



Operating instructions **NLSW®45-3 Ex SIL2**

24 V AC, 24 V DC, 230 V AC





The installation company and the system operator are responsible for observing and complying with the relevant national Ex regulations.

Static charges on plastic and cable parts as well as interference radiation must be avoided.

Protect devices effectively against damage.

The sensor cable must be laid securely and effectively protected against damage.

CONTENTS

CONTENTS	3
1. SAFETY INSTRUCTIONS	4
1.1 General safety instructions	4
1.2 Intended use.....	5
2. GENERAL INFORMATION ON EXPLOSION PROTECTION	5
2.1 Electrical circuit diagram for Ex-i.....	6
2.2 Intrinsically safe characteristics.....	7
2.3 Properties of the various sensor types	7
2.4 Type code.....	7
2.5 Dimensions of the air flow sensors F3.x Ex SIL2	8
2.6 Temperature class	8
3. GENERAL INFORMATION	8
3.1 Field of application and practical use.....	8
3.2 Functionality.....	9
4. TECHNICAL DATA	10
4.1 Device dimensions.....	11
4.2 Labeling of the sensors (type plate)	11
5. INSTALLATION AND COMMISSIONING	12
5.1 Installation conditions for air flow sensors F3.x Ex SIL2	13
5.2 Installation.....	14
5.3 Electrical connection	14
5.4 Commissioning the device.....	15
5.5 Switching point adjustment.....	16
6. SERVICING AND MAINTENANCE	17
6.1 Definition of terms according to IEC 60079-17.....	17
7. TROUBLESHOOTING	18
8. DISPOSAL	19
9. EU DECLARATION OF CONFORMITY	20

1. SAFETY INSTRUCTIONS

1.1 General safety instructions



Please read the product description carefully before using the device. Make sure that the product is fully suitable for your application.

Improper or improper use can lead to malfunctions of the device or to undesirable effects on your application. For this reason, installation, electrical connection, commissioning, operation and maintenance of the device may only be carried out by trained personnel.

The following standards were taken into account when evaluating the product:

- a) IEC 60079-0:2017 Ed. 7 "*Potentially explosive atmospheres - Part 0: Equipment - General requirements*"
- b) IEC 60079-11:2011 Ed. 6 + Corr. 2012 / EN 60079-11:2012 "*Potentially explosive atmospheres - Part 11: Equipment protection by intrinsic safety 'i'*"
- c) TRGS 727:2016 "*Avoidance of ignition hazards due to electrostatic charge*"

The sensor corresponds to the state of the art and is safe to operate. The sensor may pose a residual risk if it is used and operated improperly by untrained personnel.

Every person responsible for the installation, commissioning, maintenance or repair of the product must have read and understood the operating instructions and in particular the safety instructions.

- a) When selecting and operating a product as intended, follow the general rules of technology.
- b) All connected electrical and mechanical equipment must be suitable for the respective application.
- c) Observe the information in these operating instructions as well as the operating conditions and permissible data indicated on the imprints/type plates of the respective products.
- d) Ensure that only the product ignition protection types corresponding to the zones are installed.
- e) The product is only approved for proper and intended use in a normal industrial atmosphere. Immersion in liquids is not permitted.
- f) It must be ensured that no falling objects can hit the product. In combination with rust, light metal and kinetic energy, an exothermic ignitable reaction can be caused.
- g) The operator must ensure lightning protection for the entire system in accordance with local regulations.
- h) It is the responsibility of the installer to ensure that the sensors function properly in conjunction with the individual evaluation devices and are approved for the intended use.
- i) The intrinsically safe connection - including the sensors - must be made via approved evaluation devices, which may have to be equipped with suitable Zener barriers or switching amplifiers.

1.2 Intended use

- a) To ensure safe operation, the products may only be used in accordance with the information in the operating instructions. During use, the legal and safety regulations required for the respective application must also be observed. This also applies to the use of accessories.
- b) If the instructions given in this excerpt are not observed or if the product is handled improperly, our liability shall lapse. In addition, the warranty on products and spare parts is void.
- c) The products are not safety elements in the sense of the intended use.
- d) Only original parts from the manufacturer may be used.

