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# National standards of the People's Republic of China

**GB/T 1299—2014**
Instead of GB / T 1299—2000.GB/T 1298- -2008

# tool and mould steel

**Tool and mould steels**

2014-12-05 Release 2 0 1 5-0 9-0 1 implementation

General Administration of Quality Supervision, Inspection and Qua ran

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# preface

This standard is drafted according to the rules given in GB / T 1.1-2009.
This standard replaces GB / T1299-2000 Alloy Tool Steel and GB / T 1298-2008 Carbon Tool Steel. The main changes of this standard from GB / T 1299-2000 are as follows:

—— The standard name is modified to "Work Die Steel";

—— The maximum diameter or side length of forged round steel and square steel to 800 mm; the maximum size of hot rolled flat steel to 200 mm (thickness) 850 mm (width); the maximum size of forged flat steel to 1000 mm (thickness) 1500 mm (width):

——— Modified the delivery length and allowable deviation of hot rolled round steel and square steel; —— modified the size, shape and allowable deviation of hot rolled flat steel;

—— Modified the dimensions and allowable deviation regulations of forged round steel, square steel and flat steel;

—— Add steel size, shape and allowable deviation of hot rolled strip, silver bright steel bar and machining delivery; —— Add delivery weight regulation:

—— Added non-alloy steel for die steel and steel for roll;

—— Add 55 grades and related technical requirements, including: T7, T8, T 8 Mn, T9, T10, T11, T12, T13 and other 8 non-alloy steel (i. e. the original GB / T 1298-2008 standard middle grade).6CrW 2SiV Steel for 5 rollers for impact resistance tools, including 9 Cr 2 V, 9Cr2Mo, 9Cr2MoV, 8Cr3NiMoV, 9Cr5NiMoV, MnCrWV, 7CrMn2Mo, 5Cr8MoVSi, Cr8Mo2VSi, W6Mo5Cr4V2, Cr 8, Cr12W, 7Cr7Mo2V2Si and other 8 cold-working mold steel, 4CrNi4Mo, 4Cr2NiMoV, 5CrNi2MoV, 5Cr2NiMoVSi, 4Cr5MoWVSi, 5Cr5WMoSi, 4Cr5Mo2V, 3Cr3Mo3V, 4Cr5Mo3V, 3Cr3Mo3VCo3 And other 10 hot-making mold steel;

SM45、SM50、SM55、4Cr2Mn1M oS 、8Cr2MnWMoVS 、5CrNiMnMoVSCa 、2CrNiMoMnV、

06Ni6CrMoVTiAI, 2CrNi3Mo Al, 1Ni3MnCuMoAI, 00Ni18Co8Mo5TiAI, 2Cr13,4Cr13,4Cr13NiVSi, 2Cr17Ni2,3Cr17Mo, 3Cr17NiMoV, 9Cr18,9Cr18MoV, et al. 19 plastic die steel 2Cr25Ni20Si2,0Cr17N i4Cu4Nb, Ni25Cr15Ti2MoMn , Ni53Cr19Mo3TiNb and other 4 special purpose mold steel:

—— Cancel allowable deviation of chemical composition of finished steel:

—— Modified the provisions on phosphorus, sulfur and other residual elements in steel; —— modified the provisions of steel delivery status:

——— Modified the qualification level of steel low tissue and added the inspection method of electric slag refused steel; ——— tightened the qualification grade of round steel and square steel:

____Added test requirements for nonmetallic inclusions:

____Added ultrasound test regulations:

——— Strict steel surface quality requirements. And added the silver bright steel bar and machining steel rod surface quality requirements;

——— Appendix A (normative appendix) added non-alloy steel "bead body organization standard rating chart and mesh carbide standard rating chart" (i. e. GB / T 1298- -2008 appendix A);

——— Revised "Domestic and foreign standard number control table of industrial die steel", and adjusted from Appendix B (informative appendix) to Appendix D (informative appendix):

——— Annex B (Normative Annex) "Test Method" (i. e. Annex B in GB / T 1298- -2008. At the same time, the sample sampling location is specified to GB / T 225):

——— Annex C (informative appendix) "Main features and uses of each sign".

This standard is put forward by the China Iron and Steel Association.

This standard is centralized by the National Technical Committee of Steel Standardization (SAC / T C 183).

The main drafting units of this standard: Fushun Special Steel Co., LTD., Steel Research Institute, Metallurgical Industry Standard Information Research Institute.

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Previous releases of this standard are:

——GB/T 1299—1977.GB/T 1299—1985.GB/T 1299—2000:

——-GB/T 1298—1977.GB/T 1298—1986.GB/T 1298—2008

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# tool and mould steel

## 1 Range

This standard specifies the classification, order content, size, shape, weight and allowable deviation, technical requirements, test methods, inspection rules, packaging, marking and quality certificate of work and die steel.

This standard is applicable to industrial mold steel hot rolling, forging, cold drawing, silver bright strip steel and machining delivery steel, and its chemical composition is also applicable to ingot, broken and its products.

## 2. Normative references to the reference documents

The following documents are essential for the application of this document. For all dated references, the dated version only applies to this document. The latest version (including all amendments) applies to this document.

| | |
|---|---|
| GB/T 223.5 | Determination of silicon and all silicon content of prototype silicon molybdate spectrophotometric method |
| GB/T 223.8 | Steel and Alloy Chemical Analysis-Sodium Fluoride separation-EDTA titration method for determination of aluminum content |
| GB/T 223.11 | Determination of steel and alloy chromium content by visible titration or potential titration |
| GB/T 223.13 | Steel and alloy chemical analysis method Determination of vanadium content by ammonium ferrous sulfate titration |
| GB/T 223.14 | Chemical analysis methods for steel and alloys — Determination of vanadium content by tantalum reagent |
| GB/T 223.18 | Chemical analysis methods for steel and alloys — Sodium thiosulfate separation-iodine measurement method to determine copper quantity |
| GB/T223.19 | Chemical analysis methods for steel and alloys — Determination of copper content by photometric extraction of trichloromethane |
| GB/T223.22 | Chemical analysis methods for steel and alloys — Determination of cobalt content by spectrophotometric method of nitroso-R salt |
| GB/T 223.23 | Determination of steel and alloy nickel content by butadione oxime spectrophotometry |
| GB/T 223.26 | Determination of steel and alloy molybdenum content by thiocyanate spectrophotometric method |
| GB/T 223.28 | Method for chemical analysis of steel and alloy determination of molybdenum by α -benzooxime weight |
| GB/T 223.29 | Determination of lead content in steel and alloy carrier precipitation-crethanol orange spectrophotometric method |
| GB/T 223.31 | Determination of arsenic content in steel and alloy: distillation and separation-molybdenum blue spectrophotometric method |

| | |
|---|---|
| GB/T223.43 | Determination of steel and alloy tungsten content by weight method and spectrophotometry method |
| GB/T 223.47 | Methods for steel and alloy chemical analysis: Determination of antimony by carrier precipitation-molybdenum blue photometry |
| GB/T 223.48 | Chemical analysis of steel and alloy: Determination of bismuth by orange photometry |
| GB/T 223.50 | Steel and alloy chemical analysis: Phenyl fluorescent ketone-hexadecyltrimethylamine bromide was measured by direct photometry |

Tin quantity

| | |
|---|---|
| GB/T 223.53 | Chemical analysis of steel and alloy: Measurement of copper content by flame atomic absorption spectrophotometry |
| GB/T 223.54 | Methods for chemical analysis of steel and alloy; determination of nickel content by flame atomic absorption spectrophotometry |
| GB/T 223.58 | Methods for steel and alloy chemical analysis of sodium arsenite-sodium nitrite titration |
| GB/T 223.59 | Determination of steel and alloy phosphorus content bismuth phosphorus-molybdenum blue spectrophotometry and antimony phosphorus-molybdenum blue spectrophotometry |
| GB/T 223.60 | Chemical analysis methods for steel and alloys — Decontent was determined by perchloric acid |
| GB/T 223.61 | Chemical analysis methods for steel and alloys — The phosphorus amount was determined by the Ammonium phosphorolybdate volume method |
| GB/T 223.62 | Chemical analysis methods for steel and alloys — Ptermination phowas determined by butyl acetate |
| GB/T 223.63 | Chemical analysis methods for steel and alloys — Mangn was measured photometrically by sodium periodate (potassium) |
| GB/T 223.64 | Determination of steel and alloy manganese content by flame atomic absorption spectrometry |

GB / T 223.67 Determination of sulfur content in steel and alloy by secondary methyl blue spectrophotometry
GB / T 223.68 Iron and steel and alloy chemical analysis method Measurement of potassium iodate in tubular furnace GB / T 223.69 Determination of carbon content in steel and alloy after combustion gas capacity method in pipe furnace
GB / T 223.71 Steel and alloy chemical analysis method tube furnace after combustion weight method determination of carbon content GB / T 223.72 Determination of sulfur content of steel and alloy weight method
GB / T 223.76 Steel and Alloy chemical analysis method Flame atomic absorption spectrometry determination of vanadium content GB / T 223.82 Iron and steel determination of hydrogen content inert gas pulse melting heat conductivity method
GB / T 223.85 Determination of sulfur content of steel and alloy after combustion infrared absorption method of induction furnace
GB / T 223.86 Determination of total carbon content of steel and alloys after combustion of induction furnace decarbonization layer depth determination of GB / T 224 steel
Test method for end quenching permeability of GB / T 225 steel (Jominy test) Low power tissue and defect acid corrosion test method of GB / T 226 steel
GB / T 230.1 Metallic materials-Rockwell hardness test-Part 1; test methods (A, B, C, D, E, F, G, H, K, N, T scale)
GB / T 231.1 Metal materials-hardness test-Part 1: Test methods GB / T 702-2008 Dimension, shape, weight and allowable deviation of hot rolled steel bars
GB / T 905- -1994 Cold-drawn round steel, square steel, the dimension, shape, weight and allowable deviation of hexagonal steel
GB / T 908- -2008 Dimension, shape, weight and allowable deviation of forged steel rod GB / T 1979- -2001 structural steel
GB / T 2101 section steel acceptance, packaging, marking and quality certificate of the general provisions of GB / T 3207- -2008 Silver bright steel
GB / T 4336 atomic emission spectrum analysis method of carbon steel and medium and low alloy steel (conventional method) GB / T 6402- -2008, ultrasonic detection method of steel forgings
GB / T 6394 average grain size of metals

GB / T 10561- -2005 Determination of nonmetallic inclusions in steel a standard rating graph microtest method GB / T 11261 steel oxygen content determination of pulse heating inert gas melting a infrared absorption method
GB / T 13298 metal microtissue test method
GB / T 14979- -1994 steel size, shape, weight and allowable deviation GB / T 17505 steel and steel products delivery general technical requirements
Sampling and sample preparation methods for GB / T 20066 steel and iron chemical composition determination
Determination of total carbon and Sulphur content in GB / T 20123 Steel post-combustion infrared Absorption method (conventional method)
Determination of nitrogen content in GB / T 20124 Steel inert gas (conventional method)
GJB 937- -1990 Measurement method of magnetic permeability of weak magnetic materials
ASTM A 604 Test method for reimmersion of steel rod and remelting of self-consuming electrode (Standard test method for macroetch testing of consumable electrode remelt ed steel bars and billets)

## 3 Classification

3.1 Steel is divided into eight categories according to its use:
A) Non-alloy steel for blade die:
B) steel for measuring tool:
C) Steel for impact-resistant tools:

And d) Steel for roll:

E) Steel for cold mold;

F) Steel for hot working die:

G) Steel for plastic mold:

H) Steel for special purpose molds.

3.2 Steel is divided into two categories according to the processing method:

A) Steel UP for pressure processing:

1) Thermal pressure processing of UHP;

2) Cold pressure processing of UCP.

B) Steel UC for cutting and processing.

The processing method of steel shall be indicated in the contract.

3.3 Steel is divided into four categories according to its chemical composition:

A) Non-alloy tool steel (brand head with "T");

B) Alloy tool steel:

C) Non-alloy die steel (with "SM"):

And d) alloy die steel.

Note: Non-alloy tool steel is the original carbon tool steel.

## 4 Order content

A contract or order for steel ordered under this standard shall at least include the following:

A) Standard number;

b) product name:

c) the name of a shop:

And d) The smelting method (see 6.2):

e) condition of delivery;

Ff) size and allowable deviation group (see Chapter 5):

For g) using the processing method (see 3.2):

H) Other special requirements (see 6.12).

## 5 Size, shape, and weight

### 5.1 Dimension, shape and allowable deviation of hot rolled steel rod and rod

#### 5.1.1 Hot-rolled round steel and square steel

**5.1.1.1**The size, shape and allowable deviation of hot-rolled round steel and square steel shall comply with the provisions of the 2 groups in GB / T 702-2008. If the demander requires other groups, the allowable deviation shall be indicated in the contract.

**5.1.1.2**The general length of hot-rolled round steel and square steel shall be 2000 mm~7000 mm. It is allowed to overlap no more than 10% of the total weight and a length of not less than 1000 mm. The length shall be specified in the contract • the allowable deviation of the length is + 0mm.

### 5.1.2 Hot-rolled flat steel

#### 5.1.2.1 Dimensions and allowable deviation

5.1.2.1.1 The size and allowable deviation of hot rolled flat steel with nominal width of 10 mm ~310 mm shall comply with the provisions in Table 1.

5.1.2.1.2 The size and allowable deviation of hot rolled flat steel with nominal width greater than 310 mm ~850 mm shall comply with the provisions in Table 2, and the size allowable deviation group shall be indicated in the contract.

**Table 1 Dimensions and allowable deviation of hot-rolled flat steel with 1 nominal width of 10 mm~310 mm**Unit is mm

| nominal width | Allowed deviation, not greater than | normal thickness | Allowed deviation, not greater than |
|---|---|---|---|
| 10 | ten point seven | ≥4～6 | ten point four |
| >10~-18 | ten point eight | >6～10 | ten point five |
| >18~30 | +1.20 | >10～14 | +0.60 |
| >30～50 | +1.60 | >14～25 | +0.80 |
| >50~80 | +2.30 | >25～30 | eleven point two |
| >80~160 | +2.50 | >30～60 | +1.40 |
| >160~200 | +2.80 | >60~100 | eleven point six |
| >200～250 | thirteen | | |
| >250～-310 | thirteen point two | — | — |

**Table 2 Dimensions and allowable deviation of hot-rolled flat steel with a nominal width greater than 310 mm ~850 mm** Unit is mm

| normal thickness | Dimensions allow deviation | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Group 1 | | | | Group 2 | | Three groups | |
| | Nominal width is> 300~455 | | Nominal width is> 455~850 | | Nominal width is> 300~850 | | Nominal width is 510~850 | |
| | Thickness allows, allow for deviation | Width allowed, allowed deviation | Thickness allows, allow for deviation | Width allowed, allowed deviation | Thickness allows, allow for deviation | Width allowed, allowed deviation | Thickness allows, allow for deviation | Width allowed, allowed deviation |
| 6～12 | +1.20 | +5.00 | +1.50 | +7.00 | +1.50 | +15.00 | protocol | protocol |
| >12～20 | +1.20 | X 6.0--2.0 | +1.50 | X., 7.0-3.0 | elevenpoints | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | x | | | |
| >20～70 | +1.4 0 | +6.0 — 2.0 | +1.7 0 | +7.0 — 3.0 | +1.8 0 | | | |
| >70～90 | | | | | thirteen | | | |
| >90~-100 | +2.0 0 | +7.0 — 3.0 | twelve | +10.0 — 3.0 | | | +6.0 0 | +15.0 0 |
| >100～200 | | | | | | | | |

5.1.2.2 Delivery length

5.1.2.2.1 The usual delivery length of hot-rolled flat steel shall comply with the provisions of Table 3.

Table 3 The usual delivery length of hot-rolled flat steel is in mm

| nominal width | Usually the length | Short ruler length | Short-foot matching rate |
|---|---|---|---|
| 10～310 | 2000～6000 | ≥1000 | The delivery of the ruler length shall not exceed 10% of the total weight of the steel |
| >310~850 | 1000~6000 | 500 | |

5.1.2.2.2 When fixed or delivery, the length shall be indicated in the contract. The allowable length deviation is + ″ mm. 5.1.2.3appearance

5.1.2.3.1 The bending degree of hot-rolled flat steel shall comply with the provisions in Table 4.

Table 4 Curtuosity of hot-rolled flat steelUnit is mm

| nominal width | Size-allowed deviation group | Curosity (plane, side) | |
|---|---|---|---|
| | | Bend per meter | Total bending degree |
| | | Not greater than | |
| 10～310 | | 4.0 | 0.40% of the steel length |
| >310～850 | Group 1 | 3.0 | 0.30% of the steel length |
| | Group 2, group 3 | 4.0 | 0.40% of the steel length |

5.1.2.3.2 The section shape of hot-rolled flat steel is not correct as shown in GB / T 702-2008. Figure 4. The maximum allowable size (or side drum shape) C value shall comply with the following provisions:

A) The C value of hot-rolled flat steel with a nominal width of 10 mm ~310 mm shall meet the provisions in Table 12 of GB / T 702-2008:

B) The C value of hot-rolled flat steel with a nominal width greater than 310 mm ~850 mm shall comply with the provisions of Table 5:

C) If the C value is too poor, it can be cleaned by machining. If the supplier can guarantee that the C value is qualified, it can not be detected.

Table 5 C value with nominal width over 310 mm to 850 mmUnit is mm

| Group 1 | | | Group 2 | | Three groups | |
|---|---|---|---|---|---|---|
| normal thickness | Nominal width is> 310~455 | Nominal width is> 455~850 | normal thickness | Nominal width is> 310~850 | normal thickness | Nominal width is> 510~850 |
| | Not greater | | | Not | | Not |

| | than | | | greater than | | greater than |
|---|---|---|---|---|---|---|
| 6～40 | 2.5 | 3.0 | 6~13 | 8.0 | 100～200 | 10.0 |
| >40~70 | 2.0 | 2.5 | >13～50 | 3.0 | | |
| >70～90 | 1.5 | 2.0 | >50~-200 | 8.0 | | |
| >90～200 | 2.0 | 2.5 | | | | |

5.1.2.3.3, the corner radius R of hot rolled flat steel shall comply with the provisions of Table 6.

Table 6 Round radius of hot rolled flat steelUnit is mm

| nominal width | Size-allowed deviation group | radius of corner R. Not greater than |
|---|---|---|
| 10～310 | | Permit a slight blunt angle |
| >310~850 | Group 1 | 4.0 |
| | Group 2, group 3 | 10.0 |

5.1.2.3.4 The ends of hot-rolled flat steel shall be cut straight. Burrs at both ends shall be removed, but the presence of burrs not greater than 5.0 mm is allowed. Hot-rolled flat steel cut by a press. Local deformation is allowed at both ends. The shear slope of hot-rolled flat steel shall meet the provisions of Table 7.

