

SHAPE IT

OSG Global Tooling Magazine | WINTER 2020

OSG Dental Solutions in China

Quality tooling innovations with mass customization capability optimized for today's dental prosthetics manufacturing

Technical Insight

AM-EBT & AM-CRE Carbide End Mills for Additive Manufacturing Applications

Customer Report

Deep-Hole Drilling

ADO-30xD carbide drill with through-coolant holes eliminates frequent tool breakage in engine block production

Meet OSG

Employee Interview in Belgium

M&A: A Powerful Pillar of OSG's Growth Strategy



A Message from the President

Over the years, OSG has grown into an international organization with more than 70 consolidated subsidiaries. Many of the companies are not directly established by OSG, but rather, have joined the OSG group through mergers and acquisitions (M&A). These companies would often undergo further M&A, thus the combined company total is actually larger than reflected in record. The number of M&A at OSG has increased at a rapid pace since 1997 in order to better penetrate new markets particularly in Europe and Africa. Through M&A, OSG is able extensively expand its presence worldwide. The core products of OSG are solid tools, mostly notably represented by taps, which are the founding products of the company. Sales of OSG brand products that support growth have been greatly expanded globally by employees of companies that conducted M&A. In 2020, it is expected that the number of M&A at OSG will continue to rise.

Post-merger integration (PMI) is a term that refers to the integration process after an M&A. It consists of three stages: management integration, business integration, and consciousness integration. The PMI is a key aspect of M&A, where original systems between merging organizations are strategically combined in order to maximize performance. Whether it is a company established from ground or through M&A, OSG firmly believes in open communication. OSG always operates with a high degree of transparency and strives to maintain a corporate culture that encourages creativity and innovation, in which every employee is proud of.

A great deal of uncertainties lies ahead in the world economy in 2020. In order to achieve growth, the OSG group will combine strengths from around the world and act accordingly based on the 4Cs – Clear Vision, Clear Objective, Clear Game Plan and Clear Priority.

Norio Ishikawa
President & CEO of OSG Corporation

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OSG Dental Solutions in China

Quality tooling innovations with mass customization capability optimized for today's dental prosthetics manufacturing

George Gu
OSG Shanghai

Although teeth are not the main organs of the human body, they accompany our lives for decades from birth until old age. The condition of teeth not only affects a person's daily diet, but also has a subtle influence on physical health. With China's rapid economic development, the expectation for quality of life today has become much higher in comparison to 30 years ago. As living standards rise, so does the demand for dental services. The driving

force behind China's growing dental market is attributed to factors such as an aging population, greater awareness of oral health and cosmetic dentistry, improved accessibility to dental clinics, and technological advances in the restorative dentistry. As a populous country, the dental industry and manufacturers for dental machining are ushered in a wave of new business opportunities brought by the surged of increased market demand.



Key Materials in Denture Processing

Three main materials are used in denture processing in China – zirconia ceramics, glass ceramics, and metals (titanium alloy and cobalt chromium alloy).

Zirconia Ceramics

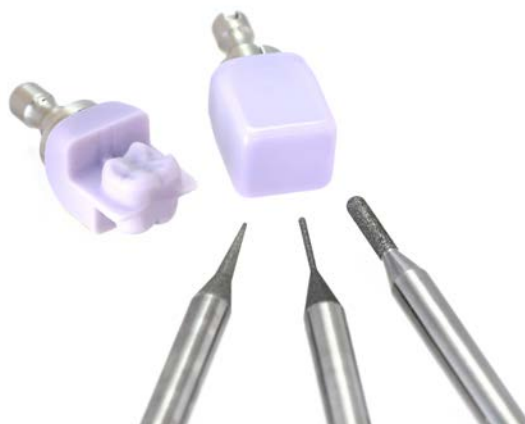
Among the three key major materials, zirconia is the most widely used in China, which is inexpensive and has high hardness after heat treatment. The processing characteristics of zirconia is its waterless processing. Zirconia is a relatively easy-processed material because it is powdery and does not easily generate heat during machining. In China, the mainstream processing method for zirconia is by using carbide tooling without coating. With this machining method, tool life averages around 500 teeth. OSG's DLC coated end mills especially excel in the processing of zirconia. OSG's DLC coating's low coefficient of friction characteristic provides excellent wear resistance to ensure stable and long tool life in zirconia applications. By employing OSG's DLC coated end mill, average tool life can be tripled to approximately 1,500 teeth versus local dental tooling providers.



OSG's DLC coated end mills especially excel in the processing of zirconia. OSG's DLC coating's low coefficient of friction characteristic provides excellent wear resistance to ensure stable and long tool life in zirconia applications.

Glass Ceramics

Glass ceramic applications can be used without heat treatment after processing. Due to its pure white color after polishing, dentures made of glass ceramics are highly aesthetically pleasing and natural in appearance. Although the price of glass ceramics is much more expensive than zirconia, demand has been gradually increasing as greater emphasis is placed on beauty. In a few years, it is anticipated that the position of zirconia may be replaced by high-esthetic glass ceramics. Ordinary end mills cannot meet the processing requirements of glass ceramics. However, a key advantage that local Chinese tool manufacturers can offer is their competitive pricing. An increasing number of dental tooling manufacturers are turning their attention from zirconia to glass ceramics, and are developing their own electroplated diamond end mills that average 20 dentures in tool life. OSG's electroplated diamond grinding tools perform exceptionally well in glass ceramic applications with high-speed capability and long tool life. Although result may vary depending on equipment and cutting condition, OSG's electroplated diamond grinding tooling can on average complete 25 to 32 dentures per tool.



OSG's electroplated diamond grinding tools perform exceptionally well in glass ceramic applications with high-speed capability and long tool life.

Metallic Materials

Today in China, all implants are made of pure titanium metal. A wide variety of cutting tools are used in the machining of implants, such as thread milling cutters, ball end mills, flat-bottomed milling cutters and drills. It requires approximately eight to nine tools to complete a single implant. Metal dentures are non-standard parts due to the uniqueness of each person's teeth. As a result, dentures are commonly processed by compact dental milling machines rather than being mass

produced on large industrial equipment. In general, about eight hours is required to process a standard dental tray (98 mm). OSG's WXL and WXS end mill series are especially suitable for the machining of titanium and cobalt chrome dental applications. OSG's WXL and WXS series are premium carbide end mills designed for hard milling and high-speed milling. These end mills feature OSG's patented WXL and WXS nanocoating technology and are available in various styles, including

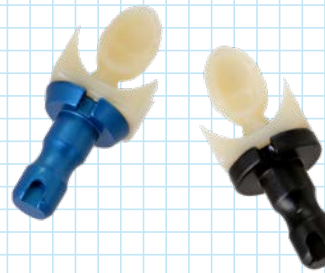
Common Materials in Today's Dental Prosthetics Manufacturing



Zirconia Ceramics



Glass Ceramics



Hybrid Resin

DG-LN-EBD



DG-LN-EBD (with attachment)



DG-LN-EBD (with attachment)



ED-BS



ED-BS (with attachment)



DG-LN-EBD



corner radius, ball end, long neck, high helix and tapered. Internal cutting trial results have shown that OSG's WXL and WXS end mills are able to process two standard dental trays, which is double the life versus the local manufacturers' tooling.

