

# SINEAX U 554

## Transducer for AC Voltage with Different Characteristics

With power supply  
RMS value measurement  
Carrying rail housing P13/70



### Application

The transducer **SINEAX U 554** (Fig. 1) converts a sinusoidal or a distorted AC voltage into a **load independent** DC current or a **load independent** DC voltage proportional to the measured value.

Depending on the version, part of the measuring range of interest may be amplified at the beginning or end. The section of no or minor interest is suppressed. A live zero output signal is possible with all versions (see Fig. 3 and 4).

The transducer fulfils all the important requirements and regulations concerning electromagnetic compatibility **EMC** and **Safety** (IEC 1010 resp. EN 61 010). It was developed and is manufactured and tested in strict accordance with the **quality assurance standard** ISO 9001.



Fig. 1. Transducer SINEAX U 554 in housing **P13/70** clipped onto a top-hat rail.

### Features / Benefits

- Measuring input: AC voltage, sine or distorted wave forms, RMS value measurement

| Measured variable | Measuring range limits |
|-------------------|------------------------|
| AC voltage        | 0 ... 20 à 0 ... 690 V |

- Measuring output: Unipolar and live-zero output variables
- Measuring principle: Logarithmic method
- DC, AC-power pack with wide power supply tolerance

### Mode of operation

Input signal  $U_{\sim}$  is galvanically separated from the mains network using a transformer.

The following mathematical expression is then formed using a root-mean-square value computer

$$U_{\text{eff}} = \sqrt{\frac{1}{T} \int_0^T u^2 dt}$$

Following filtration by means of an active filter, the transformation properties of the measuring transducer are determined in the succeeding characteristics circuit.

The output amplifier transforms the measuring signal into an impressed output signal  $A$ .

The electronic components are supplied with voltage  $H$  from the mains supply unit  $H$ .

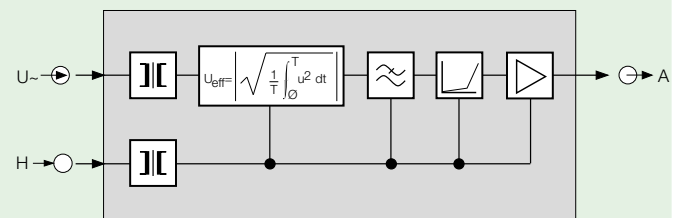


Fig. 2. Block diagram.

### Technical data

#### General

|                      |  |
|----------------------|--|
| Measured quantity:   | AC voltage<br>Sine or distorted wave form<br>RMS value measurement |
| Measuring principle: | Logarithmic method   |

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### Measuring input E $\rightarrow$

Nominal frequency  $f_N$ : 50/60 or 400 Hz

Nominal input voltage  $U_N$   
(measuring range end value): 0 ... 20 to 0 ... 690 V

Own consumption:  $\leq 1$  VA with input end value

Overload capacity:

| Measured quantity $U_N$ | Number of applications | Duration of one application | Interval between two successive applications |
|-------------------------|------------------------|-----------------------------|--|
| $1.2 \cdot U_N^1$       | —                      | continuously                | —  |
| $2 \cdot U_N^1$         | 10                     | 1 s                         | 10 s   |

### Measuring output A $\rightarrow$

Load-independent DC current: 0 ... 1 to 0 ... 20 mA  
resp. live-zero  
0.2 ... 1 to 4 ... 20 mA

Burden voltage: 15 V

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

Load-independent DC voltage: 0 ... 1 to 0 ... 10 V  
resp. live-zero  
0.2 ... 1 to 2 ... 10 V

External resistance:  $R_{\text{ext min.}} [\text{k}\Omega] \geq \frac{U_A [\text{V}]}{4 \text{ mA}}$

Current limit under overload:  $\leq 1.5 \cdot I_{\text{AN}}$  at current output  
Approx. 10 mA at voltage output

Voltage limit under  $R_{\text{ext}} = \infty$ :  $\leq 25$  V

Residual ripple in output current:  $\leq 1\%$  p.p. at setting time 300 ms  
 $\leq 5\%$  p.p. at setting time 50 ms and  $c \leq 2.5$   
 $\leq 5\%$  p.p. +  $c \times 0.5\%$  at setting time 50 ms and  $c > 2.5$

Setting time: 50 ms or 300 ms

### Output characteristics

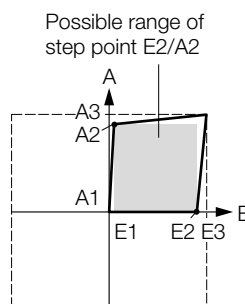


Fig. 3. Characteristic A:

$E1 = 0$   
 $0.1 \times E3 \leq E2 \leq 0.9 \times E3$   
 $A1 = 0$   
 $A1 \leq A2 \leq 0.9 \times A3$

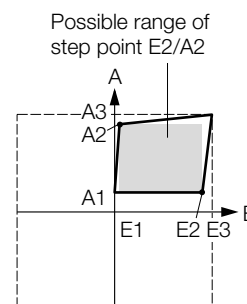


Fig. 4. Characteristic B:

$E1 = 0$   
 $0.1 \times E3 \leq E2 \leq 0.9 \times E3$   
 $A1 = 0.2 \times A3$   
 $A1 \leq A2 \leq 0.9 \times A3$

### Power supply H $\rightarrow$

| Nominal voltage $U_N$ | Rated operating range |
|-----------------------|-----------------------|
| AC 230 V              | 207 ... 253 V         |

Rated operating range of frequency: 45 ... **50 to 60** ... 65 Hz

Power consumption:  $\leq 3$  VA at  $H = U_N$

DC, AC-power pack (DC or 40 to 400 Hz)

Table 1: Rated voltages and permissible variations

| Nominal voltage $U_N$ | Permissible variation |
|-----------------------|-----------------------|
| 85 to 230 V DC, AC    | DC – 15 to + 33%      |
| 24 to 60 V DC, AC     | AC $\pm 15\%$         |

Option: Connected to the low tension terminal side 12 and 13  
24 V AC or 24 ... 60 V DC

Power consumption:  $\leq 2$  W resp.  $\leq 4$  VA

### Accuracy (acc. to EN 60 688)

Reference value: Output end value

Basic accuracy: Class 0.5 with setting time 300 ms  
Class 0.5 x c with setting time 50 ms

Factor c:  $c = \frac{E3}{E2}$

with main value magnification in initial range

$c = \frac{1}{1 - E2/E3}$

with main value magnification in end range

<sup>1</sup>But max. 264 V with power supply from measuring input

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## Transducer for AC Voltage with Different Characteristics

### Reference conditions:

|                     |  |
|---------------------|--|
| Ambient temperature | 15 ... 30 °C   |
| Input variable      | Rated operating range  |
| Frequency           | $f_N \pm 2$ Hz   |
| Curve shape         | Sine-wave  |
| Crest factor        | $\sqrt{2}$   |
| Power supply        | In rated range   |
| Output burden       | Current: $0.5 \cdot R_{ext}$ max.<br>Voltage: $2 \cdot R_{ext}$ min. |
| Warm-up time        | $\leq 5$ min.  |

### Influence effects (maxima):

|                     |   |
|---------------------|---|
| Setting time 300 ms | $c = 1$   |
| Setting time 50 ms  | $c$ acc. to calculation   |
| Frequency influence | 40 ... 400 Hz, $\pm 0.3\% \times c$<br>30 ... 1000 Hz, $\pm 0.5\% \times c$ |
| Crest factor        | 1 ... 2.5 $\pm 0.2\% \times c$<br>> 2.5 ... 6 $\pm 0.5\% \times c$          |

| Influence quantity  | Rated operating range              | Permitted effect as factor of precision class |
|---------------------|------------------------------------|---|
| Ambient temperature | - 10 ... <b>15 to 30</b> ... 40 °C | 1   |
|                     | 10 ... <b>15 to 30</b> ... 55 °C   | 3   |

### Safety

|  |   |
|--|---|
| Protection class:                        | II (protection isolated, EN 61 010)   |
| Housing protection:                      | IP 40, housing (test wire, EN 60 529)<br>IP 20, terminals (test finger, EN 60 529)  |
| Contamination level:                     | 2   |
| Overvoltage category:                    | III   |
| Rated insulation voltage (versus earth): | 400 V, input<br>230 V, power supply<br>40 V, output   |
| Test voltage:                            | 50 Hz, 1 min. acc. to EN 61 010-1<br>3700 resp. 5550 V, input versus all other circuits as well as outer surface<br>3700 V, power supply versus output as well as outer surface<br>490 V, output versus outer surface |

