ACPC Advanced SCR Power Controller Quick Start Manual 0037-75601(PK577)

This manual is intended to be a quick reference guide for basic installation requirements and an overview of the connections, wiring considerations and general specifications for the ACPC Advanced SCR Power Controller. For complete installation and operation, refer to the PK**575** ACPC Hardware Instruction Manual. For complete configuration and programming refer to the PK**576** ACPC Configuration and Programming Manual. The most current revisions may be found on the Chromalox website: www.chromalox.com

1. IMPORTANT SAFEGUARDS

⚠WARNING

ELECTRIC SHOCK HAZARD: Read and understand all instructions before installing, servicing or operating this controller. Failure to do so could result in equipment or property damage as well as personal injury and even death.

HIGH VOLTAGE is used in the operation of this equipment. DEATH ON CONTACT may result if personnel fail to observe safety precautions. Learn the areas containing high-voltage connections when installing or operating this equipment.

Be careful not to contact high-voltage connections when installing or operating this equipment. Before working inside the equipment, turn power off and ground all points of high voltage potential before touching.

ELECTRIC SHOCK HAZARD. Any installation involving control equipment must be performed by a qualified person and must be effectively grounded in accordance with the National Electrical Code to eliminate shock hazard.

⚠CAUTION

The Owner/Installer must provide all necessary safety and protection devices and follow all current electrical wiring standards and regulations. Failure to do so may compromise the integrity of the controller and/or cause product failure resulting in a safety risk to operational service and personnel.

This controller utilizes a heat sink which is designed to cool the unit during operation. Under no circumstance should air flow around the controller be compromised in any way. Failure to do so may result in the overheating of the controller, product failure, product temperatures and even fire.

⚠WARNING

During continuous operation, the heat sink can reach a very high temperatures, and keeps a high temperature even after the unit is turned off due to its high thermal inertia.

2. OVERVIEW & LAYOUT

This section contains the instructions needed for correct installation of ACPC modular power controller on the machine/host system control panel and for correct connection of the power supply, inputs, outputs and interfaces.

⚠CAUTION

Carefully read the following warnings before installing the instrument! Disregard of such warnings could create electrical safety and electromagnetic compatibility problems, as well as void the warranty.

ELECTRICAL POWER SUPPLY
The controller DOES NOT have an On/Off switch: the user must install switch/isolator con forming to safety requisites (CE mark) to cut off the power supply up-line of the controller.

The switch must be installed in the immediate vicinity of the controller in easy reach of the operator.

A single switch can be used for multiple devices.
- the earth connection must be made with a specific lead
- if the product is used in applications with risk of harm to persons or damage to machines or materials, it MUST be equipped with auxiliary alarm devices.

It is advisable to provide the ability to check for tripped alarms during regular operation.

NOTES ON ELECTRICAL SAFETY AND ELECTROMAGNETIC COMPATIBILITY:
CE: Conformity EMC (electromagnetic compatibility) conformity) in compliance with Direc-tive 2014/30/EU and following modifications. Series ACPC are mainly intended for industrial use, installed on panels or control panels of production process machines or systems. For purposes of electromagnetic compatibility, the most restrictive generic standards have been adopted, as shown on the table.

LV (low voltage) conformity in compliance with Directive 2014/35/EU.
EMC conformity has been verified with the connections indicated on table 1 (see user's manual).

RECOMMENDATIONS FOR CORRECT INSTALLATION FOR PURPOSES OF EMC
Instrument power supply
- The power supply for the electronic instrumentation on the panels must always come directly from a cut-off device with fuse for the instrument part.
- Electronic instrumentation and electromechanical power devices such as relays, contactors, solenoids,etc., MUST ALWAYS be powered by separate lines.
- When the power supply line of electronic instruments is heavily disturbed by switching of thyristor power groups or by motors, you should use an isolation transformer only for the controllers, grounding its sheathing.
- It is important for the system to be well-grounded:
  - voltage between neutral and ground must not be > 1V
  - Ohmic resistance must be < 6Ω;
- If the grid voltage is highly unstable, use a voltage stabilizer.
- In proximity of high-frequency generators or arc welders, use adequate grid filters.
- The power supply lines must be separate from instrument input and output lines.

