CZAZ-NT
Feeder Bay Controller for MV Power Grid

GENERAL CHARACTERISTICS

CZAZ-NT is a modern, digital feeder bay controller dedicated for MV power grid. The device fullfils the functionality of protection, control, measuring, registers and communication with supervision system. The CZAZ-NT is built as two-elements device: logical unit and HMI. Its construction allows to mount the device in three ways: surface mounted, flush mounted or mixed mount.

Depending on application, the logical unit can be chosen between three possible width options: 36TE, 46TE or 56TE. The device consists of set of basic functional modules i.e. power and CPU module and set of extending modules which depends on specific need: current and voltage measuring module, binary inputs modules, relay outputs modules, analog inputs module, communication modules. Device construction, huge set of extension modules, rich library of protection and control functions allows to provide complex control of each power object which has to be protected.

MAIN FEATURES

- versatile in use device construction:
  o two-elements: logical unit and HMI, three mounting possibilities
  o three width options: 36TE, 46TE, 56TE
- redunant power module: can be powered by two independed voltage sources, provides safe operation in case of lack of one of power supply
- rich, versatile protection functions library (see table below)
- set of register functions: events, disturbance recorder, last disturbance parameters recorder, trend recorder
- modular construction: can be extended by 8, 12 or 16 modules. Rich set of extension modules:
  o current and voltage measuring module
  o 10 binary inputs module
  o 8 relay outputs module
  o module of 4 inputs for PTC sensors
  o module of 4 inputs for 4-20mA or 0-10V measuring converters
  o module of 4 inputs for arc flash sensors
  o communication extensions modules: 4xRS-485 port, RS485+Ethernet ports – redundant communication
- modern, functional Human Machine Interface
  o 7" touch scrren
  o 16 programmable RGB LEDs
  o 4 LED diodes for indication of device status
  o possibility to equip with key lock to be configured
  o set of functional buttons to control or acknowledgment purposes
  o 5 programmable buttons with programmable diodes (ex. to confirm acknowledgment action)
- settable list of users with their acces permissions: up to 4 users
- USB-A port to insert the memory stick for: download or upload settings, download registers data

- USB-B port to connect with PC computer what allows to browse device status, download registers data, configure the device
- screw or screwless terminals according to the order
- built-in PLC with rich set of logical functions, user-friendly graphical interface:
  o NOT, OR, AND, XOR gates
  o time elements: rising edge delay, falling edge delay, pulse, generator
  o analog values comparators
  o flip-flop
  o counters
- power quality meter basic functionality:
  o THD
  o voltage dips, sags and swells counter
  o frequency deviations
  o graphical user-friendly presentation of data
- rich set of measured values incl. electrical values directly measured and calculated as well as non-electrical values
- set of functional contacts: alarm, failure, trip to cooperate with substation control system

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TECHNICAL DATA

Auxilliaty rated voltage U_{Pn}	110-230 V AC, 110-220 V DC
Range of auxilliary voltage	$0{,}8 – 1{,}1\ U_{pN}$
Burden in power supply U_{Pn}	<30 W
Control voltage U_{Sn}	110 V AC/DC 220 V AC/DC
Range of control voltage U_{sn}	$0{,}8 – 1{,}1\ U_{sN}$

Current inputs

Rated current I_N	1/5 A
Measuring range of current input	$60\ I_N$
Burden by $I=I_N$	<0,5 VA
Continuoes measured current	$4\ I_N$
Thermal withstand (1s)	$100\ I_N$
Dynamic withstand (10 ms)	$250\ I_N$

Sensitive earth current measuring inputs (I_0)

Measuring range I_{0max}	12 A
Burden by $I_0=5A$	<0,4 VA
Continuoes measured current	11 A
Thermal withstand (1s)	250 A
Dynamic withstand (10 ms)	625 A

Voltage inputs

Rated voltage U_N	58 V/100 V
Measuring range of voltage input	$1{,}5\ U_N$
Burden by $U=U_N$	<0,5 VA
Thermal withstand (10 s)	$1{,}5\ U_N$
Long-term thermal withstand	$1{,}2\ U_N$
Rated frequency f_N	50/60 Hz

