



BURKHARDT
+
WEBER



strong. precise. customized.

MC μ SERIES.

MCμ 750

MCμ 800

MCμ 900

MCμ 1000

MCμ 1200

MCμ 1250

+ HIGH BURKHARDT+WEBER
CONTENT

+ EXCLUSIVE DESIGN FOR PRECISION

+ MADE IN REUTLINGEN

+ ACCURACY BY DESIGN, NOT BY COMPENSATION

+ RIGID BASIC STRUCTURE

+ LONG TERM ACCURACY

BW BURKHARDT
+
WEBER

MCμ 1200

BW BURKHARDT
+
WEBER

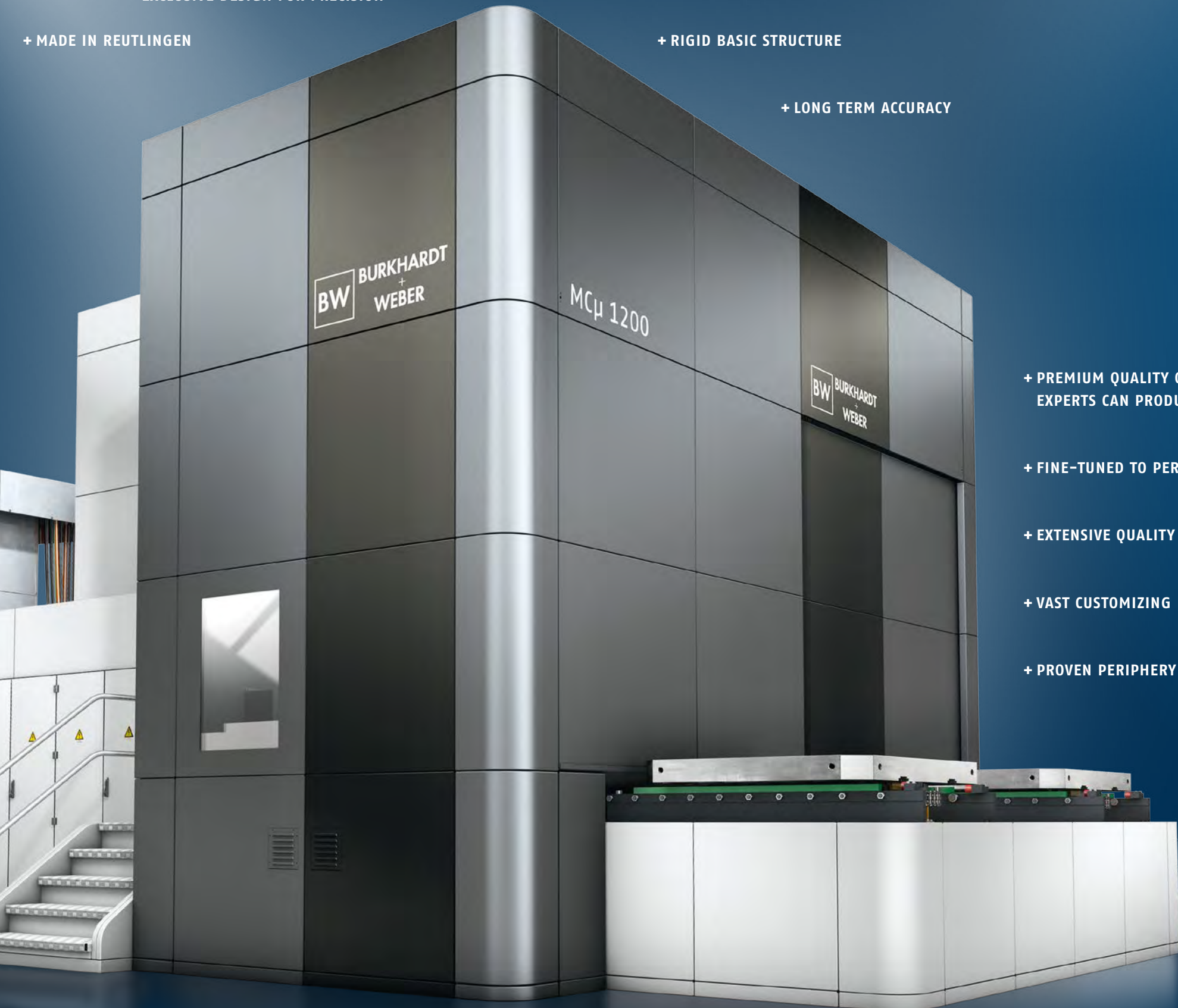
+ PREMIUM QUALITY ONLY
EXPERTS CAN PRODUCE

