



# SPECIFICATION FOR APPROVAL

File No.: Q/FRK 0.GS.E.C3E-F06

Product Name	High Voltage DC-Link Capacitor (Dry-Type)
Product Type:	C3E
Product Code	
Customer	
Customer Code	
Issue Date	2015-7



**Xiamen Faratronic Co. Ltd.**

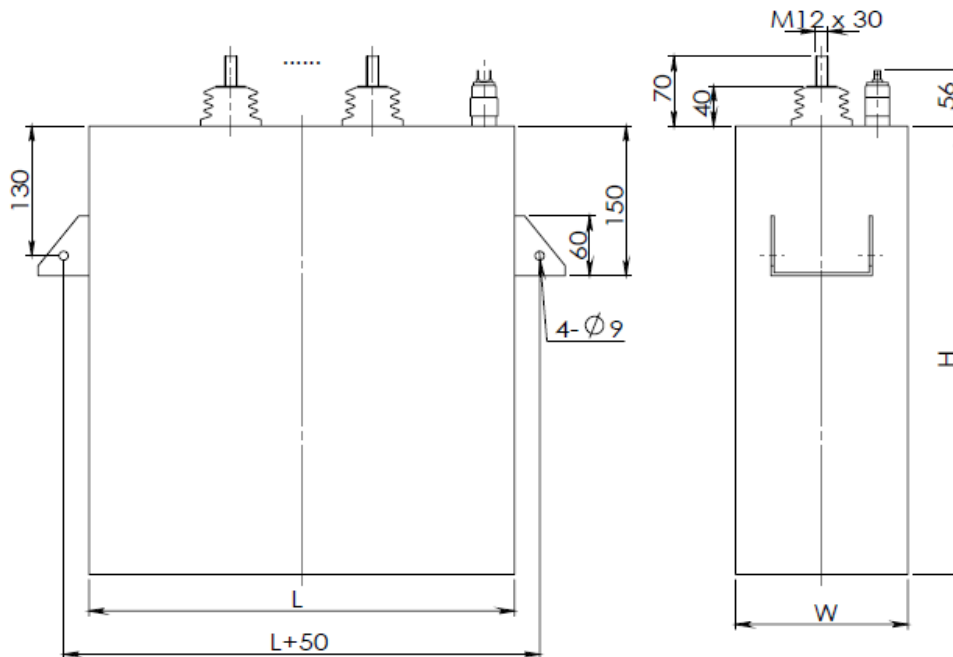
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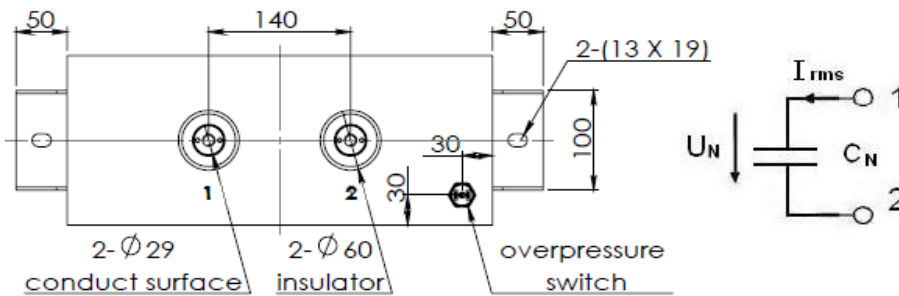
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## High Voltage DC-Link Capacitor (Dry-Type)

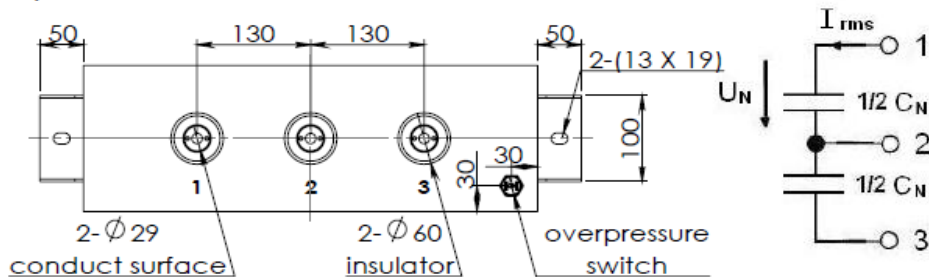
### ■ Outline Drawing



#### 1) When $L=340\text{mm}$ or $420\text{mm}$ ,



#### 2) When $L=520\text{mm}$ ,



### ■ Features

- Stainless steel case, Epoxy resin sealing
- Dry construction, No leaking fluids
- Self-healing property, Segmented metalized-film design
- Low ESL & Low ESR
- High rms current capability

