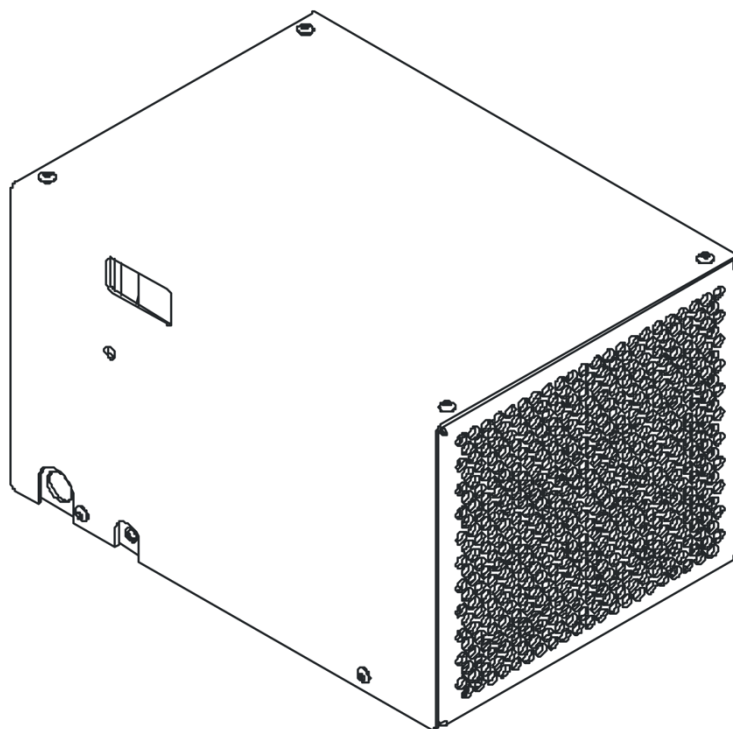


PCP-35 capacitor charging module

User manual



Warning! This equipment might be dangerous.
Please read this user manual before starting any operations.

Important note. Module is sensitive to the reverse polarity applied to the output. If you aren't sure in your application, please contact the factory for the details.

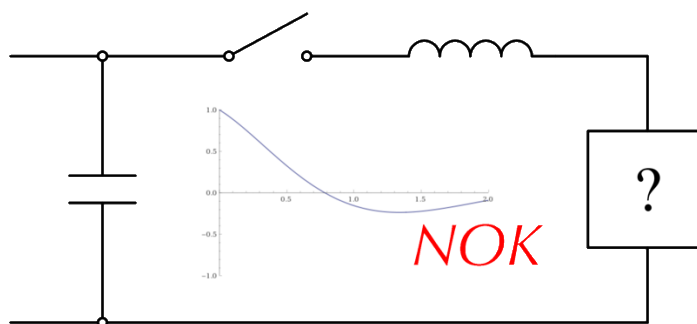
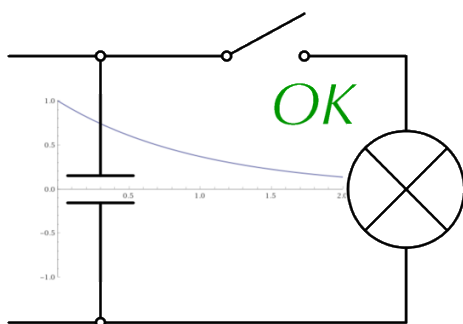


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Overview / Appearance

The PCP-35 capacitor charging module is a high-frequency switch-mode converter, which transforms AC input to a regulated high voltage DC output to charge capacitors.

Output power is over 3500W for modifications with partial discharge (PD) and over 3000J/s for modifications with complete discharge (CD). Maximum output voltage (V_{MAX}) is customer defined in the 300-4000V range.

The module is “industrial grade” and is not recommended for use in medical or aesthetic systems.



Cooling

The module is cooled by a built-in fan. No external cooling required.

