**Elektrometal Energetyka SA**

# e²TANGO®
# Protection Relay

e²ALPHA
Elektrometal Energetyka SA

1 POLE ODPŁYWOWE

e²TANGO-800

Elektrometal Energetyka SA

Pole 1 | Bank 1
2015-03-26 14:38:11

Q2
Q1

U12 = 0.00 V
U23 = 0.00 V
U31 = 0.00 V

Q3

Zdarzenia

RESTART e²TANGO
BRAK NAPIĘCIA ZASILANIA
POB. WE A2
ODWZB. WE A1

2015-03-26
14:20:33.730
2015-03-19
13:03:59.021
2015-03-19
14:08:26.021
2015-03-19
14:08:26.021

F2
F3
F4

e²ECHO-B

Elektrometal Energetyka SA

OBECNOŚĆ
NAPIĘCIA
NA KABLU

STOP

STEROWANIE
CZŁONEM
WYSUWNYM

STEROWANIE
WYŁĄCZNIKIEM

STEROWANIE
UZIEMNIKIEM

OŚWIETLENIE
PRZEDZIAŁÓW

ROZDZIELNICA ŚREDNIEGO NAPIĘCIA
TYP: e²ALPHA

# ≋ We create ideas with power!

Protection relay e²TANGO by ELEKTROMETAL ENERGETYKA SA has been developed by our Research and Development Team composed of engineers with vast practical knowledge and many years of professional experience in power engineering industry. Ideas and solutions which has been applied in e²TANGO are solving problems which our customers have to face every day. Finding solutions to this problems was our inspiration during our construction work. In result we have created an exceptionally friendly and intuitive e²TANGO protection relay for every day use which doesn't require an advanced introduction training.

We have designed a technically advanced device, universal in terms of software and hardware, dedicated to protection automatics, controlling, measuring, recording and supervising of MV and HV switchgear bays.

e²TANGO protection relay has a lot of interesting features but easy and convenient use are it's very special advantages. We intended to develop an extremely friendly and intuitive device for every day use, which can be applied in a system of intelligent power grids SMART GRID.

Versatility of e²TANGO enables it to be easily adapted to individual requirements and safe loads. We have strongly focused on safety because we know how it is important in the power industry. All our products, including the family of protection relays, have certificates confirming complete type examination carried out in the most demanding laboratories.


e²TANGO is an exceptional protection relay. We strongly believe it and therefore recommend it as a special one.

Dariusz Rybak
Chief Constructor, Head of Digital Development Department
Elektrometal Energetyka SA

# ≋ APPLICATION

e²TANGO protection relay is an universal solution in terms of hardware and software. It is equipped in complete set of protection- and station- automatics and can be therefore applied in each kind of bay of various intended use and operation characteristics, eg. incoming-, line-, transformer-, incoming-outgoing-, measurement-, coupler-, capacitor-, wind power plants- bay etc for MV and HV power grid. Additional automatic transfer switch with auto re-transfer allows complete protection in powering the outflows in the objects which require continuous and guaranteed power supply.



## wind power plant bay
- synchrocheck
- df/dt
- du/dt

## transformer bay
- thermal protection
- flux-gas protection
- 2nd harmonic restraint

## capacitor battery bay
- internal current of capacitor battery
- automatic inclusion of capacitor battery

## incoming bays
- ARS automation
- Automatic bus-bar protection
- automatic breaker failure protection

## motor bay
- thermal protection
- thermal sensors PT100/PT1000
- motor start-up protection

## line bays
- earth fault protection
- distance protection
- automatic frequency relieve of the system

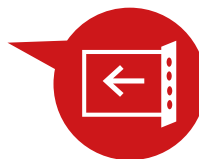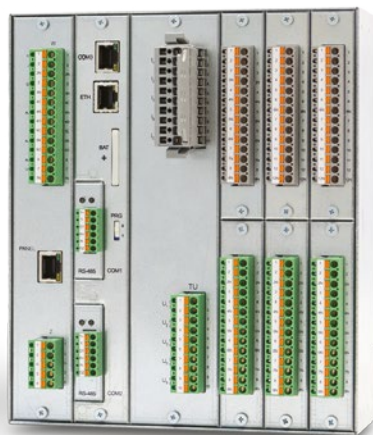# ≋ ADVANTAGES OF THE PROTECTION RELAY

## quick start
first run configuration assistant, predefined synoptic scheme library, predefined protective functions
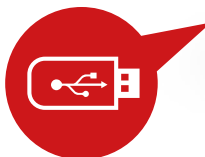
## trouble-free battery change
possible to change battery without turning off the feeder

## remote service acces
remote and local read of diagnostic data, allows to send data to manufacturer service

## variety of expansion cards
modular construction based on expansion and communication cards, up to 168 input and up to 39 output

## hot reserve
restoring within a few minutes functioning of the bay after fail, possibility to recover all bay data such as: settings, logic, events
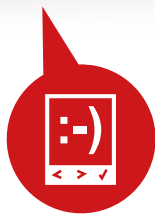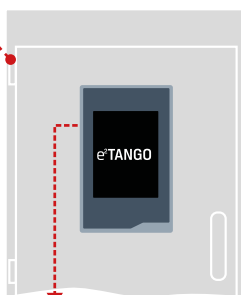
## intuitive interface
clear menu layout, graphic expression of menu positions and other designations
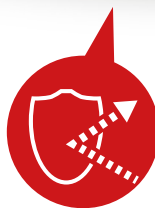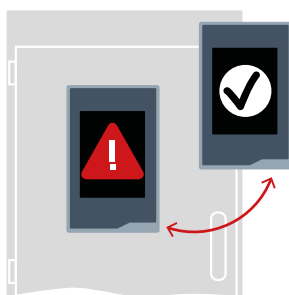
## strong resistance to interference
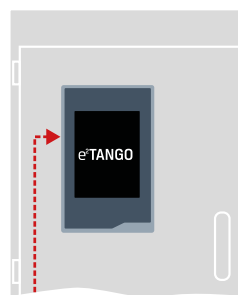up to 100% higher than required by standards

