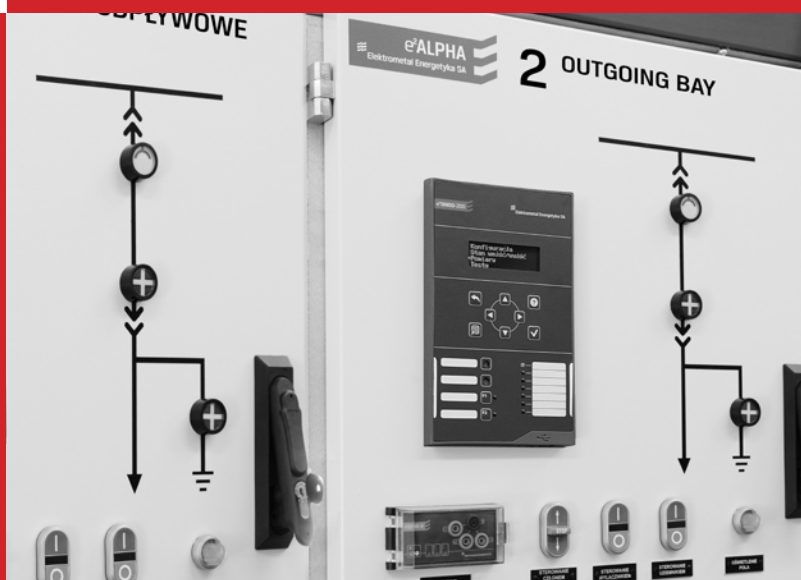




Elektrometal Energetyka SA®



e²TANGO[®]-200 Overcurrent Relay





e²ALPHA

Elektrometal Energetyka SA



e²TANGO-200

Elektrometal Energetyka SA

Zab. nadprądowe 2
Faza I I_{max} = 120 A
11-11-2016
12:23:45:127 1/38



- AW
- UP
- P1>
- P2>
- t>
- Usyg



NAPIĘCIE
NA KABLU



STEROWANIE
CZŁONEM
RUCHOMYM



STEROWANIE
WYŁĄCZNIKIEM



STEROWANIE
UZIEMNIKIEM



OŚWIETLENIE
POLA

We Create Ideas With Power!

e²TANGO-200 protection relay is a 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-200 is a perfect addition to e²TANGO protection devices' line-up. The device has an interface consistent with that of a protection relay and additionally it may operate autonomously.

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

The protection relay 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-200 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-200 is a unique protection system. This knowledge gives us confidence when recommending this device to our customers.

