

Just That Easy: Reactive Power Compensation using the Controller CR4.0

Installation:

Attach 230V AC to the power supply U_B pins 5/6 (in any order) of the 24-pin long connector strip. At three-phase systems with 400V AC you may bridge the star (wye) voltage 230V AC (L-N) to the measurement voltage U_M pins 1/3 (in any order) with the supply voltage. Attach the current transducer to the measurement current I_M pins 8/9 (in any order); remove the current transducer short (if any). Now half the work is done - the controller CR4.0 is empowered to gauge the net configuration.

One after another attach the branch lines to the capacitor bank to the outputs K1 to K8, pins 11 to 18 of the connector strip (in any order). Attach the phase pole of the 230V AC supply for the contactors of the capacitor bank to the common output COM, pin 10 (or COM2, pin19) and the corresponding neutral to the return paths from the contactors within the capacitor bank. Now the Reactive Power Controller CR4.0 is enabled to compensate the reactive currents in your system by smart activating the capacitors of the bank.

Commissioning:

For check all lamps of the Reactive Power Controller CR4.0 light for a few seconds when powering up (turn in the controller fuse resp. switch on the circuit breaker). Then the controller is ready for commissioning. The green LED "U (V)" lights and the numerical 7-segment display shows the voltage actually measured. By the "↓" key you may proceed to the next LED "I (A)" while the actual current through the current loop transducer <--> controller (0..5A) is displayed. The numerical display is blinking because the current transducer ratio (ctr) is still unknown (the shown value bases on 5A:5A).

Start the Automatic Self Commissioning process by a long keystroke (3 seconds) on both green arrow keys "↓" and "→" (=reset) or by selecting menu item "In. 2" followed by "SET". While the commissioning process is running the CR4.0 controller switches several times steps of the capacitor bank. It determines from the changes in strength and phasing of current and voltage the net configuration as well as the capacitors reactive powers. That process may take about 5 to 15 minutes. In the meantime the controller displays clocked in sequence "SELF" / "InIt" / "...".

Commissioning is finished when the displayed sequence changes to **"SELF"** / **"InIt"** / **"donE"** followed by lighting all lamps during change to the Automatic Regulation Mode by reset.

If not turned off the sequence **"SELF"** / **"InIt"** / **"..."** is two or three times intercepted by displaying the results of the commissioning process starting with **"APPr"** (for "approve !"; for details refer to the respective chapters in the verbose Operations Manual.

If you want to speed up the commissioning process or if you want to track each action you may select special settings prior to start of commissioning. Refer to the following verbose detailed operating instructions. It also comprises the statements necessary for non-standard commissioning.

Automatic Regulation Mode Operation:

Whilst compensating the reactive power in automatic mode operation your controller CR4.0 shows the obtained power factor $\cos \phi$ at the numerical 7-segment display indicated by the green LED **"cosphi"** as far as it works nice. The more $\cos \phi$ approaches 1.00 the less your mains is stressed by reactive current. But note that at low active load the power factor $\cos \phi$ may achieve any value without relevance because the reactive power is low, too; low load conditions are indicated by no or only one capacitor being switched on.

The green "Steps" LEDs show which steps of the capacitor bank are actually switched on.

During automatic mode operation the mains conditions and the system utilization are tracked by the controller. That gives an extensive collection of actually measured values with their minimum and maximum to be obtained by using the menu tree "Info". The menu tree "Set" offers a multiplicity of settings due to adapt operation, error detection and alarming to your requirements.



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Technical Data

Measuring System

Type of measuring system single phase, electrical

<u>Measuring Voltage</u>	58V..700V AC {-100V variant 50V..250V AC}, max, 780V AC
Resolution	raw approx. 1,0V {0,4V}; filtered approx.0,2V {0,1V}
Accuracy	repeat accuracy approx. 0,6%; abs. approx. 1,5%
Input impedance	high impedance, <50 μ A
Fusing	max. 4A
Harmonics	Fourier analysis, filtered 1. .. 31. harmonics
<u>Measuring Current</u>	0 .. 5A AC, max. 7.7A (-1A variant 0 .. 1A AC, max. 2A)
Resolution	raw approx. 10mA {2mA}; filtered approx. 3mA {1mA}
Accuracy	repeat accuracy approx. 0,6%; abs. approx. 1,5%
Input impedance	0,3VA q 5A =12m Ω (90mVA @ 1A =90m Ω)
Harmonics	Fourier analysis, filtered 1. .. 31. harmonics
Frequency Range	45Hz .. 65Hz (lock-in range); 41Hz .. 69Hz (pull-in r.)
Temperature Measur.	Regulation bases on the filtered measuring readings (-8K) resp. on the raw measuring values (-8T, -4T4K) about -20°C ... +70°C

Power Supply

Supply Voltage	230V AC, 50/60Hz
Power consumption	<15VA
Fusing	max. 4A
Ambient Temperature	-10°C .. +60°C

Steps Outputs

Number of Outputs / Output Types	8, Relays for contactors (-8K) or Transistors for thyristor switches (-8T), in variant -4T4K mixed
<u>Relay Output</u>	for contactors: 250V AC, max. 4A, in total max. 4A
Fusing	max. 4A
<u>Transistor Output</u>	for thyristor switches 10V DC, max. 150mA (single / Σ)
external power supply	(variants -E) 8..16V DC (abs.max. 20V), Σ max. 1.2A
<u>Alarms / Fan relay</u>	250V AC, max.4A
Fusing	max.4A

Panel Mounting

Case	Panel-mounting case 144mm x 144mm acc. DIN IEC 61554 approx.
Panel Opening	138mm x 138mm
Case Depth	60mm

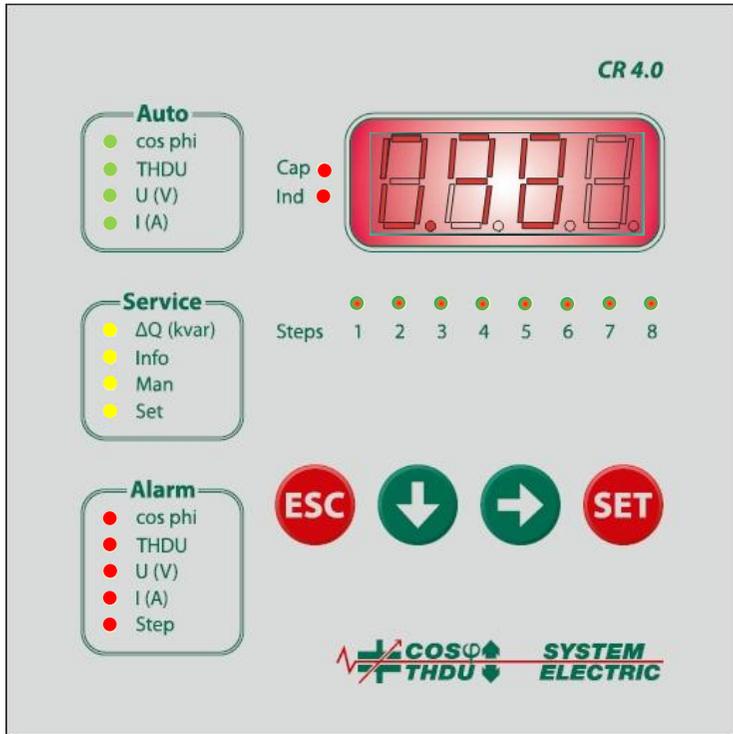


Figure 1

Front Panel of the Reactive Power Controller CR4.0