

RISH Ducer E15 TRANSDUCER FOR AC CURRENT OR AC VOLTAGE WITH DIFFERENT CHARACTERISTICS

The RISH Ducer E15 transducer (Fig. 1 and 2) is used where a sine-wave AC current or voltage is to be converted into a DC signal proportional to the measured value (load-independent current or voltage). Depending on the version, part of the measuring range of interest may be amplified at the beginning or end (voltage magnifier). The section of no or minor interest is suppressed. A live zero output signal is possible with all versions.

Features / Benefits

- Different characteristics / Choice of the most suitable version according to application
- Narrow housing, 35 mm / Saves space and therefore costs
- Provision for either snapping the transducer onto top-hat rails or securing it with screws to a wall or panel
- Manufactured in SMD technology / Compact and reliable
- The device fulfils the protection requirements of the EMC guidelines (89/336/EWG). The device bears the CE symbol for EMC
- Screw terminals suitable for multistoried or thick solid wires
- Electric isolation between input/output and power supply (4kV) / Personnel protection assured

Technical data

General

Measured quantity: AC current or AC voltage sinusoidal Arithmetical mean measured, calibration to rams with sine wave form

Measuring principle: Active rectifier

Measuring input E

Nominal frequency f_N ① : 50 or 60 Hz
 Nominal input current I_N (measuring range end value) ② ④ ⑤ : 1 / 1.2 / 5 or 6 A
 Nominal input voltage U_N (measuring range end value) ③ ④ ⑤ : 100/ $\sqrt{3}$ / 110/ $\sqrt{3}$ / 120/ $\sqrt{3}$ / 100 / 110 / 116.66 / 120/125 / 133.33 / 150 / 250 / 400 or 500 V

Own consumption: <0.2 VA at current transducer
 see section "Special features" <1 mA at voltage transducer

① to ⑤ see section "Special features"

Response sensitivity: <0.05% of full range value Overload capacity:

| Measured quantity I_N, U_N | Number of applications | Duration of one application | Interval between two successive applications |
|------------------------------|------------------------|-----------------------------|--|
| $2xI_N$ | contin. | — | — |
| $10xI_N$ | 5 | 15s | 5min |
| $40xI_N$ | 1 | 1s | — |
| $1.5xU_N$ | contin. | — | — |
| $2xU_N$ | 10 | 10s | 10s |
| $4xU_N$ | 1 | 2s | — |

Measuring output A

Output variable: Load-independent DC voltage U_A or load-independent DC current I_A

Standard ranges of U_A : ⑥ ⑦
 0...10 / 1...5 V
 Load capacity 20 mA External resistance $R_{ext} [k\Omega] > \frac{U_A [V]}{20 \text{ mA}}$

Standard ranges of I_A : ⑧ ⑨
 0...1/0...5/0...10/0...20/4...20 mA
 Burden voltage 15 V External resistance $R_{ext} \text{ max. } [k\Omega] = \frac{15 \text{ V}}{I_{AN} [mA]}$

I_{AN} = Full output value

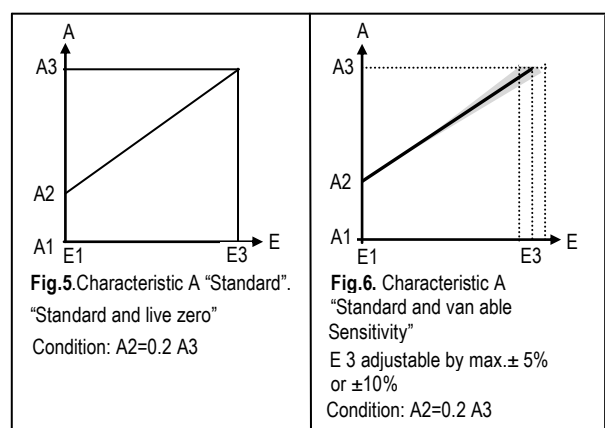
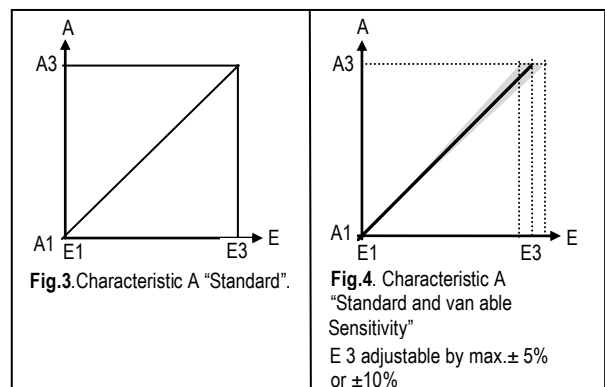
Voltage limit under $R_{ext} = \infty$: Approx. 40 V
 Current limit under overload: Approx. $1.3 \times I_{AN}$ at current output
 Approx. 30 mA at voltage output
 Span adjustment: Approx. $\pm 2\%$

