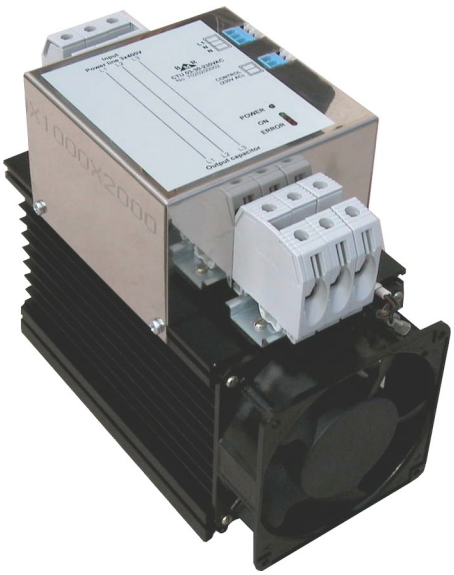
CTU 03/33

Thyristor switching module for fast power factor compensation

User and service manual



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Content

BMR *trading*
Horní lán 17
779 00 Olomouc
Czech Republic

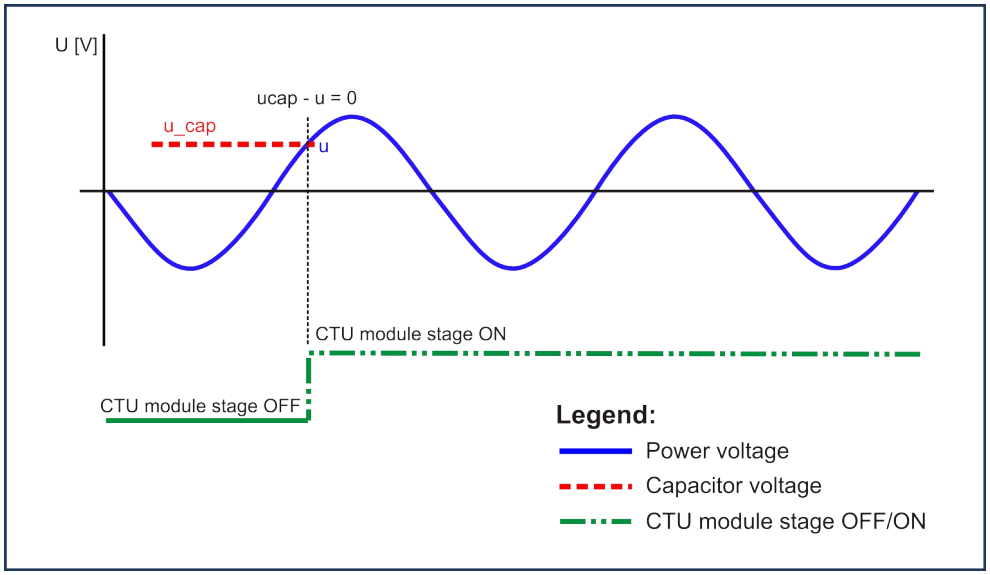
phone: +420 778 066 566
export@bmr-trading.com
www.bmr-trading.com

1. Function description

Contact-less thyristor modules of CTU03 range are designed for fast switching of power capacitors, eventually for switching L – C circuits with dominant capacity factor (detuned capacitor stages). CTU03 modules are suitable for power factor compensation in application with fast load changes like, for example welding plants, pressing lines, lifts, cranes and controlled drives.

The advantage of CTU03 modules usage, comparing to the standard switching of capacitor stages by mechanical contactors, is immediate capacitor connection and fast disconnection without any disturbances to the network.

Fast compensation in CTU03 and single-phase capacitors delta connection according to picture 3, gives possibility of immediate connection of capacitor without its previous discharging after disconnection. This fast reaction is possible thanks to CTU03 module switching operation principle. CTU03 module disconnects every single-phase capacitor independently at the moment of "zero" current. Thanks to this fact, the capacitor is after disconnection charged on the minimum power and at the voltage lower than system voltage. Then CTU03 module can switch capacitor immediately at the moment when the difference between capacitor voltage and system voltage equals zero.



