BROYCE CONTROL

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ELR01PN & ELR30PN

Earth Leakage Relay (Type A) with NFC Technology

Data Sheet/Technical Information
English

Issue 3 – 02/2025

Contents

1. Key Features

- **Programmable user settings/adjustments**
- **Built-in NFC (Near Field Communication) allows user to access and change settings via compatible Smartphone/Device with installed app^ as well as retrieve historical data**
- **Two models available 6mA – 1A (ELR01PN) and 30mA – 30A (ELR30PN)**
- **True R.M.S. measurements**
- **Option to select alternative toroid ratio, tripping method (latch or auto-reclosure modes), Output relay logic (pre-alarm, energise or de-energise on trip) and filter cut-off points**
- **Connection facility for remote "Test" and "Reset" push buttons or N.O. contacts**
- **Toroid open and short-circuit detection forces unit to trip (Red LED flashes during this condition)**
- **2 Relay outputs – Relay 1 (SPDT) and Relay 2 (SPNO) - User configurable**
- **Wide auxiliary operating supply voltage - 24 – 230V AC/DC**
- **Compliant with IEC 60947-2 / Annex M**
- **UL Listed**

2. Overview

The ELR…PN is a fully featured, Earth Leakage Relay that can be easily configured using the built-in pre-defined "Profiles" or tailored specifically to suit the application. The app^ allows the user to define how the unit should operate (see Function diagrams on the next page) as well as configure and set parameters such as the toroid ratio, relay logic (i.e. energise or de-energise on trip) and define how the Auto-Reclosure mode should operate. Additionally, the option to set a filter cut-off point can also be defined therefore allowing the unit to ignore signals above a certain frequency.

Utilising NFC technology allows the unit to be used in a "Passive" mode whereby settings can be made in the app and written to the unit without the need for the unit to be powered. This feature is useful where a panel needs to be shut down and power removed (for safety reasons) before any work or alterations need to be made. Using the app, the user also has the ability to read back the configuration of a unit in order to establish/check the settings. Additionally, it is possible to measure (and display) the actual leakage current present in the system.

An option to recall previous tripping information (accessed via the Logs option in the app) provides the user with historical data allowing the user to establish a pattern in the tripping occurrence's and hence make any necessary adjustments.

^ App available from:

GET IT ON Google Play

3. Function Diagrams

The following operational modes are either factory default or enabled using the app.

