

# CALIPRI

THE POWER OF

# 3

All relevant wear parameters in the railway and tram area can be measured comfortably and reproducibly with the non-contact CALIPRI measuring device.

Behind the **3 laser lines** of CALIPRI lies the secret of this versatile, precise and easy-to-handle optical measurement device.

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next**SENSE**

[www.calipri.at](http://www.calipri.at)

NextSense GmbH  
Straßganger Straße 295  
8053 Graz, AUSTRIA

Phone +43 316 232400 - 0  
Fax +43 316 232400 - 599  
office@nextsense.at

[www.calipri.at](http://www.calipri.at)

[www.rubicon.at](http://www.rubicon.at)



# CALIPRI



RAILWAY

[www.calipri.at](http://www.calipri.at)

# CALIPRI



**MULTIFUNCTIONAL AND  
COST-CUTTING MEASUREMENT**



**USER-INDEPENDENT AND  
REPRODUCIBLE RESULTS**



**EASY AND  
FAST MEASUREMENT**

## NON-CONTACT WEAR MEASUREMENT OF HEAVY RAIL AND LIGHT RAIL WHEELSETS



### ERRORLESS MEASUREMENTS. REPRODUCIBLE MEASUREMENT RESULTS WITHOUT OPERATOR INFLUENCE.

+ The contact-free mode of operation of CALIPRI delivers measurement values that are significantly more reliable and better reproducible in comparison to conventional measurement methods using contact. The measurement result is free of operator influences.

The measurement is carried out on a non-contact basis. For the measurement, the user moves the sensor by hand over the object to be measured. The intelligent image processing system continually records segments of the object from various viewing directions and combines them. Typical measurement errors, when measuring with classic gauges – for example, due to tilted scanning, undefined measuring force or loop-sided application of the device – are ruled out with CALIPRI.



Non-contact measurements can be made of all essential wear parameters. Thus the measurement is free of operator influences and the measurement result is reproducible.

### COMFORTABLE MEASUREMENTS. NON-CONTACT PROFILE MEASUREMENTS WITH THE GREATEST PRECISION.

+ Confined spaces or difficult access pose no problem for the CALIPRI. The ergonomically designed handheld sensor and the high-performance software make for an effortless measurement and reduce measuring times. A complete measurement process takes only a few seconds. This means substantially reduced time expenditure, greater productivity and outstanding comfort.

The measurement is performed hands-free. The distance and angle of the sensor to the measured object do not have to be kept exactly the same throughout the measurement process. The acoustic signals as well as the graphic display help, independent of the experience of the user, to attain a quick and reproducible result. Once the entire profile line of the object to be measured has been recorded, the data will be analyzed and the resulting measurement values will be visible on the CALIPRI display. Any overstepping of given tolerances is displayed immediately.



Shortest possible measurement times and sensors that are adapted to the given space make for comfortable measurements, even with difficult access.

## OPTICAL MEASURE- MENT TECHNOLOGY FOR PROFILE MEAS- UREMENT OF SWITCHES AND RAILS.



### REDUCED OVERALL COSTS. MODULAR CONCEPT WITH MAXI- MUM ADAPTABILITY.

+ The innovative CALIPRI measurement method facilitates the recording of a wide range of profile shapes with one and the same measurement device. This feature makes possible a broad spectrum of applications and substantially reduces purchase costs, calibration costs and training costs.

The software can be expanded by modules. A great number of measurement modules makes it possible to tailor CALIPRI to fit the given user situation exactly. In addition, special software solutions for the extended analysis of measurement data and for the comparison to target profiles are available. Our Sales Department is happy to assist you with any questions about customiza-  
tion.



The upgradeable CALIPRI software constitutes the core of the module concept. The delivery includes a high-performance tablet PC.

### DATA PROCESSING. A MULTITUDE OF INTERFACES WITH UPGRADEABLE ANALYTICAL FUNCTIONS.

+ Comprehensive analysis and reporting functions of the CALIPRI software result in a maximum of customization of data processing. For customized processing, CALIPRI measurement data can be stored and exported.

All measurement and profile data are made available in the XML, CSV and DXF format. In addition, individual PDF reports can be created and sent directly to a printer. With optional software upgrades, measurements can be administered and compared to reference profiles and stencils. By foregoing hand-written records and manual transmissions, the reports by CALIPRI are faultless and tamper-proof.



