

CAPABILITIES

Ellwood Specialty Steel is a fully integrated producer of a wide range of specialty tool steels. Our ExELL grades are made with the most advanced steel making facilities.

Our steel making expertise and capability is further enhanced from a long forging history with

optimum forging and heat treating practices to develop very 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 provide products and services that will consistently meet or exceed all quality and performance expectations. We will provide customer and technical service that will ensure complete satisfaction.

Ellwood Specialty Steel will establish product and stock programs to fully support special customer requirements. Manufacturing is supported by very short mill times for custom forged requirements and steel grades.

This information is intended to provide general data on our products and 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 product described or suitability for a particular application. Ellwood Specialty Steel reserves the right to make changes in practices that may render some information outdated or obsolete. Ellwood Specialty Steel should be consulted for current information and/or capabilities.



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ExELL 17-4 PH was developed by Ellwood Specialty Steel as a premium quality mold steel. ExELL 17-4 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
- Excellent polishability
- Good dimensional stability
- Very good toughness

APPLICATIONS

ExELL 17-4 PH is used in various tooling and engineered parts. Some typical applications are:

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

TYPICAL ANALYSIS

C	0.04	Cr	15.50
Mn	0.75	Ni	4.50
Si	0.30	Cu	4.00
Mo	0.25	Cb	0.30

IMPROVED MANUFACTURING AND RELATED PERFORMANCE

ExELL 17-4 PH is manufactured to the highest tooling quality standards for optimum service performance. From melting through final product testing, the finished product is a material with very good structure and mechanical property uniformity.

- Solution heat treating
- Precipitation (age) hardening if requested
- Complete manufacturing, testing and quality assurance in facilities certified to ISO 9002

Some manufacturing specifics include:

- VAR, Vacuum Arc Remelting
- Very precise chemistry control
- Heavy forging reduction

PHYSICAL PROPERTIES

Physical Properties:

Coefficient of Thermal Expansion, in/in/F
400 F _____ 0.000006

Thermal Conductivity, BTU in/ft ft hr F
70 F _____ 130
400 F _____ 155

Density, lbs/cu.in.
70 F _____ 0.283

Modulus of Elasticity, psi

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

Specific heat, Btu/lb F

70 F _____ 0.11

HEAT TREATMENT (General Recommendations)

ExELL 17-4 PH is normally supplied in either the solution annealed condition or the solution annealed plus 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 17-4 PH should not be necessary. However, if aged material requires to be re-solution annealed treat as follows. Heat to

1900°F, equalize, hold 30 minutes at temperature and air quench. Movement and distortion are likely. Resulting hardness will be ~ 30-33 HRC.

AGE HARDENING

If ExELL 17-4 PH was not supplied in a specified aged condition (prehardened), the material can be age hardened with an aging temperature generally between 925° and 1150°F. The aging temperature is typically selected to attain a desired hardness level.

Condition	Aging Temp	Hardness (HRC)
H925	925°F	~ 42-44
H975	975°F	~ 39-41
H1025	1025°F	~ 38-40
H1150	1150°F	~ 33-35

temperature, equalizing temperature from surface to center, holding 4 hours at temperature and air cooling. Slight shrinkage will occur after aging on the order of about 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 certain balance of hardness and toughness while higher temperature aging treatments will improve toughness and minimize over-aging if higher service temperatures are encountered.

Aging is performed by uniformly heating to the aging

PROPERTY COMPARISONS

FEATURE	P-20	HOLDER	420F.m	S-7	H-13	420	17-4PH
Typical Hardness	302 HB	293 HB	320 HB	55 HRC	52 HRC	50 HRC	40 HRC
Strength	2	1	2	9	7	6	4
Wear Resistance	1	1	1	7	6	5	4
Toughness	8	4	4	3	3	2	6
Texturing	6	1	1	5	5	5	8
Polishability	3	1	1	6	7	7	6
Corrosion Resistance	1	1	4	1	1	6	8
Machinability*	4	6	5	6	6	6	3
Weldability	6	4	2	4	4	4	8
Nitriding Ability	6	5	N/A	4	7	N/A	N/A
Flame Hardening	7	7	2	2	2	2	N/A

* Machinability of P-20, Holder, 420F and 17-4PH 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.

TOOLMAKING

For any additional information to include welding, machining, grinding, EDM processing, nitriding, polishing or texturing, please contact Ellwood Specialty Steel direct at **800-932-2188**.