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# 全球钢号百科!

Global Steel Grade Encyclopedia



涵盖的行业或国家与地区类别



国材料与试验协会

GJB

国家军用标准



动力机械工程师协会

EU

前欧洲标准化

AISI

美国钢铁学会



德国工业标准

AMS

航空航天材料规范



国际标准

JASO

日本汽车标准组织

EN

欧洲标准

JB

机械行业标准

UNS

统一编号系统

UNI

意大利标准



美国机械工程师协会

SS

瑞典标准



国家标准



日本工业标准

# DATA SHEET

## MLQ™Xtra 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  
Vacuum Arc Remelted (VAR)

	BHN	HRC	N/mm <sup>2</sup>
MLQ	320-355	34-38	1082-1202
MLQ Xtra	355-390	38-42	1202-1322

**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 near 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

**MLQ™Xtra** is an excellent material for Polishing, Photo-Etching & Texturing. The patented Double Vacuum Process, Vacuum Degassing followed by Vacuum Arc Remelting process eliminates 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 :

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

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

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

# DATA SHEET

## PREMIUM QUALITY MOLD STEEL

### MLQ™ Xtra

#### MATERIAL CHARACTERISTICS

##### The benefits of through high hardness are :

- Stable and continued machining can be performed with (C.N.C.) automatic machines.
- A defect free machined surface can be obtained.
- Dimensional stability of parting lines.

##### Structure

After hardening and tempering, the structure of MLQ™ Xtra consists of tempered martensite to fine bainite.

##### The benefits of the 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.

#### PROPERTIES MLQ™ Xtra

##### • Cleanliness :

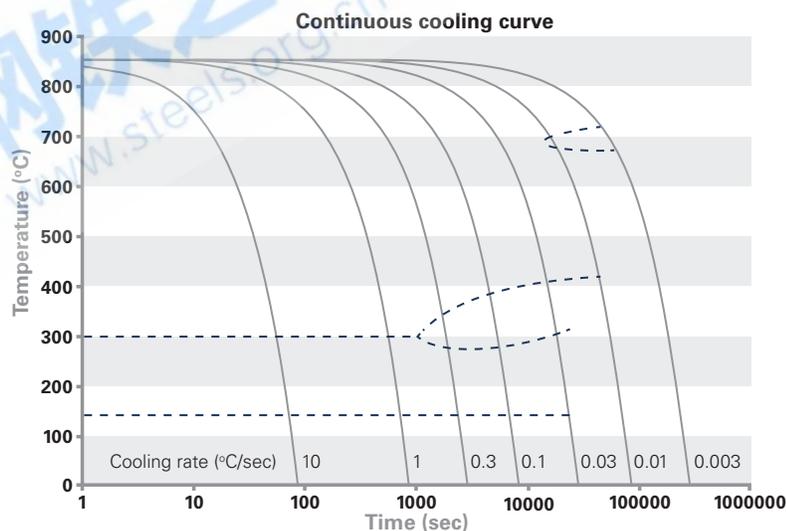
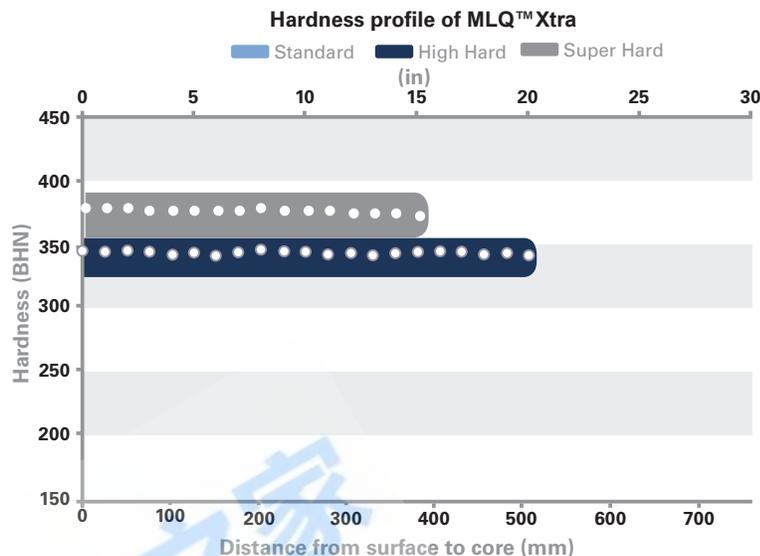
Method	A	B	C	D
ASTM E45	≤ 0.5	≤ 0.5	0	≤ 0.5
DIN 50602	K1 ≤ 10			

