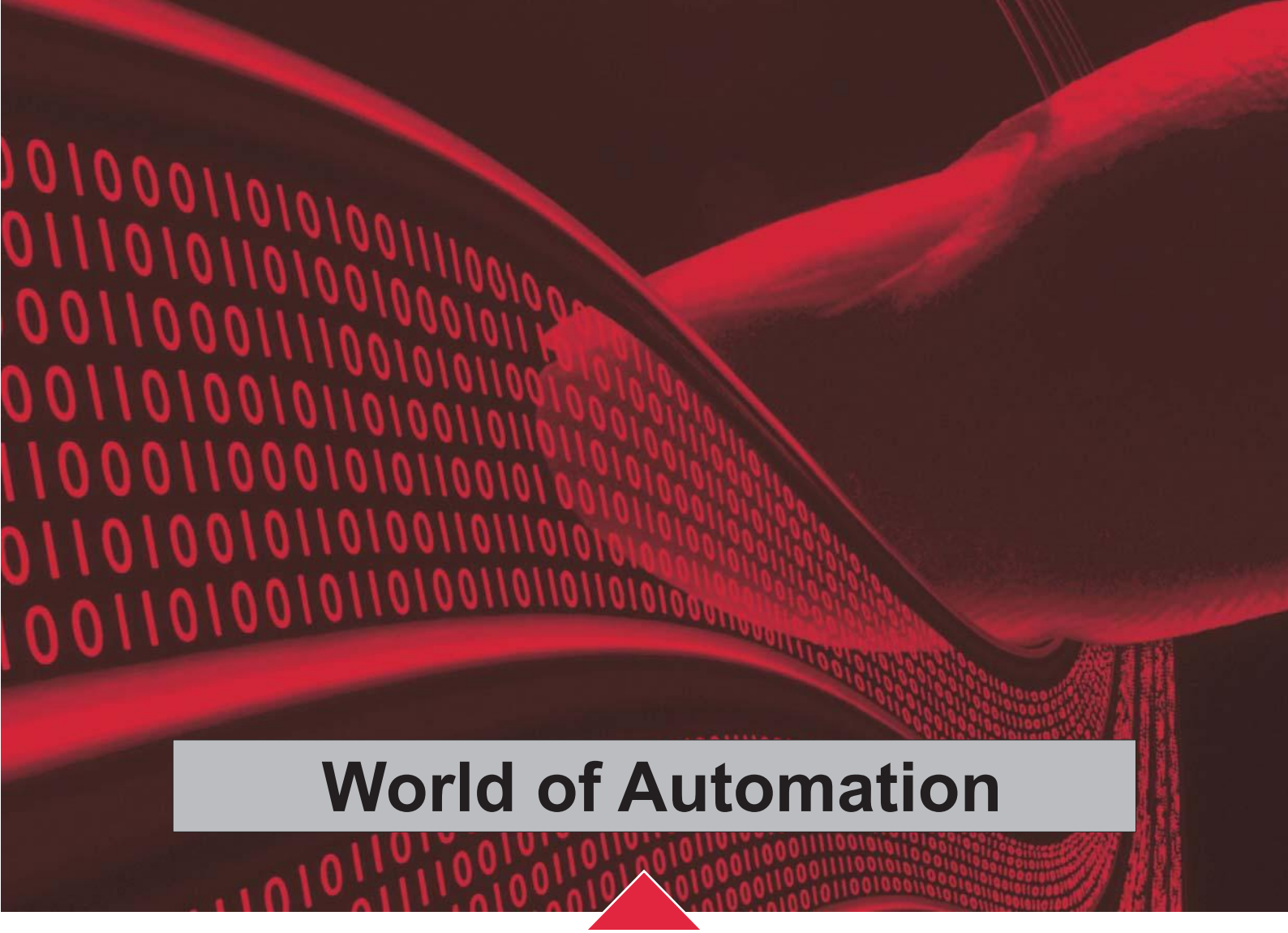


World of Automation

Chapter 2: Monitoring relays

HIQUEL®
HIGH QUALITY ELECTRONICS

www.hiquel.com

INDEX

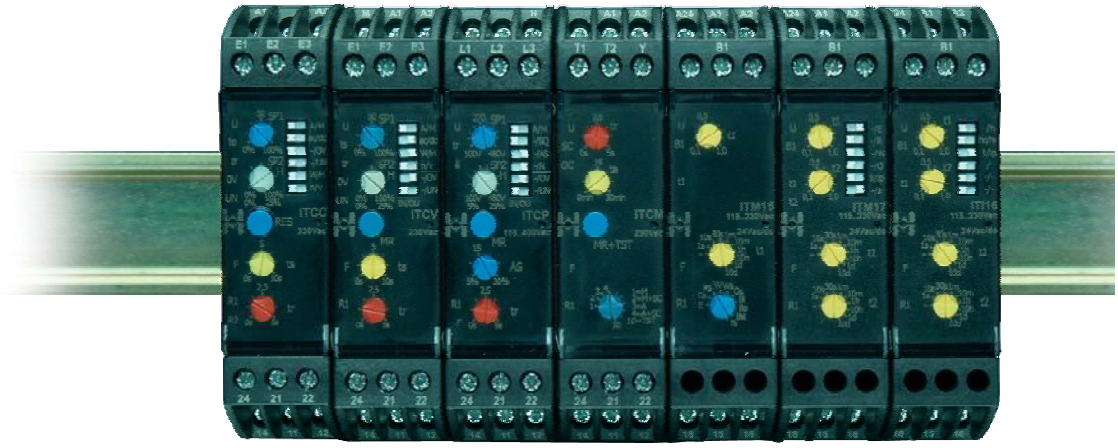
2 Chapter 2: Monitoring relays

HIQUEL® HIGH QUALITY ELECTRONICS

in-case Series

Monitoring and Timing Relays

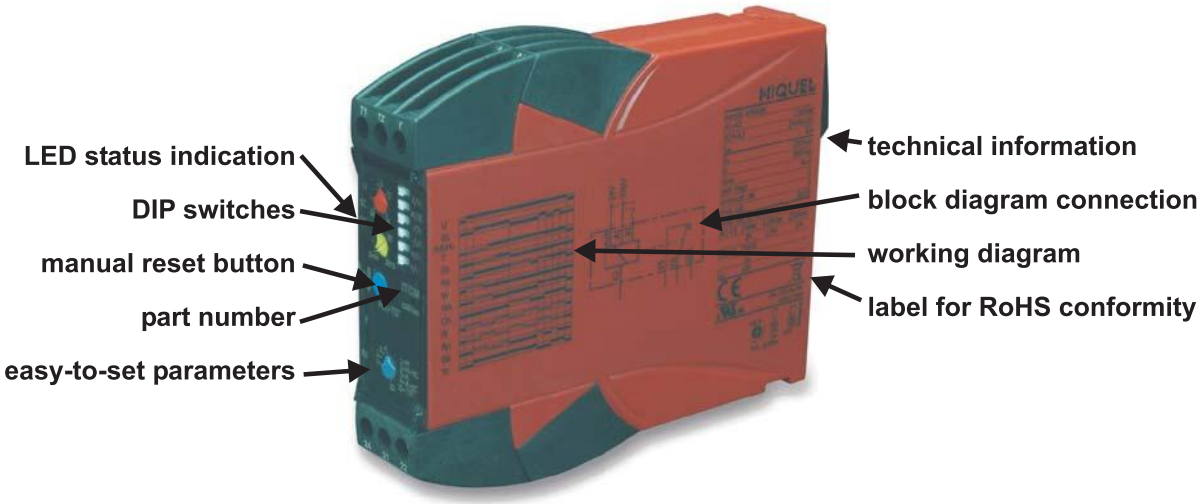
in-case from HIQUEL: *in*-telligent, *in*-tegrated, *in*-dustrial



Customer demands placed on today's control systems mean ever more complex control requirements but at the same time often place limits on the amount of space available.
Hiquel's solution is the new *in*-Case series, an integrated range of Industrial Monitoring and Timing relays in a new, compact 22.5mm DIN rail case. Designed with the emphasis on flexibility and incorporating a new micro-controller, just four monitoring relays offer a complete range featuring single phase current and voltage, three phase voltage, and Thermistor monitoring, with all popular function variants, combinations and options selected by switches.
HIQUEL'S new custom IC means that just three Timing relays offer all standard timing functions and incorporate special features such as dual timing functions, and elapsed time indication.
As a result, customers will benefit from lower stock investment and faster deliveries.

Features at a glance:

Full installation details on the side:



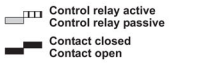
HIQUEL® HIGH QUALITY ELECTRONICS

ICC

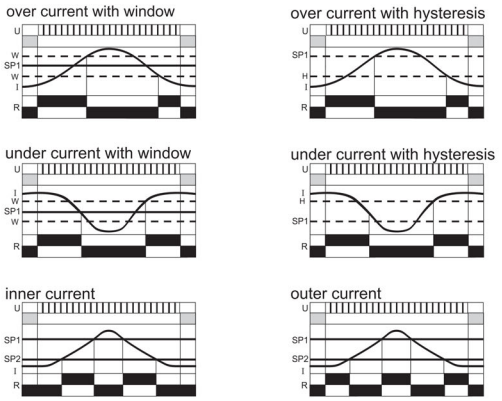
overview

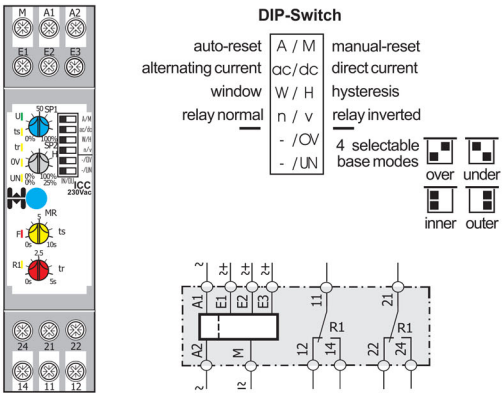
- **AC or DC current monitor**
- **3 different current ranges**
- **4 selectable base modes (over, under, between setpoints, outside setpoints)**
- **2 selectable measuring functions**
- **automatic or manual reset selectable**
- **Alarm memory function**
- **output relay contact invertable**
- **DPCO output relay**
- **LED indicators for power supply, over and under current, failure and status of the output relay, start-up and reaction timer**
- **22.5mm DIN rail mount housing**

Function



DIP-Switch: autom.-Reset / Relay normal





input	range	resistance	I_{EMAX} (20°C)
E1-M	0mA - 100mA	500 mOhm	0,5 A
E2-M	0mA - 1A	50 mOhm	2 A
E3-M	0A - 10A	5 mOhm	15 A

specification

supply voltage variation	nominal voltage -20%..+10%
frequency range	48 - 63 Hz
duty cycle	100%
repeat accuracy	<1%
output relay specification	max. 6A 230V~
Ue/Ie AC-15	24V/1,5A 115V/1,5A 230V/1,5A
Ue/Ie DC-13	24V/1A
expected life time	DPCO
mechanical	10 x 10^6 operations
electrical	8 x 10^4 operations
screws	pozidrive 1
screw tightening torque	0,6..0,8Nm
operating conditions	-20°C to 60 °C non condensing

* EN 60947-5-1 VDE 0435

ordering information

part no	supply		output	sup. galv. iso*	cULus	housing types
ICC 400Vac	400V~	2,5VA/1W	DPCO	yes	-	L
ICC 230Vac	230V~	2,5VA/1W	DPCO		-	L
ICC 115Vac	115V~	2,5VA/1W	DPCO	yes	-	L
ICC 24Vac	24V~	2,5VA/1W	DPCO	yes	-	L

* The measurement input is galvanically isolated from the power supply

HIQUEL® HIGH QUALITY ELECTRONICS

TCC-H

overview

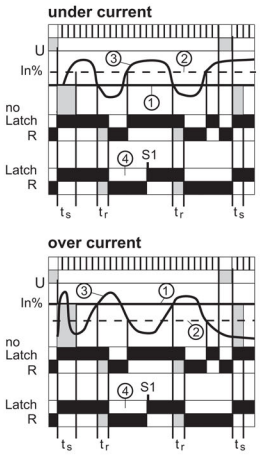
- **AC or DC over or under current monitor**
- **DPCO output max. 6A**
- **3 measuring ranges 5mA - 10A RMS**
- **level and hysteresis adjustments**
- **programmable latch/no latch alarm**
- **LED indicators for power supply, contact and reaction timer**
- **45mm DIN rail mount housing**

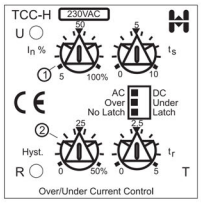
Function

Control relay active
Control relay passive
Contact closed
Contact open

① Threshold "In"
② Hysteresis
③ Monitored current
④ Latch

ts... Start surge delay
tr... Reaction timer
T... LED indication reaction timer



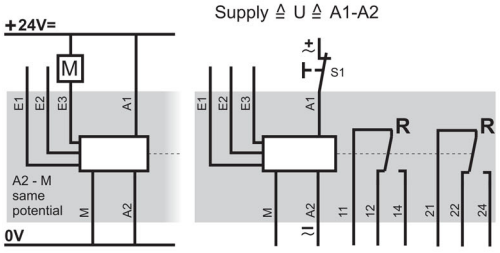


Over/under current control relay
On application of the supply voltage the output relay pulls in and the timing period **ts** starts.

