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LANDIS LT2HHE

Twin wheelhead grinding machine

Date: 11/10/20

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Landis LT2HHe

Twin wheelhead grinding machine

Designed for grinding crankpins & journals on crankshafts up to 4.5m in length

- Heavy Duty Cast Iron Bed, Synthetically Coated Coolant Channels
  - Long term stability
  - Full environmental and safety enclosure
- Wear Free Hydrostatic X axis Slideways – Maximum System Stiffness and Repeatability
  - Linear motor with absolute scale
  - Ultra Responsive Linear Positioning, Unprecedented Axis Interpolation
- Linear motor Z axis on precision linear rails
  - Absolute scale for precision contouring and dressing
- Hydrostatic Grinding Wheel Spindle up to 80 m/sec
  - CBN Wheels Up to 1000mm Diameter & 100 mm Wide
  - Integral Grinding Wheel Spindle Motors Eliminates Belts and Pulleys
- Integral C Axis Workhead Servo Motors
  - Left and Right Hand Synchronized Integral Frameless Brushless Servo Motors
  - Variable RPM with Angular Measuring Systems
- Single Hydrostatic / Hydraulic Unit
- Landis 6400 CNC Control
  - Industry Standard PC Using Windows Operating System
  - Flexible and Easily Updated
  - Full automatic cycle

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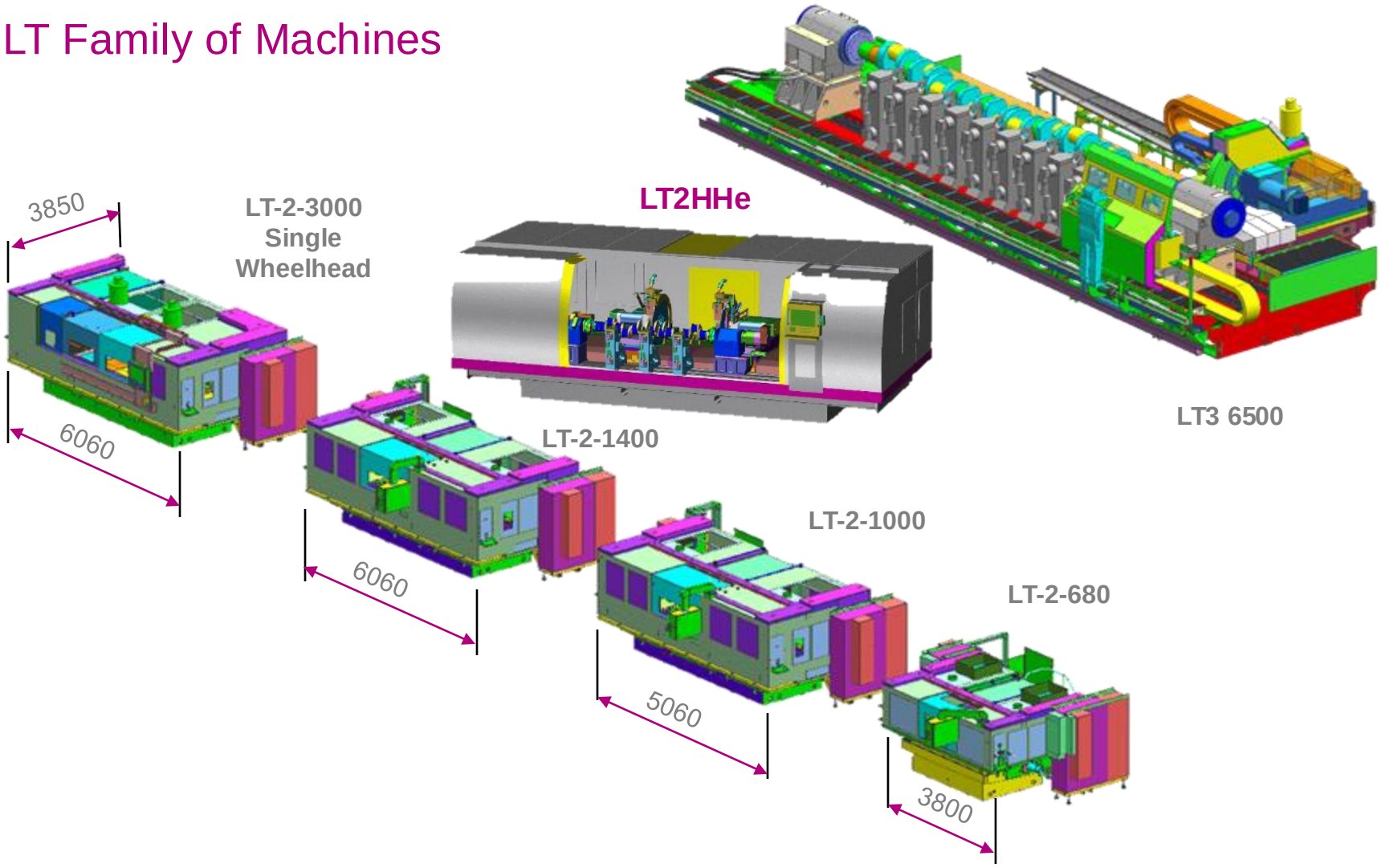
LT Family of Machines



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Machine Bed

- Cast Iron
- Rigid Cross Web Construction
- Rack & Pinion for Crankhead and Workrest repositioning
- Deep Coolant Channels
- Synthetically Coated to Prevent Swarf Build-Up
- Design optimized by FEA and Error Budget Analysis

Mist Enclosure

- Windows for Viewing Operation Progress
- Dry Floor
- Mist-Free Environment

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Linear Motors – X & Z Axes

- First Grinding Machine Manufacturer to use Linear Motor Wheel-Feed
- Total Contact-Free Feed
- Improved Reliability
- Zero Backlash
- Absolute Encoders – No Datum Switches
- Highly Responsive, Absolute Linear Positioning
- Unprecedented Axis Interpolation
- Improved Cycle Times
- No Ballscrew
- Over 1200 Applications Implemented with Success
- Landis Linear Motor applications are being imitated by competitors
- First Linear Motor Machine in Production Since 1999 – still in operation

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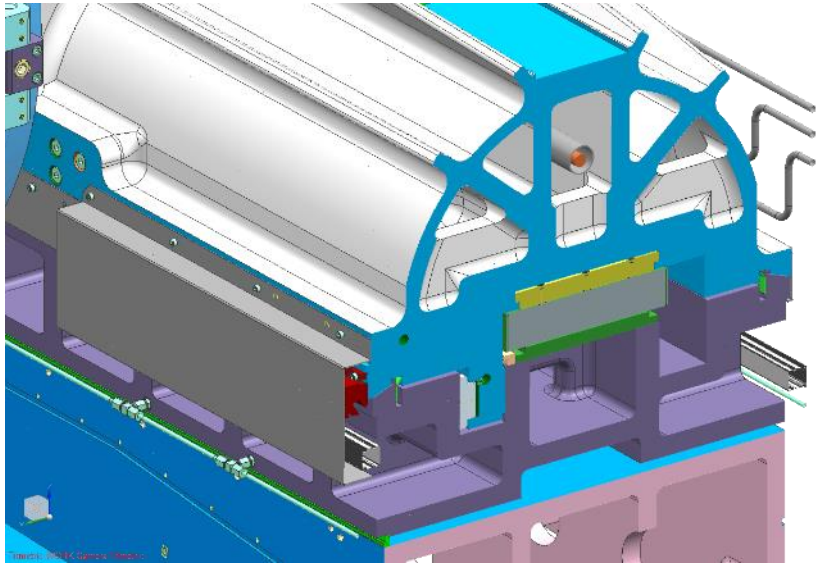
Constrained Hydrostatic Ways