OSG's WXL and WXS end mill series are especially suitable for the machining of titanium and cobalt chrome dental applications. OSG's WXL and WXS series are premium carbide end mills designed for hard milling and high-speed milling.



PMMA / PEEK

Titanium / Cobalt Chrome

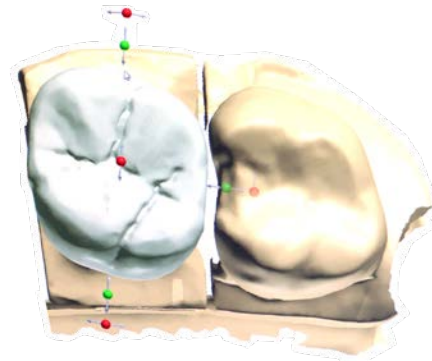


OSG's high-tech dental lineup features proprietary coating and tool geometry engineered to excel in common dental materials such as cobalt chrome, titanium, zirconium oxide, wax, PMMA and glass ceramics.

"Quality assurance, abundant dental technical information and a strong global network are the three key advantages of OSG's dental tooling," said Yusuke 'Julio' Kubota, OSG Corporation Dental Product Manager.

In addition to China, OSG has dental application engineers who can provide technical support in Europe, North America, Southeast Asia, Japan and Brazil. OSG is structured to both monitor and respond to customer needs in each country efficiently. Moreover, cutting trials are being held at OSG's international headquarters in Japan frequently to evaluate the latest available dental materials in order to accommodate evolving needs.

"Made in Japan quality is highly valued by our customers," said Kubota. "Cutting tools for dental CAD / CAM systems can be purchased worldwide from OSG with the same quality and confidence."



With a wide spectrum of tooling lineup and effective support network, OSG is positioned to provide global dental manufacturers high-quality and customizable tooling solutions tailored for every unique application.



Comprehensive Tooling Offering

with various styles, sizes and coating options

WXL & WXS Series: High Performance End Mills

Premium carbide end mills designed for hard milling and high-speed milling. Featuring OSG's patented WXL and WXS nanocoating technology. Available in various styles, including corner radius, ball end, long neck, high helix and tapered.

Solid Carbide Drills

Premium carbide drills for maximum performance and reliability.

DG Series: Diamond Coated End Mills

Featuring OSG's proprietary diamond coating for difficult-to-machine dental materials and applications.

ED-BS Series: Electroplated End Mills

High-speed capability with long tool life when working with ceramic materials.



AM-EBT & AM-CRE

Carbide End Mills for Additive Manufacturing Applications

Takeo Suzuki, Ikuo Takikawa & Isao Nakanishi
OSG Corporation Applications Engineers

In recent manufacturing trade fairs, many machine builders from around the world are exhibiting new state-of-the-art machinery engineered for additive manufacturing. Although initially used mostly as a prototyping solution in the manufacturing sector, increasing digitalization and government initiatives are driving manufacturers to further accelerate the development of advanced additive manufacturing solutions.



What is Additive Manufacturing?

Unlike conventional processing, where an object is formed by removing excessive materials, additive manufacturing deposits material layer upon layer to form a three-dimensional object. Various substances can be employed for the layering material, such as metal powder, thermoplastics, ceramics, composites, glass, and more.

Additive manufacturing is agnostic to part complexity and can manufacture unique geometries that would be impossible or unrealistic by using traditional manufacturing methods. Coupled with today's high connectivity production environment, additive manufacturing is radically revolutionizing the way products are produced by allowing companies to manufacture end products with similar scale and strength to injection-molded parts. In addition, additive manufacturing allows shorter delivery time, lower cost, higher quality parts, and generates minimal waste as compared to conventional manufacturing techniques. Due to these advantages, the adoption of additive manufacturing platforms has greatly accelerated across industries worldwide.

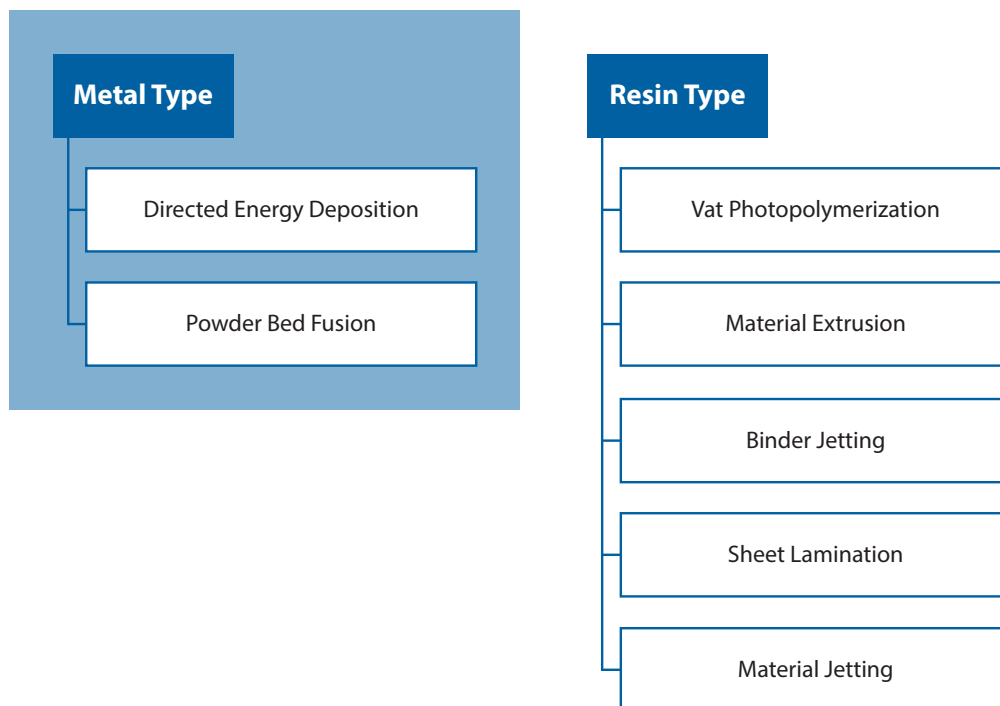
The AM-EBT and AM-CRE are designed for the roughing of additive manufacturing applications and built-up welding parts.

Types of Additive Manufacturing

As illustrated in figure 1, there are two key categories of additive manufacturing based on material – metal and

resin. For this article, we will only focus on metal additive manufacturing.

