



G20Mn5 (EN 1.6220) Low-Alloy Steel Casting Material

Introduction

G20Mn5 is a low-alloy steel casting grade covered by EN 10213, EN 10293, EN 10340. Casting process options include Investment Casting, Shell Molding Casting, Sand Casting, subject to the applicable specification and component requirements.

Manufacturing Process

Investment Casting
Shell Molding Casting
Sand Casting

Equivalent Grades

N/A

Reference Standards

Standard	Standard Title	Edition	Specification	Identifier
EN 10213	Steel castings for pressure purposes	2007+A1:2016	G20Mn5	EN 1.6220
EN 10293	Steel castings — Steel castings for general engineering uses	2015	G20Mn5	EN 1.6220
EN 10340	Steel castings for structural uses	2007	G20Mn5	EN 1.6220

Physical Properties

EN 10213–2007+A1:2016

Property	Value	Note
Density	7.8 kg/dm ³	Test at 20 °C
Thermal Expansion	13.0 ×10 ⁻⁶ /K	Temperature range: 20–100 °C
Thermal Expansion	13.8 ×10 ⁻⁶ /K	Temperature range: 20–300 °C
Thermal Expansion	15 ×10 ⁻⁶ /K	Temperature range: 20–500 °C
Thermal Conductivity	45 W/(m·K)	Test at 50 °C
Specific Heat	460 J/(kg·K)	Test at 20 °C
Magnetic Property	Magnetic	

Chemical Composition



Element	EN 10213 Edition 2007+A1:2016 · wt.% Cast analysis	EN 10293 Edition 2015 · wt.% Cast analysis	EN 10340 Edition 2007 · wt.% Cast analysis
C	0.17–0.23	0.17–0.23	0.17–0.23
Si	<= 0.60	<= 0.60	<= 0.60
Mn	1.00–1.60	1.00–1.60	1.00–1.50
P	<= 0.020	<= 0.020 ^[1]	<= 0.020
S	<= 0.020 ^[2]	<= 0.020 ^[3]	<= 0.020 ^[4]
Cr	<= 0.30	<= 0.30 ^[5]	<= 0.30 ^[6]
Ni	<= 0.80	<= 0.80	<= 0.80 ^[6]
Mo	<= 0.12	<= 0.12 ^[5]	<= 0.12 ^[6]
Cu	<= 0.30	<= 0.30 ^[5]	<= 0.30 ^[6]
V	<= 0.03	<= 0.03 ^[5]	<= 0.03 ^[6]

Notes

EN 10293 · Edition 2015

^[1] P: A maximum phosphorus content of 0.025 wt.% is permitted by agreement between purchaser and manufacturer.

^[3] S: For castings of ruling thickness <28 mm, sulfur up to 0.030 wt.% is permitted.

^[5] Cr/Mo/Cu/V: Applies only where unspecified in unless otherwise agreed; no intentional addition except for finishing the heat.

EN 10213 · Edition 2007+A1:2016

^[2] S: For ruling thickness < 28 mm, sulfur up to 0.030 wt.% is permitted.

EN 10340 · Edition 2007

^[4] S: For castings of ruling thickness <28 mm, sulfur up to 0.030 wt.% is permitted.

^[6] Cr/Ni/Mo/Cu/V: Cr + Mo + Ni + V + Cu <=1.00 wt.%.

Heat Treatment

EN 10213–2007+A1:2016 · +N

Step	Operation	Temperature
1	: normalizing	900–980 °C ^[1]

EN 10213–2007+A1:2016 · +QT

Step	Operation	Temperature	Cooling
1	: quenching	900–940 °C ^[2]	air or liquid quench
2	: tempering	610–660 °C ^[2]	—



EN 10293–2015 · +N

Step	Operation	Temperature	Cooling
1	: normalizing	900–980 °C	air

EN 10293–2015 · +QT

Step	Operation	Temperature	Cooling
1	: quenching	900–980 °C	air or liquid
2	: tempering	610–660 °C	—

EN 10340–2007 · +N

Step	Operation	Temperature	Cooling
1	: normalizing	900–980 °C	air

EN 10340–2007 · +QT

Step	Operation	Temperature	Cooling
1	: quenching	900–980 °C	air or liquid
2	: tempering	610–660 °C	—

Notes

EN 10213 · Edition 2007+A1:2016

^[1] +N: Treatment temperatures are given for information; required delivery condition is specified separately.

