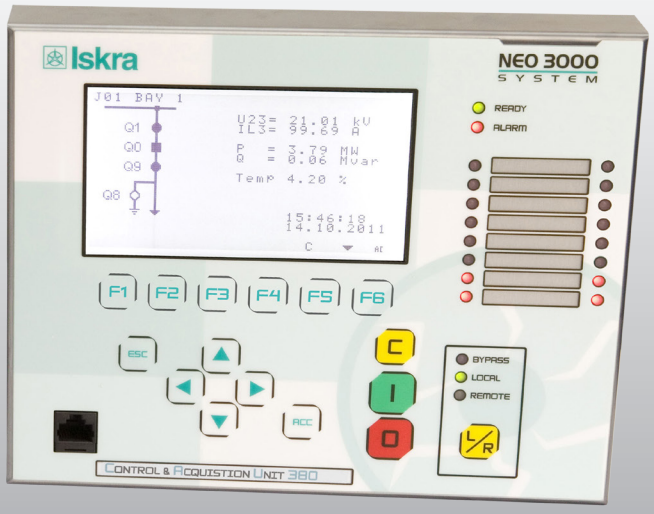
NEO 3000
SYSTEM



CAU 380
Bay Computer

THE FAMILY OF EQUIPMENT DEDICATED FOR POWER UTILITIES

Energy Sector

Iskra®

CAU 380

Bay Computer

Description

CAU 380 is a comprehensive and cost effective bay computer for control, measuring and supervision of utility and industrial distribution substations. CAU 380 is a member of NEO 3000® Substation system and a part of CAU control product series. The CAU 380 supports the IEC 61850 substation automation standard including horizontal GOOSE communication offering seamless connectivity to substation automation and SCADA systems.

CAU 380 can be used in applications of any HV/MV/LV networks. Control of feeder or bay can be applied locally through local display unit LDU or remotely through substation control system.

Communication interface with IEC 61850 protocol enables integration of CAU 380 within substation control system and remote control centers.

CAU 380 is IEC 61850 certified by KEMA (Level A) independent laboratories.

Main features

Complete feeder control
Local and remote control of feeder switching elements applied through configurable interlocking.

Measurements and energy metering
Complete range of voltage, current, frequency, active and reactive power and power factor measurements with reactive and apparent double tariff forward/reverse energy metering.

Fault and event recording
Fault recording with 1 ms resolution time tagging.

Disturbance recorder and power quality monitoring (PQM)
Disturbance recorder with capability of up to 20 recordings, up to 9 seconds each, COMTRADE format. Monitoring of parameters such as THD, sags and swells and harmonics up to 40th order.

Communication capabilities
Easy integration of the module within NEO 3000 substation control and protection system through IEC 61850 protocol, (optional DNP3, IEC 60870-5-104, IEC 60870-5-101 and IEC 60870-5-103 protocols).

Intuitive user interface
Bay computer parameterizing, measurements and alarming, control with single line diagram presentation can be applied through Local Display Unit (LDU).

NEO3000 Power System Manager software tool
PC based software tool for device parameterizing, commissioning, testing, ...

CAU 380

Bay Computer

Functions

Control

- internal data acquisition
- external data acquisition (switching elements, alarm devices) - up to 110 DI
- power relay outputs - up to 24 DO
- synchro-check- V, deg & Hz (25)
- Voltage regulation
- Fault current detection
- Time tagging (high resolution events)
- Local and remote setting

Monitoring and measurements

- Current, voltage, power, frequency and power factor measurements
- Energy metering
- Event recording
- Transient disturbance recorder (DREC)
- Power Quality Monitoring
- Statistical data processing (circuit breakers)
- Self-monitoring

Local Display Unit (LDU)

- Graphic LCD display with single line diagram
- Control for switching elements
- Showing measurements and alarms
- Event list
- Local/Remote switch with LED indication
- Easy to use navigation keys
- Open/Close control keys
- Ready LED + Alarm LED + 16 programmable LEDs
- 6 programmable function keys
- Front Ethernet RJ-45 communication port for parameterizing

