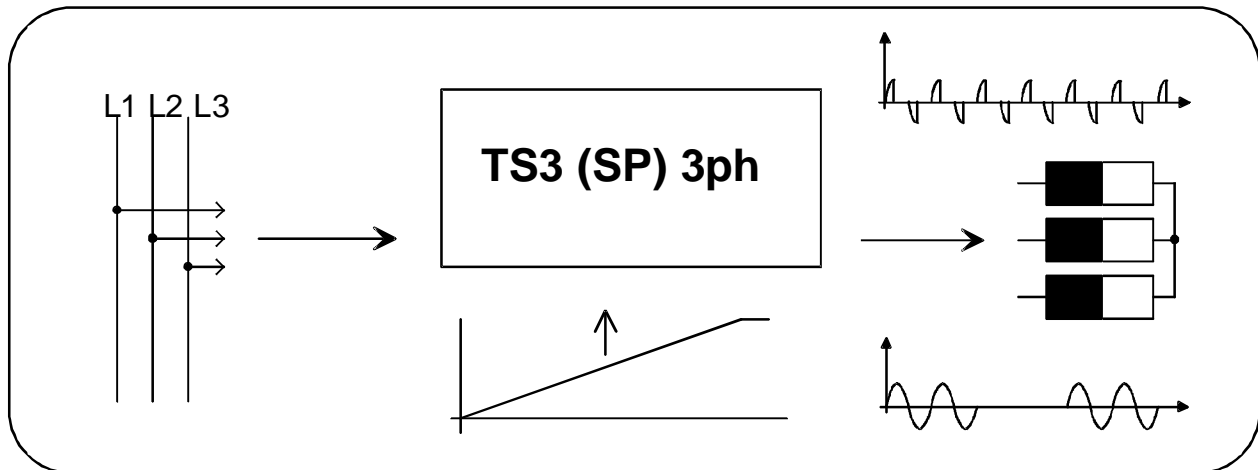


Power Thyristor TS3 (SP) 3ph

Installation Guide



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1. General Description

Power Thyristors are more and more used where increased resistive and inductive loads have to be controlled (e.g. industry furnace construction, plastics processing and so on). By means of the modular and compact construction as well as the control by a continuous action control signal, these Power Thyristors are becoming a perfect actuator for industrial power control.

The power unit of the Thyristor is made up of two anti-parallel connected Thyristors, the insulated heat sink and the control electronics. Due to the use of function modules, the adaption to any application is one of the biggest advantages of these types.

Explanation of Types:

TS3 3ph	Andiductor, phase angle control for three-phase systems
TS3 SP 3ph	Andiductor in pulse group operation (Oscillation package)

Construction:

The Thyristors correspond to the VDE 0558 Part 1 and VDE 0160 Table 4.

The Power Thyristor type TS3 (SP) 3ph is constructed modularly. It is built up of three basic components.

- a) **Power Unit** with heat sink and Thyristor wiring
- b) **Control Unit** with starter and control electronic (Diagnosis display, control outputs etc.)

2. Set-up of Power Thyristor TS3 (SP) 3ph

A sufficient cooling (e.g. forced-air cooling) is of paramount importance. Temperature is not allowed to exceed 50°C. The device has to be mounted on a vertical surface, so that a sufficient air circulation is guaranteed. Moreover, the Thyristor has to be mounted in dry rooms.

Further on-site conditions:

- Protection against dust and humidity
- Protection against aggressive atmosphere
- Free of vibrations

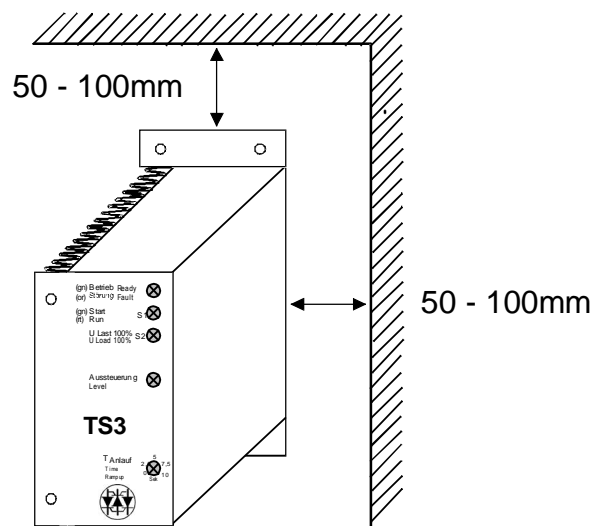
In order to avoid any interferences of the cooling, no further components should be installed around the Thyristor within a distance from 50 to 100mm.

