# CZIP® - PV Pro

## integrated protection control relay

res/epV terminals for LV/MV power grid


CE

- The **CZIP®-PV Pro** terminal is intended for switching stations operating in places where **renewable energy facilities** are connected, in particular photovoltaic power plants to LV and MV distribution grids, including for the so-called micro-installations,
- meets **all the requirements** in the field of safety automation for photovoltaic power plants,
- includes **under-impedance protection** against the effects of phase-to-phase short-circuits, allowing for its detection irrespective of its current value and obtaining independence of the protection range from its type,
- **CZIP®-Set tool software** for operating all devices of the **CZIP® system**, including **CZIP®-PV Pro.**

# CZIP® - PV Pro integrated protection control relay

The dynamic development of solar power plants, i.e. photovoltaic (epV) plants, requires the use of specialized protection and control relays that provide protection against the effects of various disturbances.
In particular, protection of electrical devices through which they are connected to the networks and the networks themselves. The specific requirements for protection functions were the inspiration for the development of a new protection relay design by Relpol S.A. marked as **CZIP®-PV Pro.**

The **CZIP®-PV Pro** terminal is intended for switching stations at the connection points of photovoltaic power plants to MV and LV distribution networks, including the so-called micro-installations. The device meets all the requirements
In the field of protection automation for epV, written in TNC and the standards en 50549-1 and en 50549-2. it has both protections powered from the MV and LV side circuits. to perform the required functions, the new relay has been equipped with additional inputs for measuring voltages on the LV side.


## CZIP® - PV Pro

is built on the basis of proven hardware and software solutions known from the **CZIP®** system, including the **CZIP®-Set** tool software.

It implements under-impedance protection, which is a proposal to solve the problems related to phase-to-phase short-circuits occurring near the epV. The under-impedance protection solves the problems caused by the fact that the short-circuit current generated by epV is only 10% greater than their rated current.

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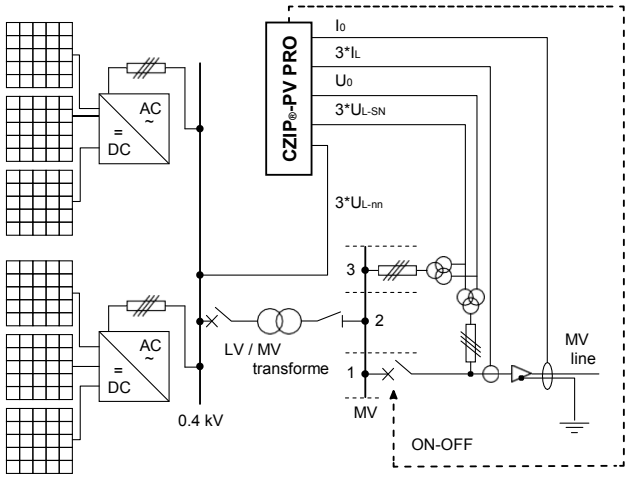
## APPLICATIONS - RECOMMENDED EPV CONNECTION DIAGRAMS TO POWER

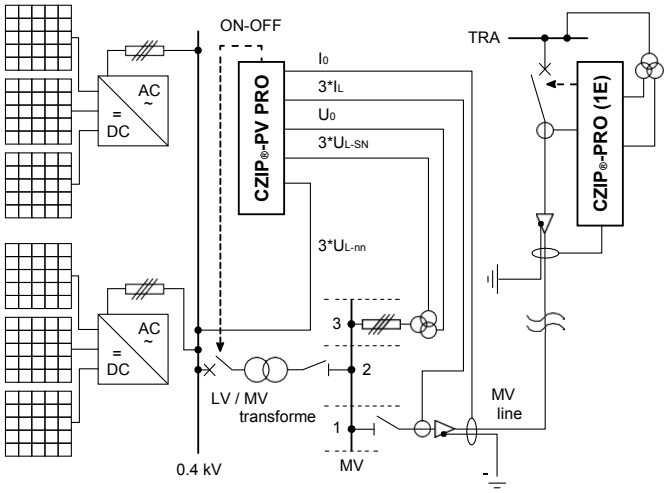
### Connection of the EPV to the MV line with users




EPV includes MV/LV transformer and connection point is deep in the network.