Picture 1. Principles of switching in "zero"

Result of fast compensation by CTU03 modules is the high reduction of current peaks in the system. This is very important feature that protects electronic appliances against the damage or interference. At some level of system disturbances CTU03 modules together with fast regulators FCR06 (12) or GCR06 (12) can bring the similar or even better result than active filters.

For appropriate function and longer working time it is recommended use CTU03 thyristor modules only with detuned reactors (protected capacitor stage). In case that step is without detuned reactor it is necessary to mount the JTC reactors into series with the thyristor module for the minimum protection of the thyristors against current peaks (di/dt).

Module itself is protected against overheating by electronic thermostat that switches the module off when the temperature exceeds 80ºC.

2. Device description and indication features

CTU03 and CTU33 is a compact module which mechanical base consists of cooling aluminium profile to which power thyristors, power terminals and control unit are mounted. Modules for power 50 kvar and higher are equipped by fan.

In the CTU03 and CTU33 module there are five signal LEDs.

1st green LED	Presence of power supply voltage
2nd red LED	Temperature error of thyristor module at 80°C or at thermistor sensor failure
3rd green LED	Phase 3 operation switched on
4th green LED	Phase 2 operation switched on
5th green LED	Phase 1 operation switched on

CTU 03 modules are produced in the following types of power and control voltage:

Type	3 single phase capacitor power [kvar]	System voltage for Δ connection	System voltage for Y connection	Control voltage
CTU03-400-06	18 (3 x 6)	400 VAC	690 VAC	24 VDC / 230 VAC
CTU03-400-17	51 (3 x 17)	400 VAC	690 VAC	24 VDC / 230 VAC
CTU03-400-36	108 (3 x 36)	400 VAC	690 VAC	24 VDC / 230 VAC
CTU03-400-42	126 (3 x 42)	400 VAC	690 VAC	24 VDC / 230 VAC

Important

CTU03 modules can be operated by control voltage 230 VAC 50 Hz or 24 VDC. For the application where only thyristor modules are used, 24 VDC control voltage is recommended.

CTU33 modules are produced in the following types of power and control voltage:

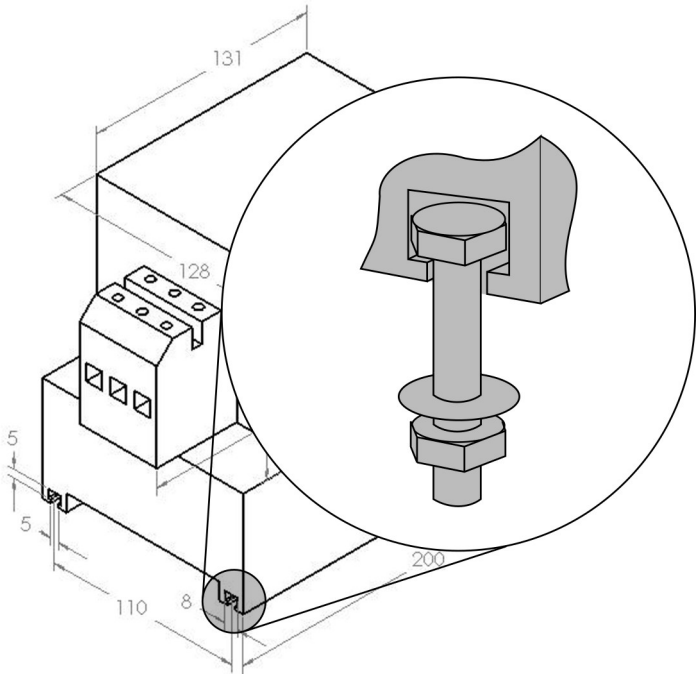
Type	3 single phase capacitor power [kvar]	System voltage for Δ connection	Control voltage
CTU33-400-06	18 (3 x 6)	400 VAC	24 VDC
CTU33-400-17	51 (3 x 17)	400 VAC	24 VDC
CTU33-400-36	108 (3 x 36)	400 VAC	24 VDC
CTU33-400-42	126 (3 x 42)	400 VAC	24 VDC

Important

CTU33 modules can be operated by control voltage 24 VDC only.

3. Mounting

The module has to be installed in vertical position in the switchboard by four screws. Vertical position is important for well cooling of heat-sink. Power conductors and cables from capacitors are connected to power connectors of power thyristor module in the way as it is described on the scheme on the label.



