ERD & NSD measuring tool

Digital Effective Rim Diameter (ERD) & Nipple Seat Diameter (NSD) Measuring Device

Thank you for choosing this digital ERD / NSD measuring tool. The device is designed specifically for wheel builders who require precise, repeatable & convenient rim measurements for spoke length calculations. While it fully supports classic ERD measurement, its primary focus is Nipple Seat Diameter (NSD).

Using DRO (Digital Read-Out) electronics and precision stainless steel (inox) probes, the tool allows direct digital measurement with high resolution and minimal interpretation.

SUPPORTED: Modern rims up to 32" wheel size, with a maximum 90 mm external rim width, and accessible nipple holes allowing probe insertion for direct measurement.

Intended use

1) Measuring **Nipple Seat Diameter (NSD)** directly at the nipple bed surface inside the rim

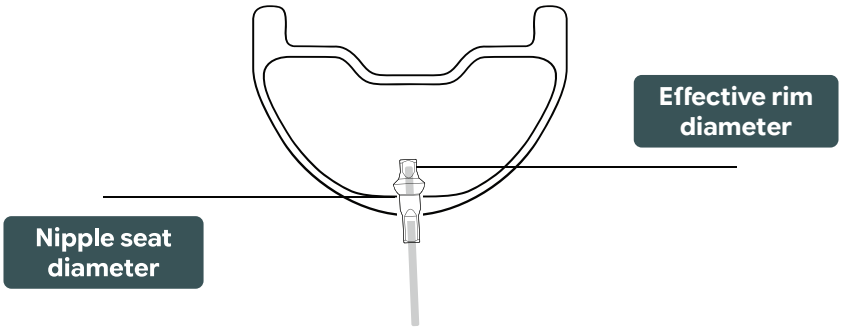
2) Measuring **Effective Rim Diameter (ERD)** for comparison with traditional specifications

Performing real-life measurements with mounted nipples, reflecting actual build conditions. The tool is optimized for professional and advanced wheel building applications.

Key concepts: ERD vs NSD

According to traditional definition - *"The ERD is that point in the rim where the end of the spoke sits."* - **Effective Rim Diameter** isn't a pure rim dimension; it's a derived measurement that quietly depends on nipple geometry and seating. Modern rims, nipple designs (DSN, hex-head, extended heads), and elastic spokes introduce significant variability.

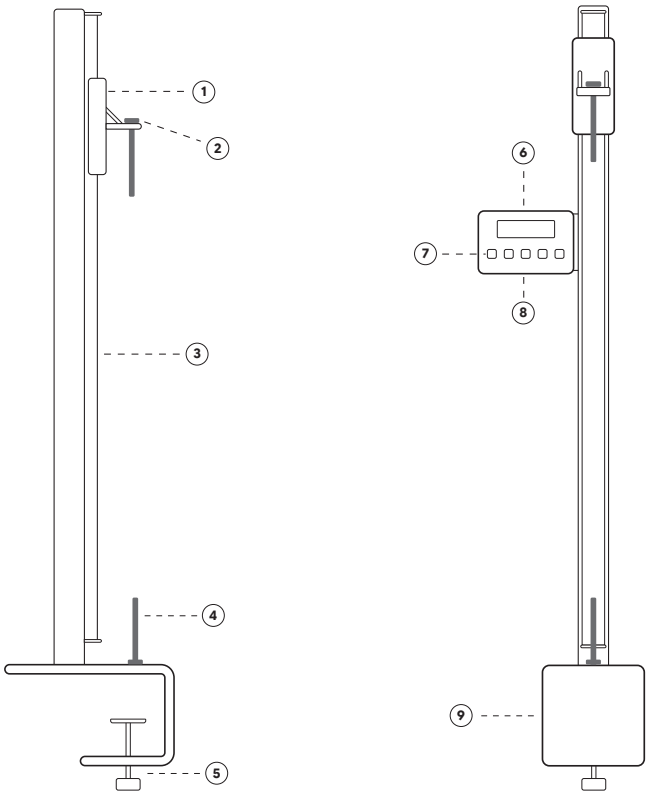
On the other hand, ***NSD (Nipple Seat Diameter)*** defines the diameter at the actual nipple seat bed, independent of nipple length or spoke type. This provides a fixed geometric reference with improved repeatability and reduced ambiguity in spoke length calculations.



NOTE: Most spoke calculators, including SpokeCalc, require final spoke position (ERD). The latest update of the App SpokeCalc introduces the direct use of Nipple Seat Diameter (NSD) as a complementary rim reference.

Using NSD requires explicit definition of nipple geometry (head type, head height, seating profile). When combined, NSD and nipple geometry fully define the final spoke position. Further details are covered later in this manual.

Contents & Specifications



Main parts

1. Sliding block
2. Adjustable bolt
3. Sliding rail
4. Measuring probe
5. Table clamp bolt
6. Digital display
7. Operating buttons
8. Battery slot
9. Table mount

Technical data:

- Size: 1050 x 70 x 165 mm
- Table thickness range: 20-55 mm
- Type: Digital
- Connectivity: None
- Unit: mm / inch
- Resolution: 0,01 mm
- Measuring range: 0 - 700mm
- Temperature range: -10°C to +40°C
- Battery: 2 x CR2032 (supplied)
- Probe material: Stainless steel (inox)

Quick start guide

1. Setup instructions

- Secure the tool to a stable workbench using the table mount and clamp bolt.
- Turn On the device using the Turn On / Off button.
- Clean the probes and rim contact surfaces before measurement.
- Make sure that inox measuring probes are firmly in place, tightened with adjustable bolts.

2. Zero calibration

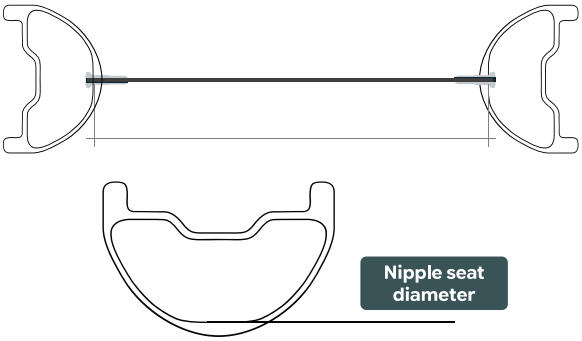
- Bring both probes into contact with each other, without any spoke nipple mounted on them.
- Ensure full, flat contact without preload.
- Press the ZERO button on the digital display.

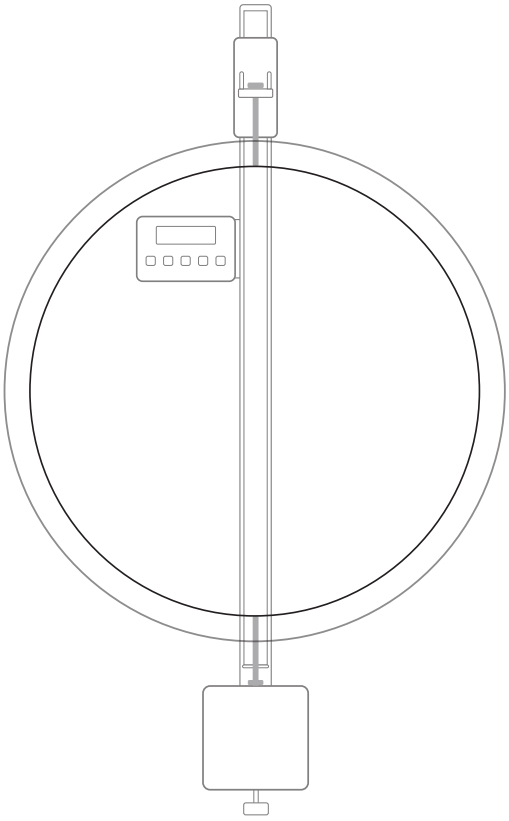
NOTE: Even though the device remembers the zero position frequent zeroing is still essential and recommended after every power up.

2. Taking measurements

- Push sliding block to the upper region of the device to allow rim position.
- Insert the probe(s) into the rim until they contact the nipple seat surface / spoke nipples fully sit into the bed.
- Lightly press on sliding block so that the contact between probes and rim has no play.
- Take readings from the display. More information in next section.

Measuring Nipple Seat Diameter (NSD)





Where probes touch inner rim wall of opposing spoke holes, the distance between two points is the NSD.