INPUT AND OUTPUT CONNECTIONS
Before connecting or disconnecting any connection, always check that the power and control cables are isolated from voltage. Appropriate devices must be provided: fuses or automatic switches to protect power lines. The fuses present in the module function solely as a protec-tion for the ACPC semiconductors.

- Connected outside circuits must be doubly isolated.
- To connect analog inputs, strain gauges, linears, (you have to:
  - physically separate the input cables from those of the power supply, outputs, and power connections.
  - use braided and shielded cables, with sheathing grounded at a single point.

INSTALLATION NOTES
Use the extra-rapid fuse indicated in the catalogue according to the connection example equipped.
- Moreover, the applications with solid-state units require a safety automatic switch to section the load power line. To ensure the high reliability of the device, it is necessary to install it properly inside the panel so to obtain an adequate thermal exchange. Fit the device vertically (maximum angle 10° to the vertical axis)
- Vertical distance between a device and the panel wall >100mm
- Horizontal distance between a device and the panel wall at last 10mm
- Vertical distance between a device and the next one at last 300mm.
- Horizontal distance between a device and the next one at last 10mm.

Check that the cable holder runners do not reduce these distances, in this case fit the cantilever units opposite the panel so that the air can flow vertically without any obstacles.
- Dissipation of device thermal power with effects on installation room temperature.
- Thermal power dissipation with limits on installation room temperature.
- Requires exchange with external air or an air conditioner to transfer dissipated power outside the panel.
- Maximum limits of voltage and derived power of transients on the line, for which the solid state power unit contains protective devices (based on the model).
- Presence of dispersion current in ACPC in non-conducting state (current of a few mA due to RC Snubber circuit to protect the thyristor).

CHROMALOX
Advanced Thermal Technologies

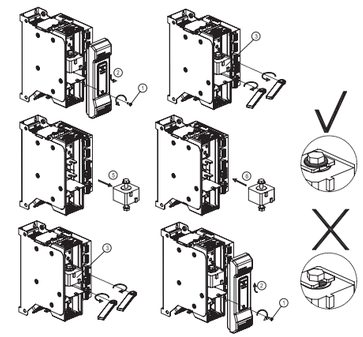
PK577
0037-75601
July 2023

3. FUSE REPLACEMENT

Replacing the Internal Fuse (Optional)

⚠WARNING

CUT OFF POWER BEFORE AND DURING FUSE SUBSTITUTION PROCEDURE
- Undo the cover fastening screw (1)
- Remove the cover following the movement indicated by the arrow (2)
- In this way the fuse is discovered (3)
- Slacken the two bolts fixing the fuse in place with a No.19 spanner (ACPC 500/600A) or a No.17 spanner (ACPC 400A). There is no need to remove the bolts, as the fuse is pulled out of its housing as shown by the arrows (5).
- Insert the new fuse as indicated by the arrows (6)



⚠WARNING

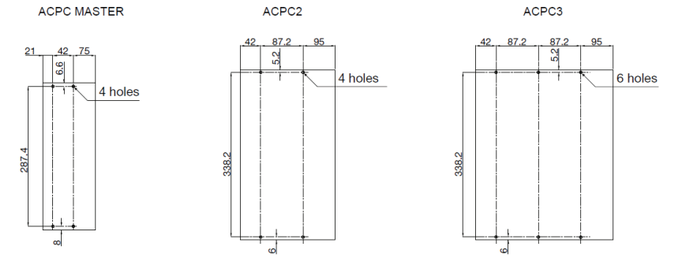
WARNING: the washer must be between the bolt and the copper strap (NOT under the fuse).
- Undo the cover fastening screw (1)
- Remove the cover following the movement indicated by the arrow (2)
- In this way the fuse is discovered (3)
- Slacken the two bolts fixing the fuse in place with a No.19 spanner (ACPC 500/600A) or a No.17 spanner (ACPC 400A). There is no need to remove the bolts, as the fuse is pulled out of its housing as shown by the arrows (5).
- Insert the new fuse as indicated by the arrows (6)

