# LABOR – ASTER

**INDUSTRIAL AUTOMATION**

AC 083
QMS

## PROGRAMMABLE LOW FREQUENCY CONVERTER
## type FP-S2-LF

- **Dedicated to measurement network frequency 50Hz**
  **Range of input frequencies 0.5Hz ÷ 30kHz**
- **Programmable standard of output analog signal:**
  **4÷20mA or 0,05÷10V**
- **Two programmable alarm thresholds,**
- **Galvanic isolation of circuits**
- **input / output / supply**
- **Mounting on TS35 rail**
- **Setting the parameters using the Labor Programmer program**


### APPLICATION:

The transmitter converts the linear frequency of the input signal to a standard analog signal 4÷20mA or 0.05÷10V. The input, output and power supply circuit are mutually galvanically isolated.

The converter has relay outputs and optical indication of two alert thresholds.

The converter is most of all designed to measure the network frequency 50Hz. Programmable range of measured frequency is 0.5Hz÷30kHz.

The converter if configured by Labor Programmer software and RS232 serial port. The user can program the following parameters:

- lower and upper range of the frequency of the input signal,
- switching thresholds of two alarm signals (two thresholds for each alarm signal allows you to set the maximum and minimum).
- output type current / voltage
- time limit of the measurement (timeout)

On request, the converter can be equipped with selective input system allowing shaping of the frequency response and the input circuit adapted to small and large signal amplitudes. Standard input has hysteresis (Schmidt system), which reduces object interference.

A typical application of the converter is to work with:

- angle-pulse track converters
- two-wire proximity sensors (e.g. NAMUR 1.2/2.1mA) or three-wire sensors,
- oscillation and vibration sensors,
- cooperation with turbine flow meters and vortex (Vortex)
- flow meters with pulse output signal such as COMMON OPTO, with 1.2 / 2.1 mA signal.

### BASIC TECHNICAL PARAMETERS:

| | | | |
|---|---|---|---|
| 1. | Dimensions | - | 22,5x99x114,5mm |
| 2. | Mounting | | on TS35 rail |
| 3. | Power supply | - | 22V÷30Vdc / 80mA |
| 4. | **Standard input signal:** | | |
| | **- voltage** | - | 0/5V ÷ 0/24V /20kΩ |
| | switching thresholds Hi/Lo | | 2.6V/3.8V |
| | **- current** | - | NAMUR 1,2mA/2,1mA/1kΩ |
| | switching thresholds Hi/Lo | - | 1,45mA/1,85mA |
| 5. | **Custom input signal:** | | |
| | **- voltage** | - | as agreed |
| | **- current** | - | as agreed |
| 6. | **Frequency range:** | - | **programmable** 0.5 Hz ÷ 30 kHz |
| 7. | **Output signal:** | | **programmable** |
| | - current | - | 4 ÷ 20mA / 800Ω |
| | - voltage | - | **0,05** ÷ 10V / 2kΩ |
| 8. | Time limit (timeout) | - | calculated automatically from fmin or set manually |
| 9. | Output response time | - | current measured interval + 4ms + time constant 20ms (or other) |
| 10. | Total output update time | - | response time + timeout (in case of lack of input singal) |
| 11. | **Class** | - | **0,03% up to 10kHz** **0,1% up to 30kHz** |
| 12. | Maximum output current | - | 25mA |
| 13. | Max load of alarm relays | - | 1A/120Vac |
| | | - | 2A/24Vdc |
| 14. | Connection cables terminal | - | 0,5 ...2,5mm$^2$ |
| 15. | Insulation test voltage | - | 2 kV |
| 16. | Error due to ambient temperature | - | 0,01% / °C |
| 17. | Additional output to power the sensor e.g. proximity sensor: | | |
| | standard | - | 8,2V / 20mA |
| | acceptable (on request) | - | 3 … 12V |
| 18. | Operating conditions: | - | |

- Ambient temperature - storing: -30°C...+60°C
- Ambient temperature - working: -25°C...+60°C
- Relative humidity: max 90%, no water vapor condensation
- Ambient atmosphere: free from dust and aggressive fumes

Safety requirements – PN-EN 61010-1:2002
EMC requirements – PN-EN 61000-6-1, PN-EN 61000-6-3

## DESCRIPTION OF OPERATION:

The converter measures input pulses frequency through measurement of time interval between 2 falling edges. In case of higher frequencies the devices measures time interval between 4 edges (900Hz…5kHz) and 16 edges for frequencies >5kHz. Analog output signal is updated not less often than t = 1/f + 4ms, were f is the current measured frequency. After entering the maximal frequency the program will decide if the input edge division (4 or 16) should be set).

If there is no input signal then after set time (timeout) the device will automatically set wrong state of the output signal ("control" -100 which is -1%) so in case of current analog output 4-20mA it will be 3.84mA. Timeout is set automatically after entering the minimal frequency. It is possible to manually correct this value. When the input signal is suddenly turned off, the output signal is hold at the value before it happened. After the timeout time the output switches to -1%. For this reason, the device is not suitable for measuring evry low frequencies, e.g. <1Hz. Example: if the range is set to 0.1Hz…100Hz, then in order for the device to correctly measure frequencies of 0.1Hz (10s period), it must have the timeout set to >10s (e.g. 12s). This means that when the input frequency was 100Hz (the output was 20mA, assuming the output range is 4-20mA) and it suddenly disappears (e.g. the connection line is damaged), the 20mA at the output will remain for another 12s and then drop to 3.84mA (-1%). This may not be acceptable in some applications. This behavior of the device is no longer a problem when the lower frequency of the range is e.g. 10Hz (0.1s period). Then the timeout can be, for example, 110ms and this will be the delay in changing the output signal from 20mA to 3.84mA (plus 0.2s of the analog time constant – see fig. 2.) in the event of a loss of the 100Hz input.