Wiring:

Power supply (L1, L2, L3) must be produced via a fail-save circuit breaker with the common backups.

The wiring for the power supply and the control unit must be done in separate channels or protection tube.

During the electrical installation procedure, the general VDE-regulations (VDE 0100, VDE 0113, VDE 160) must be observed, accordingly.



3. Installation

First of all, all electrical connections should be set-up, according to the attached circuit diagrams: L1, L2, L3, T1(U), T2(V), T3 (W).

According to the VDE-regulations, the Thyristors must be connected to the supply net in that way, that they can be separated from the net by means of corresponding clearing instruments (e.g. main switch, contactor, protective power-switch).

Cabling:

The net and consumer lead wires as well as the control circuit must be lead in separate cables.

In order to avoid any interferences, it is advisable to wire the electronic signal lines separated from the load leads and/or the contactor control circuit and to twist the coming and going wires of the signal line.

Protections:

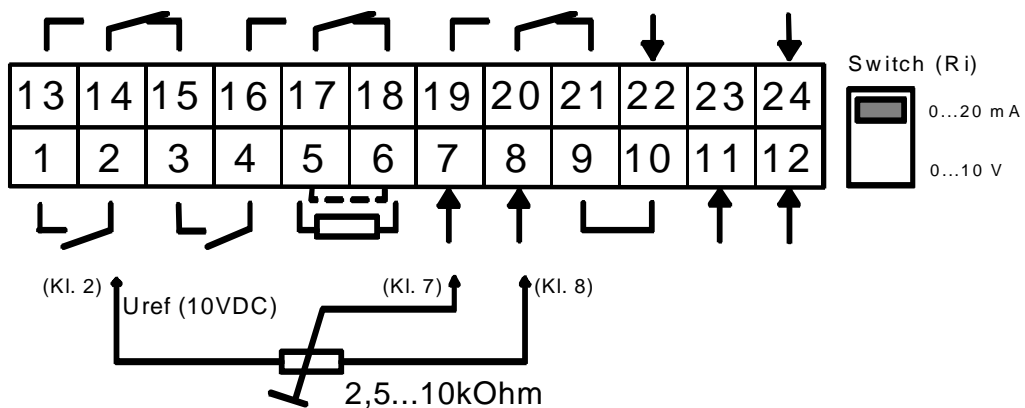
The net protection depends on the recommended respectively the used conductor cross section and must be made according to DIN 57100 Part 430/VDE 0100 Part 430/6.81.

General Information:

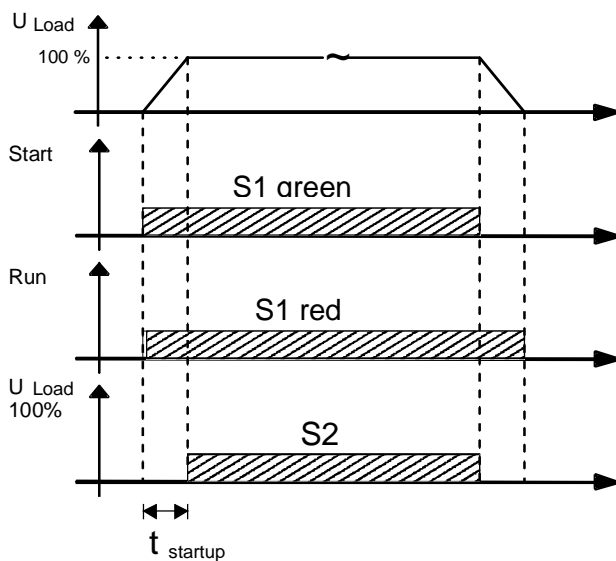
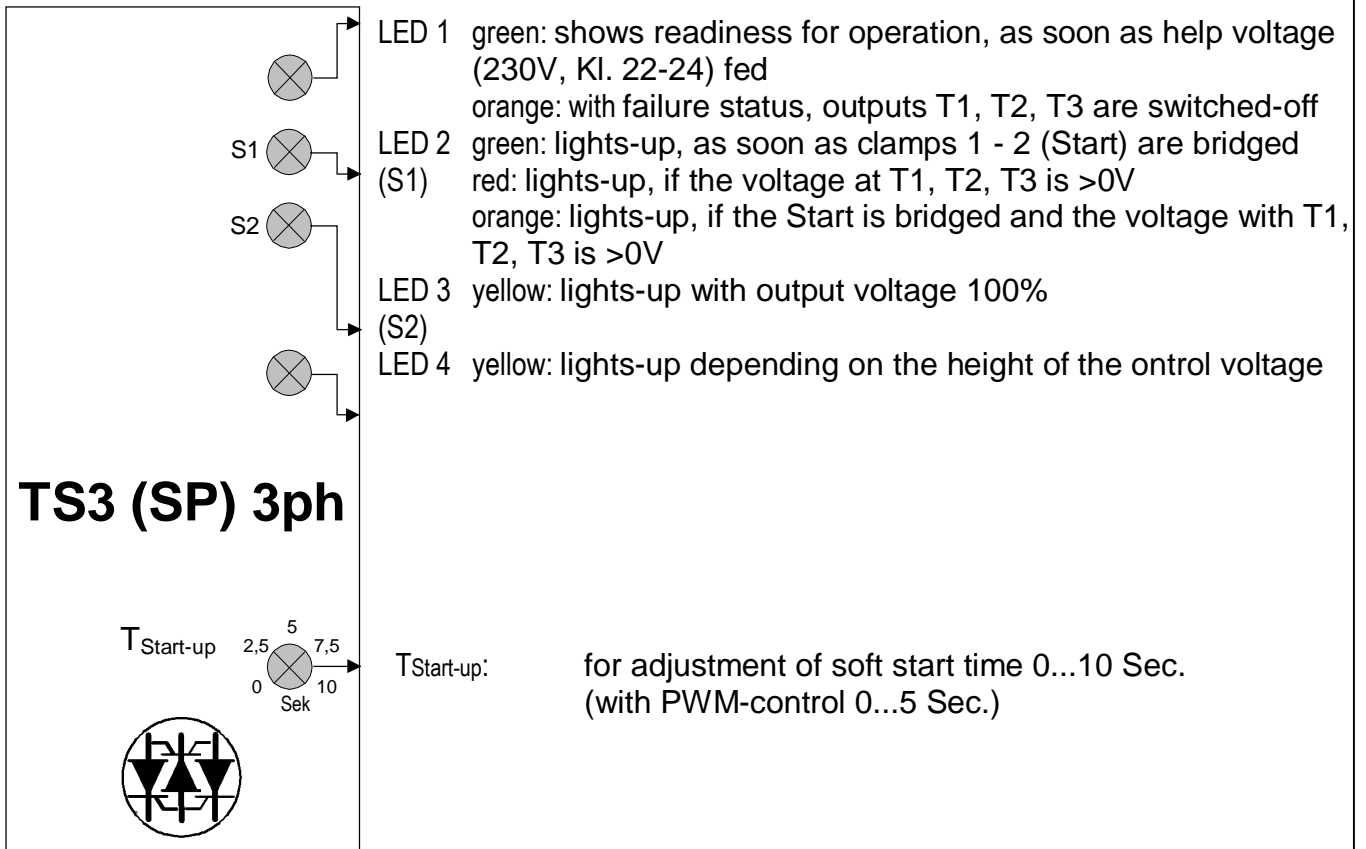
Thyristor TS3 for phase angle control is designed for the control of resistive and inductive loads. As a standard the control is made via the analog signal (0...10V or 0...20mA). The phase angle control respectively the on and off timing relation of the oscillation package control (pulse group operation) is continuously corrected by the control electronics, in order to reach a sufficient proportionality between the Power Thyristor control and the output (T1, T2, T3).

