



**EXELL 420-SMDQ | Stainless Mold Steel**



**ELLWOOD**

YOUR METALS PARTNER, FROM MELT TO DISTRIBUTION

## IMPROVED MANUFACTURING AND RELATED PERFORMANCE

ExELL 420-SMDQ is a premium grade stainless steel used in many tooling applications with these typical properties:

- Good corrosion resistance
- Very good polishability
- Excellent steel cleanliness
- High working hardness/strength
- Good wear resistance
- Very good stability in hardening

### TYPICAL ANALYSIS

<b>C</b>	<b>0.38</b>	<b>Mn</b>	<b>0.45</b>
<b>Si</b>	<b>0.75</b>	<b>Cr</b>	<b>13.75</b>
<b>V</b>	<b>0.30</b>		

ExELL 420-SMDQ is manufactured with special melting, refining, forging, and thermal treatment to produce Special Mold and Die Quality (SMDQ). It is used for applications that demand optimum steel properties: material cleanliness, structure uniformity, strength, toughness, and ability to polish.

## CHARACTERISTICS

### PHYSICAL PROPERTIES

#### Coefficient of Thermal Expansion, in/in/F

- 70-400 F ..... 0.0000060
- 70-600 F ..... 0.0000064

#### Thermal Conductivity, BTU/ft hr F

- 70 F ..... 13
- 400 F ..... 14
- 750 F ..... 15

#### Density, lbs/cu.in.

- 70 F ..... 0.2833
- 400 F ..... 0.280
- 750 F ..... 0.276

#### Modulus of Elasticity, psi

- 70 F ..... 29,000,000
- 400 F ..... 28,000,000
- 750 F ..... 26,500,000

#### Specific Heat, Btu/lb F

- 70 F ..... 0.115

#### Typical Tensile vs. Hardness at Room Temperature

	Tensile Strength PSI	0.2% Yield Strength PSI
• 52 HRC .....	255,000.....	215,000
• 46 HRC.....	210,000.....	185,000

## HEAT TREATMENT (General Recommendations)



### STRESS RELIEVING

After rough machining of an annealed component, heat the part to 1200°F. Equalize and hold for 1-2 hours. Furnace cool to 900°F and then air cool to room temperature.

### ANNEALING

With a protective atmosphere or vacuum furnace, heat slowly to 1450°F. Equalize and hold one hour per inch of thickness. Furnace cool 20°F per hour to 1200°F. Equalize and air cool to room temperature. Hardness should be no more than 229 HB.

## HARDENING AND QUENCHING

Protect against decarburization and oxidation during austenitizing.

### PREHEATING

Heat to 1200°F and equalize. Continue heating to 1550°F and equalize. Complete heating to hardening temperature.

### HARDENING

The common austenitizing range is 1870°F -1920°F. Hardening temperature can be adjusted to develop maximum hardness. A hardening temperature of 1870°F -1880°F is normally used for most applications while 1910°F -1920°F can be used for maximum hardness.

### QUENCHING

Perform quenching as rapidly as possible without encouraging excessive movement or cracking.

Hardening Temperature	Hold Time*	As-Quenched Hardness
1870 F	30 min.	56 ± 2 HRC
1910 F	30 min.	57 ± 2 HRC

\*Hold Time = time at temperature after tool is fully heated through.

#### Typical quenching media includes:

- High speed gas with sufficient positive pressure in a vacuum furnace
- Circulating air/atmosphere
- Martempering bath or fluidized bed at 480°F - 1020°F, then air cool to room temperature
- Warm oil

## TEMPERING

Temper immediately after quenching to around 150°F. Choose the temperature to develop required hardness (The recommended temper is 480°F for optimum material properties). ExELL 420-SMDQ should be heated to the desired temperature and held a minimum of two hours. Air cool to room temperature. Check hardness and adjust temperature for any additional operations. Repeat for added tempers.

Typical tempering responses are as follows:

Tempering Temperature	Harden 1870F HRC	Harden 1910F HRC
480F	52	53
550F	51	52
1020F	46	47
1110F	40	40

**Note:** Use for approximate guideline only. Avoid tempering between 550°F-1020°F due to risk of temper embrittlement and decrease in corrosion resistance.



## CHARACTERISTICS

### CORROSION RESISTANCE

ExELL 420-SMDQ resists rusting and staining that comes from humid service or storage conditions. It will also resist corrosion by water, water vapor, weak organic acids, and when molding corrosive plastics under normal conditions.

ExELL 420-SMDQ will exhibit maximum corrosion resistance when using a low temperature temper (480°F) in heat treatment and when polished to a very fine finish.

## CAPABILITIES

ELLWOOD Specialty Steel is a fully integrated producer of specialty tool steels. Our ExELL grades are made with advanced ASEA-SKF steel making capabilities. This includes an ultra-high powered electric arc furnace with subsequent state-of-the-art ladle refining, and vacuum degassing equipment for complete and modern ladle metallurgy technology.

Our steel making expertise is further enhanced by a long forging history of optimum forging and heat treatment practices. This allows us to develop special material characteristics of product uniformity, cleanliness, ability to polish, strength, toughness, hardenability, and more. All from ISO 9002 certified production facilities.

## QUALITY ASSURANCE

ELLWOOD Specialty Steel is committed to providing products and services that consistently meet and exceed quality and performance expectations. Our customer support and technical services help to ensure complete satisfaction.

As a flexible provider, we establish product programs to support industry or customer requirements. Our extensive stock program allows short mill lead times of custom forged products. Customized programs are and can be available for specific customer needs.



## TOOL MAKING

ExELL 420-SMDQ is manufactured to the highest, premium quality to provide molders with long-life tools with low maintenance costs. For additional information including machining, welding, grinding, polishing, or EDM processing, please contact ELLWOOD Specialty Steel at: 800-932-2188.

This information is intended to provide general data on our products, their uses and is based on our knowledge at the time of publication. No information should be construed as a guarantee of specific properties of the procedures described or suitability for a particular application. ELLWOOD Specialty Steel reserves the right to make changes in practices which may render some information outdated or obsolete. ELLWOOD Specialty Steel should be consulted for current information and/or capabilities.



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