- X Axes
- Sub – micron positioning
- System Stiffness & Repeatability
- Wear-Free
- Eliminates Floating/Sticking when using V and Flat Design
- 15 Years of Production History, Proven reliability
- MTBF >4,000,000 Hours



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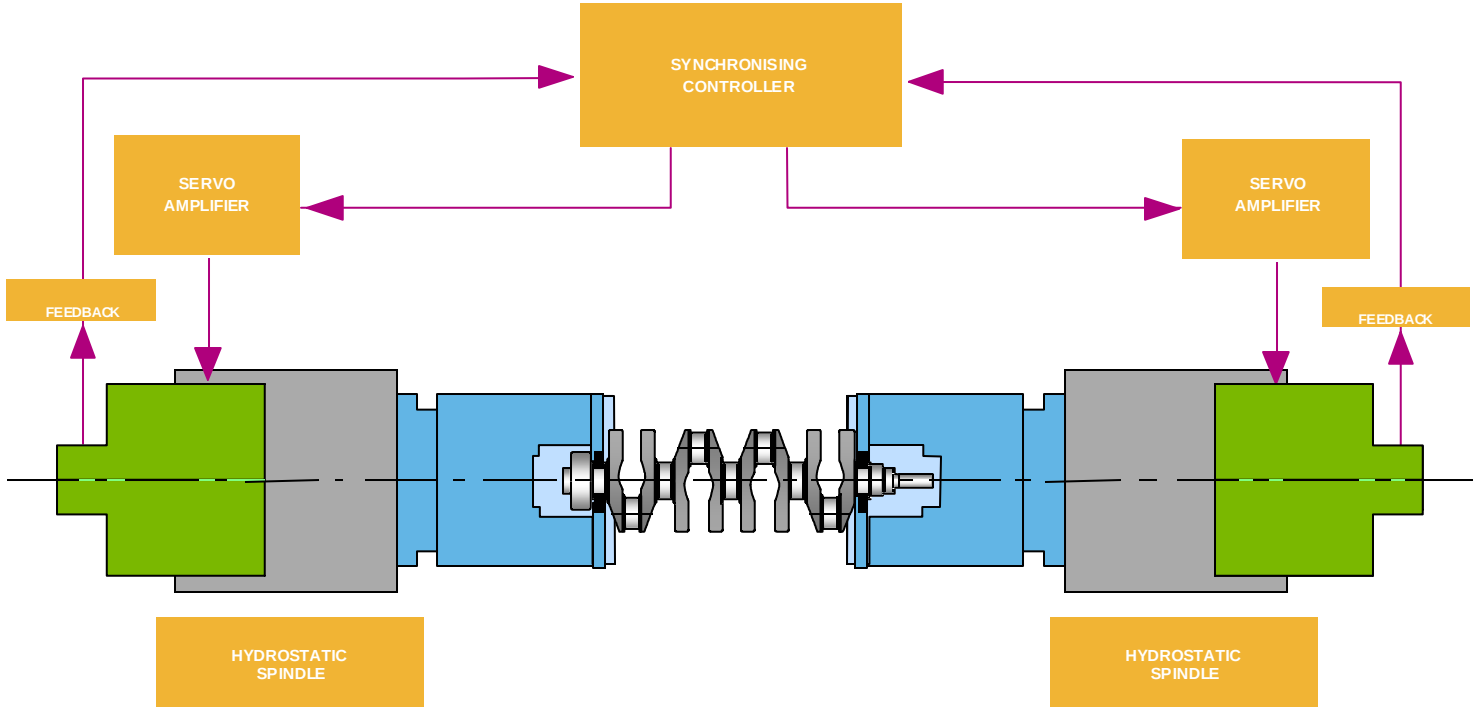
Servo-Driven Synchronized Crankheads

- Accuracy Improved Through the Elimination of Torsional Windup & Vibration
- Electronic Interlocking via Precision Feedback Encoders
- Elimination of Belts, Pulleys, Gears and Jackshafts Reduce Maintenance & Downtime



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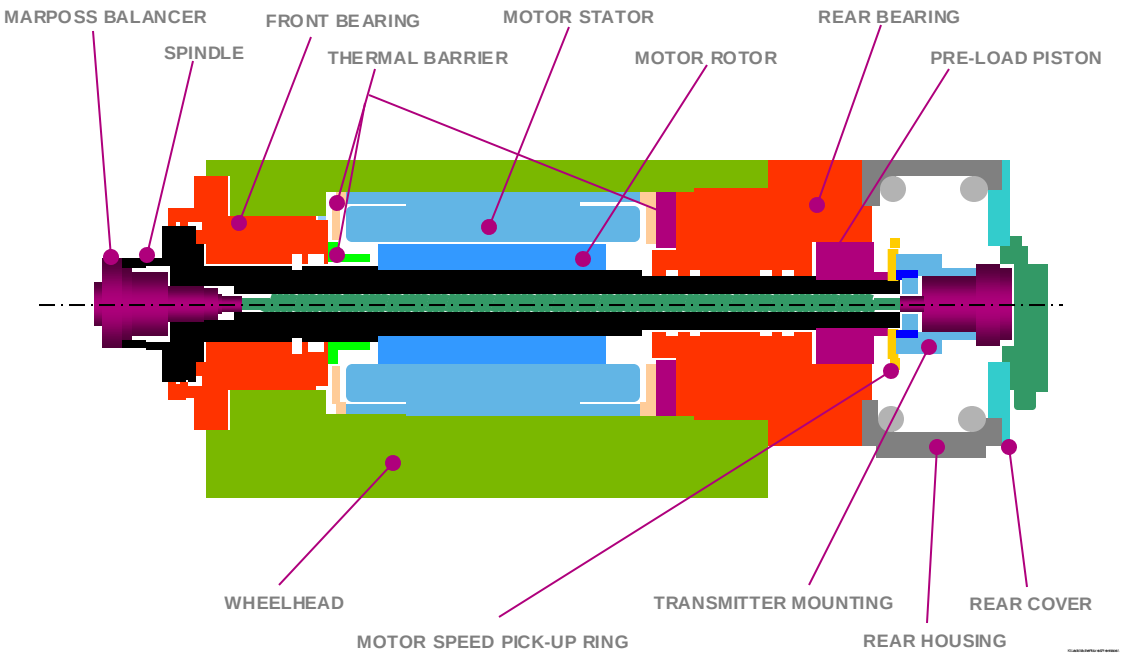
Wheel Support

Hydrostatic Wheel Spindle Bearing

- In Use on Machines for over 25 Years
- Designed for Optimum Stiffness & Support
- Maintains Spindle Radial Error Motion to Less than .0005mm
- Wear/Maintenance Free
- Integral Motors
- Dampens Chatter Causing Vibration
- Manufactured In-House to Ensure Quality



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Grinding Process

- Landis is able to offer both plunge and vector grind (patent pending) processes supported by robust accurate machine design
- Vector grinding can increase wheel life and reduces risk of sidewall and radii grinder burn in addition to holding bearing width to statistical capability
- Landis is the innovator of this process to address the above grinding requirements
- Hydrostatic spindle design allows for the higher thrust loads
- Other suppliers have not been successful with vector grinding due to rolling element bearing design, less accurate Z axis and total system stiffness
- Landis software to update and track wheel width is cutting edge and requires no development, it is field proven!

