

ALPES TECHNOLOGIES

USER'S MANUAL ALPISTATIC CAPACITOR BANK WITH ALPTEC11-ST CONTROLLER

- Protection – Connection**
- Commissioning**
- Maintenance**

CONTENTS

I - PROTECTION - CONNECTIONS

A - PROTECTION	4
B - CONNECTIONS	4
1) Power circuit	4
2) Auxiliary circuits	4
C - OPERATION ON GENSET	5

II - OPERATIONS AND INSPECTIONS TO BE PERFORMED AT THE COMMISSIONING

A - BEFORE APPLYING POWER	7
B - APPLY POWER	8

III - MAINTENANCE

9

IV - DESCRIPTION OF ALPTEC11-ST CONTROLLER FRONT PANEL

10

V - ALPISTATIC CAPACITOR BANK WIRING DIAGRAM

A - 220 / 240V NETWORK	13
B - 380 / 415V NETWORK	14
C - NETWORK > 415V AND ABOVE OR EGAL AT 690V	15

VI - APPENDICES

A - MANUAL MODE OPERATION	14
B - MEANING OF ALARM MESSAGES	15
C - REQUIRED COS φ SETTING – KEYPAD LOCK - MODIFICATION OF C.T SETTING	18

I – PROTECTION - CONNECTIONS

A - PROTECTION

For capacitor banks which do not have a factory-fitted general protection system, a protective device must be fitted at the head of the power cable:

- either a circuit breaker:

- thermal relay: set between 1.3 times the nominal current of the bank
- magnetic relay: set between 6 and 8 times the nominal current of the bank

- or a fuse-switch, type gG, rated between 1.4 and 1.6 times the nominal current of the bank

B - CONNECTIONS

1) Power circuit

The capacitor and its accessories require power cables with a minimum rating of:

$$I = 1.3 \text{ times the nominal current of the bank}$$

When calculating the cross-section it is also essential to take account of the usual cable-related coefficients (type, length, method of fitting, etc.).

For **ALPISTATIC** units, the **phase order L1 - L2 - L3** marked on the **capacitor bank busbars** must be respected for the connection of the power cables.

Nota: earthing of the capacitor bank must be done by a cable with appropriate cross-section according to the updated standards.

2) Auxiliary circuits

For correct operation of the power factor controller, a **current transformer** must be connected to **ALPISTATIC** units.

It must be fitted on phase L3 of the unit to be compensated, **upline from all receivers and the capacitor bank.**

The current transformer secondary must be connected on the auxiliary terminal block, marked S1 and S2 (see diagram below).

- Current Transformer characteristics:**
 - primary : adapted to the current line of the electrical general network**
 - secondary : 5 A**
 - minimum power: 10 VA**
 - class: 1**

Diagram 1: Current transformer only supplying the P.F controller

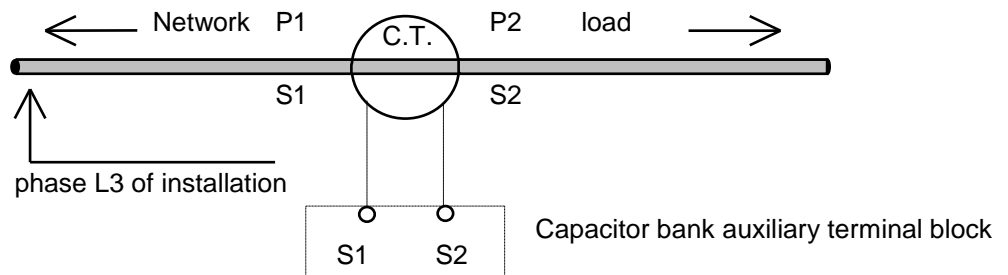
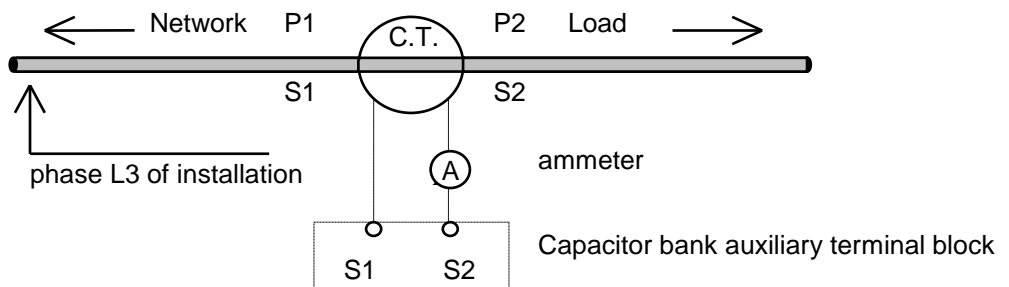


Diagram 2: Current transformer already supplying an ammeter



Particular cases:

- If the installation has an existing C.T you may use it, provided it meets the recommendations on page 4 (position, characteristics, power, etc.).
In this case, the power factor controller is connected **in series with the existing ammeter** (diagram 2).
- If the installation has **two or more power transformers in parallel, compensated by a single capacitor bank**, you must plan:
 - **one C.T** on phase L3 of **each transformer**
 - **one overall C.T, adding type 5 + 5 ... / 5 A**

In this case, the equivalent C.T primary to be programmed in the controller is calculated by adding the primary values of each C.T.

