

D1414-3

Mounting and Commissioning

of wheel sensor type

RSR180

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Review list

Version	Date	Prepared by	Sections modified	Reason
1	21.12.2002	Berer	all	New Version
2	15.11.2004	Berer	all	Wording
3	27.11.2006	Berer	chapter 1.2, 3, 5	new testing plate und added SAV

1. Range of Types

1.1 Wheel sensor

Wheel sensor type RSR180
(complete reference: RSR180/S-250)

type code

RSR..... Wheel sensor
180..... Code for sensor system spacing and electrical interface
GS m.n..... Equipment version

1.2 Testing plate

Testing plate type PB200

type code

PB..... Testing plate
200..... Length of testing plate in mm



The standard damping plate can be used wider in existing equipments.

Standard damping plate type NB200

type code

NB..... Standard damping plate
200..... Length of damping plate in mm

1.3 Fixing elements

1.3.1 Web of rail mounting

Eccentric bolt type EXC10 or EXC10/21 (see fig. 1)

type code

EXC..... **Ex**center (eccentric)
10..... Max. stroke of height adjustment in mm
21..... Length of the hexagon

Eccentric bolt type EXC10/21 for width of head of rail ≤ 64 mm

1.3.2 Rail claw mounting

Rail claw type SK140 (see fig. 2)

type code

SK.....Rail claw
140.....Width of claw in mm

Fixing bolts for claw type BBKb (see fig. 2)

BBK5..... Fixing bolt, hexagon length 5 mm
BBK11..... Fixing bolt, hexagon length 11 mm
BBK17,5..... Fixing bolt, hexagon length 17,5 mm
BBK22..... Fixing bolt, hexagon length 22 mm

type code

BBK..... Fixing bolt for claw
b.....Length of hexagon socket wrench in mm, measure "L" see fig. 2

2. Technical Data of Wheel Sensor RSR180

2.1 Design

Dimensions.....	60 x 60 x 230 mm
Housing.....	glas-fiber reinforced plastic
Fixing/drilling distance.....	145 mm
Connection cable.....	5 m, fixed moulded, S05Z1Q-F 4 x 0,75 mm ²
Protection tube.....	4,8 m black, inside Ø 19 mm, outside Ø 27 mm with 2 tube clamps
Weight without fixing elements/protection tube :	1,54 kg
Weight with fixing element EXC10 :	1,98 kg
Weight with rail claw SK140 :	8,78 kg
Weight of protection tube :	1,66 kg

2.2 Connection data

Power supply..... constant current 59 mA DC, $U_0 = 30$ V DC
The maximum loop resistance depends on the evaluation board connected.

2.3 Pin configuration



Attention: Wheel sensor RSR180 only has an incorporated reverse voltage protection as from GS02!

System 1.....	wire brown	(1)
System 2.....	wire yellow	(2)
Vcc.....	wire green	(3)
GND.....	wire white	(4)



Pin configuration of wheel sensor RSR180 is also shown on the rating plate.

3. Mounting



Correct mounting in compliance with instructions is the basis for a long service life of the sensor. Incorrect mounting forfeits warranty. In case of axles without wheel flange or applications in the guard rail area please consult the manufacturer. General safety regulations in force apply !



Mounting and commissioning is to be carried out by specially trained personnel only.



The following mounting notes and instructions apply for conditions of EBO (Railway construction and operation instructions) (among others wheel measurements). In case of deviations please consult the manufacturer.



The maximum rail wear is determined by rail profile and type of mounting. Please comply with the requirements set forth in the mounting instructions of measure "A" (see fig.1 and fig.2) between top of rail (SOK) and top of wheel sensor. In case of deviations please consult the manufacturer.

