

# MEEHANITE<sup>®</sup> SELECTION GUIDE



Presented by Lodi Iron Works, Inc  
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## General Engineering Applications

### Meehanite Flake Graphite Types

*-Type AQ* is a wear and abrasion resisting iron that is readily machinable as-cast but may be "air-hardened" after machining with minimum risk of cracking or distortion. Type AQ is easily heat treated and locally hardened. Recommended for dies, punches, spinning mandrels and other hard wearing applications

*-Type GM-60* possesses exceptionally high physical properties, including good impact strength and shock resistance--responds well to heat treatment and surface hardening. Type GM machines to a very fine finish and is recommended for heavy section castings where pressure tightness is required.

*-Type GA-50* combines high strength, toughness, wear resistance and damping capacity with excellent machinability. Responds well to heat treatment, local and surface hardening.

*-Type GC-40* combines good strength with low coefficient of friction and self lubricating properties. It is easily machinable with a fine, dense, close grain structure. Recommended for heavy brake drums and pressure castings up to 2 1/2" thick.

*-Type GE-30* combines improved strength and solidity with higher machining feeds and speeds than ordinary gray iron.

*-Type GF-20* designed principally for high machinability and is used where ultimate strength is not an important factor.

### Meehanite Nodular Graphite Types (Ductliron<sup>®</sup>).

*-Type SP-80* possesses in the as-cast condition more than twice the strength of conventional gray cast iron in combination with exceptional toughness. It has a predominantly pearlitic structure, is readily machinable and responds easily to surface hardening by chill casting or by flame or electric induction heat treatment.

*-Type SH-100* is characterized by its exceptional hardenability. It is particularly suited where high strengths are desired in relatively heavy casting sections. In the as-cast condition it has a pearlitic structure. Any hardness value may be obtained, ranging from that of a free machinable iron to that of the fully hardened tool steel. SH-100 oil quenched from 1650°F and drawn at 750°F results in a good combination of hardness, strength and toughness.

-**Type SF-60** possesses high ductility and exceptional resistance to shock. It has maximum toughness and machinability. Its structure is essentially ferritic and not readily flame hardened.

-**Type AQS** is an air hardened metal possessing high strength, toughness and hardness. It may be fully air quenched throughout casting section after machining to a wide range of strength and hardness values that are uniform with little or no risk of cracking or distortion. It has high endurance strength and provides an excellent degree of abrasion resistance.

**Table 1** **Meehanite Flake Graphite Types**

PROPERTY	TYPE AQ	TYPE GM-60	TYPE GA-50	TYPE GC-40	TYPE GE-30	TYPE GF-20
Tensile Strength-psi	50/65,000	60,000	50,000	40,000	30,000	20,000
Proportional Limit-psi .01% permanent set	25,000	25,000	22,000	14,000	11,500	9,500
Modulus of Elasticity-psi	22,000,000	21,500,000	20,000,000	16,500,000	13,000,000	9,000,000
Modulus of Rigidity-psi	9,500,000	9,500,000	8,750,000	7,750,000	5,500,000	4,000,000
Poisson's Ratio	0.33	0.33	0.32	0.30	0.27	0.24
Modulus of Rupture-psi	93,000	93,000	90,000	80,000	61,000	41,000
Compression Strength-psi	200,000	200,000	180,000	150,000	120,000	90,000
Fatigue Strength-psi	30,000	25,000	22,000	17,500	13,500	11,000
Shear Strength-psi		53,000	50,000	40,000	30,000	21,550
Single Impact -Izod  .798"						
Dia. Unnotched Bar	30-40	30-40	25-35	12-20	6-12	4-9
Brinell Hardness (Nominal)	280-550	230	220	180	up to 160	150
Machinability Rating (Dalcher)	52	50	48	47	38	30
Thermal Conductivity 50-450°F. BTU/Hr/Sq. Ft./Inch Thickness/ °F		355	350	325	290	--
Coefficient of Thermal Expansion Per °F. from 100° to 1000°F.	.00000675	.00000705	.00000720	.00000760	.00000790	--
Specific Gravity	7.34	7.34	7.31	7.25	7.06	6.80
Solid Contraction (Patternmaker's Shrinkage)	5/32"- 6/32" per ft. (1.3- 1.5%)	5/32"-6/32" per ft. (1.3- 1.5%)	5/32"-6/32" per ft. (1.3- 1.5%)	4/32"-5/32" per ft. (1.0- 1.3%)	1/10"-1/8" per ft. (0.8- 1.0%)	1/10" (0.8%)

**Table 2** **Meehanite Nodular Graphite Types**

PROPERTY	TYPE SP-80	TYPE SH-100	TYPE SF-60	TYPE AQS
Tensile Strength-psi	80/100,000	100/170,000	>60,000	80/180,000
Yield Strength-psi	60/75,000	70/130,000	>45,000	70/140,000
Modules of Elasticity (tension) EX 10 <sup>6</sup>	25	24	23	25

<b>Elongation %</b>	<b>3%-10%</b>	<b>1%-5%</b>	<b>15%-25%</b>	<b>1%-3%</b>
<b>Endurance Limit (unnotched)</b>	<b>39,000</b>	<b>43,000</b>	<b>30,000</b>	<b>53,000</b>
<b>Endurance Ratio (unnotched) (45° notch)</b>	<b>0.49</b>	<b>0.33</b>	<b>0.50</b>	<b>0.33</b>
	<b>0.35</b>	<b>0.25</b>	<b>0.35</b>	
<b>Poisson's Ratio</b>	<b>0.37</b>	<b>0.37</b>	<b>0.32</b>	
<b>Brinell Hardness (Nominal)</b>	<b>200</b>	<b>207/600</b>	<b>161</b>	<b>225/500</b>
<b>Impact Strength-Charpy Ft. lbs. 10mm Square bar "V" notch</b>	<b>1-5</b>	<b>1-3</b>	<b>7-15</b>	<b>1-3</b>
<b>Specific Gravity</b>	<b>7.20</b>	<b>7.22</b>	<b>7.18</b>	
<b>Solid Contraction Patternmaker's Shrinkage</b>	<b>5/32" per foot 1.3%</b>	<b>5/32" per foot 1.3%</b>	<b>1/8" per foot 1.0%</b>	<b>5/32" per foot 1.3%</b>
<b>Specifications Met</b>	<b>ASTM-A48-83</b>	<b>ASTM-A536-84</b>	<b>ASME SA395 MIL-1-24137 Ships ASTM A395-80 ASTM A536-84</b>	

### Heavy-Duty Applications

*Type K-295 and K-325* are used for applications such as gears requiring high contact rolling and tooth bending fatigue properties. Also possesses high fracture toughness impact strength. *K-405* is for applications involving wear and requiring high tensile and endurance limit. All types are useful to meet high mechanical properties with a 10% weight savings compared to steel. Excellent founding properties enable more accurate castings with saving in machine stock required. Damping capacity and notch sensitivity are superior to steel castings and forgings. Self-lubricating properties of all types make them ideal for wear conditions involving minimal lubrication.

Table 3

Meehanite ADI Types (Austempered Ductile Iron)

PROPERTY	TYPE K-295	TYPE K-325	TYPE K-405
<b>Tensile Strength-psi</b>	<b>130,000</b>	<b>145,000</b>	<b>175,000</b>
<b>Yield Strength-psi</b>	<b>98,000</b>	<b>112,000</b>	<b>140,000</b>
<b>Endurance Limit -</b>	<b>63</b>	<b>66</b>	<b>74</b>
<b>Unnotched -Notched</b>	<b>39</b>	<b>47</b>	<b>51</b>
<b>Elongation-%</b>	<b>8-12</b>	<b>5-8</b>	<b>2-5</b>
<b>Hardness (Approx.)</b>	<b>280-310</b>	<b>300-350</b>	<b>380-430</b>

### Wear Resisting Applications

**-Type W** is a series of austenitic-martensitic white irons characterized by high hardness and relatively good impact strength. Type W has a pearlitic matrix; Type W2 has a martensitic matrix; Type W4 is highly alloyed to provide an austenitic matrix in the as-cast condition which may be further modified to give a martensitic matrix by heat treatment or by freezing.

