# TC2000 TC2001

MODELS


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EUROTHERM®

# Two Phase Solid State Relays

## Specification Sheet

- **Current range from 25A to 1650A at 40°C**
- **Voltage up to 500V (690V for TC2001)**
- **Logic and analogue inputs**
- **Phase angle, burst firing, soft start and single cycle firing available**

Compact, two phase thyristor power switches for electrical heating applications from 100 to 690 volts, 60 to 1200 amps. Higher current ranges available with separate MC2001 driver and thyristor units.

### Economic three phase power control

The TC2000 and TC2001 use two thyristor pairs to switch the supply to two legs of a three phase, three wire star or delta load. They can also control two independent single phase loads. The TC2000 and TC2001 work with logic or analogue inputs and deliver whole supply cycles to the load for minimum electrical interference.

### Compact size and low power dissipation

These units give space-efficient power control for three phase loads. Switching only two phases reduces by 33% the power dissipated by the thyristors. The compact size and lower dissipation mean that the control cubicle too can be more compact and less expensive.

### Better temperature control than contactors

For a reasonable lifetime, mechanical contactors cannot be switched too frequently. The resulting long cycle times cause temperature fluctuation. Shorter cycle times possible with thyristors mean power can be delivered exactly as it is needed to maintain a constant temperature. When used with analogue inputs the TC2000 and TC2001 also compensate for supply variations to hold load power constant and further reduce temperature changes.

### Low maintenance costs

Mechanical contactors in electrical heating applications can switch millions of times every year, resulting in relatively short lifetimes. The TC2000 and TC2001 have no moving contacts so will last almost indefinitely.

### Additional savings

The short on/off cycle times cause less heater expansion and contraction and reduce breakage due to fatigue and thermo-mechanical stress. Overall savings include reduced costs of new heaters, contacts, installation and lost production. The reduction of scrap also provides a positive benefit.

## TC2000

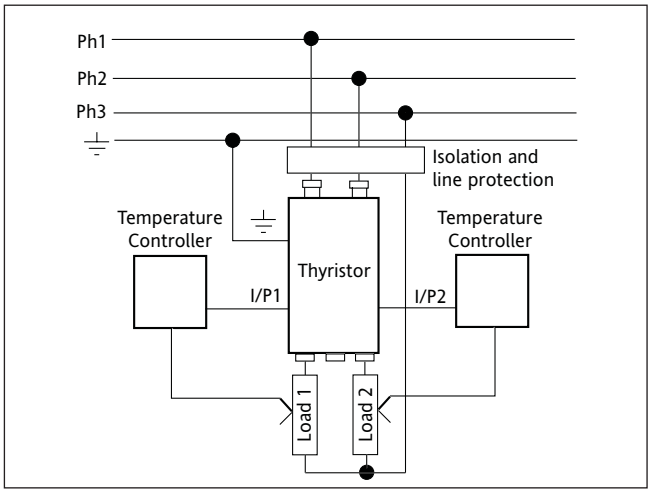
The TC2000 is suitable for controlling Resistive loads with low temperature coefficient. The firing mode is either Burst Firing for analogue inputs or Logic Firing for logic inputs.

## TC2001

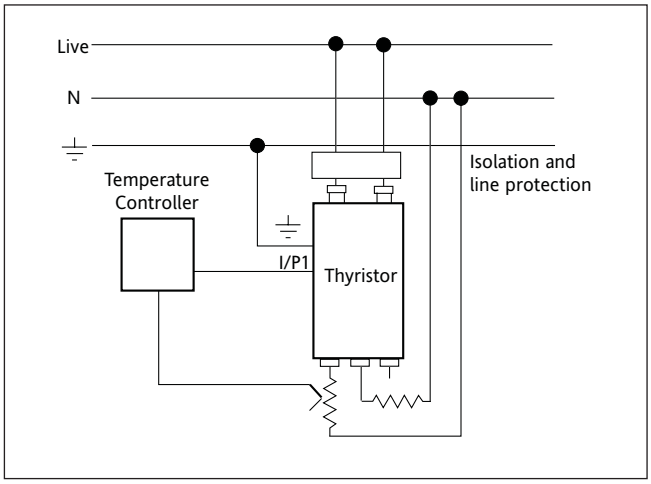
The TC2001 is suitable for controlling Inductive loads including three phase transformers as well as Resistive loads with low temperature coefficient. The firing mode is either Burst Firing with adjustable delayed firing angle on first Cycle or Logic Firing.

The TC2000 and TC2001 thyristor units can either be used to drive either a single three phase 3 wire load or two independent single phase loads.

