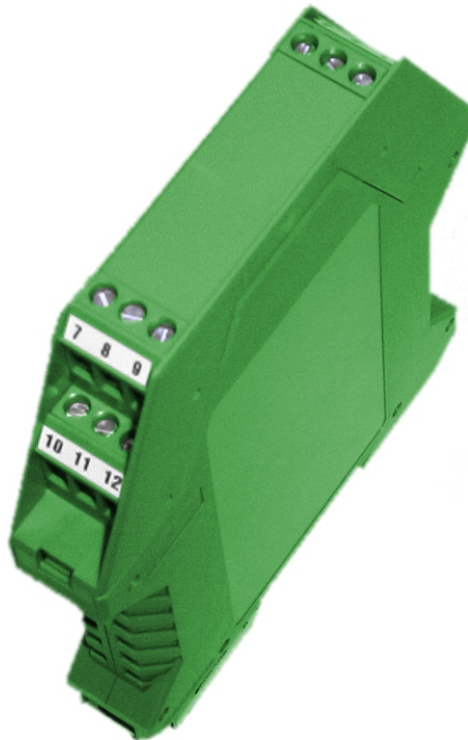

AF 9001

Analogue To Frequency Converter

Instruction Manual



ERMA

Electronic GmbH

Warranty

For delivered products our "Allgemeine Lieferungs- und Zahlungsbedingungen" are effective. In no event we or our suppliers shall be liable for any other damages whatsoever (including, without limitation, damages for loss of business profits, business interruption or other pecuniary loss) arising out of or inability to use this product.

All our products are warranted against defective material and workmanship for a period of two (2) years from date of delivery. If it is necessary to return the product, the sender is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit. The warranty does not apply to defects resulting from action of the buyer, such as mishandling, improper interfacing, operation outside of design limits, improper repair or unauthorized modification.

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1. Description

The unit **AF 9001** is an analogue to frequency converter for converting an analogue input signal into a proportional output frequency signal.

The input signal (either voltage or current) is processed by an internal converter into a frequency.

The input signal may be a voltage 0...10V or a current 0/4...20 mA. The final value of the input signal (20 mA resp. 10 V) results in an internal frequency of 25 kHz. The actual frequency at the output channel is determined by an internal divider value. The value of the divider can be adjusted by the user. The range of the divider value can be selected between 1 and 4080. The value can be adjusted by the user. For this reason the converter is provided with an internal 8-pole DIP-Switch (divider range 1...255) and 5 jumper. positions (ranges 1, 2, 4, 8, 16). The output frequency is proportional to the input frequency divided by the value of the divider. The puls/pause ratio is 1:1.

Construction

Picture 1, the block diagram shows the construction and the functions of the screw terminals.

