ZEZ SILKO
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CAPACITORS FOR POWER ELECTRONICS

Power capacitors

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COMPANY PROFILE

ZEZ SILKO s.r.o. is a reputable manufacturer of power capacitors, capacitors for power electronics, capacitors for induction heating and many other capacitor types. Company ZEZ SILKO s.r.o. provides complete power factor correction service including: power system evaluation including harmonic analysis, technical and commercial quotations, capacitor banks production and commissioning. Components for power factor correction and regulation of electrical energy are also supplied. ZEZ SILKO products are being exported to countries all around the world. They are for use on traction systems (locomotives, trams, trolleybuses), green energy generation (wind and photovoltaic power plants), energy sector (power factor correction) and also induction heating equipment. ZEZ SILKO s.r.o. has always been and will continue to be your reliable business partner.

European manufacturer of capacitors

Tradition of capacitor production since 1930

Emphasis to quality of products

Quality control system (ISO 9001) since 1999

IRIS certification since 2014

Products are exported to countries all around the world

BUREAU VERITAS Certification

Certificate

ZEZ SILKO, s.r.o.

ČSN EN ISO 9001:2016

DEVELOPMENT, PRODUCTION, SALE AND SERVICE OF POWER CAPACITORS AND INDUCTORS.
PRODUCTION OF SWITCHGEAR CABINETS AND METAL PARTS.
DESIGN, PRODUCTION, INSTALLATION AND SERVICE IN A BRANCH OF THE POWER FACTOR COMPENSATION.
SALE OF COMPONENTS FOR POWER ELETRONICS.

IAF

S 3100

POWER ELECTRONICS

Applications

Energy - Production and distribution of electricity

- Wind power plant
- Photovoltaic power plant
- ESS - Energy Storage Systems
- UPS - Uninterruptible Power Supply/Source

Industry

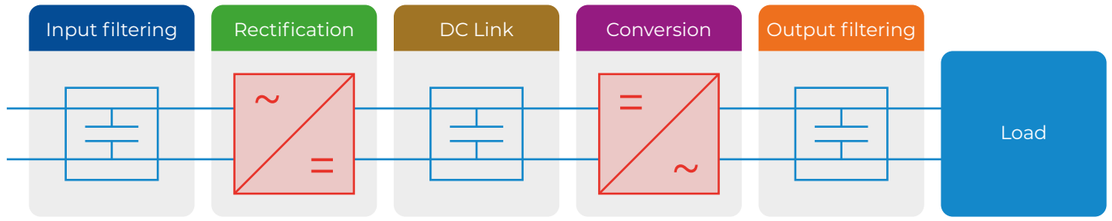
- Machinery - Drives of industrial lines and equipment
- Oil and mining industry

Transport

- Railway traction vehicles - Electric trains
- Trams, Trolleybuses, Metro
- Electric and hybrid buses

Others

- Medical equipment, Laboratory, etc.



DC link capacitors

› DC filters of power converters

Voltage: up to 3 kV DC
Capacitance: up to 4 500 µF
Low stray inductance

AC filter capacitors

› Power converters (AC current filtering)

Voltage: up to 3,5 kV
Capacitance: up to 600 µF
Overpressure disconnector

Snubber capacitors

› Semiconductors protection (IGBT, SCR)

Voltage: up to 10 kV DC
Capacitance: up to 60 µF
Extremely low stray inductance

DC link capacitors

› DC filters of power converters

Voltage: up to 6 kV DC
Capacitance: up to 20 000 µF
Low stray inductance

Standards

- **IEC 61071** – Capacitors for power electronics
- **IEC 61881** – Railways applications - Capacitors for power electronics
- **EN 61373** – Railways applications - Shock and vibration tests
- **EN 45545** – Railways applications - Fire protection on railway vehicle
- **UL 810** – US standard for capacitors

Design

MKP capacitors uses polypropylene film as the dielectric, which excels in low dielectric loss. PP film is metalized with a thin layer of zinc-aluminium alloy. Two layers of metalized film are wound into cylindrical windings. Flat sides of windings are contacted with zinc layer ensuring connection to terminals.

Special structure of winding ensures feature called “self-healing”. In the event of voltage breakdown, the metal layer is evaporated around the breakdown channel in very short time. Thanks to evaporation, no conductive channel is created between both metal layers and capacitor remains in full functionality.

Case

Most of our capacitors - cylindrical DC Link capacitors, AC filters, some types of rectangular DC Link or impulse capacitors - are cased in aluminium can. Other bigger rectangular capacitors may be encapsulated in stainless steel can. Plastic housing is mainly used for snubber or impulse capacitors.

PU resin

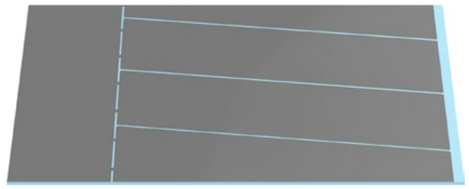
Winding elements are very vulnerable to humidity, oxygen and other environmental interferences. Therefore capacitors are filled with PU resin to protect winding elements from entering by air environmental interferences. As a result, is extension of lifetime of capacitor. On top of that resin also keeps winding elements mechanically safe and fixed against any vibrations.

Dry system

No impregnation is used for metalized polypropylene film.

Safety System

Segmented film



Segmented film offers one of the most important internal protective mechanism that ensures safe operation through the lifetime, ageing and during overload of the capacitor. Special segmented metallization feature fuse gates protect capacitor element from internal faults in case of improper self-healing caused by weak spots in PP film. Fuse gates are limiting current flowing into the weak spot and disconnects particular segment. Which protects winding element from destruction. Depending on rated voltage and type of foil, different segments are used. Capacitance decrease takes place when the capacitor is on the edge of its lifetime. Segmented film is used in DC applications.

Overpressure disconnector

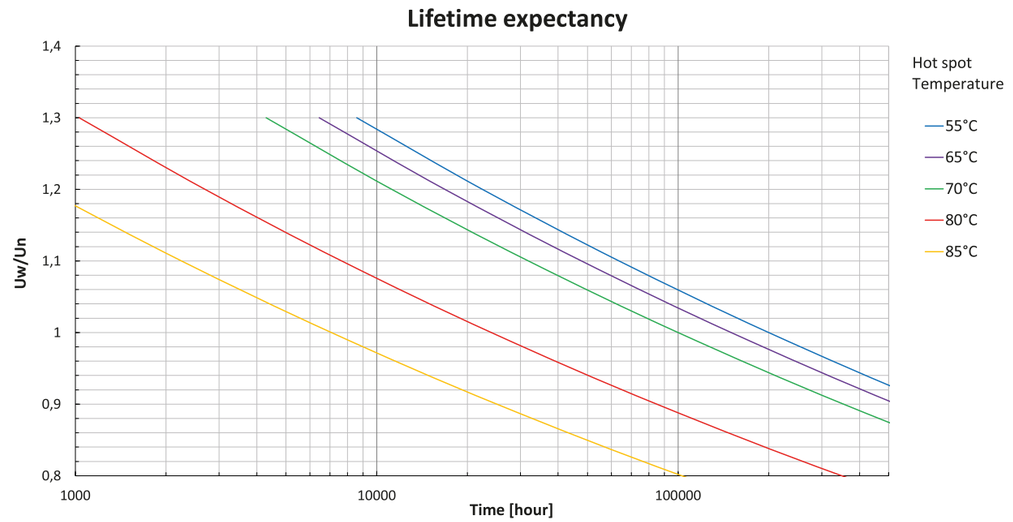
There is an attenuated spot at internal wiring of the capacitor. When pressure starts to increase, case expands. Pressure is forced to push the lid, where terminals are placed. Expansion of the lid cause separation of connecting wires at attenuated spot and capacitor disconnects. Only AC filters capacitors use overpressure disconnector.

Pressure switch

Pressure switch might be used for capacitors with hermetical housing. When self-healing system fails, surge of temperature and pressure occurs and the capacitor might tear up. Overpressure sensor detects the surge of pressure and provides signal which shall be used for safety circuit and disconnection of capacitor. Sensor contains NC or NO switch. Switch is activated when overpressure reaches 0,3-0,5 bar. Switching voltage and current up to 250 V and 5 A.

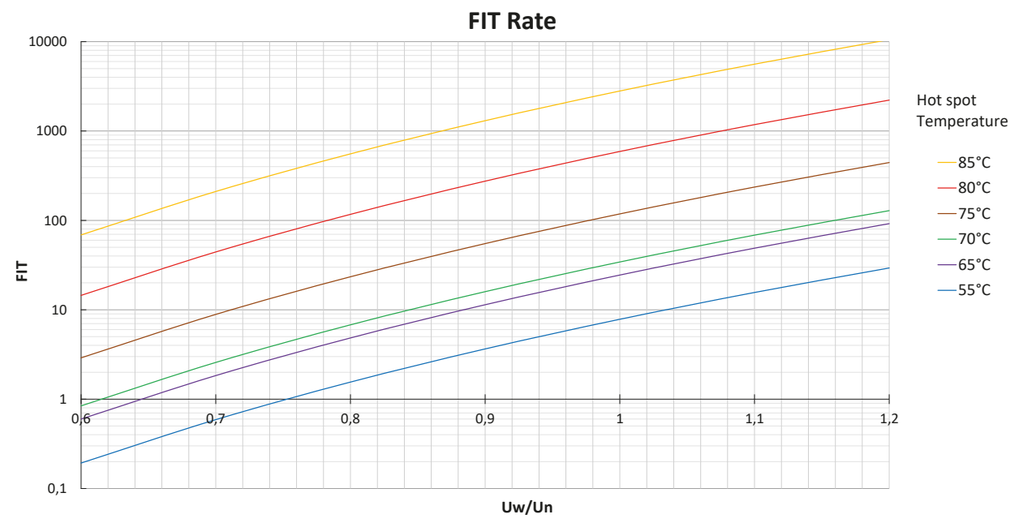
Lifetime

Capacitor lifetime depends strongly on hotspot temperature and working voltage. The higher the hotspot temperature and the voltage is, the lifetime decreases exponentially. Hotspot temperature is linked with current load of the capacitor. Lifetime expectancy, described in graph below, is calculated according to previous experiments, long-time experiences and theoretical predictions. Graph is theoretical curve and lifetime of different types of capacitors may vary. Standard designed lifetime is 100.000 hours at hot spot temperature 70°C.



