Film Capacitors – Power Factor Correction

PhaseCap Energy Capacitors - Gas-filled

Series/Type:	**MKK**
Ordering code:	**B25674A***
Date:	December 2016
Version:	2

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Construction



- Dielectric: Polypropylene film
- Gas-impregnated, dry type, Non-PCB
- Wave cut
- Extruded round aluminum can with stud
- Provided with ceramic discharge module or discharge module block
- Over pressure disconnector for **all 3** phases

Features

- Three-phase, delta connected
- Self-healing technology
- Naturally air cooled (or forced air cooling)
- Indoor mounting

Typical applications

- For Power Factor Correction

Terminals

- Optimized capacitor safety terminals

Mounting

- Threaded stud at bottom of can (max. torque for M12 = 10 Nm)

Technical data and specifications

Characteristics	B25674A*	
Rated capacitance C_R	See table in page 7 to 10	
Tolerance	–5 / +5%	
Connection	D (Delta)	
Rated voltage V_R	Up to 690 V RMS (Details as per table in page 7 to 10)	
Rated frequency f_R	50 Hz	60 Hz
Output	Up to 33.1 kvar (Details as per table in page 7 to 10)	
Rated current I_R	As per table in page 7 to 10	
Dimensions (d x h)	As per table in page 7 to 10	
Weight (approx.)	As per table in page 7 to 10	

Maximum ratings	
Maximum permissible voltage (V_{max})	VR +10% (up to 8 h daily) VR +15% (up to 30 min. daily) VR +20% (up to 5 min. daily) VR +30% (up to 1 min. daily)
Maximum permissible current (I_{max})	Up to 1.6 …2.0 • I_R (A) (including combined effects of harmonics, overvoltages and capacitance tolerance) depending on the individual type
Maximum inrush current (I_S)	≤ 500 I_R (A) depending on the individual type Max. 15000 switching's per year

Test data	
Voltage test between terminals (V_{TT})	2.15 • V_R V AC / 50 Hz, 2s
Voltage test between terminals and container (V_{TC})	3600 V AC / 50 Hz, 2 s up to V_R = 525 V AC 6000 V AC / 50 Hz, 2 s above V_R = 525 V AC

Design data	
Dielectric losses	0.2 W / kvar
* Total losses	0.45 W / kvar
Impregnation	Non PCB, dry, inert gas

* Without discharge resistor

Climatic category	
Θ Minimum	-40 °C
Θ Maximum	+60 °C
Ambient temperature	Class -40/60: Max. short time: +60 °C max. mean 24 h: 45 °C; max mean 1 year: +35 °C; lowest temperature: -40 °C
Storage temperature	-40 °C …. +85 °C
$Θ_{Hotspot}$ max.	+85 °C
Humidity	Average relative < 95%

Mean life expectancy	
t_{LD}	Up to 180 000 hours (temperature class –40/D) ; Up to 160 000 hours (temperature class –40/60) ; $Θ_{HS} \leq 70$ °C (Max. mean ambient temperature per year = +35 °C) Failure rate < 3%

Terminals		
Protection degree	Isolated terminals, IP20, indoor mounting (optionally with terminal cap for IP54), VDE 0106 part 100	
Terminal type	Terminal type A & C	Terminal type B & D
Max. torque	1.2 Nm	2.0 Nm
Terminal cross section	16 mm^2 (without cable and lug)	25 mm^2 (without cable and lug)
Maximum terminal current	50 A	80 A
Creepage distance (min)	12.7 mm	
Clearance (min)	9.6 mm	

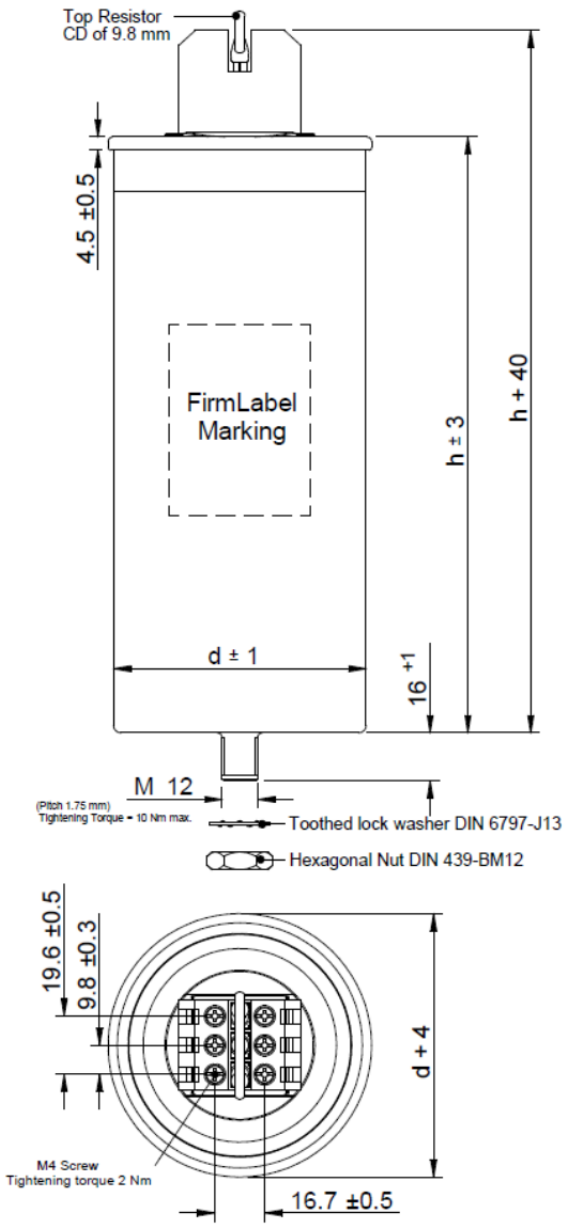
Mounting	
Fixing	Threaded bolt M12
Max. torque (Al can stud)	10 Nm
Mounting position	Upright/horizontal See “Maintenance and Installation Manual” for further details.
Maximum altitude	4000 m