## wide array of hardware configuration
main units with 6, 10, 14 expansion slots, avalible in flush, wall and mixed mounting

## continious data backup

## quick exchange of broken hardware

## data restoration

# ≋ ADVANTAGES OF THE PROTECTION RELAY

**preview of logic scheme and status**
logic scheme, synoptic scheme

**full operating manual**
quick acces to proper sections of technical documentation

**intuitive menu**
picturing of descriptions

**application scheme of the bay**
access to the application scheme from the level of operator's panel

**graphic parameter presentation**
phasor diagram, harmonic spectrum diagram

**manual-free operating**
on-side assistance

**fully adjustable graphic interface**
up to 5 user configurable screens, widgets

Intuitive e²TANGO protection relay is equipped in fully configurable clear interface, extended configuration, recorders and measurement- functions. Good readability of indicators and signalization, easy access manual, easy verification of logic and graphical verification of protection characteristics as well as remote service access greatly improve everyday work with device.

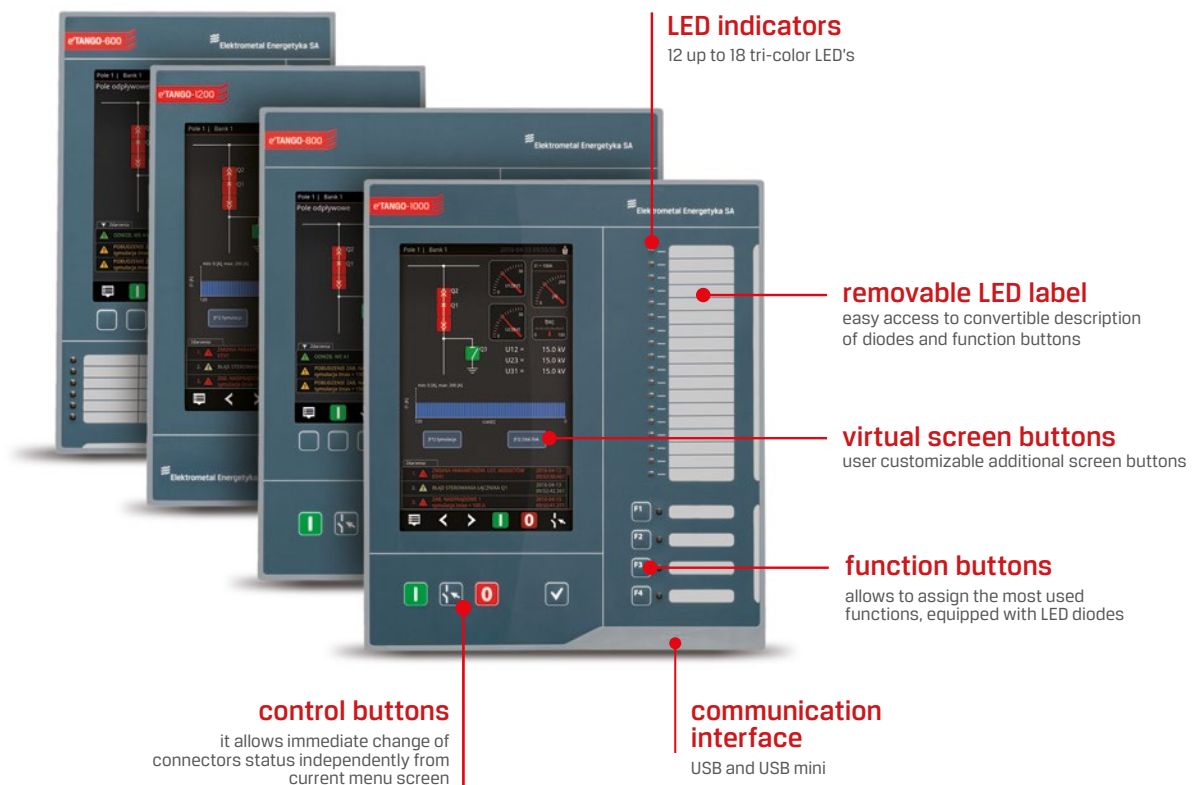# ADVANTAGES OF THE PROTECTION RELAY WITH TOUCH PANEL
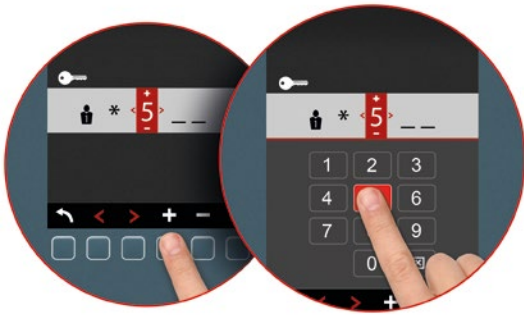
- alphanumeric keyboard
- touch control menu
- touch control for logic through fluent scrolling of diagrams
- screen buttons allowing use of bigger number of functional buttons as well as assigning them short-cuts option
- direct choice of switch for controlling from panel screen
- events scrolling on widget
- camera support

# DESIGN

e²TANGO protection relay consists of two elements: operating panel and central processing unit. Central unit is manufactured based on expansion cards and is offered in three versions of metal housing: J6 (six cards), J10 (ten cards) and J14 (fourteen cards) – depending on switchgear's bay configuration complexity and the needs of the user. Operating panels e²TANGO-600 i e²TANGO-800 in big, good readable, 6-inch colour screens. Operating panels e²TANGO-1000 i e²TANGO-1200 have 7-inch, colour touch screens. Panels (depending on the version) are equipped in number of buttons allowing device control.

For small-size switchgears there is possibility to use a set of protections with the smallest available on the market operating panel e²TANGO-600 or e²TANGO-1200 with the external dimension of only 147x235 mm. Despite the small external dimension the panels are equipped in 6- or 7-inch screens, which allow displaying of any configuration, measurements, diagrams or graphs.

