

THE CHALLENGER

— global quality and service system of metal working industry —



Product

- AXILE V series

Distributor

- Smart Partnership for Optimistic Future

R&D Zone

- Study of motorized spindle reliability monitoring- Part II

Application

- Seamless connection of the virtual and real value chain

Key Component

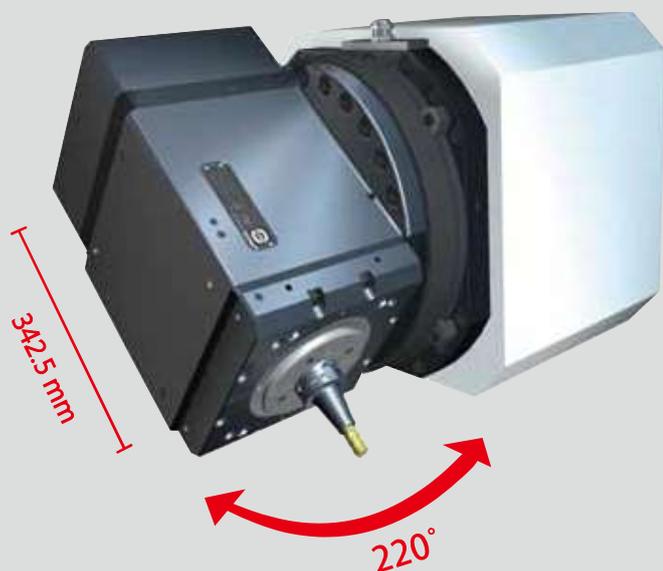
- High-Precision Free-Form Surfaces

Event

- AXILE Stood out in the EMO Hannover 2017



SAUTER



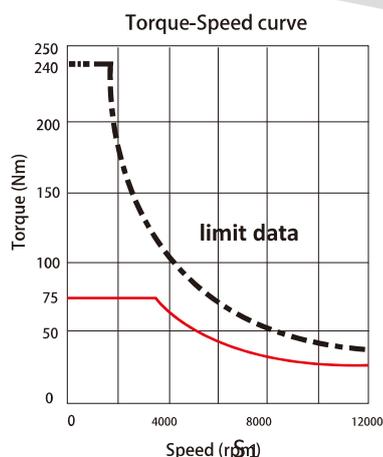
Motor Spindle

- Equipped with permanent-magnet motor, Compact design
- Locking by hirth coupling, increasing rigidity
- Achieving complex and high precision processing needs
- Applicable to multi-spindle compound machine

Max torque 120 Nm

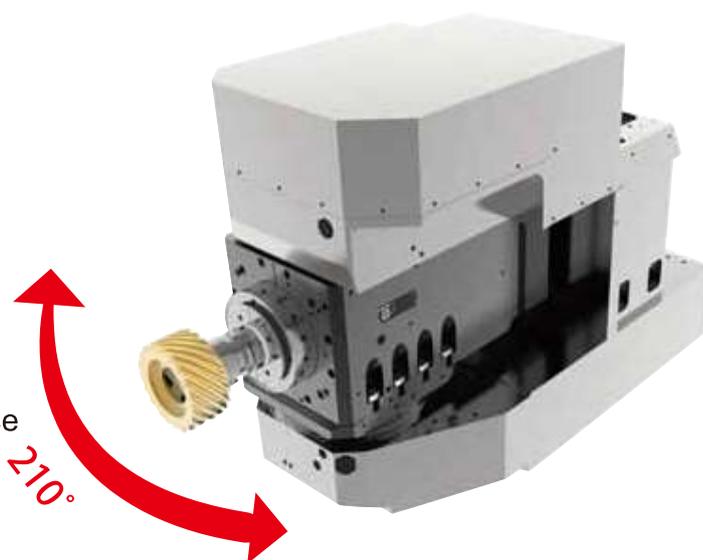
Max speed 12,000 RPM

for HSK-63/C6 model



B-axis Motor Spindle

- Single idle wheel design, no backlash
- Collocated with tool magazine making diverse processing outcome possible
- Applicable for installing on X axis or Y axis according to machine design
- Providing high- precision processing solution



Repeating accuracy: $\pm 0.8 \mu\text{m}$

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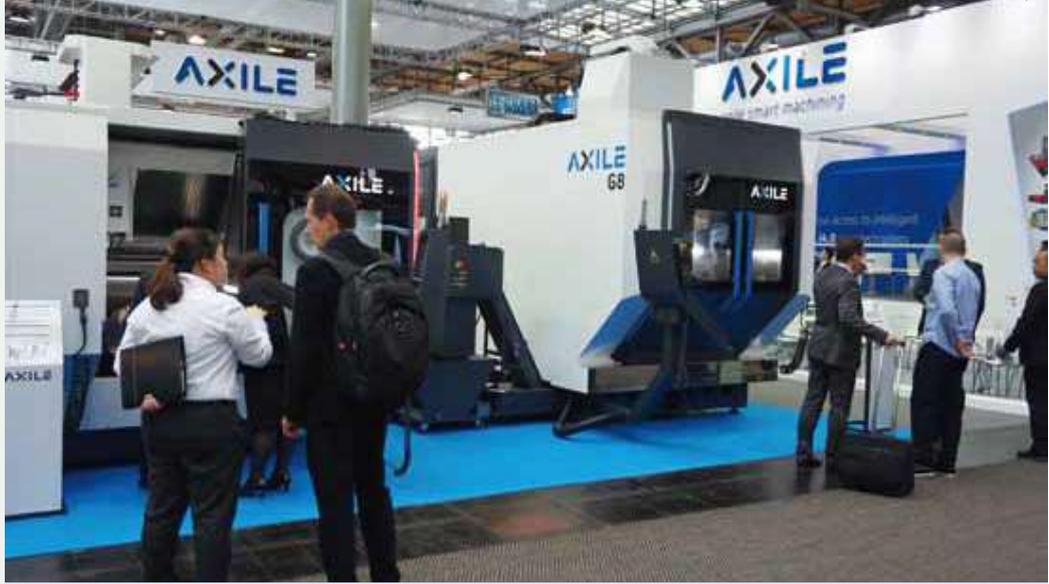
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Article contribution is welcome!

The Challenger welcome submission from all fields of machine tool industry related. The Challenger is committed to prompt evaluation and publication of submitted articles. Company profiles, production experience, feedback of using MICRO CUT's products are the most valuable article to share with "The Challenger" readers. Please send the article and pictures (if any, images resolution in 300 dpi or above) to the local Challenger Factory Outlet or email to info@mail.buffalo.com.tw



Life has never been so exciting as before, after many years studying the technology of management – Total Quality Management, the solution of Industrie 4.0 provider which is the combination of SMT – Smart Machining Technology and ART – AXILE Reliability Technology, the development team combined these knowledge in one function.

Via many outsource supports and cooperation, the company decided to launch new AXILE line adapting the requirement of Industrie 4.0 since Taipei Machine Tools show and then the recent EMO fair. It is honor that the press from EMO sponsor selected Buffalo Machinery as one of the 4-5 companies to report that these machines are ready to go. Certainly, we all know that the others are the CNC manufacturers and the three big CNC machine players, which means that Buffalo can provide the same technology as those well-known brands in metal cutting machines field. AXILE is ready to release its lines into commercial production and benefit the end-users.

Readers can find these reports via the following link:
<http://www.emo-hannover.de/en/news/smart-5-axis-machine-for-high-end-applications.xhtml>



Buffalo Machinery has been proved that being awarded the very top three-star award from Taiwan Quality Association as one of the best TQM companies, it is to confirm the procedure of our management is on a good and right direction, the management team has decided to go deeper and continue further management tools training. We want to be sure that the management and all production procedure will become outstanding function, beside the technique to reach high reliability, predicable and adapting automation. Buffalo Machinery is ready to provide another grade of excellent products and services to the world.

And I am so happy to share my happiness to become a grandfather, she is active and sweet, though only three months till end of Oct. The whole family is so happy, and to keep us busy that we have one more activity to do during the weekend. The life is nothing but wonderful. Please enjoy with our happiness. 

Dr. Paul Chang
Nov. 2017

The President of Buffalo Machinery,
A Smart Machining Technology Service

The coming BREAKTHROUGH...

It has been 9 years since Buffalo published the technical journal “the Challenger”. With the industrial market moving toward industrie 4.0, Buffalo also has moved from a fast-growing phase to a solid innovation phase, which is a great timing for “the Challenger” to move forward with a new look to the readers.

It is the breakthrough power that makes AXILE to convey agile, smart and reliable high-end machine tools to the market. As the global premium metal working equipment and services provider, in 2018, “the Challenger” will have a new look and new name BREAKTHROUGH to continue delivering the update technology and news to our readers.

AXILE Debut Showcase in MICROCUT Europe



After the TIMTOS and EMO fairs, Buffalo's high-end production line AXILE is now ready to promote in the central-eastern European market. MICROCUT Europe held the debut open house for AXILE in late October 2017 and successfully rounded with positive feedbacks.

MICROCUT Europe showcased the complete product range of AXILE which included the 5-axis, G series and 3-axis, V series. Moreover, the latest updated MICROCUT Vertical Machining Center, M series is also well displayed on this occasion. This 3-day informative activity attracted more than 150 visitors, including the distributors, end users and potential clients who stepped into Buffalo's European service center for having huge interests on the high-innovative new products of AXILE. Visitors came from Croatia, Austria, Slovenia, Bosnia, Herzegovina, Serbia, Macedonia, Bulgaria and Czech Republic that implied Buffalo Machinery's potential growth in central-eastern European countries.

Dr. Paul Chang, the General Manager of Buffalo Machinery presented the leading technology of AXILE on the opening seminar, showing his care and ambition in European market. AXILE embraces the innovative functions such as Smart Machining Technology(SMT) and AXILE Reliability Technology(ART) as the solutions for Industry 4.0 to ensure the machining center having the best machining performance and higher reliability to avoid unexpected machine downtime. The manager of MICRO-CUT Europe, Mr. Željko Ranković focused on the comparison of AXILE and competitors and illustrated the AXILE's position in the regional market. This was a golden opportunity to express AXILE's insight and competitiveness in high-end market to our precious partners.



The presentation of update technology by Dr. Paul Chang



Mr. Željko Rankovic is expressing AXILE's strength

The on-site demonstration was a significant part in the rest two days, AXILE G6, G8, V5 and V6 were displayed with Heidenhain and Siemens control system to allow the visitors to have deeper knowledge of the advantages of machining functions. M800 and M1050 represented MICROCUT on this occasion for its popularity and the wide range of specification and accessories. M series has covered 90% of the market requirement and satisfied the needs of different industries. MICROCUT Europe Open House did not only provide the theoretical analysis but also demonstrated the quality of machining performance to customers. MICROCUT Europe will continue to build strong relationship with regional customers by the excellent products and service. [🔗](#)



On-site demonstration of G6



Customers are discussing V5 with the staff

A Rewarding Outcome of TQM Implementation

Buffalo Machinery has been awarded the top three-star prize from Chinese Society for Quality in November 2017. Dr. Paul Chang, the General Manager of Buffalo Machinery, indicated that this honor belongs to all employees in Buffalo Machinery because their persistence and belief led all to the right path.

Quality Award is held by Chinese Society for Quality which was founded in 1964. The Quality Award was founded the same year whose purpose is to motivate and help the enterprises, regardless of national or personal, to achieve better quality of products and to provide better customer service through the advanced theories and experiences of quality management.

Buffalo Machinery practices TQM strategy in six aspects which are Leadership, Strategy Planning and Innovation, Customer and Market, Resources Management, Operation Management and Management of Information and Knowledge. Quality control, design and production of highly-controlled quality, and the quality management are the three main points of Buffalo Machinery's total quality management policies. The managers of Buffalo Machinery take the responsibility of Quality Control Cycle, QCC activities to motivate and encourage all employees of participation to ensure the achieving of goals in innovation, continuous improvement and customer satisfaction. In the meantime, all members of Buffalo Machinery follow the strategy of TQM and using the PDCA-B (Plan, Do, Check, Action, Benchmarking) as the tool to keep progressing the quality of strategies. PDCA-B is not only used in the policies of departments but also is used in personal daily work management, so the company can be improved from the details to the greater picture. Figure 1 shows the achievement of QCC activities of Buffalo Machinery since 2014. It's obvious that the cost of Buffalo Machinery has decreased approximately 18 million, and in the meantime, the workhour has also decreased nearly 4000 hours. The fully practice of TQM strategy has released the pressure for Buffalo Machinery to raise the price of products because of the risen cost of materials, the newly announced labor law by Taiwanese government and the unstable of exchanged rate.



