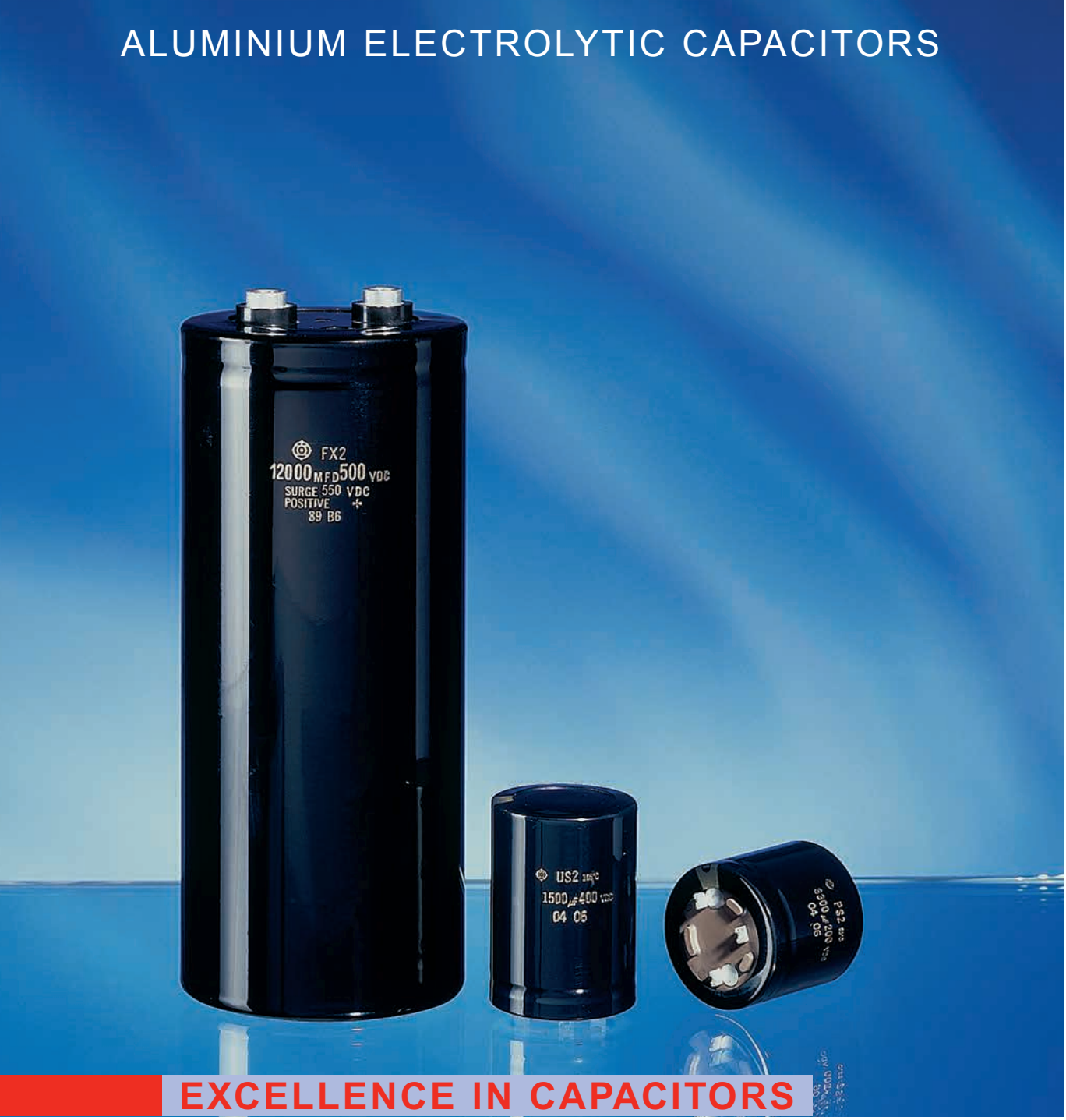
ALUMINIUM ELECTROLYTIC CAPACITORS

2014

Hitachi AlC



EXCELLENCE IN CAPACITORS

Properties

- ► Ultra compact
- ► Large CV – value
- ► High permissible ripple current
- ► High rated voltage (to 600VDC)
- ► Long useful life

Eigenschaften

- ► Ultra kompakt
- ► Großes CV – Produkt
- ► Hohe Wechselstrombelastung
- ► Hohe Nennspannung (bis 600VDC)
- ► Lange Brauchbarkeitsdauer

Applications

- ► Professional power supplies for industrial, scientific and medical applications
- ► Static frequency inverters / Servo-drives
- ► Traction drives and auxiliary inverters
- ► Uninterruptible power supplies
- ► Energy buffer for textile machines and electrical cutter-knife-drives
- ► Wind generators
- ► Solar inverters

Anwendungen

- ► Professionelle Stromversorgungen für Industrie, Wissenschaft und Medizintechnik
- ► Statische Frequenzumrichter / Servoantriebe
- ► Bahnantriebe und Hilfsumrichter
- ► Unterbrechungsfreie Stromversorgungen
- ► Energiespeicher für Textilmaschinen und elektrische Querschneider
- ► Windkraftanlagen
- ► Solarumrichter

RoHS

- ► Hitachi Aluminium Electrolytic Capacitors follow the RoHS (**R**estriction **o**f certain **H**azardous **S**ubstances) Requirements of the European Union and therefore do not contain Cd, Hg, Cr(VI), PBBs, PBDEs or Pb.
  These capacitors do not contain halogen compounds, halides or bromides.

RoHS

- ► Hitachi Aluminium Elektrolyt Kondensatoren sind konform mit den RoHS (**R**estriction **o**f certain **H**azardous **S**ubstances) Bestimmungen der Europäischen Union und enthalten daher kein Cd, Hg, Cr(VI), PBBs, PBDEs oder Pb.
  Weiterhin enthalten diese Kondensatoren keine Halogenverbindungen, Halide oder Bromide.

Edition / Ausgabe 2014

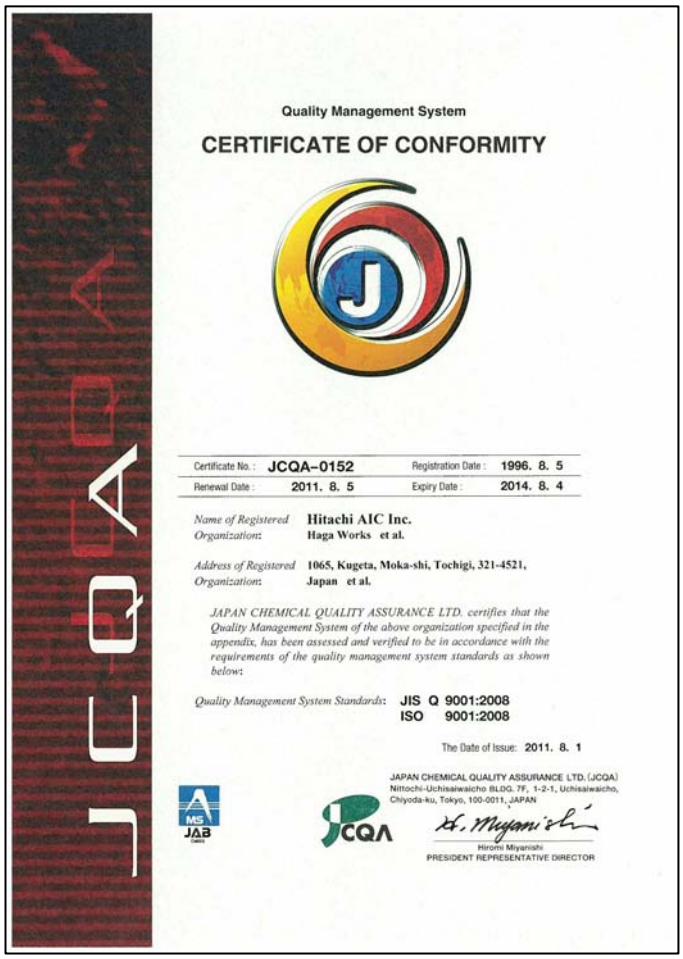
Aluminium Electrolytic Capacitors of Hitachi AIC

Hitachi AIC Japan is a world class manufacturer of Aluminium Electrolytic Capacitors. In-house development and manufacturing (incl. etching and forming) of anode foil over many years leaded to an outstanding record. With long-time experience and continuous improvements Hitachi has achieved the highest reliability for this product group. The technology for the largest rated voltage capability in this market has been developed by Hitachi first. The industrial release of power electronic capacitors (350VDC~500VDC) with the largest capacitance per product has been done by Hitachi as pioneer once more.

– 60 Years of Capacitor Manufacturing and Innovation –

Aluminium-Elektrolyt-Kondensatoren von Hitachi AIC

Hitachi AIC Japan ist ein weltweit führender Hersteller von Aluminium-Elektrolyt-Kondensatoren. Die Entwicklung und Herstellung (inkl. Ätzung und Formierung) der Anodenfolie als eine Schlüsselkomponente erfolgt innerbetrieblich. Durch die langjährige Erfahrung und stetige Optimierung hat Hitachi eine außergewöhnlich hohe Zuverlässigkeit für diese Produktgruppe erlangt. Die Technologie, welche die zum jeweiligen Zeitpunkt höchste Nennspannung im Markt erreicht hat, wurde von Hitachi entwickelt. Bei der Markeinführung von Leistungskondensatoren (350VDC~500VDC) mit der höchstmöglichen Kapazität ist Hitachi ebenfalls ein Pionier für ein neues Design.



JCQA

Quality Management System

CERTIFICATE OF CONFORMITY

Certificate No.:	JCQA-0152	Registration Date:	1996. 8. 5
Renewal Date:	2011. 8. 5	Expiry Date:	2014. 8. 4

Name of Registered Organization: Hitachi AIC Inc. Haga Works et al.

Address of Registered Organization: 1065, Kugeta, Moka-shi, Tochigi, 321-4521, Japan et al.

JAPAN CHEMICAL QUALITY ASSURANCE LTD. certifies that the Quality Management System of the above organization specified in the appendix, has been assessed and verified to be in accordance with the requirements of the quality management system standards as shown below:

Quality Management System Standards: JIS Q 9001:2008
ISO 9001:2008

The Date of Issue: 2011. 8. 1

JAPAN CHEMICAL QUALITY ASSURANCE LTD. (JCQA)
Nittochi-Uchisaiwaicho BLDG. 7F, 1-2-1, Uchisaiwaicho, Chiyoda-ku, Tokyo, 100-0011, JAPAN

Hiromi Miyanishi
PRESIDENT REPRESENTATIVE DIRECTOR

CERTIFICATE

This is to certify that

Hitachi AIC Inc.
Haga Works
1065 Kugeta, Moka-shi, Tochigi 321-4521 Japan

has implemented and maintains an **Environmental Management System.**

Scope:
The design, development and manufacture of aluminium none solid type electrolytic capacitors and aluminium vapor deposition products.
See the certificate annex.

Through an audit, documented in a report, it was verified that the management system fulfills the requirements of the following standard:

ISO 14001 : 2004

Certification registration no.	20001249 UM
Date of original certification	1999-11-15
Date of revision	2012-06-22
Date of Certification	2012-07-15
Valid until	2015-07-14

UL DQS Inc.

Ganesh Rao
President

Certification Body: UL DQS Inc., 1130 West Lake Cook Road, Suite 340, Buffalo Grove, IL 60089 U.S.A

IQNet

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Snap-In Capacitors / Snap-In Kondensatoren

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HU3	16V - 500V	-40°C ~ +105°C	6 000h at 105°C	19
HU	200V - 500V	-40°C ~ +105°C	6 000h at 105°C	28
HL2	200V - 500V	-40°C ~ +105°C	12 000h at 105°C	33
HL	200V - 500V	-25°C ~ +105°C	12 000h at 105°C	37
YL	400V - 500V	-25°C ~ +105°C	15 000h at 105°C	42
CU	400V - 500V	-25°C ~ +105°C	6 000h at 105°C	46
DH	400V - 450V	-25°C ~ +105°C	6 000h at 105°C	49

Board-Mount Capacitors / Board-Mount Kondensatoren

Series	Voltage	Temperature	Useful life	Page
PS2	200V - 600V	-40°C ~ + 85°C	6 000h at 85°C	52
US2	200V - 500V [1)]	-40°C ~ +105°C	6 000h at 105°C	56

Screw-Terminal Capacitors / Schraubanschluss-Kondensatoren

Series	Voltage	Temperature	Useful life	Page
HCGF5	160V - 250V	-40°C ~ + 85°C	6 000h at 85°C	60
HCGF5X	350V - 450V	-40°C ~ + 85°C	10 000h at 85°C	63
HCGF6	350V - 500V	-25°C ~ + 85°C	6 000h at 85°C	67
HCGW	350V - 500V	-10°C ~ + 85°C	6 000h at 85°C	71
HCGW2	400V - 500V	-10°C ~ + 85°C	6 000h at 85°C	74
PH	600V [2)]	-25°C ~ + 85°C	6 000h at 85°C	77
FXA	350V - 450V	-40°C ~ + 85°C	12 000h at 85°C	80
FX2	350V - 600V	-40°C ~ + 85°C	12 000h at 85°C	84
FX3	400V - 500V	-40°C ~ + 85°C	10 000h at 85°C	89
FXR	350V - 500V	-40°C ~ + 85°C	12 000h at 85°C	92
FXR3	400V - 500V	-40°C ~ + 85°C	12 000h at 85°C	95
HCGH	25V - 450V	-40°C ~ +105°C	6 000h at 105°C	98
GXA	350V - 450V	-40°C ~ +105°C	12 000h at 105°C	104
GX2	400V - 500V	-40°C ~ +105°C	12 000h at 105°C	107
GXR	350V - 450V	-40°C ~ +105°C	12 000h at 105°C	110

[1)] **550 VDC ~ 600 VDC under development**
[2)] **650 VDC ~ 700 VDC under development**

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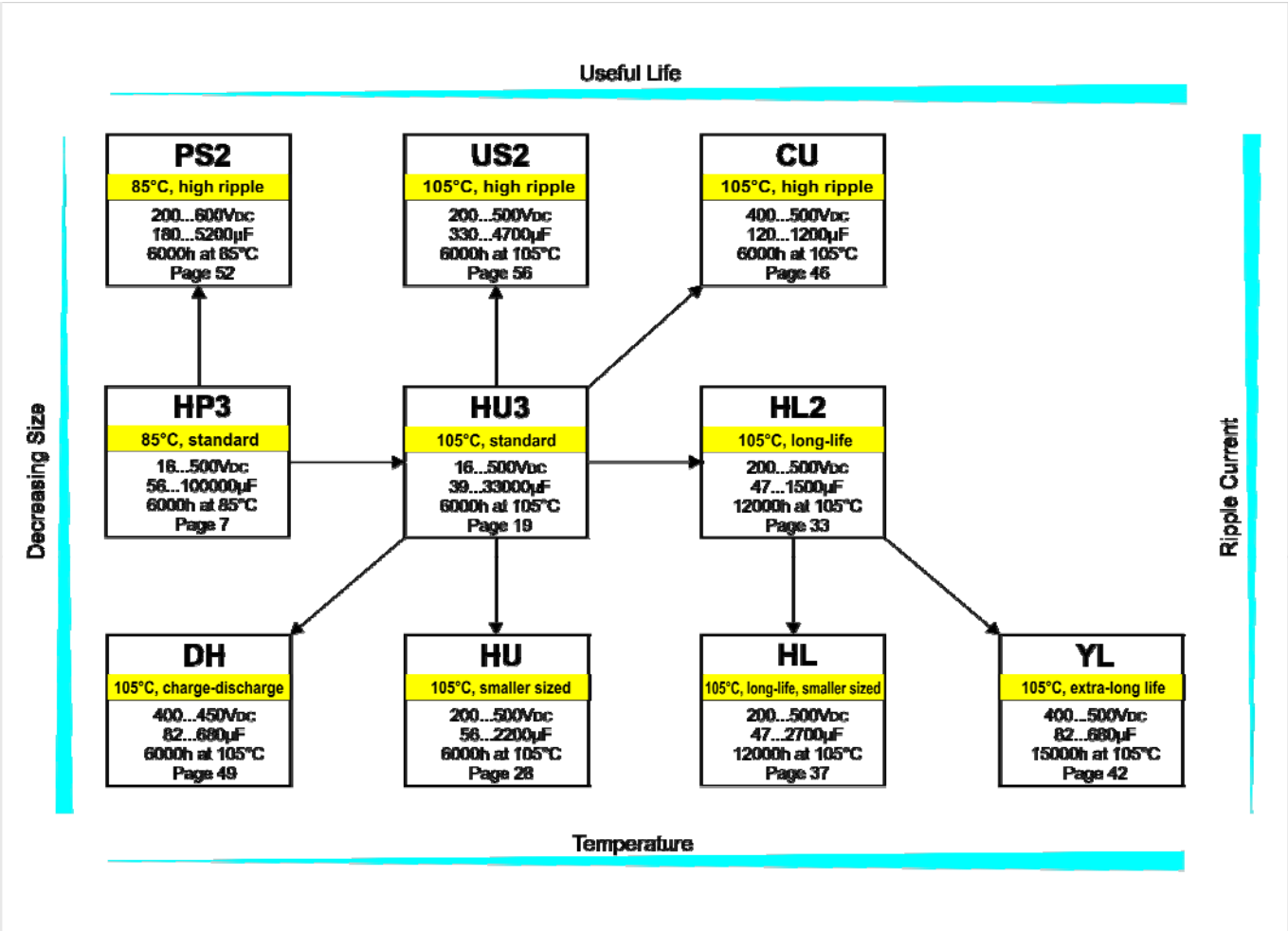
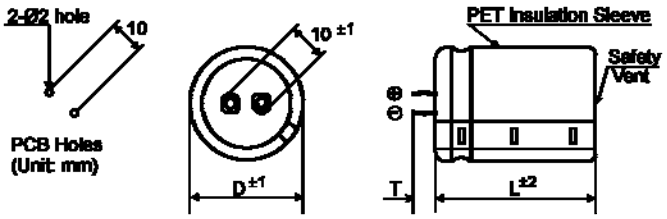
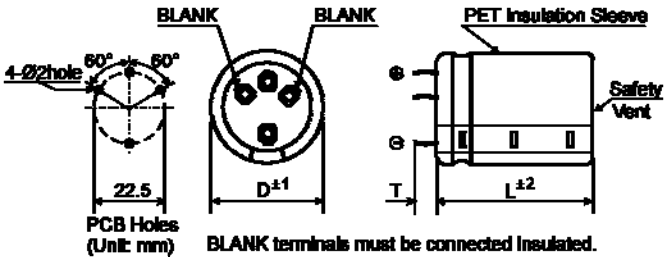
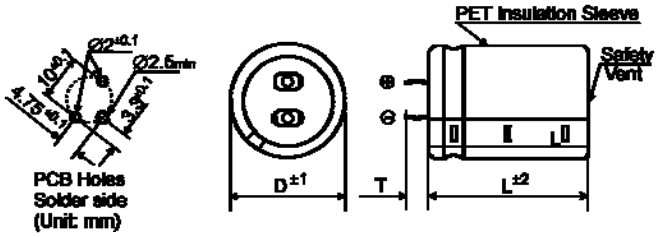


Snap-in Outline Drawings / Snap-in Bauformen



Shape / Form: C (D = 20 ~ 35mm, short pin T = 4.0 ± 0.5mm)
R (D = 20 ~ 35mm, long pin T = 6.3 ± 1.0mm)

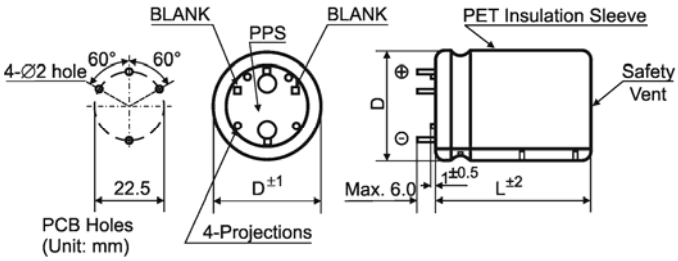




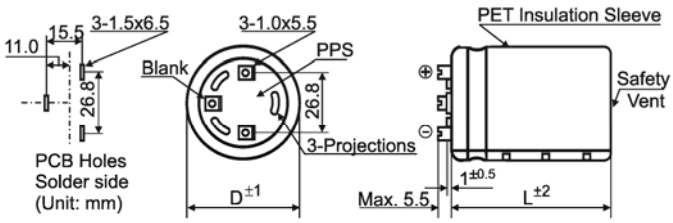
Shape / Form: S (D = 35 ~ 40mm, standard T = 6.3 ± 1.0mm)
X (D = 35 ~ 40mm, short pin T = 4.0 ± 1.0mm)

Shape / Form: E (D = 22 ~ 35mm, T = 4.0 ± 1.0mm)

Board-Mount Outline Drawings / Board-Mount Bauformen



Shape / Form: S (D = 41, 46mm)



Shape / Form: T (D = 51mm)

HP3 Snap-In 6 000h / 85°C

►Specifications / Spezifikationen

Items	Characteristics
Temperature range	-40°C ~ + 85°C
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5min)	0.02 • C • V_r [µA] or 3 mA, which is smaller.
Useful life	6000h at 85°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10...55Hz, 10g, 3x2h

►Outline Drawings / Bauformen

Refer to page 6 for available terminal shapes and dimensions. / Auf Seite 6 finden Sie die verfügbaren Bauformen und Maße.

►Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]		50/60	120	300	1k	≥ 10k
multiplier	16V – 100V	0.70	1.00	1.10	1.20	1.20
	160V – 500V	0.70	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 1.0	v ≥ 1.0
multiplier	1.0	1.1

Temperature [°C]	40	60	70	85
multiplier	2.0	1.6	1.4	1.0

►Product Code / Bestellbezeichnung

Example: HP3 350V 1200µF ±20% 35x80mm Shape „S“

HP3 2V 122 M S A S13 WPEC

Type of series

Capacitance code

The first two digits are significant. The last digit indicates the number of following zeros in µF.

Terminal symbol code

- R: 2-pin terminal
- S: 4-pin terminal
- C: 2-pin short terminal
- X: 4-pin short terminal
- E: 3-pin short terminal

Outer design code

- None: PET sleeve and PVC plate
- WPEC: PET sleeve without plate

Rated voltage code

Code	Voltage	Code	Voltage	Code	Voltage
1C	16	2A	100	2G	400
1E	25	2C	160	420V	420
1V	35	2P	180	2W	450
1H	50	2D	200	2H	500
1J	63	2E	250		
1K	80	2V	350		

Capacitance tolerance

- M : ± 20%
- Q : -10% ~ +30%

Diameter code

Code	ØD
W	20
X	22
Y	25
Z	30
A	35
B	40

Length code

Code	L	Code	L	Code	L
S1	20	S8	55	S15	90
S2	25	S9	60	S16	95
S3	30	S10	65	S17	100
S4	35	S11	70	S18	105
S5	40	S12	75	S19	110
S6	45	S13	80		
S7	50	S14	85		

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
16 1C (20)	6 800	0.50	3.92	1.96	51	22x25	HP31C682M□XS2
	10 000	0.50	4.22	2.11	41	25x25	HP31C103M□YS2
		0.50	4.26	2.13	41	22x30	HP31C103M□XS3
	15 000	0.50	5.54	2.77	28	25x30	HP31C153M□YS3
		0.50	5.54	2.77	28	30x25	HP31C153M□ZS2
		0.50	5.84	2.92	28	22x40	HP31C153M□XS5
	22 000	0.50	7.10	3.55	22	30x30	HP31C223M□ZS3
		0.50	7.10	3.55	22	35x25	HP31C223M□AS2
		0.50	7.74	3.87	22	25x45	HP31C223M□YS6
	33 000	0.50	9.06	4.53	17	35x35	HP31C333M□AS4
		0.50	9.42	4.71	17	30x45	HP31C333M□ZS6
	47 000	0.50	11.33	5.66	12	35x40	HP31C473M□AS5
	68 000	0.90	14.24	7.12	12	35x60	HP31C683M□AS9
	100 000	1.20	17.76	8.88	10	40x60	HP31C104M□BS9
25 1E (32)	4 700	0.40	3.26	1.63	88	22x25	HP31E472M□XS2
	6 800	0.40	4.12	2.06	70	25x25	HP31E682M□YS2
		0.40	4.16	2.08	70	22x30	HP31E682M□XS3
	10 000	0.40	4.54	2.27	48	22x35	HP31E103M□XS4
		0.40	4.54	2.27	48	25x30	HP31E103M□YS3
		0.40	4.54	2.27	48	30x25	HP31E103M□ZS2
	15 000	0.40	5.88	2.94	32	25x35	HP31E153M□YS4
		0.40	5.88	2.94	32	30x30	HP31E153M□ZS3
		0.40	5.88	2.94	32	35x25	HP31E153M□AS2
		0.40	6.12	3.06	32	22x45	HP31E153M□XS6
	22 000	0.40	7.50	3.75	22	30x35	HP31E223M□ZS4
		0.40	7.50	3.75	22	35x30	HP31E223M□AS3
		0.40	7.74	3.87	22	25x45	HP31E223M□YS6
	33 000	0.40	9.48	4.74	17	35x40	HP31E333M□AS5
		0.40	9.78	4.89	17	30x50	HP31E333M□ZS7
35 1V (44)	3 300	0.35	3.04	1.52	165	22x25	HP31V332M□XS2
	4 700	0.35	3.44	1.72	115	25x25	HP31V472M□YS2
		0.35	3.46	1.73	115	22x30	HP31V472M□XS3
	6 800	0.35	4.42	2.21	80	22x35	HP31V682M□XS4
		0.35	4.42	2.21	80	25x30	HP31V682M□YS3
		0.35	4.42	2.21	80	30x25	HP31V682M□ZS2
	10 000	0.35	4.80	2.40	55	25x35	HP31V103M□YS4
		0.35	4.80	2.40	55	30x30	HP31V103M□ZS3
		0.35	4.80	2.40	55	35x25	HP31V103M□AS2
		0.35	5.00	2.50	55	22x45	HP31V103M□XS6
	15 000	0.35	6.20	3.10	35	30x35	HP31V153M□ZS4
		0.35	6.20	3.10	35	35x30	HP31V153M□AS3
		0.35	6.66	3.33	35	25x50	HP31V153M□YS7
	18 000	0.35	7.10	3.55	30	30x40	HP31V183M□ZS5
	22 000	0.35	8.20	4.10	25	30x45	HP31V223M□ZS6
		0.35	8.28	4.14	25	35x40	HP31V223M□AS6
	33 000	0.40	10.28	5.14	20	35x50	HP31V333M□AS7
50 1H (63)	2 200	0.30	2.48	1.24	108	22x25	HP31H222M□XS2
	3 300	0.30	3.22	1.61	72	25x25	HP31H332M□YS2
		0.30	3.24	1.62	72	22x30	HP31H332M□XS3
	4 700	0.30	3.68	1.84	50	22x35	HP31H472M□XS4
		0.30	3.68	1.84	50	25x30	HP31H472M□YS3
		0.30	3.68	1.84	50	30x25	HP31H472M□ZS2
	6 800	0.30	4.68	2.34	35	30x30	HP31H682M□ZS3
		0.30	4.68	2.34	35	35x25	HP31H682M□AS2
		0.30	4.86	2.43	35	25x40	HP31H682M□YS5
		0.30	5.08	2.54	35	22x50	HP31H682M□XS7

HP3 Series Snap-In 6 000 h / 85°C

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
50 1H (63)	10 000	0.35	5.06	2.53	32	30x35	HP31H103M□ZS4
		0.35	5.06	2.53	32	35x30	HP31H103M□AS3
		0.35	5.46	2.73	32	25x50	HP31H103M□YS7
	15 000	0.35	6.82	3.41	25	35x40	HP31H153M□AS5
		0.35	7.06	3.53	25	30x50	HP31H153M□ZS7
63 1J (79)	1 500	0.25	2.38	1.19	159	22x25	HP31J152M□XS2
	2 200	0.25	2.62	1.31	108	25x25	HP31J222M□YS2
		0.25	2.64	1.32	108	22x30	HP31J222M□XS3
	3 300	0.25	3.44	1.72	80	22x35	HP31J332M□XS4
		0.25	3.44	1.72	80	25x30	HP31J332M□YS3
		0.25	3.44	1.72	80	30x25	HP31J332M□ZS2
	4 700	0.25	3.90	1.95	60	25x35	HP31J472M□YS4
		0.25	3.90	1.95	60	30x30	HP31J472M□ZS3
		0.25	3.90	1.95	60	35x25	HP31J472M□AS2
		0.25	4.04	2.02	60	22x45	HP31J472M□XS6
	6 800	0.25	4.96	2.48	40	30x35	HP31J682M□ZS4
		0.25	4.96	2.48	40	35x30	HP31J682M□AS3
		0.25	5.32	2.66	40	25x50	HP31J682M□YS7
	8 200	0.25	5.36	2.68	42	35x30	HP31J822M□AS3
	10 000	0.35	5.54	2.77	42	30x45	HP31J103M□ZS6
		0.35	5.56	2.78	35	35x40	HP31J103M□AS5
	15 000	0.35	7.40	3.70	35	35x50	HP31J153M□AS7
80 1K (100)	1 000	0.20	1.94	0.97	230	22x25	HP31K102M□XS2
	1 200	0.20	2.12	1.06	155	22x25	HP31K122M□XS2
	1 500	0.20	2.48	1.24	105	25x25	HP31K152M□YS2
		0.20	2.52	1.26	155	22x30	HP31K152M□XS3
	2 200	0.20	2.82	1.41	105	25x30	HP31K222M□YS3
		0.20	2.82	1.41	70	30x25	HP31K222M□ZS2
		0.20	2.94	1.47	105	22x40	HP31K222M□XS5
	3 300	0.25	3.64	1.82	70	30x30	HP31K332M□ZS3
		0.25	3.64	1.82	50	35x25	HP31K332M□AS2
		0.25	3.78	1.89	70	25x40	HP31K332M□YS5
		0.25	3.96	1.98	70	22x50	HP31K332M□XS7
	4 700	0.25	4.12	2.06	50	35x30	HP31K472M□AS3
		0.25	4.32	2.16	50	30x40	HP31K472M□ZS5
		0.25	4.42	2.21	50	25x50	HP31K472M□YS7
	6 800	0.25	5.44	2.72	35	35x40	HP31K682M□AS5
		0.25	5.64	2.82	35	30x50	HP31K682M□ZS7
	8 200	0.30	6.64	3.32	30	30x60	HP31K822M□ZS9
	10 000	0.30	7.48	3.74	25	41x50	HP31K103M□BS7
	12 000	0.30	15.40	7.70	25	35x60	HP31K123M□AS9
100 2A (125)	1 000	0.20	2.04	1.02	180	25x25	HP32A102M□YS2
		0.20	2.06	1.03	180	22x30	HP32A102M□XS3
	1 500	0.20	2.68	1.34	120	22x35	HP32A152M□XS4
		0.20	2.68	1.34	120	25x30	HP32A152M□YS3
		0.20	2.68	1.34	120	30x25	HP32A152M□ZS2
	2 200	0.20	2.96	1.48	82	30x30	HP32A222M□ZS3
		0.20	2.96	1.48	82	35x25	HP32A222M□AS2
		0.20	3.10	1.55	82	25x40	HP32A222M□YS5
		0.20	3.24	1.62	82	22x50	HP32A222M□XS7
	3 300	0.20	3.84	1.92	60	35x30	HP32A332M□AS3
		0.20	4.02	2.01	60	30x40	HP32A332M□ZS5
		0.20	4.14	2.07	60	25x50	HP32A332M□YS7
	4 700	0.25	4.52	2.26	45	35x40	HP32A472M□AS5
		0.25	4.66	2.33	45	30x50	HP32A472M□ZS7
	5 600	0.25	4.91	2.45	40	35x40	HP32A562M□AS5
		0.25	5.14	2.57	40	35x45	HP32A562M□AS6
	6 800	0.25	5.90	2.95	35	35x50	HP32A682M□AS7

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
160 2C (200)	390	0.15	3.30	1.65	365	22x25	HP32C391M□XS2
	470	0.15	3.82	1.91	305	25x25	HP32C471M□YS2
		0.15	3.88	1.94	305	22x30	HP32C471M□XS3
	560	0.15	4.44	2.22	255	25x30	HP32C561M□YS3
		0.15	4.46	2.23	255	22x35	HP32C561M□XS4
	680	0.15	4.92	2.46	210	25x30	HP32C681M□YS3
		0.15	4.92	2.46	210	30x25	HP32C681M□ZS2
		0.15	5.20	2.60	210	22x40	HP32C681M□XS5
	820	0.15	5.74	2.87	175	25x35	HP32C821M□YS4
		0.15	5.74	2.87	175	30x30	HP32C821M□ZS3
		0.15	5.98	2.99	175	22x45	HP32C821M□XS6
	1 000	0.15	6.34	3.17	145	30x30	HP32C102M□ZS3
		0.15	6.34	3.17	145	35x25	HP32C102M□AS2
		0.15	6.60	3.30	145	25x40	HP32C102M□YS5
		0.15	6.88	3.44	145	22x50	HP32C102M□XS7
	1 200	0.15	7.34	3.67	120	30x35	HP32C122M□ZS4
		0.15	7.34	3.67	120	35x30	HP32C122M□AS3
		0.15	7.56	3.78	120	25x45	HP32C122M□YS6
	1 500	0.15	8.60	4.30	95	30x40	HP32C152M□ZS5
		0.15	8.72	4.36	95	35x35	HP32C152M□AS4
	1 800	0.15	9.54	4.77	80	35x35	HP32C182M□AS4
		0.15	9.84	4.92	80	30x45	HP32C182M□ZS6
	3 300	0.20	16.22	8.11	45	41x61	HP32C332M□BS9
180 2P (225)	330	0.15	3.04	1.52	375	22x25	HP32P331M□XS2
	390	0.15	3.48	1.74	320	25x25	HP32P391M□YS2
		0.15	3.52	1.76	320	22x30	HP32P391M□XS3
	470	0.15	3.82	1.91	265	25x25	HP32P471M□YS2
		0.15	3.88	1.94	265	22x30	HP32P471M□XS3
	560	0.15	4.46	2.23	225	22x35	HP32P561M□XS4
		0.15	4.46	2.23	225	25x30	HP32P561M□YS3
		0.15	4.46	2.23	225	30x25	HP32P561M□ZS2
	680	0.15	4.92	2.46	185	30x25	HP32P681M□ZS2
		0.15	5.16	2.58	185	25x35	HP32P681M□YS4
		0.15	5.20	2.60	185	22x40	HP32P681M□XS5
	820	0.15	5.74	2.87	155	30x30	HP32P821M□ZS3
		0.15	5.74	2.87	155	35x25	HP32P821M□AS2
		0.15	5.98	2.99	155	22x45	HP32P821M□XS6
		0.15	5.98	2.99	155	25x40	HP32P821M□YS5
	1 000	0.15	6.34	3.17	125	35x25	HP32P102M□AS2
		0.15	6.68	3.34	125	30x35	HP32P102M□ZS4
		0.15	6.90	3.45	125	25x45	HP32P102M□YS6
	1 200	0.15	7.34	3.67	105	35x30	HP32P122M□AS3
		0.15	7.68	3.84	105	30x40	HP32P122M□ZS5
		0.15	7.90	3.95	105	25x50	HP32P122M□YS7
	1 500	0.15	8.72	4.36	85	35x35	HP32P152M□AS4
		0.15	8.98	4.49	85	30x45	HP32P152M□ZS6
	1 800	0.15	9.90	4.95	70	35x40	HP32P182M□AS5
		0.15	10.04	5.02	70	40x36	HP32P182M□BS4
200 2D (250)	220	0.15	3.00	1.50	485	22x25	HP32D221M□XS2
	270	0.15	3.30	1.65	395	22x25	HP32D271M□XS2
	330	0.15	3.63	1.82	325	22x25	HP32D331M□XS2
		0.15	3.86	1.93	325	25x25	HP32D331M□YS2
		0.15	3.88	1.94	325	22x30	HP32D331M□XS3
	390	0.15	4.18	2.09	275	25x25	HP32D391M□YS2
		0.15	4.22	2.11	275	22x30	HP32D391M□XS3
	470	0.15	4.90	2.45	230	22x35	HP32D471M□XS4
		0.15	4.90	2.45	230	25x30	HP32D471M□YS3
		0.15	4.90	2.45	230	30x25	HP32D471M□ZS2

HP3 Series Snap-In 6 000 h / 85°C

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
200 2D (250)	560	0.15	5.36	2.68	190	30x25	HP32D561M□ZS2
		0.15	5.66	2.83	190	22x40	HP32D561M□XS5
		0.15	5.66	2.83	190	25x35	HP32D561M□YS4
	680	0.15	6.30	3.15	160	25x35	HP32D681M□YS4
		0.15	6.30	3.15	160	30x30	HP32D681M□ZS3
		0.15	6.30	3.15	160	35x25	HP32D681M□AS2
		0.15	6.56	3.28	160	22x45	HP32D681M□XS6
	820	0.15	6.88	3.44	130	30x30	HP32D821M□ZS3
		0.15	6.88	3.44	130	35x25	HP32D821M□AS2
		0.15	7.18	3.59	130	25x40	HP32D821M□YS5
	1 000	0.15	8.00	4.00	110	30x35	HP32D102M□ZS4
		0.15	8.06	4.03	110	35x30	HP32D102M□AS3
		0.15	8.62	4.31	110	25x50	HP32D102M□YS7
	1 200	0.15	9.22	4.61	90	30x40	HP32D122M□ZS5
		0.15	9.36	4.68	90	35x35	HP32D122M□AS4
	1 500	0.15	10.84	5.42	75	35x40	HP32D152M□AS5
		0.15	10.98	5.49	75	40x36	HP32D152M□BS4
	1 800	0.15	12.46	6.23	60	40x41	HP32D182M□BS5
		0.15	12.84	6.42	60	35x50	HP32D182M□AS7
	2 200	0.15	13.36	6.68	50	35x50	HP32D222M□AS7
	2 700	0.15	13.11	6.56	50	35x50	HP32D272M□AS7
250 2E (300)	220	0.15	3.00	1.50	485	22x25	HP32E221M□XS2
	270	0.15	3.48	1.74	395	25x25	HP32E271M□YS2
		0.15	3.52	1.76	395	22x30	HP32E271M□XS3
	330	0.15	4.10	2.05	325	25x30	HP32E331M□YS3
		0.15	4.12	2.06	325	22x35	HP32E331M□XS4
	390	0.15	4.48	2.24	275	22x35	HP32E391M□XS4
		0.15	4.48	2.24	275	25x30	HP32E391M□YS3
		0.15	4.48	2.24	275	30x25	HP32E391M□ZS2
	470	0.15	4.92	2.46	230	30x25	HP32E471M□ZS2
		0.15	5.16	2.58	230	22x40	HP32E471M□XS5
		0.15	5.16	2.58	230	25x35	HP32E471M□YS4
		0.15	5.24	2.62	230	35x25	HP32E471M□AS2
	560	0.15	5.64	2.82	190	25x35	HP32E561M□YS4
		0.15	5.70	2.85	190	30x30	HP32E561M□ZS3
		0.15	5.70	2.85	190	35x25	HP32E561M□AS2
		0.15	5.92	2.96	190	25x40	HP32E561M□YS5
		0.15	6.18	3.09	190	22x50	HP32E561M□XS7
	680	0.15	6.62	3.31	160	30x35	HP32E681M□ZS4
		0.15	6.62	3.31	160	35x30	HP32E681M□AS3
		0.15	6.80	3.40	160	22x50	HP32E681M□XS7
		0.15	6.84	3.42	160	25x45	HP32E681M□YS6
	820	0.15	7.28	3.64	130	35x30	HP32E821M□AS3
		0.15	7.64	3.82	130	30x40	HP32E821M□ZS5
		0.15	7.80	3.90	130	25x50	HP32E821M□YS7
	1 000	0.15	8.43	4.21	110	30x40	HP32E102M□ZS5
		0.15	8.54	4.27	110	35x35	HP32E102M□AS4
		0.15	8.80	4.40	110	30x45	HP32E102M□ZS6
		0.15	8.93	4.47	110	35x40	HP32E102M□AS5
	1 200	0.15	9.68	4.84	90	35x40	HP32E122M□AS5
		0.15	9.82	4.91	90	40x36	HP32E122M□BS4
		0.15	10.00	5.00	90	30x50	HP32E122M□ZS7
	1 500	0.15	11.31	5.65	75	35x45	HP32E152M□AS6
		0.15	11.64	5.82	75	40x41	HP32E152M□BS5
		0.15	11.74	5.87	75	35x50	HP32E152M□AS7
	1 800	0.15	12.85	6.42	60	35x50	HP32E182M□AS7
		0.15	13.44	6.72	60	40x51	HP32E182M□BS7
	2 200	0.15	12.96	6.48	50	35x60	HP32E222M□AS9

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
350 2V (400)	100	0.15	1.68	0.84	1065	22x25	HP32V101M□XS2
	120	0.15	1.94	0.97	885	25x25	HP32V121M□YS2
		0.15	1.96	0.98	885	22x30	HP32V121M□XS3
	150	0.15	2.16	1.08	710	25x25	HP32V151M□YS2
		0.15	2.18	1.09	710	22x30	HP32V151M□XS3
	180	0.15	2.52	1.26	590	22x35	HP32V181M□XS4
		0.15	2.52	1.26	590	25x30	HP32V181M□YS3
		0.15	2.52	1.26	590	30x25	HP32V181M□ZS2
	220	0.15	2.76	1.38	485	35x25	HP32V221M□AS2
		0.15	2.82	1.41	485	30x25	HP32V221M□ZS2
		0.15	2.94	1.47	485	22x40	HP32V221M□XS5
		0.15	2.94	1.47	485	25x35	HP32V221M□YS4
	270	0.15	3.30	1.65	395	30x30	HP32V271M□ZS3
		0.15	3.30	1.65	395	35x25	HP32V271M□AS2
		0.15	3.44	1.72	395	25x40	HP32V271M□YS5
		0.15	3.58	1.79	395	22x50	HP32V271M□XS7
	330	0.15	3.84	1.92	325	30x35	HP32V331M□ZS4
		0.15	3.84	1.92	325	35x30	HP32V331M□AS3
		0.15	3.96	1.98	325	25x45	HP32V331M□YS6
	390	0.15	4.18	2.09	275	35x30	HP32V391M□AS3
		0.15	4.38	2.19	275	30x40	HP32V391M□ZS5
		0.15	4.48	2.24	275	25x50	HP32V391M□YS7
	470	0.15	4.82	2.41	230	30x40	HP32V471M□ZS5
		0.15	4.88	2.44	230	35x35	HP32V471M□AS4
	560	0.15	5.58	2.79	190	35x40	HP32V561M□AS5
		0.15	5.58	2.79	190	40x36	HP32V561M□BS4
		0.15	5.70	2.85	190	30x50	HP32V561M□ZS7
	680	0.15	6.34	3.17	160	35x45	HP32V681M□AS6
		0.15	6.38	3.19	160	40x41	HP32V681M□BS5
	1 000	0.15	8.36	4.18	110	40x51	HP32V102M□BS7
		0.15	8.56	4.28	110	35x60	HP32V102M□AS9
	1 200	0.15	9.72	4.86	90	35x75	HP32V122M□AS12
		0.15	9.76	4.88	90	35x80	HP32V122M□AS13
		0.15	9.76	4.88	90	40x61	HP32V122M□BS9
	1 500	0.15	11.04	5.52	78	40x71	HP32V152M□BS11
		0.15	11.15	5.58	78	35x80	HP32V152M□AS13
	2 200	0.15	15.90	7.95	50	40x110	HP32V222M□BS19
400 2G (450)	82	0.20	1.78	0.89	1259	20x25	HP32G820M□WS2
		0.20	1.82	0.91	1259	22x25	HP32G820M□XS2
	100	0.20	1.96	0.98	1065	20x25	HP32G101M□WS2
		0.20	2.02	1.01	1065	22x25	HP32G101M□XS2
		0.20	2.08	1.04	1065	20x30	HP32G101M□WS3
		0.20	2.12	1.06	1065	25x25	HP32G101M□YS2
		0.20	2.14	1.07	1065	22x30	HP32G101M□XS3
	120	0.20	2.20	1.10	885	22x25	HP32G121M□XS2
		0.20	2.28	1.14	885	20x30	HP32G121M□WS3
		0.20	2.34	1.17	885	25x25	HP32G121M□YS2
		0.20	2.36	1.18	885	22x30	HP32G121M□XS3
	150	0.20	2.60	1.30	710	25x25	HP32G151M□YS2
		0.20	2.64	1.32	710	22x30	HP32G151M□XS3
		0.20	2.72	1.36	710	20x35	HP32G151M□WS4
		0.20	2.78	1.39	710	22x35	HP32G151M□XS4
		0.20	2.78	1.39	710	25x30	HP32G151M□YS3
		0.20	2.78	1.39	710	30x25	HP32G151M□ZS2
	180	0.20	2.84	1.42	590	25x25	HP32G181M□YS2
		0.20	2.90	1.45	590	22x30	HP32G181M□XS3
		0.20	3.04	1.52	590	22x35	HP32G181M□XS4
		0.20	3.04	1.52	590	25x30	HP32G181M□YS3
		0.20	3.04	1.52	590	30x25	HP32G181M□ZS2
		0.20	3.20	1.60	590	25x35	HP32G181M□YS4
		0.20	3.22	1.61	590	22x40	HP32G181M□XS5

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
400 2G (450)	220	0.20	3.34	1.67	485	25x30	HP32G221M□YS3
		0.20	3.34	1.67	485	30x25	HP32G221M□ZS2
		0.20	3.38	1.69	485	22x35	HP32G221M□XS4
		0.20	3.56	1.78	485	22x40	HP32G221M□XS5
		0.20	3.56	1.78	485	25x35	HP32G221M□YS4
		0.20	3.56	1.78	485	30x30	HP32G221M□ZS3
		0.20	3.56	1.78	485	35x25	HP32G221M□AS2
		0.20	3.72	1.86	485	25x40	HP32G221M□YS5
		0.20	3.88	1.94	485	22x50	HP32G221M□XS7
	270	0.20	3.72	1.86	395	30x25	HP32G271M□ZS2
		0.20	3.92	1.96	395	25x35	HP32G271M□YS4
		0.20	3.94	1.97	395	22x30	HP32G271M□XS3
		0.20	3.94	1.97	395	30x30	HP32G271M□ZS3
		0.20	3.94	1.97	395	35x25	HP32G271M□AS2
		0.20	3.96	1.98	395	22x40	HP32G271M□XS5
		0.20	4.14	2.07	395	22x45	HP32G271M□XS6
		0.20	4.14	2.07	395	25x40	HP32G271M□YS5
		0.20	4.18	2.09	395	30x35	HP32G271M□ZS4
		0.20	4.18	2.09	395	35x30	HP32G271M□AS3
		0.20	4.32	2.16	395	25x45	HP32G271M□YS6
	330	0.20	4.36	2.18	325	30x30	HP32G331M□ZS3
		0.20	4.36	2.18	325	35x25	HP32G331M□AS2
		0.20	4.56	2.28	325	25x40	HP32G331M□YS5
		0.20	4.58	2.29	325	30x35	HP32G331M□ZS4
		0.20	4.62	2.31	325	35x30	HP32G331M□AS3
		0.20	4.78	2.39	325	22x50	HP32G331M□XS7
		0.20	4.78	2.39	325	25x45	HP32G331M□YS6
		0.20	4.82	2.41	325	30x40	HP32G331M□ZS5
		0.20	4.98	2.49	325	25x50	HP32G331M□YS7
	390	0.20	4.76	2.38	275	35x25	HP32G391M□AS2
		0.20	5.00	2.50	275	30x35	HP32G391M□ZS4
		0.20	5.02	2.51	275	35x30	HP32G391M□AS3
		0.20	5.20	2.60	275	25x45	HP32G391M□YS6
		0.20	5.24	2.62	275	30x40	HP32G391M□ZS5
		0.20	5.32	2.66	275	35x35	HP32G391M□AS4
		0.20	5.42	2.71	275	25x50	HP32G391M□YS7
		0.20	5.50	2.75	275	30x45	HP32G391M□ZS6
	470	0.20	5.50	2.75	230	35x30	HP32G471M□AS3
		0.20	5.74	2.87	230	30x40	HP32G471M□ZS5
		0.20	5.78	2.89	230	35x35	HP32G471M□AS4
		0.20	5.94	2.97	230	25x50	HP32G471M□YS7
		0.20	6.00	3.00	230	30x45	HP32G471M□ZS6
		0.20	6.08	3.04	230	35x40	HP32G471M□AS5
		0.20	6.16	3.08	230	40x36	HP32G471M□BS4
		0.20	6.36	3.18	230	30x50	HP32G471M□ZS7
	560	0.20	6.31	3.16	190	35x35	HP32G561M□AS4
		0.20	6.56	3.28	190	30x45	HP32G561M□ZS6
		0.20	6.62	3.31	190	35x40	HP32G561M□AS5
		0.20	6.82	3.41	190	30x50	HP32G561M□ZS7
		0.20	6.88	3.44	190	35x45	HP32G561M□AS6
		0.20	6.96	3.48	190	40x41	HP32G561M□BS5
	680	0.20	7.28	3.64	160	35x40	HP32G681M□AS5
		0.20	7.50	3.75	160	30x50	HP32G681M□ZS7
		0.20	7.60	3.80	160	35x45	HP32G681M□AS6
		0.20	7.82	3.91	160	30x55	HP32G681M□ZS8
		0.20	7.90	3.95	160	35x50	HP32G681M□AS7
		0.20	8.10	4.05	160	40x35	HP32G681M□BS4
		0.20	8.47	4.24	160	35x60	HP32G681M□AS9

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
400 2G (450)	820	0.20	8.34	4.17	130	35x45	HP32G821M□AS6
		0.20	8.66	4.33	130	35x50	HP32G821M□AS7
		0.20	9.06	4.53	130	40x51	HP32G821M□BS7
		0.20	9.28	4.64	130	35x60	HP32G821M□AS9
	1 000	0.20	9.58	4.79	110	35x50	HP32G102M□AS7
		0.20	9.90	4.95	110	35x55	HP32G102M□AS8
		0.20	10.16	5.08	110	40x61	HP32G102M□BS9
		0.20	10.26	5.13	110	35x60	HP32G102M□AS9
	1 200	0.20	10.48	5.24	90	40x81	HP32G122M□BS13
		0.20	11.77	5.88	90	40x60	HP32G122M□BS9
		0.20	12.14	6.07	90	40x76	HP32G122M□BS12
	1 500	0.20	12.90	6.45	75	35x100	HP32G152M□AS17
		0.20	13.16	6.58	75	40x81	HP32G152M□BS13
	2 100	0.20	19.16	9.58	51	40x101	HP32G212M□BS17
420 420V (470)	68	0.20	1.60	0.80	1620	20x25	HP3420V680M□WS2
		0.20	1.68	0.84	1620	22x25	HP3420V680M□XS2
	82	0.20	1.78	0.89	1340	20x25	HP3420V820M□WS2
		0.20	1.90	0.95	1340	22x30	HP3420V820M□XS3
	100	0.20	2.02	1.01	1100	22x25	HP3420V101M□XS2
		0.20	2.08	1.04	1100	20x30	HP3420V101M□WS3
		0.20	2.14	1.07	1100	25x25	HP3420V101M□YS2
		0.20	2.16	1.08	1100	22x30	HP3420V101M□XS3
	120	0.20	2.22	1.11	915	22x25	HP3420V121M□XS2
		0.20	2.29	1.14	915	20x30	HP3420V121M□WS3
		0.20	2.34	1.17	915	25x25	HP3420V121M□YS2
		0.20	2.36	1.18	915	22x30	HP3420V121M□XS3
		0.20	2.44	1.22	915	20x35	HP3420V121M□WS4
		0.20	2.46	1.23	915	25x30	HP3420V121M□YS3
		0.20	2.48	1.24	915	22x35	HP3420V121M□XS4
	150	0.20	2.60	1.30	735	25x25	HP3420V151M□YS2
		0.20	2.64	1.32	735	22x30	HP3420V151M□XS3
		0.20	2.73	1.36	735	20x35	HP3420V151M□WS4
		0.20	2.78	1.39	735	22x35	HP3420V151M□XS4
		0.20	2.78	1.39	735	25x30	HP3420V151M□YS3
		0.20	2.78	1.39	735	30x25	HP3420V151M□ZS2
		0.20	2.90	1.45	735	25x35	HP3420V151M□YS4
		0.20	2.92	1.46	735	22x40	HP3420V151M□XS5
	180	0.20	3.04	1.52	610	25x30	HP3420V181M□YS3
		0.20	3.04	1.52	610	30x25	HP3420V181M□ZS2
		0.20	3.06	1.53	610	22x35	HP3420V181M□XS4
		0.20	3.22	1.61	610	22x40	HP3420V181M□XS5
		0.20	3.22	1.61	610	35x25	HP3420V181M□AS2
		0.20	3.24	1.62	610	30x30	HP3420V181M□ZS3
		0.20	3.34	1.67	610	22x45	HP3420V181M□XS6
		0.20	3.34	1.67	610	25x40	HP3420V181M□YS5
	220	0.20	3.34	1.67	500	30x25	HP3420V221M□ZS2
		0.20	3.54	1.77	500	25x35	HP3420V221M□YS4
		0.20	3.56	1.78	500	22x40	HP3420V221M□XS5
		0.20	3.56	1.78	500	30x30	HP3420V221M□ZS3
		0.20	3.56	1.78	500	35x25	HP3420V221M□AS2
		0.20	3.74	1.87	500	22x45	HP3420V221M□XS6
		0.20	3.76	1.88	500	30x35	HP3420V221M□ZS4
		0.20	3.78	1.89	500	35x30	HP3420V221M□AS3
		0.20	3.88	1.94	500	25x45	HP3420V221M□YS6
	270	0.20	3.90	1.95	407	25x35	HP3420V271M□YS4
		0.20	3.94	1.97	407	30x30	HP3420V271M□ZS3
		0.20	4.00	2.00	407	35x25	HP3420V271M□AS2
		0.20	4.12	2.06	407	25x40	HP3420V271M□YS5
		0.20	4.14	2.07	407	22x45	HP3420V271M□XS6

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
420 420V (470)	270	0.20	4.18	2.09	407	30x35	HP3420V271M□ZS4
		0.20	4.18	2.09	407	35x30	HP3420V271M□AS3
		0.20	4.32	2.16	407	22x50	HP3420V271M□XS7
		0.20	4.46	2.23	407	25x50	HP3420V271M□YS7
	330	0.20	4.36	2.18	335	35x25	HP3420V331M□AS2
		0.20	4.58	2.29	335	30x35	HP3420V331M□ZS4
		0.20	4.62	2.31	335	35x30	HP3420V331M□AS3
		0.20	4.78	2.39	335	25x45	HP3420V331M□YS6
		0.20	4.84	2.42	335	30x40	HP3420V331M□ZS5
		0.20	4.90	2.45	335	35x35	HP3420V331M□AS4
	390	0.20	5.00	2.50	283	30x35	HP3420V391M□ZS4
		0.20	5.02	2.51	283	35x30	HP3420V391M□AS3
		0.20	5.24	2.62	283	30x40	HP3420V391M□ZS5
		0.20	5.28	2.64	283	35x35	HP3420V391M□AS4
		0.20	5.42	2.71	283	25x50	HP3420V391M□YS7
		0.20	5.52	2.76	283	35x40	HP3420V391M□AS5
		0.20	5.58	2.79	283	40x36	HP3420V391M□BS4
		0.20	5.70	2.85	283	30x50	HP3420V391M□ZS7
	470	0.20	5.74	2.87	235	30x40	HP3420V471M□ZS5
		0.20	5.79	2.89	235	35x35	HP3420V471M□AS4
		0.20	6.00	3.00	235	30x45	HP3420V471M□ZS6
		0.20	6.04	3.02	235	35x40	HP3420V471M□AS5
		0.20	6.34	3.17	235	35x45	HP3420V471M□AS6
		0.20	6.36	3.18	235	40x41	HP3420V471M□BS5
		0.20	6.56	3.28	235	35x50	HP3420V471M□AS7
	560	0.20	6.62	3.31	200	35x40	HP3420V561M□AS5
		0.20	6.82	3.41	200	30x50	HP3420V561M□ZS7
		0.20	6.88	3.44	200	35x45	HP3420V561M□AS6
		0.20	7.20	3.60	200	35x50	HP3420V561M□AS7
	680	0.20	7.59	3.80	165	35x45	HP3420V681M□AS6
		0.20	7.90	3.95	165	35x50	HP3420V681M□AS7
	820	0.20	8.67	4.33	135	35x50	HP3420V821M□AS7
	1 000	0.20	8.95	4.48	112	40x61	HP3420V102M□BS9
	1 500	0.20	11.92	5.96	75	40x86	HP3420V152M□BS14
450 2W (500)	56	0.20	1.48	0.74	1965	20x25	HP32W560M□WS2
	68	0.20	1.60	0.80	1620	20x25	HP32W680M□WS2
	82	0.20	1.78	0.89	1340	20x25	HP32W820M□WS2
		0.20	1.82	0.91	1340	22x25	HP32W820M□XS2
		0.20	1.90	0.95	1340	20x30	HP32W820M□WS3
		0.20	1.94	0.97	1340	25x25	HP32W820M□YS2
		0.20	1.96	0.98	1340	22x30	HP32W820M□XS3
	100	0.20	2.02	1.01	1100	22x25	HP32W101M□XS2
		0.20	2.08	1.04	1100	20x30	HP32W101M□WS3
		0.20	2.12	1.06	1100	25x25	HP32W101M□YS2
		0.20	2.16	1.08	1100	22x30	HP32W101M□XS3
		0.20	2.22	1.11	1100	20x35	HP32W101M□WS4
		0.20	2.26	1.13	1100	22x35	HP32W101M□XS4
		0.20	2.26	1.13	1100	25x30	HP32W101M□YS3
		0.20	2.26	1.13	1100	30x25	HP32W101M□ZS2
	120	0.20	2.22	1.11	915	22x25	HP32W121M□XS2
		0.20	2.34	1.17	915	25x25	HP32W121M□YS2
		0.20	2.36	1.18	915	22x30	HP32W121M□XS3
		0.20	2.44	1.22	915	20x35	HP32W121M□WS4
		0.20	2.48	1.24	915	25x30	HP32W121M□YS3
		0.20	2.48	1.24	915	30x25	HP32W121M□ZS2
		0.20	2.62	1.31	915	22x40	HP32W121M□XS5
	150	0.20	2.64	1.32	735	22x30	HP32W151M□XS3
		0.20	2.78	1.39	735	22x35	HP32W151M□XS4
		0.20	2.78	1.39	735	25x30	HP32W151M□YS3

