SINEAX/EURAX U 700, Electrical Transducer for
arithmetical AC voltage difference

The electrical transducer SINEAX/EURAX U 700 measures the
difference between two AC voltages, i.e. their arithmetical means
(not the vectorial difference).

Available as output signal is a load-independent DC current or
voltage, varying in proportion to the AC voltage difference. This
output signal enables several receivers to be operated simulta-
neously – such as indicators, recorders, controllers etc. These may
be located both close to the measuring point (field installation) or
at a distance from it (control room).

The instrument is supplied in carrying rail housing SINEAX U 700
(Fig. 1) or as a plug-in module EURAX U 700 (Fig. 2).

Features / Benefits

● Measuring principle: Active rectifier
● Output signal: Load-independent DC current or impressed
  DC voltage

Mode of operation

The AC voltages U_G and U_S to be compared are isolated by in-
strument transformers, then actively rectified and smoothed. The
arithmetical difference (∆U = U_G – U_S) of the two DC voltages,
which is proportional to the measured values is passed through
an amplifier and appears as a load independent DC output current
or voltage.

Fig. 3. Block diagram: U_G = Generator voltage,
U_S = Bus voltage.

Technical Data

In carrying rail housing
SINEAX U 700 or as plug-in module
EURAX U 700

Input variables U_G and U_S

<table>
<thead>
<tr>
<th>Measuring range ∆U:</th>
<th>± 20% U_N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal input voltage U_N:</td>
<td></td>
</tr>
<tr>
<td>For both inputs a value between</td>
<td></td>
</tr>
<tr>
<td>10 V and 500 V</td>
<td></td>
</tr>
</tbody>
</table>

Camille Bauer
Data sheet 56/59-U700 Le – 10.07
SINEAX/EURAX U 700, Electrical Transducer for arithmetical AC voltage difference

Nominal frequency $f_N$: 50 or 60 Hz

Own consumption: Approx. $U_N \cdot 2 \text{ mA}$

Threshold: < 0.05%

Overload capacity (per input): $1.5 \times U_N \text{ continuous}
2 \times U_N \text{ during 10 s}
3 \times U_N \text{ during 2 s}$

Output signal $A$

Output variable $I_A$:
Load-independent DC current or voltage, proportional to $\Delta U$
$\Delta U = U_G - U_S$
$U_G = \text{generator voltage}$
$U_S = \text{bus voltage}$

Standard ranges of $I_A$:
$0 \ldots 1.00 \ldots 0 \ldots 20 \text{ mA}$
$1 \ldots 5 \ldots 4 \ldots 20 \text{ mA}$
$-1.00 \ldots 0 \ldots -1.00 \text{ to}$
$-20 \ldots 0 \ldots 20 \text{ mA}$

Burden voltage $\pm 15 \text{ V}$

External resistance
$R_{\text{ext max.}} \text{[k}\Omega\text{]} = \frac{15 \text{ V}}{I_{\text{AN}} \text{[mA]}}$

$I_{\text{AN}} = \text{full scale output}$

Standard ranges of $U_A$:
$0 \ldots 1.00 \ldots 0 \ldots 15 \text{ V}$
$1 \ldots 5 \ldots 4 \ldots 15 \text{ V}$
$-1.00 \ldots 0 \ldots -15 \text{ V}$
$-15 \ldots 0 \ldots 15 \text{ V}$

Load capacity max. 10 mA

External resistance
$R_{\text{ext}} \text{[k}\Omega\text{]} > \frac{U_A \text{[V]}}{10 \text{[mA]}}$

FSO variation: Approx. $\pm 2\%$

Current limitation: $I_A \text{ max. approx. } 30 \text{ mA}$


Response time: $\leq 500 \text{ ms}$

Behaviour of output current in different operating states:

<table>
<thead>
<tr>
<th>Generator voltage</th>
<th>Bus voltage</th>
<th>Output</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>$U_G &gt; U_S$</td>
<td></td>
<td>unipolar</td>
<td>&gt; $I_{\text{AN}} / 2$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bipolar</td>
<td>positive</td>
</tr>
<tr>
<td>missing$^2$</td>
<td>nominal value</td>
<td>unipolar</td>
<td>approx. $- 2 \text{ mA}$</td>
</tr>
<tr>
<td>nominal value</td>
<td>missing$^3$</td>
<td>bipolar</td>
<td>approx. $- 1.5 \text{ I}_{\text{AN}}$</td>
</tr>
<tr>
<td>missing$^2$</td>
<td>missing$^3$</td>
<td>unipolar</td>
<td>approx. $I_{\text{AN}} / 2$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bipolar</td>
<td>approx. 0</td>
</tr>
</tbody>
</table>

