

SINEAX F 535

Transducer for measuring frequency difference



Carrying rail housing P13/70



Application

The transducer **SINEAX F 535** (Fig. 1) converts the frequency 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 F 535 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
Frequency difference	10 to 690 V	$\Delta f = \pm 1\% f_s$ to $\pm 80\% f_s$ f_s and $f_G \geq 10$ Hz to ≤ 1.5 kHz

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

Overload capacity:

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

¹ But max. 264 V with power supply from voltage measuring input.

Wave form: Any; fundamental wave only taken into account

Measuring output

Load independent DC current:	0...1 to 0...20 mA resp. live-zero 1...5 to 4...20 mA ± 1 to ± 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 ± 1 to ± 10 V
Load capacity:	Max. 4 mA
Voltage limit under $R_{ext} = \infty$:	≤ 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

Technical data

General

Measured quantity:	Frequency difference Δf
Measuring principle:	Digital period measurement

Measuring inputs

Measuring range (f_s = bus bar f_G = generator):	See Section "Specification and ordering information"
Nominal input voltages U_N :	Generator and bus bar 10...230 V or 230...690 V (max. 230 V with power supply from voltage measuring input)
Own consumption:	$< U_N \cdot 1.5$ mA per measuring input

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Behaviour of output current in different operating states:

Operating state ¹		Output	Display
Generator frequency	Bus frequency		
$f_G > f_s$		unipolar	$> I_{AN} / 2$
		bipolar	positive
missing ²	nominal value	unipolar	approx. 0
		bipolar	approx. $-110\% I_{AN}$
nominal value	missing ²	unipolar	approx. $+110\% I_{AN}$
		bipolar	
missing ²	missing ²	unipolar	approx. $I_{AN} / 2$
		bipolar	approx. 0

¹ With power supply switched on

² E.g. switched off or fault condition

Accuracy (acc. to EN 60 688)

Reference value: Output span

Basic accuracy: Class 0.2

Reference conditions:

Ambient temperature 15...30 °C

Input voltage U_{min} to U_{max}

Distortion factor No influence

Power supply At nominal range

Output burden ΔR_{ext} max.

Safety

Protection class: II (protection isolated, 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, input
230 V, power supply
40 V, output

Test voltage: 50 Hz, 1 min. acc. to
EN 61 010-1
3700 resp. 5550 V, input versus all
other circuits as well as outer surface
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,
Note: $40 \text{ Hz} \leq f \leq 400 \text{ Hz}$

Option:

Connect to the low tension to termi-
nals 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:

$\leq 4.0 \text{ mm}^2$ single wire or
 $2 \times 2.5 \text{ mm}^2$ 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: $\pm 2 \text{ g}$

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

Number of cycles: 10, in each of the three axes

EN 60 068-2-27: Shock

Acceleration: $3 \times 50 \text{ g}$
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
EN 55 011:

Electromagnetic compatibility

Germanischer Lloyd

Type approval certificate: No. 12 261-98 HH

Ambient category: C

Vibration: 0.7 g

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Output characteristic

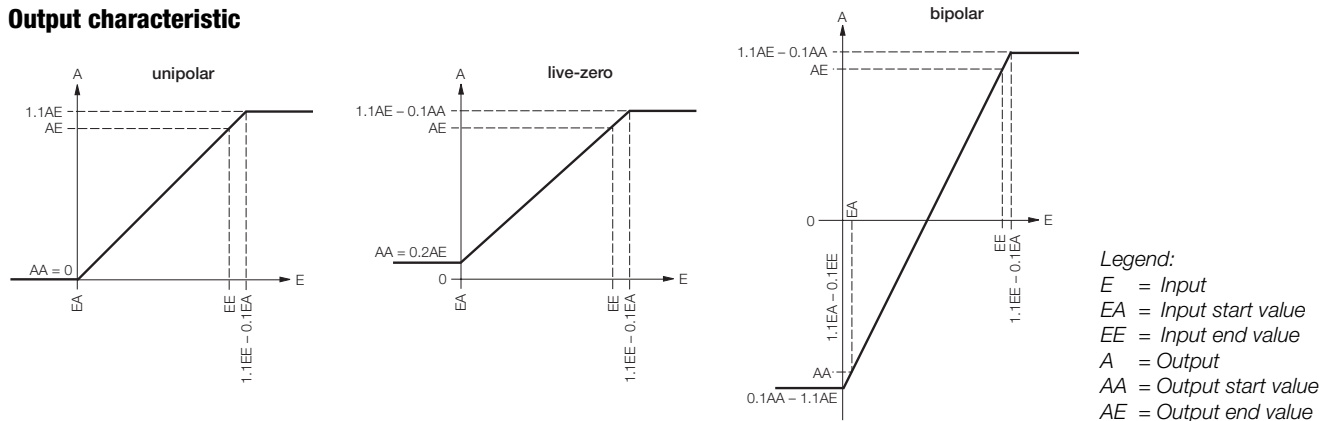


Table 2: Specification and ordering information

Order Code 535 -						
Features, Selection	*SCODE	no-go				
1. Mechanical design 4) Housing P13/70 for rail mounting						
2. Nominal input voltage Generator and bus bar: 1) U_N : 10 ... 230 V 2) U_N : > 230 ... 690 V 3 phase system: Input voltage = phase to phase voltage Line 2: Not possible with power supply from measuring input						
3. Measuring range Frequency: Bus bar = f_s / Generator = f_G 1) $f_s = 50 \text{ Hz} / f_G = 49.5 \dots 50 \dots 50.5 \text{ Hz}$ 2) $f_s = 50 \text{ Hz} / f_G = 47.5 \dots 50 \dots 52.5 \text{ Hz}$ 3) $f_s = 50 \text{ Hz} / f_G = 45 \dots 50 \dots 55 \text{ Hz}$ 4) $f_s = 50 \text{ Hz} / f_G = 40 \dots 50 \dots 60 \text{ Hz}$ 5) $f_s = 60 \text{ Hz} / f_G = 57.5 \dots 60 \dots 62.5 \text{ Hz}$ 9) Non-standard limit values [Hz] <input type="text"/> $\Delta f \pm 1\% f_s$ to $\pm 80\% f_s$ f_s and $f_G \geq 10 \text{ Hz}$ to $\leq 1.5 \text{ kHz}$ With power supply from measuring input min. 40 Hz, max. 400 Hz see feature 5, lines 3 and 4			4 1 2 1 2 3 4 5 9			
4. Output signal 1) 0 ... 20 mA 2) 4 ... 20 mA 9) Non-standard 0...1.00 to 0...< 20, [mA] <input type="text"/> -1.00...0...1.00 to -20...0...20 (symmetrical) 1...5 to < (4...20) ($AA/AE = 1/5$) A) 0 ... 10 V Z) Non-standard 0...1.00 to 0...< 10, [V] <input type="text"/> -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!

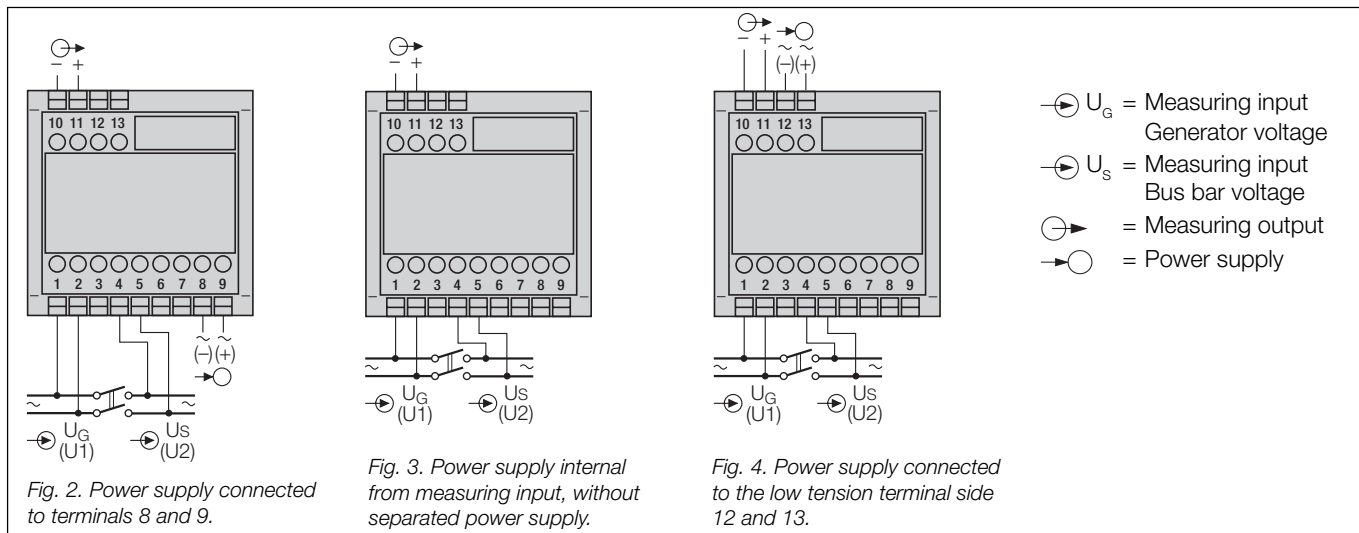
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Continuation of "Table 2: Specification and ordering information"

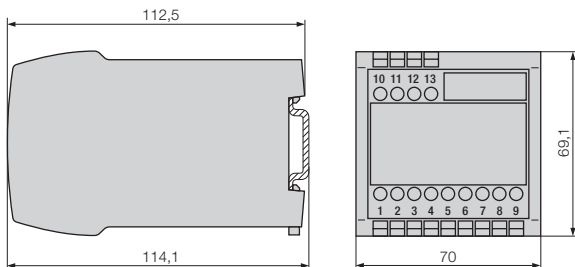
Order Code 535 -					
Features, Selection		*SCODE	no-go		
5. Power supply					
1) 85 ... 230 V DC/AC					
2) 24 ... 60 V DC/AC					
3) Internal from measuring input (24 V AC to 60 V AC)			A		
4) Internal from measuring input (85 V AC to 230 V AC)			A		
5) Connect to the low tension 24 V AC / 24 ... 60 V DC					
6. Response time					
1) 4 periods of the input frequency (Standard)					
2) 2 periods of the input frequency					
3) 8 periods of the input frequency					
4) 16 periods of the input frequency					

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

Electrical connections



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 × 15 mm or 35 × 7.5 mm, acc. to EN 50 022).