##### • Physical Properties :

Thermal conductivity	Thermal expansion coefficient (10 <sup>-6</sup> K <sup>-1</sup> )			Thermal capacity	Density
(W.m <sup>-1</sup> .K <sup>-1</sup> )	25-100 °C	25-300 °C	25-400°C	(J.Kg <sup>-1</sup> .K <sup>-1</sup> )	-
30	12.3	13.7	14.8	384	7.85

##### • Mechanical Properties : Typical values for a 4" (101.6 mm) thick plate.

Hardness range	Hardness BHN (HRC)	Y.S. 0.2 MPa (KSI)	UTS MPa (KSI)	EI (%)	Impact@RT J (Ft-lb)	
					Long.	Trans.
320-355 BHN	331 (36)	924 (134)	1041 (151)	> 15	142 (105)	129 (98)
355-390 BHN	363 (39)	1082 (157)	1179 (174)	> 15	60 (44)	56 (41)



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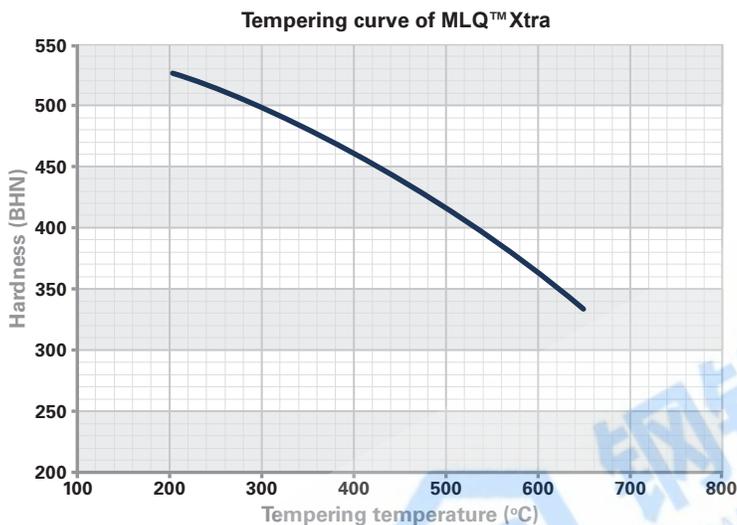
## PREMIUM QUALITY MOLD STEEL

### MLQ™Xtra

#### HEAT TREATMENT

##### Attainable Hardness of MLQ™Xtra

Quenched from 1650 °F (900 °C) and Tempered 4 hours  
(Size of section – 4" X 4" (101.6 mm X 101.6 mm))



#### Stress Relieving

Molds can be finish machined to their final dimensions. Heat finished die at a rate of one hour per inch (25.4 mm) of maximum thickness to 850 to 900 °F (454-482 °C) Hold at temperature for one hour per inch (25.4 mm) and air cool.

#### Tempering

Tempering treatments vary for different sizes and applications. The following instructions will provide through tempering :

Heat uniformly at the selected tempering temperatures and hold at temperature for one hour per inch (25.4 mm) of total thickness.

#### INDUCTION AND LASER HARDENING

MLQ™Xtra lends itself 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 MLQ™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 (4) hours at 350 °F (180 °C) in order to avoid hydrogen embrittlement. In case of replating, 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.

# DATA SHEET

## PREMIUM QUALITY MOLD STEEL MLQ™ Xtra

### 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
- The following is an example of good hardpolishing 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 SERVICES

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), *Macroetch 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.