



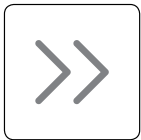
 BÖHLER

HIGH SPEED STEEL  
quality is our passion

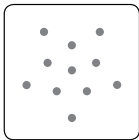
# HIGH PERFORMANCE MATERIALS FOR HIGH PERFORMANCE TOOLS

## Speed skills

**BÖHLER** is your partner of choice, if you require High Speed Steel that is capable of defining new limits in tool life connected with consistent quality and the passion to go the extra mile.



HIGH SPEED  
STEEL



POWDER  
METALLURGY

## **MICROCLEAN®**

Powder Metallurgy high performance steels

## **ISORAPID®**

Electro Slag Remelted steels (ESR quality)

## **Conventional HIGH SPEED STEEL**

High Speed Steels that are produced with conventional ingot casting.



# 3 QUALITY LEVELS – 3 TECHNOLOGIES

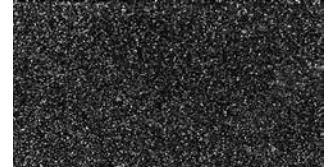
## MICROCLEAN®

### Powder Metallurgical Production



#### For the highest demands:

- » Segregation free high performance steel
- » The finest carbide distribution
- » The highest metallurgical purity
- » Isotropic properties
- » Maximum wear resistance with a simultaneously higher toughness
- » A high degree of hardness
- » Very good dimensional stability
- » High compressive strength



MICROCLEAN®  
Microstructure PM materials

## ISORAPID®

### ESR Production

(Electro Slag Remelting Production)



#### Improved service life due to:

- » The least possible inclusion content
- » Lower micro and macro segregation
- » Good homogeneity and a higher degree of purity
- » A homogenic structure throughout the entire cross-section and bar length
- » Producing larger bar dimensions at a constant carbide distribution
- » Uniform dimensional stability
- » A broad range of application owing to a high degree of toughness



Microstructure BÖHLER S600 in ESR quality

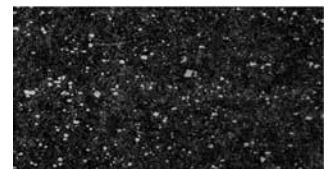
## Conventional Production

### Production



#### The Standard material for reliable benefits – State of the Art level:

- » Structural conditions
- » Carbide distribution
- » Homogeneity
- » Individual carbides
- » Degree of purity
- » Toughness



Microstructure BÖHLER S600



# OUR SPECIALITY

## MICROCLEAN®

### **BÖHLER MICROCLEAN steels offer you the following benefits:**

- » Extremely high wear resistance
- » The best grindability
- » High degree of toughness
- » Low isotopic dimensional changes
- » Reproducible production sequences
- » Better resistance to oscillation
- » More resistance to mechanical impacts

<b>Your</b>	<b>The result</b>
The highest precision parts	Better in productivity
The longest tool service life	Lower unit costs
Predictable tool service life	Greater chances on the market with a greater yield

### **HIGHEST PRODUCTIVITY**

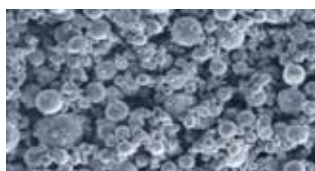


Image of the powderstructure  
BÖHLER-S390 MICROCLEAN

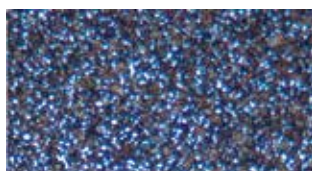


Image of the microstructure  
BÖHLER-S390 MICROCLEAN



BÖHLER HAS IMPROVED THE PRODUCTION PROCESS FOR POWDER METALLURGY  
STEELS AND TOOL STEELS. MICROCLEAN MATERIALS  
OF THE 3RD GENERATION WITH IMPROVED PERFORMANCE  
FEATURES ARE PRODUCED IN KAPFENBERG ON THE MOST MODERN UNIT WORLDWIDE.  
AN WIDE RANGE OF HIGH SPEED STEELS PROVIDES OUR CUSTOMERS WITH  
A DEFINITIVE COMPETITIVE ADVANTAGE..

# MOST FREQUENTLY USED HIGH SPEED STEELS

This range of products shows the master brands of our High Speed Steel. You can quickly and clearly find the most suitable quality for your application.