### Installation data

|                      |  |
|----------------------|--|
| Mechanical design:   | Housing <b>P13/70</b>  |
| Material of housing: | Lexan 940 (polycarbonate), flammability Class V-0 acc. to UL 94, self-extinguishing, non-dripping, free of halogen |

|                    |                   |
|--------------------|-------------------|
| Mounting:          | For rail mounting |
| Mounting position: | Any               |
| Weight:            | Approx. 0.3 kg    |

### Connecting terminals

|                      |  |
|----------------------|--|
| Connection element : | Screw-type terminals with indirect wire pressure |
|----------------------|--|

|  |   |
|--|---|
| Permissible cross section of the connection leads: | $\leq 4.0$ mm <sup>2</sup> single wire or<br>$2 \times 2.5$ mm <sup>2</sup> fine wire |
|--|---|

### Environmental conditions

|                                   |                 |
|-----------------------------------|-----------------|
| Operating temperature:            | - 10 to + 55 °C |
| Storage temperature:              | - 40 to + 70 °C |
| Relative humidity of annual mean: | $\leq 75\%$     |
| Altitude:                         | 2000 m max.     |
| Indoor use statement!             |                 |

### Ambient tests

|  |   |
|--|---|
| EN 60 068-2-6:                         | Vibration   |
| Acceleration:                          | $\pm 2$ g   |
| Frequency range:                       | 10 ... 150 ... 10 Hz, rate of frequency sweep:<br>1 octave/minute |
| Number of cycles:                      | 10, in each of the three axes                                     |
| EN 60 068-2-27:                        | Shock   |
| Acceleration:                          | $3 \times 50$ g<br>3 shocks each in 6 directions                  |
| EN 60 068-2-1/-2/-3:                   | Cold, dry heat, damp heat,  |
| IEC 1000-4-2/-3/-4/-5/-6<br>EN 55 011: | Electromagnetic compatibility                                     |

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## Transducer for AC Voltage with Different Characteristics

**Table 2: Specification and ordering informations**

| Designation   | *Blocking code                       | No-go with blocking code | Article No./ Feature |
|---|--------------------------------------|--------------------------|----------------------|
| <b>SINEAX U 554</b>   | <b>Order Code 554 - xxxx xxxx xx</b> |                          | 554 -                |
| <b>Features, Selection</b>  |                                      |                          |                      |
| <b>1. Mechanical design</b>   |                                      |                          |                      |
| Housing P13/70 for rail mounting  |                                      |                          | 4                    |
| <b>2. Nominal input frequency</b>   |                                      |                          |                      |
| Nominal frequency 50/60 Hz  |                                      |                          | 1                    |
| Nominal frequency 400 Hz  |                                      |                          | 3                    |
| <b>3. Input voltage, final value</b>  |                                      |                          |                      |
| Final value E3 ( $\geq 20$ V to $\leq 690$ V*) [V] <input type="text"/>   |                                      |                          | Z                    |
| With power supply from measuring input min. 24 V / max. 230 V, see feature 8.                                     |                                      |                          |                      |
| * > 400 V for connection between 2 phases in 3-phase system only  |                                      |                          |                      |
| <b>4. Input voltage, step point</b>   |                                      |                          |                      |
| Step point E2 (permissible values: $0.1 \cdot E3$ to $0.9 \cdot E3$ ) [V] <input type="text"/>                    |                                      |                          | Z                    |
| <b>5. Output signal, initial value</b>  |                                      |                          |                      |
| Initial value A1: 0 (standard)  | A                                    |                          | 1                    |
| Initial value A1: 20% of final value A3 (live zero)   | B                                    |                          | 2                    |
| <b>6. Output signal, final value</b>  |                                      |                          |                      |
| Final value A3: 1 mA  |                                      |                          | 1                    |
| Final value A3: 5 mA  |                                      |                          | 2                    |
| Final value A3: 10 mA   |                                      |                          | 3                    |
| Final value A3: 20 mA   |                                      |                          | 4                    |
| Non-standard ( $> 1$ to $< 20$ mA) [mA] <input type="text"/>  |                                      |                          | 9                    |
| Final value A3: 10 V  |                                      |                          | A                    |
| Non-standard ( $\geq 1$ to $< 10$ V) [V] <input type="text"/>   |                                      |                          | Z                    |
| <b>7. Output signal, step point</b>   |                                      |                          |                      |
| Without step point ( $A2 = A1$ )  |                                      |                          | 0                    |
| Standard step point A2 [mA, V] <input type="text"/><br>(permissible values: $> 0$ to $0.9 \cdot A3$ )             |                                      | B                        | A                    |
| Live zero step point A2 [mA, V] <input type="text"/><br>(permissible values: $> 0.2 \cdot A3$ to $0.9 \cdot A3$ ) |                                      | A                        | B                    |
| Specify step point A2 in mA or V, acc. to selection of A3 in feature 6.   |                                      |                          |                      |
| <b>8. Power supply</b>  |                                      |                          |                      |
| AC 230 V (207 ... 253 V)  |                                      |                          | 5                    |
| 24 ... 60 V DC, AC  |                                      |                          | A                    |
| 85 ... 230 V DC, AC   |                                      |                          | B                    |
| Power supply from measuring input ( $\geq 24$ to 60 V AC)   |                                      |                          | C                    |
| Power supply from measuring input ( $\geq 85$ to 230 V AC)  |                                      |                          | D                    |
| Uh: 24 V AC / 24 ... 60 V DC, low terminal side   |                                      |                          | E                    |
| <b>9. Setting time</b>  |                                      |                          |                      |
| Setting time 0.3 s  |                                      |                          | 1                    |
| Setting time 50 ms  |                                      |                          | 2                    |

