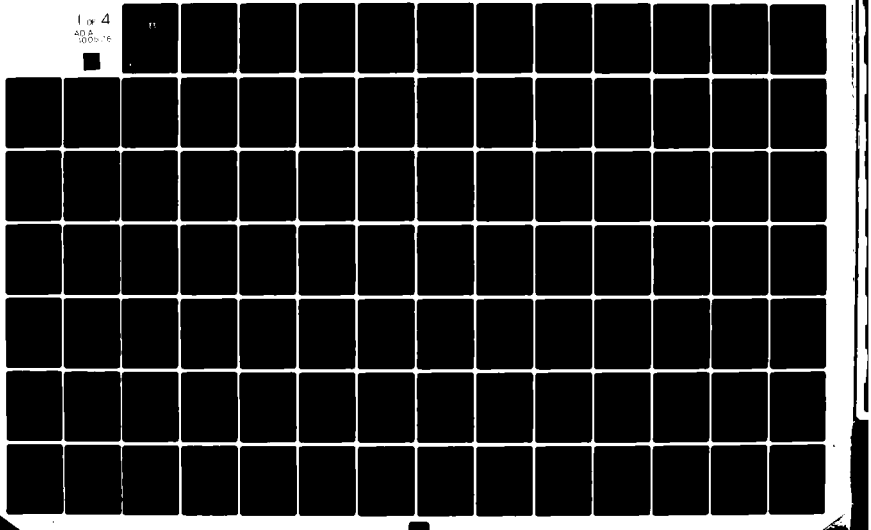
AD-A100 576 FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OH F/G 15/5
HANDBOOK OF EQUIPMENT REPAIR.(U)
MAY 81
UNCLASSIFIED FTD-ID(RS)T-0685-80 NL



AD A100576

FTD-ID(RS)T-0685-80

(2)

FOREIGN TECHNOLOGY DIVISION



HANDBOOK OF EQUIPMENT REPAIR

DTIC
JUN 2 5 1981
E



DTIC FILE COPY

Approved for public release;
distribution unlimited.

81 6 23 098

EDITED TRANSLATION

FTD-ID(RS)T-0685-80 14 May 1981

MICROFICHE NR: FTD-81-C-000426

HANDBOOK OF EQUIPMENT REPAIR

English pages: 290

Source: Handbook of Mechanical Engineering Equipment Repair and Maintenance, Part I, Volume II, Peking, 1976, pp. 1-271

Country of origin: (China)
Translated by: LINGUISTIC SYSTEMS, INC.
F33657-78-D-0618
H. P. Lee.
Requester: FTD/TQTA
Approved for public release; distribution unlimited.

THIS TRANSLATION IS A RENDITION OF THE ORIGINAL FOREIGN TEXT WITHOUT ANY ANALYTICAL OR EDITORIAL COMMENT. STATEMENTS OR THEORIES ADVOCATED OR IMPLIED ARE THOSE OF THE SOURCE AND DO NOT NECESSARILY REFLECT THE POSITION OR OPINION OF THE FOREIGN TECHNOLOGY DIVISION.

PREPARED BY:

TRANSLATION DIVISION
FOREIGN TECHNOLOGY DIVISION
WP-AFB, OHIO.

Machine Manufacturing Plant

Handbook of Mechanical and Power Equipment Repair and Maintenance

---

Part 1
Volume 2

HANDBOOK OF EQUIPMENT REPAIR

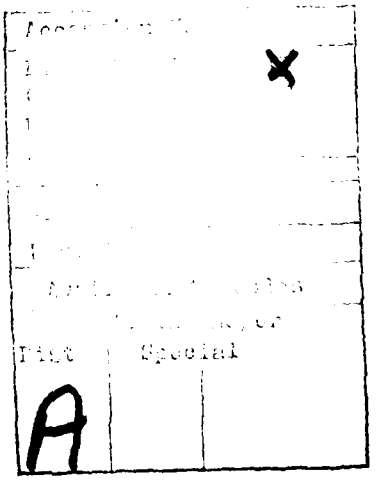
Commonly Used Materials For Equipment Repair and Maintenance

(first revised edition)

The Revising Group of "Handbook of Mechanical and Power Equipment Repair and Maintenance", Part One

Edited by
China Mechanical Engineering Association
and
Mechanical Industry Department, No. 1

Mechanical Industry Publications



The revision of this book is made in response to the requests of a great number of readers, and in this revised edition new materials are amply added. Firstly, in the parts of both ferrous metal material and non-ferrous metal material, section materials are added; secondly, in the part of non-metallic materials, many of daily used materials, such as rubber, plastic materials, asbestos and sealing materials are added; and thirdly, a comparison of steel grade and brands of non-ferrous metal of China with those of other countries is made more inclusive. Compared with the tentative edition of this book, the contents of this revised edition are relatively complete and more practical.

This book can be used as reference by equipment repair and maintenance workers and technicians.

It must be made clear here that this revision is made entirely by Peking Factory of Switches.

Commonly Used Materials For
Equipment Repair and Maintenance

(first revised edition)

The Revising Group of "Handbook of Mechanical and
Power Equipment Repair and Maintenance", Part One

Mechanical Industry Publications
Peking, 1976

Explanations of the Revision

The tentative edition of this Mechanical Repair Manual began, since 1966, to be published in separate volumes and up to the end of 1973 the publication was basically completed. Since the beginning of the Proletarian Great Cultural Revolution, people throughout China, under the direction of Chairman Mao's revolutionary line, created a high tide of grasping revolution and promoting production, so the socialistic revolution and economic development and construction were all found in a state of leaping forward. In recent years, many mechanical repair workers often write and ask us to reprint the book. In our consideration, however, a part of the contents of the tentative edition appears to be out of date, and the rest few parts of this book, which has not been published yet, due to the fact that the manuscipt of them was drafted some times ago, have the same problem. So we have no plan to print the unpublished parts in the form of tentative edition, and we now try to revise both the published and the unpublished parts and publish it as "Revised First Edition".

After revision, this manual consists of seven sections. Section I: The Design of Equipment Repairing, Calculation and Measurement Drawing; Section II: The Repair of Equipment Parts and Working Techniques; Section III: The Repair of Metal Cutting Machine; Section IV: The Repair of Casting, Forging Press, Lifting and Transportation equipment and Industtry Furnace; Section V: The Repair of Power Equipment; Section VI: The Repair of Electrical Equipment; and Section VII: The Maintenance of Equipment.

This section is the revision of the Section 1 of the tentative edition. Originally it consists of seventeen chapters. Except that Chapter 17, The Manufacturing Techniques of Main Repair Pieces of Equipment, is alloted to Section 11, the rest sixteen chapters remain. Because the original chapters 1, 2 and 3 are combined into one chapter, and there is an additional chapter, "The Standard Pieces", this section now comprises fifteen chapters and is divided into thirteen volumes. Chapter 1: "The Fundamental data of Equipment Repair" (Volume I); Chapter 2: "The Materials often Used in Equipment Repair" (Volume II); Chapter 3: "The Driving of Cylindrical Gear" (Volume III); Chapter 4: "The Driving of Conical Gear" (Volume IV); Chapter 5: "The Driving of Screw Rod" (Volume V); Chapter 6: "The Belt Driving" and Chapter 7: "The Chain Driving" (Volume VI); Chapter 8: "Screw Thread and Ball Wire Support" (Volume VII); Chapter 9: "Spring" and Chapter 10: "Key Linkage" (Volume VIII); Chapter 11: "Axes Connector" (Volume IX); Chapter 12: "Standard Pieces" (Volume X); Chapter 13: "Rolling Bearing" (Volume XI); Chapter 14: "Sliding Bearing" (Volume XII); Chapter 15: "The Driving of Liquid Pressure" (Volume XIII). To the chapters which remain, revision and addition of different degrees are also made. Among them, Chapter 4 "The Driving of Conical Gear" is the result of rewriting and Chapter 15 "The Driving of Liquid Pressure" is never published in the form of tentative edition and it is also the result of rewriting.

Of this revision, the revising group and those who take part in writing and editing, based on the opinions suggested by readers regarding the tentative edition, all make some definite investigation and research. Even though, inadequacy and errors in this revised edition are certainly not

nonexsistent.

The revision of this Section is carried out by the revising group, which is selected and organized under the guidance of Mechanical Industry Bureau and Motor Industry Company of Peking. The revising group includes members from Peking Automobile Factory; Peking Machine-tool Factory,No.1; Peking General Factory of Internal Combustion Engine; Peking Factory of Switches; Peking Machine-tool Factory; No.6, Peking Factory of Machine-tool Accessories; Peking Crane Factory.

CONTENTS

1. Ferrous Metal Materials

(1) The Principles of Naming and Numbering Steel Produced in China 1

1. Current Standard (GB221-63) 1

2. Old Standard (regulated by former Heavy Industry Ministry) 9

(2) The Brand, Composition, Property and Uses of Steel 11

1. General Carbon Steel (GB700-65) 11

2. High Quality Carbon Construction Steel (GB699-65) 15

3. Easy-to-cut Construction Steel (YB191-63) 27

4. General Low Alloy Construction Steel (YB13-69) 28

5. Alloy Construction Steel (YB6-71) 33

6. Carbon Tool Steel (YB5-59) 56

7. Alloy Tool Steel (YB7-59) 59

8. High Speed Tool Steel (YB12-59) 67

9. Hot Rolled Flat and Screw Spring Steel (YB8-59) 69

10. Stainless and Anti-acid Steel (YB10-59) 73

11. Heat Resisting and Blisterless Steel (YB11-59) 76

12. Chrome Bearing Steel (YB9-62) 82

(3) The Heat Treatment Norms and Substituting Materials of Steel 83

1. The Commonly Used Heat Treatment Methods of Steel 83

2. The Symbols of Steel Heat Treatment (GC423-62) 84

3. Heat Treatment Norms and Substituting Materials 85

(4) Iron Casting and Steel Casting 101

1. Gray Iron Casting (GB976-67) 101

2. Gray Iron Casting (JB297-62) 103

3. Spheroidal Graphitic Iron Casting (JB298-62) 104

4. Forgeable Iron Casting (GB978-67) 105
5. Heat-resisting Iron Casting (JB640-65) 106
6. Carbon Steel Casting (GB979-67) 108
(5) Section Steel 109
1. Rolled Thin Steel Plate (GB708-65) 109
2. Hot-rolled Thick Steel Plate (GB709-65) 111
3. Hot-rolled Round Steel and Square Steel (GB702-65,GB703-65) 113
4. Hot-rolled Hexagonal Steel (GB704-65) 115
5. Cold Draw Round Steel (GB905-66) 116
6. Cold Draw Square Steel (GB906-66) 117
7. Cold Draw Hexagonal Steel (GB907-66) 118
8. Hot-rolled Flat Steel (GB704-65) 119
9. Hot-rolled Equilateral Angle Steel (YB166-65) 120
10. Hot-rolled Unequilateral Angle Steel (YB167-65) 126
11. Hot-rolled General Channel Steel (GB707-65) 129
12. Hot-rolled Light Channel Steel (YB161-63) 131
13. Hot-rolled General I Steel (GB706-65) 132
14. Hot-rolled Light I Steel (YB163-63) 134
15. Crance Steel Runway (YB172-63) 135
16. Steel Rail 136
17. Electric-welding Steel Pipe (YB242-63) 139
18. Water and Gas Feeding Steel Pipe (YB234-63) 141
19. Hot-rolled Seamless Steel Pipe (YB231-64) 143
20. Cold Draw (Cold-rolled) Seamless Steel Pipe (YB231-64) 146
21. Boiler-use Seamless Steel Pipe (YB232-63) 151
22. Carbon Spring Steel Wire (YB274-64) 152

23. Spring Steel Wire for Important Use (YB550-65) 154

(6) A Comparison of China's Principal Steel Grades With Those of Other Countries 156

1. The Principles of Naming and Numbering Steel in Other Countries 156

2. A Comparison of China's Steel Grades With Those of Other Countries 190

(7) The Marks of Steel Material Painting 197

11. Non-ferrous Metal Materials 200

(1) The Methods of Indicating the Brand of Non-ferrous Metal and Alloy Products 200

(2) The Brand, Composition, Property and Uses of Non-ferrous Metal and Alloy Products 204

1. Products from Pure Copper Processing (YB145-65) 204

2. Cast Brass 205

3. Products from Brass Processing (YB146-71) 208

4. Cast Bronze 212

5. Products from Bronze Processing (YB147-71) 213

6. Cast Aluminium Alloy (YB143-65) 217

7. Tin-base Bearing Alloy (YB487-65) 219

(3) Section Materials 220

1. Copper Bar (YB456-71) 220

2. Brass Bar (YB457-71) 220

3. Silcon Bronze Bar (YB455-71) 222

4. Copper Plate and Bar (YB459-64) 223

5. Brass Plate and Band (YB460-71) 224

6. The Different Kinds of Aluminum and Aluminum Alloy Plate(YB605-66) 226

7. Aluminum and Aluminum Alloy Plate Which Cannot be Strengthened Through Heat Treatment 227

8. Aluminum Alloy Plate Which Can Be Strengthened Through Heat Treatment 228

9. Hot-rolled Aluminum and Aluminum Alloy Plate (YB608-66) 229

10. Extruded Copper Pipe (YB447-70) 230

11. Drawn Copper Pipe (YB447-70) 232

12. Extruded Brass Pipe (YB448-71) 236

13. Drawn Brass Pipe (YB448-71) 238

(4) A Comparison of China's Principal Non-ferrous Metal Brands With Those of Other Countries 240

III. Non-metallic Materials 244

(1) Rubber and Rubber Products 244

1. Sealing Rubber Products (HG4-329-66) (ring-shaped) 244

2. Rubber Sheet for Industry Use (HG4-400-66) 246

3. Square and Round Rubber Strip (Hu Q/HG16-019-63) 249

4. General All-rubber Tube (HG4-404-66) 249

5. Rubber Tube Reinforced With Cotton Thread (HG4-405-66) 250

6. Pressure Rubber Tube of Rubber-sandwich-cloth (HGB4005-60) 251

7. High Pressure Rubber Tube With Steel Wire Reinforcement (HG4-406-66) 252

(2) Plastic Materials and Their Products 253

1. Phenolic Plastic Material 253

2. Industry Organic Glass (HG2-343-66) 255

3. Polyvinyl-choride 255

4. Fluorinated Plastic Materials 260

5. Cinnamene-Butadiene-Propenyl-cyanide Copolymer (ABS) 265

6. Low Pressure Polythene 266

7. Polyamide (nylon) 266

8. Polyformaldehyde 268

9. Polycarbonate 269

10. Polysulfone 270

(3) Asbestos and Asbestos Products 270

1. Rubber Asbestos Sheet (JC125-66) 271

2. Oil-resistant Rubber Asbestos Sheet (GH539-65) 272

3. Asbestos Brake Band, Brake Friction Blade and Clutch Friction Blade (manufacturing mark 48-61, JC23-66 and JC124-66) 273

4. Oil-immersed Asbestos Coil Root (JC68-64) 274

5. Rubber Asbestos Coil Root (JC67-64) 276

(4) Wool Blanket for Industry Use (FJ814-66) 277

(5) Sealing Materials 279

A List of Tables (Substitute for Index) 283

1. Ferrous Metal Material

(1) The Principles of Naming and Numbering Steel Produced in China

1. Current Standard (GB221-63)

(1) Chemical Elements Indicated by International Chemical Symbols (Table 2-1-1)

Table 2-1-1 The Chemical Symbols of the Brand of Steel Products

Element Name in Chinese	Internatl Chemical Symbol	Element Name in Chinese	Internatl Chemical Symbol	Element Name in Chinese	Internatl Chemical Symbol	Element Name in Chinese	Internatl Chemical Symbol
Ge 硅	Cr	Wu 钨	W	Peng 硼	B	A 铝	Ac
Nie 镍	Ni	Mu 钼	Mo	Ku 钴	Co	Tan 碳	C
Gui 硅	Si	Fan 钒	V	Dan 铌	Nb	Shi 铈	Ce
Meng 锰	Mn	Tai 钛	Ti	Ni 铌	Nb	Se 铯	Cs
Lü 铝	Al	Tong 铜	Cu	Tan 钽	Ta	Gao 锆	Zr
Lin 磷	P	Tie 铁	Fe	Gai 钙	Ca	Lan 镧	La

(2) The Chinese Characters and the Initials of Romanized Chinese used for Indicating the Uses, Smelting Methods and Pouring Methods of the Products (Table 2-1-2)

Table 2-1-2 The Symbols of Uses, Smelting Methods and Pouring Methods of Steel Products

Name	Chinese Character	Initial of Romanized Chinese	Name	Chinese Character	Initial of Romanized Chinese
Open furnace	Ping 平	Capital P	Bridge steel	Qiao 桥	Small q
Acid side-blown converter	Suan 酸	S	Furnace steel	Guo 锅	g
Basic side-blown converter	Jian 碱	J	Rail steel	Gui 轨	Capital U
Top-blown converter	Ding 顶	D	Grade A steel		A
Boiling steel	Fu 沸	F	Grade B steel		B
Semi-killed steel	Ban 半	Small b	Special kind steel	Te 特	C
Cast pig iron	Zhu 铸	Z	Rivet screw steel	Mao 铆 luo 螺	ML
Cold-cast wheel pig iron	Leng 冷	L	High frequency (used for electric silcon steel)	Gao 高	G
Silcon steel used in electric industry	Dian 电	D	Weal magnetic field (used for electric silcon steel)	Ruo 弱	R
Pure iron used in electric industry	Dian Tie 电铁	DT	Medium magnetic field		

TO BE CONTINUED

Continued

Name	Chinese Character	Initial of Romanized Chinese	Name	Chinese Character	Initial of Romanized Chinese
Easy-cutting steel	Yi	Y	(used for electric silcon steel)	Zhong	H
Magnetic steel	Ci	C	Steel used for geological exploring tube	Dizhi 地质	DZ
Carbon tool steel	Tan	T	Gray cast iron	Huitie 灰铁	HT
Welding bar steel	Han 焊	H	Forgeable cast iron	Ketie	KT
Ball bearing steel	Gun 滚	G	Spheriodal graphite cast iron (machine mark)	Quitie	QT
High grade steel	Gao 高	A	Pearlite forgeable cast iron (machine mark)		KTZ
Special Grade Ship-building steel	Te 特 Chuan 船	E C	Heat-resisting spheriodal graphite cast iron (machine mark)		RQT
Heat-resisting cast iron (machine mark)	Retie 热铁	RT			
Cast steel		ZG			

(3) The Brand of Steel Products Indicated by Chinese Characters or the Letters of Romanized Chinese (Table 2-1-3)

Table 2-1-3 The Methods of Indicating the Brand of Steel Products

Name of Products	Samples of Brand: Brand in Chinese	Samples of Brand: Letter Symbol	Methods of Indicating Brands
Pig iron			The brands of pig iron are indicated by the regulated symbols. Then the average silcon content of some per ten thousand is added. For instance, of cast pig iron, of which the silcon content is 3.76 - 4.25%, the brand is "Zhu 40" or "Z40".
Open furnace pig iron	Jianping 08 Jianping 10	P08, P10	
Acid converter pig iron	Xuanzhuan 13 Xuanzhuan 18	S13, S18	
Basic side-blown converter pig iron	Jianzhuan 08 Jianzhuan 10	J08, J10	
Cast pig iron	Zhu 40, Zhu 30	Z40, Z30	
Cold-cast wheel pig iron	Leng 08	L08	
Iron alloy			The symbols of the chemical elements in the iron alloy brands are indicated according to regulations, and
Silcon iron	Gui90, Gui45	Si90, Si45	
Manganese iron	Meng 1, Meng 3	Mn1, Mn3	
Titanium iron	Tai 25, Tai 231	Ti25, Ti231	

TO BE CONTINUED

Continued

Name of Products	Samples of Brand: Brand in Chinese	Samples of Brand: Letter Symbol	Methods of Indicating Brands
Iron alloy			only the chemical elements not the iron element are indicated. For example, the brand of silcon iron (Si75%) is "Gui75" or "Si75". The brand of manganese-silcon alloy is "Meng-gui 20" or "MnSi20". If the contents of main elements are same and the contents of foreign materials are different, the main contents are indicated by arabic numbers after the Chinese character according to the order of thier quantity. For example, the molybdenum iron of which the molybdenum content is 55%, it is indicated as "Mu 551", "Mu 552" and "Mu 553" or "Mo551", "Mo552", and Mo553". Chromium iron and manganese iron are indicated respectively by arabic number in due order after the element symbols.
Chromium iron	Ge0000, Ge 5	Cr0000, Cr5	
Boron iron	Peng 51, Peng 52	B 51, B52	
Phosphorus iron	Lin 20	P20	
Molybdenum iron	Mu 551, Mu 552	Mo551, Mo552	
Tungsten iron	Wu 80, Wu 65	W80, W65	
Niobium iron	Ni 20	Nb20	
Vanadium iron	Fan 351, Fan 352	V351, V352	
Manganese-silcon alloy	Meng-gui 20	MnSi20	
	Meng-gui 17	Mn17	
Calcium-silcon alloy	Gai-gui 20	CaSi20	
General carbon steel			General carbon steels are indicated by the symbols of A, B, C, and arabic numbers in order. The general carbon steels can be divided into A grade steel (guaranteed mechanical property), B grade steel (guaranteed chemical components) and C grade steel (guaranteed mechanical property and chemical components). Converter steel is prefixed with symbols of processing methods;
A grade steel	A3, A-Jian-3, A-Suan-3, A3-Fu, A-Ding-3, A3-ban	A3, Aj3, AS3, A3F, AD3, A3b	
B grade steel	B1, B-Suan-3, B-Jian-3, B1-Fu, B-Suan-3-Fu, B-Jian-3-Fu, B-Ding-3, B1-ban, B-Suan-3-ban, B-Jian-3-ban	B1, BS3, BJs, B1F, BS3F, BJ3F, BD3, B1b, BS3b, BJ3b	
Special steel	Te-3, Te-Jian3, Te-Ding-3	C3, CJ3, CD3	

TO BE CONTINUED

Continued

Name of Products	Samples of Brand: Brand in Chinese	Samples of Brand: Letter Symbol	Methods of indicating brands
			basic converter steel is marked with "J"; acid converter steel with "Suan" or "S", top-blown converter steel with "Ding" or "D";and open furnace steel is not marked with any symbol, for example, "Jia 1" or "A1"; "Yi-Jian 2" or "BJ2"; and "Te-Suan 3" or "CS3". Steel which is for special use is marked with an initial letter of the usage at its end, for example, "Jia-3-qiao" or "A3q"; boiling steel and semi-dead-melted steel are respectively marked with "Fu" or "F" and "Ban" or "D" at the end; the killed steel is not marked with any symbol.
High-quality carbon steel	05, 08Fu 50 meng, 20 ban	05,08F 50Mn,20b	High quality carbon steel is often indicated that its average content of carbon is only some by ten thousand. Boiling steel and semi-dead-melted steel must be indicated specifically, for example, the brand of semi-dead-melted steel of which the average content of carbon is 0.10% is "10-ban"or "10b". Of the high quality carbon steel which has high content of manganese, the manganese element must be marked out, for example, the brand of killed steel of which the carbon content is 0.5% and the manganese content is 0.70 - 1.00% is "50 meng" or "50Mn".

TO BE CONTINUED

Continued

Name of Products	Samples of Brand: Brand in Chinese	Samples of Brand: Letter Symbol	Methods of indicating brands
			The high quality carbon steel for special use must be marked by using Chinese characters indicating usage or letters of romanized Chinese, such as "20 guo" or "20g".
Carbon tool steel	Tan 7, Tan 8 Tan-10- meng Tan-10-gao	T7, T8 T10Mn T10A	Carbon tool steel can be shown by using "Tan" or "T" and indicated by some per thousand of the average carbon content. The manganese element of carbon tool steel with high content of manganese must be marked out. The high grade good quality carbon tool steel is marked with symbols of "Gao" or "A", for example, the brand of high manganese content (0.15 - 0.40%) carbon tool steel with an average carbon content of 1.00% is "Tan-10-meng" or "T10Mn".
East-to-cut steel	Yi 12, Yi-40-meng	Y12 Y40Mn	The easy-to-cut steel is often marked by using "Yi" or "Y" and indicated by some per ten thousand of average carbon content, for example, the brand of high manganese content (1.20 - 1.55%) easy-to-cut steel with an average carbon content of 0.40% is "Yu-40-meng" or "Y40Mn".
Silcon steel used in electric industry	Dian 31 Dian Gao 310 Dian3100	D31 DG310 D3100	The Chinese characters, letters of romanized Chinese and numbers in the brand of silcon steel used in electric industry give the following meanings: The first Chinese character "Dian" or a letter "D" indicates steel used in electric industry.

TO BE CONTINUED

Continued

Name of Products	Samples of Brand: Brand in Chinese	Samples of Brand: Letter Symbol	Methods of indicating brands
			The second Chinese characters "Gao", "Ruo", "Zhong" or the letters "G", "R" and "H" are used respectively to indicate the conditions of magnetic field when the steel plates are examined. "Gao" or "G" —— steel plates examined when the frequency is 400 cycles. "Ruo" or "R" —— steel plates examined at a weak magnetic field. "Zhong" or "H" —— steel plates examined at a medium magnetic field. If there is no second Chinese character, it indicates that steel plates are examined at a strong magnetic field. The first digits of numbers (1, 2, 3, 4) are used respectively to indicate the degree of silcon contat of the steel plate: 1 —— low silcon steel 2 —— medium silcon steel 3 —— higher silcon steel 4 —— high silcon steel The second digit (1, 2, 3, 4) shows the guaranteed electromagnetic property of the steel plates. Of the same alloy grade and at the same examining magnetic field, the greater the second digit is, the better the electromagnetic property of the steel plate is. The third and fourth digits (0.00) signify the following cold-rolled steel plates: 0 —— crystal orientation

TO BE CONTINUED

Continued

Name of Products	Samples of Brand: Brand in Chinese	Samples of Brand: Letter Symbol	Methods of indicating brands
			cold-rolled steel plate 00 —— cold-rolled steel plate of lesser degree of crystal orientation.
Pure iron used in electric industry	Dian-tie 1 Dian-tie-1-Gao Dian-tie-1-Te	DT1 DT1A DT1E	"Dian-tie" or "DT" is used to represent pure iron used in electric industry and 1, 2, 3 ... the order number added after is to distinguish the different brands. At the end of the pure iron which has better electromagnetic property is marked with "Gao" or "A". At the end of pure iron which has specially good electromagnetic property is marked with "Te" or "E", for example, "Dian-tie-1-Te" or "DT1E".
Alloy steel			
Low alloy structural steel	10-Meng-Gui-Tong 25-Meng-Gui	10MnSiCu 25MnSi	The chemical element symbols in the brand of alloy steel are marked according to the existing regulations
Alloy structural steel	38-Ge-Mu-Lu-Gao 30-Ge-Meng-Gui	38CrMoAlA 30CrMnSi	The ways of indicating chemical components are as follows:
Alloy tool steel	5-Ge-Nie-Mu Ge-12, Ge-06 4-Ge-Wu-2-Gui	5CrNiMo Cr12, CrO6 4CrW2Si	1. Carbon content: They are all indicated by some per ten thousand of average carbon content. The carbon content of stainless steel, high electric resistant alloy, high speed steel, magnetic steel and other alloy steels is not marked out. If there is redundance, the carbon content will be indicated by some per thousand. When the average carbon content of alloy tool steel is larger than or equal to 1.00%, the carbon content will not be marked out. If the content is less than 1.00%, it will be
Spring steel	55-Gui-2 60-Gui-2	55Si2 60Si2	
Heat-resistant, stainless and acid-resistant steel	2-Ge-13 1-Ge-18-Nie-9Tai	2Cr13 1Cr18Ni9Ti	
Steel and high electric resistance alloy	0-Ge-17-Lu-5 Ge-14-Nie-14-Gui-2-Wu-2-Mu	0Cr17Al5 Cr14Ni14Si2W2Mo	
High-speed tool steel	Wu-1-Ge-4-Fan Wu-9-Ge	W18Cr4V W9Cr	
Ball bearing steel	Gun-Ge-6 Gun-Ge-15-Gui-Meng	GCr6 GCr15SiMn	
Steel used for welding bar	Han-08-Gao Han-0-Ge-13-	H08A H0Cr13-	

TO BE CONTINUED

Continued

Name of Products	Samples of Brand: Brand in Chinese	Samples of Brand: Letter Symbol	Methods of indicating brands
Magnetic steel	Nie-9-Tai Ci-Ge-5	Ni9Ti CCr5	indicated by some per thousand. 2. Alloy elements content: Except for ball bearing steel and low chrome alloy tool steel, the content of alloy elements will be indicated in accordance with the following principles (average content). 1) When alloy average content is less than 1.50%, in steel grade, only are elements shown not the content. 2) When alloy average content is equal to or larger than 1.50%, 2.50%, 3.50% ... 23.50% ..., it should be correspondingly written into 2, 3, 4, ... 24 ... 3) When alloy average content is 1.50 - 2.49%, 2.50 - 3.49% ... 22.50 - 23.49% ... , it should be correspondingly written into 2, 3, ... 23 ... 4) In order to avoid redundance of the brand of ball bearing steel with that of other alloys, the carbon content of ball bearing steel will not be given, and the chrome content is indicated by some per thousand and is also prefixed with the name of usage, for instance, of ball bearing steel, of which the chrome content is 0.90%, the brand is "Gun-Ge-9" or "GCr9". Low chrome alloy tool steel shows its chrome content by some per thousand, and the content is prefixed with "0", for example, the brand of alloy tool steel, which has a chrome content of 0.90%, is "Ge09" or "Cr09". The mark of welding bar steel is prefixed with "Han"

TO BE CONTINUED

Continued

Name of Products	Samples of Brand		Methods of indicating brands
	Brand in Chinese	Letter Symbol	
			or "H", for example, "Han-2-Ge-3" or "H2Cr13". Magnetic steel is indicated by alloy elements, which is prefixed with Chinese character "Ci" or "C", for example, the brand of magnetic steel, which has chrome content of 5%, is "CiGe-5" or "CCr5".

2. Old Standard (regulated by former Heavy Industry Ministry)

In 1952, the former Heavy Industry Ministry issued the steel numbering method, which is essentially identical with the current standard except that letters of the romanized Chinese characters are used to indicate chemical elements, uses, processing methods and pouring and casting methods (Table 2-1-4)

Table 2-1-4 A Contrastive Table of the Old and New Standards of Using Symbols to Indicate the Brands of Steel Products

Name	Old Standars	New Standards
Acid converter steel	ㄅㄠ	BS(acid converter steel, grade B)
Open furnace steel	ㄆㄠ	B (open furnace steel, grade B)
Molybdenum	ㄇ	Mo
Vanadium	ㄈ	V
Carbon, carbon steel	ㄊ	T
Chromium	ㄉ	Cr
Cobalt	ㄍ	Co
High quality steel	ㄐ	A
Silcon	ㄒ	Si
Ball bearing steel	ㄔ	G
East-to-cut steel	ㄕ	Y
High speed tool steel	ㄙ	—
Tungsten	ㄨ	W
Aluminum	ㄩ	Al
Nickel	ㄝ	Ni
Titanium	ㄞ	Ti
Steel	ㄠ	A (grade A steel)
Manganese	ㄥ	Mn

Examples

ㄠ3——A3

ㄆㄠ2——B2

40ㄥ——40Mn

ㄊ8ㄐ——T8A

ㄔㄉ15——GCr15

ㄉㄨㄥ——CrWMn

60ㄒ2——60Si2

1ㄉ18ㄝ9ㄞ——1Cr18Ni9Ti

(2) The Brands, Composition, Properties and Uses of Steel

1. General Carbon Steel (GB700-65)

Table 2-1-5 The Mechanical Properties and Uses of General Carbon Steel (1)

No. of Order	Steel Grade: Basic Open Furnace Steel — Grade A — Brand	Symbol	Special Grade — Brand	Symbol	Side-blown Basic Converter Steel — Grade A — Brand	Symbol	Special Grade — Brand	Symbol	Side-blown Acid Converter Steel — Grade A — Brand	Symbol
1	甲1 (Jia 1)	A1								
	甲1沸 (Jai 1-Fu)	A1F								
2	甲2 (Jia 2)	A2	特2 (Te 2)	C2	甲碱2 (Jia-Jian 2)	AJ2	特碱2 (Te-Jian 2)	CJ2		
	甲2沸 (Jia 2-Fu)	A2F	特2沸 (Te 2 Fu)	C2F	甲碱2沸 (Jia-Jian 2Fu)	AJ2F	特碱2沸 (Te-Jian 2 Fu)	CJ2F		
3	甲3 (Jia 3)	A3	特3 (Te 3)	C3	甲碱3 (Jia-Jian 3)	AJ3	特碱3 (Te-Jian 3)	CJ3	甲酸3 (Jia-Suan 3)	AS3
	甲3沸 (Jia 3 Fu)	A3F	特3沸 (Te 3 Fu)	C3F	甲碱3沸 (Jia-Jian 3 Fu)	AJ3F	特碱3沸 (Te-Jian 3 Fu)	CJ3F	甲酸3沸 (Jia-Suan 3 Fu)	AS3F
4	甲4 (Jia 4)	A4	特4 (Te 4)	C4	甲碱4 (Jia-Jian 4)	AJ4	特碱4 (Te-Jian 4)	CJ4	甲酸4 (Jia-Suan 4)	AS4
	甲4沸 (Jia 4 Fu)	A4F	特4沸 (Te 4 Fu)	C4F	甲碱4沸 (Jia-Jian 4 Fu)	AJ4F	特碱4沸 (Te-Jian 4 Fu)	CJ4F	甲酸4沸 (Jia-Suan 4 Fu)	AS4F

TO BE CONTINUED

Table 2-1-5 The Mechanical Properties and Uses of General Carbon Steel (2)

No. of Order	Mechanical Properties: Yield Strength (kg/mm^2) Grouped by Size Gp 1	Gp 2	Gp 3	Tensile Strnth	Rate of Ext.	Cold Bend Test. d = bend diameter o = thickness of tstg pcs	Samples of Uses
1				34-40	33 28	d = o	Spare parts of metal structure for small load, padding piece, rivet, padding ring, foundation bolt, open pin, guy rod, parts of press and welding piece.
2	22	20	19	34-42	31 26		Metal structure component, guy rod, ring, rivet, bolt, stub axle, mandrel, cam wheel (for small load), hook, padding ring, carbureter part and welding piece.
3	24	23	22	38-40	27 23	d = 0.5a	Metal structure component, carbureter or cyanation parts which require no high central strength, hook, guy rod, carrier hook, ring, cylinder, cam wheel, bolt, female screw, connecting rod, wheel axle, wedge, cover and welding piece.
				41-43	26 22		
				44-47	25 21		
	24	22	21	38-40	27 23		
				41-43	26 22		
				44-47	25 21		
4	26	25	24	42-44	25 21	d = 2a	Metal structure component, burning axle, mandrel, guy rod, hook, hoop, rowing rod, bolt, wedge, switch and other spare parts which require no high strength. Weldability is quite good.
				45-48	24 20		
				49-52	23 19		

TO BE CONTINUED

Continued (1)

Steel Grade										
Basic Open Furnace Steel				Side-blown Basic Converter Steel				Side-blown Acid Converter Steel		
Grade	A	Special Grade		Grade	A	Special Grade		Grade	A	
Brand	Symbol	Brand	Symbol	Brand	Symbol	Brand	Symbol	Brand	Symbol	
甲 5 5 (Jia 5)	A5	特 5 (Te 5)	C5	甲誠 5 (Jia-Jing 5)	AJ5	特誠 5 (Te-Jing 5)	CJ5	甲酸 5 (Jia-Suan 5)	AS5	
甲 6 6 (Jia 6)	A6			甲誠 6 (Jia-Jing 6)	AJ6			甲酸 6 (Jia-Suan 6)	AS6	
甲 7 (Jia 7)	A7			甲誠 7 (Jia-Jing 7)	AJ7					

Continued (2)

	Mechanical Properties						
	Yeild Strength (kg/mm^2) Grouped by size			Tensile Strnth	Rate of Ext.	180° Cold Bend Test, d = bend diameter o = thickness of tstg pcs	Samples of Uses
	Gp 1	Gp 2	Gp 3				
5	28	27	26	50-53 54-57 58-62	21 20 19	17 16 15	d = 3a	Turning axle, mandrel, pin axle, switch wheel, brake bar, bolt, female screw, padding ring, connecting rod, hook, wedge, cogwheel, switch and other parts of which the requirement of strength is high. The weldability is quite good
6	31	30	30	60-63 64-67 68-72	16 15 14	13 12 11		Turning axle, mandrel, main axle, clutch and frictional clutch, chain-ring, brake steel band, switch and spare parts, of which the requirement of strength is high. Weldability is not good enough
7				70-74 ⩾ 75	11 10	9 8		Turning axle, mandrel, main axle, clutch and frictional clutch, chain-ring, brake steel band, switch and spare parts which can endure strong friction. Weldability is poor

2. High Quality Carbon Construction Steel (GB699-65)

Table 2-1-6 The Chemical Composition, Mechanical Properties and Uses of High Quality Carbon Construction Steel (1)

Steel Grade		Chemical Components (%)						
Brand	Symbol	C	Si	Mn	P	S	Cr	Ni
					<			
05# (05Fei)	05F	≤ 0.06	≤ 0.03	0.40	0.035	0.040	0.10	0.25
08# (08Fei)	08F	0.05~0.11	≤ 0.03	0.25~0.50	0.040	0.040	0.10	0.25
08	08	0.05~0.12	0.17~0.37	0.35~0.65	0.035	0.040	0.10	0.25
10# (10Fei)	10F	0.07~0.14	≤ 0.07	0.25~0.50	0.040	0.040	0.15	0.25
10	10	0.07~0.14	0.17~0.37	0.35~0.65	0.035	0.040	0.15	0.25
15# (15Fei)	15F	0.12~0.19	≤ 0.07	0.25~0.50	0.040	0.040	0.25	0.25
15	15	0.12~0.19	0.17~0.37	0.35~0.65	0.040	0.040	0.25	0.25
20# (20Fei)	20F	0.17~0.24	≤ 0.07	0.25~0.50	0.040	0.040	0.25	0.25
20	20	0.17~0.24	0.17~0.37	0.35~0.65	0.040	0.040	0.25	0.25

TO BE CONTINUED

Table 2-1-6 The Chemical Composition, Mechanical Properties and Uses of High Quality Carbon Construction Steel (2)

Mechanical Properties					
Yield Strength σ_s (kg/mm^2)	Tensile Strength σ_b (kg/mm^2)	Rate of Extension δ_5 (%)	Rate of Contraction ψ (%)	Impact Value α_k ($kg.m/cm^2$)	Hardness: Hot-rolled Steel
≥					≤
17	30	35	60		131
20	33	33	60		131
19	32	33	55		137
21	34	31	55		137
22	36	29	55		143
23	38	27	55		143
23	39	27	55		156
25	42	25	55		156

TO BE CONTINUED

Table 2-1-6 The Chemical Composition, Mechanical Properties and Uses of High Quality Carbon Construction Steel (3)

	Samples of Uses
	Spare parts of cold washed bar steel and deep die pressed thin plate
	The strength of this steel is not great but its plasticity and tenacity is high and performance in pressing, extending and bending is good. Spare parts which require good plasticity: pipe, padding piece, cap, packing ring. Carbureter and cyanation spare parts which require no high central strength: sleeve, stub axle, stopping block, supporting stand, copying die, cogwheel, clutch cushion. The weldability is good.
	Spare parts which require good plasticity: pipe, padding piece, packing ring. Carbureter and cyanation parts which require no high central strength: sleeve, stub axle, stopping block, supporting stand, copying die, cogwheel, clutch cushion. The weldability is good.
	The yield point and tensile strength specific value of this kind of steel is relatively low but itsplasticity and tenacity are both high, so in the cold state, it is easy to be pressed into shape. This steel is generally used to make guy rod, clamp head, steel pipe backing piece, packing ring, rivet. This steel shows no tendency of temper brittleness and its weldability is very good so it is often used to make welding parts.
	Spare parts which require good plasticity: pipe, padding piece, packing ring. Carbureter and cyanation parts which require no high central strength: sleeve, stub axle, stopping block, supporting stand, copying die, cogwheel, clutch cushion. The weldability is good. It can also be used to make rowing rod, hook, transverse pole, patching work, bolt, carriage hook.
	Plasticity, tenacity, weldability and cold washing performance are all good, but the strength is relatively low. It can be used to make spare parts which receive no great force and require high tenacity. It can also be used as carbureter parts, fastening parts, mold pressed forging and low load parts which require no heat treatment, such as bolt, screw, draw strip, flannel disk and storage vessel in chemical industry and steam boiler.
	Same as 15F steel
	It can be used in various spare parts which do not bear great stress and require very great tenacity, such as lever, axlebox, screw, guy rod, crane hook. It can also be used as carbureter and cyanation spare parts which has surface of high degree hardness and require no great central strength.

TO BE CONTINUED

Continued (1)

Steel Grade		Chemical Composition(%)						
Brand	Symbol	C	Si	Mn	P	S	Cr	Ni
					≤			
25	25	0.22~0.30	0.17~0.37	0.50~0.80	0.040	0.040	0.25	0.25
30	30	0.27~0.35	0.17~0.37	0.50~0.80	0.040	0.040	0.25	0.25
35	35	0.32~0.40	0.17~0.37	0.50~0.80	0.040	0.040	0.25	0.25
40	40	0.37~0.45	0.17~0.37	0.50~0.80	0.040	0.040	0.25	0.25
45	45	0.42~0.50	0.17~0.37	0.50~0.80	0.040	0.040	0.25	0.25
50	50	0.47~0.55	0.17~0.37	0.50~0.80	0.040	0.040	0.25	0.25
55	55	0.52~0.60	0.17~0.37	0.50~0.80	0.040	0.040	0.25	0.25

TO BE CONTINUED

Continued (2)

Mechanical Properties						
Yield Strength σ_s (kg/mm^2)	Tensile Strength σ_b (kg/mm^2)	Rate of Extension δ_5 (%)	Rate of Contraction ψ (%)	Impact Value a_k ($kg.m/cm^2$)	Hardness Hot-rolled Steel	Annealed Steel
≥					≤	
28	46	23	50	9	170	
30	50	21	50	8	179	
32	54	20	45	7	187	
34	58	19	45	6	217	187
36	61	16	40	5	241	197
38	64	14	40	4	241	207
39	66	13	35		255	217

TO BE CONTINUED

Continued (3)

Sample of Uses

The property is similar to that of steel No.20. This steel can be used to make welding equipment and spare parts which are processed through forging, hot pressing and mechanical working and bear no high stress, such as axle, roller, connector, packing ring, bolt, screw and female screw. The weldability and cold straining plasticity of this steel are high and there is no tendency of temper brittleness.

When this steel is used in steel product of small profile, after hardening and tempering, there comes a sorbite structure and thereby its strength and synthesis performance become better. Such spare parts as screw, wire rod, guy rod, sleeve and axle.

The property is similar to that of No.30. It has good plasticity and adequate strength, so it can be used to make such articles as bent axle, turning axle, axle pin, lever, linking rod, beam, star wheel, disk, sleeve, hook ring, packing ring, screw and female screw. This kind of is mostly being used in the state of normalizing and modification and generally it is not used for welding.

This kind of steel has high strength and it is generally through the processes of hardening and tempering. It can be used for welding, but before welding it must be heated to 150°C.Its workability is good. When it is making cold transformation, its plasticity is so so. It can be used to make roller, axle, crank pin, live axle, piston rod, link rod and disk.

It can be used in spare parts which require high strength, and it is generally being used in the state of modification and normalizing. It is used to make blade wheel of steam turbine, and spare parts of compressor and pump. In making spare parts of cogwheel, axle, piston pin, steel No.45 can be used to replace cementation steel and it must go through high frequency current or flame surface hardening.

The fine steel of medium carbon with high degree of strength can be used to make spare parts which require high abrasive resistance and their dynamic load and the percusive action are not great, such as forged cogwheel, guy rod, roller, axle friction disk, secondary spring, ploughshare used in farming, heavy-load central axle andaxle. The weldability of this steel is not good.

After heat treatment, this steel shows high degree of surface hardness and strength. It has good plasticity and generally is used after normalizing, hardening and tempering. It can be used to make cogwheel, link rod, axle ring, wheel rim, flat spring and roller, and it can also be used for casting. Its weldability and cold alterability are low.

This is a kind of steel which has considerably high strength and flexibility. In hardening, it can produce hardening crack. Only the

TO BE CONTINUED

Continued (1)

Steel Grade		Chemical Composition(%)						
Brand	Symbol	C	Si	Mn	P	S	Cr	Ni
					<			
60	60	0.57~0.65	0.17~0.37	0.50~0.80	0.040	0.040	0.25	0.25
65	65	0.62~0.70	0.17~0.37	0.50~0.80	0.040	0.040	0.25	0.25
70	70	0.67~0.75	0.17~0.37	0.50~0.80	0.040	0.040	0.25	0.25
75	75	0.72~0.80	0.17~0.37	0.50~0.80	0.040	0.040	0.25	0.25
80	80	0.77~0.85	0.17~0.37	0.50~0.80	0.040	0.040	0.25	0.25
85	85	0.82~0.90	0.17~0.37	0.50~0.80	0.040	0.040	0.25	0.25
15锰 (15Meng)	15Mn	0.12~0.19	0.17~0.37	0.70~1.00	0.040	0.040	0.25	0.25
20锰 (20Meng)	20Mn	0.17~0.24	0.17~0.37	0.70~1.00	0.040	0.040	0.25	0.25
25锰 (25Meng)	25Mn	0.22~0.30	0.17~0.37	0.70~1.00	0.040	0.040	0.25	0.25

TO BE CONTINUED

Continued (2)

Mechanical Properties						
Yield Strength σ_s (kg/mm^2)	Tensile Strength σ_b (kg/mm^2)	Rate of Extension δ_5 (%)	Rate of Contraction ψ (%)	Impact Value a_k ($kg.m/cm^2$)	Hardness Hot-rolled Steel	Hardness Annealed Steel
>					<	
41	69	12	35		255	229
42	71	10	30		255	229
43	73	9	30		269	229
90	110	7	30		285	241
95	110	6	30		285	241
100	115	6	30		302	255
25	42	26	55		163	
28	46	24	50		197	
30	50	22	50	9	207	

TO BE CONTINUED

Continued (3)

Samples of Uses

small sized articles made of this steel can go through hardening and those of large size are mostly through normalizing. It can be used to make roller, axle, spring ring, spring, various packing rings, clutch, cam wheel, and steel rope. The cold alterability is low.

After proper heat treatment, the strength and flexibility of this steel become considerably high. Articles of large size made of this steel will produce crack easily when they are through hardening, so it is good to have normalizing. But article of small size can have hardening. This steel is not sensitive to tempering. It is mainly used to make valve spring, srping ring, axle, roller, various packing rings and cam wheel.

The strength and plasticity of this steel are higher than steel No.65 and the other properties are very approximate. The hardenability is relatively low. It cannot go through hardening if the diameter of a spring is over 12-15mm. It is only good for making spring of small cross-section and it is mainly used to make flat spring, cylindrical spring, steel wire, steel band and wheel rim.

Band spring, helical spring and abrasive resistant spare parts

Band spring, helical spring and abrasive resistant spare parts

The strength of this steel is higher than steel No.70 but the flexibility is low and the other properties are approximate. Its hardenability is poor, so it is only good for making vibrating spring of small cross-section and low bearing strength. It can also be used to make rail car, automobile, tractor and flate spring of machines, cylindrical spiral spring and steel wire and steel band.

15Mn steel is a cementation steel with high manganese and low carbon. Its properties are similar to those of steel No.15 except that its hardenability, strength and plasticity are all higher than steel No.15. It can be used to make spare parts which must be carburized and require high mechanical property at central part. The weldability is high.

Carburized steel with high manganese and low carbon has properties similar to those of 15Mn. It can be used to make cam shaft, cogwheel, axle connector, winch chain, draw rod. The weldability is good.

The strength and hardenability of this steel are better than those of steel No. 10 and 15. It can be used to make carbureter and welding spare parts, such as cam shaft, cogwheel, axle connector, winch chain, pin, draw rod. The weldability is good.

TO BE CONTINUED

Continued (1)

Steel Grade		Chemical Composition (%)						
Brand	Symbol	C	Si	Mn	P	S	Cr	Ni
					<			
30锰 (30Meng)	30Mn	0.27~0.35	0.17~0.37	0.70~1.00	0.040	0.040	0.25	0.25
35锰 (35Meng)	35Mn	0.32~0.40	0.17~0.37	0.70~1.00	0.040	0.040	0.25	0.25
40锰 (40Meng)	40Mn	0.37~0.45	0.17~0.37	0.70~1.00	0.040	0.040	0.25	0.25
45锰 (45Meng)	45Mn	0.42~0.50	0.17~0.37	0.70~1.00	0.040	0.040	0.25	0.25
50锰 (50Meng)	50Mn	0.48~0.56	0.17~0.37	0.70~1.00	0.040	0.040	0.25	0.25
60锰 (60Meng)	60Mn	0.57~0.65	0.17~0.37	0.70~1.00	0.040	0.040	0.25	0.25
65锰 (65Meng)	65Mn	0.62~0.70	0.17~0.37	0.90~1.20	0.040	0.040	0.25	0.25
70锰 (70Meng)	70Mn	0.67~0.75	0.17~0.37	0.90~1.20	0.040	0.040	0.25	0.25

Continued (2)

Mechanical Properties						
Yield Strength σ_s (kg/mm2)	Tensile Strength σ_b (kg/mm2)	Rate of Extension δ_5 (%)	Rate of Contraction ψ (%)	Impact Value α_k (kg.m/cm^2)	Hardness Hot-rooled Steel	Hardness Annealed Steel
≥					≤	
32	55	20	45	8	217	187
34	57	18	45	7	229	187
36	60	17	45	6	229	207
38	63	15	40	5	241	217
40	66	13	40	4	255	217
42	71	11	35		269	229
44	75	9	30		285	229
46	80	8	30		285	229

Continued (3)

Samples of Uses

The strength and hardenability of this steel are higher than the corresponding carbon steel. The weldability is medium and the plasticity is good in cold transformation. It has good cutting workability, too. But there is a tendency of temper brittleness. After forging it must be tempered immediately. It is generally being used in a state of normalizing. It is used to make bolt, screw cap, screw, lever, brake paddle.
Abrasive resistant spare parts: turning axle, mandrel, cogwheel, fork, gripping rod, bolt, female screw, screw. The weldability is poor.
This steel can be used in the state of normalizing or hardening and tempering. Its cutting workability is good. The plasticity is medium in cold transformation. The weldability is poor. It can be used to make fatigue load bearing parts, such as axle-tree, screw which works under high stress and screw cap.
Abrasive resistant spare parts: turning axle, mandrel, cogwheel, fork, gripping rod, bolt, female screw, screw. The weldability is poor but the laoding ability is good. It can also be used to make clutch cushion, splined shaft, free joint, cam shaft, bent axle, automobile rear axle, anchor bolt and double-headed bolt.
The flexibility, strength and hardness of this steel are all high, and it is used mostly after hardening and tempering but under some condition it can be used after normalizing. The weldability is poor. It can be used to make heat treatment parts which require high abrasive resistance and can act under high load, such as cogwheel, rear shaft, friction disk and central axle with a cross-section under 30mm.
The strength of this steel is high and the hardenability is better than carbon spring steel. And the tendency of decarbonization is small but it has overheat sensitiveness, so it is easy to produce hardening cracks and also shows temper brittleness. It can be used to make large spiral spring, plate spring, various flat and cylindrical springs, spring ring and leaf and cold-draw steel wire ($\leq$ 7mm) and spring cord.
The strength of this steel is high and the hardenability is great. The tendency of decarbonization is small but it has overheat sensitiveness, so it is easy to produce hardening cracks and also has temper brittleness. It can be used to make various flat and cylindrical springs of large size, such as seat spring, spring cord and other abrasive resistant agricultural machines parts, such as plough and cutting knife. It can also be used to make clutch spring for light load truck.
Spring ring, spring washer, coiled spring, anti-thrust ring, clutch cushion and binding ring.

3 Easy-to-cut Construction Steel (YB191-63)

Table 2-1-7 The Chemical Composition, Mechanical Properties and Uses of Easy-to-cut Construction Steel

Steel grade		Chemical Composition					Mechanical Properties									Sample of Uses
							Hot rolling no heat treatment				Cold drawing no heat treatment					
Brand	Symbol	C	Mn	Si	S	P	Tnsl strth σb (kg/mm2)	Ext. rate δ5 (%)	Sect. contrdns rate ψ (%)	Brnl hdns HB	Tensile strgth σb (kg/mm2) Bar steel Diameter(mm) 20-	20-30	30+	Ext. rate (%)	Brnl hdns HB	
易12	Y12	0.08~0.16	0.60~0.90	0.15~0.35	0.08~0.20	0.08~0.15	42~57	22	36	160	60~80	55~75	52~70	7.0	167~217	To make screw and female screw
易20	Y20	0.15~0.25	0.60~0.90	0.15~0.35	0.08~0.15	<0.06	46~61	20	30	168	62~80	57~76	54~73	7.0	187~217	To make parts of low machinability and complicated section, such as ram shaft
易30	Y30	0.25~0.35	0.70~1.0	0.15~0.35	0.08~0.15	<0.06	52~67	15	25	185	64~84	60~80	55~77	6.0	174~223	To make parts which require high strength
易40Mn	Y40Mn	0.35~0.45	1.20~1.55	0.15~0.35	0.18~0.30	<0.06	60~75	14	28	207		68~80		17.0	179~229	

2. General Low Alloy Construction Steel (YB13-63)

Table 2-1-6 The Chemical Composition of General Low Alloy Construction Steel

No.	Steel Grade		Chemical Composition (%)								
	Brand	Symbol	C (碳)	Mn (锰)	Si (硅)	V (钒)	Ti (钛)	Nb (铌)	P (磷)	Re (稀土)	Others
1	09锰钒	09MnV	≤0.12	0.80～1.20	0.20～0.60	0.04～0.12	—	—	—	—	—
2	09锰铌	09MnNb	≤0.12	0.80～1.20	0.20～0.60	—	—	0.015～0.050	—	—	—
3	(09锰2)	(09Mn2)	≤0.12	1.40～1.80	0.20～0.50	—	—	—	—	—	—
4	12锰	12Mn	≤0.16	1.10～1.50	0.20～0.60	—	—	—	—	—	—
5	18铌半	18Nbb	0.14～0.22	0.40～0.65	≤0.17	—	—	0.015～0.050	—	—	—
6	08锰稀土	08MnPRe	≤0.12	0.90～1.30	0.20～0.50	—	—	—	0.08～0.13	≤0.20	—
7	09锰铜稀钛	09MnCuPTi	≤0.12	1.00～1.50	0.20～0.50	—	≤0.03	—	0.05～0.12	—	Cu 0.20～0.40
8	09锰2钒	09Mn2V	≤0.12	1.40～1.80	0.20～0.50	0.04～0.10	—	—	—	—	—
9	(09锰2硅)	(09Mn2Si)	≤0.12	1.30～1.80	0.50～0.80	—	—	—	—	—	—
10	12锰钒	12MnV	≤0.16	1.00～1.40	0.20～0.60	0.04～0.12	—	—	—	—	—
11	12锰稀土	12MnPRe	≤0.16	0.70～1.00	0.20～0.50	—	—	—	0.07～0.12	≤0.20	—
12	14锰铌半	14MnNbb	0.12～0.18	0.80～1.20	≤0.17	—	—	0.015～0.050	—	—	—
13	14锰铌	14MnNb	0.12～0.18	0.80～1.20	0.20～0.60	—	—	0.015～0.050	—	—	—
14	16锰	16Mn	0.12～0.20	1.20～1.60	0.20～0.60	—	—	—	—	—	—
15	16锰稀土	16MnRe	0.12～0.20	1.20～1.60	0.20～0.60	—	—	—	—	≤0.20	—
16	10锰磷铌稀土	10MnPNbRe	≤0.14	0.80～1.20	0.20～0.60	—	—	0.015～0.050	0.08～0.12	≤0.20	—
17	15锰钒	15MnV	0.12～0.18	1.20～1.60	0.20～0.60	0.04～0.12	—	—	—	—	—
18	15锰钛	15MnTi	0.12～0.18	1.20～1.60	0.20～0.60	—	0.12～0.20	—	—	—	—
19	15锰铌	16MnNb	0.12～0.20	1.00～1.40	0.20～0.60	—	—	0.015～0.050	—	—	—
20	14锰钒钛稀土	14MnVTiRe	≤0.18	1.30～1.60	0.20～0.60	0.04～0.10	0.09～0.16	—	—	≤0.20	—
21	15锰钒氮	15MnVN	0.12～0.20	1.20～1.60	0.20～0.50	0.05～0.12	—	—	—	—	N 0.012～0.020
		15MnVNr	0.12～0.20	1.30～1.70	0.20～0.50	0.06～0.15	—	—	—	—	N 0.012～0.020

Table 2-1-9 The Mechanical Properties of General Low Alloy Construction Steel

Ordinal	Steel Grade		Steel thickness or diameter (mm)	Yield point σ_s (kg/mm²)	Tensile strength σ_b (kg/mm²)	Ext. rate δ_5 (%)	Cold bending test
	Brand	Symbol		No less than			
1	09锰钒	09MnV	≤16	30	44	22	$d=2a$
			17～25	28	44	22	$d=3a$
2	09锰铌	09MnNb	≤16	30	42	23	$d=2a$
			17～25	28	40	21	$d=3a$
3	(09锰2)	(09Mn2)	≤16	30	45	21	$d=2a$
			17～30	28	43	21	$d=3a$
			32～100 s,r	26	42	21	$d=3a$
4	12锰	12Mn	≤16	30	45	21	$d=2a$
			17～25	28	44	19	$d=3a$
5	16铌半	16Nbb	6～16	30	46	24	$d=2a$
6	08锰磷稀土	08MnPRe	≤5	36	48	20	$d=2a$
			6～16	33	46	20	$d=2a$
7	09锰铜磷钛	09MnCuPTi	≤16	35	50	21	$d=2a$
			17～25	34	50	19	$d=3a$
8	09锰2钒	09Mn2V	5～20	35	50	21	$d=2a$
9	(09锰2硅)	(09Mn2Si)	≤16	34	48	23	$d=2a$
			17～30	33	47	23	$d=2a$
10	12锰钒	12MnV	≤16	35	50	21	$d=2a$
			17～25	34	50	19	$d=3a$
11	12锰磷稀土	12MnPRe	6～20	35	52	21	$d=2a$
12	14锰铌半	14MnNbb	6～20	35	50	21	$d=2a$
13	14锰铌	14MnNb	≤16	36	50	20	$d=2a$
			17～25 b	34	48	18	$d=3a$

Translator's note: s,r = square and round steel and b = bar steel

TO BE CONTINUED

Continued

Ordinal	Steel Grade: Brand	Steel Grade: Symbol	Steel thickness or diameter (mm)	Yield point σ_s (kg/mm²)	Tensile strength σ_b (kg/mm²)	Ext. rate δ_5 (%)	Cold bending test
				No less than			
14	16锰	16Mn	≤16	35	52	21	$d=2a$
			17～25	33	50	19	$d=3a$
			26～36	31	48	19	$d=3a$
			38～50	29	48	19	$d=3a$
			55～100 s,r	28	48	19	$d=3a$
15	16锰稀土	16MnRe	≤16	35	52	21	$d=2a$
16	10锰磷铌稀土	10MnPNbRe	≤10	40	52	19	$d=2a$
17	15锰钒	15MnV	<5	42	56	19	$d=2a$
			5～16	40	54	19	$d=2a$
			17～25	38	52	17	$d=3a$
			26～36	36	50	17	$d=3a$
			38～50	34	50	17	$d=3a$
18	15锰钛	15MnTi	≤25	40	54	19	$d=3a$
			26～40	38	52	19	$d=3a$
19	16锰铌	16MnNb	≤16	40	54	19	$d=2a$
			17～20	38	52	18	$d=3a$
20	14锰钒钛稀土	14MnVTiRe	≤12	45	58	18	$d=2a$
			13～20	42	54	18	$d=3a$
21	15锰钒氮	15MnVN	≤10	48	65	17	$d=2a$
			≤17 p	45	60	18	$d=3a$
		15MnVNr	11～25	45	60	18	$d=3a$
			26～38	42	56	17	$d=3a$
			40～50	40	54	17	$d=3a$

Translator's note: s,r = square and round steel and p = profile steel

Table 2-1-10 The Uses of General Low Alloy Steel

Steel Grade	Samples of Uses
09MnV	The 09MnV steel has good impact tenacity, weldability and anti-errosion property. I can be used to make autocar, welding pipe and vessels.
09MnNb	The 09MnNb steel can be used in the state of hot-rolling to make autocar and locomotive.car.
09Mn2	The 09Mn2 steel has good plasticity and tenacity and its weldability is excellent, so it can be used to make locomotive car.
12Mn	The integrated property and moderate temperature performance of 12Mn steel are good, so it can be used to make boiler and vessel.
18MnBb	The 18MnBb semi-dead steel has good plasticity and weldability, so it can be used to make pressure vessel and elevator machinery.
08MnPRe	The 08MnPRe steel has good anti-atmospheric corrosion performance and excellent weldability, so it can be used to make vehicle, welding pipe and other spare parts which require strict anti-atmospheric corrosion performance.
09MnCuPTi	The 09MnCuPTi steel has good anti-atmospheric corrosion performance and good integrated property, so it can be used to make vehicle and vessels.
09Mn2V	The 09Mn2V steel is the steel which is used at low temperature of - 70°C. Its integrated property is good and it is widely used to make freezing equipment, vessel and pipe line.
09Mn2Si	The 09Mn2Si steel can be used to make low pressure boiler.
12MnV	The 12MnV steel is an ordinary construction steel, which can be used to make vehicle, metal structural piece and mechanical parts.
12MnPRe	The 12MnPRe steel has good integrated property and its anti-atmospheric corrosion performance is particularly great, so it can be used to make crane and other metal structural pieces.
14MnNbb	The 14MnNbb semi-dead steel has very good integrated mechanical property and its plasticity and weldability are

TO BE CONTINUED

Continued

Steel Grade	Samples of Uses
	particularly good, so it can be used to make vessels used in chemical industry, pipe line and crane.
14MnNb	The 14MnNb steel has good integrated mechanical property and weldability and it can be used to make vessels of which the operating temperature is - 20-45°C and other welding structural pieces.
16Mn	The 16Mn steel has good integrated mechanical property, weldability and workability, and it can be widely used to make vehicles, large vessels, pipe line and heavy machines.
16MnRe	The impact tenacity and cold bending performance of 16MnRe steel are higher than those of 16Mn steel, and the uses of this steel are same as 16Mn steel.
10MnPNbRe	The 10MnPNbRe steel has good integrated mechanical property, weldability and anti-corrosion performance, so it can be used to make metal structural piece.
15MnV	The 15MnV steel has good machinability, workability and weldability, so it is widely used to make high pressure boiler, high pressure vessel and elevation equipment.
15MnTi	The 15MnTi steel has good integrated property and weldability, and it is used to make welding structural piece for bearing dynamic load.
16MnNb	The 16MnNb steel has good integrated property and it is used to make large welding structure, such as vessel, pipe line and heavy machine equipment.
14MnVTiRe	The 14MnVTiRe steel has good integrated property and weldability, and its low temperature tenacity is particularly good, so it can be used to make high pressure vessel, elevation machine and other welding structural piece.
15MnVN	The 15MnVN steel has high strength and good plasticity, tenacity and welding performance. It can be used to make boiler and high pressure vessel.