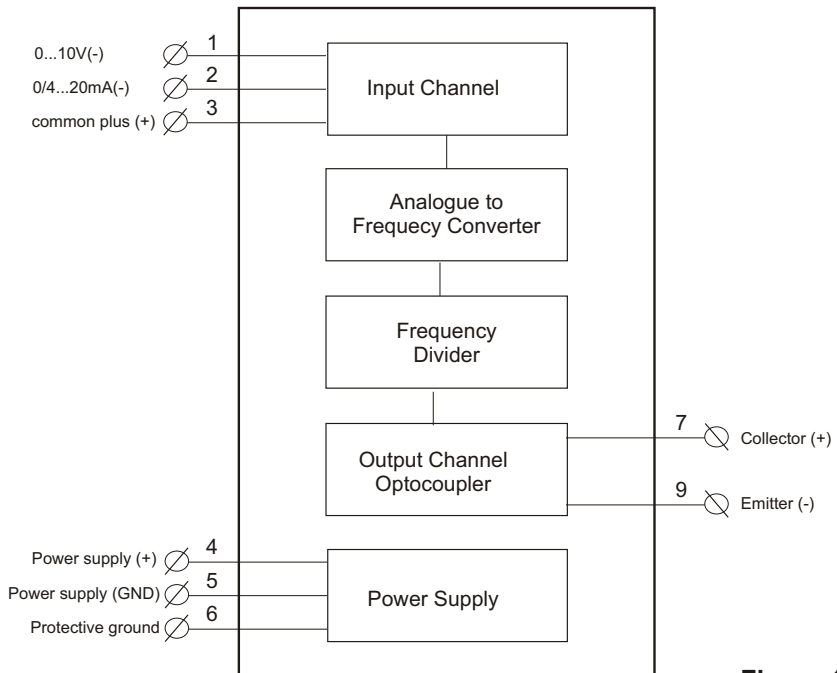


Figure 1

2. Safety Instructions

This instrument is produced in accordance with Class II of IEC 348 and VDE 0411. When delivered the instrument has been tested to meet all functions described. Before installing the instrument please read the mounting and servicing instructions. We have no liability or responsibility to customer or any other person or entity with respect to any liability, loss or damage caused or alleged to be caused directly or indirectly by equipment or software sold or furnished by us. Read the installation instruction carefully. No liability will be assumed for any damage caused by improper installation. Inspect the instrument module carton for obvious damage. Be sure there are no shipping and handling damages on the module before processing. Do not apply power to the instrument if it has damaged.

ERMA's warranty does not apply to defects resulting from action of buyer, such as mishandling, improper interfacing, operation outside of design limits, improper repair or unauthorized modifications.

2.1. Symbol explanation



Caution



Attention



Instruction



Tip

Caution: Will be used at **dangerous for life and health !**.

Attention: Will cause **damage**

Instruction: If not noticed, **trouble** may occur

Tip: Useful hints for **better operation**

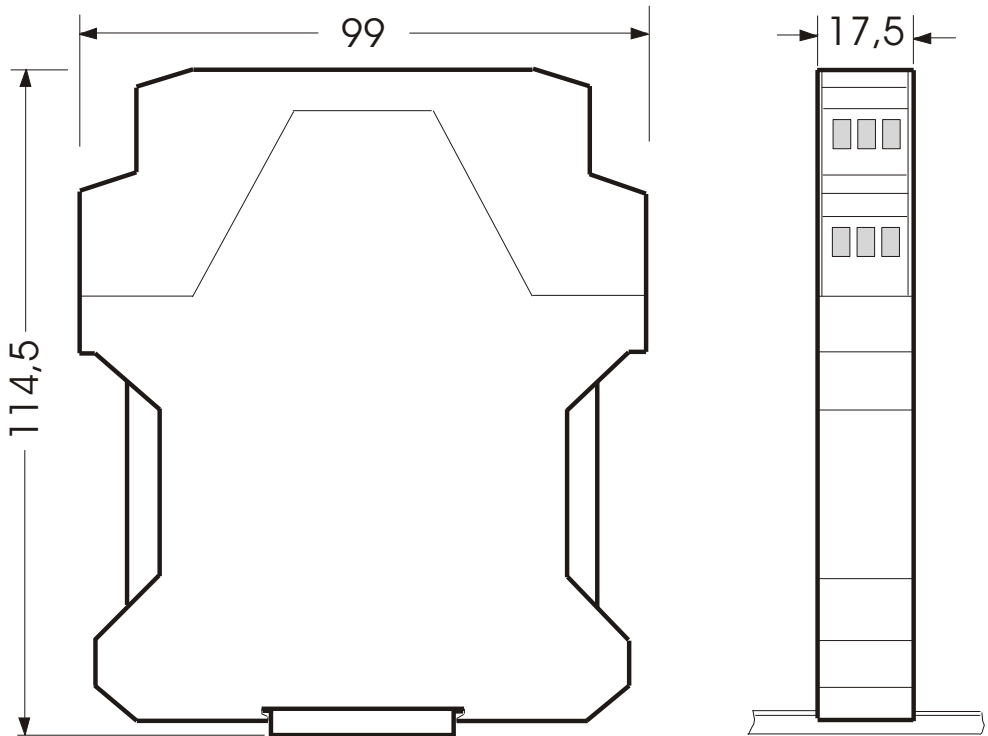
3. Mounting

3.1. Place of operation

Attention must be paid to the protection against humidity, dust and high temperatures at the place of operation.

