

BW **BURKHARDT**
+
WEBER



MAINTAIN. OPTIMIZE. CHANGE.

SERVICE CATALOGUE.

THE HEART OF IT ALL.

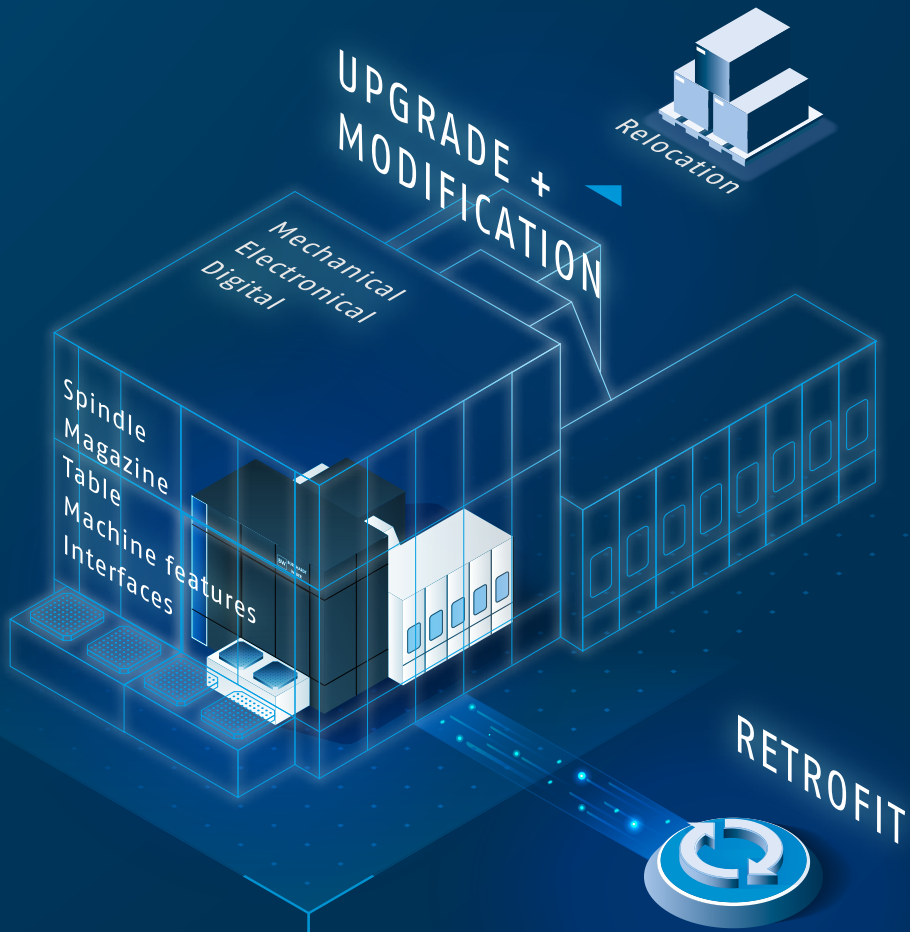
AT THE SPEED OF LIFE.

Machines from BURKHARDT+WEBER represent the heart part of complex manufacturing processes worldwide. They produce massive workpieces of complex geometries and are exposed to enormous forces in the process. Many machines don't have these criteria of endurance. But our machines do. Because each one is equipped with an extremely strong heart. With inter-linking measures of maintenance, optimization and continued development we ensure that your machine will be of lasting value and its pulse will continue to beat with endurance.

CHANGE.

MORE POSSIBILITIES.

Lasting consistency can only be achieved by changing. This is why our machines are designed to adapt to changing requirements: by upgrading, partly or complete retrofitting, we maximize the potential of your machine. Time and again.



Maintenance +
Predictive +
Maintenance
Repair +
Spare Parts +

MAINTAIN

Process Optimization +
Measuring +
Diagnosis
Trials
Trainings +

OPTIMIZATION

Upgrade +
Relocation +
Retrofitting +
Case Study +

CHANGE

Component Manufacturing +

COMPONENT
MANUFACTURING



MAINTAIN.

MORE CONTROL.

Planning is a key to those who have access to essential information. Our compact offer on individual maintenance variants, remote or on-site service and efficient maintenance measures can prevent downtimes, reduce wear, and tear and avoid unplanned shutdowns.



OPTIMIZE.

MORE PERFORMANCE.

Sometimes it is essential to have a view of the big picture to capture the full potential. Our experts support you step by step to a profound production- and process planning to ensure that all opportunities for optimization are fully used. Various diagnostic and measuring methods provide important data for this purpose. We will show you everything your machine has to offer during subsequent production support and individual training sessions.



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CONSULTING WITH HEART AND MIND.

You will always meet people at BW who are eager to understand the essence of things. It is particularly important for us to be friendly, reliable and in direct contact with you. We research, explore and plan until we find the perfect solution. Above all: we attend to your project and examine it intensively.

Our commitment does not end with the delivery of our machines, it continues for the entire life cycle: our consulting- and service team supports you in all technical and technological, process related and strategic matters. What characterizes us compared to others is our profound manufacturing competence and process know-how. These skills influence the design of our machines, our consulting, maintenance, and optimization measures.

"WE AT BW ...

... are committed to invest all our expertise to the design, construction, and further development of our machines. We are not only passionate about equipping you with the best machine, but also with the best solution."

Marcos Ahorn, International Sales Support

TECHNIQUES. PROCESSES. POSSIBILITIES.

UNLIMITED SUPPORT.

