



AKADEMIA KALISKA
im. Prezydenta Stanisława Wojciechowskiego



INSTITUTE OF GEARS RESEARCH EXCELLENCE CENTER



Kalisz, 2020 r.



SCHEDULE:

- ⚙ The Research Center
- ⚙ The Origin
- ⚙ Laboratories
- ⚙ Equipment
- ⚙ Cooperation Proposal





WHY IN CITY OF KALISZ ?

- ⚙ Academic staff
- ⚙ Department of Mechanics and Mechanical Engineering
- ⚙ Traditions (since the 1950s Kalisz has been the cradle of gear production in Greater Poland)
- ⚙ Modern industry (7 aviation industry plants)
- ⚙ Wielkopolska Aerospace Cluster





THE ORIGIN

Construction and equipment costs

- ⚙️ **25 304 207,21 PLN** (value of the project)
- ⚙️ **18 634 051,57 PLN** (support from UE budget)
- ⚙️ **4 185 615,42 PLN** (financial contribution)
- ⚙️ **2 484 540,22 PLN** (support from Kalisz city budget)

The institute in numbers:

- ⚙️ building cubature: 11 300 m³
- ⚙️ usable area: 2 114 m²
- ⚙️ three laboratories
- ⚙️ the auditorium room (110 seats)



