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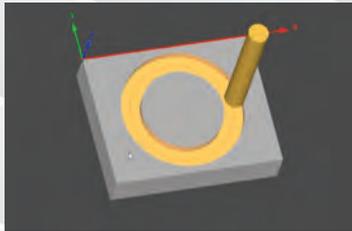
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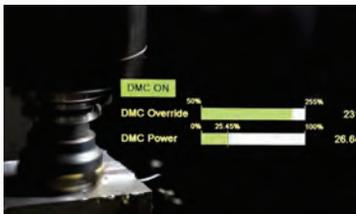
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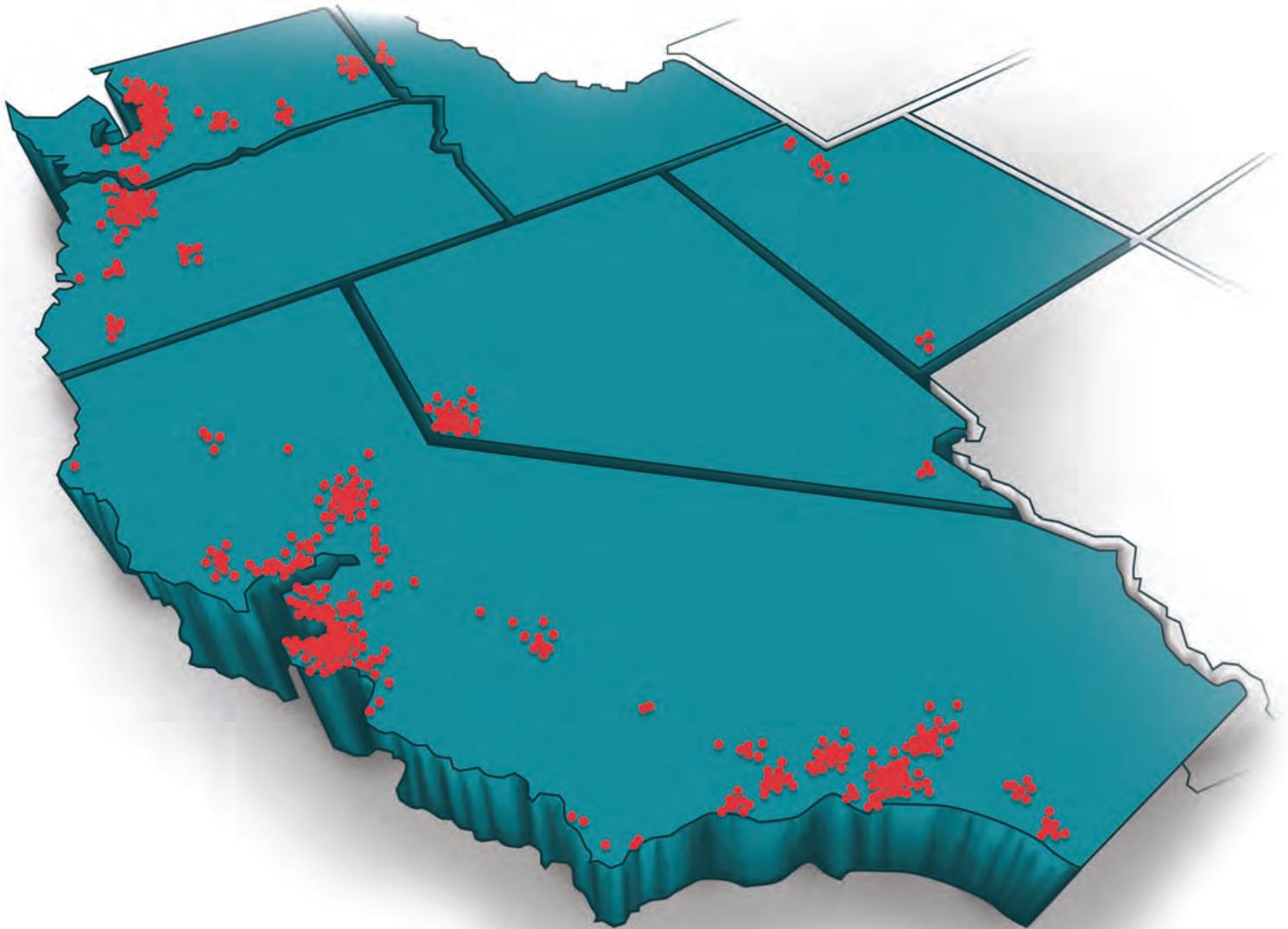
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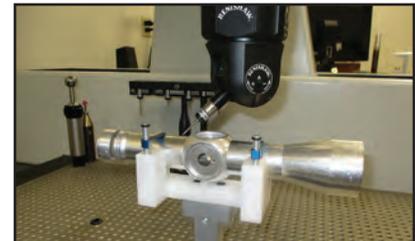
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Coming in April/May 2021
Software and Controls —Don't miss this issue! It will be an idea-packed focus on developments in computer controls, networking, automating plant management, the latest in CNC software, hardware and machine control technology.

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The oldest regional industrial publication serving the Western States manufacturing managers, owners and engineers from 1 employee to those larger plants of 5,000 or more. Its editorials feature numerical control applications in all size machine shops, tooling, programming, robotics and shop operations, training personnel, financing of new equipment, cutting tools and all related manufacturing requirements. Coverage extends to all of Arizona, California, Oregon, Washington, Nevada, Utah, Idaho, Colorado, New Mexico and Texas.

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Let's Hope 2021 is a Smoother Ride

Well 2020 is in the rearview mirror and we are now driving on Highway 2021. Fingers crossed that this road is a helluva lot smoother than the last one. At this time people are starting to get vaccines-and no matter your take on them—it will start to open up the economy. Here in California we can eat outdoors again which is better than not being able to I guess. While these are small steps, they are steps in the right direction. The more people out doing and buying things, the more things have to be made...and we are an industry that makes things.

This issue is our annual aerospace issue. I grew up in Lakewood, California which supposedly was built to provide housing for McDonnell Douglas workers in Long Beach. The plant was about 3 miles from where I grew up and on our block of about 70 houses I am pretty sure that at least 20 people worked at Douglas at one time or another. My father worked for a machine tool publication when I grew up so between the neighbors and my dad I have always had an interest in aerospace products and how they were made. That is why this is always one of my favorite issues of the year.

Our cover story is on a shop in northern California shop that does lots of aerospace work. They have been able to do more and more with the addition of some 5-axis machines and they plan on getting more.

In keeping with the aerospace theme we have an article on a Caltech/Nasa joint project that has PERSEVERANCE Rover Bringing 3D-Printed Metal Parts To Mars. Also there is a story about how Fastems is going to deliver a laser cleaner robot for the F-35 lightning II wing assembly line along with one highlighting that Boeing will provide six more solar arrays for the International Space Station.

Another story is on a Corona, CA. shop that mixes aerospace with medical and any other work that they can get. They feel good in knowing lots of the work they do make a difference in peoples lives. There is also a story on an Idaho riflescope maker where quality is key in making their product.

That does it for this issue. Our next issue is our annual software and control issue and if you sell one of these products be sure to contact me about getting your product in this issue. Thanks for reading

Sincerely,

Shawn Arnold

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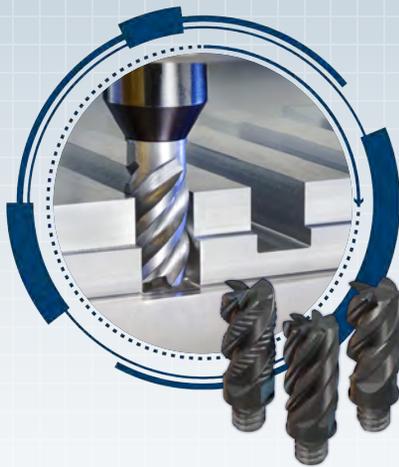
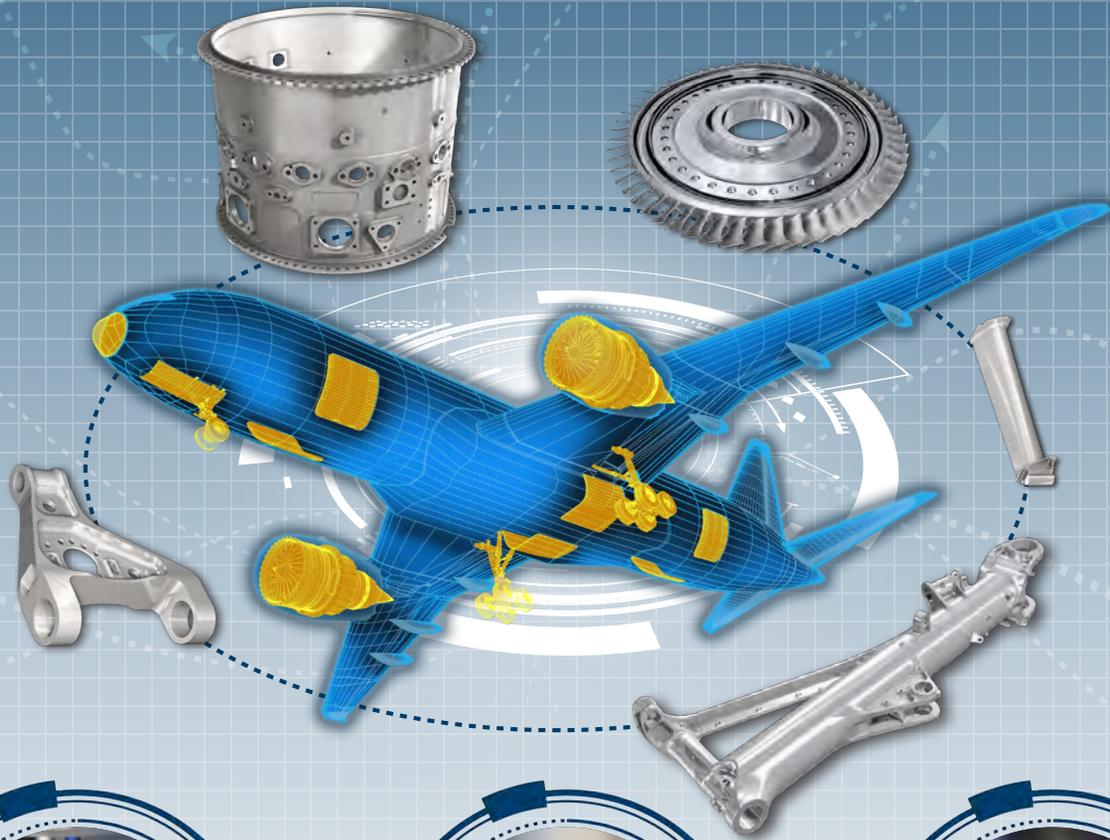
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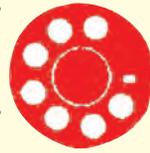
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Kratos to Continue Support for Air Force's Attritable Aircraft Program

San Diego based Kratos Defense and Security Solutions has secured a \$17.8M contract modification from the U.S. Air Force to continue helping its research laboratory arm develop low-cost, attritable unmanned aircraft systems that are reusable with minimal maintenance.

Kratos said Monday it will support various efforts, including the company's own XQ-58A Valkyrie, to develop low-cost attritable aircraft technology.

The Air Force Research Laboratory demonstrated Valkyrie's performance as an autonomous attritable aircraft at Arizona-based Yuma Proving Ground earlier this month under the attritableONE program.

USAF seeks to implement the use of low-cost UAS for manned-unmanned aircraft teaming.

Aerojet Rocketdyne Sells for \$4.4 Billion

Aerospace giant Lockheed Martin Corp. is set to acquire El Segundo-based Aerojet Rocketdyne Holdings Inc. in a deal worth \$4.4 billion, according to Lockheed Martin.

The two companies announced the deal on Dec. 20.

The company said propulsion systems manufactured by Aerojet Rocketdyne are already a part of the Lockheed Martin supply chain.

What remains to be seen is whether federal regulators will approve the deal, which would give Lockheed Martin control over production of propulsion systems used by competitors.

Aerojet Rocketdyne formed through the 2013 merger of veteran aerospace firms Aerojet and Pratt & Whitney Rocketdyne (the latter a successor firm to Canoga Park-based Rocketdyne).

Aerojet Rocketdyne's current headquarters is located less than 2 miles from Lockheed Martin's El Segundo office, close to the Los Angeles Air Force Base. Lockheed Martin, which formed in 1995 with the merger of Lockheed and Martin Marietta, also has close ties to the Los Angeles area.

For most of the 20th century, Lockheed based its operations in Burbank though its manufacturing facility there closed in the early 1990s.

Under terms of the acquisition deal, Lockheed Martin will pay \$56 per share, which the

company says will be reduced to \$51 per share following payment of a special dividend to Aerojet Rocketdyne shareholders. The transaction is expected to close in the second half of 2021.

NASA Awards Venture Class Launch Services Demonstration 2 Contract

NASA's Launch Services Program (LSP) has awarded multiple Venture Class Launch Services Demonstration 2 (VCLS Demo 2) contracts to launch small satellites (SmallSats) to space, including CubeSats, microsats or nanosatellites. The three companies selected to provide these commercial launch capabilities, and the value of their firm fixed-price contracts, are: Astra Space Inc. of Alameda, California: \$3.9 million, Relativity Space Inc. of Long Beach, California: \$3.0 million and Firefly Black LLC of Cedar Park, Texas: \$9.8 million.

SmallSats, including CubeSats, are playing an increasingly larger role in exploration, technology demonstration, scientific research, and educational investigations at NASA. These miniature satellites provide a low-cost platform for NASA missions.

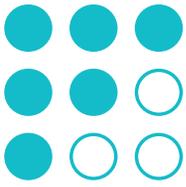
LSP supports the agency's CubeSat Launch Initiative (CSLI) by providing launch opportunities to CubeSats that are awaiting launch. The VCLS Demo 2 contracts will launch CubeSats selected through the CSLI to demonstrate a launch capability for smaller payloads that NASA anticipates it will require on a recurring basis for future science missions.

Deal for 15 More Boeing KC-46 Tankers

The U.S. Air Force in January awarded Boeing a \$2.1 billion contract for 15 KC-46A tankers, expanding its fleet of aircraft that will not only set the standard for aerial refueling but will also help enable the integrated digital battlespace.

The KC-46 is a widebody, multirole tanker designed for state-of-the-art air refueling, cargo and medical transport. Boeing is now on contract for 94 KC-46A tankers.

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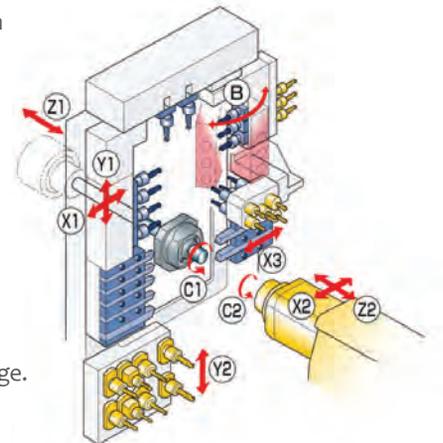
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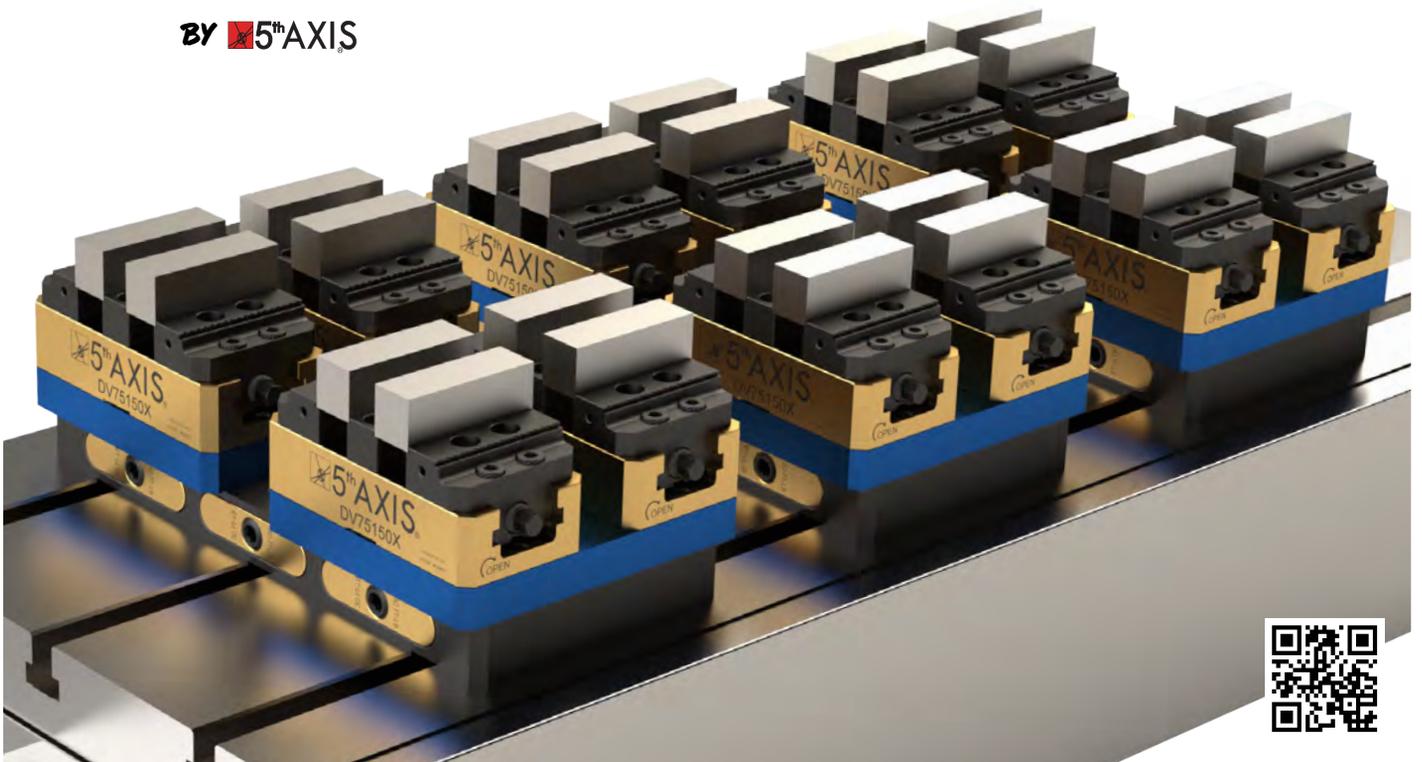
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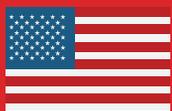
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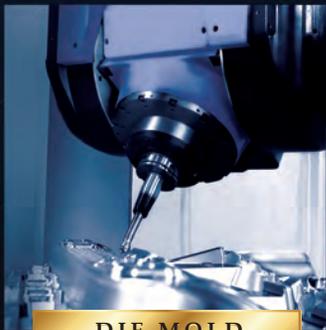
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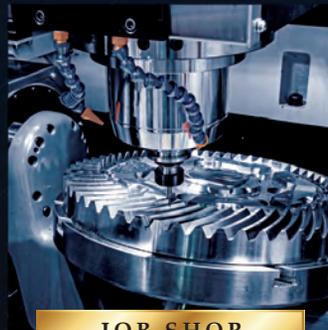
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					4	TG-6400F	\$ 71.66	8"	8-RTG-6400A	\$ 158.83
8"	.312	.499	3/8	1.750	2	TG-8200F	\$ 22.15	8"	RTG-8200A	\$ 103.80
					3	TG-8300F	\$ 64.44	10"	10-RTG-8300A	\$ 240.33
10"	.501	.749	1/2	2.125	2	TG-10200F	\$ 23.83	12"	12-RTG-10200A	\$ 184.94
					4	TG-10400F	\$ 75.33	15"	15-RTG-10400A	\$ 607.05
12"	.501	.749	1/2	2.500	2.5	TG-12250F	\$ 72.22	15"	15-RTG-12250A	\$ 494.11
					4	TG-12400F	\$ 102.35	18"	18-RTG-12400A	\$ 851.69
					2.5	TG-15250F	\$ 87.22	21"	21-RTG-15250A	\$ 908.09
15"	.501	.749	5/8	3.000	4	TG-15400F	\$ 113.74	24"	24-RTG-15400A	\$ 1,550.55

