21377	SL2D	1	F	BFI	1	26.9 (683)	76	35
	160	2-22653	SL2D	1	F	BFI	1	26.9 (683)	83	38
	175	2-21378-7	AL2D	1	F	BFI	1	30.6 (778)	96	43
	180	2-22654	AL2D	1	F	BFI	1	30.6 (778)	97	44
	200	2-21378	AL2D	1	F	BFI	1	30.6 (778)	99	45
	210	3-22652	SL2D	1	F	BFI	2	26.9 (683)	115	52
	225	3-21377	SL2D	1	F	BFI	2	26.9 (683)	118	53
	240	3-22653	SL2D	1	F	BFI	2	26.9 (683)	128	58
	250	3-22654-2	AL2D	1	F	BFI	2	30.6 (778)	142	68
	270	3-22654	AL2D	1	F	BFI	2	30.6 (778)	145	65
	275	3-21378-7	AL2D	1	F	BFI	2	30.6 (778)	148	66
	290	3-21378-4	AL2D	1	F	BFI	2	30.6 (778)	157	71
	300	3-21378	AL2D	1	F	BFI	2	30.6 (778)	168	77
	320	4-22653	SL2D	1	F	BFI	3	26.9 (683)	174	79
	360	4-22654	AL2D	1	F	BFI	3	30.6 (778)	192	87
	400	4-21378	AL2D	1	F	BFI	3	30.6 (778)	200	91
	430	4-21378-3	AL2D	1	F	BFI	3	30.6 (778)	231	105
	450	5-22654	AL2D	1	F	BFI	4	30.6 (778)	257	117
	475	5-21378-7	AL2D	1	F	BFI	4	30.6 (778)	284	129
	500	5-21378	AL2D	1	F	BFI	4	30.6 (778)	288	131
	540	6-22654	AL2D	1	F	BFI	4	30.6 (778)	290	132
	600	6-21378	AL2D	1	F	BFI	4	30.6 (778)	299	135
600 Volts	120	2-9959	SL2D	1	F	BFI	1	26.9 (683)	69	31
	150	2-21365	AL2D	1	F	BFI	1	30.6 (778)	73	33
	175	2-21366-5	TL2D	1	F	BFI	1	34.6 (878)	109	49
	200	2-21366	TL2D	1	F	BFI	1	34.6 (878)	110	52
	225	3-21365	AL2D	1	F	BFI	2	30.6 (778)	115	53
	250	3-21366-6	TL2D	1	F	BFI	2	34.6 (878)	148	67
	275	3-21366-5	TL2D	1	F	BFI	2	34.6 (878)	148	69
	300	3-21366	TL2D	1	F	BFI	2	34.6 (878)	150	71
	350	4-21366-6	TL2D	1	F	BFI	3	34.6 (878)	200	91
	375	4-21366-5	TL2D	1	F	BFI	3	34.6 (878)	210	93
	400	4-21366	TL2D	1	F	BFI	3	34.6 (878)	225	95
	450	5-21366-6	TL2D	1	F	BFI	4	34.6 (878)	230	104
	500	5-21366	TL2D	1	F	BFI	4	34.6 (878)	235	114
	550	6-21366-6	TL2D	1	F	BFI	4	34.6 (878)	255	120
	600	6-21366	TL2D	1	F	BFI	4	34.6 (878)	300	135

Model # = **DSHM -6-21366 - AL2D - 12 - F - BFI**

Others Power are available on request Contact Gentec factory
Type = 1, 12 or 3R

C100 Series Low Voltage Auto Capacitor Bank

Comprised of Type DSHI units, the C100 series Automatic Switched Banks offer the same totally dry seal-healing metallized polypropylene design with individually internally fuse protected capacitor elements.

The installation of a C100 Automatic Switched Bank on the main bus can often meet the varying power factor correction needs of an entire industrial plant. It can also reduce installation and maintenance costs compared to individual capacitors. A PT (included) and a CT, provided by the user, provide the signal necessary for the DPFR Automatic Switched Bank's controller to bring on the required kVAR in steps to maintain the customer's predetermined power factor level.

Fig. 2

Fig. 1

FEATURES

- Dry self-healing metallized polypropylene cells
- Internally protected cells
- Discharge resistors
- CSA, UL Approved
- 200 KA interrupting capacity fuses on all 3 phases of each capacitor
- NEMA rated contactors
- Air core reactors to limit inrush current
- Optional main breaker with door interlock
- Optional blown fuse indicating lights

ENCLOSURE

- 14 gauge steel
- NEMA 1, NEMA 3R & Dustproof enclosures available
- Top lifting eyes
- Key lockable doors
- Top entry (bottom, back or side entry available)

Fig. 3

Fig. 4

CONTROLLER

(More details page 24)

- 12 step solid state
- Digital display of power factor (capacitive/inductive)
- Digital display of user adjustable control settings
- Capacitor step indication
- Automatic polarity correction if connected in reverse
- No volt release of capacitors on power failure
- Field adjustable time delay settings for capacitor switching
- When heavy compensation is required, time delays are automatically reduced for quicker response times
- Insufficient kVAR alarm contacts

RATINGS :

240 V	10-300 kVAR
480 V	10-2000 kVAR
600 V	10-2000 kVAR
660 V	10-2000 kVAR

UNIT CONFIGURATIONS :

4 units	fig. 1
6 units	fig. 1 & 2
12 units	fig. 3

Fig. 5

C100 series Automatic Low Voltage Power Factor Correction / Selection Guide

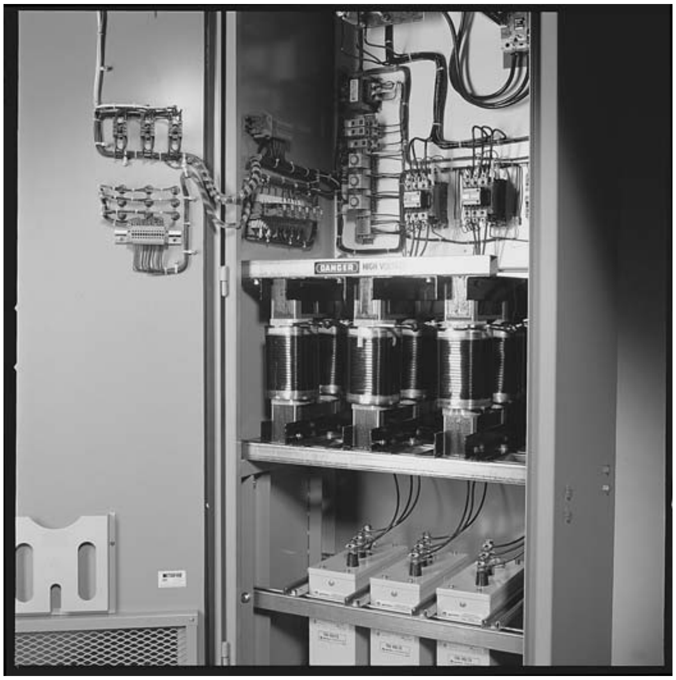
	Total kVAR	MODEL ## series	MODEL ## System Volts	MODEL ## Reactive Power	# of step	Option (s) Lights BFI	Option (s) Breaker or F.Disconnect	Nema 1,12,3R	Binary Switched kVAR	Enclose Fig. #	Approx. Weight Lbs	Approx. Weight Kg
240 Volts	50	C100	240	50	5	BFI	B or FD	1	10	1	280	127
	75	C100	240	75	3	BFI	- -	1	25	1	390	177
	100	C100	240	100	4	BFI	- -	1	25	1	415	189
	120	C100	240	120	3	BFI	- -	1	40	1	420	191
	125	C100	240	125	5	BFI	- -	1	25	1	435	198
	150	C100	240	150	6	BFI	- -	1	25	1	457	208
	160	C100	240	160	4	BFI	- -	1	40	1	445	202
	175	C100	240	175	7	BFI	- -	1	25	2 - 3	955	434
	200	C100	240	200	4	BFI	- -	1	50	2 - 3	965	439
	225	C100	240	225	9	BFI	- -	1	25	2 - 3	975	443
	250	C100	240	250	5	BFI	- -	1	50	2 - 3	980	445
	300	C100	240	300	6	BFI	- -	1	50	2 - 3	1000	455
480 Volts	50	C100	480	50	5	BFI	- -	1	10	1	268	122
	75	C100	480	75	5	BFI	- -	1	15	1	268	122
	100	C100	480	100	5	BFI	- -	1	20	1	278	126
	125	C100	480	125	5	BFI	- -	1	25	1	379	172
	150	C100	480	150	3	BFI	- -	1	50	1	406	185
	175	C100	480	175	7	BFI	- -	1	25	1	425	193
	200	C100	480	200	4	BFI	- -	1	50	1	435	198
	225	C100	480	225	9	BFI	- -	1	25	2 - 3	650	295
	250	C100	480	250	5	BFI	- -	1	50	2 - 3	660	300
	275	C100	480	275	11	BFI	- -	1	25	2 - 3	695	316
	300	C100	480	300	6	BFI	- -	1	50	2 - 3	789	359
	350	C100	480	350	7	BFI	- -	1	50	2 - 3	1125	511
	400	C100	480	400	8	BFI	- -	1	50	2 - 3	1149	522
	450	C100	480	450	9	BFI	- -	1	50	2 - 3	1165	530
	500	C100	480	500	10	BFI	- -	1	50	2 - 3	1275	580
	550	C100	480	550	11	BFI	- -	1	50	2 - 3	1290	586
	600	C100	480	600	12	BFI	- -	1	50	4	1435	652
	700	C100	480	700	14	BFI	- -	1	50	4	1535	698
	800	C100	480	800	16	BFI	- -	1	50	4	1640	745
	900	C100	480	900	18	BFI	- -	1	50	4	1725	784
	1000	C100	480	1000	20	BFI	- -	1	50	4	1800	818
	1100	C100	480	1100	22	BFI	- -	1	50	5	2000	864
	1200	C100	480	1200	24	BFI	- -	1	50	5	2100	909
600 Volts	50	C100	600	50	5	BFI	- -	1	10	1	268	122
	75	C100	600	75	5	BFI	- -	1	15	1	268	122
	100	C100	600	100	5	BFI	- -	1	20	1	278	126
	125	C100	600	125	5	BFI	- -	1	25	1	379	172
	150	C100	600	150	5	BFI	- -	1	30	1	406	185
	200	C100	600	200	4	BFI	- -	1	50	1	435	198
	225	C100	600	225	9	BFI	- -	1	25	2 - 3	450	205
	250	C100	600	250	5	BFI	- -	1	50	2 - 3	560	255
	300	C100	600	300	6	BFI	- -	1	50	2 - 3	789	359
	350	C100	600	350	7	BFI	- -	1	50	2 - 3	1125	511
	400	C100	600	400	8	BFI	- -	1	50	2 - 3	1149	522
	450	C100	600	450	9	BFI	- -	1	50	2 - 3	1165	530
	500	C100	600	500	10	BFI	- -	1	50	2 - 3	1275	580
	550	C100	600	550	11	BFI	- -	1	50	2 - 3	1290	586
	600	C100	600	600	12	BFI	- -	1	50	4	1435	652
	700	C100	600	700	14	BFI	- -	1	50	4	1535	698
	800	C100	600	800	16	BFI	- -	1	50	4	1640	745
	900	C100	600	900	18	BFI	- -	1	50	4	1725	784
	1000	C100	600	1000	20	BFI	- -	1	50	4	1800	818
	1100	C100	600	1100	22	BFI	- -	1	50	5	2000	910
	1200	C100	600	1200	24	BFI	- -	1	50	5	2100	955
	Suffix =	1	2	3	4	5	6	7				

