



**Brüel & Kjær Vibro**

A member of the NSK Group

# B&K vibro

Instructions

**IN-08x**

Non-Contacting Displacement Sensor with integrated Oscillator



Keep accessible for future reference

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Instructions - **Sensor IN-08x**,

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## Table of Contents

<b>1</b>	<b>Hints</b> .....	<b>4</b>
1.1	Pictograms and their Meanings .....	4
1.2	User Qualification .....	4
1.3	Intended Use .....	4
1.3.1	Recommendations to User .....	5
1.3.2	Prohibition of Unauthorized Modifications .....	5
<b>2</b>	<b>Application</b> .....	<b>5</b>
<b>3</b>	<b>Dimensioned drawing</b> .....	<b>6</b>
3.1	IN-081 .....	6
3.2	IN-083 .....	6
3.3	IN-084 .....	6
3.4	IN-085 .....	7
<b>4</b>	<b>Connection</b> .....	<b>7</b>
4.1	Connection for IN-085 .....	7
<b>5</b>	<b>Sensitivity of the displacement sensor</b> .....	<b>8</b>
5.1	Dependent on measurement track material .....	8
5.2	At room temperature .....	8
<b>6</b>	<b>Mounting the displacement sensor</b> .....	<b>9</b>
6.1	Mounting advice.....	9
6.2	Free space and minimum distances for non-contacting displacement sensors .....	9
<b>7</b>	<b>Technical Data</b> .....	<b>10</b>
7.1	Characteristic curve of displacement sensor .....	11
7.2	EMC .....	12
7.3	Calibration .....	12
<b>8</b>	<b>Disposal</b> .....	<b>12</b>
<b>9</b>	<b>Declaration of Conformity</b> .....	<b>13</b>



## 1 Hints



### NOTE!

This manual is a part of the product. Read the manual carefully before using the product and keep it accessible for future use.

### 1.1 Pictograms and their Meanings



This symbol warns of dangerous situations which can result from misuse of the product.

### 1.2 User Qualification

Ensure that all work in conjunction with our systems is performed by skilled, expert and authorized workers. Among these works are:

#### **Installation and Commissioning**

Installation and commissioning primarily concern work on electrical equipment. These works may be performed exclusively by electricians or workers instructed and supervised by an electrician in accordance with electrotechnical regulations/directives.

#### **Change of System Specification**

Any change of system specification has its effects on monitoring process with stationary systems and on the measuring sequence with portable measuring systems.

### 1.3 Intended Use

If sensors and the cables are used in a way not described in the relevant user manuals, function and protection may be impaired and serious personal damage, death or serious, irreversible injuries may result.

- Exclusively use sensor as specified in data sheet. Any use other than specified is considered inappropriate. Brüel & Kjær Vibro does not assume any liability for damages resulting from inappropriate use. The user is solely responsible. For originally intended use, see system documentation.
- Mounted sensors must not be used as steps.
- Ensure that system is exposed only to admissible environmental influences specified in technical system data sheet.
- Handle the systems with care in order to prevent damage to the systems or personal damage due to falling.
- Maintain electrical equipment in regular intervals. Remedy defects, e.g. loose wires, defective connectors, immediately.
- Check cable and connectors in regular intervals.
- Never use cable to pull plug out of socket.

## Hot surfaces

- In line with the user manuals, sensors and cables can be operated in extensive ambient temperature ranges, whereby they can become hot through self-heating on housing walls and can produce burning.
- When mounted at external heat or cold sources (e.g. machine parts), systems, sensors and cables can adopt dangerous temperatures, whereby burning, among other things, can occur in the event of contact.

### 1.3.1 Recommendations to User

If the use of the system in conjunction with machines or plant sections can produce risks outside of Brüel & Kjær Vibro's responsibility, the user is expected to prepare and distribute safety technical instructions or warnings and to ensure that the personnel concerned has received and understood same.



If system is integrated into a machine or designed to be assembled, commissioning must not take place until the machine the system is to be integrated in conforms to the EC directives.

