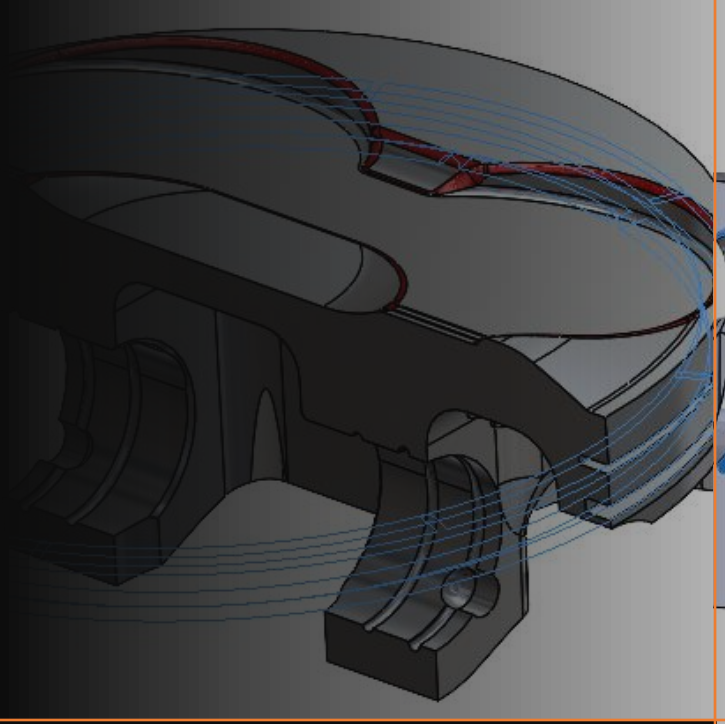
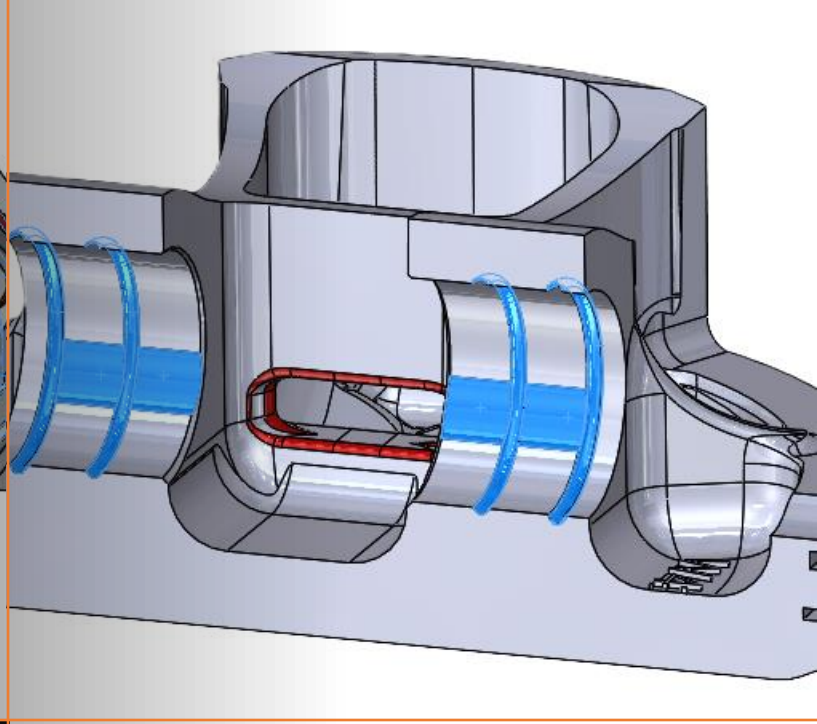
Wössner Technical Summary

