



# LABOR – ASTER

## INDUSTRIAL AUTOMATION



Certyfikat nr QS/14/07



AC 083  
QMS

## RMS CURRENT OR VOLTAGE CONVERTER type RMS-S2

- **Input:** current or voltage alternating analog signal (AC+DC)
- **Frequency band:** 10 kHz with 1% error
- **Output :** any standard
- **Galvanic separation** between input, output and power supply circuits
- **ZERO and SPAN** regulation by incremental keys
- **Possibility of choosing** converting function and digital filter



### APPLICATION :

Converter **RMS-S2** is designed to measure RMS or average value of signals (especially distorted signals e.g. from thyristor converter) and then convert it to standard current or voltage analog signal.

Input signals can be voltage or current flowing through internal shunt for currents lower than 5A. For measuring greater currents user must use current converter or install external shunt.

All circuits (input, output, power supply) are galvanically separated from each other. d

User can choose one of the three converting functions :

$$- \text{RMS} = \sqrt{\frac{1}{T} \int_0^T [f(t)]^2 dt}$$

$$- \text{average rectified value} = \frac{1}{T} \int_0^T |f(t)| \bullet dt$$

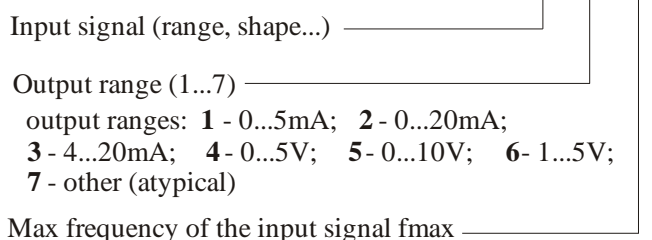
$$- \text{average value} = \frac{1}{T} \int_0^T f(t) \bullet dt$$

User can also choose one of the three kinds of digital filter:

- fast with time constant  $\tau = 0,1$  s.
- standard with time constant  $\tau = 0,5$  s.
- slow with time constant  $\tau = 2$  s.

For specialized staff a procedure of the automatic calibration of the converter is available.

### HOW TO ORDER: RMS-S2-



Note: for current input provide information about voltage in the circuit where the current is measured.

### ORDER EXAMPLE:

RMS converter, input sinus 0...5Aac in circuit 230Vac, output 4...20mA, max input signal freq. 50Hz, type: **RMS-S2-(0...5Aac in circuit 230Vac)-3-50Hz**

### BASIC TECHNIAL PARAMTERES :

Input signal –	voltage	-	minimal range 0...60 mV
	current	-	maximal range, 0...500 V
			internal shunt up to 5A
Shape of the input signal	-	any alternating signal (DC+AC)	
<b>Note: Standard version is AC+DC. If DC should be cut off please specify it in the order.</b>			
Sampling frequency	-	50kHz	
Input resistance	-	depending on the range	
	current input	-	~ 0,02Ω for 5A
	voltage input	-	≥ 2 MΩ for 230V
<b>Note: version for cathodic protection with <math>R_{in} \geq 10M\Omega</math> is recommended with converter type U-S2A, link: <a href="http://U-S2A(labor-automatyka.pl)">U-S2A (labor-automatyka.pl)</a></b>			
Input signal dynamic	-	2,5 x range	
Output signal	-	any standard : 0/4...20mA,	
		0...10V or other	
Load resistance $R_{load}$	-		
	for 0/4...20mA	-	≤ 550Ω
	for 0...10V	-	≥ 2kΩ
Accuracy class	-		0,2% for f=4kHz
			1% for f=10kHz
			5% for f=30kHz
Nonlinearity	-		±0,025%
Temperature drift	-		0,01 % / °C
Error due to load changes ( $R_{load}$ )	-		0,05%
Galvanic separation 2kV/50Hz	-		between all circuits
Configuration of the converter	-		by internal keys
“Zero” and “Span” regulation	-		in range of ±20% by internal keys
Operation indicator	-		LED in the front panel
Time constant of the digital filter	-		settable 0.1s, 0.5s, 2s
Power supply voltage	-		nominal 24 VDC / 60mA
			allowed 22...28 VDC
Housing	-		rail 106.7 x 79 x 12.5mm
Housing protection level	-		IP 20
Operating conditions	-		
	ambient temperature	-	0...55°C
	relative humidity	-	do 95%
Safety requirements	-		PN-EN 61010-1:2002
EMC requirements	-		PN-EN 61000-6-1
			PN-EN 61000-6-3

