



Operating manual **NLSW[®] 45-3 Ex (SZB)** **& Sensor F3.x Ex**

24 V AC, 24 V DC, 230 V AC



Version 1.0 SZB



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 must be avoided.

Protect devices effectively against damage.

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

Interference must be avoided.

Our products comply with the requirements of the European directives WEEE 2012/19/EU and RoHS 2011/65/EU.

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1. PREAMBLE

1.1 Safety instructions

To ensure proper function and for your own safety, please read the enclosed operating instructions carefully before starting the installation. If you have any questions, please contact the SEIKOM-Electronic team. These original operating instructions must always be followed.

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 charging*"

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 operating 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 for 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 supplied 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:

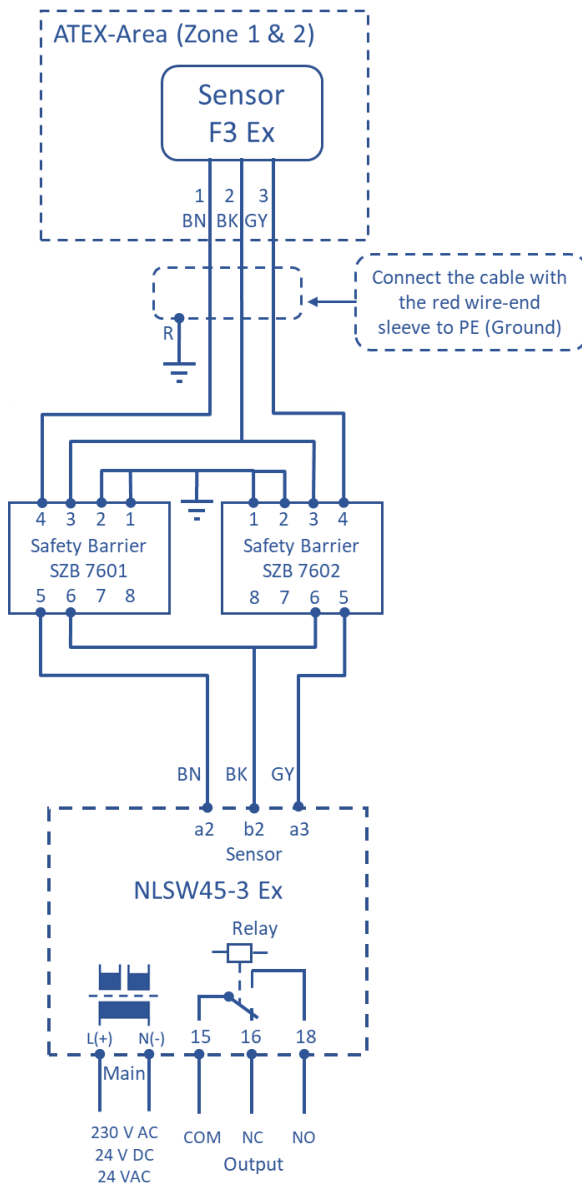
- In Zone 2 (Gas-Ex, EPL Gc) in explosion groups IIA, IIB and IIC

The qualification with regard to the surface temperature is T4. For all gases, vapors and mists with an ignition temperature > 135 °C, the equipment is not a source of ignition.

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 evaluation electronics NLSW® 45-3 Ex is from $-20^{\circ}\text{C} \leq T_a \leq 50^{\circ}\text{C}$. The permissible media temperature (air flow sensor) is $0^{\circ}\text{C} \leq T \leq 60^{\circ}\text{C}$.

Self-heating is generally negligible; in the event of a fault, the permissible limit values of temperature class T4 can be reached.

2.1 Electrical Characteristics for Ex-i





When installing, please note that the Zener barriers SZB 7601 and SZB 7602 have different values. If the barriers are interchanged, the air flow monitor NLSW® 45-3 Ex will not function correctly.

