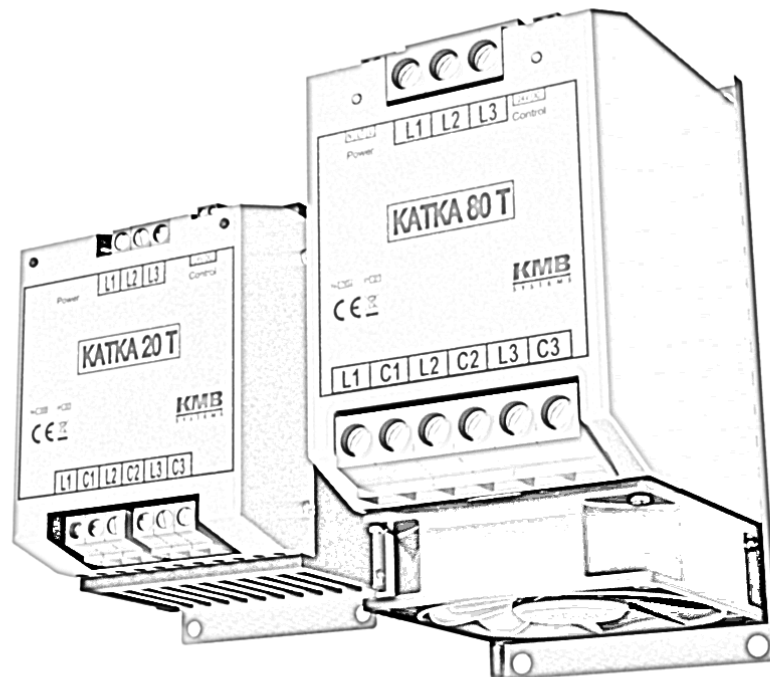


Operating Manual for

THYRISTOR SWITCHING MODULES
KATKA 20ST 400

version 2.0



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1 Applications

KATKA 20ST 400 series of thyristor switching modules have been designed especially for switching power factor correction capacitors in rapid reactive power compensation (up to 20 control interventions in one second) in conjunction with fast power factor controllers of the **NOVAR** series. They can, of course, be also used in other applications where contact-less load switching is required.

The modules are designed to switch a star- or delta-wired, symmetric or asymmetric, capacitive, resistive or inductive load in a 400V/230V (440V/250V) system. Load is connected under **near-zero voltage** (typically 5V) across the switching device and disconnected on zero-cross current.

The benefits of contact-less switching are:

- long life (high number of connections and disconnections)
- reduced current and voltage interference (connection and disconnection at near-zero power)
- fast connection and disconnection
- no switching noise

These benefits are demanded especially at following sectors:

- Welding Plants
- Presses, mills
- Windturbines
- Elevators
- Cranes
- places sensitive to harmonic distortions

2 Connections

2.1 Internal Wiring of KATKA 20ST 400

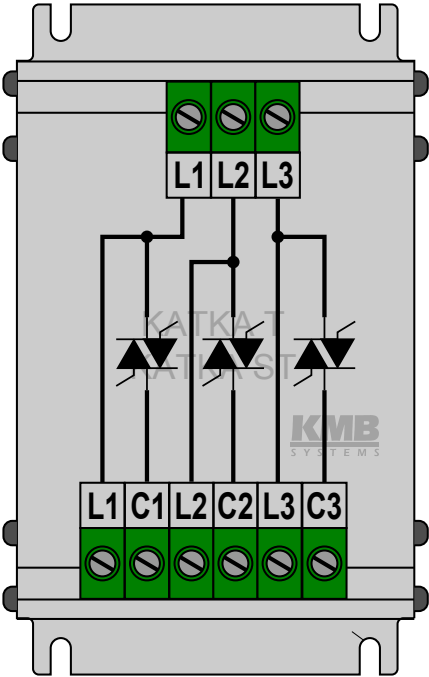


Figure 1: Internal wiring

2.2 Installation of KATKA into cabinet

During normal operation, modules produce great amount of heat. Therefore it's necessary to provide sufficient air flow in the cabinet (holes in bottom and top of the cabinet) and sometimes also use of active cooling (use of fan) might be necessary. Modules have to be installed vertically to allow air to flow through heatsink from bottom to top. Ambient temperature (air provided for cooling of the module) should be kept bellow 45°C.