^[2] +QT: Treatment temperatures are given for information; required delivery condition is specified separately.

Mechanical Properties

Conditions are not identical. Compare each stated condition and applicability separately.

Property	EN 10213 Edition 2007+A1:2016 +N	EN 10213 Edition 2007+A1:2016 +QT	EN 10293 Edition 2015 +N ^[1]	EN 10293 Edition 2015 +QT ^[2]	EN 10340 Edition 2007 +N ^[3]	EN 10340 Edition 2007 +QT ^[4]
Yield Strength (Rp0.2)	>= 300 MPa ^[5]	>= 300 MPa ^[6] >= 270 MPa ^[7] >= 254 MPa ^[8] >= 244 MPa ^[9] >= 236 MPa ^[10] >= 225 MPa ^[11] >= 210 MPa ^[12] >= 189 MPa ^[13]	>= 300 MPa ^[14]	>= 300 MPa ^[15]	>= 300 MPa ^[16]	>= 300 MPa ^[17]



Property	EN 10213 Edition 2007+A1:2016 +N	EN 10213 Edition 2007+A1:2016 +QT	EN 10293 Edition 2015 +N ^[1]	EN 10293 Edition 2015 +QT ^[2]	EN 10340 Edition 2007 +N ^[3]	EN 10340 Edition 2007 +QT ^[4]
Tensile Strength	480–620 MPa ^[5]	500–650 MPa ^[6]	480–620 MPa ^[14]	500–650 MPa ^[15]	480–620 MPa ^[16]	500–650 MPa ^[17]
Elongation	>= 20 % ^[5]	>= 22 % ^[6]	>= 20 % ^[14]	>= 22 % ^[15]	>= 20 % ^[16]	>= 22 % ^[17]
Impact Energy	>= 27 J ^[18]	>= 27 J ^[19]	>= 27 J ^[20] >= 50 J ^[14]	>= 27 J ^[21] >= 60 J ^[15]	>= 27 J ^[22] >= 50 J ^[16]	>= 27 J ^[23] >= 60 J ^[17]

Notes

EN 10293 · Edition 2015

^[1] All properties in this column; +N: wall thickness ≤ 30 mm; Test block of relevant thickness; maximum test-block wall thickness 150 mm; Properties apply to the casting up to the specified maximum wall thickness; above this, foreseeable lowering shall be agreed.

^[2] All properties in this column; +QT: wall thickness ≤ 100 mm; Test block of relevant thickness; maximum test-block wall thickness 150 mm; Properties apply to the casting up to the specified maximum wall thickness; above this, foreseeable lowering shall be agreed.

^[14] Yield Strength (Rp0.2)/Tensile Strength/Elongation/Impact Energy; +N: Room temperature

^[15] Yield Strength (Rp0.2)/Tensile Strength/Elongation/Impact Energy; +QT: Room temperature

^[20] Impact Energy; +N: Test at -30 °C

^[21] Impact Energy; +QT: Test at -40 °C

EN 10340 · Edition 2007

^[3] All properties in this column; +N: wall thickness ≤ 30 mm; Test block of relevant thickness; maximum thickness 150 mm; Yield and tensile strength also apply to the casting up to the maximum relevant wall thickness.

^[4] All properties in this column; +QT: wall thickness ≤ 100 mm; Test block of relevant thickness; maximum thickness 150 mm; Yield and tensile strength also apply to the casting up to the maximum relevant wall thickness.

^[16] Yield Strength (Rp0.2)/Tensile Strength/Elongation/Impact Energy; +N: Room temperature

^[17] Yield Strength (Rp0.2)/Tensile Strength/Elongation/Impact Energy; +QT: Room temperature

^[22] Impact Energy; +N: Test at -30 °C

^[23] Impact Energy; +QT: Test at -40 °C

EN 10213 · Edition 2007+A1:2016

^[5] Yield Strength (Rp0.2)/Tensile Strength/Elongation; +N: wall thickness ≤ 30 mm; Properties verified on test blocks of thickness up to 150 mm; applicability to casting wall thickness as stated. Larger governing thickness requires agreement.; Room temperature

^[6] Yield Strength (Rp0.2)/Tensile Strength/Elongation; +QT: wall thickness ≤ 100 mm; Properties verified on test blocks of thickness up to 150 mm; applicability to casting wall thickness as stated. Larger governing thickness requires agreement.; Room temperature

^[7] Yield Strength (Rp0.2); +QT: Test at 100 °C; Verification of elevated-temperature yield values is subject to agreement at enquiry and order.

