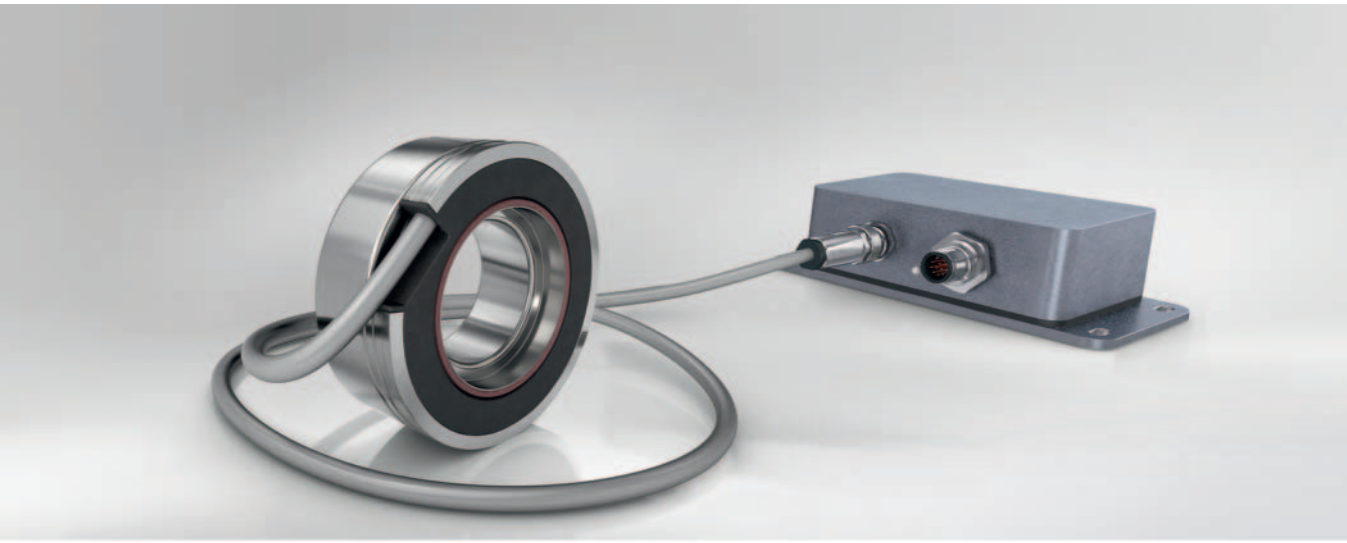
SCHAEFFLER



Schaeffler VarioSense

User manual

Foreword

As a result of the trend towards networked and intelligent machinery and plant, it is becoming increasingly important to gain information about the operating mode of machinery. Due to the high precision of rolling bearings and the accuracy of the adjacent construction, bearing positions are often the ideal measuring point.

Product

Schaeffler VarioSense combines standard rolling bearings with a modular sensor concept. The product range is being continually expanded. This makes it possible to offer a large selection of standard rolling bearings, which can be flexibly combined with sensors for different measurement values.

Described design

The design described in this manual is a combination of deep groove ball bearings of series 62 with sensor technology for speed measurement. Optional use of the interface unit, which is also part of the product range, is possible here.

Further information

This manual contains all information required for mounting, connection and operation.

Further information on Schaeffler VarioSense, such as details on the characteristics of rolling bearings or guidelines on the design of the adjacent instruction, can be found in publication TPI 253, Schaeffler VarioSense.

The current edition of TPI 253 is already available for download at:

- **www.schaeffler.de/std/1D55**.

Contents

About the user manual

The user manual is part of the product and contains important information. It should also be immediately available after mounting and commissioning.

Described product variants

This user manual is valid only for deep groove ball bearings of series 62 in designs 6205-C to 6210-C in combination with a sensor fitting of product configuration 001, i.e. with speed measurement as the sole sensor function.

Symbols

The warning and hazard symbols are defined in accordance with ANSI Z535.6-2011.

WARNING In case of non-compliance, death or serious injury may occur. ◁

NOTICE In case of non-compliance, damage or malfunctions in the product or the adjacent construction will occur. ◁

Legal guidelines

The information in this manual reflects the status as at December 2018. Autonomous modifications and usage of the system not for the intended purpose are not permissible. Schaeffler accepts no liability in these cases.

General safety guidelines

Usage for the intended purpose

Schaeffler VarioSense is intended for fitting in machinery and plant. Here, the bearing assumes the function of a classic rolling bearing, which has been expanded to include the recording of measurement values such as speed or temperature. The available measurement values are determined by the specific product configuration.
The product configuration described in this manual includes only the speed measurement.

Schaeffler VarioSense is intended exclusively for applications in the machine and equipment building sector where no particular protection requirements apply.

Usage not for the intended purpose

Any use involving a safety-related application of the measurement values is excluded. The safety of the machine or equipment itself, of the adjacent systems and of persons must be taken into account.

Application areas in which the use of Schaeffler VarioSense is not permitted:

- explosive environments (ATEX)
- nuclear power
- aerospace
- rail
- military
- medical equipment.

Any use that exceeds the operating limits of the integrated bearing is also excluded.

Further information

Detailed information on the integrated bearings:

- TPI 165, Deep Groove Ball Bearings, Generation C
- Catalogue HR 1, Rolling Bearings
- TPI 253, Schaeffler VarioSense.

Ambient conditions

Magnetic or electrically conductive dusts and particles are not permitted in the area adjacent to the Schaeffler VarioSense, as they can influence the function of the measuring system.

If there is a fluid circuit in the immediate vicinity of the bearing, the use of a magnetic separator is recommended.

The permissible ambient pressure for the sensor and interface unit is in the range of 700 hPa to 1 050 hPa.

The sensor unit can be operated under the ambient conditions permissible for the bearing. The interface unit is designed in accordance with the protection type IP67 to ISO 20653. If dust exposure is elevated in the area adjacent to Schaeffler VarioSense, please consult Schaeffler.

Special storage conditions apply, see page 13.

Electrostatic discharges (ESD)

The sensor unit and the interface unit contain electrostatically sensitive components. These can be destroyed by the action of an electric field or by **e**lectro**s**tatic **d**ischarge (abbreviated to ESD) through contact, or influenced in terms of rating life.

