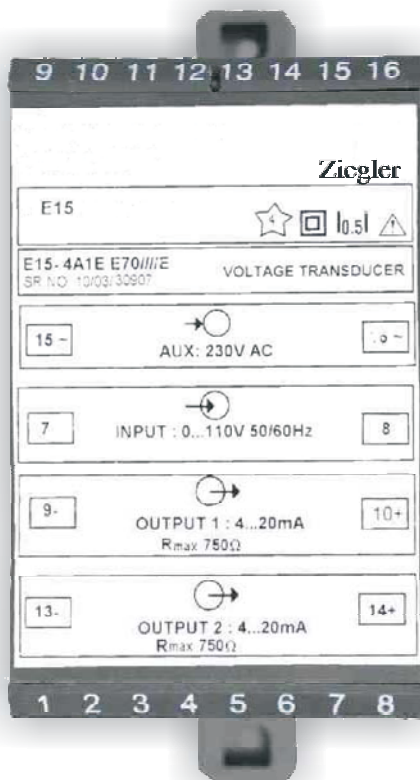


ZIEGLER E15

Transducer For AC Current and AC Voltage With Different Characteristics

With One or Two Output



With Two Output



With One Output



Application

The Ziegler E15 transducer (Fig. 1 and 2) is used where a sinewave AC current or voltage is to be converted into a DC signal proportional to the measured value (load-independent current or voltage).

The transducer gives linear output proportional to the measured input (refer fig. 3 and 4 for output characteristics).

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 (refer fig. 7 to 9 for output characteristics).

A live zero output signal is possible with all versions (refer fig. 5 and 6 for output characteristics).

Features / Benefits

- Different characteristics / Choice of the most suitable version according to application
- Narrow housing, saves space and therefore cost
- Provision for either snapping the transducer onto top - hat rails or securing it with screw to a wall or panel
- Manufactured in SMD technology / Compact and reliable
- Electric isolation between input/output and power supply (4 kV) / Personal procreation assured
- Screw terminals suitable for multistrand or thick solid wires
- Two isolated output (Optional) in E16 housing
- Electric isolation between output 1 and output 2 is 4KV for 1 min.
- Applicable standards : DIN / IEC 60688-1 / IS 12784

Technical Data

General

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

Measured principle : Active rectifier

Measuring input E \rightarrow

Nominal frequency f_N ① : 50 or 60 Hz

Nominal input current I_N : 1 / 1.2 / 5 or 6 A
(measuring range end value)

② ④ ⑤

Nominal input voltage U_N : $100\sqrt{3}$ / $110\sqrt{3}$ / 100 / 110 / 116.66
(measuring range end value)
120 $\sqrt{3}$ / 120 / 125 / 133.33 / 150 / 250 / 400 or 500 V

③ ④ ⑤

Own consumption : < 0.2 VA at current transducer
< 1 mA at voltage transducer for one output
< 2 mA at voltage transducer for two outputs

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
$2 \times I_N$	contin.	—	—
$10 \times I_N$	5	15 s	5 min.
$20 \times I_N$	5	1 s	5 min.
$40 \times I_N$	1	1 s	—
$1.5 \times U_N$	contin.	—	—
$2 \times U_N$	10	10s	10 s
$4 \times U_N$	1	2 s	—

measuring output A \rightarrow

Output variable : Load - independent DC voltage U_A
OR
Load - independent DC current I_A

Standard ranges of U_A : 0...10 / 1 ... 5 V
⑥ ⑦
Load capacity 20 mA
External resistance

$$R_{\text{ext}} [\text{k}\Omega] \geq \frac{U_A [\text{V}]}{20 \text{ mA}}$$

U_A = Full output value

Standard ranges of I_A : 0...10 / 0 ... 5 / 0 ... 10 / 0... 20 / 4...20 mA
⑧ ⑨

Burden voltage 15 V

External resistance

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

I_{AN} = Full output value

Voltage limit under

$R_{\text{ext}} = \infty$: Approx. 40 V

Current limit under overload

: Approx. 1.3 x 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

Output characteristic

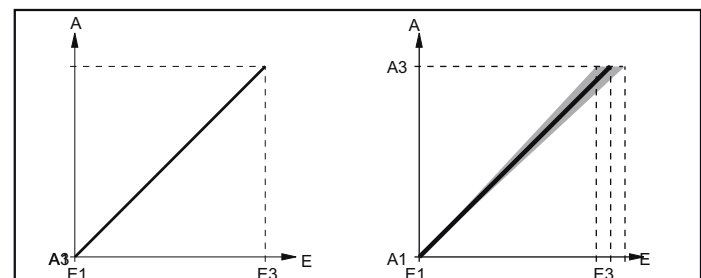


Fig. 3. Characteristic A "Standard".

