

# Guangxi Chentian Metal Product Co., Ltd.

Add.: Luzhai Industrial Park, Liuzhou, Guangxi, China 545600

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## Tungsten Alloy Swaging Rod for Military

### Tungsten Alloy Military Swaging Rod

Swaging greatly increases tungsten alloy rod's ultimate tensile strength. The ultimate tensile strength of regular tungsten alloy rod is 1050 MPa . However, after swaging, the ultimate tensile strength can reach 1200 MPa min, we can even control tungsten alloy military swaging rod at 1400 MPa. Tungsten alloy military swaging rod is one of our main products. The composition of **tungsten alloy military swaging rod** is 93%WNiFe. Our common types:

Diameter: 12mm~20mm, Length: less than 400mm;

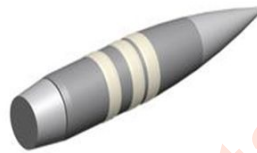
Diameter: 20mm~400mm, Length: less than 500mm.

We can manufacture other products according to customers' specific requirements.

### Tungsten Alloy Military Swaging Rod Pictures



Tungsten Alloy Military Swaging Rod-01



Tungsten Alloy Swaging Rod for Military-02



Tungsten Alloy Military Swaging Rod

15.8 - 18.75 g/cm<sup>3</sup>, 20 - 35 Tungsten Alloy Swaging Rod for Military; Tungsten Alloy Rod Used In The FJFB-3 3-die Set

Contiguity and hardness variation in sintered, heat-treated and swaged tungsten alloy.

### Tungsten Alloy Swaging Rod Main Properties :

- \* High density
- \* High melting point
- \* Small volume
- \* Excellent hardness
- \* Superior wearing resistance
- \* High ultimate tensile strength
- \* High ductility
- \* High temperature resistance
- \* Low vapor pressure

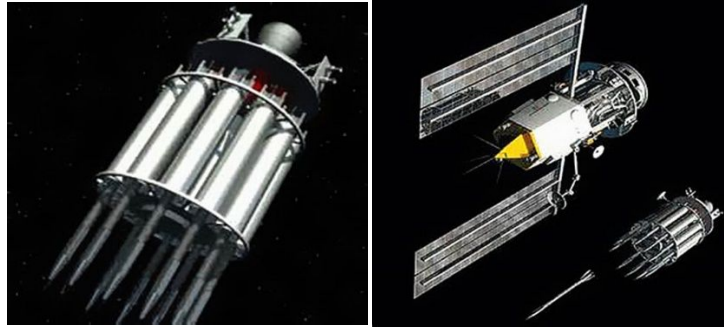
### Military Application of Tungsten Alloy Swaging Rod

Tungsten alloy swaging rod can be used in military defense, such as depleted uranium kinetic energy penetrators, bullet, armor piercing, armor piercing bullets, sniper rifle penetrator, etc.

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Tungsten Alloy “Rods From God”

## Main Processing of Tungsten Alloy Swaging Rod:

- 1). Mixing
- 2). Pressing
- 3). Sintering
- 4). Heat treatment
- 5). Swaging
- 6). Machining

Repeated heat treatment and swaging is performed need at least several times.

In this way, tungsten alloy swaging rod can be improved at tensile strength as well decrease elongation and impact toughnes.

### Tungsten Alloy Swaging Military Rod Properties Table

Composition	Processing	Density g/cm <sup>3</sup>	Tensile strength	Elongation	Hardness	Impact Energy
			Min. Mpa	Min. %	Min. HRC	J/cm <sup>2</sup>
90WNiFe	Heat treatment	17.10±0.15	1000-1100	18-29	25-29	170
92.2WNiFe	Heat treatment	17.60±0.15	900-1000	15-25	25-29	170
	Swaging		1300-1500	8-18	35-45	120
91.7WNiFe	Heat treatment	17.65±0.15	1000-1100	15-25	25-29	170
93 WNiFe	Heat treatment	18.10±0.10	900-1000	15-25	25-30	160
94 WNiFe	Heat treatment	17.90±0.10	900-1000	15-25	25-30	160
95 WNiFe	Heat treatment	18.10±0.15	900-1000	12-20	25-31	160
	Swaging		1300-1450	6-12	35-45	120
96 WNiFe	Heat treatment	18.30±0.15	900-1000	12-18	25-31	160
	Swaging		1300-1450	6-12	35-45	120
97 WNiFe	Heat treatment	18.3±0.15	800-900	9-13	28-31	130

