



HUNPRENCO

Work with a  
world leader in  
manufacturing



## Welcome to Hunpreco, leaders in precision engineering for the glass container industry.

With a history that is deeply rooted in the manufacturing of plungers and coolers for the glass container industry to support NNPB and Standard Press/Blow operations throughout the world, Hunpreco is recognised as the leader in precision glass engineering.

## The HVOF Coatings Experts

High Velocity Oxygen Fuel (HVOF) technology is used for coating plungers, robotically applying the coatings at speeds in excess of Mach 2, then using a complex fusion process to metallurgically bond the coating to the base material.

The fusion process allows for a high bond strength to ensure a uniform, dense and porous free coating with the options of a surface hardness of 45HRC to 65HRC to meet different customer requirements.



## Investing in World Leading Technology

Striving for excellence and lean methods, we have invested in the world's leading technology. Utilising the industry's most advanced robots, we have fully automated our metal spraying processes to ensure the coatings are applied efficiently and effectively.

Hunpreco is a market leader within the industry with quality and reliability that is second to none. We ensure our high standards are maintained by adhering to methodical procedures and offering excellent service to our customers.

## Unrivalled Capability

With more than 50 years of experience in coating plungers and coolers, we have developed advanced processes to continuously deliver the quality and consistency of our products. Our unrivalled capabilities are what makes us a leader in the industry.





## Products Designed to Last

While Hunprencos heritage is firmly rooted in North Yorkshire, our reputation as global leaders in precision engineering for the glass container industry continues to grow.

Here at Hunprencos, we are specialists in manufacturing and spraying plungers and coolers supplying over 50 different countries across the world. Our products are designed to last and we ensure the same consistency and quality of every product we manufacture.

## Hardness is Not Always Wear Resistance

Hardness does not always provide wear resistance. Several factors can contribute to this such as temperature. Many coatings can lose their wear resistance when operating at high temperatures.

It is dependant on the application and working conditions.

- Abrasion (Hot & Cold)
- Corrosion
- Impact
- Cavitation
- Erosion



## Optimise to Last Longer

Hunprencos are able to offer a range of metal coatings which are applied using advanced robotics.

- High Temperature
- Hot Abrasion

## How do They Work?

The alloys used are chemically engineered to overcome oxidation which allows for welding without protective gases and to produce a dense, fully fused overlay/coating.

This property is known as "SELF FLUXING".

Principle elements to achieve self fluxing are:  
BORON AND SILICON



# Choosing The Right Coating

Selecting the optimum coating for application can sometimes be challenging. This can depend on the speed of production and plunger temperature. This information is used to select the correct coating. Hunprencos in-house experts can provide guidance.

Our plungers and coolers are manufactured with various coatings, applied by state-of-the-art technology ensuring a uniform dense coating and reliability. Our experts can help you choose the best coating for your application.



## Available Coatings

We have a range of coatings available at Hunprencos. The table listed below provides some examples of the coatings we apply to our plungers. It details the hardness and also a breakdown of each coating and its degrading points.

Coating	Hunprencos Reference	Hardness Range Rockwell
Nickel Alloys	HN40C	40-42
	HN50C	48-50
	HN60C	58-60
Ni Cr B Si W	HT60C	58-62
38% / 62% Tungsten carbide / NiCrBSi Matrix	HT62C	56-60
50%/50% Tungsten carbide / NiCrBSi Matrix	HT63C	58-62
35% / 65% Tungsten Carbide / CoCrWBSi Matrix	HTC61C	59-63

**Note:** These hardness figures have been converted from readings obtained on a Micro-Vickers testing machine to give the accuracy of thin coatings which have been applied using the HVOF system.