3.1 Latching Mode (Factory default)

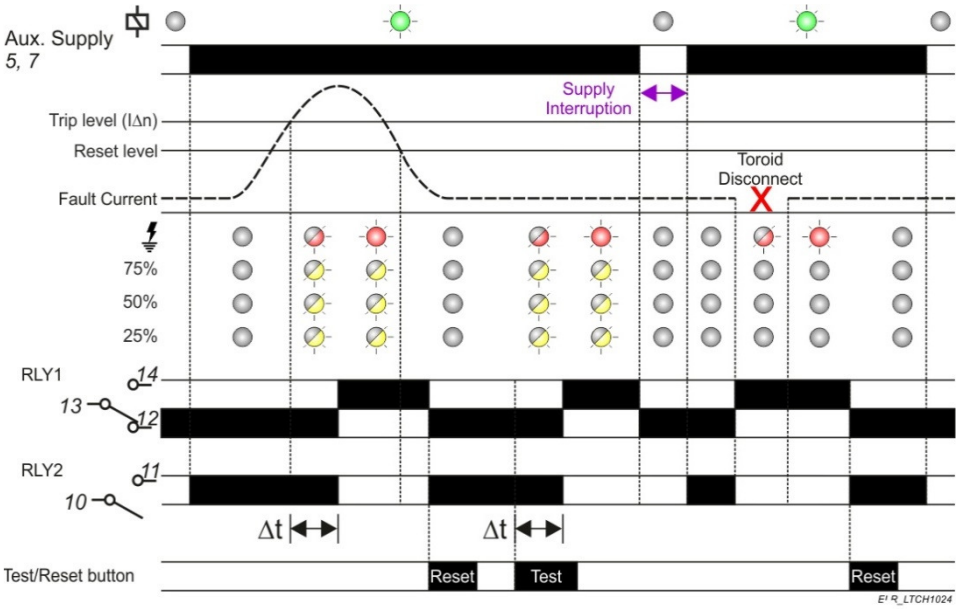


Fig. 1

3.2 Auto-reset Mode (Enabled via app)

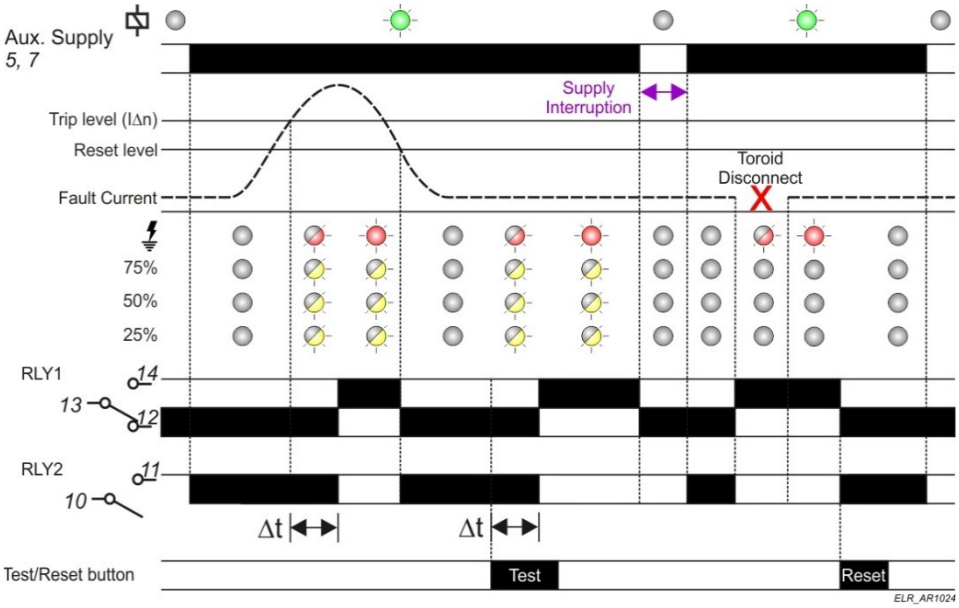


Fig. 2

3.3 Auto-reclosure Mode (Enabled via app)

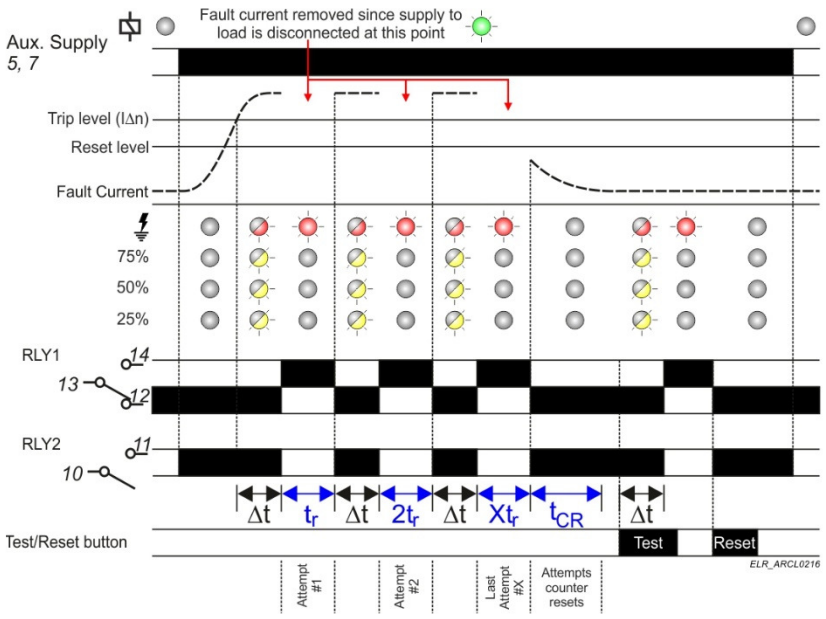


Fig. 3

3.4 Pre-Alarm Mode (Enabled via app)

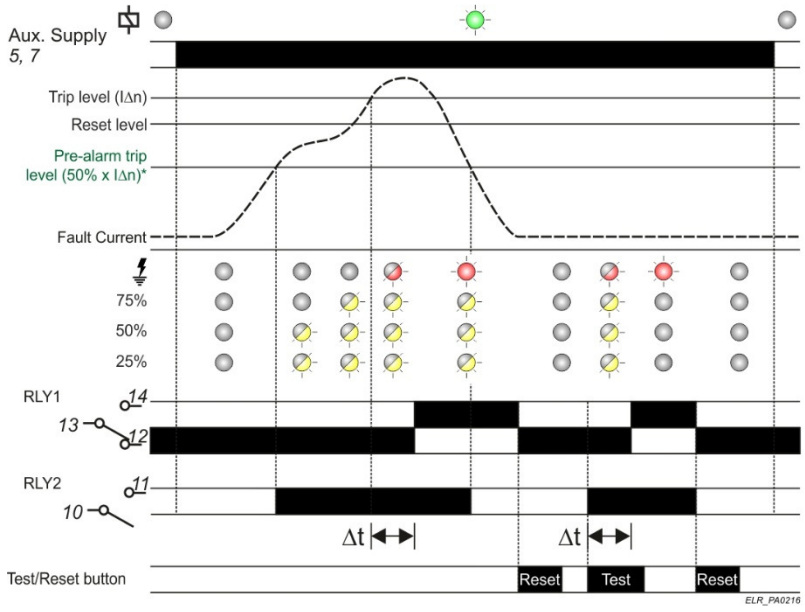


Fig. 4

Note: relays are shown operating in their factory default states i.e. RLY1 = Standard Output and RLY2 = Positive Safety Output (Pre-Alarm default states are RLY1 and RLY2 = Standard Output)

LED legend

Off On Flashing

4. LED & Relay Status

System status	Green LED	Yellow LEDs	Red LED	RLY 1 (S.O.) **	RLY 2 (P.S.O.) **
Normal operation (IΔ = 0)	On	Off	Off	DE-EN	EN
Fault condition during Dt (IΔ > IΔn)	On	Flashing	Flashing	DE-EN	EN
Fault condition after Dt (IΔ > IΔn) [1]	On	Off	On	EN	DE-EN
"Reset" button pressed (IΔ = 0) [1]	On	Off	Off	DE-EN	EN
"Test" button pressed (IΔ = 0) [1]	On	Off	Off	DE-EN	EN
Toroid disconnected	On	Off	Flashing	EN	DE-EN
Toroid re-connected	On	Off	On	EN	DE-EN
NFC communication error	Flashing*	Off	Off	DE-EN	EN

* Flash rate 2 or 4Hz depending on error
** Factory default assignment of relays
[1] Assumes fault current removed

Key to relay abbreviations:
EN = Relay Energised
DE-EN = Relay De-Energised

5. Installation

Installation work must be carried out by qualified personnel.

- BEFORE INSTALLATION, **ENSURE ALL SUPPLIES ARE ISOLATED.**
- Connect the unit as shown in the diagram below on the next page (N.B. certain features may not be required and therefore do not need to be connected).
- Ensure the Auxiliary supply voltage to be connected to terminals 5 and 7 matches the rating of the product.
