
K/P1
CIRCUTOR
Test
ALARMA
FOTOCELULA
POWER
Reset
Test
Mode
Select
Comm
Cpu
Prog
CDR-8

P.3/5

Protection relays and transformers

Protection relays and transformers

CIRCUTOR offers a range of protection relays for different and specific applications. Many of these products have been designed in compliance with the corresponding specifications, always catering for the needs of our clients.

Our range of products includes simple relays that are very easy to use, such as current relays, or even protection relays used to assemble cells in substations.

We can highlight the following applications in this section:

- Beacon control relays
- Current control relays
- Harmonics relays
- Overload protection relays for substations.

There is also a full range of current transformers, the **TRP** and **TRM** Series, encapsulated in resin, used in measurement and/or protection applications. Transformers with other power, ratio, accuracy, class, dimensional, etc. features, different from those described in the following sections can be manufactured on demand. This range of transformers expands the offer of current transformers described in the Measurement section.

P. 3/5

Protection transformers

Selection table of the type of transformer, in accordance with the list of transformers between the nominal current of the primary (I_p) and secondary (I_s)

	MEASUREMENT							PROTECTION						
5 000/5							TRM 180						TRP 180
4 000/5						TRM 140						TRP 140	
-													
3 000/5					TRM 100						TRP 100		
2 500/5				TRM 80									
2 000/5								TRP 400					
1 500/5			TRM 60							TRP 80			
1 000/5									TRP 60				
-													
800/5		TRM 40											
750/5													
700/5													
600/5													
500/5								TRP 40					
400/5	TRM 30												
-													
300/5													
250/5													
200/5													
-													
150/5													
125/5													
100/5													
-													
75/5													

CIRCUTOR offers a complete range of current transformers encapsulated in resin. One of the advantages of this type of transformers is that they increase the degree of robustness (high mechanical resistance, high electrical rigidity, tropicalization, etc.). In addition, this range fully prevents the manipulation of the transformer's core.

There are two types of transformers:

- **TRM**: Measurement transformers encapsulated in resin
- **TRP**: Protection transformers encapsulated in resin.

Features	
Primary current	75 ... 5000 A
Secondary current	5 A (1 A on demand)
Frequency	50 ... 60 Hz
Insulation voltage	3 kV
Highest operating voltage	0.72 kVac
Thermal class	B
Thermal short-circuit current	I_{th} = 60 I_n
Dynamic current	I_{dyn} = 2.5 I_{th}
Secondary terminals	Sealable
Indoor	Installation
Standards	
IEC 60044-1, UNE-EN 60044-1	



Selection

You must know the following before choosing the adequate transformer (measurement or protection):

- The application (measurement or protection)
- Features of the work environment or operating conditions (indoors or outdoors, maximum operating temperature, etc.)
- The features of the line where it will be installed:
  - Cable or plate dimensions
  - Measurement margin of the current being measured (maximum and minimum)
  - Overload (range and time)
  - Grid voltage (low, medium or high)
  - Short-circuit current
  - Grid frequency
- Features of the associated instrument or relay (accuracy, nominal current, consumption, etc.)
- Distance between the transformer and instrument, as well as the section of the cable used for the connection

Power of the transformer

This is an important parameter. In the transformer, the primary current must induce the necessary power in the secondary current in order to transmit it to

the measurement unit. Induced power must be equal to or more than the line losses plus the power consumed by the measurement equipment.

Line losses, P_L:

Power losses due to the transmission of current through the cabling resistor R_L of the secondary cabling circuit of the transformer.

Factors that must be taken into account:

- Secondary current. $P_L = R_L \cdot I^2$
- Cable diameter. R_L is inversely proportional to the diameter square
- Cable length. R_L is proportional to the cabling length (both ways)

Precision power:

Is the apparent nominal power (V·A), with a specific power factor, which the current transformer transmits to the secondary circuit with the current assigned when it is connected with its nominal load, $S(V \cdot A) = Z_s \cdot I_s^2$

In accordance with the regulations, the inductive power factor is 0.8 for an apparent power that is equal to or greater than 5 V·A. The power factor for smaller apparent power values is the unit.

Accuracy of a transformer

The type of error in the transformer is established by the IEC 44-1. 25% in measurement transformers and at 100% of the nominal power. In the case of protection transformers, only at 100% of the nominal power.

The transformer's response to saturation

A current transformer will become saturated when its primary current or load are above the nominal values. The linearity of the current transformation between the primary and secondary decreases, so that the error can be quite high. The saturation of the transformer is inversely proportional to the load, as shown on the following figure. (Fig 1)

The difference between current transformers used for measurement or protection purposes is the behaviour in the event of an overload in the primary.

In the case of measurement transformers, they are saturated by overloads in order to make sure that the equipment is not damaged from the secondary. In the case of protection transformers, they are not saturated until they reach a very high current.

A class **5P15** protection transformer will not become saturated until the nominal current passes 15 times through the primary.

The transformers used for the measurement of the **Safety Factor (FS)** parameter show the number of primary current transmissions the transformer is capable of transferring to the measurement equipment.

