Nokeval
made to measure

641

User Manual

Contents

Document information

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Introduction

641 is a 3-way galvanic isolator and signal converter, which is designed for mA, V and mV inputs and outputs. Galvanic isolation is the best way to cut noise paths to the measurement amplifier and to prevent problems due to potential differences. 641 is more versatile replacement for obsolete 640 device.

Warnings

Always use shielded signal cables. If possible, install devices to a metal box. If the power supply line carries inductive spikes, reduce them with ferrite clamps. Do not cover the ventilation holes.

Manufacturer

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Description

General information

641 has been designed for several types of signal conversions. The device can be used to separate the input and the output galvanically and also simultaneously perform signal conversions.

The 641 input can be mA (current), V or mV (voltage) and bi-polar forms of these (for example -10…+10 V) or of potentiometer type.

The 641 output can be mA (current) or V (voltage) and bi-polar forms of these (for example -10…+10 V).

Several common examples of usage: 4…20 mA current input signal can be converted to 0…10 V voltage output signal or vice versa, bi-polar ±10 V voltage input signal can be converted to 0…10 V voltage output signal or vice versa, small mV input signals can be converted to standard signals.

A 2-wire transmitters operating with a 4…20 mA loop, like a pressure or level sensor and for example Nokeval 620S, 6570, 6580 or 6720 devices, can be connected directly to a 641 device without a separate power supply. 641 itself needs a 24 VDC power supply to operate. This power supply line is galvanically isolated from the input and the output circuits.

The 641 range is changeable by DIP-switches and adjusted with the front panel potentiometers. Signal damping is possible by setting signal filter to a desired filtering speed, whose time constant can be chosen among 100 µs, 1 ms, 10 ms, 100 ms (default), or 1 s.

Special ranges requiring design work or component assembly changes are priced a little higher than devices delivered at default ranges.

Installation

Connection

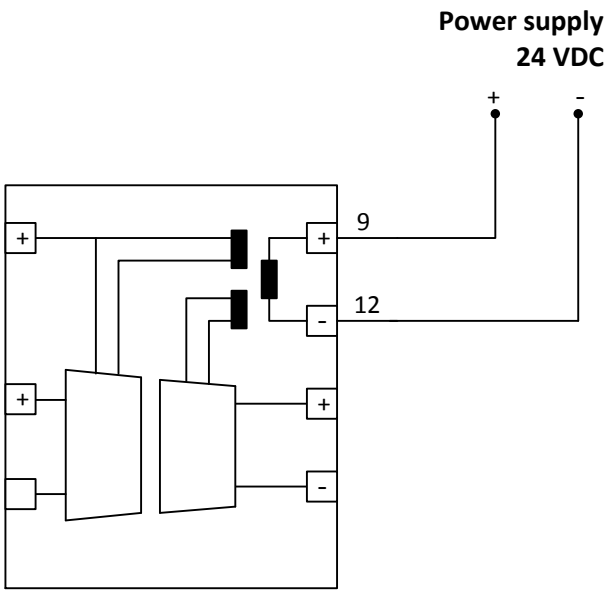
Install 641 to a DIN rail in a way that the text “Nokeval” on the front panel is readable. Unscrew screw terminals that are needed and connect wires one by one while tightening their screw terminals. On the right side there is a picture about screw terminal numbering and below are some examples of connections.

The rule of thumb for the 641 screw terminal numbering is to read the numbers like this text starting from top left and ending to bottom right.