2. GENERAL INFORMATION ON EXPLOSION PROTECTION

The intrinsically safe air flow sensor measures air flow velocities in the range of 0.1 20.0 m/s according to the calorimetric measuring principle. Depending on the functional principle, either the degree of cooling (cooling method) or the heating power required to bring the heating element to a constant temperature (constant temperature method) is used as an indicator of the flow rate.

The air flow sensor is intended for commercial installations and may only be used in accordance with the specifications in the technical documentation from SEIKOM-Electronic GmbH & Co.KG and the information on the type plate. It is only operated together with certified products via an intrinsically safe circuit that is powered by a safety barrier. They comply with the applicable standards and regulations.

The installation regulations (e.g. EN 60079-14) for systems in potentially explosive atmospheres must be observed.

Further important details can be found in the corresponding EC type examination certificate.

The requirements for simple electrical equipment that apply to Zone 1 potentially explosive gas atmospheres in accordance with EN 60079-11 are met.

The air flow sensor can be used as follows, in accordance with the type plate:

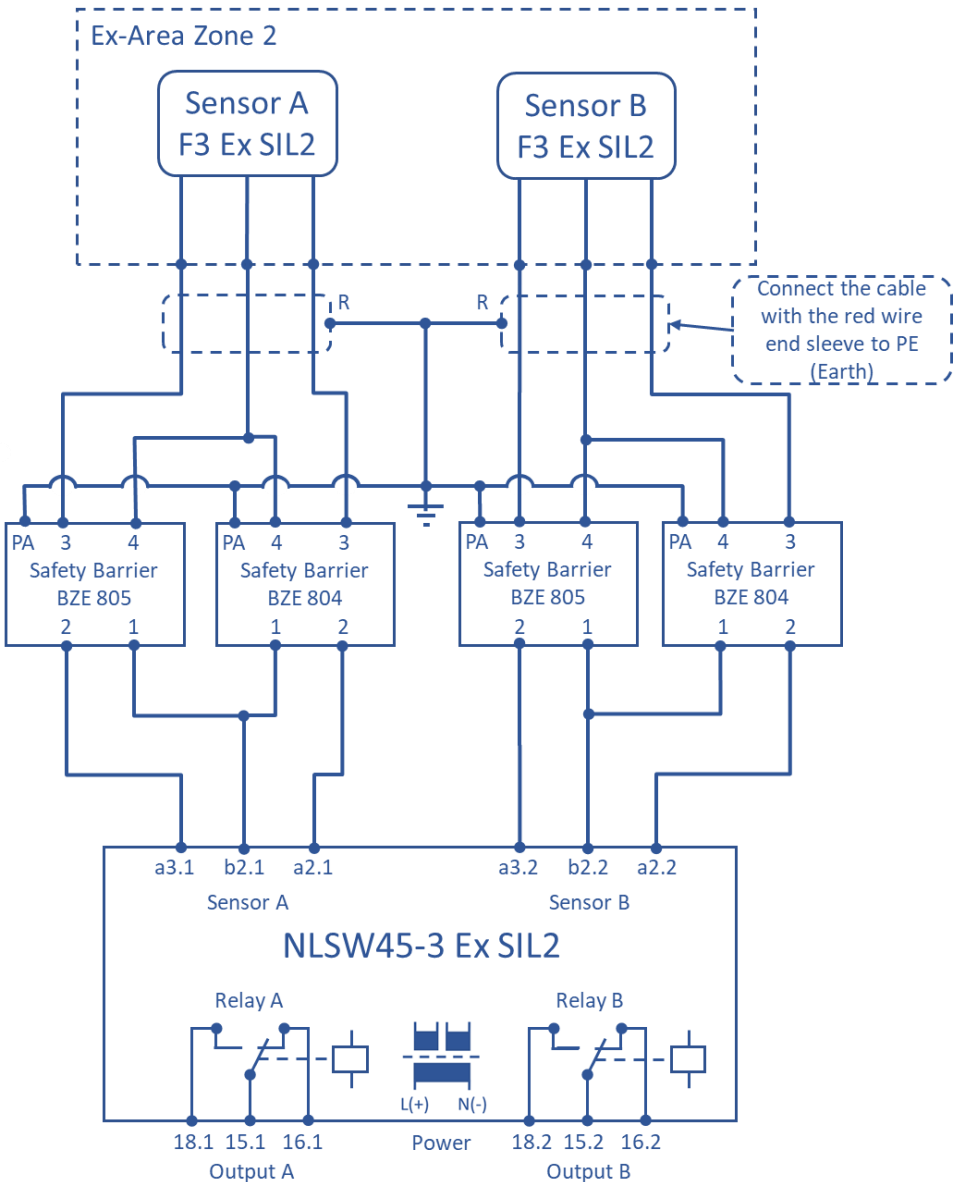
- In Zone 2 (Gas-Ex, EPL Gc) in explosion groups IIA, IIB and IIC

