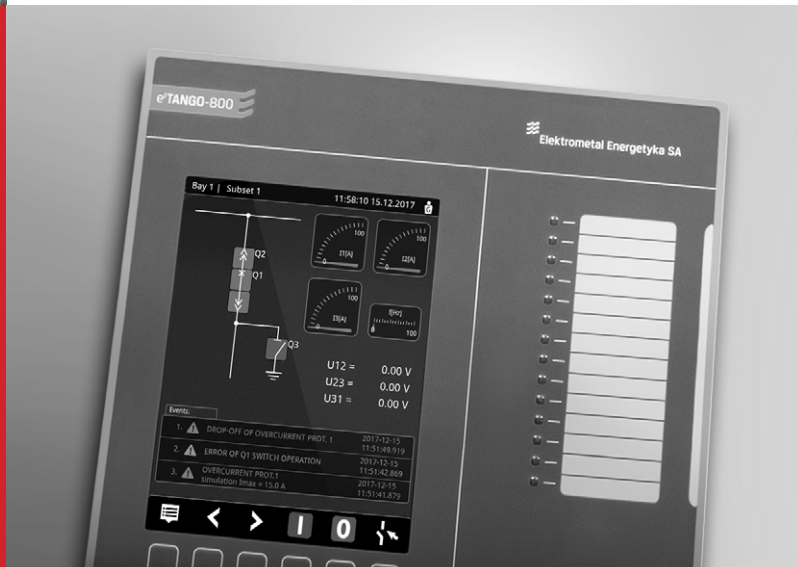




Elektrometal Energetyka SA



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



e²TANGO-800
Elektrometal Energetyka SA



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

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

Q2
Q1
Q3
T

Wydarzenia

- REZERWY WZNIKLO 2015-03-26 14:38:33
- SPRAW. NAPĘDZA OAKULANA 2015-03-19 13:00:24
- POB. WE A2 2015-03-19 14:08:26
- ODWZB. WE A1 2015-03-19 14:08:26

I 0 ✓



e²ECHO-B



L1 L2 L3 N

OBECNOŚĆ
NAPIĘCIA
NA KABLU



STEROWANIE
CZŁONEM
WYSUWNYM



STEROWANIE
WYŁĄCZNIKIEM



STEROWANIE
UZIEMNIKIEM



OŚWIETLENIE
PRZEDZIAŁÓW

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



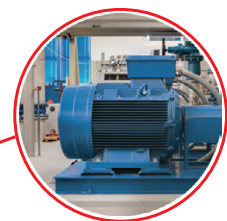
APPLICATION

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

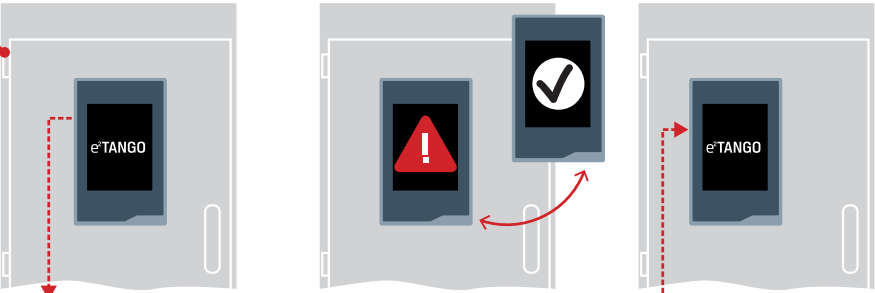
hot reserve
restoring within a few minutes functioning of the bay after fail, possibility to recover all bay data such as: settings, logic, events

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

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


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



continous data backup

quick exchange of broken hardware

data restoration



ADVANTAGES OF THE PROTECTION RELAY

preview of logic diagram and status
logic diagram, synoptic diagram

full operating manual
quick access to proper sections of technical documentation

intuitive menu
clarity of descriptions

application diagram of the bay
access to the application diagram 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-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

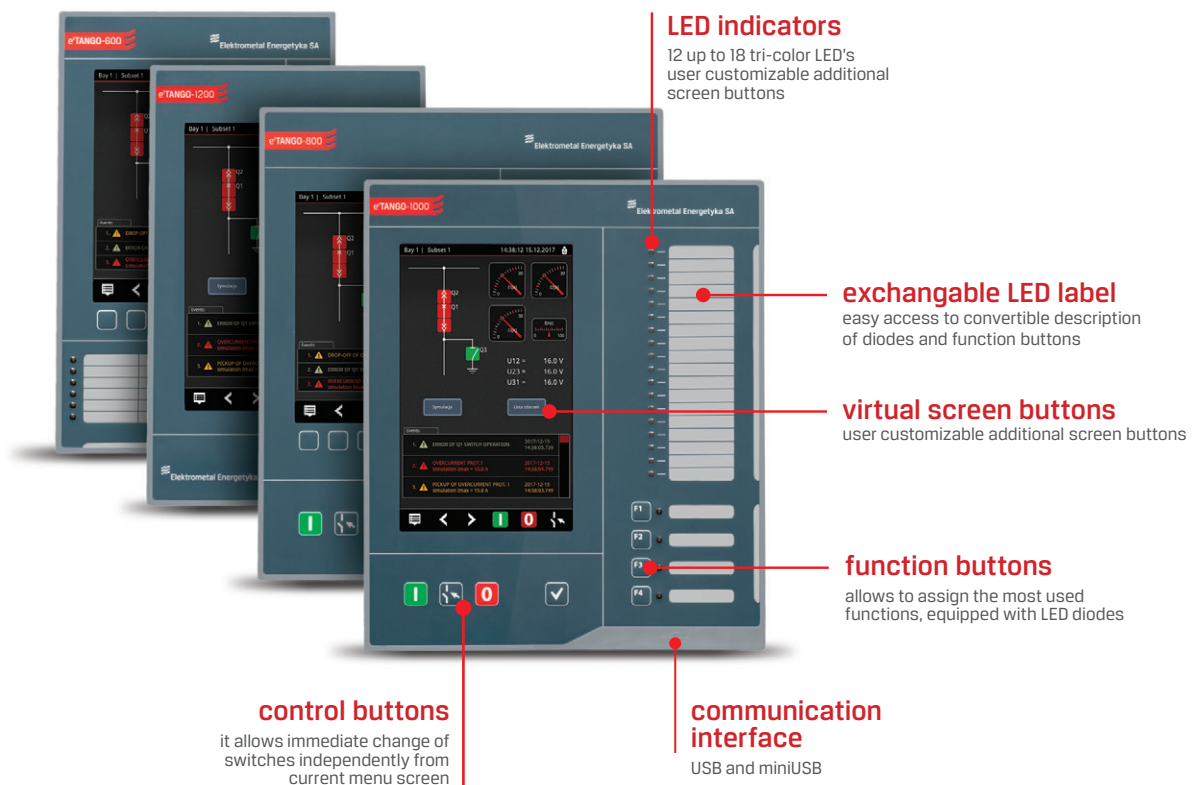


- alphanumeric keyboard
- touch control menu
- touch control for logic through fluent scrolling of diagrams
- screen buttons allowing use of bigger number of functional buttons as well as assigning them short-cuts option
- direct choice of switch for controlling from panel screen
- events scrolling on 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

	600	800	1000	1200
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 <ul style="list-style-type: none"> 6 slots dimensions: 222 × 187 × 103 (H×W×D) 	•	•	0	0
Unit J10 <ul style="list-style-type: none"> 10 slots dimensions: 222 × 234 × 103 (H×W×D) 	0	0	•	•
Unit J14 <ul style="list-style-type: none"> 14 slots dimensions: 222 × 281 × 103 (H×W×D) 	0	0	0	0

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

13	Synchronous-Speed
21NY	Admittance directional protection
23/26	Temperature protection (PT100 sensor)
23/26	Temperature measurement from busbars with optical fiber sensors
23/26/62	Temperature protection (binary)
27/27P	Undervoltage
27/ARC	Arc protection
27ROC/59ROC	Rate of change of voltage
32P	Reverse active power protection
32Q	Reverse reactive power protection
37	Undercurrent protection
46	Phase balance or reverse sequence current protection
48	Incomplete Sequence
49	Thermal protection
50/50N/50Ns/50G	Overcurrent / ground overcurrent protection
50HS/S0TF	Switch on to fault protection
50LR/51LR	Locked rotor
50NC/51NC	Capacitor bank overcurrent
51/51N	Inverse overcurrent protection
51/51N/51Ns/51G	Time overcurrent / ground time overcurrent protection

51N/59N	Ground time overcurrent with voltage interlock
51Ns/51G	Inverse ground overcurrent protection
59/59P/59_1/59_2	Overvoltage
59/Ufr	Ferroresonance detection algorithm
59N	Ground overvoltage
62	External binary protection
66	Notching or Jogging Device/ Maximum Starting Rate/Starts Per Hour/Time Between Starts
67/67N/67Ns/67G	Directional overcurrent / ground directional overcurrent protection
74TCS	Trip, close coil supervision
80	Flux-gas
810	Under-frequency protection
81R	Rate of change of frequency
81U	Over-frequency protection
87L/87LG	Line / Ground Line differential
87M	Motor differential
87T	Transformer differential
CAM*	Preview from the cameras on the panel screen
INS*	Insulation of MV cables set of measurements
S&H*	Safety and health notice

* special version on client's requests

AUTOMATION SYSTEMS

- (25) Synchronism-Check
- (41N) Active component forcing
- (50/68) Busbar protection
- (50BF) Breaker failure protection
- (79) Auto reclose
- (79VF) Automatic "island" reclose function with option of locking after multiple power-up
- (81U/810) Automatic load shedding
- (83) Automatic transfer switch
- (90C) Capacitor bank switching

ATS AUTOMATION

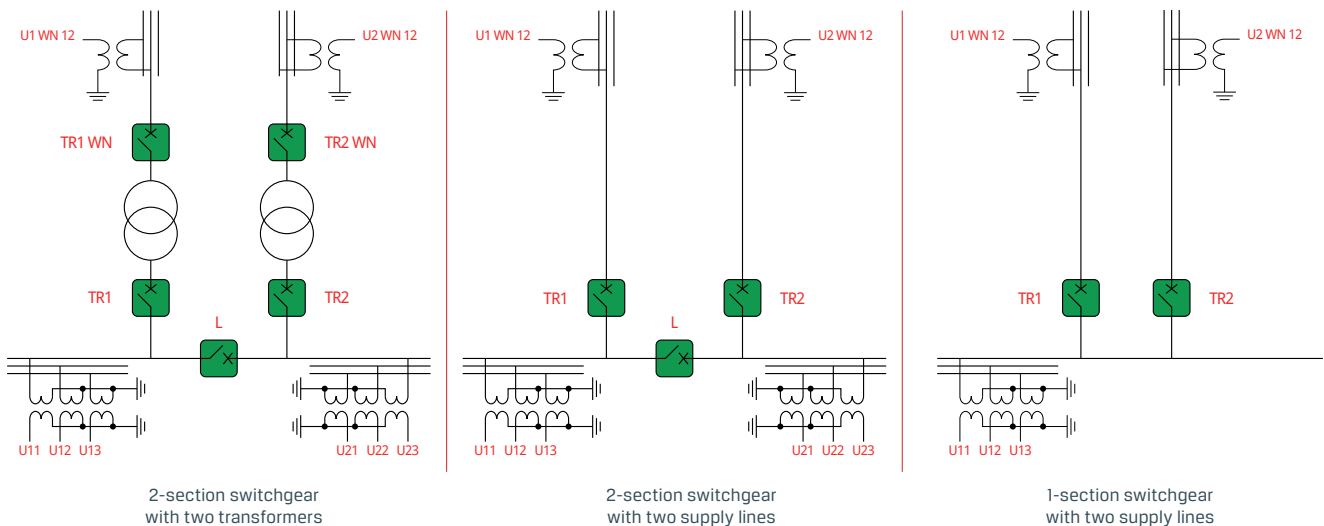
Controllers for automatic transfer switch with auto re-transfer - e²TANGO ATS have been developed on the base of e²TANGO controllers and supports the same features and functions. They are available in various configurations for LV, MV and HV network. Standard version allows implementation of automation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



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 strengthened 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 (3I+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)
- redundancy supply card

COMMUNICATION PORTS AND PROTOCOLS

- Ethernet
- Single mode fibre optic - OPTOSM
- Multimode fibre optic - OPTOMM
- Plastic fibre optic - OPTOP
- RS485
- CANbus 2x
- 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



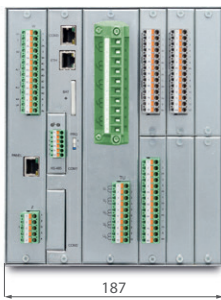
e²TANGO-1000



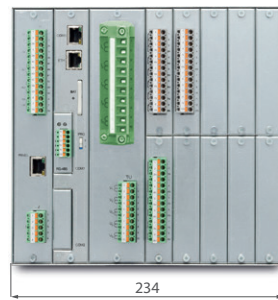
e²TANGO-1200



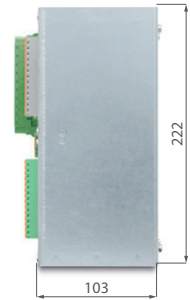
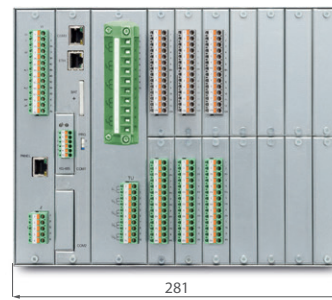
J6



J10

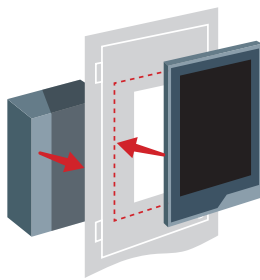


J14

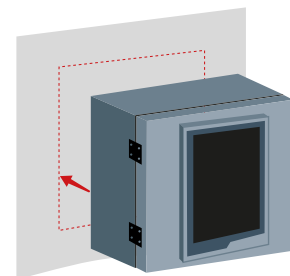
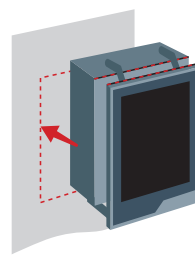


MOUNTING METHOD

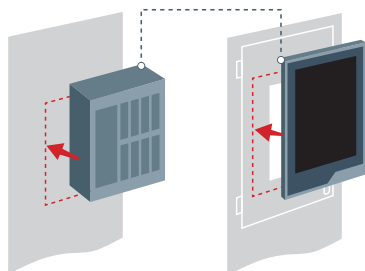
flush mounting



wall mounting

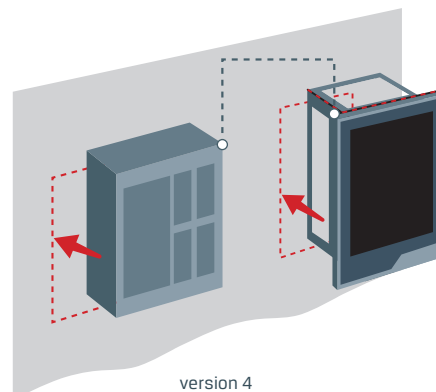


mixed mounting



version 1

version 3



version 4

TECHNICAL PARAMETERS

AUXILIARY POWER SUPPLY	
DC Voltage	110 V, 220 V (80-300 V)
AC Voltage Option	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 I _g in feeder TU	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/√3 or 3,25/√3 V
Voltage measurement range with current transformers	3-120 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
MEASUREMENT ACCURACY	
I ₁ , I ₂ , I ₃ (0.1-150 A/5-1400 mV)	1%
U ₁ , U ₂ , U ₃ , U ₀ (5-120 V/5-280/0.16- 2.3 V)	1%
I ₀ (0.001-10A)	1%
P, Q, EC, EB (U>5V, 0.1A<I<10A, 60°<φ <-60°)	1%
φ ₁ , φ ₂ , φ ₃ , φ ₀	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 to +55 °C
Storage temperature	-25 to +70 °C
Relative humidity	5 to 95%
Vibration and mechanical shock resistance	Class 1 acc. IEC 60255-21
Electromagnetic disturbances	Class B acc. IEC 60255-26
SAFETY	
Insulation electric strength	2 kV/50 Hz/60 s acc. 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	IP3X/IP4X (option)
Degree of protection for operating panel (front side)	IP4X/IP54 (option)

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

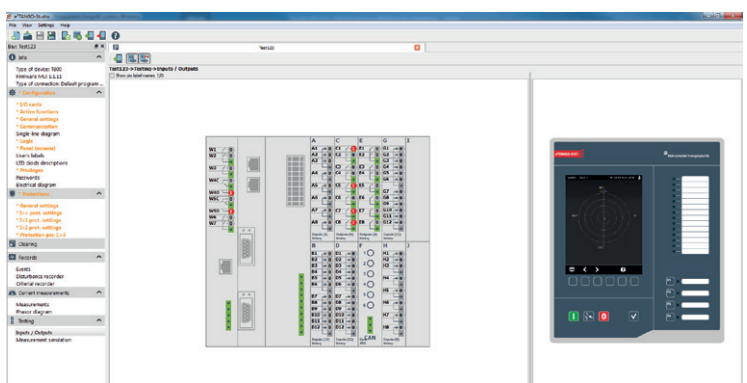


on-line preview

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

display conformity

preview of the actual panel screen

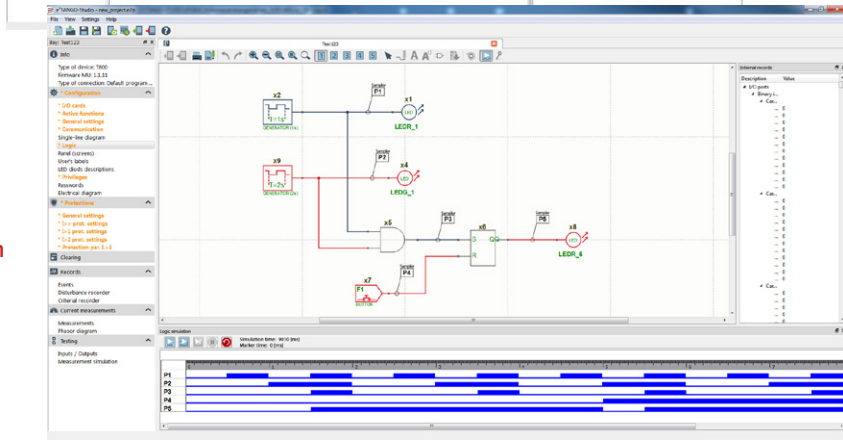


visual characteristic modification

graphical and classic protection setpoint configuration

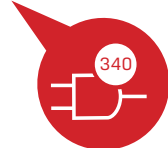
easy setpoint and selectivity verification

displaying setpoints of all related overcurrent protection functions on one chart



full status preview

access to all internal device and protection function statuses



support for sophisticated logical dependencies

up to 340 logic gates / elements



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

„miniSCADA” FUNCTIONALITY

e²TANGO-Studio has possibility to expand 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.

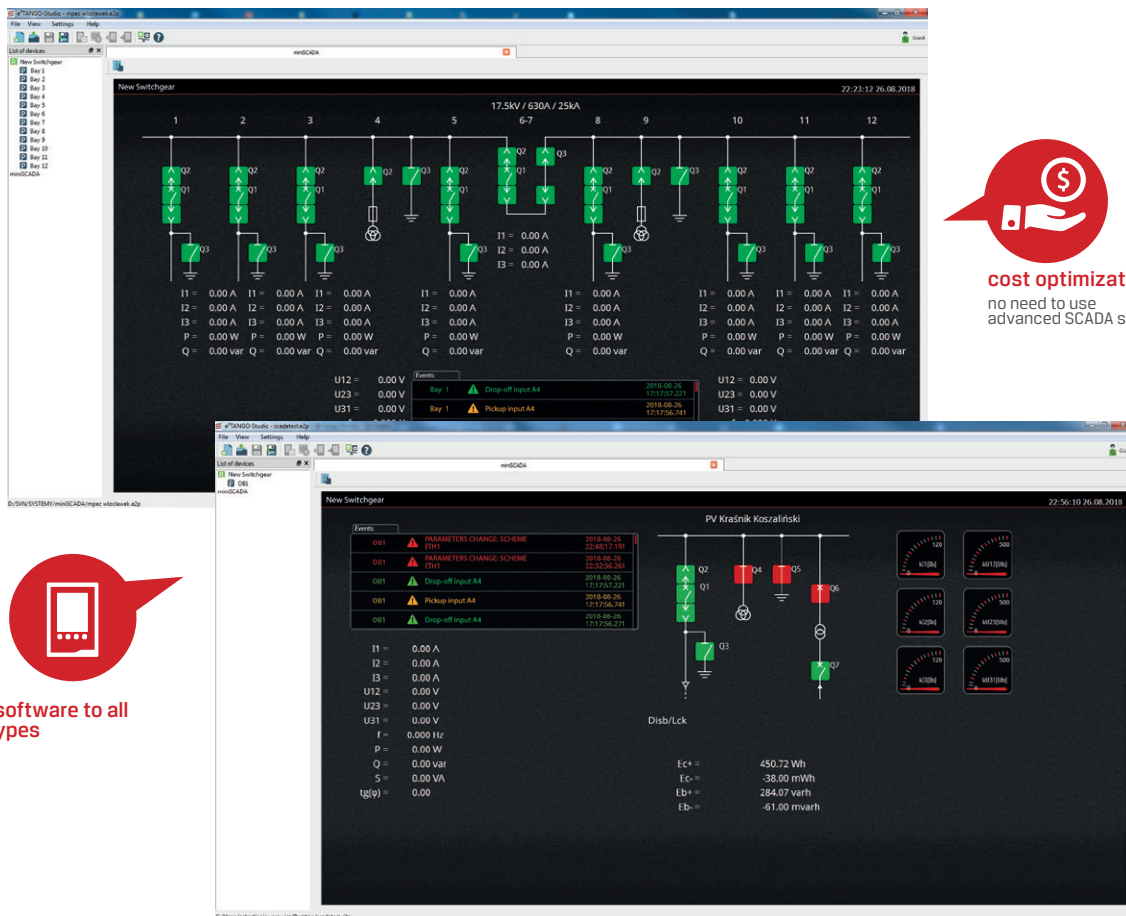
"miniSCADA" plug-in is optional as additional license.



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



Masovian Quality Award



The Minister of Energy Cup
ENERGETAB 2018 Fairs



Forbes Diamonds 2023

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	<input type="checkbox"/> 600	<input checked="" type="checkbox"/> 800	<input type="checkbox"/> 1000	<input type="checkbox"/> 1200		
② main unit type	<input checked="" type="checkbox"/> J6	<input type="checkbox"/> J10	<input type="checkbox"/> J14	<input type="checkbox"/> J6H ¹⁾	<input type="checkbox"/> J10H ¹⁾	<input type="checkbox"/> J14H ¹⁾
TR measurement card type	<input type="checkbox"/> TR (standard, 5I+4U)	<input checked="" type="checkbox"/> TRS (for synchrocheck, 4I+5U)	<input type="checkbox"/> TRU (for SZR,9U)	<input type="checkbox"/> TRSG (5I+5U)	<input type="checkbox"/> TRP (5I+3Ip+4U)	
③ change the way of measurement method (from core transformer) ²⁾	<input type="checkbox"/> TRC (Rogowski coils 3I _{CR} + 2I + 4U) <input type="checkbox"/> TRCZ (Rogowski coils 3I _{CR} + 2I + voltage sensors 3U)					
④ rated current of the measurement card	<input checked="" type="checkbox"/> 5A, 100V (dla kart TR, TRS, TRP, TRSG)		<input type="checkbox"/> 100V, 230 V (TRU)	<input type="checkbox"/> X - none (for TRC, TRCZ cards)		
⑤ binary input voltage	<input checked="" type="checkbox"/> UNI (110/230V AC/DC)	<input type="checkbox"/> 24V (24/48V AC/DC) ⁴⁾	<input type="checkbox"/> other (on consultation with the manufacturer)			
communication ETHERNET (standard equipment in each central unit)						
⑥ COM1	<input checked="" type="checkbox"/> x-none	<input type="checkbox"/> RS485	<input type="checkbox"/> CANx2	<input type="checkbox"/> OPTOMM		
	<input type="checkbox"/> OPTOP	<input type="checkbox"/> Profibus	<input type="checkbox"/> other			
⑦ COM2	<input checked="" type="checkbox"/> x-none	<input type="checkbox"/> RS485	<input type="checkbox"/> CANx2	<input type="checkbox"/> OPTOMM	<input type="checkbox"/> OPTOSM ⁵⁾	
	<input type="checkbox"/> OPTOP	<input type="checkbox"/> Profibus	<input type="checkbox"/> other			
⑧ mounting method	<input checked="" type="checkbox"/> Z- flush	<input type="checkbox"/> N1- wall version 1	<input type="checkbox"/> N3- wall version 3	<input type="checkbox"/> N4- wall version 4	<input type="checkbox"/> M-mixed	<input type="checkbox"/> ZR-installation in a rack cabinet
⑨ panel-main unit cable length ⁶⁾	<input checked="" type="checkbox"/> S-1 m	<input type="checkbox"/> L-2 m	<input type="checkbox"/> other (on consultation with the manufacturer)			
⑩ IP protection level ⁷⁾	<input checked="" type="checkbox"/> IP4X	<input type="checkbox"/> IP54 ⁸⁾				
⑪ IEC 61850 ⁹⁾	<input checked="" type="checkbox"/> EX-none	<input type="checkbox"/> O-ETH fiber optics	<input type="checkbox"/> O2-ETH fiber optics with PRP	<input type="checkbox"/> O2G-ETH fiber optics with PRP + GOOSE	<input type="checkbox"/> E2-electrical	
	<input type="checkbox"/> E-ETH electrical	<input type="checkbox"/> EG-ETH electrical +GOOSE	<input type="checkbox"/> OG-ETH fiber optics +GOOSE	<input type="checkbox"/> E2G-ETH electrical with PRP + GOOSE		
⑫ language version:	<input type="checkbox"/> PL	<input checked="" type="checkbox"/> EN	<input type="checkbox"/> other (in agreement with manufacturer)			

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

	Kod	Slot													
		A	B	C	D	E	F	G	H	I	J	K	L	M	N
card type															
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	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12 binary inputs	12IN	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8 binary inputs 24 V ¹⁾	8IN24	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12 binary inputs 24 V ¹⁾	12IN24	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8 binary outputs	8OUT	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 binary outputs (highcurrent)	4OUTH	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 analogue input 0-10 V	AI10	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 analogue input 4-20 mA	AI20	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 analogue output 0-10 V	AO10	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 analogue output 4-20 mA	AO20	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 PT100 temperature sensor input	PT1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 TMP inputs (busbar temperature measurement) + 3 sensors	3TMP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 TMP inputs (busbar temperature measurement sensors)	6TMP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 arc detector input with CANbus communication + 3 arc detectors	ARC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 arc detector input (passive) + 3 arc detectors	ARP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
redundancy supply card	PSU2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
additional voltage set measurement with transformers card (4U) ²⁾	TV	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
additional voltage measurement set with sensors for synchro check ⁴⁾	TVZ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
additional current measurement MVI side ³⁾	TRR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
additional current measurement M21 side or LV side ³⁾		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		J6				J10				J14					

1) universal card for voltage range 24-48 V AC/DC

2) card placed in slot E, TR or TRS card required

3) card placed in slot F for differential current measurement on the MVI side, available for J10 and J14 units, the card is placed in two slots D and E. Transformer card required for motor differential current measurement on the MV2 side or additional current measurement of transformer on the LV side available for J10 and J14 units, the card is placed in two slots D and F.

4) card placed in slot E, inserting TR card required

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

⑫

A

B

C

D

E

F

G

H

I

J

K

L

M

N

FORM INSTRUCTIONS

STEP 1

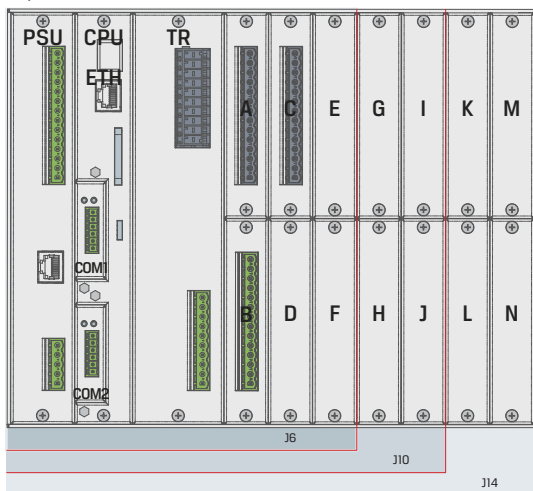
In the presented table there are the basic technical parameters of the e²TANGO-600, -800, -1000, -1200 protection relay. From each position marked with a numbers from 1 to 11 there is only one position to be selected. If you choose "other", in STEP 3 in the corresponding field, please enter the requested value.

STEP 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 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

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 instructions

- - recommended basic configuration
- max 4 cards 8OUT
- max 1 card AI10 or 1 card AI20
- max 1 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 temperature measurement is equipped with 5 m long communication fiber optic, other length on customer's request; Dimensions of the busebar must be specified as additional requirement
- the standard length of the flash sensors optical fiber is 5 m, other lengths in consultation with the manufacturer

Example of e²TANGO protection relay configuration:

① e ² TANGO-1000 panel	⑩ IP4X protection level
② J10 main unit	⑪ standard IEC 61850
③ TRC measurement card (voltage measurement current by core transformer and Rogowski coil)	⑫ EN
④ rated current of measurement card 5A: X	A slot A: 8IN card
⑤ universal binary input voltage	B slot B: 8OUT card
⑥ OPTOMM	C slot C: 12IN card
⑦ RS485	D slot D: X card
⑧ mixed mounting	E slot E: ARC card
⑨ 8 m cable	F slot F: TRR card

Example of correct filled code:

e ² TANGO	1000	J10	TRC	X	UNI	OPTOMM	RS485	M	8	IP4X	E	EN
8IN	8OUT	12IN	X	ARC	TRR							

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