- A suitably rated fuse should be installed in series with connection to terminal 5 (A1) to protect the unit. See Technical specification for further information.
- Refer to separate data sheet for installation advice regarding the externally connected toroid.

5.1 Installation in accordance with UL

When designing/installing this product into a UL approved installation, the following information should be followed.

This product has been classified as "Open type" Auxiliary Devices. Ratings given must not be exceeded when the product is in use.

Ratings in accordance with UL 508	
Aux. supply fuse type and rating:	UL 248 Listed 1.25A Time Delay (See section 10 - Connection Diagram)
Relay load (RLY1/RLY2):	General Use or Resistive
Temperature rating:	60°C (*140°F)*
Wiring terminal connections:	See section 10 - Connection Diagram
Terminal tightening torque:	0.4 in-lb
Terminal temperature rating:	75°C
Field wiring type:	Copper 24 – 12 AWG
Compatible current transformers:	See section 9 - Technical specification (Toroid Options)

6. App

Video available showing how to make setting adjustments to the unit using the app. Click the link below.

WATCH VIDEO

To utilise the full features, the app must be downloaded and installed on to the device used to communicate with the unit.

This app can be obtained as follows:

- Visit https://play.google.com/store/apps and search for ELR-NFC
- Scan the QR code below. This will take you directly to the app

GET IT ON Google Play

Instructions on using the app to set the additional features can be found in the Help menu within the app itself.

