ICT
Int. Consulting & Trading

your partner
in high precision mechanics

Mission

To provide to our Customers Strategical, Technical and Commercial Solutions For High Precision Mechanics.
To help them to be more successful!

ICT customers deal with products and processes whose precision is of the order of bigness of one micron or of few fractions of one micron.
We are aware not to sell products but to provide SOLUTIONS! To succeed in this task **ICT** professionals enter in a strict partnership with customers, understand the real root demands and work hard and close to them to find the best way to give real value through proven effective solutions.

ICT supports the customers to get more and more success in their daily activities. This is possible through:

a) State-of-the-art technologies, simplification of all processes and new work methods;
b) Innovative IT and ERP systems;
c) Relationship based on long-term partnership;
d) Coherence with our company's values.

We believe so much in what we do to be available to link a very important part of our consultancy services pricing to the real achievements of quantifiable pre-fixed targets. Without such proven results, customer shall be entitled not to pay us!

Values

Openess and Integrity
Hands on the Job
Networking with partners
Long-term relationship with customers

Customers are our precious value: whatever may happen, they shall "enrich" both our knowledge and our vision of the world. We never think of working with them in short term perspective, we are focused to show our capabilities in honest and professional way: we are aware that they shall be able to recognize such type of approach of ours and shall award it with more and more opportunities in the long term perspective.
We genuinely feel to be important actors contributing to the results and to the achievements of all our customers.

"Our values shape everything we do and every choice we make on behalf of the company!"

Consultancy

Technical Consultancy

Through a worldwide network of partners, professionals, researchers, collaborators and suppliers, **ICT** can assist the companies of high precision mechanics also for solving technical issues in their manufacturing process and to extensively implement the concepts of lean manufacturing methodology.
The process operations where main contributions can be provided to the customers are **wire drawing**, **cold pressing**, **heat treatment**, **grinding**, **lapping**, **assembly**, different types of **controls** and **process automation** in general.
Examples of such activities are:

- To assess the manufacturing process capabilities to produce specific products or to comply with certain tolerances;
- To verify the compliance of Quality systems to norms like ISO 9001 or ISO TS16491;
- To verify the compliance of Environmental systems to norms like 14001 or ISO 14040.

Strategic Consultancy

ICT supports customers in high precision mechanichs industry in defining both the company vision and the best strategy to reach such a vision. Our action consists mainly of 5 different steps:

- Analysis of main hystorical businesss performances and definition of few KPIs (*Key Performance Indicators*)
- Definition of company vision
- SWOT analysis, i.e. the identification of company **Strengths** on which to leverage the strategy, of the **Weaknesses** to take special care of during the strategy implementation, of the **Opportunities** to catch and take advantage of and of the **Threats** that may jeopardize the company plans
- Qualitative description of directions that company wants to go for in terms of company sales purpose and company values
- Preparation of a complete list of operative actions to be programmed in the fixed time span of strategy implementation.

Commercial Consultancy

ICT helps companies of high precision mechanics sector to develop their sales organization in new markets.
Typical customers are Asian companies who are willing to distribute thier products in Europe or, viceversa, European customers who want to sell their products in Asian countries (mostly India and China).

In these cases **ICT** can support the clients in two different ways:

- helping them to create a network of distributors or agents that can cover the target territory and develop the sales, supporting in all marketing activities required to create the customer's brand recognition;
- managing directly the exclusive representation of the customer's products in the territory, promoting the sales through **ICT** own network.

Components

Balls

The heart of any ball bearing is represented by the balls themselves that, paired between inner and outer ring, allow the relative movement between the parts and determine most of the bearing functional performances.
ICT offers steel balls in quality grades from G3 to G40, including the special **Super-Premium** grade designed for applications with high silence requirements . The chrome steel balls are made with clean 100Cr6 steel (i.e. without metallic and not metallic inclusions) produced only by well known Japanese, Korean and French steel mills. This is a guarantee of excellent resistance of balls to fatigue and wear, in such a way to avoid dangerous phenomena of balls spalling that might result into the same failure mode also on rings grooves.

NHB Inside
The logo *NHB Inside* is the symbol of a superior quality, of an higher attention to all the aspects that can make the difference in the final bearing application in terms of both performances and total costs.

Qualità Super Premium
Through the partner NHB, **ICT** is able to offer a quality grade better than G3, i.e. better than the best grade defined in ISO 3290. This very special quality grade is called **Super-Premium**.

In addition to very low values of ovality, Super-Premium balls are classified through very restrictive parameters of waviness and they are manufactured in a *Premium philosophy* shop-floor environment based on "no-deviation approach", best in class machinery, procedures and suppliers.
Advantages for the customers in using Super Premium quality are:

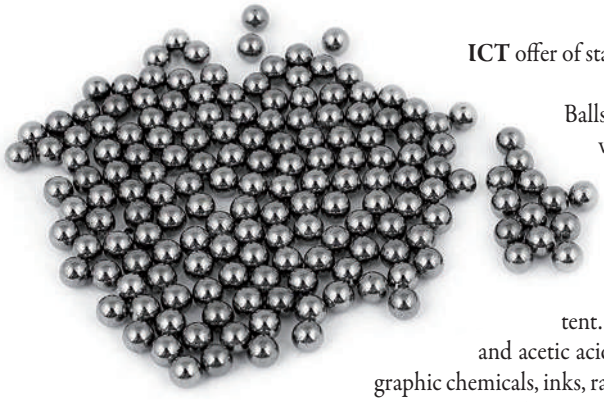
- Silent bearings in the final application
- Up to 50% reduction of bearing noise rejections in assembly lines, keeping constant the other process parameters;
- Continuous flow in manufacturing without need of reworking;
- Longer life bearings in final application.

Chrome Steel Balls

100Cr6, i.e. the chrome steel used for bearings application, is the most widely used material for balls and is also known as 52100 or SUJ2 steel.
The steel sources that **ICT** uses guarantee very fine-grain martensitic microstructure, which allows high hardness and exceptional wear and fatigue resistance properties.
Our chrome steel balls are widely used worldwide in various applications, from bearings to ball screws, from constant velocity joints to check valves, from automotive steering to seating systems, just to mention few. We produce more than 4 billions a year of chrome steel balls. This allows the flexibility of a wide offer, served worldwide with *just-in-time* policy.

Quality range includes the very special Super Premium specification besides the best ISO 3290 grades, i.e. G3, G5 and G10, for noise sensitive bearings. We offer G10 and G16 grades for HUB wheel bearings and G20, G24 and G28 for constant velocity joints. However we can support our customers to chose the best fit products for their own needs.

Stainless Steel Balls



ICT offer of stainless steel balls covers multiple types of materials.

Balls in **AISI 304/302** steel are dedicated to those applications whose conditions require corrosion and toughness performances not available in hardenable stainless steels. Exemple of such applications are couplings, valves and pumps

AISI 316 stainless steel balls have exceptional corrosion resistance thanks to their higher nickel and molybdenum content. Developed to resist in contact with sulphuric, phosphoric and acetic acid, they are extensively used in applications involving photographic chemicals, inks, rayon, rubber, textile bleaches, dye stuffs and high temperature equipments. Examples of such applications are medical, health and beauty aid, food and beverage parts and assemblies.

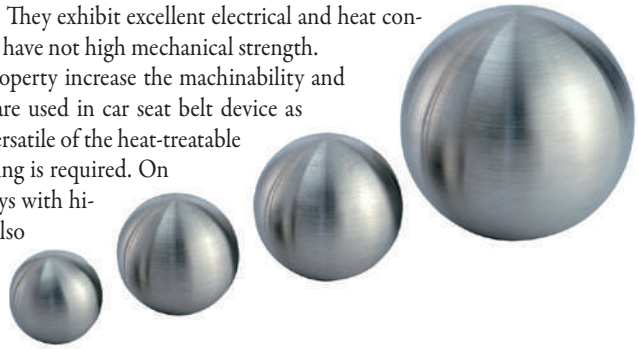
AISI 420 steel balls show good wear characteristics, high hardness and excellent resistance to corrosion from mild atmospheres, fresh water, steam, blood, ammonia, petroleum products and mild acidic environments.

Balls in **AISI 430** steel offer good resistance to mild atmospheric conditions, steam, dairy products, nitric acid and many petroleum products and organic materials, and provide superior resistance at elevated temperatures compared to AISI 302 or 304 or 316 materials. Balls in this steel are passivated. Among the applications we can count nail polishing mixing beads, agricultural and industrial equipment.

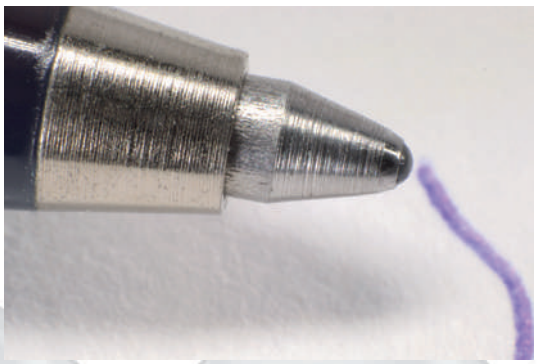
Balls in **AISI 440C** steel provide maximum hardness, toughness and dimensional stability. After heat treatment process, they reach high values of hardness that allow excellent properties of resistance to rolling-contact fatigue. Excellent is also the resistance to mild acids, alkalis, food, fresh water and air. They are passivated to remove free iron contaminants and to facilitate spontaneous formation of a protective passive film. They are widely used in rolling bearings, actuators and pumps.

Alluminum Balls

ICT offer of aluminum balls is mostly made of type **2017 aluminum**, i.e. solution treated copper alloy with natural aging to T4 conditions. Indeed balls also in **6061** and **7075 alloys** are available.
Aluminum balls are light and corrosion resistant. They exhibit excellent electrical and heat conductivity properties. On the other side these balls have not high mechanical strength.
The 2017 alloy is very cold headable and this property increase the machinability and reduce the production costs: balls in this alloy are used in car seat belt device as safety item. Aluminum 6061 is one of the most versatile of the heat-treatable alloys: it is generally used where welding or brazing is required. On the other side, aluminum 7075 is among the alloys with highest strength and, for this reason, may be used also by aircraft industry. Both 6061 and 7075 alloys are very good applicants for hard anodize.