3.1 General mounting instructions

- ➡ Wheel sensor RSR180 is to be mounted at the inside face of the rail (wheel flange side).
- ➡ In curves, wheel sensor RSR180 is to be mounted preferably at the inside face of the rail (less wear of head of rail / rail shoulder).
- ➡ In point areas, the minimum admissible space between rails is 100 mm (inside width between heads of rail).
- ➡ Minimum spacing between two wheel sensors, parallel to the rail, is two spaces between sleepers.
- ➡ Minimum spacing to next rail joint or next rail weld is one space between sleepers.
- ➡ The wheel sensor must be mounted concentrically between two sleepers.
- ➡ Mounting of the wheel sensor RSR180 in the short pitch corrugation area is to be avoided where possible.
- ➡ The wheel sensor housing must not touch the head of rail.



In case of possible need to deviate from mounting instructions, please consult the manufacturer.

3.2 Web of rail mounting

For web of rail mounting following guiding values apply:

min. height of rail.....	120 mm
min. width of head of rail.....	50 mm
max. width of head of rail.....	78 mm
min. width of web.....	9 mm
max. width of web.....	18 mm

Where one or several measurements are close to above guiding values, please consult the manufacturer.

The following rail profiles comply with the above stated guiding values: **S49, S54, R65, UIC54, UIC54E, UIC60, SBB1 (=UIC860V), VST36, R50, S48-U**

Following bolts have proven their reliability for web of rail mounting:

Rail profile	S49	S54	R65	UIC54	UIC54E	UIC60
Bolt type	EXC10	EXC10	EXC10	EXC10	EXC10	EXC10



Due to rail profile and drilling tolerance the upper mounting position (see chapter 3.2.3) may require a 2 mm washer between web of rail and eccentric bolt, in order to prevent contact between wheel sensor housing and head of rail.



For rail profiles not listed above, please consult the manufacturer.

3.2.1 Scope of delivery

Scope of delivery comprises the following components (see fig. 1):

- **pos.1:** 1 pc. wheel sensor type RSR180 with connection cable (5 m)
- **pos.2:** 2 pc. eccentric bolts type EXC10 or EXC10/21
1 pc. protection tube (4,8 m)



Upon joint purchase of wheel sensor, eccentric bolt and protection tube and indication of the rail profile, the matching eccentric bolts and protection tube will be mounted to the sensor at the factory.

3.2.2 Preparatory works

Required tools

- drilling device (e.g. CEMBRE)
- 13 mm drill + countersink 90°
- torque wrench (range 15 - 40 Nm)
- nut for socket spanner SW19 and SW17
- manual angle grinder
- wire brush
- steel tape measure

Drillings

- Clean drilling location from coarse dirt using a wire.
- Drill fastening holes with 13 mm (± 0.1 mm) diameter, at a distance of 145 mm (± 0.25 mm) to web of rail according to fig. 1. At a distance of 86.5 mm (± 0.5 mm) between top of rail and holes, measure "A" (top of rail to top of wheel sensor) is set at about 43.5 mm. At a distance of 84 mm between top of rail and holes, measure "A" is set at about 41 mm.



Vertical tolerance between the two holes = **max. 0.5 mm.**

Horizontal tolerance between the two holes = **max. 0.25 mm.**

- Grind any engraved markings in the drilling area (both sides of web of rail) flush with the web of rail surface.
- Bevel holes at both sides with 1,5 mm x 45°.

3.2.3 Fixing and height adjustment

The following mounting instructions apply to fig. 1.


Fixing

- Remove nuts *pos.2.1* and strain washer *pos.2.2*.
- Insert wheel sensor with bolts *pos.2* into prepared holes from the inside face of the rail.
- Place strain washer *pos.2.2* and slightly tighten nuts *pos.2.1*.



The housing must not touch the head of rail!

Ensure correct position of strain washer *pos.2.2* (bulge of washer outside)!

- Determine measure “A“ using a steel tape measure.
Rated range: 40 .. 45 mm.
If measure “A” < 40 mm or > 45 mm see “**Height adjustment**“ (page 9 and page 10).
- Determine measure “B” using a steel tape measure.
Rated range: 0 ... 8 mm.
If measure “B” is outside the rated range see “**Horizontal position correction**” (page 10).
- Tighten nuts *pos.2.1* with **40 Nm**.
-  In special cases (e.g. wheel flange does not comply with EBO) the rated ranges for measure “A” and “B” may be expanded or limited by the manufacturer.