Binary inputs

Rated input voltage	110V AC/DC, 220 V AC/DC
Burden in binary inputs	< 5 mA

Relay outputs

Continuoes contact carry	5 A
Breaking capacity	
For DC voltage 250 V	
- resistive load	0,3 A
- inductive load L/R=40 ms	0,12 A
For AC voltage 250V/50Hz	
- inductive load of $\cos\varphi=0{,}4$	3 A
Accuracy of current treshold values	1%
Accuracy of voltage treshold values	1%
Accuracy of frequency treshold values	0,05 Hz
Accuracy of time	1% ±5 ms
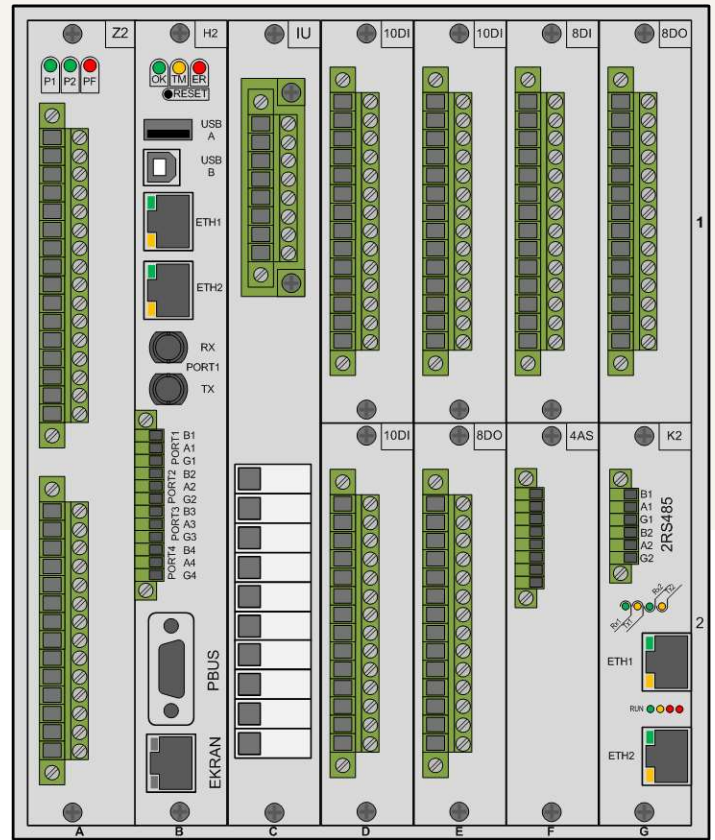
Relay response time	
excl. frequency protection	≤40 ms
frequency protection functions	≤80 ms
Sustain time	>50 ms
Reset coefficient	
- for over- protection functions	settable: 0,60 – 0,99
- for under- protection functions	settable: 1,01 – 1,40

Communication

Ports:
- USB – A
- USB – B
- 1-2 x Ethernet
- 2-4 x RS-485 (optionally fiber-optic)

Possibility to add extra communication ports

Protocols:
- IEC 60870-5-103
- IEC 61850
- MODBUS
- DNP 3.0

Dimensions (width x height x depth)

Logical unit	
• 36 TE	205 x 227 x 147 mm
• 46 TE	255 x 227 x 147 mm
• 56 TE	305 x 227 x 147 mm
Front panel	205 x 227 x 30 mm
Weight	7 kg
Ingress protection degree	IP40
Ambient temperatture	-20...55°C
Relative humidity	≤95%

