SKF TraX Technical Specification Connected version

WEM-200/US
WEM-200/32
WEM-200/EU

WEM-200/US
(US version)

WEM-200/32
(European version)

WEM-200/EU
(European version)

Non-contractual images

Contents

1 Document identification 3

2 Document references 3

3 Introduction 4

4 Specification 5
4.1 Mechanical specification 5
4.2 Operating temperature 5
4.3 Application 5
4.4 Temperature measurement 6
4.5 Bearing damage detection 6
4.6 Pilot test session 7
4.7 Temperature alarm 7
4.7 Mode description 8
Figure 1. Modes of operation *8*
4.8 Changing mode description 9
Figure 2. Magnet activation *9*
Figure 3. Changing modes *9*
4.9 Configuration 10
4.10 Communication 10
4.10.1 Protocol 10
4.10.2 Advertising frame description 10
4.10.2 Advertising frame description 10
4.10.3 Byte Position/Axle 11
4.10.4 Byte Failure status (battery and health status) 11
4.10.5 Temperature 12
4.10.6 Firmware version 12
4.10.7 Byte Vibration monitoring status 12
4.10.8 Advertising timing 12
4.11 Reset 13
4.12 Overview of firmware features 13
4.13 LED blinking 13
4.14 Product lifespan 13

5 Certifications 14
5.1 FCC 14
5.2 Bluetooth SIG 14
5.3 RCM 14

6 Precautions and maintenance 14

7 General information 15

8 Technical specification 16
8.1 US baseplate 16
8.2 32 baseplate 16
8.3 EU baseplate 16

1 Document identification

Table 1

Revision

Version	Date	Author	Comment
1	October 2019	CV	Initial creation
2	January 2021	CV	Update specification for Pilot 2 parts
3	July 2021	CV	Update specification for start of production
4	April 2023	BT	Addition of other baseplate references and clarifications
5	September 2023	BT	Update specification for BSS10 release
6	February 2025	BT	Update specification for BSS11 release

