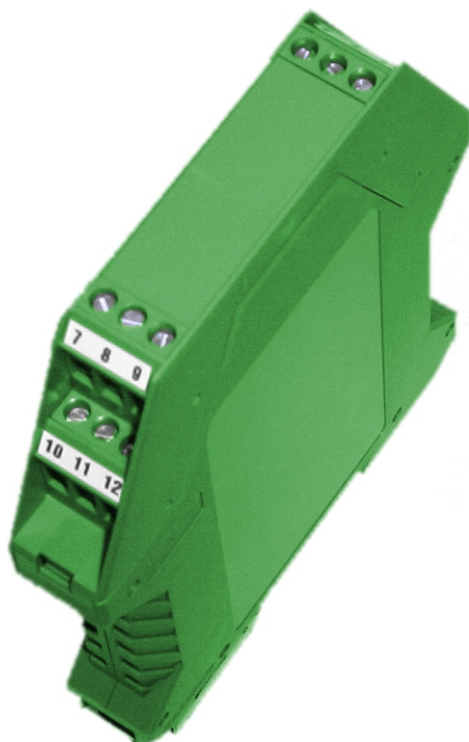

FM 9000

**Signal Converter
Multiplying Frequency Unit**

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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Technical subjects to change

1. Description

The model type **FM 9000** is used for converting an input frequency to a proportional output frequency, but different to the input frequency by a selected factor. The unit **FM 9000** is able to generate output frequencies higher than the applied input frequency.

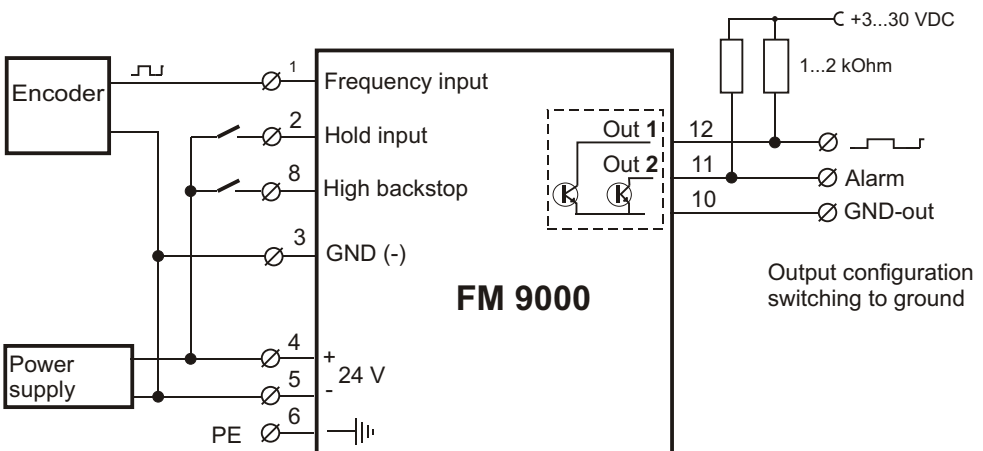
The conversion value itself, the multiplier, is selectable by the user. The conversion time can be chosen between one or ten periods. The accuracy achieved depends on the adjusted factor, the input frequency applied, and the conversion time. Using one period as conversion time, accuracy is better than 0.1%, if the product of input frequency and selected factor is lower than 1000. Selecting ten period as conversion time, accuracy is better than 0.1%, if the product of factor and input frequency is lower than 10000.

There are three input channels and two output channels. All channels are optically isolated from the internal circuitry. By this way disturbances by a noisy environment are avoided.

One channel is used for the applied input frequency. A second input channel is able to switch off the two output channels. This channel can be used as start-up inhibit. The third input channel has a hold function. If activated, the output frequency will be constant, independently of the input frequency.

For correct technical applications voltage levels of the input channels are adjustable by the user.

There are two output channels. One output channel serves as frequency output. The second output channel is used to indicate, if the input frequency is too low or the output frequency too high. The output channels are open-collector outputs and can be configured by the user for high- or lowside configurations.