Fig. 4. Characteristic A "Standard and variable sensitivity".
E3 adjustable by max. $\pm 5\%$ or $\pm 10\%$

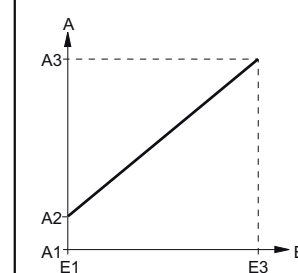


Fig. 5. Characteristic A "Standard and live zero".
Condition : $A2 = 0.2 A3$

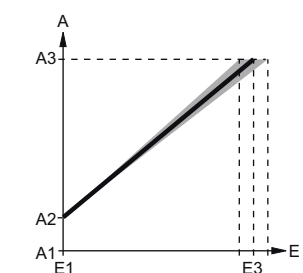


Fig. 6. Characteristic A "Standard & variable sensitivity and live zero".
E3 adjustable by max. $\pm 5\%$ or $\pm 10\%$
Condition : $A2 = 0.2 A3$

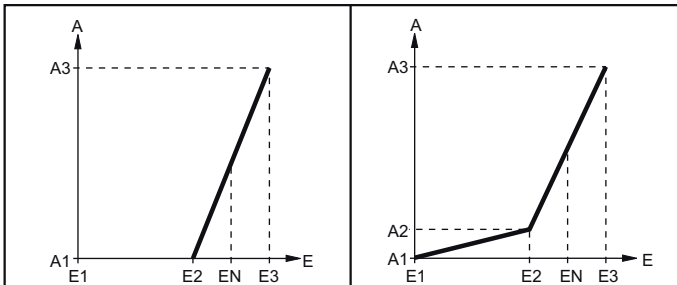


Fig. 7. Characteristic B
"Current resp. voltage magnifier in end range".

E1...E2 suppressed completely
E2...E3 (main measuring range) magnified

$$\text{Condition : } \frac{E3}{E2} = 1.22...1.66$$

or, if power supply derived from voltage measuring input :

$$\frac{E3}{E2} = 1.22...1.35$$

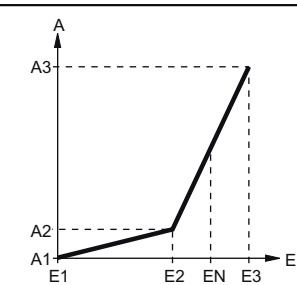


Fig. 8. Characteristic C "main value magnification in end range".

E1...E2(secondary measuring range) suppressed
E2...E3 (main measuring range) magnified

$$\text{Condition : } \frac{E3}{E2} = 1.22...1.66$$

$$A2 = (0.1 \text{ to } 0.25) A3$$

$$\frac{A2 - A1}{A3 - A1} \leq 0.95 \cdot \frac{E2}{E3}$$

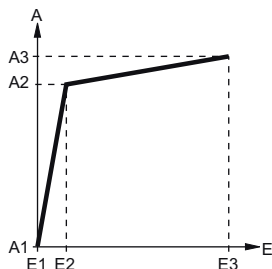


Fig. 9. Characteristic D "Main value magnification in initial range".