Output current ripple ⑩ : $\leq 1\%$ p.p.
 Response time: <300 ms

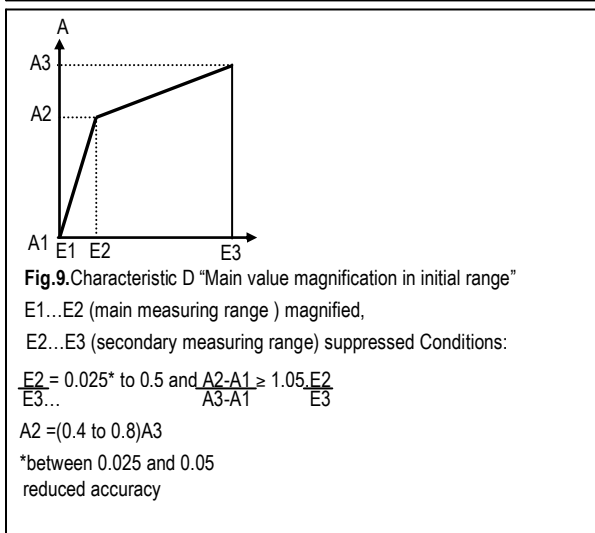
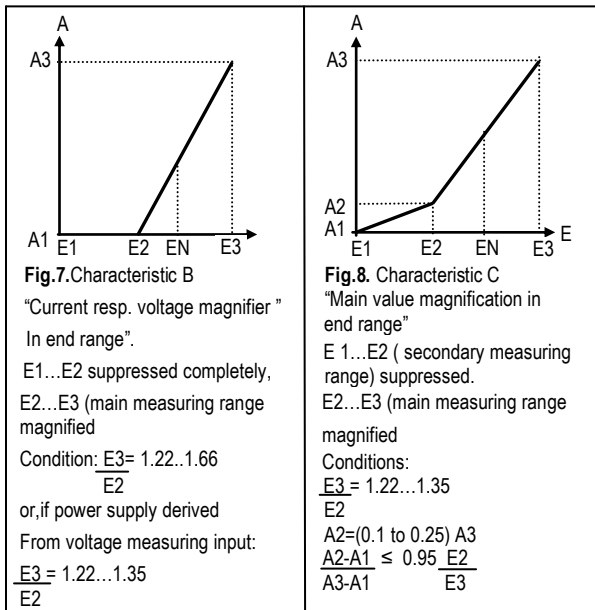


Fig. 1. RISH Ducer E15 clipped onto a top-hat rail.

Output characteristic



RISH *Ducer* E15 TRANSDUCER FOR AC CURRENT OR AC VOLTAGE WITH DIFFERENT CHARACTERISTICS



⑥ to ⑩ see section "Special features"

Accuracy (acc. to DIN/IEC 688—1)

Reference value:

Output span
 Exceptions:
 Characteristics B and C,
 Input end value
 Class 0.5

Basic accuracy:

Reference conditions

Ambient temperature:

23 °C, ± 5 K

Frequency:

$f_N \pm 2\%$

Distortion factor

<0.2%

Power supply:

$U_{HN} \pm 15\%$ (AC),
 $U_{HN} 15 / +33\%$ (DC)

Output burden

0... $R_{ext \text{ max.}}$ at current output
 $R_{ext \text{ min.}}$... ∞ at voltage output

Output voltage:

0...15 V

Output current:

0...20 mA

Influence effects (maxima)