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**

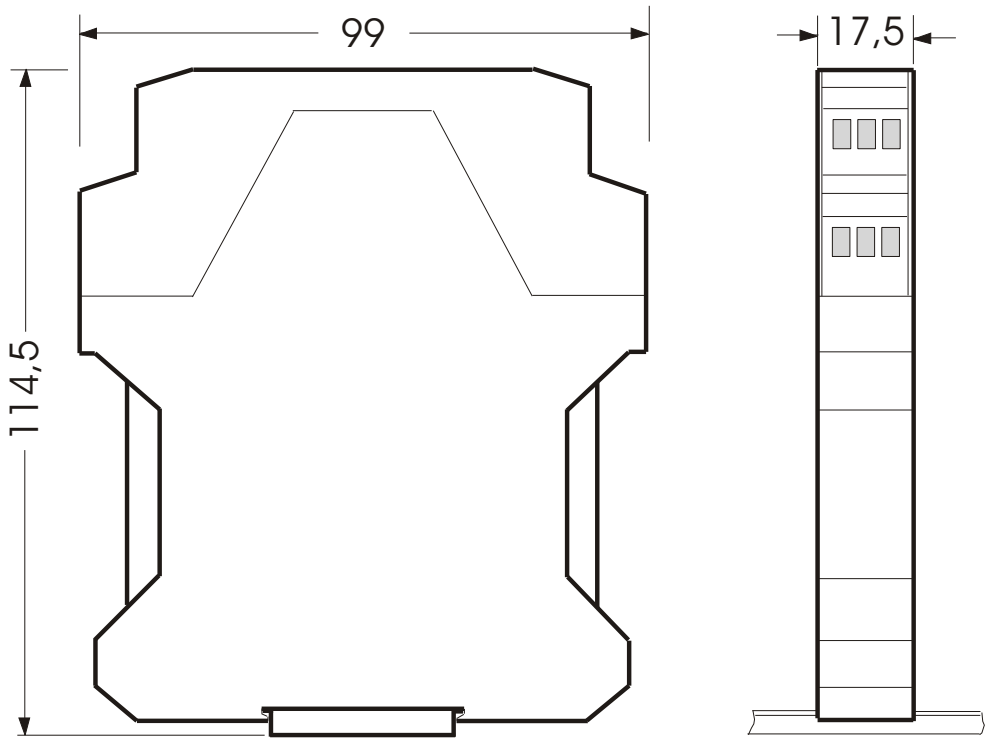
3. Mounting

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 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 signals and AC power lines should be avoided.
- The parallel output lines must be as short as possible.
- It is necessary to use shielded twisted pair cable for the RS422-lines as well as for the SSI signal lines



5. Function

The model type **FM 9000** can be used for converting an input frequency " F_{IN} " to a proportional output frequency " F_{OUT} ". The conversion time is very short. The conversion time can be chosen between 1 or 10 periods of the input frequency. The output frequency " F_{OUT} " can be calculated by the following equation:

$$F_{OUT} = (\text{Multiplier} * F_{IN})/\text{periods}$$

The Multiplier is adjustable by the user by an internal 16-pole DIP-Switch. The unit **FM 9000** is able to generate output frequencies higher than the applied input frequency. The accuracy achieved depends on the adjusted multiplier, the input frequency applied, and the conversion time. Using one period as conversion time, accuracy is better than 0.1%, if the product of input frequency and selected factor is lower than 1000. Selecting 10 periods as conversion time, accuracy is better than 0.1%, if the product of factor and input frequency is lower than 10000.

Input and output channels

There are three input channels and two output channels. All channels are optically isolated from the internal circuitry. By this way disturbances by a noisy environment are avoided.

One input channel is used for the applied input frequency. A second input channel is able to switch off the two output channels. This channel can be used as start-up inhibit. The third input channel has a hold function. If activated, the output frequency will be constant, independently of the input frequency. For correct technical applications voltage levels of the input channels are adjustable by the user.

There are two output channels. One output channel serves as frequency output. The second output channel is used for a warning message, indicating that the input frequency is too low or the output frequency too high.

The output channels are open-collector outputs and can be configured by the user for high- or lowside switching. Max. output current is 25 mA.

Alternatively the output channels can be delivered as solid state outputs. Output frequency is then limited to 5 kHz, but output currents up to 0.5 A are possible.

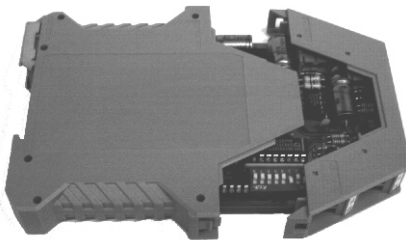


Figure 2

6. Opening the case

Many functions of the model FM 9000 can be configured according to the requirements of the user. For this reason there are some jumper and DIP-switches located inside of the unit. For the configuration of the FM 9000 the device must be opened.