The relevant protective measures for working with electrostatically sensitive components must be observed. These include:

- Establishing electrostatic potential equalisation between all persons, who come into direct contact with the components, and their environment. This requires the use of ESD protection field equipment (shoes, clothing, anti-static wrist strap).
- ESD-protected storage of components, for example in a conductive ESD protective bag.

Electromagnetic compatibility

The sensor unit, interface unit and all accessories, including the supplied cables and plug connections, must be designed to comply with the electromagnetic compatibility requirements of Directive 2014/30/EU.

The sensor unit cable is shielded. If the customer makes changes to the coupling or cable for customer-side connection, he is responsible for complying with the requirements for electromagnetic compatibility. In particular, it must be ensured that the cable shielding is contacted at both cable ends. It is not permissible to extend the cable.

So as not to jeopardise electromagnetic compatibility in the respective application, the following specifications must be observed:

- integrated earthing concept between the housings of the sensor unit and the interface unit on one side and the machine housing on the other side
- laying of signal and power cables as far apart as possible
- additional shielding measures, for example shielded power cables or earthed cable ducts.

Qualified personnel

Schaeffler VarioSense may only be mounted, commissioned, operated and maintained by qualified personnel. The scope of competence, area of responsibility and monitoring of personnel must be precisely regulated by the site operator.

A person defined as qualified personnel:

- is authorised to perform mounting of the bearing and electronic components
- has all the necessary knowledge
- is familiar with the safety guidelines
- has read and understood this manual.

Work on electrical devices

Work on electrical devices may only be carried out by a trained electrician.

A trained electrician is in a position, on the basis of his technical training, knowledge and experience as well as his knowledge of the appropriate regulations, to assess the work assigned to him and recognise possible hazards.

Safety regulations

This section contains important safety regulations relating to working with Schaeffler VarioSense. Further guidelines can be found in the individual chapters of this user manual.

General handling

Schaeffler VarioSense is a sensitive measuring system. Shocks and compressive loads can damage the components, render the system unusable or result in erroneous output values. Shocks, such as those that occur due to falling, and other impermissible mechanical loads must therefore be avoided.

Adhesive bond

The sensor ring and rolling bearing are connected by an adhesive bond. To protect this connection, the mounting specifications must be closely observed.

As damage to the adhesive bond cannot be ruled out in dismounting of the sensor/bearing unit, further use of the sensor/bearing unit is not permitted after dismounting.

Conversion

Unauthorised modifications to the sensor/bearing unit, interface unit and accessories, including the supplied cables and plug connections, may affect the safety and function of the device and are not permitted.

Modifications to the specified components are only permissible in consultation withSchaeffler. Only components authorised by Schaeffler may be used.

If unauthorised modifications and conversions are carried out or unauthorised components are used, Schaeffler cannot accept any liability for the resulting negative consequences.

Scope of delivery

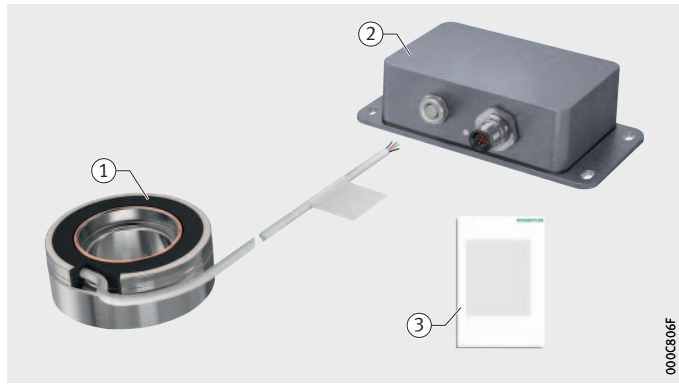
Schaeffler VarioSense in product configuration 001 (speed measurement as the only measurement value) can be operated both with and without an interface unit. As a result, the interface unit is not included in the scope of delivery, but can be ordered separately, see *table* and *Figure 1*.

In product configuration 001, the sensor/bearing unit is only supplied with open cable ends (without a plug). If required, the customer can attach a plug for connection to the interface unit, see page 22.

Scope of delivery of product configuration 001

Component	Product configuration 001 (speed measurement only)
Sensor/bearing unit	●
Interface unit	– can be ordered separately
Safety guidelines	●

● Included in the scope of delivery.



① Sensor/bearing unit
② Interface unit (only if ordered separately)
③ Safety guidelines

Figure 1
Scope of delivery

The enclosed safety guidelines are accompanied by a link to this user manual (BA 47), which is always available online in the latest version.

Damage during transit

Any damage during transit must be reported immediately as a complaint to the carrier:

- ▶ Check the delivery immediately upon arrival for any damage during transit.
- ▶ Report any damage during transit promptly as a complaint to the carrier.

Defects

Any defects must be reported promptly as a complaint:

- ▶ Check the product immediately upon delivery for visible defects.
- ▶ Report any defects promptly as a complaint to Schaeffler.

Description

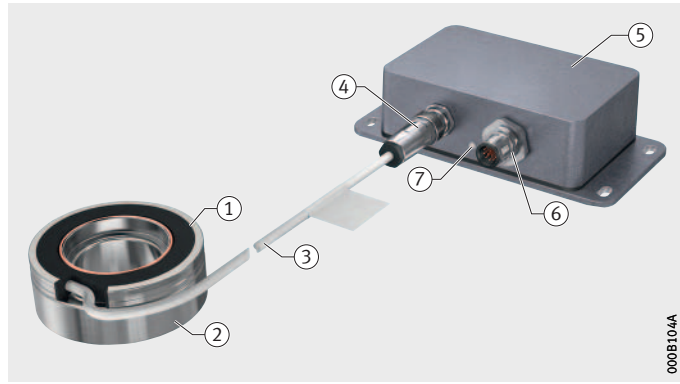
Schaeffler VarioSense comprises a standard rolling bearing in combination with a sensor unit and a separately available evaluation unit (interface unit) for determining measured values on the bearing.