5. Alloy Construction Steel (YB6-71)

Table 2-1-11 The Chemical Components of Alloy Construction Steel

No.	Steel Grade		Chemical Composition (%)										
	Brand	Symbol	C	Si	Mn	Mo	W	Cr	Ni	V	Ti	B	Al
1	10锰2	10Mn2	0.07～0.13	0.20～0.40	1.20～1.60								
2	15锰2	15Mn2	0.12～0.18	0.20～0.40	2.00～2.40								
3	20锰2	20Mn2	0.17～0.24	0.20～0.40	1.40～1.80								
4	30锰2	30Mn2	0.27～0.34	0.20～0.40	1.40～1.80								
5	35锰2	35Mn2	0.32～0.39	0.20～0.40	1.40～1.80								
6	40锰2	40Mn2	0.37～0.44	0.20～0.40	1.40～1.80								
7	45锰2	45Mn2	0.42～0.49	0.20～0.40	1.40～1.80								
8	50锰2	50Mn2	0.47～0.55	0.20～0.40	1.40～1.80								
9	27硅锰	27SiMn	0.24～0.32	1.10～1.40	1.10～1.40								
10	35硅锰	35SiMn	0.32～0.40	1.10～1.40	1.10～1.40								
11	42硅锰	42SiMn	0.39～	1.10～1.40	1.10～								
12	10硅锰2	*10SiMn2	0.37～	0.60～1.00	1.10～								

TO BE CONTINUED

Continued

No.	Steel Grade		Chemical Composition (%)										
	Brand	Symbol	C	Si	Mn	Mo	W	Cr	Ni	V	Ti	B	Al
13	15锰钒	*15MnV	0.12～0.18	0.20～0.40	1.30～1.60					0.07～0.12			
14	20锰钒	20MnV	0.17～0.24	0.20～0.40	1.30～1.60					0.07～0.12			
15	25锰2钒	25Mn2V	0.22～0.29	0.20～0.40	1.80～2.10					0.10～0.20			
16	42锰2钒	42Mn2V	0.38～0.45	0.20～0.40	1.60～1.90					0.07～0.12			
17	45锰2钒	*45Mn2V	0.42～0.49	0.20～0.40	1.60～1.90					0.10～0.20			
18	15硅锰3钼	*15SiMn3Mo	0.11～0.17	0.90～1.20	3.00～3.[illegible]	0.50～0.60							
19	30锰2钼钨	*30Mn2MoW	0.27～0.34	0.20～0.40	1.70～2.00	0.40～0.50	0.60～1.00						
20	20硅锰2钼钒	*20SiMn2MoV	0.17～0.23	0.90～1.20	2.20～2.60	0.30～0.40				0.05～0.12			
21	25硅锰2钼钒	*25SiMn2MoV	0.22～0.28	0.90～1.20	2.20～2.60	0.30～0.40				0.05～0.12			
22	30硅锰2钼钒	*30SiMn2MoV	0.27～0.33	0.40～0.70	1.60～1.90	0.40～0.50				0.15～0.25			
23	35硅2锰2钼钒	*35Si2Mn2MoV	0.32～0.38	1.45～1.75	1.60～1.90	0.35～0.45				0.10～0.20			
24	37硅锰2钼钒	*37SiMn2MoV	0.33～0.39	0.60～0.90	1.60～1.90	0.40～0.50				0.05～0.12			

TO BE CONTINUED

Continued

No.	Steel Grade		Chemical Composition (%)										
	Brand	Symbol	C	Si	Mn	Mo	W	Cr	Ni	V	Ti	B	Al
25	12硅锰2钨钒	*12SiMn2WV	0.09～0.15	0.50～0.80	2.30～2.70		0.40～0.80			0.05～0.12			
26	16硅锰2钨钒	*16SiMn2WV	0.13～0.19	0.50～0.80	2.20～2.60		0.40～0.80			0.05～0.12			
27	15硅锰3钼钨钒	*15SiMn3MoWV	0.12～0.18	0.40～0.70	2.90～3.30	0.40～0.50	0.40～0.80			0.05～0.12			
28	37硅锰2钼钨钒	*37SiMn2MoWV	0.34～0.40	0.60～0.90	1.60～1.90	0.40～0.50	0.60～1.00			0.05～0.12			
29	20锰2硼	20Mn2B	0.17～0.24	0.20～0.40	1.50～1.80							0.001～0.004	
30	20锰钛硼	20MnTiB	0.17～0.24	0.20～0.40	1.30～1.60						0.06～0.12	0.001～0.004	
31	25锰钛硼	*25MnTiB	0.22～0.28	0.20～0.40	1.30～1.60						0.06～0.12	0.001～0.004	
32	20锰2钛硼	*20Mn2TiB	0.17～0.24	0.20～0.40	1.50～1.80						0.06～0.12	0.001～0.004	
33	15锰钒硼	*15MnVB	0.12～0.18	0.20～0.40	1.20～1.60					0.07～0.12		0.001～0.004	
34	20锰钒硼	20MnVB	0.17～0.24	0.20～0.40	1.20～1.60					0.07～0.12		0.001～0.004	
35	20锰2钒硼	*20Mn2VB	0.17～0.24	0.20～0.40	1.50～1.80					0.07～0.12		0.001～0.004	
36	20硅锰钒硼	20SiMnVB	0.17～0.24	0.50～0.80	1.30～1.60					0.07～0.12		0.001～0.004	

TO BE CONTINUED

Continued

No.	Steel Grade		Chemical Composition (%)										
	Brand	Symbol	C	Si	Mn	Mo	W	Cr	Ni	V	Ti	B	Al
37	30锰2钼钛硼	*30Mn2MoTiB	0.27～0.33	0.20～0.40	1.40～1.80	0.30～0.40					0.02～0.08	0.001～0.004	
38	40硼	40B	0.37～0.44	0.20～0.40	0.60～0.90							0.001～0.004	
39	45硼	45B	0.42～0.49	0.20～0.40	0.60～0.90							0.001～0.004	
40	50硼	50B	0.47～0.55	0.20～0.40	0.60～0.90							0.001～0.004	
41	40锰硼	40MnB	0.37～0.44	0.20～0.40	1.10～1.40							0.001～0.0035	
42	45锰硼	45MnB	0.42～0.49	0.20～0.40	1.10～1.40							0.001～0.0035	
43	45锰2硼	*45Mn2B	0.42～0.49	0.20～0.40	1.40～1.80							0.001～0.0035	
44	40锰钒硼	40MnVB	0.37～0.44	0.20～0.40	1.10～1.40					0.05～0.10		0.001～0.004	
45	40锰钨硼	*40MnWB	0.37～0.44	0.20～0.40	1.10～1.40		0.40～0.80					0.001～0.004	
46	38铬硅	38CrSi	0.35～0.43	1.00～1.30	0.30～0.60			1.30～1.60					
47	40铬硅	40CrSi	0.37～0.45	1.20～1.60	0.30～0.60			1.30～1.60					
48	15铬锰	15CrMn	0.12～0.18	0.20～0.40	1.10～1.40			0.40～0.70					

TO BE CONTINUED

Continued

No.	Steel Grade		Chemical Composition (%)										
	Brand	Symbol	C	Si	Mn	Mo	W	Cr	Ni	V	Ti	B	Al
49	20铬锰	20CrMn	0.17～0.24	0.20～0.40	0.90～1.20			0.90～1.20					
50	40铬锰	40CrMn	0.37～0.45	0.20～0.40	0.90～1.20			0.90～1.20					
51	20铬锰硅	20CrMnSi	0.17～0.23	0.90～1.20	0.80～1.10			0.80～1.10					
52	25铬锰硅	25CrMnSi	0.22～0.29	0.90～1.20	0.80～1.10			0.80～1.10					
53	30铬锰硅	30CrMnSi	0.27～0.34	0.90～1.20	0.80～1.10			0.80～1.10					
54	35铬锰硅	35CrMnSi	0.32～0.39	1.10～1.40	0.80～1.10			1.10～1.40					
55	15铬锰2硅钼	*15CrMn2SiMo	0.13～0.19	0.40～0.70	2.00～2.40	0.40～0.50		0.40～0.70					
56	20铬钒	20CrV	0.17～0.24	0.20～0.40	0.50～0.80			0.80～1.10		0.10～0.20			
57	40铬钒	40CrV	0.37～0.44	0.20～0.40	0.50～0.80			0.80～1.10		0.10～0.20			
58	45铬钒	45CrV	0.42～0.49	0.20～0.40	0.50～0.80			0.80～1.10		0.10～0.20			
59	50铬钒	50CrV	0.47～0.54	0.20～0.40	0.50～0.80			0.80～1.10		0.10～0.20			
60	20铬锰钛	20CrMnTi	0.17～0.24	0.20～0.40	0.80～1.10			1.00～1.30			0.06～0.12		

TO BE CONTINUED

Continued

No.	Steel Grade		Chemical Composition (%)										
	Brand	Symbol	C	Si	Mn	Mo	W	Cr	Ni	V	Ti	B	Al
61	30铬锰钛	30CrMnTi	0.24～0.32	0.20～0.40	0.80～1.10			1.00～1.30			0.06～0.12		
62	16钼	16Mo	0.13～0.19	0.20～0.40	0.40～0.70	0.40～0.55							
63	12铬钼	12CrMo	≤0.15	0.20～0.40	0.40～0.70	0.40～0.55		0.40～0.70					
64	15铬钼	15CrMo	0.12～0.18	0.20～0.40	0.40～0.70	0.40～0.55		0.80～1.10					
65	20铬钼	20CrMo	0.17～0.24	0.20～0.40	0.40～0.70	0.15～0.25		0.80～1.10					
66	30铬钼	30CrMo	0.26～0.34	0.20～0.40	0.40～0.70	0.15～0.25		0.80～1.10					
67	35铬钼	35CrMo	0.32～0.40	0.20～0.40	0.40～0.70	0.15～0.25		0.80～1.10					
68	42铬钼	42CrMo	0.38～0.45	0.20～0.40	0.50～0.80	0.15～0.25		0.90～1.20					
69	15铬锰钼	15CrMnMo	0.12～0.18	0.20～0.40	0.90～1.20	0.20～0.30		1.00～1.30					
70	20铬锰钼	20CrMnMo	0.17～0.24	0.20～0.40	0.90～1.20	0.20～0.30		1.10～1.40					
71	40铬锰钼	40CrMnMo	0.37～0.45	0.20～0.40	0.90～1.20	0.20～0.30		0.90～1.20					
72	12铬钼钒	12CrMoV	0.08～0.15	0.20～0.40	0.40～0.70	0.25～0.35		0.30～0.60		0.15～0.30			

TO BE CONTINUED

Continued

No.	Steel Grade		Chemical Composition (%)										
	Brand	Symbol	C	Si	Mn	Mo	W	Cr	Ni	V	Ti	B	Al
73	12铬1钼钒	12CrMoV	0.08～0.15	0.20～0.40	0.40～0.70	0.25～0.35		0.80～1.20		0.15～0.30			
74	24铬钼钒	24CrMoV	0.20～0.28	0.20～0.40	0.30～0.60	0.50～0.60		1.20～1.50		0.15～0.30			
75	25铬2钼钒	25Cr2MoV	0.22～0.29	0.20～0.40	0.10～0.70	0.25～0.35		1.50～1.80		0.15～0.30			
76	25铬2钼1钒	25Cr2Mo1V	0.22～0.29	0.20～0.40	0.50～0.80	0.90～1.10		2.10～2.50		0.30～0.50			
77	35铬钼钒	35CrMoV	0.30～0.38	0.20～0.40	0.40～0.70	0.20～0.30		1.00～1.30		0.10～0.20			
78	38铬钼铝	38CrMoAl	0.35～0.42	0.20～0.40	0.30～0.60	0.15～0.25		1.35～1.65					0.70～1.10
79	18铬3钼钨钒	18Cr3MoWV	0.15～0.21	0.20～0.40	0.30～0.60	0.50～0.70	0.50～0.80	2.50～3.00		0.05～0.12			
80	20铬3钼钨钒	20Cr3MoWV	0.17～0.24	0.20～0.40	0.30～0.60	0.35～0.50	0.30～0.60	2.60～3.00		0.70～0.90			
81	15铬	15Cr	0.12～0.18	0.20～0.40	0.40～0.70			0.70～1.00					
82	20铬	20Cr	0.17～0.24	0.20～0.40	0.50～0.80			0.70～1.00					
83	30铬	30Cr	0.27～0.34	0.20～0.40	0.50～0.80			0.80～1.10					
84	35铬	35Cr	0.32～0.39	0.20～0.40	0.50～0.80			0.70～1.10					

TO BE CONTINUED

Continued

No.	Steel Grade		Chemical Composition (%)										
	Brand	Symbol	C	Si	Mn	Mo	W	Cr	Ni	V	Ti	B	Al
85	40铬	40Cr	0.37～0.45	0.20～0.40	0.50～0.80			0.80～1.10					
86	45铬	45Cr	0.42～0.49	0.20～0.40	0.50～0.80			0.80～1.10					
87	50铬	50Cr	0.47～0.54	0.20～0.40	0.50～0.80			0.80～1.10					
88	20铬镍	20CrNi	0.17～0.24	0.20～0.40	0.40～0.70			0.45～0.75	1.00～1.40				
89	40铬镍	40CrNi	0.37～0.44	0.20～0.40	0.50～0.80			0.45～0.75	1.00～1.40				
90	45铬镍	45CrNi	0.42～0.49	0.20～0.40	0.50～0.80			0.45～0.75	1.00～1.40				
91	12铬镍2	12CrNi2	0.10～0.17	0.20～0.40	0.30～0.60			0.60～0.90	1.50～2.00				
92	12铬镍3	12CrNi3	0.10～0.17	0.20～0.40	0.30～0.60			0.60～0.90	2.75～3.25				
93	20铬镍3	20CrNi3	0.17～0.24	0.20～0.40	0.30～0.60			0.60～0.90	2.75～3.25				
94	30铬镍3	30CrNi3	0.27～0.34	0.20～0.40	0.30～0.60			0.60～0.90	2.75～3.25				

TO BE CONTINUED

Continued

No.	Steel Grade		Chemical Composition (%)										
	Brand	Symbol	C	Si	Mn	Mo	W	Cr	Ni	V	Ti	B	Al
95	37铬镍3	37CrNi3	0.34～0.41	0.20～0.40	0.30～0.60			1.20～1.60	3.00～3.50				
96	12铬2镍4	12Cr2Ni4	0.10～0.17	0.20～0.40	0.30～0.60			1.25～1.75	3.25～3.75				
97	20铬2镍4	20Cr2Ni4	0.17～0.24	0.20～0.40	0.30～0.60			1.25～1.75	3.25～3.75				
98	40铬镍钼	40CrNiMo	0.37～0.44	0.20～0.40	0.50～0.80	0.15～0.25		0.60～0.90	1.25～1.75				
99	45铬镍钼钒	45CrNiMoV	0.42～0.49	0.20～0.40	0.50～0.80	0.20～0.30		0.80～1.10	1.30～1.80	0.10～0.20			
100	30铬镍2钼钒	30CrNi2MoV	0.27～0.34	0.20～0.40	0.30～0.60	0.15～0.25		0.60～0.90	2.00～2.50	0.15～0.30			
101	18铬2镍4钨	18Cr2Ni4W	0.13～0.19	0.20～0.40	0.30～0.60		0.80～1.20	1.35～1.65	4.00～4.50				
102	25铬2镍4钨	25Cr2Ni4W	0.21～0.28	0.20～0.40	0.50～0.80		0.80～1.20	1.35～1.65	4.00～4.50				
103	30铬锰硅镍2	30CrMnSiNi2	0.26～0.33	0.90～1.20	1.00～1.30			0.90～1.20	1.40～1.80				

Note: Those which are attached * are new steel grade

Table 2-1-12 The Mechanical Properties of Alloy Construction Steel (1)

Ordinal number	Brand	Symbol	Size of rough sample (mm)	Heat Treatment: Quenching: Temperature (°C) 1st quench	Quenching: Temperature (°C) 2nd quench	Quenching: Coolant	Tempering: Temp. (°C)	Tempering: Coolant
1	10锰2	10Mn2	15	900	—	a	—	—
2	15锰2	15Mn2	15	900	—	a	—	—
3	20锰2	20Mn2	15	850 880	— —	W,O W,O	200 440	W,a W,a
4	30锰2	30Mn2	25	840	—	W	500	W
5	35锰2	35Mn2	25	840	—	W	500	W
6	40锰2	40Mn2	25	840	—	W	520	W
7	45锰2	45Mn2	25	840	—	O	550	W,O
8	50锰2	50Mn2	25	820	—	O	550	W,O
9	27硅锰	27SiMn	25	920	—	W	450	W,O
10	35硅锰	35SiMn	25	900	—	W	590	W,O
11	42硅锰	42SiMn	25	880	—	W	590	W
12	40硅锰2	*40SiMn2	25	880	—	W,O	550	W,O
13	15锰钒	*15MnV	15	880	—	W,O	200	W,a
14	20锰钒	20MnV	15	880	—	W,O	200	W,a
15	25锰2钒	25Mn2V	25	900	—	W,O	650	W
16	42锰2钒	42Mn2V	25	860	—	O	600	W
17	45锰2钒	*45Mn2V	25	860	—	O	600	W
18	15硅锰3钼	*15SiMn3Mo	15	950	870	a	200	W,a
19	30锰2钼钨	*30Mn2MoW	25	900	—	O	610	W,O
20	20硅锰2钼钒	*20SiMn2MoV	S	900	—	O	200	W,a
21	25硅锰2钼钒	*25SiMn2MoV	S	900	—	O	200	W,a
22	30硅锰2钼钒	*30SiMn2MoV	25	870	—	O	650	O
23	35硅2锰2钼钒	*35Si2Mn2MoV	S	920	—	O	250	W,a
24	37硅锰2钼钒	*37SiMn2MoV	25	870	—	W,O	650	W,a

Translator's note: a = air; w = water; o = oil; and s = sample

TO BE CONTINUED

Table 2-1-12 The Mechanical Properties of Alloy Construction Steel (2)

Mechanical Properties					The Brinell hardness of steel in annealing or high temperature tempering providing state, the impression diameter is no less than (mm)
Tensile strength σ_b (kg/mm^2)	Yield point σ_s (kg/mm^2)	Ext. rate δ_5 (%)	Contr. rate ψ (%)	Impact value a_k ($kg/m/cm^2$)	
No less than					
43	25	25	55	—	4.5
60	35	17	40	—	4.5
80	60	10	40	6	4.4
80	65	12	45	8	4.2
85	70	12	45	7	4.2
100	80	10	45	6	4.1
90	75	10	45	6	4.1
95	80	9	40	5	4.0
100	85	12	40	5	4.1
90	75	15	45	6	4.0
90	75	15	40	6	4.0
85	70	12	40	6	4.0
75	50	11	45	7	4.4
80	60	10	40	7	4.4
75	60	15	50	10	4.2
100	85	11	45	6	4.1
100	85	11	45	6	4.0
120	90	10	45	10	3.7
100	85	12	50	9	3.7
140	—	10	45	7	3.7
150		10	40	6	3.7
90		12	50	9	3.7
170		9	40	5	3.7
100	85	12	50	8	3.7

TO BE CONTINUED

Continued (1)

Ordinal Number	Brand	Symbol	Size of rough sample (mm)	Heat Treatment: Quenching: Temperature (°C) first quench	Quenching: Temperature (°C) 2nd quench	Quenching: Coolant	Tempering: Temp. (°C)	Tempering: Coolant
25	12硅锰2钨钒	*12SiMn2WV	15	860	—	O	200	W,a
26	16硅锰2钨钒	*16SiMn2WV	15	860	—	O	200	W,a
27	15硅锰3钼钨钒	*15SiMn3MoWV	15	950	880	a	200	W,a
28	37硅锰2钼钨钒	*37SiMn2MoWV	25	900	—	W,O	650	W,a
29	20锰2硼	20Mn2B	15	880	—	O	200	W,a
30	20锰钛硼	20MnTiB	15	860	—	O	200	W,a
31	25锰钛硼	*25MnTiB	S	860	—	O	200	W,a
32	20锰2钛硼	*20Mn2TiB	15	860	—	O	200	W,a
33	15锰钒硼	*15MnVB	15	860	—	O	200	W,a
34	20锰钒硼	20MnVB	15	860	—	O	200	W,a
35	20锰2钒硼	*20Mn2VB	15	860	—	O	200	W,a
36	20硅锰钒硼	20SiMnVB	15	900	—	O	200	W,a
37	30锰2钼钛硼	*30Mn2MoTiB	S	870	—	O	200	W,a
38	40硼	40B	25	840	—	W	550	W
39	45硼	45B	25	840	—	W	550	W
40	50硼	50B	20	840	—	O	600	a
41	40锰硼	40MnB	25	850	—	O	500	W,O
42	45锰硼	45MnB	25	840	—	O	500	W,O
43	45锰2硼	*45Mn2B	25	840	—	O	520	W
44	40锰钒硼	40MnVB	25	850	—	O	500	W,O
45	40锰钨硼	*40MnWB	25	870	—	W,O	500	W,O
46	38铬硅	38CrSi	25	900	—	O	600	W,O
47	40铬硅	40CrSi	S	900于330～350 i 900		O	540	W,O
48	15铬锰	15CrMn	15	880	—	O	200	W,a

Translator's note : a = air; o = oil; W = water; s = sample and i = isothermal quenching

TO BE CONTINUED

Continued (2)

Mechanical Properties					The Brinell hardness of steel in annealing or high temperature tempering providing state, the impression diameter is no less than (mm)
Tensile strength σ_b (kg/mm^2)	Yield point σ_s (kg/mm^2)	Ext. rate δ_5 (%)	Contr. rate ψ (%)	Impact value a_k (kg/m/cm^2)	
No less than					
100	80	10	50	10	3.7
120	90	10	45	8	3.7
120	90	10	45	10	3.7
100	85	12	45	7	3.7
100	80	10	45	7	4.4
115	95	10	45	7	4.4
140	—	10	40	6	4.0
115	95	10	45	7	4.2
90	65	10	45	7	4.2
110	90	10	45	7	4.2
120	90	10	45	7	4.2
120	100	10	45	7	4.2
150	—	9	40	5	3.8
80	65	12	45	7	4.2
85	70	12	45	6	4.1
80	55	10	45	5	4.2
100	80	10	45	6	4.2
105	85	9	40	5	4.1
100	85	9	40	5	4.1
100	80	10	45	6	4.2
100	80	10	45	7	4.0
100	85	12	50	7	3.8
125	105	11	40	5	3.8
80	60	12	50	6	4.5

TO BE CONTINUED

Continued (1)

Ordinal Number	Brand	Symbol	Size of rough sample (mm)	Heat Treatment: Quenching: Temperature (°C): first punch	Quenching: Temperature (°C): 2nd punch	Quenching: Coolant	Tempering: Temp. (°C)	Tempering: Coolant
49	20铬锰	20CrMn	15	850	—	o	200	w,a
50	40铬锰	40CrMn	25	840	—	o	520	w,o
51	20铬锰硅	20CrMnSi	25	880	—	o	480	w,o
52	25铬锰硅	25CrMnSi	25	880	—	o	450	w,o
53	30铬锰硅	30CrMnSi	25	880	—	o	520	w,o
54	35铬锰硅	35CrMnSi	s	880 $\frac{i}{880}$ 280~320		o	230	w,a
55	15铬锰2硅钼	*15CrMn2SiMo	15	860	—	o	200	w,a
56	20铬钒	20CrV	15	880	800	w,o	200	w,a
57	40铬钒	40CrV	25	880	—	o	650	w,o
58	45铬钒	45CrV	25	860	—	o	600	w,o
59	50铬钒	50CrV	25	860	—	o	500	w,o
60	20铬锰钛	20CrMnTi	15	880	870	o	200	w,a
61	30铬锰钛	30CrMnTi	s	880	850	o	200	w,a
62	16钼	16Mo	30	880	—	a	630	a
63	12铬钼	12CrMo	30	900	—	a	650	a
64	15铬钼	15CrMo	30	900	—	a	650	a
65	20铬钼	20CrMo	15	880	—	w,o	500	w,o
66	30铬钼	30CrMo	25	880	—	w,o	540	w,o
67	35铬钼	35CrMo	25	850	—	o	550	w,o
68	42铬钼	42CrMo	25	850	—	o	580	w,o
69	15铬锰钼	15CrMnMo	15	860	—	o	200	w,a
70	20铬锰钼	20CrMnMo	15	850	—	o	200	w,a
71	40铬锰钼	40CrMnMo	25	850	—	o	600	w,o
72	12铬钼钒	12CrMoV	30	970	—	a	750	a

Translator's note: a = air; w = water; o = oil; s = sample; and i = isothermal quenching

TO BE CONTINUED

Continued (2)

Mechanical Properties					The Brinell hardness of steel in annealing or high temperature tempering providing state, the impression diameter is no less than (mm)
Tensile strength σ_b (kg/mm^2)	Yield point σ_s (kg/mm^2)	Ext. rate δ_5 (%)	Contr. rate ψ (%)	Impact value a_k (kg/m/cm^2)	
not less than					
95	75	10	45	6	4.4
100	85	9	45	6	4.0
80	65	12	45	7	4.2
110	90	10	40	5	4.1
110	90	10	45	5	4.0
165	—	9	40	5	4.0
120	90	10	45	8	4.0
85	60	12	45	7	4.3
90	75	10	50	9	3.9
100	80	10	45	8	3.8
130	115	10	40	—	3.8
110	85	10	45	7	4.1
150	—	9	40	6	4.0
40	25	25	60	12	4.5
42	27	24	60	14	4.5
45	30	22	60	12	4.5
90	70	12	50	10	4.3
95	80	12	50	8	4.0
100	85	12	45	8	4.0
110	95	12	45	8	4.1
95	70	11	50	9	4.3
120	90	10	45	7	4.1
100	80	10	45	8	4.1
45	23	22	50	10	3.9

TO BE CONTINUED

Continued (1)

Ordinal Number	Brand	Symbol	Size of rough sample (mm)	Heat Treatment: Quenching: Temperature (°C) first punch	Quenching: Temperature (°C) 2nd punch	Quenching: Coolant	Tempering: Temp. (°C)	Tempering: Coolant
73	12铬 1 钼钒	12Cr1MoV	30	970	—	a	750	a
74	24铬钼钒	24CrMoV	25	900	—	o	600	W,o
75	25铬 2 钼钒	25Cr2MoV	25	900	—	o	620	a
76	25铬 2 钼1钒	25Cr2Mo1V	25	1040	—	a	700	a
77	35铬钼钒	35CrMoV	25	900	—	o	630	W,o
78	38铬钼铝	38CrMoAl	30	940	—	W,o	640	W,o
79	18铬 3 钼钨钒	18Cr3MoWV	25	960	—	o	700	W,o
80	20铬 3 钼钨钒	20Cr3MoWV	25	1050	—	a,o	720	W,o
81	15铬	15Cr	15	880	800	W,o	200	W,a
82	20铬	20Cr	15	880	800	W,o	200	W,a
83	30铬	30Cr	25	860	—	o	500	W,o
84	35铬	35Cr	25	860	—	o	500	W,o
85	40铬	40Cr	25	850	—	o	500	W,o
86	45铬	45Cr	25	840	—	o	520	W,o
87	50铬	50Cr	25	830	—	o	520	W,o
88	20铬镍	20CrNi	25	850	—	W,o	460	W,o
89	40铬镍	40CrNi	25	820	—	o	500	W,o
90	45铬镍	45CrNi	25	820	—	o	530	W,o
91	12铬镍 2	12CrNi2	15	860	780	W,o	200	W,a
92	12铬镍 3	12CrNi3	15	860	780	o	200	W,a
93	20铬镍 3	20CrNi3	25	830	—	W,o	480	W,o
94	30铬镍 3	30CrNi3	25	820	—	o	500	W,o
95	37铬镍 3	37CrNi3	25	820	—	o	500	W,o
96	12铬 2 镍 4	12Cr2Ni4	15	860	780	o	200	W,a
97	20铬 2 镍 4	20Cr2Ni4	15	880	780	o	200	W,a
98	40铬镍钼	40CrNiMo	25	850	—	o	600	W,o
99	45铬镍钼钒	45CrNiMoV	s	860	—	o	460	o
100	30铬镍 2 钼钒	30CrNi2MoV	25	860	—	o	650	W,o
101	18铬 2 镍 4 钨	18Cr2Ni4W	15	950	850	a	200	W,a
102	25铬 2 镍 4 钨	25Cr2Ni4W	25	850	—	o	550	W,o
103	30铬锰硅镍 2	30CrMnSiNi2	s	900	—	o	250	W,a
				900干260±20 i				

Translator's note: a = air; o = oil; w = water; s = sample and
i = isothermal quenching

Note: * indicates new steel of which the mechanical properties can only be used as reference and not a base upon which a conclusion is made

Continued (2)

Mechanical Properties					The Brinell hardness of steel in annealing or high temperature tempering providing state, the impression diameter is no less than (mm)
Tensile strength σ_b (kg/mm^2)	Yield point σ_s (kg/mm^2)	Ext. rate δ_5 (%)	Contr. rate ψ (%)	Impact value a_k (kg.m/cm^2)	
No less than					
50	25	22	50	9	4.5
80	60	14	50	6	3.8
95	80	14	55	8	3.9
75	60	16	50	6	3.9
110	95	10	50	9	3.9
100	85	14	50	9	4.0
65	45	18	40	12	4.0
80	65	14	40	7	4.0
75	50	11	45	7	4.5
85	55	10	40	6	4.5
90	70	11	45	6	4.4
95	75	11	45	6	4.2
100	80	9	45	6	4.2
105	85	9	40	5	4.1
110	95	9	40	5	4.0
80	60	10	50	8	4.3
100	80	10	45	7	3.9
100	80	10	45	7	3.8
80	60	12	50	8	4.2
95	70	11	50	9	4.1
95	75	11	55	10	3.9
100	80	9	45	8	3.9
115	100	10	50	6	3.7
110	85	10	50	9	3.7
120	110	10	45	8	3.7
100	85	12	55	10	3.7
150	135	7	35	4	3.7
90	80	12	50	9	3.9
120	85	10	45	10	3.7
110	95	11	45	9	3.7
160	—	9	40	6	3.8

Table 2-1-13 The Uses of Alloy Construction Steel

Kind of Steel	Steel Grade	Samples of Uses
Manganese steel	10Mn2	It is used to make steel plate and steel pipe. It is usually through normalizing.
	15Mn2	It is used to make steel plate and steel pipe. It is usually through normalizing or modification.
	20Mn2	It is equivalent to 20Cr steel in making spare parts of small cross-section. This steel can be used to make small gears of carbureter, pony axle, piston pin, diesel engine sleeve, valve push rod and steel case.
	30Mn2	It can be used to make modification steel, such as cold-heading bolt and modification parts with larger cross-section.
	35Mn2	It is equivalent to 40Cr steel in making spare parts of small cross-section. This steel can be used to make various cold-heading bolts (less than 15mm) for trucks and pony axle.
	40Mn2	It is equivalent to 40Cr steel in making spare parts of small cross-section. This steel can be used to substitute 40Cr steel to make important bolt and parts when the diameter is less than 50mm.
	45Mn2	It is equivalent to 40Cr steel in making spare parts of small cross-section. This steel can be used to substitute 40Cr steel to make important bolt and parts when the diameter is less than 50mm.
	50Mn2	This steel can be used to make spline shaft of autocar, internal gear of heavy machine and gear shaft.
Silicon-manganese steel	27 SiMn	This steel can be used to make modification steel
	35SiMn	This steel can be used to substitute 40Cr steel to make mdofication parts when low temperature (-20°C) and high tenacity are required and can also partially substitute 40CrNi steel. The anti-abroadability and fatigure resistance of this steel are both very good, so it can be used to make axle, comwheel and important fastening piece under 430°C.
	36Mn2Si	It can be used to make steel pipe, and after normalizing, it can also be used to make modification parts which can avoid hardening transformation.
	42SiMn	It is same as 35SiMn steel, but it is exclusively used to do surface hardening.
Manganese-vanadium steel	30MnV	It is equivalent to 20CrNi steel
	25Mn2V	It can be used to make baffle plate and blade (medium temperature and pressure) of steam engine.
	42Mn2V	It can be used to make high strength axle and the important autocar modification piece, such as swivel joint and secondary axis.

TO BE CONTINUED

Continued

Kind of Steel	Steel Grade	Samples of Uses
Chrome Steel	15Cr	This steel can be used to make bolt used on the main engine of a ship, piston pin, cam wheel, cam axle, cover ring of steam engine and small spare parts of locomotive. It can also be used to make carbureter parts which require high central strength.
	20Cr	This steel is used to make piston pin of diesel engine, cam wheel, axle, the turning gear of small tractor and some important carburetion parts. 20MnVB, 20Mn2B can be used as its substitute.
	30Cr	This steel can be used to make bolt and other important modification spare parts.
	40Cr	This steel is used to make modification parts, such as autocar swivel joint, conecting rod, bolt, gas inlet valve, important gear and axle. 40MnB and 40MnVB can be used as its substitute.
	45Cr	This steel can be used to make tractor clutch, gear, diesel engine connecting rod, bolt and tappet rod.
	50Cr	This steel is used to make central axle of bearing roll, axle or gear which requires high strength and abrasive resistance, and axle cover of ring oiling bearing.
Chrome Silicon Steel	38CrSi	This steel can be used to make gas inlet valve of tractor and oil pump gear of internal combustion engine.
	40CrSi	This steel can be used to make axlebox, heat resistant piece, bearing plate and hot-saw.
	15CrMn	This steel can be used to make sealed axlebox of steam engine
	20CrMn	This steel can be used to make machine casced accelerator, friction-wheel, gear and axle. Its properties are similar to thos of 20CrMi steel, and they can be better than 20Cr after heat treatment.
	35CrMn2	This steel can be used as substite for 35CrMo to make spare parts of which the cross-section is not very large and the temperature is not very high.
	40CrMn	This steel can be used to substitute 42CrMo to make spare parts of which the cross-section is not very large and the temperature is not very high.
Chrome-manganes-silicon Steel	20CrMnSi	This steel can make components of high strength and its weldability is good.
	25CrMnSi	This steel can make components of high strength and it can be welded.

TO BE CONTINUED

Continued

Kind of Steel	Steel Grade	Samples of Uses
	30CrMnSi	This steel can be used to make high strength steel, high pressure blower, high pressure compressor and axle of high speed rotating emery wheel.
	35CrMnSiA	This steel can be used to make high strength steel, the blade wheel of high pressure blower and high pressure used on aircrafts.
Chrome-vanadium Steel	10CrV	This steel can be used to make blade of separation plate on a steam turbine and nozzle.
	16Cr2VA	This steel can be used to make core of high pressure anti-chlorine jar.
	20CrV	This steel can be used to make female screw for the use on steam turbine.
	35Cr2V	This steel can be used to make blade wheel of steam turbine and its yield point σ_s is required to be 60-70kg/mm^2.
	40CrV	This steel can be used to make water-injection pump shaft, tension couple-bolt (420°C, 360 atmosphere pressure), locomotive connecting rod.
	45CrV	This steel can be used to substitute 40CrNi steel to make large axle (500-900mm), universal joint of rolling mill (1000-1200mm), pressure bolt (above 300mm). Its integrated mechanical property is good.
	50CrVA	This steel can be used to make important spare parts of steam temperature over 400°C and large springs which can bear large load and have high fatigue strength.
Chrome-manganese-titanium Steel	18CrMnTi	This steel can be used to make important gears for the use on automobile and tractor and decelerator gear of high strength and tenacity. It can have carburization treatment.
	30CrMnTi	This steel can be used to make important gears of large cross-section for the use on automobile and tractor, such as drive bevel gear, rear main gear and carburization gear which requires very high central strength.
	35CrMnTi	This steel can be used to make modification steel pieces of large size.
	40CrMnTi	This steel can be used to make large gears and main axle which must have great strength and good abrasive resistance, such as the large gears and main axle on heavy machine tool.
Chrome-tungsten-vanadium Steel	20CrWV	This steel can be used to make blades and pins of steam turbine
Molybdenum Steel	16Mo	This steel can be used to make separation plate, special bolt and flannel disc (steam parameter reaches 450°C and the temperature of pipe wall is

TO BE CONTINUED

Continued

Kind of Steel	Steel Grade	Samples of Uses
		475°C of various coil pipes and conduit pipes and their corresponding forgings for the use on steam turbine.
	12CrMo	This steel can be used to make main steam pipe of which the steam temperature can reach 510°C, coil pipes of which the pipe wall temperature is over 540°C and conduit pipes and their forgings.
	12Cr3MoV	This steel can be used to make high pressure anti-chlorine steel.
	15CrMo	This steel can be used to make main steam pipe of which the steam temperature can reach 510°C, various coil pipes of which the pipe wall temperature is over 530°C, conduit pipes and their corresponding forgings.
	20CrMo	This steel can be used as high grade steel used for carburization.
	25CrMoV	This steel can be used to make bolt and flange which show great stress when under 500°C, steam pipe, high pressure pipe of more than 50 atmospher pressure and bolts and flanges on large equipment.
	30CrMo	This steel can be used to make fastening piece of boiler under 480°C, flange and bolt receiving high pressure under 500°C. It is especially good for making pipes which receive 300 atmosphere pressure and above 400°C.
	35CrMo	This steel can be used to substitute 30CrNiMo and 40CrNi steel to make large gears and axle, generator rotor of steam turbine and fastener of boiler under 470°C.
	42CrMo	This steel can be used to substitute modification steel which contains Ni and the steel used to make large forgings. It can also be used to make large towing gear of locomotive, turning gear of pressurizer and the joint of petroleum driller for a well depth of 1200-2000 meters and drawing instrument.
Chrome-manganese-molybdenum Steel	15CrMnMo	This steel can be used as high grade carburized steel and substitute carburized steel which has high content of Ni. It can also be used to make turning gear on the rear axle of a large tractor, piston pin, geared drill of petroleum driller and spare parts of small cross-section. 22CrMnMo
	22CrMnMo	This steel can be used to make component parts of large cross-section.
	35Cr2MnMo	This steel is good for making petroleum equipment

TO BE CONTINUED

Continued

Kind of Steel	Steel Grade	Samples of Uses
		and high pressure pipeline and steel plate used for making carbon hydrogen compound. It can also be used to make component parts of which the wall thickness is above 120mm, such as furnace shell and furnace cover.
	40CrMnMo	This steel is equivalent to 40CrNiMo high grade modification steel
Chrome-molybdenum-vanadium Steel	12CrMoV	This steel can be used to make steam turbine separation plate, separation plate outer ring, main steam pipe and steering blade ring.
	12Cr1MoV	This steel can be used to make main steam pipe in which the steam temperature can reach 540°C, coil pipe of which the pipe wall temperature is over 570°C and conduit pipe and its corresponding forgings.
	15CrMoV	This steel can be used to make main steam pipe in which the steam temperature can reach 580°C.
	24CrMoV	This steel can be used to make rotor of 50,000 - 100,000kw steam turbo-generator, steam turbine blade wheel (yield strength σ_s 65-75kg/mm^2), and it can subtitute chrome-nickel-molybdenum steel to make turning gear and axle for electric spade of 4m^3.
	25Cr2MoVA	This steel can be used to make rotor sleeve of a steam turbin, valve, main steam valve, adjusting valve, female screw for steam temperature 535 - 550°C and bolt for temperature under 530°C.
	25Cr2MoVA	This steel can be used to make front cylinder of steam turbine in which the steam temperature can reach 565°C, bolt, and valve stem.
	30Cr2MoV	This steel can be used to make rotor of large steam turbo-generator, high grade modification steel, 1150 blooming mill gear, shaft gear and petroleum drill explore aperture gun.
	35CrMoV	This steel can be used to make rotor of turbo-blower and compressor, cover disk and shaft disk.
	40Cr2MoV	This is high grade modification steel of high strength and good tenacity. It can be used to make gears of large cross-section and high strength, axle, wheel rim and the rotating part of a wheel. It can have high frequency hardening.
Chrome-silicon-molybdenum-vanadium Steel	30CrSiMoV	This steel can be used to make high pressure bolt and flange under 500°C and heat resistant bolt which requires very high creep strength. It can also be used to make steam pipeline and high pressure pipeline over 100 atmosphere pressure and bolt and flange of large cross-section.

Continued

Kind of Steel	Steel Grade	Samples of Uses
Chrome-aluminum Steel	38CrAl	This steel can be used in machine tool to make carburation component parts which must have very high hardness, abrasive resistance, fatigue strength and corrosion resistance, and component parts which has little change after heat treatment, such as precise sleeve and machine tool main axle.
Chrome-molybdenum-aluminum Steel	38CrMoAlA	This steel can be used to make carburation parts, such as high pressure valve stem and valve opening.
Chrome-wolfram-vanadium-aluminum Steel	38CrWVAl	This steel can be used to make machine parts which require Vickers hardness HV above 900 after being nitrogenated, such as borer, bore rod and screw rod.
Boron Steel	20Mn2B	This steel can substitute 20Cr steel to make carburation component parts.
	20MnTiB	This steel can substitute 18CrMnTi steel to make high grade gears.
	20MnVB	This steel can substitute 20CrNi steel to make carburation parts and can also be used as 20Cr steel.
	20SiMnVB	This steel can substitute 18CrMnTi steel to make high grade carburation gears.
	20CrMnB	This steel can substitute 18CrMnTi steel to make high grade carburation gears.
	20MnMoB	Generally this steel can substitute 12CrNi3 steel to important gears.
	20CrMnVBA	This steel can be used to make high grade carburation gears. It is equivalent to chrome-nickel steel which contains Ni3-4%.
	40B	The hardenability and strength of this steel are higher than steel No.40. It can be used to make machine parts of large cross-section.
	45B	The hardenability and strength of this steel are higher than steel No.45. It can be used to make machine parts of large cross-section.
	40MnB	The properties of this steel are similar to 40Cr steel. It can be used to make modification steel, and can also be used as 40Cr steel.
	45MnB	The properties of this steel are similar to those of 45Cr steel. It can be used to make modification steel, and can also be used as 40Cr steel.
	40MnVB	The properties of this steel are better than those of 40Cr steel. It can be used to make modification steel, and can also be used as 40Cr steel
	40CrB	The contents of chrome of this steel is lower than 40Cr steel. It can be used as 40Cr steel

Continued

Kind of Steel	Steel Grade	Samples of Uses
	40CrMnB	This steel can substitute 40CrMnMo steel.
	40CrMnMoVBA	This is high grade modification steel. The component parts made of this steel can have large cross-section, such as high pressure blower blade wheel and large gears.
Chrome-molybdenum-tungsten-vanadium Steel	18Cr3MoWVA	This steel is used for high pressure anti-hydrogen (300 atmosphere pressure equipment).
	20Cr3MoWVA	This steel is used for high pressure anti-hydrogen (700 atmosphere pressure equipment).

6. Carbon Tool Steel (YB5-59)

Table 2-1-14 The Chemical Composition of Carbon Tool Steel

No.	Steel Grade		Chemical Composition (%)				
	Brand	Symbol	Carbon	Manganese	Silcon	S	P
						No More Than	
1	碳7	T7	0.65～0.74	0.20～0.40	0.15～0.35	0.030	0.035
2	碳8	T8	0.75～0.84	0.20～0.40	0.15～0.35	0.030	0.035
3	碳8锰	T8Mn	0.80～0.90	0.35～0.60	0.15～0.35	0.030	0.035
4	碳9	T9	0.85～0.94	0.15～0.35	0.15～0.35	0.030	0.035
5	碳10	T10	0.95～1.04	0.15～0.35	0.15～0.35	0.030	0.035
6	碳11	T11	1.05～1.14	0.15～0.35	0.15～0.35	0.030	0.035
7	碳12	T12	1.15～1.24	0.15～0.35	0.15～0.35	0.030	0.035
8	碳13	T13	1.25～1.35	0.15～0.35	0.15～0.35	0.030	0.035
9	碳7高	T7A	0.65～0.74	0.15～0.30	0.15～0.30	0.020	0.030
10	碳8高	T8A	0.75～0.84	0.15～0.30	0.15～0.30	0.020	0.030
11	碳8锰高	T8MnA	0.80～0.90	0.35～0.60	0.15～0.30	0.020	0.030
12	碳9高	T9A	0.85～0.94	0.15～0.30	0.15～0.30	0.020	0.030
13	碳10高	T10A	0.95～1.04	0.15～0.30	0.15～0.30	0.020	0.030
14	碳11高	T11A	1.05～1.14	0.15～0.30	0.15～0.30	0.020	0.030
15	碳12高	T12A	1.15～1.24	0.15～0.30	0.15～0.30	0.020	0.030
16	碳13高	T13A	1.25～1.35	0.15～0.30	0.15～0.30	0.020	0.030

Table 2-1-15 The Hardness of Carbon Tool Steel

Steel Grade	Hardness after annealin		Hardness after hardening	
	HB No more than	d = 10mm, p = 300°kg impression diameter (mm) no less than	Hardening temp. (°C) and cool-ant	HRC No less than
T7, T7A	187	4.4	800-820, water	62
T8, T8A	187	4.4	780-800, water	62
T8Mn, T8MnA	187	4.4	780-800, water	62
T9, T9A	192	4.35	760-780, water	62
T10, T10A	197	4.3	760-780, water	62
T11, T11A	207	4.2	760-780, water	62
T12, T12A	207	4.2	760-780, water	62
T13, T13A	217	4.1	760-780, water	62

Table 2-1-16 The uses of carbon tool steel

Steel Grade	Samples of Uses
T7A	This steel can be used to make tools which can stand vibration and shock, and under the condition of appropriate hardness the tool has great tenacity, such as chisel, carpenter's saw and metal saw and hammer.
T8A	This steel can be used to make various tools which can stand vibration and require adequate tenacity and high hardness, such as simple press mold and saw blade.
T9A	This steel can be used to make tools which has tenacity and definite hardness, such as press mold.
T10A	This steel can be used to make tool which receives no strong vibration but requires sharp cutting edge, such as cutter, bore-bit, wire-drawing mold and file.
T11A	This steel can be used to make cutters which require an integrated property of good tenacity, hardness and abrasive resistance, such as wire-cone and erasing knife.
T12A	This steel can be used to make tools which receive no shock but have high strength, such as cutter, milling cutter, shear, wire-cone, measuring gauge, edge-cutting mold and punching mold.
T13A	This steel can be used to make cutters which receive no shock but require extremely high strength, such as erasing knife, and wire-drawing tool.

7. Alloy Tool Steel (YB7-59)

Table 2-1-17 The Chemical Composition of Alloy Tool Steel

Group No.	Ordinal No.	Steel Group	Steel Grade		Chemical Composition (%)						
			Brand	Symbol	C	Mn	Si	Cr	V	W	Mo
1	1	Mn steel	9 锰 2	9Mn2	0.85～0.95	1.70～2.00	≤0.35	—	—	—	—
2	2	MnV steel	9 锰 2 钒	9Mn2V	0.85～0.95	1.70～2.00	≤0.35	—	—	0.10～0.25	—
3	3	MnCrWV steel	锰铬钨钒	MnCrWV	0.95～1.05	1.00～1.30	≤0.35	0.40～0.60	0.40～0.60	0.15～0.30	—
4	4	MnSi steel	8 锰硅	8MnSi	0.75～0.85	0.80～1.10	0.30～0.60	—	—	—	—
	5	SiMn steel	5 锰硅	5MnSi	0.50～0.60	0.90～1.20	0.80～1.10	—	—	—	—
	6		7 锰硅 2	7MnSi2	0.65～0.75	0.50～0.80	1.50～1.80	—	—	—	—
	7		锰硅	MnSi	0.95～1.05	0.60～0.90	0.65～0.95	—	—	—	—
5	8	SiMnV steel	6 硅锰钒	6SiMnV	0.55～0.65	0.90～1.20	0.80～1.10	—	—	0.15～0.30	—
	9		硅锰钒	SiMnV	1.30～1.50	0.70～1.00	0.70～1.00	—	—	0.15～0.30	—
6	10	SiMnW steel	6 硅锰钨	6SiMnW	0.60～0.70	0.60～0.90	0.90～1.20	—	1.20～1.50	—	—
7	11	SiMnMoV steel	5 硅锰钼钒	5SiMnMoV	0.45～0.55	0.50～0.70	1.50～1.80	0.20～0.40	—	0.20～0.30	0.30～0.50
8	12	SiCr steel	6 硅铬	6SiCr	0.55～0.65	0.40～0.60	1.20～1.50	0.50～0.80	—	—	—
	13		9 硅铬	9SiCr	0.85～0.95	0.30～0.60	1.20～1.60	0.95～1.25	—	—	—
	14		硅铬	SiCr	1.10～1.30	≤0.40	1.00～1.30	1.10～1.40	—	—	—
	15		硅铬 3	SiCr3	1.40～1.60	≤0.40	1.30～1.60	3.30～3.60	—	—	—
9	16	SiCrV steel	4 硅铬钒	4SiCrV	0.40～0.50	≤0.40	1.20～1.50	1.30～1.60	—	0.20～0.35	—
10	17	Cr steel	铬 2	Cr2	0.95～1.10	≤0.40	≤0.35	1.30～1.65	—	—	—
	18		铬	Cr	0.95～1.10	≤0.40	≤0.35	0.75～1.05	—	—	—
	19		铬 06	Cr06	1.30～1.45	0.20～0.40	≤0.35	0.50～0.70	—	—	—

TO BE CONTINUED

Continued

Group No.	Ordinal	Steel Group	Steel Grade		Chemical Composition (%)						
			Brand	Symbol	C	Mn	Si	Cr	W	V	Mo
	20		9铬2	9Cr2	0.80～0.95	0.20～0.35	0.25～0.45	1.40～1.70	—	—	—
	21		8铬3	8Cr3	0.76～0.85	0.20～0.40	≤0.35	3.2～3.80	—	—	—
	22		8铬	8Cr	0.80～0.90	0.20～0.40	≤0.35	0.45～0.70	—	—	—
	23		铬12	Cr12	2.00～2.30	≤0.35	≤0.40	11.50～13.00	—	—	—
11	24	Cr'n steel	铬2钼	Cr2Mo	1.80～2.10	0.70～1.00	≤0.40	1.80～2.10	—	—	—
	25		铬锰	CrMn	1.30～1.50	0.45～0.75	≤0.35	1.30～1.60	—	—	—
12	26	CrMn'o steel	5铬锰钼	5CrMnMo	0.50～0.60	1.20～1.60	0.25～0.60	0.60～0.90	—	—	0.15～0.30
13	27	Cr'nWV steel	铬6钨钒	Cr6WV	1.00～1.15	≤0.45	≤0.35	5.50～7.00	1.10～1.50	0.50～0.70	—
14	28	CrMnSi steel	铬2锰硅	Cr2MnSi	0.95～1.10	0.80～1.20	0.50～1.00	1.40～1.80	—	—	—
15	29	Cr'nSiWV steel	4铬3锰硅钨钒	4Cr3MnSiWV	0.40～0.50	1.35～1.65	0.80～1.20	2.50～3.00	0.80～1.20	0.20～0.40	—
16	30	CrW steel	铬钨	CrW	1.10～1.25	0.20～0.40	≤0.35	0.60～0.80	1.20～1.50	—	—
	31		铬钨5	CrW5	1.25～1.50	≤0.30	≤0.30	0.40～0.70	4.50～5.50	—	—
	32		铬12钨	Cr12W	2.00～2.30	≤0.35	≤0.40	11.00～12.50	0.60～0.90	—	—
17	33	CrWV steel	3铬2钨8钒	3Cr2W8V	0.30～0.40	0.20～0.40	≤0.35	2.20～2.70	7.50～9.00	0.20～0.50	—
18	34	CrWV steel	铬钨锰	CrWMn	0.90～1.05	0.80～1.10	0.15～0.35	0.90～1.20	1.20～1.60	—	—
	35		9铬钨锰	9CrWMn	0.85～0.95	0.90～1.20	0.15～0.35	0.50～0.80	0.50～0.90	—	—
19	36	CrWSi steel	5铬钨2硅	5CrW2Si	0.45～0.55	0.20～0.40	0.50～0.80	1.00～1.30	2.00～2.50	—	—
	37		6铬钨2硅	6CrW2Si	0.55～0.65	0.20～0.40	0.50～0.80	1.00～1.30	2.20～2.70	—	—
	38		4铬钨2硅	4CrW2Si	0.35～0.45	0.20～0.40	0.80～1.00	1.00～1.30	2.00～2.50	—	—
20	39	CrMoV steel	铬12钼钒	Cr12MoV	1.45～1.70	≤0.35	≤0.40	11.00～12.50	—	0.15～0.30	0.40～0.60

TO BE CONTINUED

Continued

Group No.	Ord. No.	Steel Group	Steel Grade		Chemical Composition (%)						
			Brand	Symbol	C	Mn	Si	Cr	W	V	Mo
21	40	CrVMoW steel	4铬钒钼钨	4CrVMoW	0.40～0.50	0.30～0.60	0.50～0.80	1.20～1.50	0.40～0.50	0.75～0.85	0.30～0.50
22	41	Cr Al Steel	3铬铝	3CrAl	0.30～0.40	0.20～0.40	≤0.35	1.20～1.50	铝1.00～1.50	—	—
23	42	CrV steel	8铬钒	8CrV	0.80～0.90	0.30～0.60	≤0.35	0.45～0.70	—	0.15～0.30	—
	43		铬钒	CrV	1.10～1.25	≤0.40	≤0.35	0.45～0.70	—	0.15～0.30	—
24	44	CrNiMo steel	5铬镍钼	5CrNiMo	0.50～0.60	0.50～0.80	≤0.35	0.50～0.80	镍1.40～1.80	—	0.15～0.30
25	45	W steel	钨	W	1.05～1.25	0.20～0.40	≤0.35	0.10～0.30	0.80～1.20	—	—
	46		钨2	W2	1.10～1.25	0.20～0.40	≤0.35	0.10～0.30	1.80～2.20	—	—
26	47	WCrSiV steel	5钨2铬硅钒	5W2CrSiV	0.50～0.60	0.20～0.40	0.80～1.10	0.80～1.10	1.80～2.20	0.15～0.30	—
	48		4钨2铬硅钒	4W2CrSiV	0.40～0.50	0.20～0.40	0.80～1.10	0.80～1.10	1.80～2.20	0.15～0.30	—
	49		3钨2铬硅钒	3W2CrSiV	0.30～0.40	0.20～0.40	0.80～1.10	0.80～1.10	1.80～2.20	0.15～0.30	—
	50		3钨4铬硅钒	3W4CrSiV	0.30～0.40	0.20～0.40	0.80～1.10	0.80～1.10	3.80～4.20	0.15～0.30	—
27	51	WCrV steel	3钨4铬2钒	3W4Cr2V	0.30～0.40	0.20～0.40	≤0.35	2.20～2.70	4.20～4.70	0.50～0.70	—
	52		8钨2铬钒	8W2CrV	0.75～0.90	≤0.40	≤0.35	1.00～1.20	1.80～2.10	0.20～0.40	—
	53		钨铬钒	WCrV	1.20～1.40	≤0.40	≤0.35	0.30～0.50	0.80～1.10	0.15～0.30	—
	54		钨3铬钒	W3CrV	1.30～1.50	≤0.40	≤0.35	0.30～0.50	3.00～3.50	0.20～0.40	—
28	55	V steel	钒	V	0.95～1.05	0.20～0.40	≤0.35	—	—	0.20～0.40	—
	56	V steel	8钒	8V	0.75～0.85	0.20～0.40	≤0.35	—	—	0.15～0.30	—

Note: The contents of sulfur and phosphorus in the steel must not be over 0.03%.

Table 2-1-18 The Hardness of Alloy Tool Steel

Group No.	Ordinal	Steel Grade	Delivery state steel (HB)	Delivery state steel Impression diameter(mm) d = 10mm P = 3000kg	Hardened steel Temperature(°C) and test piece hardener	Hardened steel HRC (no lower than)
1	1	*9Mn2	≤229	≥4.0	760~780, water	62
2	2	*9Mn2V	≤229	≥4.0	780~810, oil	62
3	3	*MnCrWV	≤223	≥4.05	800~820, oil	63
4	4	*8MnSi	≤229	≥4.0	800~820, oil	60
	5	*5MnSi	≤229	≥4.0	800~840, water	58
	6	*7MnSi2	≤229	≥4.0	820~850, oil	55
	7	*MnSi	229~187	4.0~4.4	800~820, water	62
5	8	*6SiMnV	≤229	≥4.0	830~860, oil	56
	9	*SiMnV	≤217	≥4.1	780~815, oil	64
6	10	*6SiMnW	≤229	≥4.0	820~850, oil	57
7	11	*5SiMnMoV	≤217	≥4.1	840~900, water	61
8	12	*6SiCr	≤229	≥4.0	830~860, oil	57
	13	*9SiCr	241~197	3.9~4.3	820~860, oil	62
	14	*SiCr	≤241	≥3.9	830~860, oil	62
	15	*SiCr3	≤269	≥3.7	840~860, oil	64
9	16	*4SiCrV	≤229	≥4.0	860~900, oil	57
10	17	*Cr2	229~179	4.0~4.5	830~860, oil	62
	18	*Cr	229~179	4.0~4.5	830~860, oil	62
	19	*Cr06	241~187	3.9~4.4	780~810, water	64
	20	9Cr2	217~179	4.1~4.5	820~850, oil	62
	21	8Cr8	255~207	3.8~4.2	850~880, oil	55
	22	*8Cr	≤229	≥4.0	800~830, oil	61
	23	Cr12	269~217	3.7~4.1	950~1000, oil	60
11	24	*Cr2Mn	≤229	≥4.0	830~860, oil	62
	25	CrMn	241~197	3.9~4.3	800~830, oil	61
12	26	5CrMnMo	241~197	3.9~4.3	820~850, oil	60
13	27	*Cr6WV	≤235	≥3.95	960-1020 oil or air	60
14	28	Cr2MnSi	255~207	3.8~4.2	830~860, oil	62
15	29	*4Cr3MnSiWV	≤229	≥4.0	930~960, oil	52
16	30	*CrW	≤223	≥4.05	840~870, oil	62
	31	CrW5	285~229	3.6~4.0	800~820, water	63
	32	*Cr12W	≤272	≥3.68	940~970, oil	59
17	33	3Cr2W8V	255~207	3.8~4.2	1075~1125, oil	46

TO BE CONTINUED

Continued

Group No.	Ordinal	Steel Grade	Delivery state steel (HB)	Delivery state steel Impression diameter(mm) d = 10mm P = 3000kg	Hardened steel Temperature (°C) and test piece hardness	Hardened steel HRC (no lower than
18	34	CrWMn	255~207	3.8~4.2	800~830, oil	62
	35	9CrWMn	241~197	3.9~4.3	800~830, oil	62
19	36	6CrW2Si	285~229	3.6~4.0	860~900, oil	57
	37	5CrW2Si	255~207	3.8~4.2	860~900, oil	55
	38	4CrW2Si	217~179	4.1~4.5	860~900, oil	53
20	39	Cr12MoV	255~207	3.8~4.2	950~1000, oil	58
21	40	*4CrVMoW	≤244	≥3.88	1000~1050, oil	56
22	41	*3CrAl	≤244	≥3.88	850~880, water	50
23	42	8CrV	207~170	4.2~4.6	800~850, water	61
	43	*CrV	≤229	≥4.0	810~840, oil	62
24	44	5CrNiMo	241~197	3.9~4.3	830~860, oil	47
25	45	W	229~187	4.0~4.4	800~830, water	62
	46	W2	255~207	3.8~4.2	800~830, water	62
26	47	*5W2CrSiV	≤223	≥4.05	840~860, oil	58
	48	*4W2CrSiV	≤234	≥3.96	880~920, oil	56
	49	*3W2CrSiV	≤229	≥4.0	960~1000, oil	50
	50	*3W4CrSiV	≤244	≥3.88	1000~1050, oil	48
27	51	*3W4Cr2V	≤244	≥3.88	1050~1100, oil	52
	52	*8W2CrV	≤244	≥3.88	850~880, oil	61
	53	*WCrV	≤234	≥3.96	770~800, water	64
	54	*W3CrV	≤272	≥3.68	790~820, water	64
28	55	V	217~179	4.1~4.5	780~820, water	62
	56	*8V	≤201	≥4.25	780~810, water	60

Note: The data of steels which are attached a mark of * can only be used as reference.

Table 2-1-19 The Uses of Alloy Tool Steel

Group No.	Order No.	Steel Grade	Samples of Uses
1	1	9Mn2	Small die, die and shear, cold press die, carving die, die-filling, various measuring gauges of slight shape-change, profile gauge, die hob, die block and shear.
2	2	9Mn2V	Same as stated above.
3	3	MnCrW	Same as stated above.
4	4	8MnSi	Carpenter's chisel, saw blade and other cutting tools.
	5	MnSi	This steel can be used to make puncher and hole-magnifier and hot-forging die and punch of small size.
	6	7MnSi2	Edger, puncher, hole-magnifier, hot-press forming die, bolt, dogmail and punch.
	7	MnSi	Drawing die, cold punch and cutters.
5	8	6SiMnV	Forging die of small or medium size.
	9	SiMnV	Die plate, cold reviting die, cut-off die, cold punch, measuring gauge and die hob.
6	10	6SiMnV	Hand chisel, pneumatic chisel, punch, revit die, pneumatic bore and pneumatic pickax.
7	11	5SiMnMoV	Hand or pneumatic chisel, boiler tools, forging tools, heavy-load punch, shear, impetuous-vibration cutter, revit die and cold boring die.
8	12	6SiCr	Cold punch, pneumatic chisel.
	13	9SiCr	Die block, die hob, bore bit, shear, gear milling cutter, cold punch and cold-rolling roller.
	14	SiCr	Stamp-forming die, steel stamp and puncher, shear, milling cutter and die block.
	15	SiCr3	Die, press-forging die, complicated punching die, punch, shear, die hob and milling cutter.
9	16	4SiCrV	Hot hammer, stamp-forming die, hot-cutting tools and stamping die.
10	17	Cr2	Cutting tools, cutter, knife, block cutter, measuring tools, profile gauge, shear, ram pin, eccentric wheel and cold roller.
	18	Cr	Same as stated above.
	19	Cr06	Shaving knife and blade, erasing knife, craving knife and file.
	20	9Cr2	This steel can be used to make cold-rolling roller, press-rolling roller, steel stamp piercing chisel, cold die and punch and carpenter's tools.
	21	3Cr2	Hot-combing die, bolt and screw die.
	22	3Cr	Cold-working steel stamp, combing die, punch, chain rod, push rod, chisel, carpenter's planer and blade cutter.

TO BE CONTINUED

Continued

Group No.	Order No.	Steel Grade	Samples of Uses
	23	Cr12	Cold-die punch, cold-cutting shear (hard and thin metal) bore jacket, measuring gauge, screw-thread rolling die, metallurgical powder die, die filling, drawing die and carpenter's cutting tools.
11	24	Cr2Mn	Drawing die of high abrasive resistance and drawing plate and other abrasive resisting tools.
	25	CrMn	Various measuring gauges and block gauges.
12	26	5CrMnMo	Forging die of medium size.
13	27	Cr6WV	Forming die, bore jacket, cold-punching die, punch, combing die, stamping die, screw-thread rolling die, shear and measuring gauges.
14	28	Cr2MnSi	Measuring tools which have absolutely no shape-change after hardening.
15	29	4Cr3MnSiWV	Forging die of medium size and ferrous metal (aluminum alloy) casting die.
16	30	CrW	Wood-work plane, cutter (for wood work, hard rubber and leather), wood work chisel and cutting tools.
	31	CrW5	Cutters for low speed cutting of hard metal, such as milling cutter, lathe knife and planer; and carving knife working under high pressure.
	32	Cr12W	Cold cutting shear knife, circular saw, combing die, slitting die, standard tools and measuring gauge, die hob, thin metal punch and screw-thread rolling die.
17	33	3Cr2WV	High stress press die, bolt or screw hot-press die and hot-shearing cutter.
18	34	CrMn	Die block, scraping-out cutter, measuring gauge and die of complicated shape and high precision.
	35	9CrMn	Measuring gauge and profile gauge.
19	36	5CrW2Si	Hand or pneumatic chisel, air hammer tool, boiler tool, top die and upper die, shear knife (heavy vibration), cutter (heavy vibration) and cement breaker.
	37	6CrW2Si	Same as stated above, but this steel can be used to make tools to cut even harder metal.
	38	4CrW2Si	Hot-forging die of medium stress.
20	39	Cr12MoV	Cold-cutting shear knife, circular saw, combing die, slitting die, standard tools and measuring gauge, die hob, punching die and screw thread rolling die.
21	40	4CrMoW	Hot-cutting tools, hot-punching die, forging die, screw, female screw, hot forging die.
22	41	3CrAl	Anti-acid die and blanking die.
23	42	7CrV	Steel stamp, combing die and punch.

TO BE CONTINUED

Continued

Group No.	Order No.	Steel Grade	Samples of Uses
	43	CrV	Various advanced saw and file for cutting metal, milling cutter for wood work, planer and bore bit and coining dies.
24	44	5CrNiMo	Blanking die and large forging die.
25	45	W	Twist drill, die hob, shear knife and plain spiral milling cutter.
	46	W2	Twist drill, die hob, shear knife, plain spiral milling cutter, blade and special cutting tools.
26	47	5W2CrSiV	Hot forging die of medium size, forming die and tools for cutting metal.
	48	4W2CrSiV	Hot forging die of large and medium size, casting die and shear knife for cutting metal.
	49	3W2CrSiV	Hot forging die of large and medium size, casting die and extruding die, and tools which can bear heavy impact load.
	50	3W4CrSiV	Same as stated above.
27	51	3W4Cr2V	Large size hammer forging die and extruding die.
	52	8W2CrV	Cold punching die, combing die and punching die.
	53	WCrV	Cold shear knife and advanced sawing and cutting tools.
	54	W3CrV	Cutter for cutting extremely hard metal and cutter for cutting extremely soft metal.
28	55	V	Cold punching die, shear, chisel, pneumatic bore, pneumatic pickax, hollow-bore (for mining mineral), die, cold punch (bolt and rivit) and cold die.
	56	9V	Same as stated above.

8. High Speed Tool Steel (YB12-59)

Table 2-1-30 The Chemical Composition and Hardness of High Speed Tool Steel

Ordinal	Steel Grade		Chemical Composition									Heat Treatment			Hardness	
	Brand	Symbol	C	Mn	Si	Cr	W	Mo	V	S less than	P less than	Hdng temp. °C	Cool-ant	Tempr. rule	HB Delivery state	RC(aft hdng & tempr.)
1	钨12铬4钒1钼	W12Cr4V4Mo	1.20/1.40	≤0.40	≤0.40	3.80/4.40	11.50/13.00	0.90/1.20	3.80/4.40	0.03	0.03	1250~1270	oil	550-570°C temp. retain for 1 hr, tempr. 2 times	Forging steel 235-207 cutting steel 255-207 cutting steel W12Cr 4Mo HB 262	≥62
2	钨18铬4钒	W18Cr4V	0.70/0.80	≤0.40	≤0.40	3.80/4.40	17.50/19.00	≤0.30	1.00/1.40	0.03	0.03	1270~1285	oil			≥62
3	钨9铬4钒2	W9Cr4V2	0.85/0.95	≤0.40	≤0.40	3.80/4.40	8.50/10.00	≤0.30	2.00/2.60	0.03	0.03	1225~1240	oil			≥62
4	钨9铬4钒	W9Cr4V	0.70/0.80	≤0.40	≤0.40	3.80/4.40	8.50/10.00	≤0.30	1.40/1.70	0.03	0.03	1220~1240	oil			≥62

Table 2-1-21 The Uses of High Speed Tool Steel

Steel Grade	Samples of Uses
W12Cr4V4Mo	The abrasive machinability of this steel is not very good. It is generally used to make fine lathe knife, milling cutter, shear knife, plain cutter, block gear cutter and forming lathe knife. It is also suitable to make machining abrasive material, such as plastics, fiber, plywood and it is also suitable to make working heat-resisting alloy, titanium-based alloy and steel of medium hardness.
W18Cr4V	This steel has good red hardness, tenacity, and abrasive machinability, so it can be widely used. It can be used to make twist bore, screw cutter, lathe knife, milling cutter, shear knife, block gear cutter and materials of working soft or medium hardness.
W9Cr4Va	The abrasive machinability of this steel is not good and it can be widely used. It is good for making bore bit, lathe knife, milling cutter, screw cutter, belt saw and wood work tools.

9. Hot Rolled Flat and Screw Spring Steel (YB8-59)

Table 2-1-22 The Chemical Composition, Mechanical Properties and Uses of Hot Rolled Flat and Screw Spring Steel

Steel Grade	Chemical Composition (%)									Heat Treatment	
Symbol	C	Si	Mn	Cr	Ni	W	V	S ≤	P ≤	quench temper T (℃)	Coolant
65	0.62~0.70	0.17~0.37	0.50~0.80	≤0.25	≤0.25			0.045	0.040	840 480	quench oil tempering
70	0.67~0.75	0.17~0.37	0.50~0.80	≤0.25	≤0.25			0.045	0.040	830 480	quench oil tempering
75	0.72~0.80	0.17~0.37	0.50~0.80	≤0.25	≤0.30			0.045	0.040	820 480	quench oil tempering
85	0.82~0.90	0.17~0.37	0.50~0.80	≤0.25	≤0.30			0.045	0.040	820 480	quench oil tempering
60Mn	0.57~0.65	0.17~0.37	0.70~1.00	≤0.25	≤0.25			0.045	0.040	830 480	quench oil tempering
65Mn	0.62~0.70	0.17~0.37	0.90~1.20	≤0.25	≤0.25			0.045	0.040	830 480	quench oil tempering
55MnSi	0.52~0.60	0.50~0.80	0.80~0.90	≤0.25	≤0.40			0.045	0.040	820 460	quench oil tempering
55SiMn	0.50~0.60	1.30~1.80	0.80~1.00	≤0.30	≤0.40			0.045	0.040	880 460	quench oil tempering
60SiMn	0.55~0.65	1.30~1.80	0.80~1.00	≤0.30	≤0.40			0.045	0.040	860 460	quench oil tempering
60SiMnA	0.56~0.64	1.30~1.80	0.90~1.00	≤0.30	≤0.40			0.030	0.035	860 460	quench oil tempering
50Si2Mn	0.47~0.55	1.50~2.00	0.60~0.90	≤0.30	≤0.40			0.045	0.040	870 460	quench oil or water,tempering
55Si2Mn	0.52~0.60	1.50~2.00	0.60~0.90	≤0.30	≤0.40			0.045	0.040	870 460	quench oil or water,tempering

TO BE CONTINUED

Continued

Steel grade / Symbol	Mechanical properties: Yield point $\sigma_{0.2}$ (kg/mm²) ≥	Tensile strength σ_b (kg/mm²) ≥	Ext. rate δ_{10} (%) ≥	Contr. rate ψ (%) ≥	Hardness HB (hot rolling state) ≤	Samples of Uses
65	80	100	9	35	255	This steel will have high strength after heat treatment and it also has adequate plasticity and tenacity. It is usually used to make plate spring and spiral spring of small size to be used on automobile, tractor, locomotive car and other machines.
70	85	105	8	30	269	
75	90	110	7	30	285	
85	100	115	6	30	302	
60Mn	80	100	9	35	269	The strength of this steel is high and its hardenability is better than carbon spring steel. Its decarbonization tendency is small but it has over-heat sensitivity, so it is easy to produce quenching crack and temper brittleness. It can be used to make large spiral spring, plate spring, various flat and cylindrical springs, spring coil and spring leaf.
65Mn	80	100	8	30	269	The strength of this steel is high, the hardenability is great, and the decarbonization tendency is small; but there is an overheat sensitivity so it is easy to produce hardening flaw and tempering brittleness. The steel is good to be used to make various flat and cylindrical springs of large size, cushion spring, spring rib, spring coil, valve spring, cold-drawn steel wire <4mm and cold rolling spring.
55MnSi	80	100	8	30	285	The hardenability and strength of this steel are both high and its decarbonization tendency is small. But its shortcomings are overheat sensitivity and tempering brittleness. It is good to be used to make flat, buffer and spiral springs of large size.
55Si2Mn	120	130	5	30	285	Among these nine different kinds of Si-Mn steel, 55Si2Mn, 60Si2Mn and 60Si2MnA have longest records of various usages and they are used most widely. The are mainly used to make rail locomotive car, automobile, plate spring and spiral springs for tractors, safe valve spring of cylinder, check valve spring and some other important springs which work under high stress, and anti-heat spring which is used under the condition of below 250°C.
60SiMn	120	130	5	25	285	
60SiMnA	110	160	5	25	285	
50Si2Mn	110	120	6	30	285	
55Si2Mn	120	130	6	30	285	

Continued

Steel Grade	Chemical Composition (%)									Heat Treatment	
Symbol	C	Si	Mn	Cr	Ni	W	V	S	P	quench; temper. T(°C)	Coolant
								≤			
60Si2Mn	0.57~0.65	1.50~2.0(	0.60~0.9(	≤0.30	≤0.40			0.045	0.040	870 460	quench oil tempering
60Si2MnA	0.56~0.64	1.60~2.0(	0.60~0.9(	≤0.30	≤0.40			0.030	0.035	870 460	quench oil tempering
63Si2MnA	0.60~0.65	1.80~2.20	0.60~0.9(	≤0.30	≤0.40			0.030	0.035	860 460	quench oil tempering
70Si3MnA	0.66~0.74	2.40~2.80	0.60~0.90	≤0.30	≤0.40			0.030	0.035	860 420	quench oil tempering
60Si2CrA	0.56~0.64	1.40~1.80	0.40~0.70	0.70~1.0(	≤0.40			0.030	0.035	870 420	quench oil tempering
65SiCrA	0.62~0.70	1.20~1.50	0.40~0.70	0.40~0.6(	≤0.40			0.030	0.035	850 450~500	quench oil tempering
50CrMn	0.46~0.54	0.17~0.37	0.70~1.0(	0.90~1.20	≤0.40			0.045	0.040	840 490	quench oil tempering
50CrMnA	0.46~0.54	0.17~0.37	0.80~1.0(	0.95~1.20	≤0.40			0.030	0.03[illegible]	840 490	quench oil tempering
50CrVA	0.46~0.54	0.17~0.37	0.50~0.80	0.80~1.10	≤0.40		0.10~0.20	0.030	0.035	850 520	quench oil tempering
50CrMnVA	0.48~0.55	0.17~0.37	0.80~1.0(	0.95~1.2(	≤0.40		0.15~0.25	0.030	0.035	850 520	quench oil tempering
30W4Cr2VA	0.26~0.34	0.1[illegible]~0.37	≤0.4	2.00~2.50	≤0.40	4.00~4.50	0.50~0.80	0.030	0.035	1050~110(550~650	quench oil tempering
60Si2CrVA	0.56~0.64	1.40~1.80	0.40~0.70	0.90~1.20	≤0.40		0.10~0.2(	0.030	0.035	850 410	quench oil tempering
65Si2MnWA	0.61~0.69	1.50~2.0(	0.70~1.00	≤0.30	≤0.40	0.80~1.20		0.030	0.035	850 420	quench oil tempering

Note: The mechanical of 65SiCrA and 30 W4Cr2VA can only used as reference.

Continued

Steel grade / Symbol	Mechanical properties: Yield point $\sigma_{0.2}$ (kg/mm²)	Tensile strength σ_b (kg/mm²)	Ext. rate δ_{10} (%)	Contr. rate ψ (%)	Hardness HB (hot rolling state)	Samples of Uses
	≥				≤	
60Si2Mn	120	130	5	25	302	Among these nine different kinds of Si-Mn steel, 60Si2Mn and 60Si2MnA have longest records of various uses and they are used most widely. They are mainly used to make plate spring and spiral spring used on rail locomotive car, automobile and tractor, the safty valve spring of cylinder, the check valve spring and some other important springs which can work under high stress, and it can also be used to make anti-heat spring which can be used under below 250°C.
60Si2MnA	140	160	5	20	302	
65Si2MnA	140	160	6	20	302	
70Si3MnA	160	180	5	20	302	
60Si2CrA	160	180	6	20	321	The mechanical properties of 60Si2CrA and 65Si2CrA are very good because they are added chrome and vanadium. They are mainly used to make springs which can stand high stress and it is specially good to be used to make anti-heat spring and impact stress bearing spring which can be used below 300-350°C.
65SiCrA	130~120	170~150	5	20	302	
50CrMn	110	302	5	35	130	The hardenability of 50CrMn(50CrMnA) is very high because it is added about 1% of chrome and manganese. Even a spring with a diameter of 50mm can be hardened, so its hardenability is better than silcon-manganese spring steel and slightly better than silcon-chrome spring steel. This steel is mostly used to make important plate spring and spiral spring of large cross-section.
50CrMnA	120	302	6	35	130	
50CrVA	110	130	10	45	302	The hardenability of this steel is similar to that of 60Si2CrVA, 65Si2MnWA and50CrMn. This steel is mainly used to make high stress bearing spiral spring of large cross-section and valve spring and piston spring which can work below 210°C.
50CrMnVA	120	130	6	35	321	50CrMnVA has high strength, hardenability and it is not easy to be over heated. It has the properties of chrome manganese steel and chrome vandium steel. It is mainly used to make plate spring & spiral spring which can bear heavy load and great stress.
30W4Cr2VA		170~150			321	This is an anti-heat spring steel with high strength and it has specially high hardenability. It is mainly used to make spring which can be used at high temperature (≤500°C).
60Si2CrVA	170	190	5	20	302	Its properties are similar to that of 60Si2CrA and 65Si2CrA, and it can be used to make important spring to bear heavy load.
65Si2MnWA	170	190	5	20	302	It is used to make the most important spring which can bear heavy load, resist heat (≤350°C)and resist impact.

10. Stainless and Anti-acid Steel (YB10-59)

Table 2-1-23 The Chemical Composition of Stainless and Anti-acid Steel

Ordinal	Steel Grade		Chemical Composition (%)							
	Brand	Symbol	C	Si	Mn	Cr	Ni	Ti	S %	P %
1	1铬13	1Cr13	≤0.15	≤0.60	≤0.60	12.0～14.0	—	—	0.030	0.035
2	2铬13	2Cr13	0.16～0.24	≤0.60	≤0.60	12.0～14.0	—	—	0.030	0.035
3	3铬13	3Cr13	0.25～0.34	≤0.60	≤0.60	12.0～14.0	—	—	0.030	0.035
4	4铬13	4Cr13	0.35～0.45	≤0.60	≤0.60	12.0～14.0	—	—	0.030	0.035
5	1铬18镍9	1Cr18Ni9	≤0.14	≤0.80	≤2.00	17.0～19.0	8.0～11.0	—	0.030	0.035
6	2铬18镍9	2Cr18Ni9	0.15～0.24	≤0.80	≤2.00	17.0～19.0	8.0～11.0	—	0.030	0.035

Table 2-1-24 The Mechanical Properties of Stainless and Anti-acid Steel

Ordinal	Steel Grade		Heat Treatment				Mechanical Properties						
	Brand	Symbol	Quench temp. (°C)	Coolant	Temper temp. (°C)	Coolant	Insl strth (kg/mm²)	Yield point (kg/mm²)	Ext. Contr rateate (%)	(%)	Impact value (kg.m/cm²)	HRC	HB (Annealing)
							No less than						
1	1 铬13	1Cr13	1000～1050	o,W	700～790	o,W,a	60	42	20	60	9	—	121～187
2	2 铬13	2Cr13	1000～1050	o,W	660～770	o,W,a	66	45	16	55	8	—	126～197
3	3 铬13	3Cr13	1000～1050	o	200～300	—	—	—	—	—	—	48	131～207
4	4 铬13	4Cr13	1050～1100	o	200～300	—	—	—	—	—	—	50	113～229
5	1铬18镍9	1Cr18Ni9	1100～1150	W	—	—	55	20	45	50	—	—	—
6	2铬18镍9	2Cr18Ni9	1100～1150	W	—	—	58	22	40	55	—	—	—

Translator's note: o = oil; W = water; and a = air

Table 2-1-25 The Uses of Stainless and Anti-acid Steel

Steel Garde	Main Properties	Samples of Uses
1Cr13 2Cr13	They have good anti-corrosion performance in syeam, air and weak corrosion agent. After heat treatment and polishing, the anti-corrosion performance becomes even better.	To make anti-aircorrosion parts and parts which require high tenacity and can bear impact load, such valve, axle and hastening piece
3Cr13		Same as indicated above. It can also be used to make parts which require high hardness.
4Cr13		To make anti-air corrosion parts, main axle for heavy load and srew rod. And to make spring, carburetor needle valve and ball bearing.
9Cr13	High anti-corrosion performance in atmosphere	To make parts of high abrasive resistance and corrosion resistance, such as ball bearing and valve.
1Cr18Ni9 2Cr18Ni9	Anti-acid and they show high performance of corrosion resistance when they are in various corrosive media.	To make parts which require high performance of various medium corrosion resistance.
1Cr18Ni9Ti	Anti-acid and it has high performance of corrosion resistance when it is in various corrosive media. It has special ability of inter-crystalline corrosion resistance.	Same as 1Cr18Ni9. It can be used to make parts which require no inter-crystalline corrosion.

11. Heat Resisting and Blisterless Steel (YB11-59)

Table 2-1-26 The Chemical Composition of Heat Resisting and Blisterless Steel (1)

Group No.	Steel Group	Ordinal	Steel Grade		Chemical Composition (%)		
			Brand	Symbol	C	Si	Mn
1	CrSi steel	1	铬 3 硅	Cr3Si	≤0.10	1.00～1.50	≤0.70
		2	4 铬 9 硅 2	4Cr9Si2	0.35～0.50	2.00～3.00	≤0.70
		3	铬13硅 3	Cr13Si3	≤0.12	2.30～2.80	≤0.70
		4	铬18硅 2	Cr18Si2	≤0.12	1.90～2.40	≤1.00
		5	铬20硅 3	Cr20Si3	≤0.15	2.50～3.00	≤1.00
		6	铬25硅 2	Cr25Si2	≤0.10	1.60～2.10	≤1.00
		7	4 铬 3 硅 4	4Cr3Si4	0.40～0.50	3.80～4.30	≤0.70
2	CrMo steel	8	铬 5 钼	Cr5Mo	≤0.15	≤0.50	≤0.60
3	CrSiV steel	9	铬 6 硅钼	Cr6SiMo	≤0.15	1.50～2.00	≤0.70
		10	4 铬10硅 2 钼	4Cr10Si2Mo	0.35～0.45	1.90～2.60	≤0.70
4	1Cr13 steel	11	1 铬13	1Cr13	≤0.15	≤0.60	≤0.60
5	Cr11MoV steel	12	铬11钼钒	Cr11MoV	0.11～0.18	≤0.50	≤0.60
6	CrNiTi steel	13	1 铬18镍 9 钛	1Cr18Ni9Ti	≤0.12	≤0.80	≤2.00
		14	1 铬18镍12钛	1Cr18Ni12Ti	0.08～0.12	≤0.80	1.00～2.00
		15	铬13硅铝	Cr13SiAl	0.10～0.20	1.00～1.50	≤0.70
7	CrAlSi steel	16	铬17铝 4 硅	Cr17Al4Si	≤0.10	1.00～1.50	≤0.70
		17	铬24铝 2 硅	Cr24Al2Si	≤0.12	0.80～1.20	≤1.00
		18	铬 6 硅 2 钛	Cr6Si2Ti	≤0.15	2.00～2.50	≤0.70
8	CrSiTi steel	19	铬 2 硅钼钛	Cr2SiMoTi	≤0.15	1.30～1.70	≤0.70
9	CrSiMoTi steel	20	铬硅钼钒	CrSiMoV	0.10～0.16	1.20～1.60	≤0.70
10	CrSiMoV steel	21	铬 8 铝 5	Cr8Al5	≤0.10	≤1.00	≤0.70
11	CrAl steel	22	铬 7 铝 7	Cr7Al7	≤0.12	≤1.00	≤0.70
		23	铬20铝 5 钴 2	Cr20Al5Co2	≤0.12	≤1.00	≤0.70
		24	铬13铝 4	Cr13Al4	≤0.15	≤1.00	≤0.70
		25	1 铬17铝 5	1Cr17Al5	≤0.12	≤1.20	≤0.70
		26	0 铬17铝 5	0Cr17Al5	≤0.06	≤0.60	≤0.70
		27	1 铬25铝 5	1Cr25Al5	≤0.12	≤1.20	≤0.70
		28	0 铬25铝 5	0Cr25Al5	≤0.06	≤0.60	≤0.70
12	CrNiWMoTi steel	29	1 铬14镍14钨 2 钼钛	1Cr14Ni14W2MoTi	≤0.15	≤0.80	≤0.70
13	CrNiWMo steel	30	4 铬14镍14钨 2 钼	4Cr14Ni14W2Mo	0.40～0.50	≤0.80	≤0.70
14	CrNiWTi steel	31	铬15镍36钨 3 钛	Cr15Ni36W3Ti	≤0.12	≤0.80	1.00～2.00

Note: Except otherwise indicated, no remanent content of nickel in the steel is more than 0.60%.

