



KELCAP – POWER CAPACITORS

HEAVY DUTY/ SUPER HEAVY DUTY APPLICATION

POWER FACTOR CORRECTION IN INDUSTRIES HAVING FLUCTUATING LOAD SUCH AS CHEMICAL INDUSTRIES, PHARMACEUTICALS, FLOUR MILLS, CEMENT PLANTS, AUTOMOBILE INDUSTRIES, SUGAR PLANTS ETC

KELCAP – HDC	KELCAP - SHS
 A cylindrical metal capacitor with a black top cap and a label. The label includes the KELTRON logo and technical specifications.	 A rectangular capacitor with a green top section and a light-colored main body. It has mounting brackets on the sides and a label with technical details.

KELTRON COMPONENT COMPLEX LIMITED

KELCAP – POWER CAPACITORS
KELCAP – HDC / KELCAP – SHS

KELTRON POWER CAPACITORS – SELF HEALING TYPE
FOR AC POWER SYSTEMS CONFIRMING TO INDIAN STANDARD IS 13340-1993

The need for improved power quality and reduction in energy cost is the order of the day. Every electrical load operating on the principle of magnetic field such as motors, chokes, transformers, welding sets, inductive heating and generators consume both reactive and active power. This scenario results in lower quality of power and reduced availability with lower capacity utilization and increased cost of generation. Keltron with the state of art latest technologies and extensive expertise has developed wide range of low tension power factor correction capacitors which offer simple and cost effective solution to improve power quality with reduction in energy cost.

CONSTRUCTIONAL FEATURES

Keltron power factor correction capacitor integrates MPP wound elements using self healing low loss MPP film. These dry sections are end sprayed with Zinc and are inserted into cans with filling of fire retardant resin and then cured. These cans are mounted inside metal enclosures with appropriate termination and discharge resistors. Heavy duty and super heavy duty types are explosion proof designs with low wattage losses. The different types of heavy duty power factor correction capacitors are:

MODEL	SALIENT FEATURES
KELCAP-HDC	<ul style="list-style-type: none"> ➤ For heavy duty application with cylindrical metal can construction. ➤ Provided with explosion proof design ➤ PF correction in industries having fluctuating loads such as chemical industries, pharmaceuticals, flour mills, process industries etc ➤ M12 stud mounting ➤ Confirms to Indian Standard IS 13340-1993 ➤ MPP Self healing type/ with safety discharge resistor/over pressure cut off device. ➤ ISI marked/ Low wattage losses.
KELCAP-SHS	<ul style="list-style-type: none"> ➤ For super heavy duty application with square cap construction. ➤ Provided with explosion proof design. ➤ PF correction in industries having fluctuating loads such as rolling mills, cement plants, welding equipment, automobile industries etc. ➤ Mounting – with the help of clamps. ➤ Confirms to Indian Standard IS 13340-1993. ➤ MPP Self healing type/ with over pressure cut off device for 3 kvar and above/ discharge resistors. ➤ ISI marked/ Low wattage losses.

I. KELCAP - HDC

**POWER CAPACITOR – METALLIZED POLY PROPYLENE FILM SELF HEALING TYPE
HEAVY DUTY – CYLINDRICAL CONSTRUCTION**

KELCAP – HDC capacitors are heavy duty power factor correction capacitors of cylindrical aluminium can construction. Capacitors conform to Indian standard IS 13340 -1993. The capacitors are provided with explosion proof design. Mounting of capacitors are with the help of M12 mounting stud. These capacitors are meant for industries having fluctuating loads with 20% max harmonics such as chemical industries, pharmaceuticals, flour mills, process industries and food processing plants

I.1) Technical specifications	
Voltage rating	440V/415V/3 phase/50Hz
Kvar rating	5 kvar – 25 kvar
Connection	Delta
Temperature class	-10°C to +55°C
Dielectric	MPP
Maximum over current	1.8 rated I
Peak inrush current	200 times rated I
Operational losses at dielectric level	≤ 0.20 W/kvar
Operational losses at termination including discharge resistor	≤ 0.45 W/kvar
Insulation level	3 KV
Installation	Indoor
Reference standard	IS 13340/1993, IS 13341/1992, IEC 60831-1(2002), IEC 60831-2(1995)
Mounting position	Vertical
Mounting and earthing	M12
Protection and safety	Provided with over pressure cut off device, self healing, discharge resistors
Termination	5-8 kvar fast on ‘U’ terminal, 10-25 kvar screw type connection

