**Seamless Steel Pipe** Is Made Of Whole Metal And Has No Seams On Its Surface. According To The Production Method, Seamless Pipe Is Divided Into Hot-Rolled Pipe, Cold-Rolled Pipe, Cold-Drawn Pipe, Extruded Pipe, Pipe Jacking And So On. According To The Cross-Section Shape, Seamless Steel Pipe Can Be Divided Into Two Kinds: Circular And Irregular. The Irregular Pipe Has Many Complex Shapes, Such As Square, Ellipse, Triangle, Hexagonal, Melon Seed, Star And Finned Pipe.

The Maximum Diameter Is 650 mm And The Minimum Diameter Is 0.3 mm. Depending On The Use, There Are Thick-Walled And Thin-Walled Tubes. Seamless Steel Pipes Are Mainly Used For Petroleum Geological Drilling Pipes, Cracking Pipes For Petrochemical Industry, Boiler Pipes, Bearing Pipes And High-Precision Structural Steel Pipes For Automobiles, Tractors And Aviation.

**Classification**

Seamless Steel Pipe Along The Circumference Of Its Cross Section. According To The Different Production Methods, It Can Be Divided Into Hot-Rolled Pipe, Cold-Rolled Pipe, Cold-Drawn Pipe, Extruded Pipe, Pipe Jacking And So On. The Materials Are Ordinary And High Quality Carbon Structural Steel (Q215-A-Q275-A and 10-50 steel), Low Alloy Steel (09MnV, 16Mn, etc.), Alloy Steel, Stainless Acid-Resistant Steel, Etc. According To Their Use, They Are Divided Into Two Categories: General Use (For Water Conveyance, Gas Pipeline And Structural Components, Mechanical Parts) And Special Use (For Boilers, Geological Exploration, Bearings, Acid Resistance, Etc.).

**Purpose**

Seamless Steel Tubes Are Widely Used. Seamless Steel Pipe For General Use Is Rolled By Common Carbon Structural Steel, Low Alloy Structural Steel Or Alloy Structural Steel, With The Largest Output. It Is Mainly Used As Pipeline Or Structural Parts For Conveying Fluids. 2. According To Different Uses, There Are Three Types Of Supply: a. Supply According To Chemical Composition And Mechanical Properties; b. Supply According To Mechanical Properties; c. Supply According To Hydraulic Test. Hydraulic Tests Should Also Be Carried Out For Steel Pipes Supplied According To Category a and b, If They Are Used To Withstand Liquid Pressure. 3. Seamless Tubes For Special Purposes Include Seamless Tubes For Boilers, Chemical And Electric Power, Seamless Tubes For Geology And Seamless Tubes For Petroleum, Etc.

Seamless Steel Pipe Has Hollow Section, Which Is Widely Used As Pipeline For Fluid Transportation, Such As Pipeline For Oil, Natural Gas, Gas, Water And Some Solid Materials. Compared With Solid Steel Such As Round Steel, Steel Pipe Has Lighter Weight When Its Bending And Torsional Strength Is The Same. It Is A Kind Of Steel With Economic Section.

It Is Widely Used In Manufacturing Structural And Mechanical Parts, Such As Oil Drill Pipe, Automobile Transmission Shaft, Bicycle Frame And Steel Scaffolding Used In Construction. It Can Improve Material Utilization, Simplify Manufacturing Process, Save Material And Processing Time. Steel Pipe Has Been Widely Used In Manufacturing.

**Production Process**

(1) The Main Production Processes Of Hot Rolled Seamless Steel Tubes (Main Inspection Processes):
Billet Preparation And Inspection Billet Heating Piercing Rolling Pipe Reheating Sizing Heat Treatment Straightening Finishing Inspection Storage
(2) Major Production Processes Of Cold Rolled (Drawn) Seamless Steel Tubes:
Billet Preparation Pickling Lubrication Cold Rolling (Drawing) Heat Treatment Straightening Finishing Inspection
Generally, The Production Process Of Seamless Steel Pipe Can Be Divided Into Cold Drawing And Hot Rolling. The
Production Process Of Cold-Rolled Seamless Steel Pipe Is Generally More Complicated Than Hot Rolling. First, The
Billet Must Be Rolled Three Rolls Continuously, Then The Diameter Test Must Be Carried Out After Extrusion. If
The Surface Does Not Respond To Cracks, The Round Pipe Must Be Cut By Cutting Machine, And The Billet With a
Growth Of About One Meter Is Cut. Then Enter The Annealing Process, Annealing To Acid Liquid Pickling, Pickling
Should Pay Attention To Whether There Is a Large Number Of Bubbles On The Surface, If There Is a Large Number
Of Bubbles, Indicating That The Quality Of Steel Pipes Can Not Meet The Corresponding Standards. The
Appearance Of Cold-Rolled Seamless Steel Tube Is Shorter Than Hot-Rolled Seamless Steel Tube. The Wall
Thickness Of Cold-Rolled Seamless Steel Tube Is Generally Smaller Than That Of Hot-Rolled Seamless Steel Tube,
But The Surface Looks Brighter Than That Of Thick-Walled Seamless Steel Tube. The Surface Is Not Too Rough
And The Caliber Is Not Too Much Burr.

The Delivery Status Of Hot-Rolled Seamless Steel Pipe Is Usually Hot-Rolled After Heat Treatment. Hot-Rolled
Seamless Steel Pipe After Quality Inspection Must Be Strictly Selected By The Staff By Hand. After Quality
Inspection, Surface Oiling Should Be Carried Out, Followed By Several Cold-Drawing Experiments. After
Hot-Rolling Treatment, Perforation Experiments Should Be Carried Out. If The Perforation Enlargement Is Too
Large, Straightening And Rectification Should Be Carried Out. After Straightening, The Conveyor Is Transferred To
The Flaw Detector For Flaw Detection Experiment. Finally, The Label Is Affixed, The Specifications Are Arranged
And Placed In The Warehouse.

Round Billet Heating Piercing Three-Roll Cross Rolling, Continuous Rolling Or Extrusion Stripping Sizing (Or
Reducing) Cooling Straightening Water Pressure Test (Or Flaw Detection) Marking Storage Seamless Steel Tube Is
Made Of Steel Ingot Or Solid Billet Through Perforation, And Then Hot Rolling, Cold Rolling Or Cold Drawing. The
Specification Of Seamless Steel Pipe Is Expressed By Millimeter Number Of Outer Diameter * Wall Thickness.
The Outer Diameter Of Hot-Rolled Seamless Pipe Is Generally Larger Than 32 Mm, The Wall Thickness Is 2.5-200
Mm, The Outer Diameter Of Cold-Rolled Seamless Pipe Can Reach 6 Mm, The Wall Thickness Can Reach 0.25 Mm,
The Outer Diameter Of Thin-Walled Pipe Can Reach 5 Mm, The Wall Thickness Is Less Than 0.25 Mm, And The
Dimension Precision Of Cold-Rolled Seamless Pipe Is Higher Than That Of Hot-Rolled Pipe.

Seamless Steel Pipes Are Generally Made By Hot Rolling Or Cold Rolling Of High Quality Carbon-Bonded Steel
16mn, 5mn Or Low Alloy Structural Steel 40cr, 30crmns, 45mn2, 40mnb, Etc. Seamless Pipes Made Of Low
Carbon Steel Such As 10 And 20 Are Mainly Used For Fluid Transmission Pipelines. Seamless Tubes Made Of
Medium Carbon Steel, Such As 45, 40cr, Are Used To Manufacture Mechanical Parts, Such As Stress Parts Of
Automobiles And Tractors. Generally, Seamless Steel Tube Should Be Used To Ensure Strength And Flattening Test.
Hot-Rolled Steel Pipes Are Delivered In Hot-Rolled Or Heat-Treated State; Cold-Rolled Steel Pipes Are Delivered In
Heat-Treated State.

Hot Rolling, As Its Name Implies, Has a High Temperature, So The Resistance To Deformation Is Small And Large
Deformation Can Be Achieved. Taking The Rolling Of Steel Plate As An Example, The Thickness Of Continuous
Casting Slab Is About 230 Mm, And The Final Thickness Is 1 ~ 20 Mm After Rough Rolling And Finishing Rolling. At
The Same Time, Because The Width-Thickness Ratio Of Steel Plate Is Small And The Requirement Of Dimension
Accuracy Is Relatively Low, It Is Not Easy To Have The Shape Problem, And The Control Of Convexity Is The Main

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Method. For the requirement of structure, it is generally realized by controlling rolling and cooling, i.e., starting and finishing temperature of finishing rolling. Round billet heating piercing punching annealing pickling oiling (Copper Plating) Multi-Pass Cold Drawing (Cold Rolling) Billet Tube Heat Treatment Straightening Water Pressure Test Marking Storage.

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Mechanical Properties Index

The mechanical property of steel is an important index to ensure the ultimate service performance (mechanical property), which depends on the chemical composition and heat treatment system of steel. In the steel pipe standard, according to different application requirements, the tensile properties (tensile strength, yield strength or yield point, elongation), hardness and toughness indexes, as well as the high and low temperature properties required by users are specified.

(1) Tensile strength (b)

In the process of tension, the maximum force (Fb) that the specimen bears at break is divided by the stress (σ) obtained by the original cross-sectional area (So), which is called tensile strength (b), in units of N/mm² (MPa). It represents the maximum resistance of metal materials to damage under tension.
(2) Yield point (_s)
For metal materials with yielding phenomena, the stress at which the tensile force does not increase (keeps constant) and the specimen can continue to elongate is called yield point. If the force decreases, the upper and lower yield points should be distinguished. The yield point is N/mm² (MPa).
Upper yield point (su): the maximum stress before the first drop in force occurs when the specimen yields; and downward yield point (sl): the minimum stress in the yield stage when the initial instantaneous stress is not taken into account.

The formula for calculating yield point is as follows:
In the formula: Fs - the yield force (constant) during the tensile process of the specimen, N (Newton) So - the original cross-sectional area of the specimen, mm².

(3) Post-break elongation (_)
In the tensile test, the percentage of the length of the standard distance increased by the specimen after breaking to that of the original standard distance is called elongation. In _, the unit is. The formula is_=(Lh-Lo)/L0*100%
In the formula: Lh - the length of standard distance after specimen breaking, mm; L0 - the original length of standard distance of specimen, mm.

(4) Section shrinkage (_)
In tensile test, the percentage of the maximum reduction of cross-sectional area at the shrinkage of specimen after breaking to the original cross-sectional area is called the cross-sectional shrinkage rate. In _, the unit is. The calculation formula is as follows:
Formula: S0 - the original cross-sectional area of the specimen, mm²; S1 - the minimum cross-sectional area at the shrinkage point of the specimen after breaking, mm².

**Hardness index**
The ability of a metal material to resist the collapse of a hard surface is called hardness. According to different test methods and application scope, hardness can be divided into Brinell hardness, Rockwell hardness, Vickers hardness, Shore hardness, microhardness and high temperature hardness. Brinell hardness, Rockwell hardness and Vickers hardness are commonly used for pipes.

A. Brinell Hardness (HB)
A steel ball or cemented carbide ball with a certain diameter is pressed into the surface of the sample with the prescribed test force (F). After the prescribed holding time, the test pressure is removed and the indentation diameter (L) of the sample surface is measured. Brinell hardness is a quotient obtained by dividing the test force by the indentation spherical surface area. In terms of HBS (steel ball), the unit is N/mm² (MPa).

The calculation formula is as follows:
Formula: F - Test force, N; D - test ball diameter, mm; D - average indentation diameter, mm.
The measurement of Brinell hardness is more accurate and reliable, but generally HBS is only suitable for metal materials below 450N/mm² (MPa), not for harder steel or thinner plates. In steel pipe standards, Brinell hardness is the most widely used. The indentation diameter D is often used to express the hardness of the material, which is both intuitive and convenient.
For example: 120HBS10/1000/30: It means that the Brinell hardness of steel balls with diameter of 10mm is 120N/mm² (MPa) when the test force is 1000Kgf (9.807KN) and the measured Brinell hardness is kept for 30s (seconds).