Exemple / **Model # : C100 - 480— 600—6—BFI—B - 12**
(1 2 3 4 5 6 7)

****** Call factory for other ratings***

Enclose Fig. #	Height Inch	Height Mm	Wide Inch	Wide Mm	Deep Inch	Deep Mm
1	48	1220	28	710	16	406
2	78	1980	42	1067	16	406
3	90	2290	36	915	24	610
4	90	2290	72	1830	24	610
5	90	2290	108	2745	24	610

Power Quality Solution in Low Voltage Harmonic Filters



Due to the many non-linear loads today, modern power systems generate harmonics. They are typically caused by adjustable speed drives, programmable controllers, induction furnaces, UPS, and any other loads with semiconductors. Nuisance fuse blowings, capacitor failures, overheated wiring and transformers, circuit breaker tripping, telephone interference, and motor burnouts are often signs of system harmonics. These harmonics need to be considered when applying capacitors.

Although capacitors do not cause harmonics, improperly applying them can aggravate harmonics. Capacitors act as a low impedance path for harmonics. This can cause two problems. The increased current through the capacitor can cause it to fail. Also the increased current can create a resonant condition in which harmonic currents are magnified.

Gentec FT100, FT200, FT300 and FT400 Series offers four solutions when harmonics are present in a power system: Harmonic Detuned Filter and Reactive & Active Filters.

LOW VOLTAGE HARMONIC DETUNE FILTER BANKS

Power factor correction by means of conventional capacitor banks is not always possible in systems affected by harmonics.

The Gentec FT100 Series Harmonic Detuned Filter Bank provides power factor correction in harmonic rich environments by combining harmonic duty capable capacitors with iron core reactors. This combination forms a series resonant circuit tuned to the 4.08th harmonic. This blocking bank also acts as a detuned filter removing up to 50% of the lower order harmonic currents from the system.

They are CSA and UL Approved and are availaible in both fixed and automatic switched configurations at 240, 480, and 600 volts in indoor (NEMA 1), outdoor (NEMA 3R), and dustproof enclosures.

LOW VOLTAGE HARMONIC FILTERS

Gentec FT200 and FT400 Series Harmonic Filters are the best way to targate and eliminate harmonic distortion from your power system, while still improving your power factor.

The Reactive filter FT200 are sized to provide power factor correction while the iron core reactors are tuned to the 4.7th so the filter forms a very low impedance series resonant circuit at the harmonic frequency or FT400 Active filter for a total filtration from 3th to 52 th. These harmonic filters are custom designed for each application using standard components to ensure the best possible power factor correction at an affordable price.

The power quality serie solution are available in both fixed and automatic switched configurations at 240, 480, and 600 volts in indoor (NEMA 1), outdoor (NEMA 3R), and dustproof enclosures.

Drive Saver

DS100 & D200 SERIES

FEATURES

Fixed Harmonic Filters (DS200) and Detuned Filter Banks (DS100)

- UL and CSA Listed Harmonic duty capable dry self-healing internally protected metallized polypropylene capacitors
- Tuned iron core reactors (to the 4.7th for Harmonic Filters and to the 4.08th for Detuned Banks)
- 200 KA interrupting capacity fuses
- Optional blown fuse indicating lights
- NEMA 1, 12, & 3R enclosures available

Automatic Switched Multi-Step Harmonic Filters FT200 and Detuned Banks FT100

- UL and CSA Listed harmonic duty capable dry self-healing internally protected metallized polypropylene capacitors
- Tuned iron core reactors (to the 4.7th for Harmonic Filters and to the 4.08th for Detuned Banks)
- NEMA rated contactors
- 12 step solid state control (see page for details)
- 200 KA interrupting capacity fuses on all 3 phases of each capacitor
- NEMA 1, 3R, & Dustproof enclosures available
- Top lifting eyes
- Key lockable doors
- Optional main breaker with door interlock
- Optionnal blown fuse indicating lights
- CSA and UL Approved

DYNAMIC COMPENSATION SYSTEM FT300 and ACTIVE FILTER FT400

Those systems are also available for special application like:
- FT300 Quick reactive power requirement and phase balancing
- FT400 Total harmonic filtration on the 3 phases and neutral.

(contact factory for your application)

RATINGS

Because of Gentec's "custom approach" using standard components, any size fixed or switched capacitor bank can be supplied as a Harmonic Detuned, Filter Bank or Active filter

SYSTEM HARMONIC INFORMATION

Reactive filter or Active filter should not be applied without first performing an analysis to determine the specific needs of your power system. To properly do this, certain information is needed.

Network Characteristics (include a one line diagram)
- Main power distribution transformer KVA, voltage, impedance, and frequency
- Total system load
- Existing and target power factor
- Drive and rectifier information
- Existing reactive power on the system
- Reactive power to be added

FT100 De-tuned Filter
Automatic Switched Bank

FT200 Tuned Filter
Automatic Switched Bank

FT300 Dynamic Compensation
Automatic Dynamic System

FT400 Active Filter
Total Harmonic Filtration

Medium Voltage 3 Phase Capacitors

These low loss all-film dielectric capacitors are internally fused to offer the most reliable power factor correction available. They are available for use on 2400, 4160, 4800 up to 6900 volts motors from 50 to 900 kVAR in both indoor and outdoor enclosures.

FEATURES

- All film dielectric
- Internally fused units
- Weld-sealed porcelain bushings
- Discharge resistors
- TYPE 1, 12, & 3R enclosures available
- CSA Approved, UL listed

RATINGS

2400 V	50-900 kVAR
4160 V	50-900 kVAR
4800 V	50-900 kVAR

other voltage / reactive Power on request

MOUNTING & CONNECTION

These Medium Voltage equipements can be mounted in an upright position. Connections can be made from either end to the enclosed solderless connectors.

EXTERNAL FUSING

The internal fusing eliminates the need for additional fuses to protect the capacitors. NEC article 460-8B, however, may dictate the need for external overcurrent protection to protect the conductors leading to the capacitors.