Height adjustment



If for the purpose of height correction, strain washers *pos.2.2* and *pos.2.4* are removed, ensure correct position when placed again: bulge of washer outside!

If measure “A“ is between 37,5 .. 40 mm:

- Unscrew wheel sensor by loosening nuts *pos.2.3* and *pos.2.1*.
- Stagger both eccentric bolts by 60° in the same sense of rotation.
- Tighten nuts *pos.2.3* with **15 Nm**.
- Insert wheel sensor with bolts *pos.2* into fixing holes, place strain washers *pos.2.2* and tighten nuts *pos.2.1* with **40 Nm**.

If measure “A“ is between 32,5 .. 37,5 mm:

- Unscrew wheel sensor by loosening nuts *pos.2.3* and *pos.2.1*.
- Stagger both eccentric bolts by 120° in the same sense of rotation.
- Tighten nuts *pos.2.3* with **15 Nm**.
- Insert wheel sensor with bolts *pos.2* into fixing holes, place strain washers *pos.2.2* and tighten nuts *pos.2.1* with **40 Nm**.

If measure “A“ is between 30 .. 32,5 mm:

- Unscrew wheel sensor by loosening nuts *pos.2.3* and *pos.2.1*.
- Stagger both eccentric bolts by 180° in the same sense of rotation.
- Tighten nuts *pos.2.3* with **15 Nm**.
- Insert wheel sensor with bolts *pos.2* into fixing holes, place strain washers *pos.2.2* and tighten nuts *pos.2.1* with **40 Nm**.

If measure “A“ is < 30 mm:

- Verify drillings as set forth in chapter 3.2.2 and drill new holes complying with the current track superstructure regulations, where appropriate.

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If measure “A” > 45 mm:

- Check whether the eccentric bolt has been fastened at the uppermost mounting position.
- If not, new holes, complying with the current track superstructure regulations, have to be drilled for the eccentric bolt.

Horizontal position correction

if measure “B” is outside the rated range:

- use shorter bolts (EXC10/21).
- please consult the manufacturer.

3.2.4 Insert cable into trackside connection box

- If necessary, slip a protection tube over the cable and fix cable of wheel sensor using a tube clip.
- Fix protection tube.
- Connect cable, see chapter 3.4

