

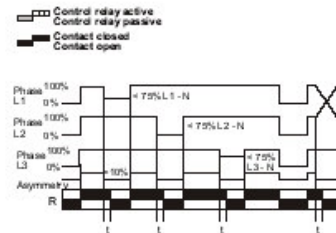
# TCP

## overview

- ◆ detects phase failure, phase sequence and phase asymmetry
- ◆ detects phase failure with regenerated voltage present
- ◆ SPCO or DPCO output max. 6A
- ◆ fixed asymmetry alarm  
TCP / PCP >10%  
TCP-L / PCP-L >30%
- ◆ measuring voltage without neutral
- ◆ adjustable reaction timer 0.1 - 10s
- ◆ LED indicators for power supply, contact and reaction timer
- ◆ 22.5 or 45mm DIN rail mount housing or 11pin plug in housing



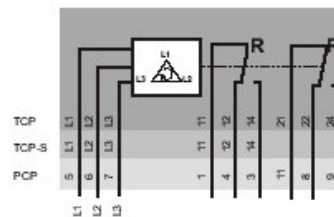
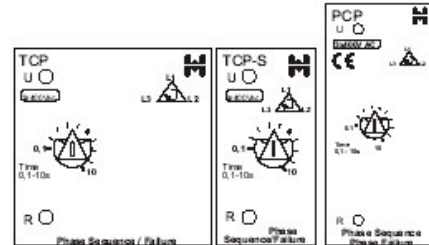
### Function



Control relay to monitor 3-wire, 3-phase systems for the failure of one or more phase, a phase asymmetry shift exceeding 10% and the correct phase rotation (L1, L2, L3)

The TCP detects if the phase sequence is correct and that no phase has failed, in which case the output relay R energises. At a loss of one phase (> 25% under nominal voltage) or at a detection of an asymmetry shift (> 10%), the reaction time t starts. At the end of time t the output relay R de-energises. Time t is adjustable between 0.1s and 10s and is used to time out short transients which would otherwise cause nuisance tripping. The relay energises again when phase L1, L2 and L3 return to within the permitted range.

The control relay will detect a phase failure even with a regenerated voltage present on the failed phase (no detection on request).



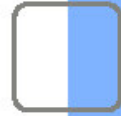
## specification

supply voltage variation	nominal voltage +10% / -15%
frequency range	48 - 63 Hz
duty cycle	100%
reaction timer	0,1 - 10s
reset time	< 100ms
output relay specification	max. 6A 230V~ Ue/Ie AC-15 120V/4A 240V/3A Ue/Ie DC-13 24V/2A
	EN 60947-5-1 VDE 0435
expected life time	DPCO SPCO
mechanical	2 x 10 <sup>5</sup> 1 x 10 <sup>7</sup>
electrical	1 x 10 <sup>5</sup> 1 x 10 <sup>5</sup>
operating conditions	-20 to +60 °C non condensing

## ordering information

part no	supply	output	UL 508	housing types
TCP 3x400Vac	3x 400V~ 2,5VA	DPCO	yes	C
TCP 3x230Vac	3x 230V~ 2,5VA	DPCO	yes	C
TCP-S 3x400Vac	3x 400V~ 2,5VA	SPCO	yes	B
TCP-S 3x230Vac	3x 230V~ 2,5VA	SPCO	yes	B
PCP 3x400Vac	3x 400V~ 2,5VA	DPCO	no	G
PCP 3x230Vac	3x 230V~ 2,5VA	DPCO	no	G
TCP-L 3x400Vac	3x 400V~ 2,5VA	DPCO	no	C
TCP-L 3x230Vac	3x 230V~ 2,5VA	DPCO	no	C
PCP-L 3x400Vac	3x 400V~ 2,5VA	DPCO	no	G
PCP-L 3x230Vac	3x 230V~ 2,5VA	DPCO	no	G

other voltages on request



phase failure, phase sequence, phase asymmetry



# TCP-SF

## overview

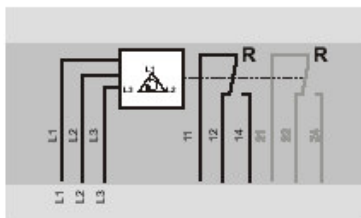
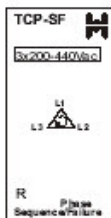


- ◆ detects phase failure and phase sequence
- ◆ SPCO output max. 8A
- ◆ measuring voltage without neutral
- ◆ does not detect phase failure with regenerated voltage present
- ◆ LED indicators for power supply, contact and reaction timer
- ◆ 22.5mm DIN rail mount housing

### Function



Control relay to monitor 3-wire, 3-phase systems for the failure of one or more phase and the correct phase rotation (L1, L2, L3). The TCP-SF detects if the phase sequence is correct and that no phase has failed. If this is the case, the output relay R energises and the yellow LED is illuminated. At a loss of one phase the output relay R de-energises. The relay energises again, when the failed phase/phases resume. The control relay will not detect a phase failure with a regenerated voltage present on the failed phase. An additional supply voltage for the relay is not necessary. The nominal voltage is 3 x 200 - 440Vac.



