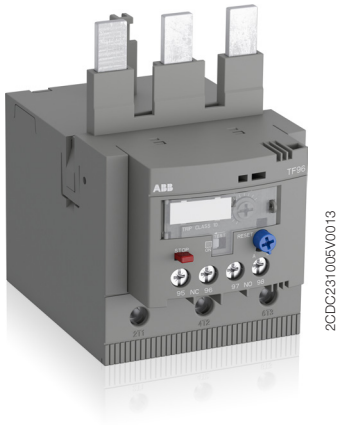
Data sheet

# Thermal overload relay TF65 and TF96

Thermal overload relays are economic electromechanical protection devices for the main circuit. They are used mainly to protect motors against overload and phase failures. Starter combinations are setup together with contactors.




## Description

- Overload protection – trip class 10
- Phase loss sensitivity
- Temperature compensation from -25 … +60 °C
- Adjustable current setting for overload protection
- Automatic or manual reset selectable
- Suitable for three- and single-phase application
- Trip-free mechanism
- Status indication
- STOP and TEST function
- Direct mounting onto block contactors
- Sealable operating elements

## Order data

TF65 and TF96 screw terminal
For AF contactors

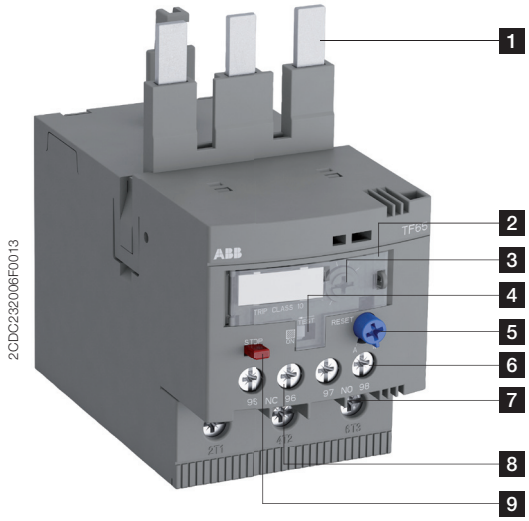


| Setting range<br>A | Type | Order code | Packing unit<br>PCE | Weight per PCE<br>kg |
|---|---|---|---|---|
| 22.0 ... 28.0 | TF65-28 | 1SAZ811201R1001 | 1 | 0.456 |
| 25.0 ... 33.0 | TF65-33 | 1SAZ811201R1002 | 1 | 0.456 |
| 30.0 ... 40.0 | TF65-40 | 1SAZ811201R1003 | 1 | 0.456 |
| 36.0 ... 47.0 | TF65-47 | 1SAZ811201R1004 | 1 | 0.456 |
| 44.0 ... 53.0 | TF65-53 | 1SAZ811201R1005 | 1 | 0.456 |
| 50.0 ... 60.0 | TF65-60 | 1SAZ811201R1006 | 1 | 0.466 |
| 57.0 ... 67.0 | TF65-67 | 1SAZ811201R1007 | 1 | 0.466 |
| 40.0 ... 51.0 | TF96-51 | 1SAZ911201R1001 | 1 | 0.620 |
| 48.0 ... 60.0 | TF96-60 | 1SAZ911201R1002 | 1 | 0.620 |
| 57.0 ... 68.0 | TF96-68 | 1SAZ911201R1003 | 1 | 0.620 |
| 65.0 ... 78.0 | TF96-78 | 1SAZ911201R1004 | 1 | 0.620 |
| 75.0 ... 87.0 | TF96-87 | 1SAZ911201R1005 | 1 | 0.620 |
| 84.0 ... 96.0 | TF96-96 | 1SAZ911201R1006 | 1 | 0.630 |