FIT Rate

FIT (failures in time) represents probability of failure during operating procedure under specific conditions. In the other word, it provides information about what can we expect when capacitor is overloaded. It is statistic value calculated from long-time experiences and theoretical predictions. FIT rate depends mainly on working hot spot temperature and applied working voltage but of course also on capacitor design itself.



DC Link Capacitors

General technical parameters

Rated voltage	500 V - 3000 V DC
Rated capacitance	25 µF – 4 500 µF
Capacitance tolerance	±10 %
Voltage test between terminals	1,5 x U_N DC/10 s
Mounting position	Any
Case temperature	-40/85 °C
Storage temperature	-40/85 °C
Hot spot	max 85 °C
Lifetime expectancy	100 000 - 200 000 h
FIT	50
Case	Aluminium

Standard types

(other parameters on request)

U_N = 600 V DC U_r = 100 V U_s = 900 V

C_N (µF)	Type	I (A)	Î (kA)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x H (mm)	m (kg)	Drw. No.
750	PVAJP 24 - 0,6/750	30	3,1	9,3	1,3	4,1	55	85 x 110	0,7	1
1080	PVAJP 24 - 0,6/1080	60	7,3	20	1,0	2,6	40	85 x 157	1,1	1
1300	PVAJP 24 - 0,6/1300	60	7,3	20	1,1	2,5	50	85 x 185	1,3	1
2100	PVAJP 34 - 0,6/2100	80	14,0	42	2,2	2,3	40	116 x 165	2,0	2
3150	PVAJP 34 - 0,6/3150	100	21,0	63	1,7	1,7	60	116 x 230	2,8	2
4200	PVAJP 34 - 0,6/4200	100	28,0	70	1,3	1,4	70	116 x 295	3,6	2

U_N = 900 V DC U_r = 200 V U_s = 1350 V

C_N (µF)	Type	I (A)	Î (kA)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x H (mm)	m (kg)	Drw. No.
200	PVAJP 24 - 0,9/200	35	2,6	7,3	1,3	4,9	50	85 x 100	0,7	1
460	PVAJP 24 - 0,9/460	60	4,2	12,0	1,3	2,6	25	85 x 138	1,0	1
610	PVAJP 24 - 0,9/610	60	5,6	16,6	1,1	3,5	45	85 x 157	1,1	1
900	PVAJP 24 - 0,9/900	60	3,2	9,6	1,6	2,2	55	85 x 234	1,6	1
960	PVAJP 341 - 0,9/960	80	3,9	15,0	1,3	2,4	40	116 x 145	1,8	2
1000	PVAJP 34 - 0,9/1000	80	8,8	16,0	0,9	2,3	60	116 x 165	2,0	2
1500	PVAJP 34 - 0,9/1500	100	14,8	40,0	0,7	1,7	60	116 x 230	2,8	2
2000	PVAJP 34 - 0,9/2000	100	18,0	50,0	0,6	1,4	70	116 x 295	3,6	2

U_N = 1100 V DC U_r = 200 V U_s = 1650 V

C_N (µF)	Type	I (A)	Î (kA)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x H (mm)	m (kg)	Drw. No.
415	PVAJP 24 - 1,1/415	60	3,5	18,0	1,5	2,2	50	85 x 138	1,0	1
420	PVAJP 242 - 1,1/420	60	3,6	8,0	1,3	2,6	50	85 x 157	1,1	1
500	PVAJP 240 - 1,1/500	60	3,6	10,8	2,2	2,5	50	85 x 185	1,3	1
680	PVAJP 24 - 1,1/680	60	3,7	18,0	1,5	2,2	55	85 x 234	1,6	1
800	PVAJP 341 - 1,1/800	80	3,8	11,4	1,2	2,4	35	116 x 145	1,8	2
1200	PVAJP 34 - 1,1/1200	100	12,0	30,0	0,7	1,7	60	116 x 230	2,8	2
1600	PVAJP 34 - 1,1/1600	100	16,0	45,0	0,6	1,4	70	116 x 295	3,6	2

U_N = 1300 V DC U_r = 200 V U_s = 1950 V

C_N (µF)	Type	I (A)	Î (kA)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x H (mm)	m (kg)	Drw. No.
270	PVAJP 24 - 1,3/270	60	2,8	7,8	1,6	3,3	45	85 x 138	1,0	1
290	PVAJP 24 - 1,3/290	60	4,0	12,0	1,2	3,1	40	85 x 157	1,1	1
320	PVAJP 24 - 1,3/320	60	3,9	10,7	1,5	2,8	60	85 x 185	1,3	1
450	PVAJP 24 - 1,3/450	60	4,0	12,0	1,8	2,2	55	85 x 234	1,6	1
550	PVAJP 341 - 1,3/550	80	3,3	8,6	1,5	1,3	40	116 x 145	1,8	2
820	PVAJP 34 - 1,3/820	100	8,2	24,0	0,7	1,7	60	116 x 230	2,8	2
1100	PVAJP 34 - 1,3/1100	100	14,0	38,0	0,7	1,3	75	116 x 295	3,6	2

U_N = 1500 V DC U_r = 200 V U_s = 2250 V

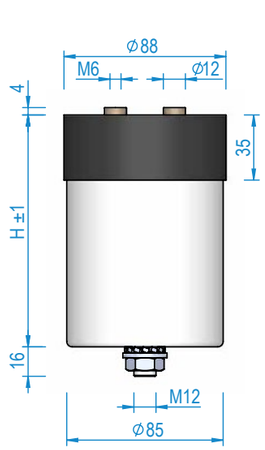
C_N (µF)	Type	I (A)	Î (kA)	I_s (kA)	R_s (mΩ)	R_{TH} (K/W)	L_s (nH)	D x H (mm)	m (kg)	Drw. No.
200	PVAJP 24 - 1,5/200	50	3,8	11,4	1,5	3,3	50	85 x 138	1,0	1
210	PVAJP 24 - 1,5/210	60	3,2	9,6	1,3	3,1	40	85 x 157	1,1	1
250	PVAJP 24 - 1,5/250	60	3,2	9,6	1,5	2,8	60	85 x 185	1,3	1
350	PVAJP 24 - 1,5/350	60	16,0	44,0	1,7	2,2	55	85 x 234	1,6	1
400	PVAJP 341 - 1,5/400	80	2,9	7,5	2,1	2,3	30	116 x 145	1,8	2
430	PVAJP 34 - 1,5/430	60	4,0	12,0	1,2	2,3	55	116 x 136	2,0	2
615	PVAJP 34 - 1,5/615	100	6,2	18,0	0,8	1,7	60	116 x 230	2,8	2
820	PVAJP 34 - 1,5/820	100	8,2	24,0	0,7	1,4	70	116 x 295	3,6	2

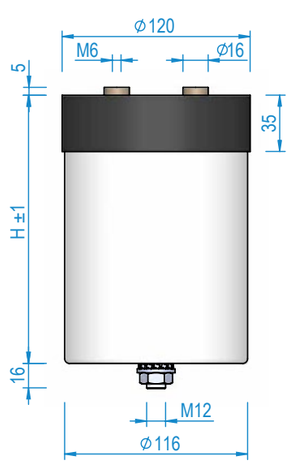
U_N = 1800 V DC U_r = 250 V U_s = 2700 V

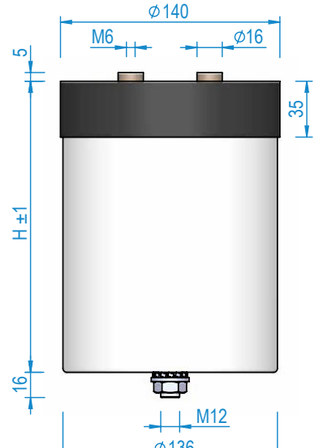
C_N (µF)	Type	I (A)	Î (kA)	I_s (kA)	R_s (mΩ)	R_{TH} (K/W)	L_s (nH)	D x H (mm)	m (kg)	Drw. No.
210	PVAJP 34 - 1,8/210	70	2,7	6,3	0,9	2,3	40	116 x 165	1,8	2
295	PVAJP 34 - 1,8/295	80	5,3	15,0	0,8	2,3	55	116 x 165	2,0	2
900	PVAJP 44 - 1,8/900	60	7,5	21,0	1,0	1,1	75	136 x 295	4,8	3

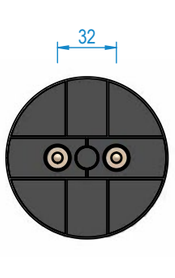
U_N = 3000 V DC U_r = 250 V U_s = 4500 V

C_N (µF)	Type	I (A)	Î (kA)	I_s (kA)	R_s (mΩ)	R_{TH} (K/W)	L_s (nH)	D x H (mm)	m (kg)	Drw. No.
300	PVAJP 44 - 3/300	60	7,6	23,0	1,0	1,1	70	136 x 295	4,8	3

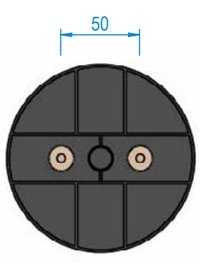




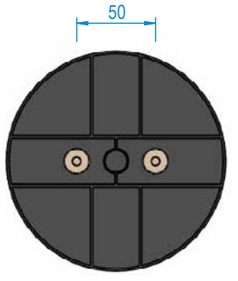




Drawing 1



Drawing 2



Drawing 3

Low Inductance DC Link Capacitors

General technical parameters

Rated voltage	600 V - 2000 V DC
Rated capacitance	10 µF – 500 µF
Capacitance tolerance	±10 %
Voltage test between terminals	1,5 x U_N DC/10 s
Mounting position	Any
Case temperature	-40/85 °C
Storage temperature	-40/85 °C
Hot spot	max 85 °C
Lifetime expectancy	100 000 h
FIT	50
Case	Plastic - PA
Terminal	M8 – bolt terminal F8 – inner thread

HC – low self-inductance design, grinded bottom

Additional cooling with mounting at bottom on heatsink is necessary for max current load.