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Grinding Process

Landis offers expertise in both oil and emulsion coolant

- Most vector grinding processes have been done using emulsion coolant offering lower disposal and coolant costs
- Plunge grinding has been done using oil, primarily to enhance wheel wear
- Landis machines are designed to accommodate either emulsion coolant or oil
- Other suppliers compensate for poor machine design by recommending oil

Crankshaft Processing Methods

Many cycle options available

- Finish Grind Two Main Journal Diameters Simultaneously
- Finish Grind Two Crankpin Journal Diameters Simultaneously
- Finish Grind Main and Crankpin Journal Diameters in a Combined Operation
- Finish Grind Other Concentric Diameters and Thrustwalls by Various Sequencing of Twin Wheelheads

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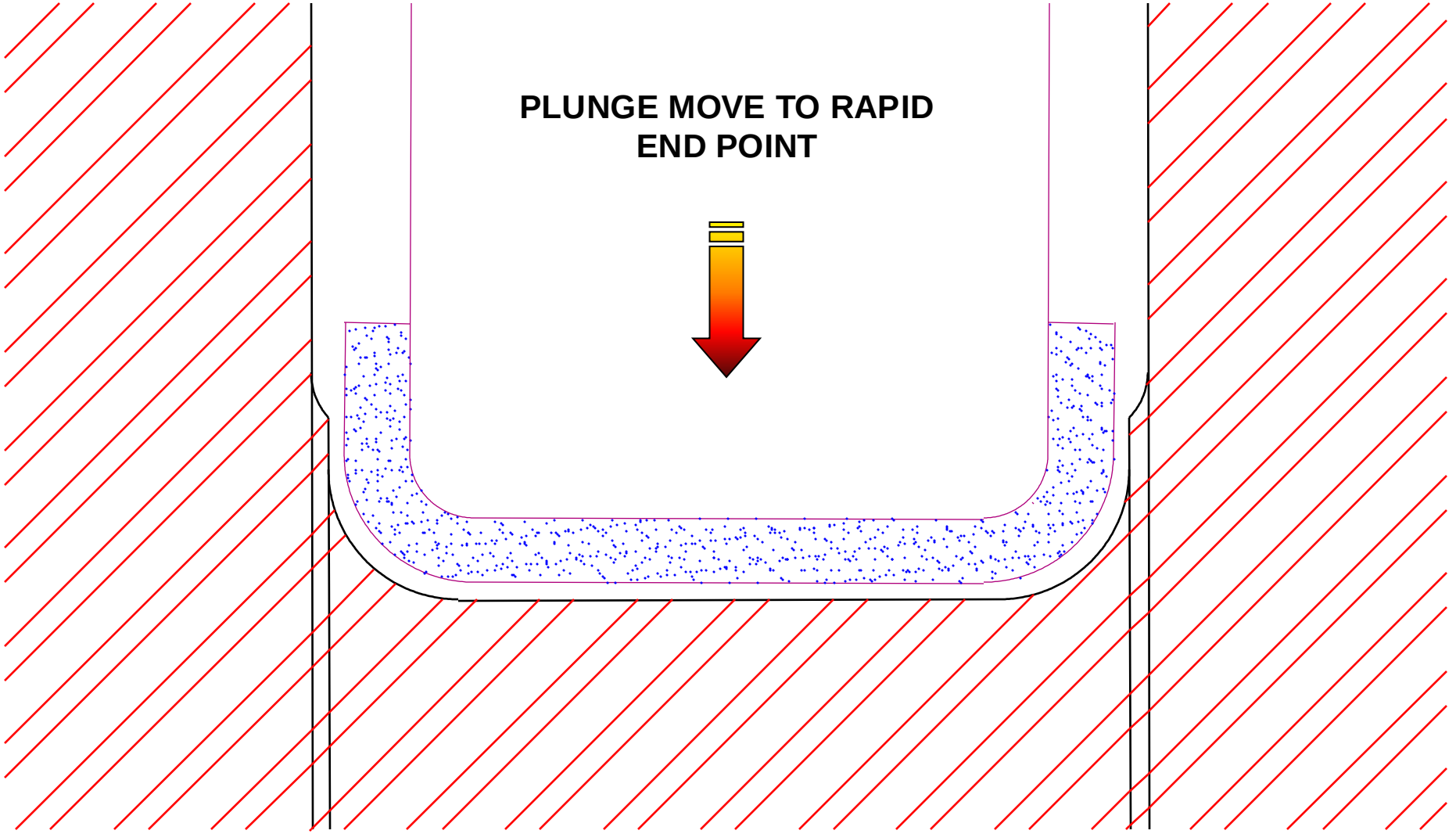

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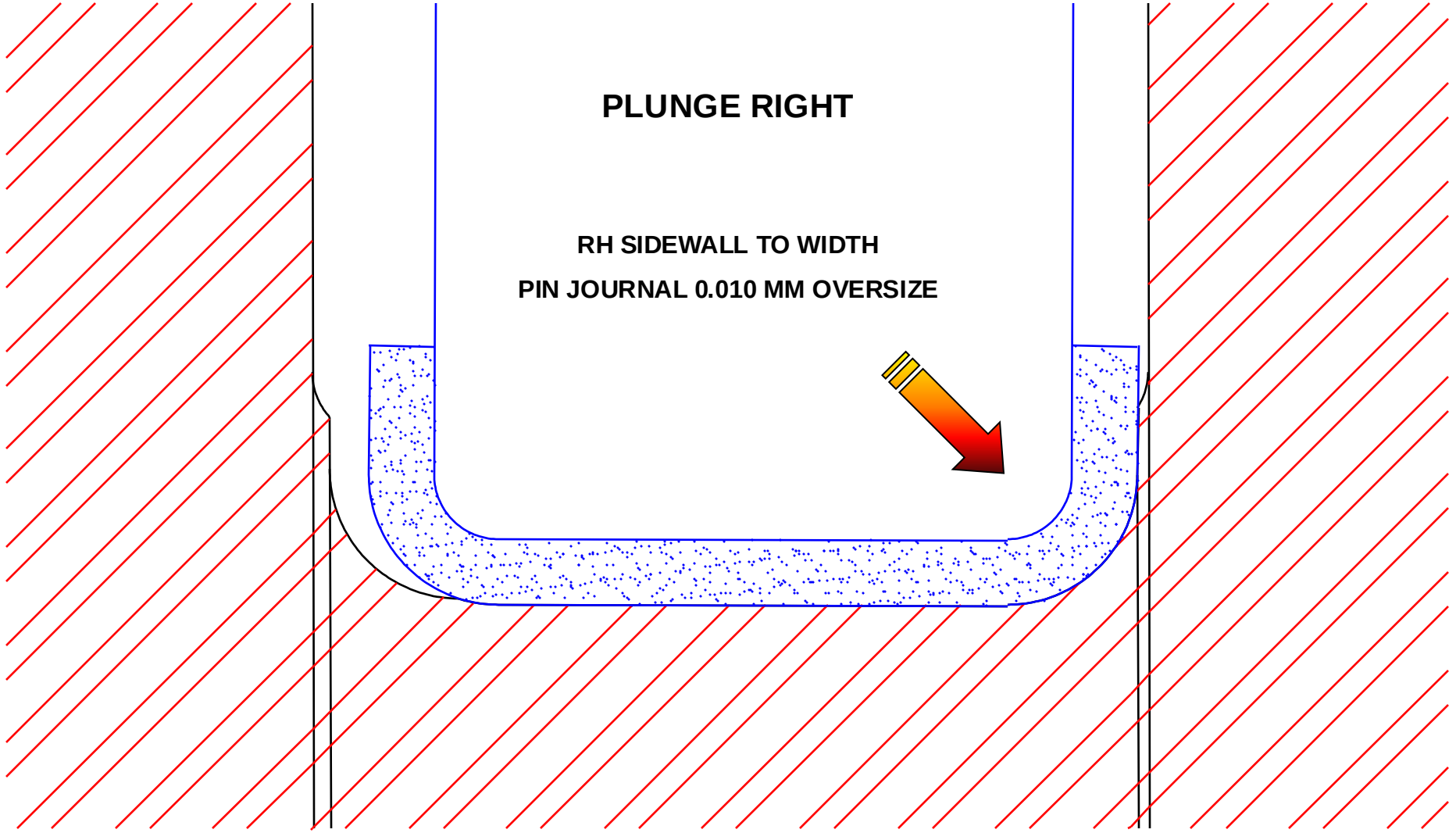

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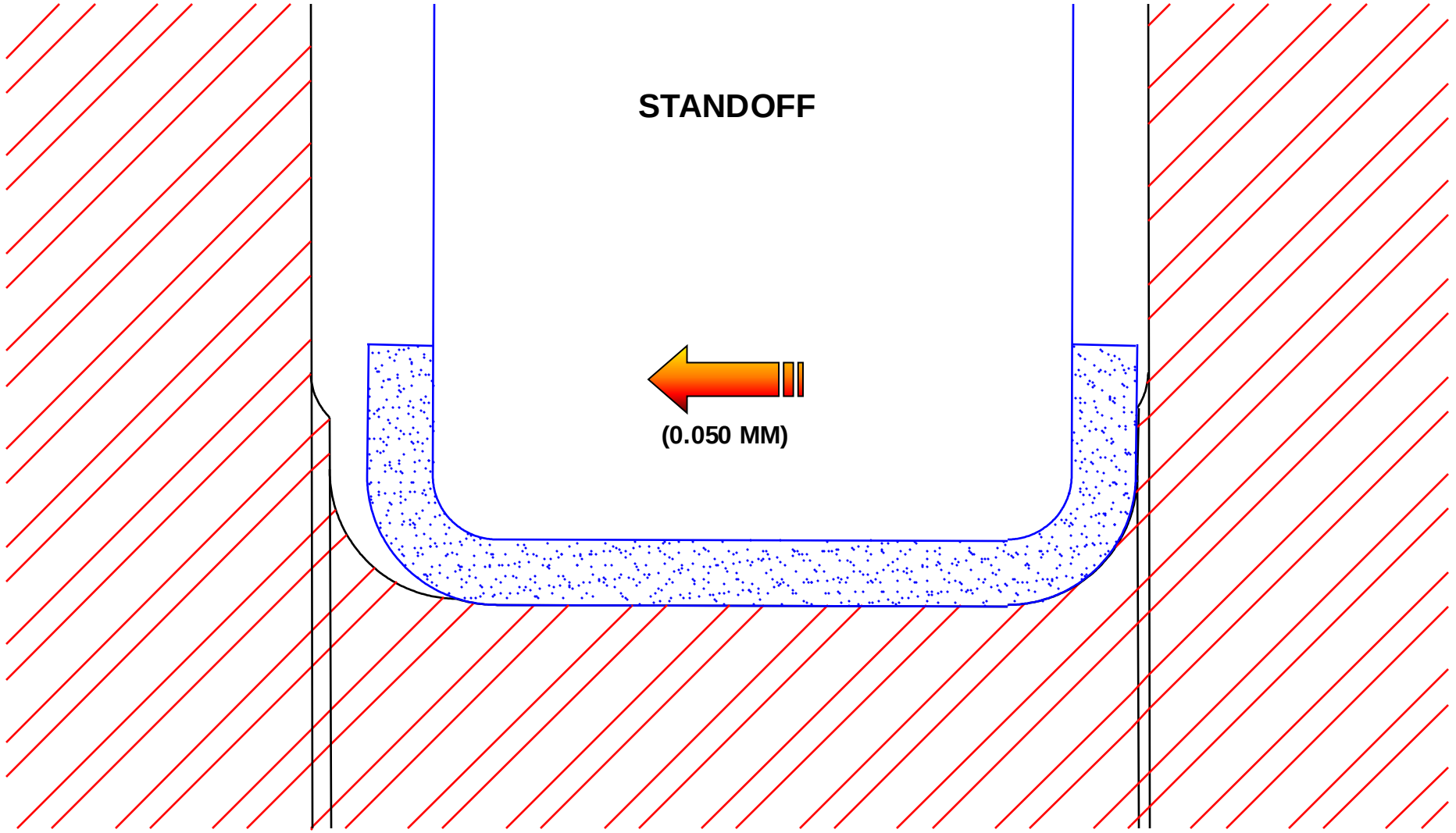

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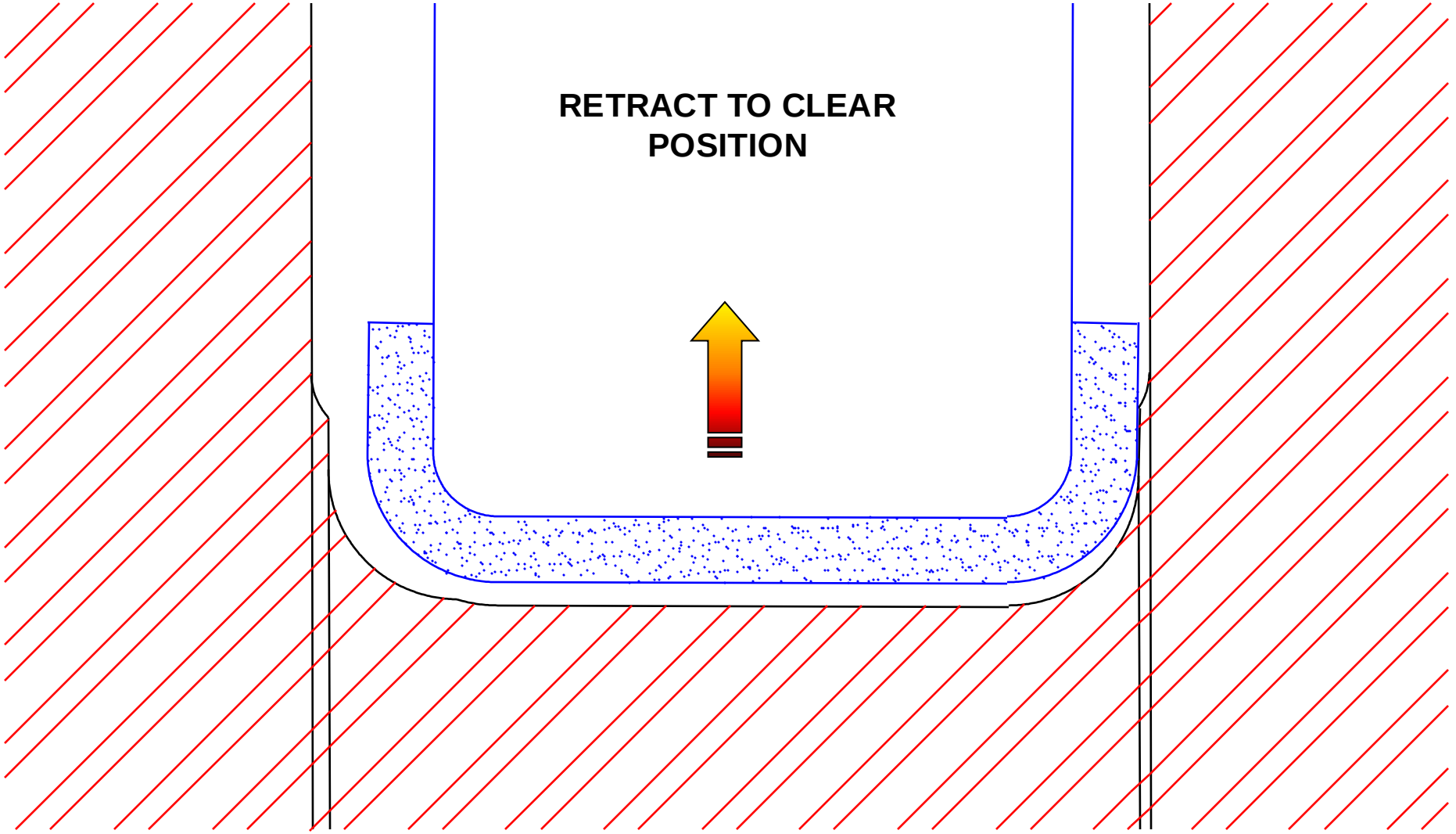