Communication

- Communication via fiber optic or RJ45 Ethernet (optional serial communication – RS232, RS485 or optical)
- Front and/or back RJ45 Ethernet interface for NEO 3000® Power System Manager® parameterizing and analysis tools
- Communication using IEC 61850 (optional DNP3 or IEC 60870-5-10x protocols)
- System time synchronization over NTP/SNTP or through other comm. protocols

Application

- Control of HV/MV/LV transmission, distribution and industrial overhead or cable feeders/bays, bus couplers, measuring bays, capacitor banks
- Transformer bays (HV, MV)
- Distribution automation system (FRTU)
- Suitable for solidly earthed, resistor earthed, Petersen-coil compensated and insulated power networks

Control and monitoring

CAU 380 is much more than just a powerful bay computer because it also comprehends all the control functions that perfect IED for integration in distributed substation control systems. All information from CAU 380 can be also transmitted through IEC 61850 communication protocol to higher level equipment (e.g. SCADA, protocol gateways, control centers,...) and also via GOOSE transmission to other IED supporting IEC 61850.

Inputs and outputs

CAU 380 acquires electrical values and digital signaling through analogue and digital inputs. Current and voltage inputs expand the functionality of device also for monitoring the feeder/bay power flow, energy, power quality (PQM) and useful disturbance recorder. All together the device offers up to 9 current and voltage analog inputs, 9 DC (mA or Voltage) analog inputs, up to 110 digital inputs and up to 24 digital outputs. Each digital input is configured to type and input logic of digital signal, while digital outputs can be freely configured for external signaling and switchgear control.

Synchro-check (25)

Synchro-check function provides supervised joining of the feeder/bay to busbars in single or double busbar systems. Using measurements of voltage, frequency and phase angle of busbars and feeder the CAU 380 can perform manual or automatic feeder synchronization. Mode of operation is synchronous or asynchronous.

Voltage regulation

Voltage regulation function provides regulation of voltage over RAISE/LOWER commands to tap changer. Function compares measured voltage with settable requested voltage (parameter or via communication as set-point command) and execute regulation command according predefined limits and conditions. It will also detect if the limits are reached or the command is blocked by any reason.

Fault current detection
CAU 380 provides also fault current detection function, which follows ARC function in substations and independently signals excursion over set values and follows reclosures (up to 5). It also detects direction of fault (forward or reverse direction).

Local/remote control
Using input and output capabilities CAU 380 offers complete control of switchgear either locally or remotely.
CAU 380 provides acquisition of digital and analogue values, and control over relay outputs. In that way it is ideal solution for complete control of switchgear from different control levels.
Local control is possible via optional Local Display Unit (LDU) that displays single line diagram, measurements, metering, statistic counters, alarm lists and enables user SCADA-like supervision over feeder. LDU can also be ordered as decoupled unit from CAU 380 it can be used on the cubicle door while CAU 380 is situated inside low-voltage compartment. Selection of control level can be applied via LDU Local/Remote button (or hardware lock) or external digital input (selection switch). Remote control is possible from substation level SCADA or remotely from dispatch center.

Measuring and Metering
Measurements are acquired using voltage and currents inputs. Nominal values of each input are configurable. Following measurements are performed by CAU 380:

- currents: I1, I2, I3, IE
- voltages: U1, U2, U3, UE, U12, U23, U31
- power measurements: P, Q, S
- power factor: PF
- frequency: f
- active and reactive energy: forward and reverse, high and low tariff
- energy metering using external digital input for external energy counter pulse output.
- current symmetrical sequence component calculations (I1, I2, I0)
- voltage symmetrical sequence component calculations (U1,U2,U0)
- Power quality measurements (harmonics up to 40, THD, RMS...)

