

# MD®Xtra

## Quality Prehardened Mold Steel

### Data Sheet

~AISI P20mod - 1.2738 mod (HH)

#### Typical Applications

- Molds for painted Parts of any size
- Grained or Textured molds
- Molds for Chrome-Plated parts
- Compression molds
- Long run molds
- Abrasive or filled plastic injection molds
- Dies for non corrosive plastic extrusion

#### Delivery Condition

- Hardened and tempered

#### Surface Hardness Range

	BHN	HRC	MPa
Standard	285–321	30–34	963–1082
High Hard	321–352	34–38	1082–1202
Super Hard	363–401	39–43	1255–1393

**MD®Xtra** is a new, patented, pre-hardened mold steel grade specially designed for through-hardenability, ease of machining and simple postproduction mold maintenance. It has high impact strength to prevent cracking and very high thermal conductivity that improves heat extraction and reduces molding cycle times. The well-balanced chemistry assures homogeneous hardness and microstructure in very large cross sections with nearly no section hardness loss due to mass.

**MD®Xtra** is forged on our largest presses equipped with wide dies assuring maximum deformation during the forging process.

#### Chemical composition in %

C	Mn	Si	Ni	Cr	Mo	Other
0.26	1.00	0.35	0.60	1.45	0.55	Micro alloying

**MD®Xtra** is forged using a special densifying process which assures optimum consolidation of centers.

**MD®Xtra** is melted to a low sulphur content to enhance polishability.

**MD®Xtra** is quenched in water. Best properties in steel are produced with the highest achievable quench severity.

**MD®Xtra** is characterized by :

- Improved through hardenability
- Good polishability
- Excellent weldability
- Uniform hardness
- Superior texturing
- Improved wear resistance

**MD®Xtra** is 100 % ultrasonic tested to very stringent acceptance levels.

**MD®Xtra** has high hardenability that achieves hardness loss from surface to core of less than 3 HRC points, even on molds up to 45" (1150 mm) thick with deep impressions.

**MD®Xtra** is an excellent material for Photo-Etching & Acid Texturing. The patented low alloy composition minimizes segregation.

®Finkl Steel Trademark

# MD<sup>®</sup>Xtra

## Quality Prehardened Mold Steel

### Material characteristics

Uniform, high through-hardness assures:

- Stable and continued machining with automatic (CNC) machines
- Defect-free machined surfaces
- Dimensional stability of parting lines Structure

After hardening and tempering, the structure of MD<sup>®</sup>Xtra consists of tempered martensite to fine bainite.

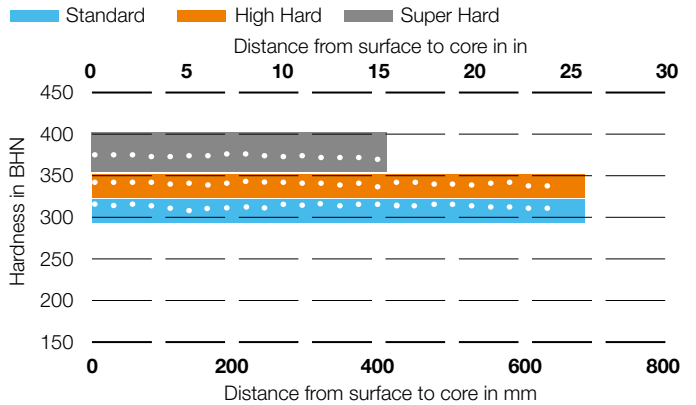
The benefits of through hardness combined with a uniform and stable micro-structure are:

- For mold design, consistent properties are assured.
- The machining distortion is minimized in the finished mold.
- A uniform luster can be obtained upon surface polishing.