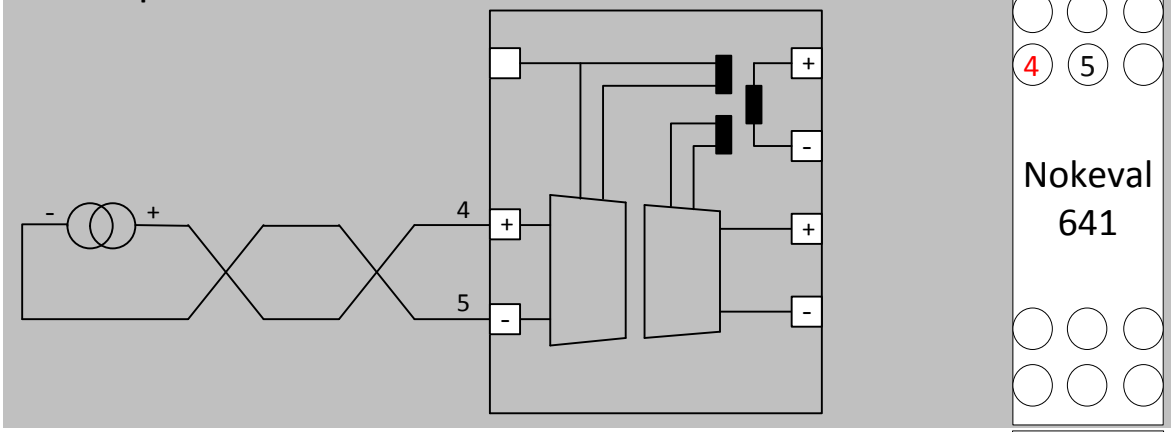
Screw terminal 1 can be used to provide a 15 VDC supply for an external device.

Screw terminals 3 and 6 are internally connected to each other starting from V4.0, so they can be used to replace each other.

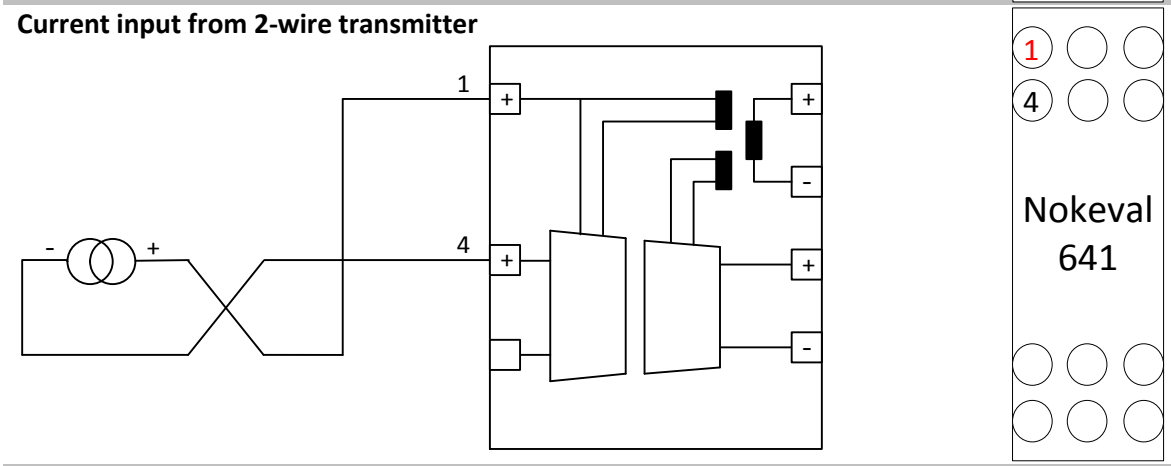
The wires used should be twisted pair type like illustrated by wires alternating from side to side in the drawn examples of connections.