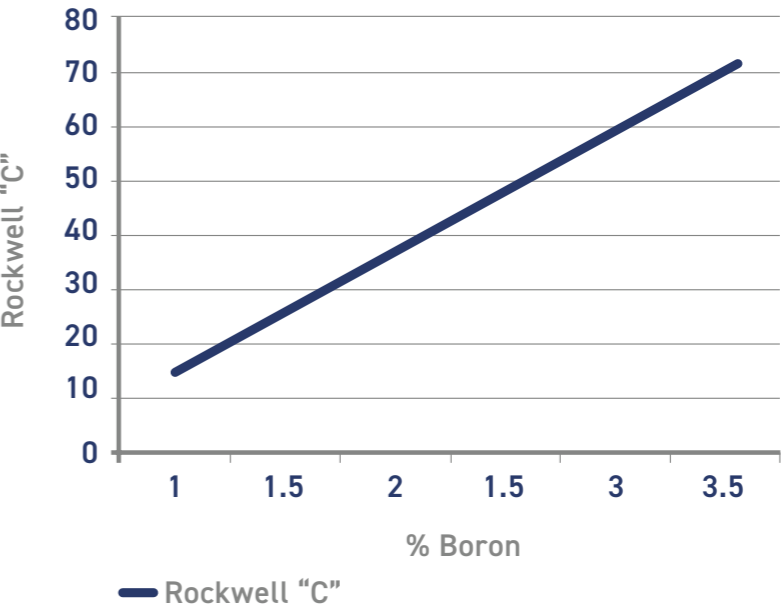
## Boron

Boron is an element used in the powder's formulation.

- Primary influence on HARDNESS and MELTING TEMPERATURE.  
**Rule of thumb:**  
1% 15HRc and 1,1500C  
3% 60HRc and 1,0000C
- Acts with SILICON to produce a self fluxing action.
- Boron will also react with Chromium to create Chromium Boride (CrB) hard phases.



## % Boron v Hardness



## Chromium

Chromium is an element used in the powder's formulation.

- Adds Corrosion & Abrasion Resistance.
- Has a High Temperature Resistance to Oxidation.
- Forms hard, wear resistant phases by reacting with Carbon to produce Chromium Carbide.

## Silicon

Silicon is an element used in the powder's formulation.

- Influences hardness and melting point.
- Secondary to Boron.
- Acts with Boron to produce a self fluxing action.
- Produces SILICIDES & SILICON CARBIDE.
- Silicides are structurally closer to borides than to carbides.
  - Creating minor Hard Phases.



## Coatings and Specifications

### Coatings HN40C, HN50C and HN60C

- HN40C, HN50C, HN60C.
  - NiCrBSi – 40, 50, 60HRc nominal respectively.
  - Hard phases form by precipitation.
  - Precipitates:
    - Chrome Carbides, Borides & Silicides
- Relatively good wear resistance.
- More suited for Wide mouth, Semi-Wide mouth & Tableware.
- Has temperature limitations
  - Starts to degrade at around 500/525°C



### Coatings HT60C

- HT60C. (Colmonoy 88)
- NiCrWBSi
  - 60HRc Nominal
- Hard Phases by precipitation
- Precipitates:
  - Tungsten Carbides, Chromium Carbides, Borides & Silicides.
- Excellent high temperature and wear resistant properties.
  - Suitable up to 600/625°C.



### Coatings HT60C

- HT60C is a pre-alloyed TUNGSTEN baring alloy benefitting from a high hot hardness property.
- The Alloy Chemistry, includes TUNGSTEN, this will react to the CARBON when alloyed, producing TUNGSTEN CARBIDE.
- Tungsten Carbide is 15% Tungsten to 1% Carbon.
  - HT60C is 15%W & 0.6%C
  - The 0.6% Carbon will only use up 9% of the W to make WC
- The rest goes into solution with the alloy.
- Tungsten melts at around 2,700°C thus giving the alloy a very good hot hardness property.



### Coatings HT62C (Colmonoy 49WH)

- HT62C. (Colmonoy 49WH)
- This alloy is a blend
- 38%WC/62% NiCrBSi matrix
  - 58HRc nominal
- Hard Phases form in the matrix by precipitation
- Precipitates:
  - Chromium Carbides, Borides & Silicides
- Excellent wear resistant properties
- Matrix will start to degrade beyond 575/600°C



### Coatings HT63C (Colmonoy 55WH)

- HT63C. (Colmonoy 55WH)
- This alloy is a blend
- 50%WC/50% NiCrBSi matrix
  - 60HRc nominal
- Hard Phases form in the matrix by precipitation
- Precipitates:
  - Chromium Carbide, Borides & Silicides
- Excellent wear resistant properties
- Matrix will start to degrade beyond 575/600°C



### Coatings HTC61C (Colmonoy 7502-35H)

- HTC61C. (Colmonoy 7502-35H)
- This alloy is a blend
- 35%WC/65% CoCrWBSi matrix
  - 61HRc nominal
- Hard Phases form in the matrix by precipitation
- Precipitates:
  - Tungsten Carbide, Chromium Carbide, Borides & Silicides
- Excellent wear resistant properties
- Matrix will withstand temperatures up to 600/650°C

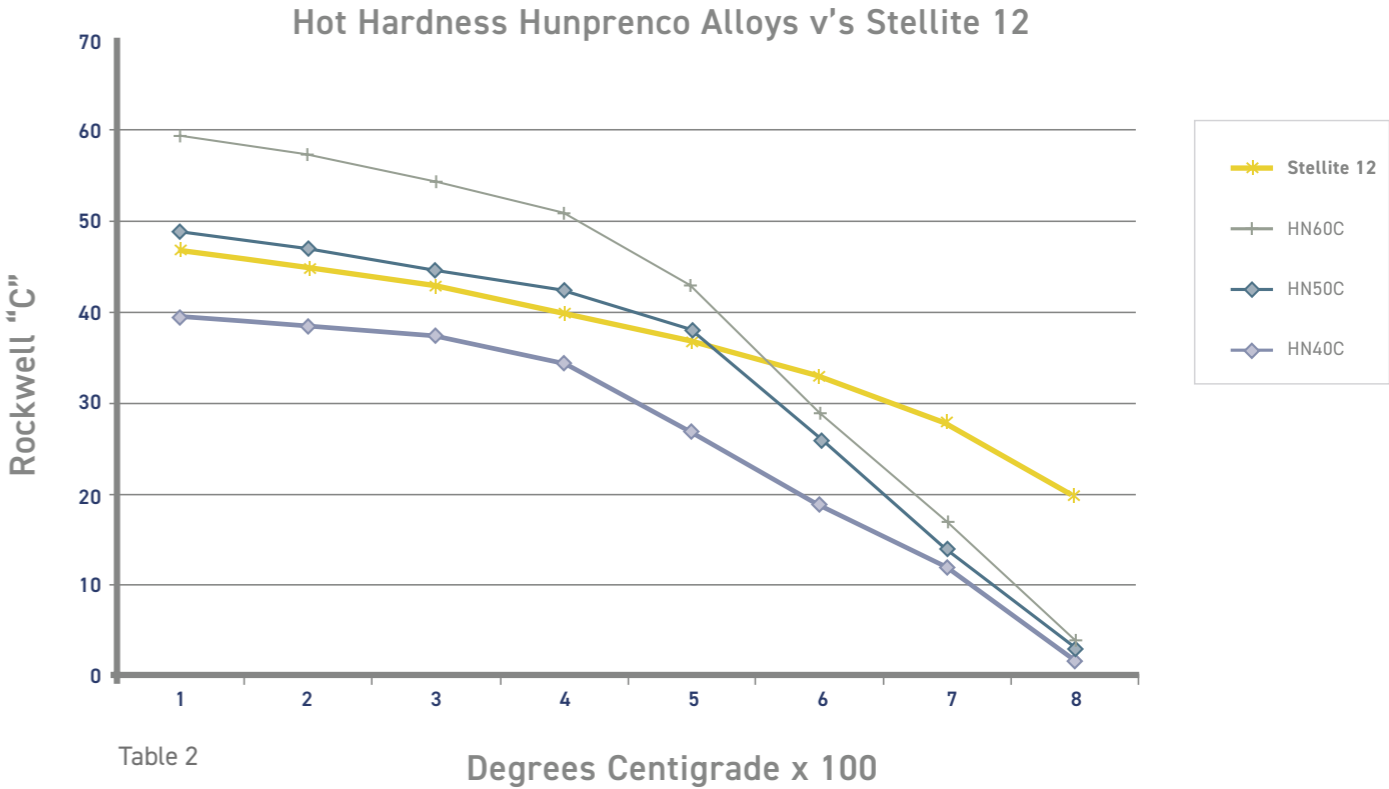
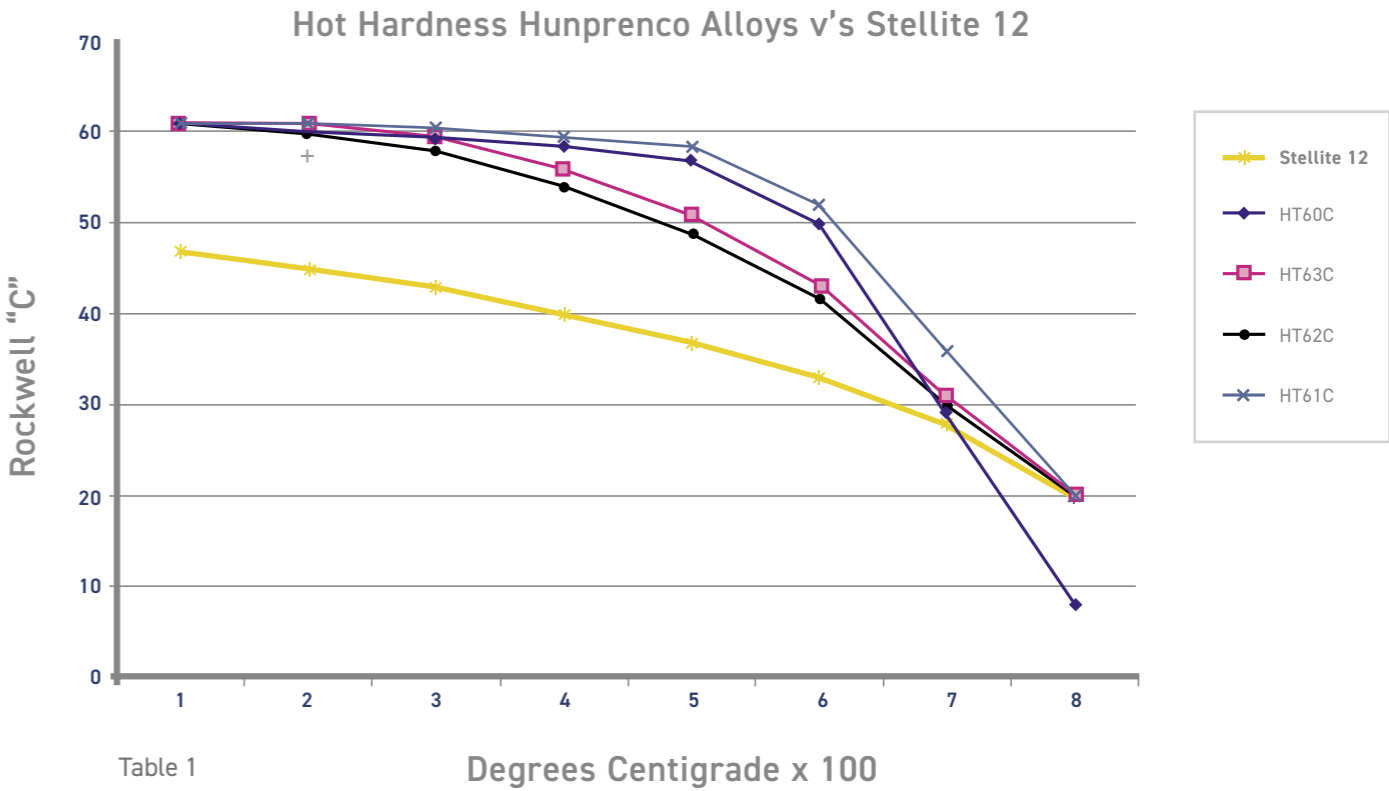




## Recognising Durability and Quality

The Hot hardness tables opposite show how different powders react at different temperatures giving reduced hardness as they react to the temperature to which they are exposed. These graphs can help you decide which powder formulation you require specific to your process.

