



RAILSTRAIGHT

Electronic measuring devices for longitudinal profile control

OPERATION MANUAL

RAIL JOINING

RAIL SERVICES

MEASUREMENT

TOOLS & MACHINES

EQUIPMENT

MEMBER OF



GOLDSCHMIDT
THERMIT GROUP

Revision overview

Revision	Date	Notes, affected sections/chapters	Edited by
01	25.09.2017	Editorial revision	Measurement technology
02	28.05.2018	Chap. 2.4 Note, Chap. 3.4.1 (1), Chap. 4.2 Point 5., Chap. 5, Chap. 6.2.2, Chap. 10.1, new Chap. 10.2	Measurement technology



EU Conformity Declaration

according to the EC Machinery Directive 2006/42/EC, Appendix II, 1.A

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Description and identification of the machinery:

Product / Merchandise: RAILSTRAIGHT WAVE / RAILSTRAIGHT COMPACT /
RAILSTRAIGHT DUAL
Type: R2SRC / SECRC / SEDRC
Function: Measurement of the surface roughness on railway tracks

It is expressly stated, that the machinery fulfils all the relevant provisions of the following European Directives:

2006/42/EC:2006-05-17	EC Machinery Directive 2006/42/EC
2004/108/EC:	(Electromagnetic compatibility) Directive 2004/108/EC of the European Parliament and the Council of the 15th of December, 2004 to approximate the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC.

Halle (Saale), 15.09.2017
Place and date of issuing



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1 Notes on the Manual

1.1 Signal words and symbols

Symbol	Meaning
DANGER	The signal word DANGER indicates a hazard with a high level of risk that, if not avoided, will result in death or serious injury.
WARNING	The signal word WARNING indicates a hazard with a medium level of risk that, if not avoided, can result in death or serious injury.
CAUTION	The signal word CAUTION indicates a hazard with a low level of risk that, if not avoided, can result in minor or moderate injury.
NOTE	The signal word NOTE indicates a hazard that, if not avoided, can result in damage.
	The Info symbol indicates information (tips, recommendations, comments, etc.) that can be useful when dealing with the RAILSTRAIGHT.
	Situations with a risk of injury are additionally marked with a warning sign.

1.2 Device identification

In this manual, the three RAILSTRAIGHT models WAVE, COMPACT and DUAL are described.

Not all chapters and descriptions are relevant for all RAILSTRAIGHT models. These contents are marked accordingly:

W = RAILSTRAIGHT WAVE

C = RAILSTRAIGHT COMPACT

D = RAILSTRAIGHT DUAL

	DANGER
	Non-observance of the manual. There is a danger to life! Carefully read the manual before using the RAILSTRAIGHT. Always follow instructions, prohibitions and commandments of the manual.

 The manual is part of the product. Always be sure to keep the manual close to the product. When handing over the RAILSTRAIGHT, the manual must also be passed on.

2 Notes on the RAILSTRAIGHT

2.1 Intended use

The RAILSTRAIGHT is used for non-destructive measurement of the straightness and surface quality of iron and crane rail tracks, as well as for locating corrugations. It may only be used and operated for this purpose. Only the accessories included in the scope of supply and which are to be purchased from Elektro-Thermit may be used.

The RAILSTRAIGHT may only be used and operated in the track area by technical personnel who are trained and authorised specifically in the track area.

2.2 Non-intended use

Non-intended use is when the RAILSTRAIGHT is used for a different purpose than is described in "Chap. 2.1 Intended use". Unauthorised use also applies if the RAILSTRAIGHT is used and operated in the track area by technical personnel who are not specifically trained and not authorised. The RAILSTRAIGHT is not suitable for the measurement of steel beams.

2.3 Disposal

RAILSTRAIGHT

The RAILSTRAIGHT, the charging devices, the Smartphone and the power supply must be sent back to the Elektro-Thermit GmbH & Co. KG company for disposal.

Transport bag

The transport bag must be disposed of as residual waste.

	WARNING
	The internal batteries of the RAILSTRAIGHT are highly flammable and react with water to form extremely flammable gases. This may cause long-term adverse effects in the aquatic environment. Therefore, batteries must not be disposed of with residual or household waste or in the sewage system.

2.4 General safety instructions

Work in the track area

	DANGER
	<ol style="list-style-type: none"> 1. Regional varying sources of danger and safety regulations. There is a danger to life! The applicable safety regulations in the respective country of use and/or rail network for the duration and work in the track area are to be observed. 2. Moving rail vehicles and live parts in the track area. There is a danger to life! Work in the track area may only be carried out by specially trained and authorised technical personnel.

RAILSTRAIGHT

	WARNING
	<ol style="list-style-type: none"> 1. If water penetrates into the power supply connected to the electricity grid, there is a risk of serious injury due to electric shock. This can lead to cardiac ventricular fibrillation, cardiac arrest or respiratory paralysis with a fatal outcome. Protect the power supply from rain and moisture! Charge the RAILSTRAIGHT only in protected locations. 2. When power supply cables are severed or live wires are exposed, there is a risk of serious injury due to electric shock. This can lead to cardiac ventricular fibrillation, cardiac arrest or respiratory paralysis with a fatal outcome. Protect power supply cables from moving parts, tools or sharp edges! Damaged power supplies must not be used. 3. The internal batteries can catch fire and explode if handled improperly. This can cause burns and chemical burns with a fatal outcome. When using the RAILSTRAIGHT, under no circumstances short-circuit it, pierce it, throw it into a fire, crush it, immerse it in water, forcibly discharge it or expose it to temperature above +60° C.

NOTE

1. Sensitive inspection mechanism. The measurement accuracy can be affected by shocks, vibrations and heat. Protect the RAILSTRAIGHT against shocks, vibrations and heat. Avoid standing the appliance up on one end.
2. Moisture and humidity can cause short-circuiting. The electronics, batteries and other accessories can be damaged. Protect the RAILSTRAIGHT and other accessories from prolonged moisture and humidity. Always store the RAILSTRAIGHT in the transport bag provided.
3. Heat-sensitive measurement surface. The measurement surface can be damaged by temperatures above +60° C. Never place the RAILSTRAIGHT on a still hot welded seam.
4. To transport the appliance safely, we recommend using a transport box (see Chapter 3.2).

2.5 Maintenance and care

The RAILSTRAIGHT does not require any extensive maintenance and care. Nevertheless, you should clean it regularly and check for correct functioning by using the calibration check every 1,000 measurements.

→ *Chap. 9 Checking calibration*

i If the App then recommends that the RAILSTRAIGHT should be calibrated, please contact Customer Service. In general, we recommend sending the RAILSTRAIGHT to Customer Service for a comprehensive service and calibration at the latest after 5,000 measurements or one year.

i If you have any questions regarding maintenance and care, or if a malfunction occurs, please contact our Customer Service.

Customer Service

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	WARNING
	<p>The electronics and internal batteries of the RAILSTRAIGHT are sensitive to moisture and can be damaged in contact with water. The batteries are also highly flammable and react with water to form highly flammable gases. The batteries can catch fire and explode. This can cause burns and chemical burns with a fatal outcome.</p> <p>Never immerse the RAILSTRAIGHT in water.</p>

NOTE
<p>Scratch-sensitive measurement surface. The measurement surface can easily be damaged if it is not properly cleaned. Observe the following instructions during cleaning:</p> <ul style="list-style-type: none"> • Do not use any steel wool, fleece cloths, brushes or aggressive cleaning agents. • Only use a clean, soft cloth. • Protect the RAILSTRAIGHT from prolonged moisture and humidity. • After use in the rain, wipe the RAILSTRAIGHT dry with a clean, soft cloth. • Clean the RAILSTRAIGHT with stubborn dirt (e.g. from lubricant on the rail) with a degreasing detergent and a soft cloth.

2.6 Legal notices

Liability

The user shall be liable for the non-observance of the manual. A warranty for damage to the RAILSTRAIGHT or to the accessories or for malfunctions arising from the non-observance of the manual or through incorrect use by the user. Unauthorised modifications or changes to the RAILSTRAIGHT or accessories - without prior consultation with the manufacturer - are prohibited and excluded from the liability.

Copyright protection

This manual is protected by the copyright of the Elektro-Thermit GmbH & Co. KG. A duplication of the entire document or in extracts and/or disclosure to third parties is permitted only with prior written permission of Elektro-Thermit GmbH & Co. KG.

Warranty

The statutory warranty period applies. Objectionable defects on the RAILSTRAIGHT or on the accessories, which were not caused by improper or incorrect use by the user, but for which the manufacturer clearly bears responsibility, give rise to the right for defect-free replacement. Damage due to wear that was caused through the use of the RAILSTRAIGHT is excluded from the warranty.

3 Device description

3.1 Scope of delivery



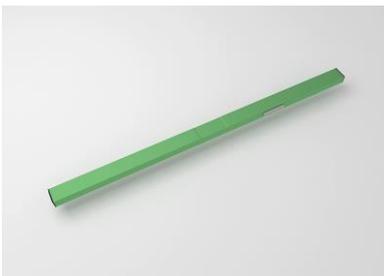
RAILSTRAIGHT WAVE (W)



RAILSTRAIGHT COMPACT (C)



RAILSTRAIGHT DUAL (D)



Green reference bar



Transport bag



Silicone caps (W/C)



Micro-USB charger 110/220 V

- Manual - RAILSTRAIGHT
- Micro SDHC memory card with adapter
- AA batteries and charger
- Auto Charger 12 V (not shown)

3.2 Optional accessories

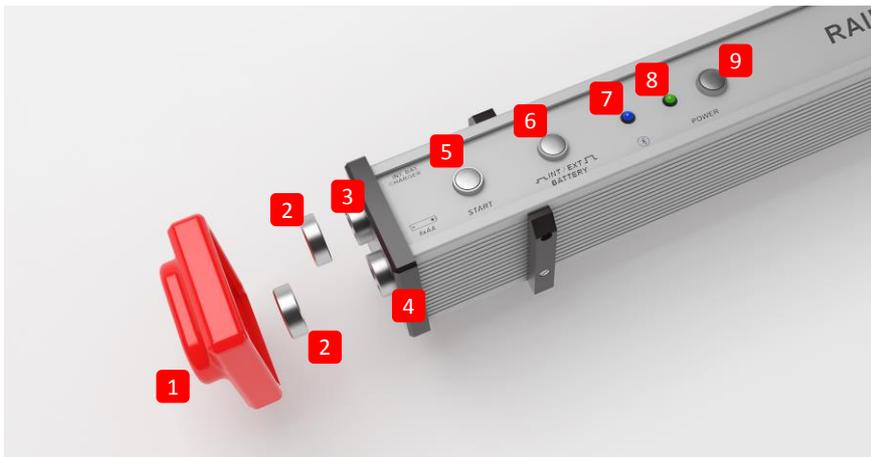
Name	Article number
Transport box Aluminium	363007
Android device	363006
Silicone caps for COMPACT / WAVE	363322
Calibration service	864162
Bluetooth BT-10 rail thermometer	363337
Auto charger 12 V	363338
AA batteries and charger	363339
Magnetic holder for running edge	363340