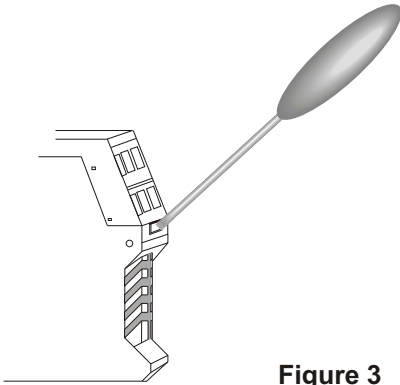


Figure 3

To open the Housing of the FA9000 only a small screw driver is needed. With the screw driver the two little 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.

7. Jumper and DIP-Switch Configuration

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 SL1 to SL7 and two 8-pole Dip-switches labelled SW1 and SW2.

Adjustment of the voltage level of the input channels:

The voltage level of the input channels can be configured for input voltage levels of 24 V, 12 V and 5 V. Each input channel can be adjusted separately. For adjusting the run-up input voltage the jumper SL2 must be used, for the hold input channel jumper SL3, and for the frequency input channel jumper SL4. For all these jumpers the general conditions are valid:

- 24 V --> no jumper is used
- 12 V --> pin 2 and 3 must be connected by a jumper
- 5 V --> pin 1 und 2 must be connected by a jumper

Multiplier:

For adjusting the value of the multiplier the two 8-pole DIP-switches must be used. There are the following possibilities of adjustment:

- selection of a numerical value from 1 to 999
- selection of four ranges of the numerical value
- selection of four time-out values for a alarm message.

7. Jumper and DIP-Switch Configuration

Selection of the numerical value: There are two 8-pole DIP-switches labelled SW1 and SW2. The adjustment of the digits must be made using BCD-code. The two most significant numerical digits are adjustable by DIP-switch SW1 and the least significant digit by the lower DIP-switch SW2 with the switches 1 to 4. This means for the upper DIP-switch SW1:

DIP-switches 1...4 (valency: 8, 4, 2, 1); adjustable range 1...9 = 100...900

DIP-switches 5...8 (valency: 8, 4, 2, 1); adjustable range 1...9 = 10...90

and for the lower DIP-switch SW2

DIP-switches 1...4 (valency: 8, 4, 2, 1); adjustable range 1...9 = 1...9

The numerical value is the sum of the switches in position "ON".

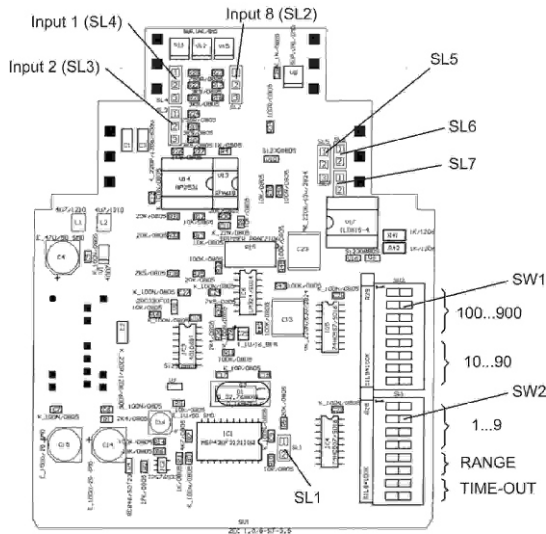


Figure 4

Example: The numerical value 168 shall be adjusted. The position of the switches is:

upper switch SW1: 4 = ON --> value 100

upper switch SW1: 6 = ON --> value 40

upper switch SW1: 7 = ON --> value 20

lower switch SW2: 1 = ON --> value 8

sum --> 168

Multiplier ranges: For the selection of the multiplier value the switches 5 and 6 of the DIP-Schalter SW2 are provided according the table below.

DIP-switch 5	DIP-switch 6	Factor	Range
OFF	OFF	0,001	0,001...0,999
OFF	ON	0,01	0,01...9,99
ON	OFF	0,1	0,1...99,9
ON	ON	1	1...999

Example: If DIP-switch 5 = ON and DIP-switch 6 = OFF (factor = 0.1), the value of the multiplier is

$$\text{Range} = 168 \cdot (0,1) = 16,8.$$

Adjustment of time-out: The time-out is controlling the frequency of the input channel. If the input frequency is absent or lower than the time-out the alarm output will be activated and the frequency output channel switched off. Generally the time-out must be longer than the lowest period time of the input frequency.