Example of three phase load being controlled by a TC2000 or TC2001. Load connection “02” in ordering code.




Example of two single phase loads being controlled by TC2000 or TC2001. Load connection “21” in ordering code.




## SPECIFICATION

| | | |
|---|---|---|
| Current: | | 60A to 1650A per channel (500A max. for TC2000) |
| Voltage: | | 120V to 500V per channel (+10%, -15%) |
| Supply frequency: | | 50Hz to 60Hz |
| Auxiliary supply | TC2000: | 100V to 240V (+10%, -15%). No auxiliary supply for 60A and 75A logic input units without PLU option. Rating 5VA + fans |
| | TC2001: | Up to 500A none (self supply), 750A to 1200A-115 or 230VAC fan supply |
| Environment: | | Pollution degree 2 (IEC 664) |
| Altitude: | | Maximum altitude 2000m |
| Storage temperature: | | -10°C to 70°C |
| Operating temperature: | | 0°C to 50°C with unit mounted vertically. (40°C for 500A units) |
| Cooling: | | Natural cooling up to 75A |
| | | Two fans for 100A and 250A, (additional auxiliary supply consumption 25VA per fan) Three fans from 300A to 500A, (additional auxiliary supply consumption 25VA per fan) |
| | TC2001 only: | 750A to 1200A one fan 230V 115W (auxiliary supply) |
| | | Over temperature shut down for fan cooled units |
| Power dissipation: | | Allow for 2Watts per amp per switched phase (includes thyristors and fuses) |
| Humidity: | | 5% to 95% RH non condensing |
| Enclosure protection: | | IP20 (IEC 529) |
| Electrical safety: | | Complies with EEC Low Voltage Directive 73/23/EEC dated 19/2/73 amended by directive 93/68/EEC dated 22/7/93 EN 61010 installation category 3 ( voltage transients must not exceed 4.0KV) |
| Electrical protection: | | RC snubber network and varistor Built in high speed fuses for thyristor protection only. Line protection to be provided separately |

### Load

| | | |
|---|---|---|
| Load types | TC2000: | Resistive load |
| | TC2001: | Any three phase constant resistance or inductive load |
| Load configuration; | | 3 wire star, 3 wire delta |
| Control type: | | Two phases of a three phase system |
| Phase rotation: | | Phase rotation insensitive - connect phases in any order (except when PLU selected on TC2001) |

### Operation

| | | |
|---|---|---|
| Firing modes | TC2000 Burst: | Power level determined by analogue input Cycle time 600ms at 500% power |
| | Logic: | Cycle time defined by logic input |
| | | Switches on zero crossing in both of the above firing modes |
| | TC2001 Burst: | Fast cycle 600ms or slow cycle 20s |
| | Logic: | Cycle time defined by logic input |
| | | Switches on at zero voltage for resistive loads, at zero current for inductive loads (adjusted by pot. on unit) |
| Power ramps: | | Setpoint ramp after reset |

### Control

| | | |
|---|---|---|
| Analogue input: | | |
| | TC2000 DC voltage: | 0-5V, 1-5V, 0-10V, 2-10V Input impedance 68k |
| | DC current: | 0-20mA, 4-20mA Input impedance 250Ω |
| | TC2001 DC voltage: | 0-5V, 1-5V, 0-10V, 2-10V Input impedance 100k |
| | DC current: | 0-20mA, 4-20mA Input impedance 50ohmΩ |
| Second input: | | Same input ranges as first input - lowest used |
| Logic input: | | Range selected from analogue input. >5V =ON, <1V=OFF |
| Control mode: | | Open loop, $V^2$ 12 or W |
| Linearity: | | Burst firing ±2% for all feedback modes |
| Stability: | | Burst firing ±2% for +10% to -15% supply variation, for 0°C to 50°C ambient temperature |
| Enable/inhibit: | | Logic input of +10V enables operation |

### Alarm

Loss of any supply phase, under voltage - below 70% or 50%, over voltage above 20% of nominal, frequency error, external measurement signal failure. Thermal switch operation. Any of these will give an alarm

### Options

| | |
|---|---|
| Partial load unbalance: | Detects 10% unbalance of line currents, fuse failure or short circuit of one thyristor Only with three phase loads |
| Fuse blown microswitches | |

## TC2000 Ordering code

| TC2000 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 00 |
|---|---|---|---|---|---|---|---|---|---|---|---|

*Fuses internal*

**1 Load Configuration**

| | |
|---|---|
| **02** | Three phase loads |
| **21** | Two single phase loads |

