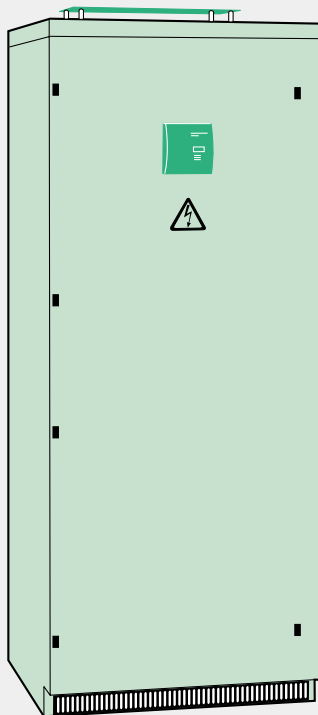
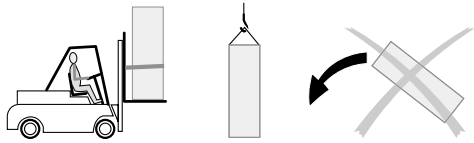


Thyrimat

Low voltage
Transient free
automatic capacitor banks





Reception

Overview

The Thyrimat is an automatic capacitor bank consisting of cubicles A3, A3B, A4 and A4B fitted with detuned reactors (DR).

Receiving the equipment

- we disclaim all responsibility for any missing goods or for damage caused by the carrier. The recipient should send any complaints to the carrier by registered letter within 48 hours
- check that no packages are missing and that the equipment has not been subjected to any impact liable to impair its insulation and operation
- check that the electrical characteristics indicated on the rating plate correspond to those specified on the order form
- if this is not the case, please enclose the dispatch note reference with your complaint.

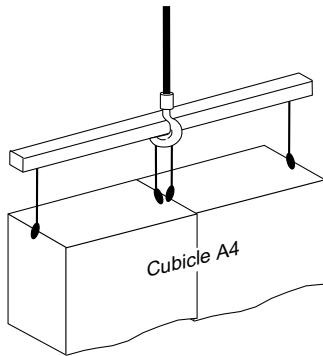
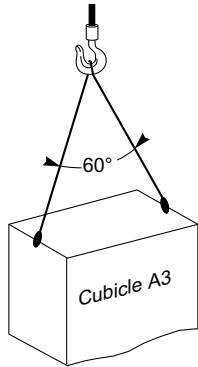


Fig. 1

Handling (Fig. 1)

- unpack the equipment on the site where it is to be installed
- a fork-lift truck is recommended
- when lifting cubicle A3, use the 2 lifting rings to ensure that it remains vertical
- cubicles A3B, A4 and A4B must be lifted vertically using a lifting beam
- ensure that the equipment is not subjected to impact or distortion.

Storage

- Store the equipment in a dry, well-ventilated area sheltered from rain, water spray, chemicals and dust
- storage temperature -20 °C to +45 °C.

Dimensions and weights (Fig. 2)