## specification

<b>supply voltage variation</b>	nominal voltage +/-10%	
<b>frequency range</b>	48 - 63 Hz	
<b>duty cycle</b>	100%	
<b>reset time</b>	< 25ms	
<b>relay type</b>	1	2
<b>output relay spec.</b>	230V~	8A
le AC-15	120V~	1,5A
le AC-15	240V~	1,5A
le DC-13	24V=	1A
	EN 60947-5-1 VDE 0435	
<b>expected life time</b>	DPCO	SPCO
mechanical	30 x 10 <sup>4</sup>	30 x 10 <sup>4</sup>
<b>operating conditions</b>	-20 to +60 °C non condensing	

## ordering information

part no	supply	output	relay type	housing types
TCP-SF	3x 200-440V~	6VA	SPCO	1
TCP-SF	3x 200-440V~	6VA	DPCO	2

# TCP-M

## overview

- ◆ detects phase failure, phase sequence phase asymmetry and over-temperature using PTC sensors.
- ◆ detects phase failure with regenerated voltage present
- ◆ up to 6 PTC sensors in series
- ◆ DPCO output max. 6A
- ◆ fixed asymmetry alarm >10%
- ◆ measuring voltage without neutral
- ◆ adjustable reaction timer 0.1 - 10s
- ◆ LED indicators for power supply, contact and reaction timer
- ◆ 45mm DIN rail mount housing

## specification

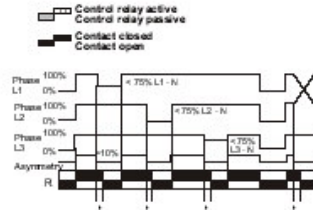
supply voltage variation	nominal voltage +10% / -15%	
frequency range	48 - 63 Hz	
duty cycle	100%	
response/delay time	< 300ms	
reset time	< 500ms	
max measuring voltage	< 2,5V	
max resistance	1500 Ohm (6 sensors)	
triggering threshold	3100 Ohm	
reset threshold	1650 Ohm	
short circuit detection	0 - 20 Ohm	
output relay specification	max. 6A 230V~	
Ue/Ie AC-15	120V/4A 240V/3A	
Ue/Ie DC-13	24V/2A	
	EN 60947-5-1 VDE 0435	
expected life time	DPCO	SPCO
mechanical	2 x 10 <sup>6</sup>	1 x 10 <sup>7</sup>
electrical	1 x 10 <sup>6</sup>	1 x 10 <sup>5</sup>

## ordering information

part no	supply	output	housing types
TCP-M 3x400Vac	3x 400V~ 2,5VA	DPCO	C
TCP-M 3x230Vac	3x 230V~ 2,5VA	DPCO	C
TCP-M 3x440Vac	3x 440V~ 2,5VA	DPCO	C



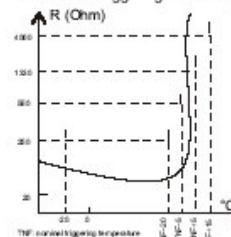
### Function



#### Control relay for phase failure and thermistor protection

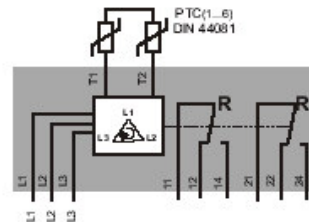
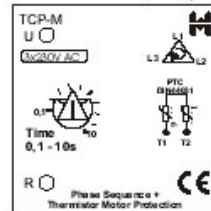
The TCP-M monitors phase sequence, phase failure, phase asymmetry and is used with PTC sensors to provide over temperature protection for motors and other equipment. When the phase sequence is correct, all phases are detected, and the resistance of the sensors on the input T1 - T2 is within the correct range, the output relay R energises.

At a loss of one phase (> 25% under nominal voltage), or the detection of an asymmetry imbalance >10%, or when the resistance of the sensors exceeds the triggering threshold (3100 Ohm) the reaction time t starts.

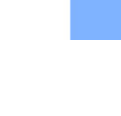


At the end of time t the output relay R de-energises. Time t is adjustable between 0.1s and 10s and is used to time out short transients which would otherwise cause nuisance tripping. The relay energises again when phase L1, L2 and L3 return to the correct range and the resistance of the sensors falls below the reset threshold (1650 Ohms).