**LED indicators**
12 up to 18 tri-color LED's

**removable LED label**
easy access to convertible description of diodes and function buttons

**virtual screen buttons**
user customizable additional screen buttons

**function buttons**
allows to assign the most used functions, equipped with LED diodes

**control buttons**
it allows immediate change of connectors status independently from current menu screen

**communication interface**
USB and USB mini

* Detailed information in e²TANGO TYPES, page 13.

# PROTECTION FUNCTIONS

| Code | Description |
|------|-------------|
| 50/50N | short-circuit / ground short-circuit instantaneous |
| 51/51N | overcurrent / ground overcurrent delayed 3-stage |
| 50HS | accelerated action of protection automation |
| 51 | inverse overcurrent (IEC/IEEE characteristic or user customized) |
| 60/67N | overcurrent / ground overcurrent directional |
| 49/51 | thermal overload |
| 46 | phase-balance or reverse sequence current protection |
| 37 | undercurrent |
| 32P | reverse active power |
| 32Q | reverse reactive power |
| 51VN | ground overcurrent with voltage interlock |
| 59 | over-voltage with two stages [with option for phase voltage or line voltage |
| 27 | under-voltage with two stages (with option for phase voltage or line voltage) |
| 81H | over-frequency |
| 81L | under-frequency |
| 81R | rate of change of frequency df/dt |

| Code | Description |
|------|-------------|
| 59N | zero sequence over-voltage |
| 21N | admittance |
| 21ND | admittance directional |
| 64S | earth fault stator |
| 66/86 | motor start-up protection |
| 66 | limitation of motor starts |
| 48 | motor starting time supervision |
| 50LR | locked rotor protection |
| 25 | synchronism check |
| 87M | motor differential protection |
| 30/74 | flux-gas |
| 49 | thermal (digital or analogue input 4-20 mA) |
| 74TCS | continuity of control circuits |
| 50C | overcurrent of capacitor bank |
| AFP* | arc protection (cooperates witch arc detectors) |

\* - not mentioned on ANSI code list

# AUTOMATION SYSTEMS

- Accelerated protection action automation system
- Automatic load shedding equipment
- Automatic releasing equipment with control of circuit breaker's position and possibility to determinate type of protection initializing stimulation of automatic restart
- Automatic breaker failure protection equipment
- Automatic capacitor battery activating equipment
- Automation of the system grounding zero point of the grid*
- Automatic active component forcing equipment
- Automatic bus-bar protection
- Automatic transfer switch with auto re-transfer
- Other based on programmable logic

\* in agreement with the producer

# ≋ ATS AUTOMATION

Controllers for automatic transfer switch with auto re-transfer - e²TANGO ATS have been developed on the base of e²TANGO controllers and supports the same features and functions. They are available in various configurations for LV, MV and HV network. Standard version allows implementation of automation in 1 or 2-sectional switchgears.

Controller features:
- ⌐ explicit, implicit stand-by, automatic selection (based on the configuration of switches)
- ⌐ fast and slow mode
- ⌐ measurement of 6 phase voltages on the bus-bars and two wire voltages on the top side of power supply transformers or power lines,
- ⌐ optional measurement of currents,
- ⌐ optional re-transfer to the normal power supply,
- ⌐ optional automatic locking of automation after operation,
- ⌐ two communication ports RS485/optical fibre, Ethernet link to cooperate with the dispatch centre or engineering link. Support for Modbus RTU, Modbus TCP, IEC870-5-103, DNP3.0, Canbus, Profibus protocols.
- ⌐ event recorder for 1000 events, recording all automation-, interlocks operations and emergency states.
- ⌐ disturbance recorder recording the measured voltages with configurable recording time after triggering the recorder.

Standard version of automatic transfer switch with auto re-transfer:

The controller in the standard version supports the 2-section switchgear with two transformers or two supply lines, with sections connected by a bus-bar connector or 1-section switchboard with two supply lines. In the case of 2-sectional switchboard the controller performs explicit and implicit automation with optional re-transfer to the normal power supply.



2-section switchgear
with two transformers

2-section switchgear
with two supply lines

1-section switchgear
with two supply lines
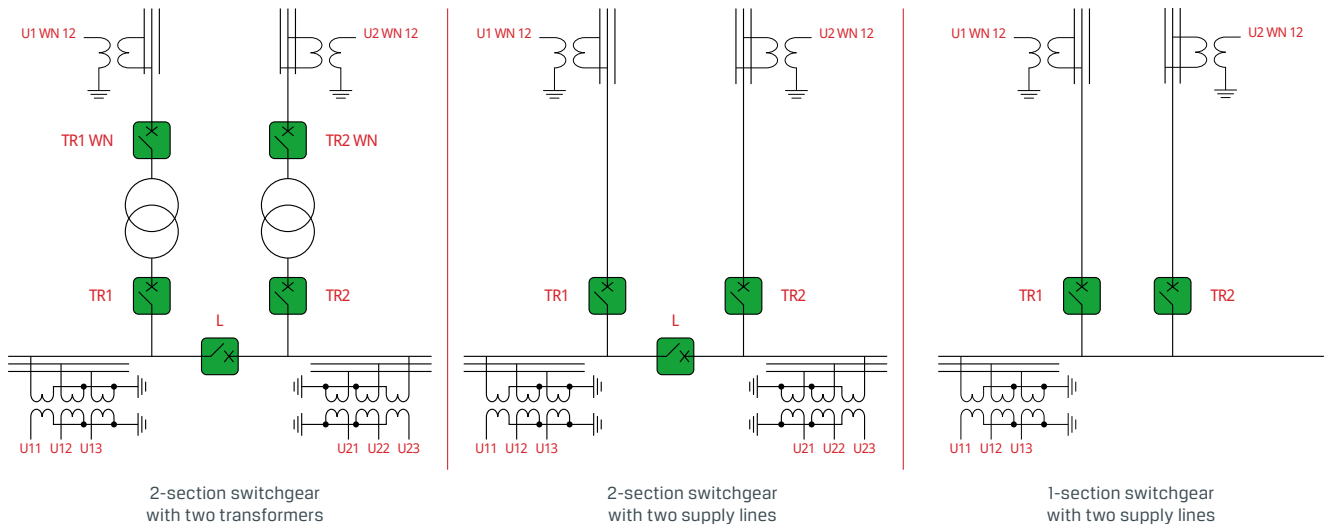
Customized version:

In addition to standard solutions for automatic transfer switch with auto re-transfer we offer to develop special versions, tailored to individual customer needs. Dedicated systems are created in close cooperation between the R&D department and the client.