The qualification with regard to the surface temperature is T4. The equipment is a source of ignition for all gases, vapors and mists with an ignition temperature > 135 °C.

The permissible ambient temperature range for the air flow sensor is from $0^{\circ}\text{C} \leq T_a \leq 60^{\circ}\text{C}$. The permissible ambient temperature range for the NLSW45-3 Ex SIL2 evaluation electronics is from $-20^{\circ}\text{C} \leq T_a \leq 50^{\circ}\text{C}$. The permissible media temperature (air flow sensor) is $0^{\circ}\text{C} \leq T \leq 60^{\circ}\text{C}$.

The self-heating of the air flow sensors is generally negligible; in the event of a fault, the permissible limit values of temperature class T4 can be reached.

2.1 Electrical circuit diagram for Ex-i



When installing, please note that the supplied Zener barriers BZE804 and BZE805 have different values. If the barriers are interchanged, the NLSW45-3 Ex SIL2 airflow monitor will not function properly.

2.2 Intrinsically safe characteristics

Type	Value
U _I	25 VDC
I _I	80 mA
P _I	0.35 W @ 40°C
	0.24 W @ 110°C
C _I	Negligible
L _I	Negligible

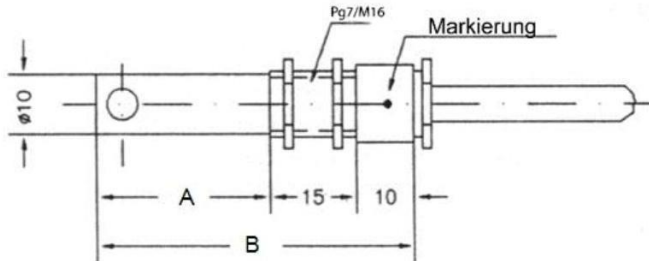
2.3 Properties of the various sensor types

Type	F3.x Ex SIL2
Article no.	50276ExSIL2/[Immersion depth]
Immersion depth	50 mm (F3 Ex SIL2), 130 mm (F3.1 Ex SIL2), 165 mm (F3.2 Ex SIL2), 300 mm (F3.3 Ex SIL2), 400 mm (F3.4 Ex SIL2), 500 mm (F3.5 Ex SIL2)
Media temperature	0 °C ... 60 °C
Ambient temperature	0 °C ... 50 °C
Temperature gradient	30 K/min
Process connection	PG7 thread
Sensor tube material	MS58, nickel-plated brass
Compressive strength	10 bar
Electrical connection	2.5 m / 3 x 0.75 mm ²
Protection class	IP67
Evaluation electronics	NLSW@45-3 Ex SIL2
Wire colors	Brown, black, gray, numbered (1, 2, 3)

2.4 Type code

Only one product type F3.x Ex SIL2 is manufactured, which differs only in the different sensor length. See previous table.

2.5 Dimensions of the air flow sensors F3.x Ex SIL2



Sensor type	Length A (in mm)	Length B (in mm)
F3 Ex SIL2	35	60
F3.1 Ex SIL2	115	140
F3.2 Ex SIL2	150	175
F3.3 Ex SIL2	285	310
F3.4 Ex SIL2	385	410
F3.5 Ex SIL2	485	510

2.6 Temperature class

The sensor is suitable for temperature class T4.