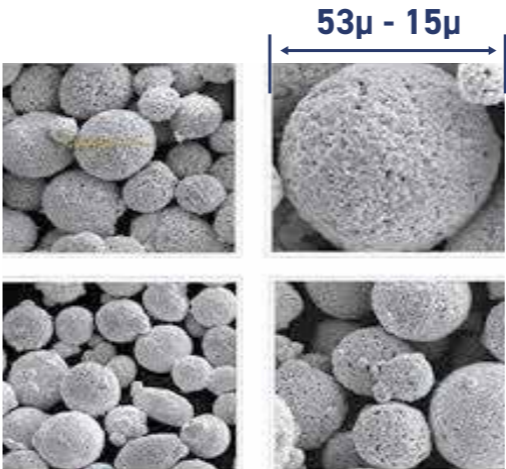
At Hunpreco we have experts on hand to help with any other information you may require.



# Tungsten Carbide

Tungsten carbide has excellent wear resistance and works well at high temperatures meaning it's a great element for coating plungers.

- There is a large variation of Tungsten Carbide and they are a great addition to any alloy:
- Sintered Tungsten Carbide.
  - Tungsten Carbide with Binder.
  - Binders being Co. or Ni. – 17%, 12%, 7%
  - We use 88/12Co.
- Fused Tungsten Carbide.
- Macro crystalline Tungsten Carbide
- Sintered Tungsten Carbide tend to be used for thermal spraying due to their ability to Carbide dispersion, giving a Dense & Uniform distribution of Tungsten Carbide.
  - Ideal for thin coatings.
- Fused Tungsten Carbide, Macro crystalline Carbide tend to be used with the PTA welding process and for Laser deposition.
- Sintered Tungsten Carbide is not normally used for welding as dissolution of the finer carbide can happen.



88% Tungsten Carbide /  
12% Cobalt Agglomerated Carbide  
53μ - 15μ Particle size



## Sintered (Agglomerated) Tungsten Carbide

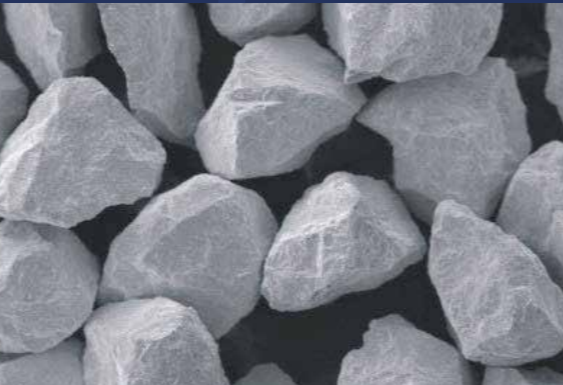
- Although the agglomerated Carbide has a PSD of 53μ - 15μ, each particle is made up of carbides 4μ - 6μ held together with a Co Binder.
- When fused the Cobalt goes into solution and disperses the fine carbides through the coating giving a dense volume of WEAR resistant Tungsten Carbide particles.

## Expertise You Can Trust

Hunpreco have worked closely with universities to ensure our coatings are consistent and have the formulations required to provide longevity of our plungers.

