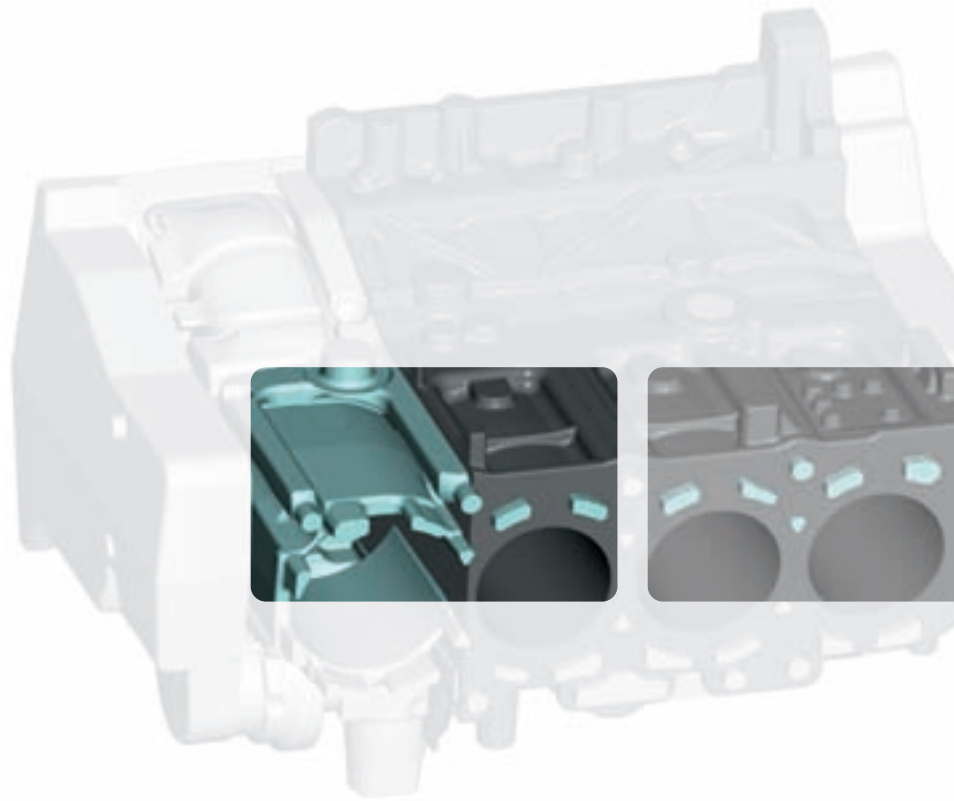




- “THE WHOLE IS MORE THAN THE SUM OF ITS PARTS.”
ARITOTLE



KRÄMER+GREBE

Modell- und Werkzeugbau



- “... AND WE KNOW FROM OUR MANY YEARS OF EXPERIENCE THAT KRÄMER+GREBE IS WITHOUT DOUBT ONE OF THE BEST TOOLING MANUFACTURERS GLOBALLY ...”



- **AN OVERVIEW OF KRÄMER+GREBE**

- Individual overall solutions for foundry requirements
- Tooling equipment – from prototype to serial production
- More than 65 years of experience in pattern and tooling manufacturing
- 190 qualified employees
- Simultaneous Engineering
- Advanced CAD, CAE and CAM technology and know-how
- Short development and lead times
- Modern, comprehensive and flexible manufacturing technology
- Universal machining centers with simultaneous milling capability
- Optimal human resource management
- Certified quality and environmental management
- Advanced technologies and standards for quality assurance
- Comprehensive after sales service
- Central location in Germany



● ● GREAT TO KNOW THAT SUCCESS IS NO COINCIDENCE.



•• **Trusting know-how and experience ...**

There are a lot of reasons why Krämer+ Grebe is one of the global market leaders in the pattern and tool manufacturing branch: such as, for example, 190 employees, who are among the best in their profession, the use of advanced technology, more than 65 years of experience, extremely short development and through-put times, dedication and reliability.

However, there is a different and more important reason for our success: we develop and realize the best design and manufacturing concepts for our customers.

This fundamental principle is passed down from one generation to the next. Just like the know-how that has been gathered during this time and which ensures customers the benefit of being ahead.