3.3 Technical data

	RAILSTRAIGHT WAVE (W)	RAILSTRAIGHT COMPACT (C)	RAILSTRAIGHT DUAL (D)
Measuring length	1 m	1 m	1 m
Horizontal resolution	500 measurement points	500 measurement points	500 measurement points
Vertical resolution	0.001 mm	0.001 mm	0.001 mm
Display resolution	0.01 mm	0.01 mm	0.01 mm
Linearity error	± 0.5 %	± 0.5 %	± 0.5 %
Measuring range	<ul style="list-style-type: none"> max: +1 mm min: -2 mm 	<ul style="list-style-type: none"> max: +1.5 mm min: -2.5 mm 	<ul style="list-style-type: none"> max: +1 mm min: -2 mm
Measuring time	6 secs	6 secs	6 secs
Weight	5 kg	5 kg	8 kg
Dimensions (W × D × H)	1230 × 165 × 110 mm	1230 × 165 × 110 mm	1330 × 192 × 95 mm
Internal battery	<ul style="list-style-type: none"> 3 x 3.7V Li-Ion 3000mAh Operating time: approximately 400 measurements Charging time: approx. 7 hrs 	<ul style="list-style-type: none"> 3 x 3.7V Li-Ion 3000mAh Operating time: approx. 400 measurements Charging time: approx. 7 hrs 	<ul style="list-style-type: none"> 3 x 3.7V Li-Ion 3000mAh Operating time: approx. 400 measurements Charging time: approx. 7 hrs
Protection class	IP54 (protection against dust, complete protection against contact, protection against all-round splashing water)	IP54 (protection against dust, complete protection against contact, protection against all-round splashing water)	IP54 (protected against dust, complete protection against contact, protection against all-round splashing water)
Ambient temperature	<ul style="list-style-type: none"> min: -10°C max: +50°C 	<ul style="list-style-type: none"> min: -10°C max: +50°C 	<ul style="list-style-type: none"> min: -10°C max: +50°C
Rail temperature	<ul style="list-style-type: none"> min: -20°C max: +60°C 	<ul style="list-style-type: none"> min: -20°C max: +60°C 	<ul style="list-style-type: none"> min: -20 max: +60°C
Air humidity	not higher than 90% relative humidity	not higher than 90% relative humidity	not higher than 90% relative humidity
Connections	<ul style="list-style-type: none"> Bluetooth USB 	<ul style="list-style-type: none"> Bluetooth USB 	<ul style="list-style-type: none"> Bluetooth USB
Standard requirements	<ul style="list-style-type: none"> EN 61000-4-2 EN 55022 	<ul style="list-style-type: none"> EN 61000-4-2 EN 55022 	<ul style="list-style-type: none"> EN 61000-4-2 EN 55022

3.4 Device components

3.4.1 RAILSTRAIGHT WAVE (W) and RAILSTRAIGHT COMPACT (C)



(1) The two **silicone protection caps** protect the sides of the RAILSTRAIGHT WAVE & COMPACT from external influences. (See information note Chap. 5).

→ *Chap. 4.1 Charging the RAILSTRAIGHT*

→ *Chap. 4.2 Using external batteries*

(2) The two **screw caps** protect the **(3) charger** and the **(4) battery** from external influences (rain, shocks, etc.).

→ *Chap. 4.1 Charging the RAILSTRAIGHT*

→ *Chap. 4.2 Using external batteries*

(3) With the **micro-USB charging connection**, you can charge the RAILSTRAIGHT.

→ *Chap. 4.1 Charging the RAILSTRAIGHT*

(4) You can insert external batteries into the **battery compartment** to extend the operating time of the RAILSTRAIGHT.

→ *Chap. 4.2 Using external batteries*

(5) With the **manual start button**, you can also start up the RAILSTRAIGHT WAVE & COMPACT manually when measuring.

→ *Chap. 6.2 Performing rail joint measurement*

→ *Chap. 6.3 Carrying out corrugated measurement (W)*

(6) With the **switch INT / EXT BATTERY** you can switch the power supply of the RAILSTRAIGHT from internal battery to external batteries.

→ *Chap. 4.2 Using external batteries*

(7) The **Bluetooth LED** lights up blue when the RAILSTRAIGHT is connected to your Android device via Bluetooth.

→ *Chap. 6.1 Connecting the RAILSTRAIGHT application with the RAILSTRAIGHT*

(8) The **power LED** lights up green when you turn on the RAILSTRAIGHT on the power button and blinks red when the battery charge of the RAILSTRAIGHT or the external batteries is too low.

→ *Chap. 4 Power supply*

(9) With the **power button** (on - / off switch) you can turn the RAILSTRAIGHT on and off.

→ *Chap. 6.1 Connecting the RAILSTRAIGHT application with the RAILSTRAIGHT*

(10) With the two **spacers**, you can adjust the RAILSTRAIGHT WAVE & COMPACT to the different types of Rails.

→ *Chap. 5 Adjusting the RAILSTRAIGHT to the rail and placing it there*

(11) Using the **carrying handle**, you can place the RAILSTRAIGHT, on the rail, lift and transport it.

3.4.2 RAILSTRAIGHT DUAL (D)



(1) The two **screw caps** protect **(2) charger** and the **(3) battery compartment** from external influences (rain, shocks, etc.).

→ *Chap. 4.1 Charging the RAILSTRAIGHT*

→ *Chap. 4.2 Using external batteries*

(2) With the **micro-USB charging connection**, you can charge the RAILSTRAIGHT.

→ *Chap. 4.1 Charging the RAILSTRAIGHT*

(3) You can insert external batteries into the **battery compartment** to extend the operating time of the RAILSTRAIGHT.

→ *Chap. 4.2 Using external batteries*

(4) With the **switch INT / EXT BATTERY** you can switch the power supply of the RAILSTRAIGHT from internal battery to external batteries.

→ *Chap. 4.2 Using external batteries*

(5) With the **power button** (On/Off switch), you can switch the RAILSTRAIGHT on and off.

→ *Chap. 6.1 Connecting the RAILSTRAIGHT application with the RAILSTRAIGHT*

(6) The **power LED** lights up green when you turn on the RAILSTRAIGHT on the power button and blinks red when the battery charge of the RAILSTRAIGHT or the external batteries is too low.

→ *Chap. 4 Power supply*

(7) The **Bluetooth LED** lights up blue when the RAILSTRAIGHT is connected to your Android device via Bluetooth.

→ *Chap. 6.1 Connecting the RAILSTRAIGHT application with the RAILSTRAIGHT*

(8) Using the **carrying handle**, you can place the RAILSTRAIGHT on the rail, lift and transport it.

3.5 RAILSTRAIGHT Application

Using the RAILSTRAIGHT application, you can operate the RAILSTRAIGHT. The application can be downloaded from the Google play store.

3.5.1 System requirements

 To install the RAILSTRAIGHT application, you will need a Smartphone or tablet computer with the operating system Android and a working Internet connection.

The following system requirements apply for the installation of the RAILSTRAIGHT application on your Smartphone/Tablet:

- Android operating system starting from version 2.3.3 ("gingerbread")
- Bluetooth function required
- free disk space of at least 20 MB

3.5.2 Installation and updates

 Before installing, make sure that your Smartphone/Tablet has an active Internet connection.

 Depending on model and version of your Smartphone, it is possible that you can skip individual steps.

Logging into the Google Play Store

1. Open the Google Play Store App.
2. Login with your Google ID.

 You need a Google account to register at the Google play store. If you do not have an account yet, please create one. To do this, follow the instructions on the screen.

Installation of the GOLDSCHMIDT DIGITAL APP

Through the GOLDSCHMIDT DIGITAL APP you have access to all digital applications of the Goldschmidt Thermit Group, including the RAILSTRAIGHT application.

1. Open the Google Play Store App.
2. Using the search function, locate the GOLDSCHMIDT DIGITAL APP and select it from the search results. Alternatively, you can scan the following QR code.
3. Tap on the **Install button** and accept the access rights if necessary. The GOLDSCHMIDT DIGITAL APP will be automatically downloaded and installed. When the process is complete, the **Open** button appears.



Installation of the RAILSTRAIGHT application

1. Open the **GOLDSCHMIDT DIGITAL APP**.
2. Tap on the icon of the RAILSTRAIGHT application. You will find this under **Apps available in the store**.
3. From the detailed view, you can go directly to the RAILSTRAIGHT application in the Google Play Store using the **Google Play** button.
4. Tap on the **Install** button and accept the access rights if necessary. The RAILSTRAIGHT application will be automatically downloaded and installed.

Update of the RAILSTRAIGHT application

1. Open the Google Play Store App.
2. Select the menu item **My Apps and Games**.
3. If an update of the RAILSTRAIGHT application is available, the application is listed under the heading **Updates**. Tap to select the application.
4. Tap on the **Update** button and accept additional access rights if necessary. The update of the RAILSTRAIGHT application will be automatically downloaded and installed. A message appears when the operation has been completed.

 At least once a month, check whether there are new updates for the RAILSTRAIGHT application. If no regular updates are performed, this can distort the documentation process.

 Before each update, make sure that your Smartphone/Tablet has an active internet connection.

Uninstalling the RAILSTRAIGHT application

1. Open the Google Play Store App.
2. Select the menu item **My Apps and Games**.
3. Tap on the RAILSTRAIGHT application to select it.
4. Tap on the **Uninstall** button and confirm with **OK**. The RAILSTRAIGHT application will be uninstalled automatically.

3.5.3 The RAILSTRAIGHT toolbar application

Using the **toolbar** you can among other things show and hide the menu or the assistance. Depending on which screen is opened, the **toolbar** contains more buttons, such as save, add, export, etc.



