



DUCTILE IRON

Grade Specification Sheet

Mechanical property tables, chemical composition ranges, and applicable standards for ferritic/pearlitic ductile (spheroidal graphite) iron, compiled for offline engineering reference.

Compiled from ASTM A536, ISO 1083, EN 1563, JIS G5502, and GB/T 1348. Values are standard minimums / nominal ranges from the referenced specifications — always confirm against the current edition of the governing standard before use in a purchase specification or design calculation.

1. Conventional Ductile (Spheroidal Graphite) Iron — Mechanical Properties

1.1 ASTM A536 (US)

Grade	Tensile Strength min	Yield Strength (0.2%) min	Elongation min (%)	Typical Hardness (HB)	Typical Matrix
60-40-18	60 ksi / 414 MPa	40 ksi / 276 MPa	18	140-190	Ferritic
65-45-12	65 ksi / 448 MPa	45 ksi / 310 MPa	12	150-200	Ferritic
80-55-06	80 ksi / 552 MPa	55 ksi / 379 MPa	6	180-255	Ferritic-Pearlitic
100-70-03	100 ksi / 689 MPa	70 ksi / 483 MPa	3	220-300	Pearlitic
120-90-02	120 ksi / 827 MPa	90 ksi / 621 MPa	2	240-330	Tempered Martensite

Source: ASTM A536-84(2019). Elongation measured on 2 in / 50 mm gauge length.

1.2 ISO 1083 / EN 1563 (Europe / International)

Grade (EN)	Tensile Strength Rm min (MPa)	Yield Strength Rp0.2 min (MPa)	Elongation A min (%)	Typical Hardness (HB)
GJS-350-22	350	220	22	≤160
GJS-400-18	400	250	18	120-175
GJS-400-15	400	250	15	120-180
GJS-450-10	450	310	10	160-210
GJS-500-7	500	320	7	170-230
GJS-600-3	600	370	3	190-270
GJS-700-2	700	420	2	225-305
GJS-800-2	800	480	2	245-335
GJS-900-2	900	600	2	270-360

Source: EN 1563:2018 / ISO 1083:2018. Properties apply to separately cast (or cast-on) test samples; wall-thickness-dependent properties are given in Annex tables of EN 1563 and are not reproduced here.

1.3 JIS G5502 / GB/T 1348 (Japan / China — cross reference)

JIS Grade	Nearest GB/T 1348 Grade	Tensile Strength min (MPa)	Elongation min (%)
FCD 400	QT400-18	400	18

JIS Grade	Nearest GB/T 1348 Grade	Tensile Strength min (MPa)	Elongation min (%)
FCD 450	QT450-10	450	10
FCD 500	QT500-7	500	7
FCD 600	QT600-3	600	3
FCD 700	QT700-2	700	2
FCD 800	QT800-2	800	2

JIS/GB grade designations are approximate cross-references based on nominal tensile strength, not a declaration of equivalence — chemistry and impact requirements differ between standards.

2. Chemical Composition Ranges — Conventional Ductile Iron

Ductile iron grades are primarily controlled by mechanical properties rather than fixed chemistry; the ranges below are typical foundry practice for producing the matrix structures in Section 1, not mandatory specification limits (ASTM A536 and EN 1563 do not prescribe chemical composition).

Element	Ferritic Grades (e.g. 60-40-18 / GJS-400)	Pearlitic Grades (e.g. 100-70-03 / GJS-700)	High-Strength / As-Cast Martensitic (120-90-02)
Carbon (C)	3.40 – 3.90 %	3.30 – 3.80 %	3.30 – 3.60 %
Silicon (Si)	2.20 – 2.80 %	1.80 – 2.40 %	2.00 – 2.50 %
Manganese (Mn)	0.15 – 0.40 %	0.30 – 0.80 %	0.40 – 0.60 %
Phosphorus (P)	≤ 0.05 %	≤ 0.05 %	≤ 0.03 %
Sulfur (S)	≤ 0.02 %	≤ 0.02 %	≤ 0.015 %
Magnesium (Mg, residual)	0.030 – 0.060 %	0.030 – 0.060 %	0.035 – 0.060 %
Copper (Cu)	— (0 – 0.3 %)	0.40 – 0.80 % (pearlite promoter)	0.50 – 1.00 %
Nickel (Ni)	—	— (0 – 1.0 % optional)	0.50 – 1.50 %
Molybdenum (Mo)	—	— (0 – 0.3 % optional)	0.20 – 0.40 %
Chromium (Cr)	≤ 0.05 % (kept low)	≤ 0.10 %	≤ 0.10 %

Cu, Ni, Mo, and Sn are used as pearlite promoters / hardenability agents; Cr is minimized to avoid carbide stabilization. Actual foundry chemistry is proprietary and adjusted per section-thickness and inoculation practice.

3. Applicable Standards — Summary

Standard	Title / Scope	Region
ASTM A536-84(2019)	Standard Specification for Ductile Iron Castings	USA
ISO 1083:2018	Spheroidal graphite cast irons — Classification	International
EN 1563:2018	Founding — Spheroidal graphite cast irons	Europe
JIS G5502:2001	Spheroidal graphite iron castings	Japan
GB/T 1348-2019	Spheroidal graphite iron castings	China
ASTM A247	Standard Test Method for Evaluating Microstructure of Graphite in Iron Castings	USA

4. Reference Notes

- Grade designations: ASTM A536 uses Tensile(ksi)-Yield(ksi)-Elongation(%); EN/ISO use GJS-Tensile(MPa)-Elongation(%).

- Impact testing is not required for conventional ferritic/pearlitic ductile iron under A536/EN 1563 unless specified as a supplementary requirement.
- Section-size (wall thickness) sensitivity: heavier sections cool more slowly and typically shift toward lower-strength / higher-elongation properties for the same nominal chemistry — thickness-dependent property tables in EN 1563 Annex C should be consulted for critical sections.

Prepared for internal engineering reference only. Verify current revision levels and full clauses of each cited standard before use in contracts, drawings, or acceptance testing.

