Elektrometal Energetyka SA®

e²TANGO®-400 Overcurrent Relay

K-33.1.3 Catalogue EN


e²ALPHA
Elektrometal Energetyka SA
e²TANGO-400
Elektrometal Energetyka SA
STOP
NAPIĘCIE NA KABLU
STEROWANIE CZŁONEM RUCHOMYM
STEROWANIE WYŁĄCZNIKIEM
STEROWANIE UZIEMNIKIEM
OŚWIETLENIE POLA
WUG
GE-16/15

We Create Ideas With Power!

e²TANGO-400 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-400 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 and hardware 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-400 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-400 is a unique protection relay This knowledge gives us confidence when recommending this device to our customers.

Dariusz Rybak
Main Designer, Head of Digital Development Department
Elektrometal Energetyka SA

APPLICATION

e²TANGO-400 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-400 protection relays are also capable of autonomous operation.

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

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

availability of expansion cards
input and output cards, communication cards, measurement cards

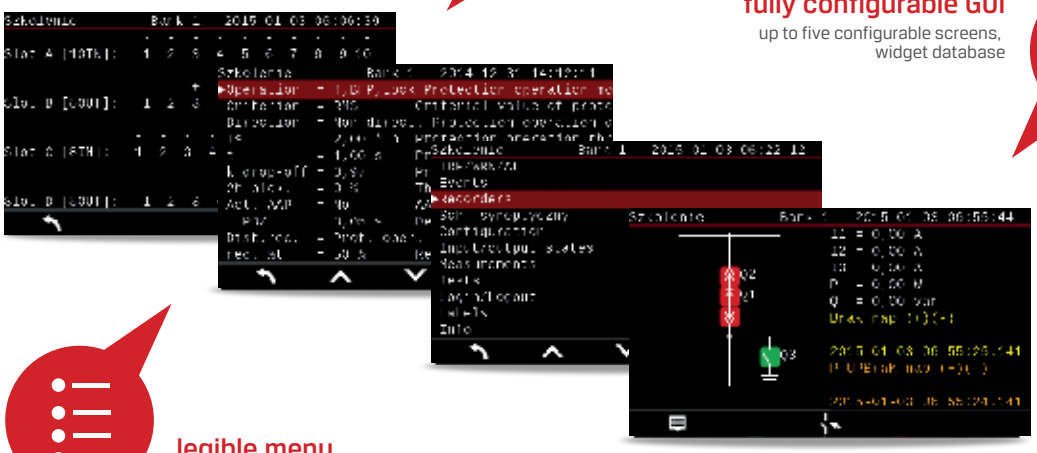
autonomous operation
suitable for operation with autonomic adapter, operation on auxiliary power failure

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

fully configurable GUI
up to five configurable screens, widget database



legible menu
consistent across e²TANGO protection systems and relays

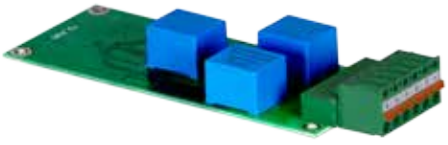
DESIGN

e²TANGO-400 protection relay has a 4.3" colour graphical display and a keyboard with 5 context-sensitive buttons for easy operation. Additional four dedicated buttons for switching device control are available. 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 the relay front panel for function button and LED/indicator labels.

INTERFACE AND OPERATION	
Display	4,3"
Display resolution	480x272px
Colour display	•
Operating buttons (number)	6
Control buttons (I,0,<-)	4
Programmable function keys with LED	2
LED	7
LED or electromagnetic indicators	2
Replaceable labels	•
DESIGN AND STANDARD EQUIPMENT	
Dimensions (external - HxWxD)	235x147x90,5
current input no.	4
voltage input no. 1	1
binary input no.	10/26
relay input no.	8/24
Max. switching device no.*	5
AVAILABLE EXPANSION CARDS**	
Binary input cards	o (16)
Relay output cards	o (16)
4 binary input and 4 relay output cards	o (8/8)
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)
DATA RECORDERS	
Event recorder	1000
Disturbance recorder	10s
OTHER	
Widgets	•
Synoptic diagram database	•
No. of configurable screens	5

