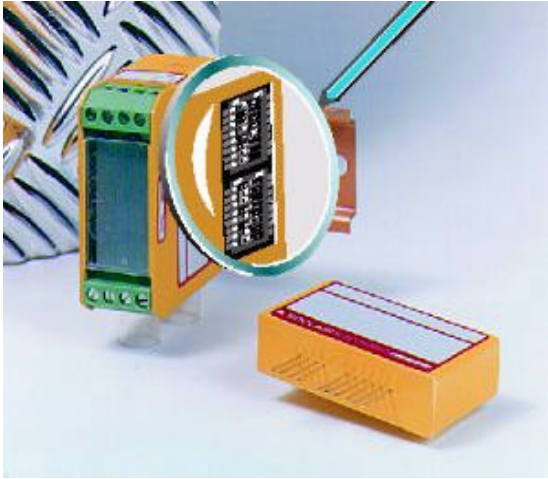


# Frequency to Voltage/Current-Transducer FVM70/82



## General Description

These transducers convert a frequency signal of any form and polarity into a normalised voltage or current signal (e.g., 0-10 V or 0/4-20 mA). A microprocessor measures the frequency or the period and controls the analog output signal. The measurement range is selected via DIL-switches on the reversal of the unit. The standard version has 64 calibrated ranges from 0-100 Hz to 0-28.8 kHz. Intermediate values can be adjusted using the build in potentiometers.

Special versions are available for low frequencies (FVM70/82 – L). The measuring range can be selected via DIL-switches in steps of 0.1 Hz between 0-0.1 Hz and 0-12.7 Hz or in steps of 1 Hz between 0-1 Hz and 0-127 Hz. The analog output signal is completely ripple-free. All ranges are calibrated.

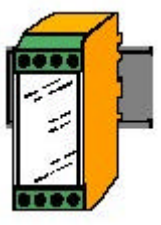
Versions FVM70/82-2L allow the adjustment of the measuring range in steps of 10 Hz between 0-10 Hz and 0-1270 Hz. The analog output signal is completely ripple-free. All ranges are calibrated.

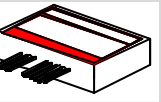
**Transducers for frequencies between 0.1Hz und 30 kHz, with DIN-rail housings or for printed circuit boards.**

**Special versions for very low input frequencies, ripple-free analog output signal.**

- For flow measurement and other frequency signals
- Microprocessor based, digital frequency to voltage conversion, extremely accurate
- Schmitt-trigger input protects against interference, AC-coupling
- Control LED on units with 24 V power supply

## Overview

Housing for DIN-rails	Type	Output	Supply	Range	Special Features
 <p>Dimensions: 55x60x23mm</p>	FVM 70	V	19-30V/ ±15V	progr.	Ranges from 100 Hz to 28800 Hz
	FVM 82	0/4-20mA	19-30V	progr.	Ranges from 100 Hz to 28800 Hz
	FVM 70-L	V	19-30V/ ±15V	progr.	Ranges from 0.1 Hz to 127 Hz
	FVM 82-L	0/4-20mA	19-30V	progr.	Ranges from 0.1 Hz to 127 Hz
	FVM 70-2L	V	19-30V/ ±15V	progr.	Ranges from 10 Hz to 1270 Hz
	FVM 82-2L	0/4-20mA	19-30V	progr.	Ranges from 10 Hz to 1270 Hz

Housing for printed circuits	Type	Output	Supply	Range	Special Features
 <p>Dimensions: 55x32x15mm</p>	FVM 10	V	18-30V/ ±15V	progr.	Ranges from 100 Hz to 28800 Hz
	FVM 32	0/4-20mA	18-30V	progr.	Ranges from 100 Hz to 28800 Hz
	FVM 10-L	V	18-30V/ ±15V	progr.	Ranges from 0.1 Hz to 127 Hz
	FVM 32-L	0/4-20mA	18-30V	progr.	Ranges from 0.1 Hz to 127 Hz
	FVM 10-2L	V	18-30V/ ±15V	progr.	Ranges from 10 Hz to 1270 Hz
	FVM 32-2L	0/4-20mA	18-30V	progr.	Ranges from 10 Hz to 1270 Hz