4. CERTIFICATIONS

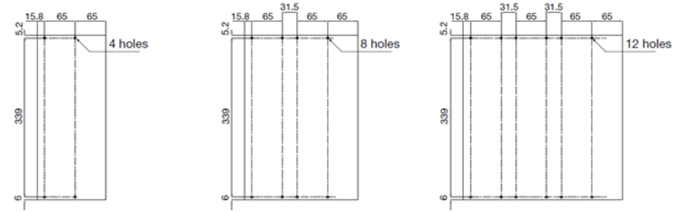
	Conformity C/CSA/US CoFC no. **70002856** (NOTE: CFW 400-600A products are not approved CSA)
CE	The device are manufactured according with the Community Directives 2011/65/EU (RoHS) 2014/30/EU (EMC), 2014/35/EU (LVD) in reference to product standard: EN 50581:2012 e EN 60947-4-3:2014
	Conformity C/UL/US file no. **E243386** vol. 1 sez. 5 (NOTE: UL pending for CFW 400...600A)
SCCR RMS SYM 100KA / 600V	Short Circuit Current Rating 100KA / 600V according to UL 508 for 100 A, 200 A and 250 A, 480 V and 600 V models only

FIXING INSTALLATION

ACPC 40 to 300A



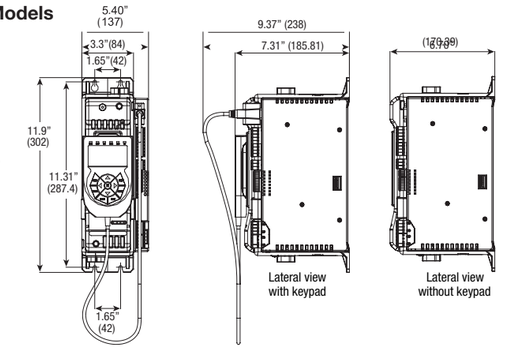
ACPC 400 to 600A



6. OVERVIEW & LAYOUT

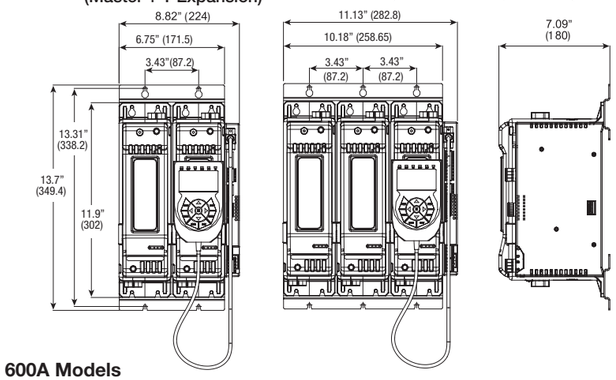
40A to 300A Models

ACPC
Single Phase



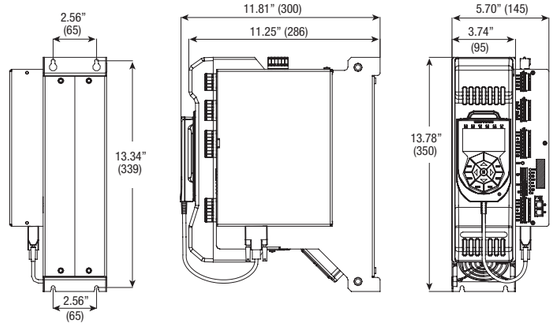
ACPC 3P 2-Leg
(Master + 1 Expansion)

ACPC 3P 2-Leg
(Master + 2 Expansions)



