



Vogel & Plötscher

Track and switch  
measurement devices

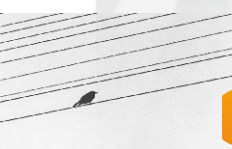
# RCAD

Digital switch gauge and cant measurement device

Vogel & Plötscher



➤ Switch Measurement



➤ Track Bed



➤ Track Gauge



➤ Digital

## RCAD: Practical, precise, digital

Our RCAD digital switch gauge and cant measuring device combines maximum precision and reliability with outstanding ease of use.

All measured values are clearly displayed on a central LCD display. The integrated back light on the display enables work to be carried out in darkness. This helps reduce reading errors and inaccuracies.

The proven V&P measuring technology guarantees high measurement resolution (0.1 mm). The RCAD also meets the highest standards in terms of repeatability and measurement uncertainty ( $\leq 0.25$  mm), and is also **approved by DB**.

The device is extremely ergonomic and features just two control elements: Push buttons and a fine adjustment knob. It can be operated for up to 120 hours using two conventional AA batteries (1.5 volt).

Taking digital measurements with the RCAD is even more efficient and safe for day-to-day operations – especially compared with analogue measuring devices.

RCAD is available in a number of variants with different features :

### Variant: RCAD-BT

RCAD measuring device with data storage function and Bluetooth (including software). Measured values are stored in the measuring device at the touch of a button and then transmitted to a computer via Bluetooth.



Optional RCAD-BT

### Variant: RCAD-SD

RCAD measuring device equipped with data storage function and SD card (including software). Measured values are stored on the SD card at the push of a button and can then be transferred to a computer using the card.



Optional RCAD-SD

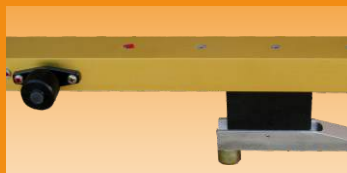
## ➤ Measuring parameters and ranges

	Gauge 1435 mm	Gauge 1000 mm
Track gauge (mm)	1367 – 1475	932 – 1040
Flangeway clearance (mm)	20 – 128	20 – 128
Check-rail gauge (mm)	1347 – 1455	912 – 1020
Back-to-back distance (mm)	1327 – 1435	892 – 1000
Cant (mm)	$\pm 200$	$\pm 200$

### Notes:

Other track gauges are available on request.

The measuring device is insulated and approved by Deutsche Bahn (DB).



Narrow contact with fine adjustment knob (including clutch torque mechanism)



Broad contact with power supply



Adapter for checking switch blades (optional)



Fully insulated GRP model (optional)



Transport case (option)





Vogel & Plötscher

# User Manual

## RCAD





# Table of Contents

Table of Contents .....	2
1. Introduction .....	4
1.1 Intended use .....	4
1.2 Standard supply package .....	4
2. Functional components .....	5
3. Start-up .....	7
3.1 Safety instructions.....	7
3.2 Preparations .....	7
3.2.1 Initial start .....	7
3.2.2 Illumination.....	7
3.3 Checking measurement sensors .....	8
3.3.1 Track gauge sensor (minimum gauge check) .....	8
3.3.2 Initialization of gauge sensor .....	9
3.3.3 Inclination sensor (roll-over test) .....	9
3.3.4 Initialization of inclination sensor .....	10
4. Measurement practice.....	11
4.1 Application on the track.....	11
4.1.1 Wide measuring support .....	11
4.1.2 Narrow measuring support .....	12
4.2 Parameters .....	13
4.2.1 Track gauge measurement.....	13
4.2.2 Flangeway clearance measurement.....	13
4.2.3 Check rail gauge measurement.....	13
4.2.4 Measuring of check rail gauge with broad measurement base (optional).....	14
4.2.5 Back-to-back distance measurement .....	15
4.2.6 Cant measurement .....	15
5. Maintenance instructions.....	16
5.1 Care.....	16
5.2 Storage and transportation .....	16
5.3 Battery replacement.....	17
6. Technical data.....	18
6.1 RCAD – 1435 mm.....	18
6.2 RCAD – 1000 mm.....	19
6.3 RCAD – 1067 mm.....	20
6.4 RCAD – 1524 mm.....	21

6.5 RCAD – 1668 mm.....	22
7. EC Declaration of Conformity.....	23
8. Miscellany .....	24
9. Add-ons and options .....	25
9.1 Data storage and Bluetooth (= option -BT) .....	25
9.2 Data storage on SD card (= option -SD) .....	25
9.3 Switch tongue control adapter (option -P).....	26
9.4 Cogwheel operation (option -ZB).....	26
9.5 Frog tip inclination (option -H) .....	27
9.6 Check rail height measuring device (option -RH) .....	27
9.7 Interchangeable probes (option -W).....	28
9.8 Transport case.....	28

Notes

*The company and brand names used in this document are generally protected by trademark or patent law.*

*All technical data provided in this manual was acquired, collated and verified with the greatest care and diligence. Since the possibility of error cannot be entirely ruled out, however, we hereby advise that we provide no guarantee as to the accuracy of the technical data, nor will we accept any legal responsibility or liability of any kind for the consequences of any incorrect data or information given.*

*Vogel & Plötscher GmbH & Co. KG reserves the right to make changes to the product, the software and this manual. Any such changes are made for the sole purposes of ongoing technical development.*

# 1. Introduction

## 1.1 Intended use

RCAD is an electronic track and switch measurement device for checking vignole and grooved rails on railways. In general the following parameters can be measured:

- Track gauge
- Check rail gauge
- Flangeway clearance
- Back-to-back distance
- Cant

Depending on the technical design and configuration options, RCAD can be used to measure and record a range of different measurement variables. Data is acquired within the specified measuring ranges and tolerances (→ chapter 6).