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

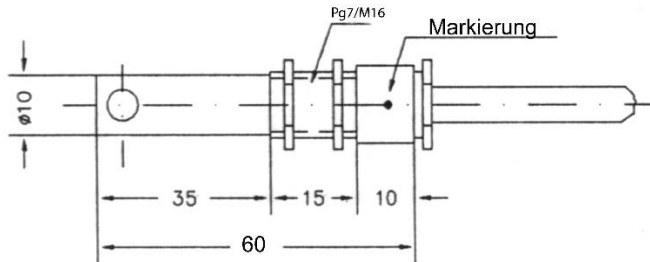
Type	F3 Ex	F3.1 Ex	F3.2 Ex	F3.3 Ex
Article no.	50276Ex/50	50276Ex/130	50276Ex/165	50276Ex/300
Immersion depth	50 mm	130 mm	165 mm	300 mm
Permissible media temperature	0 °C ... 60 °C			
Permissible ambient temperature	0 °C ... 60°C			
Temperature gradient	30 K/min			
Process connection	PG7			
Sensor tube material	CuZn39Pb2, nickel-plated			
Compressive strength	10 bar			
Electrical connection	2.5 m, 3 x 0.75 mm ²			
Protection class	IP67			
Evaluation electronics	NLSW®45-3 Ex, NLSW® 75A Ex			
Wire colors	Black with white numbers			
Type-tested in accordance with DIN EN 61010-1:2011-07 by TÜV-Nord				
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2.4 Type code

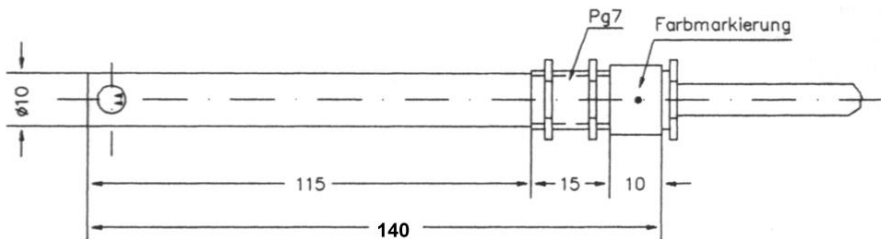
Only one product type F3 Ex is manufactured, which only differs in length. See previous table.

2.5 Dimensions of the air flow sensors F3.x Ex

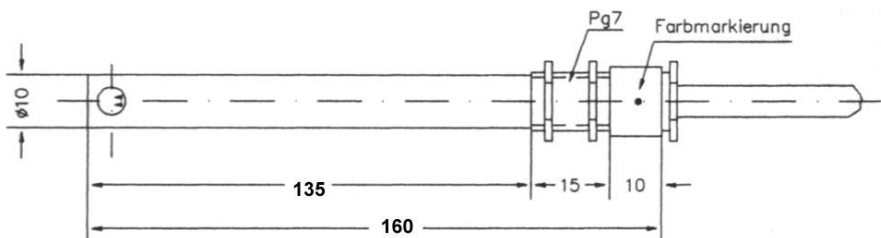
2.5.1 F3 Ex



2.5.2 F3.1 Ex



2.5.3 F3.2 Ex



2.6 Temperature class

The sensor is suitable for temperature class T4.

2.7 General requirements

2.7.1 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.

2.7.2 General safety instructions

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) When selecting and operating a product, follow the general rules of technology.
- i) 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.
- j) 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.

3. COMMISSIONING AND INSTALLATION

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 sensor must be protected against the ingress of liquids and/or dirt.
- 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 sensor 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 PA; 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, which is issued by a notified body for explosion protection.
- n) The total power P_o 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 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) If a Zener barrier is used, equipotential bonding must be established between the earth connection and along the intrinsically safe circuit 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!