Accuracy (acc. to DIN/IEC 688-1)

Reference value: Output span

Basic accuracy: Class 0.5

1) With power supply switched on
2) e.g. switched off or fault condition

Behaviour of output current when generator measuring range is exceeded

(Bus voltage = nominal value)

Unipolar output:
Any value between 0...1 and 0...20 mA

(Burden voltage $\leq 15 \text{ V}$)
$U_B = I_{\text{max.}} \cdot R_{\text{ext}}$

Symmetrical bipolar output:

Any value between $\pm 1$ and $\pm 20 \text{ mA}$

(Burden voltage $\leq \pm 15 \text{ V}$)
$U_B = I_{\text{max.}} \cdot R_{\text{ext}}$

Live zero signal output:
4...20 mA

(Burden voltage $\leq \pm 15 \text{ V}$)
$U_B = I_{\text{max.}} \cdot R_{\text{ext}}$
### SINEAX/EURAX U 700, Electrical Transducer for arithmetical AC voltage difference

**Reference conditions:**
- Ambient temperature: 23 °C ± 5 °C
- Input voltage: Within measuring range
- Frequency \( f_n \): ± 10%
- Waveform: sine-wave
- Distortion factor: < 0.5%
- Power supply \( U_{Hn} \): ± 20% with AC, 20 to 135 V with DC
- Output burden: 0...\( R_{\text{ext}} \) max. at \( I_A \)
- \( R_{\text{ext}} \) min. ...<\( \infty \) at \( U_A \)

**Influence effects (maximum values) (included in basic error):**
- Linearity error: ± 0.1%
- Frequency influence \( f_n \): ± 10% ± 0.05%
- Dependence on external resistance \( \Delta R_{\text{ext}} \) max.: ± 0.05%
- Distortion factor (K < 0.5%): ± 0.2%
- Power supply influence \( \Delta U_{Hn} \) max.: ± 0.05%

**Additional errors (maximum values):**
- Temperature influence (–25...+ 55 °C): ± 0.1% / 10 K
- External field influence 0.5 mT: ± 0.1%
- Distortion factor influence (K < 10%): ± 0.4 · K (%)

**Electromagnetic compatibility:**
- Influence: < 2%
- IEC 801-2: Electrostatic discharge (ESD)
  - Housing: ± 6 kV contact ± 6 kV air
- IEC 801-3: Electromagnetic fields
  - 20 – 500 MHz, 10 V/m CW
  - ITU frequencies 10 V/m influence < 2%
- IEC 801-4: Electrical fast transient / Burst influence, input and output lines
  - Burst: ± 1 kV, 5/50 μs, 5 kHz, 2 min.
  - Asymmetrical
  - Burst: ± 2 kV, 5/50 μs, 5 kHz
- IEC 801-5: Interference test
  - Surge ± 1 kV AC, ± 0.5 kV = symmetrical
  - Surge ± 2 kV AC, ± 1.0 kV = asymmetrical

**Power supply \( U_{Hn} \):**
- AC voltage: 230, 115 V~, ± 20%, 42 to 70 Hz
- Power input ≤ 4.5 VA

**DC voltage:** 24 to 110 V~, –15 ... + 33%
- Power input ≤ 4 W

**Regulations:**
- Impulse voltage protection: 5 kV, 1.2/50 μs, 0.5Ws acc. to IEC 255 – 4 Cl. III
- HF-surge compatibility: 2.5/1 kV, 1 MHz, 400 surges/s acc. to IEC 255 – 4 Cl. III
- Electrical standards: Acc. to DIN 57 410 and 57 411
- Housing protection: SINEAX U700 (carrying rail housing E16), IP 40
  - Terminals IP 20
- EURAX U700 (plug-in module)
  - IP 00 acc. to EN 60 529
- Test voltage: 4 kV / 50 Hz / 1 min.
- Between isolated circuits and versus housing (SINEAX U700)

**Environmental conditions:**
- Climatic rating: Operating temperature –10... + 55 °C
- Storage temperature – 40... + 70 °C
- Relative humidity ≤ 75% annual mean
- Altitude: 2000 m max.
- Indoor use statement!

