

TOOLMAKING

For additional information including welding, machining, grinding or EDM processing, nitriding, polishing, or texturing, please contact ELLWOOD Specialty Steel direct at: 800.932.2188

CAPABILITIES

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

Our steel making expertise and capability is further enhanced from a long forging history with optimum forging and heat treating practices to develop special material characteristics of product uniformity, cleanliness, machinability, polishability, strength, toughness, hardenability and other steel properties. All this from production facilities certified to ISO 9002.

QUALITY ASSURANCE

ELLWOOD Specialty Steel is committed to providing products and services which consistently meet or exceed your quality and performance expectations. We will provide customer and technical service that will ensure complete satisfaction.

ELLWOOD Specialty Steel will establish product programs to fully support industry or customer requirements. Our extensive stock programs are supported by short mill lead times of custom forged products.

Customized stock programs can be available for specific customer needs.



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 ELLWOOD Specialty Steel reserves the right to make changes in practices which may render some information outdated or obsolete.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.



EXELL 15-5 PH

Stainless Mold Steel



ELLWOOD
YOUR METALS PARTNER, FROM MELT TO DISTRIBUTION

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EXELL 15-5 PH

ExELL 15-5 PH was developed by ELLWOOD Specialty Steel as a premium quality mold steel. ExELL 15-5 PH is a martensitic precipitation hardening stainless steel with certain advantages over conventional stainless mold steels.

- Some of these characteristics include:
- Superior corrosion resistance
 - Simple heat treatment
 - Uniformity of mechanical properties
 - Easy to weld
 - Good dimensional stability
 - Good toughness

MANUFACTURING

ExELL 15-5 PH is manufactured to the highest tooling quality standards for optimum service performance. From melting through final testing, the finished steel is a material with very good structure and mechanical property uniformity.

- Steel manufacture specifics include:
- Vacuum Arc Remelting (VAR)
 - Precise chemistry control
 - Heavy forging reductions
 - Solution heat treating
 - Precipitation (age) hardening if requested
 - Complete manufacturing in facilities certified to ISO 9002

CHARACTERISTICS

PHYSICAL PROPERTIES

Coefficient of Thermal Expansion, in/in/F

- 400F - 0.000006

Thermal Conductivity, BTU/ft hr F

- 70F - 11
- 400F - 13



APPLICATIONS

ExELL 15-5 PH is used in various tooling and engineered parts. Some typical applications include:

- Injection molds for plastics and rubbers
- Medical and food industry tooling
- Extrusion dies
- Compression molds
- Plastic processing equipment
- Engineered components

TYPICAL ANALYSIS	
C	0.04
Si	0.30
Mn	0.70
Cr	15.20
Ni	4.80
Mo	0.25
Cu	3.70
Cb	0.30

Density, lbs/cu.in.

- 70F - 0.283

Modulus of Elasticity, psi

- 70F - 29,000,000
- 400F - 27,700,000



HEAT TREATMENT (General Recommendations)

ExELL 15-5 PH is normally supplied in either the solution annealed condition or the precipitation hardened (aged) condition. However, the following thermal treat data may be useful if stress relieving, aging or re-solution annealing might be necessary.

STRESS RELIEVING

- Stress relieving after aging is generally not performed because of the risk of undesired aging.
- Stress relieving will simultaneously age harden the material. Thus, it is very useful to perform major machining in the solution annealed condition, then age the part as required. The aging treatment in this context will both precipitation harden and stress relieve the material.

SOLUTION ANNEALING

- Solution annealing ExELL 15-5 PH should not be necessary.
- However, if material requires to be re-solution annealed treat as follows: Heat to 1900F, equalize, hold 30 minutes at temperature and air quench. Movement and distortion are likely. Resulting hardness will be approximately 30-33 HRC.

AGE HARDENING

If ExELL 15-5 PH was not supplied in a specific aged condition (prehardened), the material can be age hardened with a temperature generally between 925° and 1150°F. The aging temperature is selected to attain a desired hardness level.

Aging is performed by uniformly heating and equalizing temperature from surface to center, holding 4 hours at temperature and air cooling. Slight shrinkage will occur after aging on the order of 0.0005 to 0.0010 inches per inch.

Most aging is accomplished by using a 975°F age or higher. A 975°F aging treatment is

used for a balance of hardness and toughness while higher temperature treatments will improve toughness and minimize over-aging, if higher service temperatures are encountered.

AGE HARDENING		
CONDITION	AGING TEMP (F)	HARDNESS (HRC)
H925	925	~42-44
H975	975	~39-41
H1025	1025	~38-40
H1150	1150	~33-35

PROPERTY COMPARISONS						
FEATURE	P-20	HOLDER	S-7	H-13	420 SS	15-5 PH
TYPICAL HARDNESS	302 HB	293 HB	55 HRC	52 HRC	50 HRC	40 HRC
STRENGTH	2	1	9	7	6	4
WEAR RESISTANCE	1	1	7	6	5	4
TOUGHNESS	8	4	3	3	2	6
TEXTURING	6	1	5	5	5	8
POLISHABILITY	3	1	6	7	7	6
CORROSION RESISTANCE	1	1	1	1	6	8
MACHINABILITY*	4	6	6	6	6	3
WELDABILITY	6	4	4	4	4	8
NITRIDING ABILITY	6	5	4	7	N/A	N/A
FLAME HARDENING	7	7	2	2	2	N/A

*Machinability of P-20, Holder, and 15-5 PH is rated in the pre-hardened condition. S-7, H-13, and 420 are rated in the annealed condition. Overall ratings are 1-10 where 1 is the lowest rating.