Safety	
Mechanical safety	Overpressure disconnector
Max. short circuit current	(AFC: 10 kA)
Discharge resistor time	≤ 60 s to 50 V or less

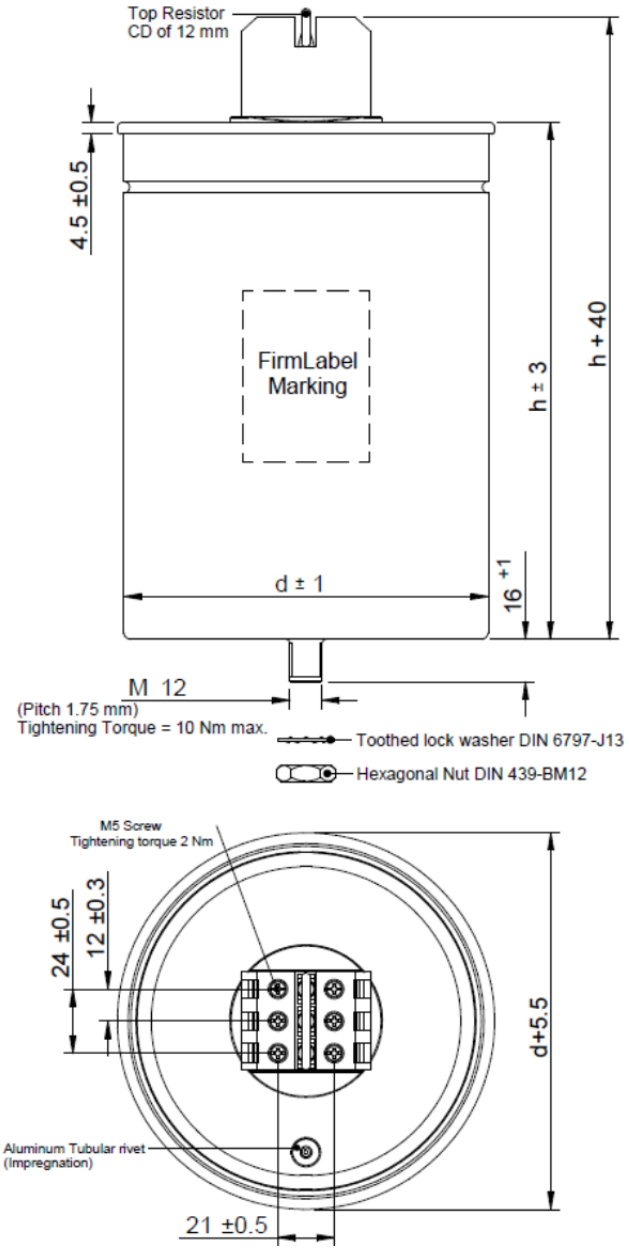
Approvals/Reference standards		
Approval mark	**Standard of reference**	**Certificate**
CE	IEC 60831–1/2 Edition 3.0 (2014)	-
c UL us	UL 810-5th edition	Available from 230 to 660 V AC
IS: 13340 CM/L: AAAAAAAA	IS 13340–1/2 (1993, 2012)	-
DVE	IEC 60831–1/2 Edition 3.0 (2014)	In process