Table 7 Slslope of hot rolled flat steelUnit is mm

| nominal width | Cut the slope | |
|---|---|---|
| 10~-310 | Width oneself 100 | ≤6.0 |
| | Width> 100 | ≤8.0 |
| >310～850 | thickness | It is 8% of the thickness of the uterus |
| | width | 4% The width of the uterus |

5.1.2.3.5 No obvious torsion is allowed for hot-rolled flat steel. The length difference between the two diagonal lines on the same section shall not be greater than the nominal width tolerance of the flat steel.

### 5.1.3 Hot-rolled disc strip

The size, shape and allowable deviation of the hot rolled strip shall comply with the provisions of GB / T 14981.

## 5.2 Dimension, shape and allowable deviation of wrought steel bars

### 5.2.1 Forging of round steel and square steel

**5.2.1.1**The size and allowable deviation of wrought round steel and square steel with nominal diameter or side length of 90 mm ~400 mm shall comply with the provisions of Group 2 in Table 3 of GB / T 908-2008. If the demander requires, the allowable deviation of other groups shall be indicated in the contract.

**5.2.1.2**The allowable size deviation of forged round steel and square steel with nominal diameter or side length greater than 400 mm ~800 mm shall comply with the provisions of Table 8.

**Table 8 The allowable size deviation unit of forged round steel and square steel with nominal diameter or side length greater than 400 mm~800 mm is 12 mm**

| Nominal diameter or side length | Dimensions allow deviation |
|---|---|
| >400～500 | +12.<br>0 —<br>3.0 |
| >500～800 | +13.<br>0 -<br>3.0 |

**5.2.1.3** The delivery length of forged round steel and square steel shall not be less than 1000 mm. Interlap shall not exceed 10% of total weight and not less than length

500 mm short material. When fixed ruler or double ruler for delivery. The length shall be indicated in the contract. The allowable length deviation is + 80mm.

**5.2.1.4**The curvature of forged round steel shall not be greater than 5.0 mm per meter, and the total curvature shall not be greater than 0.50% of the total length; the irroundness of round steel shall not be greater than 0.7 times the nominal diameter tolerance.

**5.2.1.5**The bending of forged square steel shall not be greater than 5.0 mm per meter, and the total bending shall not be greater than 0.5% of the total length; the diagonal length difference of square steel in the same section shall not be greater than 0.7 times the nominal side length tolerance; the side length shall not be greater than 300 mm. The radius of the corners R at the corners shall not be greater than 5.0 mm. For square steel with edge length greater than 300 mm, the angular radius shall not be greater than 10.0 mm. However, the distance between the relative rounded corners (diagonal) should not be less than 1.3 times of the nominal side length: significant torsion is not allowed.

**5.2.1.6**The two ends of forged round steel and square steel should be cut straight.

### 5.2.2 Forged flat steel

**5.2.2.1**The size and allowable deviation of forged flat steel of nominal width 40 mm ~300 mm shall comply with the provisions of Group 2 in Table 4 of GB / T 908-2008. If the demander requires other groups, the allowable deviation shall be indicated in the contract.

**5.2.2.2**The size and allowable deviation of forged flat steel with a nominal width over 300 mm ~1500 mm shall comply with the provisions of Table 9.

**Table 9 Dimensions and allowable deviation units of forged flat steel greater than 300 mm~1500 mm are mm**

| normal thickness | Thickness allows for deviation | nominal width | Width allows deviation |
|---|---|---|---|
| >160~200 | eighteen | >300~-400 | +15.00 |
| >200～400 | +10.00 | >400~600 | +20.00 |
| >400~1000 | +15.00 | >600~-1500 | +25.00 |
| The cross-sectional area of the forged flat steel is 1200-000 mm ². Width: it is 6:1 thick. | | | |

**5.2.2.3**The delivery length of forged flat steel shall not be less than 1000 mm, and the mating shall not exceed 10% of the total weight, and the length is not less than 500 mm. When delivery, the length shall be specified in the contract. The allowable length deviation is + 8mm.

**5.2.2.4**The plane curvature of the forged flat steel shall not be greater than 5.0 mm per meter. The total plane curvature shall not be greater than 0.50% of the total length: the side curvature of the flat steel (sickle bend) shall not be greater than 5.0 mm per meter. The total side curvature (sickle bend) shall not be greater than 0.50% of the total length.

**5.2.2.5**For flat steel with nominal thickness or width not greater than 300 mm, the angular radius R at the corners shall not be greater than 5.0 mm; for flat steel with nominal thickness or width greater than 300 mm, the rounded radius R at the corners shall not be greater than 10.0 mm, but the length difference between two diagonal bars on the same section shall not be greater than its nominal width tolerance. No significant torsion is allowed for the flat steel.

**5.2.2.6**Both ends of forged flat steel shall be cut straight.

## 5.3 Dimension, shape and allowable deviation of the cold-drawn steel bar

The size, shape and allowable deviation of the cold pull steel rod shall comply with the h11 class provisions of GB / T 905-1994. If the demander requires other groups, the allowable deviation shall be indicated in the contract.

## 5.4 Dimension, shape and allowable deviation of silver-bright steel bar

The size, shape and allowable deviation of the silver bright steel bar shall comply with the h1 class 1 regulation of GB / T 3207- -2008. If the demander requires other groups, the allowable deviation shall be indicated in the contract.

## 5.5 Dimension, shape and allowable deviation of steel delivered by machining

5.5.1 The allowable dimensional deviation of the machined steel shall comply with the provisions of Table 10. If the demander requires other dimensional allowable deviation, it shall be indicated in the contract.

Table 1 0 The allowable deviation unit of machining steel is mm

| Nominal dimensions (diameter, side length, or width, thickness) | allowable deviation |
|---|---|
| ≤200 | +1.<br>5<br>0 |
| >200～400 | +2.<br>0<br>0 |
| >400 | +3.<br>0<br>0 |

5.5.2 The curvature of machined steel shall not be greater than 2.5 mm per meter: the rounded radius R of square steel and flat steel shall not be greater than 2.0 mm. Other requirements shall be implemented according to the corresponding standards.

### 5.6 Weight

Steel is generally delivered by actual weight.

## 6 Technical requirements

### 6.1 Brand number and chemical composition

6.1.1 The grade number and chemical composition of the steel (finished product analysis) shall comply with the provisions of Table 11 to Table 18.

**Table 11 Brand number and chemical composition of non-alloy steel for blade molds**

| order number | Unified digital code name | the name of a shop | Chemical composition (mass fraction)/% | | |
|---|---|---|---|---|---|
| | | | ( | Si | Mn |
| 1-1 | T00070 | T7 | 0,65～0.74 | ≤0.35 | ≤0,40 |
| 1-2 | T00080 | T8 | 0.75～~0.84 | ≤0.35 | 0.40 |
| 1-3 | T01080 | T8Mn | 0.80～-0,90 | ≤0.35 | 0.40～0.60 |
| 1-4 | T00090 | T9 | 0.85～0,94 | ≤0.35 | ≤0.40 |
| 1-5 | T00100 | T10 | 0.95～1,04 | 0.35 | 0.40 |
| 1-6 | T00110 | T11 | 1,05～1,14 | ≤0.35 | 0.40 |
| 1-7 | T00120 | T12 | 1.15~1.24 | 0.35 | ≤0.40 |
| 1-8 | T00130 | T13 | 1,25~-1,35 | ≤0.35 | ≤0.40 |
| Table steel can supply high quality steel • at this grade with "A". | | | | | |

**Table 12 Grade and chemical composition of steel for instrument blade**

| order number | Unified digital code name | the name of a shop | Chemical composition (mass fraction)/% | | | | |
|---|---|---|---|---|---|---|---|
| | | | ( | Si | Mn | Cr | W |
| 2-1 | T31219 | 9Si(r | 0.85~-0.95 | 1,20～1,60 | 0,30～-0,60 | 0.95~-1.25 | |
| 2-2 | T30108 | 8MnSi | 0.75～0.85 | 0.30~0.60 | 0.80~1.10 | | |
| 2-3 | T30200 | (r06 | 1.30~1,45 | ≤0.40 | ≤0.40 | 0.50～0.70 | |
| 2-4 | T31200 | Cr2 | 0.95~1,10 | 0.40 | 0.40 | 1,30～1,65 | - |
| 2-5 | T31209 | 9Cr2 | 0.80~-0.95 | 0.40 | 0.40 | 1.30~1.70 | - |
| 2-6 | T30800 | W | 1,05～1,25 | ≤0.40 | ≤0.40 | 0.10~-0,30 | 0.80~1.20 |

o

Table 13 Brand number and chemical composition of steel for impact resistant tools

| order number | Unified digital code name | the name of a shop | Chemical composition (mass fraction)/% | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | C | Si | Mn | Cr | W | Mo | V |
| 3-1 | T40294 | 4('rW2Si | 0.35~0.45 | 0.80～1.10 | 0.40 | 1.00~1.30 | 2.00~2.50 | | |
| 3-2 | T40295 | 5CrW2Si | 0.45~-0.55 | 0,50～0.80 | 0.40 | 1.00~-1,30 | 2.00~2.50 | — | — |
| 3-3 | T40296 | 6CrW2Si | 0.55～0.65 | 0.50～0.80 | 0,40 | 1,10～1,30 | 2.20～2.70 | — | — |
| 3-4 | T40356 | 6C'rMnSi2MolV | 0.50～0.65 | 1,75~-2,25 | 0.60~1.00 | 0.10~-0,50 | — | 0.20~1.35 | 0.15~-0,35 |
| 3-5 | T40355 | 5Cr3MnSiMol | 0.45～0.55 | 0,20～-1,00 | 0.20～0.90 | 3,00～3,50 | — | 1.30～1.80 | ≤0.35 |
| 3-6 | T40376 | 6C'rW2SiV | 0.55~0.65 | 0.70~-1.00 | 0.15～0.45 | 0.90~-1,20 | 1.70~2.20 | | 0.10~-0,20 |

Table 14 Grade plate and chemical composition of steel for roll

| order number | Unified digital code name | the name of a shop | Chemical composition (mass fraction)/% | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ( | Si | Mn | P | S | Cr | W | Mo | Ni | V |
| 4-1 | T42239 | 9Cr2V | 0.85~-0.95 | 0.20~-0.40 | 0,20~-0.45 | | | 1.40~1,70 | - | — | — | 0.10-0.25 |
| 4-2 | T42309 | 9Cr2Mo | 0.85~-0,95 | 0,25~-0,45 | 0,20～-0,35 | | | 1.70-2.10 | - | 0.20~-0.40 | — | — |
| 4-3 | T42319 | 9Cr2MoV | 0.80~0,90 | 0.15~-0.40 | 0,25~0.55 | | | 1.80~2.40 | - | 0.20~0.40 | — | 0.05～0.15 |
| 4-4 | T42518 | 8(r3NiMoV | 0.82~-0.90 | 0.30~-0.50 | 0.20~-0.45 | 0.020 | 0.015 | 2.80～3,20 | - | 0.20~-0.40 | 0.60~0.80 | 0.05～0.15 |
| 4-5 | T42519 | 9Cr5NiMoV | 0.82~0.90 | 0.50~-0.80 | 0.20～0.50 | ≤0.020 | ≤0.015 | 4.80~5,20 | - | 0.20～0.40 | 0.30～0.50 | 0.10~0.20 |
| * See Table 19. | | | | | | | | | | | | |

**Table 15 Grade and chemical composition of steel for cold-making mold**

| order number | Unified digital code name | the name of a shop | Chemical composition (mass fraction)/% | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | Si | Mn | p | S | Cr | W | Mo | V | Nb | Co |
| 5-1 | 120019 | 9Mn2V | 0.85~0,95 | 0.40 | 1.70~2,00 | | | | | | 0,10~0.25 | | |
| 5-2 | 120299 | 90rWMn | 0.85~0.95 | 0.40 | 0.90~1.20 | A | | 0.50~0.80 | 0.50~0.80 | | | | |
| 5-3 | 121290 | (rWMn | 0.90~1,05 | 0.40 | 0.80~1,10 | | | 0.90~1.20 | 1,20~1,60 | | | | - |
| 5-4 | 120250 | Mn(rWV | 0.90~105 | 0,10~0.40 | 1.05~1.35 | | | 0.50~0.70 | 0.50~~0.70 | | 0.05~~0.15 | | |
| 5-5 | 121347 | 7CrMn2Mo | 0.65~0.75 | 0.10~0.50 | 1.80~2.50 | A | | 0.90~1,20 | | 0,90~1,40 | | | |
| 5-6 | T21355 | 5C8MoVSi | 0,48~0.53 | 0,75~1,05 | 0,35~0,50 | ≤0.030 | 0,015 | 8.00~9.00 | | 1,25~1.70 | 0.30~0,55 | | - |
| 5-7 | 121357 | 7CrSiMnMoV | 0.65~0.75 | 0.85~1.15 | 0.65~105 | | | 0.90~1.20 | — | 0.20~0.50 | 0.15~~0.30 | | - |
| 5-8 | T21350 | Cr8Mo2SiV | 0.95~1.03 | 0.80~1.20 | 0.20~0.50 | | | 7.80~8,30 | | 2.00~2.80 | 0.25~0.40 | | |
| 5-9 | 121320 | Cr4W2MoV | 1.12~1,25 | 0.40~0.70 | ≤0.40 | | | 3.50~4,00 | 1,90~2,60 | 0,80~1,20 | 0.80~1.10 | | |
| 5-10 | 121386 | 6Cr4W3Mo2VNb | 0.60~0.70 | 0.40 | ≤0.40 | | | 3.80~4.40 | 2.50~3.50 | 1.80~2.50 | 0.80~1.20 | 0.20~0.35 | |
| 5-1I | T21836 | 6W6Mo5C'r4V | 0.55~0,65 | 0,40 | 0.60 | | | 3,70~4.30 | 6.00~7,00 | 4.50~5.50 | 0.70~1,10 | | |
| 5-12 | T21830 | W6Mo5Cr4V2 | 0,80~0,90 | 0,15~0.40 | 0,20~0,45 | | | 3,80~4.40 | 5,50~6.75 | 4,50~5,50 | 1.75~2,20 | | |
| 5-13 | 121209 | Cr8 | 1.60~1.90 | 0.20~0.60 | 0.20~0.60 | | | 7.50~8.50 | | | — | — | |
| 5-14 | 121200 | (r12 | 2.00~2,30 | 0,40 | 0.40 | | | 11,50~13.00 | | | | | |
| 5-15 | 121290 | (r12W | 2.00~2.30 | 0.10~0.40 | 0.30~0.60 | | | 11.00~13.00 | 0.60~0.80 | | — | | - |
| 5-16 | 121317 | 7Cr7Mo2V2Si | 0.68~0.78 | 0.70~1.20 | ≤0.40 | | | 6.50~7.50 | | 1.90~2.30 | 1.80~2.20 | | |
| 5-17 | T21318 | Cr5MolV | 0,95~1,05 | 0.50 | ≤1.00 | | | 4.75~5.50 | | 0.90~1.40 | 0.15~0.50 | | |
| 5-18 | 121319 | (r12MoV | 1.45~1.70 | 0.40 | ≤0.40 | | | 11.00~12.50 | — | 0.10~~0.60 | 0.15~~0.30 | — | - |
| 5-19 | T21310 | (r12MolVI | 1.40~1.60 | 0.60 | ≤0.60 | | | I1.00~13.00 | — | 0.70~1.20 | 0.50~1,10 | | ≤1.00 |
| mouth | "See Table 19. | | | | | | | | | | | | |

## Table 16 Grade and chemical composition of steel for hot molds

| order number | Unified digital code name | the name of a shop | Chemical composition (mass fraction)/% | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ( | Si | Mn | P | S | Cr | W | Mo | Ni | V | Al | Co |
| 6-1 | T22345 | 5CrMnMo | 0.50～0.60 | 0.25~-0,60 | 1.20~-1.60 | | | 0.60～0.90 | | 0,15～-0.30 | | | | |
| 6-2 | T22505 | 5CrNiMo | 0.50～0,60 | 0.40 | 0.50~-0.80 | | | 0.50~-0.80 | | 0.15~-0.30 | 1.40~-1.80 | | | |
| 6-3 | 123504 | 4CrNi4Mo | 0.40~0.50 | 0.10~-0.40 | 0.20～0.50 | | A | 1,20~1.50 | | 0.15~-0.35 | 3.80~-4.30 | | | |
| 6-4 | 123514 | 4Cr2NiMoV | 0.35~-0.45 | 0.40 | 0.40 | | | 1.80~2.20 | | 0.45～-0.60 | 1.10～1,50 | 0.10~-0.30 | | |
| 6-5 | 123515 | 5CrNi2MoV | 0.50~-0.60 | 0.10～0.40 | 0.60~-0.90 | | | 0.80~1.20 | | 0.35～0.55 | 1.50~1,80 | 0.05~-0.15 | | |
| 6-6 | I23535 | 5Cr2NiMoVS | 0.46～0.54 | 0.60-0.90 | 0.40~0.60 | | | 1.50～2.00 | | 0.80~1.20 | 0.80～1.20 | 0,30～0.50 | | |
| 6-7 | T23208 | 8Cr3 | 0.75~0.85 | 0.40 | ≤0.40 | | | 3,20～3.80 | | | | | — | |
| 6-8 | T23274 | 4Cr5W2VSi | 0.32～0.42 | 0.80~1,20 | ≤0.40 | | | 4.50~5.50 | 1.60~-2.40 | | | 0,60~-1.00 | | |
| 6-9 | 123273 | 30r2W8V | 0.30~-0.40 | 0.40 | ≤0.40 | | | 2,20-2.70 | 7.50~9.00 | —— | | 0.20~-0.50 | | |
| 6-10 | T23352 | 4Cr5MoSiV | 0.33～0.43 | 0.80～1,20 | 0.20～0.50 | | A | 4.75~5.50 | | 1.10~1.60 | | 0,30～-0.60 | | |
| 6-11 | 123353 | Cr5MoSiVI | 0.32~0.45 | 0.80～1.20 | 0.20~-0.50 | | | 4,75~5.50 | | 1,10~1.75 | | 0.80～~1.20 | | |
| 6-12 | T23354 | 4(r3Mo3SiV | 0,35~-0,45 | 0,80~1,20 | 0.25~-0.70 | | | 3,00-3.75 | | 2,00~-3,00 | | 0,25~-0.75 | | |
| 6-13 | T23355 | 5Cr4M%3SiMnVAI | 0,47~-0,57 | 0,80~-1,10 | 0,80~-1,10 | | | 3,80~4.30 | | 2,80~-3,40 | | 0,80~-1,20 | 0,30~-0,70 | |
| 6-14 | 123364 | 4CrMnSiMoV | 0,35~-0.45 | 0.80~-1.10 | 0.80~1.10 | | A | 1,30~-1.50 | | 0.40~-0.60 | | 0.20~-0.40 | | |
| 6-15 | 123375 | 5Cr5WMoSi | 0.50~0.60 | 0.75~1.10 | 0.20～0,50 | | | 4.75~5.50 | 1.00~-1,50 | 1.15~1.65 | | | | – |
| 6-16 | 123324 | ICr5MoWVSi | 0.32~-0.40 | 0.80～1.20 | 0.20-0.50 | | | 4.75～5.50 | 1.10～1.60 | 1.25~1.60 | | 0.20～0.50 | | |
| 6-17 | T23323 | 3Cr3Mo3W2V | 0.32~-0.42 | 0.60-0,90 | ≤0.65 | | | 2,80～3.30 | 1.20~-1.80 | 2.50～3.00 | | 0,80~1,20 | | |
| 6-18 | T23325 | 5Cr4W5Mo2V | 0.40~-0,50 | 0.40 | ≤0.40 | | A | 3,40～4.40 | 4.50～-5.30 | 1.50~-2.10 | | 0.70~-1.10 | | |
| 6-19 | T23314 | 4Cr5M ₆ 2V | 0.35～0.42 | 0.25-0,50 | 0.40～-0.60 | ≤0.020 | 0,008 | 5.00～5.50 | | 2.30~-2.60 | | 0.60~-0.80 | — | |
| 6-20 | 123313 | 3Cr3M3V | 0.28～-0.35 | 0.10~-0.40 | 0.15~-0.45 | 0.030 | 0.020 | 2.70~3.20 | — | 2.50~-3.00 | | 0.40~-0.70 | | |
| 6-21 | 123314 | 4Cr5Mo3V | 0.35~-0.40 | 0.30-0.50 | 0.30~0.50 | 0.030 | 0.020 | 4.80~5.20 | | 2.70~3.20 | | 0,40～-0.60 | | |
| 6-22 | 123393 | 3Cr3Mo3VCo3 | 0.28~-0.35 | 0.10~-0,40 | 0.15~0,45 | ≤0.030 | ≤0,020 | 2.70～3,20 | | 2,60~3,00 | | 0,40~-0,70 | | 2.50~-3,00 |

See Table 19.

