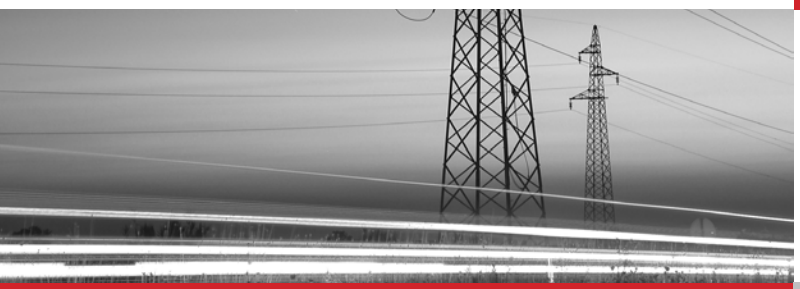


Elektrometal Energetyka SA

e²TANGO®-600, -800, -1000, -1200 Protection Relay

K-3.2.9 Catalogue EN

e²ALPHA
Elektrometal Energetyka SA
1
POLE ODPŁYWOWE
e²TANGO-800
Elektrometal Energetyka SA
Pole 1 | Bank 1
U12 = 0.00 V
U23 = 0.00 V
U31 = 0.00 V
Q1
Q2
Q3
F2
F3
F4
e²ECHO-B
STOP
OBECNOŚĆ NAPIĘCIA NA KABLU
STEROWANIE CZŁONEM WYSUWNYM
STEROWANIE WYŁĄCZNIKIEM
STEROWANIE UZIEMNIKIEM
OŚWIETLENIE PRZEDZIAŁÓW
ROZDZIELNICA ŚREDNIEGO NAPIĘCIA
TYP: e²ALPHA

We create ideas with power!

Protection relay e²TANGO-600, -800, -1000, -1200 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

APPLICATION

e²TANGO -600, -800, -1000, -1200 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- and capacitor bay. Thanks to the additional measurement of current and voltage, both on the MV and LV sides, they can be used in particular in all types of renewable power plants energy, such as wind farms and solar farms, both for low, medium and high voltage grids. 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 and solar power plant bay

- synchrocheck
- df/dt
- du/dt

motor bay

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

transformer bay

- thermal protection
- flux-gas protection
- 2nd harmonic restraint

line bays

- earth fault protection
- distance protection
- automatic frequency load shedding

capacitor battery bay

- internal current of capacitor battery
- automatic inclusion capacitor switching bank

incoming bays

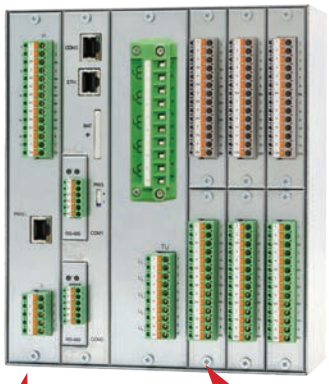
- ATS automation
- automatic bus-bar protection
- automatic breaker failure protection

ADVANTAGES OF THE PROTECTION RELAY

quick start
first run configuration assistant, predefined synoptic diagram library, predefined protections 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



high safety / increase safety
possible to visualise switch states on the panel screen by camera; possible to cooperate with busbar temperature sensors

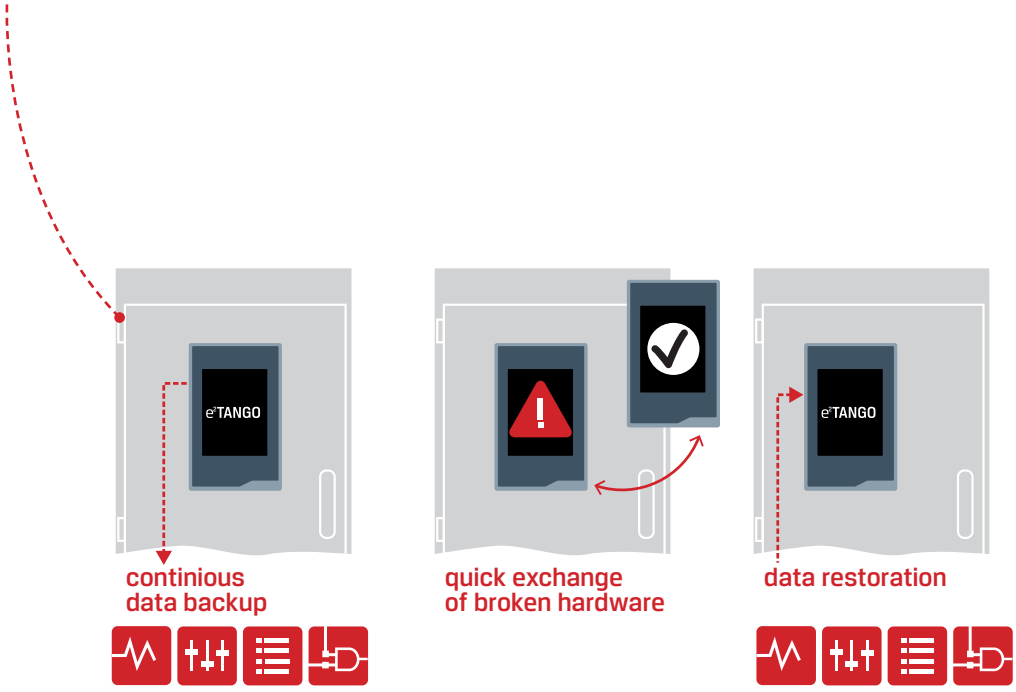
hot reserve
restoring within a few minutes functioning of the bay after fail, possibility to recover all bay data such as: settings, logic, events

