Types of Hot Work Tool Steel: A Comprehensive Guide to Different Grades

With its specialized alloys, the **Hot Work Steel** grades are designed to endure harsh conditions that typically come with manufacturing processes requiring high temperatures. This steel grade is designed to withstand intense pressure, heat, and abrasion. This allows for better tool performance and prolonged tool longevity. A common choice for the glass and pipe industry, it is also helpful for procedures that involve die casting, forging and extrusion. However, there are different types of tool steel of this variety available, each serving some unique purposes.

The ASTM Standard

As per the American Society for Testing and Materials or ASTM standards, the different types of **hot work steel** are divided into categories:

- H10-14 steel.
- H13-14 steel.
- H19 steel.
- H21-26 steel.
- H42 Steel.

Again, this steel grade can be categorized as per chemical composition.

Chromium hot work tool steel

As one of the most utilized hot work tool steel types, it contains about 3-5% chromium. They are also likely to contain less than 5% of additional alloying elements. The most common options include tungsten, molybdenum, and vanadium. Other important features include:

- Its high chromium content provides tremendous wear resistance and shields against oxidation.
- Its carbon content is approximately 0.34 to 0.40.
- The working hardness of around 400~600 HV indicates its hardness. This high hardness level typically comes from particular alloying elements and precise heat treatment.

· Its common applications include extrusion dies, forging dies, hot stamping dies, plastic injection moulds and hot working punches.
· The steel grades ranging from H10 to H19 fall under this group.

Tungsten hot work tool steel

This tool steel comes with 9-18% tungsten and 2-4% chromium. Although brittle, this steel grade offers first-rate heat resistance. And it is possible to get around this brittleness if the mechanics preheat the metal to an ideal working temperature before utilizing it. Other important features include:

· Its relatively high chromium content enhances its red hardness, or the capacity to keep hardness at a higher temperature range.
· It is ideal for applications that involve a lot of stress, such as extrusion dies and glass moulding.
· It has a hardness of about 450-600 HV, indicating it is quite hard.
· Steel Grades ranging from H21 to H26 are under this category.

Molybdenum Tungsten Hot Work Tool Steels

Both tungsten and molybdenum add to the general performance of all steels. However, the precise ratio of the two elements, alongside additional alloying additions, determines the ultimate steel property.

· This steel type is low in carbon content but high in molybdenum.
· With chromium and tungsten added as alloys, this variety offers elevated red hardness and potent wear resistance.
· It is ideal for plastic injection moulding and die casting.
· Examples include **h13 steel,** H14, as well as steel grades from H41 to H43.

Other vital Grades

Some of the other varieties of **hot work steel** tools include:

· H42: this high-chromium and high-carbon steel offers powerful wear resistance.
· H23-H24: these air-hardening tools give a fair share of dimensional stability.

Challenges in Hot Work Steel

Despite all the potential, **h11 steel and** other hot work tool steel can be vulnerable to thermal fatigue, cracking and erosion. However, it is possible to overcome these issues with a reasonable choice of steel, proper heat treatment, and accurate cooling.