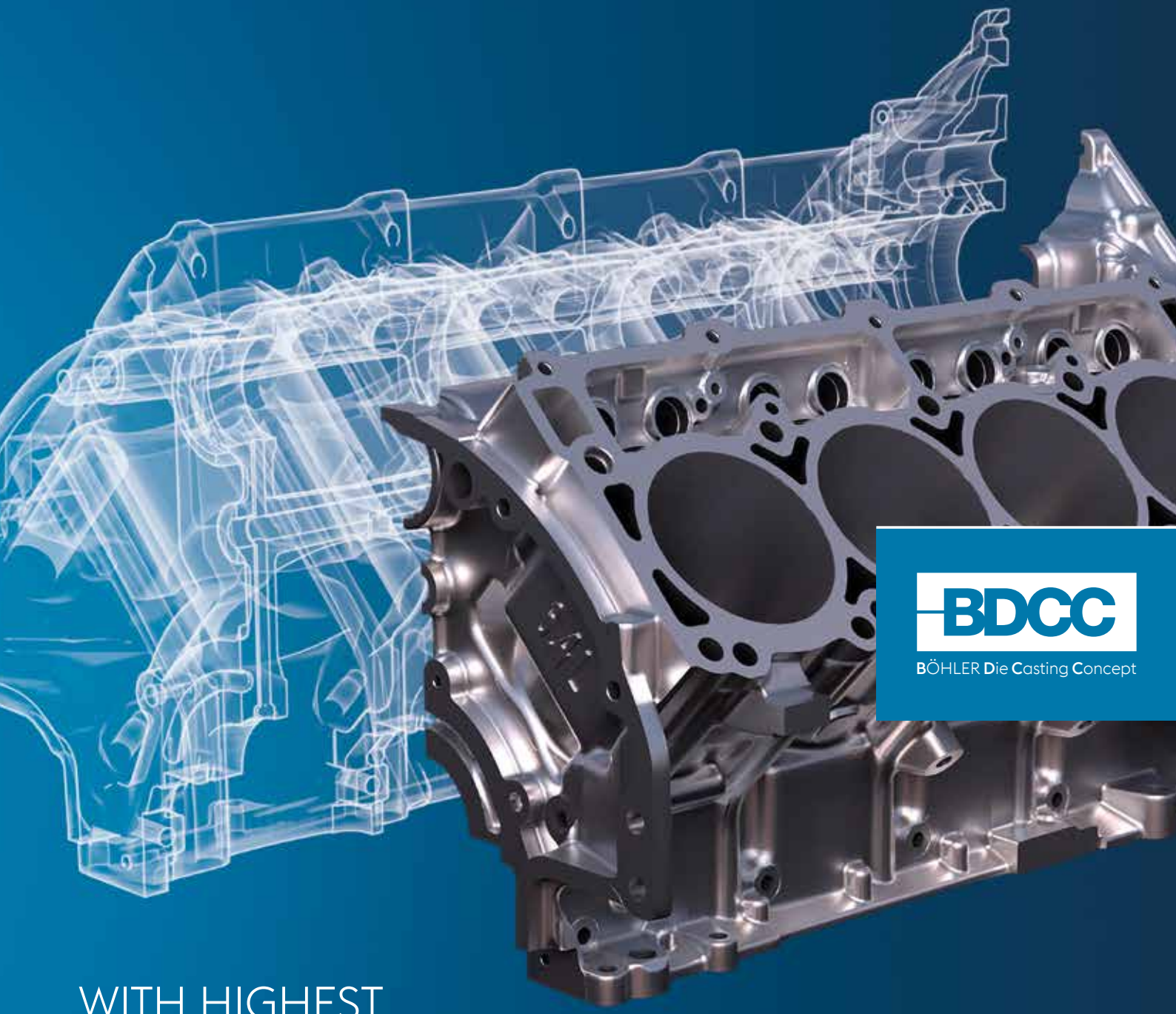
BÖHLER



BDCC
BÖHLER Die Casting Concept

WITH HIGHEST PRESSURE TO BEST RESULTS

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

NO PRESSURE
NO DIAMONDS

BÖHLER Die Casting Concept
your full service provider in Die Casting

VAR
VACUUM ARC
REMELTING
FURNACE

As one of the most important producer of tool steels worldwide, voestalpine BÖHLER Edelstahl concentrates on solving the demanding problems of its customers. One of the main areas of emphasis is tool steel for the high pressure die casting industry.

We speak customer language and offer taylor made die casting solutions – project by project. The material selection is based on the actual loading condition. We offer improved quality for BÖHLER die casting materials. We only accept the highest quality standards for heat treatment. With our process- and material know-how, our global network and our state of the art technology we are your full service provider for machining, heat treatment, coating and additive manufacturing powder.