OPTION (S)

- Blown fuses indications
- Damping reactions
- Current Measurement
- Auto Bank
- Detuned filter bank

HVCE SERIES

HVCB SERIES

C1000 Fixed or Auto Bank c/w Ground Switch

HVCB SERIES

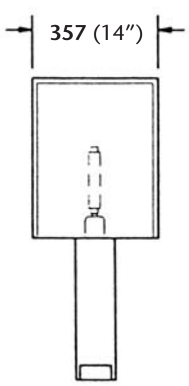


FIGURE 1

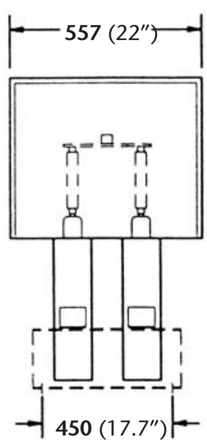


FIGURE 2

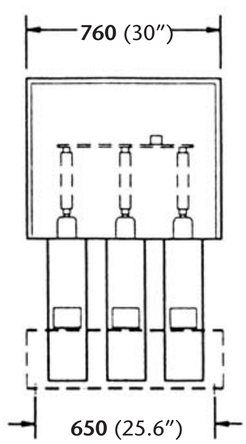
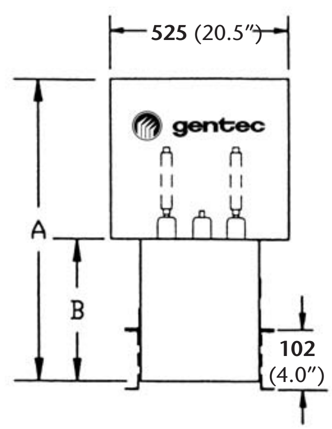


FIGURE 3



Side View

HVCB & HVCE Medium Voltage Capacitors / SELECTION GUIDE

	Kvar	MODEL #	#				Fig. #	Dimensions A		Dimensions B		Weight	
		Style	Cat.#	Fuse	Type	Option		inch	mm	Inch	Mm	Lbs	kg
2400 Volts / 3 Phase	25	HVCE	31167	F	12	-	1	27,2	690	7,5	190	13,2	29
	50	HVCE	31168	F	12	-	1	27,2	690	7,5	190	13,2	29
	75	HVCE	31169	F	12	-	1	27,2	690	7,5	190	14,1	31
	100	HVCE	31170	F	12	-	1	29,1	740	9,4	240	14,1	31
	125	HVCE	31171	F	12	-	1	29,9	760	10,2	260	15,9	35
	150	HVCE	31172	F	12	-	1	32,3	820	12,6	320	16,8	37
	175	HVCE	31173	F	12	-	1	33,1	840	13,4	340	17,7	39
	200	HVCE	31174	F	12	-	1	33,1	840	13,4	340	19,1	42
	225	HVCE	31316	F	12	-	1	35,4	900	15,7	400	21,4	47
	250	HVCE	31317	F	12	-	1	35,4	900	15,7	400	21,8	48
	275	HVCE	31318	F	12	-	1	38,6	980	18,9	480	23,6	52
	400	HVCE	2-31174	F	12	-	2	33,1	840	13,4	340	35,5	78
	500	HVCE	2-31317	F	12	-	2	35,4	900	15,7	400	38,2	84
	750	HVCE	3-31317	F	12	-	3	35,4	900	15,7	400	54,5	120
4160 Volts / 3 Phase	25	HVCE	31151	F	12	-	1	27,2	690	7,5	190	13,2	29
	50	HVCE	31152	F	12	-	1	27,2	690	7,5	190	13,2	29
	75	HVCE	31153	F	12	-	1	27,2	690	7,5	190	14,1	31
	100	HVCE	31154	F	12	-	1	29,1	740	9,4	240	14,1	31
	125	HVCE	31155	F	12	-	1	29,9	760	10,2	260	15,9	35
	150	HVCE	31156	F	12	-	1	32,3	820	12,6	320	16,8	37
	175	HVCE	31157	F	12	-	1	32,9	835	13,4	340	17,7	39
	200	HVCE	31158	F	12	-	1	32,9	835	13,4	340	19,1	42
	225	HVCE	31319	F	12	-	1	35,6	905	15,9	405	20,5	45
	250	HVCE	31320	F	12	-	1	35,4	900	15,9	405	22,7	50
	275	HVCE	31321	F	12	-	1	38,6	980	18,9	480	22,7	50
	300	HVCE	31322	F	12	-	1	38,6	980	18,9	480	23,6	52
	400	HVCE	2-31158	F	12	-	2	32,9	835	13,4	340	30,9	68
	500	HVCE	2-31320	F	12	-	2	35,6	905	15,9	405	38,6	85
	600	HVCE	2-31322	F	12	-	2	38,6	980	18,9	480	40,0	88
	900	HVCE	3-31322	F	12	-	3	38,6	980	18,9	480	56,4	124
4800 Volts / 3 Phase	25	HVCE	31159	F	12	-	1	27,2	690	7,5	190	13,2	29
	50	HVCE	31160	F	12	-	1	27,2	690	7,5	190	13,2	29
	75	HVCE	31161	F	12	-	1	27,2	690	7,5	190	14,1	31
	100	HVCE	31162	F	12	-	1	29,1	740	9,4	240	14,1	31
	125	HVCE	31163	F	12	-	1	29,9	760	10,2	260	15,9	35
	150	HVCE	31164	F	12	-	1	32,3	820	12,6	320	16,8	37
	175	HVCE	31165	F	12	-	1	33,1	840	13,4	340	17,7	39
	200	HVCE	31166	F	12	-	1	33,1	840	13,4	340	19,1	42
	225	HVCE	31323	F	12	-	1	35,6	905	15,9	405	21,4	47
	250	HVCE	31324	F	12	-	1	35,6	905	15,9	405	21,4	47
	275	HVCE	31325	F	12	-	1	38,6	980	18,9	480	23,6	52
	300	HVCE	31326	F	12	-	1	38,6	980	18,9	480	23,6	52
	600	HVCE	2-31326	F	12	-	2	32,9	835	18,9	480	42,7	94
	900	HVCE	3-31326	F	12	-	3	35,6	905	18,9	480	62,3	137

* For other Capacity Contact Factory

Model # : HVCE -3-31326 - F -12 - OPTION

HVCB : Open Bare Unit
HVCE : Enclose Unit in TYPE-1, 12, 3R

Fuse Configuration : F=3 Fuses 2F = 2 Fuses

Option(s)	Avalaible on request
DR	Damping Reactor
DS2000	Tuned Reactor
DS1000	Detuned Reactor
BFI	Blown Fuse Indication
CM	Current Monitoring (Phase)

- **3300, 6600, and 6900 Volts are also available (contact factory for details)**
- See page 21 IEEE Table Selecting Guide per Motors size vs Capacitors (kVAR)

Application and Installation of Power Factor Correction Capacitors

Understanding Power Factor

Power factor is a measure of an electrical system's efficiency. In order to understand how this efficiency is measured it is important to understand a few terms first.

- Real, or active power, measured in watts, performs the actual work in an industrial plant, such as creating heat or light or producing machine output.
- Reactive, or magnetizing power, measured in vars, provides the magnetizing power to create the flux needed for inductive devices such as induction motors or transformers.
- Apparent power, measured in volt amps, is made up of real and reactive power.

The relationship of these three is best illustrated using a right angle

The equation that expresses the relationship between these three is:

$$KVA^2 = KW^2 + kVAR^2$$

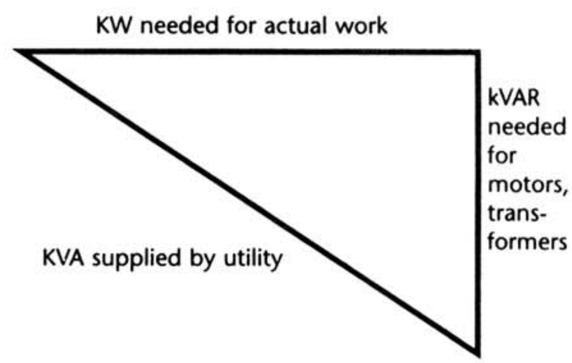
Electrical systems require both watts and kVAR and it is the relationship between them that determines the power factor.

Power factor is the ratio of real (working) power to apparent power. Expressed as an equation this is:

$$\text{Power factor} = \frac{KW}{KVA}$$

Looking at the right angle, you can see that by using capacitors to supply the kVARs, you can reduce the amount of KVA needed from the utility. By reducing the KVA required you can often reduce your electric bill.

Power Factor



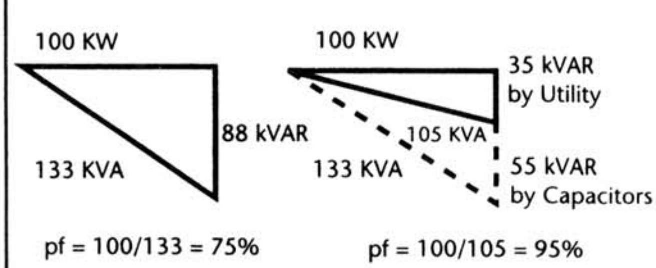
BENEFITS OF POWER FACTOR CORRECTION CAPACITORS

There are several benefits associated with applying power factor correction capacitors. These are:

- Reduced electric bills because of higher power factor
- Increased system capacity
- Reduced line losses
- Improved system voltage

Let's take a look at each of these benefits and see how you can take advantage of them.

