



# ALPTEC POWER FACTOR CONTROLLER

ALPTEC3

ALPTEC5

ALPTEC7



ALPTEC12

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## I GENERAL INFORMATION

### DESCRIPTION

- Digital microprocessor power factor controller
- 3 digit 7 segment LED display
- 4 key membrane keypad
- TTL-RS232 serial interface for set-up and automatic testing via PC (Personal Computer)
- Internal temperature sensor
- Advanced functions for capacitor current overload measurement, average weekly power factor, maximum value logging
- 2 relays programmable as alarm and/or fan control

### VERSIONS

ALPTEC3 3 steps, 96x96mm housing  
ALPTEC5 5 steps, 96x96mm housing  
ALPTEC7 7 steps, 96x96mm housing  
ALPTEC12 12 steps, 144x144mm housing

### INSTALLATION

- Install the controller according to wiring diagrams given on page 13.
  - The CT (Current Transformer) must be connected to the free phase, i.e. not on phases used to supply the unit, as indicated in the wiring diagrams on page 13.
  - The controller automatically recognizes the CT current flow. In case of co-generation systems, disable this function (refer to advanced menu section) and connect the CT correctly.
- The CT secondary must be earthed/grounded
- This equipment must be installed by trained personnel, complying to current standards, to avoid damages or safety hazards.

### CONNECTIONS CONTROL

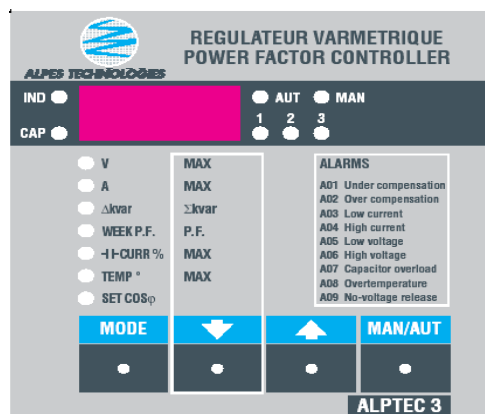
- At the first power up, the ALPTEC display views --- which means no parameter has been programmed yet.
  - In these conditions, a manual test of the steps can be conducted to check the connections.
  - By pressing the ↓ or ↑ key, the steps are connected or disconnected.
- (WARNING! During this phase, the step control is totally manual and the unit does not control the reconnection time to consent the capacitor discharge)

Note: Products illustrated herein are subject to alterations and changes without prior notice. Technical data and descriptions in the documentation are accurate to the best of our knowledge, but no liabilities for errors, omissions, or contingencies will be accepted.



## FRONT PANEL DESCRIPTION

- The display shows the  $\cos\phi$  of the system together with the IND and CAP LEDs. The flashing decimal point indicates the negative sign (inverse energy flow).
  - By pressing the MODE key, the V, A,  $\Delta kvar$ , etc. LEDs are switched on one after another and the relative measurement of each is viewed.
  - An optional function is available for each LED and indicated on front viewable by pressing the  $\downarrow$  key; the LED flashes quickly thereafter.
  - For some measurements, a second optional function is displayable by pressing the  $\uparrow$  key.
- Programmed; the  $\downarrow$  and  $\uparrow$  keys respectively increase or decrease the value. The set  $\cos\phi$  can be adjusted between 0.80 IND and 0.80 CAP.

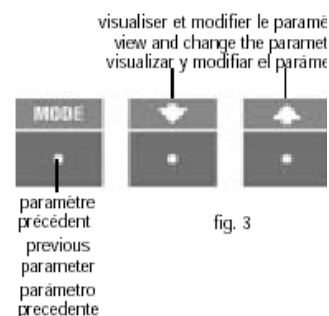
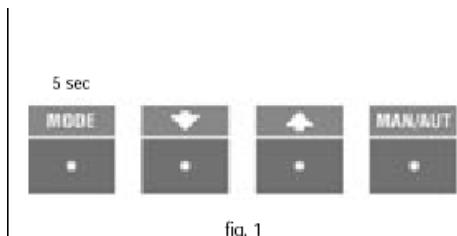