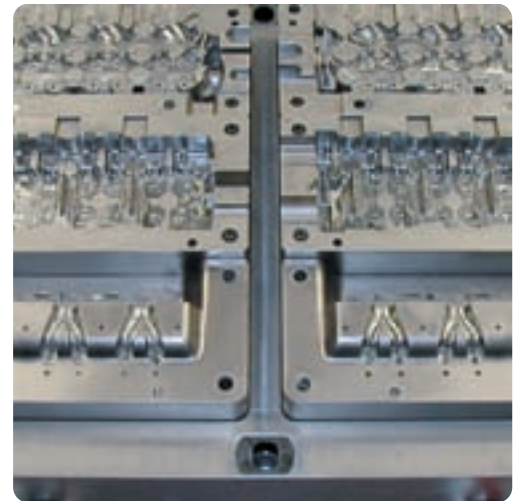
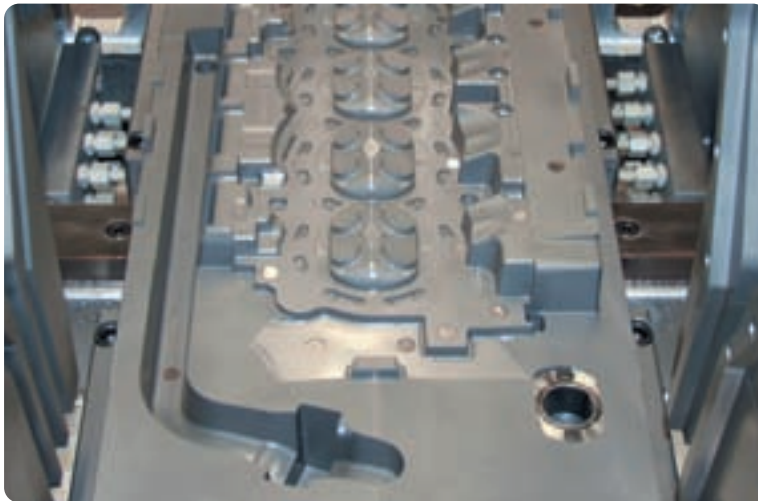
•• **... ensuring future success.**

The company is an innovative partner for the international automobile industry and foundries and has been developing creative concepts for foundry needs in connection with all areas concerning motors for many years. In close cooperation with the customer, high-quality tool equipment for prototype and serial manufacturing from cast iron, steel, aluminum and plastic is produced. This includes patterns, core boxes, permanent molds and special machines as well as the necessary fixtures and handling machines.

The proven and successful foundation for this – both for the design and manufacturing concepts as well as for the optimal process capability of the tools – is simultaneous engineering. The close cooperation between the automobile manufacturer, the foundry, the pattern maker and the use of advanced technology ensure safety in later production phases and save valuable resources.

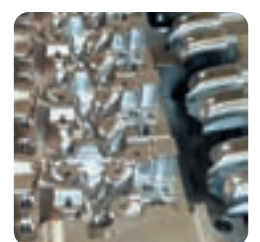
These factors, coupled with modern and certified quality management and excellent service, make Krämer+Grebe the partner that is necessary for success.

- “... ANYONE WHO WANTS THE OPTIMUM IN DESIGN AND MANUFACTURING CONCEPTS HAS A BENCHMARK: KRÄMER+GREBE.”

