

**Competence  
in magnesium die casting**

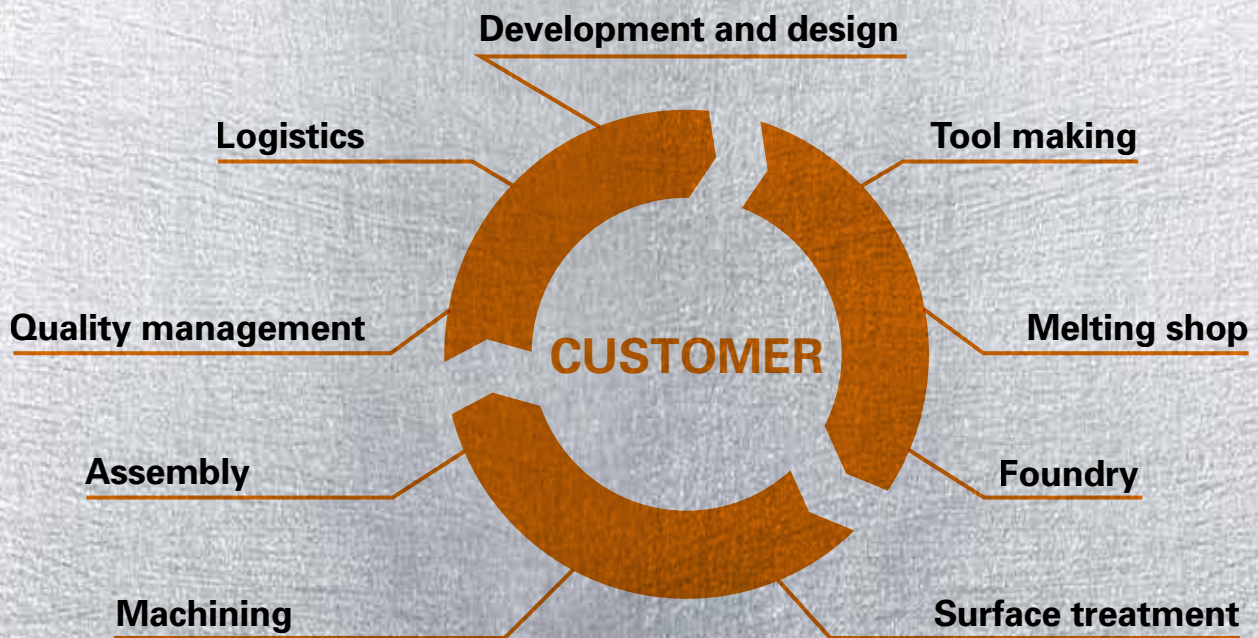


More than four decades of magnesium diecasting knowhow, top level engineering competence, and a comprehensive range of one source services. The customers of STIHL Magnesium Druckguss take advantage of the complete potential, provided by this future material. But let the following pages do the convincing!



<b>Title</b>	<b>Page</b>
Editorial .....	5
Development and design .....	7
Tool making .....	9
Melting shop .....	11
Foundry .....	13
Surface treatment .....	15
Machining .....	17
Assembly .....	19
Quality management .....	21
Logistics .....	23
Training and development .....	25
Materials and properties .....	27
Certificates .....	30

The whole process cycle from the one source – STIHL Magnesium Druckguss competence is our customers' constant companion from the idea to the end product. Our services therefore extend far beyond the walls of a diecasting plant.





Founded on quality: Prüm-Weinsheim in the Eifel is home to one of the largest magnesium diecasting plants in Europe.

## Welcome to one of the leading magnesium diecasting specialists in Europe

Today, the light metal magnesium is considered to be the **structural material of the 21<sup>st</sup> century**. The outstanding characteristics of this material are its stability, excellent casting properties, and workability.

Magnesium presents many advantages in comparison to other materials. It can be **recycled any number of times** – completely in line with the ecological trend towards nature awareness in today's society.

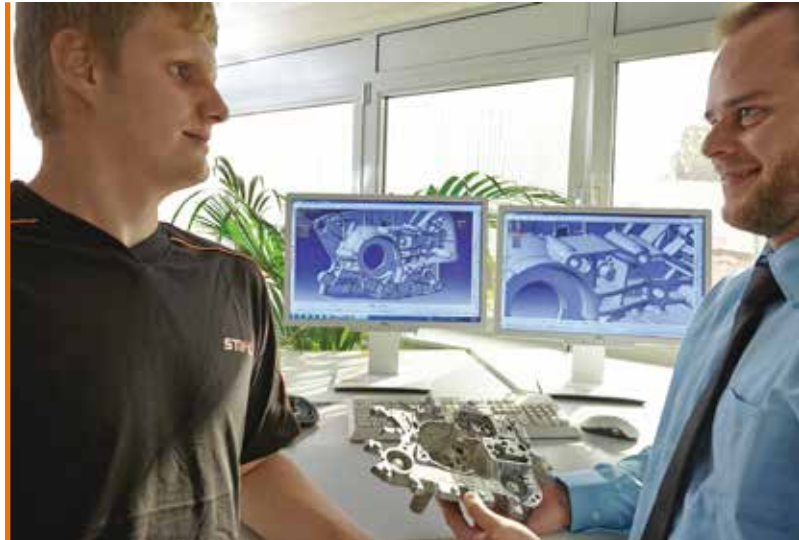
It was not least this responsibility alone that saw our magnesium alloy components adopt a significant role from the very outset in the design of our STIHL chainsaws and power tools.

Over the course of these developments and as a measure to assure our high quality claims on a permanent basis, STIHL founded a magnesium diecasting plant in Weinsheim as early as 1971. With over 600 dedicated employees, it is one of the largest and most modern magnesium diecasting plants in Europe and can offer the best facilities today to master the requirements of tomorrow.