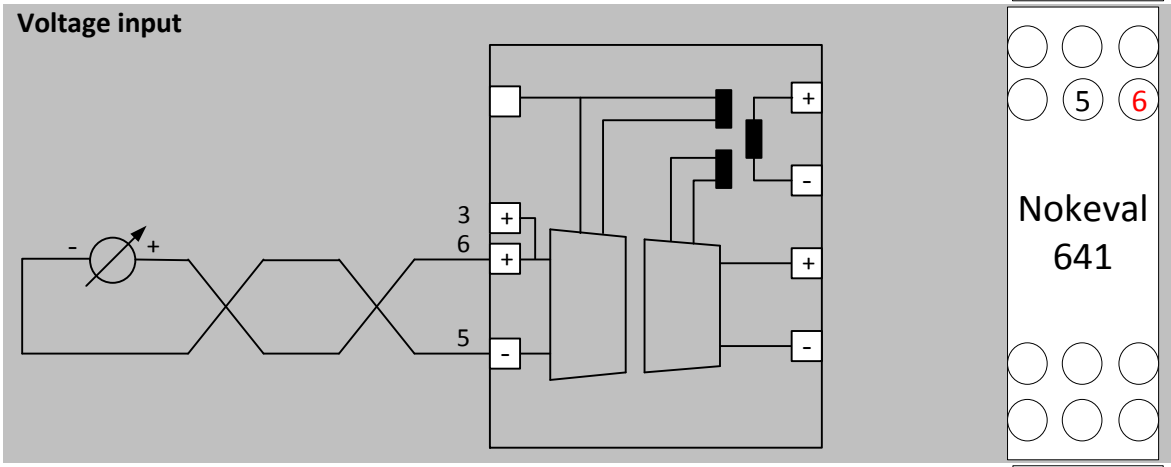
Current input from active transmitter



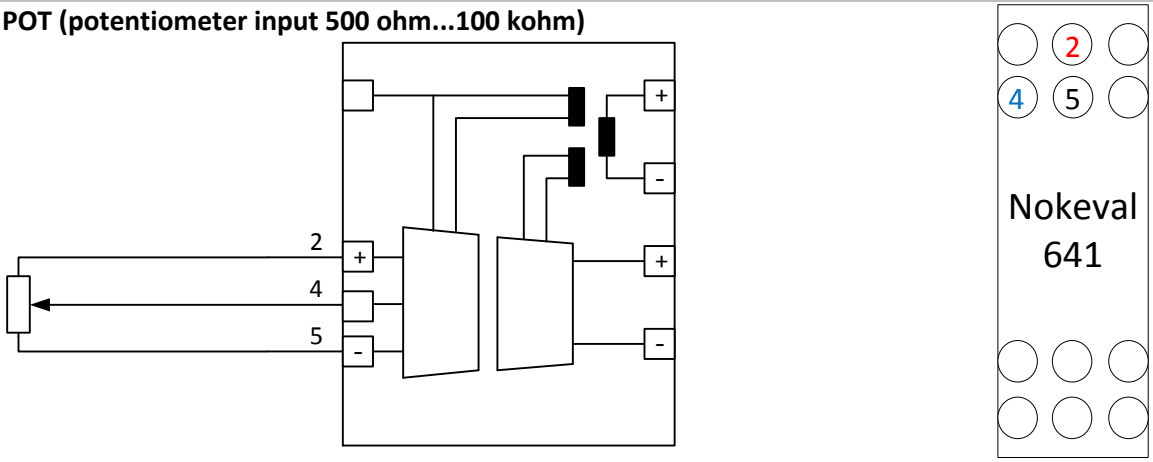
Current input from 2-wire transmitter



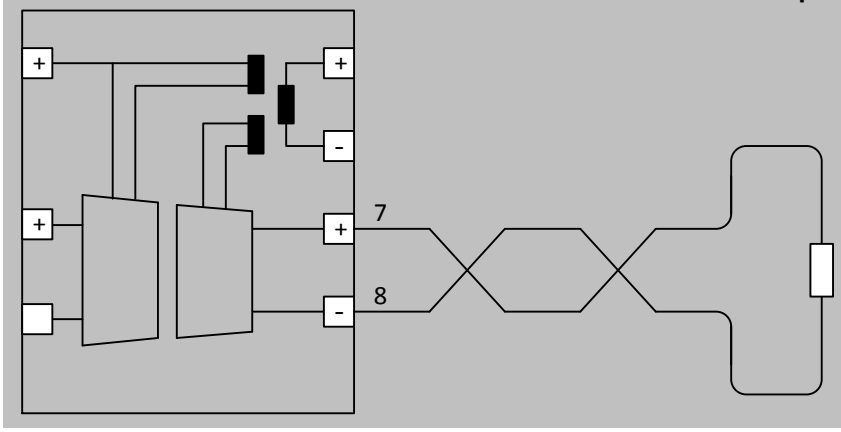
Voltage input

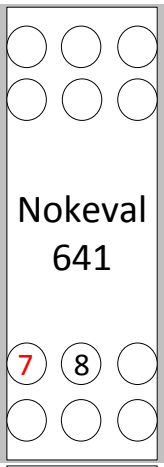


POT (potentiometer input 500 ohm...100 kohm)

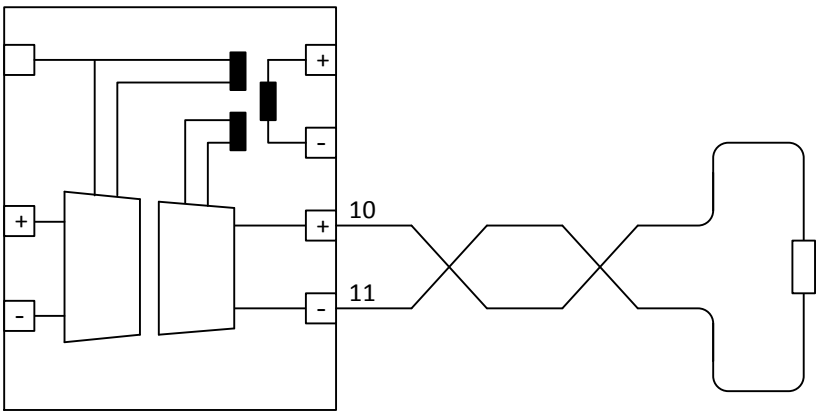


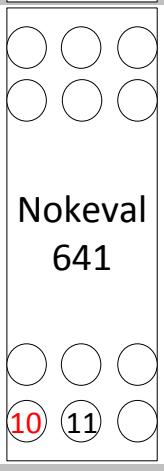
Active current output





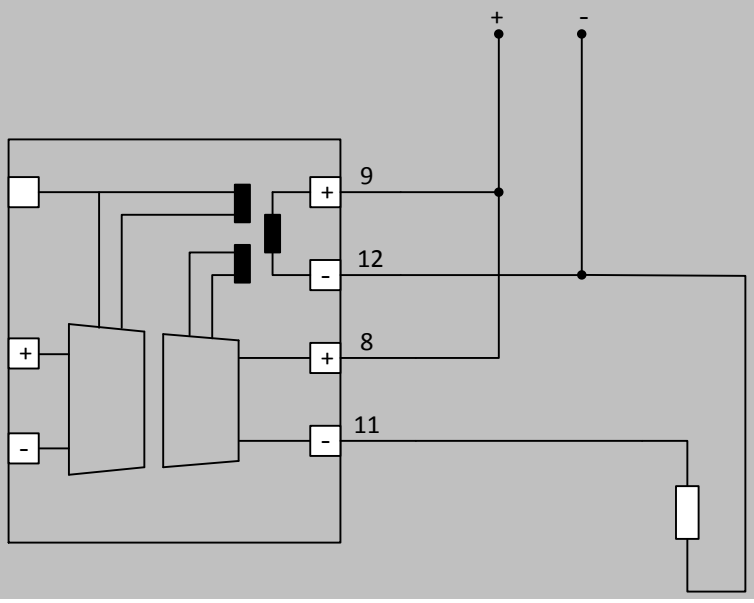
Voltage output (also mV output)

