FLEXIBLE SOLUTIONS FOR THE ENERGY INDUSTRY

COMPREHENSIVE INSTRUMENT FOR MEASUREMENT AND CONTROL OF POWER SYSTEMS
CENTRAX CU3000 / CU5000 combines the functionality of a highly accurate instrument for heavy current application with the possibilities of a freely programmable PLC in one housing. This makes the need of a separate control, a control system, a remote display or an additional data collector superfluous. The measuring part of the instrument determines more than 1500 high-quality items of status, energy consumption and power quality. The control application is based on CODESYS and can now, depending on the application, process this data logically, use it in control algorithms or interact with energy generation or consumers as the situation demands. The instrument can communicate with the process environment via freely selectable I/Os and Modbus interfaces. The ADVANCED and PROFESSIONAL versions offer the additional possibility of importing measured data of other field instruments into the control application via Modbus interfaces for further processing.

CENTRAX CU3000 / CU5000 can thus be used for autarkic solutions in the areas of energy management, control and optimisation of the energy consumption, utility monitoring and other general automation and control tasks. A connection to higher-ranking systems is possible at any time.
ADAPTABLE
Adaptable to the task at hand via control application
Possibility of providing own on-site and web visualizations
Horizontal and vertical extension possible

INTUITIVE
Easy device operation with language-specific plain text menu guidance
Topical arrangement of measured data information for quick access to desired data
Service area for maintenance and commissioning

MULTIFUNCTIONAL
Measurement and control in one instrument
Central acquisition of measured data and energy consumption
Monitoring of plant, process and utilities

FLEXIBLE
Universal measuring inputs for any type of grid
Freely selectable mean value and meter measuring variables
Configurable access authorisation

SCALABLE
Combinable device version (functionality, interfaces, I/Os, power supply)
Selectable design: Top hat rail or panel installation (96x96 or 144x144mm)
Integration as a standard object into the SMARTCOLLECT software
Control generation with standard languages according to IEC61131-3:
- LD  Ladder diagram
- IL  Instruction list
- FBD  Function block diagram
- SFC  Sequential function chart
- ST  Structured text
- CFC  Continuous function chart

The approach of the CENTRAX CU3000 is the use of the SINEAX AM3000 as a measuring instrument, supplemented by a freely programmable control application, based on the widely used CODESYS, which takes over the function of the control system or PLC. The control functionality is provided in different performance classes:

- **BASIC**: Flexible processing of the measuring data of the measuring instrument with full use of the I/O functionality
- **ADVANCED**: In addition, the possibility to read and use data from other measuring instruments via Modbus RTU/TCP, as well as to trigger time-depending processes
- **PROFESSIONAL**: To create your own web visualization and to use the local display for self-defined visualizations

**POSSIBLE APPLICATIONS**
- Load balancing, load control
- Acquisition of energy consumption of any kind
- Energy management, summation station
- Monitoring of production equipment such as transformers, motors, generators, etc.
- Load management, peak load optimization, power factor compensation
- Local data display and control unit
- Monitoring of changes (Long-time-Drift / Degradation)
- Start / Stop process control, i.e. for control and monitoring of process steps

**INDIVIDUAL SYSTEM SOLUTIONS**

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# Measured Values

## Measured Value Group

<table>
<thead>
<tr>
<th>Instantaneous Values</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>U, I, IMS, P, Q, S, PF, LF, QF ...</td>
<td>Transparent monitoring of present system state</td>
</tr>
<tr>
<td>Angle between voltage phasors</td>
<td>Fault detection, connection check, sense of rotation check</td>
</tr>
<tr>
<td>Min/max of instantaneous values with time stamp</td>
<td>Determination of grid variable variance with time reference</td>
</tr>
</tbody>
</table>

## Extended Reactive Power Analysis

- Total reactive power, fundamental frequency, harmonics
- $\cos \phi, \tan \phi$ of fundamental frequency with min values in all quadrants

## Harmonics Analysis (According to EN 61 000-4-7)

- Total harmonics content THD U/I and TDD I
- Individual harmonics U/I up to 50th

## Imbalance Analysis

- Symmetrical components (positive, negative, zero sequence system)
- Imbalance (from symmetrical components)
- Deviation from U/I mean value