The control relay will detect a phase failure even with a regenerated voltage present on the failed phase (no detection on request).



phase failure and thermistor motor protection





# TCP-3N

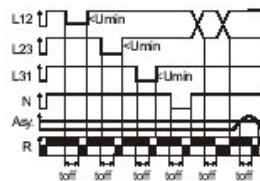
## overview

- ◆ for 3-wire and 4-wire power supply systems
- ◆ systems with 110V - 440V phase to phase
- ◆ checks phase sequence
- ◆ measures phase to phase voltage (adjustable from 110V to 440V)
- ◆ detects neutral connection (selectable by a DIP-switch)
- ◆ monitors asymmetry (adjustable from 5% to 30%, selectable by a DIP-switch)
- ◆ 22,5 or 45mm DIN rail mount housing



### Function

- Control relay active
- Control relay passive
- Contact closed
- Contact open

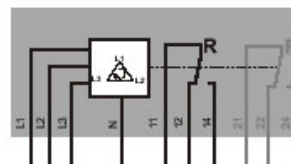
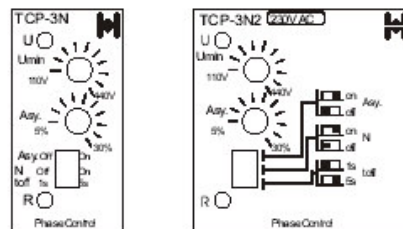


Control relay to monitor 3-wire and 4-wire 3-phase power supply systems for the failure of one or more phase, the correct phase rotation and the existence of a neutral connection. The TCP-3N also measures the phase to phase voltages and calculates the asymmetry. Only if no failure appears, the output relay energises.

With the potentiometer "Umin" the minimal phase to phase voltage is selected between 110V and 440V, with the potentiometer "Asy." the maximal asymmetry is chosen from 5% to 30%. The monitoring of the neutral connection and the asymmetry is selectable by two different DIP-switches. If the monitoring of the neutral connection is disabled, the neutral connection is not required. Two different off-delays are selectable by a DIP-switch (1s or 5s).

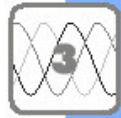
## specification

supply voltage variation	nominal voltage +/-10%	
frequency range	48 - 63 Hz	
duty cycle	100%	
relay type	1	2
output relay spec.	230V~	6A
le AC-15	120V~	1A
	240V~	1,6A
le AC-15	240V~	1A
	24V=	1,0A
	EN 60947-5-1 VDE 0435	
expected life time	DPCO	
mechanical	10 x 10 <sup>6</sup> operations	
operating conditions	-20 to +60 °C non condensing	



## ordering information

part no	supply	output	relay type	housing type
TCP-3N	3x 110-440V~	30VA	SPCO	B
TCP-3N2	3x 110-440V~	30VA	DPCO	C



failure, sequence, voltage and asymmetry of phase; N-failure



# TCP-LC/TCP-LS

## overview

- ◆ DPCO output max. 8A
- ◆ will not trip with regenerated voltage present
- ◆ requires neutral connection (3-phase 4-wire)
- ◆ LED indicators for power supply, contact and reaction timer
- ◆ 22,5 or 45mm DIN rail mount housing



### Function

- Control relay active
- Control relay passive
- Contact closed
- Contact open



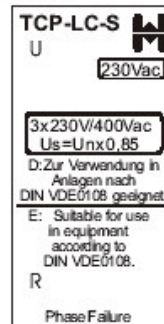
### Phase failure relay 3-phase and neutral (TCP-LC / TCP-LS)

The TCP-LC is a phase failure relay for monitoring 4-wire, 3-phase systems for phase failure or phase voltage reduction down to  $U_n \times 0,85$  or less. When the control relay detects all 3 phases within the correct range the output relay R energises. At a loss of one phase ( $> U_n \times 0,85$ ) the output relay R de-energises. The relay energises again, when phase L1, L2 and L3 return to the correct range ( $> U_n \times 0,8$ ).

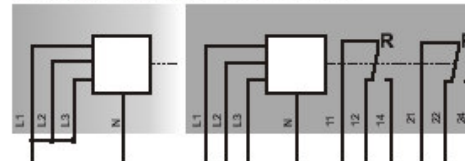
The TCP-LC may be used for monitoring a 1-phase system, in which case L1, L2 & L3 must be connected together (see below).

### Push Button (only TCP-LS)

The push button at the front simulates a phase failure (the relay is switched off).



### 1-phase connection 3-phase connection



## specification

<b>supply voltage variation</b>	nominal voltage +10% / -20%
<b>frequency range</b>	48 - 63 Hz
<b>duty cycle</b>	100%
<b>output relay specification</b>	8A 230V~
U <sub>e</sub> /I <sub>e</sub> AC-15	120V/1,6A 240V/1,6A
U <sub>e</sub> /I <sub>e</sub> DC-13	24V/1A
	EN 60947-5-1 VDE 0435
<b>expected life</b>	DPCO
mechanical	30 x 10 <sup>5</sup> operations
<b>operating conditions</b>	-20 to +60 °C non condensing

## ordering information

part no	supply	output	trip	housing types
TCP-LC	3x 230V/400V~ 16VA	DPCO	no	C
TCP-LC-S	3x 230V/400V~ 16VA	DPCO	no	B
TCP-LS	3x 230V/400V~ 16VA	DPCO	no	C
TCP-LS-S	3x 230V/400V~ 16VA	DPCO	no	B

phase voltage control