C – OPERATION ON GENSET

If the installation can be powered by a generator unit in the event of a mains power cut, it is not necessary to disconnect the capacitor bank: the response time is maxi 40ms, so the operation is compatible with a GenSet.

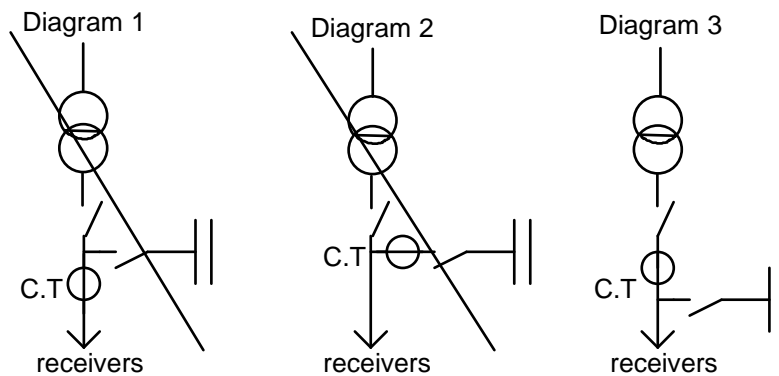
If, for any reason you want to disconnect the capacitor bank, simply **remove the shunt** between terminals G and E (see diagrams on pages 12, 13 and 14) and **connect between them a contact which is opened** when the generator is operating.

When the generator is started, the capacitor bank will be disconnected automatically.

II - OPERATIONS AND INSPECTIONS TO BE PERFORMED AT THE COMMISSIONING OF THE ALPISTATIC CAPACITOR BANK

A – BEFORE APPLYING POWER

- ❑ **Check** the protective device settings and the power cable connections (page 4).
- ❑ **Check that the current transformer is located on phase L3 of the main installation, upline from all receivers to be compensated and the capacitor bank** (see diagram 3 below)



❑ **Ventilation**

- ♦ Install the capacitor bank in electrical room properly ventilated
 - * temperature **maxi** : 40° C and average over 24 h : 35°C
- ♦ Ventilation of the capacitor bank is made by an airflow
 - * entry by the bottom (ventilation area on front door and back - sides)
 - * output by the top (ventilation area on front door and back - sides)
- ♦ Make sure these ventilation areas have a clearance distance at least 100mm from any obstacle (wall, electrical enclosure...)
- ♦ Make the airflow is sufficient by removing any obstacle from air input and output
- ♦ Make sure the capacitor bank is installed in a dry and non dusty electrical room

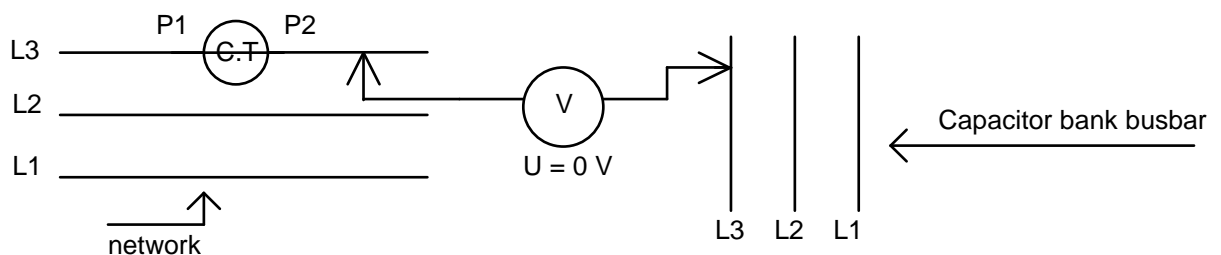
B – APPLY POWER

- ❑ **If the power factor controller displays the message “Ct”, you must enter the primary value of your C.T, using the arrows Δ and ∇ : enter this value**

(Examples : T.C. 800/5 A : P01 = 800 ; T.C. 1000/5 A : P01 = 1.00 ; T.C. 1250/5 A : P01 = 1.25)

To validate press the key **MAN / AUT**

- ❑ Switch to manual mode by pressing the key **MAN / AUT** → the led “MAN” flashes and all steps connected are disconnected
- ❑ **Check** the location of the current transformer: a simple method of checking that the C.T is correctly located on phase L3 of the installation involves checking that **there is zero voltage difference between network phase L3**, on which the C.T is installed, and **phase L3** of the capacitor bank.