Figure 1. Types of additive manufacturing and deposit methods



Various metals and metal alloys can be used in additive manufacturing, such as stainless steel, titanium, precious metals, and more. Within metal additive manufacturing, there are two main deposit methods – directed energy deposition (DED) and powder bed fusion (PBF). Furthermore, machines used for metal additive manufacturing can be classified into two categories – those that are used solely for deposition; and hybrid

machines equipped with capabilities to deposit, heat treat, coat and metal cutting. Major machine builders in Japan have begun the production and sales of hybrid metal additive manufacturing machines. In response to new market demand, OSG Corporation has recently launched a new end mill series engineered for these hybrid machines, especially for the DED method.

Figure 2. Cutting tool requirement, advantages and disadvantages based on deposit method

Deposit Method	Advantage	Disadvantage	Cutting Tool Requirement
Directed Energy Deposition	<ul style="list-style-type: none"> • High-speed deposition • Simultaneous deposition of multiple materials • Coating possible • Heat treatment possible • Large scale deposition possible 	<ul style="list-style-type: none"> • Poor deposition accuracy • Complicated parameters 	<ul style="list-style-type: none"> • Strong tool geometry for machining uneven, wavy surfaces • Enables large depth of cut to minimize air cut • Suitable for various work materials • Accommodates 3-axis and 5-axis machines
Powder Bed Fusion	<ul style="list-style-type: none"> • High deposition accuracy • Complex shape possible • Simple parameters 	<ul style="list-style-type: none"> • Slow deposition speed • Single material deposition only • Limited deposition size (mostly small components) 	<ul style="list-style-type: none"> • Optimal tool lineup for complex shapes • Optimal tool geometry for finishing • Optimal tool geometry and coating to prevent welding

As shown in figure 2, although the DED method offers many advantages, its deposit accuracy is inferior to PBF. This shortcoming has a large effect on secondary operations, especially on the cutting process where cutting tools are used to complete the product.

Figure 3 depicts deposited SKD11 (60 HRC) by the DED method. As shown in the photograph, a step difference of over 1 mm can be observed after the deposition. In the cutting process, a change in machining allowance of unevenness exceeding 1 mm greatly affects tool life and is a major cause to tool life reduction.

Figure 3. Photograph of deposit by the DED method in SKD11 (60 HRC)



To resolve this dilemma, OSG has developed the AM-EBT ball type carbide end mill (six sizes available from R3 to R10) and AM-CRE radius type carbide end mill (six sizes available from dia. 6 mm to 20 mm) that can achieve efficiency and long tool life in large depth of cut and high hardness additive manufacturing work applications.

Figure 4. From left, OSG ball end mill AM-EBT R6 and radius end mill AM-CRE dia. 12 x R2

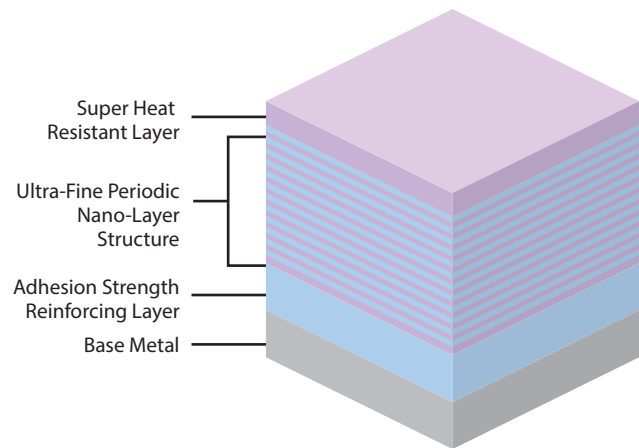


Features & Benefits of OSG's End Mills for Additive Manufacturing Applications

The AM-EBT ball type carbide end mill features a robust 3-dimensional negative geometry optimized for large depth of cut. The AM-CRE radius type carbide end mill is available in 6-flute or 8-flute configuration. OSG's AM series end mills are recommended for materials in hardened steel, pre-hardened steel, stainless steel, heat-resistant alloy additive manufacturing applications and built-up welding parts.

The AM-EBT and AM-CRE are coated with OSG's original DUROREY coating (see figure 5). The super heat resistant layer and ultra-fine periodic nano-layer structure of the DUROREY coating provides superior toughness while maintaining high heat resistance and abrasion resistance. The DUROREY coating also suppresses chipping in high hardness milling and enables long tool life even in the milling of built-up welding parts with large depth of cut.

Figure 5. Properties of DUROREY coating



The secondary process after metal additive manufacturing has very many similarities to the milling of built-up welding parts. For die and mold repair and correction applications, time-consuming air cutting is commonly employed. OSG's AM-EBT ball type carbide end mill and AM-CRE radius type carbide end mill are able to achieve high-efficiency and long tool life for the roughing of additive manufacturing applications and mold overlay surfaces. These end mills have received many positive feedbacks from manufacturers who have used them for trials and are able to successfully minimize air cutting and reduce machining time.

Today, the increasing demand for smaller, higher quality and more versatile end products are accelerating the development of additive manufacturing technologies. The global market for additive manufacturing is expected to experience significant growth in the coming years. The sales volume of additive manufacturing machines is steadily increasing, and business correlated to secondary processing is expected to increase correspondingly. OSG is positioned to readily respond to evolving needs through continuous research and development to help manufacturers further enhance flexibility, productivity and speed of digital manufacturing.

Deep-Hole Drilling

ADO-30xD carbide drill with through-coolant holes eliminates frequent tool breakage in engine block production

Marcela Rattin Bombini

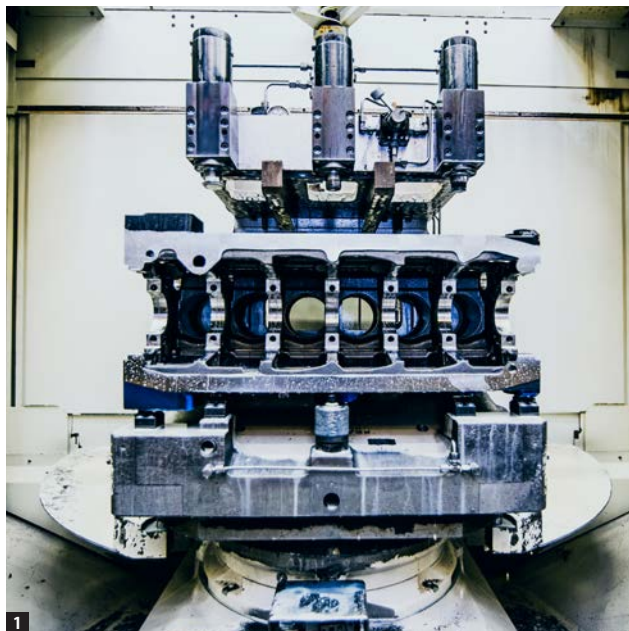
OSG Sulamericana



The ADO series is OSG's premium line of carbide drills with through-coolant. The ADO's unique flute specification with smooth chip evacuation and high tool rigidity qualities are engineered for optimum performance in ultra-deep-hole applications. Standard stock is available from 3xD up to 50xD.