4. Meaning of Terminal Connectors

Clamps:	Function:	Switch Status:	Function Description:
1 - 2	Start	closed open	Soft starting is activated Ready
3 - 4	Reset (key)	actuated	Reset of failure status (e.g access-temperature, PTC-input, failure of 1 or more phases, undervoltage)
5 - 6	PTC-input		Switching-off of power with Overvoltage
5 - 6	Bridge		Circuit without PTC-sensor
7	UContr. -input	0..10V, 0..20mA, 2,5...10kΩ	Input for voltage and current signal or potentiometer adjustment
8	Mass		For current-, voltage-, invers-, PWM-inputs and for potentiometer-adjustments
9-10	Closing (Opener)	closed open	Soft run, continuous run; Closing of power unit
11	Inverse input	10...0V	Input for inverse voltage signal (Option)
12	PWM-input	5V/5...10kHz	Input for impulse signal ($T_v = 0...1$)
13 - 14 - 15	Interference relay output	13 - 14 closed	With failure status
16 - 17 - 18	Relay output S2	16 - 17 closed	with U_{Load} 100%
19 - 20 - 21	Relay output S1	19 - 20 closed	If there is a voltage at T1, T2, T3 > 0V
22 -24	Supply Voltage	230V/50 - 60Hz	Supply voltage (optional, not necessary)
23	Not occupied		



5. Description of Front



Switch function S1 executed (contacts S1 and LED S1 (red) are activated at the same time)

Switch function S2 executed (contacts S2 are activated at the same time)

5.1 Display of Diagnosis-LED during Operation

Pos.	LED 1	LED 2 (S1)	LED 3 (S2)	LED 4	Function Status	Input voltage	S1-Relay output (same time with LED 2)	S2-Relay output (same time with LED 3)
1	gn	*	*	*	Help voltage (Cl. 22 + 24) is fed Device ready for operation	0V	Cl. 20-21 closed	Cl. 17-18 closed
2	gn	gn	*	*	Start is activated (Cl. 1 + 2 bridged)	0V	Cl. 20-21 closed	Cl. 17-18 closed
3	gn	or	*	yel 0-100%	Device ready Start activated Uload: 0-100% LED 4 lights-up depending on Input voltage 0-100%	0-100%	Cl. 19-20 closed	Cl. 17-18 closed
4	gn	or	yel	yel 100%	Device ready Start activated Uload: 100% Led 4 lights 100%	100%	Cl. 19-20 closed	Cl. 16-17 closed
5	gn	rd	yel	yel 100%	Device ready Start deactivated (Cl.1 + 2 open) LED 2 (S1) lights red for short time LED 2,3,4 off	100%	first Cl. 19-20 closed as soon as LED 2 (S1) is off Cl. 20-21 closed	first Cl. 16-17 closed as soon as LED 3 (S2) is off Cl. 17-18 closed
6	gn	rd	*	yel 100-0%	Device ready Start deactivated (Cl.1 + 2 open) LED 2 (S1) lights red for short time LED 2 + 4 off	0-100%	first Cl. 19-20 closed as soon as LED 2 (S1) is off Cl. 20-21 closed	Cl. 17-18 closed

5.2 Display of Diagnosis-LED with Failure

Pos.	Led1	Led 2 (S1)	Led 3 (S2)	Led 4	Funktionszustand	Eingangsspannung	S1-Relaisausgang	S2-Relaisausgang	Fehler	Abhilfe
7	orange	*	*	*	Gerät ist betriebsbereit; Ein Stöorzustand liegt vor;	0-100%	Kl. 20-21 geschlossen	Kl. 17-18 geschlossen	>PTC hat ausgelöst; >Anschlüsse 5 und 6 offen; >Übertemperatur des Kühlkörpers bzw. Leistungsteiles; >Überlast; >zu hoher Strom; >zu hohe Umgebungstemperatur; >Eine oder mehrere Phasen haben keine Verbindung zu den Netz- anschlüssen L1, L2, L3; >Unterspannung;	>Kl. 5 und 6 auf korrekten Anschluß überprüfen (z.B.:Brücke, PTC- Fühler, Kontakte); >Abkühlen lassen; >Last überprüfen; >Stromaufnahme überprüfen; >Abschaltsschwelle liegt bei ca. 85°C; >Anschlüsse L1, L2, L3 überprüfen; >Netzspannung prüfen; >Gerät reagiert bei Netzspannung < 300V;
8	orange	grün	*	*	Gerät ist betriebsbereit; Start ist aktiviert; Ein Stöorzustand liegt vor;	0-100%	Kl. 20-21 geschlossen	Kl. 17-18 geschlossen	siehe Position 7	siehe Position 7
9	grün	grün	*	*	Gerät ist betriebsbereit; Start ist aktiviert;	0-100%	Kl. 20-21 geschlossen	Kl. 17-18 geschlossen	keine Funktion	Sperrn Kl. 9 und 10 überprüfen (geschlossen)