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
450 2W (500)	150	0.20	2.78	1.39	735	30x25	HP32W151M□ZS2
		0.20	2.94	1.47	735	25x35	HP32W151M□YS4
		0.20	2.94	1.47	735	30x30	HP32W151M□ZS3
		0.20	3.06	1.53	735	22x45	HP32W151M□XS6
	180	0.20	3.04	1.52	610	25x30	HP32W181M□YS3
		0.20	3.04	1.52	610	30x25	HP32W181M□ZS2
		0.20	3.06	1.53	610	22x35	HP32W181M□XS4
		0.20	3.22	1.61	610	22x40	HP32W181M□XS5
		0.20	3.22	1.61	610	25x35	HP32W181M□YS4
		0.20	3.22	1.61	610	30x30	HP32W181M□ZS3
		0.20	3.22	1.61	610	35x25	HP32W181M□AS2
		0.20	3.34	1.67	610	25x40	HP32W181M□YS5
		0.20	3.52	1.76	610	22x50	HP32W181M□XS7
	220	0.20	3.34	1.67	500	30x25	HP32W221M□ZS2
		0.20	3.54	1.77	500	25x35	HP32W221M□YS4
		0.20	3.56	1.78	500	30x30	HP32W221M□ZS3
		0.20	3.56	1.78	500	35x25	HP32W221M□AS2
		0.20	3.56	1.78	500	22x40	HP32W221M□XS5
		0.20	3.74	1.87	500	22x45	HP32W221M□XS6
		0.20	3.74	1.87	500	25x40	HP32W221M□YS5
		0.20	3.78	1.89	500	30x35	HP32W221M□ZS4
		0.20	3.88	1.94	500	25x45	HP32W221M□YS6
		0.20	3.90	1.95	500	22x50	HP32W221M□XS7
	270	0.20	3.94	1.97	407	35x25	HP32W271M□AS2
		0.20	3.94	1.97	407	30x30	HP32W271M□ZS3
		0.20	4.12	2.06	407	25x40	HP32W271M□YS5
		0.20	4.14	2.07	407	22x45	HP32W271M□XS6
		0.20	4.18	2.09	407	30x35	HP32W271M□ZS4
		0.20	4.18	2.09	407	35x30	HP32W271M□AS3
		0.20	4.31	2.16	407	22x50	HP32W271M□XS7
		0.20	4.32	2.16	407	25x45	HP32W271M□YS6
		0.20	4.38	2.19	407	30x40	HP32W271M□ZS5
		0.20	4.44	2.22	407	35x35	HP32W271M□AS4
	330	0.20	4.36	2.18	335	35x25	HP32W331M□AS2
		0.20	4.44	2.22	335	25x45	HP32W331M□YS6
		0.20	4.58	2.29	335	30x35	HP32W331M□ZS4
		0.20	4.82	2.41	335	30x40	HP32W331M□ZS5
		0.20	4.90	2.45	335	35x35	HP32W331M□AS4
		0.20	4.98	2.49	335	25x50	HP32W331M□YS7
		0.20	5.04	2.52	335	30x45	HP32W331M□ZS6
	390	0.20	5.00	2.50	283	30x35	HP32W391M□ZS4
		0.20	5.02	2.51	283	35x30	HP32W391M□AS3
		0.20	5.24	2.62	283	30x40	HP32W391M□ZS5
		0.20	5.28	2.64	283	35x35	HP32W391M□AS4
		0.20	5.42	2.71	283	25x50	HP32W391M□YS7
		0.20	5.46	2.73	283	30x45	HP32W391M□ZS6
		0.20	5.52	2.76	283	35x40	HP32W391M□AS5
		0.20	5.58	2.79	283	40x36	HP32W391M□BS4
	470	0.20	5.74	2.87	235	30x40	HP32W471M□ZS5
		0.20	5.79	2.89	235	35x35	HP32W471M□AS4
		0.20	6.00	3.00	235	30x45	HP32W471M□ZS6
		0.20	6.04	3.02	235	35x40	HP32W471M□AS5
		0.20	6.24	3.12	235	30x50	HP32W471M□ZS7
		0.20	6.34	3.17	235	35x45	HP32W471M□AS6
		0.20	6.36	3.18	235	40x41	HP32W471M□BS5
	560	0.20	6.62	3.31	200	35x40	HP32W561M□AS5
		0.20	6.82	3.41	200	30x50	HP32W561M□ZS7
		0.20	6.82	3.41	200	35x50	HP32W561M□ZS7
		0.20	6.88	3.44	200	35x45	HP32W561M□AS6
		0.20	7.50	3.75	200	40x51	HP32W561M□BS7

HP3 Series Snap-In 6 000 h / 85°C

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
450 2W (500)	680	0.20	7.59	3.80	165	35x45	HP32W681M□AS6
		0.20	7.88	3.94	165	35x50	HP32W681M□AS7
		0.20	8.24	4.12	165	40x51	HP32W681M□BS7
		0.20	8.38	4.19	165	30x75	HP32W681M□ZS12
		0.20	8.48	4.24	165	35x60	HP32W681M□AS9
	820	0.20	8.66	4.33	135	35x50	HP32W821M□AS7
		0.20	9.28	4.64	135	35x60	HP32W821M□AS9
		0.20	9.70	4.85	135	40x61	HP32W821M□BS9
		0.20	9.90	4.95	135	35x80	HP32W821M□AS13
	1 000	0.20	10.74	5.37	110	40x60	HP32W102M□BS9
		0.20	11.12	5.56	110	40x76	HP32W102M□BS12
		0.20	11.40	5.70	110	40x81	HP32W102M□BS13
	1 100	0.20	9.42	4.71	100	40x75	HP32W112M□BS12
	1 200	0.20	12.48	6.24	97	40x81	HP32W122M□BS13
	1 300	0.20	11.70	5.85	85	40x96	HP32W132M□BS16
	1 500	0.20	12.68	6.34	75	40x100	HP32W152M□BS17
	1 600	0.20	13.10	6.55	70	40x100	HP32W162M□BS17
500 2H (550)	56	0.20	1.30	0.65	2135	25x25	HP32H560M□YS2
		0.20	1.36	0.68	2135	22x30	HP32H560M□XS3
	68	0.20	1.58	0.79	1758	22x35	HP32H680M□XS4
	82	0.20	1.69	0.85	1458	25x30	HP32H820M□YS3
		0.20	1.85	0.92	1458	22x40	HP32H820M□XS5
	100	0.20	1.90	0.95	960	30x25	HP32H101M□ZS2
		0.20	1.96	0.98	960	25x35	HP32H101M□YS4
		0.20	2.13	1.07	960	22x45	HP32H101M□XS6
	120	0.20	2.20	1.10	800	30x30	HP32H121M□ZS3
		0.20	2.20	1.10	800	35x25	HP32H121M□AS2
		0.20	2.27	1.13	800	25x40	HP32H121M□YS5
		0.20	2.44	1.22	800	22x50	HP32H121M□XS7
	150	0.20	2.60	1.30	640	30x35	HP32H151M□ZS4
		0.20	2.64	1.32	640	25x45	HP32H151M□YS6
		0.20	2.86	1.43	640	35x30	HP32H151M□AS3
	180	0.20	2.86	1.43	535	35x30	HP32H181M□AS3
		0.20	3.00	1.50	535	30x40	HP32H181M□ZS5
		0.20	3.04	1.52	535	25x50	HP32H181M□YS7
	220	0.20	3.32	1.66	434	35x35	HP32H221M□AS4
		0.20	3.46	1.73	434	30x45	HP32H221M□ZS6
	270	0.20	3.84	1.92	360	35x40	HP32H271M□AS5
		0.20	3.98	1.99	360	30x50	HP32H271M□ZS7
	330	0.20	4.24	2.12	365	35x40	HP32H331M□AS5
		0.20	4.42	2.21	290	35x45	HP32H331M□AS6
	390	0.20	4.80	2.40	308	35x45	HP32H391M□AS6
		0.20	5.00	2.50	245	35x50	HP32H391M□AS7
	470	0.20	5.88	2.94	210	35x60	HP32H471M□AS9
		0.20	6.20	3.10	210	40x50	HP32H471M□BS7
		0.20	6.28	3.14	210	35x80	HP32H471M□AS13
	560	0.20	7.30	3.65	170	40x76	HP32H561M□BS12
	680	0.20	9.06	4.53	140	40x100	HP32H681M□BS17
	820	0.20	9.38	4.69	140	40x100	HP32H821M□BS17
	1 000	0.20	10.36	5.18	100	40x100	HP32H102M□BS17
	1 200	0.20	11.81	5.91	90	40x110	HP32H122M□BS19

►Life Time Table / Brauchbarkeitsdauer – Tabelle

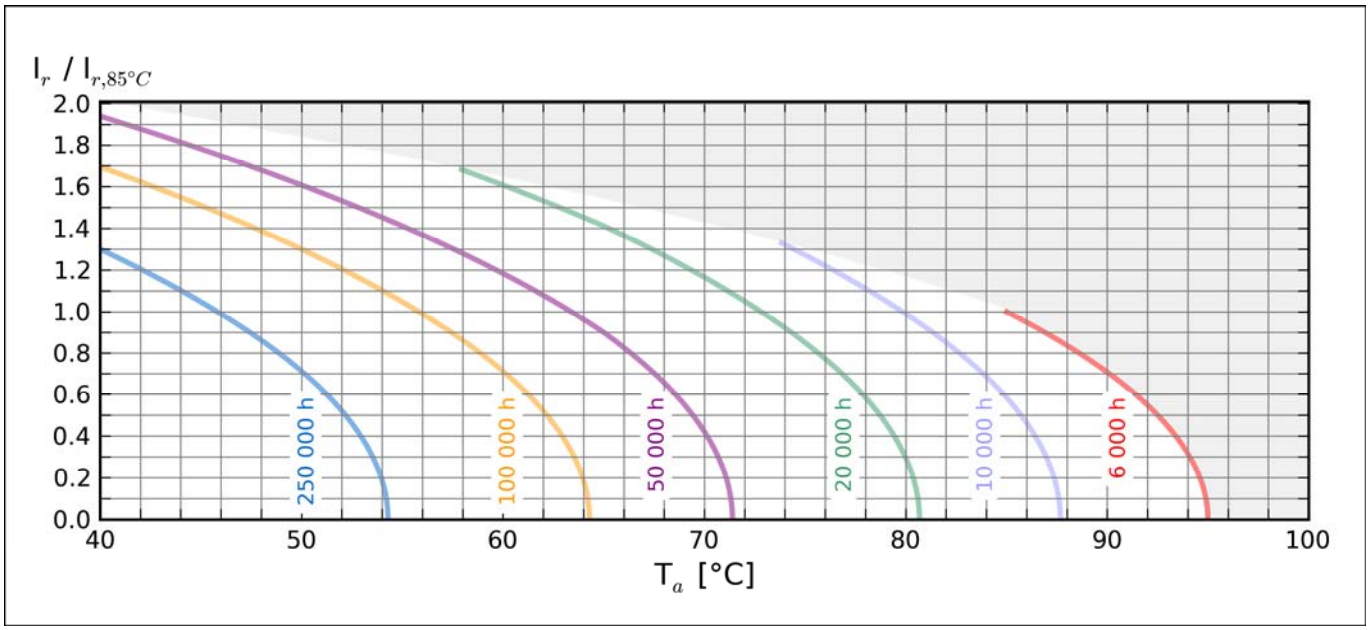
HP3	Useful life as function of ambient temperature and ripple current										
I_r at 85°C	x 1.0	x 1.1	x 1.2	x 1.3	x 1.4	x 1.5	x 1.6	x 1.7	x 1.8	x 1.9	x 2.0
T_a = 40°C	250	250	250	249	202	161	127	98	74	56	41
T_a = 45°C	250	229	191	157	128	102	80	62	47	35	
T_a = 50°C	170	144	121	99	80	64	50	39	29		
T_a = 55°C	107	91	76	63	51	40	32	24			
T_a = 60°C	68	57	48	39	32	25	20				
T_a = 65°C	43	36	30	25	20	16					
T_a = 70°C	27	23	19	15	12						
T_a = 75°C	17	14	12	10							
T_a = 80°C	10	9	7								
T_a = 85°C	6		khrs								

Max. value limited to 250 000 hours.

►Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r,85°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,85°C,120Hz}$



►Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	**T_a = 85°C; V_r, I_r applied 4000 hours**	**ΔC/C ≤ 15% (of initial value) Tanδ ≤ 175% (of specified value) I_L ≤ specified value**
Useful life	**T_a = 85°C; V_r, I_r applied 6000 hours**	**ΔC/C ≤ 20% (of initial value) Tanδ < 200% (of specified value) I_L ≤ specified value**

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

HU3 Snap-In 6 000h / 105°C

►Specifications / Spezifikationen

Items	Characteristics
Temperature range	-40°C ~ + 105°C
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.02 • C • V_r [µA] or 3 mA, which is smaller.
Useful life	6000h at 105°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10...55Hz, 10g, 3x2h

►Outline Drawings / Bauformen

Refer to page 6 for available terminal shapes and dimensions. / Auf Seite 6 finden Sie die verfügbaren Bauformen und Maße.

►Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]		50/60	120	300	1k	≥ 10k
multiplier	16V – 100V	0.70	1.00	1.10	1.20	1.20
	160V – 500V	0.70	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 1.0	v ≥ 1.0
multiplier	1.0	1.1

Temperature [°C]	40	60	70	85	105
multiplier	2.8	2.4	2.1	2.0	1.0

►Product Code / Bestellbezeichnung

Example: HU3 400V 390µF ±20% 30x50mm Shape „R“

HU3 2G 391 M R Z S7 WPEC

Type of series

Capacitance code
The first two digits are significant. The last digit indicates the number of following zeros in µF.

Terminal symbol code
- R: 2-pin terminal
- S: 4-pin terminal
- C: 2-pin short terminal
- X: 4-pin short terminal
- E: 3-pin short terminal

Outer design code
- None: PET sleeve and PVC plate
- WPEC: PET sleeve without plate

Rated voltage code

Code	Voltage	Code	Voltage	Code	Voltage
1C	16	2A	100	2G	400
1E	25	2C	160	420V	420
1V	35	2P	180	2W	450
1H	50	2D	200	2H	500
1J	63	2E	250		
1K	80	2V	350		

Capacitance tolerance
- M : ± 20%
- Q : -10% ~ +30%

Diameter code

Code	ØD
W	20
X	22
Y	25
Z	30
A	35
B	40

Length code

Code	L	Code	L	Code	L
S1	20	S8	55	S15	90
S2	25	S9	60	S16	95
S3	30	S10	65	S17	100
S4	35	S11	70	S18	105
S5	40	S12	75	S19	110
S6	45	S13	80		
S7	50	S14	85		

HU3 Series Snap-In 6 000 h / 105°C

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
16 1C (20)	4 700	0.50	4.56	1.63	95	22x25	HU31C472M□XS2
	6 800	0.50	5.94	2.12	65	25x30	HU31C682M□YS3
		0.50	6.22	2.22	65	22x35	HU31C682M□XS4
	10 000	0.50	7.45	2.66	45	30x25	HU31C103M□ZS2
		0.50	7.84	2.80	45	25x35	HU31C103M□YS4
		0.50	8.34	2.98	45	22x45	HU31C103M□XS6
	15 000	0.50	10.14	3.62	30	30x35	HU31C153M□ZS4
		0.50	10.14	3.62	30	35x30	HU31C153M□AS3
		0.50	10.30	3.68	30	25x45	HU31C153M□YS6
	22 000	0.50	12.96	4.63	20	35x35	HU31C223M□AS4
		0.50	13.50	4.82	20	30x45	HU31C223M□ZS6
	33 000	0.50	17.86	6.38	15	35x50	HU31C333M□AS7
25 1E (32)	3 300	0.40	4.28	1.53	130	22x25	HU31E332M□XS2
	4 700	0.40	5.18	1.85	90	25x25	HU31E472M□YS2
		0.40	5.43	1.94	90	22x30	HU31E472M□XS3
	6 800	0.40	6.86	2.45	65	25x30	HU31E682M□YS3
		0.40	6.86	2.45	65	30x25	HU31E682M□ZS2
		0.40	6.97	2.49	65	22x35	HU31E682M□XS4
	10 000	0.40	8.82	3.15	45	25x35	HU31E103M□YS4
		0.40	8.82	3.15	45	30x30	HU31E103M□ZS3
		0.40	8.82	3.15	45	35x25	HU31E103M□AS2
		0.40	9.32	3.33	45	22x45	HU31E103M□XS6
	15 000	0.40	11.34	4.05	30	30x35	HU31E153M□ZS4
		0.40	11.34	4.05	30	35x30	HU31E153M□AS3
		0.40	11.54	4.12	30	25x45	HU31E153M□YS6
	22 000	0.40	15.06	5.38	20	30x45	HU31E223M□ZS6
		0.40	15.06	5.38	20	35x40	HU31E223M□AS5
	33 000	0.40	19.96	7.13	15	35x50	HU31E333M□AS7
35 1V (44)	2 200	0.35	3.72	1.33	160	22x25	HU31V222M□XS2
	3 300	0.35	4.87	1.74	105	22x30	HU31V332M□XS3
		0.35	4.65	1.66	105	25x25	HU31V332M□YS2
	4 700	0.35	6.10	2.18	75	25x30	HU31V472M□YS3
		0.35	6.10	2.18	75	30x25	HU31V472M□ZS2
		0.35	6.19	2.21	75	22x35	HU31V472M□XS4
	5 600	0.35	6.44	2.30	65	25x30	HU31V562M□YS3
	6 800	0.35	7.73	2.76	55	25x40	HU31V682M□YS5
		0.35	7.73	2.76	55	30x30	HU31V682M□ZS3
		0.35	7.73	2.76	55	35x25	HU31V682M□AS2
		0.35	8.54	3.05	55	22x50	HU31V682M□XS7
	8 200	0.35	8.48	3.03	45	35x25	HU31V822M□AS2
	10 000	0.35	9.88	3.53	35	30x35	HU31V103M□ZS4
		0.35	9.88	3.53	35	35x30	HU31V103M□AS3
		0.35	10.53	3.76	35	25x50	HU31V103M□YS7
	15 000	0.35	13.33	4.76	25	35x40	HU31V153M□AS5
		0.35	13.80	4.93	25	30x50	HU31V153M□ZS7
	22 000	0.35	17.50	6.25	20	35x50	HU31V223M□AS7
50 1H (63)	1 500	0.30	3.33	1.19	215	22x25	HU31H152M□XS2
	2 200	0.30	4.09	1.46	145	25x25	HU31H222M□YS2
		0.30	4.28	1.53	145	22x30	HU31H222M□XS3
	3 300	0.30	5.49	1.96	100	25x30	HU31H332M□YS3
		0.30	5.52	1.97	100	30x25	HU31H332M□ZS2
		0.30	5.60	2.00	100	22x35	HU31H332M□XS4
	4 700	0.30	6.89	2.46	70	25x35	HU31H472M□YS4
		0.30	6.97	2.49	70	30x30	HU31H472M□ZS3
		0.30	6.97	2.49	70	35x25	HU31H472M□AS2
		0.30	7.39	2.64	70	22x45	HU31H472M□XS6
	6 800	0.30	8.82	3.15	50	30x35	HU31H682M□ZS4
		0.30	8.82	3.15	50	35x30	HU31H682M□AS3
		0.30	9.35	3.34	50	25x50	HU31H682M□YS7
	10 000	0.35	11.76	4.20	35	30x45	HU31H103M□ZS6
		0.35	11.76	4.20	35	35x40	HU31H103M□AS5
	15 000	0.35	15.62	5.58	25	35x50	HU31H153M□AS7

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
63 1J (79)	**1 000**	0.25	3.00	1.07	265	22x25	HU31J102M□XS2
	1 500	0.25	3.70	1.32	180	25x25	HU31J152M□YS2
		0.25	3.89	1.39	180	22x30	HU31J152M□XS3
	2 200	0.25	4.87	1.74	120	25x30	HU31J222M□YS2
		0.25	4.93	1.76	120	30x25	HU31J222M□ZS2
		0.25	5.01	1.79	120	22x35	HU31J222M□XS4
	3 300	0.25	6.38	2.28	80	30x30	HU31J332M□ZS3
		0.25	6.38	2.28	80	35x25	HU31J332M□AS2
		0.25	6.75	2.41	80	30x35	HU31J332M□ZS4
		0.25	6.78	2.42	80	22x45	HU31J332M□XS6
		0.25	6.78	2.42	80	25x40	HU31J332M□YS5
	4 700	0.25	8.01	2.86	60	30x35	HU31J472M□ZS4
		0.25	8.01	2.86	60	35x30	HU31J472M□AS3
		0.25	8.54	3.05	60	25x50	HU31J472M□YS7
		0.25	8.81	3.15	60	30x45	HU31J472M□ZS6
	5 600	0.25	9.18	3.28	50	35x35	HU31J562M□AS4
	6 800	0.25	10.58	3.78	40	30x45	HU31J682M□ZS6
		0.25	10.58	3.78	40	35x40	HU31J682M□AS5
	8 200	0.25	12.17	4.34	35	35x45	HU31J822M□AS6
	10 000	0.35	13.94	4.98	30	35x50	HU31J103M□AS7
80 1K (100)	**1 000**	0.20	3.39	1.21	230	25x25	HU31K102M□YS2
		0.20	3.53	1.26	230	22x30	HU31K102M□XS3
	1 500	0.20	4.56	1.63	155	25x30	HU31K152M□YS3
		0.20	4.56	1.63	155	30x25	HU31K152M□ZS2
		0.20	4.62	1.65	155	22x35	HU31K152M□XS4
	2 200	0.20	5.82	2.08	105	30x30	HU31K222M□ZS3
		0.20	5.82	2.08	105	35x25	HU31K222M□AS2
		0.20	5.91	2.11	105	25x40	HU31K222M□YS5
		0.20	6.41	2.29	105	22x50	HU31K222M□XS7
	3 300	0.20	7.50	2.68	70	35x30	HU31K332M□AS3
		0.20	7.67	2.74	70	30x40	HU31K332M□ZS5
		0.20	7.98	2.85	70	25x50	HU31K332M□YS7
	4 700	0.25	9.88	3.53	50	35x40	HU31K472M□AS5
		0.25	10.22	3.65	50	30x50	HU31K472M□ZS7
	6 800	0.25	12.88	4.60	35	35x50	HU31K682M□AS7
100 2A (125)	**560**	0.20	2.49	0.89	325	22x25	HU32A561M□XS2
	1 000	0.20	3.39	1.21	180	25x25	HU32A102M□YS2
		0.20	3.53	1.26	180	22x30	HU32A102M□XS3
	1 500	0.20	4.56	1.63	130	30x25	HU32A152M□ZS2
		0.20	4.84	1.73	130	22x40	HU32A152M□XS5
		0.20	4.84	1.73	130	25x35	HU32A152M□YS4
		0.20	5.30	1.89	130	30x40	HU32A152M□ZS5
	2 200	0.20	6.13	2.19	90	30x35	HU32A222M□ZS4
		0.20	6.24	2.23	90	25x45	HU32A222M□YS6
	3 300	0.20	7.92	2.83	60	35x35	HU32A332M□AS4
		0.20	8.26	2.95	60	30x45	HU32A332M□ZS6
	4 700	0.25	10.36	3.70	45	35x45	HU32A472M□AS6
160 2C (200)	**330**	0.15	3.02	1.08	430	22x25	HU32C331M□XS2
	390	0.15	3.36	1.20	365	25x25	HU32C391M□YS2
		0.15	3.39	1.21	365	22x30	HU32C391M□XS3
	470	0.15	3.67	1.31	305	25x25	HU32C471M□YS2
		0.15	3.72	1.33	305	22x30	HU32C471M□XS3
	560	0.15	4.31	1.54	255	22x35	HU32C561M□XS4
		0.15	4.31	1.54	255	25x30	HU32C561M□YS3
		0.15	4.31	1.54	255	30x25	HU32C561M□ZS2
	680	0.15	4.73	1.69	210	30x25	HU32C681M□ZS2
		0.15	4.96	1.77	210	25x35	HU32C681M□YS4
		0.15	4.98	1.78	210	22x40	HU32C681M□XS5
	820	0.15	5.52	1.97	175	30x30	HU32C821M□ZS3
		0.15	5.52	1.97	175	35x25	HU32C821M□AS2
		0.15	5.74	2.05	175	22x45	HU32C821M□XS6
		0.15	5.74	2.05	175	25x40	HU32C821M□YS5

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
160 2C (200)	1 000	0.15	6.10	2.18	145	35x25	HU32C102M□AS2
		0.15	6.44	2.30	145	30x35	HU32C102M□ZS4
		0.15	6.64	2.37	145	25x45	HU32C102M□YS6
	1 200	0.15	7.06	2.52	120	30x35	HU32C122M□ZS4
		0.15	7.06	2.52	120	35x30	HU32C122M□AS3
		0.15	7.59	2.71	120	25x50	HU32C122M□YS7
	1 500	0.15	8.37	2.99	95	35x35	HU32C152M□AS4
		0.15	8.62	3.08	95	30x45	HU32C152M□ZS6
	1 800	0.15	9.52	3.40	80	35x40	HU32C182M□AS5
		0.15	9.63	3.44	80	40x36	HU32C182M□BS4
180 2P (225)	270	0.15	2.66	0.95	460	22x25	HU32P271M□XS2
	330	0.15	3.08	1.10	375	25x25	HU32P331M□YS2
		0.15	3.11	1.11	375	22x30	HU32P331M□XS3
	390	0.15	3.36	1.20	320	25x25	HU32P391M□YS2
		0.15	3.39	1.21	320	22x30	HU32P391M□XS3
	470	0.15	3.95	1.41	265	22x35	HU32P471M□XS4
		0.15	3.95	1.41	265	25x30	HU32P471M□YS3
		0.15	3.95	1.41	265	30x25	HU32P471M□ZS2
	560	0.15	4.31	1.54	225	25x30	HU32P561M□YS3
		0.15	4.31	1.54	225	30x25	HU32P561M□ZS2
		0.15	4.54	1.62	225	22x40	HU32P561M□XS5
	680	0.15	5.01	1.79	185	25x35	HU32P681M□YS4
		0.15	5.01	1.79	185	30x30	HU32P681M□ZS3
		0.15	5.01	1.79	185	35x25	HU32P681M□AS2
		0.15	5.24	1.87	185	22x45	HU32P681M□XS6
	820	0.15	5.52	1.97	155	30x30	HU32P821M□ZS3
		0.15	5.52	1.97	155	35x25	HU32P821M□AS2
		0.15	5.77	2.06	155	25x40	HU32P821M□YS5
		0.15	5.96	2.13	155	22x50	HU32P821M□XS7
	1 000	0.15	6.44	2.30	125	30x35	HU32P102M□ZS4
		0.15	6.44	2.30	125	35x30	HU32P102M□AS3
		0.15	6.64	2.37	125	25x45	HU32P102M□YS6
	1 200	0.15	7.06	2.52	105	35x30	HU32P122M□AS3
		0.15	7.36	2.63	105	30x40	HU32P122M□ZS5
	1 500	0.15	8.37	2.99	85	35x35	HU32P152M□AS4
		0.15	8.96	3.20	85	30x50	HU32P152M□ZS7
	1 800	0.15	9.52	3.40	70	35x40	HU32P182M□AS5
		0.15	9.63	3.44	70	40x36	HU32P182M□BS4
200 2D (250)	220	0.15	2.83	1.01	485	22x25	HU32D221M□XS2
	270	0.15	3.16	1.13	395	22x25	HU32D271M□XS2
	330	0.15	3.70	1.32	325	25x25	HU32D331M□YS2
		0.15	3.72	1.33	325	22x30	HU32D331M□XS3
	390	0.15	4.03	1.44	275	25x25	HU32D391M□YS2
		0.15	4.28	1.53	275	22x35	HU32D391M□XS4
	470	0.15	4.68	1.67	230	25x30	HU32D471M□YS3
		0.15	4.73	1.69	230	30x25	HU32D471M□ZS2
		0.15	4.98	1.78	230	22x40	HU32D471M□XS5
		0.15	5.45	1.95	230	22x50	HU32D471M□XS7
	560	0.15	5.38	1.92	190	25x35	HU32D561M□YS4
		0.15	5.49	1.96	190	30x30	HU32D561M□ZS3
		0.15	5.71	2.04	190	22x45	HU32D561M□XS6
	680	0.15	6.05	2.16	160	30x30	HU32D681M□ZS3
		0.15	6.05	2.16	160	35x25	HU32D681M□AS2
		0.15	6.27	2.24	160	22x45	HU32D681M□XS6
		0.15	6.27	2.24	160	25x40	HU32D681M□YS5
	820	0.15	7.00	2.50	130	30x35	HU32D821M□ZS4
		0.15	7.00	2.50	130	35x30	HU32D821M□AS3
		0.15	7.20	2.57	130	25x45	HU32D821M□YS6

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
200 2D (250)	1 000	0.15	7.73	2.76	110	35x30	HU32D102M□AS3
		0.15	8.09	2.89	110	30x40	HU32D102M□ZS5
		0.15	8.32	2.97	110	25x50	HU32D102M□YS7
	1 200	0.15	8.99	3.21	90	35x35	HU32D122M□AS4
		0.15	9.24	3.30	90	30x45	HU32D122M□ZS6
	1 500	0.15	10.42	3.72	75	35x45	HU32D152M□AS6
		0.15	10.56	3.77	75	40x36	HU32D152M□BS4
	1 800	0.15	11.98	4.28	60	40x41	HU32D182M□BS5
		0.15	12.35	4.41	60	35x50	HU32D182M□AS7
	2 200	0.15	11.40	4.07	50	35x50	HU32D222M□AS7
250 2E (300)	220	0.15	3.02	1.08	445	25x25	HU32E221M□YS2
		0.15	3.08	1.10	445	22x30	HU32E221M□XS2
	270	0.15	3.33	1.19	360	25x25	HU32E271M□YS2
		0.15	3.58	1.28	360	22x35	HU32E271M□XS4
	330	0.15	3.92	1.40	295	25x30	HU32E331M□YS3
		0.15	3.95	1.41	295	22x35	HU32E331M□XS4
		0.15	3.95	1.41	295	30x25	HU32E331M□ZS2
	390	0.15	4.28	1.53	250	30x25	HU32E391M□ZS2
		0.15	4.51	1.61	250	25x35	HU32E391M□YS4
		0.15	4.56	1.63	250	22x40	HU32E391M□XS5
	470	0.15	4.98	1.78	210	35x25	HU32E471M□AS2
		0.15	5.01	1.79	210	30x30	HU32E471M□ZS3
		0.15	5.21	1.86	210	25x40	HU32E471M□YS5
		0.15	5.43	1.94	210	22x50	HU32E471M□XS7
	560	0.15	5.49	1.96	175	35x25	HU32E561M□AS2
		0.15	5.77	2.06	175	30x35	HU32E561M□ZS4
		0.15	5.94	2.12	175	25x45	HU32E561M□YS6
	680	0.15	6.36	2.27	145	30x35	HU32E681M□ZS4
		0.15	6.36	2.27	145	35x30	HU32E681M□AS3
		0.15	6.83	2.44	145	25x50	HU32E681M□YS7
	820	0.15	7.42	2.65	120	35x35	HU32E821M□AS4
		0.15	7.64	2.73	120	30x45	HU32E821M□ZS6
	1 000	0.15	8.51	3.04	100	35x40	HU32E102M□AS5
		0.15	8.62	3.08	100	40x36	HU32E102M□BS4
	1 200	0.15	9.66	3.45	85	35x45	HU32E122M□AS6
		0.15	9.77	3.49	85	40x41	HU32E122M□BS5
	1 500	0.15	10.81	3.86	65	35x45	HU32E152M□AS6
		0.15	11.28	4.03	65	35x50	HU32E152M□AS7
	1 800	0.15	12.94	4.62	55	40x51	HU32E182M□BS7
	2 200	0.15	13.74	4.91	45	40x60	HU32E222M□BS9
350 2V (400)	82	0.15	1.46	0.52	1126	22x25	HU32V820M□XS2
	100	0.15	1.68	0.60	924	25x25	HU32V101M□YS2
		0.15	1.74	0.62	924	22x30	HU32V101M□XS3
	120	0.15	1.85	0.66	770	25x25	HU32V121M□YS2
		0.15	1.88	0.67	770	22x30	HU32V121M□XS3
	150	0.15	2.21	0.79	615	22x35	HU32V151M□XS4
		0.15	2.21	0.79	615	25x30	HU32V151M□YS3
		0.15	2.21	0.79	615	30x25	HU32V151M□ZS2
	180	0.15	2.55	0.91	520	22x40	HU32V181M□XS5
		0.15	2.55	0.91	520	25x35	HU32V181M□YS4
		0.15	2.58	0.92	520	30x30	HU32V181M□ZS3
	220	0.15	2.86	1.02	450	30x30	HU32V221M□ZS3
		0.15	2.86	1.02	450	35x25	HU32V221M□AS2
		0.15	2.97	1.06	450	25x40	HU32V221M□YS5
		0.15	3.11	1.11	450	22x50	HU32V221M□XS7
	270	0.15	3.36	1.20	366	30x35	HU32V271M□ZS4
		0.15	3.36	1.20	366	35x30	HU32V271M□AS3
		0.15	3.44	1.23	366	25x45	HU32V271M□YS6

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
350 2V (400)	330	0.15	3.70	1.32	299	35x30	HU32V331M□AS3
		0.15	3.89	1.39	299	30x40	HU32V331M□ZS5
		0.15	3.98	1.42	299	25x50	HU32V331M□YS7
	390	0.15	4.26	1.52	253	35x35	HU32V391M□AS4
		0.15	4.40	1.57	253	30x45	HU32V391M□ZS6
	470	0.15	4.87	1.74	210	35x40	HU32V471M□AS5
		0.15	4.93	1.76	210	40x36	HU32V471M□BS4
	560	0.15	5.48	1.96	181	30x50	HU32V561M□ZS7
		0.15	5.52	1.97	181	35x45	HU32V561M□AS6
		0.15	5.54	1.98	181	40x41	HU32V561M□BS5
	1 000	0.15	7.98	2.85	90	35x51	HU32V102M□AS7
400 2G (450)	68	0.15	1.60	0.57	1300	22x25	HU32G680M□XS2
	82	0.15	1.85	0.66	1080	22x30	HU32G820M□XS3
		0.15	1.85	0.66	1080	25x25	HU32G820M□YS2
	100	0.15	2.04	0.73	890	25x25	HU32G101M□YS2
		0.15	2.07	0.74	890	22x30	HU32G101M□XS3
	120	0.15	2.38	0.85	740	25x30	HU32G121M□YS3
		0.15	2.41	0.86	740	22x35	HU32G121M□XS4
		0.15	2.41	0.86	740	30x25	HU32G121M□ZS2
	150	0.15	2.80	1.00	590	22x40	HU32G151M□XS5
		0.15	2.80	1.00	590	25x35	HU32G151M□YS4
		0.15	2.83	1.01	590	30x30	HU32G151M□ZS3
	180	0.15	3.11	1.11	490	30x30	HU32G181M□ZS3
		0.15	3.11	1.11	490	35x25	HU32G181M□AS2
		0.15	3.19	1.14	490	22x45	HU32G181M□XS6
		0.15	3.19	1.14	490	25x40	HU32G181M□YS5
	220	0.15	3.42	1.22	400	30x30	HU32G221M□ZS3
		0.15	3.64	1.30	400	30x35	HU32G221M□ZS4
		0.15	3.64	1.30	400	35x30	HU32G221M□AS3
		0.15	3.72	1.33	400	25x45	HU32G221M□YS6
	270	0.15	4.03	1.44	330	35x30	HU32G271M□AS3
		0.15	4.23	1.51	330	30x40	HU32G271M□ZS5
		0.15	4.31	1.54	330	25x50	HU32G271M□YS7
	330	0.15	4.68	1.67	270	35x35	HU32G331M□AS4
		0.15	4.84	1.73	270	30x45	HU32G331M□ZS6
	390	0.15	5.32	1.90	230	35x40	HU32G391M□AS5
		0.15	5.35	1.91	230	40x36	HU32G391M□BS4
		0.15	5.48	1.96	230	30x50	HU32G391M□ZS7
	470	0.15	6.08	2.17	190	35x45	HU32G471M□AS6
		0.15	6.10	2.18	190	40x41	HU32G471M□BS5
		0.15	6.33	2.26	190	35x50	HU32G471M□AS7
	560	0.15	6.41	2.29	181	40x36	HU32G561M□BS4
		0.15	6.80	2.43	160	30x55	HU32G561M□ZS8
		0.15	6.86	2.45	160	35x50	HU32G561M□AS7
	680	0.15	8.12	2.90	130	35x60	HU32G681M□AS9
	820	0.15	8.90	3.18	110	35x60	HU32G821M□AS9
		0.15	9.16	3.27	110	40x61	HU32G821M□BS9
	1 000	0.15	9.86	3.52	90	40x76	HU32G102M□BS12
		0.15	10.63	3.80	90	41x81	HU32G102M□BS13
	1 200	0.15	10.11	3.61	75	40x86	HU32G122M□BS14
		0.15	10.50	3.75	75	40x75	HU32G122M□BS12
	1 500	0.15	12.10	4.32	60	40x100	HU32G152M□BS17
420 420V (470)	47	0.15	1.18	0.42	1880	22x25	HU3420V470M□XS2
	68	0.15	1.54	0.55	1300	22x30	HU3420V680M□XS3
	82	0.15	1.65	0.59	1080	22x30	HU3420V820M□XS3
		0.15	1.65	0.59	1080	25x25	HU3420V820M□YS2
	100	0.15	1.93	0.69	890	22x35	HU3420V101M□XS4
		0.15	1.93	0.69	890	25x30	HU3420V101M□YS3

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
420 420V (470)	120	0.15	2.16	0.77	740	25x30	HU3420V121M□YS3
		0.15	2.16	0.77	740	30x25	HU3420V121M□ZS2
		0.15	2.24	0.80	740	22x40	HU3420V121M□XS5
	150	0.15	2.52	0.90	590	25x35	HU3420V151M□YS4
		0.15	2.55	0.91	590	30x30	HU3420V151M□ZS3
		0.15	2.66	0.95	590	22x45	HU3420V151M□XS6
	180	0.15	2.77	0.99	490	35x25	HU3420V181M□AS2
		0.15	2.80	1.00	490	30x30	HU3420V181M□ZS3
		0.15	2.88	1.03	490	25x40	HU3420V181M□YS5
	220	0.15	3.25	1.16	400	30x35	HU3420V221M□ZS4
		0.15	3.25	1.16	400	35x30	HU3420V221M□AS3
		0.15	3.47	1.24	400	25x50	HU3420V221M□YS7
	270	0.15	3.75	1.34	330	30x40	HU3420V271M□ZS5
		0.15	3.78	1.35	330	35x35	HU3420V271M□AS4
	330	0.15	4.34	1.55	270	35x40	HU3420V331M□AS5
		0.15	4.59	1.64	270	30x50	HU3420V331M□ZS7
	390	0.15	4.96	1.77	230	35x45	HU3420V391M□AS6
	470	0.15	5.71	2.04	140	35x50	HU3420V471M□AS7
450 2W (500)	47	0.15	1.29	0.46	1880	22x25	HU32W470M□XS2
	68	0.15	1.65	0.59	1300	25x25	HU32W680M□YS2
		0.15	1.68	0.60	1300	22x30	HU32W680M□XS3
	82	0.15	1.96	0.70	1080	22x35	HU32W820M□XS4
		0.15	1.96	0.70	1080	25x30	HU32W820M□YS3
	100	0.15	2.18	0.78	890	30x25	HU32W101M□ZS2
		0.15	2.27	0.81	890	22x40	HU32W101M□XS5
		0.15	2.27	0.81	890	25x35	HU32W101M□YS4
	120	0.15	2.46	0.88	740	25x35	HU32W121M□YS4
		0.15	2.52	0.90	740	30x30	HU32W121M□ZS3
		0.15	2.52	0.90	740	35x25	HU32W121M□AS2
		0.15	2.63	0.94	740	22x45	HU32W121M□XS6
	150	0.15	2.97	1.06	590	30x35	HU32W151M□ZS4
		0.15	2.97	1.06	590	35x30	HU32W151M□AS3
		0.15	3.08	1.10	590	25x45	HU32W151M□YS6
	180	0.15	3.28	1.17	490	30x35	HU32W181M□ZS4
		0.15	3.28	1.17	490	35x30	HU32W181M□AS3
		0.15	3.50	1.25	490	25x50	HU32W181M□YS7
	220	0.15	3.75	1.34	400	30x40	HU32W221M□ZS5
		0.15	3.81	1.36	400	35x35	HU32W221M□AS4
	270	0.15	4.22	1.51	330	35x35	HU32W271M□AS4
		0.15	4.40	1.57	330	35x40	HU32W271M□AS5
		0.15	4.56	1.63	330	30x50	HU32W271M□ZS7
	330	0.15	5.04	1.80	270	35x45	HU32W331M□AS6
	390	0.15	5.74	2.05	230	35x50	HU32W391M□AS7
	470	0.15	6.27	2.24	140	35x50	HU32W471M□AS7
		0.15	6.53	2.33	140	35x55	HU32W471M□AS8
	560	0.15	7.56	2.70	160	40x61	HU32W561M□BS9
		0.15	7.95	2.84	159	40x75	HU32W561M□BS12
	680	0.15	8.10	2.89	130	35x60	HU32W681M□AS9
		0.15	8.43	3.01	130	35x75	HU32W681M□AS12
		0.15	8.57	3.06	130	40x61	HU32W681M□BS9
	750	0.15	8.43	3.01	128	40x61	HU32W751M□BS11
		0.15	9.13	3.26	128	35x81	HU32W751M□AS13
		0.15	9.44	3.37	128	40x81	HU32W751M□BS13
	820	0.15	7.95	2.84	110	40x76	HU32W821M□BS12
		0.15	9.49	3.39	110	35x80	HU32W821M□AS13
		0.15	9.60	3.43	110	40x91	HU32W821M□BS15
	1 000	0.15	10.64	3.80	100	40x76	HU32W102M□BS12
	1 300	0.15	11.12	3.97	69	40x96	HU32W132M□BS16

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
500 2H (550)	**39**	0.20	1.06	0.38	2440	22x30	HU32H390M□XS3
	47	0.20	1.26	0.45	2030	22x35	HU32H470M□XS4
	56	0.20	1.46	0.52	1700	22x40	HU32H560M□XS5
	68	0.20	1.51	0.54	1400	30x25	HU32H680M□ZS2
		0.20	1.65	0.59	1400	22x45	HU32H680M□XS6
	82	0.20	1.72	0.62	1165	35x25	HU32H820M□AS2
		0.20	1.76	0.63	1165	30x30	HU32H820M□ZS3
		0.20	1.79	0.64	1165	25x40	HU32H820M□YS5
		0.20	1.90	0.68	1165	22x50	HU32H820M□XS7
		0.20	1.91	0.68	1165	22x45	HU32H820M□XS5
	100	0.20	2.03	0.73	960	35x30	HU32H101M□AS3
		0.20	2.04	0.73	960	30x35	HU32H101M□ZS4
		0.20	2.07	0.74	960	25x45	HU32H101M□YS6
	120	0.20	2.22	0.79	800	30x35	HU32H121M□ZS4
		0.20	2.22	0.79	800	35x30	HU32H121M□AS3
		0.20	2.34	0.84	800	30x40	HU32H121M□ZS5
		0.20	2.38	0.85	800	25x50	HU32H121M□YS7
	150	0.20	2.63	0.94	640	30x40	HU32H151M□ZS5
		0.20	2.63	0.94	640	35x35	HU32H151M□AS4
		0.20	2.65	0.95	640	25x50	HU32H151M□YS7
		0.20	2.72	0.97	640	30x45	HU32H151M□ZS6
	180	0.20	3.00	1.07	535	35x40	HU32H181M□AS5
		0.20	3.11	1.11	535	30x50	HU32H181M□ZS7
	220	0.20	3.30	1.18	434	35x40	HU32H221M□AS5
		0.20	3.44	1.23	434	35x45	HU32H221M□AS6
	270	0.20	3.98	1.42	360	35x50	HU32H271M□AS7
	330	0.20	4.40	1.57	290	35x50	HU32H331M□AS7
		0.20	4.70	1.68	290	35x60	HU32H331M□AS9
	390	0.20	5.32	1.90	245	35x75	HU32H391M□AS12
	470	0.20	5.85	2.09	210	40x61	HU32H471M□BS9
		0.20	6.08	2.17	210	35x85	HU32H471M□AS14
		0.20	6.08	2.17	210	40x76	HU32H471M□BS12
	560	0.20	6.78	2.42	188	40x81	HU32H561M□BS13
	680	0.20	7.48	2.67	140	40x81	HU32H681M□BS13
	820	0.20	8.99	3.21	128	40x101	HU32H821M□BS17

►Life Time Table / Brauchbarkeitsdauer – Tabelle

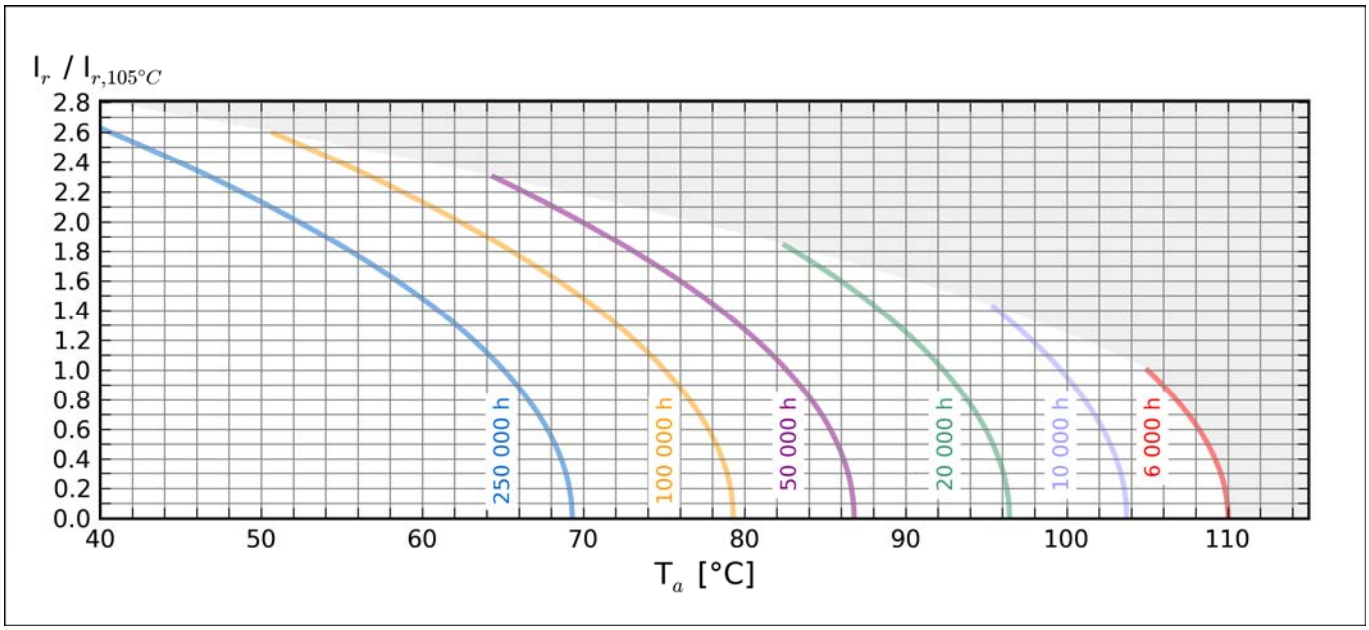
HU3	Useful life as function of ambient temperature and ripple current													
I_r at 105°C	x 1.0	x 1.2	x 1.4	x 1.6	x 1.8	x 2.0	x 2.1	x 2.2	x 2.3	x 2.4	x 2.5	x 2.6	x 2.7	x 2.8
T_a = 40°C	250	250	250	250	250	250	250	250	250	250	250	250	216	174
T_a = 45°C	250	250	250	250	250	250	250	250	250	247	204	168	136	
T_a = 50°C	250	250	250	250	250	250	250	223	188	156	129	106		
T_a = 55°C	250	250	250	250	250	196	167	141	118	99	81			
T_a = 60°C	250	250	250	216	166	124	105	89	75	62				
T_a = 65°C	250	211	173	137	105	78	66	56	47					
T_a = 70°C	158	134	109	86	66	49	42							
T_a = 75°C	100	84	69	54	42	31	26							
T_a = 80°C	63	53	43	34	26	19								
T_a = 85°C	40	33	27	21	16	12								
T_a = 90°C	25	21	17	13	10									
T_a = 95°C	16	13	11	8										
T_a = 100°C	10	8												
T_a = 105°C	6													

khrs Max. value limited to 250 000 hours.

►Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r,105°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,105°C,120Hz}$



►Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	**T_a = 105°C; V_r, I_r applied 4000 hours**	**ΔC/C ≤ 15% (of initial value) Tanδ ≤ 175% (of specified value) I_L ≤ specified value**
Useful life	**T_a = 105°C; V_r, I_r applied 6000 hours**	**ΔC/C ≤ 20% (of initial value) Tanδ < 200% (of specified value) I_L ≤ specified value**

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

HU Snap-In 6000h / 105°C

►Specifications / Spezifikationen

Items	Characteristics
Temperature range	-40°C ~ + 105°C (200VDC - 250VDC) -25°C ~ + 105°C (400VDC - 500VDC)
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.02 • C • V_r [µA] or 3 mA, which is smaller.
Useful life	6000h at 105°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10...55Hz, 10g, 3x2h

►Outline Drawings / Bauformen

Refer to page 6 for available terminal shapes and dimensions. / Auf Seite 6 finden Sie die verfügbaren Bauformen und Maße.

►Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]	50/60	120	300	1k	≥ 10k
multiplier	0.70	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 1.0	v ≥ 1.0
multiplier	1.0	1.1

Temperature [°C]	40	60	70	85	105
multiplier	2.3	1.9	1.7	1.4	1.0

►Product Code / Bestellbezeichnung

Example: HU 400V 330µF ±20% 30x30mm Shape „R“

HU 2G 331 M R Z S3 WPEC

Type of series

Capacitance code
The first two digits are significant. The last digit indicates the number of following zeros in µF.