TO BE CONTINUED

Continued

Table 2-1-26 The Chemical Composition of Heat Resisting and Blisterless Steel (2)

Chemical Composition (%)								
Cr	Ni	Mo	Ti	Al	W	V	S No more than	P No more than
3.0～3.5	—	—	—	—	—	—	0.030	0.035
8.0～10.0	—	—	—	—	—	—	0.030	0.035
12.5～14.5	—	—	—	—	—	—	0.030	0.035
17.0～19.0	—	—	—	—	—	—	0.030	0.035
19.0～21.0	—	—	—	—	—	—	0.030	0.035
24.0～26.0	—	—	—	—	—	—	0.030	0.035
2.5～3.0	—	—	—	—	—	—	0.030	0.035
4.0～6.0	—	0.50～0.60	—	—	—	—	0.030	0.035
5.0～6.5	—	0.45～0.60	—	—	—	—	0.030	0.035
9.0～10.5	≤0.50	0.70～0.90	—	—	—	—	0.030	0.035
12.0～14.0	—	—	—	—	—	—	0.030	0.035
10.0～11.5	—	0.5～0.7	—	—	—	0.25～0.40	0.030	0.035
17.0～19.0	8.0～11.0	—	5×(C%−0.02)～0.80	—	—	—	0.030	0.035
17.0～19.0	11.0～13.0	—	5×(C%−0.02)～0.65	—	—	—	0.030	0.035
12.0～14.0	—	—	—	1.00～1.80	—	—	0.030	0.035
16.5～18.5	—	—	—	3.50～4.50	—	—	0.030	0.035
23.0～25.0	—	—	—	1.40～2.40	—	—	0.030	0.035
5.8～6.8	—	—	0.08～0.15	—	—	—	0.030	0.035
2.0～2.5	—	0.45～0.60	≤0.20	—	—	—	0.030	0.035
1.5～1.8	—	0.20～0.50	—	—	—	0.22～0.32	0.030	0.035
7.5～8.5	—	—	—	4.50～5.50	—	—	0.030	0.035
6.5～7.5	—	—	—	6.00～8.00	Co 1.50～3.00	—	0.035	0.035
19.0～21.0	—	—	—	4.00～6.00	—	—	0.030	0.035
13.0～15.0	—	—	—	3.50～5.50	—	—	0.030	0.030
16.0～19.0	—	—	—	4.00～6.00	—	—	0.030	0.035
16.0～19.0	—	—	—	4.00～6.00	—	—	0.030	0.035
23.0～27.0	—	—	—	4.50～6.50	—	—	0.030	0.035
23.0～27.0	—	—	—	4.50～6.50	—	—	0.030	0.030
13.0～15.0	13.0～15.0	0.45～0.60	≥0.50, Ti:C=4～5	—	2.00～2.75	—	0.030	0.035
13.0～15.0	13.0～15.0	0.26～0.40	—	—	1.75～2.25	—	0.030	0.035
14.0～16.0	24.0～38.0	—	1.10～1.40	—	2.80～3.20	—	0.030	0.035

Table 2-1-27 The Mechanical Properties of Heat Resisting and Blisterless Steel (1)

Group No.	Steel Group	Ordinal	Steel Grade		Heat Treatment Quenching temperature (°C)
			Brand	Symbol	
1	CrSi steel	1	铬3硅	Cr3Si	—
		2	4铬9硅2	4Cr9Si2	1050
		3	铬13硅3	Cr13Si3	—
		4	铬18硅2	Cr18Si2	—
		5	铬20硅3	Cr20Si3	—
		6	铬25硅2	Cr25Si2	—
		7	4铬3硅4	4Cr3Si4	950～1000
2	CrMo steel	8	铬5钼	Cr5Mo	—
3	CrSiMo steel	9	铬6硅钼	Cr6SiMo	—
		10	4铬10硅2钼	4Cr10Si2Mo	1010～1040
4	Cr steel	11	1铬13	1Cr13	1000～1050
5	CrMoV steel	12	铬11钼钒	Cr11MoV	1050～1100
6	CrNiTi steel	13	1铬18镍9钛	1Cr18Ni9Ti	1100～1150
		14	1铬18镍12钛	1Cr18Ni12Ti	1100～1150
7	CrMoSi steel	15	铬13硅铝	Cr13SiAl	—
		16	铬17铝4硅	Cr17Al4Si	—
		17	铬24铝2硅	Cr24Al2Si	—
8	CrSiTi steel	18	铬6硅2钛	Cr6Si2Ti	—
9	CrSiMoTi steel	19	铬2硅钼钛	Cr2SiMoTi	—
10	CrSiMoV steel	20	铬硅钼钒	CrSiMoV	—
11	CrAl steel	21	铬8铝5	Cr8Al5	—
		22	铬7铝7	Cr7Al7	—
		23	铬20铝5钴2	Cr20Al5Co2	—
		24	铬13铝4	Cr13Al4	—
		25	1铬17铝5	1Cr17Al5	—
		26	0铬17铝5	0Cr17Al5	—
		27	1铬25铝5	1Cr25Al5	—
		28	0铬25铝5	0Cr25Al5	—
12	CrNiWMoTi steel	29	1铬14镍14钨2钼钛	1Cr14Ni14W2MoTi	1150
13	CrNiWMo steel	30	4铬14镍14钨2钼	4Cr14Ni14W2Mo	—
14	CrNiWTi steel	31	铬15镍36钨3钛	Cr15Ni36W3Ti	1150

Note: 1. Of those the data are not presented in the table, they can be decided by supplier and consumer upon their agreement.
2. There is not impact tenacity test of round steel of which the diameter is less than 16mm and square steel or flat steel of which the thickness is less than 12mm.

TO BE CONTINUED

Continued

Table 2-1-27 The Mechanical Properties of Heat Resisting and Blisterless Steel (2)

Heat Treatment			Mechanical Properties				
Coolant	Temper temp. (°C)	Coolant	Tensile strength (kg/mm^2)	Yield point (kg/mm^2)	Ext. (%)	Contr. rate (%)	($kg.m/cm^2$)
			No less than				
–	–	–	50	35	14		–
oil	700	oil	90	60	20	55	–
–	700~800	air	60	40	15		–
–	700~800	air	55	35	15	35	–
–	700~800	air	55	40	18		–
–	700~800	air	50	35	15		–
oil water	700~750	air	90	70	14	40	–
–	–	–	60	40	18		–
–	–	–	55	30	30	60	–
oil	740	air	90	70	10	35	–
oil water	700~790	oil water	60	42	20	60	–
air	720~740	air	70	50	16	55	6
oil water	–	–	55	29	40	55	–
water	700~800	air	55	20	40	55	–
–	700~800	air	50	28	16	–	–
–	700~800	air	60	35	15	–	–
–	700~800	air	50	35	15	–	–
–	–	–	55	40	18	–	–
–	–	–	45	27	22	–	–
–	–	–	45	27	22	–	–
–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–
air	750	ageing	55	20	35	60	–
–	820	ageing	72	32	15	35	–
water	780~790 730~740	ageing	75	40	15	35	6

Table 2-1-26 The Properties and Uses of Heat Resisting and Blisterless Steel

Order	Steel Grade	Main Properties	Samples of Uses
1 3 5 13 15	Cr3Si Cr13Si3 Cr20Si3 Cr6Si2Ti Cr13SiAl	Good anti-oxygenization performance, suitable to make high temperature structural component of high temerature low load and loderate load. Cr3Si is good to be used to work under 750°C. Cr13Si3, Cr13SiAl and Cr20Si3 are good to work under 800 - 1000°C. Cr6Si2Ti is good to work under 850°C.	They can be used to make ash-blower pipe, nozzle, annealing furnace with an air circulator and annealing vessel of light metal and overheater stand. Stand of pipe-type heating furnace used in petroleum industry.
17 6	Cr24Al2Si Cr25Si2	Good anti-oxygenization performance, and it is especially good to work under strong temperature fluctuation.	They can be used under strong temperature fluctuation when 18% chrome steel cannot be used, and heat resisting component of temperature over 1050°C.
16	Cr17Al4Si	It will not blister at 1100°C and it is weldable. The welding cannot be used as impact load bearing component.	It can be used to make hardening box, heat exchanger component and high temperature component to contact gas which contains sulfur.
19 20	Cr2SiMoTi CrSiMo	Heat resisting and no blister under 650°C. Heat resisting and no blister under 620°C.	They can be used to make seamless steel pipe of 550-700°C, overheating pipe, stand, tube, bottom plate and coil pipe and hot gas blower component.
2 10	4Cr9Si2 4Cr10Si2Mo	No blister under 800°C Heat resisting and no blister under 950°C.	Automobile engine exhaust valve.
7	4Cr3Si4	No blister under 750°C	Inlet valve of especially high load and exhaust valve of low load.
4	Cr18Si2	No blister under 1000°C and other properties are similar to those of Cr17Al4Si.	It can be used to make hardening box, heat exchanger and heat resisting structural component.
8 9	Cr5Mo Cr6SiMo	Heat resisting and no blister under 700°C.	Pipe which receives corrosion action in the cracking process, Pump component, valve, piston rod, and component of high pressure hydrogenization equipment.

TO BE CONTINUED

Continued

Order	Steel Grade	Mina Properties	Samples of Uses
11	1Cr13		Steam turbine blade which receives steam action.
12	Cr11NiMoV		
13	1Cr18Ni9Ti	No blister under 1000°C.	Cracking equipment which can be heated to 650-720°C, overheater pipe, aero-engine, nozzle and collector used on exhaust system.
14	1Cr18Ni12Ti		
29	1Cr14Ni14W2MoTi	Heat resisting and no blister under 600°C.	High temperature and high pressure steam overheater parts and component of 600-620°C furnace steel pipe.
30	1Cr14Ni14W2Mo	Heat resisting and no blister under 600°C.	Engine valve and steam and gas pipeline parts.
31	Cr15Ni36W3Ti		It can be used to make blade which works under 650°C and connection parts under 650-680°C.
21	Cr8Al5	No blister under 950°C, specific resistance is 1.2 ohm-mm^2/m	Resistance wire for electric furnace.
22	Cr7Al7	No blister under 1000°C, specific resistance is 1.2 ohm-mm^2/m	Resistance wire for electric furnace.
23	Cr20Al5Co5	It can be used at 1150-1300°C.	
24	Cr13Al4	No blister under 850°C, specific resistance is 1.4 ohm-mm^2/m	Resistance wire for general heater and electric heater.
25	1Cr17Al5	No blister under 1000°C, specific resistance is 1.24 ohm-mm^2/m	Electric wire and electric heat belt for large electric furnace.
26	0Cr17Al5	No blister under 1000°C, specific resistance is 1.24 ohm-mm^2/m	Electric wire and electric heat belt for large electric furnace and the service life is longer.
27	1Cr25Al5	No blister under 1150°C, specific resistance is 1.35 ohm-mm^2/m	Electric wire and electric heat belt for large electric furnace.
28	0Cr25Al5	No blister under 1200°C, specific resistance is 1.35 ohm-mm^2/m	Electric wire and electric heat belt for large electric furnace and the service life is longer.

12. Chrome Bearing Steel (YB9-63)

Table 2-1-29 The Chemical Composition of Chrome Bearing Steel

Order	Steel Grade		Chemical Composition (%)					
	Brand	Symbol	C	Mn	Si	Cr	S	P
1	滾铬 6	GCr6	1.05～1.15	0.20～0.40	0.15～0.35	0.40～0.70	≤0.020	≤0.027
2	滾铬 9	GCr9	1.00～1.10	0.20～0.40	0.15～0.35	0.90～1.20	≤0.020	≤0.027
3	滾铬9硅锰	GCr9SiMn	1.00～1.10	0.90～1.20	0.40～0.70	0.90～1.20	≤0.020	≤0.027
4	滾铬15	GCr15	0.95～1.05	0.20～0.40	0.15～0.35	1.30～1.65	≤0.020	≤0.027
5	滾铬15硅锰	GCr15SiMn	0.95～1.05	0.90～1.20	0.40～0.65	1.30～1.65	≤0.020	≤0.027

Table 2-1-30 The Properties and Uses of Chrome Bearing Steel

Ordinal	Steel Grade	Main Properties and Uses
1	GCr6	This is a fine low chrome steel, its abrasive resistance is higher than that of carbon tool steel, its cold working plastic deformation and cutability are also better but it is sensitive to the formation of white spot. It shows a tendency of tempering brittleness and its weldability is not good so it can be used to make bearing steel ball and roller.
2	GCr9	This is a widely used ball steel and its abrasive resistance and hardenability are higher than those of GCr6. It is rather sensitive to the formation of white spot and its cutability is good but weldability is poor so it can be used to make bearing steel ball and roller.
3	GCr9SiMn	Same as GCr15
4	GCr15	This steel has very high abrasive resistance. It is sensitive to the formation of white spot and its cold working plastic deformation is medium. It can be used to make automobile, various heavy equipment and high speed rotation and heavy load bearing steel ball, roller and sleeving ring.
5	GCr15SiMn	The abrasive resistance and hardenability of this steel are higher than those of GCr15. It is sensitive to the formation of white spot and its cold working plastic deformation is medium. It can be used to make large bearing, steel ball and roller. Its other usages are same as GCr15.

(3) The Heat Treatment Norms and Substituting Materials of Steel

1. The Commonly Used Heat Treatment Methods of Steel

Table 2-1-31 The commonly used heat treatment methods of steel

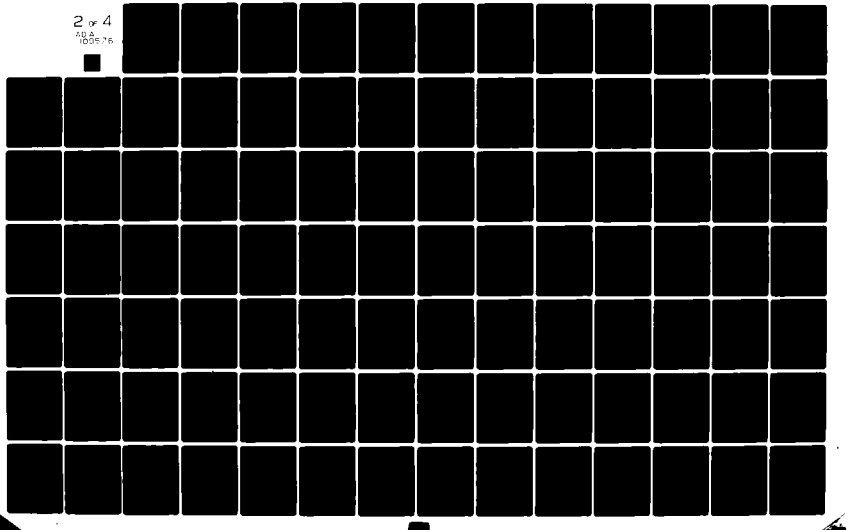
Name	Method
Full annealing	When heating reaches a point above Ac3, insulating and the steel begins cooling slowly in furnace or insulator. Full annealing can be applied to hypo-eutectoid steel and eutectoid steel parts. Its purposes are to reduce hardness, to improve machinability, to increase tenacity, to eliminate inner stress, to refine its structure and to elevate the homogeneity of the structure.
Spheroidized annealing	When heating reaches a point above Ac1, the steel begins to cool in furnace to a certain degree and changes to air cooling. Spheroidized annealing is suitable for eutectoid steel and hyper-eutectoid steel parts. Its purposes are to improve the machinability, to reduce hardness and to eliminate inner stree.
Formalization	When heating reaches a point above Ac3 (or Acm), after insulation, the steel begins to cool in the air. The purposes of formalization are to refine the structure and elevate the homogeneity of the structure, to eliminate inner stress and to improve such properties as hardness and strength.
Quenching	When heating reaches a quenching temperature above Ac3 (or Ac1), insulating and then the steel is put into a coolant to cool off rapidly, so as to elevate such properties as hardness and strength.
Tempering	When heating reaches a tempering temperature below Ac1, insulating, and then the steel begins to cool off rapidly or slowly in water, oil or air. The purposes are to eliminate the inner stress during quenching, to elevate tenacity so as to meet the machinability requirement.
Cementation	Adding carbon at a temperature above Ac3 to the steel surface layer to make it contain saturated carbon element. The purposes are to maintain the core hardness and tenacity and to increase surface hardness, abrasive resistance and fatigue strength.
Nitridation	At temperature under 500-600°C, adding nitrogen to surface layer of the steel to make it contain saturated nitrogen element. The purposes are to elevate the surface layer hardness, abrasive resistance, corrosive resistance and fatigue strength.
Cyanidation	At a temperature under 500-620°C or 750-850°C, adding carbon and nitrogen simultaneously to the surface layer of steel to saturate the carbon and nitrogen elements. The purposes are to elevate the abrasive resistance and fatigue strength of steel surface layer and to maintain the core plasticity and tenacity.

2. The Symbols of Steel Heat Treatment (GB423-82)

Table 2-1-32 The Symbols of Steel Heat Treatment Methods

Heat Treatment Methods	Symbol	Indications
Annealing	Th	--
Normalization	Z	--
Modification	T	T235 - modifying to HB220-250
Quenching	C	C42 - quenching tempering HRC45-50
Oil cold quenching	Y	Y35 - oil cold quenching tempering HRC30-40
High frequency quenching	G	G52 - high frequency quenching tempering HRC50-55
Modification high frequency quenching	T-G	T-G54 - modification high frequency quenching tempering HRC52-58
Flame quenching	H	H54 - flame heating quenching tempering HRC52-58
Cyaniding	Q	Q59 - cyaniding quenching tempering HRC56-62
Nitriding	D	DC.3 - 900 nitriding depth reaches 0.3mm and hardness is greater than HV850.
Carburizing quenching	S-C	S 0.5 - C59 - carburizing layer 0.5mm of depth, quenching tempering HRC56-62
Carburizing high frequency quenching	S-G	S 0.8-G59 - carburizing layer 0.8mm of depth, high frequency quenching tempering HRC56-62

AD-A100 576 FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OH F/G 15/5
HANDBOOK OF EQUIPMENT REPAIR.(U)
MAY 81
UNCLASSIFIED FTD-ID(RS)T-0685-80 NL



3. Heat Treatment Norms and Substitute Materials

Table 2-1-33 The Heat Treatment Norms and Substitute Materials of Steel (1)

Steel Grade	Heat treatment	Heat treatment norms	Mechanical Properties: Tnsl strth σ_b (kg/mm²)	Yield point σ_s (kg/mm²)	Ext. rate δ (%)	Contr. rate ψ (%)	Impact value a_k (Kg.m/cm²)	Fatigue strength σ_{-1} (kg/mm²)
08	Th	950~960℃ furnace cooling 400℃ air cooling	≥33	≥20	≥33	≥55		
15	Z	900~940℃ air cooling	≥38	≥23	≥27	≥55	≥6.5	
	S-C59	900~950℃ carburizing 780~800℃ water cooling 180~200℃ tempering	Core					
	S-G59	900~950℃ carburizing 820~840℃ high frequency heating water cooling 180~200℃ tempering	45~55	25~30	≥20	≥50		
	Q-59	830~850℃ cyanating oil cooling 180~200℃ tempering						
35	Z	860~880℃ air cooling	≥54	≥32	≥20	≥45	≥7	
	C35	840~860℃ water cooling 380~420℃ tempering	≥100	≥65	≥8	≥30	≥6	
45	Z	840~860℃ air cooling	≥61	≥36	≥16	≥40	≥5	≥26
	T235	820~840℃ water cooling 560~600℃ tempering	≥75	≥45	≥13	≥35	>4	
	Y35	830~850℃ oil cooling 160~180℃ tempering	≥90	≥65	≥15	≥40	~4	

TO BE CONTINUED

Table 2-1-33 The Heat Treatment Norms and Substitute Materials of Steel (2)

Mechanical Properties Hardness HRC	HB	Permitted sect. size	Samples of Uses	Substitude steel grade
	≤131		To make sparts which have good magnetic conductivity and less surplus magnet, such as magnetic absorb disk and magnetic iron.	
	≤143		To make spare parts of low load and simple shape, which can stand friction and impact, such as pony axle, sleeve, blocking iron and pin	
56~62	core 146~163	≤100		20
56~62	core ≤143	≤100		
56~62	core 146~163	small size		23
	≤187		To make low load and less friction spare parts, such as axle, gun rod and handle.	7
30~40		φ16 ≤φ50	To make spare parts which require high strength, such as pony axle, blocking iron, screw, female screw, ring, pin and backing ring.	35, 36
	≤229		To make spare parts which can bear medium load, such as axle, wire bar, thimble and gear.	
	220~250	≤100	To make spare parts of which the cross-section is under 100mm to bear medium pressure and low speed work, such as gear, axle, splined shaft, sleeve, snail bar, large set screw and large positioning screw cap.	34
30~40		≤80	To make thin and small spare parts of complicated shape, of which the cross-section is under 6-7mm, such as sleeve, ring and fastening screw cap.	

TO BE CONTINUED

Continued (1)

Steel Grade	Heat treatment	Heat treatment norms	Mechanical Properties					
			Tnsl strth σ_b (Kg/mm2)	Yield point σ_s (kg/mm2)	Ext. rate δ (%)	Contr. rate ψ (%)	Impact value a_k (kg.m/cm2)	Fatigue strength σ_{-1} (kg/mm2)
45	C42	820~840°C water cooling 350~370°C tempering	120	100	10	40	6	
	C48	820~840°C water cooling 260~280°C tempering	≥120	≥95	≥6	≥22		
	G42	860~900°C high frequency heating water cooling 320~340°C tempering						
	G48	860~900°C high frequency heating water cooling 220~250°C tempering						
	G54	860~890°C high frequency heating water cooling 180~200°C tempering	≥75	≥45	Core ≥17	Core ≥35		
75	C45	780~800°C oil or water cooling 400~420°C tempering						
T8	C58	760~780°C water cooling 240~260°C tempering						
T10	Th	760~770°C heat-preserving 630~650°C spheroidizing furnace cooling						
	T215	810~830°C water or oil cooling 600~640°C tempering						
	C61	770~790°C water cooling 180~220°C tempering						

TO BE CONTINUED

Continued (2)

Mechanical Properties Hardness		Permitted sect. size	Samples of Uses	Substitute steel grade
HRC	HB			
40~45		≤80	To make spare parts which have high strength hardness and simple shape and its cross-section is under 80mm, such as gear, clutch, blocking iron, axle, positioning pin and key	36
45~50		≤50	To make high strength spare parts which receive no impact and its cross-section is under 50mm, such as gear, new wheel and axle.	
40~45		≤60	To make low load, medium speed and smaller impact gear, clutch and axle of large diameter.	
45~50		≤60	To make low load, medium speed gear, clutch of smaller impact and axle of large diameter	
52~58	心部 220~250		To make constant load and medium speed gear of which the modulus is smaller than 4, clutch of smaller impact and axle of large diameter	
42~48			To make small cross-section, simple shape and receiving no large stress spring and elastic spare parts.	
55~60		≤80	To make top point, clamping head and abrasive resisting parts.	
	≤197		To make wire bar for making precise machine tool.	
200~230			To make wire bar which can bear heavy load and have definite abrasive resistance.	
58~64			To make spare parts which have high abrasive resistance, such as top point, thimble, spring and clamping head.	

TO BE CONTINUED

Continued (1)

Steel Grade	Heat treatment	Heat treatment norms	Mechanical Properties: Tnsl strth σ_b (kg/mm²)	Yield point σ_s (kg/mm²)	Ext. rate δ (%)	Contr. rate ψ (%)	Impact value a_k (kg·m/cm²)	Fatigue strength σ_{-1} (kg/mm²)
T12	Th	760~770℃ heat preserving 630~650℃ spheroidizing furnace cooling						
	T215	810~830℃ water or oil cooling 630~650℃ tempering						
	C61	780~800℃ water cooling 180~220℃ tempering						
50Mn2	Z	820~840℃ air cooling	≥75	≥43	≥10	≥35	≥6	
	T280	810~840℃ oil cooling 500~600℃ tempering	≥95	≥70	≥9	~40		
35SiMn	T235	840~860℃ oil cooling 600~650℃ tempering	83~100	73~91	≥11	≥40	≥6	
	Y42	840~860℃ oil cooling 350~370℃ tempering	>131	≥124	8.3	54	8.7	
	Y48	860~880℃ oil cooling 250~270℃ tempering	179		5	40	5.6	
42SiMn	Y42	840~860℃ oil cooling 370~390℃ tempering	141.4	113.7	13.6	48.6	8.2	
	Y48	840~860℃ oil cooling 280~320℃ tempering	199			34.7	4.0	

TO BE CONTINUED

Continued (2)

Mechanical Properties Hardness		Permitted sect. size	Samples of Uses	Substitude steel grade
HRC	HB			
	≤207		Same as T10	
	200~230		Same as T10	T10
53~64		≤60	Same as T10	
	≤241		To make medium load and large cross-section spare parts, such as gear and main axle.	
	235~302		To make main axle of machine tool which roates in the rolling bearing and medium load large gears	
	220~250		To make medium load and medium speed spare parts, such as gear, screw rod, splined shaft, top socket and main axle which rotates in the rolling bearing.	
40~45			To make medium speed and heavy load spare parts, such as gear, main axle, rotor of hydraulic pump and slipper.	
45~50				
40~45		≤φ50	Same as 35SiMn-Y42	
45~50		≤φ40	Same as SiMn-Y48	

TO BE CONTINUED

Continued (1)

Steel Grade	Heat treatment	Heat treatment norms	Mechanical Properties: Tnsl strth σ_b (kg/mm²)	Yield point σ_s (kg/mm²)	Ext. rate δ (%)	Contr. rate ψ (%)	Impact value a_k (kg·m/cm²)	Fat. strth σ_{-1} (kg/cm²)
42SiMn	Y52	850~860°C oil cooling 180~200°C tempering	206			33	3.5	
	G42	860~880°C high frequency heating emulsion cooling 350~370°C tempering						
	G52 T-G52	860~880°C high frequency heating emulsion cooling 180~200°C tempering						
20Mn2B	S-Y59	900~950°C carburization 820~840°C oil cooling 180~200°C tempering	137		Core 12	58.5	11	
	S-G59	900~950°C carburization 830~880°C high frequency heating emulsion cooling 180~200°C tempering						
20MnVB	S-Y59	900~950°C carburization 810~830°C oil cooling 180~200°C tempering			Core			
	S-G59	900~950°C carburization 820~860°C high frequency heating emulsion cooling 180~200°C tempering	153		11.5	45	13	
20SiMnVB	S-Y59	900~950°C carburization 820~840°C oil cooling 180~200°C tempering	≥120	100	≥10	≥50	≥8	
	S-G59	900~950°C carburization 820~880°C high frequency heating emulsion cooling 180~200°C tempering						

TO BE CONTINUED

Continued (2)

Mechanical Properties Hardness		Permitted sect. size	Samples of Uses	Substitude steel grade
HRC	HB			
50~55		≤φ30	Same as 5iMn-Y48 but the cross-section is smaller	
40~45			To make medium speed and medium load gear and other spare parts	
50~55			To make spare parts which require high surface strength and high abrasive resistance, such as main axle, axle and gear.	
56~62		≤40	To make spare parts of medium and small soze, which can bear impact and high speed work, such as the main axle which rotates in sliding bearing, speed-changing box gear, clutch, sleeve, direction plate, simulation plate and screw rod.	
56~62		≤120	To make spare parts which have high abrasive resistance and less deformation after heat treatment, such as gear of which the modulus is smaller than 3mm, main axle, axle and splined shaft.	
	Core 389	≤40	Same as 20Mn2B-Y59	
	Core 143~179	≤120	Same as 20Mn2B-G59	
56~62	Core ≤285		To make spare parts which can bear impact and high speed work, such as gear, screw rod, claw clutch, sleeve and main axle which rotates in sliding bearing.	
56~62			Same as 20SiMnVB-S-G59 and used to make spare parts which require less deformation after heat treatment, such as gear and claw clutch.	

TO BE CONTINUED

Continued (1)

Steel Grade	Heat treatment	Heat treatment Norms	Mechanical Properties: Tnsl strth σ_b (kg/mm^2)	Yield point σ_s (kg/mm^2)	Ext. rate δ (%)	Contr. rate ψ (%)	Impact value a_k (kg·m/cm^2)	Fatigue strength σ_{-1} (kg/mm^2)
45MnB	T235	840~860℃ oil cooling 600~650℃ tempering	≥74	≥60	≥22	≥64	≥16	
	Y42	830~850℃ oil cooling 350~370℃ tempering						
	Y48	830~850℃ oil cooling 280~300℃ tempering						
	Y52	840~860℃ oil cooling 180~200℃ tempering						
40MnVB	T235	830~850℃ oil cooling 550~650℃ tempering	≥80	≥70	≥30	≥55	≥12	
	C42	830~850℃ oil cooling 350~370℃ tempering						
	C48	830~850℃ oil cooling 280~320℃ tempering						
	C52	830~850℃ oil cooling 180~200℃ tempering						
	G48	860~880℃ water or emulsion cooling 260~280℃ tempering						
	G52 T·G52	860~880℃ water or emulsion cooling 260~280℃ tempering						
18CrMnTi	S-Y59	900~950℃ carburization 820~840℃ oil cooling 180~200℃ tempering	≥100	≥80	Core ≥9	≥50	≥8	65
	S-G59	900~950℃ carburization 820~860℃ high frequency heating emulsion cooling 180~200℃ tempering						

TO BE CONTINUED

Continued (2)

Mechanical Properties Hardness		Permitted sect. size	Samples of Uses	Substitude steel grade
HRC	HB			
	220~250		Same as 35SiMn-T235	
40~45			Same as 35SiMn-Y42	
45~50			Same as 35SiMn-Y48	
50~55			Same as 42SiMn-Y52	
	220~250		Same as 35SiMn-T235	
		≤50	Same as 35SiMn-Y42	
		≤40	Same as 35SiMn-Y48	
		≤30	Same as 42SiMn-Y52	
46~51		≤100	Same as 42SiMn-G48	
50~55		≤100	Same as 42SiMn-G52	
56~62	Core 240~300	≤80	To make spare parts which can bear medium load and impact load and high speed work, such as gear, screw rod, claw clutch and main axle which rotates in sliding bearing.	20MnTiB 20SiMnVB
56~62		≤120	Same as 18CrMnTi-Y59 and the spare parts which require less deformation after heat treatment.	

TO BE CONTINUED

Continued (1)

Steel Grade	Heat treat-ment	Heat treatment norms	Mechanical Properties: Tnsl strth σ_b (kg/mm²)	Yield point σ_s (kg/mm²)	Ext. rate δ (%)	Contr rate ψ (%)	Impact value α_k (kg·m/cm²)	Fatigue strength σ_{-1} (kg/mm²)
35CrMo	T280	850~870°C oil cooling 600~650°C tempering	≥90	≥80	≥15	≥40	≥7	
	Y48	850~870°C oil cooling 200~220°C tempering	≥160	≥140	≥12	≥38		65
38CrMoAl	T280	930~950°C oil or water cooling 620~640°C tempering	100	85	15	50	9	
	D900	510~560°C carburization 100~150°C air cooling	The core hardness is determined by previous heat treatment					
20Cr	S-Y59	900~950°C carburization 800~820°C oil cooling 180~200°C tempering						
	S-G59	900~950°C carburization 830~880°C high frequency heating emulsion cooling 180~200°C tempering						
40Cr	T235	840~860°C oil cooling 600~650°C tempering	>85	>65	≥10	≥40	≥6	40
	Y42	830~850°C oil cooling 350~370°C tempering						
	Y48	840~860°C oil cooling 280~320°C tempering						
	Y52	850~870°C oil cooling 180~200°C tempering						
	G48	860~880°C high frequency heating emulsion cooling 240~280°C tempering						

TO BE CONTINUED

Continued (2)

Mechanical Properties Hardness HRC	HB	Permitted sect size	Samples of Uses	Substitude steel grade
	255~302		To make spare parts of high rotation precision, such as gears	
45~50			To make gears of high fatigue strength, medium speed and heavy load, main axle and other spare parts	
	≥280		To make spare parts which have have high abrasive resistance, high fatigue strength, high strength and less deformation after heat treatment, such as boring bar, main axle, gear, screw rod, thimble and sleeving ring.	
	HV ≥900			
56~62	Core ≥212	≤40	Same as 20Mn2B-S-T59	20Mn2B 20Mn7
		≤120	Same as 20Mn2B-S-G59	
	220~250	≤80	Same as 35SiMn-T235	35SiMn 40MnB 45Mn2
40~45		≤50	Same as 35SiMn-T42	40MnB 45MnB
45~50		≤40	Same as 35SiMn-T42	
50~55		≤25	Same as 42Mn-T52	
45~50		≤100	Same as 42SiMn-G42	

TO BE CONTINUED

Continued (1)

Steel Grade	Heat treatment	Heat treatment norms	Mechanical Properties					
			Tnsl strth σ_b (kg/mm^2)	Yield point σ_s (kg/mm^2)	Ext. rate δ (%)	Contr. rate ψ (%)	Impact value a_k (kg·m/cm^2)	Fatigue strength σ_{-1} (kg/mm^2)
40Cr	G52 T-G52	860~880°C high frequency heating emulsion cooling 180~200°C tempering						
9Mn2V	Y56	780~810°C oil cooling 240~260°C tempering						
	Y62	780~810°C oil cooling 180~200°C tempering						
	T-G60	810~830°C oil cooling 180~200°C tempering						
CrMn	Y56	830~850°C oil cooling 260~320°C tempering						
	Y62	830~850°C oil cooling 180~200°C tempering						
CrWMn	Y56	830~850°C oil cooling 280~340°C tempering						
	Y62	830~850°C oil cooling 180~200°C tempering						
65Mn	Y45	790~820°C oil cooling 370~400°C tempering	≥150	≥125	≥5	≥10		
	Y58	790~820°C oil cooling 200~280°C tempering						
60Si2MnA	Y42	860~880°C oil cooling 460°C tempering	≥130	≥120	≥5	≥25		
	Y45	860~880°C oil cooling 400~425°C tempering	≥150	≥130	≥5	≥20		

TO BE CONTINUED

Continued (2)

Mechanical Properties Hardness HRC	HB	Permitted sect. size	Samples of Uses	Substitude steel grade
50~55		≤80	Same as 42SiMn-G52	40Mn7B 40MnB
54~58		≤50	To make precision quenching wire rod of less deformation and high abrasive resistance, profile gauge, cam wheel, mould and other spare parts.	
60~64		≤30		
60~62			To make main axle of grinding machine which rotates with high speed.	
54~58		≤40	To make precision quenching wire rod, of which the diameter is smaller than 40mm and it has less deformation and high abrasive resistance, cam wheel, profile gauge, mould directing sleeve.	9Mn2V
60~64		≤30		
54~58		≤70	To make precision quenching wire rod of less deformation and high abrasive resistance, and directing sleeve	9Mn2V
60~64		≤40		
42~48		≤35	To make belt spring and spring of which the cross-section is larger than 6mm and backing ring.	
55~60	55~60	≤15	To make spare parts of highelasticity, high abrasive resistance and high strength, such as spring clamping head and machine tool main axle.	
40~45			To make large spring of which the cross-section is over 6mm and it can bear heavy load.	
42~48				

TO BE CONTINUED

Continued (1)

Steel Grade	Heat treatment	Heat treatment norms	Mechanical Properties: Tnsl strth σ_b (kg/mm²)	Yield point σ_s (kg/mm²)	Ext. rate δ (%)	Contr. rate ψ (%)	Impact value a_k (kg·m/cm²)	Fatigue strength σ_{-1} (kg/mm²)
50CrVA	Y42	850~870°C oil cooling 460~480°C tempering	≥130	≥110	≥10	≥45	~3	
	Y45	840~860°C oil cooling 370~420°C tempering	≥150	≥130	≥12	≥40		69
2Cr13	T250	1000~1050°C oil cooling 600~700°C. tempering	≥66	≥45	≥16	≥55	≥3	
GCr6	Y63	830~850°C oil cooling 150~160°C. tempering						
GCr15	Y60	840~860°C oil cooling 180~200°C tempering						
	Y63	840~860°C oil cooling 150~160°C tempering						
GCr15SiMn	Y63	830~840°C oil cooling 150~160°C tempering						
W9Cr4V2	Y63	750~800°C. pre-heating 1220~1240°C oil cooling 560~580°C tempering						
W18Cr4V	Y63	750~800°C. pre-heating 1260~1280°C oil cooling 560~580°C tempering two times						

Continued (2)

Mechanical Properties Hardness		Permitted sect. size	Samples of Uses	Substitute steel grade
HRC	HB			
40~45		≤35	To make important spring of heavy load, high fatigue strength and high elasticity.	60Si2MnA
42~48		≤25		
	240~260		To make spare parts which can remain rustproof in atmosphere and bear no heavy load, such as mirror shaft, standard gauge and fastening piece	
61~65		≤10	To make steel ball of which the diameter is smaller than 13mm and roller and various pins of which the diameter is under 10mm.	
58~62		≤35	To make padding block and mandrel which have high abrasive resistance and bear no great pressure.	
61~65		≤15	To make spare parts of heavy load and high abrasive resistance, such as vane pump setter, copying die, sleeve of which the wall thickness is less than 14mm, bearing ring of which the external diameter is less than 250mm, steel ball of which the diameter is less than 50mm and roller of which the diameter is less than 23mm.	
61~65		≤35	To make bearing ring of which the wall thickness is more than 14mm or the external diameter is more than 250mm, steel ball of which the diameter is more than 50mm and roller of which the diameter is more than 23mm.	
			To make oil pump blade, screw-thread grinding machine top point and other spare parts of high temperature antiabrasion.	
60~66				

(4) Iron Casting and Steel Casting

1. Gray Iron Casting (GB976-67)

Table 2-1-34 The Mechanical Properties and Uses of Gray Iron Casting (GB976-67)

Brand	Casting main wall thickness (mm)	Rough test bar diam. D (mm)	Tensile strength σ_b (kg/mm^2) ≥	Bendg strength σ_w (kg/mm^2) ≥	Deflexion Fulcrum = 10D (mm) ≥	Compression strength σ_y (kg/mm^2) ≥	HB	Samples of Uses
HT10-26	all sizes	30	10	26	2	50	143~229	
HT15-33	4~8	13	28	47	1.6	65	170~241	End-cover, steam turbin pump body, valve shell, pipe and pipeline accessory, hand-wheel, machine tool surport, machine body and complicated parts, sliding seat and working stand.
	>8~15	20	20	39	2		170~241	
	>15~30	30	15	33	2.5		163~229	
	>30~50	45	12	25	3		163~229	
	>50	60	10	21	4		143~229	
HT20-40	6~8	13	32	53	1.8	75	187~255	Cylinder, gear, bottom support, machine body, fly wheel, gear rack, auxiliary cylinder, machine body of machine tool which has guide track and liquid pressure cylinder of medium pressure (under 80kg/cm^2), liquid pressure pump and valve shell.
	>8~15	20	25	45	2.5		170~241	
	>15~30	30	20	40	2.5		170~241	
	>30~50	45	18	34	3		170~241	
	>50	60	16	31	4.5		163~229	

HT25-47	>8~15	20	29	50	2.8	100	187~256	Valve shell, oil tank, cylinder, axle connector, machine body, gear, gear-box shell, fly wheel, auxiliary cylinder, camwheel and bearing pile.
	>15~30	30	25	47	3		170~241	
	>30~50	45	22	42	4		170~241	
	>50	60	20	39	4.5		163~229	
HT30-54	15~30	30	30	54	3	110	187~256	Gear, camwheel, machine tool clamping disk, shear bench, pressure machine body, guide plate, hexagon, automatic lathe and machine body of heavy load machine tool which has guide track, high pressure liquid-pressure cylinder, liquid-pressure pump and sliding valve shell.
	>30~50	45	27	50	4		170~241	
	>50	60	26	48	4.5		170~241	
HT35-61	>15~30	30	35	61	3.5	120	197~269	
	>30~50	45	32	58	4		187~255	
	>50	60	31	54	4.5		170~241	
HT40-68	>20~30	30	40	68	3.5		207~269	
	>30~50	45	38	65	4		197~269	
	>50	60	37	63	4.5		197~269	

Note: 1. The first group of numbers folowing "HT" signifies the lowest tensile strength; the second group of numbers signifies the lowest bending strength.
2. The main wall thickness of the casting refers to the point of the casting that bears load.
3. The permitted minimum number of the "casting main wall thickness" of each brand in the table is generally corresponding to the permitted minimum wall thickness of the iron casting of that brand.
4. In the new standard, compression strength has not been regulated yet, the numbers given in the table indicate the compression strength when wall thickness is more than 15-30mm, and they are based on the standard of (JB297-62).

2. Gray Iron Casting (JB297-62)

Table 2-1-35 The Mechanical Properties of Gray Iron Casting (JB297-62)

Brand	Mechanical Properties					
	Tensile strength σ_b (kg/mm^2)	Bending strength σ_w (kg/mm^2)	Deflexion (mm) Fulcrum distance 600	Deflexion (mm) Fulcrum distance 300	Compression strength σ_y (kg/mm^2)	HB
HT00	No test	No test	—	—	—	—
HT12-28	12	28	6	2	50	143～229
HT15-32	15	32	8	2.5	65	163～229
HT18-36	18	36	8	2.5	70	170～229
HT21-40	21	40	9	3	75	170～241
HT24-44	24	44	9	3	85	170～241
HT28-48	28	48	9	3	100	170～241
HT32-52	32	52	9	3	110	187～255
HT35-56	35	56	9	3	120	197～269
HT38-60	38	60	9	3	130	207～269

3. Spheroidal Graphitic Iron Casting · (JB299-82)

Table 2-1-36 The Mechanical Properties and Uses of Spheroidal Graphitic Cast Iron Piece

Brand	Tensile strength σ_b (kg/mm²)	Yield strength σ_s (kg/mm²)	Ext. rate δ (%)	Impact value a_k (kg.m/cm²)	HB	Samples of Uses
QT45-0	45	36			187~255	1. To make axle parts, such as diesel engine bent axle (generally QT50-1.5 or QT60-2), cam axle and water pump parts.
QT50-1.5	50	38	1.5	1.5	187~255	2. To make gears (generally QT45-5), the proper casting wall thickness is 10-75mm.
QT60-2	60	42	2.0	1.5	197~269	3. To make piston ring, friction blade and automobile rear bridge and other spare parts.
QT45-5	45	33	5.0	2.0	170~207	4. Medium pressure valve, low pressure valve, bearing support and jack support.
QT40-10	40	30	10.0	3.0	156~197	

Note: The first group of numbers following "QT" indicates the lowest tensile strength, and the second group of numbers indicates the lowest extension rate.

4. Forgeable Iron Casting (GB978-67)

Table 2-1-37 The Mechanical Properties and Uses of Forgeable Cast Iron Piece

Brand	Casting arm wall thickness (mm)	Testing bar diameter (mm)	Tensile strength σ_b (kg/mm²)	Ext. rate δ (%)	Yield strength σ_s (kg/mm²)	HB	Samples of Uses
KT-30-6	<8	8	34	10		120~163	1. Tractor, automobile casting parts, such as wheel hub on rear bridge shell, steering mechanism shell body and spring plate support. 2. Various machine tool accessory, such as hook-shaped trigger, and screw-thread hinge trigger. 3. Various pipe joints which can be used to substitute copper casting, such as running water nozzle. 4. To make low pressure valve and farming instruments.
	8~12	12	33	9			
	>12	16	30	6			
KT-33-8	<8	8	37	12		120~163	
	8~12	12	36	11			
	>12	16	33	8			
KT-35-10	<8	8	39	14		120~163	
	8~12	12	38	13			
	>12	16	35	10			
KT-37-12	<8	8	41	16		120~163	
	8~12	12	40	15			
	>12	16	37	12			
KTZ-45-5		16	45	5	28	152~219	
KTZ-50-4		16	50	4	34	179~241	
KTZ-60-3		16	60	3	42	201~269	
KTZ-70-2		16	70	2	55	240~270	

Note: The first group of numbers following "KT" and "KTZ" indicate minimum tensile strength and the second group of numbers indicate minimum extension rate.

5. Heat-resisting Iron Casting (JB640-65)

Table 2-1-38 The Mechanical Properties and Uses of Heat-resisting Cast Iron Piece (1)

Name	Brand	Chemical Composition (%) C	Si	Mn	P	S	Cr	Heat resisting temp. (°C)	Mechanical Properties at Room Temperature Tnsl strth σ_b (kg/mm²)	Bendg strth σ_w (kg/mm²)	Deflexion 2 fulcrum distance 300mm (mm)	HB
Containing chrome heat resisting cast iron	RTCr-0.8	2.8 ~3.6	1.5 ~2.5	<1.0	<0.3	<0.12	0.5 ~1.1	Below 600	15	36	2.5	207~285
Containing chrome heat resisting cast iron	RTCr-1.5	2.8 ~3.6	1.7 ~2.7	<1.0	<0.3	<0.12	1.2 ~1.9	Below 650	15	32	2.5	207~285
High silcon heat resis-ting cast iron	RTSi-5.5	2.2 ~3.0	5.0 ~6.0	<1.0	<0.2	<0.12	0.5 ~0.9	Below 850	10	24	2.0	140~255
High silcon heat resis-ting cast iron	RQTSi-5.5	2.4 ~3.0	5.0 ~6.0	<0.7	<0.2	<0.03		Below 900	22	Not mea-sur-ed	Not measured	228~321

Note: 1. The graphite of RQTSi-5.5 high silcon heat-resisting spheroidal graphitic cast iron should be spheroidal and the flaky graphite is no more than 15%.

2. The high silcon heat-resisting cast iron piece and high silcon heat-resisting spheroidal graphitic cast iron piece should all go through heat treatment to eliminate internal stress.

Table 2-1-38 The Mechanical Properties and Uses of Heat-resisting Cast Iron Piece (2)

Matrix structure	Samples of Uses
Pearlite or pearlite plus cementite	To make spare parts which can work in the air below 600°C and in furnace gas medium, such as gas producer fixodrate, furnace bar and open hearth furnace cooling cabinet.
Pearlite or pearlite plus cementite	To make spare parts which can work in the air below 650°C, furnace gas or producer gas medium, such as furnace bar, furnace bar support, open hearth furnace cooling cabinet and heat exchange pipe.
Ferrite or ferrite plus pearlite (less than 20%)	To make spare parts which can work in the air below 850°C and in furnace gas or producer gas medium, such as heat exchange pipe, gas control valve, open hearth furnace cooling cabinet, the furnace bar beam of steam boiler.
Ferrite or ferrite plus pearlite (less than 10%)	To make spare parts which can work in the air below 950°C (Si content less than 5%) and below 1000°C (Si content more than 5.5%) and in furnace gas medium, such as heat exchange pipe and furnace bar.

6. Carbon Steel Casting (GB979-67)

Table 2-1-39 The Chemical Composition, Mechanical Properties and Uses of Carbon Steel Casting

Steel Grade	Chemical Composition (%) C	Mn	Si	Mechanical Properties Yield strth σ_s (kg/mm²) ≥	Insl strth σ_b (kg/mm²) ≥	Ext. rate δ_5 (%) ≥	Contr. rate ψ (%) ≥	Impact value α_k (kg·m/cm²) ≥	Samples of Uses
ZG 15	0.12~0.22	0.35~0.65	0.20~0.45	20	40	25	40	6.0	Machine parts of various shapes, such as machine stand and speed change box shell
ZG 25	>0.22~0.32	0.50~0.80	0.20~0.45	24	45	20	32	4.5	To make machine stand, harrer wheel, box body and pipeline accessories which can work under 450°C. Good weldability.
ZG 35	>0.32~0.42	0.50~0.80	0.20~0.45	28	50	16	25	3.5	Machine articles of various shapes, such as fly wheel, machine stand, steam hammer, ram harrer, tooth wheel, water engine operation cistern and beam. Weldability is all right.
ZG 45	>0.42~0.52	0.50~0.80	0.20~0.45	32	58	12	20	3.0	Machine articles of various shapes, such as axle connector, wheel, cylinder, gear, gear ring and heavy machine stand.
ZG 55	>0.52~0.62	0.50~0.80	0.20~0.45	35	65	10	18	2.0	Crane and transporter gear, axle connector and important machine parts.

Note: 1. The castings can, according to their quality, be classified into three grades: Grade I - high grade casting; grade II - fine casting and grade III - ordinary casting.

Casting grades	Chemical composition (%) S ≤	P ≤
I	0.04	0.04
II	0.05	0.05
III	0.06	0.06

2. The grade of the mass of castings is indicated after the steel grade, but grade III is not given, for example, ZG35 I; ZG35 II; and ZG35.

3. Grade I casting should have tests of chemical composition and σ_s, σ_b, δ_5, α_k; grade II, chemical composition and σ_s, σ_b, δ_5; and grade III, chemical composition and σ_b, δ_5.

(5) Section Steel

1. Rolled Thin Steel Plate (GB708-65)

Table 2-1-40 The Norms and Dimensions of Rolled Thin Steel Plate

Thickness (mm)	Width (mm)												
	500	600	710	750	800	850	900	950	1000	1100	1250	1400	1500
	Length (mm)												
Hot rolled steel plate													
0.35, 0.4, 0.45, 0.5, 0.55, 0.6, 0.7, 0.75	1000 1500 2000	1200 1500 1800 2000	1000 1420 2000	1000 1500 1800 2000	1500 2000	1700 2000	1500 1800 2000	1500 1900 2000	1500 2000				
0.8, 0.9	1000 1500	1200 1420	1420 2000	1500 1800 2000	1500 2000	1500 1700 2000	1500 1800 2000	1500 1900 2000	1500 2000				
1, 1.1, 1.2, 1.25, 1.4, 1.5, 1.6, 1.8	1000 1500 2000	1200 1420 2000	1000 1420 2000	1000 1500 1800 2000	1500 2000	1500 1700 2000	1000 1500 1800 2000	1500 1900 2000	1500 2000				
2, 2.2, 2.5, 2.8	500 1000 1500	600 1200 1500	1000 1420 2000	1500 1800 2000	1500 2000	1500 1700 2000	1000 1500 1800 2000	1500 1900 2000	1500 2000 3000	2200 3000 4000	2500 3000 4000	2800 3000 4000	3000 4000
3, 3.2, 3.5, 3.8, 4	500 1000	600 1200	1420 2000	1000 1500 1800 2000	1500 2000	1500 1700 2000	1000 1500 1800 2000	1500 1900 2000	1500 2000 4000	2200 3000 4000	2500 3000 4000	2800 3000 4000	3000 3500 4000

Cold rolled steel plate

0.2, 0.25, 0.3, 0.4		1200	1420	1500	1500	1500						
	1000	1800	1800	1800	1800	1800	1500		1500			
	1500	2000	2000	2000	2000	2000	1800		2000			
0.5, 0.55, 0.6		1200	1420	1500	1500	1500						
	1000	1800	1800	1800	1800	1800	1500		1500			
	1500	2000	2000	2000	2000	2000	1800		2000			
0.7, 0.75		1200	1420	1500	1500	1500						
	1000	1800	1800	1800	1800	1800	1500		1500			
	1500	2000	2000	2000	2000	2000	1800		2000			
0.8, 0.9		1200	1420	1500	1500	1500	1500					
	1000	1800	1800	1800	1800	1800	1800		1500	2000	2000	
	1500	2000	2000	2000	2000	2000	2000		2000	2200	2500	
1, 1.1, 1.2, 1.4, 1.5, 1.6, 1.8, 2	1000	1200	1420	1500	1500	1500						2800	2800
	1500	1800	1800	1800	1800	1800	1800			2000	2000	3000	3000
	2000	2000	2000	2000	2000	2000	2000		2000	2200	2500	3500	3500
2.2, 2.5, 2.8, 3, 3.2, 3.5, 3.8, 4	500	600											
	1000	1200	1420	1500	1500	1500							
	1500	1800	1800	1800	1800	1800							
	2000	2000	2000	2000	2000	2000	1800		2000				

Note: 1. Common materials: ordinary carbon steel (A3[illegible]), fine carbon steel (A[illegible]), ordinary low alloy construction steel ([illegible]) and stainless anti-acid steel (1Cr18Ni9Ti)

2. For theoretical weight of steel plate, see Table 2-1-42.

2. Hot-rolled Thick Steel Plate (GB709-65)

Table 3-1-41 The Norms and Dimensions of Hot-rolled Thick Steel Plate

Thickness (mm)	Width (m)									
	0.6~1.2	>1.2~1.5	>1.5~1.6	>1.6~1.7	>1.7~1.8	>1.8~2.0	>2.0~2.2	>2.2~2.5	>2.5~2.8	>2.8~3.0
	Maximum length (m)									
4.5~5.5	12	12	12	12	12	6				
6~7	12	12	12	12	12	10				
8~10	12	12	12	12	12	12	9	9		
11~15	12	12	12	12	12	12	9	8	8	8
16~20	12	12	12	10	10	9	8	7	7	7
21~25	12	11	11	10	9	8	7	6	6	6
26~30	12	10	9	9	9	8	7	6	6	6
32~34	12	9	8	7	7	7	7	7	6	5
36~40	10	8	7	7	6.5	6.5	5.5	5.5	5	
42~50	9	8	7	7	6.5	6	5	4		
52~60	8	6	6	6	5.5	5	4.5	4		

Note: 1. Commonly used materials: ordinary carbon steel (A3F, A3), fine carbon steel (20#, 45#), ordinary low alloy construction steel (16Mn, 15MnV) and stainless anti-acid steel (1Cr18Ni9Ti).
2. The thickness of steel plate is more than 4-4mm and the thickness interval is 0.5mm. If the thickness is more than 4-20 mm, the thickness interval is 1mm. If the thickness is more than 20-60mm, the thickness interval is 2mm.
3. The width of steel plate is 50mm, the length is a multiple of 100mm, but it must not be less than 1200mm.
4. For theoretical weight of steel plate, see Table 3-1-42.

Table 2-1-42 The Theoretical Weight of Steel Plate

Thickness (mm)	Theoretical weight (kg)	Thickness (mm)	Theoretical weight (kg)	Thickness (mm)	Theoretical weight (kg)	Thickness (mm)	Theoretical weight (kg)
0.2	1.570	1.50	11.78	10.0	78.50	29	227.70
0.25	1.963	1.6	12.56	11	86.35	30	235.50
0.27	2.120	1.8	14.13	12	94.20	32	251.20
0.30	2.355	2.0	15.70	13	102.10	34	266.90
0.35	2.748	2.2	17.27	14	109.90	36	282.60
0.40	3.140	2.5	19.63	15	117.80	38	298.30
0.45	3.533	2.8	21.98	16	125.60	40	314.00
0.50	3.925	3.0	23.55	17	133.50	42	329.70
0.55	4.318	3.2	25.12	18	141.30	44	345.40
0.60	4.710	3.5	27.48	19	149.20	46	361.10
0.70	5.495	3.8	29.83	20	157.00	48	376.80
0.75	5.888	4.0	31.40	21	164.90	50	392.50
0.80	6.280	4.5	35.33	22	172.70	52	408.20
0.90	7.065	5.0	39.25	23	180.60	54	423.90
1.00	7.850	5.5	43.18	24	188.40	56	439.60
1.10	8.635	6.0	47.10	25	196.30	58	455.30
1.20	9.420	7.0	54.95	26	204.10	60	471.00
1.25	9.813	8.0	62.80	27	212.00		
1.40	10.990	9.0	70.65	28	219.80		

3. Hot-rolled Round Steel and Square Steel (GB702-65, GB703-65)

Table 2-1-43 The Norms and Dimensions of Hot-rolled Round Steel and Square Steel

Diameter d or length of Side a (mm)	Permitted Deviation (mm)		Sectional Area (cm^2)		Theoretical Weigth (kg/m)	
	Ordinary Precision	High Precision	Round Steel	Square Steel	Round Steel	Square Steel
5	±0.4	±0.2	0.1963	0.25	0.154	0.196
5.5			0.2375	0.30	0.193	0.236
6			0.2827	0.36	0.222	0.283
6.5			0.3318	0.42	0.260	0.332
7			0.3848	0.49	0.302	0.385
8			0.5027	0.64	0.395	0.502
9			0.6362	0.81	0.499	0.636
10		±0.25	0.7854	1.0	0.617	0.785
11	±0.4	±0.25	0.9503	1.21	0.746	0.95
12			1.131	1.44	0.888	1.13
13			1.327	1.69	1.04	1.33
14			1.539	1.96	1.21	1.54
15			1.767	2.25	1.39	1.77
16			2.011	2.56	1.58	2.01
17			2.270	2.89	1.78	2.27
18			2.545	3.24	2.00	2.54
19			2.835	3.61	2.23	2.82
20			3.142	4.00	2.47	3.14
21	±0.5	±0.3	3.464	4.41	2.72	3.46
22			3.801	4.84	2.98	3.80
23			4.155	5.29	3.26	4.15
24			4.524	5.76	3.55	4.52
25			4.909	6.25	3.85	4.91
26			5.309	6.76	4.17	5.30
27			5.726	7.29	4.49	5.72
28	±0.5	±0.3	6.158	7.84	4.83	6.15
29			6.605	8.41	5.18	6.60
30			7.069	9.00	5.55	7.06
31	±0.6	±0.4	7.548	9.61	5.93	7.54
32			8.042	10.24	6.31	8.04
33			8.553	10.89	6.71	8.55
34			9.079	11.56	7.13	9.07
35			9.621	12.25	7.55	9.62
36			10.18	12.96	7.99	10.17
38			11.34	14.44	8.90	11.24
40			12.57	16.00	9.87	12.56

TO BE CONTINUED

Continued

Diameter d or length of Side a (mm)	Permitted Deviation (mm)		Sectional Area (cm^2)		Theoretical Weight (kg/m)	
	Ordinary Precision	High Precision	Round Steel	Square Steel	Round Steel	Square Steel
42			13.85	17.64	10.87	13.85
45			15.90	20.25	12.48	15.90
48			18.10	23.04	14.21	18.09
50			19.64	25.00	15.42	19.63
52	±0.8	±0.6	21.24	27.04	16.67	21.23
55			23.76	30.25	18.65	23.75
56			24.63	31.36	19.33	24.61
58			26.42	33.64	20.74	26.41
60			28.27	36.00	22.19	28.26
63	±0.8	±0.6	31.17	39.69	24.47	31.16
65			33.18	42.25	26.05	33.17
68			36.32	46.24	28.51	36.30
70			38.48	49.00	30.21	38.47
75			44.18	56.25	34.68	44.16
80			50.27	64.00	39.46	50.24
85			56.75	72.25	44.55	56.72
90			63.62	81.00	49.94	63.59
95			70.88	90.25	55.64	70.85
100	±1.1	±0.9	78.54	100.00	61.65	78.50
105			86.59	—	67.97	—
110			95.03		74.60	
115			103.82		81.50	
120			113.10		88.78	
125	±1.4	—	122.72	—	96.33	—
130			132.73		104.20	
140			153.94		120.84	
150			176.72		138.72	
160			201.06		157.83	
170	±2.0	—	226.98	—	178.18	—
180			254.47		199.76	
190			283.53		222.57	
200			314.16		246.62	
210			346.36		271.89	
220	±2.5	—	380.13	—	298.40	—
240			452.39		355.13	
250			490.88		385.34	

Note: 1. Commonly used materials: ordinary carbon steel (GB700-65), fine carbon steel (YB699-65), easy-to-cut construction steel (YB191-63) and alloy construction steel (YB6-59).

2. The length of hot-rolled round steel and square steel:

Name	Round steel	Square steel
d or a (mm)	≤25	≥26
Length (m) Ordinary steel	4 - 10	3 - 9
Fine steel	2 - 6	

4. Hot-rolled Hexagonal Steel (GB704-65)

Table 2-1-44 The Norms and Dimensions of Hot-rolled Hexagonal Steel

Inscribed Circle Diameter a (mm)	Permitted Deviation (mm)		Sectional Area (cm^2)	Theoretical Weight (kg/m)
	Ordinary precision	High precision		
8		+0.1	0.5542	0.435
9		-0.3	0.7015	0.551
10			0.866	0.680
11			1.048	0.823
12			1.247	0.979
13	+0.3 -0.5		1.463	1.15
14		+0.2	1.697	1.33
15		-0.3	1.948	1.53
16			2.217	1.74
17			2.490	1.96
18			2.806	2.20
19			3.126	2.45
20			3.464	2.72
21			3.822	3.00
22	+0.4	+0.2	4.191	3.29
23	-0.5	-0.4	4.581	3.59
24			4.993	3.92
25			5.412	4.25
26			5.847	4.59
27			6.313	4.96
28			6.790	5.33
30			7.794	6.12
32			8.868	6.96
34	+0.4	+0.2	10.010	7.86
36	-0.7	-0.6	11.220	8.81
38			12.510	9.82
40			13.86	10.88
42			15.27	11.99
45			17.54	13.77
48			20.00	15.66
50			21.64	16.99
53	+0.4	+0.2	24.33	19.10
56	-1.0	-0.9	27.15	21.32
58			28.13	22.08
60			31.18	24.50
63	+0.5	+0.3	34.37	26.98
65	-1.1	-1.0	36.59	28.70
68			40.04	31.43
70			42.43	33.30

Note: 1. Commonly used materials: ordinary carbon steel (GB700-65), fine carbon steel (GB699-65), cast-to-cut construction steel (YB191-63) and alloy construction steel (YB10-59).
2. The length of hot-rolled hexagonal steel is 3-6m.

5. Cold Draw Round Steel (GB905-66)

Table 2-1-45 The Norms and Dimensions of Cold-draw Round Steel

Round Steel Diameter d	Grade of Precision grade 4	grade 5	grade 6	grade 7	Round Steel Diameter d	Grade of Precision grade 4	grade 5	grade 6	grade 7
	Permitted Deviation					Permitted Deviation			
3.0	-0.02	-0.04	-0.06	-0.12	16.0				
3.2					17.0	-0.04	-0.07	-0.12	-0.24
3.4					18.0				
3.5					19.0				
3.8					20.0				
4.0					21.0				
4.2	-0.02	-0.05	-0.08	-0.16	22.0				
4.5					24.0	-0.04	-0.08	-0.14	-0.28
4.8					25.0				
5.0					26.0				
5.3					28.0				
5.6					30.0				
6.0					32.0				
6.3					34.0				
6.7					35.0				
7.0					38.0				
7.5					40.0	-0.05	-0.10	-0.17	-0.34
8.0	-0.03	-0.06	-0.10	-0.20	42.0				
8.5					45.0				
9.0					48.0				
9.5					50.0				
10.0					53.0				
10.5					56.0				
11.0					60.0				
11.5					63.0				
12.0	-0.04	-0.07	-0.12	-0.24	67.0	-0.06	-0.12	-0.20	-0.4
13.0					70.0				
14.0					75.0				
15.0					80.0				

Note: 1. Commonly used materials: ordinary carbon steel (GB700-65), fine carbon steel (GB699-65), east-to-cut construction steel steel YB191-63) and allow construction steel (YB6-59).

2. The length of cold-draw steel: precision of 4 grade -- 2-4m and precision of 5-7 grade -- 2-6m.

6. Cold Draw Square Steel (GB906-66)

Table 2-1-46 The Norms and Dimensions of Cold-draw Square Steel

Square Steel Length of Side a	Grade of Precision			Square Steel Length of Side a	Grade of Precision		
	Grade 5	Grade 6	Grade 7		Grade 5	Grade 6	Grade 7
	Permitted Deviation				Permitted Deviation		
3.0	- 0.04	- 0.06	- 0.12	15.0			
3.2				16.0			
3.4				17.0	- 0.07	- 0.12	- 0.24
3.5				18.0			
3.8				19.0			
4.0				20.0			
4.2	- 0.05	- 0.08	- 0.16	21.0			
4.5				22.0			
4.8				24.0	- 0.08	- 0.14	- 0.28
5.0				25.0			
5.3				26.0			
5.6				28.0			
6.0				30.0			
6.3				32.0			
6.7				34.0			
7.0				35.0			
7.5				38.0			
8.0	- 0.06	- 0.10	- 0.20	40.0	- 0.10	- 0.17	- 0.34
8.5				42.0			
9.0				45.0			
9.5				48.0			
10.0				50.0			
10.5				53.0			
11.0				56.0			
11.5				60.0			
12.0	- 0.07	- 0.12	- 0.24	63.0	- 0.12	- 0.20	- 0.40
13.0				67.0			
14.0				70.0			

Note: 1. Commonly used materials: ordinary carbon steel (GB700-65), fine carbon steel (GB699-65), easy-to-cut construction steel (YB191-63) and alloy construction steel (YB6-59).
2. The length of cold-draw square steel: 2-6m.

7. Cold Draw Hexagonal Steel (GB907-66)

Table 2-1-47 The Norms and Dimensions of Cold-draw Hexagonal Steel

Hexagonal Steel Inscribed Circle Diameter d	Grade of Precision			Hexagonal Steel Inscribed Circle Diameter d	Grade of Precision		
	Grade 5	Grade 6	Grade 7		Grade 5	Grade 6	Grade 7
	Permitted Deviation				Permitted Deviation		
3.0	-0.04	-0.06	-0.12	22.0			
4.0				24.0			
4.5				25.0			
5.0	-0.05	-0.08	-0.16	26.0	-0.08	-0.14	-0.28
5.5				28.0			
6.0				30.0			
7.0				32.0			
8.0				34.0			
9.0	-0.06	-0.10	-0.20	36.0			
10.0				38.0			
11.0				40.0			
12.0				42.0	-0.10	-0.17	-0.34
13.0				45.0			
14.0				48.0			
15.0	-0.07	-0.12	-0.24	50.0			
16.0				53.0			
17.0				55.0			
18.0				60.0			
19.0				65.0	-0.12	-0.20	-0.40
20.0	-0.08	-0.14	-0.28	70.0			
21.0				75.0			

Note: 1. Commonly used materials: ordinary carbon steel (GB700-65), fine carbon steel (GB699-65), easy-to-cut construction steel (YB201-63) and alloy construction steel (YB6-59).

2. The length of cold-draw hexagonal steel: 2 - 6m.

8. Hot-rolled Flat Steel (GB704-65)

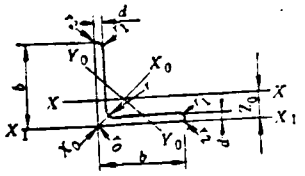
Table 2-1-48 The Norms and Dimensions of Hot-rolled Flat Steel

Width (mm)	Thickness (mm)																								Width (mm)
	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	25	28	30	32	36	40	45	50	56	60	
	Theoretical Weight (kg/m)																								
10	0.24	0.31	0.39	0.47	0.55	0.63	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10
12	0.28	0.38	0.47	0.57	0.66	0.75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	12
14	0.33	0.44	0.55	0.66	0.77	0.88	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	14
16	0.38	0.50	0.63	0.75	0.88	1.00	1.15	1.26	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	16
18	0.42	0.57	0.71	0.85	0.99	1.13	1.27	1.41	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	18
20	0.47	0.63	0.79	0.94	1.10	1.26	1.41	1.57	1.73	1.88	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20
22	0.52	0.69	0.86	1.04	1.21	1.38	1.55	1.73	1.90	2.07	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	22
25	0.59	0.79	0.98	1.18	1.37	1.57	1.77	1.96	2.16	2.36	2.75	3.14	—	—	—	—	—	—	—	—	—	—	—	—	—	25
28	0.66	0.88	1.10	1.32	1.54	1.76	1.98	2.20	2.42	2.64	3.08	3.53	—	—	—	—	—	—	—	—	—	—	—	—	—	28
30	0.71	0.94	1.18	1.41	1.65	1.88	2.12	2.36	2.59	2.83	3.36	3.77	4.2	4.71	—	—	—	—	—	—	—	—	—	—	—	30
32	0.75	1.00	1.25	1.50	1.74	2.01	2.26	2.54	2.76	3.01	3.51	4.02	4.52	5.02	—	—	—	—	—	—	—	—	—	—	—	32
36	0.85	1.13	1.41	1.69	1.97	2.26	2.51	2.82	3.11	3.39	3.95	4.52	5.09	5.65	—	—	—	—	—	—	—	—	—	—	—	36
40	0.94	1.26	1.57	1.88	2.20	2.51	2.83	3.14	3.45	3.77	4.40	5.02	5.65	6.28	6.91	7.85	8.79	—	—	—	—	—	—	—	—	40
45	1.06	1.41	1.77	2.12	2.47	2.83	3.18	3.53	3.89	4.24	4.95	5.65	6.36	7.07	7.77	8.83	9.89	10.60	11.30	12.72	—	—	—	—	—	45
50	1.18	1.57	1.96	2.36	2.75	3.14	3.53	3.93	4.32	4.71	5.50	6.28	7.07	7.85	8.64	9.81	10.99	11.78	12.56	14.13	—	—	—	—	—	50
56	1.32	1.76	2.20	2.64	3.08	3.52	3.95	4.39	4.83	5.27	6.15	7.03	7.91	8.79	9.67	10.99	12.31	13.19	14.07	15.82	—	—	—	—	—	56
60	1.41	1.88	2.36	2.83	3.30	3.77	4.24	4.71	5.18	5.65	6.59	7.54	8.48	9.42	10.36	11.78	13.19	14.13	15.07	16.95	18.84	21.20	—	—	—	60
63	1.48	1.98	2.47	2.97	3.46	3.95	4.45	4.94	5.44	5.93	6.92	7.91	8.90	9.89	10.88	12.36	13.85	14.84	15.83	17.80	19.78	22.25	—	—	—	63
65	1.53	2.04	2.55	3.06	3.57	4.08	4.59	5.10	5.61	6.12	7.14	8.16	9.18	10.21	11.23	12.76	14.29	15.31	16.33	18.37	20.41	22.96	—	—	—	65
70	1.65	2.20	2.75	3.30	3.85	4.40	4.95	5.50	6.04	6.59	7.69	8.79	9.89	10.99	12.09	13.74	15.39	16.49	17.58	19.78	21.98	24.73	—	—	—	70
75	1.77	2.36	2.94	3.53	4.12	4.71	5.30	5.89	6.48	7.07	8.24	9.42	10.60	11.78	12.95	14.72	16.49	17.66	18.84	21.19	23.55	26.49	—	—	—	75
80	1.88	2.51	3.14	3.77	4.40	5.02	5.65	6.28	6.91	7.54	8.79	10.05	11.30	12.56	13.82	15.70	17.58	18.84	20.09	22.61	25.12	28.26	31.40	35.17	—	80
85	2.00	2.67	3.33	4.00	4.67	5.34	6.01	6.67	7.34	8.01	9.34	10.68	12.01	13.35	14.68	16.68	18.68	20.02	21.35	24.02	26.69	30.03	33.36	37.36	40.04	85
90	2.12	2.83	3.53	4.24	4.95	5.65	6.36	7.07	7.77	8.48	9.89	11.30	12.72	14.13	15.54	17.66	19.78	21.20	22.61	25.43	28.26	31.79	35.32	39.56	42.39	90
95	2.24	2.98	3.73	4.47	5.22	5.97	6.71	7.46	8.20	8.95	10.44	11.93	13.42	14.92	16.41	18.84	20.88	22.37	23.86	26.85	29.83	33.56	37.29	41.76	44.75	95
100	2.36	3.14	3.93	4.71	5.50	6.28	7.07	7.85	8.64	9.42	10.99	12.56	14.13	15.70	17.27	19.63	21.98	23.55	25.12	28.26	31.40	35.32	39.25	43.96	47.10	100
105	2.47	3.30	4.12	4.95	5.77	6.59	7.42	8.24	9.07	9.89	11.54	13.19	14.84	16.49	18.16	20.61	23.08	24.73	26.37	29.67	32.97	37.07	41.21	46.16	49.46	105
110	2.59	3.45	4.32	5.18	6.04	6.91	7.77	8.64	9.50	10.36	12.09	13.82	15.54	17.27	19.00	21.59	24.18	25.91	27.63	31.09	34.54	38.86	43.18	48.35	51.81	110
120	2.83	3.77	4.71	5.65	6.59	7.54	8.48	9.42	10.36	11.30	13.19	15.07	16.96	18.84	20.72	23.55	26.38	28.26	30.14	33.91	37.68	42.39	47.10	52.75	56.52	120
125	2.94	3.93	4.91	5.89	6.87	7.85	8.83	9.81	10.79	11.78	13.74	15.70	17.66	19.63	21.50	24.53	27.48	29.44	31.40	35.32	39.25	44.16	49.06	54.95	58.88	125
130	3.06	4.08	5.10	6.12	7.14	8.16	9.18	10.21	11.23	12.25	14.29	16.33	18.37	20.41	22.45	25.51	28.57	30.62	32.65	36.73	40.82	45.92	51.03	57.14	61.22	130
140	3.30	4.40	5.50	6.59	7.69	8.79	9.89	10.99	12.09	13.19	15.39	17.58	19.78	21.98	24.18	27.48	30.77	32.97	35.17	39.56	43.96	49.46	54.95	61.54	65.94	140
150	3.53	4.71	5.89	7.07	8.24	9.42	10.60	11.78	12.95	14.13	16.49	18.84	21.20	23.55	25.91	29.44	32.97	35.33	37.68	42.39	47.10	52.99	58.88	65.94	70.65	150
160	3.77	5.02	6.28	7.54	8.79	10.05	11.30	12.56	13.82	15.07	17.58	20.10	22.61	25.12	27.63	31.40	35.17	37.63	40.19	45.22	50.24	56.52	62.80	70.33	75.36	160
170	4.00	5.34	6.67	8.01	9.34	10.68	12.01	13.35	14.68	16.01	18.68	21.35	24.02	26.69	29.36	33.36	37.37	40.04	42.70	48.04	53.38	60.05	66.73	74.73	80.07	170
180	4.24	5.65	7.07	8.48	9.89	11.30	12.72	14.13	15.54	16.96	19.78	22.61	25.43	28.26	31.09	35.33	39.56	42.39	45.22	50.87	56.52	63.59	70.65	79.12	84.78	180
190	4.47	5.97	7.46	8.95	10.44	11.93	13.42	14.92	16.41	17.90	20.88	23.86	26.85	29.83	32.81	37.29	41.76	44.75	47.72	53.69	59.65	67.12	74.56	83.52	89.49	190
200	4.71	6.28	7.85	9.42	10.99	12.56	14.13	15.70	17.27	18.84	21.98	25.12	28.26	31.40	34.54	39.25	43.96	47.10	50.24	56.52	62.80	70.65	78.50	87.92	94.20	200

Note: Commonly used materials: ordinary carbon steel (GB700-65), fine carbon steel (GB699-65), ordinary low alloy construction steel (YB13-69) and alloy construction steel (YB6-59). 2. First group - theoretical weight is less than 19kg/m; second group, more than 19-60kg/m; and third group, more than 60kg/m. 3. First group — 3-9m; second group — 3-7m; and third group — 3-5m.