Maximal and minimal frequencies set the operating range of the device. In this range the program converts the value of measured frequency to "control" value which is an abstract value of values 0…10000. It represents level of the signal in 0,01% units and is used to set the output analog signal as well as alarm thresholds. It is acceptable to exceed the "control" signal by 10%. It means that the device operates in "control" range from -100 to 11000 [0,01%] which is -1% to 110%.

Two alarm thresholds with hysteresis can be programmed. Alarm will switch on after reaching the "control" signal to level entered in field "Turning on the alarm". When the alarm is on and the "control" signal will reach the level entered in filed "Turning off the alarm" the alarm will switch off. In alarm state the corresponding red LED (PK1 or PK2) is lit on and alarm relay is switched. **Alarm 1 indicates exceeding input frequency above set threshold. Alarm 2 indicates exceeding input frequency below set threshold.**

Green LED is lit on then the correct supply is provided and internal processor is working properly.

To set the converter you should:

- use a computer with serial transmission terminal and installed program „*Labor Programmer*",
- connect RS232 computer terminal to COM input of the converter (RJ11 socket, cable is sold separately: Cable RS232 (labor-automatyka.pl)). If the computer does not have RS232 interface USB-RS232 adapter should be used,
- connect the power supply to the device,
- start the Labor Programmer program.

Transmission parameters are constant: address 127, speed 9600, 8, N, 1. Internal accuracy of the calculation is 15 bits (0,003%) no matter to exponent position which is why some calculation rounding can be seen during setting of the parameters. Program allows you to read currently programmed parameters and to modify them. RS232 COM terminal should be used only to program the desired parameters.

Design of the converter is for mounting on TS35 rail in control closet.
For small input signals, to reduce the influence of the site interferences, connection should be done with shielded cable.

## PROGRAM PAGE OF LABOR PROGRAMMER WITH AVAILABLE PARAMETERS:

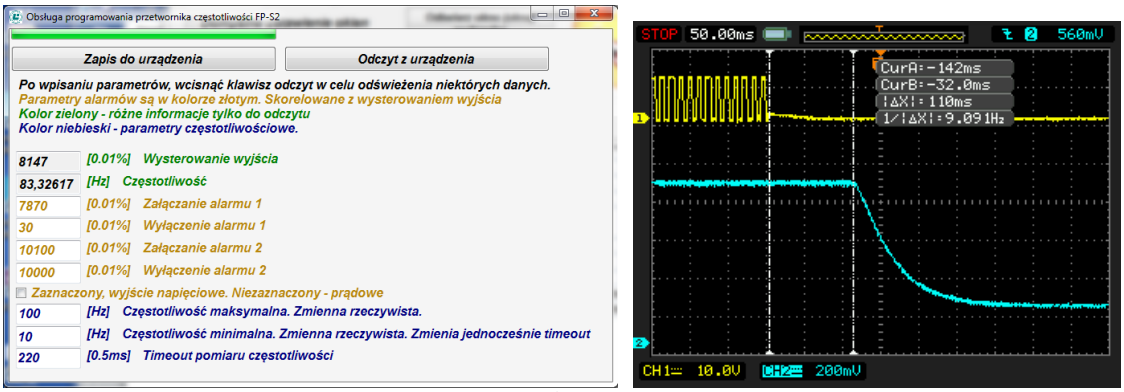


Fig. 1. Oscillogram shows behavior of the device when input signal disappear.

After programmed time of timeout=220·0.5ms=110ms since input signal disappear the processor makes a decision to set -1% as the output signal. After additional time which is from time constant of analog output (about 200ms) the output signal reaches -1%.

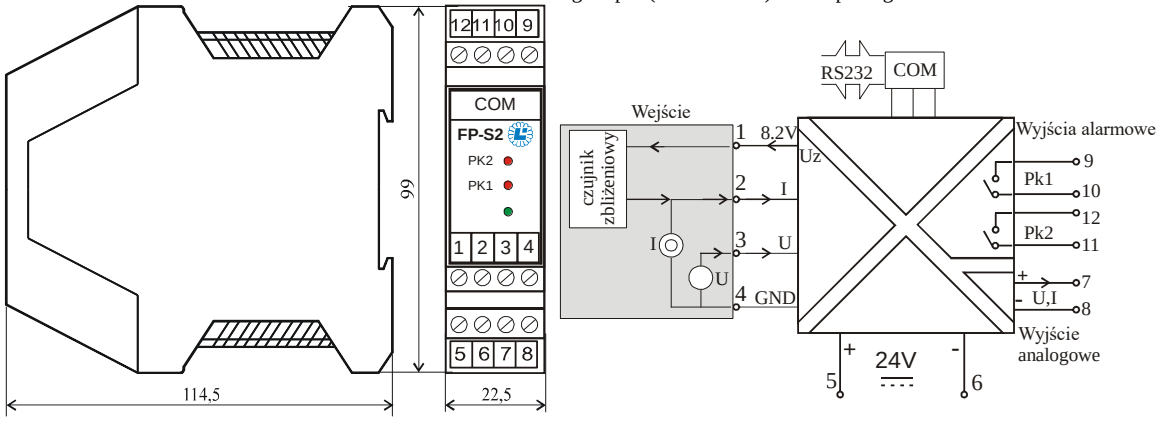


Fig. 2. Housing drawing and description of the terminals of converter FP-S2-LF.

### HOW TO ORDER:

Programmable low frequency converter type FP-S2-LF in case of not standard input signal – describe it.


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The manufacturer reserves the right to make changes to the product.


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