Picture 2. Mounting points

The module can be mounted in vertical positions only since the good ventilation has to be assured. For the mounting there are grooves on side of aluminium cooler for usage of four screws. Power conductors and cables from capacitors are connected to power connectors of power thyristor module in the way as it is shown in the scheme in the chapter 4.

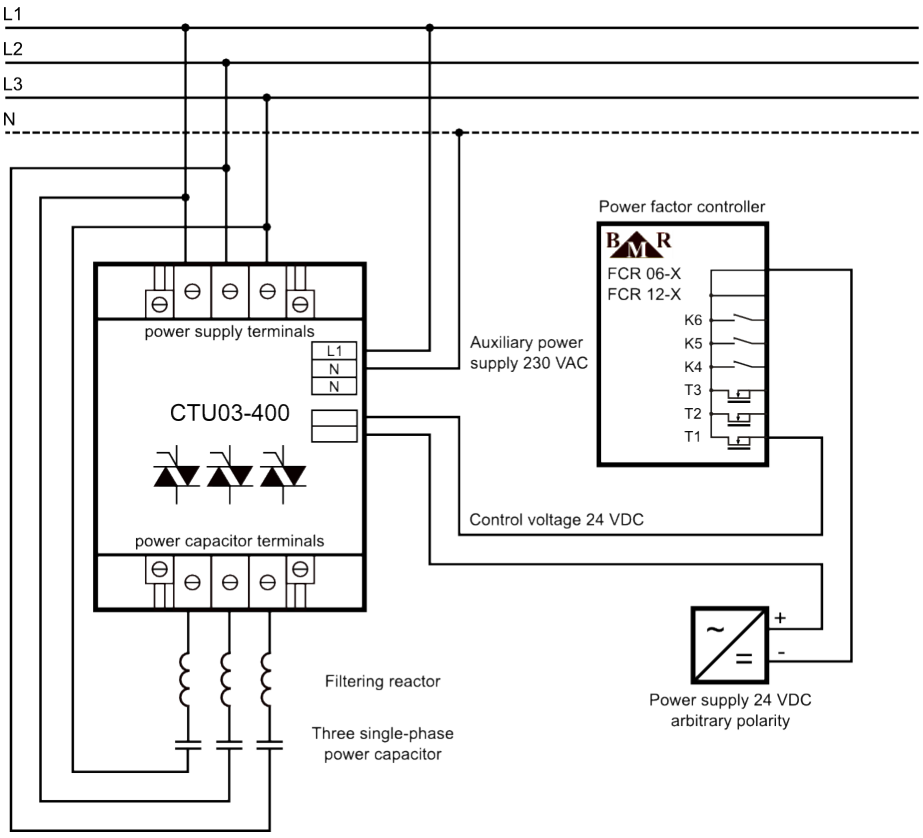
The board with control unit is power supplied from the individual circuit 230 VAC / 50 Hz, 2 VA and it shall be protected by a circuit breaker of max. 6 A. If the voltage of 230 VAC is supplied to control the step, it is necessary to assure that the auxiliary power supply voltage of CTU03 module and controlling voltage from the power factor regulator will be from the same phase.