Figure 1 - QCC achievement of Buffalo Machinery

The leadership of Buffalo Machinery leads the practice of TQM and the internal communication and management. The leading directors execute and adjust the strategies of management, marketing analysis and innovation. The execution team allows different departments to set the annual goal and strategies to conduct plans of management and training. Strategies of Buffalo Machinery are fully discussed by leaders and then announced to all employees through weekly and monthly meetings. Different levels of meetings can make sure that messages are well sent to employees, so everyone can achieve the annual goal by executing the well-made strategies. Figure 2 shows the chart of internal communication and management of Buffalo Machinery.

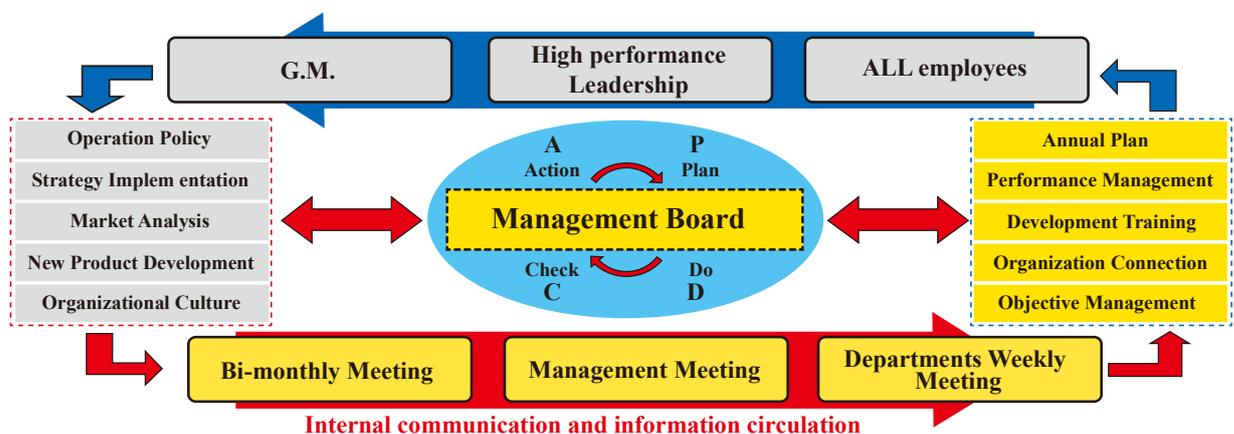


Figure 2 – Chart of internal communication and management of Buffalo Machinery

Buffalo Machinery do the annual survey on technique, quality, time of delivery, customer service, communication, price, etc. with dealers to understand the service quality offering, and according to the feedback to make rectification for the achieving of quality improvement. Figure 3 shows the outcome of the quality improvement to achieve the continuous growth of customer satisfaction in the last five years.

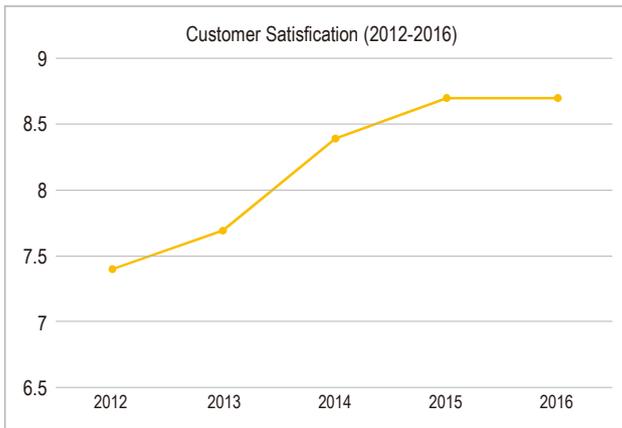


Figure 3 - Customer Satisfaction from 2012 to 2016

Moreover, Buffalo Machinery set the high-end technical innovations as the priority, so the versatility of machine tools can both satisfy the needs of customers and global market. In figure 4 shows the growth of manpower of R&D department which takes 21.2% of totally employees currently, and from the record of June 2017, Buffalo Machinery has already devoted 54.17% of sales volume in the innovation and technologies on high-end products. In consequence, Buffalo Machinery has developed the patented application of Smart Machining Technology(SMT) and AXILE Reliability Technology(ART) which are adapt to the Industrie 4.0 and were successfully presented in 2017 TIMTOS Taipei and EMO Hannover 2017.

The examination of full aspects on Buffalo Machinery has helped the leading managers to have deeper understanding on management knowledge. On the other hand, it's a great opportunity for employees to have a self-evaluation on basic theoretical knowledge and standard procedure. The fully practicing TQM at Buffalo Machinery can not only enhance the management quality but also assist for the all-round strategy making. It is pleased to say that Buffalo Machinery is ready to provide higher quality service to the high-end machine tool industry. 

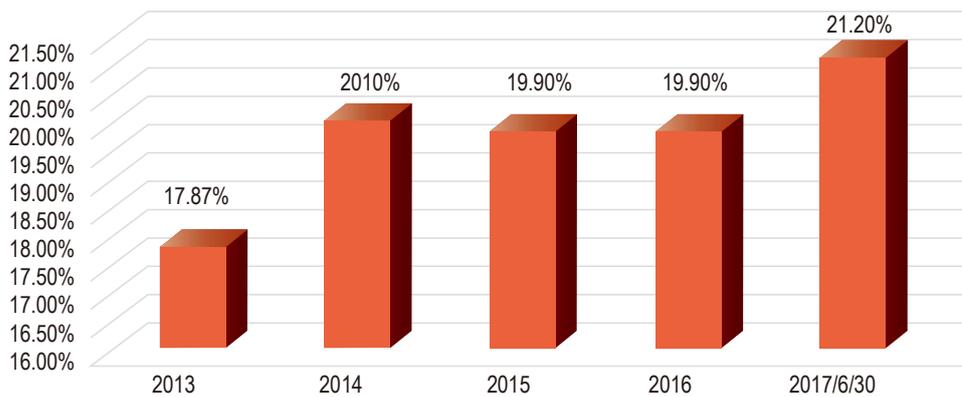


Figure 4 – employees of RD Department are increasing every year

Impressive flexibility and fast machining with A

AXILE Perform fast and agile movement • Reliability • Prod



V4



V5

AXILE V series

- X axis: 600 ~ 1200 mm
- Y axis: 400 ~ 730 mm
- Z axis: 450 ~ 650 mm
- Spindle selection: 12000 to 24000 rpm
- Feed rate: 40 m/min
- Tool Capacity: 30/40 tools



V6



V7

Industrie 4.0 ready solution

AXILE V series vertical machining center features high-speed machining with high accuracy and high productivity. With integration of Buffalo intelligent technology of ART and SMT, V series provides machine reliability and lifetime prediction to help ensuring the smooth production arrangement, on-time delivery, personnel management and effective cost control, make the maximum benefit being acquired while smart manufacturing.

Intelligent Processing

Benefits

- Predictable maintenance to retain machine reliability
- Optimize energy efficiency based on ISO14955
- Optimize machine utilization ratio with production plans

**AXILE
Reliability
Technology
(ART)**

**Smart
Machining
Technology
(SMT)**

Benefits

- Higher accuracy
- Higher productivity
- Chatter-free surface
- Longer components lifetime
- High Precision Positioning
- Axial Thermal Monitoring

AXILE 3X High-Speed Vertical Machining Center

Productivity

Feature

The AXILE V high-speed machining center combines ergonomic features and rigidity design with structure and components required for high speed machining.

High performance spindle

> In-line spindle –10 to 30 kW, 12000/15000 rpm

> Built-in spindle –15 to 46 kW, 15000/24000 rpm, 25000 rpm is also available for graphite machining only

Linear guideways

All axes provide high-feed movement with feed rate of 40 m/min

Design with ANSYS Simulation Technology

Machine structure and static characteristics are analyzed by ANSYS software to ensure design quality for optimum performance.

Accessibility

Wide opening door with roof integrated allows easy access and loading of bulky workpiece.



High Efficient Controller

- High performance path control available
- Automatic smoothing of contour
- Perfect surfaces can be created with any CAM tool
- 3D radius compensation available
- Quick mid program starts up on specific NC blocks
- 3D line graphics enable visualization of externally generated NC programs
- Free contour programming

Heidenhain
iTNC 530 HSCI / TNC 640

Siemens
840D sl

Fanuc
31iMB



Smart Partnership for Optimistic Future

Buffalo Machinery just rounded off attending the grand opening ceremony for a new research and production complex BPK-NORTH in St. Petersburg Russia on 14 September 2017.



Grand Opening of BPK-NORTH



Around 300 visitors attended the Grand Opening of BPK-NORTH



The newly established BPK-NORTH occupying 22,000 m² of floor space, including complete facilities of innovation center, workshop for the production of CNC machine tools, administrative block and the new design bureau of the Great Saint-Petersburg Polytechnic University in the new areas of the enterprise. Over 200 popular models were displayed to show the visitors multiple selections on BPK's production line.



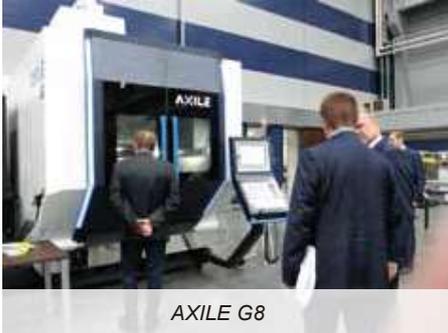
New facility BPK-NORTH displays over 200 models in 22,000m² area



The General Director of BPK, Mrs. Diana Kaledina and Dr. Paul Chang gave opening remarks in Grand Opening of BPK-NORTH

During the Opening, the General Director of BPK, Mrs. Diana Kaledina, announced that the new BPK-NORTH project going on is aimed at mastering the production of a wide range of metal-cutting machine tools in Russia. As the only supplier being invited as speaker, Dr. Paul Chang gave the opening remarks to welcome all the visitors. He mentioned the long-term intense cooperation between BPK and Buffalo made both the important partner for each other and strongly believes the opportunity always favors the prepared minds for future. He also mentioned Industrie 4.0 and introduced the newly launched AXILE satisfying the trendy demands.

In the showroom, both AXILE machines and MICRO CUT machines successfully attracted to visitors' eyes and interests. High-tech appearance of AXILE G series and V series aroused people's interests in design and features. "AXILE means agile and smart", Dr. Paul Chang explained. When a machine is not only agile but also smart, the benefits are more than others can do. Not only AXILE machines attracted many visitors, but MICRO CUT machines did well too because of the already established fine reputation in Russian market. Among the displayed machines, there were a LT-52 and a MM-800 cooperating with Fanuc robots respectively to show visitors the automation capability of MICRO CUT machines.



AXILE G8



MICROCUT LT-52 and MM-800 operated with Fanuc robot

There was a round table discussion in the agenda which comprised seven advanced machinery topics related to smart digital production. As one of the keynote speakers, Dr. Paul Chang presented AXILE adaption to Industrie 4.0. He first shared with the 70 participants the technology concepts of the Industrie 4.0 and explained the development of AXILE Reliability Technology, ART, and how it's working for reliability, prediction and automation.



Dr. Chang illustrated Industry 4.0 and AXILE solution in Round Table

The three major parts together make the best productivity a possibility that a smart machine can perform in a complex Industrie 4.0 scenario. In general, ART brings the benefits of the optimum efficiency on production and maintenance and service. With the real-time monitoring, the lifetime of main components is always predictable which allows the factory's managers to control the production line all the time and avoid the machine down time; in other words, to increase the productivity.

Besides, solution associated with energy conservation is an inevitable trend toward future production. Considering this topic, AXILE machine is applied with the advanced energy control to not only efficiently manage the energy utilization based on ISO14955 but also ensure the machine working under the best condition. In ART system, all processing data are collected and stored, and can be retrieved for analysis based on the need, which then in turn generates an ideal information for manufacturing optimization. After Round Table discussion, AXILE promptly grabbed users' attention for its innovation.

Incidentally, in the following press conference which comprised the Mrs. Diana Kaledina, keynote speakers including the academic representatives from the Great Saint-Petersburg Polytechnic University, on a question regarding the partnership between BPK and Buffalo, Dr. Chang emphasized that the intense cooperation will continue.