Terminal symbol code
- R: 2-pin terminal
- S: 4-pin terminal
- C: 2-pin short terminal
- X: 4-pin short terminal
- E: 3-pin short terminal

Outer design code
- None: PET sleeve and PVC plate
- WPEC: PET sleeve without plate

Rated voltage code

Code	Voltage
2D	200
2E	250
2G	400
420V	420
2W	450
2H	500

Capacitance tolerance
- M : ± 20%
- Q : -10% ~ +30%

Diameter code

Code	ØD
X	22
Y	25
Z	30
A	35

Length code

Code	L	Code	L
S2	25	S6	45
S3	30	S7	50
S4	35	S8	55
S5	40	S9	60

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
200 2D (250)	330	0.15	2.46	1.07	330	22x25	HU2D331M□XS2
	390	0.15	2.85	1.24	280	22x30	HU2D391M□XS3
	470	0.15	3.01	1.31	240	25x25	HU2D471M□YS2
	560	0.15	3.63	1.58	200	22x35	HU2D561M□XS4
		0.15	3.50	1.52	200	25x30	HU2D561M□YS3
	680	0.15	4.21	1.83	160	22x40	HU2D681M□XS5
		0.15	4.07	1.77	160	25x35	HU2D681M□YS4
		0.15	3.68	1.60	160	30x25	HU2D681M□ZS2
	820	0.15	5.06	2.20	140	22x50	HU2D821M□XS7
		0.15	4.72	2.05	140	25x40	HU2D821M□YS5
		0.15	4.28	1.86	140	30x30	HU2D821M□ZS3
		0.15	3.50	1.52	140	35x25	HU2D821M□AS2
	1 000	0.15	5.45	2.37	110	25x45	HU2D102M□YS6
		0.15	4.99	2.17	110	30x35	HU2D102M□ZS4
	1 200	0.15	6.21	2.70	100	25x50	HU2D122M□YS7
		0.15	5.73	2.49	100	30x40	HU2D122M□ZS5
		0.15	4.46	1.94	100	35x30	HU2D122M□AS3
	1 500	0.15	6.69	2.91	80	30x45	HU2D152M□ZS6
		0.15	5.27	2.29	80	35x35	HU2D152M□AS4
	1 800	0.15	7.64	3.32	70	30x50	HU2D182M□ZS7
		0.15	6.03	2.62	70	35x40	HU2D182M□AS5
	2 200	0.15	6.95	3.02	50	35x45	HU2D222M□AS6
250 2E (300)	220	0.15	2.19	0.95	440	22x25	HU2E221M□XS2
	330	0.15	2.99	1.30	290	20x35	HU2E331M□WS4
		0.15	2.85	1.24	290	22x30	HU2E331M□XS3
		0.15	2.74	1.19	290	25x25	HU2E331M□YS2
	390	0.15	3.27	1.42	250	22x35	HU2E391M□XS4
		0.15	3.15	1.37	250	25x30	HU2E391M□YS3
	470	0.15	3.80	1.65	210	22x40	HU2E471M□XS5
		0.15	3.27	1.42	210	30x25	HU2E471M□ZS2
	560	0.15	4.32	1.88	180	22x45	HU2E561M□XS6
		0.15	4.00	1.74	180	25x35	HU2E561M□YS4
	680	0.15	4.85	2.11	150	25x45	HU2E681M□YS6
		0.15	4.19	1.82	150	30x30	HU2E681M□ZS3
		0.15	3.50	1.52	150	35x25	HU2E681M□AS2
	820	0.15	5.54	2.41	120	25x50	HU2E821M□YS7
		0.15	4.83	2.10	120	30x35	HU2E821M□ZS4
		0.15	4.05	1.76	120	35x30	HU2E821M□AS3
	1 000	0.15	5.59	2.43	100	30x40	HU2E102M□ZS5
		0.15	4.69	2.04	100	35x35	HU2E102M□AS4
	1 200	0.15	6.65	2.89	80	30x50	HU2E122M□ZS7
		0.15	5.38	2.34	80	35x40	HU2E122M□AS5
	1 500	0.15	6.28	2.73	70	35x45	HU2E152M□AS6
	1 800	0.15	7.15	3.11	60	35x50	HU2E182M□AS7
400 2G (450)	120	0.20	1.77	0.77	800	22x25	HU2G121M□XS2
	150	0.20	2.12	0.92	640	22x30	HU2G151M□XS3
	180	0.20	2.42	1.05	540	22x35	HU2G181M□XS4
		0.20	2.28	0.99	540	25x25	HU2G181M□YS2
	220	0.20	2.81	1.22	440	22x40	HU2G221M□XS5
		0.20	2.67	1.16	440	25x30	HU2G221M□YS3
	270	0.20	3.22	1.40	360	22x45	HU2G271M□XS6
		0.20	3.11	1.35	360	25x35	HU2G271M□YS4
		0.20	2.94	1.28	360	30x25	HU2G271M□ZS2
	330	0.20	3.66	1.59	290	22x50	HU2G331M□XS7
		0.20	3.57	1.55	290	25x40	HU2G331M□YS5
		0.20	3.43	1.49	290	30x30	HU2G331M□ZS3
		0.20	3.36	1.46	290	35x25	HU2G331M□AS2

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
400 2G (450)	390	0.20	4.00	1.74	250	25x45	HU2G391M□YS6
		0.20	3.91	1.70	250	30x35	HU2G391M□ZS4
	470	0.20	4.46	1.94	210	30x40	HU2G471M□ZS5
		0.20	4.23	1.84	210	35x30	HU2G471M□AS3
	560	0.20	5.04	2.19	180	30x45	HU2G561M□ZS6
		0.20	4.81	2.09	180	35x35	HU2G561M□AS4
	680	0.20	5.70	2.48	150	30x50	HU2G681M□ZS7
		0.20	5.52	2.40	150	35x40	HU2G681M□AS5
	820	0.20	6.26	2.72	120	35x45	HU2G821M□AS6
		0.20	6.39	2.78	120	35x50	HU2G821M□AS7
	1 000	0.20	6.58	2.86	120	35x60	HU2G102M□AS9
420 420V (470)	100	0.20	1.63	0.71	1020	22x25	HU420V101M□XS2
	150	0.20	2.12	0.92	680	22x30	HU420V151M□XS3
		0.20	2.07	0.90	680	25x25	HU420V151M□YS2
	180	0.20	2.42	1.05	570	22x35	HU420V181M□XS4
		0.20	2.42	1.05	570	25x30	HU420V181M□YS3
	220	0.20	2.81	1.22	470	22x40	HU420V221M□XS5
		0.20	2.78	1.21	470	25x35	HU420V221M□YS4
		0.20	2.65	1.15	470	30x25	HU420V221M□ZS2
	270	0.20	3.31	1.44	380	22x50	HU420V271M□XS7
		0.20	3.22	1.40	380	25x40	HU420V271M□YS5
		0.20	3.11	1.35	380	30x30	HU420V271M□ZS3
		0.20	3.17	1.38	380	35x25	HU420V271M□AS2
	330	0.20	3.70	1.61	310	25x45	HU420V331M□YS6
		0.20	3.59	1.56	310	30x35	HU420V331M□ZS4
	390	0.20	4.14	1.80	270	25x50	HU420V391M□YS7
		0.20	4.05	1.76	270	30x40	HU420V391M□ZS5
		0.20	3.84	1.67	270	35x30	HU420V391M□AS3
	470	0.20	4.60	2.00	220	30x45	HU420V471M□ZS6
		0.20	4.42	1.92	220	35x35	HU420V471M□AS4
	560	0.20	5.18	2.25	190	30x50	HU420V561M□ZS7
		0.20	5.01	2.18	190	35x40	HU420V561M□AS5
	680	0.20	5.70	2.48	150	35x45	HU420V681M□AS6
	820	0.20	6.44	2.80	130	35x50	HU420V821M□AS7
450 2W (500)	100	0.20	1.63	0.71	1020	22x25	HU2W101M□XS2
		0.20	1.73	0.75	1020	22x30	HU2W101M□XS3
	120	0.20	1.89	0.82	850	22x30	HU2W121M□XS3
		0.20	1.86	0.81	850	25x25	HU2W121M□YS2
	150	0.20	2.12	0.92	680	22x30	HU2W151M□XS3
		0.20	2.21	0.96	680	22x35	HU2W151M□XS4
		0.20	2.07	0.90	680	25x25	HU2W151M□YS2
	180	0.20	2.42	1.05	570	22x35	HU2W181M□XS4
		0.20	2.51	1.09	570	22x40	HU2W181M□XS5
		0.20	2.42	1.05	570	25x30	HU2W181M□YS3
		0.20	2.51	1.09	570	25x35	HU2W181M□YS4
		0.20	2.39	1.04	570	30x25	HU2W181M□ZS2
	220	0.20	2.81	1.22	470	22x40	HU2W221M□XS5
		0.20	2.88	1.25	470	22x45	HU2W221M□XS6
		0.20	2.78	1.21	470	25x35	HU2W221M□YS4
		0.20	2.65	1.15	470	30x25	HU2W221M□ZS2
	270	0.20	3.31	1.44	380	22x50	HU2W271M□XS7
		0.20	3.22	1.40	380	25x40	HU2W271M□YS5
		0.20	3.11	1.35	380	30x30	HU2W271M□ZS3
		0.20	3.17	1.38	380	35x25	HU2W271M□AS2
	330	0.20	3.70	1.61	310	25x45	HU2W331M□YS6
		0.20	3.80	1.65	310	25x50	HU2W331M□YS7
		0.20	3.59	1.56	310	30x35	HU2W331M□ZS4
		0.20	3.52	1.53	310	35x30	HU2W331M□AS3
	390	0.20	4.14	1.80	270	25x50	HU2W391M□YS7
		0.20	4.05	1.76	270	30x40	HU2W391M□ZS5
		0.20	3.84	1.67	270	35x30	HU2W391M□AS3
	470	0.20	4.60	2.00	220	30x45	HU2W471M□ZS6
		0.20	4.78	2.08	220	30x50	HU2W471M□ZS7
		0.20	4.42	1.92	220	35x35	HU2W471M□AS4

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
450 2W (500)	**560**	0.20	5.18	2.25	190	30x50	HU2W561M□ZS7
		0.20	5.01	2.18	190	35x40	HU2W561M□AS5
		0.20	5.20	2.26	190	35x45	HU2W561M□AS6
	680	0.20	5.70	2.48	150	35x45	HU2W681M□AS6
		0.20	5.87	2.55	150	35x50	HU2W681M□AS7
	820	0.20	6.44	2.80	130	35x50	HU2W821M□AS7
500 2H (550)	**56**	0.20	1.10	0.48	1710	22x25	HU2H560M□XS2
	68	0.20	1.29	0.56	1410	22x30	HU2H680M□XS3
		0.20	1.27	0.55	1410	25x25	HU2H680M□YS2
	82	0.20	1.47	0.64	1170	22x35	HU2H820M□XS4
		0.20	1.47	0.64	1170	25x30	HU2H820M□YS3
	100	0.20	1.70	0.74	960	22x40	HU2H101M□XS5
		0.20	1.52	0.66	960	30x25	HU2H101M□ZS3
	120	0.20	1.93	0.84	800	22x45	HU2H121M□XS6
		0.20	1.86	0.81	800	25x35	HU2H121M□YS4
	150	0.20	2.23	0.97	640	25x45	HU2H151M□YS6
		0.20	1.96	0.85	640	30x30	HU2H151M□ZS3
		0.20	1.86	0.81	640	35x25	HU2H151M□AS2
	180	0.20	2.53	1.10	540	25x50	HU2H181M□YS7
		0.20	2.25	0.98	540	30x35	HU2H181M□ZS4
		0.20	2.14	0.93	540	35x30	HU2H181M□AS3
	220	0.20	2.58	1.12	440	30x40	HU2H221M□ZS5
		0.20	2.46	1.07	440	35x35	HU2H221M□AS4
	270	0.20	3.06	1.33	360	30x50	HU2H271M□ZS7
		0.20	2.83	1.23	360	35x40	HU2H271M□AS5
	330	0.20	3.24	1.41	290	35x45	HU2H331M□AS6
	390	0.20	3.63	1.58	250	35x50	HU2H391M□AS7
	470	0.20	4.88	2.12	210	35x60	HU2H471M□AS9

►Life Time Table / Brauchbarkeitsdauer – Tabelle

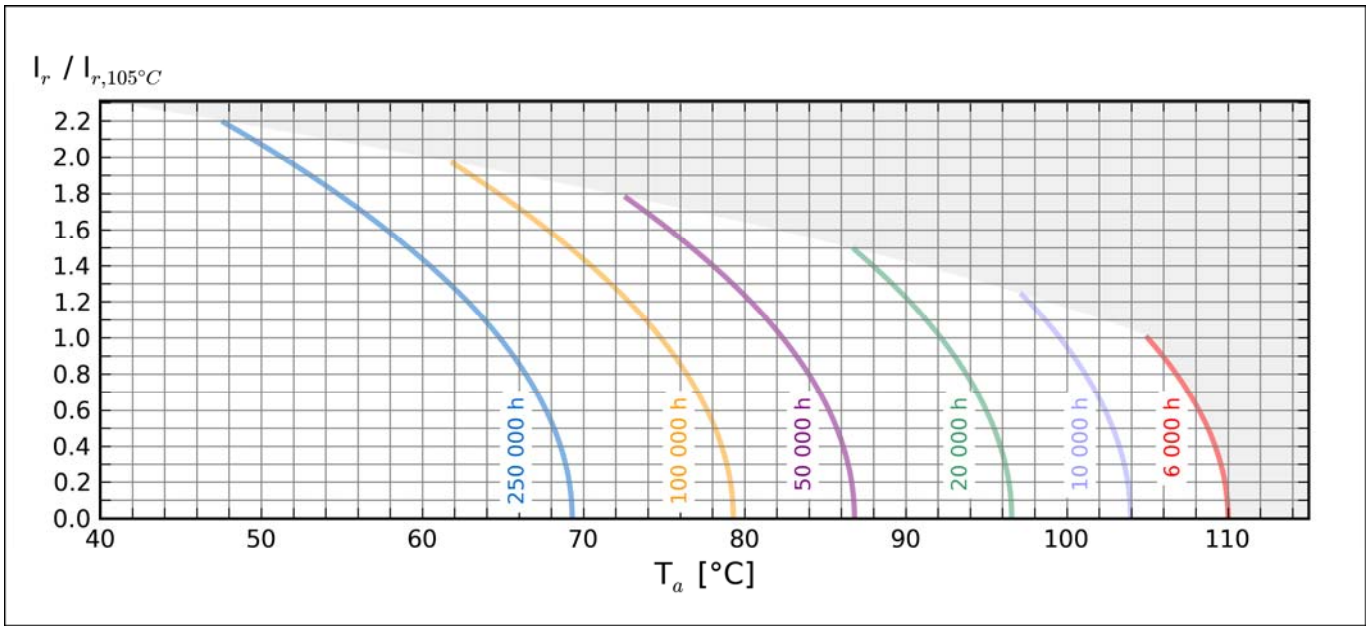
HU	Useful life as function of ambient temperature and ripple current													
I_r at 105°C	x 1.0	x 1.1	x 1.2	x 1.3	x 1.4	x 1.5	x 1.6	x 1.7	x 1.8	x 1.9	x 2.0	x 2.1	x 2.2	x 2.3
T_a = 40°C	250	250	250	250	250	250	250	250	250	250	250	250	250	250
T_a = 45°C	250	250	250	250	250	250	250	250	250	250	250	250		
T_a = 50°C	250	250	250	250	250	250	250	250	250	250	250			
T_a = 55°C	250	250	250	250	250	250	250	250	243	209	178			
T_a = 60°C	250	250	250	250	250	231	203	177	154	132				
T_a = 65°C	245	225	204	184	165	146	128	112	97					
T_a = 70°C	155	142	129	116	104	92	81	71						
T_a = 75°C	98	90	81	73	66	58	51							
T_a = 80°C	62	56	51	46	41									
T_a = 85°C	39	36	32	29	26									
T_a = 90°C	24	22	20											
T_a = 95°C	15	14												
T_a = 100°C	9	9												
T_a = 105°C	6													

khrs Max. value limited to 250 000 hours.

►Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r,105°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,105°C,120Hz}$



►Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	**T_a = 105°C; V_r, I_r applied 4000 hours**	**ΔC/C ≤ 20% (of initial value) Tanδ ≤ 200% (of specified value) I_L ≤ specified value**
Useful life	**T_a = 105°C; V_r, I_r applied 6000 hours**	**ΔC/C ≤ 30% (of initial value) Tanδ < 300% (of specified value) I_L ≤ specified value**

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

HL2 Snap-In 12 000h / 105°C

►Specifications / Spezifikationen

Items	Characteristics
Temperature range	-40°C ~ + 105°C
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.02 • C • V_r [µA] or 3 mA, which is smaller.
Useful life	12000h at 105°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10...55Hz, 10g, 3x2h

►Outline Drawings / Bauformen

Refer to page 6 for available terminal shapes and dimensions. / Auf Seite 6 finden Sie die verfügbaren Bauformen und Maße.

►Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]	50/60	120	300	1k	≥ 10k
multiplier	0.70	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 1.0	v ≥ 1.0
multiplier	1.0	1.1

Temperature [°C]	40	60	70	85	105
multiplier	2.8	2.4	2.1	2.0	1.0

►Product Code / Bestellbezeichnung

Example: HL2 400V 470µF ±20% 30x50mm Shape „X“

HL2 2G 471 M X Z S7 WPEC

Type of series

Capacitance code
The first two digits are significant. The last digit indicates the number of following zeros in µF.

Terminal symbol code
- R: 2-pin terminal
- S: 4-pin terminal
- C: 2-pin short terminal
- X: 4-pin short terminal
- E: 3-pin short terminal

Outer design code
- None: PET sleeve and PVC plate
- WPEC: PET sleeve without plate

Rated voltage Code

Code	Voltage
2D	200
2E	250
2G	400
420V	420
2W	450
2H	500

Capacitance tolerance
- M : ± 20%
- Q : -10% ~ +30%

Diameter Code

Code	ØD
W	20
X	22
Y	25
Z	30
A	35
B	40

Length Code

Code	L	Code	L
S1	20	S8	55
S2	25	S9	60
S3	30	S10	65
S4	35	S11	70
S5	40	S12	75
S6	45	S13	80
S7	50	S14	85

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
200 2D (250)	**220**	0.15	2.72	0.97	456	20x25	HL22D221M□WS2
	270	0.15	3.25	1.16	372	20x30	HL22D271M□WS3
	330	0.15	3.50	1.25	304	25x25	HL22D331M□YS2
		0.15	3.67	1.31	304	22x30	HL22D331M□XS3
		0.15	3.78	1.35	304	20x35	HL22D331M□WS4
	390	0.15	4.06	1.45	257	25x30	HL22D391M□YS3
	470	0.15	4.37	1.56	214	30x25	HL22D471M□ZS2
		0.15	4.48	1.60	214	25x30	HL22D471M□YS3
		0.15	4.87	1.74	214	22x40	HL22D471M□XS5
	560	0.15	5.15	1.84	179	25x35	HL22D561M□YS4
		0.15	5.57	1.99	179	22x45	HL22D561M□XS6
	680	0.15	5.57	1.99	148	30x30	HL22D681M□ZS3
		0.15	5.94	2.12	148	25x40	HL22D681M□YS5
	820	0.15	6.47	2.31	122	30x35	HL22D821M□ZS4
		0.15	6.83	2.44	122	25x45	HL22D821M□YS6
	1 000	0.15	6.33	2.26	100	35x30	HL22D102M□AS3
		0.15	7.48	2.67	100	30x40	HL22D102M□ZS5
	1 200	0.15	7.28	2.60	84	35x35	HL22D122M□AS4
		0.15	8.57	3.06	84	30x45	HL22D122M□ZS6
	1 500	0.15	8.51	3.04	67	35x40	HL22D152M□AS5
250 2E (300)	**150**	0.15	2.24	0.80	496	20x25	HL22E151M□WS2
	180	0.15	2.52	0.90	413	22x25	HL22E181M□XS2
		0.15	2.63	0.94	413	20x30	HL22E181M□WS3
	220	0.15	2.88	1.03	338	20x30	HL22E221M□WS3
	270	0.15	3.16	1.13	275	25x25	HL22E271M□YS2
		0.15	3.42	1.22	275	20x35	HL22E271M□WS4
	330	0.15	3.72	1.33	225	25x30	HL22E331M□YS3
		0.15	3.89	1.39	225	22x35	HL22E331M□XS4
	390	0.15	4.00	1.43	191	30x25	HL22E391M□ZS2
		0.15	4.28	1.53	191	25x35	HL22E391M□YS4
		0.15	4.42	1.58	191	22x40	HL22E391M□XS5
	470	0.15	4.65	1.66	162	30x30	HL22E471M□ZS3
		0.15	4.96	1.77	162	25x40	HL22E471M□YS5
		0.15	5.32	1.90	162	22x50	HL22E471M□XS7
	560	0.15	5.66	2.02	136	25x45	HL22E561M□YS6
	680	0.15	5.88	2.10	112	30x35	HL22E681M□ZS4
		0.15	6.50	2.32	112	25x50	HL22E681M□YS7
	820	0.15	6.78	2.42	93	30x40	HL22E821M□ZS5
	1 000	0.15	8.12	2.90	76	30x50	HL22E102M□ZS7
	1 200	0.15	7.92	2.83	64	35x45	HL22E122M□AS6
	1 500	0.15	9.21	3.29	61	35x50	HL22E152M□AS7
400 2G (450)	**47**	0.15	1.29	0.46	1625	20x25	HL22G470M□WS2
	68	0.15	1.57	0.56	1121	20x25	HL22G680M□WS2
	82	0.15	1.79	0.64	952	22x25	HL22G820M□XS2
		0.15	1.85	0.66	952	20x30	HL22G820M□WS3
	100	0.15	2.02	0.72	781	25x25	HL22G101M□YS2
		0.15	2.10	0.75	781	22x30	HL22G101M□XS3
		0.15	2.16	0.77	781	20x35	HL22G101M□WS4
	120	0.15	2.35	0.84	651	25x30	HL22G121M□YS3
		0.15	2.38	0.85	651	20x35	HL22G121M□WS4
		0.15	2.44	0.87	651	22x35	HL22G121M□XS4
	150	0.15	2.46	0.88	521	30x25	HL22G151M□ZS2
		0.15	2.63	0.94	521	25x30	HL22G151M□YS3
		0.15	2.86	1.02	521	22x40	HL22G151M□XS5
	180	0.15	2.86	1.02	475	30x30	HL22G181M□ZS3
		0.15	3.05	1.09	475	25x35	HL22G181M□YS4
		0.15	3.30	1.18	475	22x45	HL22G181M□XS6
	220	0.15	3.16	1.13	389	30x30	HL22G221M□ZS3
		0.15	3.53	1.26	389	25x40	HL22G221M□YS5
		0.15	3.78	1.35	389	22x50	HL22G221M□XS7
	270	0.15	3.72	1.33	317	30x35	HL22G271M□ZS4
		0.15	3.72	1.33	317	35x30	HL22G271M□AS3
		0.15	4.09	1.46	317	25x45	HL22G271M□YS6

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
400 2G (450)	330	0.15	4.31	1.54	259	30x40	HL22G331M□ZS5
		0.15	4.31	1.54	259	35x35	HL22G331M□AS4
		0.15	4.68	1.67	259	25x50	HL22G331M□YS7
	390	0.15	4.68	1.67	219	35x35	HL22G391M□AS4
		0.15	4.90	1.75	219	30x45	HL22G391M□ZS6
		0.15	6.04	2.16	218	40x31	HL22G391M□BS3
	470	0.15	5.38	1.92	182	35x40	HL22G471M□AS5
		0.15	5.61	2.00	182	30x50	HL22G471M□ZS7
	560	0.15	6.13	2.19	156	35x45	HL22G561M□AS6
	680	0.15	6.84	2.44	130	40x40	HL22G681M□BS5
		0.15	7.02	2.51	126	35x50	HL22G681M□AS7
	820	0.15	8.35	2.98	105	35x70	HL22G821M□AS11
	1 000	0.15	9.73	3.48	86	35x80	HL22G102M□AS13
420 420V (470)	150	0.15	2.63	0.94	570	30x30	HL2420V151M□ZS3
	180	0.15	3.02	1.08	475	30x35	HL2420V181M□ZS4
		0.15	3.02	1.08	475	35x30	HL2420V181M□AS3
	220	0.15	3.36	1.20	389	30x35	HL2420V221M□ZS4
		0.15	3.36	1.20	389	35x30	HL2420V221M□AS3
		0.15	3.82	1.36	389	25x50	HL2420V221M□YS7
	330	0.15	4.31	1.54	259	30x40	HL2420V331M□ZS5
450 2W (500)	47	0.15	1.29	0.46	1820	20x25	HL22W470M□WS2
	56	0.15	1.48	0.53	1527	22x25	HL22W560M□XS2
		0.15	1.54	0.55	1527	20x30	HL22W560M□WS3
	68	0.15	1.65	0.59	1258	25x25	HL22W680M□YS2
		0.15	1.68	0.60	1258	20x30	HL22W680M□WS3
		0.15	1.74	0.62	1258	22x30	HL22W680M□XS3
	82	0.15	1.96	0.70	1043	20x35	HL22W820M□WS4
	100	0.15	2.00	0.72	855	25x25	HL22W101M□YS2
		0.15	2.13	0.76	855	25x30	HL22W101M□YS3
		0.15	2.21	0.79	855	22x35	HL22W101M□XS4
	120	0.15	2.21	0.79	713	30x25	HL22W121M□ZS2
		0.15	2.46	0.88	713	25x35	HL22W121M□YS4
		0.15	2.55	0.91	713	22x40	HL22W121M□XS5
	150	0.15	2.63	0.94	570	30x30	HL22W151M□ZS3
		0.15	2.91	1.04	570	25x40	HL22W151M□YS5
		0.15	3.14	1.12	570	22x50	HL22W151M□XS7
	180	0.15	3.02	1.08	475	30x35	HL22W181M□ZS4
		0.15	3.33	1.19	475	25x45	HL22W181M□YS6
	220	0.15	3.36	1.20	389	35x30	HL22W221M□AS3
		0.15	3.50	1.25	389	30x40	HL22W221M□ZS5
	270	0.15	3.92	1.40	317	35x35	HL22W271M□AS4
		0.15	4.06	1.45	317	30x45	HL22W271M□ZS6
	330	0.15	4.54	1.62	259	35x40	HL22W331M□AS5
		0.15	4.68	1.67	259	30x50	HL22W331M□ZS7
	390	0.15	5.12	1.83	224	35x45	HL22W391M□AS6
	470	0.15	5.82	2.08	190	35x50	HL22W471M□AS7
500 2H (550)	100	0.20	2.06	0.74	960	25x45	HL22H101M□YS6
	120	0.20	2.22	0.79	800	30x35	HL22H121M□ZS4
		0.20	2.22	0.79	800	35x30	HL22H121M□AS3
		0.20	2.37	0.85	800	25x50	HL22H121M□YS7
	150	0.20	2.62	0.94	640	30x40	HL22H151M□ZS5
		0.20	2.62	0.94	640	35x35	HL22H151M□AS4
	180	0.20	2.99	1.07	540	35x40	HL22H181M□AS5
		0.20	3.11	1.11	540	30x50	HL22H181M□ZS7
	220	0.20	3.45	1.23	440	35x45	HL22H221M□AS6
	270	0.20	3.97	1.42	360	35x50	HL22H271M□AS7
	330	0.20	4.37	1.56	340	35x60	HL22H331M□AS9
	390	0.20	5.43	1.94	250	40x61	HL22H391M□BS9

►Life Time Table / Brauchbarkeitsdauer – Tabelle

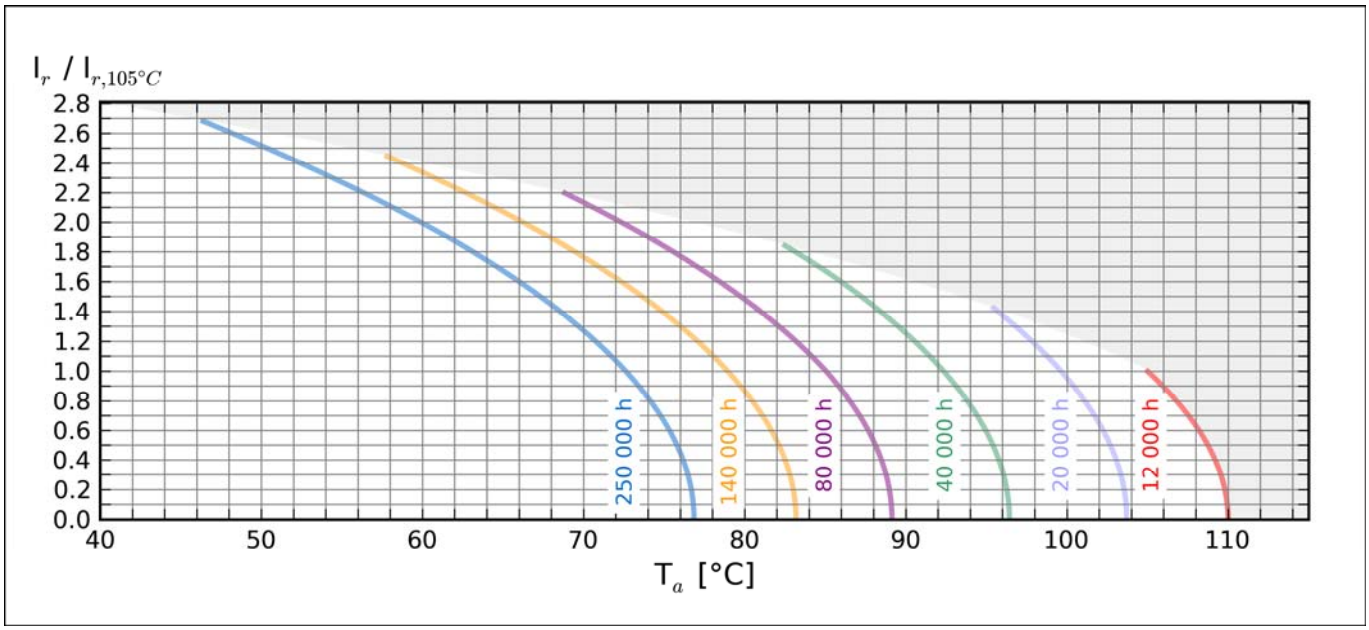
HL2	Useful life as function of ambient temperature and ripple current													
I_r at 105°C	x 1.0	x 1.2	x 1.4	x 1.6	x 1.8	x 2.0	x 2.1	x 2.2	x 2.3	x 2.4	x 2.5	x 2.6	x 2.7	x 2.8
T_a = 40°C	250	250	250	250	250	250	250	250	250	250	250	250	250	250
T_a = 45°C	250	250	250	250	250	250	250	250	250	250	250	250	250	
T_a = 50°C	250	250	250	250	250	250	250	250	250	250	250	212		
T_a = 55°C	250	250	250	250	250	250	250	250	237	198	163			
T_a = 60°C	250	250	250	250	250	248	211	179	150	125				
T_a = 65°C	250	250	250	250	210	156	133	113	95					
T_a = 70°C	250	250	219	173	133	99	84							
T_a = 75°C	201	169	138	109	84	62	53							
T_a = 80°C	127	107	87	69	53	39								
T_a = 85°C	80	67	55	43	33	25								
T_a = 90°C	50	42	35	27	21									
T_a = 95°C	32	27	22	17										
T_a = 100°C	20	17												
T_a = 105°C	12													

khrs Max. value limited to 250 000 hours.

►Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r,105°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,105°C,120Hz}$



►Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	**T_a = 105°C; V_r, I_r applied 8000 hours**	**ΔC/C ≤ 15% (of initial value) Tanδ ≤ 175% (of specified value) I_L ≤ specified value**
Useful life	**T_a = 105°C; V_r, I_r applied 12000 hours**	**ΔC/C ≤ 20% (of initial value) Tanδ < 200% (of specified value) I_L ≤ specified value**

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

HL Snap-In 12 000h / 105°C

►Specifications / Spezifikationen

Items	Characteristics
Temperature range	-40°C ~ + 105°C (200VDC - 250VDC) -25°C ~ + 105°C (400VDC - 500VDC)
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.02 • C • V_r [µA] or 3 mA, which is smaller.
Useful life	12000h at 105°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10…55Hz, 10g, 3x2h

►Outline Drawings / Bauformen

Refer to page 6 for available terminal shapes and dimensions. / Auf Seite 6 finden Sie die verfügbaren Bauformen und Maße.

►Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]	50/60	120	300	1k	≥ 10k
multiplier	0.70	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 1.0	v ≥ 1.0
multiplier	1.0	1.1

Temperature [°C]	40	60	70	85	105
multiplier	2.3	1.9	1.7	1.4	1.0

►Product Code / Bestellbezeichnung

Example: HL 500V 470µF ±20% 35x60mm Shape „C“

HL 2H 471 M C A S9 WPEC

Type of series

Capacitance code
The first two digits are significant. The last digit indicates the number of following zeros in µF.

Terminal symbol code
- R: 2-pin terminal
- S: 4-pin terminal
- C: 2-pin short terminal
- X: 4-pin short terminal
- E: 3-pin short terminal

Outer design code
- None: PET sleeve and PVC plate
- WPEC: PET sleeve without plate

Rated voltage code

Code	Voltage
2D	200
2E	250
2F	315
2G	400
420V	420
2W	450
2H	500

Capacitance tolerance
- M : ± 20%
- Q : -10% ~ +30%

Diameter code

Code	ØD
X	22
Y	25
Z	30
A	35

Length code

Code	L	Code	L
S2	25	S6	45
S3	30	S7	50
S4	35	S8	55
S5	40	S9	60

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
200 2D (250)	330	0.15	2.51	1.09	330	22x25	HL2D331M□XS2WPEC
	470	0.15	3.15	1.37	240	22x30	HL2D471M□XS3WPEC
		0.15	3.13	1.36	240	25x25	HL2D471M□YS2WPEC
	560	0.15	3.61	1.57	200	22x35	HL2D561M□XS4WPEC
		0.15	3.61	1.57	200	25x30	HL2D561M□YS3WPEC
	680	0.15	4.16	1.81	160	22x40	HL2D681M□XS5WPEC
		0.15	4.03	1.75	160	30x25	HL2D681M□ZS2WPEC
	820	0.15	4.74	2.06	140	22x45	HL2D821M□XS6WPEC
		0.15	4.58	1.99	140	25x35	HL2D821M□YS4WPEC
	1000	0.15	5.45	2.37	110	25x45	HL2D102M□YS6WPEC
		0.15	5.15	2.24	110	30x30	HL2D102M□ZS3WPEC
		0.15	4.46	1.94	110	35x25	HL2D102M□AS2WPEC
	1200	0.15	6.14	2.67	100	25x50	HL2D122M□YS7WPEC
		0.15	5.89	2.56	100	30x35	HL2D122M□ZS4WPEC
		0.15	5.13	2.23	100	35x30	HL2D122M□AS3WPEC
	1500	0.15	7.08	3.08	80	30x45	HL2D152M□ZS6WPEC
		0.15	6.00	2.61	80	35x35	HL2D152M□AS4WPEC
	1800	0.15	8.03	3.49	70	30x50	HL2D182M□ZS7WPEC
		0.15	6.83	2.97	70	35x40	HL2D182M□AS5WPEC
	2200	0.15	7.80	3.39	50	35x45	HL2D222M□AS6WPEC
	2700	0.15	8.88	3.86	50	35x50	HL2D272M□AS7WPEC
250 2E (300)	270	0.15	2.25	0.98	360	22x25	HL2E271M□XS2WPEC
	330	0.15	2.65	1.15	290	22x30	HL2E331M□XS3WPEC
		0.15	2.62	1.14	290	25x25	HL2E331M□YS2WPEC
	390	0.15	3.01	1.31	250	22x35	HL2E391M□XS4WPEC
	470	0.15	3.45	1.50	210	22x40	HL2E471M□XS5WPEC
		0.15	3.29	1.43	210	25x30	HL2E471M□YS3WPEC
		0.15	3.34	1.45	210	30x25	HL2E471M□ZS2WPEC
	560	0.15	3.91	1.70	180	22x45	HL2E561M□XS6WPEC
		0.15	3.77	1.64	180	25x35	HL2E561M□YS4WPEC
	680	0.15	4.46	1.94	150	22x50	HL2E681M□XS7WPEC
		0.15	4.32	1.88	150	25x40	HL2E681M□YS5WPEC
		0.15	4.26	1.85	150	30x30	HL2E681M□ZS3WPEC
		0.15	3.68	1.60	150	35x25	HL2E681M□AS2WPEC
	820	0.15	4.92	2.14	120	25x45	HL2E821M□YS6WPEC
		0.15	4.88	2.12	120	30x35	HL2E821M□ZS4WPEC
		0.15	4.23	1.84	120	35x30	HL2E821M□AS3WPEC
	1000	0.15	5.61	2.44	100	30x40	HL2E102M□ZS5WPEC
	1200	0.15	6.35	2.76	80	30x45	HL2E122M□ZS6WPEC
		0.15	5.36	2.33	80	35x35	HL2E122M□AS4WPEC
	1500	0.15	6.44	2.80	70	35x45	HL2E152M□AS6WPEC
	1800	0.15	7.27	3.16	60	35x50	HL2E182M□AS7WPEC
315 2F (365)	150	0.20	1.98	0.86	850	22x25	HL2F151M□XS2WPEC
	220	0.20	2.53	1.10	580	22x30	HL2F221M□XS3WPEC
		0.20	2.53	1.10	580	25x25	HL2F221M□YS2WPEC
	270	0.20	2.85	1.24	480	22x35	HL2F271M□XS4WPEC
		0.20	2.88	1.25	480	25x30	HL2F271M□YS3WPEC
	330	0.20	3.22	1.40	390	22x40	HL2F331M□XS5WPEC
		0.20	3.31	1.44	390	25x35	HL2F331M□YS4WPEC
		0.20	3.29	1.43	390	30x25	HL2F331M□ZS2WPEC
	390	0.20	3.59	1.56	330	22x45	HL2F391M□XS6WPEC
		0.20	3.68	1.60	330	25x40	HL2F391M□YS5WPEC
		0.20	3.59	1.56	330	30x30	HL2F391M□ZS3WPEC
	470	0.20	4.12	1.79	280	25x45	HL2F471M□YS6WPEC
		0.20	3.40	1.48	280	35x25	HL2F471M□AS2WPEC

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
315 2F (365)	560	0.20	4.58	1.99	230	25x50	HL2F561M□YS7WPEC
		0.20	4.44	1.93	230	30x35	HL2F561M□ZS4WPEC
		0.20	3.91	1.70	230	35x30	HL2F561M□AS3WPEC
	680	0.20	5.04	2.19	190	30x40	HL2F681M□ZS5WPEC
		0.20	4.51	1.96	190	35x35	HL2F681M□AS4WPEC
	820	0.20	5.77	2.51	160	30x50	HL2F821M□ZS7WPEC
		0.20	5.13	2.23	160	35x40	HL2F821M□AS5WPEC
	1000	0.20	5.87	2.55	130	35x45	HL2F102M□AS6WPEC
	1200	0.20	6.60	2.87	110	35x50	HL2F122M□AS7WPEC
400 2G (450)	120	0.20	1.77	0.77	800	22x25	HL2G121M□XS2WPEC
	150	0.20	2.12	0.92	640	22x30	HL2G151M□XS3WPEC
		0.20	2.07	0.90	640	25x25	HL2G151M□YS2WPEC
	180	0.20	2.42	1.05	540	22x35	HL2G181M□XS4WPEC
		0.20	2.42	1.05	540	25x30	HL2G181M□YS3WPEC
	220	0.20	2.81	1.22	440	22x40	HL2G221M□XS5WPEC
		0.20	2.78	1.21	440	25x35	HL2G221M□YS4WPEC
		0.20	2.69	1.17	440	30x25	HL2G221M□ZS2WPEC
	270	0.20	3.22	1.40	360	22x45	HL2G271M□XS6WPEC
		0.20	3.22	1.40	360	25x40	HL2G271M□YS5WPEC
	330	0.20	3.70	1.61	290	25x45	HL2G331M□YS6WPEC
		0.20	3.43	1.49	290	30x30	HL2G331M□ZS3WPEC
		0.20	3.50	1.52	290	35x25	HL2G331M□AS2WPEC
	390	0.20	4.14	1.80	250	25x50	HL2G391M□YS7WPEC
		0.20	3.91	1.70	250	30x35	HL2G391M□ZS4WPEC
		0.20	3.86	1.68	250	35x30	HL2G391M□AS3WPEC
	470	0.20	4.46	1.94	210	30x40	HL2G471M□ZS5WPEC
		0.20	4.42	1.92	210	35x35	HL2G471M□AS4WPEC
	560	0.20	5.04	2.19	180	30x45	HL2G561M□ZS6WPEC
		0.20	5.01	2.18	180	35x40	HL2G561M□AS5WPEC
	680	0.20	5.70	2.48	150	35x45	HL2G681M□AS6WPEC
	820	0.20	6.44	2.80	120	35x50	HL2G821M□AS7WPEC
420 420V (470)	100	0.20	1.63	0.71	1020	22x25	HL420V101M□XS2WPEC
	120	0.20	1.89	0.82	850	22x30	HL420V121M□XS3WPEC
		0.20	1.86	0.81	850	25x25	HL420V121M□YS2WPEC
	150	0.20	2.21	0.96	680	22x35	HL420V151M□XS4WPEC
	180	0.20	2.53	1.10	570	22x40	HL420V181M□XS5WPEC
		0.20	2.42	1.05	570	25x30	HL420V181M□YS3WPEC
		0.20	2.44	1.06	570	30x25	HL420V181M□ZS2WPEC
	220	0.20	2.90	1.26	470	22x45	HL420V221M□XS6WPEC
		0.20	2.78	1.21	470	25x35	HL420V221M□YS4WPEC
	270	0.20	3.31	1.44	380	22x50	HL420V271M□XS7WPEC
		0.20	3.22	1.40	380	25x40	HL420V271M□YS5WPEC
		0.20	3.11	1.35	380	30x30	HL420V271M□ZS3WPEC
		0.20	3.17	1.38	380	35x25	HL420V271M□AS2WPEC
	330	0.20	3.82	1.66	310	25x50	HL420V331M□YS7WPEC
		0.20	3.59	1.56	310	30x35	HL420V331M□ZS4WPEC
	390	0.20	4.05	1.76	270	30x40	HL420V391M□ZS5WPEC
		0.20	3.84	1.67	270	35x30	HL420V391M□AS3WPEC
	470	0.20	4.60	2.00	220	30x45	HL420V471M□ZS6WPEC
		0.20	4.42	1.92	220	35x35	HL420V471M□AS4WPEC
	560	0.20	5.01	2.18	190	35x40	HL420V561M□AS5WPEC
	680	0.20	5.87	2.55	150	35x50	HL420V681M□AS7WPEC
450 2W (500)	82	0.20	1.47	0.64	1250	22x25	HL2W820M□XS2WPEC
	120	0.20	1.89	0.82	850	22x30	HL2W121M□XS3WPEC
		0.20	1.86	0.81	850	25x25	HL2W121M□YS2WPEC
	150	0.20	2.21	0.96	680	22x35	HL2W151M□XS4WPEC

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
450 2W (500)	150	0.20	2.21	0.96	680	25x30	HL2W151M□YS3WPEC
	180	0.20	2.53	1.10	570	22x40	HL2W181M□XS5WPEC
		0.20	2.53	1.10	570	25x35	HL2W181M□YS4WPEC
		0.20	2.44	1.06	570	30x25	HL2W181M□ZS2WPEC
	220	0.20	2.99	1.30	470	22x50	HL2W221M□XS7WPEC
		0.20	2.92	1.27	470	25x40	HL2W221M□YS5WPEC
		0.20	2.81	1.22	470	30x30	HL2W221M□ZS3WPEC
		0.20	2.85	1.24	470	35x25	HL2W221M□AS2WPEC
	270	0.20	3.34	1.45	380	25x45	HL2W271M□YS6WPEC
		0.20	3.24	1.41	380	30x35	HL2W271M□ZS4WPEC
	330	0.20	3.73	1.62	310	30x40	HL2W331M□ZS5WPEC
		0.20	3.54	1.54	310	35x30	HL2W331M□AS3WPEC
	390	0.20	4.19	1.82	270	30x45	HL2W391M□ZS6WPEC
		0.20	4.03	1.75	270	35x35	HL2W391M□AS4WPEC
	470	0.20	4.76	2.07	220	30x50	HL2W471M□ZS7WPEC
		0.20	4.58	1.99	220	35x40	HL2W471M□AS5WPEC
	560	0.20	5.18	2.25	190	35x45	HL2W561M□AS6WPEC
	680	0.20	5.87	2.55	150	35x50	HL2W681M□AS7WPEC
500 2H (550)	47	0.20	1.01	0.44	2040	22x25	HL2H470M□XS2WPEC
	68	0.20	1.24	0.54	1410	22x30	HL2H680M□XS3WPEC
		0.20	1.27	0.55	1410	25x25	HL2H680M□YS2WPEC
	82	0.20	1.43	0.62	1170	22x35	HL2H820M□XS4WPEC
		0.20	1.47	0.64	1170	25x30	HL2H820M□YS3WPEC
	100	0.20	1.61	0.70	960	22x40	HL2H101M□XS5WPEC
		0.20	1.66	0.72	960	25x35	HL2H101M□YS4WPEC
		0.20	1.68	0.73	960	30x25	HL2H101M□ZS2WPEC
	120	0.20	1.82	0.79	800	22x50	HL2H121M□XS7WPEC
		0.20	1.86	0.81	800	25x40	HL2H121M□YS5WPEC
		0.20	1.91	0.83	800	30x30	HL2H121M□ZS3WPEC
		0.20	1.89	0.82	800	35x25	HL2H121M□AS2WPEC
	150	0.20	2.12	0.92	640	25x45	HL2H151M□YS6WPEC
		0.20	2.21	0.96	640	30x35	HL2H151M□ZS4WPEC
	180	0.20	2.35	1.02	540	25x50	HL2H181M□YS7WPEC
		0.20	2.46	1.07	540	30x40	HL2H181M□ZS5WPEC
		0.20	2.37	1.03	540	35x30	HL2H181M□AS3WPEC
	220	0.20	2.81	1.22	440	30x45	HL2H221M□ZS6WPEC
		0.20	2.67	1.16	440	35x35	HL2H221M□AS4WPEC
	270	0.20	3.04	1.32	360	30x50	HL2H271M□ZS7WPEC
		0.20	3.04	1.32	360	35x40	HL2H271M□AS5WPEC
	330	0.20	3.36	1.46	290	35x45	HL2H331M□AS6WPEC
	470	0.20	4.88	2.12	210	35x60	HL2H471M□AS9WPEC

►Life Time Table / Brauchbarkeitsdauer – Tabelle

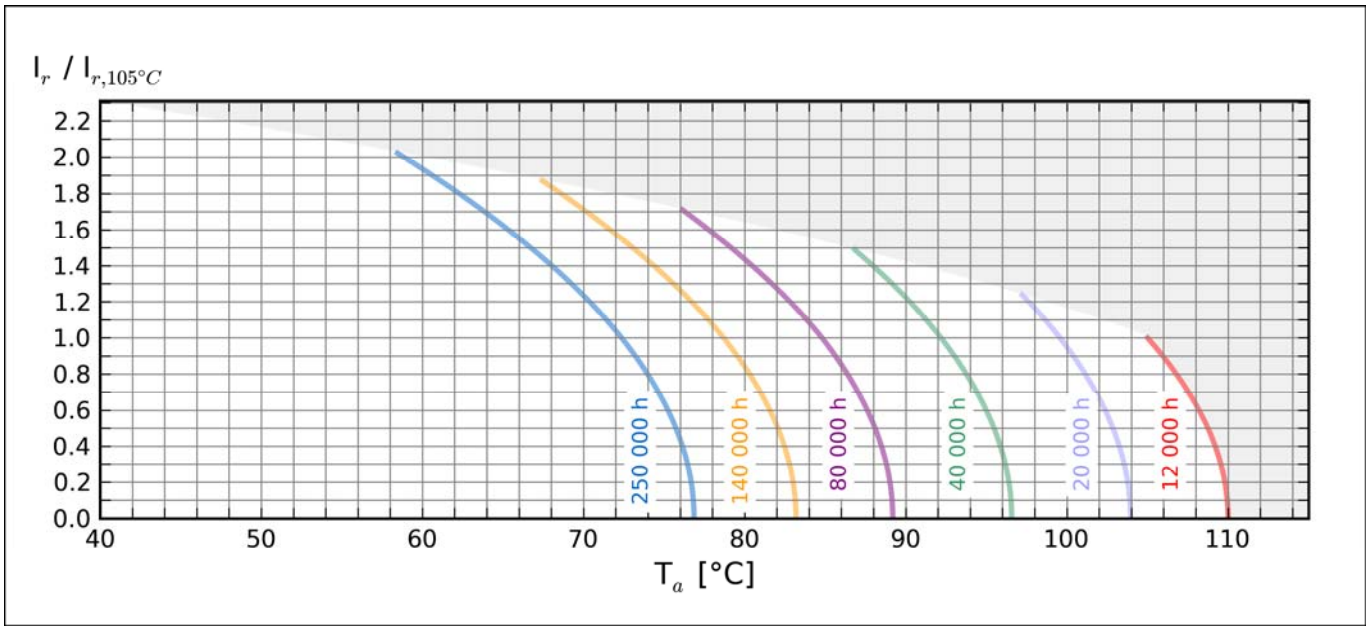
HL	Useful life as function of ambient temperature and ripple current													
I_r at 105°C	x 1.0	x 1.1	x 1.2	x 1.3	x 1.4	x 1.5	x 1.6	x 1.7	x 1.8	x 1.9	x 2.0	x 2.1	x 2.2	x 2.3
T_a = 40°C	250	250	250	250	250	250	250	250	250	250	250	250	250	250
T_a = 50°C	250	250	250	250	250	250	250	250	250	250	250			
T_a = 60°C	250	250	250	250	250	250	250	250	250	250				
T_a = 65°C	250	250	250	250	250	250	250	225	194					
T_a = 70°C	250	250	250	233	208	185	163	142						
T_a = 75°C	196	180	163	147	132	117	103							
T_a = 80°C	124	113	103	93	83									
T_a = 85°C	78	72	65	59	52									
T_a = 90°C	49	45	41											
T_a = 95°C	31	28												
T_a = 100°C	19	18												
T_a = 105°C	12													

khrs Max. value limited to 250 000 hours.

►Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r,105°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,105°C,120Hz}$



►Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	**T_a = 105°C; V_r, I_r applied 8000 hours**	**ΔC/C ≤ 20% (of initial value) Tanδ ≤ 200% (of specified value) I_L ≤ specified value**
Useful life	**T_a = 105°C; V_r, I_r applied 12000 hours**	**ΔC/C ≤ 30% (of initial value) Tanδ < 300% (of specified value) I_L ≤ specified value**

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

YL Snap-In 15 000h / 105°C

►Specifications / Spezifikationen

Items	Characteristics
Temperature range	-25°C ~ + 105°C
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.02 • C • V_r [µA] or 3 mA, which is smaller.
Useful life	15000h at 105°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10..55Hz, 10g, 3x2h

►Outline Drawings / Bauformen

Refer to page 6 for available terminal shapes and dimensions. / Auf Seite 6 finden Sie die verfügbaren Bauformen und Maße.

►Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]	50/60	120	300	1k	≥ 10k
multiplier	0.70	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 1.0	v ≥ 1.0
multiplier	1.0	1.1

Temperature [°C]	40	60	70	85	105
multiplier	2.3	1.9	1.7	1.4	1.0

►Product Code / Bestellbezeichnung

Example: YL 500V 330µF ±20% 35x50mm Shape „C“

YL 2H 331 M C A S7 WPEC

Type of series

Capacitance code
The first two digits are significant. The last digit indicates the number of following zeros in µF.

Terminal symbol code
- R: 2-pin terminal
- S: 4-pin terminal
- C: 2-pin short terminal
- X: 4-pin short terminal
- E: 3-pin short terminal

Outer design code
- None: PET sleeve and PVC plate
- WPEC: PET sleeve without plate

Rated voltage code

Code	Voltage
2G	400
420V	420
2W	450
2H	500

Capacitance tolerance
- M : ± 20%
- Q : -10% ~ +30%

Diameter code

Code	ØD
X	22
Y	25
Z	30
A	35

Length code

Code	L
S2	25
S3	30
S4	35
S5	40
S6	45
S7	50

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
400 2G (450)	82	0.20	1.36	0.59	1170	22x25	YL2G820M□XS2WPEC
	120	0.20	1.75	0.76	800	22x30	YL2G121M□XS3WPEC
		0.20	1.73	0.75	800	25x25	YL2G121M□YS2WPEC
	150	0.20	2.05	0.89	640	22x35	YL2G151M□XS4WPEC
		0.20	2.02	0.88	640	25x30	YL2G151M□YS3WPEC
	180	0.20	2.32	1.01	540	22x40	YL2G181M□XS5WPEC
		0.20	2.32	1.01	540	25x35	YL2G181M□YS4WPEC
		0.20	2.21	0.96	540	30x25	YL2G181M□ZS2WPEC
	220	0.20	2.76	1.20	440	22x50	YL2G221M□XS7WPEC
		0.20	2.69	1.17	440	25x40	YL2G221M□YS5WPEC
		0.20	2.58	1.12	440	30x30	YL2G221M□ZS3WPEC
		0.20	2.53	1.10	440	35x25	YL2G221M□AS2WPEC
	270	0.20	3.08	1.34	360	25x45	YL2G271M□YS6WPEC
		0.20	2.99	1.30	360	30x35	YL2G271M□ZS4WPEC
	330	0.20	3.52	1.53	290	25x50	YL2G331M□YS7WPEC
		0.20	3.27	1.42	290	35x30	YL2G331M□AS3WPEC
	390	0.20	3.75	1.63	250	30x40	YL2G391M□ZS5WPEC
		0.20	3.70	1.61	250	35x35	YL2G391M□AS4WPEC
	470	0.20	4.39	1.91	210	30x50	YL2G471M□ZS7WPEC
		0.20	4.23	1.84	210	35x40	YL2G471M□AS5WPEC
	560	0.20	4.78	2.08	180	35x45	YL2G561M□AS6WPEC
	680	0.20	5.43	2.36	150	35x50	YL2G681M□AS7WPEC
420 420V (470)	100	0.20	1.59	0.69	1020	22x30	YL420V101M□XS3WPEC
		0.20	1.56	0.68	1020	25x25	YL420V101M□YS2WPEC
	120	0.20	1.82	0.79	850	22x35	YL420V121M□XS4WPEC
		0.20	1.82	0.79	850	25x30	YL420V121M□YS3WPEC
	150	0.20	2.14	0.93	680	22x40	YL420V151M□XS5WPEC
		0.20	2.14	0.93	680	25x35	YL420V151M□YS4WPEC
		0.20	2.02	0.88	680	30x25	YL420V151M□ZS2WPEC
	180	0.20	2.51	1.09	570	22x50	YL420V181M□XS7WPEC
		0.20	2.44	1.06	570	25x40	YL420V181M□YS5WPEC
		0.20	2.35	1.02	570	30x30	YL420V181M□ZS3WPEC
		0.20	2.30	1.00	570	35x25	YL420V181M□AS2WPEC
	220	0.20	2.78	1.21	470	25x45	YL420V221M□YS6WPEC
		0.20	2.71	1.18	470	30x35	YL420V221M□ZS4WPEC
	270	0.20	3.17	1.38	380	25x50	YL420V271M□YS7WPEC
		0.20	3.11	1.35	380	30x40	YL420V271M□ZS5WPEC
		0.20	2.94	1.28	380	35x30	YL420V271M□AS3WPEC
	330	0.20	3.57	1.55	310	30x45	YL420V331M□ZS6WPEC
		0.20	3.40	1.48	310	35x35	YL420V331M□AS4WPEC
	390	0.20	4.00	1.74	270	30x50	YL420V391M□ZS7WPEC
		0.20	3.84	1.67	270	35x40	YL420V391M□AS5WPEC
	470	0.20	4.37	1.90	220	35x45	YL420V471M□AS6WPEC
450 2W (500)	82	0.20	1.45	0.63	1250	22x30	YL2W820M□XS3WPEC
	100	0.20	1.56	0.68	1020	25x25	YL2W101M□YS2WPEC
	120	0.20	1.82	0.79	850	22x35	YL2W121M□XS4WPEC
		0.20	1.82	0.79	850	25x30	YL2W121M□YS3WPEC
	150	0.20	2.21	0.96	680	22x45	YL2W151M□XS6WPEC
		0.20	2.14	0.93	680	25x35	YL2W151M□YS4WPEC
		0.20	2.02	0.88	680	30x25	YL2W151M□ZS2WPEC
	180	0.20	2.51	1.09	570	22x50	YL2W181M□XS7WPEC
		0.20	2.44	1.06	570	25x40	YL2W181M□YS5WPEC
		0.20	2.35	1.02	570	30x30	YL2W181M□ZS3WPEC
		0.20	2.30	1.00	570	35x25	YL2W181M□AS2WPEC
	220	0.20	2.78	1.21	470	25x45	YL2W221M□YS6WPEC
		0.20	2.71	1.18	470	30x35	YL2W221M□ZS4WPEC
		0.20	2.67	1.16	470	35x30	YL2W221M□AS3WPEC

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
450 2W (500)	**270**	0.20	3.11	1.35	380	30x40	YL2W271M□ZS5WPEC
		0.20	3.08	1.34	380	35x35	YL2W271M□AS4WPEC
	330	0.20	3.57	1.55	310	30x45	YL2W331M□ZS6WPEC
	390	0.20	4.00	1.74	270	30x50	YL2W391M□ZS7WPEC
		0.20	3.84	1.67	270	35x40	YL2W391M□AS5WPEC
	470	0.20	4.51	1.96	220	35x50	YL2W471M□AS7WPEC
500 2H (550)	**100**	0.20	1.54	0.67	960	25x35	YL2H101M□YS4WPEC
		0.20	1.47	0.64	960	30x25	YL2H101M□ZS2WPEC
	120	0.20	1.77	0.77	800	25x40	YL2H121M□YS5WPEC
		0.20	1.70	0.74	800	30x30	YL2H121M□ZS3WPEC
		0.20	1.66	0.72	800	35x25	YL2H121M□AS2WPEC
	150	0.20	2.12	0.92	640	25x50	YL2H151M□YS7WPEC
		0.20	1.98	0.86	640	30x35	YL2H151M□ZS4WPEC
		0.20	1.96	0.85	640	35x30	YL2H151M□AS3WPEC
	180	0.20	2.25	0.98	540	30x40	YL2H181M□ZS5WPEC
		0.20	2.23	0.97	540	35x35	YL2H181M□AS4WPEC
	220	0.20	2.60	1.13	440	30x45	YL2H221M□ZS6WPEC
		0.20	2.58	1.12	440	35x40	YL2H221M□AS5WPEC
	270	0.20	2.94	1.28	360	35x45	YL2H271M□AS6WPEC
	330	0.20	3.36	1.46	290	35x50	YL2H331M□AS7WPEC

►Life Time Table / Brauchbarkeitsdauer – Tabelle

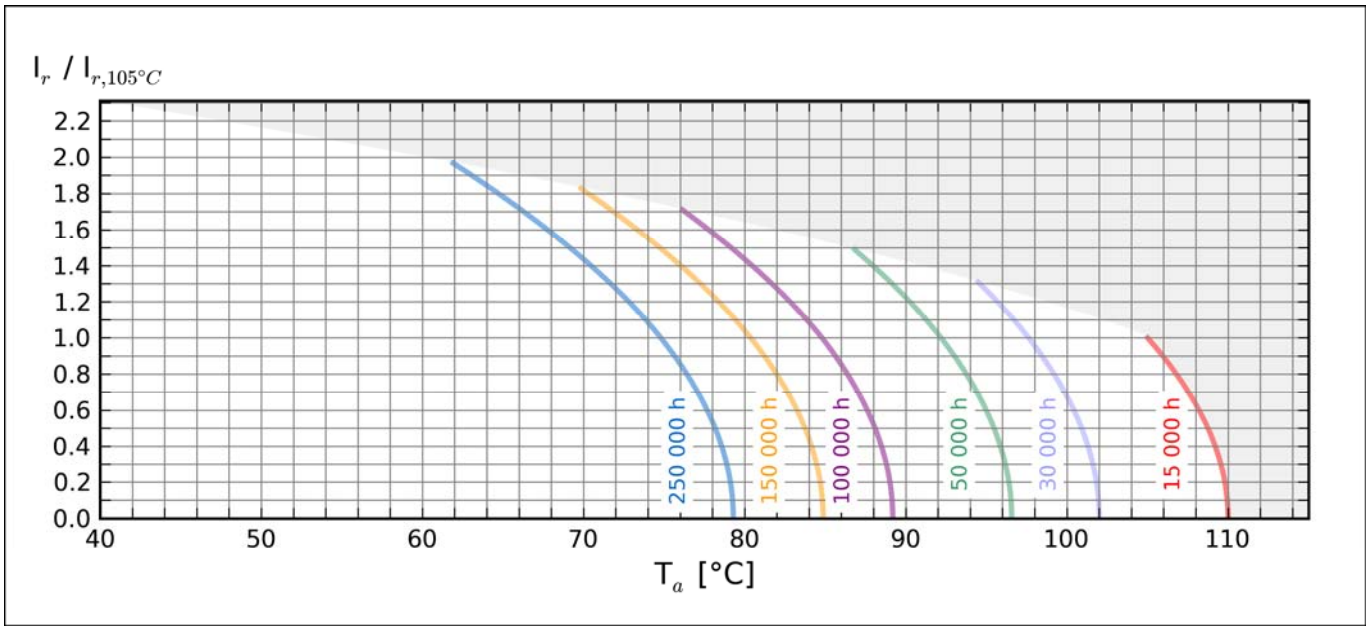
YL	Useful life as function of ambient temperature and ripple current													
I_r at 105°C	x 1.0	x 1.1	x 1.2	x 1.3	x 1.4	x 1.5	x 1.6	x 1.7	x 1.8	x 1.9	x 2.0	x 2.1	x 2.2	x 2.3
T_a = 40°C	250	250	250	250	250	250	250	250	250	250	250	250	250	250
T_a = 50°C	250	250	250	250	250	250	250	250	250	250	250			
T_a = 60°C	250	250	250	250	250	250	250	250	250	250				
T_a = 65°C	250	250	250	250	250	250	250	250	243					
T_a = 70°C	250	250	250	250	250	231	203	177						
T_a = 75°C	245	225	204	184	165	146	128							
T_a = 80°C	155	142	129	116	104									
T_a = 85°C	98	90	81	73	66									
T_a = 90°C	62	56	51											
T_a = 95°C	39	36												
T_a = 100°C	24	22												
T_a = 105°C	15													

khrs Max. value limited to 250 000 hours.

►Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r,105°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,105°C,120Hz}$



►Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	**T_a = 105°C; V_r, I_r applied 10000 hours**	**ΔC/C ≤ 20% (of initial value) Tanδ ≤ 200% (of specified value) I_L ≤ specified value**
Useful life	**T_a = 105°C; V_r, I_r applied 15000 hours**	**ΔC/C ≤ 30% (of initial value) Tanδ < 300% (of specified value) I_L ≤ specified value**

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

CU Snap-In 6000h / 105°C

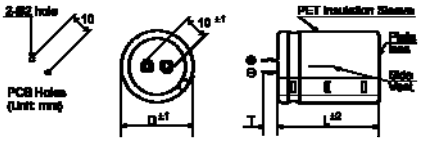
Capacitors of CU series have in average 10% higher ripple current compared with HU3 series. This is reached by improved heat radiation. The vent is located at the side of the case, vent position is not fixed.

Die CU Serie hat im Durchschnitt eine 10% höhere Wechselstrombelastbarkeit im Vergleich zur HU3 Serie. Dies wird durch eine optimierte Wärmeabstrahlung erreicht. Das Sicherheitsventil befindet sich seitlich am Becher, die Position ist variabel.

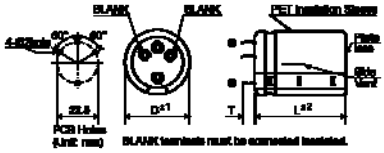
►Specifications / Spezifikationen

Items	Characteristics
Temperature range	-25°C ~ + 105°C
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.02 • C • V_r [µA] or 3 mA, which is smaller.
Useful life	6000h at 105°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10…55Hz, 10g, 3x2h

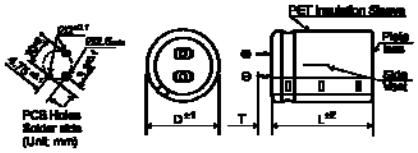
►Outline Drawings / Bauformen



Shape / Form: C (D = 30 ~ 35mm, short pin T = 4.0 ± 1.0mm)
R (D = 30 ~ 35mm, long pin T = 6.3 ± 1.0mm)



Shape / Form: S (D = 40mm, standard T = 6.3 ± 1.0mm)
X (D = 40mm, short pin T = 6.3 ± 1.0mm)



Shape / Form: E (D = 22 ~ 35mm, T = 4.0 ± 1.0mm)

►Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]	120	300	1k	≥ 10k
multiplier	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 1.0	v ≥ 1.0
Multiplier	1.0	1.1

Temperature [°C]	40	60	70	85	105
multiplier	2.3	1.9	1.7	1.4	1.0

►Product Code / Bestellbezeichnung

Example: CU 500V 470µF ±20% 35x61mm Shape „C“

CU 2H 471 M C A S9 WPEC

Type of series

Capacitance code
The first two digits are significant. The last digit indicates the number of following zeros in µF.

Terminal symbol code
- R: 2-pin terminal
- S: 4-pin terminal
- C: 2-pin short terminal
- X: 4-pin short terminal
- E: 3-pin short terminal

Outer design code
- None: PET sleeve and PVC plate
- WPEC: PET sleeve without plate

Rated voltage code

Code	Voltage
2G	400
2W	450
2H	500

Capacitance tolerance
- M : ± 20%
- Q : -10% ~ +30%

Diameter Code

Code	ØD
Z	30
A	35
B	40

Length code

Code	L	Code	L
S2	25	S5	40
S3	30	S6	45
S4	35	S7	50

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
400 2G (450)	**220**	0.20	3.36	1.46	440	30x30	CU2G221M□ZS3WPEC
	270	0.20	3.84	1.67	360	30x35	CU2G271M□ZS4WPEC
		0.20	3.98	1.73	360	35x31	CU2G271M□AS3WPEC
	330	0.20	4.35	1.89	290	30x40	CU2G331M□ZS5WPEC
		0.20	4.51	1.96	290	35x36	CU2G331M□AS4WPEC
	390	0.20	4.90	2.13	250	30x50	CU2G391M□ZS7WPEC
		0.20	5.01	2.18	250	35x41	CU2G391M□AS5WPEC
	470	0.20	5.52	2.40	210	30x60	CU2G471M□ZS9WPEC
		0.20	5.59	2.43	210	35x46	CU2G471M□AS6WPEC
	560	0.20	6.21	2.70	180	35x51	CU2G561M□AS7WPEC
		0.20	5.50	2.39	180	40x40	CU2G561M□BS5WPEC
	680	0.20	6.99	3.04	150	35x61	CU2G681M□AS9WPEC
		0.20	6.28	2.73	150	40x45	CU2G681M□BS6WPEC
	820	0.20	7.75	3.37	120	35x81	CU2G821M□AS13WPEC
		0.20	7.34	3.19	120	40x61	CU2G821M□BS9WPEC
	1200	0.20	9.45	4.11	100	40x83	CU2G122M□BS13WPEC
450 2W (500)	**150**	0.20	2.78	1.21	680	30x30	CU2W151M□ZS3WPEC
	180	0.20	3.13	1.36	570	30x35	CU2W181M□ZS4WPEC
	220	0.20	3.54	1.54	470	30x40	CU2W221M□ZS5WPEC
		0.20	3.57	1.55	470	35x31	CU2W221M□AS3WPEC
	270	0.20	4.07	1.77	380	35x36	CU2W271M□AS4WPEC
	330	0.20	4.51	1.96	310	30x50	CU2W331M□ZS7WPEC
		0.20	4.60	2.00	310	35x41	CU2W331M□AS5WPEC
	390	0.20	5.01	2.18	270	30x60	CU2W391M□ZS9WPEC
		0.20	5.08	2.21	270	35x46	CU2W391M□AS6WPEC
	470	0.20	5.66	2.46	220	35x51	CU2W471M□AS7WPEC
		0.20	5.57	2.42	220	40x40	CU2W471M□BS5WPEC
	560	0.20	6.33	2.75	190	35x61	CU2W561M□AS9WPEC
		0.20	6.16	2.68	190	40x45	CU2W561M□BS6WPEC
	680	0.20	7.06	3.07	150	35x81	CU2W681M□AS13WPEC
		0.20	6.88	2.99	150	40x50	CU2W681M□BS7WPEC
	1000	0.20	8.60	3.74	130	40x83	CU2W102M□BS13WPEC
500 2H (550)	**120**	0.20	2.25	0.98	640	30x30	CU2H121M□ZS3WPEC
	150	0.20	2.58	1.12	640	30x35	CU2H151M□ZS4WPEC
	180	0.20	2.92	1.27	540	30x40	CU2H181M□ZS5WPEC
		0.20	3.01	1.31	540	35x31	CU2H181M□AS3WPEC
	220	0.20	3.34	1.45	440	30x50	CU2H221M□ZS7WPEC
		0.20	3.43	1.49	440	35x36	CU2H221M□AS4WPEC
	270	0.20	3.82	1.66	360	30x60	CU2H271M□ZS9WPEC
		0.20	3.86	1.68	360	35x41	CU2H271M□AS5WPEC
	330	0.20	4.35	1.89	290	35x46	CU2H331M□AS6WPEC
	390	0.20	4.81	2.09	250	35x51	CU2H391M□AS7WPEC
	470	0.20	5.41	2.35	220	35x61	CU2H471M□AS9WPEC

►Life Time Table / Brauchbarkeitsdauer – Tabelle

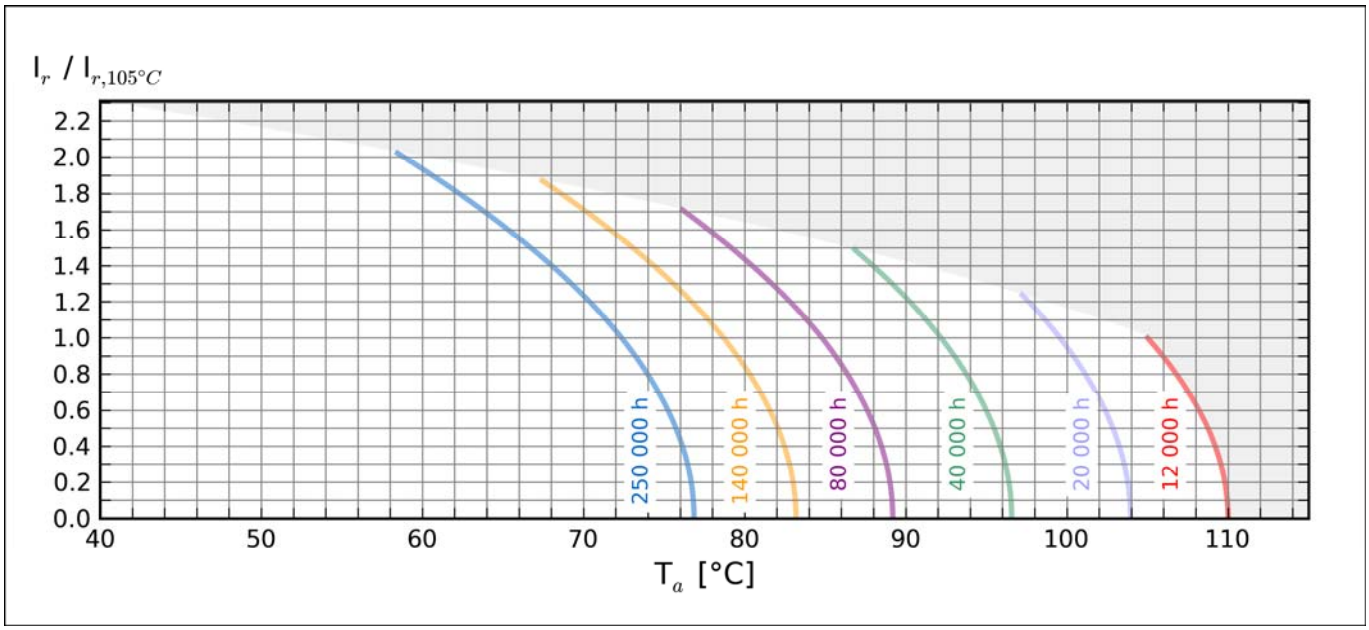
CU	Useful life as function of ambient temperature and ripple current													
I_r at 105°C	x 1.0	x 1.1	x 1.2	x 1.3	x 1.4	x 1.5	x 1.6	x 1.7	x 1.8	x 1.9	x 2.0	x 2.1	x 2.2	x 2.3
T_a = 40°C	250	250	250	250	250	250	250	250	250	250	250	250	250	250
T_a = 45°C	250	250	250	250	250	250	250	250	250	250	250	250		
T_a = 50°C	250	250	250	250	250	250	250	250	250	250	248			
T_a = 55°C	250	250	250	250	250	250	250	250	220	186	157			
T_a = 60°C	250	250	250	250	245	216	188	162	139	118				
T_a = 65°C	237	216	195	175	155	136	119	102	88					
T_a = 70°C	150	137	123	110	98	86	75	65						
T_a = 75°C	95	86	78	70	62	54	47							
T_a = 80°C	60	54	49	44	39									
T_a = 85°C	38	34	31	28	24									
T_a = 90°C	24	21	19											
T_a = 95°C	15	13												
T_a = 100°C	9	8												
T_a = 105°C	6													

khrs Max. value limited to 250 000 hours.

►Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r,105°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,105°C,120Hz}$



►Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	**T_a = 105°C; V_r, I_r applied 4000 hours**	**ΔC/C ≤ 20% (of initial value) Tanδ ≤ 200% (of specified value) I_L ≤ specified value**
Useful life	**T_a = 105°C; V_r, I_r applied 6000 hours**	**ΔC/C ≤ 30% (of initial value) Tanδ < 300% (of specified value) I_L ≤ specified value**

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

DH Snap-In 6 000h / 105°C

These capacitors have been developed especially for **charge – discharge applications** such as AC servo motors, lamp flash, X-ray, etc.

Diese Kondensatoren wurden speziell für Anwendungen mit **häufigen Lade- / Entladevorgängen** entwickelt wie z.B. AC Motoren, Blitzlampen, Röntgengeräte usw.

►Specifications / Spezifikationen

Items	Characteristics
Temperature range	-25°C ~ + 105°C
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.02 • C • V_r [µA] or 3 mA, which is smaller.
Useful life	6000h at 105°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10..55Hz, 10g, 3x2h
Charge – Discharge	ΔV = 150VDC, f = 6Hz life ≥ 100 Mio cycles at 40°C

►Outline Drawings / Bauformen

Refer to page 6 for available terminal shapes and dimensions.
Auf Seite 6 finden Sie die verfügbaren Bauformen und Maße.

►Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]	50/60	120	300	1k	≥ 10k
multiplier	0.70	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 1.0	v ≥ 1.0
multiplier	1.0	1.1

Temperature [°C]	40	60	70	85	105
multiplier	2.3	1.9	1.7	1.4	1.0

►Product Code / Bestellbezeichnung

Example: DH 400V 100µF ±20% 22x25mm Shape „R“

DH 2G 101 M R X S2 WPEC

Type of series

Rated voltage code

Code	Voltage
2G	400
2W	450

Capacitance code

The first two digits are significant. The last digit indicates the number of following zeros in µF.

Capacitance tolerance

M : ± 20%

Terminal symbol code

- R: 2-pin terminal
- S: 4-pin terminal
- C: 2-pin short terminal
- X: 4-pin short terminal
- E: 3-pin short terminal

Diameter Code

Code	ØD
X	22
Y	25
Z	30
A	35

Length Code

Code	L
S2	25
S3	30
S4	35
S5	40
S6	45
S7	50

Outer design code

- None: PET sleeve and PVC plate
- WPEC: PET sleeve without plate

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
400 2G (450)	**100**	0.20	1.61	0.70	1100	22x25	DH2G101M□XS2
	120	0.20	1.89	0.82	920	22x30	DH2G121M□XS3
		0.20	1.86	0.81	920	25x25	DH2G121M□YS2
	150	0.20	2.21	0.96	730	22x35	DH2G151M□XS4
	180	0.20	2.51	1.09	610	22x40	DH2G181M□XS5
		0.20	2.39	1.04	610	25x30	DH2G181M□YS3
	220	0.20	2.88	1.25	500	22x45	DH2G221M□XS6
		0.20	2.78	1.21	500	25x35	DH2G221M□YS4
		0.20	2.65	1.15	500	30x25	DH2G221M□ZS2
	270	0.20	3.31	1.44	410	22x50	DH2G271M□XS7
		0.20	3.20	1.39	410	25x40	DH2G271M□YS5
		0.20	3.08	1.34	410	30x30	DH2G271M□ZS3
		0.20	3.04	1.32	410	35x25	DH2G271M□AS2
	330	0.20	3.68	1.60	330	25x45	DH2G331M□YS6
		0.20	3.57	1.55	330	30x35	DH2G331M□ZS4
		0.20	3.86	1.68	330	35x30	DH2G331M□AS3
	390	0.20	4.05	1.76	280	30x40	DH2G391M□ZS5
		0.20	3.84	1.67	280	35x30	DH2G391M□AS3
	470	0.20	4.60	2.00	230	30x45	DH2G471M□ZS6
		0.20	4.39	1.91	230	35x35	DH2G471M□AS4
		0.20	4.74	2.06	230	35x40	DH2G471M□AS5
	560	0.20	5.18	2.25	200	30x50	DH2G561M□ZS7
		0.20	4.99	2.17	200	35x40	DH2G561M□AS5
	680	0.20	5.68	2.47	160	35x45	DH2G681M□AS6
450 2W (500)	**82**	0.20	1.47	0.64	1220	22x25	DH2W820M□XS2
	100	0.20	1.73	0.75	1000	22x30	DH2W101M□XS3
		0.20	1.70	0.74	1000	25x25	DH2W101M□YS2
	120	0.20	1.98	0.86	830	22x35	DH2W121M□XS4
		0.20	1.96	0.85	830	25x30	DH2W121M□YS3
	150	0.20	2.30	1.00	660	22x40	DH2W151M□XS5
		0.20	2.30	1.00	660	25x35	DH2W151M□YS4
		0.20	2.19	0.95	660	30x25	DH2W151M□ZS2
	180	0.20	2.60	1.13	550	22x45	DH2W181M□XS6
		0.20	2.51	1.09	550	25x35	DH2W181M□YS4
	220	0.20	2.99	1.30	450	25x45	DH2W221M□YS6
		0.20	2.78	1.21	450	30x30	DH2W221M□ZS3
		0.20	2.74	1.19	450	35x25	DH2W221M□AS2
	270	0.20	3.43	1.49	370	25x50	DH2W271M□YS7
		0.20	3.24	1.41	370	30x35	DH2W271M□ZS4
		0.20	3.20	1.39	370	35x30	DH2W271M□AS3
	330	0.20	3.73	1.62	300	30x40	DH2W331M□ZS5
		0.20	3.68	1.60	300	35x35	DH2W331M□AS4
	390	0.20	4.32	1.88	260	30x50	DH2W391M□ZS7
		0.20	4.16	1.81	260	35x40	DH2W391M□AS5
	470	0.20	4.72	2.05	210	35x45	DH2W471M□AS6
	560	0.20	5.31	2.31	180	35x50	DH2W561M□AS7

►Life Time Table / Brauchbarkeitsdauer – Tabelle

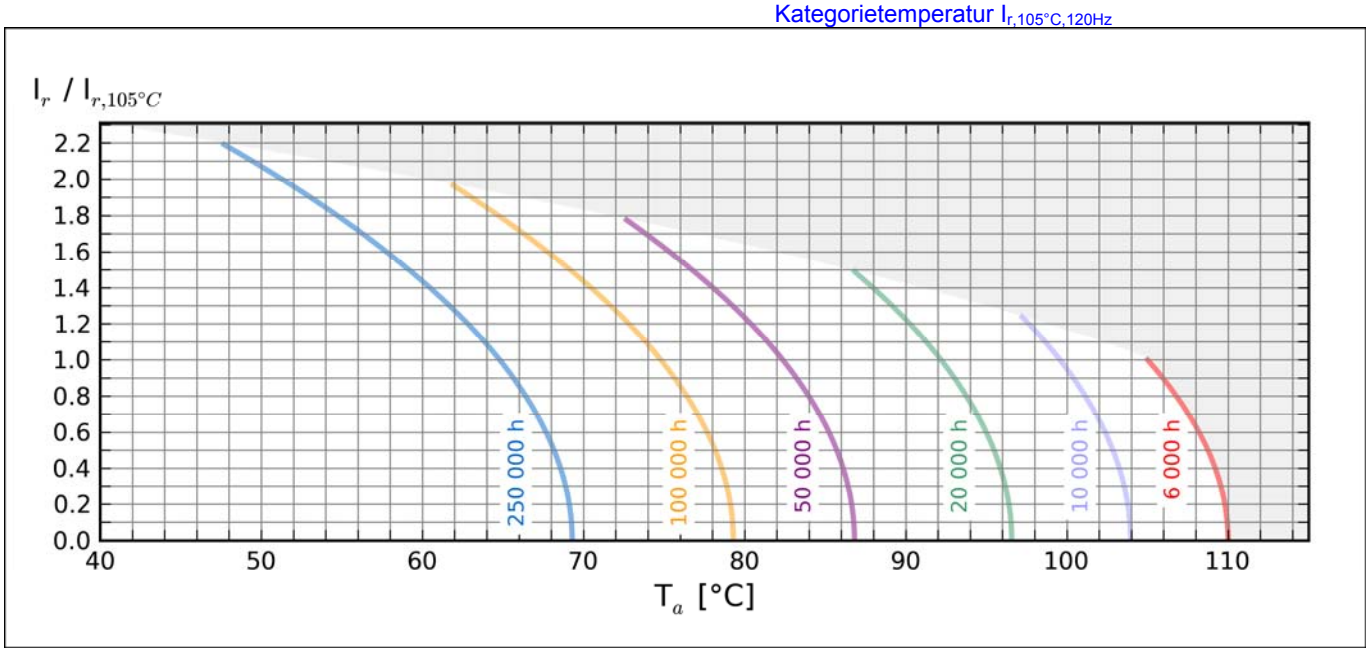
DH	Useful life as function of ambient temperature and ripple current													
I_r at 105°C	x 1.0	x 1.1	x 1.2	x 1.3	x 1.4	x 1.5	x 1.6	x 1.7	x 1.8	x 1.9	x 2.0	x 2.1	x 2.2	x 2.3
T_a = 40°C	250	250	250	250	250	250	250	250	250	250	250	250	250	250
T_a = 45°C	250	250	250	250	250	250	250	250	250	250	250	250		
T_a = 50°C	250	250	250	250	250	250	250	250	250	250	250			
T_a = 55°C	250	250	250	250	250	250	250	250	243	209	178			
T_a = 60°C	250	250	250	250	250	231	203	177	154	132				
T_a = 65°C	245	225	204	184	165	146	128	112	97					
T_a = 70°C	155	142	129	116	104	92	81	71						
T_a = 75°C	98	90	81	73	66	58	51							
T_a = 80°C	62	56	51	46	41									
T_a = 85°C	39	36	32	29	26									
T_a = 90°C	24	22	20											
T_a = 95°C	15	14												
T_a = 100°C	9	9												
T_a = 105°C	6													

khrs Max. value limited to 250 000 hours.

►Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r,105°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,105°C,120Hz}$



►Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Warranty life	T_a = 105°C; V_r, I_r applied 5000 hours	ΔC/C ≤ 20% (of initial value) Tanδ ≤ 200% (of specified value) I_L ≤ specified value
	f = 6Hz ≥ 50 Mio cycles at 40°C	
Useful life	T_a = 105°C; V_r, I_r applied 6000 hours	ΔC/C ≤ 30% (of initial value) Tanδ ≤ 300% (of specified value) I_L ≤ specified value
	f = 6Hz ≥ 100 Mio cycles at 40°C	

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

PS2 Board-Mount 6 000h / 85°C

These capacitors combine both the advantage of screw type capacitors (higher CV values and **higher ripple current capabilities**) as well as the compact size and the termination of snap mount parts.

Diese Kondensatoren vereinen die Vorteile der Schraubanschlusstypen (höhere CV-Werte und **höhere Wechselstrombelastungen**) mit denen für die Leiterplattenmontage (kompakte Bauformen und Snap-Mount-Anschlüsse).

►Specifications / Spezifikationen

Items	Characteristics
Temperature range	-40°C ~ + 85°C (200VDC - 500VDC) -25°C ~ + 85°C (550VDC - 600VDC)
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.01 • C • V_r [µA] or 3 mA, which is smaller.
Useful life	6000h at 85°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10…55Hz, 10g, 3x2h

►Outline Drawings / Bauformen

Refer to page 6 for available terminal shapes and dimensions. / Auf Seite 6 finden Sie die verfügbaren Bauformen und Maße.

►Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]		50/60	120	300	1k	≥ 10k
multiplier	200V – 500V	0.70	1.00	1.18	1.34	1.45
	550V – 600V	0.70	1.00	1.20	1.50	1.70

Forced cooling [m/sec]	v < 0.5	v ≥ 0.5	v ≥ 1.0	v ≥ 2.0
multiplier	1.00	1.10	1.20	1.25

Temperature [°C]		40	60	70	85
multiplier	200V – 500V	2.0	1.6	1.4	1.0
	550V – 600V	1.7	1.5	1.2	1.0

►Product Code / Bestellbezeichnung

Example: PS2 400V 1200µF ±20% 46x70mm Shape „S“

PS2 2G 122 M S H ( )

Type of series

Capacitance code
The first two digits are significant. The last digit indicates the number of following zeros in µF.

Terminal symbol code
S: 4-pin terminal
T: T-type terminal

Length code

Code	L
Ly	y

Rated voltage code

Code	Voltage	Code	Voltage
2D	200	2W	450
2E	250	2H	500
2G	400	2L	550
420V	420	600V	600

Capacitance tolerance
M : ± 20%
Q : -10% ~ +30%

Case code diameter

Code	ØD
B	41
H	46
C	51

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
200 2D (250)	**1 800**	0.15	12.72	6.36	63	41x45	PS22D182MSB
	2 200	0.15	13.96	6.98	52	41x55	PS22D222MSB
	2 700	0.15	14.48	7.24	42	46x51	PS22D272MSH
	3 300	0.15	15.56	7.78	35	51x51	PS22D332MTC
		0.15	16.18	8.09	34	46x61	PS22D332MSH
		0.15	16.42	8.21	34	41x64	PS22D332MSB
	3 900	0.15	17.08	8.54	30	51x61	PS22D392MTC
		0.15	17.56	8.78	29	46x70	PS22D392MSH
	4 700	0.15	18.68	9.34	25	51x70	PS22D472MTC
	5 200	0.15	19.65	9.82	23	51x70	PS22D522MTCL70
250 2E (300)	**1 200**	0.15	10.38	5.19	95	41x45	PS22E122MSB
	1 800	0.15	11.82	5.91	63	46x51	PS22E182MSH
		0.15	12.64	6.32	63	41x55	PS22E182MSB
	2 200	0.15	13.20	6.60	52	46x61	PS22E222MSH
		0.15	14.10	7.05	52	41x64	PS22E222MSB
	2 700	0.15	14.08	7.04	43	51x51	PS22E272MTC
	3 300	0.15	15.70	7.85	35	51x61	PS22E332MTC
		0.15	16.14	8.07	34	46x70	PS22E332MSH
	3 900	0.15	17.00	8.50	30	51x70	PS22E392MTC
400 2G (450)	**560**	0.15	9.28	4.64	101	41x45	PS22G561MSB
	680	0.15	10.16	5.08	83	41x55	PS22G681MSB
	820	0.15	11.28	5.64	69	46x51	PS22G821MSH
	1 000	0.15	12.46	6.23	56	41x64	PS22G102MSB
		0.15	12.46	6.23	56	46x51	PS22G102MSHL51
		0.15	12.60	6.30	56	46x61	PS22G102MSH
		0.15	12.94	6.47	57	51x51	PS22G102MTC
		0.15	13.44	6.72	75	41x78	PS22G102MSBL78
	1 100	0.15	13.38	6.69	71	41x68	PS22G112MSBL68
	1 200	0.15	13.78	6.89	47	46x70	PS22G122MSH
		0.15	14.32	7.16	47	51x61	PS22G122MTC
	1 400	0.15	14.87	7.44	56	46x70	PS22G142MSHL70
		0.15	15.91	7.95	57	41x78	PS22G142MSBL78
	1 500	0.15	15.96	7.98	38	51x70	PS22G152MTC
	1 700	0.15	13.64	6.82	35	46x70	PS22G172MSHL70
	1 800	0.15	17.47	8.73	46	51x70	PS22G182MTCL70
	2 200	0.15	21.42	10.71	38	46x100	PS22G222MSHL100
420 420V (470)	**470**	0.15	8.16	4.08	158	41x45	PS2420V471MSB
	680	0.15	9.76	4.88	109	41x55	PS2420V681MSB
		0.15	9.86	4.93	109	46x51	PS2420V681MSH
	820	0.15	10.82	5.41	90	41x64	PS2420V821MSB
		0.15	11.24	5.62	91	51x51	PS2420V821MTC
	1 000	0.15	12.08	6.04	74	46x61	PS2420V102MSH
		0.15	12.41	6.20	75	51x51	PS2420V102MTCL51
	1 200	0.15	13.22	6.61	62	46x70	PS2420V122MSH
		0.15	13.76	6.88	62	51x61	PS2420V122MTC
	1 500	0.15	15.32	7.66	50	51x70	PS2420V152MTC
450 2W (500)	**390**	0.15	7.44	3.72	190	41x45	PS22W391MSB
	560	0.15	8.86	4.43	132	41x55	PS22W561MSB
		0.15	9.20	4.60	135	41x61	PS22W561MSBL61
	680	0.15	9.86	4.93	109	46x51	PS22W681MSH
	820	0.15	10.82	5.41	90	41x64	PS22W821MSB
		0.15	10.96	5.48	90	46x61	PS22W821MSH
		0.15	11.24	5.62	91	51x51	PS22W821MTC
	1 000	0.15	12.06	6.03	74	46x70	PS22W102MSH
		0.15	12.54	6.27	74	51x61	PS22W102MTC

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
450 2W (500)	**1 100**	0.15	13.16	6.58	68	51x61	PS22W112MTCL61
		0.15	17.05	8.52	68	46x70	PS22W112MSHL70
	1 200	0.15	13.68	6.84	62	51x70	PS22W122MTC
	1 500	0.15	15.29	7.65	50	51x70	PS22W152MTCL70
	2 000	0.15	15.69	7.84	55	46x100	PS22W202MSHL100
500 2H (550)	**330**	0.20	6.51	3.26	290	41x45	PS22H331MSBL45
	470	0.20	7.72	3.86	210	41x55	PS22H471MSBL55
		0.20	7.79	3.89	210	46x51	PS22H471MSHL51
	560	0.20	8.51	4.26	180	41x64	PS22H561MSBL64
	680	0.20	9.48	4.74	150	46x61	PS22H681MSHL61
		0.20	9.75	4.87	150	51x51	PS22H681MTCL51
	820	0.20	10.38	5.19	120	46x70	PS22H821MSHL70
		0.20	10.80	5.40	120	51x61	PS22H821MTCL61
	1 000	0.20	11.88	5.94	100	51x70	PS22H102MTCL70
550 2L (600)	**220**	0.20	4.35	2.56	510	41x45	PS22L221MSBL45
	270	0.20	4.81	2.83	420	41x55	PS22L271MSBL55
	330	0.20	5.37	3.16	340	46x51	PS22L331MSHL51
	390	0.20	5.83	3.43	290	41x64	PS22L391MSBL64
		0.20	5.88	3.46	290	46x61	PS22L391MSHL61
		0.20	6.05	3.56	290	51x51	PS22L391MTCL51
	560	0.20	7.06	4.15	200	46x70	PS22L561MSHL70
		0.20	7.33	4.31	200	51x61	PS22L561MTCL61
	680	0.20	8.06	4.74	170	51x70	PS22L681MTCL70
600 600V (650)	**180**	0.20	3.94	2.32	620	41x45	PS2600V181MSBL45
	220	0.20	4.34	2.55	510	41x55	PS2600V221MSBL55
	270	0.20	4.85	2.85	420	46x51	PS2600V271MSHL51
	330	0.20	5.37	3.16	340	41x64	PS2600V331MSBL64
	390	0.20	5.88	3.46	290	46x61	PS2600V391MSHL61
		0.20	6.05	3.56	290	51x51	PS2600V391MTCL51
	470	0.20	6.46	3.80	240	46x70	PS2600V471MSHL70
		0.20	6.72	3.95	240	51x61	PS2600V471MTCL61
	560	0.20	7.31	4.30	200	51x70	PS2600V561MTCL70

►Life Time Table / Brauchbarkeitsdauer – Tabelle

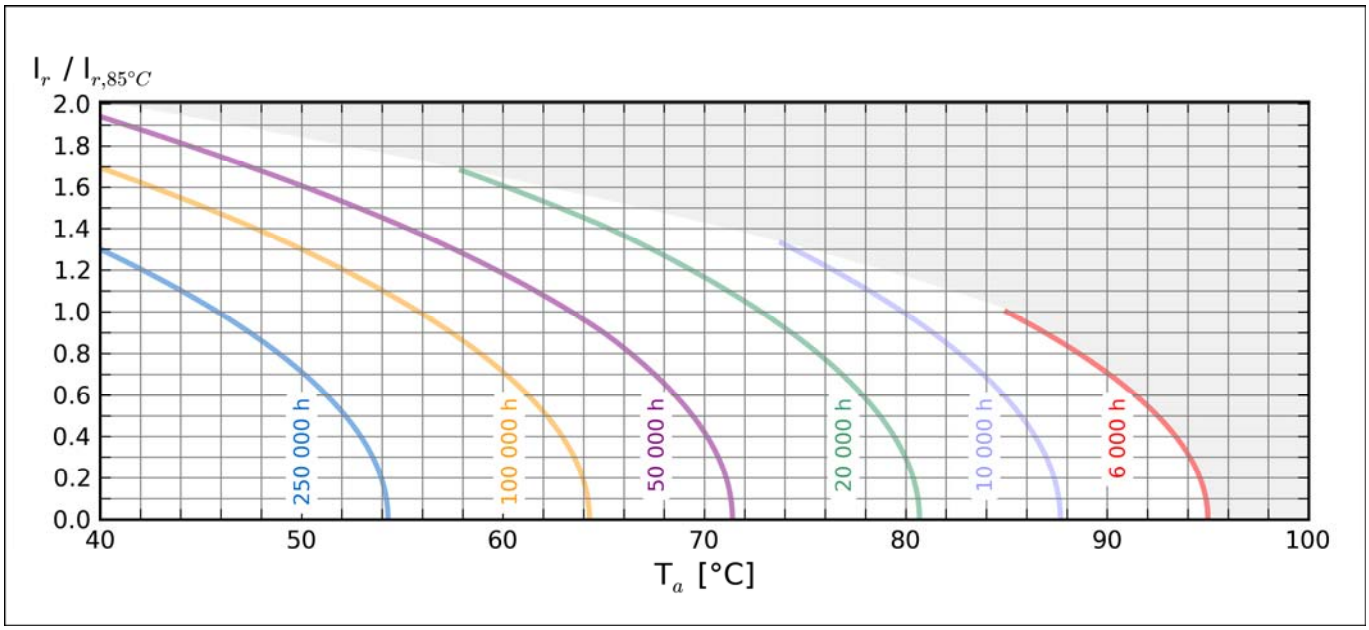
PS2	Useful life as function of ambient temperature and ripple current										
I_r at 85°C	x 1.0	x 1.1	x 1.2	x 1.3	x 1.4	x 1.5	x 1.6	x 1.7	x 1.8	x 1.9	x 2.0
T_a = 40°C	250	250	250	249	202	161	127	98	74	56	41
T_a = 45°C	250	229	191	157	128	102	80	62	47	35	
T_a = 50°C	170	144	121	99	80	64	50	39	29		
T_a = 55°C	107	91	76	63	51	40	32	24			
T_a = 60°C	68	57	48	39	32	25	20				
T_a = 65°C	43	36	30	25	20	16					
T_a = 70°C	27	23	19	15	12						
T_a = 75°C	17	14	12	10							
T_a = 80°C	10	9	7								
T_a = 85°C	6		khrs								

Max. value limited to 250 000 hours.

►Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r,85°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,85°C,120Hz}$



►Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	**T_a = 85°C; V_r, I_r applied 4000 hours**	**ΔC/C ≤ 15% (of initial value) Tanδ ≤ 175% (of specified value) I_L ≤ specified value**
Useful life	**T_a = 85°C; V_r, I_r applied 6000 hours**	**ΔC/C ≤ 20% (of initial value) Tanδ < 200% (of specified value) I_L ≤ specified value**

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

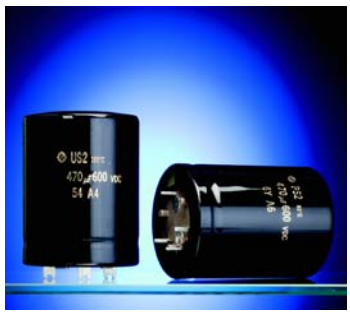
US2 Board-Mount 6 000h / 105°C

These capacitors combine both the advantage of screw type capacitors (higher CV values and **higher ripple current capabilities**) as well as the compact size and the termination of snap mount parts.

Diese Kondensatoren vereinen die Vorteile der Schraubanschlusstypen (höhere CV-Werte und **höhere Wechselstrombelastungen**) mit denen für die Leiterplattenmontage (kompakte Bauformen und Snap-Mount-Anschlüsse).

►Specifications / Spezifikationen

Items	Characteristics
Temperature range	-40°C ~ + 105°C
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.01 • C • V_r [µA] or 3 mA, which is smaller.
Useful life	6000h at 105°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10…55Hz, 10g, 3x2h



►Outline Drawings / Bauformen

Refer to page 6 for available terminal shapes and dimensions. / Auf Seite 6 finden Sie die verfügbaren Bauformen und Maße.

►Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]	50/60	120	300	1k	≥ 10k
multiplier	0.70	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 0.5	v ≥ 0.5	v ≥ 1.0	v ≥ 2.0
multiplier	1.00	1.10	1.20	1.25

Temperature [°C]	40	60	70	85	105
multiplier	2.8	2.4	2.1	2.0	1.0

►Product Code / Bestellbezeichnung

Example: US2 420V 1200µF ±20% 51x70mm Shape „T“

US2 420V 122 M T C ( )

Type of series

Capacitance code

The first two digits are significant. The last digit indicates the number of following zeros in µF.

Terminal symbol code

S: 4-pin terminal
T: T-type terminal

Length code

Code	L
Ly	y

Rated voltage code

Code	Voltage	Code	Voltage
2D	200	2W	450
2E	250	2H	500
2G	400	2L	550
420V	420	600V	600

Capacitance tolerance

M : ± 20%
Q : -10% ~ +30%

Case code diameter

Code	ØD
B	41
H	46
C	51

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Dissipation factor tan δ	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	DxL [mm]	Product Code
200 2D (250)	1 500	0.15	12.29	4.39	76	41x45	US22D152MSB
	2 200	0.15	13.83	4.94	52	46x51	US22D222MSH
		0.15	14.78	5.28	52	41x55	US22D222MSB
	2 700	0.15	14.90	5.32	43	51x51	US22D272MTC
		0.15	16.55	5.91	42	41x64	US22D272MSB
	3 300	0.15	17.14	6.12	34	46x61	US22D332MSH
	3 900	0.15	18.09	6.46	30	51x61	US22D392MTC
		0.15	18.56	6.63	29	46x70	US22D392MSH
	4 700	0.15	19.77	7.06	25	51x70	US22D472MTC
250 2E (300)	1 000	0.15	10.05	3.59	115	41x45	US22E102MSB
	1 500	0.15	12.21	4.36	76	41x55	US22E152MSB
	1 800	0.15	12.15	4.34	67	51x51	US22E182MTC
		0.15	12.52	4.47	63	46x51	US22E182MSH
		0.15	13.50	4.82	63	41x64	US22E182MSB
	2 200	0.15	13.97	4.99	52	46x61	US22E222MSH
	2 700	0.15	15.04	5.37	45	51x61	US22E272MTC
		0.15	15.46	5.52	42	46x70	US22E272MSH
	3 300	0.15	16.58	5.92	38	51x70	US22E332MTC
400 2G (450)	470	0.15	8.99	3.21	120	41x45	US22G471MSB
	680	0.15	10.78	3.85	83	41x55	US22G681MSB
		0.15	10.86	3.88	83	46x51	US22G681MSH
	820	0.15	11.93	4.26	69	41x64	US22G821MSB
		0.15	11.93	4.26	69	46x51	US22G821MSHL51
		0.15	12.40	4.43	69	51x51	US22G821MTC
	1 000	0.15	13.33	4.76	56	46x61	US22G102MSH
		0.15	14.20	5.07	75	41x78	US22G102MSBL78
	1 200	0.15	14.48	5.17	47	41x78	US22G122MSBL78
		0.15	14.56	5.20	47	46x70	US22G122MSH
		0.15	15.15	5.41	47	51x61	US22G122MTC
	1 500	0.15	16.88	6.03	38	51x70	US22G152MTC
420 420V (470)	390	0.15	7.90	2.82	190	41x45	US2420V391MSB
	560	0.15	9.35	3.34	132	41x55	US2420V561MSB
	680	0.15	10.44	3.73	109	46x51	US2420V681MSH
	820	0.15	11.45	4.09	90	41x64	US2420V821MSB
		0.15	11.59	4.14	90	46x61	US2420V821MSH
		0.15	11.93	4.26	90	51x51	US2420V821MTC
	1 000	0.15	12.80	4.57	74	46x70	US2420V102MSH
		0.15	13.27	4.74	74	51x61	US2420V102MTC
	1 200	0.15	14.50	5.18	62	51x70	US2420V122MTC
450 2W (500)	330	0.15	7.22	2.58	225	41x45	US22W331MSB
	470	0.15	8.60	3.07	158	41x55	US22W471MSB
	560	0.15	9.46	3.38	132	41x64	US22W561MSB
		0.15	9.46	3.38	132	46x51	US22W561MSH
	680	0.15	10.56	3.77	109	46x61	US22W681MSH
		0.15	10.84	3.87	109	51x51	US22W681MTC
	820	0.15	11.54	4.12	90	46x70	US22W821MSH
		0.15	12.01	4.29	90	51x61	US22W821MTC
	1 000	0.15	13.24	4.73	74	51x70	US22W102MTC
	1 200	0.15	15.15	5.41	69	41x100	US22W122MSBL100
500 2H (550)	470	0.15	7.50	2.68	207	41x64	US22H471MSB
	560	0.15	7.14	2.55	188	41x81	US22H561MSBL81
	680	0.15	9.18	3.28	143	46x70	US22H681MSH
	1 000	0.15	10.75	3.84	90	46x100	US22H102MSHSL100

▶ Life Time Table / Brauchbarkeitsdauer – Tabelle

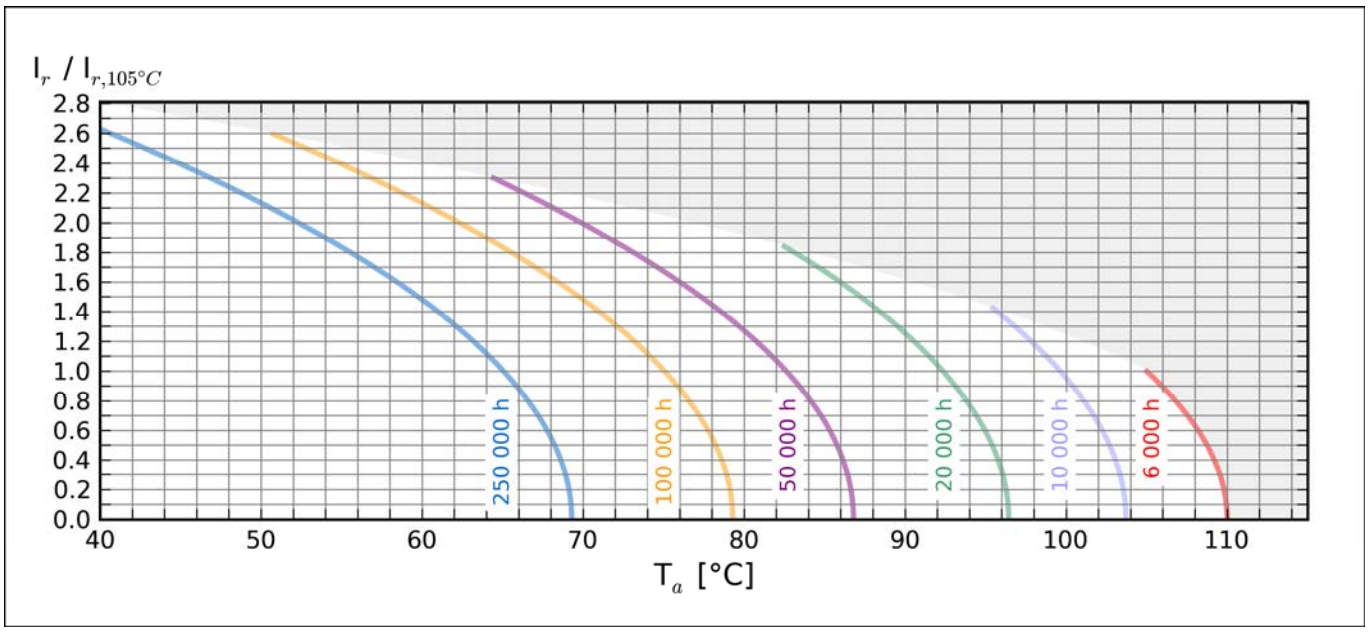
US2	Useful life as function of ambient temperature and ripple current													
I_r at 105°C	x 1.0	x 1.2	x 1.4	x 1.6	x 1.8	x 2.0	x 2.1	x 2.2	x 2.3	x 2.4	x 2.5	x 2.6	x 2.7	x 2.8
T_a = 40°C	250	250	250	250	250	250	250	250	250	250	250	250	216	174
T_a = 45°C	250	250	250	250	250	250	250	250	250	247	204	168	136	
T_a = 50°C	250	250	250	250	250	250	250	223	188	156	129	106		
T_a = 55°C	250	250	250	250	250	196	167	141	118	99	81			
T_a = 60°C	250	250	250	216	166	124	105	89	75	62				
T_a = 65°C	250	211	173	137	105	78	66	56	47					
T_a = 70°C	158	134	109	86	66	49	42							
T_a = 75°C	100	84	69	54	42	31	26							
T_a = 80°C	63	53	43	34	26	19								
T_a = 85°C	40	33	27	21	16	12								
T_a = 90°C	25	21	17	13	10									
T_a = 95°C	16	13	11	8										
T_a = 100°C	10	8												
T_a = 105°C	6													

khrs Max. value limited to 250 000 hours.

▶ Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r,105°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,105°C,120Hz}$



▶ Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	**T_a = 105°C; V_r, I_r applied 4000 hours**	**ΔC/C ≤ 15% (of initial value) Tanδ ≤ 175% (of specified value) I_L ≤ specified value**
Useful life	**T_a = 105°C; V_r, I_r applied 6000 hours**	**ΔC/C ≤ 20% (of initial value) Tanδ < 200% (of specified value) I_L ≤ specified value**

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

Screw-Terminal Capacitors

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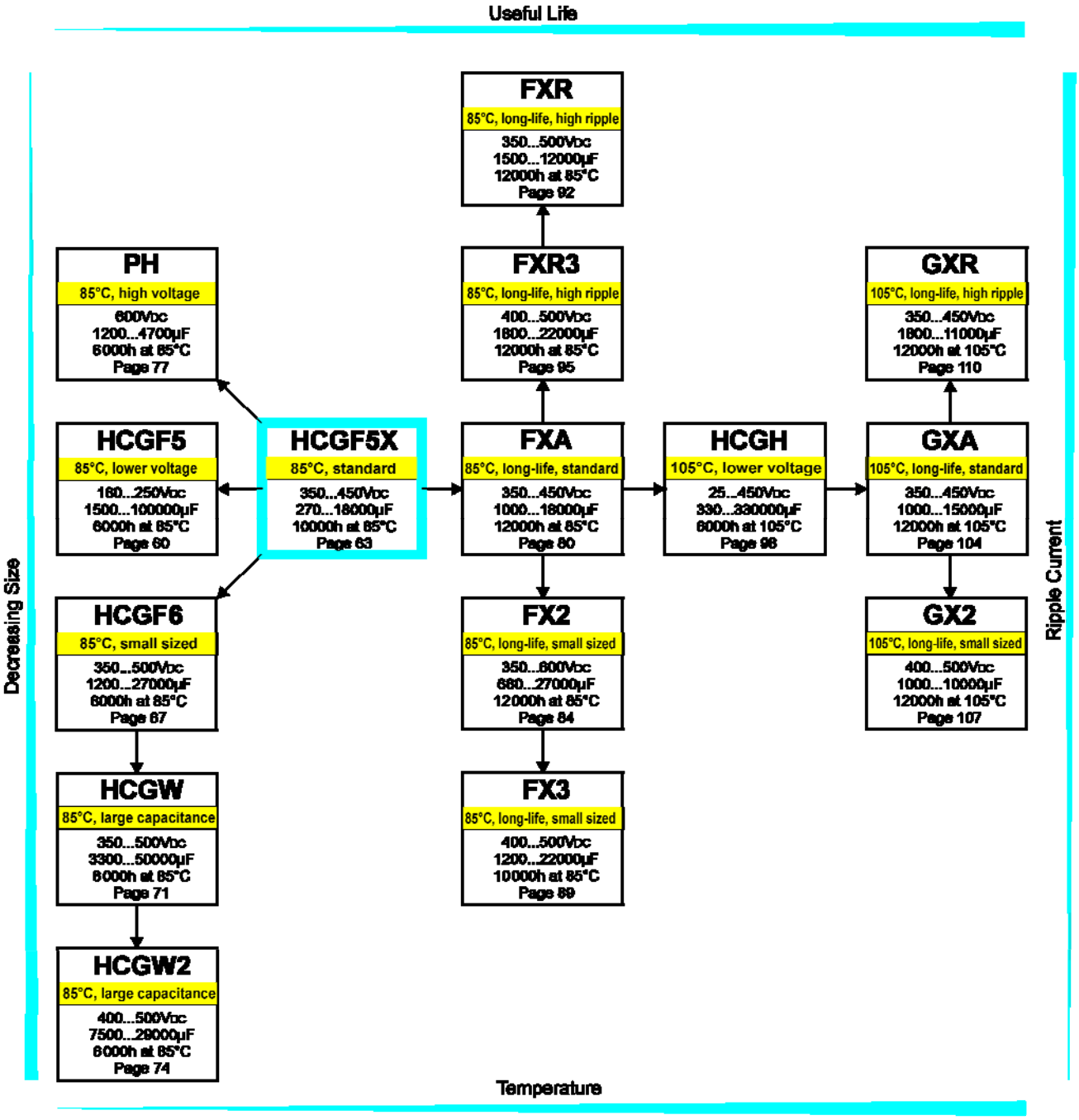


HCGF5 Screw-Terminal 6 000 h / 85°C

►Specifications / Spezifikationen

Items	Characteristics
Temperature range	-25°C ~ + 85°C
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.01 • C • V_r [µA] or 3 mA, which is smaller.
Useful life	+/- 20%
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10...55Hz, 10g, 3x2h

►Outline Drawings / Bauformen

Shape: B (ØD = 51-90)
(for Bolt – Mounting, M12x16, stud bolt is not isolated)

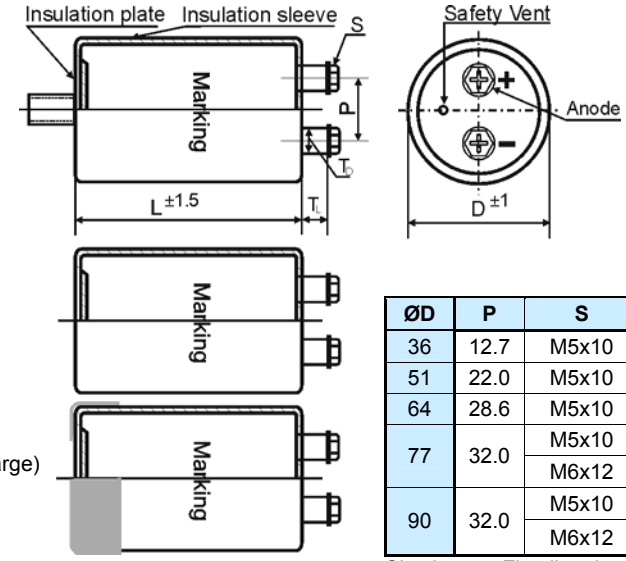
Form: B (ØD = 51-90)
(für Bolzenbefestigung, M12x16, Bolzen nicht isoliert)

Shape: N (for PBT-Holder ØD = 77-90 and Press Ring ØD = 64-90)

Form: N (für PBT-Halter ØD = 77-90 und Einpressring ØD = 64-90)

Shape: I (ØD = 36)
Shape: Y (ØD = 51-90)
(double sleeve, bracket free of charge)

Form: I (ØD = 36)
Form: Y (ØD = 51-90)
(doppelte Isolierung, Schelle wird kostenlos mitgeliefert)



ØD	P	S	T_L	T_D	Cap material
36	12.7	M5x10	7.0	8	PPS
51	22.0	M5x10	4.5	10	PPS
64	28.6	M5x10	4.5	10	PPS
77	32.0	M5x10	4.5	10	PPS
		M6x12	5.0	16	PPS
90	32.0	M5x10	4.0	10	PPS
		M6x12	4.0	16	PPS

Size in mm. First listed terminal is standard.

►Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]	50/60	120	300	1k	≥ 10k
multiplier	0.80	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 1.0	v ≥ 1.0
multiplier	1.0	1.1

►Product Code / Bestellbezeichnung

Example: 4700µF 200V D=51mm L=96mm with Y-Bracket

HCGF5 2D 472 Y C 096 ( )

Type of series

Capacitance code
The first two digits are significant. The last digit indicates the number of following zeros in µF.

Rated Voltage Code

Code	Voltage
2C	160
2D	200
2E	250

Fixing symbol code

B : Bolt ØD = 51 - 90
N : No double sleeve (PBT-Safety-holder or press ring)
Y : 3 Stoppers Bracket ØD = 51 - 90
I : 2 Stoppers Bracket ØD = 36

refer to pages 113 – 119

Case code diameter

ØD	Code
36	A
51	C
64	D
77	E
90	F

Case Code length
Length in mm (3 digits)

Customers` specification

HCGF5 Series Screw-Terminal 6 000 h / 85°C

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	DxL [mm]	Product Code
160 2C (200)	**3 300**	16.2	6.0	40	30	15	36x121	HCGF52C332□A121
	3 900	16.5	6.1	37	28	17	51x75	HCGF52C392□C075
	4 700	18.1	6.7	30	25	17	51x75	HCGF52C472□C075
	5 600	21.6	8.0	26	23	17	51x96	HCGF52C562□C096
	6 800	24.3	9.0	21	21	17	51x96	HCGF52C682□C096
	8 200	28.4	10.5	18	19	17	51x115	HCGF52C822□C115
	10 000	32.4	12.0	14	17	18	64x96	HCGF52C103□D096
		32.9	12.2	15	16	17	51x130	HCGF52C103□C130
	12 000	35.1	13.0	12	15	18	64x96	HCGF52C123□D096
	15 000	44.3	16.4	11	12	18	64x130	HCGF52C153□D130
	18 000	48.3	17.9	9	11	18	64x130	HCGF52C183□D130
	22 000	56.7	21.0	8	8	20	77x130	HCGF52C223□E130
	27 000	62.6	23.2	7	8	20	77x130	HCGF52C273□E130
	33 000	74.0	27.4	6	7	20	90x131	HCGF52C333□F131
	39 000	86.7	32.1	5	7	20	90x157	HCGF52C393□F157
	47 000	102.6	38.0	5	7	20	77x220	HCGF52C473□E220
	68 000	115.0	42.6	4	6	20	90x203	HCGF52C683□F203
	100 000	150.4	55.7	6	6	29	101x250	HCGF52C104□G250
200 2D (250)	**2 200**	12.2	4.5	51	45	15	36x100	HCGF52D222□A100
	2 700	14.6	5.4	48	39	15	36x121	HCGF52D272□A121
	3 300	15.1	5.6	43	35	17	51x75	HCGF52D332□C075
	3 900	16.5	6.1	37	30	17	51x75	HCGF52D392□C075
	4 700	20.0	7.4	30	27	17	51x96	HCGF52D472□C096
	5 600	23.2	8.6	26	25	17	51x115	HCGF52D562□C115
	6 800	27.3	10.1	21	20	17	51x130	HCGF52D682□C130
	8 200	29.2	10.8	17	18	18	64x96	HCGF52D822□D096
	10 000	32.4	12.0	14	14	18	64x96	HCGF52D103□D096
	12 000	37.5	13.9	12	14	20	77x96	HCGF52D123□E096
	15 000	44.8	16.6	10	13	20	77x96	HCGF52D153□E096
	18 000	51.3	19.0	8	12	20	77x130	HCGF52D183□E130
	20 000	56.7	21.0	8	8	20	77x145	HCGF52D203□C145
	22 000	60.8	22.5	7	7	20	77x155	HCGF52D223□E155
	27 000	67.0	24.8	6	7	20	90x131	HCGF52D273□F131
		78.0	28.9	6	7	20	77x220	HCGF52D273□E220
	33 000	79.1	29.3	5	7	20	90x157	HCGF52D333□F157
	39 000	93.7	34.7	5	7	20	77x220	HCGF52D393□E220
	40 000	87.2	32.3	5	7	20	90x157	HCGF52D403□F157
	52 000	108.8	40.3	5	7	20	90x196	HCGF52D523□F196
250 2E (300)	**1 500**	10.0	3.7	56	50	15	36x100	HCGF52E152□A100
	1 800	10.8	4.0	52	44	15	36x100	HCGF52E182□A100
	2 200	12.4	4.6	50	40	17	51x75	HCGF52E222□C075
	2 700	13.8	5.1	41	36	17	51x75	HCGF52E272□C075
	3 300	16.7	6.2	36	35	17	51x96	HCGF52E332□C096
	3 900	19.4	7.2	31	30	17	51x115	HCGF52E392□C115
	4 700	22.1	8.2	25	23	18	64x96	HCGF52E472□D096
	5 600	24.3	9.0	21	21	18	64x96	HCGF52E562□D096
	6 800	28.4	10.5	18	18	18	64x115	HCGF52E682□D115
	8 200	31.0	11.5	15	16	18	64x115	HCGF52E822□D115
	10 000	36.4	13.5	12	14	18	64x130	HCGF52E103□D130
	12 000	40.0	14.8	10	11	20	77x115	HCGF52E123□E115
	15 000	47.0	17.4	8	11	20	77x130	HCGF52E153□E130
	18 000	55.1	20.4	7	10	20	77x155	HCGF52E183□E155
	22 000	64.8	24.0	6	8	20	90x157	HCGF52E223□F157

►Life Time Table / Brauchbarkeitsdauer – Tabelle

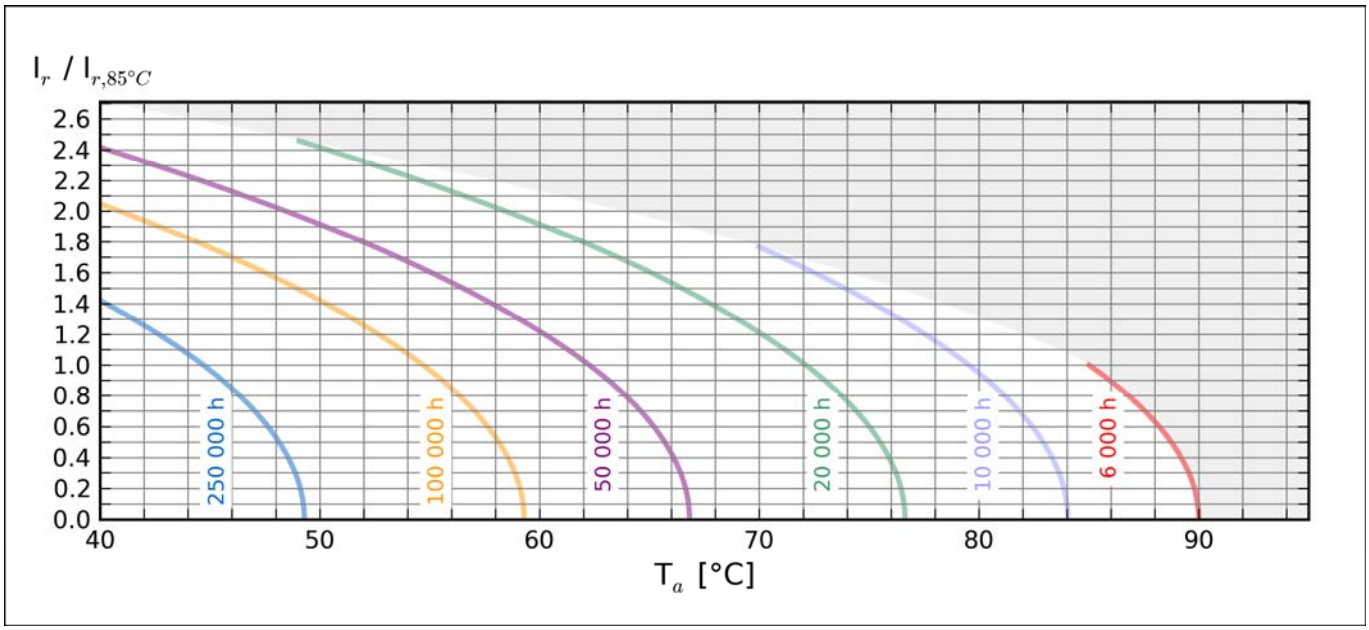
HCGF5	Useful life as function of ambient temperature and ripple current												
I_r at 85°C	x 1.0	x 1.2	x 1.4	x 1.6	x 1.8	x 2.0	x 2.1	x 2.2	x 2.3	x 2.4	x 2.5	x 2.6	x 2.7
T_a = 40°C	250	250	250	199	149	108	91	76	63	51	42	33	27
T_a = 45°C	243	201	162	125	94	68	57	48	39	32	26	21	
T_a = 50°C	153	127	102	79	59	43	36	30	25	20			
T_a = 55°C	97	80	64	50	37	27	23	19					
T_a = 60°C	61	51	41	31	23	17							
T_a = 65°C	38	32	25	20	15								
T_a = 70°C	24	20	16	12									
T_a = 75°C	15	12	10										
T_a = 80°C	9	8											
T_a = 85°C	6												

khrs Max. value limited to 250 000 hours.

►Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r,85°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,85°C,120Hz}$



►Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	**T_a = 85°C; V_r, I_r applied 4000 hours**	**ΔC/C ≤ 15% (of initial value) Tanδ ≤ 175% (of specified value) I_L ≤ specified value**
Useful life	**T_a = 85°C; V_r, I_r applied 6000 hours**	**ΔC/C ≤ 20% (of initial value) Tanδ < 200% (of specified value) I_L ≤ specified value**

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

HCGF5X Screw-Terminal 10 000 h / 85°C

▶ Specifications / Spezifikationen

Items	Characteristics
Temperature range	-40°C ~ + 85°C
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.01 • C • V_r [µA] or 3 mA, which is smaller.
Useful life	10000 h at 85°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10…55Hz, 10g, 3x2h

▶ Outline Drawings / Bauformen

Shape: B (ØD = 51-90)
(for Bolt – Mounting, M12x16, stud bolt is not isolated)

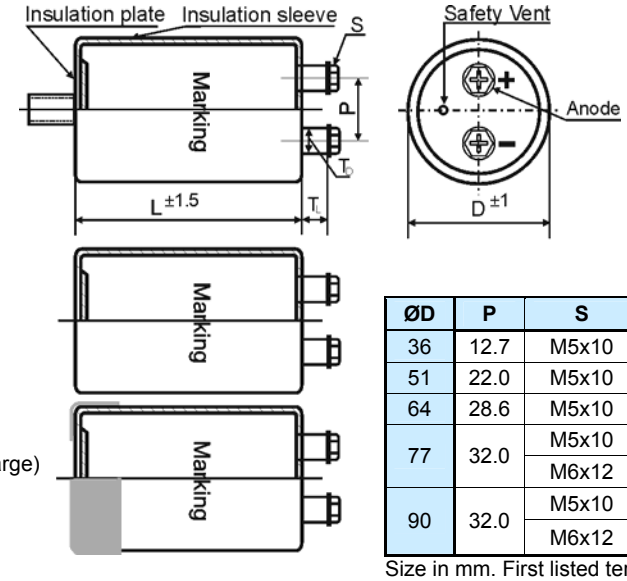
Form: B (ØD = 51-90)
(für Bolzenbefestigung, M12x16, Bolzen nicht isoliert)

Shape: N (for PBT-Holder ØD = 77-90 and Press Ring ØD = 64-90)

Form: N (für PBT-Halter ØD = 77-90 und Einpressring ØD = 64-90)

Shape: I (ØD = 36)
Shape: Y (ØD = 51-90)
(double sleeve, bracket free of charge)

Form: I (ØD = 36)
Form: Y (ØD = 51-90)
(doppelte Isolierung, Schelle wird kostenlos mitgeliefert)



ØD	P	S	T_L	T_D	Cap material
36	12.7	M5x10	7.0	8	PPS
51	22.0	M5x10	4.5	10	PPS
64	28.6	M5x10	4.5	10	PPS
77	32.0	M5x10	4.5	10	PPS
		M6x12	5.0	16	PPS
90	32.0	M5x10	4.0	10	PPS
		M6x12	4.0	16	PPS

Size in mm. First listed terminal is standard.

▶ Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]	50/60	120	300	1k	≥ 10k
multiplier	0.80	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 1.0	v ≥ 1.0
multiplier	1.0	1.1

▶ Product Code / Bestellbezeichnung

Example: 2700µF 400V D=64mm L=96mm with Y-Bracket

HCGF5X 2G 272 Y D 096 ( )

Type of series

Capacitance code
The first two digits are significant. The last digit indicates the number of following zeros in µF.

Rated Voltage Code

Code	Voltage
2V	350
2G	400
2W	450

Fixing symbol code
B : Bolt ØD = 51 - 90
N : No double sleeve (PBT-Safety-holder or press ring)
Y : 3 Stoppers Bracket ØD = 51 - 90
I : 2 Stoppers Bracket ØD = 36

refer to pages 113 – 119

Case code diameter

ØD	Code
36	A
51	C
64	D
77	E
90	F

Case Code length
Length in mm (3 digits)

Customers` specification

HCGF5X Series Screw-Terminal 10 000 h / 85°C

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	DxL [mm]	Product Code
350 2V (400)	390	5.9	2.8	215	219	15	36x53	HCGF5X2V391□A053
	470	7.6	3.6	179	182	15	36x83	HCGF5X2V471□A083
	560	8.2	3.9	162	165	15	36x83	HCGF5X2V561□A083
	680	9.0	4.3	144	147	15	36x83	HCGF5X2V681□A083
	820	10.7	5.1	119	122	15	36x100	HCGF5X2V821□A100
	1 200	13.2	6.3	76	79	17	51x75	HCGF5X2V122□C075
	1 500	14.7	7.0	60	63	17	51x75	HCGF5X2V152□C075
	1 800	17.9	8.5	44	44	17	51x96	HCGF5X2V182□C096
	2 200	19.7	9.4	28	28	17	51x96	HCGF5X2V222□C096
	2 700	24.6	11.7	27	27	17	51x130	HCGF5X2V272□C130
		26.3	12.5	25	27	20	77x105	HCGF5X2V272□E105
	3 300	26.7	12.7	21	22	18	64x96	HCGF5X2V332□D096
		27.3	13.0	21	22	17	51x130	HCGF5X2V332□C130
	3 900	30.9	14.7	18	20	18	64x115	HCGF5X2V392□D115
	4 700	35.7	17.0	16	20	18	64x130	HCGF5X2V472□D130
	5 600	39.3	18.7	14	20	20	77x115	HCGF5X2V562□E115
	6 800	45.4	21.6	14	18	20	77x130	HCGF5X2V682□E130
		47.0	22.4	14	18	20	77x143	HCGF5X2V682□E143
	8 200	53.3	25.4	12	15	20	77x155	HCGF5X2V822□E155
	10 000	62.6	29.8	10	15	20	90x157	HCGF5X2V103□F157
	12 000	68.7	32.7	8	13	20	90x157	HCGF5X2V123□F157
	15 000	83.6	39.8	6	10	20	90x196	HCGF5X2V153□F196
	18 000	99.3	47.3	5	10	20	90x236	HCGF5X2V183□F236
400 2G (450)	330	5.3	2.5	275	279	15	36x53	HCGF5X2G331□A053
	390	6.7	3.2	251	255	15	36x83	HCGF5X2G391□A083
	470	7.6	3.6	208	211	15	36x83	HCGF5X2G471□A083
	560	8.2	3.9	174	177	15	36x83	HCGF5X2G561□A083
	680	9.7	4.6	143	145	15	36x100	HCGF5X2G681□A100
	820	10.7	5.1	119	121	15	36x100	HCGF5X2G821□A100
	1 000	12.2	5.8	102	105	17	51x75	HCGF5X2G102□C075
	1 200	13.2	6.3	69	63	17	51x75	HCGF5X2G122□C075
	1 500	16.2	7.7	50	55	17	51x96	HCGF5X2G152□C096
	1 800	17.9	8.5	40	40	17	51x96	HCGF5X2G182□C096
	2 200	21.4	10.2	30	30	18	64x96	HCGF5X2G222□D096
		22.3	10.6	28	28	17	51x130	HCGF5X2G222□C130
	2 700	23.9	11.4	24	25	18	64x96	HCGF5X2G272□D096
	3 300	28.6	13.6	21	22	18	64x115	HCGF5X2G332□D115
		29.0	13.8	21	22	20	77x105	HCGF5X2G332□E105
		32.6	15.5	20	20	20	77x143	HCGF5X2G332□E143
	3 900	32.6	15.5	18	20	18	64x130	HCGF5X2G392□D130
	4 700	35.9	17.1	14	18	20	77x115	HCGF5X2G472□E115
		39.1	18.6	14	18	20	77x143	HCGF5X2G472□E143
	5 600	41.2	19.6	14	18	20	77x130	HCGF5X2G562□E130
	6 800	47.0	22.4	14	18	20	77x145	HCGF5X2G682□E145
		48.7	23.2	14	18	20	77x155	HCGF5X2G682□E155
	8 200	56.7	27.0	12	15	20	90x157	HCGF5X2G822□F157
	10 000	62.6	29.8	10	15	20	90x157	HCGF5X2G103□F157
	12 000	75.0	35.7	8	13	20	90x196	HCGF5X2G123□F196
	15 000	90.5	43.1	6	10	20	90x236	HCGF5X2G153□F236
450 2W (500)	270	4.8	2.3	362	367	15	36x53	HCGF5X2W271□A053
	330	6.3	3.0	296	301	15	36x83	HCGF5X2W331□A083
	390	6.7	3.2	251	256	15	36x83	HCGF5X2W391□A083
	470	7.6	3.6	208	213	15	36x83	HCGF5X2W471□A083
	560	8.6	4.1	174	178	15	36x100	HCGF5X2W561□A100
	680	9.7	4.6	143	147	15	36x100	HCGF5X2W681□A100
	820	10.9	5.2	118	122	17	51x75	HCGF5X2W821□C075
	1 000	12.2	5.8	95	100	17	51x75	HCGF5X2W102□C075
	1 200	14.5	6.9	70	80	17	51x96	HCGF5X2W122□C096

HCGF5X Series Screw-Terminal 10 000 h / 85°C

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	DxL [mm]	Product Code
450 2W (500)	**1 500**	17.4	8.3	55	60	17	51x115	HCGF5X2W152□C115
	1 800	20.0	9.5	46	47	17	51x130	HCGF5X2W182□C130
	2 200	21.8	10.4	42	45	18	64x96	HCGF5X2W222□D096
		23.7	11.3	42	45	20	77x103	HCGF5X2W222□E103
	2 700	25.8	12.3	38	40	18	64x115	HCGF5X2W272□D115
	3 300	30.2	14.4	30	35	20	77x115	HCGF5X2W332□E115
		30.0	14.3	30	35	18	64x130	HCGF5X2W332□D130
		32.8	15.6	30	35	20	77x143	HCGF5X2W332□E143
	3 900	32.8	15.6	24	27	20	77x115	HCGF5X2W392□E115
	4 700	37.6	17.9	22	23	20	77x130	HCGF5X2W472□E130
	5 600	44.1	21.0	20	20	20	77x155	HCGF5X2W562□E155
	6 800	50.0	23.8	18	18	20	90x145	HCGF5X2W682□F145
		51.7	24.6	18	18	20	90x157	HCGF5X2W682□F157
	8 200	56.7	27.0	15	17	20	90x157	HCGF5X2W822□F157
	10 000	60.7	28.9	12	15	20	90x145	HCGF5X2W103□F145
		68.3	32.5	12	15	20	90x196	HCGF5X2W103□F196
	12 000	81.1	38.6	9	12	20	90x236	HCGF5X2W123□F236

►Life Time Table / Brauchbarkeitsdauer – Tabelle

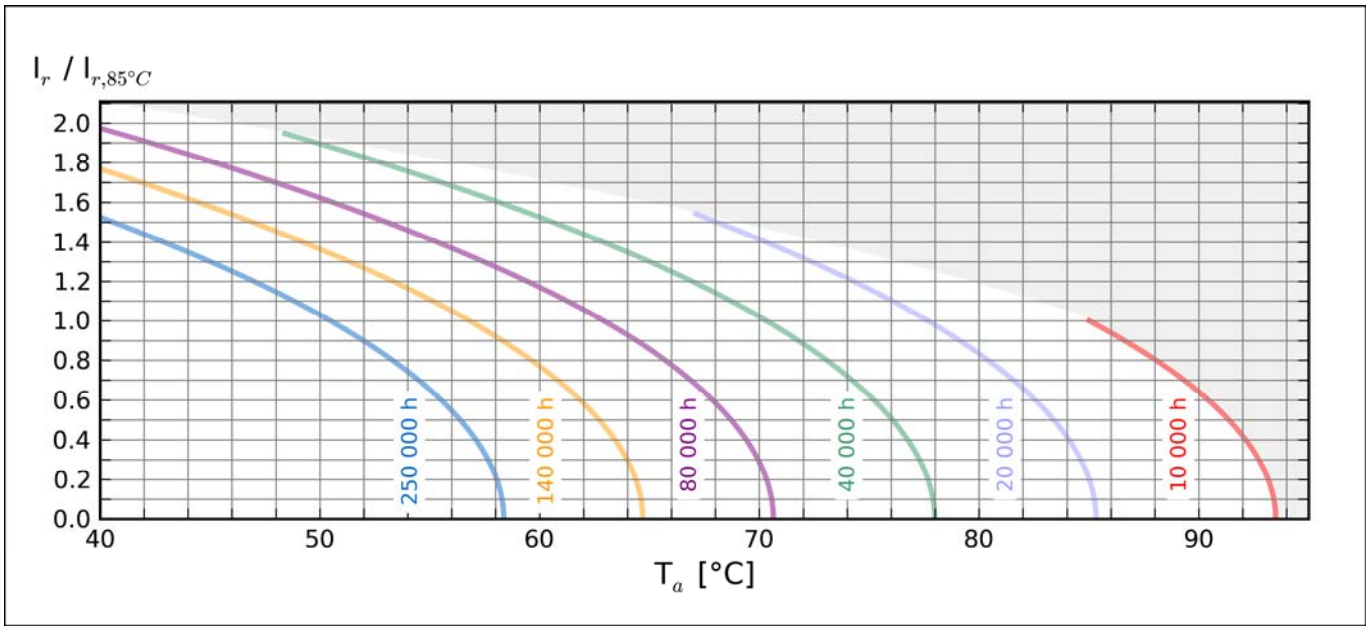
HCGF5X	Useful life as function of ambient temperature and ripple current											
I_r at 85°C	x 1.0	x 1.1	x 1.2	x 1.3	x 1.4	x 1.5	x 1.6	x 1.7	x 1.8	x 1.9	x 2.0	x 2.1
T_a = 40°C	250	250	250	250	250	250	210	166	128	98	74	55
T_a = 45°C	250	250	250	250	205	166	133	105	81	62	47	
T_a = 50°C	250	224	189	158	130	105	84	66	51	39		
T_a = 55°C	165	141	120	100	82	66	53	42	32			
T_a = 60°C	104	89	75	63	52	42	33	26				
T_a = 65°C	66	56	48	40	32	26						
T_a = 70°C	41	35	30	25	20							
T_a = 75°C	26	22	19	16								
T_a = 80°C	16	14										
T_a = 85°C	10											

khrs Max. value limited to 250 000 hours.

►Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r,85°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,85°C,120Hz}$



►Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	**T_a = 85°C; V_r, I_r applied 6000 hours**	**ΔC/C ≤ 15% (of initial value) Tanδ ≤ 175% (of specified value) I_L ≤ specified value**
Useful life	**T_a = 85°C; V_r, I_r applied 10000 hours**	**ΔC/C ≤ 20% (of initial value) Tanδ < 200% (of specified value) I_L ≤ specified value**

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

HCGF6 Screw-Terminal 6 000 h / 85°C

Special charge-discharge proof design available upon request.

Auf Anfrage spezielles Design für Lade-, Entladeanwendungen erhältlich.

►Specifications / Spezifikationen

Items	Characteristics
Temperature range	-25°C ~ + 85°C
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.01 • C • V_r [µA] or 3 mA, which is smaller.
Useful life	6000 h at 85°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10…55Hz, 10g, 3x2h

►Outline Drawings / Bauformen

Shape: B (ØD = 51-101)
(for Bolt - Mounting, M12x16, stud bolt is not isolated)

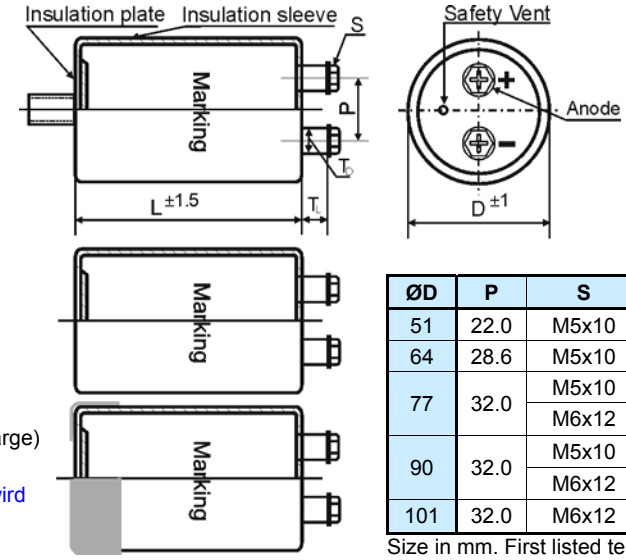
Form: B (ØD = 51-101)
(für Bolzenbefestigung, M12x16, Bolzen ist nicht isoliert)

Shape: N (for PBT-Holder ØD = 77-90 and Press Ring ØD = 64-90)

Form: N (für PBT-Halter ØD = 77-90 und Einpressring ØD = 64-90)

Shape: Y (ØD = 51-101)
(double sleeve, bracket free of charge)

Form: Y (ØD = 51-101)
(mit doppelter Isolierung, Schelle wird kostenlos mitgeliefert)



ØD	P	S	T_L	T_D	Cap material
51	22.0	M5x10	4.5	10	PPS
64	28.6	M5x10	4.5	10	PPS
77	32.0	M5x10	4.5	10	PPS
		M6x12	5.0	16	PPS
90	32.0	M5x10	4.0	10	PPS
		M6x12	4.0	16	PPS
101	32.0	M6x12	3.0	14	PPS

Size in mm. First listed terminal is standard.

►Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]	50/60	120	300	1k	≥ 10k
multiplier	0.80	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 1.0	v ≥ 1.0
multiplier	1.0	1.1

►Product Code / Bestellbezeichnung

Example: 12000µF 500V D=101mm L=237mm with Y-Bracket

HCGF6 2H 123 Y G 237 ( )

Type of series

Capacitance code
The first two digits are significant. The last digit indicates the number of following zeros in µF.

Rated voltage code

Code	Voltage	Code	Voltage
2V	350	2W	450
2G	400	2H	500

Fixing symbol code
B : Bolt ØD = 51 - 90
N : No double sleeve (PBT-Safety-holder or press ring)
Y : 3 Stoppers Bracket ØD = 51 – 101

refer to pages 113 – 119

Case code diameter

ØD	Code
51	C
64	D
77	E
90	F
101	G

Case Code length
Length in mm (3 digits)

Customers` specification

HCGF6 Series Screw-Terminal 6 000 h / 85°C

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	DxL [mm]	Product Code
350 2V (400)	2 700	20.8	7.7	48	50	17	51x115	HCGF62V272□C115
	3 300	24.3	9.0	39	40	17	51x130	HCGF62V332□C130
	3 900	25.6	9.5	33	35	18	64x96	HCGF62V392□D096
	4 700	30.5	11.3	27	30	18	64x115	HCGF62V472□D115
	5 600	34.6	12.8	25	28	18	64x130	HCGF62V562□D130
	6 800	38.6	14.3	21	24	20	77x115	HCGF62V682□E115
	8 200	44.1	16.3	17	21	20	77x130	HCGF62V822□E130
	10 000	52.4	19.4	14	17	20	77x155	HCGF62V103□E155
	12 000	57.5	21.3	12	15	20	90x131	HCGF62V123□F131
		59.6	22.1	12	15	20	77x171	HCGF62V123□E171
	15 000	68.8	25.5	10	13	20	90x157	HCGF62V153□F157
	18 000	82.0	30.4	9	15	20	90x196	HCGF62V183□F196
	20 000	86.4	32.0	8	11	20	90x196	HCGF62V203□F196
	22 000	88.8	32.9	8	11	29	101x175	HCGF62V223□G175
		97.8	36.2	8	13	20	90x236	HCGF62V223□F236
		98.0	36.3	8	10	20	90x221	HCGF62V223□F221
	27 000	110.4	40.9	7	8	29	101x237*)	HCGF62V273□G237
400 2G (450)	2 200	17.8	6.6	58	60	17	51x100	HCGF62G222□C100
		18.9	7.0	58	60	17	51x115	HCGF62G222□C115
	2 700	21.4	7.9	48	50	18	64x96	HCGF62G272□D096
		22.0	8.2	48	50	17	51x130	HCGF62G272□C130
	3 300	23.6	8.7	39	40	18	64x96	HCGF62G332□D096
	3 900	27.5	10.2	33	35	18	64x115	HCGF62G392□D115
	4 700	31.7	11.7	27	30	18	64x130	HCGF62G472□D130
	5 600	35.1	13.0	25	28	20	77x115	HCGF62G562□E115
	6 800	40.4	15.0	21	24	20	77x130	HCGF62G682□E130
	8 200	47.5	17.6	17	20	20	77x155	HCGF62G822□E155
	10 000	52.5	19.4	14	17	20	90x131	HCGF62G103□F131
		55.1	20.4	17	20	20	77x171	HCGF62G103□E171
		57.8	21.4	17	20	20	77x195	HCGF62G103□E195
	12 000	61.8	22.9	12	15	20	90x157	HCGF62G123□F157
	15 000	75.3	27.9	10	13	20	90x196	HCGF62G153□F196
	18 000	80.1	29.7	9	12	29	101x175	HCGF62G183□G175
		86.9	32.2	9	12	20	90x221	HCGF62G183□F221
		89.1	33.0	9	12	20	90x236	HCGF62G183□F236
	20 000	94.2	34.9	9	12	20	90x236	HCGF62G203□F236
	22 000	99.6	36.9	8	11	29	101x237*)	HCGF62G223□G237
		102.0	37.8	8	11	29	101x250	HCGF62G223□G250
	27 000	119.0	44.1	7	10	29	101x283	HCGF62G273□G283
450 2W (500)	1 800	17.0	6.3	77	80	17	51x115	HCGF62W182□C115
	2 200	19.5	7.2	63	65	18	64x96	HCGF62W222□D096
		19.9	7.4	63	65	17	51x130	HCGF62W222□C130
	2 700	21.3	7.9	52	54	18	64x96	HCGF62W272□D096
	3 300	25.2	9.3	42	44	20	77x96	HCGF62W332□E096
		25.4	9.4	42	44	18	64x115	HCGF62W332□D115
	3 900	28.9	10.7	38	40	18	64x130	HCGF62W392□D130
	4 700	32.0	11.8	34	36	20	77x115	HCGF62W472□E115
	5 600	36.6	13.6	31	33	20	77x130	HCGF62W562□E130
	6 800	43.5	16.1	25	27	20	77x155	HCGF62W682□E155
	8 200	47.5	17.6	21	23	20	90x131	HCGF62W822□F131
		52.5	19.4	21	23	20	77x195	HCGF62W822□E195
	10 000	58.0	21.5	17	19	20	90x171	HCGF62W103□F171
	12 000	65.5	24.3	16	18	29	101x175	HCGF62W123□G175
		67.4	25.0	16	18	20	90x196	HCGF62W123□F196

HCGF6 Series Screw-Terminal 6 000 h / 85°C

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	DxL [mm]	Product Code
450 2W (500)	15 000	76.4	28.3	15	17	29	101x195	HCGF62W153□G195
		79.2	29.4	15	17	20	90x221	HCGF62W153□F221
		81.4	30.1	15	17	20	90x236	HCGF62W153□F236
	16 000	81.8	30.3	16	18	20	90x221	HCGF62W163□F221
	17 000	86.7	32.1	15	17	20	90x236	HCGF62W173□F236
	18 000	90.2	33.4	14	16	29	101x237*)	HCGF62W183□G237
		92.2	34.2	14	16	29	101x250	HCGF62W183□G250
	22 000	107.4	39.8	12	14	29	101x283	HCGF62W223□G283
500 2H (550)	1 200	14.0	5.2	112	120	17	51x115	HCGF62H122□C115
		14.3	5.3	112	120	18	64x96	HCGF62H122□D096
	1 500	15.8	5.9	90	96	18	64x96	HCGF62H152□D096
		16.1	6.0	90	96	17	51x130	HCGF62H152□C130
	1 800	18.6	6.9	75	80	18	64x115	HCGF62H182□D115
	2 200	21.6	8.0	61	65	18	64x130	HCGF62H222□D130
		24.0	8.9	61	65	20	77x145	HCGF62H222□E145
	2 700	24.6	9.1	50	53	20	77x115	HCGF62H272□E115
	3 300	28.4	10.5	45	48	20	77x130	HCGF62H332□E130
	3 900	32.9	12.2	38	41	20	77x155	HCGF62H392□E155
	4 700	36.0	13.3	34	37	20	90x131	HCGF62H472□F131
		37.6	13.9	34	37	20	77x171	HCGF62H472□E171
	5 600	41.9	15.5	28	31	20	90x157	HCGF62H562□F157
		43.1	16.0	28	31	20	77x195	HCGF62H562□E195
	6 800	47.8	17.7	23	25	20	90x171	HCGF62H682□F171
	8 200	54.0	20.0	21	23	29	101x175	HCGF62H822□G175
		55.6	20.6	21	23	20	90x196	HCGF62H822□F196
	10 000	62.1	23.0	17	19	29	101x195	HCGF62H103□G195
		64.8	24.0	17	19	20	90x221	HCGF62H103□F221
		66.4	24.6	17	19	20	90x236	HCGF62H103□F236
	12 000	72.9	27.0	16	18	20	90x236	HCGF62H123□F236
		73.6	27.3	16	18	29	101x237*)	HCGF62H123□G237
	15 000	82.4	30.5	14	16	29	101x237*)	HCGF62H153□G237

*) For Bolt - Mounting dimensions are 101x242mm.

►Life Time Table / Brauchbarkeitsdauer – Tabelle

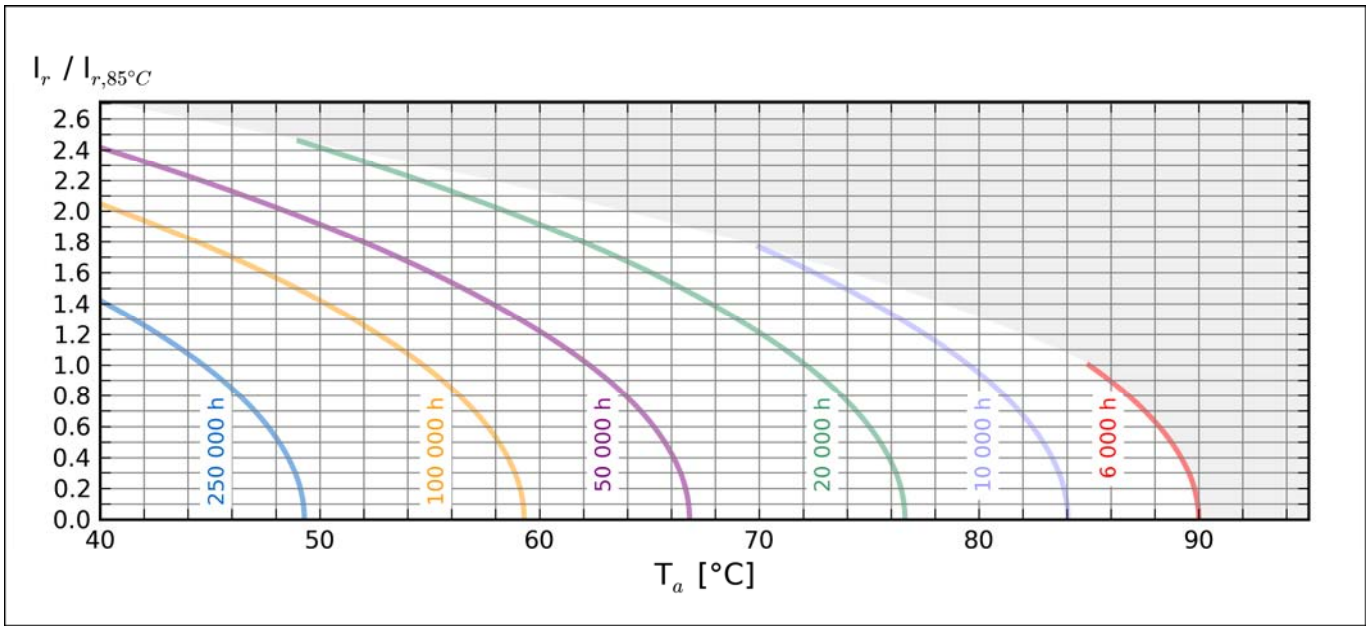
HCGF6	Useful life as function of ambient temperature and ripple current												
I_r at 85°C	x 1.0	x 1.2	x 1.4	x 1.6	x 1.8	x 2.0	x 2.1	x 2.2	x 2.3	x 2.4	x 2.5	x 2.6	x 2.7
T_a = 40°C	250	250	250	199	149	108	91	76	63	51	42	33	27
T_a = 45°C	243	201	162	125	94	68	57	48	39	32	26	21	
T_a = 50°C	153	127	102	79	59	43	36	30	25	20			
T_a = 55°C	97	80	64	50	37	27	23	19					
T_a = 60°C	61	51	41	31	23	17							
T_a = 65°C	38	32	25	20	15								
T_a = 70°C	24	20	16	12									
T_a = 75°C	15	12	10										
T_a = 80°C	9	8											
T_a = 85°C	6												

khrs Max. value limited to 250 000 hours.

►Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r,85°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,85°C,120Hz}$



►Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	**T_a = 85°C; V_r, I_r applied 4000 hours**	**ΔC/C ≤ 15% (of initial value) Tanδ ≤ 175% (of specified value) I_L ≤ specified value**
Useful life	**T_a = 85°C; V_r, I_r applied 6000 hours**	**ΔC/C ≤ 20% (of initial value) Tanδ < 200% (of specified value) I_L ≤ specified value**

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

HCGW Screw - Terminal 6 000 h / 85°C

►Specifications / Spezifikationen

Items	Characteristics
Temperature range	-10°C ~ + 85°C
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.01 • C • V_r [µA] or 7 mA, which is smaller.
Useful life	6000 h at 85°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10…55Hz, 10g, 3x2h

►Outline Drawings / Bauformen

Shape: B (ØD = 51-101)
(for Bolt – Mounting, M12x16, stud bolt is not isolated)

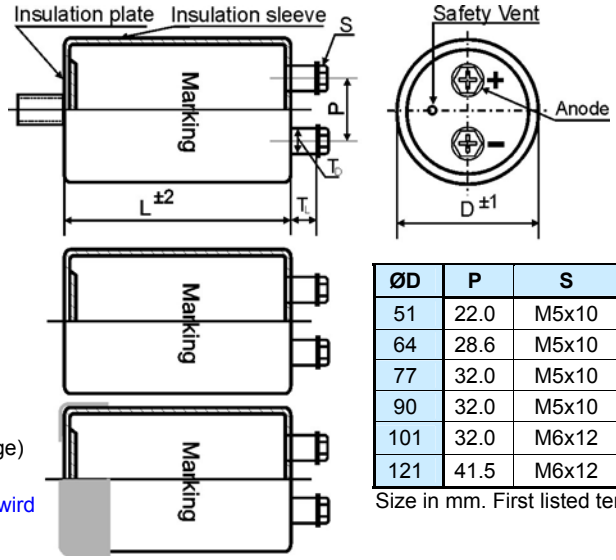
Form: B (ØD = 51-101)
(für Bolzenbefestigung, M12x16, Bolzen nicht isoliert)

Shape: N, X (ØD = 121)
(for PBT-Holder ØD = 77-101 and Press Ring ØD = 64-90)

Form: N, X (ØD = 121)
(für PBT-Halter ØD = 77-101 und Einpressring ØD = 64-90)

Shape: Y (ØD = 51-101)
(double sleeve, bracket free of charge)

Form: Y (ØD = 51-101)
(mit doppelter Isolierung, Y-Schelle wird kostenlos mitgeliefert)



ØD	P	S	T_L	T_D	Cap material
51	22.0	M5x10	5.5	10	PH
64	28.6	M5x10	5.5	10	PH
77	32.0	M5x10	5.0	10	PH
90	32.0	M5x10	5.0	10	PH
101	32.0	M6x12	3.0	14	PPS
121	41.5	M6x12	3.0	14	PPS

Size in mm. First listed terminal is standard.

►Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]	50/60	120	300	1k	≥ 10k
multiplier	0.70	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 1.0	v ≥ 1.0
multiplier	1.0	1.1

►Product Code / Bestellbezeichnung

Example: 32000µF 400V D=101mm L=237mm with Y-Bracket

HCGW 2G 323 Y G 237 ( )

Type of series

Capacitance code
The first two digits are significant. The last digit indicates the number of following zeros in µF.

Rated voltage code

Code	Voltage	Code	Voltage
2V	350	2W	450
2G	400	2H	500

Fixing symbol code
- B : Bolt ØD = 51 - 101
- N : No double sleeve (PBT-Safety-holder or press ring) ØD = 51 - 101
- Y : 3 Stoppers Bracket ØD = 51 - 101
- X : Plastic Isolation Casing ØD = 121

refer to pages 113 – 119

Case code diameter

ØD	Code
51	C
64	D
77	E
90	F
101	G
121	K

Case Code length
Length in mm (3 digits)

Customers` specification

HCGW Series Screw-Terminal 6 000 h / 85°C

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	DxL [mm]	Product Code
350 2V (400)	**13 000**	23.8	8.8	25	26	22	77x155	HCGW2V133□E155
	17 000	29.2	10.8	19	20	22	90x157	HCGW2V173□F157
	18 000	30.8	11.4	18	20	22	77x195	HCGW2V183□E195
	20 000	35.1	13.0	19	20	22	77x235	HCGW2V203□E235
	22 000	37.0	13.7	17	18	22	77x235	HCGW2V223□E235
	24 000	38.9	14.4	16	18	32	101x175	HCGW2V243□G175
	25 000	38.6	14.3	15	16	22	90x196	HCGW2V253□F196
	30 000	45.6	16.9	13	14	22	90x236	HCGW2V303□F236
	31 000	43.7	16.2	12	13	32	101x195	HCGW2V313□G195
		46.4	17.2	12	13	22	90x236	HCGW2V313□F236
	39 000	53.2	19.7	10	12	32	101x237*)	HCGW2V393□G237
	44 000	61.6	22.8	10	12	32	101x283	HCGW2V443□G283
400 2G (450)	**11 000**	22.1	8.2	31	32	22	77x155	HCGW2G113□E155
	14 000	27.5	10.2	24	25	22	77x195	HCGW2G143□E195
	15 000	30.2	11.2	23	24	22	77x220	HCGW2G153□E220
	16 000	28.6	10.6	21	22	22	90x157	HCGW2G163□F157
		32.1	11.9	21	22	22	77x235	HCGW2G163□E235
	20 000	34.8	12.9	20	21	22	90x196	HCGW2G203□F196
	22 000	35.4	13.1	18	19	32	101x175	HCGW2G223□G175
		38.3	14.2	18	19	22	90x221	HCGW2G223□F221
	25 000	39.7	14.7	16	18	32	101x195	HCGW2G253□G195
		42.1	15.6	16	18	22	90x236	HCGW2G253□F236
	32 000	48.1	17.8	12	13	32	101x237*)	HCGW2G323□G237
	36 000	54.8	20.3	11	15	32	101x250	HCGW2G363□G250
	37 000	55.7	20.6	10	11	32	101x283	HCGW2G373□G283
	50 000	72.7	26.9	9	11	32	121x283	HCGW2G503XK283
450 2W (500)	**3 300**	9.7	3.6	114	118	19	51x130	HCGW2W332□C130
	5 600	14.0	5.2	67	70	20	64x130	HCGW2W562□D130
	9 500	20.5	7.6	36	37	22	77x155	HCGW2W952□E155
	10 000	20.2	7.5	34	35	22	90x145	HCGW2W103□F145
	12 000	25.4	9.4	28	29	22	77x195	HCGW2W123□E195
	13 000	24.0	8.9	26	27	22	90x157	HCGW2W133□F157
	15 000	31.3	11.6	24	27	22	77x235	HCGW2W153□E235
	17 000	32.1	11.9	21	22	22	90x196	HCGW2W173□F196
	18 000	32.9	12.2	20	21	22	90x196	HCGW2W183□F196
		32.1	11.9	20	21	32	101x175	HCGW2W183□G175
	22 000	37.0	13.7	18	19	32	101x195	HCGW2W223□G195
		39.4	14.6	18	19	22	90x236	HCGW2W223□F236
	27 000	44.3	16.4	15	17	32	101x237*)	HCGW2W273□G237
	29 000	46.7	17.3	14	16	32	101x250	HCGW2W293□G250
	33 000	52.6	19.5	12	15	32	101x283	HCGW2W333□G283
	42 000	66.5	24.6	10	12	32	121x283	HCGW2W423XK283
500 2H (550)	**5 600**	15.7	5.8	60	62	22	77x155	HCGW2H562□E155
	8 200	20.2	7.5	41	43	22	90x157	HCGW2H822□F157
		21.1	7.8	41	43	22	77x195	HCGW2H822□E195
	9 500	24.8	9.2	36	37	22	77x235	HCGW2H952□E235
	11 000	25.6	9.5	32	33	22	90x196	HCGW2H113□F196
	12 000	26.2	9.7	30	33	32	101x175	HCGW2H123□G175
		29.2	10.8	30	33	22	90x236	HCGW2H123□F236
	14 000	29.4	10.9	29	30	32	101x195	HCGW2H143□G195
		31.6	11.7	29	30	22	90x236	HCGW2H143□F236
	16 000	34.0	12.6	25	26	32	101x237*)	HCGW2H163□G237

*) For Bolt - Mounting dimensions are 101x242mm.

►Life Time Table / Brauchbarkeitsdauer – Tabelle

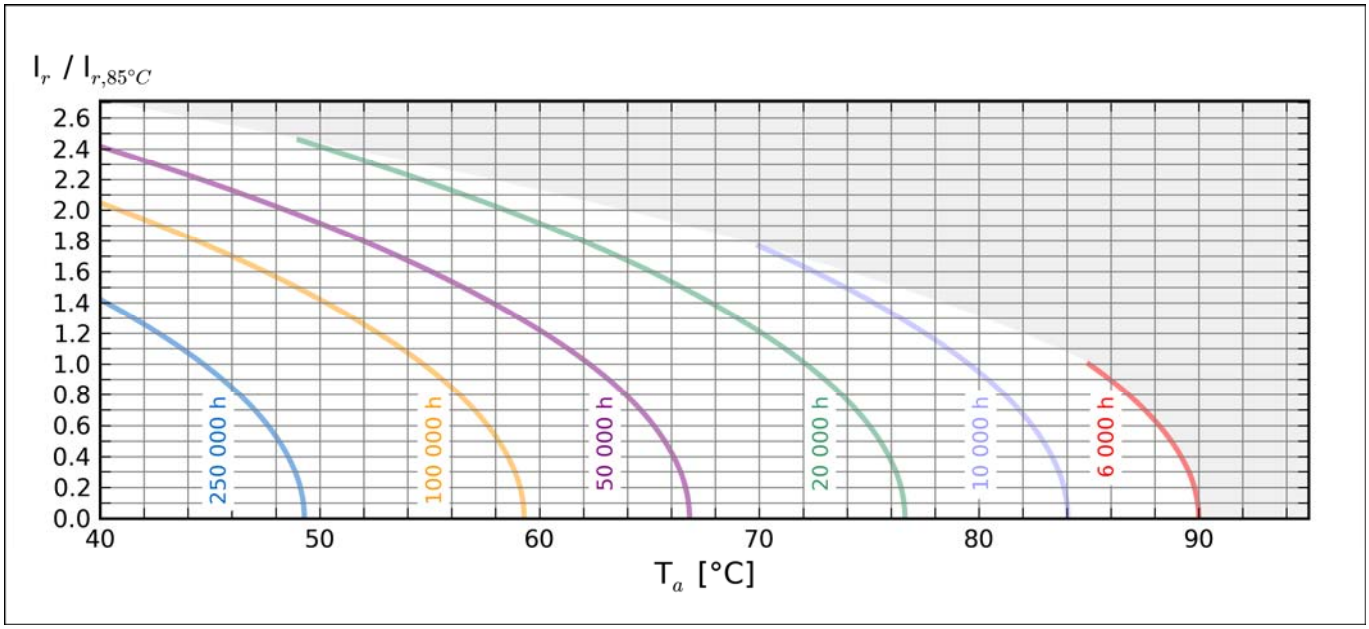
HCGW	Useful life as function of ambient temperature and ripple current												
I_r at 85°C	x 1.0	x 1.2	x 1.4	x 1.6	x 1.8	x 2.0	x 2.1	x 2.2	x 2.3	x 2.4	x 2.5	x 2.6	x 2.7
T_a = 40°C	250	250	250	199	149	108	91	76	63	51	42	33	27
T_a = 45°C	243	201	162	125	94	68	57	48	39	32	26	21	
T_a = 50°C	153	127	102	79	59	43	36	30	25	20			
T_a = 55°C	97	80	64	50	37	27	23	19					
T_a = 60°C	61	51	41	31	23	17							
T_a = 65°C	38	32	25	20	15								
T_a = 70°C	24	20	16	12									
T_a = 75°C	15	12	10										
T_a = 80°C	9	8											
T_a = 85°C	6												

khrs Max. value limited to 250 000 hours.

►Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r,85°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,85°C,120Hz}$



►Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	**T_a = 85°C; V_r, I_r applied 4000 hours**	**ΔC/C ≤ 15% (of initial value) Tanδ ≤ 175% (of specified value) I_L ≤ specified value**
Useful life	**T_a = 85°C; V_r, I_r applied 6000 hours**	**ΔC/C ≤ 20% (of initial value) Tanδ < 200% (of specified value) I_L ≤ specified value**

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

HCGW2 Screw - Terminal 6 000 h / 85°C

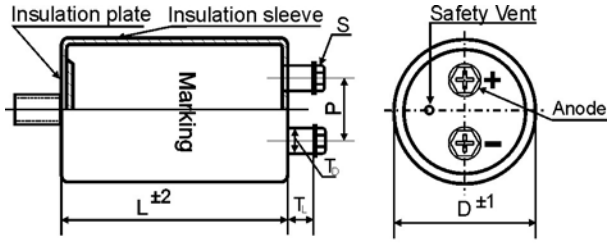
►Specifications / Spezifikationen

Items	Characteristics
Temperature range	-10°C ~ + 85°C
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.01 • C • V_r [µA] or 7 mA, which is smaller.
Useful life	6000 h at 85°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10...55Hz, 10g, 3x2h

►Outline Drawings / Bauformen

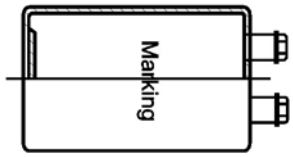
Shape: B (ØD = 77-90)
(for Bolt – Mounting, M12x16, stud bolt is not isolated)

Form: B (ØD = 77-90)
(für Bolzenbefestigung, M12x16, Bolzen nicht isoliert)



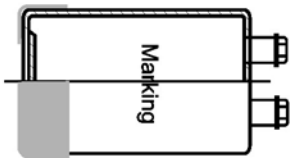
Shape: N, (for PBT-Holder ØD = 77-90 and Press Ring ØD = 77-90)

Form: N, (für PBT-Halter ØD = 77-90 und Einpressring ØD = 77-90)



Shape: Y (ØD = 77-90)
(double sleeve, bracket free of charge)

Form: Y (ØD = 77-90)
(mit doppelter Isolierung, Y-Schelle wird kostenlos mitgeliefert)



ØD	P	S	T_L	T_D	Cap material
77	31.5	M6x12	9.0	12	PH
		M5x10	8.0	11	PH
90	31.5	M6x12	8.0	12	PH

Size in mm. First listed terminal is standard.

►Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]	50/60	120	300	1k	≥ 10k
multiplier	0.70	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 1.0	v ≥ 1.0
multiplier	1.0	1.1

►Product Code / Bestellbezeichnung

Example: 29000µF 400V D=90mm L=230mm with Y-Bracket

HCGW2 2G 293 Y F 230 ( )

Type of series

Capacitance code
The first two digits are significant. The last digit indicates the number of following zeros in µF.

Rated voltage code

Code	Voltage	Code	Voltage
2V	350	2W	450
2G	400	2H	500

Fixing symbol code
B : Bolt
ØD = 51 - 101
N : No double sleeve (PBT-Safety-holder or press ring)
ØD = 51 - 101
Y : 3 Stoppers Bracket
ØD = 51 - 101

refer to pages 113 – 119

Case code diameter

ØD	Code
77	E
90	F

Case Code length
Length in mm (3 digits)

Customers` specification

HCGW2 Series Screw-Terminal 6 000 h / 85°C

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	DxL [mm]	Product Code
400 2G (450)	**13 000**	26.6	9.8	26	27	20	77x148	HCGW22G133□E148
	14 000	28.8	10.7	24	25	20	77x165	HCGW22G143□E165
	16 000	31.7	11.7	21	22	20	77x188	HCGW22G163□E188
	18 000	33.4	12.4	19	20	20	90x150	HCGW22G183□F150
	19 000	35.8	13.2	18	20	20	90x167	HCGW22G193□F167
	20 000	38.4	14.2	17	18	20	77x228	HCGW22G203□E228
	23 000	40.4	14.9	15	16	20	90x190	HCGW22G233□F190
	29 000	48.9	18.1	12	13	20	90x230	HCGW22G293□F230
450 2W (500)	**10 000**	22.3	8.3	40	42	20	77x148	HCGW22W103□E148
	12 000	25.5	9.4	33	35	20	77x165	HCGW22W123□E165
	14 000	28.2	10.4	29	30	20	77x188	HCGW22W143□E188
	15 000	29.0	10.7	27	29	20	90x150	HCGW22W153□F150
	17 000	32.2	11.9	24	26	20	90x167	HCGW22W173□F167
	18 000	34.7	12.8	22	23	20	77x228	HCGW22W183□E228
	20 000	35.8	13.2	20	21	20	90x190	HCGW22W203□F190
	25 000	43.2	16.0	16	17	20	90x230	HCGW22W253□F230
500 2H (550)	**7 500**	19.4	7.2	47	48	20	77x148	HCGW22H752□E148
	9 000	22.1	8.2	40	41	20	77x165	HCGW22H902□E165
	10 000	23.9	8.8	36	38	20	77x188	HCGW22H103□E188
	11 000	25.0	9.3	33	34	20	90x150	HCGW22H113□F150
	13 000	29.5	10.9	28	29	20	77x228	HCGW22H133□E228
		28.3	10.5	28	29	20	90x167	HCGW22H133□F167
	15 000	31.0	11.5	24	25	20	90x190	HCGW22H153□F190
	18 000	36.8	13.6	20	21	20	90x230	HCGW22H183□F230

►Life Time Table / Brauchbarkeitsdauer – Tabelle

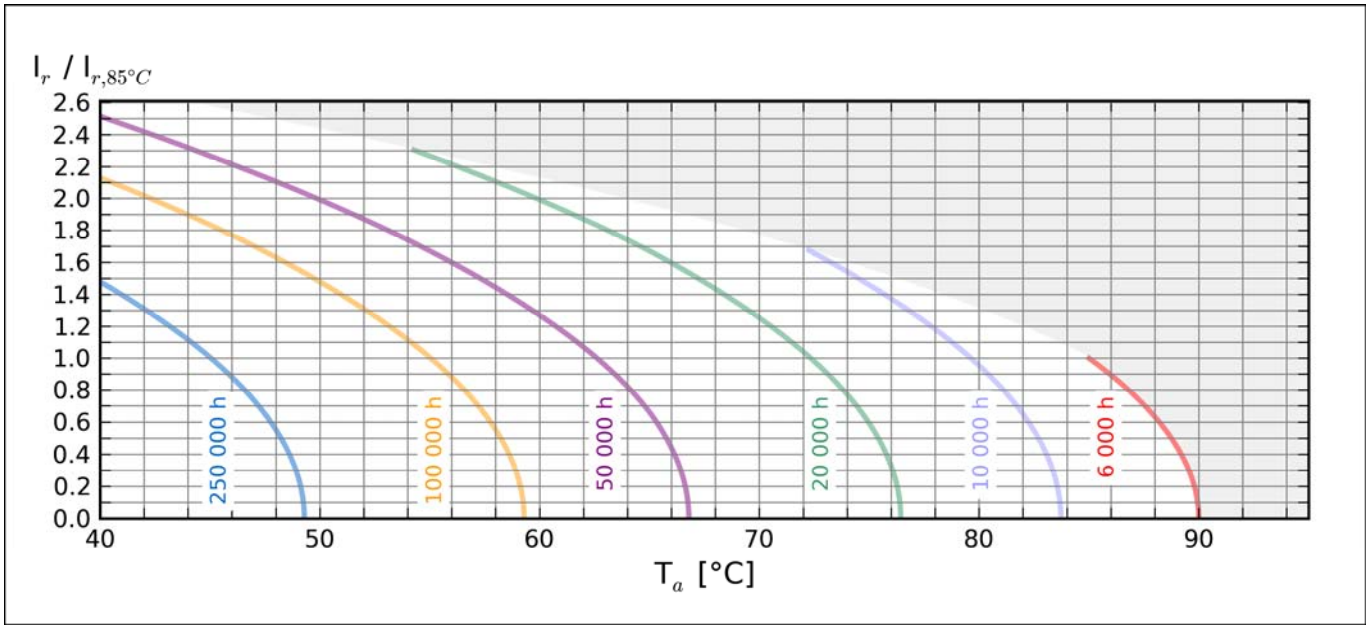
HCGW2	Useful life as function of ambient temperature and ripple current												
I_r at 85°C	x 1.0	x 1.2	x 1.4	x 1.6	x 1.8	x 2.0	x 2.1	x 2.2	x 2.3	x 2.4	x 2.5	x 2.6	x 2.7
T_a = 40°C	250	250	250	216	165	123	105	88	74	62	51	42	34
T_a = 45°C	250	211	172	136	104	78	66	56	47	39	32	26	
T_a = 50°C	158	133	109	86	66	49	42	35	29	24			
T_a = 55°C	100	84	69	54	41	31	26	22					
T_a = 60°C	63	53	43	34	26	19							
T_a = 65°C	40	33	27	21	16								
T_a = 70°C	25	21	17	13									
T_a = 75°C	16	13	11										
T_a = 80°C	10	8											
T_a = 85°C	6												

khrs Max. value limited to 250 000 hours.

►Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r,85°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,85°C,120Hz}$



►Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	**T_a = 85°C; V_r, I_r applied 4000 hours**	**ΔC/C ≤ 15% (of initial value) Tanδ ≤ 175% (of specified value) I_L ≤ specified value**
Useful life	**T_a = 85°C; V_r, I_r applied 6000 hours**	**ΔC/C ≤ 20% (of initial value) Tanδ < 200% (of specified value) I_L ≤ specified value**

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

PH Screw-Terminal 6 000 h / 85°C

►Specifications / Spezifikationen

Items	Characteristics
Temperature range	-25°C ~ + 85°C
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.01 • C_r • V_r [µA] or 5 mA, which is smaller.
Useful life	6000 h at 85°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10…55Hz, 10g, 3x2h

*) 650 VDC ~ 700 VDC under development

►Outline Drawings / Bauformen

Shape: B (ØD = 64-90)
(for Bolt – Mounting, M12x16, stud bolt is not isolated)

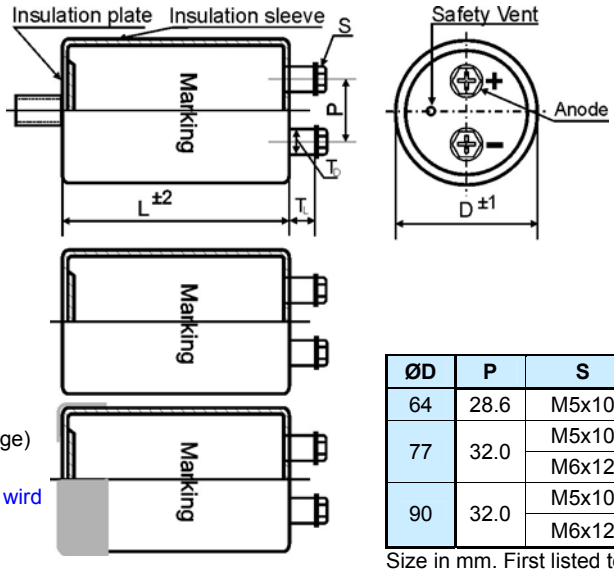
Form: B (ØD = 64-90)
(für Bolzenbefestigung, M12x16, Bolzen nicht isoliert)

Shape: N (for PBT-Holder ØD = 77-90 and Press Ring ØD = 64-90)

Form: N (für PBT-Halter ØD = 77-90 und Einpressring ØD = 64-90)

Shape: Y (ØD = 64-90)
(double sleeve, bracket free of charge)

Form: Y (ØD = 64-90)
(mit doppelter Isolierung, Y-Schelle wird kostenlos mitgeliefert)



ØD	P	S	T_L	T_D	Cap material
64	28.6	M5x10	5.5	10	PH
77	32.0	M5x10	5.0	10	PH
		M6x12	5.0	16	PPS
90	32.0	M5x10	5.0	10	PH
		M6x12	4.0	16	PPS

Size in mm. First listed terminal is standard.

►Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]	50/60	120	300	1k	≥ 10k
multiplier	0.70	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 1.0	v ≥ 1.0
multiplier	1.0	1.1

►Product Code / Bestellbezeichnung

Example: 3300µF 600V D=77mm L=155mm with Y-Bracket

PH 600V 332 Y E 155 ( )

Type of series

Rated voltage code

Code	Voltage
600V	600
650V	650
700V	700

Capacitance code
The first two digits are significant. The last digit indicates the number of following zeros in µF.