3.1 Installation conditions for air flow sensors F3.x Ex

To avoid malfunctions, the following points must be observed when installing the air flow sensors:

- a) The sensor tip should be located in the center of the pipe if possible. The gaseous medium must flow completely through the cross bore in the sensor housing
- b) The marking serves as an assembly aid
- c) For vertically installed pipes, the flow direction should be from bottom to top. An inlet section of 5xD before and an outlet section of 3xD after the sensor should be observed (D=pipe inner diameter)
- d) 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
- e) The screen (shielding) must be connected to the equipotential bonding
- f) An extension of the sensor cable (shielded) is only permitted in a non-explosive atmosphere and must not exceed a total length of 30 m with a minimum cross-section of 1.5 mm²

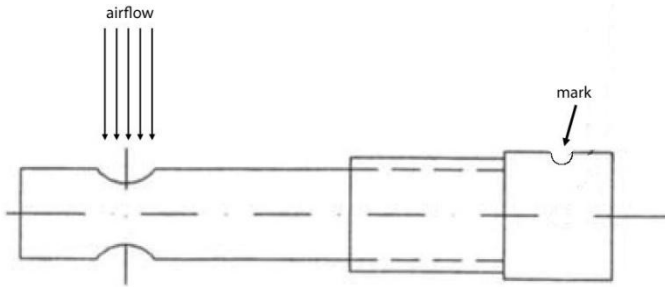
The following points must be observed for the connecting cable during operation:

- g) The temperature range for movable mounting is -5°C ... 80°C; minimum bending radius 10 x cable diameter
- h) The temperature range for fixed installation is -40°C .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.

3.2 Installation

Mounting is carried out via the PG7 located 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 seconds until it is ready for operation.



4. INSTALLATION OF AIRFLOW MONITOR NLSW®45-3 Ex

The flow monitors of the NLSW® 45-3Ex series must be installed together with the safety barriers outside the potentially explosive area. Make sure that the housing has a protection rating of IP40.

Connection and commissioning must be carried out by qualified personnel. The specialist personnel must have knowledge of ignition protection types, regulations and ordinances for equipment in hazardous areas! Check whether the classification (according to these instructions and device labeling) is suitable for the application.

The standard housing used allows mounting on an NS35/7.5 profile rail in accordance with DIN EN 50022-35. If this rail is exposed to major vibrations, it must be mounted with vibration damping. Please refer to DIN EN 60034-14 (IEC34-14).

The following points must also be observed:

- a. A block diagram (system description) to be drawn up by the installer/operator is required for the installation of the intrinsically safe circuit
- b. The installation may only be carried out in an unlocked state
- c. Commissioning may only take place after complete electrical connection and assembly
- d. The ambient conditions specified in these operating instructions must be observed



Under no circumstances is it permitted to connect the "N" connection of the operating voltage to b2 of the sensor connection cable (wire number 2) on 24 V AC and DC airflow monitors of the NLSW® 45-3 Ex, it is not permitted to connect the "N" connection of the operating voltage to b2 of the sensor connection cable (wire number 2).

4.1 Commissioning and switching point setting

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 becomes smaller and smaller with the same flow changes. This should be taken into account when setting the switching point. The following requirements must be observed:

Low flow change in the high flow range: The switching point must be selected very close to the measured value of the normal flow, as the measured value changes are 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.

Minor flow change in the low flow range: The switching point can be selected with some distance to the measured value of the normal flow, as the change in measured value 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 stopped). Therefore, such a large safety distance can be selected that neither temperature changes nor turbulence have an influence on the switching behavior.

The following procedure is recommended for commissioning:

1. Install the air flow sensor and monitor in accordance with the operating instructions
2. Set the "air flow" trimmer on the monitor to minimum sensitivity (left stop)
3. Set the trimmer "t=start bridging" to the desired start bridging time (approx. five to 60s; right stop corresponds to 60s)
4. Switch on the mains voltage; the green LED lights up and the potential-free changeover contact switches; the device is ready for operation within five seconds
5. The yellow LED lights up until the start-up bridging time has elapsed and then goes out
6. Switch on the flow generator
7. Slowly turn the "air flow" trimmer towards maximum until the yellow LED lights up and the potential-free changeover contact switches; to achieve stable switching conditions, the "air flow" trimmer should be turned slightly past the switching point
8. Check the setting; to do this, switch off the air flow, the yellow LED goes out, the potential-free changeover contact switches; switch the air flow back on, the yellow LED lights up, the potential-free changeover contact switches again

The guard is now set to monitoring function.