Users must be properly trained and qualified to use the measurement device. Consequently, users are advised to undergo a practical induction course by V&P or someone authorised by V&P to supplement the information provided in this user manual.



*If RCAD is not used in accordance with this requirement, safe operation of the measurement system cannot be guaranteed. Users themselves, not V&P, are responsible for any resultant injury or damage to property.*

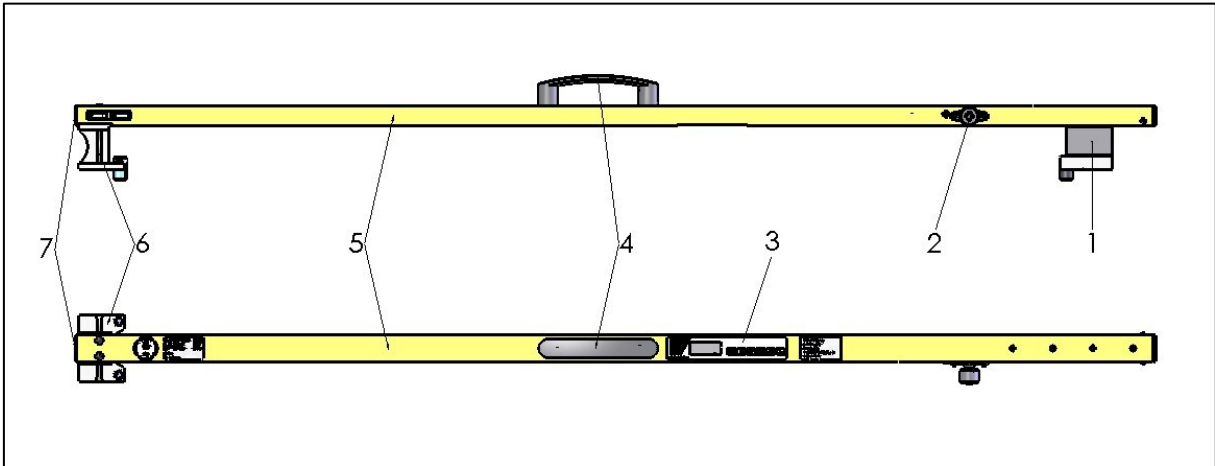
## 1.2 Standard supply package

- 1 x Digital measuring device RCAD
- 2 x Rechargeable batteries type AA
- 1 x User manual

## 2. Functional components

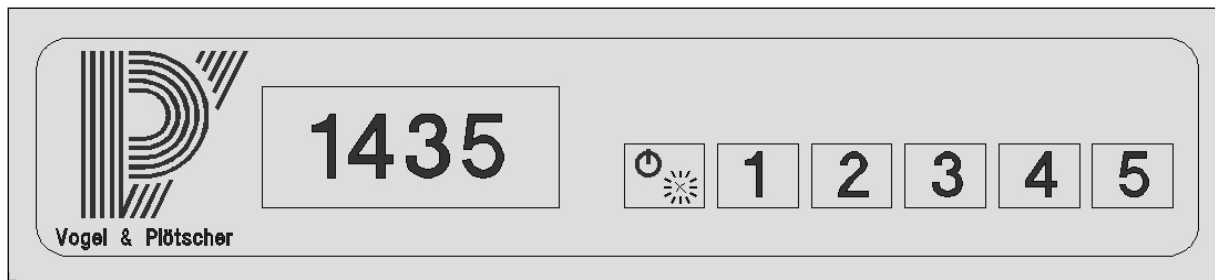
The measurement device comprises the following functional components:







**Fig. 1:**



#	Designation
1	Narrow support (moveable)
2	Adjusting knob (incl. clutch-mechanism)
3	Display with keypad
4	Handle
5	Base frame
6	Wide support
7	Battery box

Fig. 2:



Key	Mode	Function
	Device ON   OFF Illumination ON   OFF	Press button for ~ 1 second to switch device on. (*) For switching off press <u>and hold</u> button.
	Cant	Press button to read the current cant value. Press and hold button for 5 seconds to start the cant initialization.
	Flangeway clearance	Press button for starting measurement of the flangeway clearance. (default initial value is 20 mm = diameter of the probe).
	Check-rail gauge	Press button to read the current check-rail gauge value.
	Back-to-back distance	Press button to read the current back-to-back distance.
	Track gauge	Press button to read the current track gauge value.

(\*) *Background illumination will be enabled (disabled) if ON/OFF button is pressed again while device is already switched on.*



*Activated background illumination of the display will stress the batteries and shorten operation time.*



## 3. Start-up

### 3.1 Safety instructions

RCAD is a state-of-the-art system, assuring a high degree of reliability.

However, that reliability can only be attained in practice if all the necessary measures are taken. It falls within the duty of care of the company operating the measuring device to ensure that those measures are taken, and to monitor their implementation.

The operating company must in particular ensure that...

1. The measuring device is used only in accordance with its intended purpose.
2. The measuring device is only operated in perfect working condition.
3. The measuring device is only operated by adequately qualified and authorised personnel.
4. This user manual is available at the place of use, and is readable and complete.



*The measuring device must be checked for visible damage prior to every measurement. It must be ensured that the measuring device is operated only when in proper working order.*

### 3.2 Preparations

To ensure correct and proper operation of the measuring device, observe the following points:

- All device components are in correct and proper condition and undamaged.
- The batteries are fully charged and/or charged replacement batteries available.