9. Hot Rolled Equilateral Angle Steel (YB166-65)

Table 2-1-49 The Norms and Dimensions of Hot-rolled Equilateral Angle Steel



Legend

b – Side width
d – Side thickness
r – Internal circular arc radius
r_1 – Side-end internal arc radius ($r_1 = \frac{1}{3}d$)
r_2 – Side-end outer arc radius
r_0 – Topcircular arc radius
I – Inertial moment
i – Inertial moment
W – Section coefficient
Z_0 – Center of gravity distance

Angle steel Number	Dimension (mm) b	d	r	Section area (cm^2)	Theoretical weight (kg/m)	Surface area (m^2/m)	Reference numerical value $X-X$ I_x (cm^4)	i_x (cm)	W_x (cm^3)	X_0-X_0 I_{x0} (cm^4)	i_{x0} (cm)	W_{x0} (cm^3)	Y_0-Y_0 I_{y0} (cm^4)	i_{y0} (cm)	W_{y0} (cm^3)	X_1-X_1 I_{x1} (cm^4)	Z_0 (cm)
2	20	3	3.5	1.132	0.889	0.078	0.40	0.59	0.29	0.63	0.75	0.45	0.17	0.39	0.20	0.81	0.60
		4		1.459	1.145	0.077	0.50	0.58	0.36	0.78	0.73	0.55	0.22	0.38	0.24	1.09	0.64
2.5	25	3		1.432	1.124	0.098	0.82	0.76	0.46	1.29	0.95	0.73	0.34	0.49	0.33	1.57	0.73
		4		1.859	1.459	0.097	1.03	0.74	0.59	1.62	0.93	0.92	0.43	0.48	0.40	2.11	0.76
3.0	30	3	4.5	1.749	1.373	0.117	1.46	0.91	0.68	2.31	1.15	1.09	0.61	0.59	0.51	2.71	0.85
		4		2.278	1.786	0.117	1.84	0.90	0.87	2.92	1.13	1.37	0.77	0.58	0.62	3.63	0.89

3.6	36	3	4.5	2.109	1.656	0.141	2.58	1.11	0.99	4.09	1.39	1.81	1.07	0.71	0.76	4.68	1.30
		4		2.756	2.163	0.141	3.29	1.09	1.28	5.22	1.38	2.05	1.37	0.70	0.93	6.25	1.04
		5		3.382	2.654	0.141	3.95	1.08	1.56	6.24	1.36	2.45	1.65	0.70	1.09	7.84	1.07
4	40	3	5	2.359	1.852	0.157	3.59	1.23	1.23	5.69	1.55	2.01	1.49	0.79	0.96	6.41	1.09
		4		3.086	2.422	0.157	4.60	1.22	1.60	7.29	1.54	2.58	1.91	0.79	1.19	8.56	1.13
		5		3.791	2.976	0.156	5.53	1.21	1.96	8.76	1.52	3.10	2.30	0.78	1.39	10.74	1.17
4.5	45	3		2.659	2.088	0.177	5.17	1.40	1.58	8.20	1.76	2.58	2.14	0.90	1.24	9.12	1.22
		4		3.486	2.736	0.177	6.65	1.38	2.05	10.56	1.74	3.32	2.76	0.89	1.54	12.18	1.26
		5		4.292	3.369	0.176	8.04	1.37	2.51	12.74	1.72	4.00	3.33	0.88	1.81	15.25	1.30
		6		5.076	3.985	0.176	9.33	1.36	2.95	14.76	1.70	4.64	3.89	0.88	2.06	18.36	1.33
5	50	3	5.5	2.971	2.332	0.197	7.18	1.55	1.96	11.37	1.96	3.22	2.98	1.00	1.57	12.50	1.34
		4		3.897	3.059	0.197	9.26	1.54	2.56	14.70	1.94	4.16	3.82	0.99	1.96	16.69	1.38
		5		4.803	3.770	0.196	11.21	1.53	3.13	17.79	1.92	5.03	4.64	0.98	2.31	20.90	1.42
		6		5.688	4.465	0.196	13.05	1.52	3.68	20.68	1.91	5.85	5.42	0.98	2.63	25.14	1.46
5.6	56	3	6	3.343	2.624	0.221	10.13	1.75	2.48	16.14	2.20	4.08	4.24	1.13	2.02	17.56	1.48
		4		4.390	3.446	0.220	13.18	1.73	3.21	20.92	2.18	5.28	5.46	1.11	2.52	23.43	1.53
		5		5.415	4.251	0.220	16.02	1.72	3.97	25.42	2.17	6.42	6.61	1.10	2.98	29.33	1.57

Continued

Angle Steel Number	Dimension (mm) b	d	r	Sect. Area (cm²)	Theoretical Weight (kg/m)	Surface Area (m²/m)	Reference Numerical Value $X-X$ I_x (cm⁴)	i_x (cm)	W_x (cm³)	X_0-X_0 I_{x0} (cm⁴)	i_{x0} (cm)	W_{x0} (cm³)	Y_0-Y_0 I_{y0} (cm⁴)	i_{y0} (cm)	W_{y0} (cm³)	X_1-X_1 I_{x1} (cm⁴)	Z_0 (cm)
5.6	56	8	6	8.367	6.568	0.219	23.63	1.68	6.03	37.37	2.11	9.44	9.89	1.09	4.16	47.24	1.68
6.3	63	4	7	4.978	3.907	0.248	19.03	1.96	4.13	30.17	2.46	6.78	7.89	1.26	3.29	33.35	1.70
		5		6.143	4.822	0.248	23.17	1.94	5.08	36.77	2.45	8.25	9.57	1.25	3.90	41.73	1.74
		6		7.288	5.721	0.247	27.12	1.93	6.00	43.03	2.43	9.66	11.20	1.24	4.46	50.14	1.78
		8		9.515	7.469	0.247	34.46	1.90	7.75	54.56	2.40	12.25	14.33	1.23	5.47	67.11	1.85
		10		11.657	9.151	0.246	41.09	1.88	9.39	64.85	2.36	14.56	17.33	1.22	6.36	84.31	1.93
7	70	4	8	5.570	4.372	0.275	26.39	2.18	5.14	41.80	2.74	8.41	10.99	1.40	4.17	45.74	1.86
		5		6.875	5.397	0.275	32.21	2.16	6.32	51.08	2.73	10.32	13.34	1.39	4.95	57.21	1.91
		6		8.160	6.406	0.275	37.77	2.15	7.48	59.93	2.71	12.11	15.61	1.38	5.67	68.73	1.95
		7		9.424	7.398	0.275	43.09	2.14	8.59	68.35	2.69	13.81	17.82	1.38	6.34	80.29	1.99
		8		10.667	8.373	0.274	48.17	2.12	9.68	76.37	2.68	15.43	19.98	1.37	6.98	91.92	2.03
(7.5)	75	5	9	7.367	5.818	0.295	39.97	2.33	7.32	63.30	2.92	11.94	16.63	1.50	5.77	70.56	2.04
		6		8.797	6.905	0.294	46.95	2.31	8.64	74.38	2.90	14.02	19.51	1.49	6.67	84.55	2.07
		7		10.160	7.976	0.294	53.57	2.30	9.93	84.96	2.89	16.02	22.18	1.48	7.44	98.71	2.11
		8		11.503	9.030	0.294	59.96	2.28	11.20	95.07	2.88	17.93	24.86	1.47	8.19	112.97	2.15
		10		14.126	11.089	0.293	71.98	2.26	13.64	113.92	2.84	21.48	30.05	1.46	9.56	141.71	2.22

		5		7.912	6.211	0.315	48.79	2.48	8.34	77.13	3.13	13.67	20.25	1.60	5.66	85.36	2.15
		6		9.397	7.376	0.314	57.35	2.47	9.97	90.98	3.11	16.08	23.72	1.59	7.65	102.50	2.19
8	80	7	9	10.860	8.525	0.314	65.53	2.46	11.37	104.07	3.10	18.10	27.09	1.58	8.58	119.70	2.23
		8		12.303	9.658	0.314	73.19	2.44	12.83	116.60	3.08	20.61	30.39	1.57	9.46	136.97	2.27
		10		15.126	11.874	0.313	88.43	2.42	15.64	140.09	3.04	24.76	36.77	1.56	11.08	171.74	2.35
		6		10.637	8.350	0.354	82.77	2.79	12.61	131.26	3.51	20.63	34.28	1.80	9.95	145.87	2.44
		7		12.301	9.656	0.354	94.83	2.78	14.54	150.47	3.50	23.84	39.18	1.78	11.19	170.30	2.48
9	90	8	10	13.944	10.946	0.353	106.47	2.76	16.42	168.97	3.48	26.55	43.97	1.78	12.35	194.80	2.52
		10		17.167	13.476	0.353	128.58	2.74	20.07	203.90	3.45	32.04	53.26	1.76	14.52	244.07	2.59
		12		20.306	15.940	0.352	149.22	2.71	23.57	236.21	3.41	37.12	62.22	1.75	16.19	293.76	2.67
		6		11.932	9.366	0.393	114.95	3.10	15.68	181.98	3.90	25.74	47.92	2.00	12.69	200.07	2.67
		7		13.796	10.830	0.393	131.86	3.09	18.10	208.97	3.89	29.55	54.71	1.99	14.26	233.51	2.71
		8		15.638	12.276	0.393	148.24	3.08	20.47	235.07	3.88	33.24	61.41	1.98	15.75	267.09	2.76
10	100	10		19.261	15.120	0.392	179.51	3.05	25.06	284.68	3.84	40.26	74.35	1.96	18.54	334.48	2.84
		12		22.800	17.898	0.391	208.90	3.03	29.48	330.95	3.81	46.80	86.84	1.95	21.08	402.34	2.91
		14	12	26.256	20.611	0.391	236.53	3.00	33.73	374.06	3.77	52.90	99.00	1.94	23.44	470.75	2.99
		16		29.627	23.257	0.390	262.53	2.98	37.82	414.16	3.74	58.57	110.89	1.94	25.63	539.40	3.06
		7		15.196	11.928	0.433	177.16	3.41	22.75	280.94	4.30	36.12	73.38	2.20	17.51	310.64	2.96
		8		17.238	13.532	0.433	199.16	3.40	24.95	316.19	4.28	40.89	82.42	2.19	19.39	355.20	3.01
11	110	10		21.281	16.690	0.432	242.19	3.38	30.80	384.39	4.25	49.42	99.98	2.17	22.31	444.65	3.09
		12		25.200	19.782	0.431	282.55	3.35	36.05	448.17	4.22	57.52	116.93	2.15	26.15	534.60	3.16
		14		29.036	22.809	0.431	320.71	3.32	41.13	508.01	4.18	65.21	133.40	2.14	29.14	625.16	3.24

TO BE CONTINUED

Unit: [illegible]

Angle Steel Number	Dimension (mm) b	d	r	Sect. Area (cm²)	Theoretical Weight (kg/m)	Surface Area (m²/m)	Reference Numerical Value $X-X$ I_x (cm⁴)	i_x (cm)	W_x (cm³)	X_0-X_0 I_{x0} (cm⁴)	i_{x0} (cm)	W_{x0} (cm³)	Y_0-Y_0 I_{y0} (cm⁴)	i_{y0} (cm)	W_{y0} (cm³)	$Y-Y$ I_y (cm⁴)	Z_0 (cm)
		8		19.750	15.504	0.492	297.03	3.88	32.52	470.89	4.88	53.28	123.16	2.50	25.86	521.01	3.37
		10		24.373	19.133	0.491	361.67	3.85	39.97	573.89	4.85	64.93	149.46	2.48	30.62	651.93	3.45
12.5	125	12		28.912	22.696	0.491	423.16	3.83	47.17	671.44	4.82	75.96	174.88	2.46	35.03	783.42	3.53
		14		33.367	26.193	0.490	481.65	3.80	54.16	763.73	4.78	86.41	199.57	2.45	39.13	915.61	3.61
		10	14	27.373	21.488	0.551	514.65	4.34	50.58	817.27	5.46	82.56	212.04	2.78	39.20	915.11	3.82
		12		32.512	25.522	0.551	603.68	4.31	59.80	958.79	5.43	96.85	248.57	2.76	45.02	1099.28	3.90
14	140	14		37.567	29.490	0.550	688.81	4.28	68.75	1093.56	5.40	110.47	284.06	2.75	50.45	1284.22	3.98
		16		42.539	33.393	0.549	770.24	4.26	77.46	1221.81	5.36	123.42	318.67	2.74	55.55	1470.07	4.06
		10		31.502	24.729	0.630	779.53	4.98	66.70	1237.30	6.27	109.36	321.76	3.20	52.76	1365.33	4.31
		12		37.441	29.391	0.630	916.58	4.95	78.98	1455.68	6.24	128.67	377.49	3.18	60.74	1639.57	4.39
16	160	14	16	43.296	33.987	0.629	1048.36	4.92	90.95	1665.02	6.20	147.17	431.70	3.16	68.24	1914.68	4.47
		16		49.067	38.518	0.629	1175.08	4.89	102.63	1865.57	6.17	164.89	484.59	3.14	75.31	2190.82	4.55

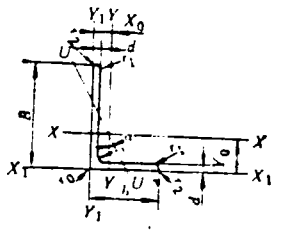
		12		42.241	33.159	0.710	1321.35	5.59	100.82	2100.10	7.05	165.00	542.61	3.58	78.41	2332.80	4.89
		14		48.896	38.383	0.709	1514.48	5.56	116.25	2107.12	7.02	189.14	621.53	3.56	88.38	2723.48	1.97
18	180	16	16	55.467	43.542	0.709	1700.99	5.54	131.13	2703.37	6.38	212.40	698.60	3.55	97.83	3115.29	5.95
		18		61.955	48.634	0.708	1875.12	5.50	145.64	2988.24	6.94	234.78	762.01	3.51	105.14	3502.43	5.13
		14		54.642	42.894	0.788	2103.55	6.20	144.70	3343.26	7.82	236.40	863.83	3.98	111.82	3731.16	5.16
		16		62.013	48.680	0.788	2366.15	6.18	163.65	3760.89	7.79	265.93	971.41	3.96	123.96	4270.39	5.54
20	200	18	18	69.301	54.401	0.787	2620.64	6.15	182.22	4164.54	7.75	294.48	1076.74	3.94	135.52	4808.13	5.62
		20		76.505	60.056	0.787	2867.30	6.12	200.42	4554.55	7.72	322.06	1180.04	3.93	146.55	5347.51	5.69
		24		90.661	71.168	0.785	3338.25	6.07	236.17	5294.97	7.64	374.41	1381.53	3.90	166.55	6457.16	5.87

Note: 1. Commonly used material: ordinary carbon steel (GB700-65)
2. The length of hot-rolled equilateral angle steel:

Angle steel number	2~4	4.5~8	9~14	16~20
Length (m)	3~9	4~12	4~19	6~19

10. Hot Rolled Unequilateral Angle Steel (YB167-65)

Table 2-1-50 The Norms and Dimensions of Hot-rolled Unequilateral Angle Steel



Legend

B – Width of long side
b – Width of short side
d – Thickness of side
r – Interior circular arc radius
r_1 – Sid-end interior arc radius ($r_1 = \frac{1}{3}d$)
r_2 – Top circular arc radius
r_3 – Side-end external arc radius
i – Inertial radius
I – Inertial moment
X_0 – Center of gravity distance
W – Section coefficient
Y_0 – Center of gravity distance

Angle Steel Number	Dimension (mm) B	b	d	r	Sect. Area (cm²)	Theoretical Weight (kg/m)	Surface Area (m²/m)	Reference Numerical Value: X–X I_x (cm⁴)	i_x (cm)	W_x (cm³)	Y–Y I_y (cm⁴)	i_y (cm)	W_y (cm³)	X_1–X_1 I_{x_1} (cm⁴)	Y_0 (cm)	Y_1–Y_1 I_{y_1} (cm⁴)	X_0 (cm)	U–U I_u (cm⁴)	i_u (cm)	W_u (cm³)	tgα
2.5/1.6	25	16	3	3.5	1.162	0.912	0.080	0.70	0.78	0.43	0.22	0.44	0.19	1.56	0.86	0.43	0.42	0.14	0.34	0.16	0.392
			4		1.499	1.176	0.079	0.88	0.77	0.55	0.27	0.43	0.24	2.09	0.90	0.59	0.46	0.17	0.34	0.20	0.381
3.2/2	32	20	3		1.492	1.171	0.102	1.53	1.01	0.72	0.46	0.55	0.30	3.27	1.08	0.82	0.49	0.28	0.43	0.25	0.382
			4		1.939	1.522	0.101	1.93	1.00	0.93	0.57	0.54	0.39	4.37	1.12	1.12	0.53	0.35	0.42	0.32	0.374
4/2.5	40	25	3	4	1.890	1.484	0.127	3.08	1.28	1.15	0.93	0.70	0.49	6.39	1.32	1.59	0.59	0.56	0.54	0.40	0.386
			4		2.467	1.936	0.127	3.93	1.26	1.49	1.18	0.69	0.63	8.53	1.37	2.14	0.63	0.71	0.54	0.52	0.381
4.5/2.8	45	28	3	5	2.149	1.687	0.143	4.45	1.44	1.47	1.34	0.79	0.62	9.10	1.47	2.23	0.64	0.80	0.61	0.61	0.383
			4		2.806	2.202	0.143	5.69	1.42	1.91	1.70	0.78	0.80	12.13	1.51	3.00	0.68	1.02	0.60	0.60	0.380
5/3.2	50	32	3	5.5	2.431	1.908	0.161	6.24	1.60	1.84	2.02	0.91	0.82	12.49	1.60	3.31	0.73	1.20	0.70	0.68	0.404
			4		3.177	2.494	0.160	8.02	1.58	2.39	2.58	0.90	1.06	16.65	1.65	4.45	0.77	1.53	0.69	0.87	0.402
5.6/3.6	56	36	3	6	2.743	2.153	0.181	8.88	1.80	2.32	2.92	1.03	1.05	17.54	1.78	4.70	0.80	1.73	0.79	0.87	0.408
			4		3.590	2.818	0.180	11.45	1.79	3.03	3.76	1.02	1.37	23.39	1.82	6.33	0.85	2.23	0.79	1.13	0.408
			5		4.415	3.466	0.180	13.86	1.77	3.71	4.49	1.01	1.65	29.25	1.87	7.94	0.88	2.67	0.78	1.36	0.404

Continued

Nominal Size	Dimensions (mm) H	B	d	r	Area (cm²)	Mass (kg/m)	Surface Area (m²/t)	Reference Numerical Value X-X I_x (cm⁴)	i_x (cm)	W_x (cm³)	Y-Y I_y (cm⁴)	i_y (cm)	W_y (cm³)	X_1-X_1 I_{x1} (cm⁴)	Y_0 (cm)	Y_2-Y_2 I_{y2} (cm⁴)	X_0 (cm)	U-U I_u (cm⁴)	i_u (cm)	W_u (cm³)	tan α
			4		4.058	3.185	0.202	16.49	2.02	3.87	5.23	1.14	1.70	33.30	2.04	8.63	0.92	3.12	0.88	1.40	0.398
6.3/4	63	40	5	7	4.993	3.920	0.202	20.02	2.00	4.74	6.31	1.12	2.21	41.63	2.08	10.86	0.95	3.78	0.87	1.71	0.396
			6		5.908	4.638	0.201	23.36	1.99	5.59	7.29	1.11	2.63	49.98	2.12	13.17	0.99	4.54	0.86	1.99	0.393
			7		6.802	5.339	0.201	26.53	1.98	6.40	8.24	1.10	2.78	58.07	2.16	15.47	1.03	4.97	0.86	2.24	0.390
			4		4.847	3.570	0.226	23.17	2.26	4.86	7.55	1.39	2.17	45.92	2.24	12.76	1.02	4.46	0.98	1.77	0.410
7/4.5	70	45	5	7.5	5.909	4.601	0.225	27.95	2.25	5.92	9.13	1.38	2.68	57.10	2.28	15.39	1.06	5.40	0.98	2.19	0.407
			6		6.947	5.218	0.225	32.54	2.21	6.95	10.62	1.36	3.12	68.35	2.32	18.08	1.09	6.32	0.98	2.59	0.404
			7		7.957	6.011	0.225	37.22	2.20	8.03	12.01	1.35	3.52	78.90	2.36	21.01	1.13	7.16	0.97	2.94	0.402
			5		6.125	4.808	0.245	34.46	2.37	6.83	12.61	1.44	3.10	70.00	2.40	21.04	1.17	7.41	1.10	2.74	0.435
(7.5/5)	75	50	6		7.260	5.699	0.245	41.12	2.38	8.12	14.70	1.42	3.68	84.34	2.44	25.37	1.21	8.54	1.08	3.19	0.429
			8		9.467	7.431	0.244	52.39	2.35	10.62	18.53	1.40	4.69	112.80	2.52	34.23	1.29	10.85	1.07	4.19	0.424
			10	8	11.590	9.098	0.244	62.71	2.33	12.79	21.96	1.38	5.64	140.80	2.60	43.43	1.36	13.10	1.06	4.98	0.423
			5		6.375	5.005	0.255	41.96	2.56	7.78	12.82	1.42	3.32	85.21	2.60	21.06	1.14	7.66	1.10	2.74	0.388
8/5	80	50	6		7.560	5.935	0.255	49.49	2.56	9.35	14.96	1.41	3.91	102.63	2.65	25.41	1.18	8.85	1.08	3.20	0.39.
			7		8.724	6.848	0.255	56.16	2.54	10.81	16.96	1.39	4.48	119.33	2.69	29.89	1.21	10.18	1.08	3.70	0.384
			8		9.867	7.745	0.254	62.83	2.52	11.92	18.85	1.38	5.03	136.41	2.73	34.32	1.25	11.58	1.07	4.16	0.381
			5		7.212	5.661	0.287	60.45	2.90	9.92	18.32	1.59	4.21	121.32	2.91	29.53	1.25	10.98	1.23	3.49	0.395
9/5.6	90	56	6	9	8.557	6.717	0.286	71.03	2.88	11.74	21.47	1.58	4.98	145.59	2.95	35.59	1.29	12.90	1.23	4.13	0.394
			7		9.880	7.756	0.286	81.01	2.86	13.40	24.36	1.57	5.70	169.08	3.00	41.71	1.33	14.67	1.22	4.72	0.392
			8		11.183	8.779	0.286	91.03	2.85	15.27	27.15	1.56	6.41	194.17	3.04	47.93	1.36	16.34	1.21	5.29	0.390
			6		9.617	7.550	0.320	99.06	3.21	14.64	30.94	1.79	6.35	199.71	3.24	50.50	1.43	18.42	1.38	5.25	0.394
10/6.3	100	63	7		11.111	8.722	0.320	113.45	3.20	16.88	35.26	1.78	7.29	233.00	3.28	59.14	1.47	21.00	1.38	6.02	0.393
			8		12.584	9.878	0.319	127.37	3.18	19.08	39.39	1.77	8.21	266.32	3.32	67.88	1.50	23.50	1.37	6.78	0.391
			10		15.467	12.142	0.319	153.81	3.15	23.32	47.12	1.74	9.98	333.06	3.40	85.73	1.58	28.33	1.35	8.24	0.387
			6	10	10.637	8.350	0.354	107.91	3.17	15.19	61.24	2.40	10.16	199.83	2.95	102.68	1.97	31.65	1.72	8.37	0.527
10/8	100	80	7		12.301	9.661	0.354	122.73	3.16	17.67	70.06	2.39	11.71	233.20	3.00	119.98	2.01	36.17	1.72	9.60	0.526
			8		13.944	10.946	0.353	137.92	3.14	19.81	78.58	2.37	13.21	266.61	3.04	137.37	2.05	40.58	1.71	10.80	0.525
			10		17.167	13.476	0.353	166.87	3.12	24.24	94.65	2.35	16.12	333.63	3.12	172.48	2.13	49.10	1.69	13.12	0.522
11/7	110	70	6		10.637	8.350	0.364	133.37	3.54	17.85	42.93	2.01	7.98	266.78	3.53	69.08	1.57	25.36	1.54	8.63	0.403
			7		12.301	9.656	0.364	153.00	3.53	20.60	49.01	2.00	9.09	310.07	3.57	80.82	1.61	28.96	1.53	7.60	0.402

Continued

Angle Steel	Dimension (mm)				Cross-Sectional Area	Theoretical Weight	Reference Numerical Value													
							$X-X$			$Y-Y$			X_1-X_1		Y_1-Y_1		$U-U$			
	B	b	d	r	(cm^2)	(kg/m)	I_x (cm^4)	i_x (cm)	W_x (cm^3)	I_y (cm^4)	i_y (cm)	W_y (cm^3)	I_{x1} (cm^4)	y_0 (cm)	I_{y1} (cm^4)	x_0 (cm)	I_u (cm^4)	i_u (cm)	W_u (cm^3)	$\tan\alpha$
11/7	110	70	8	10	15.044	10.809	0.353	172.04	3.51	25.30	84.87	1.98	10.26	364.89	3.62	62.70	1.85	32.45	1.53	8.49	0.401
			10		17.167	13.476	0.353	208.39	3.48	29.54	66.88	1.96	12.48	443.13	3.70	116.83	1.77	38.20	1.51	10.24	0.397
12.5/8	125	80	7	11	14.096	11.066	0.403	227.98	4.02	28.86	74.42	2.30	12.01	454.99	4.01	120.32	1.80	43.81	1.76	9.92	0.408
			8		15.989	12.551	0.403	256.77	4.01	30.41	83.49	2.24	13.56	519.99	4.06	137.85	1.84	49.15	1.75	11.18	0.407
			10		19.712	15.474	0.402	312.04	3.98	37.33	100.67	2.26	16.56	650.09	4.14	173.40	1.92	58.45	1.74	13.64	0.404
			12		23.351	18.330	0.402	364.41	3.95	44.01	116.67	2.24	19.43	780.39	4.22	209.67	2.00	69.35	1.72	16.01	0.400
14/9	140	90	8	12	18.038	14.160	0.453	365.64	4.50	50.18	120.69	2.58	17.34	730.53	4.50	195.79	2.04	70.83	1.98	14.31	0.411
			10		22.261	17.475	0.452	445.50	4.47	67.31	146.03	2.56	21.22	913.20	4.58	245.92	2.12	85.82	1.96	17.48	0.409
			12		26.400	20.724	0.451	521.59	4.44	80.87	169.79	2.54	24.95	1096.09	4.66	296.89	2.19	100.21	1.95	20.54	0.406
			14		30.456	23.908	0.451	594.10	4.42	94.18	192.10	2.51	28.54	1279.26	4.74	348.82	2.27	114.13	1.94	23.52	0.403
16/10	160	100	10	13	25.315	19.872	0.512	668.69	5.14	82.13	206.83	2.86	26.56	1362.89	5.24	336.59	2.28	121.74	2.19	21.92	0.390
			12		30.054	23.592	0.511	784.91	5.11	73.49	239.06	2.82	31.28	1635.56	5.32	405.94	2.36	142.33	2.17	25.79	0.388
			14		34.709	27.247	0.510	896.30	5.08	84.56	271.20	2.80	36.83	1908.50	5.40	476.42	2.43	162.23	2.16	29.56	0.385
			16		39.281	30.835	0.510	1003.04	5.05	98.33	301.60	2.77	40.24	2181.79	5.48	548.22	2.51	182.57	2.16	33.44	0.382
18/11	180	110	10	14	28.373	22.273	0.571	958.75	5.80	78.96	278.11	3.13	32.49	1940.40	5.80	447.22	2.44	166.50	2.42	28.88	0.378
			12		33.712	26.464	0.571	1124.72	5.78	93.53	325.03	3.10	38.32	2328.38	5.88	538.94	2.52	194.87	2.40	33.86	0.374
			14		38.967	30.589	0.570	1286.91	5.75	107.76	369.55	3.08	43.97	2716.60	6.06	631.95	2.59	222.30	2.39	38.37	0.372
			16		44.139	34.649	0.569	1443.06	5.72	121.64	411.85	3.08	49.44	3105.15	6.14	726.46	2.67	248.94	2.38	42.87	0.368
20/12.5	200	125	12	14	37.912	29.761	0.641	1570.90	6.44	116.73	483.16	3.57	49.99	3193.85	6.54	787.74	2.85	285.79	2.74	41.23	0.392
			14		43.867	34.436	0.640	1800.97	6.41	134.65	550.83	3.54	57.44	3726.17	6.62	922.47	2.91	326.58	2.73	47.34	0.390
			16		49.739	39.045	0.639	2023.35	6.38	152.18	618.14	3.52	64.69	4258.86	6.70	1058.86	2.99	366.21	2.71	53.32	0.388
			18		55.526	43.588	0.639	2238.30	6.35	169.33	677.19	3.49	71.74	4792.00	6.78	1197.13	3.06	404.83	2.70	59.18	0.385

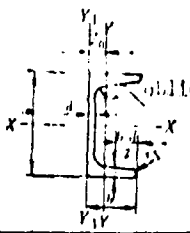
Note: 1. Commonly used materials: ordinary carbon steel (GB700-65)

2. The length of hot-rolled unequilateral angle steel:

Angle steel number	2.5/1.6~5.6/3.6	6.3/4~9/5.6	10/6.3~14/9	16/10~20/12.5
Length (m)	4~9	4~12	4~19	6~19

11. Hot Rolled General Channel Steel (GB707-65)

Table 2-1-51 The Norms and Dimensions of Hot-rolled General Channel Steel



Legend

h—Height
b—Leg width
d—Waist thickness
t—Mean leg thickness
r—Inner circular arc radius
r1—Leg-end circular arc radius
I—Inertial moment
W—Section coefficient
i—Inertial radius
Z0—Y-Y1Y1 Y. Distance between axes

Type No.	Dimension h	b	d	t	r	r1	Sect. Area cm²	Theore tical Weight kg/m	Reference Numerical Value X-X W_x cm³	I_x cm⁴	i_x cm	Y-Y W_y cm³	I_y cm⁴	i_y cm	Y_1-Y_1 I_{y_1} cm⁴	Z_0 cm
	mm															
5	50	37	4.5	7	7	3.5	6.93	5.44	10.4	26	1.94	3.55	8.3	1.1	20.9	1.35
6.3	63	40	4.8	7.5	7.5	3.75	8.444	6.63	16.123	50.786	2.453		11.872	1.185	28.38	1.36
8	80	43	5	8	8	4	10.24	8.04	25.3	101.3	3.15	5.79	16.6	1.27	37.4	1.43
10	100	48	5.3	8.5	8.5	4.25	12.74	10	39.7	198.3	3.95	7.8	25.6	1.41	54.9	1.52
12.6	126	53	5.5	9	9	4.5	15.69	12.37	62.137	391.466	4.953	10.242	37.99	1.567	77.09	1.59
14 a	140	58	6	9.5	9.5	4.75	18.51	14.53	80.5	563.7	5.52	13.01	53.2	1.7	107.1	1.71
b	140	60	8	9.5	9.5	4.75	21.31	16.73	87.1	609.4	5.35	14.12	61.1	1.69	120.6	1.67
16 a	160	63	6.5	10	10	5	21.95	17.23	108.3	866.2	6.28	16.3	73.3	1.83	144.1	1.8
16	160	65	8.5	10	10	5	25.15	19.74	116.8	934.5	6.1	17.55	83.4	1.82	160.8	1.75
18 a	180	68	7	10.5	10.5	5.25	25.69	20.17	141.4	1272.7	7.04	20.03	98.6	1.96	189.7	1.88
18	180	70	9	10.5	10.5	5.25	29.29	23.00	152.2	1369.9	6.84	21.52	111	1.95	210.1	1.84

Continued

Type	Dimensions of section						Geometric Characteristics: Area, Theoretical Weight		Reference Numerical Values							
									$X-X$			$Y-Y$			Y_1-Y_1	
	h	b	d	t	r	r_1			W_x	I_x	i_x	W_y	I_y	i_y	I_{y_1}	Z_0
	mm						cm^2	kg/m	cm^3	cm^4	cm	cm^3	cm^4	cm	cm^4	cm
20a	200	73	7	11	11	5.5	28.83	22.63	178	1780.4	7.86	24.2	128	2.11	244	2.01
20	200	75	9	11	11	5.5	32.83	25.77	191.4	1913.7	7.64	25.88	143.6	2.09	268.4	1.95
22a	220	77	7	11.5	11.5	5.75	31.84	24.99	217.6	2393.9	8.67	28.17	157.8	2.23	298.2	2.1
22	220	79	9	11.5	11.5	5.75	36.24	28.45	233.8	2571.4	8.42	30.05	176.4	2.21	326.3	2.03
a	250	78	7	12	12	6	34.91	27.47	280.097	3560.82	9.823	30.607	175.529	2.243	322.256	2.065
25b	250	80	9	12	12	6	39.91	31.39	282.402	3530.04	9.406	33.687	196.421	2.218	353.187	1.982
c	250	82	11	12	12	6	44.91	35.32	295.236	3690.45	9.065	35.926	218.415	2.206	384.133	1.921
a	280	82	7.5	12.5	12.5	6.25	40.02	31.42	340.328	4764.59	10.91	35.718	217.989	2.333	387.566	2.097
28b	280	84	9.5	12.5	12.5	6.25	45.62	35.81	366.46	5130.45	10.6	37.929	242.144	2.304	427.589	2.016
c	280	86	11.5	12.5	12.5	6.25	51.22	40.21	392.594	5496.32	10.35	40.301	267.602	2.286	470.887	1.951
a	320	88	8	14	14	7	48.7	38.22	474.879	7598.06	12.49	46.473	304.797	2.502	552.31	2.242
32b	320	90	10	14	14	7	55.1	43.25	509.019	8111.2	12.15	48.157	336.332	2.471	592.933	2.158
c	320	92	12	14	14	7	61.5	48.28	543.145	8690.33	11.88	52.642	374.175	2.467	643.299	2.092
a	360	96	9	16	16	8	60.89	47.8	659.7	11874.2	13.97	63.54	455	2.73	818.4	2.44
36b	360	98	11	16	16	8	68.09	53.45	702.9	12651.8	13.63	66.76	496.7	2.7	880.4	2.37
c	360	100	13	16	16	8	75.29	59.1	746.1	13429.4	13.36	70.02	536.4	2.67	947.9	2.34
a	400	100	10.5	18	18	9	75.05	58.91	878.9	17577.9	15.30	78.83	592	2.81	1067.7	2.49
40b	400	102	12.5	18	18	9	83.05	65.19	932.2	18644.5	14.98	82.52	640	2.78	1135.8	2.44
c	400	104	14.5	18	18	9	91.05	71.47	986.6	19711.2	14.71	86.19	687.8	2.75	1220.7	2.42

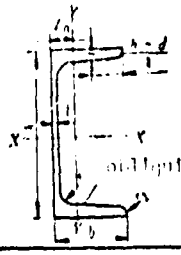
Notes: 1. Commonly used material: ordinary carbon steel (GB700-65)

2. Hot-rolled general channel steel length:

Channel steel number	5~6	10~18	20~40
Length (m)	5~12	5~19	5~19

12. Hot Rolled Light Channel Steel (YB161-63)

Table 2-1-52 The Norms and Dimensions of Hot-rolled Light Channel Steel



Legend

h—Height
b—Leg width
d—Waist thickness
t—Mean leg thickness
r—Inner circular arc radius
r_1—Leg end circular arc radius
I—Inertial moment
W—Section coefficient
i—Inertial radius
S—Static moment of semi-section
Z—Center of gravity distance

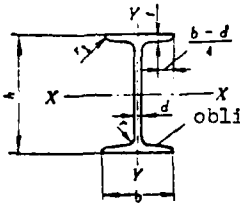
Type No.	Dimension (mm)						Sect. Area (cm^2)	Theoretical Weight (kg/m)	Reference Number X-X				Y-Y			Z (cm)
	h	b	d	t	r	r_1			I_x (cm^4)	W_x (cm^3)	i_x (cm)	S_x (cm^3)	I_y (cm^4)	W_y (cm^3)	i_y (cm)	
5	50	32	4.4	7.0	8.0	2.5	6.928	5.44	22.8	9.10	1.92	5.59	8.64	3.75	0.964	1.35
6.5	65	36	4.4	7.2	6.0	3.5	7.51	5.90	48.6	15.0	2.54	9.00	8.70	3.68	1.08	1.24
8	80	40	4.5	7.4	8.5	3.5	8.98	7.05	89.4	22.4	3.16	13.7	12.8	4.75	1.19	1.33
10	100	48	4.8	7.6	7.0	3.0	10.90	8.59	174	34.8	3.99	20.4	20.4	6.46	1.37	1.48
12	120	52	4.8	7.8	7.5	3.0	13.10	10.4	304	50.6	4.78	29.6	31.2	8.52	1.54	1.59
14	140	58	4.9	8.1	8.0	3.0	15.60	12.3	491	70.2	5.60	40.8	45.4	11.0	1.70	1.71
14a	140	62	4.9	8.7	8.0	3.0	17.80	13.9	545	77.8	5.54	45.1	57.5	13.3	1.84	1.87
16	160	64	5.0	8.4	8.5	3.5	18.10	14.2	747	93.4	6.42	54.1	73.3	15.8	1.87	1.80
16a	160	68	5.0	9.0	8.5	3.5	19.50	15.3	823	103	6.49	59.4	78.8	16.4	2.01	1.95
18	180	70	5.1	8.7	9.0	3.5	20.70	16.3	1090	121	7.24	69.8	86.0	17.0	2.04	1.94
18a		74	5.1	9.3	9.0	3.5	22.20	17.4	1190	132	7.32	76.1	105	20.0	2.18	2.13
20	200	76	5.2	9.0	9.5	4.0	23.4	18.4	1520	152	8.07	87.8	113	20.5	2.20	2.07
20a	200	80	5.2	9.7	9.5	4.0	25.2	19.8	1670	167	8.15	96.8	139	24.2	2.35	2.28
22	220	82	5.4	9.5	10.0	4.0	26.7	21.0	2110	192		110	151	25.1	2.37	2.23
22a	220	87	5.4	10.2	10.0	4.0	28.8	22.6	2330	211		121	187	30.9	2.55	2.46
24	240	90	5.6	10.0	10.5	4.0	30.6	24.0	2900	242	9.73	138	208	31.6	2.60	2.42
24a	240	95	5.6	10.7	10.5	4.0	32.9	25.8	3280	265	9.84	151	254	37.2	2.78	2.67
27	270	95	6.0	10.5	11	4.5	35.2	27.7	4160	308	10.9	178	262	37.3	2.73	2.47
30	300	100	6.5	11.0	12	5	40.5	31.8	5810	387	12.0	224	327	43.6	2.84	2.52
33	330	105	7.0	11.7	13	5	46.5	36.5	7980	484	13.1	281	410	51.8	2.97	2.64
36	360	110	7.5	12.6	14	6	53.4	41.9	10820	601	14.2	350	513	61.7	3.10	2.84
40	400	115	8.0	13.5	15	6	61.5	48.3	15220	761	15.7	444	642	73.4	3.23	2.75

Notes: 1. Commonly used materials: ordinary carbon steel (700-65)
2. The length of hot-rolled channel steel:

Channel steel No.	5~8	10~18	20~40
Length (m)	5~12	5~19	6~19

13. Hot Rolled General I Steel (GB706-65)

Table 2-1-53 The Norms and Dimensions of Hot-rolled General I Steel



Legend

h—Height
b—Leg width
d—Waist thickness
t—Mean leg thickness
r—Inner circular arc radius
r_1—Leg end circular arc radius
I—Inertial moment
W—Section coefficient
i—Inertial radius
S—Static moment of semi-section

Type No.	Dimension h	b	d	t	r	r_1	Sect. Area	Theoretical Weight	Reference Numerical Value X–X I_x	W_x	i_x	$I_x:S_x$	Y–Y I_y	W_y	i_y
	mm						cm^2	kg/m	cm^4	cm^3	cm		cm^4	cm^3	cm
10	100	68	4.5	7.6	6.5	3.3	14.3	11.2	245	49	4.14	8.59	33	9.72	1.52
12.6	126	74	5	8.4	7	3.5	18.1	14.2	488.43	77.529	5.195	10.85	46.906	12.677	1.609
14	140	80	5.5	9.1	7.5	3.8	21.5	16.9	712	102	5.76	12	64.4	16.1	1.73
16	160	88	6	9.9	8	4	26.1	20.5	1130	141	6.58	13.8	93.1	21.2	1.89
18	180	94	6.5	10.7	8.5	4.3	30.6	24.1	1660	185	7.36	15.4	122	26	2
20a	200	100	7	11.4	9	4.5	35.5	27.9	2370	237	8.15	17.2	158	31.5	2.12
20b	200	102	9	11.4	9	4.5	39.5	31.1	2500	250	7.96	16.9	169	33.1	2.06
22a	220	110	7.5	12.3	9.5	4.8	42	33	3400	309	8.99	18.9	225	40.9	2.31
22b	220	112	9.5	12.3	9.5	4.8	46.4	36.4	3570	325	8.78	18.7	239	42.7	2.27
25a	250	116	8	13	10	5	48.5	38.1	5023.54	401.88	10.18	21.58	280.046	48.283	2.403
25b	250	118	10	13	10	5	53.5	42	5283.96	422.72	9.938	21.27	309.297	52.423	2.404

Continued

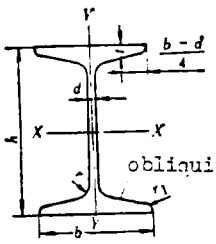
Type No.	Dimension						Sect. Area	Theoretical Weight	Reference Numerical Value						
									$X-X$				$Y-Y$		
	h	b	d	t	r	r_1			I_x	W_x	i_x	$I_x:S_x$	I_y	W_y	i_y
	mm						cm^2	kg/m	cm^4	cm^3	cm		cm^4	cm^3	cm
28a	280	122	8.5	13.7	10.5	5.3	55.45	43.4	7114.14	508.15	11.32	24.62	345.051	56.565	2.495
28b	280	124	10.5	13.7	10.5	5.3	61.05	47.9	7480	534.29	11.08	24.24	379.496	61.209	2.493
32a	320	130	9.5	15	11.5	5.8	67.05	52.7	11075.5	692.2	12.84	27.46	459.93	70.758	2.619
32b	320	132	11.5	15	11.5	5.8	73.45	57.7	11621.4	726.33	12.58	27.09	501.53	75.989	2.614
32c	320	134	13.5	15	11.5	5.8	79.95	62.8	12167.5	760.47	12.34	26.77	543.81	81.166	2.608
36a	360	136	10	15.8	12	6	76.3	59.9	15760	875	14.4	30.7	552	81.2	2.69
36b	360	138	12	15.8	12	6	83.5	65.6	16530	919	14.1	30.3	582	84.3	2.64
36c	360	140	14	15.8	12	6	90.7	71.2	17310	962	13.8	29.9	612	87.4	2.6
40a	400	142	10.5	16.5	12.5	6.3	86.1	67.6	21720	1090	15.9	34.1	660	93.2	2.77
40b	400	144	12.5	16.5	12.5	6.3	94.1	73.8	22780	1140	15.6	33.6	692	96.2	2.71
40c	400	146	14.5	16.5	12.5	6.3	102	80.1	23856	1190	15.2	33.2	727	99.6	2.65
45a	450	150	11.5	18	13.5	6.8	102	80.4	32240	1430	17.7	38.6	855	114	2.89
45b	450	152	13.5	18	13.5	6.8	111	87.4	33760	1500	17.4	38	894	118	2.84
45c	450	154	15.5	18	13.5	6.8	120	94.5	35280	1570	17.1	37.6	938	122	2.79
50a	500	158	12	20	14	7	119	93.6	46470	1860	19.7	42.8	1120	142	3.07
50b	500	160	14	20	14	7	129	101	48560	1940	19.4	42.4	1170	146	3.01
50c	500	162	16	20	14	7	139	109	50640	2080	19	41.8	1220	151	2.96
56a	560	166	12.5	21	14.5	7.3	135.25	106.2	65585.6	2342.31	22.02	47.73	1370.16	165.08	3.182
56b	560	168	14.5	21	14.5	7.3	146.45	115	68512.5	2446.69	21.63	47.17	1486.75	174.25	3.162
56c	560	170	16.5	21	14.5	7.3	157.85	123.9	71439.4	2551.41	21.27	46.66	1558.39	183.34	3.158
63a	630	176	13	22	15	7.5	154.9	121.6	93915.2	2981.47	24.62	54.17	1700.55	193.24	3.314
63b	630	178	15	22	15	7.5	167.5	131.5	98083.6	3163.98	24.2	53.51	1812.07	203.6	3.289
63c	630	180	17	22	15	7.5	180.1	141	102251.1	3298.42	23.82	52.92	1924.91	213.88	3.268

Note: 1. Material used: ordinary carbon steel (GB700-65)
2. The length of hot-rolled I steel:

I steel type No.	10~18	20~63
Length (m)	5~19	6~19

14. Hot Rolled Light I Steel (YB163-63)

Table 2-1-54 The Norms and Dimensions of Hot-rolled Light I Steel



Legend

h—Height
b—Leg width
d—Waist thickness
t—Mean leg thickness
r—Inner circular arc radius
r_1—Leg end circular arc radius
I—Inertial moment
W—Section coefficient
i—Inertial radius
S—Static moment of semi-section

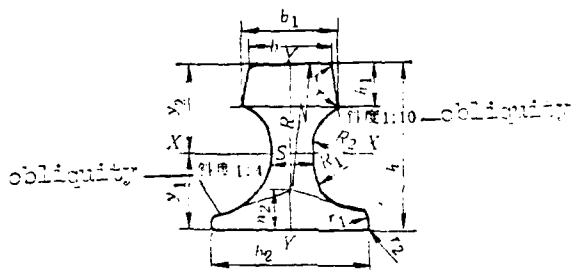
Type No.	Dimension h	b	d	t	r	r_1	Sect. Area	Theor. Weight	Reference Numerical Value X-X I_x	W_x	i_x	S_x	Y-Y I_y	W_y	i_y
	mm						cm^2	kg/m	cm^4	cm^3	cm	cm^3	cm^4	cm^3	cm
10	100	55	4.5	7.2	7.0	3.5	12.0	9.46	198	39.7	4.06	23.0	17.9	6.49	1.22
12	120	64	4.8	7.3	7.5	3.0	14.7	11.5	350	58.4	4.88	33.7	27.9	8.72	1.38
14	140	73	4.9	7.5	8.0	3.0	17.4	13.7	572	81.7	5.73	46.8	41.9	11.5	1.55
16	160	81	5.0	7.8	8.5	3.5	20.2	15	873	109	6.57	62.3	58.6	14.5	1.70
18	180	90	5.1	8.1	9.0	3.5	23.4	18.4	1290	143	7.42	81.4	82.6	18.4	1.88
18a	180	100	5.1	8.3	9.0	3.5	25.4	19.9	1430	159	7.51	89.8	114	22.8	2.12
20	200	100	5.2	8.4	9.5	4.0	26.8	21.0	1840	184	8.28	104	115	23.1	2.07
20a	200	110	5.2	8.6	9.5	4.0	28.9	22.7	2030	203	8.37	114	155	28.2	2.32
22	220	110	5.4	8.7	10.0	4.0	30.6	24.0	2550	232	9.13	131	157	28.6	2.27
22a	220	120	5.4	8.9	10.0	4.0	32.8	25.8	2790	254	9.22	143	206	34.3	2.50
24	240	116	5.6	9.5	10.5	4.0	34.8	27.3	3460	289	9.97	163	198	34.5	2.37
24a	240	125	5.6	9.8	10.5	4.0	37.5	29.4	3800	317	10.1	178	260	41.6	2.63
27	270	125	6.0	9.8	11.0	4.5	40.2	31.5	5010	371	11.2	210	260	41.5	2.54
27a	270	135	6.0	10.2	11.0	4.5	43.2	33.9	5500	407	11.3	229	337	50.0	2.80
30	300	125	6.5	10.2	12.0	5.0	46.5	36.5	7080	472	12.3	268	337	49.9	2.69
30a	300	145	6.5	10.7	12.0	5.0	49.9	39.2	7780	518	12.5	292	436	60.1	2.95
33	330	140	7.0	11.2	13.0	5.0	53.8	42.2	9840	597	13.5	339	419	59.9	2.79
36	360	145	7.5	12.3	14.0	6.0	61.9	48.6	13380	743	14.7	423	516	71.1	2.89
40	400	155	8.0	13.0	15.0	6.0	71.4	56.1	18930	947	16.3	540	666	85.9	3.05
45	450	160	8.6	14.2	16.0	7.0	83.0	65.2	27450	1220	18.2	699	807	101	3.12
50	500	170	9.5	15.2	17.0	7.0	97.8	76.8	39290	1570	20.0	905	1040	122	3.26
55	550	180	10.3	16.5	18.0	7.0	114	89.8	55150	2000	22.0	1150	1350	150	3.44
60	600	190	11.1	17.8	20.0	8.0	132	104	75450	2510	23.9	1450	1720	181	3.60
65	650	200	12	19.2	22.0	9.0	153	120	101400	3120	25.8	1800	2170	217	3.77
70	700	210	13	20.8	24.0	10.0	176	138	131600	3840	27.7	2230	2730	260	3.94
70a	700	210	15	24.0	24.0	10.0	202	158	152700	4360	27.5	2550	3240	309	4.01
70b	700	210	17.5	28.2	24.0	10.0	234	184	175370	5010	27.4	2940	3910	373	4.09

Note: 1. Material used: 1. ordinary carbon steel (GB700-65)
2. The length of hot-rolled light I steel:

I steel type No.	10~18	20~70
Length (m)	5~9	6~19

15. Crane Steel Runway (YB172-63)

Table 2-1-55 The Norms and Dimensions of Crane Steel Runway



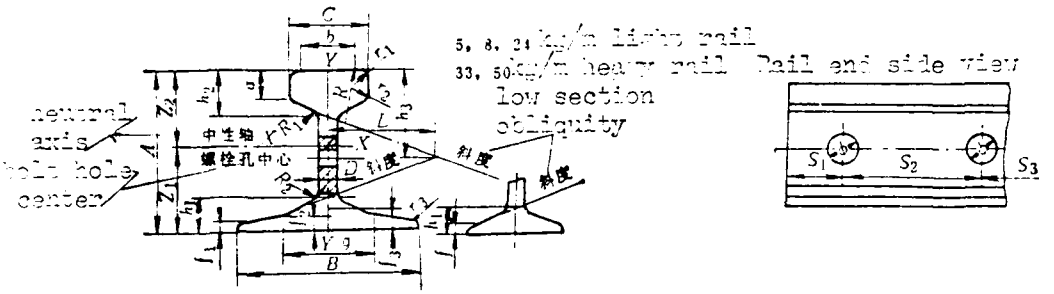
Steel runway mark	Section area	* C G D		Inertial Moment		Section Coefficient			Theoretical weight	Dimension												
		Y_1	Y_2	I_x	I_y	$W_1=\frac{I_x}{Y_1}$	$W_2=\frac{I_x}{Y_2}$	$W_y=\frac{I_y}{b_2/2}$		h	b_1	b_2	s	h_1	h_2	R_1	R_2	R_3	r	r_1	r_2
	cm^2	cm		cm^4		cm^3			kg/m	cm												
QU70	67.3	5.93	6.07	1081.99	327.16	182.46	178.12	54.53	52.8	70	76.5	120	28	120	32.5	24	400	23	38.6	6	11.5
QU80	81.13	6.43	6.57	1547.40	482.39	240.65	235.52	74.21	63.69	80	87	130	32	130	35	26	400	26	41.8	6	11.5
QU100	113.32	7.60	7.40	2984.73	940.98	376.94	387.12	125.45	88.96	100	108	150	38	150	40	30	450	30	50.8	8	12
QU120	150.44	8.43	8.57	4923.79	1694.83	584.08	574.54	199.39	118.1	120	120	170	44	170	45	35	500	34	56.8	8	12

Note: 1. Steel runway material: P 71.
2. The standard length of steel runway: 9, 9.5, 10, 10.5, 11, 11.5, 12 and 12.5m.

*Translator's note: C G D stands for center of gravity distance.

16. Steel Rail

Table 2-1-56 The Norms, Dimensions and Materials of Steel Rail



Rail type	* MD A	B	C	D	Sect. Area F	*CGD *TH Z1	*TP Z2	*IY Jx	Jy	*SO *RH W1 = Jx/Z1	*RP W2 = Jx/Z2	W3 = Jx/(B/2)	*O	*TW	*UL	Standard Symbol
(kg/m)	mm				cm²	cm		cm⁴		cm³				kg/m	m	
Light rail	5	50	44	22	4.5	6.41	2.22	2.78	25.2	3.35	11.4	9.1	2.13	1:4	5.03	5~10	YB222-63
	8	65	54	25	7.0	10.76	2.89	3.41	59.3	9.62	20.6	16.4	3.56	1:3.5	8.42	5~10	YB222-63
	11	80.5	66	32	7.0	14.31	3.46	4.09	125	15.1	31.7	30.5	4.58	1:3.78	11.20	6~10	YB222-63
	15	91	76	37	7.5	18.80	4.35	4.75	222	30.2	51.0	46.6	7.94	1:2	14.72	6~12	YB222-63
	18	90	80	40	10.0	23.07	4.29	4.71	219	41.1	50.1	51.0	10.3	1:1.304	18.06	7~12	YB222-63
	24	107	92	51	10.9	31.24	5.305	5.195	386	60.46	91.61	90.12	17.19	1:4	24.46	7~12	YB222-63
Heavy rail	33	120	110	60	12.5	42.5	5.76	6.24	831.9	165.1	142.6	131.8	30	1:4	33.286	12.5	YB350-63
	38	134	114	68	13	49.5	6.67	6.73	1204.4	209.3	180.6	178.9	36.7	1:3	38.733	12.5,25	GB183-63
	43	140	114	70	14.5	57.0	6.90	7.10	1489	260	217.3	208.3	45	1:3	44.653	12.5,25	GB182-63
	50	152	132	70	15.5	65.8	7.10	8.10	2037	377	287.2	251.3	57.1	1:4	51.514	12.5,25	GB181-63

Translator's note: *MD = main dimension; *CGD = center of gravity distance; *TH = to rail bottom; *TP = to rail top; *IY = inertial moment; *SO = section coefficient; *RH = rail bottom; *RP = rail top; *O = obliquity; *TW = theoretical weight; *UL = usual length.

Continued

Rail type (kg/m)		Dimension (mm)																		
		h_1	h_2	h_3	a	b	g	f_1	f_2	f_3	r_1	r_2	r_3	S_1	S_2	S_3	ϕ	R	R_1	R_2	L
Light	5	9.0	12	27.8	9.25			3.5			4	2	2	26	52		13		4	4	58
	8	12	17	35	13.4			4.3			5	3	2.5	32	70		16		5	5	63
	11	12.5	23	45.5	17.25	19.4	33.3	4			7	2	3.5	44	100		16	95	5	5	62.5
	15	16.25	28.75	51.75	19.5	24.2	37	4.5	6.5	9	7	2.5	4	47	100		19	146.25	5	5	46
rail	18	20	32	51	20.9	28.2	36.1	4.25	7	9.4	7	4	4	46.5	100		19	90	4.5	4.5	34.3
	24	17	32	61	23.28	26.13		5.5	10	14.75	13	3	4	60	100		22	300	5	8	
Heavy	33	21	35	67	27.5	35.5		7.3			13	3	4	66	160		29	309	7	10	
	38	24	39	74.5	27.7	43.9	79	9	10.8		13	4	4	56	110	160	29	300	7	7	
	43	27	42	77.5	30.4	46	78	11	14		13	2	4	56	110	160	29	300	5,10	15	
rail	50	27	42	83.5	33.3	46		10.5			13	2.5	4	66	150	140	31	300	5,12	20	

TO BE CONTINUED

Continued

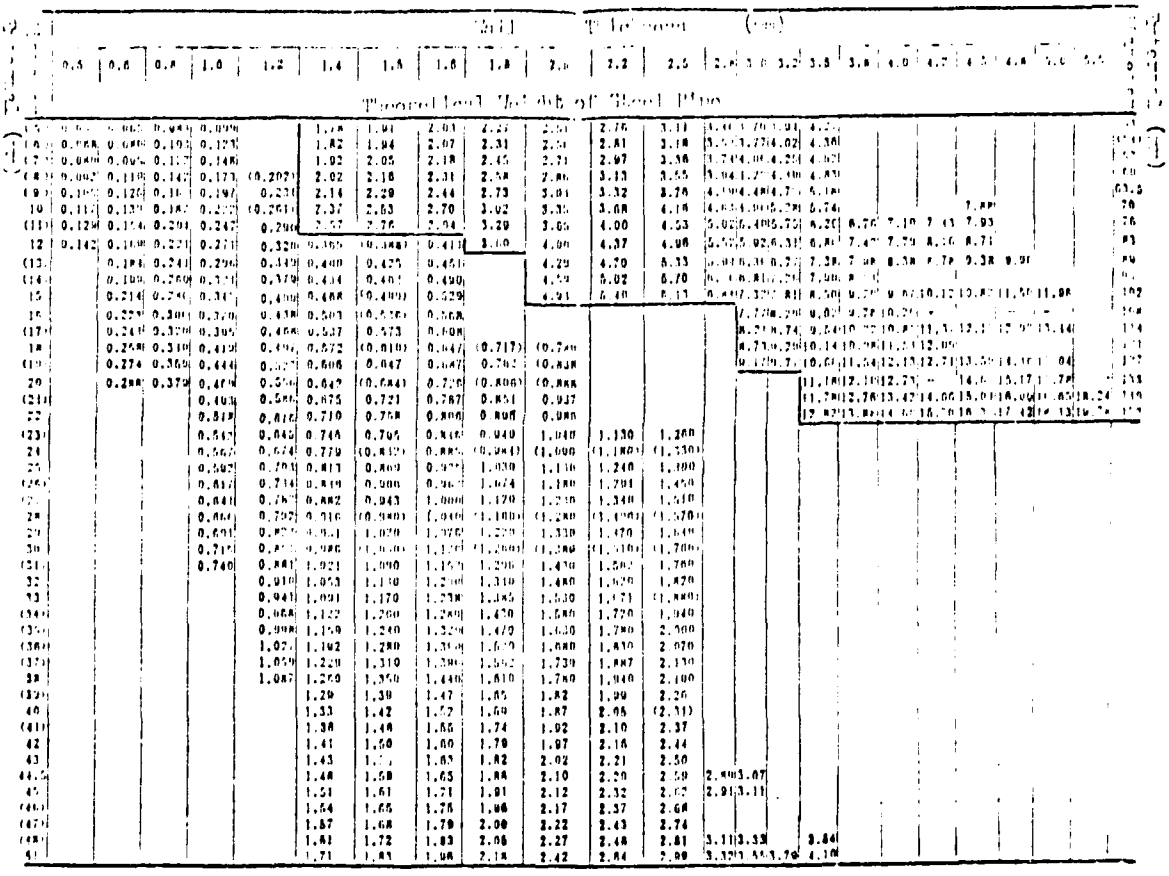
Rail Materials

5~24kg/m light rail			33~50 kg/m heavy rail									
Rail type	* CbRH		* SK	*OHKS		*CCS			Low alloy steel			
Kind of steel	15~11kg/m	15~20kg/m	name	P 71	P 71	P 67	J 68	J 63	J 53	U—Cu	U—Mn	U—Si	U—Ti
Open hearth steel	P	P	Tensile strength kg/mm²	≥90	≥80	≥75	≥80	≥75	≥65	≥92	≥90	≥92	≥92
	I	I											
Acid side-blown converter steel	P	P	Range of uses	60 kg/m	38 kg/m	33 kg/m	50 kg/m	38 kg/m	33 kg/m				
		I											
Basic side-blown converter steel	P	P	*TCS	YB32-60			YB33-60			YB34-60			
		I											
Technical Condition standard	YB221-64	YB220-63											
Classification by carbon content:	P—*CLR	I—*HLR	U—Cu 铜轨, U—Mn 锰轨, U—Si 硅轨, U—Ti 钛轨 Cu-rail Mn-rail Si-rail Ti-rail										

Translator's note: * CbRH = classification by rail hardness; * SK = symbols of kind of steel; * OHKS = open hearth killed steel; * CCS = converter carbon steel; * TCS = technical condition standard; * CLR = general light rail; and * HLR = hard light rail.

17. Electric-welding Steel Pipe (YBY3-63)

Table 2-17 The Specification of Electric-welding Steel Pipe



An Appendant Table

Steel Grade	*MSP		*LHSP		*HSP	
	*TS (kg/mm^2)	*ER δ_{10} (%)	*TS (kg/mm^2)	*ER δ_{10} (%)	*TS (kg/mm^2)	*ER δ_{10} (%)
	≥					
08 &10	32	20	38	12	40	5
15	36	18	41	10	45	4
20	40	17	45	8	50	3
A2 和 AJ2	34	20	36	12		
A3 和 AJ3	38	18	40	10		
A4 和 AJ4	42	17	44	8		

Translator's note: *MSP = mild steel pipe; *LHSP = low hardness steel pipe; *HSP = hard steel pipe; *TS = tensile strength; and *ER = extension rate.

Note: 1. In Table 2-1-57, the external diameter and weight which are in parentheses refer to the steel pipes that go through the process of cold-drawing, the external diameter is less than 33.5mm and wall thickness is less than 2.5mm. Those external diameters and weight which are not in parenthese refer to the steel pipes that are made through or not through process of cold-drawing. The rest of the pipe are made without the process of cold-drawing.

2. The length of electric-welding steel pipe: If external diameter is less than 30mm, the length is 2-6m ; external diameter is more than 30-70mm, the length is 3-10m; and external diameter more than 70mm, the length is 4-12m.

3. According to the state of material, the steel pipes are made mild; low hardness, of which the external diameter is more than 70mm; and hard cold-drawn pipes and those of which the external diameter is less than 30mm are made without through cold-drawing.

4. Materials used: ordinary carbon steel (GB700-65) and fine carbon steel (GB699-65).

5. For mechanical properties of the steel pipe, see the Appendant Table.

18. Water and Gas Feeding Steel Pipe (YB234-63)

Table 2-1-58 The Norms and Dimensions of Water and Gas Feeding Steel Pipe

Nominal diameter		External diameter	Steel Pipe				Pipe Screw Thread				Joint weight shared by each meter of the pipe (one joint by every 6 meters) (kg)
			Common pipe		Thickened pipe		Base plane diameter	Teeth of each inch	Length of Screw Thread (mm)		
(mm)	(in.)		Wall thickness (mm)	*DTW	Wall thickness (mm)	*DTW	(mm)		Conical pipe thread	Cylindric pipe thread	
6	$\frac{1}{8}$	10	2.00	0.39	2.50	0.46					
8	$\frac{1}{4}$	13.5	2.25	0.62	2.75	0.73					
10	$\frac{3}{8}$	17	2.25	0.82	2.75	0.97					
15	$\frac{1}{2}$	21.25	2.75	1.25	3.25	1.44	20.956	14	12	14	0.01
20	$\frac{3}{4}$	26.75	2.75	1.63	3.50	2.01	26.442	14	14	16	0.02
25	1	33.50	3.25	2.42	4.00	2.91	33.250	11	15	18	0.03
32	$1\frac{1}{4}$	42.25	3.25	3.13	4.00	3.77	41.912	11	17	20	0.04
40	$1\frac{1}{2}$	48	3.50	3.84	4.25	4.58	47.805	11	19	22	0.06

Translator's note: *DTW = disregarding pipe joint theoretical weight.

Continued

Nominal diameter		External diameter	Steel Pipe				Pipe Screw Thread				Joint weight shared by each meter of the pipe (one joint by every 6 meters) (kg)
			Common pipe		Thickened pipe		Base plane diameter (mm)	Teeth of each inch	Length of Screw thread (mm)		
(mm)	(in.)		Wall thickness (mm)	*DTW (kg/m)	Wall thickness (mm)	*DTW (kg/m)			Conical pipe thread	Cylindrical pipe thread	
50	2	60	3.50	4.88	4.50	6.16	59.616	11	22	24	0.08
70	2 1/2	75.5	3.75	6.64	4.50	7.88	75.187	11	23	27	0.13
80	3	88.5	4.00	8.34	4.75	9.81	87.887	11	32	30	0.20
100	4	114	4.00	10.85	5.00	13.44	113.034	11	38	36	0.40
125	5	140	4.50	15.04	5.50	18.24	138.435	11	41	38	0.60
150	6	165	4.50	17.81	5.50	21.62	163.836	11	45	42	0.80

Note: 1. The steel pipes are classified into zinc plated (black pipe) and non-zinc plated: screw threaded and non-screw threaded.
2. The zinc plated pipe is heavier than non-zinc plated by 3-6%.
3. Commonly used material: ordinary carbon steel (GB700-65).
4. The length of water and gas feeding steel pipe: the non-zinc plated pipe without screw thread is 4-12m and the zinc plated and non-zinc plated with screw thread are 4-9m.

