

Industrial Solid State Contactor

TE10S

**Static switching of resistive loads and
shortwave infrared heating tubes up to 20 kW**

Partial load failure (PLF) detection option

User Manual

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EUROPEAN DIRECTIVES

SAFETY

The **TE10S** products installed and used in accordance with this User Manual are designed to comply with the essential protection requirements of the European Low Voltage Directive 73/23/EEC dated 19/02/73 (amended by Directive 93/68/EEC dated 22/07/93).

CE MARK

The CE Mark of **TE10S** products implies that the essential protection requirements of the European Low Voltage Directive are observed.

The **TE10S** Technical Construction File is approved by a Notified Body, **LCIE** (Laboratoire Central des Industries Électriques). For further information on CE Mark, please contact your nearest Eurotherm office.

CE DECLARATION OF CONFORMITY

A CE Declaration of Conformity is available on request.

ELECTROMAGNETIC COMPATIBILITY (EMC)

For industrial environments, excluding residential environments

The **TE10S** products are considered as components without any direct function as defined in the EMC Directive. The system or installation in which these products are incorporated must comply with the essential protection requirements of the EMC Directive.

However, Eurotherm certifies that the **TE10S** products, when installed and used in accordance with their User Manual, meets the following EMC test standards and enables the system or installation in which there are installed to comply with the EMC Directive in regards to the **TE10S** products.

EMC TEST STANDARDS

Test		EMC test standards
Immunity	Electrostatic discharge	IEC 1000-4-2 (EN 61000-4-2) - 06/1995
	Fast transients	IEC 1000-4-4 (EN 61000-4-4) - 01/1995
	Radioelectric frequency electromagnetic fields	IEC 801-3 (prEN 61000-4-3) - 1984
Emission	<u>Radiated and Conducted</u>	<u>EN 55011 - 1991</u>
	The choice of the Conducted Emission applicable standard depends on the application : • EN 50081-2 - 1991 • IEC 1800-3 (prEN 61800-3) - 1996 Applies for the second environment	

FILTER EMC

To reduce the conducted emissions that occur when using thyristor units, the EMC **internal** filter is added from April 1996

VALIDATION BY A COMPETENT BODY

In order to guarantee the best service, Eurotherm has validated the compliance of the **TE10S** products with these test standards through design and laboratory tests that have been validated with a Technical Construction File by a competent body, **LCIE** (Laboratoire Central des Industries Électriques).

EMC INSTALLATION GUIDE

In order to help you reduce risks related to the effects of electromagnetic interference depending on the installation of the product, Eurotherm can supply you with the 'EMC Installation Guide' (Part No. HA 025464).

MANUALS IN USE

- This **TE10S/PLF User Manual (Part No. HA174784ENG)** applies to TE10S series with PLF from **January 1996**.
- The TE10S/PLF User Manual Part No. HA174401 are valid for products manufactured before this date.

PRECAUTIONS

Read **completely** this Manual before installation. EUROTHERM cannot be held responsible for any damage to persons or property, or for any resulting financial loss or cost caused by the inappropriate product use or the failure to observe this manual.

PERSONNEL

The installation, configuration, commissioning and maintenance of the power unit must only be performed by a person **qualified and authorised to perform work in an industrial low voltage electrical environment**.

INDEPENDENT SAFETY

It is the responsibility of the user and it is highly recommended, given the value of the equipment controlled using TE10S, to install **independent safety** devices. This alarm must be tested regularly. Eurotherm can supply suitable equipment.

FURTHER INFORMATION

For any further information and if in doubt, please contact your EUROTHERM office where technicians are at your disposal should you require advice or assistance with the commissioning of your installation.

TE10S

Industrial Solid State Contactor for static switching of resistive loads
and shortwave infrared heating tubes up to 20 kW

Partial load failure (PLF) detection option

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INSTALLATION AND USE SAFETY



DANGER !

Failure to take note of the information may have serious consequences for the safety of personnel and may even result in the risk of electrocution.

- Installation and use in a correctly cooled electrical cabinet, with guarantees of protection from condensation and pollution.

The cabinet must be closed and connected to safety earth conforming to IEC 364 or applicable National Standards.