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

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

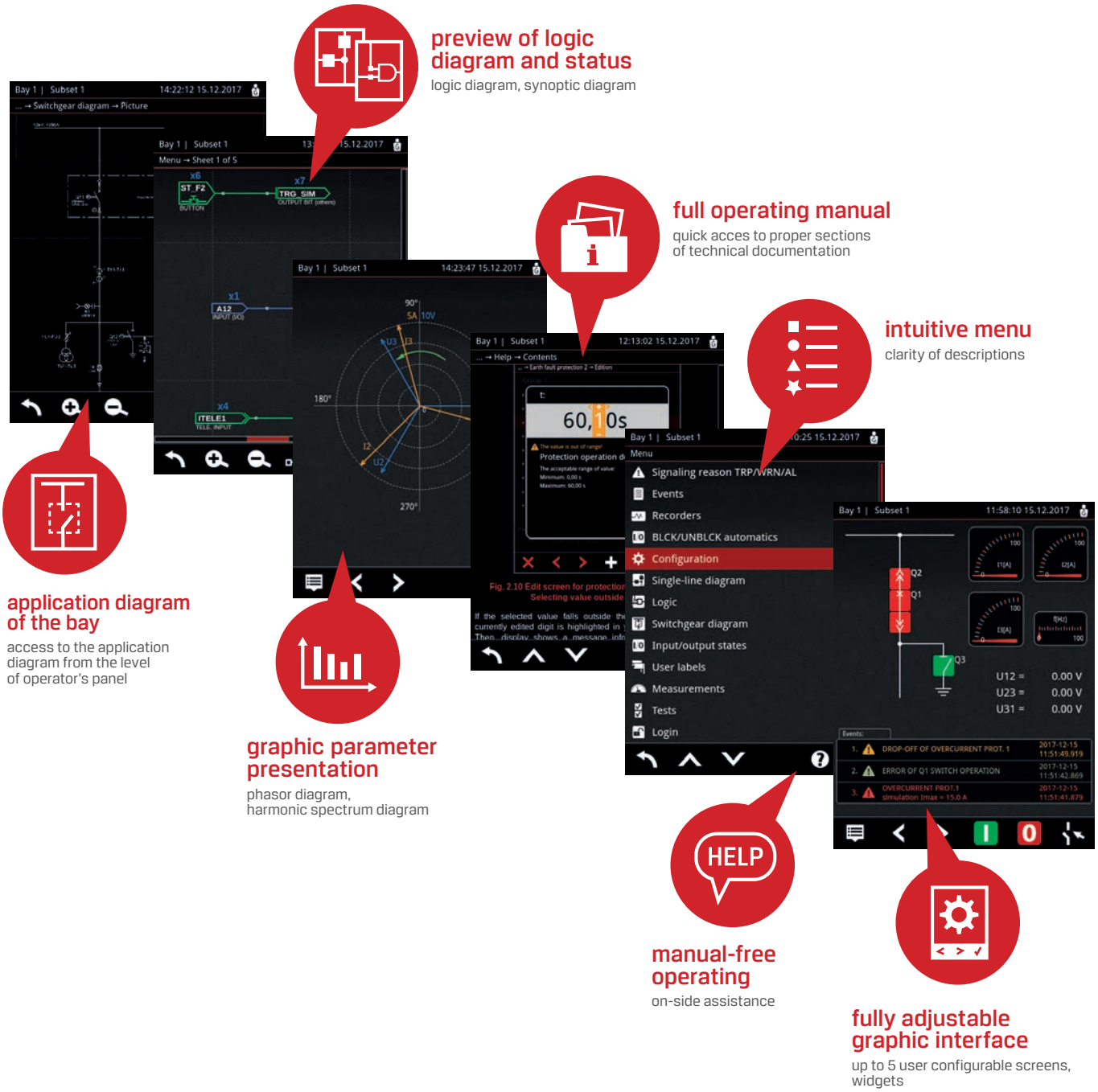


continious data backup

quick exchange of broken hardware

data restoration

ADVANTAGES OF THE PROTECTION RELAY



Intuitive e²TANGO-600, -800, -1000, -1200 protection relay is equipped in fully configurable clear interface, extended configuration, recorders and measurement functions. Clarity 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.

