

# Varplus<sup>2</sup>

## LV Capacitor User manual

### Reception of goods

- check that no package is missing and that goods have not suffered from any impact that would have damaged their insulation or good operation.
- check that characteristics meet specifications of the order form.
- if characteristics are not right please note the delivery document number on your claim form.
- our goods are transported at the addressee's risk. We decline all responsibility in the case of missing goods or damages due to the carriers.

### Storage

Capacitors should be stored in a dry, well ventilated room away from rain, water, chemicals and dust. Storage temperature: -40+75°C

### Handling

- unpack on the installation site
- keep this user manual at disposal of personnel in charge of installation, mounting, operation and maintenance.
- Avoid shocks and distortion on capacitor element B.

### Presentation

Varplus<sup>2</sup> capacitors can be used alone or assembled together. Maximum assembly power ratings given in table 14 must be strictly followed. Capacitors are delivered with their accessories (fig 2). Protective covers and interconnection copper bars (fig.3) are delivered separately on an optional basis.

Material list :

- A : power terminals
- B : capacitor element
- C1: support base
- C2: cover
- D : fixing holes
- E1 : female guiding area
- E2 : male guiding area
- F : nut
- G : contact washer
- H : IP42 cable entry
- I : terminals protective cover
- J : self forming crucifix screw
- K1 : interconnection bars 1
- K2 : interconnection bars 2

### Installation

#### Applicable standards:

IEC 60831-1/2, UL810, C 22.2 and current local regulations.

Indoor installation on firm support in a correctly ventilated local or envelope. Ambient temperature around capacitors must not exceed 35°C over one year, 45°C over 24hours and 55°C max (according to IEC 60831 for -25/D temperature category).

#### Capacitors assembly

Assembly of 2 capacitors (fig. 5)

- 1 : main capacitor
- 2 : additional capacitor

Mechanical assembly

- First place the capacitor 1 in the cubicle or on the support with the two upper fixing holes D2. Use 2 M6-screws with appropriate length regarding support. No washer is required (fig 1).
- Present the capacitor 2 below capacitor 1, slide capacitor 2 (D2) into capacitor 1 (D1) using guiding areas.
- Fix capacitor 2 on the support with D2 upper fixing holes (2 M6-screws).

Electrical connections (fig. 6 and 7)

Realise electrical connection with interconnection bars K1 K2, contact washer G, screws F and appropriate cable terminals plugs.

Tighten to torque 19±3 N.m.

For assembling an additional capacitor, do not exceed max kvar limits (fig 14). For these maximum reactive power use 20 mm x3 mm bus bar section (as the optional bus bar kit), just repeat the same operations as above. The first assembly being considered as capacitor number one.

## Mounting

- Capacitors and assemblies must be installed in well ventilated rooms or envelopes in order not to exceed the ambient temperature values corresponding to -25°C/D category given in paragraph "Installation".
- Vertical or horizontal positions according to fig 4 are accepted except the vertical one with upside down terminals.
- A space of 25mm must be respected between two capacitors or assemblies for a better air-cooling circulation (fig 15).
- The use of punched mounting plates or support bars between two stages is compulsory in to facilitate air-flow.

## Electrical connection

- Connect the capacitor by fixing cables with connecting plugs on the terminals (fig. 6 and 7). Cables can be oriented in all directions but respecting insulation distance of 12 mm between metallic parts.
- Cables should be rated at minimum 1,5 times the nominal capacitor current.

## Protective cover

Refer to fig. 8, 9, 10 and 11.

According to required degree of protection the rubber cable gland will be used or not.

The assembly of several protective covers will be done by breaking the front or rear pre formed accesses (fig 11). Whatever the number of capacitors is, always start by the last one (opposite position from the connection cables).

## Ventilation

Capacitors, contactors, fuses and electrical connections generate heat dissipation (about 2,5W/kvar total or 8W/kvar with series reactors). Specific precautions must be taken in order not to exceed temperature values of -25°C/D category around the capacitors inside the cubicle (see paragraph "Installation").

The airflow inside the cubicle must go from bottom to top (fig 16).

The cross section of the top air outlet must be at least equal to 1,1 times the cross-section of the bottom air inlet.

For powers higher than 200kvar in 2m high cubicle a forced ventilation is necessary.

It is recommended to install forced ventilation with extractor fans on the cubicle roof.

In case of series reactors use, it is recommended to install them in a separate column from the capacitor's one.