### ■ Applications

- DC-Link
- Speed inverter (drives and traction)
- Wind power converter
- Substation



## ■ Specifications

Reference Standards	IEC 61071, IEC 61881-1		
Rated Voltage ( $U_N$ )	2 000Vdc~6 000Vdc		
Capacitance Range ( $C_N$ )	100 $\mu$ F~6 000 $\mu$ F		
Capacitance Tolerance	$\pm 5\%$ (J), $\pm 10\%$ (K)		
Dielectric Dissipation Factor ( $\text{tg}\delta_d$ )	0.0002		
Operating Temperature Range ( $\theta_{\text{case}}$ )	-40 $^{\circ}$ C~70 $^{\circ}$ C		
Hot-spot Temperature ( $\theta_{\text{hs}}$ )	$\leq 70^{\circ}$ C		
Storage Temperature Range	-40 $^{\circ}$ C~70 $^{\circ}$ C		
Climatic Category	40/70/56		
Case	Stainless steel		
Test Voltage Between Terminals	1.5 $U_N$ , 10s		
Test Voltage Between Terminals And Case	$(\sqrt{2} U_N + 1\ 000)\text{Vac}$ , 10s		
Insulation Voltage ( $U_i$ )	$U_N / \sqrt{2}$ Vac		
Over Voltage	1.1 $U_N$ (30% of on-load-dur.)		
	1.15 $U_N$ (30min/day)		
	1.2 $U_N$ (5min/day)		
	1.3 $U_N$ (1min/day)		
	1.5 $U_N$ (30ms every time, 1 000times during the whole lif)		
Insulation Resistance( $\text{IR}\times C_N$ )	$\geq 5\ 000\text{s}$ (20 $^{\circ}$ C, 100Vdc, 1min)		
Terminals	Thread hole M8 $\times$ 24	Thread hole M10 $\times$ 24	Thread stud M12 $\times$ 30
Max. Torque of terminals	6Nm	8Nm	12Nm
Protection	Overpressure detector or Pressure valve		
Max. Altitude	2 000m		
Expected lifetime	100 000hrs @ $U_N$ , $\theta_{\text{hs}}\leq 70^{\circ}$ C		
Failure rate	100 FIT		

## Part number system

■ The 18 digits part number is formed as follow:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
C	3	E															