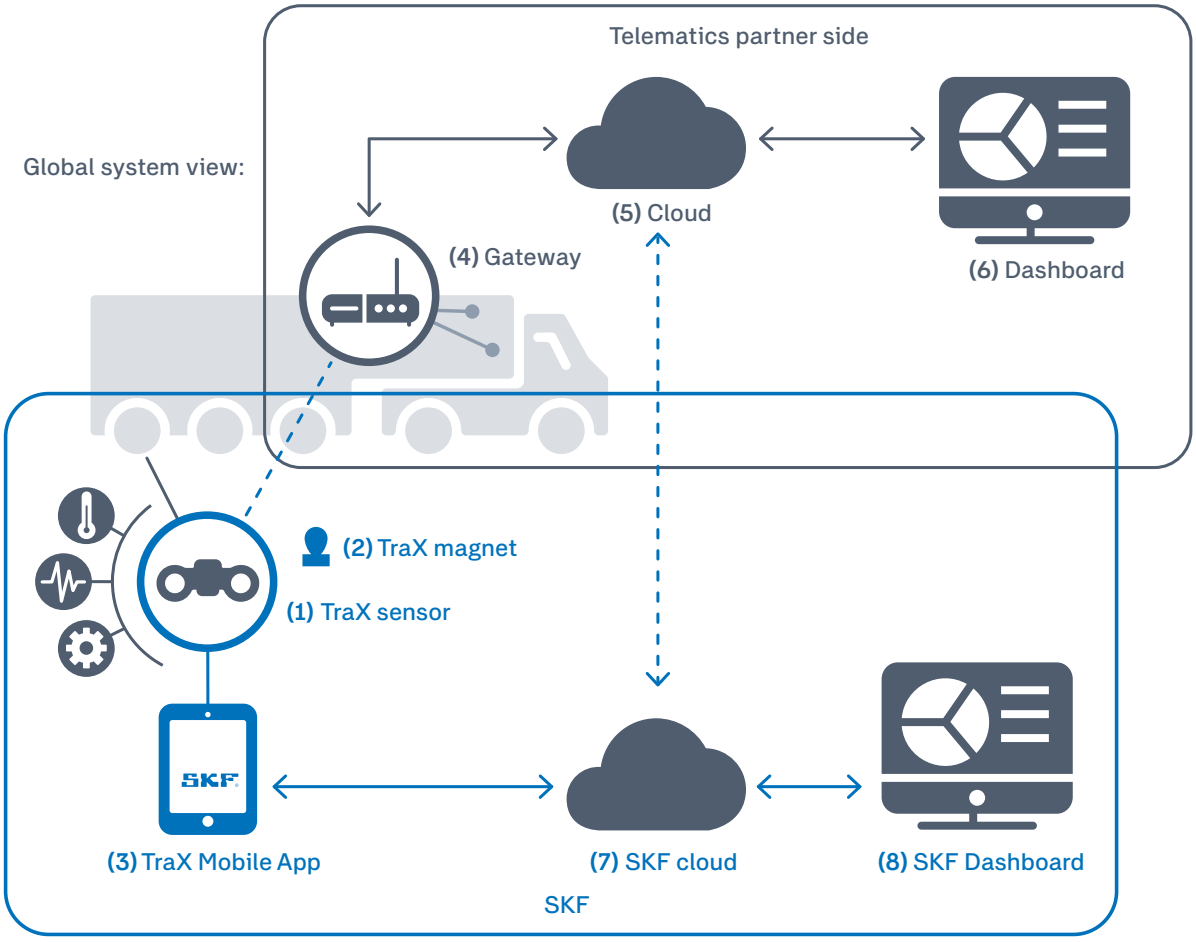
2 Document references

Table 2

References

Document title	Document reference	Document revision
Sensor drawing dwp	WEM-200/US	Ed. 5) 23 09
	WEM-200/32	Ed. 5) 23 09
	WEM-200/EU	Ed. 6) 23 09

3 Introduction



The SKF TraX system monitors the condition of wheel end bearings by measuring and analyzing wheel end vibration, usually on trucks, trailers and buses. It provides warnings when bearing failures are detected and facilitates checks on the condition of wheel end bearings.

SKF TraX system is composed of five elements:

(1) The TraX WEM-200 sensor, is a battery-powered, wireless sensor that can be mounted on the wheel. It monitors the condition of the bearing and measures its temperature. It is available with three different baseplate dimensions depending on the pitch circle diameter of the wheel. The data it collects is sent by BLE (Bluetooth Low Energy) and collected by the gateway **(4)**, which displays relevant information on the dashboard **(6)**.

(2) A standard magnet is used to wake up the TraX sensor with a minimum field strength of 60 Gauss @ 10 mm from the magnet surface. This magnet is not in the scope of SKF's products. For example, a push pin magnet with neodymium material can be used.

(3) The TraX Mobile App is an i-OS or Android application that can be installed on a smart device and used to configure the TraX sensor.

(7) SKF cloud is used for data storage and exchange

(8) SKF dashboard is used for data visualization

(2), **(4)**, **(5)**, **(6)** are not in the scope of SKF's products.
The current technical specification only relates to the TraX sensor **(1)**.

4 Specification

4.1 Mechanical specification

Table 3

Parameter	US baseplate	32 baseplate	EU baseplate	Unit	Comment
Pitch circle diameter	285	335	335	mm	
Holes diameter	25	32	25	mm	
Part weight	225	215	237	g	
Holes center-to-center distance	88.302	103.52	103.52	mm	
	36	36	36	°	
Maximum fixing torque	725	725	725	Nm	
Part thickness	26.86 ± 1.14	26.86 ± 1.14	26.86 ± 1.14	mm	
Baseplate thickness	4 ± 0.1	4 ± 0.1	4 ± 0.1	mm	