Suitable for mounting on:
TF65: AF40, AF52, AF65
TF96: AF80, AF96

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## Functional description




**1** **Terminals 1L1, 3L2, 5L3**

**2** **Sealable operating elements**

**3** **Current setting range**
Adjustable current setting for overload protection

**4** **TEST**
Status indication

**5** **RESET**
Automatic or manual reset selectable

**6** **Signaling contacts 97-98**

**7** **Terminals 2T1, 4T2, 6T3**

**8** **Tripping contacts 95-96**

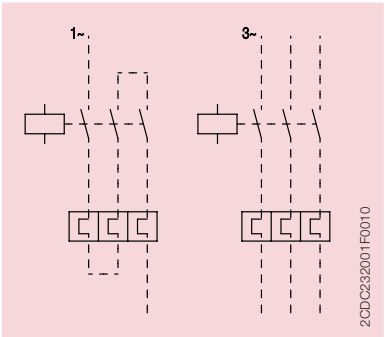
**9** **STOP**

### Application / internal function

The thermal overload relays are three pole relays with bimetal tripping elements (1 per pole). The motor current flows through the bimetal tripping elements and heats them directly and indirectly. In case of an overload (over current), the bimetal elements become bent as a result of the heating. This leads to a release of the relay and a change of the contacts switching position (95-96 / 97-98). The contact 95-96 is used to control the load contactor.

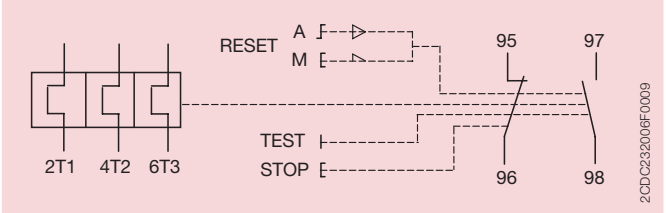
The overload relays have a setting scale in Amperes, which allows the direct adjusting of the relay without any additional calculation. In compliance with international and national standards, the setting current is the rated current of the motor and not the tripping current (no tripping at 1.05 x I, tripping at 1.2 x I; I = setting current). The relays are constructed in way that they protect themselves in the event of an overload. The overload relay has to be protected against short-circuit. The appropriate short-circuit protective devices are shown in the table.

### Operation mode




| | Contact 95-96 | Contact 97-98 | Status indication | Comment |
|---|---|---|---|---|
| Trip state | open | closed | | |
| RESET state | closed | open | ON | |
| TEST manual reset mode | open | closed | | |
| TEST auto reset mode | open | closed | | while TEST is operated |
| STOP while device is in trip state | open | closed | | STOP button has no function |
| STOP while device is in RESET state | open | open | | while STOP button is pressed |

### Wiring diagram

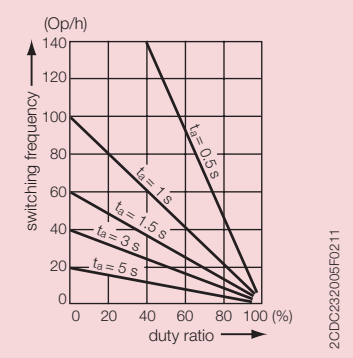


## Resistance and power loss per pole and short-circuit protective devices

| Type | Setting range | | Resistance per pole | Power loss | | Short-circuit protective device |
|---|---|---|---|---|---|---|
| | lower value A | upper value A | mΩ | at lower value W | at upper value W | coordination type 2 |
| TF65-28 | 22.0 | 28.0 | 3.937 | 1.9 | 3.1 | 80 A, gG Type Fuses |
| TF65-33 | 25.0 | 33.0 | 3.474 | 2.2 | 3.8 | 80 A, gG Type Fuses |
| TF65-40 | 30.0 | 40.0 | 2.321 | 2.1 | 3.7 | 100 A, gG Type Fuses |
| TF65-47 | 36.0 | 47.0 | 1.645 | 2.1 | 3.6 | 125 A, gG Type Fuses |
| TF65-53 | 44.0 | 53.0 | 1.292 | 2.5 | 3.6 | 125 A, gG Type Fuses |
| TF65-60 | 50.0 | 60.0 | 0.939 | 2.3 | 3.4 | 125 A, gG Type Fuses |
| TF65-67 | 57.0 | 67.0 | 0.759 | 2.5 | 3.4 | 160 A, gG Type Fuses |
| TF96-51 | 40.0 | 51.0 | 1.647 | 2.6 | 4.3 | 125 A, gG Type Fuses |
| TF96-60 | 48.0 | 60.0 | 1.316 | 3.0 | 4.7 | 160 A, gG Type Fuses |
| TF96-68 | 57.0 | 68.0 | 0.992 | 3.2 | 4.6 | 160 A, gG Type Fuses |
| TF96-78 | 65.0 | 78.0 | 0.632 | 2.7 | 3.8 | 200 A, gG Type Fuses |
| TF96-87 | 75.0 | 87.0 | 0.516 | 2.9 | 3.9 | 200 A, gG Type Fuses |
| TF96-96 | 84.0 | 96.0 | 0.397 | 2.8 | 3.7 | 250 A, gG Type Fuses |