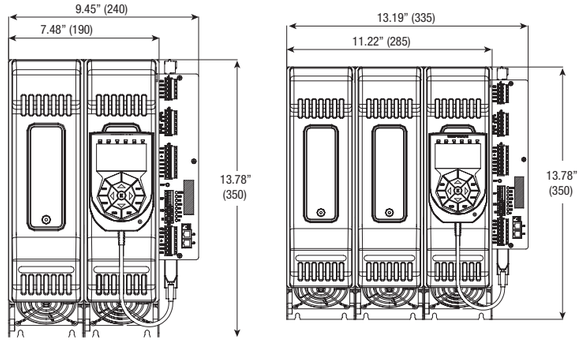
400A to 600A Models

ACPC
Single Phase

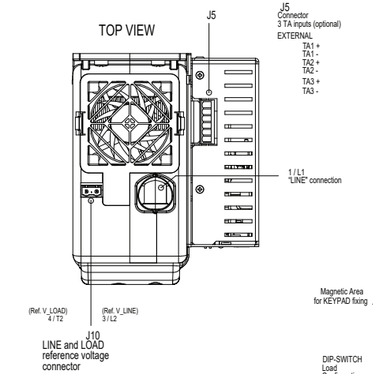


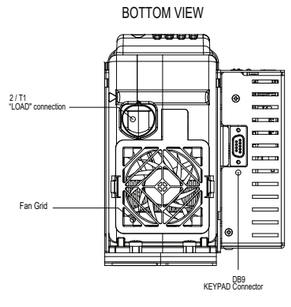
ACPC 3P 2-Leg (Master + 1 Expansion)

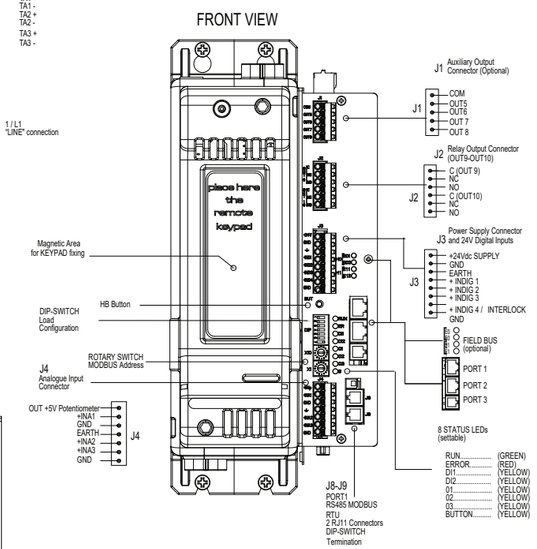
ACPC 3P 2-Leg (Master + 2 Expansions)