Design

The main components of Schaeffler VarioSense are the sensor/bearing unit, comprising rolling bearing and sensor unit, and an optionally available interface unit, which is required for product configuration 002 and above. The rolling bearing and sensor unit are rigidly connected by an adhesive bond.

The sensor unit and interface unit are connected by a detachable plug connection. If speed is the only measurement value to be measured, the interface unit is not required. Therefore, for product configuration 002 and above, the interface unit is supplied with a detachable plug connection and, for product configuration 001, with open cable ends.

The customer-side interface and an LED for displaying the status are also located on the end face of the interface unit, *Figure 2*.



① Sensor unit
② Rolling bearing
③ Cable
④ Detachable plug connection
⑤ Interface unit
⑥ Customer-side connection
⑦ LED for operating mode

Figure 2
Design

Function

The rolling bearing used is a standard rolling bearing. It assumes all the functions of a conventional rolling bearing of the corresponding bearing type.

The measurement values are recorded by sensors integrated in the sensor unit. For the version described in this manual (product configuration 001), speed is the only measurement value.

The processing of the measurement signals takes place in the interface unit, which also constitutes the interface to the customer system. A USB communication interface is integrated in the flange plug for customer-side connection, by way of addition to the signal and supply connections. This permits the installation of new software versions, adjustments to the customer-side application (parameter settings) and the reading out of error and status memory from service activities.

Product variants

The product configurations available as standard are shown below, see *table*.

Product configurations

Product configuration	Sensor			Interface unit
	Speed	Temperature	Displacement	
001	●	–	–	Optional
002	●	●	–	●
003	●	●	●	●
004	–	–	●	●

● Component of product configuration.

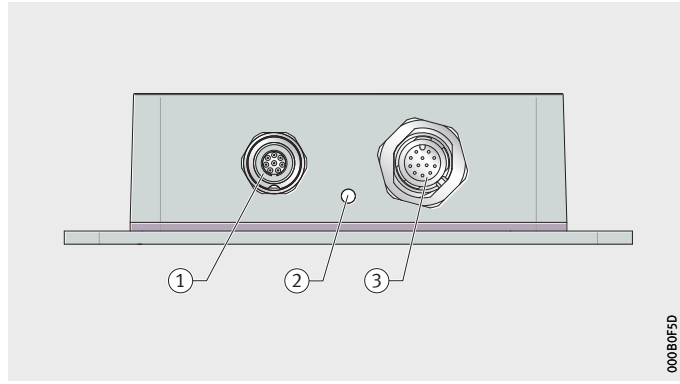
Interfaces

The interface unit forms the interface between the sensor unit fitted to the bearing and the customer system for processing of the measurement results. With speed measurement as the only measurement value, the use of the interface unit is optional.

Interfaces of interface unit

The interface unit has the following interfaces, *Figure 3*:

- Flange socket for connection of the sensor unit.
- Flange plug for the customer-side connection.
  This interface is used for the output of measurement signals and status as well as the supply of voltage.
- USB communication interface, integrated in the flange plug for customer-side connection.
  This interface is used to access the interface unit via a Windows PC, for example to install firmware updates or perform settings in the interface unit (such as weighting of the analog signals).
- RS485 interface, integrated in the flange plug for customer-side connection.
  Data such as measured values and status messages can be outputted to the customer-side application or controller, via this communication interface, on request.
- LED for display of the operating and error status.



① Flange socket for connection of sensor unit
② LED for operating mode
③ Flange plug for customer-side connection, with integrated USB communication interface and integrated RS485 interface

Figure 3
End face of interface unit

Interfaces in pure speed measurement

The product configuration 001, in which the only sensor function is speed measurement, does not have an interface unit as standard.

In this case, the cable on the sensor unit forms the external interface. For connection information, see page 28.

Transport and storage

The specifications for transport and storage apply to the sensor/bearing unit and to the interface unit.

Transport

During transport, the following should be avoided:

- shocks and compressive loads.

Storage

Storage conditions:

- ambient temperature: +5 °C up to +40 °C
- relative humidity: $<$ 65%
- maximum storage period: 3 years.

During storage, the following should be avoided:

- action by aggressive media such as gases, mist or aerosols of acids, alkalis or salts
- direct sunlight
- condensation
- shocks and compressive loads.

For protection against electric fields and electrostatic discharges, the system should be stored in a conductive ESD protective bag.

Mounting Demands on the adjacent construction

The bearing position and adjacent construction must meet the requirements resulting from the geometry and function of the sensor/bearing unit. These requirements are described in detail in publication TPI 253.

We recommend checking the adjacent construction in respect of the following criteria before starting mounting work:

- The bearing position is designed as a locating bearing arrangement.
- The bearing is fitted with a stationary outer ring.
- The mounting dimensions correspond to the requirements.
- The cable guide permits a minimum bending radius of 35 mm.

Further information

- TPI 253, Schaeffler VarioSense.

Protection against electrostatic discharges

The sensor unit and the interface unit are fitted with electrostatically sensitive components.

NOTICE

Electric fields or electrostatic discharges can damage sensitive components. Observe the following protective measures. ◁

Protective measures:

- ▶ ESD protection field equipment (shoes, clothing, anti-static wrist band) must be fitted before carrying out any work with Schaeffler VarioSense.
- ▶ Only then can the system be removed from the packaging.
- ▶ Always store the system in a conductive ESD protective bag.
- ▶ Keep the ESD protective bag for storing the system at a later stage or for returning the system as necessary.

Cleanliness

Contamination can reduce the operating life of rolling bearings and impair the function of sensors.

To protect against contamination:

- ▶ Ensure that all mounting surfaces and components are free of swarf and other contaminants prior to mounting.

NOTICE

Residues of cleaning agents can contribute to contamination. Only use volatile solvents and lint-free cloths for cleaning. ◁

Sensor/bearing unit

The sensor/bearing unit is mounted on the shaft with an interference fit to the inner ring and in the housing with a sliding seat of the outer ring.

Recommended mounting methods:

- mechanical mounting by pressing on
- thermal mounting.

Due to the sensor unit connected to the bearing, special requirements must be observed during mounting, which are described in detail in this manual.

