

# SINEAX G 537

## Transducer for phase angle difference

Carrying rail housing P13/70



### Application

The transducer **SINEAX G 537** (Fig. 1) converts the phase angle difference of two synchronised supplies into a **load independent** DC current or a **load independent** DC voltage proportional to the measured value.

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 G 537 in housing P13/70 clipped onto a top-hat rail.

### Features / Benefits

- **Measuring inputs:** Sine, rectangular or distorted wave forms of nominal input voltages with dominant fundamental waves

Measured variables	Nominal input voltages	Measuring range limits
Phase angle difference	10 to 690 V	$\pm 10$ to $\pm 180$ °el

- **Measuring output:** Unipolar, bipolar or live zero output variables
- **Measuring principle:** Measurement of the zero crossing interval
- **AC/DC power supply / Universal**
- **Standard as marine version per Lloyd's Register of Shipping**

### Technical data

#### General

Measured quantity:	Phase angle difference
Measuring principle:	Measurement of the zero crossing interval

#### Measuring inputs $\rightarrow$

Measuring range:	See Section "Specification and ordering information"
Nominal frequency $f_N$ :	50 or 60 Hz
Nominal input voltage $U_N$ :	Generator and bus bar 10...230 V or 230...690 V (max. 230 V with power supply from voltage measuring input)
Sensitivity:	10 ... 120% $U_N$
Own consumption:	$< U_N \cdot 1.5$ mA per measuring input

Overload capacity:

Measured quantities $U_N$	Number of applications	Duration of one application	Interval between two successive applications
$1,2 \times U_N^1$	---	perman.	---
$2 \times U_N^1$	10	1 s	10 s

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

#### Measuring output $\rightarrow$

Load independent DC current:	0...1 to 0...20 mA resp. live-zero 1...5 to 4...20 mA $\pm 1$ to $\pm 20$ mA
Burden voltage:	+ 15 V, resp. - 12 V
Load independent DC voltage:	0...1 to 0...10 V resp. live-zero 0.2...1 to 2...10 V $\pm 1$ to $\pm 10$ V
Load capacity:	Max. 4 mA
Voltage limit under $R_{ext} = \infty$ :	$\leq 25$ V
Current limit under overload:	Approx. $1.3 \times I_{AN}$ at current output Approx. 30 mA at voltage output
Residual ripple in output current:	$< 0.5\%$ p.p.
Nominal value of response time:	4 periods of the measuring frequency
Other ranges:	2, 8 or 16 periods of the measuring frequency

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Behaviour of output current in different operating states:

Operating state <sup>1</sup>		Output	
Generator voltage U <sub>G</sub>	Bus bar voltage U <sub>S</sub>	unipolar	bipolar
leading (f <sub>G</sub> = f <sub>S</sub> )		> I <sub>AN</sub> / 2	positive
missing <sup>2</sup>	nominal value	indefinite	indefinite
nominal value	missing <sup>2</sup>		
missing <sup>2</sup>	missing <sup>2</sup>		

<sup>1</sup> With power supply switched on

<sup>2</sup> E.g. switched off or fault condition

### Accuracy (acc. to DIN/IEC 688)

Reference value:  $\Delta\varphi = 90^\circ$

Basic accuracy: Class 0.5

### Reference conditions:

Ambient temperature 15...30 °C

Input voltage U<sub>G</sub> = 0.8 ... 1.2 U<sub>S</sub>

Frequency f<sub>N</sub> ± 10%

Wave form Sine

Power supply At nominal range

Output burden  $\Delta R_{\text{ext}}$  max.

### Safety

Protection class: II (protection isolated, DIN EN 61 010)

Housing protection: IP 40, housing (test wire, EN 60 529)  
IP 20, terminals (test finger, EN 60 529)

Contamination level: 2

Overvoltage category: III

Rated insulation voltage (against earth): 230 resp. 400 V, inputs  
230 V, power supply  
40 V, output

Test voltage: 50 Hz, 1 min. acc. to DIN EN 61 010-1  
3700 resp. 5550 V, inputs versus all other circuits as well as outer surface  
3250 V, inputs versus each other  
3700 V, power supply versus output as well as outer surface  
490 V, output versus outer surface

### Power supply →○

AC/DC power pack (DC or 40 ... 400 Hz)

Table 1: Rated voltages and permissible variations

Rated voltage	Tolerance
85 ... 230 V DC / AC	DC - 15 ... + 33%
24 ... 60 V DC / AC	AC ± 15%

or

Power supply from voltage measuring input: 24...60 V AC or 85...230 V AC

Option: Connect to the low tension to terminals 12 and 13  
24 V AC or 24 ... 60 V DC

Power consumption: Approx. 2 W resp. 4 VA

### Installation data

Mechanical design: Housing **P13/70**

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. 0.27 kg

### Connecting terminals

Connection element: Screw-type terminals with indirect wire pressure

Permissible cross section of the connection leads: ≤ 4.0 mm<sup>2</sup> single wire or 2 × 2.5 mm<sup>2</sup> fine wire

### Environmental conditions

Climatic rating: Climate class 3 acc. to VDI/VDE 3540

Operating temperature: - 10 to + 55 °C

Storage temperature: - 40 to + 70 °C

Relative humidity of annual mean: ≤ 75%

### Vibration withstand

(tested according to DIN EN 60 068-2-6)

Acceleration: ± 2 g

Frequency range: 10 ... 150 ... 10 Hz, rate of frequency sweep: 1 octave/minute

Number of cycles: 10 in each of the three axes

Result: No faults occurred, no loss of accuracy and no problems with the snap fastener