Standard types

(other parameters on request)

U_N = 600 V DC

C_N (µF)	Type	U_r (V)	I (A)	Î (kA)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x H (mm)	m (kg)
300	PVDJP 311 - 0,6/300-M8-HC	100	100	3,5	9,8	0,8	8,0	20	85 x 51	0,4
400	PVDJP 312 - 0,6/400-M8-HC	100	100	3,7	10,4	1,0	7,2	20	85 x 64	0,5
450	PVDJP 313 - 0,6/450-M8	100	80	3,8	10,6	1,3	5,6	35	85 x 76	0,6

U_N = 900 V DC

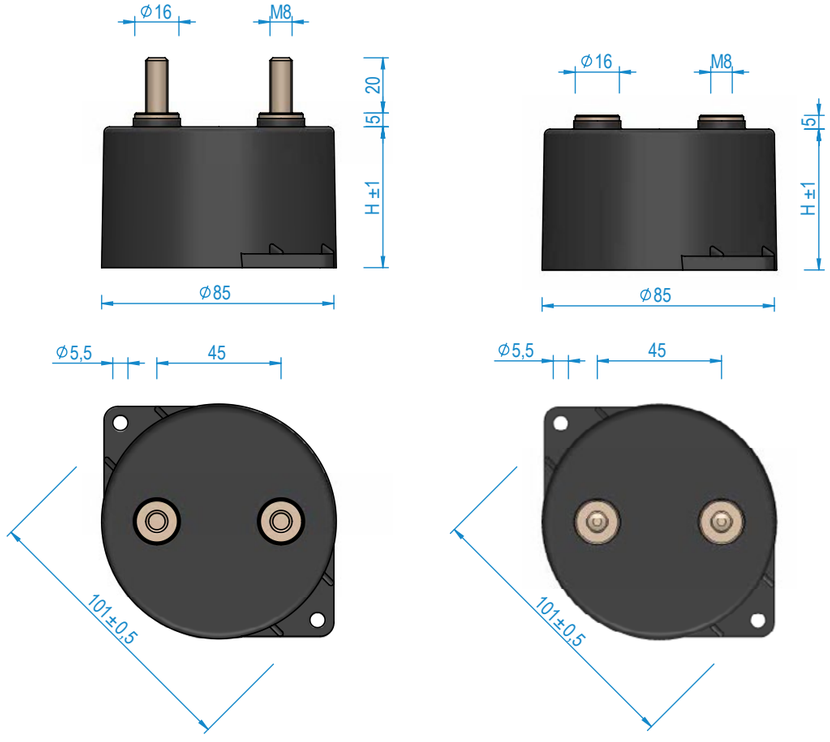
C_N (µF)	Type	U_r (V)	I (A)	Î (kA)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x H (mm)	m (kg)
70	PVDJP 311 - 0,9/70-M8-HC	200	100	1,4	4,1	1,2	8,0	20	85 x 51	0,4
120	PVDJP 311 - 0,9/120-M8	150	60	2,2	6,4	0,8	8,0	30	85 x 51	0,4
150	PVDJP 311 - 0,9/150-M8-HC	200	100	3,5	10,5	0,8	8,0	20	85 x 51	0,4
200	PVDJP 312 - 0,9/200-M8	150	60	2,1	6,3	1,1	7,2	30	85 x 64	0,5
250	PVDJP 313 - 0,9/250-M8	150	80	2,2	6,6	1,3	5,6	35	85 x 76	0,6

U_N = 1100 V DC

C_N (µF)	Type	U_r (V)	I (A)	Î (kA)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x H (mm)	m (kg)
70	PVDJP 311 - 1,1/70-M8	200	42	1,4	4,1	1,2	8,0	30	85 x 51	0,4
100	PVDJP 311 - 1,1/100-M8	200	60	2,0	5,8	0,9	8,0	30	85 x 51	0,4
100	PVDJP 311 - 1,1/100-M8-HC	200	100	2,0	6,0	0,9	8,0	20	85 x 51	0,4
140	PVDJP 312 - 1,1/140-M8	200	60	2,0	5,8	1,1	7,2	35	85 x 64	0,5
140	PVDJP 312 - 1,1/140-F8	200	60	2,0	5,8	1,1	7,2	35	85 x 64	0,5

U_N = 1300 V DC

C_N (µF)	Type	U_r (V)	I (A)	Î (kA)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x H (mm)	m (kg)
50	PVDJP 311 - 1,3/50-M8	250	70	1,5	4,5	1,1	8,0	30	85 x 51	0,4
70	PVDJP 312 - 1,3/70-M8	250	70	1,5	4,5	1,3	7,2	30	85 x 64	0,5
100	PVDJP 312 - 1,3/100-M8	250	45	1,7	5,1	1,3	7,2	30	85 x 64	0,5
130	PVDJP 313 - 1,3/130-M8	250	45	1,9	5,5	1,7	5,6	35	85 x 76	0,6



AC Filter Capacitors

General technical parameters

Rated voltage	250 V – 2 500 V AC
Rated capacitance	1 µF – 600 µF
Capacitance tolerance	±5 %
Voltage test between terminals	1,5 x U_{RMS} AC/10 s
Mounting position	Vertical
Case temperature	-40/85 °C
Storage temperature	-40/85 °C
Hot spot	max 85 °C
Lifetime expectancy	100 000 – 150 000 h
FIT	50 – 100
Case	Aluminium

Standard types

(other parameters on request)

U_{RMS} = 250 V U_N = 350 V AC Single phase

C_N (µF)	Type	I (A)	Î (kA)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x H (mm)	m (kg)	Drw. No.
100	PVAJP 16 - 0,25/100 AC	20	1,3	3,9	1,1	5,2	70	65 x 110	0,4	1
200	PVAJP 2 - 0,25/200 AC	35	1,6	4,8	0,9	4,6	70	85 x 135	0,9	2
300	PVAJP 2 - 0,25/300 AC	50	2,8	8,4	0,7	3,7	80	85 x 200	1,3	2
400	PVAJP 2 - 0,25/400 AC	50	3,7	11,1	0,6	3,7	80	85 x 200	1,3	2
500	PVAJP 2 - 0,25/500 AC	50	4,3	12,9	0,4	3,0	120	85 x 261	1,7	2

U_{RMS} = 330 V U_N = 460 V AC Single phase

C_N (µF)	Type	I (A)	Î (kA)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x H (mm)	m (kg)	Drw. No.
150	PVAJP 2 - 0,33/150 AC	30	1,6	6,0	1,2	4,1	70	85 x 150	1,0	2
200	PVAJP 2 - 0,33/200 AC	40	2,2	7,0	0,9	4,1	70	85 x 150	1,0	2
300	PVAJP 2 - 0,33/300 AC	50	3,6	10,8	0,4	3,4	80	85 x 220	1,5	2
400	PVAJP 2 - 0,33/400 AC	50	3,9	11,7	0,4	3,0	120	85 x 261	1,7	2
500	PVAJP 2 - 0,33/500 AC	65	5,1	15,3	0,3	2,1	90	110 x 220	2,2	2

U_{RMS} = 420 V U_N = 600 V AC Single phase

C_N (µF)	Type	I (A)	Î (kA)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x H (mm)	m (kg)	Drw. No.
22	PVAJP 2 - 0,42/22 AC	40	1,3	3,9	1,5	6,5	60	65 x 120	0,4	1
33	PVAJP 2 - 0,42/33 AC	40	1,9	5,7	1,2	6,5	60	65 x 120	0,4	1
47	PVAJP 2 - 0,42/47 AC	60	2,6	7,8	0,7	4,2	70	85 x 145	1,0	2