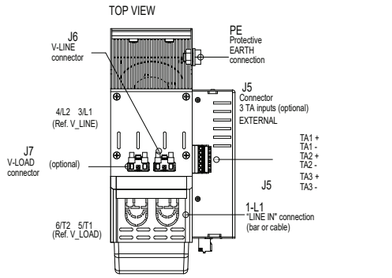


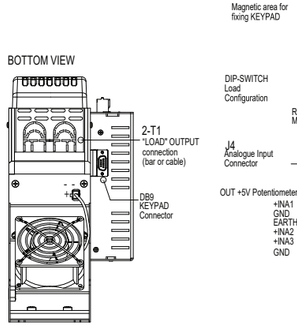
7. CONNECTIONS

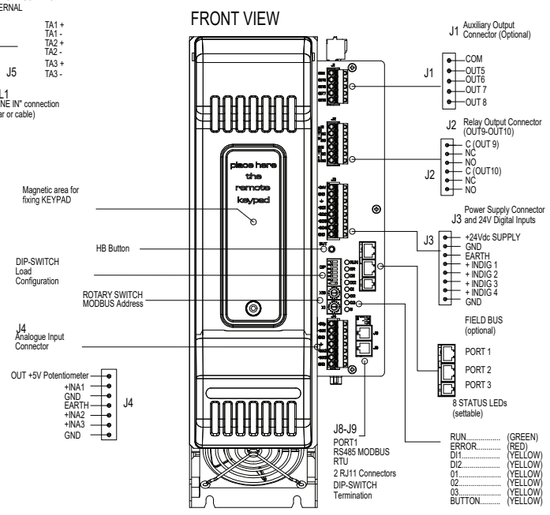












8. WIRE GAUGES

ACPC Current Level	Terminal	Wire Gauge	Terminal Type	Tightening/Tool Torque
40 A	1/L1, 2/T1	10 mm² 7 AWG	Wire stripped for 25 mm or with crimped pre-insulated terminal tube CEMBRE PKC1018	5 Nm / Flat-head screwdriver tip 1 x 5.5 mm
60 A	1/L1, 2/T1	16 mm² 5 AWG	Wire stripped for 25 mm or with crimped pre-insulated terminal tube CEMBRE PKC1618	5 Nm / Flat-head screwdriver tip 1 x 5.5 mm
100 A	1/L1, 2/T1	50 mm² 1 AWG	Wire stripped for 25 mm or with crimped pre-insulated terminal tube CEMBRE PKC50025	5 Nm / Flat-head screwdriver tip 1 x 5.5 mm
150 A	1/L1, 2/T1	70 mm² 2/0 AWG	Wire stripped for 25 mm or with crimped pre-insulated terminal tube CEMBRE PKC70022	6 Nm / No. 6 hex head wrench
200 A	1/L1, 2/T1	95 mm² 4/0 AWG	Wire stripped for 25 mm or with crimped pre-insulated terminal tube CEMBRE PKC95025	6 Nm / No. 6 hex head wrench
250 A	1/L1, 2/T1	120 mm² 250 AWG	Wire stripped for 25 mm	6 Nm / No. 6 hex head wrench
300A	1/L1, 2/T1	185 mm² 350 KCMIL	Wire stripped for 25 mm	6 Nm / No. 6 hex head wrench
---	3/L2 (Ref. Vline) 4/T2 (Ref. Vload)	0.25 ...2.5 mm² 23...14 AWG	Wire stripped for 8 mm or with tag terminal	0.5 ... 0.6 Nm Flat-head screwdriver tip 0.6 x 3.5 mm

NOTE: Cables must be copper "Stranded Wire" or "Compact-Stranded Wire" type with max. operating temp. 60/75°C

ACPC Current Level	Terminal	Type Cable/ Section Type Rail/Section	Terminal Type Cable/Rail	Tightening/Tool Torque
400 A	1/L1, 2/T1	Single cable 300 mm² (600kcmil)	Wire crimped at terminal tube CEMBRE A60-M12	N. 1 Bolt M12x25mm UNI 5739 hex head wrench n. 18 Pair: 50 Nm (**) (***)
400 A	1/L1, 2/T1	Double cable 2 x 95 mm² (3/0 AWG)	Wire crimped at terminal tube CEMBRE A19-M10	N. 2 Bolts M10x25mm UNI 5739 hex head wrench n. 17 Pair: 40 Nm (***)
400 A	1/L1, 2/T1	Double cable 2 x 95 mm² (3/0 AWG)	Wire stripped for 30mm inserted in ILSCO AU-350 lug (Accessory)	N. 1 Bolt M12x25mm UNI 5739 hex head wrench n. 18 Pair: 50 Nm (*) see note
400 A	1/L1, 2/T1	Copper rail Width = 40 32 24 mm Height = 2 2 3 mm	Insulated copper rail with terminal non-insulated for L= 60-65mm max	N. 1 Bolt M12x25mm UNI 5739 hex head wrench n. 18 Pair: 50 Nm
400 A	PE	Cable 95 mm² (3/0 AWG)	Wire crimped at terminal tube CEMBRE A19-M10	N. 1 Bolt M10x20mm UNI 5739 hex head wrench n. 17 Pair: 40 Nm (***)
500 A	1/L1, 2/T1	Double cable 2 x 120 mm²(350 kcmil)	Wire crimped at terminal tube CEMBRE A24-M10	N. 2 Bolts M10x25mm UNI 5739 hex head wrench n. 17 Pair: 40 Nm (***)
500 A	1/L1, 2/T1	Double cable 2 x 120 mm²(350 kcmil)	Wire stripped for 30mm inserted in ILSCO AU-350 lug (Accessory)	N.1 Bolt M12x25mm UNI 5739 hex head wrench n. 18 Pair: 50 Nm (*) see note
500 A	1/L1, 2/T1	Copper rail Width = 50 40 32 mm Height = 4 4 5 mm	Insulated copper rail with terminal non-insulated for L= 60-65mm max	N.1 Bolt M12x25mm UNI 5739 hex head wrench n. 18 Pair: 50 Nm
500 A	PE	Cable 185 mm² (350 kcmil)	Wire crimped at terminal tube CEMBRE A24-M10	N. 1 Bolt M10x20mm UNI 5739 hex head wrench n. 17 Pair: 40 Nm (***)
600 A	1/L1, 2/T1	Double cable 2 x 185 mm²(350 kcmil)	Wire crimped at terminal tube CEMBRE A37-M10	N. 2 Bolts M10x25mm UNI 5739 hex head wrench n. 17 Pair: 40 Nm (***)
600 A	1/L1, 2/T1	Double cable 2 x 185 mm²(350 kcmil)	Wire stripped for 30mm inserted in ILSCO AU-350 lug (Accessory)	N.1 Bolt M12x25mm UNI 5739 hex head wrench n. 18 Pair: 50 Nm (*) see note
600 A	1/L1, 2/T1	Copper rail Width = 50 40 32 mm Height = 4 4 5 mm	Insulated copper rail with terminal non-insulated for L= 60-65mm max	N.1 Bolt M12x25mm UNI 5739 hex head wrench n. 18 Pair: 50 Nm
600 A	PE	Cable 185 mm² (350 kcmil)	Wire crimped at terminal tube CEMBRE A37-M10	N. 1 Bolt M10x20mm UNI 5739 hex head wrench n. 17 Pair: 40 Nm (***)
400/500/ 600 A	J6, J7	Cable 0.25 … 2.5 mm² 23 …14 AWG	Cable peeled for 8mm or with a tag terminal	0.5 …0.6 Nm / 0.6 x 3.5mm slotted screwdriver