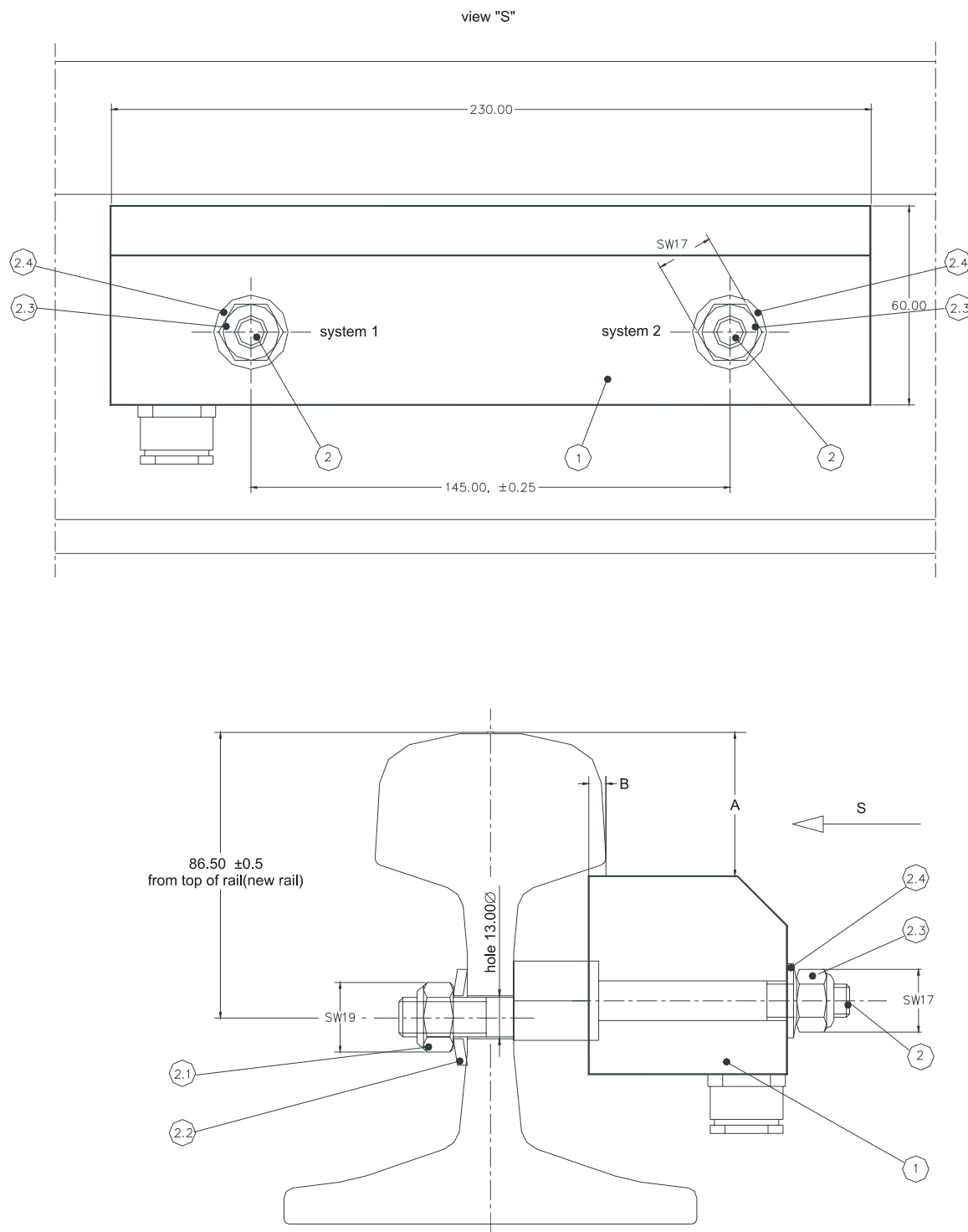


Fig. 1: Web of rail mounting of wheel sensor type RSR180

3.3 Rail claw mounting

For rail claw mounting following guiding values apply:

min. width of foot of rail.....	110 mm
max. width of foot of rail.....	155 mm
min. height of rail.....	130 mm
max. height of rail.....	180 mm

Where one or several measurements are close to above guiding values, please consult the manufacturer.

The following rail profiles comply with the above stated guiding values: **S49, R65, S54, UIC54, UIC54E, UIC60, SBB1 (=UIC860V), R50.**

Following bolts have proven their reliability for rail claw mounting:

Rail profile	S49	R65	UIC54	UIC54E	UIC60
Bolt type	BBK11	BBK22	BBK17,5	BBK11	BBK22
Rail profile	S54				
Bolt type	BBK5 + 2 washer, each 2.5mm thick between fixing bolt and rail claw (see fig. 2, dash-lined position of washer 3.3)				



For rail profiles not listed above, please consult the manufacturer.

3.3.1 Scope of delivery

Scope of delivery comprises the following components (see fig. 2):

- **pos. 1:** 1 pc. wheel sensor type RSR180 with connection cable (5 m)
- **pos. 2:** 1 pc. rail claw type SK140
- **pos. 3:** 2 pc. fixing bolt for rail claw type BBK5/11/17,5/22
1 pc. protection tube (4,8 m)



Upon joint purchase of wheel sensor, rail claw and protection tube and indication of the rail profile, the matching fastening bolt BBKnn, sensor and protection tube will be mounted to the claw at the factory.