Vanadium content is less than 0.20%

**Table 17 Grade plate and chemical composition of steel for plastic mold**

| order number | Unified number, the word code name | the name of a shop | Chemical composition (mass fraction)/% | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | Si | Mn | p | S | Cr | W | Mo | Ni | V | AI | Co | other |
| 7-1 | T10450 | SMI5 | 0.42～0.48 | 0.17~0,37 | 0.50~0.80 | | | | | | | | | | |
| 7-2 | T10500 | SM50 | 0.47～0.53 | 0,17~0,37 | 0,50-0,80 | | | | | | | | | | |
| 7-3 | T10550 | SM55 | 0.52～0,58 | 0,17~0,37 | 0.50~0.80 | | | | | | | | | one | one |
| 7-4 | T25303 | 3Cr2M | 0.28~0,40 | 0.20~0,80 | 0,60～1,00 | | | 1.40～2,00 | | 0,30~0.55 | | | | | |
| 7-5 | T25553 | 3Cr2MnNiMo | 0.32～0.40 | 0.20~0.40 | 1.10~1.50 | | | 1.70~2,00 | | 0,25~0.40 | 0.85~1.15 | one | | | |
| 7-6 | T25344 | 4CY2MnlMoS | 0.35~0,45 | 0.30~0.50 | 1.40～1,60 | ≤0.030 | 0,05~0.10 | 1.80～2,00 | | 0,15~0,25 | | | | | |
| 7-7 | T25378 | 8Cr2MnWMoVS | 0.75~0.85 | 0.40 | 1.30~1.70 | 0.030 | 0.08~0.15 | 2,30~2,60 | 0.70~L.10 | 0.50~0.80 | | 0.10~0,25 | | | |
| 7-8 | T25515 | 5(rNiMnMVSCa | 0.50~0.60 | 0.45 | 0.80～1,20 | 0.030 | 0.06~0.15 | 0.80～1,20 | | 0.30～0.60 | 0.80～1,20 | 0.15~0.30 | | — | (a;0.002～0.008 |
| 7-9 | T25512 | 2CrNiMoMnV | 0.24~0.30 | 0,30 | 1.40~1,60 | 0.025 | ≤0,015 | 1,25~-1,45 | | 0.45~0.60 | 0,80~1,20 | 0,10~0,20 | | | |
| 7-10 | 125572 | 20rNi3MoAl | 0.20~0.30 | 0.20~0,50 | 0.50~0.80 | | | 1.20~-1,80 | | 0.20～-0.40 | 3.00~4,00 | | 1.00~1.60 | | |
| 7-11 | T25611 | INi3Mn(uMbAl | 0.10~0,20 | 0.45 | 1.40-2,00 | 0.030 | 0.015 | | — | 0,20~0,50 | 2.90~3,40 | | 0.70~1.20 | — | C:0.80-1,20 |
| 7-12 | A64060 | 06Ni6CrMhVTiAl | 0.06 | 0.50 | 0.50 | | | 1.30~1,60 | | 0,90~1.20 | 5.50~6,50 | 0.08~0.16 | 0.50~0.90 | | li:0.90~-1,30 |
| 7-13 | A64000 | 00Nil8Co8Mo57iAl | ≤0.03 | 0.10 | ≤0.15 | 0.010 | 0.010 | 0.60 | | 4.50～5.00 | 17.5～18,5 | | 0.05～0.15 | 8,50～10.0 | li:0.80～-1,10 |
| 7-14 | S42023 | 2(r13 | 0.16~0.25 | ≤1.00 | ≤1.00 | | | 12,00~14,00 | | | 0.60 | | | | |

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| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7-15 | S42043 | 4(r13 | 0.36~-0.45 | 0.60 | 0.80 | | | 12,00～14,00 | — | | 0,60 | | | | |
| 7-16 | 125444 | 4(rl3NiVSi | 0.36~-0.45 | 0.90~-1.20 | 0.40~-0,70 | 0.010 | ≤0.003 | 13.00~-14.00 | | | 0,15~-0,30 | 0.25~-0.35 | | | |
| 7-17 | 125402 | 20rl7Ni2 | 0.12~0,22 | ≤L00 | 1.50 | | | 15.00～17,00 | | | 1.50～2.50 | | | | |
| 7-18 | T25303 | 3Cr17Mo | 0.33~-0.45 | 1,00 | 1.50 | | | 15.50～17,50 | | 0,80～1,30 | ≤1,00 | | | | |
| 7-19 | 125513 | 3Cr17NiMV | 0.32~-0.40 | 0.30～-0.60 | 0.60～0.80 | 0.025 | 0.005 | 16.00～18.00 | | 1.00～1,30 | 0.60～100 | 0.15~-0.35 | | | |
| 7-20 | S44093 | 9Cr18 | 0.90~-1,00 | 0.80 | 0,80 | | | 17.00~-19,00 | | | 0,60 | | | | |
| 7-21 | S46993 | 9Cr18MbV | 0.85~-0.95 | 080 | 0.80 | | | 17,00~19.00 | — | 1,00~1.30 | ≤0.60 | 0.07~-0.12 | | — | |
| See Table 19. | | | | | | | | | | | | | | | |

two **Table 18 Brand number and chemical composition of steel for special use molds**

| order number | Unified number, the word code name | the name of a shop | Chemical composition (mass fraction)/% | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ( | Si | Mn | P | S | Cr | W | Mo | Ni | V | Al | Nb | Co | other |
| 8-1 | T26377 | 7Mn15Cr2A I 3V2WM | 0,65 ~ 0.75 | ≤0.80 | 14,50 ~ 16,50 | | | 2.00~-2,50 | 0.50~- 0.80 | 0.50~- 0,80 | — | 1.50~- 2.00 | 2.30～3,30 | | — | — |
| 8-2 | S31049 | 2Cr25Ni20Si2 | 0.25 | 1.50~ 2.50 | ≤1.50 | | | 24.00~- 27.00 | - | | 18,00~-21.00 | | | | | |
| 8-3 | S51740 | 0Cr17N4C4Nb | ≤0.07 | ≤1,00 | ≤1.00 | A | | 15.00~- 17.00 | - | | 3.00~-5,00 | - | | Nb: 0,15~- 0,45 | | Cu;3.00~-5,00 |
| 8-4 | H21231 | Ni25(r15Ti2MoMn | ≤0.08 | ≤1.00 | 2,00 | 0.030 | 0.020 | 13,50～ 17.00 | | 1.00～ 1,50 | 22.00～26.00 | 0.10~- 0.50 | ≤0.40 | —— | — | Ti:1.80~-2,50 B:0.001~- 0.010 |
| 8-5 | H07718 | Ni53Or19Mo3TiNb | 008 | 0.35 | ≤0.35 | 0,015 | ≤0.015 | 17.00~- 21.00 | - | 2,80~- 3,30 | 50.00~-55.00 | | 0.20~-0,80 | Nb+Ta*: 4.75~- 5,50 | 1,00 | Ti:0,65~- 1.15 B 0.006 |
| See Table 19.<br>Only Nb analysis is allowed, unless specifically requested. | | | | | | | | | | | | | | | | |

6.1.2 The content of residual elements in steel shall comply with the provisions of Table 19.

**Table 19 Content of residual elements in steel**

<table>
<tr><td rowspan="2">group</td><td rowspan="2">smelting process</td><td colspan="5">Chemical composition (mass fraction) /%. Not greater than</td></tr>
<tr><td colspan="2">P</td><td colspan="2">S</td><td>Cu</td><td>Cr</td><td>Ni</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">arc furnace</td><td>High-grade, high-quality non-alloy tool steel</td><td>0.030</td><td>High-grade, high-quality non-alloy tool steel</td><td>0.020</td><td rowspan="4">0.25</td><td rowspan="4">0.25</td><td rowspan="4">0.25</td></tr>
<tr><td>Other steel</td><td>0.030</td><td>Other steel</td><td>0.030</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Electric arc furnace ten vacuum degassing</td><td>Cold mold steel<br>High-grade, high-quality non-alloy tool steel</td><td>0.030</td><td>Cold mold steel<br>High-grade, high-quality non-alloy tool steel</td><td>0.020</td></tr>
<tr><td>Other steel</td><td>0.025</td><td>Other steel</td><td>0.025</td></tr>
<tr><td>3</td><td>Electric arc arc remelting (VAR)</td><td colspan="2">0.025</td><td colspan="2">0.010</td></tr>
<tr><td colspan="8">For the manufacture of lead bath quenching non-alloy tool steel wire, the residual chromium content in the steel is not more than 0.10%. Nickel content not greater than 0.12% • Copper content not greater than 0.20%. The sum of the three is not greater than 0.40%.</td></tr>
</table>

6.1.3 After negotiation, lead, arsenic, tin, antimony, bismuth, hydrogen, oxygen, nitrogen and other elements may be tested, and the specific requirements shall be specified in the contract.

## 6.2 Smelting method

Steel shall be smelted by electric arc furnace, electric arc furnace + vacuum degassing, electric arc furnace + electric slag remelting, vacuum arc remelting (VAR) and other methods to meet the requirements, and the specific smelting method shall be indicated in the contract.

## 6.3 Delivery status

6.3.1 Tool steel is generally delivered in annealing state, but SM45, SM50, SM55,2Cr25Ni20Si2 and 7 $Mn_1$ 5Cr2Al3V2WMo steel is generally delivered in hot rolling or hot forging state, and non-alloy tool steel can be annealed by cold pull.

6.3.2 According to the requirements of the demander and indicated in the contract, plastic, hot, cold and special purpose molds can be delivered in pre-hardening state.

## 6.4 Delivery Hardness

6.4.1 The hardness value of the delivery state steel and the quenching hardness value of the test sample shall comply with the provisions of Table 20 to Table 27. If the supplier can guarantee that the quenching hardness value of the test sample conforms to the provisions of Table 20~ Table 27, no inspection can be made.

6.4.2 The annealed steel with less than 5 mm shall not undergo hardness test. According to the requirements of the demander, stretching or other tests can be conducted, and the technical indicators shall be stipulated by the two parties through negotiation.

**Table 20 Hardness value of non-alloy steel for blade mold and quenching hardness value of test sample**

| order number | Unified number, the word code name | the name of a shop | The hardness of steel HBW, not greater than | Resquing hardness of sample | | |
|---|---|---|---|---|---|---|
| | | | | hardening temperature ℃ | coolant | Rockwell hardness HRC is not less than |
| 1-1 | To0070 | T7 | 187 | 800～820 | water | 62 |
| 1-2 | T00080 | T8 | 187 | 780～800 | water | 62 |
| 1-3 | T01080 | T8Mn | 187 | 780~-800 | water | 62 |
| 1-4 | T00090 | T9 | 192 | 760~780 | water | 62 |

**Table 20 (continued)**

| order number | Unified number, the word code name | the name of a shop | Annealing delivery status Steel hardness HBW. Not greater than | Resquing hardness of sample | | |
|---|---|---|---|---|---|---|
| | | | | hardening temperature ℃ | coolant | Rockwell hardness HRC, not less than |
| 1-5 | T00100 | T10 | 197 | 760～780 | water | 62 |
| 1-6 | To0110 | T11 | 207 | 760～780 | water | 62 |
| 1-7 | To0120 | T12 | 207 | 760～780 | water | 62 |
| 1-8 | To0130 | T13 | 217 | 760~780 | water | 62 |
| The hardness of steel of non-alloy tool shall not be greater than HBW241. | | | | | | |

**Table 2 1 Hardness value of steel delivery state and quenching hardness value of test samples**

| order number | Unified number, the word code name | the name of a shop | Annealing delivery status Steel hardness HBW | Resquing hardness of sample | | |
|---|---|---|---|---|---|---|
| | | | | hardening temperature ℃ | coolant | Rockwell hardness HRC is not less than |
| 2-1 | T31219 | 9SiCr | 197～241 “ | 820~860 | oil | 62 |
| 2-2 | T30108 | 8MnSi | ≤229 | 800~820 | oil | 60 |
| 2-3 | T30200 | Cr06 | 187~-241 | 780～810 | water | 64 |
| 2-4 | T31200 | Cr2 | 179~229 | 830~-860 | oil | 62 |
| 2-5 | T31209 | 9Cr2 | 179~217 | 820～850 | oil | 62 |
| 2-6 | T30800 | W | 187～229 | 800~830 | water | 62 |
| According to the demander’s requirements. And indicate in the contract that the steel used for manufacturing the thread blade is HBW187~HBW229. | | | | | | |

**Table 22 Hardness value of steel delivery state for impact resistant tools and quenching hardness value of test specimens**

| order number | Unified number, the word | the name of a shop | Annealing delivery status Steel hardness HBW | Resquing hardness of sample | | |
|---|---|---|---|---|---|---|
| | | | | hardening temperature ℃ | coolant | Rockwell hardness HRC is not less than |

| | code<br>name | | | | | |
|---|---|---|---|---|---|---|
| 3-1 | T40294 | 4CrW2Si | 179～217 | 860~900 | oil | 53 |
| 3-2 | T40295 | 5CrW2Si | 207~255 | 860~900 | oil | 55 |
| 3-3 | T40296 | 6CrW2Si | 229~-285 | 860~900 | oil | 57 |
| 3-4 | T40356 | 6CrMnSi2MolVa | ≤229 | 667℃± 15℃ to preheat.885℃ (salt bath) or 900℃ (furnace controlled atmosphere) ± 6℃ heating. Heat insulation for 5 min~~15 min oil cooling.58℃~201℃ tempering | | 58 |
| 3-5 | T40355 | 5Cr3MnSiMolVa | ≤235 | 667℃± 15℃ to preheat.941℃ (salt bath) or 955℃ (furnace controlled atmosphere) ± 6℃ heat, insulation 5min ~~15 min oil cooling.56℃~204℃ tempering | | 56 |
| 3-6 | T40376 | 6CrW2SiV | ≤225 | 870～910 | oil | 58 |
| Note: The insulation time refers to the time of the sample after reaching the heating temperature. | | | | | | |
| Samples were kept for 5 min in a salt bath. For 5 min to 15 min in furnace controlled atmosphere. | | | | | | |

**Table 23 Hardness value of steel and quenching hardness value of test samples**

| order number | Unified number, the word code name | the name of a shop | Annealing delivery status Steel hardness HBW | Resquing hardness of sample | | |
|---|---|---|---|---|---|---|
| | | | | hardening temperature ℃ | coolant | Rockwell hardness HRC is not less than |
| 4-1 | T42239 | 9Cr2V | ≤229 | 830~900 | air | 64 |
| 4-2 | T42309 | 9Cr2Mo | 229 | 830~900 | air | 64 |
| 4-3 | T42319 | 9Cr2MoV | ≤229 | 880~900 | air | 64 |
| 4-4 | T42518 | 8Cr3 NiMoV | ≤269 | 900～920 | air | 64 |
| 4-5 | T42519 | 9Cr5 NiMoV | ≤269 | 930～950 | air | 64 |

**Table 24 Hardness value of steel for cold mold and quenching hardness value of test sample**

| order number | Unified number, the word code name | the name of a shop | Annealing delivery status Steel hardness HBW | Resquing hardness of sample | | |
|---|---|---|---|---|---|---|
| | | | | hardening temperature ℃ | coolant | Rockwell hardness HRC is not less than |
| 5-1 | T20019 | 9Mn2V | ≤229 | 780~810 | oil | 62 |
| 5-2 | T20299 | 9CrWMn | 197～241 | 800~830 | oil | 62 |
| 5-3 | T21290 | CrWMn | 207～255 | 800~830 | oil | 62 |
| 5-4 | T20250 | MnCrWV | ≤255 | 790~820 | oil | 62 |
| 5-5 | T21347 | 7CrMn2Mo | ≤235 | 820~870 | air | 61 |
| 5-6 | T21355 | 5Cr8MoVSi | ≤229 | 1000～1050 | oil | 59 |
| 5-7 | T21357 | 7CrSiMnMoV | ≤235 | 870℃ ~900℃ oil cooled or air cooled.150℃± 10℃ return air cooling | | 60 |
| 5-8 | T21350 | Cr8Mo2SiV | ≤255 | 1020～1040 | Oil or air | 62 |
| 5-9 | T21320 | Cr4W2MoV | ≤269 | 960 ~ ~ ~ 980 or 1020~1040 | oil | 60 |
| 5-10 | T21386 | 6Cr4W3Mo2VNb | ≤255 | 1100~1160 | oil | 60 |
| 5-11 | T21836 | 6W6Mo5Cr4V | ≤269 | 1180～1200 | oil | 60 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 5-12 | T21830 | W6Mo5Cr4V2 “ | ≤255 | 730℃ ~810℃ preheat.1210℃ ~1230℃ (salt bath or Control the atmosphere) heating, heat preservation for 5 min~15 min, oil cooling<br>540℃ ~560℃ tempering twice (salt bath or control atmosphere). Each time 2h | | 64 (salt bath) 63 (furnace-controlled atmosphere) |
| 5-13 | T21209 | Cr8 | ≤255 | 920~980 | oil | 63 |
| 5-14 | T21200 | Cr12 | 217~269 | 950~-1000 | oil | 60 |
| 5-15 | T21290 | Cr12W | ≤255 | 950~980 | oil | 60 |
| 5-16 | T21317 | 7Cr7Mo2V2Si | ≤255 | 1100~1150 | Oil or air | 60 |
| 5-17 | T21318 | Cr5MolV# | ≤255 | 790℃± 15℃ to preheat.940℃ (salt bath) or 950℃<br>(Furnace-controlled atmosphere) ± 6℃ for heating.5 min~<br>Oil cooled for 15 min: 200℃± 6℃ return once, 2 h | | 60 |
| 5-18 | T21319 | Cr12MoV | 207~255 | 950～1000 | oil | 58 |