Measurement results can be presented and exported in multiple ways. Thus CALIPRI replaces hand-written data transmissions.

## THE CALIPRI PACKAGE



### TECHNICAL DATA

**Accuracy:**

< +/- 80 µm\*

**Repeatability:**

< +/- 35 µm\*

**Dimensions (W x H x D):**

Sensor: 86 x 72 x 188 mm // 108 x 72 x 105 mm

Computer unit: 280 x 184 x 40.5 mm

Measuring case: 445 x 125 x 345 mm

**Weight:**

Sensor: 530 g // 450 g

Computer unit: 1,600 g

Measurement device, total: 2,500 g // 2,050 g

Measuring case, total: 8,900 g // 8,450 g

**Display:**

Computer unit: 10.1 inch TFT-LCD

Sensor: 2.3 inch FSTN LCD // xxx

**Rechargeable battery:**

Lithium-ion, running time approx. 3.0 hours

**Ambient conditions:**

Temperature – operation:

+5° C to +35° C

Temperature – storage:

-20° C to +65° C

Humidity – operation:

20% to 80% no condensation

Humidity – storage:

8% to 90% no condensation

Impact resistance: 100 G

Protection class: IP 54

**Laser:**

Red, 660 nm, 2M class

**Conformity:**

CE

### SCOPE OF DELIVERY

The scope of delivery of the ready-to-use measurement system includes:

- + sensor
- + sensor cable
- + portable computer unit (tablet PC)
- + carrying strap
- + self-test and calibration device
- + hard protective case with foam rubber cushion for all components
- + user manual
- + installed measurement software of your choice



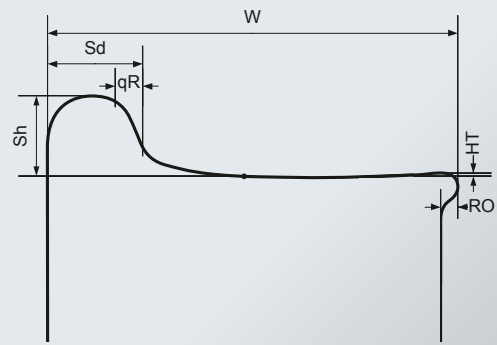
\* except wheel clearance and wheel diameter measurement modules



## WHEEL PROFILE

“Wheel Profile” is the main module for the measurement of heavy rail and light rail wheel sets. This module allows for the measurement of an entire wheel profile cross-section within a few seconds.

In addition to the key wheel flange dimensions (height, width, qR), the wheel width, hollow tread as well as the rollover are determined. As an alternative to the module for standard heavy rail wheel, a separate measurement module for light rail wheels is available. Thus well-nigh all common wheel widths and wheel profile shapes of railway vehicles can be measured.



## WHEEL DIAMETER

You can determine the diameter of a railway wheel with the “Wheel diameter” module even on the installed wheel. In the process, CALIPRI is supported by a gauge that has been manufactured in carbon fiber reinforced plastic lightweight construction.

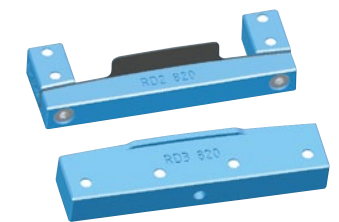
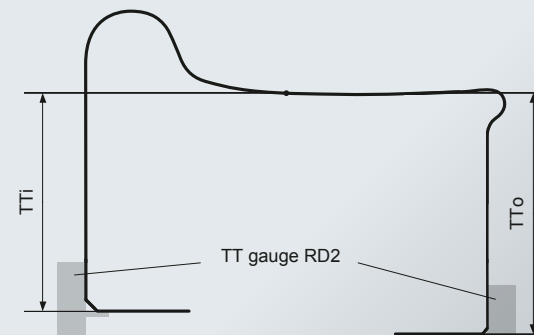
The robust wheel diameter gauge can be mounted on the wheel with a flick of the wrist. The user moves the sensor by hand close to the gauge for the measurement, which does not take more than a few seconds. A precise alignment of the sensor is not necessary. Subsequent to another measurement over the track profile, the rolling circle diameter, in addition to the flange diameter, is shown automatically on the display.



## TYRE THICKNESS

This module allows the measurement of the tyre thickness within a few seconds. For that purpose, all that has to be done is to attach the gauges that are included in the delivery to the front faces of the wheel or, optionally, to the inner edge or the wear limit groove.

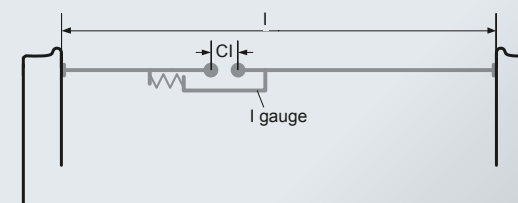
The measurement is done in conjunction with the measuring of the wheel profile. The measurements of the tyre thickness inside / outside / groove are displayed together with the measurement parameters of the wheel profile. If the inside radius of the tyre is known, the diameter can also be concluded from this measurement.



## WHEEL CLEARANCE

You can make a precise measurement of the wheel clearance of a rail vehicle with the “Wheel clearance” module. For the measurement, a gauge that is equipped with a spring mechanism is included in the delivery of this module.

For the measurement, the gauge is clamped between both wheels. Subsequently, CALIPRI determines precisely the distance between the cylinders of the gauge. The offset values of the two gauge shanks are added automatically. Thus the exact wheel clearance is displayed with each measurement.

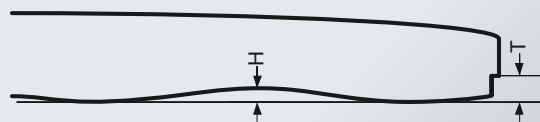




## BRAKE DISC

The “Brake Disk” module allows for the completely contact-free measurement of security-relevant wear parameters, like brake disk thickness and brake disk hollowing.

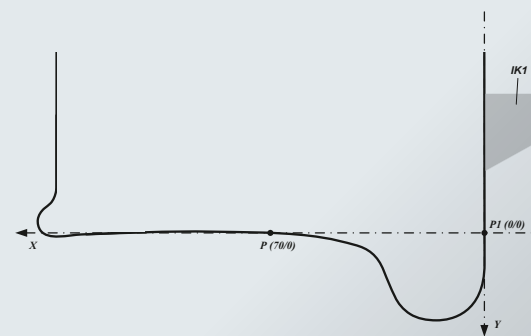
Brake disk hollowing and brake disk thickness can be determined for all common brake discs with radial reference edge. When used as an addition to the Wheel clearance and Wheel profile modules, a complete measurement cycle can be carried out with just one measurement device. The collected measurement data is subsequently available in one single measurement file and can be processed.



## RADIAL/AXIAL RUNOUT

With the “Radial runout/Axial runout” module, it is possible to measure the ovality and excentricity as well as possibly existing lateral runouts of rail vehicle wheels. There is no special wiring or any rotary encoder required.

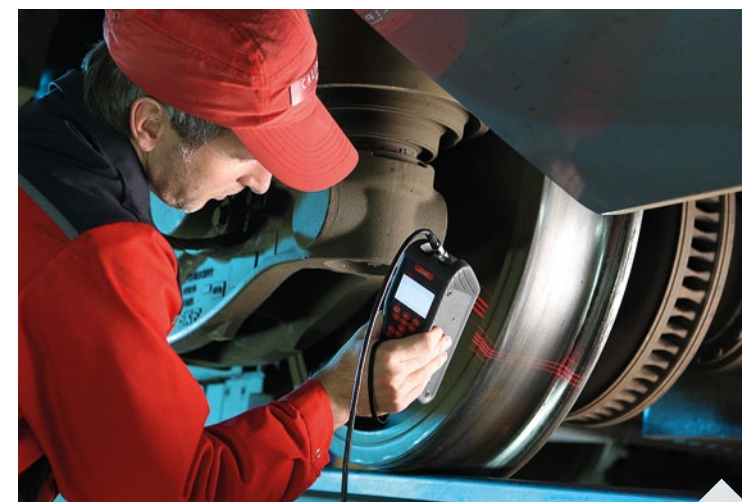
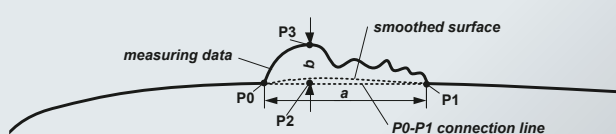
For the measurement, the sensor is simply mounted to a stand in front of the wheel to be measured; the trigger wedge included in the delivery is fastened magnetically to the wheel, and the wheel is turned. Diameter changes are determined through the automatic combination of the measurement data on opposite sides of the wheel. An additional spectral presentation allows for more in-depth analyses, e.g. the detection of polygon formations of the wheel.



## WHEEL DEFECTS

The “Wheel defects” module helps the user to differentiate critical defects from uncritical ones. Flat spots as well as pittings can be identified and measured.

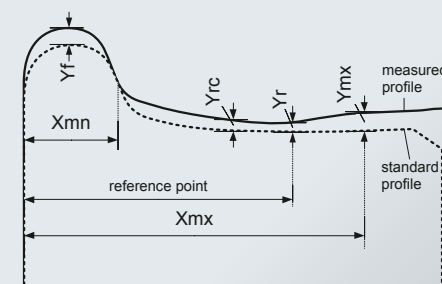
When measuring, the defect is targeted with the measuring device. In doing so, the sensor does not have to be in contact with the wheel nor does it have to be aligned accurately. When the defect is detected, an acoustic signal will sound and the width and depth of the defect are calculated. With regard to pittings, the measurement ranges are between 1 x 0.5 and 50 x 5 mm (W x D); with regard to flat spots, between 15 x 0.1 and 80 x 2 mm (W x D).

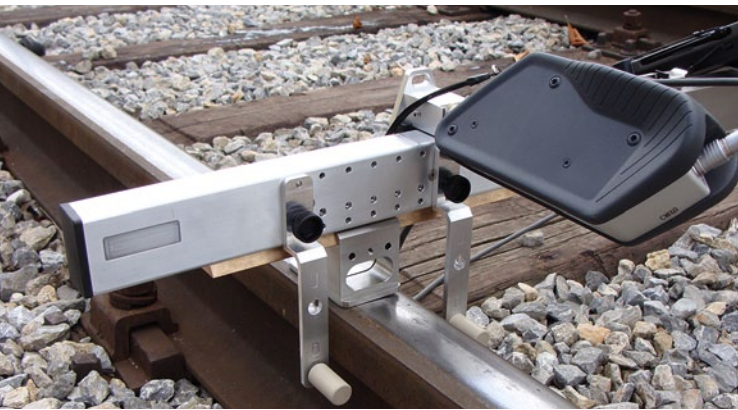


## WHEELSHOP

The “Wheelshop” module allows you to make an independent measurement of your wheel profiles for the wheel set machining. The depth of cut that is optimal for the respective wheel profile is calculated.

The Wheelshop module is applicable if your wheel set machine tool does not have any or a sufficiently exact measurement system or if the determination of the optimal depth of cut is to be done independently of the machine tool. To this end, you select the desired target wheel profile and the reference point of the cutting tool. The wheel sets can be measured in an installed or detached state. All measurement results as well as the measured profile shapes will be stored electronically.





**RAIL, GROOVED RAIL AND SWITCH GEOMETRY**

With these modules, it is possible to record the profile shapes of both rail sides in a common coordinate system. For this purpose, the sensor is installed on the geometry gauge that is included in the delivery.

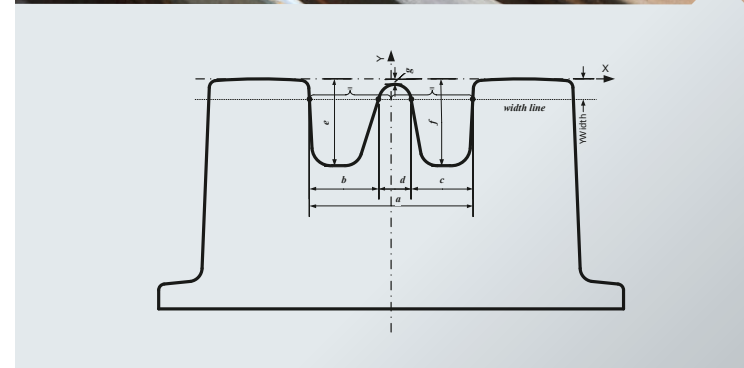
This device allows the sensor to allocate the data precisely to the opposite side as well as the upper edge of the rail. In addition, the geometry gauge guarantees the measurement of an exactly defined cross section even with conic objects like blades and switch frogs. Thus the modules provide essential raw data that are required for the analysis of the driving behavior and the calculation of the equivalent conicity.



**SWITCH**

The "Switch" module allows for the non-contact measurement of switch frogs and switch blades. With this module, the CALIPRI results in precise recording of measurement data for all common switch profiles.

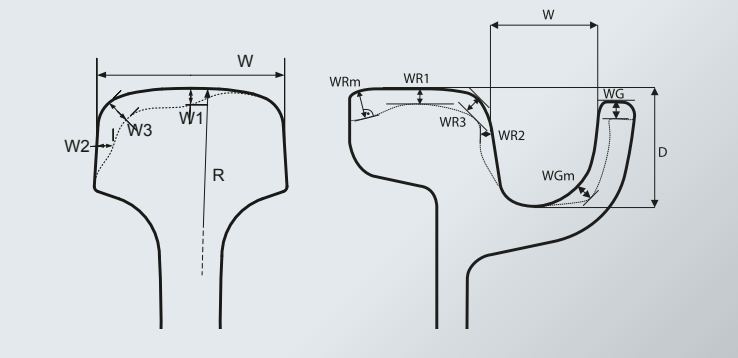
Important measurements like groove width, groove depth, frog width or the lowering of the frog center, are determined in the area of switch frogs. In addition, head width, blade height difference and flange gradient of switch blades can be determined. The result is free of operator influences due to the non-contact measurement. Thus the measurement values are significantly more reliable and better reproducible.

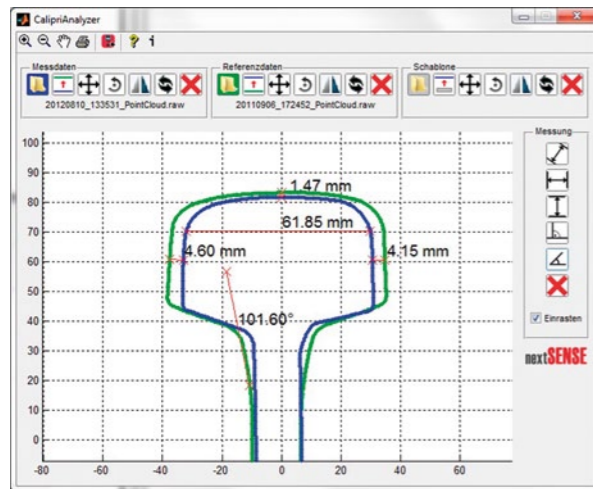


**RAIL/GROOVED RAIL**

With the "Rail" and "Grooved Rail" modules, it is possible to measure the complete cross-section of a rail head within a few seconds and calculate the key data and wear parameters.

Along with the essential measurements like head width and crown radius, the wear at the top and the sides can be determined by comparison with the standard profile. All established flat bottom rails and groove rails can be measured. In order to measure, the user moves the sensor around the rail head by hand. In the process, the sensor does not have to be in contact; nor does it have to be precisely aligned to the rail.

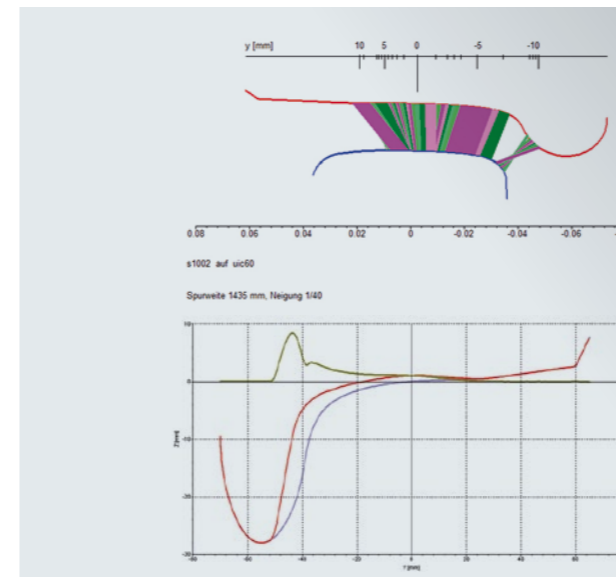




### ANALYZER

The “Analyzer” is a special software solution for the quick display and measurement of CALIPRI profile data. Intuitively simple, a measurement profile is visualized, measured and compared to a second profile.

All profile data recorded by the measurement device can be opened by the Analyzer and comfortably evaluated. To this end, the profiles can be moved, rotated or mirrored. In addition, measurement tools such as length gauge and angle gauge are available. “Magnetic” stencils, which position themselves exactly on a profile by mouse click, are especially helpful in the process. An additional reference profile can be opened for comparison to other profile data. If the Analyzer is activated in addition to the CALIPRI software, all currently measured profiles will be displayed on the Analyzer in real time. PDF files can be created of all profiles and measurement data for documentation purposes.



In collaboration with:



### WHEEL-RAIL ANALYSIS SOFTWARE

The “Wheel-Rail analysis” module is an analysis and synthesis software for the examination of the wheel/rail kinematics and for wear evaluation. The equivalent conicity, for instance, can be calculated compliant with UIC 519 and EN 15302.

All entry data, from the wheel profile to the flange gauge up to the wheel diameter, can be measured with the aid of the various modules of CALIPRI. You will not need any other measuring devices. You have the choice, though, of entering the requisite data or employing standard profiles that have been stored.

The software consists of three parts:

#### RSPROF

- Analytical presentation of the wheel and rail profiles that have been measured.
- Profile generator for different standardized wheel and rail profiles and the generation of any profiles consisting of straight lines, circular arcs and polynomials.
- Graphical presentation of the profiles and an option for processing via an interactive graphical user interface by moving, deleting and adding of profile points.

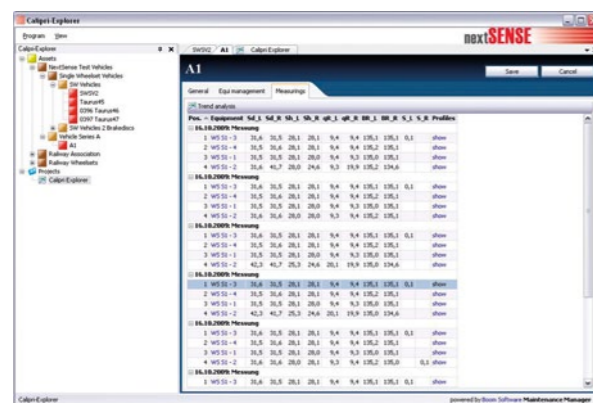
#### RSCEO

- Calculation of the contact points for given transverse displacements and turning angles of the wheel set.
- Generation of kinematic tables such as rolling radii/angle difference function, including harmonized linearization for the calculation of equivalent conicity, etc.
- If axle loads are given, calculation of the normal stresses of the non-elliptical contact surfaces according to Bousinesq and the equivalent contact ellipses.

- Graphical presentation of the rail profiles and wheel envelopes of the projection in the longitudinal direction of the rail and as top view.

#### RSANAPROF

- Calculation of the difference of two profiles from wear or plastic deformation.
- Alignment of the second profile to the reference profile by dint of the definition of partial profiles; with respect to rail profiles, e.g. parts of the outside and inside face.
- Calculation of the abrasion and buildup, including graphical presentation.



### EXPLORER

The “Explorer” module supports the user by dint of a structured management of the recording, storing and analyzing of measurement data. Measurements, wear limit infractions (tolerances) and historical runs are documented.

This special software solution uses a clear tree structure for the administration and documentation of measurement data. Thus the measurements are always mapped in a structure that corresponds to the actual situation and can be traced back over many years. The visualization of historical measurement records gives information about the probable remaining useful life of measurement objects, allowing for a more precise planning and the optimization of maintenance intervals. The Explorer offers an additional range of analytical functions, which allow, among other things, the comparison of several measurement profiles with one another or with a target profile.