Included in basic error

Linearity error

± 0.2%

Frequency influence

± 0.05%

$f_N \pm 5\%$

| | |
|---|--------------|
| Dependence on external resistance ($\Delta R_{ext \text{ max.}}$) | ± 0.05% |
| Power supply influence $U_{HN} \pm 15\%$ | ± 0.05% |
| <i>Additional errors</i> | |
| Temperature influence (—25...+55 °C) | ± 0.5% / 10K |
| Frequency influence 45 — 65 Hz | ± 0.5% |
| Stray field influence 0.5 mT | ± 0.5% |
| Power supply influence $U_{HN} 20\%$ | ± 0.2% |
| Influence of common mode voltage 220 V, 50 Hz or 10 V, 1 MHz | ± 0.5% |

Power supply

| | |
|------------------------------|---|
| AC voltage: | 24, 115, 120, 127, 230 or 240 V, ± 15%, 50 / 60 Hz |
| ⑪ ⑫ Power input approx. 5 VA | |
| DC voltage: | 24, 48, 60 or 110 V -15 / +33%, Power input approx. 5 W |

⑪ to ⑬ see section "Special features"

Installation data

| | |
|-------------------------|--|
| Mechanical design: | Carrying rail housing type E8 Dimensions see section "Dimensional drawing" |
| Material of housing: | Lean 940 (polycarbonate), Flammability Class V-0 according to UL 94, self-extinguishing, no dripping, free of halogen |
| Mounting: | For snapping onto top-hat rail (35 x 15 mm or 35 x 7.5 mm) acc. to EN 50 022 or directly onto a wall or panel using the pull-out screw hole brackets |
| Mounting position: | Any |
| Electrical connections: | Screw-type terminals with indirect wire pressure, for max. 2 x 2.5 mm 2or 1 x 6 mm |
| Weight: | Approx. 0.45 kg |

Regulations

| | |
|---|---|
| Impulse withstand voltage acc. to IEC 255-4, Cl. III: | 5 kV, 1.2 / 50 μ s, 0.5 Ws Common-mode and differential mode between any terminals |
| Electrical standards: | Acc. to DIN 57410 |
| Housing protection: | IP 40 acc. to IEC 529 |
| Insulation group acc. to DIN 57110 b: | A (instrument) C (terminals) |
| Test voltage: | |
| Test voltage: | 4 kV / 50 Hz / 1 min. between electrically isolated circuits and versus housing |

Environmental conditions

| | |
|----------------------|---|
| Climatic rating ⑬ : | Climate class 3Z acc. to VDI/VDE 3540, but temperature continuously —25 to +55 °C. Relative humidity ≤75% annual mean (application class HVE acc. to DIN 40 040) |
| Storage temperature: | —40 to +70 °C |

RISH *Ducer* E15 TRANSDUCER FOR AC CURRENT OR AC VOLTAGE WITH DIFFERENT CHARACTERISTICS

Table 1: Electromagnetic compatibility

The basic standards EN 50 081-2 and EN 50 082-2 were taken in account.

| | | | |
|---|-----------|--|-------------------|
| Conducted interference from the instrument | EN 55 011 | Group 1, Class A | complies |
| HF radiation from complete instrument | EN 55 011 | Group 1, Class A | complies |
| Electrostatic discharge on instrument | IEC 801-2 | ± 4 kV contact ± 8 kV air | without influence |
| HF field influence on instrument | IEC 801-3 | 27...500 MHz: 3 V/m, not modulated (ITU frequencies: 10 V/m) | influence < 2% |
| Electrical fast transient/Burst influence power, supply lines | IEC 801-4 | ± 2 kV, 5/50 ns, 5 kHz, asymmetrical, 2 min. | influence < 2% |
| Electrical fast transient/Burst influence, input and output lines | IEC 801-4 | ± 1 kV, 5/50 ns, 5 kHz, 2 min. capacitive coupled | without influence |
| Surge Immunity Requirements coupled on the power supply lines | IEC 801-5 | symmetrical ±1 kV asymmetrical ± 2 kV | without influence |

The device fulfils the protection requirements of the EMC guidelines (89/336/EWG). **The device bears the CE symbol for EMC.**