**-Type WS** is a hard wearing martensitic iron with exceptional impact strength...not readily

machinable...work hardens in service to high hardness values. Type WS is recommended for crusher jaws, impact hammers, pulverizers, etc.

-*Type WSH* is an austenitic nodular iron possessing superior tensile strength, toughness and ability to work harden under conditions of severe pounding impact. It is extremely difficult to machine. Recommended for crusher liners, hammers, grinding balls, etc.

Table 4 Meehanite Wear and Abrasion Resisting Types  
(Almanite<sup>®</sup>)

PROPERTY	TYPE W1	TYPE W2	TYPE W4	TYPE WS	TYPE WSH
Tensile Strength-psi	50/60,000	50/60,000	60/80,000	60/80,000	>100,000
Yield Strength-psi				50/65,000	75,000
Modules of Elasticity-psi	26,000,000	26,000,000		24,000,000	24,000,000
Elongation %				2-4	4-10
Brinell Hardness	500/600	500-600	400/700	400/525	350/500
Izod Impact 1.2" bar unnotched ft. lbs.	30-50	40-60	40-70	up to 180	up to 120

### Heat Resisting Applications

-*Type HS* compares very favorably from a strength standpoint with any heat resisting metal and is recommended for applications at temperatures up to 1800°F under both conditions of cyclic and continuous heating without thermal shock. Compositional adjustments are made to suit the exact service conditions. It machines easily and provides maximum resistance to scaling and growth. Recommended for blast furnace parts, hot gas valves, doors, frames, annealing pots.

-*Type HSV* is an iron developed essentially for engineering parts that are subjected to long continuous heating at temperatures up to 1600°F. It has been designed to have the maximum load bearing ability.

-*Type HR* is a strong, dense iron of high rigidity and excellent resistance to scaling under most conditions. It is non-growing for temperatures up to 1350°F and possesses good load carrying ability. Recommended for service conditions without thermal shock such as furnace parts, retorts, tube supports, etc.

-*Type HE* is a freely machinable material in the as-cast condition. Withstands rapid heating and cooling without premature failure, offers good dimensional stability and a good range of strength properties. Recommended for ingot molds, slag pots, hot plates, and parts heated rapidly by a naked flame.

Table 5 Meehanite Heat Resisting Types

PROPERTY	TYPE HS	TYPE HSV	TYPE HR	TYPE HE
Tensile Strength-psi	60/100,000	100/120,000	40,000	25,000
Modules of Elasticity-psi	23,000,000	24,000,000	21,000,000	10,000,000
Elongation %	2-10	2-10		
Brinell Hardness (Nominal)	200	200	300 or over	170
Thermal Conductivity 50°/450°F. BUT/Hr./Sq. Ft./Inch Thickness		278	360	298

Coefficient of Thermal Expansion Per °F from 100° to 1000°F	.00000700	.00000674	.00000743	.00000666
Machinability	Good	Good	Difficult	Good

### Corrosion Applications

-*Type CC* is a general utility material providing good corrosive resistance. It can be used for slightly acid solutions, alkali solutions at temperatures up to 150°F. and concentrated sulphuric acid at temperatures up to 250°F.

-*Type CR* is an austenitic material especially designed to meet a wide variety of corrosion, wear and heat applications. It has flake graphite and chemical analysis conforming to ASTM Specification A-436-61T.

-*Type CRS* is an austenitic material with graphite in the nodular form. It conforms to ASTM designation A439-60T and provides much higher strength than Type CR with excellent resistance to corrosion, wear and heat.

Both Type CR and CRS are recommended for components which involve handling acid and alkali solution at temperatures up to 1300°F; for a brasive slurries, salt water and other heat and wear applications with or without corrosive media.

-*Type CHS* is a higher strength material with good shock resistance. Compositional adjustments are made to suit exact service requirements. Recommended for use for components subjected to concentrated sulphuric acid or oleum.

Table 6 Meehanite Heat Resisting Types

PROPERTY	TYPE CC	TYPE CR	TYPE CRS	TYPE CHS
Tensile Strength-psi	40,000	25,000	58,000	60/100,000
Brinell Hardness	200	131/183	139/202	200
Elongation %			6-20	2-10

**For more information please contact Lodi Iron Works at 1-888-368-5395**