#### 3.2.1 Initial start

Press and hold the ON/OFF-button for about 1 second. The display will show the message "ON" and afterwards the current track gauge value.

#### 3.2.2 Illumination

After the device has been switched on, press ON/OFF-button again for enabling (or disabling) the background illumination of the display.

### 3.3 Checking measurement sensors



*Check the proper functioning and accuracy of the track gauge and inclination sensors before every working shift.*

#### 3.3.1 Track gauge sensor (minimum gauge check)

A reference value for the minimum gauge is imprinted on the underside of the measuring device. This reference value must be compared against the displayed actual track gauge value in measuring mode. The narrow support must be at the innermost position when doing so. The actual value should be in the range of  $\pm 0.5$  mm relative to the reference value.

In the event of variation  $> 1$  mm, you are advised to initialize the gauge sensor ( $\rightarrow$  Section 3.3.2).

#	Procedure	Details
1	Read off reference value from underside of measuring device	$\rightarrow$ Fig. 3a
2	Start-up measuring device	$\rightarrow$ section 3.2.1
3	Press button 5 on the keypad	$\rightarrow$ Fig. 2
4	Move narrow support all the way in	$\rightarrow$ Fig. 3b
5	Read off displayed actual value and compare against reference value	

**Fig. 3a**



**Fig. 3b**



### 3.3.2 Initialization of gauge sensor

#### **Procedure**

Ensure that the device is switched off. The measurement probes have to be adjusted into a distance of 1435 mm. This is best done by use of a suitable template or calibration jig. Otherwise use a ruler and set markings determining a distance of 1435 mm use. Then adjust the measurement probes according to the markings.

Press and hold button 5 on the keypad while switching on the device. Finally release button 5 as soon as the display indicates the value of 1435,0 mm.

Now perform the minimum gauge check (→ Section 3.3.1) again if the situation has been improved.

In case the initialization procedure fails to deliver any improvement, the measuring device must be checked and recalibrated at the factory.

### 3.3.3 Inclination sensor (roll-over test)

#	Procedure	Details
1	Start-up measuring device	→ Abschnitt 3.2.1
2	Press button 1 on the keypad	→ Fig. 2
3	Place measuring device correctly on track and wait about 5-10 seconds	
4	Read off and record cant value #1	
5	Rotate measuring device by 180°, place it at same track position and wait about 5-10 seconds	
6	Read off cant value #2	
7	Finally compare cant value #1 with cant value #2	

The two recorded cant values are compared. The values should not differ by more than 1,0 mm, **with an inverted preceding sign.**

In the event of a variation > 2 mm, the inclination sensor has to be initialized (→ Section 3.3.4).

### 3.3.4 Initialization of inclination sensor

#### Procedure

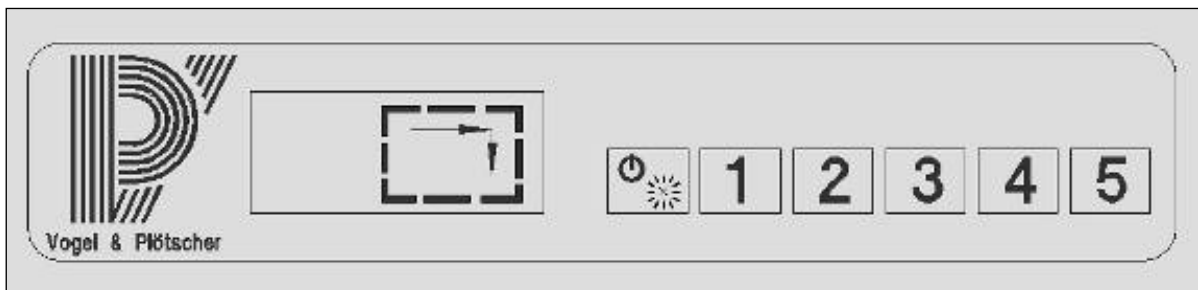
Put the device on the track and switch on the device. Press and hold button 1 until the display will show a rotating square (→ Fig. 4a).

Wait about 10 seconds then press button 1 again and wait for the rotating square is changing its running direction (→ Fig. 4b). Now lift up the device, turn it by 180° and place it on same track position again. Wait for about 10 seconds before pressing button 1 again. The new sensor setting will be saved while the current cant value is shown in the display.

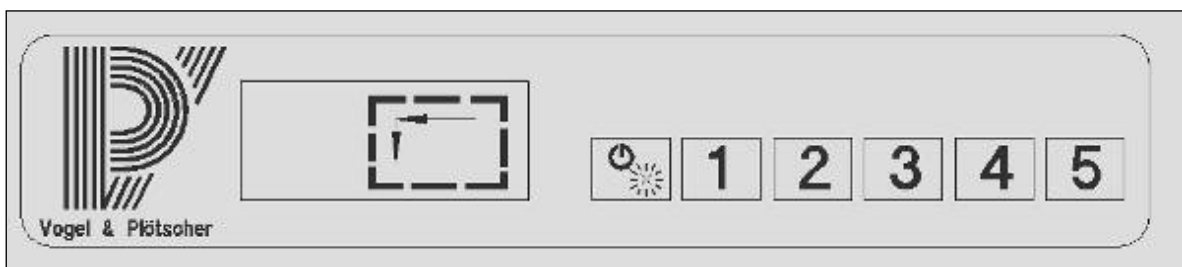
Now perform the roll-over test (→ Section 3.3.3) again to check if the situation has been improved.

In case the initialization procedure fails to deliver any improvement, the measuring device must be checked and recalibrated at the factory.

**Fig. 4a**



**Fig. 4b**



## 4. Measurement practice

### 4.1 Application on the track

#### 4.1.1 Wide measuring support



During measurement, the **two outer** measuring probes (B) of the wide measuring support must be contacting on the rail head in order to avoid measurement inaccuracy due to angle errors. (→ Fig. 5a | 5b).

Fig. 5a:

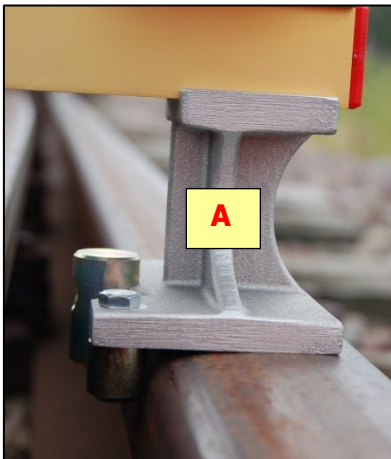
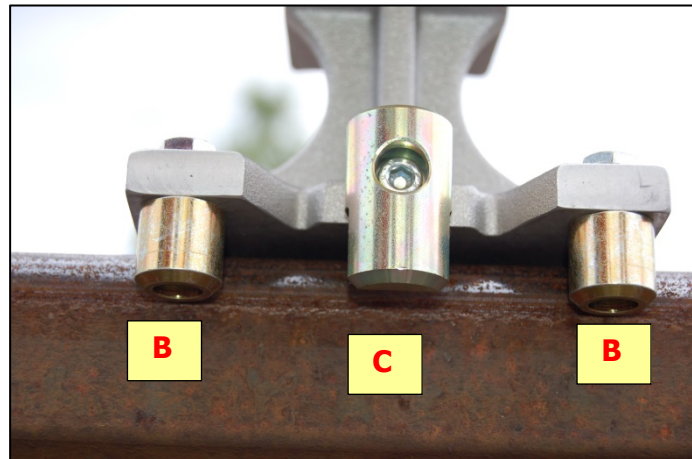


Fig. 5b:



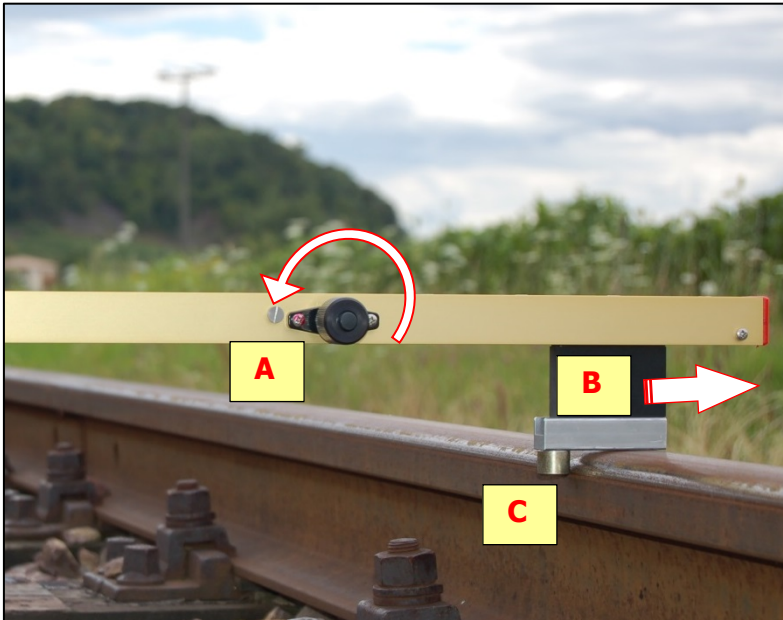
#### Legend

#	Designation
A	Wide measuring support
B	Outer measuring probes
C	Centre measuring probe (for measurements at check rail)

#### 4.1.2 Narrow measuring support

Turn the adjusting knob (A) to move the measuring probe (C) of the narrow support (B) to the rail (→ Fig. 6). The final measuring position has been reached as soon as the clutch-mechanism of the turning knob contacts the stop (= loose rotation).

**Fig. 6:**



#### Legend

#	Designation
A	Adjusting knob (incl. clutch-mechanism)
B	Narrow measuring support
C	Measuring probe

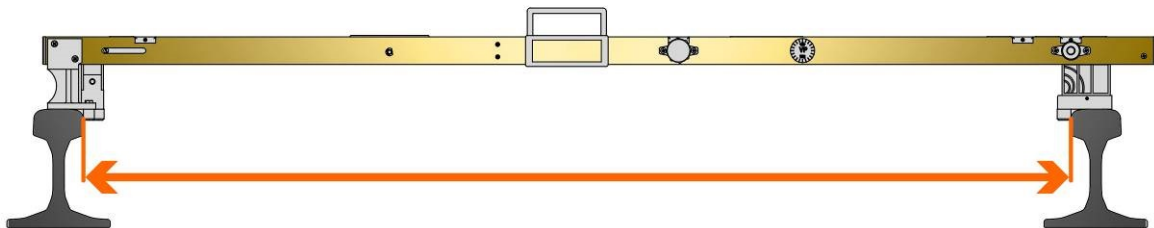


## 4.2 Parameters

### 4.2.1 Track gauge measurement

The measuring device must be correctly inserted into the track at the measuring point. Press button 5 on the keypad. With the adjusting knob, turn the measuring probe of the narrow support towards the rail head as far as it will go (Fig. 7). The measurement value can now be read.

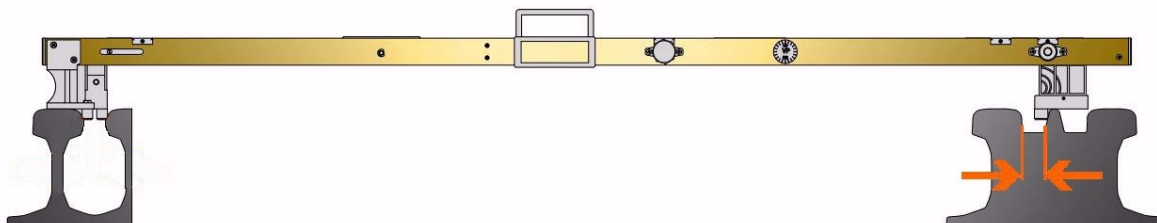
**Fig. 7:**



### 4.2.2 Flangeway clearance measurement

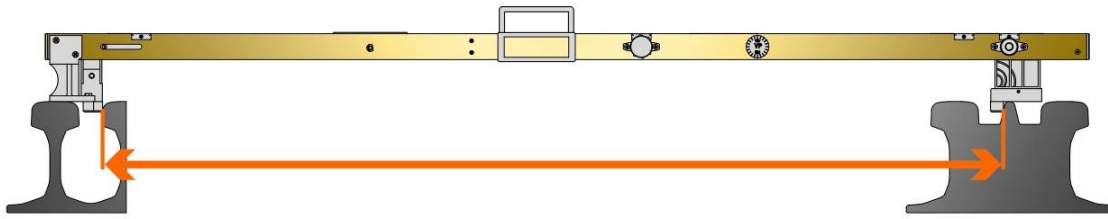
The measuring device must be correctly inserted into the track at the measuring point. Press button 2 on the keypad. With the adjusting knob, turn the measuring probe of the narrow support towards the track construction (e.g. check rail or wing rail) until the measuring probe is contacting (→ Fig. 8). The measurement value can now be read.

**Fig. 8:**



### 4.2.3 Check rail gauge measurement

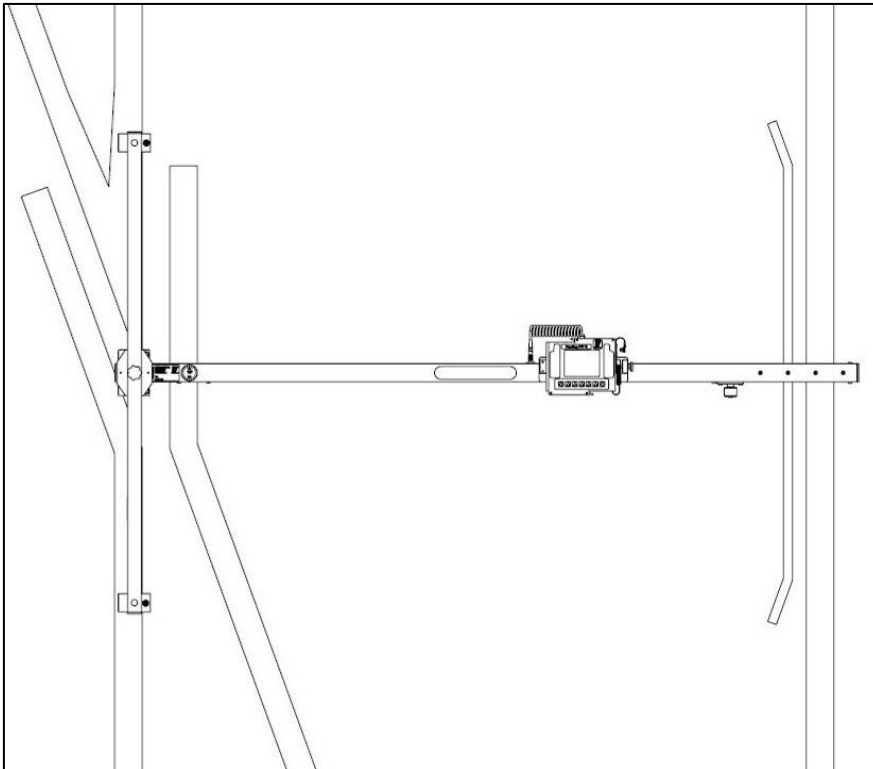
The measuring device must be correctly inserted into the track at the measuring point. Press button 3 from the keypad. Position the measuring device so that the centre measuring probe of the broad support makes contact on the inside (that is, on the check rail) (→ Fig. 9). With the adjusting knob, turn the measuring probe of the narrow support towards the crossing as far as it will go. The measurement value can now be read.

**Fig. 9**

#### 4.2.4 Measuring of check rail gauge with broad measurement base (optional)

Mount the broad measuring base on the corresponding fixture on the RCAD and fix it in place by the screw fitting. Then insert the broad measuring base in the switch on the crossing side. When doing so, bridge the tip of the crossing and the inside edge of the wing rail in front of the wing rail bend point (→ Fig. 10).

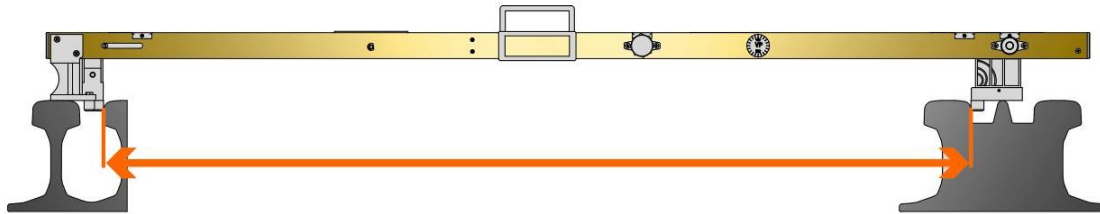
For measurement follow the instructions as explained in section 4.2.3.