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						Part Number	Set Price
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					3	RKT-6300A	\$ 104.86
					4	RKT-6400A	\$ 118.88
Kit B208 N208 HS-08	8"	0.551	12MM	0.984	2	RKT-8200A	\$ 85.36
					3	RKT-8300A	\$ 134.30
					4	RKT-8400A	\$ 159.83
Kit B210 HS-10	10"	0.630	12MM	1.181	2	RKT-10200A	\$ 126.28
					4	RKT-10400A	\$ 193.60
Kit B12 HS-12	12"	0.709	14MM	1.181	2	RKT-12200A	\$ 184.71
					3	RKT-12300A	\$ 245.72
Kit B212 BBM 315	12"	0.827	16MM	1.181	2	RKT-12208A	\$ 184.71
					3	RKT-12308A	\$ 278.56

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Model	Chuck Size	Groove Width	Screw Size	Hole Space	Hgt Inch	STEEL		ALUMINUM	
						Part Number	Set Price	Part Number	Set Price
Kit B206 HO27M6 HS-06	6"	0.472	10MM	0.787	2	KT-6200F	\$ 34.37	KT-6200AF	\$ 31.59
					3	KT-6300F	\$ 44.99	KT-6300AF	\$ 41.12
					4	KT-6400F	\$ 95.71	KT-6400AF	\$ 86.08
Kit B208 ZA6-8 HS-08	8"	0.551	12MM	0.984	2	KT-8200F	\$ 40.70	KT-8200AF	\$ 38.56
					3	KT-8300F	\$ 46.82	KT-8300AF	\$ 50.90
					4	KT-8400F	\$ 61.00	KT-8400AF	\$ 62.11
Kit B210 HS-10	10"	0.630	12MM	1.181	2	KT-10200F	\$ 45.84	KT-10200AF	\$ 46.66
					4	KT-10400F	\$ 76.14	KT-10400AF	\$ 67.46
Kit B12 HS-12	12"	0.709	14MM	1.181	2	KT-12200F	\$ 72.00	KT-12200AF	\$ 74.05
					3	KT-12300F	\$ 107.96	KT-12300AF	\$ 90.10
Kit B212 BBM 315	12"	0.827	16MM	1.181	2	KT-12208F	\$ 72.00	KT-12208AF	\$ 74.05
					3	KT-12308F	\$ 107.96	KT-12308AF	\$ 90.10

*For Pointed Soft Jaws, replace the "F" with "P" & add \$4.00 (6"-10")/\$7.00 (12" & above) per set.

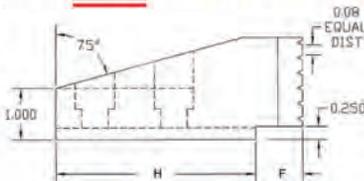
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10"	1.5mm x 60°	1.50"	4.95"	2.00"	0.631	M12	1.181	0.95	4.00"	KT-100HJP1	\$ 449.00	B210, N210, HS10



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8"	200/210/215/225	GBK-200-A	\$ 320.00
10"	250/265/275	GBK-250-A	\$ 360.00
12"	315/340	GBK-315-A	\$ 445.00
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8"	2.165"	BI-7866-0800	\$ 1,272.15	\$ 1,156.50
10"	2.992"	BI-7866-1000	\$ 1,443.42	\$ 1,312.20
12"	4.055"	BI-7866-1200	\$ 2,143.35	\$ 1,948.50
16"	5.354"	BI-7866-1600	\$ 4,349.07	\$ 3,953.70

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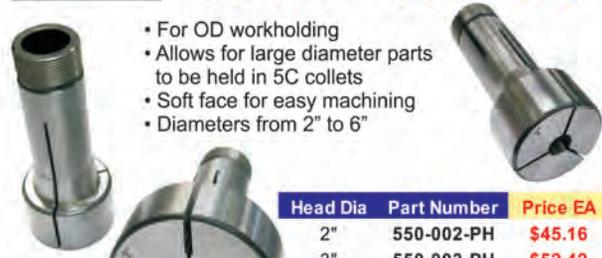
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5"	550-005-PH	\$109.90
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Fastems to Deliver a Laser Cleaner Robot for F-35 Lightning II Wing Assembly Line



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Fastems to Deliver a Laser Cleaner Robot for F-35 Lightning II Wing Assembly Line

Fastems is delivering two Automated Structure Laser Cleaner (AutoSLC) units for the F-35 Lightning II Wing Line. The delivery of the new project is estimated to be completed near the end of 2021.

Fastems' AutoSLC solution is based on a robotized system, which is equipped with a laser ablation scan head, designed to automatically remove primers and other protective coatings from F-35 wing components. Laser ablation provides a pristine surface to which nutplates can be mechanically bonded without using attach rivets. Previous methods of coating removal entailed manual sanding and solvent wiping which proved to be timely and yielded inconsistent bonding results. The Fastems AutoSLC system will process more than 3,000 drilled holes, reducing touch labor hours and improving aircraft quality for the end customer.

The AutoSLC's new technical advancements, such as automated image processing, gathers information on quality anomalies for traceability and process improvement. It will also include a tailored operating system based on Fastems MMS (Manufacturing Management System). The solution is expected to shorten lead times by approximately 88 hours per unit, driving down the cost of the F-35.

Fastems and Lockheed Martin have previously collaborated to integrate the F-35 Lightning II Forward Fuse-

lage Machine Tool Transfer Line (MTTL) in 2012. The MTTL has been critical in improving safety, quality, and efficiency for the F-35 forward fuselage manufacturing process. For this project, Fastems built five Load Unload & Skin Installation (LUSI) Stations, a Wash Station, and the MTTL Stacker Crane at the Lockheed Martin Fort Worth F-35 plant. Further, the system was scalable to enable Lockheed Martin to meet increasing production rates since 2012, currently stretching the line to 130 meters long. The Fastems MMS controls and schedules production based on the due date of the component, integrating processing phases and machining. The LUSI stations allow operators to carry out pre-assembly tasks and adjustments ergonomically. This latest MTTL solution has already delivered savings of approximately 26 hours per unit.

"We are proud and excited to continue our collaboration with Lockheed Martin on the production of their advanced, fifth-generation stealth fighter, the F-35. The path to successful cooperation with Lockheed Martin has been open and frequent collaboration from the very beginning and, together, developing a clear unified vision for the project. This has made processes and decision making much faster and has allowed us to deliver and even exceed the expected results," says Mikko Nyman, CEO, Fastems. "This has been a truly unique project for our Finnish company, and we look forward to continuing and further expanding our cooperation with Lockheed Martin."

Fastems has gathered a partner network of industry leaders for the development of the AutoSLC project. For example, the Finnish laser processing company Ionix is helping to develop the laser ablation end effector of the robot. During the AutoSLC project delivery, with this established partner network, Fastems and the Finnish supply chain are providing a substantial contribution to the F-35 program worldwide.

"At Lockheed Martin, we test and validate any new complex solution from the initial concept, through design and build, and after delivery. The fact that Fastems understands and shares this attention to detail positions them well to deliver a quality product at every phase," says Steve Callaghan, vice president, F-35 Business Development and Strategic Integration. "Fastems' AutoSLC solution will help us achieve full rate production at our targeted costs and will provide our customer with a high-quality product."

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M & M MACHINE



M&M Machine in Auburn, Ca. outperforms similar sized operations by investing in technology and treating employees as part of the family.

AUBURN, CA. JOB SHOP EMBRACING 5 AXIS MACHINING

Article by Sean Buur Photos by Sean Buur & supplied by M&M Machine & Aimee O'Brien Photography

Jon Duckett is laying the foundation to become the 3rd generation of owner at M&M Machine in Auburn, Ca. Since 1972, M&M has been a job shop serving niche markets within northern California. The company was founded by Richard Mitchell in his Mountain View, Ca. garage. His daughter Janis and her husband Chris Duckett took ownership in 1980. Their son Jon has lofty goals and ambitions as the company nears its 50th anniversary.

Jon's punishment for being suspended in high school was having to work on the M&M's old machines in the back of the shop. It was a fitting chastisement that most family-owned operations dole out to their misbehaving children when given the opportunity. Through the years it became less of a penalty and more of a way to earn a few bucks while attending classes to become an accountant. At the time of Jon's college graduation, Chris was gearing up for retirement and setting in motion plans to eventually

sell the business. Business was good, but technology was at a standstill. With retirement on the horizon, investing in new machines wasn't in the cards. "It's funny that what used to be punishment is now what I love," explains Jon Duckett, Operations Manager and future owner of M&M Machine. "I graduated college in 2014 with a degree in accounting but decided being close to family was more important than traveling all over with the large firm that had hired me. It was a difficult decision, but not really if that makes sense. I love the math and numbers that goes along with accounting, but I get the same satisfaction out of CNC manufacturing. I worked my way through college taking classes 3 days a week and working at M&M 3 days a week, so I already knew the ins and outs of the operation. I called my dad and asked if he would be interested in selling me the business and staying on for as long as he wants to help with the transition. This business is my dad's baby. His experience is more valuable than anything

The Haas UMC750ss was purchased 2 years ago and has transformed how M&M Machine processes jobs. The 5-axis machining center has impressive specs for its price point and exceeds expectations. Jon feeds the machine a nonstop diet of 5 axis aerospace parts.

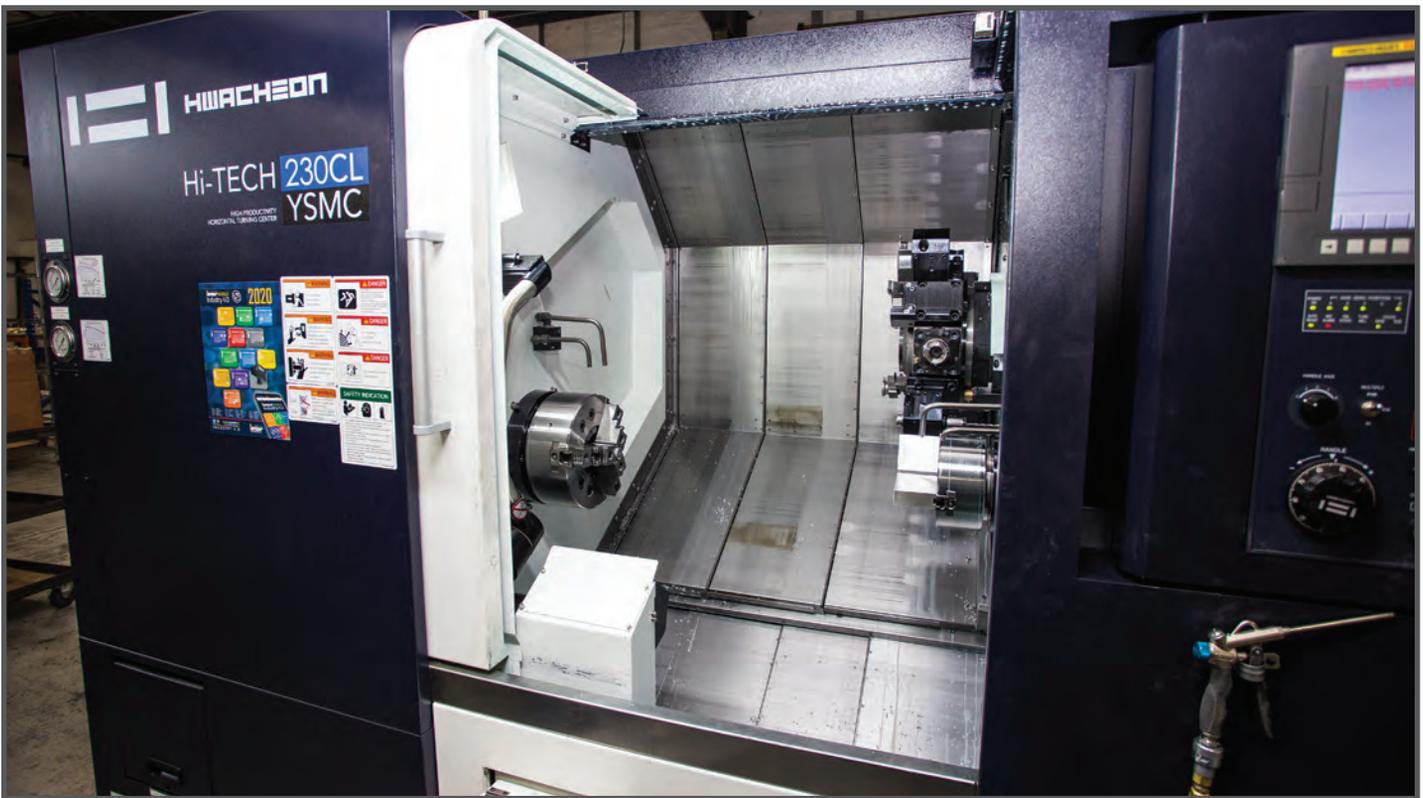


money can buy. Even when he officially retires, I still expect him to be here all the time. Family businesses can be hard, and we are so fortunate that isn't the case with us. Spending more time together is the goal. There is no tension, no animosity, we all really love working together."

The opportunity to continue the family legacy was great, but to set M&M up for another generation of success they needed a different mentality. "To grow the business, we needed to invest in newer technology," tells Jon. "We started the processes of finding a machine tool that could take us into the future. Once we embraced dropping the 3-axis mindset everything became clearer. We knew Swiss screw machines, multi-turret/multi

spindle lathes, live tooling, and 5 axis milling is where we needed to go. Before investing in new CNC machines, we invested a ton of money into our inspection lab. We knew more complicated machining required better equipment to verify the processes."

M&M Machine purchased a Keyence IM-7030 instant measurement optical comparator and a Keyence XM-1200 handheld probe CMM. Jon admittedly wasn't great at finding true positions measuring by hand, but the Keyence XM-1200 has made that much easier. "We had a couple companies come in and do a demo," tells Jon. "We wanted something quick, easy, and accurate, the XM1200 fit the bill. Pick it up, do a few clicks and it is ready to go.



The Hwacheon Hi-Tech-Tech 230CL is a live tooling lathe with a 10" chuck, sub spindle, 24 tools and Y axis, everything M&M wanted in a turning center.

Ours has 3 different light sources and as long as the lights can see the camera it knows where the probe tip is. On the handheld unit there are green and red lights letting you know if everything is aligned and fully operational. You can swivel the table around and it will swivel the part knowing where everything is in relation." Jon, who handles the QC for M&M, wanted a solution that didn't take up a lot space and that was mobile. The optical comparator

gets used on the shop floor all the time, but he also sought the ability to check 100% of the parts coming directly off the machine if need be. "The accuracy is amazing on such a clever device," details Jon. "I trust it to a tenth all day, every day, and theoretically it's good down to a micron. Since it is a handheld device there is a little more room for user error, but it is fast, so it is not hard to take 3 measurements if I really need to be sure."



Mill foreman Jeff Parker has been with M&M for 27 years. The 4 axis Haas HRT210 Rotary is one of M&M's newest additions.

Three years ago, M&M had a shop full of 3 axis Haas mills, traditional Haas lathes, and their Miyano Citizen Swiss screw machines. Plans were set in motion to "just go big" and enter the world of 5 axis machining. As lifelong Haas supporters, Selway Tool was one of the first calls. "We've championed the Haas brand for many years," tells Jon. "We like the support and service we get from Selway, and love that everyone knows how to run them. They do a great job for us, and their 5- axis is priced well enough that we can invest in the technology to see how the company evolves without breaking the bank." M&M purchased the Haas UMC750ss two years ago and have been more than impressed. The midsized machine has a 20" platter, 1200 I.P.M. rapids,

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One of the two Miyano Citizen Swiss screw machines is dedicated solely to this hand grip used in exercise equipment while the other runs every other Swiss job.