Examples of custom solutions:
- ⌐ switchgear with three sections (e.g. 3 power supplies, 2 coupling)
- ⌐ dedicated switching algorithms
- ⌐ current measurements and analysis of power supply load.
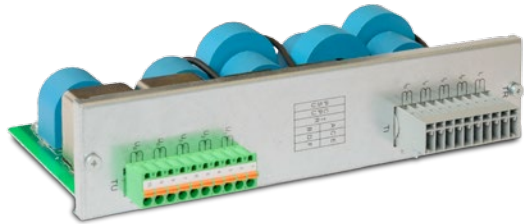
# ⚏ EXPANSION CARDS

**BASIC CARDS**
- power supply
- processor

**MEASUREMENT CARDS**
- standard (5I+4U)
- synchrocheck (4I+5U)
- ATS (9U)

**FUNCTION CARDS**
- 8 binary inputs
- 12 binary inputs
- 8 binary outputs

**ANALOGUE CARDS**
- 4 analogue inputs 0-10 V
- 4 analogue inputs 4-20 mA
- 4 analogue outputs 0-10 V
- 4 analogue outputs 4-20 mA

**ARC DETECTOR INPUT CARDS**
- 6 arc detector input with CAN communication
- 6 arc detector input passive

**TEMPERATURE SENSORS CARDS**
- 6 PT100 inputs
- 6 PT1000 inputs

**OTHER**
- current metering card for differential protection

# ≋ COMMUNICATION PORTS AND PROTOCOLS

- Ethernet
- USB 2.0
- RS485
- Optic-MM
- Profibus
- CANbus 2×
- WiFi*

- IEC 60870-5-103
- DNP 3.0
- Modbus RTU
- Modbus TCP
- IEC 61850*

\* in agreement with the producer

# ≋ RECORDERS

- event recorder, 1000 events
- disturbances recorder up to 160 s sampling rate 1,6; 3,2 kHz
- criterial recorder up to 600 s
- temporary value recorder, TrueRMS
- power factor recorder
- load profile recorder
- phasor diagram

Criterial recorder example data
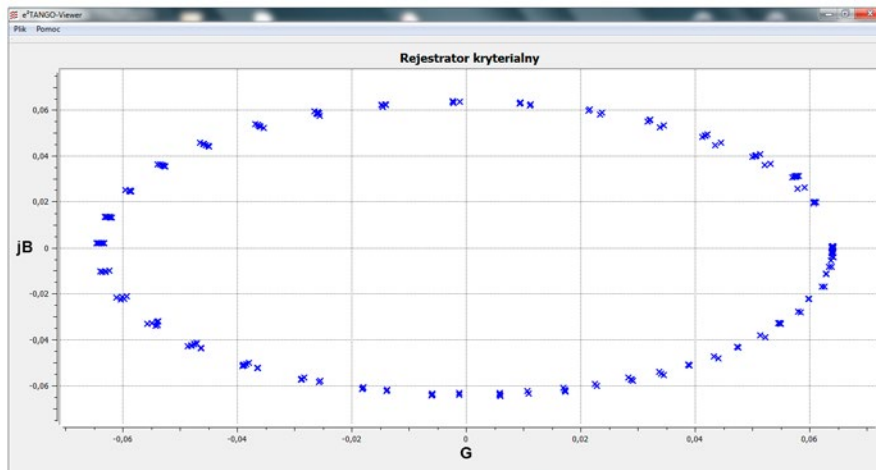
# ≋ BASIC SIZES

e²TANGO-600

e²TANGO-800

e²TANGO-1000

e²TANGO-1200

235 / 147

252 / 215

252 / 215

235 / 147

J6

J10

J14

187

234

281

222 / 103
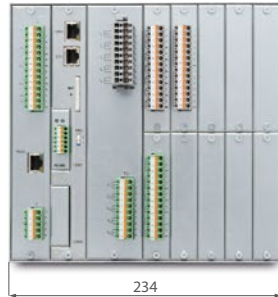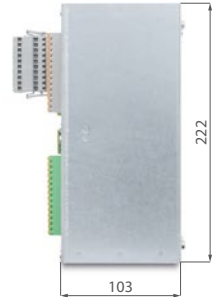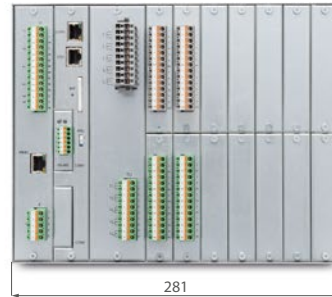
# ≋ MOUNTING METHOD

flush mounting
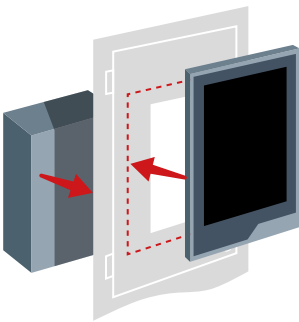
wall mounting
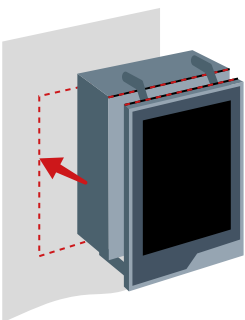
wersja 1
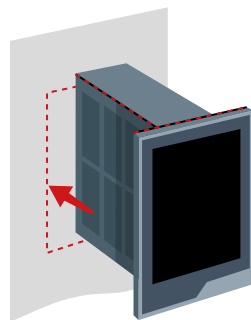
wersja 2