When installing multiple rows of modules in one cabinet each row should be staggered or heat deflectors should be used. Air coming out of the module is very hot and might have negative effect to module directly above. Modules should be installed to higher levels so hot air can escape cabinet as soon as possible.

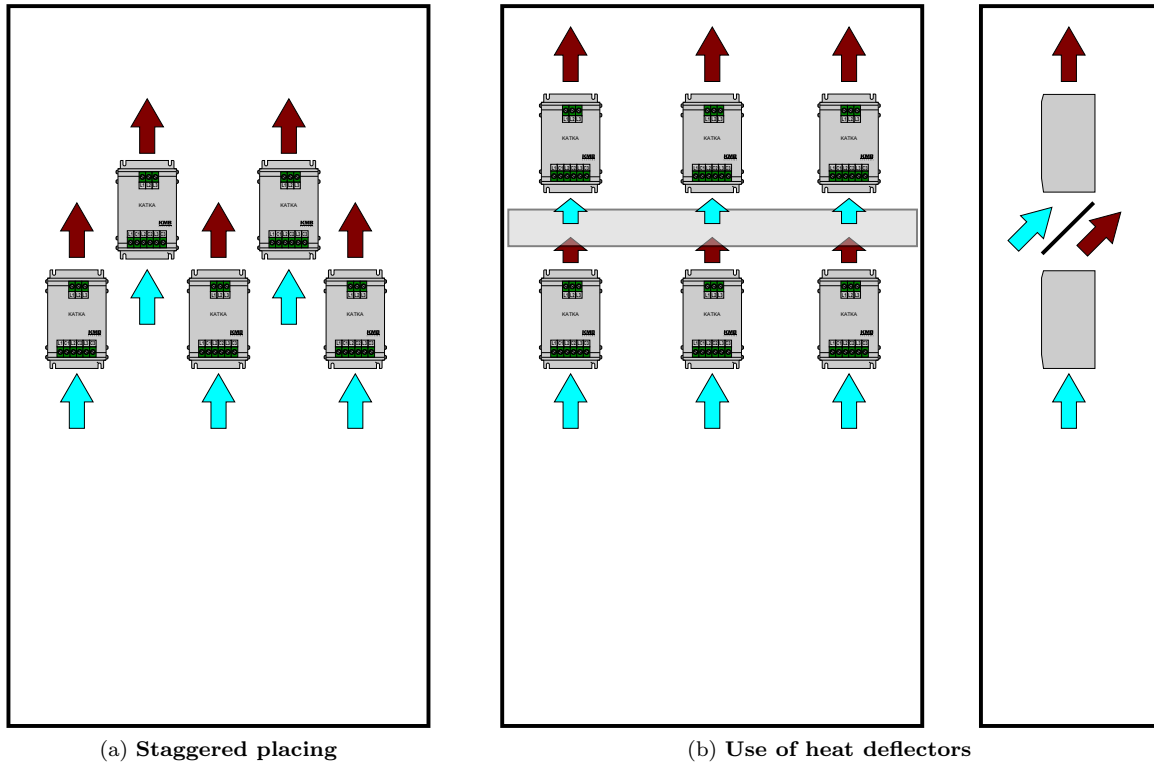


Figure 2: Installation example

2.3 Connection of Load

When using power factor correction capacitors, implementation of **detuned power factor correction is highly recommended**, otherwise an inductance of at least 12 μH must be wired in series with the switch to prevent thyristor damage by reducing speed of current rise. A detuning reactor also expands life of power factor correction capacitors and improves control accuracy. The modules incorporate class C over-voltage protection varistors. It is further recommended that a class B, 50 kA, lightning current protection device should be installed in the power lead.

2.3.1 1-phase delta connected capacitors (400 V ÷ 440 V systems)

Using this connection you get highest possible switching rate of all connections. Each capacitor have its own switch and is not overcharged while disconnected. This allows almost immediate reconnection. Filter reactor can be connected before thyristor module, like with standard detuned PFC (fig. 3a). But it's also possible to connect reactor in series with capacitors (fig. 3b) which leads to smaller reactor.