TYPE		5P	10P
± % Error for % I_n		± 1	± 3
Offset ± for % I_n	Minutes	± 60	---
	Centiradians	± 1,8	---
Compound error		5	10

In the case of protection transformers

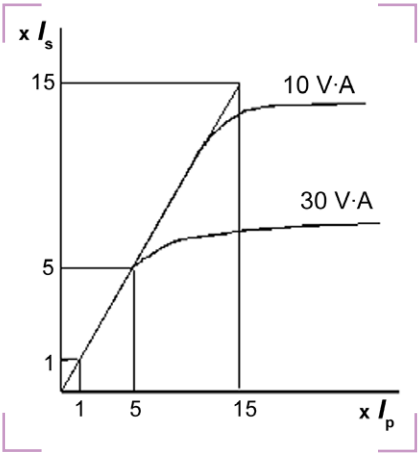
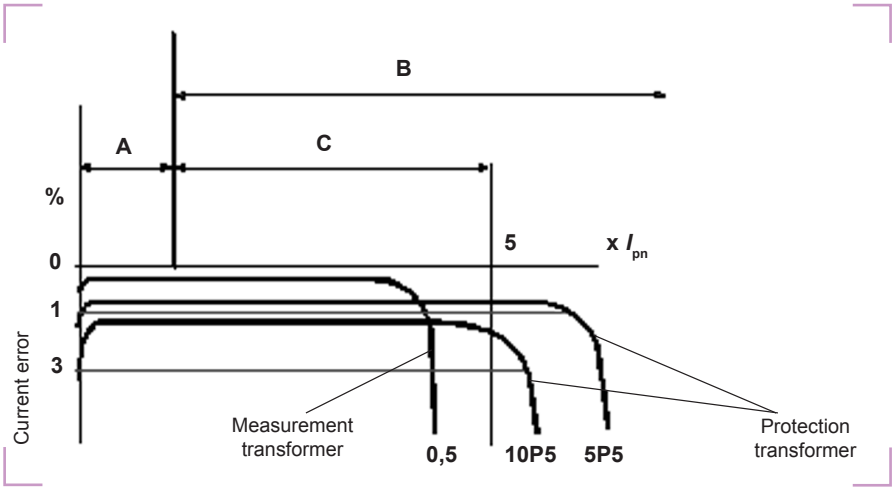


***Fig. 1**. Curve of the V·A measurement transformer*

***A:** Nominal current zone*
***B:** Overload zone for protection transformers*
***C:** Maximum overload zone for measurement transformers FS < 5*



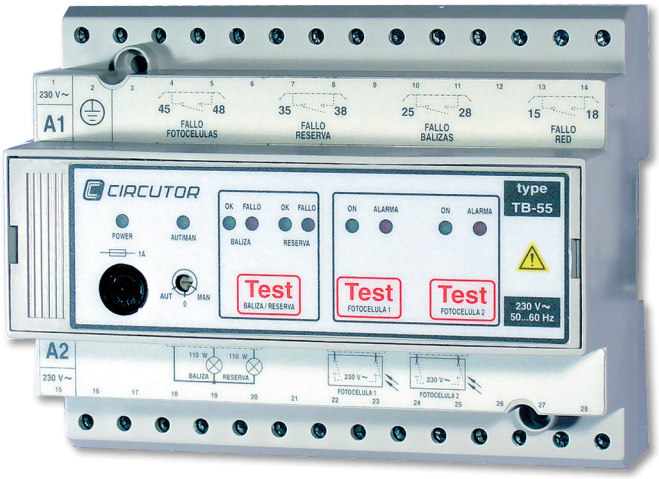
Class curves

Product selection table

	Equipment	Sub-division	Application	Page
TB		P3	Beacon control equipment	7
TB-3		P3	Beacon control equipment	9
RV		P3		
WDH		P3	Harmonics relay	13
WI		P3	Current relay	11
CDR-8		P3	Earth leakage current station	15
MPRB		P4	Transformer overload protection relays	17
TRP		P5	Protection and measurement transformer	21
TRM		P5	Measurement transformers	25

TB

Beacon control relays



Description

The **TB** type Beacon control system is in charge of the supervision, control and indication of anomalies detected in the different Beacon components of the telephony transmission towers.

TB / **TB-55** Features:

- Control and measurement of the consumption of the two sets of independent ballasts(230 Vac power supply): the main circuit and the reserve circuit. The reserve circuit is connected when there is a fault in the main circuit or when a lamp goes out.
- Control inputs of the two twilight photocells on the tower. When the light level is under the threshold, an internal contact is closed (applying a 230 Vac voltage at the input of the photocell of the **TB**), and the ballasts will be connected. Said photocells are not supplied with the equipment and can be purchased separately.
- Alarms indicated with LEDs on the front of the unit.
- Alarm signalling relay outputs

Application

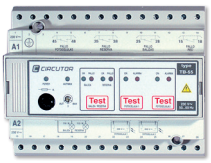
Designed to control and supervise the night ballasts on metallic antennae support structures, with a dual Beacon circuit (main and reserve), and to supervise the operation of the dual photocell circuit. Said ballasts will start operating when the level of lighting is below a determined threshold, detected by twilight cells.