Hole drilling is a common manufacturing operation. Deep-hole drilling, however, presents a different level of difficulty. In general, a ratio of 5-to-1 or greater in depth versus hole diameter is considered as deep-hole drilling. Deep-hole drilling operations are challenging

because of the confined environment that constraints chip evacuation and coolant delivery. Unstable chip generation and heat control may lead to tool breakage and poor surface finish, which can be very costly.



1. MWM's Acteon engine block is made of gray cast iron GG25 and requires the drilling of two deep-holes at a depth of 405 mm and 8 mm in diameter.

In the manufacturing of engine blocks, a variety of holes are required to be drilled. The largest holes are the cylinders, the small round orifices are mounting holes, and the small oval orifices are coolant or oil duct. The engine block is one of the most important components of the internal combustion engine. Commonly referred to as a cylinder block, the key function of the engine block is to contain and support parts of the engine, such as the piston, connecting rod, crankshaft, cooling circuit, etc. When a vehicle is running, high mechanical and thermal stress are applied on the engine block, which must withstand high forces, pressures, vibrations and temperatures. With safety in jeopardy, the quality of the holes drilled must meet the required tolerance. In one of the engine blocks that MWM Motores Diesel produces, two deep-holes at a depth of 405 mm and 8 mm in diameter are required to be drilled.

Founded in 1953, MWM is a leader in technology and development of Diesel engines in Latin America. In 2005,



2



3

2. MWM's plant in São Paulo, Brazil has approximately 83,000-square-meter of production floor space and employs 1,250 staff.

3. MWM uses a Heller MCH 350 five axis horizontal machining center for the manufacturing of engine blocks at its São Paulo, Brazil plant.

MWM became a part of the North American Navistar Engine Group. MWM has plants in São Paulo, Brazil and Jesús María in Córdoba, Argentina. MWM's products serve the vehicular, agricultural, industrial, power generation and maritime segments. In addition to the

traditional Diesel engines, MWM also offers a complete portfolio of spare parts well over 16,000 items. Today, the company exports to over 45 countries in South America, North America, Central America, Europe, Asia, Africa and Oceania.



4

4. MWM has been producing the Acteon engine block since 2011 and manufactures approximately 3,800 blocks annually.



5

5. From left to right, OSG Sales Technician Valdir Lima and MWM Process Engineer Tarcisio Bottaccini inspect an engine block on a Heller MCH 350 five axis horizontal machining center.

MWM's plant in São Paulo, Brazil has approximately 83,000-square-meter of production floor space and employs 1,250 staff. MWM Process Engineer Tarcisio Bottaccini, who is in charge of MWM's Acteon engine block production, was troubled by frequent tool breakage during machining, which resulted in repeated rework of the part. The Acteon engine block is made

of gray cast iron GG25. MWM has been producing this part since 2011 and manufactures approximately 3,800 blocks annually. Each part requires the drilling of two 8 mm diameter through-holes at a depth of 405 mm. The accuracy tolerance must lie within ± 0.1 mm and requires a surface roughness of Rz 63.

MWM uses a Heller MCH 350 five axis horizontal machining center for the application with an HSK-100 toolholder and soluble oil for the coolant. MWM was originally using a competitor 8 mm diameter carbide drill with through-coolant with unstable performance. As an existing OSG client with proven successes in other applications, Bottaccini decided to consult with OSG Sales Technician Valdir Lima to seek processing improvement.



6

6. From left to right, OSG Sales Technician Valdir Lima and MWM Process Engineer Tarcisio Bottaccini show the 8 mm diameter ADO 30xD next generation high performance carbide drill to the camera.

Upon a detail evaluation of the application, Lima recommended OSG's ADO 30xD 8 mm diameter next generation high performance carbide drill. The ADO series is OSG's premium line of carbide drills with through-coolant. Standard stock is available from 3xD



7. MWM Process Engineer Tarcisio Bottaccini inspects the 8 mm diameter ADO 30xD next generation high performance carbide drill.

up to 50xD. The ADO's unique flute specification with smooth chip evacuation and high tool rigidity qualities are engineered for optimum performance in ultra-deep-hole applications. Especially critical in MWM's application, the ADO's capability to break chips into small and manageable pieces stably provides a great advantage versus the competitor tool.

MWM ran the competitor carbide drill at Vc 80 m, a feed rate of 0.08 mm per revolution, and obtained an average tool life of 40 minutes. The ADO drill, on the other hand, is able to excel at Vc 100 m, increase feed rate to 0.12 mm per revolution, and extend tool life to 60 minutes.

In addition to being able to eliminate the headache of frequent tool breakage, MWM is able to generate a 33 percent savings by implementing the ADO drill. With reliable tooling, MWM is able to turbocharge its engine block production with excellent quality consistently and economically.



8. From left to right, MWM Process Engineer Tarcisio Bottaccini and OSG Sales Technician Valdir Lima pose for a photograph at MWM's plant in São Paulo, Brazil.

Quadruple Productivity

Next generation AD solid carbide drill helps wheel hub bearing supplier achieve lean and agile manufacturing

Norick Naito
OSG USA

The global manufacturing industry is evolving at exponential speed driven by Industry 4.0. Advancements in technology continues to place pressure on manufacturers to embrace new lean practices. To thrive in today's volatile market environment, NTA Precision Axle Corporation in Illinois, United States is taking advantage of OSG's advanced drilling solutions to maximize production efficiency in its wheel hub bearing production.

NTA was established in 2010 in the city of Carol Stream as a joint venture between NTN Corporation, Takao Kogyo Co., Ltd. and Asahi Forge Corporation to integrate forging, heat-treatment and turning in order to pre-process automobile hub bearings. NTA currently employs 270 staff at its 53,500-square-meter site.

The wheel hub bearing is a main product of NTA, which the company has been manufacturing since its founding. A wheel hub bearing is an automotive part used in most vehicles. Wheel hub bearings are located



1. Each of NTA's wheel hub bearing requires the drilling of five holes in grade S53C carbon steel. NTA produces approximately 840,000 parts per year, accounting for 4,200,000 drilled holes annually.

2. From left to right, NTA Trainer Toru Tokikuni, NTA Tool Crib Coordinator Eriko Suzuki and OSG JTA Account Manager Ken Sato.

on each axle and have to sustain a variety of forces from the vehicle. Working in conjunction with other automotive components, the wheel hub assemblies connect the wheels to the vehicle body and provide the power needed for the wheels to rotate. Wheel hub bearings are mounted and connected to other components by nuts and bolts, requiring the drilling of holes. Each of NTA's wheel hub bearing requires the drilling of five holes in grade S53C carbon steel. NTA produces approximately 840,000 parts per year, accounting for 4,200,000 drilled holes annually.

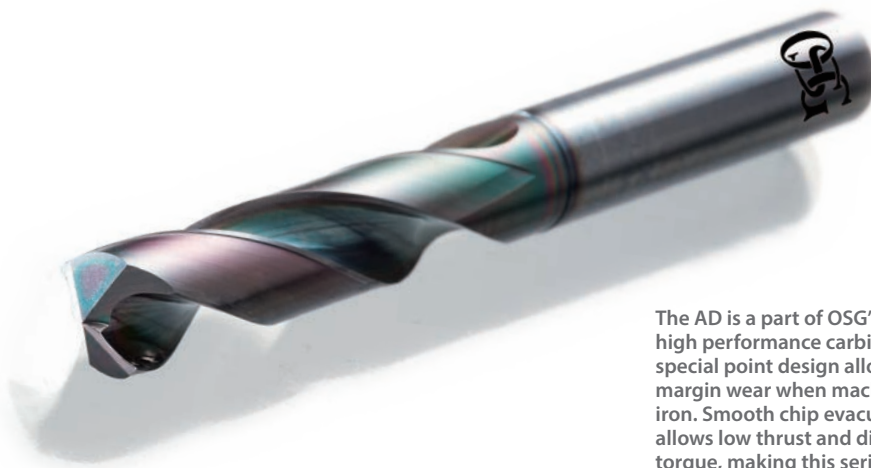
NTA was originally using a competitor 11.8 mm diameter straight cutting edge carbide drill for the application. NTA's objective was to further improve cost per unit without sacrificing quality. NTA is an existing user of OSG taps, but the company has little experience with other OSG tooling solutions. After multiple visits and performing a detail evaluation of the application, OSG JTA Account Manager Ken Sato proposed the AD-2D solid carbide drill from OSG's premium A Brand series to tackle the challenge of reducing cost per unit.

The AD drill is a part of OSG's versatile next generation high performance carbide drill series. Standard stock is available in 2xD length and 4xD length with diameters ranging from 2 to 20 mm. The AD series' special point design allows it to dramatically inhibit margin wear

when machining carbon steel and cast iron. Smooth chip evacuation capability further allows low thrust and disturbance-free machining torque, making this series highly adaptable to a variety of machining environments.

NTA's goal for the cutting trial was to achieve an improvement from the competitor drill by making 1,600 parts per drill, which is equivalent to 8,000 holes. When Sato reviewed the AD drill's result with NTA, the performance was too good to believe that he had to double-check the numbers. The average tool life of the AD drill was 6,400 parts, which is equivalent to an astonishing 32,000 holes per drill. The AD solid carbide drill is able to exceed four times the expectation. With consistent performance from multiple cutting trials, NTA was confident to make the switch. In addition to the upfront cost-savings, OSG also provides reconditioning services to further assist NTA to maximize cost efficiency.


Wheel hub bearings today are becoming more and more sophisticated and integrated to achieve greater efficiency. The increasing demand for quality and performance are putting automotive suppliers to the test in terms of agility. As NTA celebrates its 10th anniversary in 2020, the company will continue its journey to success by continuous manufacturing process improvement.



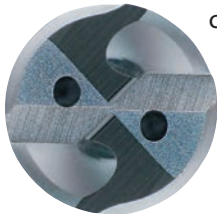
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ADO-MICRO

Small Diameter Coolant-Through Carbide Drill Series



The ADO-MICRO small diameter coolant-through carbide drill series is engineered for stable and high efficiency drilling in small diameter deep-hole applications. Poor chip evacuation is a common complication in small diameter deep-hole drilling. Micro sludges can be easily accumulated around the outer periphery of the cutting tool, which is a key cause of abrupt tool breakage. The ADO-MICRO features a unique double margin geometry with an extended flute and shortened end margin to enhance chip evacuation capability. In addition to the outstanding chip ejection performance, the double margin configuration supports the straightness stability of



the tool and reduces rifle marks on the inner surface of holes. Furthermore, the ADO-MICRO features a pair of large oil holes and employs a hollow shank design to allow large coolant flow volume for trouble-free chip evacuation.

The ADO-MICRO is coated with OSG's original IchAda coating that provides excellent surface smoothness in conjunction with high abrasion resistance and heat resistance to enable small diameter tools to achieve long tool life. The ADO-MICRO is suitable for carbon steel, alloy steel, stainless steel, cast iron, ductile cast iron, aluminum alloy, titanium alloy and heat resistant alloy.

ADO-40D & 50D

Coolant-Through Carbide Drills



The ADO-40D and 50D coolant-through carbide drills are engineered for ultra-efficiency in deep-hole drilling applications. The ADO-40D and 50D feature a unique R gash geometry that enables super low cutting resistance and exceptional chip control. This feature allows the creation of compact chips that are tightly curled with no elongation for trouble-free chip evacuation even in deep-hole applications. Furthermore, a new flute specification with smooth chip evacuation and high tool rigidity qualities has been applied. The ADO-40D and 50D employ a highly rigid 25-degree helical flute optimal for stable and high-performance drilling in deep-hole

applications. Internal cutting trials have demonstrated that a 20-degree helix angle is insufficient and can cause the clogging of chips and tool breakage; whereas a 30-degree helix angle lacks rigidity and may lead to unstable processing.

The ADO-40D and 50D are coated with OSG's original EgiAs coating, which is constructed with extreme toughness, high wear and heat resistance characteristics to ensure stable and consistent tool life. The ADO-40D and 50D are ideal for deep-hole applications in carbon steel, alloy steel, cast iron, ductile cast iron and stainless steel.

AE-BM-H, AE-BD-H & AE-LNBD-H

Carbide Ball End Mills for High Hardness Steels

The AE-BM-H, AE-BD-H and AE-LNBD-H carbide ball end mills are designed to accommodate a wide range of applications and milling methods in high hardness steels with superior performance.

The AE-BM-H is a 4-flute carbide ball end mill designed for high-efficiency processing of high-hardness steels. It features a sharp spiral curve for reducing cutting resistance, allowing stable performance with extended tool life. The AE-BM-H is suitable for both roughing and semi-roughing.

The AE-BD-H is a 2-flute carbide ball end mill designed for high-precision finishing. It features a variable negative spiral gash for better chipping control. The AE-BD-H's superior ball R precision ensures a stable radius accuracy across 180 degrees.

The AE-LNBD-H is a 2-flute long neck carbide ball end mill designed for high-precision finishing. Similar to the AE-BD-H, it also features a thick center core to help prevent deformation of the ball tip to improve chipping control. Its teardrop-shaped outer periphery strong back taper geometry enables milling by point, which prevents chattering and chipping, resulting in improvement of surface accuracy.

This carbide ball end mill series is coated with OSG's original DUREY coating with superior heat resistance and high toughness optimized for high hardness steel milling.