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**
» **higher working hardness**
and therefore
» **longer tool life**

OUR SPECIALITIES

As a tool manufacturer you expect:

Economical production of 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

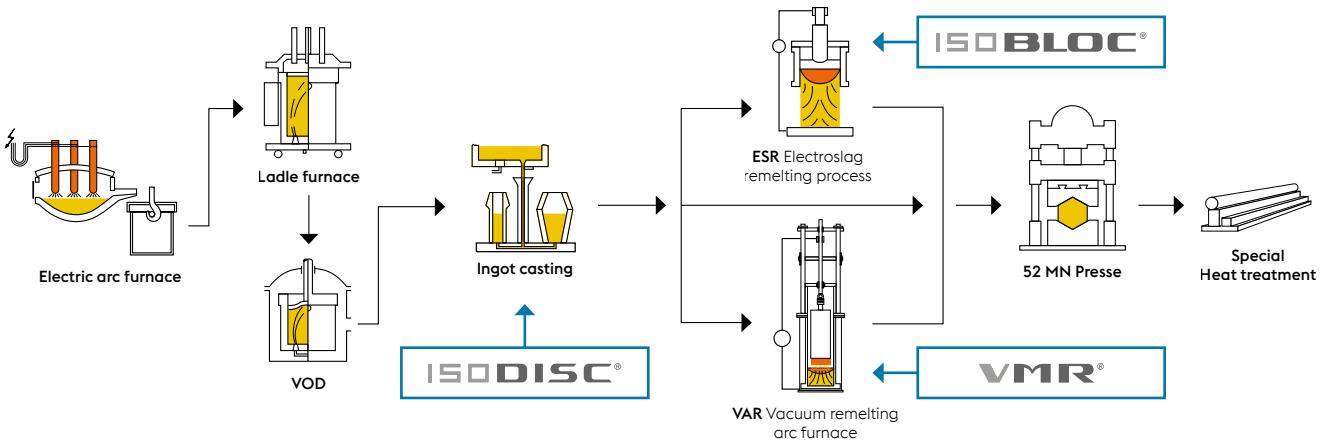
» high thermal conductivity

» low sticking tendency

Three qualities for a wide area of applications

PRODUCTION ROUTES FOR BÖHLER HOT WORK TOOL STEELS

→ MELTING → SECONDARY METALLURGY → CASTING → REMELTING



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

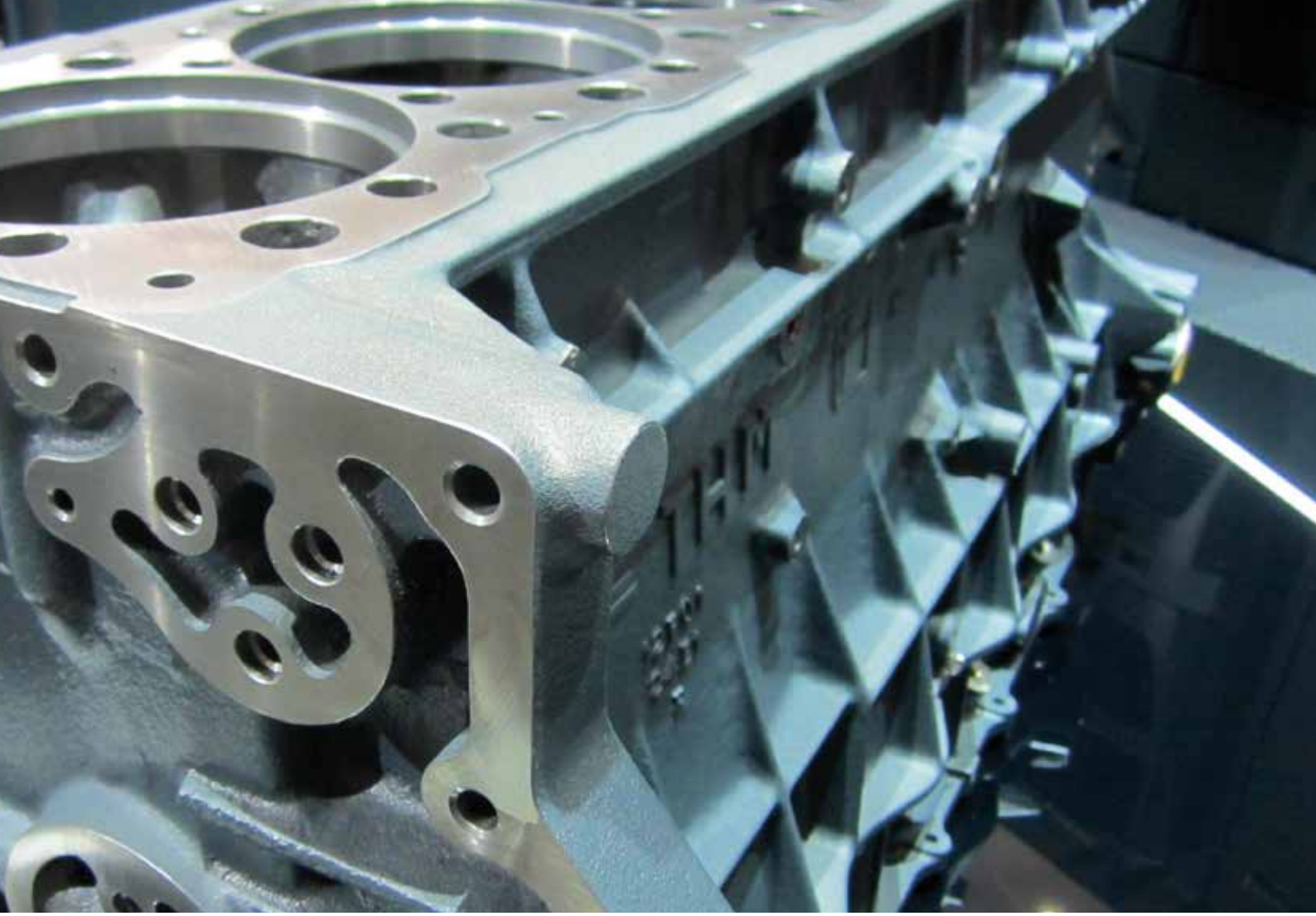
TOP-QUALITY FOR ADDED VALUE

BÖHLER Hot Work Tool Steels – why?
