SEIKOM ELECTRONIC

Operating instructions
NLSW®45-4 SIL2

24 V AC/DC, 230 V AC

Version

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Contents

1. SAFETY INSTRUCTIONS

Read the product description before operating the device. Make sure that the product is fully suitable for your application.

Improper or unintended use may result in malfunction of the device or undesirable effects on your application. For this reason, installation, electrical connection, commissioning, operation, and maintenance of the device must only be carried out by trained personnel.

When used in liquids, the glycol content in cooling circuits must not exceed 30%. A glycol content of more than 30% can lead to failure or false triggering.

2. GENERAL INFORMATION

The NLSW®45 series of calorimetric flow switches are an economical alternative to conventional pressure transducers. Installation is quick and easy using a flange mounting (for duct installation) or a threaded connection (G½-inch or G¼-inch).

The switching point is set using the integrated potentiometer. The relay switches as soon as the flow velocity reaches the preselected threshold value.

The NLSW®45-4 SIL2 air and liquid flow monitor is a flow monitor consisting of two closed sensors and two integrated evaluation units for measuring liquids from minus 15 to 80°C. Both the circuit in the evaluation unit and the sensor are redundant.

The NLSW®45-4 SIL2 operates according to the calorimetric measuring principle and complies with the SIL2 standards according to IEC 61508-5:2010.

2.1. Area of application and practical use

The electronic flow monitors of the NLSW®45-4 SIL2 series are used for monitoring cooling systems, pumps, water treatment plants, sewage treatment plants, and in conjunction with (exhaust) gases or liquids where SIL2-compliant current monitoring is required.

The main areas of application are heating and cooling systems (HVAC), air conditioning systems, process monitoring in, for example, the chemical, pharmaceutical, and food industries, power plants, the oil and gas industry, water treatment plants, and the automotive industry.

2.2. Proper use

The NLSW®45-4 series flow switches are designed for monitoring liquid and gaseous media within the specified technical data. The sensor line is monitored for short circuit and wire break.

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2.3. Functional principle

Flow switches of the NLSW®45-4 series operate according to the calorimetric measuring principle. The calorimetric measuring principle is based on a heated, temperature-sensitive resistor. The flow in the medium extracts heat from the precision resistor, causing the temperature of the resistor to change and thus its resistance value. This change is evaluated by the device. However, since not only the flow velocity of the medium influences the amount of heat dissipated, but also its temperature, a correlation between flow and temperature must be established. This is achieved by a second, temperature-dependent precision resistor next to the first. The second precision resistor (temperature compensation) is not heated and is only used to measure the temperature.

2.4. Output

The NLSW®45-4 SIL2 devices have one relay per flow channel. The relay with changeover contact switches as soon as the flow velocity reaches the preset threshold value. The yellow LEDs on the device light up as long as the flow is above the set value. The relay switches off again as soon as the flow falls below the set flow velocity. The yellow LEDs on the device go out.

Note: It is advisable to set the same threshold value (switching point) for both channels.

For liquids, the threshold value can be set between 0.05 and 3 m/s, and for air between 0.5 and 20.0 m/s.

The relay outputs are available for further evaluation, e.g., by a (safety) PLC or SPS, or can directly control other devices.

Flow rate≥ Threshold value	Relay outputs activated	Yellow "Flow" LEDs light up
Flow rate< s threshold value	Relay outputs not activated	Yellow "Flow" LEDs go out

3. TECHNICAL DATA

Type	**NLSW®45-4 SIL2**	
Item	75108SIL2	74298SIL2
Operating voltage	24 V AC/DC	230 V AC
Voltage tolerance	±10	±10
Power consumption max.	5 VA	10 VA
Signal display voltage	Green LEDs	
Signal indicator for flow	Yellow LEDs	
Signal output current	2x relay, 1 changeover contact per channel	
Switching point setting	Adjustable via potentiometer	
Water/air flow range	0.05 … 3 m/s // 0.5 … 20.0 m/s	
Media temperature range	-15 … 80°C	
Switching function with flow	Relay pulls in	
Relay output	250 V AC, 8 A, 2 kVA	
Minimum switching capacity	10 mA / 5 V DC	
Mechanical service life	10^7 switching operations (600 / 72,000 minutes)	
Electrical service life at 10 A / 250 V AC	100,× 10^3 (100,000) switching operations	
Electrical service life at 0.15 A / 220 V DC	100,× 10^3 (100,000) switching operations	
Measuring sensor (sold separately F6.x SIL2)	F6.x SIL2 with 2.5 m cable Special lengths available separately	
Immersion depth depending on sensor, approx.	25 mm, 46 mm, 70 mm, 150 mm	
Process connection	G1/2 inch, G1/4 inch	
Sensor material	Stainless steel (V4A)	
Pressure resistance of sensor	10 bar	
Ambient temperature of device	-20 … 50°C	
Electrical connection	14 terminals,≤ 2.5 mm²	
Overvoltage category	II	
Protection class housing	IP6	
Protection class sensor	IP50	
Contamination class	2	
Housing dimensions (L x W x H)	165.5 mm x 85.5 mm x 55 mm	
SIL classification	SIL2 classification IEC 61508 SIL 2: 09.2024, Type A	
Test mark	Type tested by TÜV Nord according to DIN EN 61010-1:2011-07	
Further certifications	CE, UKCA	

