



BÖHLER HOT WORK TOOL STEELS
for forging

HOT WORK TOOL STEEL

FORGED PIECES ARE USED WHENEVER THE REQUIREMENTS FOR THE MECHANICAL PROPERTIES OF CERTAIN COMPONENTS ARE HIGH.

Naturally, compliance with these properties will only be able to be fulfilled by high strength materials; materials which in turn require the appropriate wear resistant tool steels during the deformation process in order to be able to meet those diverse requirements.

We at BÖHLER know these requirements well and offer you custom-made hot work tool steel for your commercial needs.



HOT WORK
TOOL STEEL





YOUR BENEFIT

As a forger you expect

high and uniform life-times

maximum safety against failure
during operation

As a tool maker you expect

economical production 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 result, many demands on the steel are derived, such as

high thermal shock resistance

high hot strength

high retention of hardness

high hot toughness

high hot wear resistance

high thermal conductivity

low sticking tendency





THE SELECTION CRITERIA

SELECTION OF THE FORGING PROCESS

	Hot (Forging)	Semi hot	Cold (extrusion)
Process temperature	> 950 °C	650 – 950 °C	< 200 °C
Shape	any shape desired	rotation symmetric where possible	mostly rotation symmetric
forged materials	any material desired	any material desired	low alloyed steel (C < 0.45 %)
tolerances attainable	IT12 – IT16	IT9 – IT12	IT7 – IT11
surface quality R attainable	> 100 µm	< 50 µm	< 10 µm
economical serial size	> 500 Pieces	> 10.000 Pieces	> 3.000 Pieces
tool material	Hot work tool steel	Hot work tool steel, high speed steel, cemented carbides	Cold work tool steel, high speed steel, cemented carbides
tool life	5.000 – 10.000 Pieces	10.000 – 20.000 Pieces	20.000 – 30.000 Pieces
material output	60 – 80 %	~ 85 %	85 – 90 %



FORGING IS THE NON-CUTTING SHAPING OF METALS
BETWEEN TWO TOOLS. THE CHOICE OF TOOL STEEL
IS PRIMARILY DETERMINED BY
THE RESPECTIVE FORGING PROCESS.



CUSTOM-MADE TOOL MATERIALS

Drop forging

Drop forging is carried out by impacting material with a hammer or by applying a great amount of pressure with a forging press or forging machine.

When forging with a hammer the forging piece is only in contact with the die for a short period of time. Due to this, the die has to withstand lower temperatures. However, the mechanical stress is high. This, it is quite important for the hot work tool steel used to have very good toughness properties.

Compared with that, the contact during forging pressing occurs over a longer period of time, which then causes a higher temperature strain on the tool. Thus, in such a case hot work tool steels with a chromium-molybdenum base are used, which are singled out as having good tempering resistance, high temperature strength, hot wear resistance, and hot toughness.

Rapid forging

A fully automatic multi-stage press is forging equipment that produces even the most difficult shapes from materials hard to deform in several stages of deformation. This equipment mostly produces rotation symmetric parts. Heating the slugs, feeding, shearing and deforming take place completely automatically.

Semi hot forging

The term semi hot forging refers to a deformation process in which the workpiece is preheated to such a point that permanent strain hardening occurs under the given deformation conditions. This definition means that the material is deformed below the recrystallization temperature, yet the term is also used for temperatures occurring above this. In practice this is understood to be the deformation of steel in the temperature range of 650 to approx. 950 °C. These temperatures lie significantly below the conventional forging temperatures of 1100 – 1250 °C.

WITH A HAMMER

Forging	Tool	BÖHLER grade	Hardness in service in HRc (guide)
close die	die	BÖHLER W300	38 – 52
	die insert	BÖHLER W300	41 – 52
		BÖHLER W302	41 – 52
		BÖHLER W303	41 – 52
		BÖHLER W350 ISOBLOC®	41 – 52
		BÖHLER W360 ISOBLOC®	50 – 56
		BÖHLER W400 VMR®	41 – 52
		BÖHLER W403 VMR®	41 – 52