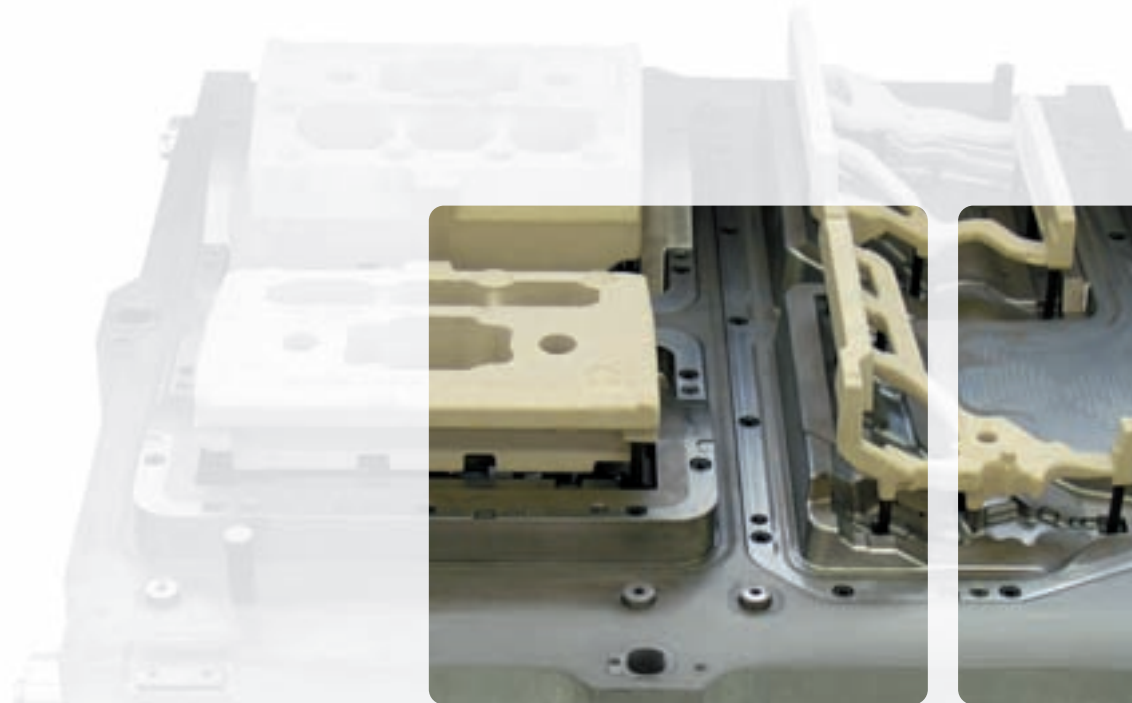


- AN OVERVIEW OF SOLUTIONS

- Analyses and studies
- Engineering
- Tool equipment
- Special machines
- Initial sampling
- After sales service



● ● WE ARE NOT JUST SATISFIED WITH MEETING STANDARDS, WE WANT TO SET THEM.



●● High-quality prototypes are one thing ...

Krämer+Grebe is focused on developing extremely high-quality tools and universal pattern equipment for engine casting and other automobile cast parts.

A team of excellent tooling engineers designs and manufactures complete equipment for foundry requirements. Complex casting concepts for motor components are developed in close cooperation with customers and part-

ners – an approach that taps synergies and saves time.

A wide range of materials is used: cast iron, steel, light metal casting and resin. In the phase of the pre-series equipment and the development of the prototype tools – in different types of resin for varied requirement profiles – Krämer+Grebe is an experienced and innovative partner.

●● ... robust and completely reliable serial tools are another.

Of course, the scope of services includes all of the required serial tools for the various casting processes such as sand casting, precision sand casting (CPS) and permanent mold casting. Patterns, core boxes, permanent molds and all the necessary special ma-

chines are designed and manufactured for cylinder blocks, cylinder heads, transmission and clutch housing, crankshafts and camshafts, manifolds and safety and suspension parts.



PATTERNS

Krämer+Grebe manufactures high-quality patterns for small and large batches in all required materials complete with all technical casting and venting details – in a very short time and in close coordination.

CORE BOXES

As a specialist for complete tooling equipment -individual and made to measure- for all core shooters and core manufacturing processes, Krämer+Grebe naturally offers the required accessories of the highest quality standard:

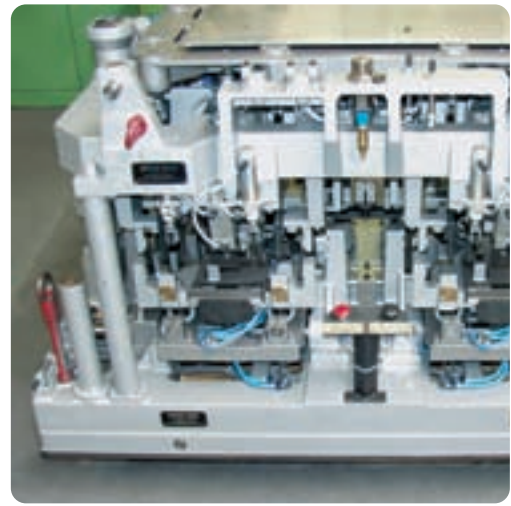
- Cold box process
- Hot box process
- Croning process
- Inorganic warm box process

PERMANENT MOLDS

Krämer+Grebe is the right partner for extraordinarily precise casting.