E1 ... E2 (main measuring range) magnified,
E2 ... E3 (secondary measuring range) suppressed

$$\text{Conditions : } \frac{E2}{E3} = 0.025^* \text{ to } 0.5 \text{ and } \frac{A2 - A1}{A3 - A1} \geq 1.05 \cdot \frac{E2}{E3}$$

$$A2 = (0.4 \text{ to } 0.8) A3$$

* between 0.025 and 0.05 reduced accuracy

Accuracy

(acc. to DIN/IEC 688 - 1)

Reference value	:	Output span
	:	Exceptions :
	:	Characteristics B and C, Input end value
Basic accuracy	:	Class 0.5 / Class 0.2
Reference conditions	:	
Ambient temperature	:	23°C ± 5°C
Frequency	:	f _N ± 2%
Distortion factor	:	< 0.2%
Power supply	:	U _{HN} ± 15% AC U _{HN} - 15 / +33% (DC)
Output burden	:	0...R _{ext} max. at current output R _{ext} min. ... ∞ at voltage output
Output voltage	:	0...15 V
Output Current	:	0...20 mA

Influence effects (maxima)

(include basic error)

Linearity error : ± 0.2 %

Frequency influence
f_N ± 5% : ± 0.05 %

Dependence on external
resistance (ΔR_{ext} max.) : ± 0.05 %

Power supply influence
U_{HN} ± 15% : ± 0.05 %

Additional errors

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

⑪ ⑫

24, 115, 120, 127, 230, or 240 V,
± 15%, 50 / 60 Hz

Power input approx. 5VA for one o/p

Power input approx. 8VA for two o/p

DC voltage

For one output :- 24, 48, 60, 110V,
24-60V, 85-230V AC/DC

AC : +/- 15%, 50 / 60 Hz

DC : -15 / +33%,

power input approx. 5 W

For two output :- 24-60V, 85-230V
AC/DC

AC : +/- 15%, 50 / 60 Hz

DC : -15 / +33%,

Power input approx. 8W / 8VA.

Environmental conditions

Climatic rating

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

① to ② see section "Special features"



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 instruments	IEC 801 - 3	27 ... 500 MHz : 3V/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 inputs 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

Regulations

Impulse withstand voltage acc. to IEC 255-4, Cl. III	5 kV, 1.2 / 50 µs, 0.5 Ws Common-mode and differential - mode between any terminals
Electrical standards	Acc. to DIN 57 410
Housing protection	IP 40 acc. to IEC 529 Terminals IP 20
Insulation group acc. to DIN 57 110 b	A (instrument) C (terminals)
Test voltage	
Input versus Output	4KV, 50Hz, 1min
Input versus Housing	4KV, 50Hz, 1min
Output versus Housing	4KV, 50Hz, 1min
Output 1 versus Output 2	4KV, 50Hz, 1min

Installation Data

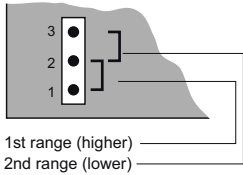
Mechanical design	Carrying rail housing type E8 / E16 Dimensions see section "Dimensional drawing"
Material of housing	Lexan 940 (polycarbonate), Flammability class V-0 according to UL 94, self-extinguishing, non - dripping, free of halogen
Mounting	For snapping onto top-hat rail (35 X 15 mm or 35 X 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 connection	Screw - type terminals with indirect wire pressure, for max. 2 X 2.5 mm ² or 1 X 6 mm ²
Weight	Approx. 0.45 kg for one output Approx. 0.7 kg for two outputs

Special features

Nature of Special features	
Nominal frequency f_N	① between ≥ 16 to 400 Hz, besides the standard ranges 50/60 Hz Restrictions : 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 Restrictions : 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 $f_N \geq 40$ Hz With $I_N > 8.3$ A : Reference conditions $I_E \leq 10$ A
Nominal input voltage U_N	③ between 0...10 and 0...750 V, besides the standard ranges 0...100/ $\sqrt{3}$ / 0...110/ $\sqrt{3}$ / 0...120/ $\sqrt{3}$ / 0...100 / 0...110 / 0...166.66 / 0...120 / 0...125 / 0...133.33 / 0...150 / 0...250 / 0...400 and 0...500 V Restrictions : 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 x I_N resp. U_N (± 5%) 0.9...1.1 x I_N resp. U_N (± 10%) Restrictions : Possible only with characteristic A, Figs. 4 and 6
Two measuring ranges (for measuring input E)	⑤ Current between 0...0.01 to 0...10 A voltage between 0...10 to 0...750 V $I1 : I2$ or $U1 : U2 > 1.053$ to ≤ 2

Nature of Special features

Restrictions :
Possible only with characteristic A, Figs. 3, 4, 5 or 6



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

1st range (higher)

2nd range (lower)

Output signal A (measuring output A) output 1 & output 2

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
($24 \text{ V} \leq U_N \leq 380 \text{ V}$, $f_N > 40 \text{ Hz}$) for one outputs.
($24 \text{ V} \leq U_N \leq 240 \text{ V}$, $f_N > 40 \text{ Hz}$) for two outputs.