Dimensional drawings

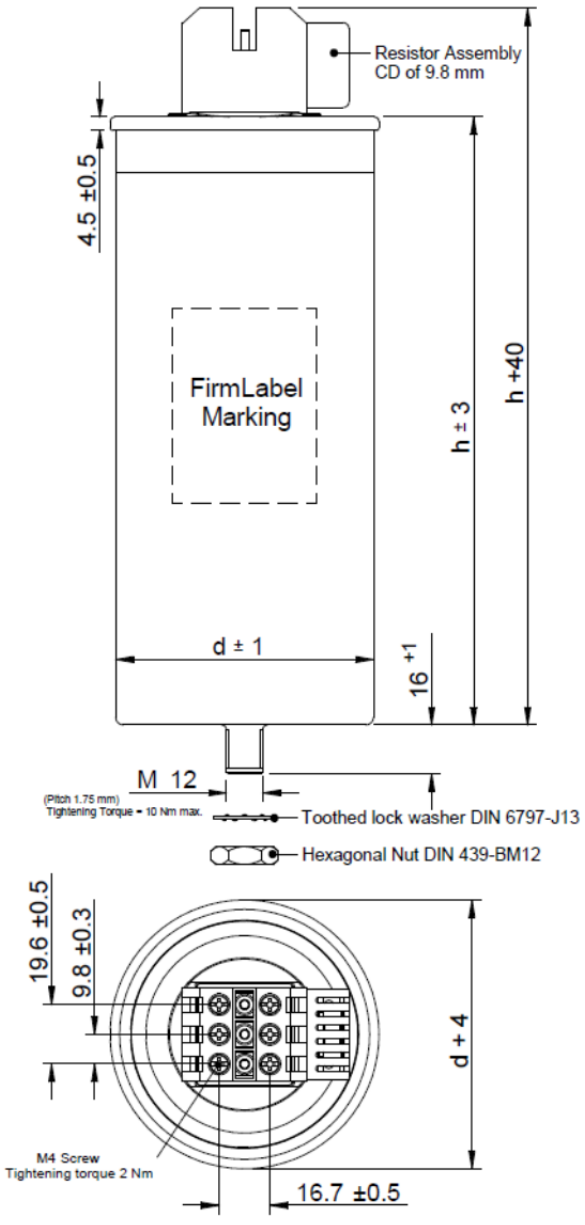
Terminal type A



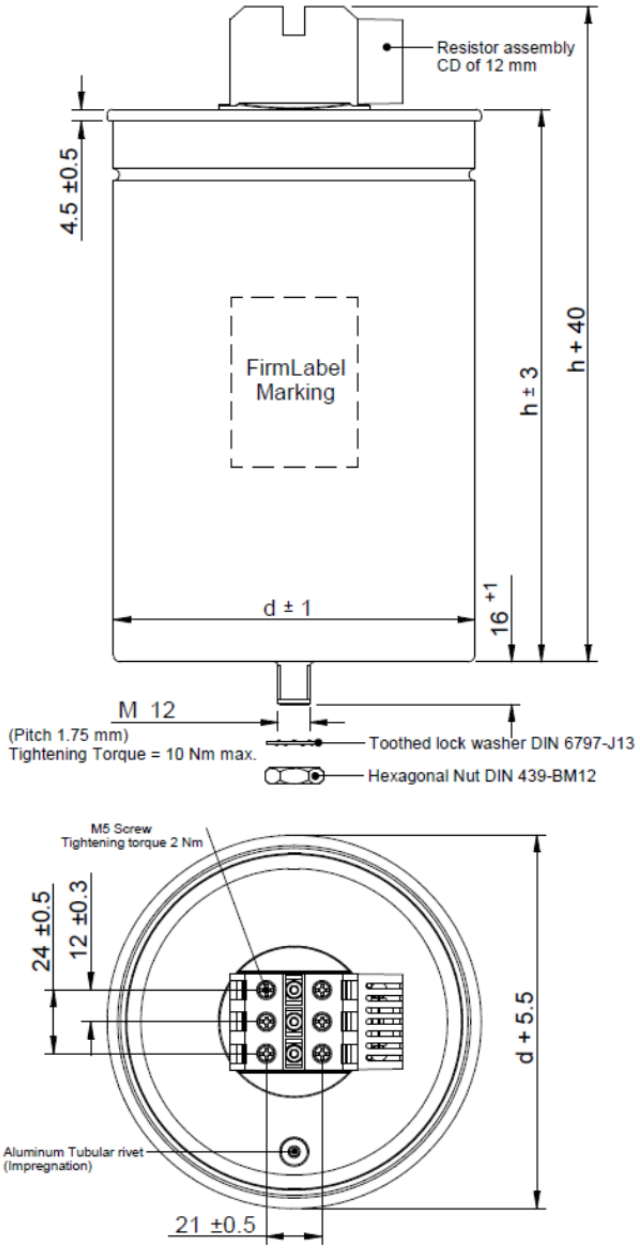
Terminal type B



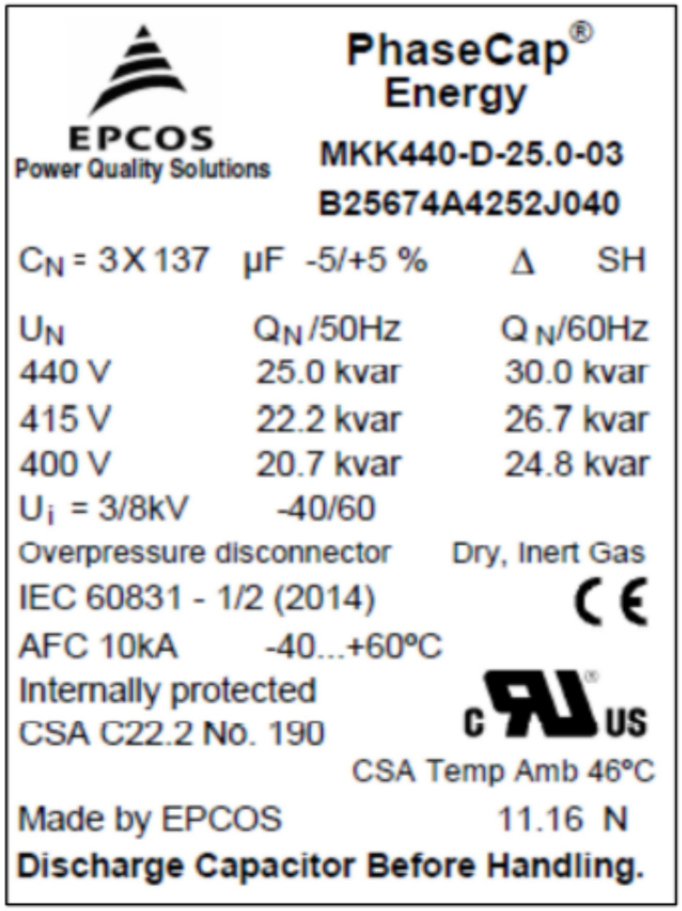
Terminal type C



Terminal type D



Label design



Ordering codes

Ordering code	Series/type	Rated capacitance C_R	Rated voltage V_R	Output & Rated current at 50 Hz, I_R		Output & Rated current at 60 Hz, I_R		Dimensions (d × h)	Weight approx.	Terminal type	PU*
		µF	V	kvar	A	kvar	A	mm	kg		pcs
Rated voltage 230 V AC, delta connection											
B25674A2052J030	MKK230-D-5.0-03	3x 100.3	230	5.0	12.6	6.0	15.1	75 x 218	0.9	A	9
B25674A2072J530	MKK230-D-7.5-03	3x 150.4	230	7.5	18.8	9.0	22.6	100 x 192	1.4	B	6
B25674A2102J030	MKK230-D-10.0-03	3x 200.5	230	10.0	25.1	12.0	30.1	100 x 224	1.7	B	4
B25674A2122J530	MKK230-D-12.5-03	3x 250.7	230	12.5	31.4	15.0	37.7	116 x 207	2.1	B	4
B25674A2152J030	MKK230-D-15.0-03	3x 300.8	230	15.0	37.7	-	-	125 x 207	2.4	B	4
Rated voltage 400 V AC, delta connection											
B25674A4052J000	MKK400-D-5.0-03	3x 33.2	400	5.0	7.2	6.0	8.7	75 x 164	0.7	A	6
B25674A4062J300	MKK400-D-6.3-03	3x 41.8	400	6.3	9.1	7.6	11.0	75 x 164	0.7	A	6
B25674A4072J500	MKK400-D-7.5-03	3x 49.7	400	7.5	10.8	9.0	13.0	75 x 200	0.8	A	6
B25674A4082J300	MKK400-D-8.3-03	3x 55.0	400	8.3	12.0	10.0	14.4	75 x 200	0.8	A	6
B25674A4102J400	MKK400-D-10.4-03	3x 69.0	400	10.4	15.0	12.5	18.0	75 x 218	0.9	A	9
B25674A4122J500	MKK400-D-12.5-03	3x 82.9	400	12.5	18.0	15.0	21.7	85 x 200	1.1	A	9
B25674A4152J000	MKK400-D-15.0-03	3x 99.5	400	15.0	21.7	18.0	26.0	85 x 218	1.2	A	4
B25674A4162J700	MKK400-D-16.7-03	3x 110.7	400	16.7	24.1	20.0	28.9	100 x 207	1.6	B	6