### 1.3.2 Prohibition of Unauthorized Modifications

System and accessories must not be changed neither in construction nor safety technology without the express consent of Brüel & Kjær Vibro. Any unauthorized modification excludes Brüel & Kjær Vibro's liability for resulting damages.

## 2 Application

The non-contacting displacement sensors are used to measure relative shaft vibration, relative shaft displacement, rotor speeds ect. A prerequisite for measurement is a metallic measuring surface, preferably made of 42CrMo4.

The output voltage of the sensor is proportional to the distance between the probe tip and the measuring surface, within the displacement measuring range. Extraneous disturbances, such as earth loops, temperature influences and dielectric influences like oil and gas can be neglected.

Direct connection of signal cables with a length up to 1000 m, is possible. Moreover, the sensor can be replaced without recalibration.



### 3 Dimensioned drawing

#### 3.1 IN-081

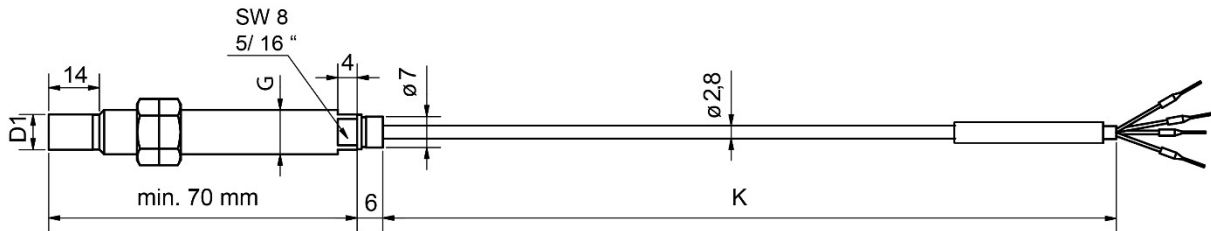


Figure 3-1) Dimensions IN-081

#### 3.2 IN-083

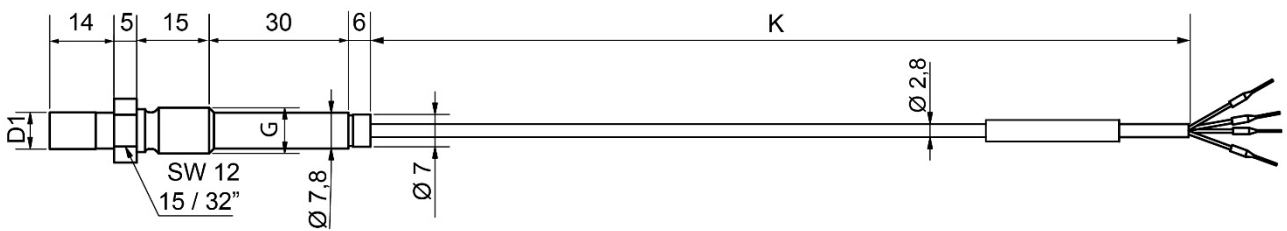


Figure 3-2) Dimensions IN-083

#### 3.3 IN-084

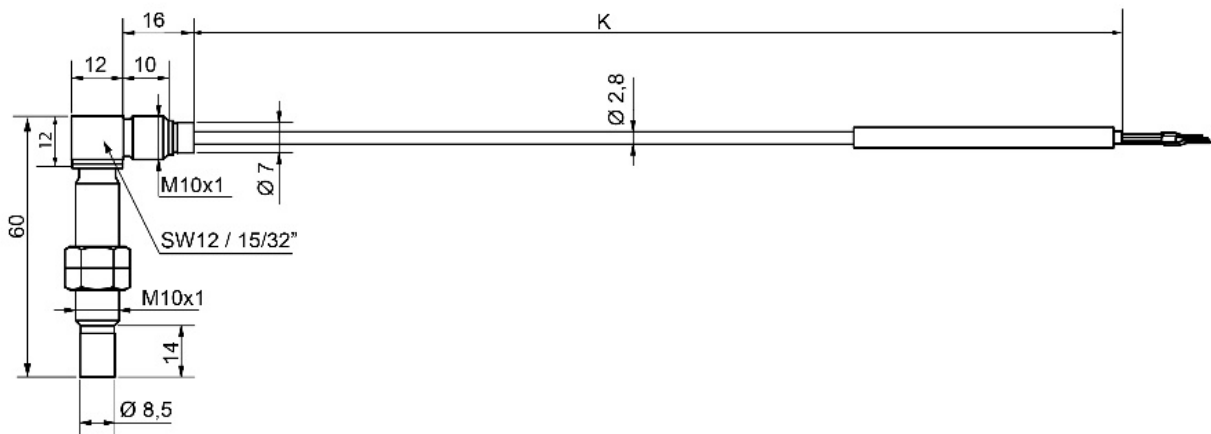


Figure 3-3) Dimensions IN-084

### 3.4 IN-085

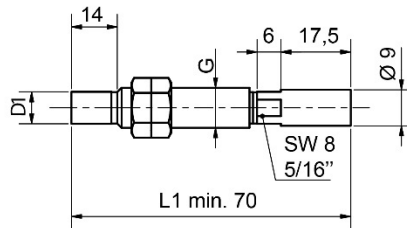


Figure 3-4) Dimensions IN-085

Sensor length L1	
IN-081	70 ... 250 mm
IN-083	70 mm
IN-084	60 mm
IN-085	70 ... 150 mm
Thread G, diameter D1	M10 x 1 - 6 g, Ø 8,5 mm 3/8" - 24 UNF -2 A, Ø 8 mm