## Fused (Cast and Crushed) Tungsten Carbide.

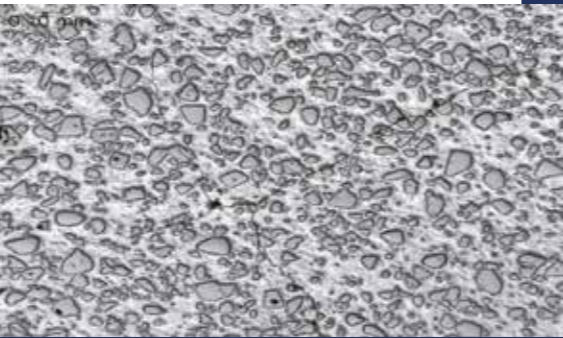
- Fused Tungsten Carbide, although cheaper does not work so well. The particles are 53µ - 15µ and irregular shapes.
- The larger irregular particles do not pack as dense as the smaller ones, leaving large gaps between the particles allowing premature wear to the matrix



Mainly used for Welding purpose, can be used through a Spray welder, ideal for thicker coatings

Fused Tungsten Carbide 53µ - 15µ

Gaps between the Carbides



## Focus on Quality and Excellence

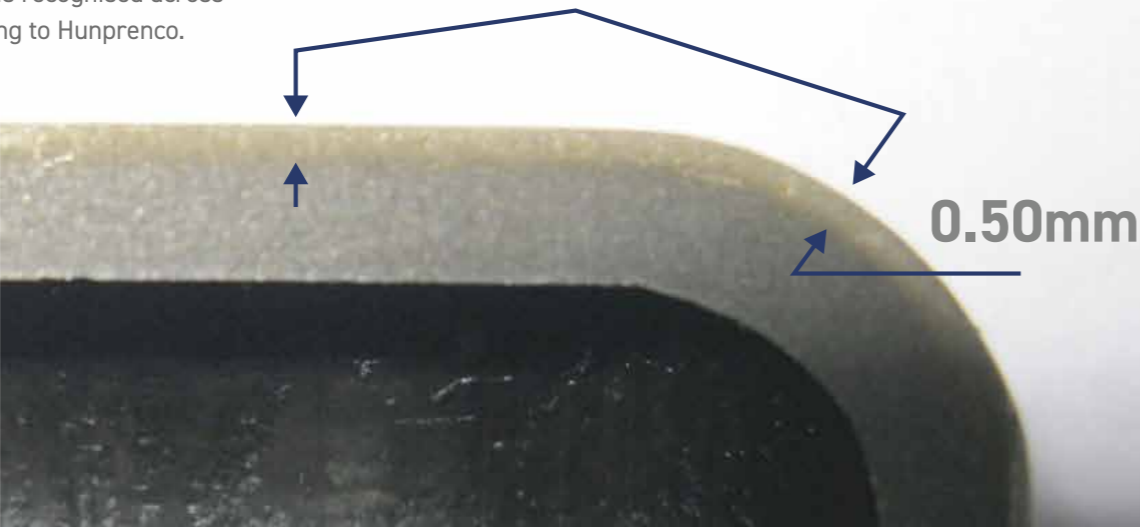
Hunprencore are focused on supplying only the best products. We ensure our coatings are applied evenly using only the best quality powders. This combined with our unique application and polishing processes, ensures we deliver world-leading plungers.

## Plunger Coating Application

Hunprencore take pride in providing the highest quality products. Upon completion, each plunger is polished to 0.2ra.

This high quality finish is recognised across the industry as belonging to Hunprencore.

### Coating Thickness



## Coating Specifications

We ensure that our coatings are applied evenly and only using high quality powders. Applying them robotically ensures an even covering.

Element	Min	Max	Nominal
B	1.00	1.20	1.10
C	2.70	3.10	2.90
Cr	5.90	6.50	6.20
Fe	1.50	2.00	1.80
Si	1.65	2.00	1.85
W	40.70	42.00	41.30
Co	5.50	6.50	6.00
Ni	<b>Balance</b> Contains - 50% WC-12Co particles		

**Particle size distribution** 53 to 15 Micron

**Hardness** 58 - 62 HRC



For further information about us and how  
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