Current control with no latch (auto reset) function
At the end of **ts**, when the measured current exceeds the set threshold, timing period **tr** starts. At the end of **tr** the output relay changes over if the current measurement still exceeds the threshold.
The output relay resets immediately when the monitored current reaches the hysteresis set value.

Current control with latch (manual reset) function.
At the end of **ts**, if the measured current exceeds the set threshold, timing period **tr** starts. At the end of **tr** the output relay changes over and remains in this condition, even if the monitored current reaches the hysteresis set value.
An external reset (S1) must be operated to reset the relay.

Supply ≙ U ≙ A1-A2



input	range	resistance	I_{EMAX} (20°C)
E1-M	5mA - 100mA	1,0 Ohm	1,5 A
E2-M	50mA - 1A	0,1 Ohm	3,5 A
E3-M	0,5A - 10A	0,01 Ohm	14 A

specification

supply voltage variation	nominal voltage +10% / -15%
frequency range	48 - 63 Hz
duty cycle	100%
start surge delay	0 - 10s
reaction time	0 - 5s
reset time	< 100ms
output relay specification	max. 6A 230V~
Ue/Ie AC-15	120V/4A 240V/3A
Ue/Ie DC-13	24V/2A
expected life time	DPCO SPCO
mechanical	2×10^6 resp. 1×10^7 operations
electrical	1×10^5 resp. 1×10^5 operations
screws	pozidrive 1
screw tightening torque	0,6..0,8Nm
operating conditions	-20 to +60 °C non condensing

* EN 60947-5-1 VDE 0435

ordering information

part no	supply		output	sup. galv. iso*	cULus	housing types
TCC-H 230Vac	230V~	2,5VA	DPCO	yes	yes	C
TCC-H 115Vac	115V~	2,5VA	DPCO	yes	yes	C
TCC-H 24Vac	24V~	2,5VA	DPCO	yes	yes	C
TCC-H 24Vdc	24V=	2W	DPCO	no	yes	C

* The measurement input is galvanically isolated from the power supply

over/under current control

5mA-10A

DIN

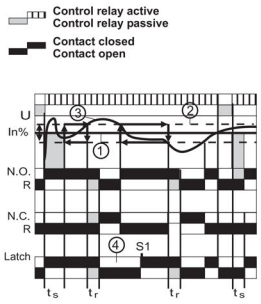
HIQUEL® HIGH QUALITY ELECTRONICS

TCC-W

overview

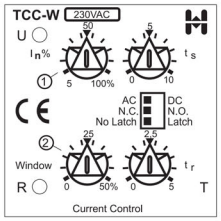
- **AC or DC over or under current monitor with window function**
- **DPCO output max. 6A**
- **3 measuring ranges 5mA - 10A RMS**
- **level and hysteresis adjustments**
- **programmable latch/no latch alarm**
- **LED indicators for power supply, contact and reaction timer**
- **45mm DIN rail mount housing**

Function

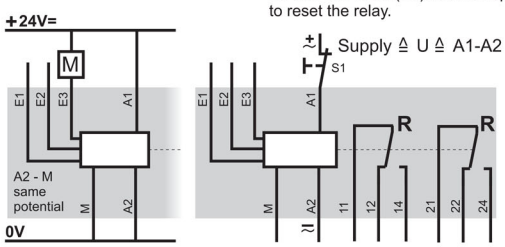


On application of the supply voltage with N.O. Mode selected, the output relay pulls in and the timing period **ts** starts.

Current control with no latch (auto reset) function
At the end of **ts**, if the measured current exceeds the window in either direction, timing period **tr** starts. At the end of **tr**, if the measurement still exceeds the setpoint the output relay changes over.
The output relay resets immediately, when the monitored current reaches the hysteresis set value.



Current control with latch (manual reset) function
At the end of **ts**, when the measured current exceeds the window in either direction, timing period **tr** starts.
At the end of **tr**, if the measurement still exceeds the setpoint the output relay changes over and remains in this condition, even when the measured current reaches the hysteresis set value.
An external reset (S1) must be operated to reset the relay.



input	range	resistance	I_{EMAX} (20°C)
E1-M	5mA - 100mA	1,0 Ohm	1,5 A
E2-M	50mA - 1A	0,1 Ohm	3,5 A
E3-M	0,5A - 10A	0,01 Ohm	14 A

specification

supply voltage variation	nominal voltage +10% / -15%
frequency range	48 - 63 Hz
duty cycle	100%
start surge delay	0 - 10s
reaction time	0 - 5s
reset time	< 100ms
output relay specification	max. 6A 230V~
Ue / Ie AC-15	120V/4A 240V/3A
Ue / Ie DC-13	24V/2A
expected life time	DPCO SPCO
mechanical	2×10^6 resp. 1×10^7 operations
electrical	1×10^5 resp. 1×10^5 operations
screws	pozidrive 1
screw tightening torque	0,6..0,8Nm
operating conditions	-20 to +60°C non condensing

* EN 60947-5-1 VDE 0435

ordering information

part no	supply		output	sup. galv. iso*	cULus	housing types
TCC-W 230Vac	230V~	2,5VA	DPCO	yes	yes	C
TCC-W 115Vac	115V~	2,5VA	DPCO	yes	yes	C
TCC-W 24Vac	24V~	2,5VA	DPCO	yes	yes	C
TCC-W 24Vdc	24V=	2W	DPCO	no	yes	C

* The measurement input is galvanically isolated from the power supply

HIQUEL® HIGH QUALITY ELECTRONICS

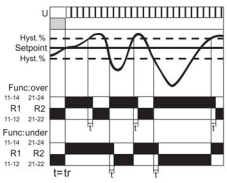
TCC-H2

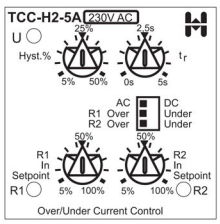
overview

- **AC or DC over or under current monitor**
- **2 x SPCO output relays max. 6A, each independently configured over/under current**
- **2 measuring ranges 0.25-5A and 0.5-10A RMS**
- **2 separate switch points independently adjustable**
- **programmable latch/no latch alarm**
- **LED indicators for power supply, relay 1 (R1) and relay 2 (R2)**
- **45mm DIN rail mount housing**

Function

Control relay active
Control relay passive
Contact closed
Contact open





Control relay for monitoring AC and DC voltage with two separately adjustable relay outputs.
Under or over current function can be set independently for R1 and R2 by DIP-Switch selection.
The trip point (Hyst) can be set independently for both R1 and R2 from 5-50% of the measured range.
At the end of **tr,** the output relay changes when the measured current exceeds the set value of one of the trip points (Hyst). The time **tr** is valid for both relays.
When the measured current returns to within the permitted range, the corresponding relay resets immediately.

Switch "AC-DC" is used to select AC or DC input.

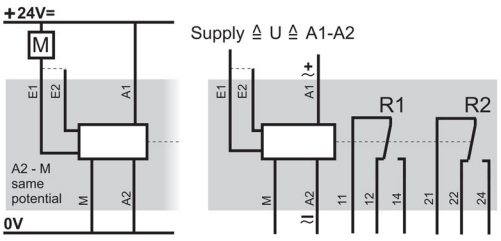
upper threshold: [Y*(100+Hyst%)] /100
lower threshold: [Y*(100-Hyst%)] /100

Y= (Z*Setpoint%) /100
Z= 5A or 10A

specification

supply voltage variation	nominal voltage +10% / -15%
frequency range	48 - 63 Hz
duty cycle	100%
reaction time	0 - 5s
reset time	< 100ms
output relay specification	max. 6A 230V~
Ue/Ie AC-15	120V/4A 240V/3A
Ue/Ie DC-13	24V/2A
expected life time	SPCO
mechanical	5 x 10^6 operations
screws	pozidrive 1
screw tightening torque	0,6..0,8Nm
operating conditions	-20 to +60°C non condensing

* EN 60947-5-1 VDE 0435



input	range	resistance	I_{EMAX} (20°C)
E1-M	0,25A - 5A	0,01 Ohm	7 A
E1+E2-M	0,5A - 10A	0,005 Ohm	14 A

ordering information

part no	supply		output	sup. galv. iso*	cULus	housing types
TCC-H2 5A 230Vac	230V~	2,5VA	2 x SPCO	yes	yes	C
TCC-H2 5A 115Vac	115V~	2,5VA	2 x SPCO	yes	yes	C
TCC-H2 5A 24Vac	24V~	2,5VA	2 x SPCO	yes	yes	C
TCC-H2 5A 24Vdc	24V=	2W	2 x SPCO	no	yes	C

* The measurement input is galvanically isolated from the power supply

over/under current monitor with two switch points

250mA-10A

DIN

HIQUEL®
HIGH QUALITY ELECTRONICS

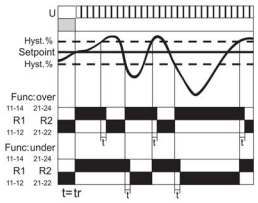
TCC-GW

overview

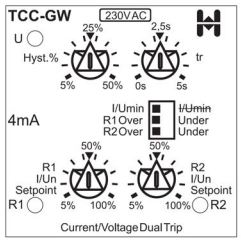
- **current/voltage dual trip for analogue signals**
- **2 x SPCO output relays max. 6A, each independently configured over/under current/voltage**
- **2 measuring ranges 0-10V and 0-20mA DC**
- **2 separate independently adjustable set points**
- **LED indicators for power supply, contact and reaction timer**
- **45mm DIN rail mount housing**

Function

Control relay active
Control relay passive
Contact closed
Contact open



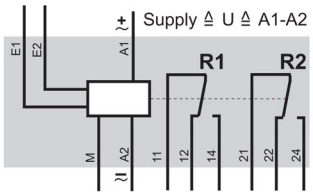
Control relay for monitoring DC current and DC voltage with two independently adjustable relay outputs.
Under or over current function can be set independently for R1 and R2 by DIP-Switch selection.
The setpoint (Hyst) can be independently adjusted for both R1 and R2 from 5-50%.
At the end of **tr,** the output relay changes as soon as the measured value exceeds one of the set points (Hyst). The time **tr** is valid for both relays.
When the measured value returns to within the permitted range, the corresponding relay resets immediately.



Switch "I/Umin" can be used to enable or disable the minimum level control (<4mA or <2V). This could be particularly useful with 4-20mA signals in "Over" function.

upper threshold: [Y*(100+Hyst%)] /100
lower threshold: [Y*(100-Hyst%)] /100

Y= (Z*Setpoint%) /100
Z= 10V or 20mA



input	range	resistance	IN_{MAX} (20°C)
E1-M	0 - 10V	98 kOhm	20V
E2-M	0 - 20mA	50 Ohm	40mA

specification

supply voltage variation	nominal voltage +10% / -15%
frequency range	48 - 63 Hz
duty cycle	100%
reaction time	0 - 5s
reset time	< 100ms
output relay specification	max. 6A 230V
Ue/Ie AC-15	240V/3A
Ue/Ie DC-13	24V/2A
expected life time	SPCO
mechanical	5 x 10^6 operations
screws	pozidrive 1
screw tightening torque	0,6..0,8Nm
operating conditions	-20 to +60°C non condensing

* EN 60947-5-1 VDE 0435

ordering information

part no	supply		output	sup. galv. iso*	c UL us	housing types
TCC-GW 230Vac	230V~	2,5VA	2 x SPCO	yes	yes	C
TCC-GW 115Vac	115V~	2,5VA	2 x SPCO	yes	yes	C
TCC-GW 24Vac	24V~	2,5VA	2 x SPCO	yes	yes	C
TCC-GW 24Vdc	24V=	2W	2 x SPCO	no	yes	C

* The measurement input is galvanically isolated from the power supply

HIQUEL® HIGH QUALITY ELECTRONICS

ICV

overview

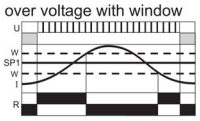
- AC or DC voltage monitor
- 3 different voltage ranges
- 4 selectable base modes (over, under, between setpoints, outside setpoints)
- 2 selectable measuring functions
- automatic and manual reset selectable
- Alarm memory function
- output relay contact invertable
- DPCOalarm relay
- LED indicators for power supply, over voltage and under voltage, failure and status of the output relay, start-up & reaction timer
- 22.5mm DIN rail mount housing

Function

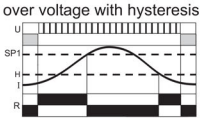
Control relay active
Control relay passive
Contact closed
Contact open