# Technical Data

Specifications (Max. values at 25°C)

General	A	C	D	Unit
Linearity error, range, 0-1 kHz	0.01	0.02	0.1	%
3dB-Bandwidth, typ. <sup>1)</sup>	5	5	5	Hz
Settling time auf 1% typ. <sup>1)</sup>	200	200	200	ms
Calibration error	0.03	0.05	0.15	% FS
Max. rippel, noise and jitter (FVM70/82, > 200 Hz):	0.1	0.1	0.1	%

Input	A	C	D	Unit
Input impedance, typ.	50	50	50	kOhm
Input level, min. <sup>2)</sup>	0.5	0.5	0.5	V
Input level, max.	40	40	40	V

Stability of gain with:	A	C	D	Unit
Temperature	30	70	150	ppm/K
Age, 1 year	400	800		ppm
Age, 10 years	1200	2500		ppm

<sup>1)</sup> Bessel low-pass filter 2nd order. Other Bandwidth on request. At 50 Hz input, approx. 1% output ripple (0-100 Hz-Range). No output ripple using low frequency versions -L, -2L

<sup>2)</sup> Other input levels on request.

Temperature range in °C: recommended: 0/60 functional: -20/90

## Frequency Input

The module processes both unipolar and bipolar impulses or frequency signals of almost any form. In standard modules the frequency signal is AC-coupled. For symmetrical signals (duty cycle 50%), the trigger level is automatically at the mid-point. If required, DC-coupling can also be supplied for very asymmetrical signals (e.g., needle pulses). In this case, the trigger level is always positive (between 50 mV and 3 V).

Hysteresis is standard approx. 300 mV, other values on request (up to 2 V for higher insensitivity to noise).

### Low frequency version -L, -2L:

Min. Input frequency version -L: 0.014 Hz lower range (max. 12.7 Hz), 0.9 Hz upper range (max. 127 Hz), frequency signals below these values result in a zero output signal (reaction time up to 71 sec for low range, up to 2 sec for high range).

Min. Input frequency version -2L: 1 Hz, lower input frequencies result in a zero output signal (reaction time approx. 1 sec.)

## Analog Output

**Voltage (FVM70):** Standard between 0 und 10 V, on request also negative values (down to -10 V). The output is short circuit proof and protected against overvoltages. The technical data (specs) are valid for the current output, the voltage output is usually slightly more accurate and stable. Min. output voltage with unipolar power supply: approx. 20 mV.

**Current (FVM82):** Standard 0-20 mA or 4-20 mA (please specify when ordering), short circuit proof. Other output ranges on request.

**Settling time version -L** if no input pulses present: 71 sec low range, 1.2 sec upper range. During this time, the last output value is kept. Different reaction times or frequencies on request.

## Measurement Ranges

The selection of the measuring range is done using the values of the tables. The max. calibration error is 0.1%. Intermediate values can be adjusted using the internal potentiometers (external one in case of printed circuit housing). Standard output values: 0-10 V, 0-20 mA or 4-20mA.

If an input range is specified by the customer, the correct settings will be done prior to delivery.

## Power Supply

All modules are suited for unregulated, noisy industrial power supplies, nominal value is 24 VDC (min. 19 V, max. 30 V). Other supply voltages on request (e.g. 15 V). Current consumption without load is approx. 10 mA. For a negative output voltage a negative power supply is needed (e.g. -15V or -24V) or an optional DCDC-converter has to be used (option 1). AC power supply on request.

