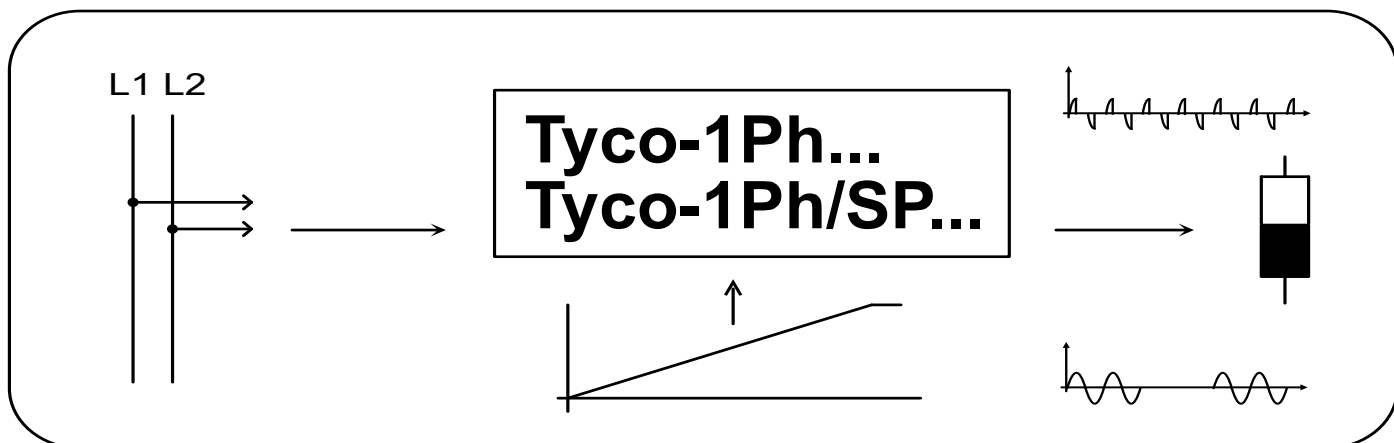




Start-up instructions

Thyristor controller Type: Tyco-1Ph, Tyco-1Ph/SP



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1. General information

The situations in which thyristor controllers have to be employed can be found in all the areas where greater resistor and inductive loads have to be controlled (e.g. industrial heating systems, tems, plastics processing, transformers, infrared elements, etc.)

Because of its modular, compact assembly and the controlling with a continuous control signal these power controllers have to be regarded as a perfect final controlling device for the industrial power controlling.

The power device of the thyristor controllers consists of two thyristor modules, an isolated heat sink and the control unit. On account of the use of function modules the adaptation to any application is one of the largest advantages of these devices.

Type description:

Tyco-1Ph...	alternating current power controller, phase angle control for single phase systems
Tyco-1Ph/SP...	alternating current power controller for burst firing control
Tyco-3Ph...	three phase controller, phase angle control for three phase systems
Tyco-3Ph/N...	three phase controller, phase angle control for three phase systems with neutral point connection (option)
Tyco-3Ph/SP...	three phase controller for burst firing control
Tyco-3Ph/SP/N...	three phase controller for burst firing control with neutral point connection (option)

Construction:

The thyristor controller agrees with VDE 0558 part 1 and VDE 0160 table 4.

The thyristor controller Tyco-1Ph... is assembled modularly. It consists of three basic elements:

- power element with cooling system and thyristor modules
- control unit with firing and control board (diagnostic display, control outputs, etc.)

2. Installation of the thyristor controller Tyco-1Ph, Tyco-1Ph/SP

The thyristor controller (IP 40) should be mounted vertically in a housing. The upper and lower side of the heat sink have to be kept free to allow cooling air to circulate freely. Controllers must be mounted on a flat surface to ensure that cooling air is channelled to the heat sink. The thyristor configuration is indifferent to the order of the supply phase rotation. It is the user's responsibility to ensure that the nominal values of the thyristor unit are compatible with the conditions of installation and operation before commissioning the the thyristor unit.