Circuit breaker is on MV side of EPV and it is controlled by **CZIP®-PV Pro.**

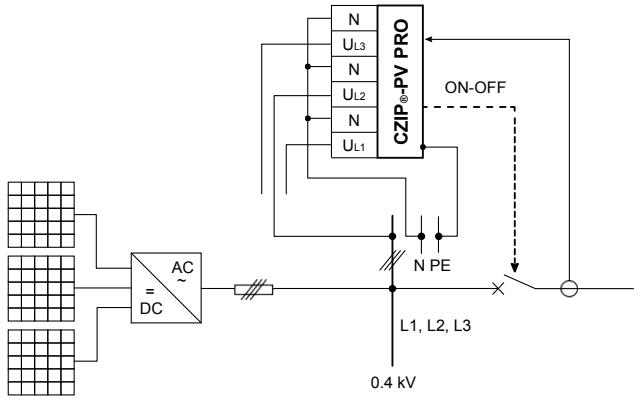
### Connection of EPV to the MV power grid using a subscriber line




EPV includes MV/LV transformer and is connected with a subscriber line to a bay of transformer or switchgear station.

If circuit-breaker is only at the connection point beyond the EPV (e.g. in transformer station), then CZIP®-PV Pro controls the circuit-breaker on the LV side.

### Connection of the epV (micro-source) to the LV network




if a specialized protection relay is used in a micro installation, no capacitor voltage transformers are installed (including the u0 filter), it only directly connects the 230 V / 400 V net and the phase currents from the LV side.

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## Technical data

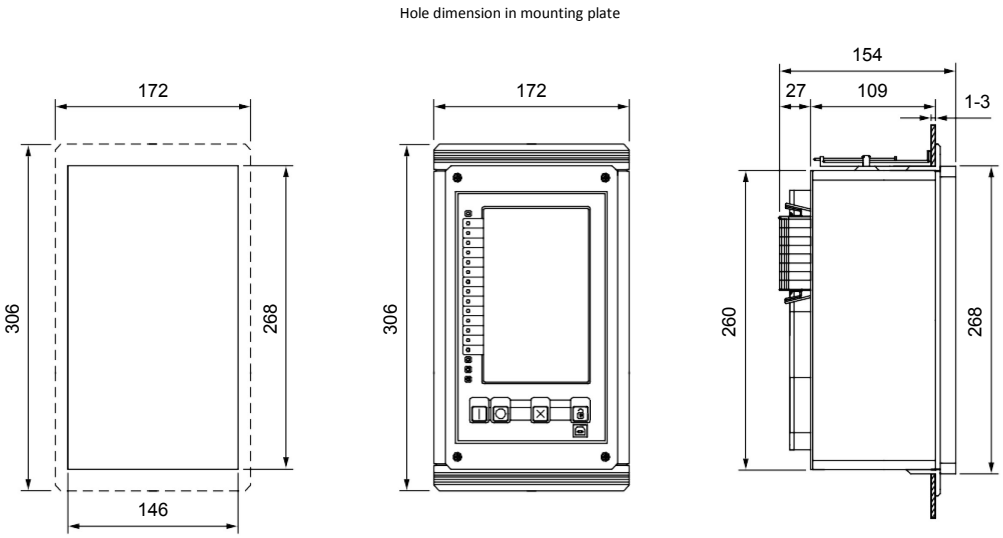
| phase current input circuits | | |
|---|---|---|
| rated current $i_n$ | | 5 a or 1 a |
| measurement range | | 0...192 a |
| measurement error 0 a> 0.35 ... 50 a | | < 10% < 1.5% < 10% |
| <192 a rated frequency fn | | 50 hz |
| power consumption at $i=i_n$ | | <0.5 Va at rated current |
| **phase voltage input circuits** | | |
| rated voltage $u_n$ | | 100 V |
| measurement range | | 0...130 V |
| measurement error in the measuring range | 0...130 V | < 1,5% |
| rated frequency $f_n$ | | 50 hz |
| power consumption at $u=u_n$ | | <0.4 Va at rated voltage |
| **zero sequence current input circuits** | | |
| rated current $i_{0n}$ | | 0.5a |
| measurement range | | 0...5 a |
| measurement error | 0.02...3.5 a | < 1,5% |
| rated frequency $f_n$ | | 50 hz |
| power consumption at $i=i_{0n}$ | | <0.4 Va at rated current |
| **zero sequence voltage input circuits** | | |
| rated voltage $u_{0n}$ | | 100 V |
| measurement range | | 0...130 V |
| measurement error in the measuring range | 0...130 V | < 1,5% |
| rated frequency $f_n$ | | 50 hz |
| power consumption at $u=u_{0n}$ | | <0.4 Va at rated voltage |
| **binary input circuits** | | |
| rated input voltage | 24 V dc | 220 V dc |
| input voltage range | 17...32 V | 88...253 V |
| current consumption | < 0,25 ma | < 3 ma |

