

# Instruction Manual

## 1. Marking

Inductive sensor NBB20-U1K-N0
ATEX marking Ⓜ II 1G Ex ia IIC T6...T1 Ga Ⓜ II 1G Ex ia IIC T6...T1 Ga Ⓜ II 3G Ex ic IIC T6...T1 Gc Ⓜ II 1D Ex ia IIIC T135°C Da
IECEx marking Ex ia IIC T6...T1 Ga Ex ia IIC T6...T1 Ga Ex ia IIIC T135°C Da Ex ia I Mb
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## 2. Validity

Specific processes and instructions in this instruction manual require special provisions to guarantee the safety of the operating personnel.

## 3. Target Group, Personnel

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismantling lies with the plant operator.

The personnel must be appropriately trained and qualified in order to carry out mounting, installation, commissioning, operation, maintenance, and dismantling of the device. The trained and qualified personnel must have read and understood the instruction manual.

## 4. Reference to Further Documentation

Observe laws, standards, and directives applicable to the intended use and the operating location. Observe Directive 1999/92/EC in relation to hazardous areas.

The corresponding datasheets, manuals, declarations of conformity, EU-type examination certificates, certificates, and control drawings if applicable (see datasheet) are an integral part of this document. You can find this information under [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com).

Due to constant revisions, documentation is subject to permanent change. Please refer only to the most up-to-date version, which can be found under [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com).

## 5. Intended Use

The device is only approved for appropriate and intended use. Ignoring these instructions will void any warranty and absolve the manufacturer from any liability.

Technical data provided in the datasheet may be partly restrained by the information given in this instruction manual.

Use the device only within the specified ambient and operating conditions. The device is an electrical apparatus for hazardous areas.

The certificate applies only to the use of apparatus under atmospheric conditions.

If you use the device outside atmospheric conditions, consider that the permissible safety parameters should be reduced.

The device can be used in hazardous areas containing gas, vapor, and mist.

The device can be used in hazardous areas containing combustible dust.

The device can be used in underground parts of mines as well as those parts of surface installations of such mines containing firedamp and/or combustible dust.

### 5.1. Requirements for Equipment Protection Level Ga

Refer to the relevant certificate to see the relationship between the connected circuit type, the maximum permitted ambient temperature, the effective inner reactances, and if applicable the surface temperature or the temperature class.

The suitability for use of the device at ambient temperatures >60 °C in conjunction with hot surfaces has been checked by the notified body.

For usage as apparatus according to ATEX Directive, the temperature reduction of 20 % according to EN 1127-1 was taken into account in the temperature table for the corresponding equipment protection level.

### 5.2. Requirements for Equipment Protection Level Gb

Refer to the relevant certificate to see the relationship between the connected circuit type, the maximum permitted ambient temperature, the effective inner reactances, and if applicable the surface temperature or the temperature class.

The suitability for use of the device at ambient temperatures >60 °C in conjunction with hot surfaces has been checked by the notified body.

### 5.3. Requirements for Equipment Protection Level Da

Refer to the relevant certificate to see the relationship between the connected circuit type, the maximum permitted ambient temperature, the effective inner reactances, and if applicable the surface temperature or the temperature class.

The suitability for use of the device at ambient temperatures >60 °C in conjunction with hot surfaces has been checked by the notified body.

### 5.4. Requirements for Equipment Protection Level Mb

Refer to the relevant certificate to see the relationship between the connected circuit type, the maximum permitted ambient temperature, the effective inner reactances, and if applicable the surface temperature or the temperature class.

The suitability for use of the device at ambient temperatures >60 °C in conjunction with hot surfaces has been checked by the notified body.

## 6. Improper Use

Protection of the personnel and the plant is not ensured if the device is not used according to its intended use.

## 7. Mounting and Installation

Observe the installation instructions according to IEC/EN 60079-14.

Safety-relevant markings are found on the nameplate of the device or the nameplate supplied.

Attach the nameplate supplied in the immediate vicinity of the device. Attach the nameplate so that it is legible and indelible. Take the ambient conditions into account.

Do not mount a damaged or polluted device.

Mount the device so that it complies with the specified degree of protection according to IEC/EN 60529.

If you use the device in environments subject to adverse conditions, you must protect the device accordingly.

Do not remove the warning markings.

Prevent the inside of the device from becoming contaminated when the connector is disconnected.

Before you close the surrounding enclosure, ensure that the seals are clean, undamaged, and correctly fitted.

### 7.1. Requirements for Usage as Intrinsically Safe Apparatus

When connecting intrinsically safe devices with intrinsically safe circuits of associated apparatus, observe the maximum peak values with regard to explosion protection (verification of intrinsic safety). Observe the standards IEC/EN 60079-14 or IEC/EN 60079-25.