Communication

CAU 380 comprehends two Ethernet communication ports for use with IEC 61850 communication protocol (optional DNP3 TCP/IP, IEC 60870-5-104). Front Ethernet port on LDU is used for bay level configuration by using NEO 3000 Power System Manager (PSM) application software. Optional CAU 380 includes two serial communication ports for protocols like DNP3, IEC 60870-5-103 and IEC 60870-5-101. Ethernet ports can be delivered with RJ45 or ST Glass Fiber Optic interface, while serial ports can be RS232, ST Glass Fiber Optic or RS485 interface. Accurate time is distributed via Ethernet NTP/SNTP protocol or via protocol clock sync.

Local Display Unit (LDU)
CAU 380 is equipped with integrated (optional standalone) Local Display Unit (LDU). LDU represents simple screen graphic operation panel that enable local control from cubicle door and hence avoiding the need of push-buttons.

Hardware properties:

- LCD size with resolution of 240 x 128 pixels
- navigation buttons (6)
- control buttons (3)
- Local/Remote/Bypass button with LEDS
- programmable LEDS (16)
- programmable function keys (6)

Functions:

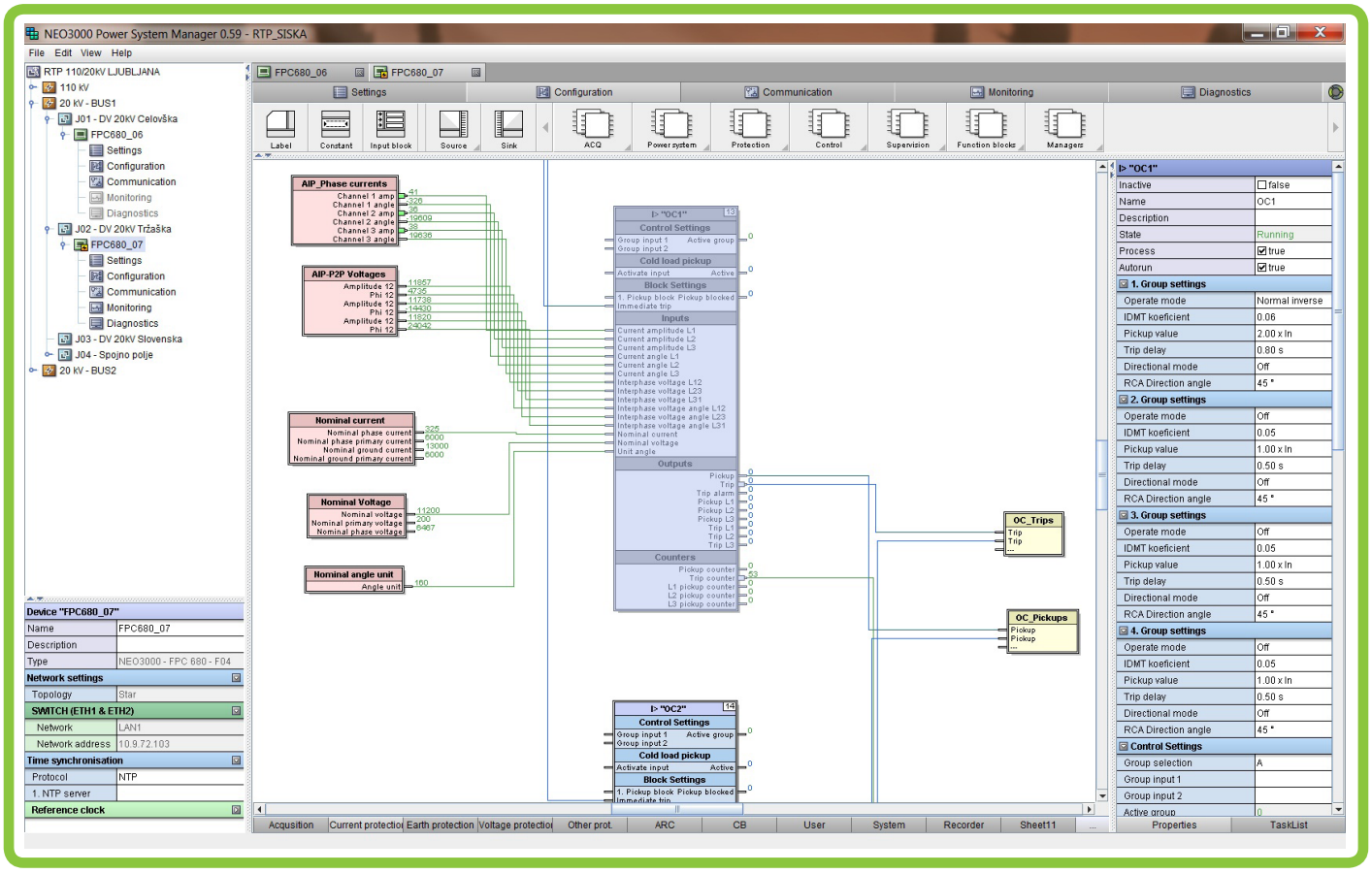
- display of single line diagram with interactive representation and control of circuit breakers, disconnection switches, etc.
- chronological event list
- alarm list
- measurements (U, I, P, Q cos φf,...)
- change control parameters settings via LDU
- selection between Local/Remote bay control
- 16 programmable LEDs for alarm indication
- 6 programmable function keys