<p>Menu icon/screen title</p>	<p>Tap the menu icon and/or on the screen titles to show and hide the menu.</p> <p>i Alternatively, you can wipe your finger from the left edge of the screen to the right in order to display the menu, or from right to left to hide the menu.</p>
<p>Paper clip</p>	<p>Using the paper clip, you can export projects and measurements.</p> <p>→ Chap. 7.2.4 Exporting projects</p> <p>→ Chap. 7.4 Exporting measurements</p>
<p>Check mark</p>	<p>Using the Tick, you can save input or changes, for example when creating or editing a project.</p>
<p>Plus sign</p>	<p>Using the Plus sign you can create new projects in the project list.</p> <p>→ Chap. 7.2.1 Creating projects</p>
<p>Thermometer</p>	<p>Using the thermometer you can select a Bluetooth rail thermometer.</p> <p>i The screen select thermometer appears. Select your Bluetooth rail thermometers from the list available devices.</p> <p>i If you connect the App with a Bluetooth rail thermometer for the first time, a further dialogue box appears. In it, you are prompted to enter the password ID of the Bluetooth rail thermometer. This eight-digit ID always consists of 1212 and the last 4 digits of the Bluetooth name (such as BTEMP6290 = password ID 12126290).</p>
<p>Question mark</p>	<p>Using the question mark, you can open the Operation Manual.</p>

<p>Goldschmidt logo</p>	<p>The Goldschmidt logo indicates whether the App is connected with the RAILSTRAIGHT.</p> <ul style="list-style-type: none"> • White: The App is not connected to the RAILSTRAIGHT. • Red: The App is connected with the RAILSTRAIGHT. <p> If the App is connected with the RAILSTRAIGHT, you can use the Goldschmidt logo to query the status of the RAILSTRAIGHT, export log files, verify the calibration and disconnect from the RAILSTRAIGHT.</p> <p>Tap the Goldschmidt logo, to open the dialogue screen Device status.</p> <p>→ <i>Chap. 3.5.4 Device status</i></p>
<p>Three vertical dots (Action overflow)</p>	<p>The three vertical dots (Action overflow) appear when there is not enough space for all symbols.</p> <p> If you own an Android powered device with a hardware menu button, then press this hardware menu button to use the hidden buttons.</p>

3.5.4 Device status

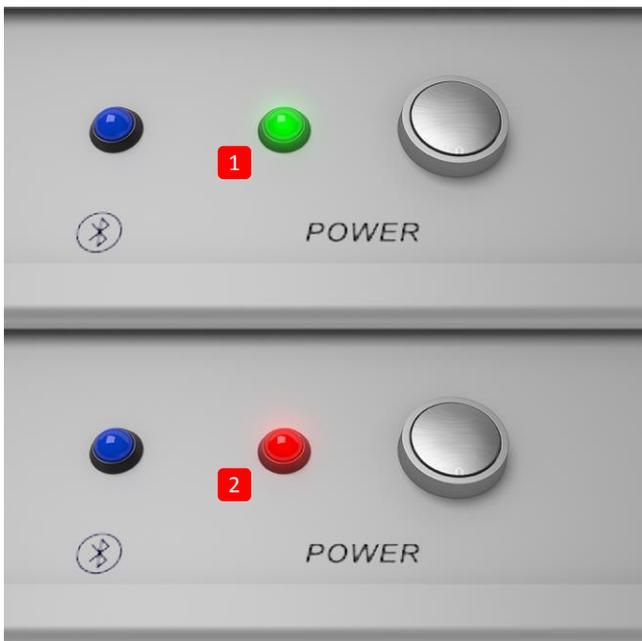
Type on the **Goldschmidt logo** in the icon toolbar to **open** the dialogue **screen device status**.

Battery	The Battery indicator displays the charging status of the RAILSTRAIGHT.
Panel temperature	The Panel temperature indicator displays the temperature inside the unit.
Housing temperature	The Housing temperature indicator displays the temperature of the housing.
Version	The Version indicator displays the version of the RAILSTRAIGHT.
Device no.	The Device no. indicator displays the serial number of the RAILSTRAIGHT.
Internal ID	The Internal ID indicator displays the Password ID of the Bluetooth connection.
Calibration time	The Calibration time indicator displays when the RAILSTRAIGHT was last calibrated.
Measure count	The Measure count indicator displays how many times measurement with the RAILSTRAIGHT took place since the last calibration.
Bluetooth	The Bluetooth indicator displays the Bluetooth name and the MAC address of the RAILSTRAIGHT.
Check calibration	<p>Tap on Check calibration to conduct a reference measurement with the RAILSTRAIGHT. The screen Start calibration check appears. In this screen, you can start the reference measurements.</p> <p>→ <i>Chap. 9 Check calibration</i></p> <p> To check the calibration of the RAILSTRAIGHT, you will need the Green reference bar that is appropriate for the RAILSTRAIGHT. Therefore, check if the serial numbers of the RAILSTRAIGHT and the Green reference bar are the same.</p>
Export log files	<p>Tap on Export log files to export the log files of the device.</p> <p> If there are problems with the RAILSTRAIGHT, the log file can be used for troubleshooting.</p>
Disconnect	Tap Disconnect to separate the current Bluetooth connection between Android device and RAILSTRAIGHT.

4 Power supply

	<p>WARNING</p>
	<ol style="list-style-type: none"> 1. If water penetrates into the power supply connected to the electricity grid, there is a risk of serious injury due to electric shock. This can lead to cardiac ventricular fibrillation, cardiac arrest or respiratory paralysis with a fatal outcome. Protect the power supply from rain and moisture! Charge RAILSTRAIGHT only in protected locations. 2. When power supply cables are severed or live wires are exposed, there is a risk of serious injury due to electric shock. This can lead to cardiac ventricular fibrillation, cardiac arrest or respiratory paralysis with a fatal outcome. Protect power supply cables from moving parts, tools or sharp edges! Damaged power supplies must not be used. 3. The internal batteries can catch fire and explode if handled improperly. This can cause burns and chemical burns with a fatal outcome. When using RAILSTRAIGHT, under no circumstances short-circuit it, pierce it, throw it into a fire, crush it, immerse it in water, forcibly discharge it or expose it to temperature above +60 °C. 4. Through the use of foreign power supplies, the RAILSTRAIGHT can catch fire and explode. This can cause burns and chemical burns with a fatal outcome. Use only the original AC adapter of the Elektro-Thermit GmbH & Co. KG.

The battery indicator



(1) Lights up green when the RAILSTRAIGHT is fully charged.

(2) Flashes red when the battery charge of the RAILSTRAIGHT or the external batteries is too low.

4.1 Charging the RAILSTRAIGHT

i The charging time of the RAILSTRAIGHT is approx. 7 hrs.

i With a fully charged RAILSTRAIGHT you can perform approximately 400 measurements



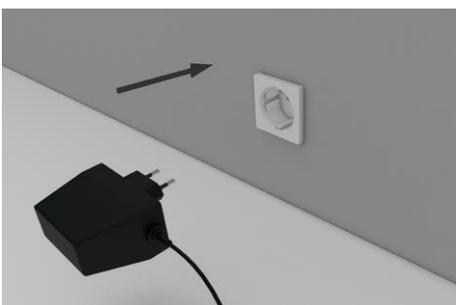
1. Remove the red protective cap. (W/C)



2. Undo the screw cap of the charger port.



3. Connect the power supply to the RAILSTRAIGHT.

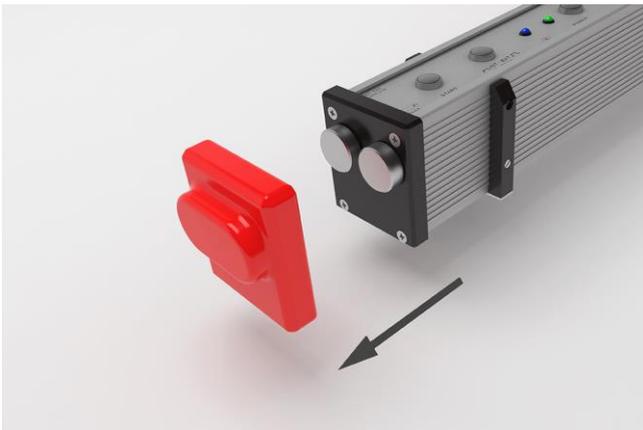


4. Connect the power plug to the socket.
The battery is charged.

4.2 Using external batteries

You can also use the RAILSTRAIGHT with external batteries, for example, to extend the operating time or if no possibility to recharge is available.

i For a sufficient power supply, you need eight **1.5 volt AA batteries** or **1.2 V rechargeable AA batteries**.



1. Remove the red protective cap. (W/C)



2. Undo the screw cap of the battery compartment.

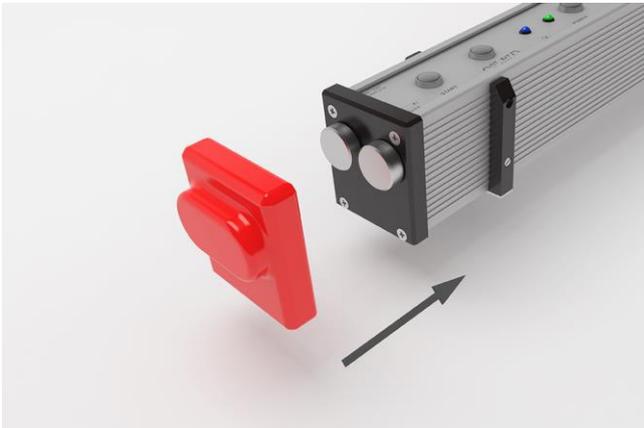


3. Insert the batteries into the battery compartment.

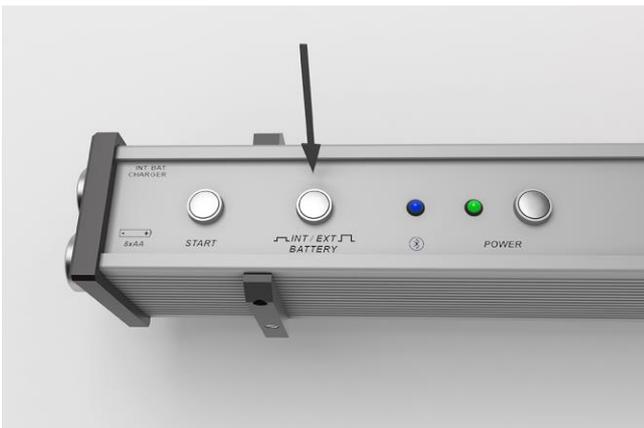
i The plus poles of the batteries point inwards.



4. Screw the battery compartment closed.



5. Attach the red protective cap. (W/C)
See information note Chap. 5.



6. Press the **INT / EXT BATTERY** button on the RAILSTRAIGHT. The RAILSTRAIGHT switches the power from internal battery to external battery.

i Press the button **INT / EXT BATTERY** again to switch the power supply back again from external battery to internal battery.