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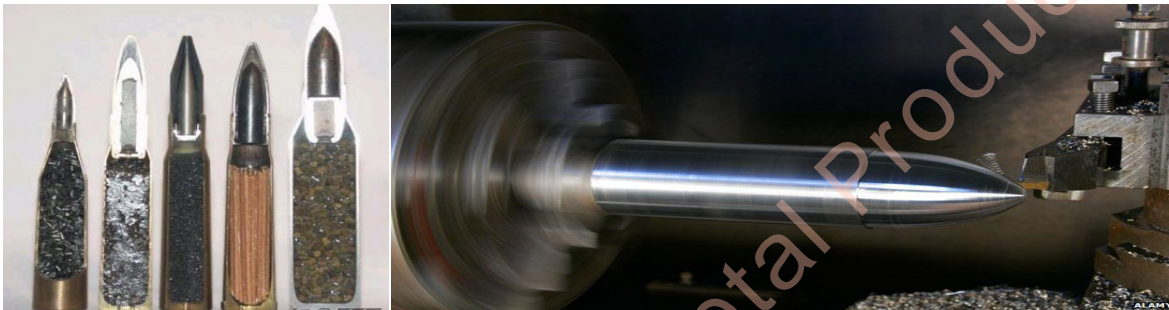
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## Tungsten Armour Piercing Bullet

### What is Tungsten Armour Piercing Bullet?

**Tungsten armour piercing bullet** are specifically designed to penetrate steel and other metal armour. Tungsten Armour piercing bullet behave exactly like any other full-metal jacketed bullet until they impact hard steel armour. In fact standard Canadian Military rifle (C7) ammunition, with its SS109 bullet incorporates an armour piercing capability.

**Armour piercing bullets** are a specific design which incorporates a hard steel or tungsten penetrator inside the ammunition core. Only ammunition with this hard penetrator design is considered to be armour piercing. When the bullet impacts armour, it begins to flatten. As the nose flattens, the hard penetrator continues forward into the armoured surface while being supported by the bullet as it continues to flatten.



### Tungsten Armor Piercing Bullet Advantages:

Tungsten Armour Piercing bullets do not explode, fragment or do any of the things you might see in a Hollywood movie. They are a simple kinetic energy penetrator. AP bullets are mainly found in military ammunition.

Tungsten armor piercing bullet has the properties of high initial velocity, low trajectory, short flying time, high accuracy, high penetration and more by adopting decorticating theory, new structure and material of tungsten heavy alloy:

It can deal with high-speed target efficiently

Fracture surface of bullet has high density

Has good ductility, which is contrary to the broken of hard steel or tungsten carbide core during penetration

Has excellent property of second penetration and penetrates to armor in splash type

Has significant penetration to composite armor which has big impact angle, or layered construction

Has been widely adopted for large caliber bullet or small caliber shell, as ammunition to target which

has light armor such as panzer or attack helicopter



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## Tungsten Prefabricated Fragments

### Fragmentation Damage Warhead's Mechanism and Characteristic

Fragmentation warhead is one of the main types of warheads, mainly by the role of high-energy explosives, the formation of a large number of high-speed fragments, using high-speed hitting the tungsten prefabricated fragments, the role of ignition and detonation damage targets, and can be used for anti-effectives (human, animal), no armor or light armored vehicles, aircraft, radar and missiles and other weapons and equipment. According to the generation of fragments channels, fragmentation warhead can be divided into natural, pre-control and pre-fragmented warhead three types.

Tungsten prefabricated fragments are natural under detonation. **Tungsten alloy ball**, the shell expansion, fracture broken of such warheads is characterized not only as a container shell to form another anti-elements, fragments the size of the uneven, irregular shape in the air fast decay in flight speed, so that the effective anti-personnel grenade is limited in scope. Usually, tungsten prefabricated fragments made from tungsten alloy ball. We can provide different sizes of tungsten alloy balls in accordance with your requirements.