4.2 Operating temperature

Table 4

Parameter	Value	Unit	Comment
Operating temperature	–10 to 85 *14 to 185*	°C *°F*	All functions available
Operating temperature for magnet use	–20 to 85 *–4 to 185*	°C *°F*	Possibility to pair with the Mobile App
Operating temperature for vibration analysis	–10 to 105 *14 to 221*	°C *°F*	Bearing damage detection possible
Operating temperature for BLE communication	–20 to 105 *–4 to 221*	°C *°F*	Receiving data by gateway possible
Operating temperature for temperature measurement	–40 to 105 *–40 to 221*	 *°F*	Temperature alarm enabled

Above 105 °C (*221 °F*), the sensor will continue to measure and transmit information, although its accuracy cannot be guaranteed.[1] –40 °C is the minimum acceptable limit to use the product.

4.3 Application

Table 5

Parameter	Value	Unit	Comment
Minimum speed for vibration analysis	60 40	km/h mph	

[1] A sensor replacement is recommended if the temperature has exceeded 105 °C (*221 °F*)

4.4 Temperature measurement

Table 6

Parameter	Value	Unit	Comment
Temperature measurement frequency	5 10 5	Min Sec Sec	If T < 70 °C (*150 °F)* If 70 °C (*150 °F)* < T < 100 °C (*212 °F)* If T > 100 °C (*212 °F)*
Temperature measurement accuracy	±3	°C	

High temperature in wheel ends could be caused by many things: bearing damages, brake problems, braking for long periods, tire problems and ambient conditions.

SKF shall not be liable if a temperature alarm is triggered but no damage is observed on the wheel end, nor if no or late temperature alarm is triggered even where damage has been encountered.

4.5 Bearing damage detection

The product has been validated[2)] to detect large spalling bearing damages.

Table 7

Sensor Ref	Axle type	Bearing Type	Bearing Reference		SKF Set reference	
			Inner	Outer	Inner	Outer
WEM-200/32	Non driven	THU2	BTF-0110B	BTF-0110B	VKBA5377	VKBA5377
WEM-200/32	Drive	sTRB standard hub	542-100	542-100	VKBA5423	VKBA5423
WEM-200/US	FF Steer non driven	PreSet	HM212011 HM212049	3720 3782	Set427	Set428
WEM-200/US	FF Steer non driven	sTRB standard hub	HM212011 HM212049	3720 3782	Set413	Set406
WEM-200/US	TN-TQ Tapered trailer non driven	sTRB standard hub	HM218210 HM218248	HM212011 HM212049	Set414	Set413
WEM-200/US	TP Parallel trailer non driven	sTRB standard hub	HM518410 HM518445	HM518410 HM518445	Set415	Set415

High vibration in wheel ends could be caused by many things: bearing damages, brake problems, tire problems and ambient conditions. SKF shall not be liable where a vibration alarm is triggered but no damage is observed on the wheel end, nor for cases where no vibration alarm is triggered or it is triggered late, even if damage has been encountered.

The product can be used to detect other types of defects on the wheel end and on other types of axles.

2) Validation has been performed on a reduced number of tests. TraX sensors should only be mounted with agreed data sharing between Telematics and SKF and with a specific customer agreement.

4.6 Pilot test session

The product has been tested during specific pilot test sessions on the following bearing designations.

Table 8

Sensor Ref	Axle type	Bearing Type	Bearing Reference		SKF Set reference	
			Inner	Outer	Inner	Outer
WEM-200/USPP	Trailer non driven	THU1	BTH-0500	BTH-0500	VKBA5460	VKBA5460
WEM-200/USPP	TN Tapered trailer non-driven (Hendrickson)	PreSet			Set431	Set427
WEM-200/USPP	FL Steer (Meritor)	PreSet			Set440	Set495
WEM-200/USPP	BPW	sTRB - Metric	33118	33213	33118	33213
WEM-200/USPP	Meritor Twin FF Steer	sTRB standard hub	HM212011 HM212049	3720 3782	Set413	Set406

4.7 Temperature alarm

A temperature alarm has been implemented only for BSS10a firmware release. The temperature measurement is checked against a predefined temperature threshold. If this temperature is above the threshold for the defined period, an alarm is triggered.