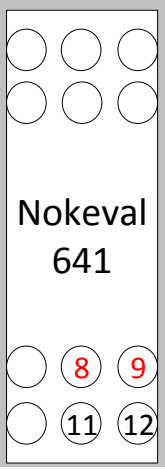




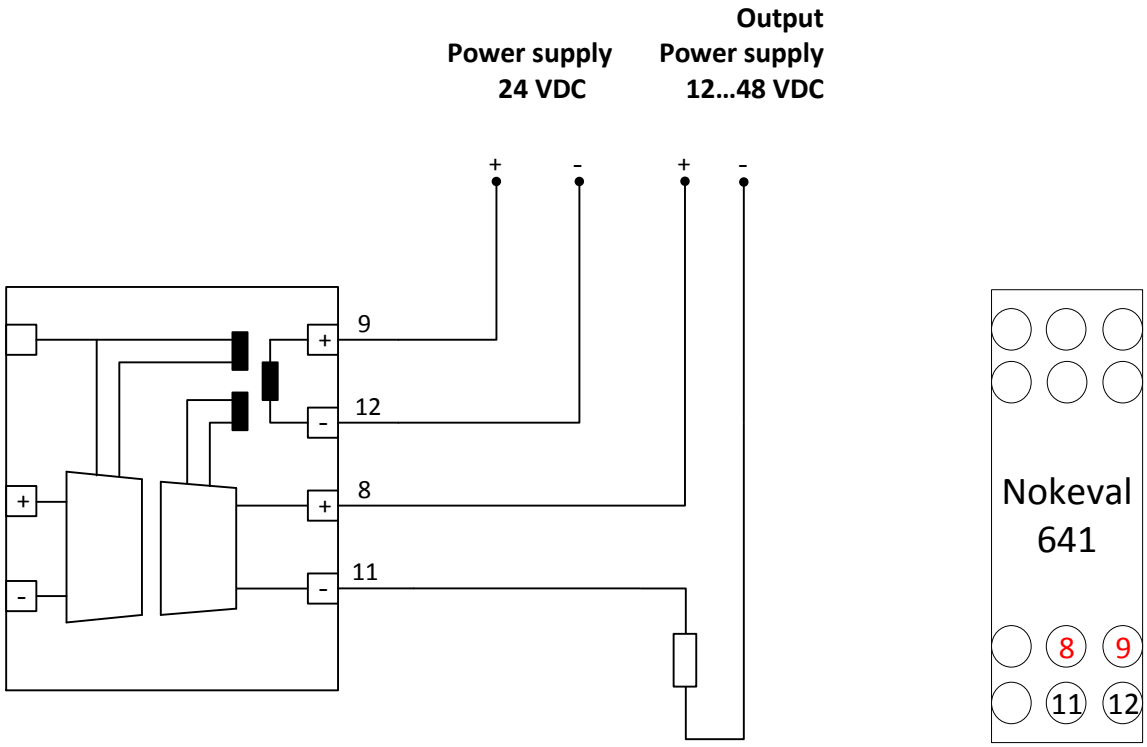
This way the output load can be raised up to 1000 ohms:

Power supply 24 VDC





In this mode the output load can be raised all the way up to 2000 ohms by using a separate power supply. However care has to be taken that the 641 output stage power dissipation does not exceed 0.5 watts.



Configuration

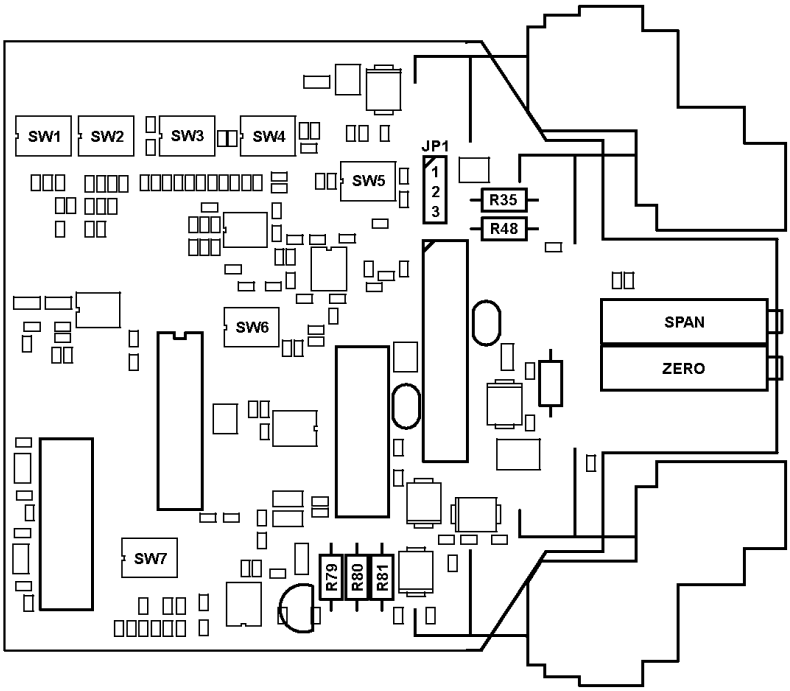
641 will be delivered configured to the range ordered by the customer. In this document, “range” refers to the combination of the input and output signals and their ranges. Range can be changed according to the following instructions.