STIHL Magnesium Druckguss is your competent partner for integrated solutions from the one source.

From the idea to the product:  
the STIHL result is a component  
optimised to perfection.





In the beginning, there is active customer support: STIHL knowhow is an invaluable aid as early as the draft phases. This casting specialist provides support for the optimal layout of the component.

## Quality from the outset

We attach great importance to efficiency. Accordingly, optimisations on the end product are developed and realised with our customers before the draft phase has even ended. This greatly shortens project times and allows requested changes to be integrated at an early stage.

Our design, production, and quality assurance specialists then work closely with our customers on project teams, true to the principles of **Simultaneous Engineering with STIHL**.

The competence of our personnel provides the unfailing guarantee over all phases from the component's layout for the optimal diecasting results to the efficient production methods, with state

of the art CAD software and short term customer consultations as standard constituents of our services. These standard services also include mould filling and solidification simulations.

In safeguarding a reliable development as the starting point for the optimally planned process stream, STIHL relies on a consistent CAD/CAM system for programming the machining cycles, generating the mould, and transferring the 3D data to the check station.

The result is enhanced product quality with reduced costs and machining times – series production can be launched faster.

EDM electrodes being milled on a CNC machine tool.





## We give shape to your ideas

**Ultra precision** provides the standard for all of our procedures.

All of the tools and moulds we use come from our own mould-making department. We use exclusively top quality **hot work tool steels**. This guarantees compliance with our customers' quality requirements.

We are convinced: by providing the whole process stream from the one source, we have quality completely under control over all production phases.

In addition, this **efficiency of short routes between development and tool shop** allows our customers to integrate design changes at an early time.



Inspecting, measuring, finishing: there are many steps up to the final tool. STIHL quality is the sum of decades of knowhow and quality ideals embodied by our personnel.



In the end there is a new beginning: all magnesium alloys can be reintroduced to the production process without waste. We guarantee alloy purity by marking each cast part with a material code – further testimony to our consistent quality ideals.



Discarded magnesium parts are melted at about 700 °C and cast into bars.

## Reintroducing secondary resources the STIHL way

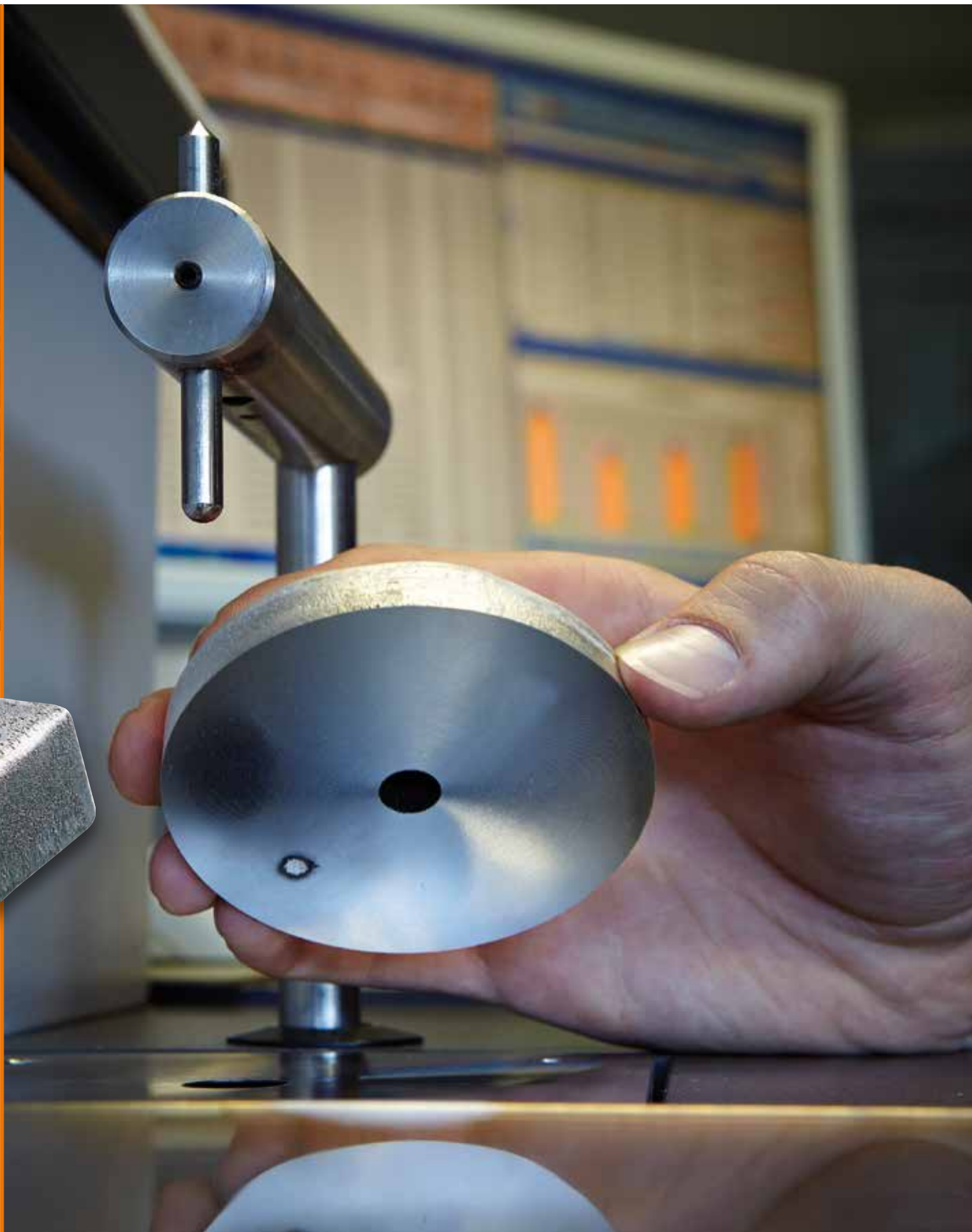
The melting plant processes about 4500 tonnes every year.