5 Adjusting the RAILSTRAIGHT to the rail and placing it there

NOTE

The RAILSTRAIGHT performs a self-test after power up. If the RAILSTRAIGHT is in contact with the rail or other metallic surfaces while doing so, the App cannot connect with the RAILSTRAIGHT. Do not place the RAILSTRAIGHT on the rail or a metallic surface prior to connecting.

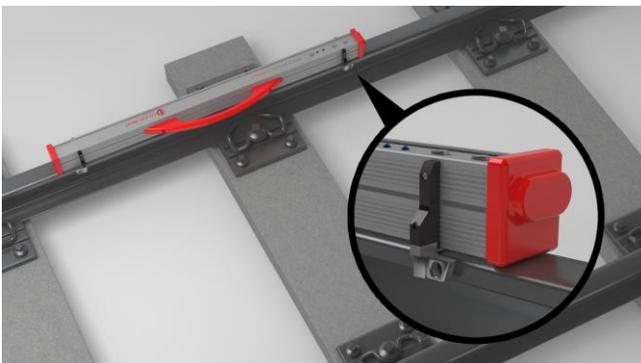
i Note the specified type of rail on the rolling mark of the rail to adjust the RAILSTRAIGHT for the correct rail type.

→ *Chap. 10 Types of rails and position of the spacers*

i The RAILSTRAIGHT DUAL eliminates the need for adjustment to the rail, as it measures the running surface and the running edge at the same time.

i The red protective caps must be fitted correctly to prevent the RAILSTRAIGHT from being positioned too high. Ensure that the three surfaces with the thicker walls are oriented to the sides and upwards. Also ensure that there is no dirt between the silicone caps and the black end plate. If in doubt, remove the red protective caps before taking any measurements.

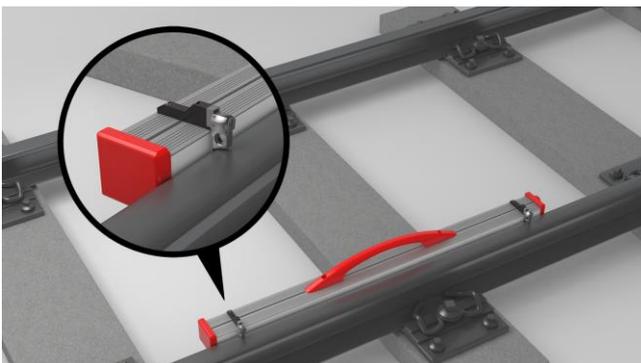
5.1 Adjusting and positioning the RAILSTRAIGHT for running surface measurement (W/C)



1. Turn the two spacers to the desired position (e.g. in the image: Position A). The spacers latch in a manner that is perceptible and audible for each location.
2. Place the RAILSTRAIGHT with the measuring surface **on the running surface**.

i The **spacers** are in contact with the surface of the engraved letter on the **track inner running edge**.

5.2 Adjusting and positioning the RAILSTRAIGHT for running edge measurement (W/C)



1. Turn the two spacers to **Position G**. The spacers latch in in a manner that is perceptible and audible.
2. Place the RAILSTRAIGHT with the measuring surface on the **inner track running edge**.

i The spacers are in contact with the surface of the engraved letter "G" **on the running surface**.

6 Measuring with the RAILSTRAIGHT

i To measure with the RAILSTRAIGHT, you need an Android device on which the RAILSTRAIGHT application is installed

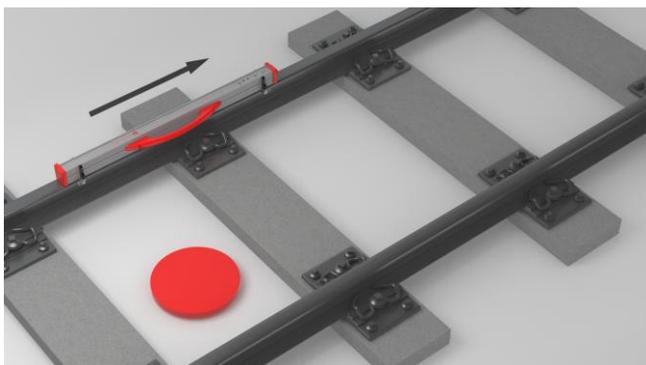
→ *Chap. 3.5 RAILSTRAIGHT application*

i The RAILSTRAIGHT and the Android device must be charged.

→ *Chap. 4.1 Charging the RAILSTRAIGHT*

i You can also use the RAILSTRAIGHT with external batteries, e.g. in order to extend the operating time or if there is no possibility of charging.

→ *Chap. 4.1 Charging the RAILSTRAIGHT*



i Consider the interpretation of the measurement results on the inside of the track (see the red dot in the figure). Seen from this direction, the RAILSTRAIGHT measures from left to right, i.e. in the reading direction. This makes it easier for you to interpret the results diagram in the App, since it also builds up (in reading order) from left to right.

NOTE

In several countries (e.g. in the Netherlands), you are **not allowed to stand on the inside of the track** during the measurement, but only on the outside of the rail to be measured. Seen from this direction, the RAILSTRAIGHT measures from right to left, i.e. contrary to the reading direction. Therefore, you must interpret the measurement result in the Netherlands in a mirror-inverted manner.

6.1 Connecting the RAILSTRAIGHT application with the RAILSTRAIGHT

NOTE

The RAILSTRAIGHT performs a self-test after power up. If the RAILSTRAIGHT is in contact with the rail or other metallic surfaces while doing so, the App cannot connect with the RAILSTRAIGHT. Do not place the RAILSTRAIGHT on the rail or a metallic surface prior to connecting.

1. Press the **Power button** (On/Off switch) on the RAILSTRAIGHT. The power LED on the RAILSTRAIGHT lights up green. The RAILSTRAIGHT performs a self-test.
2. In the menu of the RAILSTRAIGHT application, tap on **Measure**.

 If you don't have a GPS enabled, a dialogue box appears. In it, you are asked whether you want to enable GPS. Confirm the dialogue box with OK, if you want to store the corresponding GPS coordinates to go with your measurements. Then, follow the instructions to activate your Android device's location feature.

3. Tap **connect** to connect the app with the RAILSTRAIGHT.

 If Bluetooth is not enabled, a dialogue box appears. It will tell you that an App is trying to enable Bluetooth.

4. Confirm the dialogue box with **Yes** Bluetooth is activated. The app connects to the RAILSTRAIGHT. The Bluetooth LED on the RAILSTRAIGHT lights up blue. The screen **start measurement** appears.

NOTE

If you connect the App to a RAILSTRAIGHT for the first time, a further dialogue box appears. In it, you are prompted to enter the password ID of the RAILSTRAIGHT. This eight-digit ID always consists of 1212 and the last 4 digits of the Bluetooth name (such as SECRC6290 = password ID 12126290).

6.2 Performing rail joint measurement

In the context of a rail joint measurement, you can measure the running surface and the running edge of the rail. The RAILSTRAIGHT DUAL measures both at the same time. With the RAILSTRAIGHT COMPACT and the RAILSTRAIGHT WAVE, measure the running surface and the running edge separately. Proceed as follows:

6.2.1 Measuring the running surface

1. Adjust the spacers on the RAILSTRAIGHT to the type of rail. (W/C)
→ *Chap. 5.1 Adjusting and positioning the RAILSTRAIGHT for running surface measurement (W/C)*
2. Place the RAILSTRAIGHT with the measuring surface on the running surface.

i The spacers and/or limit stops are put in contact with the **inside track running edge**.

3. In the menu of the RAILSTRAIGHT application, tap on **Measure**.
4. Tap **Joint measurement**. (W)
5. Tap **Running surface**. (W/C)
6. Check whether the spacers and/or limit stops are in contact with the **running edge**.
7. Tap **Start measurement**. The RAILSTRAIGHT starts to measure. The measurement results are then displayed.
→ *Chap. 6.4.1 Measurement results of a rail joint measurement*

6.2.2 Measuring the running edge (W/C)

1. Place the spacers on the RAILSTRAIGHT in **Position G** (running edge).
→ *Chap. 5.2 Adjusting and positioning the RAILSTRAIGHT for running edge measurement (W/C)*
2. Place the RAILSTRAIGHT with the measuring surface on the inner track running edge.

i The spacers are on the **running surface**.

3. In the menu of the RAILSTRAIGHT application, tap on **Measure**.
4. Tap **Running edge**.
5. Check that the spacers are on the running surface.
6. Tap **Start measurement**. The RAILSTRAIGHT starts to measure. The measurement results are then displayed.
→ *Chap. 6.4.1 Measurement results of a rail joint measurement*

i To better control the RAILSTRAIGHT when measuring, you can also start the measurement via the manual start button on the RAILSTRAIGHT.

6.3 Carrying out corrugated measurement (W)

i Corrugated measurements are possible only in conjunction with the RAILSTRAIGHT WAVE.

As part of a corrugated measurement, you are measuring a distance of up to 5 m. The RAILSTRAIGHT WAVE, for this, is newly placed from left to right every 50 cm on the running surface. The **section display** in the RAILSTRAIGHT application shows which sections you have already measured or how many metres were already measured.

i Draw a mark on the rail every 50 cm. Use also the marks on the RAILSTRAIGHT WAVE.

1. Adjust the spacers on the RAILSTRAIGHT WAVE to the type of rail.
→ *Chap. 5.1 Adjusting and positioning the RAILSTRAIGHT for running surface measurement (W/C)*
2. Place the RAILSTRAIGHT WAVE with the measuring surface on the running surface.

i The spacers are put in contact with the inside track running edge.

3. In the menu of the RAILSTRAIGHT application, tap on **Measure**.
4. Tap **Corrugation measurement**.
5. Check whether the spacers are in contact with the running edge.
6. Tap **Start measurement**. The RAILSTRAIGHT WAVE starts to measure the first corrugation measurement section. The screen **Corrugation measurement** appears.
7. Move the RAILSTRAIGHT WAVE 50 cm to the right.
8. Tap **Measure next section** to measure the next section. The RAILSTRAIGHT WAVE starts to measure the next section.
9. Repeat steps 7 through 8 until all sections are measured. The measurement results are then displayed.
→ *Chap. 6.4.2 Measurement results of a corrugation measurement (W)*

i You can also prematurely end the corrugation measuring. Tap **Stop measurement** to do so. The measurement results for the sections measured previously appear then.

i To better control the RAILSTRAIGHT WAVE when measuring, you can also start the measurement via the manual **Start button** on the RAILSTRAIGHT WAVE.

6.4 Measurement results

6.4.1 Measurement results of a rail joint measurement

Following the rail joint measurements, you can evaluate them according to various methods. You can add a running edge or running surface the measurement, repeat the measurement, or save it.