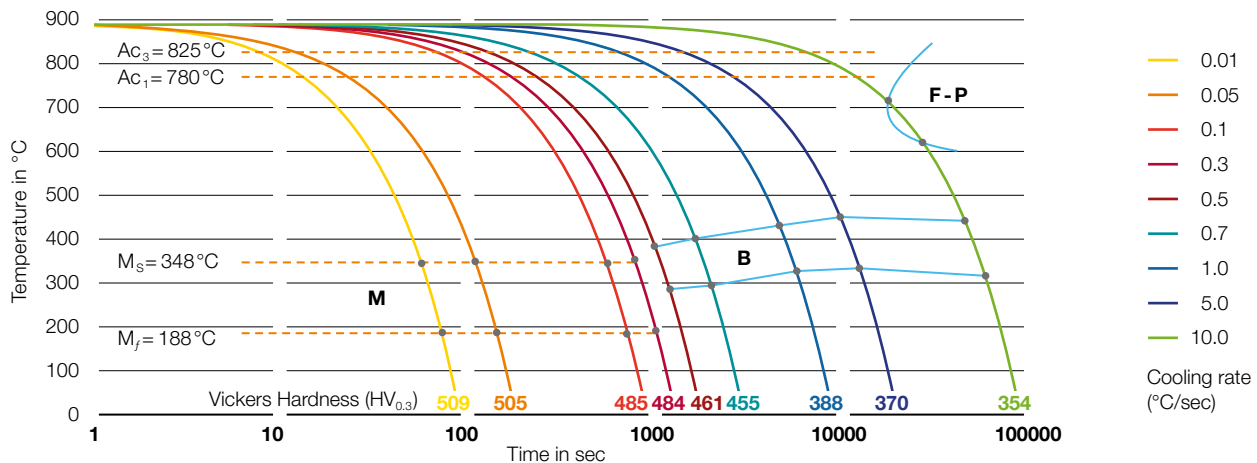
### Microcleanliness

Method	A	B	C	D
ASTM E45	≤ 1.5	≤ 1.0	≤ 0.5	≤ 1.0
DIN 50602	K4 ≤ 20			

### Hardness profile of MD<sup>®</sup>Xtra



### Continuous cooling curve



### Physical Properties

Thermal conductivity	Coefficient of thermal expansion (10 <sup>-6</sup> K <sup>-1</sup> )			Thermal capacity	Density
W/m <sup>2</sup> K (BTU/hr <sup>2</sup> ft <sup>2</sup> °F)	25–100 °C	25–300 °C	25–400 °C	(J/Kg*K)	(g/cm <sup>3</sup> )
> 45 (26)	12.3	13.7	14.8	620	7.68

# MD<sup>®</sup>Xtra

## Quality Prehardened Mold Steel

### Mechanical Properties

Typical values for a 4" (101.6 mm) thick plate.

Hardness range	Hardness BHN (HRC)	Yield Strength R <sub>p0.2</sub> MPa (KSI)	UTS MPa (KSI)	Elongation %	Impact@R <sub>T</sub> J (Ft-lb)	
					Long.	Trans.
285–321 BHN	311 (33)	827 (120)	979 (142)	> 15	111 (82)	108 (80)
321–352 BHN	331 (36)	924 (134)	1062 (154)	> 15	88 (65)	81 (60)
363–401 BHN	363 (39)	1007 (146)	1124 (163)	> 15	34 (25)	30 (22)

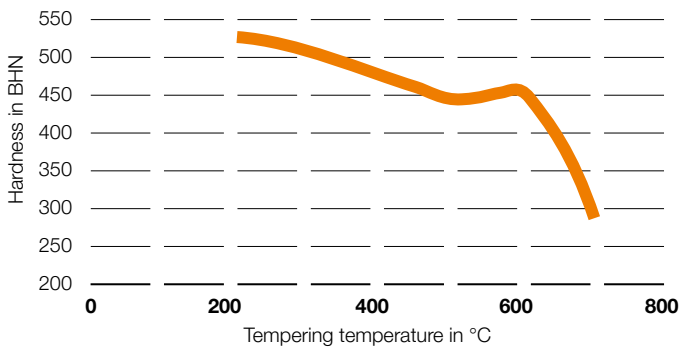
### Heat treatment

#### Attainable Hardness of MD<sup>®</sup>Xtra

Quenched from 1650 °F (900 °C) and Tempered 4 hours

Size of section – 4" X 4" (101.6 mm X 101.6 mm)

#### Tempering curve of MD<sup>®</sup>Xtra



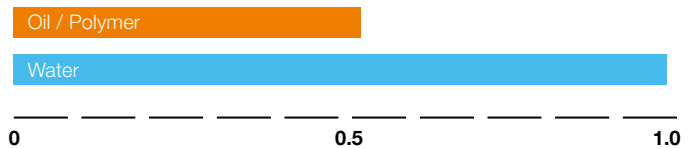
#### Tempering

Tempering treatments vary for different sizes and applications. To ensure through-tempering, heat uniformly at the selected tempering temperature and hold at temperature for one hour per inch (25.4 mm) of total thickness.