Digit 1 to 3 Series code

C3E

Digit 4 to 5 DC rated voltage

4M=1 500V, 3D=2 000V, 2N=2 200V, 1N=2 400V, 3N=2 600V,  
6P=2 800V, 4Q=3 000V, 3G=4 000V, 3H=5 000V, 6U=6 000V

Digit 6 to 8 Rated capacitance value

for example: 207=10 $\times$ 10<sup>7</sup>pF=200 $\mu$ F

Digit 9 Capacitance tolerance

J= $\pm 5\%$ , K= $\pm 10\%$

Digit 10 to 15 Sequence number

Digit 16 to 18 Internal use



## ■ Technical data

U <sub>N</sub> (Vdc)	C <sub>N</sub> (µF)	R <sub>s</sub> (mΩ) @20°C 1kHz	L <sub>s</sub> (nH)	R <sub>th</sub> (K/W)	İ (A)	I <sub>max</sub> (A)			Dimensions (mm)			Weight (kg)	Part number
						40°C	50°C	60°C	L±3	W±3	H±3		
2 000	1 550	0.41	<100	0.68	9 800	220	220	169	340	140	285	22.6	C3E3D158-000001+++
	2 070	0.37	<100	0.55	13 100	220	220	198	340	140	365	28.1	C3E3D208-000002+++
	2 590	0.35	<100	0.46	16 400	220	220	220	340	140	445	33.6	C3E3D258-000003+++
	3 100	0.33	<100	0.40	19 700	220	220	220	340	140	525	39.2	C3E3D318-000004+++
	3 620	0.32	<100	0.34	22 900	220	220	220	340	140	610	45.1	C3E3D368-000005+++
	4 140	0.31	<100	0.31	26 200	220	220	220	340	140	690	50.6	C3E3D418-000006+++
	4 660	0.30	<100	0.27	29 500	220	220	220	340	140	770	56.2	C3E3D468-000007+++
	1 940	0.38	<100	0.56	12 300	220	220	195	420	140	285	27.4	C3E3D198-000008+++
	2 590	0.34	<100	0.46	16 400	220	220	220	420	140	365	34.1	C3E3D258-000009+++
	3 230	0.32	<100	0.38	20 500	220	220	220	420	140	445	40.9	C3E3D328-000010+++
	3 880	0.31	<100	0.33	24 600	220	220	220	420	140	525	47.7	C3E3D388-000011+++
	4 530	0.30	<100	0.29	28 700	220	220	220	420	140	610	55.0	C3E3D458-000012+++
	5 180	0.29	<100	0.26	32 800	220	220	220	420	140	690	61.7	C3E3D518-000013+++
	5 820	0.29	<100	0.23	36 900	220	220	220	420	140	770	68.5	C3E3D588-000014+++
	2×1 640	0.44	<100	0.37	10 400	220	220	159	520	140	375	43.3	C3E3D328-000015+++
	2×2 050	0.41	<100	0.31	13 000	220	220	180	520	140	455	51.6	C3E3D418-000016+++
2×2 460	0.39	<100	0.27	15 600	220	220	200	520	140	540	60.5	C3E3D498-000017+++	
2×2 870	0.37	<100	0.23	18 200	220	220	219	520	140	620	68.7	C3E3D578-000018+++	
2 200	1 250	0.43	<100	0.69	8 800	220	220	168	340	140	285	22.5	C3E2N128-000051+++
	1 670	0.38	<100	0.56	11 700	220	220	198	340	140	365	28.1	C3E2N168-000052+++
	2 080	0.36	<100	0.47	14 700	220	220	220	340	140	445	33.6	C3E2N208-000053+++
	2 500	0.34	<100	0.40	17 600	220	220	220	340	140	525	39.1	C3E2N258-000054+++
	2 920	0.32	<100	0.35	20 600	220	220	220	340	140	610	45.1	C3E2N298-000055+++
	3 340	0.31	<100	0.31	23 500	220	220	220	340	140	690	50.6	C3E2N338-000056+++
	3 760	0.31	<100	0.28	26 500	220	220	220	340	140	770	56.1	C3E2N378-000057+++
	1 560	0.39	<100	0.57	11 000	220	220	194	420	140	285	27.3	C3E2N158-000058+++