Restriction :
Possible only with characteristic B
With $U_N \geq 170 \text{ V}$:
Impulse withstand voltage acc. to IEC 255 - 4, Cl. II : 1kV, 1.2/50 μs , 0.5 Ws or overload capacity of the voltage input max. 680 V_R, 2 s
The additional power taken from the input voltage signal is approx. 5 VA for one output & 8 VA for two outputs

⑫ With AC voltage
any voltage between 24 to 380 V, $\pm 15\%$, for one output & 24 to 240 V, $\pm 15\%$, for two outputs 50/60 Hz
Power consumption approx. 5 VA for one output,
Power consumption approx. 8 VA for one output,
besides the standard voltages : 24, 115, 120, 127, 230, or 240 V

⑬ Improved climate rating
Climate class 3Z acc. to VDI / VDE 3540, but temperature continuously - 25 to +55°C.
Relative humidity $\leq 90\%$ annual mean
(Application class HVR acc. to DIN 40 040)

Electrical connections

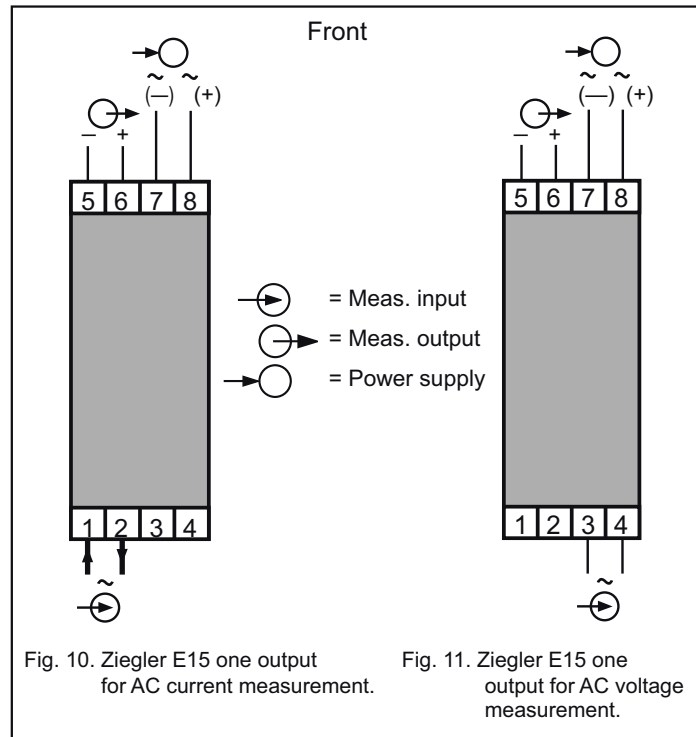


Fig. 10. Ziegler E15 one output for AC current measurement.

Fig. 11. Ziegler E15 one output for AC voltage measurement.