Adding Capacitors Reduces Power Bills



Capacitors reduce KVA required & raise pf eliminating the pf penalty & saving money

Reduced Electric Bills

Since utilities have to supply the kVAR for a plant's inductive loads they usually include a charge for this in their electric bills. This charge can take several different forms.

KVA DEMAND CHARGE

The Situation A plant uses 1000 KVA and 800 KW, giving it a power factor of 80%.
The desired power factor is 95%.
The utility charges $2.50/KVA of demand.

The Solution Determine the amount of kVAR needed to increase the power factor from 80% to 95%. Using the Power Factor Table *(See page 17)* find the factor .421.
Multiply this factor times the KW to determine the kVAR needed to correct to this power factor.
800 KW X .421 = 337 kVAR (The nearest available size is 320 kVAR).

The Savings Determine the reduced KVA at 95% power factor.

$$\frac{800\ KW}{.95} = 842\ KVA$$

(1000 KVA - 842 KVA) X $2.50/KVA X 12 months = $4740.
The annual savings for applying 320 kVAR is almost $5000.

KW DEMAND CHARGE

The Situation A plant uses 1000 KW at 75% power factor.
The utility charges $10/KW and has a target power factor of 85%.
Therefore the present Demand Charge is:
1000 KW X 85/75 X $10/KW
Demand Charge is $11333 per month.

The Solution Determine the amount of kVAR needed to increase the power factor from 75% to 85%.
Using the Power Factor Table *(See page 17)* find the factor .262.
Multiply this factor times the KW to determine the kVAR needed to correct to this power factor.
1000 KW X .262 = 262 kVAR (The nearest available size is 250 kVAR)

The Savings After capacitors are installed the new Demand Charge will be reduced to:
1000 KW X .85/.85 X $10/KW = $10000 per month.
This represents a savings of $1333 per month or an annual savings of $16000.

kVAR DEMAND CHARGE

The Situation A plant presently has a Demand of 1500 KW and 1200 kVAR.
The utility charges $1.50/kVAR Demand in excess of 1/3 of the KW Demand.

The Solution Calculate the kVAR in excess of 1/3 of the KW Demand

$$1200 - \left(\frac{1500}{3}\right) = 700\ kVAR$$

This results in a monthly charge of 700 kVAR X $1.50/kVAR = $1050.
700 kVAR is needed to eliminate the kVAR Demand penalty.

The Savings By applying 700 kVAR of capacitors, $12600 in annual Demand Charges can be eliminated.

Increased System Capacity

The application of capacitors releases system capacity by reducing the current drawn from the power supply. This takes some of the load off transformers and cable. In systems that are already overloaded or near the limit, the addition of capacitors can eliminate the need to purchase transformers, switchgear and cable, often saving many times the price of the capacitors.

The Situation An individual plant, operating near capacity, uses 1000 KVA at 75% power factor for a real working power load of 750 KW. It is planning an expansion that will require 950 KW, which is beyond their transformer's capacity at 75% power factor. Rather than buying a new transformer they can accommodate this additional load by adding capacitors.

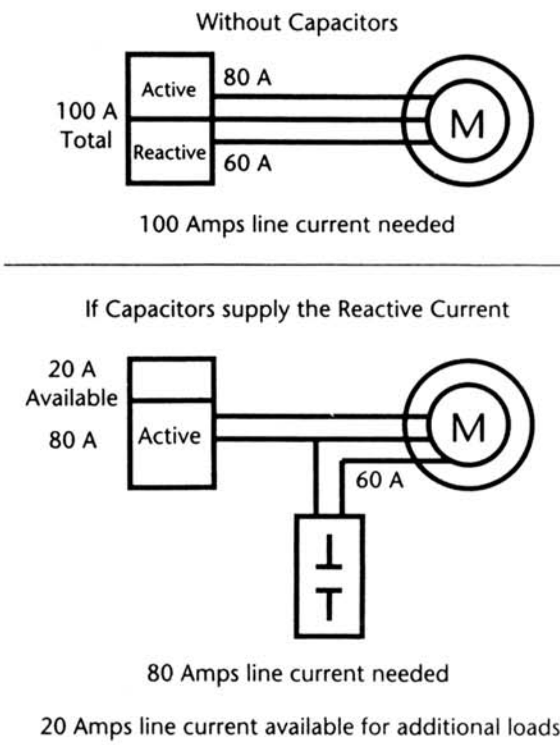
The Solution The new power factor required for a 950 KW load at 1000 KVA is:
950 KW/1000 KVA = 95% power factor.
Determine the amount of the kVAR needed to increase the power factor from 75% to 95%. Using the Power Factor Table *(See page 17)* find factor .553. Multiply this factor times the KW to determine the kVAR needed to correct to this power factor.
750 KW X .553 = 415 kVAR (the nearest available size is 400 kVAR.)

The Savings By applying capacitors, the need for a new transformer is eliminated.

Reduced Line Losses

When an industrial plant has a poor power factor, additional reactive current must be carried through the distribution system to the inductive loads. This creates additional I^2R losses that must be paid for through the purchase of additional kilowatt hours.

Capacitors Increase System Capacity



By placing capacitors at the inductive loads, and thereby raising the power factor, these losses are eliminated and fewer kilowatt hours need to be purchased. This reduction in the system losses can be calculated by the following:

$$\% \text{ line loss reduction} = 100 - 100 \left(\frac{\text{original power factor}}{\text{corrected power factor}}\right)^2$$

Improved System Voltage

The addition of capacitors also helps improve system voltage. Excessive voltage drops cause poor motor performance and overheating which can shorten the motor's life. It also interferes with lighting and electronic controls. Adding capacitors will boost the system voltage, especially on long distribution lines, providing more efficient motor performance, longer motor life and overall improved plant productivity. This expected voltage rise can be calculated by:

$$\% \text{ voltage rise} = \frac{\% \text{ transformer impedance X kVAR of capacitors}}{\text{transformer KVA}}$$