Binary input card

Relay output card



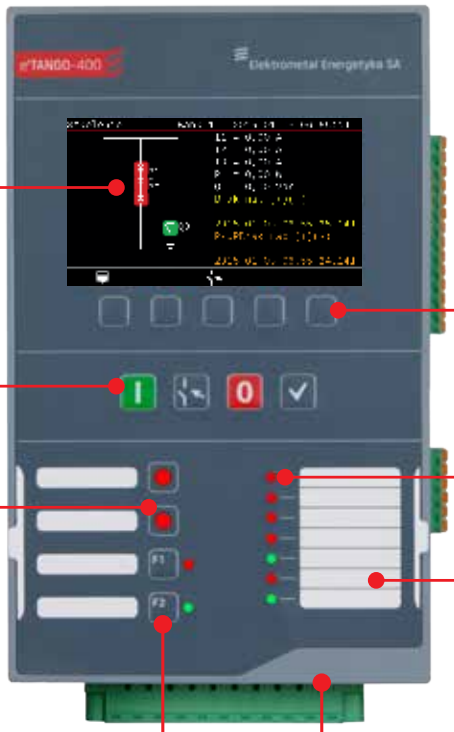
Voltage measurement cards

•/o - standard/option

* - requires appropriate number of expansion cards

** - maximum 2 slots available; input/output number provided in brackets is for a device with all slots holding cards of one type. This does not apply to voltage measurement card

*** - only 1 module may be installed



LCD
legible 4.3"
colour display

operating buttons
allow instantaneous switching
of switching device state irrespective
of currently displayed menu

LED/electromagnetic indicators
provide indication even in case
of power failure

operating buttons
allow navigating device menus

LED indicators
4 red LEDs,
3 red-green LEDs

replaceable labels
easily accessible and replaceable 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

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
32Q	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)
81H	overfrequency
81L	underfrequency
81R	instantaneous frequency change df/dt
59N	zero-sequence component overvoltage
21N	admittance based
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)
50C	capacitor bank internal short-circuit protection
AFD	arc protection (with arc detectors)