I.2) Other Information		
Rating	Ordering code	Overall size with top cap in mm (Dia X Height)
5 kvar	PC05R0HDC440	72x265 (440V)
	PC05R0HDC415	75X265 (415V)
6 kvar	PC06R0HDC440	75x265
	PC06R0HDC415	(440V & 415V)
7.5 kvar	PC07R5HDC440	72x325 (440V)
	PC07R5HDC415	75X325 (415V)
8 kvar	PC08R0HDC440	72x325 (440V)
	PC08R0HDC415	75X325 (415V)
10 kvar	PC10R0HDC440	85x340
	PC10R0HDC415	(440V & 415V)
12.5 kvar	PC12R5HDC440	85x415
	PC12R5HDC415	(440V & 415V)
15 kvar	PC15R0HDC440	85x415 (440V)
	PC15R0HDC415	90x415(415V)
20 kvar	PC20R0HDC440	85x415 (440V)
	PC20R0HDC415	90x415(415V)
25 kvar	PC25R0HDC440	95x415(440V)

II. KELCAP - SHS

**POWER CAPACITOR – METALLIZED POLY PROPYLENE FILM SELF HEALING TYPE
SUPER HEAVY DUTY – SQUARE CAP CONSTRUCTION**

KELCAP – SHS capacitors are super heavy duty power factor correction capacitors of square cap construction. Capacitors conform to Indian standard IS 13340 -1993. The capacitors are provided with explosion proof design. Mounting is provided with the help of clamps attached to the capacitor body. These capacitors are meant for industries having fluctuating loads with 25% max harmonics such as rolling mills, cement plants, welding equipments, automobile industries, sugar plants and paper industries.

II.1) Technical specifications	
Voltage rating	440V/415V/3 phase/50Hz
Kvar rating	1 kvar – 25 kvar
Connection	Delta
Temperature class	-10°C to +55°C
Dielectric	MPP
Maximum over current	2 rated I
Peak inrush current	250 times rated I
Operational losses at dielectric level	≤ 0.20 W/kvar
Operational losses at termination including discharge resistor	≤ 0.45 W/kvar
Operational losses at termination including resistor & inductor coil	≤ 0.65 W/kvar
Insulation level	3 KV
Installation	Indoor
Reference standard	IS 13340/1993, IS 13341/1992, IEC 60831-1(2002), IEC 60831-2(1995)
Mounting position	Vertical
Mounting and earthing	M8
Protection and safety	Provided with over pressure cut off device for 3 kvar & above, self healing, discharge resistors
Termination	M8 terminal provided

II.2) Other Information		
Rating	Ordering code	Overall size with top cap in mm (Dia X Height)
1 kvar	PC01R0SHS440	60x170x115
	PC01R0SHS415	WT (440V & 415V)
2 kvar	PC02R0SHS440	65x185x(190+60)
	PC02R0SHS415	TT (440V & 415V)
3 kvar	PC03R0SHS440	85x(250+60)x(250+85)
	PC03R0SHS415	TT (440V & 415V)
4 kvar	PC04R0SHS440	85x(250+60)x(250+85)
	PC04R0SHS415	TT (440V & 415V)
5 kvar	PC05R0SHS440	85x(250+60)x(250+85)
	PC05R0SHS415	TT (440V & 415V)
6 kvar	PC06R0SHS440	85x(250+60)x(305+85)
	PC06R0SHS415	TT (440V & 415V)
7 kvar	PC07R0SHS440	85x(250+60)x(305+85)
	PC07R0SHS415	TT (440V & 415V)
7.5 kvar	PC07R5SHS440	85x(250+60)x(305+85)
	PC07R5SHS415	TT (440V & 415V)
8 kvar	PC08R0SHS440	85x(250+60)x(305+85)
	PC08R0SHS415	TT (440V & 415V)
9 kvar	PC09R0SHS440	95x(275+60)x(350+85)
	PC09R0SHS415	TT(440V & 415V)
10 kvar	PC10R0SHS440	95x(275+60)x(350+85)
	PC10R0SHS415	TT (440V & 415V)
12.5 kvar	PC12R5SHS440	95x(275+60)x(350+85)
	PC12R5SHS415	TT (440V & 415V)
15 kvar	PC15R0SHS440	190x(275+60)x(350+85)
	PC15R0SHS415	TT (440V & 415V)
20 kvar	PC20R0SHS440	190x(275+60)x(350+85)
	PC25R0SHS415	TT (440V & 415V)

WT: wire termination
TT: terminal type

RECOMMENDED CAPACITOR RATING FOR DIRECT CONNECTION TO INDUCTION MOTORS

(For improvement of power factor to 0.95 or better)