BÖHLER Grade	Chemical composition in %							Standards	
	C	Cr	W	Mo	V	Co	Others	DIN/ EN	AISI
<b>MICROCLEAN</b>									
<b>BÖHLER S290</b> MICROCLEAN®	2.00	3.80	14.30	2.50	5.10	11.00	-	-	-
<b>BÖHLER S390</b> <sup>1)2)</sup> MICROCLEAN®	1.64	4.80	10.40	2.00	4.80	8.00	-	-	-
<b>BÖHLER S393</b> MICROCLEAN®	1.64	4.00	12.10	-	4.80	5.00	-	-	T15
<b>BÖHLER S590</b> <sup>1)2)</sup> MICROCLEAN®	1.29	4.20	6.30	5.00	3.00	8.40	-	< 1.3244 > HS6-5-3-8	-
<b>BÖHLER S690</b> <sup>2)</sup> MICROCLEAN®	1.35	4.10	5.90	5.00	4.10	-	-	~ 1.3351 ~ HS6-5-4	~ M4
<b>BÖHLER S790</b> <sup>1)2)</sup> MICROCLEAN®	1.29	4.20	6.30	5.00	3.00	-	-	< 1.3345 > HS6-5-3C	~ M3 Cl.2
<b>ISORAPID</b>									
<b>BÖHLER S600</b> ISORAPID®	0.90	4.10	6.20	5.00	1.80	-	-	< 1.3343 > ~ 1.3554 LW HS6-5-2C	~ M2 reg.C
<b>CONVENTIONAL HIGH SPEED STEEL</b>									
<b>BÖHLER S200</b>	0.76	4.10	18.00	-	1.10	-	-	< 1.3355 > HS18-0-1	T1
<b>BÖHLER S400</b>	1.02	3.80	1.80	8.60	1.90	-	-	< 1.3348 > HS2-9-2	M7
<b>BÖHLER S401</b>	0.84	3.80	1.80	8.60	1.20	-	-	< 1.3346 > HS2-9-1	M1
<b>BÖHLER S404</b>	0.89	3.80	1.00	4.30	1.80	-	-	< 1.3326 > HS2-4-1	M52
<b>BÖHLER S600</b> <sup>1)</sup>	0.90	4.10	6.20	5.00	1.80	-	-	< 1.3343 > ~ 1.3554 LW HS26-5-2C	~ M2 reg.C
<b>BÖHLER S607</b>	1.21	4.10	6.20	5.00	2.90	-	-	< 1.3344 > HS6-5-3	~ M3 Cl.2
<b>BÖHLER S630</b> <sup>3)</sup>	0.95	4.00	4.00	4.00	2.00	-	+ Al	< 1.3330 > HS4-4-2	-
<b>BÖHLER S500</b> <sup>1)</sup>	1.10	3.90	1.40	9.20	1.00	7.80	-	< 1.3248 > HS2-9-1-8	~ M42
<b>BÖHLER S705</b> <sup>1)</sup>	0.92	4.10	6.20	5.00	1.90	4.80	-	< 1.3243 > HS6-5-2-5	~ M35
<b>BÖHLER S730</b> <sup>3)</sup>	0.92	4.10	4.25	4.15	1.95	4.75	+ Al	< 1.3230 > HS4-4-2-5	-

<sup>1)</sup> also available in the BHT execution

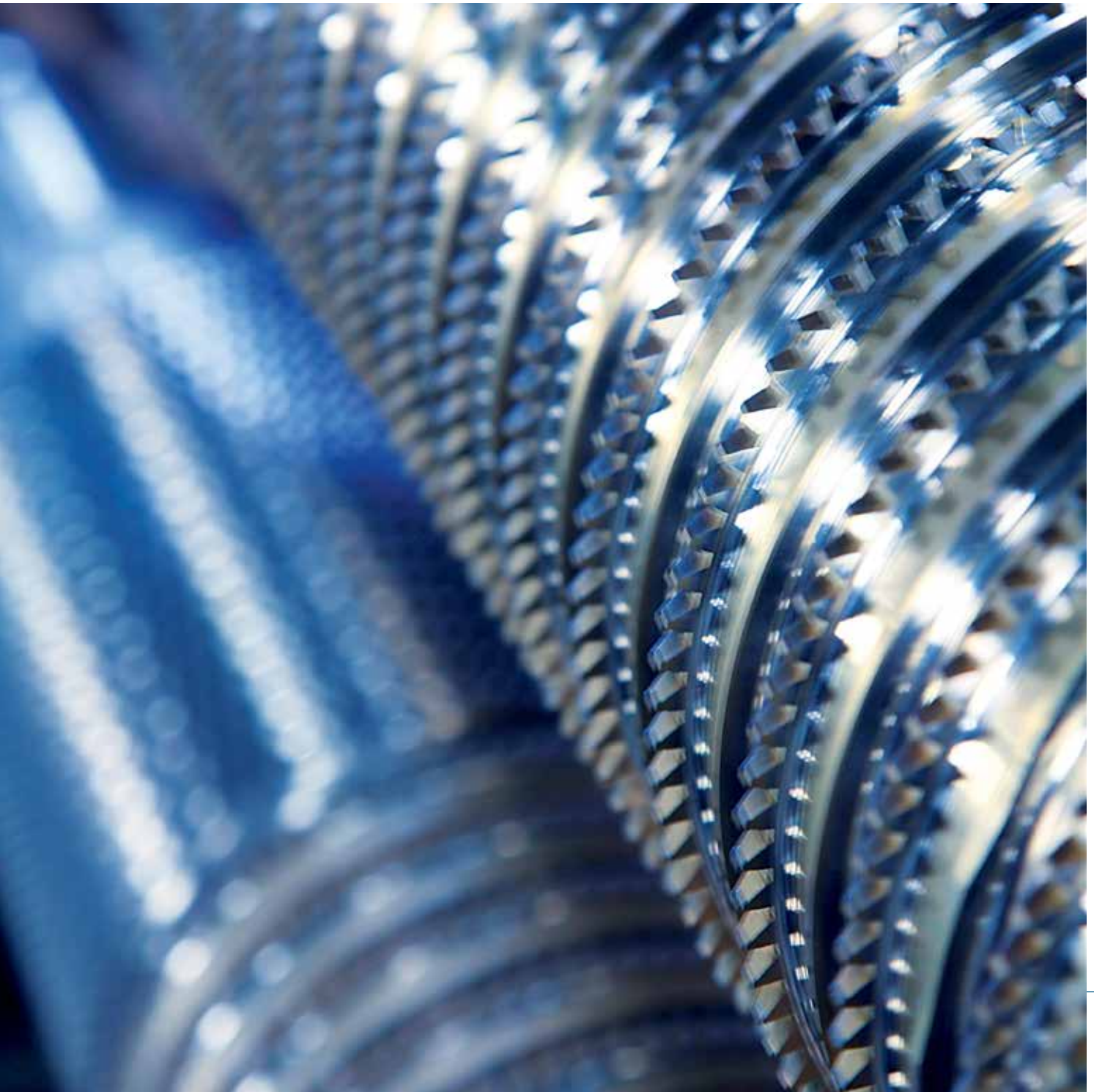
<sup>2)</sup> also available with sulphur as S392 MICROCLEAN, S592 MICROCLEAN, S692 MICROCLEAN, S792 MICROCLEAN;

<sup>3)</sup> BÖHLER Patent





# COMPARISON OF THE MAJOR STEEL PROPERTIES

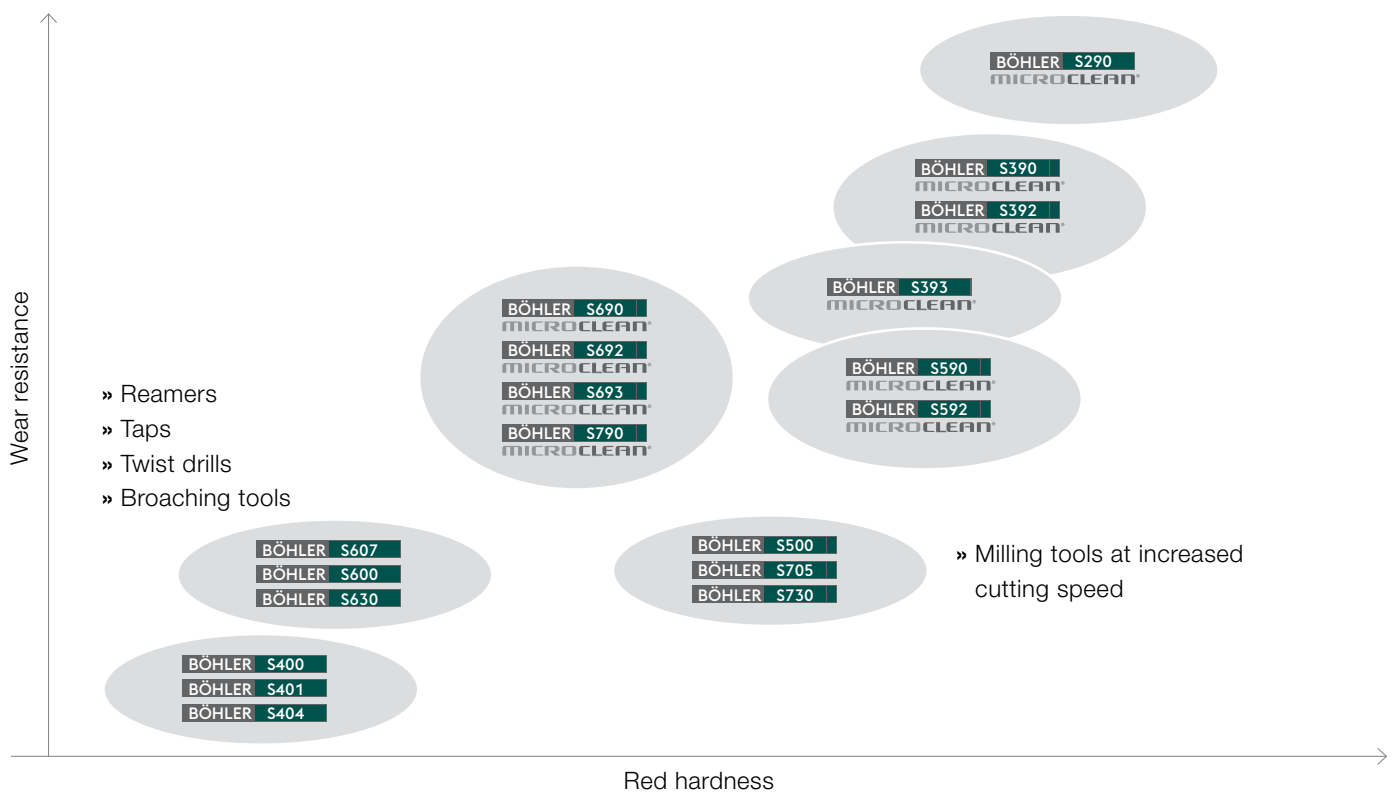


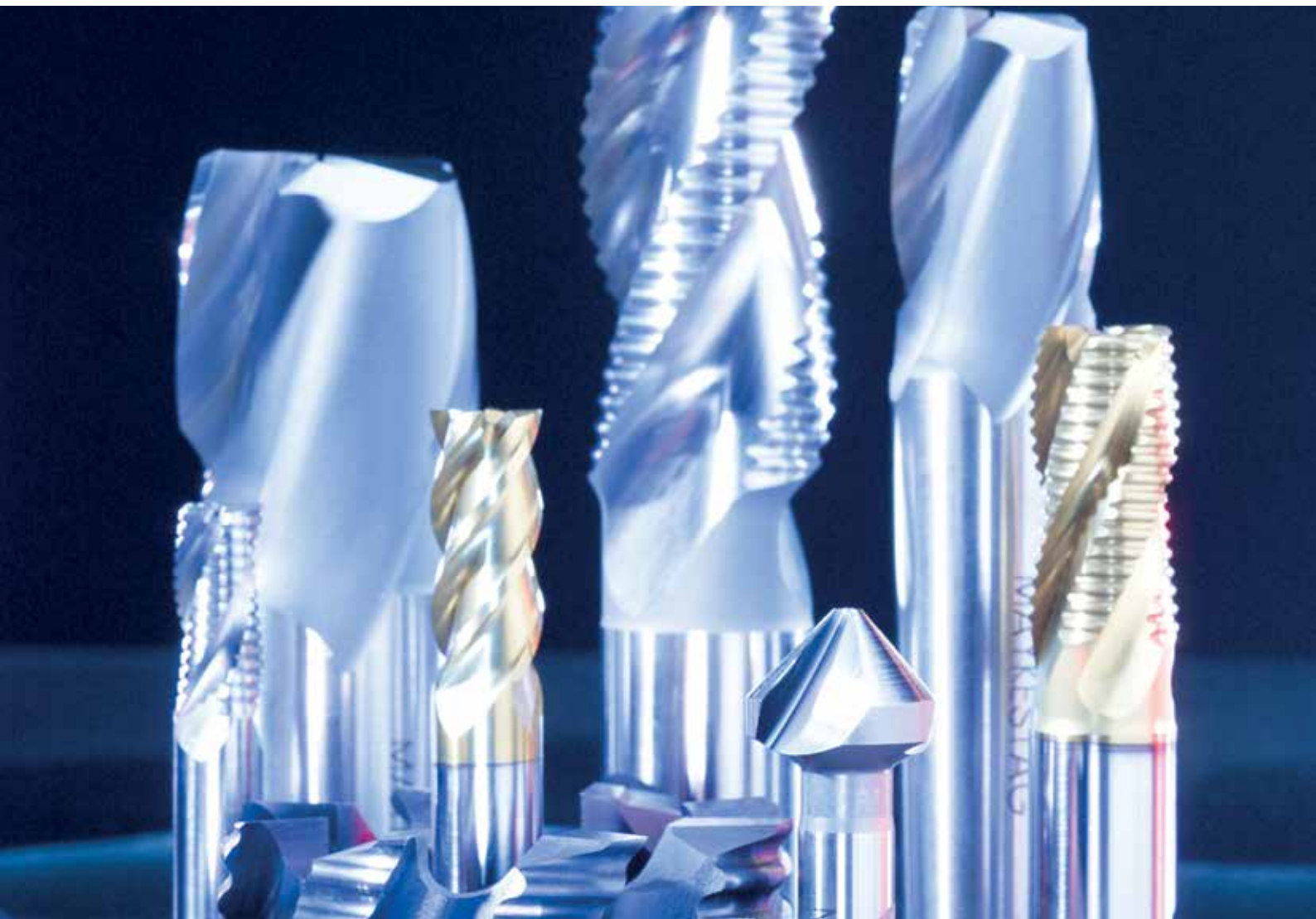
BÖHLER grade	Red hardness	Wear resistance	Toughness	Grindability	Compressive strenght
BÖHLER S290 MICROCLEAR®					
BÖHLER S390 MICROCLEAR®					
BÖHLER S393 MICROCLEAR®					
BÖHLER S590 MICROCLEAR®					
BÖHLER S690 MICROCLEAR®					
BÖHLER S790 MICROCLEAR®					
BÖHLER S200					
BÖHLER S400					
BÖHLER S401					
BÖHLER S404					
BÖHLER S600					
BÖHLER S630					
BÖHLER S607					
BÖHLER S500					
BÖHLER S705					
BÖHLER S730					

Overview for first orientation. Please contact us for our expertise.

# MAIN SEGMENTS HIGH SPEED STEEL: CUTTING

## Requirements in the cutting industry





### **Applications**

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Drilling

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Tapping

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Gear cutting tools

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Broaching and reaming

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End milling

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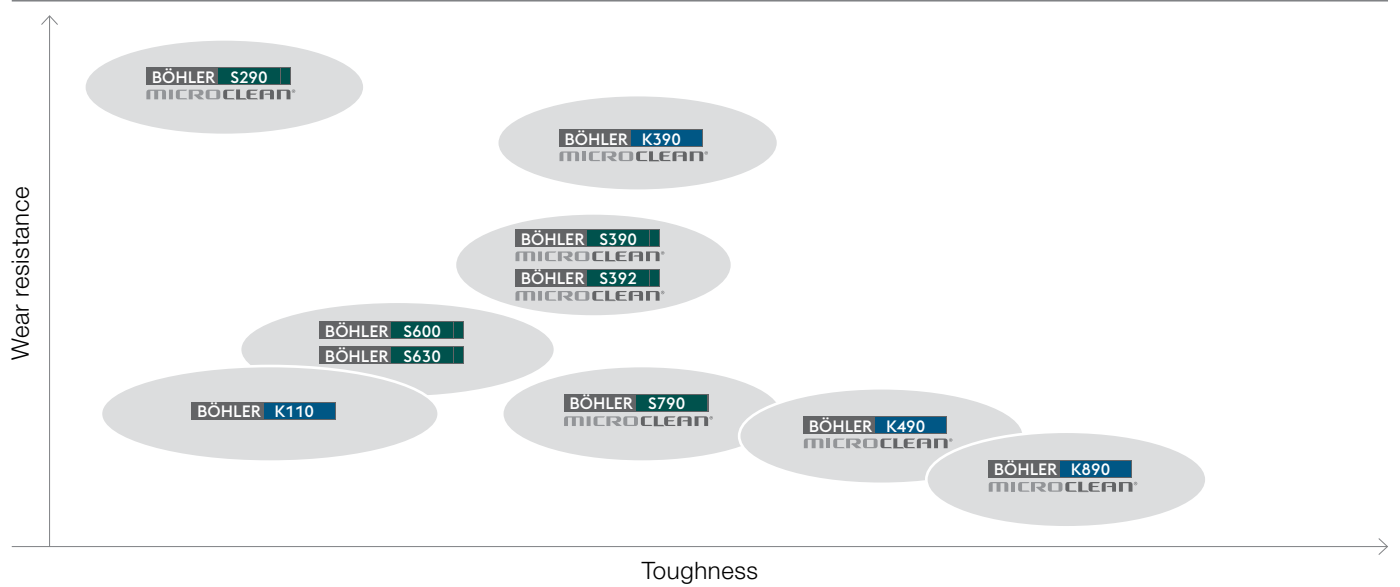
Sawing

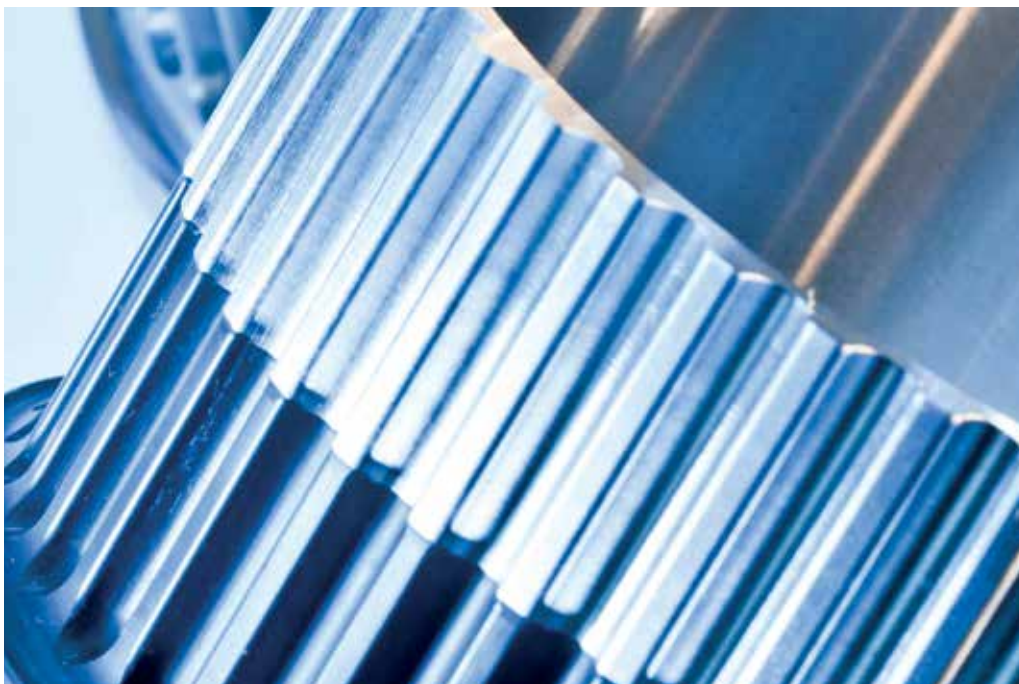
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# MAIN SEGMENTS HIGH SPEED STEEL: COLD WORK