Additional points must be considered when mounting the unit:

- Vibration free environment
- Protection against hazardous environments
- Protection against dust and humidity

Please avoid to mount other components in distance of 100mm around the controller as the cooling system can be affected.

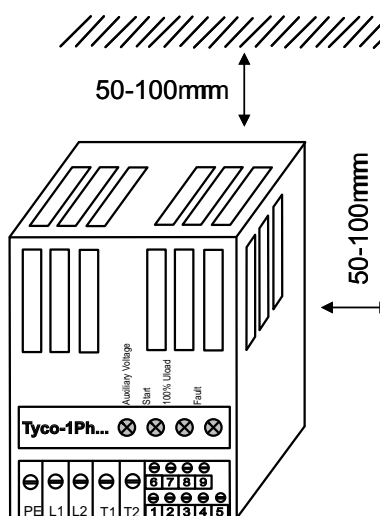
The housing design according to IP 54 (Option) can be mounted in places which are not protected from dust and humidity.

Wiring the device:

The mains connections L1, L2, (N) have to be connected by using a disconnecting switch and usual fuses.

The connection for mains cable and the connections for controlling have to be laid in channels and protector tubes.

The electric installation always has to comply with the essential protection requirements of the European Low Voltage Directive 73/23/EEC dated 19/02/73 and 93/68/EEC Directive 22/07/93.



3. Operation

To begin with, all electrical connections have to be established according to the circuit diagrams L1, L2, (N), T1, T2.

The thyristor control has to be connected to the mains according to the electric regulations (low voltage directive) so that they can be separated by disconnecting switches (e.g. load interrupter, contactor etc.) from the mains. Cabling must be performed by personnel who are qualified to work low voltage electrical equipment. Before any connection or disconnection, make sure that the power and control cables and wires are isolated from the voltage sources.

Recommended connection:

The mains connections, the connection to the load and the control connections have to be laid in separate cables.

In order to avoid faults the electronic control connections should be separated from the power wires and/or contactor control wires and one should twist the control wires.

In order to reduce risks related to the effects of electromagnetic interference depending on the installation of the product please consider the rules for electromagnetic compatibility.

Fuses:

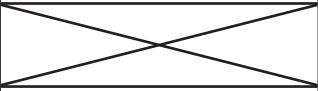
The net-lateral security depends on the recommended and/or the used cross-section of a wire and has to be made according to DIN 57100 part 430/VDE 0100 part 430/6.81 (Low Voltage Directive).

Common information:

Thyristor units for phase angle (Tyco-1Ph... and Tyco-3Ph...) are produced to control resistor and inductive loads. The controlling of the devices is achieved by using continuous signals (0-10V or 0-20mA). The phase control angle and/or the switch on-off relation at burst firing control (Tyco-1Ph/SP... and Tyco-3Ph/SP...) will be continuously controlled by the control unit in order to receive a sufficient linearity between thyristor controller input and power output (T1, T2).

Apart from these series we also produce three-phase thyristor units, which cover the upper current range to 1600A. These devices are also available within a short time.

4. Meaning of the clamp connections

Clamps	Function	State	Description of the function
1-2	start	closed	softstart and operation will be activated
		open	ready for operation
3	U_{ref}	10V	to be used during potentiometer adjustment
4	U_{steuer}	0-10V 0-20mA 2,5-10k Ω	input of voltage and current signal and potentiometer adjustment
5	ground (GND)		for using of current, voltage, inverse, PWM and potentiometer input
6-7	fault relay output	ter. 6, 7 closed	switching at fault
8-9	auxiliary voltage	230V/50-60Hz	voltage supply of the internal electronic by the load voltage (in case of internal supply it is generated out of the mains voltage L1, L2(N))
L1-L2(N)	main potential (U_{Main})	400V AC (optional: 110V, 230V, 240V, 440V, 500V)	Bemessungsspannung
T1-T2	load	0- U_{Main} (according to voltage at L1-L2 (N))	Load (Heizwiderstand, Motor)