## Energy Balance Analysis

- Meters for the demand/supply of active/reactive power, high/low tariff, meters with selectable fundamental variable
- Power mean values active/reactive power, demand and supply, freely definable mean values (e.g. phase power, voltage, current and much more).
- Mean value trends

## Operating Hours

- Operating hours of the device

## Web Visualization

All of the measured data may be displayed via webpage

- Voltage and current phasors and power factors of all phases
- Waveform of all voltages and currents

Flexible solutions for the energy industry
TECHNICAL DATA

INPUTS

NOMINAL CURRENT
1 … 5 A
Maximum 7,5 A

NOMINAL VOLTAGE
57,7 … 400 Vlij; 100 … 693 Vll
Maximum 480 Vlij; 832 Vll (sinusoidal)
Nominal frequency 42 … 50 … 58 Hz, 50,5 … 60 … 69,5 Hz
Sampling rate 18 kHz

POWER SUPPLY VARIANTS

Nominal voltage 100 … 230 V AC/DC (CU5000)
110 … 230 V AC, 130 … 200 V DC (CU3000)
24 … 48 V DC (CU3000/CU5000)

Consumption ≤ 20 VA

UNINTERRUPTIBLE POWER SUPPLY (UPS)
Type (3,7 V) VARTA Easy Pack EZPAckL, UL listed MH16707

TYPES OF CONNECTION
- Single phase or split phase (2-phase system)
- 3 or 4-wire balanced load
- 3-wire balanced load [2U, 1I]
- 3-wire unbalanced load, Aron connection
- 3 or 4-wire unbalanced load
- 4-wire unbalanced load, Open-Y

I/O-INTERFACE

ANALOG OUTPUTS (optional)
Range ±20 mA (24 mA max.), bipolar

RELAYS (optional)
Contacts Changeover contact
Load capacity 250 V AC, 2 A, 500 VA; 30 V DC, 2 A, 60 W

DIGITAL INPUTS PASSIVE
Nominal voltage 12/24 V DC (30 V max.)

DIGITAL INPUTS ACTIVE (optional)
Open circuit voltage ≤ 15 V

DIGITAL OUTPUTS
Nominal voltage 12/24 V DC (30 V max.)

BASIC UNCERTAINTY ACCORDING IEC/EN 60688
Voltage, current ±0,1 %
Power ±0,2 %
Power factor ±0,1°
Frequency ±0,01 Hz
Imbalance U, I ±0,5 %
Harmonic ±0,5 %
THD U, I ±0,5 %
Active energy Class 0,5S (EN 62 053-22)
Reactive energy Class 0,5S (EN 62 053-24)

INTERFACES

ETHERNET
RJ45 socket
Protocols Modbus/TCP, http, NTP (time synchronisation)
MODBUS/RTU
Standard (CU5000), optional (CU3000)
Baud rate 9,6 to 115,2 kBaud

TIME REFERENCE
Internal clock
Clock accuracy ± 2 minutes/month (15 to 30°C)
Synchronisation NTP server

ENVIRONMENTAL CONDITIONS, GENERAL INFORMATION
Operating temperature without UPS: –10 up to 15 up to 30 up to + 55 °C
with UPS: 0 up to 15 up to 30 up to + 35 °C

MECHANICAL PROPERTIES
Housing material Polycarbonate (Makrolon)
Weight 800 g (CU3000), 600 g (CU5000)

SAFETY
Current inputs are galvanically isolated from each other.
Protection class II (protective insulation, voltage inputs via protective impedance)
Measurement category CATIII

Further technical data is available in the operating instructions of the instrument.