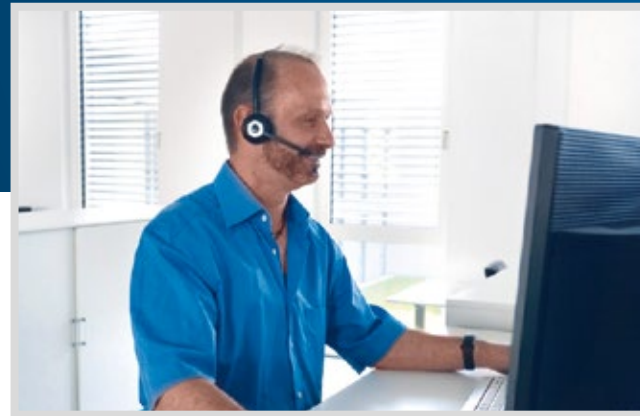


THE CONTACT.

We are connected to our customers by the motivation of producing high-precision and complex workpieces using powerful and robust machines. Projects of such dimensions can only be fulfilled when operating as "associate" and partner. Our aim in every project is to prove that you have made the right decision to choose BW.

"Fast, competent, and solution-oriented" is the service promise of our Competence Centre Service team directed by Customer Service Manager Andreas Greiner. Being a reliable and competent business partner, we attend to your questions or concerns and ensure quick solutions at any time. Whether by remote diagnosis or on site, we are committed to keeping your machines running all over the world.

Our range of competences includes a lot more: we are your partner for maximum productivity and machine availability. We support you when planning your new machine projects including process optimization and decision finding on retrofitting your existing machinery portfolio. We are your qualified partner and ensure the performance and efficiency of your machine with our knowledge and know-how.



THE HOTLINE.

First level – you can contact us quickly and directly via our central hotline number and email address for all service requirements. Our hotline is operated by experienced and highly skilled BW-service technicians who answer your calls. Our CRM-system enables us to start troubleshooting immediately.

Our employees guarantee quick support in all technical and mechanical questions concerning your BW-machines. Via online-connection they can access to your machine to get a quick and overall picture of the failure. Software updates can be also imported directly in this way.

Our hotline-department has all generations of control systems to provide a simulation of failures. This enables us to support you even faster and more efficiently.

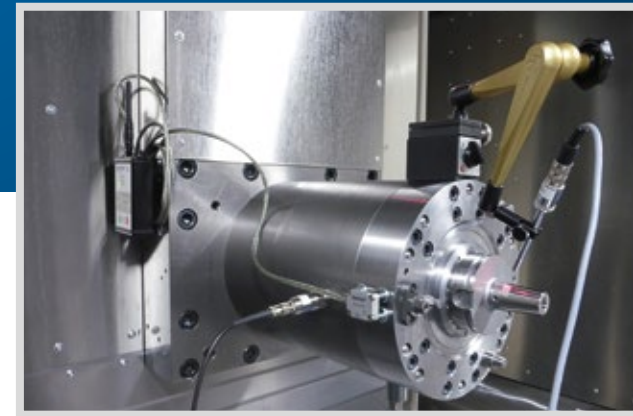
DIRECT CONTACT



+49 7121 315-900
(Service)



service@burkhardt-weber.de



FINGERPRINT.

You will get to know your machine even better with a digital fingerprint: This captures the current machine status by means of measurement technology and identifies irregularities in the vibration behaviour of the spindle or in the axis movements at an early stage.

The basis for evaluating the machine condition is determined by data which is recorded either before delivery of the machine or later on-site, as well as data collected by BW during various machine projects.

With a detailed analysis of your measurement and machine parameters, BW experts can indicate on discrepancies to the usual nominal values in a timely manner. This can reduce wear, prevent damage, increase machine availability, and ensure process reliability.

Benefit from this type of predictive maintenance and maximize your productivity.

BENEFITS



- + Increase the machine availability
- + Avoid unplanned downtimes
- + Status update on the current machine condition



MACHINE CONDITION RECORDING.

Using the BW Smart Manufacturing interface, you can access to your machine via the standardized communication protocol OPC UA and collect important data about the operating status and energy consumption of your machine independently of time and location. By analysing the data, downtimes can be avoided more effectively, critical conditions can be detected at an early stage and minor maintenance interventions can be scheduled easily.

The interface can be upgraded to all machines equipped with the Siemens SINUMERIK 840D sl control generation or Siemens SINUMERIK ONE, older machines on request.

Following data can be collected:

- + Display operating hours
- + Fill levels, e.g., oil level
- + Temperature of spindle, drives and pumps
- + Humidity and temperature in the control cabinet
- + Spindle vibration
- + Energy recording
- + Error and operating messages & crash detection
- + Monitoring data regarding tool life
- + Magazine places, types of places and tool identification
- + Geometry and cutting data
- + Tool status (locked, released, active ...)
- + Pressure and flow rate of the internal coolant supply in the tool

MAINTENANCE.



SERVICE CONTRACT.

Efficiency and a high level of performance of your machine is the key to success in production. We can support you with regular maintenance schedules and the bundled know-how of our BW-service team to maintain the machine availability and process reliability of your BW-machining centre and to save your production from unplanned downtimes.

We exclusively use original spare parts for every maintenance intervention. All results are collected in a maintenance report from which we can advise you on further necessary repairs to uphold the process reliability of your machine.