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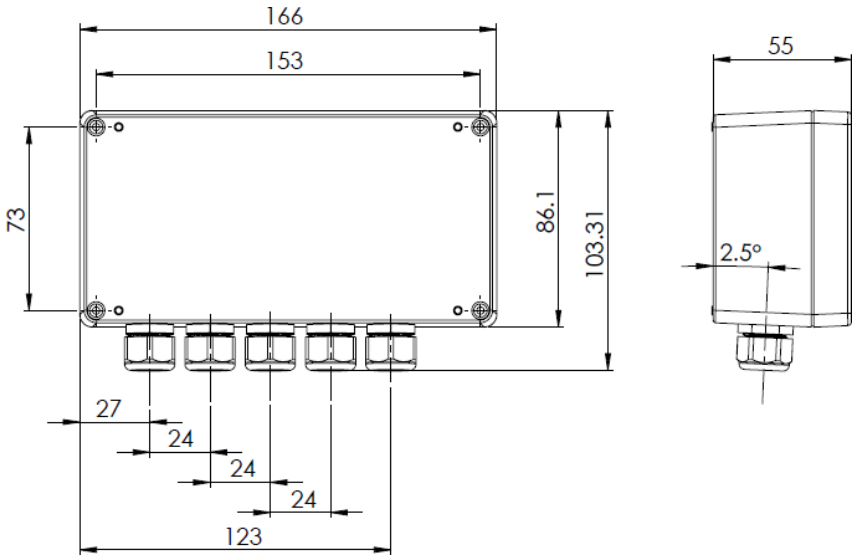
3.1. Device dimensions



4. INSTALLATION AND COMMISSIONING

Installation and commissioning must be carried out by authorized and qualified personnel.

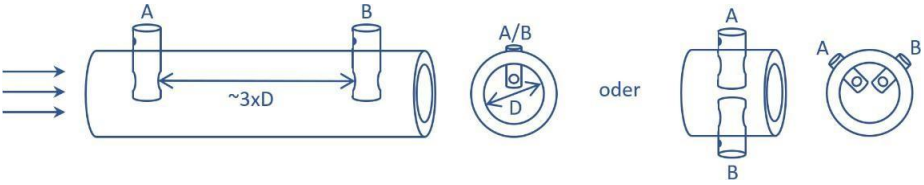
The connection to the main power supply (L, N) must be made via a protected isolating switch with standard fuses. The general VDE regulations must be observed (VDE 0100, VDE 0113, VDE 0160). If the potential-free contact is connected to a protective low voltage, the connection cables must be adequately insulated up to the terminal, as otherwise the double insulation to the mains voltage side may be impaired. The current carrying capacity of the potential-free contact is limited to 8 A. If the sensor is exposed to significant vibrations at its installation location, it should be mounted on a vibration-damping metal base.

4.1. Installation conditions for flow sensors

To avoid malfunctions, please observe the following points:

- The tip of the sensor should be as close as possible to the center of the pipe. The through-hole in the sensor shaft must be completely within the channel.