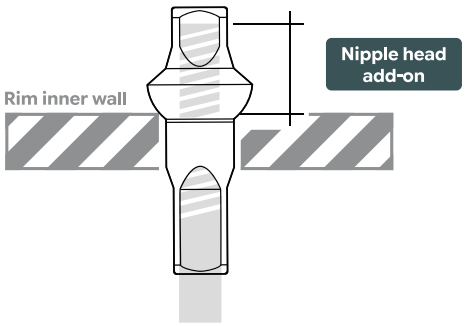
1. Probe positioning

- Use bare inox probes without any spoke nipple mounted.
- Insert the probe(s) into the rim until they contact the nipple seat surface (bed).
- Make sure probes contact the nipple seat surface concentrically at opposing spoke holes.

2. Readings

- Store the value, refrenced as Nipple Seat Diameter.

Although this is pure geometric rim dimension, independent of spoke nipple head shape, you still need to define the nipple head offset to determine final spoke position.



2. Spoke nipple offset (NSD addon)

- Also known as NSD offset / addon, this measurement is nipple type (geometry) dependent.
- ERD = NSD + 2 * NSD addon + 2 * nipple washer
- You can now reuse NSD with different spoke nipples.

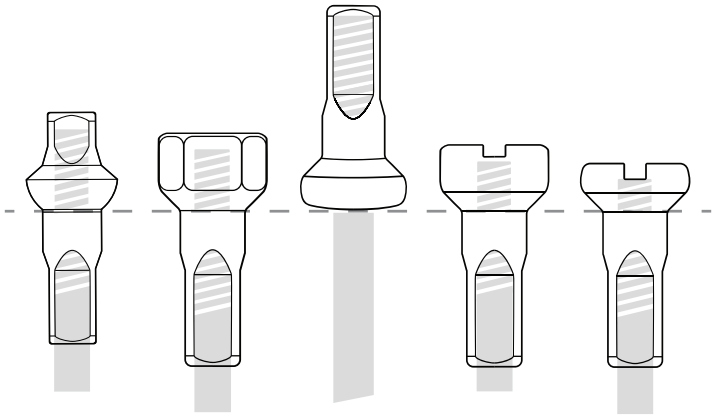
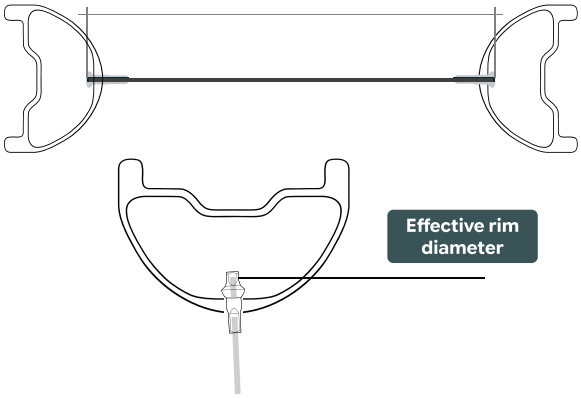
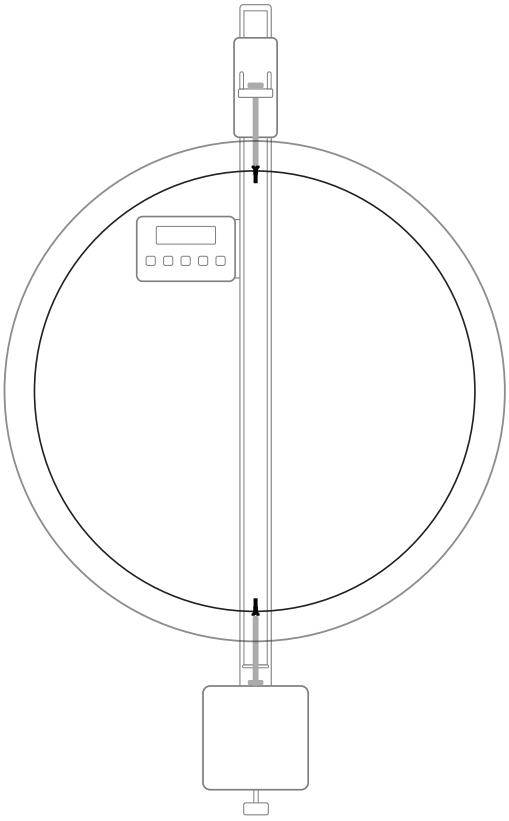


Illustration of different nipple geometries used and how nipple choice eventually affects spoke positioning inside the rim.