Evaluation according to	<p>Tap the selection list Evaluation according to, in order to evaluate the measurement according to various methods.</p> <p>Available methods:</p> <ul style="list-style-type: none"> • Min, Max & absolute → <i>Chap. 6.4.1.1 Min., Max. & Absolute evaluation (W)</i> • QI (RLN 00127-2) → <i>Chap. 6.4.1.2 QI (RLN 00127-2) evaluation</i> • EN 14730-2 → <i>Chap. 6.4.1.3 EN-14730-2 evaluation</i> • Insulated rail joint → <i>Chap. 6.4.1.4 Insulated rail joint evaluation</i> • RZD → <i>Chap. 6.4.1.5 RZD evaluation (railways of the Russian Federation)</i> • Virtual steel ruler → <i>Chap. 6.4.1.6 Virtual steel ruler evaluation</i>
Add running edge	<p>Tap on the button Add running edge, to add a running edge to the measurement. → <i>Chap. 6.2.2 Measuring the running edge (W/C)</i></p>
Add running surface	<p>Tap on the button Add running surface, to add a running surface to the measurement. → <i>Chap. 6.2.1 Measuring the running surface</i></p>

<p>Save to project</p>	<ol style="list-style-type: none"> 1. Tap on the button Save to project, to add the measurement to a project. The measurement details are displayed. 2. Enter the details of the measurement. → <i>Chap. 7.3 Editing measurement details</i> 3. Confirm the input with the button Add to project. → <i>Chap. 7.2 Projects</i> <p> The input of all details extends the stay duration in the track. To reduce the length of stay, deposit the measurement in the Measurement folder and waive the entry of details. At a later date, you can then reopen the measurement, enter the details, and then add it to a project.</p>
<p>Save measurement</p>	<p>Tap Save measurement to deposit the measurement in the Measurement folder.</p> <p> Use this function to reduce the stay duration in the track. At a later date, you can then reopen the measurement there, enter the details, and then add it to a project.</p>
<p>Repeat measurement</p>	<p>Tap Repeat measurement to perform the measurement once again.</p> <p> The current measurement(s) are lost in the process.</p>

6.4.1.1 Min., Max. & Absolute evaluation (W)

This evaluation shows **Minimum (Min.)**, **Maximum (Max.)** and the **Absolute value (Abs. = distance between Min and max)** of the measurements.

- **Red:** Measurement results of the surface measurement
- **Dark blue:** Measurement result of the running edge measurement

<p>Measurement diagram Min., Max. & Absolute</p>	<p>The measurement diagram shows the measurement curve(s) of the measurement(s). The Minimum (Min.) and Maximum (Max.) values of the measurement(s) are indicated by dots.</p> <ul style="list-style-type: none"> • Red: Graph of the running surface measurement • Dark blue: Graph of the running edge measurement • Light blue: Limit value depending on the selected speed class <p> The measurement diagram can be enlarged and adapted via the magnifier.</p> <p>→ <i>Chap. 6.4.3 Enlarging and adjusting Measurement diagrams</i></p>
<p>Line speed</p>	<p>Tap the Line speed selection list and select the appropriate speed range of the measured track.</p> <p> You also have the option to define your own speed range within the Line speed selection list.</p> <p>Add Line speed</p> <ol style="list-style-type: none"> 1. Tap the Plus sign, to add a new track speed range. A dialogue box appears. 2. Tap Description, to enter the track speed range. 3. Tap the Centre field and enter the lower limit value for running edge and running surface. 4. Tap the Lowest field and enter the upper limit value for running edge and running surface. 5. Confirm the entries with OK. 6. Tap Cancel to stop entering the track speed range.

6.4.1.2 QI (RLN 00127-2) evaluation

This evaluation indicates the calculated **Quality index** at the measured rail location.

- **QI (OK!):** Corresponds to the permissible limit values of the quality index.
- **QI (too high):** Does not correspond to the permissible limit values of the quality index.

<p>QI Measurement diagram (RLN 00127-2)</p>	<p>The measurement diagram shows the measurement curve (s), the quality index curve, the maximum quality index and the limit value of the measurement (s).</p> <ul style="list-style-type: none"> • Red: Graph of the running surface measurement • Dark blue: Graph of the running edge measurement • Orange: Quality value at the respective measured point • Marked point: Maximum value of the QI • Light blue: Limit value depending on the selected speed class <p> The measurement diagram can be enlarged and adapted via the magnifier.</p> <p>→ <i>Chap. 6.4.3 Enlarging and adjusting Measurement diagrams</i></p>
<p>Line speed</p>	<p>Tap the Line speed selection list and select the appropriate speed range of the measured track.</p>

6.4.1.3 EN-14730-2 evaluation

This evaluation indicates whether the weld is within the tolerances of EN 14730-2.

- **Weld accepted:** The weld is within the tolerances of EN 14730-2
- **Weld not accepted:** The weld is outside the tolerances of EN 14730-2

<p>Measurement diagram EN 14730-2</p>	<p>The measurement diagram shows the measuring curve, grinding zone and a virtual steel ruler of the measurement (s).</p> <ul style="list-style-type: none"> • Red: Graph of the running surface measurement • Dark blue: Graph of the running edge measurement • Green: Simulates a virtual steel ruler, which lies on the rail • Yellow: Editable points of the EN 14730-2-evaluation <p>Adjust grinding zone in the measurement diagram EN 14730-2:</p> <p> If you enable the box Edit grinding area, you can edit the grinding zone in the full-screen mode of the EN-14730-2 measurement diagram. The activation of the selection box is documented in the log.</p> <p>→ <i>Chap. 6.4.3 Enlarging and adjusting Measurement diagrams</i></p>
<p>Category of the running surface / running edge EN 14730-2</p>	<p>Tap the Running surface / running edge category selection list and select the appropriate category of the running surface / running edge.</p>
<p>Measured value / Reference value Table EN 14730-2</p>	<p>The measured value / reference value table shows the measured value and the associated reference value of the measurement(s).</p> <ul style="list-style-type: none"> • Orange: Quality value exceeded for the grinding zone <p> The reference value from the standard is always assumed for the grinding zone if you do not edit the grinding zone.</p>

6.4.1.4 Insulated rail joint evaluation

This evaluation shows the measured **length of insulated rail joint**.

 This value can be changed by adjusting the insulated rail joint in the measurement diagram.

Insulated rail joint measurement diagram	<p>The measurement diagram displays the measurement curve of the rail joint measurement.</p> <ul style="list-style-type: none"> • Red: Graph of the running surface measurement • Grey: Editable region of the insulated rail joint <p>Adjusting the insulated rail joint in the measurement diagram:</p> <p> In the full screen mode of the Insulated rail joint measurement diagram, you can edit the insulated rail joint.</p> <p>→ <i>Chap. 6.4.3 Enlarging and adjusting Measurement diagrams</i></p> <ol style="list-style-type: none"> 1. To do this, tap and hold the desired point at each end of the grey area. The marked point enlarges. 2. Move the point to the desired position. 3. Tap the tick to confirm the position of the marked point. 4. Tap on OK to save the adjusted insulated rail joint.
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6.4.1.5 RZD evaluation (railways of the Russian Federation)

Similar to EN 14730-2, this method evaluates the running surfaces and running edge in accordance with the line categories. You can define the latter as individual line categories. The tolerances include **local deviations**, **straightness deviations** and also a **value for the central lowering**.

6.4.1.6 Virtual steel ruler evaluation

This evaluation calculates the vertical gap between the virtual steel ruler and the measured longitudinal profile. The gap is displayed at the top of the graph. Under the diagram, you can enter the maximum permissible feeler **gauge thickness**.

- **Black:** The gap is allowed and is within the tolerance.
- **Red:** The gap is not allowed and is outside the tolerance.

 Tap on the **magnifying glass** of the measurement diagram and zoom in on the diagram to visualise the gaps and their longitudinal dimensions.

→ *Chap. 6.4.3 Enlarging and adjusting Measurement diagrams*

6.4.2 Measurement results of a corrugation measurement (W)

After a corrugation measurement, you can evaluate these according to various methods. You can repeat the measurement, or save it.

<p>Evaluation according to</p>	<p>Tap the selection list Evaluation according to, to evaluate the measurement according to various methods.</p> <p>Available methods:</p> <ul style="list-style-type: none"> • Min., Max. & Absolute → <i>Chap. 6.4.2.1 Min., Max. & Absolute evaluation (W)</i> • DB 824.8310 → <i>Chap. 6.4.2.2 DB 824.8310 evaluation (W)</i> • QI (RLN 00127-2) → <i>Chap. 6.4.2.3 QI (RLN 00127-2) evaluation (W)</i> • GTR Corrugation → <i>Chap. 6.4.2.4 GTR corrugation measurement evaluation (W)</i> • EN 13231-3 → <i>Chap. 6.4.2.5 EN 13231-3 evaluation (W)</i> • Virtual steel ruler → <i>Chap. 6.4.2.6 Virtual steel ruler evaluation</i>
<p>Save to project</p>	<ol style="list-style-type: none"> 1. Tap on the button store in project, to add the measurement (s) to a project. The measurement details are displayed. 2. Enter the details of the measurement. → <i>Chap. 7.3 Editing measurement details</i> 3. Confirm the input with the button Add to project. → <i>Chap. 7.2 Projects</i> <p>i The input of all details extends the stay duration in the track. To reduce the length of stay, first deposit the measurement in the Measurement folder and waive the entry details. At a later date, you can then reopen the measurement, enter the details, and then add it to a project.</p>
<p>Save measurement</p>	<p>Tap Save measurement to deposit the measurement in the Measurement folder.</p> <p>i Use this function to reduce the stay duration in the track. At a later date, you can then reopen the measurement there, enter the details, and then add it to a project.</p>
<p>Repeat measurement</p>	<p>Tap Repeat measurement to perform the measurement once again.</p> <p>i The current measurement(s) are lost in the process.</p>

6.4.2.1 Min., Max. & Absolute evaluation (W)

This evaluation shows **Minimum (Min.)**, **Maximum (Max.)** and the **Absolute value (Abs. = distance between the Min. and Max.)** of the measurement(s).

<p>Measurement diagram Min., Max. & Absolute</p>	<p>The measurement diagram shows the measurement curve(s) of the measurement(s). The Minimum (Min.) and Maximum (Max.) values of the measurement(s) are indicated by dots.</p> <ul style="list-style-type: none"> • Red: Graph of corrugation measurement • Light blue: Limit value depending on the selected speed class <p> The measurement diagram can be enlarged and adapted via the magnifier.</p> <p>→ <i>Chap. 6.4.3 Enlarging and adjusting Measurement diagrams</i></p>
<p>Line speed</p>	<p>Tap the Line speed selection list and select the appropriate speed range of the measured track.</p> <p> You also have the option to define your own speed range within the Line speed selection list.</p> <p>Adding Line speed</p> <ol style="list-style-type: none"> 1. Tap the Plus sign, to add a new track speed range. A dialogue box appears. 2. Tap Description, to enter the track speed range. 3. Tap the Centre field and enter the lower limit value. 4. Tap the Lowest field and enter the upper limit value. 5. Confirm the entries with OK. 6. Tap Cancel to stop entering the track speed range.