Return all the DIP switches to the OFF position, use the DIP switches SW1, SW2, SW3, SW4, SW4, SW6, SW7, and jumper JP1 for coarse adjustment of the output. For example: 7.2 in the tables below means ON position for the second switch in SW7.

Set the desired damping by using switches 1, 2, and 3 of DIP switch SW5. The factory default is 100 ms.

Connect to the calibrator device and supply input low and high values in turns in a way that both will be adjusted accurately with ZERO (lower one) and SPAN (higher one) potentiometers. Repeat the adjustment until the both ends of the range are accurate. If the output is 0…20 mA, adjust at slightly higher than the zero value, for example at 1 mA (5 %).

Set SW5.4 switch to ON position only when R48 is installed as required by some special ranges.



Note! If a DIP switch has a tape over it, remove it by peeling it off for example with a sharp knife. Do not set the DIP switches through the tape! The DIP switches should be set with an as small and light tool as possible pushing lightly so that the force will not break the switch

Table 1. Damping options

DAMPING	SW5.1	SW5.2	SW5.3
100 µs = 0,1 ms*	OFF	OFF	ON
1 ms	OFF	OFF	OFF
10 ms	OFF	ON	ON
100 ms	OFF	ON	OFF
1 s	ON	OFF	OFF

* When using 100 µs damping with 641 mA-input other DIP-switch positions are exceptional so if the device will be changed afterwards to 100 µs damping, DIP-switches configuration and adjusting have to be repeated.

Range

The table below contains the most common ranges and their configuration. Other, more specific, ranges are possible, and configuring them is advised by Nokeval support in addition to 641DIP which is a switch calculator program freely available at www.nokeval.com website with keyword "641DIP" and from Nokeval Software CD.

