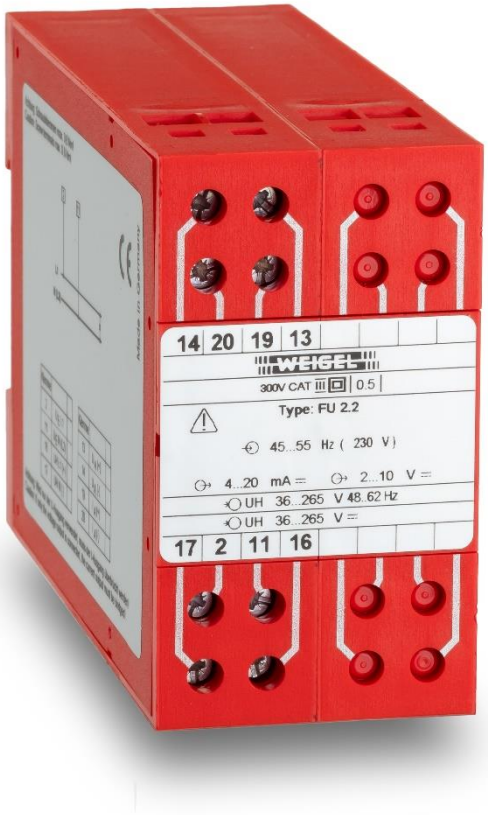
Transducer for frequency

-for sinusoidal signals-

FU 2.2



Application

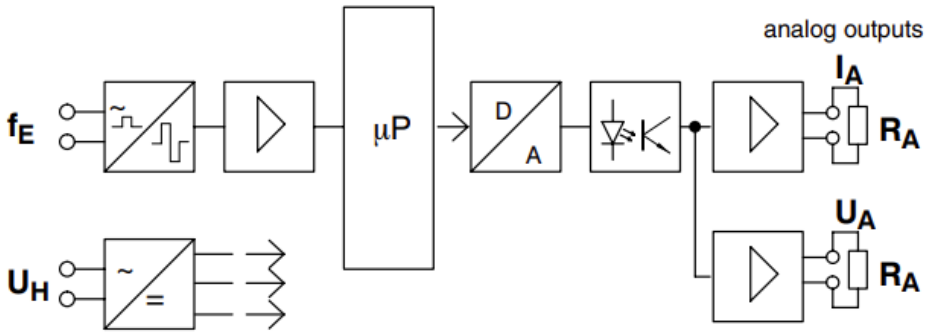
The transducer FU 2.2 convert frequency inputs to proportional load independent DC current and DC voltage output signals. The signals can be transmitted over a considerable distance and fed into indicators, recorders, data loggers and/or control systems. It is possible to connect more than one measuring, recording or control device to the output circuit provided the total impedance does not exceed the rating.
Power supply is provided by a separate auxiliary voltage input. Input, outputs and power supply are galvanically isolated from each other. The output circuits are short-circuit proof and safe against idling.

The transducers are designed to be mounted in machines/systems. Regulations for installation of electrical systems and equipment have to be observed.

Operating principle

The input AC signal is converted into a constant rectangular waveform and then passed to a microprocessor analyzing unit. Using a D/A converter, the signal is fed via an optocoupler for galvanic isolation to the output stages producing a load independent DC current and a synchronous DC voltage proportional to the frequency of the input signal.

Block Circuit Diagram



Note:
Input, outputs and auxiliary voltage are galvanically isolated from each other.

Input

Input rating	sinusoidal AC voltage
Measuring unit	Frequency f_E $f_{Emin} \geq 14$ Hz $f_{Emax} \leq 500$ Hz

Measuring ranges

$f_{Emin}...f_N...f_{Emax}$	Δf	class
45...50...55 Hz	10 Hz	0.2
48...50...52 Hz	4 Hz	0.3
55...60...65 Hz	10Hz	0.2
58...60...62 Hz	4Hz	0.5
360...400...440 Hz	80 Hz	0.2
380...400...420 Hz	40 Hz	0.2

($\Delta f = f_{Emax} - f_{Emin}$)

Rated voltage U_{EN}	100V, 110V, 230V, 240V, 380V, 400V, 415V, 440V
Operating voltage	max. 519 V (300V CAT III)
Overload limit	1.2 U_{EN} continuous, 2 U_{EN}, max.1s
Power consumption	approx. 0.25 mA