- ❑ **Switch to automatic mode** by pressing key **MAN / AUT** → the led “AUT” light-on and the capacitor bank starts to operate.

III - MAINTENANCE

When conducting inspection or maintenance operations, it is **essential to comply with applicable safety standards. Supervision must be done by an approved person.**

Before accessing any parts under voltage:

1) **open the fuse-switch on the auxiliary circuits**

(ref. F1 – F2 – F3 – F4 on pages 12, 13 and 14)

2) **open the circuit breaker, switch or cut-off on the power circuit.**

The capacitors are fitted with discharge resistors which reduce the residual voltage to 75V in 3 minutes (in compliance with applicable standards). Before short-circuiting the terminals and earthing the capacitors,

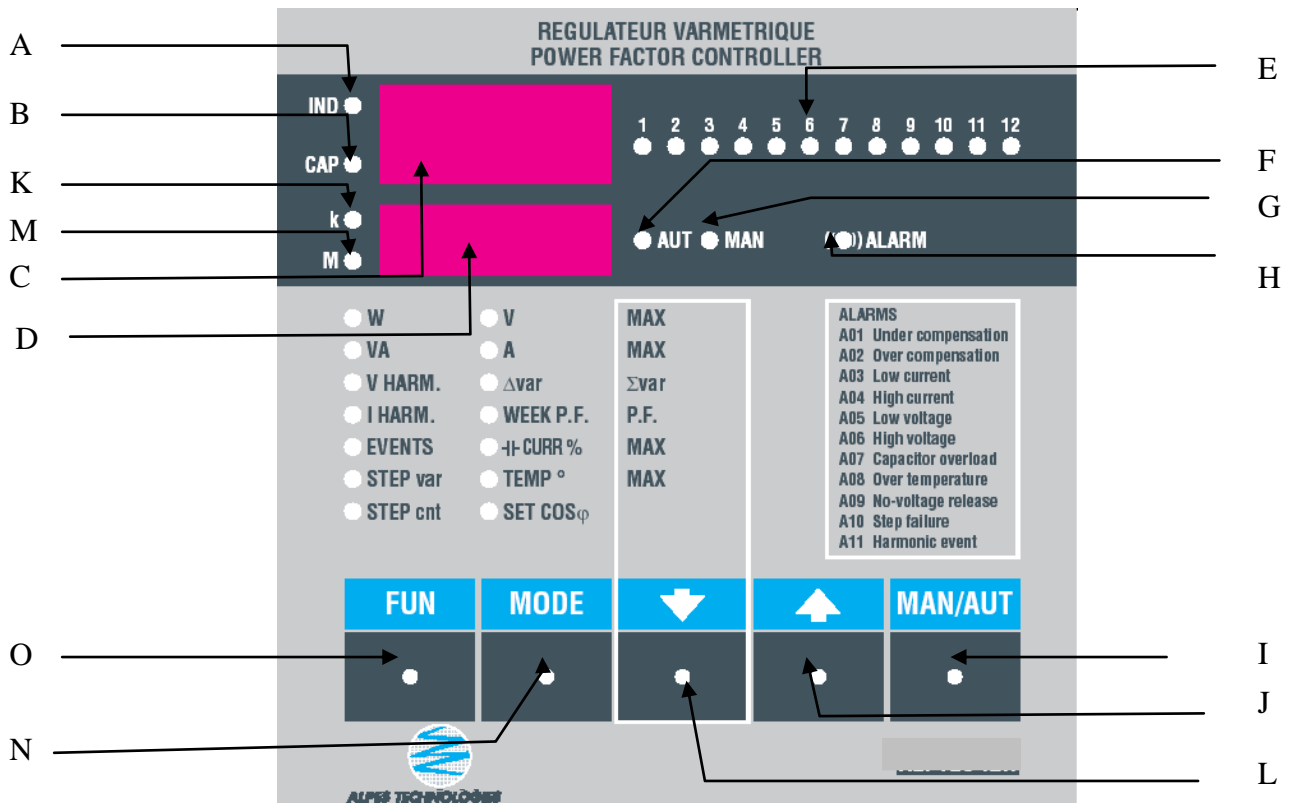
Wait for 5 minutes

Capacitors are static devices, little maintenance is required. However, we recommend performing the following **checking annually**:

- check that the **equipment is clean**, as accumulated dust can hamper correct ventilation and insulation.
- check the **condition of the solid state contactors and electronic command cards located on the side** (a red led located on the card is lit if the card or the solid state contactors are faulty)
- check the **tightness of the connections, particularly on the contactor terminals (a first checking 2 months after the commissioning must be done).**
- remove dust and check the correct operation of the **ventilation..**
- check the **current delivered by the capacitor bank.**
- Check the **ventilation of the local** where the equipment is installed (maximum temperature 40°C and an average value of 35°C during 24h must be respected).
- check the **temperature inside the capacitor enclosure** (maximum temperature 45°C and an average value of 40°C during 24h must be respected).