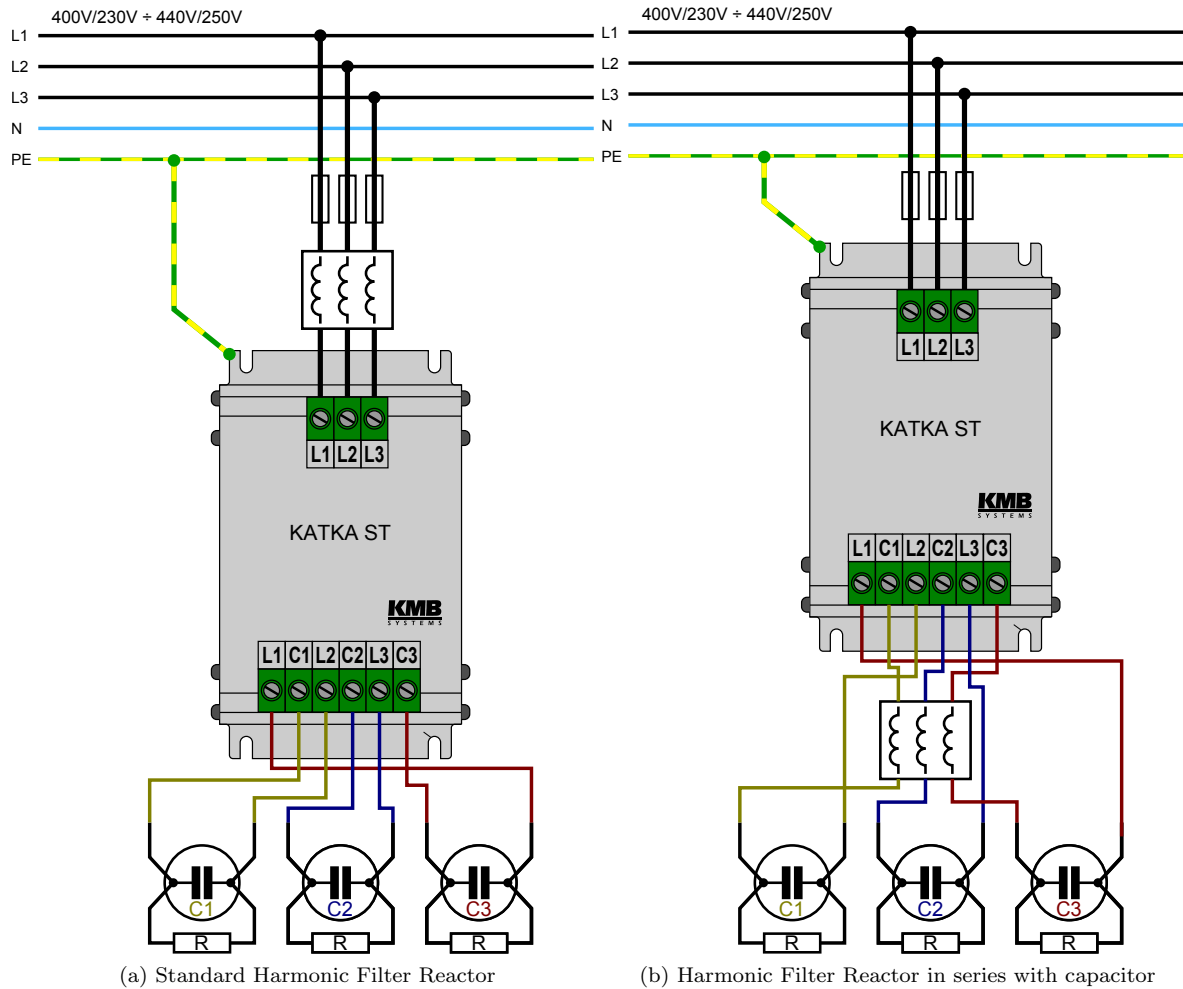


Figure 3: 3 single phase delta connected capacitors

	System Voltage	Max. step output	Current/phase
KATKA 20ST 400	400V	26 kvar	22 A
	440V	29 kvar	22 A

Table 1: Maximum allowed power

NOTE:

This connection is suitable mainly for rapidly changing loads where there is not enough time for discharging of capacitors. Great example are welding plants.

2.3.2 3-phase delta connected capacitor (400 V systems)

Budgetary connection with which you get fast reaction but you have to wait longer for reconnection. Capacitor gets overcharged while disconnected ($2,1 \times U_{nom}$) and it takes longer to discharge (at least to $1,4 \times U_{nom}$) to allow reconnection compared to three 1-ph capacitors.

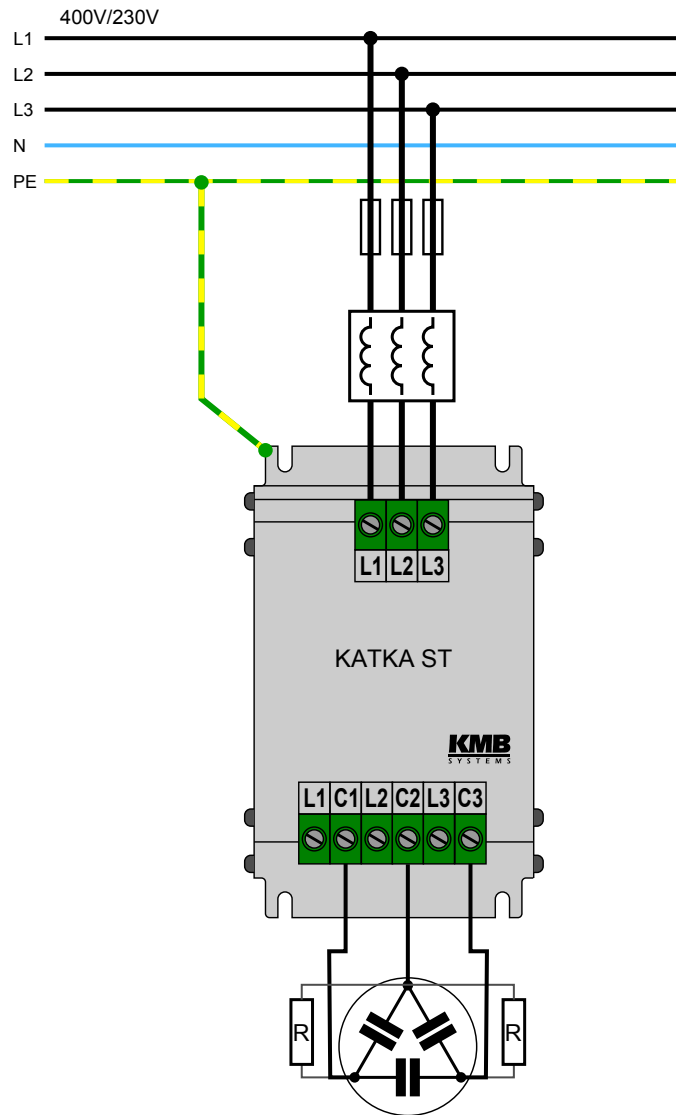


Figure 4: 3 phase delta connected capacitor

	System Voltage	Max. step output	Current/phase
KATKA 20ST 400	400V	15 kvar	22 A

Table 2: Maximum allowed power

NOTE:

This connection is suitable mainly for application where prompt reaction is necessary. Great example are cranes, elevators, presses or to decrease THD or acoustical pollution as replacement of mechanical contactors.

2.3.3 1-phase star connected capacitors

Solution for simple single phase power factor correction using 3-phase power factor controller.

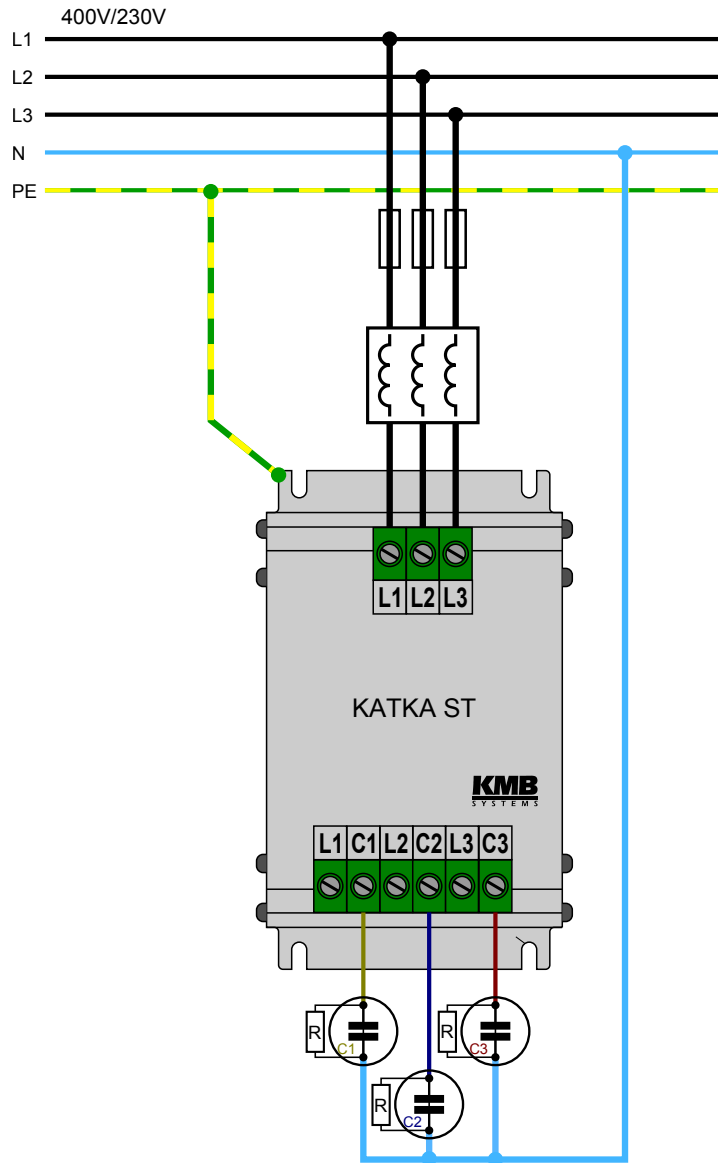


Figure 5: 1-phase star connected capacitors

	System Voltage	Max. step output	Current/phase
KATKA 20ST 400	400V	3 × 5 kvar	22 A
	440V	3 × 5,5 kvar	22 A

Table 3: Maximum allowed power

2.4 Connection of Control Signal to KATKA 20ST 400

The control voltage is galvanically isolated from the other circuits. The modules have a Power indicator, to indicate voltage presence, and a Control indicator to indicate closed circuit condition of the module when control voltage is applied.

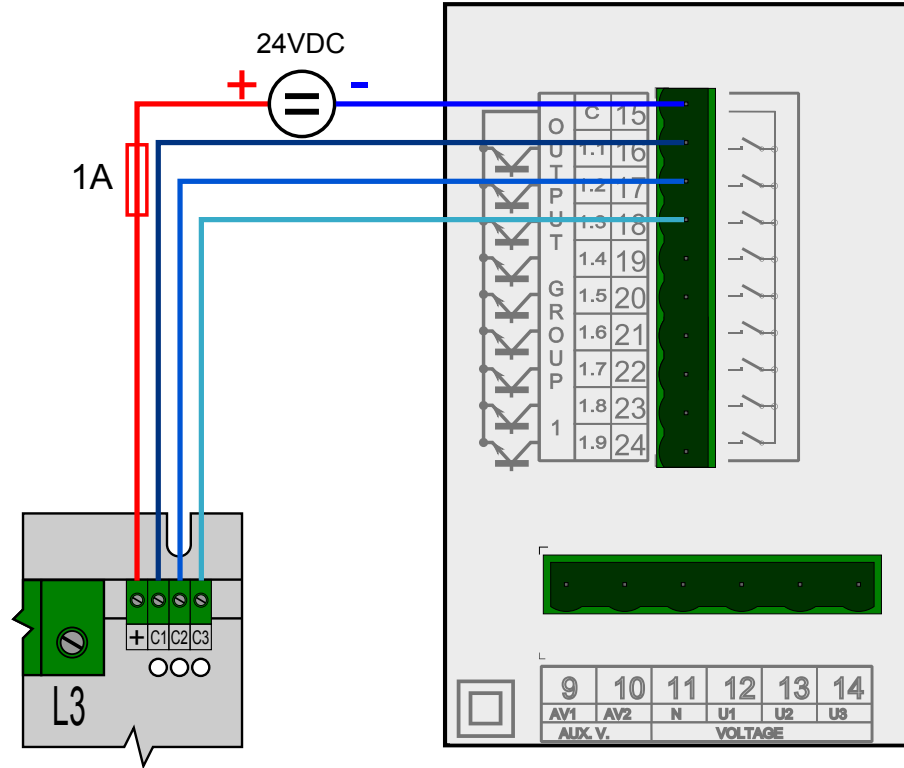


Figure 6: Connection of control signal

NOTE:

When C1, C2, C3 terminals are connected to same signal (fig. 7), all three switches of KATKA will be switched at same time. Behavior of KATKA will be then similar to KATKA T models.