6.4.2.2 DB 824.8310 evaluation (W)

The evaluation indicates whether the grinding is within the tolerances of DB 824.8310

- **Grinding accepted:** The grinding is within the tolerances of DB 824.8310
- **Grinding not accepted:** The grinding is outside the tolerances of DB 824.8310

<p>Wavelength</p>	<p>The Wavelength screen area displays the measurement results in different wavelength ranges of the measurement. Tap the Option fields to filter the display of the measurement results by different wavelength ranges. The display of the measurement curve is adapted accordingly in the measurement diagram.</p> <ul style="list-style-type: none"> • Orange: The quality value for the peak-peak evaluation is exceeded in the respective wavelength range.
<p>Measurement diagram DB 824.8310</p>	<p>The measurement diagram displays the measurement curve, results and limit values of the measurement.</p> <ul style="list-style-type: none"> • Red: Graph of the running surface measurement, filtered according to the DB 824.8310 standard • Blue: Limit value for the DB 824.8310 evaluation • Orange: Quality value of the DB 824.8310 evaluation <p> The measurement diagram can be enlarged and adapted via the magnifier.</p> <p>→ <i>Chap. 6.4.3 Enlarging and adjusting Measurement diagrams</i></p>

6.4.2.3 QI (RLN 00127-2) evaluation (W)

This evaluation indicates the calculated **Quality index** at the measured rail location.

- **QI (OK!)**: Corresponds to the permissible limit values of the quality index.
- **QI (too high)**: Does not correspond to the permissible limit values of the quality index.

<p>QI Measurement diagram (RLN 00127-2)</p>	<p>The measurement diagram shows the measurement curve, the quality index curve, the maximum quality index and the limit value of the measurement.</p> <ul style="list-style-type: none"> • Red: Graph of corrugation measurement • Orange: Quality value at the respective measured point • Marked point: Maximum value of the QI • Blue: Limit value depending on the selected speed class <p> The measurement diagram can be enlarged and adapted via the magnifier.</p> <p>→ <i>Chap. 6.4.3 Enlarging and adjusting Measurement diagrams</i></p>
<p>Line speed</p>	<p>Tap the Line speed selection list and select the appropriate speed range of the measured track.</p>

6.4.2.4 GTR corrugation measurement evaluation (W)

This evaluation shows the measured **surface in the wavelength range of 10-30 mm** on a measuring length of one meter.

<p>Measurement diagram GTR corrugation measurement</p>	<p>The measurement diagram displays the measurement curve of the corrugation measurement. The maximum and the average amplitude are displayed under the measurement diagram.</p> <ul style="list-style-type: none"> • Red: Graph of corrugation measurement <p> The measurement diagram can be enlarged and adapted via the magnifier.</p> <p>→ <i>Chap. 6.4.3 Enlarging and adjusting Measurement diagrams</i></p>
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6.4.2.5 EN 13231-3 evaluation (W)

This evaluation indicates whether the weld is within the tolerances of EN 13231-3.

- **Weld accepted:** The weld is within the tolerances of EN 13231-3
- **Weld not accepted:** The weld is outside the tolerances of EN 13231-3

 You can choose for this evaluation from between the Directives versions of 2006 and 2012.

<p>Wavelength</p>	<p>The Wavelength screen area displays the measurement results in different wavelength ranges of the measurement. Tap the Option fields to filter the display of the measurement results by different wavelength ranges. The display of the measuring curve is adapted accordingly in the measurement diagram.</p> <ul style="list-style-type: none"> • Orange: The quality value for the evaluation is exceeded in the respective wavelength range.
<p>Measurement diagram EN 13231-3 (2006)</p>	<p>The measurement diagram displays the measurement curve, results and limit values of the measurement.</p> <ul style="list-style-type: none"> • Red: Graph of corrugation measurement, filtered according to the EN 13231-3 • Blue: Limit value for the EN 13231-3 evaluation • Orange: Quality value of the EN 13231-3-evaluation <p> The measurement diagram can be enlarged and adapted via the magnifier.</p> <p>→ <i>Chap. 6.4.3 Enlarging and adjusting Measurement diagrams</i></p>
<p>Measurement diagram EN 13231-3 (2012)</p>	<p>The measurement diagram displays the measurement curve, results and limit values of the measurement.</p> <ul style="list-style-type: none"> • Red: Graph of corrugation measurement, filtered according to the EN 13231-3 • Blue: Limit value for the EN 13231-3 evaluation <p> The measurement diagram can be enlarged and adapted via the magnifier.</p> <p>→ <i>Chap. 6.4.3 Enlarging and adjusting Measurement diagrams</i></p>
<p>Class</p>	<p>Tap the Class selection list and select the appropriate Class of the running surface.</p>
<p>Method</p>	<p>Tap the Method selection list and select the corresponding Method of the evaluation.</p>

6.4.2.6 Virtual steel ruler evaluation

This evaluation calculates the vertical gap between the virtual steel ruler and the measured longitudinal profile. The gap is displayed at the top of the graph. Under the diagram, you can enter the maximum permissible feeler **gauge thickness**.

- **Black:** The gap is allowed and is within the tolerance.
- **Red:** The gap is not allowed and is outside the tolerance.

 Tap on the **magnifying glass** of the measurement diagram and zoom in on the diagram to visualise the gaps and their longitudinal dimensions.

→ *Chap. 6.4.3 Enlarging and adjusting Measurement diagrams*

6.4.3 Enlarging and adjusting Measurement diagrams

Use the **magnifier** to view the measurement diagrams in **full-screen mode**. In the **full-screen mode** of the measurement diagrams, you can zoom in, add, move and delete new measurement points and, depending on the evaluation, edit a grinding zone or an insulated rail joint. Proceed as follows:

Zooming in	<ol style="list-style-type: none"> 1. Tap on the screen with two fingers. 2. Pull the fingers apart to enlarge the diagram. 3. Pull the fingers together to shrink the diagram again.
Adding / moving a measurement point	<ol style="list-style-type: none"> 1. Tap Add point of interest. A new measurement point appears. 2. Tap the measurement point and hold it down until it enlarges. 3. Move the measurement point to the desired location. 4. Tap the tick to confirm the new measurement point. <p> Min., Max. and QI values cannot be moved.</p>
Deleting measurement point	<ol style="list-style-type: none"> 1. Tap the desired measurement point and hold it down until it enlarges. 2. Tap Delete point of interest to delete the point. <p> Min., Max. and QI values cannot be deleted.</p>
Edit grinding area	<p>The editable region is marked in the EN 14730-2 evaluation by a yellow line. You can edit this field using the two yellow points.</p> <ol style="list-style-type: none"> 1. Activate the Edit grinding zone selection box. On the left and right of the yellow line, a yellow dot appears. 2. Tap on one of the two yellow points. 3. Move the point to the desired position. 4. Tap the tick to confirm the edited area.
Editing insulated rail joint	<p>The editable region is marked grey in the insulated rail joint evaluation. You can edit this field using the two yellow points.</p> <ol style="list-style-type: none"> 1. Tap on one of the two yellow points. 2. Move the point to the desired position. 3. Tap the tick to confirm the edited area.

7 Administering measurements

7.1 Folder measurements

In the **Measurements** folder, you can store your measurements quickly and easily. This is particularly useful if you want to reduce the stay duration in the track. In the folder of measurements, you can open the stored measurements at any time, edit their details and add them to a project if necessary.

1. Tap on measurements in the main menu.
2. Tap the desired **measurement** in the list.
3. Complement the measurement details if necessary.

→ *Chap. 7.3 Editing measurement details*

4. Tap the **tick** to save the entries.

- or -

Tap **Add to project** if you want to save the measurement in a project. The measurement then no longer appears in the folder measurements. To edit the measurement again, you must open the corresponding project instead.

→ *Chap. 7.2 Projects*

7.2 Projects

7.2.1 Creating projects

So that you do not lose track, you should summarize your measurements in the form of projects. You can create an unlimited number of projects. Proceed as follows:

1. In the main menu, tap on **Projects**.
2. Tap the **plus sign**.
3. Enter the details of the project.

→ *Chap. 7.2.2 Editing project details*

4. Tap the **tick**, to save the project.

7.2.2 Editing project details

For each project, you can specify many details of the project. So, the projects and the measurements contained therein can always be recovered.

1. In the main menu, tap on **Projects**.
2. In the project list, tap the desired project.
3. Enter the details of the project.
4. Tap the **tick**, to save the project.

Project name	Enter the Project name .
Target of measurement	Enter the Target of measurement (E.g. acceptance track welding, in accordance with EN 13231-3 class 1, EN 13231-3 class 2, DB 824.8310).
Name of the track	Enter the Name of track .
Direction of traffic	Enter the Direction of traffic .
Customer	Enter the name of the Customer .
Engineer	Enter the Engineer responsible for the measurement project.
Note	Enter an optional Note for the measurement project.
Measurements	<p>Tap Measurements to open the list of measurements. A list appears with all measurements which have been added to this project. You can open the measurements, and you can edit their details.</p> <p>→ <i>Chap. 7.3 Editing measurement details</i></p>

7.2.3 Sorting measurements

For a better overview, you can sort the measurements of a project according to specific criteria. Proceed as follows:

1. In the main menu, tap on **Projects**.
2. In the project list, tap the desired project.
3. In the project details, tap **Measurements**.
4. In the list of measurements, tap the **Arrows**.
5. Select the desired sorting criterion in the sort function. According to this criterion, you can now sort the list of measurements in ascending or descending order.
6. Activate one of the ticks if you want to select another sorting criterion.