Features

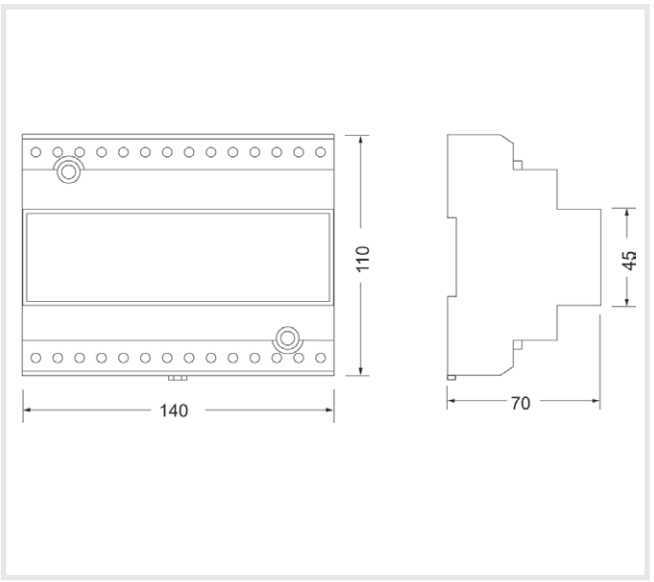
Power circuit:	
Voltage	Single phase 230 Vac (± 25 %)
Frequency	50 ... 60 Hz
Consumption of the unit	5 V·A
Consumption of the unit + Ballasts	305 W
Ballasts	
Maximum number of ballasts (limited by power)	**TB-55**: 110 W main circuit + 110W reserve Example: Two 55 W ballasts or five 22 W ballasts per circuit **TB**: 150 W main circuit + 150W reserve Example: Two 75 W ballasts per circuit
Photocell input	
Number of inputs	2
Type of input	230 Vac ± 20%
Output relay features (alarm)	
Insulation voltage (U_i)	250 Vac / 30 Vdc
Thermal current I_{th}	5 A
Maximum switching voltage	1250 VA
Mechanical working life	1 x 10^5 operations
Electrical working life	1 x 10^5 operations
Build features:	
Type of box	Modular, self-extinguishing plastic material
Connection	Metallic terminals for "posidriv" screws
Fixing	DIN Rail 46277 (EN 50022) Optional fixing with screws (fixing drill hole Ø 4.2 mm)
Dimensions	8 modules (140 x 70 x 110) in accordance with DIN 43880
Degree of protection	Embedded relay : IP 41 / Terminals : IP 20
Safety	Category II, EN 61010
Ambient conditions	
Operating temperature	-5 ... +55 ºC
Standards	
IEC 60255-5, EN 61010, EN 60664, EN 61000	

TB

Beacon control relays



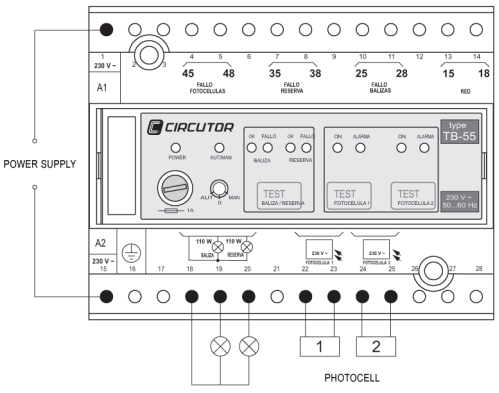
Dimensions



References

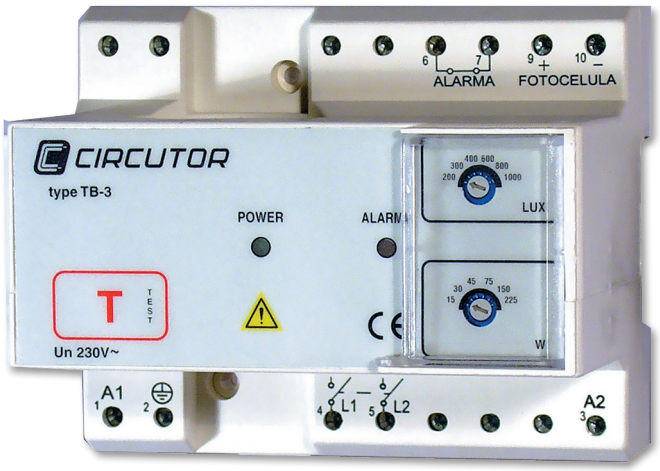
Description	Type	Code
Ballasts 110 W (2 x 55 W) Control of 2 circuits: Main (Beacon) and reserve4 fault alarm relays: Grid voltage, photocell, main and reserve circuit (The photocell is not included)	**TB-55**	**P30101**
Ballasts 150 W (2 x 75 W) Control of 2 circuits: Main (Beacon) and reserve4 fault alarm relays: Grid voltage, photocell, main and reserve circuit (The photocell is not included)	**TB**	**P30104**

Connections



TB-3

Beacon control relays



Description

The **TB-3** type Beacon control system is in charge of the supervision, control and transmission of anomalies detected in the different Beacon components of the telephony transmission towers.

TB-3 Features:

- Start-up control and measurement of the consumption of a single Beacon circuit: group of 1, 2 or 3 75W/230V or 15W/230Vac lamps.
- Inputs for a twilight photocell. The photocell will be supplied with the unit and is connected with the corresponding terminals (+ and - inputs of the photocell).
- Adjustments of the **TB-3**
  - Power of the 15 to 225 W lamp circuit.
  - Light level between 200 and 1000 lux.
- Relay output used to signal alarms.

