

polymeca

GENERAL CONTRACTOR FOR PRECISION ENGINEERING.

Technological data

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## *Our services*

Partnership, assistance or project management for:

- Black Box Engineering
- Ratio projects
- Process concepts
- Cost consulting
- Design consulting
- Metrology
- Production planning
- Machine programming
- Quality control
- Tool design
- Machining trials (materials, tooling, etc.)
- Auditing and reviews
- Production plant evaluation
- Supplier selection and assessment
- Benchmarking
- Outsourcing
- C-technology (DNC, etc.)
- Various

## *Your benefits*

Our specialist team (engineers, designers, production experts, quality control specialists, etc.) has a well-proven track record in production technology and related areas. They dedicate their entire experience and know-how to your needs.

## *Facilities*

Comprehensive machine tool park

- CAD 3D-IDEAS
- Programming systems
- Environmental technology and materials laboratory
- Cooperation with Leica Geosystems subsidiaries in electronics, optics, materials and process technology
- Close-knit network of suppliers and partners

## *Specialities*

General contractor services for production mandates

# Turning technology

## *Machine-tools*

See machine tool park on page 16

## *Materials*

Aluminium, brass, steel, nitride steel, titanium, etc.

## *Maximum dimensions*

Bar machining: 6 - 100 mm dia.  
Chuck capacity: 230 mm dia.

## *Tolerance range*

Precision under mass-production conditions (typical):  
brass, 24 mm ID, concentricity tolerance <0.002 mm  
tolerance 0.005 mm

## *Surface roughness*

≤ N5, Ra <0.3

## *Chucking systems*

Bar machining, pneumatic chuck, collet chuck, various.

## *Measuring equipment*

3D measuring robot (Leitz), 3D measuring machines (Leitz and Tesa), concentricity measuring machine (Talyrond), inside and outside micrometry (Marposs and Movomatic), surface inspection equipment, conventional measuring technology.

## *Programming system*

3D-IDEAS / Unigraphics NX6

## *Pre-machining and finishing*

Lapping, trowalizing, sandblasting, grinding, engraving, tooth-cutting, enamelling (wet dust-free and wet paint), galvanizing.

## *Packaging options*

Standard plastic containers (WEZ), Europallets with inserts, customized packaging.

## *Delivery time*

As from 2 weeks, depending on component group type, tool design, programming outlay, inspection requirements, etc.

## *Specialities*

- Complete machining of aluminium and titanium from bar
- Finish-machining to close tolerances and concentricities

# Milling technology

## *Machine-tools*

See machine tool park on page 17

## *Materials*

Aluminium, ferrous metals, steel, nitride steel, titanium, etc. (castings, pressings, solid)

## *Maximum dimensions*

Work piece size 630 mm x 630 mm x 650 mm

## *Maximum traverse per axis*

x 800 mm, y 600 mm, z 700 mm

## *Maximum workpiece weight*

600 kg

## *Tolerance range*

0.01 to 0.04 mm, depending on machine tool

## *Surface roughness*

N6

## *Chucking systems*

Cubic chucking, Erowa, modular system, vice chucking, vacuum chucks, perforated disk system, proprietary systems.

## *Measuring equipment*

3D measuring robot (Leitz), 3D measuring machines (Leitz and Tesa), concentricity measuring machine (Talyrond), inside and outside micrometry (Marposs and Movomatic), surface inspection equipment, conventional measuring technology.

## *Programming system*

Alphacam 7.5 / 3D-IDEAS I Unigraphics NX6

## *Pre-machining and finishing*

Lapping, trowalizing, sandblasting, grinding, engraving, enamelling (wet dust-free and wet paint), galvanizing.

## *Packaging options*

Standard plastic containers (WEZ), Europallets with inserts, customized packaging.

## *Delivery time*

As from 2 weeks, depending on component group type, tool design, programming outlay, inspection requirements, etc.

## *Specialities*

- Complete machining of thin-walled unstable workpieces
- Machining from solid with CAD coupling
- Curve machining
- Finish milling to close tolerances

# Grinding technology

## *Machine-tools*

See machine tool park on page 16

## *Materials*

Aluminium (hard anodized), brass, steel, nitride steel, titanium, FeNi, Al-NiCo, etc.