Motor rating in HP	Capacitor rating in Kvar when motor speed in RPM is:						Motor rating in HP	Capacitor rating in Kvar when motor speed in RPM is:					
	3000	1500	1000	750	600	500		3000	1500	1000	750	600	500
2.5	1	1	1.5	2	2.5	2.5	105	22	24	27	29	36	41
5	2	2	2.5	3.5	4	4	110	23	25	28	30	38	43
7.5	2.5	3	3.5	4.5	5	5.5	115	24	26	29	31	39	44
10	3	4	4.5	5.5	6	6.5	120	25	27	30	32	40	46
12.5	3.5	4.5	5	6.5	7.5	8	125	26	28	31	33	41	47
15	4	5	6	7.5	8.5	9	130	27	29	32	34	43	49
17.5	4.5	5.5	6.5	8	10	10.5	135	28	30	33	35	44	50
20	5	6	7	9	11	12	140	29	31	34	36	46	52
22.5	5.5	6.5	8	10	12	13	145	30	32	35	37	47	54
25	6	7	9	10.5	13	14.5	150	31	33	36	38	48	55
27.5	6.5	7.5	9.5	11.5	14	16	115	32	34	37	39	49	56
30	7	8	10	12	15	17	160	33	35	38	40	50	57
32.5	7.5	8.5	11	13	16	18	165	34	36	39	41	51	59
35	8	9	11.5	13.5	17	19	170	35	37	40	42	53	60
37.5	8.5	9.5	12	14	18	20	175	36	38	41	43	54	61
40	9	10	13	15	19	21	180	37	39	42	44	55	62
42.5	9.5	11	14	16	20	22	185	38	40	43	45	56	63
45	10	11.5	14.5	16.5	21	23	190	38	40	43	45	58	65
47.5	10.5	12	15	17	22	24	195	39	41	44	46	59	66
50	11	12.5	16	18	23	25	200	40	42	45	47	60	67
55	12	13.5	17	19	24	26	205	41	43	46	48	61	68
60	13	14.5	18	20	26	28	210	42	44	47	49	61	69
65	14	15.5	19	21	27	29	215	42	44	47	49	62	70
70	15	16.5	20	22	28	31	220	43	45	48	50	63	71
75	16	17	21	23	29	32	225	44	46	49	51	64	72
80	17	19	22	24	30	34	230	45	47	50	52	65	73
85	18	20	23	25	31	35	235	46	48	51	53	65	74
90	19	21	24	26	33	37	240	46	48	51	53	66	75
95	20	22	25	27	34	38	245	47	49	52	54	67	75
100	21	23	26	28	35	40	250	48	50	53	55	68	76

RECOMMENDED CABLE SIZE, HRC FUSES AND CONTACTOR RATINGS FOR USE WITH DIFFERENT KVAR RATING CAPACITORS

Unit Rating (Kvar)	Rated current @ Rated voltage (A)		Recommended				Unit rating (Kvar)	Rated current @ Rated voltage (A)		Recommended			
	415V Rated volt	440V Rated volt	Cable size (sq.mm)		HRC fuse Rating (A)	Contactor* Rating (A)		415V Rated volt	440V Rated volt	Cable size (sq.mm)		HRC fuse Rating (A)	Contactor* Rating (A)
			Cu.	Al.						Cu.	Al.		
1	1.39	1.31	0.75	1.5	4	9	8	11.13	10.50	2.50	4	20	32
2	2.78	2.62	0.75	1.5	6	9	9	12.52	11.81	4	6	25	32
3	4.17	3.94	1	1.5	10	12	10	13.91	13.12	4	6	25	32
4	5.56	5.25	1	1.5	10	12	12.5	17.39	16.40	6	10	32	40
5	6.96	6.56	1.5	2.5	16	16	15	20.87	19.68	10	16	40	63
6	8.35	7.87	2.5	2.5	16	22	20	27.82	26.24	10	16	50	63
7	9.74	9.19	2.50	4	20	22	25	34.78	32.80	16	25	63	63
7.5	10.43	9.84	2.5	4	20	22	30	41.74	39.36	25	35	80	85