mixed mounting

# ⚞ e²TANGO TYPES
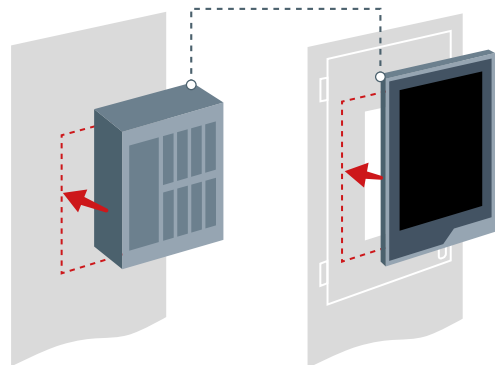
| e²TANGO | 600 | 800 | 1000 | 1200 |
|---|:---:|:---:|:---:|:---:|
| **INTERFACE AND OPERATION** | | | | |
| Display | 6" | 6" | 7" | 7" |
| Display resolution | 640×480 px | 640×480 px | 800×480 px | 800×480 px |
| Colour display | • | • | • | • |
| Touch display | - | - | • | • |
| Context buttons | 6 | 6 | - | - |
| Control buttons (I,0,⟨-⟩,v) | • | • | • | - |
| Function buttons with LED (programmable) | 2 | 4 | 4 | - |
| LEDs | 12 | 14 | 18 | 18 |
| Virtual LED (on screen) | 4 | 4 | 8 | 8 |
| Virtual function buttons (on screen) | - | - | 4 | 8 |
| Removable LED label | • | • | • | - |
| **DESIGN** | | | | |
| Panel dimensions (H×W×D) | 235×147×41,5 | 252×215×41,5 | 252×215×41,5 | 235×147×41,5 |
| Mounting hole dimension in flush mounting version | 228×123 | 228×191 | 228×191 | 228×123 |
| Detachable main unit | • | • | • | • |
| Unit J6 <br> • 6 slots <br> • dimensions: 222 × 187 × 103 (H×W×D) | • | • | o | o |
| Unit J10 <br> • 10 slots <br> • dimensions: 222 × 234 × 103 (H×W×D) | o | o | • | • |
| Unit J14 <br> • 14 slots <br> • dimensions: 222 × 281 × 103 (H×W×D) | o | o | o | o |
| **STANDARD EQUIPMENT** | | | | |
| Inputs (max*) | 20 (168) | 20 (168) | 28 (168) | 28 (168) |
| Outputs (max*) | 15 (39) | 15 (39) | 23 (39) | 23 (39) |
| Max number of connectors** | 12 | 12 | 12 | 12 |
| Arc detector input (max)** | 0 (12) | 0 (12) | 0 (12) | 0 (12) |
| Analogue input 4-20 mA (max.)** | 0 (4) | 0 (4) | 0 (4) | 0 (4) |
| Analogue input 0-10 V (max)** | 0 (4) | 0 (4) | 0 (4) | 0 (4) |
| Analogue output 4-20 mA (max)** | 0 (4) | 0 (4) | 0 (4) | 0 (4) |
| Analogue output 0-10 V (max)** | 0 (4) | 0 (4) | 0 (4) | 0 (4) |
| PT 100/PT 1000 input (max)** | 0 (6) | 0 (6) | 0 (6) | 0 (6) |
| **OTHER** | | | | |
| Widgets | • | • | • | • |
| Synoptic scheme library | 55 | 55 | 55 | 55 |
| Number of screen tabs for configuration | 5 | 5 | 5 | 5 |
| Logic scheme preview | • | • | • | • |

•/o - standard/option

\* - for the biggest main unit filled up with one type of extension card

\*\* - require proper number and types of extension cards

# ≋ e²TANGO-STUDIO SOFTWARE

e²TANGO-Studio software intended to operate e²TANGO protection relay. It is at the same time configuration tool for the operating panel. This software has been equipped in extended set of functions, which are combined with clear graphic interface. Finally it creates great tool which supports every-day work and allows creation of projects for many devices, bays, switchgears and stations.

### advanced projects developing
possibility to prepare configuration of devices for the whole switchgear on PC and distribute it while using USB

### user's elements
defining own graphic elements of synoptic diagram

### quick configuration wizard
facilitation of first use and support during regular work
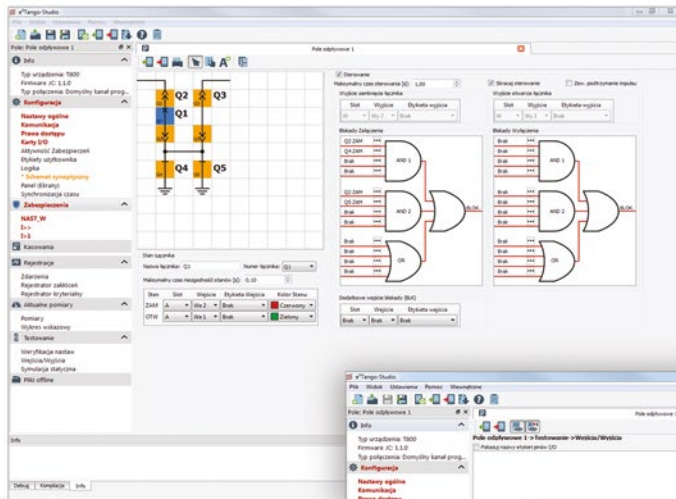
### on-line view
On-line view of input and output states, meassurements, real view of the LCD screen.