Table 2. Standard range examples

INPUT	OUTPUT	DAMPING	JP1	DIP-SWITCHES TO BE SET TO ON-POSITION
0…20 mA	0…20 mA	≥ 1 ms	1-2	5.2 6.1 6.4 7.2
		100 µs *	1-2	3.1 3.3 4.1 4.3 5.3 7.2
	4…20 mA	≥1 ms	1-2	1.2 1.4 2.2 3.2 4.1 4.2 4.3 4.4 5.2 6.4 7.2
		100 µs *	1-2	1.2 1.3 3.1 3.2 3.3 4.1 4.2 4.3 5.3 7.2
	0…10 V	≥1 ms	1-2	5.2 6.1 6.4
		100 µs *	1-2	3.1 3.3 4.1 4.3 5.3
	0…5 V	≥1 ms	1-2	5.2 6.1 6.4 7.1
		100 µs *	1-2	3.1 3.3 4.1 4.3 5.3 7.1
	-10…+10 V	≥1 ms	1-2	1.1 2.1 2.3 3.1 3.2 3.3 3.4 4.1 4.3 4.4 5.2 6.3 6.4
		100 µs *	1-2	1.1 1.4 3.1 3.3 3.4 4.1 4.3 4.4 5.3 6.2
4…20 mA	0…20 mA	≥1 ms	1-2	1.1 2.2 3.1 3.2 3.4 4.2 4.3 4.4 5.2 6.4 7.2
		100 µs *	1-2	1.1 1.3 3.2 3.4 4.2 5.3 7.2
	4…20 mA	≥1 ms	1-2	5.2 6.1 6.4 7.2
		100 µs *	1-2	3.1 3.3 4.1 4.3 5.3 7.2
	0…10 V	≥1 ms	1-2	1.1 2.2 3.1 3.2 3.4 4.2 4.3 4.4 5.2 6.4
		100 µs *	1-2	1.1 1.3 3.2 3.4 4.2 5.3
	0…5 V	≥1 ms	1-2	1.1 2.2 3.1 3.2 3.4 4.2 4.3 4.4 5.2 6.4 7.1
		100 µs *	1-2	1.1 1.3 3.2 3.4 4.2 5.3 7.1
	-10…+10 V	≥1 ms	1-2	1.1 2.2 2.3 3.1 3.2 3.3 4.1 4.3 4.4 5.2 6.3 6.4
		100 µs *	1-2	1.1 1.4 3.3 4.1 4.3 4.4 5.3 6.2
0…10 V	0…20 mA	all	2-3	5.2 6.1 7.2
	4…20 mA	all	2-3	1.2 1.4 2.2 3.2 4.1 4.2 4.3 4.4 5.2 7.2
	0…10 V	all	2-3	5.2 6.1
	0…5 V	all	2-3	5.2 6.1 7.1
	-10…+10 V	all	2-3	1.1 2.1 2.3 3.1 3.2 3.3 3.4 4.1 4.3 4.4 5.2 6.3
0…5 V	0…20 mA	all	2-3	3.1 3.2 3.3 3.4 4.1 4.3 4.4 5.2 7.2
	4…20 mA	all	2-3	1.2 1.3 2.1 3.1 3.3 4.2 4.3 4.4 5.2 7.2
	0…10 V	all	2-3	3.1 3.2 3.3 3.4 4.1 4.3 4.4 5.2
	0…5 V	all	2-3	3.1 3.2 3.3 3.4 4.1 4.3 4.4 5.2 7.1
	-10…+10 V	all	2-3	1.1 1.4 2.2 3.1 3.2 3.3 3.4 4.1 4.2 4.4 5.2
-10…+10 V	0…20 mA	all	2-3	1.2 2.2 2.4 3.1 3.2 3.3 4.1 4.2 4.3 4.4 5.2 6.3 7.2
	4…20 mA	all	2-3	1.2 1.3 2.1 2.2 2.3 2.4 3.1 3.4 4.1 4.2 4.3 4.4 5.2 6.3 7.2
	0…10 V	all	2-3	1.2 2.2 2.4 3.1 3.2 3.3 4.1 4.2 4.3 4.4 5.2 6.3
	0…5 V	all	2-3	1.2 2.2 2.4 3.1 3.2 3.3 4.1 4.2 4.3 4.4 5.2 6.3 7.1
	-10…+10 V	all	2-3	5.2 6.1
-5…+5 V	0…5 V	all	2-3	1.2 2.1 2.3 5.2 6.1 6.3 7.1
-1.2…+1.2 V	4…20 mA	all	2-3	1.2 1.3 1.4 2.1 3.2 3.4 4.3 4.4 5.2 7.2
0…1 V & Pot.	0…20 mA	all	2-3	3.1 3.2 3.3 3.4 4.1 4.3 5.2 7.2
	4…20 mA	all	2-3	1.2 1.3 3.1 3.2 3.3 3.4 4.1 4.2 4.3 5.2 7.2
	0…10 V	all	2-3	3.1 3.2 3.3 3.4 4.1 4.3 5.2
	0…5 V	all	2-3	3.1 3.2 3.3 3.4 4.1 4.3 5.2 7.1
	-10…+10 V	all	2-3	1.1 1.4 3.1 3.2 3.3 3.4 4.1 4.3 4.4 5.2 6.2