## DESCRIPTION OF THE CALIBRATION AND CONFIGURATION OF THE CONVERTER:

Four keys and two LEDs are accessible after sliding out the converter from the housing which allow calibration and configuration of the converter.

- “0%” – regulation of the beginning of the measurement range,
- “100%” – regulation of the end of the measurement range,
- “UP” – increase key,
- “DOWN” – decrease key,
- LED\_A – indication diode,
- LED\_B – indication diode.

### Converting function indication

When the converter is in normal operation mode LEDs indicate chosen converting function in the following way::

- LED\_A and LED\_B lights – RMS
- only LED\_A lights – average rectified value
- only LED\_B lights – average value

### Indication of the digital filter value

After simultaneously pressing “0%” and “100%” keys the converter enters configuration mode and indicates value of the digital filter by alternately flashing LED\_A and LED\_B with frequency depending on chosen filter:

- flashing frequency 5 Hz – fast filter ( $\tau = 0.1s$ )
- flashing frequency 2 Hz – standard filter ( $\tau = 0.5s$ )
- flashing frequency 0.5 Hz – slow filter ( $\tau = 2s$ )

### Configuration of the converting function

In the configuration mode (both LEDs flashing) pressing and holding “DOWN” key cause indication of the converting function (as described above in chapter Converting function indication). To change the converting function user has to press “UP” key, while “DOWN” key is pressed and hold, until the desired function is chosen (indicated by LEDs).

### Configuration of the digital filter

In the configuration mode (both LEDs flashing) each pressing of “UP” key changes the value of the digital filter to the next value (as described above in chapter Indication of the digital filter).

### Calibration procedure of the input of the converter (only for version AC+DC !!!)

To perform calibration procedure of the input an accurate DC signal setting unit with values from the whole range of the converter input is needed. Connect it to the converter input. Set 0% of the signal. Press “DOWN” key and hold it for about 10 sec until LED\_B starts flashing. For next 4 sec (LED\_B flashing) the converter is being calibrated. If the operation was performed correctly the converter will enter normal mode (LEDs indicated chosen converting function). If there was an error both LEDs will start flashing alternately with frequency of about 10Hz. Then set 100% of the signal and do the same but using “UP” key. LED\_A will start flashing and rest is as above.

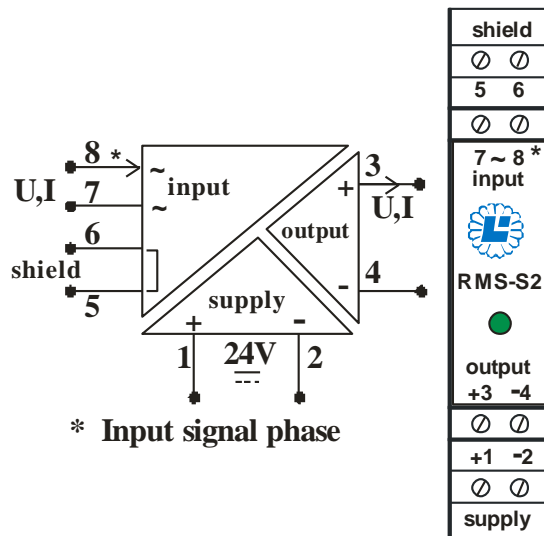
### Calibration procedure of the output of the converter

To perform calibration procedure of the output an accurate meter is needed. Connect it to the converter output. By pressing “0%” or “100%” keys output signal is set respectively to 0% or 100% of the range regardless of the input signal. LED\_A is flashing for 100% of the output signal and LED\_B for 0%. Changing the value of 0% or 100% of the output signal is possible by:

- a) for the beginning of the range (0%): holding “0%” key and pressing “UP” key to increase the value of the signal for 0% or “DOWN” for decreasing it,
- b) for the end of the range (100%): similarly holding “100%” key and pressing “UP” / “DOWN” keys for changing the value of the signal for 100%.