### compatible display
real view of panel screen

### extendibilty
through plug-ins
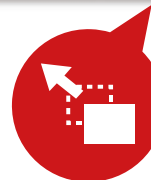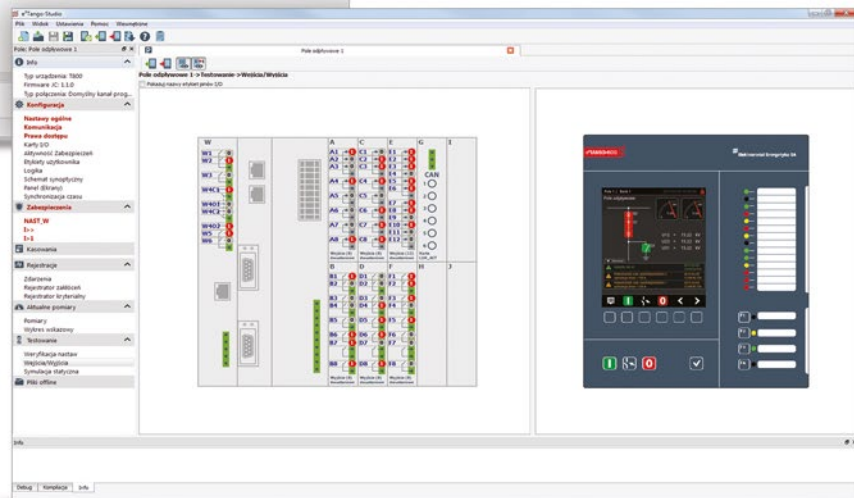
### quick design of user's configurable screens
placing elements with drag&drop method.

# e²TANGO-STUDIO SOFTWARE
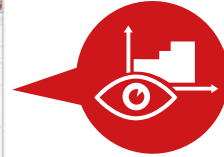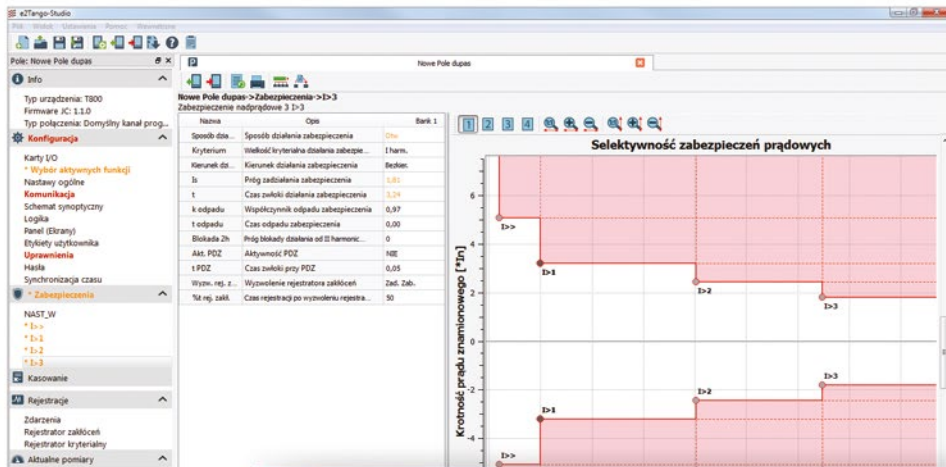


**visual characteristic specifying**
graphic and text configuration of protection settings

**easy verification of settings and selectivity**
presentation of the whole overcurrent protection settings on one graph
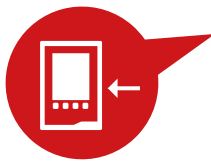
**full preview of status**
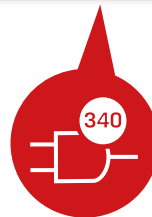access to all internal device states and protections states
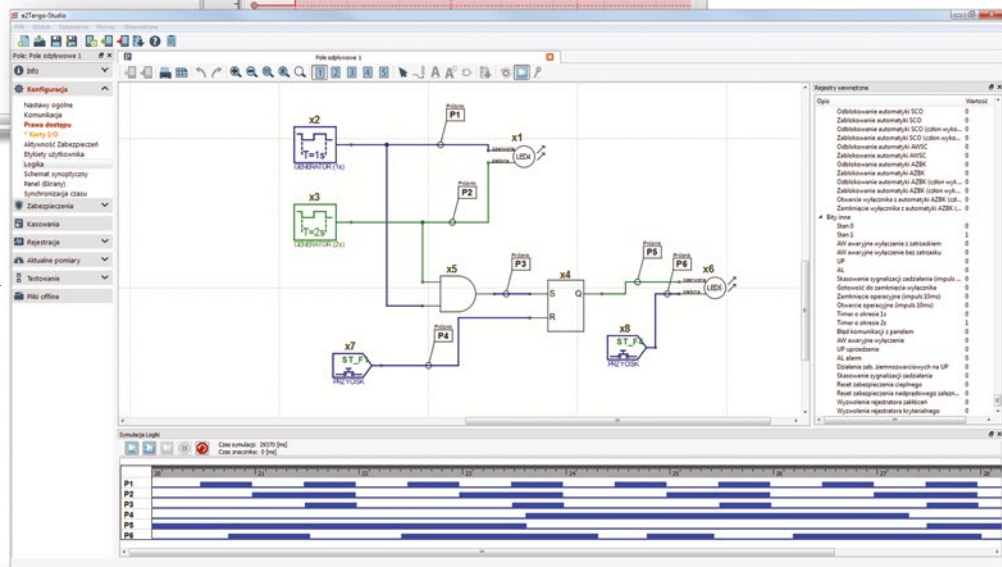
**logic simulator**
possibility to simulate whole logic without connection with device

**logic clarity**
possibility to split logic in blocks and sheets

**Operating of extensive logical dependence**
up to 340 logical gates / functors

# ADVANCED LOGIC EDITOR AND SIMULATOR

e²TANGO-Studio is characterized by advanced and extended logic editor which allows to perform logic simulation visible also on the panel level without device connecting. It gives possibility to view logic state while working with the device. It ensures easier project preparation as well as start-up and service of the switching stations. It allows to use non-standard logics dedicated to the specific customer's requirements.