3.2. Mounting of signal converter

Simple snap up at 35 mm rail (DIN EN 50022).



4. **Electrical connections**

4.1. **General instructions**



- It is forbidden to plug or unplug terminals with voltage applied.
- Attach input and output wires to terminals only without voltages applied.
- Cords must be provided with sleeves.
- Attention must be paid that the power supply voltage applied will agree with the voltage noticed at the name plate.
- The instrument has no power-on switch. So it will be in operation as soon as the power supply voltage is connected.

4.2. **Hints against noisy environment**

All inputs and outputs are protected against noisy environment and high voltage spikes. Nevertheless the location should be selected to ensure that no capacitive or inductive interference can have an effect on the instrument or connection lines.

It is advisable:

- To use shielded cables.
- The wiring of shields and ground (0V) should be star-shaped.
- The distance to interference sources should be as far as possible. If necessary, protective screen or metal enclosures must be provided.
- Coils of relays must be supplied with filters.
- Parallel wiring of input output lines to any AC power lines should be avoided.
- The lines should be as short as possible.
- It is advisable to use shielded twisted pair cable for input and output lines.



5. Function

The unit **AF 9001** is an analogue to frequency converter for converting an analog input signal into a proportional output frequency. The input signal (either voltage or current) is processed by a converter into a frequency. The final value of the input signal (20 mA resp. 10 V) results in a internal frequency of 25 kHz. The actual frequency at the output channel can be adjusted by a built in divider. The wished dividing value may be adjusted by the user. This could be done by an internal 8-pole DIP-switch and 5 jumper. The output frequency is proportional to the input frequency and the puls/pause ratio is 1:1.

The input channel is protected against overvoltages and spikes. The following inputs ranges are deliverable. The desired input range has to be specified according to the ordering information.

- 0...10 V
- 0...20 mA
- 4...20 mA

The output channel is isolated. The output transistor is able to switch up to 30 V and 25 mA.

The frequency at the final value of the input signal is an internal frequency of 25 kHz . By the built -in divider the frequency can be adjusted in a wide range to customer requirements.

6. Opening the case

Many functions of the model AF 9001 can be configured according the requirements of the user. For this reason there are some jumper and one DIP-switch located inside of the unit. For the configuration of the of AF 9001 the device must be opened. For opening the case only a small screw driver is needed. With the screw driver the two flat links between the top and the base of the housing have to be pressed inwardly

on both sides. When the flat links were pressed, the top can be separated from the base. Now, the PCB can be pulled out together with the top of the housing.

Look for the possible jumper and DIP-switch settings in figure 4 at the next page.

To put the housing together, just push the top with the PCB inside the base until the flat links snap in on both sides.

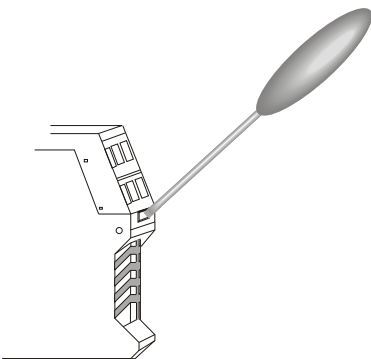


Figure 2

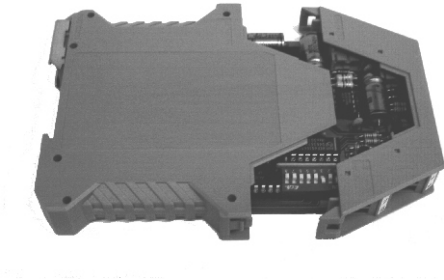


Figure 3

7. Jumper and DIP-Switch

The printed board is shown in figure 4. In figure 4 the equipment for configurations is labelled. The equipment consists of an array of jumpers labelled J3 and one 8-pole DIP-Switch.