Remote configuration
CAU 380 is a part of NEO 3000 Substation protection and control system.
Since all communication between device and NEO 3000 Power System Manager tool are done via TCP/IP media, there are several ways to establish remote diagnostics, configuration and testing of device behavior.

Analysis and parameterizing software

Basic tool for nowadays engineers are laptop computers that makes surveillance of IEDs easier. CAU 380 uses a software package NEO 3000 Power System Manager (PSM) for parameterizing, analysis and commissioning.

NEO 3000 Power System Manager
NEO 3000 Power System Manager is PC based software that makes handling with NEO 3000 substation control and protection system simple. Under password protected access the user can set parameters of CAU 380 device via transparent graphical and tree based menus. It enables online or offline setting of device parameters.



CAU 380

Bay Computer

Technical data

Control and monitoring

Metering

Currents:	IL1, IL2, IL3, IE
Range:	0,01 – 20 x In
Accuracy:	≤ ± 0.2% Full scale
Voltages:	U1, U2, U3, UE, U12, U23, U31
Range:	0,005 - 1,5 x Un
Accuracy:	≤ ± 0.1% Full scale
Power:	Active (P), Reactive (Q), Apparent (S)
Range:	0,05 - 1,2 x Pn
Accuracy:	< 0,5% Pn
Power factor:	cos Fi, total power
Range:	-1 to +1
Frequency:	f
Range:	40,00 – 60,00 Hz
Energy:	active, reactive energy
Acquisition:	internally calculated through external digital inputs
No. of tariffs:	two
Measuring method:	four quadrant

Synchro-check (25)

Amplitude diff.:	3-100 % Un
Angle diff.:	3 – 80 °
Frequency diff.:	0,01 – 2,00 Hz
Maximal synchronization time:	0,00 - 300,00 s

Disturbance Recorder

Data channels:	9 analog, 64 digital
Sampling rate:	32/64/128 samples per cycle
Trigger source:	external digital input and internal digital data
Storage capacity:	up to 20 recordings up to 9s each
Storage media:	non-volatile flash remote FTP server
Recording format:	COMTRADE

Power Quality Monitoring (PQM)

Monitoring values:	Spectral analysis up to 40th harmonic THD, TRMS, sags & swells

Inputs

Nominal frequency:	50 Hz

Current inputs

Rated current In:	1 or 5 A
Range:	up to 20 x In
Consumption:	<0,06 VA at In= 1 A <0,3 VA at In= 5 A