Note

The unit will need to be power cycled if a new profile is uploaded to the unit.

7. Front Panel Description

1. IΔn Trip level selector
2. Δt Time delay selector
3. Power on LED indication (Green)
4. "Tripped" LED indication (Red)
5. Bargraph LED indication (Yellow)
6. Combined "Test/Reset" button

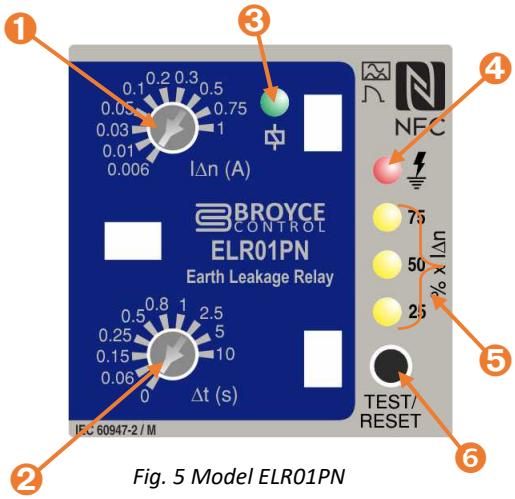


Fig. 5 Model ELR01PN

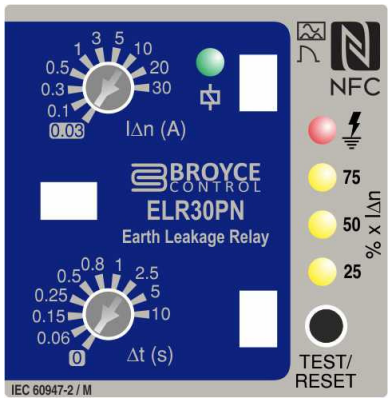


Fig. 6 Model ELR30PN

8. Operation

- The unit is supplied with factory default settings.
- It should be set according to the requirements of the application and the features required.

Applying Power.

- Apply power and the green “supply on” LED ❸ will illuminate.
- Assuming the relays are in their factory default state will operate as follows: The “positive safety output” (RLY2) relay will energise.
- The positive safety output relay will de-energise if:
  a, the fault current level exceeds the set trip level (IΔn) **
  b, there is a failure of the connection between the relay and the toroid ** (Note the red “tripped” LED ❹ will flash during this condition)
  c, the supply to the unit is removed
  ** causes the “standard output” relay (RLY1) to energise in response to the fault condition.
- Prior to the unit tripping, the LED bargraph ❺ will indicate the % of IΔn being detected (the display is scaled between 25, 50, and 75% of the actual trip level). After all 3 LED's have illuminated and the unit trips due to an excessive fault current, the red “tripped” LED ❹ will illuminate.
- After the fault has cleared, the unit will then continue to operate as follows depending on how initially setup:
  a, remain in the latched state
  b, automatically reset (if the fault current has cleared and auto-reset mode has been enabled)
  c, carry out the auto-reclosing function (if enabled)

Fault simulation (Test mode).

- The unit can be placed into a fault condition by pressing the “Test/Reset” button ❻ on the front of the unit (or by pressing the remote “Test” button - if fitted). The output relays operate accordingly. *Note, if the time delay (Δt) is set, the “Test” button must be held for this duration before tripping occurs.*
- Press the same “Test/Reset” button on the front of the unit (or remote “Reset” button - if fitted) to reset the unit. The output relays revert to their “non-tripped” state.
- The unit can also be reset by interrupting the power supply.
- To satisfy regulations, it is recommended that the device be tested periodically to ensure correct operation.

Troubleshooting.

- If the unit fails to operate correctly check that all wiring and connections are good. Also check that the externally connected toroid meets the requirements of the product.

Note:
The operating function of this unit is classed as a **Type A**  for which tripping is ensured for residual sinusoidal alternating currents and residual pulsating direct currents, whether applied suddenly or slowly rising. Additionally, this unit is protected against nuisance tripping ⎍. This unit will also satisfy the requirements for **Type AC** devices which only need to detect residual alternating currents.