The highest dimensional accuracy and optimal functionality of the tools for a broad range of casting machines create safety in production.

- Gravity molds
- Low pressure molds
- Molds for rotacast processes



SPECIAL MACHINES AND DEVICES FOR PROCESS AUTOMATION, PROCESS SAFETY AND CORE HANDLING

Individual solutions for individual requirements are an integral part of the daily work of the highly qualified skilled personnel at Krämer+Grebe. Their innovative approach to handling, controlling, adjusting, mechanization and automation leads to professional universal solutions and optimal production flows.

- Core assembly and setting fixtures
- Core drilling fixtures
- Core assembly and screwing fixtures
- Core grippers and manipulators
- Core take-out fixtures
- Core deburring fixtures
- Core stacking control devices
- Lifting and turning devices
- Key core fixtures
- Rough casting control fixtures
- Adjusting devices/ Spotting machines
- Leak test fixtures

PROTOTYPES

Close-to-production solutions, visual models, short development times and short paths to the first casting – this is what characterizes prototype production at Krämer+Grebe.

This includes:

- Prototype tools in aluminum and resin
- Rapid prototype components
- 3D print models
- PEPSET processes for small numbers of units

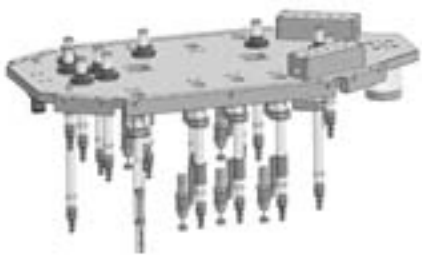


- “... FOR US, THERE IS ONLY ONE PATTERN MAKER WHO CAN RELIABLY IMPLEMENT PROJECTS, WHICH ARE CLOSE TO THE SERIES, IN A VERY SHORT TIME: KRÄMER+GREBE.”



•• AN OVERVIEW OF SYSTEMS •• Realizing visions, putting creative ideas into practice ...

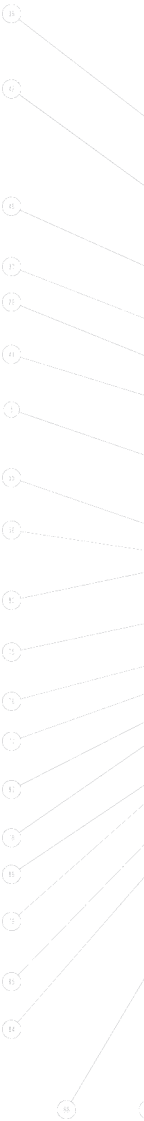
- CATIA V4 and V5
- Pro Engineer, Wildfire
- Unigraphics NX
- EUKLID
- ME 10



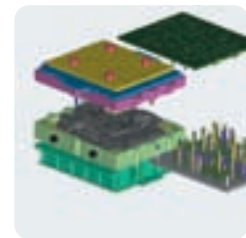
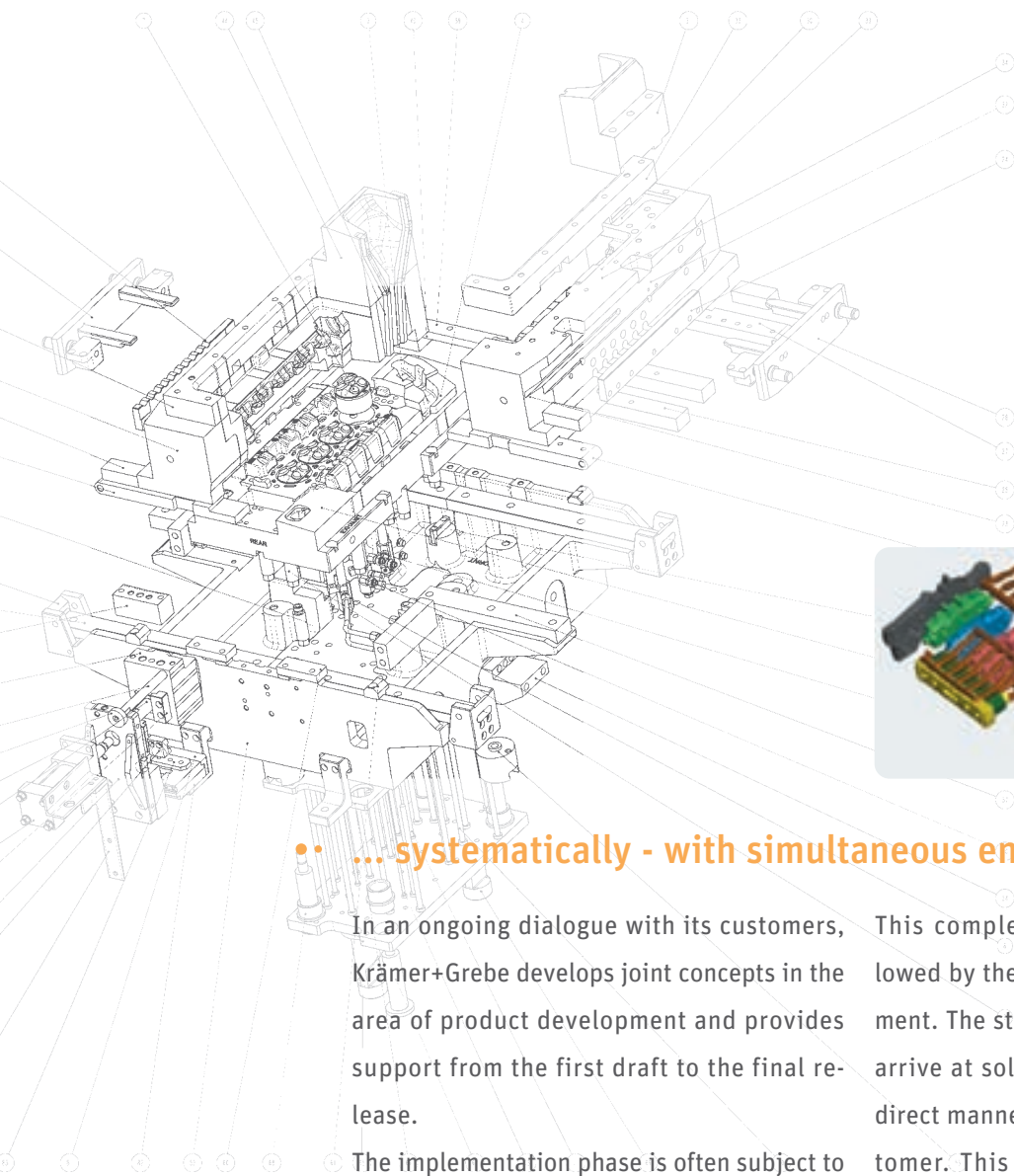
The reduction of design times in the automobile industry goes hand in hand with an ever-quicker succession of model life cycles; parallel to this, requirement structures are becoming increasingly complex while manufacturing tolerance levels have sunk.

To make high-tech visions become a reality, an intense dialogue with the customer as well as a broad range of experience and creativity are needed.

This is what the company history and the team at Krämer+Grebe are all about.



● ● TO BENEFIT FROM BEING AHEAD.

