

|POLYDEC|

*MORE THAN
JUST SMALL*



MICRO-TURNING

www.polydec.ch

OVERVIEW

WHO ARE WE?



OUR HISTORY



OUR EXPERTISE



FIELDS OF ACTIVITY



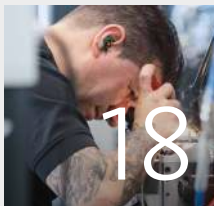
OUR ADDITIONAL SERVICES



PARTS PRODUCED



MANUFACTURING PROCESS



OUR COMPANY IN BRIEF...

Main Business Activity

- Bar turning of micro-parts from simple (“Escomatic”) to complex shapes (5- to 10-axis CNC sliding head turning machines)

Usual Dimensions

- Diameter from 0.05 to 6 mm
- Max. length 80 mm

Most Commonly Used Materials

- Carbon steels
- Austenitic and martensitic stainless steels
- Copper alloys
- Precious metals
- Titanium
- Etc.

Tolerances

- $\pm 2\mu\text{m}$ (0.002 mm), depending on the material and geometry of the part

Fields of Activity

-  Watchmaking
-  Automotive
-  Electronics
-  Medical

Certifications

- ISO 9001 (quality management)
- IATF 16949 (automotive industry)
- ISO 14001 (environment)
- ISO 45001 (occupational health & safety)
- ISO 13485 (medical devices)

OUR PHILOSOPHY

Customer satisfaction, the longevity of the company and the enthusiasm of our staff are the three aspects which drive our business forward.

OUR MISSION

To be a strategic and trusted supplier of micro-component solutions, as well as offering our staff a working environment that promotes personal development.

OUR VISION

To provide industries with innovative micro-components, so that they are able to develop their own product in the best conditions. We aim to be proactive with all requests, offering a comprehensive solution that respects our commitments by providing an excellent service.

OUR VALUES



WHO ARE WE?

Located in the Jura Arc, a region seen as the birthplace of precision bar turning, we have been producing very small, high-precision turned parts for the watchmaking, automotive, electronics and medical industries for over 35 years.

A COMPREHENSIVE SOLUTION

We machine all types of material with diameters of 0.05 to 6 mm and a maximum length of 80 mm. Our machine inventory, primarily "Swiss made", comprises 5- to 10-axis CNC sliding head turning machines, as well as Escomatic bar turning machines. The combination of these two types of machining processes allows us to offer a wide range of products: from a large volume of simple parts, to small production runs of complex-shaped micro parts.

Other complementary operations and additional treatments are often carried out to complete the finish on parts. In this way, we are able to provide customised solutions to every industry where precision, quality and responsiveness play a crucial role!

A SERVICE WHICH GOES BEYOND BAR TURNING

Our strategy goes beyond simple production: We are constantly seeking to push the limits of what is "technically feasible".

Monitoring technological advances is part of our daily work. We have set up an R&D department comprising a multi-disciplinary team, in order to develop our own equipment.

Our aim is twofold: Firstly, to integrate as many operations and services as possible in our company; Secondly, to continually adapt to our customers' needs and to changes in the current market.

QUALITY IS AT THE HEART OF EVERYTHING WE DO

We want to foster a culture which ensures our company stands out, one which focuses on customer satisfaction whilst respecting the well-being of our staff and the environment. With this in mind, we have structured our management system around the following five certifications: ISO 9001, IATF 16949, ISO 14001, ISO 45001 and ISO 13485.

These standards form part of our "Integrated Management System" (IMS) which has become a comprehensive and essential management tool in our daily work. All of these requirements enable us to guarantee deliveries which comply with the specific expectations of our customers.

THE IMPORTANCE OF OUR PEOPLE

Our performance in recent years has only been possible thanks to the expertise and ongoing commitment of our team of specialists. These results are the fruit of their expertise and their investment. This is why we have always paid particular attention to ongoing training and the working environment, encouraging dialogue and transparency.



OUR HISTORY
OVER 35 YEARS OF EXPERIENCE



OUR EXPERTISE

Bar turning is a process enabling the production of parts through automatic turning and machining with the removal of metal. The material, in the form of bars or reel, is machined on CNC sliding head turning machines or “Escomatic” turning machines cam-type or CNC.