B25674A4202J000	MKK400-D-20.0-03	3x 132.6	400	20.0	28.9	24.0	34.6	100 x 224	1.7	B	4
B25674A4252J000	MKK400-D-25.0-03	3x 165.8	400	25.0	36.1	30.0	43.3	116 x 192	1.9	B	4
B25674A4282J100	MKK400-D-28.1-03	3x 186.3	400	28.1	40.6	-	-	125 x 192	2.3	B	4
B25674A4302J000	MKK400-D-30.0-03	3x 198.9	400	30.0	43.3	-	-	116 x 224	2.3	B	4
B25674A4332J000	MKK400-D-33.0-03	3x 218.8	400	33.0	47.6	-	-	125 x 207	2.4	B	4
Rated voltage 415 V AC, delta connection											
B25674A4052J015	MKK415-D-5.0-03	3x 30.8	415	5.0	7.0	6.0	8.3	75 x 164	0.7	A	6
B25674A4062J315	MKK415-D-6.3-03	3x 38.8	415	6.3	8.8	7.6	10.6	75 x 164	0.7	A	6
B25674A4072J515	MKK415-D-7.5-03	3x 46.2	415	7.5	10.4	9.0	12.5	75 x 200	0.8	A	6
B25674A4082J315	MKK415-D-8.3-03	3x 51.1	415	8.3	11.5	10.0	13.9	75 x 200	0.8	A	6
B25674A4102J415	MKK415-D-10.4-03	3x 64.1	415	10.4	14.5	12.5	17.4	75 x 200	0.8	A	6
B25674A4122J515	MKK415-D-12.5-03	3x 77.0	415	12.5	17.4	15.0	20.9	85 x 200	1.1	A	9
B25674A4152J015	MKK415-D-15.0-03	3x 92.4	415	15.0	20.9	18.0	25.0	85 x 200	1.1	A	9
B25674A4162J715	MKK415-D-16.7-03	3x 102.9	415	16.7	23.2	20.0	27.8	100 x 207	1.6	B	6
B25674A4202J015	MKK415-D-20.0-03	3x 123.2	415	20.0	27.8	24.0	33.4	100 x 207	1.6	B	6
B25674A4252J015	MKK415-D-25.0-03	3x 154.0	415	25.0	34.8	30.0	41.7	116 x 192	1.9	B	4
B25674A4282J115	MKK415-D-28.1-03	3x 173.1	415	28.1	39.1	-	-	116 x 207	2.1	B	4
B25674A4302J015	MKK415-D-30.0-03	3x 184.8	415	30.0	41.7	-	-	116 x 207	2.1	B	4
B25674A4332J015	MKK415-D-33.0-03	3x 203.3	415	33.0	45.9	-	-	116 x 224	2.3	B	4

* Packing units for capacitors equal minimum order quantity. Orders will be rounded up to packing unit or multiple thereof.