Table 9

Parameter	Value	Unit	Comment
Temperature threshold	95 203	°C °F	
Time period above the threshold	30	min	

During temperature alarm mode, the product is still in normal operation mode and continues to detect wheel end damage.

High temperature in wheel ends could be caused by many things: bearing damages, brake problems, braking for long periods, tire problems and ambient conditions.
SKF shall not be liable if a temperature alarm is triggered but no damage is observed on the wheel end, nor if no or late temperature alarm is triggered even where damage has been encountered.

4.7 Mode description

The product has five modes of operation. The transport mode is used for part transportation only. The standstill and operating modes are used when the product is mounted on a vehicle. The configuration mode is used after wake up to commission the product. The reset/remove mode is used to enable a connection with the Mobile App for product reset and/or decommissioning.

Table 10

	Transport mode	Configuration mode	Standstill mode	Driving mode	Reset/Remove mode
BLE emission if T < 70 °C (*150 °F*)	No	Every 1 s	No	Every 30 min	Every 1 s
BLE emission if 70 °C (*150 °F*) < T < 100 °C (*212 °F*)	No	Every 1 s	Every 1 min	Every 1 min	Every 1 s
BLE emission if T > 100 °C (*212 °F*)	No	Every 1 s	Every 10 s	Every 10 s	Every 1 s
Vibration analysis	No	No	No	Yes	No
Temperature measurement	No	No	Yes	Yes	No

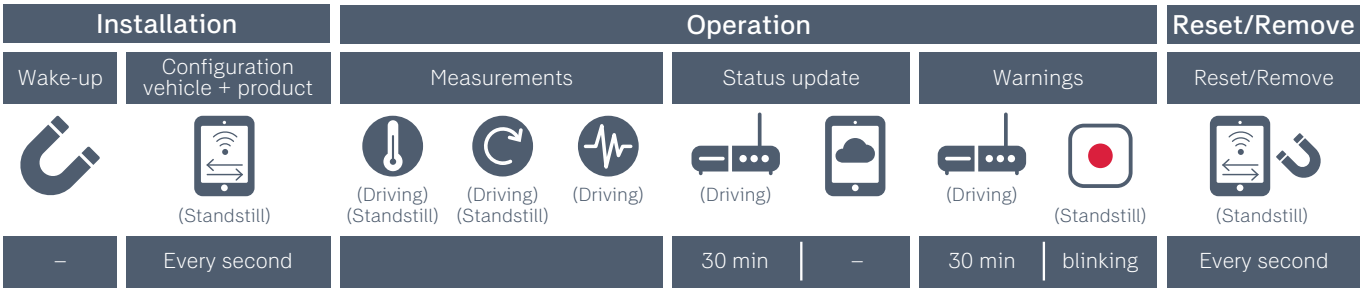


Figure 1. Modes of operation

4.8 Changing mode description

The product is delivered in transport mode. The product should be put into configuration mode using the magnet. The product is configured with the mobile application in configuration mode. Switching between modes is indicated by an LED light.

When configured, the product automatically goes to standstill mode. The product automatically switches from standstill to operating mode according to vehicle movement[3].

Table 11

Sensor state	Action[4]	Result
Transport mode	Put the magnet on the plastic housing until the LED lights	LED lights green The part goes to Configuration mode
Wait for Configuration mode	Configure the product with the Mobile App	LED switches off The part goes to Standstill mode
Wait for Configuration mode	No action for 30 seconds	LED switches off The part returns to Transport mode
Analysis mode (or Operating mode)	Put the magnet on the plastic housing until the LED lights	LED lights green The part goes to Reset/Remove mode
Temperature alarm[4]	Put the magnet on the plastic housing and wait more than 31 sec until LED switches off to reset the Temperature failure alarm	LED lights green during 30 sec LED lights red during 1 sec Temperature alarm cleared. LED switches off
Wheel end failure alarm[4]	Put the magnet on the plastic housing and wait more than 31 sec until LED switches off to reset the Wheel end failure alarm	LED lights green during 30 sec LED lights red during 1 sec Wheel end damage cleared. LED switches off
Wheel end failure alarm	Reset the product with the Mobile App	LED switches off Wheel end damage cleared Temperatures cleared The part returns to Standstill mode
Reset/Remove mode	Remove configuration of the product with the Mobile App	LED switches off The part returns to Transport mode
Reset/Remove mode	Take no further action for 30 seconds	LED switches off The part returns to Standstill mode