Pre-control use of shell fragments groove, groove or increase the lining of explosives and other technical measures to make the shell partial reduction of the intensity to control the explosion of the broken parts to form fragments. Such warheads are characterized by the formation of uniform fragment size and shape. Tungsten alloy ball is one among our leading products.

Tungsten prefabricated fragments forming pre-processing will be the shape and quality of pre-designed tungsten alloy ball, steel arrows, tungsten alloy ball, tungsten alloy ball and other prefabricated column fragments produced prefabricated sets of body fragments and installed in the grenade projectile outer surface or inner surface. Tungsten alloy ball prefabricated projectile fragmentation grenade explosion with the formation of fragments together constitute the natural fragmentation field, due to resistance of tungsten prefabricated fragments flying characteristic consistency, with tungsten prefabricated fragments of the grenade will be set within the framework of the lethal effect of a relatively dense, full-bombs a greater degree of lethality increase.

Because there is a tungsten prefabricated fragments will affect the negative effects of missile body structures, usually only in low-pressure chamber which uses artillery and ammunition, such as the forced large-caliber bullets and grenades. Applications also are the most common aircraft shells, grenades, mines and so on. The current high chamber pressure prefabricated artillery fragments, are used in canister form, such as Switzerland, L70-type 40 mm grenade where overhead is filled with tungsten alloy ball. Tungsten prefabricated fragments technology has been widely used on all types of warheads. Cylindrical fragments (Tungsten column) as a type of tungsten prefabricated fragments, due to high density, armor-piercing capability, as air defense, anti-radiation, anti-surface, one of the main anti-elements, and widely used.

### Tungsten Alloy Ball for Prefabricated Fragments



Tungsten Alloy Ball-1



Tungsten Alloy Ball-2



Tungsten Alloy Ball-3

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Tungsten Alloy Ball

Specification:  $\Phi 2\text{mm}-\Phi 100\text{mm}$

Density:  $\leq 18.5\text{g/cm}^3$

Application: High density tungsten alloy ball usually use as prefabricated fragment in ammunition.

Guangxi Chentian Metal Products Co. Ltd can provide advanced tungsten alloy ball in various sizes and with different surface finishing. We are able to manufacture tungsten alloy ball that can meet any military standard. We can supply any kind of tungsten alloy ball in accordance with customer's special requirements.

Tungsten Prefabricated Fragments Physical and Mechanical Properties

Brands	Physical and Mechanical Properties				
	Density g/cm <sup>3</sup>	Hardness HRC	Tensile strength	Elongation %	Toughness MJ/m <sup>2</sup>
W263H	17.25±0.15	≥35	≥1050 MPa	≥8	≥0.3
W253H	17.40±0.15	≥35	≥1050 MPa	≥8	≥0.3
W243H	17.60±0.15	≥35	≥1050 MPa	≥7	≥0.3
W232H	18.10±0.15	≥37	≥1050 MPa	≥6	≥0.1
W231H	18.30±0.15	≥37	≥1050 MPa	≥3	≥0.1
W221H	18.50±0.15	≥37	≥1050 MPa	≥2	≥0.07
W243H	17.60±0.15	≥40	≥1300 MPa	≥6	≥0.15
W232E	18.10±0.15	≥40	≥1300 MPa	≥6	≥0.15
W273	17.10±0.15	≥23	≥900 MPa	≥24	≥1.30
W263	17.25±0.15	≥23	≥900 MPa	≥23	≥1.20
W253	17.40±0.15	≥24	≥900 MPa	≥22	≥1.10
W243	17.60±0.15	≥24	≥920 MPa	≥20	≥0.90
W232	18.10±0.15	≥25	≥920 MPa	≥14	≥0.45
W231	18.30±0.15	≥26	≥920 MPa	≥12	≥0.30
W221	18.50±0.15	≥27	≥920 MPa	≥10	≥0.22
WNiCu	16.00-18.50	≥22	≥450 MPa	2-8	/

## Tungsten Alloy Cubes for Military Defense

### The Advantages of Tungsten Alloy Cubes for Military Defense

With its high density, tungsten alloy is the ideal metal for military defense. Tungsten is non-toxic, and environmentally friendly materia. **Tungsten alloy cubes for military defense** can easily replace lead in most cases.