+ FINE-TUNED TO PERFECT PRECISION

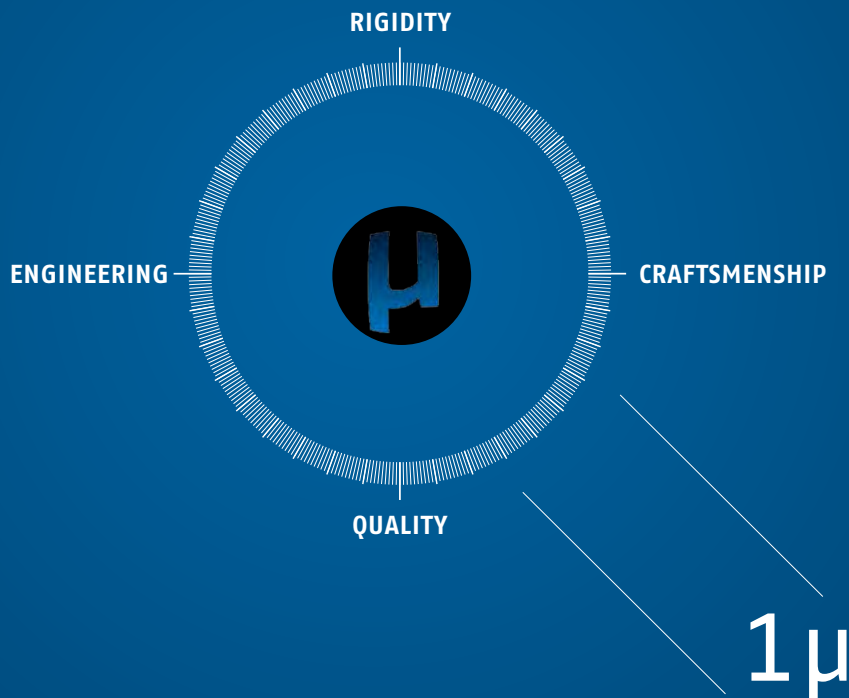
+ EXTENSIVE QUALITY INSPECTIONS

+ VAST CUSTOMIZING

+ PROVEN PERIPHERY



WHEN YOU NEED TO IMPROVE ULTIMATE ACCURACY AND PRECISION EVEN FURTHER.



Machines for a select user circle. For technologically advanced companies striving for ultra-precision. For the engineers in whose eyes the smallest deviation misses the target by a yard. For the engineering perfectionist who regards the smallest deviation an unacceptable solution. For the razor-sharp minds knowing that micron precision is a golden opportunity. Simply for everyone who can only smile at accuracy results, delivered by precise standard machines.

This user circle has now one distinctive machine series to select from: The MCμ by **BURKHARDT+WEBER**. Crafted without compromise for highest precision and rigidity. Performance close to the single micron. Not only at the time of acceptance, but for many years of service life.



99.99 % OF THE ACCURACY
IS MADE BY MASTERING
DESIGN AND ENGINEERING.
THE REST IS OUR PASSION.



One hundred years ago accuracy already meant a lot to us. The metrology and manufacturing techniques advanced – only the passion remained.

WHY PRECISELY THIS 0.01 % MAKES ALL THE DIFFERENCE IN THE WORLD.

There are many precise machining centers. Indeed, it is quite simple to fine-tune a good standard machine for precision and then to achieve mostly satisfactory precise results.

It is quite different when it comes to the last micron, the “ μ ”. The market for these machines is growing as ultra-precision accuracy requirements are increasing in the overall process chain. BURKHARDT+WEBER are well-known for their solid machining center designs. Already they deliver high-precision machining results, well above the norm. So what is better than to use this wealth of experience to tackle a new project: The development and design of a “new” ultra-precise, yet economical machining center series. From this, our passion has achieved again a new standard in ultimate machining precision for fit and quality.

The result is our MC μ series.

PERFECTION IS NOT WHEN THERE IS
NOTHING TO ADD, IT IS ACHIEVED WHEN
YOU CANNOT TAKE ANYTHING AWAY.