NOTE: For more information on how to define the distance from NSD to spoke end inside the rim based on the nipple head geometry (shape), visit the article on Nipple Seat Diameter: https://spokecalc.io/nipple-seat-diameter.php

Measuring Effective Rim diameter (ERD)





The reading represents the effective spoke position for the specific nipple geometry used during measurement.

1. Probe positioning

• Mount short reference nipples onto both probes using hex key (1.5 mm) to tighten them securly.

• Ensure nipple heads are fully seated against the rim nipple seat surface.

• Make sure probes contact the nipple seat surface concentrically at opposing spoke holes.

NOTE: This method measures the distance from one effective spoke end to the other, independent of nipple actual length.

2. Readings

• Store the measured value as ERD. The reading represents “head-end to head end distance” - the effective spoke position for the specific nipple geometry used during measurement.

Important: If a different nipple type is used in the final build, the ERD must be corrected accordingly.

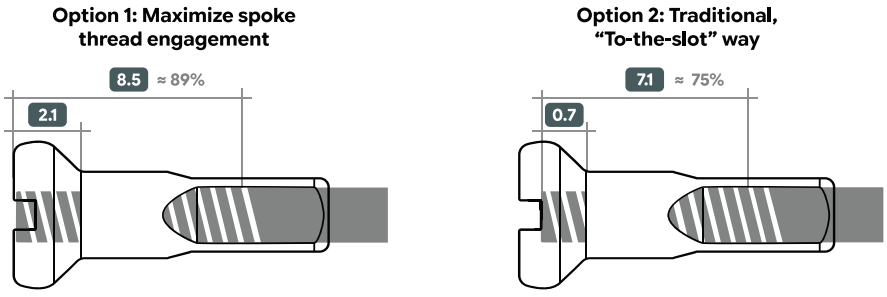
3. *Nipple geometry correction*

Modern nipple designs vary significantly in head height, seating depth, and internal spoke stop position. When measuring ERD, this must be accounted for explicitly.

• Standard / external nipples: Minimal correction required if geometry matches the reference nipple.

• Long / DSN nipples: Spoke end typically terminates earlier — ERD must be reduced.

• Washer thickness (if applicable) must be added per side.



Using traditional short reference spoke nipples for ERD requires minimal correction after taking readings since spoke termination can be either to the head end, or to the end of the slot.

Recommended workflow

For highest accuracy and flexibility:

- Measure NSD using bare probes.
- For asymmetric or drilled rims, measure multiple holes and average the results.
- Define nipple geometry (offset / add-on) using a helper table.

Let ERD be a derived dimension, not measured. NSD-based workflows eliminate the need to re-measure rims when changing nipple types.

Maintenance

1. Battery care

- Batteries are located behind the display unit.
- To replace the display batteries, use a compatible type, e.g., CR2032. Slide the whole display upwards ("click-in") to dismount it from the backplate.
- Turn off when finished with measurements. For optimal performance, consider using high quality batteries. Dispose of old batteries responsibly.

2. Careful handling

- This is a precision instrument; handle it gently to prevent damage.
- Avoid dropping, rough handling or applying excessive force to the device.

3. Spare parts

- Replacement parts and accessories for your tool are available. For inquiries, write to info@spokecalc.io to check availability and order directly.

4. Keep it clean

- Use a soft, dry cloth to remove dust or grease.
- Avoid using cleaning agents or harsh chemicals.

Warranty

Warranty conditions are stated on the original invoice. To claim warranty service or inquire for a spare part, write to info@spokecalc.io with full description of the problem, proof of purchase and serial number (identifier) of the tool.

Not covered by warranty:

- Device modifications or altercations.
- Damage due to improper handling or misuse.
- Normal wear and tear produced by regular use.

Compliance and disposal

CE (Conformité Européenne) certified for compliance with EU safety, health, and environmental standards.

This product contains a battery. According to Battery Directive 2006/66/EC, batteries must be recycled or disposed of separately from household waste. Please use designated recycling facilities for proper disposal.

This product complies with the RoHS Directive 2011/65/EU, ensuring that hazardous materials are not used in its components.

Waste Electrical and Electronic Equipment (WEEE) Directive. This product includes electrical or electronic equipment and should not be disposed of with household waste. Please recycle it at designated collection points for electrical and electronic equipment.

The protective casing of this product is made from recyclable polypropylene (PP). When disposing it, please recycle it at designated facilities according to local guidelines.