Tungsten Carbide Balls



High hardness and dimensional stability make tungsten carbide balls the preferred choice for precision hydraulic valves, high-load bearings, inertial navigation systems, ball screws, linear bearings in slideways, gauging and checking instruments and meters. They are also used for ballizing, to work-harden and to improve fretting fatigue strength. Other features are their high resistance to wear, impact, elevated temperatures, corrosion, humidity, abrasion and poor lubrication conditions.
ICT can offer also balls in cobalt-chromium-tungsten alloy who find their application in industries as aerospace, petro-chemistry, battery, etc., where high temperature and pressure requirements exist.
Special chapter of tungsten carbide balls must be dedicated to the **micro-balls for ball pens** writing. In this field the key know-how is the choice of the right chemical composition of the material together with proper surface finishing grade in order to have the perfect flow of the ink on ball and a consistent and long life writing experience.
ICT offer of pen balls in tungsten carbide cover the range from 0.4 to 1.2 mm of diameter.

Ceramic Balls

Silicon nitride balls are used in high technology industries such as aerospace and defense, inside hybrid bearings and full ceramic bearings. Main features are the excellent corrosion resistance from chemicals and other demanding environmental conditions, the reduced density that minimize centrifugal force, skidding and wear under high speed and acceleration, the resistance to fatigue of around 10 times more than in chrome steel balls, the electric insulation properties and capability to resist very high temperatures. **ICT** offers range from 0.5 to 63.5 mm, in quality grades starting from G3.

Despite **silicon carbide balls** are less frequently used than other ceramic materials due to the raw material costs and difficulty to machine, they offer the best heat and corrosion resistance of all the ceramic balls. Their ideal usage is under low loads, low to moderate speeds and in highly corrosive environments.

Zirconia oxide balls have the highest strength and toughness at room temperature of all the advanced ceramic materials. Therefore they offer superior load bearing capability. We provide zirconia oxide balls in the range from 0.5 to 38.1 mm, in quality grades starting from G3.

Alumina oxide balls are often used in processing equipment to improve bearing performance. They are lighter, stiffer, smoother, harder, corrosion resistant, require less lubrication and have a lower thermal expansion than their chrome steel counterparts. All these properties allow the bearing to run at higher speeds and higher operational temperatures with lower torque.

Plastic Balls

ICT offers colored plastic balls in any customized color, in any size from 0.5 to 200 mm and in a plenty of different materials. Here below only main ones are listed: many more are also available.
Acetal balls offer predictable mechanical, chemical and electrical properties over a broad temperature range for extended period of times. They exhibit good fatigue resistance, impact resistance, tensile and shear strength and dimensional stability. They have very low moisture absorption characteristics and maintain a natural lubricity that provide a low coefficient of friction when in contact with other materials. This material is also known as polyoxymethylene (POM) and polyacetal and with commercial names Delrin (a DuPont product) and Celcon (a Hoechst Celanese product).

Nylon balls are insoluble in diluted mineral acids, in most organic acids and in common solvents. They are exceptionally resistant to alkalis, petroleum oil and greases at temperatures up to 150°C. Furthermore nylon balls are an excellent choice for applications that require a lightweight, resilient and abrasion-resistant material that performs well in hot, chemically aggressive and humid environments. Used without lubrication, they provide greater thoughness and ductility than most plastics.
Polyethylene balls are a low-cost thermoplastic alternative that provide excellent abrasion resistance and high impact characteristics. They are available in low density and high density grades (respectively LDPE and HDPE) and are also used to reduce unpleasant odors. The smooth surface of polyethilene balls prevents chemicals from depositing on their surface. Typical applications are pharmaceutical, medical and electronic sector, as well as where it is desirable to minimize the evaporation of exposed liquids.
Polypropylene balls have very good chemical resistance and low density, as well as the highest melting point of the volume thermoplastics. They are excellent electrical insulator, with low dielectric constant and loss factors. This type of plastic balls is highly resistant to acids, alkalis, alchools and many inorganic chemicals. Furthermore, they are non-toxic.
Teflon balls do resist to any industrial acid or caustic as well as to any solvent. They are reccomended for applications where light weight, non-metallic and erosion-resistant properties are required. The maximum work temperature is of 280°C.
Ethylene Tetrafluoroethylene (ETFE) balls show high corrosion resistance and strength over a wide temperature range. With very high melting temperature, excellent chemical, electrical and high energy radiation resistancee properties, this product is part of high performance plastic balls.
Balls in polytetrafluoroethylene (PTFE) belong to the same cathegory. They are made of a syntetic fluoropolymer that shows extraordinary chemical resistance and is insoluble in all known solvents: it is attacked only by molten alkali and by fluorine at high temperatures. PTFE balls are fire-resistant and may be used up to 260°C.
Balls in **Vespel** (registered brand of DuPont and one of the highest performing engineering plastics currently available) can continuously operate from cryogenic temperatures to 290°C (with excursions up to 480°C) without melting.

Glass Balls

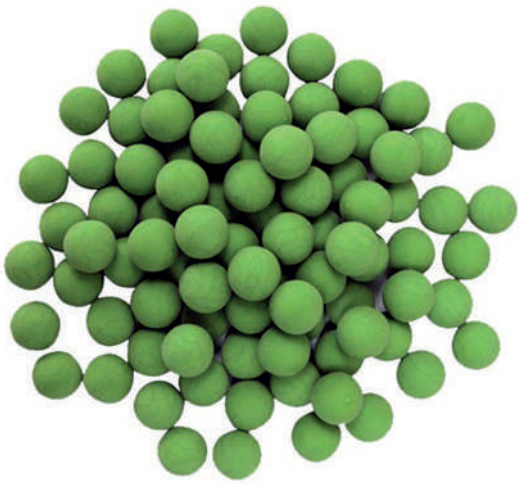
Like balls in AISI 300-series stainless steels, also glass balls resist corrosion and chemical absorption and are non magnetic. For all these properties they are ideal for valve applications in medical devices, instrumentation gauges, pumps, water treatment bearings, roll-on applicators and other uses.
The adventage of glass balls is in the cost. While most of the AISI 300-series steels contain between 8 and 14% of nickel – a material whose availability and cost have always been quite volatile – glass is mostly made of silica, which is abundant on the earth. Furthermore they are dimensionally stable and can withstand high temperatures (up to 290°C).
ICT offer of glass balls is of three types: soda-lime, borosilicate and black materials. Sizes are from 0.8 up to 50 mm of diameter, while available colors are pratically infinite.
Soda-lime are recommended fo applications requiring hardness and excellent resistance to corrosion. They are normally used in economical check valves that are not subject to mechanical shock.

In applications where high temperatures and/or sudden temperature changes are expected, bosorilicate glass is instead recommended for its additional resistance to chemical corrosion and to temperatures fluctuation.

Black glass balls are used in a variety of functions, especially in instrumentation like flow-meters, aircraft slip and turn indicators. They are moderately resistant to corrosion.

We do also provide colorful glass and marble balls for toy and decoration purposes.

Rubber Balls



High performances and lightweight make of rubber and technopolymer balls an increasingly popular component. In addition to the more traditional seamless **Nitrile Butadiene** rubber (NBR), **Silicone** rubber and **Neoprene** rubber (whose balls are available for non critical applications), new materials have been introduced and are included in **ICT** products offer.

Balls in **EPDM** (*Ethilene-Propylene-Diene-Monomer*) rubber are made of an elastomer which is characterized by a wide range of applications. They are compatible with fireproof hydraulic fluids, ketones, hot and cold water and alkalis. Other properties are the resistance to heat, ozone, polar substances and steam, together with good electrical insulation capabilities.

Balls in **Viton** rubber are available in diameters from 1 to 200 mm and are largely used in check and safety valves, special pumps and in other applications at high temperature and with corrosive environment. Viton is a brand of synthetic rubber and fluoropolymer elastomer that is registered trademark of DuPont Performance Elastomers. Different Viton grades are available, depending on fluorine content that ranges mostly from 66 to 70%. The optimal grade choice depends on the application.

Polyurethane balls have excellent fuel and oil resistance, with high firmness, tensile and tear properties.

Also balls in **Santoprene Thermo Plastic Elastomer (TPE)** are used in safety valves and in diaphragm pumps and in any application that requires a flexible material but limited chemical resistance. The Santoprene material combines the quality of the rubber with the machinability of thermoplastic materials. The balls are lighter than water (i.e. they float in water) and are available in black as well as in other colors. **ICT** range goes from 5 to 115 mm of diameter.

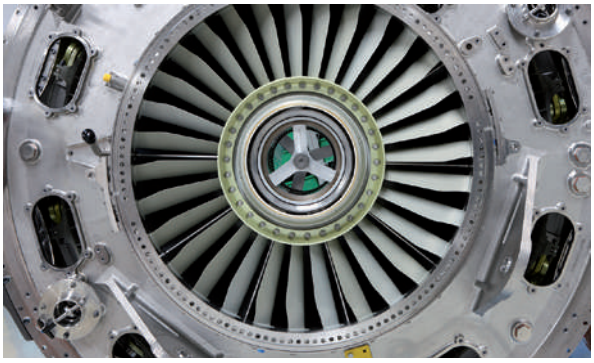
Bearings, pumps and special valves are instead the main applications for balls in **PEEK** (*Poly-Ether-Ether-Ketone*), a thermoplastic material that guarantees high mechanical features like wear resistance, tensile strength, abrasion, temperature and corrosion resistance, despite it is quite difficult to machine. Precision balls in PEEK are used in medical devices and industrial equipment that are exposed to high temperatures, wear and abrasion. **ICT** offers these balls in the range from 1.5 to 350 mm of diameter.

Brass & Copper Balls

Brass balls as well as pure copper balls are used in electrical devices, petrochemical industry operations and consumer products such as appliances. Small diameter balls are often used in valves. Their electrical conductivity makes brass and copper balls a good option for electronic applications.

ICT precision brass and copper balls exhibit a very good resistance to water, gas, oil and chemicals like benzene, butane, methyl acetone and ethyl chloride. Furthermore they have low friction properties and are relatively soft. Additions of small amounts of alloying elements like Cr, Zr, Ag, Cd and Mg allow to improve the mechanical properties. Beryllium copper balls are also used when higher strength and stiffness, combined with good conductivity, are required.
Typical applications include gasoline rollover valves, fire equipment hose couplings and electrical contacts. Furthermore they have found use in artistic applications as well, but they are not recommended where exposure to corrosive agents or high mechanical stress are key factors of the application.

Aircraft Balls



Special chapter is dedicated to balls for aircraft application, indeed made of different high performing materials and by documented high technological processes.
Through our certified partner we can provide balls in special steels like **M50** and **M50Nil AMS6491**, **AISI 52100 AMS 6440** and **AMS 6444**, with **VIM** (*Vacuum Induction Melting*) and **VAR** (*Vacuum Arc Remelt*) process too, as well as in silicon nitride, zirconia and tungsten carbide material.
We can also offer balls both in **AISI 440C** stainless steel (**AMS 5618** and **AMS 5630**) with sub-zero treatment in order to guarantee excellent dimensional stability up to temperatures of 150°C and in corrosion resistant unhardened steel **AISI 302/304/316** (**AMS 5515**, **AMS 5513** and **AMS 5524**).
All products – offered also in small batches – are capable of meeting the stringent quality requirements of the aerospace industry and are available in the range from 2 up to 42 mm.
Steel balls are of course eddy-current inspected at 100% and all metrological, metallurgical and raw material certifications are provided to customers together with products. Quality grades range from G3 to G20.

Phenolic resin balls

ICT can offer phenolic resin balls for pool, snooker, carom billiards and the more 800 other varieties of the billiard games that exist throughout the world. Furthermore our offer targets also other sectors like industrial, computer, medical and other games like bowling.
ICT balls range goes from 9.525 to over 175 mm of diameter, with different grades of phenolic resins depending on the final application.

Premium phenolic resin is dedicated to the high precision billiard balls for professionals and is characterized by finer grain that results in very smooth and glossy surface capable to last over long period of times. In addition, through different hardening steps, the material shows a transparent vitrified surface that is highly wear-resistant, making both the ball and the cloth of table last longer. All the balls pass through a very stringent release procedures by which they are controlled for density, balance, diameter tolerance, roundness, color precision, surface polish and brilliance.
We can even create custom pool sets based on your specific needs, including graphic design balls with your choice of emblem. Private label and/or advertisement gadgets are also possible for these products.
For valves, pumps and flow control application **ICT** offer is based on custom formulated phenolic resin or G-10 glass epoxy resins. These solutions offer excellent abrasion and impact resistance and are suitable for replacement of stainless steel in many applications.
Phenolic resin balls offer also an excellent combination of chemical and heat resistance with superior tensile and compressive strength properties than plastic balls. They also perform as Frac balls in oil and natural gas applications.

Other Materials

ICT balls are also available in a plenty of further different materials.
If you don't find what you are looking for, get in touch with us at **info@consulting-trading.com** and explain us your requirements.

Bronze balls are made of high quality alloy created for environments subject to attack by gasoline, water and other solvents. Bronze offers resistance to corrosion and is an excellent electrical conductor. We can provide bronze balls for the electronic industry as well as to manufacture various valves.

Hastelloy (a nickel-molybdenum-chromium wrought alloy) balls are available from 3 to 100 mm of diameter. They find use in petrochemical process equipment, in gas turbines in the hot combustor zone sections and in industrial furnaces. These balls have excellent oxidation, corrosion, pitting, stress corrosion cracking and reducing media resistance. They are also resistant to sulfur compounds and chloride ions, that's why they are also used in flue gas desulfurization systems.

Monel 400 balls are reccomended for applications requiring a very high resistance to corrosion. They are impervious to the effects of steam, gas, salt water, ammonia, calcium chloride and of the acids associated with food products, even at high temperatures. They are typically used in marine engineering, chemical and hydrocarbon processing equipment, valves, pumps and heat exchangers. **ICT** offer ranges from 1.5 to 100 mm of diameter.

Balls **in K-Monel** are available too. This material is an age hardenable version of the nickel-copper alloy Monel 400. For this reason Monel K500 balls have increased strength with excellent resistance to seawater corrosion. They are used in grease fittings and seawater applications and wherever additional hardness is required.

Inconel balls are made by a nickel-chromium precipitation-hardening alloy suited for high strength at temperatures above 700°C, with useful strength up to 980°C. These balls have also excellent properties and ductility at cryogenic temperatures.

Rock bit AISI S2 tool steel balls are designed to work well in the very extreme conditions of any drilling operation into the ground. The balls provide the strength and toughness that is required to withstand the heavy force and the abrasion of pulverized rock. Most of products are in the dimensional range from 6.35 to 12.7 mm of diameter and in quality grades G100 or G200.

Stellite (trade name from Deloro Stellite Holdings Corporation) balls provide excellent wear and high temperature resistance. Different grades of materials are available, depending on final application: special bearings, valves, slurry and homogeniser pumps and, more in general, anywhere high wear, corrosion and temperature resistances are demanded. Balls are provided in the passivated conditions.

Tantalum balls are used in electronic components, chemical equipment and nuclear reactors. They are completely immune to any chemical attack at temperatures below 150°C, except for acids containing fluoride ion and free sulphur trioxide.

Titanium balls are light weight, non magnetic and with good heat transfer properties. **ICT** offer ranges from 3 to 100 mm of diameter. These balls are used in valves, pumps and flow meters and in other applications where the ball must be resistant to oxiding acids and to organic chemical solutions, sea-water, hydrobromin and formin acids, chlorine, bromine and iodine as well as cold ammonio. Furthermore the combination of high strength, stiffness, good thoughnesss and low density make titanium balls an excellent choice for many aerospace applications. Thanks to their surface uniformity and good aestetics, **ICT** supplies titanium ball salso for jewelry use.

ICT can also provide **gold** balls to jewelry industry. Typical sizes are 3.175, 3.969, 4.172, 5.556 and 6.35 mm, in both 14K and 18K yellow gold sizes, in white gold and in nickel-free gold.

Platinum balls are especially suited for electrical and electronic contacts, thanks to the conductivity uniformity guaranteed by the very smooth surface finish. For the same reasons these balls are used also in jewelry. **ICT** offers them in a wide range of platinum alloys, including nickel, iridium and palladium. Platinum rivets for use in electrical contacts in automotive applications are also available.

Niobium balls are destined to jewelry industry too. This material is a shiny, white, soft and ductile metal and takes on a bluish tinge when exposed to air at room temperature for long time. For this reason, to be processed these balls require a protective atmosphere that minimizes any oxidation. They can be offered in different colors through anodizing.

Hollow, Drilled & Coated Balls

Hollow balls are offered in different material and sizes. For example those ones made in **AISI 440A** stainless steel are mainly used for transporting, moving, loading and unloading goods in cargo airplane. Viceversa the **AISI 420** hollow stainless steel balls find mainly application for stop valves.

ICT offers hollow ball salso in plastic materials, like **polypropylene**, **LDPE** (*Low-Density Polyethilene*) and **HDPE** (*High-Density Polyethilene*), mostly for applications like heat loss and evaporation control, odor and mist control, check-valve ball in flow control. A very special application that we serve too is to camouflage lagoons, setting ponds, open pits, reservoirs and runoff basins to prevent birds from landing and nesting. In these cases the U.V. black hollow float balls have chemical resistant HDPE that withstands sun, rain, ice, snow and wind for a service life of over 10 years. They also prevent algal blooms in water tanks.
Very large hollow plastic balls (up to 800 mm) are used for display, technical research, telescope bodies, signage and large anymal toys. Made in polyethilene, they have a small hole in top that is completely enclosed with a welded plastic patch or threaded plug and are available in many colors.

Upon customers' orders, **ICT** can source special-shaped balls as perforated or other remodeled balls that might be used for various applications as mechanical parts, in industries like aerospace, medical, electronic, semi conductor, automotive, marine, industrial and many more. Examples of these products are perforated balls (for rod-ends, for variable transmission, etc.), grooved balls, perforated balls with grooves, flat balls and many others. These parts may be supplied also in very small batches, pratically in all materials, including ceramics, and always in very close tolerances and smooth surface finish.

Furthermore **ICT** can offer balls with different types of coatings and plating. In addition to the more traditional **zinc** and **chrome plating** processes and to various **plastics** and **rubber coatings** of all types, we can perform different technical coatings through **CVD** (*Chemical Vapour Deposition*) and **PVD** (*Physical Vapour Deposition*) technologies.
Specifically **titanium carbide coated balls** of AISI 440C AMS 5618 steel can drastically improve the bearing performances and life and are used in aircraft applications. **Titanium nitride coating** is also possible by PVD, basically on all sizes and plenty of materials, so offering a versatile combination of high hardness along with thoughness, low friction and good release properties.

Rollers

As for balls in ball bearings also rollers allow the relative movement between the parts and adjust the load transmission in the proper way, i.e. radially for cylindrical rollers, radially and axially for taper rollers and along variable direction for spherical rollers.
Steel is 100Cr6 steel, but also 100CrMn6 steel (for diameters larger than 40 mm) and case hardened steel (wherever application requires special resistance to fatigue and/or wear) are available.
The profile of these rollers may be "micro" designed in order to optimize the load distribution on the tracks of bearing rings, minimize the friction and the starting torque, optimize the energy efficiency of the final application and maximize the overall bearing performances.
ICT is capable to offer the whole dimensional range of steel rollers through partners who have high quality standards in their process and flexibility of short lead-times. Furthermore, through consignment stocks available in Europe, it is possible to supply customers with *just-in-time* policy.
Rollers are offered by **ICT** mostly in the dimensional range from 4 mm up to 160 mm of diameter (indeed for needles and pins it is possible to offer also smaller diameters, from 0.8 mm). Besides 100Cr6 steel and Chrome Manganese steel (for rollers larger than 40 mm of diameter), it's possible to order also plenty of other materials: all stainless steels, many types of plastics, ceramics and many others.

For all **ZB** and **logarithmic** profiles are available.

- Cylindrical Rollers
- Taper rollers
- Spherical rollers
- Needles
- Ceramic rollers

Chrome Steel Cylindrical Rollers & Pins

Cylindrical Rollers
100Cr6 (or 52100 or SUJ2) steel is the most widely used material also for rollers. The steel sources that **ICT** uses guarantee very fine-grain martensitic microstructure, which allows high hardness and exceptional wear and fatigue resistance properties. For rollers diameter larger than 40 mm, the steel is 100CrMn6 in order to guarantee better heat treatment properties up to the core of the product and, at the end, superior performances in application.
Our chrome steel cylindrical rollers are widely used worldwide in various applications, from bearings to ball screws, from constant velocity joints to check valves, from automotive steering to seating systems, just to mention few. The precision we offer allows to use them in very high speed applications.