IV - DESCRIPTION OF ALPTEC11-ST FRONT PANEL

- | | |
|---|---|
| <p>A Indicator lit : inductive network</p> <p>B Indicator lit : capacitive network</p> <p>K Indicator lit : values displayed on screen D must be x 1000</p> <p>M Indicator lit : values displayed on screen D must be x 1000000</p> <p>C Digital display of instantaneous $\cos \varphi$ and alarm messages</p> <p>D Digital display of all other parameters</p> <p>E Led lit: indicates the steps connected</p> <p>F Led lit: operation in automatic mode</p> | <p>G Indicators lit: operation in manual mode</p> <p>H Indicator lit : a programmed alarm has been memorised</p> <p>I MAN/AUT key : switch from manual to automatic mode</p> <p>J Parameter selection or modification key (increase Δ)</p> <p>L Parameter selection or modification key (decrease ∇)</p> <p>N MODE key: setting of the parameters or scrolling from functions V to SET $\cos \varphi$</p> <p>O FUN key: to scroll functions from W to STEP cnt</p> |
|---|---|



By pressing FUN key you can access to the following parameters:

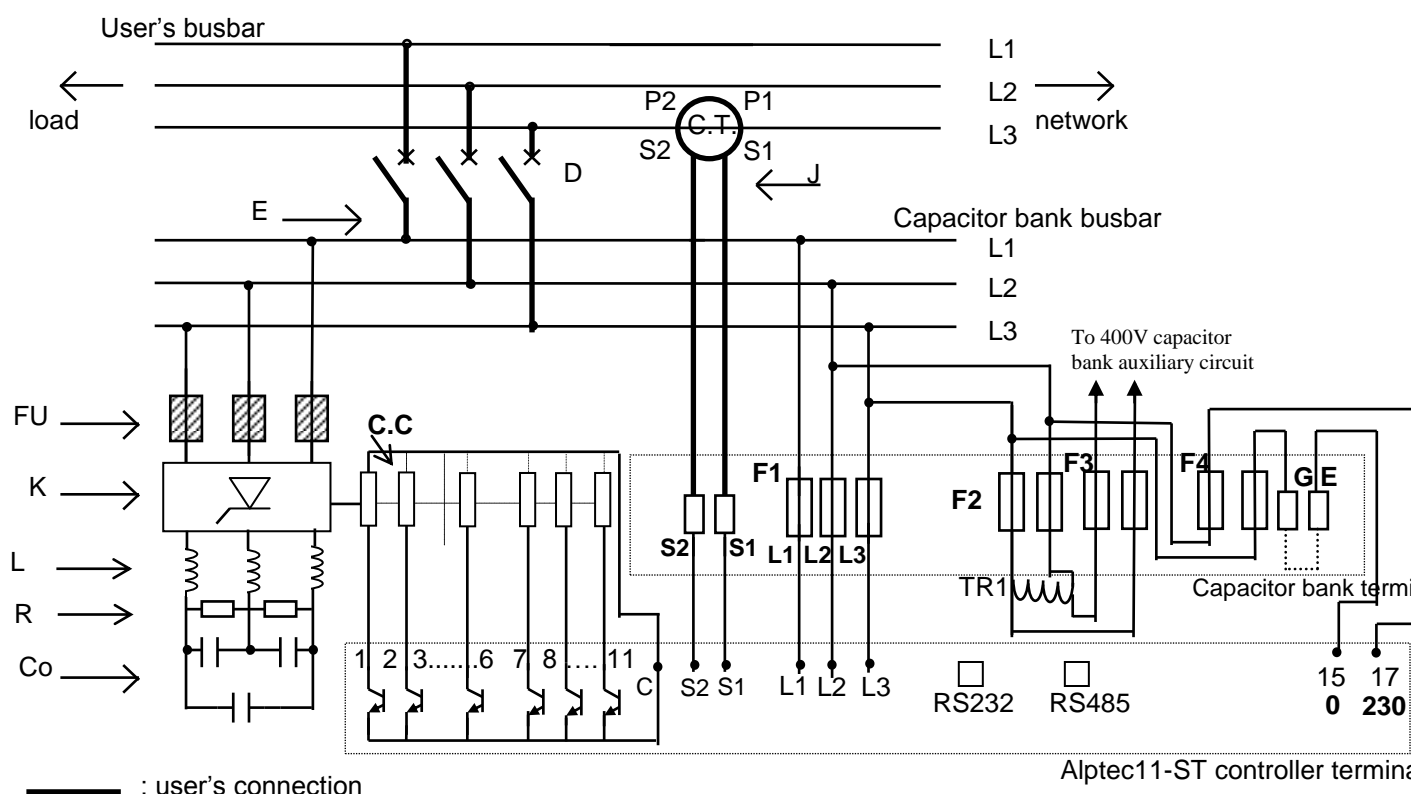
LED	Meaning	Pressing ↓	Pressing ↑
V	Display « D » indicates the network voltage	Display “D” indicates the highest memorised network voltage	
A	Display « D » indicates the current value of phase L3 of the network	Display “D” indicates the highest memorised current on phase L3.	
Δ Kvar	Display « D » indicates the required reactive power to reach the set point $\cos\phi$ (kvar if K is lit, MVAR if M is lit). * led IND lit indicates a lack of reactive power * led CAP lit indicates an excess of reactive power.	Display “D” indicates the required number of steps to reach the set point $\cos\phi$	Display “D” indicates the multiplying factor of the smallest step to reach the set point $\cos\phi$
WEEK P.F.	Display « D » indicates the average weekly power factor.	Display “D” indicates the actual power factor.	
⚡ CURR %	Display « D » indicates the current capacitor overload (%) caused by harmonics.	Display “D” indicates the max. % overload of the capacitor memorised and due to harmonics.	Display “D” indicates the number of exceeds compare to the programmed threshold
TEMP°	Display « D » indicates the temperature inside the cubicle (temperature sensor at the back of the controller)	Display “D” indicates the max. temperature recorded in the cubicle	Measuring units °C or °F
SET COSφ	Display « D » indicates the value of the set point $\cos\phi$	Decrease the set point $\cos\phi$	Increase the set point $\cos\phi$ (if letter C is flashing, the $\cos\phi$ is capacitive)