7.2.4 Exporting projects

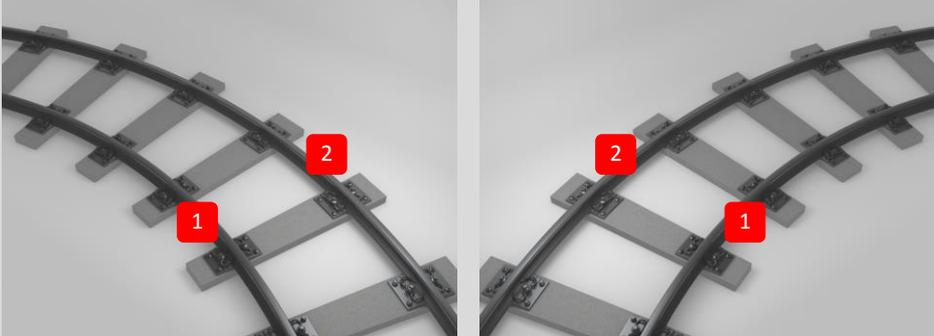
1. In the main menu, tap on **Projects**.
2. In the project list, tap the desired project.
3. Tap on the **paper clip** or the **three vertical points** (Action overflow), to export the project.
4. Tap **Export PDF, Export CSV, Summary CSV, Export XLS** in order to export the project details.
5. Select whether you want to send the project as an **e-mail** or save it on your **Android device**.
6. Give a **name** for the export file.
7. Confirm the entries with **OK**.
8. Tap **Cancel** to cancel the export.

7.3 Editing measurement details

Each measurement provides important **Measurement details**. These include among others the rail temperature, the curvature of the track, the name of the section and of the welder.

i You can enter the details of the measurement immediately after each measurement. However, this extends the duration of the stay on the track. To reduce the duration of the stay, you can initially save measurements without entering the measurement details. In the **Measurements** folder or via **Projects** you can open the measurement at any time and edit its details.

Info block	<p>Info block shows date, time, latitude and longitude, rail temperature and ambient temperature of the measurement.</p> <p>i Latitude and longitude are specified only when GPS is enabled.</p> <p>i The rail temperature is only specified if the RAILSTRAIGHT application is connected to the optional BT-10 Bluetooth rail thermometer.</p> <p>→ <i>Chap. 3.1 Scope of delivery</i></p> <p>i To change the data, you can tap on the respective field.</p>
Track/rail	<ul style="list-style-type: none"> • Track: Select whether it is the left or right track. • Rail: Select whether it is the left or the right rail of the track. <p>i Make the information in each case in the direction of view of increasing kilometres of track.</p>

<p>Rail curvature</p>	<ul style="list-style-type: none"> • Select Straight when the rail runs straight. • Select Inside (1), if the rail is on the inside of a curve (= rail with smaller radius). • Select Outside (2), if the rail is on the outside of a curve (= rail with larger radius, see no. 2 in the figure). <p>i The input of the rail curvature in conjunction with a value for the radius of curvature affects the measured values of the measurement of the running edge.</p> 
<p>Name of the section</p>	<p>Enter the Name of the section (e.g. between Site A and Site B).</p>
<p>Welder</p>	<p>Enter the name of the Welder.</p>
<p>Type of weld</p>	<p>Specify the Type of weld.</p>
<p>Number of weld</p>	<p>Enter the Number of weld.</p> <p>i This information is only required when you have measured at a weld and a corresponding number of weld is attached to the weld.</p>
<p>Length of the insulated rail joint</p>	<p>Specify the length of the insulated rail joint.</p> <p>i The information is only required if there is an insulated rail joint. By specifying the length, a possible deflection of the curve measurement can be identified beyond doubt as an insulated rail joint.</p>
<p>Comment</p>	<p>Enter an optional comment for the measurement.</p>
<p>Add to project</p>	<p>Tap Add to project if you want to add the measurement to a project.</p> <p>i The button is only available if you have not yet added the measurement to a project.</p>

7.4 Exporting measurements

1. Open the desired measurement (via main menu/measurements or main menu/projects).
2. Type in the measurement details on the **paper clip**.
3. Select if you want to export the measurement as **PDF, XLS** or **CSV**.
4. Select whether you want to send the measurement as an **e-mail** or save it on your **Android device**.
5. Give a **name** for the export file.
6. Confirm the entries with **OK**.
7. Tap **Cancel** to cancel the export.

8 Settings

Bluetooth

Select RAILSTRAIGHT device

The RAILSTRAIGHT appears that you are currently connected with.

 If there is no RAILSTRAIGHT displayed here or not the desired one, tap the **button** to select the desired RAILSTRAIGHT. Proceed as follows:

1. Tap on the button **No device selected. Press to select device!**. If Bluetooth is not enabled, a dialogue box appears. It will tell you that an App is trying to enable Bluetooth.
2. Confirm the dialogue box with **Yes**. Bluetooth is activated. A list of RAILSTRAIGHT devices appears.
 - **Paired devices:** All the RAILSTRAIGHT are listed below that the App was already connected with.
 - **Available devices:** All the RAILSTRAIGHT that are available in the environment are listed below.
3. Select the RAILSTRAIGHT from the list that you want to measure.

 If you connect the App to a RAILSTRAIGHT for the first time, a further dialogue box appears. In it, you are prompted to enter the password ID of the RAILSTRAIGHT. This eight-digit ID always consists of 1212 and the last 4 digits of the Bluetooth name (such as SECRC6290 = password ID 12126290).

<p>Selecting Bluetooth rail thermometer</p>	<p>The Bluetooth rail thermometer appears that you are currently connected with.</p> <p>i If you do not see the desired Bluetooth rail thermometer here, tap the button to select the desired Bluetooth rail thermometer. Proceed as follows:</p> <ol style="list-style-type: none"> 1. Tap on the button No device selected. Press to select device!. If Bluetooth is not enabled, a dialogue box appears. It will tell you that an App is trying to enable Bluetooth. 2. Confirm the dialogue box with Yes. Bluetooth is activated. A list with Bluetooth rail thermometers appears. <ul style="list-style-type: none"> ○ Paired devices: All the Bluetooth rail thermometers are listed below that the App was already connected with. ○ Available devices: All the Bluetooth rail thermometers that are available in the environment are listed below. 3. From this list, select the Bluetooth rail thermometer with which you want to measure. <p>i If you connect the app with the selected Bluetooth rail thermometer for the first time, a further dialogue box appears. In it, you are prompted to enter the password ID of the Bluetooth rail thermometer. This eight-digit ID always consists of 1212 and the last 4 digits of the Bluetooth name (such as SECRC6290 = password ID 12126290).</p>
<p>Bluetooth Connection Workaround</p>	<p>Tap Bluetooth Connection Workaround to activate or deactivate an alternate Bluetooth connection setup. If this setting is activated, a connection setup is established that avoids errors in the Bluetooth integration of many Android devices.</p> <p>i To avoid errors, this setting should remain activated on most Android devices.</p>

User interface

<p>Smooth lines for graph painting</p>	<p>Tap Smooth lines for graph painting to activate or deactivate the image edge smoothing.</p> <p> Deactivate this setting if your Android device is experiencing problems by using the full-screen view and its options.</p>
<p>Unit system for the unit of length</p>	<p>Choose here between the representation of the length unit value in the metric (millimetre) or imperial (inch) unit of length system.</p>
<p>Unit system for the unit of temperature</p>	<p>Choose here between the representation of the temperature in Celsius or Fahrenheit.</p>

Stored data

<p>Reset data</p>	<p>NOTE</p> <p>The RAILSTRAIGHT application is reset to the factory setting. All measurements and projects are then deleted. Backup measurements and projects beforehand.</p> <ol style="list-style-type: none"> 1. Tap Reset data to reset the RAILSTRAIGHT application to the factory setting. A dialogue box appears asking you if you want to continue. 2. Confirm the dialogue box with OK. The RAILSTRAIGHT application is reset to the factory setting. All measurements and projects are then deleted.
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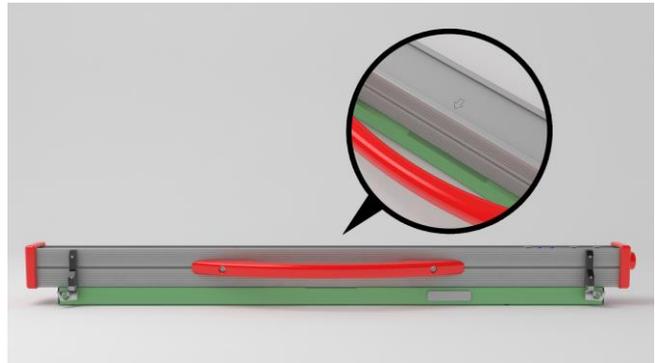
Selected logo

<p>Select logo</p>	<ol style="list-style-type: none"> 1. Tap Select logo to display your logo on the exported measurement reports. A dialogue box appears asking you what action should be performed. 2. Follow the instructions of your Android device to select your logo.
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9 Checking calibration

i To check the calibration of the RAILSTRAIGHT, you will need the Green reference bar that is appropriate for the RAILSTRAIGHT. Therefore, check if the serial numbers of the RAILSTRAIGHT and the Green reference bar are the same.

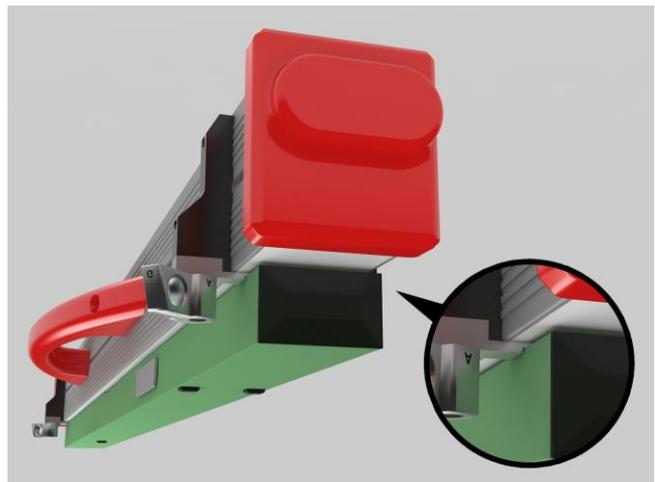
1. Place the spacers on the RAILSTRAIGHT on **Position A**. (W/C)
2. Place the RAILSTRAIGHT with the measuring surface on the green reference bar.



i On the RAILSTRAIGHT there is an **arrow** attached in the middle. This arrow must lie **centrally above the indentation** of the reference bar during the calibration check.

W/C: On the RAILSTRAIGHT WAVE (W) and COMPACT (C), there are small heels on the support surface in front of the two spacers. These must fit on the reference bar. The spacers themselves must not touch the reference bar.

D: On the RAILSTRAIGHT DUAL (D), the measurement surface running edges must fit on the edge of the green reference bar.