## Harmonics

In case of network polluted by high harmonics content it is necessary to use specific overrated capacitors, and with additional series reactors in case of resonance risk. The use of inappropriate capacitor will reduce its life time .

## Switching and protection devices

- Use switching and protection devices designed for capacitive switching duty.
- After switching off a capacitor, a delay of at least 1 minute must be allowed before switching on again to allow capacitor discharge.

## Commissioning

Before connecting the equipment to the supply, check :

- electrical diagram has been followed
- all components and connections are tight
- performance of natural or forced ventilation

After connection to the supply, check the nominal current, the voltage, the temperature and the correct working of regulation.

## Annual checks

Check the following :

- the condition of switching and protective devices.
- the general cleanliness of the equipment.
- the correct tightening of all power connections.
- the condition of ventilation system and cleanliness of filters if any.
- the working parameters like voltage, current and temperature.

## Safety

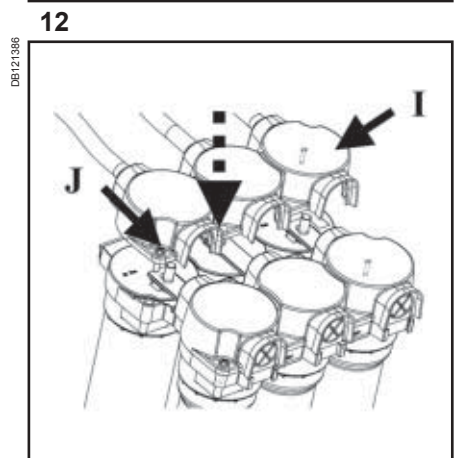
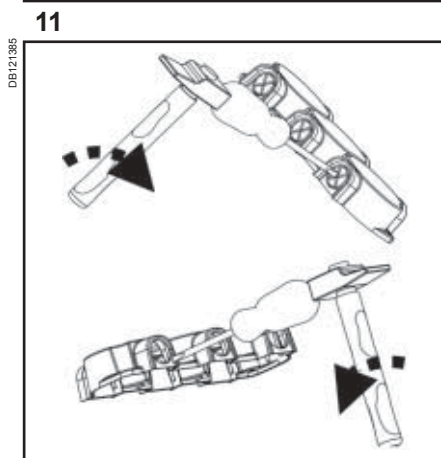
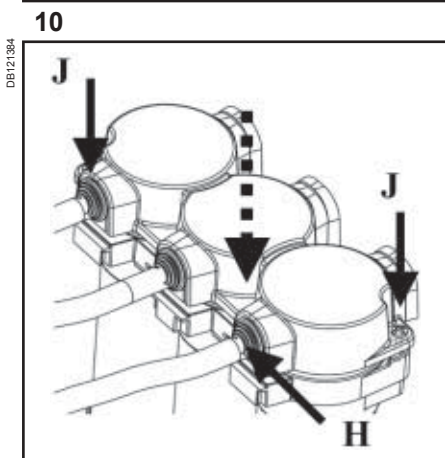
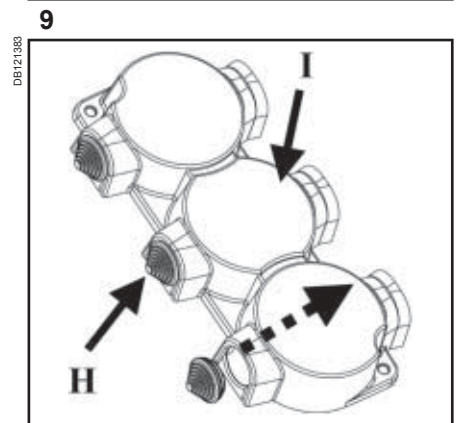
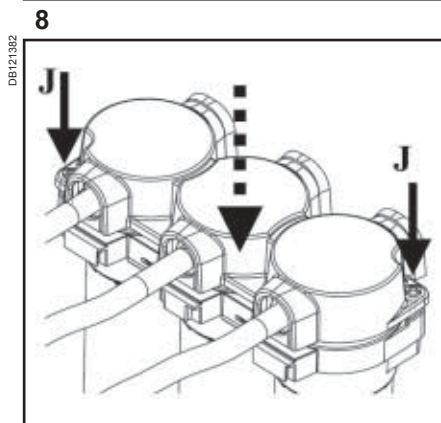
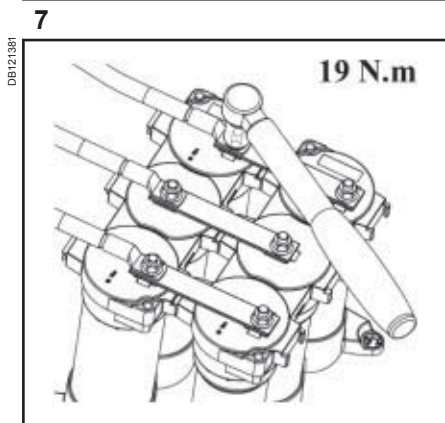
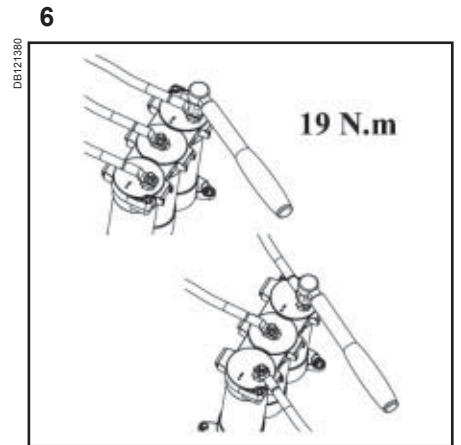
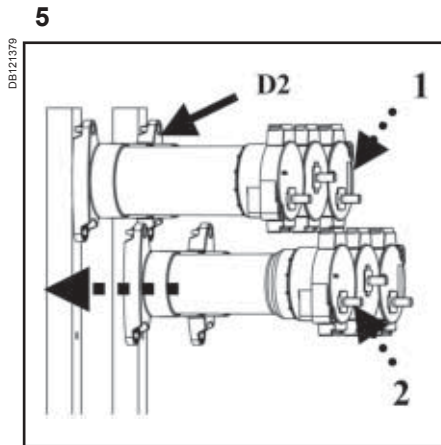
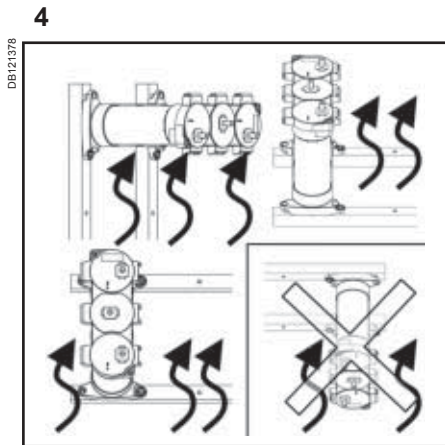
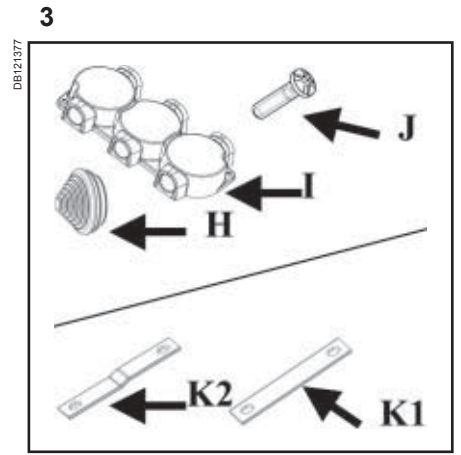
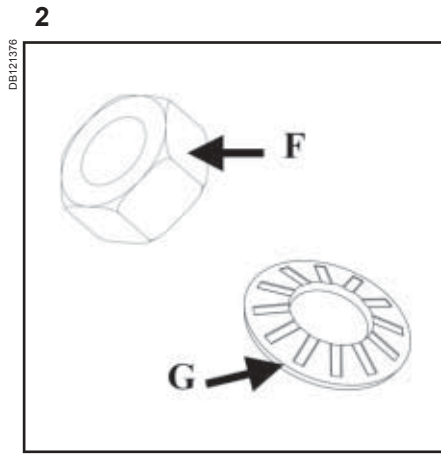
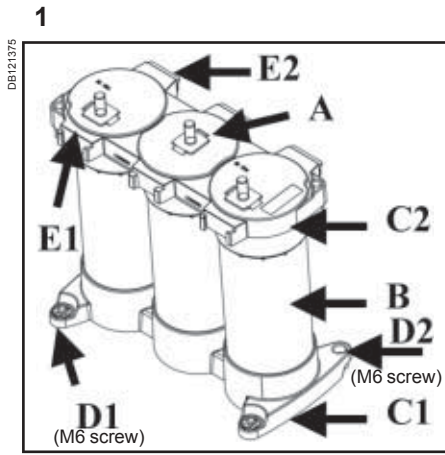
All operations described in this user manual must carried out in compliance with safety standards under the responsibility of a competent authority.