Application

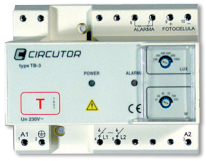
Simple unit used to control and supervise a simple Beacon circuit, in addition to the supervision of the photocell's operation.

Features

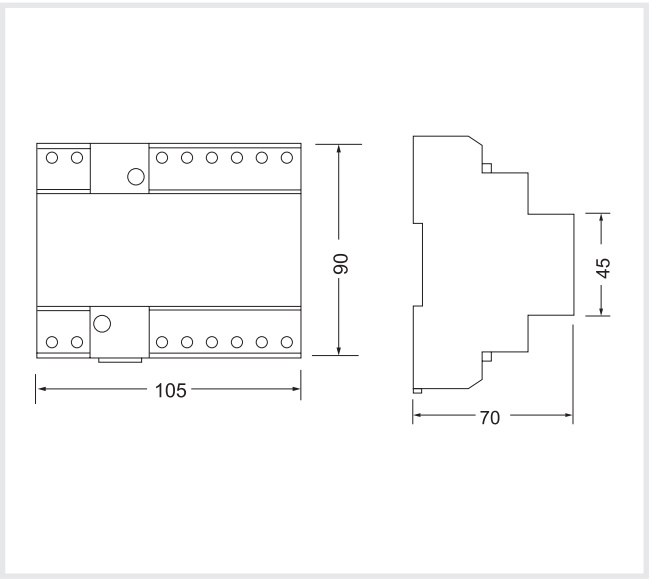
Power supply circuit	
Voltage (A1-A2)	230 Vac (± 20 %)
Frequency	50 ... 60 Hz
Consumption of the unit	5 V·A
Consumption of lamps	225 W maximum
Beacon lamps	
Power ratings	15, 30, 45, 75, 150, 225 W
Accuracy	± 10 %
Type of measurement	True root mean square
Light level	
Scales	200, 300, 400, 600, 800, 1000 lx
Accuracy	± 10 %
Inputs and outputs	
Photocell input	Photocell (+) (-)
Beacon lamp outputs	Power supply: 230 Vac (± 20 %)
Alarm relay output	Nominal switching current: 0.5 Aac Nominal switching voltage: 200 VacInsulation voltage between the coil and contacts: 2500 Vac
Insulation	
Dielectric rigidity (between the housing and terminals)	2500 Vac, 50 Hz, 1 min
Build features	
Type of box	Modular, self-extinguishing plastic material
Connection	Metallic terminals for "posidriv" screws
Fixing	DIN rail
Dimensions	6 modules
Degree of protection	Embedded relay : IP 41; Terminals: IP 20
Ambient conditions	
Operating temperature	-10 ... +50 ºC
Standards	
IEC 255-5, UNE 801-2, UNE 801-3, UNE 801-4, UNE 60730-1	

TB-3

Beacon control relays



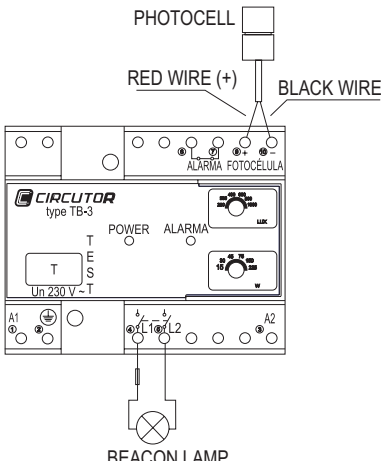
Dimensions



References

Description	Type	Code
Power can be programmed between 15 ... 225 W Control of 1 circuit (Beacon)Control of the light level with the photocell supplied with the unit. 1 alarm relay to detect faults in the circuit or photocell	**TB-3**	**P30102**

Connections



RV-M / RV-T / RV-TS

Voltage detector control relay

Description

Electronic relay for protection and continuous voltage monitoring.

- Protection against voltage surges, triggers at voltages higher than 265 V. Trigger time according to the voltage value less than or equal to:
  - 300 V triggers after 3 s
  - 350 V triggers after 800 ms
  - 400 V triggers after 200 ms
- Protection against voltage drop, triggers at voltages less than 160 V. Fixed trigger time of 300 ms.
- Error in phase sequence (incorrect phase connection order for **RV-T.** Fixed trigger time 1 s.
- The **RV-TS** type does not include phase sequence monitoring.
- Activation by external input (TRIGGER). Trigger time less than or equal to 10 ms.
- Indication LEDs for power supply and voltage error.

Application

The **RV** relay range has been designed to provide protection from disruption to the neutral connection of electrical installations by measuring voltages between phase in neutral. It may be applied to both single phase (type **RV-M**) and three-phase installations **RV-T** / **RV-TS**).