Controlling with voltage signal:

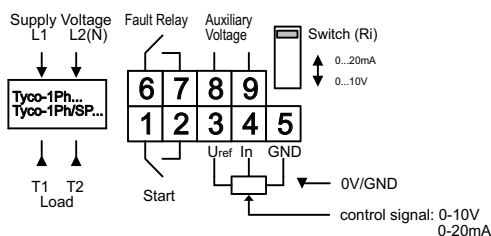
Switch (Ri)	set 0-10V ($R_i > 50k\Omega$)	
Clamp:	4	signal input
	5	ground (GND)

Controlling with current signal:

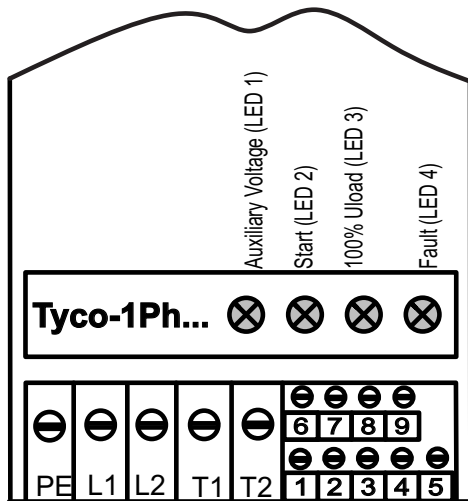
Switch (Ri)	set 0-20mA	
Clamp:	4	signal input
	5	ground (GND)

Controlling with poentiometer:

Switch (Ri)	set 0-10V ($R_i > 50k\Omega$)	
Clamp:	3	reference voltage (10V, supply voltage for potentiometer)
	4	sliding contact
	5	ground (GND)



5. Meaning of the LEDs



LED 1	green	lights if there is any auxiliary voltage (ter. 8,9) or in case of internal supply, if L1 and L2(N) are connected to mains
LED 2	yellow	lights if "Start" (ter. 1, 2) is bridged
LED 3	yellow	lights if output voltage has reached 100%
LED 4	red	lights if ambient temperature is too high; switch-off threshold is at approx. 90°C What to do in case of temperature exceedance? <ul style="list-style-type: none"> • cool down the whole system • check load • check power input • reset with "Start" (ter. 1, 2) and restart

Helping you understand the different functions of the LEDs:

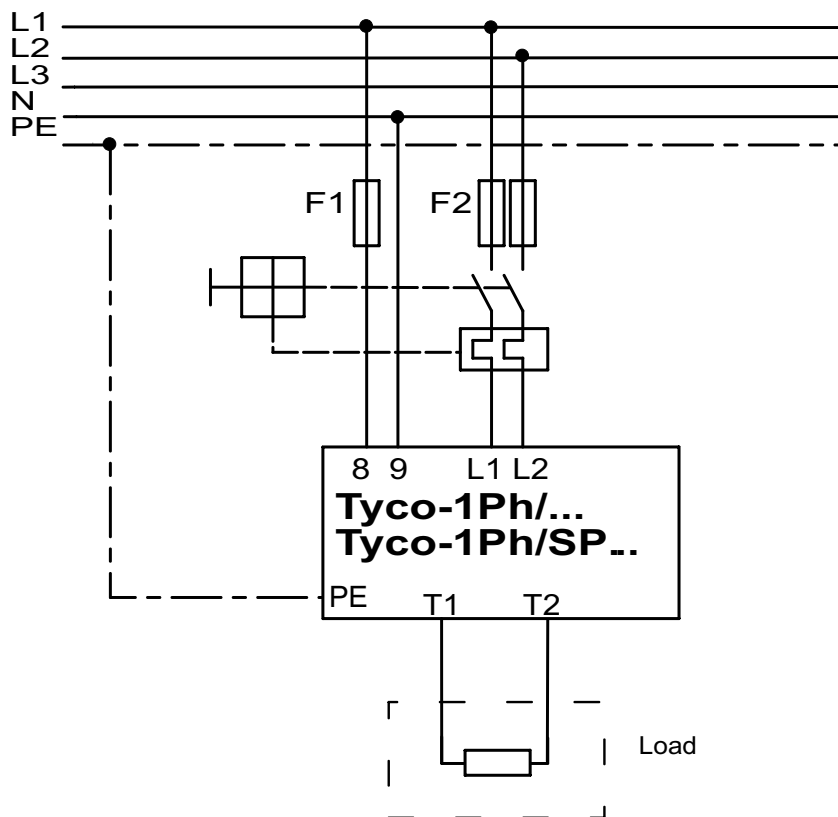
Pos.	LED 1	LED 2	LED 3	LED 4	State	Fault relay output (at the same time with LED 4)
1	green	*	*	*	<ul style="list-style-type: none"> • auxiliary voltage connected (ter. 8, 9) • device is ready for use 	
2	green	yellow	*	*	<ul style="list-style-type: none"> • device is ready for use • "Start" is enabled (ter. 1, 2 are bridged) 	
3	green	yellow	yellow	*	<ul style="list-style-type: none"> • device is ready for use • "Start" is enabled • U_{load} beträgt 0-100% 	
4	green	*	*	red	<ul style="list-style-type: none"> • device is ready for use • "Fault" is activated 	ter. 6, 7 closed
5	green	yellow	*	red	<ul style="list-style-type: none"> • device is ready for use • "Start" is enabled • "Fault" is activated 	ter. 6, 7 closed

* no change

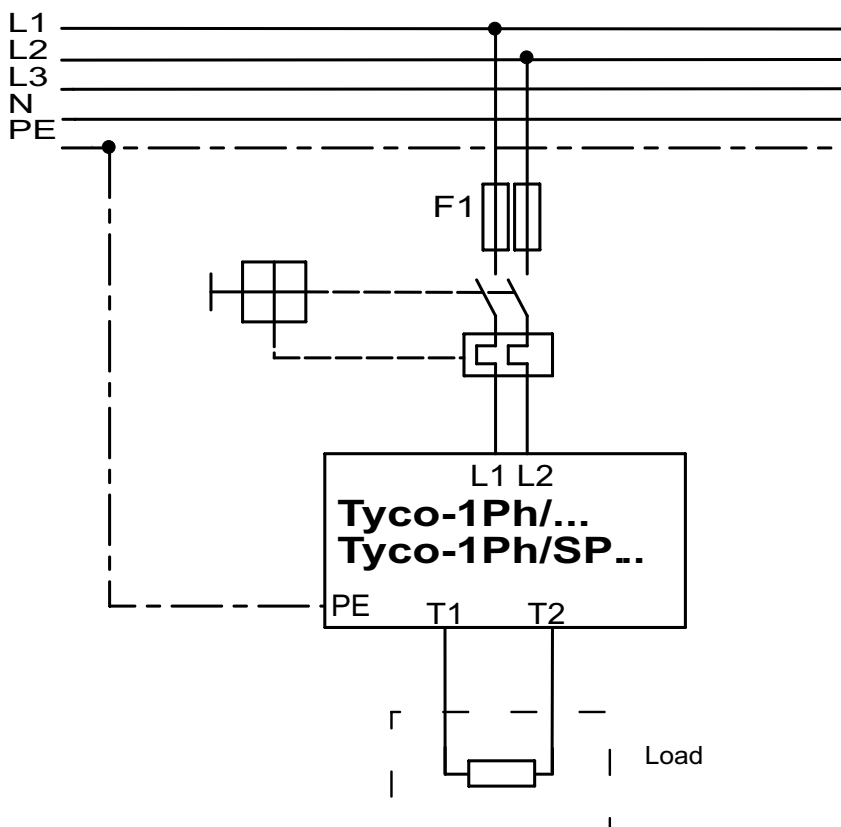
6. Basic circuit

400V single phase:

load voltage: 400V AC, auxiliary voltage: 230V AC, order reference: Tyco-1Ph...