3.3.2 Preparatory works

Required tools

- wire brush
- torque wrench (range 15 - 40 Nm)
- nut for socket spanner SW19 and SW17
- fixed spanner SW36
- steel tape measure

Verification of fixing bolt type BBK



Provided rail profile is informed, the adequate fixing bolt BBKnn will be delivered already mounted to the rail claw. See table of rail profiles and respective fixing bolts in chapter 3.3.

3.3.3 Fixing and adjustments

The following mounting instructions apply to fig. 2.

Fixing

- Mount wheel sensor with respective fixing bolt to rail claw, if not already mounted at works.
- Clean mounting area at foot of rail from coarse dirt.
- Place rail claw *pos.2* on the foot of rail from the inside of the rail.
- Clip tie-rod *pos.2.2* and spring washer *pos.2.7* on the outside face of rail.
- Tighten nut *pos.2.3* until the rail claw *pos.2* touches the foot of rail on both sides (ensure parallelism with foot of rail).



The housing must not touch the head of rail! Ensure correct position of strain washer *pos.3.4* and *pos.3.5* (bulge of washer outside)! The hexagon socket head screw *pos.2.6* must not be changed.

- Determine measure “B” with steel tape measure.
Rated range: 0 ... 8 mm.
If measure is outside of rated range, see “**Horizontal position correction**” (page 14).
- Determine measure “A” with steel tape measure.
Rated range: 40 .. 45 mm.
If measure is outside of rated range, see “**Height correction**” (page 15).



In special cases (e.g. wheel flange does not comply with EBO) the rated ranges for measure “A” and “B” may be expanded or limited by the manufacturer.

Horizontal position correction



If for the purpose of height correction, strain washers *pos.3.4* (*pos. 3.5*) are removed, ensure correct position when placed again: bulge of washer outside!

If measure “B” is not within rated range

- place washer *pos. 3.3* (dash-lined) on the inside face of support *pos. 2.1* or/and
 - replace the fixing bolt.
- Tighten nut *pos.3.1* with **15 Nm**.
 - Tighten nut *pos.3.2* (*pos.2.4*) with **40 Nm**.

Height correction

- Loosen nut *pos.2.4*.
- Shift support *pos.2.1* until measure “A” is between 40 mm and 45 mm.



If for the purpose of height correction strain washer *pos.2.5* is removed, ensure correct position when placed again: bulge of washer outside!

- Tighten nuts *pos.2.4* with **40 Nm**.

3.3.4 Insert cable into trackside connection box

- If necessary, slip a protection tube over the cable and fix cable of wheel sensor using a tube clip.
- Fix protection tube.
- Place cable, see chapter 3.4.

