General Description

The K109UI module is a V - mA converter with 3-way isolation designed for standard industrial voltage or current signals with passive input and active output.
14 bit analog to digital conversion is used for every input range.
The module also provides the following functions:

- Selectable 50 or 60 Hz line rejection.
- Additional input stabilization filter.
- Inverted input and inverted output scaling.
- Input out-of-range programmable to 2.5% or 5.0%
- Square Root function.
- Linearization for horizontal cylindrical tanks.

The module also features an extremely compact size, 35 mm DIN mounting, available bus power supply, quick connect spring-type wire terminals, 3-way isolation, on-site configuration using DIP-switches.

Technical Features

Power supply:	19.2 to 30 VDC
Consumption:	Max 22 mA at 24 VDC (20 mA output)
Voltage input (max. 50 V):	0 - 15 V, 0 - 30 V, Input impedance: 325 kΩ
Voltage input (max. 30 V):	0 - 10 V, 2 - 10 V, 0 - 5 V, 1 - 5 V, Input imp.: 110 kΩ
Current input (max. 24 V):	0 - 20 mA, 4 - 20 mA, Input impedance: 35 Ω
Permissible max. Input Out-of-Range:	± 2.5 or 5% depending on setting (see section on Input Out-of-Range Limits)
Voltage output:	0 - 5 VDC, 1 - 5 VDC, 0 - 10 VDC and 10 - 0 VDC. Minimum load resistance: 2 KΩ
Current output:	0 - 20 mA, 4 - 20 mA, 20 - 0 mA, 20 - 4 mA. Maximum load resistance: 500 Ω
Maximum applied Voltage:	± 30 V
Max. output out-of-range:	Fixed (see section on Output Out-of-Range Limits)
Current output protection:	Approximately 25 mA

Processing :	Digital, 32 bit floating-point calculation
ADC :	14 bits for every input range

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10 - 90% response:	50 Hz : max 41 ms without filter and 88 ms with filter; 60 Hz : max 35 ms without filter and 74 ms with filter.
Transmission:	Digital Optical
Max. transmission error: [1]	0.08% of the f.s. value for mA or 5 V output 0.07% of the f.s. value for 10 V output
Resolution: [1]	1 mV for voltage output, 2 uA for current output
Thermal drift:	Lower than 120 ppm/K
SQRT error: [2] [3]	in the range 1 - 100%: floating point 32 bit
Linearization error cylindrical tank: [2]	0.05%

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Isolation Voltage:	1.5 KV (50 Hz for 1 min)
Protection Index:	IP20
Operating Conditions:	Temperature –20 to +65 °C Humidity 30 - 90 % at 40°C (non-condensing) Altitude 2000 slm
Storage Temperature:	–40 - +85 °C
LED Indicators:	Input or output out-of-range limiter device triggered or input saturation. Internal fault.
Connections:	Spring terminals
Conductor Sizes:	24 to 14 AWG, 0.2 - 2.5 mm^2
Wire Stripping:	5/16" or 8 mm
Housing:	PBT (black color)
Dimensions, Weight:	6.2 x 93.1 x 102.5 mm, 50 g.
Standards:	EN50081-2 (electromagnetic emission, industrial surroundings) EN50082-2 (electromagnetic immunity, industrial surroundings) EN61010-1 (safety)

Notes:
- Use with copper conductors.
- Use in Pollution Degree 2 Environment .
- Power Supply must be Class 2.
- When supplied by an Isolated Limited Voltage/Limited Current power supply a fuse rated max 2.5A shall be installed in the field.

[1] No linearization function enabled

[2] Linearization functions operate only in the 0 - 100% rated range. For under-range and over-range conditions, the input signal is transferred without any linearization (G=1). Continuity and monotonic quality of transfer guaranteed throughout the entire range of measurement.

[3] In the 0 - 1% range, the curve is linear with gain G=10 in order to avoid over-amplification of the noise in the initial section of the measurement range.


Installation

This module has been designed for attachment to a 35 mm DIN 46277 rail. Assembly in a vertical position is recommended in order to increase the module's ventilation, and no raceways or other objects that compromise air flow must be positioned in the vicinity. Do not position the module above equipment that generates heat; we recommend positioning the module in the lower part of the control panel or compartment. We recommend using the K-BUS power connector that eliminates the need to connect the power supply to each module.
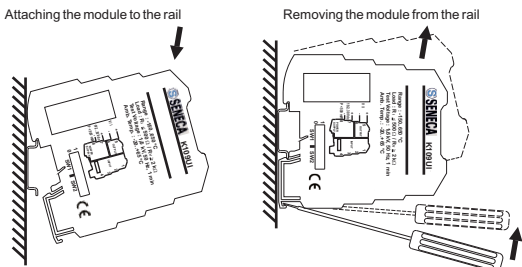
Attaching the module to the rail

Removing the module from the rail

1 - Attach the module to the upper part of the rail.
2 - Press the module downwards.

1 - Apply leverage using a screwdriver (as shown in the figure).
2 - Rotate the module upwards.

Using the K-BUS connector
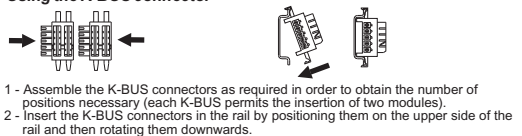
1 - Assemble the K-BUS connectors as required in order to obtain the number of positions necessary (each K-BUS permits the insertion of two modules).
2 - Insert the K-BUS connectors in the rail by positioning them on the upper side of the rail and then rotating them downwards.
IMPORTANT: Pay particular attention to the position of the protruding terminals of the K-BUS. The K-bus must be inserted in the guide with the protruding terminals on the left (as shown in the figure) otherwise the modules will be upside down.

- Never connect the power supply directly to the bus connector on the DIN rail.
- Never tap power supply from the bus connector either directly or by using the module's terminals.

SETTING THE DIPSWITCHES

Factory settings

All the module DIP switches are set to OFF as default configuration.
This set correspond to the following configuration :

Input signal	→	0 - 20 mA
50-60 Hz frequency rejection	→	50 Hz
Input filter	→	Present
Inversion	→	No
Linearization	→	None
Output signal	→	0 - 20 mA
Input Out-of-range	→	± 5% limit

The above configuration is valid only with all the DIP switches at position 0. If one switch is moved, it is necessary to set all the other parameters as indicated in the following tables.

Note: for all following tables
The indication ● indicates that the DIP-switch is set in Position 1 (ON).
No indication is provided when the DIP-switch is set in Position 0 (OFF).

INPUT SIGNAL

SW1	1	2	3	
				0 - 20 mA
	●			4 - 20 mA
		●		0 - 10 VDC
	●	●		2 - 10 VDC
			●	1 - 5 VDC
	●		●	0 - 5 VDC
		●	●	0 - 30 VDC
	●	●	●	0 - 15 VDC

50-60 Hz MAINS FREQUENCY REJECTION

SW1	4	
	●	60 Hz
		50 Hz

INPUT FILTER (*)

SW1	5	
	●	Present
		Absent

(*) The filter increases line frequency rejection and stabilizes the reading reducing measurement noise. It is advisable to leave it on if maximum response time is not required.

INVERSION

SW1	6	
	●	Present
		Absent

FUNCTION

SW1	7	8	
			Default
	●		None
		●	SQRT
	●	●	Tank

OUTPUT SIGNAL

SW2	1	2	3	
				0 - 20 mA
	●			4 - 20 mA
		●		20 - 0 mA [5]
	●	●		20 - 4 mA [5]
			●	0 - 10 VDC
	●		●	0 - 5 VDC
		●	●	1 - 5 VDC
	●	●	●	2 - 10 VDC

[5] These are inverse output ranges that are useful whenever the linearization applied is incompatible with the inversion of the input.
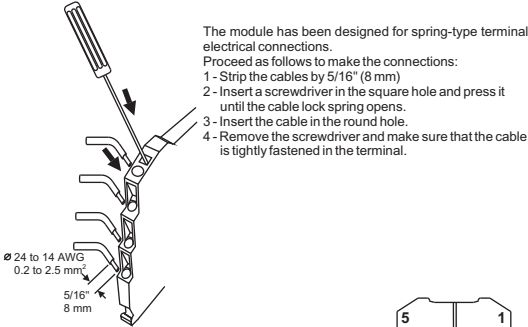
INPUT OUT-OF-RANGE

SW2	4	
	●	5%
		2.5%

Input Out-of-Range Limits

The Out-of-Range Limits in the following table are applied to the input signal
These fixed limits are applied to the output signal: 0-21 mA, 0-5.25 VDC, 0-10.5 VDC.