DIP-Switch: Autom.-Reset / Relay normal

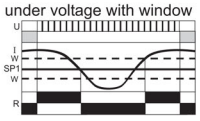
over voltage with window



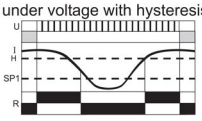
over voltage with hysteresis



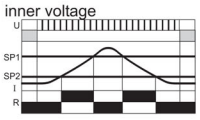
under voltage with window



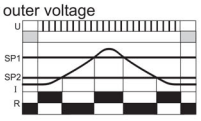
under voltage with hysteresis



inner voltage

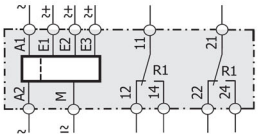


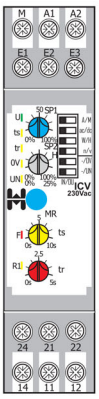
outer voltage



DIP-Switch

autom.-reset	A / M	manual-reset
alternating current	ac/dc	direct current
window	W / H	hysteresis
relay normal	n / v	relay inverted
	- /OV	4 selectable base modes: over, under
	- /UN	inner, outer





specification

supply voltage variation	nominal voltage -20%..+10%
frequency range	48 - 63 Hz
duty cycle	100%
repeat accuracy	<1%
output relay specification	max. 6A 230V~
Ue/Ie AC-15	24V/1,5A 115V/1,5A 230V/1,5A
Ue/Ie DC-13	24V/1A
expected life time	DPCO
mechanical	10 x 10^6 operations
electrical	8 x 10^4 operations
screws	pozidrive 1
screw tightening torque	0,6..0,8Nm
operating conditions	-20°C to 60 °C non condensing

* EN 60947-5-1 VDE 0435

input	range	resistance	U_{EMAX} (20°C)
E1-M	0V - 10V	30 kOhm	13Vac
E2-M	0V - 45V	200 kOhm	75Vac
E3-M	0V - 450V	1,7 MOhm	550Vac

ordering information

part no	supply		output	sup. galv. iso*	cULus	housing types
ICV 400Vac	400V~	2,5VA/1W	DPCO	yes	-	L
ICV 230Vac	230V~	2,5VA/1W	DPCO	yes	-	L
ICV 115Vac	115V~	2,5VA/1W	DPCO	yes	-	L
ICV 24Vac	24V~	2,5VA/1W	DPCO	yes	-	L

* The measurement input is galvanically isolated from the power supply

single phase voltage control

HIQUEL® HIGH QUALITY ELECTRONICS

TCV-H

overview

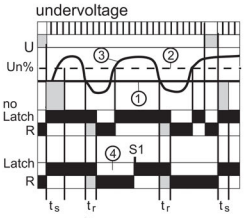
- **AC or DC over or under voltage monitor**
- **DPCO output max. 6A**
- **3 measuring ranges 0.5 - 600V RMS**
- **level and hysteresis adjustments**
- **programmable latch/no latch alarm**
- **LED indicators for power supply, contact and reaction timer**
- **45mm DIN rail mount housing**

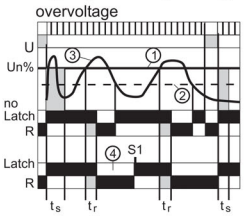
Function

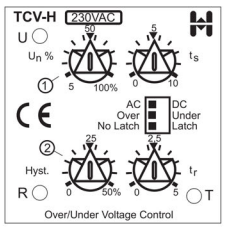
Control relay active
Control relay passive
Contact closed
Contact open

① Threshold "Un"
② Hysteresis
③ Monitored current
④ Latch

ts... Start surge delay
tr... Reaction timer
T... LED indication reaction timer



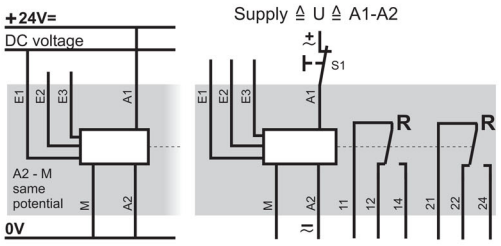




On the application of the supply voltage the output relay pulls in and the timing period **ts** starts.

Voltage monitor with no latch (auto reset) function
At the end of **ts**, when the measured voltage exceeds the set point (Hyst), the timing period **tr** starts. At the end of **tr,** if the measured value still exceeds the set point the output relay changes over. The output relay resets immediately when the measured voltage reaches the hysteresis set value.

Voltage monitor with latch (manual reset) function.
At the end of **ts**, when the measured voltage exceeds the set threshold, timing period **tr** starts. At the end of **tr** if the measured value still exceeds the set point the output relay changes over and remains in this condition, even when the measured voltage reaches the hysteresis set value. An external reset (S1) must be operated to reset the relay.



input	range	resistance	U_{EMAX} (20°C)
E1-M	0,5V - 10V	3,9 kOhm	30V
E2-M	3V - 60V	68 kOhm	130V
E3-M	30V - 600V	820 kOhm	660V

specification

supply voltage variation	nominal voltage +10% / -15%
frequency range	48 - 63 Hz
duty cycle	100%
start surge delay	0 - 10s
reaction time	0 - 5s
reset time	< 100ms
output relay specification	max. 6A 230V~
Ue/Ie AC-15	120V/4A 240V/3A
Ue/Ie DC-13	24V/2A
expected life time	DPCO SPCO
mechanical	2 x 10^6 resp. 1 x 10^7 operations
electrical	1 x 10^5 resp. 1 x 10^5 operations
screws	pozidrive 1
screw tightening torque	0,6..0,8Nm
operating conditions	-20 to +60°C non condensing

* EN 60947-5-1 VDE 0435

ordering information

part no	supply		output	sup. galv. iso*	cULus	housing types
TCV-H 230Vac	230V~	2,5VA	DPCO	yes	yes	C
TCV-H 115Vac	115V~	2,5VA	DPCO	yes	yes	C
TCV-H 24Vac	24V~	2,5VA	DPCO	yes	yes	C
TCV-H 24Vdc	24V=	2W	DPCO	no	yes	C

* The measurement input is galvanically isolated from the power supply

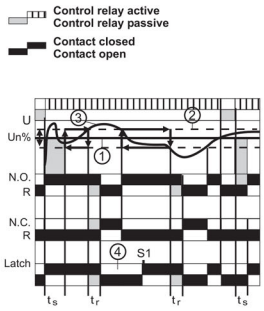
HIQUEL® HIGH QUALITY ELECTRONICS

TCV-W

overview

- **AC or DC over or under voltage monitor with window function**
- **DPCO output max. 6A**
- **3 measuring ranges 0.5 - 600V RMS**
- **level and hysteresis adjustments**
- **programmable latch/no latch alarm**
- **LED indicators for power supply, contact and reaction timer**
- **45mm DIN rail mount housing**

Function

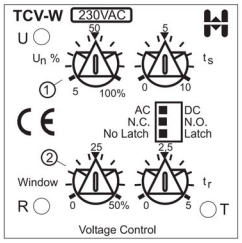


① Threshold "Un"
② Hysteresis
③ Monitored current
④ Latch

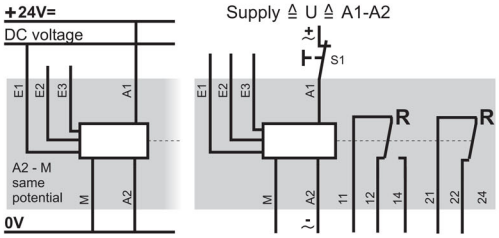
ts... Start surge delay
tr... Reaction timer
T... LED indication reaction timer

On application of the supply voltage with N.O. Mode selected, the output relay pulls in and the timing period **ts** starts.

Voltage monitor with no latch (auto reset) function
At the end of **ts** when the measured voltage exceeds the window in either direction timing period **tr** starts. At the end of **tr** if the measurement still exceeds the set point the output relay changes over. The output relay resets immediately when the monitored voltage reaches the hysteresis set value.



Voltage monitor with latch (manual reset) function
At the end of **ts** when the measured voltage exceeds the window in either direction, timing period **tr** starts. At the end of **tr** if the measurement still exceeds the set point the output relay changes over and remains in this condition, even when the measured voltage reaches the hysteresis set value. An external reset (S1) must be operated to reset the relay.



input	range	resistance	U_{EMAX} (20°C)
E1-M	0,5 - 10V	3,9 kOhm	30V
E2-M	3 - 60V	68 kOhm	130V
E3-M	30 - 600V	820 kOhm	660V

specification

supply voltage variation	nominal voltage +10% / -15%
frequency range	48 - 63 Hz
duty cycle	100%
start surge delay	0 - 10s
reaction time	0 - 5s
reset time	< 100ms
output relay specification	max. 6A 230V~
Ue/Ie AC-15	120V/4A 240V/3A
Ue/Ie DC-13	24V/2A
expected life time	DPCO SPCO
mechanical	2 x 10^6 resp. 1 x 10^7 operations
electrical	1 x 10^5 resp. 1 x 10^5 operations
screws	pozidrive 1
screw tightening torque	0,6..0,8Nm
operating conditions	-20 to +60°C non condensing

* EN 60947-5-1 VDE 0435

ordering information

part no	supply		output	sup. galv. iso*	cULus	housing types
TCV-W 230Vac	230V~	2,5VA	DPCO	yes	yes	C
TCV-W 115Vac	115V~	2,5VA	DPCO	yes	yes	C
TCV-W 24Vac	24V~	2,5VA	DPCO	yes	yes	C
TCV-W 24Vdc	24V=	2W	DPCO	no	yes	C

* The measurement input is galvanically isolated from the power supply

voltage monitor window function

HIQUEL® HIGH QUALITY ELECTRONICS

TCV-P

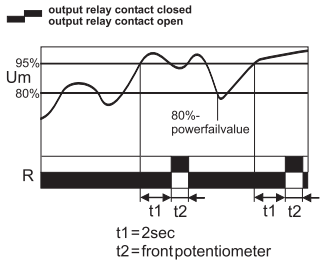
overview

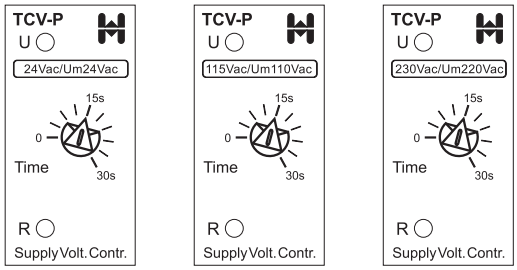
- **supply voltage 'brown-out' monitor for 24V~, 115V~ and 230V~ supplies**
- **SPCO output for post brown-out control panel reset**
- **LED indicators for power supply and relay**
- **22.5mm DIN rail mount housing**

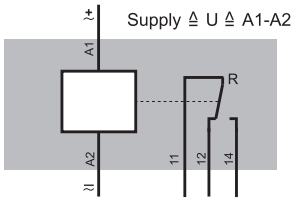
Function

With the introduction of modern multi-voltage electronic devices a common problem exists under supply voltage dip ('brown-out') conditions where electrical devices such as Contactors and Relays can drop out, but multi-voltage electronic devices remain energised, thus the control panel switch sequence is lost. The TCV-P monitors the supply voltage to detect a supply 'brown-out' (< Vn x 0.8) or supply interruption.