10. Hot Rolled Seamless Steel Pipe (YB231-64)

Table 4-4-40 The Forms and Dimensions of Hot-rolled Seamless Steel Pipe

Nominal	Wall Thickness (mm)															
	2.5	2.8	3	3.5	4	4.5	5	5.5	6	6.5	7	8	9	10	11	12
( )	Theoretical weight (kg/m)															
32	1.76	2.02	2.16	2.46	2.76	3.05	3.31	3.59	3.85	4.09	4.32	4.73	5.01			
38	2.19	2.48	2.69	2.98	3.35	3.72	4.07	4.41	4.74	5.05	5.35	5.84	6.02			
42	2.44	2.78	2.89	3.35	3.75	4.16	4.56	4.95	5.33	5.69	6.04	6.38	6.61	7.02	7.32	7.60
45	2.62	2.91	3.11	3.54	4.04	4.49	4.93	5.38	5.77	6.17	6.56	6.94	7.30	7.66	7.95	8.32
50	2.93	3.26	3.48	4.01	4.54	5.05	5.55	6.04	6.51	6.97	7.42	7.86	8.29	8.76	9.10	9.49
54			3.77	4.36	4.93	5.49	6.04	6.59	7.10	7.61	8.11	8.60	9.08	9.54	9.99	10.43
57			4.00	4.62	5.23	5.83	6.41	6.99	7.56	8.10	8.63	9.10	9.67	10.17	10.66	11.13
60			4.22	4.88	5.52	6.16	6.78	7.39	7.98	8.58	9.15	9.71	10.26	10.80	11.32	11.83
63.5			4.48	5.18	5.87	6.55	7.21	7.87	8.51	9.14	9.75	10.36	10.95	11.53	12.10	12.65
68			4.81	5.57	6.31	7.04	7.77	8.48	9.17	9.86	10.53	11.19	11.84	12.47	13.10	13.71
70			4.96	5.74	6.51	7.27	8.01	8.76	9.47	10.18	10.84	11.52	12.19	12.83	13.47	14.09
73			5.18	6.00	6.81	7.60	8.38	9.16	9.91	10.66	11.39	12.11	12.82	13.52	14.21	14.89
76			5.40	6.26	7.10	7.93	8.76	9.58	10.36	11.14	11.91	12.67	13.42	14.15	14.87	15.58
83				6.86	7.79	8.71	9.62	10.53	11.39	12.26	13.12	13.97	14.81	15.64	16.46	17.27
89				7.36	8.38	9.38	10.36	11.33	12.28	13.22	14.16	15.07	15.98	16.87	17.76	18.63
95				7.86	8.98	10.04	11.10	12.14	13.17	14.19	15.19	16.18	17.16	18.13	19.09	20.05
102				8.50	9.67	10.82	11.96	13.09	14.21	15.31	16.40	17.48	18.55	19.60	20.64	21.67
108					10.26	11.49	12.70	13.90	15.09	16.27	17.44	18.59	19.73	20.86	21.97	23.08
114					10.86	12.16	13.44	14.72	15.98	17.23	18.47	19.70	20.91	22.12	23.31	24.49
121					11.54	12.93	14.30	15.67	17.02	18.35	19.68	20.99	22.29	23.58	24.86	26.12
127					12.13	13.59	15.04	16.48	17.90	19.32	20.72	22.12	23.50	24.87	26.24	27.59
133					12.73	14.26	15.78	17.29	18.79	20.28	21.75	23.21	24.66	26.10	27.53	28.95
140						15.04	16.65	18.24	19.83	21.40	22.96	24.51	26.04	27.56	29.08	30.57
146						15.70	17.39	19.06	20.72	22.36	24.00	25.62	27.23	28.82	30.41	31.98
152						16.37	18.13	19.87	21.60	23.32	25.03	26.73	28.41	30.08	31.74	33.39
159						17.15	18.99	20.82	22.64	24.45	26.24	28.02	29.79	31.53	33.27	35.00
168							20.10	22.04	23.97	25.89	27.79	29.69	31.57	33.43	35.29	37.13
180							21.60	23.70	25.79	27.86	29.92	31.97	33.99	35.99	37.98	39.97
194							23.31	25.60	27.87	30.09	32.29	34.50	36.70	38.89	41.06	43.23
203									29.24	31.56	33.85	36.14	38.42	40.67	42.92	45.15
219									31.62	34.06	36.50	38.92	41.33	43.72	46.11	48.48
245										38.23	41.06	43.87	46.67	49.46	52.24	54.99
273										42.64	45.82	49.00	52.17	55.33	58.48	61.62
299												53.81	57.41	60.99	64.57	68.13
325												58.76	62.64	66.52	70.38	74.23
351													67.87	71.80	75.91	80.01
377															81.68	86.10
402															87.21	91.95
426															92.55	97.57
450															97.87	103.20
(465)															101.10	106.60
480															104.52	110.22

Continued

Thickness (mm)	Weld Reinforcement (mm)															
	10	11	12	(13)	14	(15)	16	(17)	18	(19)	20	22	(24)	26	(28)	29
	Theoretical Weld Metal (mm)															
32																
36																
42	7.88															
45	8.83															
50	9.86															
54	10.85	11.87														
57	11.59	12.48	13.32	14.11												
60	12.33	13.29	14.21	15.07	15.88											
63.5	13.19	14.24	15.24	16.19	17.09											
66	14.30	15.46	16.57	17.63	18.64	19.61	20.52									
70	14.40	16.01	17.10	18.27	19.33	20.34	21.31									
73	15.54	16.82	18.06	19.24	20.37	21.46	22.49	23.48	24.41	25.30						
76	16.28	17.63	18.94	20.20	21.41	22.57	25.68	24.74	25.75	26.72						
83	18.00	19.53	21.01	22.44	23.82	25.15	26.44	27.67	28.85	29.99						
89	19.48	21.10	22.70	24.27	25.80	27.27	28.69	30.19	31.57	32.90	34.03	36.38	38.47			
95	20.96	22.70	24.50	26.29	27.97	29.59	31.17	32.70	34.18	35.61	36.90	39.61	42.02			
102	22.69	24.60	26.63	28.63	30.38	32.18	33.93	35.64	37.29	38.88	40.44	43.40	46.17			
108	24.17	26.31	28.45	30.48	32.45	34.40	36.30	38.15	39.95	41.70	43.40	46.66	49.72	51.17	52.78	55.24
114	25.86	27.94	30.19	32.38	34.53	36.62	38.67	40.67	42.62	44.51	46.36	49.91	53.27	54.87	56.43	59.14
121	27.37	29.84	32.26	34.62	36.94	39.21	41.43	43.60	45.72	47.79	49.82	53.71	57.41	59.14	60.91	64.0
127	28.88	31.47	34.03	36.56	39.01	41.43	43.80	46.12	48.39	50.61	52.78	56.97	60.96	62.89	64.78	68.06
133	30.33	33.10	35.81	38.41	41.00	43.65	46.17	48.63	51.05	53.42	55.73	60.22	64.51	66.59	68.61	72.10
140	32.08	34.99	37.88	40.72	43.60	46.24	48.93	51.57	54.16	56.70	59.19	64.02	68.66	70.90	73.10	77.14
146	33.54	36.62	39.66	42.64	45.67	48.48	51.30	54.08	56.82	59.51	62.15	64.28	72.71	74.99	78.24	81.48
152	35.02	38.25	41.45	44.56	47.68	50.68	53.66	56.60	59.48	62.32	65.11	71.59	75.78	78.30	80.79	85.02
159	36.78	40.15	43.50	46.81	50.06	53.27	56.43	59.53	62.58	65.58	68.53	74.33	79.00	82.02	85.28	90.48
168	38.87	42.50	46.17	49.69	53.17	56.60	59.98	63.31	66.59	69.82	73.00	79.21	85.23	88.16	91.05	96.47
180	41.92	45.85	49.72	53.54	57.31	61.04	64.71	68.34	71.91	75.44	78.92	85.72	92.33	95.56	98.74	104.96
194	45.38	49.64	53.86	58.03	62.15	66.22	70.24	74.21	78.13	82.00	85.82	93.32	100.67	104.19	107.72	114.63
203	47.69	52.08	56.52	60.91	65.24	69.54	73.78	77.97	82.12	86.21	90.26	98.20	105.94	109.74	113.49	120.83
219	51.84	56.65	61.26	66.04	70.78	75.46	80.10	84.69	89.23	93.71	98.15	106.88	115.42	119.61	123.75	131.84
245	57.95	63.48	68.95	74.38	79.76	85.09	90.38	95.62	100.77	105.90	110.98	120.99	130.80	135.64	140.47	149.84
273	64.88	71.07	77.24	83.36	89.42	95.44	101.41	107.33	113.20	119.02	124.79	136.18	147.38	152.90	158.38	169.18
299	71.27	78.13	84.91	91.69	98.40	105.06	111.67	118.23	124.74	131.20	137.61	150.29	162.77	168.93	175.05	187.13
325	77.69	85.18	92.63	100.03	107.38	114.68	121.93	129.13	136.28	143.38	150.44	164.50	178.15	184.96	191.72	205.09
341	84.10	92.23	100.32	108.36	116.35	124.29	132.19	140.03	147.82	155.56	163.26	178.50	193.54	200.99	208.39	223.04
377	90.81	99.29	108.02	117.06	126.35	135.01	142.44	150.03	158.36	167.76	176.08	192.61	208.93	217.02	225.06	240.99
402	96.87	106.06	115.41	124.71	133.96	143.15	152.30	161.40	170.45	179.45	188.40	206.14	223.72	232.42	241.08	258.24
426	102.69	112.58	122.62	132.61	142.55	152.44	162.28	171.07	181.11	190.71	200.25	219.19	237.93	247.23	256.48	274.83
450	108.50	119.08	130.81	140.09	150.52	160.90	171.24	181.52	191.76	201.94	212.08	232.20	252.12	262.01	271.85	291.38
(465)	112.20	123.15	134.05	144.90	155.70	166.46					219.47	240.34	261.00	271.20	281.47	301.74
480	115.90	127.22	138.49	149.71	160.88	172.00								280.61	291.08	312.10

Continued

Outside diameter (mm)	Wall Thickness (mm)																
	30	32	(34)	(35)	36	(38)	40	(42)	(45)	(48)	50	55	60	65	(68)	70	75
	Theoretical Weight (mm)																
32																	
38																	
42																	
45																	
50																	
54																	
57																	
60																	
63.5																	
68																	
70																	
73																	
76																	
83																	
89																	
95																	
102																	
108																	
114																	
121																	
127	71.76																
133	76.20	78.71															
140	81.14	84.29	86.88	88.81	92.33												
146	85.42	89.97	93.07	95.81	97.88												
152	90.28	94.70	98.04	100.39	102.99												
159	95.44	100.27	104.81	107.03	109.20												
168	102.10	107.31	112.36	114.88	117.19	121.85	126.27	130.81	138.30								
180	110.48	116.80	122.42	125.18	127.85	133.07	138.10	142.94	149.82								
194	121.33	127.85	134.16	137.24	140.27	146.19	151.91	157.44	166.36								
203	127.93	134.94	141.70	145.00	148.26	154.62	160.78	166.76	176.33	183.47	188.85						
219	138.83	147.57	155.12	158.92	162.47	169.62	176.58	183.33	193.10	202.83	208.38						
245	156.07	166.09	174.92	181.70	185.66	193.98	202.22	210.29	221.95	233.25	240.14						
273	174.78	186.19	200.46	206.41	210.41	220.23	229.85	239.27	253.03	266.40	274.96						
299	191.82	210.71	227.70	227.87	233.50	244.59	255.49	266.19	281.88	297.10	307.12	335.57	353.82	366.84	378.08	396.10	414.29
325	208.25	231.29	248.00	250.91	258.53	268.08	281.14	294.11	310.73	327.90	339.10	371.49	392.09	407.04	418.75	440.74	462.28
351	237.49	251.74	268.80	272.76	279.88	293.12	306.79	320.08	339.59	358.88	371.16	407.40	430.38	447.41	458.43	485.24	510.46
377	256.73	272.26	287.81	295.04	302.77	317.66	332.44	346.89	368.44	389.45	403.22	442.30	466.86	484.82	500.14	529.48	558.56
402	276.21	291.18	308.55	316.76	324.92	341.10	357.08	372.86	396.18	419.02	434.01	477.81	504.62	524.66	540.17	573.10	606.79
426	292.98	310.93	328.69	337.49	346.27	363.81	380.77	397.74	422.82	447.46	463.64	510.97	541.57	560.47	578.68	614.58	649.23
450	310.72	329.86	348.79	358.19	367.53	386.08	404.42	422.56	449.43	476.84	495.70	544.10	577.04	601.24	617.12	655.06	693.56
(466)	321.87	341.89	361.37	371.33	380.85	400.13	419.22	438.11	466.07	493.59	511.70	564.83	599.24	624.54	641.10	681.44	721.31
480	332.91	353.52	373.94	384.08	394.17	414.19	434.01	453.64	482.72	511.36	530.19	585.53	621.43	632.31	666.29	707.74	749.06

10. Cold Draw (Cold-rolled) Seamless Steel Pipe (YB231-64)

Table 2-1-60 The Norms and Dimensions of Cold Draw (Cold-rolled Seamless Steel Pipe

Internal diameter (mm)	Wall Thickness (mm)																
	0.25	0.30	0.40	0.50	0.60	0.80	1.0	1.2	1.4	(1.5)	1.6	1.8	2.0	2.2	2.5	2.8	3.0	3.2
	Theoretical Weight (kg/m)																	
2	0.0108																	
2.5	0.0139	0.0163	0.0207															
3	0.0169	0.0200	0.0256															
4	0.0231	0.0274	0.0355	0.043	0.050	0.063	0.074	0.083										
5	0.0292	0.0348	0.0454	0.055	0.065	0.083	0.099	0.112	0.124	0.129	0.134							
6	0.0354	0.0421	0.055	0.068	0.080	0.103	0.123	0.142	0.159	0.166	0.174	0.186	0.197					
7	0.0416	0.0496	0.065	0.080	0.095	0.123	0.148	0.172	0.193	0.203	0.213	0.230	0.247	0.260	0.277			
8	0.0477	0.057	0.075	0.092	0.110	0.142	0.173	0.202	0.227	0.240	0.253	0.275	0.296	0.315	0.339			
9	0.054	0.064	0.085	0.105	0.125	0.162	0.197	0.231	0.262	0.277	0.292	0.319	0.345	0.369	0.401	0.427		
10	0.060	0.072	0.095	0.117	0.139	0.182	0.222	0.261	0.296	0.314	0.332	0.363	0.395	0.423	0.462	0.496	0.518	0.536
11	0.066	0.079	0.105	0.129	0.154	0.201	0.247	0.290	0.331	0.351	0.371	0.407	0.444	0.477	0.524	0.566	0.592	0.615
12	0.072	0.087	0.115	0.142	0.169	0.221	0.271	0.320	0.365	0.388	0.411	0.452	0.493	0.532	0.586	0.635	0.666	0.694
(13)	0.079	0.094	0.124	0.154	0.184	0.241	0.296	0.349	0.400	0.425	0.451	0.496	0.543	0.585	0.647	0.703	0.740	0.774
14	0.085	0.101	0.134	0.166	0.199	0.260	0.321	0.379	0.434	0.462	0.490	0.541	0.592	0.640	0.709	0.772	0.814	0.852
(15)	0.091	0.109	0.144	0.179	0.214	0.280	0.345	0.409	0.468	0.499	0.529	0.585	0.641	0.694	0.771	0.841	0.888	0.932
16	0.097	0.116	0.154	0.191	0.228	0.300	0.370	0.438	0.503	0.536	0.568	0.629	0.691	0.747	0.832	0.910	0.962	1.01
(17)	0.103	0.124	0.164	0.203	0.244	0.320	0.395	0.468	0.537	0.573	0.608	0.674	0.740	0.802	0.894	0.980	1.04	1.09
18	0.109	0.131	0.174	0.216	0.258	0.340	0.419	0.497	0.572	0.610	0.647	0.717	0.789	0.856	0.956	1.05	1.11	1.17
(19)	0.115	0.138	0.183	0.228	0.274	0.359	0.441	0.527	0.606	0.647	0.687	0.762	0.838	0.910	1.02	1.12	1.18	1.25
20	0.122	0.146	0.193	0.240	0.288	0.379	0.469	0.556	0.642	0.684	0.726	0.806	0.888	0.965	1.08	1.19	1.26	1.33
(21)			0.203	0.253	0.303	0.399	0.493	0.586	0.675	0.721	0.767	0.851	0.937	1.02	1.14	1.26	1.33	1.41
22			0.212	0.265	0.318	0.419	0.518	0.616	0.710	0.758	0.806	0.895	0.986	1.07	1.20	1.33	1.41	1.49
(23)			0.222	0.277	0.333	0.438	0.543	0.645	0.745	0.795	0.846	0.940	1.04	1.13	1.26	1.39	1.48	1.57
(24)			0.236	0.290	0.347	0.458	0.567	0.674	0.779	0.832	0.885	0.984	1.09	1.18	1.33	1.46	1.55	1.64
25			0.242	0.303	0.363	0.478	0.592	0.703	0.813	0.869	0.925	1.03	1.13	1.24	1.39	1.53	1.63	1.72
(27)			0.262	0.327	0.392	0.518	0.641	0.762	0.882	0.943	1.00	1.12	1.23	1.34	1.51	1.67	1.78	1.88
28			0.272	0.340	0.406	0.536	0.666	0.792	0.916	0.980	1.04	1.16	1.28	1.40	1.57	1.74	1.85	1.96
29			0.282	0.352	0.418	0.553	0.691	0.823	0.951	1.02	1.08	1.22	1.33	1.47	1.63	1.83	1.92	2.02
30			0.292	0.364	0.436	0.576	0.715	0.851	0.986	1.05	1.12	1.25	1.38	1.51	1.70	1.88	2.00	2.12
32			0.311	0.389	0.466	0.615	0.755	0.910	1.05	1.13	1.20	1.34	1.48	1.62	1.76	2.02	2.15	2.28
34			0.331	0.413	0.496	0.655	0.814	0.968	1.12	1.20	1.28	1.43	1.58	1.72	1.94	2.15	2.29	2.43

(35)			0.341	0.426	0.510	0.675	0.838	0.998	1.16	1.24	1.32	1.47	1.63	1.78	2.00	2.22	2.37	2.51
36			0.350	0.438	0.525	0.695	0.863	1.03	1.19	1.28	1.36	1.52	1.68	1.83	2.07	2.29	2.14	2.59
38			0.370	0.464	0.555	0.734	0.912	1.09	1.26	1.35	1.44	1.61	1.78	1.94	2.19	2.43	2.59	2.75
40			0.390	0.494	0.585	0.774	0.962	1.15	1.33	1.42	1.52	1.69	1.87	2.05	2.31	2.56	2.74	2.91
42							1.01	1.21	1.41	1.50	1.60	1.79	1.97	2.16	2.44	2.70	2.89	3.07
44.5							1.07	1.28	1.48	1.59	1.65	1.88	2.10	2.29	2.59	2.89	3.07	3.25
45							1.09	1.30	1.51	1.61	1.71	1.91	2.12	2.32	2.62	2.91	3.11	3.31
48							1.15	1.38	1.61	1.72	1.83	2.05	2.27	2.48	2.81	3.11	3.33	3.54
50							1.21	1.44	1.68	1.79	1.91	2.14	2.37	2.59	2.93	3.25	3.48	3.70
(51)							1.23	1.47	1.71	1.83	1.96	2.18	2.42	2.64	2.99	3.32	3.55	3.79
53							1.28	1.53	1.78	1.90	2.03	2.27	2.51	2.76	3.11	3.46	3.70	3.94
(54)							1.31	1.59	1.82	1.94	2.07	2.31	2.56	2.81	3.18	3.53	3.77	4.02
56							1.36	1.62	1.89	2.02	2.15	2.40	2.66	2.92	3.30	3.66	3.92	4.17
(57)							1.38	1.65	1.92	2.05	2.18	2.45	2.71	2.97	3.36	3.74	4.00	4.25
60							1.46	1.74	2.02	2.16	2.31	2.58	2.86	3.13	3.55	3.94	4.22	4.49
63							1.53	1.83	2.13	2.27	2.42	2.71	3.01	3.30	3.72	4.15	4.44	4.73
65							1.58	1.89	2.20	2.35	2.50	2.80	3.11	3.40	3.85	4.29	4.59	4.89
(68)							1.65	1.98	2.30	2.46	2.62	2.93	3.26	3.57	4.04	4.49	4.81	5.12
70							1.70	2.03	2.37	2.53	2.70	3.02	3.35	3.68	4.16	4.63	4.96	5.28
(73)							1.78	2.12	2.47	2.64	2.82	3.16	3.50	3.84	4.35	4.84	5.18	5.52
75							1.82	2.18	2.54	2.71	2.90	3.24	3.60	3.95	4.46	4.97	5.32	5.68
(76)							1.85	2.21	2.57	2.76	2.94	3.29	3.65	4.00	4.53	5.05	5.40	5.75
80									2.71	2.90	3.09	3.47	3.84	4.22	4.77	5.32	5.69	6.07
(83)									2.82	3.02	3.21	3.60	4.00	4.37	4.96	5.52	5.92	6.31
85									2.88	3.08	3.29	3.69	4.09	4.48	5.08	5.66	6.06	6.46
(89)									3.02	3.24	3.45	3.86	4.29	4.70	5.33	5.94	6.36	6.77
90									3.05	3.27	3.49	3.91	4.34	4.76	5.39	6.01	6.43	6.86
95									3.21	3.46	3.68	4.13	4.59	5.02	5.70	6.36	6.81	7.26
100									3.40	3.64	3.88	4.35	4.83	5.30	6.00	6.70	7.17	7.65
(102)									3.46	3.73	3.97	4.45	4.93	5.40	6.13	6.84	7.32	7.81
(108)									3.67	3.95	4.21	4.72	5.23	5.74	6.50	7.25	7.77	8.29
110									3.74	4.03	4.28	4.81	5.32	5.84	6.62	7.39	7.92	8.43
120										4.36	4.64	5.25	5.83	6.38	7.24	8.07	8.66	9.22
125												5.46	6.06	6.64	7.54	8.42	9.02	9.61
130															7.86	8.78	9.40	10.00
(133)															8.05	8.98	9.59	10.25
140																	10.11	10.79
150																	10.85	11.52

Continued

Internal diameter (mm)	Wall thickness (mm)															
	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9	9.5	10	11	12	13	14
	Theoretical weight (mm)																	
2																		
2.5																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10	0.561																	
11	0.647																	
12	0.734	0.789																
(13)	0.820	0.888																
14	0.906	0.986																
(15)	0.993	1.09	1.17	1.23														
16	1.08	1.18	1.28	1.35														
(17)	1.17	1.28	1.39	1.48														
18	1.25	1.38	1.50	1.60														
(19)	1.34	1.48	1.61	1.73	1.84	1.92												
20	1.42	1.58	1.72	1.85	1.97	2.07												
(21)	1.51	1.68	1.83	1.97	2.10	2.22												
22	1.60	1.77	1.94	2.10	2.24	2.37												
(23)	1.68	1.87	2.05	2.22	2.37	2.52												
(24)	1.77	1.97	2.16	2.34	2.51	2.66	2.81	2.93										
25	1.86	2.07	2.28	2.47	2.64	2.81	2.97	3.11										
(27)	2.03	2.27	2.50	2.71	2.92	3.11	3.29	3.45										
28	2.11	2.37	2.61	2.84	3.06	3.26	3.45	3.63										
29	2.20	2.47	2.72	2.96	3.19	3.40	3.61	3.80	3.98									
30	2.29	2.56	2.83	3.08	3.32	3.55	3.77	3.97	4.16	4.34								
32	2.46	2.76	3.05	3.33	3.59	3.85	4.09	4.32	4.53	4.74								
34	2.63	2.96	3.27	3.58	3.87	4.14	4.41	4.66	4.90	5.13								

(35)	2.72	3.06	3.38	3.70	4.00	4.29	4.57	4.83	5.09	5.33									
36	2.81	3.16	3.50	3.82	4.14	4.44	4.73	5.01	5.27	5.52									
38	2.98	3.35	3.72	4.07	4.41	4.74	5.05	5.35	5.64	5.92	6.18	6.44							
40	3.15	3.55	3.94	4.32	4.68	5.03	5.37	5.70	6.01	6.31	6.60	6.88							
42	3.32	3.75	4.16	4.56	4.95	5.33	5.69	6.04	6.38	6.71	7.02	7.32							
44.5	3.54	4.00	4.44	4.87	5.29	5.70	6.09	6.47	6.84	7.20	7.55	7.88							
45	3.58	4.04	4.49	4.93	5.36	5.77	6.17	6.56	6.94	7.30	7.65	7.99	8.32	8.63					
48	3.84	4.34	4.83	5.30	5.76	6.21	6.65	7.08	7.49	7.89	8.28	8.65	9.02	9.37					
50	4.01	4.54	5.05	5.55	6.04	6.51	6.97	7.42	7.86	8.29	8.70	9.10	9.49	9.86	10.59	11.25			
(51)	4.10	4.64	5.16	5.67	6.17	6.66	7.13	7.60	8.05	8.48	8.91	9.32	9.72	10.11	10.85	11.54			
53	4.27	4.83	5.38	5.92	6.44	6.95	7.45	7.94	8.42	8.88	9.33	9.77	10.19	10.60	11.39	12.13			
(54)	4.36	4.93	5.49	6.04	6.58	7.10	7.61	8.11	8.60	9.08	9.54	9.99	10.43	10.85	11.67	12.43			
56	4.53	5.13	5.71	6.29	6.85	7.40	7.93	8.40	8.97	9.47	9.96	10.43	10.90	11.34	12.21	13.02			
(57)	4.62	5.23	5.83	6.41	6.99	7.55	8.10	8.63	9.16	9.67	10.17	10.65	11.13	11.59	12.48	13.32	14.11		
60	4.83	5.52	5.16	6.78	7.39	7.99	8.58	9.15	9.71	10.26	10.80	11.32	11.83	12.33	13.29	14.21	15.07	15.88	
63	5.13	5.81	6.49	7.14	7.77	8.41	9.04	9.57	10.23	10.81	11.40	11.96	12.49	13.05	14.07	15.09			
65	5.31	6.02	6.71	7.40	8.07	8.73	9.38	10.01	10.65	11.25	11.84	12.43	13.00	13.56	14.65	15.68			
(68)	5.57	6.31	7.05	7.77	8.48	9.17	9.86	10.53	11.19	11.84	12.47	13.10	13.71	14.30	15.46	16.57	17.53	18.64	
70	5.74	6.51	7.27	8.01	8.75	9.47	10.18	10.88	11.56	12.23	12.89	13.54	14.17	14.80	16.01	17.16	18.27	19.33	
(73)	6.00	6.81	7.60	8.38	9.16	9.91	10.66	11.39	12.11	12.82	13.52	14.21	14.88	15.54	16.82	18.05	19.21	20.37	
75	6.17	7.00	7.82	8.62	9.41	10.18	10.96	11.72	12.48	13.17	13.91	14.61	15.30	15.99	17.31	18.65			
(76)	6.26	7.10	7.93	8.75	9.56	10.36	11.14	11.91	12.67	13.42	14.15	14.87	15.58	16.29	17.63	18.94	20.20	21.41	
80	6.60	7.49	8.37	9.24	10.07	10.91	11.75	12.59	13.39	14.15	14.96	15.73	16.45	17.22	18.60	20.10			
(83)	6.86	7.79	8.71	9.62	10.51	11.39	12.26	13.12	13.96	14.80	15.62	16.42	17.22	18.00	19.53	21.01	22.44	23.82	
85	7.04	7.98	8.93	9.86	10.75	11.65	12.55	13.45	14.31	15.13	15.01	16.85	17.63	18.43	20.01	21.60			
(89)	7.38	8.38	9.38	10.38	11.33	12.28	13.22	14.16	15.07	15.93	16.87	17.76	18.62	19.48	21.16	22.79	24.37	25.89	
90	7.47	8.47	9.49	10.47	11.42	12.39	13.35	14.31	15.22	16.11	17.05	17.95	18.79	14.67	21.43	23.07			
95	7.90	8.98	10.04	11.10	12.14	13.17	14.19	15.19	16.19	17.18	18.13	19.09	20.03	20.96	22.79	24.56			
100	8.32	9.46	10.59	11.71	12.77	13.87	14.95	16.02	17.06	18.09	19.15	20.15	21.15	22.19	24.14	26.01			
(102)	8.50	9.67	10.82	11.96	13.09	14.21	15.31	16.40	17.48	18.53	19.60	20.63	21.67	22.69	24.69	26.6			
(108)	9.02	10.26	11.49	12.70	13.90	15.09	16.27	17.41	18.56	19.73	20.8	21.97	23.08	24.17	26.31	28.41			
110	9.19	10.46	11.70	12.93	14.18	15.40	16.59	17.75	19.00	20.05	21.06	22.50	23.54	24.70	26.85	29.00			
120	10.06	11.44	12.93	14.30	15.51	16.89	18.20	19.50	20.8	22.10	23.10	24.72	25.98	27.20	29.59	31.96			
125	10.50	11.91	13.37	14.80	16.15	17.55	19.02	20.25	21.73	23.08	24.12	25.75	27.06	28.36	30.92	33.41			
130	10.92	12.43	13.92	15.18	16.88	18.25	19.64	21.01	22.70	24.11	25.20	26.90	28.23	29.70	32.37	34.92			
(132)	11.18	12.75	14.25	15.75	17.29	18.79	20.28	21.75	23.21	24.64	26.10	27.72	28.93	30.33	33.10	35.81			
140	11.80	13.42	15.05	16.65	18.24	19.83	21.40	22.96	24.50	26.04	27.57	29.08	30.57	32.06	34.99	37.85			
150	12.65	14.39	16.11	17.83	19.55	21.25	23.00	24.68	26.35	28.01	29.66	31.29	32.91	34.52	37.71	40.84			

Note: The four points that follow are applicable to hot-rolled seamless steel pipe and cold-drawn seamless steel pipe (Table 2-1-59 and Table 2-1-60).

1. Commonly used materials: ordinary carbon steel (GB700-65), fine carbon steel (GB699-69), general low alloy struction steel (YB13-69) and alloy construction steel (YB6-59).
2. The length of seamless steel pipe: the hot-rolled pipe is 4-12.5m, and the cold-drawn pipe of which the wall thickness is less than 1mm is 1.5-7m and of which the wall thickness is more than 1mm is 1.5-9m.
3. In Table 2-1-60, the dimensions which are in parentheses are not recommended for use.
4. For mechanical properties of seamless steel pipes, see the table that follows:

Steel Grade	Tensile strength σ_b (kg/mm^2)	Yield strength σ_s (kg/mm^2)	Extension rate δ_5 (%)	Steel Pipe Supplying State
	≥			
10	34	21	24	1. Hot-rolled steel pipe undergoes no annealing, but cold-drawn steel pipe undergoes annealing. 2. Supplying according to their chemical compositions and mechanical properties.
15	38	23	22	
20	40	25	20	
25	46	28	19	
30	50	30	18	
35	52	32	17	
40	56	34	15	
45	60	36	14	
A2, AS2, AJ2	34	22	24	1. Hot-rolled steel pipe undergoes no annealing, but cold-drawn steel pipe undergoes annealing. 2. Supplying according to their mechanical properties.
A3, AS3, AJ3	38	24	22	
A4, AS4, AJ4	42	26	20	
A5, AS5, AJ5	50	28	17	
A6, AS6, AJ6	60	31	14	

21. Boiler-use Seamless Steel Pipe (YB232-63)

Table 2-1-61 The Norms and Dimensions of Boiler-use Seamless Steel Pipe

Name		Steel Grade	External diameter(mm)	Wall Thickness (mm)
Various construction boiler-use steel pipes.	Superheated steam pipe	10	22, 24, 25	2.5, 3, 3.5, 4
		20	29	2.5, 3, 3.5, 4, 4.5, 5, 5.5
			32, 35, 38, 40, 42	2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6
	Boiling water pipe	10	51, 57	2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 7, 8
			60, 63.5	3, 3.5, 4, 4.5, 5, 5.5, 6, 7, 8, 9
		20	70	3, 3.5, 4, 4.5, 5, 5.5, 6, 7, 8, 9, 10
			76, 83, 89	3.5, 4, 4.5, 5, 5.5, 6, 7, 8, 9, 10
			95, 102, 108	4, 4.5, 5, 5.5, 6, 7, 8, 9, 10
Locomotive boiler-use steel pipe	Superheated steam pipe	10	24, (29), 30	3
			35, 38,	3.5
			42	4
	Small smoke pipe	10	44.5, 51	3.5
			57	3
	Arch pipe		76, 89	5
	Large smoke pipe	10	89	3.5
			127, 133	4
			140, 152	4.5

Note: 1. Commonly used material: fine carbon steel (GB699-65)
2. The length of boiler-use seamless steel pipe: The hot-rolled pipe is 4-12.5m and the cold-drawn pipe is 1.5-9m.
3. The dimensions which are in parenthese are not recommended for use.

11. Carbon Spring Steel Wire (YB249-64)

Table 2-1-62 The Norms, Dimensions and Mechanical Properties of Carbon Spring Steel Wire

Diameter (mm)	Mechanical Properties											
	Group I			Group II			Group IIa			Group III		
	Tensile strength σ_b (kg/mm^2)	Repeated bending times	Twist-ing times	Tensile strength σ_b (kg/mm^2)	Repeated bending times	Twist-ing times	Tensile strength σ_b (kg/mm^2)	Repeated bending times	Twist-ing times	Tensile strength σ_b (kg/mm^2)	Repeated bending times	Twist-ing times
		≥	≥		≥	≥		≥	≥		≥	≥
0.14	270～310		35	225～270		35	225～270		35	175～225		35
0.15	270～310		34	225～270		34	225～270		34	175～225		34
0.16	270～310		33	225～270		33	225～270		33	175～225		33
0.18	270～310		31	225～270		31	225～270		33	175～225		31
0.20	270～310		30	225～270		30	225～270		32	175～225		30
0.22	270～310		29	225～270		29	225～270		32	175～225		29
0.25	270～310		27	225～270		27	225～270		32	175～225		27
0.28	270～310		26	225～270		26	225～270		31	175～225		26
0.30	270～310		23	225～270		23	225～270		31	175～225		23
0.32	265～305		22	220～265		22	220～265		30	170～220		22
0.36	265～305		22	220～265		22	220～265		30	170～220		22
0.40	265～305		20	220～265		21	220～265		28	170～220		21
0.45	265～305		17	220～265		20	220～265		28	170～220		20
0.50	265～305		16	220～265		19	220～265		27	170～220		19
0.56	265～305		16	220～265		19	220～265		27	170～220		19
0.60	265～305		16	220～265		18	220～265		25	170～220		18
0.63	260～300		16	215～260		18	215～260		25	170～215		18
0.70	260～300		16	215～260		18	215～260		25	170～215		18

0.75	260～300		16	215～260		17	215～260		24	170～215		17
0.80	260～300	11	16	215～260	12	17	215～260	12	24	170～215	12	17
0.85	255～290	11	16	210～255	11	17	210～255	11	24	165～210	11	17
0.90	255～290	10	16	210～255	11	17	210～255	11	24	165～210	11	17
1.00	250～285	9	16	205～250	10	17	205～250	10	24	165～210	10	17
1.10	240～275	9	16	195～240	8	17	195～240	8	24	155～200	9	17
1.20	240～270	7	16	195～240	7	17	195～240	7	24	155～200	8	17
1.30	230～260	19	16	190～230	18	17	190～230	18	24	150～190	18	17
1.40	230～260	17	16	190～230	17	17	190～230	17	24	150～190	17	17
1.50	220～250	15	16	185～220	15	17	185～220	15	24	145～185	15	17
1.60	220～250	13	16	185～220	13	17	185～220	13	24	145～185	13	17
1.70	210～240	11	15	180～210	10	17	180～210	10	24	140～180	11	17
1.80	210～240	10	15	180～210	10	17	180～210	10	24	140～180	11	17
2.00	200～230	8	14	180～210	9	16	180～210	9	23	140～180	10	16
2.20	190～220	7	13	170～200	8	15	170～200	8	22	140～175	9	15
2.50	180～205	6	12	165～195	7	15	165～195	7	21	130～165	8	15
2.80	175～200	7	11	165～195	9	14	165～195	9	19	130～165	10	14
3.00	170～195	4	10	165～195	5	13	165～195	5	18	130～165	7	13
3.20	170～195	4	10	155～185	5	13	155～180	5	18	120～155	7	13
3.40	165～190	3	9	155～180	5	13	155～180	5	18	120～155	6	13
3.60	165～190	3	7	155～180	5	13	155～180	5	18	120～155	5	13
4.00	160～185	4	6	150～175	6	13	150～175	6	18	115～150	6	13
4.50	150～175	4	6	140～165	5	12	140～165	5	17	115～145	5	12
5.00	150～175	3	4	140～165	4	9	140～165	4	15	110～140	4	9
5.60	145～170	5	4	135～160	6	6	135～160	6	8	105～135	6	6
6.00	145～170	3	2	135～160	6	4	135～160	6	6	105～135	6	4
6.30				125～145	6					100～125	6	
7.00				125～145	6					100～125	6	
8.00				125～145	5					100～125	5	

Note: 1. Carbon spring steel wire (YB247-64) is used for cold-drawn spring steel wire, which is of round section. This steel wire is used to make spring which is wound into form under cold state and without going through quenching.

2. Commonly used materials: ordinary carbon steel (GB699-65) and carbon tool steel (YB5-59).

23. Spring Steel Wire for Important Use (YB550-65)

Table 2-1-63 The Norms and Dimensions of Spring Steel Wire for Important Use

Steel wire Diameter	Permitted Deviation	Steel Wire Diameter	Permitted Deviation	Sreel Wire Diameter	Permitted Deviation
1.0	±0.03	2.5	±0.03	4.0	±0.04
1.1		2.8		4.2	
1.2		3.0		4.5	
1.4		3.2	±0.04	4.8	
1.6		3.4		5.0	
1.8		3.5		5.3	
2.0		3.8		5.5	
2.2				6.0	

Table 2-1-64 The Mechanical Properties of Spring Steel Wire for Important Use

Steel Wire Diameter (mm)	Tensile Strength σ_b (kg/mm^2)	Bending Times no Less Than	Twisting Times no Less Than	Steel Wire Diameter (mm)	Tensile Strength σ_b (kg/mm^2)	Bending Times no Less Than	Twisting Times no Less Than
1.0	180~215	8	19	3.4	160~185	6	13
1.1	180~215	8	19	3.5	150~175	5	11
1.2	180~215	8	19	3.8	145~170	5	10
1.4	175~205	7	18	4.0	145~170	4	10
1.6	175~205	6	17	4.2	145~170	3	9
1.8	170~200	5	16	4.5	140~165	3	9
2.0	170~200	5	16	4.8	135~160	2	8
2.2	165~195	4	15	5.0	135~160	2	8
2.5	165~190	3	15	5.3	135~160	2	6
2.8	160~185	3	15	5.5	130~155	2	6
3.0	160~185	6	13	6.0	130~155	2	5
3.2	160~185	6	13				

Note: Material used: 65Mn.

(6) A Comparison of China's Principal Steel Grades With Those of Other Countries

1. The Principles of Naming and Numbering Steel in Other Countries

(1) The ГОСТ [GOST] System of Soviet Union

The way of indicating steel brands in the ГОСТ system is fundamentally similar to the way of indicating steel brands in China's GB system, except that in the Soviet system, the names of chemical elements, the smelting process, pouring method and uses of steel grade are indicated by using Russian language.

The following is a comparison of symbols in GB system and ГОСТ system.

Name	GB Symbol	ГОСТ Symbol	Name	GB Symbol	ГОСТ symbol
High grade fine	A	А	Semi-killed steel	b (*)	ПС
Nitrogen	N	А	Boron	B (**)	Р
Niobium	Nb	Б	High speed steel		Р
Wolfram	W	В	Silicon	Si	С
Manganese	Mn	Г	Titanium	Ti	Т
Copper	Cu	Д	Carbon tool steel	T	У
Chrome stainless steel		Ж	Vanadium	V	Ф
Cobalt	Co	К	Chrome	Cr	Х
Boiling steel	F (*)	КП	Ball bearing steel	G	ШХ
Molybdenum	Mo	М	Aluminum	Al	Ю
Nickel	Ni	Н	Cr-Ni stainless steel		Я

Example:

08КП — 08 F	30ХГС — 30CrMnSi
А 40 — Y 40	ШХ15 — GCr15
У10А — Т 10 А	Ж1 — 1Cr13
9ХС — 9SiCr	1Х18Н9Т — 1Cr18Ni9Ti
15ГС — 15MnSi	

Translator's note: * (звёд) means "boil" and ** (звёд) means boron.

(2) The DIN system of German Federal Republic

The way of indicating steel grade of DIN system is fundamentally similar to that of TGL system of German Democratic Republic.

The basic structure of indicating steel grade of DIN system is to use figures and alphabetical letters. The order of steel grade is prefixed by a letter which stands for smelting method, and then come in order the letters which stand for original characteristics, marking core and figures which stand for guarantee range and alphabetical letters indicating treatment state. These letters and figures can be used simultaneously or singly but in many cases only "marking core" is used.

1) The significance of letters and figures

① The letters which stand for smelting methods:

Smelting methods	Symbol	Smelting methods	Symbol
Bessemer steel(acid converter steel)	B	Electric furnace steel	E
Thomas steel(basic converter steel)	T	Open hearth steel	M
Converter substituting steel	U	Crucible furnace steel	TT
Arc furnace steel	LE	Welding-use steel	SS
Induction furnace steel	I	Hammered iron	SR

Additional letters: B -- alkalinity and Y --acidity. These letters follow those which stand for smelting methods.

For example: EY -- acid electric furnace steel.

② The letters which stand for original characteristics:

Original characteristics	Symbol	Original characteristics	Symbol
High P and (or) S contents	C	Boiling pouring	-
Low P and (or) S contents	K	Extendable	E
Semi-dead pouring	H	Weldable	S
Dead pouring	R	Pressure weldable(forge weldable)	P
Alkaline-resisting brittleness	L	Cold can be weldable (extrudable and cold deformable)	Z
Anti-aging	A		

③ Marking core:

When it is based on material strength, the order is:

Core mark "st", tensile strength lower limit value.

When it is based on chemical composition, the order is:

Carbon symbol, carbon content value or

Carbon content value, alloying elements symbols, alloy value or

Prefixing letter K, carbon content value, alloying elements symbols,

alloy value.

④ The figures standing for gurantee range:

Guarantee Range	Figure
Bending or top forging test (one time a furnace)	No figure
Yield point	1
Bending or top forging test	2
Impact tenacity	3
Yield point and bending or top forging test	4
Impact tenacity and bending or top forging test	5
Yield point and impact tenacity	6
Yield point and impact tenacity and bending or top forging test	7
High temperature strength or creep strength	8
Electric propertity or magnetic property	9

The figures standing for guarantee range follow the marking core and the figures must be separated by a point. For example, st42.6.

⑤ The letters standing for treatment state:

Treatment State	Symbol	Treatment State	Symbol
Through tempering	A	Through surface spark quenching	FF
Through quenching	H	Through surface high frequency	
Through normalization treatment	N	induction quenching	HI
Through cementation quenching	E	Having best cutability through	
Through softening annealing	G	treatment	B
Through cementation	NT	Through cold working (cold	
Through hardening and tempering	V	rolling and cold drawing)	K
		Through eliminating internal	
		stress annealing	S
		Without treatment	--

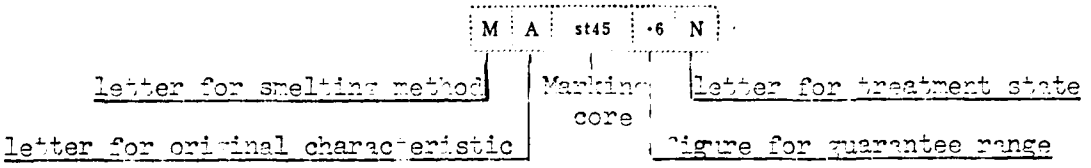
2) Numbering according to material strength

This kind of numbering is applicable only to non-alloy steel.

The marking core is composed of a sign of "st" and the following tensile strength lower limit value.

For example, Ast42 = anti-ageing steel and its tensile strength is 42kg/mm^2.

The following is a more complete mark:



Anti-ageing open hearth steel of which the tensile strength is 45kg/mm^2, guarantee yield point and impact tenacity through normalization treatment.

3) Numbering according to chemical composition

This kind of numbering is better because it can distinguish non-alloy steel, low alloy steel and high alloy steel. Carbon steel can be marked according to its chemical composition only when other characteristics become more decisive in its use than tensile strength or yield point or when the steel requires consumer to to make heat treatment (such as cementation steel and hardened and tempered steel).

① Non-alloy steel

The marking core is composed of carbon symbol "C" and the following carbon content value (it is indicated by average carbon content value percentage multiplied by 100).

For example, C15, C35, C35 are guaranteed carbon steel pipe material of a certain high temperature. C15 is cementation steel. C30, C35, C35,C45

and C60 are hardened and tempered steel. C15 is cementation steel of which the carbon content is 0.15%, through cementation quenching. C35 is hardened and tempered steel of which the carbon content is 0.35%, through normalization treatment.

If the tensile strength lower limit has to be indicated. the tensile strength value is given after the letters which stand for heat treatment. If there is no heat treatment and no letters standing for heat treatment,a letter "F" is placed after carbon content value to indicate that the figures after F are strength value.

For example, C35Z50 is hardened and tempered steel of which the carbon content is 0.35% and through normalization treatment. Its tensile strength lower limit is 50kg/mm^2.

C35F60 is hardened and tempered steel of which the carbon content is 0.35% and its tensile strength lower limit is 60kg/mm^2.

MnC35F70 is acid open hearth steel of which the carbon content is 0.35%, and its tensile strength lower limit can reach 70kg/mm^{2}after hardening and tempering.

Generally, a large quantity of steel used for production has undergone heat treatment in the plant and very few requires consumer to give heat treatment. These kinds of steel are usually marked by letters,which stand for smelting method,and carbon content value. Sometimes there is an additional letter to indicate the original characteristic. The symbol "Q" can be understood.

For example, TS is Thomas steel of which the carbon content is 0.22%.

MnQ is open hearth building steel of which the carbon

content is 0.12%.

MB14 is anti-ageing basic open herath steel of which the carbon content is 0.14%.

In case, some certain characteristics have to be indicated, the chemical symbols of elements that cause these characteristics are given after the mark. Al is aluminum content, Cu is copper, Mn is manganese, P and S indicate a higher phosphorus and sulfur content and Si, a higher silcon content.

For example, M10MnSi is open hearth steel killed by using silcon and its carbon content is 0.10% but manganese content is higher.

M12Cu is open hearth steel containing a small amount of copper and its carbon content is 0.12%.

② Low alloy steel (total alloy content is not more than 5%)

The marking core is composed of carbon content value, symbols of alloy elements and alloy value. The foremost carbon content value is similar to non-alloy steel. That means the percentage of carbon content is multiplied by 100, but the prefixing symbol C is omitted. The chemical symbols of alloy elements are arranged in order according to their respective quantity. If the the contents are equal to each other, the letters are arranged in alphabetic order. Alloy value equals to that the percentage of alloy content is multiplied respectively by 4, 10 or 100, and the products are made into integral numbers by disregarding fractions lower than five.

Cr, Co, Mn, Ni.Si and W multiplied by 4.

Al, Cu, Mo, Ti, Ta, Zr and V multiplied by 10.

C, N, P, S multiplied by 100.

If the treatment methods must be given, then the letters standing for treatment state are connected by a sign of "+". In order to avoid mistake, the letters for treatment state and strength lower limit value can be placed together.

For example, 15Cr3E is chrome steel containing C0.15%, Cr0.75%
and through cementation quench.
25CrMo56Y + 65S is chrome-molybdenum steel containing C0.25%, Cr1.25%, Mo0.6%, its tensile strength can reach 65kg/mm^2 after hardening and tempering and it underwent internal stress eliminating annealing.
E13Cr753.8 is chrome-vanadium steel containing C0.13%, Cr1.25%, V0.3% and guarantee a certain degree of high temperature.

③ High alloy steel

In order to make distinction from other kinds of steel, the steel grade of high alloy steel is prefixed with a letter X, then come the carbon content value, chemical symbols of alloy elements and alloy value. Because of the high alloy content, the number of alloy value is 1.

For example, X10CrNi1188 is stainless steel containing C 0.10%, Cr18%
and Ni8%.
X10CrNiTi1892 is stainless steel containing C 0.1%, Cr18%, Ni9% and Ti2%.

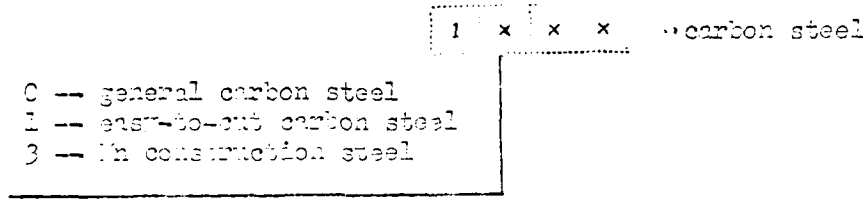
If the carbon content is insignificant without a mark of C, the prefixing letter X can be omitted.

(5) The AISI and SAE system of the United States

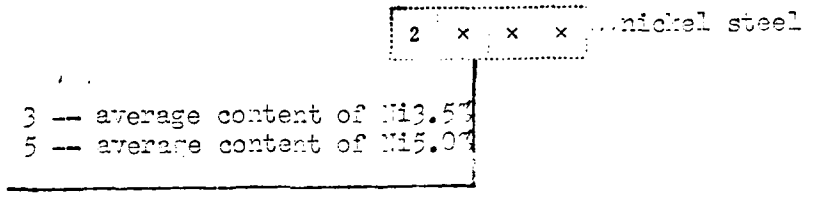
1) Construction Steel

(1) The way of indicating steel grade of SAE system

Generally, the steel grade is indicated by using a four-digit number. the first two digits indicate the kind of steel and the second two digits indicate the numerical value per 10000 of average carbon content.

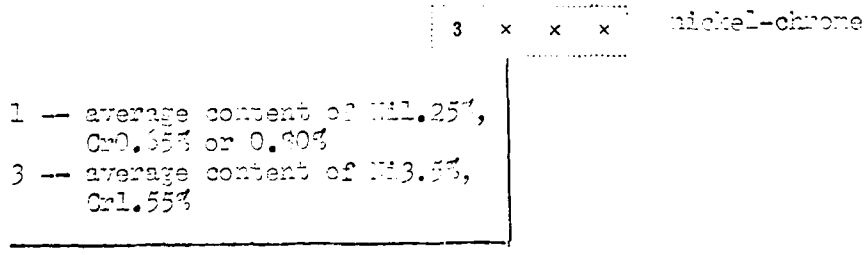


For example, 1030 is carbon steel and its average carbon content is 0.30%.



For example, 2517 is nickel steel and its average Ni content is 5.0%

and C 0.17%.



For example, 3310 is nickel-chrome steel and its average content of

Ni is 3.5%, Cr1.55% and C 0.10%.

4	×	×	×	steel containing Mo

0, 4, 5 -- molybdenum steel has different Mo contents
1 -- chrome-molybdenum steel
3, 7 -- molybdenum steel has different Ni, Cr and Mo contents
6, 8 -- molybdenum steel has different Ni and Mo contents

For example, 4315 is nickel-molybdenum steel containing Ni3.25%-3.75%, Mo 0.2-0.3% and C 0.13-0.18%.

5	×	×	×	chrome steel

0 -- low chrome steel has an average content of Cr 0.27% and 0.65%
1 -- low chrome steel has an average content of Cr 0.80%,0.95% and 1.05%

For example, 5135 is chrome steel containing Cr 0.80-1.05% and C 0.33-0.38%.

6	1	×	×	chrome-vanadium steel containing Cr0.95% and V>0.10%.

For example, 6150 is chrome-vanadium steel containing Cr0.80-1.10% and V more than 0.15% and C 0.48-0.53%.

8	×	×	×	low NiCrMo steel

6 -- average content of Ni0.55%, Cr0.50% and Mo0.20%
7 -- average content of Ni0.55%, Cr0.50% and Mo0.25%
8 -- average content of Ni0.55%, Cr0.50% and Mo0.35%

For example, 8740 is NiCrMo steel containing Ni0.4-0.7%, Cr0.40-0.60%, Mo0.2-0.3% and C 0.38-0.43%.

9 2 × × ... Si'n steel containing Si1.30-2.2% and Mn0.70-1.00%.

9 × × ×

2 -- Si'n steel containing Si 1.30-2.2% and Mn 0.70-1.00%
3 -- NiCrMo steel with an average content of Ni3.25%, Cr1.20% and Mo0.12%
4 -- NiCrMo steel with an average content of Ni0.45%, Cr0.40% and Mo0.12%
7 -- NiCrMo steel with an average content of Ni0.55%, Cr0.17% and Mo0.20%
8 -- NiCrMo steel with an average content of Ni 1.00%, Cr0.80% and Mo.25%

× × B × × steel containing boron

For example, 50 B 46 is CrB steel with an average content of C 0.46%, Cr 0.20-0.35% and B less than 0.0005%.

× × L × × steel containing lead

For example, 12L14 is easy-to-cut steel containing C 0.15%, Mn 0.7-1.20% and Pb 0.15-035%.

× × × × -H steel which requires a certain hardenability

For example, 4140-H is CrMo steel which requires a certain hardenability.

③ The way of indicating steel grade of AISI system is basically similar to that of SAE system. However, there is some difference. For example,

in AISI system, some steel grade has prefixing letters or suffixing letters.

The steel grade of easy-to-cut steel and carbon steel is prefixed with:

C — open hearth steel

B — Basic converter steel

The steel grade of alloy steel is prefixed with:

E — electric steel

TS — standard steel grade of testing

At the end of steel grade, a letter F is attached — easy-to-cut steel

Moreover, in addition to the whole set of steel grades of SAE system, which are included in those listed in the AISI system, there still are some which are not listed in the SAE system, such as TS4140, 9440. A complete comparison will be given as follows:

A comparison of the ways of indicating steel grade of construction steel in both AISI and SAE systems

AISI	SAE	AISI	SAE
C1006	1006	4815	4815
C1030	1030	5135	5135
B1113	1113	6150	6150
1335	1335	86B45	86B45
E2517	2517	94B40	—
E3310	3310	12L14	12L14
TS4140	—	4140-H	4140-H

2) Rolling Bearing Steel

The indication of steel grade of SAE system

5 × × × × — rolling bearing steel

0 -- average content of Cr0.50%
1 -- average content of Cr1.00%
2 -- average content of Cr1.45%

indicating average content of carbon

The ways of indicating steel grade of rolling bearing steel are basically the same in AISI system and SAE system. The following is a comparison of the ways of indicating:

AISI	SAE	Type of steel	Average content of chrome
E501 × ×	501 × ×	Low chrome bearing steel	0.50%
E511 × ×	511 × ×	Medium chrome bearing steel	1.00%
E521 × ×	521 × ×	Highchrome bearing steel	1.45%

For example, 52100 is a type of high carbon and high chrome bearing steel which contains C 0.95-1.10% and Cr 1.30-1.60%.

3) Tool Steel

A unified numbering system of AISI-SAE is widely adopted.

× × × — tool steel

W -- water quenched tool steel (general carbon tool steel containing a small quantity of Cr and V

S -- Impact resisting tool steel (CrW steel, SiMo steel and CrMo steel containing C 0.50-1.45%)

O -- Oil quenching [illegible] working tool steel (CrMn steel, MnMo steel, SiMn steel and CrMoW steel containing C 0.9-1.45%)

A -- Alloy cold working tool steel in air cooling and hardening (CrMo steel and CrMnMo steel containing C [illegible])

serial number

D — High carbon and high chrome type cold working tool steel (Cr steel, CrMo steel, CrWSi steel and CrWCo steel containing C1.00-2.25%)

H1 — Medium carbon and medium chrome type hot working mould steel (CrMo steel, CrMoV steel and CrMoWV steel containing C 0.35-0.55 and Cr5.0-7.0%)

H2 — Tungsten wire hot working mould steel (CrV steel and CrWV steel containing C 0.35-050 and W 9.0-18.0%)

H4 — Molybdenum wire hot working mould steel (CrMoV steel and CrMoWV steel containing C 0.55-0.65 and Mo5.0-8.0%)

T — Tungsten wire high speed steel

M — Molybdenum wire high speed steel

L — Low alloy tool steel for special use (Cr steel, CrV steel, CrNiMo steel, CrNiMo steel and CrMo steel containing C 0.5-1.1%)

F — Carbon-tungsten tool steel (W steel and Cr_1^W steel containing C1.0-1.25% and W1.25-3.50%)

P — Low carbon tool steel (Cr steel, CrNi steel, CrMo steel and CrNiMo steel containing C less than 0.07-0.30%)

For example, OT is oil quench cold working tool steel which contains

C 1.30%, Cr 0.75%, W1.75% and Mn 0.30%.

4) Stainless Steel and Heat-resistant Steel

(C) The indication of steel grade of AISI system

× × × stainless steel and heat-resistant steel

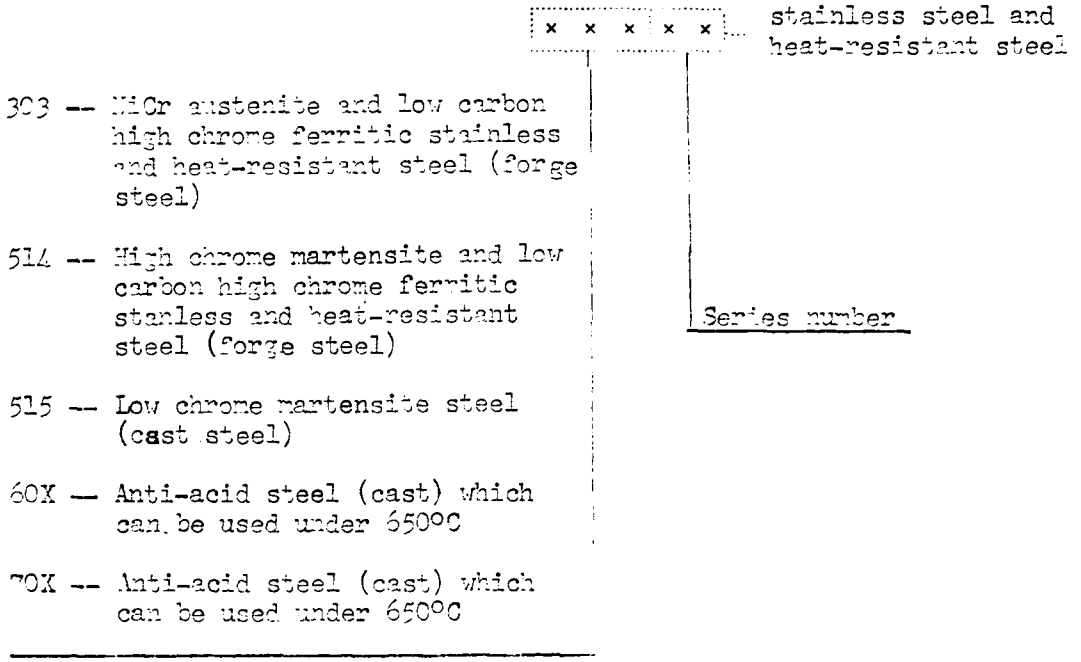
2 — CrNiMn austenite steel
3 — NiCr austenite steel
4 — High Cr martensite steel and low carbon high chrome ferritic stainless and heat-resistant steel
5 — Low chrome martensite steel

series number

For example, 302 is stainless steel which contains C less than 0.15%,

Cr 17.0-19.0% and Ni 8.0-10.0%.

② The indication of steel grade of SAE system

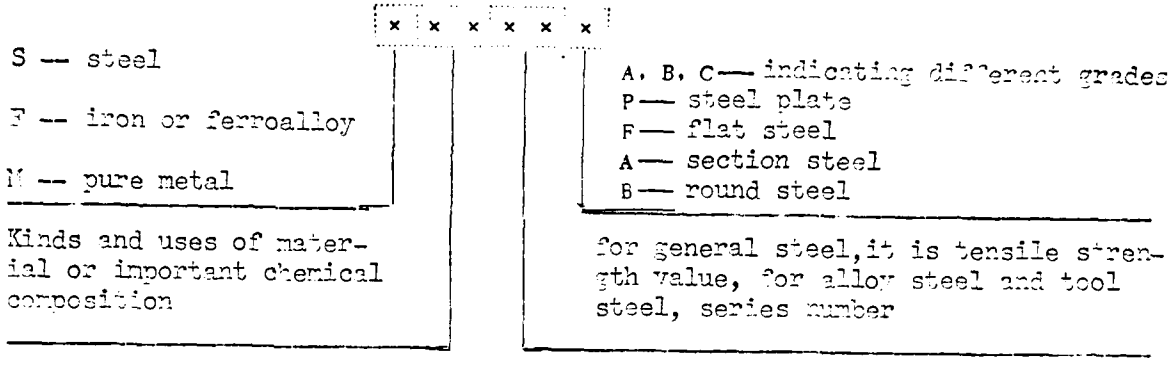


For example, 51501 is heat-resistant steel containing C more than 0.10%,

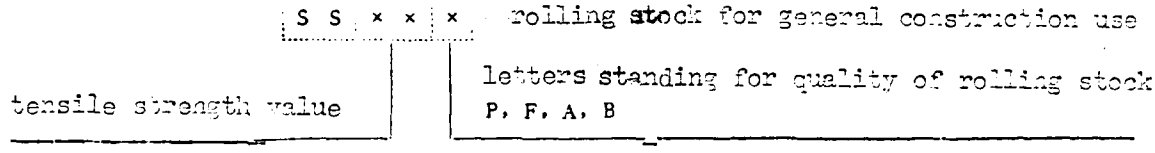
Cr4.0-6.0% and Mo0.40-0.65%.

(4) The JIS system of Japan

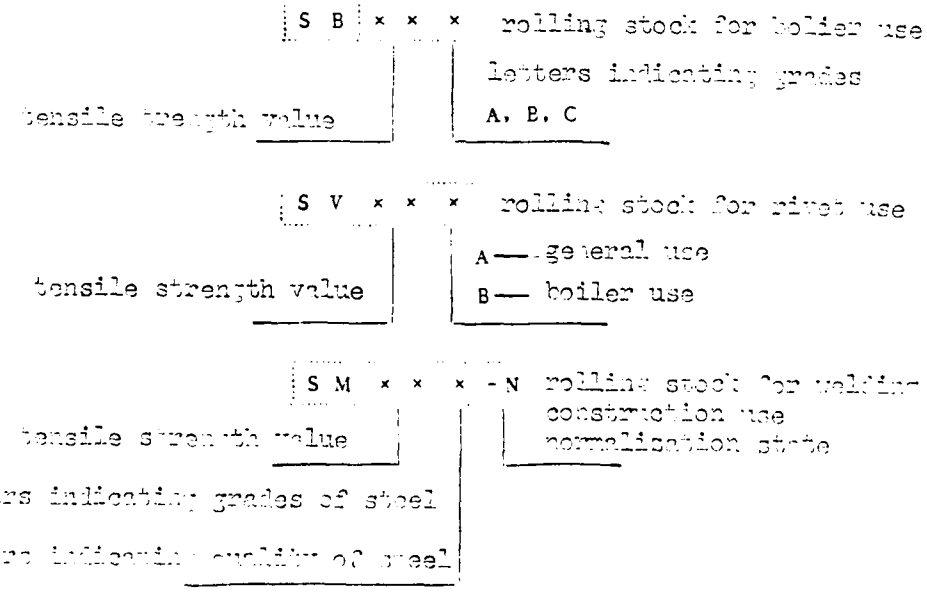
By the method of indicating steel grade of JIS system, the steel grade is composed of three different parts. The first part is the letters which stand for material classification, then the letters for the kind of material and uses and finally the letters for the order of different kinds and the minimum value of tensile strength. At the end of some steel grade, there are letters to indicate the grade of steel or the quality of steel.



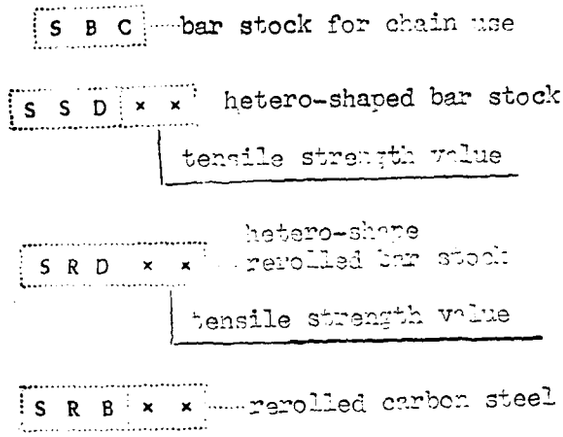
1) General steel and rolling stock (bar stock and section material)



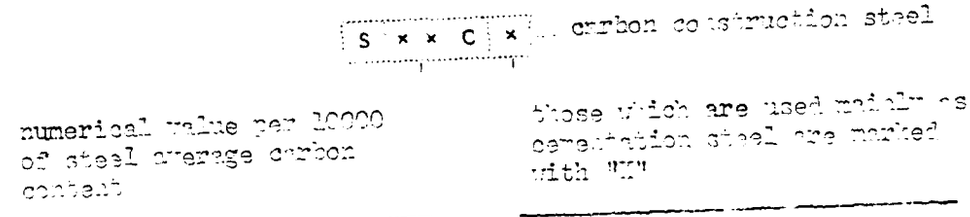
For example, SS34P is plate material for general construction use and its tensile strength is no less than 34kg/mm².



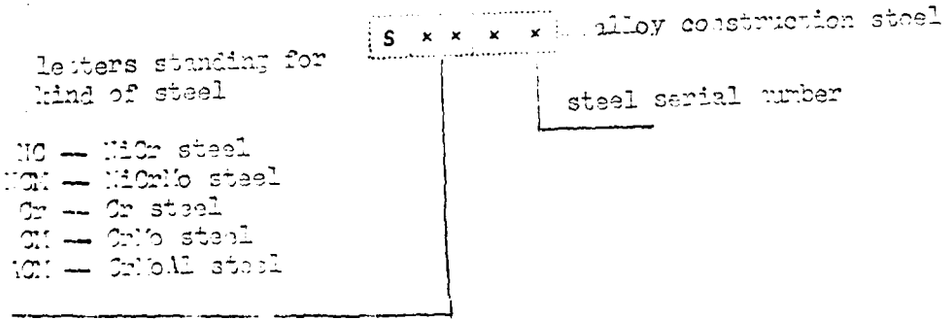
For example, SM50BP-H is flat steel for B-grade welding construction use and its tensile strength is no less than 50kg/mm^2.



2) Construction Steel



For example, S15CK is cementation steel containing C 0.15%.



For example, SNCl is NiCr alloy construction steel which has an average content of C 0.32-0.40%, Ni 1.00-1.50% and Cr 0.50-0.90%.

Of cold worked rolling stock, including general steel and carbon construction steel, symbols are given at the end of steel grade:

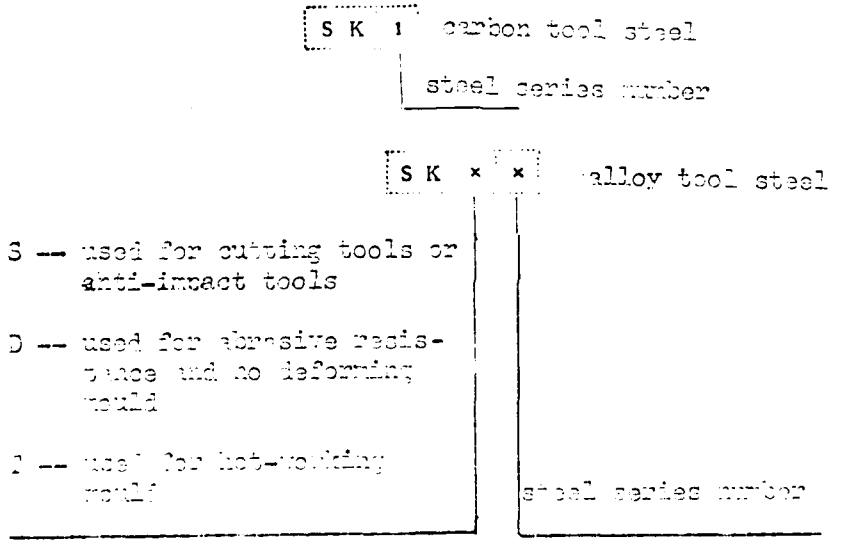
- D -- cold draw working
- T -- through machine working
- G -- through grinding

Following the symbols listed above, figures, 0,1,2,3, are added to indicate the common difference series of cold processing.

Those which are through quenching treatment are marked with "Q" between the symbols listed above and original steel grade.

For example, SCMQ-DG1 is No.1 CrMo construction steel bar stock, which, according to the first grade common difference, first has cold drawing, then quenching and finally grinding.

3) Tool Steel



S K H × high speed tool steel

S K C × hollow steel

S K U × cutter steel

4) Steel for special use

S E H × heat-resisting steel

steel series number

S U S × × × stainless anti-acid steel

steel number

letters standing for kind of steel material

B	bar material
HP	hot-rolled plate
CP	cold-rolled plate
HS	hot-rolled strip steel
CS	cold-rolled strip steel
WR	wire material
WSx	steel wire and the last figure is wire number
TP	austenite stainless steel pipe
TB	steel pipe for boiler and heat-exchanger use

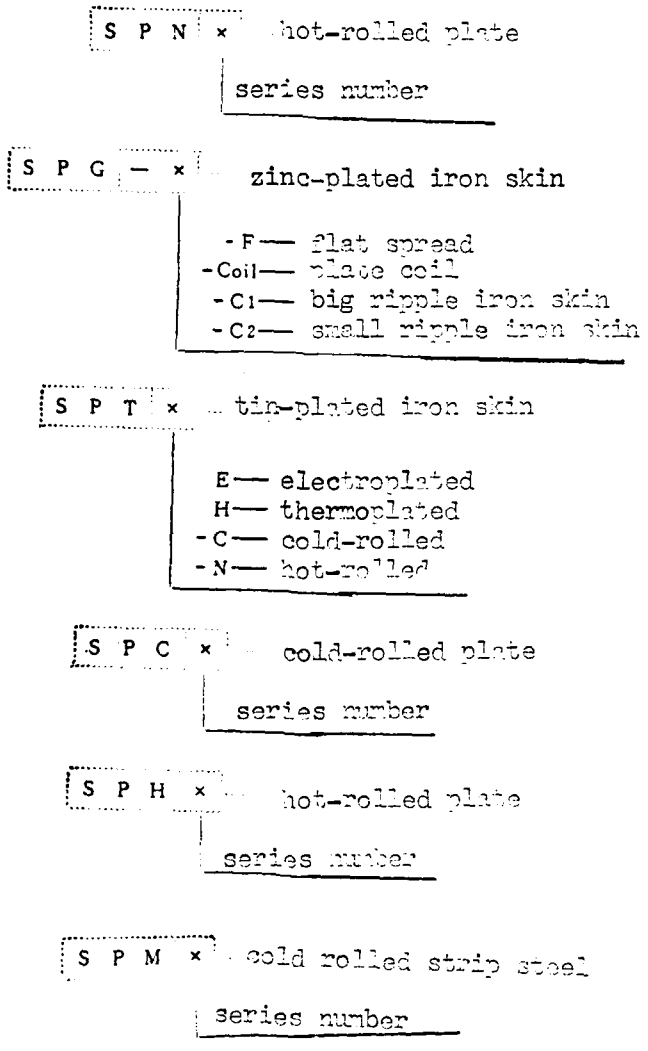
S U P × spring steel

steel series number

S U J × rolling bearing steel

steel series number

5) Plate material



For example, SPTE-C is cold-rolled and tin electroplated iron skin.

6) Pipe material

S G P General carbon steel pipe

S G P W Zinc-plated pipe used for running water

S T M — × × × seamless pipe for exploring; tensile strength value

C -- core pipe use

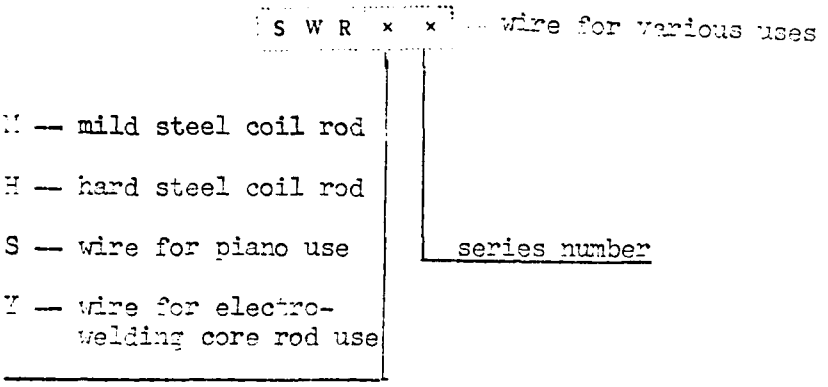
R -- bore rod use

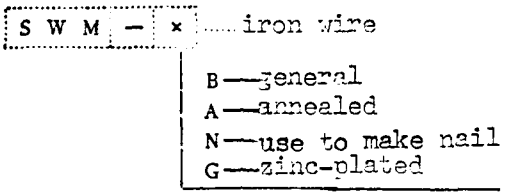
S T × × × × steel pipe for various uses

tensile strength value (STPA, STBA, STKS indicating pipe number)

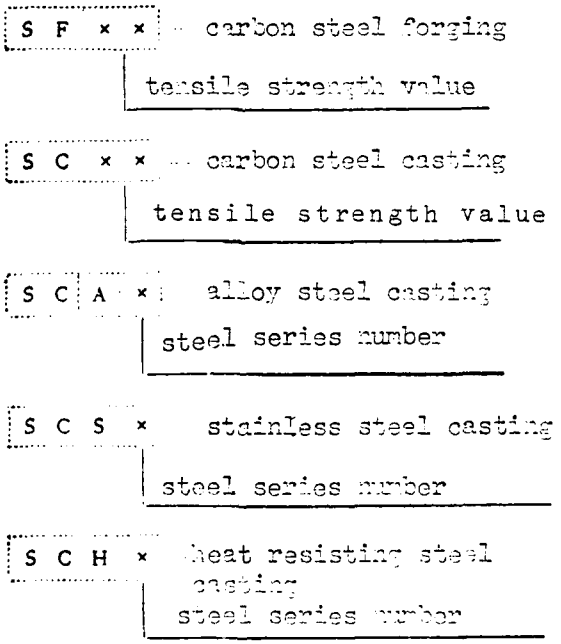
PG -- carbon steel pipe used to bear pressure under 350°C
S -- carbon steel pipe used for high pressure
PT -- carbon steel pipe used for high temperature(above 350°C)
PY -- electric arc welding carbon steel pipe
PA -- alloy steel pipe
PL -- steel pipe used for low temperature (below 0°C)
B -- carbon steel pipe for boiler and heat exchanger use
L -- steel pipe for locomotive boiler use
BA -- alloy steel pipe for boiler and heat exchanger use
BL -- below 0°C heat exchanger steel pipe
K -- carbon steel pipe for general construction use
KM -- carbon steel pipe for mechanical construction use
KS -- alloy steel pipe for construction use
H -- seamless steel pipe for high temperature gas cyanation use

7) Wire material





8) Casting and Forging



S C Mn H × — high Mn steel casting

steel series number

(5) The BS System of England

From the way of indicating steel grade of the British BS system, the chemical composition and mechanical properties of the material cannot be directly seen, so the definite standard must be checked. However, from the classification that follows, the kind of steel of the commonly used steel grade can be found out. For steel of same kind and the components are similar, letters A,B,C,D,... are often marked at the end.

1) Carbon Steel

En1A, En1B, En2, En3, En3A, En3B, En4, En4A, En5, En5D, En6, En6A, En7, En8, En8M, En9, En15A, En15B, En43A

2) Alloy Steel

En10, En11, En12, En13, En14A, En14B, En15, En16, En17, En18, En19, En19A, En20, En21, En22, En23, En24, En25, En26, En27, En28, En29, En30A, En30B, En100, En111, En160

3) Rolling Bearing Steel

En31

4) Cementation Steel

En32A, En32B, En32M, En33, En34, En35, En36, En37, En38, En39A, En39B, En201, En202, En320, En325

5) Nitride Steel

En40A, En40B, En40C, En41

6) Spring Steel

En42, En43, En44, En45, En45A, En46, En47, En48, En49, En50

7) Valve Steel

En51, En52, En53, En54, En55, En59

8) Stainless, Anti-acid and Wear-resisting Steel

En56, En57, En58

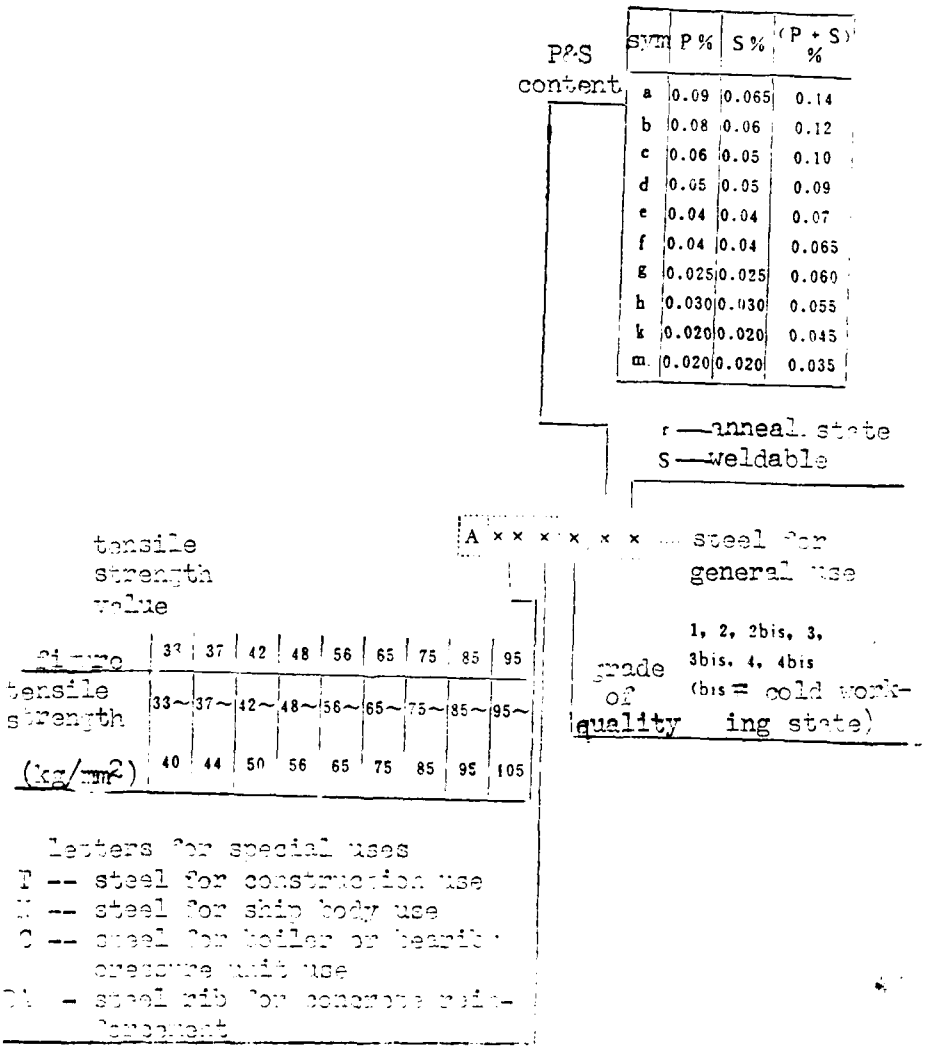
(6) The NF System of France

The steel grade in NF system is made on the basis of steel classification and the indicating methods are as follows:

1) Non-alloy steel and carbon steel

① Of steel for general use (steel A), there are:

ADx -- general commercial steel and its tensile strength is 33-50 kg/mm^2. The steel grades of other kinds of steel consist of A33, A37, A42, A48, A56, A65, A75, A85 and A95. The following is the way of indicating the steel grade:



For example, A37T2bisbr is steel A of which tensile strength is 37-44 kg/mm^2, the grade of quality is No.2 in cold working state. It is steel plate for construction use, and its P content is 0.08% and S content 0.06% in annealing state.

(2) Non-alloy steel for heat treatment use

Of non-alloy steel for construction use, there are:

Steel C

C × × ... steel C

figure per 10000 of average carbon content

For example, C 10S is weldable carbon steel and its average C content is 0.10%.