Taking the cycle of nature as its model, STIHL does not waste secondary resources unnecessarily. For instance, our melting plant processes reintroduced material to provide new input stock without any loss of quality, unlike primary resources.

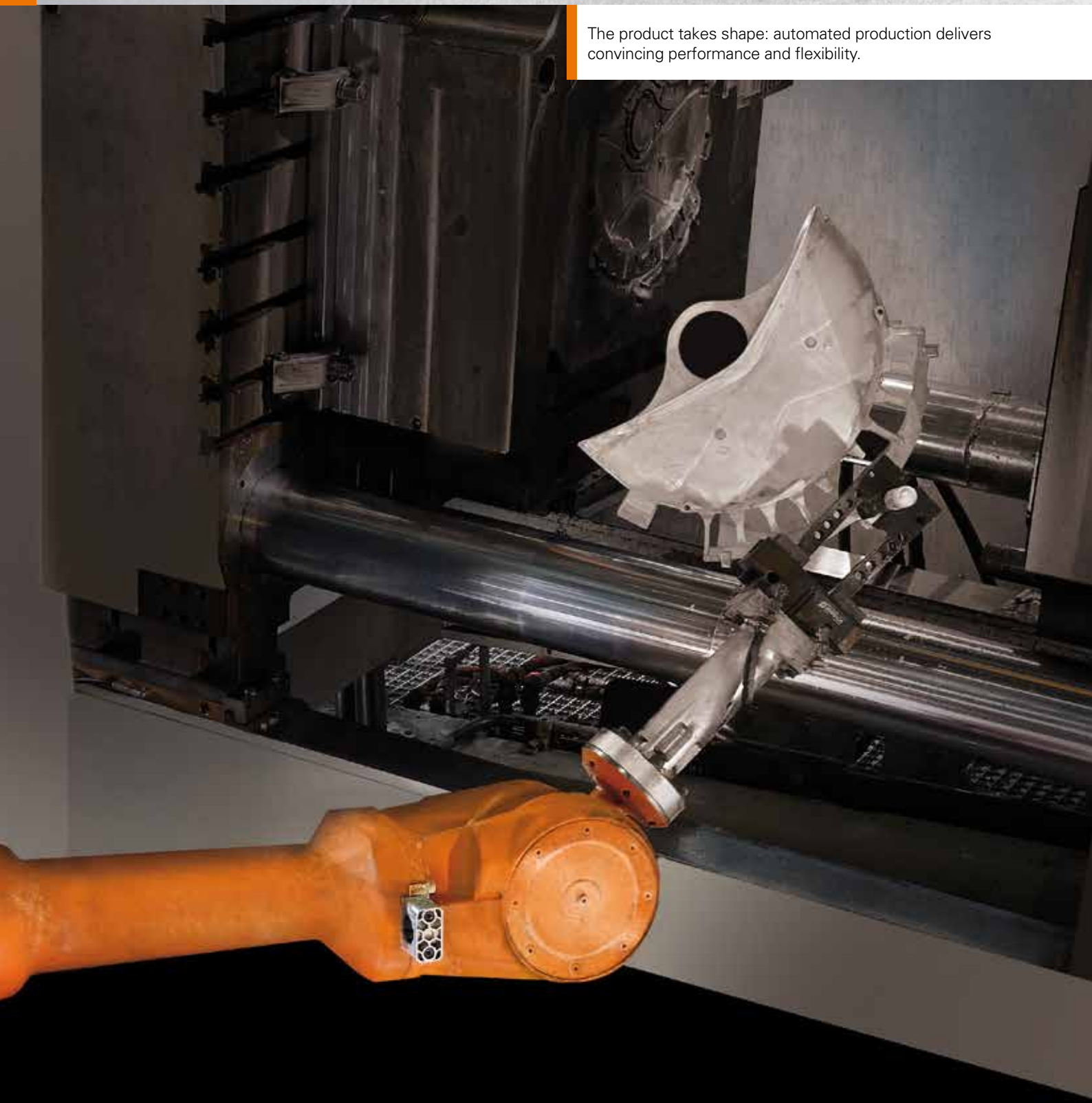
This is particularly important in the face of the manufacturer's responsibility for **product recycling** and the **protection of resources**.

**With our certified and accredited processes, sequences, and auditing procedures** in this industry, we, "**STIHL Magnesium Druckguss**" can assure our customers a reliable partnership hallmarked by experience and expertise.





The product takes shape: automated production delivers convincing performance and flexibility.



## Hot and cold chamber casting under control

Processing about **6500 tonnes** a year, STIHL ranks among the highest performance manufacturers of magnesium **diecasting products** in Europe.

Fully automated hot and cold chamber diecasting cells produce parts of standard and special alloy components designed for high requirements.

The underlying quality factors at STIHL Magnesium Druckguss are **long lifetime, dimensional stability, and surface quality**.



Individual colour schemes can be compiled from a wide range. Our systems produce little waste: excess powder is reintroduced to the cycle.



# A new coat for your product

We are equipped to coat magnesium diecasting parts in any colour.

At the same time, high quality is safeguarded by two powder coating installations featuring state of the art **ESP technology**. Even after years of use, the component does not suffer any loss in its surface protection or visual appeal.

The ultra modern production facilities ensure **short changeover times, fast workpiece cycles** – and a further important argument in favour of STIHL magnesium diecasts.

Also significant is how the parts are pretreated according to their constituent materials, e.g. degreasing and washing. Here our customers benefit from our decades of experience.



Not at all superficial – the three essential steps: pretreatment, powder coating, hardening.