U_{RMS} = 450 V U_N = 640 V AC Single phase

C_N (µF)	Type	I (A)	Î (kA)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x H (mm)	m (kg)	Drw. No.
10	PVAJP 2 - 0,45/10 AC	40	0,5	1,5	4,1	9,6	60	65 x 85	0,3	1
30	PVAJP 2 - 0,45/30 AC	40	1,2	3,6	1,3	6,5	60	65 x 120	0,4	1
50	PVAJP 2 - 0,45/50 AC	50	1,5	4,5	0,7	4,2	60	85 x 145	1,0	2
100	PVAJP 2 - 0,45/100 AC	60	2,9	8,7	0,5	4,2	70	85 x 145	1,0	2
150	PVAJP 2 - 0,45/150 AC	40	2,6	7,8	0,9	3,7	80	85 x 200	1,3	2
200	PVAJP 2 - 0,45/200 AC	60	3,2	9,6	0,4	3,4	90	85 x 220	1,5	2
300	PVAJP 2 - 0,45/300 AC	50	3,8	11,4	0,3	2,1	90	110 x 220	2,2	2
350	PVAJP 2 - 0,45/350 AC	60	4,2	12,6	0,3	2,1	90	110 x 220	2,2	2
500	PVAJP 2 - 0,45/500 AC	80	6,3	18,9	0,2	1,9	120	136 x 220	3,3	2

U_{RMS} = 480 V U_N = 680 V AC Single phase

C_N (µF)	Type	I (A)	Î (kA)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x H (mm)	m (kg)	Drw. No.
60	PVAJP 2 - 0,48/60 AC	43	1,8	5,4	0,7	4,2	70	85 x 145	1,0	2
100	PVAJP 2 - 0,48/100 AC	43	2,2	6,6	0,8	3,4	90	85 x 220	1,5	2
150	PVAJP 2 - 0,48/150 AC	50	2,8	8,4	0,5	3,4	90	85 x 220	1,5	2
200	PVAJP 2 - 0,48/200 AC	55	2,9	8,7	0,4	2,1	90	110 x 220	2,2	2
300	PVAJP 2 - 0,48/300 AC	65	3,9	11,7	0,4	1,9	120	110 x 261	2,6	2
300	PVAJP 20 - 0,48/300 AC	80	4,8	13,0	0,7	1,9	80	110 x 220	2,2	2
400	PVAJP 2 - 0,48/400 AC	65	5,6	16,8	0,5	1,9	120	110 x 261	2,6	2

U_{RMS} = 530 V U_N = 750 V AC Single phase

C_N (µF)	Type	I (A)	Î (kA)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x H (mm)	m (kg)	Drw. No.
70	PVAJP 2 - 0,53/70 AC	26	1,9	5,7	1,0	5,6	60	65 x 165	0,6	1
90	PVAJP 2 - 0,53/90 AC	43	3,2	9,6	0,8	4,0	80	85 x 175	1,1	2
100	PVAJP 2 - 0,53/100 AC	60	3,3	12,1	0,6	3,1	90	85 x 220	1,5	2
150	PVAJP 22 - 0,53/150 AC	80	4,8	13,0	0,7	2,1	90	110 x 175	1,9	2
220	PVAJP 2 - 0,53/220 AC	80	4,6	14,0	0,6	2,1	60	110 x 220	2,2	2

U_{RMS} = 600 V U_N = 850 V AC Single phase

C_N (µF)	Type	I (A)	Î (kA)	I_s (kA)	R_s (mΩ)	R_{TH} (K/W)	L_s (nH)	D x H (mm)	m (kg)	Drw. No.
68	PVAJP 2 - 0,6/68 AC	40	1,8	5,4	0,5	4,0	80	85 x 175	1,1	2
100	PVAJP 2 - 0,6/100 AC	40	2,9	8,7	0,6	3,4	90	85 x 220	1,5	2
120	PVAJP 2 - 0,6/120 AC	80	3,3	9,9	0,3	2,9	90	110 x 185	1,9	2
150	PVAJP 2 - 0,6/150 AC	50	3,8	11,4	0,4	2,1	90	110 x 220	2,2	2

U_{RMS} = 720 V U_N = 1020 V AC Single phase

C_N (µF)	Type	I (A)	Î (kA)	I_s (kA)	R_s (mΩ)	R_{TH} (K/W)	L_s (nH)	D x H (mm)	m (kg)	Drw. No.
53	PVAJP 2 - 0,72/53 AC	80	2,9	8,7	0,6	3,4	90	85 x 220	1,5	2
68	PVAJP 2 - 0,72/68 AC	80	3,2	9,6	0,6	2,9	90	110 x 185	1,9	2

U_{RMS} = 780 V U_N = 1100 V AC Single phase

C_N (µF)	Type	I (A)	Î (kA)	I_s (kA)	R_s (mΩ)	R_{TH} (K/W)	L_s (nH)	D x H (mm)	m (kg)	Drw. No.
33	PVAJP 2 - 0,78/33 AC	50	3,2	9,0	0,8	4,1	70	85 x 150	1,0	2
47	PVAJP 2 - 0,78/47 AC	60	4,2	12,6	0,5	3,4	90	85 x 220	1,5	2
68	PVAJP 2 - 0,78/68 AC	60	5,6	16,8	0,3	2,1	90	110 x 220	2,2	2

U_{RMS} = 850 V U_N = 1200 V AC Single phase

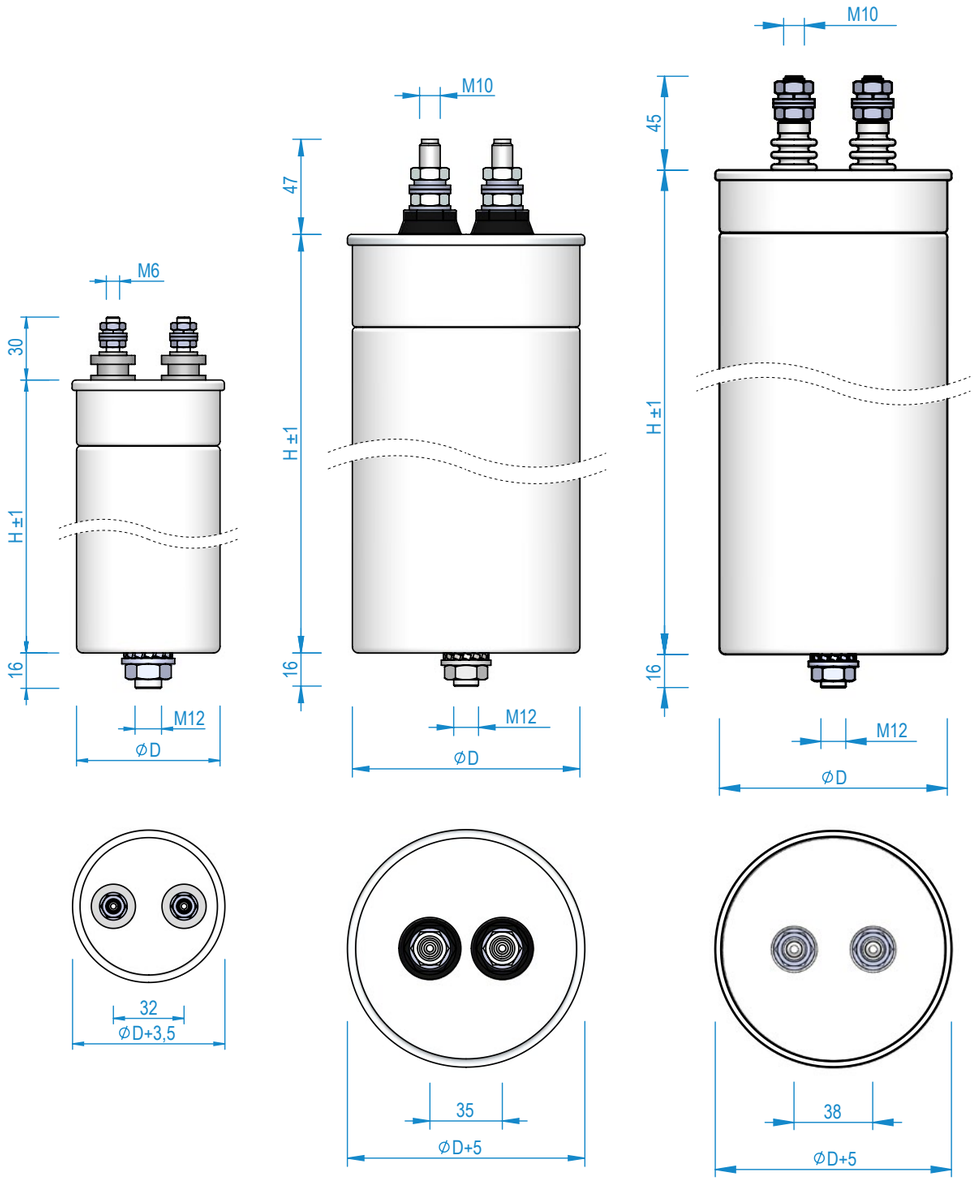
C_N (µF)	Type	I (A)	Î (kA)	I_s (kA)	R_s (mΩ)	R_{TH} (K/W)	L_s (nH)	D x H (mm)	m (kg)	Drw. No.
33	PVAJP 2 - 0,85/33 AC	50	3,3	9,9	0,4	3,7	90	85 x 200	1,3	2
55,7	PVAJP 2 - 0,85/55,7 AC	60	6,1	18,3	0,3	2,1	90	110 x 220	2,2	2
80	PVAJP 2 - 0,85/80 AC	65	4,2	12,0	0,6	2,1	110	110 x 220	2,4	2
120	PVAJP 2 - 0,85/120 AC	60	6,5	19,5	1,0	2,1	120	136 x 220	3,3	2

U_{RMS} = 1200 V U_N = 1700 V AC Single phase

C_N (µF)	Type	I (A)	Î (kA)	I_s (kA)	R_s (mΩ)	R_{TH} (K/W)	L_s (nH)	D x H (mm)	m (kg)	Drw. No.
40	PVAJP 116 - 1,2/40 AC	60	4,0	11,8	0,7	2,2	90	116 x 175	1,9	2
60	PVAJP 116 - 1,2/60 AC	80	5,5	15,4	0,7	1,8	110	116 x 220	2,4	2
60	PJAJP 116 - 1,2/60 AC	80	5,5	15,4	0,7	1,8	110	116 x 220	2,4	2