NOTICE

When dismounting the sensor/bearing unit, damage to the adhesive bond between the sensor ring and rolling bearing cannot be ruled out.

A sensor/bearing unit that has already been dismounted once may not be remounted. ◁

Further information

Basic information on mounting of rolling bearings:

- MH 1, Mounting Handbook.

Mounting procedure

The procedure for mounting the sensor/bearing unit is as follows:

▶ Before mounting work is started, familiarise yourself with the design.

▶ Check the machine-side connection components for dimensional and geometrical accuracy.

▶ Mount the sensor/bearing unit on the shaft.
Use either the mechanical process by pressing on, see page 16, or the thermal method, see page 17.

▶ If required by the adjacent construction, pull the sensor unit cable through the cable guides provided.

▶ Insert the assembly comprising shaft and sensor/bearing unit into the housing.

▶ Finish laying the cable, observing the guidelines for laying cables, see page 20.

▶ Secure the outer ring against rotation.
There are various methods available for securing against rotation, depending on the application, see page 18.

Mechanical mounting by pressing on

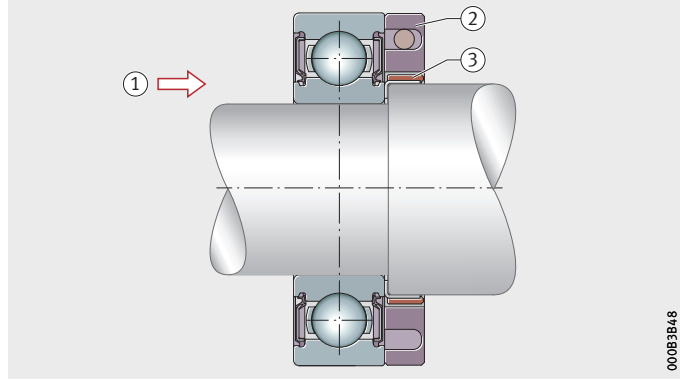
The preferred mounting method for the sensor/bearing unit is pressing on. The use of hydraulic presses is permissible.

The procedure for mounting the bearing by pressing on is as follows:

- ▶ Apply a thin layer of Arcanol mounting paste to the bearing seating surface of the shaft.
- ▶ Select the pressing direction such that the press-on forces are not introduced via the sensor unit, *Figure 4*.
- ▶ Press the bearing onto the shaft, ensuring the press-on forces are introduced evenly and uniformly.

NOTICE

If the press-on forces are directed through the rolling elements, the bearing may become damaged. Press-on forces may only be introduced to the inner ring.◁



① Preferred pressing direction
② Sensor ring
③ Encoder

Figure 4
Pressing on the sensor/bearing unit

NOTICE

Shocks and shock-type loads can damage the bearing.
As a result, the use of mounting sleeves is not permissible.◁

Thermal mounting

The thermal mounting method requires the following:

- an electric heating plate with temperature control
- a metal stud matched to the size of the sensor/bearing unit, *Figure 5*. This must be designed such that it is not in contact with the bearing seal.

The procedure for mounting the bearing using the thermal method is as follows:

▶ Apply a thin layer of Arcanol mounting paste to the bearing seating surface of the shaft.

▶ Place the sensor/bearing unit on the heating plate using the stud, ensuring that the sensor unit is pointing in the direction facing away from the heating plate, *Figure 5*.

⚠WARNING

Risk of burns during heating of the bearing.

Wear heat-resistant safety gloves. ◁

▶ Set the temperature control for the heating plate to +80 °C and switch the heating plate on to heat the bearing.

NOTICE

Excessively high temperatures can damage the bearing or sensor unit. Observe the maximum heating temperature of +80 °C. ◁

▶ Push the heated sensor/bearing unit promptly onto the bearing seat of the shaft.

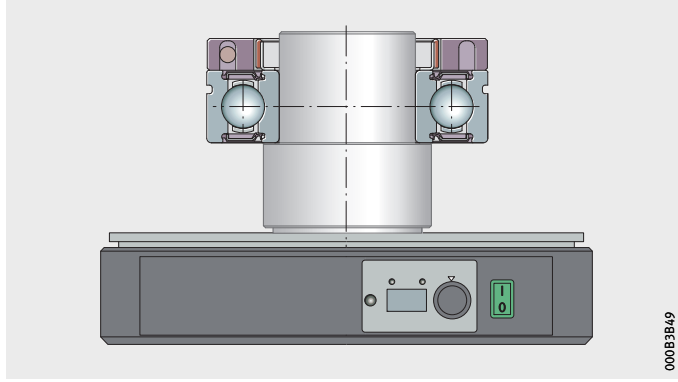


Figure 5
Heating of the bearing using heating plate and stud

NOTICE

Induction heating methods can damage the sensor unit and are therefore not permitted. ◁

Securing the outer ring against rotation

Due to the cable connection arrangement, it is necessary to secure the outer ring against rotation.

Design options for securing against rotation:

- axial locking at the outer ring, *Figure 6*
- bonding the outer ring in place
- positive anti-rotation locking at the cable output of the sensor unit or at the outer ring.

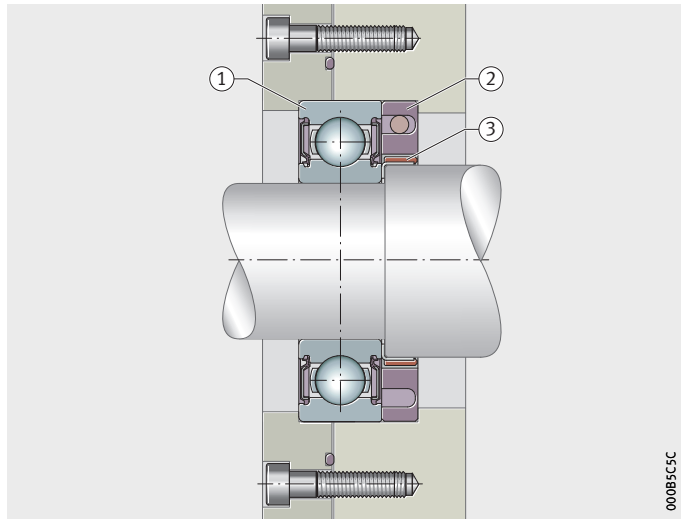
NOTICE

If bonding or positive anti-rotation locking is not carried out correctly, the rolling bearing and the sensor unit may become damaged. If necessary, please consult Schaeffler. ◁

For axial locking of the outer ring, we recommend a minimum locking force, see *table*.