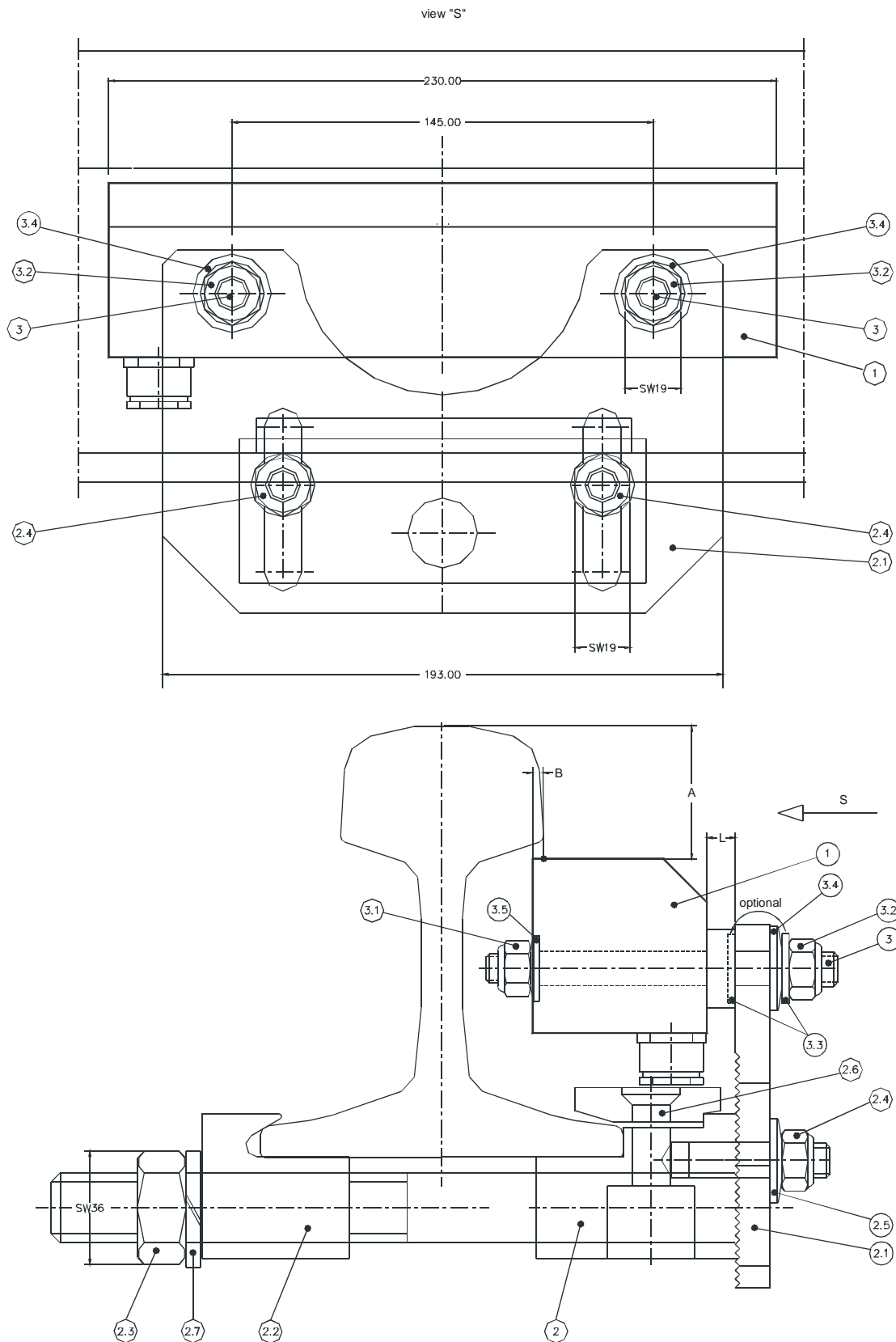


Fig. 2: Rail claw mounting of a wheel sensor RSR180

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3.4 Connect wire cables to the terminals of the trackside connection box



Prior to connection of wheel sensor cable check isolation from earth of earthing cable wires.

Connect wires according to Fig. 3.