**Fig. 10:**

#### 4.2.5 Back-to-back distance measurement

The measuring device must be correctly inserted into the track at the measuring point. Press button 4 from on the keypad. Position the measuring device so that the centre measuring probe of the broad support makes contact on the inside (that is, on the check rail)! With the adjusting knob, turn the measuring probe of the narrow support towards the wing rail as far as it will go (→ Fig. 11). The measurement value can now be read.

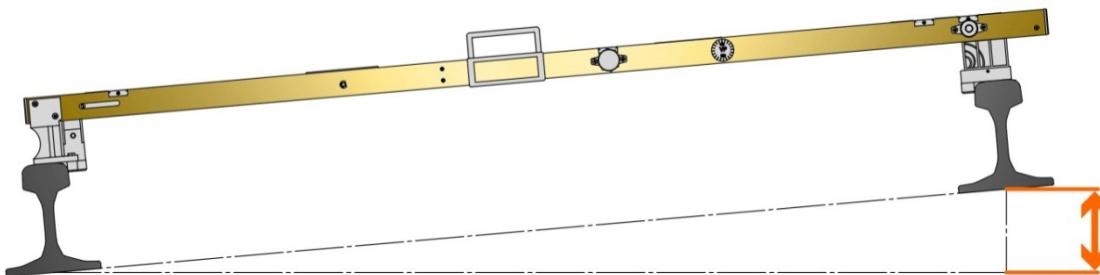
**Fig. 11:**



#### 4.2.6 Cant measurement

The measuring device must be correctly inserted into the track at the measuring point. Press button 1 on the keypad. With the adjusting knob, turn the measuring probe of the narrow support towards the rail head as far as it will go (→ Fig. 12). Wait a few seconds until the inclination sensor has come to rest, then you can read off the measurement value.

**Fig. 12:**



## 5. Maintenance instructions

### 5.1 Care

- (1) Any contamination, such as dirt, grinding dust or tar, must be removed from the measuring device and accessories (e.g. measuring probes) directly when the measurement is finished.
- (2) When operating in a damp/humid climate or in rain, be sure to dry the measuring device off before placing it back in the transport case.
- (3) Heavy impacts i.e. caused by pushing, shaking or falling down of the device may badly influence its proper operation or calibration setting and therefore has to be avoided.
- (4) A regular service and calibration duty (i.e. every 12 months) performed by V&P or any authorized V&P service partner is recommended.

### 5.2 Storage and transportation

- (1) The measuring device is best stored and transported in a suitable case (→ Section 9.8).
- (2) When transporting the case on a flat load space, secure it so that it cannot slide.
- (3) The measuring device must be dry and clean when being transported and stored in a case.
- (4) Check the measuring device for damage every time after transporting it.
- (5) When out of the transport case, the measuring device is carried by the handle mounted in the centre of the unit.

## 5.3 Battery replacement

The electronics of RCAD is supplied by two pieces of AA batteries inside. A screen message in the display (= Low Batt) will indicate to the user, if the batteries are weak and need to be replaced.

Therefore open the cover of the battery box by using a suitable tool (i.e. screwdriver, coin). Remove the empty batteries inside and insert new ones.

Note: the batteries must be inserted with the minus pole first → Fig. 13a | 13b).

Finally put on the cover and fix it again.

**Fig. 13a**



**Fig. 13b**



## 6. Technical data

### 6.1 RCAD – 1435 mm

Nominal track width
<b>1435 mm</b>

Measurement parameters	Measuring range [mm]	Resolution [mm]	Measurement uncertainty $U_{95}$ [mm]
Track gauge	1367 – 1475	0.1	$\pm 0.25$
Check rail gauge	1347 – 1455	0.1	$\pm 0.25$
Back-to-back distance	1327 – 1435	0.1	$\pm 0.25$
Flangeway clearance	20 – 128	0.1	$\pm 0.25$
Cant	$\pm 200$	0.1	$\pm 0.50$

Dimensions and weight	
RCAD (length x width x height)	~ 1618 x 100 x 156 mm
Weight RCAD	~ 2,5 kg
Transport case (length x width x height)	~ 1750 x 200 x 190 mm
Weight transport case (unloaded)	~ 7.0 kg

Operating conditions	
Ambient temperature	-10°C   +45°C
Humidity (non-condensing)	30% to 80% relative humidity
Miscellany	The measuring device is insulated.
	The measuring device is DB approved.



## 6.2 RCAD – 1000 mm

Nominal track width
<b>1000 mm</b>

Measurement parameters	Measuring range [mm]	Resolution [mm]	Measurement uncertainty $U_{95}$ [mm]
Track gauge	932 - 1040	0.1	$\pm 0.25$
Check rail gauge	912 - 1020	0.1	$\pm 0.25$
Back-to-back distance	892 - 1000	0.1	$\pm 0.25$
Flangeway clearance	20 - 128	0.1	$\pm 0.25$
Cant	$\pm 200$	0.1	$\pm 0.50$

Dimensions and weight	
RCAD (length x width x height)	~ 1183 x 100 x 156 mm
Weight RCAD	~ 2,3 kg
Transport case (length x width x height)	~ 1350 x 200 x 190 mm
Weight transport case (unloaded)	~ 6.5 kg

Operating conditions	
Ambient temperature	-10°C   +45°C
Humidity (non-condensing)	30% to 80% relative humidity
Miscellany	The measuring device is insulated.
	The measuring device is DB approved.