15,000 RPM Spindle, X=30 in., Y=20 in., Z=20 in., and a 40-tool changer. “The UMC750ss outdoes everything we had hoped it would do,” touts Jon. “The aerospace part on it right now is similar to ones we’ve done before. Our programmer/operator really pushes himself to keep improving processes to make better parts faster. Honestly, we struggled in the beginning to achieve true 5 axis simultaneous machining. We went back to Haas, and to Gibbs, looked everywhere for a solution. Once we got the answer, everything opened up for us. We do so much

more with it today than we did even 6 months ago. Our success with the UMC has been so great that we are only investing in higher complexity machine tools right now.”

Since purchasing the UMC750ss, M&M has added a 5th axis trunnion to one of their new VF3 machines and acquired a new 4 axis HRT210 rotary. They’ve also expanded with a second Miyano Citizen BNA-42MSY dual spindle Swiss turning center and a Hwacheon High-Tech 230CL, both with dual spindles and live tooling. “We sat down and looked at what we had capability wise and what we were missing,” explains Jon. “We have 3 axis and 5 axis so a dedicated 4 axis machine seemed logical. Combine that with the 5th axis trunnion and 70% of the parts we run on the UMC can also be run on one of those two machines. Only the larger and more complex parts need to be run on the UMC. We’ve been able to take on a lot more 5 axis work because of it.”



Janis Duckett, Jon Duckett and Chris Duckett

The 5 axis is also directly responsible for M&M’s latest lathe as well. Already familiar with complex turning work from their Swiss experience, M&M knew the time to foray into a larger live tooling lathe was a top priority. “We purchased a Hwacheon Hi-Tech 230CL from Selway and honestly we are nowhere near reaching the potential of that machine,” tells Jon. “It has a 10” chuck, good horsepower, sub-spindle, Y axis, 24 tools and everything you could ask for, but we are sneaking up on setting it loose. Slowly we are reprogramming jobs to match the capabilities



Parts range in material, size and complexity. As a job shop with 3, 4, and 5 axis milling, Swiss screw machines, and mill turn they can manufacture pretty much anything.

it has on offer, but not as much as we should. We need to dedicate more time to learning what is possible on it. We figured two of our guys could tag team learning it, but our lathe foreman who is managing 6 other lathes, and the 5-axis guy is inundated with 5 axis work. It's great that

we are so busy, but not ideal to learn a new machine. I have no doubt that it will be cranking out insane parts soon, but it will take us a little time to gain comfort in running it to the level it is designed for.”

“The future is 5- axis for us,” concludes Jon. “Going forward we will continue to increase our 5 axis capabilities. We will undoubtedly buy another UMC, and after that get a larger Japanese 5 axis for longer production runs. We bill ourselves as a high-tech job shop that runs everything from exercise equipment to aerospace. Other shops of similar size in the area don't have near the capabilities we do and we like it like that.”

Jon's parents met at a grocery store and fate had it that they shared the same birthday. He's an extension of their destiny and carrying on the M&M Machine legacy is something you can tell is very important to him.

Maybe his kids will want to do the same someday. He might even use working on the machines as a punishment when they get older. It worked out pretty well for him.



Jon Duckett handles QC for M&M Machine. He utilizes the Keyence XM1200 handheld CMM to measure one of the many aerospace parts they produce.

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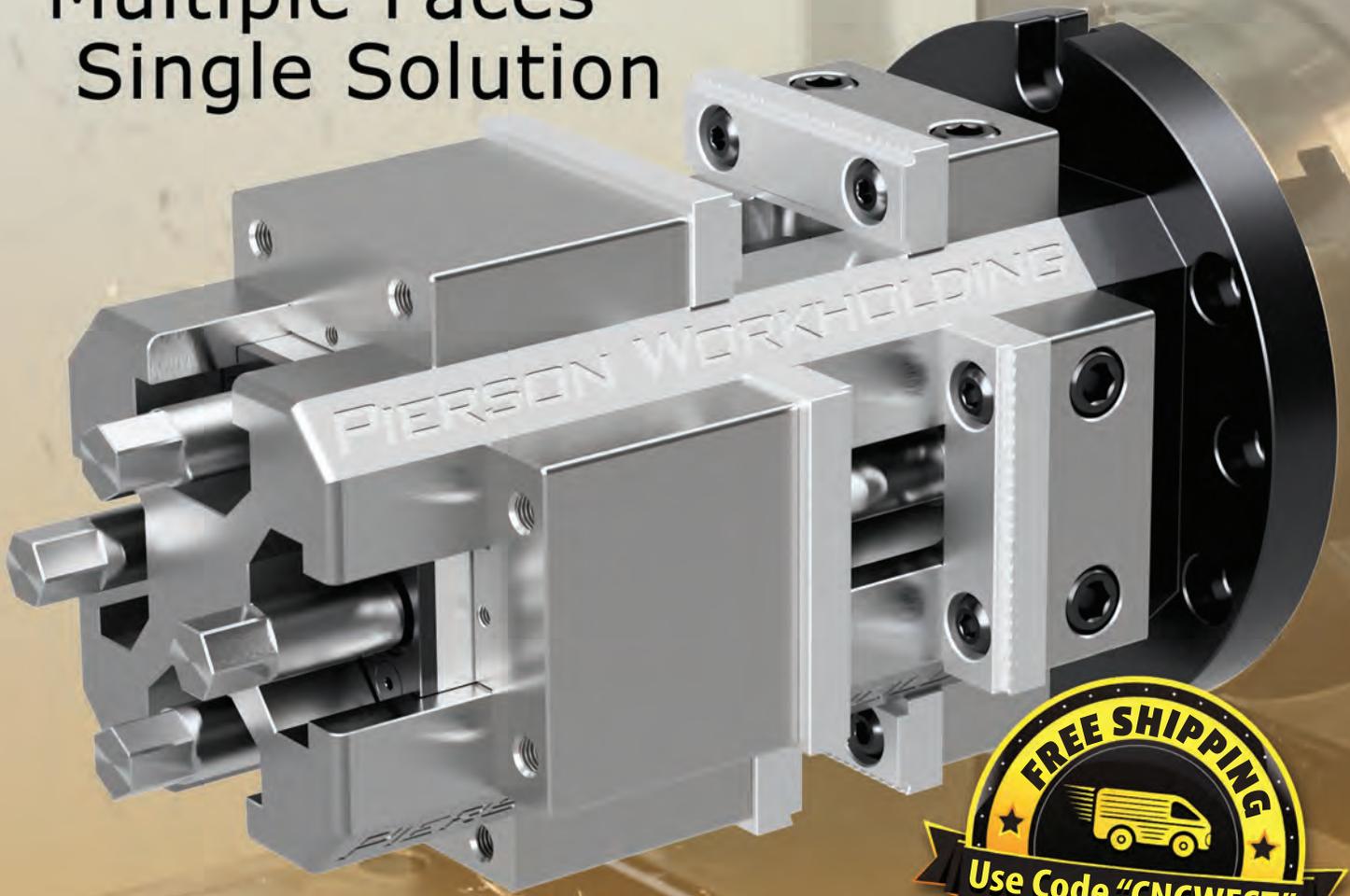
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Bar Feeder Interface

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Article & Photos by Sean Buur

MAKING PARTS THAT MAKE A DIFFERENCE

RKL Technologies Inc. is a contract machine shop in Corona, Ca. supplying precision machined parts for medical, aerospace and general industrial sectors. Opened in 1983, they offer 100 years of manufacturing experience to customers such as: Medtronic Inc, Edwards Lifesciences Inc, The Boeing Company, The National Institute of Standards and Technology (NIST) and many other well-known medical, aerospace, and defense OEMs. From prototype to production there is not much this ISO13485, AS9100, ISO9001 certified and “Made in California” registered business can’t do.

ORIGINS

Co-founders Roy Hornstein and Kerry Von Clark first met at American Medical Optics in 1981, but it wasn’t until a few years later that the engineer and machinist partnered on a garage-based business. “I have a degree in mechanical engineering and am a licensed PE in the state of California,” tells RKL President Roy Hornstein. “As an engineer in the early 80’s I was working on projects that ranged from orange juice and coffee at Proctor and Gamble corporation to contact lenses and implantables at Allergan Inc. Kerry came to me one day and said ‘you’re an engineer and I can make things. I’ve got a mill in my garage so let’s start a business.’ And that’s what we did. Kerry is our VP of Operations and truly is a fantastic machinist.” Roy and Kerry’s initial efforts originally targeted medical

devices, the industry they knew best. Soon the garage was too small and they outgrew unit buildings. In 1996 they purchased their current 17,200 sq.ft. manufacturing headquarters in Corona, CA. Today, with 25 employees, two shifts, and through a pandemic, RKL continues to support the industries they know so well.

ARMY STRONG

Nighttime reconnaissance missions didn’t set up Business Development Manager, Kip Sullivan, and Quality Assurance Manager, Torry Lamp, for careers in manufacturing, but it did give them plenty of time to think about their futures. Torry and Kip met in basic training before being shipped off to Iraq together. Long nights on guard duty left them with plenty of time to brainstorm future endeavors. Admittedly, Subway franchise, or fishing charter were the most likely contenders, but after five years in the Army and getting their Bachelors in Marketing from Cal State Fullerton together they knew the opportunity to work in a non-combat environment would present itself. “We’ve been a great team since 2004,” touts Torry. “We bring out the best in each other. I’ve been at RKL now for 3.5 years and Kip came on board shortly after. We always knew we would partner on something; we just didn’t know it would be in manufacturing, and we didn’t know how much job satisfaction was possible in manufacturing.” “I’ve always had a love of math, geometry, and technology,” tells Kip. “When Torry was



Above - The 2 Star SB-20R machines came on line in August of 2020. RKL is still tweaking the programming to maximize production on the one part it will run 24/7. Cycle time with the new technology has drastically improved and the team at RKL feel there are gains still to be had. Since 1995 they have shipped almost 9 million of this part.



Left - The Accu-Cut is a one of a kind machine designed specifically for the part coming off the Swiss turning centers. Each part is precision ground on the OD before having the ID honed on the Accu-Cut in an 8 cycle process to mate perfectly with the OD.



An an AS9100, ISO9001 and ISO1345 certified company quality is a top priority at RKL Technologies Inc. Parts are measured using the latest Keyence IM 7030 vision system. With automated focus, lighting and edge detection technology human error is all but eliminated. Cody with one button push can measure up to 99 dimensions on 100 different parts and create inspection reports that integrate straight into their JobBoss work flow. RKL's complex parts are no match for the Keyence 7030.

telling me about everything they were doing over here at RKL I wanted to be a part of it. RKL satisfies the cravings that civilian life mostly lacks. We did nothing with CNC, medical or manufacturing in the Army, but there is still a parallel. As sergeants we had to learn things we've never seen before, become experts in it, and teach it to others. That applies directly to what we do here. The thought of learning something new is exciting and challenging and makes us glad to come to work." "I've been doing this longer than these guys have," adds Roy. "But I too love coming to work. Every day is another opportunity to learn and to make a difference."

QUALITY

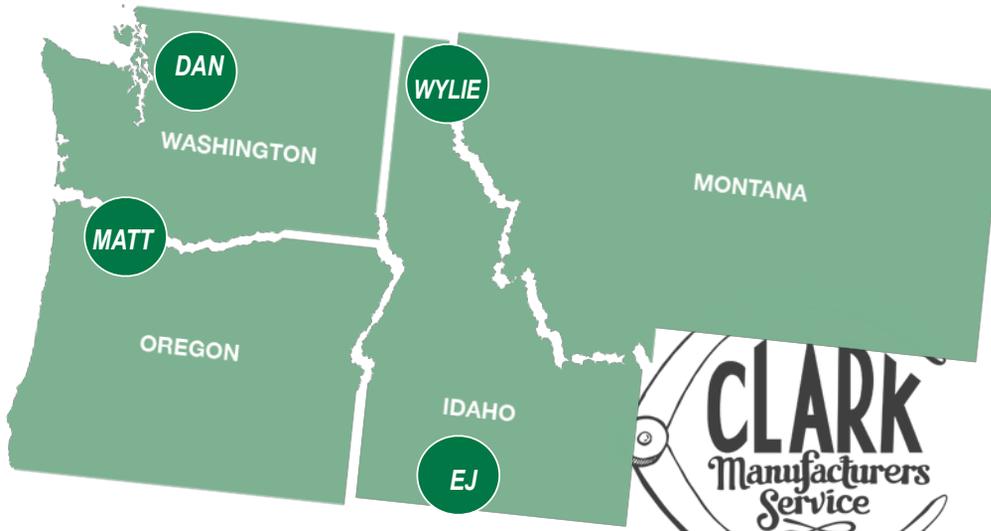
Quality is of the utmost concern for everyone at RKL, it truly is a top priority. "We make sure to do an outstanding job both in manufacturing and inspecting the parts," explains Roy. "With Medtronic for example, I can't remember the last time we didn't have a 100% quality rating with them." "We actually go above and beyond what's required," adds Torry. "Unless otherwise specified by the customer, our extensive internal standards exceed most customer's requirements. With that in mind, we can assure our customers are completely satisfied." Torry was originally hired for business development, but since day

one he had expressed an interest in production. "I came from a completely different career path than most people in my job," continues Torry. "I was lucky that the retiring QC manager took an interest in training me. Every day he would teach me a few things and everyday I'm still learning things." It was all new to Torry, and a year after he took over QC, he was tasked with getting RKL their ISO13485 certification. It was a trial by fire but was the best way to absorb as much information as possible into the shortest time frame. "Tag teaming as much as possible with Kip made things go a lot easier," continues Torry. "I came out of the process a lot more confident and with a whole new skill set. Typically, the business development guy is not lending a hand in QC, but the experience really upped Kip's game as well."

BUSINESS DEVELOPMENT

As Business Development Manager, Kip's job is primarily to expand RKL's customer base. Targeting new business in this industry is a lot different from how he did things in a similar role at a golf country club. Campaigns on social media work differently when you are targeting a hyper-specific group of people. "Not a lot of Facebook groups out there dedicated to medical device mid-level engineers," jokes Kip. "So, we rely more on intra company

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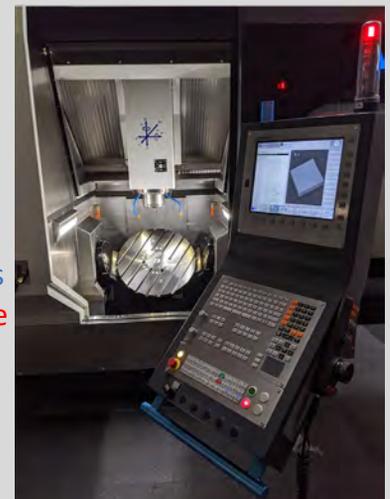
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What does this mean? It means, the performance of a Hermle and DMG at the price of a Hurco

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Left - The modified Harding lathes make the RKL's smallest part and the only implantable. It is a marker for surgery? They are small, 3 times the thickness of your hair.
 Right - Honing and tumbling are all part of the daily grind at RKL. Every part gets tumbled in their extensive tumbling lab.

and word of mouth referrals to gain business.” “Word of mouth has always been our best sales tool,” adds Roy. “That’s how we grew in the beginning. I was Director of Engineering at AMO and engineers I used to work with, work for, or had working for me moved around from company to company and brought us with them.” RKL still works for companies that started with Roy and Kerry over 30 years ago.

A lot of new business is driven by internal recommendations from RKL’s key customers. Some of the organizations are so large that each department might as well be a separate company. “As an example: we have a relationship with the Heart Valve group in Irvine for

the last 3 decades and one of their engineers moves over to new a department within the company” explains Kip. “They rave about us and now we are getting new PO’s for prototype fixtures out of the Colorado group. Having the ISO13485 certification has opened many doors for us in the Medical device industry. Companies contacted us after seeing the certification posted on the website. Having lent a hand in the qualification process gives me an edge when engaging with potential clients.”

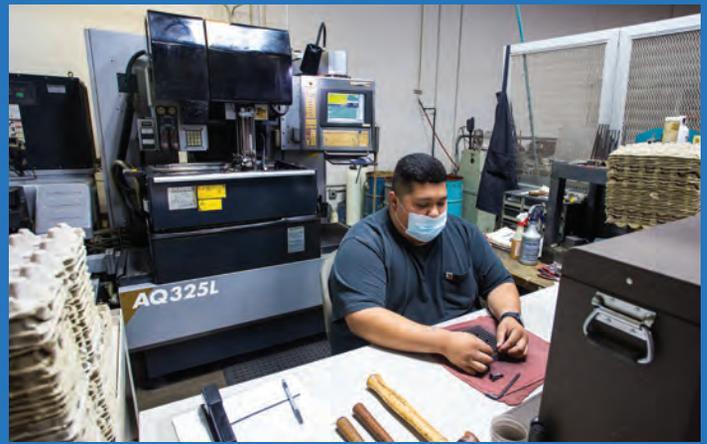
MACHINES

RKL has an extensive list of CNC machining centers that range in age and brand depending on the need. With



Most of RKL's turning centers were dedicated to a plastic catheter part when CNC West was on site, but several were left open to be able to run other jobs. Long run parts are programmed to run on both the Hyundai and Takisawa lathes for the most flexibility.

an AQ325 Sodick wire EDM, various brand mills, multiple turning centers and Swiss screw machines, basically, there is a lot they can manufacture. The newest machines are 3 Hyundai WIA lathes, 3 Takisawa LA-200 lathes and a pair of Star SB-20R Type G Swiss turning centers. “The Star SB-20R’s are the newest machining centers and were installed back in August,” tells Torry. “We get most of our new equipment from Kraig Wilson at West Coast CNC. Even though we have extensive experience in Swiss turning, these are the first Star turning centers for us, so we wanted a little training to minimize the learning curve. Even with the pandemic in full effect, Kraig with his Star training team got us going quickly and efficiently.” The pair of Star SB-20R’s were brought online to replace a set of older Citizen machines that have ran a single part nonstop since 1995. “We’ve made almost 9 million units



Left - Parts are all cleaned in a gowned and capped clean room environment. Right - RKL's Sokik wire EDM is cutting 164 parts at a time with three different operations. Freddy is one of RKL's top programmers for the mills and runs their EDM department.

of these parts over the years," tells Torry. "We are in the process of proving out the new machines on this single part. This newer technology will yield us big production gains. We were able to see a 15% reduction in cycle time right away. We're estimating with a few more tweaks it will end up even faster. The Citizens will be repurposed for other jobs. They still hold tight tolerances and have earned a little break after so many years of dedicated service."