Contents of delivery

By default, the following items are supplied as standard:

- PCP-35 capacitor charging power supply – 1pc
- Mating INTERFACE cable (0.3m length) – 1pc

Connectors, pins, interface signals

INPUT:

Blue wires (2pcs) – 200-240VAC 50/60Hz input

HV OUTPUT:

Red wire – HV OUTPUT positive

Black wire – HV OUTPUT negative

By default, the PCP-35 is supplied with positive output polarity (P). Negative output (N), floating output (F) and bipolar output (B) are available as options. Wire layouts in dependence on modification are given in the table below:

WIRE (color)	Modification			
	P	N	F	B
HV+ (red)	+V	GND	HV Positive	+V/2
HV– (black)	GND	-V	HV Negative	-V/2
PCP-35 chassis	GND	GND	GND	GND
INTERFACE return	GND	GND	GND	GND

“V” is the output voltage amplitude

GROUND: M4 thread

The module should be grounded using this thread. This should be done before connecting the module to the mains.

Warning! GROUND thread depth is 6mm only.
Please use screws of the appropriate length

Grounding policy

P modification: HV OUTPUT negative and INTERFACE return are internally connected to each other AND to the chassis ground.

N modification: HV OUTPUT positive and INTERFACE return are internally connected to each other AND to the chassis ground.

F, B modifications: neither HV OUTPUT positive nor HV OUTPUT negative are connected to the chassis ground, but INTERFACE return is.

