SKF TraX Technical Specification Standalone version

WEM-200/USPP
WEM-200/32PP
WEM-200/EUPP

*WEM-200/USPP
(US version)*

*WEM-200/32PP
(European version)*

*WEM-200/EUPP
(European version)*

Non-contractual images

Contents

1 Document identification

Revision

Version	Date	Author	Comment
1	September 2022	DCS team	Initial creation
2	December 2022	DCS team	Addition of temperature alarm and reset functionalities
3	April 2023	DCS team	Update with RCM certification and mounting instructions Addition of other baseplate references and clarifications
4	September 2023	DCS team	Update with BSS10 software release.

2 Document references

References

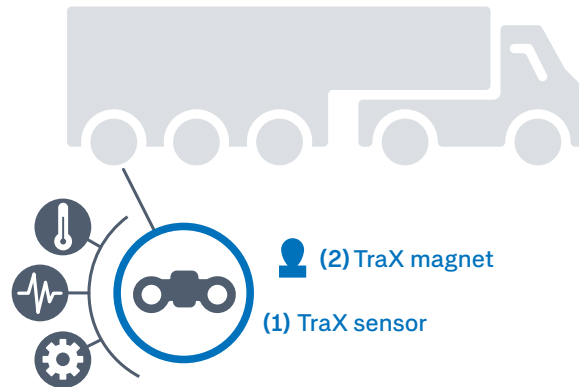| Document title	Document reference	Document revision
Sensor drawing dwp	WEM-200/USPP	Ed. 2) 23 09
	WEM-200/32PP	Ed. 2) 23 09
	WEM-200/EUPP	Ed. 2) 23 09

3 Introduction

Figure 1: Global system view

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 wheel end failures are detected and facilitates checks on the condition of wheel end bearings. It also provides temperature alarms when the temperature measured by the sensor exceeds a predefined threshold.

SKF TraX system is composed of two elements:

(1) The TraX 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.

(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.

The current technical specification only relates to the TraX sensor **(1)**.

4 Specification

4.1 Mechanical specification

Parameter	US baseplate	32 baseplate	EU baseplate	Unit	Comment
					Table 3
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

Parameter	Value	Unit	Comment
			Table 4
Operating temperature	−10 to 85	°C	All functions available
	14 to 185	*°F*	
Operating temperature for magnet use	−20 to 85	°C	
	−4 to 185	*°F*	
Operating temperature for vibration analysis	−10 to 105	°C	Bearing damage detection possible
	14 to 221	*°F*	
Operating temperature for temperature measurement	−40 to 105	°C	Temperature alarm enabled
	−40 to 221	*°F*	

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

Parameter	Value	Unit	Comment
			Table 5
Minimum speed for vibration analysis	60	km/h	
	40	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	Min	If T < 70 °C (*150 °F*)
	10	Sec	If 70 °C (*150 °F*) < T < 100 °C (*212 °F*)
	5	Sec	If T > 100 °C (*212 °F*)
Temperature measurement accuracy	±3	°C	

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. In that case, a pilot test session of three months is recommended to validate the sensor with the new configuration.

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[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 Inner	Outer	SKF Set reference 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

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.

4.8 Mode description

The product has 4 standard modes of operation:

- **Transport mode:** Used for part transportation only. No BLE emission. No measurement performed.
- **Standstill mode:** Used after wake-up of the sensor by magnet and automatic configuration.
  The product is mounted on a vehicle and the vehicle is not driving.
- **Driving mode:** Used when a minimum speed of the vehicle is reached.
- **Reset/remove mode:** Used to reset the product or remove the configuration of the product.
  Only available from standstill mode because it is for maintenance purpose.

Table 10

	Transport mode	Standstill mode	Driving mode	Reset/Remove mode
BLE emission	No	On magnet activation[3] 30 sec	No	No
Vibration analysis	No	No	Yes	No
Temperature measurement	No	Yes	Yes	No

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[3] The BLE emission on magnet activation is for SKF internal use only (development purpose, field return investigation, …)

4.9 Changing mode description

The product is delivered in transport mode. The product should be activated using the magnet. It is done when the LED lights green. This operation takes up to 10 seconds.