4. Connection diagrams

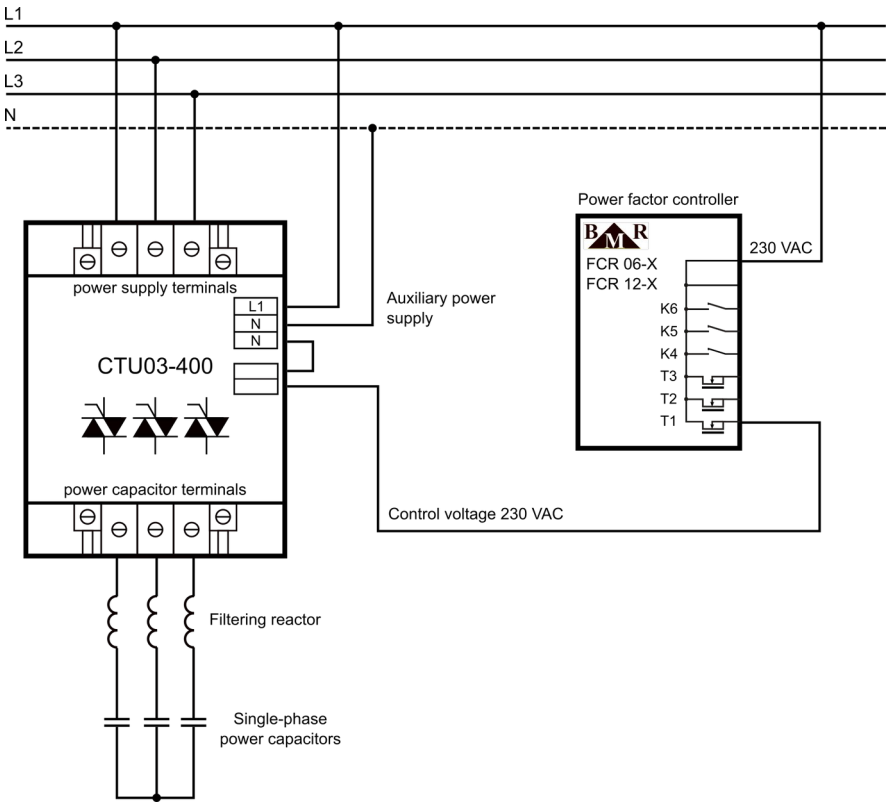
The board with control unit is power supplied from the individual circuit 230 V AC / 50 Hz, 2 VA and it must be protected by fuse or circuit breaker of max. 6 A. If the voltage of 230 V AC is supplied to control the stage, it is necessary to assure that the auxiliary power supply voltage of CTU03 module and controlling voltage from the power factor regulator will be from the same phase.

Switching module has to be protected by fuse gR characteristic with the body size 00 in the open design for better cooling. It is important select the proper fuse according the I2tc (A2s) parameter to be not higher than 10 kA. Only that way chosen fuse protects semiconductor in correct way.

4.1. Control voltage of 24 VDC

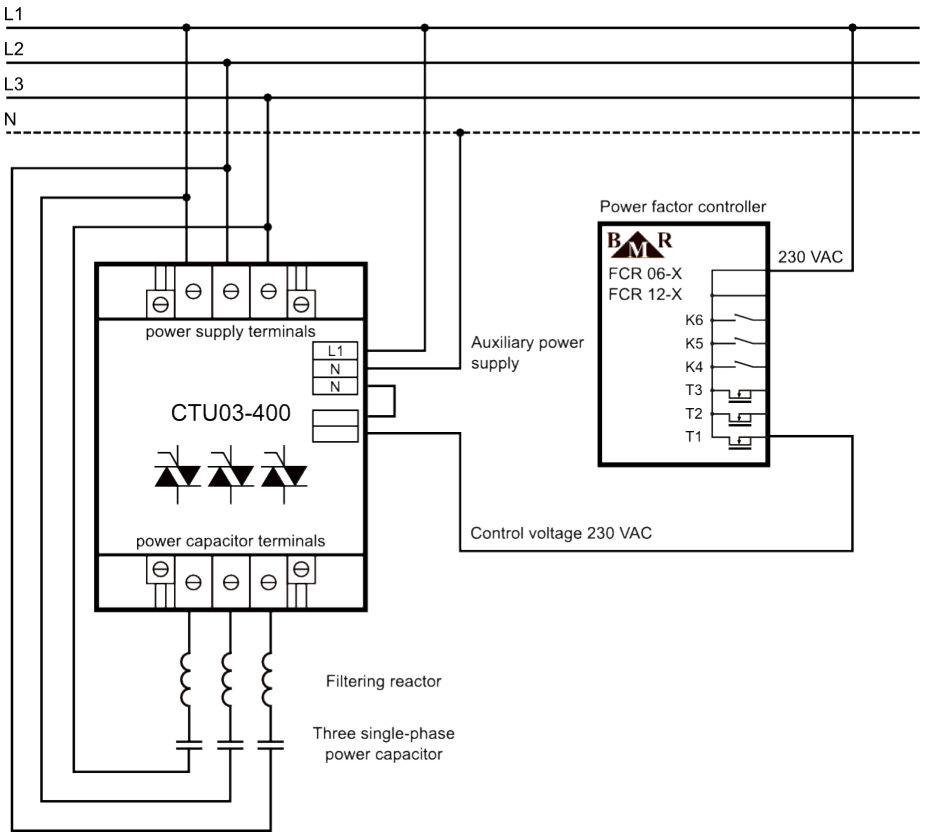


Picture 3. Connection diagram of CTU03 and 3 single-phase capacitors connected into Δ