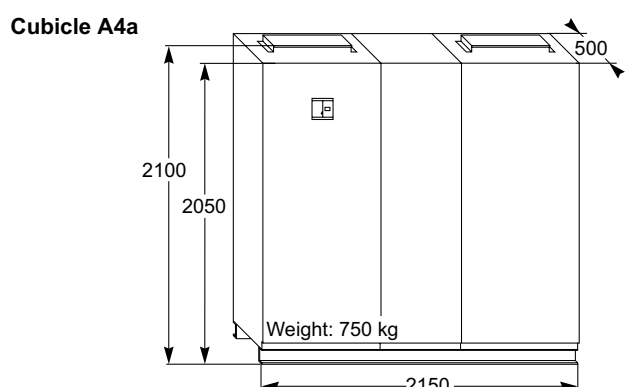
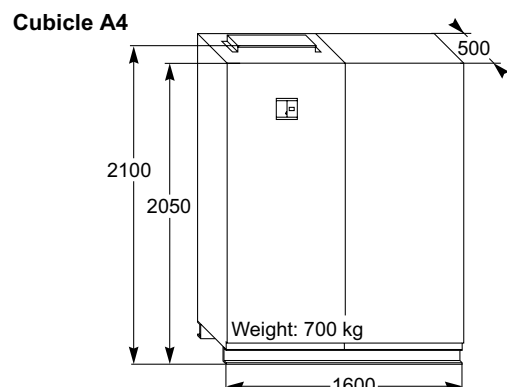
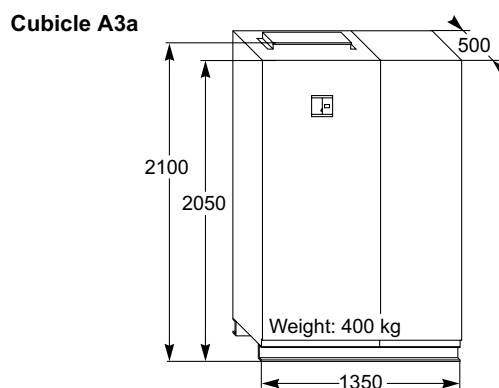
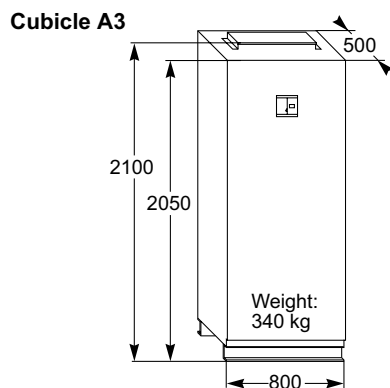


Fig. 2

Description

- A: stepped-control solid-state contactors.
- B: stepped-protection HPC fuse.
- C: capacitors.
- D: current transformer connection terminal block.
- E: control circuit safety fuses.
- F: power cable connection pads.
- G: fan according to power.
- H: vents.
- I: voltage transformer.
- J: detuned reactors according to range.
- K: lifting rings.
- N: main busbar.
- R: power factor controller.

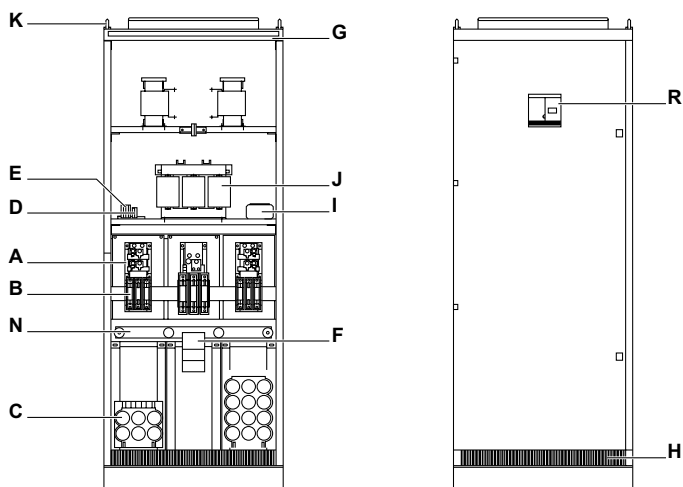


Fig. 3

Ventilation

- install the equipment in a well ventilated room
- position the equipment so that the vents are not obstructed: leave a space of 10 cm between the rear of the capacitor bank and the wall
- check that the maximum temperatures are not exceeded when the equipment is in use (see page 4, Technical data)
- ensure that the vents are not obstructed
- ensure that the equipment is protected from dust and moisture.

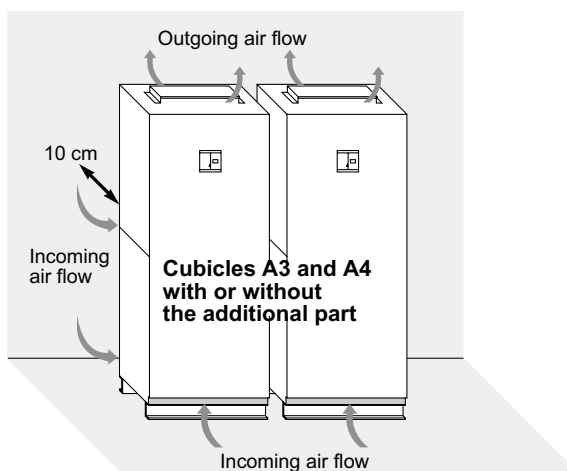


Fig. 4

Installation

Fixation

- position the equipment so that the vents are not obstructed: leave a space of 10 cm between the rear of the capacitor bank and the wall
- fix the cubicle to the floor using the fixing points provided.