Ajusting the divider:

For adjusting the value of the divider the 8-pole DIP-switch table 1, and the jumper field J3 must be used.

- **8-pole DIP-Switch::**Select of a numerical value of table 1 from 1 to 255
- **Jumper field J3::** Select four values from 1 to the value of 16

Selection of a numerical value:

There is one 8-pole DIP-switch located at the PCB.board. The adjustment of the switches must be made using binary code. The possible values to be selected are shown in table.

Number of DIP-Sitch	Divider Value
1	1
2	2
3	4
4	8
5	16
6	32
7	64
8	128

Example:

If wanted a desired divider value is
value = 100.

The following switches must in position "ON"

Number 7, value = 64

Number 6, value = 32

Number 3, value = 4

7. Jumper and DIP-Switch

The final divider value is the sum of the switches located in position ON.

$$\text{sum} = 64 + 32 + 4 = 100$$

For the adjustment of the jumper field J3 there is only one jumper which must be used. The values selectable are 1, 2, 4, 8, or 16. The value of the 8-pole DIP-Switch will be multiplied with the value selected by the position of the jumper of field J3.

Example:

The desired divider value will be 800. In this case the jumper of field "8" must be selected. The value consists as follow:

$$\text{Divider value} = 100 * 8 = 800$$

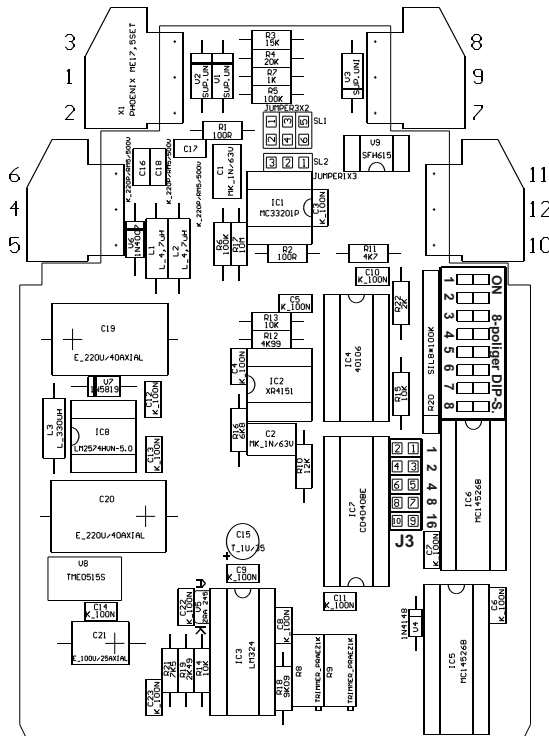


Figure 4

Hints for adjusting and operating of the output channel

Some hints when using the output channel must be observed. The output channel is realized by an optocoupler device. So the external voltage at the output channel and the load resistance applied must meet the requirements of the unit.

The load resistance applied is dependent of the adjusted frequency of the output channel. The table below shows the value of the required load resistance using different output frequencies.