Minimum locking force at outer ring

Sensor/bearing unit	Integrated bearing	Recommended minimum locking force at outer ring N	Maximum axial stress on adhesive bond N
SB6205C	6205-C	1 200	7 500
SB6206C	6206-C	1 700	11 000
SB6207C	6207-C	2 200	15 000
SB6208C	6208-C	2 500	17 000
SB6209C	6209-C	2 700	19 500
SB6210C	6210-C	3 200	23 500



① Outer ring
② Sensor ring
③ Encoder

Figure 6
Axial locking at outer ring

Location of the interface unit

The housing of the interface unit must be screw mounted to a base plate.

The base plate and fasteners, see *tables*, page 20, are not included in the scope of delivery.

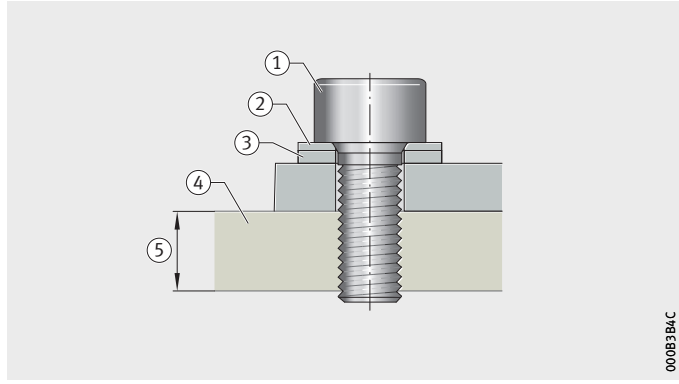
The procedure for screw mounting the interface unit is as follows:

- ▶ Ensure that the base plate used for mounting is flat and free from contaminants.
- ▶ Check whether the position of the threaded holes matches the position of the extended slots in the housing of the interface unit.

NOTICE

The sealing integrity and function of the interface unit are not ensured if the housing is deformed. Avoid exposing the housing to bracing and bending stresses. ◁

- ▶ Place the interface unit on the base plate so that the connections are easily accessible.
- ▶ Fix the housing to the base plate using the specified fasteners and initially tighten until finger tight, observing the sequence, *Figure 7*.
- ▶ Tighten the screws using a tightening torque of 3 Nm. We also recommend the use of a screw locking varnish.



① Socket head screw
② Spring washer
③ Support washer
④ Base plate
⑤ Minimum screw depth 5 mm

Figure 7
Location of the interface unit

The spring washers are used to secure the screws in the event that vibrations occur at the screw-mounting point.

Base plate

Holes	Thick-ness	Material
4 threaded holes M4, spacing in accordance with the dimensions of the interface unit, see page 28	≧ 5 mm	Metal

Fasteners

Element	Design	Nominal size	Material
Socket head screw	Hexagonal socket head screw to DIN 912 (ISO 4762), grade 8.8	M4	High grade steel A2
Spring washer	Spring washer to DIN 137, Form B (wave)		
Support washer	Washer for socket head screws to DIN 433		

Laying of cables

The cables must not be crushed or subjected to kinking when laid or during operation.

Bending radii

The minimum bending radii must be observed in order to avoid damage to the cables.

Minimum bending radii:

- connection cable between sensor unit and interface unit:
  - 35 mm
- cable for customer-side connection:
  - in accordance with manufacturer's data sheet.

Static laying of cables

The connection cable between the sensor unit and interface unit is not suitable for drag chain use. In addition, vibrations can damage the cable.

NOTICE

The cable between the sensor unit and interface unit can be damaged by constant movement or by vibrations.

Ensure static laying of the cable. Attach fixings to the cable at 5 cm intervals.◁

Commissioning

The procedure for connecting and commissioning the system differs depending on whether an interface unit is used.

System without interface unit

In the case of product configuration 001 (speed measurement as only measurement value), the cable for the sensor unit is delivered as standard with four stripped and tinned cable ends.

The procedure for connecting and commissioning Schaeffler VarioSense in product configuration 001 is as follows if no interface unit is used:

- ▶ Switch off the voltage supply that the system is to be connected to.
- ▶ Connect the signal cables for the speed, observing the signal assignment, see page 28. Use the recommended pull-up resistors, see page 31.

NOTICE

Incorrect pull-up resistors can result in damage to or malfunction of the sensor unit. Ensure that the correct pull-up resistors are selected. ◁

- ▶ Connect the cables for the supply voltage, observing the signal assignment, see page 28, and connect the ground wire first.

NOTICE

If supply voltages are above the stated range, the sensor unit will be electrically destroyed. Check the supply voltage prior to reconnection. ◁

NOTICE

Incorrect assignment of the connections may damage the components of Schaeffler VarioSense. Before reconnecting the voltage supply, check for the correct assignment of the supply and signal connections. ◁

- ▶ Switch on the voltage supply.
- ▶ Check the output of the speed signals, for example using an oscilloscope, by slowly rotating the shaft.
- ▶ If no speed signal is outputted, check the assignment of the connections again using a suitable measuring device (such as an oscilloscope) after switching off the voltage supply.

System with interface unit

In product configuration 001 (speed measurement as the only measurement value), the cable for the sensor unit can be fitted as an option on the customer side with the corresponding 8-pin plug. This is used to connect the interface unit, which can also be ordered optionally.

The procedure for connecting and commissioning the Schaeffler VarioSense in product configuration 001 is as follows, if the interface unit is used:

- ▶ Switch off the voltage supply that the system is to be connected to.
- ▶ Fit the corresponding 8-pin plug to the sensor unit cable, observing the signal assignment, see page 28.
- ▶ Insert the 8-pin plug of the sensor unit into the corresponding flange socket of the interface unit and screw the contact finger tight.