Technical data

- voltage, frequency, power, as specified on the rating plate
- capacitance tolerance: -5 %, +10 %
- permissible voltage overloads (8 / 24 hours according to IEC 831-1/2): 10 %
- insulation class: 690 V
 - withstand 50 Hz 1 min: 2.5 kV
- ambient room temperature class:
 - maximum temperature: 40 °C
 - average temperature over a 24-hour period: 35 °C
 - average annual temperature: 25 °C
 - minimum temperature: -5 °C
- power loss: 13 W maximum / kvar
- degree of protection: IP21 - D
- colour:
 - metal sheet: RAL 9002
 - front plate: RAL 7021
- conform to IEC 439-1 and NF EN 60439.

Wiring diagram

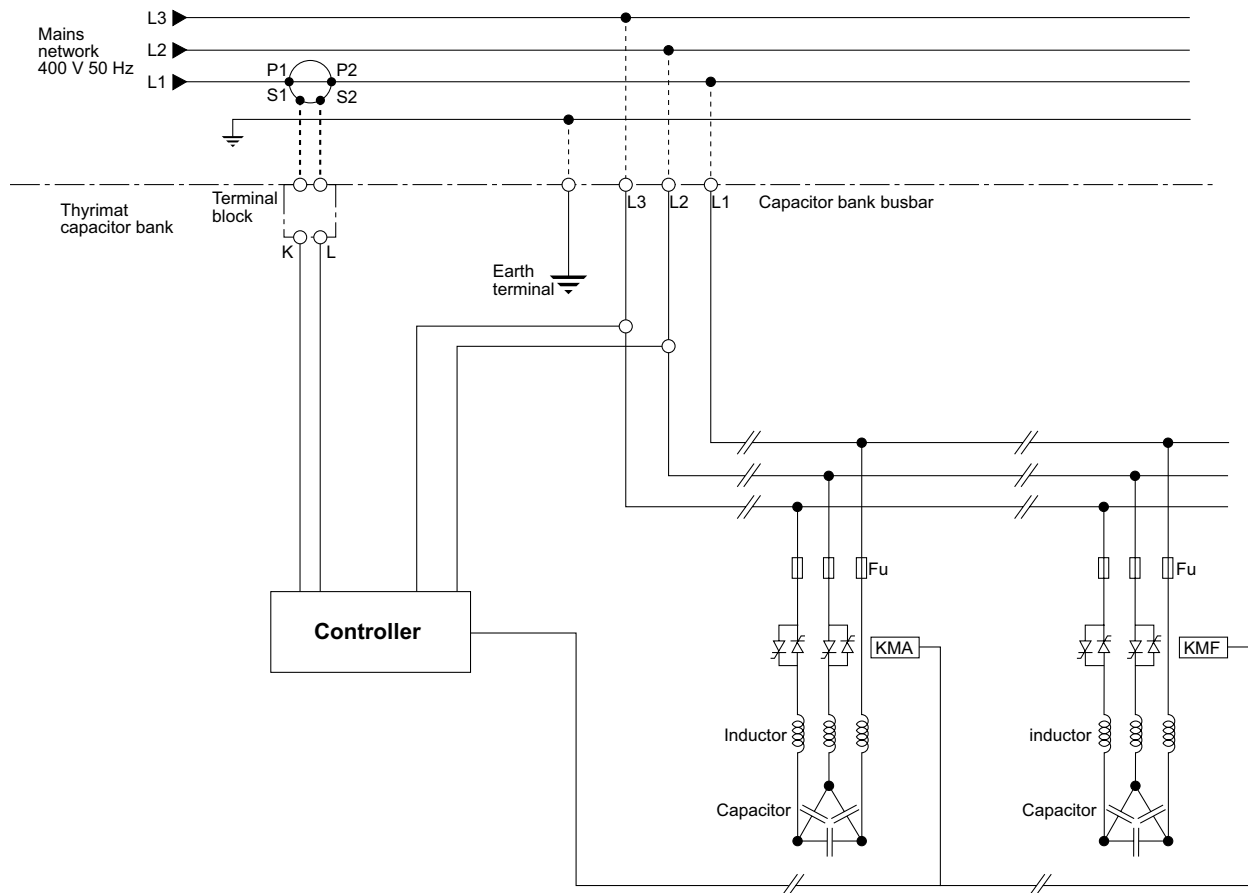


Fig. 5

Electrical connections

Refer to the wiring diagram for the electrical connections (page 4, Fig. 5). A safety device is required for the power connection.

- current transformer/controller connecting cable cross-section: 2.5 mm² minimum
- switchgear and cable dimensioning current at 400 V 50 Hz: 2 A/kvar.

Current circuit connection

■ Existing CT (Fig. 6):