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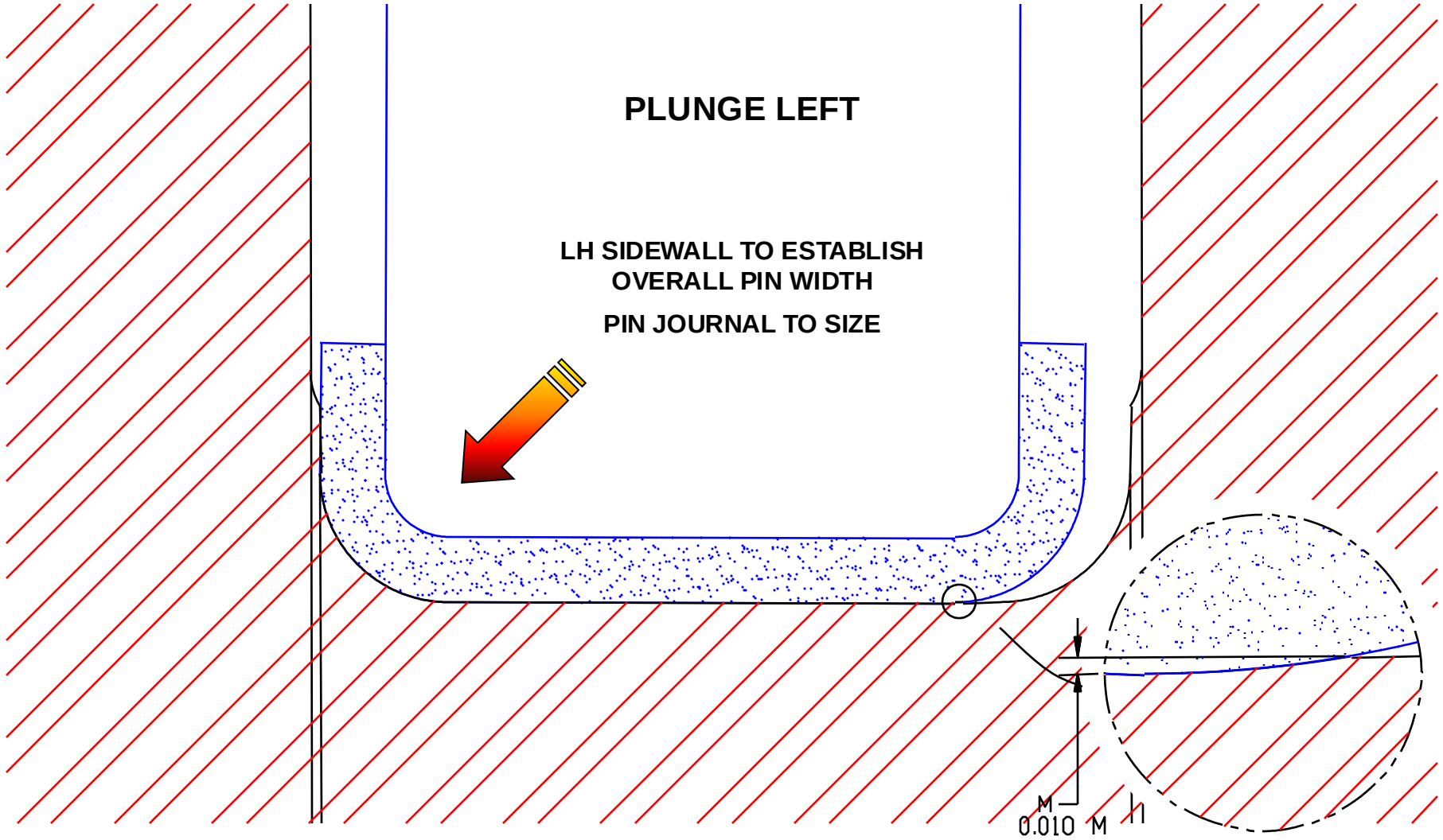

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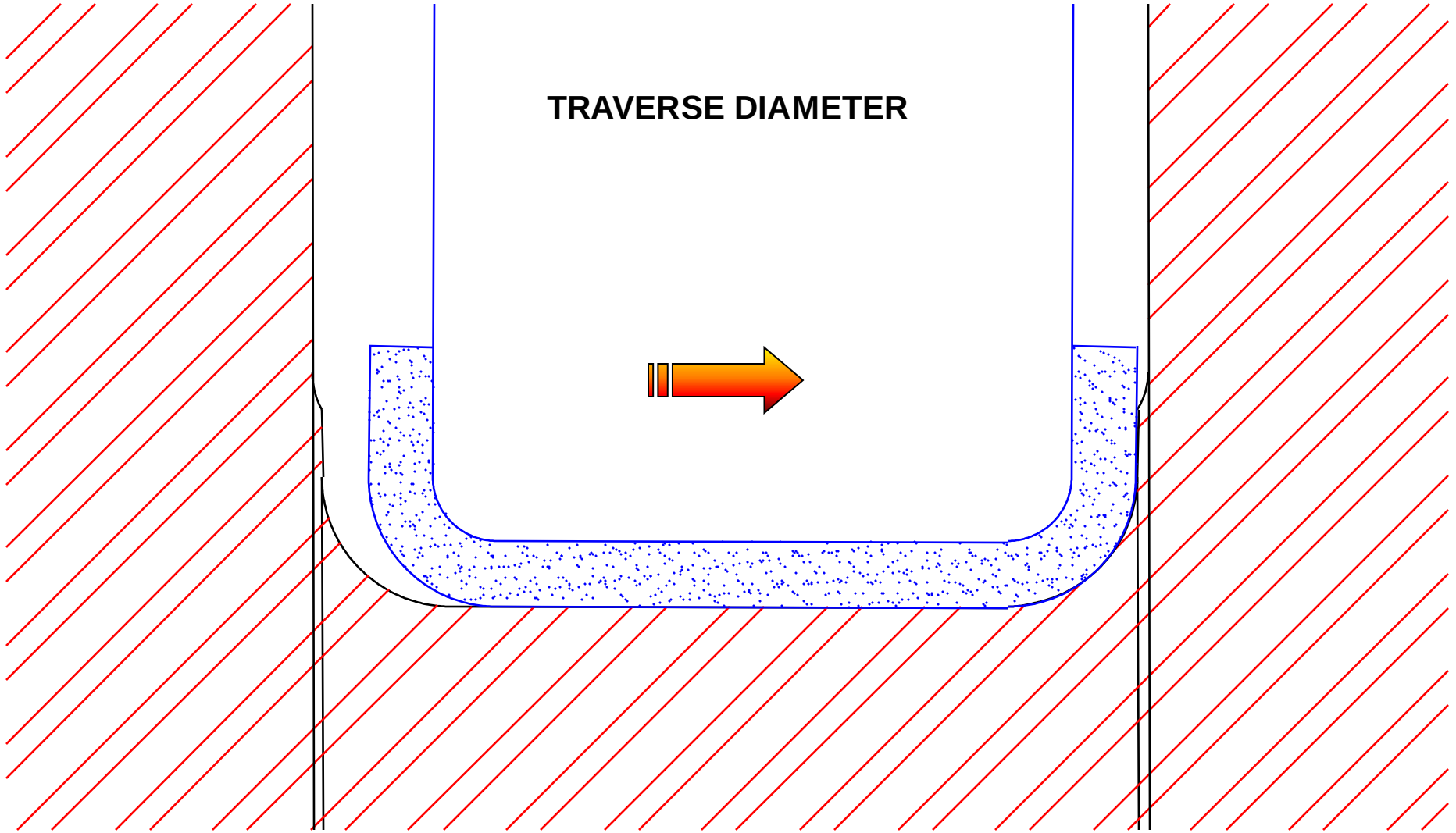