The type of protection is determined by the connected intrinsically safe circuit.

### 7.2. Specific Conditions of Use

Mount the device so that it complies with the specified degree of protection according to IEC/EN 60529.

#### 7.2.1. Requirements in Relation to Electrostatics

Information on electrostatic hazards can be found in the technical specification IEC/TS 60079-32-1.

Do not mount the supplied nameplate in areas that can be electrostatically charged.

#### 7.2.1.1. Requirements for Equipment Protection Level Ga

Usage in Gas Group IIC:

Avoid electrostatic charges which could result in electrostatic discharges while installing, operating, or maintaining the device.

#### 7.2.1.2. Requirements for Equipment Protection Level Gb

Usage in Gas Group IIC:

Avoid electrostatic charges which could result in electrostatic discharges while installing, operating, or maintaining the device.

#### 7.2.1.3. Requirements for Equipment Protection Level Gc (ic)

Usage in Gas Group IIC:

Avoid electrostatic charges which could result in electrostatic discharges while installing, operating, or maintaining the device.

#### 7.2.1.4. Requirements for Equipment Protection Level Da

Avoid electrostatic charges which could result in electrostatic discharges while installing, operating, or maintaining the device.

#### 7.2.2. Requirements to Mechanics

##### 7.2.2.1. Requirements for Usage as Intrinsically Safe Apparatus

Protect the device from impact effects by mounting in a surrounding enclosure if it is used in the temperature range between the minimum permissible ambient temperature and -20 °C.

Mount the device with at least a degree of protection of IP20 according to IEC/EN 60529.

### 7.3. Requirements for Cable Glands

Seal the housing. Use a seal that is suitable for the specified application.

## 8. Operation, Maintenance, Repair

Observe the specific conditions of use.

Safety-relevant markings are found on the nameplate of the device or the nameplate supplied.

Do not use a damaged or polluted device.

Do not repair, modify, or manipulate the device.

Modifications are permitted only if approved in this instruction manual and in the device-related documentation.

If there is a defect, always replace the device with an original device.

Do not remove the warning markings.

Prevent the inside of the device from becoming contaminated when the connector is disconnected.

Before you close the surrounding enclosure, ensure that the seals are clean, undamaged, and correctly fitted.

### 8.1. Requirements for Usage as Intrinsically Safe Apparatus

Only operate the device with intrinsically safe circuits according to IEC/EN 60079-11.

The type of protection is determined by the connected intrinsically safe circuit.

### 8.2. Requirements for Equipment Protection Level Ga

Observe the temperature table for the corresponding equipment protection level in the certificate.

Also observe the maximum permissible ambient temperature stated in the technical data. Keep to the lower of the two values.

### 8.3. Requirements for Equipment Protection Level Gb

Observe the temperature table for the corresponding equipment protection level in the certificate.

Also observe the maximum permissible ambient temperature stated in the technical data. Keep to the lower of the two values.

### 8.4. Requirements for Equipment Protection Level Da

Observe the temperature table for the corresponding equipment protection level in the certificate.

Also observe the maximum permissible ambient temperature stated in the technical data. Keep to the lower of the two values.

### 8.5. Requirements for Equipment Protection Level Mb

Observe the temperature table for the corresponding equipment protection level in the certificate.

Also observe the maximum permissible ambient temperature stated in the technical data. Keep to the lower of the two values.

## 9. Delivery, Transport, Disposal

Check the packaging and contents for damage.

Check if you have received every item and if the items received are the ones you ordered.

Keep the original packaging. Always store and transport the device in the original packaging.

Store the device in a clean and dry environment. The permitted ambient conditions must be considered, see datasheet.

The device, built-in components, packaging, and any batteries contained within must be disposed in compliance with the applicable laws and guidelines of the respective country.

## 10. National Ex approvals

EAC-EX:	TC RU C-DE.AA87.B.00394
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UL HAZLOC:	E501628 116-0451
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ANZEx:	ANZEx 19.3001X
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## 11. Safety-Relevant Technical Data

### 11.1. Equipment protection level Ga

Type of protection	Intrinsic safety
CE marking	CE-0102
Certificates	
Appropriate type	NBB20-U...K-N0...
ATEX certificate	PTB 00 ATEX 2032 X
ATEX marking	Ⓜ II 1G Ex ia IIC T6...T1 Ga

