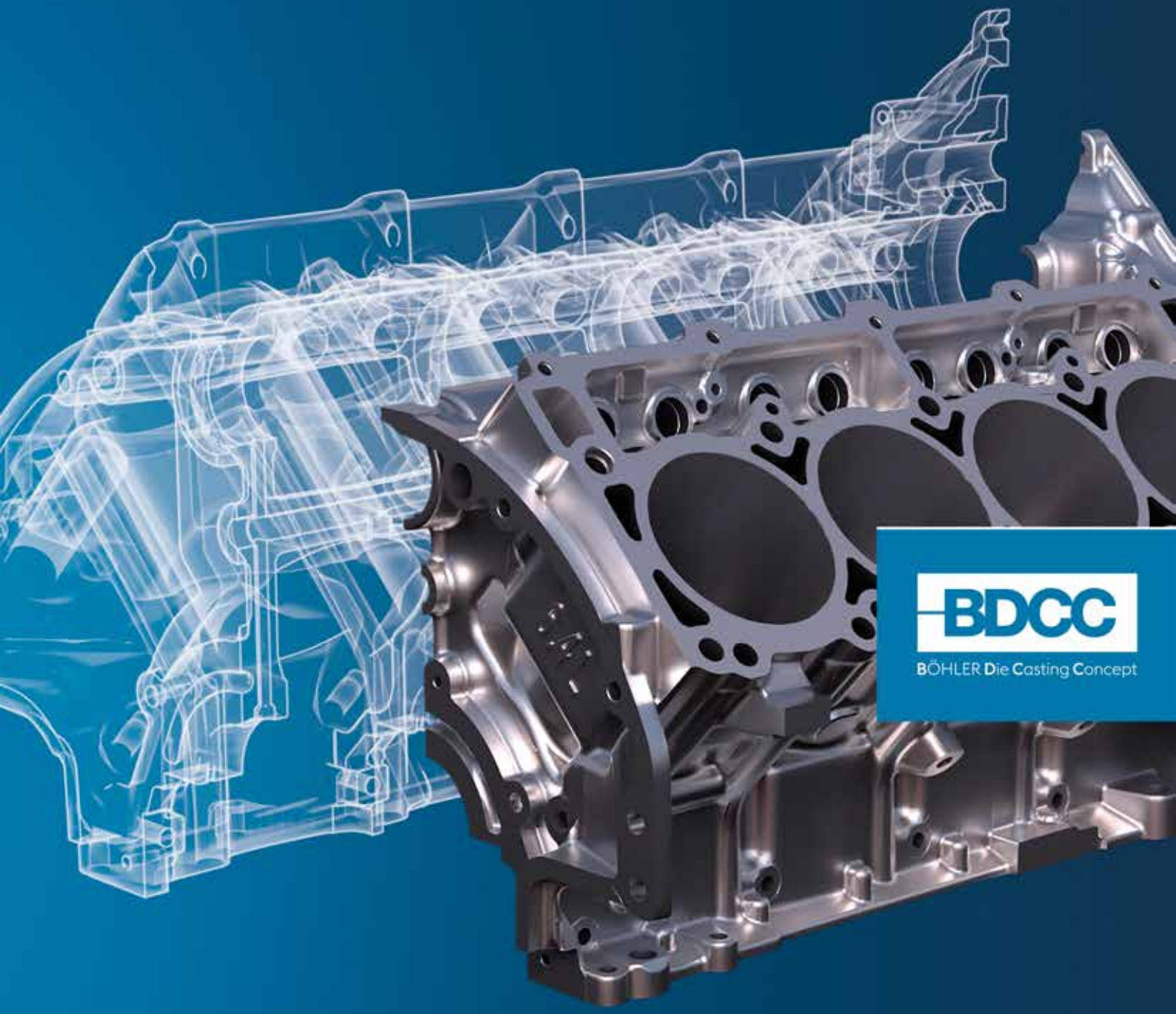
BÖHLER



WITH HIGHEST PRESSURE TO TAILOR-MADE SOLUTIONS

BÖHLER Tool Steels
for the high pressure die casting industry

voestalpine BÖHLER Edelstahl GmbH & Co KG
www.voestalpine.com/bohler-edelstahl

voestalpine
ONE STEP AHEAD.