High speed in the machining centres:  
Fitted with the most diverse tools, our machining centres can execute a numerous operations in succession on the one work-piece – without changeovers. Flexible fixtures allow machining on all surfaces of the diecasting parts.



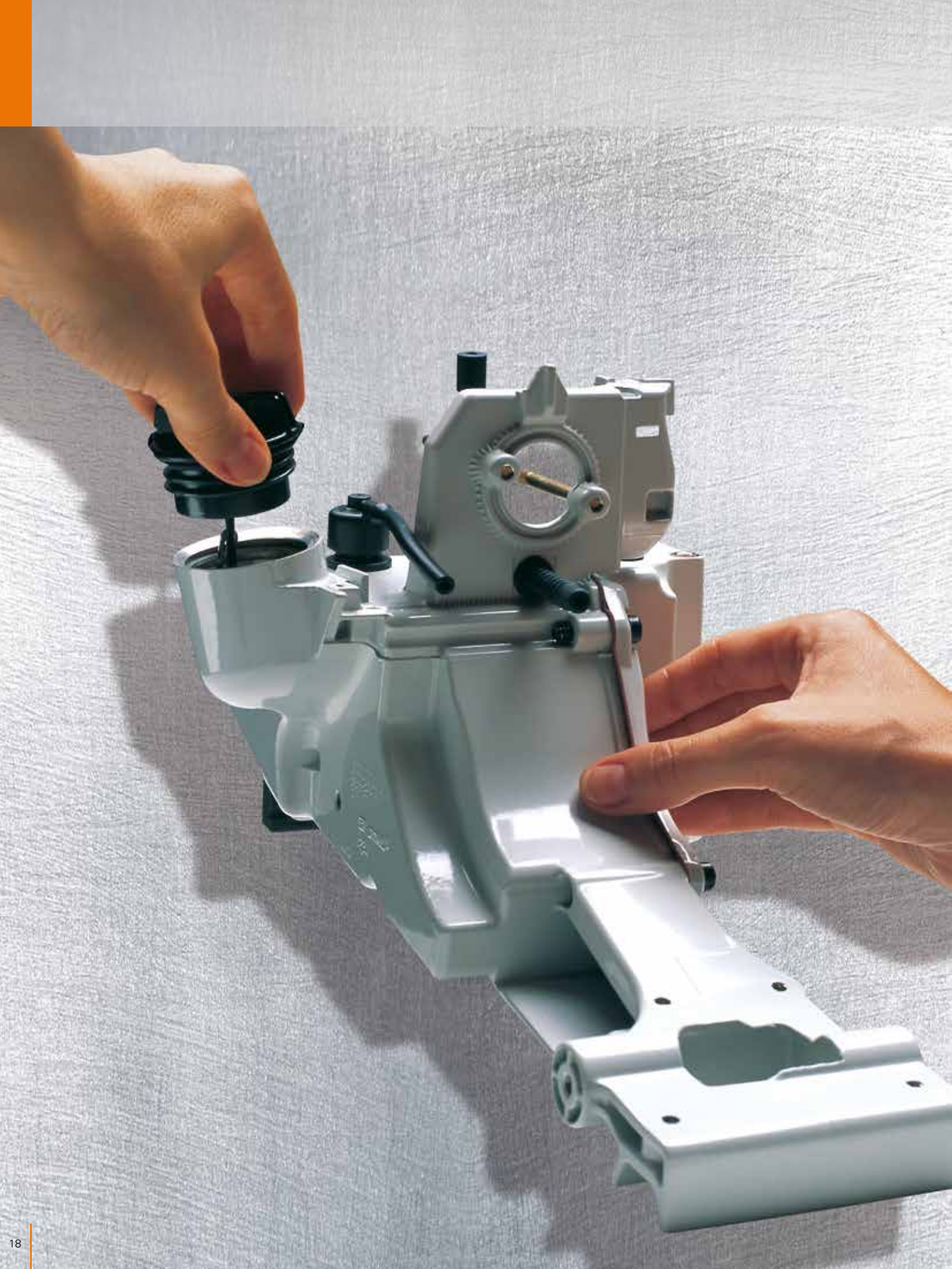
## Machining on the highest quality level

A lot of magnesium casts undergo a series of machining operations. Some examples are milling, spindling, and thread cutting on ultra modern high speed installations.

STIHL competence in magnesium machining has also been integrated in our machinery: high speed machines from leading manufacturers are at our disposal.

Our machinery also includes production systems developed and built by STIHL. Efficient production and consistently high quality are safeguarded by machining lines of both series production installations and special designs.