**PROGRAM
REGIONALNY**
NARODOWA STRATEGIA SPÓJNOŚCI



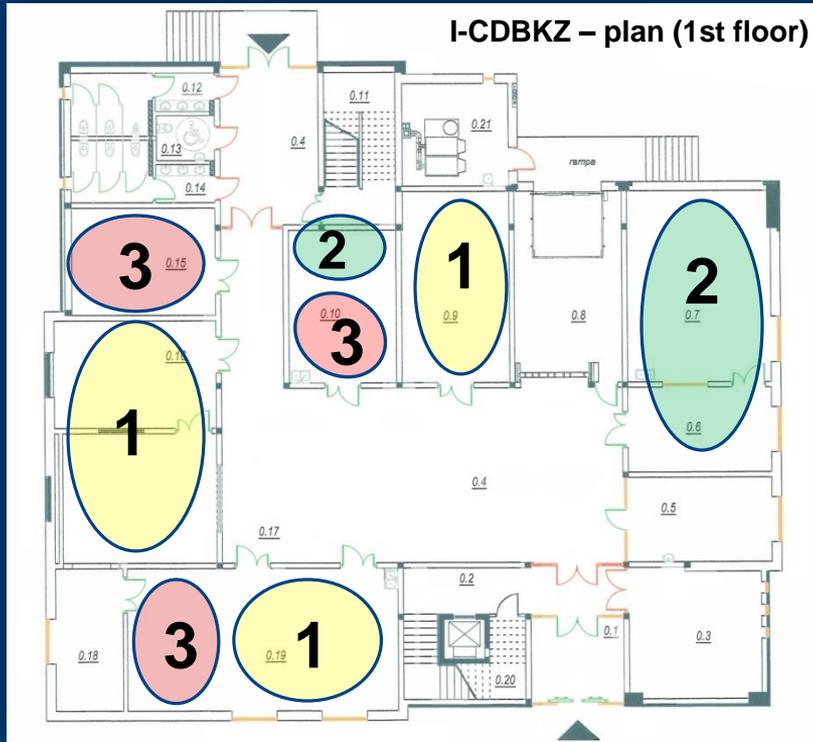
WOJEWÓDZTWO
WIELKOPOLSKIE

UNIA EUROPEJSKA
EUROPEJSKI FUNDUSZ
ROZWOJU REGIONALNEGO





LABORATORIES



1. Geometric Accuracy Laboratory

2. Strength Testing Laboratory

3. Materials Research Laboratory



LABORATORIES - EQUIPMENT

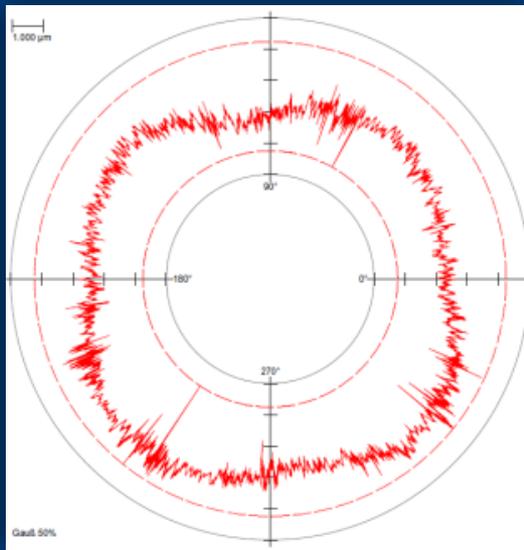
Measuring machines and devices along with instrumentation, software and standards were made and delivered by industry leaders

		 The company of μ	 apply innovation
		 a schunk company	 Optical Measuring Techniques
	 INSTYTUT PIB TECHNOLOGII EKSPLOATACJI PAŃSTWOWY INSTYTUT BADAWCZY RADOM	 Meß- und Prüftechnik GmbH	 METALLOGRAPHY
			
	 pure perfection		



Formline Roundscan 555 HR

A stand for unequivocal measurement of form and positional tolerances



MEASUREMENTS:

- ⚙ roundness
- ⚙ coaxiality, concentricity
- ⚙ radial/axial run-out
- ⚙ totalradial/axial run-out
- ⚙ parallelism
- ⚙ perpendicularity
- ⚙ cylindricity
- ⚙ straightness
- ⚙ angularity

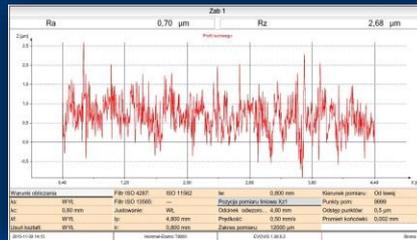
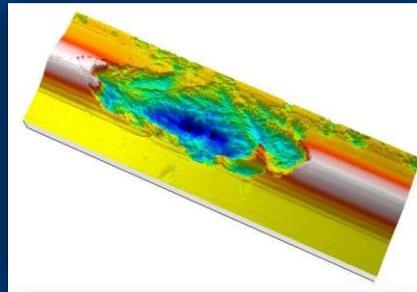
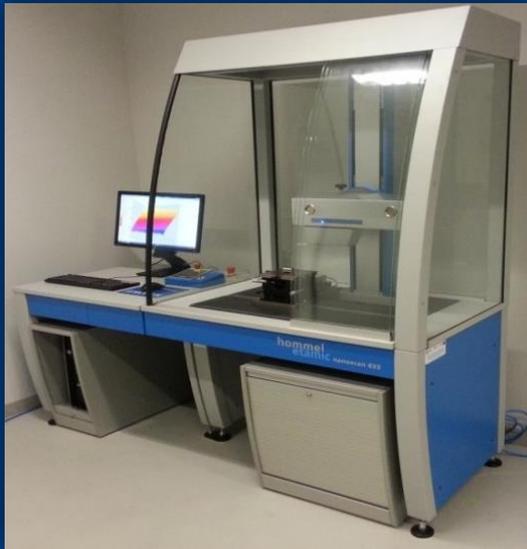
SPECIFICATION:

- ⚙ measurable diameter: **430 mm**
- ⚙ measurable height: **550 mm**
- ⚙ measuring axes: **C, Z, R, X, Y**



Waveline Nanoscan 855

A stand for simultaneous control of roughness and surface contour (in one pass)



MEASUREMENTS:

- ⚙ roughness
- ⚙ surface topography
- ⚙ contour

SPECIFICATION:

- ⚙ measuring range: **24 mm**
- ⚙ resolution: **0,6 nm**
- ⚙ positioning accuracy: **$\pm 25 \mu\text{m}$**



LH 65 Coordinate Measuring Machine

Geometry measurements of rotationally symmetrical and prismatic parts



EQUIPMENT:

- ⚙ touch trigger measuring system
RENISHAW PH20

SPECIFICATION:

- ⚙ measuring ranges [mm]:
X = 650, Y = 750, Z = 500
- ⚙ accuracy: **2,5 μ m + L/300**



LEITZ Infinity Ultra High Accuracy Coordinate Measuring Machine

A reference measuring machine for manufacturing, quality control centers and metrology labs



EQUIPMENT:

- ⚙️ “Closed Frame”- design with fixed portal and moving table
- ⚙️ separated air-conditioning system (Weisstechnik)

SPECIFICATION:

- ⚙️ measuring ranges [mm]:
X = 1200, Y = 1000, Z = 600
- ⚙️ measuring error: **0,2 μm**
- ⚙️ accuracy: **0,3 $\mu\text{m} + L / 1000$**
- ⚙️ max. positioning speed: **400 mm/s**
- ⚙️ max. acceleration: **3000 mm/s²**
- ⚙️ scales resolution: **0.004 μm**



WGT 600 Specialized 4-axis Measuring Machine for Gears

Measurements of gears and gear machining tools using specialized measuring device



SPECIFICATION:

- ⚙ accuracy: **Group 1 acc to VDI/VDE 2612/13**
- ⚙ measuring range [mm]:
X = 500, Y = 320, Z = 650
- ⚙ measurable diameter: **430 mm**



Stans for Single Flank of Bevel and Cylindrical Gears Measurements: do-140 k, do-2 pc



do-140 k pc: stand for single flank of
bevel gears measurements

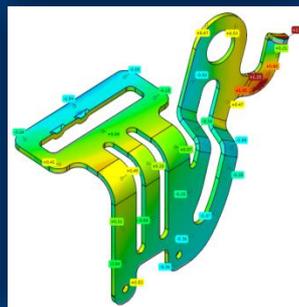


do-2 pc: stand for single flank of
cylindrical gears measurements



ATOS ScanBOX 5108 with ATOS III Triple Scan 3D scanner

3D coordinate measuring, full-field scanning & inspection, quality control, reverse engineering, GD&T analysis



SPECIFICATION (box):

- ⚙ dimensions: **2000 × 2550 × 2700 mm**
- ⚙ max. diameter of part: **Ø800 mm**
- ⚙ maks. weight of part: **300 kg**

SPECIFICATION (scanner):

- ⚙ accuracy: **< 0,02 mm**
- ⚙ working distance: **490 x 2 000 mm**
- ⚙ resolution: **3296 x 2472 pxl**
- ⚙ measuring points per scan: **8 mln**



Tribological Testing Machines for Bevel (T-30) and Cylindrical (T-12UM) Gears

Tribological properties testing of oils, gears construction materials, gears resistance to accelerated-stage (scuffing and scoring) and bevel and cylindrical gears fatigue tests (pitting and spalling)



SPECIFICATION (T-30):

- ⚙ engine rotation speed: **up to 6000 rpm**
- ⚙ max. load level: **14 (about 726 Nm)**
- ⚙ lubrication: **immersion type**



SPECIFICATION (T-12UM):

- ⚙ Testing gears (FZG): **typ A (20 mm) or A10 (10 mm)**
- ⚙ Engine rotation speed: **up to 3000 rpm**
- ⚙ max. load level: **12 (about 534 Nm)**
- ⚙ lubrication: **immersion type**



Inspekt 250 kN Universal Testing Machine

Static tensile tension, bending, compression tests under uniaxial, quasi-static loads and/or displacement of samples

SPECIFICATION:

- ⚙ max. test force: 250 kN
- ⚙ test room: 510 x 1145 mm
- ⚙ test speed: from 0,01 up to 175 mm/min





Aramis 5M Displacements and Deformations 3D Measuring System

A stereoscopic system for dynamic measurement and real time analysis of deformation and deformation

POSSIBLE TESTS:

- ⚙ stress estimation
- ⚙ dimensioning
- ⚙ nonlinear behaviour of materials
- ⚙ creep and aging process characterisation
- ⚙ determination of Forming Limit Curve (FLC)
- ⚙ Finite Element Models verification
- ⚙ materials characteristics determination

SPECIFICATION:

- ⚙ resolution: 2448 x 2050 pix
- ⚙ frequency: 15 – 29 Hz





S7 Metal Lab Plus Optical Emission Spektrometer



Chemical composition analysis of alloys

SPECIFICATION:

- ⚙ detectors: 16 CCD
- ⚙ spectra field: 130 – 900 nm
- ⚙ detection thresholds: up to 10 ppm
- ⚙ focal length: 500 mm
- ⚙ spectra area: 178 x 460 nm



Stress X Diffractometer

A X-Ray diffractometer dedicated to residual stresses analysis in surface layer

SPECIFICATION:

- gear robot: 6-axes
- gear X-Ray tube: 130 – 900 nm
- gear goniometer – angular range: 10 or 22°
- gear goniometer – angular accuracy: 500 mm





Metallographic preparation devices



MICRACUT 201
Microprocessor-
controlled High Speed
Table Deed Precision Cut
off Machine



VACUMET 52 Self-
contained Vacuum
Impregnation Unit



ELOPREP Automated
and Programmable
Electrolytic Polishing
and Etching System



ECOPRESS 100 Automated
Hot Mounting Press



DIGIPREP 251
Automated
Metallographic Sample
Preparation Unit



Structure characterisation devices



**OMNITEST Universal
Hardness Tester**
(HV, HR, HB)



**VMHT AUTO MOR
Microhardness Tester**
(HV, HK)



*Hawk Duo Automated
Video and Optical
Measuring System*



Cooperation proposal



- ⚙ Measurements of shape deviations, true position and run-out
- ⚙ Measurements of contour and surface roughness
- ⚙ Geometry measurements of various physical objects using Coordinate Measuring Machines
- ⚙ Quality control and measurements of gears standards
- ⚙ Single flank of bevel and cylindrical gears measurements
- ⚙ 3D coordinate measuring, full-field scanning & inspection, quality control, reverse engineering, GD&T analysis

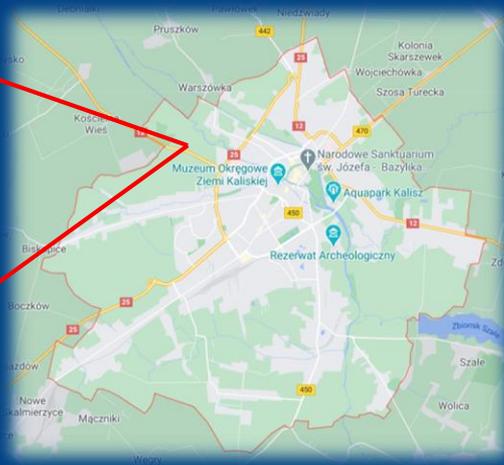
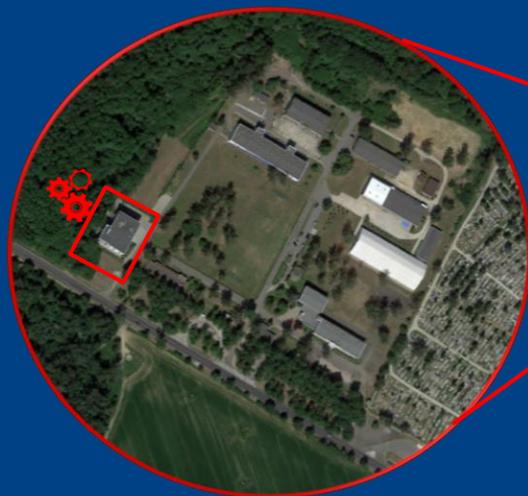


- ⚙ Tribological properties testing of oils, gears construction materials, gears resistance to accelerated-stage (scuffing and scoring) and bevel and cylindrical gears fatigue tests (pitting and spalling)
- ⚙ Static, compression and bending examination of materials
- ⚙ Real-time measurements of displacements and deformations



- ⚙ Preparation of metallographic specimens to determine microstructure
- ⚙ Hardness and microhardness measurements
- ⚙ Determination of chemical composition of alloys using optical emission spectrometry method
- ⚙ Optical microscopy geometry measurements
- ⚙ Residual stresses analysis in surface layer

WE INVITE YOU TO COOPERATION



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