# ⚡ TECHNICAL PARAMETERS

| | |
|---|---|
| **AUXILIARY POWER SUPPLY** | |
| DC Voltage | 110 V, 220 V (80-300 V) |
| AC Voltage | 230 V (88-265 V) |
| Maximal power consumption (central unit with operating panel) | 30 W (VA) |
| **CURRENT MEASUREMENT CIRCUITS** | |
| Rated current | 5 A (1 A option) |
| Rated frequency | 50/60 Hz |
| Measurement range for phase currents | 0,05-150 A |
| Measurement range for current $I_0$ | 0,001-10 A |
| Measurement range for current I0 in feeder $T_u$ | 0,01-10 A |
| **VOLTAGE MEASUREMENT CIRCUITS** | |
| Rated voltage | 57,7/100 V |
| Rated frequency | 50 Hz |
| Voltage measurement range U, $U_0$ | 3-120 V |
| **BASIC PROTECTION PARAMETERS** | |
| Return coefficient for overload protections | Configurable |
| Return coefficient for under-load protections | Configurable |
| Operate time<br>Operate time for arc protection | typically 35 ms<br>〈10 ms |
| **ACCURACY OF MEASUREMENT** | |
| I1, I2, I3 (0.1-150A) | 1% |
| U1, U2, U3, U0 (5-120V) | 1% |
| I0 (0.001-10A) | 1% |
| P, Q, EC, EB (U〉5V, 0.1A〈I〈10A, 60°〈 φ 〈-60°) | 1% |
| φ1, φ2, φ3, φ0 | 1° |
| **BINARY INPUTS CIRCUITS** | |
| Rated voltage | 110/230 V AC/DC |
| Maximal power consumption: 220 V DC, 230 V AC | 2 mA, 15 mA |
| **BINARY OUTPUTS CIRCUITS – CONTROLLING CIRCUIT BREAKER** | |
| Permitted voltage with opened contacts | 250 V AC / 440 V DC |
| Closing circuit at 220 V DC | 5,5 A |
| Opening circuit at 220 V DC (L/R = 0) | 0,4 A |
| Opening circuit at 220 V DC (L/R = 40 ms) | 0,3 A |
| **BINARY OUTPUTS CIRCUITS – OTHERS** | |
| Permitted voltage with opened contacts | 250 V AC / 440 V DC |
| Long-term current-carrying capacity | 5 A |
| Opening circuit at 220 V DC (L/R = 40 ms) | 0,1 A |
| Opening circuit at 220 V AC (cos φ = 0,1) | 2 A |
| **ENVIRONMENTAL CONDITIONS** | |
| Working temperature | -10 ºC ... +55 ºC |
| Storage temperature | -25 ºC ... +70 ºC |
| Relative humidity | 5 to 95% |
| Vibrations and mechanical shock | Class 1 according to IEC 60255-21 |
| Electromagnetic disturbance | Class B according to IEC 60255-26 |
| **SECURITY** | |
| Electric strength of insulation | 2 kV / 50 Hz / 60 s  IEC 60255-27 |
| **Dimensions** | |
| Weight (main unit/operating panel) | 5 kg / 1 kg |
| Main unit size (height x width x depth, mm) | 222 x 187/234/281 x 103 |
| Degree of protection for main unit | IP 3X |
| Degree of protection for operating panel (front side) | IP 4X / IP 54 |

# ≋ STANDARDISATION

| | |
|---|---|
| PN-EN 60255-1 | Measuring Relays And Protection Equipment - Part 1: Common Requirements |
| PN-EN 60255-26 | Measuring Relays And Protection Equipment - Part 26: Electromagnetic Compatibility Requirements |
| PN-EN 60255-27 | Measuring Relays And Protection Equipment - Part 27: Product Safety Requirements |

# ≋ CERTIFICATES AND AWARDS



**Conformity certificate IEn**
no 005/2015



**Gold medal**
ENERGETAB 2015 fairs

# ≋ ELEKTROMETAL ENERGETYKA SA QUALITY

Implemented Integrated Management System based on following standards:
- PN-EN ISO 9001      Quality Management Systems
- PN-EN ISO 14001    Environmental Management System
- PN-N 18001        Health and Safety Management Systems
- BS OHSAS 18001    Occupational Health and Safety Management System

Mazowiecka Nagroda Jakości

# ☰ ORDER FORM

To order e²TANGO protection relay, please fill in this form in accordance to FORM INSTRUCTIONS on the next page.

## STEP 1

| | | | | | |
|---|---|---|---|---|---|
| ① | panel type | ☐ 600 | ▧ 800 | ☐ 1000 | ☐ 1200 |
| ② | main unit type | ▧ J6 | ☐ J10 | ☐ J14 | |
| ③ | TR measurement card type | ▧ TR (standard, 5I+4U) | ☐ TRS (for synchrocheck, 4I+5U) | ☐ TRU (for ATS, 9U) | |
| ④ | rated current of the measurement card | ▧ 5 A | ☐ 1 A | | |
| ⑤ | binary input voltage | ▧ UNI (110/230 V AC/DC) | ☐ 24V | ☐ inne | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| communication ETHERNET + | ⑥ COM1 | ▧ x - none | ☐ RS485 | ☐ CAN×2 | ☐ OPTO-MM | ☐ Profibus | ☐ other |
| | ⑦ COM2 | ▧ x - none | ☐ RS485 | ☐ CAN×2 | ☐ OPTO-MM | ☐ Profibus | ☐ other |

| | | | | | |
|---|---|---|---|---|---|
| ⑧ | mounting method | ▧ Z - flush | ☐ N1 - wall version 1 | ☐ N2 - wall version 2 | ☐ M - mixed |
| ⑨ | panel-main unit cable length | ▧ S - 1 m | ☐ L - 2 m | ☐ other | |
| ⑩ | IP protection level | ▧ IP 4X | IP 54[1] | | |