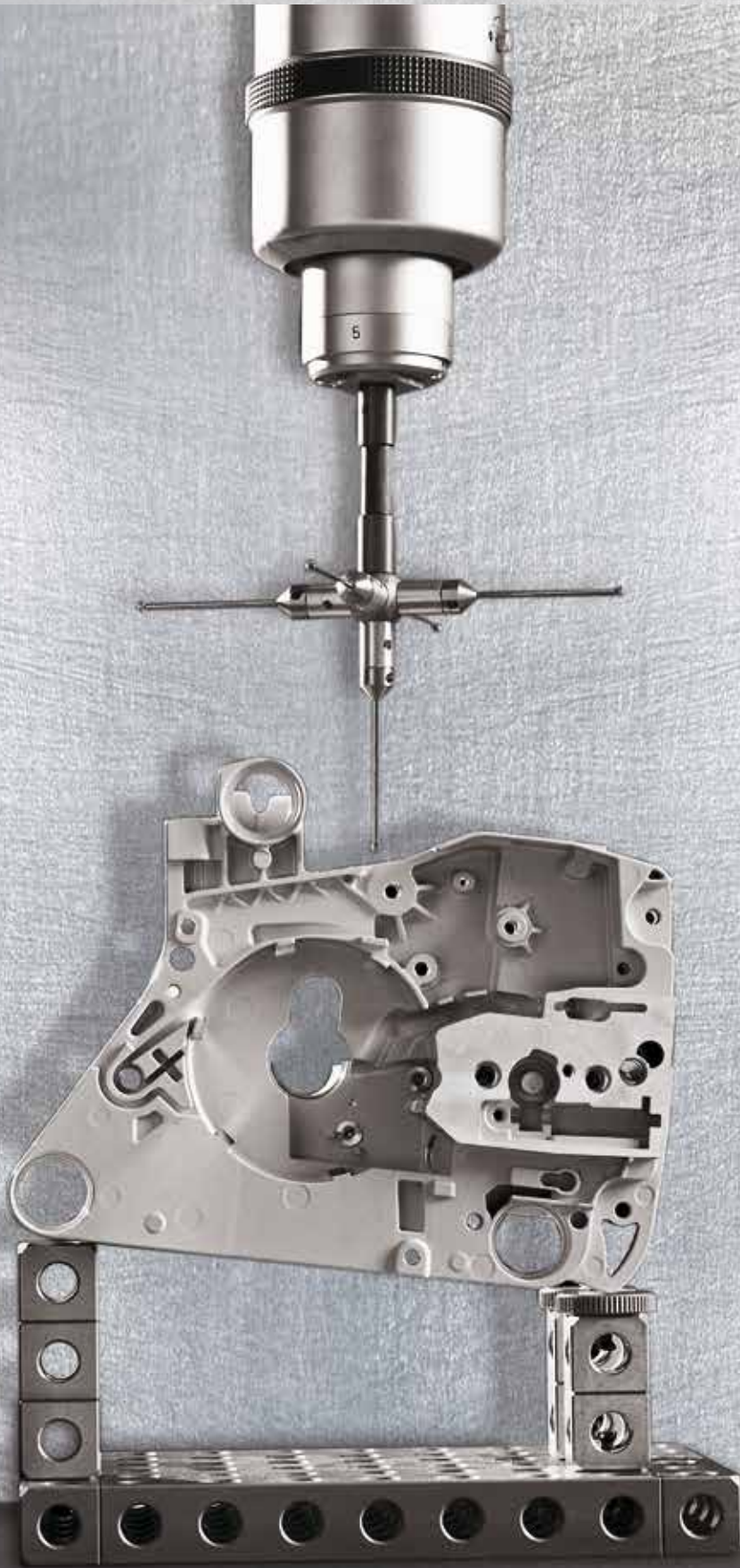
The utmost meticulousness is guaranteed: on turntable machines or special assembly lines, the diecasting parts are assembled into prefabricated units or prepared for installation. Here too, quality benefits from the highly ergonomic operations.

## Our quality claim is your guarantee

We offer our customers our entire knowhow in **partial and final assembly**, with production processes aligned to your requirements at all times.

At the same time, these processes fulfil the STIHL quality standards over the whole stream – from the development to the finished construction unit.

For our customers, this means maximised precision and short delivery times at an appealing price.



## Quality and precision

Every step along the STIHL process stream is monitored by modern quality management. This safeguards at all times the highest precision in sample moulding, mouldmaking, casting, surface treatment, machining, and assembly.

The basis is provided by consistently organised quality planning that starts as early as the development phase.

The standards we set are maintained over all production stages by ultra complex and modern measuring systems and equipment.



No matter the extent of automation, however, refined technology cannot and should not replace the skilled appraisal of experienced personnel.



## Just in time – worldwide

Once our strict quality ideals have ensured the smooth manufacture and subsequent machining of our magnesium diecasting parts, the following process steps provide our range of services for the whole field of logistics.

Constantly maintained at the state of the art level, our services provide reliable just in time deliveries, helping our customers to cut their storage costs.

STIHL Magnesium Druckguss therefore reaches numerous countries all around the world, punctually and reliably.



Our quality ideals extend consistently to the very end of the process stream. So our customers, including logistics service providers, can rely on the perfection of STIHL Magnesium Druckguss. IT assisted and partially automated, our high bay warehouse meets every demand.





## Training for the future

Over the entire production process, we need the latest technologies and a strong, competent team of highly qualified personnel if we are to rank among the best diecasting specialists in Europe.

Accordingly, **qualification, identification and motivation** are the all deciding keywords at STIHL. That is why we attach special importance to the training and development of our personnel.



Cast magnesium alloys produce low part weights at competitive manufacturing costs. The typical advantages of cast magnesium parts are thin walls, dimensional stability, short casting cycles, and long mould lifetimes.

Other points in favour include excellent machinability and good damping and (EMI) shielding properties. Thanks to their high purity and ultra modern anticorrosion techniques, our cast alloys are also the perfect choice in corrosive environments.

### EN-MC MgAl9Zn1(A) (AZ 91)

The most common diecast alloy with outstanding casting properties and high strength.

Typical applications: automotive, computer, and mobile phone parts; sports equipment; covers and housings; components for power saws, hand tools, domestic appliances, etc.