**Table 24 (Cont.)**

| order number | Unified number, the word code name | the name of a shop | Annealing delivery status Steel hardness HBW | Resquing hardness of sample | | |
|---|---|---|---|---|---|---|
| | | | | hardening temperature ℃ | coolant | Rockwell hardness HRC is not less than |
| 5-19 | T21310 | Cr12MoIVI | ≤255 | 820℃± 15℃ to preheat.1000℃ (salt bath) ± 6℃ or 1010℃ (furnace controlled atmosphere) ± 6℃ heating.keep warm For 10 min~20 min of air cooling.200℃± 6℃ return-fire once.2 h | | 59 |
| Note: The insulation time refers to the time of the sample after reaching the heating temperature. | | | | | | |
| Samples were kept for 5 min in a salt bath. For 5 min to 15 min in furnace controlled atmosphere. The sample was kept for 10 min in the salt bath and 10 min~20 min in the furnace-controlled atmosphere. | | | | | | |

**Table 25 Hardness value of steel for hot molds and quenching hardness value of sample**

| order number | Unified number, the word code name | the name of a shop | Annealing delivery status Steel hardness HBW | Resquing hardness of sample | | |
|---|---|---|---|---|---|---|
| | | | | hardening temperature ℃ | coolant | Rockwell hardness HRC |
| 6-1 | T22345 | 5CrMnMo | 197~241 | 820~850 | oil | b |
| 6-2 | T22505 | 5CrNiMo | 197~241 | 830~860 | oil | b |
| 6-3 | T23504 | 4CrNi4Mo | ≤285 | 840~870 | Oil or air | b |
| 6-4 | T23514 | ICr2NiMoV | ≤220 | 910~960 | oil | h |
| 6-5 | T23515 | 5CrNi2MoV | ≤255 | 850~880 | oil | b |
| 6-6 | T23535 | 5Cr2NiMoVSi | ≤255 | 960~1010 | oil | b |
| 6-7 | T12208 | 8Cr3 | 207～255 | 850~880 | oil | b |
| 6-8 | T23274 | 4Cr5W2VSi | ≤229 | 1030~1050 | Oil or air | b |
| 6-9 | T23273 | 3Cr2W8V | ≤255 | 1075~1125 | oil | b |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6-10 | T23352 | 4Cr5MoSiV | ≤229 | 790℃± 15℃ to preheat.1010℃ (salt bath) or 1020℃<br>(Furnace controlled atmosphere)<br>1020℃± 6℃ heated for 5 min~<br>15 min of oil cooling.550℃± 6℃ tempering and tempering twice. Each time 2 h | | b |
| 6-11 | T23353 | 4Cr5MoSiVI″ | ≤229 | 790℃± 15℃ to preheat.1000℃ (salt bath) or 1010℃ (furnace-controlled atmosphere) ± 6℃ heating, heat preservation for 5 min~15 min oil cooling.550℃± 6℃ tempering twice for 2 h | | |
| 6-12 | T23354 | 4Cr3Mo3SiV | ≤229 | 790℃± 15℃ to preheat.1010℃ (salt bath) or 1020℃<br>(Furnace controlled atmosphere)<br>1020℃± 6℃ heated for 5 min~<br>15 min of oil cooling.550℃± 6℃ tempering twice for 2 h | | |
| 6-13 | T23355 | 5CrIMo3SiMnVAl | ≤255 | 1090~1120 | air | t |
| 6-14 | T23364 | 4CrMnSiMoV | ≤255 | 870～930 | oil | h |
| 6-15 | T23375 | 5Cr5WMoSi | ≤248 | 990~1020 | oil | b |
| 6-16 | T23324 | 4Cr5MoWVSi | ≤235 | 1000～1030 | Oil or air | b |
| 6-17 | T23323 | 3Cr3Mo3W2V | ≤255 | 1060～1130 | oil | h |

Table 25 (continued)

| order number | Unified number, the word code name | the name of a shop | Annealing delivery status Steel hardness HBW | Resquing hardness of sample | | |
|---|---|---|---|---|---|---|
| | | | | hardening temperature ℃ | coolant | Rockwell hardness HRC |
| 6-18 | T23325 | 5Cr4W5Mo2V | ≤269 | 1100～1150 | oil | b |
| 6-19 | T23314 | 4Cr5Mo2V | ≤220 | 1000～1030 | oil | b |
| 6-20 | T23313 | 3Cr3Mo3V | ≤229 | 1010～1050 | oil | b |
| 6-21 | T23314 | 4Cr5Mo3V | ≤229 | 1000～1030 | Oil or air | b |
| 6-22 | T23393 | 3Cr3Mo3VCo3 | ≤229 | 1000～1050 | oil | b |
| Note: The insulation time refers to the time of the sample after reaching the heating temperature. | | | | | | |
| "The sample was kept in the salt bath for 5 min: 5 min ~ -15 min in the furnace-controlled atmosphere. According to the demander's requirements. And is indicated in the contract. Measured values can be provided. | | | | | | |

**Table 26 Hardness value of steel for plastic mold and quenching hardness value of test samples**

| order number | Unified number, the word code name | the name of a shop | Steel hardness of the delivery state | | Resquing hardness of sample | | |
|---|---|---|---|---|---|---|---|
| | | | Annealing hardness, HBW. Not greater than | Pre-hardening of the hardness of the HRC | hardening temperature ℃ | coolant | Rockwell hardness HRC is not less than |
| 7-1 | T10450 | SM45 | Hardness of hot roll delivery state 155~215 | | | | |
| 7-2 | T10500 | SM50 | Hardness of hot roll delivery state 165~225 | | | | |
| 7-3 | T10550 | SM55 | Hardness of hot roll delivery state 170~230 | | | | |
| 7-4 | T25303 | 3Cr2Mo | 235 | 28~36 | 850~880 | oil | 52 |
| 7-5 | T25553 | 3Cr2MnNiMo | 235 | 30～36 | 830～870 | Oil or air | 48 |
| 7-6 | T25344 | ICr2Mnl MoS | 235 | 28~36 | 830~870 | oil | 51 |
| 7-7 | T25378 | 8Cr2MnWMoVS | 235 | 40~48 | 860~900 | air | 62 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7-8 | T25515 | 5CrNiMnMoVSCa | 255 | 35～45 | 860~920 | oil | 62 |
| 7-9 | T25512 | 2CrNiMoMnV | 235 | 30~38 | 850~-930 | Oil or air | 48 |
| 7-10 | T25572 | 2CrNi3MoAl | | 38～43 | | | |
| 7-11 | T25611 | 1 Ni3MnCuMoAl | — | 38～42 | | | — |
| 7-12 | A64060 | 06Ni6CrMoVTiAl | 255 | 43～48 | 850℃ ~880℃ solid solution, oil or air cooling 500℃ ~540℃ aging. Empty cold | | actual measurement |
| 7-13 | A64000 | 00Ni18Co8Mo5TiAl | protocol | protocol | 805℃ ~825℃ solid solution, air cooling 460℃ ~530℃ aging, air cooling | | protocol |
| 7-14 | S42023 | 2Cr13 | 220 | 30~36 | 1000～1050 | oil | 45 |
| 7-15 | S42043 | 4Cr13 | 235 | 30～36 | 1050～1100 | oil | 50 |
| 7-16 | T25444 | 4Cr13NiVSi | 235 | 30~36 | 1000～1030 | oil | 50 |
| 7-17 | T25402 | 2Cr17Ni2 | 285 | 28～32 | 1000～1050 | oil | 19 |
| 7-18 | T25303 | 3Cr17Mo | 285 | 33~38 | 1000~-1040 | oil | 46 |

**Table 26 (continued)**

| order number | Unified number, the word code name | the name of a shop | Steel hardness of the delivery state | | Resquing hardness of sample | | |
|---|---|---|---|---|---|---|---|
| | | | Annealing hardness, HBW. Not greater than | Pre-hardening of the hardness of the HRC | hardening temperature ℃ | coolant | Rockwell hardness HRC is not less than |
| 7-19 | T25513 | 3Cr17NiMoV | 285 | 33～38 | 1030～1070 | oil | 50 |
| 7-20 | S44093 | 9Cr18 | 255 | protocol | 1000～1050 | oil | 55 |
| 7-21 | S16993 | 9Cr18MoV | 269 | protocol | 1050～1075 | oil | 55 |

**Table 27 Hardness value of steel for special use molds and quenching hardness value of test samples**

| order number | Unified number, the word code name | the name of a shop | Steel hardness of the delivery state | Resquing hardness of sample | |
|---|---|---|---|---|---|
| | | | Annealing hardness of HBW | heat treating regime | Rockwell hardness HRC is not less than |
| 8-1 | T26377 | 7Mn15Cr2Al3V2WMo | | 1170℃ ~1190℃ solid solution • water cooling 650℃ ~700℃ aging • air cooling | 45 |
| 8-2 | S31049 | 2Cr25Ni20Si2 | — | 1040℃ ~1150℃ solid solution, water or air cooling | |
| 8-3 | S51740 | 0Cr17NiICuINb | protocol | 1020℃ ~1060℃ solid solution, air cooling 470℃ ~630℃ aging. Empty cold | |
| 8-4 | H21231 | Ni25Cr15Ti2MoMn | ≤300 | 950℃ ~980℃ solid solution, water or air cooling 720℃ + 620℃ aging • air cooling | |
| 8-5 | H07718 | Ni53Cr19Mo3TiNb | ≤300 | 980℃ ~1000℃ solid solution • water, oil or air cooling 710℃ ~730℃ aging. Empty cold | |
| According to the demander's requirements. And indicated in the contract, can provide the measured value. | | | | | |

## 6.5 low-fold tissue

6.5.1 Steel shall test the acid-dip low tissue, with no visible shrinkage holes, inclusions, layers, cracks, bubbles and white spots on the acid-dip low test piece. The central loose and ingot segregation shall be shown in Figure A in Appendix A respectively.1 and Figure A.2. The qualification level shall meet the following requirements:

A) The center loose and ingot shape segregation of round steel and square steel are specified according to the 2 groups in Table 28;

B) Loose and ingot gregation of flat steel center according to the 2 groups in Table 29;

C) According to the requirements of the Demander, the supplier shall be supplied in Table 28 or 1 group in Table 29.

**Table 28 Low power defects and qualified grades of round steel and square steel**

| Steel diameter or side length of mm | Group 1 | | Group 2 | |
|---|---|---|---|---|
| | center porosity | telome theory | center porosity | telome theory |
| | Level, not greater than | | | |
| ≤80 | 2.0 | 2.0 | 3.0 | 3.0 |
| >80～150 | 2.5 | 3.0 | 3.5 | 3.0 |
| >150～250 | 3.0 | 3.0 | 4.0 | 4.0 |
| >250～100 | 3.5 | 3.0 | 4.5 | 4.0 |
| >400 | protocol | protocol | protocol | protocol |

**Table 29 Low power defect of flat steel and its qualification level**

| Steel thickness of mm | | Group 1 | | Group 2 | |
|---|---|---|---|---|---|
| | | center porosity | telome theory | center porosity | telome theory |
| | | Level, not greater than | | | |
| Hot rolled flat steel | ≤60 | 3.0 | 3.0 | 4.0 | 4.0 |
| | 60～120 | 3.5 | 3.0 | 4.5 | 4.0 |
| | >120 | protocol | protocol | protocol | protocol |
| Forging flat steel | 160~250 | 3.0 | 3.0 | 4.0 | 4.0 |
| | >250～400 | 3.5 | 3.0 | 4.5 | 4.0 |
| | >400 | protocol | protocol | protocol | protocol |

6.5.2 Upon the agreement between both parties and indicated in the contract, the low steel quality organization can be inspected by GB / T 1979, and the qualification level shall be determined by both parties through negotiation.

6.5.3 After the agreement between both parties and indicated in the contract, the low power organization of electroslag remolten steel can be inspected by ASTM A604, and the qualified level shall be determined by the supply and demand parties through negotiation.

## 6.6 Microscopic tissues

### 6.6.1, pearlosome organization

**6.6.1.1**9SiCr, Cr 2, Cr 06,9 Cr 2, W, 9CrWMn, Cr WMn, and 7CrMn2Mo steel for annealing state. As shown in Figure A.3 Evaluation, its qualified level is level 1 ~5. According to the requirements of the demander and indicated in the contract, the 9SiCr annealed steel body used for the manufacturing thread blade is grade 2 ~4.

**6.6.1.2**Non-alloy tool steel with a section size of no more than 60 mm shall be tested for annealing delivery. As shown in Figure A.4. Evaluation, and the qualification level shall comply with the provisions of Table 30. According to the requirements of the demander, non-alloy tool steel with section size of more than 60

mm. The qualification level shall be determined by the supply and demand parties through negotiation.

**Table 30 Qualification level of non-alloy tools**

| the name of a shop | Qualified level, level |
|---|---|
| T7.T8、T8Mn.T9 | 1～5 |
| T10,T11、T12、T13 | 2～4 |

**6.6.1.3**Beite organization is not tested for thermal pressure processing.

### 6.6.2, mesh carbide

**6.6.2.1**9SiCr, Cr 06, Cr 2 and CrWMn steel delivered in the annealed status shall test the mesh carbide, as per Figure A.5 Evaluation, its qualification level shall comply with the following provisions:

A) Steel with section size not greater than 60 mm is not greater than grade 3; according to the requirements of the demander and indicated in the contract, 9SiCr steel for manufacturing thread blade is not greater than Grade 2:

B) Flat steel and steel with a section size greater than 60 mm shall be determined by the supply and demand parties through negotiation.

**6.6.2.2**Non-alloy tool steels (except T7 and T8) delivered in annealed status shall be tested for mesh carbide. As shown in Figure A.6. The qualification level shall comply with the provisions of Table 31.

**Table 31 Qualification grade of non-alloy tools**

| Steel nominal size / mm | Qualified level, not greater than / level |
|---|---|
| ≤60 | 2 |
| >60～100 | 3 |
| >100 | protocol |

6.6.2.3T7, T8 non-alloy tool steel and thermal pressure processing steel do not test the mesh carbide.

### 6.6.3 Eutectic carbide inhomogeneity

6.6.3.1 Cr8Mo2VSi, 6Cr4W 3Mo2VNb, 6W6Mo5Cr4V, W6Mo5Cr4V2, Cr 8, Cr 12, for annealing status delivery

Cr12W, Cr12MoV and Cr12MoIV1 steel shall test the inhomogeneity of eutectic carbide and be assessed according to the fourth rating chart of GB / T 14979-1994 standard, and their qualification level shall comply with the provisions of the 2 groups in Table 32. As required by the demander and indicated in the contract. Can be supplied in 1 group.

**Table 32 Qualified grade of cold-made die steel**

| Steel diameter or side length of mm | Cocrystalline carbide inhomogeneity is qualified level | |
|---|---|---|
| | Group 1 | Group 2 |
| | Level, not greater than | |
| ≤50 | 3 | 4 |
| >50～70 | 4 | 5 |
| >70~120 | 5 | 6 |
| >120～400 | 6 | protocol |
| >400 | protocol | protocol |
| The qualified level of flat steel shall be determined by the supply and demand parties through negotiation. | | |

6.6.3.26Cr4W3Mo2VNb Steel may not be tested when the supplier guarantees that this requirement is met.

### 6.7 Nonmetallic inclusions

6.7.1 Non-metallic inclusions of electroslag reused steel shall be tested and rated according to the A method of GB / T 10561- -2005, and the result shall comply with the provisions of Group 1 in Table 33.

6.7.2 Non-metallic inclusions of vacuum degassing steel shall be tested and rated according to the A method of GB / T 10561- -2005, and the results shall comply with Group 2 specified in Table 33.

6.7.3 According to the requirements. Other steels may be tested for non-metallic inclusions. The qualification level shall be determined by the supply and demand parties through negotiation.

**Table 33 Qualification level of nonmetallic inclusions**

| Category of nonmetallic inclusions | Group 1 | | Group 2 | |
|---|---|---|---|---|
| | Fine department | The coarse department | Fine department | The coarse department |
| | Level, not greater than | | | |
| A “ | 1.5 | 1.5 | 2.5 | 2.0 |
| B | 1.5 | 1.5 | 2.5 | 2.0 |

**Table 33 (Cont.)**

| Category of nonmetallic inclusions | Group 1 | | Group 2 | |
|---|---|---|---|---|
| | Fine department | The coarse department | Fine department | The coarse department |
| | level. Not greater than | | | |
| C | 1.0 | 1.0 | 1.5 | 1.5 |
| D | 2.0 | 1.5 | 2.5 | 2.0 |
| According to the demander's requirements. DS class nonmetallic inclusions can be tested. The qualification level shall be determined by the supply and demand parties through negotiation. | | | | |
| "4Cr 2MnIMoS, 8Cr 2MnWMoVS and 5CrNiMnMoVSCa easy to cut plastic mold steel does not test class A inclusions. | | | | |

## 6.8, and the decarbonization layer

6.8.1 The total decarbonization layer (ferrite + transition layer) on one side of the hot rolled and forged steel shall comply with the provisions of Group 2 in Table 34. According to the requirements of the demander, the parties agree and the contract can be supplied in 1 group.

**Table 34 Total decarbonization layer depth of hot-rolled and forged steel**Unit is mm

| Steel diameter or side length | Total decarburization depth, not greater than | |
|---|---|---|
| | Group 1 | Group 2 |
| 5～150 | 0.25+1%D | 0.20+2%D |
| >150 | agreement between two sides | |
| Note: D is the nominal size of the steel section. | | |

6.8.2 The total depth of the decarbonization layer on one side of the cold-pulled steel shall comply with the provisions of Table 35.

**Table 35 The total depth of decarbonization layer of cold-pulled steel is mm**

| Steel | divide into groups | Total decarbonization bed depth. Not greater than |
|---|---|---|
| Non-alloy tool steel | 16 mm | 1.5%D |
| | >16 mm | 1.3%D |
| | High frequency quenching | 1.0%D |
| other | Do not contain silicon steel | Of 1.5% of the nominal size |
| | Silicon steel | Of 2.0% of the nominal size |
| Note: D is the nominal size of the steel section. | | |

6.8.3 According to the requirements of the demander, the decarbonization layer of the flat steel can be tested, and the specific requirements shall be determined by the supply and demand parties through negotiation.

6.8.4 No decarbonization layer is allowed on the surface of silver bright steel.

The decarbonization layer of 6.8.5 6W6Mo5Cr4V, 4Cr3Mo3SiV and 3Cr3Mo3W2V steel shall be determined by the supply and demand parties through negotiation.

6.8.6 7Mn15Cr2Al3V2WMo Steel without magnetic mold does not test the decarbonization layer.

## 6.9 Relative magnetic permeability

The relative permeability of steel for 7Mn15Cr2Al3V2WMo non-magnetic die shall be less than 1.01. When the supplier guarantees to meet this requirement, it may not be met

To test.

## 6.10, detected by ultrasound

6.10.1 Steel shall be ultrasonic tested according to GB / T 6402, and metallurgical defects such as white spot, slag inclusion, stratification, internal crack and shrinkage hole are not allowed inside.

6.10.2 The size classification and quantity level of the allowable limit value are specified in Table 36 and Table 37 respectively, and the eligibility level shall meet the provisions of Group 2 in Table 38. However, high quality steel such as electroslag remolten steel shall comply with the provisions of 1 group.

6.10.3 The qualified level of ultrasonic testing of special purpose die steel shall be determined by both parties through negotiation.

**Table 36 Ultimate values of allowable defect dimensions**

| Defect size level | Single defect flat-bottom hole diameter ″ mm | Continuous defect flat bottom hole diameter mm | Max length mm |
|---|---|---|---|
| A | 14 | 10 | 80 |
| B | 10 | 7 | 60 |
| C | 7 | 5 | 40 |
| D | 5 | 3 | 30 |
| E | 3 | 2 | 30 |
| ″Based on the defect size level required by the order, the distance of a single defect diameter shall be greater than or equal to 5 times the required flat-bottom hole diameter, otherwise, the defect shall be considered a continuous defect.<br>The stage difference of the defect size shall be the amplitude of 6 dB.<br>If the maximum continuous defect length exceeds the standard level. An additional quantity level may be considered. For example, if the continuous length is 160 mm A, the quantity level is 160:80=2. | | | |

**Table 37 Ultimate values of the number of defects allowed by ultrasound detection**

| Defect quantity level | Number of individual defects | Number of continuous defects |
|---|---|---|
| | number. Not greater than | |
| a | 32 | 16 |
| b | 16 | 8 |
| c | 8 | 4 |
| d | 4 | 2 |
| e | 2 | 1 |

Table 38 Eligibility level for ultrasound testing

| Steel diameter, side length, or thickness of mm | Qualified level | |
|---|---|---|
| | Group 1 | Group 2 |
| ≤150° | E/e | E/d |
| >150～250 | E/d | D/d |
| >250～400 | D/d | C/e |
| >400 | C/e | B/b |
| On the premise that the supplier meets the requirements. It can be replaced with a blank material or without ultrasonic detection. | | |

**6.11, and the surface quality**

6.11.1 Hot rolled and forged steel used for pressure processing shall not have visually visible cracks, folding, scars and inclusion. In case of the above defects, they shall be removed and the removal depth shall comply with the provisions of the steel starting from the actual size of Table 39. The clearance width is not less than 5 times the depth. Other minor surface defects with depth within half of the tolerance may not be cleared.

**Table 39 Surface quality requirements of steel used for pressure processing**Unit is mm

| Steel diameter, side length, thickness, or width | The lowed defect clearance depth is not greater than |
|---|---|
| <80 | Half the difference |
| 80～140 | common difference |
| >140 | 4% of the steel cross-section size |

6.11.2 For hot rolled and forged steel for cutting, the surface shall have the local defects from the depth specified in Table 40. However, the minimum size of the steel shall be guaranteed.

**Table 40 The surface quality of cutting steel is required in millimeters**

| Steel diameter, side length, thickness, or width | Local defect is allowed in depth, not greater than |
|---|---|
| <80 | Half the difference |
| >80 | common difference |

6.11.3 The surface of cold-pulled steel shall be clean and smooth, without cracks, folding, scarring, inclusion and oxide skin, and shall comply with the following provisions:

A) Cold pulled steel with size precision h9 and h10 with no defects on the surface:

B) Cold-pulled steel with dimensional accuracy of h11 class and h12 class. The surface is allowed to have minor surface defects such as hemp points, individual scratches, hair lines, concave surfaces, black spots, cracks and lubricant traces of the nominal size tolerance calculated from the actual size: according to the requirements of the demander, and indicate in the contract, the allowable depth of the defects shall not be greater than half of the nominal size tolerance;

C) Heat treated cold pulled steel with oxidation color or slight oxide layer on the surface.

6.11.4 The surface of silver bright steel shall comply with the provisions of GB / T 3207- -2008.

6.11.5 The surface of the steel delivered by machining shall be clean and smooth, without cracks, folding, scarring and oxide skins. If the above defects exist, partial grinding shall be allowed, but the minimum size of the steel shall be guaranteed.

6.12, special requirements

According to the requirements of the demander, the parties agree and indicate in the contract. The following inspection items may be added:

A) Special chemical composition;

Bin) Special hardness value:

C) Special size and its allowable deviation;

d) grain size:

e) quenching degree:

And f) Other requirements.

## 7 Test method

The inspection items and test methods of each batch of steel shall comply with the provisions in Table 41.

## 8 Inspection rules

### 8.1 Inspection and acceptance

The quality of steel shall be inspected and accepted by the technical quality supervision department of the supplier. The Demander shall have the right to inspect and accept any inspection items specified in this Standard or the Contract.

### 8.2 Group and batch rules

8.2.1 The steel products shall be accepted in batches. Each batch of steel shall be composed of steel of the same furnace number, same processing method, same delivery state, same specification and same heat treatment furnace.

8.2.2 Each batch of electroslag remolten steel shall be composed of steel with the same subfurnace number, same processing method, same delivery state, same specification and same heat treatment furnace. Under the condition of stable process and can guarantee the requirements of this standard. The parent furnace number that is allowed to remelt with electric slag, but the chemical composition shall be 1 according to each sub-furnace number, and other items shall be executed according to the provisions of electric arc furnace steel sampling.

### 8.3 Samquantity and sampling site

The sampling quantity and sampling parts of the steel shall comply with the provisions of Table 41.

**Table 41 Details of inspection items, sampling parts, sampling quantity and test methods of steel**

| order number | inspecting item | Sampling quantity″ | | sampling location | experimental method |
|---|---|---|---|---|---|
| | | Electric arc furnace steel vacuum degassing steel | Electroslag refused steel vacuum arc remelting (VAR) steel | | |
| 1 | chemical composition | One furnace per furnace | One furnace per furnace | GB/T 20066 | GB / T 223 (see Chapter 2), GB/T 4336、GB/T 11261、GB/T 20123、GB/T 20124 |
| 2 | Delivery hardness | 5% • and no less than 5 branches | | On different roots of steel | GB/T 231.1 |
| 3 | Hardness of sample | 2 | 1 | Electric arc furnace steel or vacuum degassing steel: different root steel | GB/T 230.1 |

| | | | | | |
|---|---|---|---|---|---|
| | | | | Electroslag refused steel or vacuum arc refused steel: any single steel | |
| 4 | macrostructure | 2 | 1 | Ararc furnace steel or vacuum degassing steel: equivalent to the ingot head of different billet or steel<br>Electroslag refused steel or vacuum arc refused steel: equivalent to the billet or steel on the head of the ingot | GB / T 226. Appendix AGB / T 1979 or ASTM A604 |
| 5 | pearlitic structrure | 2 | 1 | Electric arc furnace steel or vacuum degassing steel: different root steel<br>Electroslag refused steel or vacuum arc refused steel: any single steel | GB / T 13298. Appendix A |
| 6 | net carbide | 2 | 1 | | GB / T 13298. Appendix A |
| 7 | eutectic carbide unevenness | 2 | I | | GB/T 13298<br>GB/T 14979—1994 |
| 8 | non-metallic inclusion | 2 | 1 | | GB/T 10561—2005 |
| 9 | decarburized layer | 2 | 1 | | GB/T 224 |

Table 41 (Renewal)

| order number | inspecting item | Sampling quantity | | sampling location | experimental method |
|---|---|---|---|---|---|
| | | Electric arc furnace steel vacuum degassing steel | Electroslag refused steel vacuum arc remelting (VAR) steel | | |
| 10 | relative permeability | | | On any steel | GJB 937—1990 |
| 11 | grain size | — | | On any steel | GB/T 6394 |
| 12 | quenching degree | 1 | 1 | On any steel | GB / T 225 or Appendix B |
| 13 | ultrasonic inspection and measurement | To the root | To the root | On the whole steel | GB/T 6402 |
| 14 | surface quality | To the root | To the root | On the whole steel | visual |
| 15 | size | To the root | To the root | On the whole steel | Caliper, thousand feet |
| "When the delivered quantity is less than the sampled quantity, sample sample by sample. For large gauge steel, non-metallic inclusions can be inspected on a diameter of 90 mm~120 mm; the inspection method may be specified in the contract. | | | | | |

## 8.4 Reinspection and judgment rules

8.4.1 Steel reinspection and judgment rules shall follow GB / T 17505.

8.4.2 If the supplier can ensure that the steel is qualified, the test results of the steel or the bad inferior tissue, non-metal inclusions and sample quenching hardness of the same furnace number are allowed to be replaced with bad, with large for small.

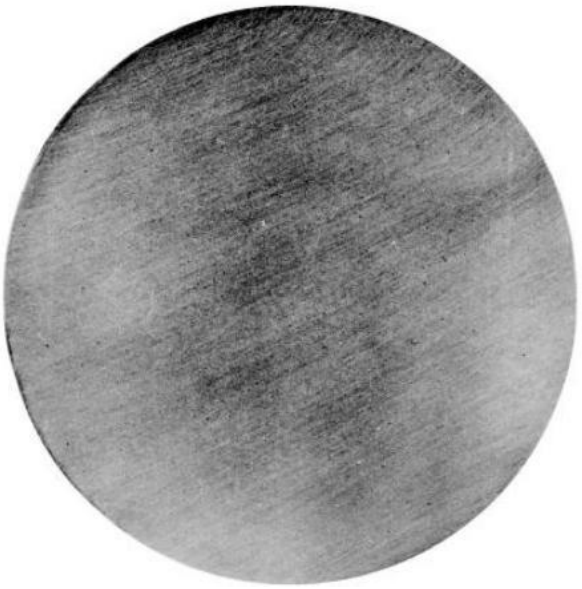
## 9 Packaging, marking and quality certificate

The packaging, marking and quality certificate of the steel shall comply with the provisions of GB / T 2101.

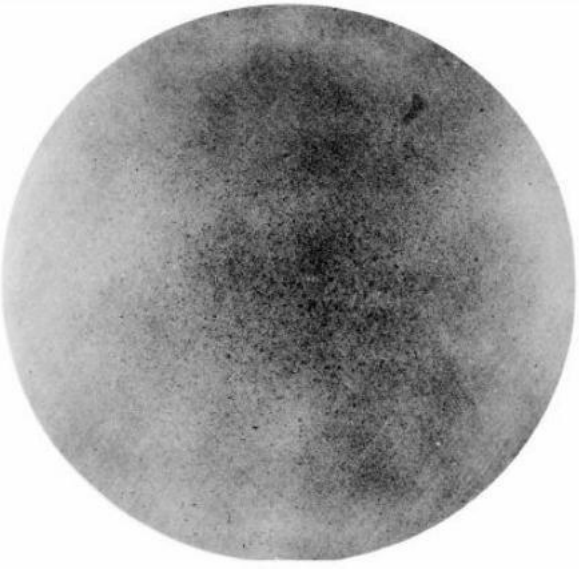
# appendix A
# (Normative appendix)
# Standard rating chart

## A.1 First-level graph for lower-power tissue

A.1.1 Center loose standard rating chart is shown in Figure A.1。

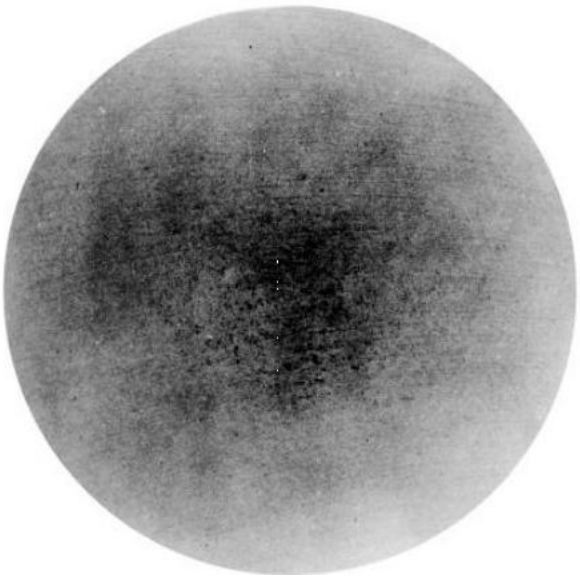


Level 1

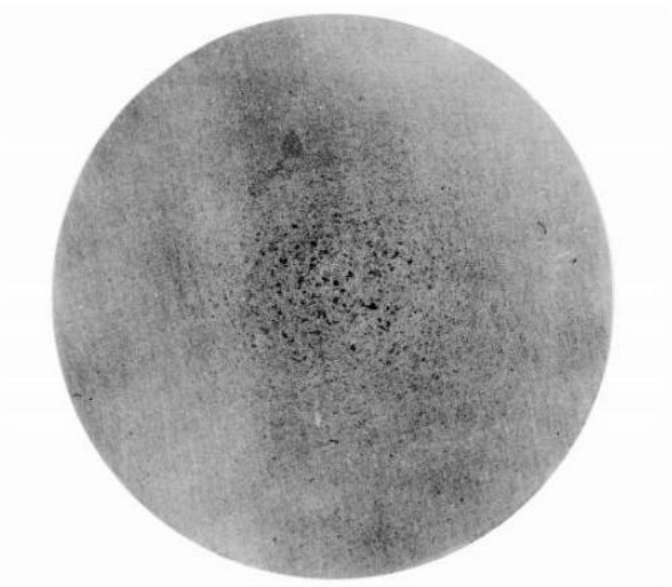


Level 2

**graph A.1 Center loose standard rating chart**

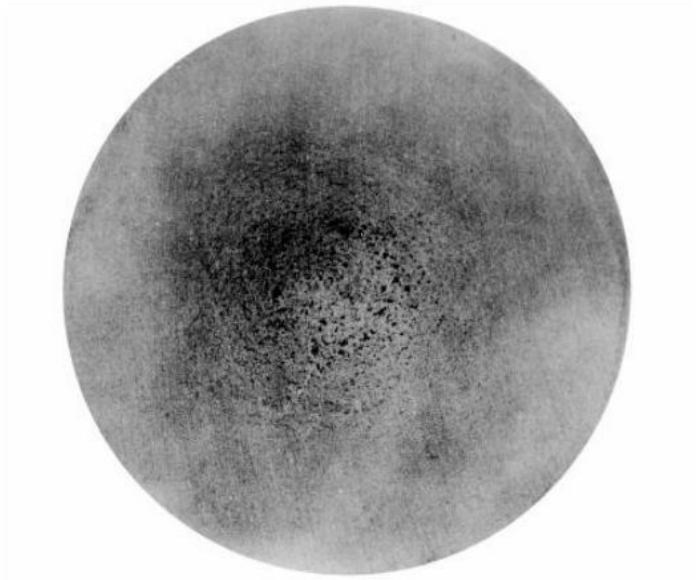


Level 3

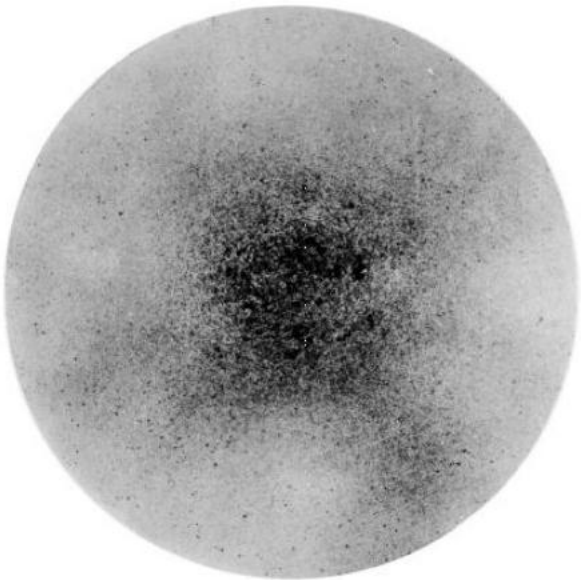


Level 4

graph A.1 (continued)



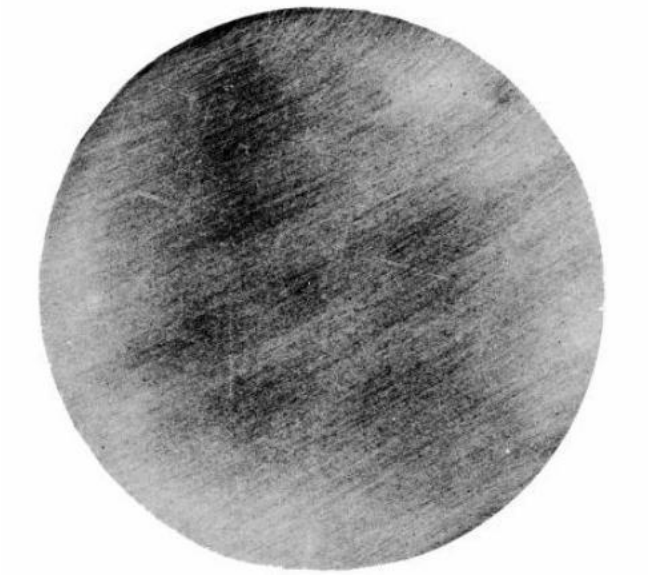
Level 5



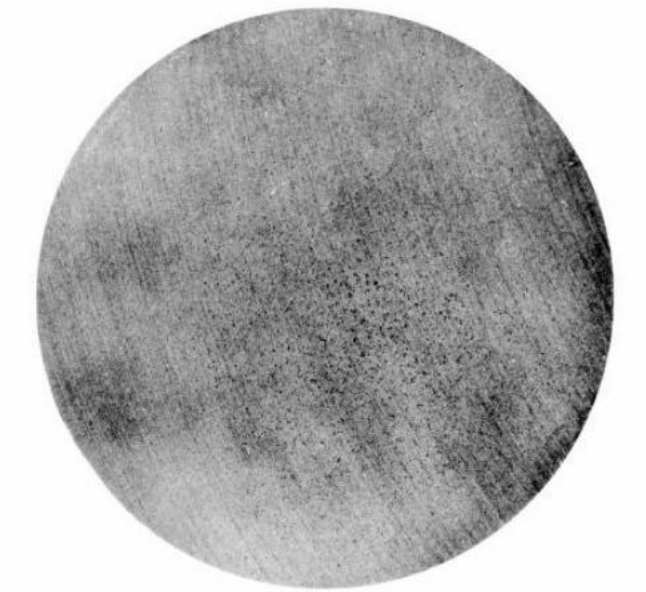
Level 6

graph A.1 (continued)