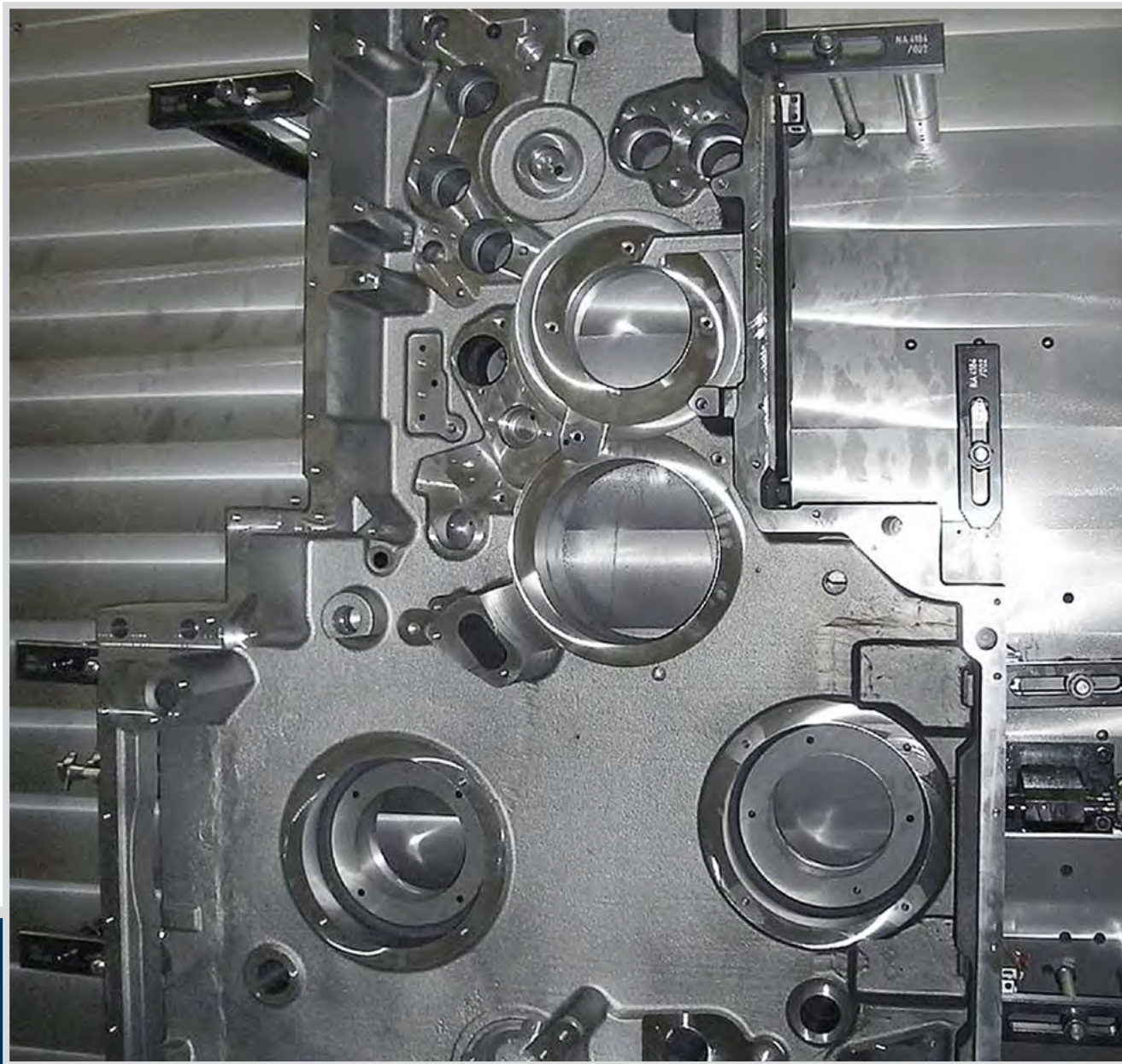


TRUE ACCURACY AND PRECISION ARE CREATED
BY DESIGN, NOT BY COMPENSATION.

CLOSEST FORM AND POSITION TOLERANCES FOR DEMANDING APPLICATIONS.

WHY SUCH A PRECISE MACHINE?

Ever-increasing pressures for cost reduction stipulate fewer part setups, which in turn results in more and more complex components. Thus, the demands on the machining tasks are increasing rapidly, reducing fitting tasks overall. The individual machining times are increasing and inventories are reduced. And what is most important, the need for quality is rapidly growing; an initial higher investment in precision will consequently result in permanent cost reductions.



POSITIONING.

PRINTING PRESS SIDE WALL.

Material: GG25, grey cast iron

Machining with the MCp: Finish machining for flatness via semi-finish, and finish milling; Ultra-fine-boring with critical, close-tolerance bearing seat spacing; ultra-precision bolt hole locations.

Key Features: Roundness, flatness, angularity, parallelity, fitting dimensions, concentricity, surface quality.

Requirements: Machining in assembled orientation, two parts aligned to each other, clamped warp-free on the final mounting pads, constant temperature.

The Advantages: Perfectly true running printing press rolls at highest printing speeds and perfect color application.



FLATNESS.

MACHINE TOOL SLIDE

Material: GGG50, cast iron

Machining with the MCp: Milling the guide mounting surfaces and stops; fine-boring fitting pins.

Key Features: Flatness, parallelity, angularity.

Requirements: Warp-free clamping, razor-sharp cutting tools, workpieces pre-machined on all sides, minimal machining stock, stress relief by unclamping sequence, resp. interim part storage.

Advantages: No fitting work required in assembly, intermediate measuring tasks and re-leveling work are eliminated. Larger surface contact areas. Basic accuracy of the related machine tool is improved.



TRUE RUNNING AND CONCENTRICITY.

MACHINE TOOL HEAD STOCK WITH BEARING HOUSING.

Material: GG40, cast iron

Machining with the MCμ: Location surfaces, bearing seats, deep hole drilling, mounting pads.

Key Features: Fine-boring of diameter 250mm, with true concentricity at a large bearing spacing, excellent angularity of seat faces.

Main Targets: Warp-relieved components, optimised bearing surfaces, non-warping clamping, minimum stock removal, tempered parts, razor-sharp cutting tools, dry machining.

Advantages: Excellent linearity and angularity, stress-free true-running spindle guide, elimination of shim plates for the guideways.



ANGULARITY AND PARALLELITY USING TABLE ROTATION.

MACHINE TOOL BED

Material: E335

Machining with the MCμ: Surfaces and stops for guide-ways, mounting surfaces, bearing mounts for ball screws and measuring scales.

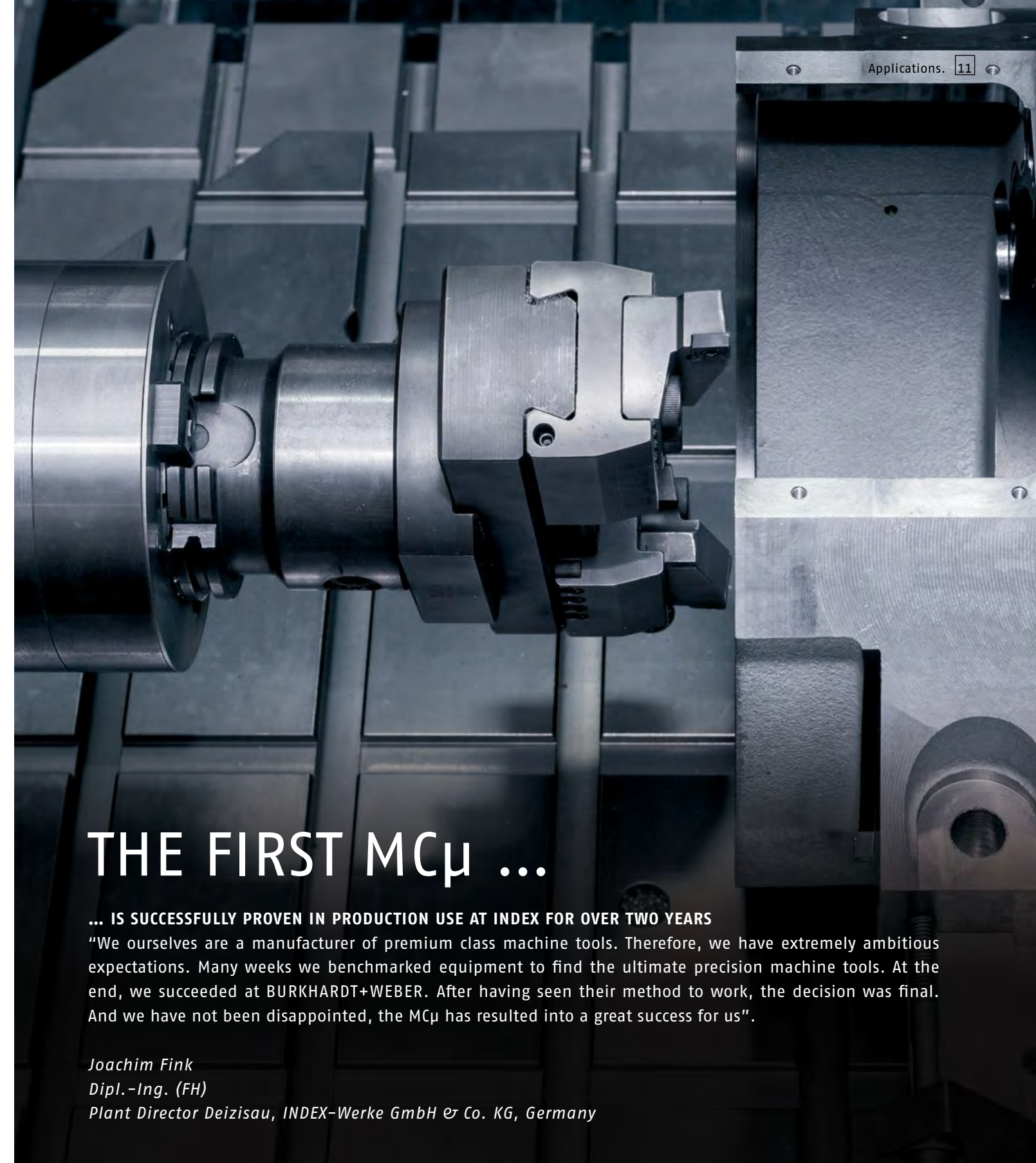
Critical Features: Maximum parallelity and flatness with excellent angularity, close-tolerance spacing distances, diameters, surface finishes.

Requirements: Rough-machined in warp-relieved state; self-supporting; finish machining in one operation; fine-finishing; surface finish.

Advantages: Closest tolerances overall, elimination of manual finishing work (e.g. scraping), long-term accuracy without electronic compensation.



CLOSEST FORM AND POSITION TOLERANCES FOR DEMANDING APPLICATIONS.



Applications. 11

THE FIRST MCμ ...

... IS SUCCESSFULLY PROVEN IN PRODUCTION USE AT INDEX FOR OVER TWO YEARS

"We ourselves are a manufacturer of premium class machine tools. Therefore, we have extremely ambitious expectations. Many weeks we benchmarked equipment to find the ultimate precision machine tools. At the end, we succeeded at BURKHARDT+WEBER. After having seen their method to work, the decision was final. And we have not been disappointed, the MCμ has resulted into a great success for us".

*Joachim Fink
Dipl.-Ing. (FH)
Plant Director Deizisau, INDEX-Werke GmbH & Co. KG, Germany*

COMPELLING COMPONENTS.

MACHINE TABLE UNIT

Runout, axial runout and repeatability are crucially determined by the quality of the machine table; therefore, our tables are *"made by BW"*. Each structural layer is precisely fitted for highest precision to form a solid foundation. Only highest grade custom bearings of highest precision, and with large support diameters, are used to satisfy the rigorous BW-quality standards our machines are well-known for.

MACHINING PALLETS

Well above norm are also the pallets of the MCμ series. Fitted to closest tolerances for runout, axial runout and locating precision they match all expectations.

MACHINE GUIDES

Only highest precision grade guides satisfy the MCμ requirements. They are perfectly matched to hand-scraped support surfaces and stops for the perfect μ-precision fit. Of course, the guides are over dimensioned multiple sizes to deliver durability for permanent accuracy and precision over time.

AXIS DRIVE SYSTEMS

Also the drive trains of all axis are optimised to the ultimate. A few extra μ are gained by special selection from highest precision ground ball screws. The result delivers better harmonised, best performing axis drives which gain even more from limiting the maximum axis speeds.

MAIN MACHINING UNIT

The spindle is of course the main component, and certainly *"made by BW"*, like all core units. The direct driven spindle has no gearing and features a perfect concentricity of <2 μ and without any vibrations. All rotating components are precision balanced to the highest grade. Of course, the spindle and the hollow shaft motor are cooled.

MACHINE BEDS AND MACHINE COLUMN

Stability in geometry and form are the basis for lasting accuracy. High guide webs and FEM-optimised machine structures guarantee optimum rigidity. In addition, the base structures, beds and column, are filled with shrink-free and form-fitting mineral cast material, to increase the mass and to deliver a superior thermally stable base. This delivers even more vibration damping and with an integrated active temperature control the components are kept at a constant temperature level.

THE BEST WHOLE IS THE SUM OF ITS EXCELLENT PARTS.

COMPELLING COMPONENTS.

THE BEST WHOLE IS THE SUM OF ITS EXCELLENT PARTS.



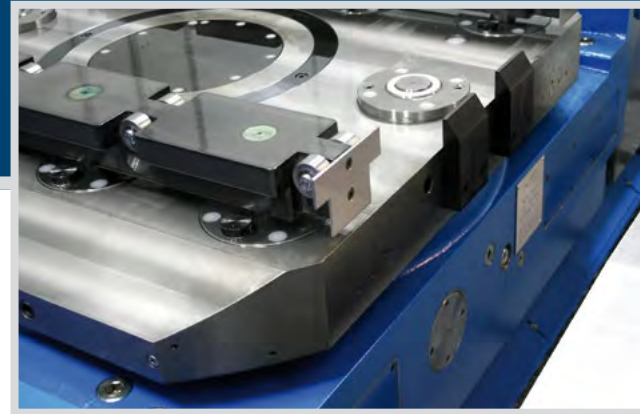
MACHINE TOOL BED AND COLUMN.

MACHINE TOOL BED.

- + Made by BURKHARDT+WEBER.
- + Oversized, super-massive design overall.
- + Extra strong ribbing.
- + Bending stiffness close to zero due to high and wide ribs under the guide supports.
- + Additional mineral cast filling for best thermal inertia and superior vibration dampening.
- + Integrated active temperature controls stable within one degree Centigrade.

MACHINE COLUMN.

- + Made by BURKHARDT+WEBER.
- + Thermo-symmetrical construction.
- + Massive design.
- + Additional mineral cast filling for best thermal inertia and superior vibration dampening.
- + Integrated active temperature controls accurate to one degree.



MACHINE TABLE AND PALLETS.

MACHINE TABLE.

- + Made by BURKHARDT+WEBER.
- + Long and wide guides, low center of gravity.
- + Hand-selected, matched table bearings.
- + Hand-scraped bearing support surface for a perfect fit and optimised flatness of side bearing surfaces.
- + Best flatness and parallelity of slide guide surfaces, top and bottom.
- + Extra large bearing diameter to offset high tilting torque.
- + Worm drive with hand-fitted backlash elimination.
- + Optimised true running capabilities and concentricity.
- + Fine-tuned on BURKHARDT+WEBER in-house test facility.
- + Option: hydraulic clamping through the table center.

MACHINE PALLETS.

- + Closest tolerances for true running, flatness, concentricity and position.
- + Precision table indexing bolts; in special accuracy execution.
- + Centrally located clamping hydraulic interface as option.



GUIDES AND AXIS MOTORS.

GUIDES.

- + Hand-selected linear roller guides in highest quality grade, sizes 55 and 65.
- + Extra large load distribution by employing more slide shoes.
- + Hand-scraped mounting surfaces and stops for the guide rails.

AXIS MOTORS.

- + Water-cooled servo motors in all linear axes.
- + Water-cooled servo motor for table rotation.
- + Ultra-precision ball screws with fine adjustment.
- + Hand-fitted seats for main bearing and counter bearings, preloaded.
- + Thermally insulated, highest resolution linear scales.
- + Reader head close to the ball screw nut.
- + Axes speeds and feeds up to 30 m/min / 1,181 in/min.
- + Acc/dec up to 0.3 g with harmonised speed ramps.



MAIN SPINDLE.

- + Made by BURKHARDT+WEBER.
- + Experience gained during decades of mastering craftsmanship.
- + 4-fold bearing supports for ultra-precision, direct driven spindle; dia. 120 mm / 4.72 inch.
- + Strong, large-diameter spindle shaft with ample support bearing spacing.
- + Water-cooled hollow shaft spindle motor.
- + Spindle nose extension of 200 mm (7.9 inch).
- + Spindle nose diameter of 150 mm (5.9 inch).
- + Spindle speed range 20 – 6,000 rpm.
- + Spindle torque S1 = 610 Nm (450 ft-lb) / S6 = 760 Nm (560 ft-lb).
- + Tool taper design for HSK-A 100 or ISO 50 taper size (HSK recommended).
- + No spindle gear box for vibration-free true running.
- + All rotating parts are ultra-precision balanced.
- + Oil/air lubrication.
- + Controlled spindle and bearing temperature.
- + Automatic spindle growth compensation, in 1 µ (micron) increments.
- + True running and concentricity better than 2 µ (micron).
- + Fine-tuning on in-house test facility.
- + MQL system as an option.



"AND WHEN THE FINAL MICRON IN ACCURACY IS THE GOAL, then you have to start at the base, at the first beginnings. Extra clean production and assembly facilities, adherence to the highest quality standards by everyone, and the use of only the best materials the market has to offer."