## Technical diagrams

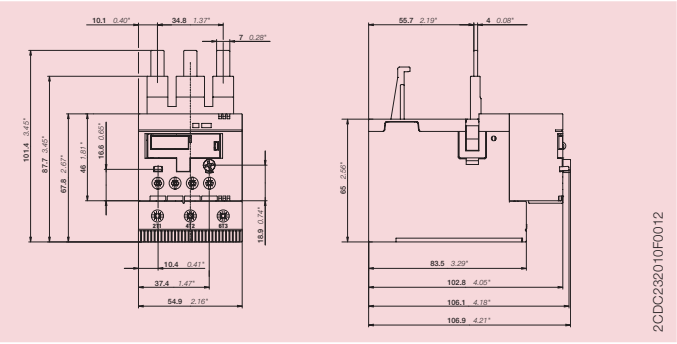
Intermittent periodic duty



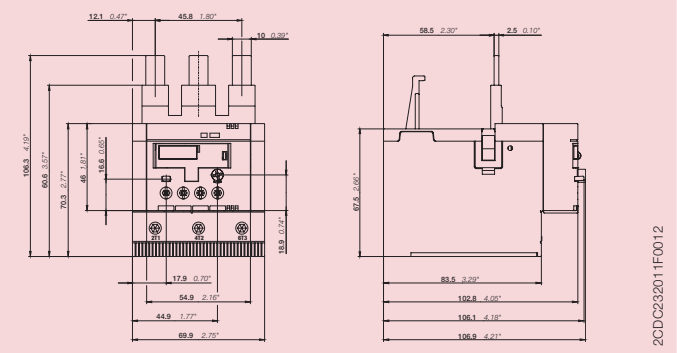

**Motor starting time**

## Dimensions

in **mm** and inches




**TF65**




**TF96**

## Technical data IEC/EN

Data at $T_A$ = 40 °C and at rated values, if nothing else indicated

### Main circuit

| | TF65 / TF96 |
|---|---|
| Rated operational voltage $U_e$ | 690 V AC |
| | - V DC |
| Setting range - thermal overload protection | see table on page 1 |
| Rated operational current AC-3 $I_e$ | see upper value of setting range, table on page 3 |
| Trip class | 10 |
| Rated frequency | 50/60 Hz |
| Number of poles | 3 |
| Resistance per pole | see table on page 3 |
| Power loss per pole | see table on page 3 |
| Short-circuit protective devices | see table on page 3 |

| Isolation data | TF65 / TF96 |
|---|---|
| Rated impulse withstand voltage $U_{imp}$ | 8 kV |
| Rated insulation voltage $U_i$ | 690 V |
| Pollution degree | 3 |

| Electrical connection | | TF65 | TF96 |
|---|---|---|---|
| Connecting capacity | solid | 1/2x 2.5 ... 16 mm² | 1/2x 6 ... 35 mm² |
| | | 1x 2.5 ... 35 mm² | 1x 6 ... 50 mm² |
| | stranded | 1/2x 2.5 ... 16 mm² | 1/2x 6 ... 35 mm² |
| | | 1x 2.5 ... 35 mm² | 1x 6 ... 50 mm² |
| | flexible with ferrule | 1/2x 2.5 ... 10 mm² | 1/2x 6 ... 35 mm² |
| | | 1x 2.5 ... 35 mm² | 1x 6 ... 50 mm² |
| | flexible with insulated ferrule | 1/2x 2.5 ... 4 mm² | 1/2x 6 ... 16 mm² |
| | | 1x 2.5 ... 35 mm² | 1x 6 ... 50 mm² |
| | flexible without ferrule | 1/2x 2.5 ... 16 mm² | 1/2x 6 ... 35 mm² |
| | | 1x 2.5 ... 35 mm² | 1x 6 ... 50 mm² |
| Stripping length | | 17 mm | 22 mm |
| Tightening torques | | 4.0 ... 4.5 Nm | 6.5 ... 9 mm |
| Connection screw | | M6 (Pozidriv 2) | M8 (Hexagon 4) |