*Wires on the ILSCO accessory must be tightened with a hex head wrench n. 8. Torque: 30 Nm.
**NOTE: Use the IP20 grid of ILSCO accessory code F067432.
***NOTE: use only UL cable terminals with their stapler

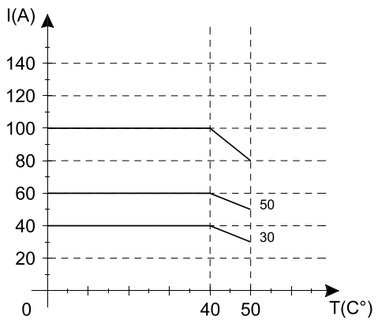
9. TECHNICAL DATA

POWER (SOLID STATE RELAY)			
CATEGORY OF USE (Tab. 2 EN60947-4-3)	AC 51 resistive or low inductance loads AC 55b short wave infrared lamps (SWIR) AC 56a transformers, resistive loads with high temperature coefficient		
Trigger Mode	**PA -** load control via adjustment of firing phase angle **ZC -** Zero Crossing with constant cycle time (settable in range 1-200s) **BF -** Burst Firing with variable cycle time (GTT) optimized minimum. **HSC -** Half Single Cycle corresponds to Burst Firing that includes ON and OFF halfcycles. Useful for reducing flicker with short-wave IR loads (applied only to calibrate each time you change feedback mode)		
Feedback Mode	**V, V²:** Voltage feedback proportional to RMS voltage value on load to compensate possible variations in line voltage. **I, I²:** Current feedback: bound to RMS current value on load to compensate variations in line voltage and/or variations in load impedance. **W:** Power feedback: proportional to real power value on load to compensate variations in line voltage and/or variations in load impedance.		
Max rated voltage	480Vac	600Vac	690Vac
Work voltage range	90…530Vac	90…660Vac	90...760Vac
Non-repetitive voltage	1200Vp	1600Vp	1600Vp
Rated frequency	50/60Hz auto-determination		
Critical Dv/dt with output deactivated	1000V/µsec		
Held nominal voltage of on the impulse	4KV		
Nominal current for short circuit condition	5KA		
Protection	RC, extrarapid fuses		
Thermic Dissipation	ACPC models dissipate thermic power based on load current: Pdissipation = I_load_Arms * 1.3V (W) For models with integrated fuse, also consider dissipated power at rated current shown on the fuse table		
Rated current AC51 non-inductive or slightly inductive loads, resistance furnaces	**ACPC 40** Nominal current 40Arms @40°C in continuous service Non-repetitive overcurrent t=10ms: 1400A I^2t for blowout: 10000A²s **ACPC 60** Nominal current 60Arms @40°C in continuous service Non-repetitive overcurrent t=10ms: 1500A I^2t for blowout: 12000A²s **ACPC 100** Nominal current 100Arms @40°C in continuous service Non-repetitive overcurrent t=10ms: 1900A I^2t for blowout: 18000A²s **ACPC 150** Nominal current 150Arms @40°C in continuous service Non-repetitive overcurrent t=10ms: 5000A I^2t for blowout: 125000A²s **ACPC 200** Nominal current 200Arms @40°C in continuous service Non-repetitive overcurrent t=10ms: 8000A I^2t for blowout: 320000A²s **ACPC 250** Nominal current 250Arms @40°C in continuous service Non-repetitive overcurrent t=10ms: 8000A I^2t for blowout: 320000A²s **ACPC 300** Nominal current 300 Arms @ 40°C in continuous service Non-repetitive overcurrent t=10ms: 8000 A I^2t for blowout: 320000 A²s **NOTE** (for all models) Minimum load controllable: 5 % of product current rated level.		
Rated current AC56A permitted trigger modes: ZC, BF with DT (Delay Triggering), PA with softstart	Derating: 20% of rated current value.		