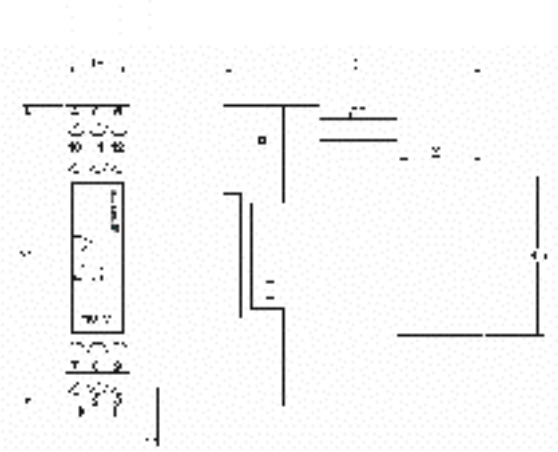
These voltage monitoring relays detect, according to the type used, incorrect phase sequence, phase loss, as well as voltage surges and drops in a single module size unit suitable for both industrial and modular cabinets. Measurement using true root mean square

Features

Operation	
Voltage measurement	True root mean square (TRMS)
Relay triggering event	• Voltage surge, values above 265 V • Voltage drop, values less than 165 V • Phase sequence error • External input
Trigger time	• Voltage surge, between 200 ms and 3 s, according to voltage. • Voltage drop, 300 ms • Phase sequence error, 1 second • External input, less than 10 ms.
Output relays	• Transistor output, 24 Vcc • Switched NO/NC contact output
Associated circuit breaker	Contactor or automatic circuit breaker using a coil
Remote Control	NC voltage input, free of voltage
LED indicator	• Power, power supply okay (led green) • Disconnection due to relay trigger
Features	
Operation voltage	150 ... 500 V ac between phase in neutral. 50/60 Hz
Output contacts	250 Vac , 5 A
Operating temperature	- 20 ... + 65 ºC
Protection level	Installation category III
Build features	
Fixing	DIN Rail 46722 (EN 50022)
Dimensions	1 module (18x85x73 mm)
Weight	71 g
Degree of protection	IP 20
Standards	
60947IEC 60755-2, IEC 62020, IEC 61008	

RV-M / RV-T / RV-TS
Voltage detector control relay

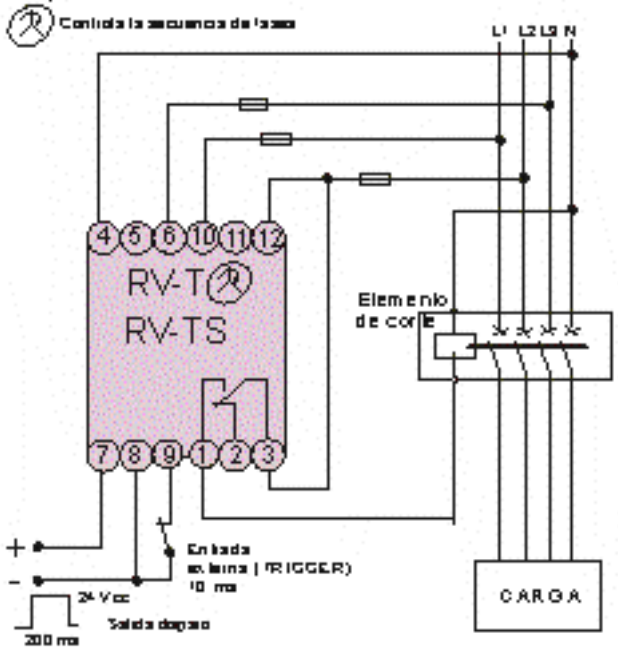
Dimensions



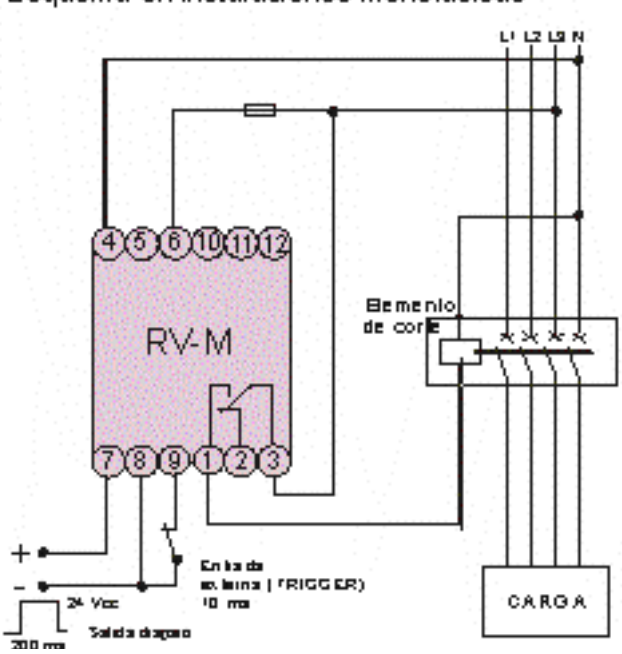
Applicable installation	Voltage surge	Voltage drop	Phase sequence	Type	Code
single phase	X	X		RV-M	P30701
three-phase (4 wire)	X	X	X	RV-T	P30702
three-phase (4 wire)	X	X		RV-TS	P30704

Connections

Esquema en instalaciones trifásicas con neutro



Esquema en instalaciones monofásicas



WI

Current detector control relay

Description

The **WI** current detectors are electronic devices with an output relay that is connected or disconnected, in accordance with the level of current detected in the circuit.