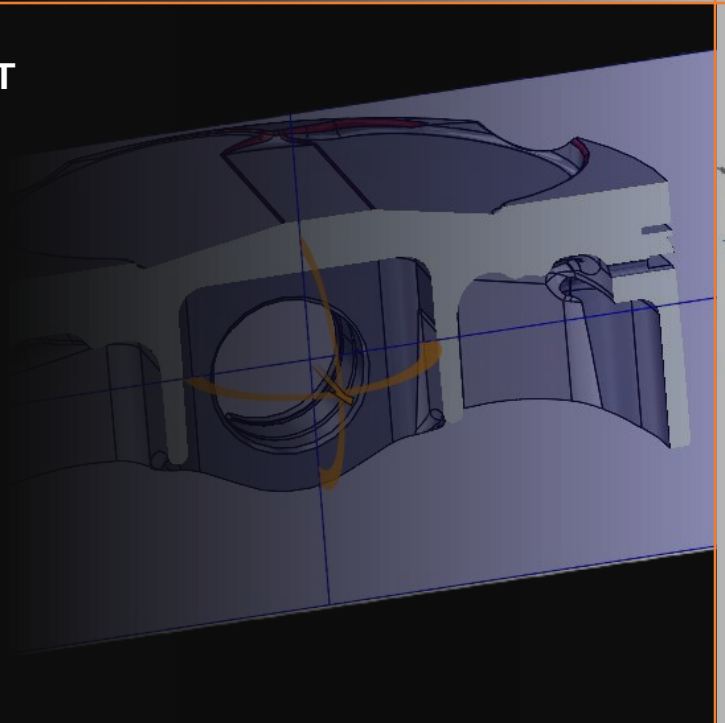
Product Capabilities and Technical Support

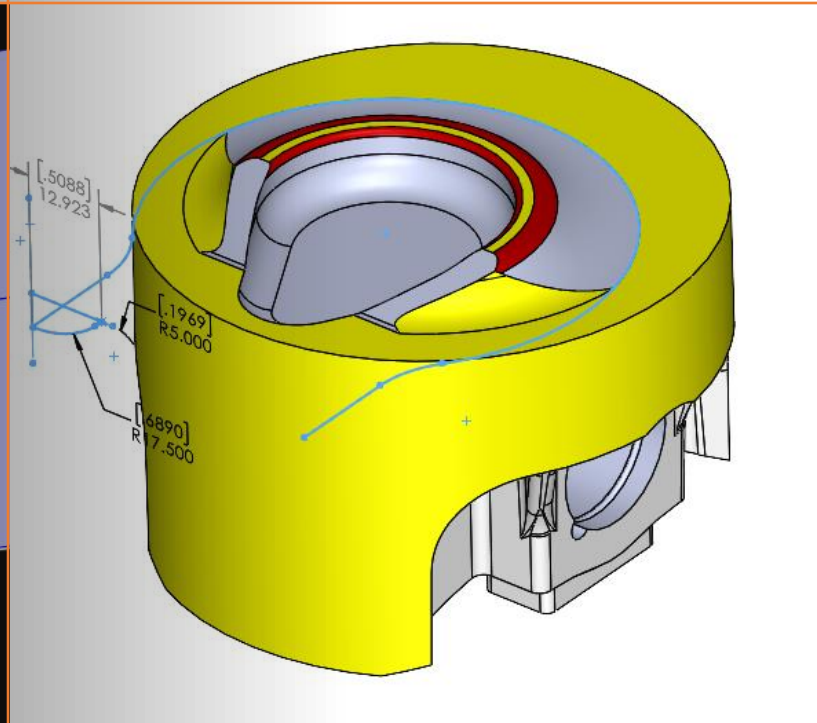
SUMMARY OVERVIEW





- WOSSNER COMPANY GLOBAL FOOTPRINT
- FORGING CAPABILITIES
- PISTON DESIGN and MANUFACTURING
- ANALYSIS / R&D CAPABILITIES
- RACE TEAM DEVELOPMENT





WOSSNER LOCATIONS:

- Wossner GmbH: Weil am Rhein, Germany
- Forging Group Monale (FGM): Monale, Italy
- Wossner Italy: Monale, Italy
- Wossner North America: Willoughby, Ohio USA
- Wossner U.K.: Kelvedon, Essex, U.K.
- Wossner Asia: Taichung, Taiwan

FORGING CAPABILITES

- **Forging Group Monale video**
- UNI EN ISO 9001:2015 certification
- Workplace Safety and Health Management System adhering to the UNI-INAIL guidelines
- Facility is 30,000 sq/m total after recent expansion
- Large range of forging presses with great capacity:
  - 3 x 1000T Hydraulic Presses
  - Automated forging line with robotic workpiece handling, equipped with a 1000T Hydraulic Press
  - 2 x 1400T Screw Presses (for non piston forging)
  - 1 x 1000T Screw Press (for non piston forging)
  - 1 x 600T Screw Press (for non piston forging)
- Automated batch heat treatment
- Automated pickling (cleaning) process
- Laser marking of workpiece available
- CNC equipment for post processing
- Solar panels (under construction) - Increases power supply, energy storage

FORGING CAPABILITES

RAW MATERIAL STORAGE

- MATERIAL IS QUEUED BASED ON DATE
- FULL TRACEABILITY TO EACH BAR PER FORGING BATCH

AUTOMATED SAW CUTTING

- WORKPIECE DETERMINED BY WEIGHT / DIMENSION
- AUTOMATED CUTTING CONSUMED WHOLE BAR – NO DROPS

WORKPIECE PRE-HEATED / FORGED

- FORGING PRESS CHOSEN BASED ON PART TYPE
- HYDRAULIC PRESS – FOR PISTON FORGINGS
- SCREW PRESS – FOR NON-PISTON FORGINGS

FORGING CAPABILITES

SETTING OVEN

- WATER QUENCH
- USED FOR MOST ALLOYS

SETTING OVEN

- OIL / WATER MIXTURE QUENCH
- REDUCES RESIDUAL STRESS IN THE WORKPIECE
- MORE DESIREABLE FOR 2618 ALLOYS WHERE DISTORTION CAN BE GREATER THAN 4032

SETTING OVEN

- WORKPIECE BASKETS ARE OVERTURNED AFTER QUENCH STEP TO DRAIN FLUID

FORGING CAPABILITES

AGING OVEN FOR T-6 CONDITION

- PLC CONTROLS
- BATCH TRACEBILITY

WORKPIECE POSITIONING

- PLACED IN “CUP POSITION”
- PROVIDES FOR OPTIMAL TREATMENT AND CONSISTANCY

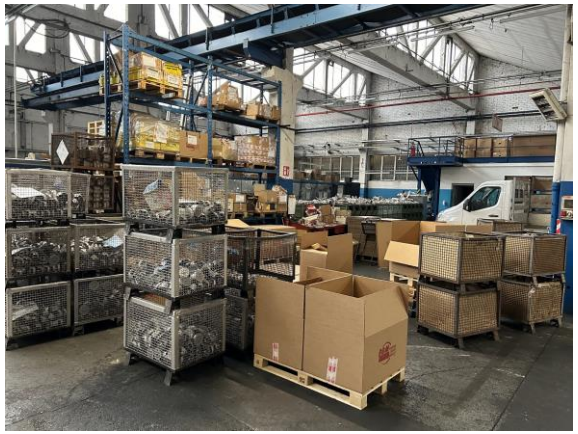
FORGING CAPABILITES

AUTOMATED PICKLING STEP

- WORKPIECE IS PLACED TO DRAIN FLUID
- BINS LOAD SIZE IS LIMITED TO PREVENT WORKPIECE DAMAGE

POST-FORGING OPERATIONS

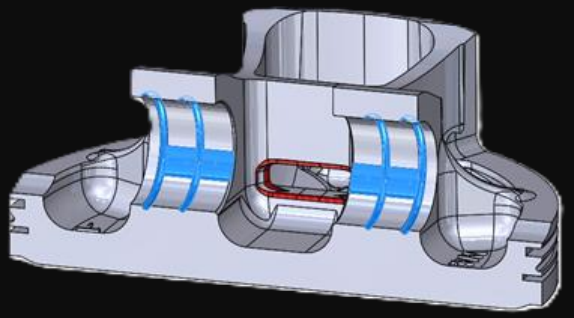
- USED FOR SQUARING WORKPIECE
- OTHER MACHINING AVAILABLE BASED ON NEEDS

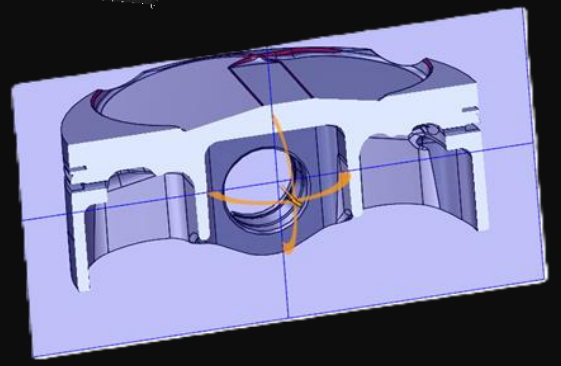


WAREHOUSING

- PRIOR TO SHIPPING TO DESTINATION
- STOCK MANAGED BASED ON DEMAND
- CUSTOM PRODUCTS STOCK LEVELS CAN BE NEGOTIATED

PISTON DESIGN and MANUFACTURING



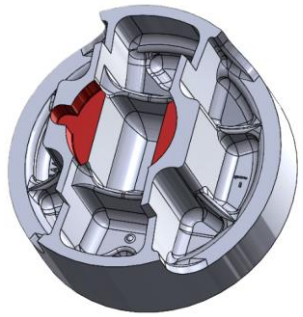


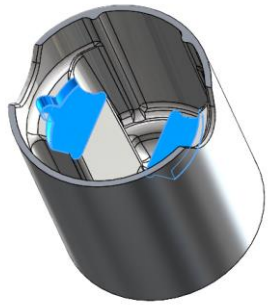
- Wossner Germany video
- ~85 years collective experience in forged aftermarket piston design
- Powersports / Automotive / 2T / 4T – all markets and types
- Racing Performance / Durability / OEM Tier 2 levels
- All Solidworks® 3D renderings designed in concert with CAMWorks® software for manufacturing optimization
- State of the art manufacturing under DIN EN ISO 9001 Quality Management system
- Facility features MAZAK® and TAKISAWA® equipment for reliability and high repeatability
- Small batch capability with rush delivery available
- Shipping worldwide from Germany / USA to destination

PISTON MANUFACTURING: PRE-MILLING

HIGH SPEED 5 AXIS VERTICAL MILL

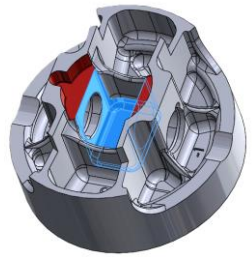
FAST AND FLEXIBLE MACHINING WITH FAST SET UP, AND HIGH REPEATABILITY

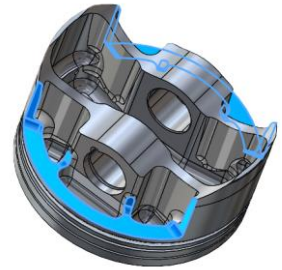




LOCATING REGISTER

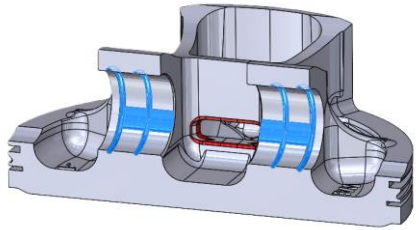
FOR PRECISE LOCATING OF ALL KEY PISTON FEATURES





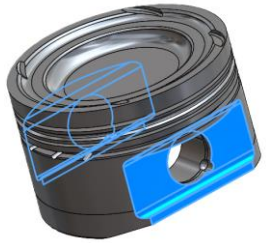
ALL INSIDE AND OUTSIDE MACHINING BELOW DECK

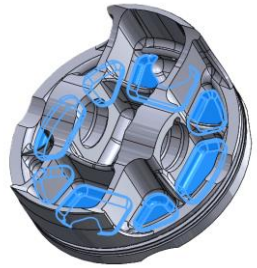
REMOVAL OF EXCESS MASS FOR OPTIMIZED WEIGHT FOR PERFORMANCE