A.1.2 Standard rating chart see Figure A.2。



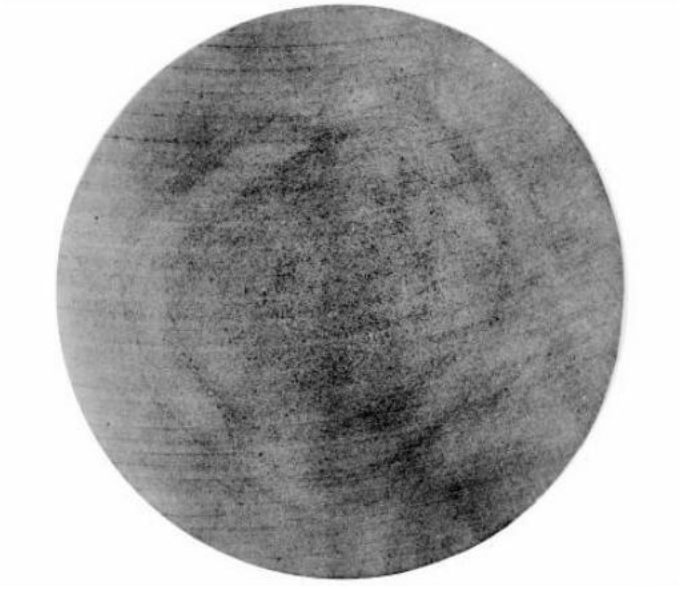
Level 1



Level 2

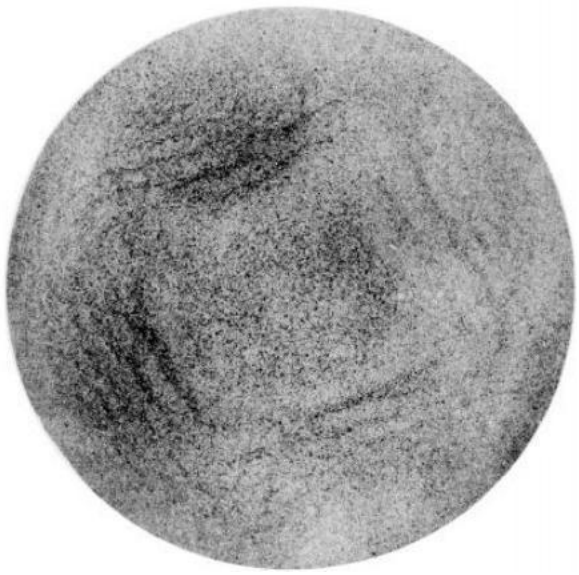
**graph A.2 ingot type segregation standard rating chart**

Level 3

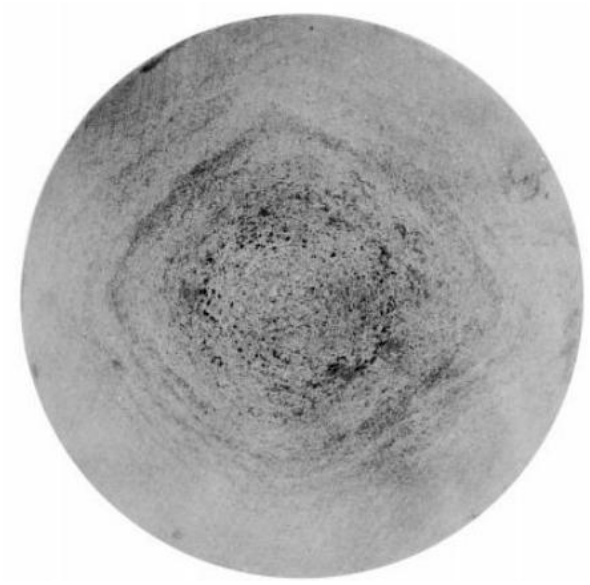


Level 4

graph A.2 (continued)



Level 5

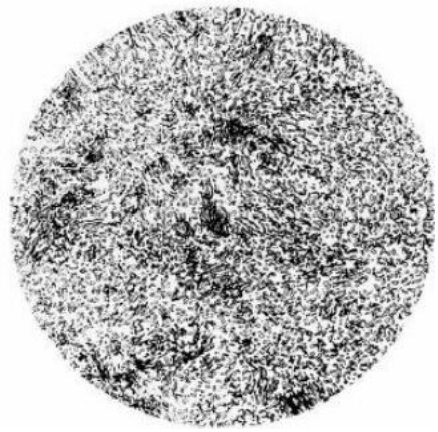


Level 6

graph A.2 (continued)

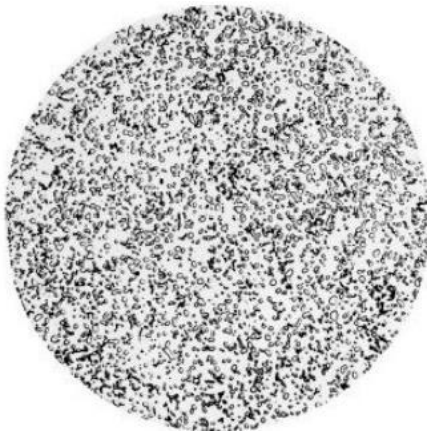
## A.2 Second level diagram, pearlessome organization

A.2.1 Standard rating chart for optical body organization of alloy tool steel beads is shown in Figure A.3。

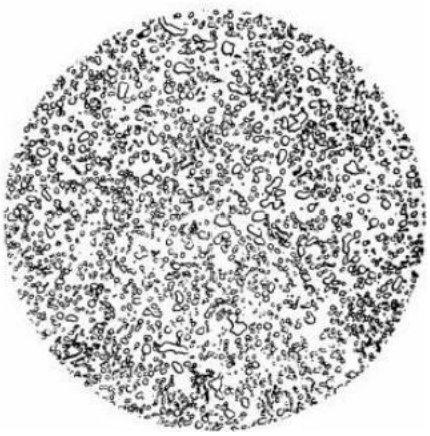


Level 1

Level 2

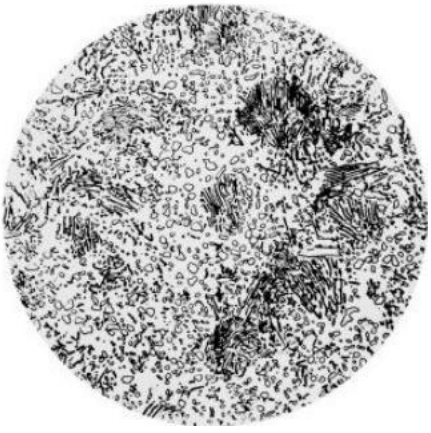


Level 3



Level 4

Level 5



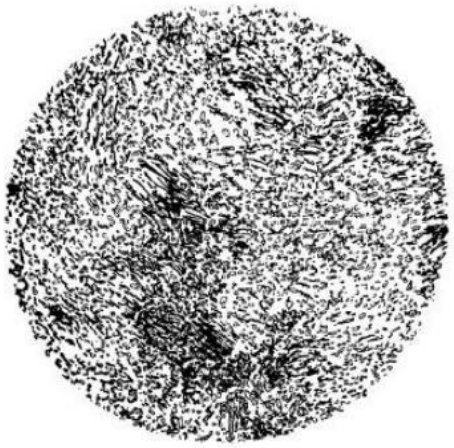
Level 6

explain:

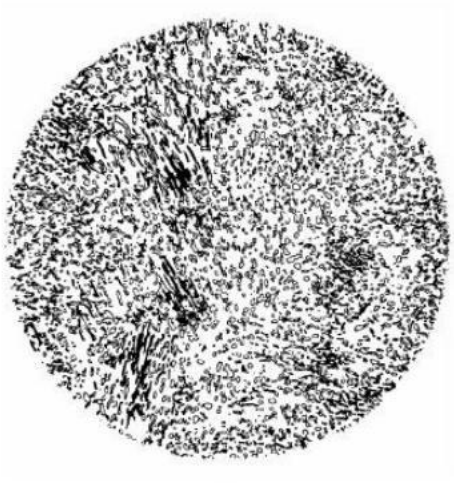
The field of view diameter of 80 mm · 100 mm represents 10 mm.

graph A.3 Standard rating diagram of alloy tool

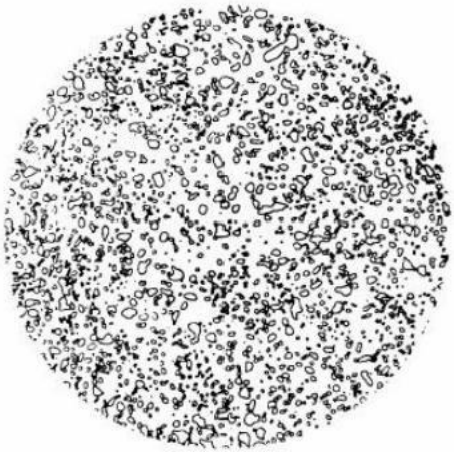
A.2.2 Standard rating chart for optical body organization of non-alloy tools, see Figure A.4 。



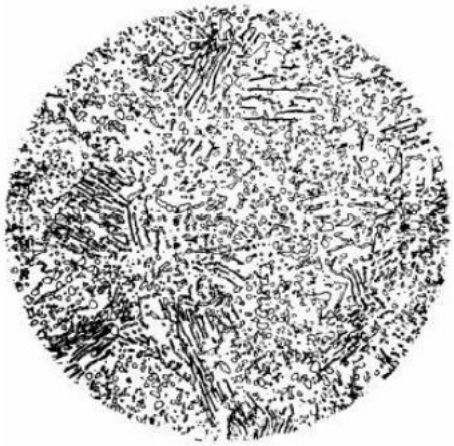
Level 1



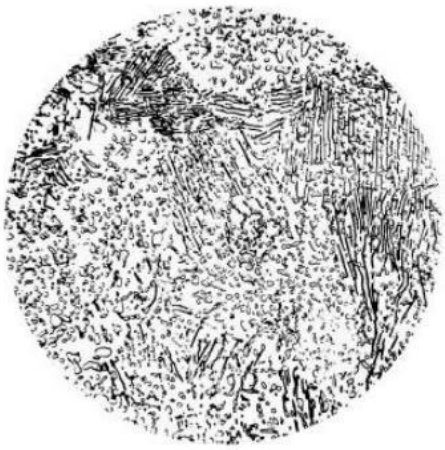
Level 2



Level 3



Level 4



Level 5

Level 6

explain:

The visual field diameter is 65 mm. The 100 m represents the 10 mm.

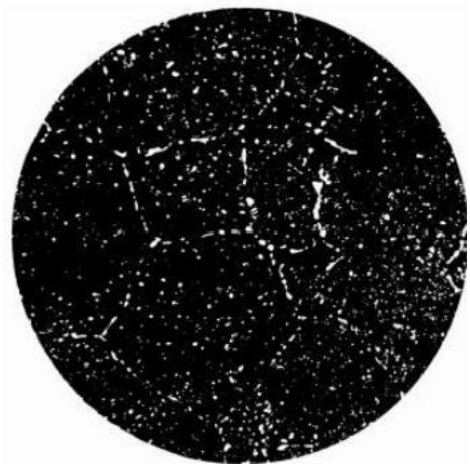
graph A.4 Standard rating diagram of non-alloy tools

## A.3 Third level diagram, mesh carbide

A.3.1 Standard rating chart for mesh carbide of alloy tool steel is shown in Figure A.5。

Level 1

Level 2



Level 3

Level 4

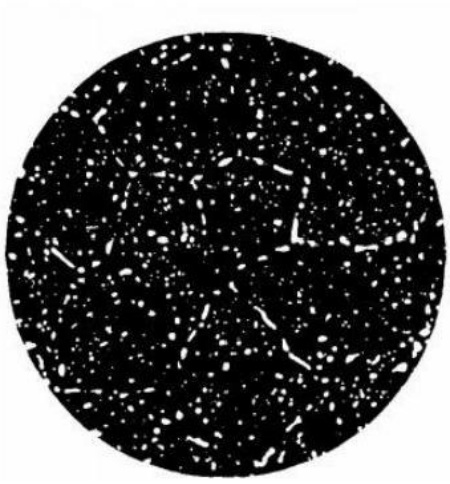
explain:
The visual field diameter is 80 mm.100 μ m represents 10 mm.

**graph A.5 alloy tool steel mesh carbide standard rating diagram**

A.3.2 Standard rating chart for steel mesh carbide of non-alloy tools is shown in Figure A.6。

Level 1

Level 2



**Level 3**

Level 4

explain:

The visual field diameter is 65 mm.100 am represents 10 mm.

**graph A.6 Standard rating diagram of non-alloy tools**

# Appendix B
(Normative
Annex)
Test method for quenability of non-alloy tools

## B.1 Principle

The sample is heated to the quenching temperature, quenching after insulation, and then the sample is interrupted from the middle to measure the quenching depth in the cross section.

## B.2 Symbols and instructions

The symbol is described in Table B.1。

outside B.1 Symbolic description

| symbol | explain | unit |
|---|---|---|
| L | Total length of sample | mm |
| D | The diameter of the sample | mm |
| H | The trough depth of the sample | mm |
| T | Quenched medium temperature | ℃ |
| e zCs; | The depth of the black zone on the back end surface | mm |
| e | Quenched depth | mm |

## B.3 The sample

### B.3.1 Preparation of sample blanks

The specimen shall be able to show complete sections of ingot, billet and steel. If necessary, it can be forged into a diameter of 25mm. Take the sample blank according to the sample location of GB / T 225.

### B.3.2 Pretreatment of the sample billet

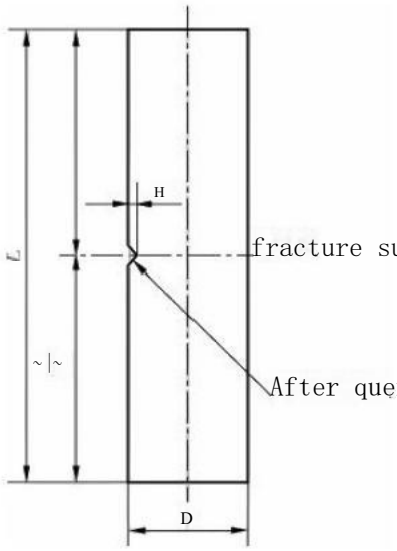
B.3.2.1 The steel delivered by normal ignition or annealing shall not be pretreated when the sample is broken.

B.3.2.2 The forged or rolled samples can be ignition or annealing, and the treatment conditions are determined according to the recommended process of the corresponding products.

B.3.2.3 The billet can also be adjusted, the quenching temperature is 870℃± 10℃, and quenched into oil after insulation. Then were then kept at 625℃ to 650℃ for 1 h and cooled in stationary air.

B.3.3 Preparation of test samples

The sample is processed by the lathe into round rod samples of diameter of 20 mm ± 0.5 mm and length of 75mm ± 0.5 mm (see Figure B.1) 。If the steel sample cannot be processed into standard due to the limitation of the size, the small sample can be made and the sample size shall be indicated.




graph B.1. Schematic diagram of the test sample

B.4. Test method

B.4.1 Heat quenching of the sample

Heating is best done in a salt bath, lead bath or a furnace with a controlled atmosphere to prevent decarbonization and oxidation of the sample surface. It can also be done in a box-type electric furnace.

The quenching and thermal insulation time is determined according to the furnace type. The uniform heating shall be guaranteed. Generally, ranging from 10 min to 30 min.

The quenching medium is a 10% sodium chloride aqueous solution of no less than 200 L. The temperature was 20℃± 10℃.

After heating, the sample should be quickly put into the medium without stirring to ensure uniform quenching until complete cooling.

B.4.2 Preparation of sample section

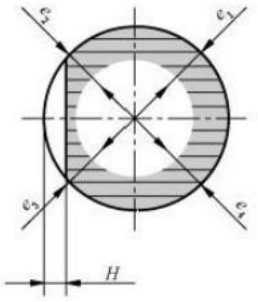
Sute the cleaned and dried specimens. The groove depth is 1.5 mm ~2 mm. The specimen can be broken by bending or bumping on the back of the slot by other physical methods. But it should not produce thermal effects.

The breaks were ground or polished in 80℃ to 85℃ containing 50% HH for 3 min. And then rinse with hot water and blow dry.

B.4.3 Determination of the quenching depth

The depth of the steel was determined by measuring the depth of the sample polishing surface in the black area after corrosion. The diameter of the groove (see Figure B.2) 。Read number is accurate to 0.25 mm. Athe four numbers:

$$e = \frac{e_1 - e_2 + e_3 - e_4}{4}$$




**graph B.2. Schematic diagram of the determination of the quenching depth**

When the measured value varies from the average of the four measured values by more than 1 mm. The readings are considered irregular and need to be re-ground for the section or re-sampled.

## B.5 The results indicate that

The quenching depth results are expressed in millimeters, accurate to 0.5 mm. For tests performed at different quenching temperatures, the results indicate a temperature index in parentheses.

Example: 3.5 (780℃) indicates a quenching temperature of 780℃. The quenching depth was 3.5 mm.4.0 (840℃) indicates a quenching temperature of 840℃. The quenching depth was 4.0 mm.