* keine Änderung

6. Description of Control Inputs

Control by voltage signal:

Switch (Ri)		Switch to "0...10V" (Ri>50kΩ)
Clamp:	7	Signal input (0...10V)
	8	Ground

Control by current signal:

Switch (Ri)		Switch to "0...20mA"
Clamp:	7	Signal input (0...20mA)
	8	Ground

Control by potentiometer 2,5... 10kΩ:

Switch (Ri)		Switch to "0... 10V" (Ri>50kΩ)
Clamp:	2	Reference voltage 10V (supply voltage for poti)
	7	Grinder contact
	8	Ground

Control by inverse signal (option):

Switch (Ri)		Switch to "0... 20mA"
Clamp:	11	Signal input 10... 0V
	8	Ground

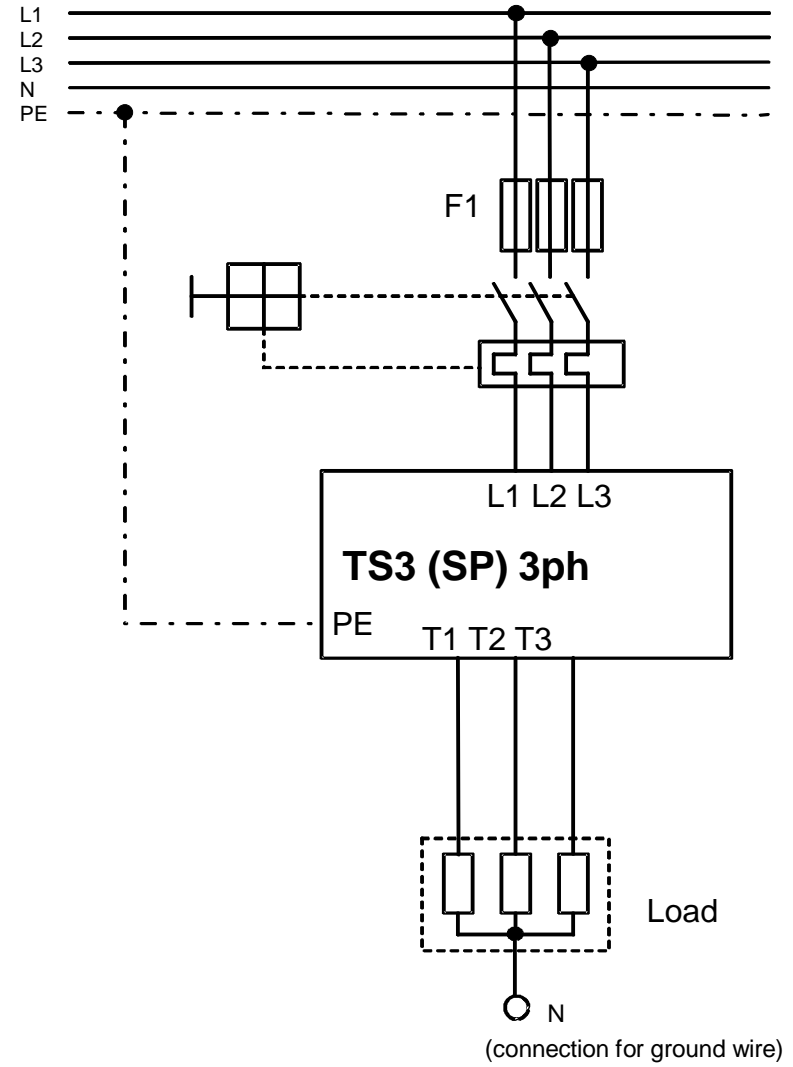
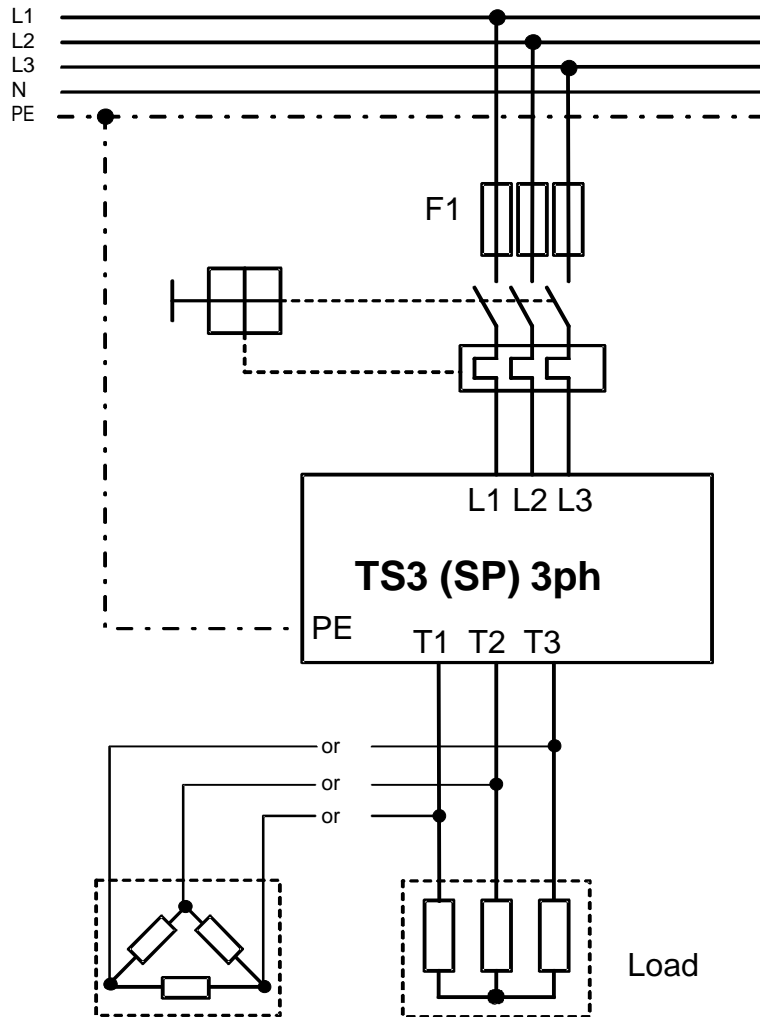
Control by pulse-widht modulation (PWM):

