

# DATA SHEET



## FINKL STEEL

SCHMOLZ + BICKENBACH GROUP

### MLQ®Xtra

~AISI P20mod - 1.2738mod (HH) Remelted

PREMIUM QUALITY

PREHARDENED MOLD STEEL

#### TYPICAL APPLICATIONS

- Clear lens molds
- Mirror surface finish molds (SPI A-1 and sharper)
- Long run molds
- Abrasive plastic injection molds
- Reinforced plastic injection molds
- Dies for non corrosive plastic extrusion

#### GENERAL

**Delivery Condition:** Hardened and tempered  
Electroslag Remelted (ESR) or  
Vacuum Arc Remelted (VAR)

Surface Hardness Range:

	BHN	HRC	N/mm <sup>2</sup>
MLQ®Xtra 40	363-401	39-43	1255-1393

Other hardness ranges are available on request

**MLQ®Xtra** is a new patented prehardened mold steel grade specially designed for through hardenability, ease of machining and simple post-production mold maintenance. It has high impact strength and excellent temper resistance. The well-balanced chemistry assures homogeneous hardness and nearly no section hardness loss due to mass.

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

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

#### Typical Chemical Analysis\* - % weight

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

\*Covered under one or more of the following U.S. Patents:  
10,260,122; 10,294,538

**MLQ®Xtra** is an excellent material for Polishing, Photo-Etching & Texturing. The high-quality mold steel undergoes premium refinement through either Vacuum Arc Remelting or Electroslag Remelting, thus eliminating nearly all segregation and inclusions.

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

**MLQ®Xtra** is characterized by:

- Highest thermal conductivity
- Improved through hardenability
- Best polishability
- Excellent weldability
- Uniform hardness
- Improved wear resistance

**MLQ®Xtra** is 100 % ultrasonic tested to very stringent acceptance levels. It is defect free.

**MLQ®Xtra** high hardenability ensures hardness levels to be maintained at the working surfaces, even on large molds with deep impressions.

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## PREMIUM QUALITY MOLD STEEL

### MLQ<sup>®</sup>Xtra

#### MATERIAL CHARACTERISTICS

Uniform, high through-hardness assures:

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

#### Structure

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

**The benefits of through hardness combined with a uniform and stable microstructure 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	≤ 0.5	≤ 0.5	0	≤ 0.5
DIN 50602	K1 ≤ 10			

#### Physical Properties

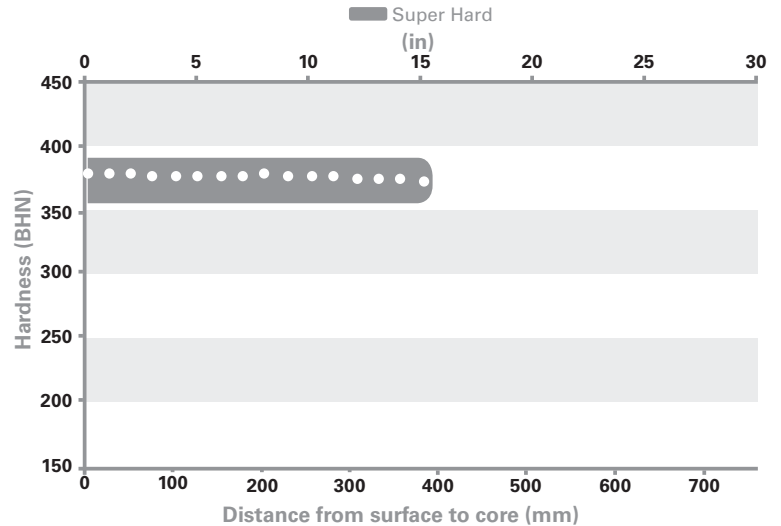
Thermal conductivity	Thermal expansion coefficient (10 <sup>-6</sup> K <sup>-1</sup> )			Thermal capacity	Density
W/m*K (BTU/hr*ft*°F)	25-100 °C	25-300 °C	25-400°C	(J/Kg*K)	-
>45 (26)	12.3	13.7	14.8	620	7.68

#### Mechanical Properties

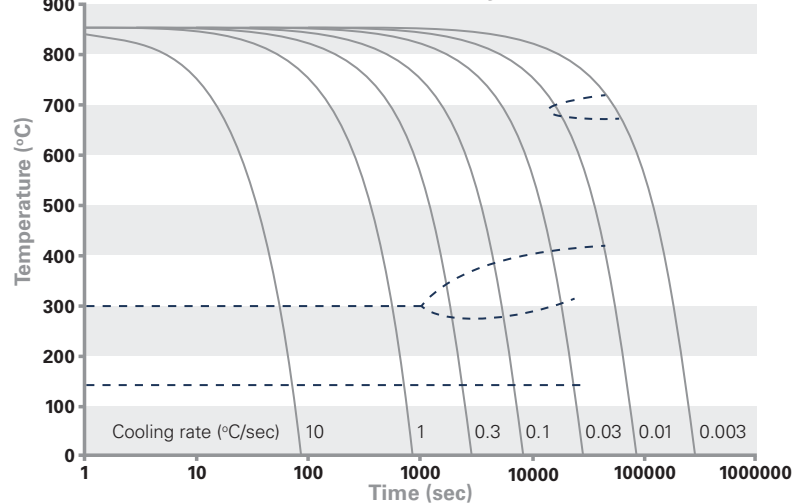
Typical values for a 102 mm (4") thick plate