Table 2: Specification and ordering information (see also Table 3: "Stock versions")

| Order Code E-15 — | | | | | | | | | |
|--|--|---------------|--------------|---|---|---|---|---|---|
| Features, Selection | | *SCODE | no-go | ↑ | ↑ | ↑ | | | |
| 1. Mechanical design 3) Carrying rail housing E8 | | | | 3 | . | . | . | . | . |
| 2. Output characteristic A) Characteristic A "Standard" see Fig. 3 "Standard and variable sensitivity", see Fig. 4 Note feature 9 "Measuring range adjustable" line A or B "Standard and live-zero", see Fig. 5 Note feature 5 "Output signal" line 2, 9, E or Z "Standard, variable sensitivity and live-zero", see Fig. 6 Note feature 9 "Measuring range adjustable" line A or B and 5 "Output signal" line 2, 9, E or Z | | G | | . | A | . | . | . | . |
| B) Characteristic B "Current resp. voltage magnifier in end range", see Fig. 7 | | A | | . | B | . | . | . | . |
| C) Characteristic C "Main value magnification in end range", see Fig. 8 | | AB | | . | C | . | . | . | . |
| D) Characteristic D "Main value magnification in initial range", see Fig. 9 The selection feature 2 "Output characteristic" and feature 4 "Measuring range" as well as feature 5 "Output signal" to be determined together. In the section "Output characteristic" conditions laid down in Figs. 3 to 9 should be noted | | AB | | | | | | | |
| 3. Nominal frequency 1) 50 / 60 Hz 9) Non-standard [Hz] ≥ 16 to 400 ① | | | | . | . | 1 | . | . | . |
| | | | | . | . | 9 | . | . | . |

① See section "Special features"

RISH *Ducer* E15 TRANSDUCER FOR AC CURRENT OR AC VOLTAGE WITH DIFFERENT CHARACTERISTICS

| Order Code E-15 — | | | | | | | | | | |
|--|--|--|--------|-------|--|---|---|---|---|---|
| Features, Selection | | | *SCODE | no-go | | | | | | |
| 4. Measuring range(measuring input E) | | | | | | | | | | |
| 1) 0...1 A | | | C | A | | 1 | . | . | . | . |
| 2) 0...1.2 A | | | C | A | | 2 | . | . | . | . |
| 3) 0...5 A | | | C | A | | 3 | . | . | . | . |
| 4) 0...6 A | | | C | A | | 4 | . | . | . | . |
| 9) Non-standard [A] <input type="text"/> | | | C | | | 9 | . | . | . | . |
| 0...0.01 to 0...10 ② | | | | | | A | . | . | . | . |
| A) 0...100/ 3 V | | | D | A | | B | . | . | . | . |
| B) 0...110/ 3 V | | | D | A | | C | . | . | . | . |
| C) 0...120/ 3 V | | | D | A | | D | . | . | . | . |
| D) 0...100 V | | | D | A | | E | . | . | . | . |
| E) 0...110 V | | | D | A | | F | . | . | . | . |
| F) 0...116.66 V | | | D | A | | G | . | . | . | . |
| G) 0...120 V | | | D | A | | H | . | . | . | . |
| H) 0...125 V | | | D | A | | J | . | . | . | . |
| J) 0...133.33 V | | | D | A | | K | . | . | . | . |
| K) 0...150 V | | | D | A | | L | . | . | . | . |
| L) 0...250 V | | | D | A | | M | . | . | . | . |
| M) 0...400 V | | | D | A | | N | . | . | . | . |
| N) 0...500 V | | | DF | A | | Z | . | . | . | . |
| Z) Non-standard [V] <input type="text"/> | | | | | | | | | | |
| 0...10.00 to 0...750 ③ | | | | | | | | | | |
| Lines 1 to 9 and A to Z: Measuring range for characteristics A, Figs. 3, 4, 5 and 6 Lines 9 and Z: Measuring range for characteristics B, C and D, Figs. 7, 8 and 9 Specify range (E1... E2... E3) e.g. with characteristic B 90...110 V e.g. with characteristic C 0... 90...120 V e.g. with characteristic D 0... 10...100 V | | | | | | | | | | |
| 5. Output signal (measuring output A) | | | | | | | | | | |
| 1) 0...10 V, $R_{ext} \geq 500 \Omega$ | | | | B | | 1 | . | . | . | . |
| 2) 1... 5 V, $R_{ext} \geq 250 \Omega$ | | | E | B | | 2 | . | . | . | . |
| 9) Non-standard [V] <input type="text"/> | | | | | | 9 | . | . | . | . |
| 0...1.00 to 0...15 ⑥ | | | | | | | | | | |
| 0.2...1 to 3...15 ⑦ | | | | | | | | | | |
| Lines 1 and 9: Output signals for characteristics A, Figs. 3 and 4 and characteristic B, Fig. 7 Lines 2 and 9: Output signals for characteristics A, Figs. 5 and 6 Line 9: Output signals for characteristics C and D, Figs. 8 and 9 Specify range (A1... A2... A3) e.g. with characteristic C 0... 2... 20 mA e.g. with characteristic D 0... 16... 20 mA | | | | | | | | | | |