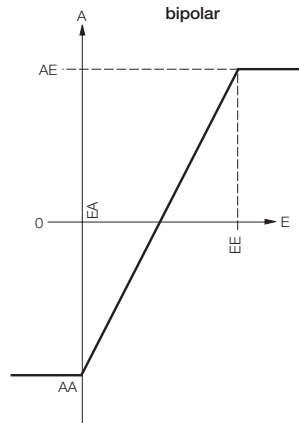
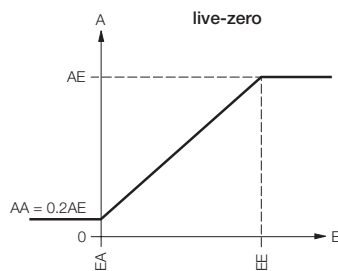
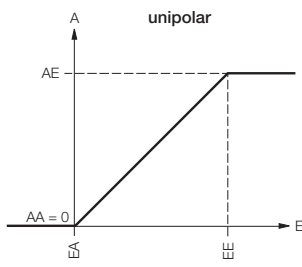
### Germanischer Lloyd

Type approval certificate: No. 12 261-98 HH

Ambient category: C

Vibration: 0.7 g

### Output characteristic



Legend:  
*E* = Input  
*EA* = Input start value  
*EE* = Input end value  
*A* = Output  
*AA* = Output start value  
*AE* = Output end value

**Table 2: Specification and ordering information**

Order Code 537 -						
Features, Selection	*SCODE	no-go				
<b>1. Mechanical design</b> 4) Housing P13/70 for rail mounting			4	.	.	.
<b>2. Nominal input frequency</b> 1) 50 Hz			.	1	.	.
2) 60 Hz			.	2	.	.
9) Non-standard [Hz] <input type="text"/>			.	9	.	.
≥ 10 to 1500; With power supply from measuring input min. 40 Hz, max. 400 Hz						
<b>3. Nominal input voltage</b> Generator and bus bar:			.	.	1	.
1) $U_N$ : 100 V	A		.	.	2	.
2) $U_N$ : 230 V	A		.	.	9	.
9) Non-standard [V] <input type="text"/>			.	.	.	.
≥ 10.00 to 690; 3 phase system: Input voltage = phase to phase voltage With power supply from measuring input min. 24 V, max. 230 V, see feature 6, lines 3 and 4						
<b>4. Measuring range</b> 1) -120 ... 0 ... 120 °el			.	.	.	1
9) Non-standard [°el] <input type="text"/>			.	.	.	9
Measuring range within -180...0...180, but unambiguous output value up to -175...0...175 °el; measuring span ≤ 20 °el						
<b>5. Output signal</b> 1) 0 ... 20 mA			.	.	.	.
2) 4 ... 20 mA			.	.	.	1
9) Non-standard 0...1.00 to 0...< 20, [mA] <input type="text"/>			.	.	.	2
-1.00...0...1.00 to -20...0...20 (symmetrical) 1...5 to < (4...20) (AA/AE = 1/5)			.	.	.	9
A) 0 ... 10 V			.	.	.	A
Z) Non-standard 0...1.00 to 0...< 10, [V] <input type="text"/>			.	.	.	Z
-1.00...0...1.00 to -10...0...10 (symmetrical) 0.2...1 to 2...10 (AA/AE = 1/5)						
AA = Output start value, AE = Output end value						

Continuation of "Table 2: Specification and ordering information" see on next page!

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## Transducer for phase angle difference

Continuation of "Table 2: Specification and ordering information"

Order Code 537 -									
Features, Selection		*SCODE		no-go					
<b>6. Power supply</b>									
1) 85 ... 230 V DC/AC									1 . . . . .
2) 24 ... 60 V DC/AC									2 . . . . .
3) Internal from measuring input (24 V AC to 60 V AC)				A					3 . . . . .
4) Internal from measuring input (85 V AC to 230 V AC)									4 . . . . .
5) Connect to the low tension 24 V AC / 24 ... 60 V DC									5 . . . . .
<b>7. Response time</b>									
1) 4 periods of the input frequency (Standard)									. 1 . . . . .
2) 2 periods of the input frequency									. 2 . . . . .
3) 8 periods of the input frequency									. 3 . . . . .
4) 16 periods of the input frequency									. 4 . . . . .

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

### Electrical connections

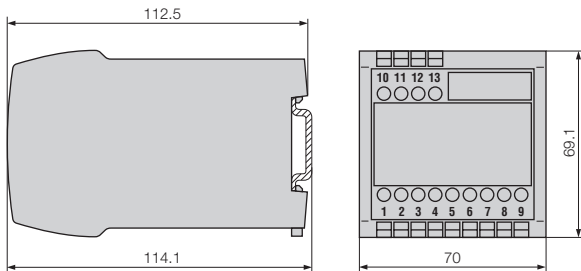
Fig. 2. Power supply connected to terminals 8 and 9.

Fig. 3. Power supply internal from measuring input, without separated power supply.

Fig. 4. Power supply connected to the low tension terminal side 12 and 13.

- $\ominus \oplus$   $U_G$  = Measuring input Generator voltage
- $\ominus \oplus$   $U_s$  = Measuring input Bus bar voltage
- $\oplus \rightarrow$  = Measuring output
- $\rightarrow \oplus$  = Power supply

### Dimensional drawing



### Standard accessories

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

Fig. 5. Housing P13/70 clipped onto a top-hat rail (35 x 15 mm or 35 x 7.5 mm, acc. to EN 50 022).