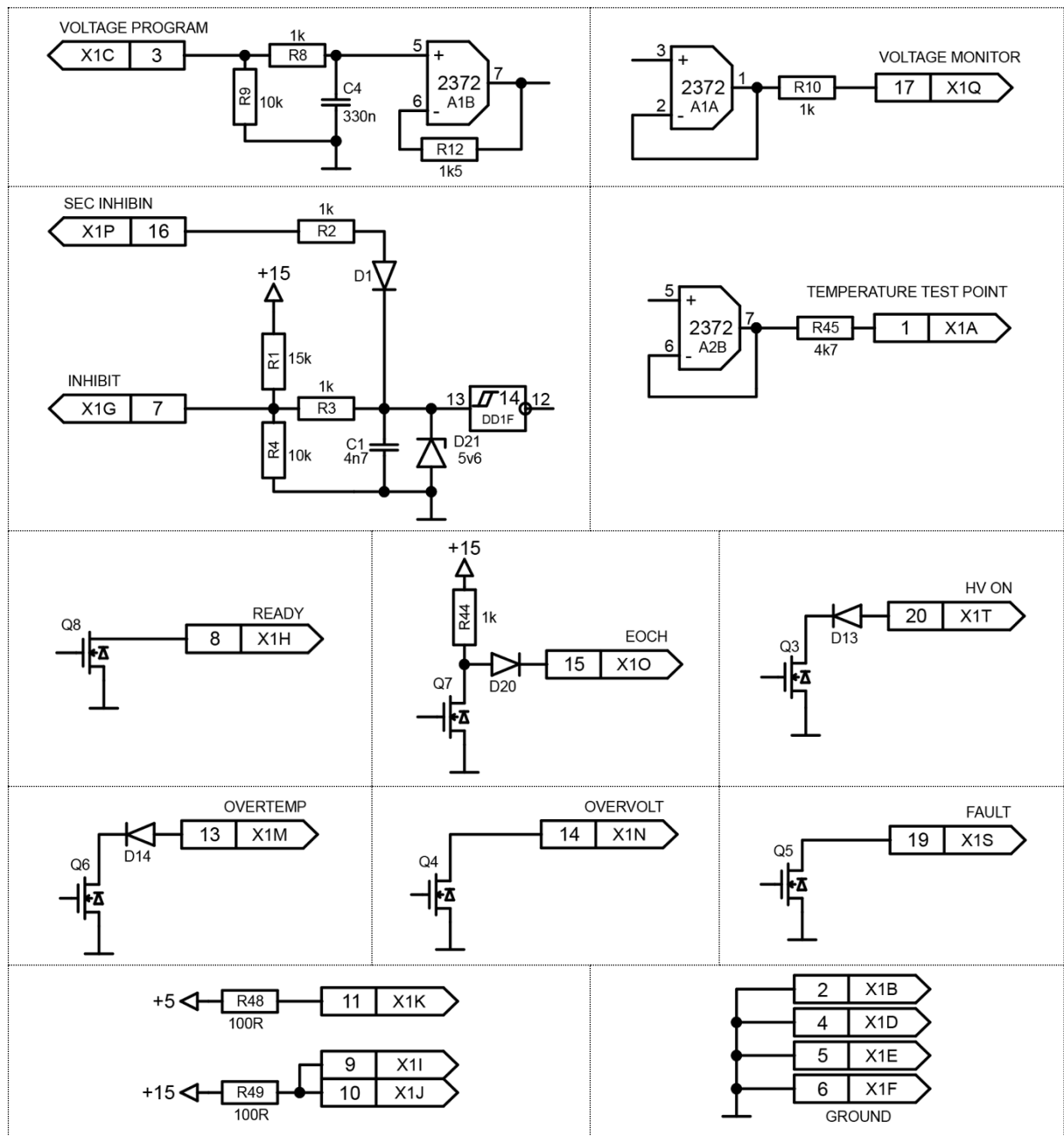
INTERFACE: PLD-20

19	17	15	13	11	9	7	5	3	1
20	18	16	14	12	10	8	6	4	2

PIN (color)	DESIGNATION	DESCRIPTION
1 (-)	TEMP Test point	Test point for the module internal temperature. N/A by default but can be supplied on request.
2,4,5,6 (black)	Ground	PINS 2,4,5,6 are connected to the circuit ground of all internal circuits. The return signal connection for all interface signals should be made to one of these pins.
3 (yellow)	Voltage Program	A positive DC voltage applied to this pin controls the output voltage set point. 0-10V corresponds to 0-V _{MAX}
7 (blue)	INHIBIT	The high voltage output is inhibited or enabled by this pin. 0V – enabled; 5V or free-standing – inhibited.
8 (green)	Ready Indicator	This pin is pulled to ground, when the output voltage is equal to the program voltage (or higher than the program voltage).
9, 10 (red)	+15 V	These pins provide +15V DC that may be used for status LEDs etc. Maximum output current 50mA.
11 (orange)	+5 V	This pin provides +5V DC that may be used for status LEDs etc. Maximum output current 50mA.
12, 18	N/C	-
13 (white; black mark)	Over TEMP	This pin is pulled to ground if the module overheats (70-90 °C in dependence on exact model).
14 (white; blue mark)	Over Voltage Status	This pin is pulled to ground when overvoltage occurs. The high voltage output is also disabled when this occurs.
15 (green / yellow)	End of Charge Indicator	PIN15 is pulled to ground when the output voltage below the program voltage. Elsewhere PIN15 is pulled to +15V.
16 (blue / white)	Secondary Inhibit	The HV OUTPUT is inhibited (when +15V are applied) or enabled (when 0V are applied or the pin is free standing). This pin only should be used to control parallel operation of two or more power modules.
17 (violet)	Voltage Monitor	The voltage at this pin is a buffered signal proportional to the instantaneous output. 0-10V corresponds to 0-V _{MAX} Current capability 1,5mA; R _{out} = 1kOhm.

19 (white; red mark)	Fault Indicator *	<p>This pin is pulled to ground when a fault is detected. The high voltage output is disabled when this occurs.</p> <p>Failures:</p> <ul style="list-style-type: none"> • output short-circuit • overtemperature • overvoltage • output open circuit • charge timeout
20 (transparent)	HV ON Indicator	<p>This pin is pulled to ground when the module is supplying power to the load.</p>

* see also **Faults** section



Safety

Warning! This equipment produces high voltages that can be very dangerous.
Be careful in a high-voltage appliances area.

- During operations all the protective covers must be securely in place and all the electrical connections must be properly attached.
- The PCP-35 is designed to be installed inside a properly grounded metal case. It is the customer's responsibility to ensure that personnel are prevented from accidental contacting of the PCP-35 capacitor charger and its high voltage cables. **Casual contact could be fatal!**
- Do not handle the capacitance load until it has been discharged. Use an appropriate meter to check for complete discharge.
- Disconnect the module from the mains before making or changing any electrical or mechanical connections.