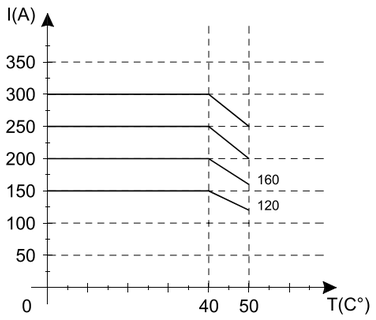
POWER (SOLID STATE RELAY)			
CATEGORY OF USE (Tab. 2 EN60947-4-3)	AC 51 resistive or low inductance loads AC 55b short wave infrared lamps (SWIR) AC 56a transformers, resistive loads with high temperature coefficient		
Trigger Mode	**PA -** load control via adjustment of firing phase angle **ZC -** Zero Crossing with constant cycle time (settable in range 1-200s) **BF -** Burst Firing with variable cycle time (GTT) optimized minimum. **HSC -** Half Single Cycle corresponds to Burst Firing that includes ON and OFF halfcycles. Useful for reducing flicker with short-wave IR loads (applied only to calibrate each time you change feedback mode)		
Feedback Mode	**V, V²:** Voltage feedback proportional to RMS voltage value on load to compensate possible variations in line voltage. **I, I²:** Current feedback: bound to RMS current value on load to compensate variations in line voltage and/or variations in load impedance. **W:** Power feedback: proportional to real power value on load to compensate variations in line voltage and/or variations in load impedance.		
Max rated voltage	480Vac	600Vac	690Vac
Work voltage range	90…530Vac	90…660Vac	90...760Vac
Non-repetitive voltage	1200Vp	1600Vp	1600Vp
Rated frequency	50/60Hz auto-determination		
Critical Dv/dt with output deactivated	1000V/µsec		
Held nominal voltage of on the impulse	4KV		
Nominal current for short circuit condition	5KA		
Protection	RC, extrarapid fuses		
Thermic Dissipation	ACPC models dissipate thermic power based on load current: Pdissipation = I_load_Arms * 1.3V (W) For models with integrated fuse, also consider dissipated power at rated current shown on the fuse table		
Rated current AC51 non-inductive or slightly inductive loads, resistance furnaces	**ACPC 400** Nominal current 400 Arms @50°C in continuous service Non-repetitive overcurrent t=10ms: 8,000 A Melting fuse I^2t: 320,000 A²s **ACPC 500** Nominal current 500 Arms @50°C in continuous service Non-repetitive overcurrent t=10ms: 15,000 A Melting fuse I^2t: 1,125,000 A²s **ACPC 600** Nominal current 600 Arms @50°C in continuous service Non-repetitive overcurrent t=10ms: 15,000 A Melting fuse I^2t: 1,125,000 A²s **NOTE** (for all models) Minimum load controllable: 5 % of product current rated level.		
Rated current AC56A permitted trigger modes: ZC, BF with DT (Delay Triggering), PA with softstart	Derating: 20% of rated current value.		