NOTICE

An extension of the sensor unit cable would unduly impair the electromagnetic compatibility and is therefore not permitted.◁

- ▶ Connect one of the 12-pin couplings with cable, see page 27, and free connection end to the customer-side signal connections and voltage supply, observing the pin assignment, see page 29, and the specifications for the voltage supply to the interface unit, see page 30. When connecting the speed signals, use the recommended pull-up resistors, see page 31.

NOTICE

Incorrect pull-up resistors can result in damage to or the malfunction of the sensor unit. Ensure that the correct pull-up resistors are selected.◁

NOTICE

If supply voltages are above the stated range, the interface unit will be electrically destroyed. Check the supply voltage prior to reconnection.◁

NOTICE

Incorrect assignment of the connections can damage the components of Schaeffler VarioSense. Before reconnecting the voltage supply, check for the correct assignment of the supply and signal connections.◁

- ▶ Alternatively, a customised connection cable can be used for customer-side connection of the interface unit, ensuring that the PIN assignment is observed, see page 29.
- ▶ Insert the 12-pin coupling into the flange socket of the interface unit and screw the contact finger tight.
- ▶ Switch on the voltage supply.
- ▶ Using the USB interface, adjust the signal assignment of the current outputs so that the speed is displayed at one of the outputs.
- ▶ Check the output of the speed signals, for example using an oscilloscope, by slowly rotating the shaft.
- ▶ If no speed signal is outputted, check the assignment of the connections again after switching off the voltage supply.

Operation

Permissible indirect process materials

The resistance of the encapsulating material used in the sensor unit has been checked and confirmed for a selection of indirect process materials, see *table*.

Indirect process materials to which the sensor unit is resistant

Type	Designation
Mounting paste	FAG ARCANOL-MOUNTINGPASTE
Oil for gearboxes and rolling bearings	Mobil SHC 626
Oil for gearboxes	OEST SYNTH SAE 75W-90
ASTM reference oil	IRM 902
Cooling lubricant	Emulcut 4020 (5%)
	Castrol Syntilo 81BF (5%)

Permissible speeds

The permissible speed of the sensor/bearing unit is identical to the permissible operating speed of the integrated standard rolling bearing.

The values for the limiting speed can be found in the product tables and must not be exceeded, even under favourable operating conditions, without the consent of Schaeffler. The reference speed is used as an ancillary value for calculating the thermally safe operating speed and must be taken into consideration in the design of the bearing arrangement.

Further information

- TPI 216, Deep Groove Ball Bearings, Generation C.

Operating temperatures

Permissible operating temperatures for product configuration 001 (pure speed measurement):

- sensor/bearing unit –40 °C to +125 °C
- interface unit: –40 °C to +80 °C.

In addition to the temperatures of the sensor unit and interface unit, the permissible operating temperature of the bearing must always also be taken into consideration.

Troubleshooting and rectification

Troubleshooting and fault correction may only be carried out by qualified personnel, see page 7.

The warning and safety guidelines and the relevant accident prevention regulations specified in this manual must be observed. Personal protective equipment, which is appropriate to the activity, must be worn.

WARNING

Danger of electrocution when correcting the fault.

Switch off the device and disconnect it from the voltage supply. Ensure that it cannot be switched on again without authorisation or unintentionally. ◁

Schaeffler explicitly recommends that only original replacement parts and accessories authorised by Schaeffler should be used.

The LED on the interface unit indicates the status of the system, see *table*.

Operating and error status

LED status display	Status	Description
 off	not in operation	operating voltage is not connected
 on	in operation	regular operation
 flashing	error	troubleshooting measures required

Measures in the event of “error” status

In the event of an “error” status, the following steps must be carried out in succession:

- ▶ Restart the system by switching off the system, waiting for at least 5 seconds and then switching the system back on again.
- ▶ If the previous step is unsuccessful: check the input voltage.
- ▶ If the previous step is unsuccessful: contact Schaeffler.

Maintenance

The sensor/bearing unit, interface unit and all accessories are maintenance-free. If a defect is identified in one of these components, please contact Schaeffler.

Updating the software

A software update can be carried out for the interface unit, if provided by Schaeffler.

NOTICE

Damage to the interface unit is possible due to interruption of the software update. Ensure that the supply voltage is not interrupted during the software update. ◁

Cleaning

External cleaning of the components can be carried out if necessary.

WARNING

Danger of electrocution during cleaning.

Switch off the device and disconnect it from the power supply. Ensure that it cannot be switched on again without authorisation or unintentionally. ◁

Cleaning should be carried out using a soft, lint-free cloth.

Decommissioning

If safe operation of the sensor/bearing unit, interface unit or accessories is no longer possible, the system must be taken out of operation and secured against inadvertent operation.

Safe operation is then no longer possible if a component:

- shows visible signs of damage
- is malfunctioning
- was exposed to conditions that contravene transport and storage specifications, see page 13.

Disposal

The sensor/bearing unit, interface unit and accessories must not be disposed of with household waste. The product contains components that must be disposed of correctly.

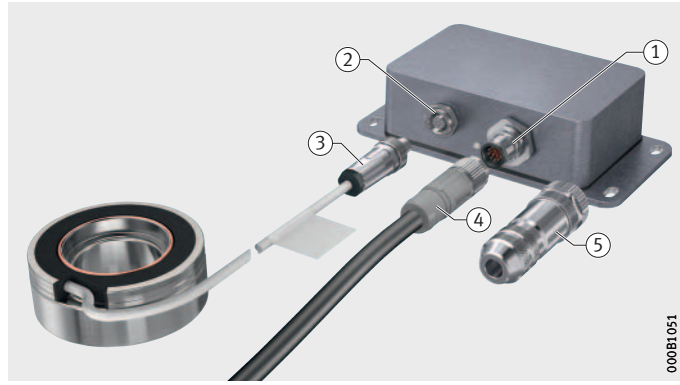
Please return the components requiring disposal to us, so that we can ensure they are disposed of in compliance with legal requirements and in an environmentally acceptable manner. By returning used devices to us, you are making an important contribution towards protecting the environment.