The product is already fully configured and ready to be used. Switching between modes is indicated by a LED light. The product automatically goes to standstill mode and switches to driving mode according to vehicle movement[4].
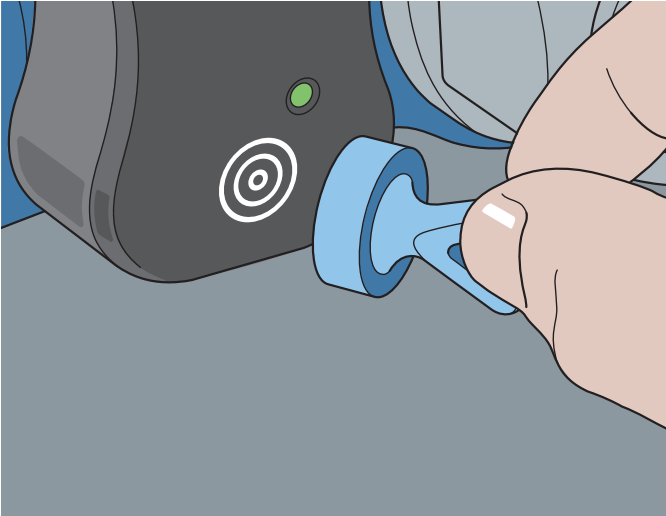

Figure 2. Magnet activation

Table 11

Operation purpose	Starting state	Action	Result
Wake-up the sensor	Transport mode	Put the magnet on the plastic housing until the LED lights	LED lights green during 5 sec 🟢 The part goes to Standstill mode
Activate the sensor by magnet	Standstill mode No failure	Put the magnet on the plastic housing until the LED lights	LED lights green during 30 sec 🟢 Advertising BLE frame The part goes back to Standstill mode
Go back to transport mode	Standstill mode No failure	Put the magnet on the plastic housing and wait more than 30 sec until LED lights red	LED lights green during 30 sec 🟢 Advertising BLE frame LED lights red during 1 sec 🔴 The part goes back to Transport mode
Reset of temperature alarm	Temperature alarm	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 ⚪
Reset of wheel end failure	Wheel end failure	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 ⚪

The LED patterns described in table 11 for alarms reset are only valid from BSS10 firmware.

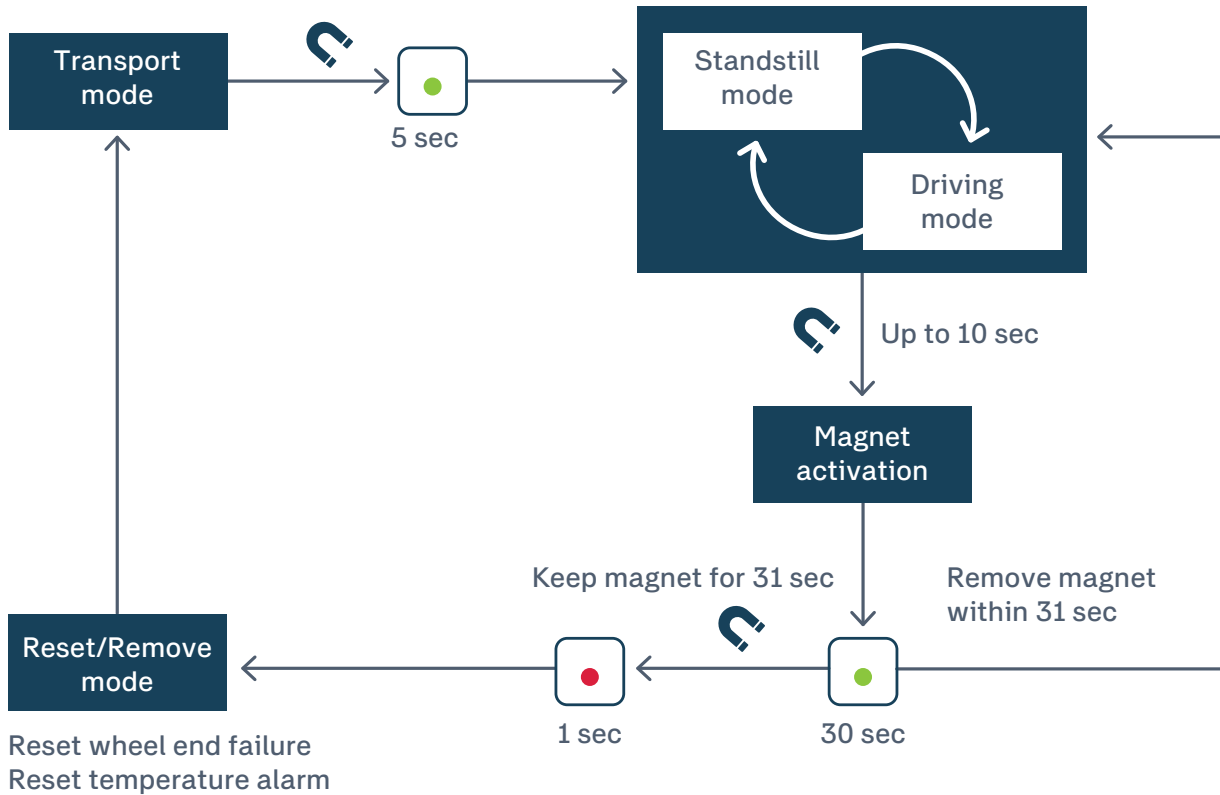[4] A minimum of 30 mph is required to detect a vehicle movement