Dr. Paul Chang was interviewed with the important publics

"Buffalo Machinery will work closely with BPK not only in production but also in technical exchange to achieve higher market share and strengthening the market position in this potential market in the future.", claimed by Dr Paul Chang at the press interview.

Since BPK has been dedicated to the machine tool market of Russia and made remarkable achievements, it is the result of their hard works over the past few years that Buffalo are able to deliver the high-quality machine tools. Now at the occasion of BPK-NORTH being established aimed to deepen their product development and production, we believe the join of AXILE will contribute the promotion of SMART Manufacturing in Russia. 📍

Study of motorized spindle reliability monitoring – Part II

Hsun-Fu Chiang, Yi-Lin He, Paul Chang

ABSTRACT

This paper proposes an intelligent monitoring system to adapt motorized high-speed spindle on machine tools to meet the requirement of Industrie 4.0, based on the techniques of power electronic engineering, mechatronics and reliability engineering. When a real-time spindle bearing life monitoring unit is applied, energy control and smart machining technology functions are performed with superior results. Raw data is transmitted through a filter to create fruitful information and allow the remote monitoring system to operate effectively. The information supports predictive maintenance plans and improves the quality of after-sales service.

Keywords: **Intelligent Monitoring; Industrie 4.0; Reliability Engineering**

2) Failure rate calculation for bearing configuration

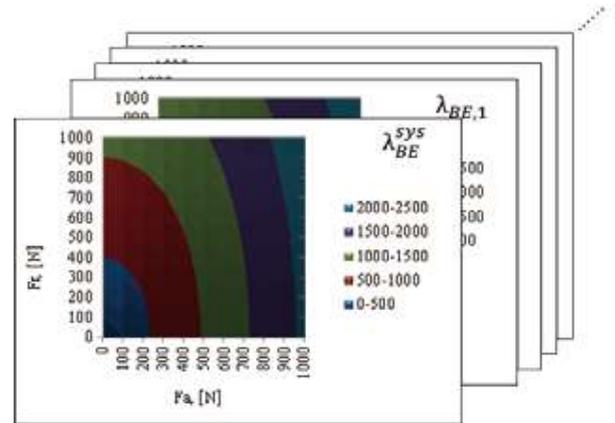
Suppose there is a bearing system, in which the configuration is composed of a number of bearings. In this bearing configuration, the bearing functionality is irreplaceable, therefore, it is regarded as a series-connected model and the total failure rate λ_{BE}^{sys} is calculated as follows:

$$\lambda_{BE}^{sys} = \sum_{i=1}^n \lambda_{BE,i}^{sys} = \sum_{i=1}^n \frac{1}{L_{a,i}} \quad (4)$$

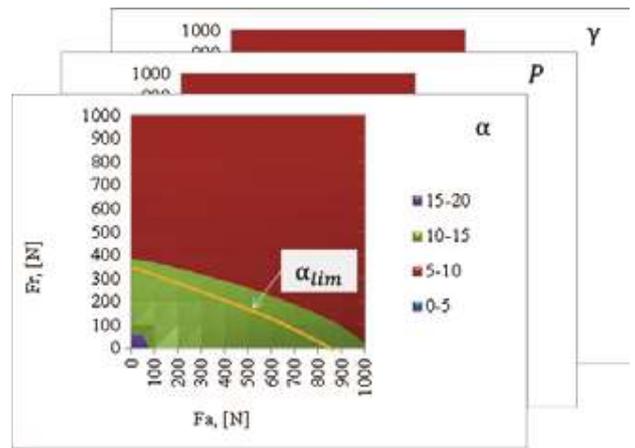
where

$$L_a^{sys} = \lambda_{BE}^{sys}$$

The cutting force should be divided into two components, the axial force F_a and radial force F_r . two independent variable factors and one dependent variable factor exist, and the distribution diagram of the intrinsic bearing properties includes three axes to present this information. An example of the intrinsic bearing characteristics is shown in Fig. 4. There are several distribution diagrams, including that of the failure rate, contact stress, and spin-roll ratio. The other diagrams can be illustrated as well, depending on whether the parameters are significant. The data in the distribution diagram are applicable only to the specific design and operating conditions. Once the bearing preloading design and/or operating speed of the spindle is changed, these data parameters are no longer applicable. According to the bearing safety parameters, each distribution diagram can be divided into several parts to identify the appropriate working areas, such as safe, sub-safe, risk, and high-risk work zones, as illustrated in Fig. 5.



(1) Distribution diagram of failure rate (λ_{BE}^{sys} and $\lambda_{BE,i}$)



(2) Distribution diagram of contact angle, contact press, and spin-roll ratio

Fig. 4 Diagram of intrinsic bearing characteristics chart- for a specific speed condition

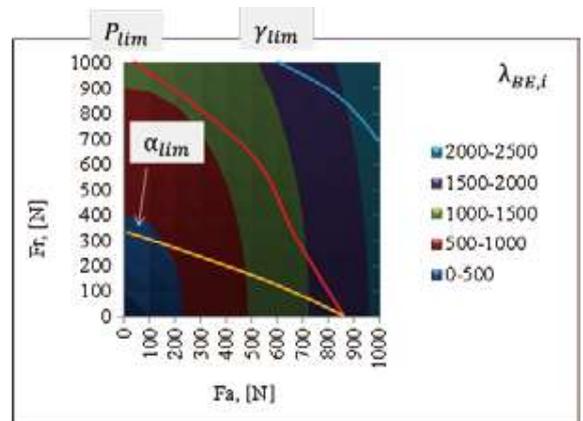


Fig. 5 Diagram of working area for a single bearing

2.3 Cutting failure rate calculation in a given cutting process

1) Given a simplified cutting process

To reduce processing time and achieve greater rigidity in metal-cutting processes, several cutting properties are essential, such as heavy cutting, high-speed milling, high-speed metal removal rate, and high precision. In the rotating system, these properties are represented with the requirements of cutting force and power, spindle speed, and work period.

Furthermore, the changing scope of cutting power and spindle speed may be relatively high, particularly in the application of high-speed motorized spindles. However, because of their complexity, these dynamic cutting properties are not appropriate for analysis. To simplify the analysis process, the complicated cutting conditions should be simplified into several important and representative metrics, such as basic spindle speed, power, and time.

(a) Cutting failure rate analysis of each bearing and the bearing system

In this step, the cutting failure rate for a given cutting process is obtained by mean of equation (5), in this paper, it is referred to as the cutting failure rate. The processing is equivalently simplified for all cutting condition and the cutting life time is presented in equation (6).

$$\lambda_{BE}^{cut} = \sum_{j=1}^N U_j^{process} \lambda_{BE,j}^{process} \quad (5)$$

Where

$\lambda_{BE,j}^{process}$: Fail rate of the j-th cutting process

$U_{BE,j}^{process}$: Duty cycle of the j-th cutting process

j : The j-th cutting process

$$L_a^{cut} = \frac{1}{\lambda_{BE}^{cut}} \quad (6)$$

3. Case study

Bearing system and its arrangement

To explain the relation between aforementioned lifetime, failure rate and metrics of bearing dynamic loading, a case study is discussed. The bearing configuration of this case is illustrated in Fig 6. In this case study, there are four bearings, including the shaft, in the bearing system design, and the bearing arrangements are assembled using the face-to-face method. The first two bearings and the next two are of the same size and code, and the spring preload is selected. The axial force F_a and radial force F_r are applied to the front of the shaft, which represents the cutting force applied, and this force ranges from 0 to 3000 N. Owing to limited space, only the

analyzed data of the bearing surface stress parameter is shown below. The maximum contact pressure of the bearing P_{max} is 2000N/mm².

(1) Analyzed results of the intrinsic characteristics of bearing configuration

The bearing failure rate and life-time for the case study are shown in Fig. 7 and 8, respectively. Due to the exponential relationship within the Probability Density Function distribution for bearing, the failure rate and life-time are reciprocal, as the failure rate increases, the bearing life-time decreases. Furthermore, the greater the cutting force applied to the system, the lower the expected bearing life. In addition, when the bearings are not influenced by an exterior force, that is, $F_a = F_r = 0$, the life-time of the four bearings are different.

However, using only the analyzed result of failure rate and lifetime is insufficient for judging whether the bearing system can meet users' requirements. Apart from the application requirements (failure rate and life-time), it is necessary to consider the metrics of bearing dynamic load and loading conditions. As aforementioned, the limitation of the loading condition for bearings should be deliberated, as mentioned previously, the loading condition limitations for bearings, such as the contact pressure P and contact angle α , should be considered. The working boundary should be drawn in the distribution diagram, and the safe operation area of such a system should be examined. Taking the case study as an example, as shown in Fig. 9(a) and 9(c), bearing no. 1 and 3 are high risk, because of the high contact pressure on the ring surface, which cause metal fatigue damage. As the boundary line, the external force acting on bearing

Nos_1,3, is mapped in Fig. 8(e), and a new distribution diagram is obtained for examination, as shown in Fig 8(f). It is clear that the safe operation boundary is surrounded by three lines, namely the vertical axis, horizontal axis, and curve of the boundary, for the two bearings. Although the safe operation area is provided by the aforementioned curves, it is preferable to operate this system under the maximum contact pressure P_{max} , indicated by the blue-dotted curve in Fig. 8(f).

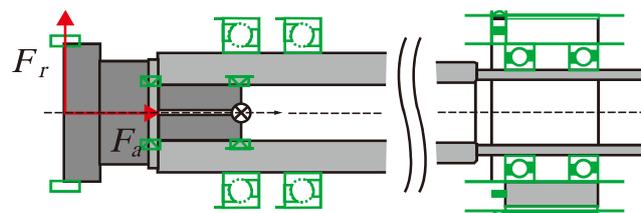


Fig. 6 Bearing arrangements of motorized spindle (not to scale)