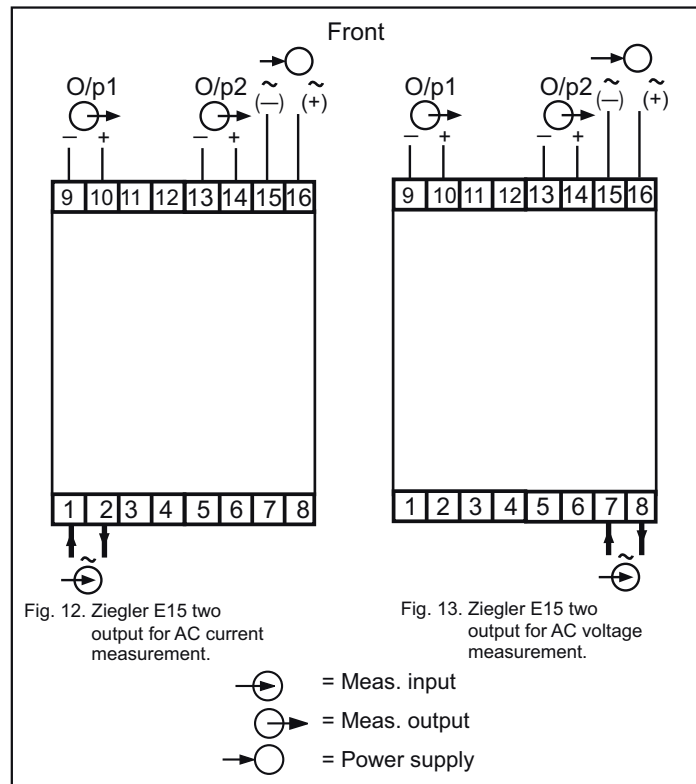


Fig. 12. Ziegler E15 two output for AC current measurement.

Fig. 13. Ziegler E15 two output for AC voltage measurement.

Dimensional Drawings (All dimension are in mm)

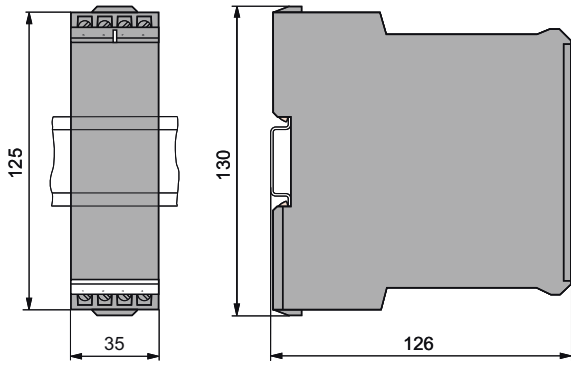


Fig. 14. Ziegler E15 one output in housing E8 clipped onto a top hat rail (35 X 15 mm or 35 X 7.5 mm) acc. to EN 50022.

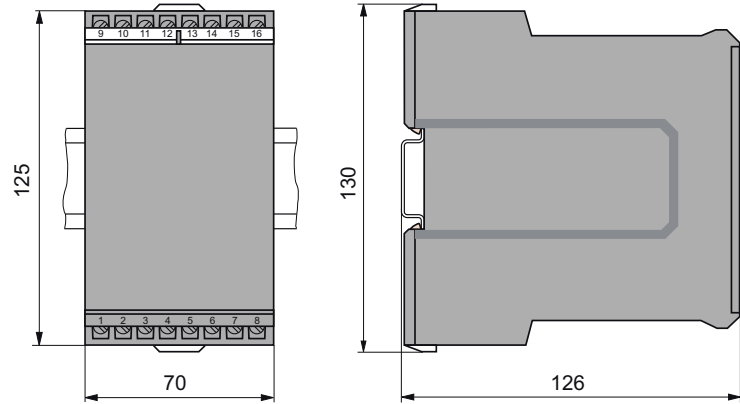


Fig. 16. Ziegler E15 two output in housing E16 clipped onto a top hat rail (35 X 15 mm or 35 X 7.5 mm) acc. to EN 50022.

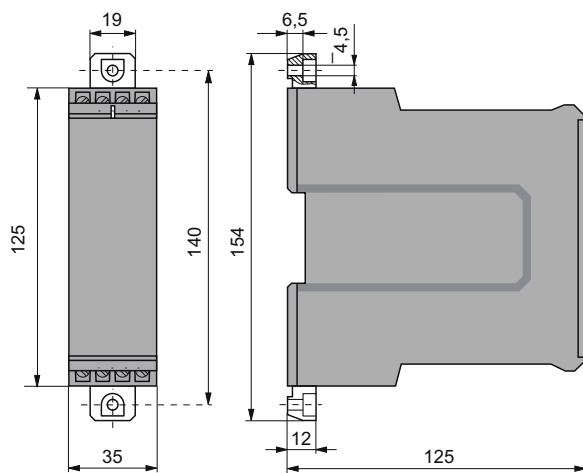


Fig. 15. Ziegler E15 one output in housing E8 with the screw hole brackets pulled out for wall mounting.