*Figure 3. Changing modes*

4.10 Reset

It is necessary to reset the sensor to clear the alarms. The temperature and wheel end failure alarms can be erased by attaching the magnet for more than 31s. The detailed resetting procedure is described in table 11 and figure 3.

> ⚠ **WARNING**
>
> From BSS10 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.

4.11 LED blinking

Table 12

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 in lowest priority on alarm modes and
will be disabled in case of wheel end or product internal failures.

4.12 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 Mounting the sensor

Follow the mounting instructions below so that the TraX sensor performs a correct analysis.

1 Remove the rim cover (if existing)
2 Unscrew two consecutive rim nuts (or lug nuts)
3 Position the TraX sensor on the bolts.
Ensure the arrows on the sensor point outwards, towards the tire.

⚠ **WARNING**

4 Tighten the wheel nuts according to the manufacturer's wheel mounting specifications. Pay attention during tightening to correctly center the baseplate on the wheel stud and to avoid contact between wrench socket and sensor plastic housing.

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5 Put back the rim cover (if existing)
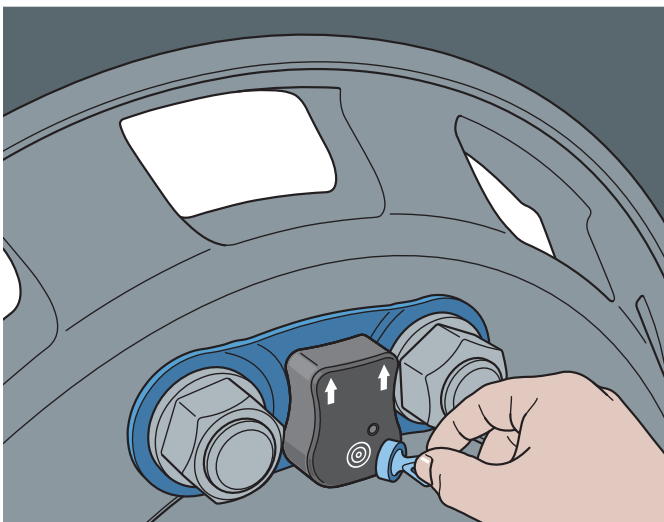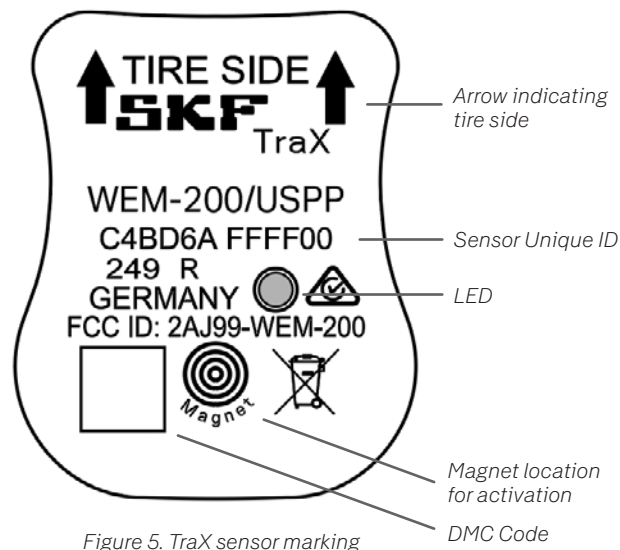

Figure 4. Mounting visualization

Figure 5. TraX sensor marking

Arrow indicating tire side

Sensor Unique ID

LED

Magnet location for activation

DMC Code

- For the mounting instructions video, click here

6 Wheel End failure

If the TraX sensor has detected a bearing failure, follow the instructions below:

1 Check the complete wheel end, a damaged part other than the bearing (e.g. tire) could have caused a high vibration level that would lead to an alarm. Issues other than bearing failure, such as tire hernias, flat tires, flat on tire due to heavy breaking, rim sides, and detached rims may also trigger the sensor's alarm.
2 If necessary, remove the sensor from the wheel
3 Replace either the bearing or the other damaged components
4 Remount the sensor
5 Reset the sensor by magnet, see section 4.10

If possible, return damaged bearings to SKF.