List of protection and supervision functions			
Function name	**C37.2 signature**	**IEC 60617 signature**	**IEC 61850 signature**
Overcurrent instantaneous protection	50	I>>	PIOC
Definite-time or inverse-time overcurrent protection	51	I>	PTOC
Undercurrent protection	37	I<	PTUC
Overcurrent directional protection	67	I> ->	PTOC
Negative-sequence overcurrent protection	46	I2>	NSPTOC
Current unbalance protection	46	I2/I1>	
Overcurrent thermal protection	49	Ith>	PTTR
Motor stall protection	51LR	I>	
Locked rotor, extended motor start, number of motor starts protection	14, 48, 51, 51LR, 66		PMSS, PMRI, PZSU
Overcurrent protection against loss of synchronism			
Motor squirrel-cage faults detector			
Overcurrent differential protection of: - motor - generator - line* - transformer	87M/L/G/T	ΔI>	PDIF/PHAR
Earth fault overcurrent protection	50N/51N	I_0>	
Earth fault directional protection - overcurrent - active/reactive-power-based - admittance-based	67N	I_0> -> P_0/Q_0> Y_0>	
Cable insulation fault detector			
Overvoltage protection	59	U>	PTOV
Undervoltage protection	27	U<	PTUV
Negative-sequence overvoltage protection	47	U2>	NSPTOV
Protection against incorrect voltage phase sequence	47	U2/U1>>	
Voltage rate of change protection		dU/dt ΔU/Δt	
Voltage vector shift protection			
Overfrequency protection	81O	f>	
Underfrequency protection	81U	f<	
Frequency rate of change protection	81R	df/dt Δf/Δt	
Volt per Hertz overexcitation protection	24	U/f>	PVPH
Protection against loss of load, power-based	32U	P<	PDUP
Reserve power protection	32R	P>	PDOP
Power factor protection	55O/U	PF> PF<	POPF, PUPF
Temperature/analog-inputs-based protection	12, 14, 26, 63	ϑ>/<, ω>/<	PTTR
Arc flash detector	AFD		
Disturbance waveform recorder	DFR		RADR
Binary data recorder	DFR		RBDR
Fault locator			RFLO
Power quality meter	PQM		
Built-in Programmable Logic Controller	LGC		
Capacitors bank control function			
Earthing resistor control function (active component injection)			
Cooperation with Automatic Transfer Switch			
Under Frequency Load Shedding			
Auto-reclose function			
Trip circuit supervision function	TCM		
* - in cooperation with another ZEG-Energetyka protection relay			

Example of wiring diagram of CZAZ-NT bay controller – basic version (36TE)

CZAZ-NT

Z2 — X1Z

Terminal	Signal
1	Aux. volt. 1
2	
3	TCM1
4	
5	CICM
6	
7	
8	In01
9	In02
10	In03
11	In04
12	
13	In05
14	In06
15	In07
16	In08

- CB - Open Command
- CB - Close Command
- D1 - pos. closed
- D1 - pos. open
- CB - pos. closed
- CB - pos. open
- ES1 - pos. closed
- ES1 - pos. open

X2Z

Terminal	Signal
1	Aux. volt. 2
2	
3	TCM2
4	
5	
6	AL NO
7	COM
8	AL NC
9	Failure
10	TRIP
11	Out01
12	Out02
13	Out03
14	Out04

- CB - open command
- ALARM
- FAILURE
- TRIP
- Busbar prot.
- Breaker failure

P1 — X1U

Terminal	Signal
1	UL1
2	UL2
3	UL3
4	UN
5	3Uo
6	3Uo
7	
8	

- UL1
- UL2
- UL3
- UN
- 3Uo

X1I

Terminal	Signal
1	IL1
2	
3	IL2
4	
5	IL3
6	
7	
8	
9	I0
10	

- IL1
- IN
- IL2
- IL3
- I0

H1 — X1H

Terminal	Signal
A	RS-485 COM1
B	
SG	
A	RS-485 COM2
B	
SG	

option - fiber-optic port: Rx, Tx, Rx, Tx

- SCADA — ETH
- USB-A
- HMI
- USB-B

10DI — X1D

Terminal	Signal
1	CB charged
2	In01 / Local close
3	In02 / Local open
4	In03
5	
6	In04 / Emergency trip 1
7	In05 / Pick-up acknow.
8	In06 / Close interlock cancel
9	
10	In07 / Tech. prot. 1
11	In08
12	
13	In09 / Ex. prot. 1
14	In10

10DI — X2D

Terminal	Signal
1	
2	In01 / Trip from LV side
3	In02
4	In03
5	
6	In04 / Ex. prot. 2
7	In05 / Tech. prot. 2
8	In06 / Emergency trip 2
9	
10	In07
11	In08
12	
13	In09
14	In10

8DO — X1Y

Terminal	Signal
1	
2	Out01 / I> 1 Pick-up
3	Out02 / I> 1 Trip
4	Out03 / I> 2 Pick-up
5	
6	Out04 / I> 2 Trip
7	Out05 / I0>1 Pick-up
8	Out06 / Recorder full
9	
10	Out07NC / Not ready to close
11	Out07NO / Ready to close
12	
13	Out08NC
14	Out08NO

4AS — X1A

Terminal	Signal
1	InAn1 / Temp. sensor 1
2	
3	InAn2 / Temp. sensor 2
4	
5	InAn3 / Temp. sensor 3
6	
7	InAn4 / Temp. sensor 4
8	

4ARCF

- Flash sensor - busbars
- Flash sensor - disconnector
- Flash sensor - earthing switch

IEC

- ETHERNET1 — IEC 61850
- ETHERNET2 — IEC 61850