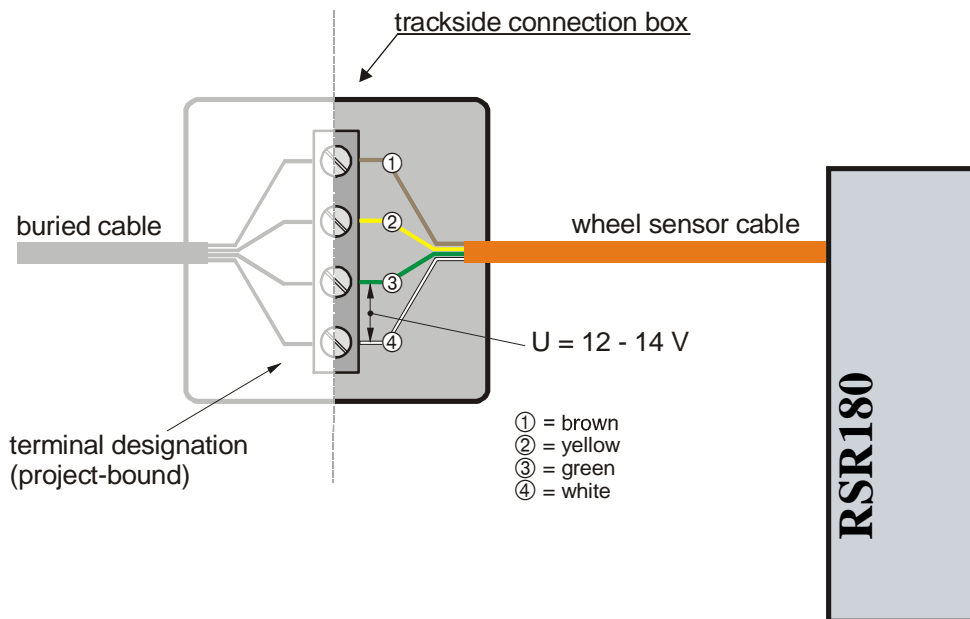


Fig. 3: Connection of wheel sensor cable

4. Commissioning

Commissioning of the wheel sensor will be carried out together with the commissioning of the indoor installation. If indoor installation instructions do not cover wheel sensor commissioning, following measurements are required.

To be measured	Rated range
Indoor installation or trackside connection box	
a) No-load voltage of evaluation unit	15 - 30 V
b) Sensor current system 1 (wire 1)	2,8 - 5 mA
c) Sensor current system 2 (wire 2)	2,8 - 5 mA } Differenz max. 0,2 mA
Trackside connection box	
d) Supply voltage at RSR180 (wire 3 and 4) 12 - 14 V	
e) Supply current (wire 3)	57 - 65 mA
Wire x = wire of wheel sensor	



System current 1 must not differ from system current 2 by more than 0,2 mA.

If a measured value exceeds the rated range, wheel sensor RSR180 must not be operated under such condition!



System currents of wheel sensor depend mainly on:

- type of fixing (web of rail or rail claw mounting)
- rail profile
- mounting position (measure "A", measure "B", concentrically between sleepers)
- metal parts in direct proximity of the RSR (e.g. earthing connectors)

5. Maintenance



Maintenance work is to be carried out by specially trained personnel only.



Replace defect wheel sensor and do not carry out unauthorized changes or modifications.



In safety relevant applications a defect wheel sensor must be replaced within 24 hours, or the installation must be switched off.



Normally, sensor system currents of the wheel sensor are evaluated by further modules (evaluation modules) connected to the signalling or protection system. Maintenance tasks may vary depending on the properties of the evaluation modules and the safety concept of the signalling or protection systems. Where maintenance instructions of the system do not refer to wheel sensor maintenance, maintenance instructions as set forth in chapter 4 will apply.

5.1 Track occupancy detection capability test

Cycle: ≤ 1 year

Test: a) Traversing of rail by a train
b) Testing plate PB200

ad a) Upon traversing by a train, the evaluation module must detect occupancy of the track.

ad b) Place the testing plate PB200 in compliance with fig.4 above the respective sensor systems (1 or 2). (Do not place the testing plate directly on the RSR.) The evaluation module must detect occupancy of the track.



Track occupancy detection capability is to be tested for both system 1 and system 2.

5.2 Test of sensor system currents

Sensor system currents must be measured under undamped condition at correctly mounted sensors.

Cycle: ≤ 1 year

Test: For test instructions see the documentation of the respective evaluation module.

5.3 Mechanical / visual inspection

Cycle: ≤ 1 year

- Check wheel sensor for excessive dirt; if necessary, remove loose dirt.
- Inspect wheel sensor for mechanical damage; if necessary, replace wheel sensor.
- Verify spacing between top face of sensor and top of rail; if necessary adjust height. See chapter 3.2.3 or chapter 3.3.3.
- Check fixing elements of wheel sensor for proper fit and tighten if necessary. Comply with torque data as stated in chapter 3.2.3 or chapter 3.3.3.
- Inspect cable protection tube for mechanical damage and replace if necessary.
- Check cable terminals for proper fit and tighten if necessary.

5.4 Documentation

- For further details see document D1413 (Application Guide for Wheel Sensor type RSR180).