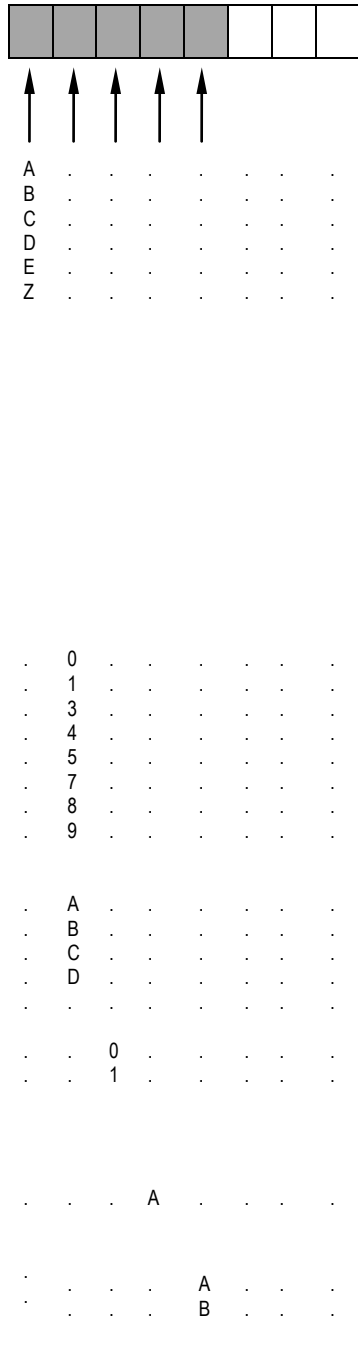
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②, ③, ⑥ and ⑦ see section "Special features"

Continuation "5 Output signal" see next page!