Sven Jetter, Manager Quality Control

"RUNNING INTO A DEAD END WOULD CLEARLY RESULT, from taking an existing machine design and then trim it best to a single μ performance. New design and construction ideas and an optimised machine concept from the base up, are absolutely necessary to deliver the best accuracy."

Horst Schmauder, Head of Construction

"COMPLETE CONTROL DELIVERS CONSISTENCY.

To reach the final μ , constant process parameters must be guaranteed, as in the case of a consistent temperature management. This requires a continuous feedback and response control."

Benjamin Rother, Deputy Manager Software Development

THE ULTIMATE IN PRECISION.

Why is it that it is so difficult to build an ultra-precision machine tool, even if designed for the μ (micron) performance, in the real world and then to make the superior accuracy capabilities durable?

This results from the overall selection of optimum designs, carefully selected materials, availability of the best production infrastructure and a highly qualified team of well-experienced master experts in all fields.

BURKHARDT+WEBER host the ideal condition based on the close to 100 % manufacturing depth for the core components, in combination with the best technological conditions, as for example the BURKHARDT+WEBER jig boring machine. All factory buildings are temperature-controlled within 1 degree Celsius and a thermo-symmetrical installed measuring machine is at the same temperature level.

The final key for the creation of the MC μ are our highly qualified and highly skilled employees. With more than 60 years of experience, we craft highly accurate machining centers. And the philosophy to improve ourselves by ongoing optimization of all parameters is a daily chore and a core value of our well-knit team of perfectionists.

Premium quality is only achieved by a team of well-experienced specialists. As for example, the hand-scraped flatness and parallelity of the guide supports.



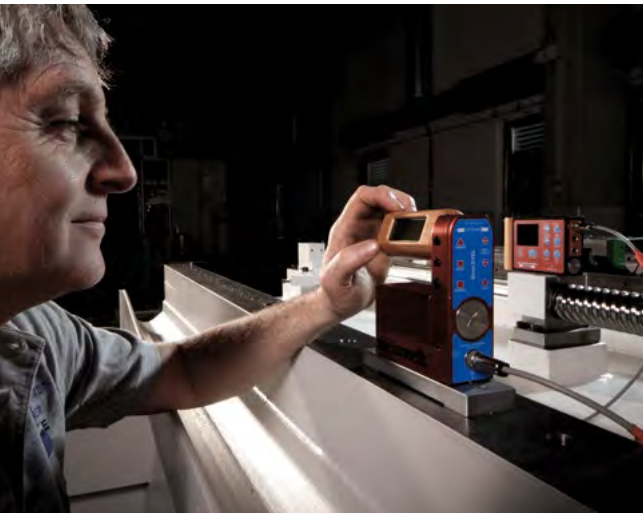
Ideal conditions: High-precision machining at BW at our air-conditioned manufacturing facilities; temperature controlled within $\pm 1^\circ\text{C}$. This complements the thermo-symmetrical structure of our coordinate measuring machine (CMM), also located within the identical temperature conditions.

THE MOST ACCURATE MACHINE IS MADE BY
ABSOLUTE PERFECTIONISTS.

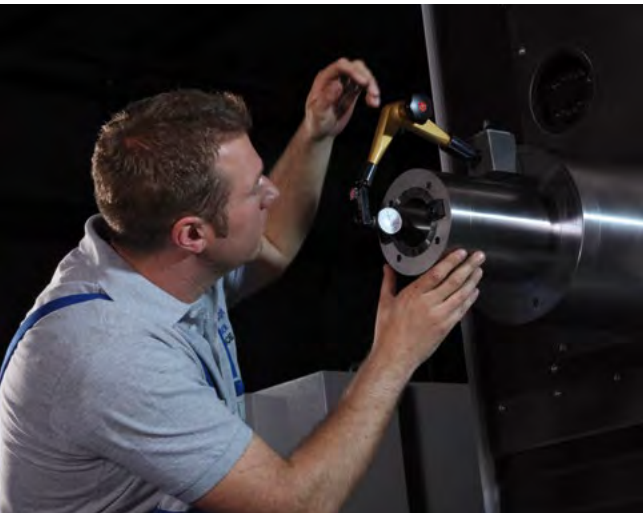
PHILOSOPHY FOR HIGHEST QUALITY THROUGHOUT.

ONLY BY USING A “TOTAL QUALITY” COMMITMENT WITHOUT COMPROMISE THE MCμ CAN BE PUT INTO PRACTICE.