- ensure that it is upstream of the entire installation, including the capacitor bank
- ensure that its secondary winding is 5 A
- connect the power factor controller in series with the existing circuit

■ CT to be installed (Fig. 7 and 8):

the current transformer must be installed upstream of the capacitor bank and the loads (motors, etc.) connected to an incoming Main Low Voltage Switchboard phase

P1 transformer or source side
P2 load and capacitor bank side

■ When the CT is installed:

- identify the phase to which the CT was connected as phase L1
- ensure that phase L1 of the capacitor bank is connected to the busbar phase pad to which the CT is connected
- transmit the data from the CT as follows: S1 to terminal **K** and S2 to terminal **L** on the terminal block (Fig. 6, 7 and 8).

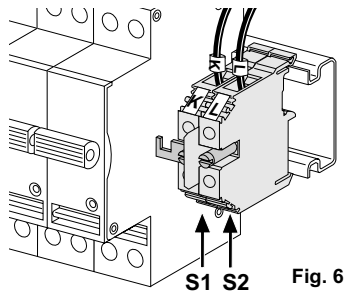


Fig. 6

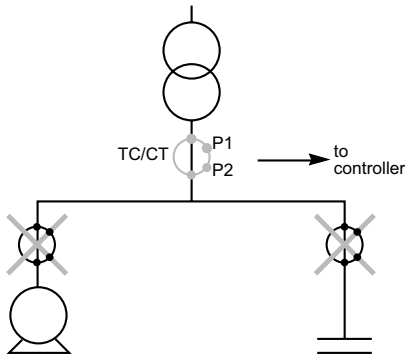


Fig. 7

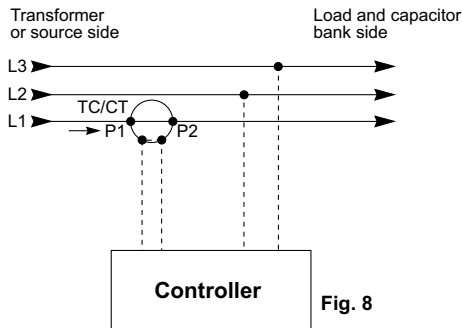


Fig. 8

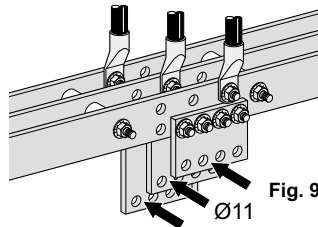


Fig. 9

Earth connection

(Fig. 10, 11).