Original Power Factor in Percent	Desired Power Factor in Percent																				
	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
50	0.982	1.008	1.034	1.060	1.086	1.112	1.139	1.165	1.192	1.220	1.248	1.276	1.306	1.337	1.369	1.403	1.440	1.481	1.529	1.590	1.732
51	0.937	0.963	0.989	1.015	1.041	1.067	1.093	1.120	1.147	1.174	1.202	1.231	1.261	1.291	1.324	1.358	1.395	1.436	1.484	1.544	1.687
52	0.893	0.919	0.945	0.971	0.997	1.023	1.049	1.076	1.103	1.130	1.158	1.187	1.217	1.247	1.280	1.314	1.351	1.392	1.440	1.500	1.643
53	0.850	0.876	0.902	0.928	0.954	0.980	1.007	1.033	1.060	1.088	1.116	1.144	1.174	1.205	1.237	1.271	1.308	1.349	1.397	1.458	1.600
54	0.809	0.835	0.861	0.887	0.913	0.939	0.965	0.992	1.019	1.046	1.074	1.103	1.133	1.163	1.196	1.230	1.267	1.308	1.356	1.416	1.559
55	0.768	0.794	0.820	0.846	0.873	0.899	0.925	0.952	0.979	1.006	1.034	1.063	1.092	1.123	1.156	1.190	1.227	1.268	1.315	1.376	1.518
56	0.729	0.755	0.781	0.807	0.834	0.860	0.886	0.913	0.940	0.967	0.995	1.024	1.053	1.084	1.116	1.151	1.188	1.229	1.276	1.337	1.479
57	0.691	0.717	0.743	0.769	0.796	0.822	0.848	0.875	0.902	0.929	0.957	0.986	1.015	1.046	1.079	1.113	1.150	1.191	1.238	1.299	1.441
58	0.655	0.681	0.707	0.733	0.759	0.785	0.811	0.838	0.865	0.892	0.920	0.949	0.979	1.009	1.042	1.076	1.113	1.154	1.201	1.262	1.405
59	0.618	0.644	0.670	0.696	0.723	0.749	0.775	0.802	0.829	0.856	0.884	0.913	0.942	0.973	1.006	1.040	1.077	1.118	1.165	1.226	1.368
60	0.583	0.609	0.635	0.661	0.687	0.714	0.740	0.767	0.794	0.821	0.849	0.878	0.907	0.938	0.970	1.005	1.042	1.083	1.130	1.191	1.333
61	0.549	0.575	0.601	0.627	0.653	0.679	0.706	0.732	0.759	0.787	0.815	0.843	0.873	0.904	0.936	0.970	1.007	1.048	1.096	1.157	1.299
62	0.515	0.541	0.567	0.593	0.620	0.646	0.672	0.699	0.726	0.753	0.781	0.810	0.839	0.870	0.903	0.937	0.974	1.015	1.062	1.123	1.265
63	0.483	0.509	0.535	0.561	0.587	0.613	0.639	0.666	0.693	0.720	0.748	0.777	0.807	0.837	0.870	0.904	0.941	0.982	1.030	1.090	1.233
64	0.451	0.477	0.503	0.529	0.555	0.581	0.607	0.634	0.661	0.688	0.716	0.745	0.775	0.805	0.838	0.872	0.909	0.950	0.998	1.058	1.201
65	0.419	0.445	0.471	0.497	0.523	0.549	0.576	0.602	0.629	0.657	0.685	0.714	0.743	0.774	0.806	0.840	0.877	0.919	0.966	1.027	1.169
66	0.388	0.414	0.440	0.466	0.492	0.519	0.545	0.572	0.599	0.626	0.654	0.683	0.712	0.743	0.775	0.810	0.847	0.888	0.935	0.996	1.138
67	0.358	0.384	0.410	0.436	0.462	0.488	0.515	0.541	0.568	0.596	0.624	0.652	0.682	0.713	0.745	0.779	0.816	0.857	0.905	0.966	1.108
68	0.328	0.354	0.380	0.406	0.432	0.459	0.485	0.512	0.539	0.566	0.594	0.623	0.652	0.683	0.715	0.750	0.787	0.828	0.875	0.936	1.078
69	0.299	0.325	0.351	0.377	0.403	0.429	0.456	0.482	0.509	0.537	0.565	0.593	0.623	0.654	0.686	0.720	0.757	0.798	0.846	0.907	1.049
70	0.270	0.296	0.322	0.348	0.374	0.400	0.427	0.453	0.480	0.508	0.536	0.565	0.594	0.625	0.657	0.692	0.729	0.770	0.817	0.878	1.020
71	0.242	0.268	0.294	0.320	0.346	0.372	0.398	0.425	0.452	0.480	0.508	0.536	0.566	0.597	0.629	0.663	0.700	0.741	0.789	0.849	0.992
72	0.214	0.240	0.266	0.292	0.318	0.344	0.370	0.397	0.424	0.452	0.480	0.508	0.538	0.569	0.601	0.635	0.672	0.713	0.761	0.821	0.964
73	0.186	0.212	0.238	0.264	0.290	0.316	0.343	0.370	0.396	0.424	0.452	0.481	0.510	0.541	0.573	0.608	0.645	0.686	0.733	0.794	0.936
74	0.159	0.185	0.211	0.237	0.263	0.289	0.316	0.342	0.369	0.397	0.425	0.453	0.483	0.514	0.546	0.580	0.617	0.658	0.706	0.766	0.909
75	0.132	0.158	0.184	0.210	0.236	0.262	0.289	0.315	0.342	0.370	0.398	0.426	0.456	0.487	0.519	0.553	0.590	0.631	0.679	0.739	0.882
76	0.105	0.131	0.157	0.183	0.209	0.235	0.262	0.288	0.315	0.343	0.371	0.400	0.429	0.460	0.492	0.526	0.563	0.605	0.652	0.713	0.855
77	0.079	0.105	0.131	0.157	0.183	0.209	0.235	0.262	0.289	0.316	0.344	0.373	0.403	0.433	0.466	0.500	0.537	0.578	0.626	0.686	0.829
78	0.052	0.078	0.104	0.130	0.156	0.183	0.209	0.236	0.263	0.290	0.318	0.347	0.376	0.407	0.439	0.474	0.511	0.552	0.599	0.660	0.802
79	0.026	0.052	0.078	0.104	0.130	0.156	0.183	0.209	0.236	0.264	0.292	0.320	0.350	0.381	0.413	0.447	0.484	0.525	0.573	0.634	0.776
80	0.000	0.026	0.052	0.078	0.104	0.130	0.157	0.183	0.210	0.238	0.266	0.294	0.324	0.355	0.387	0.421	0.458	0.499	0.547	0.608	0.750
81		0.000	0.026	0.052	0.078	0.104	0.131	0.157	0.184	0.212	0.240	0.268	0.298	0.329	0.361	0.395	0.432	0.473	0.521	0.581	0.724
82			0.000	0.026	0.052	0.078	0.105	0.131	0.158	0.186	0.214	0.242	0.272	0.303	0.335	0.369	0.406	0.447	0.495	0.556	0.698
83				0.000	0.026	0.052	0.079	0.105	0.132	0.160	0.188	0.216	0.246	0.277	0.309	0.343	0.380	0.421	0.469	0.530	0.672
84					0.000	0.026	0.053	0.079	0.106	0.134	0.162	0.190	0.220	0.251	0.283	0.317	0.354	0.395	0.443	0.503	0.646
85						0.000	0.026	0.053	0.080	0.107	0.135	0.164	0.194	0.225	0.257	0.291	0.328	0.369	0.417	0.477	0.620
86							0.000	0.027	0.054	0.081	0.109	0.138	0.167	0.198	0.230	0.265	0.302	0.343	0.390	0.451	0.593
87								0.000	0.027	0.054	0.082	0.111	0.141	0.172	0.204	0.238	0.275	0.316	0.364	0.424	0.567
88									0.000	0.027	0.055	0.084	0.114	0.145	0.177	0.211	0.248	0.289	0.337	0.397	0.540
89										0.000	0.028	0.057	0.086	0.117	0.149	0.184	0.221	0.262	0.309	0.370	0.512
90											0.000	0.029	0.058	0.089	0.121	0.156	0.193	0.234	0.281	0.342	0.484
91												0.000	0.030	0.060	0.093	0.127	0.164	0.205	0.253	0.313	0.456
92													0.000	0.031	0.063	0.097	0.134	0.175	0.223	0.284	0.426
93														0.000	0.032	0.067	0.104	0.145	0.192	0.253	0.395
94															0.000	0.034	0.071	0.112	0.160	0.220	0.363
95																0.000	0.037	0.078	0.126	0.186	0.329

Find the Original Power Factor along the Vertical scale and the Desired Power Factor along the Horizontal scale. Multiply the factor at the intersection point by the System KW. The result is the kVAR needed to bring the System up to the Desired Power Factor. **EXAMPLE:** 500 KW at 75% PF to be improved to 95% PF. From the Table read .553 where 75% and 95% intersect. Multiply this by 500 KW. The result, 276, is the kVAR needed to bring the System up to 95% PF. Select the nearest standard rating.

Installing Capacitors in the Plant

The most efficient method of applying capacitors is to use a combination of individual units, fixed banks, and automatic switched banks. It is most important to remember that in applying capacitors, the power factor must not exceed 100%. This can best be accomplished by properly applying the different types of capacitors.

Individual units usually can be applied on larger motors in the plant. Fixed and automatic switched banks can be applied on the distribution system to supply kVAR to several motor loads. If the kVAR requirement is fairly constant a fixed bank can be used. If the kVAR requirement varies considerably, an automatic switched bank may provide a better solution. The automatic bank will supply the proper amount of kVAR to the loads when it is called on to do so, up to its maximum output rating.

CAPACITOR A is installed at the motor on the secondary side of the thermal overload. Usually this location is used for new motor installations. This is an excellent application for individual units.

Advantages

- Can be switched on and off with the motor eliminating the need for a separate switch
- No additional overcurrent protection is required
- kVAR is produced at the location where it is needed
- Line losses and voltage drop are minimized
- A smaller thermal overload may be able to be used

Disadvantages

- Small individual kVAR units are usually more expensive per kVAR than larger units serving several motors
- Installation costs are higher due to the multiple installations
- If there is an existing thermal overload, it may have to be replaced with a smaller one