Hardness range	Hardness BHN (HRC)	Y.S. 0.2 MPa (KSI)	UTS MPa (KSI)	EI (%)	Impact@RT J (Ft-lb)	
					Long.	Trans.
363-401 BHN	363 (39)	1082 (157)	1179 (174)	> 15	60 (44)	56 (41)

Hardness profile of MLQ<sup>®</sup>Xtra



Continuous cooling curve



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## PREMIUM QUALITY MOLD STEEL

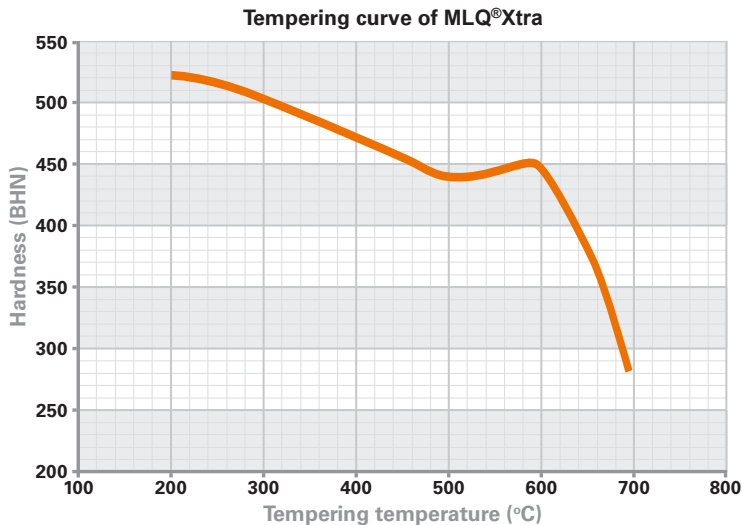
### MLQ®Xtra

#### HEAT TREATMENT

##### Attainable Hardness of MLQ®Xtra

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

Size of section – 102mm X 102mm (4" X 4")



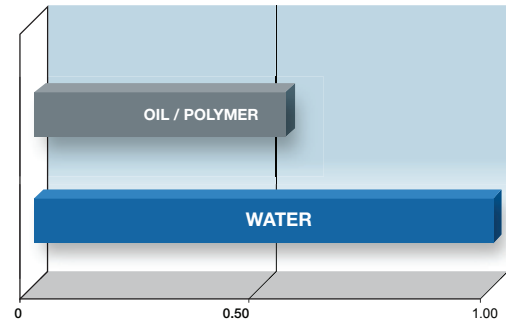
##### Stress Relieving

To minimize risk of distortion in service or during maintenance (welding), it is recommended to stress relieve tooling after roughing stages. 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.

##### 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.

#### Relative Quenching Power:



#### INDUCTION AND LASER HARDENING

MD®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®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.

#### TEXTURING

MLQ®Xtra offers excellent response to texturing because of the great homogeneity of its structure and patented low alloy composition.

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## PREMIUM QUALITY MOLD STEEL MLQ®Xtra

### POLISHING

Successful polishing requires talent, patience and experience. Some basic best practices include :

- 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

The following is an example of good hard-polishing procedure:

#### Preparation for diamond polishing

- Step 1 • Polish with 220 – grit silicon stone
- Step 2 • Polish with 320 – grit silicon stone
- Step 3 • Polish with 520 – grit silicon stone
- Step 4 • Polish with 800 – grit silicon stone
- Step 5 • Polish with diamond paste grade 15
- Step 6 • Polish with diamond paste grade 6
- Step 7 • Polish with diamond paste grade 3

When the demands for finish are particularly high, use grade 1. Be aware that the best result is obtained after a certain optimum polishing time.

**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.

### SIZE MLQ®Xtra (Finished / approx.)

Max weight	16330 kg	36000 lbs
Max section	0.90 m <sup>2</sup>	1400 sq in
Max width	1350 mm	53"
Max thickness	760 mm	30"

### METALLURGICAL SERVICE

Finkl Metallurgical Laboratories provide standard mechanical properties testing for Tensile Testing (ASTM A370), Impact Testing (ASTM E23), Hardness Testing (ASTM E10, E18, A956), Macroetch Testing (ASTM E381), and other metallurgical testing with certification of results when 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.

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