- The sensors must be installed in the same pipe so that they do not influence each other (approx. 3 x D (inner pipe diameter) distance behind each other or at the same height in the duct) – see the following drawing:



- In vertical pipes, the flow direction should be upward, especially for small flows (up to 1 m/s), to avoid interference from thermally rising flows.
- For optimum measurement, the sensor requires at least 5 x D (inner pipe diameter) of free inlet and 3 x D of outlet to avoid measurement errors due to turbulence and air bubbles.
- Only screw in the corresponding probe (sold separately) via the hexagon of the sensor housing.
- If there are deposits or air pockets in horizontal pipes, install the sensor sideways. The sensor is not dependent on the installation position.
- If the sensor cable is laid in a duct together with other live cables (e.g. motors or solenoid valves), we recommend shielding the sensor cable (attach shield).
- Connect the sensor to the device according to the connection diagram. Mixing up the connections will result in malfunctions and possibly damage.
- To avoid malfunctions, the sensor cable must be extended using a cable with a cross-section of at least 1.5 mm². The maximum cable length should not exceed 20 m!

Maintenance note: Regular cleaning is required depending on the application. The maintenance intervals must be determined and specified as required.

4.2. Sensor assembly/installation

Installation is carried out using the thread on the sensor housing. Installation using a flange or thread adapter is also possible. When starting up with media temperatures below 0°C and strong currents, the start-up time of the device may be extended to 60 seconds until it is ready for operation.

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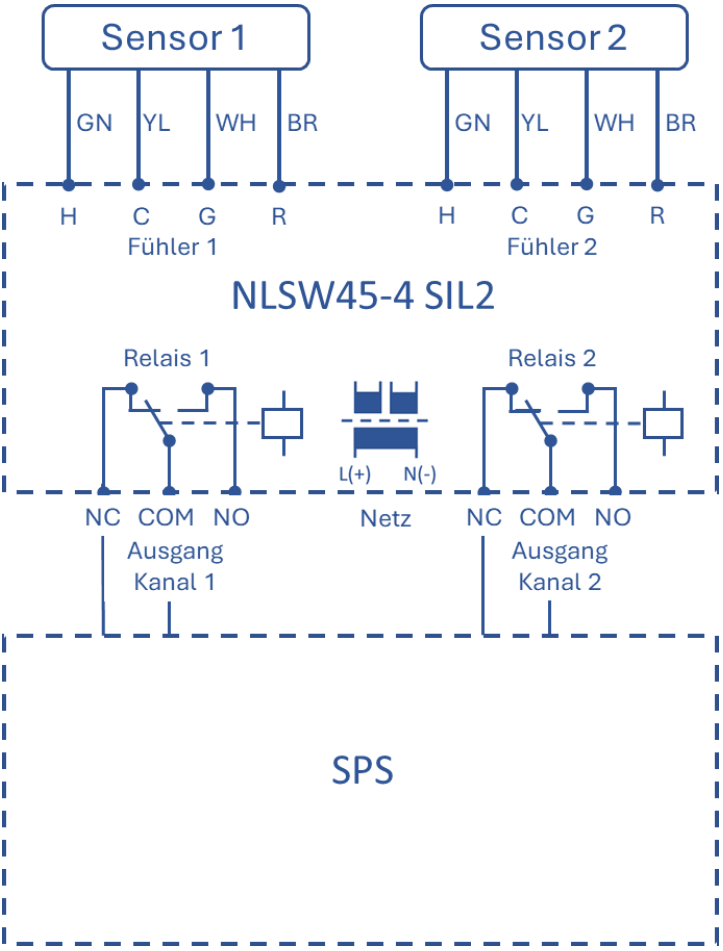
4.3. Electrical connection

The mains connection (L1, N) must be made via a fused isolating switch with the usual fuses. The general VDE regulations (VDE0100, VDE0113, VDE0160) must always be observed during electrical installation.

If the potential-free contact is supplied with a safety extra-low voltage, ensure that the connection cables are adequately insulated up to the point of connection, as otherwise the double insulation to the mains voltage side will be impaired. The current carrying capacity of the potential-free contact is limited to 8 A.