Steel XC

X C × × ... steel XC

figure per 10000 of average carbon content

For example, XC10d is XC carbon steel and its C content is 0.05-0.15% S and P content is grade d.

Tool steel for heat treatment use -- tool steel for general use belongs to the category of steel XC and the S and P content can be classified into three different grades. The symbols are suffixed to the steel grade.

Grades of classification	P. %	S. %	P + S. %
Extra-fins (highest)	<0.015	<0.02	<0.03
Fins (high)	<0.025	<0.03	<0.05
Qualite courante (general)	<0.04	<0.04	0.07

For example, KC95Mns is carbon tool steel of which the C content is 0.95% and P and S content is high grade.

2) Alloy Steel

(1) Alloy steel (steel A) for general use



S -- weldable

letters for important alloy elements

tensile strength value

For example, AS55M is weldable manganese steel and its tensile strength is 55 kg/mm^2 and manganese content is 1%.

(2) Alloy steel for heat treatment use

Low alloy steel -- carbon content is usually indicated by using C % multiplied by 100 and the important elements are indicated by letters. The element content is indicated by using the percentage of the content multiplied by the index listed in the chart.

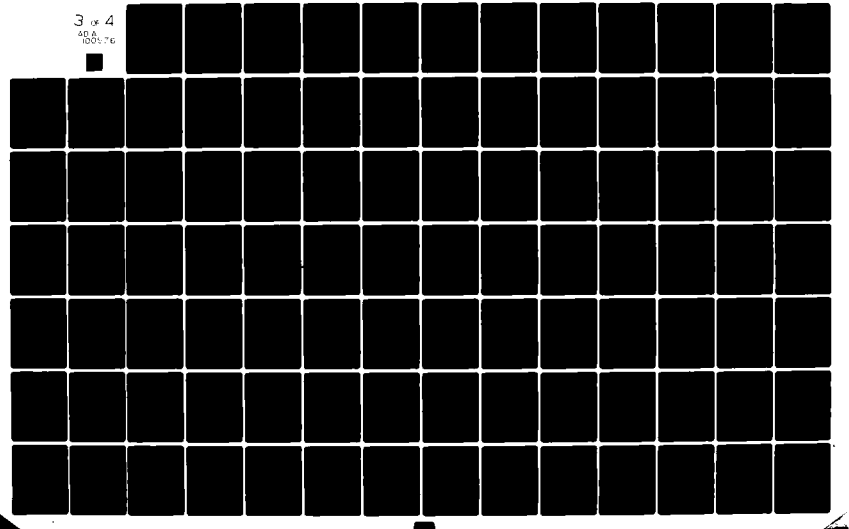
For example, 20CD4 is CrMo steel and it contains C 0.20%, Cr 1% and Mo more than 0.10%.

High alloy steel -- the steel grade is prefixed with Z and alloy element content is indicated directly. The rest are same as low alloy steel.

For example, Z30WV1 is wolfram steel and it contains C 0.30% and W1%.

Letters standing for alloy elements and indexes of content are given in the following chart.

AD-A100 576 FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OH F/G 15/5
HANDBOOK OF EQUIPMENT REPAIR,(U)
MAY 81
UNCLASSIFIED FTD-ID(RS)T-0685-80 NL



Names of elements and chemical symbols	Letters used in steel grade	Index
(ge) 铬 Cr	C	4
(gu) 钴 Co	K	4
(meng) 锰 Mn	M	4
(nie) 镍 Ni	N	4
(gui) 硅 Si	S	4
(lü) 铝 Al	A	10
(pi) 铍 Be	Be	10
(tong) 铜 Cu	U	10
(xi) 锡 Sn	E	10
(mei) 镁 Mg	G	10
(mu) 钼 Mo	D	10
(lin) 磷 P	P	10
(wu) 钨 W	W	10
(fan) 钒 V	V	10
(xin) 锌 Zn	Z	10

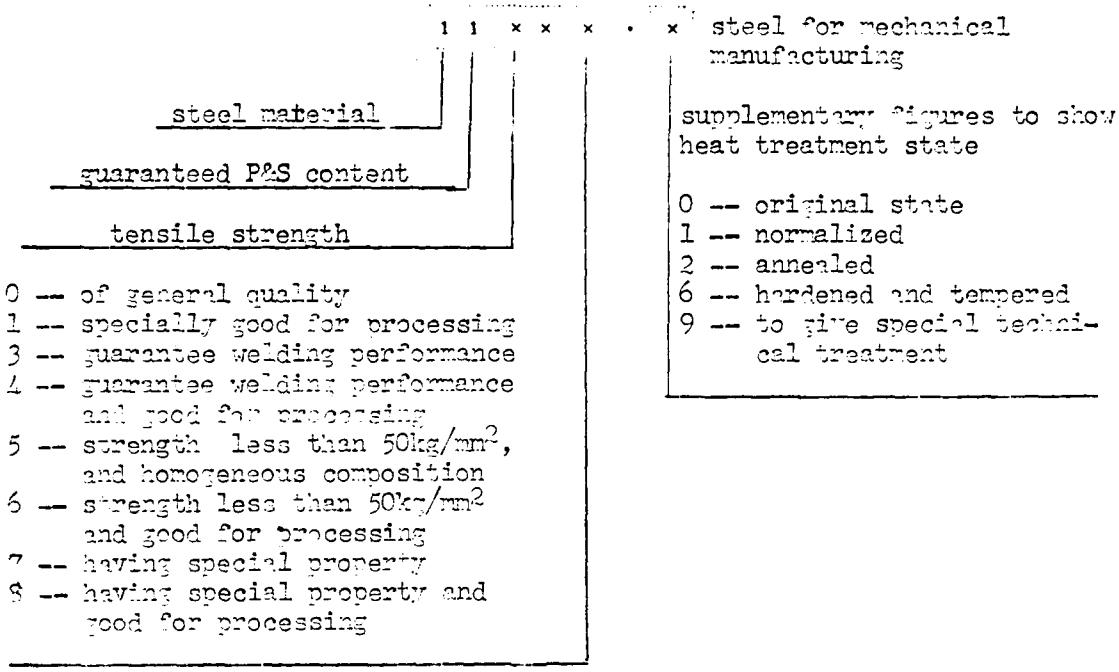
For the convenience of writing, simplified steel grades as listed in the following chart are often used.

Kind of steel	Complete steel grade	Simplified steel grade
Non-alloy special steel	XC12f	C12
Low alloy steel	28C4e	2C4
	50CV4	5CV4
High alloy steel	Z8CNT18	CNT18
	Z70WK12-05	WK12-05

(7) *The ČSN system of Czechoslovakia*

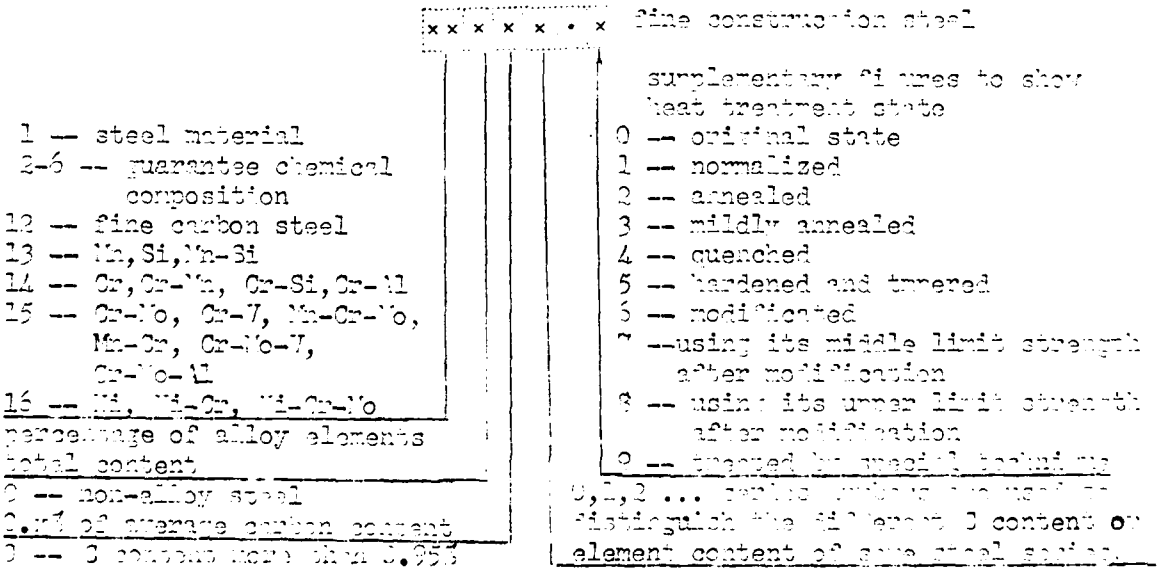
The method of numbering steel grade in ČSN system. The number is composed of a group of six digits and the first digit is "4" to indicate metallurgical material. But for construction steel, tool steel and stainless steel, this first digit is omitted. So the numbering is, in fact, made of five digits.

1) Steel for mechanical manufacturing



For example, 11340 is steel for mechanical manufacturing, it is of general quality and its tensile strength is no less than 34kg/mm².

2) Fine construction steel



For example, 14342 is fine construction steel, which contains Cr 1.2%, Mn 0.9%, Si 1.2% and total content = 3% and average C content is 0.32-0.39%.

3) Stainless anti-acid steel and heat resisting steel

1 7 × × × . ×

- 1 7 : stainless anti-acid steel and heat resisting steel
- × × × : series number related to C content
- . × : The supplementary figure shows heat treatment state (same as fine construction steel) 0 - 9
- × : 0 -- Cr steel
  1 -- Cr steel containing Al, Mo and Ni
  2 -- CrNi steel being added stable elements Ti and Nb
  3 -- CrNi steel being added stable elements Ti and Nb and containing Mo, V and W
  4 -- MnCr steel
  5 -- Ni steel
  6 -- Mn steel
  7 -- MnNi steel
  8 -- steel being added some other elements based on
  9 -- special need

The 4th digit of 170xx, 171xx, 172xx and 173xx indicates Cr content

The 4th digit of Cr steel and Ni steel among 17 kinds of steel	Cr content %	
	Cr steel	CrNi steel
17×0×	4~6	6~10
17×1×	6~10	
17×2×	10~16	10~16
17×3×		
17×4×	16~25	16~25
17×5×		
17×6×	>25	>25
17×7×		
17×8×	—	—
17×9×		

The 4th digit of 175xx indicates Ni content

The 4th digit of Ni steel among 17 kinds of steel		Ni content %
No other element is added	Other element is added	
1750×	1755×	6~10
1751×	1756×	10~16
1752×	1757×	16~25
1753×	1758×	25~40
1754×	1759×	>40

The 4th digit of 174xx indicates Mn content

The 4th digit of 176xx indicates Mn content

The 4th digit of MnCr steel among 17 kinds		Mn content %
No other element is added	Other elements Ti,Mo,N added	
1740×	1745×	6~10
1741×	1746×	
1742×	1747×	10~16
1743×	1748×	16~25
1744×	1749×	>25

The 4th digit of Mn steel among 17 kinds	Mn content %
1760×	6~10
1761×	
1762×	10~16
1763×	16~25
1764×	>25

The 4th and 5th digit of 17xx among 17 kinds of steel grade indicate:
17700-17749 are steel of which the Ni content is high.
17750-17799 are steel of which the Mn content is high.

For example, 17021.6 is Cr stainless steel in modification state and its general Cr content is 11.5-14.5% and C content is 0.15%.

4) Tool steel

1 9 × × × . × ... tool steel

To indicate the following various steel series of this steel class

the 3rd digit among 19 classes	steel class or steel series
190× ×	carbon tool steel
191× ×	
192× ×	
193× ×	A 合金工具钢和高速钢 W 锰钢: Mn, Mn-V, Mn-Cr-V, Mn-Cr-W-V, Mn-Si-V
194× ×	A 合金工具钢和高速钢 C 铬钢: Cr, Cr-V, Cr-Si, Cr-Mn-V
195× ×	A 合金工具钢和高速钢 CW 铬钼钢: Cr-Mo, Cr-Mo-V, Cr-Mo-Mn, Cr-Mo-Si, Cr-Mo-Si-V

the supplementary figure shows heat treatment state (same as fine construction steel) 0-9

the 5th digit of carbon tool steel
1,2,3 -- of general quality
4-9 -- specially required
the 5th digit of alloy tool steel indicates series number and sometimes it indicates some production method of steel

the 4th digit of alloy tool steel and high speed steel is the series number of chemical composition

Translator's note: A = alloy tool steel and high speed steel; W = Mn steel; C = Cr steel; and CW = Cr-Mo steel.

196××	镍钢，Ni-V, Cr-Ni, Cr-Ni-V, Cr-Ni-Mn-V, Cr-Ni-W, Cr-Ni-Mo(V)
197××	钨钢，W, W-Cr, W-Cr-V, W-Cr-Si, W-Cr-Si-V, W-Cr-Ni-V, W-Cr-Mo-V, W-Cr-Co-V
198××	高速切削钢，低W，高W，W-Mo，含Co及其它元素
199××	casting tool steel

Translator's note: N = Ni steel; W = W steel; and H = high speed cutting steel; low W, high W, W-Mo, containing Co and other elements.

The average C content of steel indicated by the combination of 3rd and 4th digit of carbon tool steel

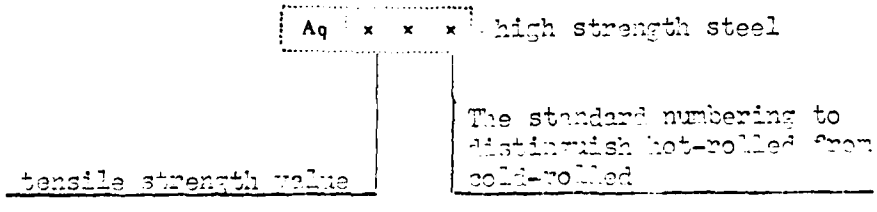
the 3rd and 4th digit	avg. C cont. %	the 3rd and 4th digit	avg. C cont. %
1900×	0.05	1915×	0.80
1901×	0.10	1916×	0.85
1902×	0.15	1917×	0.90
1903×	0.20	1918×	0.95
1904×	0.25	1919×	1.00
1905×	0.30	1920×	1.05
1906×	0.35	1921×	1.10
1907×	0.40	1922×	1.15
1908×	0.45	1923×	1.20
1909×	0.50	1924×	1.25
1910×	0.55	1925×	1.30
1911×	0.60	1926×	1.35
1912×	0.65	1927×	1.40
1913×	0.70	1928×	1.45
1914×	0.75	1929×	1.50

For example, 19191.3 is carbon tool steel of ordinary quality through spheroidized annealing and its average C content is 1.00%. 19421.0 is CrV alloy tool steel through no annealing and it contains C 1.10-1.25%, Cr 0.3-1.20% and V more than 0.06%.

(3) The UNI System of Italy

In the following, are the ways of indicating steel garde of UNI system:

1) General hot-rolled and cold-rolled high strength steel



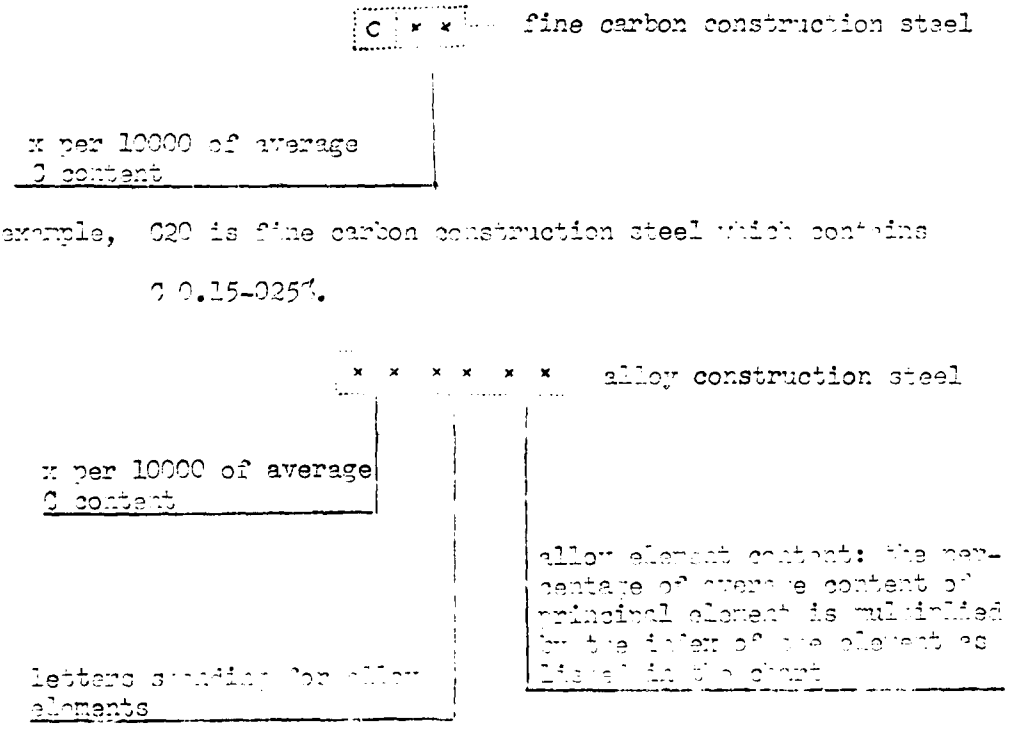
The standard numbering (UNI × × × ×) of various kinds of steel:

2953 -- cementation steel; 2954 -- hardened and tempered steel;

3096 -- nitride steel; 3097 -- rolling bearing steel; 3543 -- hot-roll high strength steel; 3544 -- cold-roll high strength steel for welding construction use; 3545 -- spring steel; 3597 -- ordinary and fine carbon steel for modification use; 4365 -- steel for rivet and screw use; 2955 -- tool steel; 4047 -- stainless steel (steel material); 3992 -- heat resisting steel (steel material); 3161 -- stainless cast steel; 3159 -- heat resisting cast steel; 3608 -- thermostrength cast steel being used under 300-500°C; 3072 -- seamless steel for ship use and also being used under high pressure; 1379 -- forgeable iron.

For example, Aq45UM13544 is cold-roll high strength steel for welding construction use and its tensile strength is 45-55 kg/mm^2.

2) Construction steel

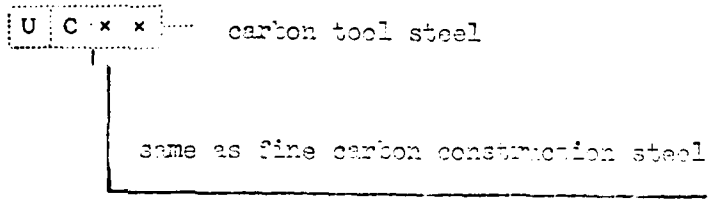


Names of elements and chemical symbols	Letters used in steel grade	Index
(ge) 铬 Cr	C	4
(gu) 钴 Co	K	4
(meng) 锰 Mn	M	4
(nie) 镍 Ni	N	4
(gui) 硅 Si	S	4
(lü) 铝 Al	A	10
(mu) 钼 Mo	D	10
(wu) 钨 W	W	10
(tai) 钛 Ti	T	10
(fan) 钒 V	V	10

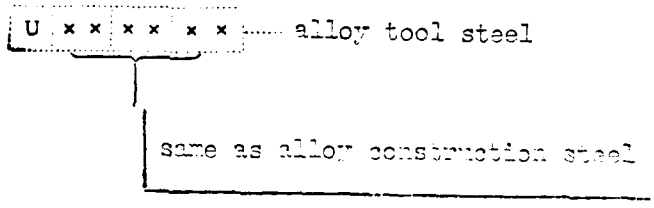
For example, 25M06 is MnCr steel and its average content of C is 0.25%, Mn 1.5% and Cr more than 0.25%.

The ways of indicating steel grade of spring steel, rolling bearing steel, nitride steel and steel for rivet and screw use are same as those of fine carbon construction steel and alloy construction steel.

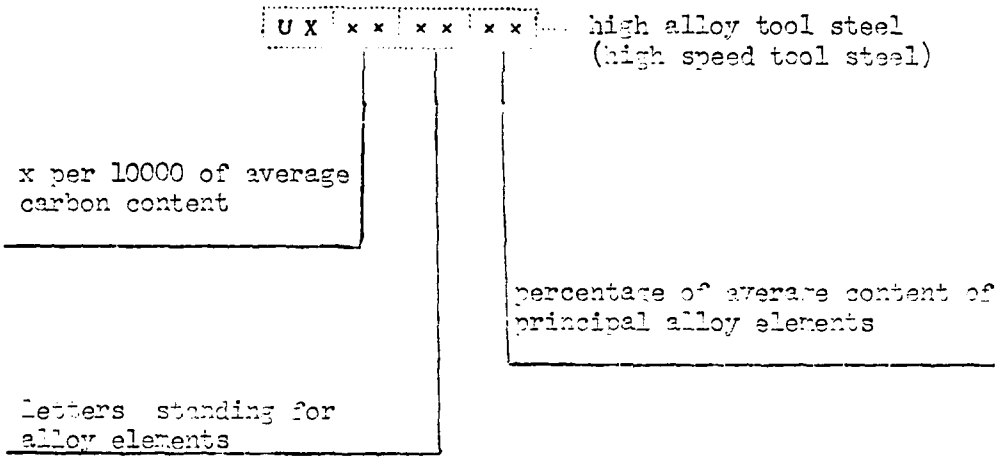
3) Tool steel



For example, TC100 is carbon tool steel of which the average C content is 1.00%.

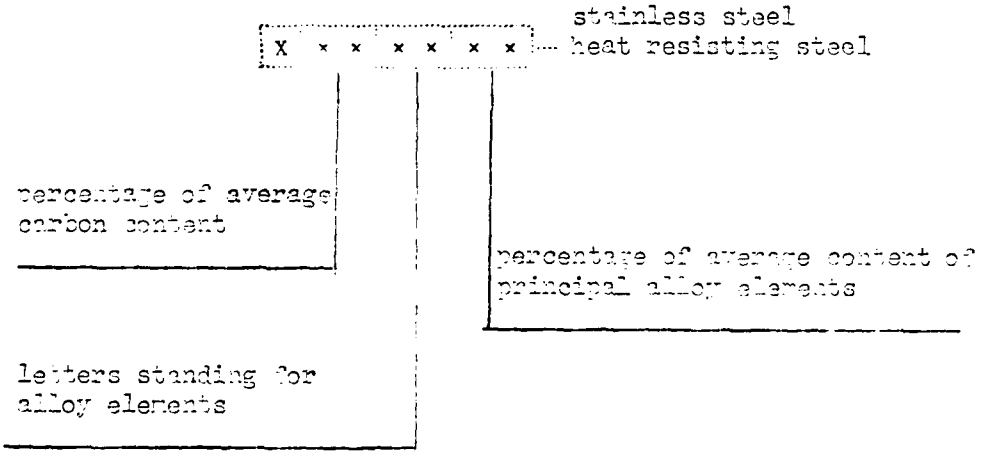


For example, 9SiWCr is SiCr tool steel which has an average content of C 0.9%, W2.0% and Cr more than 0.25%.



For example, UX30WK1810 is high speed steel which has an average content of C 0.80% , W18% and Co 10%.

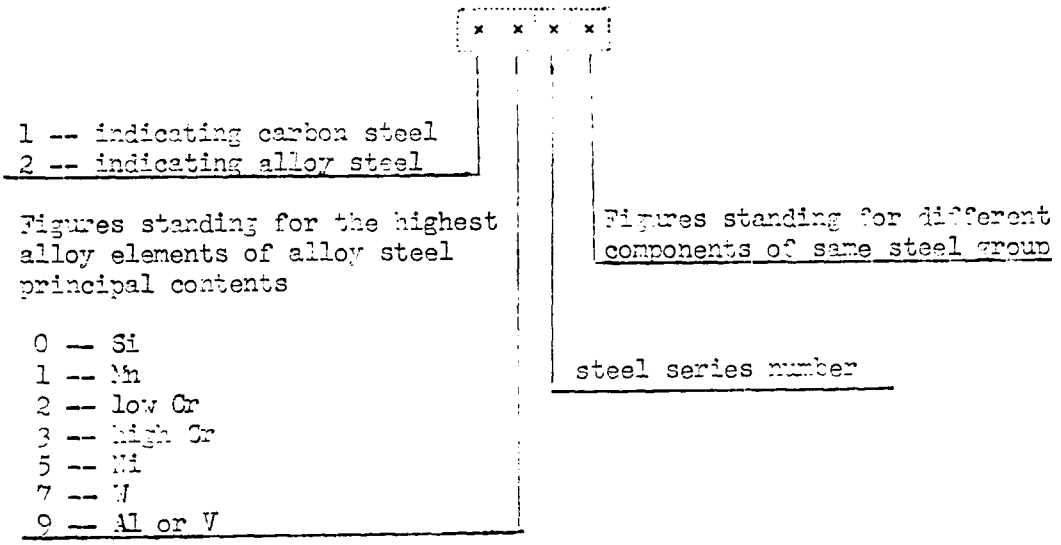
4) Stainless steel and heat resisting steel



For example, X20Cr13 is stainless steel which contains C 0.2% and Cr 13%.

(9) The SIS System of Sweden

In SIS system , a 4-digit number is used to indicate steel grade:



In making steel grades of SIS system, steel is classified into eight different kinds and each kind of steel has the following steel grades:

Kind of steel	SIS steel grade
steel for general construction	1300, 1210, 1310, 1311, 1410, 1411, 2110, 1510, 2114,
steel for mechanical manufacturing	1210, 1350, 1450, 1550, 1555, 1650, 1655
steel for pressure capacitor use	1330, 1430, 2112, (2332, 2333, 2340, 2341, 2342, 2343)*
spring steel	1770, 2090, 2230, 2231
cementation steel & nitride steel	1370, 2510, 2514, 2515, 2520, 2240, 2940, 1350, 1450
modification steel	2120, 2530, 2532, 2534, 2536, 2225, 2303, 2321, 2240, 2940, 1550, 1555, 1650, 1655
roll steel	1780, 1880, 1885, 2092, 2140, 2260, 2310, 2312, 2550, 2700, 2705, 2710, 2730, 2750, 2752, 2754, 2756, 2900
stainless steel **	2302(F + M), 2303(M), 2304(M), 2320(F), 2321(M), 2322 (F), 2323 (F + A), 2324 (F + A), 2330 (A), 2331 (A), 2332 (A), 2333 (A), 2334 (A), 2340(A), 2341(A), 2342(A), 2343(A), 2360(A), 2361(A)

* Steel grade in parentheses is stainless steel.

** Figures in parentheses indicate steel of different organization: M -- martensite steel, F -- ferritic steel, A -- austenite steel, F + M and F + A and so on.

2. A Comparison of China's Steel Grades With Those of Other Countries

Table 2-1-65 A Comparison of China's principal steel grades with those of other countries

China	Russia GOST	United States SAE	United States AISI	England BS	Japan JIS	France NF	German F.R. DIN	Czech. CSN	Italy UNI	Swedon SIS
Low carbon construction steel										
08	08	1008	C1008	En2A/1				12010		
08F	08КП	1006	C1006							
10	10	1010		En2A	S10C	XC10	C10 CK10	12021	C10	1370
15	15	1015		En2	S15C	XC15	C15 CK15	12023	C15	
20	20	1020		En2C	S20C	C20	C22 CK22	N2024	C20	1410
25	25	1025		En4 En4A	S25C	C25		12030		1450
30	30	1030		En5A En5B	S30C	C30		12031	C30	
35	35	1035		En8A	S35C	XC35	C35 CK35	12040		1550
40	40	1040		En8D	S40C	XC42		12041	C40	1568
45	45	1045			S45C	C45	C45 CK45	12050		1650
50	50	1050		En43	S50C	C50	CK53	12051	C50	
55	55	105A		En9 En9K	S55C	XC55 C55	C55	12060		
60	60	1060		En43D		C60	C60 CK60	12061	C60	1665
65	65	1065		En45E	SUP2 SWR7	XC65	CK67	12071		
70	70	1074			SUP3 SWR8	XC70	C70 MK70	12072	C70	
15Mn	15Г	1016	C1016	En32B	SB46	XC18		12020		1370
20Mn	20Г	1022	C1022	En3C						
25Mn	25Г	1026	C1026							
30Mn	30Г	1033	C1033	En5D En5K				13141		
35Mn	35Г	1037	C1037							
40Mn	40Г	1039	C1039	En15B		40M8	40M4			
45Mn	45Г	1046	C1046							
60Mn	60Г	1060	C1060	En43A En43B En43C				13160		

Continued

Global	Europe	United States		England	Japan	France	German F.R.	Czech	Italy	Sweden
	GOST	SAE	AISI	BS	JIS	NF	DIN	CSN	UNI	SIS
Alloy construction steel										
10Mn2	10Г2			En201			10Mn6			
15Mn2	15Г2							15320		
20Mn2	20Г2	1320	C1320	En14A			20Mn6			
30Mn2	30Г2	1330	C1330	En14B		32M5	30Mn6	13141		2120
35Mn2	35Г2	1336	C1335	En16 En16A		35M5	36Mn5	14240		2120
40Mn2	40Г2	1340	C1340	En18A		40M5		13142		2120
45Mn2	45Г2	1345	C1345					13250		
50Mn2	50Г2	1052	C1052			50M5		13150		
35S-Mn	35СГ						37MnSi5	13240	35MS5	
42S-Mn	42СГ			En46			46MnSi4	13240		
20MnV							20MnV6	13123		
25Mn2V							25MnV6			
42Mn2V							42MnV7	18242		
15Cr	15Х	5115			SCr21	12C3	15Cr3	14130		
20Cr	20Х	5120		En207	SCr22	18C3	20Cr4			
30Cr	30Х	5130 5132		En18A	SCr3	32C4	34Cr4			
40Cr	40Х	5140		En18D	SCr4	38C4	41Cr4	14140	40C4	2230
45Cr	45Х	5145 5147			SCr5	45C4		14150		
50Cr	50Х	5150 5152		En48				14109		
38CrSi	38ХС							14341		
40CrSi	40ХС									
15CrMn	15ХГ					16MC5	16MnCr5	14220		
20CrMn	20ХГ					20MC5	20MnCr5	14231		
40CrMn	40ХГ									
20CrMnSi	20ХГС									

Grade	Russia GOST	United States SAE	United States AISI	England BS	Japan JIS	France NF	German F.R. DIN	Czech. CSN	Italy UNI	Sweden SIS
35CrMnSi	25ХГС									
30CrMnSi	30ХГС									
35CrMnSiA	35ХГСА									
10CrV	18ХФ	6117								
20CrV	20ХФ	6120								
40CrV	40ХФА	6140								
45CrV		6145		En60						
18CrMnTi	18ХГТ									
30CrMnTi	30ХГТ									
35CrMnTi	35ХГТ									
40CrMnTi	40ХГТ									
15Mo	15М	4017		1852			15Mo3	15020		
12CrMo	12ХМ					12CD4	13CrMo44	N6120		
20CrMo	20ХМ	4119			SCM22	18CD4	20CrMo5	15124		
25CrMo				En20A		26CD4	25CrMo4	15130	25CD4	2225
30CrMo	30ХМ	4130			SCM2			15131	32CD4	
35CrMo	35ХМ		E4132 E4136	En19B	SCM3	35CD4	34CrMo4	15340	38CD4	2234
42CrMo		4140		En19A	SCM4	42CD4	42CrMo4		38CD4	2244
24CrMoV							24CrMoV55	N5238		
35CrMoV	35ХМФА									
40B			TS14B35							
40B			50B40H							
40MnB			TS14B36H							
45MnB			TS14B50H							
40CrB	40ХР	50B40	50B40							
20CrMnB	40ХГР	50B20	50B20							

Continued

Carbon	Europe ISO/CT	United States SAE	United States AISI	United Kingdom BS	Japan JIS	France NF	Germany (F.R.) DIN	Czechoslovakia CSN	Italy UNI	Sweden SIS
48CrMnB	48XTP	50B40H	50B40H							
38CrAlA	38XHJA									
38CrMoAlA	38XMHJA			En41B	SACM	40CAD6-12	34CrAlMo5	16340	38CAD7	2940
Structural steel and general purpose steel										
60Mn	60Г	1060		En43J						
65Mn	65Г	1066	C1066	En43E						
60Si2Mn	60C2	9260	9260	En45A	SUP6		60Si7Mn	13270		
50Si2Mn	50C2Г					48S7	61Si7		62S8	2090
55Si2Mn	55C2Г	9255	9255	En45		55S8	58Si7	13261	62S8	2090
65Si2Mn	65C2Г	9260	9260		SUP6		66Si7	13270		
50CrVA	50ХФА		6150	En47	SUP10	50CV4	50CrV4	15260	50CrV4	2230
Bearing bearing steel										
GCr6	ШХ6	50100	C50100			100C3	105Cr2	14103		
GCr9	ШХ9	51100	E51100	En31	SUJ1	100C5	105Cr4	14102		
GCr9SiMn					SUJ3				100CrMo	
GCr15	ШХ15	52100	E52100	En31	SUJ2	100C6	100Cr6	14100	100Cr6	
GCr15SiMn	ШХ15Г						100CrMn6	14200	25MC6	
Carbon tool steel										
T7	У7				SK7					
T7A	У7А					XC65fine	C70W1			
T8	У8	W1-0.8C	W1-0.8C		SK5	XC80 fine XC85 Courants	C85W2	19152	UC85	
T8A	У8А	W1 0.8C -Special	W1 0.8C -Special			XC80 fine	C85W1			1760
T10	У10	W1-1.0C	W1-1.0C		SK3	XC90 fine	C100W2	19292	UC105	1880
T10A	У10А	W1 1.0C -Special	W1-1.0C -Special			XC98 extra-fine	C100W1	19101	UC100	
T12	У12	W1-1.2C	W1-1.2C		SK2 SKU2	XC120 fine	C115W2	19222	UC117	1885
T12A	У12А	W1-1.3C -Special	W1-1.3C -Special			XC130 extra-fine	C110W1	19221		

Cont'd from p.

China	Russia	United States		England	Japan	France	Germany F.R.	Czech.	Italy	Sweden
	GOST	SAE	AISI	BS	JIS	NF	DIN	CSN	UNI	SIS
T13	Y13				SK SK1	XC130 fine	C130W2	19269		
T13A	Y13A					XC150 fine XC150 extra-fine		19237		
Alloy tool steel										
9Mn2V		02				90M8	90MnV8	19313	UnsMV8	
9MnSi						80NCV13	80MnSi4			
8MnSi							C76W8			
7MnSi2		S4					70Si7			
9SiCr	9XC						84SiCr8	19457		
9SiCr	9XC						90CrSi8			2083
SiCr							125CrSi8	19480		
4SiCrV	4XC						40SiCrV8	19487		
Cr3	X	L1					105Cr8			
Cr	X09					100C6	105Cr4 90Cr3	19421		
Cr08	X08				SKS8		110Cr2	19420		
9Cr2	9X					100C6	85Cr7			
8Cr	Y7X	W8					85Cr1	N9418		
Cr13	X13				SKD1	Z200C13	X210Cr13	19436	UX200C13	
CrMn	XГ	L6				140M8	148Cr6			
8CrMnMo	5XГM				SKT8		40CrMnMo7	N9520		
8CrNiMo	5X11M	L6			SKT4	60NCDV06-03 55NCD7-03	55NiCrMnV6	N9002	U62ND88	2550
CrW	XB	D7			SKS2	100WC18-04	110WCrV8	19710		
CrW8	XB8				SKS1	120WC45-02	X130W8	19714	UX140Wb	
Cr12W		D8			SKD2		X210CrW12	N9437		2312
8Cr2W8V	8X2B8	H21			SKD8	Z30WC09-03	X30WCrV9-3			
CrWMn	XBГ				SKS31	80M8	106WCr6		U100WC	
4CrW2Si	4XB2C				SKS41			19733	U40W20	

Continued

Grade	Sweden	United States		Europe	Japan	France	German F.R.	Czech.	Italy	Sweden
	GOST	SAE	API	IIC	JIS	AF	DIN	CSN	UNI	SIS
8Cr4W2Si	4Х8С					40WC20 04		19732	UNW 20	
8Cr4W2Si	6Х8С					40WC 20 04		19734	120W 20	
Cr12MoV	Х12М				SKD11	Z200C12	X165CrMoV12			2310
4Cr5MoW							45CrMoW8.8			
3Cr3Al							34CrAl6	14340		2940
8CrV	8ХФ 4ХФ	L2					80CrV2	N9420		
CrV	ХФ	W1 L2					115CrV3		U100CM4	
W	В1	F1			SKS21	100WC18-04	120W4		U115W	
W2	В2				SKS7		110W4			
6W2Cr5V							60WCrV7			
6W2Cr5V						45WC20 04	45WCrV7			
3W2Cr5V						45WCrV7				2710
3W2Cr5V							X30WCrV41	19740	U28W4S	
3W2Cr2V	4Х2В5ФМ				SKD6	40WCDS35 12	X30WCrV53			
WCrV	13ХФ				SKS21	100WC18-04	120WV4	N9711		2706
W3CrV	Е3				SKS11	120WC4S 03	142WV13	19358		
V	Ф	W2-1.0C-V-Extra			SKS42		100V1			
8V		W2-0.8C-V-Extra			SKS41			19312		2900

High speed tool steel

WCr4V2	Р9 Ф1263	T7			SKH10	270WD12	AFC1	19803		
W12Cr4V4Mo	Р9Ф5 Ф11706					Z125WV15-W	S12-1-4 DV4	19810		
W18Cr4V	Р18 РФ1	T1			SKH2	280W18	D18		UX75W18	

Steel, cast-iron and bimetallic steel

Cr5Mo	Х5М	51501	501 502			Z12CD5	12CrMo195	17102		
4Cr9Si2	4Х9С2			En52	SEH1	Z45CS10	X45CrSi93	N7110	X42CSi	
4Cr10Si2Mo	4Х10С2М				SEH3	Z40CSD10				
Cr13Si3							X10CrSi13			
Cr18Si2			442				X10CrSi18			
Cr25Si2										
Cr24Al2Si										
4Cr14Ni14W2Mo	4Х14Н14В2М			En84	SEH6	Z45CNWS18-14		N7222	X8CNW1414	
Cr18Ni38W2Ti	ХН35ВТ		330			Z10NCS36-18	X12NiCrSi3616		X25CrNi1633	

Continued

Chrom	Specific GOST	U.S.A. SAE	U.S.A. AISI	Great Britain BS	Japan JIS	France NF	Germany W.R. DIN	Czech. CSN	Italy UNI	Sweden SIS
Stainless cold rolled steel										
0Cr13	08Х13 (0Х13, ЭИ496)		410	En58A		Z6C13	X7Cr13			
1Cr13	12Х13(09К1, ЭК1)		403	En58A En58AM	SUS21	Z12C13	X10Cr13			2302
Cr17	Х17(09К1)(Э)	51430 60442	430	En60	SUS24	Z8C17 Z10C17 Z12C18	X8Cr17			
Cr17Ti	0Х17Т (ЭИ645)						X8CrTi17			
Cr17Mo2Ti							X8CrMoTi17			
Cr27	Х25(ЭИ181) Х27Т (ЭИ349)	51446 60446	446			Z15C27 Z20C25	X8Cr28			2322
2Cr13	2Х13(09К2)	51410 60410	410	En58C	SUS22	Z20C13	X20Cr13			
3Cr13	3Х13(09К3, ЭК3)	51420 60420	420	En58M	SUS23	Z30C13				2301
4Cr13	4Х13 (09К4, ЭК4)			En58D		Z40C13	X40Cr13	17029	X10C14	
30Cr17Mo							X35CrMo17			
80Cr17MoVCo							X80CrMoVCo17			
90Cr18MoV		51440B	440B				X90CrMoV18			
95Cr18	Х18(9Х18, ЭИ229)									
Cr17Ni2	Х17Н2	51431	431	En57	SUS44	Z15CN16-2				
X20Cr17Ni17									X20CN18	2321
Cr14	Х14(ЭИ241)	50410F	410	En58AM					X10CF13	
Cr18Mn8Ni5N	Х17АГ14(ЭИ878)		202 201 204			Z10CMN18 9 Z10CMN18 7 Z12CMN18-7	X8CrMnNi18			4337
08Cr18Ni9	08Х18Н10 (0Х18Н9, ЭИ0)	30304 60304	304	En58E	SUS27	Z6CN18 10 Z6CN18 10 Z5CN18 08	X5CrNi189			
12Cr18Ni9	12Х18Н9 (Х17Н9, ЭЯ1)	30302 60302	302	En58A	SUS40	Z12CN18-10	X12CrNi188			
10Cr18Ni9Ti	12Х18Н9Т (Х18Н9Т, ЭИ1Т)	30321	321	En58B En58C	SUS29	Z10CNT18-10 Z10CNT18 08	X10CrNiTi189	17248 (N7258)	X6CNT1810 (X10CNT1809)	
Cr18Ni11Nb	08Х18Н12Б (Х18Н11Б, ЭИ724 ЭИ770, ЭИ402)	30347	347 348	En58F	SUS42	Z10CNNb18-10	X10CrNiNb189	N7247		
Cr18Ni12Mo2Ti	10Х18Н12М2Т (Х17Н13М2Т, ЭИ 400, ЭИ448)			En58H		Z6CNDT18-12	X10CrNiMoTi1810	N7348 N7317		
Cr18Ni18Mo2Cu2Ti							X8CrNiMoCuTi1818			

(7) The Marks of Steel Material Painting

Table 2-1-66 The marks of steel material painting

Brand	Mark of End Surface Painting
General carbon steel	
Steel No. 1	White + black
Steel No. 2	Yellow
Steel No. 3	Red
Steel No. 4	Black
Steel No. 5	Green
Steel No. 6	Blue
Steel No. 7	Red + brown (for special kind of steel, a strip of lead-white is added)
Fine carbon construction steel	
05 - 15	White
20 - 25	Brown + green
30 - 40	White + blue
45 - 85	White + brown
15Mn - 40 Mn	Two white strips
45Mn - 70Mn	Three green strips
Alloy construction steel	
Mn steel	Yellow + blue
SiMn steel	Red + black
MnV steel	Blue + green
Cr steel	Green + yellow
CrSi steel	Blue + red
CrMn steel	Blue + black
CrMnSi steel	Red + purple
CrV steel	Green + black
CrMnTi steel	Yellow + black
CrW steel	Brown + black
Mo steel	Purple
CrMo steel	Green + purple
CrMnMo steel	Purple + white
CrMoV steel	Purple + brown
CrMoAlV steel	Purple + brown
CrAl steel	Aluminum white
CrMoAl steel	Yellow + purple
CrWMn steel	Yellow + red

Continued

Brand	Mark of End Surface Painting
B steel	Purple + blue
CrMoWV steel	Purple + black
High speed tool steel	
W18Cr4VMo	Brown - strip + yellow - strip
W18Cr4V	Brown - strip + blue - strip
W9Cr4V2	Brown - strip +
W9Cr4V	Brown - strip +
Stainless anti-acid steel	
Cr steel	Aluminum color + black
CrTi steel	Aluminum color + yellow
CrMn steel	Aluminum color + green
CrMo steel	Aluminum color + white
CrNi steel	Aluminum color + red
CrMnNi steel	Aluminum color + brown
CrNiTi steel	Aluminum color + blue
CrNiNb steel	Aluminum color + blue
CrMoTi steel	Aluminum color + white + yellow
CrNiMoTi steel	Aluminum color + red + yellow
CrMoV steel	Aluminum color + purple
CrMoWCo steel	Aluminum color + purple
CrNiWTi steel	Aluminum color + blue + white
CrNiCuTi steel	Aluminum color + blue + white
CrNiMoCuTi steel	Aluminum color + yellow + green
CrNiMoCuNb steel	Aluminum color + yellow + green (Red makes wide strip and the next narrow strip)
Heat resisting blisterless steel and electrothermal alloy	
CrSi steel	Red + white
CrMo steel	Red + green
CrSiMo steel	Red + blue
Cr steel	Aluminum color + black
CrMoV steel	Aluminum color + purple
CrNiTi steel	Aluminum color + blue
CrAlSi steel	Red + black
CrSiTi steel	Red + yellow
CrSiMoTi steel	Red + purple
CrSiMoV steel	Red + purple
CrAl steel	Red + aluminum color
CrAlMoTi steel	Red + brown

Continued

Brand	Mark of End Surface Painting
CrNiWMo steel	Red + brown
CrNiWTi steel	Aluminum color + white + red (the former is wide strip and the latter is narrow strip)
Chrome bearing steel	
Roll Cr6	Green-strip + white-strip
Roll Cr9	White-strip + yellow-strip
Roll Cr9SiMn	Two green strips
Roll Cr15	One blue strip
Roll Cr15SiMn	Green-strip + blue-strip

11 Non-ferrous Metal Materials

(1) The Methods of Indicating the Brand of Non-ferrous Metal and Alloy Products

According to the regulations of GB340-64, there are the methods that follow to indicate the brand of products of non-ferrous metal and its alloy:

1) The way of naming the brand of products of non-ferrous metal and its alloy is to use the figure which stands for components or serial number after the symbolic letter to combine the name of alloy category or alloy group.

2) The symbol of products of non-ferrous metal and its alloy is a combination of alphabetic letters of Chine pinyin as shown in Table 2-2-1 and Table 2-2-2, international chenical element symbols and Arabic numbers.

3) The general name of products of non-ferrous metal and its alloy (such as aluminum material and steel material), category, type (such as pipe, bar, wire, bend and plate), and those products which require special smelting and processing methods are all indicated by using Chinese words.

4) The condition of products of non-ferrous metal and its alloy is indicated by using alphabetic letters of Chinese pinyin as shown in Table 2-2-3.

Table 2-2-1 The commonly used names and symbols of non-ferrous metal and alloy

Serial Number	Name	Symbol
1	铜 (tong)	T
2	铝 (lü)	L
3	镁 (mei)	M
4	镍 (nie)	N
5	黄铜 (huang tong)	H
6	青铜 (qing tong)	Q
7	白铜 (bai tong)	B

Table 2-2-2 The names and symbols of non-ferrous metal and alloy for special use

Serial number	Name	Symbol
1	防锈铝 (fang-xiu-lü)	LF
2	锻 铝 (duan-lü)	LD
3	硬 铝 (ying-lü)	LY
4	超硬铝 (chao-ying lü)	LC
5	特殊铝 (te-shu-lü)	LT
6	无氧铜 (wu-yang-tong)	TU
7	真空铜 (zhen-kong-tong)	TK
8	金属粉末 (jin-shu-fen-mo)	F
9	喷铝粉 (pen-lü-fen)	FLP
10	除锈铝粉 (chu-xiao-lü-fen)	FLU
11	细铝粉 (xi-lü-fen)	FLX
12	钨钴硬质合金 (wu-gu ying-zhi he-jin)	YG
13	钨钴钛硬质合金 (wu-gu-tai ying-zhi he-jin)	YT
14	铸造碳化钨 (cast wu carbide)	YZ
15	铸造合金 (zhu-zao he-jin)	Z
16	镁合金(变形加工用) (mei he-jin)(for deformation)	MB
17	焊料合金 (han-liao he-jin)	HI
18	印刷合金 (yin-shua he-jin)	I
19	轴承合金 (zhou-cheng he-jin)	Ch
20	阳极镍 (yang-ji nie)	NY

Table 2-2-3 The names and symbols of non-ferrous metal product condition

Serial number	Name	Symbol
1	Annealing	M
2	Quenching	C
3	Quenching (natural ageing)	CZ
4	Quenching (artificial ageing)	CS
5	Hard	Y
6	3/4 hard, 1/2 hard, 1/3 hard, 1/4 hard	Y1,Y2,Y3,Y4
7	Extremely hard	T
8	Hot-roll, hot extrusion	R
9	Fine surface	O
10	Fine surface (annealing)	MO
11	Fine surface(quenching)	CO
12	Thickened aluminium clad	D
13	Hot aluminium clad	B
14	Hot aluminium clad (hot-roll)	BR
15	Hot aluminium clad (annealing)	BM
16	Hot Al clad (quenching, cold hardening)	BT
17	Hot Al clad (quenching, fine surface)	BCO
18	Hot Al clad(quench., cold hard., fine surface)	BTO
19	Quenching, aging of hot Al clad, fine surface foil	
	cold hardening	CTO

5) The method of indicating the brand of products of non-ferrous metal and alloy (Table 2-2-4).

Table 2-2-4 Methods of indicating the brand of non-ferrous metal and alloy products

Name of Product	Metal and Its Alloy	Brand	Method of Indication
Product from pure metal smelting	copper	Cu-1, Cu-2	Products from pure metal smelting are indicated by using a combination of international chemical symbols and the serial number. The chemical symbol and serial number are connected by a dash. The degree of purity of industry pure metal decreases as the serial number increases. But the degree of high purity metal elevates as the serial number increases and the serial number is prefixed with an "0".
	aluminium	Al-1, Al-02	
	lead	Pb-1, Pb-2	
Product from pure metal processing	copper	T1, T2	Products of pure metal processing of copper, aluminium, magnesium and nickel are indicated by using alphabetic letters of Chinese pinyin plus serial number. Products of other pure metal processing are indicated by using international chemical symbols and serial number.
	aluminium	L1, L2	
	nickel	N2, N4	
	zinc	Zn1, Zn2	
	lead	Pb1, Pb2	
Product from alloy processing	brass	H62, HPb59-1 HSn62-1, HMn57-3-1	The general method of indicating brass is to use letter "H" of Chinese pinyin plus the content of basis element copper. For brass of more than three elements, the indication is made of letter "H" plus the second additional element symbol and component figure except for zinc
	bronze	QSn4-3, QAl10-3-1.5 QSi1-3	The indication of bronze is made of a letter "Q" of Chinese pinyin plus the first additional element symbol and component figure except for basis element Cu.
	white brass	B16, BMn3-12	The indication of white brass is made of a letter "B" of Chinese pinyin and the content of Ni. For white brass of more than three elements, the indication is made of a letter "B" plus the second principal additional element symbol and figure for zinc and except for basis element Cu.

TO BE CONTINUED

Continued

Name of Metal and Its Alloy		Brand	Method of Indication
Product from alloy processing	nickel alloy	NCr9, NMn2-2-1	The indication of nickel alloy is to use letter "N" of Chinese pinyin plus the first principal additional element symbol and figure for component except for basis element nickel.
	Al alloy Mg alloy	LY1, LF2 MB1, MB2	The indication of aluminium alloy and magnesium alloy is to use letters of Chinese pinyin and serial number.
	Al alloy Zn alloy Mg alloy Cu alloy Intermediate alloy	PbSb2 ZnAl10-2 AgCu4 AuNi7.5-1.5 CuSi25	The indication of alloy of noble metal and rare metal which are not symbolized by letters of Chinese pinyin, such as lead, tin and zinc, is to use basis element symbol plus the first principal additional element symbol and the figure for components except for basis element.
Alloy for special use	Bearing alloy *Y alloy P alloy Welding material	ChSnSb11-6 ChPbSb0.25 YG6, YT5-7 TPbSb14-4 HICuZn64 HIAgCu20-15	The indication of alloy for special use which is symbolized by letters of Chinese pinyin (not including cast alloy) is to use the letters of Chinese pinyin plus two basis elements symbols and the figures for components except for the first basis element. But for hard metal alloy, it is to use letters of Chinese pinyin plus the symbol of principal element component which determines characteristics of alloy.
Symbol for indicating products condition		LF1-M QBe2-Y	The indication of product condition by symbols is to use letters of Chinese pinyin suffixed to the symbol which stands for product and there is a dash between the symbol for product and the Chinese pinyin letter.

* Translator's note: Y alloy = hard metal alloy; P alloy = print alloy

(2) The Brand, Composition, Property and Uses of Non-ferrous Metal and Alloy Products

1. Products from pure copper processing (YB145-65)

Table 2-2-5 The chemical composition and uses of products from pure copper processing

Group	Brand	Code	Chemical Composition (%)												Samples of Uses
			Cu+Ag	Impurities, no more than											
				Bi	Sb	As	Fe	Pb	Sn	Ni	P	Zn	O	Sp	
Pure Copper	T1	T1	99.95	0.002	0.002	0.002	0.005	0.002	0.002	0.002	0.001	0.005	0.02	0.05	For electricity conduction and alloy of high purity
	T2	T2	99.90	0.002	0.002	0.002	0.005	0.005	0.002	0.002		0.005	0.06	0.1	Copper material for conduction
	T3	T3	99.70	0.002	0.005	0.01	0.05	0.2	0.01	0.05	0.01	-	-	0.1	0.3	General copper material
	T4	T4	99.5	0.005	0.01	0.05	0.05	0.2	0.05	0.05	0.01	-	-	0.1	0.5	General copper material
Deoxidized Copper	TU1	TU1		0.002	0.002	0.002	0.005	0.002	0.005	0.002	0.005	0.003	0.003	0.001	0.03	For vacuum articles use
	TU2	TU2		0.002	0.002	0.002	0.005	0.002	0.005	0.002	0.005	0.003	0.003	0.001	0.05	For vacuum articles use
	TUP	TUP		0.003	0.05	0.05	0.05	0.2	0.01	0.05	0.01	-		0.01	0.10	For welding use
	TUMn	TUMn		0.002	0.002	0.002	0.05	0.005	0.002	0.002	0.005	0.003	0.007	-	0.30	For vacuum articles use

Remarks: * TT - total amount of foreign matter, ** 1. Tong No.1; 2. Tong No.2; 3. Tong No.3; 4. Tong No.4. *** 1. deoxidized copper No.1; 2. deoxidized copper No.2; phosphorus deoxidized copper; cadmium deoxidized copper.

2. Cast Brass

Table 2-2-6 The chemical composition and uses of cast brass

Serial number	Brand	Symbol	Chemical Composition (%)								* FT	Samples of Use	The Corresponding Russian Brand
			Cu	Pb	Al	Mn	Fe	Si	Sn	Zn			
	***									**			
1	59-1 特殊铅黄铜	ZHPb 59-1	57～61	0.8～1.9						Ss	2.0	Car brake valve, bearing case.	ЛС59-1Л
2	67-2.5 铝质铝黄铜	ZHAl 67-2.5	66～68		2～3					Ss	3.4	Anti-corrosion part in sea water; anti-abrasion part in mechanical work.	ЛА67-2.5
3	66-6-3-2 铁质铝黄铜	ZHAl 66-6-3-2	64～68		6～7	1.5～2.5	2～4			Ss	2.1	Female screw of pressure screw; heavy worm, high load female screw	ЛАЖМц 66-6-3-2
4	58-2-2 特殊锰黄铜	ZHMn 58-2-2	57～60	1.2～2.5		1.5～2.5				Ss	2.5	Axlebox, bearing and anti-abrasion article	ЛМцС58-2-2
5	58-2-2-2 铁质锰黄铜	ZHMn 58-2-2-2	56～60	0.5～2.5		1.5～2.5			1.5～2.5	Ss	1.2	Gear (of great strength)	ЛМцОС 58-2-2-2

Translator's note: * FT = total amount of foreign matter no more than; ** Ss = surplus; *** 1. cast lead brass, 2. cast aluminium brass, 3. cast aluminium brass, 4. cast manganese brass and 5. cast manganese brass.

Continued

Serial number	Brand	Symbol	Chemical Composition (%)								* FT	Samples of Use	The corresponding Russian brand
			Cu	Pb	Al	Mn	Fe	Si	Sn	Zn			
6	*** 55-3-1 铸造锰黄铜	ZHMn 55-3-1	53~58			3~4	0.5 ~1.5			** Ss	2.0	Heavy type parts which can work under 300°C; spare parts of which the shape is not complicated, for important use.	ЛМцЖ55-3-1
7	60-1-1 铸造铁黄铜	ZHFe 60-1-1	58~61		0.75 ~1.5	0.1 ~0.6	0.75 ~1.5		0.2 ~0.7	Ss	0.7	Liner and bearing (anti-corrosion)	ЛАЖ60-1-1Л
8	80-3 铸造硅黄铜	ZHSi80-3	79~81					2.5 ~4.5		Ss	2.8	Stay alloy (good mobility and abrasive resistance)	ЛК80-3Л
9	80-3-3 铸造硅黄铜	ZHSi 80-3-3	79~81	2~4				2.5 ~4.5		Ss	2.0	Bearing, liner substitute for phosphorus, tin and brass (abrasive resistance)	ЛКС80-3-3

Translator's note: *FT = total amount of foreign matter no more than; ** Ss = surplus; *** 6. cast manganese brass, 7. cast iron brass, 8. cast silicon brass and 9. cast silicon brass.

Table 2-2-7 The mechanical properties of cast brass

Symbol	Casting Method	Specific Gravity	Stretch strength (kg/mm^2) No less than	Extension rate (%) No less than
ZHAl67-2.5	hard mold casting	8.5	40	15
	sand mold casting		30	12
ZHPb59-1	centrifugal casting	8.5	20	20
ZHAl66-6-3-2	hard mold casting	8.5	65	7
	sand mold casting		60	7
	centrifugal casting		70	7
ZHMn58-2-2	hard mold casting	8.5	35	8
	sand mold casting		25	10
ZHMn58-2-2-2	hard mold casting	8.5	30	4
	sand mold casting		30	6
ZHMn55-3-1	hard mold casting	8.5	50	10
	sand mold casting		45	15
ZHAl60-1-1	hard mold casting	8.5	42	18
	sand mold casting		38	20
ZHSi80-3	hard mold casting	8.7	30	15
	sand mold casting		25	10
ZHSi80-3-3	hard mold casting	8.6	30	15
	sand mold casting		25	7

3. Products From Brass Processing (YB146-71)

Table 3-2-3 The chemical composition and uses of products from brass processing (1)

Group	Brand	Symbol	Chemical Composition (%) Principal Components								
			Cu	Pb	Sn	Fe	Mn	Al	Si	Ni	Zn
Ordinary Brass	96 黃銅 (Huang tong) (brass)	H96	95.0 ~97.0	–	–	–	–	–	–	–	Ss
	90 黃銅 (Huang tong)	H90	88.0 ~91.0	–	–	–	–	–	–	–	Ss
	85 黃銅 (Huang tong)	H85	84.0 ~86.0	–	–	–	–	–	–	–	Ss
	80 黃銅 (Huang tong)	H80	79.0 ~81.0	–	–	–	–	–	–	–	Ss
	75 黃銅 (Huang tong)	H75	74.0 ~76.0	–	–	–	–	–	–	–	Ss
	70 黃銅 (Huang tong)	H70	69.0 ~72.0	–	–	–	–	–	–	–	Ss
	68 黃銅 (Huang tong)	H68	67.0 ~70.0	–	–	–	–	–	–	–	Ss
	65 黃銅 (Huang tong)	H65	64.0 ~67.0	–	–	–	–	–	–	–	Ss
	63 黃銅 (Huang tong)	H63	62.0 ~65.0	–	–	–	–	–	–	–	Ss
	62 黃銅 (Huang tong)	H62	60.5 ~63.5	–	–	–	–	–	–	–	Ss
	59 黃銅 (Huang tong)	H59	57.0 ~60.0	–	–	–	–	–	–	–	Ss
Qian (Pb) Brass	74-3 鉛黃銅 (Qian huang tong) (Pb brass)	HPb 74-3	72.0 ~75.0	2.4 ~3.0	–	–	–	–	–	–	Ss
	64-2 鉛黃銅 (Qian huang tong)	HPb 64-2	63.0 ~66.0	1.5 ~2.0	–	–	–	–	–	–	Ss
	63-0.1 鉛黃銅 (Qian huang tong)	HPb 63-0.1	61.5 ~63.5	0.05 ~0.15	–	–	–	–	–	–	Ss
	63-3 鉛黃銅 (Qian huang tong)	HPb 63-3	62.0 ~65.0	2.4 ~3.0	–	–	–	–	–	–	Ss
	60-1 鉛黃銅 (Qian huang tong)	HPb 60-1	59.0 ~61.0	0.6 ~1.0	–	–	–	–	–	–	Ss
	60-3 鉛黃銅 (Qian huang tong)	HPb 60-3	59.0 ~61.0	2.0 ~3.0	–	–	–	–	–	–	Ss
	59-1 鉛黃銅 (Qian huang tong)	HPb 59-1	57.0 ~60.0	0.8 ~1.9	–	–	–	–	–	–	Ss
	59-1A 鉛黃銅 (Qian huang tong)	HPb 59-1A	57.0 ~61.0	0.8 ~1.9	–	–	–	–	–	–	Ss

Translator's note: Ss = surplus

Table 2-2-3 The chemical composition and uses of products from brass processing (2)

Chemical Composition (3) Foreign matter, no more than										Samples of Use	The corresponding Russian brand
Pb	Fe	Sb	Bi	P	Zn	As	Sn	Al	Tl		
0.03	0.10	0.005	0.002	0.01	—	—	—	—	0.3	plate, band, pipe, bar	Л96
0.03	0.10	0.005	0.002	0.01	—	—	—	—	0.3	bar, wire, plate, band	Л90
0.03	0.10	0.005	0.002	0.01	—	—	—	—	0.3	pipe	Л85
0.03	0.10	0.005	0.002	0.01	—	—	—	—	0.3	plate, band, bar, wire	Л80
0.03	0.20	0.005	0.002	—	—	—	—	—	0.3	plate, band, wire	Л75
0.03	0.10	0.005	0.002	0.01	—	—	—	—	0.3	plate, band	Л70
0.03	0.10	0.005	0.002	0.01	—	—	—	—	0.3	plate, band, pipe, bar, wire	Л68
0.03	0.10	0.005	0.002	0.01	—	—	—	—	0.3	plate, band, wire	Л65
0.3	0.2	0.01	—	—	0.1	—	0.1	0.1	1.2	band	Л63
0.08	0.15	0.005	0.002	0.01	—	—	—	—	0.3	plate, band, pipe, bar, wire	Л62
0.5	0.3	0.01	0.003	0.01	—	0.01	0.20	—	0.9	plate, band, wire	Л60
—	0.10	0.005	0.002	0.01	—	—	—	—	0.35	plate, band	ЛС 74-3
—	0.10	0.005	0.002	0.01	—	—	—	—	0.3	plate, band	ЛС 64-2
—	0.15	0.005	0.002	0.01	—	—	—	—	0.5	pipe, bar	—
—	0.10	0.005	0.002	0.01	—	—	—	0.5	0.75	plate, band, wire	ЛС 63-3
—	0.15	0.005	0.002	0.01	—	—	—	—	0.50	plate, band, wire	ЛС 60-1
—	0.10	0.005	0.002	0.01	—	—	—	0.50	0.75	plate, band, wire	—
—	0.5	0.010	0.003	0.02	—	—	—	—	0.75	plate, band, pipe, bar, wire	ЛС 59-1
—	0.5	0.01	0.003	0.02	—	—	—	—	1.0	plate, band, pipe, bar, wire	ЛС 59-1А

Translator's note: Tl = total amount

Continued (1)

Group	Brand	Symbol	Chemical Composition (%) Principal Components								
			Cu	Pb	Sn	Fe	Mn	Al	Si	Ni	Zn
Xi (Sn) Brass	90-1 锡黄铜 (xi huang tong) Sn brass	HSn 90-1	88.0 ~91.0	—	0.25 ~0.75	—	—	—	—	—	Ss
	70-1 锡黄铜 (xi huang tong)	HSn 70-1	69.0 ~71.0	—	1.0 ~1.5	—	—	—	—	—	Ss
	62-1 锡黄铜 (xi huang tong)	HSn 62-1	61.0 ~63.0	—	0.7 ~1.1	—	—	—	—	—	Ss
	60-1 锡黄铜 (xi huang tong)	HSn 60-1	59.0 ~61.0	—	1.0 ~1.5	—	—	—	—	—	Ss
Al (Al) Brass	77-2 铝黄铜 (lü huang tong) Al brass	HAl 77-2	76.0 ~79.0	—	—	—	—	1.75 ~2.50	—	—	Ss
	77-2A 铝黄铜 (lü huang tong)	HAl 77-2A	76.0 ~79.0	—	—	As 0.03~0.06		1.8 ~2.6	B 0.006~0.015		Ss
	77-2B 铝黄铜 (lü huang tong)	HAl 77-2B	76.0 ~79.0	—	—	Sb 0.02~0.06		1.8 ~2.6	Fe 0.006~0.015		Ss
	70-1.5 铝黄铜 (lü huang tong)	HAl 70-1.5	69.0 ~71.0	—	—	As 0.03~0.07		1.1 ~1.8	—	—	Ss
	67-2.5 铝黄铜 (lü huang tong)	HAl 67-2.5	66.0 ~68.0	—	—	—	—	2.0 ~3.0	—	—	Ss
	60-1-1 铝黄铜 (lü huang tong)	HAl 60-1-1	58.0 ~61.0	—	—	0.75 ~1.50	0.1 ~0.6	0.75 ~1.50	—	—	Ss
	59-3-2 铝黄铜 (lü huang tong)	HAl 59-3-2	57.0 ~60.0	—	—	—	—	2.50 ~3.50	—	2.0 ~3.0	Ss
	66-6-3-2 铝黄铜 (lü huang tong)	HAl 66-6-3-2	64.0 ~68.0	—	—	2.0 ~4.0	1.5 ~2.5	6.0 ~7.0	—	—	Ss
Meng (Mn) Brass	58-2 锰黄铜 (meng huang tong) Mn brass	HMn 58-2	57.0 ~60.0	—	—	—	1.0 ~2.0	—	—	—	Ss
	57-3-1 锰黄铜 (meng huang tong)	HMn 57-3-1	55.0 ~58.5	—	—	—	2.5 ~3.5	0.5 ~1.5	—	—	Ss
	55-3-1 锰黄铜 (meng huang tong)	HMn 55-3-1	53.0 ~58.0	—	—	0.5 ~1.5	3.0 ~4.0	—	—	—	Ss
Tie (Fe) Brass	59-1-1 铁黄铜 (tie huang tong)	HFe 59-1-1	57.0 ~60.0	—	0.3 ~0.7	0.6 ~1.2	0.5 ~0.8	0.1 ~0.4	—	—	Ss
	58-1-1 铁黄铜 (tie huang tong) Fe brass	HFe 58-1-1	56.0 ~58.0	0.7 ~1.3	—	0.7 ~1.3	—	—	—	—	Ss
Gui (Si) Brass	80-3 硅黄铜 (gui huang tong) Si brass	HSi 80-3	79.0 ~81.0	—	—	—	—	—	2.5 ~4.0	—	Ss
	65-1.5-3 硅黄铜 (gui huang tong)	HSi 65-1.5-3	63.5 ~66.5	2.5 ~3.5	—	—	—	—	~2	—	Ss
Nie (Ni) Brass	65-5 镍黄铜 (nie huang tong) Ni brass	HNi 65-5	64.0 ~67.0	—	—	—	—	—	—	5.0 ~6.5	Ss

Remarks: Ss = surplus

Continued (2)

Chemical Composition (3) Foreign matter, no more than										Samples of Use	The corresponding Russian brand
Pb	Fe	Sb	Bi	P	Mn	As	Sn	Al	*T1		
0.03	0.10	0.005	0.002	0.01			—	—	0.3	plate, band	ЛО 90-1
0.07	0.10	0.005	0.002	0.01	—	—	—	—	0.3	pipe	ЛО 70-1
0.10	0.10	0.005	0.002	0.01	—	—	—	—	0.3	plate, band bar, wire	ЛО 62-1
0.3	0.10	0.005	0.002	0.01	—	—	—	—	1.0	wire	ЛО 60-1
0.07	0.10	0.005	0.002	0.01	—	—	—	—	0.3	pipe, wire	ЛА77-2
0.05	0.06	0.05	0.002	0.02	—	—	—	—	0.3	pipe	—
0.05	0.06	—	0.002	0.02	—	—	—	—	0.3	pipe	—
0.05	0.06	0.05	0.002	0.02	—	—	—	—	0.3	pipe	—
0.5	0.6	0.05	—	0.02	0.5	—	0.2	—	1.5	plate, bar	—
0.40	—	0.005	0.002	0.01	—	—	—	—	0.7	plate, bar	ЛАЖ60-1-1
0.10	0.50	0.005	0.003	0.01	—	—	—	—	0.9	pipe	ЛАН 59-3-2
0.5	—	0.05	—	0.02	—	—	0.2	—	1.5	plate, bar	—
0.1	1.0	0.005	0.002	0.01	—	—	—	—	1.2	plate, band, bar, wire	ЛМш 58-2
0.2	1.0	0.005	0.002	0.01	—	—	—	—	1.3	plate, bar	ЛМшА 57-3-1
0.5	—	0.05	—	0.02	—	—	0.2	0.1	1.5	plate, bar	—
0.1	—	0.01	0.003	0.01	—	—	—	—	0.25	bar, plate	ЛЖМц 59-1-1
—	—	0.01	0.003	0.02	—	—	—	—	0.5	bar	ЛЖС 58-1-1
0.1	0.6	0.05	0.003	0.02	0.5	—	0.2	0.1	1.5	bar	—
—	0.15	0.005	0.002	0.01	—	0.1	0.20	—	0.5	plate, pipe	—
0.03	0.15	0.005	0.002	0.01	—	—	—	—	0.3	plate, band, wire	—

Translator's note: *T1 = total amount

4. Cast Bronze

Table 2-2-9 The chemical composition and uses of cast bronze

Serial No.	Brand	Symbol	Chemical Composition (%) Sn	Zn	Pb	Al	Fe	P	Cu	** Sf	Symbol of Uses	Corresponding Brand
1	5-6-5铸造锡青铜	ZQSn5-6-5	4.0~6.0	4.0~6.0	4.0~6.0				Sn	1.3	Abrasive resistance parts	Ep QBC 5-6-5
2	6-6-3铸造锡青铜	ZQSn6-6-3	5.0~7.0	5.0~7.0	2.0~4.0				Sn	1.3		Ep QBC 6-6-3
3	4-4-17铸造锡青铜	ZQSn4-4-17	3.5~5.5	2.0~6.0	14.0~20.0				Sn	1.3		Ep QBC 4-4-17
4	3.5-6-5铸造锡青铜	ZQSn3.5-6-5	3.0~4.5	5.0~7.0	4.0~6.0				Sn	1.3	Tractor part	Ep QBC 3.5-6-5
5	7-1.5-1.5铸造铝青铜	ZQAl7-1.5-1.5			1.0~1.5	6~8	1.0~1.5		Sn	1.5	Bearing, antiabrasive part	Ep ZCuAl7-1.5-1.5
6	30铸造铅青铜	ZQPb30			27~33				Sn	0.9	Gear, sleeve and liner	Ep C30
7	10-1铸造锡青铜	ZQSn10-1	9~11					0.8~1.2	Sn	0.75	High specific pressure bearing; gear and worm	Ep QSn10-1

Explanatory note: * FT = Foreign matter total amount no more than; ** Sf = sundries; and *** 1. cast tin bronze, 2. cast tin bronze, 3. cast tin bronze, 4. cast tin bronze, 5. cast aluminum bronze, 6. cast lead bronze, 7. cast tin bronze.