9. Technical Specification

Auxiliary Power Supply (5, 7)		
Voltage rating (Us):	24 - 230V AC/DC	
1.25A (T) rated fuse should be installed in line with terminal A1		
Frequency range (AC supply):	50/60Hz	
Supply variation:	85 - 115% of Us	
Auxiliary supply is galvanically isolated from the Toroid and Remote Test/Reset connections		
Overvoltage category:	III (IEC 60664)	
Rated impulse withstand voltage:	4kV (1.2/50µS) IEC 60664	
Power consumption (max.):	AC: 6VA, DC: 5W	
Monitored input (via external Toroid connected to terminals 8 and 9)		
Unit classification:	Type A	
Measurement principle:	True R.M.S.	
Input DSP filter cut-off	150, 300 or 450Hz *(factory default = 150Hz)*	
External Toroid ratio:	Selectable between 600:1 and 1000:1 in 100:1 steps *(factory default = 1000:1)*	
Monitored leakage current range:	**ELR01PN**	**ELR30PN**
	1.5mA – 1A	7.5mA – 30A
User adjustments		
External Toroid ratio:	Selectable between 600:1 and 1000:1 in 100:1 steps *(factory default = 1000:1)*	
Monitored leakage current range:	**ELR01PN**	**ELR30PN**
Trip level settings (IΔn):	6mA, 10mA, 30mA, 50mA, 100mA, 200mA, 300mA, 500mA, 750mA, 1A	30mA, 100mA, 300mA, 500mA, 1A, 3A, 5A, 10A, 20A, 30A
Actual trip level:	85% of IΔn (+/- 5%)	
Rated residual non-operating current (IΔno):	<80% of IΔn	
Reset level:	≈ 85% tripped level	
Time delay (Non-operate) settings (Δt):	0[1], 60ms, 150ms, 250ms, 500ms, 800ms, 1s, 2.5s, 5s, 10s [1] *actual delay when set to 0 (instantaneous) is <25ms @ 5 x IΔn*	
Note: 1. For IΔn of 30mA or less (model dependant) the Time delay is fixed to 0 (instantaneous) and is not adjustable (i.e., any other delay cannot be set) 2. The unit is factory set to 30mA (or 6mA) (and instantaneous delay). Adjustment of these settings can be made if necessary, to suit the requirements of the installation. To prevent tampering of the settings, the clear window can be secured in place using a 2mm or 2.5mm wide cable tie (not supplied).		
Reset time:	<1s (from supply interruption)	
LED indication *(refer also to LED status table on page 6)*		
Power Supply	Green x1	*LED is usually permanently lit but will flash if no valid profile has been selected or there was a communication error with the smartphone*
Bargraph (25, 50, 75%)	Yellow x3	
Tripped	Red x 1	*LED flashes during a time out (i.e. before tripping) or if the external toroid is disconnected. LED will also flash prior to unit reclosing if "auto-reclosure" mode enabled.*

Manual Test and Reset		
	Front push button	**Remote N.O. push buttons**
"Test" method: *(assuming unit is in the non-tripped state)*	Press once to trip the unit	Press "Test" button to trip the unit (connected to terminals 2 and 3)
"Reset" method: *(assuming unit is in the tripped state and fault current cleared)*	Press once to reset the unit	Press "Reset" button to reset the unit (connected to terminals 1 and 2)
Minimum trigger time:	>Δt	>80ms + Δt setting (only applicable to remote "Test")

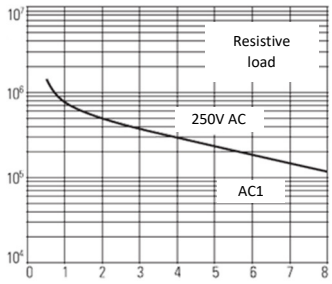
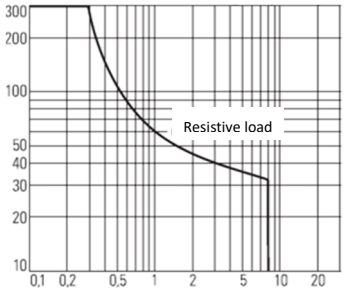
Auto-reset	
To enable:	Via app

Auto-reclosure	
To enable and adjust parameters:	Via app only
Reclosure attempts:	Selectable between 1 and 10 *(factory default = 6)*
Time between reclosure attempts (t_r):	t_r after first attempt which doubles after each attempt i.e. $2t_r$, $4\ t_r$, $8\ t_r$, etc. Options are: 1, 2.5, 5, 7.5 and 10s *(factory default = 7.5s)*
Timeout:	Selectable between 1 and 20mins *(factory default = 15mins)*

