CAMILLE BAUER

SINEAX F535
Transducer for measuring frequency difference

Carrying rail housing P13/70

Fig. 1. Transducer SINEAX F535 in housing **P13/70** clipped onto a top-hat rail.

Application

The transducer **SINEAX F535** (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.

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	$\Delta = \pm 1\% \, f_S$ to $\pm 80\% \, f_S$ f_S and f_G 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

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

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

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Current limit under overload:	Approx. 1.3 x 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

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 50/60 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 Hz ≤ f ≤ 400 Hz
Option:	Connect to the low tension to terminals 12 and 13 24 V AC or 24 … 60 V DC
Power consumption:	3 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 mm² single wire or 2 x 2.5 mm² fine wire

Environmental conditions

Operating temperature:	− 10 to + 55 °C
Storage temperature:	− 40 to + 70 °C
Relative humidity:	≤ 75%, no dew
Altitude:	2000 m max.

Indoor use statement!

Ambient tests

EN 60 068-2-6:	Vibration
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
EN 60 068-2-27:	Shock
Acceleration:	3 × 50 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

Data sheet F535 Le – 03.12 Camille Bauer

Output characteristic

unipolar

live-zero

bipolar

Legend:
E   = Input
EA = Input start value
EE = Input end value
A   = Output
AA = Output start value
AE = Output end value
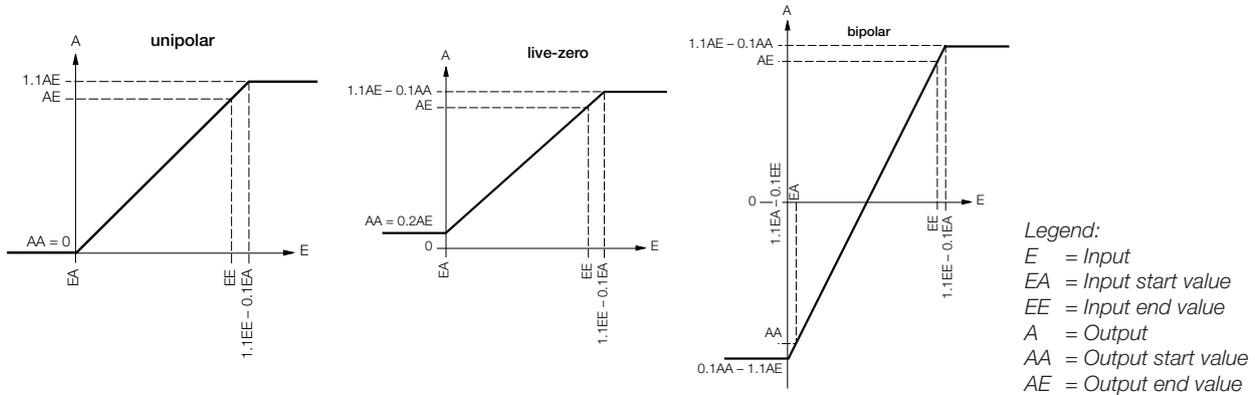
Table 2: Specification and ordering information

| Description		*Blocking code	no-go with blocking code	Article No./ Feature
SINEAX F535	**Order code 535 - xxxx xx**			535 –
Features, Selection				
1. Mechanical design				
Housing P13/70 for rail mounting				4
2. Nominal input voltage Generator and bus bar:				
U_N: 10 … 230 V				1
U_N: > 230 … 690 V Not possible with power supply from measuring input		A		2
3 phase system: Input voltage = phase to phase voltage				
3. Measuring range Frequency: Bus bar = f_S / Generator = f_G				
f_S = 50 Hz / f_G = 49.5 … 50 … 50.5 Hz				1
f_S = 50 Hz / f_G = 47.5 … 50 … 52.5 Hz				2
f_S = 50 Hz / f_G = 45 … 50 … 55 Hz				3
f_S = 50 Hz / f_G = 40 … 50 … 60 Hz				4
f_S = 60 Hz / f_G = 57.5 … 60 … 62.5 Hz				5
Non-standard limit values [Hz] $\Delta f \pm 1\% f_S$ to $\pm 80\% f_S$ f_S and $f_G \geq 10$ Hz to ≤ 1.5 kHz With power supply from measuring input min. 40 Hz, max. 400 Hz, see feature 5, lines 3 and 4				9
4. Output signal 0 … 20 mA				1
4 … 20 mA				2
Non-standard 0 … 1.00 to 0 … < 20, [mA] – 1.00 … 0 … 1.00 to – 20 … 0 … 20 (symmetrical) 1 … 5 to < (4 … 20) (AA/AE = 1/5)				9
0 … 10 V				A
Non-standard 0 … 1.00 to 0 … < 10, [V] – 1.00 … 0 … 1.00 to – 10 … 0 … 10 (symmetrical) 0.2 … 1 to 2 … 10 (AA/AE = 1/5)				Z
AA = Output start value, AE = Output end value				