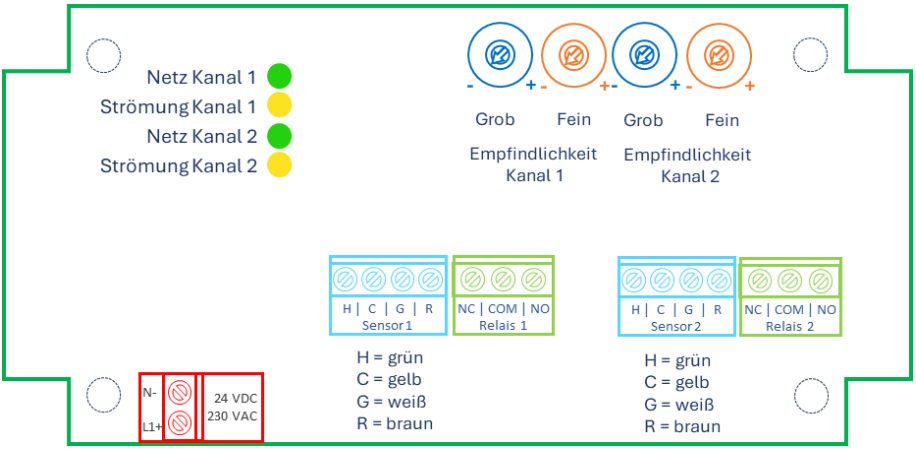


Color code: GN=green, YL=yellow, WH=white, BR=brown

4.4. Instructions for commissioning

The following procedure is recommended for commissioning and adjusting the device: The steps for commissioning and adjusting the device are described below.

- Install and close the flow regulator in accordance with the installation instructions and conditions.
- Connect the appropriate sensor (F6.1 – F6.5 SIL2 available separately).
  Please note: Mixing up the sensor connections will result in malfunctions and possibly damage.



4.4.1. Connecting the sensors and PLC to the NLSW®45-4 SIL2

- Connect two suitable sensors (F6.1 – F6.5 SIL2) to the device using the terminals supplied; sensor A to channel 1 [Sensor1], sensor B to channel 2 [Sensor2] (light blue).
- Connect the PLC/control via the supplied terminals to relay outputs 1 and 2 (green).
  Please observe the NC ("normally closed") and NO ("normally open") contact assignment in the circuit with the PLC.

4.4.2. Setting the NLSW®45-4 SIL2

- Set the "Coarse and Fine Sensitivity" potentiometer (dark blue) to minimum sensitivity and maximum current (insensitive) for both channels (left stop).
- Apply mains voltage (red). The green LEDs light up. The device is ready for operation within a few seconds.
- The yellow LEDs light up (briefly) and go out again as soon as the device is ready for operation. The relays are energized during this time.
- Switch on the flow generator and set the nominal flow rate.
- Before setting the switching point, the device should run for at least 2 minutes under operating conditions (with flow).

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4.4.3. Switch point setting

The switching point setting requires a sensitive adjustment of the potentiometer.

- Only adjust the sensitivity setting once the start-up override has expired and the yellow LED has gone out.
- Slowly turn the "Sensitivity" potentiometer [Coarse] on channel 1 (dark blue) to the right until the yellow LED lights up and the output relay is activated.
- After 1-2 minutes, make the fine adjustment using the "Sensitivity" potentiometer [Fine] (orange). Set the same switching ratio for channel 2.
- To achieve stable switching ratios, you should turn slightly beyond the switching point.
  Note: Depending on the installation position and flow situation in the channel, small switching differences between channel 1 and channel 2 are normal.
- Teach/check the flow setting with the PLC by changing or switching off the flow.
- To check the flow monitoring, reduce or switch off the flow generation. The yellow LEDs go out and the output relays drop out.
- During continuous operation, check/readjust the settings after 0.5 hours of operation if necessary.

The device is now set to monitoring mode.

The switching hysteresis is preset for NLSW®45-4 SIL2.

4.5. General setting of the switching point

The relationship between flow velocity and resistance change is not linear. In the lower range (low flow rates), the change in resistance is very large. In the upper range, the change in resistance becomes smaller and smaller for the same flow changes. When setting the switching point, it is therefore important to consider which change is to be monitored, as different settings have certain disadvantages. The following requirements should be observed:

Low flow rate change in the high flow rate range: The switching point must be selected very close to the measured value of the normal flow, as the change in the measured value is very low when the flow rate changes. Since the temperature compensation has a certain delay compared to the actual temperature change, such a switching point setting is only possible for applications with slow temperature changes.

Small flow change in the low flow rate range: The switching point can be selected at a greater distance from the measured value of the normal flow, as the change in the measured value is large when the flow changes. A temperature change does not affect the switching behavior.

Large flow change: In this case, a 'yes/no' statement is usually desired (e.g., the pump/fan is running or the pump/fan is stopped). A safety margin can therefore be selected that is large enough to prevent temperature changes or turbulence from influencing the switching behavior.