For the selection of the time-out value the switches 7 and 8 of the DIP-Switch SW2 are provided according the table below.

DIP-switch 7	DIP-switch 8	Time-out-value
OFF	OFF	0,1 Sekunden
OFF	ON	1 Sekunde
ON	OFF	10 Sekunden
ON	ON	100 Sekunder

Accuracy: For the calculation of the input frequency the time of one period of the input frequency is measured. The advantage of this method is a short reaction time of the FM 9000.

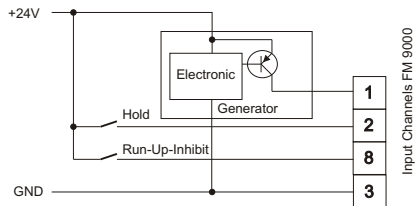
Using higher input frequencies or erratic input frequencies there is the possibility to use a measuring time of 10 periods of the input frequency. In this case jumper SL1 must be set. When using 10 periods attention must be paid that the range of the multiplier is divided by 10! On the other hand accuracy is put up to the value of 10.

8. Connections

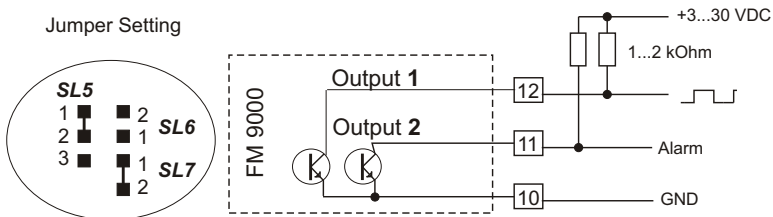
8.1. Srew Terminals Assignment

1	Input Frequency Channel (+)	7	nc
2	Hold Input Channel (+)	8	Run-Up-Inhibit Input Channel (+)
3	GND for Input Channels (-)	9	nc
4	Power Supply DC (+)	10	Output Channel
5	Power Supply (GND)	11	Output Channel
6	Protective Connection	12	Output Channel

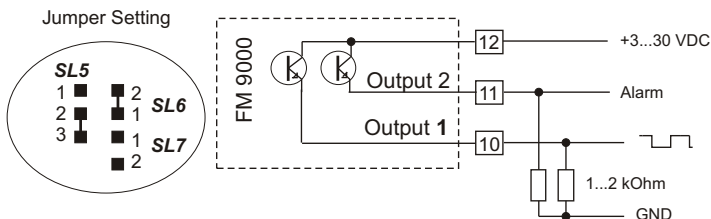
8.2. Connections of input channels



8.3. Connections of output channels, low-side switching

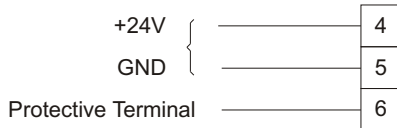


8.4. Connections of output channels, high-side switching



8.5. Connection of the power supply

Power Supply 18...36VDC



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 FA 9002/S01 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 FM 9000 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

Voltage	: 5, 12, 24 V, adjustable
Tolerance of input voltage level	: +/- 20%
Max. input frequency	: 500 Hz without jumper SL1 5 kHz with jumper SL1
Input source current	: 5 mA
Isolation voltage	: 500 V

Multiplier

Ranges (1 period)	: 16-pole DIP-switch : 0.999 / 9.99 / 99.9 / 999
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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. 10 kHz
Voltage, solid state relays	: max. 30 V DC
Current, solid state relays	: 0.5 A
Frequency, solid state relays	: max. 5 kHz

Accuracy

Measuring time 1 period	: better 0,1%, if : (Input frequency)*(factor) ≤ 1000
Measuring time 10 Periods	: (Input frequency)*(factor) ≤ 10000

Power supply

Standard	: 18...36 V DC
Current consumption	: max. 20 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 89/336/EWG : NSR 73/23/EWG

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

FM 9000 -			
			Output Channel
		0	optocoupler output
		1	solid state relais output
			Input Channels
		0	standard
		1	48 V
		2	reserved
		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)

ERMA - Electronic GmbH
Max-Eyth-Str. 8
D-78194 Immendingen

Telefon (07462) 2000 0
Fax (07462) 2000 29
email info@erma-electronic.com
Web www.erma-electronic.com