RISH *Ducer* E15 TRANSDUCER FOR AC CURRENT OR AC VOLTAGE WITH DIFFERENT CHARACTERISTICS

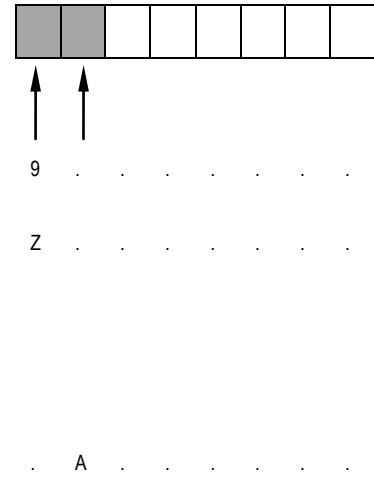
| Order Code E-15 — | | | | | | | | | |
|---|--------|-------|--|--|--|--|--|--|--|
| Features, Selection | *SCODE | no-go | | | | | | | |
| 5. Output signal (measuring output A) (continuation) | | | | | | | | | |
| A) 0... 1 mA, $R_{ext} \leq 15 \text{ k}\Omega$ | | B | | | | | | | |
| B) 0... 5 mA, $R_{ext} \leq 3 \text{ k}\Omega$ | | B | | | | | | | |
| C) 0... 10 mA, $R_{ext} \leq 1.5 \text{ k}\Omega$ | | B | | | | | | | |
| D) 0... 20 mA, $R_{ext} \leq 750 \Omega$ | | B | | | | | | | |
| E) 4... 20 mA, $R_{ext} \leq 750 \Omega$ | E | B | | | | | | | |
| Z) Non-standard [mA] | | | | | | | | | |
| 0... > 1.00 to 0... < 20 ^⑧ | | | | | | | | | |
| 1... 5 to < (4... 20) ^⑨ | | | | | | | | | |
| Lines A to D and Z: Output signals for characteristics A, Figs. 3 and 4 and characteristic B, Fig. 7 Lines E and Z: Output signals for characteristic A, Figs. 5 and 6 Line Z: Output signals for characteristics C and D, Figs. 8 and 9 Specify range (A1... A2... A3) e.g. with characteristic C 0... 2... 20 mA e.g. with characteristic D 0... 16... 20 mA | | | | | | | | | |
| 6. Power supply | | | | | | | | | |
| 0) Internal from voltage measuring input ^⑪ | | BCEFG | | | | | | | |
| 1) 24 V, 50/60 Hz | | | | | | | | | |
| 3) 115 V, 50/60 Hz | | | | | | | | | |
| 4) 120 V, 50/60 Hz | | | | | | | | | |
| 5) 127 V, 50/60 Hz | | | | | | | | | |
| 7) 230 V, 50/60 Hz | | | | | | | | | |
| 8) 240 V, 50/60 Hz | | | | | | | | | |
| 9) Non-standard 50/60 Hz [V] | | | | | | | | | |
| > 24 to 380 ^⑫ | | | | | | | | | |
| A) 24 V DC, -15...+33% | | | | | | | | | |
| B) 48 V DC, -15...+33% | | | | | | | | | |
| C) 60 V DC, -15...+33% | | | | | | | | | |
| D) 110 V DC, -15...+33% | | | | | | | | | |
| Line 0: For AC > 40 Hz and characteristic B only, Fig. 7 | | | | | | | | | |
| 7. Special features | | | | | | | | | |
| 0) Without | Y | | | | | | | | |
| 1) With | | | | | | | | | |
| Without special features (line 0): Order code complete. With special feature (line 1): The features to be omitted must be marked hereafter with / (slant line) in the order code until reaching the required feature | | | | | | | | | |
| 8. Smaller residual ripple in measuring output ^⑩ | | | | | | | | | |
| A) _ 0.5% p.p. instead of _ 1% p.p. Response time approx. 800 ms (for current signals only) | | Y | | | | | | | |
| 9. Measuring range adjustable ^④ | | | | | | | | | |
| A) E3 by max. $\pm 5\%$, characteristic A, Figs. 4 and 6 | | AY | | | | | | | |
| B) E3 by max. $\pm 10\%$, characteristic A, Figs. 4 and 6 | | AY | | | | | | | |



④ and ⑧ to ⑩ see section "Special features"

RISH *Ducer* E15 TRANSDUCER FOR AC CURRENT OR AC VOLTAGE WITH DIFFERENT CHARACTERISTICS

| Order Code E-15 — | | | | | | | | | | |
|--|--------------------------|--|--|--|--|---------------|--------------|--|--|--|
| Features, Selection | | | | | | *SCODE | no-go | | | |
| 10. Two measuring ranges (for measuring input E) ⁽⁵⁾ | | | | | | | ADY | | | |
| 9) Second measuring range for AC current [A] | [A] <input type="text"/> | | | | | | | | | |
| 0...0.01 to 0...10 | | | | | | | | | | |
| Z) Second measuring range for AC voltage [V] | [V] <input type="text"/> | | | | | | ACY | | | |
| 0...10.00 to 0...750 | | | | | | | | | | |
| Lines 9 and Z: Possible only with characteristics A, Figs. 3, 4, 5 or 6 | | | | | | | | | | |
| Condition: First meas. Range > 1.053 to ≤ 2 Second meas. range | | | | | | | | | | |
| 11. Improved climatic rating (DIN 40 040) ⁽¹³⁾ | | | | | | | Y | | | |
| A) Application class HVR instead of HVE (standard) | | | | | | | | | | |



* Lines with letter(s) under "no-go" cannot be combined with preceding lines having the same letter under "SCODE"
⁽⁵⁾ and ⁽¹³⁾ see section "Special features"