ICT cylindrical rollers are available both with profile TR and ZB, sorted in groups of 1 micron each or packed by plastic tube-packaging concept, keeping exactly the same production sequence as from the last lapping operation.
Specifically in the larger products range (from 14 to 160 mm of diameter), through its own partner **ICT** can produce more than 10 million finished rollers per year, using exclusively steel sources of extreme high quality like Ovako, Sanyo Special Steel, Timken and Dongbei Special Steel. Furthermore the special manufacturing process allows to serve the market with lead-times of only 40 to 50 days that, in cases of urgency, can be reduced to 2 or 3 weeks. However, we offer also service through consignment stocks in all continents, providing *just-in-time* policy to our customers.

Pins
The offer of pins is mostly in 100Cr6 steel with sizes that range from 3×10 up to 6×100 mm, both of type M6 and H6. In these cases the max roundness error is 1.5 micron, while the max Ra is 0.15 micron. They are conforming to norm DIN 6325. Also inch sizes are available upon request.

Cylindrical rollers precision classes
The standard GB/T 4661-2002 defines the geometrical properties of cylindrical rollers and classifies them in 4 different classes, from class 0 to class III (being class 0 the most accurate one). The ISO 683-17 norm defines the classes from G2 to G5, being the G2 the most accurate one.
ICT can offer rollers in class 0 or G2 (and worse ones), i.e. with max ovality lower than 1 micron, Ra lower than 0.1 micron and with interval gauging of diameters in 1 micron steps and of lengthes in 6 microns steps (up to 30 mm diameter).
ICT can provide also cylindrical rollers according to DIN 5402 standard.

Chrome Steel Spherical Rollers

Spherical rollers of **ICT** ranges in the diameters from 8 to 160 mm and in lengthes from 8 to 160 mm, with radius end face that are included between a minimum of 44 up to a max of 1800 mm.
Also in this case the most common type of steel is bearings chrome steel, 100 Cr6. However, for dimensions larger than 40 mm the chrome Mn steel is used in order to enhance the temprability properties of the material and to guarantee an uniform microstructure in the whole section of rollers (from surface to core).
Most of these rollers are custom designed for each customer, satisfying very high standards of precision. This allows the spherical rollers to facilitate smooth rotation of bearings, to reduce starting torque and to contribute to make longer the life of end products. Among the final applications, let's here recall gearboxes, wind turbines, continuous casting machines, pumps, mining and costruction equipments, pulp and paper processing equipments.
In the whole dimensional range, **ICT** can offer ovality error less than 2 micron, end face roughness Ra less than 0.25 micron and diameter sorting tolerances betweeen 2 and 5 micron.
Lead - time to market is typically of only 40 to 50 days that, in cases of urgency, can be reduced to 2 or 3 weeks. **ICT** can also provide consignment stocks in all continents, with *just-in-time* policy to customers.

Chrome Steel Taper Rollers

Taper rollers of **ICT** ranges in the diameters from 5 to 160 mm and in lengthes from 6 to 280 mm, with radius end face that are included between a minimum of 44 up to a max of 1800 mm. Also in this case the most common type of steel is bearings chrome steel, 100 Cr6. However, for dimensions larger than 40 mm the chrome Mn steel is used in order to enhance the temprability properties of the material and to guarantee an uniform microstructure in the whole section of rollers (from surface to core).

Most of these rollers are custom designed for each customer, satisfying very high standards of precision. This allows the taper rollers to facilitate smooth rotation of bearings, to reduce starting torque and to contribute to make longer the life of end products. Among the final applications, let's here recall the automotive (e.g. suspension hubs, engines, transmission, etc.) and industrial machinery components (e.g. speed reducers, motors, cam followers).
In the whole dimensional range, **ICT** can offer ovality error less than 1 micron, end face roughness Ra less than 0.25 micron and diameter sorting tolerances betweeen 1 and 4 micron.

Logarithmic profile
The cross-section of roller profile controls the pressure distribution in the contact area and radically affects the roller bearings basic dynamic load rating and rating lives. The most critical areas – where excessive pressure peaks may occur – are at the ends, where edge loading may happen. Logarithmic profile of roller (developed by Lundberg and improved by John-Gohar) has a continuous evolution with no discontinuities till the intersection with end fillet. Its ultimate target is to minimize the material stresses in the roller raceway contact.
ICT can offer both cylindrical and taper rollers with reliable logarithmic profile and enhanced performances in the most stressed applications.

Taper rollers precision classes
The standard GB/T 10235-2001 defines the geometrical properties of taper rollers and classifies them in 4 different classes, from class 0 to class III (being class 0 the most accurate one). The ISO 683-17 norm defines the classes from G2 to G5, being the G2 the most accurate one.
ICT can offer rollers in class 0 or G2 (and worse ones), i.e. with max ovality lower than 1 micron, Ra lower than 0.04 micron and with interval gauging of diameters in 1 micron steps. Upon customer request, taper rollers can be provided by plastic tube packing in the same output sequence from the last lapping operation, in order to minimize the diameter spread in the bearings assembly.
ICT can provide also cylindrical rollers according to DIN 5402 standard.

Chrome Steel Needles

The cylindrical needle rollers can be offered in version NRA (i.e. with both ends rounded) and in version NRB (i.e. with parallel end faces). Both solutions are available in different materials, from 100Cr6 to all types of soft and hard stainless steels, in the following dimensional range:

- Diameter form 1 to 6 mm;
- Length from 3.8 to 49.8 mm.

ICT needles are used in full complement bearings, epyciclic gear reduction units, universal joint crosses and rotating elements in general, they can be sorted in groups of 1 micron and – upon request – they can be supplied with logarithmic profile.

Stainless Steel Cylindrical Rollers & Others

Our offer of stainless steel rollers cover multiple types of materials.

Rollers in **AISI 304/302** steel are dedicated to those applications whose conditions require corrosion and toughness performances not available in hardenable stainless steels. Exemple of applications are couplings, valves and pumps

AISI 316 stainless steel rollers have exceptional corrosion resistance thanks to their higher nickel and molybdenum content. Developed to resist in contact with sulphuric, phosphoric and acetic acid, they are extensively used in applications involving photographic chemicals, inks, rayon, rubber, textile bleaches, dye stuffs and high temperature equipments. Examples of such applications are medical, health and beauty aid, food and beverage parts and assemblies.

AISI 420 steel rollers show good wear characteristics, high hardness and excellent resistance to corrosion from mild atmospheres, fresh water, steam, blood, ammonia, petroleum products and mild acidic environments.

Rollers in **AISI 430** steel offer good resistance to mild atmospheric conditions, steam, dairy products, nitric acid and many petroleum products and organic materials, and provide superior resistance at elevated temperatures compared to AISI 302 or 304 or 316 materials. Rollers in this steel are passivated.

Rollers in **AISI 440C** steel provide maximum hardness, toughness and dimensional stability. After heat treatment process, they reach high values of hardness that allow excellent properties of resistance to rolling-contact fatigue. Excellent is also the resistance to mild acids, alkalis, food, fresh water and air. They are passivated to remove free iron contaminants and to facilitate spontaneous formation of a protective passive film. They are widely used in rolling bearings, actuators and pumps.

As special rollers, **ICT** can offer both cylindrical and taper hollow rollers, in a variety of materials, diameters and profiles according to the customer specifications.

Ceramic Rollers

Silicon nitride rollers are used in high technology industries such as aerospace and defense, inside hybrid bearings and full ceramic bearings. Main features are the excellent corrosion resistance from chemicals and other demanding environmental conditions, the reduced density that minimize centrifugal force, skidding and wear under high speed and acceleration, the resistance to fatigue of around 10 times more than in chrome steel products, the electric insulation properties and capability to resist very high temperatures. They areboth used in all-ceramic bearings and in hybrid ceramic bearings. Specifically in hybrid roller bearings, weight is lighter than conventional bearings and operational speed is higher, with less friction and less lubrication need. Since the silicon nitride rollers are totally inert due to their covalently bonded crystalline structure, there is absolutely no possibility of seizure, fretting, cold welding or adhesive wear between the rolling elements and metal raceways even in "oil-off" situations.

Zirconia oxide rollers have the highest strength and toughness at room temperature of all the advanced ceramic materials. Therefore when a superior load bearing capability is required in the application, zirconia oxide roller is the optimal solution.

ICT can offer ceramic rollers in the dimensional range from 3 to 40 mm of diameter and with design according to customers' drawing.

Cages

Inside any bearing, cages have the purpose to keep the rolling elements at an appropriate distance from each other and to prevent direct contact between neighbouring rolling elements, in order to keep friction and thus heat generation at a minimum. Furthermore, through the cage, a proper load distribution is reached in the bearing, assuring quite and uniform running.

However cages are mechanically stressed by frictional, strain and inertia forces and may also be subjected to the chemical action of certain lubricants, lubricant additives, solvents or coolants. Therefore the design and material are of paramount importance for the performance of the cage as well as for the operational reliability of the bearing itself. **ICT** can offer various cage types and designs of different materials for the different bearing types.

Pressed cages are produced starting from steel sheet (in some case salso from brass sheet) and pressing it in high precision presses, with very special tooling. **ICT** can offer ribbon-type brass or steel cages, riveted steel cages, snap type brass or steel cage and window-type steel cages. They have the advantage of lower weight and more space inside the bearing, that is an important point to facilitate the entrance of lubricant into the bearing itself.

ICT offers also **solid cages** made from brass, steel, light alloy, polymer or fabric reinforced phenolic resin. Types are huge: two-pieces machined riveted cage, two-pieces machined cage with integral rivets, one-piece machined window-type cage, double pronged machined cage, injection moulded polymer window-type cage, injection moulded polymer snap-type cage and one-piece machined cage of fabric reinforced phenolic resin. They generally allow higher speeds than pressed cages and are necessary when conditions of high acceleration are important in application. **ICT** solid polymer cages represent a perfect combination of strength and elasticity, ideal in many conditions.