### Composition of diecast magnesium ingots

Alloy		% Al	% Mn	% Zn (max)	% Si (max)	% Cu (max)	% Ni (max)	% Fe (max)	% others (max)
EN-MB MgAl9Zn1(A)	EN-MB 21120	8.5–9.5	min 0.17	0.45–0.90	0.05	0.025	0.001	0.004	0.01
EN-MB MgAl6Mn	EN-MB 21230	5.6–6.4	min 0.23	max 0.20	0.05	0.008	0.001	0.004	0.01
EN-MB MgAl5Mn	EN-MB 21220	4.5–5.3	min 0.27	max 0.20	0.05	0.008	0.001	0.004	0.01
EN-MB MgAl2Mn	EN-MB 21210	1.7–2.5	min 0.35	max 0.20	0.05	0.008	0.001	0.004	0.01

### Characteristic mechanical properties (at room temperature)

Values measured on separately cast test bars

Properties	Unit	EN-MC MgAl9Zn1(A) (AZ 91)	EN-MC MgAl6Mn (AM 60)	EN-MC MgAl5Mn (AM 50)	EN-MC MgAl2Mn (AM 20)
Tensile strength	N/mm <sup>2</sup>	200–260	190–250	180–230	150–220
0.2% proof stress	N/mm <sup>2</sup>	140–170	120–150	110–130	80–100
Compressive strength	N/mm <sup>2</sup>	148	nm	113	74
Elongation at break	%	1–6	4–14	5–15	8–18
Modulus of elasticity	kN/mm <sup>2</sup>	45	45	45	45
Shear modulus	kN/mm <sup>2</sup>	17	nm	nm	nm
Brinell hardness	HBS 1/5	65–85	55–70	50–65	40–55
Impact resistance Charpy impact strength without V notch	J	6	17	18	18

nm: not measured

The mechanical properties of an alloy depend greatly on the manufacturing method and its variables.

## EN-MC MgAl5Mn (AM 50) / EN-MC MgAl6Mn (AM 60)

These alloys are characterised by particularly high elongation and energy absorption with high strength and good castability. Typical applications are in automotive engineering: seat frames, steering wheels, dashboard frames, fan impellers, etc.

## EN-MC MgAl2Mn (AM 20)

Characteristic of this alloy is its excellent elongation combined with high impact resistance. Its typical applications, therefore, are for safety components in automotive engineering.

### Diecasts

Alloy		% Al	% Mn	% Zn (max)	% Si (max)	% Cu (max)	% Ni (max)	% Fe (max)	% others (max)
EN-MC MgAl9Zn1(A)	EN-MC 21120	8.3–9.7	min 0.10	0.35–1.00	0.10	0.030	0.002	0.005	0.01
EN-MC MgAl6Mn	EN-MC 21230	5.5–6.5	min 0.10	max 0.20	0.10	0.010	0.002	0.005	0.01
EN-MC MgAl5Mn	EN-MC 21220	4.4–5.5	min 0.10	max 0.20	0.10	0.010	0.002	0.005	0.01
EN-MC MgAl2Mn	EN-MC 21210	1.6–2.6	min 0.10	max 0.20	0.10	0.010	0.002	0.005	0.01

### Characteristic physical properties

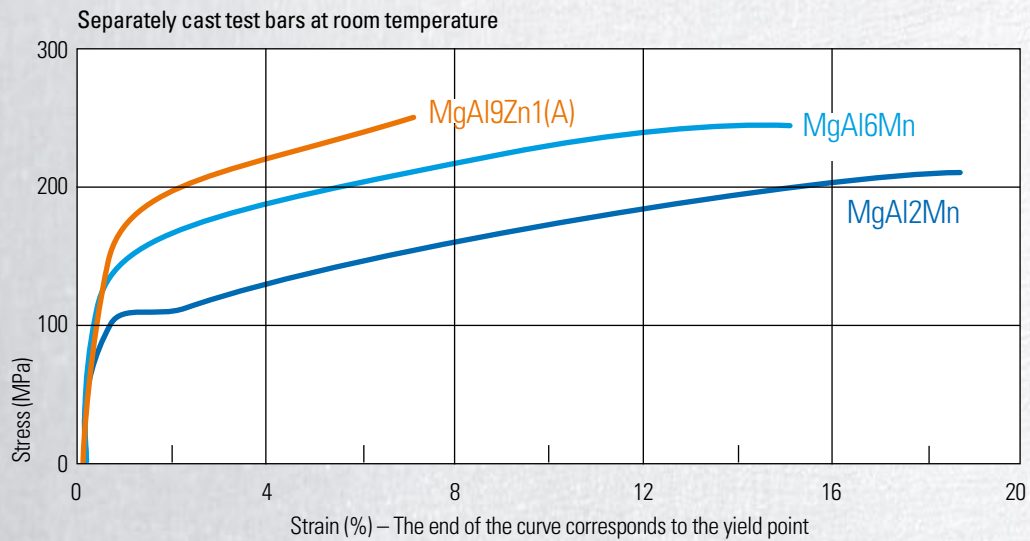
Properties	Unit	Temp. °C	EN-MC MgAl9Zn- n1(A) (AZ 91)	EN-MC MgAl6Mn (AM 60)	EN-MC MgAl5Mn (AM 50)	EN-MC MgAl2Mn (AM 20)
Density	g/cm <sup>3</sup>	20	1.81	1.80	1.77	1.75
Liquidus temperature	°C		598	615	620	638
Incipient melting temperature	°C		420–435	420–435	420–435	420–435
Coeff. of thermal expansion	µm/m-K	20–100	26.0	26.0	26.0	26.0
Effective latent heat of fusion	kJ/kg		370	370	370	370
Specific heat capacity	kJ/kg-K	20	1.02	1.02	1.02	1.02
Thermal conductivity	W/K-m	20	51	61	65	94
Electrical conductivity	MS/m	20	6.6	nm	9.1	13.1