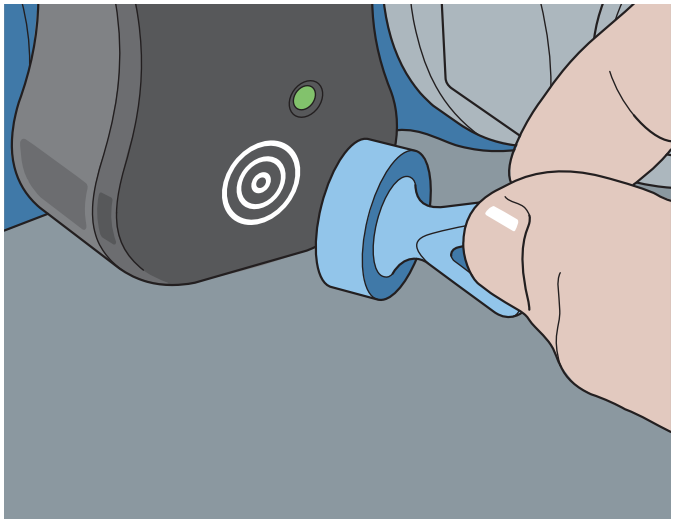


Figure 2. Magnet activation

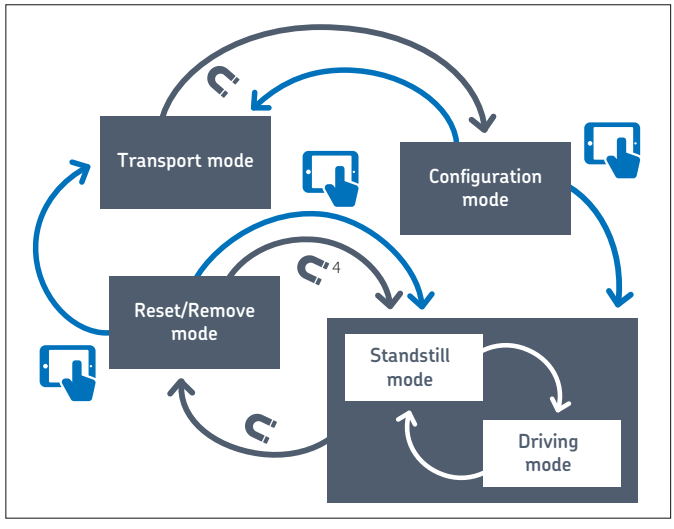


Figure 3. Changing modes

[3] The vehicle must be travelling over 30 mph.
[4] Actions are only available on BSS10a firmware.

4.9 Configuration

Configuration is required before using the product.

Use the Mobile App to configure the product following the procedure described in the SKF TraX system User Manual – Quick Start.