ATEX standards	EN 60079-0:2012-08, EN 60079-0/A11:2013-11, EN 60079-11:2012-01
IECEx certificate	IECEx PTB 11.0021X
IECEx marking	Ex ia IIC T6...T1 Ga
IECEx standards	IEC 60079-0:2011-06, IEC 60079-11:2011-06
Effective internal capacitance $C_i$	max. 110 nF A cable length of 10 m is considered.
Effective internal inductance $L_i$	max. 200 $\mu$ H A cable length of 10 m is considered.
Maximum permissible ambient temperature in $^{\circ}$ C	Also observe the maximum permissible ambient temperature stated in the general technical data. Keep to the lower of the two values.
for ATEX	$U_i = 16$ V, $I_i = 25$ mA, $P_i = 34$ mW T6: 56 $^{\circ}$ C T5: 68 $^{\circ}$ C T4: 96 $^{\circ}$ C T3: 96 $^{\circ}$ C T2: 96 $^{\circ}$ C T1: 96 $^{\circ}$ C $U_i = 16$ V, $I_i = 25$ mA, $P_i = 64$ mW T6: 49 $^{\circ}$ C T5: 61 $^{\circ}$ C T4: 89 $^{\circ}$ C T3: 89 $^{\circ}$ C T2: 89 $^{\circ}$ C T1: 89 $^{\circ}$ C $U_i = 16$ V, $I_i = 52$ mA, $P_i = 169$ mW T6: 28 $^{\circ}$ C T5: 40 $^{\circ}$ C T4: 68 $^{\circ}$ C T3: 68 $^{\circ}$ C T2: 68 $^{\circ}$ C T1: 68 $^{\circ}$ C $U_i = 16$ V, $I_i = 76$ mA, $P_i = 242$ mW T6: 13 $^{\circ}$ C T5: 25 $^{\circ}$ C T4: 53 $^{\circ}$ C T3: 53 $^{\circ}$ C T2: 53 $^{\circ}$ C T1: 53 $^{\circ}$ C

for IECEx	$U_i = 16 \text{ V}$ , $I_i = 25 \text{ mA}$ , $P_i = 34 \text{ mW}$ T6: 73 °C T5: 88 °C T4: 100 °C T3: 100 °C T2: 100 °C T1: 100 °C $U_i = 16 \text{ V}$ , $I_i = 25 \text{ mA}$ , $P_i = 64 \text{ mW}$ T6: 66 °C T5: 81 °C T4: 100 °C T3: 100 °C T2: 100 °C T1: 100 °C $U_i = 16 \text{ V}$ , $I_i = 52 \text{ mA}$ , $P_i = 169 \text{ mW}$ T6: 45 °C T5: 60 °C T4: 89 °C T3: 89 °C T2: 89 °C T1: 89 °C $U_i = 16 \text{ V}$ , $I_i = 76 \text{ mA}$ , $P_i = 242 \text{ mW}$ T6: 30 °C T5: 45 °C T4: 74 °C T3: 74 °C T2: 74 °C T1: 74 °C
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Maximum permissible ambient temperature in °C	Also observe the maximum permissible ambient temperature stated in the general technical data. Keep to the lower of the two values. $U_i = 16 \text{ V}$ , $I_i = 25 \text{ mA}$ , $P_i = 34 \text{ mW}$ T6: 73 °C T5: 88 °C T4: 100 °C T3: 100 °C T2: 100 °C T1: 100 °C $U_i = 16 \text{ V}$ , $I_i = 25 \text{ mA}$ , $P_i = 64 \text{ mW}$ T6: 66 °C T5: 81 °C T4: 100 °C T3: 100 °C T2: 100 °C T1: 100 °C $U_i = 16 \text{ V}$ , $I_i = 52 \text{ mA}$ , $P_i = 169 \text{ mW}$ T6: 45 °C T5: 60 °C T4: 89 °C T3: 89 °C T2: 89 °C T1: 89 °C $U_i = 16 \text{ V}$ , $I_i = 76 \text{ mA}$ , $P_i = 242 \text{ mW}$ T6: 30 °C T5: 45 °C T4: 74 °C T3: 74 °C T2: 74 °C T1: 74 °C
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### 11.2. Equipment protection level Gb

Type of protection	Intrinsic safety
CE marking	CE-0102
Certificates	
Appropriate type	NBB20-U...K-N0...
ATEX certificate	PTB 00 ATEX 2032 X
ATEX marking	Ⓜ II 1G Ex ia IIC T6...T1 Ga
ATEX standards	EN 60079-0:2012-08, EN 60079-0/A11:2013-11, EN 60079-11:2012-01
IECEX certificate	IECEX PTB 11.0021X
IECEX marking	Ex ia IIC T6...T1 Ga
IECEX standards	IEC 60079-0:2011-06, IEC 60079-11:2011-06
Effective internal capacitance $C_i$	max. 110 nF A cable length of 10 m is considered.
Effective internal inductance $L_i$	max. 200 µH A cable length of 10 m is considered.