Operations (single PCP-35)

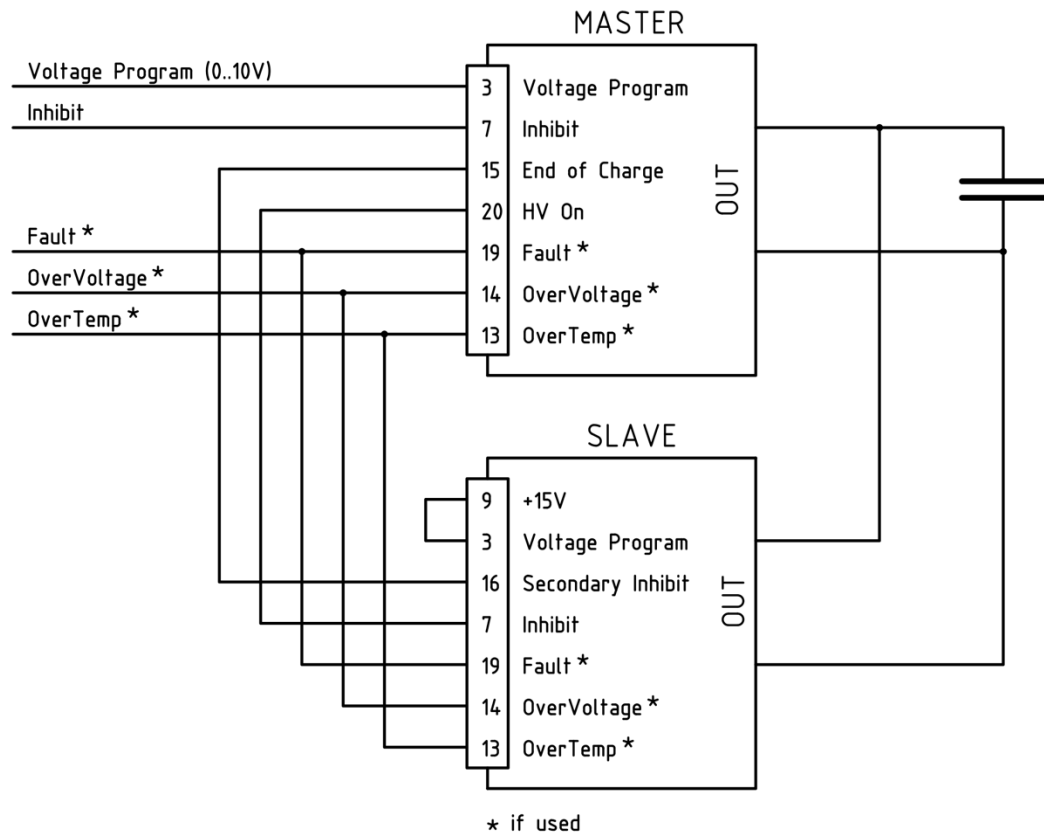
1. *Inhibit* the high voltage output (*PIN7* of *INTERFACE*).
2. Set the desired output voltage by applying a DC voltage to the *Voltage Program* (*PIN3* of *INTERFACE*).
3. Apply power to the module.
4. *Enable* the high voltage output (*PIN7* of *INTERFACE*).
5. Operate, then *Disable* the high voltage output, then disconnect the module from the mains.

Operations (two and more PCP-35 connected in parallel)

Two or more PCP-35 units can be connected in parallel to achieve the average output power of 7kW or more.

In this case, one PCP-35 power supply is the MASTER unit and operates as normal, while the other power supplies are the SLAVE units. For correct operation *Secondary Inhibit* (*PIN16*) of SLAVE units should be connected to *End of Charge* (*PIN15*) of MASTER unit.

PCA/PCP connected in parallel (Master-Slave)



Faults

Module sets *Fault* state in the following cases:

- *overheating* (the module temperature exceeds the maximum allowed level)
- *overvoltage* (the voltage on the load exceeds 110% of V_{MAX} level)
- *short-circuit* at module's output (the triggering threshold is about 0.8-1.0s)
- *open-circuit* at module's output
- *charging timeout* (default value is about 5s, other timeouts can be set on request)

For most faults, once the Fault has occurred, eliminate the cause and "reboot" the module (this means to *DISABLE* module and *ENABLE* it again).