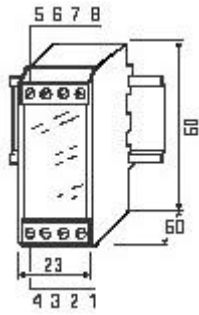
## Options

1. **DC-DC-converter** (integrated in the module) for a galvanic isolation of the power supply or to generate a negative power supply. Test voltage 1 kV oder 3 kV.
2. **Adjustable limit switch** GW1 (integrated).
3. **Other ranges**, other time constants etc.
4. **Potentiometer**, for an adjustment without PC

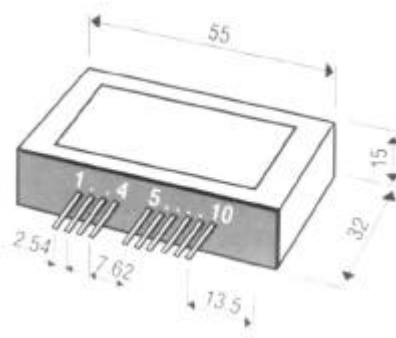
## Frequencies below 100 Hz:

The standard version FVM70/82 has a output ripple for input frequencies below approx. 100 Hz (reflecting the input frequency). Below approx. 10 Hz the output is pulsed. If frequencies below approx. 100 Hz have to be measured we strongly recommend to use our low frequency versions -L or -2L. The analog output of these modules are completely ripple-free.

## Dimensions



DIN-Rail-Module



Printed Circuit-Module

## Connections FVM70/82 (screw terminals)

- 1: Power supply + (24 V DC)
- 2: Power supply - (24 V DC) or ground unipolar supply
- 3: Analog out - (analog ground)
- 4: Analog out + (current 0/4-20 mA or voltage 0-10 V)
- 6: Ground (e.g. for screening)
- 7: Signal - (signal ground)
- 8: Signal + (frequency input)

## Connections SIGF10/32 (pins for printed circuit)

- 1: Power supply - (24 V DC) or ground unipolar supply
- 2: Power supply + (24 V DC)
- 3: Analog out + (current 0/4-20 mA or voltage 0-10 V)
- 4: Analog out - (analog ground)
- 5: Signal - (ground) and potentiometer-ground
- 6: Offset-potentiometer
- 7: Gain-potentiometer
- 8: Signal + (frequency input)

## DIL Range Switches

The DIL switch is located inside the module. Remove the transparent plastic cover carefully, then the printed circuit board can be pulled out (pull the screw terminals). The settings of the switches always refers to the standard output range of 0–10 V, 0–20 mA or 4– 0 mA. If an input range is specified by the customer, the correct settings will be done prior to delivery.

### Settings for FVM70-L und FVM82-L:

The setting takes place in steps of 1 Hz or 0.1 Hz binary coded, depending of the setting of switch 8: Step is 0.1 Hz if 8 is “off”, and 1 Hz if 8 is “on”.

Switch 8 on	
Switch	Range
1: on	+1 Hz
2: on	+2 Hz
3: on	+4 Hz
4: on	+8 Hz
5: on	+16 Hz
6: on	+32 Hz
7: on	+64 Hz
8: on	

max. Frequency: 127 Hz

Switch 8 off	
Switch	Range
1: on	+0.1 Hz
2: on	+0.2 Hz
3: on	+0.4 Hz
4: on	+0.8 Hz
5: on	+1.6 Hz
6: on	+3.2 Hz
7: on	+6.4 Hz
8: off	

max. Frequency: 12.7 Hz

**Example:** A measuring range of 0 to 10 Hz = 0 to 10 V is required. Switches 3,6,7 must be “on” and 8 “off”: 0.4 Hz + 3.2 Hz + 6.4 Hz gives together 10 Hz.

Note: If all switches are off, the output is 0.

**Minimal input frequency version -L:** 0.014 Hz for lower range (8 off) and 0.9 Hz for higher range. An input frequency which is lower than these values results an a zero output.