Longer holding of the “UP” or “DOWN” keys while changing the value of the signal causes dynamic growth.

**NOTE:** The converter is factory calibrated. Incompetent performing of the calibration procedure can cause wrong operating of the converter.



\* Input signal phase

**Note:** Terminals 5-6 are used to connect the braided shield of the input signal cable. If the input signal (terminals 7-8) is not galvanically separated from the ground GND or PE terminals 5-6 (shield) cannot be connected to GND or PE. Terminals 5-6 can be connected to the braided shield of the input signal cable only if the braided shield is not connected to the ground GND or PE from the other side of this cable.

If in some point the shield is connected to the ground GND or PE connecting the shield to the terminals 5-6 can cause a **burn** (damage) of the input circuit when the measured signal is galvanically connected with power supply network e.g. 230Vac.

This situation can occur when measuring voltage or current (shunt) in power grid without the use of transformers with separation.



The response of the output (yellow signal) to the unit step of the input signal (blue signal) with the fast filter set. The delay of the output response can be up to 80ms, because this is the period of updating the output signal control by the processor measuring the input signal (with the digital filter set to 0.1s). The rise time resulting from the analog time constant is about 200ms. The total time of setting the output can be about 200...300ms.

Production and distribution:

**LABOR – ASTER**

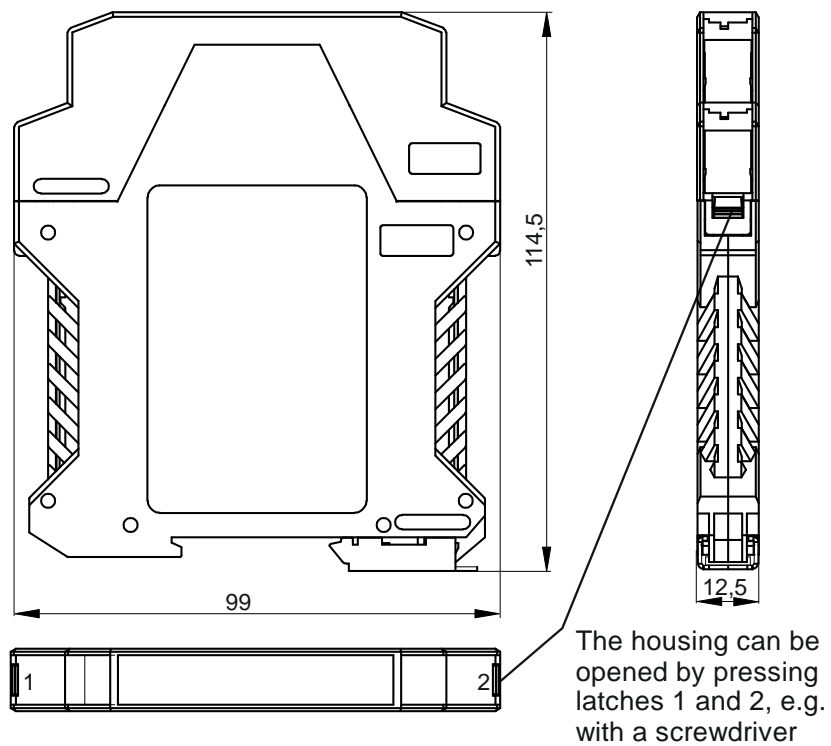
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The manufacturer reserves the right to make changes to the product.

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How to open the housing