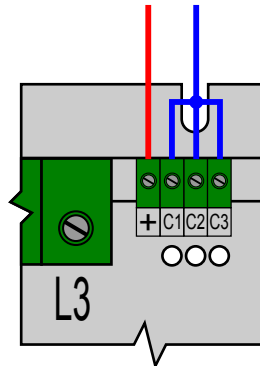
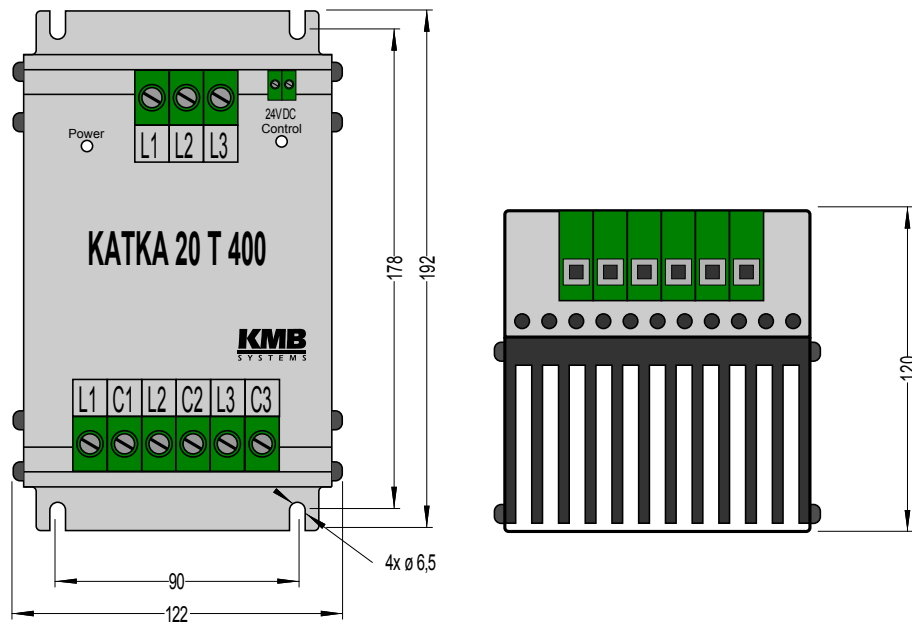


Figure 7: Linking of C1, C2 and C3

3 Mechanical Dimensions



4 Technical Parameters

Parameter	KATKA 20D 400	KATKA 20T 400 KATKA 20ST 400	KATKA 20T 690 KATKA 20ST 690	KATKA 80D 400	KATKA 80T 400 KATKA 80ST 400	KATKA 80T 690 KATKA 80ST 690
nom. operating volt.	400V/230V±10%	400V/230±10% 440V/250V±10%	690V/400V±10%	400V/230V±10%	400/230±10% 440/250±10%	690V/400V±10%
max. block. voltage	1600V					
max. oper. current	29A	22A		87A	67A	
max. rate of I rise	50A/us					
conductor x-section	10mm ²			25mm ²		
number of switches	2	3		2	3	
load character	C/R/L					
fan aux. voltage	-			230±10%		
fan power	-			32 VA		
aux. cond. x-section	-			2.5mm ²		
fan threshold temp.	-°C			60°C±5°C		
ctrl. volt. / current	24 V _{DC} / 10mA (30mA for KATKA ST)					
ctrl. cond. x-section	2.5mm ²					
thermal protection	-			100°C±5°C		
overvolt. protection	C					
IP rating	IP20					
operating temp.	-20 ÷ 45°C					
oper. humidity	5 ÷ 95% non-condensing					
dimensions	122W×192H×117Dmm			122W×245H×157Dmm		
mass	2.05kg	2.15kg		3.35kg	3.45kg	

5 Ordering Diagram

KATKA 80T 400

Instrument Class

KATKA = Thyristor switching module

Construction and power

20 = passive cooling, up to 22A (T, ST)/up to 29A(D)

80 = active cooling, up to 67A (T, ST)/up to 87A(D)

Switching method

D = two-phase, two thyristors

T = three-phase, three thyristors

ST = individual switching of each phase, three thyristors

System Voltage

400 = 400/230V up to 440/250V

690 = 690/400V (available only for option T and ST)

6 Accessories

6.1 Discharge resistors

3pcs of Auxiliary discharge resistors $33k\Omega / 13W$ are delivered with thyristor modules. Resistors are designed to be used with connection on fig. 3. Its possible to connect resistors directly to terminals of capacitors.