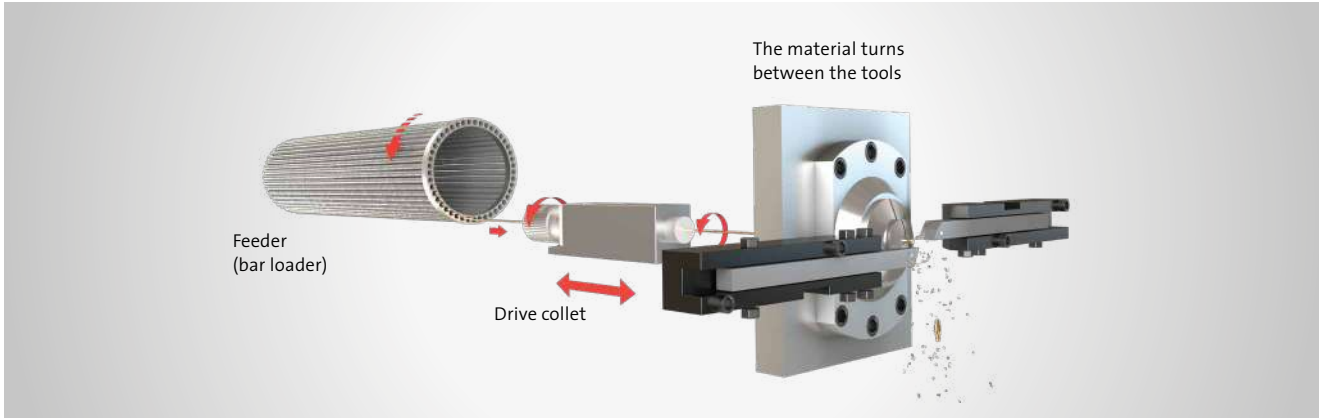
Our bar turning department comprises two types of machining:



CNC SLIDING HEAD TURNING MACHINES – COMPLEX PARTS FROM SMALL TO LARGE RUNS

Numerical control (CNC) automatic turning machines are reserved for very small turned parts with complex shapes that cannot be produced on "Escomatic" bar turning machines. They all contain an additional feeder which automatically loads the material in bars. Unlike the "Escomatic" procedure, the material turns on itself and the tools are fixed.

Technical details	
Diameters	From 0.05 mm to 6 mm
Length	Max. 80 mm
Tolerances	± 2µm (0.002 mm), depending on the material and geometry of the part
Operations which can be performed in the same work cycle	Drilling, hobbing, milling, polygon operation, threading, thread-whirling/tapping





View on our website the 3D animation presentation videos of our machining types



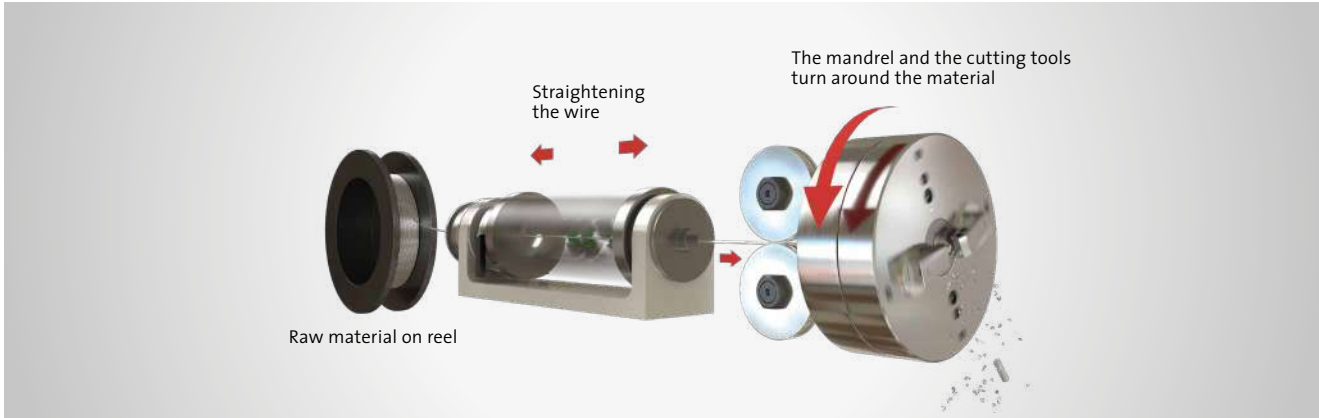
"ESCOMATIC" TYPE TURNING MACHINES – HIGH VOLUMES OF SIMPLE PARTS

"Escomatic" turning machines, either cam-type or CNC, are used mainly for machining simple parts such as pins, knurled or bent shafts. With this type of machine, the material is fed in as a wire on a reel and the tools rotate around the material.