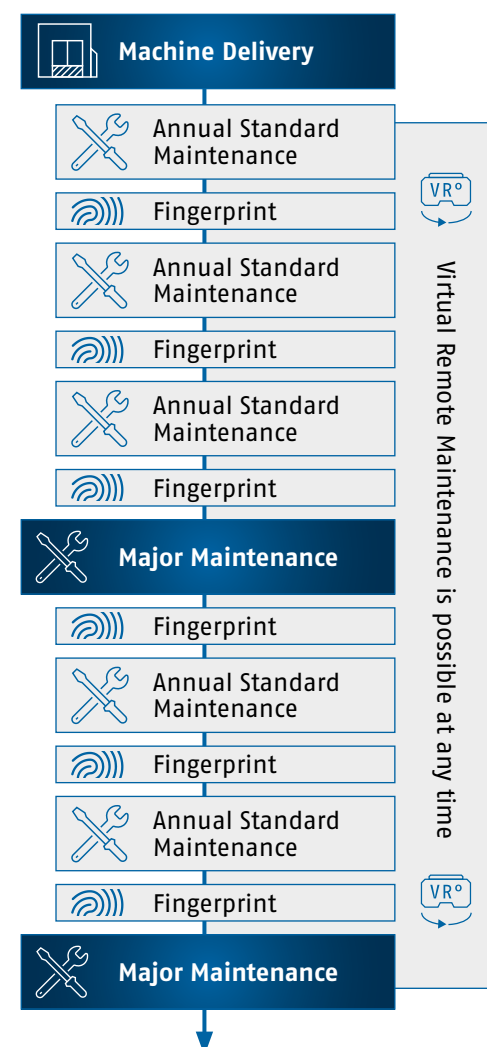
We will find solutions for any potential improvement on your machine!

ADVANTAGES+BENEFITS.

- + Securing deadlines
- + Scheduled downtimes due to maintenance
- + Optimum machine settings for highest production quality
- + Detailed information on the status of your machine
- + Increase of the machine availability
- + Performed by highly skilled BW-service technicians
- + Predictable fixed costs
- + Hotline hourly allotments included



OUR RECOMMENDATION.



ANNUAL STANDARD MAINTENANCE.

During the annual standard maintenance, we provide all necessary measuring equipment and special tools to carry out the maintenance works. This composes of Niveltronic, marble angle, measuring rods, measuring mandrel, calibration tools, etc.

MEASUREMENTS+TESTS.

- + Maintenance and functional tests of all components belonging to the machine (e.g., pallet changer, tool changer, etc.)
- + Checking of correct function and wear of the axes drives
- + Geometry measurement
- + Checking of the straightness of the machine axis

CORRECTION+OPTIMIZATION.

- + Replacement of all maintenance relevant parts such as belts, filters, scrapers, brushes, according to BW-maintenance schedule
- + Functional optimization of all components belonging to the machine



CUSTOMIZED MAINTENANCE.

Depending on the machine and its workload, we recommend extended maintenance to be carried out approx. every 2 – 5 years. After a complete evaluation of your BW machine, we will advise you on the necessary individual measures to be taken.

OUR SERVICES ACCORDING TO DEMAND.

- + Inspection of the MCR series on X-/Y-/Z-axes – hardness and surface roughness
- + Replacement of all relevant hoses
- + Replacement of all relevant cables
- + Oil change on NC-table and hydraulic unit
- + Fixture maintenance
- + Maintenance of special tools, angle heads, tool extensions (at our BW-workshop in Reutlingen)
- + Maintenance of peripheral supplier components (e.g., chip conveyor coolant system, oil mist separator)
- + Inspection of the safety windows
- + Laser measurement

REPAIR.



When maintaining your customized and special designed machines we apply the profound, complex knowledge of our repair service. We repair or overhaul following components on request:

- + Rotary tables (NC-controlled with Hirth joint) inhouse manufactured and from other manufacturers
- + Swivel heads (NC-controlled with Hirth joint)
- + Facing heads
- + Main spindles (grease and minimum oil lubricated in SK and HSK design)
- + Tool changer
- + Gear cutting heads
- + Additional equipment (tool extension, turning tool adapter, special milling heads)

We can respond extremely flexible to your requirements with our agile repair team and coordinate closely with all relevant departments to achieve the best solutions and thus reduce downtimes of your machines to a minimum.

Our skilled team members will support you whenever needed. They provide on-site support for professional disassembling of the components and reassembly after repairs have been completed.



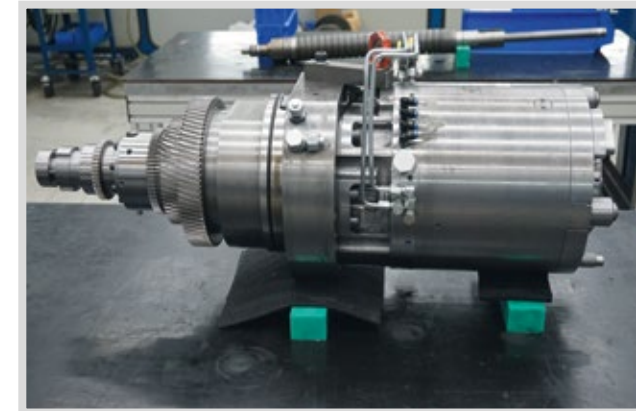
On request, we can prepare ready-to-install service kits or carry out the repairs directly on-site. In this context, we can also consult you on possible technical optimizations of your machine.

We exclusively use original parts for repairs. The components are subjected to a detailed quality test on respective test benches to guarantee their full functionality.

Installing replacement components is the perfect solution to reduce machine downtimes or facilitate scheduled repairs. Using our performance-tested replacement components ensures a continuous operation of your machine at the usual levels of precision and reliability. If requested, we even provide storage.

EXAMPLE OF A REPAIR PROCEDURE ON A SPINDLE.

All components go through these three essential steps. This is how we ensure the expected BW-quality.



1. DIAGNOSIS.

The spindle is completely disassembled in our premises to capture the cause of failure and its actual condition. We provide a cost quote based on the determined data and damages found while we always focus on the most economic and efficient use and advise you on possibilities of optimizing your production process.



2. REPAIR.

After consultation and approval, our experts carry out the repair measures. We prioritize the repairs depending on downtimes and ensure a flexible processing.



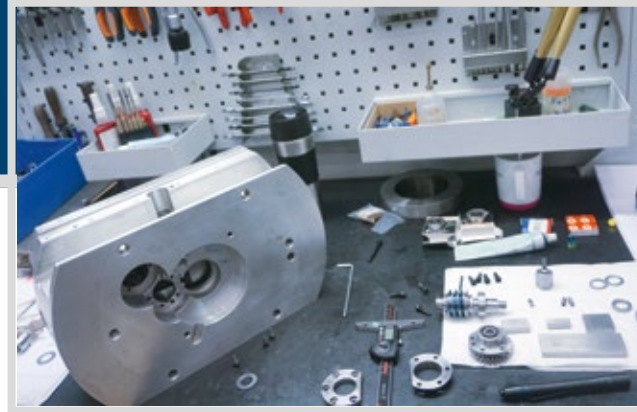
3. TEST BENCH.

Every spindle is checked on our test bench for functional quality standards (such as temperature, vibration, concentricity, clamping, etc.) and provides you with a written test protocol stating all relevant values for quality assurance.

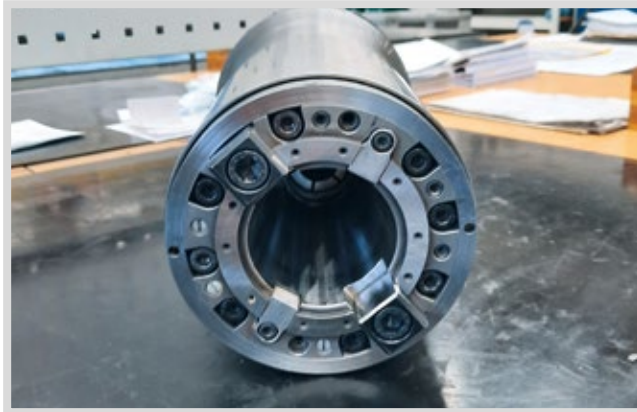
REPAIR.



FACING HEAD BEFORE REPAIR.



REPAIR WORKS ON A FACING HEAD.



TOOL EXTENSION BEFORE REASSEMBLY.



DEFECTIVE MAIN SPINDLE BEFORE DIAGNOSIS.



REPAIRED TURNING TOOL ADAPTER.



TOOL DOUBLE GRIPPER COMPLETELY ASSEMBLED.

SPARE PARTS.



STOCKKEEPING.

We keep a large stock of a wide ranged spare parts in our headquarters in Reutlingen whether your BW machine is five, ten or 30 years old. This is how we ensure a quick delivery of needed parts.

Furthermore, we have developed strategies together with our suppliers to ensure that not only the availability of BW original parts, but the entire supply chain is secured. The corresponding parts for your machine maintenance are stocked as prepared packages.

STOCK-KEEPING COMPONENTS.

Should you choose to have your replacement spindle regularly inspected by our experts, we offer storage at BURKHARDT+WEBER. Prior to storage, we thoroughly check your spindle and carry out repairs if necessary. The spindle is then packed carefully and stored in our spindle warehouse. During storage, our experts test and maintain the spindle periodically to ensure that you have a fully functional replacement spindle on call.



SPARE AND WEAR PARTS.

On request, we will provide you with a list of all the spare and wear parts we recommend, customized, and adapted to your machine. Besides all information on price and delivery time, we also evaluate the relevance of each part regarding machine downtimes. This data serves to develop a common strategy to bear this scenario.

LOGISTICS.

Daily express parcel delivery and, if required, individual courier services are part of our activities to ensure prompt supply.

BENEFITS

- + Original spare parts
- + Wear- and spare parts lists adapted to your machine
- + Individual consulting
- + Safety stock level
- + Everything from a single source

PROCESS PLANNING+ OPTIMIZATION.



Machining
Concept



Tool
Engineering



Fixture
Development



NC-
Programming



Process
Commissioning



Production
Support

FIXTURES AND CLAMPINGS.

PROCESS PLANNING.

Practising process planning we support you in increasing your productivity, process reliability and quality while at the same time reducing your unit costs and advancing to a more efficient, energy-saving, and eco-friendly production.

Our technicians and engineers analyse and prepare the process which they coordinate with you. This is how we set new impulses for your production in co-operation with our machining experts and introduce new perspectives and modern machining methods.

STAGES OF THE PROCESS PLANNING.

- + Machining concept: clamping position, creating a time study
- + Tool engineering: optimizing your tool selection regarding workpiece profile, workpiece geometry and interfering contours
- + Analysis of clamping positions
- + Fixture design and manufacturing
- + Design of NC-programs
- + Virtual simulation for collision checks as well as machining simulation
- + Process commissioning (run-in)

PRODUCTION SUPPORT.

We support you with our know-how right from the start to make the start-up at your company as smooth as possible. Our target is to ensure that your machine is perfectly aligned with your production and to integrate your employees preparing them for the new production processes down to a T.

WE OFFER OUR SUPPORT IN:

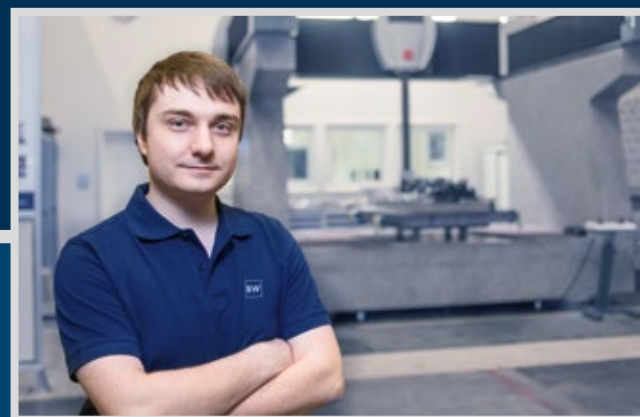
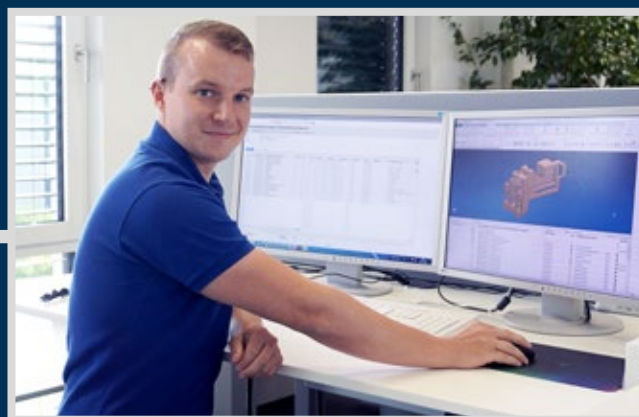
- + The evaluation and improvement of the production process
- + Intensifying of operator know-how, beyond the scope of training programs
- + Reducing your unit costs
- + Increasing the machining accuracies
- + Sustainable configuration of your processes

In addition, we offer technological support for fixtures and tools which are not designed by BW.

To guarantee an optimum matching between technology and fixture, it is essential to ensure a synergy between fixture design and technology. BW provides everything from one source:

The design and manufacture of the fixture are perfectly tailored in accordance with your workpiece and requirements. No matter if you need hydraulically or manually operated fixtures designed for an automatic loading, or whether you need flexible fixtures which can be used for several workpieces.

Fixtures from BW can also be used for narrow tolerance drillings and particularly long tools, like the BW-familiar boring bar feed for long tools which cannot be changed automatically. A hydraulic and electric query ensure highest process safety checking if the workpiece is clamped or released.



MEASURING, DIAGNOSTIC, TRIALS.



VIBRATION MEASURING.

If problems occur on your machine during physically marginal machining operations, it may be necessary to conduct vibration measurements of the machining unit in various states in addition to drive-related measurements of the main axes incl. machining unit and rotary table.

For this purpose, we have the possibility to capture and analyse the individual conditions on your machine with the support of our R&D department and to conclude respective measures.

In this context, one option is to insert a vibration sensor permanently in the machine. In combination with process support from a BW technologist and/or a development engineer, we have a wide variety of approaches to support the development of your machining process.

KINEMATICS MEASUREMENT FOR HV-SERIES.

We recommend additional Kinematics measurements at regular intervals on 5-axes machines. This is helpful to ensure the swivel accuracy of the head and perfect quality of the workpieces to be machined and to compensate any possible mechanical displacement. External factors such as temperature and small collisions can have an influence on the initial values. The corrections are made from the centre of rotation and are made in one level.



DIAGNOSTIC & TRIALS.

The complex interaction of machine, workpiece, tool, machining process (incl. cutting data) and machine environment (incl. fluids) can lead to unsatisfactory machining results.

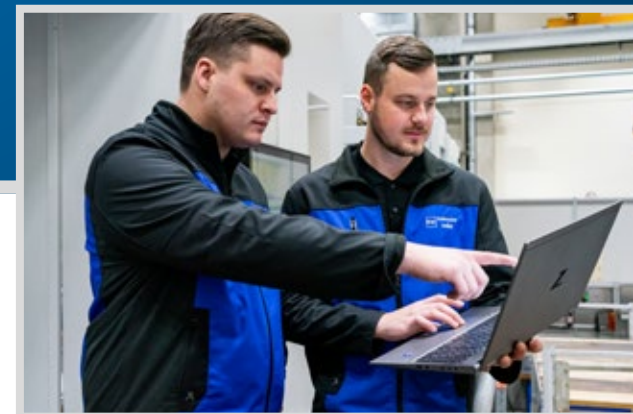
To find and resolve the cause it is necessary to make an analysis of the different influencing factors. For this purpose, we will visit you on-site together with a development engineer and carry out the necessary machine specific tests, which, depending on the set-up, can also run automatically and record the performance over a longer period in the background.

We benefit from our long-term experience when we develop the trial and measurement strategies, identify, and resolve the causes.

AUTOMATIC ZERO OFFSET MEASUREMENT.

An important parameter for the accuracy of repeatable machining results is the zero offset. We can provide an automated process for this measurement allowing you to re-check before starting a work shift. Discrepancies are determined with a separate measurement setup while the resulting compensation values are automatically incorporated into the machining process. This allows to reduce influences such as temperature fluctuations.

TRAINING.



TRAINING.

Trained handling of the machines enables you to work at maximum efficiency while avoiding costly crashes and downtimes. This is how you will contribute to increasing the service life of your machine.

Get to learn all tricks & tips before your machine is delivered during a customized in-house training session at BW. You can expect a practice-orientated and dynamic training which will be carried out directly on the machine whenever possible.

We particularly focus on operating, programming, mechanical, and electrical maintenance.

Our trainings can be held in German, English or in your national language with the assistance of an interpreter to avoid any language barriers.



	Programming
	Maintenance Training
	Mechanical
	Electrical
	Combined
	Operator Training (BW in-house)
	Experts, 3 days (for very experienced)
	Advanced, 5 days (for experienced)
	Beginners, 7 days (for beginners)
	Production Support (on site)

Would you like further support in commissioning? We offer support during the production start-up such as production support to ensure that your SOP runs smoothly.

STRONG HEART. EVERLASTING TECHNOLOGY.

Our machines do the greatest efforts: oil, sweat and even tears at times. They are built to withstand any challenge; their performance and precision are legendary. Even under dusty covers of many years, their heart still beats strong and steady.