Furthermore **ICT** can provide **steel pin-type cages**, used with pierced rollers, typically in large-sized roller bearings. These cages have relative low weight and enable a large number of rollers being incorporated.

ICT can also offer **PEEK cages** and other high-tech plastic materials cage. Specifically PEEK is an excellent material to guarantee low friction, high flexibility, wide temperature and possibility to manufacture even complex designs.

Seals and Shields

Rolling resistance is an important factor in the power losses of vehicles. Seals used in bearings can be a significant contributor due to the friction generated.

ICT can provide new designs and materials for seals with provide reduced friction nad longer service life to bearings, keeping lubricants in and contaminants out.

Our offer extends also to seals for clutch release bearings, for Hub bearing unit for light and heavy duty vehicles, for steering axle kingpin, for water pump bearings and for universal joints.

Through a rich network of partners and stores in Europe, Asia and America, **ICT** is able to find any type of seal and o-ring (different combinations of dimensiona, design and material) and to provide it within few days, even in very small quantities.

High precision metal shields for bearings and for other applications (e.g. metallic rings for seals, reinforcement for valve stem seal, special washers and caps, etc.) are part of **ICT** offer too. All the parts can be developed through proper softwares at FEM (*Finite Element Method*) that allow to optimize forms and materials and to reach the performances targets, minimizing the total cost.

Technologies for grinding

Grinding wheels

ICT deals with any product and any project in which the tolerances to be achieved are expressed in few microns or fractions of a micron. Of course, grinding and lapping operations are key processes in this context and, thanks to our network of expertises and partners, we are able to offer our customers both advanced machinery and high quality tools to work parts in different materials and complex shapes.

ICT has the full range of grinding wheels solutions for all different types of application, including vitrified, resinoid and rubber wheels

Through our R&D Center in Chennai (India) we are able to provide the best-fit solution for the customer needs, matching high quality abrasive types with high performance manufacturing process.

Through our partner, we are one of the very few abrasive wheels companies in the world that have also the complete control of the raw material. This allows us to maintain the full control of the production chain and to guarantee the best in class quality and performance of our range of abrasives.

ICT can offer products in aluminium oxide, silicon carbide, mono crystalline and ceramic for high performance (best solution in order to combine productivity and durability). Furthermore, with the new **V-cool bond** technology, we are able to engineer effective solutions of "auto cooling effect" in order to avoid any formation of micro, macro burns and re-tempering.

For the bearings industry **ICT** is able to offer best in class products with the complete range of solutions for all type of bearings and bearing components.

With all the latest advancements in the field of automobiles and machine manufacturers, the function of bearings are more and more crucial to guarantee proper performance of these applications. In this context, the role of grinding wheels is fundamental.

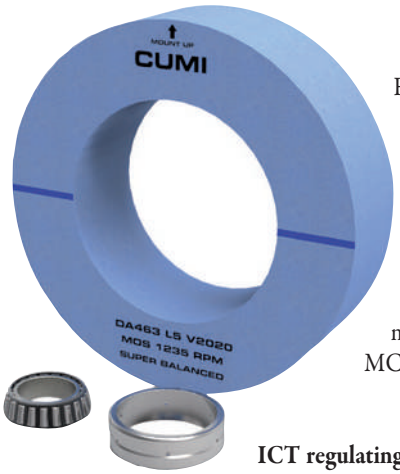
Track grinding wheels, for instance, must maintain form to ensure profile accuracy of the groove of inner ring. This ensures that the wheels are dressed less often, leading to significant improvement in productivity and consistency of the process. **ICT** offers track grinding wheels made with a special fusible glassy bond with sharp abrasive grain combination that ensures form holding while offering high material removal rates in a high contact area application. An advanced manufacturing process ensures that the wheel's hardness is consistent through the wheel life and highest levels of safety are maintained.

The combination with special bonded technology and best abrasive technology in our wheels can guaranty high material removal rate also in high contact area without any risk of micro burning and long wheels life.

For the **grinding of the bearing rings faces ICT** can propose different solutions of resinoid F-Type wheels designed for the complete range of double disc machines. We are in condition to suggest the best solution in function of the dimension of the rings and of size of the faces to be ground. In case there is a significant difference in the rings faces area between the 2 sides of ring (like, for instance, in taper roller bearing rings) **ICT** can propose different grain sizes and/or abrasives in order to increase the efficiency of the machine.

Our resinoid wheels are available with different abrasives (in aluminium oxide for standard application, in ceramic abrasive for high performance or in both in a full range of Grain size) and in a wide range of bonds (including phenolic, magnesite and polyester).

ICT wheels are proven to perform at high feed rates and material removal applications while meeting stringent quality requirements in terms of size tolerances, heat generation and surface finishes, thanks to a special technology of grain-bond combination, which ensures free cutting. Physical features like coolant slots, through holes and honeycomb structure aid in taking the performance of the wheels to the next level.



For the **rings external and internal grinding** we have a complete range of wheels and abrasives to offer, suitable for full range of grinding machines available on the market and for all types of grinding (plunge, infeed and centreless). In this segment **ICT** can offer best in class solutions that have no comparison in the market in terms of wheels durability and productivity.

Through our R&D center in Chennai (India) we are in condition to suggest the correct wheels and the customized solution to cover all your technical parameters.

Our vitrified wheels are available in a full range of abrasive: in aluminium Oxide AA, 12A and also in RA and RAA (pink aluminium oxide) designed to keep all types of profile for very long time; in monocrystalline sharp aluminium oxide 53-55A for high performance applications; in ceramic abrasive MCA-CUMISA for superior expectations.

ICT regulating wheels (rubber wheels) are without comparison in the market, thanks to the long terms experience of our business partner in making them. The calendaring process enables excellent control in size and finish of components being ground. Special features assured by these wheels are a longer wheel life, a lesser dressing frequency, a superior form retention and an excellent surface finish. **ICT** covers the full range of dimensions for these rubber wheels.

ICT's versatile range of **bore grinding wheels** is used for grinding a variety of components that require size generation, fine surface finish and fast stock removal. We also offer value added services like sulphur treatment for lubrication and cooler cutting action. These wheels are characterized by sharp aluminium oxide grains for excellent cutting action and by crystal bond for form holding (V500).

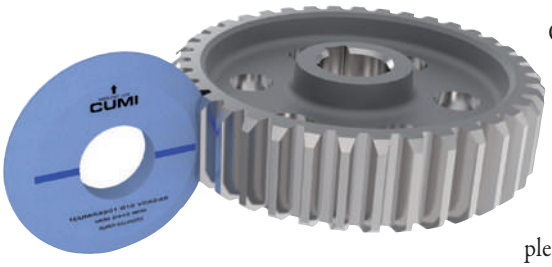
For the **bearing rollers grinding ICT** can offer a complete range of wheels and abrasives, suitable for the whole range of machines and both for centreless grinding and plunge grinding. In this segment we have best in class solutions that have no comparison in the worldwide market.

Our technicians in Chennai R&D center are in condition to suggest the correct wheels and the customized solution to cover all customer technical requirements.

ICT vitrified wheels are available in a full range of abrasive: in aluminium oxide AA, 12A and also in RA and RAA (pink aluminium oxide) designed to maintain all types of profiles for very long time; in monocrystalline sharp aluminium oxide 53-55A for high performance; in ceramic abrasive MCA-CUMISA for superior results; in silicon carbide C and GC.

For the **end face grinding of taper, cylindrical and spherical rollers ICT** has different solutions of resinoid F-Type wheels (designed for the complete range of double disc machines) and vitrified cup wheels (for taper rollers end face grinders). With a very long experience in the field, we are in condition to suggest the optimal solution in base to the roller dimensions and to the face area to be ground.

ICT resinoid and cup wheels are available in different abrasive types: in aluminium oxide for standard applications (A, SA, AA), in ceramic abrasive for high performance (CUMISA, MCA) and in a combination of the above types, all in a full range of grain sizes.



One of the most advanced grinding applications is represented by the gears industry. Intricate profile accuracy together with the needs to maintain high material removal rates and dressing frequency are the major requirements in this application.

The everyday growth of the sector of gears give us a great challenge to study and to develop continuously better abrasives to match the requirements.

Special designed sharp mono crystalline grain, high performance ceramic grain blended with friable grain and Kristal bond system enable us to offer the best generation and complete range of grinding wheels for gears.

Our world class manufacturing set-up makes sure that all the varieties of gear grinding (like single rib, multi rib, bevel, etc.) are covered. Wheels are suitable for all machines types present in the market: Niles, Hafler, Maag, Gleason, Pfauter, Samputensili and Hofler are some of them for single rib grinding; Reishauer, Liebherr, Kapp, Gleason, Pfauter and Samputensili are some few others for multi rib grinding.

Our **single rib gear grinding wheels** are engineered for traditional grinding process and CNC grinding process of single rib grinding. They are designed with best abrasives available in anyone of the following combinations:

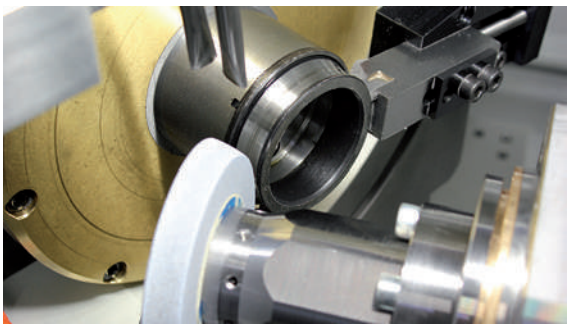
- HA sharp crystalline aluminium oxide for best performances;
- 55-71-73A sharp premium aluminium oxide for superior performances
- 1-3 CUMISA ceramic aluminium oxide for standard performances.

Multi rib gears grinding wheels are engineered for CNC grinding process and for CNC creepfeed type process till 65mps speed.