When the supply is first established and the supply voltage value increases above 95% of the nominal value (Un), time ***t1*** (fixed 2 seconds) starts to run to 'prove' the supply. When ***t1*** expires the output relay contact closes for time ***t2***. Time ***t2*** can be selected with the potentiometer on the front plate (0-30sec).
If the supply voltage decreases below 80% of the nominal value (Un - 'brown-out' value) or there is a supply voltage interruption of 1 cycle or more the relay 'remembers' this event and when the supply returns above 95% for at least 2 seconds (***t1***) the output relay pulses On for the duration of timer ***t2***. This pulse is used to initiate a reset of the control panel.







specification

supply voltage variation	nominal voltage +10% / -30%
frequency range	48 - 63 Hz
duty cycle	100%
repeat accuracy	<1% of the selected range
output relay specification	max. 12A 250V~
Ue/Ie AC-15	120V/2,5A 240V/2,5A
Ue/Ie DC-13	24V/2A
expected life time	DPCO SPCO
mechanical	2×10^6 resp. 1×10^7 operations
electrical	1×10^5 resp. 1×10^5 operations
screws	pozidrive 1
screw tightening torque	0,6..0,8Nm
operating conditions	-20 to +60°C non condensing

* EN 60947-5-1 VDE 0435

ordering information

part no	supply		output	sup. galv. iso*	cULus	housing types
TCV-P 230Vac/Um220Vac	230V~	6VA	DPCO	yes	-	A
TCV-P 115Vac/Um110Vac	115V~	6VA	DPCO	yes	-	A
TCV-P 24Vac/Um 24Vac	24V~	6VA	DPCO	yes	-	A

* The measurement input is galvanic isolated from the power supply

HIQUEL® HIGH QUALITY ELECTRONICS

module overview

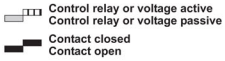
control relays ICP	phase failure ✓	phase sequence ✓	monitors asymmetry 5..30% selectable, monitoring possible to activate ✓	detects voltage break down 150..440V selectable, mode also selectable	detects phase failure with regenerated voltage present ✓	detects neutral connection possible to activate	reaction time 0,1 .. 5s	neutral connection essential Reset-button	simulate phase failure with push button at the front L	housing type	zoom supply voltage 2	output - change over	UL-Listing	thermistor protection
TCP	✓	✓	>10%		✓		0,1 .. 10s		C		2	✓		
TCP-S	✓	✓	>10%		✓		0,1 .. 10s		B		1	✓		
PCP	✓	✓	>10%		✓		0,1 .. 10s		G		2			
TCP-L	✓	✓	>30%		✓		0,1 .. 10s		C		2			
PCP-L	✓	✓	>30%		✓		0,1 .. 10s		G		2			
TCP-SF	✓	✓	X				60ms		A		1			
TCP-SF2	✓	✓	X				60ms		B		2			
TCP-M	✓	✓	>10%				0,1 .. 10s		C		2	✓		
ICPV	✓		X	80..260V selectable, mode also selectable			0,1 .. 5s	✓ Reset-button	L		2			
TCP-V	✓		X	Us = Un*0,7			0,1 .. 10s	✓	C		2	✓		
PCP-V	✓		X	Us = Un*0,7			0,1 .. 10s	✓	G		2			
TCP-VI	✓		X	Us = Un*0,85			0,1 .. 10s	✓	C		2			
TCP-3N	✓	✓	5..30% selectable, monitoring possible to activate	110..440V		possible to activate	1s, 5s		B	✓	1			
TCP-3N2	✓	✓	5..30% selectable, monitoring possible to activate	110..440V		possible to activate	1s, 5s		C	✓	2			
TCP-LC	✓		X	Us = Un*0,85			30ms	✓	C		2			
TCP-LC-S	✓		X	Us = Un*0,85			30ms	✓	B		2			
TCP-LS	✓		X	Us = Un*0,85			30ms	✓	C	✓	2			
TCP-LS-S	✓		X	Us = Un*0,85			30ms	✓	B	✓	2			

ICP

overview

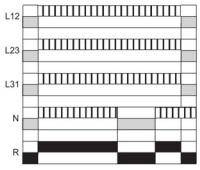
- **3 phase monitoring relay for 3x230/400V**
- **detects phase failure, phase sequence and phase asymmetry**
- **detects phase failure with regenerated voltage present**
- **for power supply with or without neutral connections**
- **4 selectable base modes**
- **3 selectable voltage measurement functions**
- **automatical and manual reset selectable**
- **selectable measuring range (150-440V)**
- **Alarm memory function**
- **DPCO alarm relay**
- **LED indicators for supply voltage, alarm, output relay status, reaction timer and setting error**
- **22.5mm DIN rail mount housing**

Function

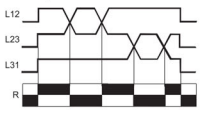


DIP-Switch: autom.-Reset

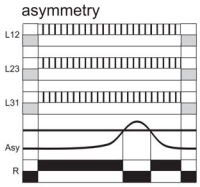
neutral



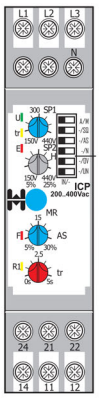
sequence

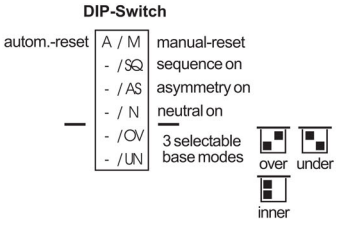


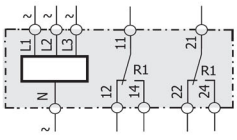
asymmetry



The device recognizes also the regenerated voltage of the consumer, starting from a load size of 0,5kW and an AS attitude of 10%.







specification

supply voltage variation	nominal voltage -20%..+10%
frequency range	48 - 63 Hz
duty cycle	100%
max. measure voltage	480V~
repeat accuracy	<1%
output relay specification	max. 6A 230V~
Ue/Ie AC-15	24V/1,5A 115V/1,5A 230V/1,5A
Ue/Ie DC-13	24V/1A
expected life time	DPCO
mechanical	10 x 10^6 operations
electrical	8 x 10^4 operations
screws	pozidrive 1
screw tightening torque	0,6...0,8Nm
operating conditions	-20 °C .. +60 °C non condensing

* EN 60947-5-1 VDE 0435

ordering information

part no	supply		output	sup. galv. iso*	cULus	housing types
ICP 200...400Vac	115-440V~	30VA/1,5W	DPCO	no	-	L
ICP 300...500Vac	180-550V~	30VA/1,5W	DPCO	no	-	L

* The measurement input is galvanically isolated from the power supply

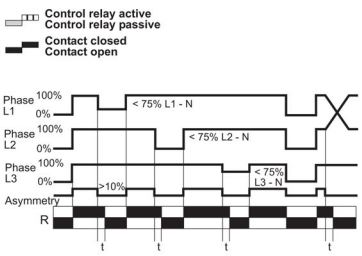
HIQUEL® HIGH QUALITY ELECTRONICS

TCP

overview

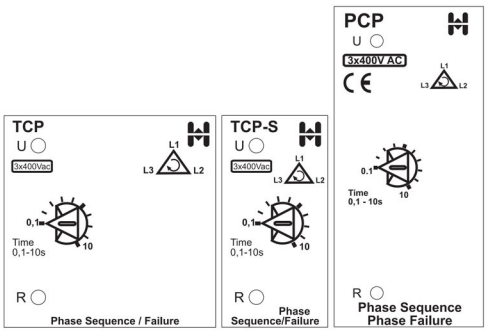
- **detects phase failure, phase sequence and phase asymmetry**
- **detects phase failure with regenerated voltage present**
- **SPCO or DPCO output max. 6A**
- **fixed asymmetry alarm**
  TCP / PCP >10%
  TCP-L / PCP-L >30%
- **no neutral connection required**
- **adjustable reaction timer 0.1 - 10s**
- **LED indicators for power supply, relay and reaction timer**
- **22.5 or 45mm DIN rail mount housing or 11pin plug in housing**

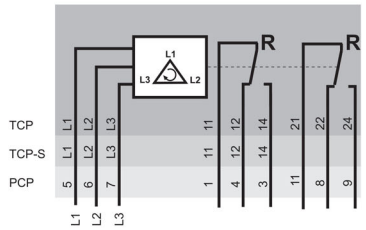
Function



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 that 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
expected life time	DPCO SPCO
mechanical	2 x 10^6 resp. 1 x 10^7 operations
electrical	1 x 10^5 resp. 1 x 10^5 operations
screws	pozidrive 1
screw tightening torque	0,6..0,8Nm
operating conditions	-20 to +60°C non condensing

* EN 60947-5-1 VDE 0435

ordering information

part no	supply	output	sup. galv. iso*	cULus	housing types
TCP 3x400Vac	3x 400V~ 2,5VA	DPCO	yes	yes	C
TCP 3x230Vac	3x 230V~ 2,5VA	DPCO	yes	yes	C
TCP-S 3x400Vac	3x 400V~ 2,5VA	SPCO	yes	yes	B
TCP-S 3x230Vac	3x 230V~ 2,5VA	SPCO	yes	yes	B
PCP 3x400Vac	3x 400V~ 2,5VA	DPCO	yes	no	G
PCP 3x230Vac	3x 230V~ 2,5VA	DPCO	yes	no	G
TCP-L 3x400Vac	3x 400V~ 2,5VA	DPCO	yes	no	C
TCP-L 3x230Vac	3x 230V~ 2,5VA	DPCO	yes	no	C
PCP-L 3x400Vac	3x 400V~ 2,5VA	DPCO	yes	no	G
PCP-L 3x230Vac	3x 230V~ 2,5VA	DPCO	yes	no	G

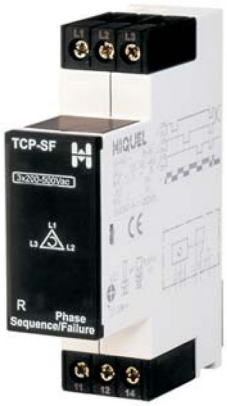
* The measurement input is galvanically isolated from the power supply

3 phase monitoring relay (phase to phase measurement)

HIQUEL® HIGH QUALITY ELECTRONICS

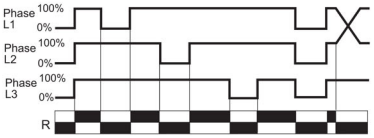
TCP-SF

overview

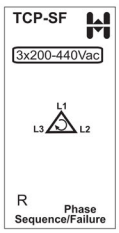


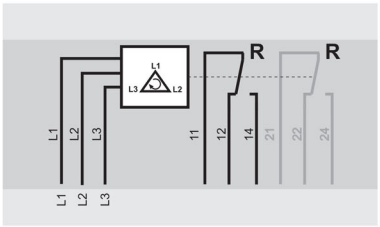
- **detects phase failure and phase sequence**
- **SPCO output max. 8A**
- **measuring voltage without neutral**
- **does not detect phase failure with regenerated voltage present**
- **LED indicators for power supply, relay and reaction timer**
- **22.5mm DIN rail mount housing**

Function



Phase failure 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. (Suitable for lift/elevator applications where the car must continue to the next stop and then not restart)





specification

supply voltage variation		nominal voltage +/-10%	
frequency range		48 - 63 Hz	
duty cycle		100%	
reset time		< 25ms	
relay type		1	2
output relay spec.	230V~	8A	8A
Ie AC-15	120V~	1,5A	1,5A
Ie AC-15	240V~	1,5A	1,5A
Ie DC-13	24V=	1A	1A
expected life time		DPCO	SPCO
mechanical		30 x 10^6 resp.	30 x 10^7 operations
screws		pozidrive 1	
screw tightening torque		0,6..0,8Nm	
operating conditions		-20 to +60°C non condensing	

* EN 60947-5-1 VDE 0435

ordering information

part no	supply		output	relay type	cULus	housing types
TCP-SF	3x 200-440V~	6VA	SPCO	1	-	A
TCP-SF2	3x 200-440V~	6VA	DPCO	2	-	B

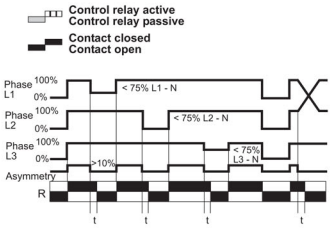
HIQUEL® HIGH QUALITY ELECTRONICS

TCP-M

overview

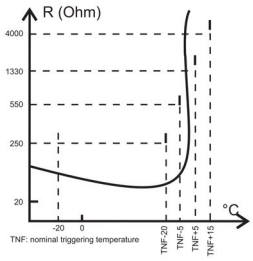
- **detects phase failure, phase sequence phase asymmetry and over-temperature using PTC sensors**
- **detects phase failure with regenerated voltage present**
- **up to 6 PTC sensors in series**
- **DPCO output max. 6A**
- **fixed asymmetry alarm >10%**
- **no neutral connection required**
- **adjustable reaction timer 0.1 - 10s**
- **LED indicators for power supply, relay and reaction timer**
- **45mm DIN rail mount housing**

Function



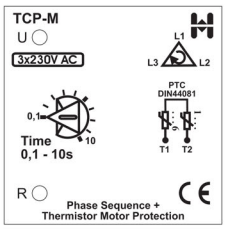
Control relay for phase failure and thermistor protection

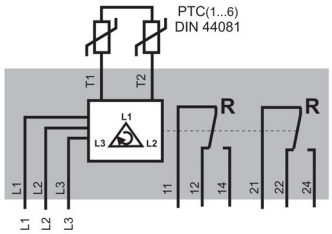
The TCP-M monitors phase sequence, phase failure and phase asymmetry, and is used with PTC sensors to provide over temperature protection for motors and other equipment. When the phase sequence is correct, all phases are detected, and the resistance of the PTC sensors on the input T1 - T2 is within the correct range, the output relay **R** energises. At a loss of one phase (> Vn x 0.75), or the detection of an asymmetry imbalance >10%, or when the resistance of the PTC 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).