Overload

	continuous: 4 x In 10 s: 30 x In 1 s: 100 x In 10 ms: 250 x In

Voltage inputs

Rated voltage Un:	100-150 V, 300 V
Range:	up to 150 V, 300 V
Consumption:	<0,23 VA at Un
Overload:	150 V continuous, 300 V continuous

External digital inputs

Quantity of inputs:	22 (optional up to 110)
Nominal voltage:	24 V DC / 48-60 V DC 110-125 V DC / 220 V DC
Permitted voltage Offset:	+/- 20%
Consumption:	<0,5 mA

Relay outputs

Quantity of relays:	8 (optional up to 24)
Contacts:	4 x DO: 2xNO, 3 x DO: 1xNO
Ready relay (8thDO):	1xCO
Trip/signal output assignment:	programmable
Switching capacity:	make: 14 A break: 1000 W @ cos Fi=1 permanent: 8 A
Switching voltage:	250 V DC
Switching reliability:	1 mio. switching

Communication interfaces

Front port on LDU

Layout:	100BaseTx (RJ45)
Usage:	used for local configuration, diagnosis and testing

Rear ports (Ethernet, Serial, System)

Up to 2 x Ethernet layouts:	100BaseTx (RJ45), 100BaseFx (ST glass FO)
Up to 2 x Serial layouts:	RS232 (DB9), RS485, ST MM glass FO
1 x System layouts:	RS232 (RJ11)
Serial Baud rate:	up to 115,2 kbps
Protocols:	IEC 61850 (MMS + Goose), IEC 60870-5-101 (optional) IEC 60870-5-103 (optional) IEC 60870-5-104 (optional) DNP3 or Modbus (optional)

Time synchronization

NTP/SNTP Ethernet (optional via comm. protocol)

Resolution:	± 1 ms
Accuracy:	± 5 ms

Power supply

Rated voltage:	24 V DC, 48-60 V DC, 110-125 V DC, 220-250 V DC
Permissible tolerance:	- 20/+30%
Power consumption:	<20 W, typ. 15 W
Voltage loss hold-up time:	>20 ms

Operating conditions

Temperature:	
Storage:	-20°C to +70°C
Operate:	-10°C to +55°C
Operate:	-10°C to +70°C (housing for extended temp. range)
Humidity:	up to 95% non-condensing

Mechanical design

Material:	stainless steel
Protection class:	IP 54 (front LDU), IP40 (housing), IP20 (housing for extended temp. range)
Mounting type:	flush or surface
Dimensions:	Small housing (1/2 19", 4U) (WxHxD): 220 x 176 x 187 mm Medium housing (2/3 19", 4U) (WxHxD): 290 x 176 x 187 mm Large housing (19", 4U) (WxHxD): 440 x 176 x 187 mm
Weight:	Small housing (1/2 19", 4U): max. 4,1 kg Medium housing (2/3 19", 4U): max. 5,1 kg Large housing (19", 4U): max. 7,1 kg

Type tests

Rated insulation voltage test:	IEC 60255-5, table 1
Dielectric test voltage test:	IEC 60255-5, table 1, series B, clause 6
Insulation resistance test:	IEC 60255-5, clause 7
Impulse voltage test:	IEC 60255-5, clause 8
Electrical disturbances test:	IEC 60255-22-1, class 3
Electrostatic discharge immunity test:	IEC 61000-4-2, level 4
Radiated immunity test:	IEC 61000-4-3, level 3 IEC 60255-22-3, class 3 IEC 61000-4-3, class 3 ENV 50204 (GSM), level 3
Fast transient/burst immunity test:	IEC 61000-4-4, level 4 IEC 60255-22-4, class 4 ANSI/IEEE C.37.90.1
Surge immunity test:	IEC 61000-4-5, level 4
Conducted immunity test:	IEC 61000-4-6, level 3
Power frequency magnetic field immunity test:	IEC 61000-4-8, level 4
Pulse magnetic field immunity test:	IEC 61000-4-9, level 5
Damped oscillatory magnetic field immunity test:	IEC 61000-4-10, level 4
Oscillatory transient immunity test:	IEC 61000-4-12, level 4 IEC 61000-4-18, level 3 ANSI/IEEE C.37.90.1
Emissions test:	IEC 60255-25
Power interruption test:	IEC 60255-11
Power frequency immunity test:	IEC 60255-22-7 IEC 61000-4-16
Temperature test:	IEC 60068-2-1 IEC 60068-2-2
Temperature gradient test:	IEC 60068-2-14
Humidity test:	IEC 60068-2-30
Damp heat test:	IEC 60068-2-78
Vibration (sinusoidal) test:	IEC 60068-2-6
Shock and bump tests:	IEC 60068-2-27
Seismic test:	IEC 60255-21-3
Communication test:	IEC 61850 Certificate Level A (IEC 61850-10 Ed1)