5. MAINTENANCE AND SERVICING

5.1. MAINTENANCE

The flow sensor should be serviced at regular intervals, i.e., the water and flow sensor should be cleaned when used in heavily contaminated media. The following procedure is recommended:

- Remove the flow switch.
- Carefully place the flow switch in lukewarm soapy water for approx. 10 minutes (depending on the degree of contamination).
- Carefully rinse the flow switch with lukewarm water.
- Install the flow switch.
- Switch on the current monitoring and, if necessary, recalibrate with the evaluation electronics.

Never use hard or sharp objects (e.g., screwdrivers, wire brushes, etc.) for cleaning. cleaning. There is a risk of damage.

5.2. Manufacturer's maintenance

specifications Definition of terms

according to IEC 60079-17

Maintenance and repair: A combination of all activities performed to maintain an item in a condition or restore it to a condition that meets the requirements of the relevant specification and ensures that the required functions are performed.

Inspection: An activity that involves the careful examination of an item with the aim of making a reliable statement about its condition, carried out without dismantling or, if necessary, with partial dismantling, supplemented by measures such as measurements.

Type of test	Definition	Recommended interval
Visual	A visual inspection is an inspection in which visible defects are identified without the use of access equipment or tools, for example damage to the sensor or dust deposits.	monthly
Close inspection	An inspection in which, in addition to the aspects of the visual inspection, defects are identified that can only be detected by using access equipment, e.g., steps (if necessary), and tools. For close-up inspections, it is not usually necessary to open the housing or disconnect the equipment from the power supply. .	Every 6 months

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Detailed inspection	A test in which, in addition to the aspects of the close-up inspection, defects such as loose connections are detected that can only be identified by opening enclosures and/or, if necessary, using tools and test equipment.	Every 12 months
Inspection of the entire system	Within the operator's area of responsibility	

6. TROUBLESHOOTING

The following instructions will help if your flow monitor is not working properly.

Problem	Possible cause	Solution
The device does not work at all.	Missing or incorrect power supply Check the power supply.	Check the power supply and connection.
The device does not detect any current (on one or both channels)	Sensor(s) is/are not installed correctly or the sensitivity on the evaluation unit is not set correctly. Set	Check that the sensor has been installed so that it is close to the center of the channel and in the flow .
	Flow is outside the measuring range	Reduce the sensitivity on the affected channel using the potentiometer [Coarse/Fine]. Adjust the diameter of the pipe to increase or decrease the diameter of the pipe.
	Glycol content is higher than 30%	Reduce glycol content to below 30% and clean the sensor if necessary.
The device detects flow even when there is no flow.	Flow is also present when the device is at a standstill, e.g. due to movement of the liquid or air (assembly or air from outside).	Set the switching point of the sensor to be slightly less sensitive.
The device reacts with a long delay and has a changed response behavior	The sensor tip is dirty. (Deposits on the sensor)	Clean the sensor carefully with water.
	Glycol content is higher than 30%.	Reduce glycol content to below 30%. Reduce
The yellow LED and relay switch on and off at short intervals	Sensitivity set too close to the switching point or the flow fluctuates around the switching point.	Increase the sensitivity on the affected channel using the potentiometer [Sense] so that the switching point becomes slightly less sensitive.

NLSW®45-4 SIL2 works, but both channels switch (very) differently.	Sensor of one channel not set correctly or defective.	Check the installation and connection of the sensors and, if necessary, replace the sensors and reset them. .
NLSW®45-4 SIL2 switches when the medium temperature rises or falls rapidly	Temperature gradient is outside the technical specification	Check the temperature gradients of the system (max. 20K/min). In the event of a fault, adjust the switching point when the medium is flowing hot .
Current setting does not correspond exactly to the set value.	System has only been in operation for a short time.	If necessary, readjust the device after 30 minutes of continuous operation.

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7. EU DECLARATION OF CONFORMITY

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EU-Konformitätserklärung

Die EU-Konformitätserklärung gilt für folgendes Gerät:

NLSW®45-4 SIL2

Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung trägt der Hersteller. Wir bestätigen die Übereinstimmung mit den grundlegenden Anforderungen der europäischen Richtlinien:

2014/30/EU (EMV-Richtlinie)
2014/35/EU (Niederspannungsrichtlinie)
2011/65/EU (Beschränkung gefährlicher Stoffe)
2015/863/EU (Ergänzung RoHS 3)

Die folgenden Standards wurden angewendet:

DIN EN IEC 63000: 2019-05
DIN EN IEC 61000-6-2: 2019-11
DIN EN 61000-6-3: 2021-03

Mettmann, den 28. März 2023

Philipp Hein
Geschäftsführer

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Our product portfolio

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