## Settings for FVM70-2L und FVM82-2L:

Switch 8 off	
Switch	Range
1: on	+10 Hz
2: on	+20 Hz
3: on	+40 Hz
4: on	+80 Hz
5: on	+160 Hz
6: on	+320 Hz
7: on	+640 Hz
<b>8: off</b>	

The setting is done in steps of 10 Hz (binary coded), max. range is 1270 Hz.  
 Note: **Switch 8 must always be "off" !**

**Example:** 0 to 500 Hz = 0 to 10V or 20 mA.  
 In this case switches 2, 5, 6 must be "on" and 8 "off": 20 Hz + 160 Hz + 320 Hz results in a total of 500 Hz.

**max. Frequency: 1270 Hz** (all switches on)

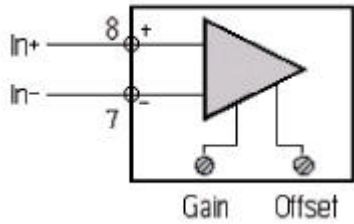
## Settings for FVM70 and FVM82:

Frequency Hz	DIL-Switch					
	1	2	3	4	5	6
100.000	on	on	on	on	off	off
125.000	on	on	off	on	off	off
140.625	on	off	on	on	off	off
156.250	on	off	off	on	off	off
166.667	off	on	on	on	off	off
187.500	off	on	off	on	off	off
200.000	on	on	on	off	on	on
208.300	off	off	on	on	off	off
225.000	off	off	off	on	off	off
250.000	on	on	off	off	on	on
281.250	on	off	on	off	on	on
312.500	on	off	off	off	on	on
333.333	off	on	on	off	on	on
375.000	off	on	off	off	on	on
400.000	on	on	on	off	on	off
416.000	off	off	on	off	on	on
450.000	off	off	off	off	on	on
500.000	on	on	off	off	on	off
562.500	on	off	on	off	on	off
625.000	on	off	off	off	on	off
666.667	off	on	on	off	on	off
750.000	off	on	off	off	on	off
800.000	on	on	on	off	off	on
833.333	off	off	on	off	on	off
900.000	off	off	off	off	on	off
1'000.000	on	on	off	off	off	on
1'125.000	on	off	on	off	off	on
1'250.000	on	off	off	off	off	on
1'333.333	off	on	on	off	off	on
1'500.000	off	on	off	off	off	on
1'600.000	on	on	on	on	on	on
1'666.667	off	off	on	off	off	on

Frequency Hz	DIL-Switch					
	1	2	3	4	5	6
1'800.000	off	off	off	off	off	on
2'000.000	on	on	off	on	on	on
2'250.000	on	off	on	on	on	on
2'500.000	on	off	off	on	on	on
2'666.667	off	on	on	on	on	on
3'000.000	off	on	off	on	on	on
3'200.000	on	on	on	on	on	off
3'333.333	off	off	on	on	on	on
3'600.000	off	off	off	on	on	on
4'000.000	on	on	off	on	on	off
4'500.000	on	off	on	on	on	off
5'000.000	on	off	off	on	on	off
5'333.333	off	on	on	on	on	off
6'000.000	off	on	off	on	on	off
6'400.000	on	on	on	on	off	on
6'666.667	off	off	on	on	on	off
7'200.000	off	off	off	on	on	off
8'000.000	on	on	off	on	off	on
9'000.000	on	off	on	on	off	on
10'000.000	on	off	off	on	off	on
10'666.667	off	on	on	on	off	on
12'000.000	off	on	off	on	off	on
12'800.000	on	on	on	off	off	off
13'333.333	off	off	on	on	off	on
14'400.000	off	off	off	on	off	on
16'000.000	on	on	off	off	off	off
18'000.000	on	off	on	off	off	off
20'000.000	on	off	off	off	off	off
21'333.333	off	on	on	off	off	off
24'000.000	off	on	off	off	off	off
26'666.667	off	off	on	off	off	off
28'800.000	off	off	off	off	off	off