U_{RMS} = 2500 V U_N = 3535 V AC Single phase

C_N (µF)	Type	I (A)	Î (kA)	I_s (kA)	R_s (mΩ)	R_{TH} (K/W)	L_s (nH)	D x H (mm)	m (kg)	Drw. No.
2,2	PJAJP 10 - 2,5/2,2 AC	30	0,6	1,8	1,1	4,1	90	85 x 165	1,1	3
4	PJAJP 20 - 2,5/4 AC	40	1,3	3,9	0,6	2,1	90	110 x 165	1,7	3



Drawing 1 Drawing 2 Drawing 3

U_{RMS} = 450 V U_N = 640 V AC Three phase

C_N (µF)	Type	I (A)	Î (kA)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x H (mm)	m (kg)	Drw. No.
3 x 33	PSAJP 10 - 0,45/3 x 33 AC	3 x 43	3 x 1,1	3 x 3,3	3 x 1,2	3,8	90	85 x 175	1,0	4
3 x 40	PSAJP 10 - 0,45/3 x 40 AC	3 x 43	3 x 1,2	3 x 3,6	3 x 1,0	3,8	90	85 x 175	1,0	4
3 x 65	PSAJP 10 - 0,45/3 x 65 AC	3 x 43	3 x 1,4	3 x 4,2	3 x 1,3	3,2	110	85 x 220	1,5	4

U_{RMS} = 530 V U_N = 750 V AC Three phase

C_N (µF)	Type	I (A)	Î (kA)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x H (mm)	m (kg)	Drw. No.
3 x 10	PSAJP 16 - 0,53/3 x 10 AC	3 x 16	3 x 0,5	3 x 8,8	3 x 3,1	5,2	70	65 x 165	0,6	4
3 x 15	PSAJP 16 - 0,53/3 x 15 AC	3 x 16	3 x 0,7	3 x 8,8	3 x 2,2	5,2	70	65 x 165	0,6	4
3 x 23	PSAJP 10 - 0,53/3 x 23 AC	3 x 43	3 x 1,1	3 x 8,8	3 x 1,3	3,8	90	85 x 175	1,1	4
3 x 44	PSAJP 4 - 0,53/3 x 44 AC	3 x 56	3 x 3,8	3 x 11,0	3 x 0,4	2,9	110	110 x 175	1,8	5
3 x 69	PSAJP 10 - 0,53/3 x 69 AC	3 x 43	3 x 2,6	3 x 8,8	3 x 0,9	2,1	110	110 x 220	2,2	4
3 x 100	PSAJP 3 - 0,53/3 x 100 AC	3 x 72	3 x 1,2	3 x 8,8	3 x 0,7	1,9	130	136 x 220	3,4	6
3 x 115	PSAJP 5 - 0,53/3 x 115 AC	3 x 56	3 x 4,5	3 x 12,6	3 x 0,5	1,8	110	136 x 220	3,3	5
3 x 150	PSAJP 5 - 0,53/3 x 150 AC	3 x 56	3 x 4,9	3 x 13,7	3 x 0,5	1,8	130	136 x 220	3,3	5

U_{RMS} = 600 V U_N = 850 V AC Three phase

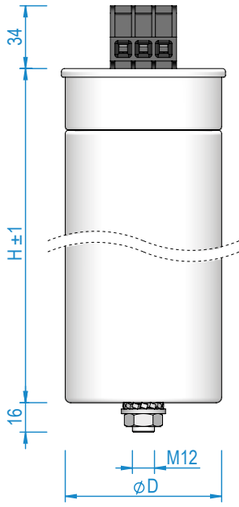
C_N (µF)	Type	I (A)	Î (kA)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x H (mm)	m (kg)	Drw. No.
3 x 47	PSAJP 10 - 0,6/3 x 47 AC	3 x 43	3 x 0,6	3 x 1,8	3 x 1,2	2,1	110	110 x 220	2,2	4
3 x 68	PSAJP 10 - 0,6/3 x 68 AC	3 x 43	3 x 0,8	3 x 2,4	3 x 0,9	2,1	110	110 x 220	2,2	4
3 x 102	PSAJP 3 - 0,6/3 x 102 AC	3 x 60	3 x 1,3	3 x 3,9	3 x 0,8	1,8	140	136 x 261	3,8	6

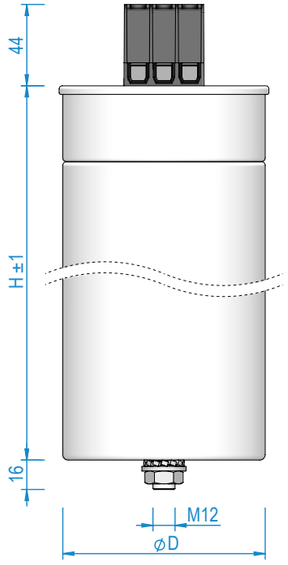
U_{RMS} = 760 V U_N = 1080 V AC Three phase

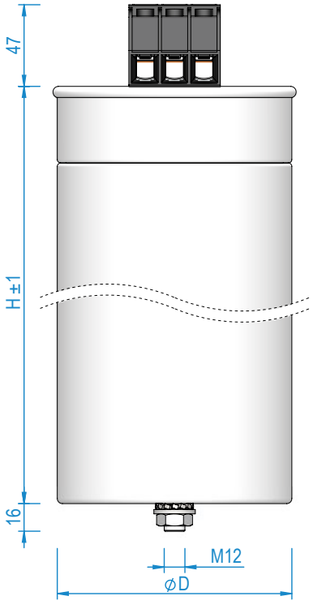
C_N (µF)	Type	I (A)	Î (kA)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x H (mm)	m (kg)	Drw. No.
3 x 11	PSAJP 10 - 0,76/3 x 11 AC	3 x 43	3 x 0,5	3 x 3,6	3 x 1,1	3,8	90	85 x 175	1,1	4
3 x 33	PSAJP 30 - 0,76/3 x 33 AC	3 x 43	3 x 1,5	3 x 4,5	3 x 0,6	1,9	130	136 x 220	3,3	4
3 x 49	PSAJP 3 - 0,76/3 x 49 AC	3 x 43	3 x 2,2	3 x 6,6	3 x 0,7	1,6	140	136 x 261	3,8	4

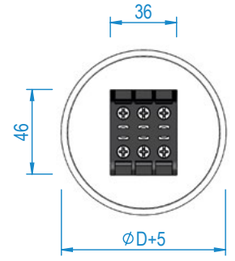
U_{RMS} = 850 V U_N = 1200 V AC Three phase

C_N (µF)	Type	I (A)	Î (kA)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x H (mm)	m (kg)	Drw. No.
3 x 8	PSAJP 10 - 0,85/3 x 8 AC	3 x 43	3 x 0,4	3 x 3,0	3 x 1,3	3,8	90	85 x 175	1,1	4
3 x 33	PSAJP 4 - 0,85/3 x 33 AC	3 x 56	3 x 4,0	3 x 12,0	3 x 0,4	2,6	110	116 x 220	2,4	5
3 x 42	PSAJP 30 - 0,85/3 x 42 AC	3 x 43	3 x 1,5	3 x 4,5	3 x 0,5	1,9	130	136 x 220	3,3	4
3 x 49	PSAJP 3 - 0,85/3 x 49 AC	3 x 43	3 x 1,9	3 x 5,7	3 x 0,7	1,8	140	136 x 261	3,8	4
3 x 56	PSAJP 3 - 0,85/3 x 56 AC	3 x 80	3 x 2,2	3 x 12,7	3 x 0,5	1,8	140	136 x 261	3,8	6

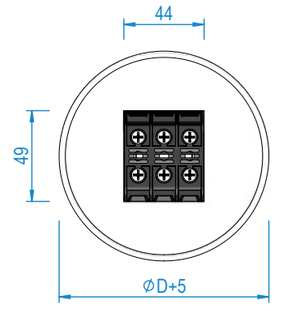




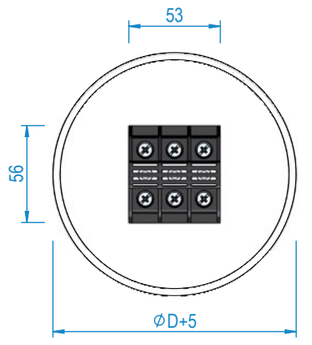




Drawing 4



Drawing 5



Drawing 6

Snubber Capacitors

General technical parameters

Rated voltage	700 V – 12 000 V DC
Rated capacitance	0,1 µF – 60 µF
Capacitance tolerance	±10 %
Voltage test between terminals	1,5 x U_N DC/10 s
Mounting position	Any
Case temperature	-40/85 °C
Storage temperature	-40/85 °C
Hot spot	max 85 °C
Lifetime expectancy	100 000 – 150 000 h
FIT	50
Case	Plastic - PA

Standard types

(other parameters on request)

U_{MAX} = 1000 V U_N = 800 V DC U_S = 1200 V U_{RMS} = 480 V

C_N (µF)	Type	I_{MAX} (A)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	Ø D (mm)	L (mm)	X (M)	Ø d (mm)	m (kg)	Drw. No.
9,0	PVDJP 50546-1/9	15	1,1	3,6	11,5	15	50	54	6	18	0,1	1
16,0	PVDJP 60546-1/16	22	2,0	2,1	10,8	15	60	54	6	18	0,2	1
30,0	PVDJP 75548-1/30	35	4,0	1,2	9,4	15	75	54	8	22	0,3	1
60,0	PVDJP 105548-1/60	60	8,0	0,6	5,7	15	105	54	8	22	0,8	1