**Installation data for SINEAX U700:**
- Dimensions: Carrying rail housing E16 (see section «Dimensional drawings»)
- Housing protection: IP 40 acc. to IEC 529
- Mounting position: Any
- Electrical connections: Screw-type terminals with indirect wire pressure, for max. 2 × 2,5 mm² or 1 × 6 mm².
- Protection IP 20 acc. EN 60529
- Weight: Approx. 1.0 kg

**Installation data for EURAX U700:**
- Dimensions: Plug-in module in Euro format, 100 × 160 mm, 7 E (E = 5.08 mm)
  - (see Section «Dimensional drawings»)
- Housing protection: IP 00 acc. to DIN 40 050
- Front plate colour: Grey RAL 7032
- Mounting position: Any
- Electrical connections: 32-pole plug acc. to DIN 41 612, pattern F (contact fitting see Section «Electrical connections»)
- Protection IP 00 acc. to EN 60529
- Weight: Approx. 0.6 kg
**SINEAX/EURAX U 700, Electrical Transducer for arithmetical AC voltage difference**

### Specification and ordering information

<table>
<thead>
<tr>
<th>Description</th>
<th>*Blocking code</th>
<th>No-go with blocking code</th>
<th>Article No./ Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>SINEAX/EURAX U 700</td>
<td>Order Code U700 - xxxx xxxx</td>
<td></td>
<td>U700 –</td>
</tr>
</tbody>
</table>

#### Features, Selection

1. **Mechanical design**
   - Plug-in module for 19" rack-mounted case (EURAX) 2
   - Carrying rail housing type E16 (SINEAX) 3

2. **Measuring range**
   - Measuring range ± 20% 1
   - Non-standard ≥ ± 15% to ≤ ± 25% [%] 9

3. **Nominal frequency**
   - Nominal frequency 50 Hz 1
   - Nominal frequency 60 Hz 2
   - Non-standard from 16.67 to 500 Hz [Hz] 9

4. **Nominal input voltage** (generator and bus)
   - 100/√3 V; A
   - 110/√3 V; B
   - 100 V; C
   - 110 V; D
   - 200 V; E
   - 230 V; F
   - 400 V; G
   - 500 V; H
   - Non-standard ≥ 10.00; to < 500; [V;V] Z

With a 3-phase system the nominal input voltage to be shown as phase to phase voltage.

For transformer connection add semicolon with primary/secondary voltage in V,

  e.g. 6800/110 (in line D) or 120;144000/120 (in line Z, non-standard).

For uneleven values show 2 positions after the comma.

5. **Output signal**
   - Non-standard [mA] 9
   - Non-standard [V] Z

   Line 9:  0 … > 1.00 to 0 … < 20
       1 … 5 to < (4 … 20)
       ≥ (– 1.00 … 0 … 1.00) to < (– 20 … 0 … 20)

   Line Z:  0 … 1.00 to 0 … 15
       0.2 … 1 to 3 … 15
       – 1.00 … 0 … 1.00 to – 15 … 0 … 15

6. **Power supply**
   - 115 V, 50/60 Hz 2
   - 230 V, 50/60 Hz 3
   - Non-standard 50/60 Hz (> 24 to 400) [V] 9
   - Un 24 … 110 V DC A
SINEAX/EURAX U 700, Electrical Transducer for arithmetical AC voltage difference

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<td>U700 –</td>
</tr>
<tr>
<td><strong>Features, Selection</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Test certificate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without test certificate</td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Test certificate in German</td>
<td></td>
<td></td>
<td>D</td>
</tr>
<tr>
<td>Test certificate in English</td>
<td></td>
<td></td>
<td>E</td>
</tr>
<tr>
<td>8. Special features</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without special features (Order Code complete)</td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>With special features (line 1), specify full text, availability on inquiry:</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>– Test sockets on front plate at EURAX version</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Output residual ripple ≤ 0.5% p.p. (instead of 2% p.p.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Extended time constant, up to max. 500 ms (higher residual ripple)</td>
<td></td>
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</tr>
</tbody>
</table>

* Lines with letter(s) under “no-go” cannot be combined with preceding lines having the same letter under “Blocking code”.

**Electrical connections**

![Fig. 4. SINEAX U700.](image1)

![Fig. 5. EURAX U700.](image2)

- **Input**
- **Output**
- **Power supply**
- **Uₐ** Measuring input generator voltage
- **Uₛ** Measuring input bus voltage

- Coding pin
- Coding pin broken out
- Contact fitted
- No contact
SINEAX/EURAX U 700, Electrical Transducer for arithmetical AC voltage difference

Dimensional drawings

Fig. 6. Housing type E16 clipped onto a top-hat rail EN 50 022, 35 × 15 mm or 35 × 7.5 mm.

Releasing the transducer

Fig. 7. EURAX plug-in module, front plate width 7 TE.