^[8] Yield Strength (Rp0.2); +QT: Test at 200 °C; Verification of elevated-temperature yield values is subject to agreement at enquiry and order.

^[9] Yield Strength (Rp0.2); +QT: Test at 300 °C; Verification of elevated-temperature yield values is subject to agreement at enquiry and order.



^[10] Yield Strength (Rp0.2); +QT: Test at 350 °C; Verification of elevated-temperature yield values is subject to agreement at enquiry and order.

^[11] Yield Strength (Rp0.2); +QT: Test at 400 °C; Verification of elevated-temperature yield values is subject to agreement at enquiry and order.

^[12] Yield Strength (Rp0.2); +QT: Test at 450 °C; Verification of elevated-temperature yield values is subject to agreement at enquiry and order.

^[13] Yield Strength (Rp0.2); +QT: Test at 500 °C; Verification of elevated-temperature yield values is subject to agreement at enquiry and order.

^[18] Impact Energy; +N: Test at -30 °C; Test block; maximum thickness 150 mm; Specified low-temperature impact requirement

^[19] Impact Energy; +QT: Test at -40 °C; Test block; maximum thickness 150 mm; Specified low-temperature impact requirement

Welding Conditions

EN 10213–2007+A1:2016

Requirement	Value
Preheat	20–150 °C ^[1]
Interpass Temperature	<= 350 °C ^[2]

EN 10293–2015

Requirement	Value
Preheat	20–150 °C ^[3]
Interpass Temperature	<= 350 °C
Post-weld Heat Treatment	No post-weld heat treatment necessary

EN 10340–2007

Requirement	Value
Preheat	20–150 °C ^[4]
Interpass Temperature	<= 350 °C
Post-weld Heat Treatment	No post-weld heat treatment necessary

Notes

EN 10213 · Edition 2007+A1:2016

^[1] Preheat: Production welding by the foundry; ferritic/martensitic guidance is informative.; Preheat temperature depends on casting geometry, thickness and climatic conditions.

^[2] Interpass Temperature: Production welding by the foundry; ferritic/martensitic guidance is informative.

EN 10293 · Edition 2015

^[3] Preheat: Preheat depends on casting geometry, thickness and climatic conditions.



EN 10340 · Edition 2007

[4] Preheat: Preheat depends on casting geometry, thickness and climatic conditions.

Applications

Typical casting applications include pump and valve castings; steam boilers and heat exchangers; marine equipment; and water-turbine components such as Francis blades, runner crowns and wicket gates.

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CASTING QUALITY



Casting Quality Industrial

As a professional manufacturer in China, We Casting Quality focus on Metal Parts OEM industry, and provide solutions and services in Metal Casting field as following:

Sand Casting

Investment Casting, Lost Wax process

Shell Casting

Lost Form Casting

Permanent Mold Casting

CNC Machining

CAD Design

Tools/Mold Design

Material Supplied

Cast Iron Castings (Grey Iron, Malleable Iron, Ductile Iron)

Carbon Steel and Alloy Steel Castings

Stainless Steel and Duplex Stainless Steel Castings

Aluminum Castings

Bronze and Brass Castings

Titanium and Cobalt Alloy Castings

What We Can Do

Design Ability

Our engineers will help you to improve the designs based on casting technology, then The simulation software will be processed to verify the casting pouring system. Pro/E, Solidworks, AutoCAD and ProCast are available in Casting Quality Industrial.

Saving Cost

Some manufacture processes may lead high cost. We will analyses the designs and advise the suitable methods to our customers. The best solution will be adopted.

Quality Control

From the raw material selecting to bulk production processing, all procedures will follow PPAP program if necessary. The certificates will be provided including chemistry, hardness, mechanical property or NDT testing.

Production Capacity

The max iron/steel castings can reach 30tons in weight, meanwhile the minus casting is around 1gram only.

We also have prototyping and 3D scanning ability for sample plan.

Logistic Service

The products will be delivered directly to customer's workshop, which will save plenty of work for clients.

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