Ordering code	Series/type	Rated capacitance C_R	Rated voltage V_R	Output & Rated current at 50 Hz, I_R		Output & Rated current at 60 Hz, I_R		Dimensions (d × h)	Weight approx.	Terminal type	PU*
		µF	V	kvar	A	kvar	A	mm	kg		pcs
Rated voltage 440 V AC, delta connection											
B25674A4052J040	MKK440-D-5.0-03	3x 27.4	440	5.0	6.6	6.0	7.9	75 x 164	0.7	A	6
B25674A4062J040	MKK440-D-6.0-03	3x 32.9	440	6.0	7.9	7.2	9.4	75 x 164	0.7	A	6
B25674A4062J340	MKK440-D-6.3-03	3x 34.5	440	6.3	8.3	7.6	10.0	75 x 164	0.7	A	6
B25674A4072J040	MKK440-D-7.0-03	3x 38.4	440	7.0	9.2	8.4	11.0	75 x 200	0.8	A	6
B25674A4072J540	MKK440-D-7.5-03	3x 41.1	440	7.5	9.8	9.0	11.8	75 x 200	0.8	A	6
B25674A4082J040	MKK440-D-8.0-03	3x 43.8	440	8.0	10.5	9.6	12.6	75 x 200	0.8	A	6
B25674A4082J340	MKK440-D-8.3-03	3x 45.5	440	8.3	10.9	10.0	13.1	75 x 200	0.8	A	6
B25674A4092J040	MKK440-D-9.0-03	3x 49.3	440	9.0	11.8	10.8	14.2	75 x 200	0.8	A	6
B25674A4102J040	MKK440-D-10.0-03	3x 54.8	440	10.0	13.1	12.0	15.7	75 x 200	0.8	A	6
B25674A4102J440	MKK440-D-10.4-03	3x 57.0	440	10.4	13.6	12.5	16.4	85 x 200	1.1	A	9
B25674A4122J040	MKK440-D-12.0-03	3x 65.8	440	12.0	15.7	14.4	18.9	85 x 200	1.1	A	9
B25674A4122J540	MKK440-D-12.5-03	3x 68.5	440	12.5	16.4	15.0	19.7	85 x 200	1.1	A	9
B25674A4142J240	MKK440-D-14.2-03	3x 77.8	440	14.2	18.6	17.0	22.3	85 x 200	1.1	A	9
B25674A4152J040	MKK440-D-15.0-03	3x 82.2	440	15.0	19.7	18.0	23.6	85 x 218	1.2	A	4
B25674A4162J740	MKK440-D-16.7-03	3x 91.5	440	16.7	21.9	20.0	26.2	100 x 207	1.6	B	6
B25674A4182J840	MKK440-D-18.8-03	3x 103.0	440	18.8	24.7	22.6	29.7	100 x 207	1.6	B	6
B25674A4202J040	MKK440-D-20.0-03	3x 109.6	440	20.0	26.2	24.0	31.5	100 x 207	1.6	B	6
B25674A4252J040	MKK440-D-25.0-03	3x 137.0	440	25.0	32.8	30.0	39.4	116 x 192	1.9	B	4
B25674A4282J140	MKK440-D-28.1-03	3x 154.0	440	28.1	36.9	-	-	116 x 207	2.1	B	4
B25674A4302J040	MKK440-D-30.0-03	3x 164.4	440	30.0	39.4	-	-	125 x 192	2.3	B	4
B25674A4332J140	MKK440-D-33.1-03	3x 181.4	440	33.1	43.4	-	-	116 x 224	2.3	B	4
Rated voltage 480 V AC, delta connection											
B25674A4052J080	MKK480-D-5.0-03	3x 23.0	480	5.0	6.0	6.0	7.2	75 x 164	0.7	A	6
B25674A4062J380	MKK480-D-6.3-03	3x 29.0	480	6.3	7.6	7.6	9.1	75 x 164	0.7	A	6
B25674A4072J580	MKK480-D-7.5-03	3x 34.5	480	7.5	9.0	9.0	10.8	75 x 200	0.8	A	6
B25674A4082J380	MKK480-D-8.3-03	3x 38.2	480	8.3	10.0	10.0	12.0	75 x 200	0.8	A	6
B25674A4102J480	MKK480-D-10.4-03	3x 47.9	480	10.4	12.5	12.5	15.0	75 x 200	0.8	A	6
B25674A4112J080	MKK480-D-11.0-03	3x 50.7	480	11.0	13.2	13.2	15.9	85 x 200	1.1	A	9
B25674A4122J580	MKK480-D-12.5-03	3x 57.6	480	12.5	15.0	15.0	18.0	85 x 200	1.1	A	9
B25674A4132J880	MKK480-D-13.8-03	3x 63.5	480	13.8	16.6	16.6	20.0	85 x 200	1.1	A	9
B25674A4152J080	MKK480-D-15.0-03	3x 69.1	480	15.0	18.0	18.0	21.7	100 x 207	1.6	B	6
B25674A4162J780	MKK480-D-16.7-03	3x 76.9	480	16.7	20.1	20.0	24.1	100 x 207	1.6	B	6
B25674A4202J080	MKK480-D-20.0-03	3x 92.1	480	20.0	24.1	24.0	28.9	100 x 207	1.6	B	6
B25674A4202J880	MKK480-D-20.8-03	3x 95.8	480	20.8	25.0	25.0	30.1	116 x 207	2.1	B	4
B25674A4222J080	MKK480-D-22.0-03	3x 101.3	480	22.0	26.5	26.4	31.8	116 x 207	2.1	B	4
B25674A4252J080	MKK480-D-25.0-03	3x 115.1	480	25.0	30.1	30.0	36.1	116 x 192	1.9	B	4
B25674A4282J180	MKK480-D-28.1-03	3x 129.4	480	28.1	33.8	-	-	116 x 207	2.1	B	4
B25674A4302J080	MKK480-D-30.0-03	3x 138.1	480	30.0	36.1	-	-	125 x 192	2.3	B	4
B25674A4312J080	MKK480-D-31.0-03	3x 142.7	480	31.0	37.3	-	-	125 x 192	2.3	B	4
B25674A4332J080	MKK480-D-33.0-03	3x 152.0	480	33.0	39.7	-	-	116 x 224	2.3	B	4