nm: not measured

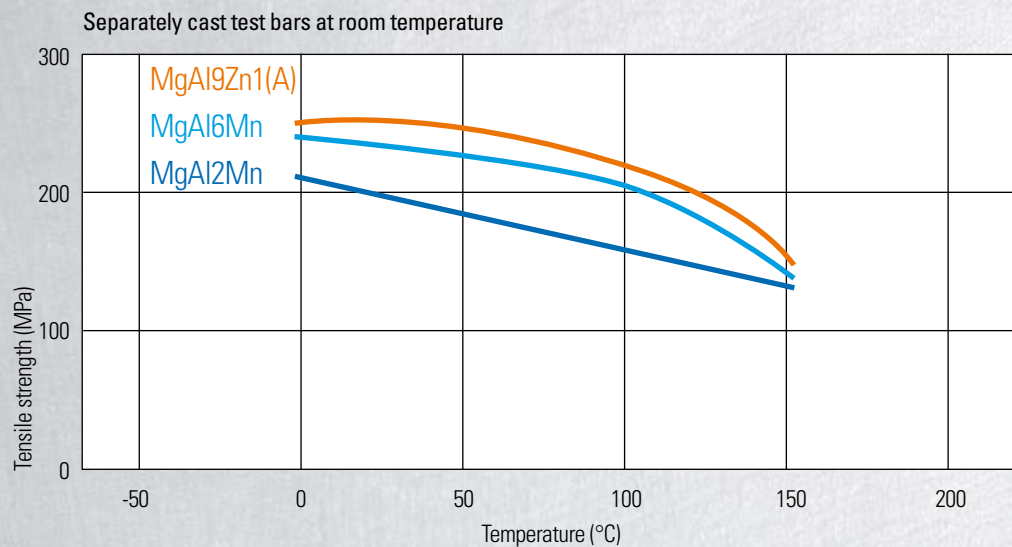
Details and specifications are listed in DIN EN 1753 and the ASTM standards.  
STIHL does not accept any warranty or liability for the details presented in this brochure.  
Misprints excepted.