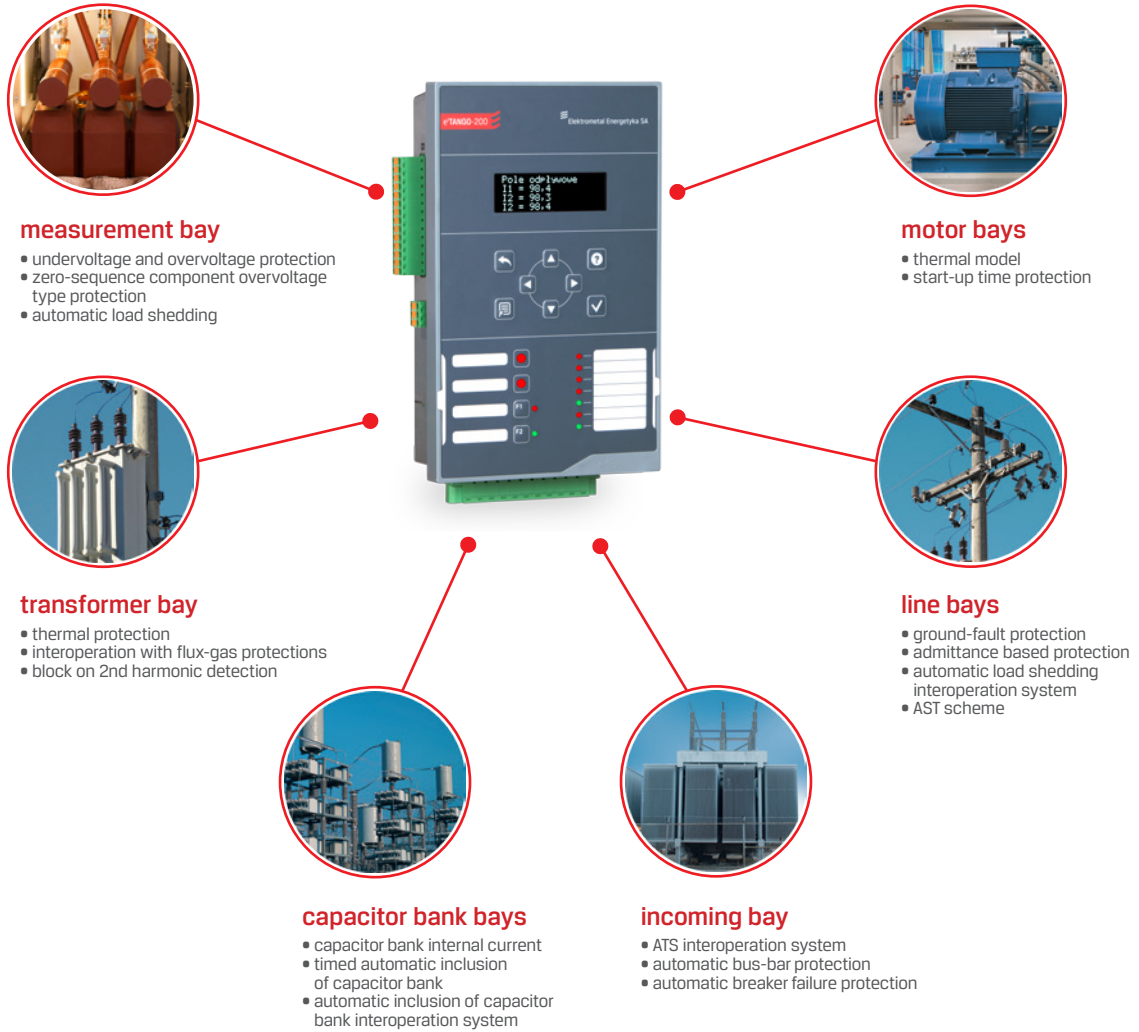


Dariusz Rybak
Main Designer
Elektrometal Energetyka SA



APPLICATION

e²TANGO-200 protection relays feature a 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. e²TANGO-200 overcurrent relays are also capable of autonomous operation.



PROTECTION RELAY ADVANTAGES



quick device start
basic configuration assistant,
comprehensive protection
set database



**no need to replace
batteries**
a supercapacitor is used



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



**autonomous
operation**
suitable for operation with
autonomic adapter,
operation on auxiliary power failure



intuitive interface
legible menus, consistent across
all e²TANGO protection systems
and relays



Rogowski coil
for phase current measurement
the device may use 1 mV/A
sensitivity Rogowski coils



may be used without training
handy help system

```
Overcurrent prot. 1
Phase1 Imax = 120 A
11-12-2016
12:34:54:125
```

```
  +_+_+_
INP: 12345678910
  +_+_+_
OUT: 12345678
```

```
▶TRP/WRN/AL
Events
Disturbance
Autom. lock
```

**fully configurable
text interface**
up to five configurable screens,
widget database



```
Incoming bay
I1 = 98,4 A
I2 = 98,3 A
I3 = 98,4 A
```