| relay output circuits (20 outputs) | | |
|---|---|---|
| rated voltage | 220 V | 24 V |
| permanent current carrying capacity | 5a | |
| opening an inductive circuit | | |
| • 220 V DC, L/R = 40 ms | 0.1a | |
| • 220 V AC, cos ϕ = 0,4 | 2a | |
| **cooperation circuits with the circuit breaker** | | |
| rated voltage | 220 V | 24 V |
| permanent current carrying capacity | 8a | |
| opening an inductive circuit | | |
| • 220 V DC, L/R = 40 ms | 1.2 a / 300 cycles | |
| duration of the turn-off pulse | min. 0,1 s | |
| duration of the turn-on pulse | min. 0,1 s | |

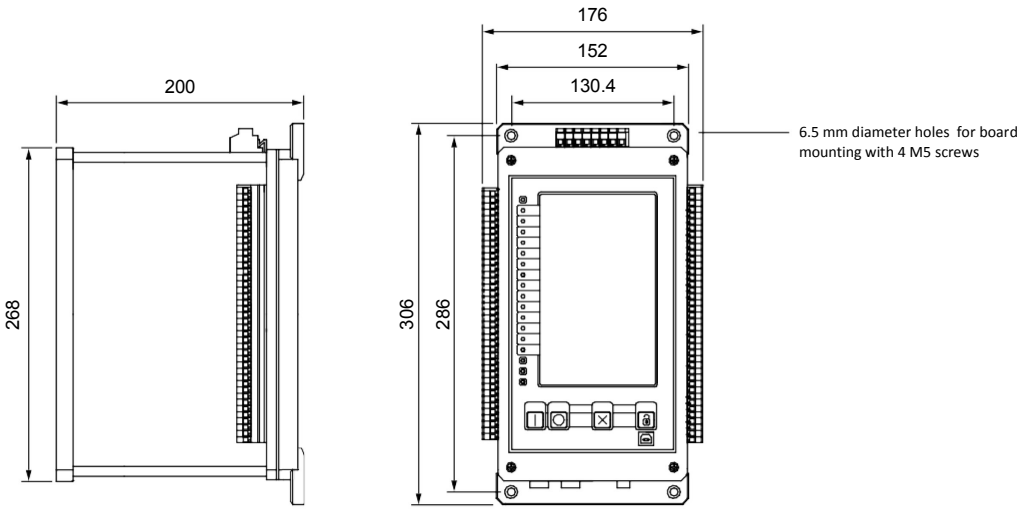
| other data | | | |
|---|---|---|---|
| power supply | | | |
| • Rated supply voltage | 220 V dc 90...300 V dc | 230 V ac 85...265 V | 24 V dc 19...65 V dc |
| Environmental conditions | | | |
| ambient temperature | -10...+55°c | | |
| storage temperature | -20...+70°c | | |
| height above sea level | ≤ 2000 m | | |
| relative humidity | 5...95% | | |
| weight | 6 kg | | |
| dimensions | 306x172x154 mm flush-mounted ver.<br>306x176x200 mm wall-mounted ver. | | |
| housing protection degree | IP 50 acc. to en 60529 | | |