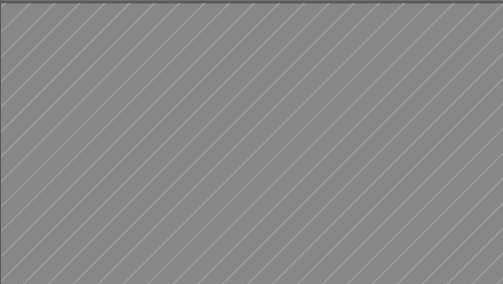
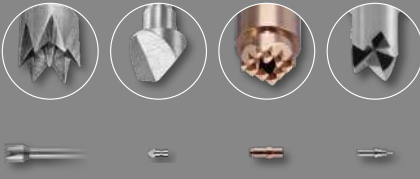
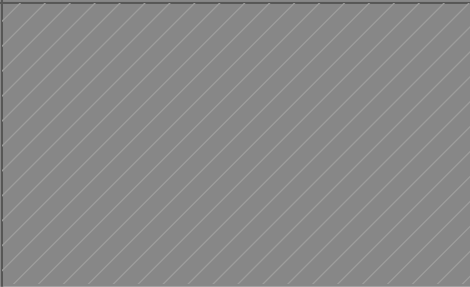
Due to its short cycle times, this method has the advantage of improving productivity, allowing the company to achieve long production runs at competitive prices compared to parts produced with CNC sliding head turning machines.

Technical details

Diameters	From 0.30 mm to 3 mm
Length	Max. 50 mm
Tolerances	± 5µm (0.005 mm), depending on the material and geometry of the part
Operations which can be performed in the same work cycle	Bending, frosting, knurling, milling



4 FIELDS OF ACTIVITY, 2 PROCESSES

	 WATCHMAKING ■ Usual dimensions: 0.08-5.50 mm, length 0.40-15.00 mm ■ Usual tolerances: ± 2µm (0.002 mm), length ± 10µm (0.01 mm) ■ Standard operations and treatments: Black/mirror polishing, bluing, chemical polishing, domed polishing, full monitoring 100% using vision systems, gold plating, hardening, micro-polishing, nickel plating, polishing, rhodium plating, sand-/micro-blasting, structural hardening, sunray polishing, tempering, etc.	 AUTOMOTIVE ■ Usual dimensions: 0.30-2.50 mm, length 4.00-40.00 mm ■ Usual tolerances: ± 5µm (0.005 mm), length ± 20µm (0.02 mm) ■ Standard operations and treatments: Carburisation, chemical polishing, “frosting”, full monitoring 100% using vision systems (0 ppm), hardening, nickel plating, polishing, sand-/micro-blasting, tempering, tin plating, etc.	 ELECTRONICS ■ Usual dimensions: 0.08-2.00 mm, length 0.55-40.00 mm ■ Usual tolerances: ± 3µm (0.003 mm), length ± 10µm (0.01 mm) ■ Standard operations and treatments: Chemical polishing, gold plating, hardening, micro-polishing, nickel plating, sand-/micro-blasting, structural hardening, tempering, etc.	 MEDICAL ■ Usual dimensions: 0.10-16.00 mm, length 0.50-80.00 mm ■ Usual tolerances: ± 5µm (0.005 mm), length ± 15µm (0.015 mm) ■ Standard operations and treatments: Hardening, micro-blasting, micro-polishing, passivation, polishing, PVD, sand-/micro-blasting, tempering, etc.
CNC SLIDING HEAD ■ Small to large runs ■ Parts with complex shapes ■ Raw material in bars ■ The material turns on itself and the cutting tools are fixed				
"ESCOMATIC" ■ Large volumes ■ Parts with simple design ■ Raw material on reel ■ Cutting tools turn around the material				

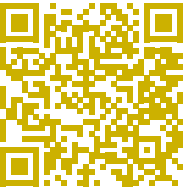
WATCHMAKING



AUTOMOTIVE



ELECTRONICS



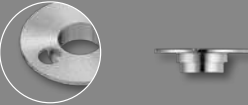
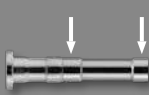
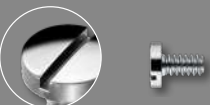
MEDICAL



OUR ADDITIONAL SERVICES

For a meticulous surface and an impeccable finish on the turned parts, we offer a complete, comprehensive service that includes additional operations and finishing treatments tailored to every requirement. These post-turning operations are performed either in-house or outsourced to trusted specialist partners – most of them ISO 9001-certified – working to strict quality standards which we impose.

HEAT TREATMENTS				
		🏠	🏠👤	
	Polishing	Deburring and brightening using friction	•	
	Hardening	Hardening by heating and rapid cooling		•
	Tempering	Stress relief of the material after hardening	•	•
	Structural hardening	Thermal hardening of copper alloys	•	
	Sand-/ micro-blasting	Surface hammering for aesthetic effect		•
	Galvanic treatments	Application of a layer of different materials		•

				🏠	🏠👤	
Frosting	Formation of surface porosity	•				
Sunray polishing	Formation of marks for aesthetic effect	•				
Rolling	Strain-hardening of material	•				
Domed polishing	Polishing and rounding of edges			•		
Black/mirror polishing	Polishing creating a mirror effect			•		
Bluing	Oxidation for aesthetic effect using heat treatment			•		
PVD	Metallisation under vacuum for aesthetic effect			•		
Automatic inspection	Automatic inspection of all the external dimensions for large volumes (0 ppm possible on certain parts)	•				

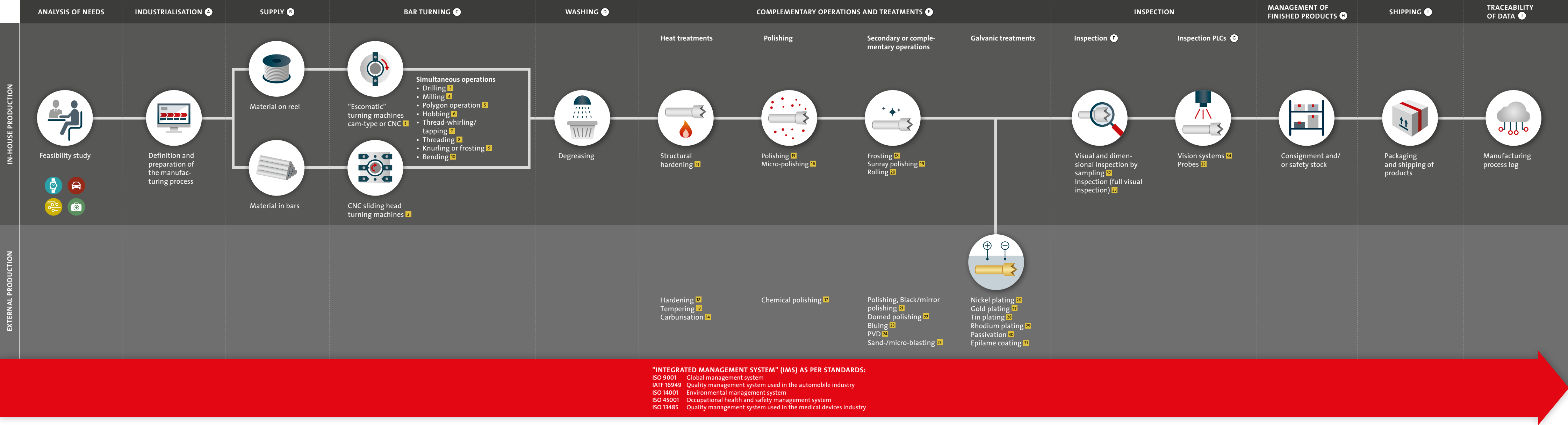
🏠 Operation performed in our workshops 🏠👤 Operation performed by trusted specialist partners, most of whom are certified

PARTS PRODUCED
PRODUCTS FOR ALL



MANUFACTURING PROCESS

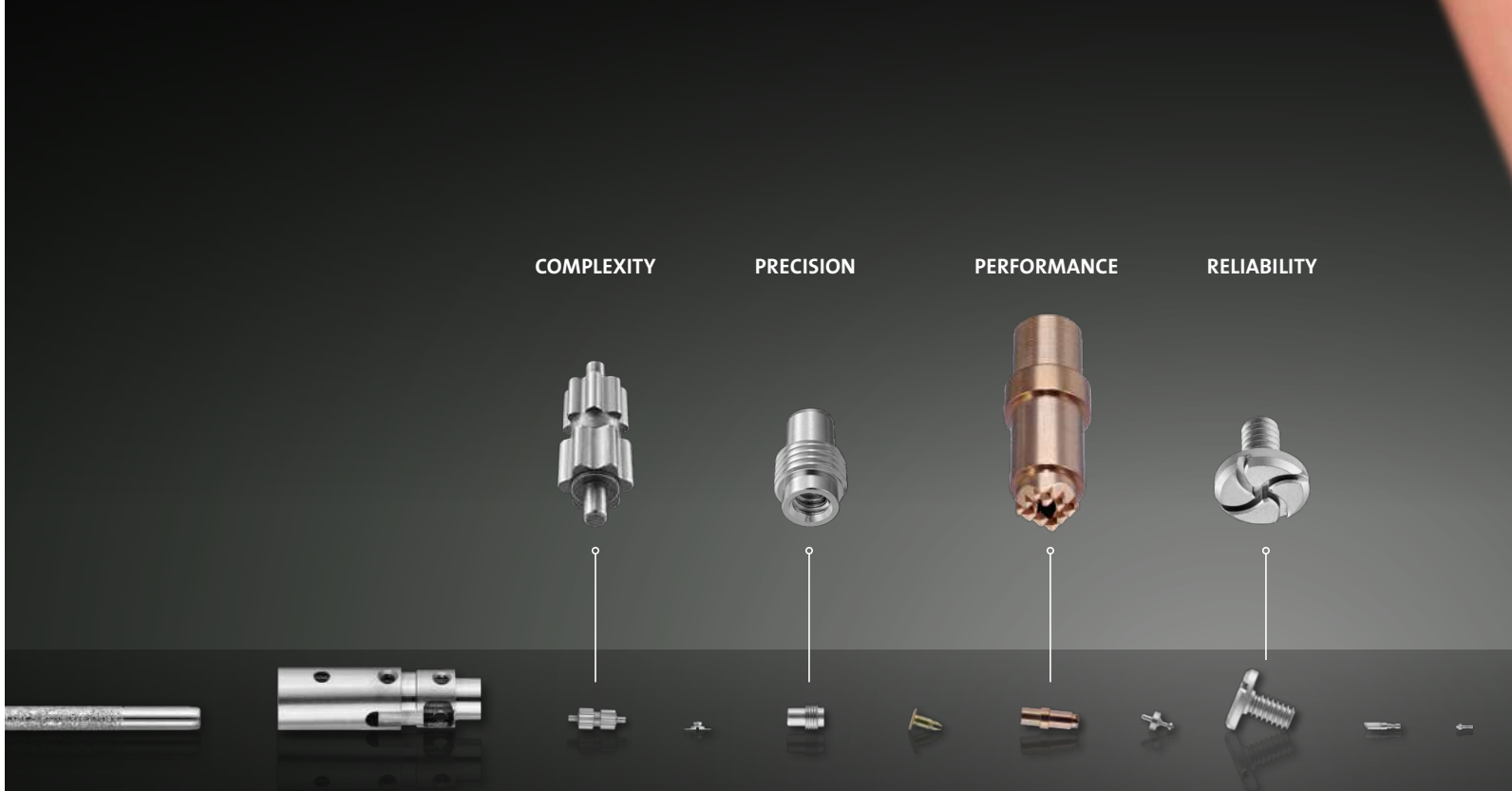
This infographic summarises the various manufacturing stages and all the operations which can be performed on our parts.