6.2 ZP 24 auxiliary power supply

Auxiliary supply 24 VDC is necessary for thyristor switches modules or auxiliary relays excitation. Maximum load of the supply is 100 mA, that means up to 10 thyristor modules (Model T or D) can be connected to a single supply. In case of higher load appropriate number of supplies is required. The supply is without case (IP 20) and is equipped withholders for installation on DIN 35 mm.

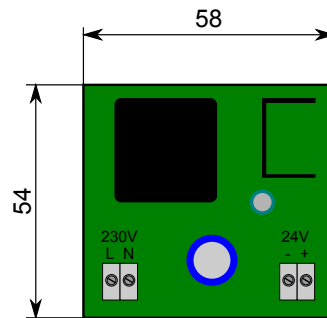


Figure 8: ZP24 dimensions

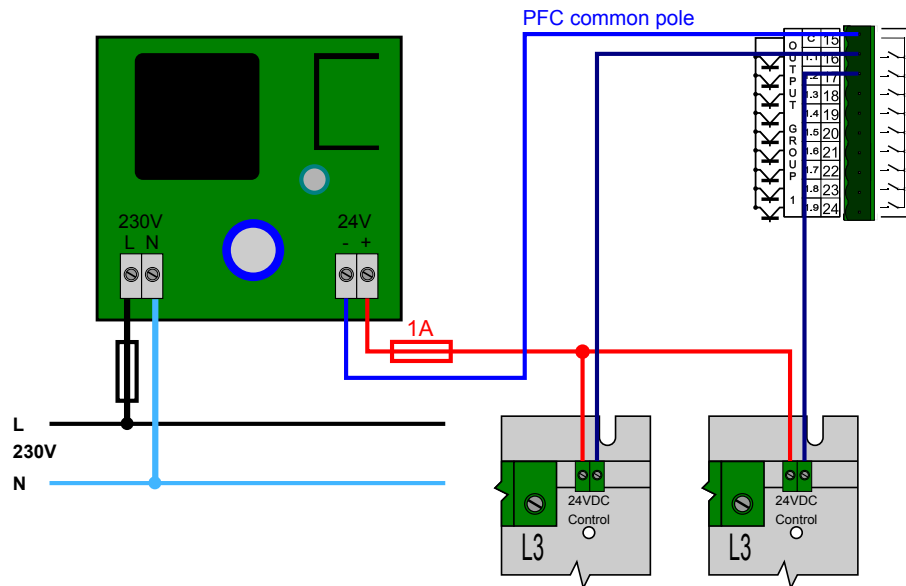


Figure 9: Possible connection of ZP24

7 Maintenance, Service, Warranty

Maintenance: the KATKA 20ST 400 modules does not require any special maintenance during its operation but following should be respected. For reliable operation heat sink should be cleaned regularly from any debris and dust as cooling performance can be reduced otherwise. Also regular inspection of fan operation (when equipped) should be performed. It is also necessary to meet the operating conditions specified and not expose the instrument to violent handling and contact with water or chemicals which could cause mechanical damage.

Service: in the case of failure or a breakdown of the product, you should contact the supplier at their address:

KMB systems, s. r. o.
Tř. dr. M. Horákové 559
460 05 Liberec 7
Czech Republic
Tel. 485 130 314, Fax 482 739 957
E-mail: kmb@kmb.cz, Web: www.kmb.cz

The product must be in proper packaging to prevent damage during transit. A description of the problem or its symptoms must be delivered together with the product.

If a warranty repair is claimed, the warranty certificate must be sent in. In case of an out-of-warranty repair you have to enclose an order for the repair.

Warranty certificate: warranty period of 24 months from the date of purchase is provided for the instrument, however, no longer than 30 months from the day of dispatch from the manufacturer. Problems in the warranty period, provably because of faulty workmanship, design or inconvenient material, will be repaired free of charge by the manufacturer or an authorized servicing organization.

The warranty ceases even within the warranty period if the user makes unauthorized modifications or changes to the instrument, connects it to out-of-range quantities, if the instrument is damaged due to ineligible or improper handling by the user, or when it is operated in contradiction with the technical specifications presented.

Type of product:	KATKA 20ST 400	Serial number:
Date of dispatch:	Final quality inspection:
		Manufacturer's seal:
Date of purchase:	Supplier's seal: