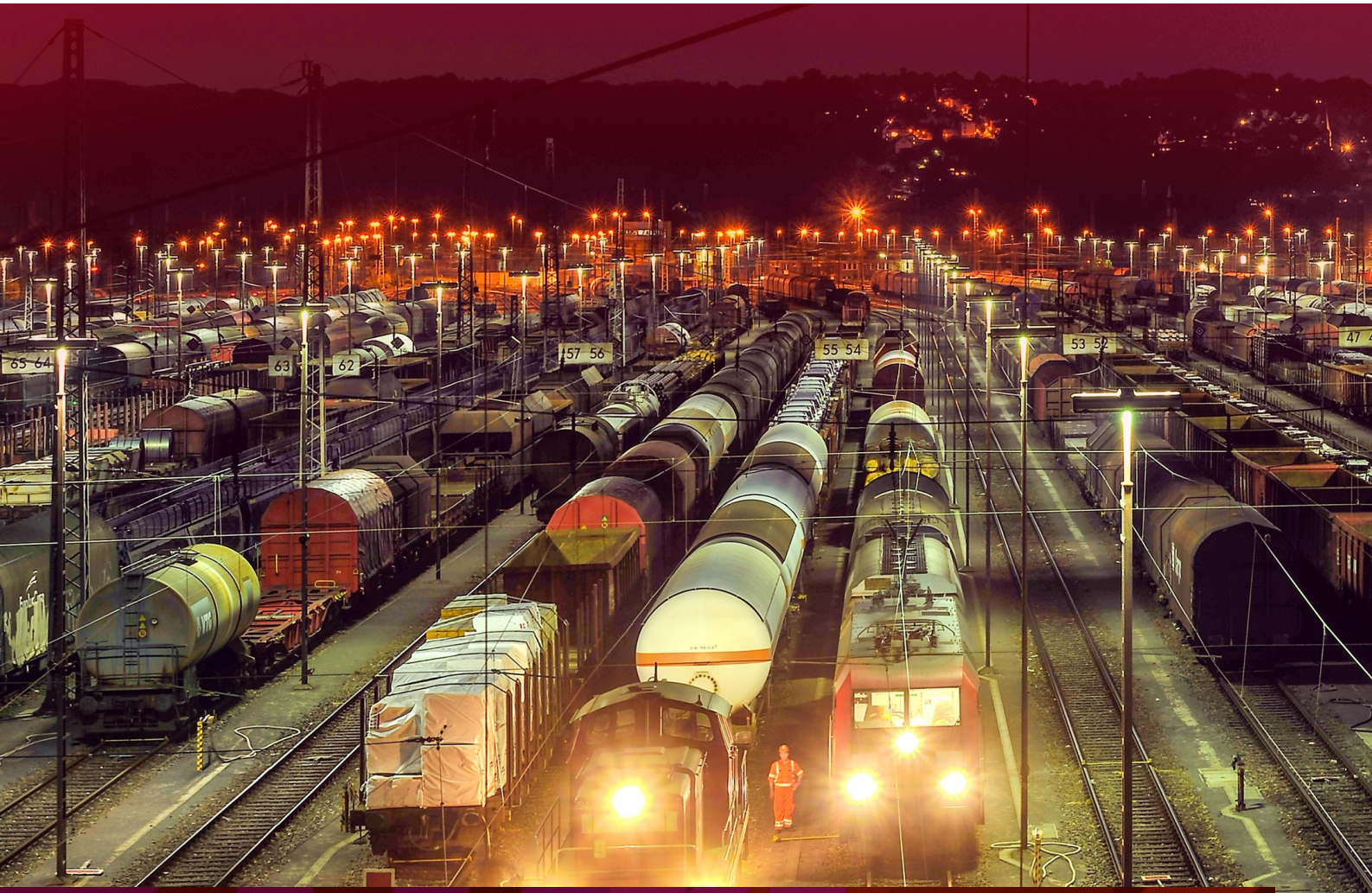
www.pintsch.net

PINTSCH
Safety for Rail

Together for safety.

We set priorities.



Wheel Sensor 2N59-1R-200-45

Document 2-EL-81248-00--EN_01_0

Datasheet

for

Double wheel sensor

2N59-1R-200-45

Date of release: 2020

1 Table of contents

1.1 Index of abbreviations

Abbreviation	Definition
ABG	Switching amplifier module
DSS	Double wheel sensor
MTBF	Mean time between failure is the predicted elapsed time between inherent failures of a system during operation
SSPV	Wheel sensor testing device

Table 1: List of abbrevations

1.2 Safety precautions

This section explains the safety-related symbols and signal words used throughout this document. Please note that it is imperative that these safety precautions be observed to prevent damage to property or injury to persons.

Symbol	Signal word	Explanation
	Recommendation	This symbol and/or signal word indicates that useful recommendations are given.
	Note	This symbol and/or signal word makes you aware of possible problems.
	Caution	This symbol and/or signal word indicates a hazardous situation which could result in minor injury or severe damage to property.
	Warning	This symbol and/or signal word indicates a hazardous situation which could result in serious injury or death.
	Danger	This symbol and/or signal word indicates an imminent hazardous situation which, with certainty, will result in serious injury or death.

Table 2: Safety precautions

2 Application

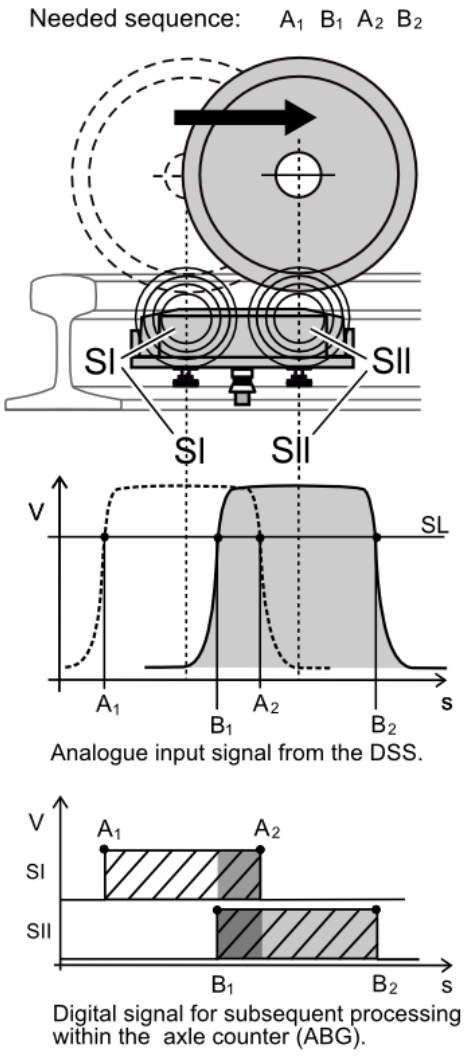


Figure 1: Switching principle

The application is for directional sensing of the wheel flanges of railway wheels. Due to the mass of a metal flange over the double wheel sensor across the rolling wheel there is an occupying of the two individual systems. This leads to a change in the internal resistance of the DSS- systems, and this is evaluated in a downstream evaluation device (ABG).

The arrangement of the two DSS systems is selected such that pulses overlap due to the occupying. Therefore they can be used for directional axle counting and / or direction- dependent switching commands
(→ Figure 1).

The installation of the sensor should be at the inner rail section, 45 mm below rail head (in accordance to a new rail).

Normally the DSS is delivered without the reduction plate assembly, but there is the possibility to install the double wheel sensor with a reduction plate. This option is necessary if a reduction plate at this point can help due to high anticipated rail currents. This should be clarified prior to installation!

3 Technical Data

3.1 Drive operation

Actuation : By the wheel flange

Rail profiles according to DS 820 : From **S33** (min. height 134 mm) to **R65** (max. height 180 mm)

Rail - diameter	:	≥ 300 mm	≥ 600 mm	≥ 1000 mm	
Traversing speed	:	≤ 60 km/h	≤ 60 km/h	≤ 60 km/h	
Min. axis-centre-distance	:	0,7 m	1,4 m	2,1 m	
Lateral offset of wheel	:	0 to 55 mm	0 to 55 mm	0 to 55 mm	

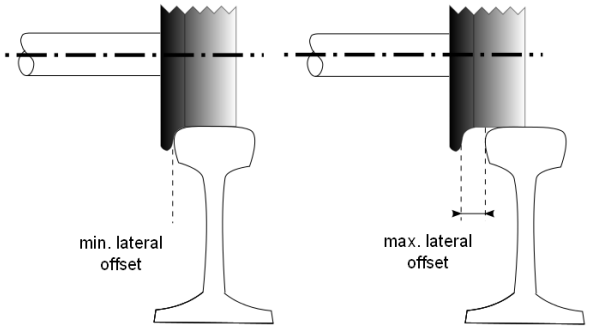


Figure 3: Lateral offset principle

Wheel flange immersion depth : 26 mm for a wheel diameter of more than 760 mm

: 32 mm for wheel diameters between 300 mm and 760 mm

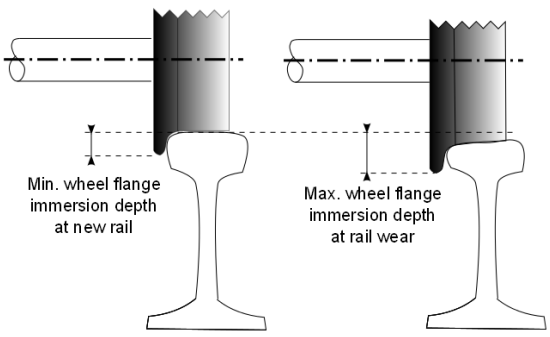


Figure 2: Immersion depth principle

Rail wear : Maximum 18 mm

After 8 mm of rail wear, the sensor is mounted 9 mm lower (see Figure 4: **2- way positioning of the DSS**Pos.1 to Pos.2), the spacing disk is removed (or respectively with two part spacing disks the upper disk is removed) and the reduction plate has to be moved

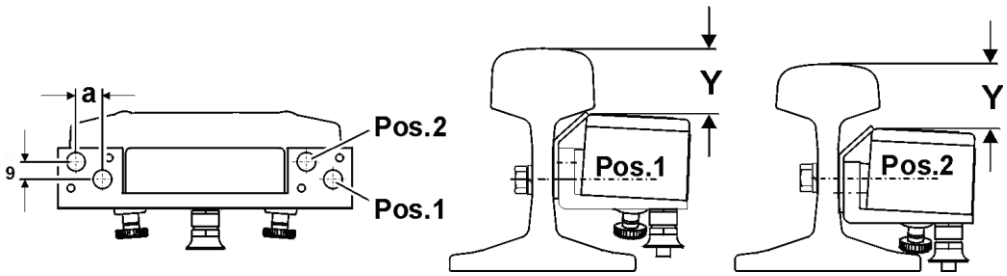


Figure 4: 2- way positioning of the DSS

3.2 Switching characteristics

Minimal switching distance	:	≥ 46,0 mm
Typical switching distance	:	47,0 mm [+2 mm / - 1 mm] → check with SSPV
Maximum switching distance	:	≤ 49,0 mm
Loosening message per system	:	Is not installed within this product!
Attenuation length at wheel diameter of	:	300 mm : ≥ 170 mm* 600 mm : ≥ 200 mm 1000 mm : ≥ 270 mm
Switching hysteresis	:	≤ 2 mm (in direction of travel)
Repetition accuracy of switching points	:	≤ 0,5 mm ≤ 0,1 mm at constant temperature
Switch-on distance	:	≥ 90 mm*
Overlapping coverage of the DSS- systems	:	≥ 70 mm*

Switching characteristics (dynamic at v = 60 km/h)

- Pulse length : ≥ 14,5 ms*
- Offset between the systems : ≥ 5 ms*
- Overlapping coverage of the systems : ≥ 9 ms*

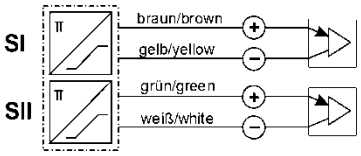
* Calculating example at new rail and new wheel:

- Diameter of wheel 300 mm
- wheel flange 27,5 mm
- wheel offset 50 mm
- temperature range - 40 °C up to + 85 °C

Signal technical safety: When the adoption of a safe switching criterion is expected (e.g. turning off the crossing), the interlocking safety can only be achieved if in combination of two criteria with the downstream signaling device.
The DSS is constructed with two different sensor systems, which each is in itself not fail safe.

3.3 Control Circuit

Connection diagram :



Operating voltage : 8.2 V [± 5 %]

Current consumption : At occupied DSS → ≤ 1,45 mA
At free DSS → ≤ 2,65 mA

Tolerated line resistance : ≤ 50 Ω (depending on the switching amplifier module higher values up to 200 Ω are possible)

Transmission frequency : 37,5 – 42,5 kHz

Transmission output : < 30 mW

Test voltage between both DSS-systems and between DSS- system to ground : Surge: 5 kV (1,2 µs / 50 µs)
Withstand voltage: 2,5 kV / 50 Hz

Lightening protection : Suppressor diode 1,5 kW / 1 ms

Interference resistance against : • HF-fields according to EN 50121-4

Permissible rail current :

AC 16 ⅔ Hz and 50 Hz	• Continuous current	$I_{cc} \leq 2\ kA_{eff}$
	• Short circuit current	$I_{scc} \leq 15\ kA_{eff}$
DC	• Continuous current	$I_{cc} \leq 10\ kA_{eff}$
	• Short circuit current	$I_{scc} \leq 30\ kA_{eff}$

Precondition is the installation of a reduction plate. For DC short-circuit currents $I_{CC} \geq 21\ kA_{eff}$ this is to the respective rail section adapted reduction plate that is recognizable by a captive-mounted designation (inquire availability for appropriate rail profile).

Exceeding the permissible rail currents the DSS behaves like a normally driven over rail with a wheel flange ⇨ destruction does not take place.

3.4 Wiring

Cable wires	:	4 each per double wheel sensor (DSS)
Cable	:	Railway cable, twisted star quad in according with the DB specification 416.0115 resp. 416.0116 or signal cable in accordance to VDE 0816 (with reinforced insulation)

3.5 Housing

Base plate	:	C-Cu-Zn 33 Pb (DIN 1709)
Cap	:	Plastic, fully cast
Connecting line	:	4 x 0.75 mm^2 PURWIL® PUR/PUR polyurethane integrally cast in the housing. Typical lengths: 5 m, 10 m, 20 m

If the application, in which the DSS will be used demands interlocking security, the cable must be laid sufficiently protected, e.g. in a neoprene protective tube 28/20 mm.

Weight	:	approx. 2,5 kg
Color	:	Light grey

3.6 Environment according to EN 50125-3

Ambient temperature according to EN 60721-3-4	:	- 40 °C up to + 85 °C
Stability	:	Lightning strike on the rail through side mounting, effects of weather, UV radiation, greases, oils, bases and salts, conditionally permanent against acids
Protective type according to EN 60529	:	IP 67 (protection against dust and ingress of water through temporary immersion)
Vibration according to EN 50125-3 (outside of rails)	:	• Random vibration 5 Hz to 2000 Hz according to EN 60068-2-64 with up to 280 m/s^2 RMS acceleration • High shock testing (peak stress) 250 g for 1 ms according to EN 60068-2-27 • Continuous shock testing (medium stress) 420 m/s^2 for 6 ms according to EN 60068-2-27 • Extreme shock testing 9810 m/s^2 for 0,4 ms according to EN 60068-2-27

4 MTBF

More than 20 different methods and procedures to predict the useful life have been developed over the years.
PITB uses the MIL-HDBK-217F and SN29500 standards.

Due to this use of two different standards and due to different mean times between failures different values can be generated.

Type \ Standard	SN29500		MIL-HDBK-217F	
	MTBF	**FIT**	**MTBF**	**FIT**
2N59-1R-200-45	Not yet calculated h	Not yet calculated * 10^{-9} h	750.000 h	1333,3 * 10^{-9} h

Table 3: MTBF- and FIT values

5 Installation

Look at corresponding installation instruction with table of rail profiles.

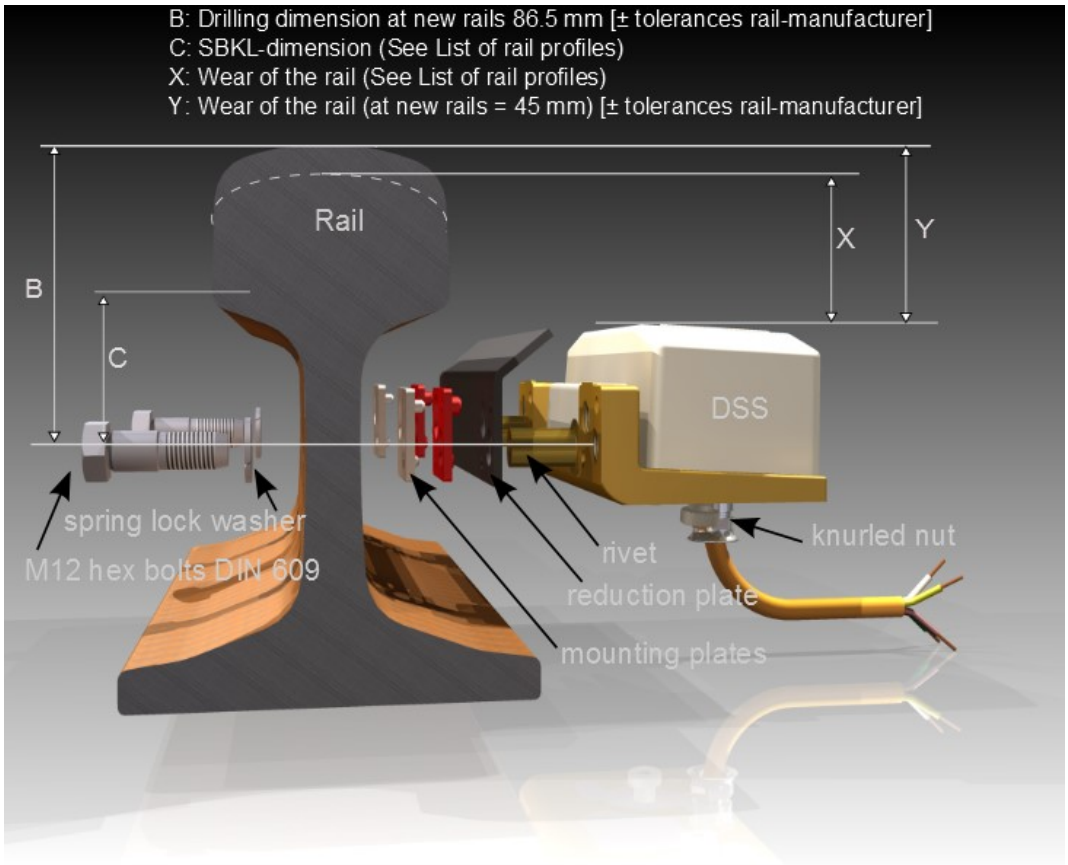


Fig. 5: Double wheel sensor installation drawing (with reduction plate)

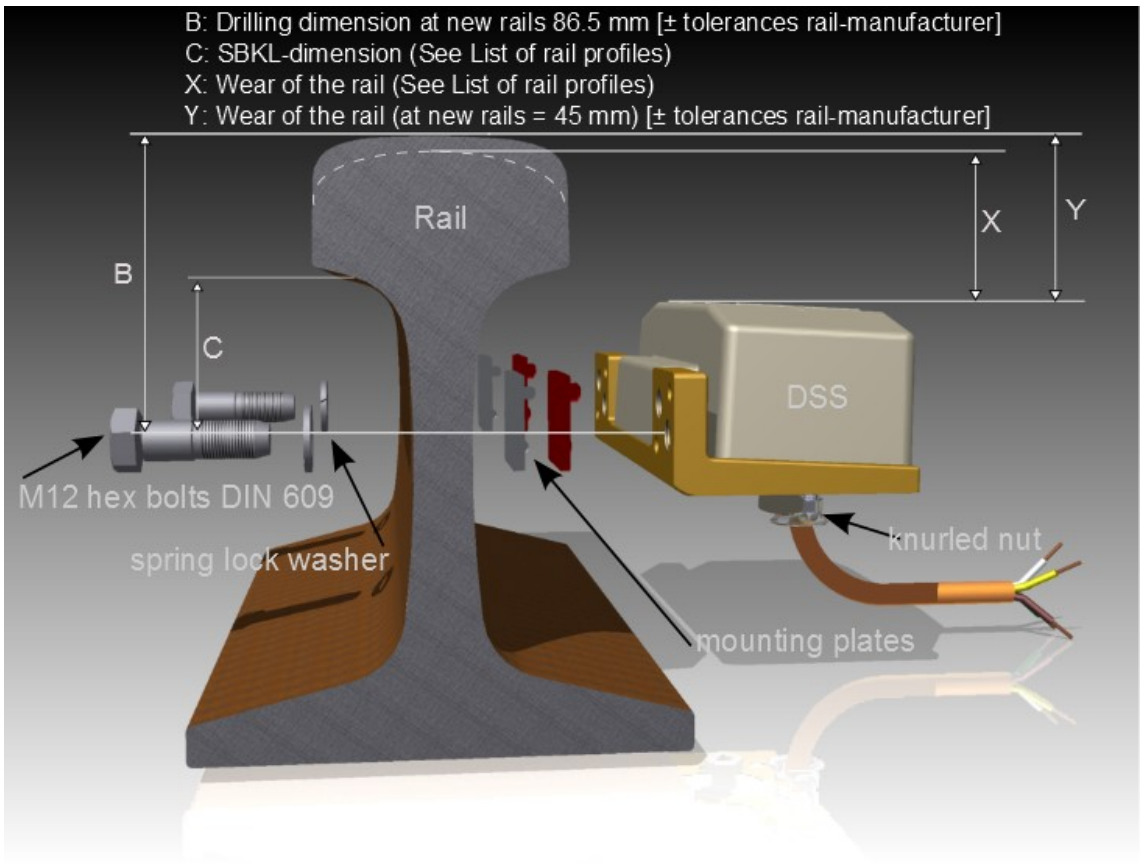


Fig. 6: Double wheel sensor installation drawing (without reduction plate)

PINTSCH
Safety for Rail

PINTSCH GmbH
Hünxer Str. 149
46537 Dinslaken
Germany

T +49 20 64 602-0
F +49 20 64 602-266

info@pintsch.net
www.pintsch.net