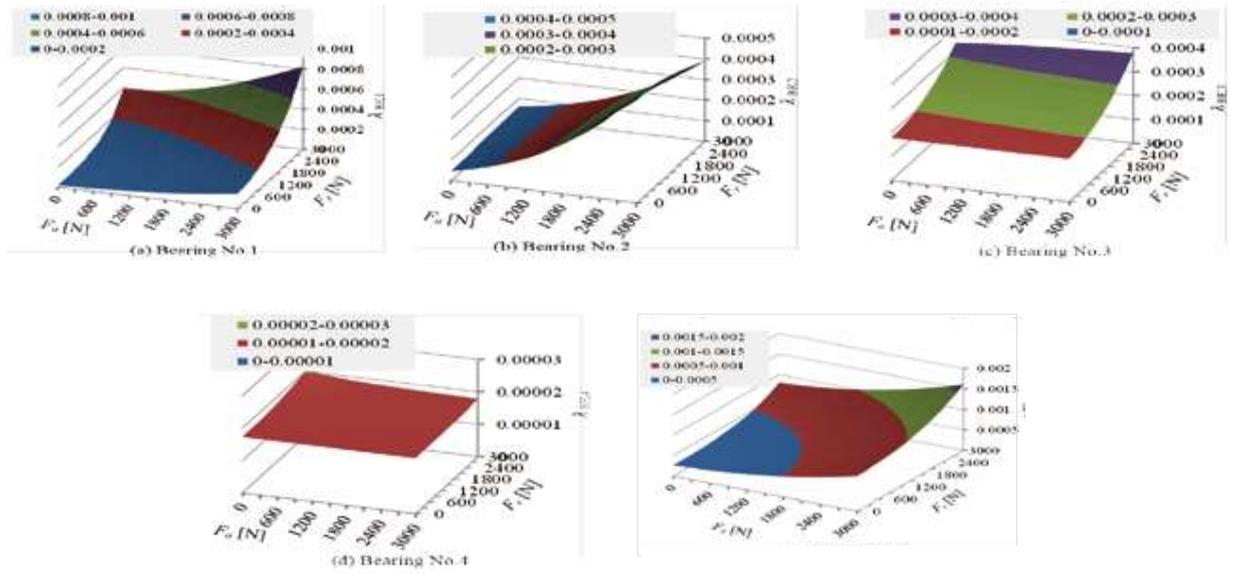


Fig. 7 Distribution diagram of failure rate for each bearing

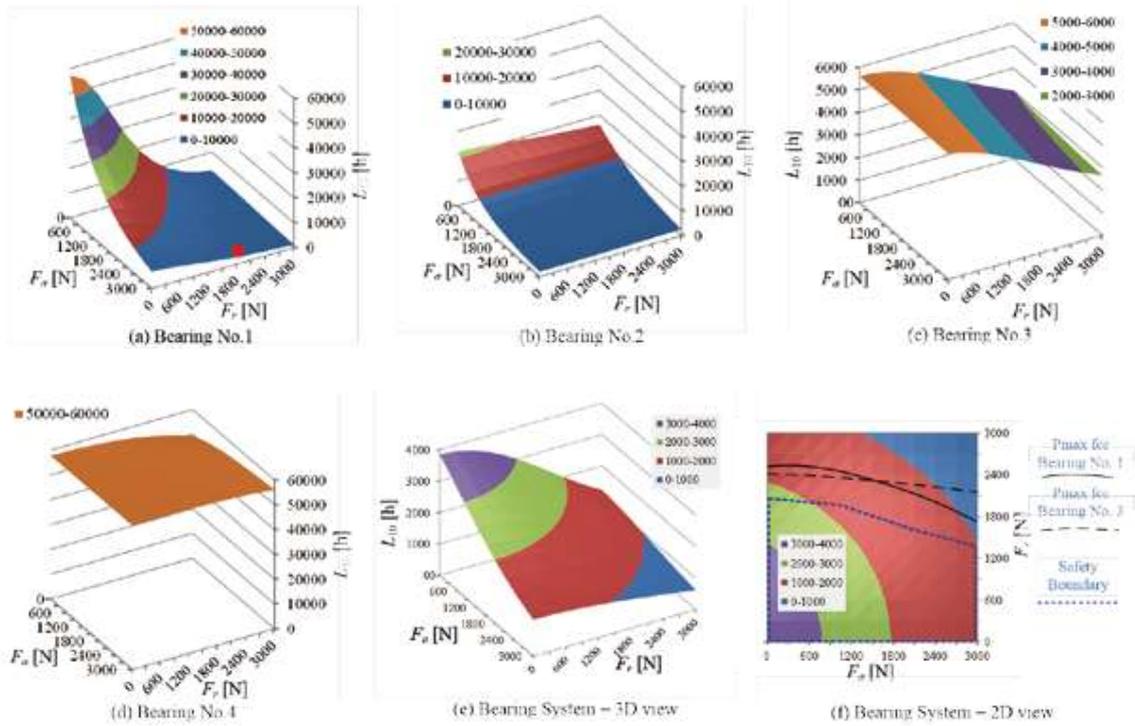


Fig. 8 Distribution diagram of life-time for each bearing

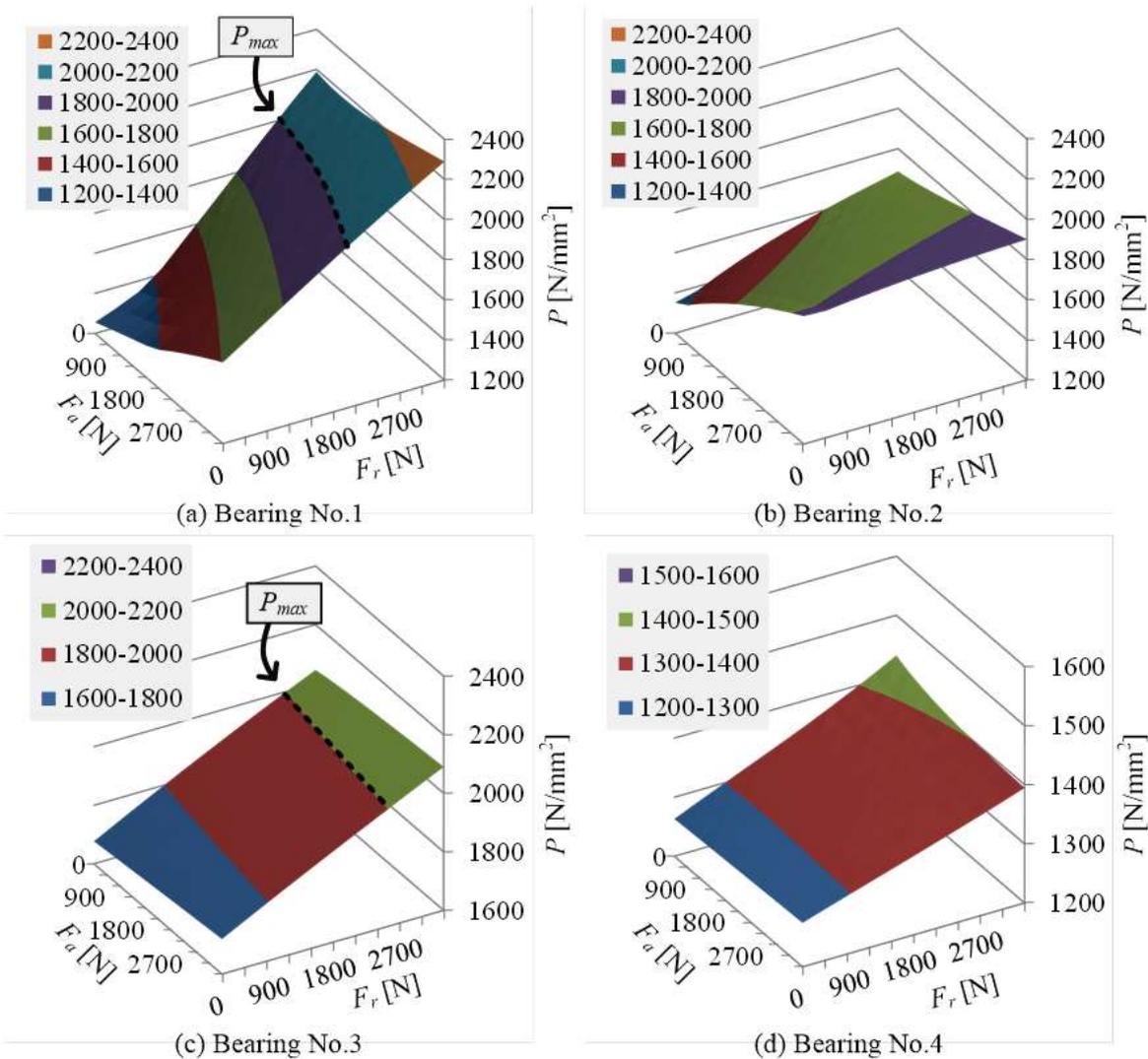


Fig. 9 Distribution diagram of bearing surface pressure

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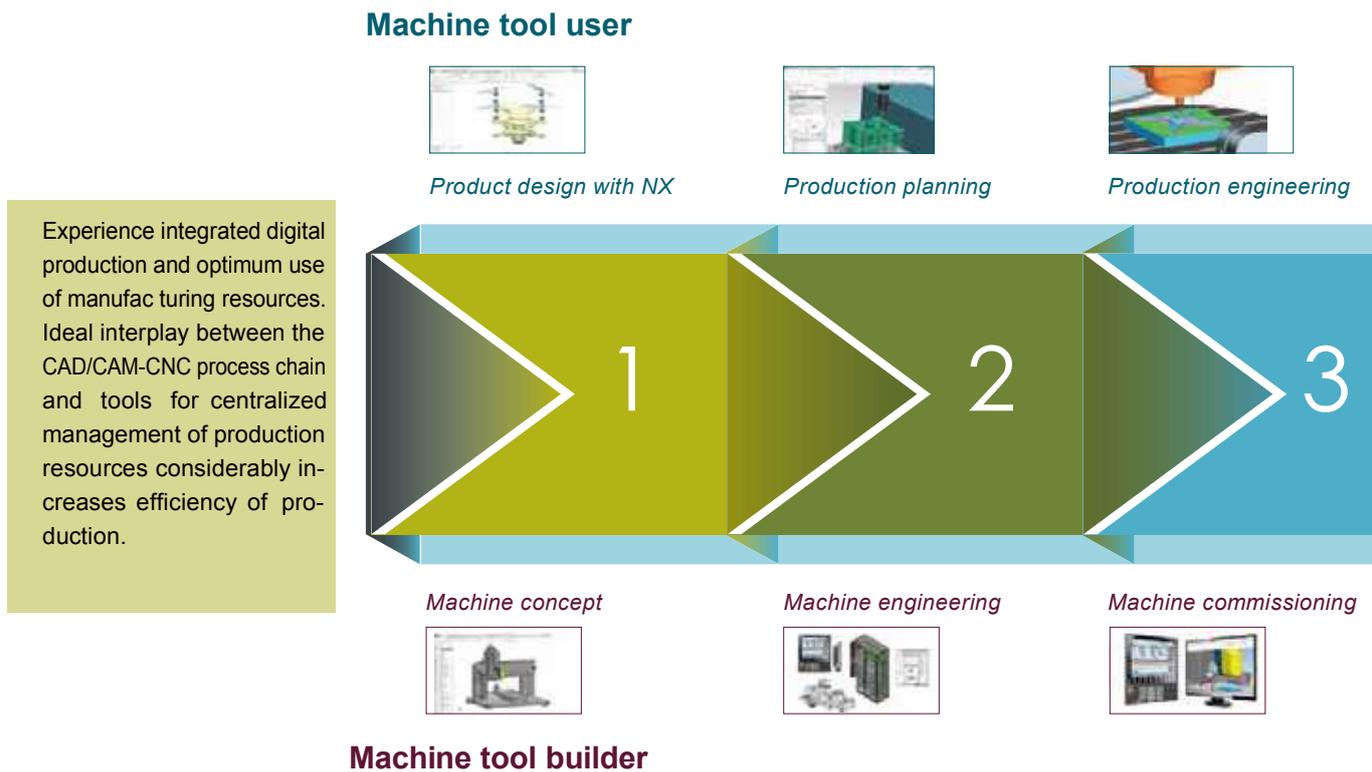
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Seamless connection of the virtual and real

Digitalization is changing all areas of companies — including both product development and production. Manufacturers are discovering completely new opportunities for meeting market requirements: Shorter product launch times are speeding up time-to-market, greater flexibility facilitating cost effective personalization of products, and more efficient production is helping to protect limited resources and the environment. However, digitalization is also increasing the quality of products — an aspect that is becoming increasingly important in decision making by customers. However, throughout all of this, the data security of production plants must also be ensured.

This requires transformation into a digital company, in which the entire value chain, from design to service, is looked at holistically.

With the Digital Enterprise Suite Siemens offers a comprehensive portfolio featuring integrated solutions from the machine tool all the way to the enterprise level. As a result, machine operators manufacturers benefit from a seamless connection between the virtual and the real world throughout the entire value chain.



value chain

Optimize your production: Siemens provides new HMI concepts for machine operators—for example new panels or personalized control consoles that can be configured to make them easier to operate. New milling and mold-making functions increase productivity. The new Sinumerik Edge platform for analyzing process data makes the machining process even more efficient.

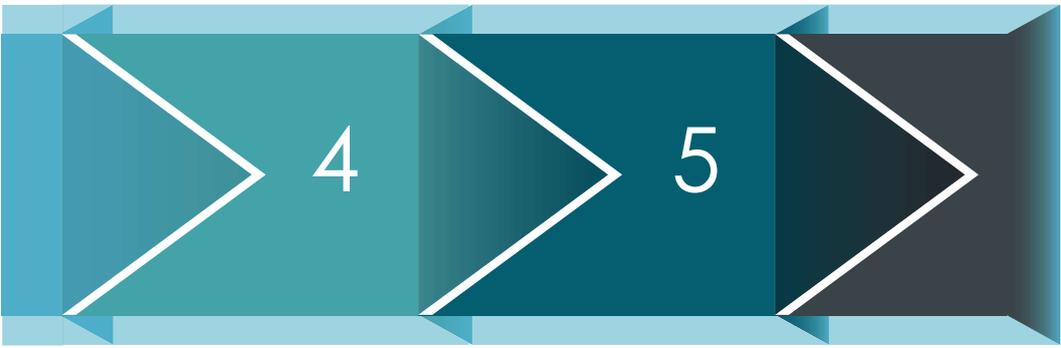
More transparency in the production process means more efficient production. The Manage MyMachines MindApp, which is connected to MindSphere, provides a convenient overview of the status of machine tools. During the digitalization of your production, Siemens also supports you with its usual Motion Control Services as well as repairs and spare parts supply.



Production execution



Services



Machine operation



Machine services



Machine tool builders can see for themselves that new multi-technologies such as additive manufacturing make completely new production options possible, and that the integration of robots into the production process increases machining efficiency.

MindSphere, the cloud-based, open IoT operating system, makes it possible for you to develop more effective service models. This means that you can use digitalization to tap into new areas of business.

Digitalization needs education
 Understanding of CAD/CAM CNC chains plays a key role in ensuring that the training of young people in machining-based occupations is future-proof. Be impressed by our training package, which prepares CNC specialists for the requirements of the future.

Transparent manufacturing

The Manage MyPrograms application ensures the integrated flow of data from production planning to manufacturing. This allows management of CNC program data throughout the factory



Components are designed in NX as part of the Siemens PLM Software solution



Servomotors are manufactured to meet specific requirements at the Bad Neustadt plant

Siemens manufactures around 600,000 servomotors in approximately 30,000 versions at its site in Bad Neustadt an der Saale, Germany. The production of so many different parts in a wide variety of batch sizes requires the highest degree of flexibility in closely interwoven processes. While facing production challenge, Siemens started to point out the solution. The Sinumerik Integrate platform provides applications for analyzing and managing data for networked plants including seamlessly integrating production development. Intelligent use of data relevant to production makes it possible to substantially improve technical and organizational processes as well as manufacture products more flexibly and efficiently.

Optimizing plant availability and maintenance

To increase the productivity of a plant, the production processes is needed to be transparent. Machine data such as capacity utilization, availability, performance, and quality can be reliably recorded using the Analyze MyPerformance application. Employees can use the captured data to increase plant availability and optimize the production schedule. Peter Zech, head of mechanical prefabrication and maintenance at the Siemens motor factory, explains: "Analyze MyPerformance allows us to visualize and analyze malfunctions or setup processes on machine tools. This allows us to identify and avoid factors that cause downtime, thus maximizing machine output." In this way, Analyze MyPerformance offers completely new approaches for optimizing maintenance and repair of machines.

By processing detailed status information, the Analyze MyCondition application forms the basis for more efficient

maintenance and continuous monitoring of quality-related machine parameters. Analyze MyCondition flags problematic machine values at an early stage, enabling efficient, automated remote service functions to be applied before a problem arises. Users are also free to specify the required variables themselves.

A seamless CAD/CAM-CNC process chain

The Siemens motor factory utilizes an integrated process chain consisting of NX CAD, NX CAM, and Sinumerik CNC to ensure its processes are efficient and fault-free from product development through to manufacturing.

The Manage MyPrograms application ensures the integrated flow of data from production planning to manufacturing. This enables programs and additional production information (such as drawings) from production planning to be easily downloaded to the machines. Changes made by the operator can be reassigned to production planning as well. "Manage MyPrograms allows us to visualize and manage our highly varied machine park and corresponding CNC programs — which helps us to keep track of things and ensure we only use approved programs," explains Zech, also adding that "using the integrated CAD/CAM-CNC chain based on NX and linking up production planning with manufacturing through Manage MyPrograms enables us to introduce product modifications or new products considerably more quickly than before." 

The article is reproduced from Siemens Motion World. The Challenger would like to acknowledge Siemens for the contribution of the materials.

Ross Sea- The World's Last Pristine Ocean



Ross Sea's geographical location Source: Wikipedia

Full of diverse array of mid-water and benthic species, the deep bay of the Southern Ocean in Antarctica - Ross Sea is named by the British explorer, James Ross, who discovered this ocean in 1841. Ross Sea is a famous scenic spot for the explorers attempt to reach the South Pole. Today the Ross Sea is one of the deepest affected areas on earth by the climate change. Ushuaia, Argentina, is one of the five gateways near to Antarctica, therefore there's another name for Ushuaia, Fin del Mundo (the End of World) which is only 800km from Antarctica. Ushuaia is regarded as the supply base before heading to the Ross Sea by most commercial ships and scientists. The 1.9 million square-mile Ross Sea is also called the "Last Ocean" for its large untouched area from human.

According to National Geographic, the Ross Sea has been a place of groundbreaking research to attract worldwide scientists to study the frozen sea and the unique animals who live below and above the ice for more than 150 years. Scientists need the long-period data of the Ross Sea to draw more accurate conclusions and better understanding about ecological change.



Ross Sea Christopher Michael/Flickr



Weddell Seals Christopher Michael/Flickr

Rich productivity of natural resources

The Ross Sea is the most productive area among the Southern Ocean and its richness relies on phytoplankton. Its plankton bloom, a biological event is immense which can be seen from the space when the weather condition is favorable. Phytoplankton can produce Released Dissolved Organic Carbon (RDOC) which is considered as the source of life. Another important role in the marine ecosystem is krill, means "whale food" in Norwegian, which is small semi-transparent crustacean. In Antarctica, whales, penguins and seals eat krill which feed on phytoplankton. Krill and plankton are extremely important organisms that maintain the life by making the initial links of food chain in aquatic habitats.

The Ross Sea encompasses less than 13% of the circumference of Antarctica, and just 3.3% of the area of the Southern Ocean. However, it provides habitat for significant populations of many animals, including Adélie penguins, Emperor penguins, Antarctic petrels, Antarctic minke whales, Orcas and Weddell Seals.

Name	Percentage of the world
Adélie penguins	32%
Emperor penguins	26%
Weddell Seals	50-72%
Antarctic petrels	more than 30%
Antarctic minke whales	6%
Orcas (killer whales)	more than 30%

Table 1. Animals who live around the Ross Sea Source: ASOC & New Zealand Foreign Affairs & Trade



Adélie penguins Eli Duke/Flickr

Endangered ecosystem in the Southern Ocean

The director, Peter Young, released the documentary "The Last Ocean" in 2012 to bring out a significant ethic question: "Due to our insatiable appetite for fish, do we fish the last ocean or do we protect it?" According to United Nations Food and Agriculture Organization, the estimation of about 89% of global wild fish stocks are either overfished or fully fished. The amazing fact is that ocean provides us with more than 80 million metric tons of fish every year. However, people did not notice the warning, the condition of heavy fishing and shipping has not changed much, and because the rising price of seafood and low cost of fuel, the commercial fishing started to aim the untouched ocean, such as Ross Sea.

Antarctic toothfish, also Chilean sea bass, is the main target of fishermen for three reasons. First, they live in the deep Antarctica sea where is no much pollution, then they don't have many thin fish bones for effortless eating, the delicious flavor would be the last reason. Therefore Antarctic toothfish is extremely expensive, sometimes they are referred as "White Gold" for their high value. The impressive commercial value makes the stock of Antarctic toothfish has been declined fast in recent decades. The illegal fishing is of course the biggest concern for Antarctic toothfish because its relative, Patagonian toothfish is nearly distinct since the massive, unleashed illegal fishing in 1970s.



Antarctic toothfish can up to 2 meters in length and weight 200 kg.
Source: Sea Creature Fact of the Week



Antarctic toothfish Source: Big Fishes of the World

The overfishing condition of Antarctic toothfish do not only impact the future of this specie, but also affect Orcas, Sperm whales, Weddell Seals and Colossal squid who eat them for living. As mentioned in previous paragraph, large percentage of Weddell Seals and Orcas live in the Ross Sea, and the entire specie might be distinct if the overfishing of Antarctic toothfish is beyond control. It's no doubt that, the distinction of toothfish will be followed by declination of significant animals in Antarctica.

Commercial fishing's another target is krill for its high biomass. Antarctic krill is most used to feed for farmed fish and omega-3 nutritional supplements for human. Most krill are found from Weddell Sea to the water around Antarctic Peninsula in where 70%-80% of the population of adult krill have been declined from last four decades. The improvement of fishing techniques, processing technologies and nutritional value of krill have renewed commercial interest in the fishery, and unfortunately, krill population seem to be in long-time decline with the increased interest. The worse is, according to Antarctic and Southern Ocean Coalition, the fishery is often concentrated in the areas where there are many marine animals feed on krill. Penguins, seals and whales are directly being threaten by the declination of krill in the Southern Ocean. More than that, scientists believe that the declined population of krill, the climate change and the Sea Ice melting are well connected in the ecosystem of Antarctica. "Domino effect" is the term that scientists use to describe the situation because these marine animals are forced to share their food, krill with human, especially when the amount of krill fishery is devastating. The food shortage leads a direct impact on Adélie penguins and Chinstrap penguins whose population has declined up to 50% since the mid-1980s.



Antarctic Krill Source: Cool Antarctica

Legal Strategies for the Ross Sea

The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) was established by International Convention in 1982 with the objective of conserving Antarctic marine life. The main purpose of this organization is to deal with the increasing commercial interest in Antarctic krill and the continuous condition of over-exploitation of several marine resources in the Southern Ocean. Except CCAMLR, UN Environment Programme, World Wildlife Fund, Antarctic and Southern Ocean Coalition and other environmental organizations have proposed the protection of the Southern Ocean, including the Ross Sea for decades. New Zealand and the United States proposed that the Ross Sea should be the Marine Protected Area (MPA) in 2012.

China and Russia had held disagreement with the Ross Sea protection for commercial fishing and seabed mining. After China withdrew the disagreement for the Ross Sea in 2015, Russia was the only country who held different opinion from other members. However, in 2016 the Russian President, Vladimir Putin announced that 2017 would be the year of ecology and was going to organize more than 600 events across all regions of Russia to support the ecological and biological diversity. Russia's late support makes the Ross Sea turning to a new milestone. In the end of October 2016, CCAMLR passed the Ross Sea as the new MPA with the agreement of 24 countries.

World's largest marine reserved

This agreement will into force on 1 December 2017 and the Ross Sea could be considered as the largest marine protected area in the world for 598,000 square-mile, around 72% is fully

protected. This marine reserve is described as the size of France, Spain and Germany combined. It will be forbidden to conduct any commercial activities here, including fishing to protect the ecosystem. Unfortunately, this agreement will be aspired in 2052. Chris Johnson, WWF Australia Ocean Science Manager brings out his concern, "According to the World Conservation Union (IUCN) guidelines, marine protected areas must be permanent. WWF has concerns that the Ross Sea agreement does not meet this standard." he said. The other concern is that scientists and environmentalists fear that the Ross Sea might be the precedent of MPA which means the legal protection won't be permanent. Most countries prefer the Ross Sea will be the marine protected area forever, but Russia was disagreed for concerning the impact on its commercial fishing, therefore 35-year is the compromised result. However, it's pleased that people made the first step to protect the Ross Sea., The protection of the Ross Sea to be permanent is the future goal to fight for, especially when CCAMLR has proposed further nine marine protected areas (MPAs) to discuss.

Antarctica, the Southern Ocean, the Ross Sea seem very far from us, but they are closely related to our lives. Every choice that human make will affect their lives and habitats. Every bite of Antarctic toothfish not only leads to its distinction, but also make others starve because of greedy and selfish humans' behavior. The ethical questions should be transformed into ethical actions, decreased and controlled strictly the commercial activities in Antarctica to protect the mother natural. ♡

Reference:

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High-Precision Free-Form Surfaces

The 3D-ToolComp option of HEIDENHAIN controls compensates for deviations from an ideal circular shape on radius milling cutters. Together with the probing cycle 444 of the TNC controls, however, it also improves the accuracy of a touch probe during use. Both features ensure high-accuracy free-form surfaces.

Process reliability thanks to 3D-ToolComp: A tool change does not result in unexpected surface changes



In spite of state-of-the-art accuracy in tool manufacturing methods, spherical cutters in particular do not have uniform geometry, and the radius of each tool usually deviates individually from the ideal circular interpolation. The effective sphere radius of a radius cutter deviates from the ideal form owing to the production process. The maximum form inaccuracy is defined by the machine tool builder. Common deviations lie between 0.005 mm and 0.01 mm. This is a problem for high-accuracy machining. The contact point of the milling radius with the workpiece as calculated by the control does not match the actual radius, and this is the case with each individual milling cutter.

The same applies to the use of workpiece touch probes. Each device has its individual switching behavior. Depending on the touch probe used and the length of the stylus, it causes error in the range of up to one hundredth of a millimeter. The measuring error might then be correspondingly large if you measure without prior calibration.

Machining with real cutter radii

The 3D-ToolComp option enables HEIDENHAIN TNC controls to perform powerful, three-dimensional tool radius compensation. A compensation-value table is used to define angle-dependent delta values that describe the tool deviation from the ideal circular form. The TNC then corrects the radius value defined for the tool's current point of contact with the workpiece. In order to determine the point of contact exactly, the NC program must have been created with surface-normal blocks (LN blocks) by a CAM system. In addition to the position of the tool tip, the vector sets include a vector that points from the point of contact on the workpiece to the center point of the radius cutter, the so-called surface normal. Moreover, such vector sets can also define the orientation of the tool relative to the workpiece.