IEC 61850 Certificate Level A by KEMA

IEC 61850 Certificate Level A[1]

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No. 74100480-MOC/INC 11-1589

Issued to:
Iskra Sistemi, d.d.
Stegne 21
Ljubljana 1000
Slovenia

For the product:
NEO 3000 FPC 680
Hardware version: FPC 680-F03
Software version: 1.0

Issued by: KEMA

The product has not shown to be non-conforming to:

IEC 61850-6, 7-1, 7-2, 7-3, 7-4 and 8-1

Communication networks and systems in substations

The conformance test has been performed according to IEC 61850-10 with product's protocol, model and technical issue implementation conformance statements: "FPC680_PICS.doc ver. 1.3", FPC680_MICS.doc ver. 1.1", "FPC680_TICS.doc ver. 1.0" and product's extra information for testing: "FPC680_PIXIT.doc ver. 1.9".

The following IEC 61850 conformance blocks have been tested with a positive result (number of relevant and executed test cases / total number of test cases as defined in the UCA International Users Group Device Test procedures v2.2b):

1	Basic Exchange (20/24)	9a	GOOSE Publish (8/12)
2	Data Sets (3/8)	9b	GOOSE Subscribe (10/10)
2+	Data Set Definition (23/23)	12a	Direct Control (7/11)
5	Unbuffered Reporting (15/18)	12d	Enhanced SBO Control (12/19)
6	Buffered Reporting (17/20)	13	Time Synchronization (4/5)

This Certificate includes a summary of the test results as carried out at Iskra Sistemi in Slovenia with UniCAsim 61850 version 3.23.02 with test suite 3.23.00 and UniCA 61850 analyzer 4.21.03. The test is based on the UCA International Users Group Device Test Procedures version 2.2b. This document has been issued for information purposes only, and the original paper copy of the KEMA report: No. 74100480-MOC/INC 11-1588 will prevail.

The test has been carried out on one single specimen of the product as referred above and submitted to KEMA by Iskra Sistemi. The manufacturer's production process has not been assessed. This Certificate does not imply that KEMA has certified or approved any product other than the specimen tested.