## *Maximum dimensions (CNC)*

Outside: diameter approx. 350 mm, length approx. 650 mm  
Inside: diameter approx. 300 mm, length approx. 200 mm

## *Tolerance range*

Precision under mass-production conditions (typical):

- Nitride steel HV 900, 20 mm ID, 45 mm long: roundness tolerance <0.0003 mm, cylindricity <0.001 mm, tolerance 0.002 mm, Ra 0.05 mm
- Nitride steel HV 900, 20 mm D, 45 mm long: overall roundness tolerance boring and shaft <0.0004 mm, pairing clearance <0.001 mm, Ra <0.05 mm.

## *Surface roughness*

N2

## *Chucking systems*

Magnetic and precision chucks, between centres, hydro-dynamic chucks etc.

## *Measuring equipment*

3D measuring robot (Leitz), 3D measuring machines (Leitz and Tesa), length measuring centre (SIP), concentricity measuring machine (Talyrond), inside and outside micrometry (Marposs and Movomatic), surface inspection equipment, etc.

## *Programming system*

Studer GRIND, Parameter programming, WOP (Fanuc).

## *Pre-machining and finishing*

Lapping, trowalizing, sandblasting, engraving, laser marking, tooth-cutting, enamelling (wet dust-free and wet paint), galvanizing, inspection for pairing clearance.

## *Packaging options*

Standard plastic containers (WEZ), Europallets with inserts, customized packaging.

## *Delivery time*

As from 2 weeks, depending on component group type, tool design, programming outlay, inspection requirements, etc.

## *Specialities*

- Synchronized outside and inside grinding
- Dimensional control of pairing grinding with automated cylindricity correction.
- Thread grinding
- Automation

## Measuring room to VDI/VDE 2627, Quality class 3, $\pm 0.5^\circ\text{C/hr}$

*Leitz PMM 12106*  
*Precision measuring machine*

Measured volume X/Y/Z (in mm)  
Accurate to the  $\mu\text{m}$  (L in mm)

1200/1000/600  
 $E = 1.0 + L/400$   
 $P = 0.8$

*SIP 550M*  
*Length measuring centre*

Measured length X (in mm)  
Accurate to the  $\mu\text{m}$  (L in mm)

550  
 $U1 = 0.2 + L/2500$

*Talyrond 252*  
*Form testing instrument*

Measured volume (in mm)  
Accurate to the  $\mu\text{m}$

diameter 350 mm  
height 300 mm  
roundness  $\leq 0.1$ , flatness  $\leq 0.1$   
cylindricity 1.0/100mm  
straightness 0.25/100mm  
orthogonality  $\leq 0.1$

## Measuring room to VDI/VDE 2627, Quality class 4, $\pm 1.0^\circ\text{C/hr}$

*Leitz Reference 15.9.7*  
*Precision measuring machine*

Measured volume X/Y/Z (in mm)  
Accurate to the  $\mu\text{m}$  (L in mm)

1500/900/700  
 $E = 1.0 + L/350$   
 $P = 1.0$

*TESA 3D Micro-MS 454*

Measured volume X/Y/Z (in mm)  
Accurate to the  $\mu\text{m}$  (L in mm)

400/500/400  
 $U1 = 5.0 + L/140$   
 $U3 = 6.0 + L/110$

*TESA 3D Micro-MS 343*

Measured volume X/Y/Z (in mm)  
Accurate to the  $\mu\text{m}$  (L in mm)

300/400/300  
 $U1 = 5.0 + L/170$   
 $U3 = 8.0 + L/125$

## In production area

*Leitz SIRIO 688 Measuring robot*

Measured volume X/Y/Z (in mm)  
Accurate to the  $\mu\text{m}$  (L in mm)

600/800/800  
 $E = 1.9 + L/250$   
 $Ur = 6.0, Ut = 7.0, Ua = 4.5$

*TESA 3D Micro-MS 343*

Measured volume X/Y/Z (in mm)  
Accurate to the  $\mu\text{m}$  (L in mm)

300/400/300  
 $U1 = 5.0 + L/170$   
 $U3 = 8.0 + L/125$

E = Volumetric length measurement deviation, P = Volumetric scan deviation  
U1 = Accurate in one axis, U3 = Accurate in the room  
Ur, Ut, Ua = Four axis measurement deviation (3D-Alpha)