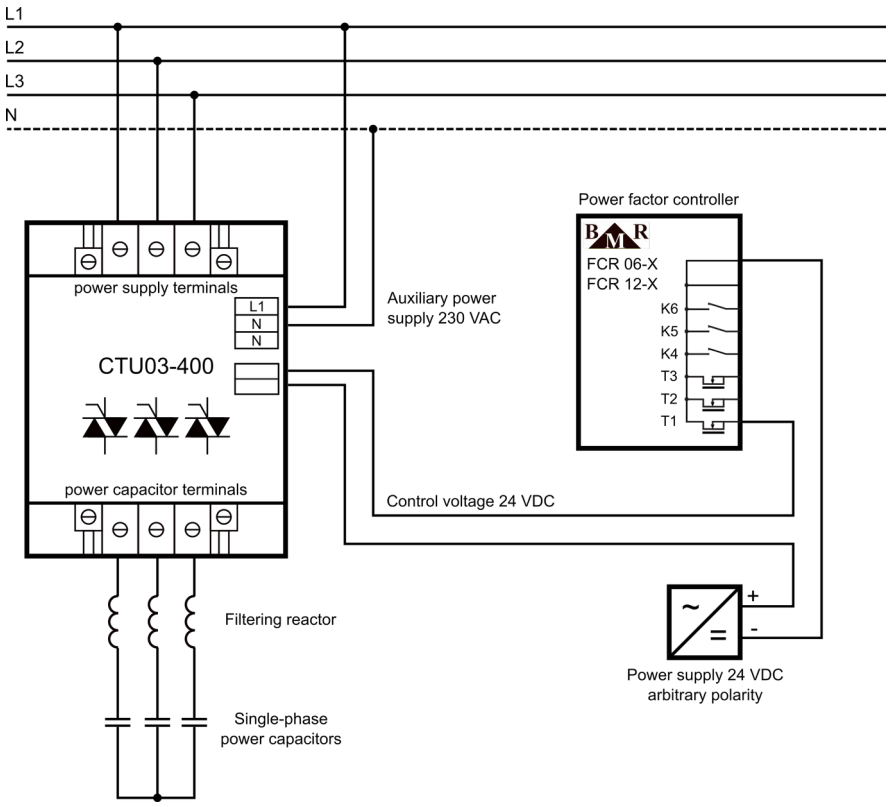


Picture 4. Connection diagram of CTU03 and 3 single-phase capacitors connected into Y