By pressing MODE key you can access to the following parameters:

Led	Meaning	Pressing ↓	Pressing ↑
W	Display « D » indicates the threephase active power of the network	Display “D” indicates the network frequency	
VA	Display « D » indicates the threephase apparent power of the network		
V HARM	Display « D » indicates the harmonic voltage (%) according to the rank displayed on screen “C”	Selection on display “C” of decreasing harmonic voltage ranks from 31 to 2 and ThdU.	Selection on display “C” of increasing harmonic voltage ranks from 2 to 31 and ThdU.
I HARM	Display « D » indicates the harmonic current (%) of phase L3 according to the rank displayed on screen “C”	Selection on display “C” of decreasing harmonic current ranks (phase L3) from 31 to 2 and Thdl.	Selection on display “C” of increasing harmonic current ranks (phase L3) from 2 to 31 and Thdl.
EVENTS	Display « D » indicates the current capacitor overload (%) caused by harmonics compare to the authorised threshold. Alternately display “D” indicates the duration of the event.	Selection of the events from: E-0 (today) to E-6 (6 days before) and E-HI (maximum value memorised over the 6 last days)	Selection of the events from: E-0 (today) to E-6 (6 days before) and E-HI (maximum value memorised over the 6 last days)
STEP var	Display « C » indicates selected step. Display “D” indicates alternately: * UAr: real power of the capacitor * PErC: % difference between real and nominal power	To select the step from S.12 to S.01	To select the step from S.01to S.12
STEP cnt	Display « C » indicates selected step. Display “D” indicates the number of connection/disconnection of the step	To select the step from S.12 to S.01	To select the step from S.01 to S.12