* Packing units for capacitors equal minimum order quantity. Orders will be rounded up to packing unit or multiple thereof.

Ordering code	Series/type	Rated capacitance C_R	Rated voltage V_R	Output & Rated current at 50 Hz, I_R		Output & Rated current at 60 Hz, I_R		Dimensions (d × h)	Weight approx.	Terminal type	PU*
		µF	V	kvar	A	kvar	A	mm	kg		pcs
Rated voltage 525 V AC, delta connection											
B25674A5052J025	MKK525-D-5.0-03	3x 19.2	525	5.0	5.5	6.0	6.6	75 x 164	0.7	A	6
B25674A5062J325	MKK525-D-6.3-03	3x 24.2	525	6.3	6.9	7.6	8.4	75 x 164	0.7	A	6
B25674A5072J525	MKK525-D-7.5-03	3x 28.9	525	7.5	8.2	9.0	9.9	75 x 185	0.8	A	6
B25674A5082J325	MKK525-D-8.3-03	3x 31.9	525	8.3	9.1	10.0	11.0	75 x 200	0.8	A	6
B25674A5102J425	MKK525-D-10.4-03	3x 40.0	525	10.4	11.4	12.5	13.7	85 x 185	1.0	A	9
B25674A5122J525	MKK525-D-12.5-03	3x 48.1	525	12.5	13.7	15.0	16.5	85 x 200	1.1	A	9
B25674A5132J225	MKK525-D-13.2-03	3x 50.8	525	13.2	14.5	15.8	17.4	85 x 200	1.1	A	9
B25674A5152J025	MKK525-D-15.0-03	3x 57.7	525	15.0	16.5	18.0	19.8	85 x 218	1.2	A	4
B25674A5162J725	MKK525-D-16.7-03	3x 64.3	525	16.7	18.4	20.0	22.0	100 x 207	1.6	B	6
B25674A5202J025	MKK525-D-20.0-03	3x 77.0	525	20.0	22.0	24.0	26.4	100 x 224	1.7	B	4
B25674A5202J825	MKK525-D-20.8-03	3x 80.1	525	20.8	22.9	25.0	27.5	100 x 224	1.7	B	4
B25674A5252J025	MKK525-D-25.0-03	3x 96.2	525	25.0	27.5	30.0	33.0	116 x 207	2.1	B	4
B25674A5262J525	MKK525-D-26.5-03	3x 102.0	525	26.5	29.1	31.8	35.0	116 x 207	2.1	B	4
B25674A5282J125	MKK525-D-28.1-03	3x 108.2	525	28.1	30.9	-	-	125 x 192	2.3	B	4
B25674A5302J025	MKK525-D-30.0-03	3x 115.5	525	30.0	33.0	-	-	125 x 207	2.4	B	4
B25674A5332J125	MKK525-D-33.1-03	3x 127.4	525	33.1	36.4	-	-	136 x 192	2.7	B	4
Rated voltage 600 V AC, delta connection											
B25674A6052J300	MKK600-D-5.3-03	3x 15.6	600	5.3	5.1	6.4	6.2	75 x 185	0.8	C	6
B25674A6062J200	MKK600-D-6.2-03	3x 18.3	600	6.2	6.0	7.4	7.1	75 x 185	0.8	C	6
B25674A6062J900	MKK600-D-6.9-03	3x 20.3	600	6.9	6.6	8.3	8.0	75 x 200	0.8	C	6
B25674A6082J300	MKK600-D-8.3-03	3x 24.5	600	8.3	8.0	10.0	9.6	75 x 218	0.9	C	9
B25674A6102J400	MKK600-D-10.4-03	3x 30.6	600	10.4	10.0	12.5	12.0	85 x 200	1.1	C	9
B25674A6122J500	MKK600-D-12.5-03	3x 36.8	600	12.5	12.0	15.0	14.4	100 x 192	1.4	D	6
B25674A6132J900	MKK600-D-13.9-03	3x 41.0	600	13.9	13.4	16.7	16.1	100 x 207	1.6	D	6
B25674A6142J600	MKK600-D-14.6-03	3x 43.0	600	14.6	14.0	17.5	16.8	100 x 207	1.6	D	6
B25674A6162J700	MKK600-D-16.7-03	3x 49.2	600	16.7	16.1	20.0	19.2	100 x 224	1.7	D	4
B25674A6202J000	MKK600-D-20.0-03	3x 58.9	600	20.0	19.2	24.0	23.1	116 x 207	2.1	D	4
B25674A6202J800	MKK600-D-20.8-03	3x 61.3	600	20.8	20.0	25.0	24.1	116 x 207	2.1	D	4
B25674A6252J000	MKK600-D-25.0-03	3x 73.7	600	25.0	24.1	30.0	28.9	125 x 207	2.4	D	4
B25674A6282J000	MKK600-D-28.0-03	3x 82.5	600	28.0	26.9	-	-	136 x 192	2.7	D	4
B25674A6302J000	MKK600-D-30.0-03	3x 88.4	600	30.0	28.9	-	-	136 x 207	2.9	D	4