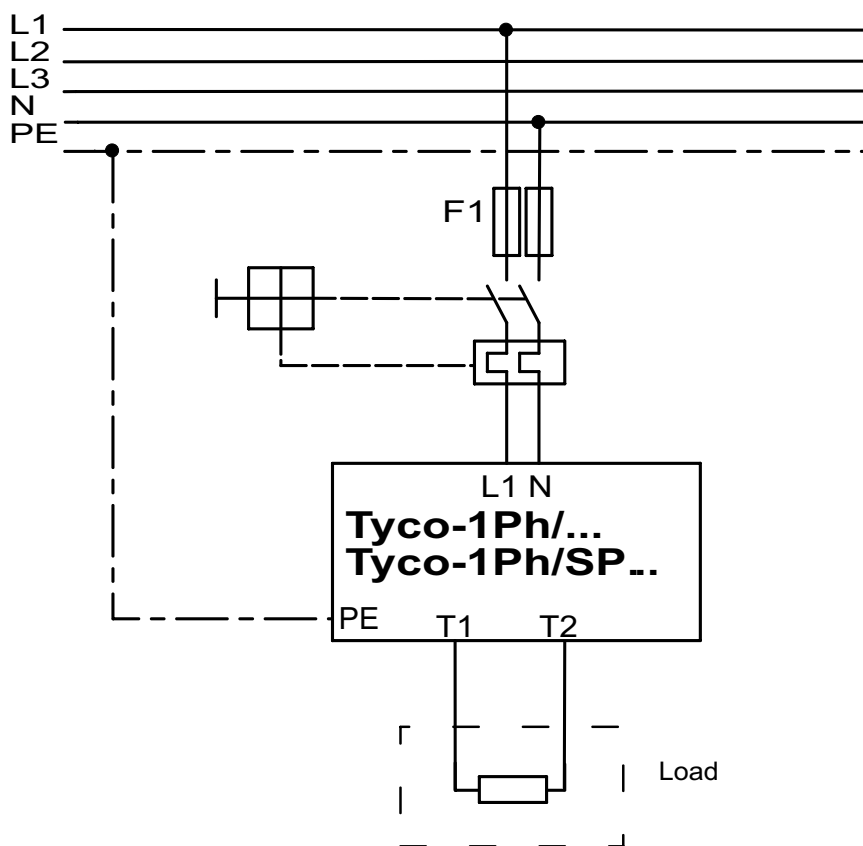


load voltage: 400V AC (supply of the internal electronic by the load voltage), order reference: Tyco-1Ph.../IV



230V single phase:

load voltage: 230V AC (supply of the internal electronic by the load voltage), order refernce: Tyco-1Ph.../IV