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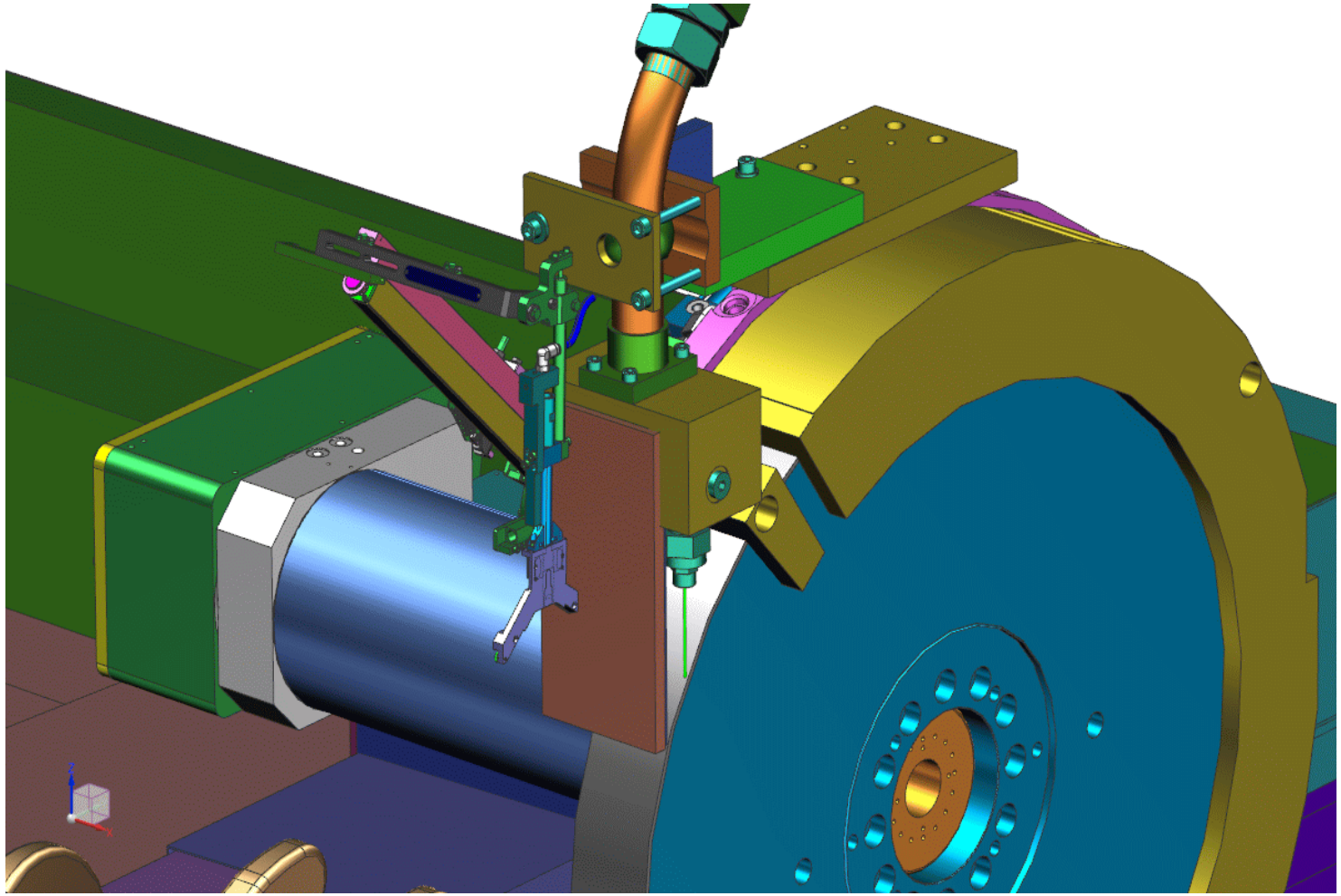
LH Wheel and Gauge



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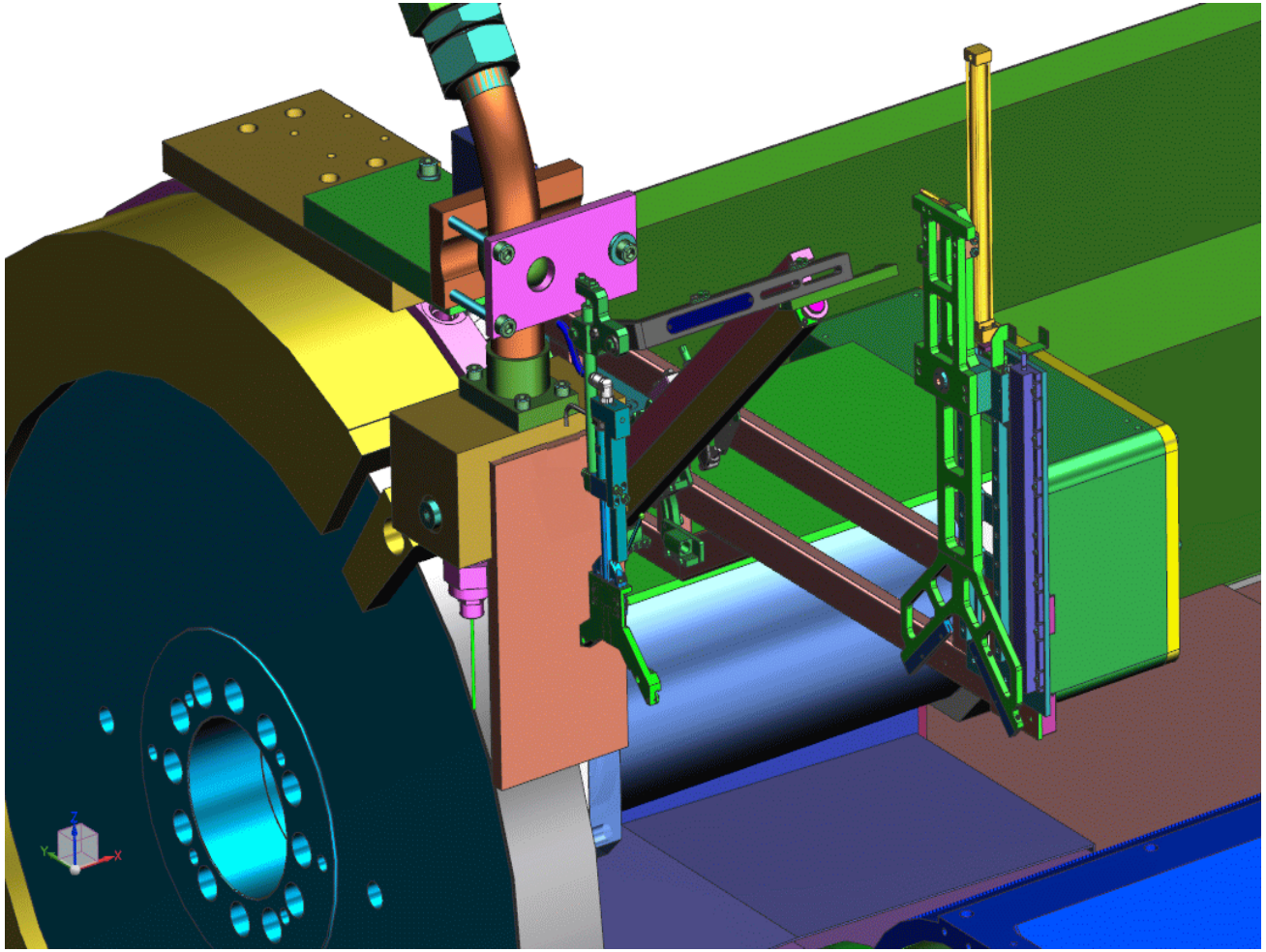
LH Wheel, Gauge and Centering device