To access installed capacitors :

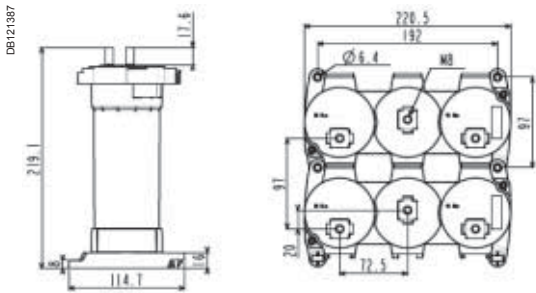
- switch off main power supply.
- switch off power supply of control circuit.
- allow capacitor discharge time (1 minute).
- short circuit and earth the terminals to ensure that capacitors are fully discharged.

## Limits of Warranty:

This equipment should only be mounted following these instructions. The manufacturer shall not be held responsible for any failure to comply with the instructions given in this manual. Mor information on : [www.merlin-gerin.com](http://www.merlin-gerin.com)



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14 - Assembly unitil 65 kvar

Network Frequency	Service Voltage (V)	Maximum KV/Ar Assembly as a pollution rate			
		Small	Medium	High (with reactor 135 Hz)	Hight (with reactor 190-215 Hz)
50 Hz	230	40	40	40	40
	400/415	65	62	50	65
	525	66	66		66
	690	67	67		
60 Hz	230/240	40	40	40	
	400/415	65	60	60	60
	440	76	76		
	480	66	66	66	
	600	60	60		

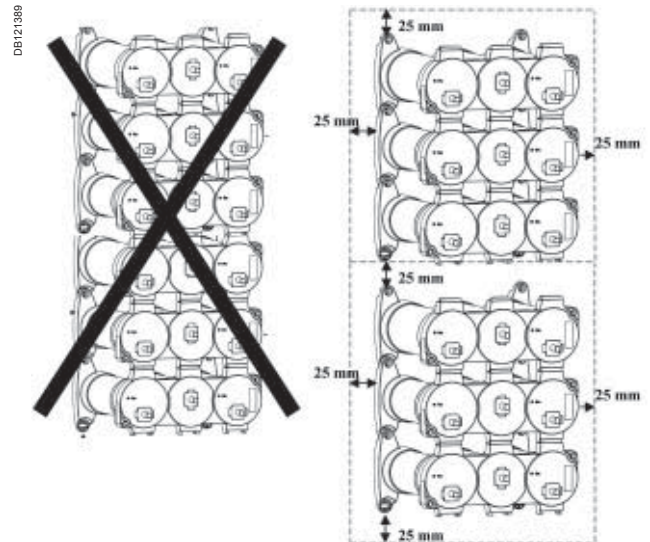
Assembly unitil 130 kvar

There are 3 conditions to respect:

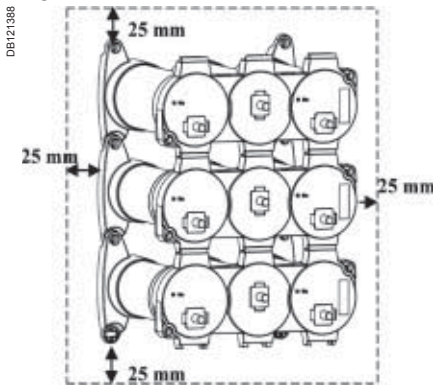
- Adapted bus bar section is required to connect the capacitor assemblies shown below.
- Minimum space of 25 mm is required between 2 groups of capacitors (see figure 14).
- According to "Ventilation" chapter, specific precautions must be taken in order not to exceed temperature category of -25°C/D inside the cubicle.

**NO**

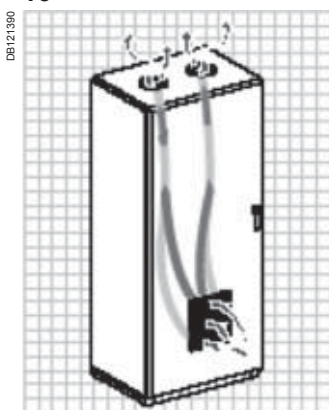
**YES**



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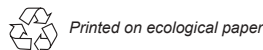
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