



TOOL STEELS

For
**DIE CASTING
APPLICATIONS**

Including an introduction to
Die Casting Specifications

BÖHLER  **UDDEHOLM**

Great Tooling Starts Here!™

DIEVAR

Dievar®

Dievar® from Uddeholm (Premium Hot Work Die Steel)

Dievar® is a high performance chromium molybdenum vanadium alloyed hot work tool steel which is manufactured utilizing the very latest in production and refining techniques. The unique chemistry and manufacturing process offers an unparalleled resistance to heat checking, gross cracking, hot wear and plastic deformation. **Dievar®** is certified to a minimum, average Charpy V-notch impact toughness of 14 ft-lbs. (19 J) and a minimum un-notched impact toughness of 220 ft-lbs. (300 J) per testing procedure defined by NADCA 207-97 and 207-2003 specifications. **Dievar® is the material of choice for high demand die casting, forging and extrusion tooling.**

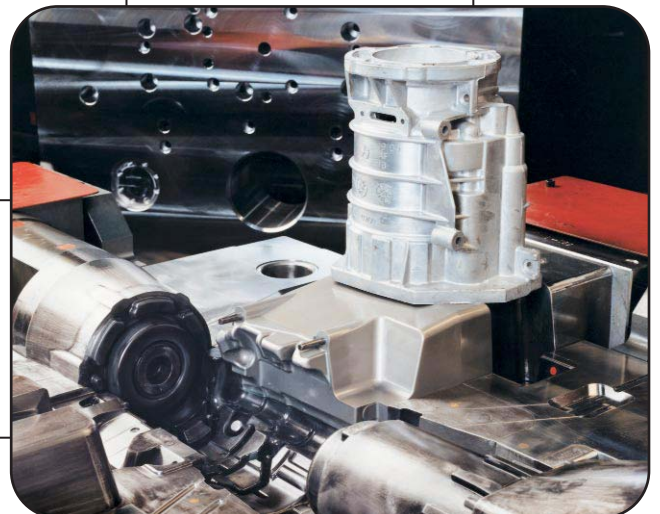
Dievar® is the material of choice for:

- Tools which are large and/or complex
- Tools which will be subjected to high service temperature and pressures
- Tools which will undergo severe thermal cycling in service
- Good dimensional stability throughout heat treatment and coating operations

Which has better material properties,
Dievar® or Premium H1 3?

Dievar® Premium H1 3

Temper Resistance	✓	—
Hot Yield Strength	✓	—
Creep Resistance	✓	—
Thermal Conductivity	✓	—
Ductility	✓	—





Superior Specification 207-2003

When dealing with superior grade H13, the steel making process needs to include secondary refining, either ESR (electro-slag remelting) or VAR (vacuum arc remelting). Additionally the specification calls for improved levels of cleanliness, a reduction in micro and macro banding, and for certification of impact toughness levels at 10 ft-lbs. average with 8 ft-lbs. single minimum value. This type of manufacturing technique combined with NADCA recommended vacuum austenitizing and pressurized gas quenching can lead to success in production where high volume production or critical performance in the die-casting process is required.

Bohler-Uddeholm Superior Grades:

Orvar® Superior from Uddeholm (Premium H1 3)

A premium Cr-Mo-V-alloyed hot work die steel with good resistance to thermal fatigue. The steel is produced by a special melting and refining technique in order to give mechanical properties with maximum isotropy and is certified to meet a minimum Charpy V-notch test result of 10 ft-lbs. Suitable for a wide variety of hot work applications, including tools for high pressure die casting, hot extrusion and press forging, **Orvar® Superior** meets or exceeds the NADCA 207-97 and the 207-2003 Superior Specification in dimensions up to 18" in thickness.

Bohler W302 Superior® (Premium H1 3)

This premium H13 grade produced via special melting and refining techniques possesses excellent toughness making it suitable for demanding hot work applications. **W302 Superior** meets or exceeds NADCA 207-97 and 207-2003 Superior Specification in dimensions 18" and greater in thickness.





Premium Specification 207-2003

- The Premium criteria for H13 material under the NADCA 207-2003 Specification does not deal with the steel making practices or the forging practices of the steel manufacturer. Rather the specification calls for improved levels of cleanliness, a reduction in micro and macro banding, and for certification of impact toughness levels at an 8ft-lbs. average with a 6 ft-lbs. single minimum value.
- Combined with NADCA recommended vacuum austenitizing and pressurized gas quenching choosing steels that meet this specification can lead to success in production in the die-casting process.

Bohler W302 Isobloc® (Premium H13)

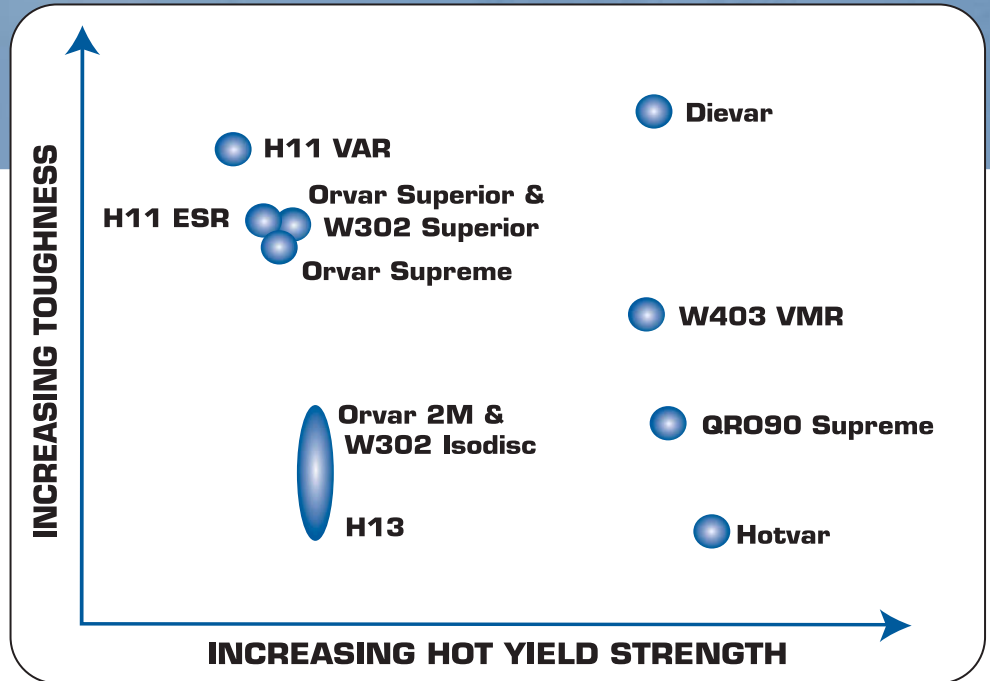
This premium H13 grade is an electro-slag remelted (ESR) steel, giving it excellent toughness making it suitable for demanding hot work applications. **W302 Isobloc** meets or exceeds the NADCA 207-97 Specification.



TOOL STEELS

Great Tooling Starts Here!™

Properties Comparison Hot Work Tool Steels



Pre-tested — to give you peace of mind

At Bohler-Uddeholm we pre-test our charpy v-notch toughness levels at our mills in order to ensure that we meet or exceed applicable specifications. By taking this additional step you can be assured that our material will consistently meet your expectations for Bohler-Uddeholm products. Our testing means that customers could consider eliminating additional qualification testing. Keep a sample for future reference and simply test for toughness after heat treatment. This will save you time and money.



Great Tooling

BÖHLER UDDEHOLM

Heat Treatment Alliance

In an effort to continue to add value in our dealings with our customers, we have now created an alliance of world-class heat treaters to support us in our commitment to supplying the World's highest quality tool steels. This alliance will allow us to supply the highest quality steel and assure our customers that the best heat treatment practices are being utilized to enhance the characteristics of our products.

Through this partnership we deliver:

- ▶ Enhanced customer service
- ▶ Joint technical support
- ▶ Joint problem solving
- ▶ An unmatched commitment to quality!

Bodycote
THERMAL PROCESSING

CENTURY SUN
METAL TREATING

FPM
HEAT TREATING
METAL FINISHING



PAULO

BÖHLER UDDEHOLM
Thermo-Tech



Starts Here!

Automotive Specifications

In addition to specifications such as those created by NADCA, many automotive OEM's and other industry leading organizations have crafted their own unique specification requirements. Bohler-Uddeholm meets or exceeds many of these specifications and a sampling of the specifications for which we have qualified material is listed here.

Die-Casting Specifications:

DAIMLERCHRYSLER



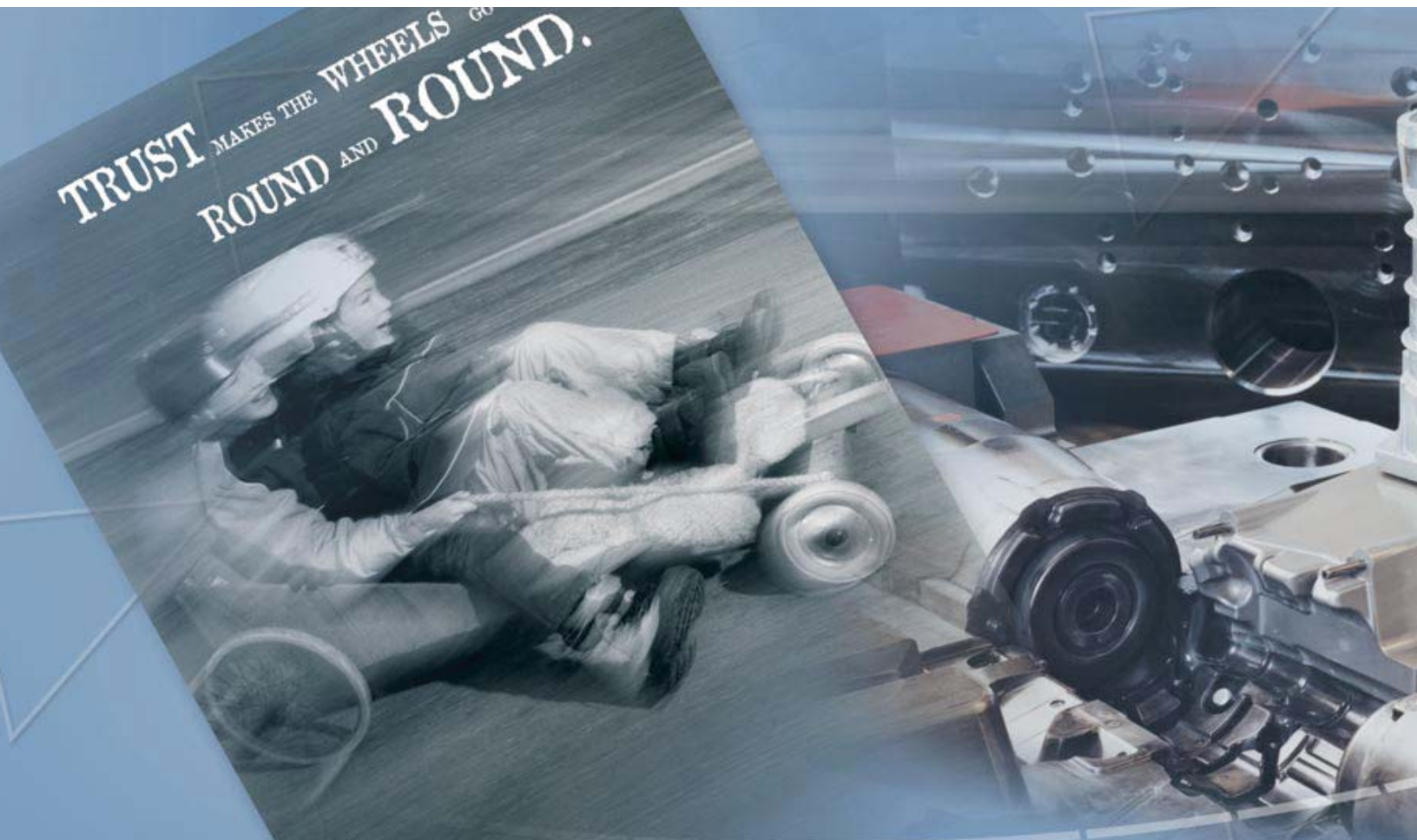
Allied Die Casting	General Motors Powertrain Group
Amcan Castings Limited	Gibbs Die Casting Corp.
Blue Ridge Pressure Castings, Inc.	J.L. French Corp.
Briggs and Stratton Corp.	Madison Kipp Corp.
Burlington Technologies Inc.	Magnesium Products
DaimlerChrysler	Metalloy
Eastern Die Casting Inc.	PHB Tool and Die
Ford Motor Company	SPX Contech
Ganton Technologies Inc.	Toral Cast

R & D

Research and development play a strategic role at Bohler-Uddeholm. We know that in depth process and material research is the basis for producing the highest quality products. In order to keep up with the constant demand for improved materials, Bohler-Uddeholm maintains a close intensive cooperation with universities and research centers and supports the exchange of information at all levels.

The knowledge of our technical experts who are engaged in fundamental research ultimately results in superior value to our customers. Our research activities yield the most modern high performance Tool Steels and High Speed Steels produced by means of Powder Metallurgy production techniques, Aluminum-Alloyed Tool Steels, Nitrogen Alloyed Tool Steels, Electro-Slag Remelted (ESR) and Vacuum Remelted (VMR/VAR) Tool Steels and special products.





BÖHLER UDDEHOLM
United States

USA
4902 Tollview Drive
Rolling Meadows, IL 60008
www.bucorp.com
email: info@bucorp.com

BÖHLER UDDEHOLM
Canada

Canada
2595 Meadowvale Blvd.
Mississauga, Ontario L5N7Y3
www.bucanada.ca
email: info@bucanada.ca

Sales:
Tel: (800) 638-2520

© Bohler-Uddeholm Corporation/Bohler-Uddeholm Ltd. 2004

BU100 9/04/2,000