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
expected life time	DPCO SPCO
mechanical	2 x 10^6 resp. 1 x 10^7 operations
electrical	1 x 10^5 resp. 1 x 10^5 operations
operating conditions	-20 to 60°C non condesning

* EN 60947-5-1 VDE 0435

ordering information

part no	supply	output	sup. galv. iso*	cULus	housing types
TCP-M 3x400Vac	3x 400V~ 2,5VA	DPCO	yes	yes	C
TCP-M 3x230Vac	3x 230V~ 2,5VA	DPCO	yes	yes	C
TCP-M 3x440Vac	3x 440V~ 2,5VA	DPCO	yes	no	C

* The measurement input is galvanically isolated from the power supply

3 phase failure and thermistor motor protection

PTC

DIN

HIQUEL® HIGH QUALITY ELECTRONICS

ICPV

overview

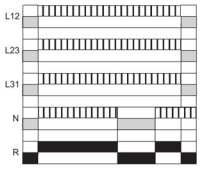
- 3 phase monitoring relay
- detects phase failure, phase sequence
- 3 phase monitoring with single or 3 phase connection
- 4 selectable base modes
- 3 selectable voltage measurement functions
- automatical and manual reset selectable
- selectable measuring range (80-260V)
- Alarm memory function
- DPCO alarm relay
- LED indicators for power supply, failure, phase sequence, over and under voltage, output relay status and reaction timer
- 22.5mm DIN rail mount housing

Function

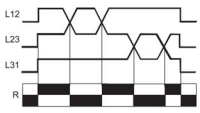
Control relay active
Control relay or voltage passive
Contact closed
Contact open

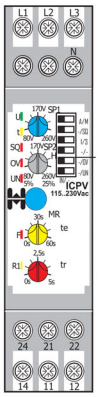
DIP-Switch: autom.-Reset

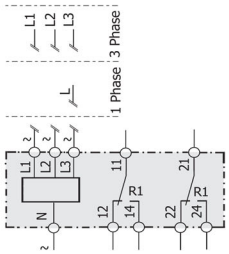
neutral



sequence







specification

supply voltage variation	nominal voltage -20%..+10%
frequency range	48 - 63 Hz
duty cycle	100%
max. measure voltage	480V~
repeat accuracy	<1%
output relay specification	max. 6A 230V~
Ue/Ie AC-15	24V/1,5A 115V/1,5A 230V/1,5A
Ue/Ie DC-13	24V/1A
expected life time	DPCO
mechanical	10 x 10^6 operations
electrical	8 x 10^4 operations
screws	pozidrive 1
screw tightening torque	0,6..0,8Nm
operating conditions	-20 °C .. +60 °C non condensing

* EN 60947-5-1 VDE 0435

ordering information

part no	supply	output	sup. galv. iso*	cULus	housing types
ICPV 115..230Vac	115-230V ~ 25VA/1,5W	DPCO	no	-	L

* The measurement input is galvanically isolated from the power supply

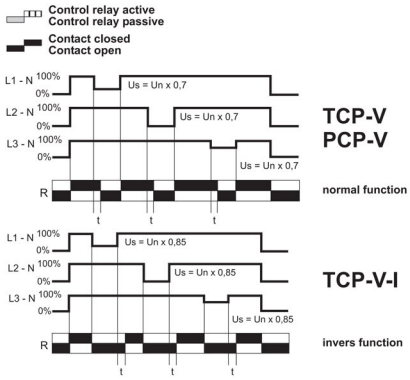
HIQUEL® HIGH QUALITY ELECTRONICS

TCP-V/PCP-V

overview

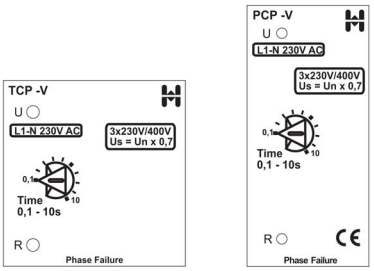
- **detects phase failure or reduction of phase voltage**
- **DPCO output max. 6A**
- **normal or inverted function available**
- **constant measuring**
  - **TCP-V** $U_s=U_n$ x 0.7
  - **PCP-V** $U_s=U_n$ x 0.7
  - **TCP-V-I** $U_s=U_n$ x 0.85
- **will not trip with regenerated voltage present**
- **requires neutral connection (3-phase 4-wire)**
- **adjustable reaction timer 0.1 - 10s**
- **LED indicators for power supply, relay and reaction timer**
- **45mm DIN rail mount housing or 11pin plug in housing**

Function

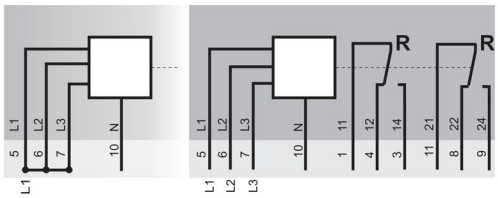


Phase failure relay 3-phase and neutral

The TCP-V is a phase failure relay for monitoring 4-wire, 3-phase systems for phase failure or phase voltage reduction down to Vn x 0.7 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 (> 30% under nominal voltage) 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.
The TCP-V may be used for monitoring a 1-phase system, in which case L1, L2 & L3 must be connected together (see below).



1-phase connection **3-phase connection**



specification

supply voltage variation	nominal voltage +10% / -20%
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
expected life time	DPCO SPCO
mechanical	2 x 10^6 resp. 1 x 10^7 operations
electrical	1 x 10^5 resp. 1 x 10^5 operations
screws	pozidrive 1
screw tightening torque	0,6..0,8Nm
operating conditions	-20 to +60°C non condensing

* EN 60947-5-1 VDE 0435

ordering information

part no	supply	output	sup. galv. iso*	cULus	housing types
TCP-V 3x440Vac	3x 250/440V~ 2,5VA	DPCO	yes	no	C
TCP-V 3x400Vac	3x 230/400V~ 2,5VA	DPCO	yes	yes	C
PCP-V 3x400Vac	3x 230/400V~ 2,5VA	DPCO	yes	no	G
TCP-V 3x230Vac	3x 115/230V~ 2,5VA	DPCO	yes	yes	C
TCP-V-I 3x440Vac	3x 250/440V~ 2,5VA	DPCO	yes	no	C
TCP-V-I 3x400Vac	3x 230/400V~ 2,5VA	DPCO	yes	no	C
TCP-V-I 3x230Vac	3x 115/230V~ 2,5VA	DPCO	yes	no	C

* The measurement input is galvanically isolated from the power supply

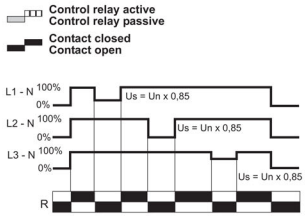
HIQUEL® HIGH QUALITY ELECTRONICS

TCP-LC/TCP-LS

overview

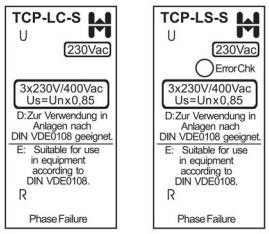
- **DPCO output max. 8A**
- **will not trip with regenerated voltage present**
- **requires neutral connection (3-phase 4-wire)**
- **LED indicators for power supply, contact and reaction timer**
- **22.5 or 45mm DIN rail mount housing**

Function

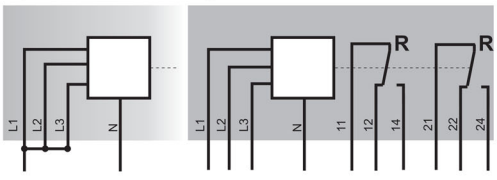


Phase failure relay 3-phase and neutral (TCP-LC / TCP-LS)
The TCP-LC is a phase failure relay for monitoring 4-wire, 3-phase systems for phase failure or phase voltage reduction down to Un x 0,85 or less. When the control relay detects all 3 phases within the correct range the output relay **R** energises.
At a loss of one phase (> Un x 0,85) the output relay **R** de-energises. The relay energises again, when phase L1, L2 and L3 return to the correct range (> Un x 0,9).
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

supply voltage variation	nominal voltage +10% / -20%
frequency range	48 - 63 Hz
duty cycle	100%
output relay specification	8A 230V~
Ue/Ie AC-15	120V/1,6A 240V/1,6A
Ue/Ie DC-13	24V/1A
expected life	DPCO
mechanical	30 x 10^6 operations
screws	pozidrive 1
screw tightening torque	0,6..0,8Nm
operating conditions	-20 to +60°C non condensing

* EN 60947-5-1 VDE 0435

ordering information

part no		supply	output	sup. galv. iso*	cULus	housing types
TCP-LC	**3x230Vac/0,85**	3x 230/400V~ 16VA	DPCO	yes	-	C
TCP-LC-S	**3x230Vac/0,85**	3x 230/400V~ 16VA	DPCO	yes	-	B
TCP-LS	**3x230Vac/0,85**	3x 230/400V~ 16VA	DPCO	yes	-	C
TCP-LS-S	**3x230Vac/0,85**	3x 230/400V~ 16VA	DPCO	yes	-	B

* The measurement input is galvanically isolated from the power supply

HIQUEL® HIGH QUALITY ELECTRONICS

TCP-3N

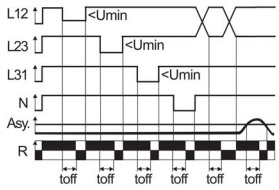
overview

- for 3-wire and 4-wire 3-phase supplies
- 3 phase monitoring relay for 3x230/400V
- monitors phase sequence
- detects phase failure with regenerated voltage present
- 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 DIP-switch)
- 22.5 or 45mm DIN rail mount housing

Function

Contol relay active
Control relay passive

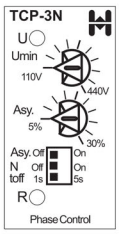
Contact closed
Contact open

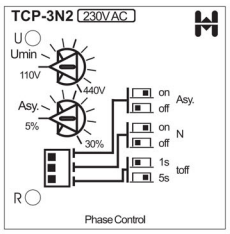


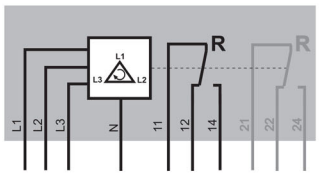
A load from 0,5kW detects the device with a AS-setting < 10% and the reverse voltage of consumers.

Control relay to monitor 3-wire and 4-wire 3-phase supplies 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 there is no failure the output relay energises.

With the "Umin" potentiometer the minimum phase to phase voltage is selected between 110V and 440V, with the "Asy." potentiometer the maximum asymmetry is chosen from 5% to 30%. The monitoring of the neutral connection and the asymmetry is selectable by two DIP-switches.
If the monitoring of the neutral connection is disabled, the neutral connection is not required. Two different off-delay times are selectable by 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	6A
Ie AC-15	120V~	1A	1,5A
Ie AC-15	240V~	1A	1,5A
Ie DC-13	24V=	1A	1,0A
expected life time		DPCO	
mechanical		10 x 10^6 operations	
screws		pozidrive 1	
screw tightening torque		0,6..0,8Nm	
operating conditions		-20 to +60°C non condensing	

* EN 60947-5-1 VDE 0435

ordering information

part no	supply		output	relay type	cULus	housing types
TCP-3N	3x 110-440V~	30VA	SPCO	1	-	B
TCP-3N2	3x 110-440V~	30VA	DPCO	2	-	C

3 phase monitoring relay (phase to neutral measurement)

HIQUEL® HIGH QUALITY ELECTRONICS

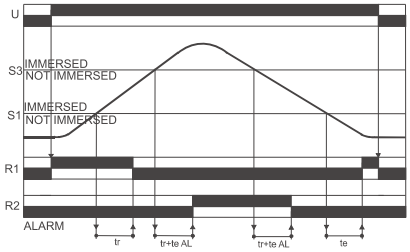
liquid level control, 3 levels, min. or max. alarm

ICL

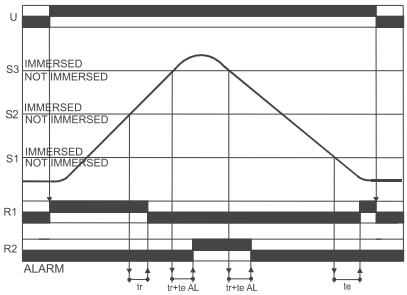
overview

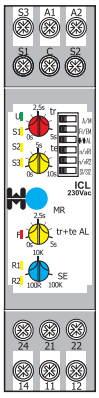
- monitors one or two levels of conductive liquids
- programmable filling or emptying mode
- selectable mode for protection against dry running/overflow
- adjustable sensitivity 100 Ohm - 100 kOhm
- automatic or manual reset mode
- alarm memory function
- 2x SPCO output relay
- LED indicators for power supply, sensors, failure, and output relay
- 22.5mm DIN rail mount housing

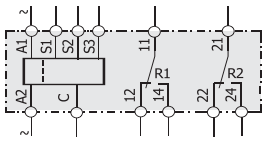
function: filling with two sensors and max. alarm



function: emptying with one sensor and min. alarm







specification

supply voltage variation	nominal voltage -20%..+10%
frequency range	48 - 63 Hz
duty cycle	100%
delay time	<1%
reset time	max. 6A 230V~
output relay specification	24V/1,5A 115V/1,5A 230V/1,5A
	24V/1A
expected life time	SPCO
mechanical	10 x 10^6 operations
electrical	8 x 10^4 operations
screws	pozidrive 1
screw tightening torque	0,6..0,8Nm
operating conditions	-20 °C .. +60 °C
	non condensing
	* EN 60947-5-1 VDE 0435

ordering information

part no	supply		output	sup. galv. iso*	cULus	housing types
ICL 400Vac	400V~	2,5VA/1W	DPCO	yes	-	L
ICL 230Vac	230V~	2,5VA/1W	DPCO	yes	-	L
ICL 115Vac	115V~	2,5VA/1W	DPCO	yes	-	L
ICL 24Vac	24V~	2,5VA/1W	DPCO	yes	-	L