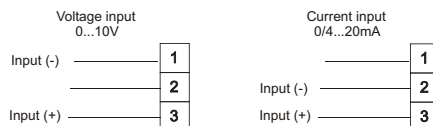
Max. output frequency	Value of load resistance
25 kHz	1 k
20 kHz	1k
15 kHz	1.5k
10 kHz	3k
5 kHz	6k
1 kHz	>6k

8. Connections

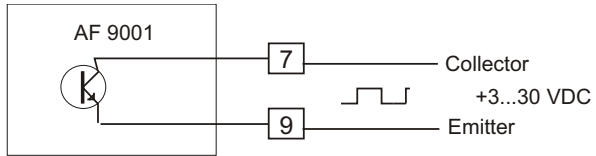
8.1. Srew Terminals Assignment

1	0...10 V input voltage terminal (-)	7	Collector of the output optocoupler (+)
2	0/4...20 mA input current terminal (-)	8	nc
3	Common plus for Input channel 1/2 (+)	9	Emitter of the output optocoupler (-)
4	Power Supply DC (+)	10	nc
5	Power Supply (GND)	11	nc
6	Protective ground	12	nc

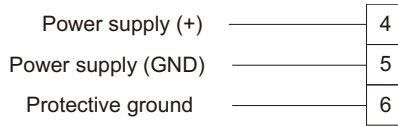
8.2. Connections of the input channels



8.3. Connections of the output channel



8.4. Connection of the power supply used



9. Startup Procedure

All devices of ERMA-Electronic GmbH are tested for perfect function during production as well as when delivered. Nevertheless it is possible that a device won't work. That is not always a reason by the new device. There are many small reasons that will result in misfunctions. If the AF 9001 won't work properly, please check the following points.



- Look for proper supply voltage
- Look for proper wiring of supply
- Look for proper configuration of the divider value
- Look if high voltage spikes are existing and have an influence to the device.

If all tests are all right, the device must be send back for controlling.

10. Handling of Malfunction

All devices of ERMA-Electronic GmbH are tested for perfect function during production as well as when delivered. Nevertheless it is possible that a device won't work. That is not always a reason by the new device. There are many small reasons that will result in misfunctions. If the AF 9001 won't work properly, please check the following points.

- Look for proper supply voltage
- Look for proper wiring of supply
- Look for proper configuration of the divider value
- Look if high voltage spikes are existing and have an influence to the device.

If all tests are all right, the device must be send back for controlling.

Attention! If changing the jumper or DIP-switch configuration, power supply must be switched off and on.

Delivery status:

Input voltage level = 24 V;

Multiplier = 10,0

Measuring time = 1 period

11. Technical Datas

11.1. Elektrical Datas

Input channels

Input voltage range	: 0...10 V, adjustable
Input resistance	: 100 k
Input current ranges	: 0/4...20 mA
Input resistance	: 100

Divider

Range	: 1...4080
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Output channels

Low-side or high-side switching	: adjustable
Isolation voltage	: 500 V
Voltage, opto-coupler	: max. 30 V DC
Current, opto-coupler	: max. 25 mA
Frequency, opto-coupler	: max. 25 kHz

Accuracy

: better 0,2%

Power supply

Standard	: 18...36 V DC
Current consumption	: max. 56 mA (24 V DC)
Isolation voltage	: 500 V
Other supply voltages	: see ordering information

11.2. Environmental Conditions

Operating temperature	: 0 .. 50 °C
Storage temperature	: -20 .. 70 °C
Humidity	: < 80 %, not condensing
Protection	: class II
Protection index	: case IP 40
	: connections IP 20
Field of application	: class 2
	: overvoltage protection II
CE	: in conform with 2014/30/EU
	: 2011/65/EU - 2015/863

11.3. Mechanical Datas

Case	: DIN rail mounting according : DIN EN 50022, 35 mm
Dimensions	: 17,5 x 99 x 114,5 mm
Weight	: ca.100 g
Connections	: 12 screw terminals

12. Ordering information

AF 9001 -			
			Output Channel
		0	0...25 kHz
		1	reserved
			Input Channels
		0	0...10 V
		1	0...20 mA
		2	4...20 mA
		3	reserved
			Power Supply
		0	18 ..36 V DC, (standard)
		1	4.5 ... 9 V DC, (option)
		2	9 ...18 V DC, (option)
		3	36 .. 48 V DC, (option)

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