## Requirements in the cold forming sector





### **Applications**

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Blanking and fine blanking tools

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Extrusion tools

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Drawing and deep-drawing tools

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Stamping tools

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Thread rolling tools

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Cold rolls for multiple roller stands

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Cold pilger tools

---

Knives

---

Powder compaction

---

Cold massive forming

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High Speed Steel is being used more and more for the so-called non-tooling applications and is utilized as a component in several different branches of industry.

**Main Segments High Speed Steel:  
Non Tooling Applications**

This is exactly where voestalpine BÖHLER High Speed Steel succeeds with its ability to deal with compressive strength, making it the ideal material for the automotive industry or for pumps and other such components.





## OUTSIDE THE BOX

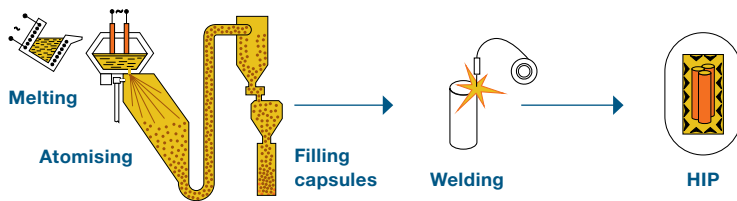
Since this segment has been growing steadily and new and challenging applications are becoming available, this is exactly where we at BÖHLER feel particularly at home. Because this is where we can show off our unbeatable product quality, our viability and our receptiveness cutting-edge demands to their best advantage, optimally supporting you with customized solutions.





