S G Iron Castings (Spheroidal Graphite Iron Castings / Nodular Iron Castings)

Manufacturer & Exporter of S G Iron Castings.

S G Iron is also known as **Spheroidal Graphite Iron, Ductile Cast Iron, Nodular Cast Iron, Spherulitic Graphite Cast Iron. S G Iron** is a type of cast iron that has been treated while molten with an element such as magnesium or cerium to induce the formation of free graphite as nodules or spherulites. This imparts a measurable degree of ductility (easily manipulated) to the cast metal. The ductile iron family offers the design engineer a unique combination of strength, wear resistance, fatigue resistance, and toughness, as well as excellent ductility characteristics.

S G Iron/Ductile iron is not a single material but is part of a group of materials which can be produced to have a wide range of properties through control of the microstructure. The common defining characteristic of this group of materials is the shape of the graphite. In ductile irons, the graphite is in the form of **nodules** rather than **flakes** as it is in grey iron. The sharp shape of the flakes of graphite create stress concentration points within the metal matrix and the rounded shape of the nodules less so, thus inhibiting the creation of cracks and providing the enhanced ductility that gives the alloy its name.

This nodular graphite structure inhibits the creation of linear cracks hence the ability to withstand distortion.

Composition :
A typical chemical analysis of this material:

- Carbon 3.2 to 3.6%
- Silicon 2.2 to 2.8%
- Manganese 0.1 to 0.5%
- Magnesium 0.03 to 0.05%
- Phosphorus 0.005 to 0.04%
- Sulfur 0.005 to 0.02%
- Copper 0.40%
- Iron balance

Other elements such as copper or tin may be added to increase tensile and yield strength while simultaneously reducing ductility. Improved corrosion resistance can be achieved by replacing 15% to 30% of the iron in the alloy with varying amounts of nickel, copper, or chromium.

Applications :
Ductile iron is specifically useful in many automotive components, where strength needs surpass that of aluminum but do not necessarily require steel. Other major industrial applications include off-highway diesel trucks, Class 8 trucks, agricultural tractors, and oil well pumps, etc.

S G Iron / Ductile Iron Chemical Components
Ductile iron is also called as nodular iron or SG iron. Its chemical components did not have strict range for many material standards, however, its range should be useful for buyers to evaluate the quality of cast iron.

Therefore, we filled some normal standards to show the reasonable range to ductile iron. Please remember the chemical components are only a reference, not a strict standard to the material. The foundry could adjust its chemical components according to their experience in order to meet the physical properties. So, physical properties should be the only standard to materials.

Specifications :
Chemical Components of Ductile Cast Iron

USA	Germany	ISO	C %	Si %	Mn %	P %	S %	Mg %	Cu %	Sn %
60-40-18	GGG40	400-18	3.50-	2.80-	0.2-0.5	0.03-	0.02-	0.020-		

			3.78	2.85		0.06	0.035	0.060		
65-45-12	GGG40	450-10	3.30-3.80	2.40-2.90	0.2-0.5	0.03-0.06	0.02-0.040	0.020-0.060		
70-50-05	GGG50	500-7	3.20-3.60	2.30-2.90	0.4-0.6	0.03-0.06	0.02-0.040	0.030-0.055	<0.4	
80-60-03	GGG60	600-3	3.00-3.50	2.40-2.80	0.3-0.5	0.03-0.06	0.02-0.040	0.035-0.050	0.30-0.40	
100-70-03	GGG70	700-2	3.65-3.90	1.70-1.90	0.3-0.5	<0.06	<0.03	0.035-0.050	0.30-0.40	0.03-0.06
120-90-02	GGG80	800-2	-	-	-	-	-	-	-	-

Equivalent Grades of Ductile Iron (SG Iron/ Nodular Graphite Iron Casting)