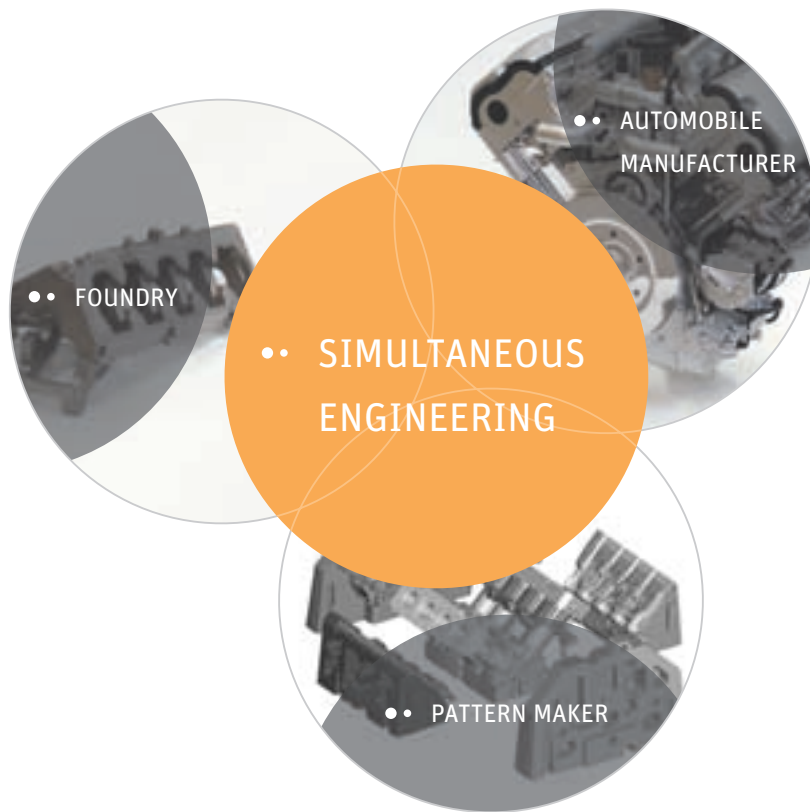


● ● ... systematically - with simultaneous engineering.

In an ongoing dialogue with its customers, Krämer+Grebe develops joint concepts in the area of product development and provides support from the first draft to the final release.

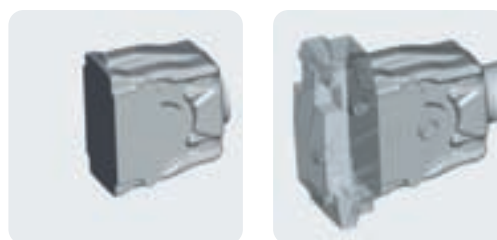
The implementation phase is often subject to a narrow time window. Under these conditions, experienced engineers and technicians with casting expertise as well as feasibility and optimization strategies ensure a clear view during the planning of the layout and tool concepts. Core layouts and mold studies are designed and modified according to casting-related aspects. All of the participants work together smoothly.

This complex engineering process is followed by the manufacture of the tool equipment. The standard for all work is always to arrive at solutions quickly and in the most direct manner to minimize costs for the customer. This means that the employees at Krämer+Grebe perform valuable work, which creates a clear competitive advantage for their customers.



•• SIMULTANEOUS ENGINEERING – THE ADVANTAGES AT A GLANCE

- Feasibility and optimization strategies
- Short development times
- Early concept determination and setting of casting strategy
- Casting optimization
- Identification and elimination of weaknesses
- Increased effectiveness
- Early focus on tool design for lifetime, maintenance etc.
- Parallel product and tool development
- Close to production design and process safety
- Short realization phase for the project
- Early production stage – time to market
- Cost reduction
- Scrap reduction
- Resource savings





- **Advanced software, system depth and trouble-free data exchange ...**

The experienced CAD/CAM specialists at Krämer+Grebe work with the most current design software systems such as CATIA, PRO ENGINEER and UNIGRAPHICS.

The openness of these systems makes data exchange in native format between all of the

customary systems possible at any time, so that 2D and 3D data can be transferred or provided without difficulty.

Data transfer takes place through all of the usual interfaces in the automotive industry.

- **... lead to a design that meets all requirements fully.**

In addition to their high competence level with respect to software, the CAE and CAD/CAM engineers at Krämer+Grebe possess extensive knowledge of tool design and complex knowledge of the foundry sector.

This has a lot of advantages for partners cooperating with Krämer+Grebe.

These advantages are enhanced by the use of various CAD systems, so that the results and developments for the design can be implemented with the original data record.

- “THE FIRST TOOL EQUIPMENT THAT WE RECEIVED FROM KRÄMER+GREBE SET NEW QUALITY STANDARDS!”