V – ALPISTATIC CAPACITOR BANK WIRING DIAGRAM

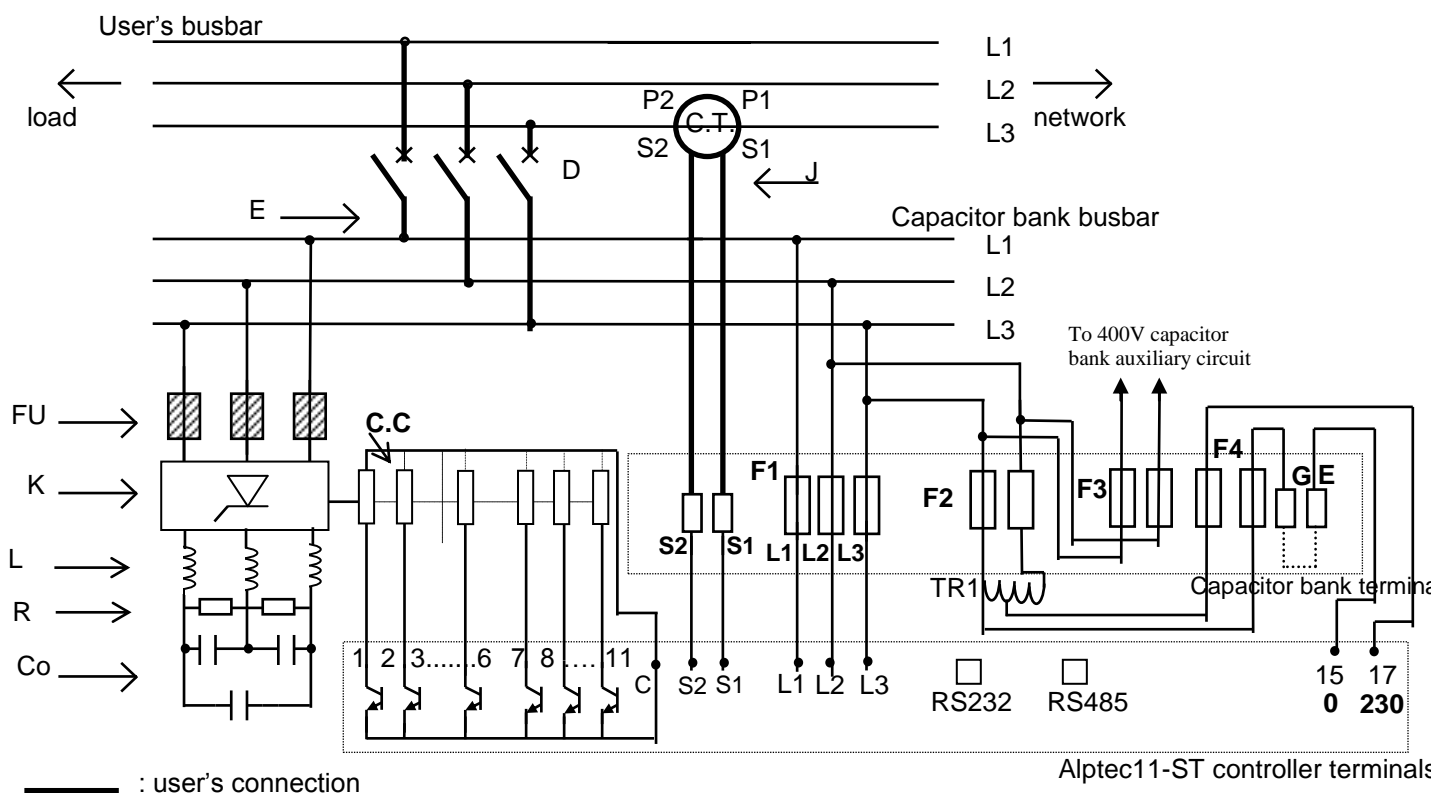
A - 220 / 240V NETWORK



C.T	Primary: depending on installation current Secondary: 5 A - minimum 10 VA – class 1	supplied by customer
J	Cables 2 × 2.5 mm ² for current transformer connection	supplied by customer
E	Three-pole battery supply cable	supplied by customer
D	Main three-pole circuit breaker (capacitor bank output)	supplied by customer
F1	Protection fuses, type aM 2A: protection of measuring circuit ALPTEC11-ST	
F2	Protection fuses, type aM 4A: protection of auto-transformer primary	
F3	Protection fuses, type gG 4A: protection of capacitor bank auxiliary circuit	
F4	Protection fuses, type aM 2A: protection of power factor auxiliary circuit	
FU	HRC fuses, type gG, size rating.....	
K	Solid state contactor	
TR1	Auto-Transformer 230V / 400V for capacitor bank auxiliary supply (400VA)	
Co	Capacitor	
R	Discharge resistors	
L	Anti Harmonic reactors (on customer request)	
S1, S2	C.T secondary connection terminal block	
G, E	Terminal block for capacitor bank bypass during GenSet operation	
C.C	Command card for solid state contactor	
ALPISTATIC capacitor bank 220 / 240V network		ALPTEC11-ST