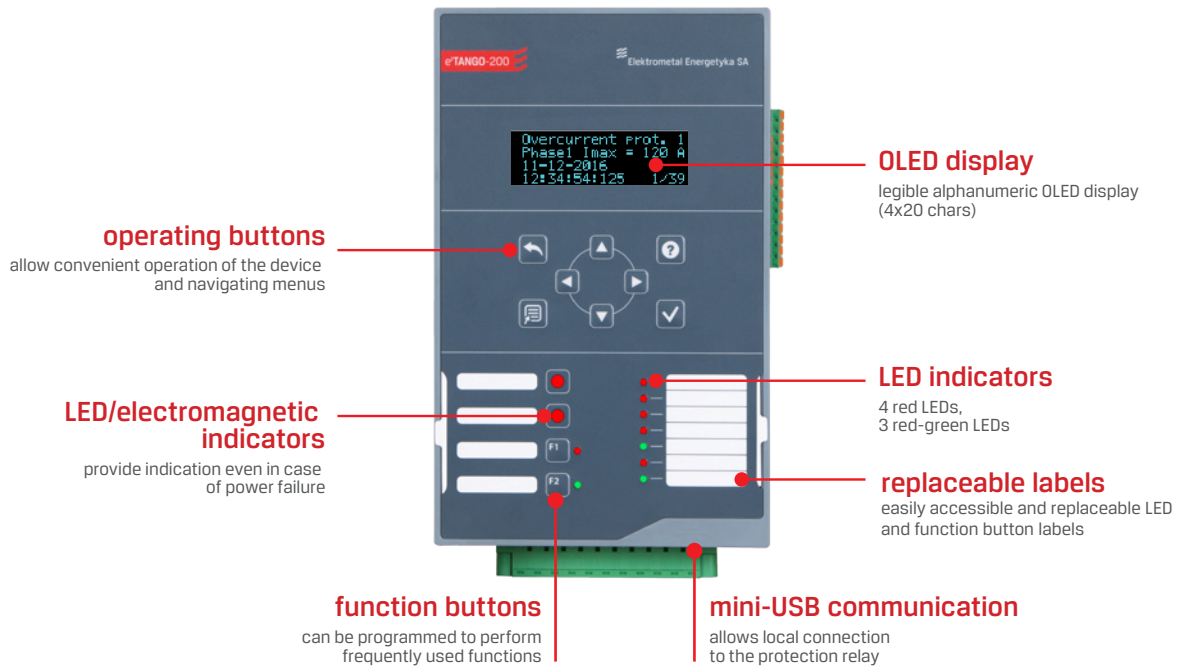
legible menu
consistent across e²TANGO
protection systems and relays

DESIGN

e²TANGO-200 overcurrent relay has an alphanumeric OLED display (4x20 characters) and a keyboard with 8 buttons for easy operation. There are 7 LEDs (4 red and 3 red-green) on the front panel providing visual indication of device statuses. There are also two additional function buttons F1 and F2 with dedicated two-colour LEDs which may be customised. Above the function buttons there are two red LEDs or optionally two electromechanical indicators providing indication even in case of power supply failure. A label pocket is provided on front panel for function button and LED/indicator labels.

INTERFACE AND OPERATION	
Display	OLED
Display resolution	4x20 characters
Colour display	-
Operating buttons (number)	8
Control buttons (I,0,<->)	-
Programmable function keys with LED	2
LED	7
LED/electromagnetic indicators	2
Replaceable labels	•
DESIGN AND STANDARD EQUIPMENT	
current input no.	4/0
voltage input no.	1/4
binary input no.	10
relay input no.	8
Max. switching device no.	1
AVAILABLE EXPANSION CARDS	
Binary input cards	-
Relay output cards	-
Temperature input cards	-
Flash sensor input cards	-
4-20 mA analogue input cards	-
0-10 V analogue input cards	-
4-20 mA analogue output cards	-
0-10 V analogue output cards	-
Voltage measurement cards	-
DATA RECORDERS	
Event recorder	512
Disturbance recorder	10S
OTHER	
Widgets	•
Synoptic diagram database	-
No. of configurable screens	5

•/o - standard/option



PROTECTION FUNCTIONS

13	Synchronous-Speed
21NY	Admittance directional protection
23/26	Temperature protection (PT100 sensor)
23/26/62	Temperature protection (binary)
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/SOTF	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
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
80	Flux-gas