BDCC – BÖHLER DIE CASTING CONCEPT

THE ANSWER OF CHALLENGES IN THE HIGH PRESSURE DIE-CASTING INDUSTRY

For years the automotive industry has been pressured to reduce weight. Lower weight means lower fuel consumption and lower CO_2 emissions. One field that can contribute greatly to this weight savings is the high pressure die-casting industry. With this process, it is possible to make components of increasing complexity, as well as larger sizes, such as structural components.

The focus in the high pressure die-casting industry is on

- **precision**
- **reproducibility**
- **efficiency**
- **low piece cost**
- **and high volume**

To address the increasing requirements of this field, voestalpine BÖHLER Edelstahl has developed a conceptual approach for its customers:

**BDCC -
the Böhler Die Casting Concept**

Bühler die-casting machine

TOP-QUALITY
FOR ADDED VALUE

This concept is about advising and supporting customers during the starting phase of their projects and providing detailed, project-related solutions—not one-size-fits-all.

By analyzing a wide range of influencing factors, it is possible to find the right hot work tool steel and the right hardness for the casting die, the inserts, the sliders, and the cores. Among these parameters, for instance, is the pressure die-casting machine itself, which is characterized by its clamping force, forming pressure, filling factor, and casting weight.

Other factors - to name just a few—include the cooling and temperature-control system, temperature management of the die (e.g., surface and background temperature), spraying technology, and the aluminum component itself.

Based on this information, our professional sales experts work close with the customer to select the right material from our specific range, providing support from the product idea through component production.

As a tool manufacturer you expect:

Economical production of high pressure die casting tools through

- **provision of raw material for minimum machining (tolerance, machining allowance)**
- **easy processing and good machinability**
- **simple, reliable heat treatment**
- **best dimensional stability during heat treatment**

As a die caster you expect:

- **high and uniform life-times**
- **maximum safety against failure during operation**

The result are various demands on the steels:

- high thermal shock resistance
- high hot strength
- high retention of hardness
- high hot toughness
- high hot wear resistance
- high thermal conductivity
- low sticking tendency

HIGH-EFFICIENCY AND HIGH-QUALITY PRODUCTION FOR CUSTOMERS

As a result of our experience and intensive research, we are able to constantly improve hot work tool steels with regards to