	2 080	0.35	<100	0.46	14 700	220	220	220	420	140	365	34.1	C3E2N208-000059+++
	2 610	0.33	<100	0.39	18 400	220	220	220	420	140	445	40.9	C3E2N268-000060+++
	3 130	0.32	<100	0.33	22 100	220	220	220	420	140	525	47.7	C3E2N318-000061+++
	3 650	0.31	<100	0.29	25 800	220	220	220	420	140	610	54.9	C3E2N368-000062+++
	4 170	0.30	<100	0.26	29 400	220	220	220	420	140	690	61.7	C3E2N418-000063+++
	4 700	0.29	<100	0.23	33 100	220	220	220	420	140	770	68.5	C3E2N478-000064+++
	2×1 320	0.46	<100	0.37	9 300	220	220	156	520	140	375	43.3	C3E2N268-000065+++
	2×1 650	0.42	<100	0.31	11 600	220	220	177	520	140	455	51.6	C3E2N338-000066+++
2×1 980	0.40	<100	0.27	14 000	220	220	198	520	140	540	60.5	C3E2N398-000067+++	
2×2 320	0.38	<100	0.23	16 300	220	220	216	520	140	620	68.7	C3E2N468-000068+++	
2 400	1 030	0.45	<100	0.69	8 000	220	220	164	340	140	285	22.5	C3E1N108-000101+++
	1 370	0.40	<100	0.56	10 700	220	220	194	340	140	365	28.1	C3E1N138-000102+++
	1 720	0.37	<100	0.47	13 300	220	220	220	340	140	445	33.6	C3E1N178-000103+++
	2 060	0.35	<100	0.41	16 000	220	220	220	340	140	525	39.1	C3E1N208-000104+++
	2 410	0.33	<100	0.35	18 700	220	220	220	340	140	610	45.1	C3E1N248-000105+++
	2 750	0.32	<100	0.31	21 400	220	220	220	340	140	690	50.6	C3E1N278-000106+++
	3 100	0.31	<100	0.28	24 100	220	220	220	340	140	770	56.1	C3E1N318-000107+++
	1 290	0.40	<100	0.58	10 000	220	220	190	420	140	285	27.3	C3E1N128-000108+++
	1 720	0.36	<100	0.47	13 300	220	220	220	420	140	365	34.1	C3E1N178-000109+++
	2 150	0.34	<100	0.39	16 700	220	220	220	420	140	445	40.9	C3E1N218-000110+++
	2 580	0.32	<100	0.34	20 000	220	220	220	420	140	525	47.6	C3E1N258-000111+++
	3 010	0.31	<100	0.29	23 400	220	220	220	420	140	610	54.9	C3E1N308-000112+++
	3 440	0.30	<100	0.26	26 700	220	220	220	420	140	690	61.7	C3E1N348-000113+++
	3 870	0.30	<100	0.24	30 100	220	220	220	420	140	770	68.4	C3E1N388-000114+++
	2×1 090	0.47	<100	0.38	85 000	220	216	153	520	140	375	43.2	C3E1N218-000115+++
	2×1 360	0.43	<100	0.32	10 600	220	220	174	520	140	455	51.5	C3E1N278-000116+++
2×1 630	0.41	<100	0.27	12 700	220	220	194	520	140	540	60.4	C3E1N328-000117+++	
2×1 910	0.39	<100	0.24	14 800	220	220	213	520	140	620	68.7	C3E1N388-000118+++	
2 600	1 100	0.48	<100	0.69	7 300	220	220	158	340	170	285	26.3	C3E3N118-000151+++
	1 470	0.43	<100	0.56	9 800	220	220	186	340	170	365	32.7	C3E3N148-000152+++
	1 830	0.39	<100	0.48	12 200	220	220	212	340	170	445	39.2	C3E3N188-000153+++
	2 200	0.37	<100	0.41	14 700	220	220	220	340	170	525	45.6	C3E3N228-000154+++
	2 570	0.35	<100	0.36	17100	220	220	220	340	170	610	52.5	C3E3N258-000155+++
	2 940	0.34	<100	0.32	19600	220	220	220	340	170	690	59.0	C3E3N298-000156+++
3 310	0.33	<100	0.29	22 000	220	220	220	340	170	770	65.4	C3E3N338-000157+++	