How can we make this power last for longer? How can we extend the life cycle of our machines making them more sustainable and more efficient? Questions, self-answered by our machines: they are robust, stable, and made of high-quality and therefore strong enough to flexibly adapt them to new challenges.

"IF YOU LOOK AT OUR OLDEST ...

... BURKHARDT+WEBER machine today, you would not believe that it has been in operation for so many years. It shines in new brilliance and has been boosted from the past into the future with new features. The purchase of a new machine would have not paid off for our customer but with a complete retrofit it can easily fill the gap profitably in their production."

Michael Wiedmaier, Head of Competence Center Sales

CHALLENGE ACCEPTED.

DESIGNED TO CHANGE.

TIME TO CHANGE. PROGRESS TO IMPRESS.

Sustainability and cost-effectiveness are not contradictory, but rather a good combination. By taking individually customized measures according to your equipment and plans, we ensure that the heart of your machine beats at full power for a long time to come. Whether upgrading a few components or a complete retrofit or relocation, we will maximize the full potential. Time and time again.

"ONLY THOSE WHO ARE OPEN ...

... for changes, for new ideas and possibilities, in experimenting and pushing forward, will have permanent success. Lasting consistency can only be achieved by changing."

Andreas Greiner,

Head of Competence Center Customer Service

PROGRESS TO IMPRESS.

UPGRADE. MECHANICAL.



UPGRADING AND MODIFYING EXISTING EQUIPMENT.

Upgrading your machines and equipment offers you a wide range of possibilities: Besides upgrading your existing machine with new functions, you can partially automate your stand-alone machine and use it more efficiently and flexibly. This will allow you to react more flexible towards new market demands, to increase your machine running times and produce more economically.

BENEFITS



- + Set-up of more parts
- + Low-manpower production in multi-shift operation
- + Higher output rate
- + More efficient use of stand-alone machines



BW offers you the full range:

- + Purchase of additional pallets
- + 3rd and 4th pallet changing station
- + Upgrade of boring bar feed
- + Partial automation stand-alone machine
- + Extension with a pallet pool
- + Connection to a multi-level system
- + Safety devices
- + Replacement spindles
- + Flushing features

TOOL MAGAZINE.

The modular, highly flexible tool magazines are unique and world market leading.

You have the choice of following upgrading options:

- + Increase of the tool magazine to expand capacity
- + Upgrade TDS/Tool coding
- + Upgrade of tool breakage control
- + Upgrade of tool cone cleaning

SPINDLE.

Powerful spindles are your guarantee for highest machining quality and productivity.

We offer following upgrade possibilities:

- + Upgrade of motor spindles
- + Integration A-axis
- + Triple support
- + Torque support
- + Facing diameter 97.5 and/or diameter 160
- + Sensor technology for crash / vibration sensing
- + Spindle length compensation



UPGRADE.

ELECTRONICAL, DIGITAL.



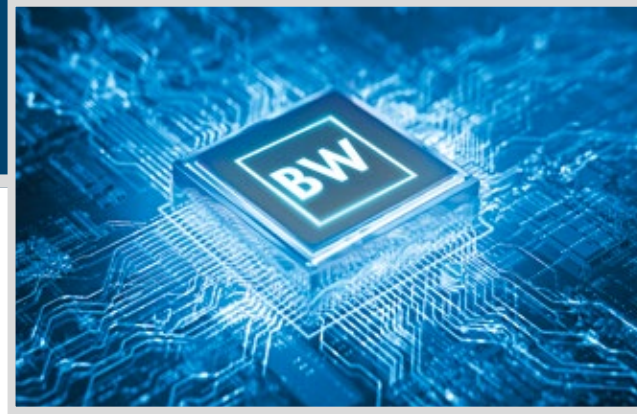
UPGRADE ELECTRONICAL.

All our machining centers are now optionally available with Siemens SINUMERIK ONE control unit. Our team is at your disposal for detailed advice.

Depending on which control unit generation you are using (Siemens SINUMERIK 840C, 840D or ONE), there are several different machine functions which can be upgraded. We can, for example, connect your existing machines to a higher-level system such as master production computer and integrate them into an ERP-system (e.g., PROCAM). Machines from other manufacturers can also be taken into account. If you intend to machine other workpieces on your machine, we offer mechanical and electronical retrofitting.

Our BW specialists can also provide you with remote maintenance access for easy and fast error analysis. This also applies for control buttons on the control panel. The operating concept and set-up functions correspond to the current BW standard. Existing special functions or customer-specific options are adopted in the new software generation.

By using the most updated safety components, your machine will continue to meet the latest safety standards after the upgrade. In selected cases, after careful testing, a renewed CE certification can be issued after retrofitting.



UPGRADE DIGITAL & PROCESS MONITORING.

Machines equipped with a Siemens SINUMERIK 840D sl or Siemens SINUMERIK ONE control generation can be upgraded for process monitoring to record the tool dependent power consumption of the machining axes (spindle, X-, Y-, Z-, B-axes).

The system works with self-learning intelligent algorithms and monitors each process through a cumulative signal from the spindle and the axis to be monitored. The learned process curves are stored in the Toolinspect box and used as a reference for the next workpiece machining operation. With this, each process stage is monitored with the previously learned process values. Any irregularities are noticed at an early stage and unexpected machine downtimes can be avoided.

Furthermore, we offer following options for upgrading your machine digitally:

- + Fingerprint
- + Integration Procam-Augusta for machine condition recording
- + Additional operation panels
- + Portable hand-held
- + Customized applications that are planned and installed by us
- + Compensation solutions
- + Safety devices, replacement spindles, flushing features

RELOCATION.



INTERNAL AND EXTERNAL RELOCATION.

The relocation of machines and equipment is a technical and logistical challenge and often difficult to perform due to a lack of manpower and physical equipment. BW can handle the relocation of complete production facilities, production lines and entire plants for you.