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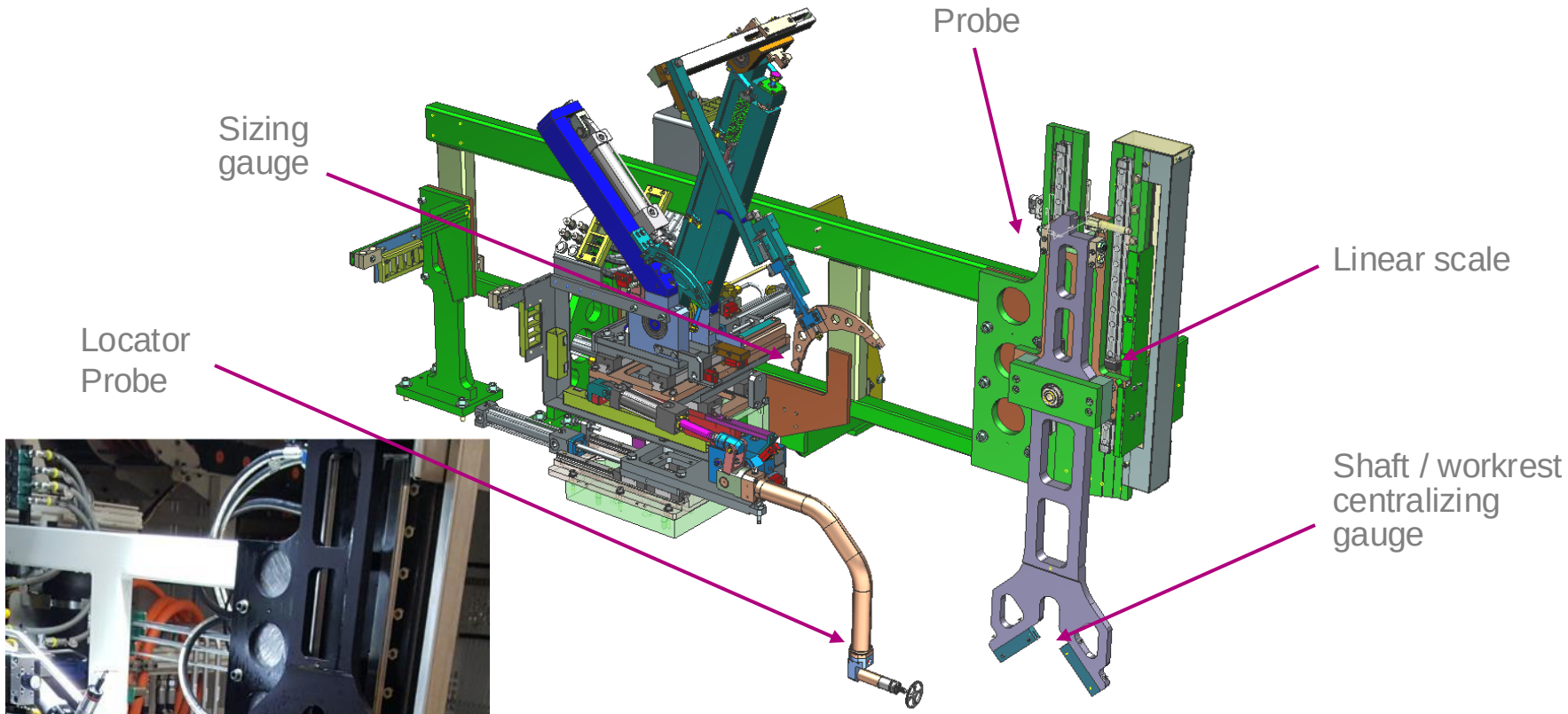
Gauging Systems



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Landis Vee Locator Mechanism

- Wheelhead mounted and located using existing X and Z axis.
- Measuring Vee hydraulically is advanced and lowered on part or setup bar.
- X and Y axis transducers are utilized to locate end datum diameters.
- X and Y axis transducers are then used to individually zero each plane at each steadyrest location by advancing the individual shoe.
- Multiple steadyrest advance rates are used during this automatic zeroing cycle.
- Lift and push offsets can be incorporated for each steadyrest as required.
- Individual crankshaft sag can be accurately measured.

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CBN Truing System

- Front Mounted at Wheel and Workpiece “Line of Contact”
- CBN Rotary Diamond Dresser
  - Motorized Spindle
  - Compact Size
- Eliminates Belts and Pulleys
- Extremely Accurate and Precise Axis of Rotation
- Truing and Dressing Combined Into a Single Process
- Adaptive Process Minimizes Amount Removed from CBN Wheel via Feedback from Acoustic Emissions Sensor
- Superior to Systems that use Pre-Programmed Truing Amounts