## 6.3 RCAD – 1067 mm

Nominal track width
<b>1067 mm</b>

Measurement parameters	Measuring range [mm]	Resolution [mm]	Measurement uncertainty $U_{95}$ [mm]
Track gauge	999 - 1107	0.1	$\pm 0.25$
Check rail gauge	979 – 1087	0.1	$\pm 0.25$
Back-to-back distance	959 – 1067	0.1	$\pm 0.25$
Flangeway clearance	20 - 128	0.1	$\pm 0.25$
Cant	$\pm 200$	0.1	$\pm 0.50$

Dimensions and weight	
RCAD (length x width x height)	~ 1250 x 100 x 156 mm
Weight RCAD	~ 2,3 kg
Transport case (length x width x height)	~ 1350 x 200 x 190 mm
Weight transport case (unloaded)	~ 6.5 kg

Operating conditions	
Ambient temperature	-10°C   +45°C
Humidity (non-condensing)	30% to 80% relative humidity
Miscellany	The measuring device is insulated.
	The measuring device is DB approved.

## 6.4 RCAD – 1524 mm

Nominal track width
<b>1524 mm</b>

Measurement parameters	Measuring range [mm]	Resolution [mm]	Measurement uncertainty $U_{95}$ [mm]
Track gauge	1456 – 1564	0.1	$\pm 0.25$
Check rail gauge	1436 – 1544	0.1	$\pm 0.25$
Back-to-back distance	1416 – 1524	0.1	$\pm 0.25$
Flangeway clearance	20 – 128	0.1	$\pm 0.25$
Cant	$\pm 200$	0.1	$\pm 0.50$

Dimensions and weight	
RCAD (length x width x height)	~ 1707 x 100 x 156 mm
Weight RCAD	~ 2,6 kg
Transport case (length x width x height)	~ 1840 x 200 x 190 mm
Weight transport case (unloaded)	~ 7.5 kg

Operating conditions	
Ambient temperature	-10°C   +45°C
Humidity (non-condensing)	30% to 80% relative humidity
Miscellany	The measuring device is insulated.
	The measuring device is DB approved.

## 6.5 RCAD – 1668 mm

Nominal track width
<b>1668 mm</b>

Measurement parameters	Measuring range [mm]	Resolution [mm]	Measurement uncertainty $U_{95}$ [mm]
Track gauge	1600 – 1708	0.1	$\pm 0.25$
Check rail gauge	1580 – 1688	0.1	$\pm 0.25$
Back-to-back distance	1560 – 1668	0.1	$\pm 0.25$
Flangeway clearance	20 – 128	0.1	$\pm 0.25$
Cant	$\pm 200$	0.1	$\pm 0.50$

Dimensions and weight	
RCAD (length x width x height)	~ 1707 x 100 x 156 mm
Weight RCAD	~ 2,6 kg
Transport case (length x width x height)	~ 1840 x 200 x 190 mm
Weight transport case (unloaded)	~ 7.5 kg

Operating conditions	
Ambient temperature	-10°C   +45°C
Humidity (non-condensing)	30% to 80% relative humidity
Miscellany	The measuring device is insulated.
	The measuring device is DB approved.

## 7. EC Declaration of Conformity

**as per Annex II A of the Machinery Directive (89/392/EC)**

**The manufacturer:**

Vogel & Plötscher GmbH + Co. KG  
Geldermannstrasse 4  
D-79206 Breisach  
Germany

**hereby declares that the measuring device described below:**

RCAD

**meets the health and safety requirements of the following EC Directives:**

Directive relating to electromagnetic compatibility 89/336/EEC (last amended by Directive 93/97/EEC)

Any design modifications which affect the technical data specified in the Operation Manual or the designated use – that is to say, which materially alter the measuring device – shall render this Declaration of Conformity invalid!

Breisach, 11. August 2020

(Rolf Herter, Managing Director)

## 8. Miscellany

If you have any questions or problems relating to the measuring device or the software, please contact your local V&P distributor or you can contact us directly at:

Vogel & Plötscher GmbH & Co. KG  
Geldermannstrasse 4  
D-79206 Breisach  
Phone: +49 (0)7667 9461 00  
Fax: +49 (0)7667 9461 20  
E-mail: [info@voploe.de](mailto:info@voploe.de)  
Web: [www.vogelundploetscher.de](http://www.vogelundploetscher.de)

Please have the following information at the ready when contacting us:

- The serial number of the measuring device
- A detailed description of your question or the problem
- Where applicable: The content of the relevant error message and/or a screenshot of it
- When the problem occurred for the first time, and in what context
- If the problem occurred just once or regularly (i.e. is reproducible)



*Unauthorised modification of the measuring device will result in Deutsche Bahn approval being rescinded and will void any guarantee or warranty claims.*



## 9. Add-ons and options

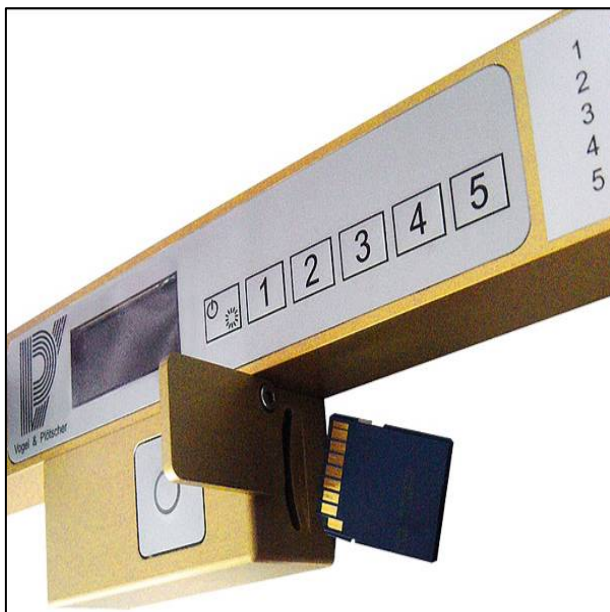
### 9.1 Data storage and Bluetooth (option -BT)

As an option RCAD can be supplied with flash memory incl. Bluetooth data transfer for storing measurement values simply by push on a button. For details please refer to extra manual RCAD-BT.