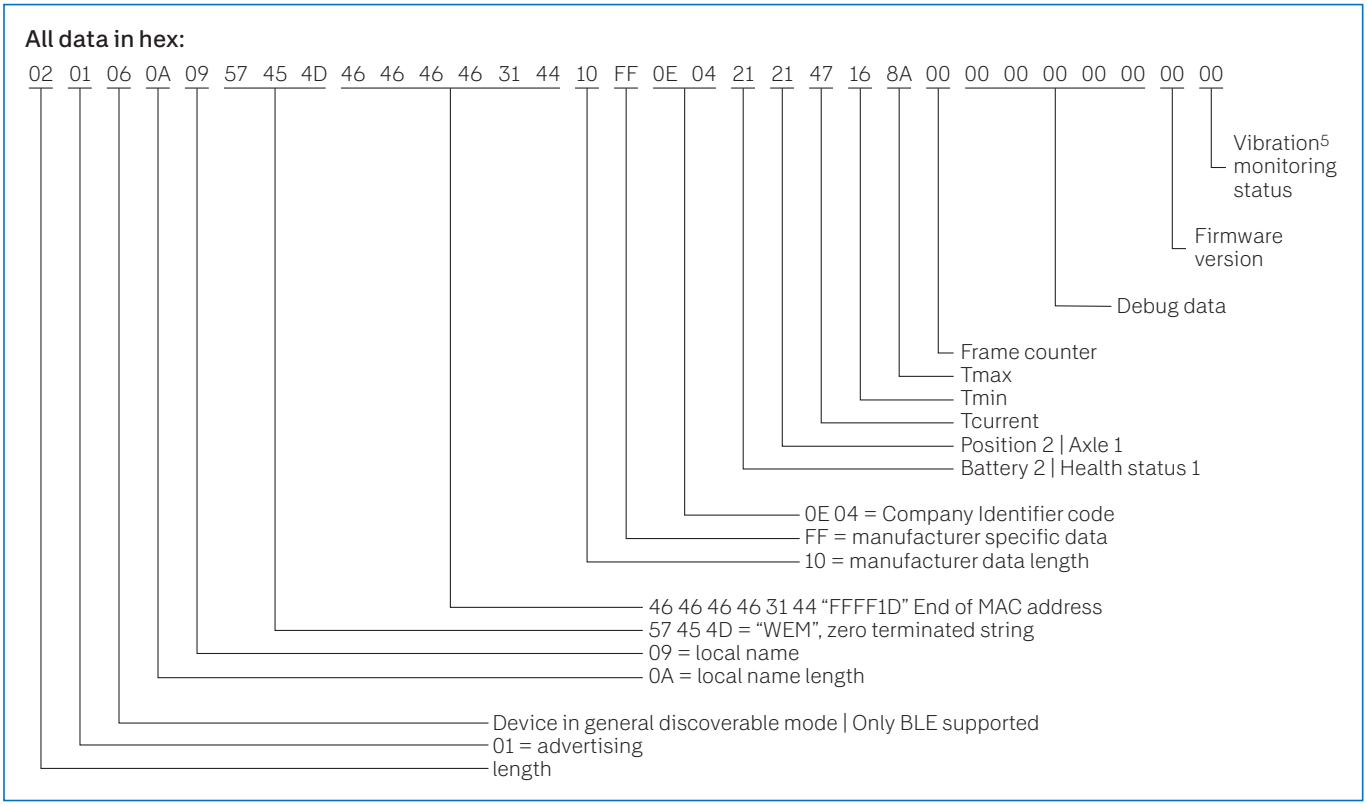
4.10 Communication

4.10.1 Protocol

Table 12

Protocol	Version
Bluetooth Low Energy Standard (2.4 GHz)	≥ 4.2

4.10.2 Advertising frame description



5) "Vibration monitoring status" byte is only available with BSS10a firmware. For other firmwares, this byte is debug data.

4.10.3 Byte Position/Axle

Table 13

Mask	Description	Comment
0x30	0: Not positioned 1: Left 2: Right	Sensor Position
0x0F	0: Not positioned 1: Axle 1 2: Axle2 3: Axle3 4: Axle4 5: Axle5 6: Axle 6 7: Axle 7 8: Axle 8 9: Axle 9 A: Axle 10	Sensor axle number

4.10.4 Byte Failure status (battery and health status)

Table 14

Mask	Description	Comment
0x30	0: Extreme low battery warning 1: Low battery warning 2: Battery OK 3: No data	Battery level
0x03	0: No Data 1: No failure 2: Failure	Wheel End failure
0xC0	0: No failure 1: Piezo Failure 2: WEM Failure 3: Reversed position	Vibration sensor failure and other internal failure warnings + incorrect mounting
0x04	0: No failure 1: Failure	Temperature sensor failure
0x08	0: No failure 1: Failure	Temperature warning active Available only with BSS10a firmware.