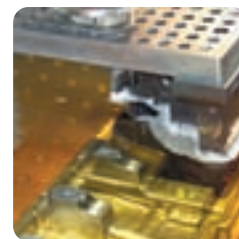
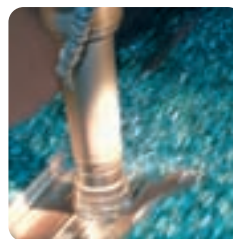


- **AN OVERVIEW OF MANUFACTURING**

Over 40 machines and machining centers are in operation around the clock.

The high-tech equipment includes:

- Standardized, high-precision CNC 3D universal machining centers
- Modern milling machines for high-speed cutting processes
- Horizontal and vertical 3-5-axis universal machining centers with simultaneous milling capability
- EDM machines
- High-performance horizontal drilling and milling machines
- Automatic lathes



● ● IT´S A MATTER OF THE INTERPLAY OF EXPERTISE AND ADVANCED TECHNOLOGY.



•• A passion for precision ...

The production of very high-quality and revisable tooling and pattern equipment requires the skills of qualified specialists and machines that can meet the highest demands.

Krämer+Grebe uses machines with advanced manufacturing technology to achieve the highest possible quality.

•• ...with dynamic manufacturing processes.

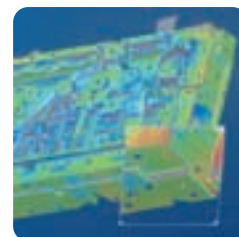
Advanced technology, however, is not enough. Krämer+Grebe would not belong to the world-class of foundry tooling companies, if it were not for its qualified employees. The skill, creativity, visions and experience of the people at Krämer+Grebe are the driving factors behind the new developments and tools.

This is why the company offers a workplace with a cooperative atmosphere and high technical standards. In-house training is an important vehicle, which the company uses intensively, for recruiting qualified junior personnel. Building commitment and loyalty to the company among employees is likewise an integral part of the company's tradition.



•• AN OVERVIEW OF QUALITY ASSURANCE

- 100 % profile check by optical digitization
- Tactile measurement of shapes and tooling interfaces
- Initial sample reports for castings
- Tool wear measurement
- Colored error map reporting and documentation
- Reverse engineering (CAD file generation)





- **Reliability and systematic quality inspection ...**

All of Krämer+Grebe's products undergo different phases of validation. It is only after the work piece has passed through the individual quality gates successfully that the process is continued or completed.

The Metrology department is equipped with 3D measuring machines and an optical digi-

tizing system with surface measurement software, so that the required accuracy of tooling is guaranteed.

This process enables a 100 % measurement of tooling, and customers can be sure that all specifications are fully met.

- **... go hand in hand with the highest expectations.**

Krämer+Grebe can draw from decades of experience in the area of pattern and tool making. Customers and partners benefit from this know-how with respect to high-quality steel and resin materials.

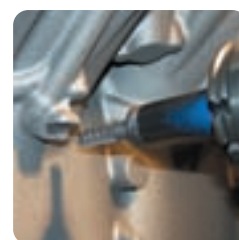
Close tolerances, high surface quality, thermal and mechanical stability as well as complex tool contours are the criteria with which Krämer+Grebe defines quality.

- “KRÄMER+GREBE OFFERS COMPREHENSIVE SERVICES, WHICH ARE OF GREAT IMPORTANCE FOR SUCH COMPLEX TOOLS.”



•• AN OVERVIEW OF SERVICES

- Short notice and flexible handling of fast repairs and modifications
- For short development times, fast design changes
- Feasibility studies and strategies
- Spotting machining of pick up points for small series
- Own truck fleet



● ● OUR CUSTOMERS KNOW THEY CAN RELY ON US.



•• **Customer satisfaction is the bottom line ...**

Krämer+Grebe offers its customers a full range of services, which are individual, focused on the customer and in step with the times. Measures that are needed on short notice are implemented with the customary and required precision.

The service range includes on-site support to break in the tools, after sales service, change service, repair service and logistics.

•• **... with certification, of course!**

Krämer+Grebe's understanding of quality also means maintaining an intensive dialogue with customers and the ability to implement suggested improvements.

Especially because the market is constantly changing, Krämer+Grebe is involved in a continuous process of optimizing quality standards and minimizing costs by conserving resources and the environment.

The company's quality and environmental management systems are of course respectively certified according to DIN ISO 9001 and DIN ISO 14001.



KRÄMER+GREBE

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