Fixing symbol code
B : Bolt ØD = 64 - 90
N : No double sleeve (PBT-Safety-holder or press ring)
Y : 3 Stoppers Bracket ØD = 64 – 90

refer to pages 113 – 119

Case code diameter

ØD	Code
64	D
77	E
90	F

Case Code length
Length in mm (3 digits)

Customers` specification

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	DxL [mm]	Product Code
600 600V (650)	**1 200**	16.2	7.7	121	125	18	64x96	PH600V122□D096
	1 300	19.3	9.2	112	115	18	64x103	PH600V132□D103
	1 500	19.5	9.3	112	115	18	64x115	PH600V152□D115
	1 800	21.2	10.1	97	100	20	77x96	PH600V182□E096
	2 200	25.2	12.0	81	83	20	77x115	PH600V222□E115
	2 700	29.2	13.9	66	67	20	77x130	PH600V272□E130
	3 000	32.8	15.6	49	50	20	77x155	PH600V302□E155
	3 300	34.4	16.4	44	45	20	77x155	PH600V332□E155
		34.4	16.4	44	45	20	90x131	PH600V332□F131
		35.9	17.1	44	45	20	77x171	PH600V332□E171
	3 900	41.4	19.7	37	40	20	77x195	PH600V392□E195
	4 700	44.1	21.0	31	32	20	90x157	PH600V472□F157

Life Time Table / Brauchbarkeitsdauer - Tabelle

PH	Useful life as function of ambient temperature and ripple current											
I_r at 85°C	x 1.0	x 1.1	x 1.2	x 1.3	x 1.4	x 1.5	x 1.6	x 1.7	x 1.8	x 1.9	x 2.0	x 2.1
Ta = 40°C	250	250	250	237	195	158	126	99	77	59	44	33
Ta = 45°C	247	212	180	150	123	100	80	63	48	37	28	
Ta = 50°C	156	134	113	95	78	63	50	39	30	23		
Ta = 55°C	99	85	72	60	49	40	32	25	19			
Ta = 60°C	62	53	45	38	31	25	20	15				
Ta = 65°C	39	34	28	24	19	16						
Ta = 70°C	25	21	18	15								
Ta = 75°C	15	13	11									
Ta = 80°C	10	8										
Ta = 85°C	6											

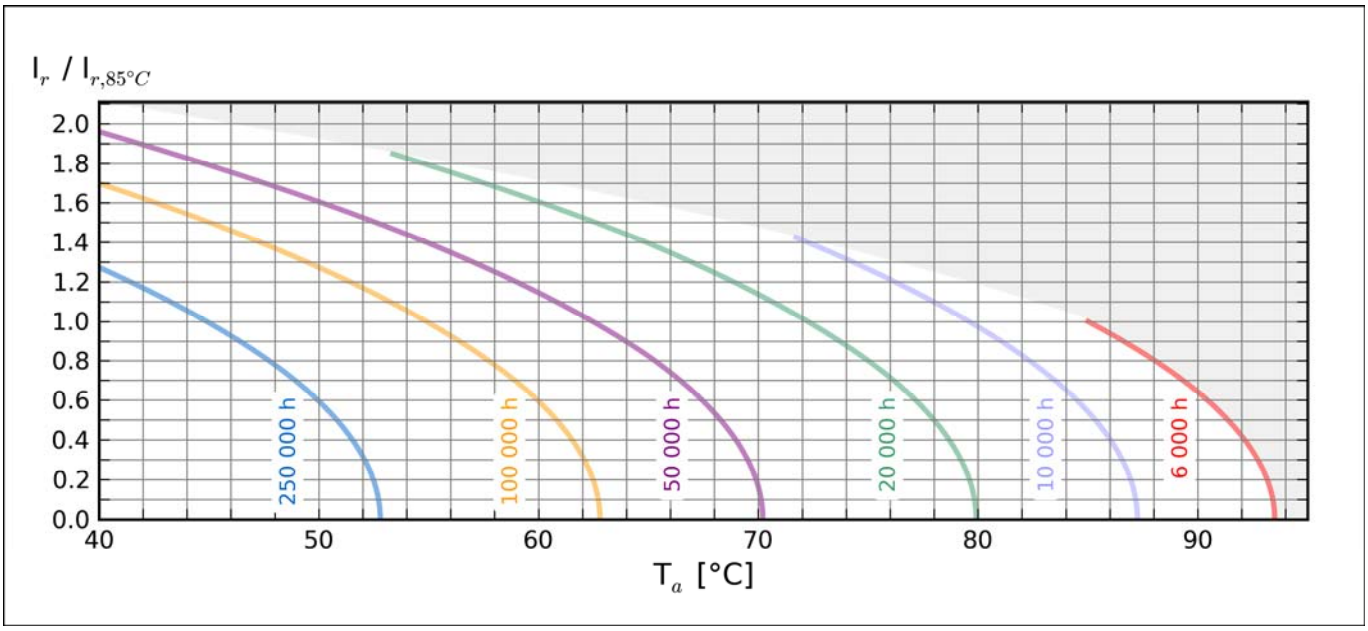
khrs

Max. value limited to 250 000 hours.

►Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r,85°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,85°C,120Hz}$



►Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	**T_a = 85°C; V_r, I_r applied 4000 hours**	**ΔC/C ≤ 15% (of initial value) Tanδ ≤ 175% (of specified value) I_L ≤ specified value**
Useful life	**T_a = 85°C; V_r, I_r applied 6000 hours**	**ΔC/C ≤ 20% (of initial value) Tanδ < 200% (of specified value) I_L ≤ specified value**

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

FXA Screw-Terminal 12 000 h / 85°C

►Specifications / Spezifikationen

Items	Characteristics
Temperature range	-40°C ~ + 85°C
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.01 • C • V_r [µA] or 3 mA, which is smaller.
Useful life	12000 h at 85°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10...55Hz, 10g, 3x2h

►Outline Drawings / Bauformen

Shape: B (ØD = 51-90)
(for Bolt – Mounting, M12x16, stud bolt is not isolated)

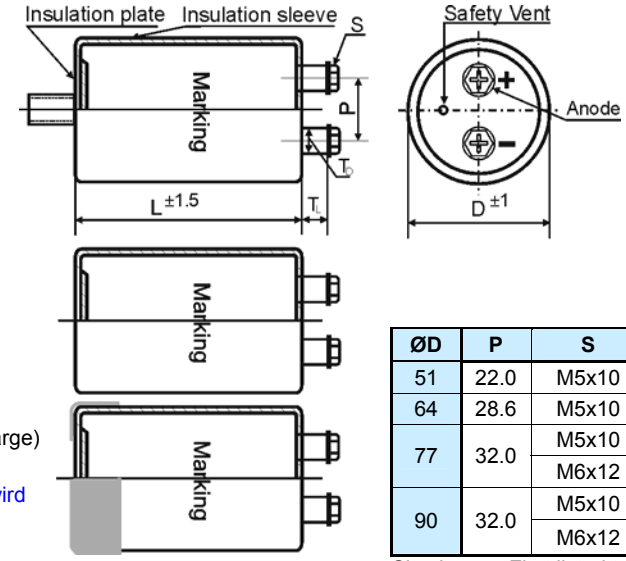
Form: B (ØD = 51-90)
(für Bolzenbefestigung, M12x16, Bolzen nicht isoliert)

Shape: N (for PBT-Holder ØD = 77-90 and Press Ring ØD = 64-90)

Form: N (für PBT-Halter ØD = 77-90 und Einpressring ØD = 64-90)

Shape: Y (ØD = 51-90)
(double sleeve, bracket free of charge)

Form: Y (ØD = 51-90)
(mit doppelter Isolierung, Schelle wird kostenlos mitgeliefert)



ØD	P	S	T_L	T_D	Cap material
51	22.0	M5x10	4.5	10	PPS
64	28.6	M5x10	4.5	10	PPS
77	32.0	M5x10	4.5	10	PPS
		M6x12	5.0	16	PPS
90	32.0	M5x10	4.0	10	PPS
		M6x12	4.0	16	PPS

Size in mm. First listed terminal is standard.

►Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]	50/60	120	300	1k	≥ 10k
multiplier	0.80	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 1.0	v ≥ 1.0
multiplier	1.0	1.1

►Product Code / Bestellbezeichnung

Example: 1800µF 450V D=51mm L=130mm with Y-Bracket

FXA 2W 182 Y C 130 ( )

Type of series

Capacitance code
The first two digits are significant. The last digit indicates the number of following zeros in µF.

Rated voltage code

Code	Voltage	Code	Voltage
2V	350	2W	450
2G	400		

Fixing symbol code
B : Bolt
ØD = 51 - 90
N : No double sleeve (PBT-Safety-holder or press ring)
Y : 3 Stoppers Bracket
ØD = 51 – 90

refer to pages 113 – 119

Case code diameter

ØD	Code
51	C
64	D
77	E
90	F

Case Code length
Length in mm (3 digits)

Customers` specification

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	DxL [mm]	Product Code
350 2V (400)	**1 500**	14.7	7.0	53	55	17	51x75	FXA2V152□C075
	1 800	17.8	8.5	44	44	17	51x96	FXA2V182□C096
	2 200	19.7	9.4	28	28	17	51x96	FXA2V222□C096
	2 700	24.6	11.7	27	27	17	51x130	FXA2V272□C130
	3 300	27.3	13.0	21	22	17	51x130	FXA2V332□C130
	3 900	30.9	14.7	18	20	18	64x115	FXA2V392□D115
	4 700	35.7	17.0	16	20	18	64x130	FXA2V472□D130
	5 600	39.3	18.7	14	20	20	77x115	FXA2V562□E115
		41.8	19.9	14	18	18	64x155	FXA2V562□D155
	6 800	45.4	21.6	14	18	20	77x130	FXA2V682□E130
		51.0	24.3	12	15	18	64x195	FXA2V682□D195
	8 200	53.3	25.4	12	15	20	77x155	FXA2V822□E155
	10 000	62.6	29.8	10	15	20	90x157	FXA2V103□F157
	12 000	68.7	32.7	8	13	20	90x157	FXA2V123□F157
	15 000	83.6	39.8	6	10	20	90x196	FXA2V153□F196
	18 000	99.3	47.3	5	10	20	90x236	FXA2V183□F236
400 2G (450)	**1 000**	12.2	5.8	102	105	17	51x75	FXA2G102□C075
		12.6	6.0	102	105	17	51x83	FXA2G102□C083
		13.8	6.6	102	105	17	51x105	FXA2G102□C105
	1 200	13.2	6.3	69	63	17	51x75	FXA2G122□C075
	1 500	16.2	7.7	50	55	17	51x96	FXA2G152□C096
		16.6	7.9	68	70	17	51x105	FXA2G152□C105
		16.7	7.9	68	70	18	64x105	FXA2G152□D105
	1 800	17.8	8.5	40	40	17	51x96	FXA2G182□C096
	2 200	22.3	10.6	28	28	17	51x130	FXA2G222□C130
		22.3	10.6	46	28	18	64x105	FXA2G222□D105
	2 700	23.9	11.4	24	25	18	64x96	FXA2G272□D096
	3 300	28.4	13.5	30	32	20	77x96	FXA2G332□E096
		28.6	13.6	21	22	18	64x115	FXA2G332□D115
		29.0	13.8	30	22	20	77x103	FXA2G332□E103
	3 900	32.6	15.5	18	20	18	64x130	FXA2G392□D130
	4 700	34.6	16.5	21	18	20	77x103	FXA2G472□E103
		35.9	17.1	14	18	20	77x115	FXA2G472□E115
		37.6	17.9	21	22	20	77x130	FXA2G472□E130
		38.4	18.3	16	20	18	64x155	FXA2G472□D155
		40.3	19.2	21	22	20	77x143	FXA2G472□E143
	5 600	41.2	19.6	12	15	20	77x130	FXA2G562□E130
		46.2	22.0	14	20	18	64x195	FXA2G562□D195
	6 800	48.7	23.2	14	18	20	77x155	FXA2G682□E155
	8 200	55.6	26.5	12	15	20	77x171	FXA2G822□E171
		56.7	27.0	12	15	20	90x157	FXA2G822□F157
	10 000	62.6	29.8	10	15	20	90x157	FXA2G103□F157
	12 000	74.8	35.6	8	13	20	90x196	FXA2G123□F196
	15 000	90.5	43.1	6	10	20	90x236	FXA2G153□F236
450 2W (500)	**1 000**	12.2	5.8	95	100	17	51x75	FXA2W102□C075
	1 200	14.5	6.9	70	80	17	51x96	FXA2W122□C096
	1 500	17.4	8.3	55	60	17	51x115	FXA2W152□C115
	1 800	20.0	9.5	46	47	17	51x130	FXA2W182□C130
	2 200	21.8	10.4	42	45	18	64x96	FXA2W222□D096
	2 700	25.6	12.2	38	40	20	77x96	FXA2W272□E096
		25.8	12.3	38	40	18	64x115	FXA2W272□D115
		26.7	12.7	38	40	20	77x107	FXA2W272□E107
	3 300	28.4	13.5	30	35	20	77x96	FXA2W332□E096
		29.4	14.0	30	35	20	77x107	FXA2W332□E107
		30.0	14.3	30	35	18	64x130	FXA2W332□D130
		30.2	14.4	30	35	20	77x115	FXA2W332□E115

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	DxL [mm]	Product Code
450 2W (500)	**3 900**	32.8	15.6	24	27	20	77x115	FXA2W392□E115
		35.1	16.7	27	32	18	64x155	FXA2W392□D155
	4 700	37.6	17.9	22	23	20	77x130	FXA2W472□E130
		39.1	18.6	21	21	20	77x143	FXA2W472□E143
		41.8	19.9	21	21	20	90x145	FXA2W472□F145
		42.2	20.1	20	21	18	64x195	FXA2W472□D195
	5 600	43.0	20.5	20	20	20	77x144	FXA2W562□E144
		44.1	21.0	20	20	20	77x155	FXA2W562□E155
	6 800	51.7	24.6	18	18	20	90x157	FXA2W682□F157
	8 200	56.7	27.0	15	17	20	90x157	FXA2W822□F157
	10 000	68.2	32.5	12	15	20	90x196	FXA2W103□F196
	12 000	81.1	38.6	9	12	20	90x236	FXA2W123□F236

►Life Time Table / Brauchbarkeitsdauer – Tabelle

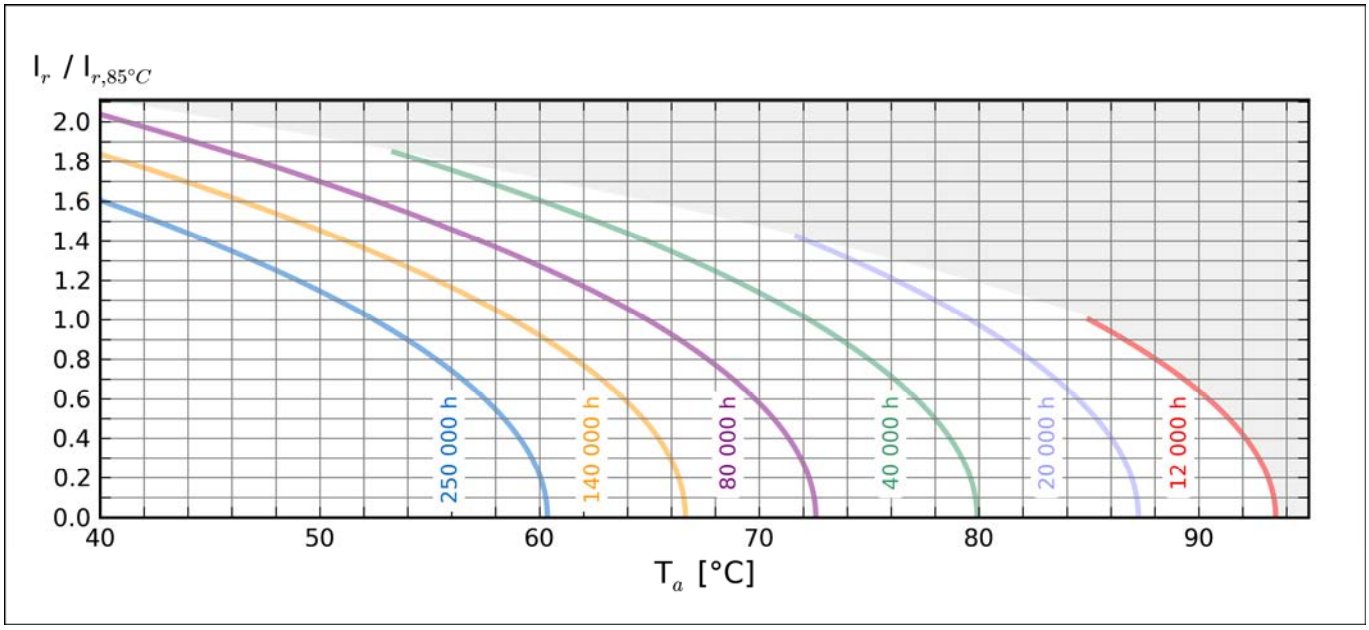
FXA	Useful life as function of ambient temperature and ripple current											
I_r at 85°C	x 1.0	x 1.1	x 1.2	x 1.3	x 1.4	x 1.5	x 1.6	x 1.7	x 1.8	x 1.9	x 2.0	x 2.1
T_a = 40°C	250	250	250	250	250	250	250	199	154	118	89	66
T_a = 45°C	250	250	250	250	247	200	160	126	97	74	56	
T_a = 50°C	250	250	227	190	156	126	101	79	61	47		
T_a = 55°C	198	170	144	120	98	80	64	50	39			
T_a = 60°C	125	107	91	76	62	50	40	31				
T_a = 65°C	79	68	57	48	39	32						
T_a = 70°C	50	43	36	30	25							
T_a = 75°C	31	27	23	19								
T_a = 80°C	20	17										
T_a = 85°C	12											

khrs Max. value limited to 250 000 hours.

►Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r,85°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,85°C,120Hz}$



►Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	**T_a = 85°C; V_r, I_r applied 8000 hours**	**ΔC/C ≤ 15% (of initial value) Tanδ ≤ 175% (of specified value) I_L ≤ specified value**
Useful life	**T_a = 85°C; V_r, I_r applied 12000 hours**	**ΔC/C ≤ 20% (of initial value) Tanδ < 200% (of specified value) I_L ≤ specified value**

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

FX2 Screw-Terminal 12 000 h / 85°C

Special charge-discharge proof design available upon request.

Auf Anfrage spezielles Design für Lade-, Entladeanwendungen erhältlich.

►Specifications / Spezifikationen

Items	Characteristics
Temperature range	-40°C ~ + 85°C
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.01 • C • V_r [µA] or 3 mA, which is smaller.
Useful life	12000 h at 85°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10...55Hz, 10g, 3x2h

►Outline Drawings / Bauformen

Shape: B (ØD = 51-101)
(for Bolt – Mounting, M12x16, stud bolt is not isolated)

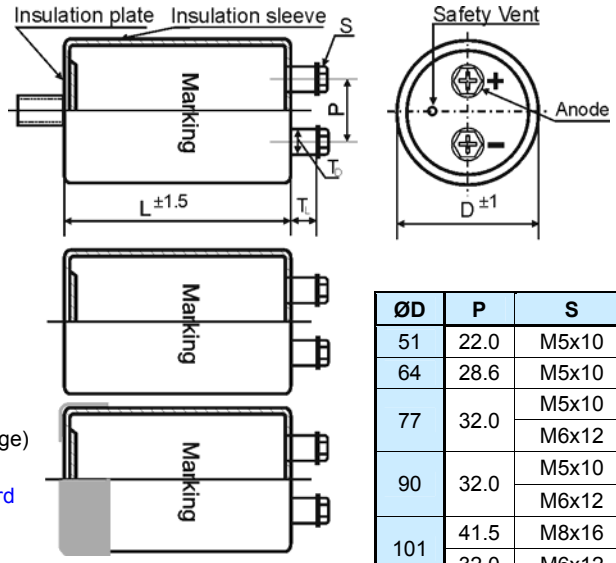
Form: B (ØD = 51-101)
(für Bolzenbefestigung, M12x16, Bolzen nicht isoliert)

Shape: N (for PBT-Holder ØD = 77-101 and Press Ring ØD = 64-90)

Form: N (für PBT-Halter ØD = 77-101 und Einpressring ØD = 64-90)

Shape: Y (ØD = 51-101)
(double sleeve, bracket free of charge)

Form: Y (ØD = 51-101)
(mit doppelter Isolierung, Schelle wird kostenlos mitgeliefert)



ØD	P	S	T_L	T_D	Cap material
51	22.0	M5x10	5.5	10	PH
64	28.6	M5x10	5.5	10	PH
77	32.0	M5x10	5.0	10	PH
		M6x12	5.0	16	PPS
90	32.0	M5x10	5.0	10	PH
		M6x12	4.0	16	PPS
101	41.5	M8x16	11.0	14	PH
	32.0	M6x12	3.0	14	PPS

Size in mm. First listed terminal is standard.

►Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]	50/60	120	300	1k	≥ 10k
multiplier	0.80	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 1.0	v ≥ 1.0
multiplier	1.0	1.1

►Product Code / Bestellbezeichnung

Example: FX2 4700µF 400V D=64mm L=130mm with Y-Bracket

FX2 2G 472 Y D 130 ( )

Type of series

Capacitance code
The first two digits are significant. The last digit indicates the number of following zeros in µF.

Rated voltage code

Code	Voltage	Code	Voltage
2V	350	2H	500
2G	400	2L	550
2W	450	575V	575

Fixing symbol code
B : Bolt ØD = 51 - 101
N : No double sleeve (PBT-Safety-holder or press ring)
Y : 3 Stoppers Bracket ØD = 51 – 101

refer to pages 113 – 119

Case code diameter

ØD	Code
51	C
64	D
77	E
90	F
101	G

Case Code length
Length in mm (3 digits)

Customers` specification

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	DxL [mm]	Product Code
350 2V (400)	**2 700**	23.5	11.2	25	25	17	51x115	FX22V272□C115
	3 300	27.3	13.0	22	22	17	51x130	FX22V332□C130
	3 900	29.0	13.8	19	21	18	64x96	FX22V392□D096
	4 700	33.8	16.1	16	20	18	64x115	FX22V472□D115
	5 600	38.8	18.5	14	18	18	64x130	FX22V562□D130
	6 800	43.3	20.6	12	15	20	77x115	FX22V682□E115
	8 200	49.8	23.7	12	15	20	77x130	FX22V822□E130
		53.3	25.4	12	15	20	77x145	FX22V822□SE145
	10 000	56.7	27.0	11	15	20	77x143	FX22V103□E143
		59.0	28.1	11	15	20	77x155	FX22V103□E155
	12 000	64.5	30.7	8	13	20	90x131	FX22V123□F131
		67.4	32.1	8	13	20	77x171	FX22V123□E171
	15 000	83.2	39.6	6	10	20	77x220	FX22V153□E220
		77.1	36.7	6	10	20	90x157	FX22V153□F157
	18 000	92.0	43.8	5	9	20	90x196	FX22V183□F196
	22 000	109.8	52.3	5	8	20	90x236	FX22V223□F236
	27 000	125.6	59.8	5	8	29	101x237*)	FX22V273□G237
400 2G (450)	**1 100**	12.6	6.0	60	40	17	51x75	FX22G112□C075
	1 800	16.2	7.7	34	37	17	51x96	FX22G182□C096
		18.1	8.6	34	37	17	51x100	FX22G182□C100
	2 200	20.4	9.7	46	48	17	51x105	FX22G222□C105
		21.2	10.1	28	28	17	51x115	FX22G222□C115
	2 700	24.2	11.5	38	40	17	51x115	FX22G272□SC115
		24.6	11.7	24	25	17	51x130	FX22G272□C130
	3 300	26.5	12.6	21	22	18	64x96	FX22G332□D096
	3 900	30.9	14.7	18	20	18	64x115	FX22G392□D115
	4 400	31.9	15.2	23	25	18	64x106	FX22G442□D106
	4 700	33.6	16.0	16	20	20	77x96	FX22G472□E096
		35.7	17.0	16	20	18	64x130	FX22G472□D130
	5 600	39.1	18.6	14	18	20	77x115	FX22G562□E115
	6 800	45.2	21.5	12	15	20	77x130	FX22G682□E130
	8 200	51.7	24.6	12	15	20	77x145	FX22G822□E145
		53.1	25.3	12	15	20	77x155	FX22G822□E155
	10 000	58.4	27.8	10	15	20	90x131	FX22G103□F131
		61.1	29.1	10	15	20	77x171	FX22G103□E171
		64.5	30.7	10	15	20	77x195	FX22G103□E195
	12 000	68.9	32.8	8	13	20	90x157	FX22G123□F157
	15 000	84.0	40.0	6	10	20	90x196	FX22G153□F196
	18 000	99.5	47.4	5	9	20	90x236	FX22G183□F236
	22 000	113.4	54.0	5	8	29	101x237*)	FX22G223□G237
	25 000	123.6	58.9	5	8	29	101x250	FX22G253□G250
	27 000	135.2	64.4	5	7	29	101x283	FX22G273□G283
450 2W (500)	**1 100**	12.2	5.8	80	70	17	51x75	FX22W112□C075
	1 500	16.2	7.7	67	70	17	51x105	FX22W152□C105
		16.6	7.9	62	60	17	51x96	FX22W152□C096
	1 800	18.3	8.7	51	56	17	51x115	FX22W182□C115
	2 000	22.2	10.6	50	52	17	51x115	FX22W202□C115
	2 200	21.2	10.1	42	45	17	51x130	FX22W222□C130
	2 700	22.9	10.9	38	40	18	64x96	FX22W272□D096
		25.1	12.0	38	40	18	64x106	FX22W272□D106
	3 300	25.4	12.1	30	35	20	77x96	FX22W332□E096
		27.1	12.9	30	35	18	64x115	FX22W332□D115
	3 900	30.9	14.7	27	32	18	64x130	FX22W392□D130
	4 700	34.0	16.2	20	21	20	77x115	FX22W472□E115
	5 600	39.1	18.6	20	20	20	77x130	FX22W562□E130

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	DxL [mm]	Product Code
450 2W (500)	6 600	46.4	22.1	18	19	20	77x143	FX22W662□E143
	6 800	46.2	22.0	15	18	20	77x155	FX22W682□E155
	8 200	50.8	24.2	14	17	20	90x131	FX22W822□F131
		55.4	26.4	13	16	20	77x195	FX22W822□E195
		58.4	27.8	14	17	20	77x220	FX22W822□E220
	8 800	54.6	26.0	12	16	20	77x171	FX22W882□E171
	10 000	62.2	29.6	10	15	20	90x171	FX22W103□F171
	12 000	70.8	33.7	7	12	29	101x175	FX22W123□G175
		71.8	34.2	7	12	20	90x196	FX22W123□F196
	15 000	82.5	39.3	7	10	29	101x195	FX22W153□G195
		86.7	41.3	7	10	20	90x236	FX22W153□F236
	18 000	95.2	45.3	6	10	20	90x236	FX22W183□F236
		97.9	46.6	6	10	29	101x237*)	FX22W183□G237
	23 000	113.0	53.8	5	9	29	101x250	FX22W233□G250
500 2H (550)	720	9.9	4.7	155	166	17	51x75	FX22H721□C075
	820	10.3	4.9	140	151	17	51x75	FX22H821□C075
	1 200	14.9	7.1	93	100	17	51x115	FX22H122□C115
		15.1	7.2	93	100	18	64x96	FX22H122□D096
	1 500	17.2	8.2	74	80	18	64x96	FX22H152□D096
		17.6	8.4	74	80	17	51x130	FX22H152□C130
	1 800	19.8	9.4	53	50	20	77x96	FX22H182□E096
		20.0	9.5	53	50	18	64x115	FX22H182□D115
	2 200	21.7	10.4	40	35	20	77x96	FX22H222□E096
		23.1	11.0	40	35	18	64x130	FX22H222□D130
	2 700	25.8	12.3	37	33	20	77x115	FX22H272□E115
	3 300	30.0	14.3	36	32	20	77x130	FX22H332□E130
	3 900	33.8	16.1	27	29	20	77x145	FX22H392□E145
		34.9	16.6	27	29	20	77x155	FX22H392□E155
	4 700	38.2	18.2	25	25	20	90x131	FX22H472□F131
		39.9	19.0	25	25	20	77x171	FX22H472□E171
	5 600	44.9	21.4	23	21	20	90x157	FX22H562□F157
		45.8	21.8	23	21	20	77x195	FX22H562□E195
	6 800	51.2	24.4	20	18	20	90x171	FX22H682□F171
	8 200	58.4	27.8	14	13	29	101x175	FX22H822□G175
		59.2	28.2	14	13	20	90x196	FX22H822□F196
	9 400	63.2	30.1	14	12	20	90x196	FX22H942□F196
	10 000	67.4	32.1	12	12	29	101x195	FX22H103□G195
		70.8	33.7	12	12	20	90x236	FX22H103□F236
	12 000	80.0	38.1	11	11	29	101x237*)	FX22H123□G237
550 2L (600)	680	10.7	5.1	165	177	17	51x105	FX22L681□C105
	1 000	14.3	6.8	112	120	17	51x130	FX22L102□C130
	1 200	16.4	7.8	93	100	18	64x115	FX22L122□D115
	1 500	19.3	9.2	74	80	18	64x130	FX22L152□D130
	1 800	21.0	10.0	74	50	20	77x115	FX22L182□E115
	2 200	24.4	11.6	45	40	20	77x130	FX22L222□E130
	2 700	27.0	12.9	40	35	20	77x130	FX22L272□E130
		29.0	13.8	40	35	20	77x155	FX22L272□E155
	3 300	32.1	15.3	38	32	20	77x155	FX22L332□E155
	3 900	37.4	17.8	30	27	20	90x157	FX22L392□F157
	4 200	37.6	17.9	30	27	20	77x171	FX22L422□E171
	4 700	42.4	20.2	25	20	20	90x171	FX22L472□F171
		42.8	20.4	25	20	20	77x203	FX22L472□E203
	5 000	47.0	22.4	24	20	20	77x235	FX22L502□E235
	5 600	48.9	23.3	20	17	20	90x196	FX22L562□F196
	6 000	51.4	24.5	19	17	20	77x235	FX22L602□E235

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	DxL [mm]	Product Code
550 2L (600)	**6 800**	53.8	25.6	17	17	20	90x196	FX22L682□F196
		58.2	27.7	17	17	20	90x236	FX22L682□F236
	8 200	63.8	30.4	15	15	20	90x236	FX22L822□F236
		65.9	31.4	15	15	29	101x237*)	FX22L822□G237
575 575V (625)	**1 200**	16.2	7.7	121	125	18	64x96	FX2575V122□D096
	1 300	19.3	9.2	112	115	18	64x103	FX2575V132□D103
	1 500	19.5	9.3	97	100	18	64x115	FX2575V152□D115
	1 800	21.2	10.1	81	83	20	77x96	FX2575V182□E096
	2 200	25.2	12.0	66	67	20	77x115	FX2575V222□E115
	2 700	29.2	13.9	54	56	20	77x130	FX2575V272□E130
	3 000	32.8	15.6	49	51	20	77x155	FX2575V302□E155
	3 300	34.4	16.4	44	45	20	90x131	FX2575V332□F131
	4 700	44.1	21.0	31	32	20	90x157	FX2575V472□F157
600 600V (650)	**1 000**	10.1	4.8	129	133	22	64x96	FX2600V102□D096
	1 200	11.8	5.6	122	125	22	64x115	FX2600V122□D115
	1 500	13.2	6.3	111	114	24	77x96	FX2600V152□E096
	1 800	15.5	7.3	99	102	24	77x115	FX2600V182□E115
	2 200	17.9	8.5	85	87	24	77x130	FX2600V222□E130
	2 700	21.2	10.1	66	68	24	77x155	FX2600V272□E155
	3 300	23.7	11.3	44	45	24	90x131	FX2600V332□F131
	3 900	27.5	13.1	22	22	24	90x157	FX2600V392□F157

*) For Bolt - Mounting dimensions are 101x242mm.

►Life Time Table / Brauchbarkeitsdauer – Tabelle

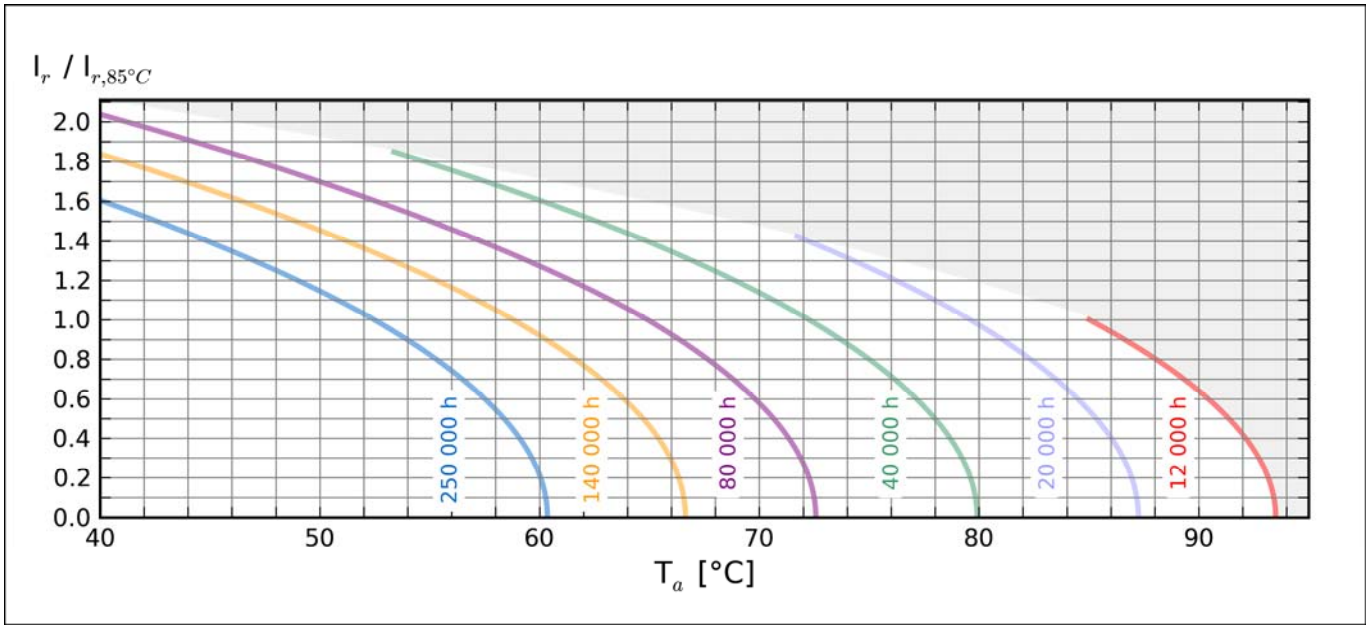
FX2	Useful life as function of ambient temperature and ripple current											
I_r at 85°C	x 1.0	x 1.1	x 1.2	x 1.3	x 1.4	x 1.5	x 1.6	x 1.7	x 1.8	x 1.9	x 2.0	x 2.1
T_a = 40°C	250	250	250	250	250	250	250	199	154	118	89	66
T_a = 45°C	250	250	250	250	247	200	160	126	97	74	56	
T_a = 50°C	250	250	227	190	156	126	101	79	61	47		
T_a = 55°C	198	170	144	120	98	80	64	50	39			
T_a = 60°C	125	107	91	76	62	50	40	31				
T_a = 65°C	79	68	57	48	39	32						
T_a = 70°C	50	43	36	30	25							
T_a = 75°C	31	27	23	19								
T_a = 80°C	20	17										
T_a = 85°C	12											

khrs Max. value limited to 250 000 hours.

►Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r,85°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,85°C,120Hz}$



►Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	**T_a = 85°C; V_r, I_r applied 8000 hours**	**ΔC/C ≤ 15% (of initial value) Tanδ ≤ 175% (of specified value) I_L ≤ specified value**
Useful life	**T_a = 85°C; V_r, I_r applied 12000 hours**	**ΔC/C ≤ 20% (of initial value) Tanδ < 200% (of specified value) I_L ≤ specified value**

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

FX3 Screw-Terminal 10 000 h / 85°C

Special charge-discharge proof design available upon request.

Auf Anfrage spezielles Design für Lade-, Entladeanwendungen erhältlich.

►Specifications / Spezifikationen

Items	Characteristics
Temperature range	-40°C ~ + 85°C
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.01 • C • V_r [µA] or 3 mA, which is smaller.
Useful life	10000 h at 85°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10…55Hz, 10g, 3x2h

►Outline Drawings / Bauformen

Shape: B (ØD = 51-101)
(for Bolt – Mounting, M12x16, stud bolt is not isolated)

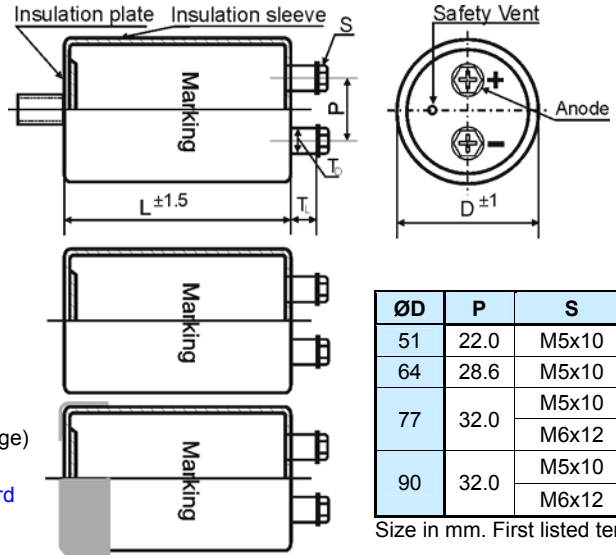
Form: B (ØD = 51-101)
(für Bolzenbefestigung, M12x16, Bolzen nicht isoliert)

Shape: N (for PBT-Holder ØD = 77-101 and Press Ring ØD = 64-90)

Form: N (für PBT-Halter ØD = 77-101 und Einpressring ØD = 64-90)

Shape: Y (ØD = 51-101)
(double sleeve, bracket free of charge)

Form: Y (ØD = 51-101)
(mit doppelter Isolierung, Schelle wird kostenlos mitgeliefert)



ØD	P	S	T_L	T_D	Cap material
51	22.0	M5x10	5.5	10	PH
64	28.6	M5x10	5.5	10	PH
77	32.0	M5x10	5.0	10	PH
		M6x12	5.0	16	PPS
90	32.0	M5x10	5.0	10	PH
		M6x12	4.0	16	PPS

Size in mm. First listed terminal is standard.

►Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]	50/60	120	300	1k	≥ 10k
multiplier	0.80	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 1.0	v ≥ 1.0
multiplier	1.0	1.1

►Product Code / Bestellbezeichnung

Example: FX3 8200µF 400V D=77mm L=130mm with Y-Bracket

FX3 2G 822 Y E 130 ( )

Type of series

Rated voltage code

Code	Voltage
2G	400
2W	450
2H	500

Capacitance code

The first two digits are significant. The last digit indicates the number of following zeros in µF.

Fixing symbol code

B : Bolt
ØD = 51 - 101

N : No double sleeve (PBT-Safety-holder or press ring)

Y : 3 Stoppers Bracket
ØD = 51 – 101

refer to pages 113 – 119

Case code diameter

ØD	Code
51	C
64	D
77	E
90	F
101	G

Case Code length

Length in mm (3 digits)

Customers` specification

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	DxL [mm]	Product Code
400 2G (450)	**2 200**	20.3	9.7	46	48	17	51x96	FX32G222□C096
	3 300	28.0	13.3	30	32	17	51x130	FX32G332□C130
	3 900	29.7	14.1	26	28	18	64x96	FX32G392□D096
	4 700	35.0	16.7	21	22	18	64x115	FX32G472□D115
	5 600	40.1	19.1	18	19	18	64x130	FX32G562□D130
	6 800	47.6	22.7	15	15	18	64x155	FX32G682□D155
		44.7	21.3	15	15	20	77x115	FX32G682□E115
	8 200	51.2	24.4	12	15	20	77x130	FX32G822□E130
	10 000	60.6	28.9	10	15	20	77x155	FX32G103□E155
	12 000	73.2	34.8	8	13	20	77x195	FX32G123□E195
	15 000	82.1	39.1	8	10	20	90x171	FX32G153□F171
	18 000	95.2	45.3	6	9	20	90x196	FX32G183□F196
	22 000	113.5	54.1	6	8	20	90x236	FX32G223□F236
450 2W (500)	**1 800**	17.4	8.3	71	73	17	51x96	FX32W182□C096
	2 200	20.8	9.9	58	60	17	51x115	FX32W222□C115
	2 700	24.4	11.6	47	49	17	51x130	FX32W272□C130
	3 300	26.1	12.4	39	41	18	64x96	FX32W332□D096
	3 900	30.4	14.5	33	35	18	64x115	FX32W392□D115
	4 700	35.3	16.8	27	29	18	64x130	FX32W472□D130
	5 600	41.3	19.7	23	25	18	64x155	FX32W562□D155
		38.6	18.4	23	25	20	77x115	FX32W562□E115
	6 800	44.7	21.3	19	21	20	77x130	FX32W682□E130
	8 200	52.6	25.1	16	18	20	77x155	FX32W822□E155
		54.8	26.1	16	18	20	77x170	FX32W822□E170
	10 000	62.1	29.6	13	15	20	90x157	FX32W103□F157
	12 000	70.3	33.5	11	13	20	90x171	FX32W123□F171
	15 000	83.1	39.6	9	11	20	90x196	FX32W153□F196
500 2H (550)	**1 200**	15.2	7.2	92	100	17	51x96	FX32H122□C096
	1 500	18.4	8.7	74	80	17	51x115	FX32H152□C115
	1 800	21.0	10.0	53	50	17	51x130	FX32H182□C130
	2 200	22.7	10.8	40	35	18	64x96	FX32H222□D096
	2 700	28.3	13.5	37	33	18	64x130	FX32H272□D130
	3 300	33.6	16.0	36	32	18	64x155	FX32H332□D155
		31.6	15.1	36	32	20	77x115	FX32H332□E115
	3 900	36.0	17.1	27	29	20	77x130	FX32H392□E130
	4 700	42.3	20.1	25	25	20	77x155	FX32H472□E155
	5 600	48.1	22.9	23	21	20	77x171	FX32H562□E171
		46.1	22.0	23	21	20	90x131	FX32H562□F131
	6 800	56.0	26.7	20	18	20	77x195	FX32H682□E195
		54.3	25.9	20	18	20	90x157	FX32H682□F157
	8 200	61.8	29.4	17	16	20	90x171	FX32H822□F171
	10 000	72.2	34.4	15	14	20	90x196	FX32H103□F196
	12 000	85.2	40.6	13	12	20	90x236	FX32H123□F236

►Life Time Table / Brauchbarkeitsdauer – Tabelle

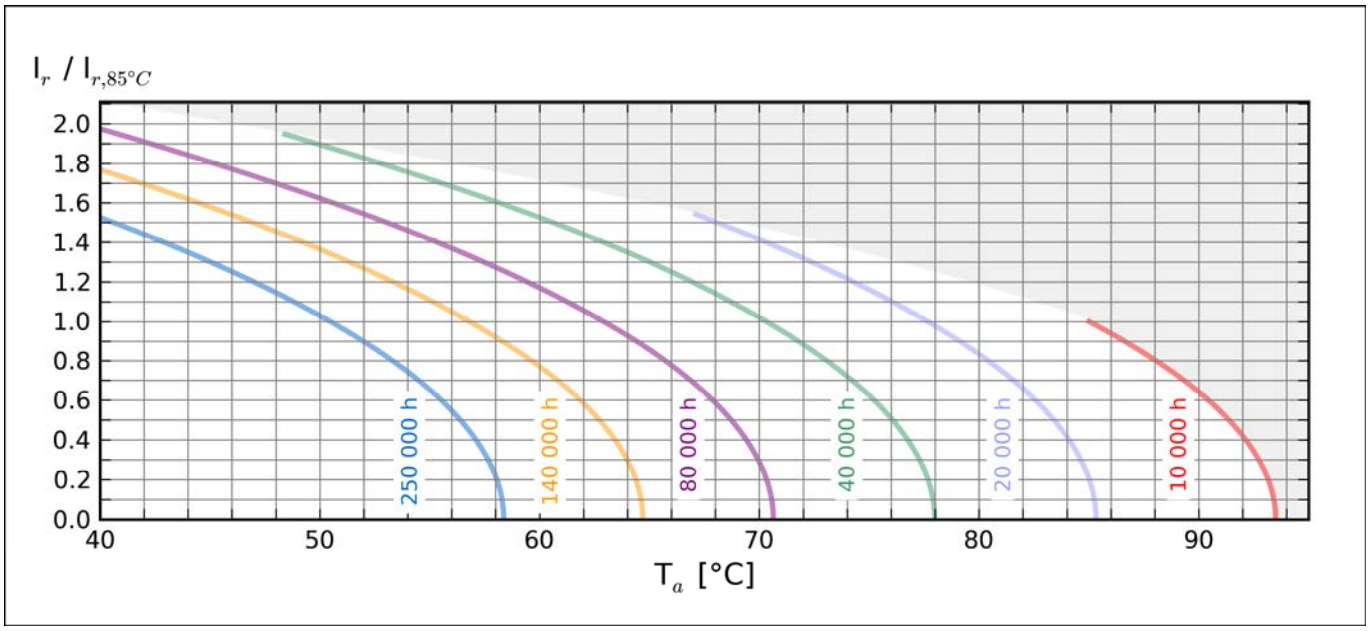
FX3	Useful life as function of ambient temperature and ripple current											
I_r at 85°C	x 1.0	x 1.1	x 1.2	x 1.3	x 1.4	x 1.5	x 1.6	x 1.7	x 1.8	x 1.9	x 2.0	x 2.1
T_a = 40°C	250	250	250	250	250	250	210	166	128	98	74	55
T_a = 45°C	250	250	250	250	205	166	133	105	81	62	47	
T_a = 50°C	250	224	189	158	130	105	84	66	51	39		
T_a = 55°C	165	141	120	100	82	66	53	42	32			
T_a = 60°C	104	89	75	63	52	42	33	26				
T_a = 65°C	66	56	48	40	32	26						
T_a = 70°C	41	35	30	25	20							
T_a = 75°C	26	22	19	16								
T_a = 80°C	16	14										
T_a = 85°C	10											

khrs Max. value limited to 250 000 hours.

►Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r,85°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,85°C,120Hz}$



►Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	**T_a = 85°C; V_r, I_r applied 8000 hours**	**ΔC/C ≤ 15% (of initial value) Tanδ ≤ 175% (of specified value) I_L ≤ specified value**
Useful life	**T_a = 85°C; V_r, I_r applied 10000 hours**	**ΔC/C ≤ 20% (of initial value) Tanδ < 200% (of specified value) I_L ≤ specified value**

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

FXR Screw-Terminal 12 000 h / 85°C

►Specifications / Spezifikationen

Items	Characteristics
Temperature range	-40°C ~ + 85°C
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.01 • C • V_r [µA] or 3 mA, which is smaller.
Useful life	12000 h at 85°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10…55Hz, 10g, 3x2h

►Outline Drawings / Bauformen

Shape: B (ØD = 64-90)
(for Bolt – Mounting, M12x16, stud bolt is not isolated)

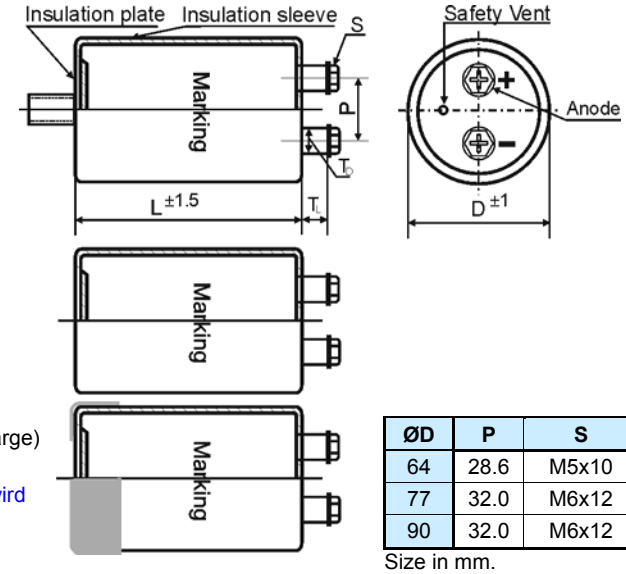
Form: B (ØD = 64-90)
(für Bolzenbefestigung, M12x16, Bolzen nicht isoliert)

Shape: N (for PBT-Holder ØD = 77-90 and Press Ring ØD = 64-90)

Form: N (für PBT-Halter ØD = 77-90 und Einpressring ØD = 64-90)

Shape: Y (ØD = 64-90)
(double sleeve, bracket free of charge)

Form: Y (ØD = 64-90)
(mit doppelter Isolierung, Schelle wird kostenlos mitgeliefert)



ØD	P	S	T_L	T_D	Cap material
64	28.6	M5x10	4.5	10	PPS
77	32.0	M6x12	3.0	16	PPS
90	32.0	M6x12	3.0	16	PPS

Size in mm.

►Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]	50/60	120	300	1k	≥ 10k
multiplier	0.80	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 0.5	v ≥ 0.5	v ≥ 1.0	v ≥ 3.0
multiplier	1.0	1.1	1.2	1.3

►Product Code / Bestellbezeichnung

Example: 3900µF 500V D=77mm L=161mm with Y-Bracket

FXR 2H 392 Y E 161 ( )

Type of series

Capacitance code
The first two digits are significant. The last digit indicates the number of following zeros in µF.

Rated voltage code

Code	Voltage	Code	Voltage
2V	350	2W	450
2G	400	2H	500

Fixing symbol code
B : Bolt
ØD = 64 - 90
N : No double sleeve (PBT-Safety-holder or press ring)
Y : 3 Stoppers Bracket
ØD = 64 - 90

refer to pages 113 – 119

Case code diameter

ØD	Code
64	D
77	E
90	F

Case Code length
Length in mm (3 digits)

Customers` specification

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	DxL [mm]	Product Code
350 2V (400)	**3 900**	33.6	16.8	19	21	18	64x115	FXR2V392□D115
	4 700	38.8	19.4	16	20	18	64x131	FXR2V472□D131
	5 600	45.6	22.8	14	18	18	64x155	FXR2V562□D155
		49.6	24.8	12	14	19	77x121	FXR2V562□E121
		51.2	25.6	13	15	19	90x106	FXR2V562□F106
	6 800	57.6	28.8	10	12	19	77x137	FXR2V682□E137
		60.2	30.1	11	13	19	90x121	FXR2V682□F121
	8 200	67.4	33.7	10	10	19	77x161	FXR2V822□E161
		69.2	34.6	12	12	19	90x137	FXR2V822□F137
	10 000	82.2	41.1	9	9	19	90x161	FXR2V103□F161
	12 000	90.0	45.0	8	8	19	90x161	FXR2V123□F161
400 2G (450)	**2 700**	26.4	13.2	24	25	18	64x100	FXR2G272□D100
	3 300	32.6	16.3	21	22	18	64x131	FXR2G332□D131
	3 900	38.0	19.0	18	20	18	64x155	FXR2G392□D155
		41.4	20.7	20	22	19	77x121	FXR2G392□E121
	4 700	41.6	20.8	15	20	18	64x155	FXR2G472□D155
		47.2	23.6	15	20	19	90x106	FXR2G472□F106
		47.8	23.9	14	18	19	77x137	FXR2G472□E137
	5 600	52.2	26.1	12	13	19	77x137	FXR2G562□E137
		54.8	27.4	13	15	19	90x121	FXR2G562□F121
	6 800	61.2	30.6	10	12	19	77x161	FXR2G682□E161
		63.0	31.5	11	14	19	90x137	FXR2G682□F137
	8 200	74.0	37.0	10	9	19	90x161	FXR2G822□F161
	10 000	82.2	41.1	9	9	19	90x161	FXR2G103□F161
450 2W (500)	**2 200**	24.0	12.0	42	45	18	64x100	FXR2W222□D100
		28.8	14.4	46	48	19	77x96	FXR2W222□E096
	2 700	29.4	14.7	38	40	18	64x131	FXR2W272□D131
	3 300	35.0	17.5	30	35	18	64x155	FXR2W332□D155
		35.4	17.7	30	35	19	77x121	FXR2W332□E121
	3 900	38.0	19.0	27	32	18	64x155	FXR2W392□D155
		41.4	20.7	25	31	19	77x121	FXR2W392□E121
		42.8	21.4	27	32	19	90x106	FXR2W392□F106
	4 700	47.8	23.9	18	19	19	77x137	FXR2W472□E137
		50.2	25.1	20	21	19	90x121	FXR2W472□F121
	5 600	55.6	27.8	15	18	19	77x161	FXR2W562□E161
		57.2	28.6	17	20	19	90x137	FXR2W562□F137
	6 800	67.6	33.8	14	12	19	90x161	FXR2W682□F161
	8 200	74.0	37.0	10	10	19	90x161	FXR2W822□F161
	10 000	84.8	42.4	9	9	19	90x178	FXR2W103□F178
500 2H (550)	**1 500**	19.8	9.9	74	80	18	64x115	FXR2H152□D115
	1 800	23.0	11.5	74	67	18	64x131	FXR2H182□D131
	2 200	27.0	13.5	53	50	18	64x155	FXR2H222□D155
	2 700	34.4	17.2	33	35	19	77x121	FXR2H272□E121
	3 300	33.8	16.9	31	34	19	90x106	FXR2H332□F106
		42.6	21.3	30	33	19	77x161	FXR2H332□E161
	3 900	43.6	21.8	26	33	19	90x121	FXR2H392□F121
		46.4	23.2	25	32	19	77x161	FXR2H392□E161
	4 200	47.2	23.6	28	23	19	77x178	FXR2H422□E178
	4 700	50.2	25.1	20	25	19	90x137	FXR2H472□F137
	5 600	58.2	29.1	18	22	19	90x161	FXR2H562□F161
	6 800	66.8	33.4	16	15	19	90x178	FXR2H682□F178

►Life Time Table / Brauchbarkeitsdauer – Tabelle

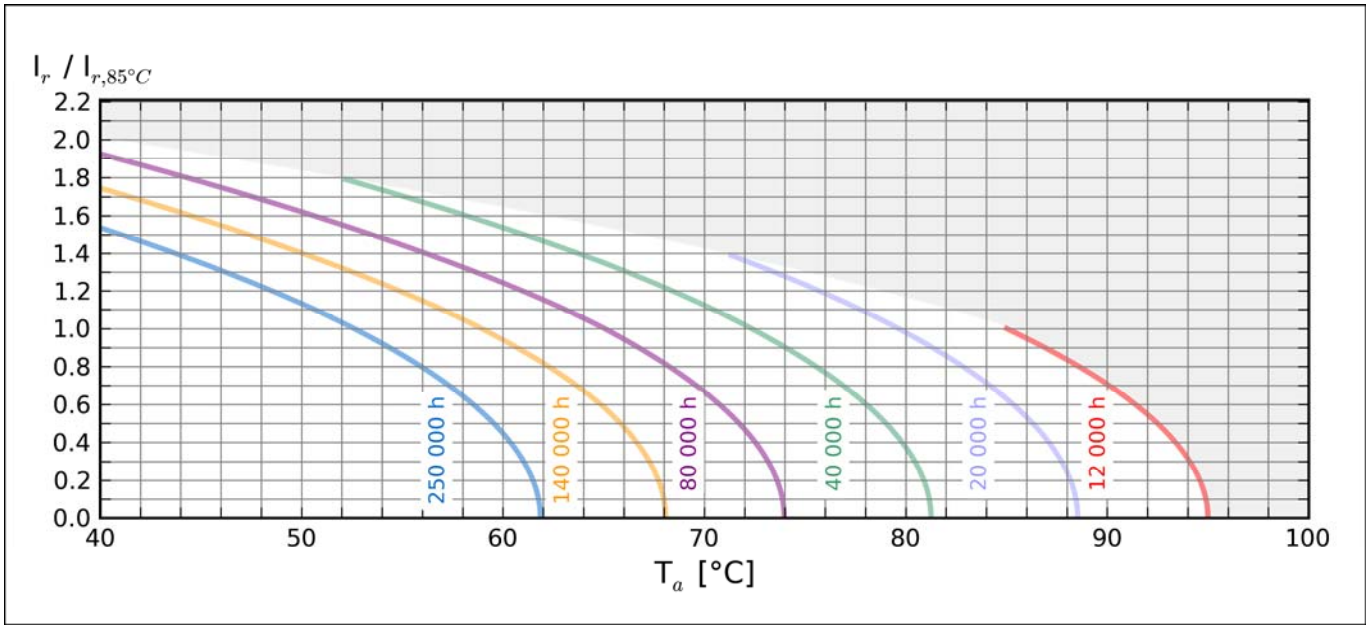
FXR	Useful life as function of ambient temperature and ripple current										
I_r at 85°C	x 1.0	x 1.1	x 1.2	x 1.3	x 1.4	x 1.5	x 1.6	x 1.7	x 1.8	x 1.9	x 2.0
T_a = 40°C	250	250	250	250	250	250	211	159	118	86	62
T_a = 45°C	250	250	250	250	222	174	133	101	75	54	39
T_a = 50°C	250	250	218	176	140	110	84	63	47	34	
T_a = 55°C	200	168	138	111	89	69	53	40	30		
T_a = 60°C	127	106	87	70	56	44	33	25			
T_a = 65°C	80	67	55	44	35	27	21				
T_a = 70°C	50	42	34	28	22	17					
T_a = 75°C	32	26	22	17							
T_a = 80°C	20	17	13								
T_a = 85°C	12		khrs								

Max. value limited to 250 000 hours.

►Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r,85°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,85°C,120Hz}$



►Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	**T_a = 85°C; V_r, I_r applied 8000 hours**	**ΔC/C ≤ 15% (of initial value) Tanδ ≤ 175% (of specified value) I_L ≤ specified value**
Useful life	**T_a = 85°C; V_r, I_r applied 12000 hours**	**ΔC/C ≤ 20% (of initial value) Tanδ < 200% (of specified value) I_L ≤ specified value**

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

FXR3 Screw-Terminal 12 000 h / 85°C

Special charge-discharge proof design available upon request.

Auf Anfrage spezielles Design für Lade-, Entladeanwendungen erhältlich.

► Specifications / Spezifikationen

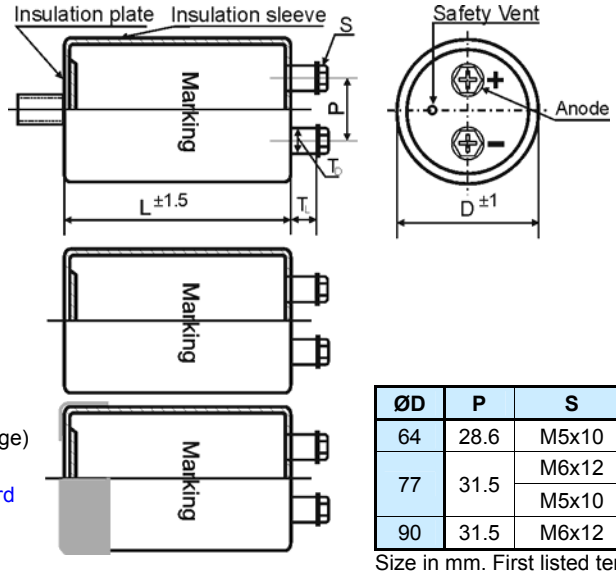
Items	Characteristics
Temperature range	-40°C ~ + 85°C
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.01 • C • V_r [µA] or 3 mA, which is smaller.
Useful life	12000 h at 85°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10…55Hz, 10g, 3x2h

► Outline Drawings / Bauformen

Shape: B (ØD = 51-101)
(for Bolt – Mounting, M12x16, stud bolt is not isolated)
Form: B (ØD = 51-101)
(für Bolzenbefestigung, M12x16, Bolzen nicht isoliert)

Shape: N (for PBT-Holder ØD = 77-101 and Press Ring ØD = 64-90)
Form: N (für PBT-Halter ØD = 77-101 und Einpressring ØD = 64-90)

Shape: Y (ØD = 51-101)
(double sleeve, bracket free of charge)
Form: Y (ØD = 51-101)
(mit doppelter Isolierung, Schelle wird kostenlos mitgeliefert)



ØD	P	S	T_L	T_D	Cap material
64	28.6	M5x10	8.0	11	PH
77	31.5	M6x12	9.0	12	PH
		M5x10	8.0	11	PH
90	31.5	M6x12	8.0	12	PH

Size in mm. First listed terminal is standard.

► Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]	50/60	120	300	1k	≥ 10k
multiplier	0.80	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 0.5	v ≥ 0.5	v ≥ 2.0	v ≥ 3.0
multiplier	1.00	1.10	1.20	1.25

► Product Code / Bestellbezeichnung

Example: 15000µF 400V D=77mm L=228mm with Y-Bracket

FXR3 2G 153 Y E 228 ( )

Type of series

Rated voltage code

Code	Voltage
2G	400
2W	450
2H	500

Capacitance code
The first two digits are significant. The last digit indicates the number of following zeros in µF.

Fixing symbol code
B : Bolt ØD = 51 - 101
N : No double sleeve (PBT-Safety-holder or press ring)
Y : 3 Stoppers Bracket ØD = 64 – 90

refer to pages 113 – 119

Case code diameter

ØD	Code
64	D
77	E
90	F

Case Code length
Length in mm (3 digits)

Customers` specification

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 85°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	DxL [mm]	Product Code
400 2G (450)	**3 900**	37.4	17.8	26	28	18	64x95	FXR32G392□D095
	4 700	43.5	20.7	21	22	18	64x124	FXR32G472□D124
	5 600	49.5	23.6	18	19	18	64x148	FXR32G562□D148
		47.8	22.8	18	19	19	77x95	FXR32G562□E095
	6 800	57.0	27.1	15	16	18	64x165	FXR32G682□D165
		55.5	26.5	15	16	19	77x124	FXR32G682□E124
	8 200	63.5	30.2	12	12	19	77x148	FXR32G822□E148
		62.3	29.7	12	12	19	90x97	FXR32G822□F097
	10 000	73.2	34.8	10	10	19	77x165	FXR32G103□E165
		72.2	34.4	10	10	19	90x126	FXR32G103□F126
	12 000	81.9	39.0	8	10	19	90x150	FXR32G123□F150
	15 000	99.7	47.5	8	10	19	77x228	FXR32G153□E228
	18 000	115.9	55.2	6	9	19	90x230	FXR32G183□F230
	22 000	128.0	61.0	6	8	19	90x230	FXR32G223□F230
450 2W (500)	**2 700**	30.7	14.6	39	41	18	64x95	FXR32W272□D095
	3 300	34.1	16.2	32	34	18	64x108	FXR32W332□D108
	3 900	39.1	18.6	26	28	18	64x124	FXR32W392□D124
	4 700	44.7	21.3	21	22	18	64x148	FXR32W472□D148
	5 600	50.7	24.2	18	19	18	64x165	FXR32W562□D165
	6 800	57.7	27.5	15	15	18	64x188	FXR32W682□D188
	8 200	65.2	31.1	12	12	19	77x165	FXR32W822□E165
	10 000	73.7	35.1	10	10	19	77x188	FXR32W103□E188
		73.4	35.0	10	10	19	90x150	FXR32W103□F150
	12 000	85.5	40.7	8	10	19	90x190	FXR32W123□F190
	15 000	103.4	49.2	8	10	19	90x230	FXR32W153□F230
500 2H (550)	**1 800**	24.6	11.7	53	50	18	64x95	FXR32H182□D095
	2 200	27.5	13.1	40	35	18	64x108	FXR32H222□D108
	2 700	32.1	15.3	37	33	18	64x124	FXR32H272□D124
	3 300	36.7	17.5	36	32	18	64x148	FXR32H332□D148
		35.7	17.0	36	32	19	77x108	FXR32H332□E108
	3 900	41.8	19.9	27	29	18	64x165	FXR32H392□D165
		41.1	19.6	27	29	19	77x124	FXR32H392□E124
	4 700	46.6	22.2	25	25	19	77x148	FXR32H472□E148
	5 600	52.9	25.2	23	21	19	77x165	FXR32H562□E165
		52.4	25.0	23	21	19	90x126	FXR32H562□F126
	6 800	59.7	28.4	20	18	19	90x150	FXR32H682□F150
	8 200	68.1	32.4	17	16	19	90x167	FXR32H822□F167
	10 000	76.8	36.6	15	14	19	90x190	FXR32H103□F190
	12 000	91.0	43.4	13	12	19	90x230	FXR32H123□F230

►Life Time Table / Brauchbarkeitsdauer – Tabelle

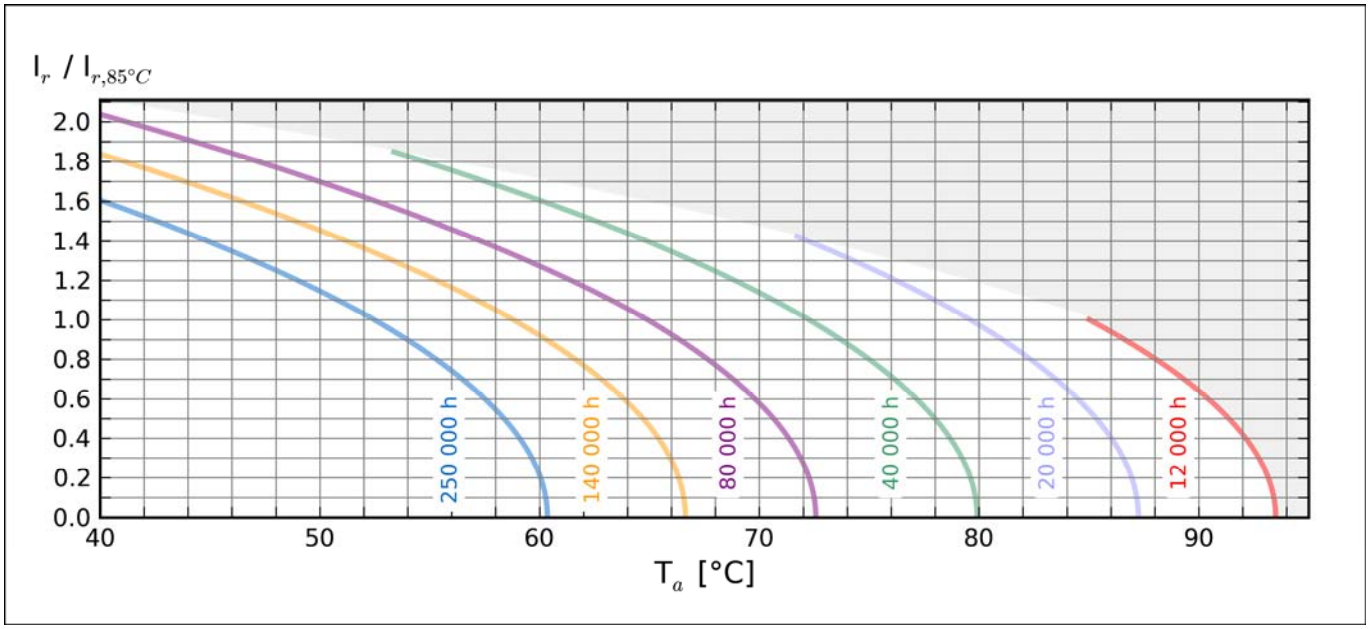
FXR3	Useful life as function of ambient temperature and ripple current											
I_r at 85°C	x 1.0	x 1.1	x 1.2	x 1.3	x 1.4	x 1.5	x 1.6	x 1.7	x 1.8	x 1.9	x 2.0	x 2.1
T_a = 40°C	250	250	250	250	250	250	250	199	154	118	89	66
T_a = 45°C	250	250	250	250	247	200	160	126	97	74	56	
T_a = 50°C	250	250	227	190	156	126	101	79	61	47		
T_a = 55°C	198	170	144	120	98	80	64	50	39			
T_a = 60°C	125	107	91	76	62	50	40	31				
T_a = 65°C	79	68	57	48	39	32						
T_a = 70°C	50	43	36	30	25							
T_a = 75°C	31	27	23	19								
T_a = 80°C	20	17										
T_a = 85°C	12											

khrs Max. value limited to 250 000 hours.

►Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r.85°C.120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r.85°C.120Hz}$



►Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	**T_a = 85°C; V_r, I_r applied 8000 hours**	**ΔC/C ≤ 15% (of initial value) Tanδ ≤ 175% (of specified value) I_L ≤ specified value**
Useful life	**T_a = 85°C; V_r, I_r applied 12000 hours**	**ΔC/C ≤ 20% (of initial value) Tanδ < 200% (of specified value) I_L ≤ specified value**

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

HCGH Screw-Terminal 6000 h / 105°C

►Specifications / Spezifikationen

Items	Characteristics
Temperature range	-40°C ~ + 105°C
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.01 • C • V_r [µA] or 3 mA, which is smaller.
Useful life	6000 h at 105°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10...55Hz, 10g, 3x2h

►Outline Drawings / Bauformen

Shape: B (ØD = 51-90)
(for Bolt – Mounting, M12x16, stud bolt is not isolated)

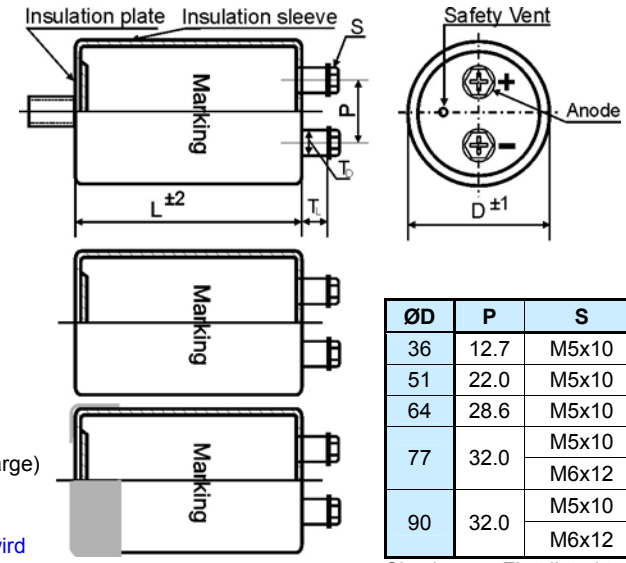
Form: B (ØD = 51-90)
(für Bolzenbefestigung, M12x16, Bolzen nicht isoliert)

Shape: N (for PBT-Holder ØD = 77-90 and Press Ring ØD = 77-90)

Form: N (für PBT-Halter ØD = 77-90 und Einpressring ØD = 77-90)

Shape: I (ØD = 36)
Shape: Y (ØD = 51-90)
(double sleeve, bracket free of charge)

Form: I (ØD = 36)
Form: Y (ØD = 51-90)
(mit doppelter Isolierung, Schelle wird kostenlos mitgeliefert)



ØD	P	S	T_L	T_D	Cap material
36	12.7	M5x10	7.0	8	PPS
51	22.0	M5x10	4.5	10	PPS
64	28.6	M5x10	4.5	10	PPS
77	32.0	M5x10	4.5	10	PPS
		M6x12	5.0	16	PPS
90	32.0	M5x10	4.0	10	PPS
		M6x12	4.0	16	PPS

Size in mm. First listed terminal is standard.

►Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]	50/60	120	300	1k	≥ 10k
multiplier	0.80	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 1.0	v ≥ 1.0
multiplier	1.0	1.1

►Product Code / Bestellbezeichnung

Example: 4700µF 250V D=64mm L=115mm with Y-Bracket

HCGH 2E 472 Y D 115 ( )

Type of series

Capacitance code
The first two digits are significant. The last digit indicates the number of following zeros in µF.

Rated voltage code

Code	Voltage	Code	Voltage	Code	Voltage
1E	25	1K	80	2E	250
1V	35	2A	100	2G	400
1H	50	2C	160	2W	450
1J	63	2D	200		

Fixing symbol code
B : Bolt ØD = 51 - 90
N : No double sleeve (PBT-Safety-holder or press ring)
Y : 3 Stoppers Bracket ØD = 51 - 90
I : 2 Stoppers Bracket ØD = 36

refer to pages 113 – 119

Case code diameter

ØD	Code
36	A
51	C
64	D
77	E
90	F

Case Code length
Length in mm (3 digits)

Customers` specification

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	DxL [mm]	Product Code
25 1E (32)	**10 000**	15.8	3.3	32	30	15	36x53	HCGH1E103□A053
	15 000	23.0	4.8	27	27	15	36x83	HCGH1E153□A083
	22 000	28.3	5.9	22	23	15	36x83	HCGH1E223□A083
	33 000	34.6	7.2	15	16	15	36x100	HCGH1E333□A100
	47 000	44.2	9.2	10	11	17	51x75	HCGH1E473□C075
	68 000	55.2	11.5	7	8	17	51x115	HCGH1E683□C115
	100 000	62.4	13.0	6	7	18	64x96	HCGH1E104□D096
	150 000	71.0	14.8	6	7	18	64x115	HCGH1E154□D115
	220 000	81.6	17.0	4	5	20	77x115	HCGH1E224□E115
	330 000	109.9	22.9	4	5	20	90x131	HCGH1E334□F131
35 1V (44)	**6 800**	14.4	3.0	42	37	15	36x53	HCGH1V682□A053
	10 000	20.6	4.3	29	31	15	36x83	HCGH1V103□A083
	15 000	25.0	5.2	19	20	15	36x83	HCGH1V153□A083
	22 000	30.2	6.3	14	15	15	36x100	HCGH1V223□A100
	33 000	37.0	7.7	12	13	17	51x75	HCGH1V333□C075
	47 000	44.6	9.3	8	9	17	51x96	HCGH1V473□C096
	68 000	55.2	11.5	7	8	17	51x115	HCGH1V683□C115
	100 000	66.7	13.9	6	7	18	64x115	HCGH1V104□D115
	150 000	76.3	15.9	5	7	20	77x115	HCGH1V154□E115
	220 000	97.0	20.2	5	7	20	90x131	HCGH1V224□F131
50 1H (63)	**3 300**	12.0	2.5	90	80	15	36x53	HCGH1H332□A053
	4 700	18.2	3.8	64	58	15	36x53	HCGH1H472□A053
	6 800	18.7	3.9	44	39	15	36x83	HCGH1H682□A083
	10 000	22.6	4.7	30	28	15	36x83	HCGH1H103□A083
	15 000	26.9	5.6	20	20	15	36x100	HCGH1H153□A100
	22 000	32.6	6.8	14	15	17	51x75	HCGH1H223□C075
	33 000	43.2	9.0	13	14	17	51x115	HCGH1H333□C115
	47 000	52.3	10.9	11	12	18	64x96	HCGH1H473□D096
	68 000	63.8	13.3	8	9	18	64x115	HCGH1H683□D115
	100 000	77.8	16.2	6	7	20	77x115	HCGH1H104□E115
	140 000	107.5	22.4	5	8	20	77x137	HCGH1H144□E137
	150 000	104.2	21.7	5	7	20	90x131	HCGH1H154□F131
63 1J (79)	**2 200**	11.5	2.4	95	87	15	36x53	HCGH1J222□A053
	3 300	12.0	2.5	63	58	15	36x53	HCGH1J332□A053
	4 700	17.3	3.6	54	50	15	36x83	HCGH1J472□A083
	6 800	20.6	4.3	38	35	15	36x83	HCGH1J682□A083
	10 000	24.5	5.1	28	28	15	36x100	HCGH1J103□A100
	15 000	31.7	6.6	21	22	17	51x75	HCGH1J153□C075
	22 000	37.4	7.8	13	14	17	51x96	HCGH1J223□C096
	33 000	50.9	10.6	10	11	18	64x96	HCGH1J333□D096
	47 000	54.1	11.3	8	9	20	90x77	HCGH1J473□F077
		60.0	12.5	8	9	18	64x115	HCGH1J473□D115
	68 000	72.0	15.0	7	8	20	77x115	HCGH1J683□E115
	100 000	95.0	19.8	7	8	20	90x131	HCGH1J104□F131
80 1K (100)	**2 200**	11.5	2.4	68	63	15	36x53	HCGH1K222□A053
	3 300	16.8	3.5	45	42	15	36x83	HCGH1K332□A083
	4 700	19.7	4.1	32	30	15	36x83	HCGH1K472□A083
	6 800	22.1	4.6	22	23	15	36x100	HCGH1K682□A100
	10 000	28.8	6.0	15	16	17	51x75	HCGH1K103□C075
	15 000	34.1	7.1	10	11	17	51x96	HCGH1K153□C096
	22 000	45.1	9.4	9	10	18	64x96	HCGH1K223□D096
	33 000	53.8	11.2	7	7	20	77x96	HCGH1K333□E096
	47 000	69.1	14.4	6	7	20	77x115	HCGH1K473□E115
	68 000	90.7	18.9	4	7	20	90x131	HCGH1K683□F131

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	DxL [mm]	Product Code
100 2A (125)	**1 000**	7.7	1.6	112	100	15	36x53	HCGH2A102□A053
	1 500	9.6	2.0	75	87	15	36x53	HCGH2A152□A053
	2 200	13.9	2.9	51	47	15	36x83	HCGH2A222□A083
	3 300	16.8	3.5	34	32	15	36x83	HCGH2A332□A083
	4 700	21.6	4.5	24	24	15	36x100	HCGH2A472□A100
	6 800	27.8	5.8	19	20	17	51x75	HCGH2A682□C075
	10 000	36.0	7.5	13	14	17	51x96	HCGH2A103□C096
	15 000	41.8	8.7	11	12	18	64x96	HCGH2A153□D096
	22 000	53.8	11.2	8	9	20	77x96	HCGH2A223□E096
	33 000	65.3	13.6	6	7	20	77x130	HCGH2A333□E130
	47 000	83.0	17.3	5	7	20	90x131	HCGH2A473□F131
160 2C (200)	**470**	5.8	1.2	277	261	15	36x53	HCGH2C471□A053
	680	6.2	1.3	191	180	15	36x53	HCGH2C681□A053
	1 000	9.6	2.0	130	120	15	36x83	HCGH2C102□A083
	1 500	11.0	2.3	87	80	15	36x83	HCGH2C152□A083
	2 200	14.9	3.1	59	53	15	36x100	HCGH2C222□A100
	3 300	19.2	4.0	40	35	17	51x75	HCGH2C332□C075
	4 700	24.5	5.1	30	25	17	51x96	HCGH2C472□C096
	6 800	32.6	6.8	22	23	18	64x96	HCGH2C682□D096
	10 000	41.8	8.7	15	16	20	77x96	HCGH2C103□E096
	15 000	56.6	11.8	14	14	20	77x130	HCGH2C153□E130
	22 000	73.0	15.2	10	10	20	90x131	HCGH2C223□F131
200 2D (250)	**330**	4.3	0.9	395	372	15	36x53	HCGH2D331□A053
	470	5.8	1.2	277	261	15	36x53	HCGH2D471□A053
	680	6.2	1.3	191	180	15	36x53	HCGH2D681□A053
	1 000	9.6	2.0	120	100	15	36x83	HCGH2D102□A083
	1 500	12.0	2.5	100	85	15	36x100	HCGH2D152□A100
	2 200	15.4	3.2	68	60	17	51x75	HCGH2D222□C075
	3 300	20.6	4.3	45	35	17	51x96	HCGH2D332□C096
	4 700	26.9	5.6	31	27	18	64x96	HCGH2D472□D096
	6 800	34.6	7.2	21	20	18	64x115	HCGH2D682□D115
		40.3	8.4	21	20	20	77x145	HCGH2D682□E145
	10 000	44.6	9.3	14	14	20	77x115	HCGH2D103□E115
		49.0	10.2	14	14	20	77x145	HCGH2D103□E145
	15 000	60.0	12.5	10	10	20	90x131	HCGH2D153□F131
	22 000	85.0	17.7	7	7	20	77x215	HCGH2D223□E215
250 2E (300)	**330**	4.3	0.9	285	268	15	36x53	HCGH2E331□A053
	470	5.8	1.2	200	187	15	36x53	HCGH2E471□A053
	680	7.7	1.6	138	131	15	36x83	HCGH2E681□A083
	1 000	10.6	2.2	84	70	15	36x100	HCGH2E102□A100
	1 500	12.5	2.6	56	50	17	51x75	HCGH2E152□C075
	2 200	17.3	3.6	50	45	17	51x96	HCGH2E222□C096
	3 300	23.0	4.8	36	35	18	64x96	HCGH2E332□D096
	4 700	29.8	6.2	25	23	18	64x115	HCGH2E472□D115
	6 800	37.9	7.9	18	18	20	77x115	HCGH2E682□E115
	10 000	51.4	10.7	13	13	20	77x155	HCGH2E103□E155
	15 000	67.2	14.0	9	9	20	90x157	HCGH2E153□F157
400 2G (450)	**1 000**	11.0	2.9	102	105	17	51x75	HCGH2G102□C075
	1 200	13.3	3.5	85	88	17	51x96	HCGH2G122□C096
	1 500	15.6	4.1	68	70	17	51x115	HCGH2G152□C115
	1 800	17.9	4.7	57	58	17	51x130	HCGH2G182□C130
	2 200	18.2	4.8	46	48	17	51x105	HCGH2G222□C105
		19.8	5.2	46	48	18	64x96	HCGH2G222□D096
	2 700	23.2	6.1	38	40	18	64x115	HCGH2G272□D115
	3 300	26.2	6.9	30	32	20	77x105	HCGH2G332□E105
		27.0	7.1	30	32	18	64x130	HCGH2G332□D130
	3 900	29.6	7.8	26	28	20	77x115	HCGH2G392□E115
		31.5	8.3	26	28	18	64x155	HCGH2G392□D155

HCGH Series Screw-Terminal 6 000 h / 105°C

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	DxL [mm]	Product Code
400 2G (450)	**4 700**	34.2	9.0	21	22	20	77x130	HCGH2G472□E130
		38.0	10.0	21	22	18	64x195	HCGH2G472□D195
	5 600	40.3	10.6	18	19	20	77x155	HCGH2G562□E155
		41.8	11.0	18	19	18	64x195	HCGH2G562□D195
	6 800	44.1	11.6	18	18	20	77x155	HCGH2G682□E155
		46.7	12.3	15	15	20	90x157	HCGH2G682□F157
	8 200	50.2	13.2	12	15	20	77x171	HCGH2G822□E171
		51.7	13.6	12	15	20	90x157	HCGH2G822□F157
	10 000	61.6	16.2	10	15	20	90x196	HCGH2G103□F196
	14 000	73.0	19.2	9	8	20	90x196	HCGH2G143□F196
	15 000	74.5	19.6	6	8	20	90x196	HCGH2G153□F196
450 2W (500)	**1 500**	14.4	3.8	67	70	17	51x105	HCGH2W152□C105
	2 200	20.9	5.5	46	48	20	77x103	HCGH2W222□E103
	4 700	33.8	8.9	24	26	20	77x144	HCGH2W472□E144
	5 600	37.2	9.8	21	22	20	77x144	HCGH2W562□E144
	6 000	39.3	10.4	19	20	20	77x155	HCGH2W602□E155

►Life Time Tables / Brauchbarkeitsdauer – Tabellen

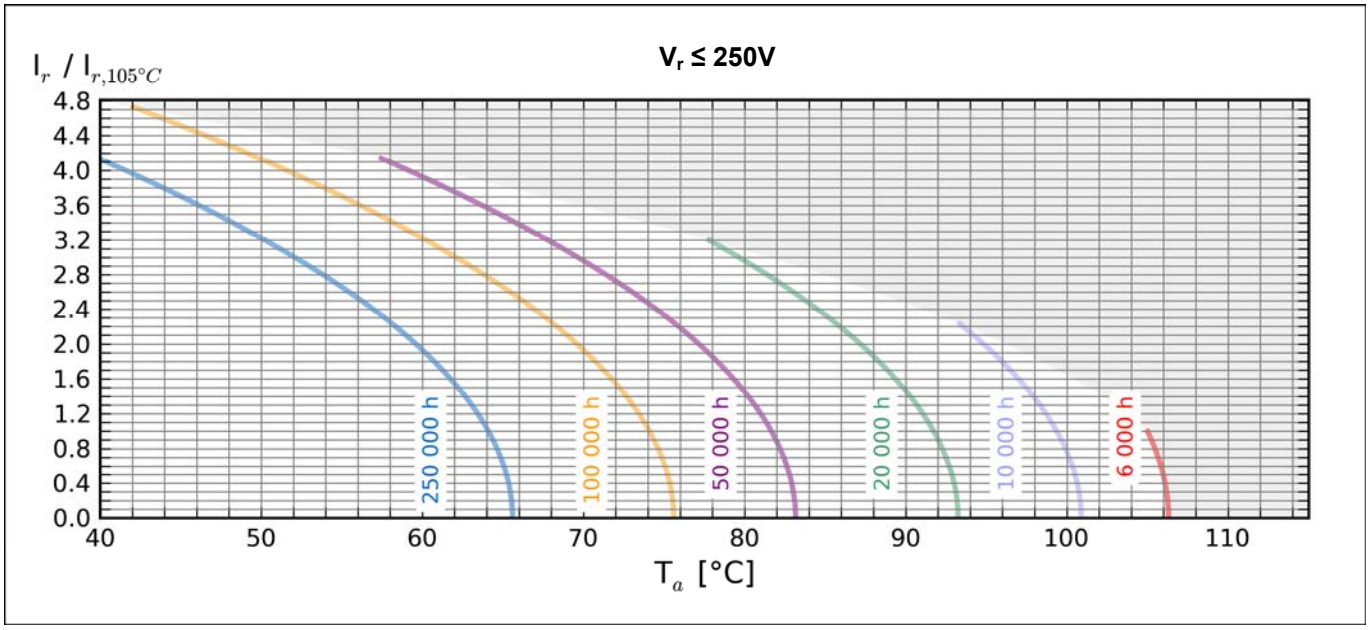
HCGH $V_r \leq 250V$	Useful life as function of ambient temperature and ripple current													
I_r at 105°C	x 1.0	x 1.6	x 2.1	x 2.4	x 2.7	x 3.0	x 3.3	x 3.5	x 3.8	x 4.0	x 4.2	x 4.4	x 4.6	x 4.8
T_a = 40°C	250	250	250	250	250	250	250	250	250	250	250	246	194	151
T_a = 45°C	250	250	250	250	250	250	250	250	250	241	195	155	122	96
T_a = 50°C	250	250	250	250	250	250	250	249	206	152	123	98		
T_a = 55°C	250	250	250	250	250	250	204	157	130	96	78			
T_a = 60°C	250	250	242	201	175	163	129	99						
T_a = 65°C	245	198	153	127	111	103	81	63						
T_a = 70°C	155	125	97	80	70	65	51							
T_a = 75°C	98	79	61											
T_a = 80°C	62	50												
T_a = 85°C	39	31												
T_a = 90°C	24													
T_a = 95°C	15													
T_a = 100°C	9													
T_a = 105°C	6		khrs		Max. value limited to 250 000 hours.									

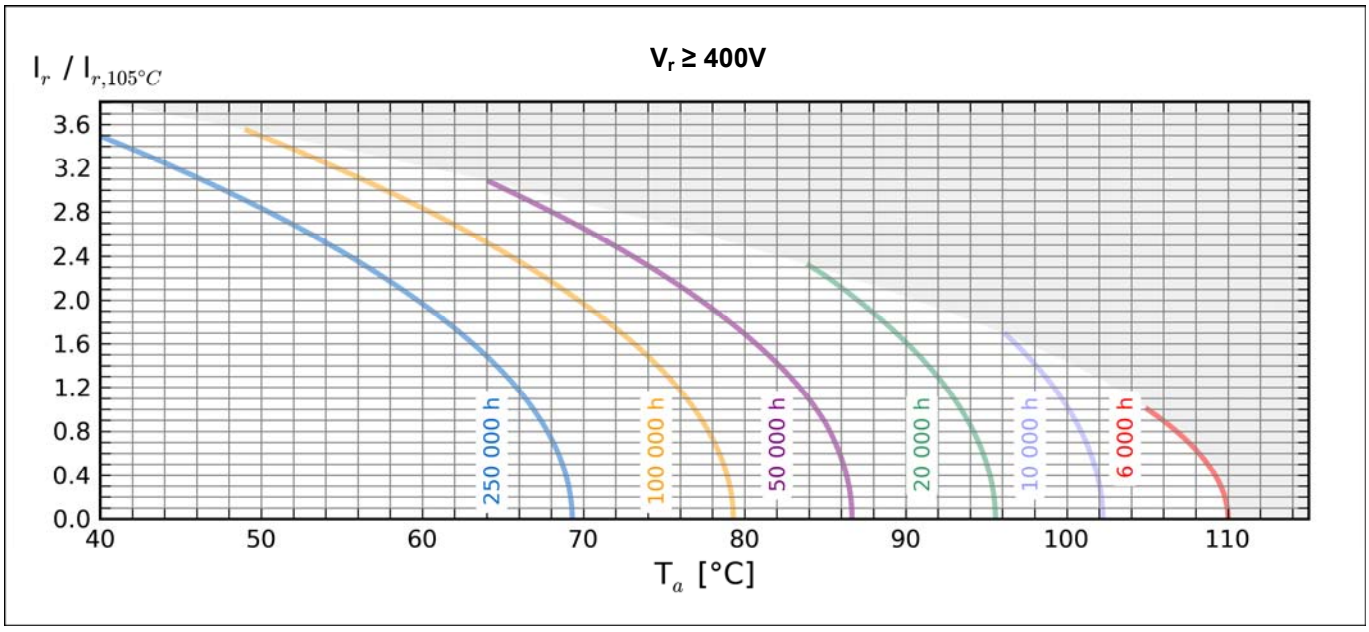
HCGH $V_r \geq 400V$	Useful life as function of ambient temperature and ripple current													
I_r at 105°C	x 1.0	x 1.4	x 1.7	x 2.0	x 2.2	x 2.4	x 2.6	x 2.8	x 3.0	x 3.2	x 3.3	x 3.5	x 3.6	x 3.8
T_a = 40°C	250	250	250	250	250	250	250	250	250	250	250	225	193	139
T_a = 45°C	250	250	250	250	250	250	250	250	250	222	192	142	122	
T_a = 50°C	250	250	250	250	250	250	250	238	184	140	121	90	77	
T_a = 55°C	250	250	250	250	250	238	191	150	116	88	77	57	48	
T_a = 60°C	250	250	250	221	184	150	120	95	73	56	48	36		
T_a = 65°C	250	219	179	140	116	95	76	60	46					
T_a = 70°C	171	138	113	88	73	60								
T_a = 75°C	108	87	71	56	46									
T_a = 80°C	68	55	45	35										
T_a = 85°C	43	35	28	22										
T_a = 90°C	27	22	18											
T_a = 95°C	17	14												
T_a = 100°C	10													
T_a = 105°C	6		khrs		Max. value limited to 250 000 hours.									

►Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r105°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,105°C,120Hz}$





►Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	**T_a = 105°C; V_r, I_r applied 4000 hours**	**ΔC/C ≤ 15% (of initial value) Tanδ ≤ 175% (of specified value) I_L ≤ specified value**
Useful life	**T_a = 105°C; V_r, I_r applied 6000 hours**	**ΔC/C ≤ 20% (of initial value) Tanδ < 200% (of specified value) I_L ≤ specified value**

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

GXA Screw-Terminal 12 000 h / 105°C

►Specifications / Spezifikationen

Items	Characteristics
Temperature range	-40°C ~ + 105°C
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.01 • C • V_r [µA] or 3 mA, which is smaller.
Useful life	12000 h at 105°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10…55Hz, 10g, 3x2h

►Outline Drawings / Bauformen

Shape: B (ØD = 51-90)
(for Bolt – Mounting, M12x16, stud bolt is not isolated)

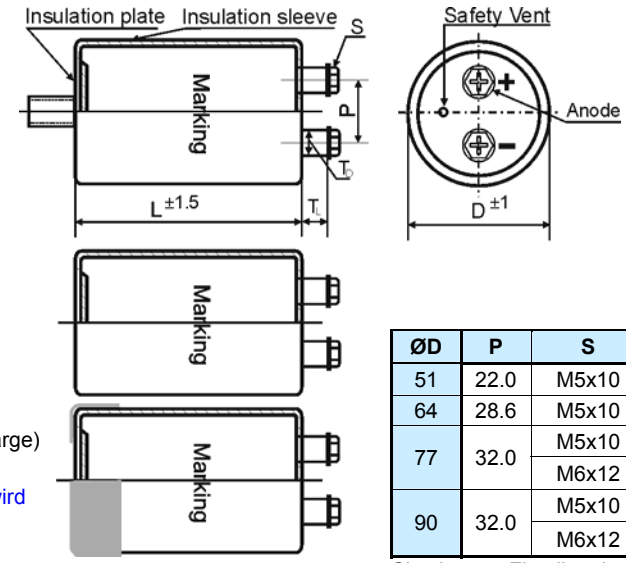
Form: B (ØD = 51-90)
(für Bolzenbefestigung, M12x16, Bolzen nicht isoliert)

Shape: N (for PBT-Holder ØD = 77-90 and Press Ring ØD = 64-90)

Form: N (für PBT-Halter ØD = 77-90 und Einpressring ØD = 64-90)

Shape: Y (ØD = 51-90)
(double sleeve, bracket free of charge)

Form: Y (ØD = 51-90)
(mit doppelter Isolierung, Schelle wird kostenlos mitgeliefert)



ØD	P	S	T_L	T_D	Cap material
51	22.0	M5x10	4.5	10	PPS
64	28.6	M5x10	4.5	10	PPS
77	32.0	M5x10	4.5	10	PPS
		M6x12	5.0	16	PPS
90	32.0	M5x10	4.0	10	PPS
		M6x12	4.0	16	PPS

Size in mm. First listed terminal is standard.

►Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]	50/60	120	300	1k	≥ 10k
multiplier	0.80	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 1.0	v ≥ 1.0
multiplier	1.0	1.1

►Product Code / Bestellbezeichnung

Example: 2700µF 350V D=64mm L=96mm with Y-Bracket

GXA 2V 272 Y D 096 ( )

Type of series

Capacitance code
The first two digits are significant. The last digit indicates the number of following zeros in µF.

Rated voltage code

Code	Voltage	Code	Voltage
2V	350	2W	450
2G	400		

Fixing symbol code
B : Bolt
ØD = 51 - 90
N : No double sleeve (PBT-Safety-holder or press ring)
Y : 3 Stoppers Bracket
ØD = 51 – 90

refer to pages 113 – 119

Case code diameter

ØD	Code
51	C
64	D
77	E
90	F

Case Code length
Length in mm (3 digits)

Customers` specification

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	DxL [mm]	Product Code
350 2V (400)	**1 000**	12.2	4.5	70	75	17	51x75	GXA2V102□C075
	1 200	13.0	4.8	65	70	17	51x75	GXA2V122□C075
	1 500	16.2	6.0	53	55	17	51x96	GXA2V152□C096
	1 800	17.8	6.6	44	44	17	51x96	GXA2V182□C096
	2 200	22.1	8.2	28	28	17	51x130	GXA2V222□C130
	2 700	24.0	8.9	24	25	18	64x96	GXA2V272□D096
	3 300	28.4	10.5	21	22	18	64x115	GXA2V332□D115
	3 900	32.4	12.0	18	20	18	64x130	GXA2V392□D130
	4 700	35.6	13.2	14	18	20	77x115	GXA2V472□E115
		37.8	14.0	16	20	18	64x155	GXA2V472□D155
	5 600	40.8	15.1	12	15	20	77x130	GXA2V562□E130
		45.4	16.8	14	20	18	64x195	GXA2V562□D195
	6 800	46.9	17.4	14	18	20	77x144	GXA2V682□E144
		48.1	17.8	14	18	20	77x155	GXA2V682□E155
	8 200	56.2	20.8	12	15	20	90x157	GXA2V822□F157
	10 000	61.8	22.9	10	15	20	90x157	GXA2V103□F157
	12 000	74.0	27.4	8	13	20	90x196	GXA2V123□F196
	15 000	89.4	33.1	6	10	20	90x236	GXA2V153□F236
400 2G (450)	**1 000**	12.2	4.5	70	75	17	51x75	GXA2G102□C075
	1 200	14.3	5.3	65	70	17	51x96	GXA2G122□C096
	1 500	17.3	6.4	53	55	17	51x115	GXA2G152□C115
	1 800	20.0	7.4	44	44	17	51x130	GXA2G182□C130
	2 200	21.3	7.9	42	45	18	64x96	GXA2G222□D096
	2 700	25.4	9.4	38	40	18	64x115	GXA2G272□D115
	3 300	28.4	10.5	30	32	20	77x103	GXA2G332□E103
		29.4	10.9	30	35	18	64x130	GXA2G332□D130
	3 900	32.4	12.0	24	27	20	77x115	GXA2G392□E115
		34.6	12.8	27	32	18	64x155	GXA2G392□D155
	4 700	37.3	13.8	22	23	20	77x130	GXA2G472□E130
		41.6	15.4	20	21	18	64x195	GXA2G472□D195
	5 600	43.5	16.1	20	20	20	77x155	GXA2G562□E155
		45.4	16.8	20	20	18	64x195	GXA2G562□D195
	6 800	51.3	19.0	18	18	20	90x157	GXA2G682□F157
	8 200	56.2	20.8	15	17	20	90x157	GXA2G822□F157
	10 000	67.5	25.0	12	15	20	90x196	GXA2G103□F196
	12 000	80.2	29.7	9	12	20	90x236	GXA2G123□F236
450 2W (500)	**1 000**	13.0	4.8	70	75	17	51x96	GXA2W102□C096
	1 200	15.7	5.8	65	70	17	51x115	GXA2W122□C115
	1 500	18.4	6.8	53	55	17	51x130	GXA2W152□C130
	1 800	19.4	7.2	44	44	18	64x96	GXA2W182□D096
	2 200	23.0	8.5	42	45	18	64x115	GXA2W222□D115
	2 700	26.7	9.9	40	42	18	64x130	GXA2W272□D130
		27.0	10.0	42	45	20	77x115	GXA2W272□E115
	3 300	31.3	11.6	35	40	20	77x130	GXA2W332□E130
		31.6	11.7	30	35	18	64x155	GXA2W332□D155
		32.7	12.1	30	35	20	77x143	GXA2W332□E143
	3 900	38.1	14.1	27	32	18	64x195	GXA2W392□D195
	4 700	38.8	14.4	24	27	20	77x143	GXA2W472□E143
		40.0	14.8	24	27	20	77x155	GXA2W472□E155
	5 600	46.2	17.1	24	27	20	90x157	GXA2W562□F157
		47.8	17.7	22	23	20	77x195	GXA2W562□E195
	6 800	55.9	20.7	20	20	20	90x196	GXA2W682□F196
	8 200	61.6	22.8	18	18	20	90x196	GXA2W822□F196
	10 000	73.2	27.1	15	15	20	90x236	GXA2W103□F236

►Life Time Table / Brauchbarkeitsdauer – Tabelle

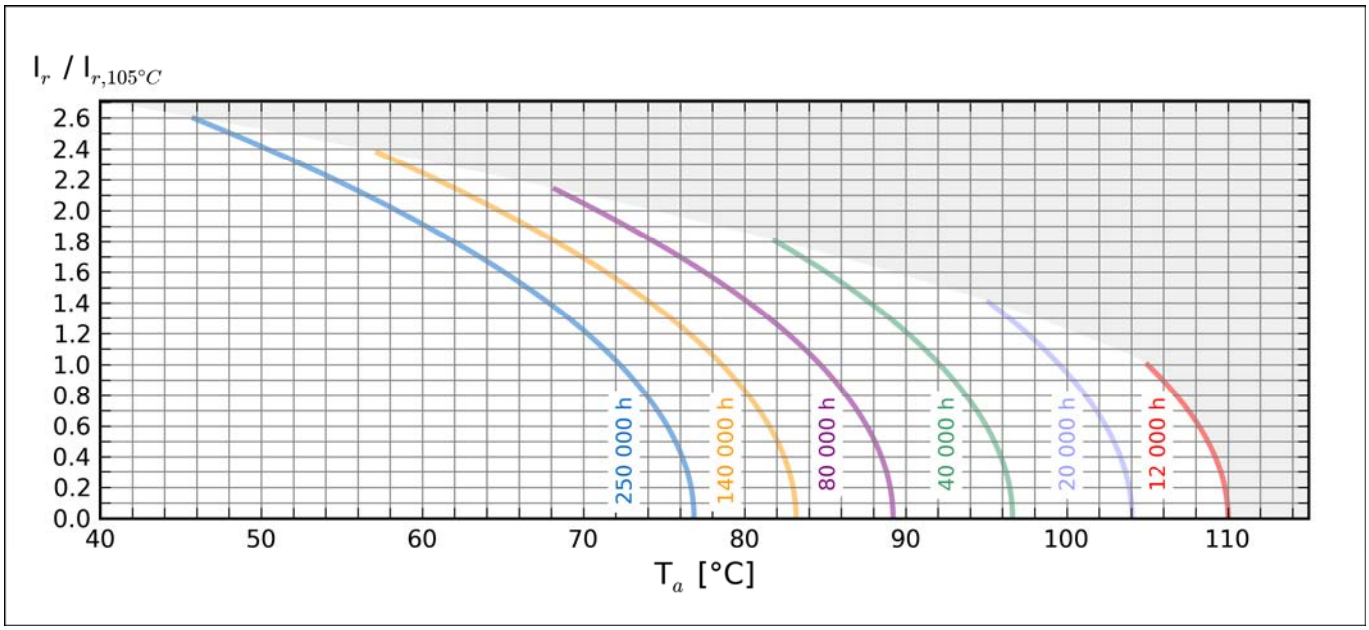
GXA	Useful life as function of ambient temperature and ripple current												
I_r at 105°C	x 1.0	x 1.2	x 1.4	x 1.6	x 1.8	x 2.0	x 2.1	x 2.2	x 2.3	x 2.4	x 2.5	x 2.6	x 2.7
T_a = 40°C	250	250	250	250	250	250	250	250	250	250	250	250	250
T_a = 45°C	250	250	250	250	250	250	250	250	250	250	250	250	
T_a = 50°C	250	250	250	250	250	250	250	250	250	250	210		
T_a = 55°C	250	250	250	250	250	250	250	240	199	163			
T_a = 60°C	250	250	250	250	250	217	182	152	126				
T_a = 65°C	250	250	250	250	189	137	115	96					
T_a = 70°C	250	250	205	159	119	86	73	60					
T_a = 75°C	194	161	129	100	75	54	46						
T_a = 80°C	123	102	82	63	47	34	29						
T_a = 85°C	77	64	51	40	30	21							
T_a = 90°C	49	40	32	25	19								
T_a = 95°C	31	25	20	16									
T_a = 100°C	19	16											
T_a = 105°C	12												

khrs Max. value limited to 250 000 hours.

►Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r,105°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,105°C,120Hz}$



►Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	**T_a = 105°C; V_r, I_r applied 8000 hours**	**ΔC/C ≤ 15% (of initial value) Tanδ ≤ 175% (of specified value) I_L ≤ specified value**
Useful life	**T_a = 105°C; V_r, I_r applied 12000 hours**	**ΔC/C ≤ 20% (of initial value) Tanδ < 200% (of specified value) I_L ≤ specified value**

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

GX2 Screw-Terminal 12 000 h / 105°C

►Specifications / Spezifikationen

Items	Characteristics
Temperature range	-40°C ~ + 105°C
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.01 • C • V_r [µA] or 3 mA, which is smaller.
Useful life	12000 h at 105°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10...55Hz, 10g, 3x2h

►Outline Drawings / Bauformen

Shape: B (ØD = 51-90)
(for Bolt – Mounting, M12x16, stud bolt is not isolated)

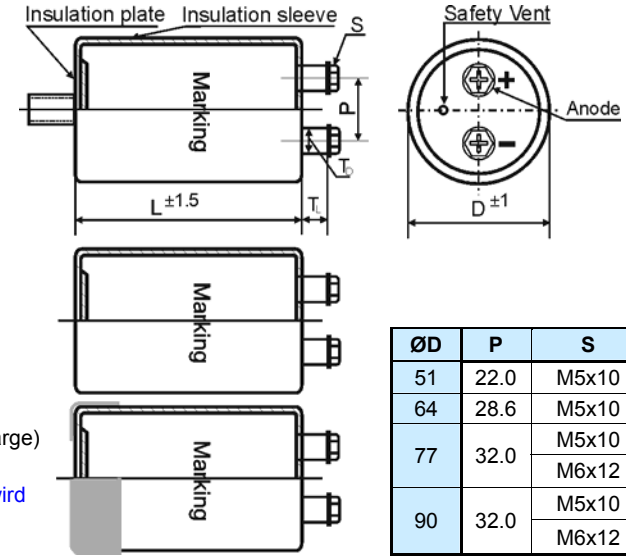
Form: B (ØD = 51-90)
(für Bolzenbefestigung, M12x16, Bolzen nicht isoliert)

Shape: N (for PBT-Holder ØD = 77-90 and Press Ring ØD = 64-90)

Form: N (für PBT-Halter ØD = 77-90 und Einpressring ØD = 64-90)

Shape: Y (ØD = 51-90)
(double sleeve, bracket free of charge)

Form: Y (ØD = 51-90)
(mit doppelter Isolierung, Schelle wird kostenlos mitgeliefert)



ØD	P	S	T_L	T_D	Cap material
51	22.0	M5x10	5.5	10	PH
64	28.6	M5x10	5.5	10	PH
77	32.0	M5x10	5.0	10	PH
		M6x12	5.0	16	PPS
90	32.0	M5x10	5.0	10	PH
		M6x12	4.0	16	PPS

Size in mm. First listed terminal is standard.

►Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]	50/60	120	300	1k	≥ 10k
multiplier	0.80	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 1.0	v ≥ 1.0
multiplier	1.0	1.1

►Product Code / Bestellbezeichnung

Example: 5600µF 500V D=90mm L=196mm with Y-Bracket

GX2 2H 562 Y F 196 ( )

Type of series

Capacitance code
The first two digits are significant. The last digit indicates the number of following zeros in µF.

Rated voltage code

Code	Voltage	Code	Voltage
2G	400	2H	500
2W	450		

Fixing symbol code
B : Bolt ØD = 51 - 90
N : No double sleeve (PBT-Safety-holder or press ring)
Y : 3 Stoppers Bracket ØD = 51 – 90

refer to pages 113 – 119

Case code diameter

ØD	Code
51	C
64	D
77	E
90	F

Case Code length
Length in mm (3 digits)

Customers` specification

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	DxL [mm]	Product Code
400 2G (450)	**1 200**	13.0	4.8	65	70	17	51x75	GX22G122□C075
	1 500	16.2	6.0	53	55	17	51x96	GX22G152□C096
	1 800	18.9	7.0	44	44	17	51x115	GX22G182□C115
	2 200	22.1	8.2	42	45	17	51x130	GX22G222□C130
	2 700	23.5	8.7	38	40	18	64x96	GX22G272□D096
	3 300	28.1	10.4	30	35	18	64x115	GX22G332□D115
	3 900	31.9	11.8	27	32	18	64x130	GX22G392□D130
	4 700	35.4	13.1	22	23	20	77x115	GX22G472□E115
		37.8	14.0	22	23	18	64x155	GX22G472□D155
	5 600	40.8	15.1	20	23	20	77x130	GX22G562□E130
		42.9	15.9	20	21	18	64x170	GX22G562□D170
	6 100	44.0	16.3	19	20	20	77x144	GX22G612□E144
		44.8	16.6	19	20	18	64x170	GX22G612□D170
	6 800	47.8	17.7	18	18	20	77x155	GX22G682□E155
		47.8	17.7	18	18	20	90x131	GX22G682□F131
	7 400	50.0	18.5	17	17	20	77x155	GX22G742□E155
	8 200	54.3	20.1	15	17	20	77x171	GX22G822□E171
		57.8	21.4	15	17	20	90x196	GX22G822□F196
	10 000	63.7	23.6	12	15	20	90x171	GX22G103□F171
450 2W (500)	**1 000**	12.2	4.5	70	75	17	51x75	GX22W102□C075
	1 200	14.3	5.3	65	70	17	51x96	GX22W122□C096
	1 500	16.5	6.1	68	70	17	51x105	GX22W152□C105
		17.0	6.3	53	55	17	51x115	GX22W152□C115
	1 800	20.0	7.4	44	45	17	51x130	GX22W182□C130
	2 200	21.3	7.9	42	42	18	64x96	GX22W222□D096
	2 700	25.1	9.3	42	42	20	77x96	GX22W272□E096
		25.4	9.4	42	42	18	64x115	GX22W272□D115
	3 300	29.7	11.0	35	40	20	77x115	GX22W332□E115
	3 900	35.4	13.1	27	32	20	77x144	GX22W392□E144
		35.9	13.3	27	32	18	64x170	GX22W392□D170
	4 700	38.8	14.4	24	27	20	77x144	GX22W472□E144
		41.6	15.4	24	27	18	64x195	GX22W472□D195
	5 600	45.4	16.8	24	23	20	77x171	GX22W562□E171
	6 800	51.3	19.0	20	20	20	90x157	GX22W682□F157
	8 200	58.0	21.5	18	18	20	90x171	GX22W822□F171
500 2H (550)	**1 000**	14.0	5.2	112	120	17	51x130	GX22H102□C130
	1 200	16.2	6.0	93	100	18	64x115	GX22H122□D115
	1 500	18.9	7.0	74	80	18	64x130	GX22H152□D130
	1 800	20.8	7.7	62	50	20	77x115	GX22H182□E115
	2 200	24.3	9.0	53	50	20	77x130	GX22H222□E130
	2 700	28.9	10.7	40	35	20	77x155	GX22H272□E155
	3 300	31.6	11.7	38	32	20	77x155	GX22H332□E155
	3 900	37.0	13.7	30	27	20	90x157	GX22H392□F157
	4 700	41.8	15.5	25	20	20	90x171	GX22H472□F171
	5 600	48.1	17.8	20	17	20	90x196	GX22H562□F196
	6 800	57.5	21.3	17	17	20	90x236	GX22H682□F236

►Life Time Table / Brauchbarkeitsdauer – Tabelle

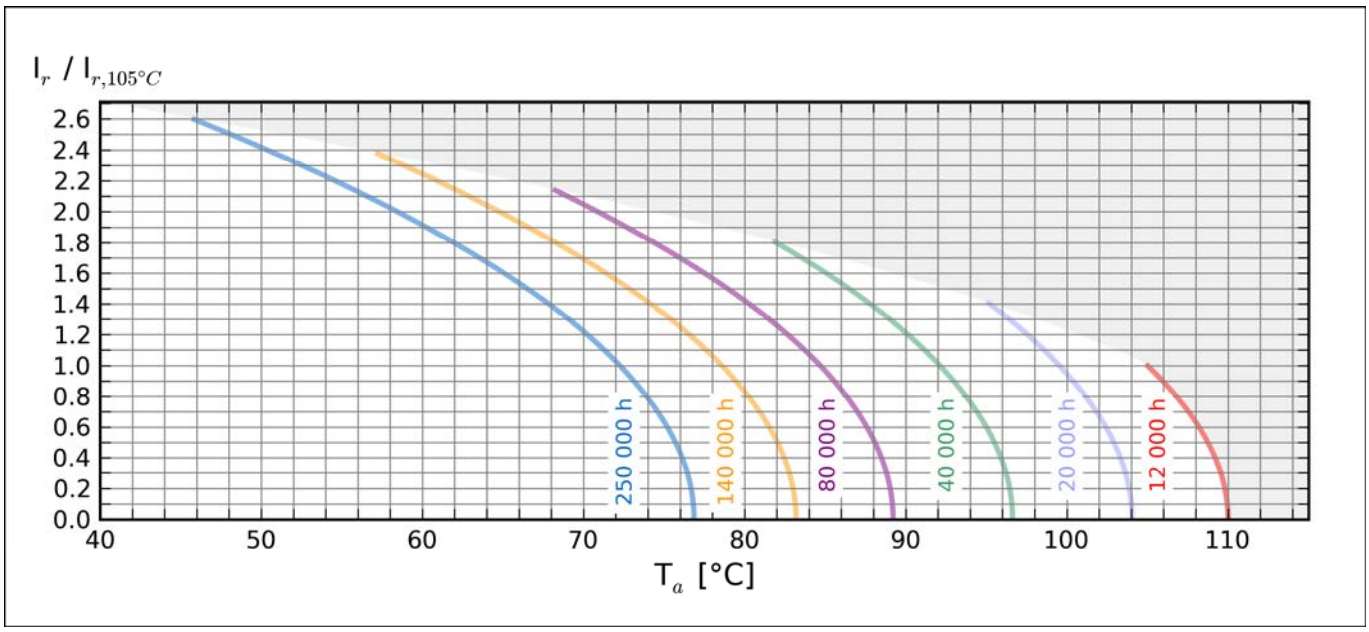
GX2	Useful life as function of ambient temperature and ripple current												
I_r at 105°C	x 1.0	x 1.2	x 1.4	x 1.6	x 1.8	x 2.0	x 2.1	x 2.2	x 2.3	x 2.4	x 2.5	x 2.6	x 2.7
T_a = 40°C	250	250	250	250	250	250	250	250	250	250	250	250	250
T_a = 45°C	250	250	250	250	250	250	250	250	250	250	250	250	
T_a = 50°C	250	250	250	250	250	250	250	250	250	250	210		
T_a = 55°C	250	250	250	250	250	250	250	240	199	163			
T_a = 60°C	250	250	250	250	250	217	182	152	126				
T_a = 65°C	250	250	250	250	189	137	115	96					
T_a = 70°C	250	250	205	159	119	86	73	60					
T_a = 75°C	194	161	129	100	75	54	46						
T_a = 80°C	123	102	82	63	47	34	29						
T_a = 85°C	77	64	51	40	30	21							
T_a = 90°C	49	40	32	25	19								
T_a = 95°C	31	25	20	16									
T_a = 100°C	19	16											
T_a = 105°C	12												

khrs Max. value limited to 250 000 hours.

►Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r,105°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,105°C,120Hz}$



►Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

Life time test	Test procedure	Life time criteria
Endurance test	**T_a = 105°C; V_r, I_r applied 8000 hours**	**ΔC/C ≤ 15% (of initial value) Tanδ ≤ 175% (of specified value) I_L ≤ specified value**
Useful life	**T_a = 105°C; V_r, I_r applied 12000 hours**	**ΔC/C ≤ 20% (of initial value) Tanδ < 200% (of specified value) I_L ≤ specified value**

Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

GXR Screw-Terminal 12 000 h / 105°C

►Specifications / Spezifikationen

Items	Characteristics
Temperature range	-40°C ~ + 105°C
Capacitance tolerance	+/- 20%
Surge voltage	Repetitive max. 30 sec per 6 Minutes
Leakage current max. I_L (20°C, 5 min)	0.01 • C • V_r [µA] or 3 mA, which is smaller.
Useful life	12000 h at 105°C
Field failure rate	0.5 FIT = 0.5 • 10^{-9} Failures/hour
RoHS conform	Directive 2002/95/ECff Annex
Specification / Vibration	JIS C 5101-4 / 0.75mm, 10...55Hz, 10g, 3x2h

►Outline Drawings / Bauformen

Shape: B (ØD = 64-90)
(for Bolt – Mounting, M12x16, stud bolt is not isolated)

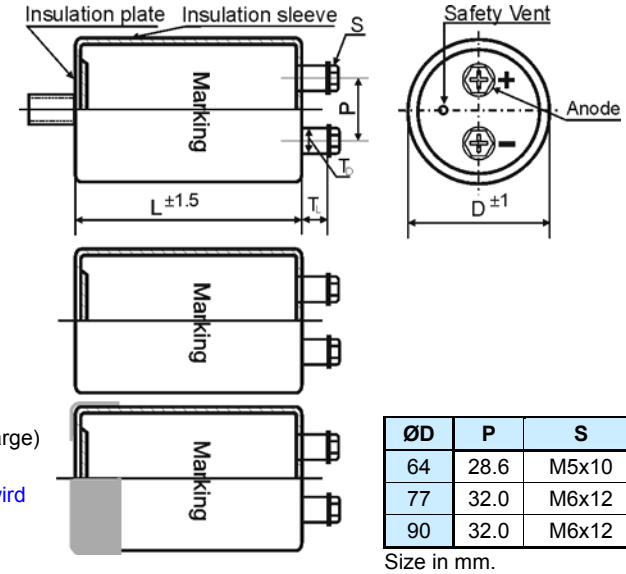
Form: B (ØD = 64-90)
(für Bolzenbefestigung, M12x16, Bolzen nicht isoliert)

Shape: N (for PBT-Holder ØD = 77-90 and Press Ring ØD = 64-90)

Form: N (für PBT-Halter ØD = 77-90 und Einpressring ØD = 64-90)

Shape: Y (ØD = 64-90)
(double sleeve, bracket free of charge)

Form: Y (ØD = 64-90)
(mit doppelter Isolierung, Schelle wird kostenlos mitgeliefert)



ØD	P	S	T_L	T_D	Cap material
64	28.6	M5x10	4.5	10	PPS
77	32.0	M6x12	3.0	16	PPS
90	32.0	M6x12	3.0	16	PPS

Size in mm.

►Ripple Current Multiplier / Wechselstrommultiplikator

Frequency [Hz]	50/60	120	300	1k	≥ 10k
multiplier	0.80	1.00	1.18	1.34	1.45

Forced cooling [m/sec]	v < 0.5	v ≥ 0.5	v ≥ 1.0	v ≥ 3.0
multiplier	1.0	1.1	1.2	1.3

►Product Code / Bestellbezeichnung

Example: 3900µF 450V D=77mm L=161mm with Y-Bracket

GXR 2W 392 Y E 161 ( )

Type of series

Capacitance code
The first two digits are significant. The last digit indicates the number of following zeros in µF.

Rated voltage code

Code	Voltage	Code	Voltage
2V	350	2W	450
2G	400		

Fixing symbol code
B : Bolt
ØD = 64 - 90
N : No double sleeve (PBT-Safety-holder or press ring)
Y : 3 Stoppers Bracket
ØD = 64 – 90

refer to pages 113 – 119

Case code diameter

ØD	Code
64	D
77	E
90	F

Case Code length
Length in mm (3 digits)

Customers` specification

Rated Voltage Code (Surge Voltage) V_r [V DC]	Capacitance C_r [µF]	Ripple Current at 40°C/120Hz [A RMS]	Ripple Current at 105°C/120Hz I_r [A RMS]	ESR (typ) at 20°C/100Hz [mΩ]	Zmax at 20°C/10kHz [mΩ]	ESL (typ) [nH]	DxL [mm]	Product Code
350 2V (400)	**2 700**	25.5	10.2	25	25	18	64x100	GXR2V272□D100
	3 300	29.5	11.8	22	22	18	64x115	GXR2V332□D115
	3 900	34.0	13.6	19	21	18	64x131	GXR2V392□D131
	4 700	40.0	16.0	16	17	18	64x155	GXR2V472□D155
		43.8	17.5	15	14	19	77x121	GXR2V472□E121
		45.2	18.1	16	15	19	90x106	GXR2V472□F106
	5 600	50.0	20.0	15	14	19	77x137	GXR2V562□E137
		52.2	20.9	15	14	19	90x121	GXR2V562□F121
	6 800	59.0	23.6	13	10	19	77x161	GXR2V682□E161
		60.5	24.2	14	11	19	90x137	GXR2V682□F137
	8 200	71.2	28.5	8	8	19	90x161	GXR2V822□F161
	10 000	78.8	31.5	8	8	19	90x161	GXR2V103□F161
	11 000	82.5	33.0	9	9	19	90x161	GXR2V113□F161
400 2G (450)	**2 700**	26.8	10.7	24	25	18	64x115	GXR2G272□D115
	3 300	31.2	12.5	21	22	18	64x131	GXR2G332□D131
	3 900	36.5	14.6	18	19	18	64x155	GXR2G392□D155
		39.8	15.9	17	16	19	77x121	GXR2G392□E121
		41.0	16.4	18	17	19	90x106	GXR2G392□F106
	4 700	45.8	18.3	16	14	19	77x137	GXR2G472□E137
		48.0	19.2	17	15	19	90x121	GXR2G472□F121
	5 600	53.5	21.4	15	12	19	77x161	GXR2G562□E161
		55.0	22.0	16	14	19	90x137	GXR2G562□F137
	6 300	59.5	23.8	17	18	19	77x161	GXR2G632□E161
	6 800	65.0	26.0	13	10	19	90x161	GXR2G682□F161
	8 200	71.2	28.5	8	7	19	90x161	GXR2G822□F161
	10 000	81.2	32.5	7	7	19	90x178	GXR2G103□F178
	11 000	85.5	34.2	9	9	19	90x178	GXR2G113□F178
450 2W (500)	**1 800**	20.8	8.3	51	56	18	64x100	GXR2W182□D100
	2 200	25.5	10.2	42	45	18	64x131	GXR2W222□D131
		28.4	11.4	42	45	19	77x106	GXR2W222□E106
	2 700	30.2	12.1	38	40	18	64x155	GXR2W272□D155
		33.0	13.2	26	25	19	77x121	GXR2W272□E121
	3 300	37.8	15.1	22	25	19	90x106	GXR2W332□F106
		38.5	15.4	21	23	19	77x137	GXR2W332□E137
	3 900	36.2	14.5	26	28	19	77x137	GXR2W392□E137
		43.8	17.5	20	21	19	90x121	GXR2W392□F121
		44.5	17.8	19	20	19	77x161	GXR2W392□E161
	4 700	49.0	19.6	16	17	19	77x161	GXR2W472□E161
		50.2	20.1	18	17	19	90x137	GXR2W472□F137
	5 600	59.0	23.6	17	17	19	90x161	GXR2W562□F161
	6 800	64.5	25.8	15	15	19	90x161	GXR2W682□F161
		67.0	26.8	14	14	19	90x178	GXR2W682□F178
	8 200	73.2	29.3	13	13	19	90x178	GXR2W822□F178

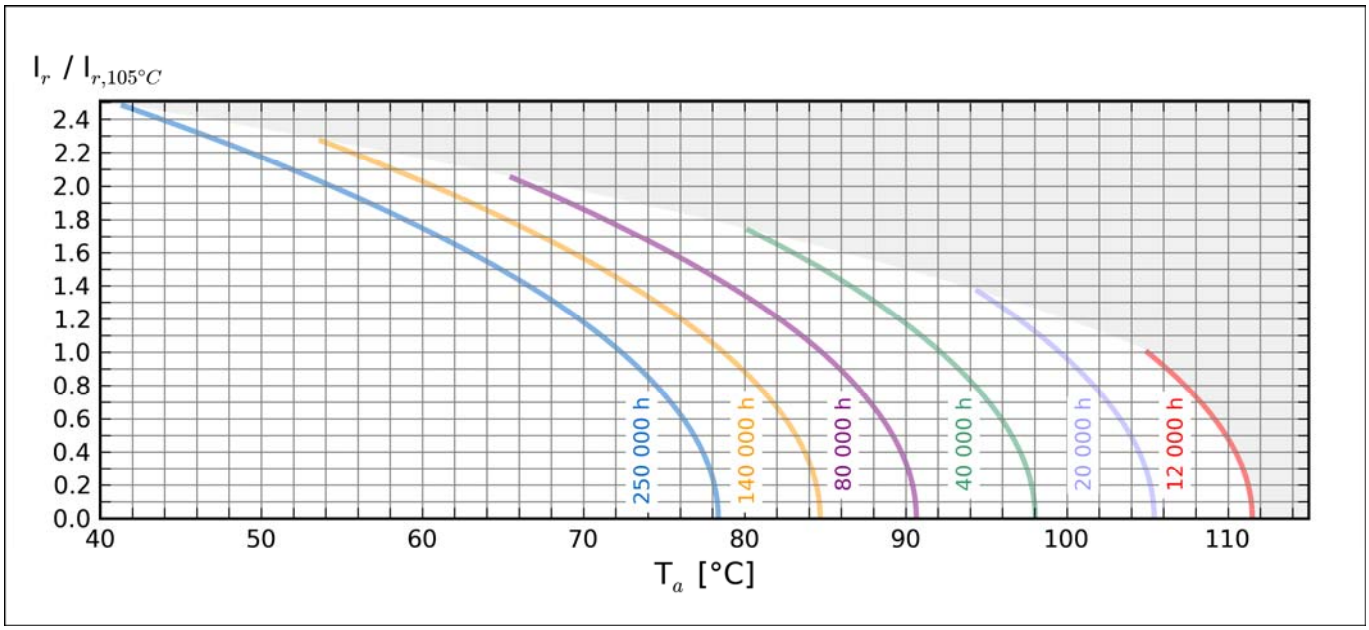
►Life Time Table / Brauchbarkeitsdauer – Tabelle

GXR	Useful life as function of ambient temperature and ripple current										
I_r at 105°C	x 1.0	x 1.2	x 1.4	x 1.6	x 1.8	x 2.0	x 2.1	x 2.2	x 2.3	x 2.4	x 2.5
T_a = 40°C	250	250	250	250	250	250	250	250	250	250	250
T_a = 45°C	250	250	250	250	250	250	250	250	250	221	169
T_a = 50°C	250	250	250	250	250	250	250	232	181	140	
T_a = 55°C	250	250	250	250	250	234	186	147	114	88	
T_a = 60°C	250	250	250	250	250	148	118	93	72		
T_a = 65°C	250	250	250	207	142	93	74	58			
T_a = 70°C	250	243	182	131	90	59	47	37			
T_a = 75°C	195	153	115	82	56	37	29				
T_a = 80°C	123	97	72	52	36	23	18				
T_a = 85°C	78	61	46	33	22	14					
T_a = 90°C	49	38	29	20	14						
T_a = 95°C	31	24	18	13							
T_a = 100°C	19	15									
T_a = 105°C	12		khrs		Max. value limited to 250 000 hours.						

►Life Time Graph / Brauchbarkeitsdauer – Diagramm

Useful life depending on ambient temperature T_a and ripple current operating conditions I_r versus rated ripple current at the upper category temperature $I_{r,105°C,120Hz}$

Brauchbarkeitsdauer in Abhängigkeit von Umgebungstemperatur T_a und Wechselstrombelastung I_r im Verhältnis zur max. Wechselstrombelastung bei oberer Kategorietemperatur $I_{r,105°C,120Hz}$



►Life Time Tests and Requirements / Anforderungen Brauchbarkeitsdauer

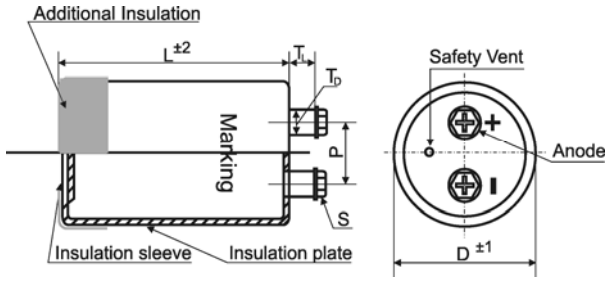
Life time test	Test procedure	Life time criteria
Endurance test	**T_a = 105°C; V_r, I_r applied 8000 hours**	**ΔC/C ≤ 15% (of initial value) Tanδ ≤ 175% (of specified value) I_L ≤ specified value**
Useful life	**T_a = 105°C; V_r, I_r applied 12000 hours**	**ΔC/C ≤ 20% (of initial value) Tanδ < 200% (of specified value) I_L ≤ specified value**

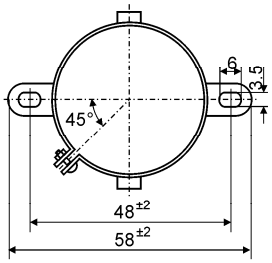
Reference Specification: JIS C 5101-4, JIS C 5102, IEC 60384-4

Mounting / Befestigung

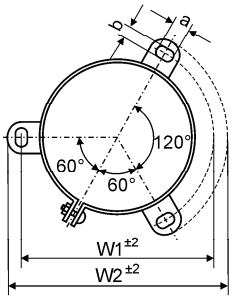
►Bracket mounting / Schellenbefestigung

Capacitor fixing symbol code „Y“, „I“ or „X“

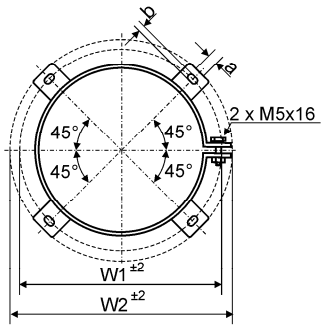




I-Type (for ØD = 36mm)



Y-Type (for ØD = 51 ~ 101mm)



X-Type (for ØD = 121mm)

For bracket mounting there is free of charge delivery of a metal bracket including capacitor.
Bei Schellenbefestigung wird die Metallschelle kostenlos mit dem Kondensator geliefert.

►Case size & dimensions / Bauformen

Capacitor	Terminals (Standard)			Y / X - Bracket				Stud bolt
ØD	P	S [1]	$I_{r\,max}$	W1	W2	a	b	ØD x L
51	22.0	M5x10	60A	63.5	73.0	7	4.5	M12x16
64	28.6	M5x10	60A	76.2	85.1	7	4.5	M12x16
77	32.0	M5x10 [2]	60A	88.9	98.4	7	4.5	M12x16
		M6x12 [3]	100A					
90	32.0	M5x10 [2]	60A	101.6	111.1	7	4.5	M12x16
		M6x12 [3]	100A					
101	32.0	M6x12 [4]	100A	115.0	127.0	8	5.5	M12x16
	41.5	M8x16 [5]	120A					
121	41.5	M6x12	100A	145.0	158.0	8	6.0	-
	41.5	M8x16	120A					

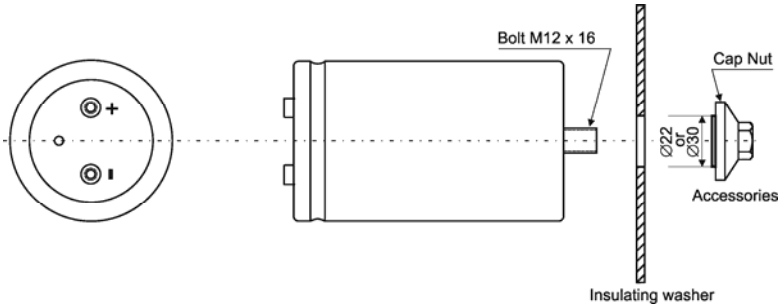
Size in mm.

1) If not mentioned in the product code
2) All series except FXR, FXR3 and GXR
3) FXR, FXR3 and GXR
4) HCGF6 and HCGW
5) FX2 / FX3

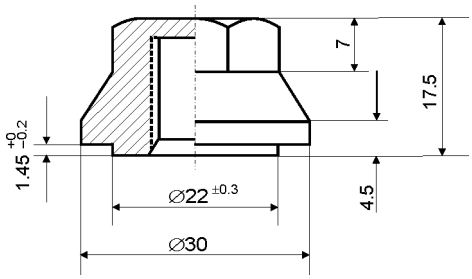
Mounting / Befestigung

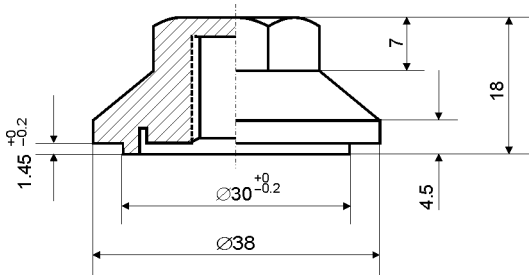
▶ Stud bolt mounting accessories
Zubehör Bolzenbefestigung

Capacitor fixing symbol code „B“



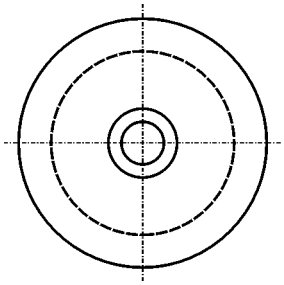
▶ Reinforced cap nut of nylon for screw-thread M12
Verstärkte Hutmutter aus Nylon für Gewinde M12

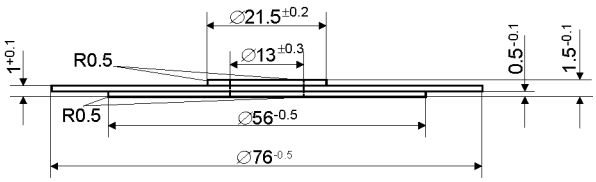




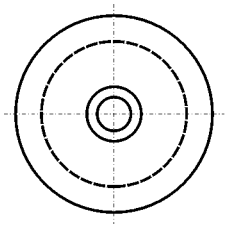
Product Code: **CNN30M12** (Ø 30mm) **CNN38M12** (Ø 38mm)

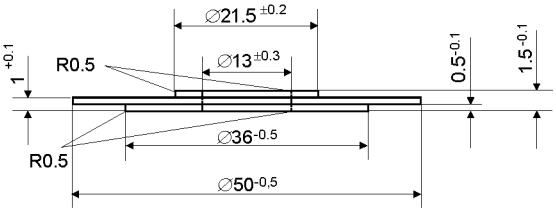
▶ Insulating washer of Polypropylene PPH
Isolierscheibe aus Polypropylene PPH





Product Code: **K500 – ISO – 77 – 13** **(for capacitor ØD = 77mm and ØD = 90mm)**



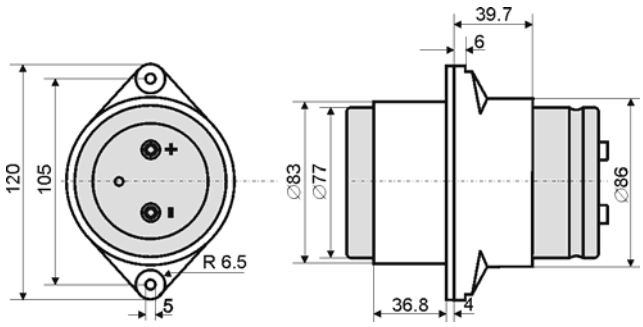


Product Code: **K500 – ISO – 50 – 13** **(for capacitor ØD = 51mm and ØD = 64mm)**

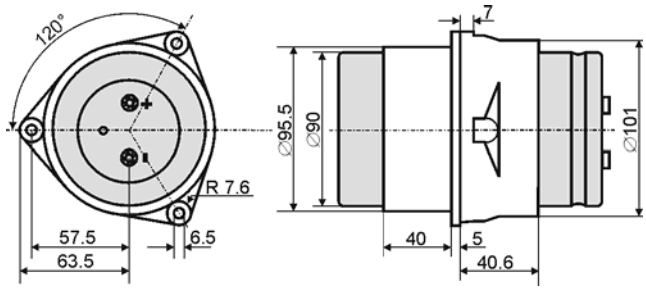
Mounting / Befestigung

►Safety-Holder of PBT / Sicherheitshalter aus PBT

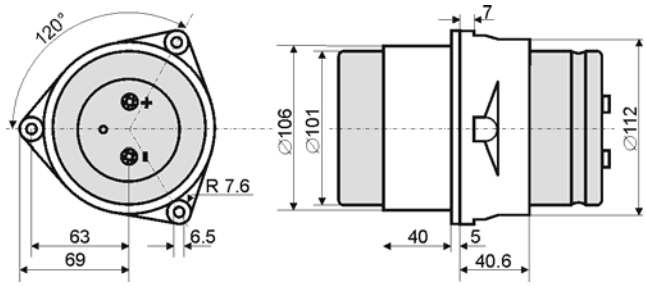
Capacitor fixing symbol code „N“



Product Code: **PBT – 77 – BF** **(for capacitor ØD = 77mm)**



Product Code: **PBT – 90 – BF** **(for capacitor ØD = 90mm)**



Product Code: **PBT – 101** **(for capacitor ØD = 101mm)**

►Features of Safety-Holders
Eigenschaften der Sicherheitshalter

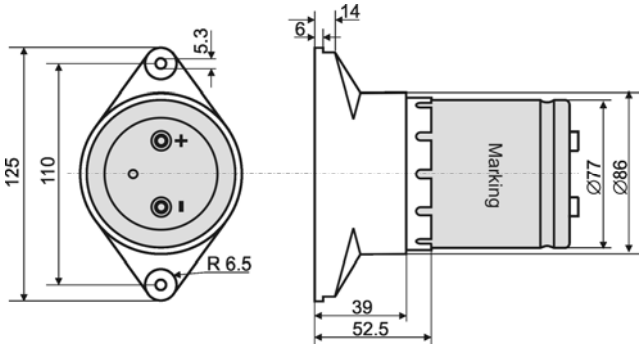
- Better insulation and vibration characteristics compared with metal brackets.
- Flammability: UL 94 V0
- Test insulation voltage: 5.4 kV AC.

- Bessere Isolations- und Vibrationsfestigkeit gegenüber Metallschellen.
- Entflammbarkeit gem. UL 94 V0.
- Prüfisolationsspannung: 5,4 kV AC.

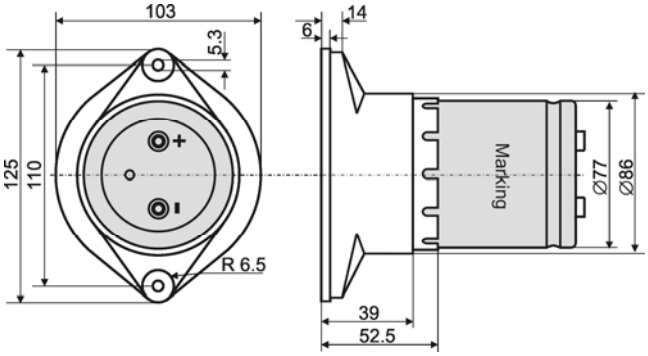
Mounting / Befestigung

►Safety-Holder of PBT for bottom cooling
Sicherheitshalter aus PBT für Bodenkühlung

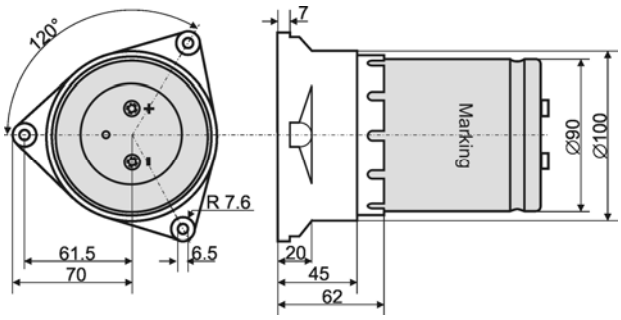
Capacitor fixing symbol code „N“ in addition with „WC“ for series FXR, FXR3 and GXR



Product Code: **PBT – 77 – BC** **(for capacitor ØD = 77mm)**

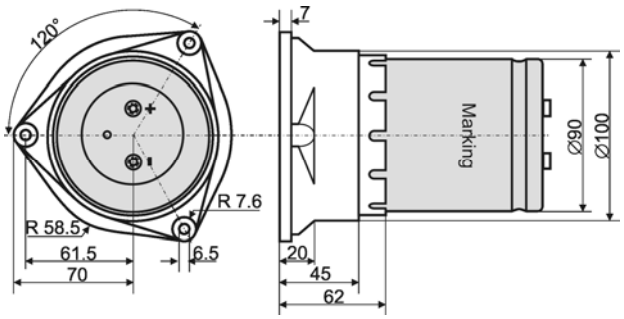


Product Code: **PBT – 77 – BC – UL** **(for capacitor ØD = 77mm, meets creepage distance requirements according to UL)**



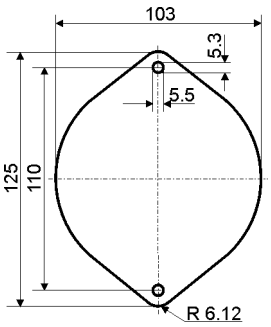
Product Code: **PBT – 90 – BC** **(for capacitor ØD = 90mm)**

Mounting / Befestigung

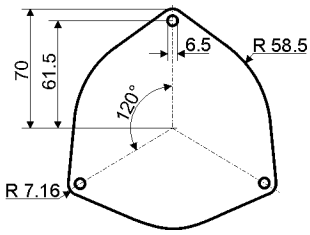


Product Code: **PBT – 90 – BC – UL** **(for capacitor ØD = 90mm, meets creepage distance requirements according to UL)**

►Insulating heat conductive thermal pad for bottom cooling
Isolierende Wärmeleitfolie für Bodenkühlung



Product Code: **PBT – TCFOIL – 77**
(for capacitor ØD = 77mm)



Product Code: **PBT – TCFOIL – 90**
(for capacitor ØD = 90mm)

►Features of thermal pad / Eigenschaften der Wärmeleitfolie

Properties

Thickness (mm)	0.229
Hardness (Shore A)	92
Continuous Use Temperature (°C)	-60 to +180
Dielectric Breakdown Voltage (VAC)	5500
Thermal Conductivity (W/m-K)	1.6

Thermal Performance vs Pressure

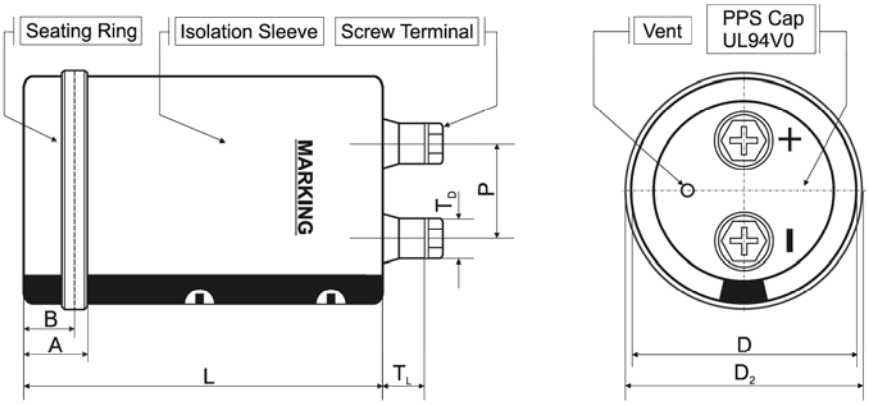
Pressure (psi)	10	25	50	100	200
TO-220 Thermal Performance (°C/W)	3.96	3.41	2.90	2.53	2.32
Thermal Impedance (°C-in^2/W) (I)	0.95	0.75	0.61	0.47	0.41

Above data are values from material supplier.
Diese Daten sind Werte des Materialherstellers.

Mounting / Befestigung

▶ Dimensions of capacitor for bottom cooling
Abmessungen für Kondensator mit Bodenkühlung

Capacitor fixing symbol code „N“ in addition with „WC“ for series FXR and GXR



Ø Capacitor	A	B
ØD = 77mm	24.5	$20.0^{\pm 0.2}$
ØD = 90mm	24.3	$20.0^{\pm 0.5}$

Size in mm. Other dimensions depending on capacitor.

▶ Ripple Current Multiplier depending on Forced Bottom Cooling
Wechselstrommultiplikator in Anhängigkeit von Bodenkühlung

Capacitor series	Temperature of cooling base	Multiplier max.
FXR	≤ 60°C	1.75 *)
	> 60°C	1.00
GXR	≤ 60°C	1.65 *)
	> 60°C	1.00

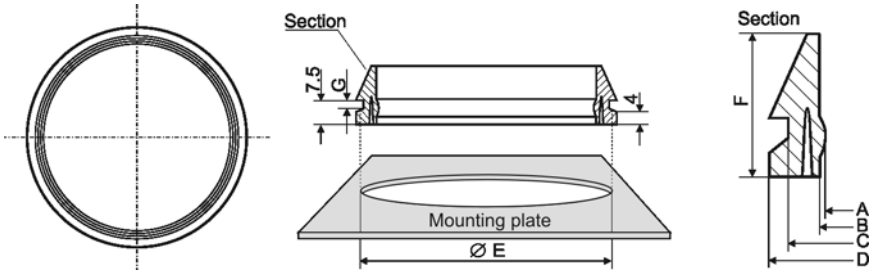
*) I_{RMS} depending on cooling capacity (0.5 °C/W)

Please contact us if you are interested in bottom cooling applications.
Bitte kontaktieren Sie uns bei Interesse an einer Anwendung mit Bodenkühlung.

Mounting / Befestigung

►Press ring of LDPE or TPE for mounting
Einpressring aus LDPE oder TPE zur Befestigung

Capacitor fixing symbol code „N“



Ø Capacitor	A +0.3	B +0.3	C +0.3	D +0.3	E +0.2	F +0.2	G -0.25	Product Code Agree with RoHS
64	62.3	64.1	70.5	74.5	71.2	18.0	3.0	K100 – 64 – BF
77	74.8	77.0	84.5	88.6	85.5	20.0	2.4	K100 – 77
90	88.0	90.0	97.9	102.0	98.6	23.5	3.0	K100 – 90 – BF

Press ring materials which agree with RoHS and UL-94-V0 are available on request. / Size in mm.

►Tightening torques for terminals and mounting options
Anzugsdrehmomente für Anschlüsse und Befestigungen

Mounting option	Screw	Tightening torque		
		Recommended	Min	Max
M5		2.2 Nm	1.5 Nm	3.0 Nm
M6		3.5 Nm	3.0 Nm	4.0 Nm
M6 Screw–in depth	≥ 9 mm	3.5 Nm	3.0 Nm	6.0 Nm
M8		7.5 Nm	7.0 Nm	8.0 Nm

Screw-in-depth for M5 and M6: 10mm, for M8: 13mm max. / Einschraubtiefe für M5 und M6: 10mm, für M8: 13mm max.

Mounting option	Screw	Tightening torque	
		Recommended	Max
Bracket		2.2 Nm	3.0 Nm
PBT-77-BF PBT-77-BC / -UL	M4x20	1.7 Nm	1.9 Nm
PBT-90-BF PBT-90-BC / -UL	M5x25	3.2 Nm	3.4 Nm
PBT-101	M5x25	3.2 Nm	3.4 Nm
Stud bolt	M12x16	10.0 Nm	12.5 Nm*)

*)This value signifies the strength of the bolt. The torque applied to the cap nuts of nylon (Product Code CNN30M12 or CNN38M12) depend on the size of the cap nut and the thickness of mounting plate.

Accessories / Zubehör

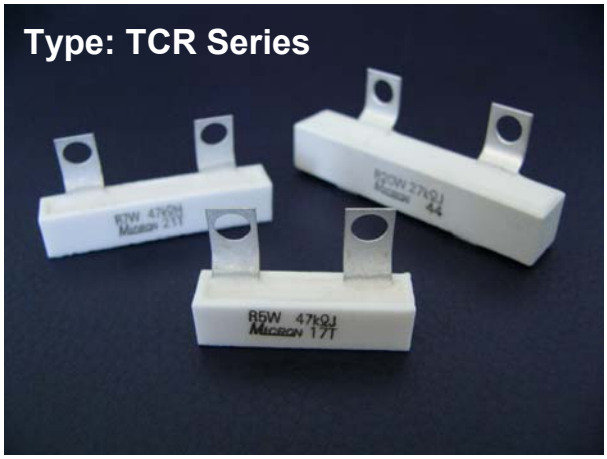
►Balancing Resistors / Symmetriewiderstände

TCR Series

►Type, Rated Power, Resistance,Tolerance
Type, Leistung, Widerstand, Toleranz

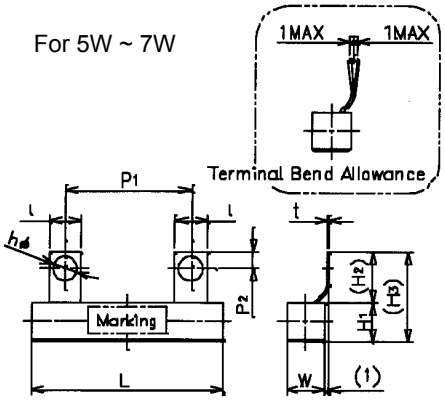
Rated Power	Nominal Resistance Range
5W	100Ω ~ 51kΩ
7W	200Ω ~ 100kΩ
10W	200Ω ~ 150kΩ
15W	510Ω ~ 200kΩ

Resistance Tolerance	
Code	Tolerance
H	± 3%
J	± 5%
K	± 10%

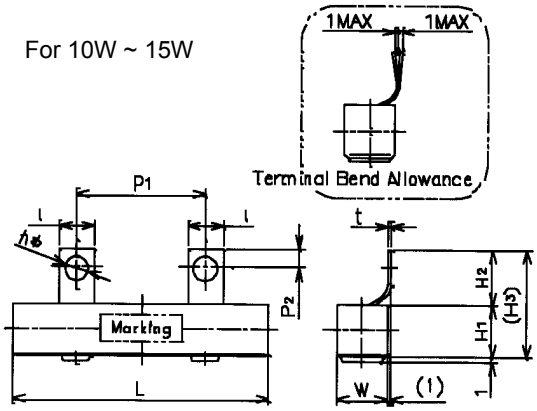


►Shape / Bauform

For 5W ~ 7W



For 10W ~ 15W



►Rated Power, Dimensions / Leistung, Abmessungen

Rated Power	L	W	H1	H2	H3	P1	P2	l	t	hØ
5W	35 ± 1.5	9.5 ± 1	9.5 ± 1	(12.5)	22	22 ± 1	4	8	0.5	6
7W	48 ± 1.5	9.5 ± 1	9.5 ± 1	(12.5)	22	28.6 ± 1	4	8	0.5	6
7W	48 ± 1.5	9.5 ± 1	9.5 ± 1	(12.5)	22	32 ± 1	4	8	0.5	6
10W	48 ± 1.5	12.5 ± 1.2	12.5 ± 1.2	(12.5)	25	28.6 ± 1	4	8	0.5	6
10W	48 ± 1.5	12.5 ± 1.2	12.5 ± 1.2	(12.5)	25	32 ± 1	4	8	0.5	6
15W	48 ± 1.5	12.5 ± 1.2	12.5 ± 1.2	(12.5)	25	32 ± 1	4	8	0.5	6

Size in mm.

►Product Code

Example: TCR 05 M 823 H

- **Element Identification Code**
- **Rated Power** (for instance 5W)
- **Terminal Pitch:** W = 32.0mm, M = 28.6mm, L = 22.0mm
- **Nominal Resistance** (for instance 82×10^3 Ω)
- **Tolerance**

Standard – Typen:

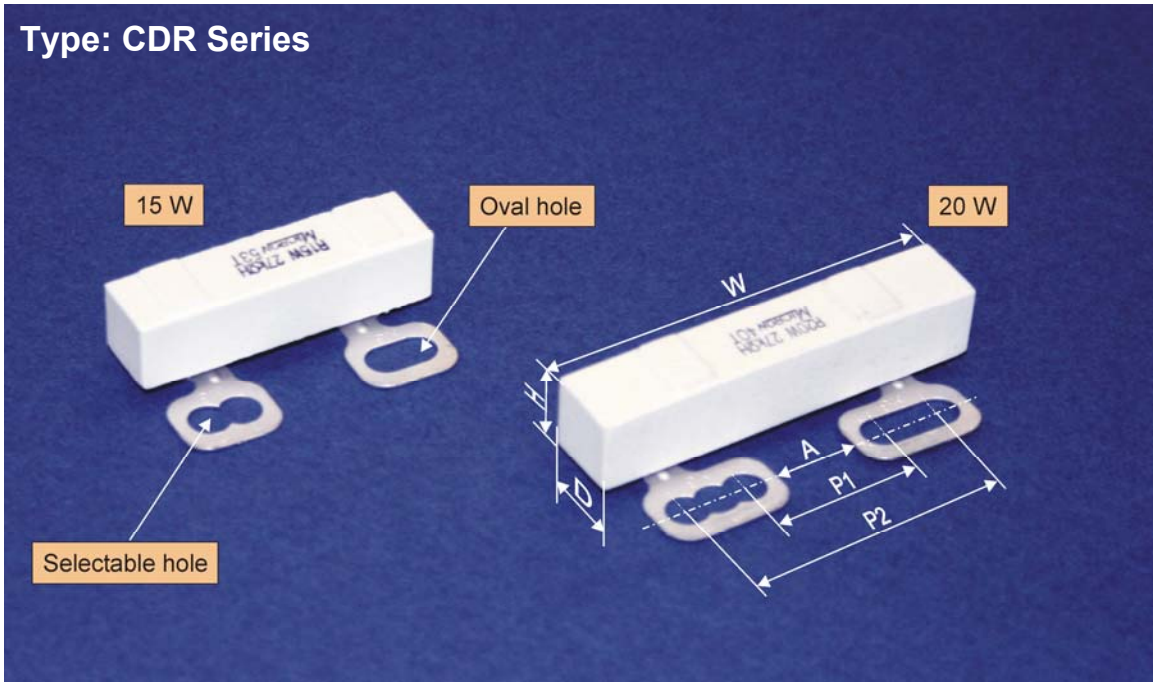
(Other values on request)
(Andere Werte auf Anfrage)

TCR05L823H
TCR05M823H
TCR07L683H
TCR10M683H
TCR10W683H
TCR10M473H
TCR10W473H

Accessories / Zubehör

►Balancing Resistors / Symmetriewiderstände CDR Series

►Type, Rated Power, Resistance,Tolerance
Type, Leistung, Widerstand, Toleranz



TYPE	CDR15N	CDR15L	CDR20N	CDR20L
Capacitor terminal screw	M5	M6	M5	M6
Hole diameter (mm)	5.4±0.3	6.5±0.3	5.4±0.3	6.5±0.3
Pitch dimensions of capacitor (mm)	26.0±1 to 32.0±1		26.0±1 to 41.5±1	
Rated Power	15W (max. voltage 700V DC)		20W (max. voltage 750V DC)	
Resistance Range	510Ω ~ 200kΩ		510Ω ~ 240kΩ	
Tolerance	± 10% (K), ± 5% (J), ± 3% (H)			
Resistor Element	metal oxide film resistor			
H (mm)	16.5 (max. 19.0)			
W (mm)	48.0±1.5		63.5±1.5	
D (mm)	12.5±1.2			
A (mm) terminal gap	13.0±1.2			
P1 (mm) min. pitch	24.0±1.0			
P2 (mm) max. pitch	34.0±1.0		43.5±1.0	
t (Terminal thickness)	0.5mm			

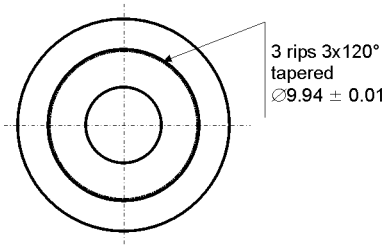
►Product Code

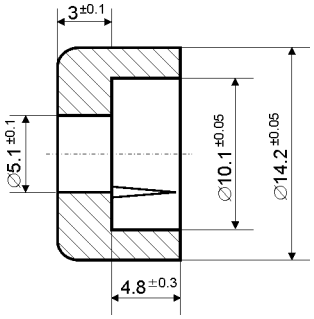
Example: CDR 20N 393 H

- **CDR 20N** → **Element Identification Code (look at table)**
- **393** → **Nominal Resistance** (for instance 39×10^3 Ω)
- **H** → **Tolerance**

Accessories / Zubehör

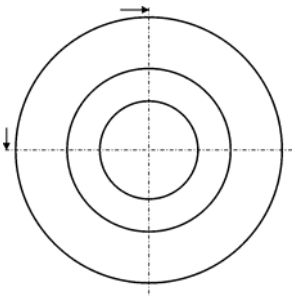
►Spacer cap for M5 terminal of $AlMgSi_1$ (Not for series FXR, GXR)
Distanzkappe für Anschlüsse M5 aus $AlMgSi_1$ (Nicht für die Serien FXR GXR)

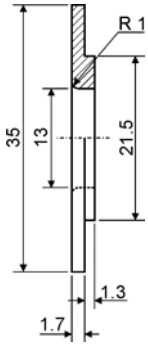




Product Code: **SC3 – 14M5**

►Insulating washer of Polyamide PA 6
Isolierscheibe aus Polyamid PA 6





Product Code: **IWD – 35 – 13 – UL**

Handling Cautions

NOTES TO USERS OF ALUMINUM ELECTROLYTIC CAPACITORS

Before using the products, please read the notes for proper use.

1. Operating environment

- Water, saltwater, oil or other electrically conductive liquid on a capacitor, or using a capacitor when it is damp with dew may cause a failure. Oil on the rubber seal or safety vent may cause a decline in airtightness. Do not use any capacitor in contact with liquid. Do not use capacitors that have been immersed in rainwater or other contaminated water.
- Do not use or leave a capacitor in areas where there is halide compound gas such as hydrogen sulfide, nitrous acid, sulfurous acid, chlorine and bromine, ammonia or other hazardous gas. The ingress of any of these gases into a capacitor may corrode it.
- Do not use or leave a capacitor in an area exposed to ozone, ultraviolet light or radiation.
- Powders (dust, etc.) that settle between terminals can absorb moisture and cause corrosion and tracking of the terminal. When there is conspicuous dust between terminals, stop the current, allow the capacitor to discharge and wipe the terminals with paper or a towel lightly dampened with water or ethanol. Do not use cleaning agents or other chemicals.
- Do not use a capacitor in an area subject to excessive vibration or impact.

2. Operating conditions

2.1. Operating temperature, ripple current

- Check the operating and installation environment and use the capacitor within the range of the rated performance specified in the catalog or specifications.
- Maintain operating temperature and ripple current within the specified ranges. Base your choice of capacitors on the maximum load conditions. A capacitor will overheat under excessive current, potentially resulting in short circuit, fire or other major failure.
- A capacitor also generates the self-heating. Please bear in mind that the capacitor heats up the interior of the equipment and take appropriate precautions. Operate the unit under normal conditions and check the temperature of the area surrounding the capacitor.
- The permissible ripple current declines with the rise in ambient temperature (the temperature of the capacitor's surroundings). Consider the permissible ripple current at the maximum predictable ambient temperature.
- Electric characteristics change as frequencies change. Check frequency changes in order to choose the right capacitor.

2.2. Applied voltage and other operating conditions

- In general, capacitors have polarity. Applying reverse voltage or AC voltage to a capacitor may activate the vent or cause a short circuit, fire or other major failure.
- Use a bipolar capacitor for circuits whose polarity reverses. However, as in any other case, do not use a bipolar capacitor in an AC circuit. Use a special AC capacitor for AC voltage.
- Do not apply voltage in excess of the rated voltage. When an AC voltage is superimposed on DC voltage, prevent the peak value from exceeding the rated voltage. Excessive voltage may cause a short circuit, fire or other major failure.
- Specifications on surge voltage have restricted conditions and therefore do not guarantee long hours of operation. Voltage should never exceed the rated voltage of the capacitor, even for brief periods. Choose your capacitor accordingly.
- When connecting more than one capacitor in parallel, give proper consideration to the resistance of the wiring. Establish the connections so that the wiring resistance will be equal at every capacitor.
- When connecting more than one capacitor in series, all must be of identical rating, then the balancing resistors connected in parallel. At that time, design the circuit so that equal voltage levels are applied to all the capacitors. Ascertain that the voltage applied to each individual capacitor does not exceed its rated voltage.
- The balancing resistors are connected in parallel to each capacitor and do all have an equivalent value of resistance apart from their technical conditioned tolerance.
- The worst circumstance is given if the capacitor with the highest leakage current is applied to the most negatively tolerance attributed balancing resistor.
- Concerning the rating of balancing resistors the following points are essential:
  - number of series connected capacitors
  - Ratio of rated voltage of capacitors to bus voltage (voltage over C-battery)
  - Minimum leakage current of capacitors
  - Maximum leakage current of capacitors
  - Tolerance of balancing resistors

- To use preferably high-resistance resistors, which cause smaller power losses, their tolerance has to be small (≤ 3%).
- Due to the minimum leakage current of Hitachi capacitors this is defined for the series connection of two capacitors while the voltage derating is ≥ 5%:

	V_r ≤ 450VDC		V_r > 450VDC	
T_a	C ≤ 8200µF	C > 8200µF	C ≤ 5600µF	C > 5600µF
< 40°C	R = 82 kΩ	R = 68 kΩ	R = 68 kΩ	R = 47 kΩ
40°C – 70°C	R = 68 kΩ	R = 47 kΩ	R = 47 kΩ	R = 47 kΩ
> 70°C	R = 47 kΩ	R = 47 kΩ	R = 47 kΩ	R = 27 kΩ

- Take into account the service life of the equipment in the use of the capacitor. Use of the capacitor beyond its service life risks such failures as safety vent activation or short circuit. Replace as necessary at regular inspection.
- Do not use a capacitor for a circuit that is quickly charged and discharged repeatedly. Use a dedicated capacitor for an application like a welding unit or photo flash charging/discharging. Consult us for selecting the proper capacitor, since the control circuits of certain rotation equipment, like servo motors, charge and discharge repeatedly.
- Even slow charging/discharging can shorten the service life of a capacitor, resulting in premature failure, where there are marked changes in voltage. Check the installation in your equipment carefully and consult us.
- General purpose capacitors should not be used for a circuit involving rapid charge and discharge or an AC circuit. Capacitors specially made for such applications should be used. Check the self-heating of the capacitor used in such a circuit in addition to the types and levels to be imposed to the capacitor of the rapid charge/discharge, rush current and voltage.

3. Installation

3.1. Before installation

- Check the specifications of the capacitors and install them within the prescribed specifications.
- Do not reverse the polarity. Do not use a capacitor where reverse voltage is applied, even if it appears problemfree. Not taking these precautions could lead to a major failure.
- Dropping or otherwise impacting a capacitor may result in a decline in its electric performance, causing a failure. Do not use any capacitor whose packaging has a noticeable abnormality on delivery.
- Do not distort the shape of the capacitor, which may lead the major failures such as liquid leakage or short circuit.

3.2. Installation method

- Do not install wiring or a circuit pattern near the vent. When the vent is activated, electrolyte may spurt out resulting in short circuit followed by fire or other secondary hazard due to tracking or migration.
- Do not lay out heat-generating components near the capacitor. Radiated heat and other partially high temperatures may shorten the life of the capacitor. PCB temperature that is higher than the internal temperatures of the capacitor markedly hinders the dissipation of heat inside the capacitor, greatly shortening its life. When designing equipment, check temperature distribution first.
- When installing the vent of the capacitor against the PCB, drill a gas bleeder hole to allow the gas to escape when the vent is activated. If the diffusion of gas is hindered while the vent is in operation, the internal pressure can rise, with danger of explosion, fire or other serious failure.

3.2.1. Snap mount type capacitors

- Do not connect the blank terminal (reinforced terminal) of multi-terminal (3-, 4-) snap mount capacitors, as this could cause a short circuit.
- Use a completely isolated circuit between the case and the electrode terminal, and between the case and the circuit pattern.
- Do not hinder the activation of the vent. Allow for the following clearance above the vent. If dissipation of gas is inhibited while the vent is in operation, the inner pressure will rise, with danger of explosion, fire or other major failure.

Capacitor diameter	Clearance
Ø 16 ~ 35	3mm or more
Ø 40 or more	5mm or more

- Solder at 260°C for not more than 10 seconds (in the case of dip) or at 380°C for not more than 3 seconds (in the case of tip of iron). Exceeding these specifications may result in a decline in electrical performance, leading to trouble. Do not let the tip of the soldering iron come in contact with the capacitor body.
- If it becomes necessary to remove a capacitor after soldering, melt the solder with a soldering iron to avoid subjecting the terminals to stress.
- Flux on the rubber seal may result in corrosion. Do not flux stick to any part other than the terminals.

3.2.2. Screw-terminal type capacitors

- Following mounting positions are recommended for screw type capacitors:
  - upright (vertical), terminals side face upwards
  - on the side (horizontal), anode above cathode terminal
  - on the side (horizontal), vent faces upwards
- The upside-down position (terminals face downwards) should not be used. If a capacitor is installed sideways, please put anode terminal or vent upward.
- Screw type capacitors with stud bolt mounting must be fixed insulated.
- Please refer to “Tightening torques for terminals and mounting options” for further notes.
- If a terminal screw is loose or angled, that portion generates heat, with a danger of fire or other serious failure. Check that the screw is inserted on the perpendicular and securely tightened.
- We recommend a bar hole diameter of 6mm for M5 terminals. An excessively large hole diameter may result in poor contact between the terminal surface and the bar, causing local heat buildup, with a danger of fire or other serious failure.
- Do not apply physical stress (tightening with fixtures, etc.) to the curled portion (seal contacting the case and cap). Any such practice may cause a liquid leak or sleeve breakage.

4. About washing PCB and fixative

- In washing, please avoid using a material which destroys the ozone layer.
- For cleaning flux, we recommend an aqueous or higher alcohol detergent or isopropyl alcohol. The recommended concentration of flux with regard to the cleaning agent is 2wt% or less. Excessively high flux concentration may cause corrosion due to halide. For use of other cleaning agents, consult us.
- If you must clean the capacitor with halogen solvents, etc., we recommend that you use washable capacitors. Make sure that the cleaning conditions are within those stipulated in the specifications, and measure the cleaning agent for conductivity, pH, specific gravity and moisture content for contamination control. After cleaning, thoroughly dry the capacitors together with PCBs. Do not store the capacitors in the same atmosphere as the cleaning agent or in a sealed container. For details on washable capacitors, consult us.
- Thoroughly remove all traces of the cleaning agent from the capacitor. Even when not cleaning the flux, dry the flux itself. Cleaning agent or flux residue may cause the halide to penetrate the rubber seal, leading to corrosion.
- When fixing a PCB and capacitor with a coating agent or fixative, use a substance completely free of halide compounds. Thoroughly dry the flux or detergent before applying the coating. Do not let the coating block the entire surface of the seal. Any halide compound present in the coating may lead to corrosion.

5. Storage

- Store all capacitors indoors at a temperature of 5-35°C and relative humidity of not more than 75%RH (25°C), away from direct sunlight. Store capacitors in their original packaging whenever possible.
- The base shelf life of capacitors is 3 years. The useful shelf life of capacitors is 5 years under proper storing conditions.
- Capacitors which have been on the shelf for more than 3-5 years may have high leakage current. Treat them with appropriate voltage before using. As treating method, we recommend the past forming process as below at room temperature:
  1. Firstly, 80% of rated voltage applied and keep 1 hour after reaching 80% of rated voltage.
  2. Secondarily, 90% of rated voltage applied and keep 1 hour after reaching 90% of rated voltage.
  3. Finally, 100% of rated voltage applied and keep 1 hour after reaching 100% of rated voltage.
- Even after discharged, capacitors may hold an electrical charge due to re-striking. Do not touch the terminals with bare hands. Touching the terminals could cause an electric shock. Discharge all capacitors with a resistor (approx. 1kΩ) or a discharge plate before use.

6. About fumigation

- To control insects during export, fumigation may be done using halide compounds such as methyl bromide. Direct fumigation of capacitors or equipment incorporating capacitors or use of fumigated timber as a pallet may cause corrosion inside a capacitor, resulting in failure. Even when covered in plastic, chemicals may penetrate through small gaps. Likewise, do not apply insecticides directly on or near the capacitors.
- When using a sterilizer against infectious diseases, do not spray it directly on or close to capacitors and equipment incorporating capacitors. Some sterilizers contain a high concentration of halide compounds. The sterilizer spray may accelerate internal corrosion, resulting in failure.

7. Miscellaneous

7.1. Maintenance and servicing

- Conduct periodic checkups on capacitors for industrial equipment. Before each periodic checkup, turn off the equipment and completely discharge the capacitor. Follow these checkpoints:
  1. Appearance: condition of the vent (open, notably swollen), liquid leaks or other considerable abnormality.
  2. Electrical performance: capacity, tangent of loss angle, leakage current, and other items specified in the delivery specifications.
     The standard temperature for measuring electrical performance is 20°C. Leave the capacitor at 20°C and wait for the inside of the capacitor to reach the specified temperature before taking measurements.
- Please ask us the advisability of using capacitor which is inspected.
- Replace all capacitors whose service life has reached its end. When replacing one capacitor, always replace all of them. Mixing old and new capacitors may cause an imbalance in the ripple current or voltage sharing, risking failures such as activation of the vent or short circuit.

7.2. In an emergency

- If gas is detected while a product is in use, turn off the main power supply or unplug it.
- When the safety vent of a capacitor is activated, a hot gas exceeding 100°C will escape. Do not place your face in close proximity to the vent and avoid proximity to areas exposed to the gas.
- Should the gas jet get in your eyes, wash them immediately with clean water. If you inhale the gas, gargle immediately. The gas is composed of a gaseous form of hydrogen or organic solvents.
- Should the electrolyte come in contact with your skin, wash with soap and water. Never put it into your mouth.

7.3. For scrapping

- Scrapped capacitors are classified as scrapped metal. For disposal they are handled as controllable industrial waste because of the nature of the contents (electrolyte). Most of the material is aluminum and cannot be completely burned.

7.4. Remarks

- For details, see the Guidelines on the Operation of Fixed Aluminum Electrolytic Capacitors for Electronic Equipment EIAJ RCR-2367B March, 2002 issue.
- Specifications are subject to change without prior notice for product improvement.

8. Quality and useful life

- The specification of quality data – which always refers to a fairly large number of components – does not constitute a guarantee of characteristics or properties in the legal sense. However, agreement on the specifications does not mean that the customer may not claim for replacement of individual defective capacitors within the terms of delivery. We cannot, however, assume any further liability beyond the replacement of defective components. This applies in particular to any further consequences of component failure.
- Furthermore, it must be taken into consideration that the figures stated for useful life and failure rate refer to the average production status and are therefore to be understood as mean values (statistical expectations) for a large number of delivery lots of identical capacitors. These figures are based on application experience and data obtained from preceding tests under normal conditions, or for purposes of accelerated aging – more severe conditions.

9. Glossary

V_r	Rated voltage
I_r	Ripple current
I_L	Leakage current
T_a	Ambient temperature
ESR	Equivalent Series Resistance
ESL	Capacitor self-inductance
Z	Impedance
DC	Direct Current
RMS	Root mean square (e.g. of ripple current)

AIC EUROPE

Hitachi Capacitors - Technical Inquiry

Please fill in your application details and either fax to: +49 (0) 2151-4943-80 or Email to: info@aic-europe.com. Please call telephone no. +49 (0) 2151-4943-5 if you have any questions.

Contact Details

Contact Name _____ Address _____

Company _____ _____

Email _____ _____

Telephone no. _____ _____

Capacitor Details

Capacitance [µF] _____

Rated Voltage [V] _____

Case ø [mm] _____

Case length [mm] _____

Snap-in terminal

2pin x 6.3mm ____

2pin x 4.0mm ____

3pin x 4.0mm ____

4pin x 6.3mm ____

4pin x 4.0mm ____

Screw terminal

Screw thread: M5 ____ M6 ____

Mounting:

Plain can – metal bracket ____

Plain can – PBT holder ____

Stud bolt can ____

Application details

Ambient temperature around capacitors Ta [°C] _____ Forced air [m/s] _____

Life required @ U_n, T_a, I_1+I_2 [khrs] _____ Heatsink [°C/W] _____

Bank configuration

Total number _____

Number in series _____

Number in parallel _____

Operating Conditions (Bank)

Normal bus voltage Un [V] _____ Surge voltage U_s [V] _____ durations _____ Cycles during life _____

Ripple current I_1 [Arms] _____ Frequency F_1 [Hz] _____

Ripple current I_2 [Arms] _____ Frequency F_2 [Hz] _____

Charge – discharge applications

Maximum charge voltage [V]_____ Minimum discharge voltage [V] _____ Discharge current [A] _____

Charge time [s]_____ Discharge time [s] _____ Time on charge [s] _____ Cycle frequency [Hz] _____

Notes

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Edition 2014 Fotos: Sven Hoppe, Thaut Images@fotolia.com