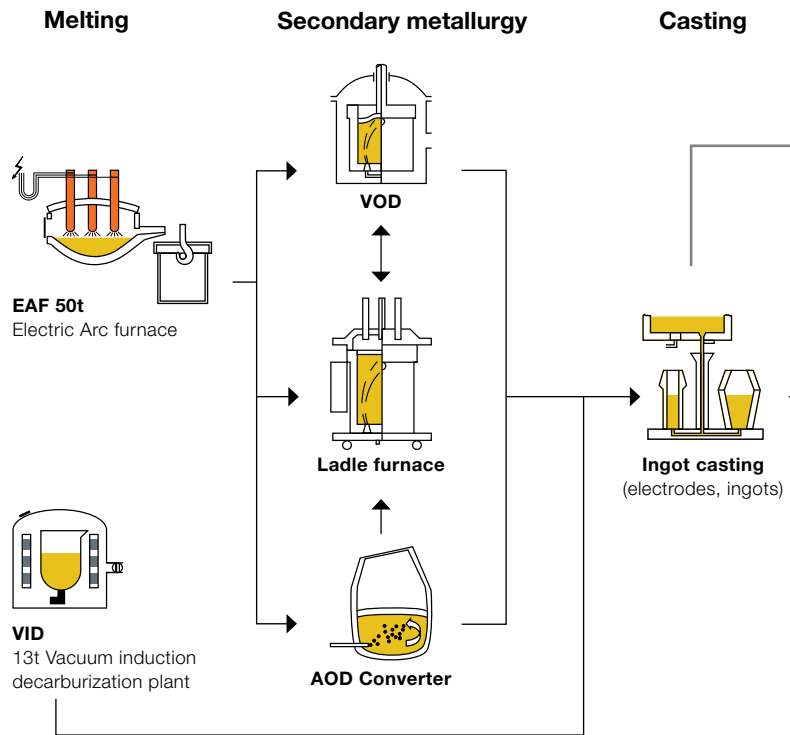
# FLOW OF MATERIAL

## Powder Metallurgical Production

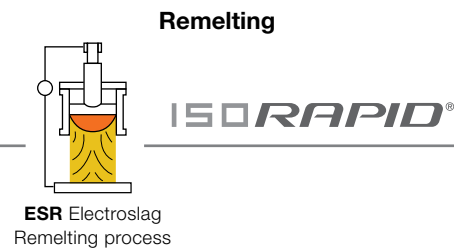