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Description		*Blocking code	no-go with blocking code	Article No./ Feature
SINEAX F535	**Order code 535 - xxxx xx**			535 –
Features, Selection				
5. Power supply				
85 … 230 V DC, AC				1
24 … 60 V DC, AC				2
Internal from measuring input (24 … 60 V AC)			A	3
Internal from measuring input (85 … 230 V AC)			A	4
Connect to the low tension 24 V AC / 24 … 60 V DC				5
6. Response time				
4 periods of the input frequency (standard)				1
2 periods of the input frequency				2
8 periods of the input frequency				3
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 "Blocking code».

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.

U_G = Measuring input Generator voltage

U_S = Measuring input Bus bar voltage

= Measuring output

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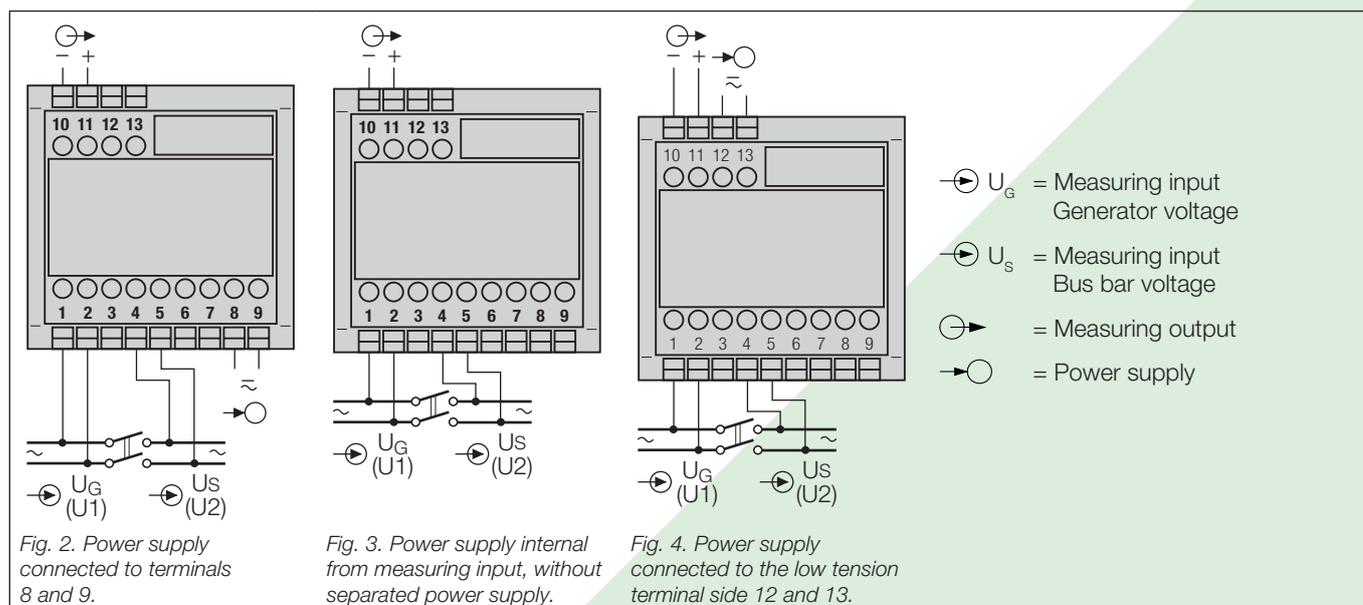
Dimensional drawing
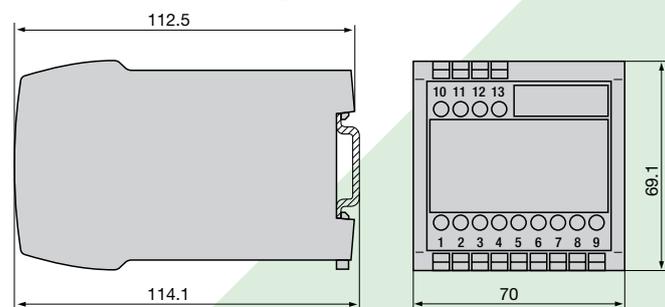
*Fig. 5. Housing **P13/70** clipped onto a top-hat rail (35 x 15 mm or 35 x 7.5 mm, acc. to EN 50 022).*

Standard accessories

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