For standard processes, wheels are designed with abrasive available in anyone of the following combinations:

- 3CUMISA ceramic aluminium oxide for best performances

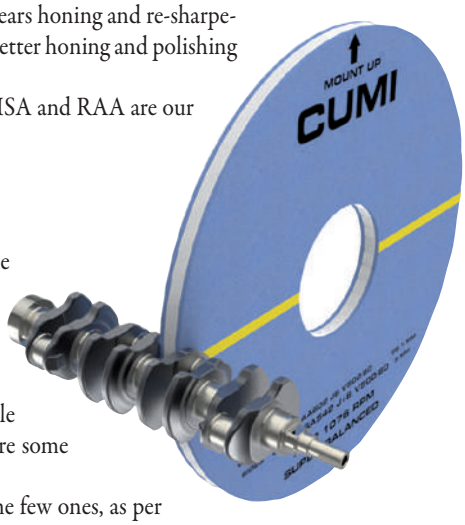
- 55R tough pink aluminium oxide for high retain grains for superior performances;
- 24R tough pink aluminium oxide for retain grains for standard performances.



In case of CNC multi rib creepfeed type process, wheels are engineered with best abrasives available in anyone of the following combinations:

- 73HA sharp crystalline aluminium oxide for best performances;
- 71HA sharp crystalline blended aluminium oxide for superior performances;
- 3CUMISA ceramic aluminium oxide for standard performances.

Our range of products for gears industry is completed by the offer of full setup of wheels for gears honing and re-sharpening gear. In that respect, we have wheels in traditional vitrified bond and also epoxy resin for better honing and polishing results.
Vitrified and resinoid wheels are available in the complete range of abrasives: 73HA, 3CUMISA and RAA are our suggestions to get the optimal results.



ICT is able to offer a wide range of products specific for automotive industry.

Our offers of versatile **grinding wheels specialized for camshaft** are engineered to obtain the best holding form along with free cutting ability in order to match the surface finish requirements and the quality consistency expectations.
These wheels are suitable for forged steel and chilled cast iron with highest amount of stock removal without any burnings damage on the cam flank.
ICT can offer in this special application wheels for roughing and finishing operations, suitable for all the special camshaft grinding machines: Landis, Naxos Union, Schaudt and Fortuna are some of them.
The camshaft grinding wheels are engineered with best abrasives. Here below you can see some few ones, as per our suggestion:

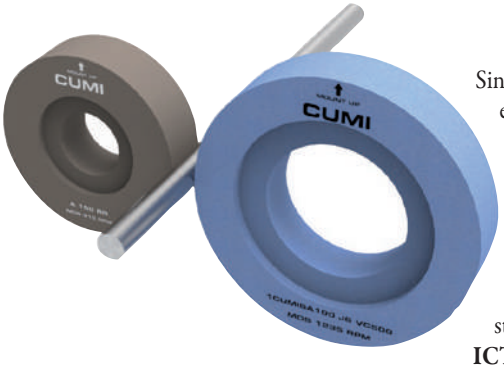
- 1/3 CUMISA ceramic blended with aluminium oxide for best performances;
- 5SA semi friable aluminium oxide for superior performances
- AA withe aluminium oxide for standard performances.

What sets crankshaft grinding apart from the other cylindrical grinding process is the extremely crucial function of the crankshaft itself. Crankshaft design requires meticulous attention from the material selection to the various hardening process. Each part of the crankshaft is designed to have different hardness matching specific requirements of the application.
Grinding of the shoulders region is a surface grinding operation, while the grinding of the pin is a cylindrical grinding operation. This poses a great challenge in designing wheels that perform efficiently in both of these processes efficiently and simultaneously.
With the incorporation of the latest advances in abrasive grains and vitrified bond technology, **ICT** provides **crankshaft grinding wheels** that can face each of these challenges. These wheels are specially engineered to match 100% of these requirements and may be designed with single abrasive and also double different abrasives (in sandwich technology and dual grade) in order to obtain maximum life and constant cutting actions. Furthermore such technology allows to avoid any type of grinding burns in the process.
Wheels are suitable for all the special crankshaft grinding machines: Zanrosso, Lampco, Prince, Tos, Schledum, Berco, Churchill, Landis, Ribbon, Van Roman, Storm Vulcan, Norton, Schou and Rex are some of them.

ICT wheels for crankshaft grinding are engineered with best abrasives. Here below we list some few of our suggestions:

- 1/3 CUMISA ceramic blended with aluminium oxide for best performances;
- AA 12A withe and semi friable aluminium oxide for superior performances;
- SA DA semi friable and brown aluminium oxide for standard performances.

Centerless grinding is an application which presents the most daunting challenges to any abrasive manufacturer. The range of its requirements and priorities varies from product to product, which calls for an equally wide range of offerings to suit the same. It is widely used in automotive applications to grind – for instance – valve stems, shock absorbers, pistons and liners.



Since in most of the centerless applications more than one wheel is mounted on the spindle, extremely tight tolerances need to be maintained in the geometry and densities of the wheels themselves to ensure uniform wear patterns even if each wheel in the set is different.

ICT has the expertise, when it comes to centerless applications, thanks to the advanced manufacturing process of our business partner, premium abrasive grains and specially designed vitrified, resin and rubber bond system to suit the application needs.

Customized solution are provided for every application and specific requirements. Be it through-feed and-feed or in-feed, these wheels ensure that components are finished to stringent quality requirements.

ICT centerless wheels are produced with entire combination of available abrasives: aluminium oxide, silicon carbide (also combined together with aluminium oxide), monocrystalline abrasives and ceramic abrasives. All of them are combined to obtain the best in class centerless grinding wheels.
The centerless wheels are also suitable for not automotive applications like, for instance, the following ones:

- Bars grinding;
- Bearing rings grinding;
- Bearing components (like rollers) grinding;
- Drills & taps grinding.

ICT completes the offer for centreless grinding with **feed regulating wheels and control wheels** that are historically been proved as one of our excellence of our business partner, recognized by our customers from all over the world for the superlative & consistent performances.
Best in class for long life and grip, these control wheels are made in different grain size depending on the application (mostly from 80 to 280) and with best resilient rubber.
Different steels, different hardness and special coatings used in the manufacturing of valves represent big challenges to any grinding wheels manufacturer. **ICT** partner engineered **valve stem grinding wheels** to match all the market requirements, included the most grievous ones.
Cylindrical side, head, under head and border: **ICT** wheels for valves are studied for grinding 100% of the valves parts.
These wheels are designed for high speed machine till 85m/sec and in several abrasives:

- GC and CGC Green silicon carbide Black silicon carbide for special applications;
- 1CUMISA-MCA ceramic aluminium oxide for best performances;
- 55A Sharp and pure monocrystalline aluminium oxide for superior performances;
- DA-A-5SA aluminium oxide for standard performances.

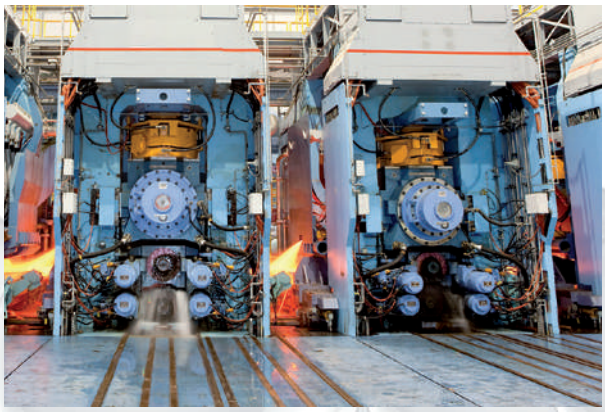
Although a simple cylindrical grinding application, what makes **roll grinding wheels** manufacturing challenging is the volume of stock removed from rolls, which is really difficult to grind. The length of roll also provides a challenge for the wheel to retain its size and form during the traverse grinding process. Maintaining high grinding ratios/roll reduction values is crucial in these applications, as they have a direct effect on the overall cost and cycle time.
ICT roll grinding wheels combine the latest developments in resin bond technology along with suitable grain combination to give the optimal balance between cutting action and wheel life, without compromising on the quality parameters.
These wheels are available in all dimensions up to 1100mm of external diameter, from 36 to 120 grain size and have been studied with the following abrasives combinations:

Hot strip mill

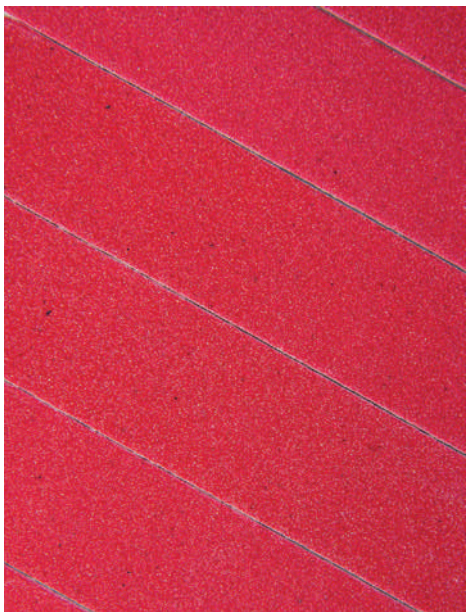
- 3CUMISA High Ceramic abrasive blended for best performances;
- 1CUMISA ceramic abrasive blended for superior performance;
- GC Green Silicon carbide abrasive for standard performances (up to 120 microns infeed).

Cold rolling mill

- 3CUMISA High Ceramic abrasive blended for best performances;
- 3AA High performance blended aluminium oxide for superior performances;
- AA White aluminium oxide for standard performances.



Coated abrasives



ICT's wide range of coated abrasives comprises of abrasive sheets, rolls, belts, fiber discs, flap discs, PSA, quick change discs, double sided discs, cartridge rolls, shaft mounted flap wheels and flap wheels.
A coated abrasive is composed of three primary raw materials: abrasive grains, backing and bonding agent. The abrasive grains are primarily attached to a backing by means of a bonding agent.
Backing materials (paper, cloth, vulcanized fiber and polyester film) form the base of coated abrasives and anchor the abrasive grains with bonding agent.
The primarily used bonding agents are glue, semi-synthetic resin and synthetic resin which are chosen depending on the end application.

Abrasive grains used in **ICT**'s coated abrasives are classified into 2 major variants:

- Natural abrasive grains (emery, garnet, flint);
- Synthetic abrasive grains (eco aluminium oxide, brown aluminium oxide, white aluminium oxide, premium aluminium oxide, silicon carbide, zirconia alumina, ceramic aluminium oxide).