Exceptions:

- for *open-circuit* failure one should remove the power from the module and apply it again
- for *overheating* failure, the module can start operating again if the temperature drops rapidly (i.e. faster than in 5-10s) to the low level of the hysteresis loop

Specifications

ELECTRICAL

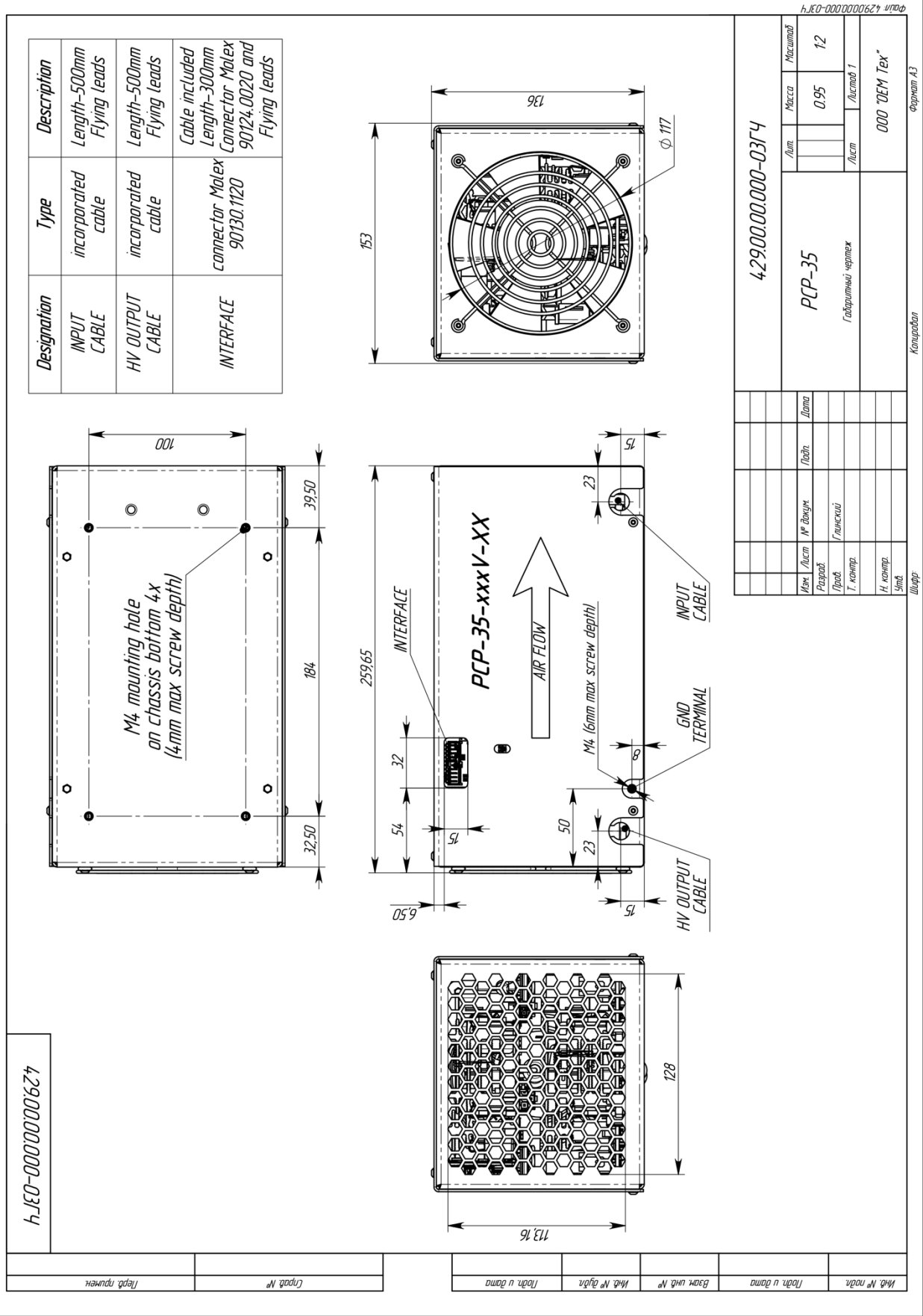
Input:	
Voltage	200-240 VAC, 50/60 Hz (see also <i>How to order?</i> section)
Output:	
Maximum output voltage (V_{MAX})	User selectable in 300-4000V range (see also <i>How to order?</i> section)
Maximum output power	>3500W (can be achieved in regime 70-100% V_{MAX} , rated input voltage, 25 °C, partial discharge modifications) >3000J/s (can be achieved in regime 0-100% V_{MAX} , rated input voltage, 25 °C, complete discharge modifications)
Stability	0.5% of V_{MAX}
Pulse to pulse	0.5% of V_{MAX}
Efficiency	More than 85%
PFC coefficient:	~ 0.90
Protections:	From open-circuit From short-circuit From over-temperature From over-voltage Shut down on charging timeout
Cooling:	Forced air (built-in fan)
Environment:	
Operation temperature	+10... +40 °C