Accessories and spare parts

Plug connections

Schaeffler sources the plug connections, *Figure 8*, from:

- **Franz Binder GmbH & Co. Elektrische Bauelemente KG**
  Rötelstraße 27 · 74172 Neckarsulm · Germany
  www.binder-connector.de
- **Phoenix Contact Deutschland GmbH**
  Flachsmarktstraße 8 · 32825 Blomberg· Germany
  www.phoenixcontact.com



① Flange plug
② Flange socket
③ Plug
④ Coupling with cable, free connection end
⑤ Coupling without cable (alternative to ④)

Figure 8
Plug connection

Technical data

Dimensions of the interface unit

Dimensions of the interface unit, *Figure 9*.

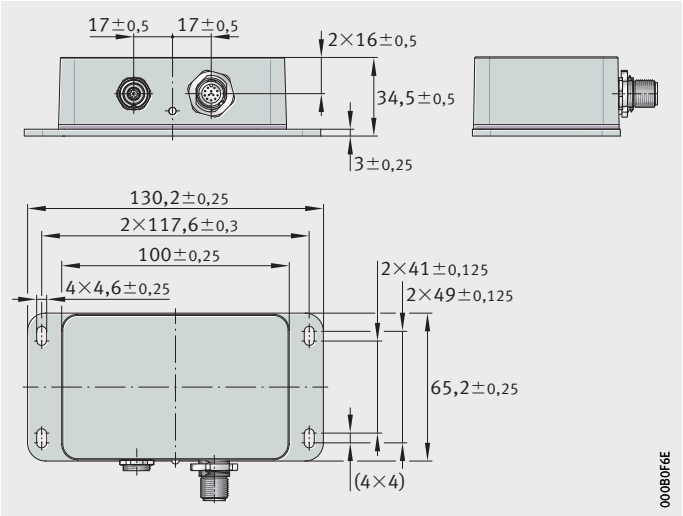


Figure 9
Interface unit

Pin assignment of connection on sensor unit

In the case of product configuration 001 (pure speed measurement), the cable for the sensor unit is delivered as standard with four stripped and tinned cable ends, see *table*.

The customer can also fit the cable for the sensor unit with an 8-pin plug, see *table* and *Figure 10*.

Connection of the sensor unit for product configuration 001

Signal direction	Signal	Cable colour	Pin
Input	Supply of voltage to sensor unit	Red	2
	Ground	Black	5
Output	Pulse trace A (speed; Open Collector)	White	6
	Pulse trace B (speed; Open Collector)	Blue	1

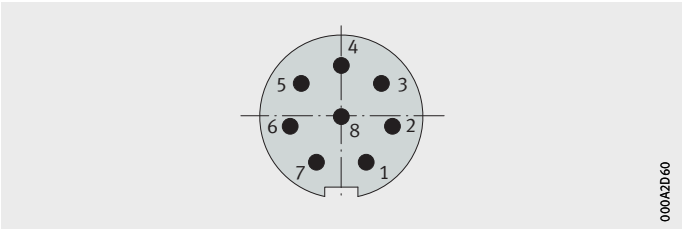


Figure 10
Pin numbering of plug on sensor unit

Pin assignment of connection on interface unit

In addition to various signals, the 12-pin flange plug also transmits the supply of voltage, see *table* and *Figure 11*.

Pin assignment of flange plug

Signal direction	Signal	Pin
Input	Supply voltage	5
	Ground	8
	USB supply voltage	10
Output	Pulse trace A (speed; Open Collector)	1
	Pulse trace B (speed; Open Collector)	3
	Current output 1, 4 mA – 20 mA, signal assignment, see *table Signal assignment of current outputs (factory setting)*	2
	Current output 2, 4 mA – 20 mA, signal assignment, see *table Signal assignment of current outputs (factory setting)*	9
	Digital error output	7
Input/output (bidirectional)	USB-D–	11
	USB-D+	12
	RS485– (half-duplex)	4
	RS485+ (half-duplex)	6

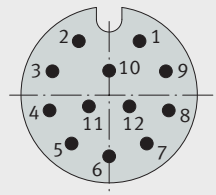


Figure 11
Pin numbering of flange plug

The signal assignment of the current outputs in the flange plug depends on the product configuration, see *table*. Other assignments are possible by agreement.

The signal assignment of product configuration 003 is set at the factory. The customer can change this setting via the USB interface. Schaeffler provides special installation software for parameter assignment.

Signal assignment of current outputs (factory setting)

Product configuration	Signal	
	Current output 1	Current output 2
001[1)]	Speed	–
002[2)]	Temperature	Speed
003[2)]	Temperature	Displacement
004[2)]	Displacement	–

1) In the case of product configuration 001, the interface unit is not necessary but can be ordered as an option.

2) Product configuration can be ordered in the future.

Supply of voltage to sensor unit

The supply of voltage to the sensor unit is usually carried out via the interface unit. With product configuration 001 (pure speed measurement), an interface unit is not required. In this case, the customer must observe the following information for connecting the sensor unit, see *table*.

Supply of voltage for product configuration 001 (without interface unit)

Designation		Value
Supply voltage	Nominal	DC 24 V
	Tolerance range	DC 4,5 V – DC 30 V

If supply voltages are above the stated range, the sensor unit will be electrically destroyed.

Supply of voltage to interface unit

The supply of voltage to the interface unit, see *table*, is carried out via the 12-pin flange plug.

Supply of voltage and overcurrent protection for interface unit

Designation		Value
Supply voltage	Nominal	DC 24 V
	Tolerance range	DC 14 V – DC 28 V
Overcurrent protection necessary on customer side	Current	0,8 A
	Tripping characteristics	0,1 A^2s – 0,15 A^2s

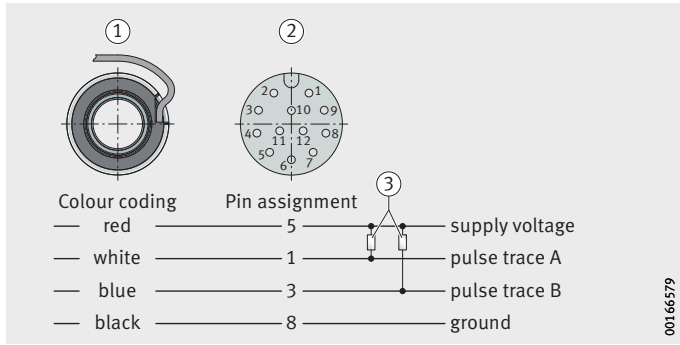
If supply voltages are above the stated range, the interface unit will be electrically destroyed.