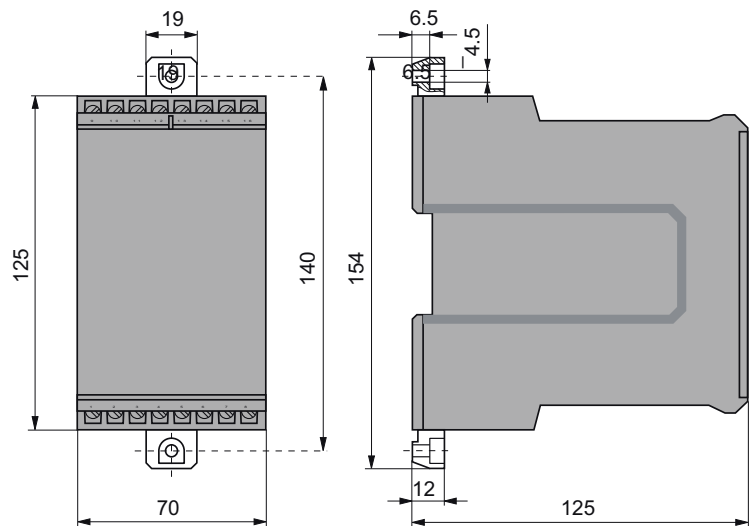
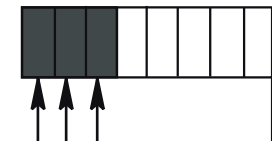
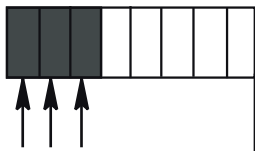





Fig. 17. Ziegler E15 two output in housing E16 with the screw hole brackets pulled out for wall mounting.

Table 2: Specification and ordering information

Order Code E15 —			
Features, Selection	*SCODE	no-go	
1. Mechanical design			
3) Carrying rail housing E8	J		3
4) Carrying rail housing E16	K		4
2. Output characteristics			
A) Characteristics A	G		. 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 "Output signal" line 2, 9, E or Z			



Order Code E15 —				
Features, Selection	*SCODE	no-go		
B) Characteristics B "Current resp. voltage magnifier in end range" see Fig. 7	A			
C) Characteristics C "Main value magnification in end range" see Fig. 8	AB		. B	
D) Characteristics D "Main value magnification in initial range" see Fig. 9	AB		. C	
The selection feature 2 "Output characteristic" and feature 4 "Measuring range" as well as feature 5 "Output signal" to be determined together.			. D	
In the section "Output characteristic" conditions laid down in Figs. 3 to 9 should be noted				
3. Nominal frequency			. . . 1	
1) 50 / 60 Hz			. . . 9	
9) Non - standard [Hz] 				
≥16 to 400 ①				
4. Measuring range (measuring input E)			1	
1) 0 ... 1 A	C	A	2	
2) 0 ... 1.2 A	C	A	3	
3) 0 ... 5 A	C	A	4	
4) 0 ... 6 A	C	A	9	
9) Non - standard 0 ... 0.01 to 0 ... 10 ② [A] 	C		A	
A) 0 ... 100 / $\sqrt{3}$ V	D	A	B	
B) 0 ... 110 / $\sqrt{3}$ V	D	A	C	
C) 0 ... 120 / $\sqrt{3}$ 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 0 ... 10.00 to 0 ... 750 ③ [V] 				
Lines 1 to 9 and A to Z : Measuring range for characteristics A, Figs. 3, 4, 5, and 6				
Lines 9 to 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				

① see section "Special features"