* Packing units for capacitors equal minimum order quantity. Orders will be rounded up to packing unit or multiple thereof.

Ordering code	Series/type	Rated capacitance C_R	Rated voltage V_R	Output & Rated current at 50 Hz, I_R		Output & Rated current at 60 Hz, I_R		Dimensions (d × h)	Weight approx.	Terminal type	PU*
		µF	V	kvar	A	kvar	A	mm	kg		pcs
Rated voltage 690 V AC, delta connection											
B25674A6052J390	MKK690-D-5.3-03	3x 11.8	690	5.3	4.4	6.4	5.4	75 x 185	0.8	C	6
B25674A6062J290	MKK690-D-6.2-03	3x 13.8	690	6.2	5.2	7.4	6.2	75 x 200	0.8	C	6
B25674A6062J990	MKK690-D-6.9-03	3x 15.4	690	6.9	5.8	8.3	6.9	75 x 200	0.8	C	6
B25674A6082J390	MKK690-D-8.3-03	3x 18.5	690	8.3	6.9	10.0	8.4	75 x 200	0.8	C	6
B25674A6102J490	MKK690-D-10.4-03	3x 23.2	690	10.4	8.7	12.5	10.5	75 x 200	0.8	C	6
B25674A6122J590	MKK690-D-12.5-03	3x 27.9	690	12.5	10.5	15.0	12.6	85 x 200	1.1	C	9
B25674A6132J990	MKK690-D-13.9-03	3x 31.0	690	13.9	11.6	16.7	14.0	85 x 200	1.1	C	9
B25674A6142J690	MKK690-D-14.6-03	3x 32.5	690	14.6	12.2	17.5	14.6	100 x 207	1.6	D	6
B25674A6162J790	MKK690-D-16.7-03	3x 37.2	690	16.7	14.0	20.0	16.7	100 x 192	1.4	D	6
B25674A6202J090	MKK690-D-20.0-03	3x 44.6	690	20.0	16.7	24.0	20.1	100 x 207	1.6	D	6
B25674A6202J890	MKK690-D-20.8-03	3x 46.3	690	20.8	17.4	25.0	20.9	100 x 224	1.7	D	4
B25674A6252J090	MKK690-D-25.0-03	3x 55.7	690	25.0	20.9	30.0	25.1	116 x 192	1.9	D	4
B25674A6282J090	MKK690-D-28.0-03	3x 62.4	690	28.0	23.4	-	-	116 x 207	2.1	D	4
B25674A6302J090	MKK690-D-30.0-03	3x 66.8	690	30.0	25.1	-	-	125 x 192	2.3	D	4

* Packing units for capacitors equal minimum order quantity. Orders will be rounded up to packing unit or multiple thereof.

Display of ordering codes for EPCOS products

The ordering code for one and the same EPCOS product can be represented differently in data sheets, data books, other publications, on the EPCOS website, or in order-related documents such as shipping notes, order confirmations and product labels. **The varying representations of the ordering codes are due to different processes employed and do not affect the specifications of the respective products**. Detailed information can be found on the Internet under www.epcos.com/orderingcodes

Cautions and warnings

- In case of dents of more than 1 mm depth or any other mechanical damage, capacitors must not be used at all.
- This applies also in cases of oil leakages.
- To ensure the full functionality of the overpressure disconnector, elastic elements must not be hindered and a minimum space of 12 mm has to be kept above each capacitor.
- Do not handle the capacitor before it is discharged.
- Resonance cases must be avoided by appropriate application design in any case.
- Handle capacitors carefully, because they may still be charged even after disconnection due to faulty discharging devices.
- Protect the capacitor properly against over current and short circuit.
- Failure to follow cautions may result, worst case, in premature failures, bursting and fire.

Discharging

Capacitors must be discharged to a maximum of 10% of rated voltage before they are switched in again. This prevents an electric impulse discharge in the application, influences the capacitor's service life and protects against electric shock. The capacitor must be discharged to 50 V or less within 1 minute. There must be not any switch, fuse or any other disconnecting device in the circuit between the power capacitor and the discharging device. PhaseCap Energy-capacitors have a pre-mounted ceramic discharge module; alternatively discharge reactors are available from EPCOS. Discharge and short circuit capacitor before handling!

Service life expectancy

Electrical components do not have an unlimited service life expectancy; this applies to self-healing capacitors too. The maximum service life expectancy may vary depending on the application the capacitor is used in.

Safety

Electrical or mechanical misapplication of capacitors may be hazardous. Personal injury or property damage may result from bursting of the capacitor or from expulsion of oil or melted material due to mechanical disruption of the capacitor.