■ Technical data

U <sub>N</sub> (Vdc)	C <sub>N</sub> (μF)	R <sub>s</sub> (mΩ) @20°C 1kHz	L <sub>s</sub> (nH)	R <sub>th</sub> (K/W)	İ (A)	I <sub>max</sub> (A)			Dimensions (mm)			Weight (kg)	Part number
						40°C	50°C	60°C	L±3	W±3	H±3		
2 600	1 380	0.43	<100	0.57	9 100	220	220	183	420	170	285	31.9	C3E3N138-000158+++
	1 830	0.39	<100	0.47	12 200	220	220	214	420	170	365	39.8	C3E3N188-000159+++
	2 290	0.36	<100	0.40	15 300	220	220	220	420	170	445	47.7	C3E3N228-000160+++
	2 750	0.34	<100	0.34	18 300	220	220	220	420	170	525	55.5	C3E3N278-000161+++
	3 210	0.33	<100	0.30	21 400	220	220	220	420	170	610	64.0	C3E3N328-000162+++
	3 670	0.31	<100	0.27	24 500	220	220	220	420	170	690	71.9	C3E3N368-000163+++
	4 130	0.31	<100	0.24	27 500	220	220	220	420	170	770	79.8	C3E3N418-000164+++
	2×1 160	0.51	<100	0.38	7 700	220	207	146	520	170	375	50.4	C3E3N238-000165+++
	2×1 450	0.46	<100	0.33	9 700	220	220	166	520	170	455	60.0	C3E3N298-000166+++
2×1 750	0.43	<100	0.28	11 600	220	220	186	520	170	540	70.4	C3E3N358-000167+++	
2×2 040	0.41	<100	0.25	13 600	220	220	204	520	170	620	80.1	C3E3N408-000168+++	
2 800	930	0.50	<100	0.69	6 700	220	219	155	340	170	285	26.3	C3E6P937-000201+++
	1 250	0.44	<100	0.57	9 000	220	220	183	340	170	365	32.7	C3E6P128-000202+++
	1 560	0.40	<100	0.48	11 300	220	220	208	340	170	445	39.1	C3E6P158-000203+++
	1 870	0.37	<100	0.41	13 500	220	220	220	340	170	525	45.6	C3E6P188-000204+++
	2 190	0.36	<100	0.36	15 800	220	220	220	340	170	610	52.5	C3E6P218-000205+++
	2 500	0.34	<100	0.32	18 000	220	220	220	340	170	690	59.0	C3E6P258-000206+++
	2 810	0.33	<100	0.29	20 300	220	220	220	340	170	770	65.4	C3E6P288-000207+++
	1 170	0.45	<100	0.58	8 400	220	220	179	420	170	285	31.9	C3E6P118-000208+++
	1 560	0.40	<100	0.48	11 300	220	220	210	420	170	365	39.8	C3E6P158-000209+++
	1 950	0.37	<100	0.40	14 100	220	220	220	420	170	445	47.6	C3E6P198-000210+++
	2 340	0.35	<100	0.35	16 900	220	220	220	420	170	525	55.5	C3E6P238-000211+++
	2 730	0.33	<100	0.30	19 700	220	220	220	420	170	610	64.0	C3E6P278-000212+++
	3 130	0.32	<100	0.27	22 600	220	220	220	420	170	690	71.9	C3E6P318-000213+++
	3 520	0.31	<100	0.24	25 400	220	220	220	420	170	770	79.8	C3E6P358-000214+++
	2×990	0.52	<100	0.39	7 100	220	202	143	520	170	375	50.4	C3E6P198-000215+++
2×1 240	0.48	<100	0.33	8 900	220	220	163	520	170	455	60.0	C3E6P248-000216+++	
2×1 480	0.44	<100	0.28	10 700	220	220	182	520	170	540	70.4	C3E6P298-000217+++	
2×1 730	0.42	<100	0.25	12 500	220	220	200	520	170	620	80.1	C3E6P348-000218+++	
3 000	800	0.52	<100	0.70	6 200	220	214	151	340	170	285	26.3	C3E4Q807-000251+++
	1 070	0.45	<100	0.58	8 300	220	220	179	340	170	365	32.7	C3E4Q108-000252+++
	1 340	0.41	<100	0.49	10 400	220	220	204	340	170	445	39.1	C3E4Q138-000253+++
	1 610	0.38	<100	0.42	12 500	220	220	220	340	170	525	45.6	C3E4Q168-000254+++
	1 880	0.36	<100	0.37	14 600	220	220	220	340	170	610	52.5	C3E4Q188-000255+++
	2 150	0.35	<100	0.33	16 700	220	220	220	340	170	690	58.9	C3E4Q218-000256+++
	2 420	0.34	<100	0.29	18 800	220	220	220	340	170	770	65.4	C3E4Q248-000257+++
	1 010	0.46	<100	0.59	7 800	220	220	175	420	170	285	31.9	C3E4Q108-000258+++
	1 340	0.41	<100	0.48	10 400	220	220	206	420	170	365	39.7	C3E4Q138-000259+++
	1 680	0.37	<100	0.41	13 100	220	220	220	420	170	445	47.6	C3E4Q168-000260+++
	2 020	0.35	<100	0.35	15 700	220	220	220	420	170	525	55.5	C3E4Q208-000261+++
	2 350	0.34	<100	0.31	18 300	220	220	220	420	170	610	64.0	C3E4Q238-000262+++
	2 690	0.33	<100	0.27	20 900	220	220	220	420	170	690	71.9	C3E4Q268-000263+++
	3 030	0.32	<100	0.25	23 600	220	220	220	420	170	770	79.7	C3E4Q308-000264+++
	2×850	0.54	<100	0.39	6 600	220	198	140	520	170	375	50.4	C3E4Q178-000265+++
2×1 060	0.49	<100	0.33	8 300	220	220	160	520	170	455	60.0	C3E4Q218-000266+++	
2×1 280	0.46	<100	0.29	9 900	220	220	179	520	170	540	70.4	C3E4Q258-000267+++	
2×1 490	0.43	<100	0.25	11 600	220	220	196	520	170	620	80.1	C3E4Q298-000268+++	