3. GENERAL INFORMATION

The NLSW45-3 Ex SIL2 air flow monitor is a flow monitor consisting of two air flow sensors and an evaluation unit. The device works according to the calorimetric measuring principle. The NLSW45-3 Ex SIL2 complies with the SIL2 standards according to IEC 61508-5:2010. Both the circuitry in the evaluation unit and the sensor have a redundant design.

3.1 Field of application and practical use

The electronic air flow monitors of the NLSW45-3 Ex SIL2 series are used for monitoring fans or dampers, for air flow-dependent monitoring of humidifiers and electric heating registers in accordance with DIN57100 Part 420 or for use in conjunction with DDC systems.

General areas of application: Fan monitoring, extraction systems, supply air systems, mechanical and plant engineering.

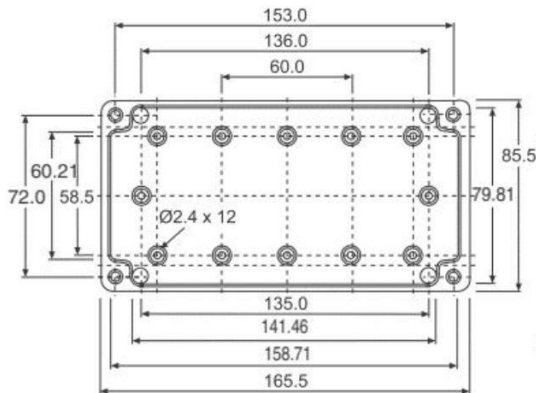
3.2 Functionality

Flow monitors of the NLSW45-3 Ex SIL2 series operate according to the calorimetric principle. The relay of a device switches when the flow velocity reaches a preselected threshold value. The calorimetric measuring principle is based on a heated, temperature-sensitive resistor. Heat is extracted from the precision resistor by the flow in the medium. The temperature of the resistor changes and with it its resistance value. This change is evaluated by the device. However, since not only the flow velocity of the medium has an influence on 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 in addition to the first. The second precision resistor (temperature compensation) is not heated and is only used to measure the temperature.

4. TECHNICAL DATA

Type	NLSW®45-3 Ex SIL2 24 V AC	NLSW®45-3 Ex SIL2 24 V DC	NLSW®45-3 Ex SIL2 230 V AC
Item number	77029ACExSIL2_Gg	77029ACExSIL2_Gg	63377ExSIL2_Gg
Operating voltage	24 V AC	24 V DC	230 V AC 50/60 Hz
Voltage tolerance	± 5%		
Overvoltage category	II		
Signal lamp Tension	Green LEDs		
Power consumption	5 VA	11 VA	
Ambient temperature temperature device	-20°C ... 50°C		
Signal output Flow	2 relay contacts (changeover contact)		
Switching function for Flow	Relay picks up		
Electricity and Contact load capacity	250 V AC, 8 A, 2 kVA		
Minimum switching power of the relays	10 mA / 5 V DC		
Signal lamp Flow	Yellow LEDs		
Start-up bypass	5 s... 60 s		
Signal lamp Start-up bypass	Yellow LEDs		
Media temperature range	0°C ... 60°C		
Temperature gradient	30 K/min		
Switching point setting	Adjustable via potentiometer		
Measuring range	0.1 ... 20.0 m/s		
Associated sensor	F3.x SIL2		
Immersion depth sensor	50 mm (F3 Ex SIL2), 130 mm (F3.1 Ex SIL2), 165 mm (F3.2 Ex SIL2), 300 mm (F3.3 Ex SIL2), 400 mm (F3.4 Ex SIL2), 500 mm (F3.5 Ex SIL2)		
Process connection	PG7 thread		
Sensor material	MS58, nickel-plated, optionally available in stainless steel		
Compressive strength	10 bar		
Electrical connection	14 Terminal plug, 2.5 mm ²		
Enclosure protection class	IP65		
Protection class Sensor	IP67		
Degree of soiling	2		
Housing dimensions (L x W x H)	165 mm x 85 mm x 55 mm		
SIL certification	SIL2 classification IEC 61508 SIL 2: 03.2023, type A		
More Certifications	CE, UKCA		

4.1 Device dimensions



4.2 Labeling of the sensors (type plate)

Each airflow sensor of the F3.x Ex SIL2 series is marked with a legible marking for the type of explosion protection required in the field as follows. This marking must not be removed.