Having more concentrated weight means having more control to achieve the center of mass that you are targeting. Owing to its great hardness and resistance to high temperature, tungsten has been increasingly adopted in military defense increasingly today. We can offer **tungsten alloy cubes for military defense** in various sizes. We offer the tungsten cubes, rod, ball, cylinder, block, etc. for

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military usage, such as bombs, armor-piercing bullet, etc. We welcome the opportunity to cooperate with our customers in the design of individual specifications. Our mission is to meet individual customer requirements. Flexibility is our strength and we pride ourselves on being able to find the right solution for every customer.

 <p>Tungsten Alloy Cube R3×3×3mm</p>	 <p>Tungsten Alloy Cube R5×5×5mm</p>	 <p>Tungsten Alloy Cube R3.2×3.2×3.2mm</p>
tungsten alloy cubes for military defense	tungsten alloy cube 5X5X5mm	tungsten alloy cube 3.2X3.2X3.2mm

## Advantage of Tungsten Alloy Cubes for Military Defense:

- 1, High-density
- 2, High absorption capacity against X-rays and gamma rays
- 3, Good modulus of elasticity
- 4, High hardness
- 5, Environment protection standard

## Tungsten Alloy Cubes Product Physical Properties

Grade	Physical and Mechanical Properties				
	Density(g/cm <sup>3</sup> )	Hardness(HRC)	Tensile Strength(MPa)	Elongation(%)	Toughness(MJ/m <sup>2</sup> )
W273	17.10±0.15	≥23	≥900	≥24	≥1.30
W263	17.25±0.15	≥23	≥900	≥23	≥1.20
W253	17.40±0.15	≥24	≥900	≥22	≥1.10
W243	17.60±0.15	≥24	≥920	≥20	≥0.90
W232	18.10±0.15	≥25	≥920	≥14	≥0.45
W231	18.30±0.15	≥26	≥920	≥12	≥0.30
W221	18.50±0.15	≥27	≥920	≥10	≥0.22
WNiCu	16.10-18.50	≥22	≥450	2-8	-

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## Tungsten Small Caliber Core

### Why is Tungsten Small Caliber Core?

Tungsten alloy, also called tungsten for short, is used as a new lead-free small caliber core for national defense. Small caliber cores range from 9mm to 0.50 caliber including 5.56mm, 7.62mm, 9mm, 0.38 and 0.45 caliber, etc., could be produced by tungsten mixtures metal with the same techniques used for the construction of lead-containing bullets but without any poison to environment. It is just as lethal as the standard core of 5.56mm without harming the environment. The day end the use of environmentally hazardous materials in small caliber cores for all ammunitions is coming.

Besides, as a high density metal, tungsten is mixed with the binder such as nickel, iron, copper, cobalt, etc. to produce the components with controlled density and mechanical properties. Powder metal mixtures such as tungsten small caliber core is simply cold pressed to produce a high-density material with superior properties, e.g. high hardness, good ultimate tensile strength, excellent elongation, etc.

### Main Manufacture Process of Tungsten Small Caliber Core

Tungsten small caliber core is manufactured by powder metallurgy technique with some complex process. The main manufacture process is mixing, de-waxing, pressing, sintering, machining, and then move to surface control if there is a need, such as electroplating, engraving, etc. Heat treating is very necessary to achieve the appropriate properties for tungsten small caliber core, elongation would be improved by that process.

The combined processes of mechanical interlocking and "cold-welding" bond the metals together, and can be varied to control the properties of the non-lead core. Tungsten small caliber core can be pressed directly to shape, or cores can be produced that can be swaged into projectiles, with or without jacketing. So swaging is another important process for reaching a higher hardness at least 40HRC, meanwhile, ultimate tensile strength could be also increased to at least 1050Mpa. If the properties are needed higher, some of the processes would be adjusted.