U_{MAX} = 2000 V U_N = 1600 V DC U_S = 2400 V U_{RMS} = 840 V

C_N (µF)	Type	I_{MAX} (A)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	Ø D (mm)	L (mm)	X (M)	Ø d (mm)	m (kg)	Drw. No.
2,8	PVDJP 50546-2/2,8	20	1,5	3,2	11,5	15	50	54	6	18	0,1	1
4,8	PVDJP 60546-2/4,8	28	2,5	1,9	10,8	15	60	54	6	18	0,2	1
6,0	PVDJP 65546-2/6	32	3,2	1,5	10,5	15	65	54	6	18	0,2	1
8,0	PVDJP 75548-2/8	40	4,2	1,1	9,4	15	75	54	8	22	0,3	1
10,0	PVDJP 85548-2/10	45	5,2	0,9	7,9	15	85	54	8	22	0,4	1
18,0	PVDJP 105548-2/18	70	9,2	0,6	5,7	15	105	54	8	22	0,5	1

U_{MAX} = 3600 V U_N = 3000 V DC U_S = 4500 V U_{RMS} = 1200 V

C_N (µF)	Type	I_{MAX} (A)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	Ø D (mm)	L (mm)	X (M)	Ø d (mm)	m (kg)	Drw. No.
0,65	PVDJP 50606-3,6/0,65	8	0,7	6,8	11,3	15	50	60	6	18	0,2	1
1,1	PVDJP 60606-3,6/1,1	12	1,1	4,2	10,6	15	60	60	6	18	0,2	1
1,4	PVDJP 65606-3,6/1,4	15	1,4	3,3	10,2	15	65	60	6	18	0,2	1
2,0	PVDJP 75608-3,6/2	18	2,0	2,6	8,8	15	75	60	8	22	0,3	1
2,7	PVDJP 85608-3,6/2,7	24	2,7	1,9	7,4	15	85	60	8	22	0,5	1
4,0	PVDJP 105608-3,6/4	30	4,0	1,3	6,3	15	105	60	8	22	0,6	1

U_{MAX} = 4000 V U_N = 3200 V DC U_S = 4800 V U_{RMS} = 1800 V

C_N (µF)	Type	I_{MAX} (A)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	Ø D (mm)	L (mm)	X (M)	Ø d (mm)	m (kg)	Drw. No.
0,7	PVDJP 50686-4/0,7	20	1,7	4,1	11,2	15	50	68	6	18	0,2	1
1,2	PVDJP 60686-4/1,2	30	2,8	2,4	10,3	15	60	68	6	18	0,2	1
1,5	PVDJP 65686-4/1,5	35	3,6	1,9	9,8	15	65	68	6	18	0,2	1
2,0	PVDJP 75688-4/2	40	4,8	1,5	8,0	15	75	68	8	22	0,4	1
3,0	PVDJP 85688-4/3	55	7,2	1,1	6,7	15	85	68	8	22	0,5	1
4,5	PVDJP 105688-4/4,5	75	10,0	0,7	5,6	15	105	68	8	22	0,8	1

U_{MAX} = 5000 V U_N = 4000 V DC U_S = 6000 V U_{RMS} = 2100 V

C_N (µF)	Type	I_{MAX} (A)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	Ø D (mm)	L (mm)	X (M)	Ø d (mm)	m (kg)	Drw. No.
0,5	PVDJP 50686-5/0,5	15	1,4	4,8	11,2	15	50	68	6	18	0,2	1
0,8	PVDJP 60686-5/0,8	25	2,2	3,1	10,3	15	60	68	6	18	0,2	1
1,1	PVDJP 65686-5/1,1	30	3,1	2,2	9,8	15	65	68	6	18	0,3	1
1,5	PVDJP 75688-5/1,5	35	4,2	1,7	8,0	15	75	68	8	22	0,4	1
2,2	PVDJP 85688-5/2,2	50	6,1	1,2	6,7	15	85	68	8	22	0,5	1
3,3	PVDJP 105608-5/3,3	70	9,0	0,8	5,6	12	105	68	8	22	0,5	1

U_{MAX} = 6800 V U_N = 6000 V DC U_S = 8200 V U_{RMS} = 3200 V

C_N (µF)	Type	I_{MAX} (A)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	Ø D (mm)	L (mm)	X (M)	Ø d (mm)	m (kg)	Drw. No.
0,11	PVDJP 50686-6,8/0,11	10	0,7	9,9	11,2	15	50	68	6	18	0,3	1
0,20	PVDJP 60686-6,8/0,2	12	1,2	6,0	10,3	15	60	68	6	18	0,4	1
0,25	PVDJP 65686-6,8/0,25	15	1,5	5,0	9,8	15	65	68	6	18	0,4	1
0,35	PVDJP 75688-6,8/0,35	18	2,1	3,5	8,0	15	75	68	8	22	0,4	1
0,47	PVDJP 85688-6,8/0,47	22	2,8	2,6	6,7	15	85	68	8	22	0,5	1
0,68	PVDJP 105688-6,8/0,68	30	4,0	1,8	5,6	15	105	68	8	22	0,7	1

Protection of SCR thyristors

U_{MAX} = 6800 V U_N = 5600 V DC U_S = 8400 V U_{RMS} = 3000 V

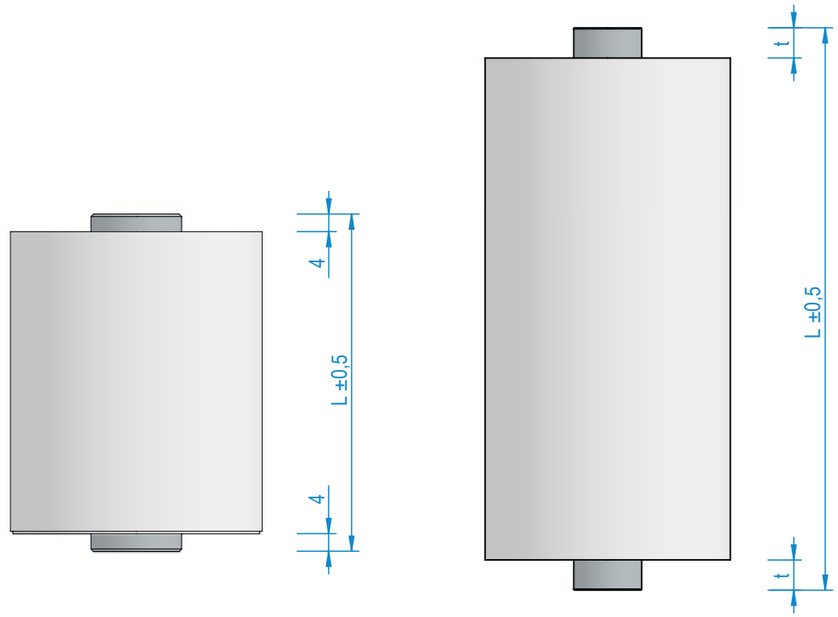
C_N (µF)	Type	I_{MAX} (A)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x L (mm)	t (mm)	m (kg)	Drw. No.
0,33	PVDJP 020-6,8/0,33	10	1,2	8,6	5,5	15	60 x 133	8	0,6	2
0,5	PVDJP 020-6,8/0,5	20	1,3	7,6	5,6	15	55 x 133	8	0,4	2
2,0	PVDJP 021-6,8/2	12	6,8	7,0	4,9	30	85 x 120	4	0,6	2

U_{MAX} = 8000 V U_N = 6400 V DC U_S = 9600 V U_{RMS} = 3200 V

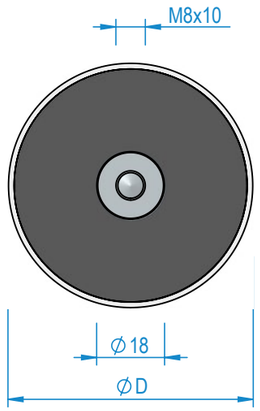
C_N (µF)	Type	I_{MAX} (A)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x L (mm)	t (mm)	m (kg)	Drw. No.
0,33	PVDJP 020-8/0,33	12	0,8	8,0	9,2	15	55 x 133	8	0,5	2
0,5	PVDJP 020-8/0,5	20	1,2	6,0	9,0	15	60 x 133	8	0,6	2
0,68	PVDJP 020-8/0,68	25	2,4	7,5	4,0	15	55 x 133	8	0,4	2
0,75	PVDJP 020-8/0,75	25	1,5	5,0	9,0	15	60 x 133	8	0,6	2
1,0	PVDJP 020-8/1	30	2,4	4,0	8,0	15	65 x 133	8	0,6	2

U_{MAX} = 10000 V U_N = 8000 V DC U_S = 12000 V U_{RMS} = 4000 V

C_N (µF)	Type	I_{MAX} (A)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x L (mm)	t (mm)	m (kg)	Drw. No.
0,33	PVDJP 020-10/0,33	10	0,9	8,5	5,5	15	60 x 133	8	0,6	2
0,47	PVDJP 020-10/0,47	12	3,9	6,6	5,4	15	65 x 133	8	0,6	2
0,5	PVDJP 020-10/0,50	12	3,0	7,1	5,5	15	60 x 133	8	0,6	2
0,56	PVDJP 020-10/0,56	12	3,0	5,8	5,4	15	65 x 133	8	0,6	2
0,62	PVDJP 020-10/0,62	12	3,0	5,5	5,4	15	65 x 133	8	0,6	2