Quality Requirement
(1) Quality Requirements
(1) Chemical Composition Of Steel: The Chemical Composition Of Steel Is One Of The Most Important Factors Affecting The Performance Of Seamless Steel Tube, And Is Also The Main Basis For Formulating Rolling Process Parameters And Heat Treatment Process Parameters Of Steel Tube.
   a. Alloy Elements: Intentionally Added, According To Use
   b. Residual Elements: Steelmaking With Proper Control
   c. Harmful Elements: Strictly Controlled (As, Sn, Sb, Bi, Pb), Gas (n, h, o)
External Refining Or Electroslag Remelting: Improve The Uniformity Of Chemical Composition And Purity Of Steel, Reduce Non-Metallic Inclusions In Billet And Improve Its Distribution.
(2) Geometric Dimension Accuracy And Shape Of Steel Pipe
   External Diameter Allowable Deviation Delta=(d-Di)/Di x 100% d: Maximum Or Minimum External Diameter Mm Di: Nominal Diameter Mm
   b. Precision Of Steel Tube Wall Thickness: Related To Heating Quality Of Billet, Process Design Parameters And Adjustment Parameters Of Each Deformation Process, Tool Quality And Lubrication Quality, Etc.
Allowable Deviation Of Wall Thickness: p=(s-Si)/Si x 100%: Maximum Or Minimum Wall Thickness On Cross Section
Si: Nominal Wall Thickness Mm

2. Length Of Steel Pipe: Normal Length, Fixed Length, Allowable Deviation Of Length
3. Bending Degree Of Steel Pipe: Indicating The Bending Degree Of Steel Pipe: The Bending Degree Of The Length Of Steel Pipe Per Meter, The Bending Degree Of The Full Length Of Steel Pipe
4. End-Face Shear Of Steel Pipe: Indicating The Degree Of Inclination Between End-Face Of Steel Pipe And Cross-Section Of Steel Pipe
5. Groove Angle And Blunt Edge Of Steel Pipe End Face
6. Surface Quality Of Steel Pipe: Requirements For Surface Smoothness

Causes:
It Is Caused By The Surface Or Internal Defects Of The Billet.
(2) During The Production Process, Such As Incorrect Design Of Rolling Process Parameters, Non-Smooth Surface Of Die, Poor Lubrication Conditions, Unreasonable Pass Design And Adjustment.
(3) In The Process Of Heating, Rolling, Heat Treatment And Straightening, If Excessive Residual Stress Occurs Due To Improper Control Of Heating Temperature, Uneven Deformation, Unreasonable Heating And Cooling Speed Or Excessive Straightening Deformation, Surface Cracks May Also Occur On The Steel Tube.
8. Metallographic Structure Of Steel Pipe: Macrostructure, Macrostructure, m, b, p, f, a, s

(2) Quality Inspection Methods For Seamless Steel Tubes:
1. Chemical Composition Analysis: Chemical Analysis, Instrumental Analysis (Infrared c-s Instrument, Direct Reading Spectrometer, Zcp, Etc.).
   Infrared c-s Instrument: Analysis Of Ferroalloys, Raw Materials For Steelmaking, c And s Elements In Steel.
2. Direct Reading Spectrometer: c, Si, Mn, p, s, Cr, Mo, Ni, Cn, a1, w, v, Ti, b, Nb, As, Sn, Sb, Pb, Bi In Bulk Samples
3. n-0 Instrument: Gas Content Analysis n, o

2. Inspection Of Geometric Dimensions And Shape Of Steel Pipes:
   (1) Inspection Of Steel Tube Wall Thickness: Micrometer And Ultrasonic Thickness Gauge, With No Less Than 8 Points At Both Ends Recorded.
   (2) Inspection Of Outer Diameter And Ellipticity Of Steel Pipe: Caliper, Vernier Caliper And Ring Gauge To Measure The Maximum And Minimum Points.
   (3) Inspection Of Steel Pipe Length: Steel Tape, Manual And Automatic Length Measurement.
   (4) Inspection Of Bending Degree Of Steel Tube: Straight Ruler, Horizontal Ruler (1m), Plug Ruler And Thin Line
Measure Bending Degree Per Meter And Full Length Bending Degree.

Inspection Of Groove Angle And Blunt Edge Of Steel Pipe End Face: Angle Ruler And Chuck.