"We've made a recent commitment to explore additive manufacturing," explains Roy. "Right now, we are running secondary processes on 3D printed parts for other companies. Being 3D printed the parts require secondary work to meet the customers finish requirements. We see a lot of potential in this area and are evaluating purchasing our own machines in the near future. Pricing has come down a lot, but even so it is a large investment to acquire what we want." They are weighing the pros and cons now of two systems: HP and GE. HP's Multi Jet Fusion system for medical grade plastic and GE's titanium or stainless-steel E-Beam Fusion system. "Pricing is on the high end, but if we can find the market for it, we will invest in the technology."

MAKING A DIFFERENCE

Job satisfaction is important to everyone, but sometimes it is difficult to quantify and to witness first-hand results. Knowing the country relies on the parts you manufacture to ensure freedom around the globe can be a tremendous source of pride for any shop. However, it is not that often that living, breathing proof walks into your shop, but that is exactly what happened at RKL a few months back. "It's interesting to learn the end use of our components and how they are integrated," tells Kip. "It's exciting to be a part of an industry that makes a difference in people's lives. Just the

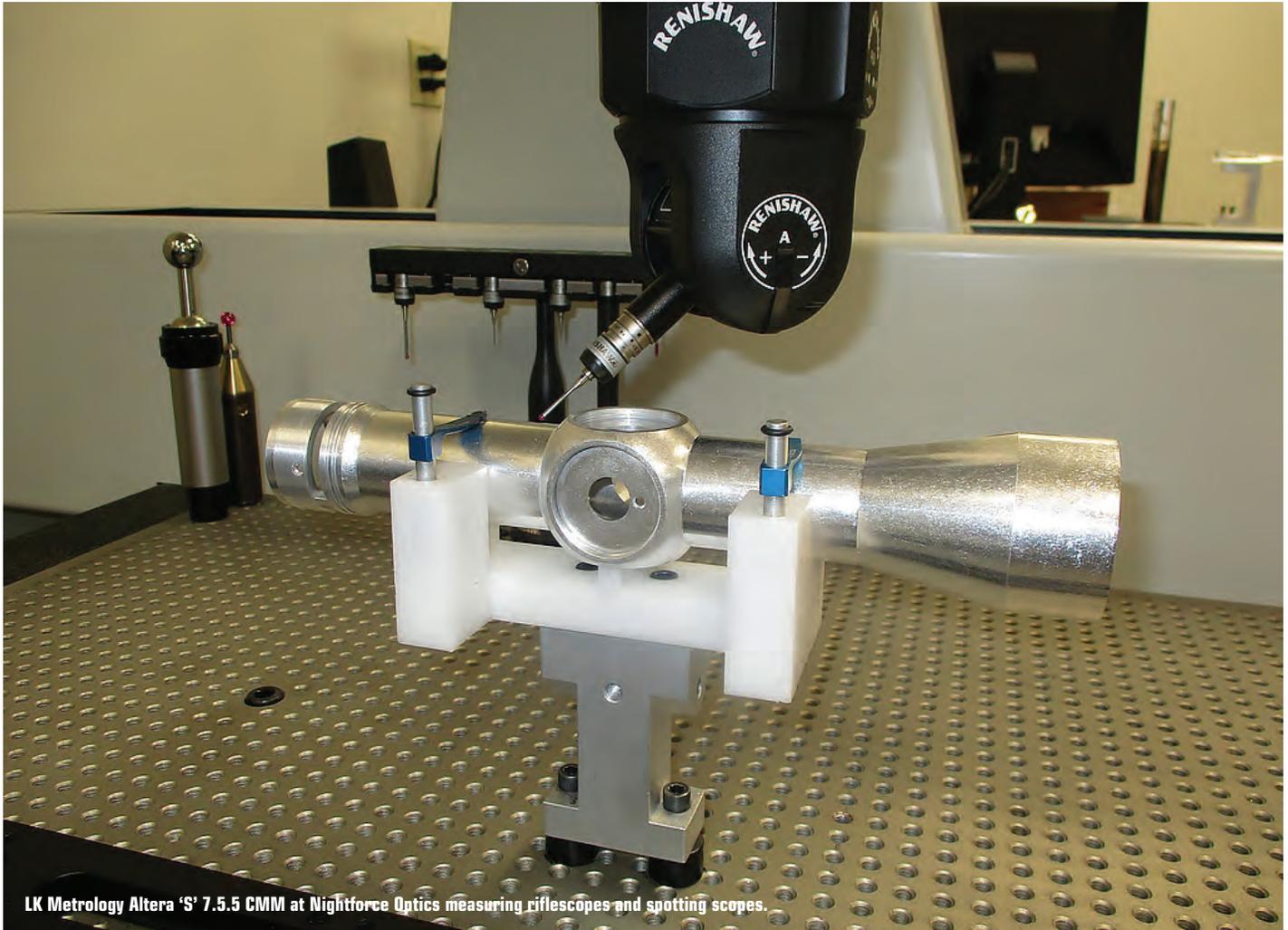
other day a delivery driver for one of our vendors came in and asked about the part he was picking up. This is a part that he has been picking up from RKL for the last 10 years. We explained to him that it is a component of a replacement heart valve. To both our surprise we figured out that he had been walking around this entire time with our component in his chest. All these years he was picking up and delivering a part that helped to keep him alive and didn't even know it. We showed him how it was created on the machine and all the processes required for it to be ready to ship." "He was so excited to see it being made," adds Torry. "It meant a lot to all of us here too. We take quality very seriously but seeing what we make walk in and out of the shop everyday measures quality in a different way than our standard dimensional inspection ever could." "What we manufacture makes a difference in people's lives and we take that to heart," concludes Roy. "From the top down we love what we do here at RKL."



Roy Hornstein - president, Kip Sullivan - business development manager, & Torry Lamp - quality assurance manager.

NIGHTFORCE® OPTICS SOLIDIFIES CONTINUOUS IMPROVEMENT OF QUALITY

Article & Photos Supplied by Al Hall



LK Metrology Altera 'S' 7.5.5 CMM at Nightforce Optics measuring riflescopes and spotting scopes.

HIGH-PRECISION IS REQUIRED IN THE MANUFACTURE OF RIFLESCOPES AND SPOTTING SCOPES WHERE REPEATABLE OPTICS ARE CRITICAL.

Nightforce Optics is headquartered in the small town of Orofino, Idaho along the famous Clearwater River. But that is the only small reference that can be said for this twenty-eight-year-old company that jumped into the highly competitive precision shooting market with the goal of building the best riflescopes in the world. That goal has turned into reality as the company continues to excel with advanced manufacturing and testing technologies.

Scott Johnson, quality manager for Nightforce Optics says, “Our approach continues to be designing and building top-of-the-line optics from the ground up. We serve the needs of military special forces, law enforcement agencies, serious competitive shooters and hunters who need the most dependable and best performing optics available. Much of the product line is hand assembled in the Orofino production facility. 100% of these products

undergo a rigorous 70-point quality checklist that tests and verifies that each product meets the highest standards for quality and functional accuracy before leaving the facility”.

Johnson explains, “Riflescopes have a wide range of precision mating parts that are all crucial to the accuracy and performance of each product. For example, our scope body tubes are made from aerospace aluminum bar stock and machined by specially designed CNC multi spindle lathes. We also use complicated multiple start thread designs with very tight tolerances in adjustment parts that require thorough inspections using custom made calibrated gages to ensure precision in each moving part. In addition, we perform ‘first article’ inspections that require proper documentation along with in-line inspections during the production run of parts to ensure the parts conform to the design requirements. As the

expanding need for accurate and documented quality inspections is required, you need to have the best measuring equipment.”

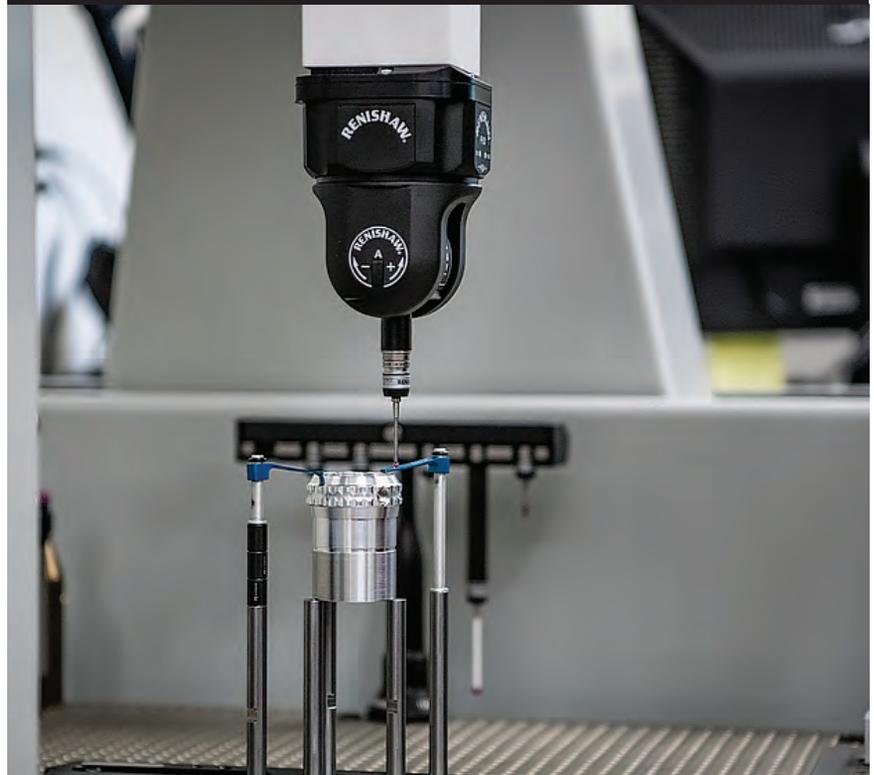
Johnson further explains, “When I first came to Nightforce Optics it was obvious we needed to reinforce our Coordinate Measuring (CMM) capabilities. Over the years, CMM technology has vastly improved and we wanted to expand our measuring capabilities. We needed five-axis capability with a Renishaw® PH20 probe head that gave us the throughput that we currently needed for our production requirements. The PH20 probe head gave us the touch-trigger capability for fast, infinite rotary positioning for high-speed point capture with minimal CMM movement. The question then was, whose CMM would be the best fit for us. We talked to a variety of CMM builders and agreed LK Metrology’s Altera ‘S’ 7.5.5 five axis CMM best fit our needs. We needed a modification of the CMM platform to be able to fit it into our temperature-controlled inspection laboratory, and LK Metrology was willing to work with us to meet our needs. They were willing to match a configuration with our stated desires and modify a standard set-up while supplying the necessary accuracies. In the process, LK Metrology demonstrated the CMM Manger software of the CMM and proved its capability with the PH20 probe head.”

The LK Metrology Altera ‘S’ 7.5.5 five-axis CMM is a multipurpose CMM with the most advanced capabilities in a compact CMM class. Innovative multi-sensor-ready technology allows the user to expand the capability to meet customer requirements without expensive controller updates.

In summary, Scott Johnson notes, “Because of recent multi-million-dollar military contracts for riflescopes that Nightforce Optics has acquired as well as continued growth in commercial sales, it looks as if the company will continue expanding even more in the years to come. I’m confident that the good working relationship we have established with LK Metrology will be crucial as well.”



Different riflescope components being measured by the LK Metrology Altera ‘S’ CMM.



Cost of Metal Removal Is Key

Part of This information was originally published by Manufacturing Engineering magazine and is reprinted here with the permission of the publisher.



The objective of both high-speed and high-efficiency machining strategies is to improve MRR, according to Yair Bruhis, global product and application manager for YG-1 Tool Co., Vernon Hills, Illinois. High-efficiency machining increases cutting by limiting air cutting time. “Because the two machining strategies are so effective, people want to switch everything towards them,” said Bruhis. “But it all depends on the part and the machining parameters. Sometimes, I can look at the part and state that it can’t be machined with high-efficiency strategies because of the shape and complexity of the part, or the machine’s capabilities, or the part features and programming, among other factors.

“I talk to a lot of people in aerospace and the trend has changed in the last 10 or 15 years,” Bruhis continued. “It’s not the cost of the tool anymore. Customers want to know the real cost of metal removal. There are a lot of cases where I meet with engineers or programmers and they clearly voice that they do not care about the price of

the tool. Cycle time and tool life are the most important considerations.”

He also noted that the trend in titanium alloys and exotics machining in the last four or five years is toward high-speed machining for medium to large parts because the cost of removing titanium or Inco-

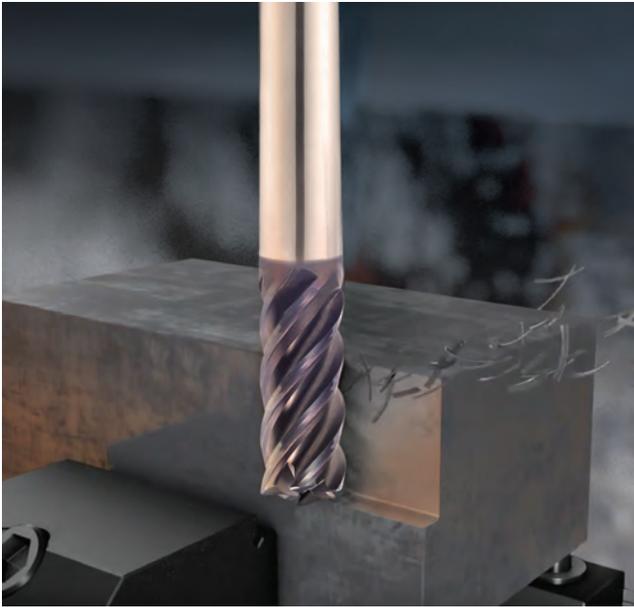
nel is much higher than that of aluminum or steel.

“In evaluating machining for large aerospace parts, for example, while I’m not a programmer, in most cases I can look at the program and tell what ought to be changed,” said Bruhis. “In the last few years between traveling and working all over the world, if I can’t review the program, I have my customer send a video of the simulation and hold an online meeting to discuss possible program modifications. Through Skype interactions, I do simulations and alter programs constantly.”

YG-1 has developed standard tools specifically for high-speed machining of titanium, but about 30 percent of its tools for this application are still custom made, with special lengths and corner radii. “One of the trends with high-speed machining is the increased number of flutes needed to take light cuts and run very fast,” he said. “The trend of the last five years is for five, six, seven and nine flutes,” he said. The advantage is longer tool life and better heat and chip control as well as machining performance.

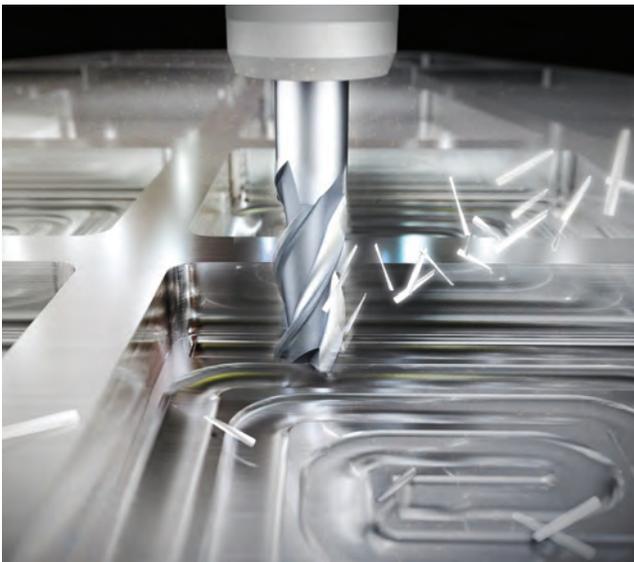
“When major OEMs call me in, it’s generally to improve tool life, the process, or both,” Bruhis continued.





“It could be a new project with them facing a serious issue. It might be a problem with part quality, or cycle time or delivering parts in time or total cost, but it’s almost never because of the cost of the tool since YG-1 offers a very attractive performance-to-cost package.”

Bruhis described how he evaluates and determines an approach to a titanium machining project. “I typically inquire first about the machine capability, whether three-, four-, or five-axis, vertical or horizontal, fixturing and tooling,” he said. He added that in the majority of cases, specific end mills are selected based on axial or radial cut, speeds and feeds, and programming for high-speed and high-efficiency machining.



Cutter paths vary and can include profiling, slotting, and pocketing. Workpieces can vary in complexity and size as well. YG-1 has tools for specific materials like titanium, Inconel or aluminum as well as general-purpose tools for smaller shops and multiple applications.

“We determine the process and program and run it within a range of speeds and feeds and estimate a cycle time,” Bruhis said. “Once the customer has a chance to run the program that we have set, we then can get feedback with real machining time results and, if the cycle time is too long and the cost is not in line with expected results, we make the required adjustments.”

Bruhis commented on an aerospace project he recently worked on. The target was to improve tool life as it was a jet engine critical part and parameters are not allowed to be changed.

Test Parameters :

- Materia
 - Inconel 718. (Stainless)
- Part –
 - Jet Engine – Pressure Plate Hole
- Operation –
 - Helical Interpolation
- Machine
 - Okuma 4 Axis
- Competitors Tools –
 - 25 competitors 4-6 Flutes style .
- Cutting tool conditions –
 - 80 SFM,
 - 18 IPM
 - 0.015 axial drop per pass
- Process
 - Helical Interpolation
- Tools –
 - Special Titanox 5 flutes double core
 - 1/4x1/4x3/4x2 with 0.045 C/R
- Tool Holder –
 - EGO FIX
- Coolant -
 - Emulsion; flood cooling
- Test Results - Tool Life – Competitor 4 - flutes Uncoated - 12-32 Holes, YG-1 tool 52 Holes
- By design a special tool we improved the process and the customer buys about 1000-3000 pieces a month. The total saving was \$500,000 on this project.