4.10.5 Temperature

Table 15

Byte	Description	Comment
Tmax	Hex value to convert in Dec value Dec value – 50 = temperature value in degrees Celsius 8A = 138 – 50 = 88 °C	Maximum recorded temperature from the last product reset
Tmin	Hex value to convert in Dec value Dec value – 50 = temperature value in degrees Celsius 16 = 22 – 50 = –28 °C	Minimum recorded temperature from the last product reset
Tcurrent	Hex value to convert in Dec value Dec value – 50 = temperature value in degrees Celsius 47 = 71 – 50 = 21 °C	Last recorded temperature (a measurement is taken every five minutes)

4.10.6 Firmware version

Table 16

Byte	Description	Comment
Firmware version	Hex value to convert in Dec value. The first digit is the main BSS version. The second digit is the corrective version (1=a, 2=b,3=c ...9=i). 0x54 = 84 = 8d	

4.10.7 Byte Vibration monitoring status

Table 17

Mask	Description	Comment
0xC0	0: Vibration monitoring active 1: Learning phase complete 2: Learning phase on going 3: Inconsistent data	Current state of the algorithm. Available only with BSS10a firmware. A new TraX starts with the learning phase. After 39 measurements, the algorithm model is calculated, and the vibration monitoring is active.

4.10.8 Advertising timing

1 frame is sent 3 successive times on 3 different channels.

Table 18

Number of frames	Number of channels	Duration	Frequency
9	3	180 ms	Each 30 min in Operating mode and if T < 70 °C (*150 °F)* Every 1 min if 70 °C (*150 °F)* < T < 100 °C (*212 °F)* Every 10 sec if T > 100 °C (*212 °)F*

4.11 Reset

After replacing a damaged wheel end component, it is necessary to reset the device by using the Mobile App or the magnet (functionality available only with BSS10a firmware).
The resetting procedure with the Mobile App is described on the SKF TraX User Manual. The resetting procedure with the magnet is described in table 11 and figure 3.

⚠ WARNING

For BSS10a firmware, it is important to reset and reconfigure the sensor in case of any change on the wheel end (sensor location change, vehicle function change, bearing replacement, ...) to ensure proper vibration analysis.

4.12 Overview of firmware features

Table 19

Firmware Feature	BSS08	BSS10	BSS11
Reset by Magnet	–	●	–
Support for Driven Axles	–	●	–
Temperature Warning	–	●	–

All other features are consistent across the different firmware releases.

4.13 LED blinking

Table 20

Blinking	Frq On time	Off time	Meaning	Duration
🔴 🔴 🔴	1s	5s	Wheel End failure detected	14 days (only at standstill)
🔴🔴🔴🔴	0.5s	2s	Product internal failure detected	14 days (all the time)
🔴🟢 🔴🟢 🔴🟢	0.25s/0.25s	4.5s	Temperature alarm	14 days (only at standstill)

The temperature alarm is only available with BSS10a firmware. It is in lowest priority on alarm modes and will be disabled in case of wheel end or product internal failures.

4.14 Product lifespan

The estimated lifespan of the product is five years.
The lifespan of the product is dependent on driving cycles and weather conditions.

5 Certifications

5.1 FCC

This product is FCC approved.
FCC Identifier: 2AJ99-WEM-200
Certificate n°: 192180930/AA/00

5.2 Bluetooth SIG

This product is Bluetooth SIG approved.
Declaration ID: D050056

5.3 RCM

The product is RCM compliant.

6 Precautions and maintenance

The TraX sensor is maintenance free and non-repairable. Users should not attempt to open the device. Firmware updates will be available OTA (Over The Air).

The TraX sensor may need to be replaced if an internal sensor failure occurs or the battery reaches the end of its life.

⚠ CAUTION

When sensors are no longer working, they should be returned to SKF. If this is not possible, they should be disposed of in accordance with applicable local laws and regulations.