Stationary & Rotary diamond dressers

ICT offer covers the whole range of stationary diamond dressers, from single to multipoint, through those chisel, cone, blade and crown type. In addition, to follow the evolution of the market with always requests for higher performances, especially in continuous process lines, **ICT** offers solutions with monocrystalline diamonds (MCD) whose life and consistency are from 5 to 7 times higher compared to dressers made with natural diamond.
ICT offer of dressing wheels include rotary diamond dressers and diamond form rolls with excellent performances.
The rotary diamond dressers allow to shape grinding wheels in automatically controlled CNC dressing operations. Their main features are:

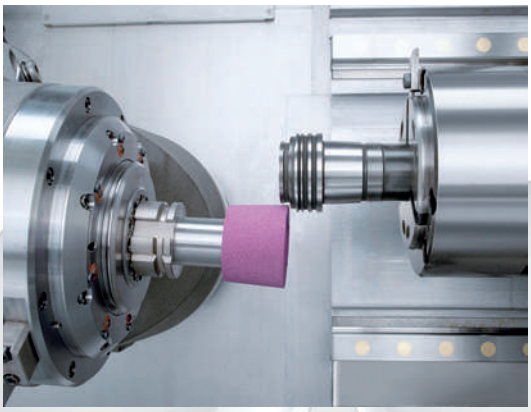
- Profiling grinding wheels by moving the diamond roll along the profine of the wheel itself to be ground;
- Precise profiling of the wheel, from the simplest work piece to the most complicated shape;
- Meeting the most demanding precision requirements;
- Offering high economic efficiency.

Grinding & Lapping Machines

Through the partnership with a major Italian manufacturer of grinding and lapping machines, **ICT** is able to offer solutions for the following operations:

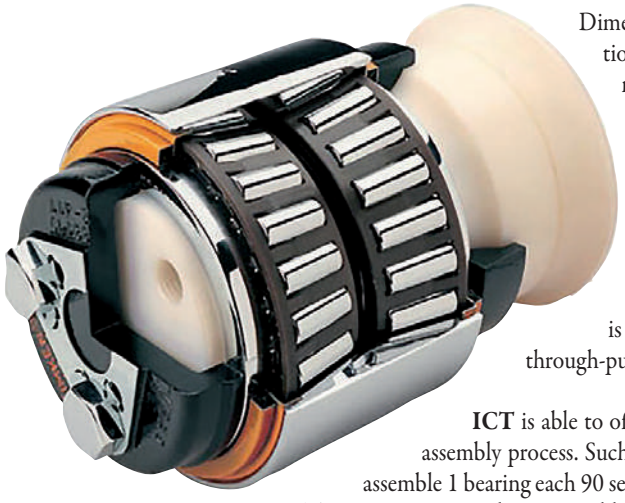
- centerless grinding of the outer diameter (rings, rollers, shafts, etc.);
- double discs faces grinding machine;
- *plunge* grinding of external diameters;
- *plunge* grinding of internal diameters;
- tapered rollers face grinding;
- lapping machines for internal and external rings (single and multiple stations).

We are also able to offer the whole processing line, including transfers and post-process control machines



TBU assembly cell

The double row taper roller bearings that are used in train wagon axles are named **TBU** (*Taper Bearing Unit*) or **TAROL** (*Tapered Roller Bearing Unit*). These bearings are clearance adjusted, greased and sealed in the manufacturing factory, i.e. they are units ready for mounting by press-fitting onto the axle journal in a single operation, while the end cap is fastened by a locking plate.
Provisions can be made for re-greasing through proper holes in the end cap or in the outer ring. The re-greasing holes in the end caps are provided with a plug screw or grease nipple, while re-greasing intervals are determined according to the respective application.

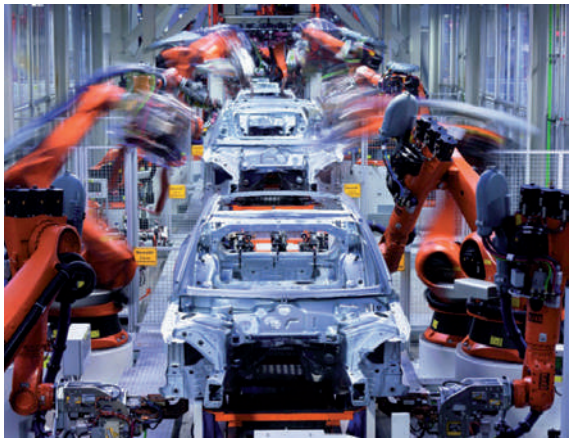


Dimensions of such bearings, required precisions and criticality of the application result in very few companies in the world that are really capable to manufacture reliable bearings for train wagon axles. Stringent certifications (e.g. IRIS in Europe and AAR in America) are required to engineer these products, to manufacture and to sell them.
The assembly phase itself of TBU is a quite complicated and long process. It consists in combining the two inner rings with single outer ring, with rollers and cages, assuring the proper axial clearance to the bearing by choosing the right spacer between the faces of the inner rings. It continues with assembly of sealing cups and of backing ring. Such operation is in most of the situations done manually, with high manpower needs, long through-put time and a certain risk to make mistakes.

ICT is able to offer to the TBU manufacturing companies the full automatization of the assembly process. Such solution allows one single operator to control the whole process and to assemble 1 bearing each 90 seconds, i.e. a potential of more than 300 TBU per shift.
These impressive results are possible through one unique robots line with 3 different stations (cells) that complete the whole assembly process as above described. The only responsibility of the operator is to feed the line with all components: IR, OR, rollers, cages, grease, spacers, sealing caps and backing rings. All the other operations are managed by robots.
The line is highly flexible, allowing quick change-overs from one bearing type to another in not more than 1 hour per each station.

Control and assembly machines

ICT can develop all kind of assembly machines for the bearing industry, based on the specific needs and inputs of the customer.

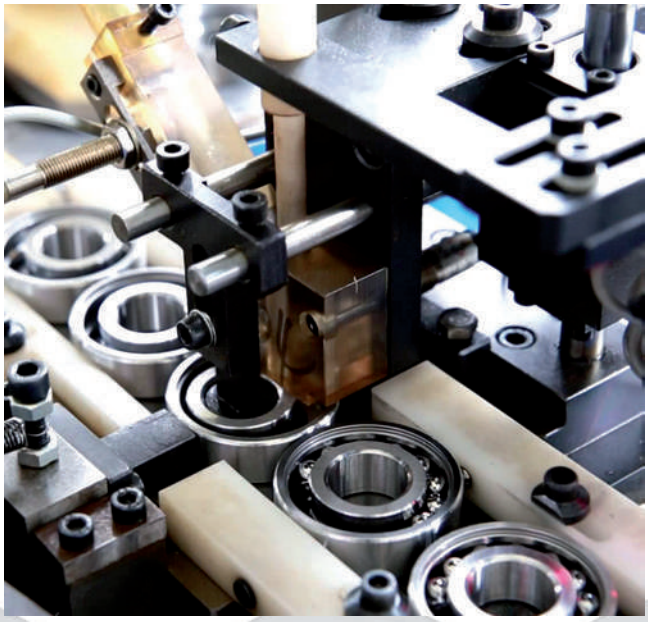


Examples of machines for assembling ball bearings are:

- Greasing machines;
- Rings and rolling elements pairing machines;
- Caging machines, for different kinds of cage technology (cages with rivets, pronged cages, welded cages);
- Seals and shields assembly machines, with post process flatness control;
- Bearings preservation machines;
- Packaging machine to automatically pack the bearings in a single package or in industrial boxes.

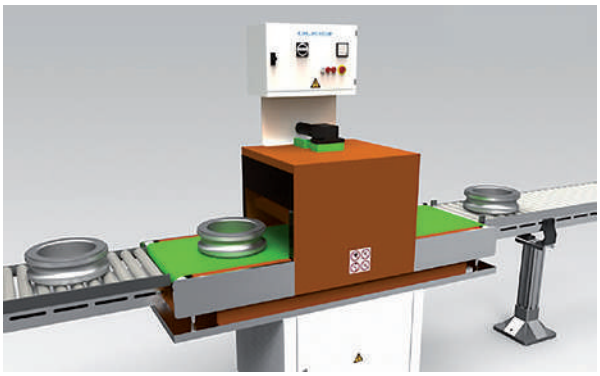
ICT can also provide the best solutions to your process needs to control (up to 100% or by sample) the products in manufacturing lines. Examples are the following:

- Eddy Current control machines for all bearing components (internal and external rings, rolling elements - both balls and rollers);
- Axial and radial control machines (both static and dynamic);
- Visual and dimensional inspection machines (both of the individual rings and of the assembled bearing);
- Automatic control devices for measurement of bearings noise and components weaviness;
- Other measuring devices for parameters such as material hardness, starting torque, amount of grease, presence of burns and retempering, etc..



Moreover **ICT** is able to provide different demagnetization technologies depending on the specific application of the customer.
Through a technology patented by our partner, we offer electronic pulse demagnetizers which guarantee very high performances.

Demagnetizers



Thanks to extensive experience in the demagnetization field, **ICT** is able to provide different demagnetization technologies according to the customer's specific application. With a careful analysis of the project variables (such as the geometry and dimensions of the parts, the type of material, the transfer system and the production process, the productivity and the residual magnetism requirements) we can formulate proposals that are the most advantageous possible for the customer.
Thanks to patented technology and on-going improvements over the years, we offer **electronic impulse demagnetizers** that ensure very high performances. In most cases the electronic demagnetizers realize a minimum residual magnetism and extremely low energy consumption (on average 150 W), which is as much as 20-30 times lower than the consumption of other demagnetizers. We furthermore propose demagnetizers with traditional technology that are suitable for other applications. Thanks to the special demagnetization coils construction, outstanding values are guaranteed in terms of residual magnetism, lower energy consumption and limited magnetic retention.

Among different products and solutions, **ICT** can offer:

- Demagnetizers in line installed in flexible conveyor chains;
- Demagnetizers in line and off line with conveyor belt;
- Demagnetizers installed in automated processes with parts handling by robot;
- Off line and manual demagnetizers for the demagnetization of single parts or parts placed in washing and transport containers;
- Demagnetizers in line installed in rolling channels;
- Contact angle measuring machine for ball bearings.