### Tungsten Small Caliber Core Properties:

The powder metallurgy approach has the potential not only to produce quality high density, non-toxic cores that are a direct replacement for lead, but also to revolutionize many of the aspects of core design and performance. Customized tungsten small caliber core is warmly welcomed with high properties as follows:

High hardness 40HRC min. (Regular tungsten material only about 28HRC)

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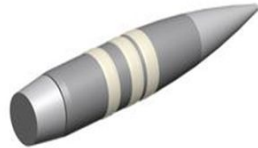
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Excellent ultimate tensile strength 1050MPa min. (Regular tungsten material only about 900Mpa)

Non-toxic to the environment

Superior machinability



## Tungsten Medium Caliber Core

### Why is Tungsten Medium Caliber Core?

Tungsten heavy alloy, also called tungsten alloy for short, is used as a new medium caliber core for national defense, such cores are being fabricated from mixtures of powdered metals, and/or coated metal powders or particulates that are consolidated to form dense metallic materials. The primary goal of the project is the development of functional, high density, non-toxic small arms projectiles with controlled impact behavior, i.e. frangibility, for training and field use. Preliminary results have been achieved using cold pressed mixtures of metal powders. Therefore, a kind of core materials with properties similar or superior to depleted uranium is badly needed to be fabricated and tested. Tungsten material should be a wonderful replacement.

### Main Manufacture Process of Tungsten Medium Caliber Core

Tungsten medium caliber core is manufactured by powder metallurgy technique with some complex processes. The main manufacture process is mixing, de-waxing, pressing, sintering, machining, and then move to surface control if there is a need, such as electroplating, engraving, etc. Heat treating is very necessary to achieve the appropriate properties for tungsten medium caliber core, elongation would be improved by that process.

The powder metallurgy approach is that the composite core materials are completely recyclable. The binder and high-density metals are not chemically bound and the binder metal does not wet the dense constituent. The metals are easily reclaimed from the scrap collected at firing ranges employing simple heat treatments. This will provide a new and less expensive source of raw materials, inevitably lowering cost. Swaging is another important process for reaching a higher hardness at least 40HRC, meanwhile, ultimate tensile strength could be also increased to at least 1050Mpa. If the properties are needed higher, some of the processes would be adjusted.

### Tungsten Medium Caliber Core Advantages:

Tungsten medium caliber core usually ranges from 20 mm to 35 mm, used on navy vessels, helicopters, fighter aircraft and anti-aircraft cannons, as well as infantry fighting vehicles, also could used for high quality percussion caps of all types, as well as links



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for various small- and medium-caliber rounds.

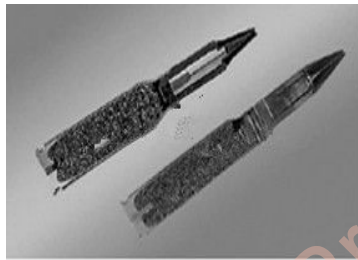
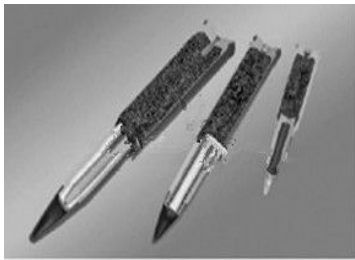
Guangxi Chentian Metal Products Co. Ltd could offer tungsten alloy fittings used as a part to tungsten medium caliber core with the following properties:

High hardness 40HRC min. (Regular tungsten material only about 28HRC)

Excellent ultimate tensile strength 1050MPa min. (Regular tungsten material only about 900Mpa)

Non-toxic to the environment (superior to depleted uranium core)

Superior machinability



## Tungsten Alloy Medium and Large Caliber Ammunition

### Tungsten Alloy for APFSDS

Tungsten Alloy for **APFSDS armour-piercing**, fin stabilized, discarding sabots are available in a range of medium to large calibres, these include 25mm, 30mm, 40mm, 76mm, 90mm, 105mm, 120mm,

125mm... Based on a nominal density of 17.5, the tungsten alloy could reach very high tensile and yield strength values -1,600MPa and above – while keeping a very high level of elongation and impact to meet performances up to: 2,500m/s velocity

35 length/diameter ratio

100,000G acceleration, especially for medium caliber



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## Medium and Large Caliber Ammunition

The **medium and large calibre ammunition** is derived from tungsten. This extremely dense, heavy metal is about 1.7 times heavier than lead, and far more difficult to deform than steel. It is excellent for use in armor-piercing. Because of tungsten's great properties and strength, it is very useful for piercing deep into synthetic, metallic targets.