Arnhem, June 15 2011

M. Adriaensen
Regional Director Management & Operations Consulting

R.S. Massink
Test Engineer

1 Level A - Independent Test lab with certified ISO 9000 or ISO 17025 Quality System

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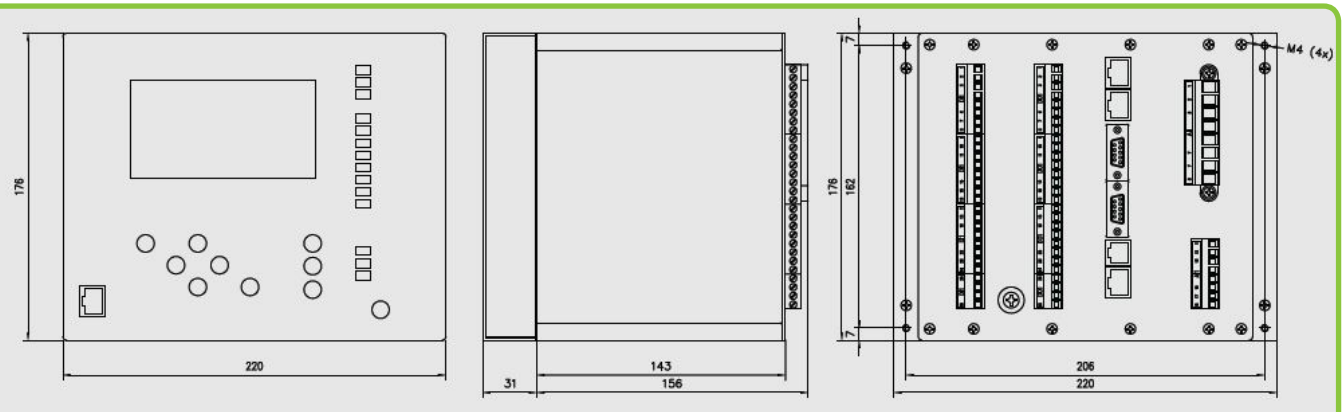
Applicable Test Procedures from the UCA International Users Group Device Test Procedures version 2.2b

Conformance Block	Mandatory	Conditional
1: Basic Exchange	Ass1, Ass2, Ass3, AssN2, AssN3, AssN4, AssN5 Srv1, Srv2, Srv3, Srv4, Srv5, SrvN1abcd, SrvN4	Srv6, Srv7, Srv8, SrvN1e, SrvN2, SrvN3
2: Data Sets	Dset1, Dset10a, DsetN1ae	
2+: Data Set Definition	Dset2, Dset3, Dset4, Dset5, Dset6, Dset7, Dset8, Dset9 DsetN1od, DsetN2, DsetN3, DsetN4, DsetN5, DsetN6, DsetN7, DsetN8, DsetN9, DsetN10, DsetN11, DsetN12, DsetN13, DsetN14, DsetN15	
5: Unbuffered Reporting	Rp1, Rp2, Rp3, Rp4, Rp7, Rp10 RpN1, RpN2, RpN3, RpN4	Rp5, Rp6, Rp8, Rp9, RpN5
6: Buffered Reporting	Br1, Br2, Br3, Br4, Br7, Br8, Br9, Br12 BrN1, BrN2, BrN3, BrN4, BrN5	Br5, Br6, Br10, Br11
9a: GOOSE publish	Gop2, Gop3, Gop4, Gop7	Gop1, GopN1
9b: GOOSE subscribe	Gos1a, Gos2, Gos3, GosN1, GosN2, GosN3, GosN4, GosN5, GosN6	Gos1b
12a: Direct control	CtlN3, CtlN8 DOns1, DOns3	Ctl2, Ctl7, CtlN11
12d: Enhanced SBO control	Ctl3, CtlN1, CtlN2, CtlN3, CtlN4, CtlN9 SBOes1, SBOes2, SBOes3	Ctl2, Ctl7, CtlN11
13: Time sync	Tm1, Tm2, TmN1	Tm3

All configuration file and data model tests have been successfully performed for the product variants using the same hardware and software version: NEO 3000 CAU 380

Dimensional drawings example



FRONT VIEW SIDE VIEW BACK VIEW

Flush mounting small housing (1/2 19", 4U) layout is represented. All units are in milimeters.

Ordering

Small housing	SW	H	AI	C1	C2	C3	C4	PS	S1	S2					
Medium housing	SW	H	AI	C1	C2	C3	C4	PS	S1	S2	S3	S4			
Large housing	SW	H	AI	C1	C2	C3	C4	PS	S1	S2	S3	S4	S5	S6	S7
My configuration															

SW – Software type

C01 – Control
C02 – Control with Synchro check
C03 – Control with Voltage regulator
C04 – Control with Synchro check and Voltage regulator
C05 – Control with Fault Current Detection

H - Housing layout

Type
L – flush mounting with integrated LDU
N – surface mounting without LDU
D – surface mounting with detachable LDU
Z – surface mounting with integrated LDU

