

## G2P Gray Iron

### Description

Dura-Bar G2P is a highly pearlitic gray iron containing Type A graphite. It was developed to best suit surface-hardenability applications. G2P is made with a substantial amount of pearlite in the rim. This requires the least amount of stock removal necessary, in order to achieve a heat-treatable surface. Carbon-rich material is forced to the outer edges of the bars. This allows the surface hardening via heat treatment (induction and flame hardening) to be accomplished quickly, consistently, and effectively.

### Applications

**Oil/Gas:**

Split/Locking Ring, Cone, Split Ring, Slip (Wicker), Oil Tool/Retainer, Bridge Plugs, Cement Plugs, Mandrels

**Fluid Power:**

Cylinder Blocks, Glands, Manifolds, Pistons, Rotors, Spools, Valves

**Automotive:**

Gears

**Machinery:**

Bushings, Gears, Gibs, Housings, Pulleys, Rams, Sheaves, Side Frames, Slides, Spindles, Ways

**Miscellaneous:**

Aluminum Molds Plates, Cams, Chain Sheaves, Core Boxes, Dies, Pattern Plates, Wheels

**Power Transmission:**

Gears, Pulleys

**Pump/Compressor:**

Gears, Housings, Liners, Pistons, Rollers, Rotors, Seals

**Steel Mill:**

Continuous Caster Rolls, Foot Rolls, Table Rolls, Torch Rolls

**Transportation:**

Brake Rotors, Cylinder Liners, Gears, Lash Adjusters, Pulleys, Shock Absorber Pistons, Valve Guides, Valve Seat Inserts

### Physical Properties

Property	Measurement
Density (lbs/in <sup>3</sup> )	0.26
Poisson's ratio [ν]	Min: 0.26 ; Max: .285 ; Average = .2725
Modulus of elasticity (Tension) (psi) [E]	1.77E+07
Modulus of rigidity (Shearing) (psi) [G]	6,943,529
Thermal conductivity (BTU/Hr/ft <sup>2</sup> /inch/°F), (Range: Room Temp - 212°F)	N/A
Thermal expansion coefficient(/°F) [α], (Range: 70 - 212°F)	N/A
Damping capacity	100-500*
Electrical Resistivity (Microhms x Cm)	78 - 104**
Magnetic properties (KiloGauss/Oersteds@100 Oersteds)	Stress less influence on mag prop. Residual mag is less affected by high temp. Intricate shapes economically casted.
Heat treat response (Rc)	N/A

\*If constant maximum stress selected, then specific damping capacity can be related to tensile strength for Gray irons. Damping can be related to chemical analysis/composition and microstructure.

\*\*Specific resistivity of all irons increases with temperature. Chemical composition and microstructure also play roles in determining electrical resistivity. Increasing amounts of carbon/silicon increase ER. More coarse flakes results in higher ER than for fine flake gray iron.

## Mechanical Properties

Brinell hardness values for nominal as-cast diameters are shown in the table. Hardness properties listed are minimum and maximum across the bar. Hardness values for rectangles and squares are a function of the height and width ratios and will be supplied on request.

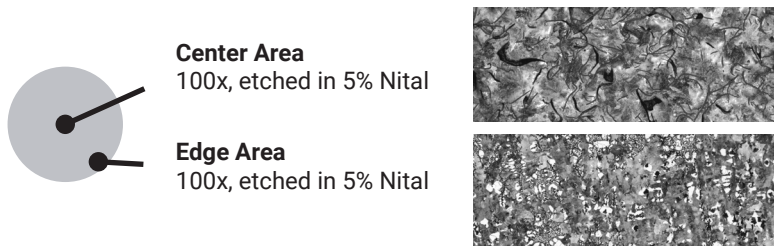
Size Range		BHN	
Inches	mm	Min	Max
0.625 – 0.750	16 - 19	229	302
0.751 – 3.000	19 - 75	207	302
3.001 – 6.000	76 - 152	197	302
6.001 – 22.000	152 - 559	183	302

Tensile strength of Dura-Bar G2P is determined from a separately cast, ASTM “B” test bar. Separately cast test bars will meet the minimum strength in pounds per square inch in the table. Additionally, a test bar is removed from the continuous cast bar for reference, as tensile strength varies with section thickness and bar diameter.

Mechanical Properties	
Tensile strength psi (min)	40,000
Yield strength psi (min)	N/A *
Elongation (min)	N/A*

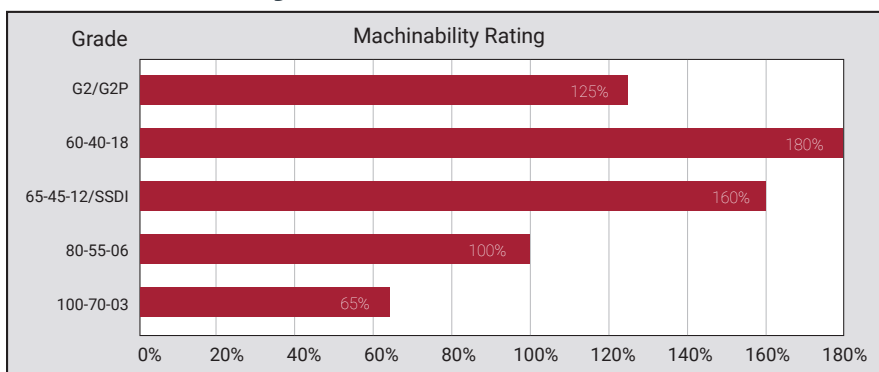
\* Gray iron will not yield/elongate before fracture. The behavior of gray iron is non-ductile.

## Microstructure



The microstructure will contain Type VII, A, size 4-6 graphite as defined in ASTM A247. The matrix is fully pearlitic. The edge or rim will consist of Type D, size 4-6 graphite in a matrix that is 80% pearlite. Chill carbides will be less than 5% in any field at 100x and are well dispersed.

## Machinability



\* Based on 1212 steel = 100%

## Heat Treat Response

Dura-Bar G2P can be hardened by fast methods, such as flame and induction hardening. Carbon-rich pearlite in the rim of the continuous cast bars will effectively transform to martensite (hard phase of iron). Contrasted with a more ferritic rim, continuous cast bars can result in untransformed microstructure and thus a less ideal material hardness after heat treatment.

In addition to surface hardening, Dura-Bar G2P can be heat treated by conventional quench and temper methods. Get more details including typical Jominy end quench curve, methods and cycle times, and temperature effects by downloading the Dura-Bar Heat Treating Guide.

## Chemical Composition

Element	Percentage
Carbon*	2.60 - 3.75%
Silicon*	1.80 - 3.00%
Manganese	0.60 - 0.95%
Sulfur	0.07% Max
Phosphorus	0.12% Max

\*Carbon and silicon targets are specified for each bar size in order to control the size and shape of the graphite flake. Alloying elements are used to stabilize the pearlitic structure.

## Applicable Specifications

ASTM A247

## Forms Manufactured

Rounds: 2.375" to 7.750"

Custom shapes available per request

## Disclaimer

All of the above information is for reference only. Actual results are influenced by process variables and actual size of the raw material.

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