# Surface galvanizing

## Black chromed

*Maximum workpiece dimensions*

300 mm x 200 mm x 100 mm

*Maximum surface coating area*

18 dm<sup>2</sup>

*Coating thickness tolerance*

± 0.002 mm

*Applications / coating properties*

- Decorative black coating with high corrosion protection, on optical coatings to prevent reflections
- Matt black

*Substrate materials*

- Iron, copper, brass
- Stainless steels

## Zinc phosphating

*Maximum workpiece dimensions*

500 mm x 500 mm x 200 mm

*Maximum surface coating area*

*Coating thickness tolerance*

± 0.001 mm

*Applications / coating properties*

- Paint adhesion base, corrosion protection
- Matt grey, non-metallic, crystalline

*Substrate materials*

Steel

## Black finishing of stainless steel

*Maximum workpiece dimensions*

450 mm x 200 mm x 500 mm

*Maximum surface coating area*

*Coating thickness tolerance*

Slight surface removal

*Applications / coating properties*

- Black finishing of stainless and high-alloy steels
- Degree of blackness depends on workpiece material

*Substrate materials*

Stainless and high-alloy steels

# Surface galvanizing

## Brass: blue pickling

<i>Maximum workpiece dimensions</i>	400 mm x 300 mm x 200 mm
<i>Maximum surface coating area</i>	
<i>Coating thickness tolerance</i>	Slight surface removal
<i>Applications / coating properties</i>	<ul style="list-style-type: none"><li>▪ Decorative black surfacing</li><li>▪ Optical scatter reduction</li><li>▪ Dense black</li></ul>
<i>Substrate materials</i>	Brass containing 58 - 65 % copper

## Copper, electrolytic

<i>Maximum workpiece dimensions</i>	500 mm x 300 mm x 150 mm
<i>Maximum surface coating area</i>	180 dm <sup>2</sup>
<i>Coating thickness tolerance</i>	± 0.003 mm
<i>Applications / coating properties</i>	<ul style="list-style-type: none"><li>▪ Intermediate layer</li><li>▪ Ductile, moderate gloss retained</li></ul>
<i>Substrate materials</i>	<ul style="list-style-type: none"><li>▪ Iron, copper, brass</li><li>▪ diecast zinc with pre-treatment</li></ul>

## Shiny chromium

<i>Maximum workpiece dimensions</i>	300 mm x 200 mm x 100 mm
<i>Maximum surface coating area</i>	18 dm <sup>2</sup>
<i>Coating thickness tolerance</i>	± 0.005 mm
<i>Applications / coating properties</i>	<ul style="list-style-type: none"><li>▪ decorative chromium</li><li>▪ high-gloss surface finish possible (depending on mechanical preprocessing)</li></ul>
<i>Substrate materials</i>	Iron, copper, brass

# Surface galvanizing

## *Electrolytic oxydation of aluminium by the direct current process*

*Maximum workpiece dimensions* 2000 mm x 500 mm x 900 mm

*Maximum surface coating area*

*Coating thickness tolerance*  $\pm 0.002$  mm

*Applications / coating properties*

- Decorative coatings, corrosion protection
- Good adhesion base for paints
- For subsequent adsorptive colouring
- Colours: jet black, gold-orange, blue, red, violet (organic).

*Substrate materials*

Aluminium and aluminium alloys

## *Nickel, galvanic*

*Maximum workpiece dimensions* 500 mm x 300 mm x 150 mm

*Maximum surface coating area*

*Coating thickness tolerance*

*Applications / coating properties*

- Particularly suitable for printed circuits
- Ductile, glossy or semi-glossy

*Substrate materials*

Iron, copper, brass

## *Nickel, chemical*

*Maximum workpiece dimensions* 700 mm x 250 mm x 400 mm

*Maximum surface coating area*

*Coating thickness tolerance*  $\pm 0.001$  mm (max. coating thickness 0.03 mm)

*Applications / coating properties*

- Protection against corrosion and wear; diffusion barrier
- Antimagnetic, 480 to 560 HV, or 1000 to 1150 HV after heat treatment, glossy
- P content  $\approx 9\%$  to  $13\%$

*Substrate materials*

All commonly used substrate metals

# Surface galvanizing

## Chemical blackening of copper

*Maximum workpiece dimensions*

450 mm x 200 mm x 500 mm

*Maximum surface coating area*

*Coating thickness tolerance*

*Applications / coating properties*

- Corrosion protection; decorative black surface
- Absorbent, heat-resistant up to 200 °C, matt to glossy

*Substrate materials*

Copper, and copper alloys containing >90% Cu

## Black finishing

*Maximum workpiece dimensions*

450 mm x 200 mm x 300 mm

*Maximum surface coating area*

*Coating thickness tolerance*

Slight surface removal, approx. 4.5 g/m<sup>2</sup>

*Applications / coating properties*

- Protection against corrosion; decorative black surface
- Matt to glossy black, according to pre-machining (degree of blackness depends on workpiece material)

*Substrate materials*

Low to high carbon steels

## Chromate of aluminium

*Maximum workpiece dimensions*

2000 mm x 650 mm x 1000 mm

*Maximum surface coating area*

*Coating thickness tolerance*

*Applications / coating properties*

- Excellent base for paints
- Excellent electrical conductor
- Colours: transparent (SurTec 650, standard; Alodine 1500)

*Substrate materials*

Aluminium and aluminium alloys

# Surface galvanizing

## *Other services*

*Ultrasonic cleaning, alkaline  
(water-based)*

Workpiece size max. 900 mm x 500 mm x 500 mm

*Sand and glass-bead blasting*

*Vibratory grinding*

*Chemical polishing (aluminium)*

## *Packaging options*

*Standard plastic containers  
(WEZ)*

*Europaletts with inserts*

*customized packaging*

*Delivery time*

By agreement

# Surface painting, wet

## *Typ of system*

Spray booth ICS/140, table model

## *Number of units*

7

## *Substrate materials*

Aluminium, steel, brass, various plastics (on inquiry)

## *Max. dimensions*

approx. 600 mm x 600 mm x 400 mm

## *Max. weight*

approx. 5 kg

## *Tolerance range*

Depending on finish required, by agreement.

## *Measuring equipment*

Film thickness metering (eddy current system)

## *Dryer system*

Compartment dryer (max. 240 °C)

## *Pre-treatment*

- Sandblasting, ultrasonic cleaning (water bath)
- Aluminium: chromating, anodizing
- Ferrous materials: Zn-phosphating

## *Other facilities*

- Stove enamelling
- Air-drying 1 and 2-component paint systems
- Structured paint finishing

## *Packaging options*

- Standard plastic containers (WEZ)
- Europallets with inserts
- Customized packaging

## *Delivery time*

By agreement

# Surface painting, wet dust-free

<i>Typ of system</i>	Spray booth CMC Industry 350
<i>Number of units</i>	1
<i>Substrate materials</i>	Aluminium, steel, brass, various plastics (on inquiry)
<i>Max. dimensions</i>	approx. 2000 mm x 1500 mm x 1000 mm
<i>Max. weight</i>	approx. 1000 kg
<i>Tolerance range</i>	Depending on finish required, by agreement.
<i>Measuring equipment</i>	Film thickness metering (eddy current system)
<i>Dryer system</i>	to directly laboured dry in the compartment dryer
<i>Pre-treatment</i>	<ul style="list-style-type: none"><li>▪ Sandblasting, ultrasonic cleaning (water bath)</li><li>▪ Aluminium: chromating, anodizing</li><li>▪ Ferrous materials: Zn-phosphating</li></ul>
<i>Other facilities</i>	<ul style="list-style-type: none"><li>▪ Stove enamelling</li><li>▪ Air-drying 1 and 2-component paint systems</li><li>▪ Structured paint finishing</li></ul>
<i>Packaging options</i>	<ul style="list-style-type: none"><li>▪ Standard plastic containers (WEZ)</li><li>▪ Europallets with inserts</li><li>▪ Customized packaging</li></ul>
<i>Delivery time</i>	By agreement.

# Installation / erection

## *Our services*

Precision mechanics installations from individual elements to complete aggregates including commissioning. Also including electronic components and adhesive jointing.