- Notes:
1. “±”=capacitance tolerance code, J=±5.0%,K=±10%
  2. “+++”= Internal use
  3. Other capacitances,voltages,and dimensions are available on request.
  4. R<sub>s</sub> is the effective ohmic resistance of the conductors of a capacitor and the approximate TCR is 0.004/°C.
  5. The R<sub>th</sub> values listed in above table depend on natural cooling.
  6. The I<sub>max</sub> values listed in above table are the maximum allowable r.m.s current at θ<sub>amb</sub> (40°C,50°C or 60°C). We can get these values by the formula θ<sub>hs</sub>=θ<sub>amb</sub>+I<sub>rms</sub><sup>2</sup>×(R<sub>s</sub>+tgδ<sub>d</sub>/(2×π×f<sub>ripple</sub>×C<sub>N</sub>))×R<sub>th</sub>, but they can't exceed the maximum allowed continuous current through the terminals. We can get higher current on request by increasing the diameter of terminals or adding the quantity of terminals.

## ■ Test Method & Performance



No.	Item	Performance	Testing Method(IEC61071)
1	Vibration	There shall be no evidence of deterioration. Compare with initial value: $ \Delta C/C  @ 100 \text{ Hz} \leq 0.5\%$ $\Delta \text{tg}\delta @ 100 \text{ Hz} \leq 0.0002$	$f = 5 \text{ Hz to } 150 \text{ Hz}$ Vertical position: $7.90 \text{ m/s}^2$ Horizontal position: $3.50 \text{ m/s}^2$ Longitudinal position: $5.50 \text{ m/s}^2$ Test time: 5h
	Shock		Vertical position: $30 \text{ m/s}^2$ Horizontal position: $30 \text{ m/s}^2$ Longitudinal position: $50 \text{ m/s}^2$ 18 Cycle, Test time: 30ms
2	Self-healing	Compare with initial value: $ \Delta C/C  @ 100 \text{ Hz} \leq 0.5\%$ $\text{tg}\delta @ 100 \text{ Hz} \leq 1.1 \times \text{tg}\delta_0 + 0.0001$ $\text{tg}\delta_0$ is the value before the test.	Test voltage: $1.5 U_N$ Test time: 10s If fewer than five clearings occur during this time, the voltage shall be increased slowly until five clearings have occurred since the start of the test or until the voltage has reached $2.5 U_N$ ; If fewer than five clearings have occurred when the voltage has reached $2.5 U_N$ , for a time of 10s, the test shall be finished.
3	Change of temperature	There shall be no evidence of deterioration.	$\theta_A = -40^\circ\text{C}, \theta_B = +70^\circ\text{C}$ 5cycles, Duration: $t=1\text{h}$
	Damp heat, steady state	There shall be no evidence of deterioration.	Temperature: $40^\circ\text{C} \pm 2^\circ\text{C}$ Humidity: $93 \pm 3\% \text{RH}$ Duration: 56days
	Final measurement	There shall be no permanent breakdown or flashover. Compare with initial value: $ \Delta C/C  @ 100 \text{ Hz} \leq 2.0\%$ $\Delta \text{tg}\delta @ 100 \text{ Hz} \leq 0.0003$ IR: $\geq 50\%$ of the rated value	Test voltage between terminals: $1.5 U_N, 60\text{s}$ Test voltage between terminal and case: $(\sqrt{2} U_N + 1000) \text{Vac}, 60\text{s}$ .
4	Thermal stability test	Throughout the last 6h, the temperature of the case near of the top rise shall not increase by more than $1^\circ\text{C}$ Compare with initial value: $ \Delta C/C  @ 100 \text{ Hz} \leq 0.5\%$ $\Delta \text{tg}\delta @ 100 \text{ Hz} \leq 0.0003$	Temperature: $+60^\circ\text{C}$ Test current: $1.1 I_{\text{max}}$ Test time: 48h During the last 6h, the temperature of the case near of the top rise shall be measured per 1.5h.
5	Endurance	There shall be no permanent breakdown or flashover in test period. Compare with initial value: $ \Delta C/C  @ 100 \text{ Hz} \leq 3.0\%$ $\text{tg}\delta @ 100 \text{ Hz} \leq 1.2 \times \text{tg}\delta_0 + 0.0003$ $\text{tg}\delta_0$ is the value before the test.	Temperature: $70^\circ\text{C}$ Test voltage: $1.3 U_N$ Duration: 1000 hrs