Storage temperature	-20 ... +60 °C
Humidity	<90%, non-condensing

MECHANICAL

Dimensions	Approx. 260x153x136mm (see also the dimensional drawing below)
Weight	Approx. 2.8 kg

Dimensions



How to order?

200-240VAC input:

PCP-35-XXXX-YY-Z, where

XXXX means V_{MAX} voltage (user selectable in 300V-4000V range).

YY means either CD (complete discharge modification) or PD (partial discharge modification); if YY is missed PD modification will be supplied.

Z means output polarity – P for positive, N for negative, F for floating output, B for bipolar output; if Z is missed P modification will be supplied.

Typical examples:

PCP-35-300V-PD	300V, partial discharge, 3500W, positive output
PCP-35-500V-PD	500V, partial discharge, 3500W, positive output
PCP-35-700V-PD	700V, partial discharge, 3500W, positive output
PCP-35-1000V-PD	1000V, partial discharge, 3500W, positive output
PCP-35-1500V-PD	1500V, partial discharge, 3500W, positive output
PCP-35-2000V-PD	2000V, partial discharge, 3500W, positive output
PCP-35-3000V-PD	3000V, partial discharge, 3500W, positive output
PCP-35-4000V-PD	4000V, partial discharge, 3500W, positive output
PCP-35-1000V-CD	1000V, complete discharge, 3000J/s, positive output
PCP-35-1500V-CD	1500V, complete discharge, 3000J/s, positive output
PCP-35-2000V-CD	2000V, complete discharge, 3000J/s, positive output
PCP-35-3000V-CD	3000V, complete discharge, 3000J/s, positive output
PCP-35-4000V-CD	4000V, complete discharge, 3000J/s, positive output

Other voltage modifications are available on request.

Although most popular versions have positive output polarity, other output polarities (N, F, B) are also available with M.O.Q. 1pc.

110-240VAC input:

For 110-240VAC wide range input one can consider:

1) Standard versions of PCA-10 or PCA-20 (please just refer to PCA-10 and PCA-20 user manuals for the details).

2) A tailored version of PCA-20 with the customizations as follows:

- high voltage modifications up to 4000V
- not only positive, but also negative, floating, bipolar output

Please note, the mentioned modifications, unlike standard versions of PCA-20 product, are not recommended for use in medical or aesthetic systems.

PCA-20-XXXX-YY-Z, where
 XXXX means V_{MAX} voltage (user selectable in range of 300V-4000V).
 YY means either CD (complete discharge modification) or PD (partial discharge modification).
 Z means output polarity – P for positive, N for negative, F for floating output, B for bipolar output.

A few examples:

PCA-20-1000V-PD-N	PCA-20, customized non-medical version, 1000V voltage, partial discharge, negative output
PCA-20-3000V-CD	PCA-20, customized non-medical version, 3000V voltage, complete discharge, positive output
PCA-20-4000V-PD	PCA-20, customized non-medical version, 4000V voltage, partial discharge, positive output