7 Temperature alarm

If the TraX sensor has detected a temperature sensor failure, follow the instructions below:

1 Inspect the wheel end corner to identify any visible defective component.
2 If necessary, remove the sensor from the wheel
3 Replace either the bearing or the other damaged components
4 Check the maximum temperature recorded by the sensor.
5 The sensor is specified for up to 105 °C (*221 °F*) and might be damaged when this temperature is exceeded. Please replace the sensor when this temperature was exceeded.
6 Reset the temperature warning, see section 4.10

If possible, return damaged bearings to SKF.

8 TraX sensor failure

If the sensor fails, a replacement is required. Replace the sensor by following the instructions below:

1 Order a new sensor
2 Remove the failed sensor
3 Follow the instructions in Section 5 to mount the replacement sensor
4 Follow the instructions in Section 4.9 to activate the replacement sensor

Non exhaustive sensor failure list:

• Battery power is low or extremely low[5]
• The sensor is not transmitting data
• The LED doesn't light when activated by the magnet
• The metal baseplate is broken

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[5] The estimated battery life is five years, although this depends on the application. A low battery warning indicates that the sensor should continue to function for three more months. An extreme low battery warning indicates that the sensor should continue to function for one more month.

9 Certifications

9.1 FCC

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

9.2 Bluetooth SIG

This product is Bluetooth SIG approved.
Declaration ID: D050056

9.3 RCM

This product is RCM compliant.

10 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.

11 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».
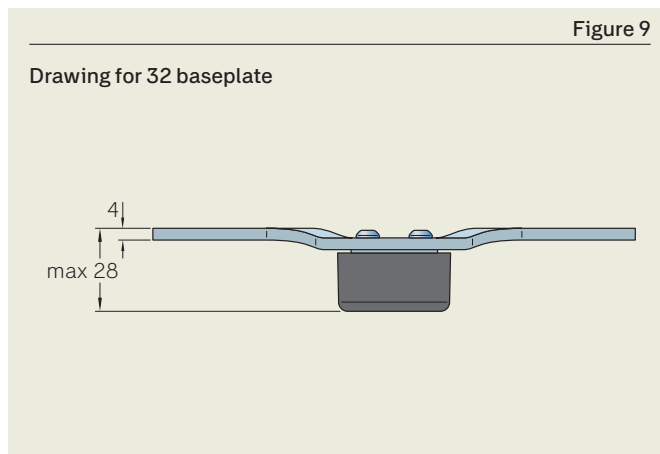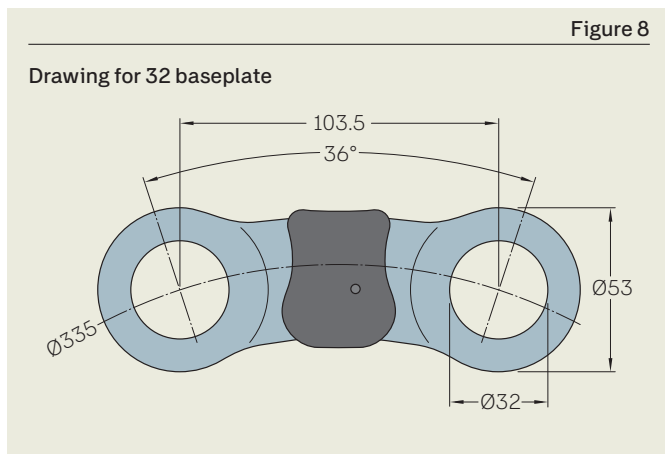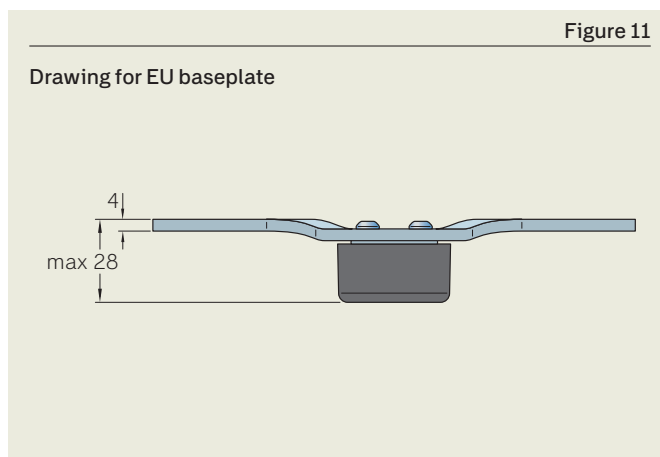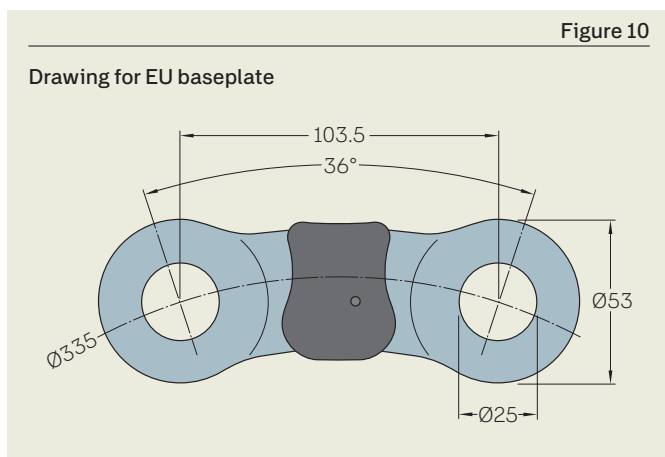
RoHS compliant