Country	Standard	Equivalent Grades of Ductile Iron (SG Iron, Nodular Graphite Iron)						
ISO	ISO 1083	400-15 400-18	450-10	500-7	600-3	700-2	800-2	900-2
China	GB 1348	QT400-18	QT450-10	QT500-7	QT600-3	QT700-2	QT800-2	QT900-2
USA	ASTM A536	60-40-18	60-42-10 65-45-12	70-50-05	80-55-06 80-60-03	100-70-03	120-90-02	—
Germany Austria	DIN 1693	GGG40	—	GGG50	GGG60	GGG70	GGG80	—
European	EN 1563	EN-GJS-400-15 EN-GJS-400-18	EN-GJS-450-10	EN-GJS-500-7	EN-GJS-600-3	EN-GJS-700-2	EN-GJS-800-2	EN-GJS-900-2
Japan	JIS G5502	FCD400	FCD450	FCD500	FCD600	FCD700	FCD800	—
Italy	UNI 4544	GS370-17	GS400-12	GS500-7	GS600-2	GS700-2	GS800-2	—
France	NF A32-201	FGS370-17	FGS400-12	FGS500-7	FGS600-2	FGS700-2	FGS800-2	—
UK	BS 2789	400/17	420/12	500/7	600/7	700/2	800/2	900/2
India	IS 1865	SG370/17	SG400/12	SG500/7	SG600/3	SG700/2	SG800/2	—
Spain	UNF	FGE38-17	FGE42-12	FGE50-7	FGE60-2	FGE70-2	FGE80-2	—
Belgium	NBN 830-02	FNG38-17	FNG42-12	FNG50-7	FNG60-2	FNG70-2	FNG80-2	—
Australia	AS 1831	300-17 400-12	—	500-7	600-3	700-2	800-2	—
Sweden	SS 14 07	0717-02	—	0727-02	0732-03	0737-01	0864-03	—
Norway	NS11 301	SJK-400.3 SJK-400	—	SJK-500	SJK-600	SJK-700	SJK-800	—

DUCTILE IRON GRADE CHART

ASTM A536 1993 (USA)

Grade		Tensile Strength σ≥/Mpa	Yield Strength σ≥/Mpa	Elongation δ≥（%）
ANSI/ASTM	UNS			
60-40-18	F32800	414	276	18

65-45-12	F33100	448	310	12
80-55-06	F33800	552	379	6.0
100-70-03	F34800	689	483	3.0
120-90-02	F36200	827	621	2.0
Special Purpose				
60-42-10		415	290	10
70-50-05		485	345	5.0
80-60-03		555	415	3.0

GB/T 1348 1998 (China)

Grade	Tensile strength σb≥/MPa	Yield strength σ0.2≥/MPa	Elongation δ5≥(%)	Hardness HBS
QT400-18 **QT400-18-LT ***	400	250	18	130~180
QT400-15	400	250	15	130~180
QT450-10	450	310	10	160~210
QT500-7	500	320	7	170~230
QT600-3	600	370	3	190~270
QT700-2	700	420	2	225~305
QT800-2	800	480	2	245~335
QT900-2	900	600	2	280~360

*** Low temperature V notch impact tested (-20±2℃)**

DIN 1693 1997 (Germany)

Grade	Material No W-Nr.	Tensile strength σb≥/Mpa	Yield strength σ0.2≥/Mpa	Elongation δ≥（%）
GGG-40	0.7040	400	250	15
GGG-50	0.7050	500	320	7
GGG-60	0.7060	600	380	3
GGG-70	0.7070	700	400	2
GGG-80	0.7080	800	500	2

EN 1563 1997 (European Standard)

Grade		Tensile Strength σ≥/Mpa	Yield Strength σ≥/Mpa	Elongation δ≥（%）
Symbol	Number			
EN GJS 350-22	EN JS1010	350	220	22

EN GJS 350-22-LT*	EN JS1015	350	220	22
EN GJS 400-18	EN JS1020	400	250	18
EN GJS 400-18-LT*	EN JS1025	400	240	18
EN GJS 400-15	EN JS1030	400	250	15
EN GJS 450-10	EN JS1040	450	310	10
EN GJS 500-7	EN JS1050	500	320	7
EN GJS 600-3	EN JS1060	600	370	3
EN GJS 700-2	EN JS1070	700	420	2
EN GJS 800-2	EN JS1080	800	480	2
EN GJS 900-2	EN JS1090	900	600	2

*** Low temperature V notch impact tested (-20±2℃)**

ISO 1083 1987 (International)

Grade	Tensile strength σb≥/Mpa	Yield strength σ0.2≥/Mpa	Elongation δ≥ (%)	Hardness HBS
900-2	900	600	2	280~360
800-2	800	480	2	245-335
700-2	700	420	2	225~305
600-3	600	370	3	190~270
500-7	500	320	7	170~230
450-10	450	320	10	160~210
400-15	400	250	15	130~180
400-18 **400-18 AL***	400	250	18	130~180
350-22	350	220	22	≤150

*** Low temperature V notch impact tested (-20±2℃)**