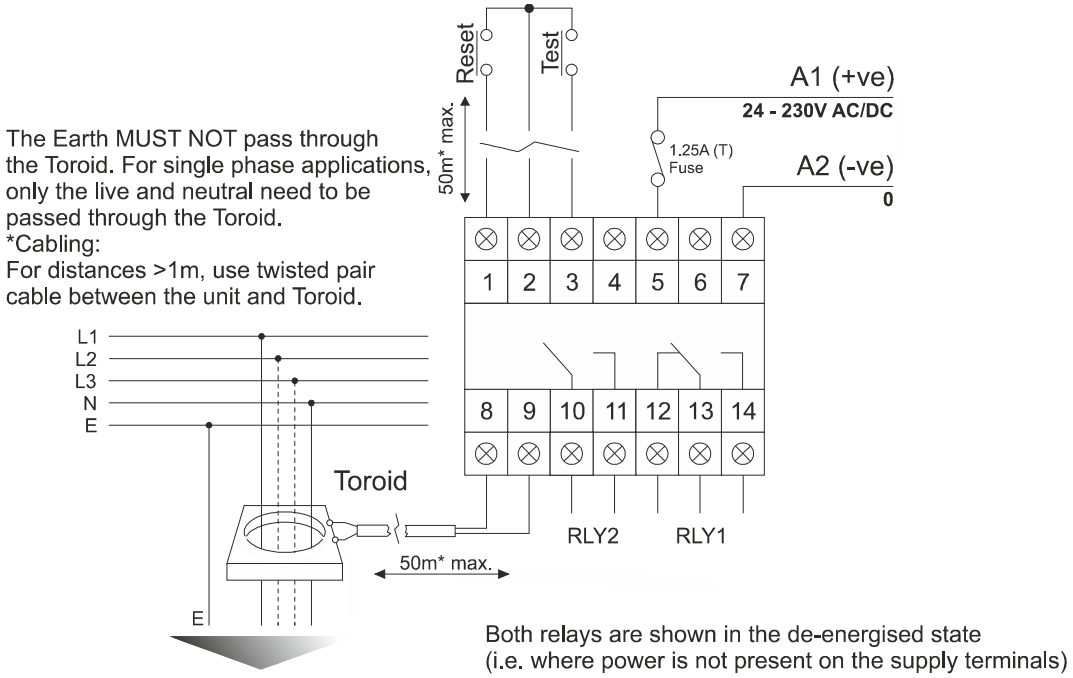
Relay operational mode *(assuming factory default settings used)*		
To change operation:	Via app only	
	RLY1	**RLY2**
Key (assuming non-tripped state): S.O. = Standard Output (relay is normally de-energised) P.S.O. = Positive Safety Output (relay is normally energised)	S.O. *(factory default)*	P.S.O. *(factory default)*
	S.O.	Pre-alarm*
	P.S.O.	P.S.O.
	S.O.	S.O.
	*Relay energises when Pre-alarm threshold is exceeded *(factory default = 50% of IΔn. Threshold can be changed via app)*	

Temperature rating	
Operating:	-20 to +60°C
Storage:	-30 to +70°C
Relative humidity:	+95% max.