4.2. Control voltage of 230 VAC

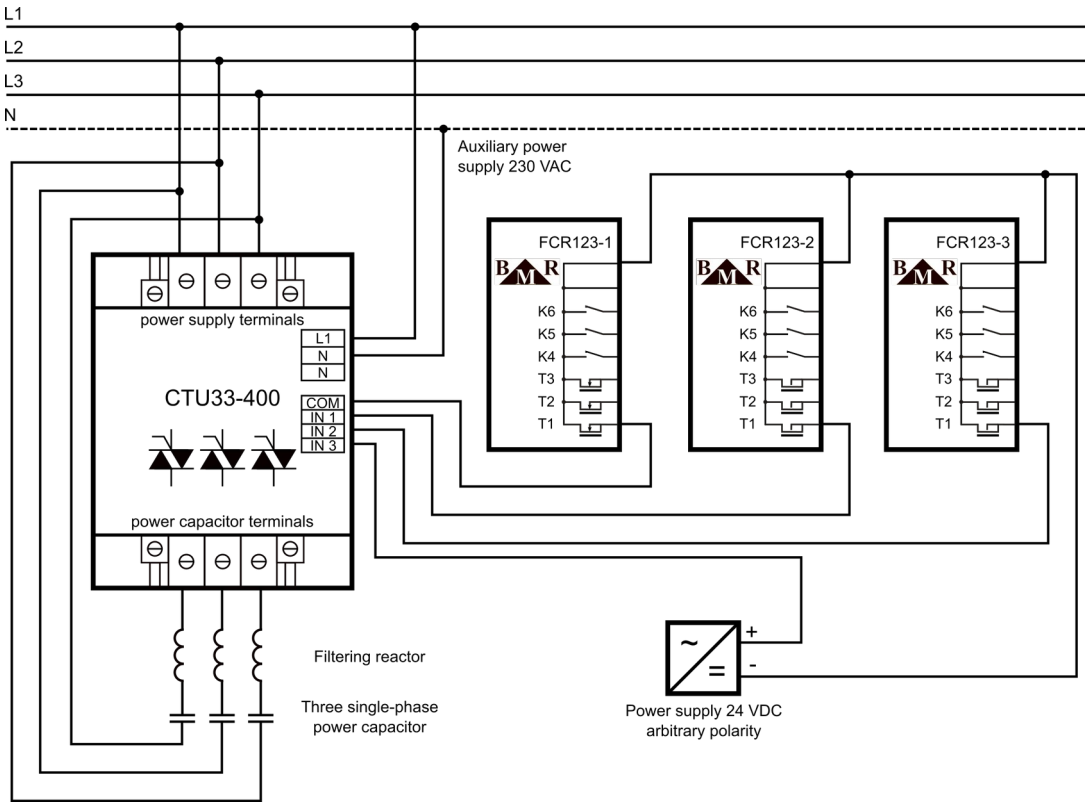


Picture 5. Connection diagram of CTU03 and 3 single-phase capacitors connected into Δ



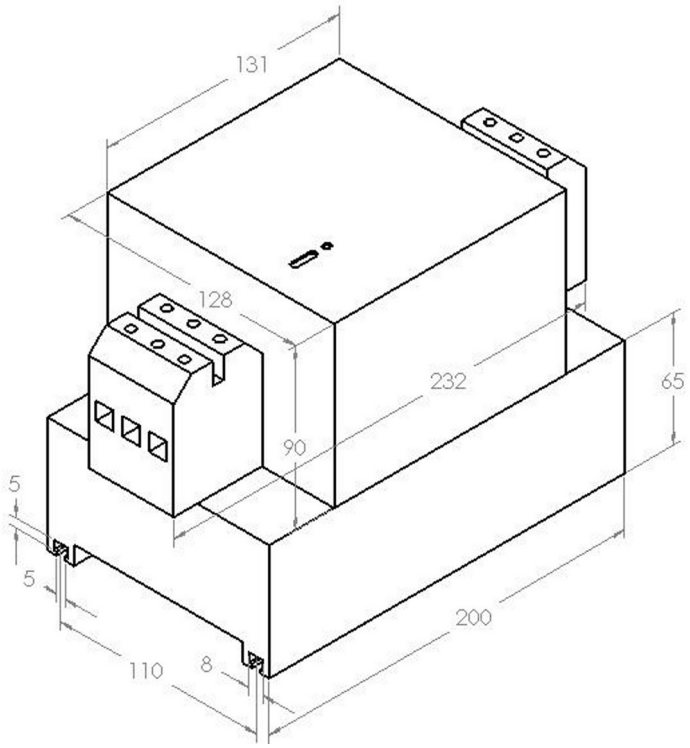
Picture 6. Connection diagram of CTU03 and 3 single-phase capacitors connected into Y