5. Products From Bronze Processing (YB1/T-71)

Table 2-2-10 The chemical composition and uses of products from bronze processing (1)

Group	Brand	Symbol	Chemical Composition (%) Principal Components							
			Al	Be	Fe	Mn	Ni	Sn	P	Cu
Tin (Sn) Bronze	4-3锡青铜 (xi qing tong) Sn bronze	QSn4-3	—	Zn 2.7～3.3		—	—	3.5～4.5	—	Ss
	4-4-2.5锡青铜 (xi qing tong)	QSn4-4-2.5	—	Zn 3.0～5.0		Pb 1.5～3.5		3.0～5.0	—	Ss
	4-4-4锡青铜 (xi qing tong)	QSn4-4-4	—	Zn 3.0～5.0		Pb 3.5～4.5		3.0～5.0	—	Ss
	6.5-0.1锡青铜 (xi qing tong)	QSn6.5-0.1	—	—	—	—	—	6.0～7.0	0.1～0.25	Ss
	6.5-0.4锡青铜 (xi qing tong)	QSn6.5-0.4	—	—	—	—	—	6.0～7.0	0.3～0.4	Ss
	7-0.2锡青铜 (xi qing tong)	QSn7-0.2	—	—	—	—	—	6.0～8.0	0.1～0.25	Ss
	4-0.3锡青铜 (xi qing tong)	QSn4-0.3	—	—	—	—	—	3.5～4.5	0.2～0.3	Ss
Al (Al) Bronze	5铝青铜 (lü qing tong) Al bronze	QA15	4.0～6.0	—	—	—	—	—	—	Ss
	7铝青铜 (lü qing tong)	QA17	6.0～8.0	—	—	—	—	—	—	Ss
	9-2铝青铜 (lü qing tong)	QA19-2	8.0～10.0	—	—	1.0～2.0	—	—	—	Ss
	9-4铝青铜 (lü qing tong)	QA19-4	8.0～10.0	—	2.0～4.0	—	—	—	—	Ss
	10-3-1.5铝青铜 (lü qing tong)	QA110-3-1.5	8.5～10.0	—	2.0～4.0	1.0～2.0	—	—	—	Ss
	10-4-4铝青铜 (lü qing tong)	QA110-4-4	9.5～11.0	—	3.5～5.5	—	3.5～5.5	—	—	Ss
	11-6-6铝青铜 (lü qing tong)	QA111-6-6	10.0～11.5	—	5.0～6.5	—	5.0～6.5	—	—	Ss

Translator's note: Ss = surplus

Table 2-2-10 The chemical composition and uses of products from bronze processing (2)

Chemical Composition (%)														Samples of Uses
Foreign matter, no more than														
As	Sb	Sn	Si	Al	Pb	P	S	Fe	Bi	Zn	Mn	Ni	Mg	*Tl	
—	0.002	—	0.002	0.002	0.02	0.01	—	0.05	0.002	—	—	—	—	0.2	plate, band, bar, wire
—	0.002	—	—	0.002	—	0.03	—	0.05	0.002	—	—	—	—	0.2	plate, band
—	0.002	—	—	0.002	—	0.03	—	0.05	0.002	—	—	—	—	0.2	plate, band
—	0.002	—	0.002	0.002	0.02	—	—	0.02	0.002	—	—	—	—	0.1	plate, band, bar, wire
—	0.002	—	0.002	0.002	0.02	—	—	0.02	0.002	—	—	—	—	0.1	plate, band, bar, wire
—	0.01	—	0.02	0.01	0.02	—	0.008	0.03	0.002	## + ##	0.2	—	—	0.3	plate, band, bar, wire
—	0.002	—	0.002	0.002	0.02	—	—	0.02	0.002	—	—	—	—	0.1	pipe
0.01	0.002	0.1	0.1	—	0.03	0.01	—	0.5	—	0.5	0.5	0.5	—	1.6	plate, band, wire
0.01	0.002	0.1	0.1	—	0.03	0.01	—	0.5	—	0.5	0.5	0.5	—	1.6	plate, band
0.01	0.002	0.1	0.1	—	0.03	0.01	—	0.5	—	1.0	0.5	—	—	1.7	plate, band, pipe, bar, wire
0.01	0.002	0.1	0.1	—	0.01	0.01	—	—	—	1.0	0.5	0.5	—	1.7	pipe, bar
0.01	0.002	0.1	0.1	—	0.03	0.01	—	—	—	0.5	0.5	—	—	0.75	pipe, bar
0.01	0.002	0.1	0.1	—	0.02	0.01	—	—	—	0.3	—	0.3	—	0.5	pipe, bar
0.01	0.05	0.2	0.2	—	0.05	0.1	—	—	—	0.6	—	0.5	—	1.5	bar

Translator's note: *Tl = total amount

Continued (1)

Group	Brand	Symbol	Chemical Composition (%) Principal Components							
			Al	Be	Fe	Mn	Ni	Sn	P	Cu
Pi (Be) Bronze	2 鈹青銅 (Pi qing tong) Be bronze	QBe2	—	1.9 ~2.2	—	—	0.2 ~0.5	—	—	Ss
	2.15鈹青銅 (Pi qing tong)	QBe2.15	—	2.0 ~2.3	—	—	—	—	—	Ss
	1.7鈹青銅 (Pi qing tong)	QBe1.7	—	1.60 ~1.85	—	—	0.20 ~0.40	0.10~0.25	Ti	Ss
	1.9鈹青銅 (Pi qing tong)	QBe1.9	—	1.85 ~2.10	—	—	0.20 ~0.40	0.10~0.25	Ti	Ss
Gui (Si) Bronze	1-3硅青銅 (Gui qing tong) Si bronze	QSi1-3	—	—	—	0.1 ~0.4	2.4 ~3.4	Si0.6~1.1		Ss
	3-1硅青銅 (Gui qing tong)	QSi3-1	—	—	—	1.0 ~1.5	—	Si2.75~3.5		Ss
Meng (Mn) Bronze	1.5錳青銅 (Meng qing tong)	QMn1.5	—	—	—	1.20 ~1.55	—	—	—	Ss
	5 錳青銅 Mn bronze (Meng qing tong)	QMn5	—	—	—	4.5 ~5.5	—	—	—	Ss
Ge Bronze	1.0鎘青銅 (Ge "Cd" qing tong)	QCd1.0	Cd 0.9~1.2		—	—	—	—	—	Ss
Le (Cr) Bronze	0.5鉻青銅 (Le qing tong) Cr bronze	QCr0.5	Cr 0.5~1.0		—	—	—	—	—	Ss
	0.5-0.2-0.1 鉻青銅 (Le qing tong)	QCr 0.5-0.2-0.1	0.1 ~0.25	—	Cr 0.4~1.0		0.1~0.25		—	Ss
Gao (Zr) Bronze	0.2鋯青銅 (Gao qing tong) Zr bronze	QZr0.2	Zr 0.15~0.25		—	—	—	—	—	Ss
	0.4鋯青銅 (Gao qing tong)	QZr0.4	Zr 0.30~0.50		—	—	—	—	—	Ss

Translator's note: Ss = surplus

Continued (2)

Chemical Composition (%)															Grades of Used
Foreign matter, no more than															
As	Sb	Sn	Bi	Al	Pb	P	S	Fe	Bi	Zn	Ni	Mn	Mg	*Σ	
–	–	–	0.15	0.15	0.005	–	–	0.15	–	–	–	–	–	0.5	plate, band bar, wire
–	–	–	0.15	0.1	0.005	0.02	–	0.4	0.002	–	0.5	–	0.05	1.2	bar, wire
–	–	–	0.15	0.15	0.005	–	–	0.15	–	–	–	–	–	0.5	plate, band, wire
–	–	–	0.15	0.15	0.005	–	–	0.15	–	–	–	–	–	0.5	plate, band, wire
–	–	0.1	–	0.02	0.15	0.01	–	0.1	–	0.1	–	–	–	0.4	bar
0.002	0.002	0.25	–	–	0.03	0.05	–	0.3	–	0.5	0.2	–	–	1.1	plate, band, bar, wire
0.1	0.005	0.05	0.1	0.07	0.01	–	0.01	0.1	0.002	1 + 0.2	–	–		0.3	plate, band
0.01	0.002	0.1	0.1	–	0.03	0.01	–	0.35	–	0.4	0.5	–	–	0.9	plate, band
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	plate, bar, wire
–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.5	plate, bar, wire
–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.5	bar
–	0.005	0.05	–	–	0.01	–	0.01	0.05	0.002	–	0.2	–	–	0.5	bar
–	0.005	0.05	–	–	0.01	–	0.01	0.05	0.002	–	0.2	–	–	0.5	bar

In alloys: *Σ = total amount

4. Cast Aluminium Alloy (YB143-65)

Table 2-2-11 The chemical composition of cast aluminium alloy

Brand ***	Symbol	Chemical Composition (%) Principal Components Si	Cu	Mg	Mn	Ni	Al	Foreign matter, not more than Fe	Si	Zn	Ni	Ti	Cu	Si+Sn	Ti	Corresponding Russian Brand
铸造铝合金 1	ZL1	—	9.0 ~11.0	—	—	—	Ss	0.5	0.5	0.5	0.5	—	—	1.0	3.0	AJ12
铸造铝合金 2	ZL2	—	4.0~5.0	—	—	—	Ss	0.5	0.1	0.2	—	—	—	1.2	2.0	AJ7
铸造铝合金 3	ZL3	5.0~6.5	6.00 ~7.0	0.3~0.5	—	—	Ss	0.5	0.5	0.5	0.3	—	—	—	1.5	AJ10B
铸造铝合金 4	ZL4	—	3.75 ~4.5	1.25~1.75	—	1.75~2.25	Ss	0.8	—	0.3	—	—	—	0.7	1.5	AJ11
铸造铝合金 5	ZL5	--	—	9.5~11.5	—	—	Ss	0.3	0.1	0.1	—	0.07	0.3	0.3	—	AJ8
铸造铝合金 6	ZL6	0.8~1.3	—	4.5~5.5	0.1~0.4	—	Ss	0.3	—	0.2	—	—	0.1	—	—	0.6 AJ13
铸造铝合金 7	ZL7	11.0~13.0	—	—	—	—	Ss	0.6	0.5	0.3	—	—	0.8	—	—	2.3 AJ12
铸造铝合金 8	ZL8	11.0~13.5	1.0~2.0	0.4~1.0	0.5~0.9	—	Ss	0.4	—	0.2	0.05	0.2	—	—	—	0.8 A328 (YB)
铸造铝合金 9	ZL9	11.0~13.0	0.5~1.5	0.7~1.3	—	2.0~3.0	Ss	0.6	0.1	0.1	—	0.2	—	—	—	1.0 A332 (YB)
铸造铝合金10	ZL10	8.5~10.5	—	0.17~0.3	0.25 ~0.5	—	Ss	0.5	—	0.3	—	0.15	0.3	—	0.01	1.1 AJ14
铸造铝合金11	ZL11	6.5~8.0	—	0.2~0.4	—	—	Ss	0.5	0.5	0.3	—	—	0.2	—	0.01	1.0 AJ19
铸造铝合金12	ZL12	4.5~6.0	2.0~3.0	—	—	—	Ss	0.7	0.3	0.3	—	—	—	—	0.1	1.8 AJ16
铸造铝合金13	ZL13	4.5~5.5	1.0~1.5	0.35~0.6	—	—	Ss	0.5	0.5	0.3	—	0.15	—	—	0.01	1.0 AJ5
铸造铝合金14	ZL14	4.0~6.0	2.0~3.5	0.2~0.8	0.2~0.8	—	Ss	0.6	—	0.3	—	—	—	—	0.01	1.2 AJ13B
铸造铝合金15	ZL15	6.0~8.0	—	—	—	Zn 11.0~14.0	Ss	0.8	0.5	—	—	—	0.6	—	Mg 0.3	1.8 ≈ AJ11
铸造铝合金16	ZL16	9.0~11.0	3.0~4.0	—	—	—	Ss	0.3	0.5	0.8	0.5	0.2	—	—	Mg 0.3	—

Translator's note: *Ti = total amount; ** From 1 through 16, the Chinese means cast aluminium alloy.

Table 2-2-12 The mechanical properties and uses of cast aluminium alloy

Brand **	Symbol	Mechanical Properties: Tensile strength σ_b (kg/mm²)	Extension rate δ (%)	Brinell hardness HB	Samples of Uses
		No less than			
铸造铝合金1	ZL1	11	—	50	Cylinder cap casting piece of air cooling low power engine
铸造铝合金2	ZL2	20	3	60	Equipment parts of heavy load and simple shape
铸造铝合金3	ZL3	16	1	80	Car and tine cylinder piston
铸造铝合金4	ZL4	18	1	80	Cylinder piston and parts of high load and complex shape working at high temperature
铸造铝合金5	ZL5	20	2	60	Parts of heavy impact load and high corrosion resistence
铸造铝合金6	ZL6	15	1	55	Part of high corrosion resistance or working under high strength
铸造铝合金7	ZL7	16	2	50	Cylinder piston and parts of complex shape and working at high temperture
铸造铝合金8	ZL8	20	—	85	High speed internal combustor piston of high strength and low exp. coeff.
铸造铝合金9	ZL9	20	—	100	After heat treatment, ll alloy and estability can be improved
铸造铝合金10	ZL10	15	2	50	Heavy and medium parts of heavy exp. and heavy load under coolin cyl. con parts
铸造铝合金11	ZL11	16	2	50	Cormlex shape and medium load exp. parts
铸造铝合金12	ZL12	12	3	40	Welding accessory, gas tank outlet, al alloy welding bar
铸造铝合金13	ZL13	18	1	65	Same as ZL4 alloy
铸造铝合金14	ZL14	17	0.5	65	Aero-engine cylinder cap, fuel pump equipment parts
铸造铝合金15	ZL15	20	1.5	80	Car and tank engine cap
铸造铝合金16	ZL16	20	1.5	80	High strength al alloy for high pressure casting

Note: Items listed in the table are hard mold casting performance.

Translator's note: ** from 1 through 16, the Chinese means cast aluminium alloy.

7. Tin-base Bearing Alloy (YB/87-65)

Table 2-2-13 The chemical composition, mechanical properties and uses of tin-base bearing alloy

Symbol	Chemical Composition (%) Principal Components Sb	Cu	Pb	Ni	Sn	MP T	MP H	MP C	Samples of Uses
ChSnSb4-4	4~5	4~5			Sn	0.35	8.6	27	Anti-corrosion, heat resisting and abrasion resisting, good for casting turbine engine, internal combustion bearing and axle bushing.
ChSnSb7.5~5	7~8	5~6			Sn	0.35	18.3	238	Tenacity is same as ChSnSb4-4, used for casting bearing and axle bushing of large machine, resist pressure bearing.
ChSnSb8-4	7.5~8.5	3.5~4.5			Sn	0.35	14.3	236	High hardness able to bear high pressure, used for casting bearing and axle bushing of large machine.
ChSnSb12-5-10	11~13	2.5~5.0	9~11		Sn	0.35	20.0	185	Soft but tough and able to stand pressure, used for casting axle bearing of engine, but not good for high temperature.
ChSnSb15-2-18	14~16	1.5~2.5	17~19		Sn	0.35	20.0	18.	Good for casting ordinary bearing of engine speed and pressure, but not good for high temperature.
ChSnSb11-6	10~12	5.5~6.5			Sn	0.35	10	211	Hardest, good for casting high speed above engine of more than 2000 horsepower and turbine engine of more than 500 horsepower, flexible connector, flexible pump and high speed internal combustion.
ChSnSb 8-3.5 0.5	7~8	3.5~4		0.3~0.5	Sn	0.35	28.4	238	Strong tenacity, pressure resistance, abrasion resistance and heat resisting same as ChSnSb7.5-3
ChSnSb8-4	8~10	3~5			Sn	0.35			Strong tenacity, good for casting internal combustion engine, axle bearing and axle bushing of automobile.
ChSnSb11-6	10~12	5~10			Sn	0.35			Good for casting high speed and high pressure engine bearing and axle bearing.
ChSnSb13-5-12	3~14	4~6	11~13		Sn	0.35			Good for casting ordinary speed and ordinary pressure machine bearing and axle bearing.

Note: This table is applicable to tin-base bearing alloy which can be used to make rolling bearing and axle bushing.

Remarks to note: MT = mechanical property; F = foreign matter; H = hardness; M = melting point; T = total amount; and Sn = tin.

(3) Section Materials

1. Copper Bar (YB456-71)

Table 2-2-14 The norms and dimensions of round, square and hexagonal drawn copper bar

Nominal Diameter (mm)	Diameter permitted deviation (mm)	
	grade 6	grade 7
5~6	-0.08	-0.16
6.5~10	-0.10	-0.20
11~18	-0.12	-0.24
19~30	-0.14	-0.28
31~50	-0.17	-0.34
51~80	-0.20	-0.40

Note: 1. The diameter of square and hexagonal bar refers to the internally tangent circle diameter.

2. Length of the bar:

diameter (mm)	5~24	25~50	51~150
length (m)	1.5~5	1~4	0.5~3

Table 2-2-15 The mechanical properties of round, square and hexagonal drawn copper bar

Material Condition	Bar Diameter (mm)	Tensile Strength (kg/mm²)	Elongation (%)
		No less than	
Hard (Y)	5~40	27	6
	>40~60	25	
	>60~80	21	
Soft (M)	5~80	20	

Note: Materials used: T1, T2, T3, T4, TU1, TU2, TP among products from pure copper processing.

2. Brass Bar (YB457-71)

Table 2-2-16 The norms and dimensions of round, square and hexagonal drawn brass bar

Diameter Dimension (mm)	Permitted Deviation (mm)	
	grade 6	grade 7
5~6	-0.08	-0.16
6.5~10	-0.10	-0.20
11~18	-0.12	-0.24
19~30	-0.14	-0.28
31~50	-0.17	-0.34
51~80	-0.20	-0.40

Note: 1. "Diameter dimension" for square and hexagonal brass bars refers to the dimension of internally tangent circle diameter.

2. Length of brass bar:

diameter (mm)	5~60	61~150
length (m)	1~5	0.5~4

Table 2-2-17 The mechanical properties of round, square and hexagonal drawn brass bar

Brand	Material Condition	Bar diameter (mm)	Tensile strength σ_b (kg/mm2) not less than	Elongation rate δ_5 (%) not less than
H62	Drawn	5~40	38	15
		>40~80	34	20
H68	Drawn	5~12	38	15
		>12~40	32	25
		>40~80	30	30
	Drawn hard	13~35	50	10
HPb59-1	Drawn	5~40	40	12
		>40~80	38	16
HPb63-3	Drawn hard	5~9.5	52	2
	Drawn 1/2hard	>9.5~14	50	3
		>14~20	45	8
		>20~30	42	10
	Drawn 1/2hard	10~20	36	12
		>20~60	35	16
HSn62-1	Drawn	5~40	40	15
		>40~80	37	20
HFe58-1-1	Drawn	5~40	45	10
		>40~80	40	12
HMn58-2	Drawn	5~12	45	10
		>12~40	42	20
		>40~80	40	25
HFe59-1-1	Drawn	5~12	50	15
		>12~40	45	17
		>40~80	42	20

Note: Materials used: Among products from large enterprises (mainly), H62、H68、HPb59-1、HPb63-3、HSn62-1、HMn58-2、HFe59-1-1、HFe58-1-1.

3. Silicon Bronze Bar (YB455-71)

Table 2-2-18 The norms and dimensions of round, square and hexagonal drawn silicon bronze bar

Drawn bar diameter			Drawn bar diameter		
Nominal dimension	Permitted deviation (mm)		Nominal dimension	Permitted deviation (mm)	
	grade 6	grade 7		grade 6	grade 7
5	-0.08	-0.16	17.0	-0.12	-0.24
5.5			18.0		
6.0			19.0	-0.14	-0.28
6.5	-0.10	-0.20	20.0		
7.0			21.0		
7.5			22.0		
8.0			24.0		
8.5			25.0		
9.0			27.0		
9.5			28.0		
10.0			30.0		
11.0	-0.12	-0.24	32.0	-0.17	-0.34
12.0			35.0		
13.0			36.0		
14.0					
15.0			38.0		
16.0			40.0		

Note: 1. The diameter of square and hexagonal bar refers to the internally tangent circle diameter.

2. Length of silicon bronze bar:

Diameter (mm)	5~30	31~75	76~100
Length (m)	1~5	0.5~4	0.3~3

Table 2-2-19 The mechanical properties of round, square and hexagonal drawn silicon bronze bar

Brand	Normalizing method	Bar diameter (mm)	Tensile strength not less than σ_b (kg/mm²)	Elongation not less than δ_5 (%)
			H2 hard	H2 hard
QSi3-1		5~12	50	10
		>12~40	48	15

Note: Material used: QSi3-1 of products from bronze processing.

(YB147-71)

4. Copper Plate and Bar (YB459-64)

Table 2-2-20 The norms and dimensions of cold rolled copper plate and bar

Thickness	Width and length of cold rolled plate				Thickness of cold rolled bar
	600×1200	700×1430	800×1500	1000×2000	Permitted deviation
	Permitted deviation of thickness				
0.20	—	—	—	—	-0.06
0.25	—	—	—	—	-0.06
0.30	—	—	—	—	-0.06
0.35	—	—	—	—	-0.07
0.40	-0.07	-0.09	—	—	-0.07
0.45	-0.07	-0.09	—	—	-0.07
0.50	-0.07	-0.09	—	—	-0.07
0.60	-0.08	-0.10	—	—	-0.07
0.70	-0.08	-0.10	—	—	-0.08
0.80	-0.10	-0.10	-0.12	-0.15	-0.08
0.90	-0.10	-0.12	-0.14	-0.17	-0.09
1.00	-0.12	-0.12	-0.14	-0.17	-0.09
1.1	-0.12	-0.12	-0.14	-0.18	—
1.2	-0.14	-0.14	-0.16	-0.18	-0.10
1.3	—	—	—	—	-0.10
1.35	-0.14	-0.14	-0.16	-0.18	—
1.40	—	—	—	—	-0.10
1.50	-0.16	-0.16	-0.18	-0.21	-0.10
1.60	—	—	—	—	-0.12
1.65	-0.16	-0.16	-0.18	-0.21	—
1.8	-0.16	-0.16	-0.18	-0.21	-0.12
2.0	-0.18	-0.18	-0.20	-0.21	-0.12
2.25	-0.18	-0.18	-0.20	-0.24	—
2.50	-0.18	-0.21	-0.22	-0.24	-0.13
2.75	-0.20	-0.21	-0.24	-0.24	-0.14
3.0	-0.20	-0.21	-0.24	-0.24	-0.14
3.5	-0.23	-0.24	-0.27	-0.30	-0.16
4.0	-0.23	-0.24	-0.27	-0.30	-0.18
4.5	-0.26	-0.27	-0.30	-0.35	-0.20
5.0	-0.26	-0.30	-0.35	-0.37	-0.20

Note: If the cold rolled bar thickness is 0.20-0.35mm, the width is 200-400mm; thickness is 0.40-3.0mm, width is 200-500mm; thickness is 0.20-0.45mm, length is 500-2000mm; thickness is 0.50-1.75mm, length is 500-2000mm; thickness is 2.00-5.0mm, length is 1000-2000mm.

Table 2-2-21 The mechanical properties of cold rolled copper plate and bar

Material Condition	Final quenching σ_b (kg/mm²)	Ext. rate δ (%) ($l_0=11.3\sqrt{F_0}$)
	No less than	
Soft M	20	30
Hard Y	30	3

Note: 1. The data listed in this table are applicable to plate and bar of width or thickness of not more than 2.5".

2. Corrosion test materials: TU, TP and [illegible] according to YB145-71 and TP. (YB145-71)

5. Brass Plate and Band (YB460-71)

Table 2-2-20 The norms and dimensions of cold rolled brass plate and band

(mm)

Thickness of Plate	*TPD		Width of Plate			
	200~500		>500~600	>600~700	>700~800	>800
	**GP	***HP	Thickness permitted deviation			
0.20~0.30	-0.06		—	—	—	—
0.35			—	—	—	—
0.40				—	—	—
0.45	-0.07		-0.07	—	—	—
0.50		—		-0.09	—	—
0.60					—	—
0.70	-0.08		-0.08	0.10	—	—
0.80			-0.09		-0.12	—
0.90	-0.09		-0.10			—
1.00		-0.08	-0.11	-0.12	-0.14	
1.10			-0.12			-0.18
1.20	-0.10	-0.09		-0.14	-0.16	
1.35			-0.14			
1.50				-0.16	-0.18	
1.65			-0.15			0.21
1.80						
2.00	-0.12	-0.10		-0.18	0.20	
2.25						
2.50			-0.16		-0.22	0.24
2.75	-0.14			-0.21	-0.24	
3.00		-0.12				
3.50	-0.16		-0.20	-0.24	-0.27	-0.30
4.00	-0.18					
4.50	-0.20	-0.15	-0.22	-0.27	-0.30	-0.35
5.00				0.30	-0.35	0.37

Translator's note: *TPD = thickness permitted deviation; **GP = general precision; ***HP = high precision.

Table 2-2-23 The norms and dimensions of cold rolled brass band (mm)

Thickness of Band	Thickness permissible deviation		Thickness of band	Flatness permissible deviation	Length
	*op	**hp			
0.05~0.09	-0.01	—	20~100	-0.6	
0.10~0.12	-0.02	—			
0.15	-0.03	—	20~200		≥2000
0.18~0.22		-0.02			
0.25~0.35	-0.04	-0.03			
0.40~0.45	-0.05	-0.04	20~300	-0.6 (if W>175 then -1.0)	
0.50	-0.06				≥10000
0.55~0.70		-0.05			
0.75~0.85	-0.07	-0.06			
0.90~1.00	-0.08				
1.10				-1.0 (if W>175 then -1.5)	≥7000
1.20~1.40	-0.09	-0.07			
1.50		-0.08			

Translator's note: *op = ordinary precision; **hp = high precision.

Table 2-2-24 The mechanical properties of cold rolled brass plate and band

Material Condition	Brand	Tesl strength Kg. R (kg/cm2)		δ (%) ($l_0 = 11.3\sqrt{F_0}$)	
		No less than			
		*op	band	*op	band
Soft (M)	H 62	30	30	40	35
	H 68	30	30	40	40
	H 80	27	27	50	50
	H 90	27	24	35	38
	HPb 59-1	35	35	25	25
1/2hard (Y2)	H 62	35	38	20	20
	H 68	35	35	25	25
	H 90	34	—	7	—
Hard (Y)	H 62	42	42	10	10
	H 80	—	—	—	—
	H 90	45	45	5	5
	H 68	40	40	15	15
	HPb 59-1	45	45	5	5
Very hard (T)	H 62	60	60	2.5	2.5
	H 68	—	50	—	4

Note: Commonly used materials: among products from brass processing (ГОСТ 15527-70), Л59, Л62, Л65, Л68, Л80, Л90, ЛС59-1, ЛО62-1, ЛМц58-2.

Translator's note: *op = cold rolled plate.

6. The Different Kinds of Aluminum and Aluminum Alloy Plate (YB605-65)

Table 2-2-25 The kinds of aluminum and aluminum alloy plate

(mm)

Thickness	Width of Plate						
	400与500	600	800	1000	1200	1500	2000
	Thickness permitted deviation						
0.3	-0.05	—	—	±0.05	±0.06	—	—
0.4	-0.05	—	—	±0.05	±0.06	—	—
0.5	-0.05	-0.05	-0.08	-0.10	-0.12	-0.13	—
0.6	-0.05	-0.06	-0.10	-0.12	-0.12	-0.14	—
0.7	-0.07	-0.07	-0.11	-0.12	-0.13	-0.14	—
0.8	-0.08	-0.08	-0.12	-0.12	-0.13	-0.14	—
0.9	-0.09	-0.09	-0.13	-0.14	-0.15	-0.16	—
1.0	-0.10	-0.10	-0.15	-0.15	-0.16	-0.17	—
1.2	-0.10	-0.15	-0.15	-0.15	-0.16	-0.17	—
1.5	-0.15	-0.15	-0.20	-0.20	-0.22	-0.23	—
1.8	-0.15	-0.15	-0.20	-0.20	-0.22	-0.25	-0.27
2.0	-0.15	-0.15	-0.20	-0.20	-0.24	-0.26	-0.28
2.3	-0.20	-0.20	-0.22	-0.23	-0.26	-0.28	-0.29
2.5	-0.20	-0.20	-0.25	-0.25	-0.28	-0.29	-0.30
2.8	-0.25	-0.25	-0.27	-0.28	-0.31	-0.32	-0.34
3.0	-0.25	-0.25	-0.30	-0.30	-0.33	-0.34	-0.35
3.5	-0.25	-0.25	-0.30	-0.30	-0.34	-0.35	-0.36
4.0	-0.25	-0.25	-0.30	-0.30	-0.35	-0.36	-0.37
5.0	-0.30	-0.30	-0.35	+0.10 -0.35	+0.10 -0.36	+0.10 -0.37	—

7. Aluminum and Aluminum Alloy Plate Which Cannot Be Strengthened Through Heat Treatment

Table 2-2-26 The mechanical properties of aluminum and aluminum alloy plate which cannot be strengthened through heat treatment

Alloy Brand	Supply Condition	Thickness (mm)	Tensile strth σ_b (kg/mm^2)	Yield strth $\sigma_{0.2}$ (kg/mm^2)	Extension rate δ (%) ($l_0 = 11.3\sqrt{F}$)
			No less than		
L1, L2, L3, L4, L5, L6	Annealed (M)	0.3~0.5	≤11	—	20
		0.51~0.9	≤11	—	25
		0.91~5.0	≤11	—	28
	Semi-cold hardened (Y_2)	0.3~0.4	10	—	3
		0.41~0.7	10	—	4
		0.71~1.0	10	—	5
		1.1~4.0	10	—	6
	Cold hardened (Y)	0.3~4.0	13	—	3
		4.1~5.0	13	—	4
LF2	Annealed (M)	0.3~1.0	17~23	—	16
		1.1~5.0	17~23	—	18
	Semi-cold hardened (Y_2)	0.3~1.0	24	—	4
		1.1~5.0	24	—	6
	Cold hardened (Y)	0.3~1.0	27	—	3
		1.1~4.0	27	—	4
LF3	Annealed (M)	0.5~4.5	20	10	15
	Semi-cold hardened (Y_2)	0.5~4.5	23	20	8
LF5, LF11	Annealed (M)	0.5~4.5	28	15	15
LF6	Annealed (M)	0.5~4.5	32	16	15
LF21	Annealed (M)	0.3~3.0	10~15	—	22
		3.1~5.0	10~15	—	20
	Semi-cold hardened (Y_2)	0.3~5.0	15~22	—	6
	Cold hardened (Y)	0.3~0.5	19	—	1
		0.6~0.8	19	—	2
		0.9~1.2	19	—	3
		1.3~5.0	19	—	4

Note: The norms and dimensions of the plate are in accordance with the regulations of aluminum and aluminum alloy plate (YB605-65).

3. Aluminum Alloy Plate Which Can Be Strengthened Through Heat Treatment

Table 2-2-27 The mechanical properties of aluminum and aluminum alloy plate which can be strengthened through heat treatment

Alloy	Kind	Supply Condition	Thickness (mm)	Tensile strength (kg/mm^2)	Yield strength (kg/mm^2)	Expansion rate δ (%) $\delta_1 = 11.3\sqrt{F}$
				No less than		
LD_2	plate not Al-clad	Annealing (M)	0.5~5	≤15	—	20
			5.1~10	≤15	—	15
		Quenching natural ageing (CZ)	0.3~0.6	20	—	18
			0.7~3	20	-	20
			3.1~5	20	—	18
			5.1~10	18	—	16
		Quenching artificial ageing (CS)	0.3~5	30	—	10
			5.1~10	30	—	8
LC_4	Al-clad plate	Annealing (M)	0.3~10	≤25	—	10
		Quenching artificial ageing (CS)	0.3~2.5	49	41	7
			2.6~10	50	42	7
LY_{12}	Al-clad plate	Annealing (M)	0.3~4	≤22	—	14
			4.1~10	≤24	—	12
		Quenching natural ageing (CZ)	0.3~2.5	41.5	27.5	13
			2.6~6	43.5	28	11
			6.1~10	43.5	28	10
		Quenching natural ageing cold hardening (CZY)	1.5~2.5	43.5	34	10
			2.6~6.5	46.5	35	8
	plate not Al-clad	Annealing (BM)	0.3~3	≤24	—	12
			3.1~10	≤24	—	11
		Quenching natural ageing (BCZ)	0.3~1.5	45	29.5	14
			1.6~6	45	29.5	13
			6.1~10	45	29.5	12
		Quenching natural ageing cold hardening (BCZY)	1.5~3	48.5	36.5	10
			3.1~6.5	48.5	36.5	9
	Thickened Al-clad plate	Annealing (M)	0.5~4	≤23	—	10
		Quenching natural ageing (CZ)	0.5~4	37	23.5	13
LY_{11}	Al-clad plate	Annealing (M)	0.3~2.5	≤23	—	12
			2.6~10	≤24	—	12
		Quenching natural ageing (CZ)	0.3~2.5	37	19	15
			2.6~10	38	20	12
LY_6	Al-clad plate	Annealing (M)	0.3~1.5	≤23	—	12
			1.6~10	≤24	—	10
		Quenching natural ageing (CZ)	0.3~0.7	37	23.5	13
			0.8~1.5	41.5	27.5	13
			1.6~2.5	43	28	12
			2.6~6	43.5	28	11
			6.1~10	43.5	28	10
		Quenching natural ageing cold hardening (CZY)	1.5	43.5	34	10
			1.6~2.5	46	35	8
			2.6~7.5	46.5	36	8
		Quenching artificial ageing cold hardening (CSY)	1.5~2.5	51	41	10
			2.6~10	52	42	9
LY_{16}		Annealing (M)	[illegible]	≤24	—	15
		Quenching natural ageing (CZ)	[illegible]	28	—	12
		Quenching artificial ageing (CS)	[illegible]	38	28	8

Note: The [illegible] and dimensions of the plate are in accordance with the specifications of the plate of aluminum and aluminum alloy plate (YB 106-63)

9. Hot-rolled Aluminum and Aluminum Alloy Plate(YB605-66)

Table 2-2-28 The mechanical properties of hot-rolled aluminum and aluminum alloy plate

Alloy Brand	Material Condition	Thickness (mm)	Tensile strength σ_b (kg/mm²)	Yield strength $\sigma_{0.2}$ (kg/mm²)	Extension rate δ_{10}(%)
			No less than		
L1, L2 L3, L5	Hot rolled (R)	5~10	7	—	15
		11~25	8	—	18
		26~80	6.5	—	10
L4, L6	Hot rolled (R)	5~10	7	—	18
		11~25	8	—	18
		26~80	6.5	—	15
LF2	Hot rolled (R)	5~25	18	—	7
		26~80	16	—	6
LF3	Hot rolled (R)	5~10	19	8	15
		11~25	18	7	12
		26~50	17	6	11
LF5, LF11	Hot rolled (R)	5~10	28	13	15
		11~25	27	12	13
		26~50	26	11	12
LF6	Hot rolled (R)	5~10	32	16	15
		11~25	31	15	11
		26~50	30	14	6
LF21	Hot rolled (R)	5~10	11	—	15
		11~25	12	—	15
		26~50	11	—	12
LD2	Quenching and natural ageing (CZ)	5~25	18	—	14
		26~40	17	—	12
		41~80	17	—	10
	Quenching and artificial ageing (CZ)	5~25	30	—	7
		26~40	29	—	6
		41~80	28	—	6

Note: The norms and dimensions of the plate are in accordance with the regulations of the Kinds of aluminum and aluminum alloy plate (YB605-66).

10. Extruded Copper Pipe (YB447-70)

Table 2-2-29 The norms and dimensions of extruded copper pipe

External diameter (mm)	Wall thickness (mm)	Theoretical weight (kg/m)	External diameter (mm)	Wall thickness (mm)	Theoretical weight (kg/m)	External diameter (mm)	Wall thickness (mm)	Theoretical weight (kg/m)
30	5.0	3.493	70	12.5	20.09	100	22.5	48.73
32	5.0	3.772	70	15.0	23.05	100	25.0	52.40
32	6.0	4.359	75	7.5	14.15	100	27.5	55.71
34	6.0	4.695	75	10.0	18.16	100	30.0	58.68
36	5.0	4.331	75	12.5	21.83	105	12.5	32.31
36	7.0	5.673	75	15.0	25.15	105	15.0	37.72
38	6.0	5.365	75	17.5	28.12	105	17.5	42.79
40	5.0	4.890	80	10.0	19.56	105	20.0	47.52
40	7.0	6.465	80	12.5	23.58	105	22.5	51.87
40	7.5	6.811	80	15.0	27.25	105	25.0	55.89
40	8.5	7.482	80	17.5	30.56	105	27.5	59.56
40	10.0	8.383	80	20.0	33.53	105	30.0	62.87
42	6.0	6.036	85	10.0	20.90	110	10.0	27.94
42	8.0	7.610	85	12.5	25.32	110	12.5	34.06
45	5.0	5.589	85	15.0	29.34	110	15.0	39.82
46	8.0	8.495	85	17.5	33.01	110	17.5	45.23
46	10.0	10.06	85	20.0	36.33	110	20.0	50.30
50	5.0	6.287	85	22.5	39.30	110	22.5	55.02
50	7.5	8.907	90	7.5	17.29	110	25.0	59.38
50	10.0	11.18	90	10.0	22.36	110	27.5	63.40
50	12.5	13.10	90	12.5	27.07	110	30.0	67.07
50	15.0	14.67	90	15.0	31.44	115	12.5	35.80
55	5.0	6.986	90	17.5	35.45	115	15.0	41.92
55	7.5	9.955	90	20.0	39.12	115	17.5	47.68
55	10.0	12.58	90	22.5	42.44	115	20.0	53.09
55	12.5	14.85	90	25.0	45.41	115	22.5	58.16
55	15.0	16.77	95	7.5	18.34	115	25.0	62.87
60	5.0	7.685	95	10.0	23.75	115	27.5	67.24
60	7.5	11.00	95	12.5	28.85	115	30.0	71.26
60	10.0	13.97	95	15.0	33.53	120	10.0	30.74
60	12.5	16.59	95	17.5	37.90	120	15.0	44.01
60	15.0	18.86	95	20.0	41.92	120	17.5	50.13
65	5.0	8.383	95	22.5	45.58	120	20.0	55.89
65	7.5	12.05	95	25.0	48.90	120	22.5	61.30
65	10.0	15.37	95	27.5	51.87	120	25.0	66.37
65	12.5	18.34	100	10.0	25.15	120	27.5	71.08
65	15.0	20.96	100	12.5	30.56	120	30.0	75.45
70	5.0	9.082	100	15.0	35.63	125	12.5	39.30
70	7.5	13.10	100	17.5	40.34	125	17.5	52.57
70	10.0	16.77	100	20.0	44.71	125	20.0	58.68

Continued

External diameter (mm)	Wall thickness (mm)	Theoretical weight (kg/m)	External diameter (mm)	Wall thickness (mm)	Theoretical weight (kg/m)	External diameter (mm)	Wall thickness (mm)	Theoretical weight (kg/m)
125	22.5	64.45	160	30.0	109.0	200	30.0	142.5
125	25.0	69.66	165	12.5	53.27	210	10.0	55.89
125	27.5	74.99	165	17.5	72.13	210	15.0	81.74
125	30.0	79.64	165	22.5	89.60	210	20.0	106.2
130	10.0	33.53	165	27.5	105.7	210	25.0	129.2
130	15.0	48.20	170	10.0	44.71	210	30.0	150.9
130	20.0	61.48	170	15.0	64.97	220	10.0	58.68
130	22.5	67.69	170	20.0	83.83	220	15.0	85.93
130	25.0	73.35	170	25.0	100.3	220	20.0	111.8
130	27.5	78.77	170	30.0	117.4	220	25.0	136.2
130	30.0	83.83	175	12.5	56.76	220	30.0	159.3
135	12.5	42.79	175	17.5	77.02	230	10.0	61.48
135	17.5	57.46	175	22.5	95.88	230	15.0	90.12
135	22.5	70.73	175	27.5	113.4	230	20.0	117.4
135	25.0	76.35	180	10.0	47.51	230	25.0	143.2
135	27.5	82.61	180	15.0	69.16	230	30.0	167.7
135	30.0	88.02	180	20.0	89.42	240	10.0	64.21
140	10.0	36.32	180	25.0	108.3	240	15.0	94.31
145	12.5	46.28	180	30.0	125.8	240	20.0	123.0
145	17.5	62.35	185	12.5	60.25	240	25.0	150.2
145	22.5	77.02	185	17.5	81.91	240	30.0	176.1
145	27.5	90.29	185	22.5	102.2	250	10.0	67.07
145	30.0	96.41	185	27.5	121.0	250	15.0	98.50
150	10.0	39.12	190	10.0	50.30	250	20.0	128.50
150	15.0	56.59	190	15.0	73.25	250	25.0	157.20
150	20.0	72.65	190	20.0	95.01	250	30.0	184.4
150	25.0	87.33	190	25.0	115.3	260	10.0	69.86
150	30.0	100.6	190	30.0	134.1	260	20.0	134.1
155	12.5	49.78	195	12.5	68.75	260	25.0	164.2
155	17.5	67.24	195	17.5	86.80	260	30.0	192.8
155	22.5	83.31	195	22.5	108.5	270	15.0	106.9
155	27.5	97.98	195	27.5	128.7	270	25.0	171.2
160	10.0	41.92	200	10.0	53.09	270	30.0	201.2
160	15.0	60.78	200	15.0	77.55	280	10.0	75.45
160	20.0	78.24	200	20.0	100.6	280	20.0	145.3
160	25.0	94.31	200	25.0	122.3	280	30.0	209.6

Note: 1. Materials used: among products from pure copper processing (ГОСТ 495-65) Т2, Т3, Т4, ТУР, ТУ1, ТУ2.
Among products from brass processing (ГОСТ 494-65) Н96.
2. The length of extruded copper pipe: 2.5-6m.

11. Drawn Copper Pipe (YB/T-70)

Table 2-3-30 The norms and dimensions of drawn copper pipe

External diameter (mm)	Wall thickness (mm)	Theoretical weight (kg/m)	External diameter (mm)	Wall thickness (mm)	Theoretical weight (kg/m)	External diameter (mm)	Wall thickness (mm)	Theoretical weight (kg/m)
3	0.5	0.035	12	1.0	0.307	18	3.0	1.258
3	0.75	0.047	12	1.5	0.444	18	3.5	1.418
4	0.5	0.049	12	2.0	0.559	18	4.0	1.565
4	0.75	0.068	12	2.5	0.664	18	4.5	1.695
4	1.0	0.084	12	3.0	0.757	19	1.0	0.503
5	0.5	0.063	12	3.5	0.832	19	1.5	0.734
5	0.75	0.089	13	1.0	0.337	19	2.0	0.951
5	1.0	0.112	13	1.5	0.482	19	2.5	1.153
5	1.5	0.147	13	2.0	0.615	19	3.0	1.341
6	0.5	0.077	13	2.5	0.731	19	3.5	1.515
6	0.75	0.110	13	3.0	0.838	19	4.0	1.677
6	1.0	0.140	13	3.5	0.929	19	4.5	1.821
6	1.5	0.189	14	1.0	0.363	20	1.0	0.531
6	2.0	0.224	14	1.5	0.524	20	1.5	0.775
7	0.5	0.091	14	2.0	0.671	20	2.0	1.006
7	0.75	0.131	14	2.5	0.803	20	2.5	1.223
7	1.0	0.168	14	3.0	0.922	20	3.0	1.427
7	1.5	0.231	14	3.5	1.027	20	3.5	1.615
7	2.0	0.280	15	1.0	0.391	20	4.0	1.778
8	0.5	0.105	15	1.5	0.566	20	4.5	1.949
8	0.75	0.152	15	2.0	0.727	20	5.0	2.096
8	1.0	0.196	15	2.5	0.873	21	1.0	0.559
8	1.5	0.273	15	3.0	1.006	21	1.5	0.817
8	2.0	0.335	15	3.5	1.125	21	2.0	1.062
8	2.5	0.384	16	1.0	0.419	21	2.5	1.291
9	0.5	0.119	16	1.5	0.608	21	3.0	1.509
9	0.75	0.173	16	2.0	0.782	21	3.5	1.703
9	1.0	0.224	16	2.5	0.943	21	4.0	1.901
9	1.5	0.314	16	3.0	1.090	21	4.5	2.073
9	2.0	0.391	16	3.5	1.223	22	1.0	0.587
9	2.5	0.454	16	4.0	1.341	22	1.5	0.859
10	0.5	0.133	16	4.5	1.445	22	2.0	1.118
10	0.75	0.194	17	1.0	0.445	22	2.5	1.361
10	1.0	0.252	17	1.5	0.644	22	3.0	1.593
10	1.5	0.356	17	2.0	0.838	22	3.5	1.800
10	2.0	0.447	17	2.5	1.012	22	4.0	2.012
10	2.5	0.524	17	3.0	1.174	22	4.5	2.201
10	3.0	0.587	17	3.5	1.320	22	5.0	2.375
11	1.0	0.280	17	4.0	1.453	23	1.0	0.615
11	1.5	0.398	17	4.5	1.570	23	1.5	0.901
11	2.0	0.503	18	1.0	0.475	23	2.0	1.174
11	2.5	0.594	18	1.5	0.692	23	2.5	1.40
11	3.0	0.671	18	2.0	0.894	23	3.0	1.561
12	0.75	0.236	18	2.5	1.082	23	3.5	1.897

Continued

External diameter (mm)	Wall thickness (mm)	Theoretical weight (kg/m)	Inner diameter (mm)	Wall thickness (mm)	Theoretical weight (kg/m)	Inner diameter (mm)	Wall thickness (mm)	Theoretical weight (kg/m)
23	4.0	2.124	28	2.5	1.782	34	4.5	3.[illegible]
23	4.5	2.326	28	3.0	2.096	34	5.0	4.[illegible]
24	1.0	0.643	28	3.5	2.395	35	1.0	0.9[illegible]
24	1.5	0.943	28	4.0	2.683	35	1.5	1.[illegible]
24	2.0	1.230	28	4.5	2.955	35	2.5	2.[illegible]
24	2.5	1.502	28	5.0	3.214	35	3.0	2.[illegible]
24	3.0	1.761	30	1.0	[illegible].810	35	3.5	3.[illegible]
24	3.5	2.005	30	1.5	1.195	35	4.0	3.46[illegible]
24	4.0	2.236	30	2.0	1.565	35	4.5	3.80[illegible]
24	4.5	2.453	30	2.5	1.922	35	5.0	4.192
24	5.0	2.655	30	3.0	2.264	36	1.0	0.978
25	1.5	0.983	30	3.5	2.592	36	1.5	1.44[illegible]
25	2.0	1.286	30	4.0	2.906	36	2.0	1.900
25	2.5	1.572	30	4.5	3.206	36	2.5	2.340
25	3.0	1.844	30	5.0	3.493	36	3.0	2.767
25	3.5	2.102	(31)	1.0	0.839	36	3.5	3.18
25	4.0	2.348	(31)	1.5	1.236	36	4.0	3.577
25	4.5	2.578	(31)	2.0	1.621	36	4.5	3.961
25	5.0	2.795	(31)	2.5	1.99	36	5.0	4.331
26	1.0	0.699	(31)	3.0	2.347	38	1.0	1.034
26	1.5	1.027	(31)	3.5	2.696	38	1.5	1.530
26	2.0	1.341	(31)	4.0	3.019	38	2.5	2.480
26	2.5	1.642	(31)	4.5	3.332	38	3.0	2.934
26	3.0	1.928	(31)	5.0	3.634	38	3.5	3.375
26	3.5	2.200	32	1.0	0.866	38	4.0	3.800
26	4.0	2.460	32	1.5	1.278	38	4.5	4.213
26	4.5	2.704	32	2.0	1.677	38	5.0	4.612
26	5.0	2.934	32	2.5	2.050	40	1.0	1.090
27	1.0	0.727	32	3.0	2.431	40	1.5	1.614
27	1.5	1.070	32	3.5	2.790	40	2.0	2.124
27	2.0	1.398	32	4.0	3.130	40	2.5	2.620
27	2.5	1.712	32	4.5	3.458	40	3.0	3.102
27	3.0	2.012	32	5.0	3.773	40	3.5	3.57
27	3.5	2.297	34	1.0	0.922	40	4.0	4.025
27	4.0	2.571	34	1.5	1.362	40	4.5	4.464
27	4.5	2.829	34	2.0	1.788	40	5.0	4.890
27	5.0	3.074	34	2.5	2.201	42	1.0	1.146
28	1.0	0.755	34	3.0	2.599	42	1.5	1.693
28	1.5	1.111	34	3.5	2.98	42	2.0	2.236
28	2.0	1.453	34	4.0	3.354	42	2.5	2.760

Continued

External diameter (mm)	Wall Theoretical thickness (mm)	Theoretical weight (kg/m)	Inter Wall Theoretical thickness (mm)	Theoretical weight (kg/m)	Inter Wall Theoretical thickness (mm)	Theoretical weight (kg/m)	Inter Wall Theoretical thickness (mm)	Theoretical weight (kg/m)
42	3.0	3.270	50	5.0	6.287	60	2.5	4.017
42	3.5	3.765	50	6.0	7.379	60	3.0	4.778
42	4.0	4.248	(51)	1.5	2.075	60	3.5	5.529
42	4.5	4.716	(51)	2.5	3.388	60	4.0	6.269
42	5.0	5.171	(51)	3.0	4.024	60	4.5	6.980
44	2.0	2.347	(51)	3.5	4.647	60	5.0	7.685
44	2.5	2.904	(51)	4.0	5.255	60	5.5	8.376
44	3.0	3.438	(51)	4.5	5.848	(63)	1.5	2.1078
44	3.5	3.962	(51)	5.0	6.429	[illegible]	[illegible]	[illegible]
44	4.0	4.472	(51)	6.0	7.547	[illegible]	[illegible]	[illegible]
44	4.5	4.968	(53)	1.5	2.133	[illegible]	[illegible]	[illegible]
44	5.0	5.450	(53)	2.0	2.850	[illegible]	[illegible]	[illegible]
44	6.0	6.373	(53)	2.5	3.529	[illegible]	[illegible]	[illegible]
45	1.0	1.230	(53)	3.0	4.198	[illegible]	[illegible]	[illegible]
45	1.5	1.823	(53)	3.5	4.847	[illegible]	[illegible]	[illegible]
45	2.0	2.403	(53)	4.0	5.478	[illegible]	[illegible]	[illegible]
45	2.5	2.969	(53)	4.5	6.100	[illegible]	[illegible]	[illegible]
45	3.0	3.521	(53)	5.0	6.708	[illegible]	[illegible]	[illegible]
45	3.5	4.059	(53)	6.0	7.882	[illegible]	[illegible]	[illegible]
45	4.0	4.584	(54)	2.0	2.906	[illegible]	[illegible]	[illegible]
45	4.5	5.094	(54)	2.5	3.599	[illegible]	[illegible]	[illegible]
45	5.0	5.589	(54)	3.0	4.276	[illegible]	[illegible]	[illegible]
45	6.0	6.540	(54)	3.5	4.940	[illegible]	[illegible]	[illegible]
48	1.5	1.949	(54)	4.0	5.590	[illegible]	[illegible]	[illegible]
48	2.0	2.571	(54)	4.5	6.226	[illegible]	[illegible]	[illegible]
48	2.5	3.180	(54)	5.0	6.848	[illegible]	[illegible]	[illegible]
48	3.0	3.772	(54)	6.0	8.050	[illegible]	[illegible]	[illegible]
48	3.5	4.353	55	1.0	1.499	[illegible]	[illegible]	[illegible]
48	4.0	4.918	55	1.5	2.243	[illegible]	[illegible]	[illegible]
48	4.5	5.471	55	2.0	2.962	[illegible]	[illegible]	[illegible]
48	5.0	6.008	55	2.5	3.668	[illegible]	[illegible]	[illegible]
48	6.0	7.043	55	3.0	4.359	[illegible]	[illegible]	[illegible]
50	1.0	1.369	55	3.5	5.038	[illegible]	[illegible]	[illegible]
50	1.5	2.033	55	4.0	5.702	[illegible]	[illegible]	[illegible]
50	2.0	2.683	55	4.5	6.351	[illegible]	[illegible]	[illegible]
50	2.5	3.318	55	5.0	6.986	[illegible]	[illegible]	[illegible]
50	3.0	3.940	55	6.0	8.217	[illegible]	[illegible]	[illegible]
50	3.5	4.559	60	1.0	1.649	[illegible]	[illegible]	[illegible]
50	4.0	5.142	60	1.5	2.452	[illegible]	[illegible]	[illegible]
50	4.5	5.723	60	2.0	3.242	[illegible]	[illegible]	[illegible]

Continued

External diameter (mm)	Wall thickness (mm)	Theoretical weight (kg/m)	Internal diameter (mm)	Wall thickness (mm)	Theoretical weight (kg/m)	Internal diameter (mm)	Wall thickness (mm)	Theoretical weight (kg/m)
70	6.0	10.733	95	1.5	3.919	150	5.0	20.[illegible]
75	1.5	3.081	95	2.0	5.198	156	3.0	12.[illegible]
75	2.0	4.080	95	2.5	6.462	157	3.5	15.02
75	2.5	5.065	96	3.0	7.796	158	4.0	17.22
75	3.0	6.036	96	5.0	13.27	160	5.0	21.67
75	3.5	6.994	100	1.5	4.129	165	2.5	11.[illegible]
75	4.0	7.936	100	2.0	5.477	166	3.0	13.67
75	4.5	8.867	100	2.5	6.811	168	4.0	18.34
75	5.0	9.780	100	3.0	8.132	170	5.0	23.[illegible]
75	6.0	11.571	100	3.5	9.438	170	10.0	44.[illegible]
(76)	3.0	6.120	104	2.0	5.70	180	10.0	47.53
(76)	3.5	7.092	105	2.5	7.16	181	3.0	14.93
(76)	4.0	8.050	106	3.0	8.64	182	3.5	17.47
(76)	4.5	8.993	107	3.5	10.13	183	4.0	20.02
(76)	5.0	9.922	108	4.0	11.63	185	5.0	25.16
(76)	6.0	11.739	110	5.0	14.68	189	7.0	35.62
80	1.5	3.290	110	10.0	27.96	206	3.0	17.03
80	2.0	4.359	114	2.0	6.26	207	3.5	19.91
80	2.5	5.414	114	7.0	20.94	208	4.0	22.81
80	3.0	6.456	115	2.5	7.86	210	5.0	28.66
80	3.5	7.484	116	3.0	9.48	212	6.0	34.56
80	4.0	8.498	120	5.0	16.08	214	7.0	40.51
80	4.5	9.496	120	10.0	30.76	231	3.0	19.12
80	5.0	10.48	122	6.0	19.46	232	3.5	22.36
80	6.0	12.410	124	7.0	22.90	233	4.0	25.61
85	1.5	3.500	125	2.5	8.56	235	5.0	32.15
85	2.0	4.639	129	2.0	7.10	239	7.0	45.41
85	2.5	5.767	130	2.5	8.91	258	4.0	28.41
85	3.5	7.971	130	10.0	33.55	260	5.0	35.65
85	4.0	9.054	131	3.0	10.74	282	3.5	27.25
85	4.5	10.12	132	3.5	12.57	283	4.0	31.20
85	5.0	11.18	135	5.0	18.17	307	3.5	29.70
(86)	3.0	6.958	137	6.0	21.98	308	4.0	34.00
90	1.5	3.709	139	7.0	25.87	310	5.0	42.64
90	2.5	6.113	144	2.0	7.94	332	3.5	32.15
90	3.5	8.460	145	2.5	9.96	357	3.5	34.59
90	4.5	10.75	145	10.0	37.75	358	4.0	39.59
90	5.0	11.88	146	3.0	11.99	360	5.0	49.63

Note: 1. [illegible] products from pure copper processing (YB[illegible]-[illegible])
T2, T3, T4, TUP, TU1, TU2.
[illegible] products from brass processing (YB[illegible]-[illegible])
2. Length of [illegible] copper pipe: 1-[illegible].
3. The [illegible] in the parenthesis is not recommended to use.

12. Extruded Brass Pipe (YB/[illegible]-71)

Table 2-2-31 The norms and dimensions of extruded brass pipe

External diameter (mm)	Wall thickness (mm)	Theoretical weight (kg/m)	External diameter (mm)	Wall thickness (mm)	Theoretical weight (kg/m)	External diameter (mm)	Wall thickness (mm)	Theoretical weight (kg/m)
21	1.5	0.781	37	4.5	3.903	55	5.0	5.877
22	2.0	1.068	37	6.0	4.964	55	6.5	7.187
23	1.5	0.861	37	8.5	6.465	55	7.5	9.501
23	2.5	1.368	38	4.0	3.630	55	10.0	12.01
24	2.0	1.174	38	6.0	5.124	58	12.5	14.53
24	3.0	1.681	38	7.0	5.791	58	15.0	16.[illegible]
25	1.5	0.941	39	4.5	4.143	58	4.0	5.767
25	2.5	1.501	39	7.0	5.978	58	6.5	8.234
25	3.5	2.006	40	2.5	2.502	58	9.0	11.76
26	2.0	1.281	40	5.0	4.670	59	4.5	6.511
26	3.0	1.841	40	7.0	6.165	60	5.0	7.239
26	4.0	2.349	40	7.5	6.505	60	7.5	10.51
27	2.5	1.635	40	8.0	6.832	60	10.0	13.34
27	3.5	2.195	40	10.0	8.706	60	12.5	15.85
27	4.5	2.702	42	7.5	3.546	60	15.0	18.01
28	3.0	2.002	42	6.0	5.577	63	4.0	6.[illegible]
28	4.0	2.562	42	8.0	7.259	63	5.0	8.[illegible]
28	5.0	3.069	43	4.0	4.163	65	7.5	11.51
29	3.5	2.382	45	2.5	2.836	65	10.0	14.68
29	4.5	2.942	45	5.0	5.308	65	12.5	17.51
30	2.0	1.495	46	3.0	3.442	65	15.0	20.02
30	4.0	2.776	46	5.0	5.945	68	4.0	6.832
30	5.0	3.336	46	8.0	8.113	68	6.5	10.67
31	2.5	1.902	46	10.0	9.608	68	9.0	14.17
31	3.5	2.569	47	3.5	4.067	68	11.5	17.34
31	4.5	3.183	47	6.0	6.565	70	5.0	8.[illegible]
32	3.0	2.322	48	4.0	4.697	70	7.5	12.51
32	5.0	3.603	48	6.5	7.199	70	10.0	16.01
32	6.0	4.163	48	9.0	9.367	70	12.5	19.18
33	3.5	2.756	50	5.0	6.002	70	15.0	22.02
34	2.0	1.708	50	7.5	8.507	72	3.5	6.398
34	4.0	3.203	50	10.0	10.68	72	8.5	14.40
34	6.0	4.484	50	12.5	12.51	73	4.0	7.[illegible]
35	2.5	2.168	50	15.0	14.01	73	11.5	18.86
35	4.5	3.663	51	3.0	3.843	73	14.0	22.04
35	5.0	4.003	52	3.5	4.530	75	5.0	9.341
36	3.0	2.642	52	6.0	7.366	75	6.5	10.93
36	5.0	4.137	53	4.0	5.231	75	7.5	13.51
36	7.0	5.418	54	4.5	5.945	75	10.0	17.35
37	3.5	3.129	54	7.0	8.780	75	12.5	20.85
75	15.0	24.02	100	17.5	38.43	120	20.0	55.[illegible]
77	17.5	26.85	100	20.0	42.70	120	22.5	5[illegible]
80	5.0	10.01	100	22.5	46.54	120	25.0	63.[illegible]
80	7.5	14.51	100	25.0	50.04	120	27.5	67.[illegible]
80	10.0	18.68	100	27.5	53.21	120	30.0	72.[illegible]
80	12.5	22.52	100	30.0	56.04	120	14.0	40.[illegible]
80	15.0	26.02	105	7.5	19.72	125	12.5	37.[illegible]
80	17.5	29.19	105	10.0	25.35	125	15.0	44.[illegible]

Continued

External Diameter (mm)	Wall Thickness (mm)	Theoretical weight (kg/m)	Inner Diameter (mm)	Wall Thickness (mm)	Theoretical weight (kg/m)	Inner Diameter (mm)	Wall Thickness (mm)	Theoretical weight (kg/m)
80	20.0	32.02	105	12.5	30.86	125	17.5	50.21
85	5.0	10.68	105	15.0	36.03	125	20.0	56.04
85	7.5	15.51	105	17.5	40.87	125	22.5	61.55
85	10.0	20.02	105	20.0	45.37	125	25.0	66.72
85	12.5	24.19	105	22.5	49.54	125	27.5	71.56
85	15.0	28.02	105	25.0	53.38	125	30.0	76.06
85	17.5	31.42	105	27.5	56.88	130	10.0	32.29
85	20.0	34.69	105	30.0	60.05	130	15.0	46.04
85	22.5	37.53	110	5.0	14.01	130	20.0	58.71
90	5.0	11.34	110	10.0	26.69	130	25.0	70.06
90	7.5	16.51	110	12.5	32.53	130	27.5	75.23
90	10.0	21.35	110	15.0	38.03	130	30.0	80.06
90	12.5	25.85	110	17.5	43.20	135	7.5	25.52
90	15.0	30.02	110	20.0	48.04	135	12.5	40.87
90	17.5	33.86	110	22.5	52.54	135	17.5	54.88
90	20.0	37.36	110	25.0	56.71	135	22.5	67.55
90	22.5	40.53	110	27.5	60.55	135	27.5	78.90
90	25.0	43.37	110	30.0	64.05	140	10.0	34.69
92	6.0	13.77	112	6.0	16.97	140	15.0	50.04
95	7.5	17.51	115	7.5	21.52	140	20.0	64.05
95	10.0	22.68	115	10.0	28.02	140	25.0	76.73
95	12.5	27.52	115	12.5	34.19	140	30.0	88.07
95	15.0	32.03	115	15.0	40.03	140	37.5	102.6
95	17.5	36.20	115	17.5	45.54	145	12.5	44.20
95	20.0	40.03	115	20.0	50.71	145	17.5	59.45
95	22.5	43.53	115	22.5	55.54	145	22.5	73.56
95	25.0	46.70	115	25.0	60.21	145	27.5	86.24
95	27.5	49.54	115	27.5	64.22	145	37.5	107.6
100	7.5	18.51	115	30.0	68.05	150	10.0	37.36
100	10.0	24.02	120	10.0	29.36	150	15.0	54.04
100	12.5	29.19	120	15.0	42.03	150	20.0	69.39
100	15.0	34.03	120	17.5	47.84	150	25.0	83.40
150	30.0	96.08	165	27.5	100.9	180	25.0	103.40
153	12.5	47.54	170	10.0	42.70	180	30.0	120.1
155	17.5	64.22	170	15.0	62.05	185	12.5	57.55
155	22.5	79.56	170	20.0	80.06	185	17.5	78.23
155	27.5	93.57	170	25.0	96.74	185	22.5	97.58
160	10.0	40.03	170	30.0	112.1	185	27.5	115.6
160	15.0	58.05	175	12.5	54.21	185	32.5	132.3
160	20.0	74.73	175	17.5	73.56	185	37.5	147.6
160	25.0	90.07	175	22.5	91.57	190	25.0	110.1
160	30.0	104.1	175	27.5	108.3	190	35.0	144.8
165	12.5	50.87	180	10.0	45.37	195	27.5	122.9
165	17.5	68.89	180	15.0	66.05	195	32.5	140.9
165	22.5	85.57	180	20.0	85.40	195	42.5	173.0

Note: 1. Materials used: brass pipes from brass enterprises (HPb62-0.5) H62, HPb59-1, HFe59-1-1,

2. Length of brass pipes 2.5-4m.

13. Drawn Brass Pipe (YB/3-71)

Table 2-2-32 The norms and dimensions of drawn brass pipe

External diameter (mm)	Wall thickness (mm)	Theoretical weight (kg/m)	Inner diameter (mm)	Wall thickness (mm)	Theoretical weight (kg/m)	Inner diameter (mm)	Wall thickness (mm)	Theoretical weight (kg/m)
3	0.5	0.0334	9	0.5	0.113	12	2.0	0.531
4	0.5	0.0467	9	0.75	0.165	12	2.5	0.634
5	0.5	0.0601	9	1.0	0.214	12	3.0	0.721
5	0.75	0.0851	9	1.5	0.300	13	0.5	0.167
5	1.0	0.107	9	2.0	0.374	13	0.75	0.245
6	0.5	0.0734	10	0.5	0.127	13	1.0	0.320
6	0.75	0.105	10	0.75	0.185	13	1.5	0.460
6	1.0	0.134	10	1.0	0.240	13	3.0	0.801
6	1.5	0.180	10	1.5	0.340	14	0.5	0.180
7	0.5	0.0868	10	2.0	0.427	14	1.0	0.347
7	0.75	0.125	11	1.0	0.267	14	1.5	0.500
8	0.5	0.100	11	1.5	0.381	14	2.0	0.641
8	0.78	0.145	12	0.5	0.154	15	0.5	0.194
8	1.0	0.187	12	0.75	0.225	15	1.0	0.374
8	1.5	0.260	12	1.0	0.294	15	1.5	0.540
8	2.0	0.320	12	1.5	0.420	15	2.0	0.694
15	2.5	0.825	22	4.0	1.922	28	3.0	2.002
15	3.0	0.961	22	6.0	2.562	28	3.5	2.299
16	0.5	0.207	23	1.0	0.587	28	4.0	2.5
16	1.0	0.400	23	1.5	0.861	28	5.0	3.069
16	1.5	0.581	23	2.5	1.368	28	6.0	3.523
16	2.0	0.747	23	3.0	1.601	29	1.0	0.747
16	2.5	0.891	23	3.5	1.822	29	2.0	1.441
16	3.0	1.041	23	4.5	2.222	30	1.0	0.773
17	0.5	0.220	24	1.0	0.614	30	1.5	1.141
17	2.5	0.967	24	2.0	1.174	30	2.0	1.495
17	3.5	1.261	24	3.0	1.681	30	2.5	1.835
18	1.0	0.454	24	4.0	2.136	30	3.0	2.162
18	1.5	0.661	24	7.0	3.176	30	4.0	2.776
18	2.0	0.854	25	1.0	0.641	30	6.0	3.243
18	3.0	1.201	25	1.5	0.941	31	3.0	2.215
18	4.0	1.495	25	2.0	1.228	31	4.0	2.882
19	0.5	0.247	25	2.5	1.501	31	4.5	3.183
19	0.75	0.366	25	3.0	1.761	32	1.0	0.827
19	1.0	0.480	25	3.5	2.008	32	1.5	1.221
19	1.5	0.701	25	4.0	2.242	32	2.0	1.601
19	2.0	0.907	26	1.0	0.667	32	4.0	2.989
19	4.5	1.741	26	2.0	1.281	32	4.5	3.303
20	1.0	0.507	26	2.5	1.568	32	5.0	3.603
20	1.5	0.741	26	3.0	1.842	34	5.0	3.870
20	2.0	0.961	26	4.0	2.349	34	6.0	4.484
20	2.5	1.168	26	5.0	2.802	35	1.0	0.907
20	3.0	1.361	26	6.0	3.203	35	1.5	1.341
20	5.0	2.002	26	7.0	3.550	35	2.0	1.761

Continued

Internal diameter (mm)	Wall thickness (mm)	Theoretical weight (kg/m)	Inner wall thickness (mm)	Theoretical weight (kg/m)	Outer wall thickness (mm)	Theoretical weight (kg/m)
21	2.0	1.014	27	0.694	35	2.5	2.168
21	2.5	1.234	27	1.334	35	3.0	2.562
21	4.5	1.932	27	1.922	35	4.0	3.309
22	1.0	0.560	27	2.195	35	4.5	3.663
22	1.5	0.821	27	5.0	2.936	35	6.0	4.644
22	2.0	1.068	28	1.0	0.271	36	3.0	2.642
22	2.5	1.301	28	1.5	1.061	36	4.0	3.416
22	3.0	1.521	28	2.0	1.388	36	5.0	4.137
36	6.0	4.804	46	5.0	5.471	56	1.0	1.575
36	7.0	5.418	47	1.0	1.229	60	2.0	3.096
37	2.5	2.302	48	3.0	3.603	60	3.0	4.501
37	7.0	5.605	48	5.0	5.905	66	3.5	5.274
38	1.0	0.988	50	1.0	1.308	60	4.0	5.978
38	1.5	1.461	50	2.0	2.562	64	2.0	3.309
38	2.0	1.922	50	2.5	3.169	64	3.5	5.651
38	2.5	2.369	50	3.0	3.763	65	2.0	3.363
38	3.0	2.802	50	3.5	4.343	65	3.5	5.745
38	4.0	3.630	50	4.0	4.911	65	7.0	10.84
38	4.5	4.023	50	7.0	8.037	70	3.0	5.364
38	5.0	4.404	51	2.0	2.615	70	4.0	7.046
38	10.0	7.473	51	3.0	3.843	75	2.5	4.670
40	1.0	1.041	51	3.5	4.437	75	4.0	7.413
40	2.0	2.028	52	1.0	1.361	76	3.0	5.845
40	2.5	2.502	52	4.5	5.705	76	4.0	7.686
40	3.5	3.409	52	6.0	7.366	76	10.0	17.61
40	4.0	3.843	54	2.0	2.776	80	2.0	4.163
40	6.0	5.444	54	4.5	5.845	80	2.5	5.174
42	1.0	1.094	54	5.0	6.539	80	4.0	8.113
42	2.0	2.135	54	6.0	7.686	80	7.0	13.64
42	3.0	3.123	55	2.0	2.829	86	4.0	8.754
42	3.5	3.596	55	3.0	4.163	90	3.0	6.966
42	5.0	4.937	55	4.0	5.444	90	4.0	9.181
45	1.5	1.741	55	5.0	6.672	90	8.0	17.31
45	2.0	2.295	58	2.0	2.989	93	2.0	4.857
45	3.0	3.363	58	3.0	4.404	96	3.0	7.416
45	3.5	3.876	58	3.5	5.091	97	2.0	5.071
45	4.0	4.377	58	4.0	5.765	100	3.0	7.766
45	6.0	6.245	58	5.0	7.072	100	4.0	10.25
46	1.0	1.201						

Note: 1. Materials used: strong brasses (from brass corresponding (ГОСТ 5-65) H62, H68, HSn70-1, HSn62-1)

2. Length of 6mm brass pipe: 0.5-4m.

(*) A Comparison of China's Principal Non-ferrous Metal Brands With Those of Other Countries

Table 2-2-33 A comparison of China's principal non-ferrous metal and alloy brands with those of other countries

Classification of metal	China	Russia	United States		England	Japan	German F.R.	Czechoslovakia
	GB	GOST	ASTM	AAS	BS	JIS	DIN	ČSN
Aluminum and Aluminum Alloy	L2	A0	996A	1060			(A199.6)	
	L3	A1	EC	EC	IB	A1[B]1	A199.5	
	L4	АД1		1230 1100				
	L5	A2	990A	1100	IB	A1[B]3	A199	
	L6	АД		1230 1100				
	LF2	АМГ	GR20A	5052	N4	A2[B]1	AlMg2.5	Al-Mg
	LF3	АМГ3		5154				
	LF5	АМГ5		5056				
	LF6	АМГ6						
	LF10	АМГ5П		5056	N6	A2[B]2	AlMg5	Al-Mg5
	LF21	АМЦ	MIN	3003	N3	A2[B]3	AlMn	Al-Mn
	LY1	Д18П			HR15	A3[F]3		Al-Cu2-Mg
	LY2	ВД17						
	LY4	Д19П						
	LY6	Д19						
	LY8	Д1П	CM41A	2017	H11	A3[B]2	AlCuMg	Al Cu4-Mg
	LY9	Д16П	CG42A	2024		A3[B]1	AlCuMg	

Classification of Metal	China	Russia	United States	Britain	Holland	Japan	German F.R.	Czechoslovakia
Aluminum and Aluminum Alloy	LY10	B65						
	LY11	Д1	CM41A	2017	H11	A3[B]2	AlCuMg	Al-Cu4-Mg
	LY12	Д16	CG42A	2024		A3[B]4	AlCuMg	Al-Cu-Mg
	LY16	Д20		2219				
	LD2	АВ		6061		A3[B]2	AlCuMg	Al-Cu4-Mg
	LD5	АК6				A3[B]1	AlCuMg	Al-Cu-Mg
	LD6	АК6-1						
	LD7	АК4-1		2618				
	LD8	АК4						
	LD9	АК2	CN42D	2018		A4[F]1	(AlCuNi)	
	LD10	АК8	CS41A	2014	H11	A3[B]1	(AlCuMgSi)	
	LC3	В94						
	LC4	В95		7075				
	LC5	В95-1						
	LT1	АК	S5A	4043	N21		SAlSi5	
	ZL-101(HB)	АЛ9						
	ZL-102(HB)	АЛ2						
	ZL-103(HB)	АЛ3						
	ZL-104(HB)	АЛ4						
	ZL-105(HB)	АЛ5						
	ZL-201(HB)	АЛ19						
	ZL-203(HB)	АЛ7						
	ZL-301(HB)	АЛ8						
	ZL-302(HB)	АЛ22						
	ZL-303(HB)	АЛ13						

Continued

Classification of metal	China	Russia	United States		England	Japan	German F.R.	Czechoslovakia
	GB	ГОСТ	ASTM	AAS	BS	JIS	DIN	ČSN
Zn and Zn alloy	ZL-401(HB)	АЦР-1						
	ZL-301(HB)	АЛ11						
Copper and Copper alloy	T1	М0						
	T2	М1						
	T3	М2						
	T4	М3						
	H96	Л96	*	**				
	H90	Л90	B36-2(p)	B134-2(w)	713	90Cu-10Zn	MS90	MS90
	H80	Л80	B36-4(p)	B134-4(w)	711	80Cu-20Zn	MS80	MS80
	H68	Л68					MS68	MS68
	H62	Л62	B134-8(w)					
	HPb59-1	ЛС59-1	B124-2		216		MS58	
	HSn70-1	ЛО70-1			1164		SOMS71	MS69Pb
	HSn62-1	ЛО62-1	B291					
	HAl60-1-1	ЛАЖ60-1-1						
	HMn58-2	ЛМЦ58-2						
	HFe59-1-1	ЛЖМЦ59-1-1						
	QSn4-3	БрОЦ4-3					MSnBZ4	Cu-Sn4Zn
	QSn4-4-2.5	БрОЦС4-4-2.5						

Translator's note: * p = plate and ** w = wire

[illegible]	China	Russia	United States	[illegible] Land	Japan	German F.R.	Czechoslovakia
[illegible]	QSn4-4-4	БрОЦС4-4-4	B139BZ		BC6	MSnBZ4Pb	
	QSn6.5-0.1	БрОФ6.5-0.15	B139 B159	107 3		SnBZ6	Cu-Sn6
	QSn6.5-0.4	БрОФ6.5-0.4					
	QSn7-0.2	БрОФ7-0.2					
Copper	QA15	БрА5	B169A				Cu-A15
	QA17	БрА7	B169B				
and	QA19-2	БрАМЦ9-2					Cu-A19-Mn
	QA19-4	БрАЖ9-4					Cu-A19-Fe
Copper	QA110-3-1.5	БрАЖМЦ10-3-1.5			ABCB22		Cu-A110 Fe-Mn
	QA110-4-4	БрАЖН10-4-4	AMS4640	2033		NiAlBZ	Cu-A110-Fe-Ni
Alloy	QBe2	БрБ2					
	QBe1.9	БрБНТ1.9					
	QBe1.7	БрБНТ1.7					
	QSi3-1	БрКМЦ3-1	B98-D	1948			Cu-Si3-Mn
	QSi1-3	БрКН1-3					
	QCd1.0	БрКД1.0					
	QCr0.5	БрХ0.5					
	B19	МН19	B171	[illegible]-2		CuNi20	
	B30	МН70-30					
	BMn3-12	МНМц3-12					
	BMn40-1.5	МНМц40-1.5					
	BZn15-20	МЦи[illegible]20	B206 B(B5)				
	NCu28-2.5 1.5	НМЖМц[illegible] 2.5 1.5					

Note: Under GTS, the letters in the bracket indicate the cross-section shape of products, such as [B] - bar, [P] - ribbon, [P] - plate, [T] - tube and [V] - wire.

III. Non-metallic Materials

(1) Rubber and Rubber Products

1. Sealing Rubber Products (HG4-329-66) (ring-shaped)

The sealing rubber products of various section shapes made of oil resisting, heat resisting and acid and alkali resisting rubber material, all-rubber or blending with fabrics, can be used on various mechanical equipment, and at a given temperature and pressure and with different working media, it can perform sealing action.