Drawing 1



Drawing 2

Snubber Capacitors

Snubber Capacitors

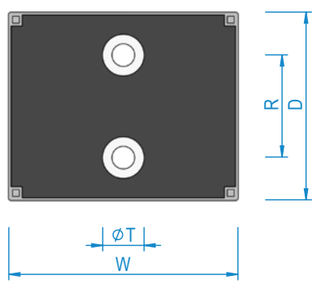
General technical parameters

Rated voltage	800 V – 12 000 V DC
Rated capacitance	0,01 µF – 10 µF
Capacitance tolerance	±10 %
Voltage test between terminals	1,5 x U_N DC/10 s
Mounting position	Any
Case temperature	-40/85 °C
Storage temperature	-40/85 °C
Hot spot	max 85 °C
Lifetime expectancy	100 000 – 150 000 h
FIT	50
Case	Plastic - PA

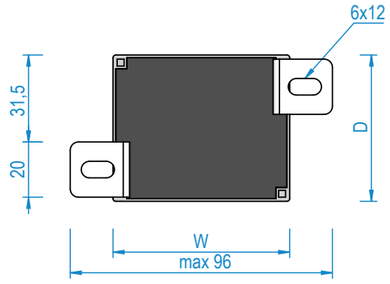
Standard types

(other parameters on request)

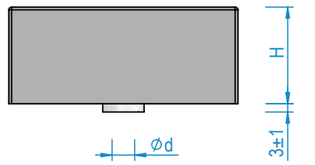
U_{MAX} (kV)	U_N (kV)	U_S (kV)	U_{RMS} (kV)	C_N (µF)	Type	I_{MAX} (A)	I_S (kA)	L_S (nH)	W x D x H (mm)	m (kg)	Drw. No.
12,0	10,0	13,0	4,8	0,06	PVDJP 43-12/0,06	3	0,06	55	64 x 53 x 28	0,13	2
6,0	5,0	10,0	2,4	0,012	PVDJP 43-6/0,012	2	0,05	30	64 x 53 x 28	0,13	2
6,2	5,0	7,8	2,4	0,1	PVDJP 42-6,2/0,1	2	0,2	15	64 x 53 x 28	0,13	3
4,5	3,6	5,0	1,8	0,25	PVDJP 42-4,5/0,25	4	0,4	15	64 x 53 x 28	0,13	3
4,0	3,2	4,5	1,6	0,33	PVDJP 40-4/0,33	4	0,15	15	64 x 53 x 28	0,13	4
3,0	2,5	3,6	1,2	0,68	PVDJP 40-3/0,68	8	0,35	15	64 x 53 x 28	0,13	4
2,5	2,0	3,0	1,0	1,0	PVDJP 40-2,5/1	12	0,5	15	64 x 53 x 28	0,13	4
2,0	1,6	2,4	0,8	1,0	PVDJP 9-2/1	36	1,6	12	83 x 68 x 35	0,30	1
1,6	1,4	2,2	0,7	2,0	PVDJP 2-1,6/2	20	0,8	15	74 x 53 x 28	0,28	1
1,6	1,4	2,2	0,7	5,0	PVDJP 1-1,6/5	20	0,8	12	83 x 68 x 35	0,28	1



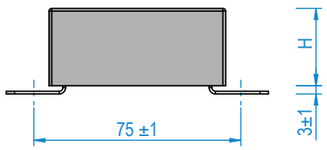
Drawing 1



Drawing 2



Drawing 3



Drawing 4

CUSTOM SOLUTION FOR POWER ELECTRONICS

General technical parameters

Rated voltage	500 V – 6 000 V DC
Rated capacitance	25 µF – 24 000 µF
Capacitance tolerance	±10 %, other on request
Voltage test between terminals	1,5 x U_N DC/10 s
Mounting position	Any
Case temperature	-40/85 °C
Storage temperature	-40/85 °C
Hot spot	max 85 °C
Lifetime expectancy	100 000 - 200 000 h
FIT	50 – 200
Case	Aluminium or stainless steel
Safety device	Optional - segmented film or pressure switch

DC Link Capacitors

Design of capacitors

Rectangular capacitors offers wide range of design possibilities to fulfill all customer demands to offer comprehensive solution for the final application. High capacitance, voltage, current rating or extremely low self inductance as well as special terminals and overall dimensions and long lifetime are apparent requirements.

For higher safety of the capacitors in operation there is optional solution to use segmented film or pressure switch. The segmented film can be used in almost all available designs, the pressure switch is only for hermetically sealed containers.

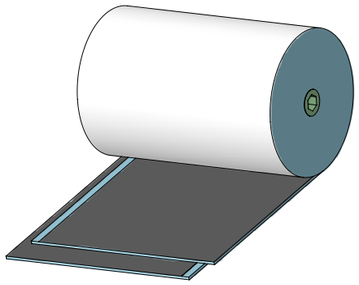
The capacitor housing may be hermetically sealed (customer design No 1) or with PUR layer on terminals side (customer design No 5) or with PUR layer on the bottom (customer design No 2). The material of the container may be stainless steel or aluminium alloy AlMg3. Aluminium containers are without surface treatment, stainless steel containers are painted.

Capacitors are filled with PU resin to protect winding elements from environmental interferences. On top of that resin also keeps winding elements mechanically safe and fixed against any vibrations.

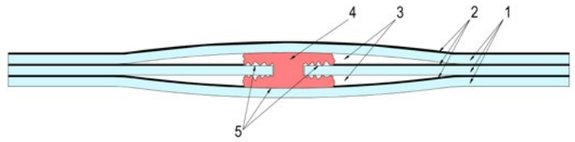
Protection and Reliability

Self-healing

Special structure of winding ensures feature called “self-healing”. In the event of voltage breakdown, the metal layer is evaporated around the breakdown channel in very short time. Thanks to evaporation, no conductive channel is created between both metal layers and capacitor is not restrained in functionality.

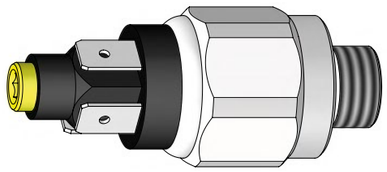


1. Dielectrics - polypropylene film
2. Electrodes - metallization (thin layer)
3. Air gap
4. Shortcircuit channel
5. Evaporated metallization area



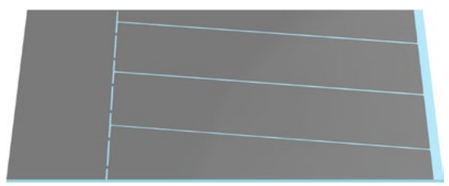
Pressure switch

Pressure switch might be used for capacitors with hermetical housing. When self-healing system fails, surge of temperature and pressure occurs and the capacitor might tear up. Overpressure sensor detects the surge of pressure and provides signal which shall be used for safety circuit and disconnection of capacitor. Sensor contains NC or NO switch. Switch is activated when overpressure reaches 0,3-0,5 bar. Switching voltage and current up to 250 V and 5 A.



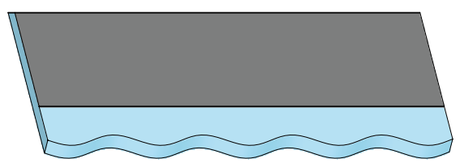
Segmented film

Segmented film offers one of the most important internal protective mechanism that ensures safe operation through the lifetime, ageing and during overload of the capacitor. Special segmented metallization feature fuse gates protect capacitor element from internal faults in case of improper self-healing caused by weak spots in PP film. Fuse gates are limiting current flowing into the weak spot and disconnects particular segment. Which protects winding element from destruction. Depending on rated voltage and type of foil, different segments are used. Capacitance decrease takes place when the capacitor is on the edge of its lifetime.



Wavecut

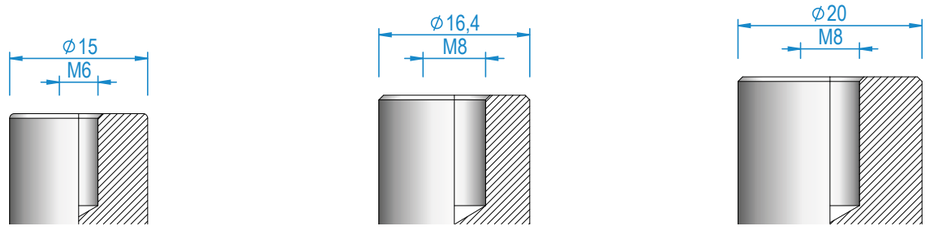
Wavecut is a special wavy edge of PP film, which provides more reliable contact with metallizing zinc layer. Film with wavecut allows higher current load of the winding element.



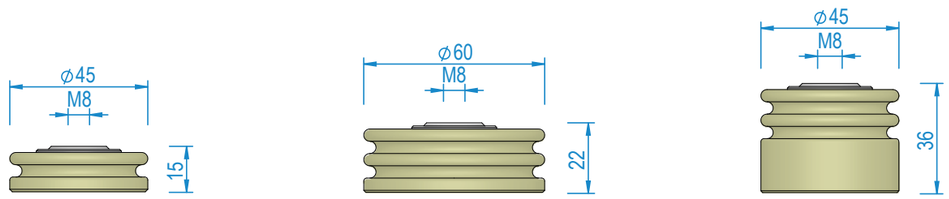
Terminal Options

Cylindrical or flat terminals are available. First possibility is cylindrical, nickeled brass terminal with an inner thread (typically M6-M8). Other possibilities are cylindrical, nickeled brass terminal with inner thread and insulator or nickeled bolt terminal with insulator. Terminals may vary in number and height according to customer specification. Flat terminals, also called “Capacitors with integrated busbar”, are made of nickeled copper. Generally, customer specified solution. Commonly used terminals are at pictures below.