The TNC-controlled machine tool compensates the tool error automatically. Also, the shape of the tool is measured using a laser system and a special cycle. The TNC control can use this data directly and document it in a compensation table. The user does not have to enter the tool compensation again in the NC program. The TNC control handles the variable influences automatically via tool form errors, and thus fulfills an important factor for reliable machining processes. However, shape deviations of the tool used can also be manually entered into the compensation value table from a measurement log made available by the tool manufacturer.

Compensating switching-characteristic deviations of workpiece touch probes

If free-form surfaces have to be measured with high accuracy after processing, then the workpiece touch probe used should be calibrated three-dimensionally. In this way, deviations of the switching behavior in any direction can be compensated. To begin, 3D-ToolComp uses a calibration ball to perform a 3-D calibration of the workpiece touch probe. Here 3D-ToolComp automatically generates a compensation value table in which the deviations of the switching characteristics are recorded.

If the 3-D calibrated workpiece touch probe is then used together with the probing cycle 444 for measuring a machined free-form surface, the control takes account of the compensation values that are stored. The surface is measured with high accuracy. The user can also define the tolerance values himself, which the probe cycle 444 uses directly to analyze the finished quality. In addition, the measured results, for example for an individual automation process, can be evaluated in the NC program. This is useful, for example, for recognizing surface quality deviations that occur during machining through tool wear, programming errors or deflection.

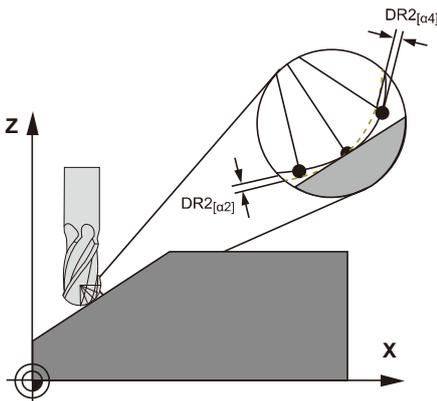


Precondition for high-accuracy measurement of free-form surfaces: the calibration of a workpiece touch probe with 3D-Tool Comp and Cycle 444

Requirement

The form inaccuracy can be saved in the form of a compensation value table. This table contains angle values and the deviation from the nominal radius R2 measured on the respective angle value. The 3D-ToolComp software option (option 92) enables the control to compensate the value defined in the compensation value table depending on the actual contact point of the tool, if the NC program was created with surface normal vectors (LN blocks). Software option 9, Advanced Function Set 2, is additionally required for this purpose.

3-D calibration of the TS touch probe can also be carried out with the 3D-ToolComp software option. During this process, the probe characteristics determined during touch probe calibration on a sphere are saved to the compensation value table. The column DR2TAB of the tool table then references this table. The compensation values are then taken into account for calculating the contact point when using touch probe cycle 444. To be able to use the software option 3D-ToolComp (option 92) the control requires the following preconditions:



High-precision machining with radius and toroidal milling tools: 3D-ToolComp compensates radius deviations from the ideal circular shape

- Option 9 is enabled
- Option 92 is enabled
- The DR2TABLE column in the TOOL.T tool table is enabled
- The name of the compensation value table (without its extension) is entered in the DR2TABLE column for the tool to be compensated

- 0 is entered in the DR2 column
 - NC program with surface normal vectors (LN blocks)
- The compensation value table contains three columns:
- NR: Consecutive line number
 - ANGLE: Measured angle in degrees
 - DR2: Radius deviation from the nominal value

The control evaluates a maximum of 100 lines in the compensation value table.

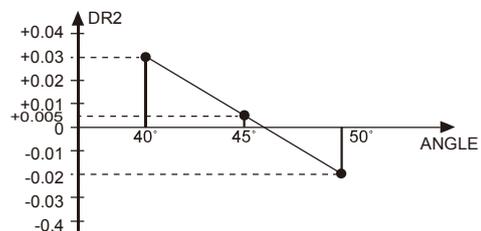
The software option 3D-ToolComp (option 92) only functions with NC programs containing surface normal vectors. Pay attention when creating the CAM program how you measure the tools:

- NC program output at the south pole of the sphere requires tools measured on the tool tip
- NC program output at the center of the sphere requires tools measured on the tool center

Function

If you are executing a program with surface normal vectors and assigned a compensation value table (DR2TABLE column) to the active tool in the tool table (TOOL.T), the TNC uses the values from the compensation value table instead of the compensation value DR2 from TOOL.T.

In doing so, the control takes the compensation value from the compensation value table defined for the current contact point of the tool with workpiece into account. If the contact point is between two compensation points, the control interpolates the compensation value linearly between the two closest angles. The control generates an error message if it cannot determine a compensation value through interpolation. The TNC uses either DR2 from TOOL.T or a compensation value from the compensation value table. If required, you can define additional offsets, such as a surface oversize, via DR2 in the TOOL CALL block.



Angle value	Compensation value
40°	0.03 mm (measured)
50°	-0.02 mm (measured)
45° (contact point)	+0.005 mm (interpolated)

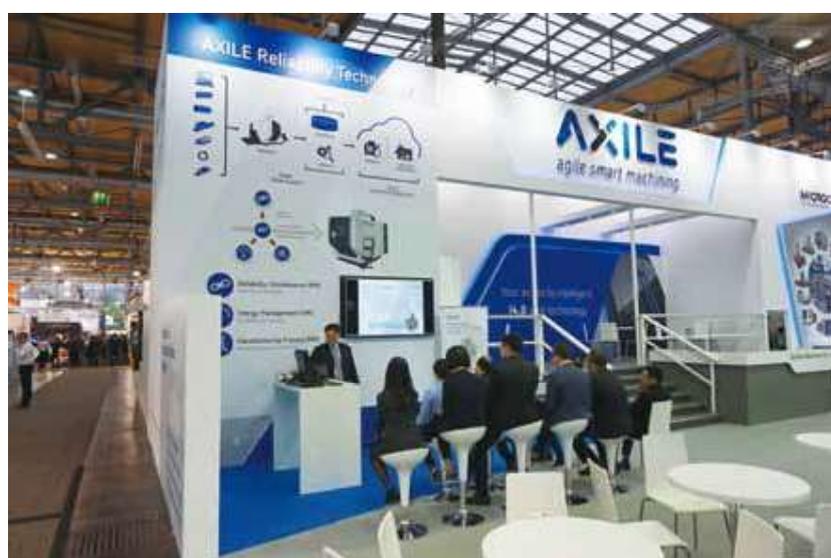
The Challenger would like to acknowledge HEIDENHAIN for the contribution of article and photos.

AXILE Stood out in the EMO Hannover 2017

Buffalo Machinery is very pleased to announce that EMO Hannover 2017 for Buffalo has been rounded out successfully, especially for the launch of AXILE machines and Industrie 4.0 applications. Buffalo's technology team has endeavored in developing the solutions for the Industrie 4.0 and working on the AXILE machines with very optimistic outcome. Buffalo Machinery not only showcased the AXILE and MICROCUT machines but also demonstrated the newly developed AXILE Reliability Technology (ART) along with Smart Machining Technology (SMT) which fully adapt to Industrie 4.0 prerequisite.

Desirable showcases at the fairground

AXILE as the representative of primum 3-axis and 5-axis high speed machining centers, at EMO Hannover, Buffalo Machinery displayed complete range of AXILE machines. AXILE G8 and G6 are the simultaneous gantry type 5-axis machines with different table size and loading capacity to meet the most industries' demands. G8 model is equipped with 800mm table size, 1300kg table loading and the table platen is prepared with three hydraulic ports and one pneumatic port for fixture and easy workpiece loading and unloading, while the G6 model is equipped with smaller table size of 600mm with 600kg loading capacity. Both are incorporate with Kessler new *V line* built-in spindle of 20,000rpm or 15,000rpm as option. The *V line* is equipped with "Quick Connect Cartridge (QCC)" which allows in case of regular service is required, the quick changing of the cartridge without removing the spindle. The flexible capacities of tool management for both machines are for every application and easy maintenance. The G8 is incorporate with single or twin carousel magazines of from 32 up to 120 tools capacity, and G6 is incorporate with travel arm type magazine of from 60 or 120 tools capacity. G8 model is equipped with Industrie 4.0 technology to in-time monitor the machine for predictive maintenance and to ensure the machine reliability while G6 is prepared for 24/7 unmanned operation with flexible automation from back side of machine.



Demonstration of AXILE Reliability Technology (ART) and Smart Machining Technology (SMT) in EMO2017

Industrie 4.0 product and service provider

As the high-end machine manufacturer and in response to the technology trends, Buffalo successfully developed a series of innovative technology to conform to the Industrie 4.0 requirement, the AXILE Reliability Technology (ART) provides the solution to Industrie 4.0 which confirms the machine reliability and lifetime prediction to help ensure the smooth production arrangement, on-time delivery, personnel management and effective cost control. All the benefits achieve better factory management and efficient production.

ART completes the diagnosis and analysis of machine to a higher reliable machine to make customer satisfied. ART facilitates the production planning and management, the in-time maintenance system avoids machine downtime to attain higher productivity.



AXILE G5 and G8

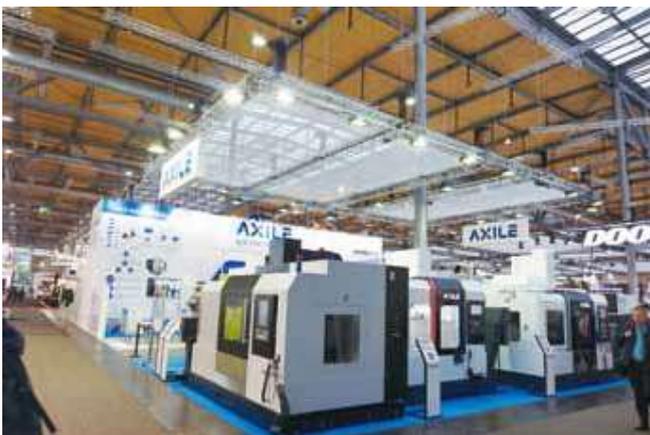
The high-end high-speed machines of AXILE V5 and V6 were also displayed at the show. There are 4 machines in the AXILE V series, X travel from 600mm up to 1200mm. AXILE V series is equipped with 12,000rpm in line spindle as standard and 15,000rpm up to 24,000rpm built-in spindle as option. The Kessler V Line built-in spindle is also available for V6 and V7 model. All AXILE V series are incorporate with patented Smart Machining Technology (SMT) with automatic supervision and precision compensation for better machining accuracy, energy saving and cost efficiency.



MIROCUT linear guideway RAM type spindle RAM-140RL and vertical machining center M1200



MIROCUT slant-bed heavy duty CNC Lathe 117HT



MIROCUT M1200

MIROCUT's most popular model M series had brought out a lot of inquiries at the EMO show. X travel of M series is from 760mm up to 1600mm for selection, and various spindles are available to suit most jobs demands, customer can choose from 10,000rpm belt type spindle, 12,000rpm or 15,000rpm in-line spindle. The standard machine of M series has equipped with most of the necessary accessories, such as wash down, chip conveyor, arm type ATC of 24 or 30 tools, and

heat exchanger, etc., therefore the user no need to spend more on accessories. The showcased self-developed MICROCUT 140-RL ram type spindle is incorporate with 140mm bore capacity with extendable ram and quill up to 1.5m, also the Straightness Compensation Technology (SCT) is applied to ensure the linearity machining. The favorable to the oil industry, heavy duty cutting slant bed lathe MICROCUT 117HT was also showcased at this EMO show.