## Auxiliary circuit

| | | 95-96, 97-98 |
|---|---|---|
| Rated operational voltage $U_e$ | | 600 V |
| Conventional free air thermal current $I_{th}$ | NC, 95-96 | 6 A |
| | NO, 97-98 | 4 A |
| Rated frequency | | DC, 50/60 Hz |
| Number of poles | | 1NC + 1NO |
| Rated operational current $I_e$ | | |
| acc. to IEC/EN 60947-5-1 for utilization category | | |
| at AC-15 at 110-120 V | NC, 95-96 | 3.00 A |
| | NO, 97-98 | 0.75 A |
| at AC-15 at 220-230-240 V | NC, 95-96 | 3.00 A |
| | NO, 97-98 | 0.75 A |
| at AC-15 at 440 V | NC, 95-96 | 0.75 A |
| | NO, 97-98 | 0.75 A |
| at AC-15 at 480-500 V | NC, 95-96 | 0.75 A |
| | NO, 97-98 | 0.75 A |
| at DC-13 at 24 V | NC, 95-96 | 1.25 A |
| | NO, 97-98 | 1.25 A |
| at DC-13 at 110-120-125 V | NC, 95-96 | 0.55 A |
| | NO, 97-98 | 0.55 A |
| at DC-13 at 250 V | NC, 95-96 | 0.27 A |
| | NO, 97-98 | 0.27 A |
| at DC-13 at 500 V | NC, 95-96 | 0.15 A |
| | NO, 97-98 | 0.15 A |
| Minimum switching capacity | | 17 V / 3 mA |
| Short-circuit protective devices | NC, 95-96 | 6 A, Type gG |
| | NO, 97-98 | 4 A, Type gG |

| **Isolation data** | | **95-96, 97-98** |
|---|---|---|
| Rated impulse withstand voltage $U_{imp}$ | | 6 kV |
| Rated insulation voltage $U_i$ | | 690 V |
| Pollution degree | | 3 |

| **Electrical connection** | | **95-96, 97-98** |
|---|---|---|
| Connecting capacity | solid | 1/2x 0.75 ... 4 mm² |
| | stranded | 1/2x 0.75 ... 4 mm² |
| | flexible with ferrule | 1/2x 0.75 ... 2.5 mm² |
| | flexible with ferrule insulated | 1x 0.75 ... 2.5 mm² |
| | | 2x 0.75 ... 1.5 mm² |
| | flexible without ferrule | 1/2x 0.75 ... 1 mm² |
| | | 1/2x 1 ... 2.5 mm² |
| Stripping length | | 9 mm |
| Tightening torques | | 1 ... 1.5 Nm |
| Connection screw | | M3 (Pozidriv 2) |

## General data

| | | | |
|---|---|---|---|
| Duty time | | | 100 % |
| Operating frequency without early tripping | | | up to 15 operations/h or 60 operations/h with 40 % duty ratio, if the motor breaking current 6 x $I_n$ and the motor starting time does not exceed 1 s |
| Dimensions (W x H x D) | | | see dimension drawing |
| Weight | | | see ordering data |
| Mounting | | | mount on the contactor and tighten the screws of the main circuit terminals or with single mounting kit on DIN rail (35 mm) |
| Mounting position | | | position 1 |
| Minimum distance to other units same type | horizontal | | none |
| | vertical | | not applicable |
| Minimum distance to electrical conductive board | horizontal | up to 400 V | none |
| | | up to 690 V | 1 mm |
| | vertical | | not applicable |
| Degree of protection | housing | | IP20 |
| | main circuit terminals | | IP10 |
| Altitude | | | up to 2000 m |

