

## G2 Gray Iron

### Description

Dura-Bar G2 is a pearlitic gray iron containing Type A graphite. Our continuous cast bars made to this robust specification are a good fit for a variety of applications, due to its good machinability, wear resistance and vibration damping properties. G2 is built around ASTM A48 Class 40 gray iron, which is validated from a separately cast bar.

### 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:**

Coupling Hubs, Gears, Pulleys, Sprockets

**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)	30.84
Thermal expansion coefficient(/°F) [α], (Range: 70 - 212°F)	5.50E-06
Damping capacity	100-500*
Electrical Resistivity (Microhms x Cm)	78 - 104**
Magnetic properties (KiloGauss/Oersteds@100 Oersteds)	Stress less influence on magnetic properties. Residual magnetic is less affected by high temp. Intricate shapes economically casted.
Heat treat response (Rc)	55-60

\*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

Hardness values 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.

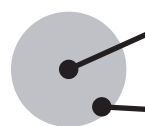
Size Range		BHN	
Inches	mm	Min	Max
0.625 – 0.750	16 - 19	229	301
0.751 – 1.500	19 - 38	207	285
1.501 – 2.000	38 - 51	207	277
2.001 – 3.000	51 - 76	207	269
3.001 – 6.000	76 – 152	197	269
6.001 – 20.000	152 – 508	183	269

Tensile strength of Dura-Bar G2 gray iron 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.

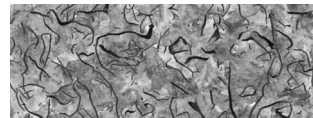
Mechanical Properties	
Tensile strength psi (min)	40,000
Yield strength psi (min)	N/A *
Elongation (min)	N/A*

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

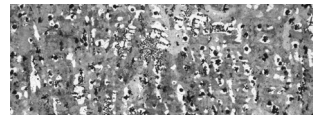
## Microstructure



**Center Area**  
100x, etched in 5% Nital

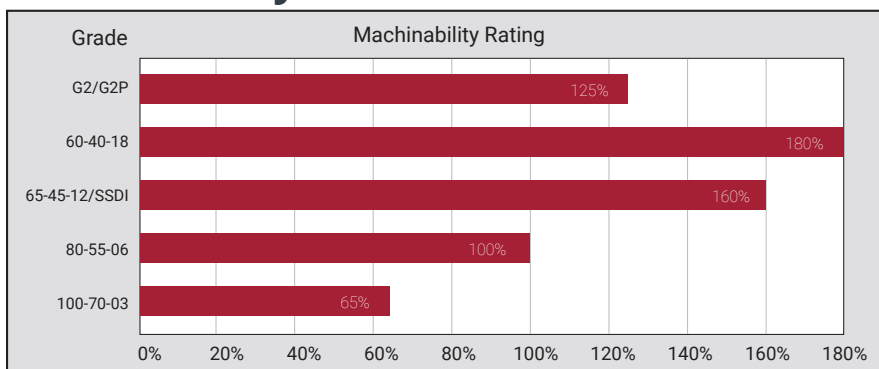


**Edge Area**  
100x, etched in 5% Nital



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 a combination of pearlite and ferrite. 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 G2 can be oil quench hardened from 1600° F (885° C) to a minimum hardness of Rockwell C 50 on the outside of the bar. The inside diameter hardness will be less than Rockwell C 50. Lower quench hardness on the inside diameters are a result of larger graphite flakes and not as loss of matrix hardness. 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.

## Applicable Specifications

ASTM A48 Class 40 gray iron

## Forms Manufactured

Rounds: 0.625" to 7.000"

Rectangles: 0.750" x 1.500" to 16.000" x 28.000"

Squares: 1.500" x 1.500" to 21.000" x 21.000"

Tubes: 1.500" x 3.500" to 7.000" x 9.000"

Custom shapes available on 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.

Visit [www.dura-bar.com/applications/index.cfm](http://www.dura-bar.com/applications/index.cfm) to see successful applications being made from Dura-Bar, including their design and cost benefits. Contact us today to discuss your application and how you can start saving with Dura-Bar.