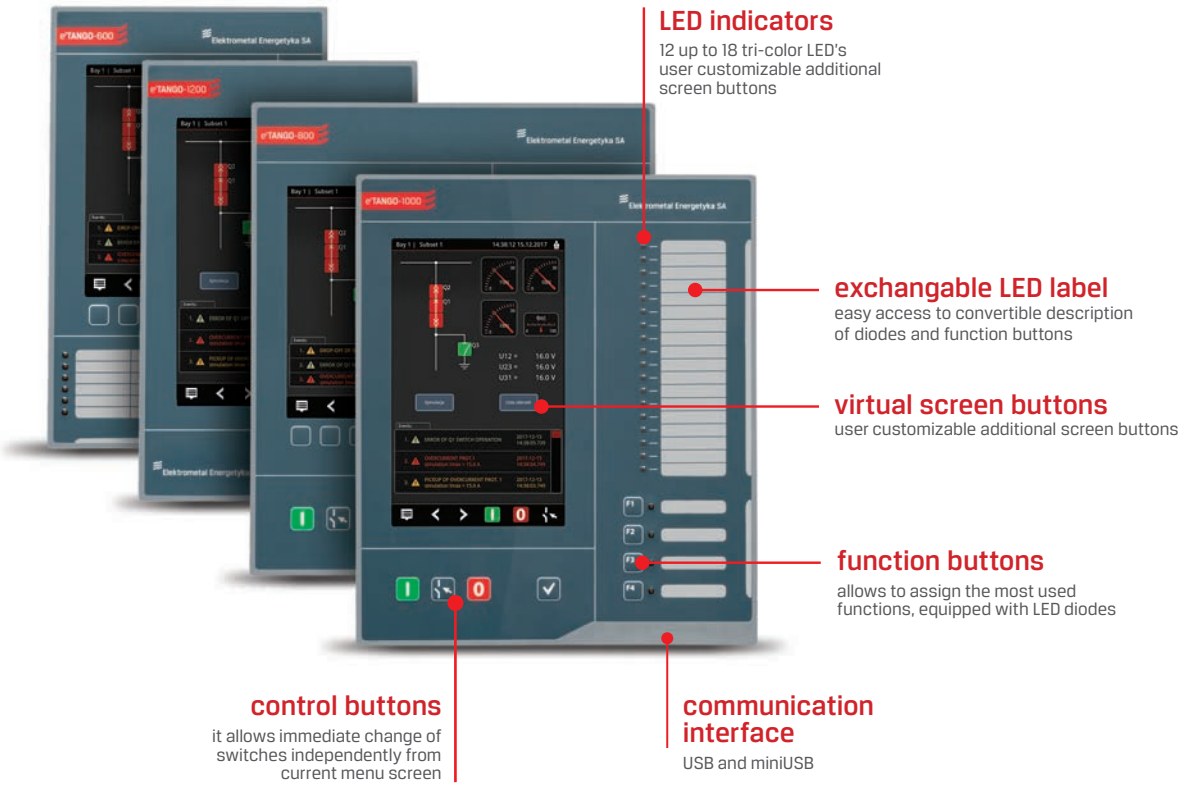
ADVANTAGES OF THE PROTECTION RELAY WITH TOUCH PANEL

- 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 and e²TANGO-800 in big, intelligible, 6-inch colour screens. Operating panels e²TANGO-1000 and e²TANGO-1200 have 7-inch, colour touch screens. Operating panels (depending on the version) are equipped with several 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 with 6- or 7-inch screens, which allow displaying of any configuration, measurements, diagrams or graphs.



* Detailed information in e²TANGO TYPES, page 8

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) (3-color)*	2	4	4	-
LEDs (3-color)*	12	14	18	18
Virtual LED (on screen)(3-color)*	0	0	10	10
Virtual function buttons (on screen)	-	-	4	8
Exchangable 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 • 6 slots • dimensions: 222 × 187 × 103 (H×W×D)	•	•	o	o
Unit J10 • 10 slots • dimensions: 222 × 234 × 103 (H×W×D)	o	o	•	•
Unit J14 • 14 slots • 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 (12)	0 (12)	0 (12)	0 (12)
OTHER				
Widgets	•	•	•	•
Synoptic diagram library	55	55	55	55
Number of screen tabs for configuration	5	5	5	5
Logic diagrams preview	•	•	•	•

•/o - standard/option
* - (3-color) - red/green/orange
** - for the biggest main unit filled up with one type of extension card
*** - require proper number and types of extension cards

PROTECTION FUNCTIONS

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
32P	reverse active power
32Q	reverse reactive power
37	undercurrent
51VN	ground overcurrent with voltage interlock
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	coils supervision
50C	overcurrent of capacitor bank
AFP*	arc protection (cooperates witch arc detectors)
59N	zero sequence over-voltage
21N	admittance
21ND	admittance directional
64S	earth fault stator
66/86	motor start-up protection
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
38/49T	temperature monitoring

AUTOMATION SYSTEMS

- Accelerated protection action automation system
- Automatic load shedding
- Auto reclose function
- Breaker failure protection failure protection equipment
- Capacitor bank switching
- Grid system zero point grounding automation*
- Active component forcing
- Automatic busbar protection
- Automatic transfer switch with auto re-transfer
- Other based on programmable logic
- Synchrocheck

* in agreement with the producer

ATS AUTOMATION

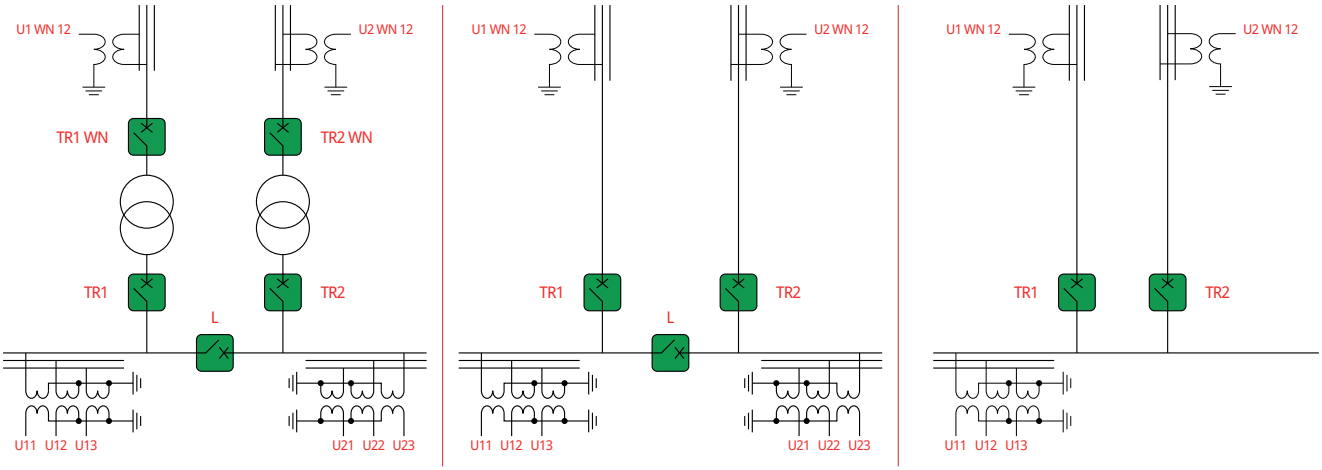
Controllers for automatic transfer switch with auto re-transfer - e²TANGO ATS have been developed on the base of e²TANGO controllers and supports the same features and functions. They are available in various configurations for LV, MV and HV network. Standard version allows implementation of automation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

Controller features:

- hidden, 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 as engineering link. Support for Modbus RTU, Modbus TCP, IEC870-5-103, DNP3.0, Canbus, Profibus protocols.
- event recorder for 1024 events, recording all automation operations, interlocks and emergency states.
- disturbance recorder recording the measured voltages with configurable recording time after triggering the recorder.
- planned transfer switch (PTS)
- synchronous uninterruptible switching
- synchronous switching with interruption
- quasisynchronous switching
- quasisynchronous switching with a short voltage interruption
- slow switching

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 switchgear with two supply lines. In the case of 2-sectional switchgear 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 unit
- central processor unit
- power supply unit with strenghtened contacts 10 A DC (110 V)

FUNCTION CARDS
- 8 binary inputs
- 12 binary inputs
- 8 binary outputs
- 4 binary outputs with strengthened contacts 10 A DC (110 V)

MEASUREMENT CARDS
- standard (5I+4U)
- synchrocheck (4I+5U)
- ATS (9U)
- universal (5I+5U)
- with Rogowski's coil and voltage sensors (3Ir+2I+4U)
- with separated inputs for measurement CTs (5I+3Ip+4U)

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

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

TEMPERATURE SENSORS CARDS
- 6 PT100 inputs
- 6 PT1000 inputs
- 6 inputs for busbar temperature measurement

OTHER
- additional current set measurement for differential card
- additional voltage set measurement card (4U)
- additional current set measurement card (4I)

COMMUNICATION PORTS AND PROTOCOLS

- Ethernet
- Single mode fibre optic - OPTOSM
- Multimode fibre optic - OPTOMM
- Plastic fibre optic - OPTOP
- RS485
- CANbus 2×
- USB 2.0
- WiFi*
- Modbus RTU/TCP
- IEC 60870-5-103
- DNP 3.0
- IEC 61850
- Profibus
- CANbus/PPM 2

* in agreement with the producer

RECORDERS

- event recorder, 1024 events
- disturbances recorder up to 166 s sampling rate 1,6; 3,2 kHz
- criterial recorder up to 710 s
- temporary value recorder, TrueRMS
- grid parameters recorder
- load profile recorder
- phasor diagram

BASIC SIZES

e²TANGO-600

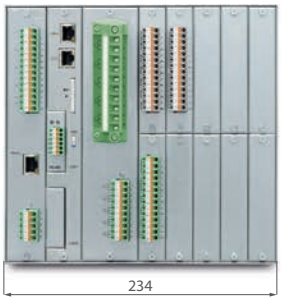
e²TANGO-800

e²TANGO-1000

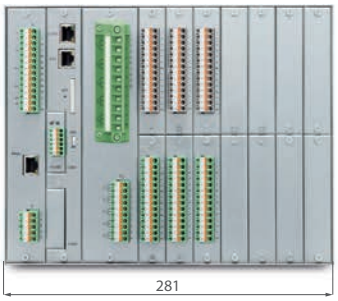
e²TANGO-1200

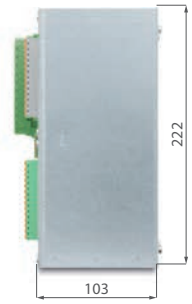
J6

J10



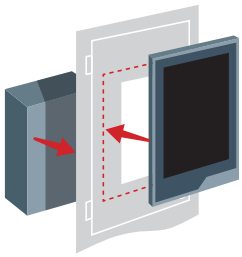
J14



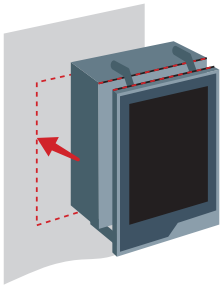


MOUNTING METHOD

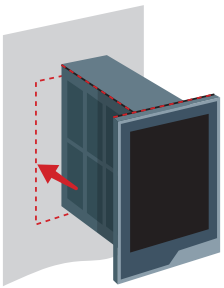
flush mounting



wall mounting

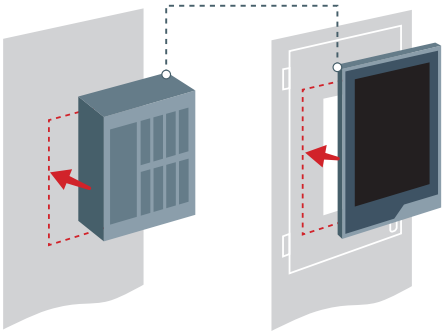


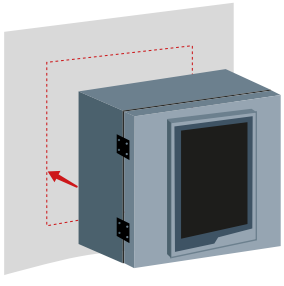
version 1



version 2

mixed mounting





version 3

TECHNICAL PARAMETERS

AUXILIARY POWER SUPPLY	
DC Voltage AC Voltage Option	110 V, 220 V (80-300 V) 230 V (88-265 V) 24 V (19-58 V AC/DC)
Maximal power consumption (central unit with operating panel)	30 W (VA)
CURRENT MEASUREMENT CIRCUITS	
Rated current	5 A/1 A
Rated frequency	50/60 Hz
Measurement range for phase currents with current transformers with Rogowski coils	 0,05-150 A 5-1400 mV (5-1400 A) Other range on request
Measurement range for current I_0	0,001-10 A
Measurement range for current Ig in feeder T_U	0,01-10 A
VOLTAGE MEASUREMENT CIRCUITS	
Rated voltage	57,7/100 V
Rated voltage for additional set of measurements	57,7/100/120 V
Rated voltage for sensors	$2/\sqrt{3}$ or $3,25/\sqrt{3}$ V
Voltage measurement range U, U_0	3-120 V
Voltage measurement range for additional set	3-280 V
Voltage measurement range for sensors	0.16-2.3 V
Heat resistance voltage 10s	150 V
BASIC PROTECTION PARAMETERS	
Return coefficient for overload protections	Configurable
Return coefficient for under-load protections	Configurable
Operate time	typically 35 ms
Operate time for arc protection	⟨10 ms
ACCURACY OF MEASUREMENT	
I1, I2, I3 (0.1-150 A/5-1400 mV)	1%
U1, U2, U3, U0 (5-120 V/5-280/0.16-2.3 V)	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 Option	110/230 V AC/DC 24 V (19-58 V AC/DC) Other on request
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 A
Opening circuit at 220 V DC (L/R = 0)	0,4 A
Opening circuit at 220 V DC (L/R = 40 ms)/PSU HI	0,3 A/5 A (for PSU HI card)
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)/OUT HI	0,1 A/5 A (for OUT HI card)
Opening circuit at 110 V DC (L/R = 40 ms)	10 A (for PSU HI and OUT HI card)
Opening circuit at 220 V AC (cos φ = 0,1)	2 A
ENVIRONMENTAL CONDITIONS	
Working temperature	-10 °C ... +55 °C
Storage temperature	-25 °C ... +70 °C
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)	187/234/281 x 103 x 222
Degree of protection for main unit	IP 3X/IP 4X (optional)
Degree of protection for operating panel (front side)	IP 4X/IP 54 (optional)

e²TANGO-STUDIO SOFTWARE

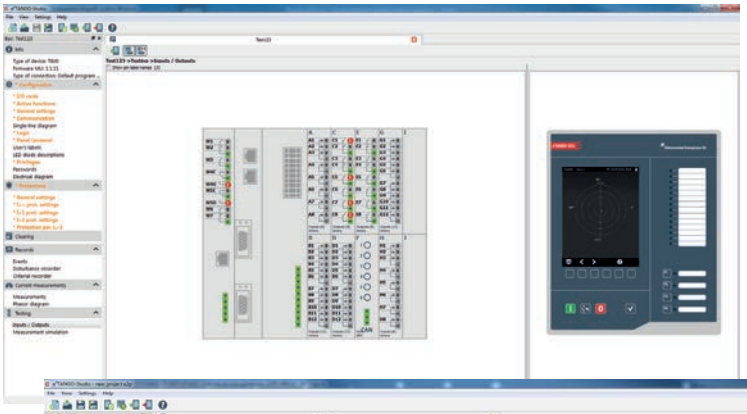
e²TANGO-Studio software intended to operate e²TANGO protection relay. It is at the same time configuration tool for the operating panel. This software has been equipped with extended set of functions, which are combined with clear graphic interface. Finally it creates great tool which supports every-day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

quick configuration assistant

helps first time users of the software and facilitates regular use

advanced design functions

ability to prepare device configuration for an entire switchgear on a PC and distribute it using USB

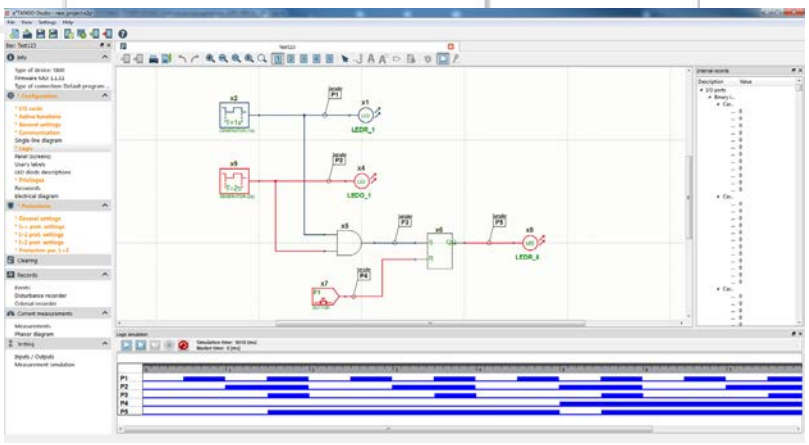


on-line preview

real-time preview of measurement input/output status displaying actual LCD screen content

display conformity

preview of the actual panel screen



visual characteristic modification

graphical and classic protection setpoint configuration

easy setpoint and selectivity verification

displaying setpoints of all related overcurrent protection functions on one chart

full status preview

access to all internal device and protection function statuses

possible expansion using plug-ins

logic simulator

possibility to simulate whole logic without connection with device

logic clarity

possibility to split logic in blocks and sheets

ultra-fast design of custom screens

drag&drop element placement

support for sophisticated logical dependencies

up to 340 logic gates / elements

„miniSCADA" FUNCTIONALITY

e²TANGO-Studio has possibility to expend with "miniSCADA" functionality that lets you visualise state of switchgear and allows to manipulate switches, alarms and events preview and online access to measured parameters of protection relay (e.g. current, voltage, power, energy) installed in switchgear. Functionality was designed to share engineering link (one communication port) to protection relays, which gives possibilities for costs optimization by wiring and infrastructure simplifying.

"miniSCADA" plug-in is optional as additional license.

intuitive configuration of screens
possible to use widgets

data transmission using available communication ports
RS485, OPTO, Ethernet and others

cost optimization
no need to use advanced SCADA systems

universal software to all e²TANGO types

possible to work in any operating system

access from mobile devices

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.

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 008/2020

Gold medal
ENERGETAB 2015 fairs

The Minister of Energy Cup
ENERGETAB 2018 Fairs

Masovian Quality Award

GAZELE BIZNESU 2020
21. EDYCJA RANKINGU NAJBARDZIEJ DYNAMICZNYCH MAŁYCH I ŚREDNICH FIRM
Puls Biznesu

Gazelles of Business 2020

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-EN ISO 45001 Health and Safety Management System

ORDER FORM

To order e²TANGO-600, -800, -1000, -1200 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	☐ J6H[1]	☐ J10H[1]	☐ J14H[1]
③	TR measurement card type change the way of measurement metod(from core transformer)[2]	☐ TR (standard, 5I+4U) ☒ TRS (for synchrocheck, 4I+5U) ☐ TRC (Rogowski coils $3I_{CR}$ + 2I +4U) ☐ TRCZ (Rogowski coils $3I_{CR}$ + 2I + voltage sansors 3U)	☐ TRU (for SZR, 9U) ☐ TRSG (5I+5U)	☐ TRP (5I+3Ip+4U)			
④	rated current of the measurement card	☒ 5 A[3]	☐ 100 V (for ATS)	☐ 230 V (for ATS)	☐ X - for TRC or TRCZ		
⑤	binary input voltage	☒ UNI (110/230 V AC/DC)	☐ 24V (24/48 V AC/DC)[4]	☐ Other (on consultation with the manufacturer)			
	communication ETHERNET (standard equipment in each central unit)						
⑥	COM1	☒ x-none	☐ RS485	☐ CANx2	☐ OPTOMM	☐ OPTOP	☐ Profibus ☐ other
⑦	COM2	☒ x-none	☐ RS485	☐ CANx2	☐ OPTOMM	☐ OPTOP	☐ OPTOSM[5] ☐ Profibus ☐ other
⑧	mounting method	☒ Z- flush	☐ N1- wall version 1	☐ N2- wall version 2	☐ N3- wall version 3	☐ M-mixed	
⑨	panel-main unit cable length[6]	☒ S-1 m	☐ L-2 m	☐ Other (on consultation withe the manufacturer)			
⑩	IP protection level[7]	☒ IP 4X	IP 54[8]				
⑪	IEC 61850[9]	☒ X-none ☐ E-electrical ETH	☐ 0-fiber optics ETH ☐ EG-electrical ETH +GOOSE	☐ 02-fiber optics ETH with PRP ☐ 0G-fiber optics ETH +GOOSE	☐ 02G-fiber optics+GOOSE ☐ E2G-electrical+GOOSE	☐ E2-electrical	

1) W1, W2, W3 strengthened outputs
2) eg.page 18
3) 5A/1A configurable from the software level
4) universal card for voltages in the range of 24-48 V AC / DC
5) OPTOSM card required for communication with the other side in the case of line differential protection
6) in the 3rd wall mounting version, a 0,25 m long cable is used
7) degree of protection for operating panel (front side)
8) IP54 protection level available only in version with flush and mixed mounting
9) IEC 61850 communication is supported by additional communication interfaces (RJ45 or SC type) located in the operating panel

STEP 2

card type	Code	Slot A	B	C	D	E	F	G	H	I	J	K	L	M	N
processor card CPU	-	installed in each device													
power supply card PSU - 7 binary outputs	-	installed in each device													
communication Ethernet	-	installed in each device													
8 binary inputs	8IN	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
12 binary inputs	12IN	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
8 binary inputs 24 V*	8IN24	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
12 binary inputs 24 V*	12IN24	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
8 binary outputs	8OUT	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
4 binary outputs (highcurrent)	0UTHI	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
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 TMP inputs (busbar temperature measurement sensors)	6TMP	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
3 TMP inputs (busbar temperature measurement) + 3 sensors	3TMP	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
6 arc detector input with CANbus communication + 3 arc detectors	ARC	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
6 arc detector input (passive) + 3 arc detectors	ARP	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
additional voltage set measurement card (4U)**	TV					☐									
current additional current measurement card (4I)***	TRR						☐								

J6 | J10 | J14

* - universal card for voltage range 24-48 V AC/DC
** - card placed in slot E
*** - card required for motor the motor differential protection or the LV side current measurement of transformer, available only for J10 and J14 units, the card is placed in two slots D and F

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	⑪
	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-600, -800, -1000, -1200 protection relay. From each position marked with a numbers from 1 to 11 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

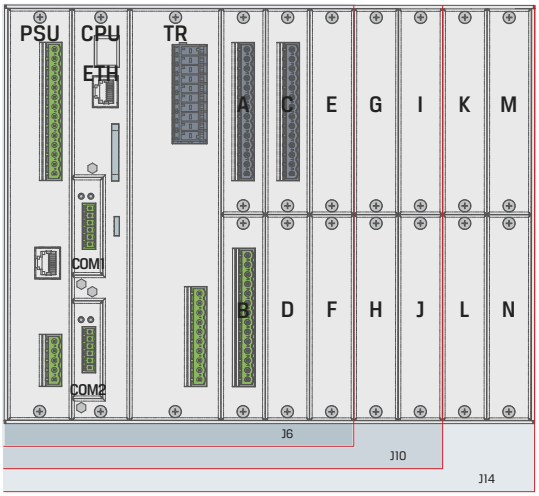
- ▢ - recommended basic configuration
- OPTOMM - multi-mode optic fibre
- N1-wall mounting version 1
- N2-wall mounting version 2
- N3-wall mounting version 3

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-600, -800, -1000, -1200. 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.

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



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
- maximum 1 3TMP or 6TMP card
- TRR card can only be installed in slot F in J10 and J14 units, occupy two slots D and F
- the ARP card can be placed in the device only if an ARC card is already installed
- TV card for additional voltage set measurement can only be installed in slot E; TV card can't be installed simultaneously with TRS card in the same equipment
- 3TMP and 6TMP cards for busbar tempearture measurement is aquipped with 5 m long communication fiber optic, other length on customer's request; Dimentions of the busebar must be specified as additional requirement

STEP 3

Selected above parameters of the e²TANGO-600, -800, -1000, -1200 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 TRC measurement card (voltage measurement current by core transformer and Rogowski coil)	⑩ IP 4X protection level
④ rated current of measurement card 5A: X	⑪ Standard IEC 61850
⑤ universal binary input voltage	A slot A: 8IN card
⑥ OPTOMM	B slot B: 8OUT card
⑦ RS485	C slot C: 12IN card
	D slot D: X card
	E slot E: ARC card
	F slot F: TRR card

Example of correct filled code:

e²TANGO	1000	J10	TRC	X	UNI	OPTOMM	RS485	M	8	IP 4X	E

8IN	8OUT	12IN	X	ARC	TRR								

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