NASA'S PERSEVERANCE ROVER BRINGING 3D-PRINTED METAL PARTS TO MARS

If you want to see science fiction at work, visit a near by machine shop, where 3D printers create materials in just about any shape you can imagine.

NASA is exploring the technique – known as additive manufacturing when used by specialized engineers – to build rocket engines as well as potential outposts on the Moon and Mars. Nearer in the future is a different milestone: NASA's Perseverance rover, which lands on the Red Planet on Feb. 18, 2021, carries 11 metal parts made with 3D printing.

Instead of forging, molding, or cutting materials, 3D printing relies on lasers to melt powder in successive layers to give shape to something. Doing so allows engineers to play with unique designs and traits, such as making hardware lighter, stronger, or responsive to heat or cold.

"It's like working with papier-mâché," said Andre Pate, the group lead for additive manufacturing at NASA's Jet Propulsion Laboratory in Southern California. "You build each feature layer by layer, and soon you have a detailed part."

Curiosity, Perseverance's predecessor, was the first mission to take 3D printing to the Red Planet. It landed in 2012 with a 3D-printed ceramic part inside the rover's ovenlike Sample Analysis at Mars (SAM) instrument. NASA has since continued to test 3D printing for use in spacecraft to make sure the reliability of the parts is well understood.

As "secondary structures," Perseverance's printed parts wouldn't jeopardize the mission if they didn't work as planned, but as Pate said, "Flying these parts to Mars

is a huge milestone that opens the door a little more for additive manufacturing in the space industry."

A Shell for PIXL

Of the 11 printed parts going to Mars, five are in Perseverance's PIXL instrument. Short for the Planetary Instrument for X-ray Lithochemistry, the lunchbox-size device will help the rover seek out signs of fossilized microbial life by shooting X-ray beams at rock surfaces to analyze them.

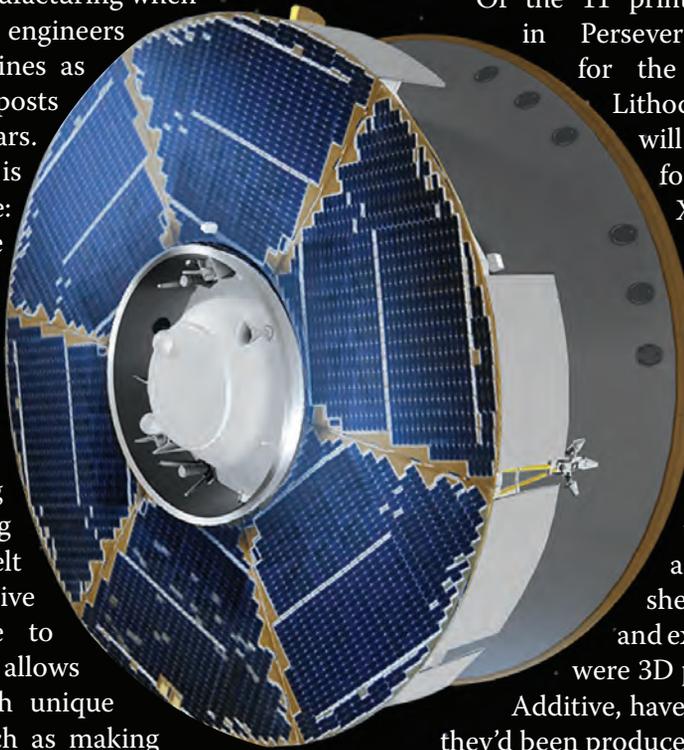
PIXL shares space with other tools in the 88-pound (40-kilogram) rotating turret at the end of the rover's 7-foot-long (2-meter-long) robotic arm. To make the instrument as light as possible, the JPL team designed PIXL's two-piece titanium shell, a mounting frame, and two support struts that secure the shell to the end of the arm to be hollow and extremely thin. In fact, the parts, which were 3D printed by a vendor called Carpenter Additive, have three or four times less mass than if they'd been produced conventionally.

"In a very real sense, 3D printing made this instrument possible," said Michael Schein, PIXL's lead mechanical engineer at JPL. "These techniques allowed us to achieve a low mass and high-precision pointing that could not be made with conventional fabrication."

MOXIE Turns Up the Heat

Perseverance's six other 3D-printed parts can be found in an instrument called the Mars Oxygen In-Situ Resource Utilization Experiment, or MOXIE. This device will test technology that, in the future, could produce industrial quantities of oxygen to create rocket propellant on Mars, helping astronauts launch back to Earth.

To create oxygen, MOXIE heats Martian air up to nearly 1,500 degrees Fahrenheit (800 degrees Celsius). Within the device are six heat exchangers – palm-size nickel-alloy plates that protect key parts of the instrument from



the effects of high temperatures.

While a conventionally machined heat exchanger would need to be made out of two parts and welded together, MOXIE's were each 3D-printed as a single piece at nearby Caltech, which manages JPL for NASA.

"These kinds of nickel parts are called superalloys because they maintain their strength even at very high temperatures," said Samad Firdosy, a material engineer at JPL who helped develop the heat exchangers. "Superalloys are typically found in jet engines or power-generating turbines. They're really good at resisting corrosion, even while really hot."

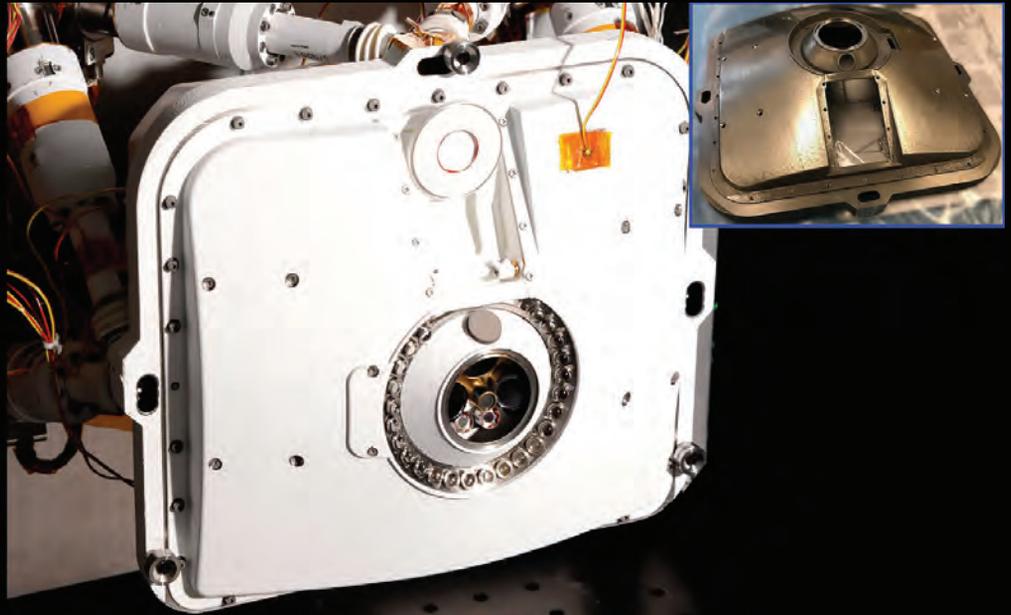
Although the new manufacturing process offers convenience, each layer of alloy that the printer lays down can form pores or cracks that can weaken the material. To avoid this, the plates were treated in a hot isostatic press – a gas crusher – that heats material to over 1,832 degrees Fahrenheit (1,000 degrees Celsius) and adds intense pressure evenly around the part. Then, engineers used microscopes and lots of mechanical testing to check the microstructure of the exchangers and ensure they were suitable for spaceflight.

"I really love microstructures," Firdosy said. "For me to see that kind of detail as material is printed, and how it evolves to make this functional part that's flying to Mars – that's very cool."

More About the Mission

A key objective of Perseverance's mission on Mars is astrobiology, including the search for signs of ancient microbial life. The rover will characterize the planet's geology and past climate, pave the way for human exploration of the Red Planet, and be the first mission to collect and cache Martian rock and regolith (broken rock and dust).

Subsequent missions, currently under consideration by NASA in cooperation with ESA (the European Space Agency), would send spacecraft to Mars to collect these cached samples from the surface and return them to



The outer shell of PIXL, one of the instruments aboard NASA's Perseverance Mars rover, includes several parts that were made of 3D-printed titanium. The inset shows the front half of the two-piece shell part it was finished.

Earth for in-depth analysis.

The Mars 2020 mission is part of a larger program that includes missions to the Moon as a way to prepare for human exploration of the Red Planet. Charged with returning astronauts to the Moon by 2024, NASA will establish a sustained human presence on and around the Moon by 2028 through NASA's Artemis lunar exploration plans.

JPL, which is managed for NASA by Caltech in Pasadena, Southern California, built and manages operations of the Perseverance and Curiosity rovers.

Where is Perseverance?

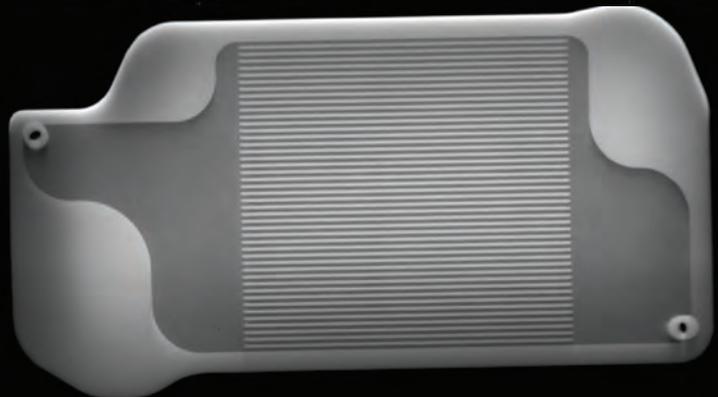
Perseverance is currently cruising to Mars.

177,984,032 miles
DISTANCE TRAVELED
FROM EARTH

57,639 mph
SPEED (RELATIVE TO SUN)

114,542,806 miles
DISTANCE TO TRAVEL
TO MARS

60.8 %
OF TRIP COMPLETED



This X-ray image shows the inside of a 3D-printed part inside of Perseverance's MOXIE instrument. Martian air will be carried inside the tiny channels in the center of this part, where they'll be pre-heated. X-ray images like these are used to check for defects inside of parts; in this case, engineers checked to make sure the channels were free of 3D printing powder.

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CNMG432	.031	AH120	TM	Super Alloys	TO-1364	\$8.78
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DNMG432	.031	T6130	SM	Stainless	TO-6805431	\$12.01
TNMG431	.015	AH120	TM	Super Alloys	TO-2833	\$9.50
TNMG432	.031	AH120	TM	Super Alloys	TO-2868	\$9.50
WNMG431	.015	AH120	TM	Super Alloys	TO-3277	\$8.78
WNMG432	.031	AH120	TM	Super Alloys	TO-3338	\$8.78

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WCMX 2.522	\$9.80 ea

Dia	Shank	LOC	Part Number	Price EA	Uses Insert
0.500	0.625	1.340	UD-0500-2D-063	\$151.80	WCMT 1.211
0.625	0.625	2.815	UD-0625-4D-063	\$218.90	WCMX 1.81.52
0.750	0.750	1.748	UD-0750-2D-075	\$168.30	WCMX 21.52
0.750	0.750	3.698	UD-0750-4D-075	\$242.00	WCMX 21.52
1.000	1.000	2.345	UD-1000-2D-100	\$184.80	WCMX 2.522
1.000	1.000	4.635	UD-1000-4D-100	\$267.30	WCMX 2.522
1.125	1.000	4.760	UD-1125-4D-100	\$267.30	WCMX 2.522

COOLANT-THRU BORING BARS

SCLCR/L Bars Using CCMT21.51 Inserts



- Coolant-thru hole design
- Chrome nickel
- 90° boring & facing with 95° approach
- Uses CCMT 21.51 inserts (not included)

MICRO 100

Shank	OAL	Min. Bore	RIGHT HAND	LEFT HAND	Price EA
1/4	3.00	.330	MI-200821	MI-200822	\$ 69.65
5/16	4.00	.380	MI-200823	MI-200824	\$ 71.50
3/8	4.50	.490	MI-200825	MI-200826	\$ 74.60
1/2	5.00	.630	MI-200827	MI-200828	\$ 77.75
5/8	6.00	.775	MI-200829	MI-200830	\$ 83.10

YG HI-PERFORMANCE ENDMILLS

4 Flute • Variable Helix • Made From C10 Micrograin Carbide



Ideal For Stainless, Mild Steels, Cast Iron & Low/Medium Hard Steels up to 40Hrc

Dia	LOC	Shank	OAL	Part Number	Price EA
1/8	3/8	1/8	1-1/2	YG-EMUGMF8901	\$ 13.51
1/4	3/4	1/4	2-1/2	YG-EMUGMF8905	\$ 23.07
3/8	7/8	3/8	2-1/2	YG-EMUGMF8907	\$ 38.02
1/2	1	1/2	3	YG-EMUGMF8909	\$ 58.42
5/8	1-1/4	5/8	3-1/2	YG-EMUGMF8911	\$ 117.96
3/4	3/4	3/4	3	YG-EMUGMF89048	\$ 150.07
1	1-1/2	1	4	YG-EMUGMF8913	\$ 272.90

WOODRUFF KEYSEAT CUTTERS



- High speed steel
- Straight tooth
- 1/2" diameter shank
- Right hand cut
- Staggered tooth and cobalt also available



Am Std#	Dia	Width	OAL	Part Number	Price
202	1/4"	1/16"	2-1/16	KEO-62010	\$26.91
303	3/8"	3/32"	2-3/32	KEO-63030	\$26.91
204	1/2"	1/16"	2-1/16	KEO-62040	\$26.91
304	1/2"	3/32"	2-3/32	KEO-63040	\$26.91
405	5/8"	1/8"	2-1/8	KEO-64050	\$27.18
806	3/4"	1/4"	2-1/4	KEO-68060	\$28.48
608	1"	3/16"	2-3/16	KEO-66080	\$34.02

SPIRAL POINTED TAPS



- Spiral point, 3 flutes, H3 limits
- HSSE-V3 3% vanadium
- Ideal for hardened tool steels such as 4140, H13 & D2
- Up to 35 HRC
- Additional sizes available

Spiral Pointed- H3 Thread Limits

Size	# flutes	Part Number	Price EA
6-32 NC	3	SOWA-123-300	\$ 6.72
8-32 NC	3	SOWA-123-302	\$ 6.72
1/4-20 NC	3	SOWA-123-308	\$ 7.44
5/16-18 NC	3	SOWA-123-310	\$ 8.40
7/16-14 NC	3	SOWA-123-314	\$ 12.32
1/2-13 NC	3	SOWA-123-316	\$ 14.24
5/8-11 NC	3	SOWA-123-318	\$ 25.84

SOLID CARBIDE ENDMILLS



- 4 flute, single end
- TiAlN Coated
- Center cutting
- 30° helix, right hand



Dia	LOC	Shank Dia	OAL	4 Flute TiAlN Coated	Price Each
1/8"	1/2	1/8	1-1/2	MO-EM001067-4	\$ 7.40
3/16	5/8	3/16	2	MO-EM001107-4	\$ 11.34
1/4	3/4	1/4	2-1/2	MO-EM001137-4	\$ 14.19
5/16	13/16	5/16	2-1/2	MO-EM001153-4	\$ 18.30
3/8	1	3/8	2-1/2	MO-EM001177-4	\$ 21.90
1/2	1	1/2	3	MO-EM001207-4	\$ 35.58
5/8	1-1/4	5/8	3-1/2	MO-EM001226-4	\$ 66.51
3/4	1-1/2	3/4	4	MO-EM001244-4	\$ 88.88

CARBIDE DRILLS STUB LENGTH • TiAlN Coated

- 135° drill point
- Right hand cut
- Made from premium submicron carbide with 10% cobalt
- For steels, stainless, titanium & nickel alloys



Size	LOC	OAL	Part Number	Price
3/64	1/2	1-1/2	SRTA-3/64-MO	\$10.04
1/16	5/8	1-5/8	SRTA-1/16-MO	\$10.12
7/64	13/16	1-13/16	SRTA-7/64-MO	\$10.80
1/8	7/8	1-7/8	SRTA-1/8-MO	\$10.82
3/16	1-1/8	2-3/16	SRTA-3/16-MO	\$14.68
1/4	1-3/8	2-1/2	SRTA-1/4-MO	\$22.66
3/8	1-13/16	3-1/8	SRTA-3/8-MO	\$44.26
1/2	2-1/4	3-3/4	SRTA-1/2-MO	\$77.94

COMBINED DRILL & COUNTERSINKS



- Plain type
- 60° angle
- HSS or M42 cobalt
- Additional sizes available

Size	Body Dia	Point Dia	OAL	For STEELS	
				HSS M2	Price
#1	1/8"	3/64	1-1/4	MAG-1150100	\$5.85
2	3/16"	5/64	1-7/8	MAG-1150200	\$5.94
3	1/4"	7/64	2"	MAG-1150300	\$6.30
4	5/16"	1/8	2-1/8	MAG-1150400	\$6.48
5	7/16"	3/16	2-3/4	MAG-1150500	\$10.22
6	1/2"	7/32	3"	MAG-1150600	\$15.12
7	5/8"	1/4	3-3/4"	MAG-1150700	\$22.14
8	3/4"	5/16	3-1/2"	MAG-1150800	\$34.29



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Length	Height	Width	Part Number	Reg. Price	PROMO!
6"	2"	3/4"	VJ-601-10	155.20	132.70
6"	2"	1"	VJ-602-10	172.30	147.32
6"	2"	1-1/4"	VJ-603-10	203.80	174.25

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W x H	Part Number	Set Price
3/4" x 1-1/2"	SN-6SER-150	\$232.75
1" x 2"	SN-6SER-200	\$232.75
1" x 2-1/2"	SN-6SER-250	\$242.25
1" x 3"	SN-6SER-300	\$270.75