- The trip level is adjusted with the potentiometer on the front of the unit.
- The reset process is automatic with currents under 10% of the trip level (Hysteresis).
- Delay: the connection and disconnection times of the output relay can be adjusted separately.
- Measurement of the current, depending on the type:
  - With built-in current transformer (net diameter ∅ 25 mm)
  - Separate transformer, input.../5 Aac

Application

WIs can be used in any application that needs to control the load:

- Power supply units for grinders or aggregate grinding units.
- Loads in extrusion machines
- Pump control
- Load on motors, etc.

Features

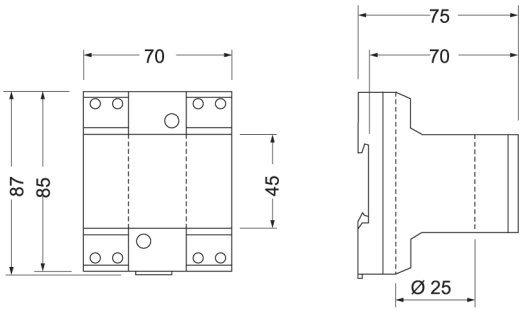
Power supply circuit	
Voltage*	230 Vac (-15 ... +10 %)
Frequency*	50 Hz
Consumption	2 VA
Testing voltages between the circuits and the grid	
Measurement circuit	2,500 V
Relay contacts	1,500 V
Output relay	
Insulation voltage (U_i)	250 Vac
Thermal current I_{th}	5 A
Interrupting power	(10^5 operations) with resistive load U_e/I_e: 240 Vac / 3.2 A with inductive load U_e/I_e: 240 Vac / 0.8 A 30 Vdc / 1.6 A
Build features	
Fixing	DIN rail
Dimensions	4 modules
Weight	250 g
Degree of protection	IP 41
Operating temperature	0 ... +50 ° C
Standards	
IEC 605, IEC 1010-1, EN 61010-1, EN 50 081, EN 50 082, IEC 255, UL 94, UNE 20 607, UNE 21 136, VDE 0110	

(*) Other voltages and frequencies on demand.

WI

Current detector control relay

Dimensions

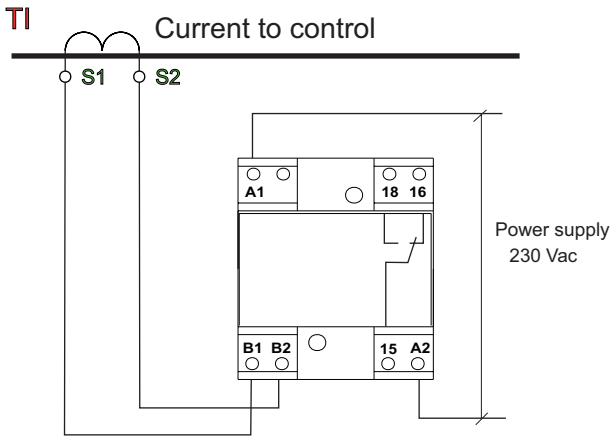


References

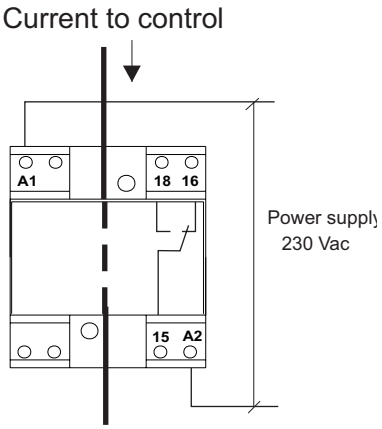
Trigger time (adjustable)	Adjustment margin (adjustable)	Type	Code
0.5 ... 30 s	0.5 ... 5 A	**WI / 005-30**	**P32011**
0.5 ... 30 s	1 ... 10 A	**WI / 010-30**	**P32012**
0.5 ... 30 s	2 ... 20 A	**WI / 020-30**	**P32013**
0.5 ... 30 s	5 ... 50 A	**WI / 050-30**	**P32014**
0.5 ... 30 s	10 ... 100 A	**WI / 0100-30**	**P32015**
0.5 ... 30 s	s / transformer ... / 5 A	**WI / TS**	**P32010**

Connections

With separate transformer

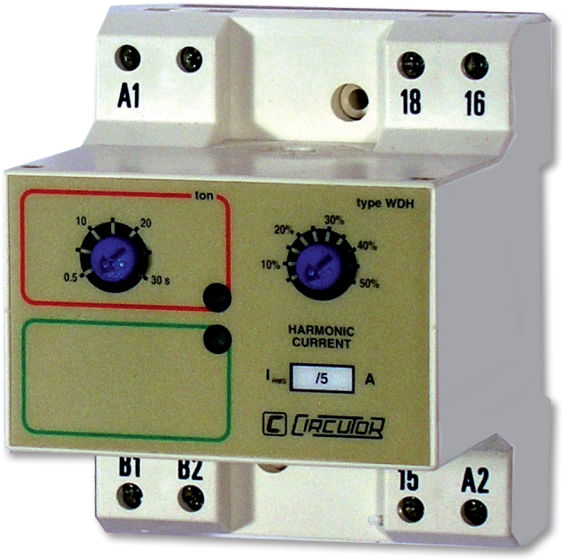


With built-in transformer



WDH

Harmonics detector control relay



Description

WDH harmonics detectors are electronic devices with an output relay that is connected when the harmonics current level measured in the circuit exceeds a threshold that can be adjusted.

- It monitors and acts in accordance with the true root mean square of the total harmonic current in a phase. The trigger level is adjusted with the potentiometer on the front of the unit.
- Delay: the output relay activation time can be adjusted (up to 30 s).
- The reset process is automatic with currents under 10% of the trip level (Hysteresis).
- Current measurement, depending on the type:
  - With built-in current transformer (net diameter ∅ 25 mm)
  - Separate transformer, input.../5 Aac

Application

The **WDH** current detectors are mainly used to protect transformers, capacitor banks, etc. In general, any receiver subject to harmonic overloads

Features

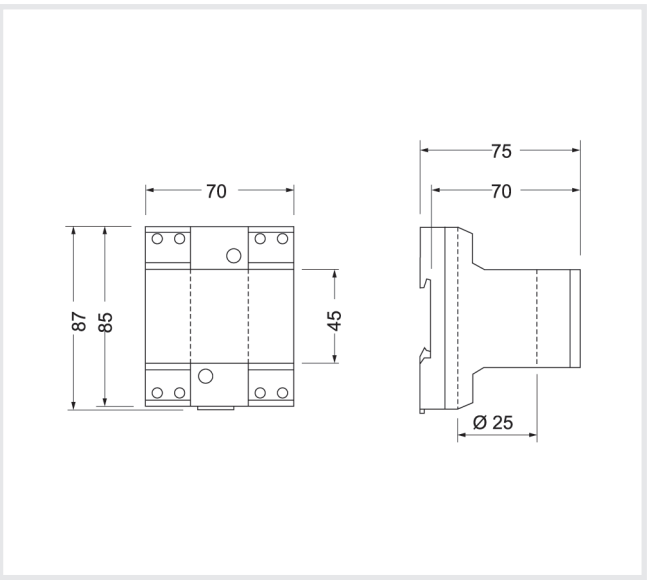
Power supply circuit	
Voltage*	230 Vac (-15 ... +10 %)
Frequency*	50 Hz
Consumption	2 VA
Testing voltages between the circuits and the grid	
Measurement circuit	2,500 V
Relay contacts	1,500 V
Output relay	
Insulation voltage (U_i)	250 Vac
Thermal current I_{th}	5 A
Interrupting power	(10^5 operations) with resistive load U_e/I_e: 240 Vac / 3.2 A with inductive load U_e/I_e: 240 Vac / 0.8 A 30 Vdc / 1.6 A
Build features	
Fixing	DIN rail
Dimensions	4 modules
Weight	250 g
Degree of protection	IP 41
Operating temperature	0 ... +50 ° C
Standards	
IEC 605, IEC 1010-1, EN 61010-1, EN 50 081, EN 50 082, IEC 255, UL 94, UNE 20 607, UNE 21 136, VDE 0110	

(*) Other voltages and frequencies on demand.

WDH

Harmonics detector control relay

Dimensions

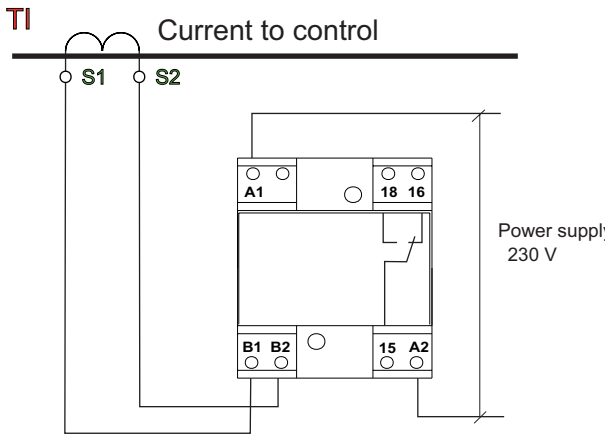


References

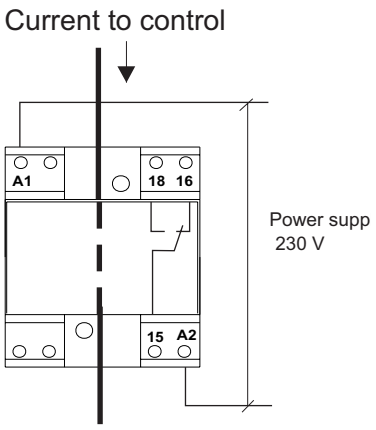
Trigger time (adjustable)	Nominal current I_n	Type	Code
0.5 ... 30 s	10 A	**WDH / 010-30**	**P32022**
0.5 ... 30 s	20 A	**WDH / 020-30**	**P32023**
0.5 ... 30 s	50 A	**WDH / 050-30**	**P32024**
0.5 ... 30 s	s / transformer ... / 5 A	**WDH / TS**	**P32020**