LED		Pressing $\downarrow$	Pressing $\uparrow$
V	RMS voltage	Max voltage value	
A	RMS Current	Max current value	
$\Delta$ Kvar	Kvar required to reach set point	$\Sigma$ Kvar	Steps required to achieve set-point.
WEEK P.F.	Average weekly average	Real power factor	
$I_{CURR}^{\circ}\%$	Capacitor overload	MAX Over load value	Over load event counter
TEMP°	Electrical panel temperature	MAX temperature value	Measure Unit °C or °F
SET COS $\phi$	Required $\cos \phi$	Decrease set $\cos \phi$	Increase set $\cos \phi$

## II WAYS TO SET UP THE CONTROLLER

### 1. MANUAL KEYPAD SET-UP

- For a manual set up it is necessary to set the proper value such as described in the parameter table.
- Place the unit in manual mode and press the MODE key for 5 consecutive seconds (fig.1).
- The word Set is viewed on the display to confirm access to the basic menu parameters (fig. 2).



PARAMETER	DESCRIPTION	RANGE	DEFAULT SETTING
P.01	CT primary current For values higher than 1000, a flashing dot indicates “thousands”	OFF to 10.00	OFF
P.02	Smallest step kvar Rated power in kvar of the smallest installed capacitor bank. Example: For 10 kvar, set <b>10.0</b>	0.10 to 300	1.00
P.03	Rated capacitor voltage. Rated voltage (nameplate) of the capacitors. Example: For 440V, set 440	80 to 750V	400
P.04	Reconnection time. Programmed by ALPES TECHNOLOGIES. Any modifications of this parameter without a written authorisation from ALPES TECHNOLOGIES exclude all warranty from the goods		
P.05	Sensitivity :The sensitivity is a coefficient, which adjust the controller regulation speed.	5 to 600Sec	30
P.06	P.06 LED 1...n Step coefficients The coefficients of the steps represent the power of each step in relation to the smallest capacitor bank, which value is programmed at P.02	0 to 16	0
P.06 LED 1 to LED n	If a step has the same power rating of the smallest step, then its coefficient will be 1, while if it is double it will be 2 and so on up to a maximum of 16. By setting 0, the step will be disabled and will never be considered or used by the controller.		
P.06 EXAMPLE	With a ALPTEC7 installed in a control panel with 6 capacitor banks, respectively 5, 10, 20, 20, 20, 20 kvar at rated 440V and needing to use the last step as alarm: P.02=5.00 (Smallest step = 5kvar) P.03= 440 (Rated voltage 440V) P.06 LED 1= 001 (5 kvar = 1 times P.02) P.06 LED 2= 002 (10 kvar = 2 times P.02) P.06 LED 3= 004 (20 kvar = 4 times P.02) P.06 LED 4= 004 (20 kvar = 4 times P.02) P.06 LED 5= 004 (20 kvar = 4 times P.02) P.06 LED 6= 004 (20 kvar = 4 times P.02) P.06 LED 7= noR (Normally open alarm)	<p>NOTE: The last two steps can be programmed to operate as normal steps or as alarm relay or again as fan control. If the second last step is linked to a function then the last step cannot be used as a normal step.</p> <p>To select these functions, press ↓ until the following codes are viewed: noR = Normally open alarm (contact open in absence of alarm) ncR = Normally closed alarm (contact closed in absence of alarm) FA n = Fan control</p>	



## 2. QUICK SET-UP VIA PC

- For quick set-up via PC, it is necessary to use the relative automatic test and remote control software ALPTECSW, that includes the PC software and the connection cable (code 51 C11). For this reason, all the ALPTEC models are provided with a communication port in the rear.
- All of the parameters are viewed on the PC monitor. The settings can be transmitted and stored with a few simple clicks of the mouse.
- This solution is ideal if you have several controllers to programme with the same setting. The set-up can be downloaded to a file and used to program other controllers.
- When the capacitor bank is power up you can monitor any parameter such as temperature, nominal voltage and current or the reactive power of each step can be viewed ...



### III OPERATING MODE

- The AUT and MAN LEDs indicate the automatic or manual operating mode.
- To change mode, press the MAN/AUT key for at least 1 second.
- When the SET COS  $\phi$  LED is switched on, no mode change is possible.
- The operating mode remains stored even if power is removed.