Outputs

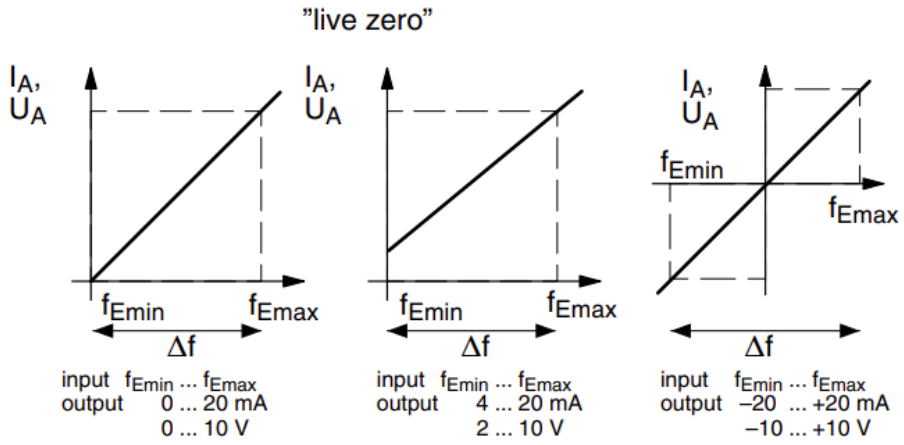
Current output

Output current I_A	impressed direct current
Rated current I_{AN}	0 ... 20 mA or 4 ... 20 mA
Burden area RA	0...10 V / I_{AN}
Current limitation	approx. 120 % of end value

Voltage output

Output voltage U_A	impressed direct voltage
Rated voltage U_{AN}	0...10 V or 2...10 V
Load R_A	≥ 4 kΩ
Load error	≤ 0.1 % based on 50 % load change
Residual ripple	≤ 1 % eff
Response time	approx. 500 ms
Idling voltage	≤ 15 V

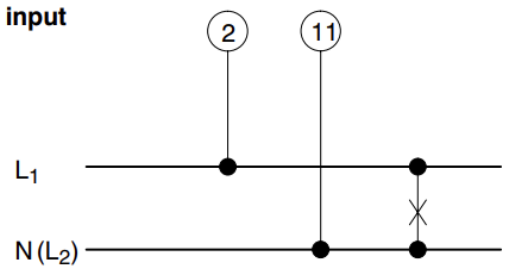
Conversion Characteristics



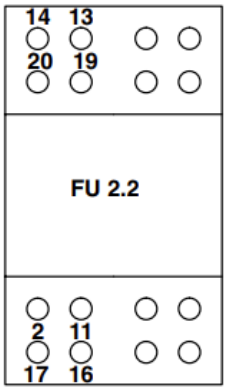
Auxiliary supply

Power supply	auxiliary voltage	power consumption
	20 ... 100 V= or 20 ... 70 V~	< 3 VA
	36 ... 265 V= or 36 ... 265 V~	< 7 VA

Connections



Terminals

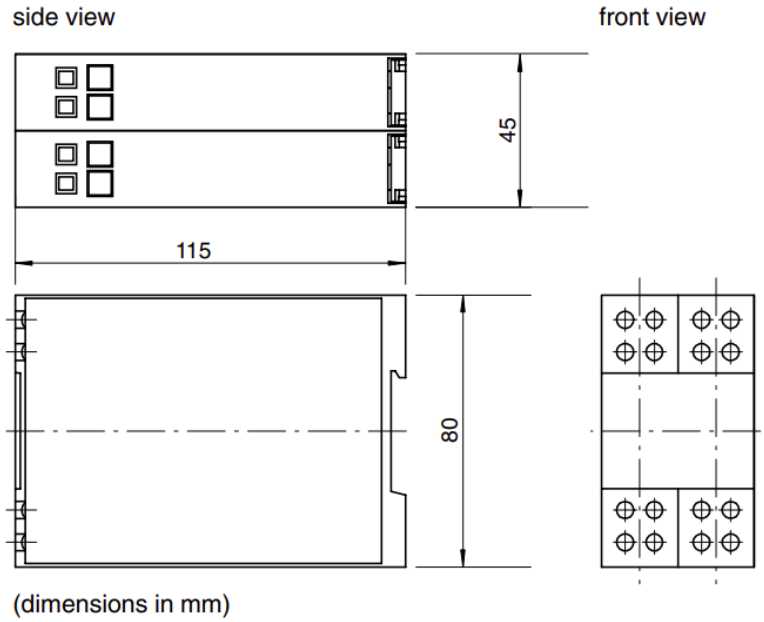


terminal	FU 2.2
2	U_E L_1
11	U_E N (L_2)
13	U_A(+)
14	U_A(–)
16	U_H L1(+)
17	U_H N (–)
19	I_A (+)
20	I_A (–)

UE	Voltage input The numbers on the terminals correspond to the information in the connection diagrams (according to DIN 43 807).
IA	current output
UA	voltage output
UH	auxiliary voltage input

Note:
The two outputs must not be connected to each other!
If only the voltage output is connected, terminals 19 and 20 (current output) must be bridged!

Dimensions



(symbolic illustration)

General technical data

Design	Surface-mounted housing for snap mounting on DIN rail TH 35 according to DIN EN 60 715
Case material	ABS/PC red self-extinguishing according to UL 94 V–0
Connections	Screw terminals, max. torque 0.8 Nm
Wire cross section	max. 4 mm²
Protection class	IP 30 housing IP 20 terminals
Test voltages	Measuring circuit and auxiliary voltage against output: 3510 Vrms 5 sec Measuring circuit and auxiliary voltage against housing: 3510 Vrms 5 sec Output against housing: 2210 Vrms 5 sec
Working voltage	300 V (nominal line voltage phase-zero)
Protection class	II
Measurement category	CAT III
Pollution level	2
Sealevel of the place of use	max. 2000 m above sea level