Order Code E15 —									
Features, Selection	*SCODE	no-go							
5. Output signal (measuring output A) Output 1									
1) 0 ... 10 V, $R_{ext} \geq 500 \Omega$	H	K							
2) 0 ... 5 V, $R_{ext} \geq 250 \Omega$		B							
9) Non - standard [V] ⑥ 0 ... 1.00 to 0 ... 15 0.2 ... 1 to 3 ... 15 ⑦	E	B							
Lines 1 and 9 : Output signal for characteristics A, Figs. 3 and 4 and characteristics B, Figs. 7 Lines 2 to 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 V e.g. with characteristic D 0... 16 ... 20 V									
5. Output signal (measuring output A) (continuation)									
A) 0 ... 1 mA, $R_{ext} \leq 15 k\Omega$		B							
B) 0 ... 5 mA, $R_{ext} \leq 3 k\Omega$		B							
C) 0 ... 10 mA, $R_{ext} \leq 1.5 k\Omega$		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 [A] ⑧ 0 ... > 1.00 to 0 ... < 20 1 ... 5 to < (4...20) ⑨		B							
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 characteristics C and D, figs. 8 and 9 Specify range (A1... A2... A3) e.g. with characteristics C 0... 2... 20 mA e.g. with characteristics D 0... 16...20 mA									
6. Power Supply ⑪									
0) Internal from voltage measuring input		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] ⑫ > 24 to 380									
A) 24 V DC, - 15...+33%		I							
B) 48 V DC, - 15...+33%		I							
C) 60 V DC, - 15...+33%		I							
D) 110 V DC, - 15...+33%		I							
Line 0 : For AC > 40 Hz and characteristics B only, Fig. 7									
F) 24... 60 V AC / DC, DC: - 15...+33%, AC: +/- 15%		H							
G) 85... 230 V AC / DC, DC: - 15...+33%, AC: +/- 15%		H							

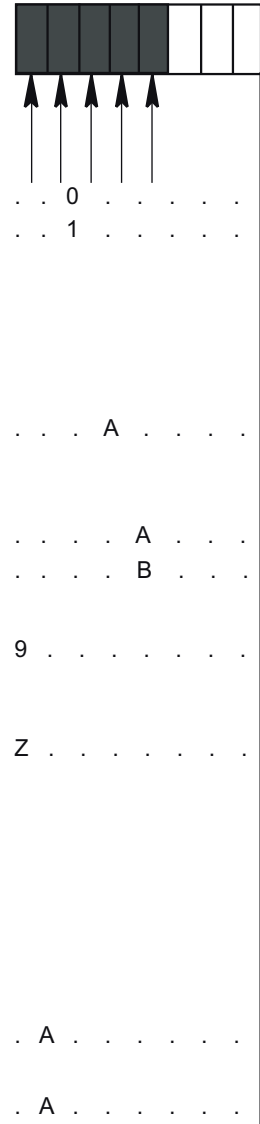
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. 1
. 2
. 9
A
B
C
D
E
Z
. 0
. 1
. 3
. 4
. 5
. 7
. 8
. 9
. A
. B
. C
. D
. F
. G

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

Order Code E15 —	*SCODE	no-go
Features, Selection		
7. Special features		
0) Without	Y	
1) With		
Without Special features (line 0) : Order code complete. With special features (line 1) : The features to be omitted must be marked hereafter with / (slant line) in order code until reaching the required feature		
8. Smaller residual ripple in measuring output ⑩		Y
A) $\leq 0.5\%$ p.p. instead of $\leq 1\%$ p.p. Response time approx. 800ms (for current signals only)		
9. Measuring range adjustable ④		
A) E3 by max. - 5%, characteristic A, Figs. 4 and 6		
B) E3 by max. - 10%, characteristic A, Figs. 4 and 6		
10. Two measuring ranges (fo measuring input E) ⑤		
9) Second measuring range		
for AC current [A] _____		ADY
0...0.01 to 0...10		
Z) Second measuring range		
for AC Voltage [V] _____		ACY
0...10.00 to 0...750		
Lines 9 and Z : Possible only with characteristics A, Figs. 3, 4, 5 or 6 Condition : $\frac{\text{First meas. range}}{\text{Second meas. range}} > 1.053$ to ≤ 2		
11. Improved climate rating (DIN 40 040) ⑬		Y
A) Application class HVR instead of HVR (standard)		
12. Output Signal (Measuring output B) Output 2	I	J
Same as output signal (Measuring output A) output 1 in Sr. No. 5		



⑧ to ⑨ and ⑪ to ⑫ see section "Special features"

* Line with letter(s) under "no-go" cannot be combined with preceding lines having the same letter under "SCODE"

④, ⑤, ⑩ and ⑬ see section "Special features"

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Redefine Innovative Metering