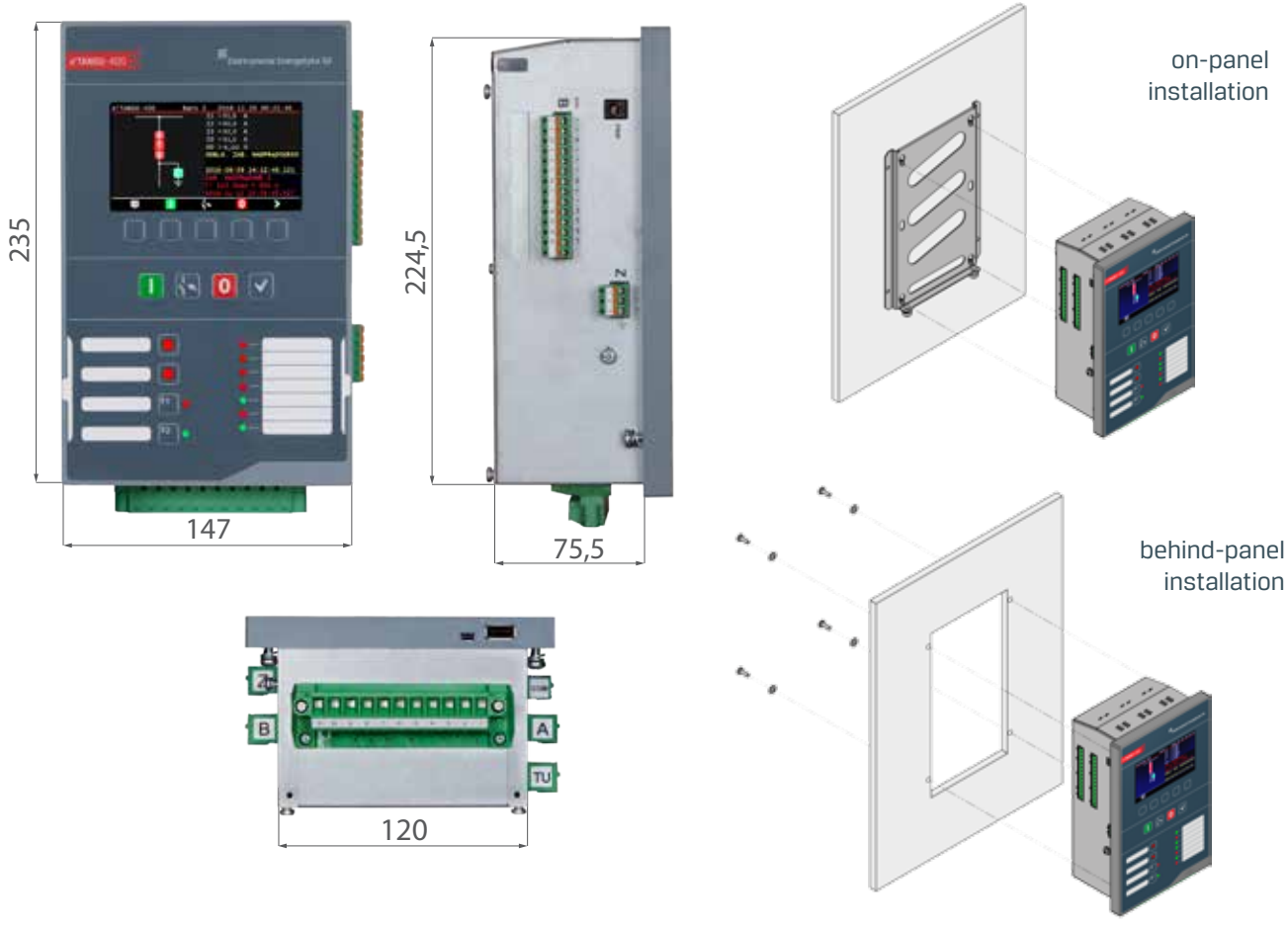
AUTOMATIC SCHEMES

- accelerated protection operation automation
- 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 breaker failure protection
- automatic bus-bar protection
- automatic active component forcing equipment
- interoperation system with automatic inclusion of capacitor bank or timed automatic inclusion of capacitor bank
- ATS interoperation system
- other programmed using logic

COMMUNICATION PORTS AND PROTOCOLS

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

DIMENSIONS AND INSTALLATION METHODS



e²TANGO-STUDIO SOFTWARE

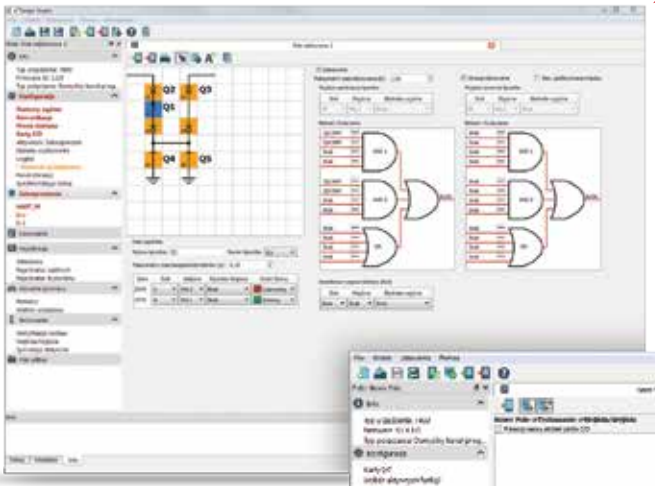
e²TANGO-Studio engineering software allows operation of e²TANGO-400 protection relay and also panel configuration. This software provides comprehensive functionality, which together with visual widget configuration is a perfect aid in daily work by enabling creation of projects for multiple devices, bays, switchgears or stations.