12 Technical specification

12.1 US baseplate

Figure 6

Drawing for US baseplate

88.3 · 36° · Ø285.75 · Ø50 · Ø25

Figure 7

Drawing for US baseplate

4 · max 28

12.2 32 baseplate

Figure 8

Drawing for 32 baseplate

103.5 · 36° · Ø335 · Ø53 · Ø32

Figure 9

Drawing for 32 baseplate

4 · max 28

12.3 EU baseplate

Figure 10

Drawing for EU baseplate

103.5 · 36° · Ø335 · Ø53 · Ø25

Figure 11

Drawing for EU baseplate

4 · max 28
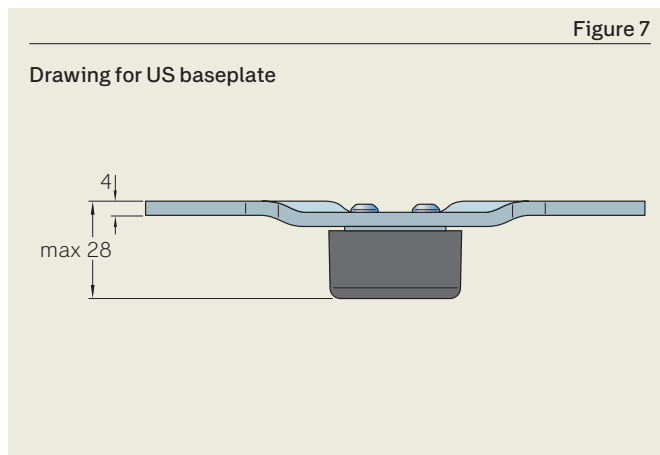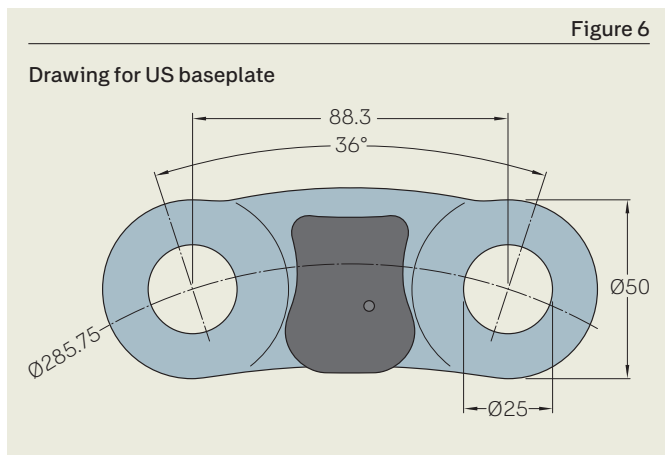
Unless stated otherwise, all dimensions are given in millimeters.