Size
1 – Small housing (1/2 19", 4U) (slots S1 ... S2)
2 – Medium housing (2/3 19", 4U) (slots S1 ... S4)
3 – Large housing (19", 4U) (slots S1 ... S7)
4 – Small housing for extended temp. range (1/2 19", 4U) (slots S1 ... S2)
5 – Medium housing for extended temp. range (2/3 19", 4U)(slots S1 ... S4)
6 – Large housing for extended temp. range (19", 4U)(slots S1 ... S7)

AI - AI AC configuration

AC board type
N –none
A – 4 CT + 4 VT [5]
B – 5 CT + 4 VT [5]
C – 4 CT + 5 VT [5]
I – 4 CT + 4 VT + 4 CT [5]
J – 4 CT + 3 VT + 5 CT [5]
L – 4 VT

Current measuring inputs
N – none
1 – 1 A current input
5 – 5 A current input

Voltage measuring inputs
N – none
1 – 150 V voltage input
3 – 300 V voltage input

DC measuring input (1 pcs)
N – none
C – 1 AI DC input 20 mA
V – 1 AI DC input +/- 10 V

C1, C2 - Ethernet Communication ports

Connector
N – none (only system)
E – 100BaseTx (RJ45)
F – 100BaseFx (ST Glass F.O.)

Communication protocol
N – none
G – IEC 61850 MMS with GOOSE
4 – IEC 60870-5-104
D – DNP3 (TCP/IP)

C3, C4 - Serial Communication ports

Connector
N – none (only system)
2 – RS232 (DB9 female)
F – ST Glass F.O.
5 – RS485

Communication protocol
N – none
1 – IEC 60870-5-101
3 – IEC 60870-5-103
D – DNP3
M – Modbus

PS - Auxiliary supply voltage

1 – 19 - 30 V DC + 8 DO
2 – 38 – 72 V DC + 8 DO
3 – 88 – 150 V DC + 8 DO
4 – 176 – 300 V DC + 8 DO
5 – 170 – 330 V AC + 8 DO
M1 – 19 - 30 V DC + 5 DO + 8 DI
M2 – 38 – 72 V DC + 5 DO + 8 DI
M3 – 88 – 150 V DC + 5 DO + 8 DI
M4 – 176 – 300 V DC + 5 DO + 8 DI
M5 – 170 – 330 V AC + 5 DO + 8 DI

S1 ... S7 – Slot configuration

NN - none
R8 - DO board (8 relays) [2] [3]
B1 - DI board (22 Digital Inputs) 24 V DC (with LEDs) [3]
B2 - DI board (22 Digital Inputs) 48-60 V DC (with LEDs) [3]
B3 - DI board (22 Digital Inputs) 110-125 V DC (with LEDs) [3]
B4 - DI board (22 Digital Inputs) 220 V DC (with LEDs) [3]
M1 – DIO board (15 Digital Inputs) 24 V DC + 4 relays (with LEDs) [3a]
M2 – DIO board (15 Digital Inputs) 48-60 V DC + 4 relays (with LEDs) [3a]
M3 – DIO board (15 Digital Inputs) 110-125 V DC + 4 relays (with LEDs) [3a]
M4 – DIO board (15 Digital Inputs) 220 V DC + 4 relays (with LEDs) [3a]
M5 – DIO board (15 Digital Inputs) 230 V AC + 4 relays (with LEDs) [3a]
D8 – AI DC board (8 inputs) [4]

Legend:
[2] up to 2 boards max
[3] sum of all DI and DO boards up to 7 boards max
[3a] DIO board uses addressing of two boards (DI + DO board)
[4] 1 board max
[5] CT range is 20 x In

Ordering examples:

CAU 380 – C02 / L2 / C51N / FG / FG / NN / NN / 3 / R8 / B3 / B3 / B3
CAU 380 – C01 / L1 / A51N / FG / FG / NN / NN / 3 / B3 / B3

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