ALL WRIST PIN HOLE DETAILS

INCLUDING LOCKRING RETAINING GROOVES, OILING FEATURES, REMOVAL NOTCHES





Wössner HIGH PERFORMANCE PISTONS RESEARCH & DEVELOPMENT

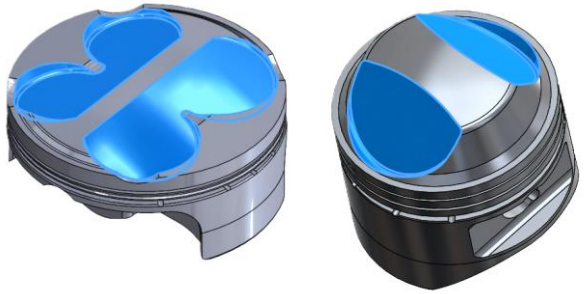
PISTON MANUFACTURING: TURNING / MILLING

MULTI-TASKING MILL / TURNING CENTER

PRECISION AND HIGH SPEED, THIS MACHINE IS ABLE TO BOTH TURN AND MILL PISTONS WITH AUTOMATED PART HANDLING

CROWN TURNING AND MILLING

COMPLETE GEOMETRIES INCLUDE POSITIVE AND REVERSE CROWN SHAPES

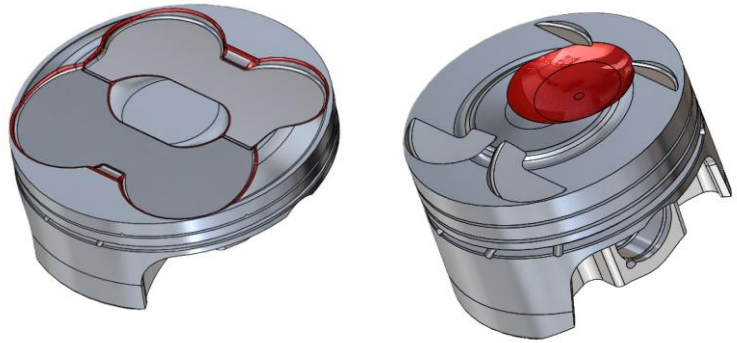


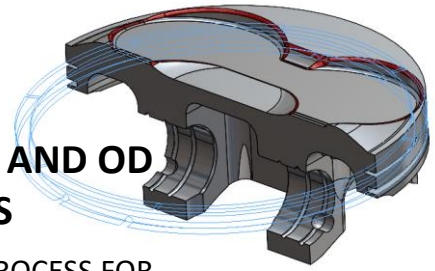
VALVE POCKETING

FROM SINGLE TO FIVE VALVE ANY LOCATION ON THE PISTON CROWN

3D CROWN MILLING

FOR “SOFTENING” OF CROWN FEATURES OR CONTOUR SHAPES





RING GROOVING AND OD FEATURES

PRECISE MACHINING PROCESS FOR ULTIMATE GROOVE FLATNESS AND OPTIMAL RING SEAL

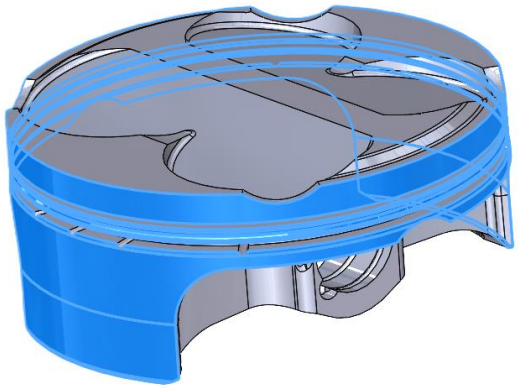
Wössner HIGH PERFORMANCE PISTONS RESEARCH & DEVELOPMENT

PISTON MANUFACTURING: FINISH TURNING

FINISH TURNING – OVALITY / TAPER

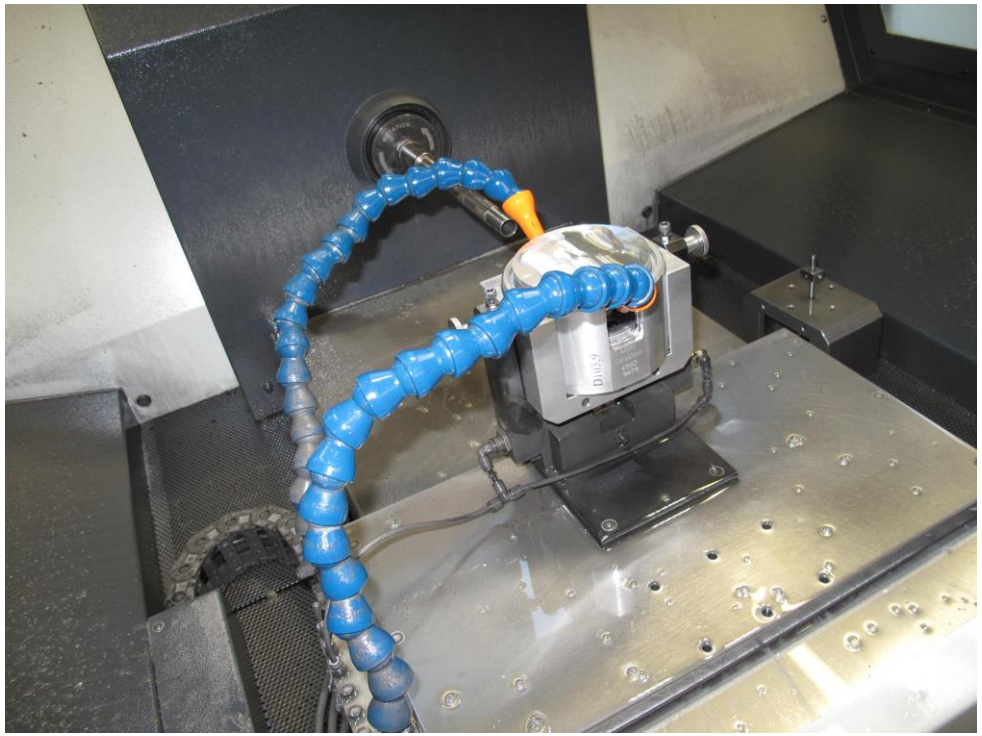
STATE OF THE ART ELIPTICAL TURNING MACHINES PROVIDE HIGH PRECISION MACHINING FOR OPTIMAL PISTON PERFORMANCE

TEMPERATURE CONTROLLED PROCESS AT 20°C / 68°F



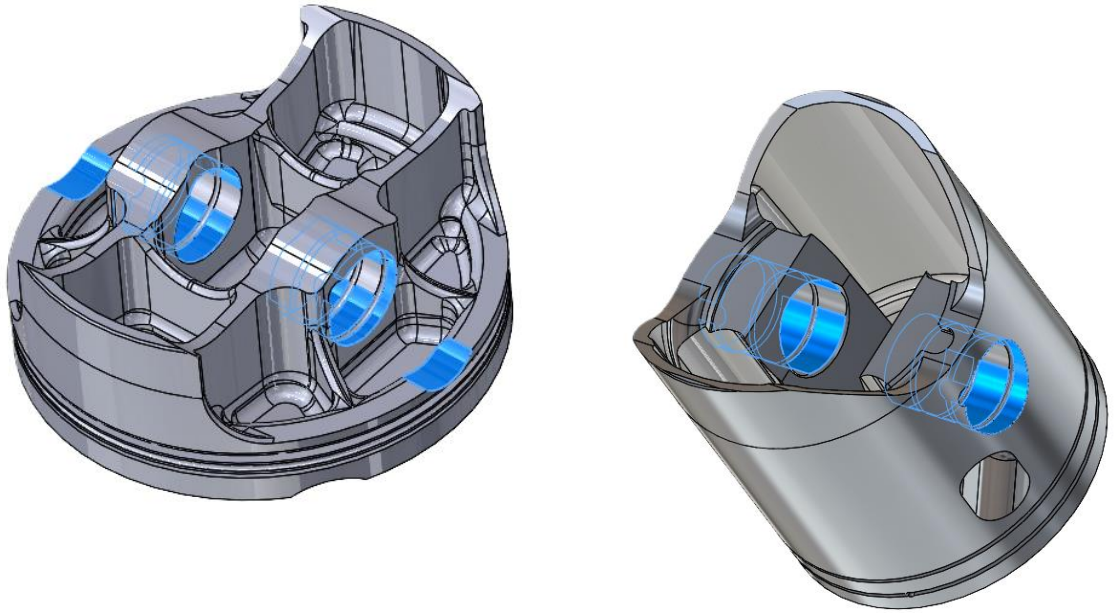
PRECISION TURNING WITHIN +0.0 / -.007MM (+0.0 / .0003”)