Our specialists take over the planning for your internal relocation, step by step. Implementation and monitoring of the entire process: Planning, electrical and mechanical disassembly, preparation of the new position and reassembly right through to commissioning. All this is offered by BW, from a single source.

When planning an in-house relocation, our retrofit experts will be pleased to advise you on optimising your machinery range if requested.

For off-site relocation, also abroad, we additionally manage the complete logistics of loading and transport, including the organisation and compliance with customs requirements and international regulations.



OUR SERVICES.

- + Project planning
- + Measuring
- + Backup of control data
- + Disassembly of all equipment, electrical and mechanical
- + Loading, securing, transportation
- + Preparation of the new location
- + Reassembly
- + Connection and commissioning
- + Machine acceptance
- + Preparation of safety concepts and CE declarations



COMPLETE RETROFIT.

FROM SMALL TO BIG.

Here at BW, we know our machine projects. You are not just a number to us. We devote all our individual knowledge, our know-how, our innovative spirit and our passion to it. We have designed and built our machines to ensure that their lifespan of 30 years is the rule, not the exception. BW machines are strong and robust and therefore perfectly suited for a second life.

There are all different kinds of reasons for retrofitting your machine rather than making a new purchase. Lower investment costs or limitations due to building conditions are just two reasons to mention. It's more profitable to retrofit larger machines. In fact, especially with large machines, a long machine lifespan is important. Even smaller partial retrofits can provide considerable advantages. Therefore, BW offers retrofits ranging from small to large

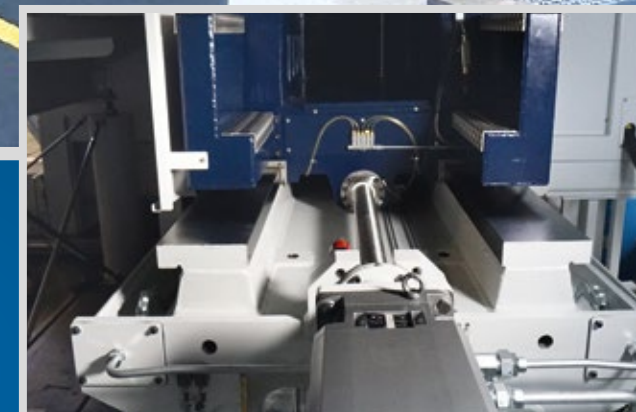
ADVANTAGES+BENEFITS.

- + More efficiency and productivity
- + Increase in machine output
- + Higher machine availability
- + Lower investment costs compared to new purchase
- + Continued use of your existing machine foundation
- + Energy saving

As the time factor of approx. 8 – 12 months for complex retrofits should not be underestimated – BW also offers on request a production support to maintain capacity. We can take over the machining of your workpieces during the period of the retrofit activities by offering you contract manufacturing which will avoid a loss in production.

EXAMPLES OF MACHINE ADAPTATIONS (INCLUDING RETROFITS).

- + Integration of machines into an ERP-system
- + New control unit generations
- + Upgrade of entire components
- + Conversion to a 5-axis machine
- + Conversion from flat-guided to roller-guided
- + Integration in interlinking
- + Extension of the tool magazine
- + Upgrading of clamping fixtures



CASE STUDY.

FROM THE “CLASSIC” TO THE POWERFUL 3-AXIS UNIT.

MORE POSSIBILITIES.

To be able to represent a wider range of different types on the machine in future, and to achieve a higher output, our experts retrofitted a 25-year-old machining centre from scratch. At first, a rigid time and cost structure was defined in cooperation with the customer. To shorten the retrofit time frame, both units were pre-produced and tested at BW.

Considering of purchasing a new machine was denied due to the high degree of customisation as well as the solid basic mechanical structure of the BW-special purpose machine. It was obvious to undertake a general overhaul with modern drive- and control components.

Originally designed as a classic double travelling column machine, the two travelling column units of the machine were completely renewed during the retrofit by powerful 3-axis units with fast travel axes. In addition, modern high-torque swivel spindles were installed, and the tool magazine was enlarged.

An important part of the retrofit was the update to the latest control generation and the integration of extended possibilities for operation via switchable control panels, the use of a tool dialogue system and the integration of in-process measurement. A tool taper cleaning system and a tool breakage control system were installed to optimize the production process. And to increase the degree of automation, the system was also extended by a further pallet storage.

OVERVIEW.

Area	Advantages+Benefits
Drive	Exchange of the drive components
Control	Update on the latest Siemens-control generation
Tool magazine	Increase of number of tools in the tool magazine, leads to less set-up operations
Main spindle	Modern, high-torque swivel spindle
Clamping fixtures	Development of an individual, adjustable clamping fixture to clamp different widths/lengths

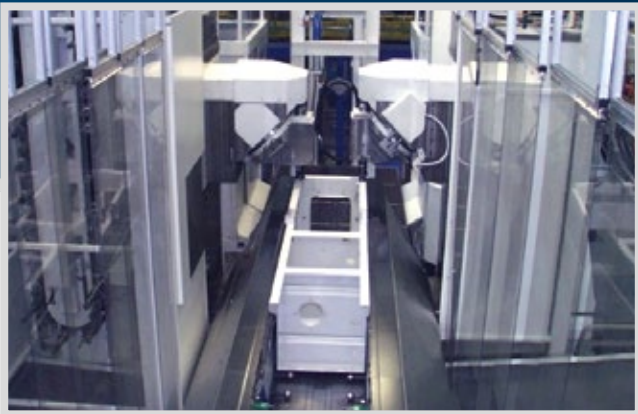
The chain magazines with special tool changers have been completely redeveloped to meet the requirements for fully automatic machining and to be able to cover the increased number of options.