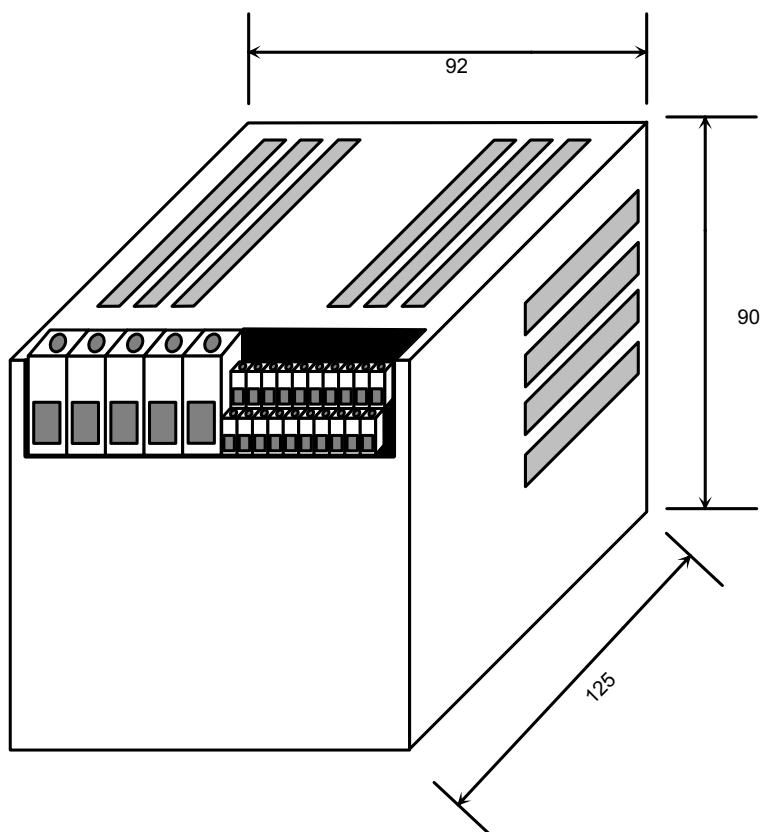
7. Survey of the individual types

Type *	Max. load current [A]	Rec. semi-conductor-fuse [A]	Mains fuse [A]	Rec. cross-section [mm ²]	Max. power [kW]	Weight [kg]	Dimensions without assembly (WxHxD) [mm]
Tyco-1Ph 05	5	10	16	2,5	2	1,1	92x125x90
Tyco-1Ph 15	15	25	25	2,5	6	1,1	92x125x90
Tyco-1Ph 25	25	30	32	4	10	1,1	92x125x90
Tyco-1Ph 35	35	40	50	6	14	1,1	92x125x90
Tyco-1Ph 50	50	60	80	10	20	1,1	92x125x90

Errors and technical modifications excepted (Date: 2008/08)

* The given details also apply to the version with burst firing control Tyco-1Ph/SP...

The given values refer to the operation voltage of 3x400V AC. The values given for overload refer to a surrounding temperature exceed of max. 50°C and an installation altitude of 1000m. Semiconductor fuses can be ordered optionally.



Dimensions with assembly for mounting on a DIN rail (WxHxD): 92x132x105mm

8. Technical data

Voltage of power circuit	400V AC +/- 15% (optional: 110V, 230V, 240V, 440V, 500V)
Rated controller current	cf. table "Survey of the individual types", p. 9
Auxiliary voltage	230V AC, Kl. 8 und 9 (optional: internal voltage supply)
Frequency	45-65Hz, self-synchronizing
Input	<ul style="list-style-type: none"> • 0-10V • 0-20mA • potentiometer input: 2,5-10kΩ • switchable input resistance: 500Ω, 50kΩ
Protection system	switch-off because of temperature exceedance, indicated by LED "Fault"
LED-Display	auxiliary voltage, "Start", "100% U _{load} ", "Fault"
Possible adjustments	softstart time: 0-10s, on PWM-controlling: 0-5s
Output	fault condition: ter. 6, 7 closed, load 2A, 230V AC, AC1
Power terminals	<ul style="list-style-type: none"> • L1, L2 input voltage • T1, T2 output voltage
Kind of controlling	phase angle (optional: burst firing control)
Power loss	1,1W/A
Operating temperature	0-50°C
Storage temperature	-10-70°C
Humidity	5-95% relative humidity, not condensing
Environment	dry, non-conducting environments
Max. altitude	1000m
Weight	1,1kg
Protection	IP 40
Dimensions (WxHxD)	92x125x90mm
Mounting	proposed to be mounted on a DIN rail
CE-regulations	Declaration of Conformity 73/23/EEC (Low voltage directive) EMC Directive 89/336 EU for industrial environments

Errors and technical modifications excepted (Date: 2008/08)