V – ALPISTATIC CAPACITOR BANK WIRING DIAGRAM

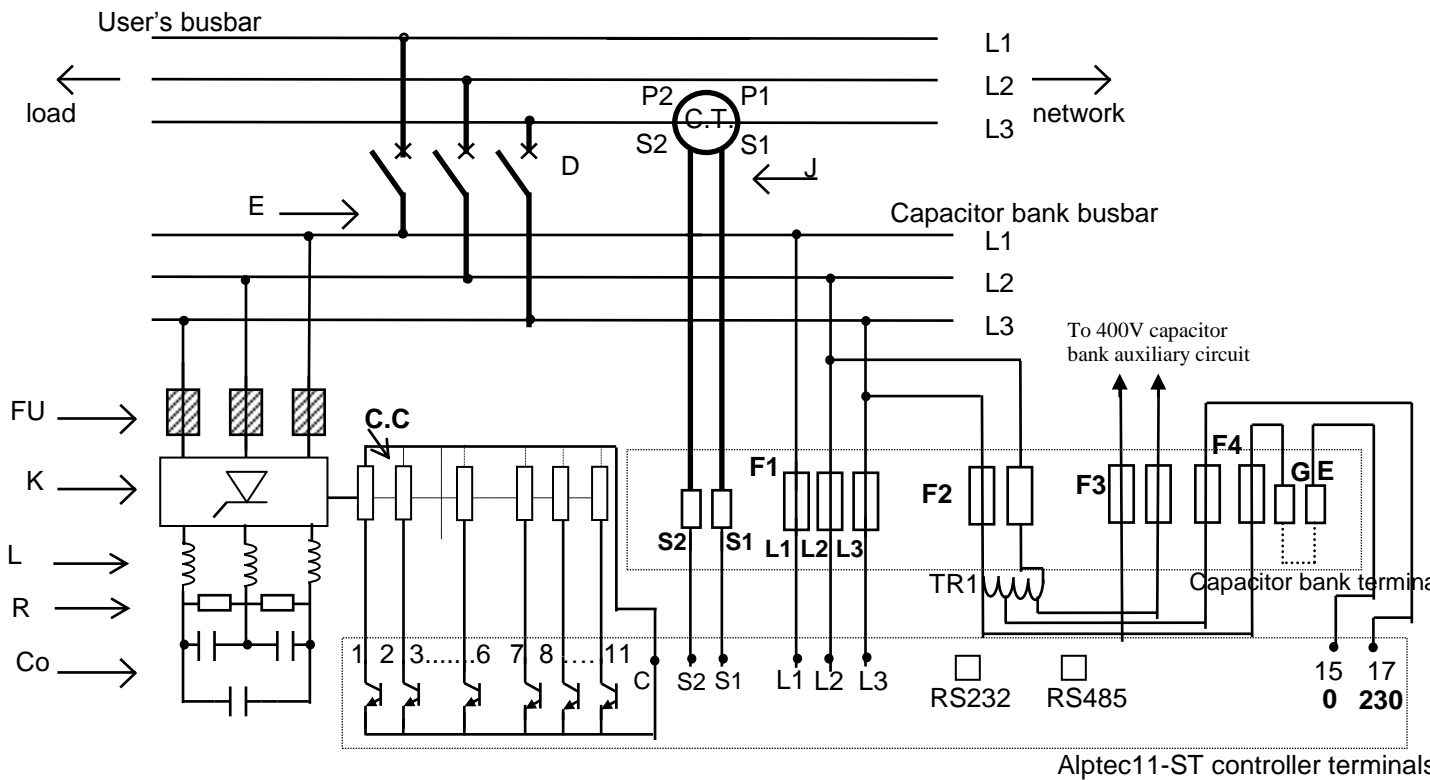
B - 380 / 415V NETWORK



C.T	Primary: depending on installation current Secondary: 5 A - minimum 10 VA – class 1	supplied by customer
J	Cables 2 × 2.5 mm ² for current transformer connection	supplied by customer
E	Three-pole battery supply cable	supplied by customer
D	Main three-pole circuit breaker (capacitor bank output)	supplied by customer
F1	Protection fuses, type aM 2A: protection of measuring circuit ALPTEC11-ST	
F2	Protection fuses, type aM 4A: protection of auto-transformer primary	
F3	Protection fuses, type gG 4A: protection of capacitor bank auxiliary circuit	
F4	Protection fuses, type aM 2A: protection of power factor auxiliary circuit	
FU	HRC fuses, type gG, size rating.....	
K	Solid state contactor	
TR1	Auto-Transformer 400V / 230V for power factor auxiliary circuit supply (75VA)	
Co	Capacitor	
R	Discharge resistors	
L	Anti Harmonic reactors (on customer request)	
S1, S2	C.T secondary connection terminal block	
G, E	Terminal block for capacitor bank bypass during GenSet operation	
C.C	Command card for solid state contactor	
ALPISTATIC capacitor bank 380 / 415V network		ALPTEC11-ST

V – ALPISTATIC CAPACITOR BANK WIRING DIAGRAM

C – NETWORK > 415V or <= 690V



Alptec11-ST controller terminals

C.T	Primary: depending on installation current Secondary: 5 A - minimum 10 VA – class 1	supplied by customer
J	Cables 2 x 2.5 mm ² for current transformer connection	supplied by customer
E	Three-pole battery supply cable	supplied by customer
D	Main three-pole circuit breaker (capacitor bank output)	supplied by customer
F1	Protection fuses, type aM 2A: protection of measuring circuit ALPTEC11-ST	
F2	Protection fuses, type aM 4A: protection of auto-transformer primary	
F3	Protection fuses, type gG 4A: protection of capacitor bank auxiliary circuit	
F4	Protection fuses, type aM 2A: protection of power factor auxiliary circuit	
FU	HRC fuses, type gG, size rating.....	
K	Solid state contactor	
TR1	Auto-Transformer .../ 230V and 400V for power factor auxiliary circuit supply and auxiliary capacitor bank supply (400VA)	
Co	Capacitor	
R	Discharge resistors	
L	Anti Harmonic reactors (on customer request)	
S1, S2	C.T secondary connection terminal block	
G, E	Terminal block for capacitor bank bypass during GenSet operation	
C.C	Command card for solid state contactor	
ALPISTATIC capacitor bank network>415V or <= 690V		ALPTEC11-ST

VI - APPENDICES

A - MANUAL MODE OPERATION

If you wish you may operate your capacitor bank in manual or "forced" mode.