#### AUTOMATIC OPERATION

- In automatic mode, the controller calculates the optimum configuration to achieve the set cos $\phi$  value.
- The selection criteria take into consideration many variables such as: power of each step, the number of operations, the total time of usage, reconnection time, etc.
- The controller displays the imminent connection or disconnection of the step by the AUT LED flashing. The LED flashing can last in cases when the connection of a step is not possible because of the reconnection time (i.e. capacitor discharge time).

#### MANUAL OPERATION

- When the controller is in manual mode, one of the steps can be selected and manually connected or disconnected.
- If a measurement other than cos $\phi$  is viewed, press MODE until all the LEDs of the measurements are switched off.
- To select one of the steps, use the ↓ and ↑ keys. The LED of the selected step starts flashing quickly.
- Press MODE to connect or disconnect the selected step.
- If the reconnection time of the selected step has not elapsed, the MAN LED flashes to indicate the operation has been confirmed and will be conducted in due time.
- The manual configuration of the steps is maintained even when voltage is removed. When power returns, the original state of the steps is restored.

#### KEYPAD LOCK

- A function to exclude all modification to operating parameters can be enabled; measurement viewing is still provided in any case.
- To lock and unlock the keypad, push and keep MODE key pressed. Then press the ↑ key three times and the ↓ key twice and then release MODE. The display will view LOC when the keypad is locked and UnL when unlocked.
- When the lock is enabled, it is not possible to make the following operations:
  - Change from automatic and manual mode
  - Access set-up menus
  - Change the cos $\phi$  set-point
  - Clear of MAX values.
- By attempting to conduct the above operations, the display will view LOC to indicate the locked keypad state



## IV ADVANCED PARAMETERS

### ADVANCED MENU SET-UP

- With the controller in MAN mode, press the MODE key for at least 5 seconds.
- The wording SEt will be viewed to indicate the access to basic menu parameters.
- At this point, simultaneously press the ↓ and ↑ keys for 5 seconds until AdS appears on the display to indicate the access to advanced menu

PARAMETER	FUNCTION	RANGE	Default setting
P.11	<b>Type of connection</b> Programs either single-phase or three-phase connection.	3PH -1PH	3PH
P.12	<b>CT connection recognition:</b> When set to Automatic, the controller operates in 2 quadrants and can be used both in normal or co-generation systems. It is however necessary to check the correct CT connection by making sure the decimal point of the $\cos\phi$ measurement is not flashing with energy import conditions. Contrarily, the CT connections (S1 and S2 terminals) must be inverted or more simply set Inverse. WARNING! Before disconnecting the S1 and S2 terminals, check that the CTSecondary terminals are shorted.	Aut (Automatic) – dir (Direct) – rEU (Inverse)	Aut
P.13	<b>Mains frequency recognition:</b> Automatic selection, fixed 50Hz or fixed 60Hz.	Aut (Automatic)- 50H (50Hz) – 60H (60Hz)	Aut
P.14	<b>Step power adjustment:</b> When this function is enabled and during normal operation, the unit provides to automatically measure the set power and modify the operating parameters in case the steps are worn (i.e. make many operations).	On (Enabled) OFF (Disable)	ON
P.15	<b>Standard or Band regulation mode:</b> In Standard mode, the controller adjusts the system $\cos\phi$ to the set value. In Band mode, the capacitors are connected when the system $\cos\phi$ is lower than the set value and are disconnected when in capacitive conditions. The Band mode is used to additionally reduce the number of capacitor connections and disconnections. Note: The Band mode configuration does not consent to capacitive $\cos\phi$ programming.	Std (Standard) - Bnd (Band)	Std
P.16	<b>Standard or Linear connection mode</b> In Standard mode, the regulator freely selects the steps according to the logic described in the Automatic operation section above. In Linear mode, the steps are connected in progression from left towards right only following the step number and according to the LIFO (Last In First Out) logic. The controller will not connect a step when the system steps are of different ratings and by connecting the next step, the set-point value would be exceeded.	Std (Standard) - Lin (Linear)	Std