SEIKOM-Electronic GmbH & Co KG Fortunastr. 20 D-42489 Wülfrath	
Type: F3.x Ex SIL2	
[Serial number]	CE [Year of construction]
TFR: 18 AT Ex 0003	
E II 3G Ex ic IIC T4 Gc	
0 °C ≤ Ta ≤ 60 °C	

As a general rule, legible marking for the type of explosion protection required in the field must be carried out before the product is put into operation for the first time.

A sensor that has already been operated in non-intrinsically safe circuits may no longer be used in intrinsically safe circuits.

5. INSTALLATION AND COMMISSIONING



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

Depending on the IP protection rating, the time for cleaning the operating equipment (dust deposits) must be specified. Other important facts:

- a) The product may only be put into operation in Zone 2 (Cat. 3G, EPL Gc) or Zone 1 (Cat. 2G, EPL Gb) in intrinsically safe circuits by specialists with a qualification similar to a competent person in accordance with TRBS 1203.
- b) The information on the rating plate must be observed.
- c) The products may only be used in a normal industrial atmosphere. The manufacturer must always be consulted if aggressive substances are present in the air. The products must be protected accordingly in adverse ambient conditions.
- d) The product may only be operated when the housing is fully assembled and undamaged. In the event of possible damage, the operator may have to take into account zone entrainment; in addition, operation is not permitted if the housing is damaged.
- e) The ambient conditions specified in the operating instructions must be complied with and the device must be protected against adverse ambient conditions.
- f) Heat radiation from external products/components must also be taken into account.
- g) The sensors must be protected against liquids and/or soiling.
- h) Stuck parts (e.g. due to frost or corrosion) must not be loosened by force if an explosive atmosphere is present. Icing must therefore be avoided.
- i) The sensors may only be exposed to low vibrations, see also IEC 34-14.
- j) To ensure the dissipation of electrostatic charges, the national requirements must be taken into account.
- k) In particular, isolated capacities must be prevented.
- l) The sensor housing should be electrostatically connected to the equipotential bonding; a limit value of 1 MΩ is permissible.
- m) Only Zener barriers or switching amplifiers whose output circuits are approved for use in potentially explosive atmospheres may be used. In Europe, use in Zone 1 requires an EC type examination certificate for the equipment concerned issued by a notified body for explosion protection.
- n) The total power $P_{o\text{ of}}$ of all supply devices must be less than or equal to the power P_i of the sensors.
- o) The voltage of the supply devices must be less than or equal to the voltage U_i of the sensors.
- p) The total current $I_{o\text{ of}}$ of the supply devices must be less than or equal to the current I_i of the sensors.
- q) A block diagram (system description) to be drawn up by the installer/operator is required for the installation of the intrinsically safe circuit.
- r) Equipotential bonding must be established between the earth connection and along the intrinsically safe circuit when using a Zener barrier and the housing of the flow sensors.
- s) The certificates, including the special conditions specified therein, must be taken into account.

- t) Stuck parts of the product (e.g. due to frost or corrosion) must not be forcibly loosened if an explosive atmosphere is present.
- u) The sensors must not be used in systems in which cathodic systems for corrosion protection are present. Although special precautions may make this possible, the manufacturer must always be consulted. Parasitic currents must not be conducted via the construction.
- v) Within the potentially explosive area, installation may only be carried out in accordance with the locally applicable installation regulations.

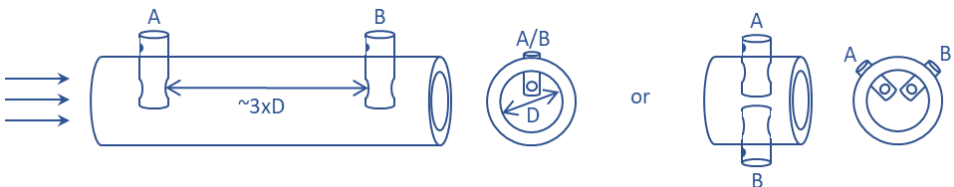
The following conditions must be observed (incomplete):

- a) Installation and maintenance may only be carried out in an explosion-free atmosphere and in compliance with the regulations applicable in the operator's country.
- b) Additional precautions must be taken if the presence of hydrogen sulphide, ethylene oxide and/or carbon monoxide is to be expected: these substances have a very low ignition energy.
- c) If these substances are present and if a substance of explosion group IIC is present and if an explosive atmosphere is likely to be present, only non-sparking tools may be used.