■ **Marking**

Main label for example:

 C3E4Q258J000267  
 3 000 VDC    -40 °C ~ 70 °C  
 2 x 1 280 μF    ± 5%  
 IEC 61071    SH  
 Discharge before handling  
 (操作前请先放电)  
 FARATRONIC    C8  


**Marking Introduction:**

Sign	Explain	Sign	Explain
	Brand	<b>IEC 61071</b>	Reference standards
<b>C3E4Q258J000267</b>	Part number	<b>SH</b>	Self-healing
<b>3 000VDC</b>	Rated voltage	<b>Discharge before handling</b> (操作前请先放电)	Handling advice
<b>-40°C~70°C</b>	Operating temperature	<b>FARATRONIC</b>	Manufacturer
<b>2× 1 280μF</b>	Capacitance	<b>C8</b>	Year/month
<b>±5%</b>	Capacitance tolerance		Bar code of capacitor information

■ **Quality ensuring test (before shipment):**

Inspection item(each batch)	Inspection level (IEC 410)	
	IL	AQL
Appearance inspection	II	1.5%
Dimensions	5 pieces (each batch)	[0,1]
Test voltage between terminals	II	0.25%
Test voltage between terminals and case		
Insulation resistance		
Capacitance		
Tangent of the loss angle		

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**■ Attention and suggestions**

- (1) Capacitors must be discharged before handling. Because the capacitor doesn't contain discharge resistor or coil, so there is residual but maybe deathful electric energy contained.
- (2) Don't take or move the capacitor by holding terminals, which can't endure the whole weight of capacitor. You should move the capacitor by holding installing supports at the two side faces or the case bottom of the capacitor.
- (3) Capacitors may not be stored or operated in corrosive atmospheres, particularly not when chlorides, sulfides, acids, lye, salts, organic solvents or similar substances are present.
- (4) The overpressure switch is closed type and should be connected to external control circuit. When the capacitor failed and internal air pressure rises to setting value (normally, it is 0.2 MPa) , the switch will signals to the control unit to disconnect the voltage applying on the capacitor.
- (5) In operating duration of the capacitor, regular check and maintenance (particularly of the connection terminals and external insulation) are absolutely necessary. Make sure the electrical connection of the terminals is no loose and there is no flashover or leakage between terminals, case, earth or potential conducting components around the capacitor.
- (6) If the altitude exceeds 2 000m,the effect of altitude on convection cooling and external insulation should be taken into consideration.
- (7) Any query, don't hesitate to contact our technology service department.