advanced design functions

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

quick configuration assistant

helps first time users of the software
and facilitates regular use

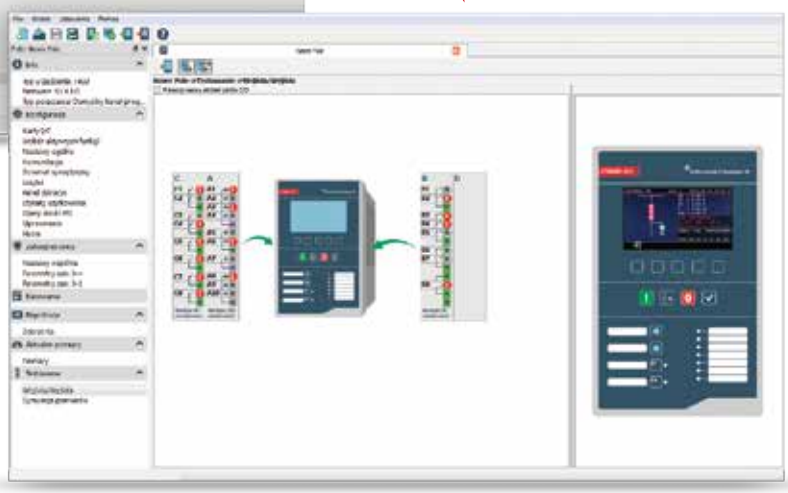


on-line preview

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

display conformity

preview of the actual panel screen

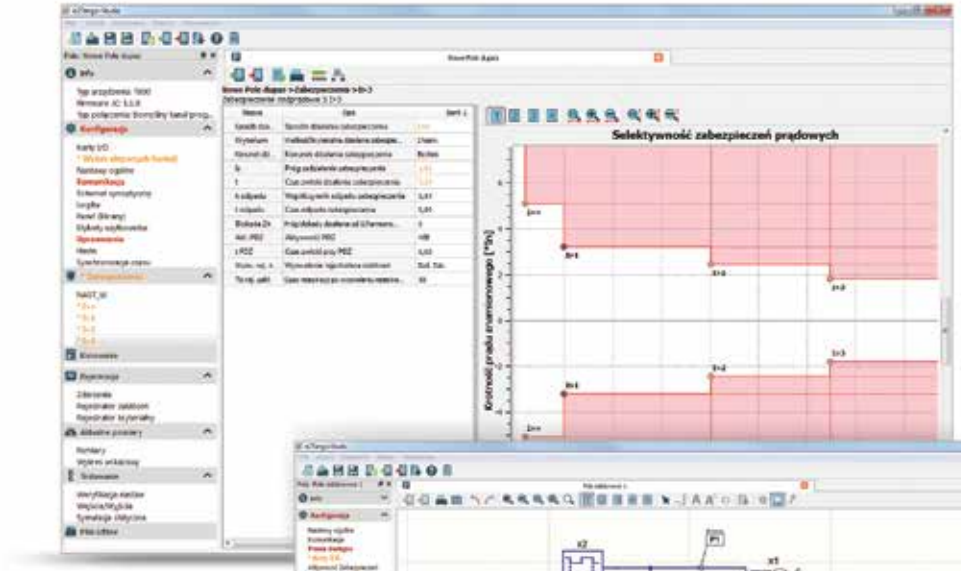


further expansion possible using plug-ins

ultra-fast design of custom screens

drag&drop element placement

e²TANGO-STUDIO SOFTWARE

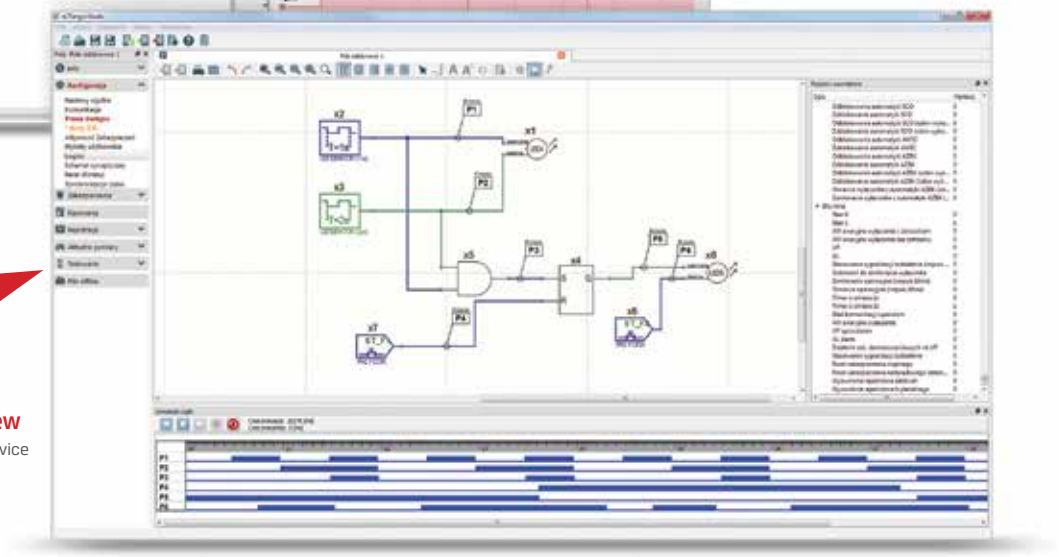


visual characteristic modification

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

logic simulator

full logic simulation without the need to connect to a device

legible logic

possibility of dividing logic into blocks and sheets

support for sophisticated logical dependencies

up to 210 logic gates / elements

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.