Switch (Ri)		Switch to "0... 20mA"
Clamp:	12	Input signal 5V/5... 10kHz
	8	Ground

Notice:

With PWM-control the soft starting time can be adjusted in the 0... 5 seconds range.

7. Basic Circuit



8. Types Available

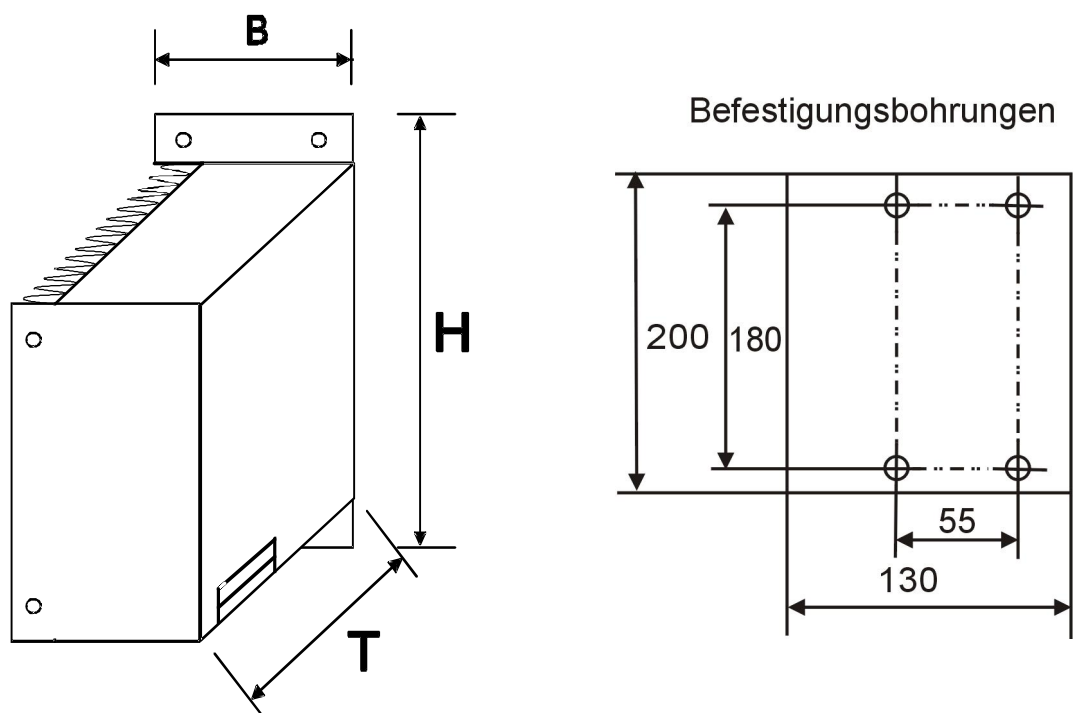
Type	Maximum Load Circuit [A]	Recommended semi-conductor fuse [A]	Power Cover [A]	Recommended cross section [mm ²]	Weight [kg]	Dimensions T x H x B [mm]
TS3 (SP) 3ph 15A	15	25	25	2,5	1,95	130x200x135
TS3 (SP) 3ph 25A	25	30	32	4	1,95	130x200x135
TS3 (SP) 3ph 35A	35	40	50	6	1,95	130x200x135
TS3 (SP) 3ph 50A	50	60	80	10	1,95	130x200x135

*Subjected to errors and technical alternations

The maximum operation temperature amounts to 50°C.

The values mentioned are relating to a nominal operating voltage of 3x400V AC.

The values mentioned for the load are valid for an ambient temperature of 40°C and a mounting height of max. 1000m.



9. Technical Data

Type	TS3 (SP) 3ph 15A	TS3 (SP) 3ph 25A	TS3 (SP) 3ph 35A	TS3 (SP) 3ph 50A
Mains voltage	400V AC			
Load current	15A	25A	35A	50A
Power supply	Internal produce			
Frequency	45 - 65Hz, self-synchronising			
Inputs	0... 10V; 0... 20mA; Potentiometer connection: 2,5... 10k Ω ; 5V/5...10kHz PWM-input			
Input impedance	Adjustable input impedance: 500 Ω , 50k Ω			
Protective function	Phase control and monitoring of device temperature (orange display of LED: "(Fault)" and switching-off)			
LED-Display	Operation, Start, Run, 100% ULoad, Fault, Level			
Adjustments	Soft starting time: 0...10 Sec, with PWM-control 0...5 Sec			
Outputs	Fault status: Cl. 13,14 closed.; load: 2A, 230V AC, AC1; S1-Relay output: Cl. 19,20 closed.; load: 2A, 230V AC, AC1; S2-Relay output: Cl. 16,17 closed.; load: 2A, 230V AC, AC1;			
Wire connections	L1, L2, L3 input voltage; T1, T2, T3 output voltage			
Control mode	Phase angle control (Optional: impulse group operation)			
Dissipation	1,1 W per Ampere			
Operating temperature	0 to 45°C			
Storage temperature	-10 to 70°C			
Humidity	5% to 95% relative humidity, non-condensing			
Environment	Dry non-conductive environment			
Max. installation height	1000m			
Weight	1,95kg	1,95kg	1,95kg	1,95kg
Protection	IP 40			
Installation	vertical, power connection downwards			
Dimensions	TxHxB = 130 x 200 x 135 mm			
Mounting	For screw mounting in control cabinets			
CE-sign	Accord. to the European low voltage directive 73/23/EEC and EMV directive 89/336 EWG for the industry			
Standards	VDE 0160, EN 60204			

*subjected to errors and technical alterations

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