- Ensure good, effective grounding for capacitor enclosures.
- Provide means of disconnecting and insulating a faulty component/bank.
- The terminals of capacitors, connected bus bars and cables as well as other devices may also be energized.
- Follow good engineering practice.

Thermal load/over-temperature

After installation of the capacitor it is necessary to verify that maximum hot-spot temperature is not exceeded at extreme service conditions.

Overpressure disconnector

To ensure full functionality of an overpressure disconnector, the following must be observed:

1. The elastic elements must not be hindered, i.e.
   - Connecting lines must be flexible leads (cables).
   - There must be sufficient space (min. 12 mm) for expansion above the connections. This will enable a longitudinal extension of the can to secure the overpressure disconnector work.
   - Folding beads must not be retained by clamps.

2. The maximum allowed fault current of 10000 A in accordance with UL 810 standard must be assured by the application.

3. Stress parameters of the capacitor must be within the IEC60831 specification.

Overcurrent and short circuit protection

- Use HRC fuses or MCCBs for short circuit protection. Short circuit protection and connecting cables should be selected so that 1.5 times the maximum total RMS capacitor current can be permanently handled.
- HRC fuses do not protect a capacitor against overload – they are only for short circuit protection.
- The HRC fuse rating should be 1.6 to 1.8 times rated capacitor current.
- Do not use HRC fuses to switch capacitors (risk of arcing).
- Use thermal magnetic over current relays for overload protection.

Resonance cases

Resonance cases must be avoided by appropriate application design in any case. Maximum total RMS capacitor current (incl. fundamental harmonic current) specified in technical data must not be exceeded.

Re-switching vs. phase-opposition

In case of voltage interruption, a sufficient discharge time has to be ensured to avoid phase-opposition and resulting high inrush currents.

Vibration resistance

The resistance to vibration of capacitors corresponds to IEC 68, part 2–6.

Max. test conditions:

Test duration	6 h*
Frequency range 1	10 ... 55 Hz*
Displacement amplitude	0.75 mm*

*corresponding to max. 98.1 m/s or 10 *g*

These figures apply to the capacitor alone. Because the fixing and the terminals may influence the vibration properties, it is necessary to check stability when a capacitor is built in and exposed to vibration. Irrespective of this, you are advised not to locate capacitors where vibration amplitude reaches the maximum in strongly vibrating equipment.

Mechanical protection

The capacitor has to be installed in a way that mechanical damages and dents in the aluminum can are avoided.

Grounding

The threaded bottom stud of the capacitor has to be used for grounding. In case grounding is done via metal chassis that the capacitor is mounted to, the layer of varnish beneath the washer and nut should be removed. The maximum tightening torque is 10 Nm for M12 stud.

Maintenance

- Check tightness of the connections/terminals periodically.
- Take current reading twice a year and compare with nominal current. Use a harmonic analyser or true effective RMS-meter.
- In case of current above the nominal current check your application for modifications.
- If a significant increase in the amount of non-linear loads has been detected, then a consultant has to be called in for a harmonic study.
- In case of the presence of harmonics installation of a de-tuned capacitor bank (reactors) must be considered.
- Check the temperature of capacitors directly after operation for a longer period, but make sure that the capacitors have been switched off. In case of excessive temperature of individual capacitors, it is recommended to replace these capacitors, as this should be an indication for loss factor increase, which is a sign for reaching end of life.

Storage and operating conditions

Do not use or store capacitors in corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present. In dusty environments regular maintenance and cleaning especially of the terminals is required to avoid conductive path between phases and/or phases and ground.

Note

For detailed information about PFC capacitors and cautions, refer to the latest version of EPCOS PFC Product Profile.

Important notes

The following applies to all products named in this publication:

1. Some parts of this publication contain **statements about the suitability of our products for certain areas of application**. These statements are based on our knowledge of typical requirements that are often placed on our products in the areas of application concerned. We nevertheless expressly point out **that such statements cannot be regarded as binding statements about the suitability of our products for a particular customer application.** As a rule, EPCOS is either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether an EPCOS product with the properties described in the product specification is suitable for use in a particular customer application.
2. We also point out that **in individual cases, a malfunction of electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified.** In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health (e.g. in accident prevention or life-saving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of an electronic component.
3. **The warnings, cautions and product-specific notes must be observed.**
4. In order to satisfy certain technical requirements, **some of the products described in this publication may contain substances subject to restrictions in certain jurisdictions (e.g. because they are classed as hazardous)**. Useful information on this will be found in our Material Data Sheets on the Internet (www.epcos.com/material). Should you have any more detailed questions, please contact our sales offices.
5. We constantly strive to improve our products. Consequently, **the products described in this publication may change from time to time**. The same is true of the corresponding product specifications. Please check therefore to what extent product descriptions and specifications contained in this publication are still applicable before or when you place an order. We also **reserve the right to discontinue production and delivery of products**. Consequently, we cannot guarantee that all products named in this publication will always be available. The aforementioned does not apply in the case of individual agreements deviating from the foregoing for customer-specific products.
6. Unless otherwise agreed in individual contracts, **all orders are subject to the current version of the "General Terms of Delivery for Products and Services in the Electrical Industry" published by the German Electrical and Electronics Industry Association (ZVEI)**.
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