Socket Head Cap Screws (Pkg of 4)
Part # SN-6LHS-13
\$9.69

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1/2-13 Stud Size

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 - 6 Forged Steel step clamps
 - 6 T-Nuts
 - 6 Steel Step Blocks
 - 1 Wall Rack
 - T-Slot Cleaner
 - Wrench
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Part # TECO-20402PL

58 PIECE KIT!

Dia	Proj	BALANCED TO 15,000 RPM		BALANCED TO 20,000 RPM	
		KINGSTON Part Number	Price Each	SPIN TRU Part Number	Price Each
1/8"	1.75"	C40-01EM175-K	\$ 49.95	C40-01EM175-KB	\$ 69.99
3/16"	1.38"	C40-18EM138-K	\$ 49.95	C40-18EM138-KB	\$ 69.99
1/4"	1.38"	C40-25EM138-K	\$ 49.95	C40-25EM138-KB	\$ 69.99
	1.75"	C40-25EM175-K	\$ 53.85	C40-25EM175-KB	\$ 69.99
5/16"	1.38"	C40-31EM138-K	\$ 53.85	C40-31EM138-KB	\$ 69.99
	1.38"	C40-37EM138-K	\$ 49.95	C40-37EM138-KB	\$ 69.99
3/8"	2.50"	C40-37EM250-K	\$ 53.85	C40-37EM250-KB	\$ 69.99
	1.75"	C40-50EM175-K	\$ 53.85	C40-50EM175-KB	\$ 69.99
1/2"	4.00"	C40-50EM400-K	\$ 53.85	C40-50EM400-KB	\$ 69.48
	1.75"	C40-62EM175-K	\$ 53.85	C40-62EM175-KB	\$ 69.99
5/8"	3.00"	C40-62EM300-K	\$ 53.85	C40-62EM400-KB	\$ 73.02
	1.75"	C40-75EM175-K	\$ 53.85	C40-75EM175-KB	\$ 69.99
3/4"	3.00"	C40-75EM300-K	\$ 53.85	C40-75EM300-KB	\$ 69.99
	1.75"	C40-10EM175-K	\$ 53.85	C40-10EM175-KB	\$ 69.99
1"	6.00"	C40-10EM600-K	\$ 60.45	C40-10EM600-KB	\$ 74.47
	1-1/4"	2.00"	C40-12EM200-K	\$ 53.85	C40-12EM200-KB



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Machine	Thread	Head Dia	Angle	Coolant	Part Number	Price EA
Fadal BT40	M16-2.0	.740	90°	No	B40-4501S	\$ 17.72
HAAS BT40	M16-2.0	.590	45°	Yes	B40-4500H	\$ 22.80
HAAS CAT40	5/8-11	.589	45°	No	C40-4501S	\$ 17.72
Fadal CAT40	5/8-11	.740	45°	No	C40-4500S	\$ 15.20
Okuma CAT40	5/8-11	.589	60°	No	C40-6000S	\$ 17.72
Mazak CAT40	5/8-11	.740	45°	Yes	C40-4500H	\$ 15.75
Mori Seiki CAT50	1-8	.905	90°	No	C50-9000S	\$ 21.85

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Taper	Height	Length	Part Number	Mfg List	Our Price
CAT/BT30	4.25"	7.09"	BI-8890-0730	\$161.98	\$145.78
CAT/BT40	4.25"	7.09"	BI-8890-0740	\$167.20	\$150.48
CAT/BT50	5.91"	9.84"	BI-8890-0750	\$246.00	\$221.40



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Boeing to Provide Six More Solar Arrays for International Space Station Augmented Power Supply to Enhance Station's Health and Enable More Research



Augmented power supply to enhance station's health and enable more research

Boeing will support the International Space Station's (ISS) growing research capabilities and commercial opportunities with new solar arrays to increase the orbiting laboratory's power supply. The modification to Boeing's ISS sustainment contract with NASA calls for Boeing to deliver six additional solar arrays to NASA for installation beginning in 2021.

The new 63-foot-by-20-foot (19-meter-by-6-meter) arrays will together produce more than 120 kilowatts of electricity from the sun's energy, enough to power more than 40 average U.S. homes. Combined with the eight original, larger arrays, this advanced hardware will provide a 20 to 30 percent increase in power, helping to maximize the station's capabilities for years to come. The arrays will provide ISS with electricity to sustain its systems and equipment, plus augment the electricity available to continue a wide variety of public and private experiments and research in the station's unique microgravity environment.

"When it comes to game-changing research and technological development, the space station is currently hitting its full stride," said John Mulholland, ISS vice president and program manager for Boeing. "These arrays, along with other recent upgrades to the station's power system and data-transfer speed, will ensure that ISS remains an incubator and business model in the commercial space

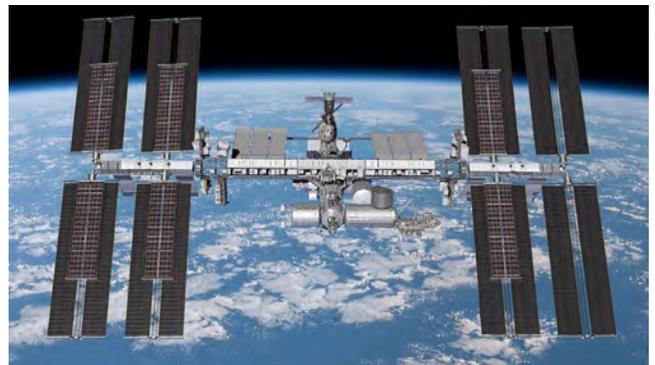
ecosystem for the coming decades. Access to this unique lab will continue to pay off as researchers study the challenges of future deep-space exploration and make discoveries that improve life on Earth."

Most of the ISS systems, including its communications systems, batteries and scientific equipment racks, have been upgraded since humans began a continuous presence on the orbiting laboratory in November 2000. Two International Docking Adapters, manufactured by Boeing, have been attached to the ISS to allow commercial spacecraft to dock autonomously to the station. Boeing is the prime contractor for ISS sustainment; the company's studies have determined that the ISS could safely operate beyond 2030 if NASA and its international partners choose to do so.

Deployable Space Systems of Santa Barbara, California, will produce the structure of the new arrays, including the canister and frame that will unfurl to hold the solar-array blankets in place. Deployable Space Systems also built the canister, frame and solar array blanket for a prototype of the new arrays that was successfully tested aboard the ISS in June 2017.

Spectrolab, a Boeing company based in Sylmar, California, produces the arrays' XTJ Prime solar cells, which will be some of the most powerful ever launched into space. They are the same solar cells that power Boeing's CST-100 Starliner spacecraft in flight and while docked to the ISS. Spectrolab also produced the station's original solar cells, as well as the solar cells tested on the prototype.

"The XTJ Prime space solar cells are much more efficient than any of their predecessors and are fit to support the cutting-edge research being done aboard the International Space Station," said Tony Mueller, president of Spectrolab.





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Industry News



James Kim Named CEO of Doosan Machine Tools America

Doosan Machine Tools has named James Kim the new CEO of its North American operations. Mr. Kim has spent the past 37 years at Doosan in a variety of roles.

“I am honored to be recognized for nearly four decades of faithful service, and I greatly look forward to promoting the incredible technology Doosan has to offer,” he said.

Mr. Kim has served Doosan Machine Tools America for the past 18 years. Prior to that, he was based in Doosan’s South Korea headquarters as marketing team leader for the Machine Tool Business Group of Daewoo Heavy Industries. In his time in the United States, he has taken on many roles, including sales management director, vice president of strategy & planning and corporate secretary (also a VP role).

“We’re very excited to see James in this new role,” said Jim Shiner, vice president of sales and marketing at Doosan Machine Tools America. “He has always been an open communicator who works to establish trust and build authentic relationships.”

Manufacturing Industry Asked to Participate in Survey of Reshoring Opportunities

What products and components offer the biggest opportunities for reshoring? What advanced manufacturing technology is needed to enable the reshoring? To what degree did the pandemic disrupt supply chains, and how did it affect sourcing? To answer these questions and better understand the needs of the manufacturing technology community, AMT – The Association For Manufacturing Technology is asking industry, including OEMs, job shops, technology suppliers and distributors, to participate in an online survey to help in “Rebuilding the Supply Chain.” The survey is open through February 28, 2021.

The survey takes about five minutes to complete. Results will be published in March on the AMT website and on [IMTS.com/supply-chain](https://www.imts.com/supply-chain), a one-stop repository for supply chain information, content and guidance resources. One of the key survey questions is whether or not OEMs and job shops would value an AMT service to connect OEMs with manufacturing technology solutions for reshoring opportunities.

“Participating in this survey will provide valuable insight on sourcing issues and which processes, products and components face the most pressure from imports and which offer the biggest opportunities to reshore,” says Peter R. Eelman, Vice President & CXO at AMT, which owns and produces IMTS – The International Manufacturing Technology Show.

“The input we receive helps AMT and IMTS develop resources to help companies make more detailed sourcing assessments and better informed sourcing decisions.”

LK Metrology adds 3D INFOTECH As Distributor

LK Metrology, Inc. announces that 3D Infotech, Inc. of Irvine, CA, has joined the distribution network for LK Metrology, a renowned CMM hardware and software solutions provider. 3D Infotech is a developer of fully integrated hardware and software solutions to standardize quality control. 3D Infotech strives to provide breakthroughs that optimize the creation, modification and comparison of 3D digital and physical information resulting in the delivery of benefits never thought possible. 3D Infotech specializes in 3D scanning and inspection automation with optical CMMs, laser and structure light scanners.

3D Infotech has been a long-time distributor of PolyWorks® software, the leader in inspection software for point cloud collection and analysis, and provider of automated inspection solutions. PolyWorks® has the ability to fully operate on a LK Metrology CMM opening new doors for CMM and Scanner solutions.

According to Scott Collier, LK Metrology’s regional manager, “3D Infotech is uniquely positioned to blend the emerging non-contact world of large-scale data scans with CMM automation on the PolyWorks® platform. With their vast knowledge of contact and non-contact measurement applications they are perfectly fitted to assist in the growth of the LK Metrology brand in the area. Having known 3D Infotech for well over 15 years, I am immensely excited to work alongside him and his team. Their blend of technical expertise and customer centric approach fits our corporate vision perfectly.”

Industry News

GTI Predictive Technology Announces New Chief Technology Officer

GTI Predictive Technology announces the appointment of Yuri Khazanov as chief technology officer, effective immediately. Khazanov leads GTI Predictive's research and development, for both hardware products and software. Additional responsibilities include product portfolio roadmap and customer technical support.

"GTI Predictive was founded to help others by developing and supplying cutting edge predictive solutions. I am pleased to have Yuri on board to help accelerate our technology and further our mission," says Tom Hoenig, president.

In his previous role with John Crane, Khazanov headed a global engineering team, specializing in developing prediction solutions for pumps and compressors. There, he researched new machine learning methods for identification of failure modes in industrial assets using sensor data.

Allied Machine Launches Allied Tool Academy

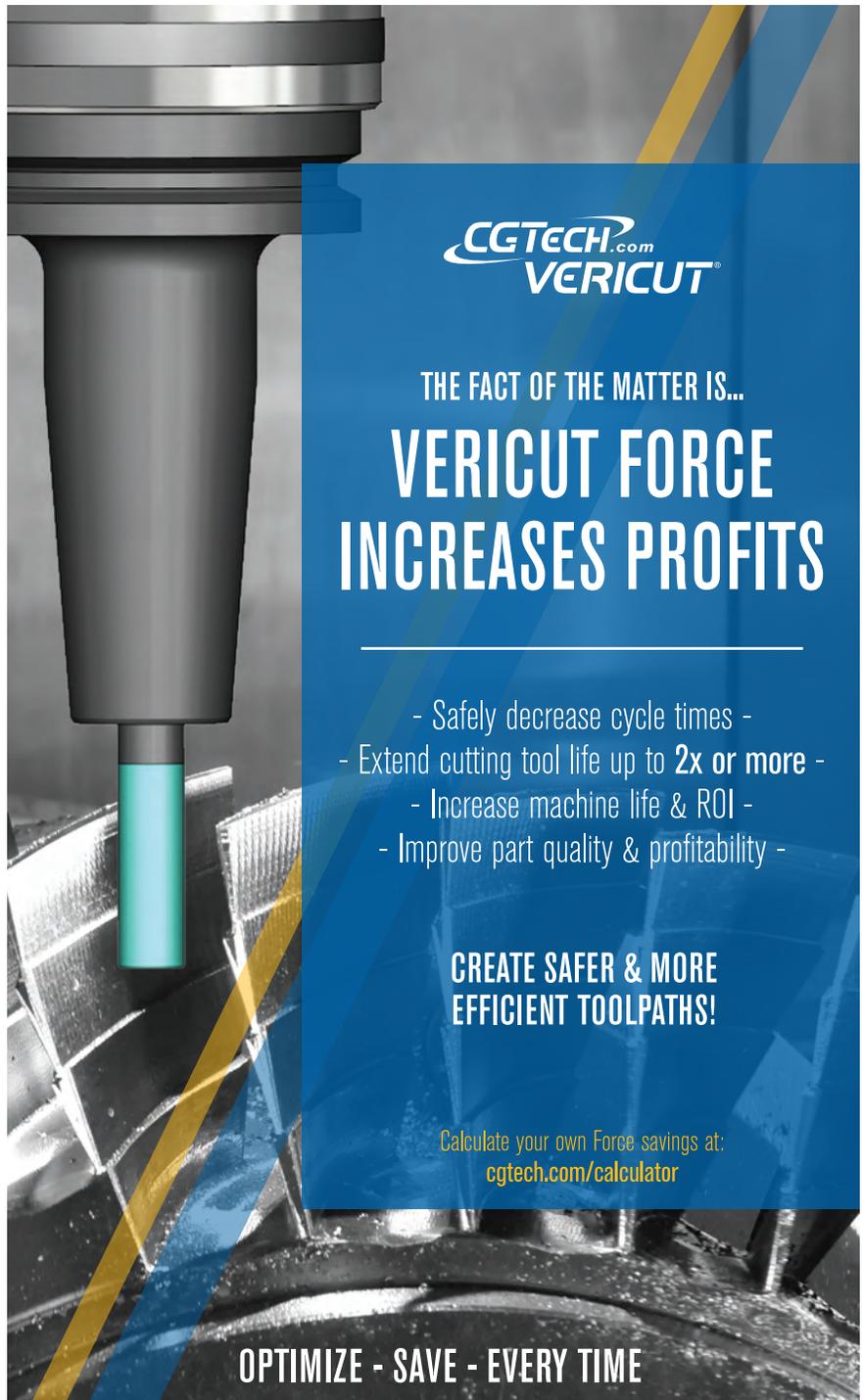
Allied Machine & Engineering launches their newly developed training program—Allied Tool Academy. Within this multilevel program, Allied distributors and end users will be able to register for online training modules, live event broadcasts and on-site Technical Education Seminars (TES). The newest segment of Allied Tool Academy, the online training platform, is now open for registration.

The Allied Tool Academy online training provides the same extensive tooling training included in the three day in-person training hosted at the company's facilities, yet distributors and end users now have access to an online resource that can be completed according to their schedule. Known

as TES Online Certification, the 10 courses currently available contain product overviews, demos and short quizzes. As the online platform grows, additional content will be added such

as specific product applications, online tools, distributor utilities and more.

Future plans for Allied Tool Academy include LIVE broadcasts and on-site TES training. Live educational broadcasts will be streamed from AI-



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Industry News

lied's training facility so that individuals worldwide can gain knowledge on a particular holmaking or finishing application. Furthermore, the in-depth application discussions and practical hands-on training sessions of TES will be offered from Allied Machine's training facilities once it is safe and appropriate to meet in person.

From basic training for associates to more advanced training for experienced persons in the industry, Allied Tool Academy now serves to meet a variety of needs. Participating in Allied Tool Academy enables individuals to be better equipped in providing optimal holmaking and finishing solutions to end users. Allied's field sales engineers are available for further on-location training as needed.

OGP Celebrates Milestone 75TH Anniversary

Optical Gaging Products (OGP®) a division of Quality Vision International Inc (QVI®), is celebrating its milestone 75-year anniversary as a world leading manufacturer of precision multisensor metrology systems for industrial quality control.

Chairman and CEO, Edward T. Polidor, remarked: "In my time with the company, I have witnessed a dramatic change in how optical instruments perform measurement. When OGP was founded 75 years ago, users typically relied on microscopes and optical comparators, depending entirely on their own judgement to ascertain the measurement. Today, the modern automatic video measuring system is

completely computer controlled, using video cameras that depend little on the operator's visual skills to produce accurate measurements. How these systems became more accurate, automated, faster, and ever more capable is OGP's contribution to this remarkable transformation."

The company started from humble beginnings in post-war 1945 producing optical comparators. Automatic edge detection for the optical comparator was developed in 1956 in the form of Projectron, an early electro-optical image sensing system. OGP introduced the first truly revolutionary computer controlled automatic video measuring system in 1980 – the Vidicom Qualifier. Then, OGP pioneered multisensor measurement by adding lasers and



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Industry News

touch probes to video systems starting in 1986 with the IQ-2000, and the technology advancements continue today with a wide range of powerful multi-sensing systems.

R. Stephen Flynn, president of OGP, added, “We have been an international company for over half of our 75 years, having established subsidiary offices in multiple countries, and channel partners covering every industrialized corner of the globe to support our growing list of customers on a local basis”.

FactoryWiz Announces Richard L. Hefner as President

FactoryWiz part of the Refresh Your Memory (RYM) family and a leading provider of machine and asset monitoring software, recently announced that Richard L. Hefner has been named as president. Mr. Hefner previously served as executive vice president for the company.

A graduate of San Jose State University (Business Administration and Information Systems), Mr. Hefner has more than 22 years employment with RYM in almost every position of the company. The last 10 years have been in senior management along with equity ownership. As a stockholder and

member of the board, Mr. Hefner has shown an extensive ability to provide leadership for the growing company.