**MICROCLEAN®**

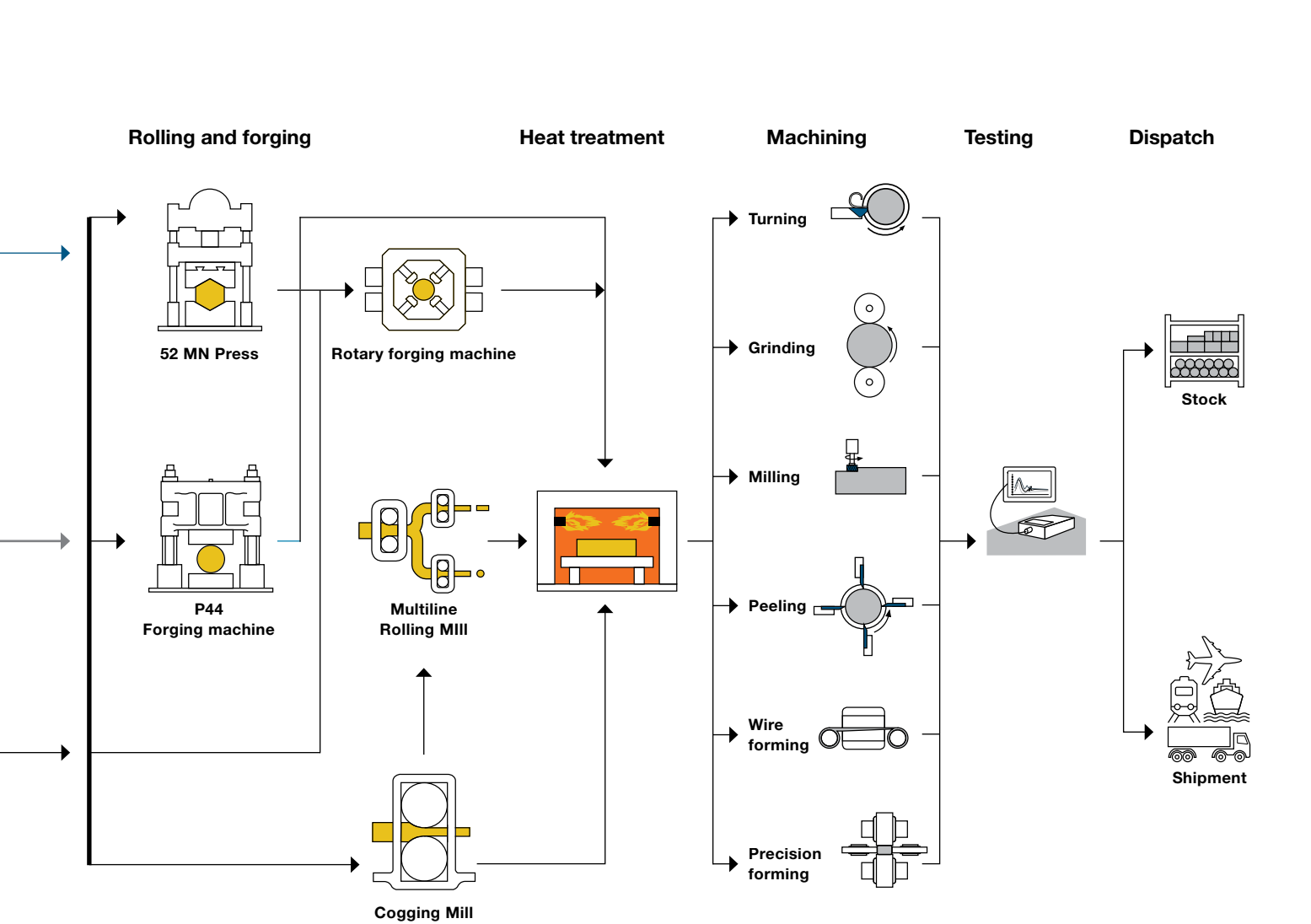
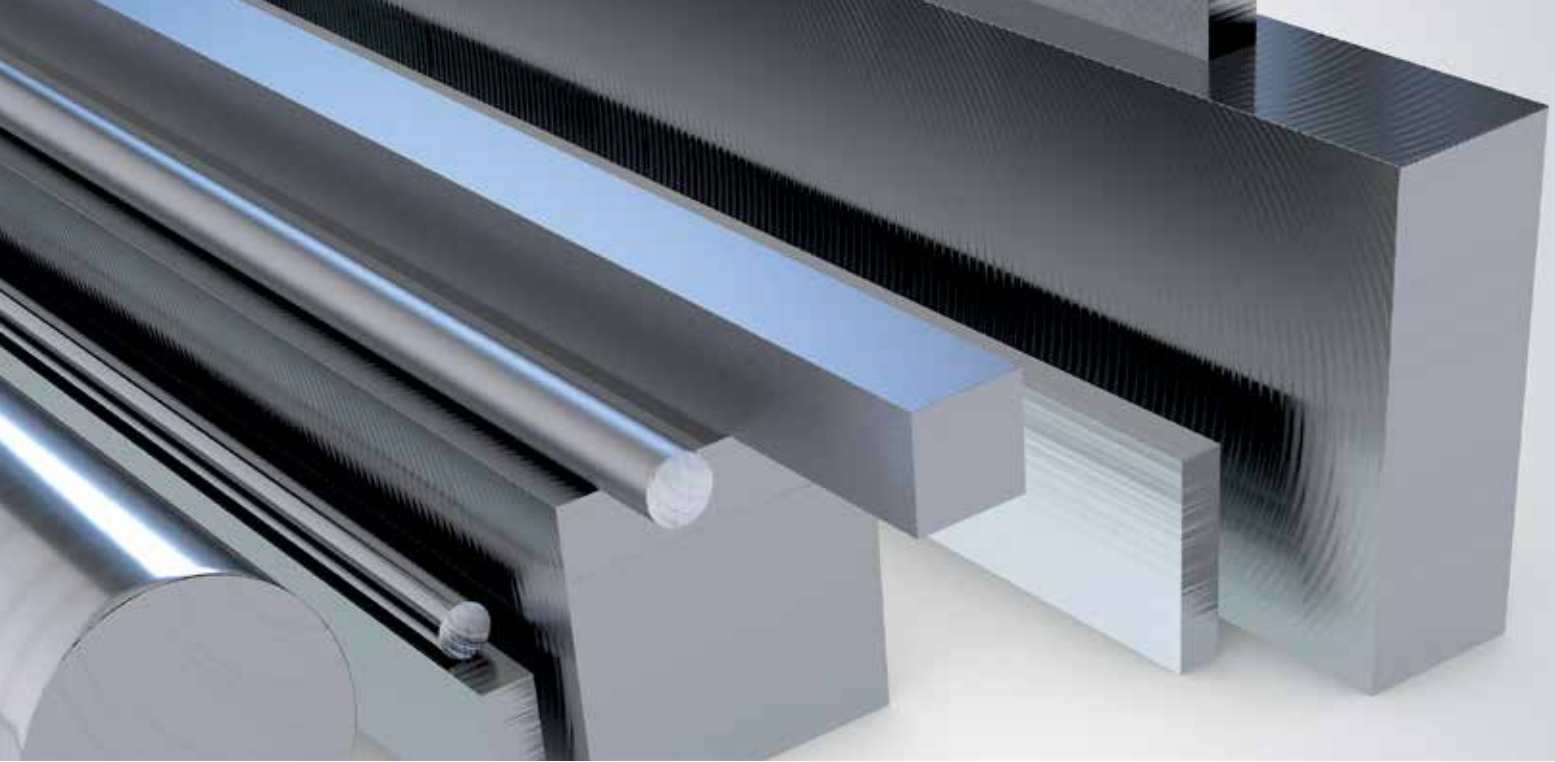
## Conventional Production