# appendix C
# (informative annex)
# The main characteristics and uses of each brand number

The main characteristics and uses of each sign are shown in Table C.1~ Table C.7 。

## outside C.1 Main features and uses of steel non-alloy for blade mold

| order number | Unified number, the word code name | the name of a shop | Main features and uses |
|---|---|---|---|
| 1-1 | T00070 | T7 | Sub-analysis steel, with good plasticity, toughness and strength, and a certain hardness. Can withstand the vibration and shock load, but the cutting performance force is poor. For the manufacture of the impact load is not large, and the requirement has the appropriate hardness and wear resistance is extremely good toughness tool |
| 1-2 | T00080 | T8 | The quenching property and toughness are better than T10 steel, and the wear resistance is also high, but the quenching heating is easy to overheat, and the deformation is also large. Plastic and strength is relatively low, large and medium section mold easy to residual mesh carbide • suitable for making small pull, stretch, extrusion mold |
| 1-3 | T01080 | T8Mn | Co-analysis steel, with high quenching and hardness, but lower plasticity and strength. For the manufacture of large section of woodworking tools, hand saw saw blade, engraving, rivets rivet die, coal mine chisel, etc |
| 1-1 | T00090 | T9 | Over analysis steel, with higher strength but lower plasticity and strength. It is used to manufacture various tools with high hardness and certain toughness. Such as engraving tools, rivet die, punch, woodworking tools, rock tools and so on |
| 1-5 | To0100 | T10 | Non-alloy tool steel with good performance has high wear resistance and low overheating sensitivity during quenching. High strength and certain toughness can be obtained after appropriate heat treatment, which is suitable for the production of molds with high wear resistance and less impact load |
| 1-6 | T00110 | T11 | The steel has good comprehensive mechanical properties (such as hardness, wear resistance and toughness, etc.), and grows the grain when heating Little sensitivity for the formation of a carbide network. Use for manufacturing constant hot tools of cutting edge at work, such as saw, silk cone, file, scraper, expansion drill, plate teeth, cold punching die and woodworking tool with small size and no sharp change |

| | | | |
|---|---|---|---|
| 1-7 | T00120 | T12 | Over analysis steel, due to the high carbon content. There is still more excess carbide after quenching. So high hardness and wear resistance. But toughness Low, and large quenching deformation. Not suitable for manufacturing high cutting speed and impact load tools, for manufacturing no impact negative Charge, cutting speed is not high, cutting blade mouth unchanged hot tools, such as car cutter, milling cutter, drill, silk cone, file, scraper, hole expansion drill, plate teeth, and section size of small cold cutting edge mold and punching mold, etc |
| 1-8 | T00130 | T13 | Over co-analysis steel, due to the high carbon content, more excess carbide after quenching, so the hardness is higher, but the toughness is worse, and by The number of carbide increases and the distribution is not uniform. Therefore, the mechanical properties are poor • not suitable for high cutting speed and impact Load tools, used to manufacture no impact load, but requires a very high hardness of metal cutting tools, such as razor, scraper, pull Silk tools, files, carving tools, and hard rock processing tools and carving tools, etc |

## outside C.2 The main characteristics and uses of steel for measuring tools

| order number | Unified number, the word code name | the name of a shop | Main features and uses |
|---|---|---|---|
| 2-1 | T31219 | 9SiCr | It has higher quenability and hardening hardness and good tempering stability than chromium steel. Suitable for the manufacture of complex shape, small deformation, high wear resistance requirements, such as drill, thread, manual hinge knife, washboard and rolling wheel, etc.: can also make cold mold (such as punching die, printing mold, etc.).cold roll. Correction roll and slender rods |
| 2-2 | T30108 | 8MnSi | The low alloy tool steel formed by human Si and Mn element is added on the basis of T8 steel. With a high tempering stability, a high Qudenability and wear resistance, heat treatment deformation is also smaller than non-alloy tool steel. Suitable for making woodworking tools, cold punching die and punch, head;: can also make the mold for cold processing |

**outside C.2 (continued)**

| order number | Unified number, the word code name | the name of a shop | Main features and uses |
|---|---|---|---|
| 2-3 | T30200 | Cr06 | Add Cr to non-alloy tool steel. Quenching ability and wear resistance are higher than that of non-alloy tool steel, cold machining plastic deformation and cutting performance is better • Suitable for woodworking tools, can also make simple cold machining mold, such as punching mold, Cold pressure mold, etc |
| 2-4 | T31200 | Cr2 | Add a certain amount of Cr. Qudenability is improved, hardness, wear resistance is also higher than non-alloy tool steel, contact fatigue strength is also high, quenching deformation is small. Suitable for manufacturing woodworking tools, cold punching die and punch, but also used in the production of small and medium size cold As a mold |
| 2-5 | T31209 | 9Cr2 | The performance is basically similar to Cr 2 steel, but the toughness is better than Cr 2 steel. Suitable for woodworking tools, cold roll, cold punching die and punch, steel stamping die, etc |
| 2-6 | T30800 | W | Add a certain amount of W to the non-alloy tool steel foundation. After heat treatment with higher hardness and wear resistance • and overheat sensitivity Small sensibility, small heat treatment deformation, good tempering stability and other characteristics. Suitable for the manufacture of small twist drill, head, can also be used to make silk Cones, files, plate teeth, and tools with low temperature and slow cutting speed |

**outside C.3. Main characteristics and uses of steel for impact-resistant tools**

| order number | Unified number, the word code name | the name of a shop | Main features and uses |
|---|---|---|---|
| 3-1 | T40294 | 4CrW2Si | A certain amount of tungsten added on the basis of chromium silicon steel has certain quenability and high temperature strength. Suitable for manufacturing tools for operating under high impact loads. Such as wind tools, cutting edge composite die, punching die, cold cutting scissors and other cutting tools. And some of the small hot-making molds |

| | | | |
|---|---|---|---|
| 3-2 | T40295 | 5CrW2Si | Add a certain amount of tungsten on the basis of chromium and silicon steel. With a certain quenability and high-temperature intensity. Suitable for the manufacture of cold shear metal blade, rubbing board blade, cold cutting and edge cutting die. And woodworking tools for working for a long time |
| 3-3 | T40296 | 6CrW2Si | Add a certain amount of tungsten on the basis of chromium and silicon steel. The quenching hardness is higher. There is a certain high-temperature intensity. Suitable for manufacturing tools that withstand impact load and require high wear resistance, such as wind tools, chisels and molds. Cold shear machine blade, cutting edge with groove, air hammer tools, etc |
| 3-4 | T40356 | 6CrMnSi2MolV | Equivalent to the S5 steel in the ASTM A681. It has high quenching ability and wear resistance and tempering stability, and the quenching temperature is low. The use process of mold rarely collapse and fracture, so it is suitable for manufacturing tools, die punching and cold cutting edge cutting under high impact load |
| 3-5 | T40355 | 5Cr3MnSiMol | Equivalent to the S7 steel in the ASTM A681. Good quenability, with higher strength and tempering stability, integrated high performance. Suitable for manufacturing in high temperature, high impact load working tools, die, can also be used for manufacturing Hammer forging mold |
| 3-6 | T40376 | 6CrW2Siv | Medium carbon oil quenching type impact resistant cold making tool steel, with good impact resistance and wear resistance performance. It also has good fatigue resistance and high dimensional stability. Suitable for the production of blades, cold forming tools and precision punching die and hot punching tools |

## outside C.4 Main characteristics and uses of steel for roll

| order number | Unified number, the word code name | the name of a shop | Main features and uses |
|---|---|---|---|
| | T42239 | 9Cr2V | 2% Cr series, high carbon content ensures high hardness: chromium, can increase the permeability of steel: vanadium. It can improve the wear resistance of steel and refine the grain of steel. Suitable for making cold rolling working roll, supporting roll, etc |
| 4-2 | T42309 | 9Cr2Mo | The 2% Cr series. High carbon content ensures high roll hardness. Adding chromium and molybdenum can increase the quenability and wear resistance of steel. This kind of steel has good forging performance, and the control of low final forging temperature and appropriate deformation can refine the grain, eliminate the mesh carbide distributed along the grain boundary, and make it evenly distributed. Suitable for making cold rolling working roll, supporting roller and correction roll |
| 4-3 | T42319 | 9Cr2MoV | The 2% Cr series. But the comprehensive performance is better than the 9 Cr 2 series steel. If the electric slag remelting process is used. Its roll billet performance is better. Suitable for manufacturing cold rolling working roll, supporting roller and correction roller |
| 4-4 | T42518 | 8Cr3NiMoV | 3% Cr series, the quenching layer can reach about 30 mm. For cold rolling roll, service life higher than 2% chromium steel |
| 4-5 | T42519 | 9Cr5NiMoV | Namely, MC 5 steel. With high quenability, the hardening layer of the finished roller can reach 35 mm ~40 mm (HSD 85). Good wear resistance, suitable for manufacturing of cold rolling rolls requiring deep hardening layer, poor rolling conditions and high accident resistance |

## outside C.5 The main characteristics and uses of steel for cold-making mold

| order number | Unified number, the word code name | the name of a shop | Main features and uses |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 5-1 | T20019 | 9Mn2V | High hardness and wear resistance; small deformation during quenching; good quenability. Suitable for manufacturing a variety of precision measuring tools, sample • can also be used for manufacturing small size punching die and cold pressure die, carving mold, drop mold, etc. And the machine tool wire poles and other structural parts |
| 5-2 | T20299 | 9CrWMn | With certain quenching ability and wear resistance • small quenching deformation, uniform carbide distribution and fine particles, suitable for making cold punching die with small section and complex deformation |
| 5-3 | T21290 | CrWMn | oil-hardening steel. Due to tungsten carbide formation, there is more excess than 9SiCr steel after quenching and low temperature tempering carbide. Higher hardness and wear resistance and better toughness. However, the steel is sensitive to the formation of carbide network, if there is the existence of mesh carbide, the blade of the mold has the risk of peeling, so as to reduce the service life of the mold. Steel with carbide mesh must be forged or fired according to its severity. Suitable for making silk cones, plate teeth, reamers, small die, etc |
| 5-4 | T20250 | MnCrWV | High carbon low alloy oil quenching steel. It has a relatively high quenability. Small deformation of heat treatment.hardness High level, with good wear resistance. Suitable for making steel plate cutting die, cutting knife, drop die, measuring tools and thermosetting plastics Module et al |
| 5-5 | T21347 | 7CrMn2Mo | Empty quenched steel. Small heat treatment deformation • Suitable for making products that need to be close to the size tolerance, such as trim die, plastic die, pressure bending tool, punching die and precision pressure die, etc |
| 5-6 | T21355 | 5Cr8MoVSi | ASTM A681 The modified steel type of A8 steel • has good quenability, toughness, heat treatment dimensional stability. Suitable for making hardness in HRC 55 ~ HR C60 punch and cold forging mold. It can also be used to make non-metallic tool materials |
| 5-7 | T21357 | 7CrSiMnMoV | Flame quenching steel. The quenching temperature range is wide, good quenability, air cooling can be quenched. Hardness reaches HRC 62 ~ HRC 64. It has easy quenching operation and low cost. Small overheating sensitivity, small air cooling deformation and other advantages • suitable for the production of automobile cold bending mold |
| 5-8 | T21350 | Cr8Mo2SiV | High toughness, high wear resistance steel • with high quenching and wear resistance, quenching size change and other characteristics, suitable for the production of cold cutting die, cutting die, rolling die, gauge, drawing die, washboard, cold punching die, etc |

**outside C.5 (continued)**

| order number | Unified number, the word code name | the name of a shop | Main features and uses |
|---|---|---|---|
| 5-9 | T21320 | Cr4W2MoV | With high quenching permeability, hardening, wear resistance and dimensional stability • suitable for all kinds of punching mold, cold heading mold, drop mold, cold extrusion concave mold and washwire board and other molds |
| 5-10 | T21386 | 6Cr4W3Mo2VNb | Namely, the 65 Nb steel. Niobium is added to improve the strength of steel and improve the process. Suitable for making cold extrusion, thick plate cold flushing, cold heading and other cold making molds bearing large load • It can also be used to make warm extrusion molds |
| 5-11 | T21836 | 6W6Mo5Cr4V | Low-carbon-type, high-speed steel. Lower carbon and vanadium content compared with W6Mo5Cr4V2. With high toughness • used for cold mold steel • mainly used for the production of steel material cold extrusion mold |
| 5-12 | T21830 | W6Mo5Cr4V2 | Tungsten and molybdenum high-speed steel. With high toughness, good thermoplastic, wear resistance, red hard high characteristics.need In cold-making mold steel. Suitable for making all types of tools, large thermoplastic cutting tools: can also be made high Wear-resistant parts under load, such as cold extrusion mold, temperature extrusion mold, etc |
| 5-13 | T21209 | Cr8 | With good quenability and high wear resistance • suitable for making all kinds of cold working die steel with high wear resistance requirements. Better toughness compared to Cr 12 |
| 5-14 | T21200 | Cr12 | Equivalent to the D3 steel in ASTM A681, with good wear resistance, suitable for the production of cold punching die, punch, cold shear knife, drilling sleeve, gauge, drawing die, etc |
| 5-15 | T21290 | Cr12W | ledeburitic steel. It has high wear resistance and quenching ability, but low plasticity and toughness. Suitable for the production of high strength, high wear resistance, and heat not more than 300℃ ~400℃, such as steel plate deep tensile die, drawing die, thread washboard, cold punching die, cutting knife, saw blade, etc |
| 5-16 | T21317 | 7Cr7Mo2V2Si | Higher strength and toughness than Cr 12 and W6Mo5Cr4V2 steel, better wear resistance and cold and cold The processing process performance is excellent, and the heat treatment deformation is small. Strong versatility, suitable for production, withstand a high load of cold extrusion mold. Cold heading die, cold punching die, etc |

| | | | |
|---|---|---|---|
| 5-17 | T21318 | Cr5MolV | Empty quenched steel. With good air quenching characteristics, wear resistance between high carbon oil quenching mold steel and high carbon high chromium wear resistance mold steel. However, it has good toughness, strong versatility, especially suitable for making good wear resistance and good toughness mold, such as the following material mold and molding mold, roll, punch, calender mold and rolling mold, etc |
| 5-18 | T21319 | Cr12MoV | ledeburitic steel. With high quenching permeability and wear resistance • small size change during quenching • uniform carbide distribution and high toughness of Cr 12 steel. Suitable for making complex shape of punching die, cold cutting knife, tensile mold, drawing<br>Mold, washboard, cold extrusion mold, measuring tools, etc |
| 5-19 | T21310 | Cr12MolV1 | ledeburitic steel. With high quenability, hardening and high wear resistance: high temperature oxidation resistance, heat treatment<br>Small deformation: suitable for the production of a variety of high precision, long life cold molds, blades and measuring tools, such as complex shapes<br>Punch concave die, cold extrusion die, rolling wheel, rubbing board, cold shear knife and precision measuring tool, etc |

## outside C.6 The main characteristics and uses of steel for hot-making mold

| order number | Unified number, the word code name | the name of a shop | Main features and uses |
|---|---|---|---|
| 6-1 | T22345 | 5CrMnMo | With similar performance to 5CrNiMo. The quenability is slightly worse than 5CrNiMo. Working at high temperatures. Heat and fatigue resistance is less than 5CrNiMo. Suitable for making various types of forging molds with high strength and high wear resistance |
| 6-2 | T22505 | 5CrNiMo | With good toughness, strength and high wear resistance, it can still maintain the hardness of around HBW300 when heated to 500℃. Because it contains Mo elements, steel is not sensitive to tempering brittleness and is suitable for making various large and medium-sized forging molds |
| 6-3 | T23504 | 4CrNi4Mo | With good quenability, toughness and polishing properties. Can be air-cold hardening. Suitable for making hot mold and plastic mold • can also be used to make part of the cold mold |

**outside C.6 (continued)**

| order number | Unified number, the word code name | the name of a shop | Main features and uses |
|---|---|---|---|
| 6-4 | T23514 | 4Cr2NiMoV | The improved type of 5CrMnMo steel has high room temperature strength and toughness, better tempering stability, quenching ability and thermal fatigue resistance. Suitable for making hot forging mold |
| 6-5 | T23515 | 5CrNi2MoV | Similar to 5CrNiMo steel • has good quenability and thermal stability. Suitable for making large forging die and hot shear |
| 6-6 | T23535 | 5Cr2NiMoVSi | With good quenability and thermal stability. Suitable for making all kinds of large hot forging die |
| 6-7 | T23208 | 8Cr3 | It has certain room temperature and high temperature mechanical properties. Suitable for the production of hot punching die punch, concave mold insert of hot edge mold, hot top forging die, hot bending mold, and working temperature lower than 500℃, less impact and required wear-resistant working parts, such as hot scissors sheet, etc. It can also be used to make cold-rolling working rolls |
| 6-8 | T23274 | 4Cr5W2VSi | Steel for die casting. In the medium temperature has a high thermal strength, hardness, wear resistance, toughness and good thermal fatigue performance, can be air cold hardening. It is suitable for making molds and brandrols for hot extrusion, die-casting die for light metals such as aluminum and zinc, tools for hot-top forging structural steel and heat-resistant steel, and high-speed hammer forging die for forming certain parts |
| 6-9 | T23273 | 3Cr2W8V | At high temperature with high strength and hardness (650℃ hardness about HBW300), resistance to cold and heat alternating fatigue Good performance, but poor toughness. Suitable for high stress under high temperature, but not by the impact load of convex mold, concave mold, such as flat forging machine with convex concave mold, insert, copper alloy extrusion die, die casting mold: can also be used to make the compressive stress, bending stress, tensile stress mold, such as back extrusion mold: can also be made under high temperature of hot metal knife, etc |
| 6-10 | T23352 | 4Cr5MoSiy | With good toughness, thermal strength and thermal fatigue performance, can be air cold hardening. At low austenite temperature, the oxidation skin produced with air quenching is less inclined and can resist the impact effect of molten aluminum. Suitable for making aluminum die casting die, hot extrusion die and perforated mandrel, plastic die, etc |

| | | | |
|---|---|---|---|
| 6-11 | T23353 | 4Cr5MoSiV1 | Steel for die casting • is equivalent to H13 steel in ASTM A681 • with good toughness and good thermal strength, Thermal fatigue performance and a certain wear resistance. Can be empty cold quenching hard. Small deformation of heat treatment. Suitable for aluminum, copper and its alloy casting die, hot extrusion die, perforating tools, mandrels, press forging die, plastic die, etc |
| 6-12 | T22354 | 4Cr3Mo3SiV | Equivalent to the H10 steel in the ASTM A681. It has very good quenability, very high toughness and high temperature strength. Suitable for making hot extrusion die, hot punching die, hot forging die, etc |
| 6-13 | T23355 | 5Cr4Mo3SiMnVAL | Use both hot and cold mold steel. With high thermal strength, high temperature hardness, tempering stability, and with Good wear resistance, heat fatigue resistance, toughness and thermoprocessing plasticity. The mold working temperature can be up to 700℃. Good antioxidant. When used for hot mold steel. Its high temperature strength and thermal fatigue performance are better than that of 3Cr2W8V steel. When used in cold casting, it has higher toughness than Cr 12 and low alloy die steel. Mainly used in hot extrusion mold and cold heading mold in bearing industry |
| 6-14 | T23364 | 4CrMnSiMoV | Steel for low alloy and large section hot forging die. It has good quenability, high thermal strength, heat resistance and fatigue resistance, wear resistance and toughness, good tempering resistance, heat resistance and cold and hot processing performance. Mainly used for production 5CrNiMo steel can not meet the requirements of large hammer forging die and machine forging die |
| 6-15 | T23375 | 5Cr5WMoSi | It has good quenability and toughness, good heat treatment size stability and moderate wear resistance. Suitable for making hardness in HRC 55 ~ HR C60 punch. It is also suitable for making cold mold, non-metal tool materials |
| 6-16 | T23324 | 4Cr5MoWVSi | With good toughness and thermal strength. Air cooling hardening, heat treatment deformation is small, air quenching when the oxide skin tendency is small, and can resist the erosion of molten aluminum. Suitable for making aluminum die casting die, forging die, hot extrusion Press die and perforation manrol, etc |
| 6-17 | T23323 | 3Cr3Mo3W2V | ASTM A681 H10 improved steel type, with high toughness and resistance to cold and heat fatigue performance, good thermal stability. Suitable for making hot extrusion die, hot punching die, hot forging die, etc |

**outside C.6 (continued)**

| order number | Unified number, the word code name | the name of a shop | Main features and uses |
|---|---|---|---|
| 6-18 | T23325 | 5Cr4W5Mo2V | It has high tempering resistance and thermal stability • high thermal strength, high temperature hardness and wear resistance, but its toughness and thermal fatigue resistance are lower than 4Cr5MoSiVI steel. Suitable for high temperature strength, and wear resistance performance<br>The required hot work mold, can replace 3Cr2W8V |
| 6-19 | T23314 | ICr5Mo2V | 4Cr5MoSiVI Improved section steel type. It has good quenability, toughness, thermal strength, fatigue resistance, heat resistance and small heat treatment deformation. Suitable for the production of aluminum, copper and alloy die, hot extrusion mold, perforation. With, core rod |
| 6-20 | T23313 | 3Cr3Mo3V | With relatively high heat strength and toughness, good antitempering stability and fatigue performance. Suitable for making heading die, hot extrusion die and die casting die |
| 6-21 | T23314 | 4Cr5Mo3V | It has good high temperature strength, good tempering stability and high thermal fatigue resistance. Suitable for making hot extrusion mold, warm forging mold and die casting mold and other hot forming mold |
| 6-22 | T23393 | 3Cr3Mo3VCo3 | It has high thermal strength, good tempering stability and thermal fatigue resistance. Suitable for making hot extrusion die, warm forging die and die casting die |

**outside C.7 The main characteristics and uses of steel for plastic molds**

| order number | Unified number, the word code name | the name of a shop | Main features and uses |
|---|---|---|---|
| 7-1 | T10450 | SM45 | Non-alloy plastic die steel. Good cutting performance, high hardness after quenching, good strong toughness and certain wear resistance, suitable for the production of medium and small medium and low grade plastic mold |

| | | | |
|---|---|---|---|
| 7-2 | T10500 | SM50 | Non-alloy plastic die steel. Good cutting performance • Suitable for making small plastic mold with simple shape or the precision requirements are not high, the service life does not need very long plastic mold, but the welding performance, cold deformation performance is poor |
| 7-3 | T10550 | SM55 | Non-alloy plastic die steel. Medium cutting performance. Suitable for making small plastic molds with simple shape or plastic molds with low precision requirements and short service life |
| 7-4 | T25303 | 3Cr2Mo | Pre-hard steel. Equivalent to the P20 steel in the ASTM A681. Its comprehensive performance is good, high quenability, large cut Surface steel can also obtain uniform hardness • and also has good polishing performance • High mold surface finish |
| 7-5 | T25553 | 3Cr2MnNiMo | Pre-hard steel. Equivalent to the 718 steel of ASSAB in Sweden. Its comprehensive mechanical properties are good, high quenability • large section steel has relatively uniform hardness distribution and good polishing performance after treatment |
| 7-6 | T25344 | 4Cr2MnlMoS | Easy to cut pre-hardened steel, its performance is similar to 3Cr2MnNiMo, but has better machining performance |
| 7-7 | T25378 | 8Cr2MnWMoVS | Pre-hardened type easy to cut steel, suitable for the production of various types of plastic mold, rubber wood mold, clay ceramic material mold and printed plate punching mold. Due to the high quenching hardness, good wear resistance, good comprehensive mechanical properties, small heat treatment deformation • also Can be used to make precision cold punching mold |
| 7-8 | T25515 | 5CrNiMnMoVSCa | Pre-hardened type easy cutting steel, adding human S element in steel to improve the cutting processing performance of steel, adding Ca element is mainly to improve the tissue form of sulfide, improve the mechanical properties of steel. Reduce the anisotropy of the steel. Suitable for making various types of precision injection mold, press plastic mold and rubber mold |
| 7-9 | T25512 | 2CrNiMoMnV | Pre-hardened mirror type plastic die steel. It is an improved type of 3Cr2MnNiMo steel, with high quenability and high hardness Uniform, and has good polishing performance, EDM performance and erosion flower (skin grain processing) performance • suitable for infiltration Nitrogen treatment + suitable for making large and medium-sized mirror plastic mold |

**outside C.7 (continued)**

| order number | Unified number, the word code name | the name of a shop | Main features and uses |
|---|---|---|---|
| 7-10 | T25572 | 2CrNi3MoAl | Statute of limitations hardening steel. Because the solid solution treatment process is done before cutting into a mold. Thus, the quenching and deformation of the mold is avoided. Therefore, the heat treatment deformation of the mold is small, and the comprehensive mechanical properties are good, suitable for making complex and precision plastic molds |
| 7-11 | T25611 | INi3MnCuMoAl | That is, 1ONi3MnCuAl. A nickel-copper-aluminum aging hardened steel. It has good quenability and small deformation by heat treatment. Mirror processing performance is good, suitable for the production of high mirror plastic mold, high appearance quality of household appliances plastic mold |
| 7-12 | A64060 | 06 Ni6CrMoVTiAl | Low-alloy martensite aging steel. And 06Ni steel for short. After solid solution treatment (also after rough machining), the hardness is HRC 25 to HRC 28. In the machining into the required mold shape and by the fitter finishing and polishing<br>After that, the aging treatment. Make the hardness significantly increase. The mold deformation is small and can be used directly. Ensure that the mold has<br>High precision and service life |
| 7-13 | A64000 | 00Nil8CoSMo5TiAI | Precipitation hardened type ultra-high strength steel. For short, 18Ni (250) steel, with high strength and toughness, low hardening index, good formability and weldability. Suitable for making aluminum alloy extrusion die and casting mold, precision mold and cold punching mold<br>And so on |
| 7-14 | S42023 | 2Cr13 | Corrosion resistant steel belongs to Cr 13 stainless steel. Good mechanical processing performance, after heat treatment has good corrosion resistance, good strength and toughness, suitable for the production of high load and under the action of plastic mold steel and transparent plastic products mold |
| 7-15 | S42043 | 4Cr13 | Corrosion resistant steel, belongs to Cr 13 type stainless steel, good mechanical properties, after heat treatment (quenching and tempering), with excellent corrosion resistance, polishing performance, high strength and wear resistance, suitable for production and bear high load<br>Under the action of corrosion medium, the plastic mold steel and transparent plastic products mold, etc |

| | | | |
|---|---|---|---|
| 7-16 | T25444 | 4Cr13NiVSi | Corrosion-resistant pre-hardened type steel. It belongs to Cr 13 type stainless steel with high hardness, super mirror processability, and can be pre-hard to HRC 31 ~ HRC 35. The mirror processability is good. Suitable for production requires high precision, high wear resistance, high corrosion resistance<br>Plastic mold: also used to make transparent plastic products mold |
| 7-17 | T25402 | 2Cr17Ni2 | Corrosion-resistant pre-hardened type steel, with good polishing performance: with good oxidation resistance in the application of glass mold. Suitable for making corrosion resistant plastic mold, and do not use Cr, Ni coating |
| 7-18 | T25303 | 3Cr17Mo | Corrosion-resistant pre-hardened type steel, which belongs to Cr 17 type stainless steel. With excellent strong toughness and high corrosion resistance • suitable for the production of various types of high precision, high wear resistance, and corrosion resistance of plastic mold and transparent plastic products mold its |
| 7-19 | T25513 | 3Cr17NiMoV | Corrosion-resistant pre-hardened type steel. It belongs to Cr 17 type stainless steel • has excellent strong toughness and high corrosion resistance • suitable for making all kinds of high precision, high wear resistance, and corrosion resistance of plastic mold and pressed transparent plastic products mold |
| 7-20 | S44093 | 9Cr18 | Corrosion-resistant and wear-resistant section steel. Belongs to the high-carbon martensitic steel. High hardness and wear resistance after quenching • improvement in corrosion resistance of Cr 17 martensitic steel • aqueous solutions in atmosphere, water and some acids and salts<br>There is excellent stainless corrosion resistance. Suitable for making corrosion resistance, high strength and wear resistance parts, such as shaft, rod, springs, fasteners, etc |
| 7-21 | S46993 | 9Cr18MoV | Corrosion resistant and wear resistant steel, belongs to high carbon chromium stainless steel, the basic performance and use are similar to 9 Cr 18 steel, but the thermal strength and tempering resistance is better. Suitable for making parts that withstand friction and work in corrosion medium<br>Equipment, stainless section mechanical blade and cutting tools, surgical blades, high wear resistance equipment parts, etc |

## outside C.8 The main characteristics and uses of steel for special molds

| order number | Unified number, the word code name | the name of a shop | Main features and uses |
|---|---|---|---|
| 8-1 | T26377 | 7Mnl5Cr2Al3V2WMo | A high Mn-V series without magnetic steel. Is stable in all states with a very low magnetic conductivity coefficient. High hardness, and strength. Good wear resistance. Suitable for making no magnetic mold, no magnetic<br>Bearings and other structural parts that require no magnetic induction in a strong magnetic field. It can also be used to make hot-working molds used at 700℃ to 800℃ |
| 8-2 | S31049 | 2Cr25Ni20Si2 | Austenitic type heat resistant steel, with good general corrosion resistance. The maximum use temperature is reached 1200℃。The maximum temperature for continuous use is 1150℃; the maximum temperature for intermittent use is 1050℃ ~ 1100℃. Suitable for the production of heating furnace components, also used in the manufacture of glass mold |
| 8-3 | S51740 | 0Cr17Ni4Cu4Nb | Martensite precipitate-hardened stainless steel. Low carbon content, its corrosion resistance and weldability is better than the general martensitic stainless steel. The steel has good acid resistance, good cutting ability and simple heat treatment process. During long-term use above 400℃: Suitable working temperature below 400℃. The components requiring acid corrosion resistance and high strength: it is also suitable to make plastic molds with high precision and high performance under the action of corrosion medium |
| 8-4 | H21231 | Ni25Cr15Ti2MoMn | That is, the GH2132B. Fe-25Ni-15 Cr base time-reinforced superalloy, with molybdenum, titanium, aluminum, vanadium and trace boron, is characterized by good high temperature wear resistance, high temperature deformation resistance, excellent high temperature oxidation resistance, no notch sensitivity, and excellent thermal fatigue performance. Suitable for long-term work below 650℃<br>High temperature bearing parts and hot mold, such as copper exhaust mold, hot extrusion mold and inner cylinder, etc |
| 8-5 | H07718 | Ni53Cr19Mo3 TiNb | That is, In718 alloy, with the body heart square Y ″ phase and face center cubic y phase precipitation reinforced nickel base high temperature combination<br>Gold, add human aluminum and titanium to form an intermetallic compound for y (Ni3AITi) phase precipitation reinforcement.<br>With high temperature strength, high temperature stability, good oxidation resistance, excellent cold and heat fatigue performance |

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| | | | and impact toughness<br>• Suitable for making hot forging die, punch, hot extrusion die, die-casting die, etc., which are used for more than 600℃ |

# Appendix D
# (informativ e appendix)
# Control table of domestic and foreign standard grade number of industrial die steel

See Table D for the reference table.1。

## outside D.1 The standard number is compared with ASTM, JIS and ISO

| Steel | order number | The brand number of this standard | ASTM A 686/ASTM A681 | JIS G4401/JIS G4404 | ISO)4957 |
|---|---|---|---|---|---|
| Non-alloy steel for blade mold | 1-1 | T7 | | SK70 | C70U |
| | 1-2 | T8 | - | SK80 | C80U |
| | I-3 | T8Mn | WI-8 | SK85 | |
| | 1-4 | T9 | W1-81/2 | SK90 | C90U |
| | 1-5 | T10 | W1-10 | SK105 | C105U |
| | 1-6 | T11 | W1-11 | | |
| | 1-7 | T12 | WI-111/2 | SK120 | C120U |
| | 1-8 | T13 | | | — |
| Steel for measuring tool and blade tool | 2-1 | 9SiCr | - | — | |
| | 2-2 | 8MnSi | — | — | |
| | 2-3 | Cr06 | | SKS8 | |
| | 2-4 | Cr2 | 13 | | |
| | 2-5 | 9Cr2 | | | |
| | 2-6 | W | FI | SKS2 | |
| impact T-tool for steel | 3-1 | 4CrW2Si | | SKS41 | |
| | 3-2 | 5CrW2Si | SI | | |
| | 3-3 | 6CrW2Si | | | |
| | 3-4 | 6CrMnSi2MolV | S5 | — | |
| | 3-5 | 5Cr3MnSiMolV | S7 | | |
| | 3-6 | 6CrW2SiV | | — | 60WCrV8 |

| | | | | | |
|---|---|---|---|---|---|
| 1 | | | | | |
| Steel for the roll roll | 4-1 | 9Cr2V | | | |
| | 4-2 | 9Cr2Mo | — | — | |
| | 4-3 | 9Cr2MoV | — | | |
| | 4-4 | 8Cr3 NiMoV | – | | |
| | 4-5 | 9Cr5NiMoV | | | |
| Steel for cold mold | 5-1 | 9Mn2V | 02 | — | |
| | 5-2 | 9CrWMn | 01 | SKS3 | 95MnCr5 |
| | 5-3 | CrWMn | | SKS31 | |
| | 5-4 | MnCrWV | | | 95MnWCr5 |

**outside D.1 (continued)**

| Steel | order number | The brand number of this standard | ASTM A 686/ASTM A681 | JIS G4401/JIS G4404 | ISO)4957 |
|---|---|---|---|---|---|
| Steel for cold mold | 5-5 | 7CrMn2Mo | | | 70MnMoCr8 |
| | 5-6 | 5Cr8MoVSi | - | - | |
| | 5-7 | 7CrSiMnMoV | | | |
| | 5-8 | Cr8Mo2VSi | - | — | — |
| | 5-9 | Cr4W2MoV | | — | |
| | 5-10 | 6Cr4W3Mo2VNb | | | |
| | 5-11 | 6W6Mo5Cr4V | | - | - |
| | 5-12 | W6Mo5Cr4V2 | | — | - |
| | 5-13 | Cr8 | | | |
| | 5-14 | Cr12 | D3 | SKDI | X210Cr12 |
| | 5-15 | Cr12W | | SKD2 | X210CrW12 |
| | 5-16 | 7Cr7Mo2V2Si | | - | |
| | 5-17 | Cr5MolV | A2 | SKD12 | X100CrMoV5 |
| | 5-18 | Cr12MoV | | | |
| | 5-19 | Cr12MolVi | D2 | SKD10 | X153CrMoV12 |
| Steel for hot-working molds | 6-1 | 5CrMnMo | | | |
| | 6-2 | 5CrNiMo | L6 | - | |
| | 6-3 | 4CrNi4Mo | | SKT6 | 45CrNiMol6 |
| | 6-4 | 4Cr2 NiMoV | | | |
| | 6-5 | 5CrNi2MoV | — | SKT4 | 55NiCrMoV7 |
| | 6-6 | 5Cr2 NiMoVSi | | - | |
| | 6-7 | 8Cr3 | - | | - |
| | 6-8 | 4Cr5W2VSi | | — | |
| | 6-9 | 3Cr2W8V | H21 | SKD5 | X30WCrV9-3 |
| | 6-10 | 4Cr5MoSiV | H11 | SKI)6 | X37CrMoV5-1 |
| | 6-11 | 4Cr5MoSiV1 | H13 | SKD61 | X40CrMoV5-1 |
| | 6-12 | 4Cr3Mo3SiV | H10 | - | |
| | 6-13 | 5Cr4Mo3SiMnVAl | | | |
| | 6-14 | 4CrMnSiMoV | | | |
| | 6-15 | 5Cr5WMoSi | A8 | | |
| | 6-16 | 4Cr5MoWVSi | H12 | | X35CrWMoV5 |
| | 6-17 | 3Cr3Mo3W2V | | | |

**outside D.1 (continued)**

| Steel | order number | The brand number of this standard | ASTM A 686/ASTM A681 | JIS G4401/JIS G4404 | IS()4957 |
|---|---|---|---|---|---|
| Steel for hot-working molds | 6-18 | 5Cr4W5Mo2V | - | | |
| | 6-19 | 4Cr5Mo2V | — | - | - |
| | 6-20 | 3Cr3Mo3V | | SKD7 | 32CrMoV12-28 |
| | 6-21 | 4Cr5Mo3V | | | |
| | 6-22 | 3Cr3Mo3 VCo3 | - | | - |
| Material and die-old steel | 7-1 | SM15 | | | C45U |
| | 7-2 | SM50 | — | — | |
| | 7-3 | SM55 | | | |
| | 7-4 | 3Cr2Mo | P20 | | 35CrMo7 |
| | 7-5 | 3Cr2MnNiMo | - | - | 40CrMnNiMo8-6-4 |
| | 7-6 | 4Cr2MnlMoS | | | |
| | 7-7 | 8Cr2MnWMoVS | - | | — |
| | 7-8 | 5CrNiMnMoVSCa | | | |
| | 7-9 | 2(rNiMoMnV | | | |
| | 7-10 | 2CrNi3MoAJ | | - | |
| | 7-11 | INi3MnCuAl | - | | |
| | 7-12 | 06Ni6CrMoVTiAl | — | | |
| | 7-13 | 00Nil8Co8Mo5TiAI | — | | |
| | 7-14 | 2Cr13 | | | |
| | 7-15 | 4Cr13 | | - | |
| | 7-16 | 4Cr13NiVSi | | | |
| | 7-17 | 2Cr17Ni2 | - | one one | |
| | 7-18 | 3Cr17Mo | | - | X38CrMo16 |
| | 7-19 | 3Cr17NiMoV | - | | |
| | 7-20 | 9Cr18 | — | - | — |
| | 7-21 | 9Cr18MoV | | | |
| Special purpose moldsteel | 8-1 | 7Mn15Cr2Al3V2WMo | | | |
| | 8-2 | 2Cr25Ni20Si2 | | | |
| | 8-3 | 0Cr17NiICuINb | — | — | |
| | 8-4 | Ni25Cr15Ti2MoMn | - | — | - |
| | 8-5 | Ni53Cr19Mo3TiNb | | | |