Table 3: Stock versions

The following 2 transducer versions are available ex stock. It is only necessary to quote the Order No:

| Order Code *) | Housing | Nom. frequency | Meas. range | Output signal | Power supply | Order No |
|---------------|---------------|----------------|-------------|---------------|--------------------|----------|
| 508-3A11 E70 | Carrying rail | 50/60 Hz | 0...1 A | 4...20 mA | 230 V, 50/60 Hz | 993 635 |
| 508-3A13 E70 | housing E8 | | 0...5 A | 4...20 mA | | 993 643 |

*) See section "Specification and ordering information"
 The complete Order Code and/or a description according to the section "Specification and ordering information" should be stated for other versions

Special features

| Nature of special features | |
|--|---|
| Nominal frequency f_N | ⁽¹⁾ between ≥ 16 to 400 Hz, besides the standard ranges 50 / 60 Hz <i>Restrictions:</i> With f _N < 40 Hz: Power supply derived from measuring input not possible Output current ripple < 0.5% p.p. not possible Response time < 800 ms |
| Nominal input current I_N | ⁽²⁾ between 0...0.01 to 0...10 A, besides the standard ranges 0...1 / 0...1.2 / 0...5 and 0...6 A <i>Restrictions:</i> With I _N > 5 A: Own consumption < 0.3 VA Overload capacity: 15 A continuously 100 A for 10 s, max. 5 times at 5 minute intervals 250 A for 1 s, once only Nominal frequency f _N 40 Hz With I _N > 8.3 A: Reference conditions I _E ≤ 10 A |

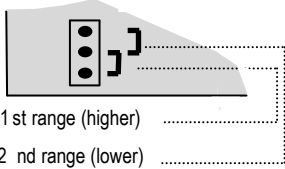
| Nature of special features | |
|--|--|
| Nominal input voltage U_N | ⁽³⁾ between 0...10 and 0...750 V, besides the standard ranges 0...100/√3 / 0...110/√3 / 0...120/√3 / 0...100/0...110 / 0...116.66 / 0...120 / 0...125 / 0...133.33 / 0...150 / 0...250 / 0...400 and 0...500 V <i>Restriction:</i> With U _N > 500 V: Overload capacity 2000 V, 2 s |
| Measuring range adjustable | ⁽⁴⁾ (Admissible alteration of full scale output, variable sensitivity, adjustable with potentiometer) Adjusting range: 0.95...1.05 · I _N resp. U _N (± 5%) 0.9...1.1 · I _N resp. U _N (± 10%) Restriction: Possible only with characteristic A, Figs. 4 and 6 <i>Continuation of "Special features" see next page!</i> |

RISH *Ducer* E15 TRANSDUCE FOR AC CURRENT OR AC VOLTAGE WITH DIFFERENT CHARACTERISTICS

Nature of special features

Two measuring ranges (for measuring input E)

- ⑤ Currents between 0...0.01 to 0...10 A
 Voltages between 0...10 to 0...750 V
 $I1 : I2$ or $U1 : U2$ 1.053 to ≤ 2
 Restriction:
 Possible only with characteristic A, Figs. 3, 4, 5 or 6



In each case the selected range is achieved by the change of jumper

Output signal A (measuring output A)

- ⑥ Load-independent DC voltage unipolar
 Ranges between 0...1 and 0...15 V
 besides the Standard range 0...10 V
- ⑦ Live-zero
 Ranges between 0.2 ...1 and 3 ...15 V
 besides the standard range 1...5 V
- ⑧ Load-independent DC current unipolar
 Ranges between 0...1 and 0...20 mA
 besides the standard ranges 0...1/0...5/0...10 and 0...20 mA
- ⑨ Live-zero
 Ranges between 1..5 and 4 ...20 mA
 besides the standard range 4...20 mA

Smaller residual ripple in measuring output

- ⑩ $\leq 0.5\%$ p.p. instead of $\leq 1\%$ p.p.
 Restriction: Response time approx. 800 ms instead of < 300 ms (for nominal frequency $f_N < 50$ Hz not possible)