3. Surface Quality Inspection Of Steel Pipe: 100%
   Artificial Naked Eye Inspection: Lighting Conditions, Standards, Experience, Marking, Steel Pipe Rotation.
   (2) Non-Destructive Testing:
   a. Ultrasound Flaw Detection Ut:
      It Is Sensitive To Surface And Internal Crack Defects Of Uniform Materials.
      Standard: Gb/t 5777-1996: c5
   b. Eddy Current Testing Et: (Electromagnetic Induction)
      It Is Mainly Sensitive To Point (Hole) Defects. Standard: Gb/t 7735-2004
      Level b
   c. Magnetic Powder Mt And Magnetic Flux Leakage Testing:
      Magnetic Flaw Detection Is Suitable For The Detection Of Surface And Near Surface Defects Of Ferromagnetic Materials.
      Standard: Gb/t 12606-1999: c4
   d. Electromagnetic Ultrasonic Flaw Detection:
      Without Coupling Medium, It Can Be Applied To The Surface Inspection Of High Temperature, High Speed And Rough Steel Pipe.
   e. Penetration Testing:
      Fluorescence, Coloring And Inspection Of Surface Defects Of Steel Pipes.

4. Inspection Of Physical And Chemical Properties Of Steel Pipes:
   (1) Tensile Test: Measuring Stress And Deformation, Determining Strength (Ys, Ts) And Plasticity Index (a, z)
      Longitudinal And Transverse Section, Arc And Circular Specimen (10, 12.5)
      Calibration Distance Of Small Caliber, Thin Wall, Large Caliber And Thick Wall.
      Note: The Elongation Of Specimen After Fracture Is Related To The Size Of Specimen Gb/t 1760
   (2) Impact Test: Cvn, Notch c, v, Work j/Cm2
      Standard Sample 10 x 10 x 55 (Mm) Non-Standard Sample 5 x 10 x 55 (Mm)
   (3) Hardness Test: Brinell Hardness Hb, Rockwell Hardness Hrc, Vickers Hardness Hv, Etc.
   (4) Hydraulic Test: Test Pressure, Voltage Stabilization Time, p=2s Delta/d

5. Inspection Process Of Steel Pipe Technological Performance:
   (1) Flattening Test: c-Shaped Specimen (s/d > 0.15) h= (1+2) s/(s/d) Of Circular Specimen
      l=40-100mm Deformation Coefficient Per Unit Length=0.07-0.08
   (2) Ring Tension Test: l=15mm Without Crack Is Qualified
   (3) Expanding And Edge-Rolling Tests: Top Taper Is 30, 40, 60.
   (4) Bending Test: Instead Of Flattening Test (For Large Caliber Tubes)

6. Metallographic Analysis Of Steel Pipe:
   (1) High Power Test (Microscopic Analysis): 100x Gb/t 10561 Grain Size Of Non-Metallic Inclusions: Grade, Gradation
      Organization: m, b, s, t, p, f, a-s
      Decarbonization Layer: Inside And Outside.
(2) Low Power Test (Macro Analysis): Naked Eye, Magnifying Glass Less Than 10x.
   a. Acid Etching Test.
   b. Sulphur Print Test (Billet Test, Showing Low-Culture Structure And Defects, Such As Looseness, Segregation, Subcutaneous Bubbles, Skin Turning, White Spots, Inclusions, Etc.).
   c. Tower Hairline Test: Check The Number, Length And Distribution Of Hairlines.
(3) China's Current Seamless Steel Pipe Standards:

2. Common Criteria:
The Acceptance, Packing, Marking And Quality Certificate Of Gb/t 2102-2006 Steel Pipe.
(2) Size, Shape, Weight And Allowable Deviation Of Seamless Steel Pipe Gb/t 17395-2008.
(3) Seamless Steel Tubes For High Pressure Boilers Gb 5310-2008.
(4) Seamless Steel Pipe For Petroleum Cracking Gb 9948-2013.
Gb 6479-2013 Seamless Steel Tube For High Pressure Chemical Fertilizer Equipment.
Gb 18248-2008 Seamless Steel Tube For Gas Cylinders.
## Seamless Steel Pipe For Rubber Lined or Polyurethane Lined Pipe Dimension & Size & Specification

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<th>Nominal O.D. (mm)</th>
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