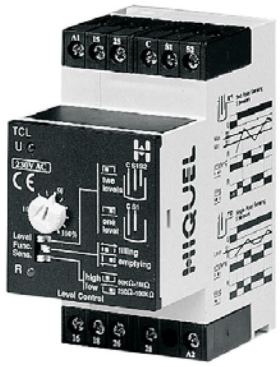
* The measurement input is galvanically isolated from the power supply

HIQUEL® HIGH QUALITY ELECTRONICS

TCL

overview

- **monitors one or two levels of conductive liquids**
- **DPCO output max. 6A**
- **programmable filling or emptying mode**
- **programmable sensitivity 250 Ohm - 100 kOhm or 50 kOhm - 1 MOhm**
- **LED indicators for power supply, relay and reaction timer**
- **45mm DIN rail mount housing or 11pin plug in housing**



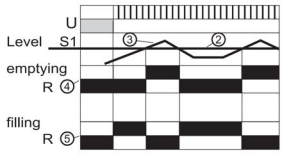
Function

Control relay active
Control relay passive
Contact closed
Contact open

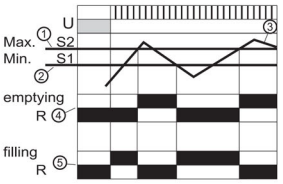
① max. level
② min. level
③ monitored level
④ Output relay, emptying function
⑤ Output relay, filling function

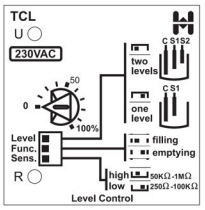
1 level Single Point Sensing using 2 Sensors

Control relay to monitor the level of conductive liquids



2 level Two Point Sensing using 3 Sensors





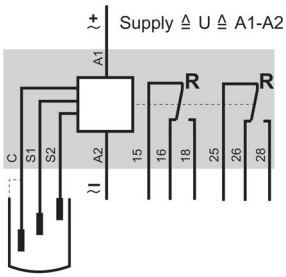
The TCL controls the level of conductive liquids in a conductive or non-conductive container and works by passing a low voltage through the liquid from a suitable probe to an earth return which can either be the container or another probe.

Single point sensing:
The relay changes over each time the liquid contacts C and S1.

Two point sensing:
The relay changes over each time the liquid contacts C, S1 and S2.
The relay resets when the liquid level returns below S1.

The polarity of the sensor voltage is periodically reversed and is sufficiently low to avoid electrolytic action between the probes.

Note:
Do not make a connection between A2 and C when using TCL without galvanic isolation. (DC supplied versions)



specification

supply voltage variation	nominal voltage +10% / -20%
frequency range	48 - 63 Hz
duty cycle	100%
delay time	1s (fixed)
reset time	< 100ms
max measuring voltage	± 5,3V
max measuring current	~ 5mA
probes	cable length max. 100m
output relay specification	max. 6A 230V~
Ue/Ie AC-15	120V/4A 240V/3A
Ue/Ie DC-13	24V/2A
expected life time	DPCO SPCO
mechanical	2×10^6 resp. 1×10^7 operations
electrical	1×10^5 resp. 1×10^5 operations
screws	pozidrive 1
screw tightening torque	0,6..0,8Nm
operating conditions	-20 to +60°C non condensing

* EN 60947-5-1 VDE 0435

ordering information

part no	supply		ouput	sup. galv. iso*	cULus	housing types
TCL 230Vac	230V~	2,5VA	DPCO	yes	-	C
TCL 115Vac	115V~	2,5VA	DPCO	yes	-	C
TCL 24Vac	24V~	2,5VA	DPCO	yes	-	C
TCL 24Vdc	24V=	2W	DPCO	no	-	C
PCL 230Vac	230V~	2,5VA	DPCO	yes	-	G
PCL 115Vac	115V~	2,5VA	DPCO	yes	-	G
PCL 24Vac	24V~	2,5VA	DPCO	yes	-	G
PCL 24Vdc	24V=	2W	DPCO	no	-	G

* The measurement input is galvanically isolated from the power supply.

liquid level control, 2 levels

TCL-LC

overview

- **monitoring one or two levels of conductive liquids**
- **LED indicators for power supply and output relay**
- **fixed switching levels with 20 kOhm and 60 kOhm**
- **22.5mm DIN rail mount housing**

Function

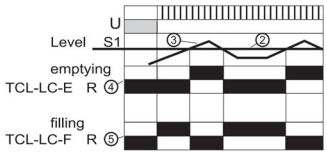
Control relay aktive
Control relay passive
Contact closed
Contact open

① Max. level
② Min. level
③ Monitored level
④ Output relay, emptying function
⑤ Output relay, fillling function

Control relay to monitor the level of conductive liquids

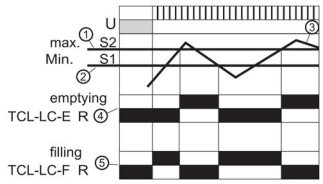
The TCL-LC works by comparing the impedance between the probes in a conductive media and depending on the function and the current state at the probes changes over the output relay.

1 level
Single Point
Sensing
2 Sensors

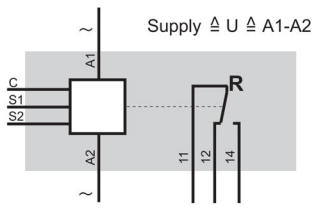


Single Point Sensing
Select single point sensing by shorting together S1 and S2.
Example TCL-LC-E (Emptying)
When the impedance between C and S1/S2 falls below 20kOhm the output relay pulls in. When the impedance between C and S1/S2 rises above 60kOhm the output relay drops out. The action os opposite on the TCL-LC-F (Filling)

2 levels
Two Point
Sensing
3 Sensors



Two Point Sensing
Example TCL-LC-E (Emptying)
If both probes (S1 & S2) are immersed and the impedance is below 20kOhm the output relay pulls in. If the impedance rises above 60kOhm the



specification

supply voltage variation	nominal voltage +10% / -10%
frequence range	48 - 63 Hz
duty cycle	100%
delay time	< 300ms
reset time	< 300ms
max. measuring voltage	< 7V~
max. measuring current	< 1mA
probes	cable length max. 100m
output relay specification	max. 12A 230V~
Ue/Ie AC-15	120V/2A 240V/2A
Ue/Ie DC-13	24V/1,5A
expected life time	
mechanical	1 x 10^7 operations
electrical	1 x 10^5 operations
screws	pozidrive 1
screw tightening torque	0,6..0,8Nm
operating conditions	-20 to +60°C non condensing

* EN 60947-5-1 VDE 0435

ordering information

part no.	supply		output	supp. galv. iso..*	cULus	Gehäusetype
TCL-LC-E 230Vac	230V~	2,5VA	SPCO	yes	-	B
TCL-LC-E 115Vac	115V~	2,5VA	SPCO	yes	-	B
TCL-LC-E 24Vac	24V~	2,5VA	SPCO	yes	-	B
TCL-LC-F 230Vac	230V~	2,5VA	SPCO	yes	-	B
TCL-LC-F 115Vac	115V~	2,5VA	SPCO	yes	-	B
TCL-LC-F 24Vac	24V~	2,5VA	SPCO	yes	-	B

TCL-LC with DPCO on request
* The measurement inout is galvanically isolated from the power supply.

HIQUEL® HIGH QUALITY ELECTRONICS

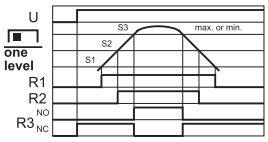
TCL-3

overview

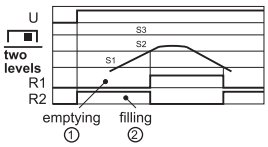
- **monitors two or three levels of conductive liquids**
- **3 x N.O. output max. 6A**
- **programmable filling or emptying mode**
- **programmable sensitivity 250 Ohm - 100 kOhm or 50 kOhm - 1 MOhm**
- **LED indicators for power-supply and all three relays**
- **45mm DIN rail mount housing**

Function

Control relay to monitor the level of conductive liquids
The TCL controls the level of conductive liquids in a conductive or non-conductive container and works by passing a low voltage through the liquid from suitable probes to an earth return which can either be the container or another probe.



① Output relay, function emptying
② Output relay, function filling



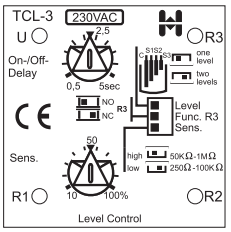
Single point sensing:
The relays R1, R2 and R3 change over each time the liquid contacts C and S1, C and S2 or C and S3. DIP-switch Function R3 inverts relay 3.

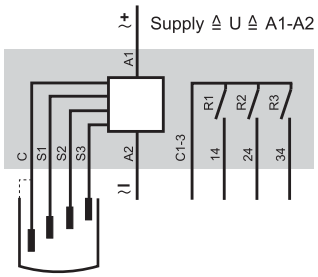
Two point sensing:
The relay changes over each time the liquid contacts C, S1 and S2. The relay resets when the liquid level returns below S1.

R1... emptying
R2... filling

S3 can be used to monitor limits.

Note: Do not make a connection between A2 and C when using TCL without galvanic isolation. (DC supply versions) DC-DC isolation on request





specification

supply voltage variation	nominal voltage +10% / -20%
frequency range	48 - 63 Hz
duty cycle	100%
delay time	0,5 - 5s
reset time	0,5 - 5s
max. measuring voltage	± 5,3V
max. measuring current	~ 5mA
probes	cable length max. 100m
output relay specification	max. 6A 230V~
Ue/Ie AC-15	120V/4A 240V/3A
Ue/Ie DC-13	24V/2A
expected life time	SPNO
mechanical	2 x 10^7 operations
electrical	1 x 10^5 operations
screws	pozidrive 1
screw tightening torque	0,6..0,8Nm
operating conditions	-20 to +60°C non condensing

* EN 60947-5-1 VDE 0435

ordering information

part no	supply		output	sup. galv. iso*	cULus	housing types
TCL3 230Vac	230V~	2,5VA	3 x NO	yes	-	C
TCL3 115Vac	115V~	2,5VA	3 x NO	yes	-	C
TCL3 24Vac	24V~	2,5VA	3 x NO	yes	-	C
TCL3 24Vdc	24V=	2W	3 x NO	yes	-	C

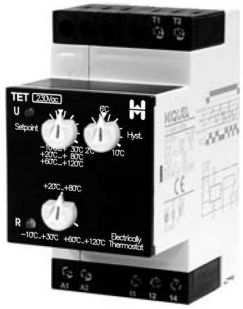
* The measurement input is galvanically isolated from the power supply

liquid level control, 3 levels

HIQUEL® HIGH QUALITY ELECTRONICS

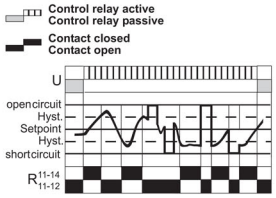
TET

overview



- **standard PT1000 detection**
- **3 measuring ranges**
- **setpoint and hysteresis independently adjustable**
- **LED indicators for power supply and output relay**
- **45mm DIN rail mount housing**

Function



Description

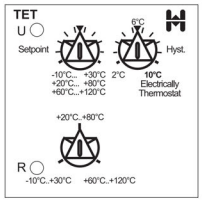
The measuring range is selected with the lower potentiometer three ranges are available:
-10°C...+30°C; +20°C...+80°C; +60°C...+120°C.

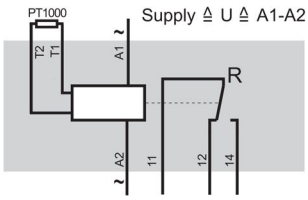
With the "Setpoint" potentiometer the required temperature value is selected, the "Hyst." potentiometer determines the trip point. The relay de-energises if the temperature is greater than "Setpoint+Hyst.", and re-energises when the temperature falls below "Setpoint-Hyst.".

The relay also de-energises if there is a short circuit, open circuit or supply failure.

The use of shielded twisted pair cable is recommended for connection of the PT1000. It is not recommended to connect the PT1000 together with the power supply.

If using shielded twisted pair use the "T2" terminal.





specification

supply voltage variation	nominal voltage +10% / -15%
frequency range	48 - 63 Hz
duty cycle	100%
output relay specification	
Ue/Ie AC-15	120V/3,5A 240V/3A
Ue/Ie DC-13	24V/2,5A
expected life time	1 SPCO
mechanical	5 x 10^6 operations
electrical	1 x 10^5 operations
screws	pozidrive 1
screw tightening torque	0,6..0,8Nm
operating conditions	-20 to +60°C non condensing

* EN 60947-5-1 VDE 0435

ordering information

part no	supply		output	sup. galv. iso*	cULus	housing types
TET 230Vac	230V~	2,5VA	SPCO	yes	-	C
TET 115Vac	115V~	2,5VA	SPCO	yes	-	C
TET 24Vac	24V~	2,5VA	SPCO	yes	-	C
TET 24Vdc	24V=	2W	SPCO	no	-	C

* The measurement input is galvanically isolated from the power supply.