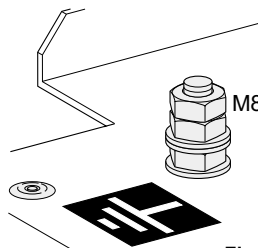


Fig. 10

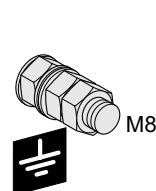
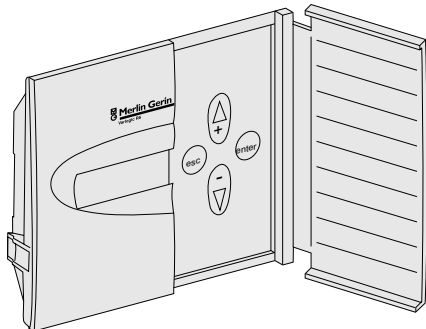


Fig. 11

Commissioning the Varlogic NR6 / NR12 standard controller



Setting the controller

The power factor controller has been configured in accordance with capacitor bank characteristics.

The only operations required at commissioning are as follows:

- if applicable, set the required $\cos \phi$
- configure the current transformer ratio.

Important:

- for a supply via a summing CT (an installation with several incoming transformers), the ratio to be taken into account is the sum of the ratios of the various instrument CTs.
- for an installation with a generating set, ensure that the capacitor bank is on before switching to the genset, by turning off the supply to the controller or remotely isolating the controller power supply phase, L2 or L3.

Commissioning the capacitor bank

When the power is first switched on, the controller will immediately ask you for the language in which you want to work.

Use the + and - keys to select the required language and press Enter to confirm your choice.

The parameters required for the capacitor bank to work correctly are factory set.

Some parameters depend on the installation specifications and will have to be modified on site during commissioning.

- $\cos \phi$ setting (default value = 1)
- current transformer ratio allowing the measurements to be correctly displayed
- response current value (C/K): it is automatically located during the verification phase.

Do not change any other parameters.

- use the MIS.SERV menu to run the commissioning sequence.

The sequence also sets the value of $\cos \phi$ and the transformation ratio and automatically checks that the parameters entered match the existing installation parameters.

Note:

If an alarm is displayed during commissioning or the first few times the equipment is used, see "Faults and corrective actions" to identify the cause of the fault.

Operating performance check

- check that $\cos \phi$ is the required value
- for full load operation, check that each step is enabled correctly
- when the equipment has been in operation for a few hours, check the ambient room temperature.

For further information on the parameters to be defined, see the Glossary (Chapter 7) in the controller manual.