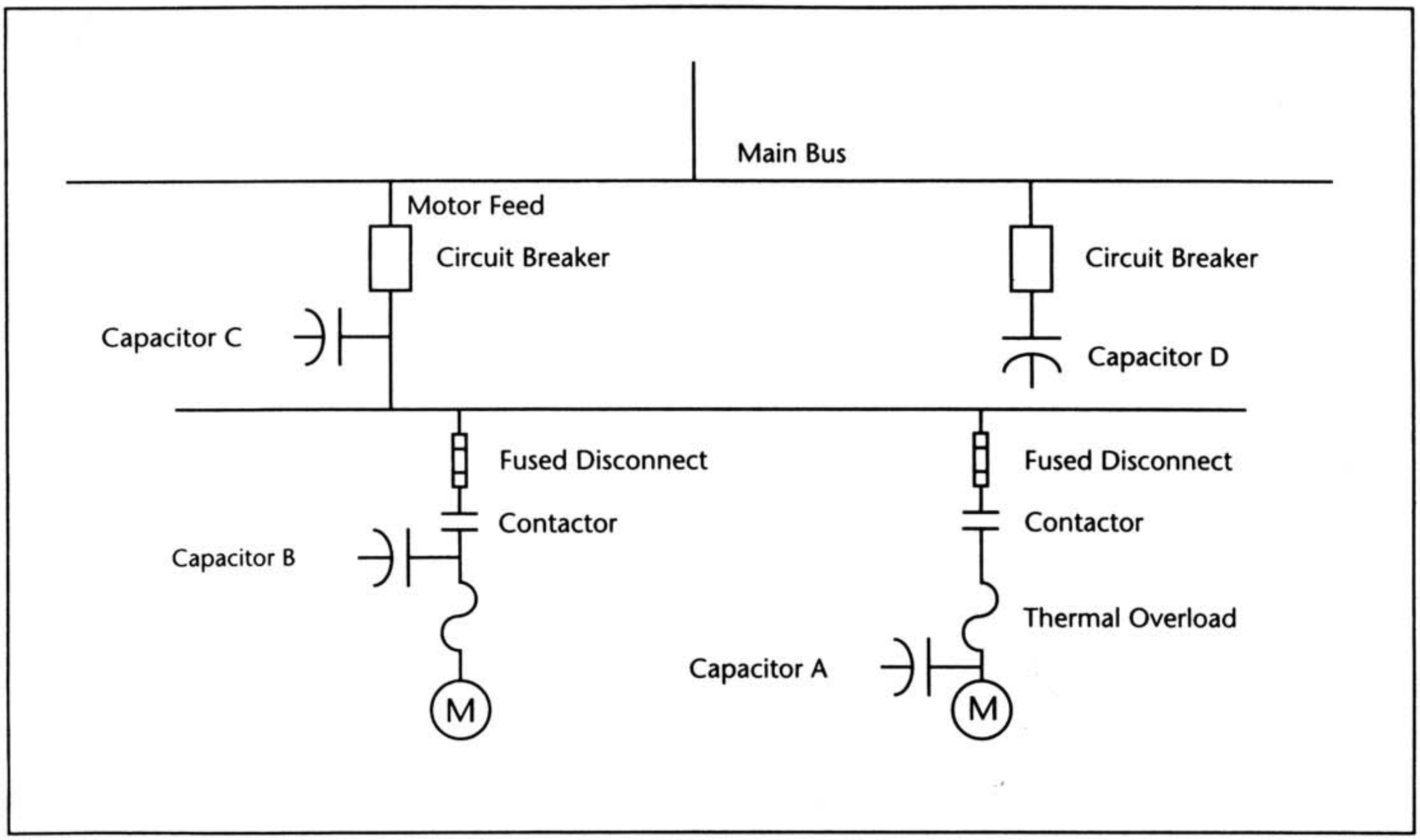
CAPACITOR B is installed at the motor between the contactor and thermal overload. Usually this location is used for existing motor installations. This is an excellent application for individual units.

Advantages

- Can be switched on and off with the motor eliminating the need for a separate switch
- No additional overcurrent protection is required
- kVAR is produced at the location where it is needed
- Line losses and voltage drop are minimized
- The thermal overload can be set for the full load current rating of the motor

Disadvantages

- Small individual kVAR units are usually more expensive per kVAR than larger units serving several motors
- Installation costs are higher due to the multiple installations



CAPACITOR C is installed between the circuit breaker and contactors. This is a good application for large fixed or automatic switched banks.

Advantages

- Since the capacitor is feeding several motors, a larger, more cost-effective size capacitor can be applied
- This location is recommended for jogging motors, multi-speed motors, and reversing motors

Disadvantages

- Higher line losses, bigger voltage drops, and less released system capacity will be realized since the capacitors are further away from where they are needed
- Because the capacitors are not switched with the motors and all motors may not be running all the time, there is more of a chance of overcorrecting, resulting in leading power factor

CAPACITOR D is installed at the main bus. This is an excellent application for an automatic switched bank or possibly a large fixed bank.

Advantages

- The lowest cost per kVAR and lowest maintenance costs are realized
- An automatic switched bank will monitor the system power factor and provide the proper amount of kVAR to reach the plant's targeted power factor

Disadvantages

- A separate means of disconnect and overcurrent protection must be provided
- Higher line losses, bigger voltage drops, and less released system capacity will be realized since the capacitors are further away from where they are needed
- If a fixed bank is used, there is more of a chance of overcorrecting, resulting in leading power factor

SELECTING CAPACITORS FOR MOTORS / SUGGESTED MAXIMUM CAPACITOR RATINGS

		NOMINAL MOTOR SPEED (IN RPM) AND NO. OF POLES											
	INDUCTION MOTOR RATING(hp)	3600 2		1800 4		1200 6		900 8		720 10		600 12	
		kVAR	% AR	kVAR	% AR	kVAR	% AR	kVAR	% AR	kVAR	% AR	kVAR	% AR
PRE-U-FRAME NEMA DESIGN B 230 V, 460 V, 575 V Squirrel-Cage Motors	3	1.5	14	1.5	15	1.5	20	2	27	2.5	35	3.5	41
	5	2	12	2	13	2	17	3	25	4	32	4.5	37
	7.5	2.5	11	2.5	12	3	15	4	22	5.5	30	6	34
	10	3	10	3	11	3.5	14	5	21	6.5	27	7.5	31
	15	4	9	4	10	5	13	6.5	18	8	23	9.5	27
	20	5	9	5	10	6.5	12	7.5	16	9	21	12	25
	25	6	9	6	10	7.5	11	9	15	11	20	14	23
	30	7	8	7	9	9	11	10	14	12	18	16	22
	40	9	8	9	9	11	10	12	13	15	16	20	20
	50	12	8	11	9	13	10	15	12	19	15	24	19
	60	14	8	14	8	15	10	18	11	22	15	27	19
	75	17	8	16	8	18	10	21	10	26	14	32.5	18
	100	22	8	21	8	25	9	27	10	32.5	13	40	17
	125	27	8	26	8	30	9	32.5	10	40	13	47.5	16
	150	32.5	8	30	8	35	9	37.5	10	47.5	12	52.5	15
	200	40	8	37.5	8	42.5	9	47.5	10	60	12	65	14
	250	50	8	45	7	52.5	8	57.5	9	70	11	77.5	13
	300	57.5	8	52.5	7	60	8	65	9	80	11	87.5	12
	350	65	8	50	7	67.5	8	75	9	87.5	10	95	11
	400	70	8	65	6	75	8	85	9	95	10	105	11
	450	75	8	67.5	6	80	8	92.5	9	100	9	110	11
	500	77.5	8	72.5	6	82.5	8	97.5	9	107.5	9	115	10
U-FRAME NEMA DESIGN B 230 V, 460 V, 575 V Squirrel-Cage Motors (to 1956)	2	1	17	1	20	1	23	1	24	–	–	–	–
	3	1	11	1	16	1	19	2	24	–	–	–	–
	5	1	9	2	15	2	19	2	20	–	–	–	–
	7.5	1	6	2	13	4	19	4	20	–	–	–	–
	10	2	5	2	11	4	16	5	15	5	17	5	21
	15	4	6	4	11	4	13	5	15	5	17	5	21
	20	4	6	5	11	5	13	5	15	10	17	5	21
	25	5	5	5	8	5	9	5	15	10	17	10	18
	30	5	6	5	8	5	9	10	15	10	15	10	18
	40	5	6	10	8	10	9	10	15	10	15	15	17
	50	5	6	10	8	10	9	15	12	15	12	20	17
	60	10	6	10	8	10	9	15	12	20	12	25	17
	75	15	6	15	8	15	9	20	11	25	12	30	17
	100	15	6	20	8	25	9	25	11	40	12	45	17
	125	20	6	25	7	30	9	30	11	45	12	45	15
	150	25	6	30	7	30	9	40	11	45	12	50	15
	200	35	6	40	7	60	9	55	11	55	11	60	13
	250	40	5	40	6	60	9	80	11	60	11	100	13
	300	45	5	45	6	80	8	80	10	80	10	120	13
	350	60	5	70	6	80	8	80	9	–	–	–	–
	400	60	5	80	6	80	6	160	–	–	–	–	–
	450	70	5	100	6	–	–	–	–	–	–	–	–
	500	70	5	–	–	–	–	–	–	–	–	–	–

Legend :
- % AR => Percentage of Amp Reduction
- kVAR => Reactive Power required for = > 93%
- 3600 => Motor Speed
- 2 => Number of pole (construction)

SELECTING CAPACITORS FOR MOTORS / SUGGESTED MAXIMUM CAPACITOR RATINGS

T-FRAME NEMA DESIGN B — 230 V, 460 V, 575 V Squirrel-Cage Motors (after 1956)