Optimistic outcome



Discussions at AXILE booth

There were more than 2200 exhibitors participated in the EMO Hannover 2017 with approx. 260,000 visitors. Around 200 visitors including 80 new potential dealers and users attended Buffalo's booth with positive feedbacks of machines and technologies. AXILE machines and technology attracted many attentions. Meanwhile, AXILE G8 is featured in the Technical Press Information section of official EMO website, honorably, it has been selected and specially reported on the EMO Hannover 2017 – TRENDSPOTS, an official press release of EMO Hannover. Please scan the following QR code to further reading of the reports. [🔗](#)

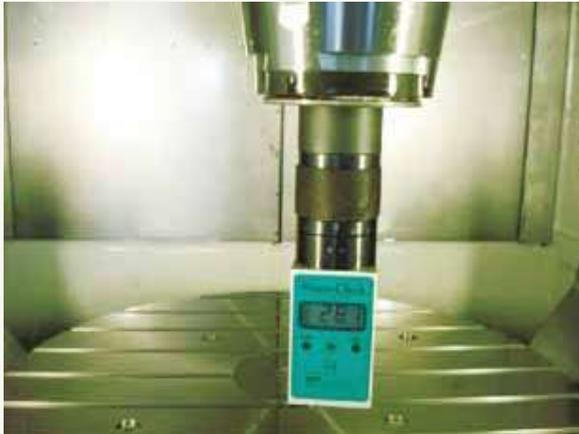
Smart 5-axis machine for high-end applications



Solutions for the intelligent machine – predictive maintenance

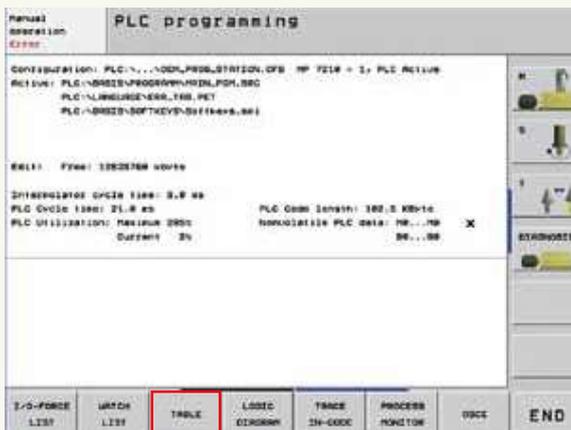


HEIDENHAIN control - Measure and check the analog output voltage of built-in spindle

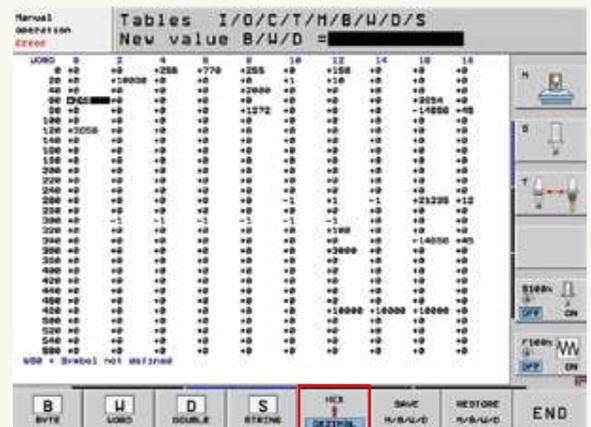
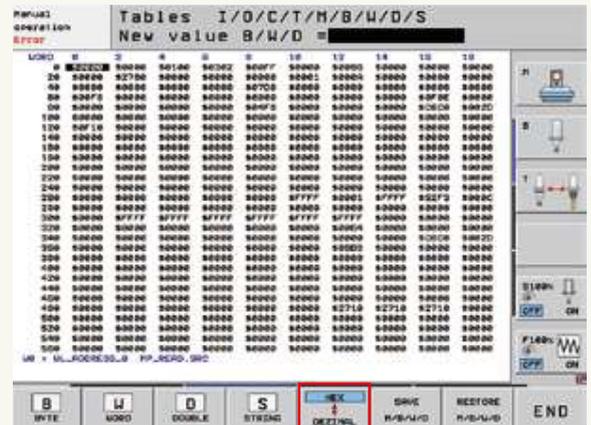


Please use OTT Power Check to measure for spindle and follow the steps below:

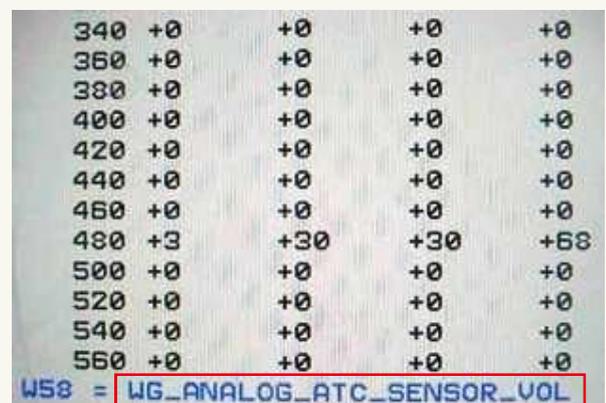
1. In Manual Mode, press program edit key.
2. Press **MOD** MOD key
3. Entering code number 807667 (PLC programming)
4. Press key to select page
5. Press “TABLE” soft key



6. Press the HEX ↔ DECIMAL soft key allows you to change the number representation.



7. Search for WG_ANALOG_ATC_SENSOR_VOL to check the ANALOG voltage value.



Check ejection path (E.M.)

8. Check ANALOG voltage value

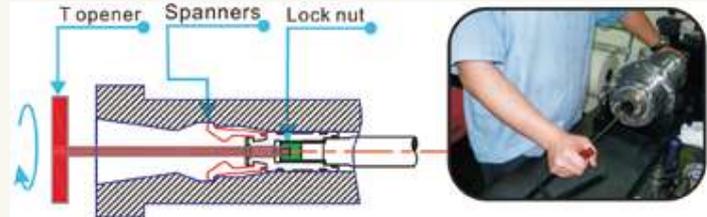
MP	Value
0	+0
20	+0
40	+0
60	+241
80	+17
100	+0
120	+0
140	+0
160	+0
180	+0
200	+0
220	+0
240	+0
260	+0
280	+0
300	-1
320	+0
340	+0
360	+0
380	+0
400	+0
420	+0
440	+0
460	+0
480	+0
500	+0
520	+0
540	+0
560	+0

MP	Value
16	+0
13	+24
23	+0
49	+1
0	+0
0	+0
0	+0
0	+0
0	+0
0	+0

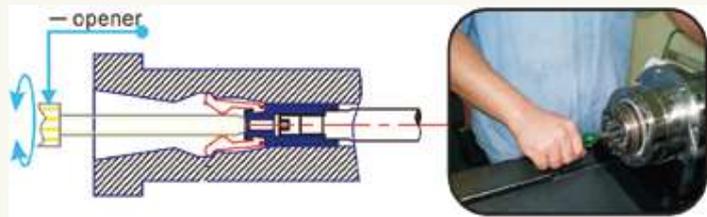
9. Enter the analog voltage value into the parameter list:

- MP 4210.12 : +148 -Spindle clamped without tool
- MP 4210.13 : +388 -Spindle clamped max. voltage (clamp with tool max)
- MP 4210.14 : +239 -Spindle clamped min. voltage (clamp with tool min)
- MP 4210.15 : +916 -Spindle unclamping

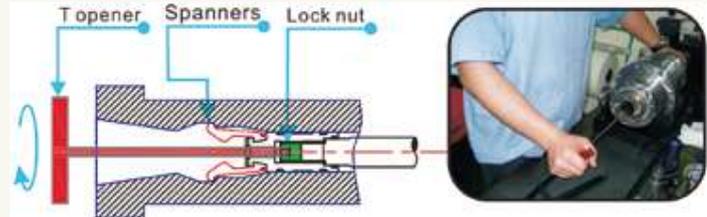
1. Turn counterclockwise to loosen through a clamped



2. Use an opener to adjust gauge dimension E.M in unclamped position



3. Turn clockwise to tighten the lock nut



Life of Lacquer Art Taiwan Living National Treasure, Master Wang Ching-Shuang



Profile

Master Wang Ching-Shuang was born in Shengang District, Taichung in 1922, and started to study lacquer art at professional high school of craft when he was 16. He studied lacquer art in Tokyo Fine Arts School by recommendation for his great performance. In 1952, Mr. Yen Shui-Long, the famous painter and researcher of craft admired Master Wang's abundant experiences of lacquer craft, so strongly invited him to join handcraft workshop of Nantou County Government to inspire the new generation and develop the craft industry.

Master Wang Ching-Shuang has won several prizes by his outstanding performances in lacquer art. In 2010 he has been honored as the Preserver of National Traditional Heritage of Art and Craft and being titled as Living National Treasure. His latest personal exhibition was taken place in Taichung City Dadun Cultural Center in September 2017 where displayed his famous lacquer artworks and the latest lacquer painting Plum Blossom in Tong-Lin that was just finished in August 2017. Below is the list of honors of Master Wang.



Master Wang is drawing

- 1997 Special Prize of Beauty Lacquer of Japan Meiji Jingu
- 1999 Folk Craft Award of 7th Worldwide Chinese Cultural and Artistic Heritage Award
- 2007 1st National Crafts Achievement Awards
- 2009 Preserver of Traditional Lacquer Craft of Nantou County
- 2010 Preserver of National Traditional Heritage of Art and Craft (Living National Treasure)
- 2014 3rd National Cultural Heritage Preservation Award
- 2016 Order of Brilliant Star with Grand Cordon

Devoted life in lacquer craft without hesitation

In 2010, National Taiwan Craft Research Institute(NTCRI) published Wang Ching-Shuang's biography and his lacquer art portfolio with the title of "Devoted life in lacquer craft without hesitation" which perfectly described Master Wang's life in lacquer art. When Master Wang was in Japan in his adolescence and early twenties, he learned lacquer art from some of the prestigious artists, Mr. Wada Sanzou and the national treasure of Japanese lacquer craft, Master Kawamen Tozan, he also learned painting and engraving from Mr. Kumada Koufuu and Mr. Kuroiwa Tansai. Master Wang came back to Taiwan in 1944, after four years of learning and practicing lacquer craft and arts in Japan.



Master Wang's latest artwork in 2017- Plum Blossom in Tong-Lin



Wang Ching-Shuang's masterpiece of Makie, Mountain Jade

The delicate details of Master Wang's paintings are overwhelming, especially the details brushwork of animals and plants are brilliant and vivid. Master Wang's observation takes important place in his creation, he observes the objects repeatedly before drafting, moreover, he always notices the minor changes through his sketching and photographs. Taking the master piece of 'Mountain Jade' as an example, Master Wang went to Tataka mountain area several times to observe the changes of mountains thought he was in his eighties. Due to his effort and persistence, the ridgelines of 'Mountain Jade' are so magnificent which showing his master techniques in Makie (the term of a Japanese lacquer technique of using gold or silver powder as decoration on the artwork). For the purpose to create a perfect artwork, Master Wang has brought Epiphyllum back home to observe its blossom condition in the middle of night repeatedly. The earliest sketching of 'Beauty Under Moonlight' was in 1998 and the latest one was in 2016.

The sophisticated lacquer process techniques are massive which taking long time to develop a good lacquer production, for example, for only the process of lacquer bodiless ware will take 6 months to complete, and follow with several processes of drawing, engraving, embossing, covering, installing, sculpting, polishing, filling, grinding to conclude a good lacquer product. Eggshells and seashells are often to be used in lacquer craft. Eggshell would be crashed into tiny pieces then be used as white color to decorate the flower, crane or house.



Master Wang sketches while takes a walk in Caotun.

The density of eggshells creates different aspects on lacquer painting, for example, Master Wang uses this feature to demonstrate the Chinese ancient architecture of Ching Dynasty in his painting, 'Historical Hong Village'.

Many materials and equipment have to be self-made in order to show the unique artistic lacquer art. Master Wang made his own Makie pen, gold powder and powder container made by reed. He filed the golden block for having coarse particle dill gold powder to emphasize the great-

ness of 'Mountain Jade'. The magnificent Makie masterpiece, 'Mountain Jade' was made with layers of covering, embossing, polishing, filling and grinding.



5 meters lacquer painting of Wang Ching-Shuang-Becoming One with Heaven

Master Wang created a 5-meter long lacquer painting, 'Becoming One with Heaven' for NTCRI's "50th Anniversary of Taiwan Art and Craft industry" in 1995. In this painting, from left to right symbolizes past, present and future, and the phoenix risen from ashes in the middle is the symbolic of reborn life which was recreated separately after the crucial 921 earthquake in 1999. At that time, Taiwan faced the largest natural disaster after WW2, the 921 earthquake caused 2,415 deaths, 29 missing and 11,305 casualties and around 100,000 collapsed houses. Master Wang's family lives in Caotun, Nantou County, which locates in central Taiwan and near to the epicenter of this severe earthquake. In commemoration of this natural disaster, Master Wang remade a small lacquer painting of reborn phoenix from his artwork "Becoming One with Heaven" to encourage Taiwanese to look forward to the future.