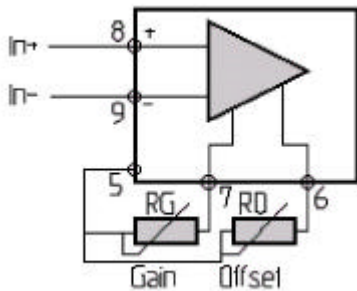
The standard output range is 0 – 10 V, 0-20 mA or 4 – 20 mA, the tables are referring to these outputs. If a **different output range** is required, e.g., 0-1 kHz = 0-2 V, one must calculate the corresponding measurement range for 0-10 V, i.e., in the above example 0-5 kHz = 0-10 V. When this range is selected one automatically obtains 0-1 kHz = 0-2 V. The rule is: always convert first to 0-10 V (or 0-20 mA or 4-20 mA).

### Connection of the Frequency Signal, DIN-Rail-Module



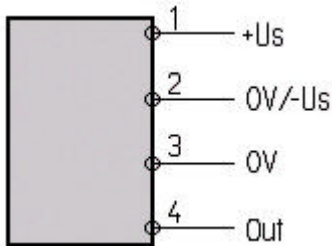
Terminal 7 (In-) is connected internally with ground

### Connection of the Frequency Signal, Printed Circuit-Module



Pin 9 (In-) is connected internally with ground  
 The external potentiometers are standard 10 kOhm, adjustment range approx. 5%.

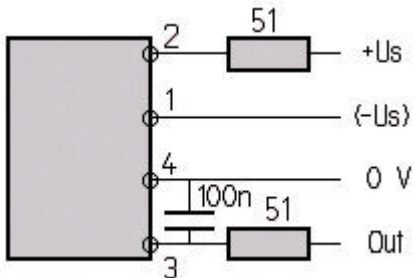
### Connection of Power Supply and Output (DIN-Rail-Module)



Terminal 1: Pos. supply, nominal 24 VDC, min. 19V  
 Terminal 2: Ground supply/neg. supply if bipolar  
 Terminal 3: Signal ground (and power supply ground if bipolar)  
 Terminal 4: Signal output (V or mA)

Versions with 2-port-isolation (option 1): supply terminals 1,2 are galvanically isolated from output terminals 3,4

### Connection of Power Supply and Output (Printed Circuit-Module)



Terminal 1: Ground power supply /neg. supply  
 Terminal 2: Pos. power supply, nominal 15/24 VDC  
 Terminal 3: Signal output (V or mA)  
 Terminal 4: Signal ground, (and power supply ground if bipolar)

If HF-noise can't be excluded, we recommend to add a filter (e.g. 50 Ohm/100nF) to the output.

## Adjustment of Measurement Range and Zero Point (Offset)

The modules with a fixed measurement range are precisely calibrated at the factory (error usually less than 0.05%), further calibration is generally unnecessary. If the output values are not correct, first of all check the connections, the power supply (is the supply voltage correct ?), the experimental arrangement and all instruments in use. We recommend that when working with programmable or configurable modules, the calibration should be checked after each new adjustment.

Adjustment is performed using a calibrator or a calibrated sensing device. The zero point (offset) is adjusted via the "Offs" potentiometer and the full scale value is adjusted via the "gain" potentiometer. The zero point is adjusted first and then the full scale. Where large adjustments are necessary, the procedure should be carried out several times. For additional reliability, the output value should be measured at half the measurement range (linearity test). The output of modules with a unipolar supply voltage can't reach exactly 0. In such cases, zero point adjustment must be performed with an input value which produces a non-zero output value.

### Important note:

Soclair Electronics is continually working to improve the quality and reliability of its products. MTBF (using MIL217) is well above 10 years (in most cases even more than 100 years). Nevertheless, electronic devices in general can malfunction or fail due to their inherent physical and chemical properties. It is the responsibility of the buyer, when utilizing Soclair Electronic products, to observe standards of safety and to avoid a situation in which a malfunction or failure of a Soclair Electronic device could cause loss of human life, injuries or damage to properties. Soclair Electronic products are not authorized for use in life support systems.