AUTOMATIC SCHEMES

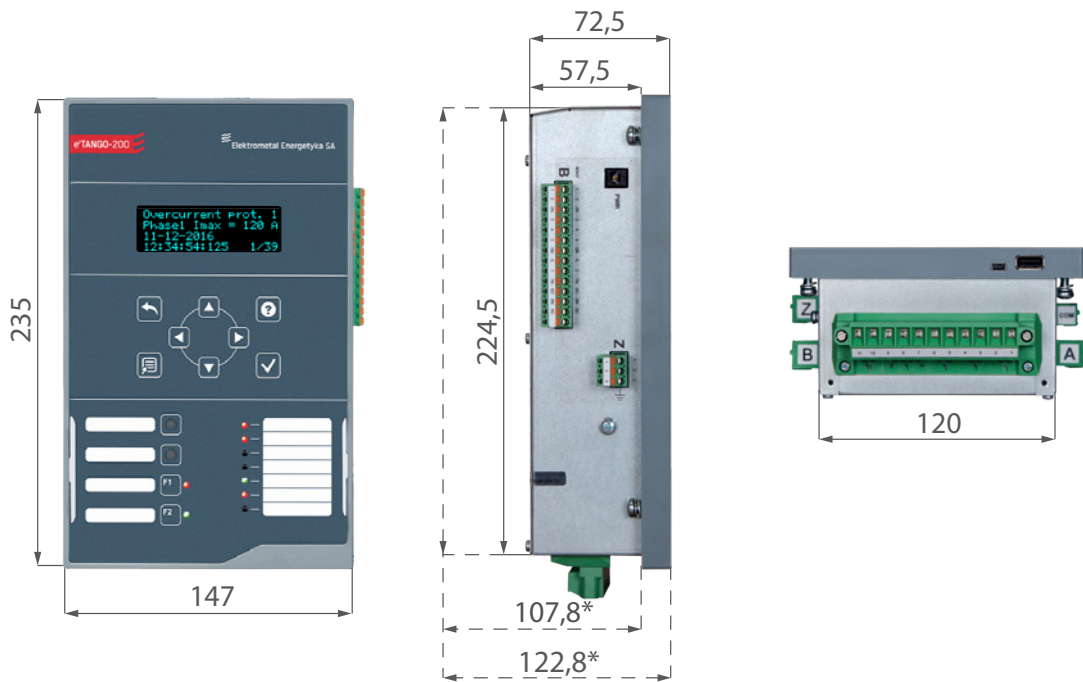
- (41N) Active component forcing
- (50/68) Busbar protection
- (50BF) Breaker failure protection
- (79) Auto reclose
- (81U/81O) Automatic load shedding
- (83) Automatic transfer switch
- (90C) Capacitor bank switching

COMMUNICATION PORTS AND PROTOCOLS

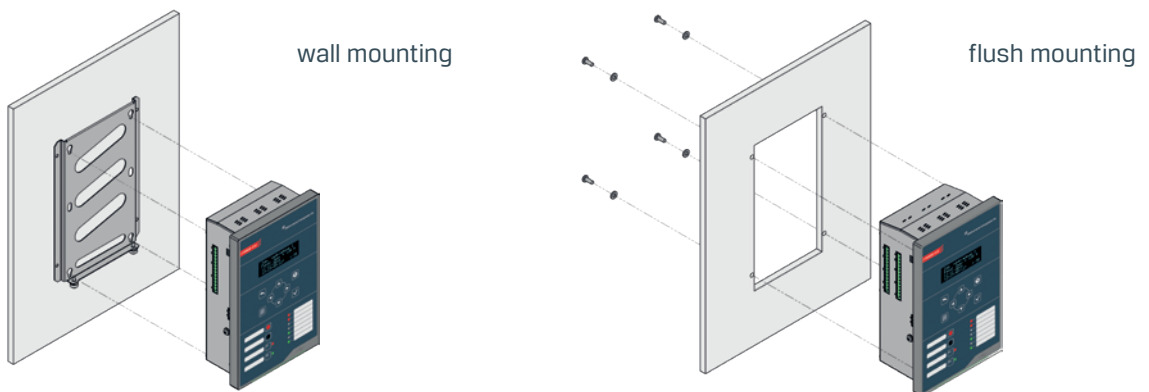
- Ethernet
- Multi-mode glass optical fibre - OPTOMM
- Single-mode plastic optical fibre - OPTOSM
- Plastic optical fibre OPTOP
- RS485
- CANbus 2x
- USB 2.0
- Modbus RTU/TCP
- IEC 60870-5-103
- DNP 3.0
- Profibus
- CANbus/PPM 2

DIMENSIONS AND MOUNTING METHODS

Standard version



* self-powered version



SELF-POWERED VERSION e²TANGO-200

Self supplied version of protection relay lets the device continue working in case of lack of auxiliary power supply, then device is supplied from secondary windings of current transformers. e²TANGO-200 cooperates with current transformers and Holmgreen system with rated current value on secondary windings equal 5A or 1A.