5.1 Installation conditions for airflow sensors F3.x Ex SIL2

The following installation conditions must be observed for the F3.x SIL2 sensors:

- The sensor tip should be located in the center of the pipe if possible and must be fully surrounded by the medium (air/gas).
- Align the mark on the sensors in the direction of the flow.
- The sensors must be mounted in the same pipe in such a way that they do not influence each other (approx. $3 \times D$ (pipe inner diameter) distance in a row or on the same height in the channel) - see drawing below:



- For vertical ducts, the flow direction should ideally be from bottom to top.
- Maintain a free inlet section $5 \times D$ upstream of the sensor and an outlet section $3 \times D$ downstream of the sensor.
- Only screw in the sensors via the hexagon of the sensor.
- The sensors are independent of the installation position.
- The sensors must be connected to the airflow monitor in accordance with the connection diagram. Mixing up the connections will lead to malfunctions and possible damage.
- The air flow sensor must be connected to the air flow monitor in accordance with the connection diagram. Mixing up the connections will lead to malfunctions and possibly defects.
- The screen (shielding) must be connected to the potential equalization (PA)

- An extension of the sensor cable (shielded) is only permitted in a non-explosive atmosphere and may not exceed a total length of 30 m with a minimum cross-section of 1.5 mm².
do not exceed

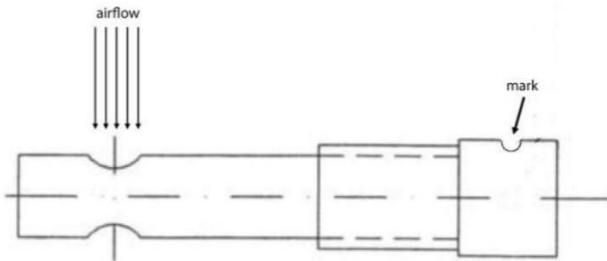
The following points must be observed for the connecting cable during operation:

- The temperature range for mobile installation is -5°C to +80°C; minimum bending radius 10 x cable diameter
- The temperature range for fixed installation is -40°C to +80°C; minimum bending radius 10 x cable diameter

The connecting cable used is not suitable for outdoor use or underground installation. Always contact the manufacturer for deviating operating conditions.

5.2 Installation

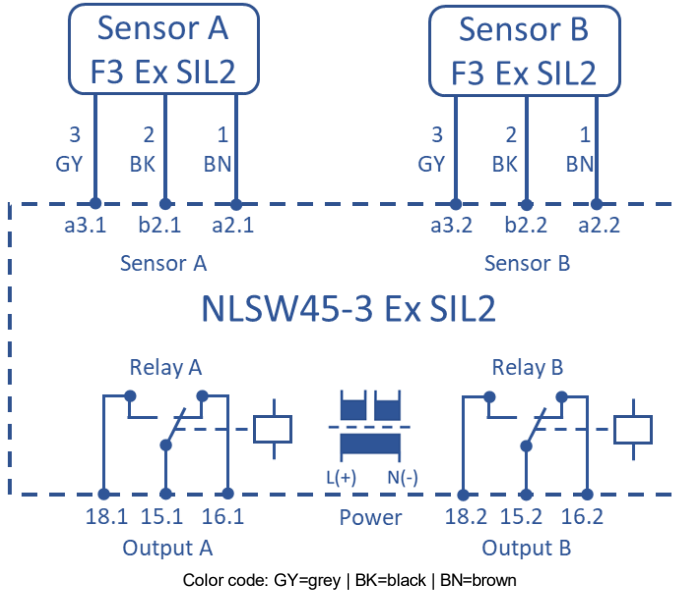
It is mounted using the PG7 thread on the sensor housing. Mounting is also possible using the enclosed PG7 nuts. The marking serves as an alignment aid to align the cross hole with the sensors in the air flow. When commissioning with media temperatures below 0°C and strong air currents, the start-up time of the device may be extended to 60 s until it is ready for operation.