Cable length K	approx. 5 m with pig-tails

## 4 Connection

### 4.1 Connection for IN-085

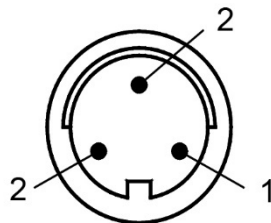


Figure 4-1) Socket assignment

- 1 = -DC
- 2 = SIG
- 3 = COM

Enclosure IN-085	IP 54
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## 5 Sensitivity of the displacement sensor

### 5.1 Dependent on measurement track material

The displacement sensor is calibrated for material no.: 1.7225 (42CrMo4) in accordance with DIN 17 200, corresponding to AISI/SAE 4140.

The sensitivity in -8mV/mil).

Further materials and their sensitivities are listed in the table below.

The sensitivity of a material can be determined by means of a material specimen with the help of a Brüel & Kjær Vibro calibration unit AC-126. Calibration to other materials is effected at the electronic at the measuring system.

### 5.2 At room temperature

Mat. no.: acc. to DIN 17 200	Abbreviated	Sensitivity -mV/ $\mu$ m
1.0050	St 50-2	7,90
1.0062	St 60	7,90
1.0501	C 35	7,95
1.0503	C 45G	7,80
1.1181	CK 35	7,85
1.1191	C 45	7,90
1.2241	51CrV4	8,20
1.2841	90MnCrV4	7,80
1.4006	X10Cr13	7,40
1.4028	X30Cr13	7,50
1.4057	X22CrNi17	7,25
1.4104	X12CrMoS17	7,50
1.4313	G-X5CrNi13 4	7,35
1.4406	X5CrNiMoN18 12	10,45
1.4449	X5CrNiMo17 13	7,65
1.4500	G-X7NiCrMoCaNb2520	10,35
1.4541	X10CrNiTi18 9	7,80
1.4571	X6CrNiMoTi17 12(2)	10,40
1.4922	X22CrMoV12 1	7,45
1.6562	40NiMoCr7.3	7,50
1.6580	30CrNiMo8	7,80
1.6587	17CrNiMo6	7,80
1.7219	27CrMo5	8,05
1.7225	42CrMo4	8,00
1.8070	21CrMoV5 11	7,80