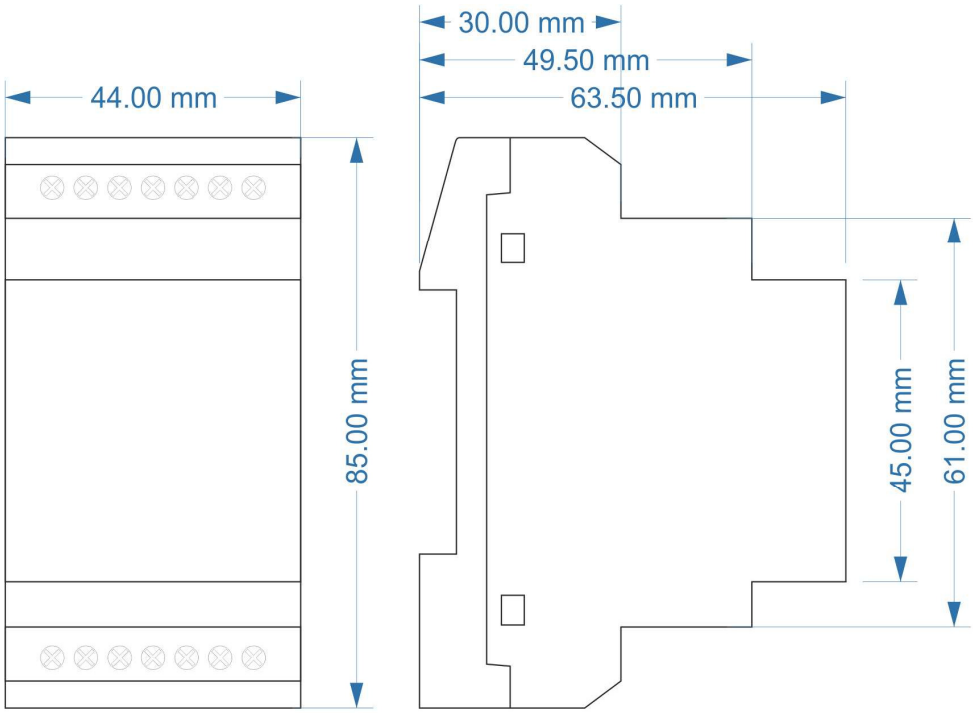
Output		
	Relay 1 (RLY1)	Relay 2 (RLY2)
Terminals:	**12, 13, 14**	**10, 11**
Contact arrangement:	1 x SPDT	1 x SPNO
AC1 (250V)	8A (2000VA)	8A (2000VA)
AC15 (250V)	2.5A	2.5A
DC1 (25V)	8A (200W)	8A (200W)

Output (continued)			
Electrical life:			
DC load capacity:			
Dielectric voltage:	2kV AC (rms) IEC 60947-1		
Rated impulse withstand voltage:	4kV (1.2/50µS) IEC 60664		
Housing			
Material:	Grey flame retardant Lexan UL94 V0		
Weight:	120g approx.		
Mounting option:	On to 35mm symmetric DIN rail to BS EN 60715		
Terminal conductor size			
Cable type:	Solid or stranded		
Nominal cross section:			
	0.2 – 4mm²	0.2 – 2.5mm²	0.2 – 2.5mm²
	30 – 12AWG	30 – 12AWG	30 – 12AWG
Stripping length:	6mm ±1mm		
Tightening torque:	0.4 Nm		
Standards			
Product:	IEC 60947-2/Annex M, IEC 60755, IEC 62020		
	UL Listed (UL508) c UL us LISTED E111187		
EMC:	IEC 61543, IEC 61000-4 Series, CISPR 22		
General Compliance:	CE, UKCA and RoHS Compliant. C-tick		
Toroid options			
Part number:	Aperture type	Internal diameter/size:	IΔn (min.) A
BZCT035	○	35mm ∅	0.006
BZCT050	○	50mm ∅	0.006
BZCT070	○	70mm ∅	0.03
BZCT120	○	120mm ∅	0.1
BZCT160	○	160mm ∅	0.1
BZCT210	○	210mm ∅	0.3
BZCT300	○	300mm ∅	0.5
BZCTR350	☐	150 x 350mm	1
BZCTR470	☐	160 x 470mm	1

10. Connection Diagram



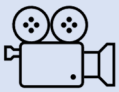
11. Product Dimensions



12. Function Demonstration Videos

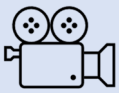
Specific videos are available to watch providing demonstrations on certain product functions. Click on the links provided below.

12.1 Auto-reclosing Demonstration and Setting Up



WATCH VIDEO

12.2 Status/Read Back



WATCH VIDEO

13. Ordering Information

Part number to be specified when ordering.

Part Number	Part Description
99-1001	ELR01PN (6mA – 1A) 24-230VAC/DC
99-1002	ELR30PN (30mA – 30A) 24-230VAC/DC

Accessories - Toroid's

Part Number	Part Description
99-1901	BZCT035
99-1902	BZCT050
99-1903	BZCT070
99-1904	BZCT120
99-1905	BZCT160
99-1906	BZCT210
99-1907	BZCT300
99-1908	BZCTR350
99-1909	BZCTR470

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