It is the user's responsibility to ensure that the installation, wiring and protection of the installation is in accordance with relevant standards and wiring regulations (e.g. VDE 0160).

- Before making any connections or disconnections make sure that the cables and wires are insulated from the supply voltage.
 - The earth connection must be connected first and disconnected last.
 - Control signal wiring must be kept separate from power cables.
 - Disconnect the TE10S completely before dismounting.
 - The recommended high speed fuse is only designed to protect the thyristors. It is not a substitute for fuse designed to protect the installation and wiring. Thyristors are not isolating devices.
- It is necessary to provide an additional protection and isolation to comply with wiring regulations, to allow safe intervention.

- Access to internal parts not allowed to non qualified personnel.
- The temperature of the heatsink may exceed 100°C. Take care when touching the heatsink and protect it from accidental contact during ON state and during 15 min after unit disconnection.

TECHNICAL SPECIFICATIONS

Power

Nominal current	16, 25, 32 or 40 amps (at 45 °C)
Nominal line-to-line voltage	120, 240, 480 or 500 Vac (+10%;-15%)
Nominal mains frequency	50 or 60 Hz (± 2 Hz)
Firing mode	Logic firing (ON/OFF). Zero crossing
OFF state leakage current	Typical less than 30 mA

Input

Command signal	Universal DC input (voltage or current) DC signal 5 V and 5 mA (nominal) Polarity insensitive '+' and '-' can be crossed
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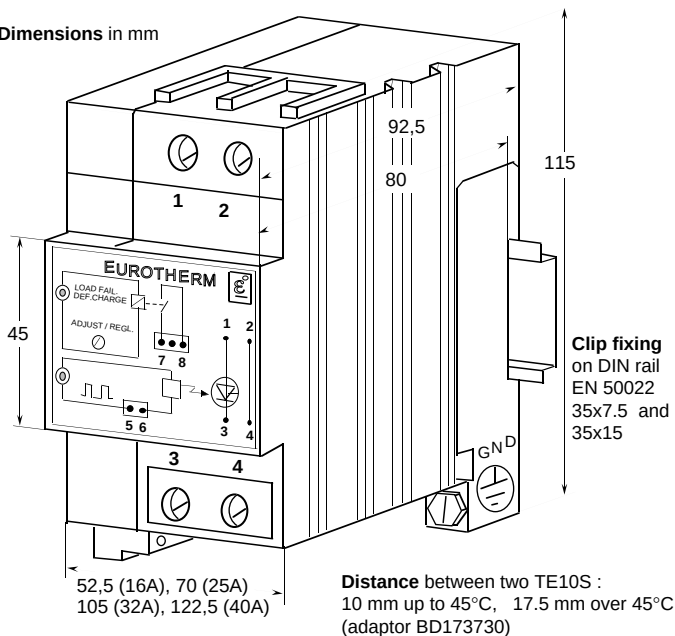
Environmental

Operating temperature	0 to 60°C , altitude 2,000 m maximum Storage : -10 to 70°C
Atmosphere	Non conductive, non explosive, non corrosive
Humidity	RH : 5 to 95% non condensing
Pollution	Pollution degree 2 (comply with IEC 664)
Isolation (1min factory test)	Main isolation to earth : 2,000 Vac Power to control : 3,600 Vac
Thyristors protection	External fuse, Varistor and RC snubber
Unit protection degree	IP20 (IEC 529 : §11.4 table 5)
Cooling	Air natural convection
Alarm (option)	Partial load failure detection
Mounting	Vertical on DIN rail
Weight	480g (16A); 660g (25A); 930g (32A); 1060g (40 A)
Guarantee	Two years (see your local representative)

As a result of the constant improvement of its products, Eurotherm may modify these specifications without warning. For any further information and if in doubt, please contact your Eurotherm office.

MOUNTING SPECIFICATIONS

Dimensions in mm



INPUT SIGNAL

Command signal

Signal type : DC logic signal.

Universal input :

accepts a voltage or current command signal.

Polarity insensitive, '+' and '-' can be crossed.

ON state :

voltage higher than 5 Vdc and

current higher than 5 mA.

Maximum voltage less than 32 V.

Maximum current (auto limit) :

10 mA at 32 Vdc

OFF state :

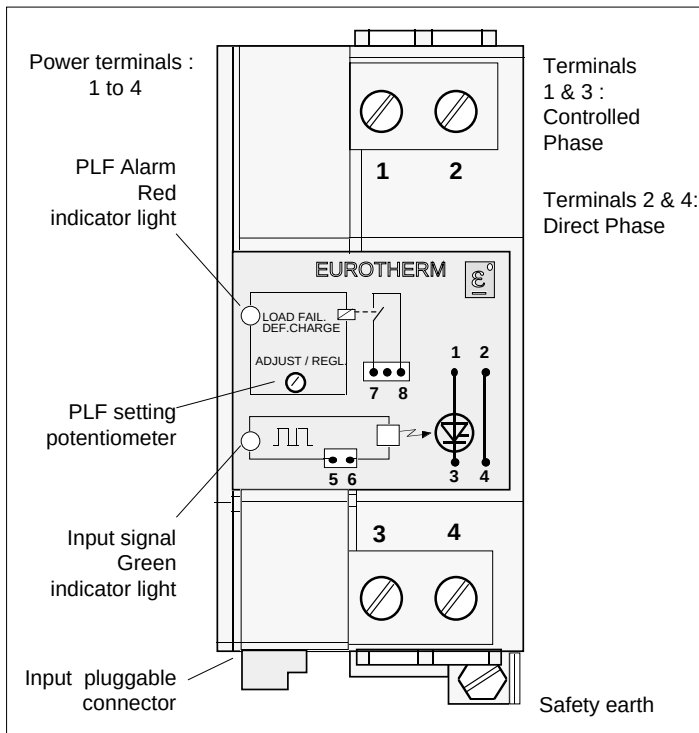
voltage less than 2 Vdc or

current less than 0.5 mA.

Signal indication

Command signal indication by green indicator light
(light emitting diode) on front fascia.

FRONT VIEW



TERMINALS AND CONNECTORS

Power terminals :

screw for cable 1.5 to 16 mm², cable stripping length 16 mm

tightening torque 1.2 N.m

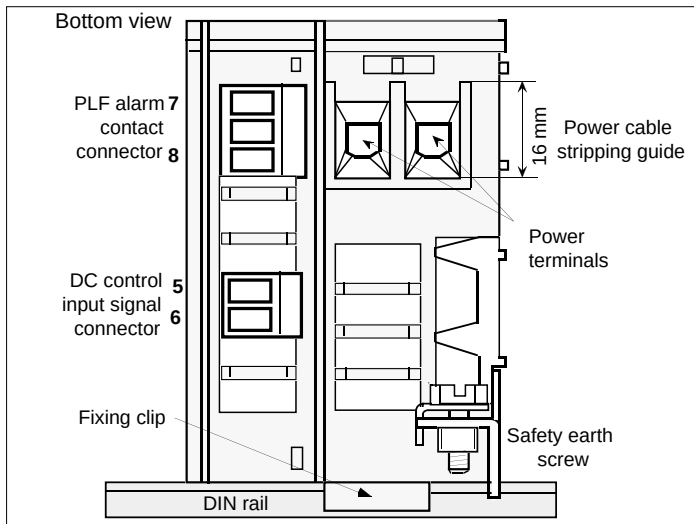
Safety earth wiring :

same cable section as power, tightening torque 2 N.m

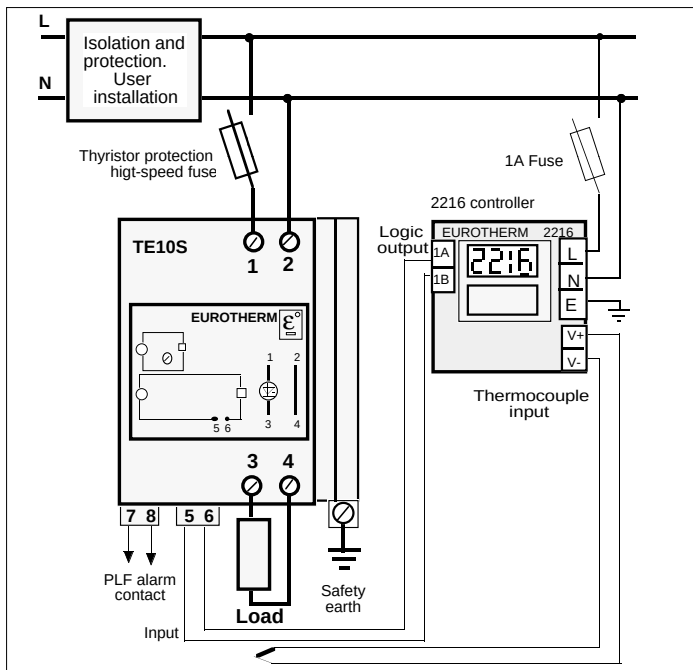
Input connection: between terminals 5 & 6

Pluggable connector for cable sizes 0.5 to 1.5 mm²

wire stripping length 7 mm, tightening torque 0.4 N.m



WIRING



Example of TE10S wiring (PLF option, 240V nominal).
Controlled by EUROTHERM 2216 controller

PLF SPECIFICATIONS

The '**Partial Load Failure**' (**PLF**) alarm detects an increase in load impedance due to the breakage, the destruction or the disconnection of the heating elements.

The PLF detection is indicated by **red** indicator light (light emitting diode) on front fascia.

Partial load failure detection changes the alarm relay state. The relay is de-energised in the alarm state, or when the **TE10S** is not powered.

Option **PLF** : the contact is open in the alarm state;
option **IPF** : the contact is closed in the alarm state.

Relay contact rating : **0,25 A** (250 Vac or 30 Vdc).

Detection sensitivity of partial load failure :

failure detection of **1** element for **6** identical parallel heater elements (for single-phase applications).

The PLF detection operates under the following conditions:

- firing time ≥ 1 s
- input signal duty cycle must be over **20%**
- the on-time load current must be greater than 5 amps (16 and 25 A nominal) or 8 amps (32 and 40 A nominal).

SETTING UP PLF DETECTIONThe 'Partial Load Failure' (PLF) alarm detects an increase in load impedance. In order to carry out PLF adjustment, the current when fully conducting must be greater than **20%** of the nominal unit current.

As a general rule, since the load current is less than the nominal thyristor current, the following **setting** must be carried out:

- Check that the thyristors are conducting (load current on and input **green** indicator light is illuminated)
- If the PLF detection **red** indicator light (identified on front as 'Load fail. / Déf. Charge') is illuminated, turn the 25 turn PLF potentiometer (identified on front as 'Adjust / Régl') anticlockwise until the PLF red indicator light switches off.
- Turn the potentiometer clockwise until the indicator lights comes on.
- Slowly turn back the potentiometer (anticlockwise) until the red indicator light is just extinguished.

The PLF detection control is now **set** to give **maximum sensitivity**.

If an erratic alarm appears, reduce the sensitivity by turning the potentiometer anticlockwise (e.g. 1/4 turn or more until the fault disappears).

Resetting the alarm is achieved either by removing power from the unit or by a returning to the previous load current.

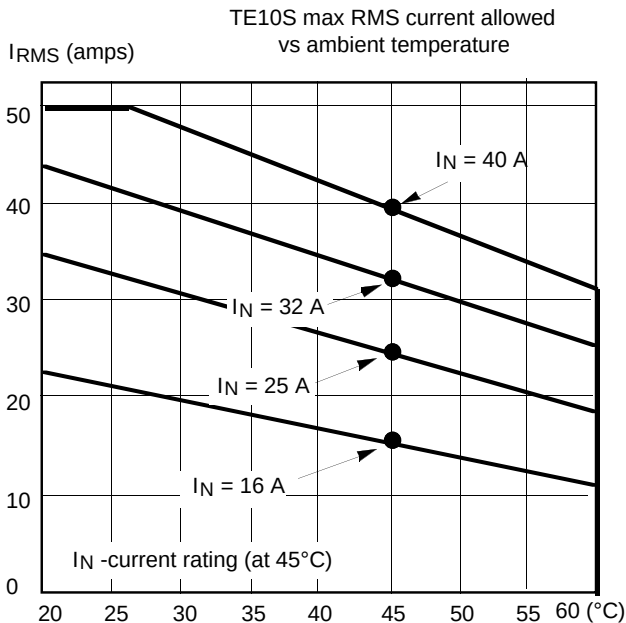
ORDERING CODE

Model	Current code	Voltage code	Input code	Option code	End
TE10S	16A 25A 32A 40A	120V 240V 480V 500V	LGC	Partial load failure detection. Alarm relay contact in alarm state Open : PLF Closed : IPF	00

THYRISTOR PROTECTION FUSE

Current range	Fuse rating	Fuse and fuse-holder code
16 A	20 A	FU1038 / 16A / 00
25 A	32 A	FU1038 / 25A / 00
32 A	40 A	FU1451 / 32A / 00
40 A	50 A	FU1451 / 40A / 00

DERATING CURVES



**Solid State Contactors TE10S
Power Controllers TE10A**



EUROTHERM

ADDENDUM

TE10S User Manual Part N°:
HA174780ENG, HA174782ENG,
HA174784ENG, HA175436ENG

TE10A User Manual Part N°:
HA175247ENG, HA175548ENG

**NOMINAL CURRENT UP TO 50 A
and
SHORT WAVE INFRARED APPLICATIONS**

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TECHNICAL SPECIFICATION

MAXIMUM CURRENT

In order to take into account supply voltage variations and heating element resistance dispersion (all types of heating elements including short wave infrared), a 0.8 safety coefficient must be used on the thyristor unit current rating to determine the maximum value of the load nominal current which the unit can safely control.

SHORT WAVE INFRARED (SWIR) APPLICATIONS

Applications using short wave infrared heaters in Single Cycle, Fast Cycle or Advanced Single Cycle are reserved to 16 A, 25 A and 40 A current rating.

With a safety coefficient of 0.8 the maximum current for SWIR which can be controlled is:

TE10 rating	SWIR maximum controlled current
16 A	13 A
25 A	20 A
40 A and 50 A	32 A

RANGE DIMENSIONS AND WEIGHT

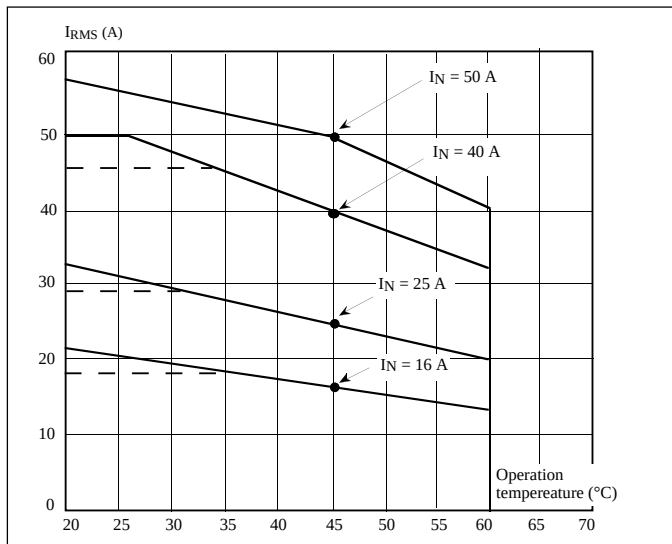
Height 115 mm / Depth 92.5 mm

Models	Nominal current	Width (mm)	Weight (g)
TE10S/DC, TE10S/AC TE10S/PDSIO	16 A 25 A 40 A 50 A	35 52.5 87.5 105	350 500 850 1100
TE10S/PLF TE10A/Burst TE10A/PA	16 A 25 A 40 A 50 A	52.5 70 105 122.5	550 700 900 1200

THYRISTOR PROTECTION FUSE

TE10 rating	Fuse rating	Fuse & fuse-holder	
		Code	Dimensions(mm)
16 A			
25 A	20 A	FU1038/16A/00	81 x 17.5 x 68
40 A	32 A	FU1038/25A/00	81 x 17.5 x 68
50 A	50 A	FU1451/40A/00	95 x 26 x 86
	63 A	FU2258/50A/00	140 x 35 x 90

Attention! For SWIR applications, the high-speed fuse must not be used



Current derating as a function of ambient temperature (I_N = nominal current at $45^{\circ}C$)

Dotted line : limit due to recommended fuse