Connections

With separate transformer

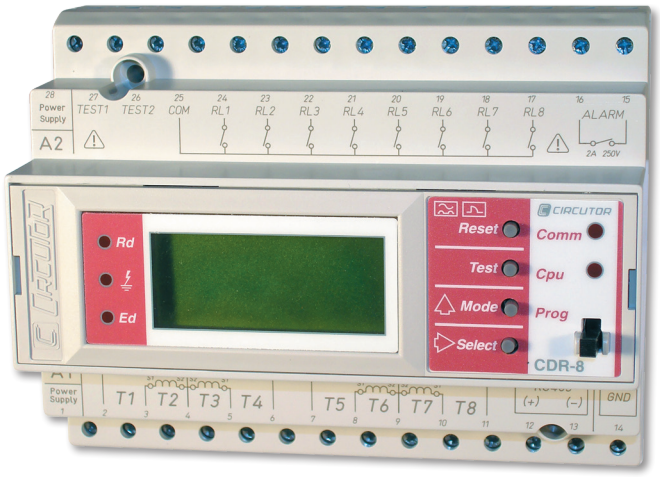


With built-in transformer



CDR-8

Current relay station



Description

The **CDR-8** unit measures, calculates and displays the current of 8 independent channels. Each channel can be configured as an earth leakage or current relay. It measures the true root mean square, taking decisions about the operations being carried out. It can work as a maximum or minimum current relay or as an earth leakage relay.

The **CDR-8** can show the earth leakage current and status of the operations relay of each of the 8 channels on an LCD display.

Application

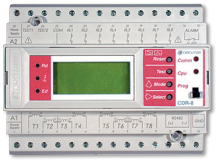
This unit can be used to measure and control the current of up to 8 lines, with a set of reduced dimensions

Features

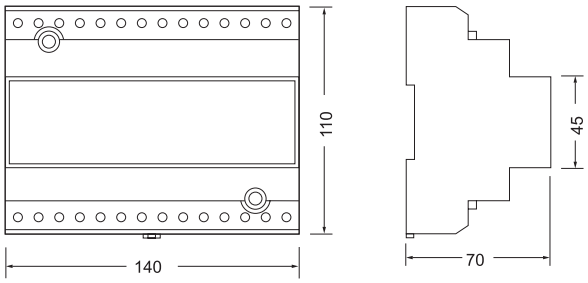
Power supply	
Auxiliary power supply	230 Vac (-15 ... +20 %)
Output contacts	Configurable contact NO/NC 250 Vac, 5 A
Number of channels	8
Class in earth leakage mode	A (superimmunized)
Measurement	True root mean square. Accuracy: 5 %
Current threshold / Sensitivity	With transformer, **WG** Series: Programmable 0.03...6 A With transformer, **WGP** Series: Programmable 0.3..0.60 A
Delay	Inverse curve: instantaneous or selective Time defined: 0,1 ... 10 s
Earth leakage transformer	External, **WG/WGP**
Test and Reset	With keys
Associated circuit breaker	Minimum coil or emission trip
Automatic reclosing	
Number of earth leakage reclosures	Programmable: 0 ... 10
Time between reclosures	Programmable: 1 ... 900 s
Partial counter reset time	Double the reclosing time
Relay signaling	
LED	Trip LED, permanent: Protection trigger Trip LED, flashing: Pre-alarm CPU LED: Indicates the presence of voltage Ed LED: Interlocked earth leakage reclosing Rd LED: Self-reclosing enabled Comm LED: Relay communications through RS-485
Display	Indicator of the level of current in each channel Indicator of the status of each channel (ON-OFF)
Remote signaling (Outputs)	
Contacts	Configurable output NO/NC for the pre-alarm indicator
Communications	RS-485. *PowerStudio* supervision and remote control **Software**
Circuit breaker control	
Output contacts	Configurable contact NO/NC 250 Vac, 5 A
Ambient conditions	
Operating temperature	-10 ... +50 ºC
Build features	
Fixing	DIN rail
Dimensions	8 modules

CDR-8

Current relay station



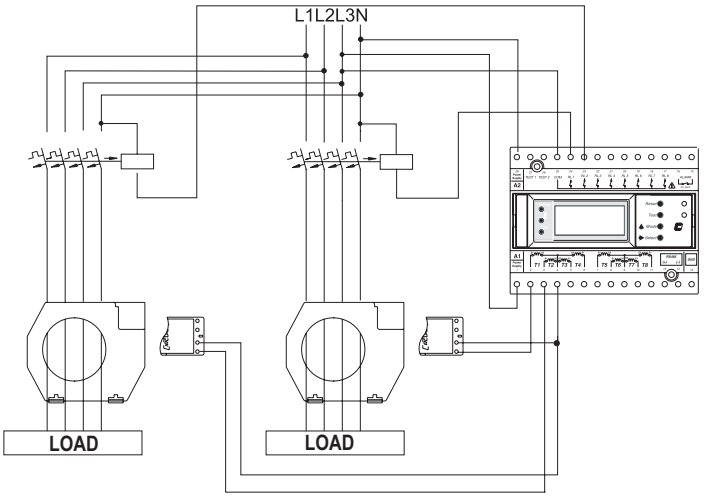
Dimensions



References

Size	Indicator	No. of reclosures	Time between reclosures	Type	Code
8 modules	LED and display	Prog.: 0 ... 10	Prog.: 1 ... 900 s	**CDR-8**	**P32111**

Connections



Relation between products and accessories

	WG	WGP
CDR-8 		
	Earth leakage transformers, **WG**	Earth leakage transformers, **WG**
	See P1	See P1

CIRCUTOR