Table 3. Special range examples with 100 ms damping

INPUT	OUTPUT	JP1	DIP-SWITCHES TO BE SET TO ON-POSITION	R48
-30…+30 V	0…10 V	OFF	1.2 1.3 1.4 2.1 2.2 2.3 2.4 3.3 3.4 4.1 4.2 4.3 4.4 (5.2) **5.4** 6.3	2 MΩ
0…20 V	4…20 mA	OFF	1.2 1.3 2.1 2.3 3.1 3.4 4.1 4.2 4.3 4.4 (5.2) 6.3 **5.4** 7.2	1 MΩ
0…30 V	4…20 mA	OFF	1.2 2.4 3.1 3.2 3.4 4.1 4.2 4.3 4.4 (5.2) 6.3 **5.4** 7.2	2.2 MΩ

Table 4. Reverse range examples (not applicable with 100 µs damping)

INPUT	OUTPUT	DAMPING	JP1	DIP-SWITCHES TO BE SET TO ON-POSITION	Other
4…20 mA	20…4 mA	≥ 1 ms	1-2	1.2 1.3 1.4 2.3 2.4 3.3 4.1 4.2 4.3 4.4 5.2 6.3 6.4 7.2	See **
0…5 V	20…4 mA	all	2-3	1.2 1.3 2.2 2.3 3.1 3.3 4.2 4.3 4.4 5.2 6.3 7.2	See **

** Connect input + and – wires reversed.

Examples of reverse range creation with 641DIP switch calculator program.

Select 641DIP input Min -20 mA, Max -4 mA and output Min 4 mA, Max 20 mA. Connect input wires 4 and 5 with reversed polarity.

641DIP input Min -5 V, Max 0 V and output Min 4 mA, Max 20 mA. Connect input wires 3 and 5 with reversed polarity.

Troubleshooting

Problem: The device front panel has no pin numbers, but the devices ordered earlier had numbers at least for pins closest to the middle part.
Solution: This is not a mistake since Nokeval Oy has left model specific printings away to unify production methods of device models 641, 620S and 6420. If needed official bulletin is available for example for your quality system. When connecting the device the information concerned is available in this user manual and in the label located in the side of the device.

Problem: We want to change the device range and trim it, but the device front panel has no S or Z markings.
Solution: Look at the solution for the previous problem. Also note that the device case needs to be opened for changing range revealing printed circuit board printings GAIN (Span) and OFFSET (Zero) next to blue potentiometers used for trimming.

Problem: We want to change the device range, but some of the DIP-switches are covered with tape.
Solution: Component factory's dust cover tapes may be removed by fingernails or carefully peeling with a sharp knife.

Problem: We have changed range with the information from 641DIP switch calculator program, but range changing has not been successful.
Solution: 641DIP can help with the ranges based on inputs and outputs of normal limits (to the maximum of 10 V and 20 mA). Information about ranges requiring component changes such as rare 641- -30/+30V-0/10V, can be requested from Nokeval support.

Technical data

Width	22.5 mm
Height	82 mm
Depth	99 mm
Weight	106 g
Mounting	DIN rail according to DIN 46277
Terminal blocks	2 x 2.5 mm²
Operating temperature	0…45 °C
Storage temperature	-40…+70 °C
Protection class	IP20
Case material	plastic
Accuracy	< 0.05 % of span
Repeatability	< 0.05 % of span
Thermal drift	< 0.006 %/°C
Input resistance	50 Ω for current input, > 100 MΩ for voltage input
Potentiometer	500 Ω…100 kΩ
Output load (mA)	max. 600 Ω
Power supply	24 VDC ± 10 %
Isolation	1000 V input-output, functional isolation, not to be connected to mains
Range selection	DIP switches and jumper
Damping	T63.3% = 100 µs (0.1 ms), 1 ms, 10 ms, 100 ms or 1 ms
Frequency band	0…1600 Hz
Power consumption	40 mA voltage output, 60mA mA-output, 80 mA 2-wire transmitter input/output