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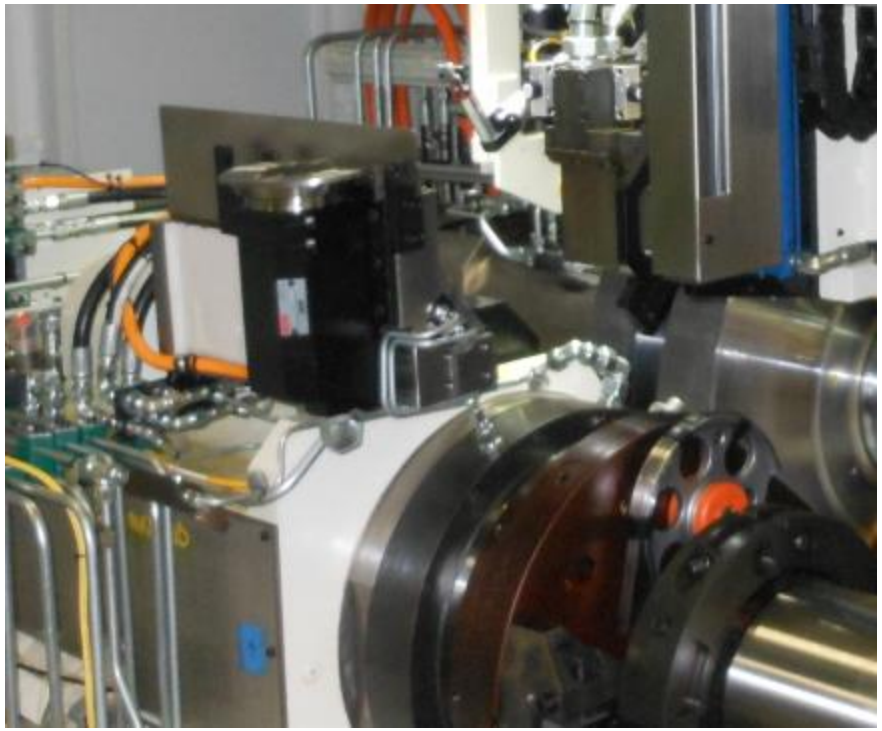
CBN Truing System

- Vertical Rotary Dressing produces the optimum radius blend at both the sidewall and the bearing diameter
- Combination of linear motor and scales on X and Z axes create a constant dresser traverse rate on the O.D. of the grinding wheel and radii
- Both X and Z axis utilize absolute encoders and therefore always know where they are without any requirement for homing procedures



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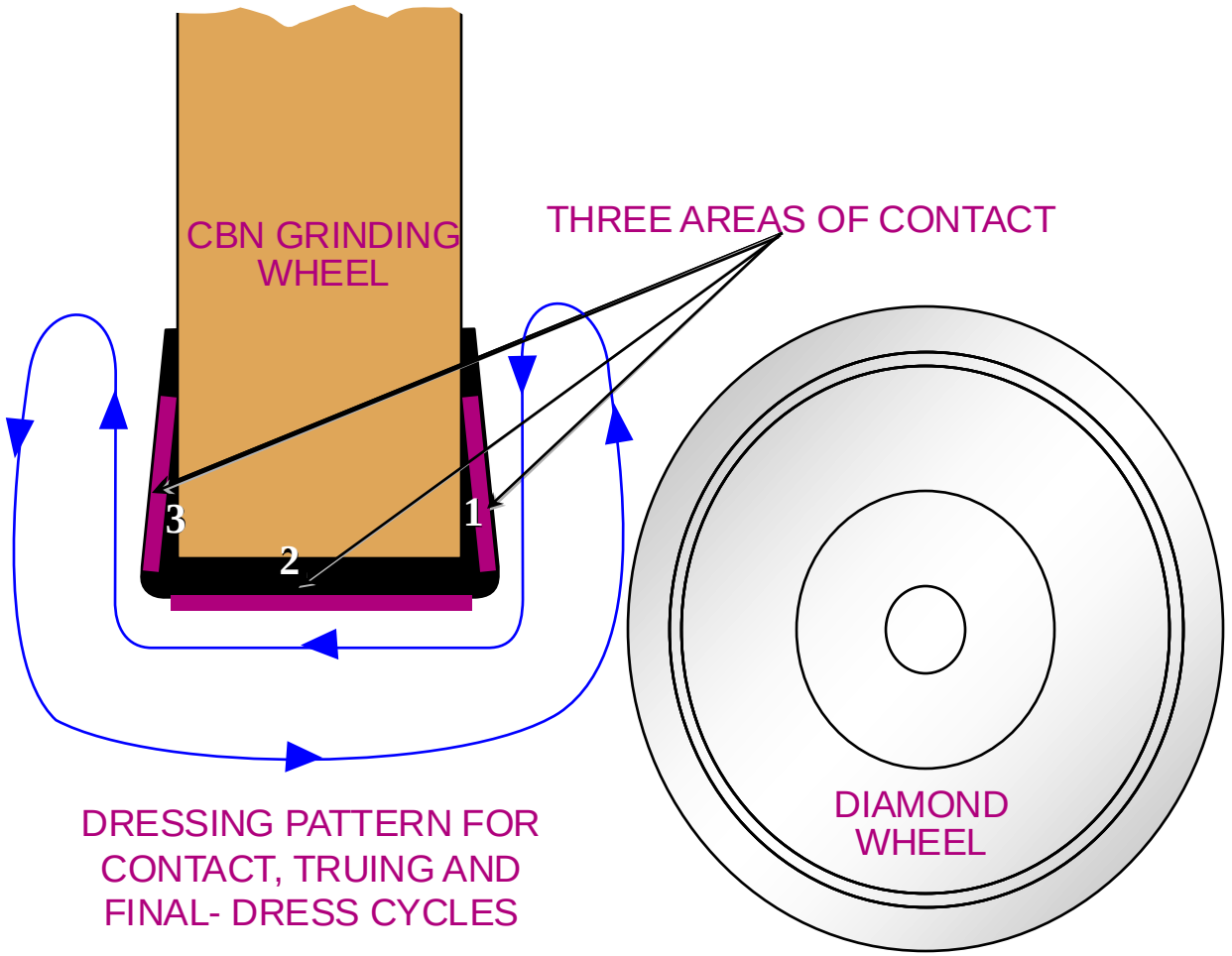
Dressing Cycle for CBN Wheel

- **CRASH CYCLE**
  Starting at 0.08mm clear, the grinding wheel follows a pre-determined profile over the Diamond Dresser in a single pass. If there is contact during the cycle, the dress will be aborted.
- **CONTACT CYCLE**
  The grinding wheel starts from the stand off position of 0.08mm clear. The wheel continues to increment toward the diamond until either 1, 2 or 3 is in contact. On the side or face contacted, the wheel backs off 0.02mm and continues following the profile until contact is made on the other 2 areas. Generally one of the other 2 areas will be contacted first so again the wheel backs off 0.02mm. Cycle continues until the last side or face is contacted.
- **TRUING CYCLE**
  The grinding wheel now approaches the diamond from the known contact point relative to both face & sides. It feeds in 0.003mm, follows the pre-determined profile over Diamond repeating until a continuous contact signal is received by the sensing system.
- **FINAL DRESS CYCLE**
  The grinding wheel feeds in 0.002mm and follows the pre-determined profile over Diamond once at the desired rate to condition the wheel.
- **PROBE DIAMOND**
  To establish diamond and wheel wear.



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Specifications

Grinding capacity	
Max. component swing	600 mm (23.6”)
Max. grinding length	4,500 mm (177.2”)
Max. workpiece weight	4,500 kg (9,921 lb)
Wheelhead	
Wheel type	CBN
Max. wheel Ø	1,000 mm (39.3”)
Max. wheel width	150 mm (5.9”)
Max. wheel surface speed	120 m/sec (393.7 ft/sec)
Max. spindle power	124 kW
B-axis swivel range	± 3° for tapers

Workhead & footstock	
Max. workhead speed	50 rpm
Workhead drive power	65 kW
Max. workhead motor torque	1,250 Nm
Footstock stroke	150 mm (5.9”)
Axes	
Linear guide ways	Hydrostatics / Linear rail
Grinding spindle	Hydrostatics
Drive	Linear motors
Dimensions	
Dimensions (W x D x H)	10,000 x 4,400 x 3,514 mm (32.8’ x 14.4’ x 11.5’)
Machine weight	70,000 kg (154,324 lb)