# Magnesium diecasting alloys

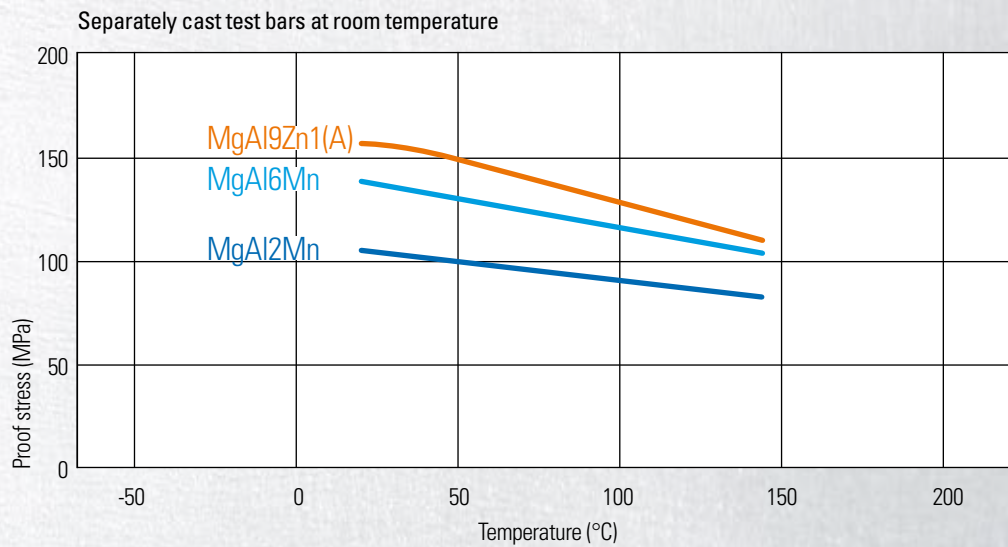
## Stress-strain curves



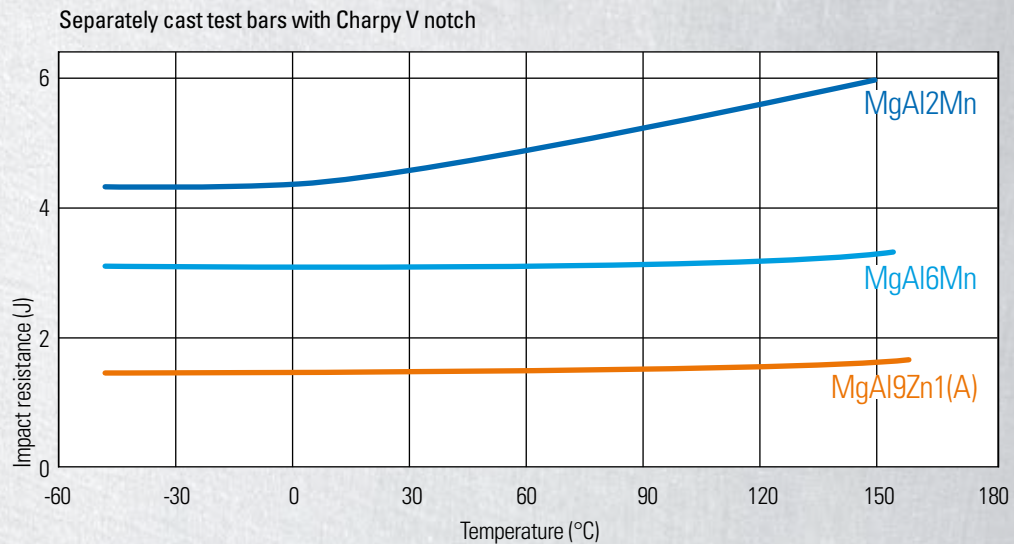
## Tensile strength



## 0.2% proof stress



## Impact resistance





**Certificate  
BS OHSAS 18001**



**Certificate  
ISO 50001**



**Certificate  
ISO 9001**



**Certificate  
ISO/TS 16949**



**Certificate  
ISO 14001**



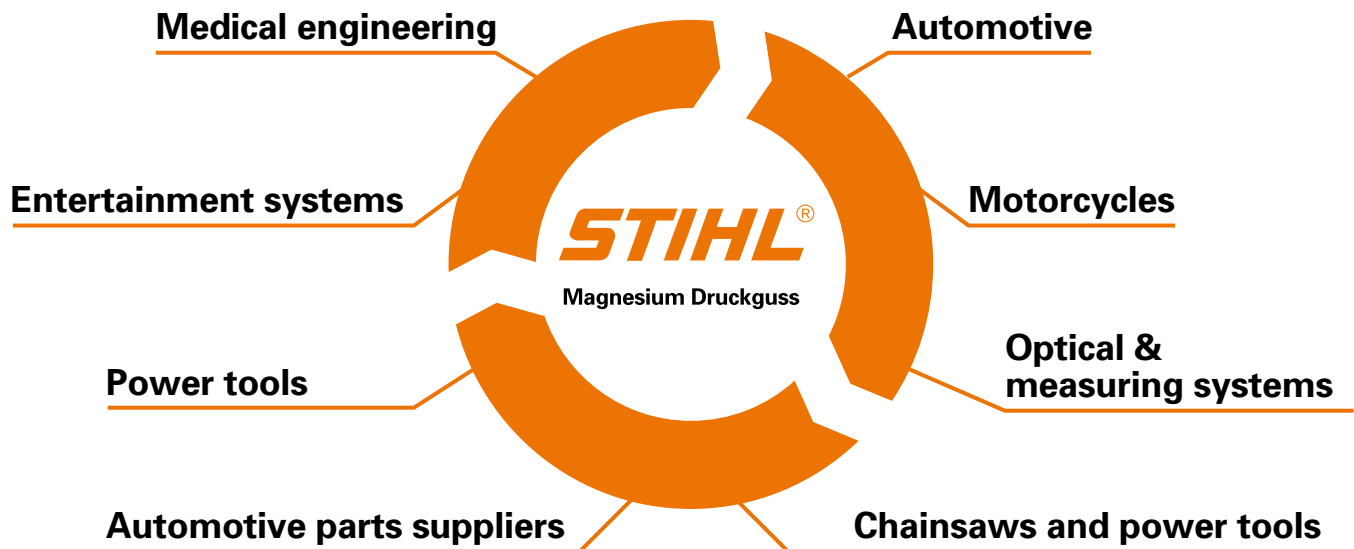
**Accreditation  
Din EN ISO/IEC  
17025**



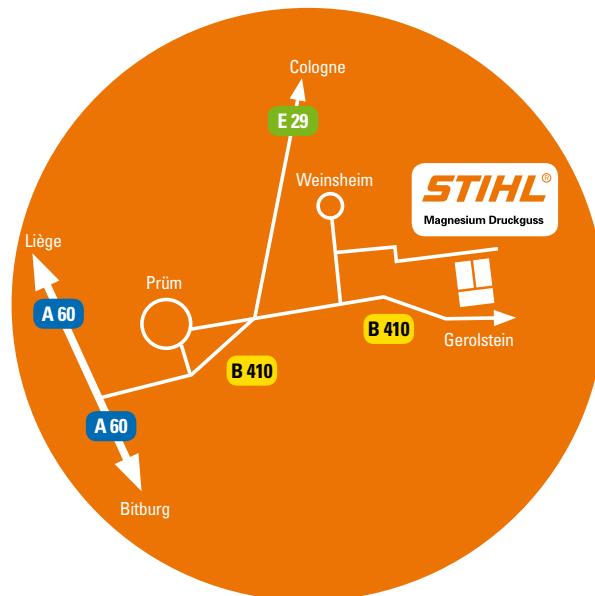
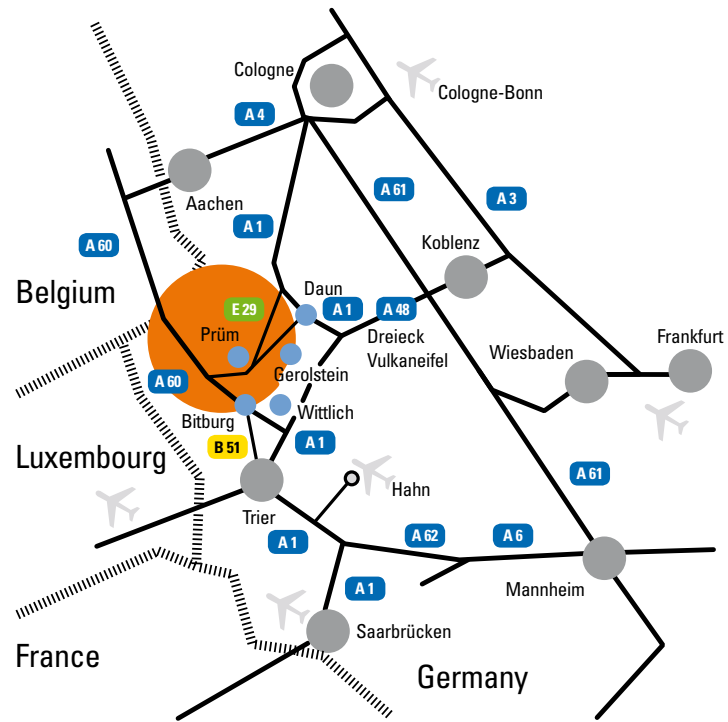
## Qualification and trust

Based on the certifications constituting the mainstays of our work, our consistent quality and environmental management is reflected in the high standards applied to all of our production processes, from development to production to aftersales services.

Our quality ideals have made us one of the world's leading specialists in magnesium diecasting and provide the foundations on which partnerships of many years' standing are built.



# How to find us



**ANDREAS STIHL AG & Co. KG**  
Andreas-Stihl-Straße • 54595 Prüm-Weinsheim  
Tel. +49 (0) 65 51-13-0 • Fax +49 (0) 65 51-13-11 07  
magnesium@stihl.de • www.magnesium.stihl.de

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