Rated value	Input Out-of-Range Limit ± 2.5 %	Input Out-of-Range Limit ± 5 %
20 mA	20.5 mA	21 mA
4 mA	3.5 mA	3 mA
0 mA	0 mA	0 mA
30 VDC	30.75 VDC	31.5 VDC
15 VDC	15.375 VDC	15.75 VDC
10 VDC	10.25 VDC	10.5 VDC
5 VDC	5.125 VDC	5.25 VDC
1 VDC	0.875 VDC	0.75 VDC
2 VDC	1.75 VDC	1.5 VDC
0 VDC	0 VDC	0 VDC

Electrical Connections

The module has been designed for spring-type terminal electrical connections.
Proceed as follows to make the connections:
1 - Strip the cables by 5/16" (8 mm)
2 - Insert a screwdriver in the square hole and press it until the cable lock spring opens.
3 - Insert the cable in the round hole.
4 - Remove the screwdriver and make sure that the cable is tightly fastened in the terminal.

Ø 24 to 14 AWG
0.2 to 2.5 mm^2

5/16"
8 mm

Power supply

There are various ways to provide the K series modules with power.

1 - Direct power supply to the modules by connecting 24 VDC power supply directly to Terminals 7 (+) and 8 (−) of each module.

2 - Using the K-BUS connector to distribute power to the modules via the bus connector. This eliminates the need to connect power supply to each module.
The bus can be supplied from any of the modules; the total power consumption of the bus must be less than 400 mA. Higher power consumption values can damage the module. An appropriately sized fuse must be connected in series with the power supply.

3 - Using the K-BUS connector to distribute power to the modules via the bus connector and the K-SUPPLY as the power supply.
The K-SUPPLY is a regulated power supply module that is designed to protect the modules connected via the K-BUS against over-voltages.
The bus connector can be provided with power using the K-SUPPLY module if the total power consumption of the bus is less than 1.5 A. Higher power consumption values can damage both the module and the bus. An appropriately sized fuse must be connected in series with the power supply.

Input
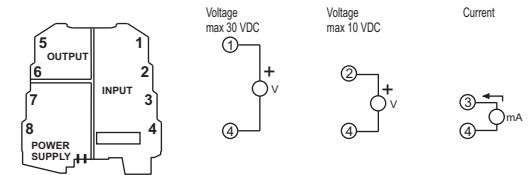The module accepts a current or voltage input signal.

The use of shield cables is recommended for the signal connections.

Voltage input

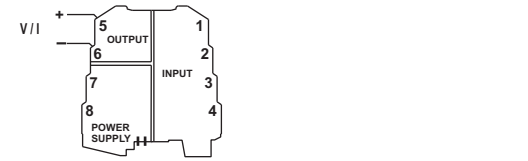|	
Terminal 1:	Voltage input up to 30 VDC (current carrying capacity 0 - 15 VDC and 0 - 30 VDC).
Terminal 2:	Voltage input up to 10 V.
Terminal 4:	Return

Current input

Terminal 3:	Current input.
Terminal 4:	Return

Output
Voltage connection - Current connection (applied current)

The use of shield cables is recommended for the signal connections.

Note: in order to reduce the instrument's heat dissipation, we recommend either using the output for voltage or applying a load of > 250 Ω to the current output.

LED indications on the front

LED (Red)	Meaning
Flashing	Internal fault.
Steady light	Input or output out-of-range limiter device triggered or input saturation.

Note: in case of an internal fault, the output will stay at null value.