No significant performance degradation is expected before the internal battery reaches the end of its life. It is advisable to monitor the estimated remaining battery life, investigate any possible anomalous readings or status errors and, when necessary, replace the sensor.

7 General information

Warranty

This product has a one year warranty against manufacturing defects.

Warranty after the initial one year period must be part of a service agreement.

FCC Compliance Statement

(§15.19 Labelling requirements)

This device complies with part 15 of the FCC Rules.

Operation is subject to the following conditions:

1 This device must not cause harmful interference.
2 This device may receive radio interference that affects its ability to function properly.

(§15.21 Information to the User)

« Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment ».

(§15.105 statement)

«This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide a reasonable protection against harmful interference in an industrial installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and uses in accordance with the instructions, may cause harmful interference to radio communications ».

RoHS compliant

8 Technical specification

8.1 US baseplate

Figure 4

Drawing for US baseplate

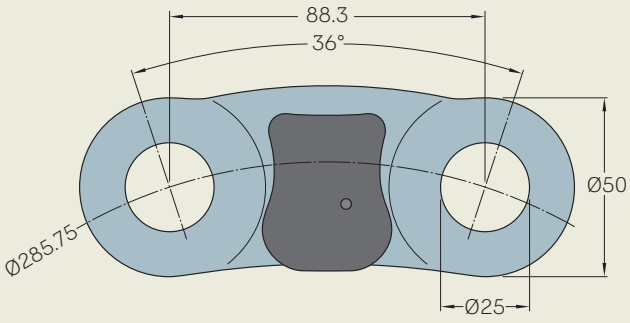
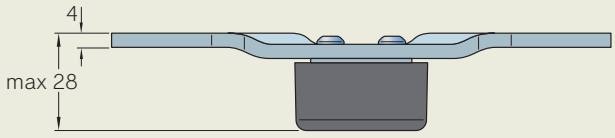


Figure 5

Drawing for US baseplate



8.2 32 baseplate

Figure 6

Drawing for 32 baseplate

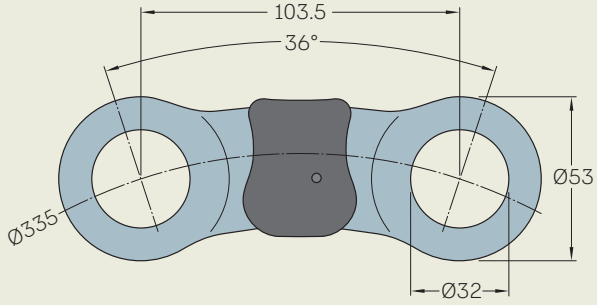
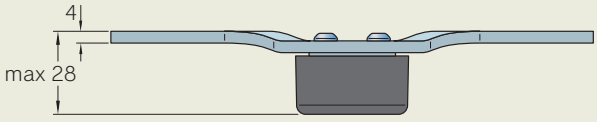


Figure 7

Drawing for 32 baseplate



8.3 EU baseplate

Figure 8

Drawing for EU baseplate

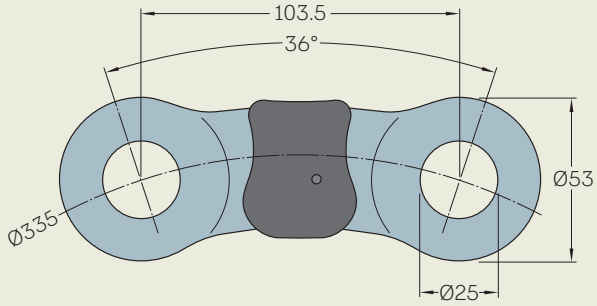
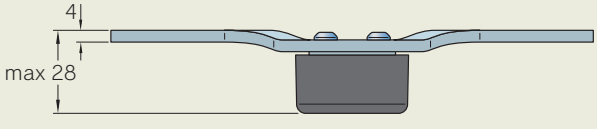


Figure 9

Drawing for EU baseplate



Unless stated otherwise, all dimensions are given in millimeters.

skf.com

PUB CM/P9 19246/3 EN · March 2025