The rubber materials which are used to make sealing rubber products can, according to their characteristics, be classified into four groups:

Group I: Oil resisting rubber

Group II: General rubber

Group III: Heat resisting rubber

Group IV: Acid-alkali resisting rubber

Table 2-3-1 The characteristics and working conditions of rubber material

Group	Grade of hardness	Rubber material characteristics	Grade of working pressure	Grade of working temperature °C	Working media
I - 1	low	oil resisting	low pressure	-25 - + 80	lubricating oil, fuel oil, hydraulic oil
I - 2	medium		medium	-30 - + 80	
I - 3	high		high	-20 - + 80	
I - 4	high		high	-20 - + 80	
II - 1	low	high breaking strength and elasticity and shock buffering	low	-40 - + 60	air, water brake liquid
II - 2	medium		medium	-40 - + 60	
II - 3	high		high	-40 - + 60	
II - 4	high		high	-40 - + 60	
III -1	low	heat resisting	low	-30 - + 120	water, air
III -2	medium		medium	-30 - + 120	
III -3	high		medium	-30 - + 120	
IV - 1	low	acid- alkali resistant	low	-20 - + 60	[illegible]
IV - 2	medium		low	-20 - + 60	[illegible]
IV - 3	high		low	-20 - + [illegible]	[illegible]

Table 2-3-2 The physical-mechanical properties of rubber

Physical Mechanical Properties	Group														
	group 1 orr				group 11 gr				group 111 hr			group IV arr			
	I-1	I-2	I-3	I-4	II-1	II-2	II-3	II-4	III-1	III-2	III-3	IV-1	IV-2	IV-3	
	LH	MG	HH		LH	MG	HH		LH	MG	HH	LH	MG	HH	
Hardness, Shore A (degree)	55±5	65±5	75±5	85±5	55±5	65±5	75±5	85±5	55±5	65±5	75±5	55±5	65±5	75±5	
Breaking strength (kg/mm^2), no less than	80	100	100	100	150	150	150	120	80	100	100	80	100	100	
Breaking elongation rate (%), no less than	350	300	250	150	450	400	300	200	400	350	300	400	350	300	
Breaking permanent deformation (%) no less than	30	25	25	20	35	30	30	25	35	30	30	35	30	30	
Brittleness temp. °C, no + 1 or less than	-35	-30	-30	-25	40	40	-35	35				30	30	30	
Aging coeff. (70±2°C×96 hrs), no less than	0.7	0.7	0.7	0.8	0.7	0.7	0.7	0.7	0.85	0.85	0.85	0.75	0.75	0.75	
Gasoline No.100 (75 mills) + kerosene (25 mills), 15 - 25°C × 24 hrs, no more than	+25	+25	+25	+20	-	-	-	-	-	-	-	-	-	-	
Machine oil No.15, 70 ± 2°C × 24 hrs.	-3~+5	-3~+5	-3~+5	-2~+4	-	-	-	-				-	-	-	
20% of sul. acid or hydrochloric acid, 15 - 25°C × 24 hrs no less than	-	-	-	-		-	-	-			-	0.8	0.8	0.8	
5% of sodium hydrate 15 - 25°C × 24 hrs. no less than	-	-	-	-								0.8	0.8	0.8	

Translator's note: group 1 orr = oil resisting rubber; group 11 gr = general rubber; group 111 hr = heat resisting rubber; and group IV arr = acid alkali resisting rubber.
LH = low hardness; MG = medium hardness; and HH = high hardness.

2. Rubber Sheet for Industry Use (HG/-400-66)

Table 2-3-3 The physical-mechanical properties of rubber sheet for industry use

Rubber sheet		Physical-Mechanical Properties									Conditions of Uses
		1. BS (kg/cm²)	2. BE (%)	3. PD (%)	Hardness (Shore A)	4. AC (70°C × 72 hr)	5. ASC (20% H_2SO_4, HCl, 20~30°C × 24 hr)	6. AS (20% NaOH, KOH, 20~30°C × 24 hr)	7. TC (70°C × 24 hr) (%)	8. GB (20~30°C × 24 hr) (%)	
		≥	≥	≤		≥	≤	≤	≤	≤	
	1120	30	250	35	60~75	0.65					High hardness and low elongation mechanical performance. Workable in the air with temp. of -30 ~ +60°C. Rubber sealing gasket, packing and washer at oil or alcohol tank, door and window gasket and the like.
	1125	50	280	35	60~75	0.65					
	1130	60	300	35	60~75	0.70					High hardness and low elongation mechanical performance. Workable in the air with temp. of -30 ~ +60°C and lower pressure use. Rubber sealing rubber plate, rubber gasket, door and window gasket and cavity floor and workbench pad.
	1140	60	350	35	55~70	0.75					Medium hardness and elongation mechanical performance. Workable in the air with temp. of -30 ~ +60°C and lower pressure use. Rubber sealing rubber plate, rubber gasket, door and window gasket and cavity floor and workbench pad.
	1260	150	400	30	50~60	0.80					Medium hardness, good elasticity and elasticity. Workable in the air with temp. of -35 ~ +60°C and high pressure. Rubber plate gasket able to resist oil and petroleum and to buffer; door and window gasket and gasket.
	1280	150	500	30	45~60	0.80					Low hardness but high elongation. Workable in the air with temp. of -35 ~ +60°C and high pressure. Rubber plate gasket able to resist oil and petroleum and to buffer; door and window gasket and gasket.

Translator's note: 1.BS = breaking strength; 2.BE = breaking extension rate; 3.PD = permenent deformation; 4. AC = ageing coeff.; 5. ASC = acid resisting coeff.; 6. AS = alkali resisting coe-f.; 7. TC = transformer oil weight change; and 8. GB = gasoline + benzene (gasoline 75 units and benzene 25 units) weight change.

Continued

	2030	70	300	15	60~75	0.70	0.8	0.8			High hardness, oil-soluble anti-acid and alkali performance. Suitable at temp. of -20 ~ 160°C and in the use for oils of 200 cst(50°C) and higher. Suitable for various steam or engine oil but not for various acid oils.
	2040	60	350	35	65~70	0.75	0.8	0.8			Suitable for various steam or engine oil but not for various acid oils.
	3001	70	200	25	60~75	0.75			+5	+20	High hardness and good resistance to oil-soluble solvent and oxidation. Suitable for such uses as lube oil, hydraulic oil and gasoline oil, temp. of -20 ~ 110°C. Suitable also for various gears.
	3002	80	250	25	60~75	0.75			+20	+35	High hardness and good resistance to oil-soluble solvent and oxidation. Suitable for such uses as lube oil, hydraulic oil and gasoline oil, temp. of -20 ~ +80°C.
	4001	80	300	15	65~75	0.8 (100°C, 48 hrs)					Suitable for [illegible] oil. Able to work in the temp. range of -20 ~ +200°C under the condition of low pressure. Suitable for [illegible]
	4002	100	350	10	70~75	0.8 (100°C, 48 hrs)					[illegible] and other [illegible] same as 4001.

Table 2-3-4 The norms and dimensions of rubber sheet for industry use

Thickness (mm)		Thickness (mm)	
Nominal dimension	Permitted deviation	Nominal dimension	Permitted deviation
0.5	±0.15	500～1000	±2%
1.0	±0.2	500～1000	±2%
1.5	+0.3 -0.2	500～1000	±2%
2.0	+0.4 -0.3	500～1000	±2%
2.5	+0.5 -0.4	500～1000	±2%
3.0	+0.6 -0.4	500～1000	±2%
4.0	+0.7 -0.5	500～1000	±2%
5.0	+0.7 -0.5	500～1000	±2%
6.0	+0.9 -0.5	500～1000	±2%
8.0	+1.0 -0.5	500～1000	±2%
10	+1.0 -0.5	500～1000	±2%
12	+1.2 -0.5	500～1000	±2%
14	+1.2 -0.5	500～1000	±2%
16	+1.5 -0.5	500～1000	±2%
18	+1.5 -0.5	500～1000	±2%
20	+1.5 -1.0	500～1000	±2%
22	+1.5 -1.0	500～1000	±2%
25	+1.5 -1.0	500～1000	±2%
30	+2.0 -1.0	500～1000	±2%
40	+2.0 -1.0	500～1000	±2%
50	+2.0 -1.0	500～1000	±2%

3. Square and Round Rubber Strip (Hu 2/HG16-219-66)

Square and round rubber strips can be used to make sealing gasket, buffer and caulking strip used in such working media as water and air.

Table 2-3-5 The physical-mechanical properties of rubber strip

Physical-mechanical Properties	Group	
	General square & round strip	Oil resisting square and round strip
Breaking strength (kg/mm^2)	>30	>30
Extension rate (%)	>250	>200
Permanent deformation (%)	<50	<40
Hardness (Shore) more than 16mm	75±5	75±5
less than 16mm	65±5	60±5
Ageing coeff. 70°C x 72 hours	>0.7	—
Soaking in gasoline at room temp. for 48 hrs weight & volume change (%)	—	<10
Soaking in engine oil at room temp. for 70 hrs weight & volume change (%)	—	<5

Table 2-3-6 The norms and dimension of rubber strip

Round rubber strip		Square rubber strip	
Diameter (mm)	Length (m)	Side length (mm)	Length (m)
3, 4, 5, 6, 8, 10	≥10	5×5, 6×6, 8×8, 10×10	≥10
12, 14, 16, 20, 25, 30	≥5	13×13, 16×16, 20×20, 25×25	≥5

4. General All-rubber Tube (HG4-401-66)

The general all-rubber tube should be used at temperature of -5 - +35°C. When this kind of pipe is used, it must try to avoid any mechanical damage and the contact of oil and organic solvent. The water hose and airtube must not contact with acid and base. When all-rubber tube is used to convey [illegible] acid and [illegible] base, the concentration of acid and alkali should be: sulfuric acid under 20%, hydrochloric acid under 20% and sodium hydroxide

under 20°.

Table 2-3-7 The physical-mechanical properties of general all-rubber tube

Physical-mechanical Properties	Conveying water and air	Conveying dilute acid and dilute base
Breaking strength (kg/mm²)	≥50	≥65
Breaking-extension rate (%)	≥250	≥300
Hardness (Shore A type) (degree)	63~78	60~75
Ageing coeff. (70°C × 72 hrs)	≥0.8	≥0.8
Anti-acid coeff. (40%H2SO4 × 24hrs)		≥0.85

Table 2-3-8 The norms and dimensions of all-rubber tube

Inner diameter (mm)	3	5	6	8	10	13	16	19	22	25	32	38	51	64	76
Thickness of rubber layer (mm)	1.5	1.5	1.5	2	2	2.5	2.5	3.5	3.5	3.5	3.5	4.5	4.5	5.5	5.5
Length (m)	>6														

5. Rubber Tube Reinforced With Cotton Thread (HG4-405-66)

Rubber tube reinforced with cotton thread is made of inner rubber layer, cotton thread fabric layer and outer rubber layer. It can be used at working temperature of -15 - +35°C and under working pressure 5 - 15 kg/cm² to convey oxygen, ethynl, air and water.

Table 2-3-9 The physical-mechanical properties of rubber tube reinforced with cotton thread

Rubber layer	Physical-mechanical properties		
	Breaking strength (kg/mm²)	Breaking extension rate (%)	Ageing coefficience (70°C × 72 hours)
Inner rubber	50	350	0.80
Outer rubber	60	400	0.80

Table 2-3-10 The norms and dimensions of rubber tube reinforced with cotton thread

Inner diameter (mm)	Thickness of rubber layer (mm)		Working pressure (kg/mm^2)
	Inner layer	Outer layer	
5	>1.4	>1.2	5, 10, 15
6	>1.4	>1.2	
8	>1.4	>1.2	
10	>1.6	>1.2	
13	>1.6	>1.2	

6. Pressure Rubber Tube of Rubber-sandwich-cloth (HGB4005-60)

Table 2-3-11 The norms and dimensions of pressure rubber tube of rubber-sandwich-cloth

Uses	Inner diameter (mm)		Layer thickness no less than (mm)		Working pressure no higher than (kg/mm^2)	Rubber tube length
	Nominal dimension	Permitted con. diff.	Inner layer	Outer layer		permitted common difference
To convey gas, gasoline petroleum, lubricating oil, and dilute acid and basic solution	5	±0.5	1.5	1.0	5, 10, 15	The length of rubber pipe is under 10m, the common difference is ± 100mm. If length is over 10m, common difference is ± 200mm.
	6.5	±0.5	1.8	1.0	5, 10, 15	
	8	±0.5	1.8	1.0	5, 10, 15	
	9.5	±0.5	2.0	1.0	5, 10, 15	
	13	±1.0	2.0	1.0	5, 10, 15	
	16	±1.0	2.0	1.2	5, 10	
	19	±1.0	2.0	1.2	5, 10	
	25	±1.0	2.3	1.5	5, 10	
	32	±1.5	2.3	1.5	5, 10	
	38	±1.5	2.5	1.5	5, 10	
	51	±2.0	2.5	1.5	5, 10	
	64	±2.0	2.5	1.5	5, 8	
	76	±2.0	2.5	1.5	5, 8	

Continued

Uses	Inner diameter (mm)		Layer thickness no less than (mm)		Working pressure no higher than	Rubber pipe length
	Nominal dimension	Permitted com. diff.	Inner layer	Outer layer	(kg/mm²)	Permitted common difference
To convey water.	8	±0.5	1.2	0.8	5,10,15,20,25	The length of rubber pipe is under 10m, the common difference is ± 100mm. If length is over 10 mm, the common difference is ± 200mm.
	9.5	±0.5	1.2	1.0	5,10,15,20,25	
	13	±1.0	1.2	1.0	5,10,15,20,25	
	16	±1.0	1.2	1.0	5,10,15,20,25	
	19	±1.0	1.2	1.0	5,10,15,20,25	
	25	±1.0	1.6	1.2	5,10,15,20,25	
	32	±1.5	1.6	1.2	5, 10, 15, 20	
	38	±1.5	1.6	1.2	5, 10, 15	
	51	±2.0	1.6	1.2	5, 10, 15	
	64	±2.0	1.6	1.2	5, 10	
	76	±2.0	1.6	1.2	5, 10	
	89	±2.0	1.6	1.2	5	
	102	±3.0	2.0	1.5	3, 5	
	127	±3.0	2.0	1.5	3, 5	
	152	±3.0	2.0	1.5	3, 5	

Note: The length is suggested by consumer and has consent from the manufacturer.

7. High Pressure Rubber Tube With Steel Wire Reinforcement(HG4-406-66)

The high pressure rubber tube with steel wire reinforcement is high pressure oil resisting hose, which is composed of the inner rubber layer, the steel wire fabric layer, auxiliary cotton thread fabric layer, middle rubber layer and outer rubber layer. According to the difference of working pressure, there are three different types of structure: rubber tube with one layer of steel wire reinforcement; rubber tube with two layers of steel wire reinforcement and rubber tube with three layers of steel wire reinforcement. The tube can be used to convey engine oil, lubricating oil and air at working temperature of -30 ~ +120°C and working pressure of 10 ~ 200 kg/cm².

Table 3-3-12 The norms and dimensions of high pressure rubber tube with steel wire reinforcement 1

Nominal inner diameter		Thickness of rubber layer no less than		Outer diameter					
				Rubber tube with one layer of steel wire		Rubber tube with two layers of steel wire		Rubber tube with three layers of steel wire	
Standard	Common size	Inner rubber	Outer rubber	Standard	Common size	Standard	Common size	Standard	Common size
4	±0.3	1.5	1.0	15	±0.8				
5	±0.3	1.5	1.0	16	±0.8				
6	±0.3	1.5	1.0	17	±0.8	19	±0.8		
8	±0.3	1.5	1.0	19	±0.8	21	±0.8		
10	±0.3	1.5	1.0	21	±1.0	24	±1.0	25	±1.0
(12)	±0.3	1.5	1.0	23	±1.0	26	±1.0	27	±1.0
13	±0.3	1.5	1.0	24	±1.0	27	±1.0	28	±1.0
16	±0.5	1.5	1.0	27	±1.0	30	±1.0	31	±1.0
19	±0.5	1.5	1.0	30	±1.0	33	±1.0	34	±1.0
(20)	±0.5	1.5	1.0	31	±1.2	34	±1.2	35	±1.2
22	±0.5	1.5	1.0	33	±1.2	36	±1.2	37	±1.2
25	±0.7	2.0	1.0	37	±1.2	40	±1.2	41	±1.2
32	±0.7	2.0	1.0	44	±1.2	47	±1.2	48	±1.2
38	±0.7	2.0	1.0			53	±1.2	54	±1.2
45	±0.7	2.0	1.0			60	±1.2	61	±1.2
51	±0.7	2.0	1.0			66	±1.2	67	±1.2

(2) Plastic Materials and Their Products

1. Phenolic Plastic Material

The phenolic plastic material is a widely used thermosetting plastics. It has great toughness and lesser cold flowability. The molding temperature is high and has the characteristics of not softening and deforming at high temperature. The commonly used type of phenolic plastic material is unmodified plastics, which can be used to make plate, bar and tube. This unmodified plastics can be filled with different materials, such as paper filled plastics, cloth filled plastics and powder filled plastics. It can be used to make spare parts of various shapes. Phenolic plastics are widely used to make handles, switch button, shell and parts of electrical instruments. The cloth filled phenolic plastics are often used to make gearwheel, cam or other mechanical parts.

The specifications and norms of commonly used phenolic plastics plate can be seen in Table 3-3-13 and Table 3-3-14.

Table 2-3-13 The physical-mechanical properties of phenolic stratified plate

Brand	Physical-mechanical properties								Uses
	Specific gravity (g/cm^3)	Water absorptivity (g/dm^2)	Tensile strength (kg/mm^2) (diametral)	Bending Strength (kg/mm^2) (diametral)	Impact value perp. to plate ($kg.mm/mm^2$) (diametral)	Pressing strength (kg/mm^2) *Pp	Pressing strength (kg/mm^2) **Bp	Martens anti-heat (°C)	
3302-1	1.30~1.45	≤0.6	≥1000	≥1600	≥35	≥2500	≥1300	≥125	As structural material and making mechanical parts
3302-2	1.30~1.45	≤0.6	≥850	≥1450	≥35	≥2300	≥1300	≥125	

Translator's note: *Pp = perpendicular to the plate and **Bp = parallel to the plate

Table 2-3-14 The norms and dimensions of phenolic stratified plate

Thickness (mm)	The breadth (mm) no less than
0.5, 0.6, 0.8, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0, 2.3, 2.5, 2.8, 3.0, 3.3, 3.5, 3.8, 4.0, 4.3, 4.5, 5.0, 5.3, 5.5, 6.0, 6.3, 6.5, 7.0, 7.3, 7.5, 8.0, 8.5, 9.0, 9.5, 10.0, 10.5, 11.0, 11.5, 12.0, 12.5, 13.0, 13.5, 14.0, 14.5, 15.0, 16.0, 17.0, 18.0, 19.0, 20.0, 21.0, 22.0, 23.0, 24.0, 25.0, 26.0, 27.0, 28.0, 29.0, 30.0, 31.0, 32.0, 33.0, 34.0, 35.0, 36.0, 37.0, 38.0, 39.0, 40.0, 42.0, 45.0, 48.0, 50.0, 52.0, 55.0, 58.0, 60.0, 62.0, 65.0, 68.0, 70.0, 75.0, 80.0, 85.0, 90.0, 95.0, 100.0	600 × 400

2. Industry Organic Glass (HG2-343-66)

Industry organic glass is a semifinished plastics extruded into the shape of plate, bar or tube from polymethyl methacrylate with or without additional plasticizer. Its appearance is transparent, semi-transparent or non-transparent and it has color or no color. It is mainly used to make component parts which require a certain degree of transparency and strength, such as oil marker, oil line, oiler, equipment mark, shell and acid-base resisting vessel.

Table 2-3-15 The physical-mechanical properties of industry organic glass

Brinell hardness (kg/mm^2)		Impact strength ($kg \cdot mm/mm^2$)		Tensile strength (kg/mm^2)	Martens antiheat (°C)	Anti-crack	Transparency (colorless piece) (%)	
Color less	Colored	Color Less	Colored				Thickness less than 20mm	Thickness more than 20mm
18	14	12	10	600	65	ok	90	85

Table 2-3-16 The norms and dimensions of industry organic glass (mm)

Norms of plate			Norms of round bar		
Thickness	Permitted deviation (grade 1)	Permitted deviation (grade II)	Diameter	Diameter permitted deviation	Length
1.0	±0.20	±0.40	5~15	+10% -0.5	Over 300
2.0~3.0	±0.35	±0.60			
4.0~5.0	±0.50	±0.80	16~40	+1.5 -0.5	Over 300
6.0~7.0	±0.60	±0.90	41~100	+2.0 -1.0	Over 300
8.0~9.0	±0.70	±1.00			
over 10	±10%	±10%	Over 100	+2.5 -1.0	Larger than diameter

3. Polyvinyl-chloride

The polyvinyl-chloride is a widely used thermosetting plastics. It has high mechanical strength, good performance used in electric equipment and chemical stability. It can be used to make various kinds of seals and [illegible]

products, such as tube, rod, plate, welding bar and thin film by adding different amount of plasticizer and stabilizer in the resin. It can also be used to make pipeline, vessel, pump body and covering shell.

The properties and norms of polyvinyl-choride plate (HG2-62-65), hard polyvinyl-choride tube (HG2-63-65) and soft polyvinyl-choride tube and band (HG2-64-65) are respectively given in Table 2-3-17 through Table 2-3-20.

Table 2-3-17 The physical-mechanical properties of hard polyvinyl-choride plate

Physical-mechanical properties				Samples of Uses
Specific gravity (g/cm^3)	Tensile strength (kg/cm^2)	Bending strength (kg/cm^2)	Martens antiheat (°C)	
1.35~1.60	≥450~500	≥800~900	≥65	Making corrosion resisting and chemical industry construction material or used as building material.

Table 2-3-18 The norms and dimensions of hard polyvinyl-choride plate (m)

Nominal Thickness	Width	Length
2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, 8.5, 10, 12, 13, 14, 15, 16, 17, 20	≥400	≥500

Table 2-3-19 The physical-mechanical properties of hard polyvinyl-choride tube

Physical-mechanical properties								
Specific gravity (g/cm^3)	Corrosive-ness (g/m^2)	Tensile strength (kg/cm^2)		Dimension change rate (%)		Using pressure (kg/cm^2)		
		20°C	60°C	Length-wise	Diametral	Light tube	Heavy tube	
1.35~1.60	≤±2	300	100	≤±4	≤±2.5	6	10	To convey some kind of liquid and gas

Table 2-3-20 The norms and dimensions of hard polyvinyl-choride tube

Nominal diameter (mm)	External diameter (mm)	Light Type (working pressure kg/cm²)		Heavy Type (working pressure kg/cm²)		Length (m)
		Wall thickness (mm)	Approximate weight (kg/m)	Wall thickness (mm)	Approximate weight (kg/m)	
8	12.5			2.25	0.10	
10	15			2.5	0.14	
15	20	2	0.16	2.5	0.19	
20	25	2	0.20	3	0.29	
25	32	3	0.38	4	0.49	
32	40	3.5	0.56	5	0.77	
40	51	4	0.88	6	1.49	4
50	65	4.5	1.17	7	1.74	
65	76	5	1.56	8	2.34	
80	90	6	2.20			
100	114	7	3.30			
125	140	8	4.54			
150	166	8	5.6			
200	218	10	7.5			

Table 2-3-21 The physical-mechanical properties of soft ploryvinyl-chloride tube and band

Indication Name		Indication		
		Insulation cable tube, band and bond	Liquid protection tube	
Volume resistivity (ohm.cm) when at 20°C	≥	1×10^{14}	1×10^{10}	—
Volume resistivity(ohm.cm) when at 70°C	≥	1×10^{11}	—	—
Breakdown voltage strength (kv/mm)	≥	18	14	—
Tensile strength (kg/cm^2)	≥	180	100	100
Breaking-extension rate (%)	≥	200	150	150
Heading loss rate (160°C, 6hrs) (%)	≤	4.0	—	—
Cold resistance (°C)	≤	-50	-40	-30
Ageing performance:				
Heat ageing tensile strength remains rate(%)	≥	90	—	80
Heat ageing breaking-extension remains rate(%)	≥	70	—	80
Water absorptivity (%)	≤	0.3	1	1.5
Oil resistance:				
Oil resisting tensile strength remains rate(%)	≥	80	—	—
Oil resisting breaking-ext. remains rate (%)	≥	60	—	—
Water pressure test:		—	—	OK
Extension (70°C, 30 minutes, kg/cm^2) (cm)	≤	—	1.5	—
Combustion resistance		Flame does not spread and should be put off at once.	—	—

Table 2-3-22 The norms and dimensions of soft polyvinyl-chloride tube and band

Tube			Band			Liquid conveying tube		
Internal diameter (mm)	Tube wall thickness (mm)	* L (m)	Width (mm)	Thickness (mm)	* L (m)	Internal diameter (mm)	Tube wall thickness (mm)	Length (m)
1.0±0.2	0.3~0.5	2	10.0±1.0	0.5~0.8	2	—	—	—
1.5±0.25	0.3~0.5	2	15.0±1.0	0.5~0.8	2	—	—	—
2.0±0.25	0.3~0.5	2	15.0±1.0	1.35~1.65	2	—	—	—
2.5±0.25	0.3~0.5	2	20.0±1.0	0.8~1.0	2	—	—	—
3.0±0.25	0.3~0.5	2	20.0±1.0	1.35~1.65	2	3.0±0.25	3.1±0.6	10
3.5±0.25	0.3~0.5	2	40.0±1.0	0.8~1.0	2	—	—	—
4.0±0.25	0.5~0.7	2	50.0±1.0	1.35~1.65	2	4.0±0.25	3.1±0.6	10
4.5±0.25	0.5~0.7	2				—	—	—
5.0±0.25	0.5~0.7	2				5.0±0.25	3.2±0.6	10
6.0±0.3	0.5~0.7	2				6.0±0.3	3.2±0.6	—
7.0±0.3	0.5~0.7	2				7.0±0.3	3.2±0.6	10
8.0±0.5	0.5~0.7	2				8.0±0.5	3.2±0.6	10
9.0±0.5	0.5~0.7	2				9.0±0.5	3.3±0.6	10
10±0.5	0.6~0.8	2				10±0.5	3.9±0.6	10
12±0.5	0.6~0.8	2				12±0.5	3.9±0.6	10
14±0.5	0.6~0.8	2				14±0.5	3.9±0.6	10
16±0.8	0.8~1.0	2				16±0.8	3.9±0.6	10
18±0.9	1.0~1.3	2				—	—	—
20±1.0	1.0~1.3	2				20±1.0	3.9±0.6	10
22±1.0	1.0~1.3	2				—	—	—
25±1.0	1.0~1.3	2				25±1.0	3.9±0.6	10
28±1.0	1.3~1.5	2				—	—	—
30±1.3	1.3~1.5	2				—	—	—
34±1.3	1.3~1.5	2				34±1.3	4.7±0.8	10
36±1.3	1.3~1.5	2				36±1.3	4.7±0.8	10
40±2.0	1.5~2.0	2				40±2.0	4.7±0.8	10
						50±2.0	5±0.8	10

Note: The permitted pressure for liquid conveying tube: If the internal diameter is 3-10mm, pressure is 2.5kg/cm² and if the internal diameter is 12-50mm, the pressure is 2kg/cm².

4. Fluorinated Plastic Materials

The fluorinated plastic material is a general name of thermoplast. It has much better chemical stability, electric insulation, wider working temperature range, water resistance and lower coefficient of friction than other plastics. It is often used in powder through cold pressing and thermosetting to make shaped pieces, such as plate, bar and tube. The fluorinated plastics are widely used to make component parts of anti-corrosion, high insulation and tight sealing, such as sealing ring, bearing, piston ring and guideway. It can also be used to make component parts of very strong corrosion resistance and very high insulation strength.

The properties and norms of the commonly used teflon plate(HG2-537-67), bar (HG2-535-67), tube (HG2-536-67) and the filling products (HG2-538-65) of plate and tube are given in the Table 2-3-24 through Table 2-3-31.

Table 2-3-23 The physical-mechanical properties of teflon

Physical-mechanical properties									Samples of uses
Spec. w. (g/cm³)	Water absorp. (%)	Lin. exp. coeff. (1/°C)	Heat cond. coeff. (kcal/m·h·°C)	Tensil strength (20±2°C) (kg/cm²)	Break ext. (20±2°C) (%)	Surface resistance (Ω)	Volume resis. (Ω·cm)	Puncture resis. (kV/mm)	
2.1 ~2.3	<0.005	7.4×10⁻⁵	0.12	No combustion	140 ~240 (No quenching test) 160 ~260 (quenching test)	350 ~350 (No quenching test) 160 ~300 (quenching test)	9.7×10¹³	>10¹⁷	40	Mainly to manufacture anti-corrosion resisting and high temperature resisting component, such as filler, liner, cup ring, valve base and valve blade. Also making high temperature conveying corrosion medium pipeline, anti-corrosion lining, sampling pipe, gasket, packing, anti-corrosion ..., anti-... and be used as paint and to make porous filtering material.

Table 2-3-24 The physical-mechanical properties of teflon plate

Brand	Physical-mechanical properties			Samples of Uses
	Specific weight (g/cm^3)	Tensile strength (kg/cm^2)	Breaking ext.rate (%)	
SFB - 1 (die-pressed plate)	2.1~2.3	≥150	≥250	Die-pressed plate can be used to make liner working in various corrosive media at temperature of -180 - +250°C, sealing and anti-friction component parts, and various insulation parts used at different frequencies. The unilaterally extending plate is suitable to be used under 120°C. Before being used, it much undergo a heat treatment at temperature 25°C higher than working temperature so as to stabilize its dimensions. It is good to be used to make diaphragm used in corrosive media and view mirror.
SFB-2 (unilaterally pressed extending plate)	2.1~2.3	≥300	≥30	
SFB - 3 (machine pared plate)		≥180	≥150	

Table 2-3-25 The norms and dimensions of teflon plate (mm)

Thickness	Width	Length
1, 1.5, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 16, 18, 20, 22, 25, 30	250	250
1, 1.5, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 16, 18, 20, 25, 30	400	400
0.3, 0.5, 0.8	200	≥200, 500
0.5, 0.6, 0.7	60, 90, 120	≥150
0.8	60, 90, 120, 300	
1.0, 1.5	60	

Table 2-3-26 The physical-mechanical properties of teflon bar

Brand	Physical-mechanical properties			
	Specific weight (g/cm^3)	Tensile strength (kg/cm^2)	Relative elm. rate (%)	
SFEV - 1 (pushing pressed bar	2.1~2.3	≥100	≥100	Making liner working in various corrosive media, sealing and friction-reducing parts and electric insulation parts used at various temperatures.
SFEV - 2 (extruded bar)	2.1~2.3	≥100	≥50	
SFEV - 3 (die-pressed bar)	2.1~2.3			

Table 2-3-27 The norms and dimensions of teflon bar

(mm)

Diameter	Length
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 16	50, 200, 300
14, 16, 18, 20	100, 200
22, 24, 26, 28	80, 80, 100
30, 32, 34, 36, 38	100, 150
40, 42, 44, 46, 48, 50, 55, 60, 65, 70, 75, 80, 90, 100	100, 150, 200
140	70
170	100, 200

Table 2-3-28 The physical-mechanical properties of teflon tube

Brand	Physical-mechanical properties								Scopes of Uses
	Tensile strength (kg/cm²)	Elongation (%)	Hardness (Shore D)	Allowable working pressure (kg/cm²)					
				0.5	0.5~1	1~5	5~10	10~15	
SFG-1	200~300	400	60	6	8	10	12		Used for conveying various corrosive media, such as strong acid, strong alkali, aqua regia, organic solvent, etc. Can be used for a long time at temperature ranging from -180~+150°C.
SFG-2	200~300	150	60	6	8	10	12	15	
SFG-3	200~300	200							

Table 2-3-29 The name and dimensions of teflon tube

(mm)

Brand	Integral diameter	Wall thickness	Length
SFG-1 Pushing pressed tube (d = 0.5~1.0)	0.5, 0.6, 0.7	0.2	200~2000
	0.8, 0.9, 1.0	0.3	200~2000
	1.2, 1.4, 1.6, 1.8	0.2	200~1000
		0.3, 0.4	200~2000
SFG-2 Teflon pressed tube (d = 2.0~20)	2.0, 2.4, 2.6, 2.8, 3.0, 3.4, 3.6, 4	0.2	200~2000
		0.3	200~2000
		0.4	200~1000
		0.5, 1.0	200~2000
	4, 6, 7	0.5	200~1000
		1.0	200~
		1.5	200~1000
		2	200~1000
	8, 9, 10	1	200~1000
		1.5	200~1000
		2	200~1000
	11, 13	1, 1.5	100~1000
	15, 17, 19, 20, 25, 30	1.5, 2	100~500
SFG-3 Extruded tube	11, 18	Selected as required	≥100

Table 2-3-30 The physical-mechanical properties of teflon plate and her filler products

Brand	Physical-mechanical properties: Specific gravity (g/cm^3)	Tensile strength (kg/cm^2)	Break ext. rate (%)	Proportion of filler	Characteristics	Scope of use
SFT - 1	≥1.85	≥100	≥10	Filling 15% of graphite	To provide lubricity and mechanical strength	Gear, bush, sealing, anti-friction bearing, plate, valve seat, packing, anti-corrosive pipe and joint, working temperature -196 ~ 250°C.
SFT - 2	≥2.3	≥100	≥150	Filling 20% of glass powder	Good reflection resistance and abrasion stability but poor lubricity	
SFT - 3	≥3.0	≥120	≥200	Filling 40% of copper powder	Good reflection resistance and heat conductivity and glue stability	
SFT - 4	≥2.2	≥70	≥50	Filling 5% of graphite and 20% glass powder	Good reflection resistance; poor mechanical strength	

Table 2-3-31 The norms and dimensions of teflon plate and her filler products

The norms of teflon filler plate (mm)		The norms of teflon filler bar (mm)	
Thickness	Length x width	Diameter	Length
3, 5, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22	250 x 250	10, 14, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 55, 60	50, 80, 100

5. Cinnamene-Butadiene-Propenyl-cyanide Copolymer (ABS)

The ABS resin is composed of three elements. Cinnamene-Butadiene-Propenyl-cyanide. It has good comprehensive properties such as heat resistance, high surface hardness, dimension stability and performance with electricity and it is easy in shape-forming and cutting, so it is widely used to make blade wheel, bearing, shell and vessel.

Table 2-3-32 The physical-mechanical properties of Cinnamene-Butadiene-Propenyl-cyanide (ABS) copolymer

Physical-mechanical properties		Physical value			
		Super impact type	High strength medium impact	Low temp. impact type	Anti-heat type
Specific weight		1.05	1.07	1.02	1.06~1.08
Water absorptivity (24 hrs)	(%)	0.3	0.3	0.2	0.2
Thermal deformation(1.8kg/cm²)	℃	96	98	98	104~116
(18.6kg/cm²)		87	89	78~85	96~110
Linear expansion coef.	$\times10^{-5}$/℃	10.0	7.0	8.6~9.9	6.8~8.2
Combustibility(>1.27mm thickness)	mm/sec.	—	—	0.55	0.55
Tensile strength (ultimate)	kg/cm²	350	630	210~280	530~560
(yield)		—	—	210~280	530~560
Tensile elasticity modulus	$\times10^4$kg/cm²	1.8	2.9	0.7~1.8	2.5
Bending strength	kg/cm²	620	970	250~460	840
Bending elasticity modulus	$\times10^4$kg/cm²	1.8	3.0	1.2~2.0	2.5~2.6
Compression strength	kg/cm³	—	—	180~390	700
Hardness (Rockwell R)		100	121	62~88	108~116
Impact strength (with breach)	kg.cm/cm²			27~49	16~32
		—	—	21~32	11~13
		—	—	8.1~18.9	1.6~5.4
Load deformation(50℃,1/4kg/cm²)	(%)	—	—	—	0.4
Disruptive strength(short time)	kv/m	—	—	15.1~15.7	14.2~15.7
Volume resistance	ohm-cm	10^{16}	10^{16}	10^{16}	10^{16}
Dielectric coefficient (10^6 cps)		2.4~5.0	2.4~5.0	3.7	2.7~3.5
Dielectric loss (10^6 cps)		0.003~0.008	0.003~0.008	0.011~0.073	0.034
Arc resistance	sec.	50~85	50~85	70~80	70~80

6. Low Pressure Polythene

Low pressure polythene is a kind of thermosetting plastics. It has good electricity insulation performance, high chemical stability and good abrasive resistance. But it is soft so its mechanical strength is low. It can be used to make component parts of friction resisting and light load, anti-corrosion vessel, or pipeline, and it can also be used to spray over metal surface as a layer of anti-friction and anti-corrosion

Table 2-3-23 The physical-mechanical properties of low pressure polythene

Physical-mechanical properties		Numerical value
Specific weight		0.94~0.965
Water absorptivity	(%)	<0.01
Melting point	°C	120~130
Tensile strength (yield)	kg/cm²	220~390
(breaking)		150~160
Extension rate (breaking)	(%)	60~150
Tensile elasticity modulus	x 10² kg/cm²	0.84~0.95
Bending strength	kg/cm²	250~400
Impact strength		
(with breach)	kg.cm/cm²	7~8
(no breach)		>182
Compression strength	kg/cm²	225
Fatigue strength (10⁷ cycle)	kg/cm³	110
Heat resistance	°C	121~127
Embrittlement temperature	°C	-70
Linear expansion coefficient	x 10⁻⁵ / °C	12.6~16.2
Volume resistance	ohm/cm	10^{16}
(After soaking in water for 7 days)		10^{16}
Dielectric coefficient (10^2hertz)		2.3~2.38
Dielectric loss (10^2hertz)		0.0026~0.00023
Disruptive strength	kv/mm	26.1~28.4
(After soaking in water for 7 days)		26.1~27.2
Arc resistance	sec.	150

7. Polyamide (nylon)

Polyamide is generally called nylon and is widely used in spraying fiber-like. It has good mechanical property and fair heat resistance. Its working temperature can reach 120°C. It also has preservative function and operation

resistance, but it is easy to absorb water, which can affect the stability of its physical-mechanical properties and dimensions. Mostly it is used to make revolving parts of machine tool and related moving parts, such as gear, cam, blade wheel, bearing and sealing pad. Nylon powder can be used to spray the friction surface such as of guideway to prevent the abrasive resistance and sealing.

Nylon which is made by way of individual pouring is called MC nylon, one kind of polyamide plastics. Its forming technique is simple but its mechanical properties are better than other kinds of nylon. It is used to make pour-casting unit, large component parts, like bushing, bearing and guide way.

Table 2-2-3/ The physical-mechanical properties of nylon

Physical-mechanical property	Brand										
	Nylon6	N 7	N 8	N 9	N 11	N 12	N 1010	N 66	N 610	N 6/66	N 66/1010
Specific weight	1.13~1.16	1.10	1.08	1.05	1.04	1.09	1.04~1.06	1.14~1.1	1.08~1.09	1.11	
Tensile strength kg/cm²	640~780	550~600	270	580~650	578	450~600	520~550	670~830	4.0~600	340	470~440
Compression strength kg/cm²	600~900							900~1200	700~900		
Bending strength kg/cm²	700~1000	1000		800~850	600~760	460~870	470~490	1000~1150	700~1000		600~6.0
Impact strength (notched) kg.cm/c	3.1		1.0~8.0		3.5~4.8		4~5	3.0	3.5~5.5		
(no break)		125~150		250~300		110~120	>400				50~60
Extension rate (%)	150~250		400		60~230	230~240	100~250	60~200	100~210	280	
Elasticity modulus x10⁴kg/cm²	0.83~2.8		0.21	0.87~1.2	1.2		1.8	1.4~ 3.3	1.2~2.3		
Hardness (Rockwell R)	86~114				100~113			100~118	90~113		
(Ball) Kg/mm²					7.5		7.1				
Melting point °C	215~223	200	200~205	200~210	180~230	178	200~210	265	210~223	170 -171	170~224
Martin anti-heat °C	40~60			42~48	(38)		45	50~60	51~56		
Vicat anti-heat °C	160~180			>150	172 178		123 -190	220	150~20		
Specific heat kcal/kg.°C	0.4~0.5			0.49			0.5	0.4~0.5	0.4~0.5		
Heat cond. coeff. kcal/m.hr.°C	0.18~0.22							0.22~0.2	0.21~0.2		
Linear exp. coeff. x10⁻⁵/°C	7.8~8.7			8~12	11.4~12.4		10.5	9.1~10.0	8.0~12.0		
Water absorbed (%)	1.9~2.8			1.2		1.5	0.19	1.5	0.5	1.5	

Note: Due to the great water absorptivity, various properties of nylon 6,66 and 610 are different.

Table 2-3-35 The physical-mechanical properties of MC nylon and filled MC nylon

Physical-mechanical properties		Classification			
		No filling	Activator C.31	[illegible]	[illegible]
Tensile strength	kg/cm^2	916	897	890	904
Extension rate	(%)	20	20	28	24
Tensile elasticity modulus x 10^4	kg/cm^2	3.6	—	—	—
Bending strength	kg/cm^2	1586	1526	1547	1608
Compression strength	kg/cm^2	1068	1102	1115	1125
Impact strength (no breach)	$kg.cm/cm^2$	520~624	512	145	138
Martins heat resistance	°C	55	52	51	57
Hardness (Brinell)	kg/cm^2	21.3	19.6	18.8	18.7
(Rockwell)		91	87	88	89
Linear expansion coeff	x 10^{-5}/°C	8.3	8.2	7.6	7.9
Specific weight		1.160	—	1.162	1.165
Friction coefficient		0.45	0.42	0.50	0.45

Translator's note: *u = unit

7. Polyformaldehyde

Polyformaldehyde is a thermosetting engineering plastics of high strength. It has excellent physical-mechanical properties, dimension stability and good performance in friction loss, but there is a shortcoming that it can burn when it touches fire. It is widely used to substitute for metal and alloy and to make gear, cam wheel, turbine wheel, bearing and female screw.

Table 2-3-36 The physical-mechanical properties of polyformaldehyde

Physical-mechanical properties		Numerical value
Specific capacity	cm^3/kg	712
Formation shrink rate	(%)	2.5~2.8
Water absorption rate (24 hrs)	(%)	0.22
Linear expansion coefficient (0~40 °C)	x 10^{-5}/°C	9.0~11.0
Martins heat resistance	°C	57~62
Continuous heat resistance	°C	104
Thermal deformation temp.(1°.6kg/cm²)	°C	110
Embrittleness temperature	°C	-40
Combustibility		Combustibility lower-ing gradually
Shading effect		
Tensile strength	kg/cm^2	620
Tensile elasticity modulus	x10^4 kg/cm^2	2.8
Extension rate (yield)	(%)	12
(break)		60
Compression strength	kg/cm^2	1130
Compression elasticity modulus	x10^4 kg/cm^2	3.2
Bending strength	kg/cm^2	910
Bending elasticity modulus	x10^4 kg/cm^2	2.6
Impact strength (no breach)	$kg.cm/cm^2$	90~100
(with breach)		6.5
Dielectric coefficient (60 hertz)		3.8
(10^6hertz)		3.8
Dielectric loss (60 hertz)		0.004~0.005
(10^6hertz)		0.004~0.005
Volume resistance	ohm-cm	1×10^{14}
Dielectric strength	kv/mm	18.6

9. Polycarbonate

Polycarbonate is a thermosetting engineering plastics of good performance. Its physical-mechanical properties are higher than those of nylon or polyformaldehyde. It has high impact strength, excellent dimension stability and good heat resistance. It is often used to make gear, arch, machine wheel, worm, and wheel, pulley and bearing.

Table 2-3-3" The physical-mechanical properties of polycarbonate

Physical-mechanical properties		Numerical value
Tensile strength	kg/cm^2	660~700
Extension rate	(%)	100 左右
Tensile elasticity modulus	$\times 10^4 kg/cm^2$	2.2~2.5
Bending strength	kg/cm^2	1060
Compression strength	kg/cm^2	830~880
Impact strength (no breach)	$kg.cm/cm^2$	No breaking
(breach)		64~75
Rockwell hardness M		75
Brinell hardness	kg/mm^2	9.7~10.4
Martins heat resistance	°C	110~130
Melting point	°C	220~230
Thermal deformation temp.(18.6 kg/cm^2)	°C	130~140
Vicat heat resistance	°C	165
Brittleness temperature	°C	-100
Heat conducting coefficient	k-cal/m.hr. °C	0.166
Linear expansion coefficient	$\times 10^{-5}$/ °C	6~7
Combustibility		Self-extinguishing
Volume resistance (20°C)	ohm-cm	10^{16}
Dielectric coefficient (20°C)		3.0
(125°C)		3.1
Dielectric loss (20°C)		(6~7) $\times 10^{-4}$
(125°C)		4×10^{-4}
Disruptive strength	kv/mm	17~22

10. Polysulfone

Polysulfone is a brand new thermosetting engineering plastics. It has good mechanical properties and electric performance. Its thermal stability is high and its long time working temperature can reach 150-174°C. It can be used to make structural piece of high strength, high dimension stability, heat resistance and multi-cycle sterilization, so it is electric insulating piece.

Table 2-?-33 The physical-mechanical properties of polysulfone

Physical-mechanical properties		Numerical value
Specific weight		1.24
Water absorptivity (24 hrs)	(%)	0.12~0.22
Linear expansion coefficient	x10^{-5}/°C	5.0~5.2
Thermal deformation temperature(18.6kg/cm^2)	°C	174
Martins heat resistance	°C	156
Combustibility		Self-extinguishing
Tensile strength (yield)	kg/cm^2	856
Extension rate (yield)	(%)	5~6
Extension rate (ultimate)	(%)	20~100
Tensile elasticity modulus	x10^{4}kg/cm^2	2.5~2.8
Bending strength	kg/cm^2	1080~1270
Bending elasticity modulus(room temp.)	x10^{4}kg/cm^2	2.8
(150°C)		2.3
Compression strength	kg/cm^2	890~970
Shearing strength	kg/cm^2	495
Impact strength (no breach)	kg.cm/cm^2	230~370
(with breach)		7.0~8.1
Hardness (Rockwell M)		69
(Rockwell R)		120

(3) Asbestos and Asbestos Products

1. Rubber Asbestos Sheet (JC125-66)

Rubber asbestos board is a kind of sealing and lining material made mainly of asbestos and rubber. It can be used to seal water, saturated steam, air, gas, ammonia, basic liquid and other inert gas, at temperature 450°C and under pressure of 60 kg/cm^2.

Table 2-3-29 The conditions of using rubber asbestos sheet

Brand	Surface color	Conditions to use
XB450	Purple	Temp. 450°C, pressure under 60kg/cm^2
XB350	Red	Temp. 350°C, pressure under 40kg/cm^2
XB300	Gray	Temp. 300°C, pressure under 25kg/cm^2

Table 2-3-40 The physical-mechanical properties of rubber asbestos sheet

Brand	Specific weight (g/cm^3)	Reduction by heating (%) No less than	Ageing coeff. (100±2°C .24hrs)	Tensile strength (kg/cm²) Longitudinal	Lateral	Sealing test Temp. (°C)	Pressure (kg/cm^2)
XB450	1.5~2.0	20	>0.9	>450	>200	440~450	110~120
XB350				>300	>125	340~350	70~80
XB200				>170	>70	195~200	25~30

Table 2-3-41 The norms and dimensions of rubber asbestos sheet

Brand	Thickness (mm) Nominal dimension	Permitted difference	Length (mm)	Width (mm)
XB450	0.5, 1.0	±0.1	500, 620 1260, 1500	500, 620, 1000, 1260, 4000
	1.5, 2.0	±0.15		
	2.5, 3.0	±0.20		
XB350 XB200	0.8, 1.0	±0.1		
	1.5, 2.0	±0.15		
	2.5, 3.0	±0.20		
	3.5, 4.0, 4.5, 5.0, 5.5, 6.0	±0.25		

2. Oil-resistant Rubber Asbestos Sheet (JC539-65)

Oil-resistant rubber asbestos sheet is made mainly of asbestos, butadiene-nitrile and natural rubber. It is used to make oil feeding pipe for aeroengine gasoline, lubrication oil and the joint and equipment of cold gas system, and is also used as sealing and lining material at valve joint.

Table 2-3-42 The physical-mechanical properties of oil-resistant rubber asbestos sheet

Specific weight (g/cm^3)	Tensile strength (kg/cm^2)		Temperature (°C)	Pressure (kg/cm^2)
	Longitudinal	Lateral		
1.5-2.0	340	130	15-30	150

Table 2-3-43 The norms and dimensions of oil-resistant rubber asbestos sheet

Thickness (mm)		Length x width (mm)
Nominal dimension	Permitted difference	
0.4, 0.5, 0.6, 0.8, 1.0	±0.1	500×500 500×1100 1100×1100
1.2, 1.5, 2.0, 2.5, 3.0	±10%	

3. Asbestos Brake Band, Brake Friction Blade, and Clutch Friction Blade (manufactering mark 48-61, JC23-66 and JC124-66)

(1) Asbestos brake band is a band-shaped brake material made of asbestos fiber, cope or cloth immersed in cohersive agent and then through dry pressing. It is used on various auto-vehicles, machine speed-reducing and brake.

(2) Asbestos brake friction blade is a kind of friction blade made of asbestos fiber, wool or cloth and cohersive agent and other auxiliary materials and through mixed hot pressing. It is used on various auto-vehicles and mechanical equipment for braking and seed-reducing.

(3) Asbestos clutch friction blade is made by the same method as asbestos brake friction blade. It is used on auto-vehicles and clutch of various machines for transmitting power.

Table 2-3-44 The physical-mechanical properties of asbestos brake band, brake friction blade and clutch friction blade

Physical-mechanical properties	Classification: Asbestos brake friction blade	Asbestos clutch friction blade	Asbestos brake band		
			* an	** ab	*** no
Brinell hardness (kg/mm^2)	20~50	20~50			
Impact strength ($kg.cm/cm^2$) no less than	3.1	3.5			
Water absorptivity(%) thickns < 6mm no less than	2.0	2.0	17	10	5
thickness ≥ 6mm no more than			20	15	7
Oil absorptivity(%) thickns < 6mm no more than	1.0	1.0	15	20	5
thickness ≥ 6mm no more than			18	25	7
Friction coefficient 120±5°C	0.4	0.36	0.42	0.5	0.42
150-250°C	0.25	0.25			
250±5°C	0.25	0.25			
Friction loss (mm/30min) no more than					
120±5°C					
If avg friction coeff.=0.36-0.46	—	0.05			
If avg friction coeff.= over 0.46	—	0.075			
120±5°C					
If avg friction coeff.=0.4-0.5	0.06	—	0.05	0.075	0.075
If avg friction coeff.= over 0.5	0.075	—			
250±5°C					
If avg friction coeff.=0.25-0.35	0.16	0.15	—		
If avg friction coeff.= over 0.35	0.21	0.20			

Translator's note: *an = asbestos resin; **ab = asbestos rubber; and ***no = asbestos oil immersion

Table 2-3-45 The norms and dimensions of asbestos brake band, brake friction blade and clutch friction blade

Classification	Thickness (mm)	Width (mm)	Length (mm)
Asbestos brake band	4 - 12	12 - 200	[illegible]
Asbestos brake friction blade Asbestos clutch friction blade	Made according to the dimension of drawing paper (including asbestos brake band)		

4. Oil-immersed Asbestos Coil Root (石棉浸油盘根)

Oil-immersed asbestos coil root is knitted or twisted [illegible] oil and asbestos fiber immersed in graphite or copper [illegible] is used as packing material for [illegible]

stem as sealing material. The working media include steam, air, industrial water and products of heavy petroleum.

Table 2-3-46 The conditions of using oil-immersed asbestos coil root

Brand	Conditions of application
YS450	Steam temperature 450°C, pressure 60kg/cm²
YS350	Steam temperature 350°C, pressure 45kg/cm²
YS250	Steam temperature 250°C, pressure 45kg/cm²

Table 2-3-47 The physical-mechanical properties of oil-immersed asbestos coil root

Brand	Physical-mechanical properties						
	Density (g/cm^3)	Limiting pressure (kg/cm²)	Ultimate temp. (°C)	Content of immersion agent (oil and graphite) (%)	Reduction by heating (no immersion agent) (%)	Lubrication oil flashing point used by coil root (°C)	Of steel corrosion test
YS450	>0.9 (*r >1.1)	60	450	25~45	>21	>300	Qualified
YS350		45	350	25~45	>24	>240	
YS250		45	250	25~45	>32	>215	

Translator's note: *r = reinforced with corner wire.

Table 2-3-47 The norms and dimensions of oil-immersed asbestos coil root

Brand	Shape	Norms (diameter or side length of square) (mm)
YS450 YS350 YS250	F	3, 4, 5, 6, 8, 10, 13, 16, 19, 22, 25, 28, 32, 35, 38, 42, 45, 50
	Y	5, 6, 8, 10, 13, 16, 19, 22, 25, 28, 32, 35, 38, 42, 45, 50
	N	3, 5, 6, 8, 10, 13, 16, 19, 22, 25

Note: 1. Each brand of oil-immersed asbestos coil root includes three different kinds: square, round and twisted, and they are indicated by the following symbols:
F - square, hollow or knitted by one or multi-layer. Y - round, there is a twisted core in the middle and the outside is knitted by one or multi-layer. N - twisted
2. Those which are reinforced with copper wire are indicated by a letter "T" in parentheses after the specification.

5. Rubber Asbestos Coil Root (JC67-64)

Rubber asbestos coil root is made by pressing into square shape after rolling or knitting using asbestos cloth or asbestos fiber and using rubber as cohesion agent, and its outside is painted with sealing material of high carbonic graphite. It can be used as sealing material to under the [illegible] and temperature under 450°C on steam engine, piston of double-action pump, valve stem and boiler inlet hole.

Table 2-3-48 The conditions of using rubber asbestos coil root

Brand	Condition of application
[illegible]	[illegible]

AD-A100 576 FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OH F/6 15/5
HANDBOOK OF EQUIPMENT REPAIR,(U)
MAY 81
UNCLASSIFIED FTD-ID(RS)T-0685-80 NL



END
DATE FILMED
7-81
DTIC

Table 2-3-50 The physical-mechanical properties of rubber asbestos coil root

Brand	Physical-mechanical properties			
	Specific weight (g/cm^3)	Elasticity	Of steel corrosion test	Reduction by heating (%)
XS450	1.10	With a certain elasticity	CK	<27
XS350				<32
XS250				<40

Table 2-3-51 The norms and dimensions of rubber asbestos coil root

Brand	Side length (mm)
XS450	3, 4, 5, 6, 8, 10, 13, 16, 19, 22, 25, 28, 32,
XS350	35, 38, 42, 45, 50
XS250	

(4) Wool Blanket for Industrial Use (FJ314-66)

The wool blanket for industrial use can be classified into rough wool blanket, semi-rought wool blanke and fine wool blanket. According to the different component part made of wool blanket, it can also be classified into:

Oil sealing wool blanket -- used to make oil sealing to sustain the lubrication oil at the friction spot and prevent water and dust from coming in.

Insulating wool blanket -- used to make gasket between metal surfaces to prevent corrosion, friction damage and to reduce impact of shock.

Filtering wool blanket -- used as filter of oil and other liquids

Table 2-3-52 The physical-mechanical properties of wool blanket for industrial use

	Brand	Physical-mechanical properties									
		Specific weight (g/cm^3)		Breaking strength (kg/cm^2) ≥	Breaking ext. rate (%) ≤	Free sulphuric acid content (%) ≤	Vegetable foreign matter content (%) ≤	Mineral foreign matter content (%) ≤	Capillary action (if thickness <10 mm) mm ≥		
									5m	10m	20m
Fine wool blanket	112-44	0.44		50	90	0.30	0.35	0.12	—	—	—
	112-41	0.41		47	105	0.30	0.35	0.12	—	—	—
	112-39	0.39		45	110	0.30	0.40	0.12	—	—	—
	112-36	0.36		35	115	0.30	0.40	0.12	—	—	—
	112-32	0.32	±0.02	25	120	0.30	0.40	0.12	—	—	—
	112-30	0.30		—	—	0.15	0.35	0.12	35	40	45
	112-25	0.25		—	—	0.15	0.35	0.12	35	40	45
	112-14	0.14		—	—	—	0.50	—	—	—	—
	112-09	0.09		—	—	—	0.50	—	—	—	—
Semi-rough wool blanket	122-38	0.38		40	95	0.40	0.60	0.15	—	—	—
	122-36	0.36		30	—	0.40	—	—	—	—	—
	122-34	0.34		25	110	0.40	0.60	0.15	—	—	—
	122-30	0.30	±0.02	25	125	0.40	0.60	0.15	—	—	—
	122-24	0.24		—	—	0.15	0.50	0.15	25	35	45
	222-36	0.36		—	—	0.40	—	—	—	—	—
	222-34	0.34		—	—	0.40	—	—	—	—	—

Table 2-3-53 The norms and dimensions of wool blanket for industrial use

Nominal dimension	Dimensions (m) Permitted difference: Fine wool blanket	Semi-rough wool blanket	Rough wool blanket	Width (m)	Length (m)
2	±0.5	—	—	0.5~1.9	1~5
3	±0.5	—	—		
4	±1	—	—		
6	±1.5	±2	—		
8	±1.5	±2	±2		
10	±1.5	±2	±2		
12	±2	±2.5	±2.5		
14	±2	±2.5	±2.5		
16	±2	±2.5	±2.5		
18	±2	±2.5	±3		
20	±2	±2.5	±3		

(5) Sealing Materials

Sealing material must have good adhesive strength to metal or non-metal with which it contacts. Various kinds of sealing materials respectively show good sealing ability and temperature resisting, water resisting and oil resisting performances.

Sealing materials can be generally classified into:

(1) Sulphidized sealing glue:

1) Creamy sealing glue -- using injecting gun to inject or to clean the surface to spread the glue on or adding solvent to make thin sealing glue, which can be spread by using a brush to make seam or surface sealing.

2) Sealing glue liquid -- to make sealing by pouring into or spreading on with a brush.

3) Sealing gasket -- used only to seal seams.

(2) Non-sulphidized sealing compound

1) Sealing compound -- using squeezer to squeeze out various cross-section shaped compound to make sealing.

2) Sealing compound cloth belt -- being used independently or together with sealing compound.

Sealing glue and sealing compound can be used independently or used together. When the location which needs to be sealed shows poor adhesive strength, it should be first painted with some adhesive agent and then applied sealing material.

Sealing compound is widely used in machine repair, and it can seal the joints and in between parts to prevent oil, gas and water leaking.

Table 2-3-54 The proportion of sealing materials

Brand	Adhesion performance	Sealing performance	Other performance	Technical performance	Main uses
1701 sealing compound HG6-496-67	Tensile strength (kg/cm²) and rate of (% alloy) [illegible]	Separation of steel from sealing at temp. -60~200°C	Softness 15/20cm, Cold resisting, at -60°C it will not break nor crack. Heat resisting, at 200°C, cable avg.dia. no less than 15cm	Used in shape of less than pressure used Used with 1601 sealing compound to be cut into steel rods. Do sulphidize. Use.	Be used about [illegible] Cables.
1601 sealing compound HG6-496-67			Thickness (cm) Single glue spread 0.25-0.35 Double-side spread 0.30-0.40 Completion of sulphidized glue	Glue used together with 1601 sealing compound	
5001 sealing material HG6-496-67	Tensile strength (kg/cm²) and [illegible] [illegible] 60-200°C after 2 hours at 25-40°C sulphidizing for 30 days(cm) [illegible]	Separation steel from sealing at -60~60°C	Tensile strength (kg/cm²) Room temp. -60~-40°C Elongation rate(%) Room temp. -200~-40°C	Glue used, it is [illegible] and compound of which the quantity is 2 [illegible]	Sealing [illegible]

Continued

Seal	Adhesion sealing area	Sealing performance	Other properties	Technical [illegible]	Main uses
102 sealing compound	Shearing strength (kg/cm²) and method 21.T. >0.18	Corrosion after sealing at -50°C -60°C load sealing 0.5p (low sealing load)	Softness Type A 2-6 sec, Type B 2-11 sec, Type C 3-16 sec. Cold resistance -35°C no breaks, Oil resistance <3% Water resistance 21.T. <3% Good corrosion resistance.	[illegible]	[illegible]
121-17 sealing compound and sealing compound	Shearing strength (kg/cm²) and adhesion 21.T. >0.1	Corrosion after sealing at -60-150°C	Elasticity 30-70 sec Cold resisting at -40°C no crack nor breaking Heat resisting at 100±2°C for 70 hrs, on the cable body of 20cm cable length, no looseness nor blister.	[illegible]	[illegible]
[illegible]	Shearing strength (kg/cm²) and adhesion 20-30°C resistance for 2-10 days or 100°C resistance for 8 [illegible]	Corrosion after sealing in the rate of -60-150 °C and [illegible] of -60-130°C.		[illegible]	[illegible]

Continued

Brand	Vibration resistance	Sealing performance	Other performance	Technical performance	[illegible]
6-1 high temperature sealing compound	Bonding strength (kg/cm^2) and stainless steel, hard titanium K_1C > 11	Base plate rivet seam and welding structure sealing at -60 ~ 250°C	Tensile strength (kg/cm^2) > 15 Elongation (%) > 100 Embedment temp. (°C) no higher than -65 Elasticity 0.5 ~ 0.3	Squeezed out the sealant used to clear with sealing compound cloth or to clean [illegible]	[illegible]
Polysulfide elastomer sealing glue	Peeling strength (kg/cm^2) and Al, 20-70°C anhydrous for 6 days (24 hrs) -50°C -- 2.5 -20°C -- 3.5 20°C -- 0.5	Corrosion sealing of mounted dead load and vibration load structure -60~80°C	Aging resisting And oil resisting	Cold, [illegible] of sealing seam or injection or injection time to be used or after hours to expand 20-70°C anhydrous for 6 days (24 hrs)	Sealing for control [illegible]

A List of Tables
(Substitute for Index)

Table 2-1-1 The chemical symbols of the brands of steel products 1

Table 2-1-2 The symbols of uses, smelting methods and pouring methods of steel products 1

Table 2-1-3 The methods of indicating the brand of steel products 2

Table 2-1-4 A constractive table of the old and new standards of using symbols to indicate the brand of steel products 10

Table 2-1-5 The mechanical properties and uses of general carbon steel 11

Table 2-1-6 The chemical composition, mechanical properties and uses of high quality carbon construction steel 15

Table 2-1-7 The chemical composition, mechanical properties and uses of easy-to-cut construction steel 27

Table 2-1-8 The chemical composition of general low alloy construction steel 28

Table 2-1-9 The mechanical properties of general low alloy construction steel 29

Table 2-1-10 The uses of general low alloy steel 31

Table 2-1-11 The chemical composition of alloy construction steel 33

Table 2-1-12 The mechanical properties of alloy construction steel 43

Table 2-1-13 The uses of alloy construction steel 50

Table 2-1-14 The chemical composition of carbon tool steel 56

Table 2-1-15 The hardness of carbon tool steel 57

Table 2-1-16 The uses of carbon tool steel 58

Table 2-1-17 The chemical composition of alloy tool steel 59

Table 2-1-18 The hardness of carbon tool steel 62

Table 2-1-19 The uses of alloy tool steel 64

Table 2-1-20 The chemical composition and hardness of high speed tool steel 67

Table 2-1-21 The uses of high speed tool steel 68

Table 2-1-22 The chemical composition, mechanical properties and uses of hot rolled flat and screw spring steel 69

Table 2-1-23 The chemical composition of stainless and anti-acid steel 73

Table 2-1-24 The mechanical properties of stainless and anti-acid steel 74

Table 2-1-25 The uses of stainless and anti-acid steel 75

Table 2-1-26 The chemical composition of heat resisting and blisterless steel 76

Table 2-1-27 The mechanical properties of heat resisting and blisterless steel 78

Table 2-1-28 The properties and uses of heat resisting and blisterless steel 80

Table 2-1-29 The chemical composition of chrome bearing steel 82

Table 2-1-30 The properties and uses of chrome bearing steel 82

Table 2-1-31 The commonly used heat treatment methods of steel 83

Table 2-1-32 The symbols of steel heat treatment methods 84

Table 2-1-33 The heat treatment norms and substitute materials of steel 85

Table 2-1-34 The mechanical properties and uses of gray iron casting (GB976-67) 101

Table 2-1-35 The mechanical properties of gray iron casting (JB297-62) 103

Table 2-1-36 The mechanical properties and uses of spheroidal graphitic cast iron piece 104

Table 2-1-37 The mechanical properties and uses of forgeable cast iron piece 105

Table 2-1-38 The mechanical properties and uses of heat-resisting cast iron piece 106

Table 2-1-39 The chemical composition, mechanical properties and uses of carbon steel casting 108

Table 2-1-40 The norms and dimensions of rolled thin steel plate 109

Table 2-1-41 The norms and dimensions of hot-rolled thick steel plate 111

Table 2-1-42 The theoretical weight of steel plate 112

Table 2-1-43 The norms and dimensions of hot-rolled round steel and square steel 113

Table 2-1-44 The norms and dimensions of hot-rolled hexagonal steel 115

Table 2-1-45 The norms and dimensions of cold draw round steel 116

Table 2-1-46 The norms and dimensions of cold-draw square steel 117

Table 2-1-47 The norms and dimensions of cold-draw hexagonal steel 118

Table 2-1-48 The norms and dimensions of hot-rolled flat steel 119

Table 2-1-49 The norms and dimensions of hot-rolled equilateral angle steel 120

Table 2-1-50 The norms and dimensions of hot-rolled uneqilateral angle steel 126

Table 2-1-51 The norms and dimensions of hot-rolled general channel steel 129

Table 2-1-52 The norms and dimensions of hot-rolled light channel steel 131

Table 2-1-53 The norms and dimensions of hot-rolled general I steel 132

Table 2-1-54 The norms and dimensions of hot-rolled light I steel 134

Table 2-1-55 The norms and dimensions of crane steel runway 135

Table 2-1-56 The norms, dimensions and materials of steel rial 136

Table 2-1-57 The norms and dimensions of electric-welding steel pipe 139

Table 2-1-58 The norms and dimensions of water and gas feeding steel pipe 141

Table 2-1-59 The norms and dimensions of hot-rolled seamless steel pipe 143

Table 2-1-60 The norms and dimensions of cold-draw (cold-rolled) seamless steel pipe 146

Table 2-1-61 The norms and dimensions of boiler-use seamless steel pipe 151

Table 2-1-62 The norms, dimensions and mechanical properties of carbon spring steel wire 152

Table 2-1-63 The norms and dimensions of spring steel wire for important use 154

Table 2-1-64 The mechanical properties of spring steel wire for important use 155

Table 2-1-65 A comparison of China's principal steel grades with those of other countries 190

Table 2-1-66 The marks of steel material painting 197

Table 2-2-1 The commonly used names and symbols of non-ferrous metal and alloy 200

Table 2-2-2 The names and symbols of non-ferrous metal and alloy for special use 201

Table 2-2-3 The names and symbols of non-ferrous metal products condition 201

Table 2-2-4 Methods of indicating the brand of non-ferrous metal and alloy products 202

Table 2-2-5 The chemical composition and uses of products from pure copper processing 204

Table 2-2-6 The chemical composition and uses of cast brass 205

Table 2-2-7 The mechanical properties of cast brass 207

Table 2-2-8 The chemical composition and uses of products from brass processing 208

Table 2-2-9 The chemical composition and uses of cast bronze 212

Table 2-2-10 The chemical composition and uses of products from bronze processing 213

Table 2-2-11 The chemical composition of cast aluminium alloy 217

Table 2-2-12 The mechanical properties and uses of cast aluminium alloy 218

Table 2-2-13 The chemical composition, mechanical properties and uses of tin-base bearing alloy 219

Table 2-2-14 The norms and dimensions of round, square and hexagonal drawn copper bar 220

Table 2-2-15 The mechanical properties of round, square and hexagonal drawn copper bar 220

Table 2-2-16 The norms and dimensions of round, square and hexagonal drawn brass bar 220

Table 2-2-17 The mechanical properties of round, square and hexagonal drawn brass bar 221

Table 2-2-18 The norms and dimensions of round, square and hexagonal drawn silcon bronze bar 222

Table 2-2-19 The mechanical properties of round, square and hexagonal drawn silcon bronze bar 222

Table 2-2-20 The norms and dimensions of cold rolled copper plate and bar 223

Table 2-2-21 The mechanical properties of cold rolled copper plate and bar 223

Table 2-2-22 The norms and dimensions of cold rolled brass plate and bar 224

Table 2-2-23 The norms and dimensions of cold rolled brass band 225

Table 2-2-24 The mechanical properties of cold rolled brass plate and band 225

Table 2-2-25 The kinds of aluminum and aluminum alloy plate 226

Table 2-2-26 The mechanical properties of aluminum and aluminum alloy plate which cannot be strengthened through heat treatment 227

Table 2-2-27 The mechanical properties of aluminum and aluminum alloy plate which can be strengthened through heat treatment 228

Table 2-2-28 The mechanical properties of aluminum and aluminum alloy hot-rolled plate 229

Tabel 2-2-29 The norms and dimensions of extruded copper pipe 230

Table 2-2-30 The norms and dimensions of drawn copper pipe 232

Table 2-2-31 The norms and dimensions of extruded brass pipe 236

Table 2-2-32 The norms and dimensions of drawn brass pipe 238

Table 2-2-33 A comparison of China's principal non-ferrous metal and alloy brands with those of other countries 240

Table 2-3-1 The characteristics and working conditions of rubber material 244

Table 2-3-2 The physical-mechanical properties of rubber 245

Table 2-3-3 The physical-mechanical properties of rubber sheet for industry use 246

Table 2-3-4 The norms and dimensions of rubber sheet for industry use 247

Table 2-3-5 The physical-mechanical properties of rubber strip 249

Table 2-3-6 The norms and dimensions of rubber strip 249

Table 2-3-7 The physical-mechancial properties of general all-rubber tube 250

Table 2-3-8 The norms and dimensions of all-rubber tube 250

Table 2-3-9 The physical-mechanical properties of rubber tube reinforced with cotton thread 250

Table 2-3-10 The norms and dimensions of rubber tube reinforced with cotton thread 251

Table 2-3-11 The norms and dimensions of pressure rubber tube of rubber-sandwich-cloth 251

Table 2-3-12 The norms and dimensions of high pressure rubber tube with steel wire reinforcement 253

Table 2-3-13 The physical-mechanical properties of phenolic stratified plate 254

Table 2-3-14 The norms and dimensions of phenolic stratified plate 254

Table 2-3-15 The physical-mechanical properties of industry organic glass 255

Table 2-3-16 The norms and dimensions of industry organic glass 255

Table 2-3-17 The physical-mechanical properties of hard polyvinyl-choride plate 256

Table 2-3-18 The norms and dimensions of hard polyvinyl-chroide plate 256

Table 2-3-19 The physical-mechanical properties of hard polyvinyl-choride tube 257

Table 2-3-20 The norms and dimensions of hard polyvinyl-choride tube 257

Table 2-3-21 The physical-mechanical properties of soft polyvinyl-choride tube and band 258

Table 2-3-22 The norms and dimensions of soft polyvinyl-choride tube and band 259

Table 2-3-23 The physical-mechanical properties of teflon 260

Table 2-3-24 The physical-mechanical properties of teflon plate 261

Table 2-3-25 The norms and dimensions of teflon plate 261

Table 2-3-26 The physical-mechanical properties of teflon bar 262

Table 2-3-27 The norms and dimensions of teflon bar 262

Table 2-3-28 The physical-mechanical properties of teflon tube 263

Table 2-3-29 The norms and dimensions of teflon tube 263

Table 2-3-30 The physical-mechanical properties of teflon plate and bar filler products 264

Table 2-3-31 The norms and dimensions of teflon plate and bar filler products 264

Table 2-3-32 The physical-mechanical properties of cinnamene-butadiene-propenyl-cyanide (ABS) copolymer 265

Table 2-3-33 The physical-mechanical properties of low pressure polythene 266

Table 2-3-34 The physical-mechanical properties of nylon 267

Table 2-3-35 The physical-mechanical properties of MC nylon and filled MC nylon 268

Table 2-3-36 The physical-mechanical properties of polyformaldehyde 269

Table 2-3-37 The physical-mechanical properties of polycarbonate 270

Table 2-3-38 The physical-mechanical properties of polysuflone 271

Table 2-3-39 The conditions of using rubber asbestos sheet 271

Table 2-3-40 The physical-mechanical properties of rubber asbestos sheet 272

Table 2-3-41 The norms and dimensions of rubber asbestos sheet 272

Table 2-3-42 The physical-mechanical properties of oil-resistant rubber asbestos sheet 273

Table 2-3-43 The norms and dimensions of oil-resistant rubber asbestos sheet 273

Table 2-3-44 The physical-mechanical properties of asbestos brake band, brake friction blade and clutch friction blade 274

Table 2-3-45 The norms and dimensions of asbestos brake band, brake friction blade and clutch friction blade 274

Table 2-3-46 The conditions of using oil-immersed asbestos coil root 275

Table 2-3-47 The physical-mechanical properties of oil-immersed asbestos coil root 275

Table 2-3-48 The norms and dimensions of oil-immersed asbestos coil root 276

Table 2-3-49 The conditions of using rubber asbestos coil root 276

Table 2-3-50 The physical-mechanical properties of rubber asbestos coil root 277

Table 2-3-51 The norms and dimensions of rubber asbestos coil root 277

Table 2-3-52 The physical-mechanical properties of wool blanket for industrial use 278

Table 2-3-53 The norms and dimensions of wool blanket for industrial use 278

Table 2-3-54 The properties of sealing materials 280