1) IP54 protection level available only in version with flush mount

## STEP 2

| | | Slot | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | C | E | | G | I | | K | M | |
| card type | Code | B | D | F | | H | J | | L | N | |
| processor card CPU | - | installed in each device | | | | | | | | | |
| power supply card PSU - 7 binary outputs | - | installed in each device | | | | | | | | | |
| 8 binary inputs | 8IN | ▧ ☐ ☐ | ☐ ☐ | ☐ | | ☐ ☐ | ☐ ☐ | | ☐ ☐ | ☐ ☐ | |
| 12 binary inputs | 12IN | ☐ ☐ ▧ | ☐ ☐ | ☐ | | ☐ ☐ | ☐ ☐ | | ☐ ☐ | ☐ ☐ | |
| 8 binary outputs | 8OUT | ☐ ▧ ☐ | ☐ ☐ | ☐ | | ☐ ☐ | ☐ ☐ | | ☐ ☐ | ☐ ☐ | |
| 4 analogue input 0-10 V | AI10 | ☐ ☐ ☐ | ☐ ☐ | ☐ | | ☐ ☐ | ☐ ☐ | | ☐ ☐ | ☐ ☐ | |
| 4 analogue input 4-20 mA | AI20 | ☐ ☐ ☐ | ☐ ☐ | ☐ | | ☐ ☐ | ☐ ☐ | | ☐ ☐ | ☐ ☐ | |
| 4 analogue output 0-10 V | AO10 | ☐ ☐ ☐ | ☐ ☐ | ☐ | | ☐ ☐ | ☐ ☐ | | ☐ ☐ | ☐ ☐ | |
| 4 analogue output 4-20 mA | AO20 | ☐ ☐ ☐ | ☐ ☐ | ☐ | | ☐ ☐ | ☐ ☐ | | ☐ ☐ | ☐ ☐ | |
| 6 PT100 temperature sensor input | PT1 | ☐ ☐ ☐ | ☐ ☐ | ☐ | | ☐ ☐ | ☐ ☐ | | ☐ ☐ | ☐ ☐ | |
| 6 PT1000 temperature sensor input | PT10 | ☐ ☐ ☐ | ☐ ☐ | ☐ | | ☐ ☐ | ☐ ☐ | | ☐ ☐ | ☐ ☐ | |
| 6 arc detector input with CANbus communication + 3 arc detectors | ARC | ☐ ☐ ☐ | ☐ ☐ | ☐ | | ☐ ☐ | ☐ ☐ | | ☐ ☐ | ☐ ☐ | |
| 6 arc detector input passive + 3 arc detectors | ARP | ☐ ☐ ☐ | ☐ ☐ | ☐ | | ☐ ☐ | ☐ ☐ | | ☐ ☐ | ☐ ☐ | |
| current metering card for differential protection | TRR | | | ☐ | | | | | | | |

J6
J10
J14

additional number of arc sensors [ ] only if the ARC or ARP card is ordered

additional requirements:
[ ]

## STEP 3

Your code:

| e²TANGO | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ | ⑩ |
|---|---|---|---|---|---|---|---|---|---|---|

| A | B | C | D | E | F | G | H | I | J | K | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

# ≋ FORM INSTRUCTIONS

## STEP 1

In the presented table there are the basic technical parameters of the e²TANGO protection relay. From each position marked with a numbers from 1 to 10 there is only one position to be selected. If you choose "other", in STEP 3 in the corresponding field, please enter the requested value.

Step 1 instructions

- ☐ - recommended basic configuration
- OPTO-MM - multi-mode optic fibre

## STEP 2

In the presented table there is a list of available expansion cards and their possible installation locations in the central unit of e²TANGO. Missing field ☐ for marking means that the card cannot be installed in a given place. Please choose from the list the ordered cards and mark with "X" a slot, in which they have to be installed. Arranging the cards has to be started from the A slot. Capacity of the units are marked appropriately with the background colour in the table.

Additional requirements have to be described in a designated area.

Step 2 instructions

- ☐ - recommended basic configuration
- max 4 cards 8OUT
- max 1 card AI10 or 1 card AI20
- max1 card AO10 or 1 card AO20
- max 1 card PT1 or 1 card PT10
- TRR card can be installed only in F slot
- ARP card can be placed in the device only if ARC card is already installed

View of the central unit indicating the arrangement of slots for expansion cards.
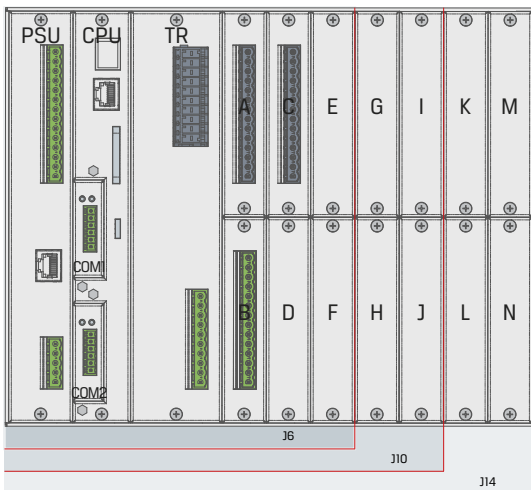


## STEP 3

Selected above parameters of the e²TANGO protection relay have to be inserted in the corresponding space. The code created in that way together other requirements or scanned order form page has to be sent along with an order to the following address:
eaz@elektrometal-energetyka.pl

Example of e²TANGO protection relay configuration:

| | | | |
|---|---|---|---|
| ① | e²TANGO-1000 panel | ⑧ | mixed mounting |
| ② | J10 main unit | ⑨ | 8 m cable |
| ③ | TR measurement card | ⑩ | IP4X protection level |
| ④ | rated current of measurement card 5A | Ⓐ | slot A: 8IN card |
| ⑤ | universal binary input voltage | Ⓑ | slot B: 8OUT card |
| ⑥ | OPTO-MM | Ⓒ | slot C: 12IN card |
| ⑦ | RS485 | Ⓓ | slot D: ARC card |

Example of correct filled code:

| e²TANGO | 1000 | J10 | TR | 5A | UNI | OPTO-MM | RS485 | M | 8 | IP4X |
|---|---|---|---|---|---|---|---|---|---|---|

| 8IN | 8OUT | 12IN | ARC | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|

**ELEKTROMETAL ENERGETYKA SA**
02-830 Warszawa, ul. Mazura 18A
tel. (+48) 22 350 75 50
fax (+48) 22 350 75 51
eaz@elektrometal-energetyka.pl
www.elektrometal-energetyka.pl