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| Designation                 | *Blocking code                       | No-go with blocking code | Article No./ Feature |
|-----------------------------|--------------------------------------|--------------------------|----------------------|
| <b>SINEAX U 554</b>         | <b>Order Code 554 - xxxx xxxx xx</b> |                          | 554 -                |
| <b>Features, Selection</b>  |                                      |                          |                      |
| <b>10. Test certificate</b> |                                      |                          |                      |
| Without test certificate    |                                      |                          | 0                    |
| Test certificate in German  |                                      |                          | D                    |
| Test certificate in English |                                      |                          | E                    |

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

### Electrical connections

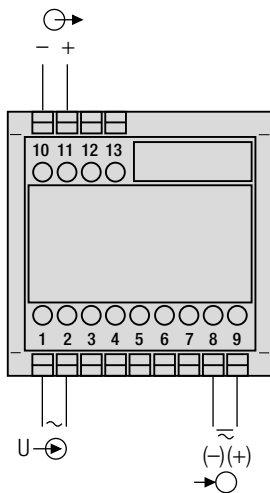


Fig. 5. Power supply connected to terminals 8 and 9.

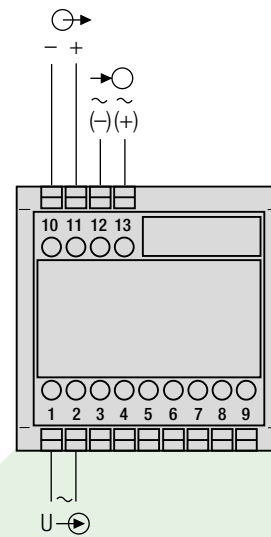


Fig. 7. Power supply connected to the low tension terminal side 12 and 13.

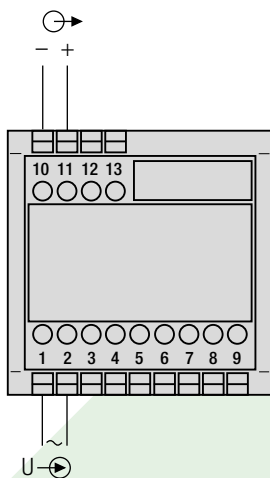





Fig. 6. Power supply internal from voltage measuring input, no power supply connection needed.

-  = Measuring input
-  = Measuring output
-  = Power supply

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## Transducer for AC Voltage with Different Characteristics

### Dimensional drawing

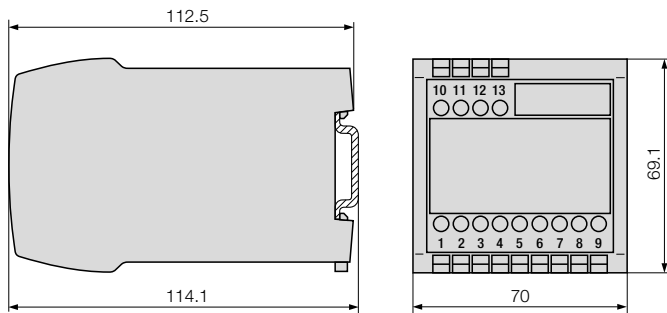


Fig. 8. SINEAX U 554 in housing **P13/70** clipped onto a top-hat rail (35 × 15 mm or 35 × 7.5 mm, acc. to EN 50 022).

### Standard accessories

1 Operating Instructions in three languages: German, French, English

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