

# Solutions for the railway industry

CALIPRI measurement devices





CALIPRI measurement devices 6

CALIPRI C42 13

CALIPRI X 69

CALIPRI Predictor 77

CALIPRI Prime 81

Add-ons | Services | Spare parts 89



Railway wheelset and track profile measurement



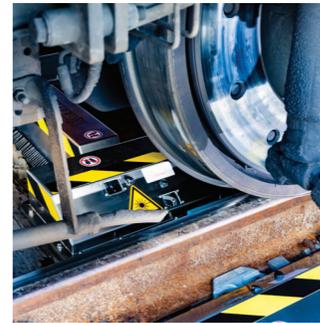
CALIPRI X



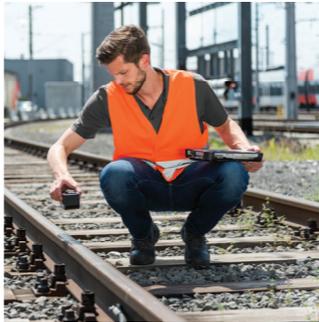
CALIPRI Prime



Spare parts  
Accessories  
Add-ons



CALIPRI C42



CALIPRI Predictor

## Many tasks, one solution

CALIPRI non-contact profile measurement devices meet the demands of the railway industry for predictive maintenance with a reproducible and simple measurement method. Whether working with wheels, brakes, rails or switches, Hexagon offers the right solution for any measurement task.

CALIPRI profile measuring devices are certified and used by operators all over the world, including in Germany (Deutsche Bahn DB), France (SNCF), China (China Railway), India (Delhi Metro Rail Corporation DMRC), Japan (East Japan Railway Company), USA (Amtrak) and Morocco (Office National des Chemins de Fer ONCF).

## CALIPRI measurement devices

CALIPRI C42 13

CALIPRI X 69

CALIPRI Predictor 77

CALIPRI Prime 81

Add-ons | Services | Spare parts 89



## Specialised solutions for railway wheelset and track profile measurement

Train wheelsets and rail infrastructure are typical wear parts that significantly affect passenger comfort, safety, noise and ride. The profiles of wheels, brake discs, rails and switches are therefore controlled by recurring measurement operations, which are performed in demanding operating conditions. The challenge lies in efficiently generating valid measurement data for the entire wheel-rail system. Efficient wheelset profile measurement can drive timely maintenance actions, help minimise train downtime and ensure a smooth and safe journey for rail passengers.

Hexagon's NEXTSENSE CALIPRI optical profile measuring instruments meet the specific demands of the railway industry by delivering accurate and reproducible results, independent of operator influence. These specialised rail profile measurement devices are widely used for wheel profile inspection, brake disc measurement, wheel distance measurement, wheel wear inspection and rail wear inspection.

### Patented technology

The unique CALIPRI Principle is a development of laser light section technology for non-contact dimension and profile measurements. It involves an innovative technology automatically correcting tilts and rotations of the measurement device. The result: Highly accurate, reproducible and user-independent measurement results – fully automated or by hand within seconds. Never again struggle with imprecise gauges: CALIPRI replaces error-prone and unreliable inspection devices.

### Benefits

- High repeatability
- Multifunctional application
- Automatic correction of tilt and rotational errors
- Real profile data



HEXAGON

CALIPRI



CALIPRI C42

LASER RADIATION  
CLASS 2M  
EN 60825-1:2014



# Multifunctional profile measurement devices for the train and rail industry



- Wheel profile measurement 20
- Rim thickness measurement 24
- Wheel diameter measurement 28
- Back-to-back measurement 32
- Brake disc measurement 38
- Radial and axial runout measurement 44
- Defect measurement 48
- Equivalent conicity evaluation 50
- Track geometry measurement 54
- Rail profile measurement 60
- Switch profile measurement 64

## One device for multiple measuring tasks with high repeatability

Designed to measure all common train wheel, brake and track profiles, CALIPRI C42 handheld measurement devices provide quick and correct evaluations with high repeatability. The series stands for multifunctionality across the board for the complete wheel-rail system. Different software measurement modules for wheels, brake discs, rails and switches allow customised use across the rolling stock domain. With CALIPRI railway measurement solutions, users can perform different measurement tasks with just one lightweight and easy-to-operate system.

The patented CALIPRI Principle automatically compensates for any rolling or tilting of the sensor. Typical measuring errors of conventional methods are caused by incorrect positioning or misreading values – both are things of the past with CALIPRI. Thanks to the laser light section technology, the user simply guides the sensor over the measurement object by hand. It is not necessary to precisely maintain the distance and angle of the sensor. During the process, the profile is captured and evaluated from different perspectives. Once measured, the data is immediately ready for analysis and transfer. Measured dimensions are displayed on a tablet, PC or directly on the sensor display and can be compared to predefined limit values. The digital data transfer is tamper-proof and replaces handwritten documentation.

CALIPRI C42 handheld measurement devices are widely used within the rail industry to support the inspection process during train and rail maintenance and service applications, including wheel profile wear and diameter measurement, brake disc wear analysis, rail and switch wear measurement and wheelset back-to-back distance measurements. CALIPRI technology is also used within the rail industry to support train wheel manufacturing and quality assurance.





### One multifunctional device enables the combination of several measurement modules

The multipurpose profile-measuring devices are easy to upgrade, even retroactively. Choose from a variety of measuring modules to create the perfect combination for application needs. Combine into a single ideal system: one device for various measuring tasks.

#### CALIPRI C42 basic system includes :

- CALIPRI C42 sensor
- 2 x sensor batteries including charger
- Tablet PC including power supply
- Pre-installed measurement application - CALIPRI Portable Operator
- Pre-installed testplan creation software - CALIPRI Manager
- Reference standard for self-test and adjustment including calibration certificate
- Carrying belts, transportation case and manuals
- Service Package Light for the first year





**Technical data**

<b>System</b>	
Purpose	Wheelset measurements in heavy rail, light rail, metro Track inspection in railway infrastructure
Measurement data display	Sensor + tablet-PC
<b>Sensor</b>	
Size	64 x 63 x 164 mm   2.5 x 2.5 x 6.5 in
Weight	590 g   20.8 oz
Operating time per battery	> 4 h
Measuring view	150 x 130 mm   6 x 5 in
Display	2.4 in TFT LCD
Laser	660 nm, class 2M
Protection class	IP 54
<b>Tablet-PC</b>	
Size	270 x 188 x 38 mm   10.5 x 7.5 x 1.5 in
Weight	1300 g   46 oz
Battery life	> 5 h
Display	10.1 in WUXGA
Operating system	Microsoft Windows® 10
Protection class	IP 65
<b>Data transfer</b>	
Sensor to tablet PC	WiFi
Tablet PC to networks	WiFi, Bluetooth, Ethernet
<b>Export interfaces</b>	
Measurement results	xml, csv, CALIPRI Predictor, customer-specific interface (on request)
Profile data	csv, dxf

# Module: Wheel profile measurement

## Application

The Wheel Profile module allows for the precise measurement of an entire wheel profile cross section within a few seconds. Alongside the key wheel flange dimensions (height, width, qR), the wheel width, hollow tread as well as the rollover are determined. The Wheel Profile module can be applied for all common heavy rail and light rail wheels. The BR 600 magnetic supporting gauge is used to measure heavily worn wheels and is included in this module offering. Mounted on the unworn area of the inner wheel side, the gauge ensures the correct alignment of the data. All dimensions are evaluated according to the standard EN 15313.



Example display of the measured variables in the CALIPRI Portable Operator (CPO)





Accuracy	Absolute accuracy: <math>\pm 80 \mu\text{m}</math> Repeatability: <math>\pm 35 \mu\text{m}</math>
Product ID	CMM1001

**Scope of supply and services**

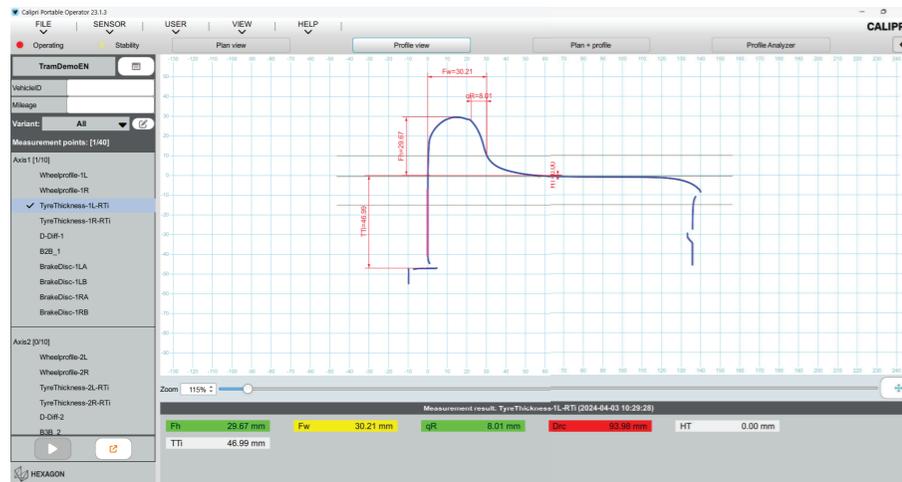
- Software licence Wheel Profile measurement module
  - Three measurement methods (Wheel profile, Wheel flange, Double flanged wheel profile)
  - In case of supplementary order: activation via remote access
- BR 600 supporting gauge
  - Magnetic gauge for heavily worn wheels



## Module: Tyre thickness measurement

### Application

The Tyre Thickness module is an expansion of the wheel profile measurement module. In addition to wheel profile measurement, this module also allows for the measurement of the rim thickness of all common wheel types in a matter of seconds. A magnetic supporting gauge (RD gauge) is used to perform the measurement. Depending on the condition of the wheel, the gauge can be placed either on the inner or the outer abutting face or the wear limit groove. Different RD gauges are available, and two types are included in this module offering. If the inner diameter of the rim is known, the rolling circle diameter can be calculated on the basis of the rim thickness values.



Example display of the measured variables in the CALIPRI Portable Operator (CPO)





System requirement	Wheel Profile measurement module
Requirement of the diameter calculation	Diameter of the reference groove (manual input of the value)
Tyre thickness accuracy	Absolute accuracy: <math>\pm 80 \mu\text{m}</math> Repeatability: <math>\pm 35 \mu\text{m}</math>
Accuracy of the diameter calculation	Depends on the manufacturing tolerances of the reference diameter
Product ID	CMM1003

**Scope of supply and services**

- Software licence Tyre Thickness measurement module
  - Two measurement methods (Wheel profile RT, Wheel flange RT)
  - In case of supplementary order: activation via remote access
- RD2 820 tyre thickness gauge
  - To be positioned on the edge between abutting face and inner radius of wheel tyre
  - Default length of the gauge shanks: 15 mm (0.6”), optional upon request: 30 mm (1.2”)
- RD3 820 tyre thickness gauge
  - To be positioned on the wear limit groove of the wheel tyre



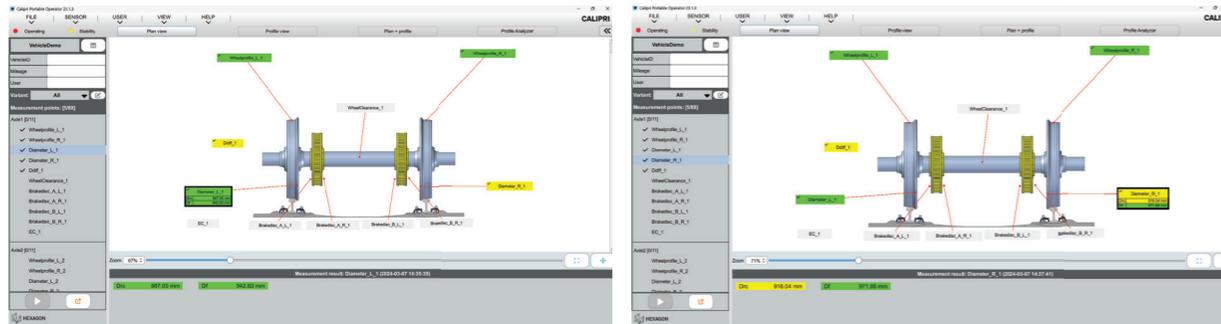
## Module: Wheel diameter measurement

### Application

The Wheel Diameter module allows for the precise measurement of the rail vehicle wheel diameter. The flange diameter is measured in order to calculate the rolling by consideration of the wheel flange dimensions, measured with the Wheel Profile module. Additionally, the following values can also be calculated automatically: diameter difference axle, diameter difference bogie and diameter difference coach.

The wheel diameter gauge (D-Gauge) is used to perform the measurement and is included in this module offering. The patented gauge is robust, has no moveable components and can be easily mounted (switchable magnet) on the wheel. A measurement can be performed quickly and easily on the installed wheel, even in difficult conditions.

Depending on wheel diameter dimensions, users can choose between 3 different D-Gauge versions.



Example display of the measured variables in the CALIPRI Portable Operator (CPO)





	D-750	D-1050	D-1350
Measurement range* CALIPRI C42:	470 – 750 mm (1'6" - 2'5")	670 – 1050 mm (2'2" - 3'5")	970 – 1350 mm (3'2" - 4'5")
Net weight	1 kg (2.2 lbs)	1.3 kg (2.9 lbs)	1.4 kg (3.1 lbs)
Shipping weight	4.2 kg (9.3 lbs)	6.0 kg (13.2 lbs)	8.0 kg (17.6 lbs)
Package size (Hard shell case)	60 x 50 x 20 cm (1'11" x 1'7" x 7.8")	100 x 20 x 45 cm (3'3" x 7.8" x 1'5")	130 x 15 x 40 cm (4'3" x 5.9" x 1'3")
Product ID	CMM1005/750	CMM1005/1050	CMM1005/1350
Accuracy	Absolute accuracy: <math>\pm 200 \mu\text{m}</math> Repeatability: <math>\pm 100 \mu\text{m}</math>		
System requirement	Measurement module "Wheel Profile"		

\* Refers to the flange diameter

**Scope of supply and services**

- Software licence Wheel Diameter measurement module
  - Additional calculation methods for calculating diameter differences of axles, bogies or coaches
  - In case of supplementary order: activation via remote access
- Wheel diameter gauge (D-Gauge) incl. calibration certificate
  - Mechanical supporting gauge for the wheel diameter measurement
  - USB stick with the gauge calibration specifications included
  - Delivered in hard shell case for the purpose of shipment and storage

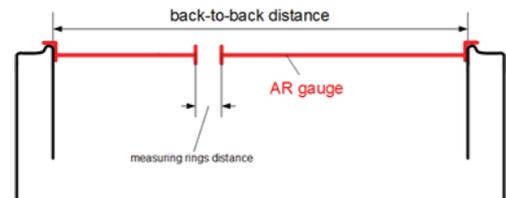
Diameter gauges  
D-750 / D-1050 / D-1350



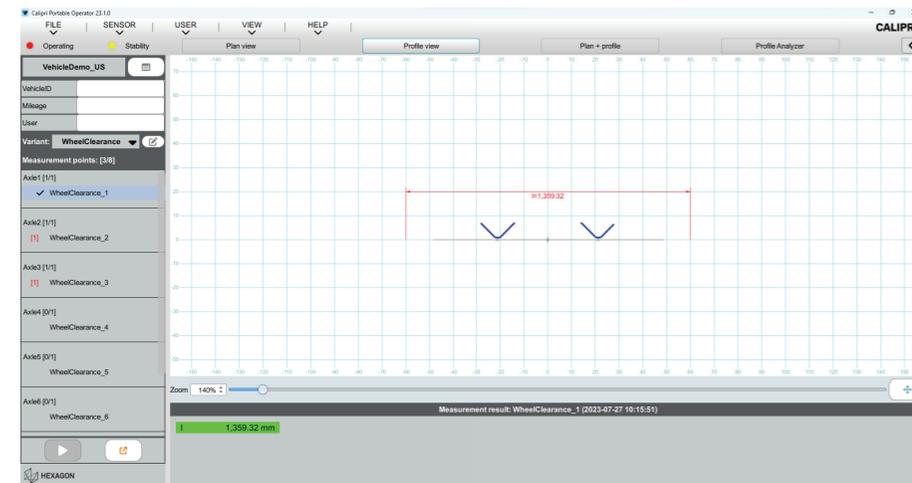
## Module: Back-to-back distance measurement

### Application

The Back To Back module allows for the precise back-to-back distance measurement of wheelsets. Additionally, the track gauge (back-to-back distance and flange widths) can be calculated and displayed if the wheel profiles have been measured.



The supporting gauge (AR-Gauge) is used to measure back-to-back distance and is included in this module offering. The carbon fibre gauge simply clamps between the wheels to allow a reference plane and distance calculation. It can be quickly mounted and dismantled on any installed wheelset or can be placed on any free wheelset. Subsequently, the back-to-back is measured and recorded. The gauge provides an automatic temperature compensation.



Example display of the measured variables in the CALIPRI Portable Operator (CPO)







	AR1360EL	AR1360ELM	CSL
Type	Foldable	Monobar	Foldable or monobar
Shipping weight	5,0 kg (11.0 lbs)	8,0 kg (17.6 lbs)	Customised
Packaging (Transport case)	100 x 25 x 25 cm (3'3" x 9.8" x 9.8")	160 x 25 x 25 cm (5'3" x 9.8" x 9.8")	Customised
Product ID	CMM1006/1360EL	CMM1006/1360ELM	CMM1006/CSL
Net weight	ca. 1,5 kg (3.3 lbs)		Customised
Measurement range	Back-to-back: 1330 – 1380 mm (4'4" – 4'6")		Customised
Contact point	30 mm (1.18") below top of wheel flange		Customised
Accuracy	Absolute accuracy: <math>\pm 200 \mu\text{m}</math> Repeatability: <math>< 35 \mu\text{m}</math>		

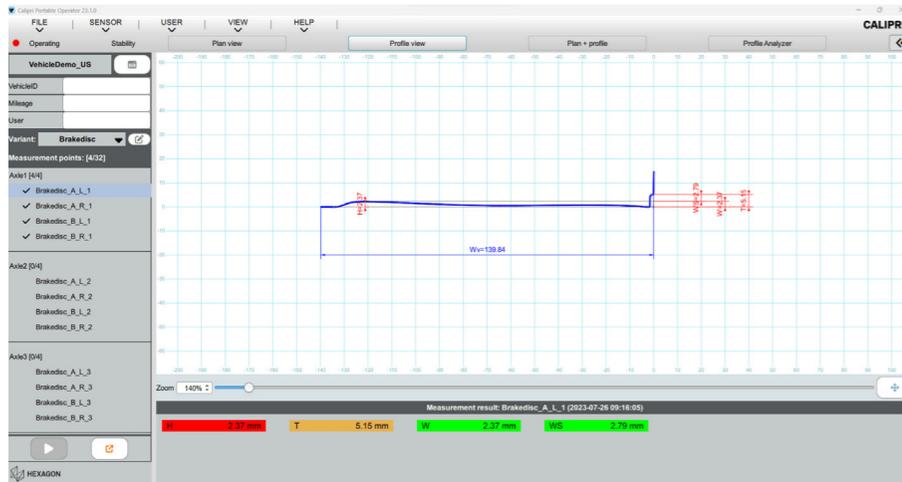
**Scope of supply and services**

- Software licence Back To Back measurement module
  - One measurement method (back-to-back)
  - In case of supplementary order: activation via remote access
- AR-Gauge incl. calibration certificate, delivered in transport case for distribution and storage
  - Mechanical supporting gauge for back-to-back distance measurement
  - Applicable for wheel sets with 1360 mm standard back-to-back distance
  - Gauges for other wheel clearances are custom-made and available upon request

## Module: Brake disc measurement

### Application

The Brake Disc module allows for the safe measurement of wear parameters for all common wheel- and axle-mounted brake discs within a few seconds. Immediately after the measurement, the data is compared with individual reference values in order to determine the current wear condition. In addition to basic measurement values like hollow tread and thickness, other values such as the wear stock and the ripple can be displayed. Furthermore, the calculation of the total thickness of axle-mounted brake discs can also be made.



Example display of the measured variables in the CALIPRI Portable Operator (CPO)







Accuracy	Absolute accuracy: <math>< \pm 80 \mu\text{m}</math> Repeatability: <math>< \pm 35 \mu\text{m}</math>
Product ID	CMM1009

#### Scope of supply and services

- Software licence Brake Disc measurement module
  - Activation via remote access (even in retrospect)
  - One measurement method (brake disc)
- BS1-500 brake disc gauge
  - Mechanical supporting gauge for worn or dirty reference edges



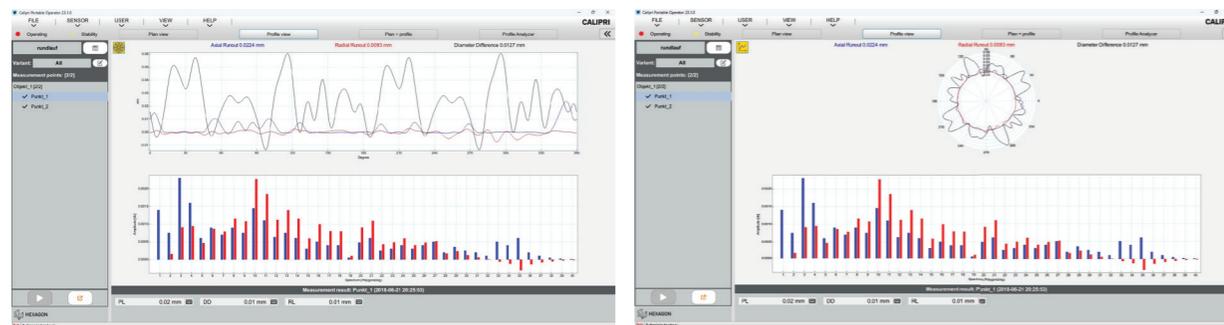
## Module: Radial and axial runout measurement

### Application

With the Radial/Axial Run-Out module, it is possible to precisely measure the ovality and eccentricity and to detect lateral runouts of rail vehicle wheels. With the CALIPRI sensor, the user captures the radial and the axial relative movements of the wheel profile during a wheel rotation. Diameter changes (diameter differences on one wheel) are determined through the automatic combination of the measurement data on opposite sides of the wheel. The measurement results can subsequently be exported as a CSV file and can be assigned to a certain wheel lathe.

In addition to the comparison of measurement values with relevant reference values, an additional spectrum presentation of the captured data allows for more in-depth analysis to check for any polygonisation of the wheel.

The Radial/Axial Run-Out module includes a V-shaped trigger wedge (IK1), which is to be attached to the inner side of the wheel – within the rolling circle diameter – and which enables the conformal allocation of the measurement data.



Example display of the measured variables in the CALIPRI Portable Operator (CPO)





Accuracy	Absolut accuracy: <math>\lt; \pm 30 \mu\text{m}</math> Repeatability: <math>\lt; \pm 20 \mu\text{m}</math>
Requirements	Rigid alignment of sensor relative to axle bearing (a.o. by sensor holder) & uniform rotation of the wheel during the measurement
Product ID	CMM1008

**Scope of supply and services**

- Software licence Radial/Axial Run-Out measurement module
  - One measurement method (RunOut)
  - In case of supplementary order: activation via remote access
- IK1 trigger wedge
  - Magnetic supporting gauge
  - Enables a conformal allocation of measurements
- Sensor holder
  - Tripod for CALIPRI sensor with ball head and magnetic holder

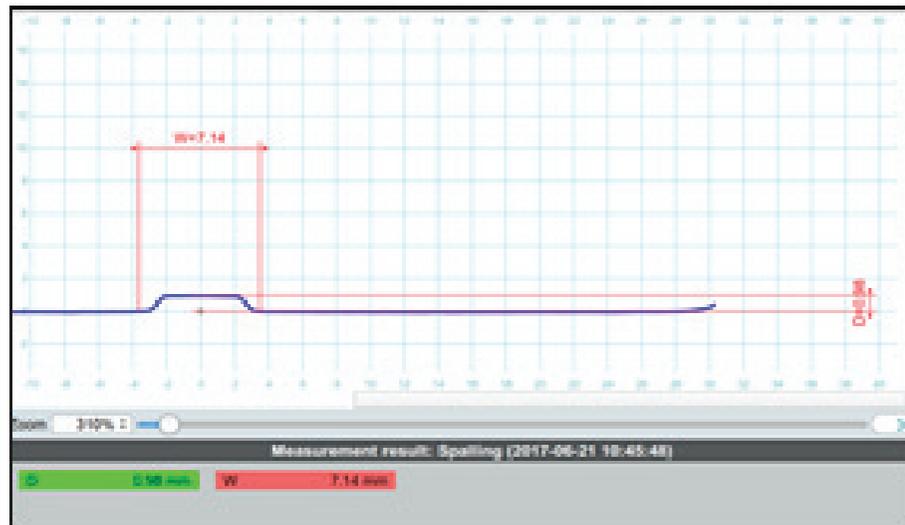


IK1 trigger wedge

## Module: Defect measurement

### Application

The Defects measurement module allows for the classification of defects on railway wheels, rails and switches within a few seconds. The wheel flats, cracks and spalling are detected and evaluated. During the measurement process, the sensor captures the defect. The graphical and acoustic tutor helps guidance of the sensor. After the measurement is completed, the depth and the width of the defect is calculated and displayed on the sensor and tablet PC in a matter of seconds. These values can then be compared automatically with reference values.



Example display of the measured variables in the CALIPRI Portable Operator (CPO)

Measurement range (WxD)	Wheel flat: 15,0 x 0,1 to 80,0 x 2,0 mm (0.6" x 0.004" to 3.1" x 0.08") Cracks and spalling: 1,0 x 0,5 to 50,0 x 5,0 mm (0.04" x 0.02" to 2.0" x 0.2")
Product ID	CMM1007

### Scope of supply and services

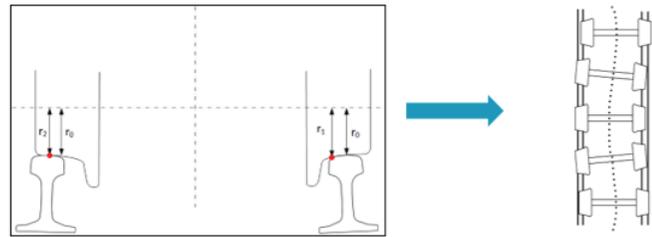
- Software licence Defects measurement method
  - Two measurement methods (SlidFlat, Spalling)
  - In case of system extension (supplementary order): activation via remote access



# Module: Equivalent conicity evaluation

## Application

The measurement module Equivalent Conicity allows for the precise analysis of the wheel rail interface. This measurement module provides the basis for the determination of possible vibrations and irregularities in vehicle dynamics as well as critical speed of railway vehicles. The conicity value (EC), calculated according to UIC 519 norm and EN 15302 norm, describes the railway vehicle motion pattern, which in turn permits drawing conclusions on the driving comfort and safety. The equivalent conicity results from geometry and profile of the wheel and rail.

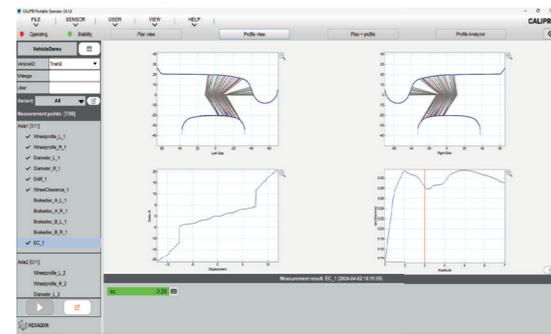


Sinusoidal motion

Typical motion pattern

### Rolling radius difference due to lateral displacement of the wheelset

The input data, required for the calculation of the equivalent conicity can be measured directly with CALIPRI C42 or entered manually (see technical data). After filling in the necessary data, the calculation proceeds automatically. The EC value will be displayed on the sensor and tablet PC. This value can be compared automatically with reference data. Additionally, four graphs will be displayed on the tablet PC for further analysis.



Example display of the measured variables in the CALIPRI Portable Operator (CPO)





Calculation method	Complies with UIC 519 and EN 15302
Necessary input data	- Wheel profiles of both wheels (measured or chosen from standard profiles) - Wheel diameter of both wheels (measured or manual input) - Wheel back-to-back distance (measured or manual input) - Rail profiles of both rails (measured or chosen from standard profiles) - Track width and rail inclination (measured or manual input)
Product ID	CMM1011

**Scope of supply and services**

- Software licence Equivalent Conicity measurement module
  - One measurement method (equivalent conicity)
  - In case of system extension (supplementary order): activation via remote access

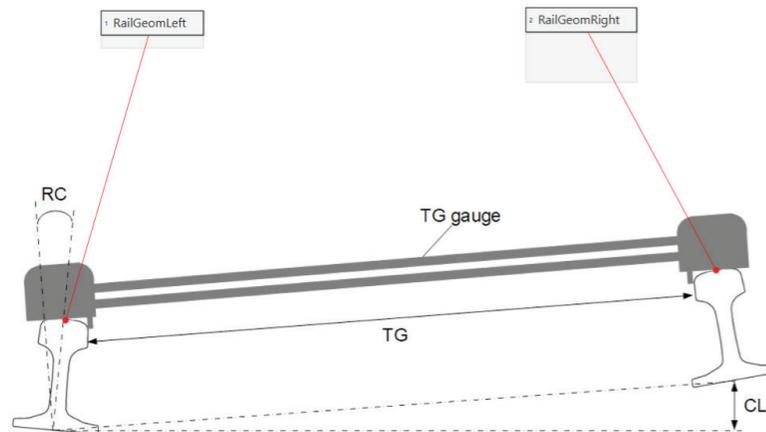
## Module: Track geometry measurement

### Application

Track geometry data provide a significant contribution to track and train safety. For example, they are included in the calculation of the maximal possible speed on a track. By analysing this data, irregularities of a track can be detected, maximal possible train speeds predefined, or maintenance work initiated. Even if the inspection of the track geometry with track measuring vehicles leads to missing or invalid measuring data, CALIPRI can be used as a compensatory measuring device.

CALIPRI and the track geometry module persuade through:

- Measurement of both track rails without turning the gage around (single gage positioning)
- Direct calculation of twist (height difference)
- Multiple applications: Additional measurement modules available, e.g., rail profile measurement module
- Direct data transfer via WLAN, instead of USB stick or SD card transfer
- Flexible interfaces for data export
- Low weight
- Patented CALIPRI Principle
- Accuracy requirements according to DIN 13848-4:2012







Nominal track width	1435 mm   56.50 in (Measurement range: 1420 – 1485 mm   55.90 – 58.46 in)		
Maximal deflection	12°		
Net weight	3.3 kg   1165.04 oz		
Dimensions	63.3 x 4.3 x 5.7in   case 68.9 x 9.8 x 9.8 in		
Accuracy	Absolute	Repeatability	Expanded measurement uncertainty (DIN EN V 13005:1999)
Track gauge	±0.2mm   0.008 in	±0.1mm   0.004 in	0.5mm   0.019 in
Cross level ≤ 50 mm	±1.5mm   0.059 in	±0.5mm   0.019 in	1.5mm   0.059 in
Cross level > 50 mm	±2.0mm   0.079 in	±0.5mm   0.019 in	2.0mm   0.079 in
Product ID	CMM3004		

### Scope of supply and services

- Software licence Track Geometry measurement module
  - One measurement method (rail geometry)
  - By system expansion (in case of supplementary module purchase): activation via remote access
- Track geometry gage TG1435 (for standard track)
  - Mechanical gage for track geometry measurement
  - 14 mm (0.04 in) pin length (other pin lengths available upon request)
  - Delivery in hard shell case for shipping and storage

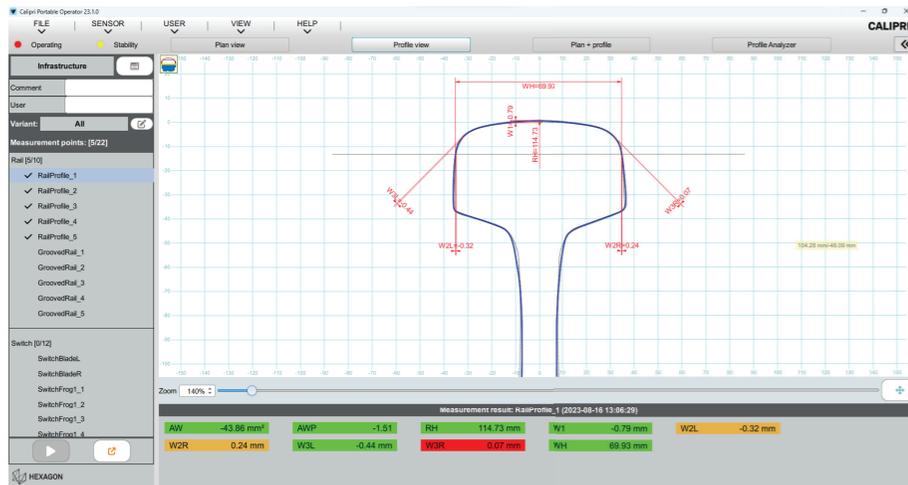
## Module: Rail profile measurement

### Application

With the Rail module it is possible to measure the complete vignole and grooved rails within a few seconds and compare them with the individual reference values. Due to various measurement methods, the Rail module is used as a part of regular maintenance measures to check the wear parameters as well as in the rail manufacturing process in the course of quality control checks.

The following 3 measurement methods are available:

- Rail Profile (Wear measurement of vignole rails)
- Grooved Rail Profile (Wear measurement of grooved rails)
- Rail Complete (Whole profile measurement of vignole rails)



Example display of the measured variables in the CALIPRI Portable Operator (CPO)





Accuracy	Absolute accuracy: <math>\pm 80 \mu\text{m}</math> Repeatability: <math>\pm 35 \mu\text{m}</math>
Requirements	Many rail types are already integrated (Detailed list available upon request)
Product ID	CMM3001

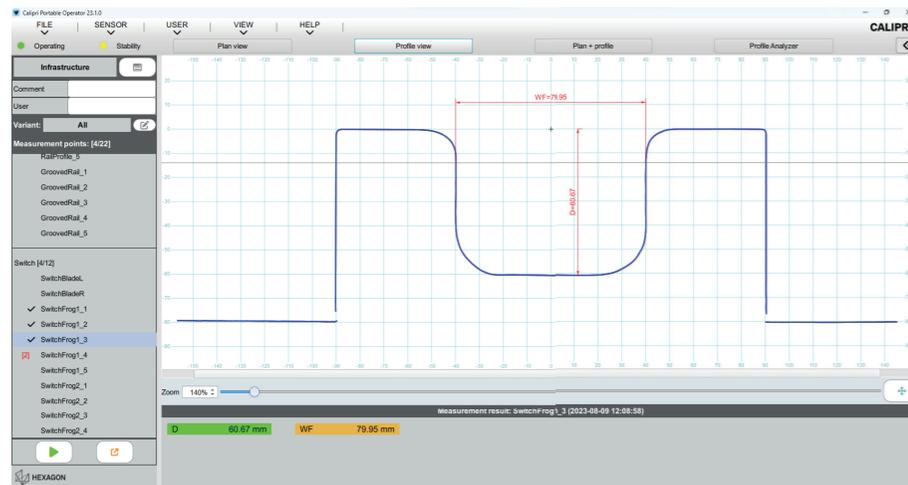
**Scope of supply and services**

- Software licence Rail profile measurement module  
(Activation through remote access possible also at a later date)

## Module: Switch profile measurement

### Application

The Switch module is used for precise measurement of switch frogs and switch blades. Important wear values like the lowering of the point of crossing are determined and compared with predefined limit values. An easy to handle and lightweight gauge (carbon fibre) facilitates thereby the sensor guidance.



Example display of the measured variables in the CALIPRI Portable Operator (CPO)





Package size	100 x 20 x 45 mm   4 x 0.8 x 1.8 in
Weight (Linear guidance)	3 kg   6.6 lb
Guided path (Slide)	550 mm   21.6 in
Product ID	CMM3003/C42

**Scope of supply and services**

- Software licence Switch profile measurement module
  - Activation through remote access
  - Two measurement methods (Switch Blade, Switch Frog)
- Linear guidance
  - Carbon fibre supporting gauge in hard shell case



# Automated on-track measurement of wheelsets

## Automated on-track measurement of wheelsets

CALIPRI X is an automated, permanently installed on-track wheelset measurement system for the rail industry. With 365/24/7 operation, it eliminates time-consuming and costly manual measurement, delivering precise results in seconds, immediately identifying out-of-tolerance areas.

An accurate understanding of wheel wear condition allows users to move from interval-based to condition-based maintenance – and ultimately true predictive maintenance – enabling better resource planning and significant cost savings. The non-contact optical laser system measures all wheelset parameters according to the European standard EN 15313 – including wheel profile, diameter, back-to-back distance, equivalent conicity, camber and wheel toe. According to ISO-1 the measured parameters are converted to a wheel temperature of 20°C. This ensures comparability of the results independently from outside temperatures.

Measurement with CALIPRI X couldn't be easier: a train only needs to drive slowly over a sensor unit where laser and camera modules automatically measure and record the profile of the wheels. The system is easily installed on existing tracks where trains frequently run – in front of depots, workshops, washing facilities or in sidings. This allows frequent measurements to be made without extra effort or costs. The unique temperature control and compensation system ensures high accurate results all year round.

In combination with the cloud storage and analysis tool CALIPRI Predictor, measurements are automatically and instantly stored in the cloud, saving the time and effort of the maintenance team. Together, CALIPRI X and the analytics of CALIPRI Predictor enable the safely operation of rolling stock with longer and more predictable maintenance intervals, less downtime and reduced lifecycle costs.

The solution ensures full traceability and allows secure 24/7 access to results and analytics for fleet technicians, workshop owners, maintenance workers and other company personnel, wherever they are located worldwide.

Together, CALIPRI X and CALIPRI Predictor offer an integrated solution that delivers unrivalled productivity gains and operational cost savings when maintaining rolling stock over its lifecycle.



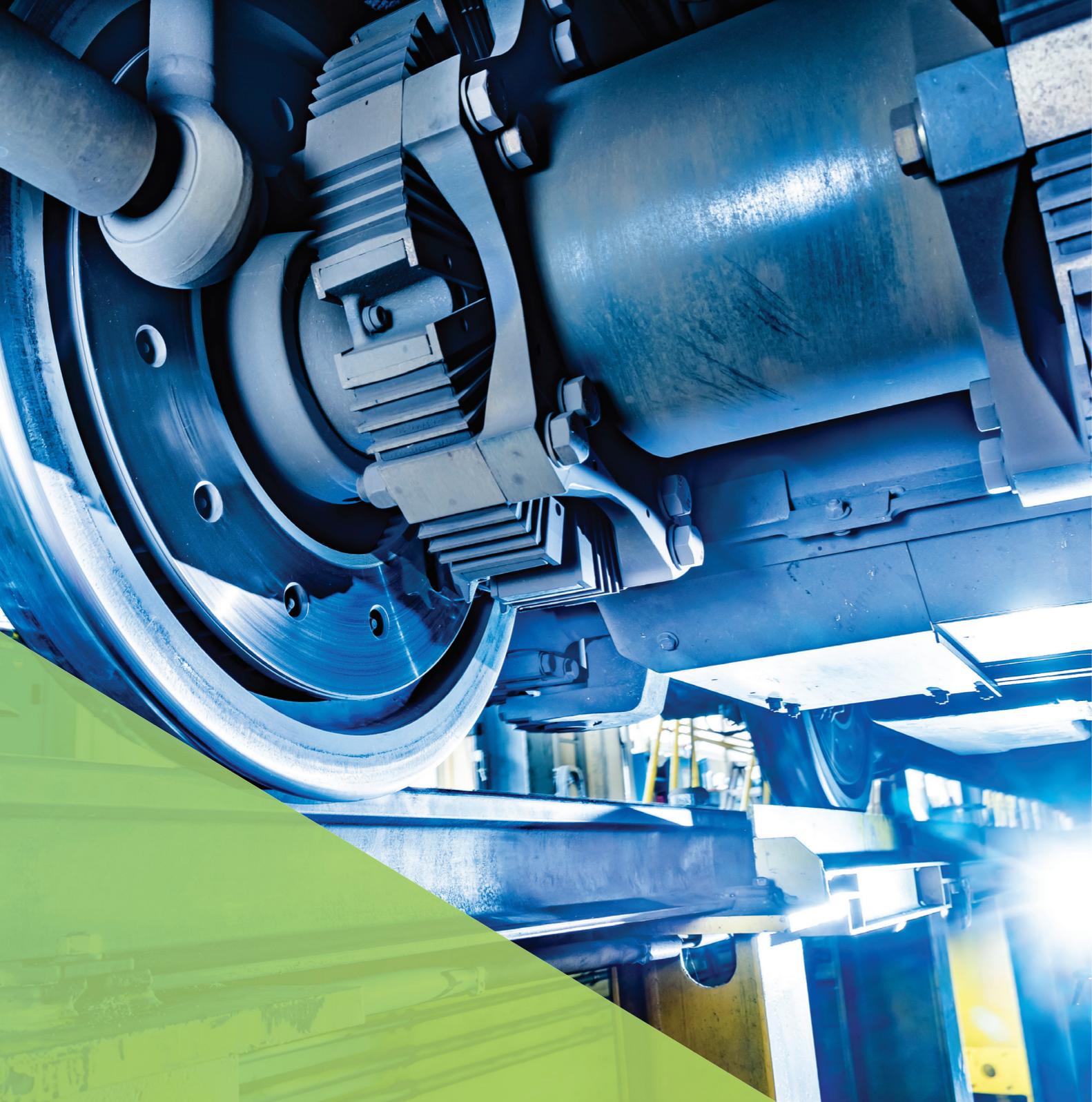




## Measured parameters

Wheel profile	
Flange height	Fh
Flange width	Fw
Flange gradient	qR
Flange angle	FAl
Hollow tread	HT
Wheel width (without rollover)	L
Roll over	RO
Wheel width with rollover	W
Wheel arris	ARR
Wheel diameter	
Rolling circle diameter	D
Wheel gauge	
Back-to-back distance	I
Wheel gauge	SR
Others	
Equivalent conicity	Ec - calculated according to EN15302 and UIC519
Wheel camber	Cam
Wheel toe	Toe
Product ID	CX1BD01

All dimensions are evaluated according to the standard EN 15313



## Simple condition assessment of all wheelsets in the fleet

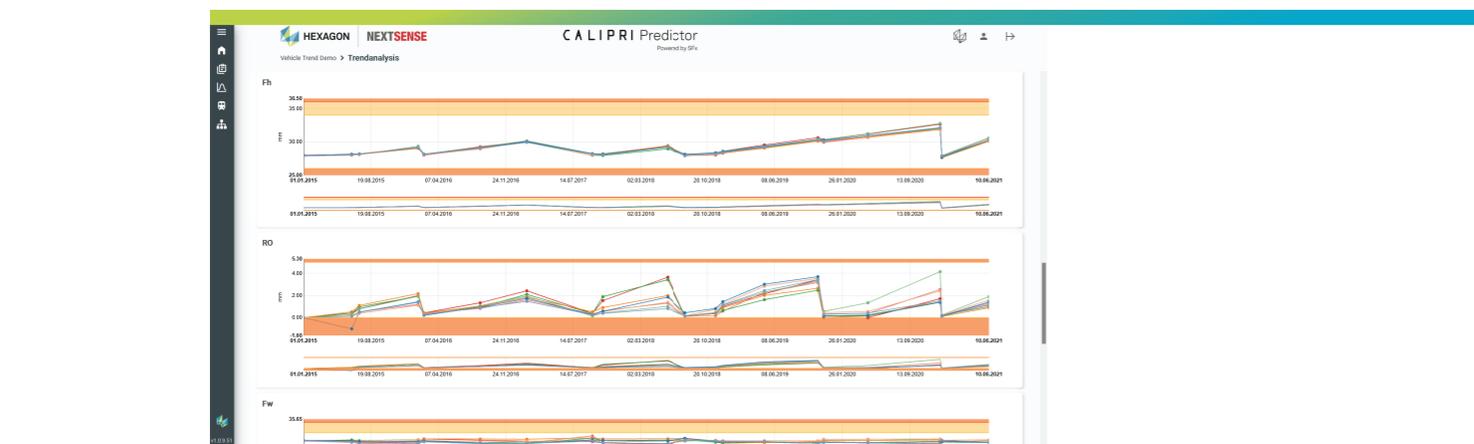


## Simple condition assessment of all wheelsets in the fleet

CALIPRI Predictor is an easy-to-use cloud storage and analysis tool for CALIPRI measurement devices. Data is securely stored, highly available, safe to access and cost effective. By predicting wear levels, the maintenance schedule can be adjusted to the condition of the vehicles, enabling the predictable and safe operation of the entire fleet.

These functions are designed for all employees, presenting the as-is condition of the fleet in a fast and easy way to fleet technicians, workshop owners, railway maintenance workers or non-technical personnel whether in the workshop, office or on the road.

Together with the measurement data from the CALIPRI measurement systems, CALIPRI Predictor generates actionable information that means the feedback loop in railway maintenance can be made more productive and cost efficient.



### Functions

Product ID CSW7020

#### Secure data storage and visualisation

- Database for CALIPRI measurements
- Review of all measurements
- Automatic data upload from CALIPRI device
- Simple user management
- Export of measurement data

#### Condition based monitoring

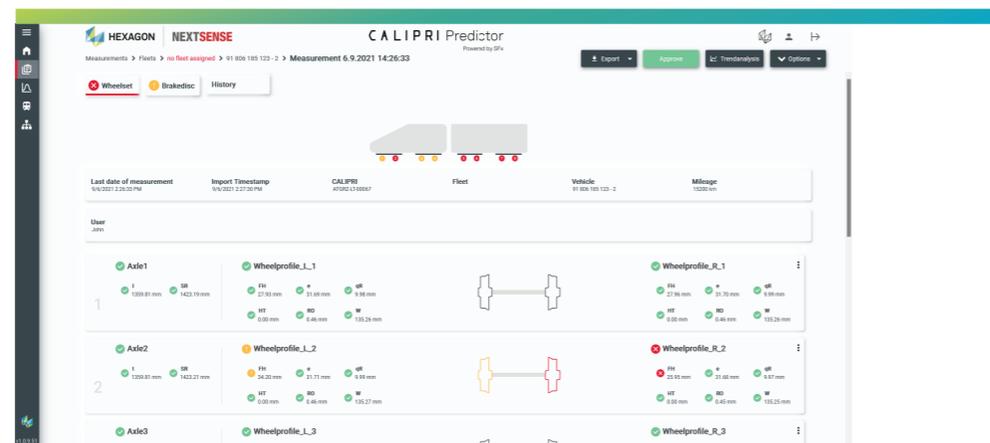
- Colourful CBM
- Reporting tools (PDF, XML)

#### Notification and share

- Email notification: events and summary
- Share measurements

#### Data and wear analysis

- Profile compare
- Trend analysis





# Handheld optical inspection solution for railway wheel profile dimensions

## Handheld optical inspection solution for railway wheel profile dimensions

CALIPRI Prime is a fully integrated optical inspection system for the precise measurement of the key railway wheel profile dimensions (height, width, qR) within a few seconds. CALIPRI Prime focuses on wheel profile measurements and thus replaces conventional mechanical gauges.

With CALIPRI Prime, errors caused when attaching bulky instruments and variations from using wheel profile wear gauges or templates are a thing of the past. CALIPRI Prime uses laser light section technology too, where a camera/laser unit in the measurement device records the cross-section profile of a wheel without having to manually attach it. The device's embedded software evaluates wheel profile dimensions (flange height, width, qR, hollow tread, etc.) according to preset limit values. All wheel profile dimensions are evaluated according to the standard EN 15313 and are displayed on the sensor screen within a few seconds, which are also available for digital transfer to PC if needed. Additional functions, such as colour highlighting of out-of-tolerance areas. The base functions of CALIPRI Prime can be extended with optionally available upgrades like self-test tools or tyre thickness measurement capabilities.

CALIPRI Prime is typically used for train wheel measurement in maintenance applications in service shops, stations or in the field. It is a compelling replacement for mechanical gauges and fixtures for several wheel measurement applications, reducing total cost and improving accuracy.





Dimensions	64 x 63 x 164 mm   2.51 x 2.48 x 6.46 inch
Weight	590 g   20.81 oz
Measurements per battery recharge	> 300
Display	2.4-inch TFT LCD
Laser	660 nm, class 2M
Degree of protection	IP54
Accuracy	Absolute accuracy: < $\pm 80 \mu\text{m}$ Repeat accuracy: < $\pm 35 \mu\text{m}$
Product ID	CP1BD01

**Scope of supply and services**

- Sensor including Prime Center Software
- Battery, AC adaptor and USB cable
- Belt clip
- Instruction manual
- Shipping and storage case

# CALIPRI Prime add-ons

Reference object add-on	
Calibrated wheel profile for the regular check of the CALIPRI Prime	
Product ID	CAO4001
Adjustment add-on	
Calibrated reference standard for independent adjustment of the CALIPRI Prime	
Product ID	CAO4002
Wheel profile add-on	
Measurement of the entire wheel profile (hollow tread, rollover, wheel width)	
Product ID	CAO4004
Tyre Thickness add-on	
Measurement of Tyre Thickness (Tyre thickness, inner and outer)	
Product ID	CAO4007
Tolerances add-on	
Definition of limit dimensions for graphic display if lower/upper limits are exceeded	
Product ID	CAO4003
Profile Export add-on	
The recorded profile curve can be exported via Prime Center	
Product ID	CAO4006
Endurance add-on	
Two additional batteries and an external battery charger	
Product ID	CAO4101

System requirements for CALIPRI Prime Center Software:  
 Windows 7 SP1, 8.1 or 10 with .net Framework 4.5 installed and Internet connection.





## Add-ons | Services | Spare parts

# Add-ons

## BS3 - Combined Brake Disc Gauge

Combined gauge for use at the outer and inner face of wheel-mounted brake discs	
<b>Compatibility</b>	CALIPRI C42
<b>System requirement</b>	Measurement module: Brake disc
<b>Product ID</b>	CAO2031

## Calibrated Wheel Profile

Reference standard for verification of the accuracy of CALIPRI C42; including calibration certificate

<b>Compatibility</b>	CALIPRI C42
<b>System requirement</b>	-
<b>Product ID</b>	CAO9050

## CALIPRI DataViewer

Reference standard for verification of the accuracy of CALIPRI C42; including calibration certificate

<b>Compatibility</b>	CALIPRI C42
<b>System requirement</b>	-
<b>Product ID</b>	CSW9010/R

## CALIPRI Manager - User licence

Software tool used to generate measurement plans (to be installed on office PC)

<b>Compatibility</b>	CALIPRI C42
<b>System requirement</b>	-
<b>Product ID</b>	CSW1008

## CALIPRI Predictor - Measurements Package Handheld

Extension of CALIPRI Predictor by additional up to 3000 measurements in the current licence year

<b>Compatibility</b>	CALIPRI Predictor
<b>System requirement</b>	-
<b>Product ID</b>	CSW7050

## CALIPRI Predictor - Standard - Additional Device

Extension of an existing CALIPRI Predictor licence by another handheld device and up to 3000 additional measurements (yearly subscription)

<b>Compatibility</b>	CALIPRI Predictor
<b>System requirement</b>	-
<b>Product ID</b>	CSW7021

## CALIPRI X - Track occupancy signal

Extension with additional sensors for detecting the track occupancy in the area of the CALIPRI X measuring system. This controls the start and end of a measurement

<b>Compatibility</b>	CALIPRI X
<b>System requirement</b>	-
<b>Product ID</b>	CAO4502

## Panasonic 4-Bay battery charger (FZ-G2)

External charging unit for up to 4 batteries of the tablet PC of CALIPRI C42 (tablet type: FZ-G2)

<b>Compatibility</b>	CALIPRI C42
<b>System requirement</b>	-
<b>Product ID</b>	CAO3012

## Panasonic Docking Station (FZ-G2)

Port replicator to extend tablet PC with several interfaces, e.g. USB3.0, HDMI, LAN, ..

<b>Compatibility</b>	CALIPRI 42
<b>System requirement</b>	-
<b>Product ID</b>	CAO3013

## Prime Add On - Adjustment

Extension of CALIPRI Prime by an adjustment set, including calibration certificate

<b>Compatibility</b>	CALIPRI Prime
<b>System requirement</b>	-
<b>Product ID</b>	CAO4002

## Prime Add On - Endurance

CALIPRI Prime extension pack for continuous operation. Consists of 2x batteries and one external battery charger

<b>Compatibility</b>	CALIPRI Prime
<b>System requirement</b>	-
<b>Product ID</b>	CAO4101

## Prime Add On - Profile export

Extension of one CALIPRI Prime that enables the export of the recorded profile point clouds for further analyses

<b>Compatibility</b>	CALIPRI Prime
<b>System requirement</b>	-
<b>Product ID</b>	CAO4006

## Prime Add On - Reference object

Calibrated wheel profile for sensor check, incl. calibration certificate (reference values) and case

<b>Compatibility</b>	CALIPRI Prime
<b>System requirement</b>	-
<b>Product ID</b>	CAO4001

## Prime Add On - Tolerances

Extension of one CALIPRI Prime by tolerance limits for measurement result classification displayed at sensor (red/yellow/green indicators)

<b>Compatibility</b>	CALIPRI Prime
<b>System requirement</b>	-
<b>Product ID</b>	CAO4003

## Prime Add On - Tyre Thickness

Extension of one CALIPRI Prime to measure the TyreThickness (additional dimension: tyre thickness). Incl. gauge: RD2-820

<b>Compatibility</b>	CALIPRI Prime
<b>System requirement</b>	-
<b>Product ID</b>	CAO4007

## Prime Add On - Wheelprofile

Extension of one CALIPRI Prime to measure the entire wheel profile (add. dimensions: width, hollow tread, rollover)

<b>Compatibility</b>	CALIPRI Prime
<b>System requirement</b>	-
<b>Product ID</b>	CAO4004

## RD2-820-15-ANT - Tyre Thickness Gauge

Supporting gauge for tyre thickness measurements (antenna-type). Length of the gauge shanks: 15 mm (0.6")

<b>Compatibility</b>	CALIPRI C42
<b>System requirement</b>	Measurement module: Tyre Thickness
<b>Product ID</b>	CAO2018

## RD2-820-30-ANT - Tyre Thickness Gauge

Supporting gauge for tyre thickness measurements (antenna-type). Length of the gauge shanks: 30 mm (1.2")

<b>Compatibility</b>	CALIPRI C42
<b>System requirement</b>	Measurement module: Tyre Thickness
<b>Product ID</b>	CAO2019

## RD5-760 - Tyre Thickness Gauge

Supporting gauge for tyre thickness measurements for bevelled reference edges (30° - 40°)

<b>Compatibility</b>	CALIPRI C42
<b>System requirement</b>	Measurement module: Tyre Thickness
<b>Product ID</b>	CAO2027

## RDBR 500 Gauge

Supporting gauge for tyre thickness measurements including a reference plane for worn wheels

<b>Compatibility</b>	CALIPRI C42
<b>System requirement</b>	Measurement module: Tyre Thickness
<b>Product ID</b>	CAO2008

## RDBR 500LE Gauge

Supporting gauge for tyre thickness measurements including a reference plane for worn wheels (LE-type)

<b>Compatibility</b>	CALIPRI C42
<b>System requirement</b>	Measurement module: Tyre Thickness
<b>Product ID</b>	CAO2020

## RDBR 500TF Gauge

Supporting gauge for tyre thickness measurements including a reference plane for worn wheels (TF-type)

<b>Compatibility</b>	CALIPRI C42
<b>System requirement</b>	Measurement module: Track geometry
<b>Product ID</b>	CAO2028

## RDBR 760 Gauge

Supporting gauge for tyre thickness measurements including a reference plane for worn wheels

<b>Compatibility</b>	CALIPRI C42
<b>System requirement</b>	Measurement module: Tyre Thickness
<b>Product ID</b>	CAO2024

# Services

CALIPRI C4X User Training	
Training for operators for an optimal use of CALIPRI devices	
Compatibility	CALIPRI C42, CALIPRI Prime
System requirement	-
Product ID	CSM2011/RAW1
CALIPRI Online Training	
Remote training for an optimal use of CALIPRI devices	
Compatibility	CALIPRI C42, CALIPRI Prime
System requirement	-
Product ID	CSM2013
CALIPRI Software Update (Portable devices)	
Installation of the latest CALIPRI Software including measurement module updates	
Compatibility	CALIPRI C42
System requirement	-
Product ID	CSM2001
CALIPRI Support Ticket	
Handling of one support ticket via hotline or email	
Compatibility	CALIPRI C42, CALIPRI Prime
System requirement	-
Product ID	CSM2002
CALIPRI X - Service Package Standard	
Annual service flat rate for long-term availability of the CALIPRI X measuring system	
Compatibility	CALIPRI X
System requirement	-
Product ID	CSM1203
Recalibration Service	
Recalibration of one item (sensor, gauge, reference standard) incl certificate	
Compatibility	CALIPRI C42, CALIPRI Prime
System requirement	-
Product ID	CSM3008/C4x

Recalibration Service "CALIPRI C42 - end to end"	
Recalibration of a CALIPRI C42 device including reference standard calibration and end-to-end tests	
Compatibility	CALIPRI C42
System requirement	-
Product ID	CSM3008/E2E
Service Package Light	
Support and many services at an overall price. Without calibrations	
Compatibility	CALIPRI C42
System requirement	-
Product ID	CSM1008
Service Package Plus	
Support and many services at an overall price. Calibration of reference standard and gauges included	
Compatibility	CALIPRI C42
System requirement	-
Product ID	CSM1004/C4P
Service Package Standard	
Support and many services at an overall price. Calibration of reference standard included	
Compatibility	CALIPRI C42
System requirement	-
Product ID	CSM1004/C4X
Panasonic 4-Bay battery charger (FZ-G2)	
External charging unit for up to 4 batteries of the tablet PC of CALIPRI C42 (tablet type: FZ-G2)	
Compatibility	CALIPRI C42
System requirement	-
Product ID	CAO3012



# Spare parts

AR1360EL - Back To Back Distance Gauge (type: EL)	
Foldable gauge for measuring back-to-back distances	
Compatibility	CALIPRI C42
System requirement	Measurement module: Back-to-back distance
Product ID	CAO2012

AR1360ELM - Back To Back Distance Gauge (type: ELM)	
Monoblock gauge for measuring back-to-back distances	
Compatibility	CALIPRI C42
System requirement	Measurement module: Back-to-back distance
Product ID	CAO2013

Battery for wireless CALIPRI sensors	
Battery for CALIPRI C42 and CALIPRI Prime sensors	
Compatibility	CALIPRI C42
System requirement	-
Product ID	CAO3301

BR600 - BR Sheet	
Supporting gauge for wheel profile measurements at worn wheels	
Compatibility	CALIPRI C42
System requirement	Measurement module: Wheel profile
Product ID	CAO2009

BS1-500 - Brake Disc Gauge	
Supporting gauge for axle mounted brake discs	
Compatibility	CALIPRI C42
System requirement	Measurement module: Brake disc
Product ID	CAO2007

C42 Sensor set	
CALIPRI C42 sensor plus one battery	
Compatibility	CALIPRI C42
System requirement	-
Product ID	CAO1007/CS

Calibration standard for CALIPRI C42	
Recalibration of one item (sensor, gauge, reference standard) incl certificate	
Compatibility	CALIPRI C42
System requirement	-
Product ID	CAO1031

Calibration standard TZ25 (PRIME)	
Calibration standard for CALIPRI C42	
Compatibility	CALIPRI Prime
System requirement	-
Product ID	CAO1036

D1050 - Wheel Diameter Gauge	
Measurement module: Wheel diameter	
Compatibility	CALIPRI C42
System requirement	-
Product ID	CAO2004

D1350 - Wheel Diameter Gauge	
Diameter gauge for flange diameters from ø 970 - 1350 mm   3'2" - 4'5"	
Compatibility	CALIPRI C42
System requirement	Measurement module: Wheel diameter
Product ID	CAO2005

D750 - Wheel Diameter Gauge	
Diameter gauge for flange diameters from ø 470 - 750mm   1'6" - 2'5"	
Compatibility	CALIPRI C42
System requirement	Measurement module: Wheel diameter
Product ID	CAO2003

External battery charger for sensor batteries	
External charging unit for one CALIPRI sensor battery	
Compatibility	CALIPRI C42, CALIPRI Prime
System requirement	-
Product ID	CAO3302

IK1-Trigger Wedge	
Supporting gauge for runout measurements	
Compatibility	CALIPRI C42
System requirement	Measurement module: Radial/Axial Run-Out
Product ID	CAO2010

Magnetic measuring stand for C42 sensor	
Holds the sensor during runout measurements	
Compatibility	CALIPRI C42
System requirement	Measurement module: Radial/Axial Run-Out
Product ID	CAO2017/C42

Panasonic - Digitizer Pen (FZ-G2)	
To work at the touch screen of the tablet PC	
Compatibility	CALIPRI C42
System requirement	-
Product ID	CAO3014

Panasonic Battery (FZ-G2)	
Battery for tablet PC of CALIPRI C42 (tablet type: FZ-G2)	
Compatibility	CALIPRI C42
System requirement	-
Product ID	CAO3014

Panasonic Battery Charger + Power Supply (FZ-G2)	
Charging unit for tablet PC of CALIPRI C42 (tablet type: FZ-G2)	
Compatibility	CALIPRI C42
System requirement	-
Product ID	CAO3014

RD2-820-15 - Tyre Thickness Gauge	
Supporting gauge for tyre thickness measurements. Length of the gauge shanks: 15 mm (0.6")	
Compatibility	CALIPRI C42
System requirement	Measurement module: Tyre Thickness
Product ID	CAO2014

RD2-820-30 - Tyre Thickness Gauge	
Supporting gauge for tyre thickness measurements. Length of the gauge shanks: 30 mm (1.2")	
Compatibility	CALIPRI C42
System requirement	Measurement module: Tyre Thickness
Product ID	CAO2015

RD3-820 - Tyre Thickness Gauge	
Supporting gauge for tyre thickness measurements	
Compatibility	CALIPRI C42
System requirement	Measurement module: Tyre Thickness
Product ID	CAO2006

Switch linear guidance (C42)	
Supporting gauge for switch measurements	
Compatibility	CALIPRI C42
System requirement	Measurement module: Switch
Product ID	CAO2022

Track geometry gauge TG1435	
Track geometry gauge for normal tracks (1435mm)	
Compatibility	CALIPRI C42
System requirement	Measurement module: Tyre Thickness
Product ID	CAO2030

USB cable and power plug for CALIPRI sensors	
For charging the inserted sensor battery	
Compatibility	CALIPRI C42, CALIPRI Prime
System requirement	-
Product ID	CAO3303

Wrist strap for CALIPRI sensors	
Prevents the sensor from dropping	
Compatibility	CALIPRI C42, CALIPRI Prime
System requirement	-
Product ID	CAO3304



Hexagon is a global leader in digital reality solutions, combining sensor, software and autonomous technologies. We are putting data to work to boost efficiency, productivity, quality and safety across industrial, manufacturing, infrastructure, public sector, and mobility applications.

Our technologies are shaping production and people-related ecosystems to become increasingly connected and autonomous – ensuring a scalable, sustainable future.

Hexagon's Manufacturing Intelligence division provides solutions that use data from design and engineering, production and metrology to make manufacturing smarter.

Learn more about Hexagon (Nasdaq Stockholm: HEXA B) at [hexagon.com](https://www.hexagon.com) and follow us [@HexagonAB](https://twitter.com/HexagonAB).