**2 Current**

| | |
|---|---|
| **60A** | 60 amps |
| **75A** | 75 amps |
| **100A** | 100 amps* |
| **150A** | 150 amps* |
| **250A** | 250 amps* |
| **300A** | 300 amps* |
| **400A** | 400 amps* |
| **500A** | 500 amps* |

** Fan cooled*

**3 Line to Line Voltage**

| | |
|---|---|
| **120V** | 120 volts |
| **240V** | 240 volts |
| **277V** | 277 volts |
| **440V** | 440 volts |
| **480V** | 480 volts |
| **500V** | 500 volts |

**4 Auxiliary Supply** (1)

| | |
|---|---|
| **000** | NONE |
| **110V** | 110 volts |
| **120V** | 120 volts |
| **220V** | 220 volts |
| **240V** | 240 volts |

*(1) Auxiliary supply only required for analogue inputs or units over 75A*

**5 Input 1**

| | |
|---|---|
| **0V5** | 0-5 volts |
| **1V5** | 1-5 volts |
| **0V10** | 0-10 volts |
| **2V10** | 2-10 volts |
| **0mA20** | 0-20mA |
| **4mA20** | 4-20mA |
| **LGC** | Logic dc input |
| **ACL** | Logic ac input |

**6 Input 2**

| | |
|---|---|
| Three Phase loads | |
| **000** | None |
| Single Phase loads | |
| **0V5** | 0-5 volts |
| **1V5** | 1-5 volts |
| **0V10** | 0-10 volts |
| **2V10** | 2-10 volts |
| **0mA20** | 0-20mA |
| **4mA20** | 4-20mA |
| **LGC** | Logic dc input |
| **ACL** | Logic ac input |

**7 Language**

| | |
|---|---|
| **ENG** | English |
| **FRA** | French |
| **GER** | German |

**8 Options**

| | |
|---|---|
| **PLU** | Partial Load Unbalance† (open in alarm) |
| **IPU** | Partial Load Unbalance† (closed in alarm) |

*† PLU /IPU are only available for three phase applications with analogue or DC Logic Input*

**9 Options**

| | |
|---|---|
| **FUMS** | Fuse Fail Microswitch |
| **FUSE** | High Speed Fuse |
| **NOFUSE** | No Fuse * |

** High speed fuses are not recommended for SWIR loads*

**10 EMC Filter**

| | |
|---|---|
| **-** | No filter |
| **FILT** | Filter |

**SPARE FUSE**

| Current rating | Fuse rating | Fuse number |
|---|---|---|
| 60A | 80A | **LA172468U080** |
| 75A | 100A | **LA172468U100** |
| 100A | 125A | **LA172468U125** |
| 150A | 200A | **LA172468U200** |
| 250A | 315A | **LA172468U315** |
| 300A | 410A | **LA172468U400** |
| 400A | 500A | **LA172468U500** |
| 500A | 630A | **LA172468U630** |

Please note that replacement fuses are marked with a higher current rating than the thyristors. This allows correct operation at elevated temperatures and does not imply that higher current is permissible.

## TC2001 Ordering code

| TC2001 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| 14 | 15 | 00 |
|---|---|---|

*Fuses included*

**1 Load Configuration ††**

| | |
|---|---|
| **02** | Three phase loads |
| **21** | Two single phase loads |

**2 Current**

| | |
|---|---|
| **60A** | 60 amps |
| **75A** | 75 amps |
| **100A** | 100 amps |
| **150A** | 150 amps* |
| **250A** | 250 amps* |
| **300A** | 300 amps* |
| **400A** | 400 amps* |
| **500A** | 500 amps* |
| **750A** | 750 amps* |
| **900A** | 900 amps* |
| **1200A** | 1200 amps* |
| **1650A** | 1650 amps†* |

** Fan cooled*
*† Above 1200A, thyristors are external to drive using MC2001 Driver. (690V not available) Fan supply of 240V required.*
*†† Consult Eurotherm if driving three phase transformer loads*

**3 Line to Line Voltage**

| | |
|---|---|
| **100V** | 100 volts |
| **110V** | 110 volts |
| **115V** | 115 volts |
| **120V** | 120 volts |
| **200V** | 200 volts |
| **220V** | 220 volts |
| **240V** | 240 volts |
| **380V** | 380 volts |
| **400V** | 400 volts |
| **415V** | 415 volts |
| **440V** | 440 volts |
| **480V** | 480 volts |
| **500V** | 500 volts |
| **690V** | 690 volts |

**4 Fan Supply**

| | |
|---|---|
| **00** | Internal up to 1200A |
| **115V** | 115 volts |
| **230V** | 230 volts |

**5 Input 1**

| | |
|---|---|
| **0V5** | 0-5 volts |
| **1V5** | 1-5 volts |
| **0V10** | 0-10 volts |
| **2V10** | 2-10 volts |
| **0mA20** | 0-20mA |
| **4mA20** | 4-20mA |

**6 Input 2**

| | |
|---|---|
| **000** | Three phase loads |
| Single phase loads | |
| **0V5** | 0-5 volts |
| **1V5** | 1-5 volts |
| **0V10** | 0-10 volts |
| **2V10** | 2-10 volts |
| **0mA20** | 0-20mA |
| **4mA20** | 4-20mA |

**7 Firing Mode**

| | |
|---|---|
| **LGC** | Logic |
| **FC** | Fast cycle |
| **SC** | Slow cycle |

**8 Control Mode**

| | |
|---|---|
| **00** | Supply compensat'n |
| **$V^2$** | Load voltage [2] |
| **$I^2$** | Load current [2] |
| **W** | Active Power |

**9 Language**

| | |
|---|---|
| **ENG** | English |
| **FRA** | French |
| **GER** | German |

**10 Frequency**

| | |
|---|---|
| **-** | 50Hz |
| **60H** | 60Hz |

**11 Current Transducer**

| | |
|---|---|
| **-** | No current transducer |
| **CTE** | Current transducer fitted |

**12**

**13 Partial Load Failure**

| | |
|---|---|
| **PLU** | Relay open in alarm |
| **IPU** | Relay closed in alarm |

**14 Fuse**

| | |
|---|---|
| **FUSE** | High speed fuse |
| **FUMS** | High speed fuse with microswitch |
| **NOFUSE** | No fuse * |

** High speed fuses are not recommended for SWIR loads*

**15 MC Driver**

| | |
|---|---|
| **-** | No MC Driver |
| **MC** | MC Driver |

**SPARE FUSE**

| Current rating amps | Fuse rating amps | Fuse number |
|---|---|---|
| 60A | 80A | **LA172468U080** |
| 75A | 100A | **LA172468U100** |
| 100A | 125A | **LA172468U125** |
| 150A | 200A | **LA172468U200** |
| 250A | 315A | **LA172468U315** |
| 300A | 400A | **LA172468U400** |
| 400A | 500A | **LA172468U500** |
| 500A | 630A | **LA172468U630** |
| 750A | 630A | **LA172468U630 *** |
| 900A | 900A | **CS175633U900 *** |
| 1200A | 1000A | **CS175633U1000 *** |
| 1650A | 1400A | **CS175633U1400 *** |

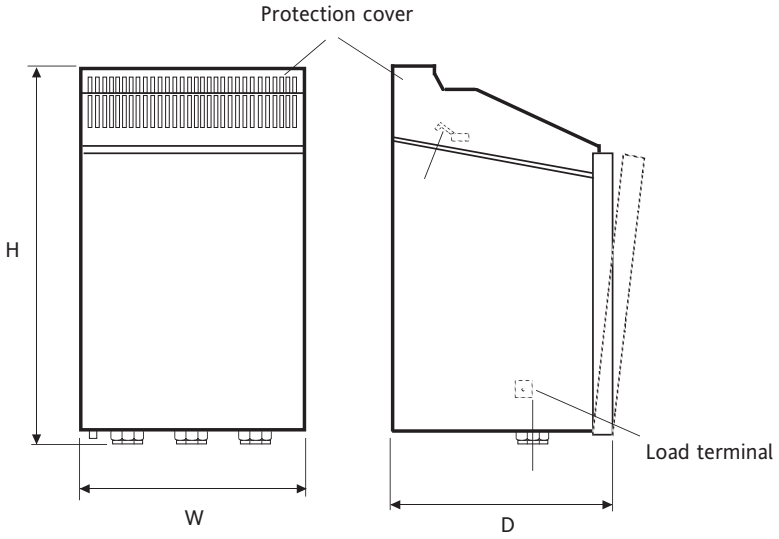
***** Two fuses are required

## ACCESSORIES

| | Code |
|---|---|
| Diagnostic 260 | **260-13-00** |

## Dimensional details

### TC2000 and TC2001




TC2000 and TC2001 (mm)

| Unit | Height (H) | Width (W) | Depth (D) | Weight |
|---|---|---|---|---|
| upto 150A | 480 | 133 | 268 | 10kg |
| 250A | 480 | 248 | 268 | 16kg |
| 300-500A | 570 | 248 | 268 | 16.5kg |
| *TC2001 only* | | | | |
| 750A | 560 | 380 | 510 | 35kg |
| 900-1200A | 560 | 380 | 510 | 39kg |

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