Special versions (on request)

Input variables

Input frequency	different from standard ranges on request
nominal voltage	different from the standard on request

Accuracy at Reference conditions

accuracy	($\Delta f = f_{Emax} - f_{Emin}$)	
Class 0.2	(± 0.2 % of Δf)	when $f_{Emin} / \Delta f \leq 10$
Class 0.3	(± 0.3 % of Δf)	when $10 < f_{Emin} / \Delta f \leq 12$
Class 0.5	(± 0.5 % of Δf)	when $12 < f_{Emin} / \Delta f$

Temperature drift ≤ 0.02 % / K, valid for standard version and max. 1 year

Reference conditions

Frequency	fn
Input voltage	U_{EN} ± 1 %
frequency	sine wave, total harmonic distortion ≤ 0.1%
Auxiliary voltage	U_{HN} ± 2 %, 48...62 Hz
Ambient temperature	23 °C ± 1 K
Warm-up time	≤ 5 min

Environmental

Climate suitability	Climate class 3 according to VDE/VDI 3540 sheet 2
Working temperature range	-10…+55 °C
Storage temperature range	-25…+65 °C

Relative humidity ≤ 75 % annual average, no condensation Only use the device indoors

Ordering Guide

Order number	measuring transducer for frequency
FMU08-	**FU 2.2**
	Measuring ranges
1	45...50...55 Hz
2	48...50...52 Hz
3	55...60...65 Hz
4	58...60...62 Hz
5	360...400...440 Hz
6	380...400...420 Hz
9	special measuring range
	Voltage input
1	57,5 V
2	63,5 V
3	100 V
4	110 V
5	115 V
6	120 V
7	230 V
8	240 V
9	special voltage input
A	380 V (max. 300 V nominal mains voltage phase-zero)
B	400 V (max. 300 V nominal mains voltage phase-zero)
C	415 V (max. 300 V nominal mains voltage phase-zero)
D	440 V (max. 300 V nominal mains voltage phase-zero)
E	500 V (max. 300 V nominal mains voltage phase-zero)
	Output
1	0...20 mA and 0...10 V
2	0...10 mA and 0...10 V
3	0...5 mA and 0...10 V
4	4...20 mA and 2...10 V
5	-20...0...20 mA and -10...0...10 V
9	special output
	Auxiliary supply
4	DC 20...100 V / AC 20...70 V
5	DC 36...265 V / AC 36...265 V
	Manufacturing certificate
0	without
1	with

*) standard

Order example:

Transmitter for frequency FU2.2, measuring range: 45...50... 55 Hz, Voltage input: 230 V, Output: 4-20 mA, auxiliary power: 230 V, without test protocol.

Item number according to number code: FMU08-17450

Guidelines and standards

Directive 2014/30/EU	EMC Directive
Directive 2014/35/EU	Low Voltage Directive
Directive 2011/65/EU	RoHS Directive
DIN EN 60529	Protection types through housing
DIN EN 60688	measuring transducer for converting alternating current variables into analog or digital signals
DIN EN 60715	Dimensions of low-voltage switching devices Standardized mounting rails for the mechanical fastening of electrical devices in switchgear
DIN EN 61010-1	Safety regulations for electrical measuring, control, regulation and laboratory devices Part 1: General requirements
DIN EN 61326-1	Electrical measuring, control, regulating and laboratory devices - EMC requirements - Part 1: General requirements 61000-4-3 Evaluation criterion B

Safety regulations and general information

- Check the relevant details for installation of the Measuring transducer against the nameplate and the terminal connections to ensure that they are suitable for your area of application.
- The Measuring transducer may only be installed by qualified electricians.
- The Measuring transducer must be checked for transport damage before commissioning and may only be put into operation if it is in perfect condition. In case of safety-relevant damages the device may not be put into operation.
- Ensure that the connections match the terminal connections.

- Circuits must be fused for the maximum permissible currents.
- When commissioning and using the Measuring transducer, the applicable laws, regulations and provisions for the respective area of use and application must be observed.
- The Measuring transducer is not suitable for use in environments with explosive gases or explosive substances.
- The Measuring transducer may only be operated in the environmental and ambient conditions specified in the data sheet. Direct sunlight must be avoided.
- The Measuring transducer may only be installed on non-flammable materials. The applicable fire protection regulations in the area of use and application must be observed.

- Due to the operating voltage, the distance or insulation from other devices must be observed in accordance with the applicable regulations.
- Stranded cables are only permitted if they are fitted with wire end sleeves.
- Connecting cables must be laid away from electromagnetic interference fields.
- Dangerous electrical voltage (more than 75 V DC or more than 50 V AC) can lead to electric shock and burns.

- The Measuring transducer must always be disconnected when fitting, removing, installing, uninstalling or troubleshooting.
- The Measuring transducer is maintenance-free when used as intended.
- Improper use and non-compliance with these safety instructions can lead to serious injury or even death.

Weigel Meßgeräte GmbH
Am Farrnbach 4a
D-90556 Cadolzburg

phone: +49 9103 / 62694-0
www.weigel–messgeraete.de
info@weigel–messgeraete.de

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