4.3. Connection of CTU33

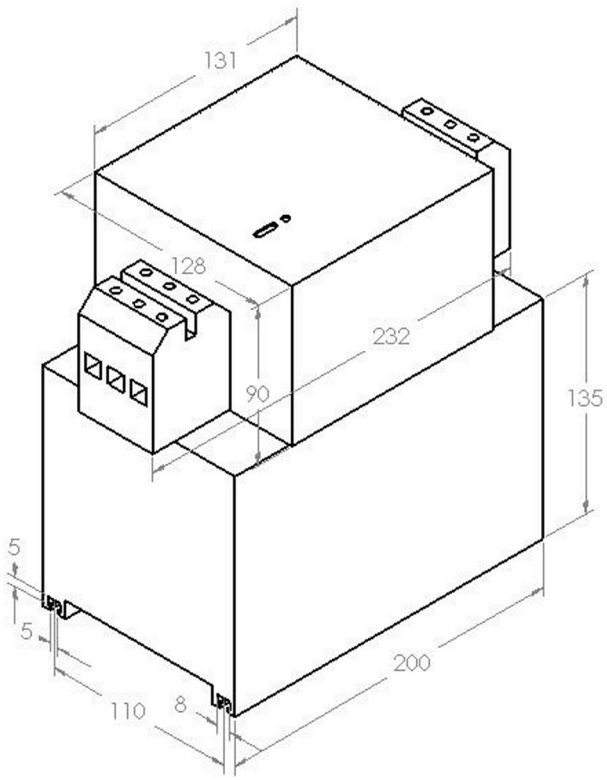


Picture 6. Connection diagram of CTU33 and 3 single-phase capacitors

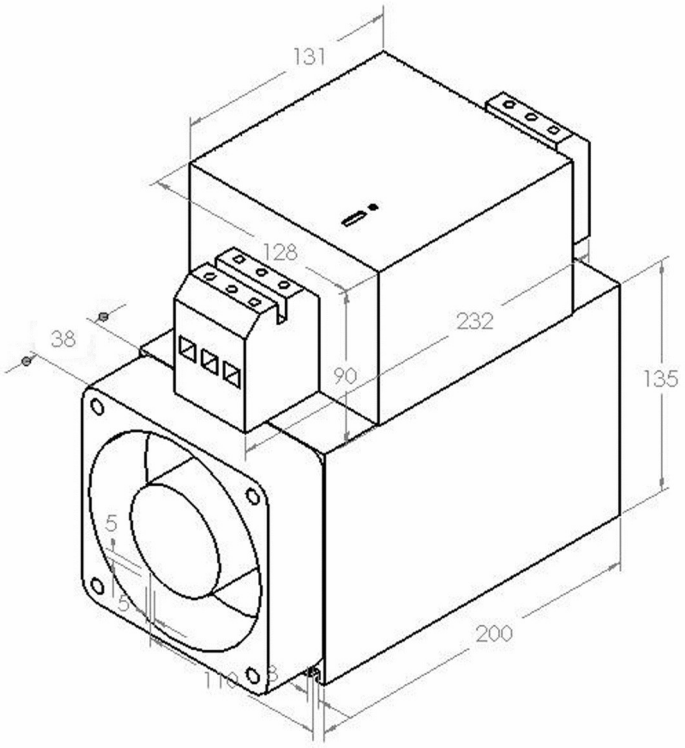
5. Dimensions



Picture 7. Dimensions of CTU03-400-06 and CTU33-400-06



Picture 8. Dimensions of CTU 03-400-17 and CTU33-400-17



Picture 9. Dimensions of CTU03-400-36 (CTU03-400-42) and CTU33-400-36 (CTU33-400-42)

6. Technical features

Parameter	CTU03-400-06 CTU33-400-06	CTU03-400-17 CTU33-400-17	CTU03-400-36 CTU33-400-36	CTU03-400-42 CTU33-400-42
Maximum system voltage for Δ connection	400 VAC 50 Hz (+10%,-15%)			
Maximum system voltage for Y connection	690 VAC 50 Hz (+10%,-15%) - only for CTU03			
Reverse blocking voltage	1600 V			
Power of single-phase capacitors	18 (3 x 6) kvar	51 (3 x 17) kvar	108 (3 x 36) kvar	126 (3 x 42) kvar
Maximum switching current	15 A	43 A	72 A	104 A
Control voltage	24 VDC or 230 VAC 50 Hz (CTU33 control voltage 24 VDC only)			
Control circuit input power	0.24 VA			
Auxiliary power supply input	230 V / 2 VA			
Operating status signalization	LED			
Load type	capacitive, resistive and combined LC			
Maximum power dissipation	60 W	150 W	250 W	300 W
Size of conductor	35 mm^2			
Fan input power	-	-	3 VA	3 VA
Working ambient temperature	-25ºC up to +45ºC			
Weight	3.4 kg	5.0 kg	5.6 kg	5.9 kg
Dimensions	200 x 120 x 155 mm	200 x 120 x 225 mm	238 x 120 x 225 mm	238 x 120 x 225 mm
Protection degree	IP00			

BMR *trading*
Horní lán 17
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phone: +420 778 066 566
export@bmr-trading.com
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