PISTON MANUFACTURING: PIN BORE SIZING



CNC PRECISION PIN BORE SIZING

PRECISION HONING TO FINAL SIZE FOR THE CRITICAL FITMENT OF THE WRIST PIN TO THE PISTON



PRECISION HONING +0.007 / +.017MM (+0.0003 / .0007”) TO FINAL PIN SIZE

ANALYSIS / R&D

- COMPLETE COMPONENT DESIGN AND CONTROL DRAWING USING SOLIDWORKS® LATEST SUITE
- ~50 YEARS EXPERIENCE IN MOTORSPORTS DESIGN AND TECHNOLOGIES
- FARO GAGE MAX AND FARO FUSION LASER SCANNING FOR REVERSE ENGINEERING AND DESIGN
- FINISH PISTON AND PISTON FORGING DESIGN FOR OPTIMIZED COMPONENTS
- BILLET PISTON DESIGN FOR RAPID PROTOTYPE / FORGING, OR FOR DESIGNS WITH SPECIFIC REQUIREMENTS
- 3D PRINTING USING DREMEL 3D45 AVAILABLE FOR RAPID PROTOTYPE CHECKING
- PISTONS AVAILABLE IN 4032-T6 OR 2618-T6 MATERIAL
- ADDITIONAL COATINGS AND TREATMENTS AVAILABLE BASED ON NEEDS, INCLUDING:
  - HARDCOAT ANODIZE TYPE III
  - ELECTROLESS NICKEL PLATING / NANO DISPOSITION COATING
  - SKIRT COATINGS AVAILABLE INCLUDING STANDARD MOLY D10 / FOR NON- FERROUS / NICKLE SILICON, OR ALUSIL TYPE CYLINDER SURFACES

ANALYSIS / R&D: WOSSNER GMBH

KEYENCE VL-700

- AUTOMATED SCANNING TO MEASURE COMPLEX SHAPES
- PRODUCT DESIGN FROM SCANNED DATA
- TRANSFER SCAN INTO .STEP OR .STL FORMAT
- COMPARISON OF CAD DESIGN AGAINST SCANNED OBJECT