TECHNICAL PARAMETERS

STRUCTURE AND BASIC EQUIPMENT	
Outputs of sensitive coil	1
Energy contained in output of sensitive coil	0,02J for 12V 0,10J for 24V (optional)
Capacitor bank	option
Energy contained in capacitor bank	7J
Minimal values of current necessary for self supply	3p connection - 0,28 Ins 2p connection - 0,42 Ins 1p connection - 0,72 Ins loh connection - 0,65 A
MEASUREMENT	
Rated current	5A / 1A
Power load in phase circuit	<5,0VA
Power load in loh circuit	<5,5VA
Long-term current durability of current inputs	10A
INTERFACE AND HANDLING	
Electromagnetics indicators (optional)	2

Functions:

- Self supply from secondary windings of current transformers
- Possible to equip in electromagnetic indicators (state sustained after power supply failure)
- Possible to measure current from 2 or 3 current transformers
- Possible to use as redundant protection
- Self supply also in case of single-phase short circuit
- Equipped in output adapted to CB sensitive trip coils
- Equipped in capacitor tank

TECHNICAL PARAMETERS

AUXILIARY POWER SUPPLY	
VDC	110 V, 220 V (80-300 V)
VAC Optional	230 V (88-265 V) 24 V(19-58 V AC/DC)
Maximum power consumption	10 W (VA)
CURRENT MEASUREMENT CIRCUITS	
Rated current	5 A/(1 A option)
Rated frequency	50 Hz
Phase current measurement range for current transformers for Rogowski coils	0,1-150 A 10-1400 mV (10-1400 A) Other on request
I0 current measurement range	0,005-1 A/0,1-10 A
Ig current measurement range in capacitor bank bay	0,1-10 A
VOLTAGE MEASUREMENT CIRCUITS	
Rated voltage	57,7/100/230 V
Rated frequency	50 Hz
U, U0 voltage measurement range	3-480 V
BASIC PROTECTION PARAMETERS	
Over protection relay resetting ratio	Configurable
Under protection relay resetting ratio	Configurable
Device operate time	typically - 35 ms
MEASUREMENT ACCURACY	
I1, I2, I3 (0.1-150 A/10-1400 mV)	2%
U1, U2, U3 (5-480 V - version with voltage measurement)	2%
U0 measured	2%
calculated	3%
I0 (0.001-10A) measured	2%
calculated	3%
$\varphi 0$ measured	1°
calculated	2°
f (U > 5 V / 0.05 V, version with voltage me- asurement)	10 mHz

BINARY INPUT CIRCUITS	
Rated voltage Optional	110/230 V AC/DC 24 V (19-58 V AC/DC) Other on request
Maximum power consumption: 220 V DC, 230 V AC	2 mA, 15 mA
RELAY OUTPUT CIRCUITS	
Allowable voltage at open contacts	250 V AC /440 V DC
Continuous current-carrying capacity	5 A
Circuit opening at 220 V DC (L/R = 40 ms)	0,1 A
Circuit opening at 220 V AC (cos φ = 0,1)	2 A
ENVIRONMENTAL CONDITIONS	
Operating temperature	-10 °C ... +55 °C
Storage 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 (standard/self-supplied version)	1 kg/3 kg
Dimensions (W x D x H mm) (standard/self-supplied version)	147x72,5x235 /147x122.8x235
Central processing unit protection rating	IP3X
Panel protection rating (at front panel side)	IP4X/(IP54 optional)

e²TANGO-STUDIO SOFTWARE

e²TANGO-Studio engineering software allows operation of e²TANGO-200 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