10. DERATING CURVES

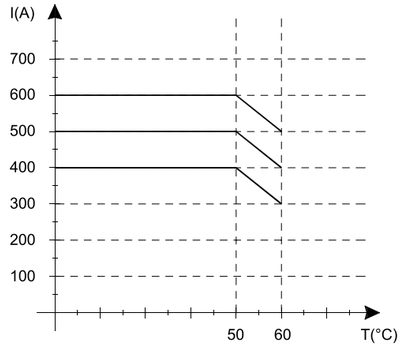
ACPC 40 / 60 / 100A



ACPC 150 / 200 / 250 / 300A



ACPC 400 / 500 / 600A

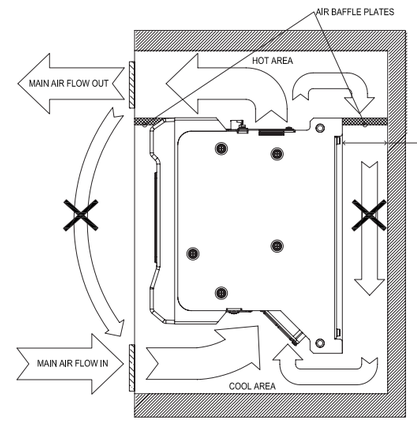


11. GENERAL DATA

POWER (SOLID STATE RELAY)				
Power Supply	24Vdc ±10%, Class II, max 8VA Max 10VA terminal KB-ADL Isolation 1000V			
Fan Power Supply	24Vdc ±10%, 500mA @ 25Vdc			
Signals	Eight led: RN (Green) run state of CPU ER (Red) error signal DI1, DI2, (Yellow) state of digital inputs INDIG1, INDIG2 O1,O2,O3 (Yellow) state of power control BT (Yellow) state key HB			
Protection	IP20			
Work/Storage Temperature	0…50°C (refer to dissipation curves) / -20 °C - +70 °C			
Relative Humidity	20…85% Ur non-condensing			
Ambient Conditions for Use	indoor use, altitude up to 2000m			
Installation	panel with screws			
Installation Requirements	Installation category II, pollution level 2, double isolation Max. temperature of air surrounding device 40°C for temperature >40°C refer to derating curves Device type: “UL Open Type			
Weight	Model with Internal Fuse	Master	Master +1 Expansion	Master +2 Expansions
	40A	2.2 kg	4.2 kg	6.2 kg
	60A	2.2 kg	4.2 kg	6.2 kg
	100A	2.2 kg	4.2 kg	6.2 kg
	150A	2.3 kg	4.4 kg	6.5 kg
	200A	2.6 kg	5.0 kg	7.4 kg
	250A	2.6 kg	5.0 kg	7.4 kg
	300A	2.6 kg	5.0 kg	7.4 kg

POWER (SOLID STATE RELAY)				
Power Supply	ACPC 1PH-400/500/600A: 24 Vdc ± 10% max 38W ACPC 2PH-400/500/600A: 24 Vdc ± 10% max 66W ACPC 3PH-400/500/600A: 24 Vdc ± 10% max 94W			
Signals	**Eight led:** RN (Green) run state of CPU; ER (Red) error signal; DI1, DI2, (Yellow) state of digital inputs INDIG1, INDIG2; O1,O2,O3 (Yellow) state of power control; BT (Yellow) state key HB			
Protection	IP20			
Work/Storage Temperature	0…50°C (refer to dissipation curves) / -20 °C - +85 °C			
Relative Humidity	20…85% Ur non-condensing			
Ambient Conditions for Use	indoor use, altitude up to 2000m			
Installation	panel with screws			
Installation Requirements	Installation category II, pollution level 2, double isolation Max. temperature of air surrounding device 50°C for temperature >50°C refer to derating curves Device type: “UL Open Type			
Weight	Model with Internal Fuse	ACPC-1PH	ACPC-2PH	ACPC 3PH
	ACPC 400	8 kg	15.5 kg	22.5 kg
	ACPC 500/600	11 kg	21 kg	31 kg

12. PANEL MOUNTING



Minimum distance <

100 mm

⚠CAUTION

Attention: respect the minimum distances shown in figure to provide adequate air circulation.