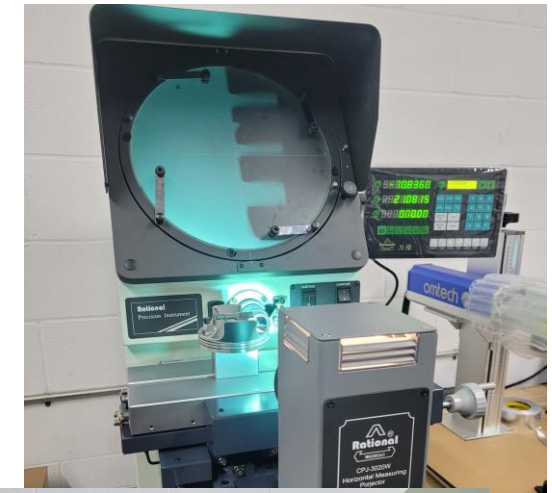
KEYENCE TM-X5120

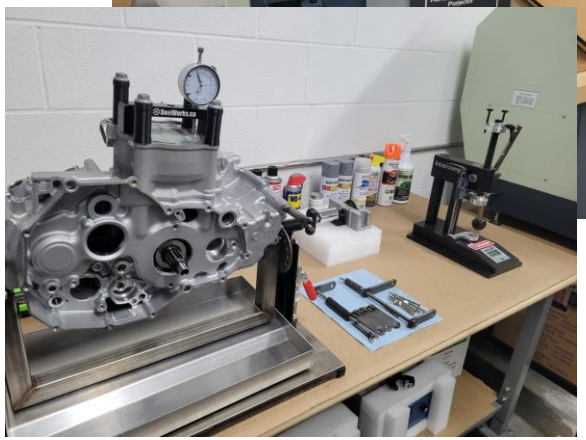
- HIGH ACCURACY SCANNING OF PISTON OUTSIDE GEOMETRY
- HIGH REPEATABILITY AND ACCURACY TO +/-2.5 UM
- IMPROVES DEVELOPMENT OF PISTON PROFILES AND OVALITY
- FUTURE STATE WILL BE USED FOR FINAL MANUFACTURING MEASUREMENT

ANALYSIS / R&D: WOSSNER NA

MATERIAL HARDNESS / PISTON INSPECTION AND MEASURING

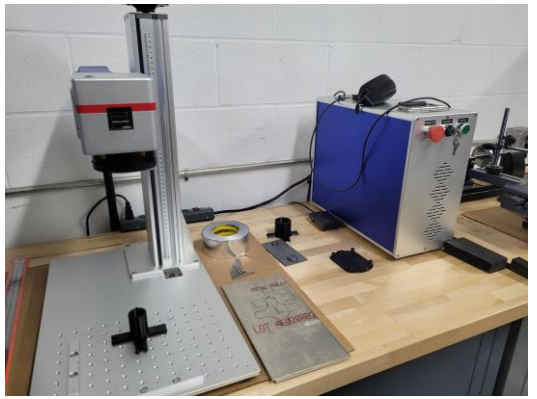
OPTICAL COMPARATOR



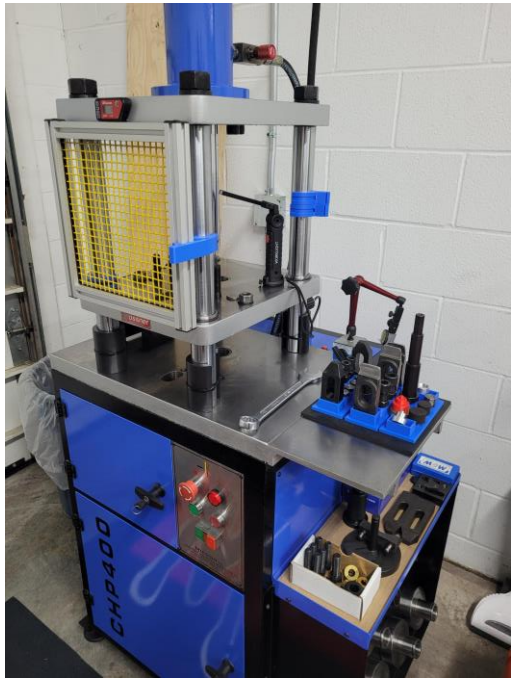


ENGINE ASSEMBLY AND INSPECTION

CRANKSHAFT PRESSING / INSPECTION



LASER MARKING COMPONENTS



Wössner HIGH PERFORMANCE PISTONS RESEARCH & DEVELOPMENT

RACE TEAM DEVELOPMENT

- MANY YEARS OF COLABORATION AND PRODUCT DEVELOPMENT BETWEEN WOSSNER AND TOP RACE TEAMS
- PISTON SOLUTIONS FOR ALL LEVELS OF RACING AND CLASS TYPES: 2-TAKT / 4-TAKT
- SOME EXAMPLES:
  - MXGP / AMA MOTOCROSS AND SUPERCROSS
  - MOTO GP / MOTO AMERICA
  - AMA FLAT TRACK
  - WORLD RALLEY CHAMPIONSHIPS
  - DRAG RACING
  - WATERCRAFT AND ALL LEVELS OF OUTBOARD RACING