## IV ADVANCED PARAMETERS

PARAMETER	FUNCTION	RANGE	Default setting
P.17	<b>Co-generation Cos<math>\phi</math> set-point:</b> This parameter is programmed when a 4-quadrant operation is needed, that is in conditions when the system can consume or produce energy. When the parameter is set to OFF, the Cos $\phi$ set-point is the only one and corresponds to the value programmed with SET Cos $\phi$ see page 3). On the other hand, when it is set to a numeric value then the set-points are two: in normal conditions (system consumes mains energy, positive Cos $\phi$ ), the set-point value is considered as programmed by SET Cos $\phi$ . With co-generation conditions (system produces energy, negative Cos $\phi$ ), it is used as programmed at P.17.	OFF – 0.80Ind to 0.80Cap	OFF
P.18	<b>Disconnection sensitivity:</b> With this parameter at OFF, the sensitivity value set at P.05 (see basic menu) adjust the reactive speed both during the connection and disconnection phases. However, if P.18 is set to a different value, the programmed value of P.05 is considered for the connection while the P.18 value for the disconnection of the steps	OFF- 1 to 1600sec	OFF
P.19	<b>Step disconnection at change to MAN mode</b> By enabling this parameter, the connected steps are disconnected in sequence when one changes from AUT to MAN mode. At the end of the disconnection, the normal manual mode function is restored	OFF Disabled – On Enabled	ON
P.20	<b>Harmonic overload alarm :</b> Programmed by ALPES TECHNOLOGIES. Any modifications of this parameter without a written authorisation from ALPES TECHNOLOGIES exclude all warranty from the goods.		
P.21	<b>Harmonic overload disconnection :</b> Programmed by ALPES TECHNOLOGIES. Any modifications of this parameter without a written authorisation from ALPES TECHNOLOGIES exclude all warranty from the goods.		



## IV ADVANCED PARAMETERS

PARAMETER	FUNCTION	RANGE	Default setting
P.22	<b>Overload event counter clear time:</b> Each time an A07 Capacitor overload alarm is generated, the event is registered by an internal counter, which can be consulted by pressing the key ↑ when the CURR %. LED is switched on. The counter indicates the number of capacitor overload events have taken place over the time period defined by P.22 . This parameter also defines the number of hours during which the events remain stored. If no event has taken place during the time period, the counter is cleared	1 to 240h	240
P.23	<b>Overload alarm reset time:</b> Time period during which the A07 Capacitor overload remains active even though the overload value has decreased below the alarm threshold.	1 to 30 min	5
P.24	<b>Unit of measure for temperature:</b> It defines the unit of measure, in degrees Celsius or Fahrenheit, of the temperature measurement and viewing along with the thresholds setting related to it.	°C Celsius - °F Fahrenheit	°C
P.25	<b>Fan start temperature:</b> Sets the temperature above which the fan relay is activated, if any is programmed on the last two steps	0 to 100°C	35
P.26	<b>Fan stop temperature:</b> Sets the temperature below which the fan relay is deactivated, if any is programmed on the last two steps.	0 to 100°C	30
P.27	<b>Temperature alarm threshold:</b> Sets the temperature above which the alarm A08 Temperature too high is activated.	30 to 100°C	40

Note: The delay time of Capacitor overload alarm operates inversely proportional to the overload entity, compared to the programmed thresholds of P.20 and P.21. When the overload is lower than the P.20 threshold, the alarm will not be generated. When the overload is equal to, the delay time is equal to the one set for the alarm (3 minutes default but can be changed via PC). As the overload increases, the delay time becomes proportionally less until it attains zero once the value set at P.21 is reached. With P.20 at OFF, there is no tripping until the P.21 value is exceeded and the immediate disconnection of the steps takes place. With P.21 at OFF, the delay TIME is also constant. With P.20 and P.21 both at OFF, the capacitor overload measurement is disabled as well as the A07 alarm. In these conditions, the display indicates instead of the overload measurement. Whenever the capacitor banks are equipped with inductances to prevent harmonic overload, P.20 and P.21 must be at OFF.



## V ALARMS

- When the controller detects an abnormal situation in the system, a flashing alarm code is displayed. By pressing any key, the alarm viewing will be momentarily ignored to permit the user to check all the measurements. If no key is pushed for 30 seconds and the alarm conditions persist, the alarm code will be displayed once again.
- Each alarm can cause diverse results such as the alarm relay tripping, the delayed or immediate step disconnection, etc., according to the programmed property.
- The property of each alarm can be changed (e.g. disabled, change the delay time or effect), by using a PC and the relative software (order code ALPTEC SW), used for the quick parameter set-up.
- The following table indicates the alarm codes and the relative meaning of each along with the default setting.

Alarm Code	Description	Enabling	Alarm relay	Disconnection	Tripping delay
A01	<b>Under compensation:</b> Capacitor are all connected and $\cos\phi$ is lower than set point value	Y	Y	N	015min
A02	<b>Over compensation:</b> All capacitors are disconnected and $\cos\phi$ is higher than set point value	Y	N	N	120s
A03	<b>Low Current:</b> Current value is lower than 2.5% full scale value. In automatic, the capacitors are disconnected after 2 minutes.	Y	N	N	5s
A04	<b>High Current:</b> Current value is 120% higher than full scale value.	Y	N	N	120s
A05	<b>Low voltage:</b> Voltage value is -15% lower than lower rate voltage	Y	Y	Y	5s
A06	<b>High voltage:</b> Voltage value is +10% higher than rated voltage	Y	N	Y	5min
A07	<b>Capacitor overload:</b> Current value flowing in the capacitors is higher than the set threshold (refer to P20 and P21)	Y	Y	Y	120s
A08	<b>Over temperature:</b> Internal temperature is higher than setted threshold (refer P27)	Y	Y	Y	30s
A09	<b>No-voltage release:</b> Voltage failure	Y	N	N	0s



## VI TECHNICAL CHARACTERISTICS

Auxiliary supply	ALPTEC3	ALPTEC5	ALPTEC7	ALPTEC12
Rated voltage Ue	380 to 415Vac (other value on request)			
Operating limit	-15 % to +10% Ue			
Rated frequency	50 or 60Hz <sup>+</sup> . 1% (self configurable)			
Maximum consumption	6.2Va			5Va
Maximum power r dissipated	2.7W			3W
Maximum power dissipated by output contact	0,5W with 5A			
Immunity time for micro breakings	≤ 30ms			
No-voltage release	≥ 8ms			

Current input	
Rated current Ie	5A (1A on request)
Operating limit	0.125 to 6A
Constant overload	+20%
Type of measurement	True RMS
Short time time withstand current	10Ie for 1s
Dynamic limit	20Ie for 10 ms
Input power	0.65W

Control range	
Power factor setting	0.80 ind to 0.80cap
Reconnection time of the same step	5 to 240s
Sensitivity	5 to 600S / step

Output relay	ALPTEC3	ALPTEC5	ALPTEC7	ALPTEC12
Number of outputs	3	5	7	12
Type of outputs	3	3 + 2 C/O/F	5 + 2 C/O/F	10 + 2C/O/F
Maximum current at contact common	12A			
Rated capacity Ith	5A			
Rated operational voltage	250VAC			
Maximum switching voltage	440VAC			
Designation according to IEC/EN 60947 5-1 AC-DC	C250, B/400			
Electrical life at 0.33A 250VAC and AC11 load conditions	5 x 10 <sup>6</sup> ops			
Electrical life at 2A 400VAC and AC11 load conditions	2 x 10 <sup>6</sup> ops			

Operating ambient conditions	
Operating temperature	-20°C to + 60°C
Storage temperature	-30°C to +80°C
Relative humidity	< 90%

Connections	
Type of terminal	Removale / Plug – in
Cable cross section (min-max)	0.2-2.5mm <sup>2</sup> (24 – 12AWG)
Tightening torque	0.8Nm (7lbin)