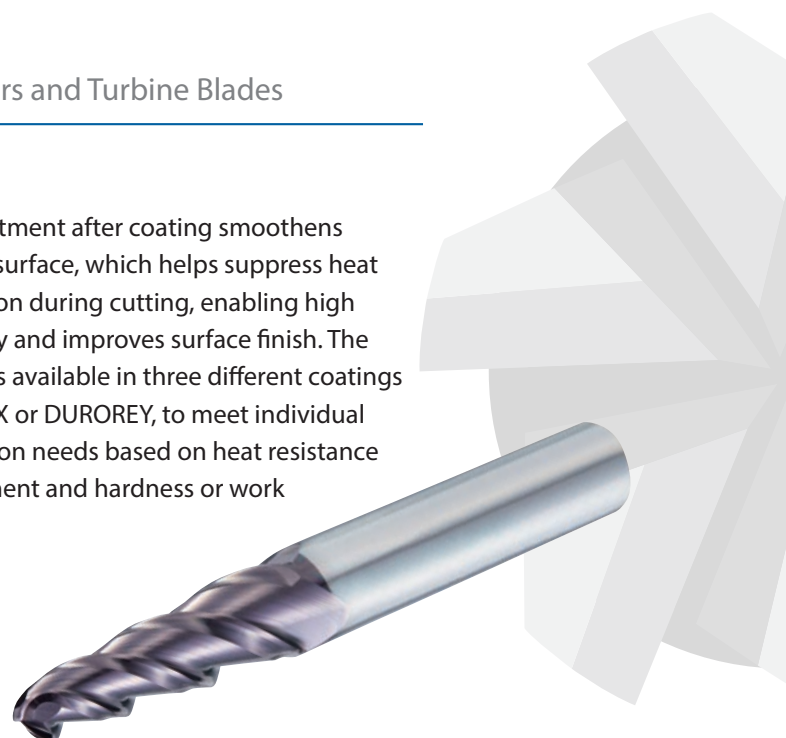


IB-TPBT

Carbide Taper Ball End Mill for Machining Impellers and Turbine Blades

The IB-TPBT carbide taper ball end mill features specifications optimized for impeller and turbine blade applications in difficult-to-machine materials and processes that are easily prone to chattering. Its large bottom R gash geometry facilitates smooth chip evacuation and enhances tool strength. Thinning on the tool's end cut significantly reduces chip clog in the center. Furthermore, the IB-TPBT's large core design provides high tool rigidity to enable stable performance even in long-hour processing.

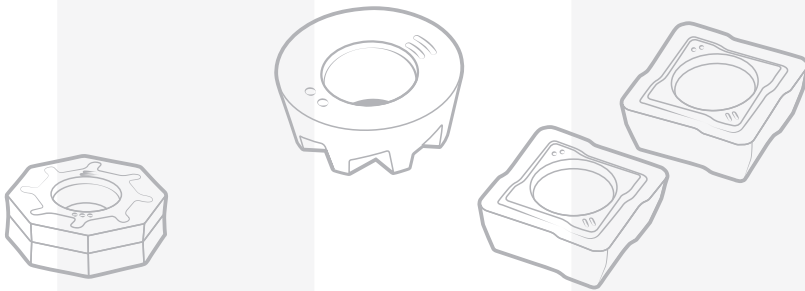
Post treatment after coating smoothens the tool surface, which helps suppress heat generation during cutting, enabling high durability and improves surface finish. The IB-TPBT is available in three different coatings – WXL, FX or DUREY, to meet individual application needs based on heat resistance requirement and hardness or work material.



Global Events

2020 Exhibition Schedule

01 January	02 February	03 March	04 April	05 May
<p>January 29–February 1 38° CIOSP São Paulo, Brazil</p>	<p>February 11–13 Expo Manufactura Monterrey, Mexico</p> <p>February 27–29 Fastener Fair Turkey Istanbul, Turkey</p>	<p>March 3–5 INNOFORM Bydgoszcz, Poland</p> <p>March 10–13 METAV Düsseldorf, Germany</p> <p>March 12–15 Western China International Equipment Manufacturing Expo Xi'an, China</p> <p>March 15–17 Grainger Expo Orlando, USA</p> <p>March 31–April 4 SIMTOS Equipment Manufacturing Expo Seoul, Korea</p>	<p>April 2 MMP Expo Abbotsford, Canada</p> <p>April 7–11 CCMT Shanghai, China</p> <p>April 15–18 INTERMOLD Osaka, Japan</p> <p>April 20–22 ISA Atlanta, USA</p> <p>April 21–23 Spånligaen Herning, Denmark</p> <p>April 21–23 Taiwan International Fastener Show Kaohsiung, Taiwan</p>	<p>May 11–13 MMTS Montreal, Canada</p> <p>May 12–15 Elmia Verktygsmaskiner Jönköping, Sweden</p> <p>May 25–29 METALLOO-BRABOTKA Moscow, Russia</p> <p>May 27 MMP Expo Winnipeg, Canada</p> <p>May 28–31 Lijia International Intelligent Equipment Exhibition Chongqing, China</p>



06

June

June 12–13

Amerimold

Novi, USA

June 18–22

ACMEE

Chennai, India

June 22–24

IFS China

Shanghai, China

09

September

September 15–19

AMB

Stuttgart, Germany

September 28–October 3

MAKTEK

Avrasya

Istanbul, Turkey

September 29–30

Fastener Show

Las Vegas, USA

10

October

October 5–9

MSV

Brno, Czech Republic

11

November

November 10–14

TMTS

Taichung, Taiwan

November 11–15

AMIC

Mexico City, Mexico

12

December

December 5–6

Fastenal

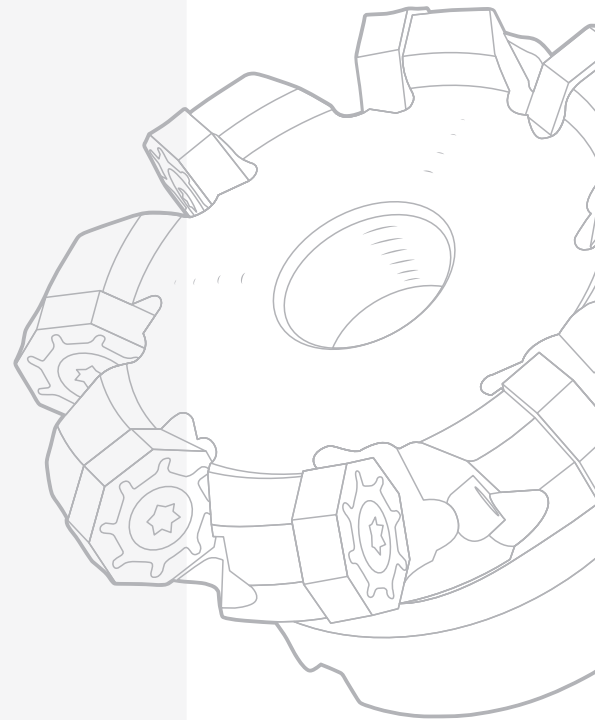
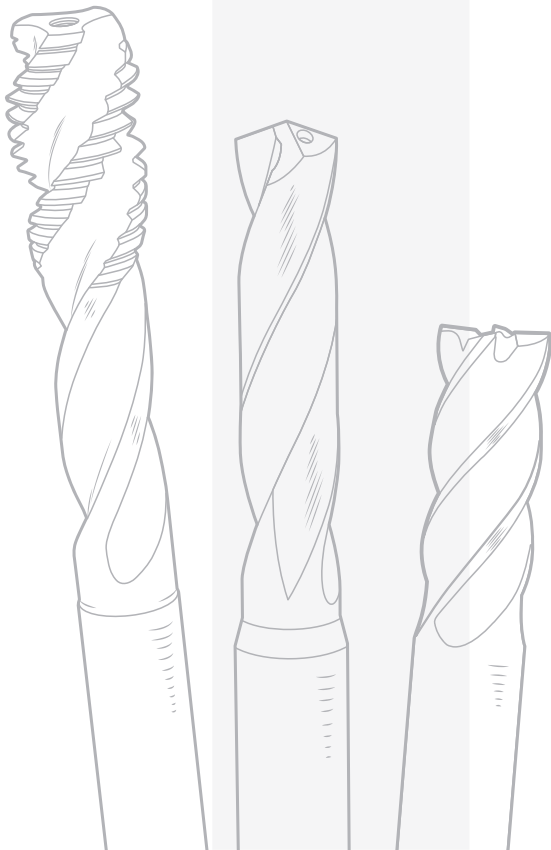
Employee Expo