#### Stress Relieving

Heat uniformly to 850 to 900 °F (454 – 482 °C). Hold at temperature for one hour per inch (25.4 mm) of total thickness and air cool. Stress Relieving is not required for REG & HH.

#### Relative Quenching Power



#### Induction and laser hardening

MD<sup>®</sup>Xtra lends itself well to induction or laser hardening of selective surfaces creating a surface hardness of up to 60–63 HRC varying in depth from skin hardness up to 0.125" (3 mm).

#### EDM (Electric Discharge Machining)

This method of machining is widely used on prehardened MD<sup>®</sup>Xtra. However, precaution should be taken since this method of machining leaves a rehardened surface layer (white layer) on the steel. It is advisable to remove this layer.

#### Hard-Chromium Plating

After hard-chromium plating, the tool should be tempered for a minimum of four hours at 350 °F (180 °C) to avoid hydrogen embrittlement. When re-plating, the tool should be tempered after it has been acid stripped.

# MD<sup>®</sup>Xtra

## Quality Prehardened Mold Steel

### Balitherm Primeform

The BALITHERM PRIMEFORM treatment has a significant influence on the surface hardness of MD<sup>®</sup>Xtra. An increase in surface hardness of more than 100% for all MD<sup>®</sup>Xtra delivery conditions is possible with no loss of base hardness, and for MD<sup>®</sup>Xtra Super Hard, values up to 66 HRC have been demonstrated. This hardness increase provides superior resistance to abrasive wear during the injection of long glass fiber thermoplastics and makes mirror polishing easier. As an added benefit, repair and retreatment of the mold is possible without stripping the surface treatment.

### Texturing

MD<sup>®</sup>Xtra offers excellent response to texturing because of the superior homogeneity of its structure and patented low alloy composition.

### Polishing

Successful polishing requires talent, patience and experience. But some known basics are:

- Practice extreme cleanliness between steps to avoid carryover of contaminant particles
- Use high quality consumables
- Over polishing is detrimental to the steel surface leading to so called orange-peeling and pitting

When the requirements for finish are particularly high (800 up to 1200 grit), it is recommended to use **MD<sup>®</sup>Xtra Super Hard**.

For high-gloss finish or SPI A 1 and greater, it is recommended to use grade **MLQ<sup>®</sup>Xtra**.

### Size MD<sup>®</sup>Xtra Standard and High Hard (as forged/approx.)

<b>Max weight</b>	64 000 kg	140 000 lbs
<b>Max section</b>	2.2 m <sup>2</sup>	3 400 sq in
<b>Max width</b>	2 600 mm	102"
<b>Max thickness</b>	1 320 mm	52"

### Size MD<sup>®</sup>Xtra Super Hard (as forged/approx.)

<b>Max weight</b>	64 000 kg	140 000 lbs
<b>Max section</b>	2.2 m <sup>2</sup>	3 400 sq in
<b>Max width</b>	2 600 mm	102"
<b>Max thickness</b>	815 mm	32"

### Metallurgical Service

The Metallurgical Laboratory provides standard mechanical properties testing for Tensile Testing (ASTM A 370), Impact Testing (ASTM E 23), Hardness Testing (ASTM E 10, E 18, A 956), Macro-etch Testing (ASTM E 381), and other metallurgical testing with certification of results where requested.

Metallurgical facilities are made available to customers through your sales representative to assist in analysis of technical issues that may arise during processing or performance of Finkl forgings. Reports and consultation are offered as a service to customers with the aim of improving product performance.

#### Note

Provided technical data and information in this data sheet are typical values. Normal variations in chemistry, size and conditions of heat treatment may cause deviations from these values. We suggest that information be verified at time of enquiry or order. For additional data or metallurgical assistance, please contact us.



#### Finkl Steel – Chicago

1355 E. 93rd Street  
Chicago, IL 60619  
USA  
sales@finkl.com  
www.finkl.com

#### Finkl Steel – Sorel

100 McCarthy Street  
St-Joseph-de-Sorel  
Quebec J3R 3M8, Canada  
sales@finkl.com  
www.sorelforge.com

#### Deutsche Edelstahlwerke

**Witten/Krefeld GmbH & Co. KG**  
Auestraße 4  
DE-58452 Witten  
info.tool@swisssteelgroup.com  
www.swisssteel-group.com