Artistic Value of Master Wang's Work



Former president Ma Ying-Jeou honored Wang Ching-Shuang the Order of Brilliant Star with Grand Cordon



Former vice president Wu Dun-Yi honored Master Wang as Living National Treasure for Preserver of National Traditional Heritage of Art and Craft

Inheritance

Under the artistic influence of Master Wang, his 2 sons, Mr. Wang Hsien-Ming and Mr. Wang Hsien-Chih also have the expertise in lacquer art. They started to work in Lacquer Art industry after graduating from university. Mr. Wang Hsien-Ming is acknowledged by Ministry of Culture as the preserver of traditional lacquer art technique of Chinkin (A special lacquer technique by carving line or spot on the lacquer artwork then fill in with liquid of gold as decoration.), and Mr. Wang Hsien-Chih is also acknowledged as the preserver of traditional lacquer art technique of Makie. Both conduct exhibitions and participate in the teaching programs of government to have more people appreciate the beauty of lacquer art.



Wang Hsien-Ming -Colorful



Wang Hsien-Chih- Peacock

The third generation, Master Wang's grandson, Wang Chun-Wei has also devoted in lacquer art as career. He is the luckiest person in the lacquer industry because of the 3 top experts in the field as his mentors. His passion for the lacquer art can be seen from his innovation of material and production. Natural resin has been used only for lacquer artwork because of the crucial demanding of humidity and temperature as well as the sophisticated lacquer process techniques and time-consuming production. Therefore, Chun-Wei decided to use cashew lacquer for lacquerwares as alternative because it can be dried within one day and it's cheaper than natural resin which made cashew lacquerwares are more competitive in the market. The grandson, Chun-Wei's goal is to make the lacquer products to be popular again, and he would like to regain the lacquer art to our daily life. Mei-Yan Lacquer Company, the Wang family owned business, under Chun-Wei's management has already cooperated with local enterprises to promote the lacquer products and also has been invited by Taichung government to design and produce lacquer souvenirs for foreign visitors as well as for the 2018 Taichung World Flora Exposition. The techniques of Lacquer art are precious which need to be well attended and preserved. Thanks to the Wang family for their great contribution and efforts which allow Taiwanese community and global market to be able to appreciate and enjoy the

lacquer art nowa days. The responsibility of traditional heritage shouldn't on the minors' shoulders, so it's never too late to cherish the beauty of traditional craft then pass it down to the young generation, like the Wangs. 🌊



The three generations (from left to right Mr. Wang Hsien-Ming, Master Wang Ching-Shuang, Mr. Wang Hsien-Chih and Mr. Wang Chun-Wei)

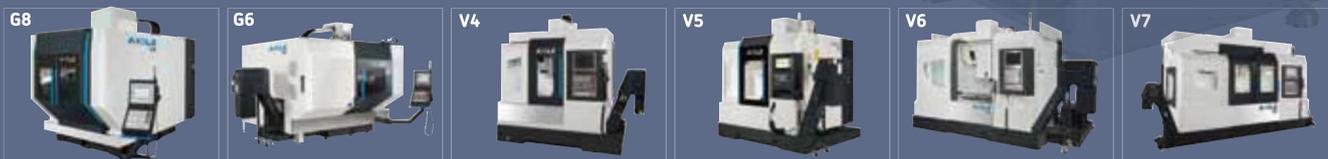
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Exhibition Calendar

2018

Month	Period	Title of Exhibition / City, Country	Distribution Company
March	13-15	Advanced Factories/ Barcelona, Spain	DIMASOL
	20-23	Tecnishow / Utrecht, Netherlands	De Ridder
	21-24	MECSPE / Parma, Italy	Tecnor, Vimar, GMV
April	3-7	SIMTOS / Gyeonggi-do, Korea	GMT
	9-13	MACH/ Birmingham, UK	Ward, XYZ
	25-28	MYMEX Malaysia 2018 / Selangor, Malaysia	CK
May	1-3	EMEX 2018/ Auckland, New Zealand	Total Machine
	14-18	2018 Metalloobrabotka / Moscow, Russia	BPK
	15-18	Industry Days / Budapest, Hungary	Optimum
	15-18	ELMIA / Jonköping, Sweden	Ahlsell Maskin
May to June	28-01	Spanish Machine Tool Biennial / Barakaldo, Spain	DIMASOL
September	26-27	MetalMadrid / Madrid, Spain	DIMASOL
November	21-24	EMAF 2018/ Porto, Portugal	Mater



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X travel: 2,000/3,000mm(RT); 3,500(RTL)
Spindle speed: 8000rpm
Spindle motor output: 38 / 57kW

Twin-Spindle & Single Turret Slant-Bed Lathe
LD-65



X: 215(200+15)mm Spindle speed:
Y: 100(±50)mm Primary : 4000rpm
Z: 520/1,020mm Second: 5000rpm
Z2: 520/1,020mm

Heavy Duty Horizontal Machining Center
HM-6300



Table size:630x630mm
Max.table load: 1,200kgx2
Travel: X:1,050mm/Y: 950mm/Z:950mm
ATC Tool storage capacity: 40(std);60/90

Floor Type Milling & Boring Machine

HBM-RF Series

Travel: X: 8,000~16,000mm
Y: 3,200mm / 4,500mm
Z+W: 800+700mm / 1,200+1,000mm
Quill Dia.: 140mm, 160mm, 180mm

Gantry Type 5-Axis Simultaneous
Machining Center

MCU-5X



Rotary table top diameter: 600mm
Max. table load: 600kg
Travel: X:600mm/Y:600mm/Z:500mm

Slant-Bed Heavy-Duty CNC Lathe

117HT



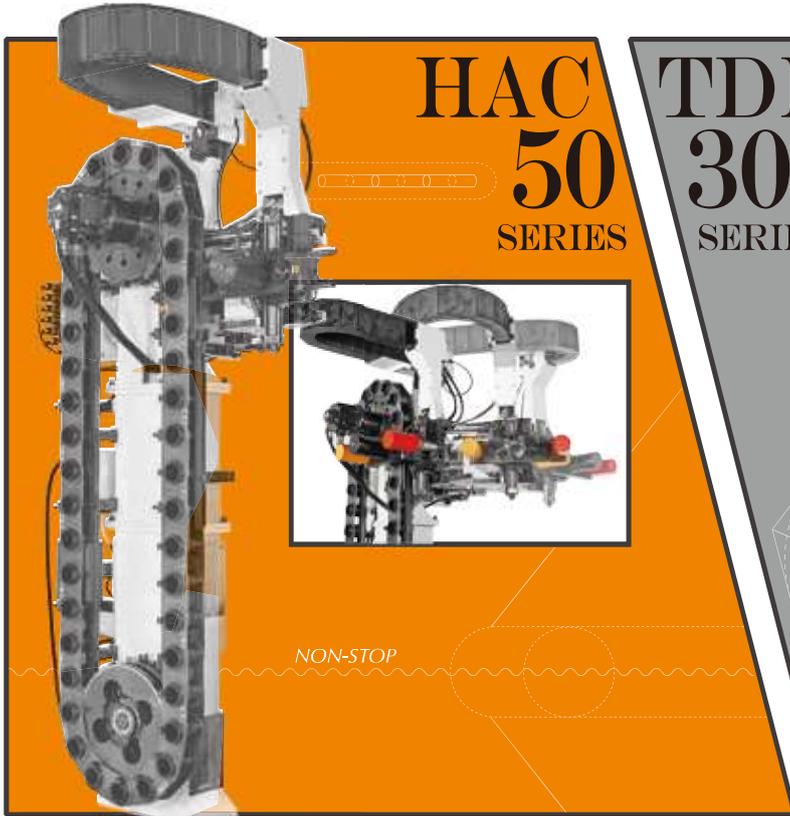
X travel: 385mm
Z travel: 1,500mm~4,000mm
Y travel(opt): ± 50mm
Bar capacity: 117mm



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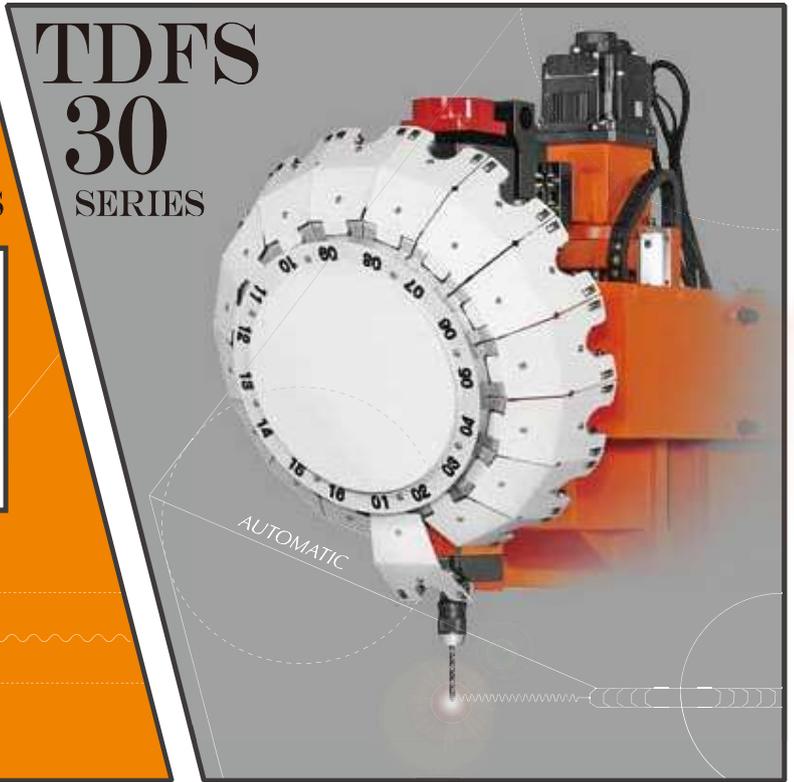
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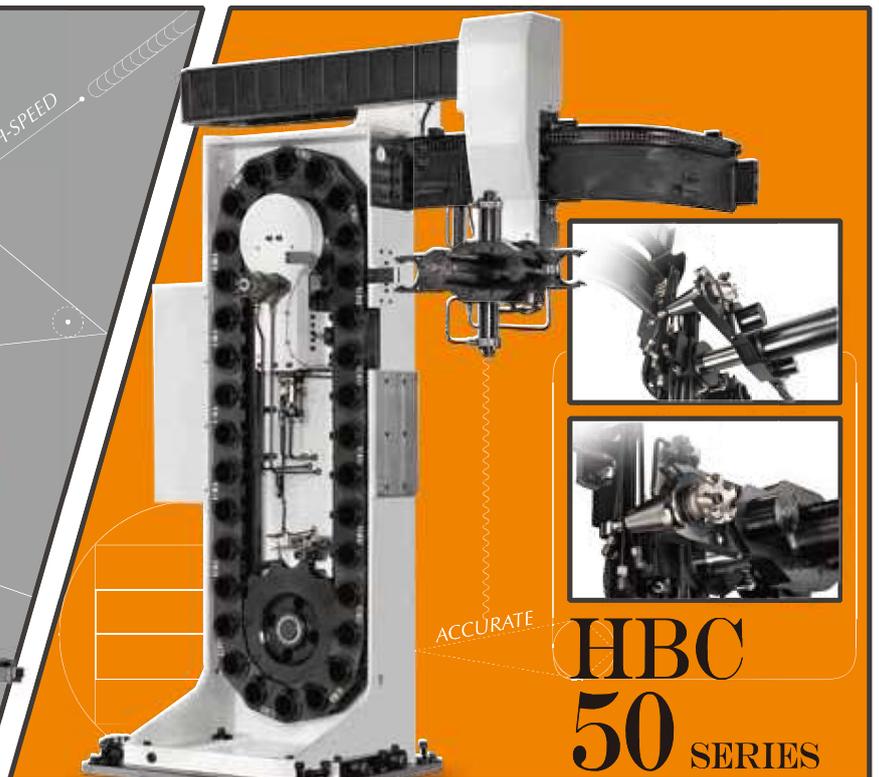
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SERIES**

AUTOMATIC



**SDK
30.40
SERIES**

HIGH-SPEED



**HBC
50
SERIES**

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