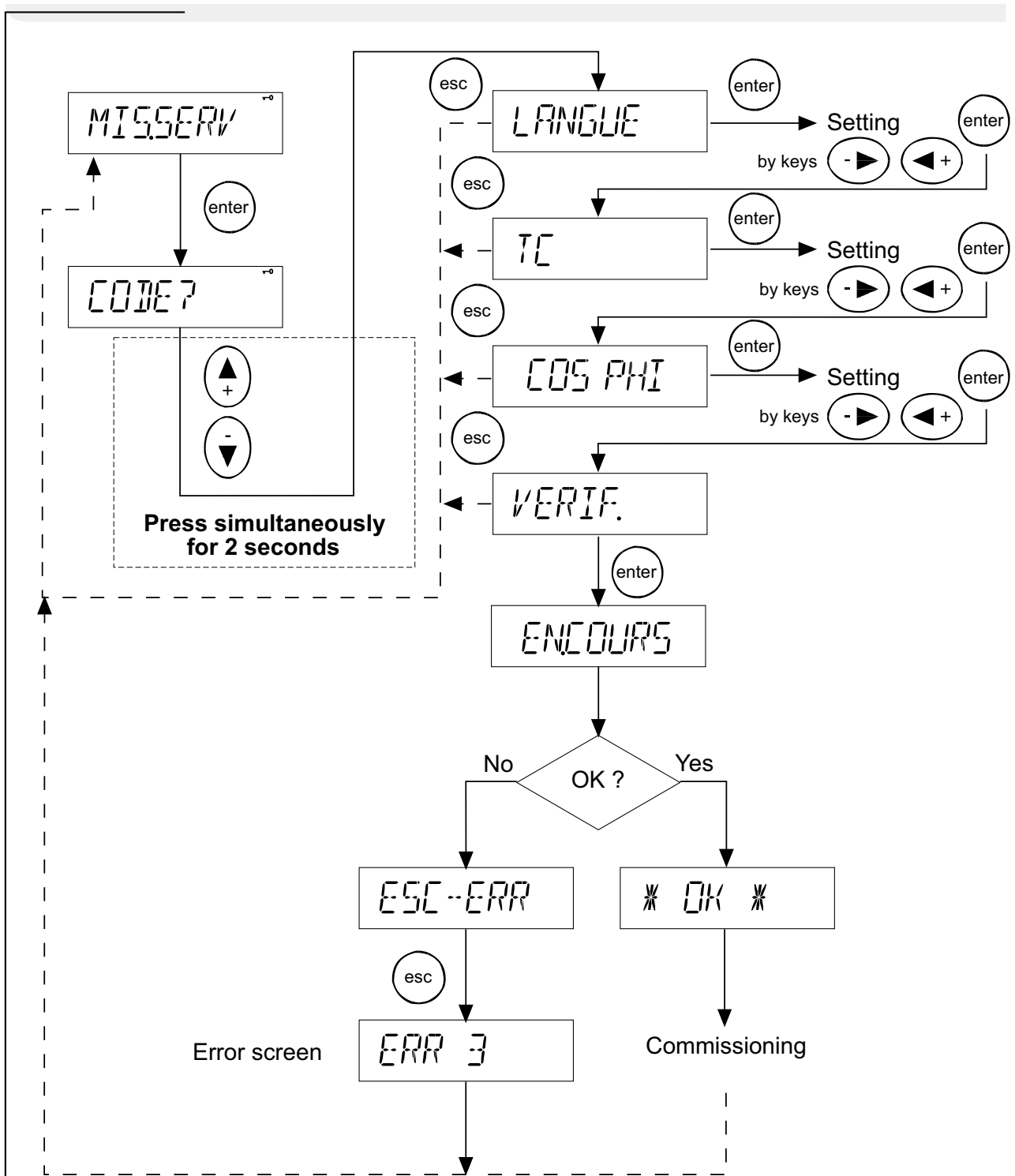


Fig. 12: Commissioning a preconfigured capacitor bank

How to proceed when an error occurs

"Error codes" are used to diagnose the cause of a problem and to provide the remedy.

See the controller manual.

After checking the installation, restart the Commissioning sequence (MIS.SERV) or the Commissioning automatic parameter setting sequence (REG.AUTO).

Commissioning the PROPHI quick controller

Setting the controller

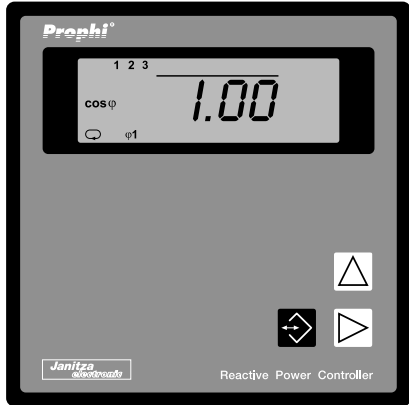
The power factor controller has been set according to the characteristics of the capacitor bank.

The only operations required at commissioning are as follows:

- if applicable, set the required $\cos \phi$
- configure the current transformer ratio.

Setting the controller to "standard programming"

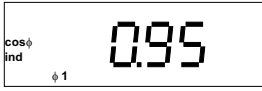

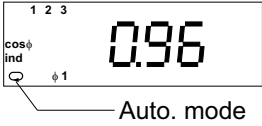

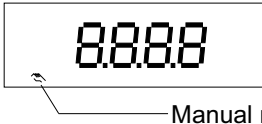

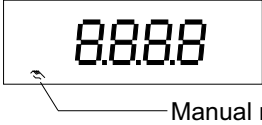
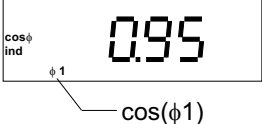




View of the controller and the configuration keys



The following parameters are available for "standard" programming:

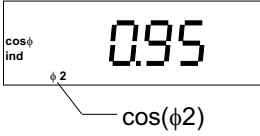
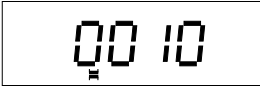