TECHNICAL PARAMETERS

Auxiliary power supply	
VDC	110 V, 220 V (80-300 V)
VAC	230 V (88-265 V)
Maximum power consumption	10 W (VA)
Input for autonomous power PWR (non-insulated)	12 - 15 V DC
Current measurement circuits	
Rated current	5 A / 1 A
Rated frequency	50 Hz
Phase current measurement range	0,1-150 A
I0 current measurement range	0,005-1 A / 0,1 - 10A
Ig current measurement range in capacitor bank bay	0,1-10 A
Voltage measurement circuits	
Rated voltage	57,7/100 V
Rated frequency	50 Hz
U, U_0 voltage measurement range	3-120 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 (0.1-150A)	2%
U1, U2, U3, U0 (5-120V)	2%
I0 (0.001-10A)	2%
φ1, φ2, φ3, φ0	1°
Binary input circuits	
Rated voltage	110/230 V AC/DC
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	5.0 A
Circuit opening at 220 V DC (L/R = 40 ms)	0,1 A
Circuit opening at 220 V AC (cos φ = 0,1)	2.0 A
Environmental conditions	
Operating temperature	-10 °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)	147 x 90,5 x 235
Protection rating (at terminal side)	IP 3X
Protection rating (at front panel side)	IP 4X / IP 54

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 certificate of conformity
no. 008/2017

Mazowsze Quality Award

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-N 18001 Occupational health and safety management systems
- BS OHSAS 18001 Occupational health and safety management systems

ORDER FORM

To order e²TANGO-400 protection relay fill in this part of the form following FORM INSTRUCTIONS provided on the next page.

STEP 1

①	version	☐ 400						
②	type	☐ S (standard, 4I+1U)						
③	measurement card rated current	☐ 5 A	☐ 1 A					
④	binary input voltage	☐ UNI (110/230 V AC/DC)		☐ 24V	☐ other			
⑤	Ethernet + COM1 communication	☐ x-none	☐ RS485	☐ CAN×2	☐ OPTO-MM	☐ OPTO-PL	☐ Profibus	☐ inne
⑥	mounting	☐ Z- behind-panel	☐ N - on-panel					
⑦	Protection rating IP	☐ IP 4X	☐ IP 54[1)]					
⑧	Electromagnetic indicators	☐ 0 - no	☐ 1 - yes					

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

STEP 2

Card name	Code	Slot C	Slot D	Slot TU
10 binary inputs		standard for the device		
8 relay outputs		standard for the device		
8 binary inputs	8IN	☐	☐	
8 relay outputs	8OUT	☐	☐	
4 binary inputs and 4 relay outputs	4IO	☐	☐	
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 measurement	TU			☐

ATTENTION: Max. 1 card in clot C and 1 card in slot D

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

wymagania dodatkowe:

STEP 3

Your code:

See FORM INSTRUCTIONS on the following page

e²TANGO	①	②	③	④	⑤	⑥	⑦	⑧	C	D	TU

FORM INSTRUCTIONS

STEP 1

The table contains basic technical specification of e²TANGO-400 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
- OPTO-MM - multi-mode optic fibre

STEP 2

The table contains a list of available expansion cards and their possible installation locations in e²TANGO-400 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
- max. 1 ARC card

Device slot C and D view

STEP 3

e²TANGO-400 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-400 protection configuration:

① e²TANGO-400	⑦ IP4X
② Standard	⑧ electromagnetic indicators
④ Uniwersalne 230/110 AC/DC	C C slot: 8OUT card
⑤ OPTO-MM	D D slot: ARC card
⑥ Behind-panel	TU TU slot: TU card

Sample e²TANGO-400 protection configuration:

e²TANGO	400	S	5A	UNI	OPTO-MM	Z	IP4X	1	8OUT	ARC	TU

e²TANGO PROTECTION INSTRUMENTS

e²TANGO-50 Short-Circuit Detectors

e²TANGO-200

e²TANGO-400

e²TANGO-600

e²TANGO-1200

e²TANGO-800

e²TANGO-1000

J6 Central
Processing Unit

J10 Central
Processing Unit

J14 Central
Processing Unit

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