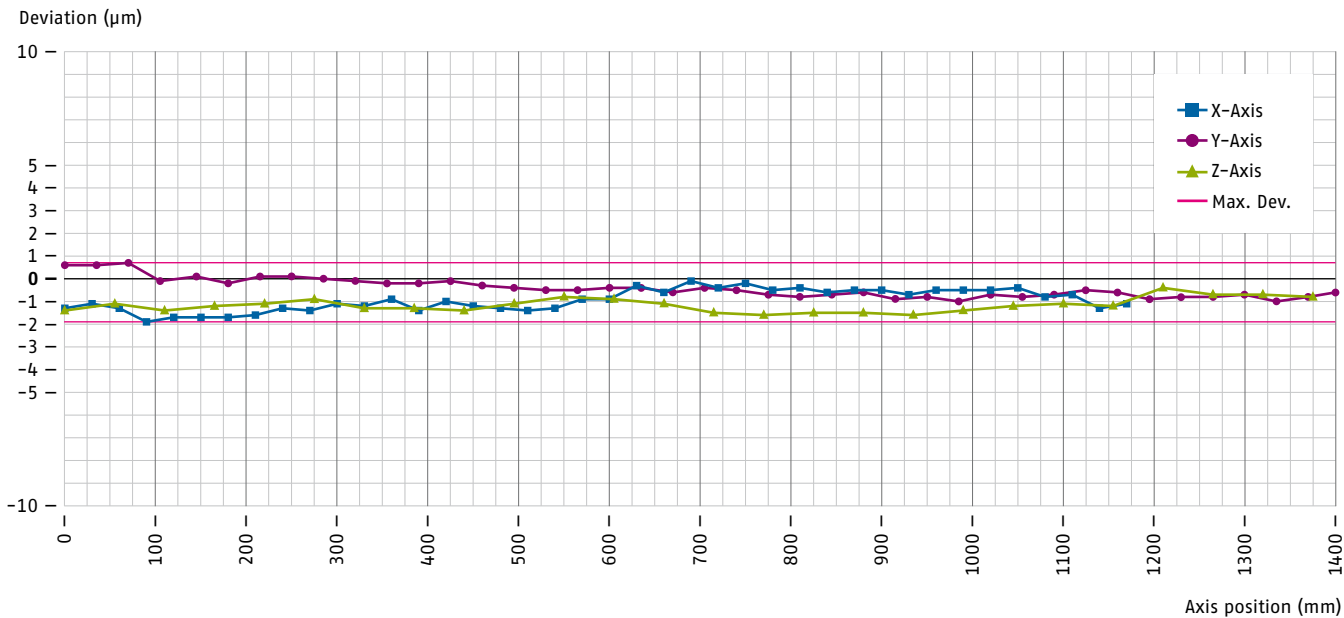
The μ at the finished component is derived from many factors: Positional accuracy, machine geometries, true running tools, fixture deflections, material behavior, process sequences, temperature variations and the measuring process technologies. To achieve the best, all components of a MCμ undergo strict and very specific quality controls. The perfect finish is confirmed by a comprehensive quality measurement of the MCμ.



- + Laser measurement of all main machine axes.
- + Stringent geometrical quality controls for all linear and rotating axes.
- + Inspection of roll, pitch and jaw in all main axis.
- + Concentricity and trueness for main spindle, machine table and pallets.
- + Contour milling.
- + Frequency analysis and temperature measurements over time.
- + Cold and warm start variations.



LINEAR AXES POSITIONING



LASER-MEASURING PROTOCOL

The MCμ is equivalent to an actual measuring machine in total accuracy, but you can machine on it.

ACCURACY / DATA

TO 1,500 mm		TO 2,800 mm	
Straightness	< 4 μ	Straightness	< 8 μ
Angularity	≤ 5 μ/1,000 mm	Angularity	≤ 6 μ/1,000 mm
P	4 μ	P	5 μ
Pa	3 μ	Pa	4 μ

BURKHARDT+WEBER guarantee all technical specifications according to the VDI/DGQ standards without limits for the travel length. The results vary with the machine size and are detailed in each specific quotation.

UNIQUE LIKE YOUR NEEDS.

BURKHARDT+WEBER make highly customized machining centers. Without compromise, this also applies for our MC μ series. We have extensive turnkey expertise, decades of experience in special machinery building and a powerful process engineering team. All options we offer with our modular machining centers are also available for the MC μ machines, such as tool magazines with up to 608 tools, workpiece automation, process monitoring etc. These factors allow us to create your custom MC μ – tailored precisely to your individual needs.



TECHNICAL DATA, METRIC SYSTEM

MCμ (Metric System)	Unit	750	800	900	1000	1200	1250
							
Working range X Y Z	mm	1,100 900 1,250	1,250 1,000 1,250	1,600 1,400 1,600	2,200 1,400 1,800	2,500 1,800 1,800	2,800 1,800 2,100
Workpiece swing diameter Ø x h	mm	1,400x1,300	1,500x1,300	1,600x1,750	2,300x1,900	2,500x2,100	2,800x2,500
Pallet size	mm	630x630	800x800	800x1,000	1,000x1,250	1,000x1,250	1,000x1,250
Pallet load	kg	1,500	2,500	3,000	5,000	6,000	7,000
Feed force X Y Z	kN	15 15 15	15 15 15	20 20 20	20 20 20	25 25 25	25 25 25
Rapid traverse X Y Z (standard axis travel)	m/min	30 30 30	30 30 30	30 30 30	30 30 30	30 30 30	30 30 30
Table speed	rpm	15	15	10	6	6	6
Tilting torque	Nm	20,000	20,000	35,000	55,000	55,000	55,000
Tangential torque	Nm	12,000	12,000	20,000	35,000	35,000	35,000
Spindle power 100% duty rating	kW	32	32	32	32	32	32
Torque 100% duty rating	Nm	610	610	610	610	610	610
Speed range	rpm	20 – 6,000	20 – 6,000	20 – 6,000	20 – 6,000	20 – 6,000	20 – 6,000
Bearing diameter main spindle	mm	120	120	120	120	120	120
Spindle radial runout	mm	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Spindle axial runout	mm	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Number of tool pockets		128 – 608	128 – 608	128 – 608	128 – 608	128 – 608	128 – 608
Machine control, Siemens Sinumerik		SIN 840D sl	SIN 840D sl	SIN 840D sl	SIN 840D sl	SIN 840D sl	SIN 840D sl
Floor space required, l x b x h approx.	mm	8,600x 6,100x4,700	8,600x 6,100x4,700	9,800x 6,500x5,100	10,200x 7,200x5,300	10,600x 7,800x5,400	11,600x 8,600x5,400
Weight approx.	kg	30,000	32,000	40,000	50,000	55,000	58,000
ACCURACY according to VDI/DGQ 3441							
P X Y Z	mm	0.004	0.004	0.004	0.005	0.005	0.005
Pa X Y Z	mm	0.003	0.003	0.003	0.004	0.004	0.004
Us X Y Z	mm	0.002	0.002	0.002	0.003 X 0.002 Y, Z	0.003	0.003
P, B	arcsec	3	3	3	3	3	3
Pa, B	arcsec	2	2	2	2	2	2
Us, B	arcsec	2	2	2	2	2	2
ANGULARITY of the linear axis X Y Z	mm	< 0.005 1,000	< 0.005 1,000	< 0.005 1,000	< 0.006 1,000 X < 0.005 1,000 Y, Z	< 0.006 1,000	< 0.006 1,000
STRAIGHTNESS of the linear axis X Y Z	mm	< 0.004	< 0.004	< 0.005	< 0.007 X < 0.005 Y, Z	< 0.008	< 0.008
EXCHANGING REPEATABILITY of pallets	mm	< 0.008	< 0.008	< 0.008	< 0.010	< 0.010	< 0.010