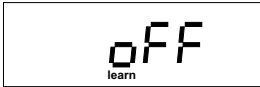
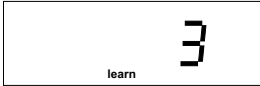
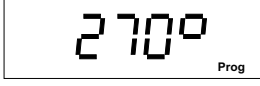


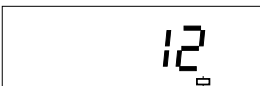
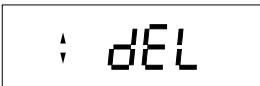
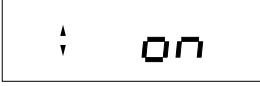
- $\cos \phi 1$
- $\cos \phi 2$
- CT current transformer ratio
- automatic detection
- capacitor power
- regulation sequence
- outputs
- elimination of peaks and troughs

Example of $\cos \phi 1$ setting

Step	Key	Action	Display	Comment
		Any initial status		
1		Press for 2 seconds		Transition to automatic mode.
2		1 pulse		Manual "standard programming" mode initial display.
3		1 or more pulses	 	Generate pulses. Until the required parameter is obtained.
4		1 or more pulses		Select the digit to be changed.
5		1 or more pulses		Change the value of the digit.
6		Press for 2 seconds		Save and return to auto. mode.
Or 6		Pulse		Proceed to another parameter.

Setting the controller to "standard programming" (continued)

To set the other parameters available in standard programming mode, repeat steps 1 to 6 on the previous page. Step 3 allows you to select one of the following parameters:

Parameter	Display / Symbol	Comment
Cos ϕ 2 setting	 <p>The display shows '0.95' with 'cos φ' and 'ind' above it. A line points from 'φ 2' to the '0.95'.</p>	Same procedure as for cos ϕ 1.
CT current transformer ratio	 	Enter the ratio value. For values > 1000, a decimal point and k meaning x 1000 appear (e.g.: ratio = 1000).
Automatic detection	  	Run automatic configuration detection (step / sequence size): Off: no auto. detection 1: step size detection 2: sequence detection 3: 1 + 2. At the end of the procedure, the angle detected is displayed.
Capacitor power		This value is the power of the first step.
Regulation sequence		The first digit is always 1 and does not appear on the display.
Outputs		Enter the number of outputs used by the controller (1 to 12).
Elimination of peaks and troughs	 	The min. and max. values are recorded every 15 minutes. They can be eliminated (with the exception of temperature peaks, connection time and number of actions per step).

For "extended" programming that includes other information, see the controller documentation.

Operating performance check

- check that cos ϕ is the required value
- for full load operation, check that each step is enabled correctly
- when the equipment has been in operation for a few hours, check the ambient room temperature.

Note: If an alarm is displayed when the capacitor bank is being commissioned, or the first few times it is used, see "Faults and corrective actions" to identify the cause of the alarm.

Maintenance

The capacitors fitted inside the cubicles can be accessed via the front face.

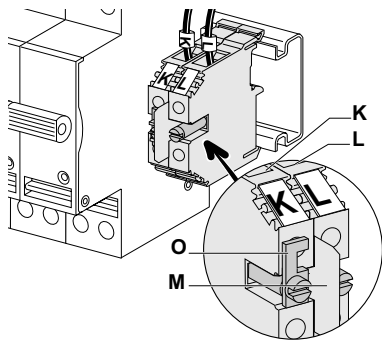


Fig. 13

Current circuit maintenance (Fig. 13, 14 and 15)

- after removing the circuit separator M, bridge CT terminals S1 and S2 (terminal block terminals K and L) with jumper O (there is a risk of damage to the current transformer if the secondary winding is open)
- when the maintenance operation is finished, disconnect the jumper O by removing it and replace the separator M.

Personal protection

Each capacitor is fitted with discharge resistors that reduce the voltage across the terminals to 50 V **one minute after powering down**.