## Dimensions

### Flush-mounted version




### Wall-mounted version



# CZIP® - PV Pro integrated protection control relay

## PROTECTION AVAILABLE IN CHIP®-PV PRO

**CZIP®-PV Pro** is almost identical to CZIP®-Pro (1E) in terms of protections powered from **MV side circuits**. it has **overcurrent and under-impedance protection** against the effects of phase-to-phase short-circuits, **voltage, frequency and earth fault protection**. Additionally, in accordance with the requirements of the standards**, overvoltage protection** has been introduced, the criterion of which is the average voltage value over the last 10 minutes. It will be activated if the starting condition meets one of the three line voltages within the set time.

| Protections powered by voltage circuits on the MV side | | | |
|---|---|---|---|
| name of the criterion | symbol | setting range criterion | timing setting range |
| undervoltage 1st degree | u< | 20...100 V | 0,05...120 s |
| undervoltage 2nd degree | u<< | 20...100 V | 0,05...120 s |
| overvoltage 1st degree | u> | 100...130 V | 0,05...120 s |
| overvoltage 2nd degree | u>> | 100...130 V | 0,05...120 s |
| overvoltage for an average of 10 min. | u10> | 100...130 V | – |
| negative sequence voltage | uneg> | 1...100 V | 0,05...60 s |
| autonomous zero voltage | u0> | 2...100 V | 0,05...24 s |
| subfrequency 1st degree | f< | 47...50 hz | 0...10 s |
| Subfrequency 2nd degree | f<< | 47...50 hz | 0...10 s |
| overfrequency 1st degree | f> | 50...52 hz | 0...10 s |
| overfrequency 2nd degree | f>> | 50...52 hz | 0...10 s |
| From effects of lom island operation | df/dt | 0,5...10 hz/s | 0...10 s |
| **Protections powered from voltage circuits of the LV side (with an MV / LV transformer or without a transformer)** | | | |
| name of the criterion | symbol | setting range criterion | timing setting range |
| undervoltage 1st degree | u< | 40...230 V | 0,05...120 s |
| undervoltage 2nd degree | u<< | 40...230 V | 0,05...120 s |
| overvoltage 1st degree | u> | 230...270 V | 0,05...120 s |
| overvoltage 2nd degree | u>> | 230...270 V | 0,05...120 s |
| overvoltage for an average of 10 min. | u10> | 230...270 V | – |
| subfrequency 1st degree | f< | 47...50 hz | 0.05...24 s |
| Subfrequency 2nd degree | f<< | 47...50 hz | 0...10 s |
| overfrequency 1st degree | f> | 50...52 hz | 0...10 s |
| overfrequency 2nd degree | f>> | 50...52 hz | 0...10 s |
| From effects of lom island operation | df/dt | 0,5...10 hz/s | 0...10 s |

**CZIP®-PV Pro** is also equipped with all protection functions powered from **current circuits**, similar to **CZIP-Pro (1E)** application for MV lines with local generation.

**LUMEL S.A.**
ul. słubicka 4, 65-127
zielona góra
phone. +48 68 45 75 100

Technical support
phone. 68 45 75 140, 45 75 141,
45 75 142, 45 75 145, 45

Order processing:
phone. 68 45 75 150, 45 75 151, 45 75 152,
45 75 153, 45 75 154, 45

automation systems
workshop: phone: 68 45

calibration
phone. 68 45 75 163
e-mail: