Elektrometal Energetyka SA®

e²TANGO®-450
Bay Controller

K-43.1.2 Catalogue EN


e²ALPHA
Elektrometal Energetyka SA
e²TANGO 450
Elektrometal Energetyka SA
e²TANGO-450 Bank 2 2016-11-29 00:21:45
I1 = 91,5 A
I2 = 90,0 A
I3 = 92,0 A
Io = 1,00 A
Uo = 6,00 V
ODBLK. ZAB. NADPRĄDOWEGO
2016-08-09 14:12:46.121
ZAB. NADPRĄDOWE 2
f: 123 Imax = 500 A
2016-11-11 12:23:45.127
Zad U>
Zad I>INV
Rej. zakł.
Symulacja pom.
F1
F2
AL
AW
UP
Zad I>>
Zad I>1
Zad I0>
Zad I0>d1
e²ECHO-B
L1
L2
L3
N
NAPIĘCIE NA KABLU
STOP
STEROWANIE CZŁONEM RUCHOMYM
STEROWANIE WYŁĄCZNIKIEM
STEROWANIE UZIEMNIKIEM
OŚWIETLENIE POLA
WUG
GE-16/15

We Create Ideas With Power!

e²TANGO-450 protection relays are the solution developed by ELEKTROMETAL ENERGETYKA SA R&D department consisting of engineers with extensive know-how and many years of experience in the industry. Employed solutions and concepts answer challenges which our customer face in their day-to-day operations. These challenges were our key inspiration during design work. This allowed us to develop this compact, user-friendly and intuitive protection relay, which does not require initial, advanced training for operating personnel. e²TANGO-450 are the perfect addition to e²TANGO protection devices line-up.

We have developed a technologically advanced device, universal in its programming and hardware functionality for operating protection relays, control, measurement, data logging and monitoring of MV switchgear bays.

The protection relays stands out in more than one way but easy and convenient operation is one of its more prominent features. We wanted to develop a uniquely user-friendly and intuitive device capable of operating in SMART GRIDS. e²TANGO-450 versatility and compact size allows easy adaptation to specific requirements of users and protected loads. We fully realize the importance of safety in power engineering, this is why this was one of the key aspects we focused on. All our products including e²TANGO protection devices are fully type-tested and certified by most demanding laboratories.

e²TANGO-450 are the unique protection relays. This knowledge gives us confidence when recommending this device to our customers.

Dariusz Rybak

Main Designer

Elektrometal Energetyka SA

APPLICATION

e²TANGO-450 protection relays have complete set of protection functions and station automation schemes making them ideal for any type of bay irrespective of its application and operational characteristics: such as incoming bay, line incoming-outgoing bay, transformer bay, measuring bay, coupling bay, capacitor bank bay for MV grids. In particular, our devices are dedicated to renewable energy power plants such as wind and solar farms.

wind and solar power plants

- undervoltage and overvoltage protection
- frequency protection
- automatic load shedding
- automatic transfer switch

measurement bay

- undervoltage and overvoltage protection
- zero-sequence component overvoltage type protection
- automatic load shedding

motor bays

- thermal model
- PT100/PT1000 sensors
- start-up time protection

transformer bay

- thermal protection
- under-/overvoltage protection
- interoperation with flux-gas protections
- block on 2nd harmonic detection

line bays

- ground-fault protection
- admittance based protection
- automatic load shedding

capacitor bank bays

- capacitor bank internal current
- automatic inclusion of capacitor bank

incoming bay

- ATS interoperation system
- automatic bus-bar protection
- automatic breaker failure protection

PROTECTION RELAY ADVANTAGES

quick device start

basic configuration assistant, comprehensive database of ready synoptic diagrams and protection sets

service access

remote and local readout of diagnostic data with possibility of sending it to manufacturer service department

trouble-free battery change

possible to change battery without turning off the feeder

high resistance to interference

up to 100% higher than required by the standard

availability of expansion cards

input and output cards, communication cards

intuitive interface

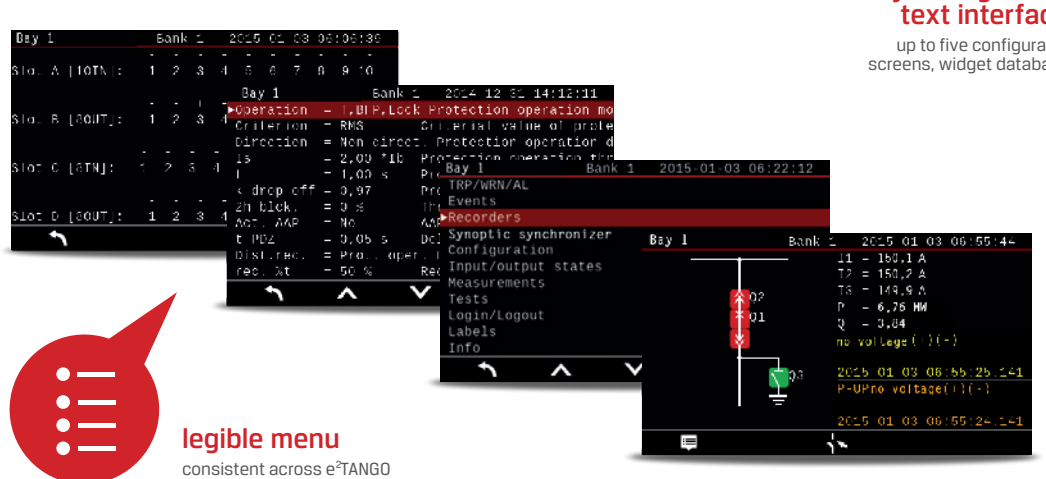
legible menus, consistent across all e²TANGO protection systems and relays

may be used without training

handy help system

fully configurable text interface

up to five configurable screens, widget database



legible menu

consistent across e²TANGO protection systems and relays

DESIGN

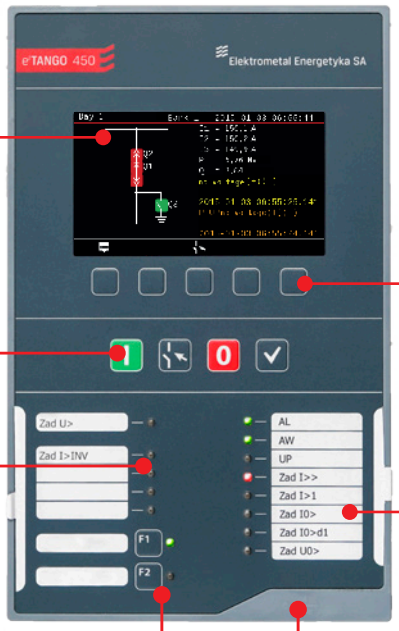
e²TANGO -450 protection relay has a 4.3" colour graphical display and a keyboard with 5 context-sensitive buttons for easy operation. There are LEDs on the front panel providing visual indication of device statuses.

e²TANGO-450 have two additional function buttons F1 and F2 with dedicated two-colour LEDs which may be customised. Label pockets are provided on the relay front panel for function buttons and LED indicator labels.

INTERFACE AND OPERATION	
Display	4,3"
Display resolution	480x272px
Colour display	•
Operating buttons (number)	5
Control buttons (I,0,<->)	4
Programmable function keys with LED	2
LED (including 3 colour)	13 (3)
Replaceable labels	•
DESIGN AND STANDARD EQUIPMENT	
Current input no.****	4
Voltage input no. 1****	1(4)
Max. switching device no.*	6
Ethernet input	1
miniUSB	1

AVAILABLE EXPANSION CARDS**	
Binary input cards	o (39)
Relay output cards	o (30)
Temperature input cards ***	o (6)
Flash sensor input cards ***	o (6)
4-20 mA analogue input cards ***	o (4)
0-10 V analogue input cards ***	o (4)
4-20 mA analogue output cards ***	o (4)
0-10 V analogue output cards ***	o (4)
Voltage measurement cards	o (3)
Communitaction cards	o (1)
DATA RECORDERS	
Event recorder	1100
Disturbance recorder	30s / 1.6kHz/s
OTHER	
Widgets	•
Synoptic diagram database	•
No. of configurable screens	5

•/o - standard/option
* - requires appropriate number of expansion cards
** - maximum 4 slots available, card 603I inserted in slot A; input/output number provided in brackets relates to the rest of slots for 12IN or 8OUT cards
*** - only 1 module may be installed
**** - avaible configuration with a card for measuring 3 voltages



LCD
legible 4.3"

operating buttons
allow navigating device menus

operating buttons
allow immediate change of switches independently from current menu screen

LED indicators
10 red LEDs,
3 red-green LEDs

exchangeable labels
easily accessible and exchangable LED and function button labels

function buttons
can be programmed to perform frequently user functions

mini-USB communication
allows local connection to the protection relay

PROTECTION FUNCTIONS

PROTECTION FUNCTIONS	
(50/50N) short-circuit/ground-fault instantaneous	•
(51/51N) overcurrent / zero-component overcurrent delayed 2-stage	•
(50HS) operate time advance on trip on short-circuit	•
(51) inverse overload (IEC characteristic or approximated in 6 points)	•
(60/67N) overcurrent / zero-component overcurrent directional	•
(49/51) thermal overload	•
(46) load unbalance based on current negative component or phase current difference	•
(37) undercurrent	•
(32P) active power, directional	•
(37Q) passive power, directional	•
(51VN) zero component overcurrent with voltage control / block	•
(59) overvoltage (selectable for phase voltage or line-to-line voltage)	•
(27) undervoltage (selectable for phase voltage or line-to-line voltage)	•
(47) negative sequence overvoltage	•
(81H) overfrequency	•
(81L) underfrequency	•
(81R) instantaneous frequency change df/dt and df/dt	•
(59N) zero-sequence component overvoltage	•
(21N) admittance based	•
(50C) capacitor bank internal short-circuit protection	•
(21ND) directional admittance based	•
(66/86) process motor start-up	•
(66) start-up number limit	•
(48) prolonged start-up	•
(50LR) rotor stall	•
(25) falling out of synchronism	•
(30/74) flux-gas	•
(49) thermal (binary input or analogue 4-20 mA input)	•
(AFD) arc protection (with arc detectors)	•

•/- - available/not available

AUTOMATIC SYSTEMS

AUTOMATIC SYSTEMS	
accelerated protection automation system	•
ATS, 3-stages with circuit-breaker position control and possibility of defining protection functions which trigger ATS	•
automatic load shedding	•
automatic load shedding interoperation system	•
automatic busbar protection	•
active component forcing	•
interoperation system with automatic inclusion of capacitor bank or timed automatic inclusion of capacitor bank	•
simultaneus operation with ATS	•
ATS interoperation system	•
ATS for island operation	•
Cold Load Pickup	•

•/- - available/not available

EXPANSION CARDS

BASIC CARDS
- power supply unit
- central processor unit

FUNCTION CARDS
- 6 relay outputs + 3 binary inputs
- 8 relay outputs
- 8 relay inputs
- 12 binary inputs
- 8 binary inputs 24 V
- 12 binary inputs 24 V

OTHER
- voltage measurement card (TU)
- current measurement card (TR)

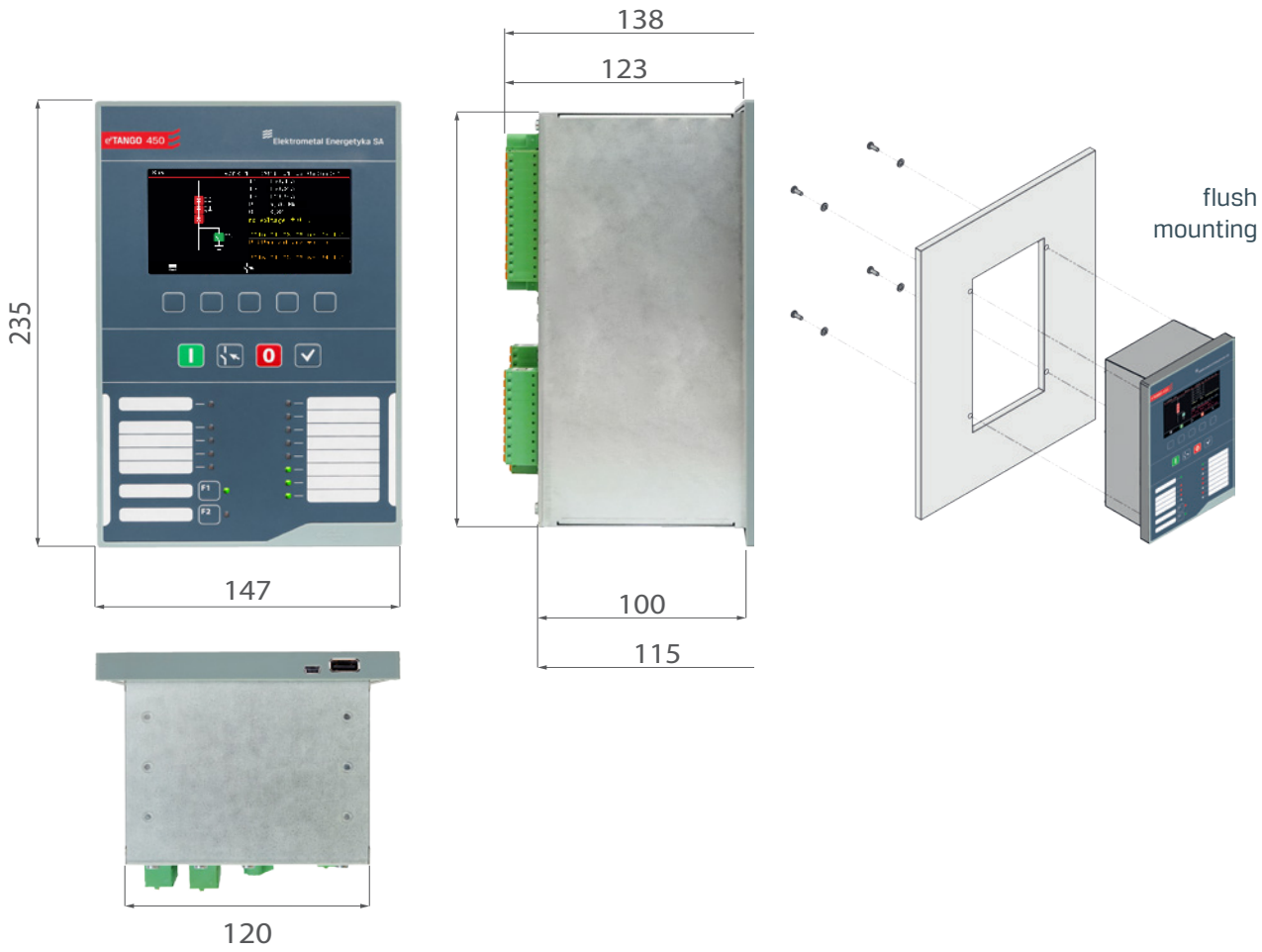
ANALOGUE CARDS
- 4 analogue inputs 0-10 V
- 4 analogue inputs 4-20 mA
- 4 analogue outputs 0-10 V
- 4 analogue outputs 4-20 mA

TEMPERATURE SENSORS CARDS
- 6 PT100 inputs
- 6 PT1000 inputs
- 6 arc detector inputs with communication CANbus + 3 standard sensors (ARC)

COMMUNICATION PORTS AND PROTOCOLS

- Ethernet
- Multi-mode glass optical fibre - OPTOMM
- Plastic optical fibre OPTOP
- RS485
- CANbus 2×
- USB 2.0
- Modbus RTU / TCP
- IEC 60870-5-103
- DNP 3.0
- Profibus
- CANbus / PPM 2
- IEC 60870-5-104

DIMENSIONS AND MOUNTING METHODS



TECHNICAL PARAMETERS e²TANGO-450

Auxiliary power supply	
VDC VAC	110 V, 220 V (80-300 V) 230 V (88-265 V)
Maximum power consumption Option	10 W (VA) 24 V, 110 V DC (19-132 V DC)
Current measurement circuits	
Rated current	5 A / 1 A (configurable)
Rated frequency	50 Hz
Phase current measurement range	0.05-150A Others for request
I_0 current measurement range	0,005-1 A/0,1-10 A
Voltage measurement circuits	
Rated voltage	57.7/100/230 V
Voltage measurement range for transformers	3-280 V
U_0 measurment circut	
Transformer measurment range	3-280 V
Basic protection parameters	
Over protection relay resetting ratio	Configurable
Under protection relay resetting ratio	Configurable
Device operate time	typically - 35 ms
Measurement accuracy	
I_1, I_2, I_3 (0.1-30 In / 0.05-0.1 In)	2% / 2.5%
U_0 measured or calculated (5-280 V)	2%
I_0 measured (0.005-1 A/0.1-10 A) calculated (0.1-30 In)	 2% 3%
U_1, U_2, U_3 (5-280 V/)	2%
φ 1, φ2, φ3, φ0 (U>5V, 0.1In<I<30 In)	2°
f (U>0.5Un)	10 mHz

Binary input circuits	
603I card 8IN, 12IN cards 8IN24, 12IN24 cards Others for request	24-230 V AC/DC 110-230 V AC/DC 24 V DC (19-58 V AC/DC)
Maximum power consumption: 220 V DC, 230 V AC	2 mA, 15 mA
Relay output circuits (603I card)	
Circuit opening at 220 V DC	5A
Circuit opening at 220 V DC (L/R = 0)	0.4A
Circuit opening at 220 V DC (L/R = 40 ms)	0.3A
Relay output circuits (others)	
Circuit opening at 220 V DC	5A
Circuit opening at 220 V DC (L/R = 40 ms)	0.1A
Circuit opening at 230 V AC (cos = 0.4)	2.0A
Allowable voltage at open contacts at 220 V DC	250 V AC/440 V DC
Environmental conditions	
Operating temperature	-25°C ... +55°C
Operating temperature	-25 °C ... +70 °C
Relative humidity	5 to 95%, non-condensing
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 (central processing unit/panel)	1 kg
Dimensions (W x D x H mm)	147x115x235
Protection rating (at terminal side)	IP3X
Protection rating (at front panel side)	IP4X / (IP54 optional)

e²TANGO-STUDIO SOFTWARE

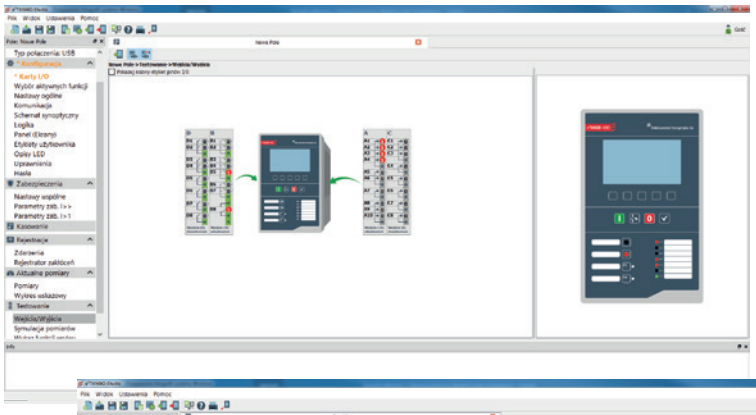
e²TANGO-Studio engineering software allows operation of e²TANGO-450 protection relay and also panel configuration. This software provides comprehensive functionality, which together with visual widget configuration is a perfect aid in daily work by enabling creation of projects for multiple devices, bays, switchgears or 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

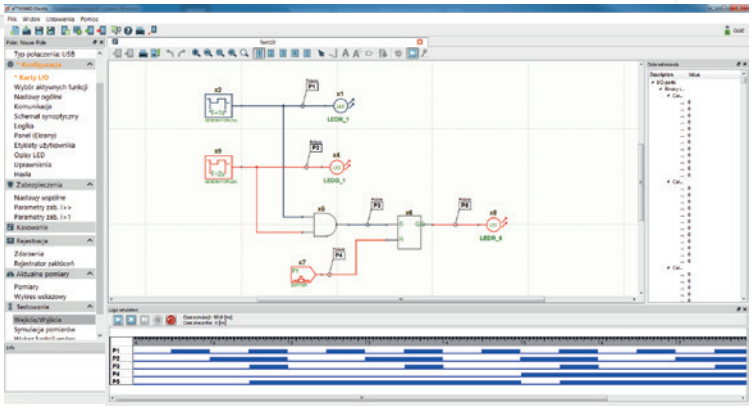


on-line preview

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

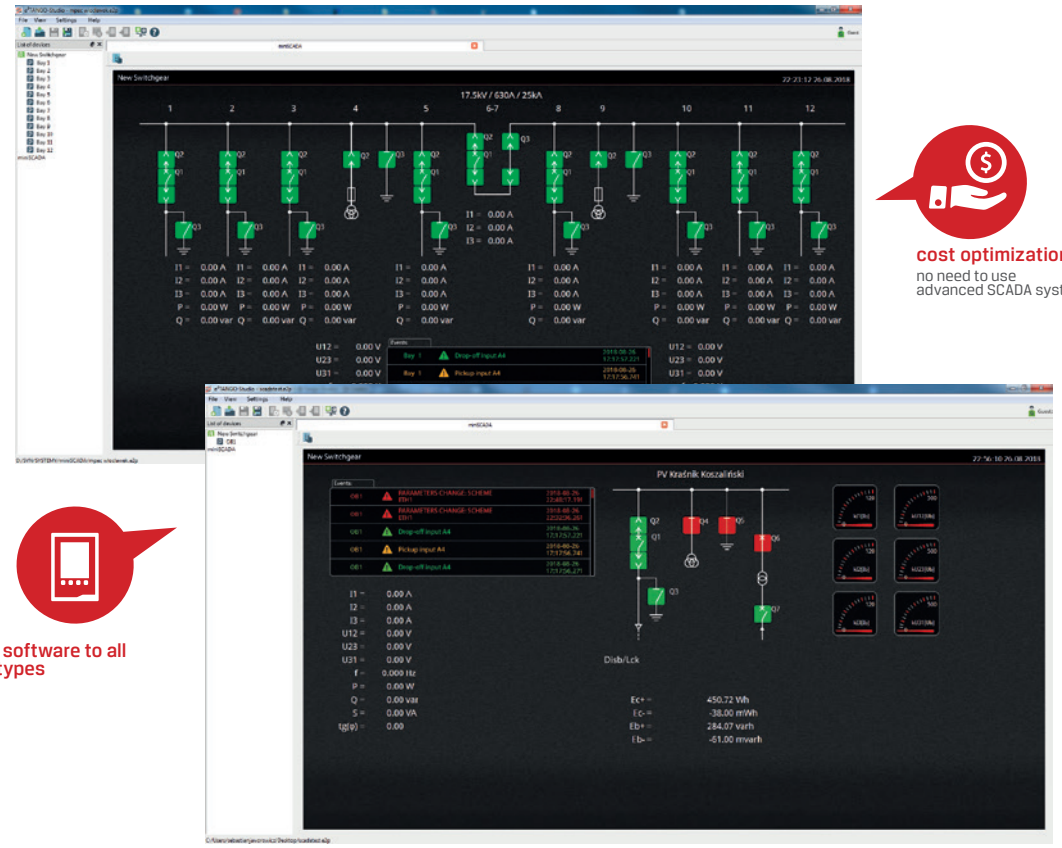
„miniSCADA" FUNCTIONALITY

e²TANGO-Studio has possibility to 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 provides an advanced and comprehensive logic editor which allows running logic simulation. It gives preview of logic states when used with a device aiding project design, as well as commissioning and servicing of switching stations. The editor allows creating custom logic adapted to customer infrastructure requirements.

STANDARDS

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 & AWARDS

Conformity certificate IEn
no DZC.521.59.2.2023

Masovian Quality Award

The Minister of Energy Cup
ENERGETAB 2018 Fairs

Diamenty Miesięcznika Forbes 2023

Forbes Diamonds 2023

ELEKTROMETAL ENERGETYKA SA QUALITY

Implemented Integrated Management System according to:

- PN-EN ISO 9001 Quality management systems
- PN-EN ISO 14001 Environmental management systems
- PN-EN ISO 45001 Health and Safety Management System

ORDER FORM

To order e²TANGO- 450 protection relay fill in this part of the form following FORM INSTRUCTIONS provided on the next page.

STEP 1

① version	■ 450							
② type	■ S (standard, 4I+1U)							
③ binary input voltage	■ UNI (110/230 V AC/DC)		☐ 24 V (24/110 V DC)					
Ethernet (standard equipment in each central unit)								
④ COM1	■ x-none	☐ RS485	☐ CAN×2	☐ OPTOMM	☐ OPTOP	☐ Profibus	☐ others	
⑤ mounting	■ Z - flush mounting							
⑥ protection rating IP	■ IP4X	☐ IP54						
⑦ language version	☐ PL	■ EN	☐ other (in agreement with manufacturer)					

STEP 2

		Slot				
		A	B	C	D	TU
Card name	Kod					
Ethernet	-	standard for the device				
6 relay outputs + 3 binary inputs	603I	X				
8 binary inputs	8IN	☐	☐	■	☐	
8 binary inputs 24 V	8IN24	☐	☐	☐	☐	
12 binary inputs	12IN	☐	☐	☐	☐	
12 binary inputs 24 V	12IN24	☐	☐	☐	☐	
8 relay outputs	8OUT	☐	☐	☐	☐	
4 0-10 V analogue inputs	AI10	☐	☐	☐	☐	
4 4-20 mA analogue inputs	AI20	☐	☐	☐	☐	
4 0-10 V analogue outputs	AO10	☐	☐	☐	☐	
4 4-20 mA analogue outputs	AO20	☐	☐	☐	☐	
6 temperature inputs PT100	PT1	☐	☐	☐	☐	
6 temperature inputs PT1000	PT10	☐	☐	☐	☐	
6 arc detector inputs with CANbus communication + 3 standard detectors	ARC	☐	☐	☐	☐	
voltage measurment	TU					☐

additional arc detectors (max. 3 pcs.) ☐ only if ARC card is ordered.

additional requirements:

STEP 3

Your code:

See FORM INSTRUCTIONS on the following page

e²TANGO	1	2	3	4	5	6	7	A	B	C	D	TU

FORM INSTRUCTIONS

STEP 1

The table contains basic technical specification of e²TANGO-450 protection relay. In each item 1 through 8 choose only ONE element. If you choose "other", in STEP 3 fill in the requested value in a corresponding field.

Step 1 instructions.

- ▢ - recommended basic configuration
- OPTOMM - multi-mode optic fibre
- OPTOP - plastic fibre optic

KROK 2

The table contains a list of available expansion cards and their possible installation locations in e²TANGO-450 protection relay

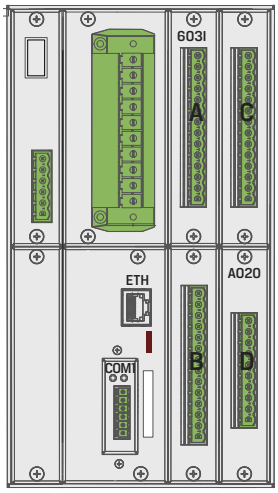
If no check mark field is available ☐ the card cannot be installed in a given location. Select desired cards from the list and put an "X" mark next to slot where the card is to be installed.

Any additional requirements should be described in designated fields.

Step 2 instructions.

- ▢ - recommended basic configuration
- max. 1 AI10 card or 1 AI20 card
- max. 1 AO10 card or 1 AO20 card
- max. 1 PT1 card or 1 PT10 card

View of the central unit



STEP 3

e²TANGO-250, -450 protection system parameters selected above should be filled-in in corresponding locations. Send thus created e²TANGO code along with other requirements or a scanned form page and order form to: eaz@elektrometal-energetyka.pl

Sample e²TANGO-450 protection configuration:

① e²TANGO-450	⑦ EN
② Standard	A slot A: 603I card
③ Universal 230 / 110 AC / DC	B slot B: 8OUT card
④ RS485	C slot C: 8OUT card
⑤ Flush mounting	D slot D: A020 card
⑥ IP4X	TU slot TU: TU card

Sample e²TANGO-450 protection configuration:

e²TANGO	450	S	UNI	RS485	Z	IP4X	EN	603I	8OUT	8OUT	A020	TU

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