To achieve this, proceed as follows:

- Enter manual mode by **pressing the MAN / AUT key**. The "MAN" indicator will be lit.
- All the steps under voltage are disconnected.
- Press the arrows Δ and ∇ as many times as necessary to select the step that you wish to connect or disconnect: the selection is obtained as soon as the corresponding led flashes.
- Press the "MODE" key to validate this selection.
- Repeat the operation for each step you wish to connect or disconnect.

Note:

In manual mode, the selected steps remain connected.

VI - APPENDICES

B – MEANING OF ALARM MESSAGES

Alarm messages may be displayed on the ALPTEC11-ST controller during commissioning or use of the capacitor bank. The meaning of the messages is as follows:

❑ Message A01: undercompensation

All the capacitors are connected but the $\cos \varphi$ is less than the $\cos \varphi$ set point.

- check the $\cos \varphi$ set point value setup.
- if the error persists, your capacitor bank is undersized, you should add reactive power to your installation. The required 'kvar' value can be displayed with the led "Δ kvar" (marked F on page 9)

❑ Message A02: overcompensation

All the capacitors are disconnected and the $\cos \varphi$ is above the set point value.

- check the $\cos \varphi$ set point value setup.
- the installation may have fixed capacitors
- the installation may be unloaded
- check the position of the current transformer (diagrams page 6 and 7).
- if the error persists (with the installation under load), call the manufacturer

❑ Message A03: current too low

The line current is 2,5% lower than the C.T primary current setting.

- check that the primary of your C.T is suitable for the mains line current.
- check your C.T. is not short-circuited
- check the current circuit is properly "conducting"
- with loads connected this message will disappear

❑ Message A04: current too high

The current exceeds the C.T primary current setting by 20%.

- check the C.T primary value set in the controller.
- check that the primary of your C.T is suitable for the mains line current.
- if the secondary current is too high (primary too low) the controller may be damaged.

❑ Message A05: voltage too low

The measured voltage is 15% lower than network voltage.

- low voltage will disconnect the steps.

❑ Message A06 : voltage too high

The measured voltage is 10% above the network voltage.

- high voltage will disconnect the steps.

❑ Message A07 : capacitor overload

The capacitor bank is stressed by important harmonic perturbations, all the steps are disconnected: please call the manufacturer

❑ Message A08 : over temperature

Temperature inside the capacitor bank is too high, report to the ventilation conditions of the electrical room (page 6).

Message A09 : no voltage release

Voltage failure duration is more than 8ms. All the steps are disconnected

Message A10 : faulty steps

- Look for the faulty step(s)
- Proceed to their replacement

Message A11 : exceeding of programmed harmonic threshold (ThdU or Thdl)

Possibility to disconnect the steps and remote this event

Message E.AL : programmable complementary alarm

For remote temperature probe or a second set point $\cos \phi$, activated by dry contact.

Nota: following 11 alarms: A01 to A08 and A10 to A11 can be removed by dry contacts..
For more information, please consult our technical department

C – REQUIRED COS ϕ SETTING

* press the key MODE several times, until the led “SET COS ϕ ” indicator on the front panel lit.

* using the arrow keys Δ and ∇ , set the $\cos \phi$ to the target value.

* **in the factory we set the $\cos \phi$ set point to 0.96 inductive**

D – KEYPAD LOCK

Locking:

It is possible to lock the keypad to avoid any modification of the parameters:

Keep pressed MODE key, press 3 times key Δ and 2 times key ∇ : then release MODE key and “Loc” will appears on the screen

Unlocking:

Keep pressed MODE key, press 3 times key Δ and 2 times key ∇ : then release MODE key and “UnL” will appears on the screen

E – MODIFICATION OF PRIMARY C.T SETTING

- Switch the controller in manual mode using the key “MAN / AUT”

- Keep pressed MODE key until “SET” is displayed on the screen

- Release MODE key, pressed key MAN / AUT, “P01” is displayed

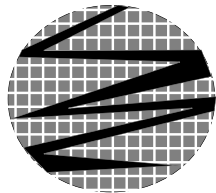
- Using keys $\Delta\nabla$ enter this value (example: C.T 800/5A – P01=800 ; C.T 1250/5A – P01=1.25)

- Press several times MAN / AUT key until the display of the count down

- Switch to automatic mode by MAN / AUT key

Note: any modifications of the power factor controller parameters (except parameter P01) will cancel the manufacturer warranty on the complete equipment.

NOTES



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