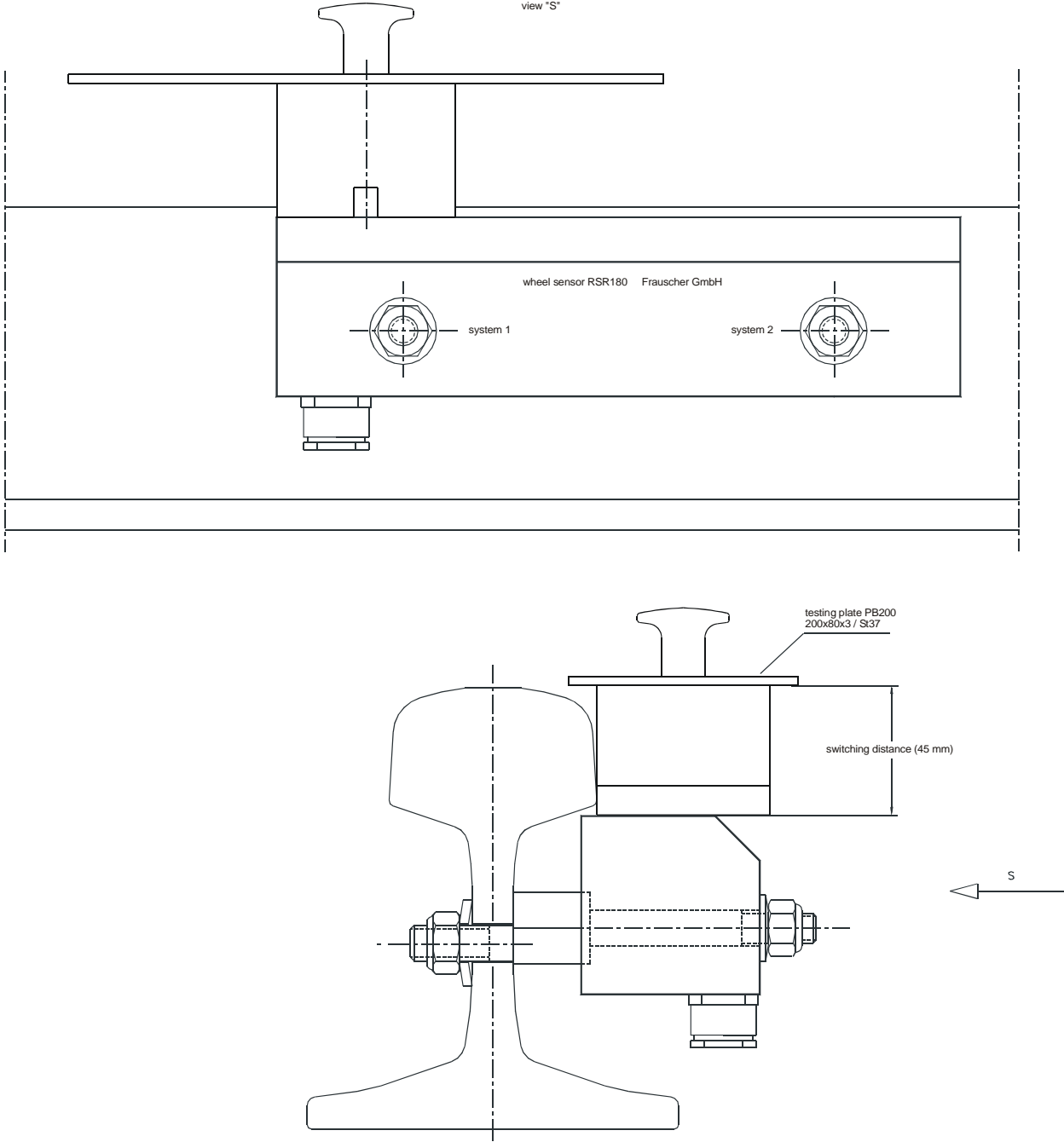


Fig. 4: Wheel sensor RSR180 with testing plate PB200 placed over system 1