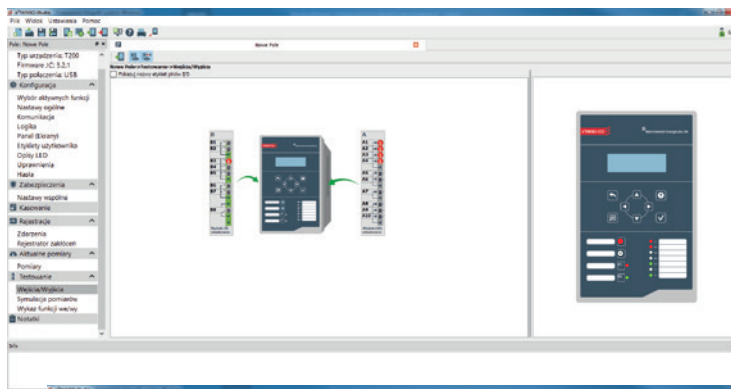


on-line preview

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

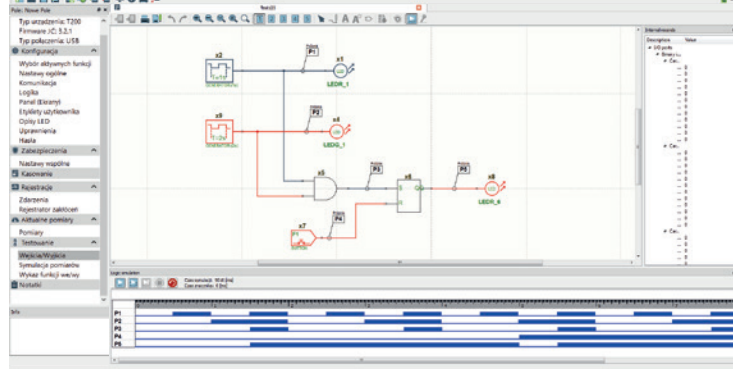
easy setpoint and selectivity verification

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 visualize state of switchgear, 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 that gives possibility for costs optimization by wiring and infrastructure simplifying.

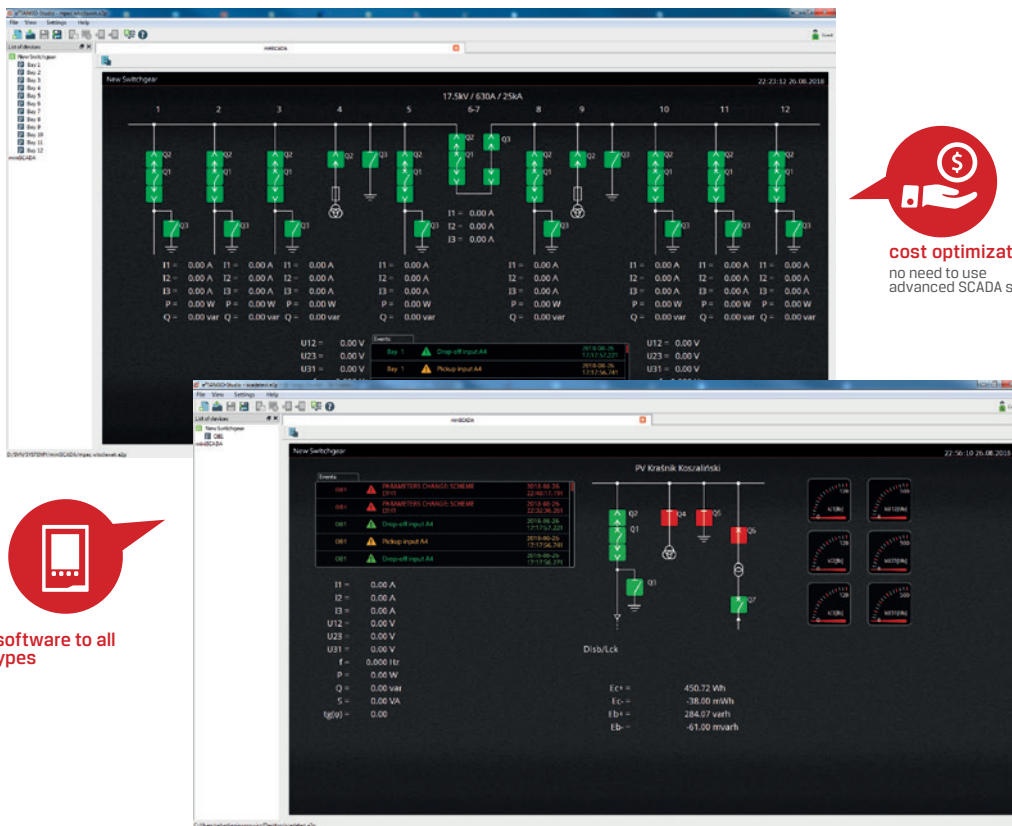
"miniSCADA" plug-in is optional as additional license.