“Richard is the right leader for FactoryWiz,” said John Hosmon, RYM’s chairman of the board. “Richard’s extensive manufacturing technology background and business development skills should help RYM strengthen channel partnerships, develop strategic alliances and expand our international sales presence. We believe his strong leadership experience will help focus RYM during their continued expansion and growth.”

“This is an exciting time at FactoryWiz. Manufacturing is running head-on into the Internet of Things, and we’ve got the right people to



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bridge that knowledge gap between manufacturing, management, and IT” notes Hefner. “We’re not just making software – we’re the field experts in this arena. We help production get what they want but we do it in a way that allows IT managers to sleep at night. We are in an excellent place to take advantage of the trend toward private clouds while keeping the manufacturing equipment itself off the internet. Establishing OEE baselines and providing the necessary reporting tools to measure them is the future of our industry.”

As a senior member of the corporation, Richard has successfully maneuvered the company through several growth phases and improvements, developed the FactoryWiz Monitoring

& DNC software product, moved the company headquarters from San Jose, CA to Corvallis, OR and managed vast trade show exhibitions around the country and internationally.

As the company welcomes Rich, they also express gratitude to John Hosmon who has served tirelessly as founder and president since the inception in 1983. Mr. Hosmon will continue to serve as board chairman and maintain his service with RYM in a position that he truly enjoys, sales administration.

Moving forward, the FactoryWiz team is excited for continued success, growth and impending innovation under the leadership of Mr. Richard Hefner.

ESPRIT Announces New On-Demand Learning Center for Programmers

ESPRIT announces the debut release of its on-demand training platform, ESPRIT Learning Center, to the general public.

Traditionally, ESPRIT’s applications engineers lead in-person trainings in ESPRIT offices and also on-site at customer facilities around the world. While application engineers offer some of the best CAM courses in the industry, the ESPRIT team understands that not everyone who needs software training has the resources to travel to an ESPRIT office.

To support customers throughout the pandemic, ESPRIT began con-

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ducting instructor-led, online training sessions in early 2020. To further satisfy users' growing appetite for high-quality online training, ESPRIT now introduces the ESPRIT Learning Center to the general public.

The ESPRIT Learning Center is an online training platform with on-demand, self-paced training courses created specifically for ESPRIT CAM programmers. ESPRIT's top engineers and instructors have poured a huge amount of effort and energy into creating these courses. The first learning paths to be released are "New User Milling," "New User Turning," and "New User Mill-Turn." Each learning path includes five to seven training courses that guide users through several different machine models and part models to introduce different machining processes in ESPRIT.

The main purpose for creating discrete online learning paths is to replicate what a student can learn from an on-site training class. Users may take the course anywhere, and at any time. Each learning path also comes with one ESPRIT student license for each learner, so users can take the courses at home or in their free time, without interrupting their daily programming or production work.

TRAK Machine Tools Chooses ModuleWorks Adaptive Roughing Technology

TRAK Machine Tools (Southwestern Industries, Inc.) has integrated ModuleWorks adaptive roughing software into its ProtoTRAK RMX CNC control.

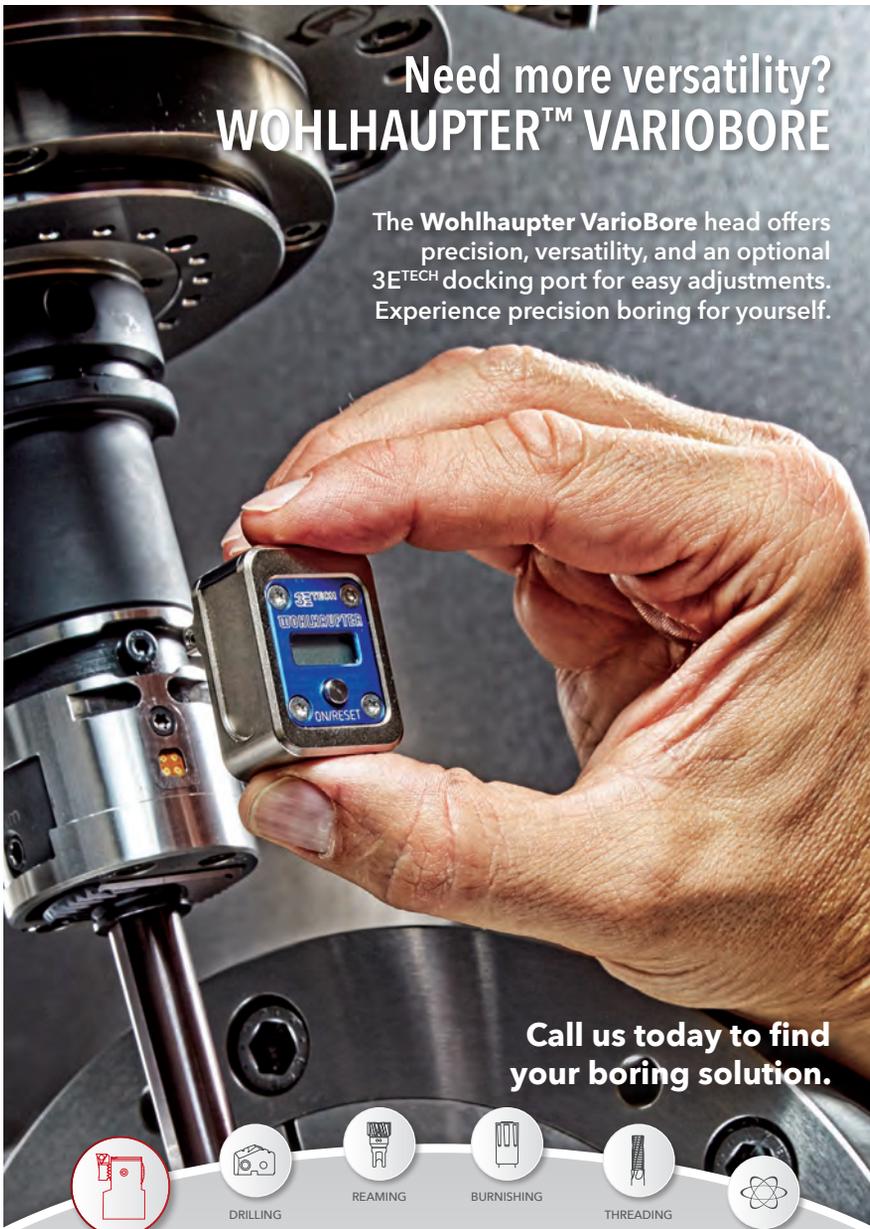
The adaptive roughing algorithms enable the ProtoTRAK RMX to achieve faster and more accurate cutting with less wear on the tool.

The ProtoTRAK RMX CNC is specially designed for efficient one-

off and small lot machining. It uses touchscreen programming with convenient tool selection for fast job set-up together with onboard toolpath verification and cutting simulation to

quickly verify jobs on the shop floor.

Southwestern Industries reports the ModuleWorks adaptive roughing technology further optimizes the overall production process by delivering faster and more precise machining



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and, therefore, lower part cycle times.

Integrated into the Proto-TRAK RMX CNC, ModuleWorks adaptive roughing engages almost the entire cutter. This speeds up machining because features such as pockets and islands are machined to full depth in

just one cut instead of multiple cuts. Moreover, the tool stays fully engaged all the time, even under high chip loads, to help ensure optimal cutting and a high-quality finish. Less power is required for cutting which means less wear on the tool, and the workpiece

stays cooler which improves the accuracy of the finished part.

Steve Pinto, president of TRAK Machine Tools, said, "With our touchscreen CAM programming, we had already reduced set-up time by around 25%. With ModuleWorks adaptive roughing, we now also accelerate the cutting process and further increase the profitability of high-mix, low volume machining."

Mark Foti, Head of Digital Factory at ModuleWorks, said "It is great to see the extended adoption of the ModuleWorks shop floor solutions, consisting of both simulation and tool-path generation technology, and we are delighted that our adaptive roughing toolpath cycle boosts the productivity of TRAK's machines to the next level."

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Print from CNC

- Standard macro DPRNT type commands from CNC
- The CNC feeds the indexer control box each AB move
- RS232 and M function communication

M function cycle

- Internal control box programming
- The CNC starts each cycle
- M function communication

Manual cycle

- Internal control box programming
- Start button activation



SGS Round Solid Carbide Tool Libraries Available for Mastercam

CNC Software, Inc., developer of Mastercam, has announced a new partnership with KYOCERA SGS Precision Tools (KSPT) to provide tool libraries to the Mastercam user base. KSPT is an ISO 9001:2015-certified manufacturer of round solid carbide cutting tools.

"CNC Software is proud to partner with KYOCERA SGS Precision Tools. We are excited to offer 10 specialty series tool libraries of SGS tools in a native Mastercam tool library format for download," said Stas Mylek, partnership program manager, CNC Software, Inc. "As a result, Mastercam users gain fast, seamless access to the latest high-performance SGS round solid carbide cutting tools."

With this collaboration, Mastercam users can download both inch and metric SGS round solid carbide cutting tool libraries from the Mastercam Tech Exchange. The native

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Industry News



Mastercam 3D tool databases are fully compatible with Mastercam 2020 and subsequent releases. These offer the latest KSPT innovations and SGS product introductions, including their latest Z-Carb HPR roughing line and H-Carb end mills for dynamic milling. The native libraries represent more than 12,000 tools including ferrous and non-ferrous cutting tools ranging from end mills, routers, micro tools and drills to reamers and countersinks.

Simmons Now Offering Niles-Simmons Machines in North America

Simmons Machine Tool Corporation has established the Niles Technical Application Center (NTAC) at its manufacturing facility and headquarters in Albany, New York. The center will be the company's platform for offering Niles-Simmons machines to North American customers.

Simmons is now responsible for all product sales and support of Niles-Simmons machinery to non-automotive customers in North America, targeting customers in industries such as aerospace, defense, railway and machinery manufacturing. Under the common ownership of the American

NSH Group (Niles-Simmons-Hegenscheidt), Niles-Simmons designs and manufactures precision CNC machining centers.

Simmons will be receiving the Niles-Simmons N30 MC multi-axis multi-function turning center at its facility in Q1 2021 to serve as the NTAC's centerpiece. This machine will allow Simmons to work closely with customers and perform "applications engineering" on workpieces. The company plans to prioritize applications development that utilizes the N30 MC's turning, milling, boring, drilling, and other machining process capabilities.

Boom Aerospace Relies on Verisurf Software



"When you are designing and building a supersonic commercial aircraft, precision and quality verification of every part is critical."

Todd Wyatt
Metrologist, Boom Aerospace

"Verisurf software works with all our measuring devices and CAD files, and those used by our supply chain. Using Verisurf as a common measurement platform has improved quality and efficiency in inspection, reverse engineering, tool building and assembly guidance at Boom."



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New Products

Expanded Range of Dual Column Fully Automatic, Miter NC Band Saws —Knuth

Knuth offers its expanded range of ABS NC series band saws.

Featuring a generous 16" cutting capacity, the dual column ABS 400 NC expands on the ABS 300 NC. This German designed saw includes: Siemens touchscreen NC control, automatic cutting angle adjustment, fully automatic workpiece feed with hydraulic shuttle vise, automatic blade breakage control, inclined saw blade for improved performance and infinitely variable cutting speed.

Also included with the machine is a 79" gravity infeed table,

coolant system, central lubrication and chip conveyor. Programmability comes by way of the PLC, with glass scales for accuracy of the feed system and cut length. Kerf compensation is also standard, compensating for blade thickness and providing precise cutting for every job.

New Compact 5-Axis VMC —Mazak

Mazak Corporation recently debuted its new VARIAXIS C-600 Vertical Machining Center (VMC). The machine's design allows seamless automation integration for production facilities of any size, from job shops to large manufacturing plants. As an

initial automation option, shops can have a two-pallet changer installed on the VARIAXIS C-600, a simple solution designed to virtually eliminate the non-cut time associated with part loading and unloading.

The VARIAXIS C-600 provides both front and side automatic door operation. The machine's full front door spans from the top to the bottom of the machine. An automatic side door allows shops to load and unload parts at the side of the machine with a robot, freeing up the machine's front work area.

Side loading also gives shops the option to easily add standard, pre-engineered robotic part-loading systems to single-pallet/table machine configurations. In those instances, the

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VARIAXIS C-600 can be equipped with through-pallet hydraulics and pneumatics. With these ports, shops can mount fixtures to the machine's table, and upon part loading, the workholding sends a signal that triggers automatic part clamping.

Mazak offers four spindle options

for the VARIAXIS C-600. In addition to the standard 12,000 RPM CAT40 spindle, 15,000 RPM, 18,000 RPM and 20,000 RPM options are available in CAT 40, BIG-PLUS or HSK A-63 types.

The 12,000 RPM spindle with a motor output of 11/11 kW (40%ED/cont.) and torque of 70/57.3 Nm (40%ED/cont.) comes standard.

On the control side, the VARIAXIS C-600 features a new MAZATROL SmoothAi CNC made specifically for maximizing full 5-axis machining performance while running peripheral functions. "The MAZATROL SmoothAi control and associated software packages offer digital enhancements designed to add efficiency and value throughout the machining process

with the power of artificial intelligence (AI), machine learning and advanced data management technology," said the spokesperson.

Other MAZATROL SmoothAi functions include SMOOTH Ai Spindle and Ai Thermal Shield. SMOOTH Ai Spindle leverages AI technology to optimize cutting conditions and surface finishes through automatic spindle vibration detection, while Ai Thermal Shield offers stable machining accuracy through machine-learning-enhanced heat displacement compensation.



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New Products

New High-Speed Video Measuring System For Quality Control

—Nikon

Nikon Corporation in Japan has developed a new CNC video measuring system that provides what they report is unparalleled accuracy, repeatability, and reliability. Also known as a vision measuring system, the NEXIV VMZ-S3020 is optimized for automated quality control applications

in a production line, as its high speed allows real-time feedback of measured results to the manufacturing process.

The system is ideal for inspecting a wide variety of mechanical, electrical, electronic, moulded, cast and pressed components that fall within its 300 x 200 x 200 mm working volume. Nikon's proprietary optical measuring, image processing and analysis technologies are employed to detect feature edges at very high speed.

The new NEXIV VMZ-S series can achieve even faster movements and image capture steps than its predecessor by the improvement of stage control technology and image processing algorithm. In-house-developed,



high-resolution, linear encoders feed the position of the stage back to the control, maintaining high measuring precision and consistency. Image transfer and subsequent processing of the data are also quicker.

Nikon has designed top-quality optical systems using its own exceptional "glassware" to deliver high quality images and further realize accurate measurement data within the field of view and beyond. Enhancements to the through-the-lens (TTL) laser auto focus, giving repeatability to better than half a micron.

Fast laser scanning (1,000 points/sec) can rapidly acquire the cross-sectional shape of a surface and evaluate the relative heights.

A fully featured measurement software environment, NEXIV Auto-Measure, enables high accuracy, high speed, and high usability with easy measurement cycles using tools that are accessible in a user-friendly GUI. For simple shape components, it has been enhanced with support functions which automate part of the measurement programming process.

Popular Kit Encoder Series Expanded —HEIDENHAIN

HEIDENHAIN introduces a new high accuracy motion feedback encoder that can now be used for absolute positioning in machines in the

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New Products

semiconductor, metrology and robotic industries. This new LIC 3100 absolute kit encoder is an additional offering that fits between HEIDENHAIN's already LIC 4100 and 2100 series.

The new LIC 3100 encoder is carried by a sturdy stainless-steel tape. This steel tape scale has a 2-track graduation resulting in a period of 80 microns. The tape scale is offered in rolls at 3m, 5m, and 10m lengths and can be inserted into an aluminum extrusion for better thermal growth behavior or can be mounted directly to the motion axis surface with an adhesive backing on the steel tape.

The reader head of the LIC 3100 can output a measuring step of just 10 nanometers and maintain a velocity of 10 meters per second. It is offered with the well-known EnDat 2.2 high speed serial electrical interface as well as five others, making it plug-and-play compatible with motion controllers. The interpolation error, or cyclical error, is merely +/- 100 nanometers.

Mounting of the reader head to the scale is fast and simple due to forging mounting tolerances and easy-to-use handheld diagnostic tools. A zero-datum position can be programmed anywhere along the scale length.

New Five-Axis Postprocessor —CNC Software

FANUC America and CNC Software, developer of the Mastercam CAM software, have released a new postprocessor designed to optimize five-axis capabilities in Fanuc CNC machines. The new postprocessor allows advanced machine tool operators to reduce their cycle times while boosting part accuracy, particularly for CAD/CAM-generated five-axis simultaneous contouring part processes.

Key functions in the Milling Standard Package for FANUC controls

include Tool Center Point (TCP), Workpiece Setting, Error Compensation (WSEC), advanced lookahead algorithms AICC II with Smooth Tolerance Control+ and an Easy Setting Function to support multiple

acceleration and process profiles. The companies designed this package to power the future of advanced five-axis machining in conjunction with the latest FANUC-controlled machine tools and the new Mastercam postprocessor.

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Horizontal CNC Machining Center for Maximum Efficiency —Hurco

The Hurco HM1700Ri (XYZ travels: 67" x 47" x 35") horizontal milling machine is designed for maximum efficiency and is equipped

with pre-tensioned, dual ballscrews for increased rigidity. The large, front and side access doors allow for easy operator use. It is fully equipped with an 8,000 RPM motorized spindle and suitable for a wide range of applications.

The HM1700Ri is also equipped with a direct drive B-axis torque table. "With fast rapids, large work cube and unique frame design, the HM1700Ri allows complex production parts to be machined efficiently and accurately," said a company spokesperson.

The Hurco HM1700Ri is equipped with the Hurco control powered by WinMax software and the patented motion system called UltiMotion. "The control helps machinists and job shops be more productive and profitable by supporting many programming meth-

ods: conversational programming; NC programming; and a Hurco-specific feature called NC/Conversational Merge that optimizes efficiency even further," said the spokesperson. The Hurco control's technical specifications include 4 GB RAM, 128 GB solid state drive and 10,000 block look-ahead.