A steel's quality is dependent upon the chemical composition, the melting technology and its heat treatment.

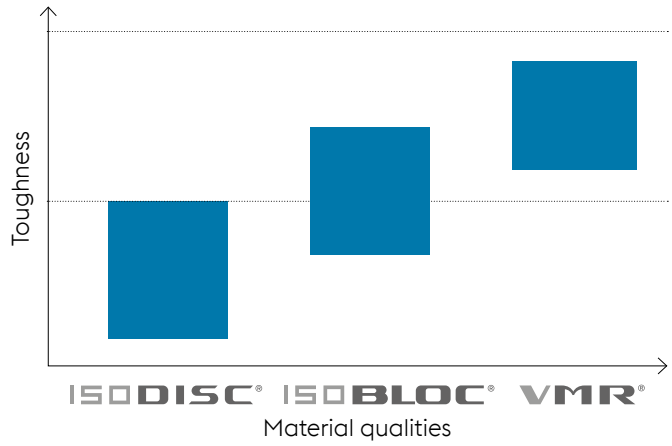
voestalpine BÖHLER Edelstahl has the most modern melting and processing equipment and can therefore offer tailormade solutions for its customers.

Component made from
1.2343 ESR

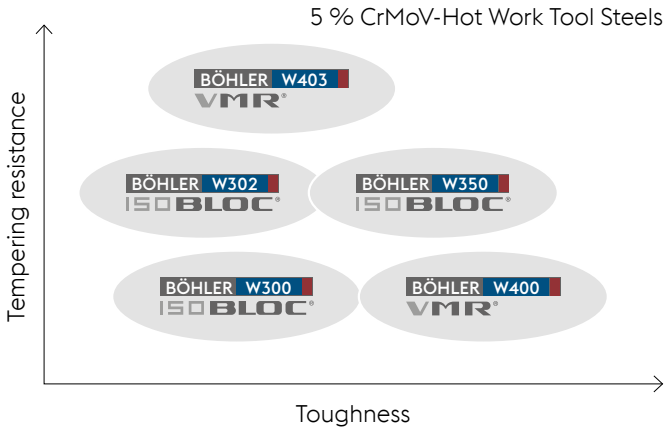
Component made from
BÖHLER W400 VMR



Remelting process vs. toughness



Retention of hardness vs. toughness



STEELS FOR HIGH PRESSURE DIE CASTING TOOLS

list of steel applications

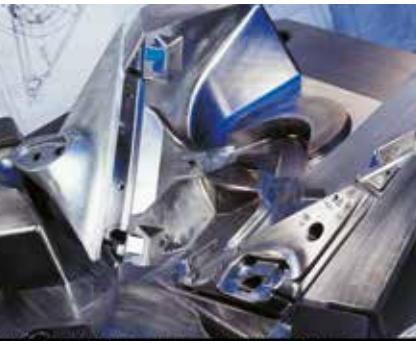
Based on our years of experience, we recommend the following materials:

Name of the machine or tool part	Workpiece alloy	BÖHLER grade	Strength / hardness
CASTING CHAMBER	Al-Mg	W300, W302, W303, W350, W400, W403	44 – 48 HRC
		W360	50– 56 HRC
	Cu	W303, W320, W403	40 – 44 HRC
		W360	48 – 52 HRC
CASTING PISTON	Al-Mg	W300, W302, W350, W400	42 – 46 HRC
	Cu	W320	38 – 43 HRC
		W360	48 – 52 HRC
DIES AND INSERTS	Zn-Sn-Pb	W300, W302, W400	44 – 48 HRC
	Al-Mg	W300, W302, W303, W350, W400, W403	44 – 48 HRC
	Al	W720	– 55 HRC
	Cu	W303, W320, W403	40 – 44 HRC
		W360	48 – 52 HRC
CORE, SLIDER, SLIDING CORE	Al, Mg	W300, W302, W303, W350, W400, W403,	44 – 48 HRC
		W360	50 – 56 HRC
	Cu	W303, W320, W403	40 – 44 HRC
		W360	48 – 52 HRC
DIE FRAME	–	M200/M238	ca. 1000 MPa
EJECTOR CLAMPING DISC	–	1.1730 / W1	650 MPa
EJECTOR	–	W302 W360	43 – 50 HRC 50 – 56 HRC

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.

BÖHLER grade	High temperature strength	High temperature toughness (small tool)	Toughness in tool (big tool)	Machinability
MATERIAL PROPERTIES				
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®	★★★★	★★★★	★★★	★★★★



TOOL TREATMENT AND MAINTENANCE

Preheating

Maximum efficiency of the pressure die casting tool can only be obtained with correct treatment both prior to installation and during operation. In order to reduce the jolting thermal stresses from the hot metal which is being processed, and thereby reduce heat checking, the dies must be carefully preheated according to the melting temperatures of the material to be processed. As a rule the following approximate values can be used:

- **for alloys with a low melting point 150 – 200 °C**
- **for light-metal alloys 250 – 300 °C**
- **for alloys with a high melting point 300 – 350 °C**

Preheating of the dies has to be carried out slowly and thoroughly.

Cooling

For larger dies, above all when processing high-melting-point alloys, it is necessary to conduct the heat away through appropriate cooling channels to prevent the temperature of the die from becoming too high. The amount of cooling medium should be matched to the shot sequence in such a way as to ensure that the temperature of the die (the preheating temperature chosen) remains more or less constant.
During down-time, at prolonged breaks, etc., the cooling cycle must be stopped. The tool must either be kept warm or allowed to cool down slowly. In order to avoid stress cracks, rapid cooling should not occur. The die cavities must be continuously cleaned and material residue must be removed in order to avoid damage to the pressure die casting tools.

TOOL TREATMENT AND MAINTENANCE

Stress relieving

Stresses which arise from the continual changes in temperature need to be relieved from time to time by means of an appropriate tempering treatment. Experience has shown that an intermediary stress relief improves tool life. This stress relieving treatment should take place over a period of several hours and should occur at a temperature 30 – 50 °C below the highest tempering temperature, followed by cooling in the furnace (cf. the tempering chart in the BÖHLER data sheets).

We recommend that the first stress relief be carried out after 1000 – 5000 shots, followed by a stress relief after every 1/5 of the total expected die life. After disassembly of tools to be kept in stock, cleaning and stress relieving is recommended. By using an appropriate release agent, adhesion of the cast pieces in the die can be greatly reduced.

For the production of pressure die cast parts, a surface that is as smooth (polished) as possible should be striven for, as a higher number of shots can be achieved with high surface quality.

It is recommended that the pressure die casting dies should not be metallically bright but should be used with the oxide layer resulting from tempering, which will reduce the tendency to adhere. A surface treatment, e.g. nitriding, improves the wear resistance and reduces the tendency to adhere. A nitriding depth of 0.05 mm has proven best.

WE SECURE COMPETITIVE ADVANTAGES FOR OUR CUSTOMERS, PROJECT BY PROJECT.

SUPPLY AND SERVICE

OPTIMUM DELIVERY LOGISTICS AND A FULLY AUTOMATED HIGH-RACK WAREHOUSE GUARANTEE FAST DELIVERY TO THE CUSTOMER

Economy piece for piece
Every material, every cut; sawn or premilled on 1, 2, 3 or all sides – and, of course, just in time.

Surface finishes

- **Unmachined (black)**
- **ALLPLAN**
- **IBO ECOMAX**
- **ECOBLANK**
- **Bright bar**

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