Technical specifications are subject to change without prior notice.

IMPERIAL SYSTEM

MCμ (Imperial System)	Unit	750	800	900	1000	1200	1250
							
Working range X Y Z	in	43.31 35.53 49.21	49.21 39.37 49.21	63.00 55.12 63.00	86.61 55.12 70.87	98.43 70.87 70.87	110.24 70.87 82.68
Workpiece swing diameter Ø x h	in	55.12x55.18	59.06x51.18	63.00x68.90	90.55x74.80	98.43x82.68	110.24x98.43
Pallet size	in	24.80x24.80	31.50x31.50	31.50x39.37	39.37x49.21	39.37x49.21	39.37x49.21
Pallet load	lbs	3,307	4,409	6,614	11,023	13,228	15,432
Feed force X Y Z	lb	3,372 3,372 3,372	3,372 3,372 3,372	4,496 4,496 4,496	4,496 4,496 4,496	5,620 5,620 5,620	5,620 5,620 5,620
Rapid traverse X Y Z (standard axis travel)	in / min	1,181 1,181 1,181	1,181 1,181 1,181	1,181 1,181 1,181	1,181 1,181 1,181	1,181 1,181 1,181	1,181 1,181 1,181
Table speed	rpm	15	15	10	6	6	6
Tilting torque	lb / in	177,015	177,015	309,776	486,791	486,791	486,791
Tangential torque	lb / in	106,209	106,209	177,015	309,776	309,776	309,776
Spindle power 100% duty rating	HP	43	43	43	43	43	43
Torque 100% duty rating	lb / in	5,400	5,400	5,400	5,400	5,400	5,400
Speed range	rpm	20 – 6,000	20 – 6,000	20 – 6,000	20 – 6,000	20 – 6,000	20 – 6,000
Bearing diameter main spindle	in	4.7244	4.7244	4.7244	4.7244	4.7244	4.7244
Spindle radial runout	in	< 0.0000787	< 0.0000787	< 0.0000787	< 0.0000787	< 0.0000787	< 0.0000787
Spindle axial runout	in	< 0.0000787	< 0.0000787	< 0.0000787	< 0.0000787	< 0.0000787	< 0.0000787
Number of tool pockets		128 – 608	128 – 608	128 – 608	128 – 608	128 – 608	128 – 608
Machine control, Siemens Sinumerik		SIN 840D sl	SIN 840D sl	SIN 840D sl	SIN 840D sl	SIN 840D sl	SIN 840D sl
Floor space required, l x b x h approx.	in	339x240x185	339x240x185	386x256x201	402x284x209	417x307x213	457x339x213
Weight approx.	lbs	66,140	70,550	88,180	110,230	121,250	127,870
ACCURACY according to VDI/DGQ 3441							
P X Y Z	in	0.000157	0.000157	0.000157	0.000197	0.000197	0.000197
Pa X Y Z	in	0.000118	0.000118	0.000118	0.000157	0.000157	0.000157
Us X Y Z	in	0.000079	0.000079	0.000079	0.000118 X 0.000079 Y, Z	0.000118	0.000118
P, B	arcsec	3	3	3	3	3	3
Pa, B	arcsec	2	2	2	2	2	2
Us, B	arcsec	2	2	2	2	2	2
ANGULARITY of the linear axis X Y Z	in	< 0.000197 39.37	< 0.000197 39.37	< 0.000197 39.37	< 0.000236 39.37 X < 0.000197 39.37 Y, Z	< 0.000236 39.37	< 0.000236 39.37
STRAIGHTNESS of the linear axis X Y Z	in	< 0.000157	< 0.000157	< 0.000197	< 0.000276 X < 0.000197 Y, Z	< 0.000315	< 0.000315
EXCHANGING REPEATABILITY of pallets	in	< 0.000315	< 0.000315	< 0.000315	< 0.000394	< 0.000394	< 0.000394

Technical specifications are subject to change without prior notice.



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