## 6 Mounting the displacement sensor

### 6.1 Mounting advice

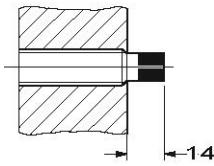
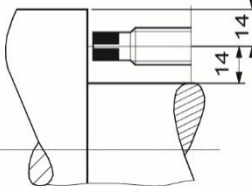
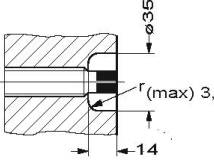
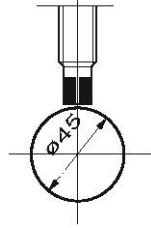
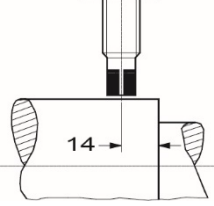
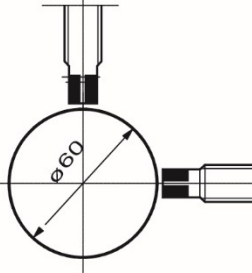
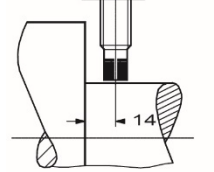
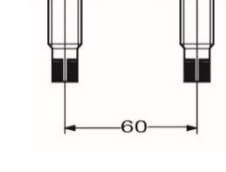
The installation of the displacement sensor must be result accordingly at the „Mounting instructions for displacement sensors,, !

Sensors for non-contacting displacement measurement are pre-ferrably to be mounted onto such machine components whose natural vibration does not falsify the measured result.

The sensor mounting torque is 4,5 Nm.

### 6.2 Free space and minimum distances for non-contacting displacement sensors

Non-contacting displacement sensors operating according to the eddy-current principle create a high-frequency electro-magnetic field. If any electrically-conducting material apart from the measured object enters this field, the measurement results will be falsified; therefore during the installation of non-contacting displacement sensors, the following free space and minimum distances must be maintained:

	<p>Probe tip projecting</p>		<p>Distance to shaft shoulder - Sensor parallel to electrically conducting material</p>
	<p>Probe tip flush</p>		<p>Required minimum diameter of the shaft for one sensor</p>
	<p>Distance to shaft end &gt; 100 % coverage</p>		<p>Required minimum diameter of the shaft for two sensors</p>
	<p>Distance to shaft shoulder - Sensor parallel to electrically conducting material</p>		<p>Sensors mounted parallel</p>

**HINT!**

If the free space and minimum distances cannot be observed due to constructional restrictions, the manufacturer must be consulted.

## 7 Technical Data

Measured parameter	relative shaft vibration relative shaft displacement
Measuring principle	eddy-current principle
Frequency range	0 ... 2 600 Hz (-3 dB)
Sensitivity	-8 mV/ $\mu$ m (material 42CrMo4) For other material refer to table page 8
Displacement measuring range, linear	1,5 mm
Sensitivity error	< $\pm$ 5 % at room temperature (+ 22 °C) < $\pm$ 10 % in operating temperature range
Deviation from reference line	$\pm$ 2 % at room temperature (+ 22 °C) $\pm$ 10 % in operating temperature range
Displacement measuring range with additional deviation of 5 %	2,4 mm
Average working position	Gap voltage -9 V

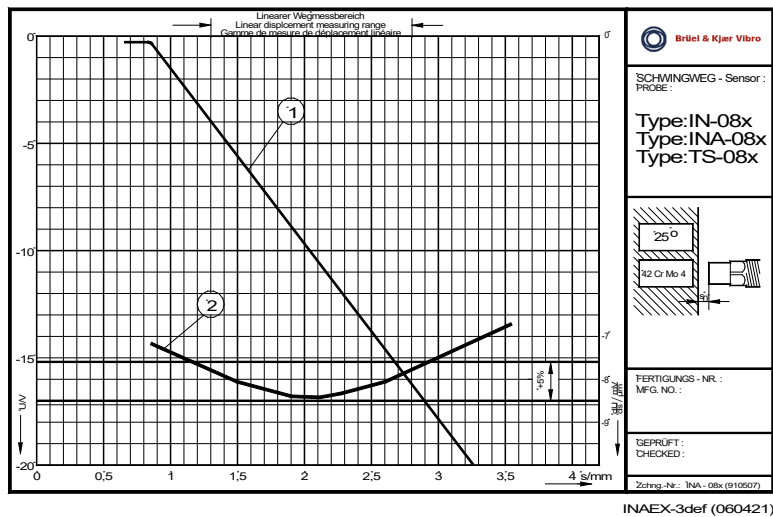
**HINT!**

The tip of the IN-084 sensor is sealed with lacquer for protection against humidity (water). This is also available as an option for other sensors of the type IN-08x.