## Electromagnetic compatibility

| | |
|---|---|
| Electromagnetic compatibility | not applicable |

## Environmental data

| | | |
|---|---|---|
| Ambient air temperature | | |
| Operation | open - compensated | -25 ... +60 °C |
| | open | -25 ... +60 °C |
| Storage | | -50 ... +85 °C |
| Ambient air temperature compensation | | acc. to IEC/EN 60947-4-1 |
| Vibration (sinusoidal) acc. to IEC/EN 60068-2-6 (Fc) | | 5g / 3 ... 150 Hz |
| Shock (half-sine) acc. to IEC/EN 60068-2-27 (Ea) | | 25g / 11 ms |

## Standards / directives

| | |
|---|---|
| Product standard | IEC/EN 60947-1<br>IEC/EN 60947-4-1<br>IEC/EN 60947-5-1<br>UL 60947-1<br>UL 60947-4-1 |
| Low Voltage Directive | 2006/95/EC |
| EMC Directive | 2004/108/EC |
| RoHS Directive | 2002/95/EC |

## Technical data UL/CSA

### Full load amps and short-circuit protective devices

| Type | Full load amps (FLA) | Short-circuit protective devices | | | |
|---|---|---|---|---|---|
| | | 480 / 600 V AC | | 480 / 600 V AC | |
| | | SCCR | Fuse type | SCCR | Fuse type |
| TF65-28 | 28 A | 5 kA | 100 A, K5 / RK5 | 18 kA | 110 A, Class J |
| TF65-33 | 33 A | 5 kA | 100 A, K5 / RK5 | 18 kA | 110 A, Class J |
| TF65-40 | 40 A | 5 kA | 100 A, K5 / RK5 | 18 kA | 110 A, Class J |
| TF65-47 | 47 A | 5 kA | 125 A, K5 / RK5 | 18 kA | 125 A, Class J |
| TF65-53 | 53 A | 10 kA | 125 A, K5 / RK5 | 18 kA | 125 A, Class J |
| TF65-60 | 60 A | 10 kA | 150 A, K5 / RK5 | 18 kA | 150 A, Class J |
| TF65-67 | 67 A | 10 kA | 150 A, K5 / RK5 | 18 kA | 150 A, Class J |
| TF96-51 | 51 A | 5 kA | 150 A, K5 / RK5 | 18 kA | 125 A, Class J |
| TF96-60 | 60 A | 10 kA | 150 A, K5 / RK5 | 18 kA | 150 A, Class J |
| TF96-68 | 68 A | 10 kA | 150 A, K5 / RK5 | 18 kA | 150 A, Class J |
| TF96-78 | 78 A | 10 kA | 175 A, K5 / RK5 | 18 kA | 175 A, Class J |
| TF96-87 | 87 A | 10 kA | 200 A, K5 / RK5 | 18 kA | 200 A, Class J |
| TF96-96 | 96 A | 10 kA | 250 A, K5 / RK5 | 18 kA | 200 A, Class J |

### Main circuit

| | |
|---|---|
| Maximum operational voltage | 600 V AC |
| Trip rating | 125 % of FLA |
| Full load amps (FLA) | see table above |
| Short-circuit rating RMS symmetrical | see table above |
| Short-circuit protective devices | see table above |

| Electrical connection | | TF65 | TF96 |
|---|---|---|---|
| Connecting capacity | stranded | 1x AWG 12 ... 2 | 1x AWG 8 ... 1 |
| | | 2x AWG 12 ... 6 | 2x AWG 8 ... 3 |
| | flexible without ferrule | 1x AWG 12 ... 2 | 1x AWG 8 ... 1 |
| | | 2x AWG 12 ... 6 | 2x AWG 8 ... 3 |
| Stripping length | | 17 mm | 22 mm |
| Tightening torques | | 35 ... 40 lb-in | 57 .. 80 lb-in |

### Auxiliary circuit

| | | |
|---|---|---|
| Conventional thermal current | NC, 95-96 | 6 A |
| | NO, 97-98 | 4 A |
| Making and breaking capacity | NC, 95-96 | B600, Q600 |
| | NO, 97-98 | D300, Q600 |

| Electrical connection | | |
|---|---|---|
| Connecting capacity | stranded | 1/2 x AWG 18 ... 12 |
| | flexible without ferrule | 1/2 x AWG 18 ... 12 |
| Stripping length | | 9 mm |
| Tightening torques | | 9 ... 13 lb-in |

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