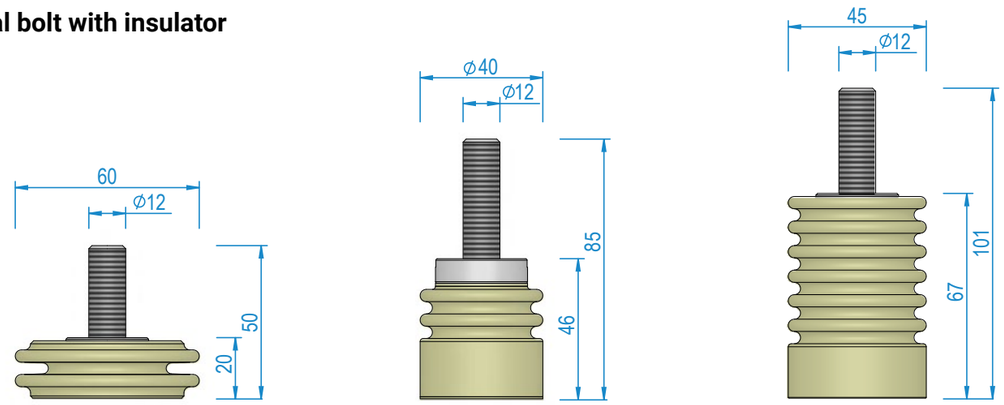
Inner thread terminal through PU resin



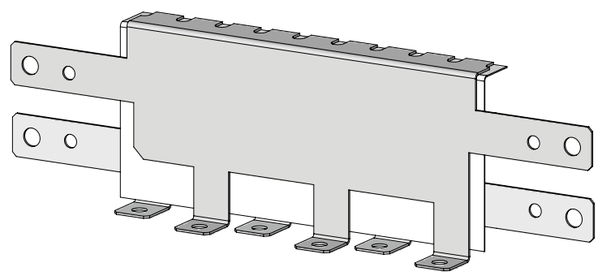
Inner thread terminal with insulator

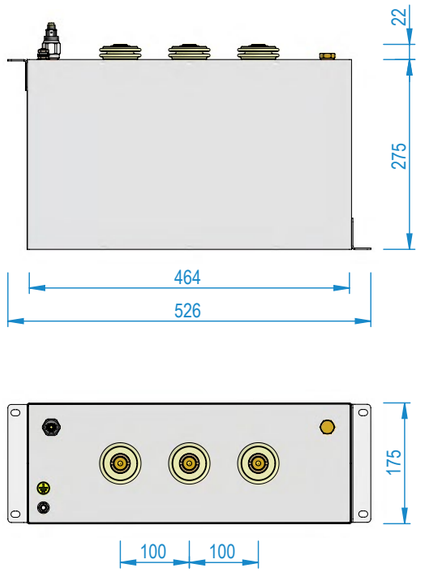


Terminal bolt with insulator

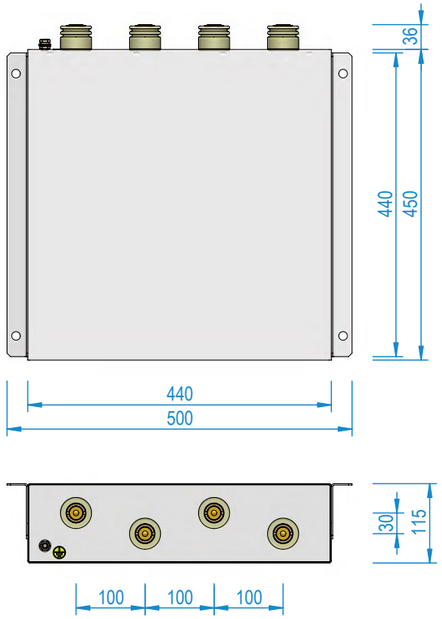


Busbar terminals

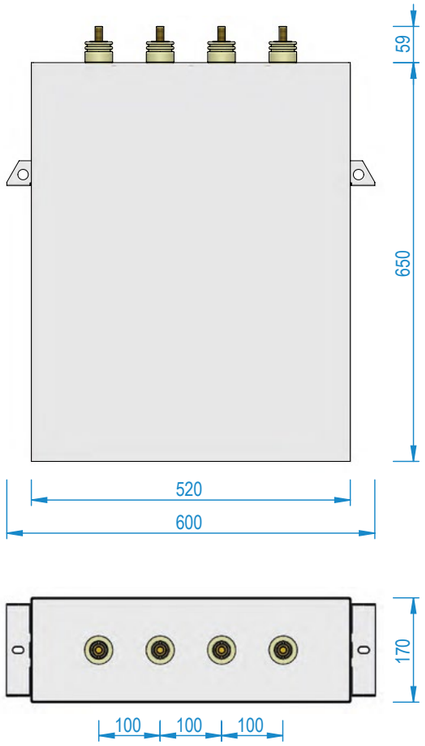




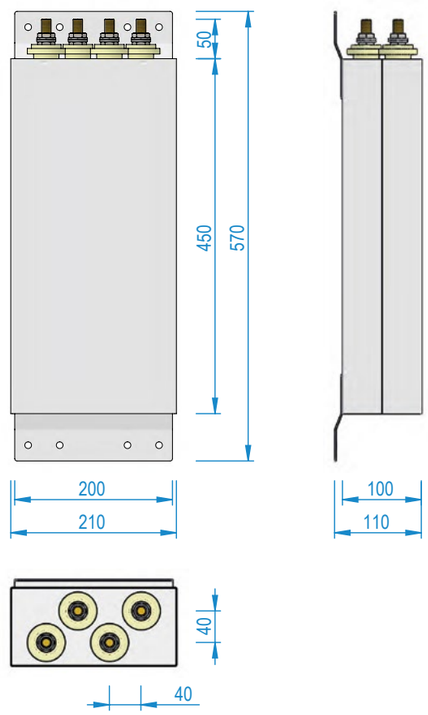
Customer design 1



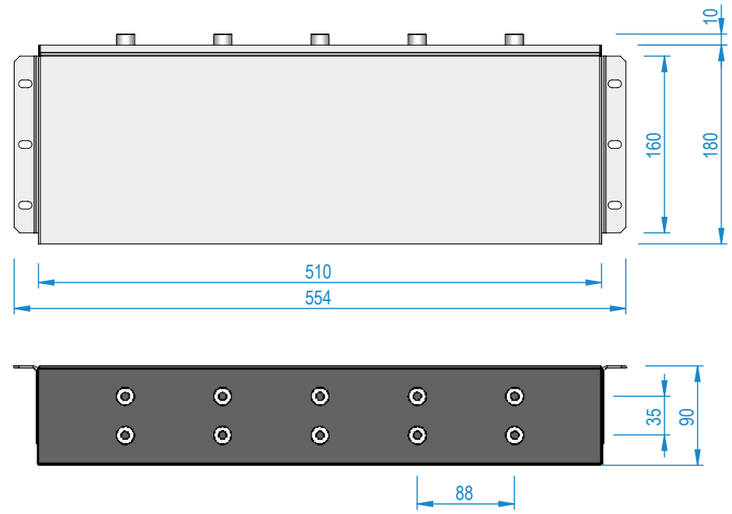
Customer design 2



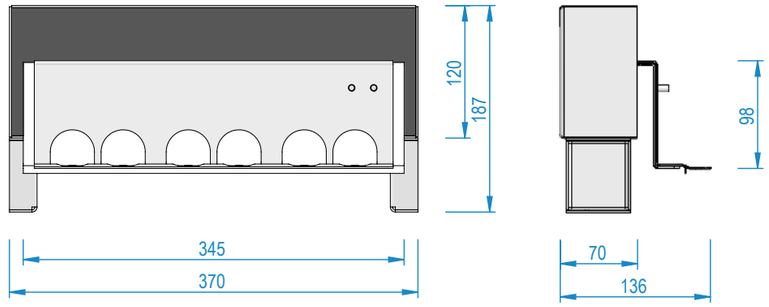
Customer design 3



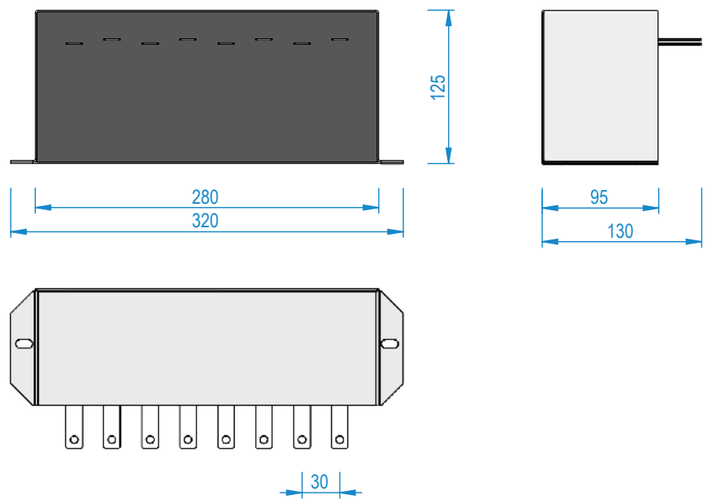
Customer design 4



Customer design 5



Customer design 6



Customer design 7

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