### 11.3. Equipment protection level Gc (ic)

Type of protection	Intrinsic safety
CE marking	CE
Certificates	
ATEX certificate	PF13CERT2895X
ATEX marking	Ⓜ II 3G Ex ic IIC T6...T1 Gc
ATEX standards	EN 60079-0:2012-08, EN 60079-0/A11:2013-11, EN 60079-11:2012-01
Effective internal capacitance $C_i$	max. 110 nF A cable length of 10 m is considered.
Effective internal inductance $L_i$	max. 200 µH A cable length of 10 m is considered.

Maximum permissible ambient temperature in °C	<p>Also observe the maximum permissible ambient temperature stated in the general technical data. Keep to the lower of the two values.</p> <p><math>U_i = 20 \text{ V}</math>, <math>I_i = 25 \text{ mA}</math>, <math>P_i = 34 \text{ mW}</math>  T6: 73 °C  T5: 88 °C  T4: 100 °C  T3: 100 °C  T2: 100 °C  T1: 100 °C</p> <p><math>U_i = 20 \text{ V}</math>, <math>I_i = 25 \text{ mA}</math>, <math>P_i = 64 \text{ mW}</math>  T6: 66 °C  T5: 81 °C  T4: 100 °C  T3: 100 °C  T2: 100 °C  T1: 100 °C</p> <p><math>U_i = 20 \text{ V}</math>, <math>I_i = 52 \text{ mA}</math>, <math>P_i = 169 \text{ mW}</math>  T6: 45 °C  T5: 60 °C  T4: 89 °C  T3: 89 °C  T2: 89 °C  T1: 89 °C</p> <p><math>U_i = 20 \text{ V}</math>, <math>I_i = 76 \text{ mA}</math>, <math>P_i = 242 \text{ mW}</math>  T6: 30 °C  T5: 45 °C  T4: 74 °C  T3: 74 °C  T2: 74 °C  T1: 74 °C</p>
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Appropriate type	NBB20-U...K-N0...
IECEX certificate	IECEX PTB 11.0021X
IECEX marking	Ex ia I Mb
IECEX standards	IEC 60079-0:2011-06, IEC 60079-11:2011-06
Effective internal capacitance $C_i$	max. 110 nF A cable length of 10 m is considered.
Effective internal inductance $L_i$	max. 200 µH A cable length of 10 m is considered.
Maximum permissible ambient temperature in °C	<p>Also observe the maximum permissible ambient temperature stated in the general technical data. Keep to the lower of the two values.</p> <p><math>U_i = 16 \text{ V}</math>, <math>I_i = 25 \text{ mA}</math>, <math>P_i = 34 \text{ mW}</math>  100 °C  <math>U_i = 16 \text{ V}</math>, <math>I_i = 25 \text{ mA}</math>, <math>P_i = 64 \text{ mW}</math>  100 °C  <math>U_i = 16 \text{ V}</math>, <math>I_i = 52 \text{ mA}</math>, <math>P_i = 169 \text{ mW}</math>  89 °C  <math>U_i = 16 \text{ V}</math>, <math>I_i = 76 \text{ mA}</math>, <math>P_i = 242 \text{ mW}</math>  74 °C</p>

#### 11.4. Equipment protection level Da

Type of protection	Intrinsic safety
CE marking	CE-0102
Certificates	
Appropriate type	NBB20-U...K-N0...
ATEX certificate	PTB 00 ATEX 2032 X
ATEX marking	Ⓔ II 1D Ex ia IIIIC T135°C Da
ATEX standards	EN 60079-0:2012-08, EN 60079-0/A11:2013-11, EN 60079-11:2012-01
IECEX certificate	IECEX PTB 11.0021X
IECEX marking	Ex ia IIIIC T135°C Da
IECEX standards	IEC 60079-0:2011-06, IEC 60079-11:2011-06
Effective internal capacitance $C_i$	max. 110 nF A cable length of 10 m is considered.
Effective internal inductance $L_i$	max. 200 µH A cable length of 10 m is considered.
Maximum permissible ambient temperature in °C	<p>Also observe the maximum permissible ambient temperature stated in the general technical data. Keep to the lower of the two values.</p> <p><math>U_i = 16 \text{ V}</math>, <math>I_i = 25 \text{ mA}</math>, <math>P_i = 34 \text{ mW}</math>  100 °C  <math>U_i = 16 \text{ V}</math>, <math>I_i = 25 \text{ mA}</math>, <math>P_i = 64 \text{ mW}</math>  100 °C  <math>U_i = 16 \text{ V}</math>, <math>I_i = 52 \text{ mA}</math>, <math>P_i = 169 \text{ mW}</math>  89 °C  <math>U_i = 16 \text{ V}</math>, <math>I_i = 76 \text{ mA}</math>, <math>P_i = 242 \text{ mW}</math>  74 °C</p>

#### 11.5. Equipment protection level Mb

Type of protection	Intrinsic safety
Certificates	