5.3 Electrical connection

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

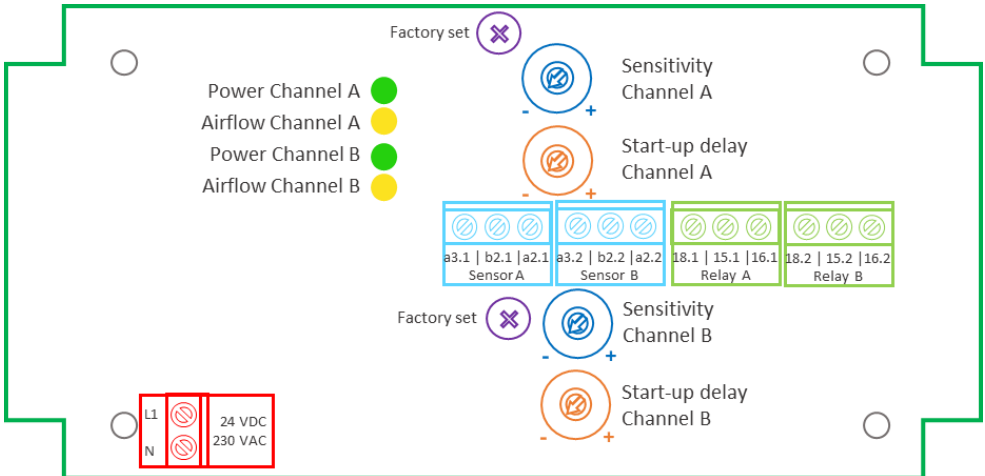
If a safety extra-low voltage is applied to the potential-free contact, ensure that the connecting cables are sufficiently insulated up to the terminal point, as otherwise the double insulation to the mains voltage side will be impaired. The current carrying capacity of the potential-free contact is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



5.4 Commissioning the device



The two potentiometers (purple) fixed with protective lacquer are set at the factory and must not be adjusted.



The following procedure is recommended for commissioning and setting the devices:

- a) Connect two suitable sensors (F3.x) to the device using the supplied terminals; sensor A to channel A, sensor B to channel B (light blue).

- b) Connect the PLC or control unit to relay output A and B (green) using the terminals supplied. Please note the NO/NC contact assignment and circuit.
- c) Set the "Sensitivity" potentiometer (dark blue) for both channels to the left stop (insensitive).
- d) Set the "Start-up bypass" potentiometer (orange) to the desired start-up bypass time approx. 5 s ... 60 s (left stop approx. 5 s/ right stop approx. 60 s) for both sensors.
- e) Apply mains voltage (red); the green LEDs light up. The device is ready for operation within 2 seconds.
- f) The yellow LEDs light up (briefly) and go out again as soon as the set start-up bridging time has elapsed. The relays are energized during this time.
- g) Switch on the airflow generator.
- h) Before setting the switching points, the device should run for at least 2 minutes under operating conditions (with flow). The switching point setting at low flow rates requires a sensitive setting on the potentiometer.
- i) Slowly turn the "Sensitivity" potentiometer for channel A (dark blue) to the right until the yellow LED lights up and the output relay is energized. To achieve stable switching conditions, you should turn slightly beyond the switching point. Set the same switching ratio for channel B.
Note: Depending on the installation position and air flow situation in the duct, small switching differences between duct A and duct B are normal.
- j) If the start-up bypass is preset, do not make this sensitivity setting until the start-up bypass has expired and the yellow LED has gone out.
- k) To check the flow monitoring, reduce or switch off the flow generation. The yellow LEDs go out and the output relays de-energize.

The device is now set to monitoring function. Preset values of the

NLSW45-3 Ex SIL2:

- The switching hysteresis is fixed.
- The switching delay is 0.2 s as standard.
- The start-up delay is adjustable from 5 s to 60 s as standard.