Tungsten alloy armor-piercing medium and large caliber ammunition possess characteristics of compression resistance and non-tensile, when it penetrate armor, nearly no deformation occurred, and form fragment after punching through armor plates, increase killability and combustion effect, besides are more than armor-piercing made by other materials. The AP shell is now little used in naval warfare, as modern warships have little or no armor protection, but it remains the preferred round in tank warfare, as it has a greater "first-hit kill" probability than a high anti-tank (HEAT) round, especially against a target with composite armor, and because of higher muzzle velocity, is also more accurate than a HEAT round. Tungsten alloy medium and large caliber is used to penetrate hardened armored targets such as ballistic vests, vehicle armor, concrete, tanks, and other defenses, depending on the caliber of the firearms. Armor-piercing ammunition consists of a penetrator constructed of hardened steel, tungsten carbide, or depleted uranium, enclosed within a softer jacket, such as copper or aluminum.

## Tungsten Alloy Hunting Shot

### What Is Tungsten Alloy Hunting Shot?

**Tungsten alloy hunting shot** is used as the shot of shotgun. A shotgun is a firearm that is usually designed to be fired from the shoulder. The shot pellets from a shotgun spread upon leaving the barrel and the power of the burning charge is divided among the pellets, which means that the energy of any one ball of shot is fairly low. In a hunting context, tungsten alloy hunting shot makes shotguns useful primarily for hunting birds and other small games.



### Why Use Tungsten Alloy Hunting Shot ?

High density, great hardness and resistance to high temperature make tungsten alloy to be one of the most sought-after materials for shotgun pellets in history. The density of tungsten is about 18g/cm<sup>3</sup>, only gold, platinum, and a few other rare metals have a similar density. It is denser than any other shot material, including lead, steel or bismuth.

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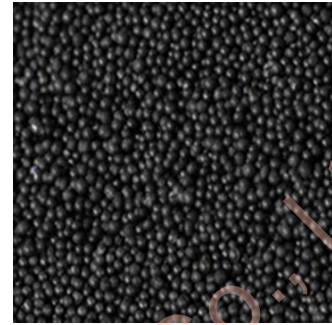
Guangxi Chentian Metal Products Co. Ltd can offer various hunting shots :



Tungsten Alloy Spheres



Tungsten Heavy Alloy Sphere



Tungsten Alloy Military Sphere



Tungsten Alloy Military Spheres



Hunting Shot



Hunting Shots

Guangxi Chentian Metal Products Co. Ltd offer hunting shots based on two surface conditions, one is polish and the other is sintered.

## Tungsten Alloy Super Weights For AR15 Buffer Systems



Endowed with tremendous domain expertise, we are successfully catering the needs of varied industries through a qualitative array of tungsten alloy counterweight.

This counterweight is manufactured by inculcating the best quality tungsten alloy and pioneering technology under the vigilance of our adept proficient.

Offered counterweight is used to balance the rotatory motion.

Furthermore, we provide this tungsten alloy counterweight in different sizes and other technical specifications as per customer's

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specific requirements at market leading prices.

## **Features:**

- Rugged design and accurate dimension
- Elevated durability and resistant against corrosion
- Impressive thermal conductivity and corrosion resistance
- Low thermal expansion and highly density
- Low volume and high density and good electrical conductivity
- Optimum strength and dimensional accuracy

## **Applications:**

In order to make all kinds of counterweights, tungsten is considered as an ideal raw material

Manufactured counterweights have their wide usage in several application areas such as machinery, aircraft, logging industries and many more

These are made in varied specifications to be used for different purposes

Guangxi Chentian Metal Product Co., Ltd