DIMENSIONAL CU3000

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<table>
<thead>
<tr>
<th>ORDER CODE CU3000-</th>
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<tbody>
<tr>
<td><strong>1. BASIC DEVICE FOR INSTRUMENTATION PANEL-MOUNTING</strong></td>
<td><strong>1. BASIC DEVICE FOR TOP-HAT RAIL MOUNTING</strong></td>
</tr>
<tr>
<td>Without data logger 0</td>
<td>Without data logger 0</td>
</tr>
<tr>
<td>Periodic Data + events 1</td>
<td>Periodic Data + events 1</td>
</tr>
<tr>
<td>Disturbance recorder + events 2</td>
<td>Disturbance recorder + events 2</td>
</tr>
<tr>
<td>Periodic Data + events + disturbance recorder 3</td>
<td>Periodic Data + events + disturbance recorder 3</td>
</tr>
<tr>
<td><strong>2. PLC FUNCTIONALITY</strong></td>
<td><strong>2. ON-SITE SERVICE AND MONITORING</strong></td>
</tr>
<tr>
<td>Performance class BASIC 1</td>
<td>Without display 0</td>
</tr>
<tr>
<td>Performance class ADVANCED 2</td>
<td>With TFT display 1</td>
</tr>
<tr>
<td>Performance class PROFESSIONAL 3</td>
<td><strong>3. PLC FUNCTIONALITY</strong></td>
</tr>
<tr>
<td><strong>4. INPUT / FREQUENCY RANGE</strong></td>
<td>Performance class BASIC 1</td>
</tr>
<tr>
<td>Current transformer inputs, 42 … 50/60 … 69,5 Hz 1</td>
<td>Performance class ADVANCED 2</td>
</tr>
<tr>
<td><strong>5. POWER SUPPLY</strong></td>
<td>Performance class PROFESSIONAL 3</td>
</tr>
<tr>
<td>Nominal voltage 110 … 230 V AC, 130 … 230 V DC 1</td>
<td><strong>4. INPUT / FREQUENCY RANGE</strong></td>
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<tr>
<td>Nominal voltage 24 … 48 V DC 2</td>
<td>Current transformer inputs, 42 … 50/60 … 69,5 Hz 1</td>
</tr>
<tr>
<td>Nominal voltage 110 … 200 V AC, 110 … 200 V DC 3</td>
<td><strong>5. POWER SUPPLY</strong></td>
</tr>
<tr>
<td><strong>6. BUS CONNECTION</strong></td>
<td>Nominal voltage 100 … 230 V AC/DC 1</td>
</tr>
<tr>
<td>Ethernet (Modbus/TCP protocol + web server) 1</td>
<td>Nominal voltage 24 … 48 V DC 2</td>
</tr>
<tr>
<td>Ethernet (Modbus/TCP; web server) + RS485 (Modbus/RTU) 2</td>
<td><strong>6. BUS CONNECTION</strong></td>
</tr>
<tr>
<td><strong>7. EXTENSION 1</strong></td>
<td>Ethernet (Modbus/TCP+web server) + RS485 (Modbus/RTU) 1</td>
</tr>
<tr>
<td>Without 0</td>
<td><strong>7. UNINTERRUPTIBLE POWER SUPPLY</strong></td>
</tr>
<tr>
<td>2 relays 1</td>
<td>Without 0</td>
</tr>
<tr>
<td>2 analog outputs bipolar (± 20 mA) 2</td>
<td>With uninterruptible power supply 1</td>
</tr>
<tr>
<td>4 analog outputs bipolar (± 20 mA) 3</td>
<td><strong>8. EXTENSION 1</strong></td>
</tr>
<tr>
<td>4 digital inputs passive 4</td>
<td>Without 0</td>
</tr>
<tr>
<td>4 digital inputs active 5</td>
<td>2 relays 1</td>
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<tr>
<td><strong>7. EXTENSION 2</strong></td>
<td>2 analog outputs bipolar (± 20 mA) 2</td>
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<td>Without 0</td>
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<td><strong>8. EXTENSION 3</strong></td>
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<tr>
<td>4 analog outputs bipolar (± 20 mA) 3</td>
<td><strong>10. TEST CERTIFICATE</strong></td>
</tr>
<tr>
<td>4 digital inputs passive 4</td>
<td>Without 0</td>
</tr>
<tr>
<td>4 digital inputs active 5</td>
<td>Test certificate in German D</td>
</tr>
<tr>
<td><strong>9. EXTENSION 4</strong></td>
<td>Test certificate in English E</td>
</tr>
<tr>
<td>Without 0</td>
<td><strong>I/O-EXTENSIONS CU3000</strong></td>
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<td>2 relays 1</td>
<td>Maximum one I/O extension with analog outputs may be provided per device.</td>
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<td>I/O extension 4 only possible for a variant without data logger.</td>
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