The following relationship exists between the air flow and the switching position of the potential-free changeover contact:

Flow \geq Threshold value	Signal output switches	Yellow "Air flow" LED lights up
Flow < threshold value	Signal output not switched	Yellow "Air flow" LED does not light up

Please contact us if you have any further questions or problems. Technical development and errors excepted.

5. SERVICING AND MAINTENANCE

5.1 Definition of terms

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, it is not usually necessary to open an enclosure or to de-energize the equipment.

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-up inspection every 6 months	Detailed check 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.

6. TROUBLESHOOTING

No changes may be made to products that are operated in connection with potentially explosive atmospheres. Repairs to the product may only be carried out by specially trained and authorized personnel.

Problem	Cause	Solution
NLSW® 45-3 Ex does not work	No or incorrect operating voltage	Check mains voltage and connection
	Zener barriers and/or sensors connected incorrectly	Check wiring and connect zener barriers / sensors according to connecting diagram
NLSW® 45-3 Ex does not detect flow	Sensor is not installed correctly or the measuring range does not correspond to the technical data	Check installation conditions and installation
NLSW® 45-3 Ex has changed response behavior	Sensor is heavily soiled by the medium (deposits on the sensor)	Carefully clean the sensor with water (soapy water). Never use hard objects for cleaning!
NLSW® 45-3 Ex switches on rapid temperature rise	Temperature gradient is outside the technical data	Reset the switching point

7. DISPOSAL

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

8. LABELING OF THE SENSOR (TYPE PLATE)



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

SEIKOM-Electronic GmbH & Co.KG Gold-Zack-Straße. 7 D-40822 Mettmann	
Type: F3.x Ex	
[Serial number]	CE [Year of construction]
TFR: 18 ATEX 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.

9. TECHNICAL DATA OF AIR FLOW SWITCHES NLSW® 45-3 Ex

Type	NLSW®45-3 Ex		
Item number	77029Ex/DC	77029Ex/AC	63377Ex
Operating voltage	24 V DC	24 V AC	230 V AC
Voltage tolerance	± 5%		
Overvoltage category	II		
Signal display voltage	Green LEDs		
Power consumption	3 VA		4.5 VA
Permissible ambient temperature Device	-20°C ... 50°C		
Signal output flow	1 changer		
Switching function with flow	Relay picks up		
Current and contact load capacity	250 V AC, 8 A, 2 kVA		
Minimum switching capacity of the relays	10 mA, 5 V DC		
Signal display with flow	Yellow LED		
Start-up bypass	Adjustable approx. 5 s... 60 s		
Start-up bypass display	none		
Permissible media temperature range	0°C ... 60°C		
Switching point	Adjustable via potentiometer		
Measuring range	0.1 ... 20.0 m/s		
Flow sensors	50 mm (F3 Ex), 130 mm (F3.1 Ex), 165 mm (F3.2 Ex), 300 mm (F3.3 Ex)		
Zener barriers	2 pieces, included in the scope of delivery		
Electrical connection	10 terminals, 2.5 mm ²		
Enclosure protection class	IP40		
Protection class Terminals	IP20		
Housing	Standard housing N45		
Housing dimensions (L x W x H)	120 mm x 45 mm x 73 mm		
Test mark	Type-tested in accordance with DIN EN 61010-1:2011-07 by TÜV-Nord  		

Technical development and errors excepted.

Change status: V1.5 – 04/2025

10. EU DECLARATION OF CONFORMITY



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EU-Konformitätserklärung

Die EU-Konformitätserklärung gilt für folgendes Gerät:

NLSW®45-3-Ex

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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Our product portfolio

 <p>Flow rate</p>	 <p>Pressure</p>	 <p>Temperature</p>
 <p>Air quality and CO₂</p>	 <p>Zener barriers</p>	 <p>Universal Transmitter</p>



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