INDUCTION MOTOR RATING(hp)	NOMINAL MOTOR SPEED (IN RPM) AND NO. OF POLES											
	3600		1800		1200		900		720		600	
	2		4		6		8		10		12	
	kVAR	% AR	kVAR	% AR	kVAR	% AR	kVAR	% AR	kVAR	% AR	kVAR	% AR
3	1.5	14	1.5	23	2.5	28	3	38	3	40	4	40
5	2	14	2.5	22	3	26	4	31	4	40	5	40
7.5	2.5	14	3	20	4	21	5	28	5	38	6	45
10	4	14	4	18	5	21	6	27	7.5	36	8	38
15	5	12	5	18	6	20	7.5	24	8	32	10	34
20	6	12	6	17	7.5	18	9	23	10	29	12	30
25	7.5	12	7.5	17	8	19	10	23	12	25	18	30
30	8	11	8	16	10	19	14	22	15	24	22.5	30
40	12	12	13	15	16	19	18	21	22.5	24	25	30
50	15	12	18	15	20	19	22.5	21	24	24	30	30
60	18	12	21	14	22.5	17	26	20	30	22	35	28
75	20	12	23	14	25	15	28	17	33	14	40	19
100	22.5	11	30	14	30	12	36	16	40	15	45	17
125	25	10	35	12	35	12	42	14	45	15	50	17
150	30	10	42	12	40	12	52.5	14	52.5	14	60	17
200	35	10	50	11	50	10	66	13	68	13	90	17
250	40	11	60	10	62.5	10	82	13	87.5	13	100	17
300	45	11	68	10	75	12	100	14	100	13	120	17
350	50	12	75	8	90	12	120	13	120	13	135	15
400	75	10	80	8	100	12	130	13	140	13	150	15
450	90	8	90	8	120	10	140	12	160	14	160	15
500	100	8	120	9	150	12	150	12	180	13	180	15

	INDUCTION MOTOR RATING(hp)	NOMINAL MOTOR SPEED (IN RPM) AND NO. OF POLES											
		3600		1800		1200		900		720		600	
		2		4		6		8		10		12	
		kVAR	% AR	kVAR	% AR	kVAR	% AR	kVAR	% AR	kVAR	% AR	kVAR	% AR
NEMA DESIGN B 2300 & 4000 Volt Motors (after 1956)	100	25	7	25	10	25	11	25	11	25	12	25	17
	120	25	7	25	9	25	10	25	10	25	11	50	15
	150	25	7	25	8	25	8	25	9	50	11	50	15
	200	25	7	25	6	50	8	50	9	50	10	75	14
	250	50	7	50	5	50	8	50	9	75	10	100	14
	300	50	7	50	5	75	8	75	9	75	9	100	12
	350	50	6	50	5	75	8	75	9	75	9	100	11
	400	50	5	50	5	75	6	100	9	100	9	100	10
	450	75	5	50	5	75	6	100	8	100	8	100	8
	500	75	5	75	5	100	6	125	8	125	8	125	8
	600	75	5	100	5	100	5	125	7	125	8	125	8
	700	100	5	100	5	100	5	125	7	150	8	150	8
	800	100	5	125	5	125	5	150	7	150	8	150	8
	900	125	5	150	5	200	5	200	6	250	7	250	7
	1000	150	5	200	5	250	5	250	6	250	7	250	7
	1250	200	5	200	5	250	5	300	6	300	6	300	6
NEMA DESIGN C 2300 & 4000 Volt Motors (after 1956)	100	–	–	25	11	25	11	25	11	25	11	–	–
	125	–	–	25	11	25	11	25	11	25	11	–	–
	150	–	–	25	9	25	9	50	9	–	–	–	–
	200	–	–	50	9	50	9	50	9	–	–	–	–
	250	–	–	50	8	50	9	50	9	–	–	–	–
	300	–	–	50	6	75	9	75	9	–	–	–	–
	350	–	–	50	6	75	8	75	9	–	–	–	–

SUGGESTED WIRE SIZES AND PROTECTIVE DEVICE RATINGS

	240 VOLTS		480 VOLTS		600 VOLTS	
kVAR	RATED CURRENT PER PHASE (A)	MINIMUM WIRE SIZE 90°C INSULATION	RATED CURRENT PER PHASE (A)	MINIMUM WIRE SIZE 90°C INSULATION	RATED CURRENT PER PHASE (A)	MINIMUM WIRE SIZE 90° INSULATION
2	–	–	2.4	14	–	–
3	–	–	3.6	14	2.9	18
4	–	–	4.8	14	–	–
5	12	12	6.0	14	–	–
6	–	–	7.2	14	5.8	14
7.5	18	10	9.0	14	7.2	14
10	24	8	12	12	9.6	14
15	36	8	18	10	14	12
20	48	8	24	8	19	10
25	60	4	30	8	24	10
30	72	3	36	8	29	10
40	96	1	48	8	38	8
50	120	2/0	60	4	48	8
60	144	3/0	72	3	58	6
70	–	–	84	2	–	–
75	–	–	90	2	72	3
80	192	250	96	1	–	–
90	217	300	108	1/0	–	–
100	241	350	120	2/0	96	2
120	289	500	144	3/0	115	2/0
140	–	–	168	4/0	–	–
150	361	(2)-4/0	180	4/0	144	3/0
160	385	(2)-250	192	250	–	–
180	433	(2)-300	217	300	173	4/0
200	481	(2)-350	241	350	192	250
210	–	–	253	350	–	–
225	–	–	–	–	217	300
240	–	–	289	500	231	300
250	601	(2)-500	301	500	241	350
270	–	–	325	(2)-3/0	–	–
280	–	–	337	(2)-3/0	–	–
300	722	(3)-350	361	(2)-4/0	289	500
320	–	–	385	(2)-250	–	–
360	–	–	433	(2)-300	–	–
375	–	–	–	–	361	(2)-4/0
400	–	–	481	(2)-350	385	(2)-250
420	–	–	505	(2)-350	–	–
450	–	–	541	(2)-400	433	(2)-300
480	–	–	577	(2)-500	–	–
500	–	–	601	(2)-500	481	(2)-350
540	–	–	650	(2)-600	–	–
600	–	–	722	(3)-350	577	(2)-500

Wire sizes based on 135% rated capacitor current and not more than 3 conductors in a raceway with 30° C ambient using copper conductor per NEC 1993 Table 310-16.

Capacitor switching and disconnect devices should be sized according to the following:

Fuses ....165% of capacitor current

Molded Case Circuit Breakers . . .135% of capacitor current

Useful Formulas

$$kVAR = \frac{2\pi f C (V)^2}{1000}$$

$$pf = \frac{KW}{KVA}$$

$$KVA = \frac{1.73 \times I \times V}{1000}$$

$$KW = \frac{1.73 \times I \times V \times PF}{1000}$$

$$KW = \frac{HP \times .746}{eff}$$

$$I_{cap} = \frac{kVAR3\phi \times 1000}{V_{L-L} \times \sqrt{3}}$$

C	=	Capacitance in μ f
f	=	Frequency
I	=	Full load current in amps
V	=	Voltage
pf	=	Power factor
HP	=	Motor horsepower
eff	=	Motor efficiency expressed as a decimal
I_{cap}	=	Capacitor current per phase

DERATING FACTORS FOR CAPACITORS

$$kVAR\ Output = Rated\ kVAR \times \left(\frac{Operating\ Voltage}{Rated\ Voltage}\right)^2 \times \left(\frac{Operating\ f}{Rated\ f}\right)$$

For Example:

Operating 240V capacitor at 208V yields 75% of nameplate kVAR

Operating 60 Hz capacitor at 50 Hz yields 83% of nameplate kVAR

Power Factor Controller 12 or 6 step
NC12 or N6/N12 Models

N6/N12

NC12

(Communication capability)

TECHNICAL INFORMATION

- Automatic search of C/K values
- Possibility to set different C/K values for inductive and capacitive side*)
- Easy-to-use menu-driven user interface
- 16 character alphanumeric display
- THD (u) **(I)** measurement and alarm*)
- I_{rms}/I_n measurement and alarm
- Measurement and alarm of low capacitor output*)
- Hunting detection and alarm
- Any step used can be defined as a fixed step (permanently ON or OFF)
- Measurement of ambient temperature, possibility to control a cooling fan
- Automatic CT polarity retrieval
- **Automatic configuration of step size, Phase voltage, stepping method, No steps & connection configuration LL / LN**
- Four-quadrant operation*)
- **Dual target P.F. with external control input**
- Display of measured values (I_s, I_q, **P, Q, S**, THD(u) **(I) spectrum**, step status) *)
- Five-language menu texts (English, French, Spanish, German, Finnish)
- State-of-the-art microprocessor technology
- Suitable for systems with or without neutral line
- All steps are released at voltage dropout
- Separate alarm relay with potential-free terminals
- Flexibility and accuracy are combined and used in the design of this regulator. It is possible to use steps of various sizes and choose a combination to suit.
- 35mm DIN-rail (EN 50022) or panel mounting 144 x 144 mm (DIN 43700), depth 90 mm
- Complies with EN 50082-2 and EN 50081-2 EMC standards

SETTINGS AND DISPLAY

- Power factor display 0.00 ind …1.00… 0.00 cap
- Capacitor step indication using alphanumeric display, simultaneously with power factor display
- Led display for alarm and ind/cap
- C/K setting and display 0.00 … 1.99, inductive and capacitive
- CT ration settings and display 100/5 … 6000/5
- Language setting and display (English, French, Spanish, German, Finnish)
- Target power factor setting and display 0.80 ind … 1.00 … 0.90 cap
- Step reconnection delay setting and display 10… 900 seconds (step response delay is automatically set to 20% **to 100%** of reconnection delay, min. 10 s)
- **Automatic** connection setting and display LN/LL
- Stepping program setting and display, Normal, Circulating A, Circulating B, Stack, **Smart**
- Number of steps setting and display 1…12
- Automatic CT polarity detect setting and display
- Setting and display of step sizes, 10…1000 kvar
- Setting and display of input voltage, 80…**750 V**
- Manual stepping and display
- Fixed stepping and display