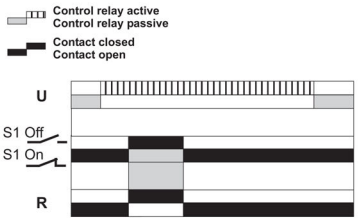
HIQUEL® HIGH QUALITY ELECTRONICS

TCV-SK

overview

- **safety edge monitor for use on industrial roller doors**
- **embedded diode or resistor detection**
- **output relay max. 6A**
- **LED indicators for power supply, contact and function**
- **TÜV-Nr. E/HG-99/101 approval for TCV-SK-S**
- **safety edge monitor, category 2 according to EN 954-1 for TCV-SK-S**
- **22.5 or 45mm DIN rail mount housing**

Function

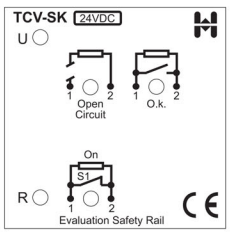


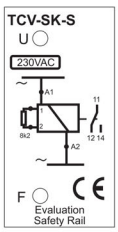
Control relay to monitor permanent safety rails on roller shutter doors
On the application of the supply voltage and after detection of a diode (only TCV-SK) or a 8k2 resistor (TCV-SK and TCV-SK-S) connected to the input, the output relay energizes and the green LED (safety rail o.k.) is illuminated.

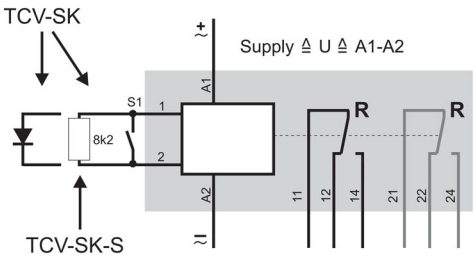
When the control relay detects an open circuit, the output relay drops out immediately and the yellow LED (open circuit) is illuminated.

When the control relay detects a short circuit, the relay drops out immediately and the red LED (failure) is illuminated.

When the output relay drops out a red LED flashes to indicate a circuit fault.







specification

supply voltage variation	nominal voltage +10% / -15%	
frequency range	48 - 63 Hz	
duty cycle	100%	
LED indicators	yellow open circuit	TCV-SK
	green safety rail o.k.	
	red failure	
output relay specification	max. 6A 230V~	
Ue/Ie AC-15	120V/4A 240V/3A	
Ue/Ie DC-13	24V/2A	
expected life time	DPCO SPCO	
mechanical	2×10^6 resp. 1×10^7 operations	
electrical	1×10^5 resp. 1×10^5 operations	
screws	pozidrive 1	
screw tightening torque	0,6..0,8Nm	
operating conditions	-20 to +60°C non condensing	

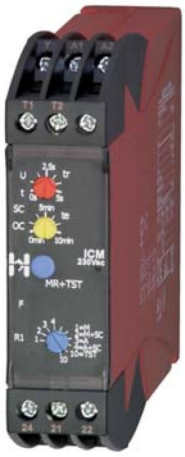
* EN 60947-5-1 VDE 0435

ordering information

part no	supply		output	sup. galv. iso*	cULus	housing types
TCV-SK 230Vac	230V~	2,5VA	DPCO	yes	yes	C
TCV-SK 115Vac	115V~	2,5VA	DPCO	yes	yes	C
TCV-SK 24Vac	24V~	2,5VA	DPCO	yes	yes	C
TCV-SK 24Vdc	24V=	2W	DPCO	no	yes	C
TCV-SK-S 230Vac	230V~	2,5VA	SPCO	yes	no	B
TCV-SK-S 115Vac	115V~	2,5VA	SPCO	yes	no	B
TCV-SK-S 24Vac	24V~	2,5VA	SPCO	yes	no	B
TCV-SK-S 24Vdc	24V=	2W	SPCO	no	no	B

* The measurement input is galvanically isolated from the power supply

HIQUEL® HIGH QUALITY ELECTRONICS

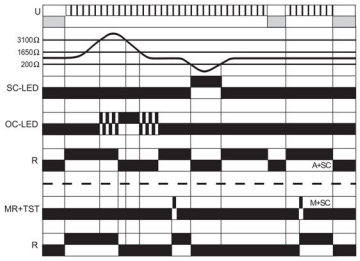


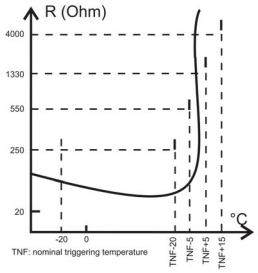
ICM

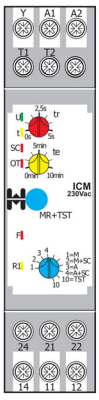
overview

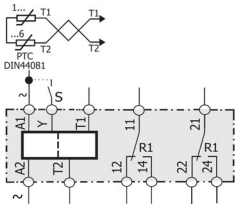
- thermistor motor protection relay
- 5 selectable functions
- up to 6 PTC-sensors in series
- switchable test function (without sensor connected)
- probe short and/or open circuit detection
- automatical, manual or external reset selectable
- Alarm memory function
- DPCO output relay
- LED indicators for power supply, over temperature, short circuit, alarm, output relay status, start and reaction timer
- 22.5mm DIN rail mount housing

Function









specification

supply voltage variation	nominal voltage -20%..+10%
frequency range	48 - 63 Hz
duty cycle	100%
repeat accuracy	<1%
output relay specification	max. 6A 230V~
Ue/Ie AC-15	24V/1,5A 115V/1,5A 230V/1,5A
Ue/Ie DC-13	24V/1A
expected life time	DPCO
mechanical	10 x 10^6 operations
electrical	8 x 10^4 operations
screws	pozidrive 1
screw tightening torque	0,6..0,8Nm
operating conditions	-20 °C .. +60 °C non condensing

* EN 60947-5-1 VDE 0435

ordering information

part no	supply		output	sup. galv. iso*	cULus	housing types
ICM 400Vac	400V~	2,5VA/1W	DPCO	yes	-	L
ICM 230Vac	230V~	2,5VA/1W	DPCO	yes	-	L
ICM 115Vac	115V~	2,5VA/1W	DPCO	yes	-	L
ICM 24Vac	24V~	2,5VA/1W	DPCO	yes	-	L

* The measurement input is galvanically isolated from the power supply

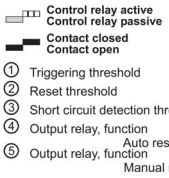
HIQUEL® HIGH QUALITY ELECTRONICS

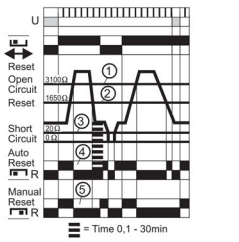
TCM

overview

- **thermistor motor protection using DIN 44081 PTC-sensors**
- **up to 6 PTC sensors in series**
- **DPCO output max. 6A**
- **fault latching function**
- **switchable test function (TCM)**
- **probe short and/or open circuit detection**
- **LED indicators for power supply and output relay**
- **22.5 or 45mm DIN rail mount housing**

Function

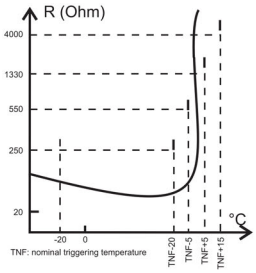




The TCM is used with PTC sensors (DIN 44081) to provide permanent over temperature protection for motors and other equipment
Up to 6 PTC´s connected in series can be used with one TCM relay. On the application of the supply voltage the output relay pulls in. When the PTC sensors reach their nominal temperature the TCM converts the sudden increase of resistance into a signal which causes the output relay **R** to change over. The red LED **F** starts blinking.

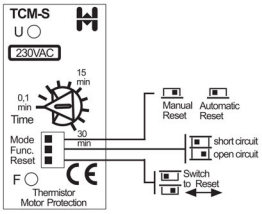
Care must be taken to ensure that long cables connecting PTC's to T1 and T2 are shielded otherwise external electro-magnetic influences can interfere with the correct function of the sensor.

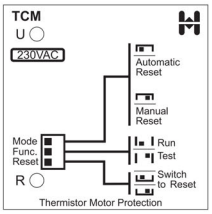
Front plate located DIP-Switches are used to select either.

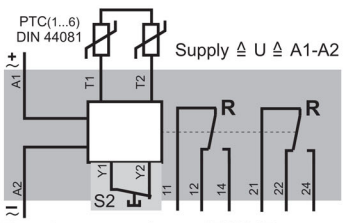


Auto reset mode
When the resistance returns under the reset threshold, time **t** starts (TCM-S). At the end of time **t,** the output relay resets and the red LED **F** goes out.

Manual reset mode
Either an external reset (S1) must be operated to reset the relay, or the third dip switch can be used to perform a manual reset. With the external switch S2 (only TCM-SR) galvanically disconnected, the reset can also be performed. This function is available if the Reset DIP-Switch is switched to the left.







To perform a manual reset of TCM-SR a momentary break contact is connected to terminals Y1 and Y2).

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
expected life time	DPCO SPCO
mechanical	2 x 10^6 resp. 1 x 10^7 operations
electrical	1 x 10^5 resp. 1 x 10^5 operations
operating conditions	-20 to +60°C non condensing

* EN 60947-5-1 VDE 0435

ordering information

part no	supply	output	sup. galv. iso*	cULus	housing types
TCM 230Vac	230V~ 2,5VA	DPCO	yes	-	C
TCM 115Vac	115V~ 2,5VA	DPCO	yes	-	C
TCM 24Vac/dc	24V~= 2W	DPCO	no	-	C
TCM-S 230Vac	230V~ 2,5VA	DPCO	yes	-	B
TCM-S 115Vac	115V~ 2,5VA	DPCO	yes	-	B
TCM-S 24Vac	24V~ 2,5VA	DPCO	yes	-	B
TCM-S 24Vdc	24V= 2W	DPCO	no	-	B
TCM-SR 230Vac	230V~ 2,5VA	DPCO	yes	-	B
TCM-SR 24Vac	24V~ 2,5VA	DPCO	yes	-	B
TCM-SR 24Vdc	24V= 2W	DPCO	no	-	B

* The measurement input is galvanically isolated from the power supply

HIQUEL® HIGH QUALITY ELECTRONICS

TCM-LC

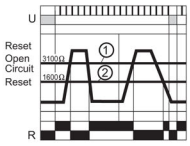
overview

- **thermistor motor protection relay using DIN 44081 PTC-sensors**
- **up to 6 PTC sensors in serie open circuit detection**
- **DPCO output max. 6A**
- **fault latching function (TCM)**
- **LED indicators for power supply and output relay**
- **22.5mm or DIN rail mount housing**

Function

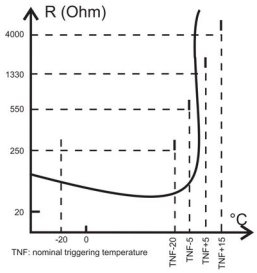
Control relays active
Control relays passive
Contact closed
Contact open

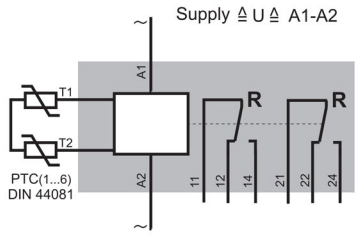
① triggering threshold
② reset threshold



The TCM-LC is used with PTC sensors (DIN 44081) to provide permanent over temperature protection for motors and other equipment.
Up to 6 PTC´s connected in series can be used with one TCM relay. On the application of the supply voltage the output relay pulls in. When the PTC sensors reach their nominal temperature the TCM converts the sudden increase of resistance in a signal which causes the output relay **R** to change over. The red LED **F** starts blinking.