Before carrying out any work on the equipment:

- switch it off.
- ensure that the discharge time is observed
- ensure that each capacitor is fully discharged by short-circuiting and earthing the contactor terminals and check with a Voltage Absence Tester (VAT).

Caution:

refer to the capacitor bank wiring diagram which indicates how to link the contactor and the capacitor.

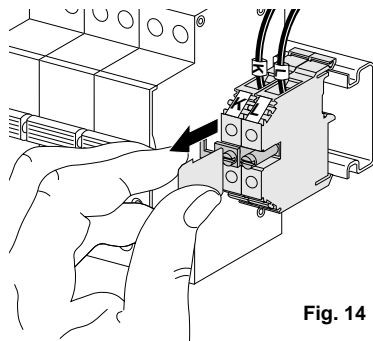


Fig. 14

Discharging the capacitors:

- single-step line disconnection (Fig. 16).
To fully discharge the capacitors, successively short-circuit the terminals (DE), (EF), (FD) and check with a Voltage Absence Tester (VAT)
- double-step line disconnection (Fig. 17).
To fully discharge the capacitors, successively short-circuit the following terminals: (D1E1), (D2E2), (E1F), (E2F), (FD1), (FD2) and check with a Voltage Absence Tester (VAT).

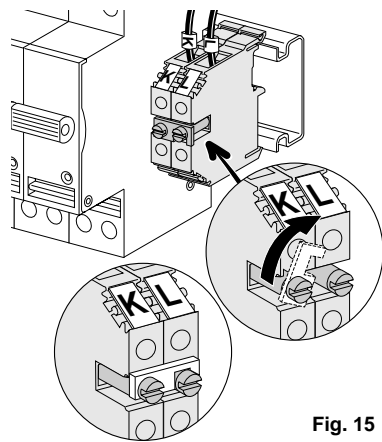


Fig. 15

Checks

Annually:

- the general cleanliness of the equipment
- the ventilation system and filters
- the electrical connection terminals for tightness
- the condition of the handling and protective devices
- the temperature of the area where the equipment is located
- the capacitance of the capacitors

Please contact us in the event of a variation of more than 10 % with respect to the rated values for the DR capacitor banks.

Safety

All the operations described in this document must be performed in accordance with current safety standards and under the supervision of an approved body.

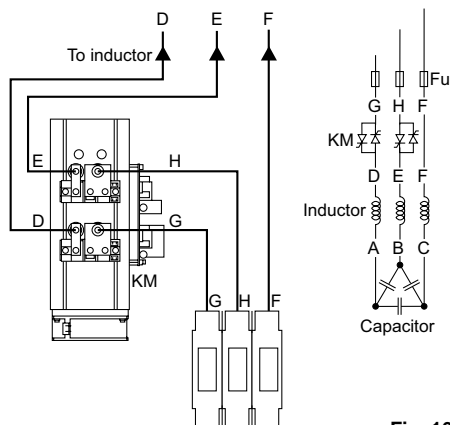


Fig. 16

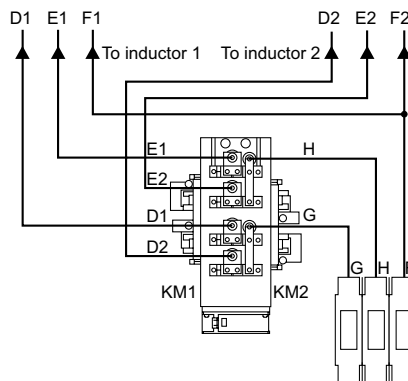


Fig. 17

Faults and corrective actions

The cause of an operating problem when a capacitor bank is commissioned can usually be diagnosed from information given by the controller.

If the display is blank, check the voltage across the controller terminals.
If no voltage is present, check the continuity of the circuit from the source: wiring, fuse, etc.

If the display is blank, but a voltage is present across the controller terminals, replace the controller, as it is damaged.

If the controller displays one or more alarms, refer to the controller documentation for the cause of the fault and the corrective action to be taken.

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Design by: Ameg
Published by: Schneider Electric
Printed by: Imprimerie des Deux-Ponts

06/2004