This retrofit now ensures the spare parts supply with original parts for many further years which is often a crucial issue with old machines. Significant savings in energy consumption were also achieved. The perfectly integrated retrofit measures ultimately led to an increase in productivity by a third.



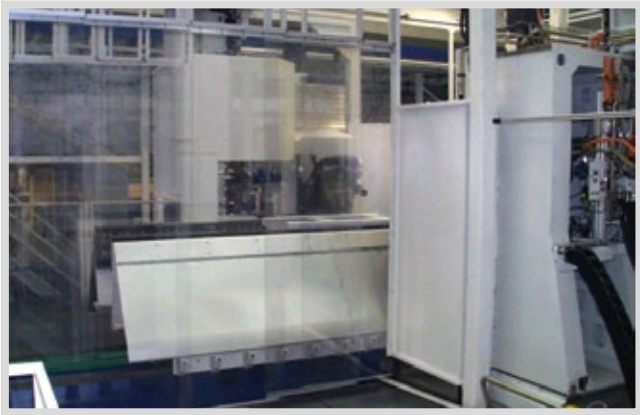
BEFORE.

After decades of use, but still reliable, it was time for a complete overhaul of the special purpose machining centre.



AFTER.

Fresh-up: State-of-the-art technology – the patina of the last 25 years removed. The machining centre is now equipped with new functions and can start-off for a second phase of life.



ERGONOMICS.

An essential aspect of the retrofit process was the improvement of the overall ergonomics. As a result, the former concept of hydraulic fixtures was replaced by a newly developed fixture technology with magnetic clamping which can be automatically adjusted in width.

CONCLUSION.

The investment has already paid off after a few years.

- + Shorter processing times
- + Wider range of workpiece types to be machined
- + Improved ergonomics
- + Faster set-up and retooling
- + Increase of production capacity by 1/3
- + Ensuring availability of spare parts
- + Energy savings

CASE STUDY.

FROM A 4-AXIS MACHINE TO A 5-AXIS MACHINE.

ON GOOD BASIS.

A total of eight machines were to be gradually retrofitted. It started off with two slide-guided machining centres of the MC 120-series built in 1996 and 2000 on which crankcases for large diesel engines were machined in 3 to 5 shifts. To keep up the production capacity during the retrofit works, the machines were modernised one after the other, and not simultaneously.

The objective of the retrofit was to significantly increase the performance of the machine with modern drives and controls, to install up-to-date systems for process monitoring and to make the machines more flexible with additional equipment.

However, another point tipped the scales in favour of a complete retrofit: besides the machine costs, the foundation costs are particularly significant. Depending on the location, environmental requirements and quality of the floor, enormous costs can be involved in the construction of the foundations. In this case, basic cleaning and recoating of the foundation shaft was sufficient, as the entire foundation contour remained the same. Machines equipped with sliding-guides, like this retrofit are perfect for modernisation as the sliding layer can be milled off with little effort, new Teflon can be applied and scraped in. The massive guide frames are largely dimensioned and are hardly subject to wear.

The retrofitting measures for the second machine were more complex: The original horizontal machining unit has been replaced by an A-axis. A 4-axis machine has been transformed into a 5-axis machine. This enables

OVERVIEW.

Area	Advantages+Benefits
Drive	+ Durability + Reliability
Optimization of drives	+ Faster pallet and tool changing + Increased axis speeds
Integration of A-axis	+ Complex 5-axis machining + Fewer clamping operations + Reduced set up and lead times
New control panels	+ Touch-panel with intuitive operation
Electrics (complete)	+ Compatible to Industry 4.0 + Energy saving up to 30%
Integration into (existing) tool magazine	+ Tool data collection
Tool- and process monitoring system	+ Spindle torque monitoring + Feed force monitoring + Adaptive feed control + Wear monitoring

more complex machining operations as the A-axis, featuring a freely adjustable angle can machine a wide range of operations in different angular positions on a single workpiece. Unproductive set-up times are eliminated and shorter set up times are achieved in one clamping operation.

Other components, such as the control system, electrics, and main spindle, were also completely upgraded and converted to the latest state of the art.

The safety aspects of the retrofits were adjusted to the latest safety standards, i.e., existing safety devices such as light barriers, door safety switches with guard locking, etc. were completely replaced by new devices. The machine housing was sandblasted and recoated.

Moreover, the machines have been equipped with a tool and process monitoring system and now meet the standards of Industry 4.0.

And finally, the machine operators were trained in individualised courses to make them familiar with the new features and additional equipment of the machine.

CONCLUSION.

The energy saving of this extensive retrofit project of a whole machine series is particularly remarkable. For reasons of sustainability this was also one of the customer's important objectives.



BEFORE.
Reliable, however up in years.



AFTER.
The machine service life after the retrofit is estimated to be at least 15 years.



A-AXIS.

COMPONENT MANUFACTURING.

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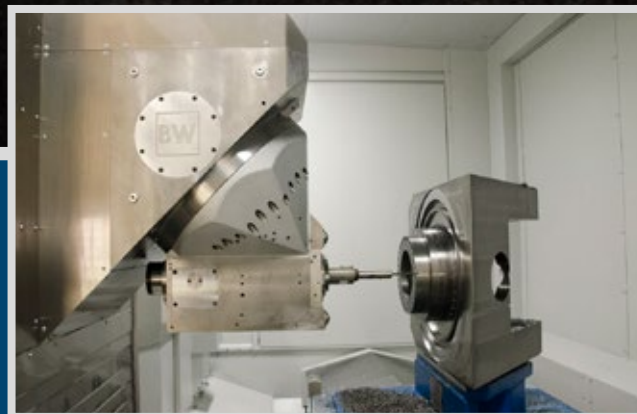
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