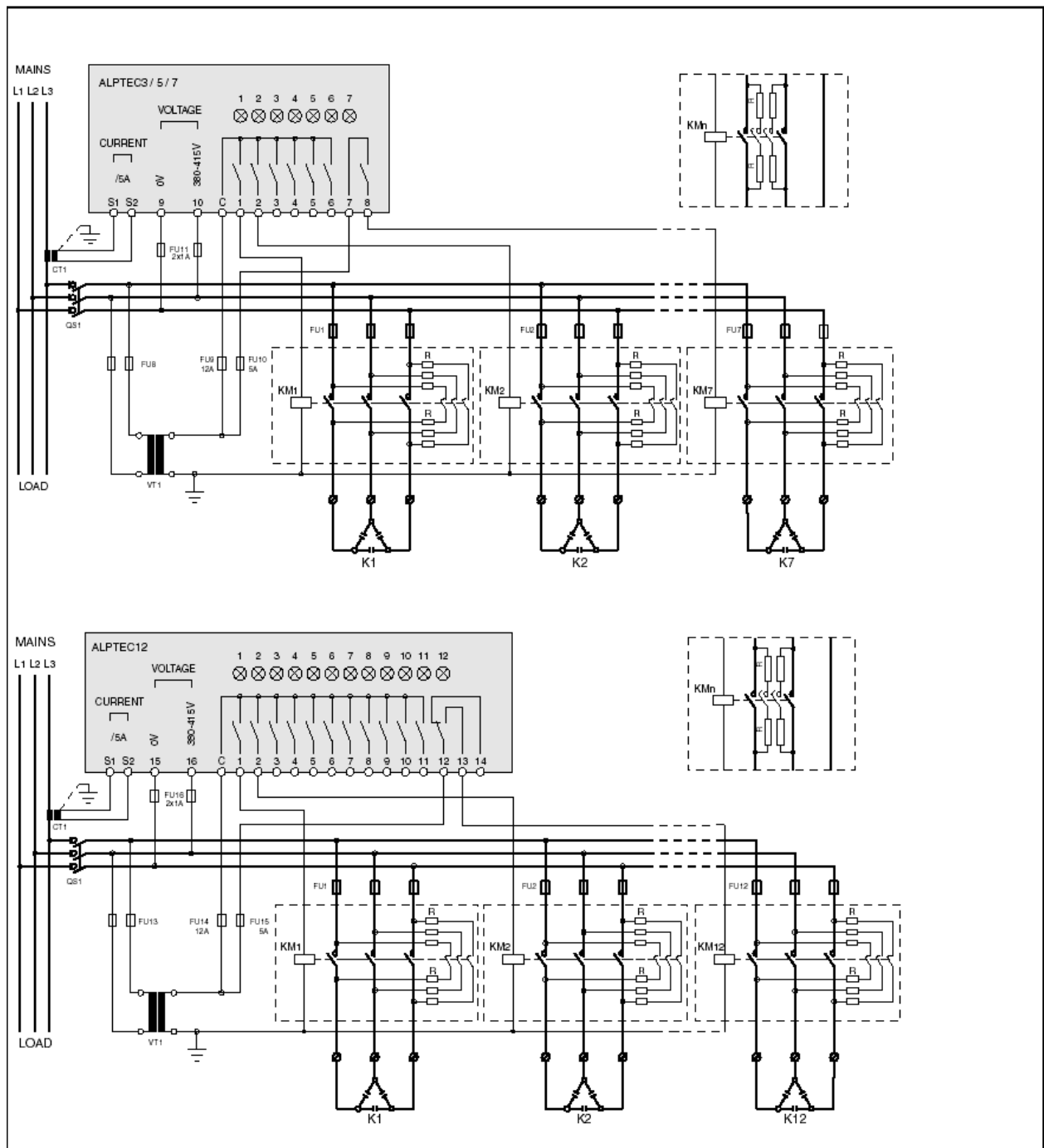


## VI TECHNICAL CHARACTERISTICS

Enclosure	ALPTEC3	ALPTEC5	ALPTEC7	ALPTEC12
Version	Flush mount			
Material	Thermoplastic NORYL SE1 GNF2			Thermoplastic LEXAN 3412R
Dimension W x H x D	96 x 96 x 65 mm			144 x 144 x 62 mm
Panel cut out dimension	91 x 91 mm			138.5 x 138.5 mm
Protection degree	IP54			IP 41 (IP54 with protection cover)
Weight	420g	440g	460g	770g

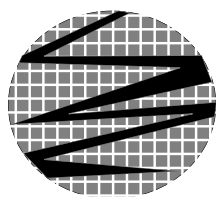
Reference standards
IEC/EN 61010-1, IEC/EN 61000-6-2, ENV 50204; CISPR 11 / EN 55011; 61000-3-3; IEC/ EN60068-2-6 ; UL508 ; CSA C22.2 No14-95

Certification
cULus pending

**WIRING DIAGRAM****IMPORTANT!**

- For three-phase connection, the voltage input must be connected phase to phase; the current transformer must be connected on the remaining phase.
- The polarity of the current/voltage input is indifferent,

**WARNING! Disconnect the line and the supply when operating on terminals.**



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