Care must be taken to ensure that long cables connecting PTC's to T1 and T2 are shielded otherwise external electro-magnetic influences can interfere with the correct function of the sensor.





specification

supply voltage variation		nominal voltage +10% / -20%	
frequeny range		48 - 63 Hz	
duty cycle		100%	
response/delay time		< 300ms	
reset time		< 300ms	
max. measuring voltage		< 2,5V	
max. resistance		1500 Ohm (6 sensors)	
triggering threshold		3100 Ohm	
reset threshold		1600 Ohm	
relaytype		1	2
output relay spec.	230V~	12,0A	8,0A
Ie AC-15*	120V~	2,0A	1,6A
Ie AC-15*	240V~	2,0A	1,6A
Ie DC-13*	24V=	1,5A	1,0A
expected life time		SPCO	2DPCO
mechanical		1 x 10^6	resp. 1x 10^7 operations
electrical		1 x 10^5	resp. 1 x 10^5 operations
operating conditions		-20 to +60°C non condensing	

* EN 60947-5-1 VDE 0435

ordering information

part no	supply		output	sup. galv. iso*	relaytype	housing types
TCM-LC 230Vac	230V~	2,5VA	SPCO	yes	1	B
TCM-LC 115Vac	115V~	2,5VA	SPCO	yes	1	B
TCM-LC 24Vac	24V~	2,5VA	DPCO	yes	1	B
TCM-LC2 230Vac	230V~	2,5VA	DPCO	yes	2	B
TCM-LC2 115Vac	115V~	2,5VA	DPCO	yes	2	B
TCM-LC2 24Vac	24V~	2,5VA	DPCO	yes	2	B

* The measurement input is galvanically isolated from the power supply

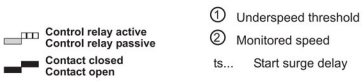
HIQUEL® HIGH QUALITY ELECTRONICS

TCS

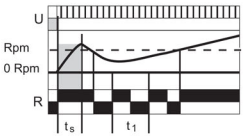
overview

- **under speed control with fault latching function**
- **SPCO output max. 6A**
- **input PNP 24Vdc, volt free contact and 15-40Vdc**
- **start surge delay 0.2-20s**
- **4 selectable speed ranges**
- **LED indicators for power supply, relay and reaction timer**
- **45mm DIN rail mount housing**

Function

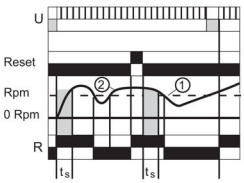


Auto Reset



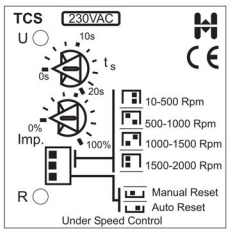
Control relay to monitor under speed
On application of the supply voltage the output relay energises and the timing period **ts** starts. The TCS monitors the time between the leading edge of successive input pulses. When the timing period between the pulses exceeds the set value, the output relay drops out.

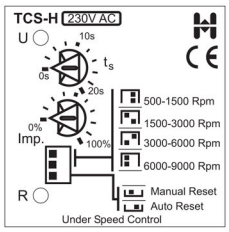
Manual Reset

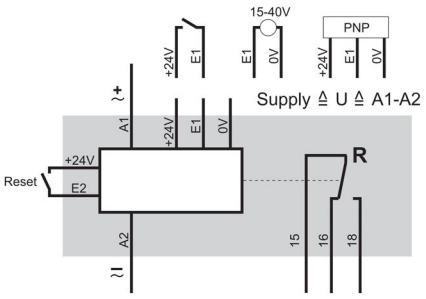


Auto Reset
When the timing period between the pulses returns to the acceptable range for three successive pulses the output relay resets.

Manual Reset
The output relay resets when terminals +24 and E2 are connected. After breaking the connection time **ts** starts.







specification

supply voltage variation		nominal voltage +10% / -20%
frequency range		48 - 63 Hz
duty cycle		100%
range	**TCS**	10-2000 Rpm
	TCS-H	500-9000 Rpm
start surge delay		0 - 20 s
output relay specification		max. 6A 230V~
Ue/Ie	AC-15	120V/5A 240V/4A
Ue/Ie	DC-13	24V/3A
expected life time		DPCO SPCO
mechanical		2×10^6 resp. 1×10^7 operations
electrical		1×10^5 resp. 1×10^5 operations
screws		pozidrive 1
screw tightening torque		0,6..0,8Nm
operating conditions		-20 to +60°C non condensing

* EN 60947-5-1 VDE 0435

ordering information

part no	supply		output	sup. galv. iso*	cULus	housing types
TCS 230Vac	230V~	2,5VA	SPCO	yes	-	C
TCS 115Vac	115V~	2,5VA	SPCO	yes	-	C
TCS 24Vdc	24V=	2W	SPCO	no	-	C
TCS-H 230Vac	230V~	2,5VA	SPCO	yes	-	C
TCS-H 115Vac	115V~	2,5VA	SPCO	yes	-	C
TCS-H 24Vdc	24V=	2W	SPCO	no	-	C

* The measurement input is galvanically isolated from the power supply

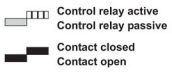
HIQUEL® HIGH QUALITY ELECTRONICS

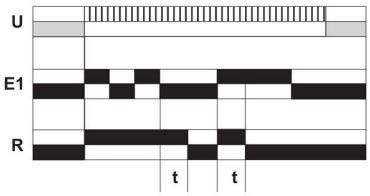
DGR

overview

- **speed control/PLC watchdog relay**
- **SPCO output max. 6A**
- **6 selectable time ranges**
- **LED indicators for power supply and output relay**
- **22.5 or 45mm DIN rail mount housing**

Function



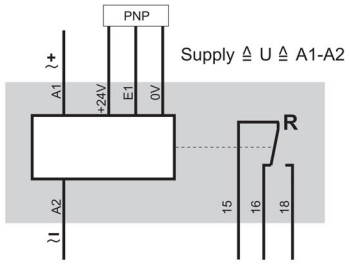


A Control relay to monitor changing impulses on a sensor
After applying the supply voltage the relay waits to see the leading edge of an input pulse.
When the pulse is detected the output relay energises. When there are no more pulses measured during time **t**, the output relay drops out.

Time ranges

0,1s-1,0s	1,0s-10s	0,1min-1,0min	1,0min-10min	0,1h-1,0h	1,0h-10h

The required delay time within the range selected is set using the potentiometer on the front plate



specification

supply voltage variation	nominal voltage +10% / -15%
frequency range	48 - 63 Hz
max delay time	100% of the selected time range
max input frequency	10Hz or 600 Rpm
output relay specification	max. 6A 230V~
Ue/Ie AC-15	120V/5A 240V/4A
Ue/Ie DC-13	24V/4A
expected life time	DPCO SPCO
mechanical	2×10^6 resp. 1×10^7 operations
electrical	1×10^5 resp. 1×10^5 operations
screws	pozidrive 1
screw tightening torque	0,6..0,8Nm
operating conditions	-20 to +60°C non condensing

* EN 60947-5-1 VDE 0435

ordering information

part no	supply		output	sup. galv. iso*	cULus	housing types
DGR 230Vac	230V~	2VA	SPCO	yes	-	C
DGR 24Vdc	24V=	1W	SPCO	no	-	B

* The measurement input is galvanically isolated from the power supply

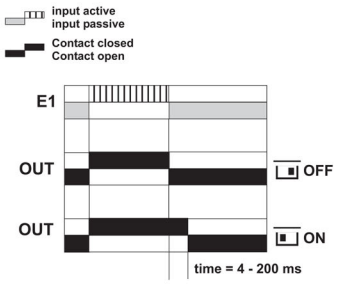
HIQUEL® HIGH QUALITY ELECTRONICS

TCE

overview

- sensor pulse extension relay
- semiconductor output max. 300mA
- input PNP/NPN selectable by dip switch
- suppression of pulses less than 0.5ms
- selectable output polarity, NO or NC
- LED indicators for power supply and output
- 22.5mm DIN rail mount housing

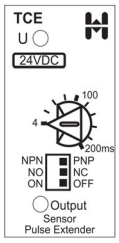
Function

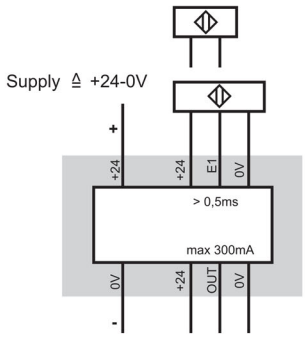


Control relay to extend sensor pulses
The TCE will operate with both NPN and PNP sensors.

Pulses <0.5ms will be suppressed, pulses >0.5ms will be extended to the time set by potentiometer.

With the dip switch setting OFF, all pulses will be re-transmitted in their original length.





specification

supply voltage	15 - 32V=
duty cycle	100%
output specification	max. 300mA
pulse extension	TCE
	4 - 200ms
screws	pozidrive 1
screw tightening torque	0,6..0,8Nm
operating conditions	-20 to +60°C non condensing
	* EN 60947-5-1 VDE 0435

ordering information

part no	supply		output	sup. galv. iso*	c UL us	housing types
TCE 24Vdc	24V=	1W	thyristor	no	-	B

* The measurement input is galvanically isolated from the power supply

DELR

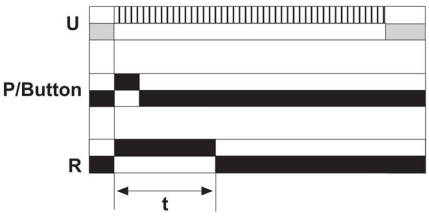
overview

- **emergency light test with on-pulse function**
- **SPCO output max. 8A**
- **2 selectable time ranges 30min/3hrs**
- **built in test function**
- **LED indicators for power supply and output relay**
- **22.5 DIN rail mount housing**

Function

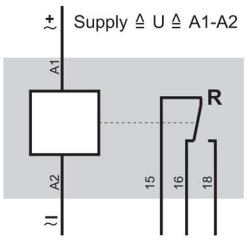
Control relay active
Control relay passive

Contact closed
Contact open



A Control Relay to monitor emergency lights
When pressing the "Test" button on the front plate, the output relay energises and time **t** starts. During this time the emergency lights remain disconnected from the supply voltage for either 30 min or 3 hours. This is to enable a test of the emergency light system. At the end of time **t** the relay drops out and the emergency lights are re-connected to the supply voltage.

Two timing periods can be selected by using the knob on the front plate.



specification

supply voltage variation	nominal voltage +10% / -15%
frequency range	48 - 63 Hz
max. delay time	100% of the selected time range
repeat accuracy	< 1% under constant conditions
output relay specification	max. 8A 230V~
Ue/Ie AC-15	120V/3A 240V/3A
Ue/Ie DC-13	24V/1,5A
expected life time	DPCO SPCO
mechanical	2 x 10^6 resp. 1 x 10^7 operations
electrical	1 x 10^5 resp. 1 x 10^5 operations
screws	pozidrive 1
screw tightening torque	0,6..0,8Nm
operating conditions	-20 to +60°C non condensing

* EN 60947-5-1 VDE 0435

ordering information

part no	supply	output	cULus	housing types
DELR 230Vac	230V~ 6VA	SPCO	-	A
			-	

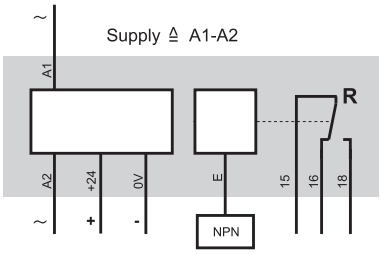
HIQUEL® HIGH QUALITY ELECTRONICS

TPS/UPS

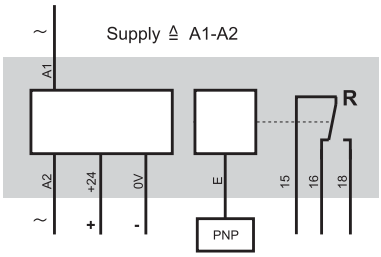
overview

- **output 24V=**
- **input 230V~ or 115V~**
- **TPS1 and TPS2 with SPCO relay max. 6A for NPN- or PNP-sensor connection**
- **UPS24 uninterruptible power supply with battery-pack**
- **LED indicators for power supply and relay**
- **22.5mm, 45mm or 67.5mm DIN rail mount housing**

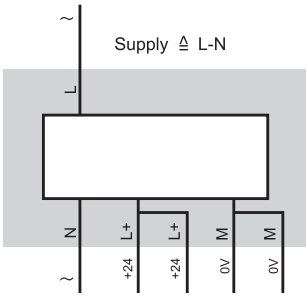
TPS1



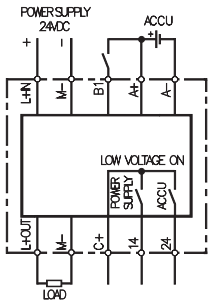
TPS2



TPS3/ TPS4



UPS24



specification

output voltage	24V=
TPS1 + TPS2	100mA cont. 150mA < 10s
TPS3 + TPS4	300mA cont. 400mA < 5min
supply voltage	nominal voltage +6% / -10%
frequency range	48 - 63 Hz
duty cycle	100%
relay specification	max. 6A 230V~
Ue/Ie AC-15	120V/4A 240V/3A
Ue/Ie DC-13	24V/2A
expected life time	SPCO
mechanical	2 x 10^7 operations
electrical	1 x 10^5 operations
screws	pozidrive 1
screw tightening torque	0,6..0,8Nm
operating conditions	-20 to +60°C non condensing

* EN 60947-5-1 VDE 0435

ordering information

part no	supply		output		relay	cULus	housing types
TPS1	230V~	3,2VA	24V=	100mA	SPCO/NPN	-	C
TPS2	230V~	3,2VA	24V=	100mA	SPCO/PNP	-	C
TPS3	230V~	10VA	24V=	300mA	-	-	E
TPS4	115V~	10VA	24V=	300mA	-	-	E
UPS24	24V=	2W		0,2A	thyristor	-	B
Akku-Pack	NiCd, 24V, 110mAh					-	

power supply & uninterruptible power supply

HIQUEL® HIGH QUALITY ELECTRONICS