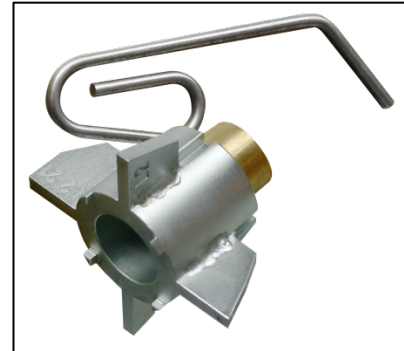
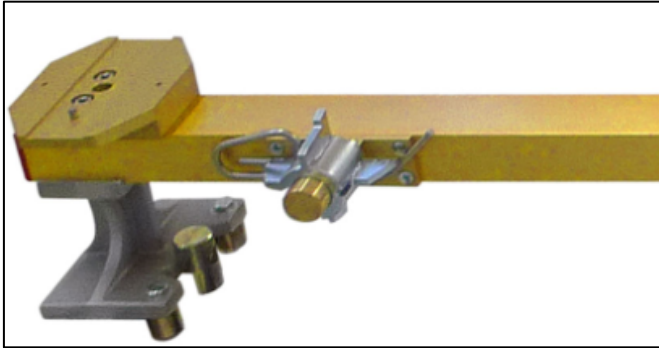
### 9.2 Data storage on SD card (option -SD)

As an option RCAD can be supplied with SD memory card for storing measurement values simply by push on a button. For details please refer to extra manual RCAD-SD.



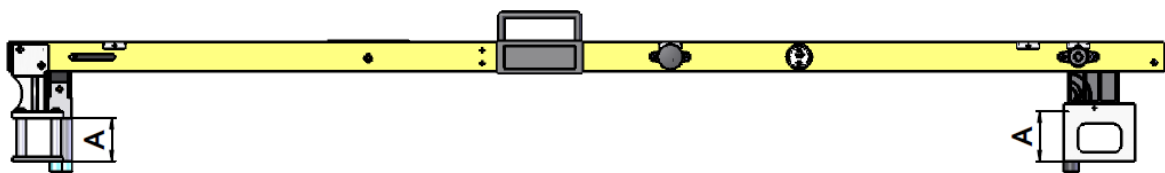
### 9.3 Switch tongue control adapter (option -P)

Detach the switch tongue inspection adapter from the retaining bolt (= hold by magnetic power) and slot it onto the measuring probe of the narrow contact. For the test conditions refer to the relevant local inspection standards.



### 9.4 Cogwheel operation (option -ZB)

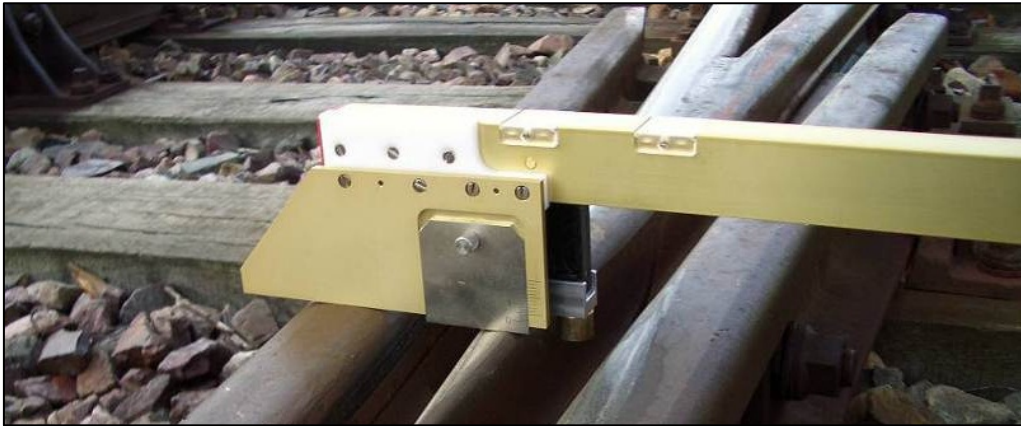
The clearance (A) between the top of the rail and the bottom of the device can be increased as required, such as to measure cogwheel rails (→ see figure below)



## 9.5 Frog tip inclination (option -H)

Position the measuring device on the crossing. Open the retainer and mount the height gauge on the crossing. Read off the measured value directly from the scale.

Default frog tip inclination measuring range: 0 – 20mm.



## 9.6 Check rail height measuring device (option -RH)

With this add-on unit the height difference between the rail surface and the check rail surface can be measured by shifting the measuring arm vertically onto the check rail.

Default measuring range: 0 – 50mm.





## 9.7 Interchangeable probes (option -W)

Interchangeable probes can be used to adapt the measuring device variably to country-specific standards and/or different rail types (e.g. vignole or grooved rail). Interchangeable probes are available as standard in the following types and lengths:

- Cylindrical measuring probes (= type Z)
- Shouldered ("mushroom") measuring probes (= type A)
- Default measuring probes lengths:  
9 | 10 | 14 | 16 mm (in each case referred to rail surface); customized lengths on request

All interchangeable probes have a screw thread and can be replaced on the measuring device by screwing in and out.



## 9.8 Transport case

Solid and well-padded case for safe transport and storage of the RCAD device.