## Electro Slag Remelting Production



**Conventional HIGH SPEED STEEL**



# YOU CAN TRUST OUR SPECIALISTS

YOU'VE GOT THE IDEAS AND WE'VE GOT THE SOLUTIONS. ANY PROBLEM THAT ARISES, ANY CUSTOMER REQUIREMENT AT HAND MEANS NEW ANSWERS TO BE FOUND, FOR OVER 100 YEARS NOW. THIS KNOW-HOW IS AVAILABLE TO YOU, WHETHER AS SUPPORT FOR MATERIALS OR AS APPLICATIONS. TECHNICAL CONSULTING IS OUR SUPREME DISCIPLINE AND YOU AS OUR PARTNER CAN CERTAINLY BENEFIT FROM IT.

## **Our services include:**

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On-going responsibility for quality  
(from the inquiry to issuing the certificate)

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Technical interface between the customer  
(sales, marketing, ...) and the production

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Technical request handling

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Technical order processing/inspection/monitoring

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Product certification (issuing certificates)

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Product and process approvals/qualifications

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Continuous product optimization throughout  
the entire production process

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Technical customer advisory service/ applications engineering

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Technical trainings

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Process optimization and development

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Central coordination of testing activities

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# RESEARCH AND DEVELOPMENT

THE RESEARCH AND DEVELOPMENT PROGRAM IS FOCUSED AMONG OTHER ISSUES ON EXPANDING ON OUR CORE COMPETENCES, ONE OF WHICH IS HIGH SPEED STEEL.



The work program for the BÖHLER Research and Development departments has turned to innovative product and process development and is oriented towards efficiently living up to market expectations and fulfilling the ever-changing customer needs.

Efficiently implementing the research and development programs is facilitated by the use and development of simulation programs for computer-assisted material and alloy development, by the mathematic simulation of manufacturing and process steps and by the physical simulation of material behavior during the production process and in components to guarantee best possible benefits for our customers.



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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