IN A PRESS

Forging	Tool	BÖHLER grade	Hardness in service in HRc (guide)
open die	die	BÖHLER W300	41 – 52
		BÖHLER W302	41 – 52
		BÖHLER W320	41 – 52
		BÖHLER W350 ISOBLOC®	41 – 52
		BÖHLER W360 ISOBLOC®	50 – 56
		BÖHLER W400 VMR®	41 – 52
		BÖHLER W403 VMR®	41 – 52
		die insert	BÖHLER W300
	BÖHLER W302		41 – 52
	BÖHLER W303		41 – 52
	BÖHLER W320		41 – 52
	BÖHLER W350 ISOBLOC®		41 – 52
	BÖHLER W360 ISOBLOC®		50 – 56
	BÖHLER W400 VMR®		41 – 52
	BÖHLER W403 VMR®		41 – 52



TOOL STEEL FOR DROP FORGING

FOR SEMI HOT FORGING

Forging	Tool	BÖHLER grade	Hardness in service in HRC (guide)
rapid forging machine, semi hot forging	die, plunger, ram	BÖHLER W302	46 – 52
		BÖHLER W303	46 – 52
		BÖHLER W320	46 – 52
		BÖHLER W350 ISO BLOC®	46 – 52
		BÖHLER W360 ISO BLOC®	50 – 57
		BÖHLER W403 VMR®	46 – 52

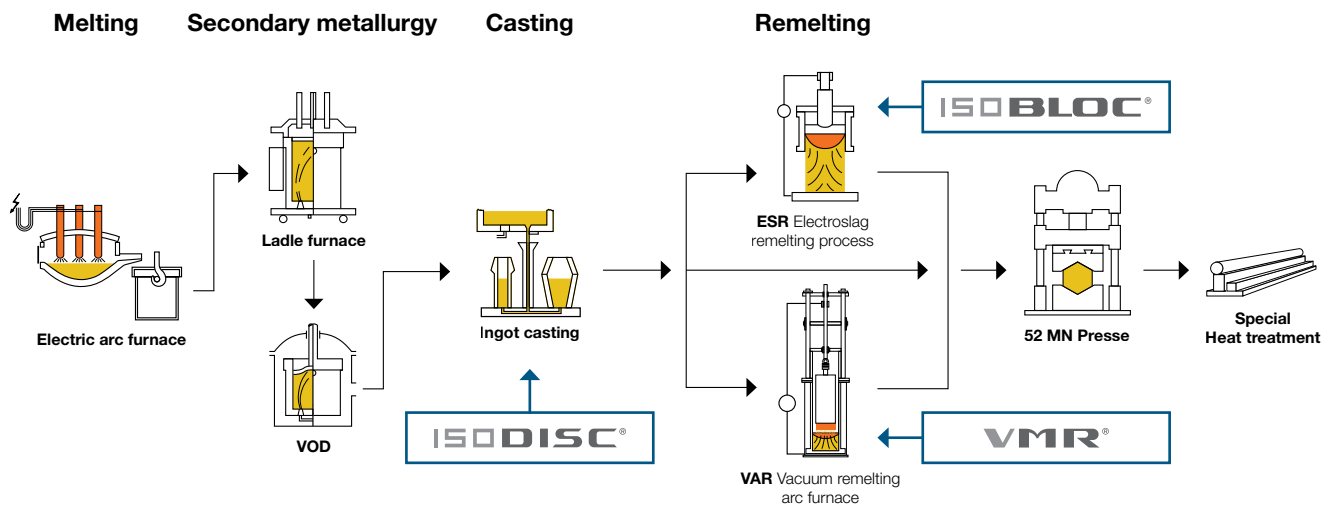




THE QUALITIES

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 Grade	Type of alloy %					Standards	
	C	Cr	Mo	V	Others	DIN/ EN	AISI
BÖHLER W300	0.38	5.00	1.30	0.40	Si 1.10	< 1.2343 > X38CrMoV 5 1	H11
BÖHLER W302	0.39	5.20	1.40	0.95	Si 1.10	< 1.2344 > X40CrMoV 5 1	H13
BÖHLER W303	0.38	5.00	2.80	0.55	-	< 1.2367 > X38CrMoV 5 3	-
BÖHLER W320	0.31	2.90	2.80	0.50	-	< 1.2365 > X32CrMoV 3 3	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			
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	-	~ 1.2367	-

The data contained in this brochure is merely for general information and therefore shall not be binding on the company. We may be bound only through a contract explicitly stipulating such data as binding. The manufacture of our products does not involve the use of substances detrimental to health or to the ozone layer.



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