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



IEn compliance certificate
no DZC.521.59.2.2023



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-200 protection relay fill in this part of the form following FORM INSTRUCTIONS provided below.

STEP 1

① version	<input checked="" type="checkbox"/> 200		
type	<input checked="" type="checkbox"/> S (standard, 4I+1U)	<input type="checkbox"/> U (voltage measurement, 4U)	
② change the way of measurement method (from core transformer):	<input type="checkbox"/> C (Rogowski coils 3I cr +II + 1U)		
③ measurement card rated current	<input checked="" type="checkbox"/> 5A	<input type="checkbox"/> 1A	<input type="checkbox"/> X - for U or C
④ binary input voltage	<input checked="" type="checkbox"/> UNI (110/230V AC/DC)	<input type="checkbox"/> 24V (24/48V AC/DC)	<input type="checkbox"/> other (on consultation with manufacturer)
Ethernet (standard equipment in each central unit)			
⑤ COM1	<input checked="" type="checkbox"/> x-none	<input type="checkbox"/> RS485	<input type="checkbox"/> CAN×2 <input type="checkbox"/> OPTOMM <input type="checkbox"/> OPTOP ¹⁾ <input type="checkbox"/> Profibus <input type="checkbox"/> other
⑥ mounting	<input checked="" type="checkbox"/> Z- flush mounting	<input type="checkbox"/> N - wall mounting	
⑦ protection rating IP	<input checked="" type="checkbox"/> IP4X	<input type="checkbox"/> IP54 ²⁾	
⑧ language version	<input type="checkbox"/> PL	<input checked="" type="checkbox"/> EN	<input type="checkbox"/> other (on consultation with manufacturer)
⑨ electromagnetic indicators ³⁾	<input checked="" type="checkbox"/> X - no	<input type="checkbox"/> W - yes	
	<input checked="" type="checkbox"/> X - no	<input type="checkbox"/> 12VX - sensitive coil output 12V, no capacitor bank	<input type="checkbox"/> 24VX - sensitive coil output 24V, no capacitor bank
⑩ self-powered version ⁴⁾		<input type="checkbox"/> 12V11 - sensitive coil output 12V, capacitor bank 110V	<input type="checkbox"/> 24V11 - sensitive coil output 24V, capacitor bank 110V
		<input type="checkbox"/> 12V22 - capacitor bank 220V	<input type="checkbox"/> 24V22 - capacitor bank 220V
selection of cards in slots A and B			
⑪ slot A	<input checked="" type="checkbox"/> 10IN	<input type="checkbox"/> 10IN24	
⑫ slot B	<input checked="" type="checkbox"/> 8OUT		

1) OPTOP recommended only in wall mounting because of optical fibre components extending beyond the panel

2) IP54 protection rating is available only for version mounted behind the panel

3) for 200H version only one electromagnetic indicator available

4) self-powered version does not work with measurement inputs for Rogowski coils

customer requirements:

STEP 2

Your code:


e ² TANGO	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫
----------------------	---	---	---	---	---	---	---	---	---	---	---	---

FORM INSTRUCTIONS

STEP 1

The table contains basic technical specification of e²TANGO-200 protection relay. In each item 1 through 8 choose only ONE element. If you choose "other", in STEP 2 fill in the requested value in a corresponding field.

Step 1 instructions.

-  - recommended basic configuration
- OPTOMM - multi-mode optic fibre

STEP 2

e²TANGO-200 protection relay 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-200 protection configuration:

① e ² TANGO-200	⑦ IP4X
② standard	⑧ EN
③ measurement card rated current	⑨ electromagnetic indicators self-powered version -
④ universal 230 / 110 AC / DC	⑩ sensitive coil output 12V, without capacitor bank
⑤ OPTOMM	⑪ 10IN
⑥ flush	⑫ 8OUT

Sample of correctly created code:

e²TANGO

200	S	5A	UNI	X	Z	IP4X	EN	W	12VX	10IN	8OUT
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