Orlando, USA

December 7–12

JIMTOF

Tokyo, Japan



OSG Corporation places commercial advertisement on manhole covers in hometown

On October 1, 2019, OSG Corporation became one of the first two companies to place commercial advertisement on manhole covers in Toyokawa, Aichi, Japan. Toyokawa is a city located in the eastern part of Aichi Prefecture. It is the home town of OSG Corporation and nearly half of its employees in Japan. OSG takes great pride in Toyokawa and hopes to continue to contribute back to its home town through meaningful initiatives.

OSG Corporation has two manhole cover advertisements featuring its logo and mascot 'Tap-kun.' They are located near the Toyokawa Inari, which is the city's most famous Buddhist temple.



1. From left, OSG mascot 'Tap-kun' and OSG global marketing supervisor Reiko Masuhara pose for a photograph with a newly made manhole cover advertisement before installation.



2. A newly installed manhole cover advertisement featuring OSG's logo.



3. On October 1, 2019, OSG Corporation became one of the first two companies to place commercial advertisement on manhole covers in Toyokawa, Aichi, Japan.

EMO Hannover 2019

The future of manufacturing – AI, additive processes, IIoT, 5G and OPC UA

The EMO 2019 exhibition took place from September 16 to 21 at the Hannover Fairground in Hannover, Germany. With over 2,200 exhibitors and approximately 117,000 production specialists from 150 countries, EMO Hannover is the world's leading international trade fair for metalworking. The theme of EMO 2019 revolves around the subjects of artificial intelligence (AI), additive processes, industrial Internet of things (IIoT), 5G and OPC unified architecture (OPC UA), where exhibitors presented some of the latest market ready solutions at the trade fair.

In the cutting tool category, in addition to new tooling innovations, a great deal of emphasis was placed on convenience for controlling the consistency of manufacturing quality and production lead time reliability. Information pertaining quality and lead time is communicated to the customer through digitalized user-friendly interfaces, cloud-based simulations and other state-of-the-art methods. Today, this digitalized system has become the market norm where all modern

channels of communication and data distribution are being fully exploited. The EMO 2019 exhibition has further demonstrated the power of digital data and the vital role it plays in the future of manufacturing.

This year, five group companies of OSG – OSG Europe, WEXO, V&B, SOMTA and SMOC participated at EMO Hannover. OSG highlighted new cutting tool innovations and also on the possibility of providing digital data; WEXO displayed its private brand and cutting tool business that can accommodate even small volume requirements; V&B demonstrated its zero point system to allow setup of the workpiece outside of the machine, thereby reducing machine downtime; SOMTA displayed its price-sensitive range of cutting tools; last but not least, SMOC demonstrated its broach machine and broaches for gear production. EMO 2019 was the first trade show in which all five companies have exhibited side-by-side to demonstrate alliance, OSG's ability to diversify and to supply a wide range of manufacturing solutions to the market.



1. At EMO 2019, OSG exhibited some of its latest cutting tool innovations and also on the possibility of providing digital data.
2. One of the entrances to the EMO trade show. EMO is a leading international trade fair for metalworking that is held every odd-numbered year. The EMO 2019 trade show was held at the Hannover Fairground in Hannover, Germany from September 16 to 21.
3. In addition to cutting tool displays, live demonstrations were held daily at the OSG booth at EMO 2019 in Hannover, Germany from September 16 to 21.

OSG Around the World

Employee Interview with

Amélie Daubremé



Amélie Daubremé

Company Location: Belgium

Position: Operations Manager

Joined OSG: 1998

Motto: "Customer service is not a department, it is a state of mind"

Tell us about your work and experience at OSG.

I studied marketing and financial management in college near Brussels. After graduation, I worked as a personal assistant of a marketing director for two years before joining OSG Europe in February 1998. My first job at OSG was in the machining department, at times when OSG was also selling machining centers beside cutting tools. In 2000, I was assigned to the customer service department and later served as customer service and logistics team leader. In December 2019, I was promoted to my current position as operations manager.



1 Daubremé at the OSG booth at the EMO 2019 trade fair in Hannover, Germany in September 2019.

Tell us about your daily routine.

My day at work starts at 8 a.m., but I usually arrive earlier at the office to check emails and plans, review statistics (pertaining to bookings, orders and shipments, etc.) from the previous day, and to prepare the daily workflow. When necessary, I would organize a briefing with my two assistants and teams. For the remainder of the day, I am working on issues, improvements and projects.

I implement the automatization and optimization of our warehouse. In addition to being in charge of customer service and logistics, I am also responsible of ISO certification and quality management related to all departments at OSG Europe. Furthermore, I provide training to employees in the office as well as to other colleagues in Europe.

What is most challenging about your work?

The most challenging aspect of my work is to keep our customers satisfied. Customer satisfaction not only depends on our high-quality tools, but also on the quality of service and after sales support provided. At OSG Europe, we have a zero-mistake policy to guarantee customer satisfaction. Having worked at OSG for 21 years, I have had a great number of opportunities

to travel all over Europe to visit clients, to better understand their business and to continuously meet their needs. It is critical to know our customers and to make them feel valued. With evolving market demand, I am constantly working to enhance efficiency and reliability of OSG's customer and logistics services.

What is unique about OSG Europe?

At OSG Europe, we are mainly dealing with OSG Groups and dealers in different countries within Europe. It is very interesting to work with our European clients and colleagues since each country has its own unique culture and business practice. We have a very positive relationship in the region since we have known our partners and coworkers for many years. Teamwork and communication are the keys for progress and improvement. At OSG Europe, team spirit is fundamental. Everyone in the organization needs someone else's support, either as a part of the regular workflow, or as a part of achievement. As they say - "none of us is as good as all of us."

What is your favorite OSG tool?