5.5 Switching point adjustment

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

Small flow change in the high flow velocity range: The switching point must be selected very close to the measured value of the normal flow, as the measured value change is very small when the flow changes. As 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 velocity range: The switching point can be selected with a greater distance to the measured value of the normal flow, as the measured value change is large when the flow changes. A change in temperature has no effect on the switching behavior.

Large flow change: A 'yes/no' statement is usually required here (e.g. fan running or fan stopped). Therefore, such a large safety distance can be selected that neither temperature changes nor turbulence have an influence on the switching behavior.

The switching points are set on the evaluation unit of the airflow monitor.

6. SERVICING AND MAINTENANCE

6.1 Definition of terms according to IEC 60079-17

Maintenance and repair: A combination of all activities carried out to maintain or restore an item to a condition that meets the requirements of the relevant specification and ensures the performance of the required functions.

Inspection: An activity involving the careful examination of an object with the aim of making a reliable statement about the condition of this object, whereby it is carried out without disassembly or, if necessary, with partial disassembly, supplemented by measures such as measurements.

Visual inspection: A visual inspection is an inspection in which visible defects are detected without the use of access equipment or tools, for example missing screws.

Close-up test: A test in which, in addition to the aspects of the visual inspection, faults such as loose screws that can only be detected by using access equipment, e.g. steps (if necessary) and tools, are detected. For close-up inspections, an enclosure does not usually need to be opened or the equipment de-energized.

Detailed inspection: An inspection in which, in addition to the aspects of the close-up inspection, defects such as loose connections, which can only be detected by opening housings and/or, if necessary, using tools and test equipment, are detected.

- a) Maintenance work may only be carried out by qualified persons.
- b) Only accessories that meet all the requirements of European directives and national legislation may be used in potentially explosive atmospheres.
- c) Maintenance work involving disassembly of the sensors may only be carried out in an explosion-free atmosphere.
- d) Components may only be replaced with original spare parts that are also approved for use in hazardous areas.
- e) The products must be regularly maintained and cleaned in hazardous areas. The intervals are determined by the operator according to the environmental conditions on site.

Activity	Visual inspection monthly	Close inspection every 6 months	Detailed inspection every 12 months
Visually check the sensors for damage, remove dust deposits	•		
Testing for integrity and function			•
Testing the overall system	In the area of responsibility of the operator		

Only clean dirty air flow sensors in lukewarm soapy water. After cleaning, allow to air dry completely before refitting the air flow sensors. Never use hard or sharp objects (e.g. screwdrivers, wire brushes, etc.) for cleaning.

7. TROUBLESHOOTING

The following instructions are intended as first aid if your airflow monitor is not working properly. If you have any further questions, the SEIKOM Electronic team will be happy to help you at any time by phone or e-mail.

Problem	Possible cause	Troubleshooting
Device does not work at all	No or incorrect mains voltage connected	Check mains voltage and connection.
Device does not detect any flow (on one or both channels)	Sensor(s) is/are not installed correctly or the sensitivity on the evaluation unit is not correct discontinued.	Check the installation conditions and sensitivity settings.
	Flow rate is outside the measuring range	Adjust the diameter of the pipe to increase the flow rate or reduce them.
NLSW45-3 Ex SIL2 works but both channels switch (very) differently.	Sensor of a channel not set correctly or defective.	Check the sensor and setting; if necessary, replace and readjust the sensor.
NLSW45-3 Ex SIL2 has Changed response behavior	Sensor is heavily soiled by the medium (deposits on the sensor)	Carefully clean the sensor with water. Never use hard objects use for cleaning.
NLSW45-3 Ex SIL2 switches with rapid media temperature increase or lowering	Temperature gradient is outside the specification	Check the temperature gradients of the system (max. 30 K/min). In the event of a fault

		flowing medium set.
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8. DISPOSAL

The packaging and used parts must be disposed of in accordance with the regulations of the country in which the product is installed.

9. EU DECLARATION OF CONFORMITY



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EU-Konformitätserklärung

Die EU-Konformitätserklärung gilt für folgendes Gerät:

NLSW®45-3 Ex 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

Wülfrath, den 28. März 2023



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WEEE-Reg.-Nr. DE38909112

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