<b>Temperatures</b>	
Storage temperature range (in original packaging)	-20 °C ... + 70 °C
Operating temperature range	0 °C ... + 110 °C
Usable temperature range	0 °C ... + 110 °C
<b>Supply</b>	
Supply Voltage $U_B$	-18 V ... -30 V DC (non polarized)
Power consumption (idling)	max. 20 mA
Power voltage feed through	$\leq$ 46 dB (f = 100 Hz) $\leq$ 27 dB (f $\leq$ 10 kHz)
Isolation resistance between housing and 0V	$R_{IS} > 20 \text{ M}\Omega$
<b>Output</b>	
Signal-Voltage	$U_{SIG} = U_B + 2 \text{ V}$
Signal current	$I_{max} = 15 \text{ mA}$
Noise	< 1 mV <sub>ss</sub> ( ... 10 kHz)
Source resistance, dynamic	< 5 $\Omega$
$R_{Load}$	> 1 k $\Omega$

Connection for IN-081, IN-083 and IN-084	
Cable	3 cores, shielded, pig tails
Shielding	not connected to sensor housing
Protection class acc. to EN 60 529	IP 54
Core colour	red = -DC white = COM yellow = SIG yellow/black = Shield
Admissible cable length	1000 m
Weight	approx. 120 g

### 7.1 Characteristic curve of displacement sensor



- Sensor temperature, constant (t = 25° C). Supply voltage -24 V. Test material 42CrMo4 AISI 4140
- Typical transmission characteristics curve (Pos. 1)
- Typical sensitivity characteristics curve (Pos. 2)

#### Transmission characteristics curve U = f(s) (Pos. 1)

This describes the relationship between gap voltage and the distance between the sensor tip and the measurement surface.

#### Characteristic curve of sensitivity $\frac{dU}{ds} = U'(s)$ (Pos. 2)

This describes the incremental gradient (sensitivity factor) as a function of the gap between sensor tip and the measurement surface.

#### Nominal measuring sensitivity

-8 mV/μm (-200 mV/mil) (with standard shaft material Material no.: 1.7225 acc. to DIN 17 200 with composition 42CrMo4).



## 7.2 EMC

see EMV-Data sheet: EMC data of displacement sensors Type IN - ...

## 7.3 Calibration

The sensor can be exchanged without requiring re-calibration of the instrumentation.

The sensor complies with the essential accuracy requirements of standards API 670 and DIN 45670.

## 8 Disposal



After use, dispose of the systems, cables and sensors in an environmentally friendly manner, in accordance with the applicable national provisions.

WEEE-Reg.-No. DE 69572330

## 9 Declaration of Conformity



### EU-Konformitätserklärung / *EU- Declaration of conformity*

Hiermit bescheinigt das Unternehmen / *The company*

**Brüel & Kjær Vibro GmbH**  
Wittichstraße 6  
D-64295 Darmstadt



die Konformität des Produkts / *herewith declares conformity of the product*

**Berührungsloser Wegsensor / *Non-contacting Displacement Sensor***

Typ / *Type*

**IN-08x**

mit folgenden einschlägigen Bestimmungen / *with applicable regulations below*  
EU-Richtlinie / *EU-directive*

**2014/30/EU EMV-Richtlinie / *EMC-Directive***

**2011/65/EU + (EU) 2015/863 Richtlinie zur Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten/ *EU Directive for the restriction of the use of certain hazardous substances in electrical and electronic equipment***

Angewendete harmonisierte Normen / *Harmonized standards applied*

**EN 61326-1: 2013**

**EN IEC 63000:2018**

Bereich / *Division*  
**Brüel & Kjær Vibro GmbH**

Unterschrift / *Signature*  
**CE-Beauftragter / *CE-Coordinator***

Ort/Place **Darmstadt**  
Datum / *Date* **14.08.2023**

  
(Njels Karg)

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