My favorite OSG tool is not a single tool, but a category of tools - end mills. OSG offers some of the industry's best end mills and a comprehensive lineup to provide solutions for every milling application. In addition to

the performance of OSG's end mill innovations, I also appreciate the design of these tools, especially ball nose end mills. I am impressed by the tool geometry, which combines strength and smoothness, enabling manufactures to produce functional yet aesthetically pleasing master piece of works.



2. OSG offers some of the industry's best end mills and a comprehensive lineup to provide solutions for every milling application.

How do you spend time on your day off?

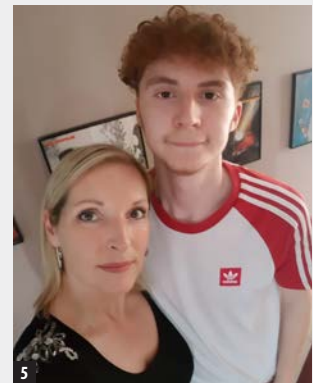
Music is my oxygen. I am often out for concerts and festivals. I also like to practice sports such as fitness and swimming. I like animals and have two cats as well as some reptiles in the house. Last but not least, I enjoy spending time with friends and with my two sons, Jim and Tom, 22 and 19 years old respectively.



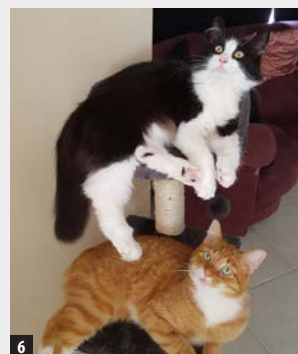
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3. Daubremé at a Rammstein concert in Brussels, Belgium in July 2019. During time off, Daubremé enjoys attending concerts and festivals.

4. From left, Daubremé and her 22-year-old son Jim.

5. From left, Daubremé and her 19-year-old son Tom.

6. Daubremé has two cats, a Norwegian and a European shorthair. From top, 5-year-old Gizmo and 5-year-old Taz.

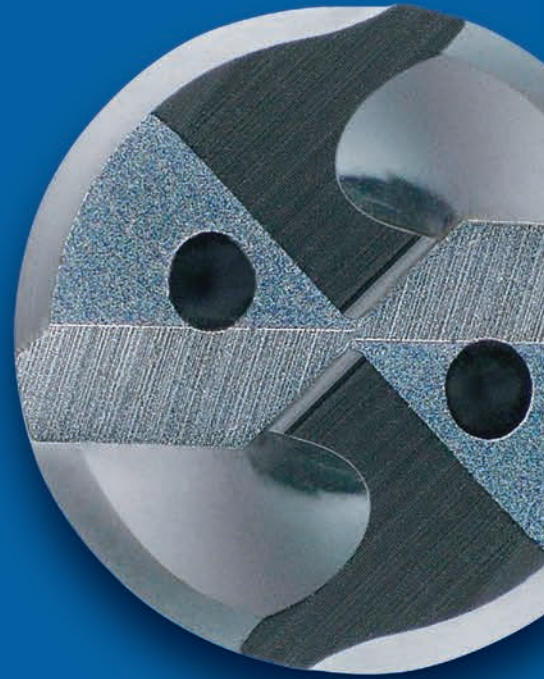
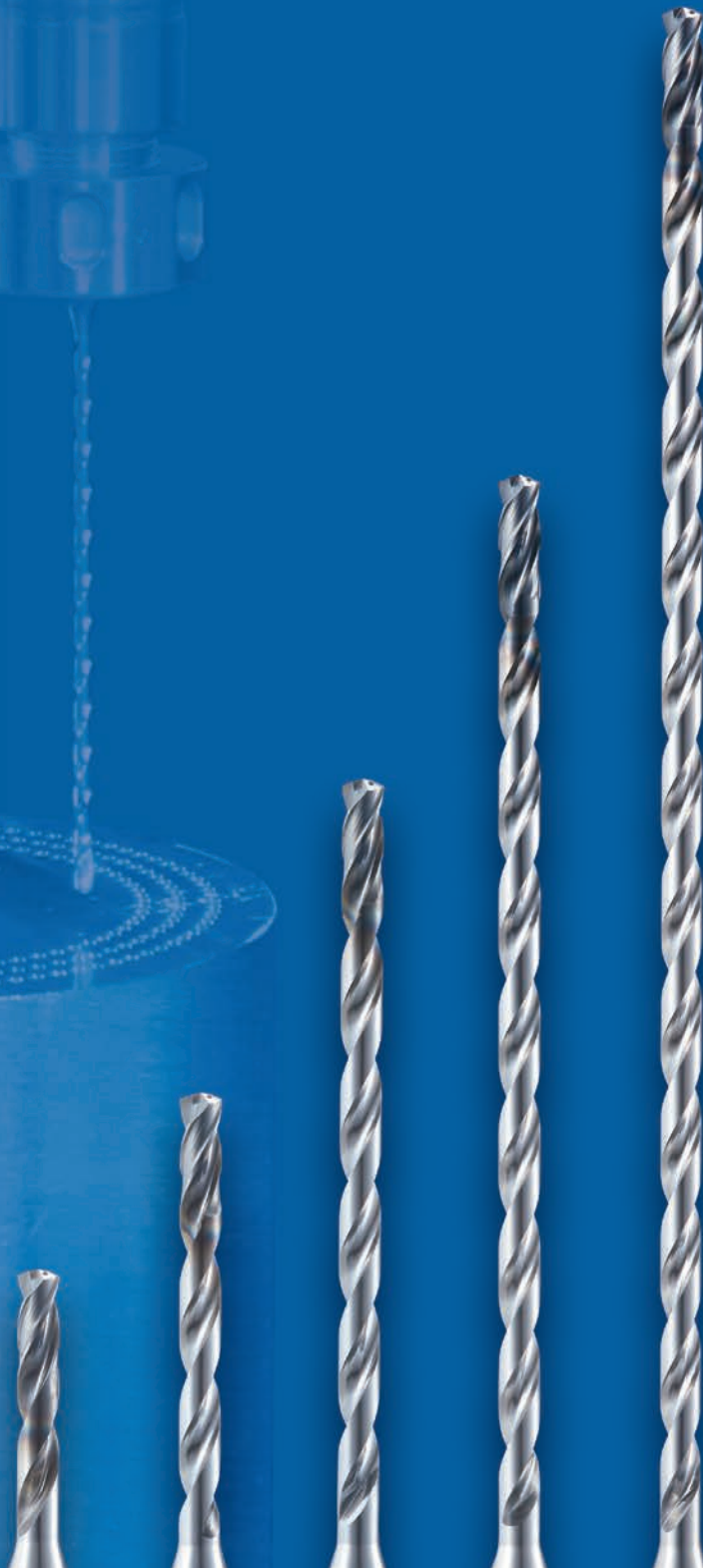


shaping your dreams

Stable and high efficiency in small diameter deep-hole applications

ADO-MICRO

Small Diameter Coolant-Through Carbide Drill



scan for details