"UltiMotion reduces cycle time and improves surface finish quality by determining the optimal trajectory to run the tool and providing consistent programmed feedrates," said the spokesperson. "With up to 10,000 blocks of dynamic variable look-ahead, UltiMotion is smart enough to adapt as required by the tool paths. Hurco equips UltiMotion on all Hurco CNC machining centers and it works automatically without any set-up required."

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New Products

Next Generation JobShop Cell PRO Introduced —Methods Machine Tools

Methods Machine Tools, Inc., has introduced the JobShop Cell PRO, a new standard automation solution featuring the RoboDrill D21SiBadv vertical machining center series. The JobShop Cell PRO incorporates a main enclosure with several different pre-engineered end-of-arm and infeed/outfeed options for a range of part and capacity requirements.

“Building on nearly 15 years of experience with the widely popular JobShop Cell, we are pleased to provide a reimagined standard PRO version which accommodates multiple infeed and outfeed options for high mix, medium volume machining applications,”



said Mr. John Lucier, FANUC automation manager, Methods Machine Tools, Inc. “Having an in-stock automation solution, featuring exceptional, proven technology, saves cost and speeds delivery to our customers.”

JobShop Cell PRO features an

industrial grade, articulating FANUC 6-axis robot in a versatile aluminum enclosure which allows the RoboDrill to be placed on the left or right side, or in a twin cell with two machines. In the twin cell, two side-by-side RoboDrill machines with a FANUC robot entering from the side of each machine gives operators full, open access to the front of the RoboDrills for tool changes, off-sets and maintenance. Removable panels on the common enclosure allow for several different infeed and outfeed options including conveyors, drawers, lazy susan style pallet system.

The compact, high speed RoboDrill D21SiBadv offers multi-axis simultaneous machining with a 10,000 or 24,000 RPM BBT-30 spindle. Customers may choose from a 3, 4 or 5-Axis

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New DHF 8000ST Five-Axis Machining Center —Doosan

Doosan Machine Tools introduces the DHF 8000ST, a single table version of the DHF 8000 five-axis horizontal machining center. This new model incorporates a turning function and

was designed without a pallet changer to offer a smaller footprint.

The nodding head spindle and direct-drive B-axis rotary table allow the DHF 8000ST to handle a complete range of machining and turning processes from roughing to finishing in a single setup. This ability to attack parts from all sides provides increased parts accuracy. In addition, the configuration makes quick work of multi-face work-

pieces and the 5-axis simultaneous machining of complex shapes.

Like the DHF 8000, the nodding head spindle has a stroke of +60 to -100 degrees (up/down) with clamping torque of over 3,600 ft-lb. The DHF 8000ST comes with a 47 horsepower HSK100-T spindle taper with a 6,000 r/min gear head spindle.

This scaled-up HMC can easily support workpieces weighing up to two tons. A 1,000mm 39.4" diameter pallet offers a bigger work envelope from the previous model, and its large working area can readily hold parts up to 62.9" diameter x 55.1" in height.

It is constructed with cross roller linear guideways. The Y and Z axis are fitted with dual ball screws, while the column is designed with high static

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New Products

and dynamic rigidity. Linear scales on each axis maintain superior positioning accuracy.

A thermal compensation system, consisting of sensors strategically placed within critical areas of the machine, is monitored and compensates if thermal growth is detected. Cooling systems for the spindle and ball screws also assist with thermal stability. A 120-tool magazine comes standard, which is expandable to 376 tools. The DHF 8000ST comes equipped with a Siemens 840D control.

New Vise Jaws Can Be Machined to Match Contours and Curves of Workpiece

—Dillon Manufacturing

Dillon Manufacturing, Inc. introduces vise jaws with exacting tolerances (+/- .002" in all dimensions, including flatness), with machined work surfaces to fit the contours and curves of the workpieces. Available in 1018 steel, stainless, 6061 aluminum, or specified alloy materials, in standard or custom blanks. Soft jaws



or hardened (heat treated) jaws in HD or HDL vises. Made in the USA in ISO 9001:2015 facilities. Dillon Vise Jaws are available with industry standard hole patterns that fit most manufactured vises including Chick,

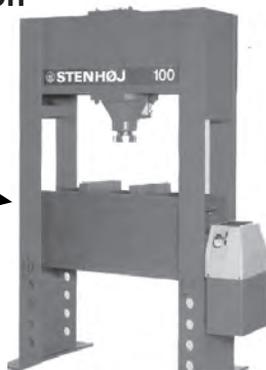
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Carbide coating can be added for improved gripping after the Vide Jaws are machined to specifications. Comprised of wear resistant carbide alloys that increase grip to enhance mill performance,

5-Axis VMC with Tower Pallet —Matsuura Machinery USA

Matsuura Machinery USA offers the MAM72-52V, a high speed, large capacity 5-axis vertical machining center (VMC). The MAM72 series originated the concept of the tower pallet system.

“Achieving process integration, complex 5-axis machining and versatile functionality in all machining environments, variable-part/variable-volume production and reliable ex-



tended unmanned operation are standard features of the MAM72 series,” said a company spokesperson. “The MAM72-52V is designed to handle a greater workpiece size than our existing models.”

With the new MAM72-52V, the maximum workpiece size is D 520 mm x H 400 mm with a load capacity of 300 kg per pallet: a 23% increase in diameter, 50% increase in weight and 75% increase in envelope volume compared to existing models.

“The newly developed 4th/5th-axis table equipped with direct drive motors achieves a rapid traverse rate of 50 RPM and 100 RPM respectively,

enabling both high speed and high accuracy in one machine,” said the spokesperson. “Improved accessibility and good operability for set-up are ensured since the distance from the machine front (oil pan edge) to the pallet center is reduced to 564 mm and spindle center to 134 mm.”

The MAM72-52V features include a matrix tool magazine (130 tools/330 tool magazine base), tower pallet system (PC15) and chip removal system (spiral chip conveyor, lift-up chip conveyor) as standard.

5-Axis Universal Machining Center —Grob

Grob Systems offers its second-generation G350 featuring a compact design, enhanced milling performance, high visibility and optimized work area access.

“The Grob Systems G350 universal machining center delivers high productivity, optimum availability and excellent maintenance access,” said a company spokesperson. “What is more, it features a unique machine concept: three linear and two rotary axes



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permit 5-axis simultaneous machining and simultaneous interpolation. The machine's unique axis arrangement permits upside down machining, offering almost limitless possibilities for part machining."

The arrangement of the three linear axes minimizes the distance between the guides and the machining point (TCP), enhancing stability. Due to the machining center's axis concept, the full tool length can be employed in any axis position, even with maximum part size. "This 'tunnel' concept provides the basis-even with extremely long tools-for being able to swivel and machine the largest possible component within the work area without colli-



sion," said the spokesperson.

It offers a swivel range of 230° in the A-axis and 360° in the B-axis. The machine bed's intrinsically stiff welded design provides machine rigidity.

The G350 also features absolute

position encoders, an air purge seal in all linear and rotary axes, and a disk-type tool magazine for fast tool change.

Clamping Device Change-Over in Less Than One Minute —Hainbuch

Hainbuch introduces the new centroteX S clamping device change-over system. The mini version has all the proven centroteX technology, however with an additional advantage: Actuation takes place with just one screw; thus, you save even more set-up time, and this system was designed to enable a robot to quickly change the clamping

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device. With lesser tightening torque than is required with the large variant, the centroteX M, the centroteX S can be assembled more quickly and this is executed with the highest repeatability and at the same time it also offers more ergonomic operation. With its diameter of just 52 mm, and the small outer diameter of 224 mm, centroteX S is the ideal quick change-over system

for machines with a small workspace.

The machine adapter is mounted on the spindle, subsequently the adapter and the adapter counterpart that is equipped with the clamping device can be exchanged within the shortest time possible. The result: shorter set-up times, fast ROI and increased cutting times. The centroteX systems can be utilized with either a Hainbuch supplied chuck or the customer's existing chuck.

Angled Round Toolholders

—THINBIT®

THINBIT®, manufactured by Kaiser Tool Company Inc., introduces angled round toolholders. These tool-



holders are designed for CNC, conventional and end working positions on Swiss screw machines.

The new angled round toolholders position the insert at 30°, 45° or 60° angles for reliefs, undercuts and angled OD and face grooves. Round shank sizes are available in diameters of 1/2", 5/8", 3/4", 1", 20 mm and 25 mm.

The angled round toolholders are



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Modifications can be provided on any of their tooling. Due to the potential complexity of configuring these toolholders, the company recommends calling contacting Thinbit for assistance.

2-Inch Non-Guide Bushing CNC Swiss —Ganesh

The GENTURN-52CS Y2 is a 2” bar capacity 8-axis Swiss mill/turn center featuring a subspindle & dual “C” &

“Y” axes for the production of complex work in just one handling. There is no guide bushing in this sliding-headstock machine which simplifies setup.

Ample tool stations are provided with 33-tool positions and 13-driven tools included. Twenty tool stations service the front side work and an additional 13-backworking tool positions are all standard! The 20 front side tool positions consist of: 6-live cross tools, 3-live axial tools, 6-turning tool stations, and 5-ID tool stations, all in a quick access gang configuration to reduce tool-to-tool time. The counter spindle has 13-tool stations including: 4-axial driven stations with 4 live tool holders included. An additional 4 driven tools can be plugged into the subspindle tool block as needed. Also 9-I.D. stations are included; 4-I.D.



stations from the dedicated subspindle tool block, and 5-I.D. stations shared from the backside of the main spindle tooling bridge.

The machine has a heavy ribbed torque-tube box casting and weighs over 13,800 pounds. Both main and counter spindle feature accurate “dead-length” gripping and feature a high-performance C-axis with full contouring and 360,000 radial posi-

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tions (0.001-degree resolution). C-axis operations facilitate engraving and milling highly complex part details. The 2" bar capacity spindle runs up to 6000 RPM and the rapid travers rate is 1,181 IPM.

A long list of standard features are included. Barloader interface and connector plug and 6-ER-20 collet extensions are also provided as well as operator and programming training.

Highly Flexible Additive Machine —Chiron

The Chiron Group has expanded its core competencies - metalworking and automation - to include additive

manufacturing. "As a result, we are now a single-source provider of complete solutions for all components that cannot be produced using conventional manufacturing methods alone," said Axel Boi, head of additive manufacturing at Chiron Group. "Laser metal deposition is the company's technology of choice for additive manufacturing, including coating, 3D-printing, and repair," he said.

The very compact Chiron AM Cube is an easy to use 3D metal printer for manufacturing large and complex components. It is suitable for coating and repairing components up to 500 mm in size, for cylindrical components up to a meter long and for the near-net-shape production of semi-finished products. The AM Cube can be provided with up



to 3 deposition heads with patented, hardwired energy, material and data supply.

Automatic deposition-head changing permits wire or powder feedstock material for 3D printing or coating, internally or externally. The AM Cube can be provided as a 3-axis, 4-axis, or 5-axis system.

The deposition head on the Chiron

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Group's AM Cube can be changed during an active printing/coating process. This allows different process requirements to be fulfilled: For example, one deposition head can be used to achieve a high-quality surface finish, while another can be used to achieve a high deposition volume. The automatic head change function enables these properties to be combined in a single workpiece. The AM Cube has three deposition heads in total and additionally allows the deposited material to be changed.

Teach-Mode Lathe —ACER

The ACER ATL-1440E is a combination of a manual lathe, a lathe with

teach modes and 2-axis CNC capability. "This combination, along with constant surface speed, reduces set-up times, lengthens tool life and reduces cycle times, which, in turn, increases productivity," said a company spokesperson. "Operations such as turning threads, tapers, chamfers and contours can be performed on the ATL faster and more efficiently."

The Fagor 8055i/A-TC control is capable of conversational and G Code programming. Additionally, the control has graphical conversational help modes with a fill-in-the-blank format that is displayed on a clear and concise 10-1/2" monitor.

The ATL-1440E has a 14" swing over bed and 40" distance between centers, integrated with a 5 HP motor,

1-9/16" (40 mm) spindle bore, dual electronic handwheels and features constant surface speed. The machine includes a semi-enclosed splash guard with a sliding door, electromagnetic brake and automatic lubrication. The lathe is constructed with a Meehanite honeycomb ribbed casting bed for enhanced rigidity and dampening capability for high accuracy during rough turning and improved surface finish during fine turning.

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New Products

has released two smaller sizes of the EWN Smart Damper precision boring heads, which eliminate vibration in deep-hole finish boring with a patented damping system. The additions make it the first time the EWN Smart Damper has been available in diameters below 1.260", down to 0.787". The CK1 head has a length of 3.937" and the CK2 4.921".

BIG KAISER's modular CK/CKB system allows for versatility in the length of tooling combinations, up to a maximum of 10 times diameter and can run on nearly every major spindle interface. All tools are coolant-through and have three different insert holder options per head size. The tried-and-true EWN analog head features a dial with 0.0005"/div setting accuracy (.0001" w/ Vernier).

The integral design of these Smart Damper heads shortens the distance from the damping mechanism to the cutting edge, which is the source of vibration. BIG KAISER reports this produces higher damping effects to the tool assembly to minimize the chatter or vibration, thus achieving better surface finishes and improved

that allow long part pass-through to help accommodate oversized parts," said the spokesperson.

The TRM3016 is equipped with the 9000 Series control that features 120 GB disk storage, 4 GB memory,

up to 10x better graphic performance, mid-travel tactile keys and a 15" LCD touchscreen. "The Windows-based platform offers all the user-friendly features that Milltronics customers are used to, such as the G-code visualization screen," said the spokesperson.

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TRM3016 CNC Machining Center —Milltronics

"Milltronics has a long history of building tool room mills that can be run as manual, teach or full CNC. Popular in tool rooms, job shops and tool & die, these machines are very flexible and can be used for a wide variety of different parts," said a company spokesperson.

The TRM3016 is a tool room mill that offers large travels (30" x 16" x 20") along with speed and power. It features a table capacity of 35.4" x 16", an 8,000 RPM BIG-PLUS ISO No. 40 spindle and a 15 HP spindle motor. "A unique feature of the TRM Series is the drop-down door openings

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"Our KC-46 fleet is growing, and we're ready to extend the reach of next-generation air refueling to more of our Airmen," said Col. Jason Lindsey, U.S. Air Force KC-46 System program manager.

Boeing delivered the first KC-46A to the U.S. Air Force in January 2019. Since then, the company has delivered 42 tankers to McConnell Air Force base in Kansas, Altus Air Force Base in Oklahoma, Pease Air National Guard base in New Jersey and Seymour Johnson Air Force base in North Carolina.

Boeing is assembling KC-46A aircraft at its Everett, Washington, facility.

Arcimoto to Expand Manufacturing Footprint by 185,000 Square Feet In Eugene, Oregon

Arcimoto, Inc.® makers of affordable, electric vehicles for everyday commuters and fleets, announced that it has agreed to purchase a 185,000 square foot manufacturing site in Eugene, Oregon. More than five times

as large as Arcimoto's current manufacturing facilities, the new site will be instrumental in achieving mass production of Arcimoto's ultra-efficient electric vehicles.

"In 2020 we articulated an aggressive goal to achieve mass production within two years," said Arcimoto Founder and CEO, Mark Frohnmayer. "We believe the acquisition of this existing manufacturing facility is a critical leap toward our goal."

"Purchasing an existing facility helps reduce risk during scale," said Chief Strategy Officer Jesse Fittipaldi. "Instead of spending time designing and then building a new factory, we can start right away with facility retrofits and production line layout. We are thrilled that this site became available at an opportune moment in our planning process."

The sale is contingent upon the Company's complete and unconditional approval of the property and its physical condition, zoning and land use restrictions, and a Phase I environmental assessment. Closing is scheduled to occur on March 31, 2021



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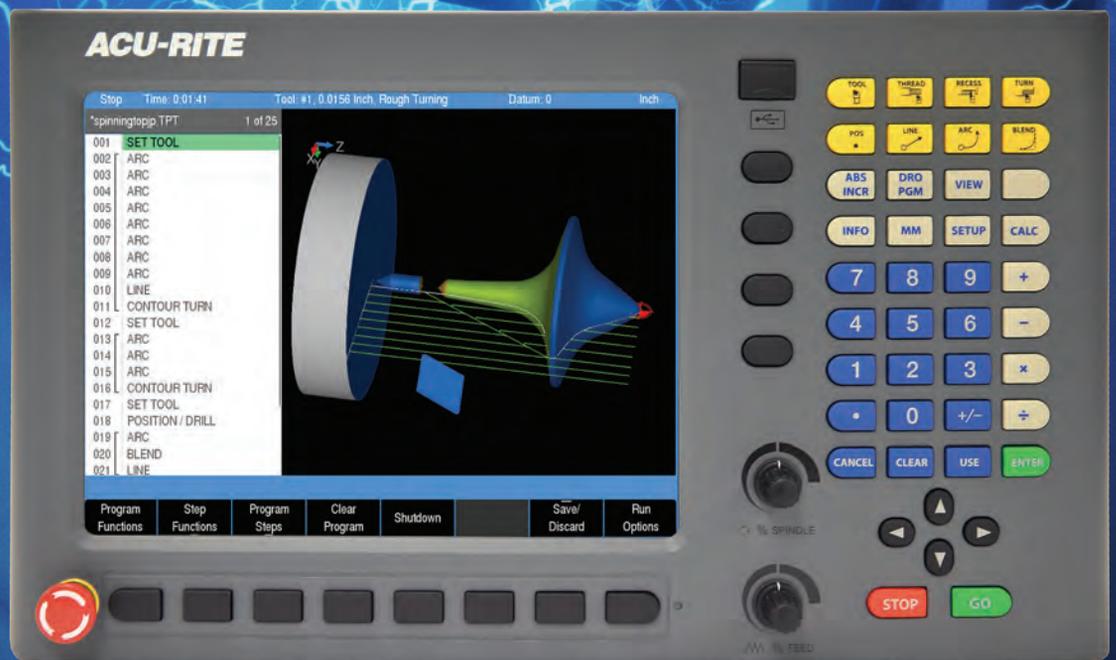
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