SELECTION GUIDELINE FOR REACTIVE COMPENSATION

Multiplying factor for calculating required capacitor rating

Initial PF	Target PF									
	0.70	0.75	0.80	0.85	0.87	0.90	0.92	0.95	0.97	1.00
0.30	2.15	2.29	2.43	2.56	2.61	2.70	2.75	2.85	2.93	3.18
0.35	1.66	1.80	1.93	2.05	2.11	2.19	2.25	2.35	2.43	2.68
0.40	1.27	1.41	1.54	1.67	1.72	1.81	1.87	1.96	2.04	2.29
0.45	0.96	1.10	1.23	1.36	1.42	1.50	1.56	1.66	1.73	1.98
0.50	0.71	0.85	0.98	1.11	1.17	1.25	1.31	1.40	1.48	1.73
0.52	0.62	0.76	0.89	1.02	1.08	1.15	1.22	1.31	1.39	1.64
0.54	0.54	0.68	0.81	0.94	0.99	1.07	1.13	1.23	1.31	1.56
0.55	0.50	0.64	0.77	0.90	0.95	1.03	1.09	1.19	1.27	1.52
0.56	0.46	0.60	0.73	0.86	0.91	1.00	1.05	1.15	1.23	1.48
0.58	0.38	0.52	0.65	0.78	0.84	0.92	0.98	1.08	1.15	1.40
0.60	0.31	0.45	0.58	0.71	0.77	0.85	0.91	1.00	1.08	1.33
0.62	0.25	0.38	0.52	0.65	0.70	0.78	0.84	0.94	1.01	1.27
0.64	0.18	0.32	0.45	0.58	0.63	0.72	0.77	0.87	0.95	1.20
0.65	0.15	0.29	0.42	0.55	0.60	0.68	0.74	0.84	0.92	1.17
0.66	0.12	0.26	0.39	0.52	0.57	0.65	0.71	0.81	0.89	1.14
0.68	0.06	0.20	0.33	0.46	0.51	0.59	0.65	0.75	0.83	1.08
0.70		0.14	0.27	0.40	0.45	0.54	0.59	0.69	0.77	1.02
0.72		0.08	0.21	0.34	0.40	0.48	0.54	0.63	0.71	0.96
0.74		0.03	0.16	0.29	0.34	0.42	0.48	0.58	0.66	0.91
0.75			0.13	0.26	0.32	0.40	0.46	0.55	0.63	0.88
0.76			0.11	0.24	0.29	0.37	0.43	0.53	0.60	0.86
0.78			0.05	0.18	0.24	0.32	0.38	0.47	0.55	0.80
0.80				0.13	0.18	0.27	0.32	0.42	0.50	0.75
0.82				0.08	0.13	0.21	0.27	0.37	0.45	0.70
0.84				0.03	0.08	0.16	0.22	0.32	0.40	0.65
0.85					0.05	0.14	0.19	0.29	0.37	0.62
0.86					0.03	0.11	0.17	0.26	0.34	0.59
0.88						0.06	0.11	0.21	0.29	0.54
0.90							0.06	0.16	0.23	0.48
0.92								0.10	0.18	0.43
0.94								0.03	0.11	0.36
0.95									0.08	0.32
0.96									0.04	0.29
0.98										0.20
1.00										0.00

KVAR selection guideline:

Consider an industrial load 500KW at 0.85 PF lag. For improving the power factor of the system to 0.95 PF

Actual power : 500KW
 Target Cos Ø : 0.95
 Initial Cos Ø : 0.85
 Multiplying factor K from the table : 0.29

Required reactive power $Q_c = 500 \times 0.29 = 145 \text{ Kvar}$
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GUIDELINES FOR INSTALLATION

- 1) Preferably capacitor must be installed in vertical position.
- 2) Installed area should be free from water, vermin dust oil and chemical.
- 3) Capacitor body should be earthed at two different positions.
- 4) SFU/MCB/MCCB is recommended for short circuit protection.
- 5) Capacitor should be installed in a cross ventilated area only.
- 6) Current rating of the cable should be minimum 1.8 times capacitor current.
- 7) Appropriate size of lugs should be used for connecting cable to terminals and tightened fully.

OPERATIONAL GUIDELINES

- 1) Avoid touching the terminals of a charged capacitor.
- 2) Do not short circuit the terminals of a capacitor.
- 3) Ensure proper earthing of capacitors before energizing the unit.
- 4) HRC fuses/MCB/MCCB of proper current rating are recommended to be installed in SERIES with power capacitors to avoid over current driving through the units.
- 5) Ensure proper tightening of cables connected to the capacitor terminals to avoid heating up at terminations.
- 6) Ensure proper selection of capacitors depending upon harmonic distortion in the electrical system and in case if the distortion is high harmonic filters may be employed to limit the current through the power capacitor.
- 7) Connect capacitors to the system when the inductive load is switched on and ensure proper compensation as per selection guideline for power factor improvement.

KELTRON COMPONENT COMPLEX LIMITED

Keltron Nagar, Kalliassery (Post), Kannur 670 562

Tel: 0497- 2780831 – 34

Fax: 0497 – 2781055

E-mail: cnn_kelmktg@bsnl.in

keltroncomplex@dataone.in