» homogeneity

» degree of purity

» toughness

This optimised material guarantees

» increased heat checking resistance

» reduced high-temperature wear

» increased high-temperature strength

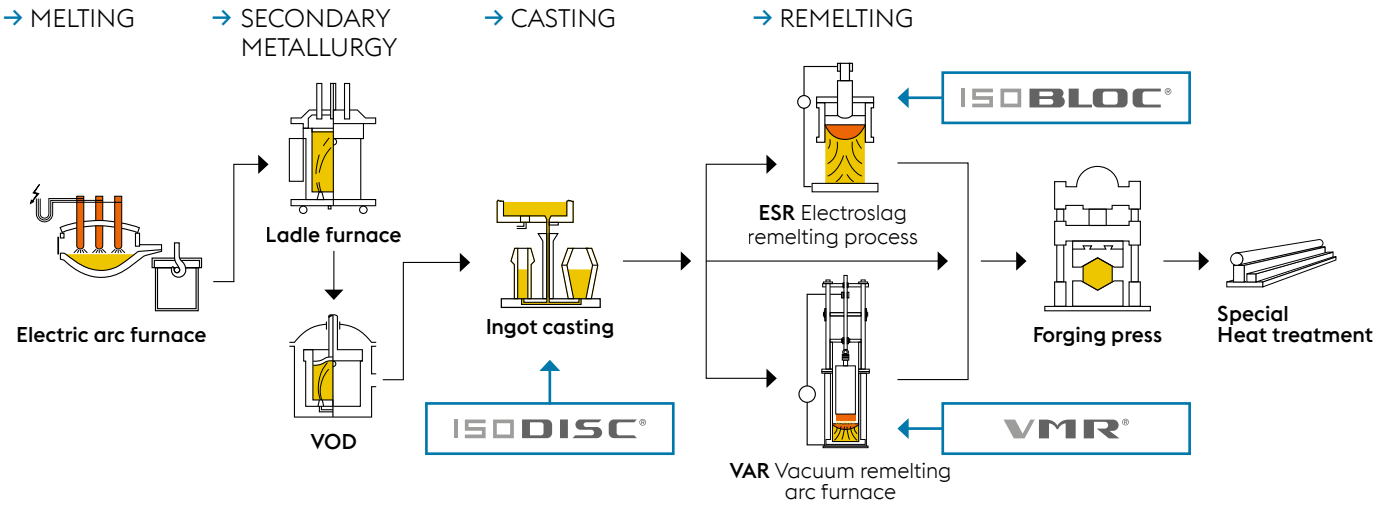
and therefore

longer tool life

BDCC is about complete solutions, not just material recommendations. This includes recommendations and advice on the right high-quality heat treatment, any potential coatings (e.g., for core pins), or the use of inserts produced by additive methods, generally known as 3D printing, which are made from our proprietary powder (AMPO). This package of expertise ensures high-efficiency and high-quality production for our customers.

Three qualities for a wide area of applications

Production routes for BÖHLER hot work tool steels



ISODISC®
» Conventional Hot Work Tool Steels
» Specially heat treated

ISOBLOC®
» Hot Work Tool Steels, ESR quality
» Specially heat treated

VMR®
» Hot Work Tool Steels, VAR quality
» Specially heat treated

BÖHLER HIGH PERFORMANCE MATERIALS FOR DIE CASTING TOOLS

voestalpine BÖHLER Edelstahl offers various hot work tool steels for use in high pressure die-casting.

The materials BÖHLER W300 ISOBLOC (1.2343) and BÖHLER W302 ISOBLOC (1.2344) conform to common standards and the NADCA.

In addition, we offer proprietary materials that are specially developed to meet higher requirements. One of these is W350 ISOBLOC, which was developed especially for large molds.

Others are the vacuum-remelted materials BÖHLER W400 VMR and BÖHLER W403 VMR, which have optimized properties, such as a very high heat checking resistance, due to their ultra-high cleanliness levels. These three materials are also listed by NADCA.

The product range is rounded out by BÖHLER W360 ISOBLOC, which is outstanding for use in small inserts and cores that are exposed to high temperatures, as this material can achieve up to 57 HRC.

Highlight grades

- BÖHLER W300 ISOBLOC®
- BÖHLER W302 ISOBLOC®
- BÖHLER W350 ISOBLOC®
- BÖHLER W360 ISOBLOC®
- BÖHLER W400 VMR®
- BÖHLER W403 VMR®

VAR, Vacuum Arc Remelting Furnace

CASE STUDY

With the BDCC, voestalpine BÖHLER Edelstahl can provide a customized solution for your high pressure die-casting mold so that you can meet tool life requirements as well.