3. Tap the **Goldschmidt logo**. The **Device status** dialogue box appears.
→ *Chap. 3.5.3 The RAILSTRAIGHT toolbar application*
 4. Tap **Check calibration**. The screen **Start calibration check** appears.
→ *Chap. 3.5.4 Device status*
 5. Tap **Start calibration check**. The RAILSTRAIGHT begins the reference measurement. The screen **Calibration check in progress** appears. On this screen, you will see the progress of the four reference measurements. The screen **Calibration check result** then appears.
 - **Calibration OK!:** The RAILSTRAIGHT is correctly calibrated.
 - **Device needs calibration!:** The RAILSTRAIGHT must be sent to the customer service for calibration.
- *Chap. 2.5 Maintenance and care*

i In general, we recommend sending RAILSTRAIGHT to Customer Service for a comprehensive service and calibration at the latest after 5,000 measurements or one year.

6. Tap **Finished!** to end the reference measurements. The **Start screen** appears.

10 Types of rails and position of the spacers

10.1 Spacer, new model (from 1 July 2018)

Rail type	Width of the railhead	Position of the Spacer	Nominal width of the railhead
JIS 50N	63,83	A	66
JIS 60	63,80	A	66
50E6 (U50)	65,00	A	66
46E1 (SBI)	65,00	A	66
45E1 (BS90A)	66,67	A	66
MÁV48	66,80	A	66
S49MÁV	66,90	A	66
49E3 (S49b)	67,00	A	66
S48U	67,00	A	66
49E1 (S49)	67,00	A	66
50E5 (S50UNI)	67,00	A	66
IRS52	67,00	A	66
54E2 (UIC54E, SBBIV)	67,00	A	66
S54	67,00	A	66
41E1 (S41-R10)	67,00	A	66
40E1 (S41-R14)	67,00	A	66
SAR48	68,00	B	68,7
SAR51	68,00	B	68,7
115A	68,00	B	68,7
45E2 (DSB45, DSBV)	69,30	B	68,7
56E1	69,85	B	68,7
95RBH	69,85	B	68,7
AS47	69,85	B	68,7
AS53	69,85	B	68,7
50E3 (BV50)	70,00	C	71,3
50E4 (UIC50)	70,00	C	71,3

Rail type	Width of the railhead	Position of the Spacer	Nominal width of the railhead
VRC50 (S50)	70,00	C	71,3
R50	70,00	C	71,3
54E1 (UIC54, SBBIII)	70,00	C	71,3
AS50	70,00	C	71,3
AS60	70,00	C	71,3
S60 (VRC60)	70,00	C	71,3
SAR57	71,10	C	71,3
60E2	72,00	C	71,3
60E1 (UIC60, SBBVI)	72,00	C	71,3
60E2-40	72,03	C	71,3
50E2 (EB50T)	73,00	D	74
R65-2	73,00	D	74
133A	73,02	D	74
136RE IH	73,11	D	74
46E3 (NP46)	73,72	D	74
136RE	74,61	D	74
141AB	74,32	D	74
AS68	74,60	D	74
S75	75,00	D	74
85AS	65,09	A	66
90RA	65,09	A	66
100RA	69,85	B	68,7
100RE	68,26	B	68,7
115RE	69,06	B	68,7
119RE	67,47	A	68,7
132RE	76,20	D	74
133RE	76,20	D	74
141RE	77,79	D	74

Other measuring tracks	Position of the spacer
Running surface, 20 mm distance from running edge	E
Running edge, 14 mm under the running surface	G

10.2 Spacer, old model (up to 1 July 2018)

Rail type	Width of the railhead	Position of the Spacer	Nominal width of the railhead	Delta from the centre
JIS 50N	63.83	A	66	-1.085
JIS 60	63.80	A	66	-1.1
50E6 (U50)	65.00	A	66	-0.5
46E1 (SBB1)	65.00	A	66	-0.5
45E1 (BS90A)	66.67	A	66	0.335
MÁV48	66.80	A	66	0.4
S49MÁV	66.90	A	66	0.45
49E3 (S49b)	67.00	B	68	-0.5
S48U	67.00	B	68	-0.5
49E1 (S49)	67.00	B	68	-0.5
50E5 (S50UNI)	67.00	B	68	-0.5
IRS52	67.00	B	68	-0.5
54E2 (UIC54E, SBBIV)	67.00	B	68	-0.5
S54	67.00	B	68	-0.5
41E1 (S41-R10)	67.00	B	68	-0.5
40E1 (S41-R14)	67.00	B	68	-0.5
SAR48	68.00	B	68	0
SAR51	68.00	B	68	0
115A	68.00	B	68	0
45E2 (DSB45, DSBV)	69.30	C	70	-0.35
56E1	69.85	C	70	-0.075
95RBH	69.85	C	70	-0.075

Rail type	Width of the railhead	Position of the Spacer	Nominal width of the railhead	Delta from the centre
AS47	69.85	C	70	-0.075
AS53	69.85	C	70	-0.075
50E3 (BV50)	70.00	C	70	0
50E4 (UIC50)	70.00	C	70	0
VRC50 (S50)	70.00	C	70	0
R50	70.00	C	70	0
54E1 (UIC54, SBBIII)	70.00	C	70	0
AS50	70.00	C	70	0
AS60	70.00	C	70	0
S60 (VRC60)	70.80	C	70	0.4
SAR57	71.10	D	72	-0.45
60E2	72.00	D	72	0
60E1 (UIC60, SBBVI)	72.00	D	72	0
60E2-40	72.03	D	72	0.015
50E2 (EB50T)	73.00	D	72	0.5
R65-2	73.00	D	72	0.5
133A	73.02	E	74	-0.49
136RE IH	73.11	E	74	-0.445
46E3 (NP46)	73.72	E	74	-0.14
136RE	74.61	E	74	0.305
141AB	74.32	E	74	0.16
AS68	74.60	E	74	0.3
S75	75.00	E	74	0.5
85AS	65.09	A	66	-0.405
90RA	65.09	A	66	-0.405
100RA	69.85	B	68	0.925
100RE	68.26	B	68	0.125
115RE	69.06	B	68	0.53

Rail type	Width of the railhead	Position of the Spacer	Nominal width of the railhead	Delta from the centre
119RE	67.47	A	66	0.265
132RE	76.20	E	74	1.1
133RE	76.20	E	74	1.1
141RE	77.79	E	74	1.395

Select spacer position G to measure the running edge.

11 Troubleshooting

Malfunction	Possible reasons	Remedy
The RAILSTRAIGHT cannot be switched on.	The main switch is switched off.	Turn on the main switch. → <i>Chap. 6.1 Connecting the RAILSTRAIGHT application with the RAILSTRAIGHT</i>
	The internal battery of the RAILSTRAIGHT is empty.	Charge the RAILSTRAIGHT or use external batteries. → <i>Chap. 4.1 Charging the RAILSTRAIGHT</i> → <i>Chap. 4.2 Using external batteries</i>
The RAILSTRAIGHT turns off during operation.	The internal battery charge of the RAILSTRAIGHT is too low.	Charge the RAILSTRAIGHT or use external batteries. → <i>Chap. 4.1 Charging the RAILSTRAIGHT</i> → <i>Chap. 4.2 Using external batteries</i>
The RAILSTRAIGHT cannot be connected with the RAILSTRAIGHT APP - and - also does not appear in the list of available devices.	The Android powered device has disabled the Bluetooth connection.	Activate the Bluetooth connection in the settings of your Android device. → <i>Chap. 6.1 Connecting the RAILSTRAIGHT application with the RAILSTRAIGHT</i>
	The RAILSTRAIGHT is not switched on.	Turn on the main switch. → <i>Chap. 6.1 Connecting the RAILSTRAIGHT application with the RAILSTRAIGHT</i>
	The RAILSTRAIGHT is too far from your Android device.	<ul style="list-style-type: none"> • Make sure that the distance between the RAILSTRAIGHT and your Android powered device is not greater than 5 m, otherwise a connection is either not possible or will be disrupted. • At low charging status of the internal battery, the max. distance drops to less than 5 m.
	There are too many Bluetooth devices nearby, and so the signal is disturbed.	Disable for other mobile devices in the immediate vicinity the Bluetooth connection or remove yourself along with the RAILSTRAIGHT and your Android device from possible sources of interference.

Malfunction	Possible reasons	Remedy
<p>The RAILSTRAIGHT cannot be connected with the RAILSTRAIGHT application, but is shown in the list of available devices.</p>	<p>The RAILSTRAIGHT was never connected before to your Android device or the RAILSTRAIGHT application installed on it.</p>	<p>If you connect the RAILSTRAIGHT APP to a RAILSTRAIGHT for the first time, a dialogue box appears. In it, you are prompted to enter the password ID of the RAILSTRAIGHT. This eight-digit ID always consists of 1212 and the last 4 digits of the Bluetooth name (such as SECRC6290 = password ID 12126290).</p> <p>→ <i>Chap. 6.1 Connecting the RAILSTRAIGHT application with the RAILSTRAIGHT</i></p>
	<p>The RAILSTRAIGHT is in contact with a metallic surface while trying to connect.</p>	<p>Do not place the RAILSTRAIGHT on the rail or a metallic surface prior to connecting.</p> <p>→ <i>Chap. 6.1 Connecting the RAILSTRAIGHT application with the RAILSTRAIGHT</i></p>
	<p>The RAILSTRAIGHT is already connected with another Android device.</p>	<p>Each RAILSTRAIGHT can be connected to only one Android device at the same time. Disconnect all connections between the RAILSTRAIGHT and other Android devices in order to connect to your Android device.</p>
<p>The connection of the RAILSTRAIGHT with the RAILSTRAIGHT application is interrupted.</p>	<p>The RAILSTRAIGHT is too far from your Android device.</p>	<ul style="list-style-type: none"> • Make sure that the distance between the RAILSTRAIGHT and your Android powered device is not greater than 5 m, otherwise a connection is either not possible or will be disrupted. • At low charging status of the internal battery, the max. distance drops to less than 5 m.
	<p>The internal battery charge of the RAILSTRAIGHT is too low.</p>	<p>Charge the RAILSTRAIGHT or use external batteries.</p> <p>→ <i>Chap. 4.1 Charging the RAILSTRAIGHT</i> → <i>Chap. 4.2 Using external batteries</i></p>
<p>It is not possible to start a measurement with the RAILSTRAIGHT.</p>	<p>The RAILSTRAIGHT is not properly connected.</p>	<p>Connect the RAILSTRAIGHT with the RAILSTRAIGHT application.</p> <p>→ <i>Chap. 6.1 Connecting the RAILSTRAIGHT application with the RAILSTRAIGHT</i></p>
	<p>The RAILSTRAIGHT is operated outside the permissible temperature range.</p>	<p>Please make sure that the ambient temperature is between -10 and + 50 ° C because the RAILSTRAIGHT does not work otherwise.</p> <p>→ <i>Chap. 3.3 Technical data</i></p>