- Ⓐ • Advanced Product Quality Planning (APQP)
• Creation of drawings from customer projects
• Analysis of potential risks (FMEA)
• Creation of operating procedures
• Machine-tool design
• Creation of inspection plans
• Measurement System Analysis (MSA)
- Ⓑ **Most commonly used materials:**
 - Carbon steels
 - Austenitic and martensitic stainless steels
 - Copper alloys
 - Precious metals
 - Titanium
 - Etc.
- Ⓒ • Setup and validation of the first part
• 24/7 series production
• Monitoring critical dimensions using SPC control charts
• Maintenance of equipment and tools
- Ⓓ Cleaning using solvents in a closed circuit
- Ⓔ Modification of aesthetic and technical specifications for parts
- Ⓕ • Visual and dimensional inspection
• Study of process capabilities (Cmk, Cpk)
• Creation of inspection protocols
- Ⓖ • Full automatic inspection for parts of all sizes in large runs
• These systems are used to attain results in certain cases of 0 ppm (number of faults per million parts)
- Ⓗ Automated storage system
- Ⓘ Delivery according to customer requirements (customised supporting documentation and packaging)
- ⓵ • Creation of PPAP (Production Part Approval Process) file
• Centralisation of data using computerised ERP (Enterprise Resource Planning) tools

- 1 • Large volumes
 - Parts with a simple design
 - Material on reel
 - The cutting tools turn around the material
- 2 • Small to large runs
 - Parts with complex shapes
 - Material in bars
 - The material turns on itself and the tools are fixed
- 3 Machining to create a hole in the part
- 4 Machining of flat faces, around the periphery or on the faces of the part
- 5 Hobbing of points or facets (without interrupting the rotation of the material)
- 6 Machining the teeth on wheels, gears and pinions
- 7 Machining a screw pitch inside a drill hole
- 8 Creating a thread along a cylindrical surface
- 9 Shaping of the material using toothed wheels or diamond-coated rollers
- 10 Shaping of the shaft of a turned part by bending
- 11 The operation involves heating turned parts made from CuBe to approx. 320°C for 2 hours, then cooling them slowly. The material becomes much harder
- 12 Hardening involves heating steel turned parts to between 800°C and 1000°C, then cooling them quickly. The material becomes hard and brittle
- 13 Tempering consists of reheating the turned part for a second time to a lower temperature until it reaches the required hardness
- 14 Alteration of the peripheral layer of the steel turned part to enable surface hardening
- 15 The turned parts are mixed with carriers, abrasives and additives and then agitated for several hours (or even days) in vibrating bowls
- 16 The turned parts are mixed with carriers, abrasives and additives and then agitated for several hours (or even days) in small bowls
- 17 Deburring and brightening of the turned parts using etching
- 18 Formation of surface porosity by scratching with diamond-coated tools, with the aim of increasing the adherence of the overmoulded plastic part

- 19 Small marks for aesthetic effect, made on the flat face of the machined part, giving a sunray appearance under light
- 20 Strain-hardening of material using special bell-shaped wheels
- 21 Extremely flat polishing of the machined part, giving a mirror effect
- 22 Polishing and rounding of the machined part edges, giving a mirror effect
- 23 Oxidation of the surface of the tempered steel part by heating to obtain a blue colour, primarily for aesthetic reasons, but also to reinforce resistance to corrosion
- 24 Depositing a fine layer of any type of material (gold, copper alloys, etc.) by sputtering, primarily for decorative effect for luxury items
- 25 Blasting a stream of sand or microbeads at high speed onto the surface of the part
- 26 Depositing a fine layer of nickel on the machined part using an electrochemical process, to protect it against oxidation
- 27 Depositing a fine layer of gold on the machined part using an electrochemical process, for aesthetic effect or for electrical conductivity
- 28 Depositing a fine layer of tin on the machined part using an electrochemical process, to increase the part's weldability
- 29 Depositing a fine layer of rhodium on the machined part using an electrochemical process, for aesthetic effect
- 30 Chemical alteration of the surface of the machined part, to reduce oxidation
- 31 Depositing a microfilm on the machined part to avoid liquid lubricants spreading over the surface when pivoted
- 32 Visual and dimensional inspection by sampling of the turned parts at different stages of manufacture
- 33 Visual inspection of turned parts, 100% of the run
- 34 100% automatic control of measurements by image analysis
- 35 100% automatic control of measurements by mechanical probing



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