Here below the main characteristics and performances of our demagnetizers:

- Minimum residual magnetism: the average residual magnetism obtained with our electronic demagnetizers is much lower than the limits of 2 A/cm that have been set by the best bearings and auto parts manufacturers;
- Minimum energy consumption: the average energy consumption of our electronic demagnetizers is between 100 and 300 VA, while the common tunnel demagnetizers have a considerably higher consumption between 1 and 25 KVA;
- High degree of demagnetization value repeatability: results of demagnetization are always repetitive and constant over time;
- Easy parts transfer without magnetic retention: the capacity discharge technology – where the energy necessary for the demagnetization is concentrated in a short impulse – guarantees an easy transfer of the parts without any magnetic retention;
- High degree of reliability and durability: meticolous design of each part and use of high quality components guarantee the maximum efficiency over time even when the production rythms are high;
- Very high productivity: the cycle time is between 2 and 20 seconds, according to the application, but in some cases cycle time of 0.8 sec are possible;
- Almost zero maintenance;
- Easy integration in line and exchange of interface I/O: possibility of programming dedicated signals for in line communications and installations;
- Easy installation;
- System modification and overhaul: after verification by feasibility study, it may be possible to overhaul exhisting systems to reach new customer requirements and economic savings.

Automation and Control Solutions

Besides the engineering and construction of automation solutions to solve assembly and/or control issues of customers in their series production, **ICT** can support in supplying the individual sensors to measure various parameters.

For the **force/displacement control** we can offer different types of equipment for 100% testing on production lines. Controlled operations are those ones that require force to force and displacement measurements: pressing, riveting, bending, etc.. The devices work with a high speed data acquisition and are therefore particularly effective in the control of very rapid cycles where the simultaneous management of the force from the press and of the displacement within the cycle time is needed.

To control the torque we offer **static or rotating torquemeters**, depending on the required application. Control the process, store the results for production data statistics and quality control are directly in line: our equipments update the data during each cycle and, when combined with a PC, the data can be displayed on the monitor, analysed and printed.

Noise and vibration multifunctional measurement system has been designed for each type of test related to vibration and noise and is configurable to the needs of the customer. It can operate in laboratory environment and in on-line production test.

We offer **systems to test the leakage**, i.e. to check the pneumatic tightness of certain items. Control the process, store the results for the statistics of the data production and quality control are directly in line: **ICT**'s equipments, combined with a PC, update the data every cycle, allowing them to be displayed on the monitor, analysed and printed.

Dimensional control systems acquire data using instruments connected to different types of transducers and can interface with industrial PC that elaborate the measures. The systems are suited to the production environment and can be implemented according to the needs to handle transducers and digital input/output signals.
The trasducers are chosen according to the application, based on criteria that take in account the available space, the measuring range and the accuracy. Dimensional tests carried out by our instruments are: concentricity, diameter, axial and radial backlash, top dead center, flickering, thickness, classes division, class correspondence check.

Based on the needs of our customers we are able to provide any type of **transducers**, from the most common ones (normally kept in stock by our business partner) to special ones. Types of transducers that we deal with are:

- Transducers for dimensional measurement;
- Transducers and force sensors for measuring static and dynamic loads in tension and compression (they are available in different versions, in function of size, scale and accuracy class);
- Torque transducers for the measurement of static or dynamic torsions (together with them we offer also effective coupling joints);
- Pressure transducers normally used for leak testing.

Finally we do offer **high precision electric presses** of different sizes. The main features are:

- Linear movement with roller screws for high load applications;
- No lubrication and no maintenance;
- Life time at least 15 times greater than similar systems using ball screws;
- Possibility to use in any assembly direction.

Special Projects

ICT team likes to assist its own customers in very special projects characterized by one or more of the following features:

- Small batches
- Very tight dimensional tolerances
- High demanding mechanical properties
- Non-standard products
- Requirements for cold forming or special heat treatment or grinding or lapping know-how
- Prototyping
- Research and development projects

Through our partners we have availability of wide balls grinding and lapping solutions which allow us to provide services that others would not be able to accomplish or would offer on prohibitive conditions. For example, **ICT** can lapp balls in any metallic material, parts of balls and balls track. We also have equipment for testing samples in production line and to inspect roundness and finish surface of the parts with spherical surfaces.

We can certify the dimensions using the NADCAP accredited laboratories for balls diameter measurements. We can make high precision pieces in small series, according to your drawings, in an infinity of different materials. We can work out your products and return them to your plant, taking care of the whole logistics process. We can make special coatings, high precision pressing and assembly of metals, Eddy Currents controls, demagnetizations, etc..

Special bearings:

ICT can supply all kinds of special bearings, i.e. bearings for specific applications that are NOT normally available on the market due to special design and / or special materials and / or very low volume by which they are required.
Examples of applications and bearing kinds in which **ICT** can provide added value to the retrieval of the products are the following ones:

- Steel industry
- Wind mills
- Mining
- Earth moving machines
- Railways
- Cardan bearings
- Ceramic bearings
- Ceramic coated bearings
- Plastic bearings
- High speed miniature bearings

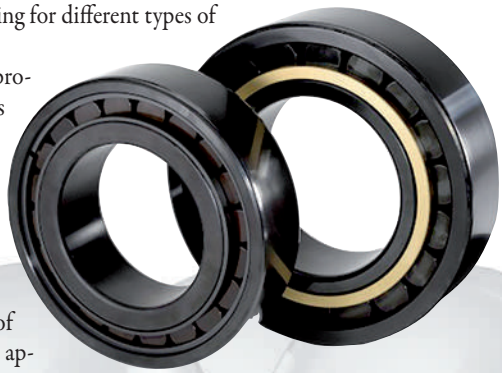
Coatings

In combination with its own customers, **ICT** can study specific coating solutions to increase the performances of different parts: bearings, bearing components like balls, rollers and rings, pressing dies and other tooling.
Through the cooperation with a selected team of partners, **ICT** can propose the most optimal solution to minimize the coating costs and maximize the performance in application.
Examples of type of coating that we can realize to our customers are:

- Zinc with metal alloy, mostly for corrosion protection purposes (on paper processing, rolling mills, automotive applications and outdoor equipment);
- Zinc and chrome (non ferrous materials), mostly for corrosion protection purposes (on various accessories, primarily for automotive engineering);
- Zinc phosphate (ZnP), for fretting corrosion and corrosion protection purposes (on tapered roller bearings, cages sleeves and wheel bearings);
- Thin dense chrome (TDC), for fretting corrosion, corrosion protection and wear resistance purposes (on vibrating screen bearings and applications involving exposure to seawater);
- Nickel plating, mostly for corrosion protection purposes (on parts destined to food industry);
- Black iron oxide, mostly for running-in behaviour oil film retention (on various parts for wind power and railways applications);
- Manganese phosphate (MnP), for sliding and running in behaviour (on spherical roller bearings, steel cages and adaptor sleeves);
- PTFE (Polytetrafluorethylene), for frictional behaviour purposes (on bearings for cement mills, ship engine, suction roll);
- PVD (physical vapour deposition), for multi purpose as various materials can be applied for each characteristic (on paper processing, rolling mills, automotive applications, wind, mining and outdoor equipment);
- Ceramic coating of aluminum oxide, for current insulation purposes (on electric motors, traction motors, axle box);
- Hybrid bearings using ceramic rolling elements, mostly for current insulation purposes (on deep groove ball bearings of electric motors).

The above list is not comprehensive of all the possible solutions that **ICT** can implement through its own partners. The bottom line in the evaluation of any application is the cost benefit and the improved life, woth the added cost of the special coating.

Black Oxiding Treatment



ICT is able to offer to his own customers a special process of black oxiding for different types of components, like bearings balls, rollers and rings.
Black Oxide processing provides an extremely cost effective form of protection and adds to the components resistance to corrosion. The process adds no dimension change to the original components dimensions and improves the visual quality while offering lubricity. In addition, thin parts can withstand bending stretching and handling. Black oxide coats all surface of a component.
ICT black oxiding treatment is a revolutionary electrochemical process that allows to modify a very thin layer of the component (typically not more than 0.5 micron depth) and to drastically lower the coefficient of friction of two connecting surfaces, with clear benefits to the life of the application.

Testimonials

"ICT professionals have proved their strength in last 5 years transforming NHB management practices from family oriented to professional oriented business, at all levels (technical as well commercial and financial fields). They revolved the company culture and people mindset by making each employee more accountable and by changing the company focus to customers."

Prashant Mistry
Business Unit Head
NHB Ball & Roller Ltd (India)

"Professionalism, know-how and experiences of ICT team are an excellent business card to introduce MAEET2. Punctuality in information and in orders management with final customer are a strength point of ICT and a guarantee of success."

Gianluca Borgo
Managing Director
MAEET2 srl (Italy)

"ICT is our strategic partner to upgrade the technology and customer base globally. We are very much pleased with the support they have extended in the last 5 years. They helped to transform company and to bring us to the next levels. Today we are appreciated by our customers for the speediest improvement in quality, cost and services, credit goes to ICT who has put all the efforts in getting these results."

Manish Patel
Business Unit Head
NHB Ball & Roller Ltd (India)

"ICT expertise and dedication helped NHB Group to gain global foot print in 5 years in ball manufacturing. With know-how in lean manufacturing and waste reduction, they helped us in rubbing shoulders with global competitors. If you are looking to transform your company, I strongly reccomend ICT as a partner."

Kalpesh Mehta,
CEO, NHB Ball & Roller Ltd (India)

"With 5 years' cooperation, we understand ICT is the most reliable partner in Europe. ICT is professional, knowledgeable and honest on bearings and rollers business."

Wang Yang
Sales Manager
Wafangdian Weiyuan Bearing Manufacturings Co. Ltd (China)

Why choose us

1

Because we offer a great service in designing your strategy, in developing your business, in simplifying your processes and in bringing new technologies inside your company.

2

Because we love what we do and we bring enthusiasm and commitment to every project we work on. Put simply, we care about your business.

3

Because we listen to your ideas, plans and objectives for your business. We discuss and then we advice. If we feel we're not a good fit, we'll be honest and tell you from the outset.

4

Because our strong sense of identification with your projects means that we are constantly striving to provide solutions, even for issues you aren't yet aware of.

The industries that we serve

BEARINGS INDUSTRY

CAR INDUSTRY

STEEL MILLS

GEARS INDUSTRY

RAILWAYS

ICT
Int. Consulting & Trading

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