## *Your benefits*

We cover all your needs comprehensively, from individual elements to finish-installed aggregates and turn-key installations. This drastically cuts your logistics and stock-keeping outlay.

## *Specialized equipment*

Various site installation facilities such as:

- automated threaded insert fitting
- ESD-protected zone for electronic aggregates
- etc.

# List of machine tools

## Grinding technology

*Studer S145 CNC*

Internal and external rotary grinding / complete machining / high precision / specialised internal grinding software solution

*Studer S145 CNC fully automatic*

Internal and external rotary grinding / complete machining / high precision / specialised internal grinding software solution / robot cell for loading and unloading incl. measurement control by trend correction

*Studer S31 CNC*

Rotary, internal and external form and thread grinding  
Complete machining, high speed

*Studer S31 CNC*

Internal and external rotary grinding / complete machining / Measuring control system for paired grinding parallel to the bore

*Studer S20 CNC*

External rotary grinding, pairing grinding, measuring control system

*Hardinge QUEST 8/51 SP*

CNC 3-axis hard lathe

*Sunnen*

Honing

*Mägerle*

Surface grinding

*ACI Nexus Marker*

Laser marking

## Turning technology

*Index G 300*

CNC machining centre

*Index G 200*

CNC machining centre

*Index G 160*

CNC machining centre

*Index C 65*

CNC machining centre

*Index GSC 100*

CNC 6-axis bar lathe

*Index GS 100*

CNC 6-axis bar lathe

*Index GS 30*

CNC 4-axis bar lathe

*Ebosa CNC 140*

CNC 2-axis high-precision lathe

*Weiler PRIMUS*

CNC 2-axis chuck lathe

*Gildemeister Twin 42*

CNC machining centre

*Lapmaster*

Lapping

# List of machine tools

## *Milling technology*

<i>MCM Clock FMS 600</i>	HSC horizontal machining centre
<i>MCM Clock MP4</i>	HSC horizontal machining centre
<i>Deckel Maho DMU 50 eVolution</i>	5-axis machining centre
<i>Deckel Maho DMC 60 U</i>	5-axis machining centre
<i>Hermle UWF 902S</i>	Universal milling machine
<i>Deckel FP4 CNC</i>	Universal milling machine

## *Metrology*

<i>Leitz SIRIO</i>	3D measuring robot
<i>Leitz PMM</i>	3D high-precision measuring machine
<i>Leitz Reference</i>	3D high-precision measuring machine
<i>Tesa MS 343</i>	3D measuring machine
<i>Tesa MS 454</i>	3D measuring machine
<i>Talyrond TR252</i>	Form testing instrument
<i>SIP 550 M</i>	Length measuring centre

## Business areas

### **GEOSYSTEMS = Surveying in mm**

Precision rotary axis, housings and surface technologies for: – Theodolite & digital surveyor's level  
– Laser Scanner (High Definition Scanning)

### **METROLOGY = Measurement in $\mu\text{m}$**

Assemblies of tube-arms, articulators and wrists for Coordinate Measuring Machines  
Precision rotary axis, housings and surface technologies for Laser Tracker

### **INDUSTRY = Assemblies re-precise within $\mu\text{m}$ , e.g.:**

- Air bearings for bonding machines
- Electromagnetic valves for Common Rail, Vacuum chamber
- Sleeve and guide shafts for precision machines
- High frequency spindle-parts
- Coupler for machine tool-handler

## Supplier of

### **Precision rotary axis systems for high accurate motion control**

- Sleeve and guide shafts
- Axle bearing: ball-bearing cage, journal- & air-bearing
- Motorized precision drives; couplers; housings
- Leica-encoders / angle sensors

### **Re-precise engineering & assemblies**

- Integrated process control 3D
- Pair grinding within  $< 1 \mu\text{m}$  tolerance

### **Surface technologies**

- Anodizing, hardening, refining,  
non conducting/reflecting
- Painting and cleaning

## Customer's benefit

**Comfort: one stop!** no need to coordinate the processes

**Safety: process-controlled!** measured and verified right to the single micron

**Cost effectiveness!** global competitiveness thanks multiple machine work and automation

**Prestige: Precision made in Switzerland!** reliability and responsibility in the performance

**Personal: Face-to-face and straightforward!** close coordination and flexible in action – authenticity