Case study differential – housing

Insert dimension	695 x 590 x 312 mm 695 x 590 x 257 mm	
Material used before	1.2340 ESR	
Working hardness	44 – 46 HRC	
Failure reason	wear, cross cracks	
Tool life	85,000 pieces	
Material	BÖHLER W350 ISOBLOC®	
Working hardness	46 – 48 HRC	
Tool life	**125.000 pieces**	
Core	BÖHLER W360 ISOBLOC® & Coating	
Casting parameters	Cycle time	72 sec.
	Piece weight	5,7 kg
	Cooling / Oil	180°C

Steels for high pressure die casting tools

BÖHLER grade	Type of alloy %					Standard		
	C	Cr	Mo	V	Others	DIN / EN		AISI
BÖHLER W300 [1]	0,38	5,00	1,30	0,40	Si = 1,10	< 1.2343 >	X38CrMoV51	H11
BÖHLER W302 [1]	0,39	5,20	1,40	0,95	Si = 1,10	< 1.2344 >	X40CrMoV51	H13
BÖHLER W303	0,38	5,00	2,80	0,55	–	< 1.2367 >	X38CrMoV53	–
BÖHLER W320	0,31	2,90	2,70	0,50	–	< 1.2365 >	32CrMoV1228 (X32CrMoV33)	H10
BÖHLER W350 ISOBLOC®	0,38	5,00	1,75	0,55	Si 0.20 N def.	–	–	–
BÖHLER W360 ISOBLOC®	0,50	4,50	3,00	0,60	Si = 0,20	–	–	–
BÖHLER W400 VMR®	0,36	5,00	1,30	0,45	Si = 0,20	< 1.2340 >	–	~ H11
BÖHLER W403 VMR®	0,38	5,00	2,80	0,65	–	–	–	–
BÖHLER W720 VMR®	max. 0,005	–	5,00	–	Ni = 18,50 Co = 9,00 Ti = 0,70 Al = 0,10	~1.2709 1.6358	– X3NiCoMo1885 – X2NiCoMo1895	–

Further details regarding these steels can be found in the data sheet for each steel.
[1] Conventional quality available as ISODISC, ESR quality available as ISOBLOC.

Material properties

BÖHLER grade	High temperature strength	High temperature toughness (small tool)	Toughness in tool (big tool)	Machinability
BÖHLER W300 ISODISC®	★★	★★★	★★	★★★★★
BÖHLER W300 ISOBLOC®	★★	★★★★	★★★	★★★★★
BÖHLER W302 ISODISC®	★★★	★★★	★★	★★★★★
BÖHLER W302 ISOBLOC®	★★★	★★★★	★★★	★★★★★
BÖHLER W303 ISODISC®	★★★★	★★★	★★	★★★★★
BÖHLER W350 ISOBLOC®	★★★	★★★★	★★★★	★★★★★
BÖHLER W360 ISOBLOC®	★★★★★	★★★★	★★★	★★★★★
BÖHLER W400 VMR®	★★	★★★★★	★★★	★★★★
BÖHLER W403 VMR®	★★★★	★★★★	★★★	★★★★

ABOUT THE AUTHORS:

voestalpine BÖHLER Edelstahl is worldwide one of the leading Special Steel and Special materials supplier. We develop, produce and deliver high speed steels, tool steels and special materials worldwide, to provide our customers with exemplary solutions.

HARALD WURMBAUER

TECHNOLOGY BÖHLER HOT WORK STEEL

Harald Wurmbauer studied material science at the University of Leoben and worked for several years in R&D of an international mining-tool, -equipment and –machine producer and subsequently started at voestalpine BÖHLER Edelstahl technology department, where he is responsible for hot-work tool steels. He has been working for several years with hot work tool steels as researcher at the university as well as in the technology department at voestalpine BÖHLER Edelstahl.

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HARALD DREMEL

PRODUCT MANAGEMENT BÖHLER HOT WORK STEEL

Harald Dremel brings more than 20 years of experience in hot work tool steel in all different segments like die casting, extrusion, forging and hot stamping. After the studies of material science at the University of Leoben he worked for several years in the technical department at voestalpine BÖHLER Edelstahl and finally became product manager for hot work tool steel.

BDCC - BÖHLER DIE CASTING CONCEPT

With the BDCC, voestalpine BÖHLER Edelstahl can provide a customized solution for your high pressure die-casting mold so that you can meet tool life requirements as well.

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