Power supply

- ⑪ Without separate power supply connection
 Internal from voltage measuring input ($24\text{ V} \leq EN \leq 380\text{ V f}$)
 Restrictions: Possible only with characteristic B With $U_N \geq 170\text{ V}$:
 Impulse withstand voltage acc. to IEC 255-4 CL.II 1 kV, 1.2/50 μs , 0.5 Ws or
 Overload capacity of the voltage input max. 680 V~, 2 s
 The additional power taken from the input voltage signal is approx. 5 VA
- ⑫ With AV voltage any voltage between 24 and 380 V, $\pm 15\%$
 50/60 Hz, power consumption approx. 5 VA besides the standard voltages: 24, 115, 120, 127, 3230 or 240 V

Improve climatic rating

- ⑬ Climate class 3Z acc. to VDI/VDE 3540
 but temperature continuously -25 to $+55\text{ }^\circ\text{C}$
 Relative humidity $\leq 90\%$ annual mean
 (Application class HVR acc. to DIN 40 040)

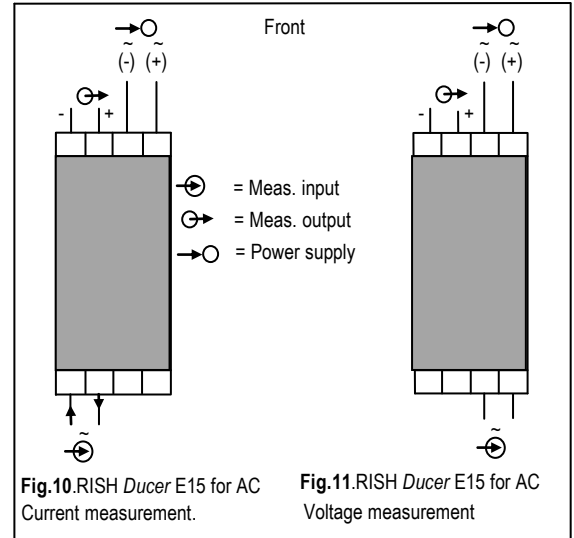


Fig.10. RISH *Ducer* E15 for AC Current measurement.

Fig.11. RISH *Ducer* E15 for AC Voltage measurement

Dimensional drawings

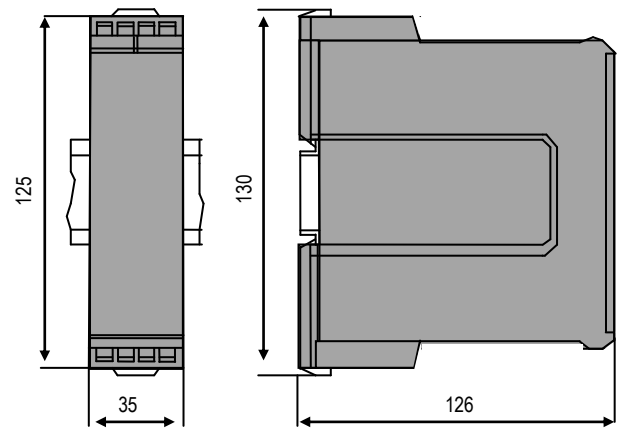


Fig.12. Transducer clipped onto a top hat rail (35*15 mm or 35*7.5 mm) acc. to EN 50 022.

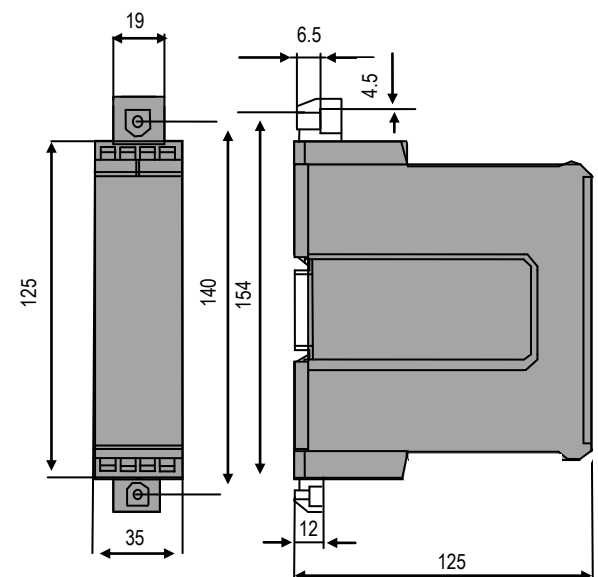


Fig.13. Transducer with the screw hole brackets pulled out for wall mounting