TECHNICAL SPECIFICATION

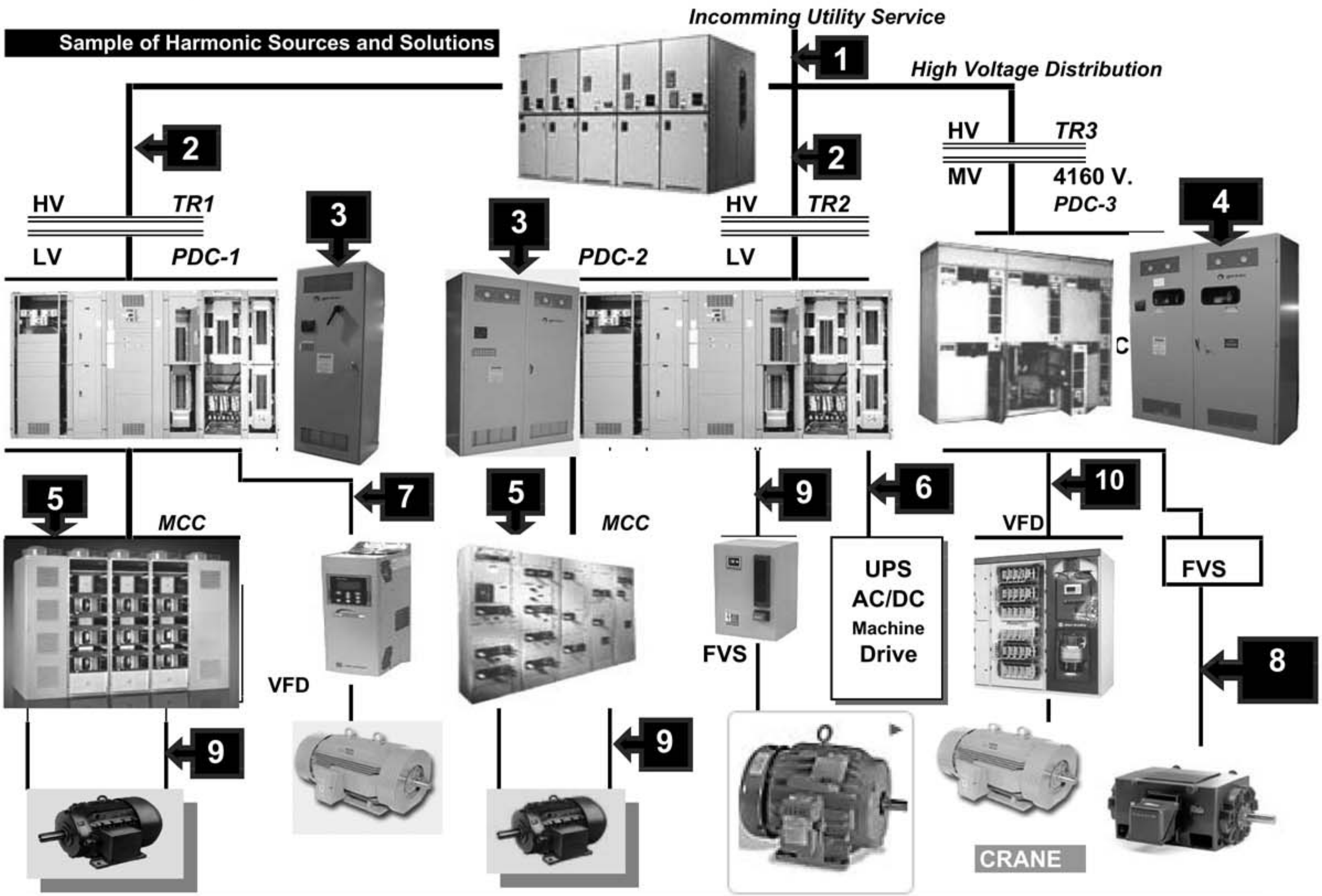
Power supply	120V±15%, burden 8 VA	
Measurement voltage	120V±15%	
	230V @ 460V. ±15%	
	384V @ 750V. ±15%	
Connection	with or without neutral line	
	50Hz or 60Hz ± 2Hz	
Frequency	automatic selection	
CT	**1** & 5 A, burden 0.7 VA	
Manual operation	Manual operation with	
	momentary push button	
Operational sequence	User-selectable from menu	
	normal	1:2:4:4
	stack	1:1:1:1
	circulating A	1:1:1:1
	circulating B	1:1:1:1
	Smart	1:2:2:2
Communication capacity	NC12 RS 485 Modbus	
	Adaptor (optional)	

Output relays	2.0 A, 400 VAC, normally
Control Fan relay	open
	0.3 A, 110 VDC
	5.0 A, 30 VDC
Alarm relay	open
	0.3 A, 110 VDC
Accuracy class	C12: 1.5%
	C6: 2.5%
Ambient temperature	0…+ 60°C
Protection class	IP 40 at panel installation
	IP 20 DIN-rail installation
Dimensions	144X144 mm, depth 90 mm
Panel cut-out	138X138 mm, -0…+1 mm
Weight	0.9 kg

Your Solution of Power Quality Correction by Location and Application

gentec

Sample of Harmonic Sources and Solutions



Zone	Power Quality Correction Network " Solution Required by Location "						
#	Improving .	PFC	V.R.	C.R.	P.R.	C.B.	H.F.
1	Outside Main HV Sub.	a, b, c, d	g	a, b, c,d, g	a, b, c,d, g	g	c, d, g
2	Inside Main HV Sub.	a, b, c, d		a, b, c, d	a, b, c, d	a, b, c, d	c, d, e
3	Inside LV Main Dist..	b, c, d, e	a, e,	b, c, d, e	b, c, d, e	e,f,	c,d, e, f
4	Inside MV Main Dist..	a, b, c, d	a, f	a, b, c,d,f	a, b, c,d,f	f	c, d ,f
5	LV MCC	b, c, d, e	a, e,	b, c, d, e	b, c, d, e	e, f,	c,d, e, f
6	LV Sub Feeder	c, d, e	e	c, d, e	c, d, e	e	c, d, e
7	LV Motor Drive	c, d, e	e	c, d, e	c, d, e	e	c, d, e
8	MV Motor	a, d,	a, d,	a, d,	a, d,	f	-
9	LV Motor	a	-	a	a	-	-
10	MV Motor	c, d, f	f	c, d, f	c, d, f	f	f, g

Location

HV	High Voltage
MV	Medium Voltage
LV	Low Voltage
UPS	Uninterruptable Power Supply
MCC	Motor Control Center
PDC	Power Distribution Center
FVS	Full Voltage Starter
VFD	Variable Frequency Drive

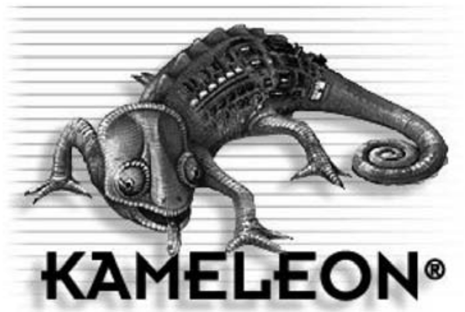
Improvement (s)

PFC.	Power Factor Correction (%)
VR .	Voltage regulation (V)
CR .	Current reduction (A)
PR .	Demand reduction (Kva)
CB .	Current Ballancing (Phase)
HF .	Harmonic Filtration (THD)

Products Solutions

FPFC.	a	Fixe Power Factor Correction
APFC.	b	Auto Power Factor Center
TF .	c	Tuned Harmonic Filter
DF .	d	Detune Harmonic Filter
AF .	e	Active Filter
FSC .	f	Fast Static Compensator
SVC .	g	Static VAR Compensator

Gentec products line over view • www.gentec.ca



With its Kameleon line, Gentec provides a solution for all your lighting control needs. Whether it is with the K4 series for small to medium-sized facilities, or with the K8 series with the Echelon[MD] technology for larger installations, our Kameleon line adapts to your specific needs.

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Whether you manage a hotel, a nursing home, a shopping centre or any other commercial building, you are committed to both your client's comfort and your facility's profitability.

Gentec's Ambiance system was developed in order to help you achieve these two goals. This integrated power management system enables you to control power consumption while preserving comfort for your tenants

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- FT100, FT200 Passive Filter
- DS100, DS200 DriveSaver
- FT400 Active Filter
- HVCE 3 Ph. Cap (2400@6900 V)
- C1000 & FT1000 HV Metal Enclosed 5,15,25 kV

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