Speed signals

The information on speed signals applies irrespective of whether the connection is made with or without an interface unit.

Pull-up resistors

The outputs for speed signals A and B are designed as Open Collector outputs. Suitable pull-up resistors must be provided on the customer side, *Figure 12*.



① Sensor unit without interface unit (product configuration 001)
② Sensor unit with interface unit
③ Pull-up resistors

Figure 12
Connection of the pull-up resistors

We recommend standard values for the pull-up resistors as a function of the pull-up voltage, see *table*.

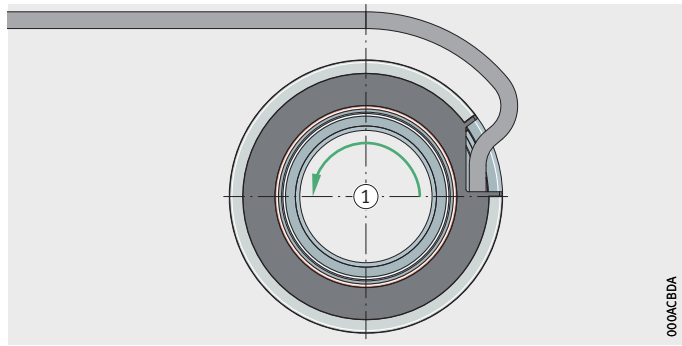
Recommended pull-up resistors

Pull-up voltage, DC V	Pull-up resistor Ω
5	270
12	680
24	1 500

The maximum permissible through current is 110 mA.
This limit value is observed as a result of the pull-up resistors.

Sign for direction of rotation

In the case of speed measurement, the sign for direction of rotation is positive in an anti-clockwise direction when viewing the open cable outlet, see *Figure 13*.



① Positive direction of rotation

Figure 13
Sign for direction of rotation

Characteristics

Characteristics of speed signals A and B, see *table*.

Characteristics of the speed signals

Designation		Value
Pulse duty factor		50% ± 10%
Phase displacement		90° ± 20°
Current consumption	nominal	10 mA
	maximum	11 mA
Pitch Error (individual measurement period for revolution sum)		–3% to +3%
Rise time		1,5 µs
Fall time		1,5 µs

The number of pulses per revolution is dependent on the bearing size, see *table*.

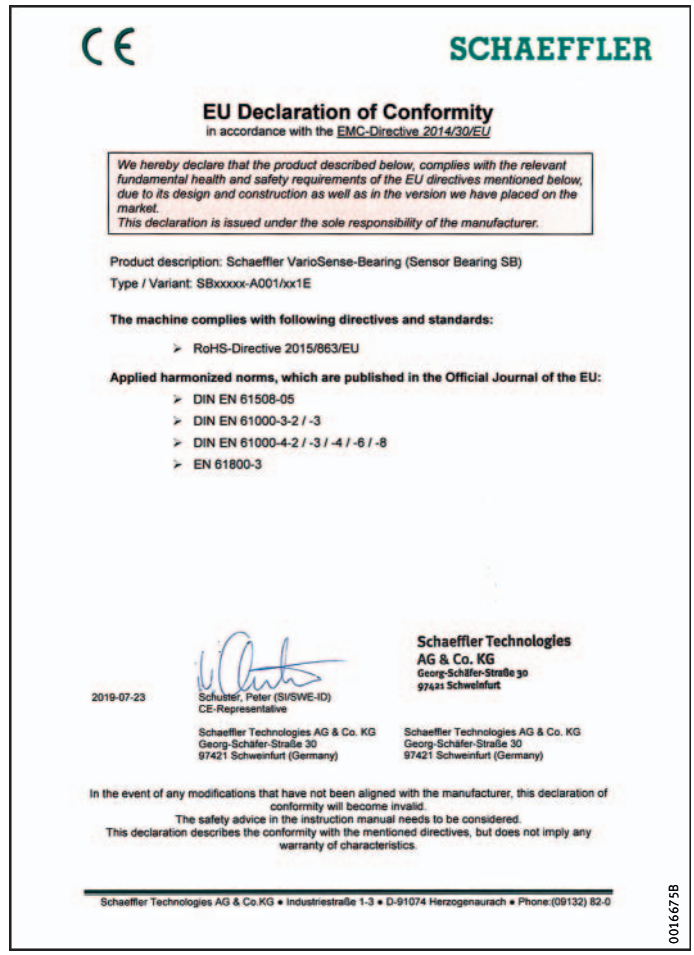
Pulses per revolution

Bearing	Number of pulses per revolution
6205-C	56
6206-C	64
6207-C	72
6208-C	80
6209-C	88
6210-C	96

Appendix

This appendix contains the EU Declaration of Conformity for Schaeffler VarioSense.

EU Declaration of Conformity



CE

SCHAEFFLER

EU Declaration of Conformity

in accordance with the EMC-Directive *2014/30/EU*

We hereby declare that the product described below, complies with the relevant fundamental health and safety requirements of the EU directives mentioned below, due to its design and construction as well as in the version we have placed on the market.
This declaration is issued under the sole responsibility of the manufacturer.

Product description: Schaeffler VarioSense-Bearing (Sensor Bearing SB)

Type / Variant: SBxxxxx-A001/xx1E

The machine complies with following directives and standards:

- RoHS-Directive 2015/863/EU

Applied harmonized norms, which are published in the Official Journal of the EU:

- DIN EN 61508-05
- DIN EN 61000-3-2 / -3
- DIN EN 61000-4-2 / -3 / -4 / -6 / -8
- EN 61800-3

2019-07-23

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In the event of any modifications that have not been aligned with the manufacturer, this declaration of conformity will become invalid.
The safety advice in the instruction manual needs to be considered.
This declaration describes the conformity with the mentioned directives, but does not imply any warranty of characteristics.

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0016675B

Figure 14
EU Declaration of Conformity

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