TOOLMAKER SOLUTIONS

# Custom-Made Inserts Blanks



Non-ISO carbide insert blanks for threading, parting, grooving, drilling, reaming and milling applications

HYPERION
Materials & Technologies

# HYPERION CUSTOM-MADE INSERT BLANKS

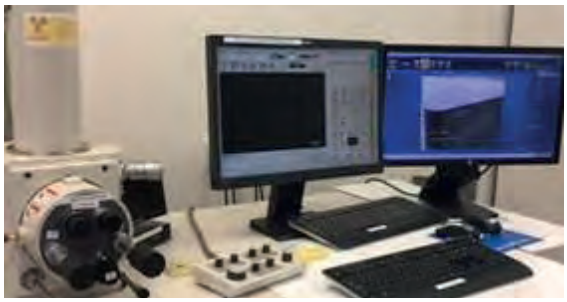
Hyperion manufacturers a full range of premium custom-made insert blanks. Our expertise and advanced manufacturing technologies give us the unique ability to partner with our customers to solve their needs.

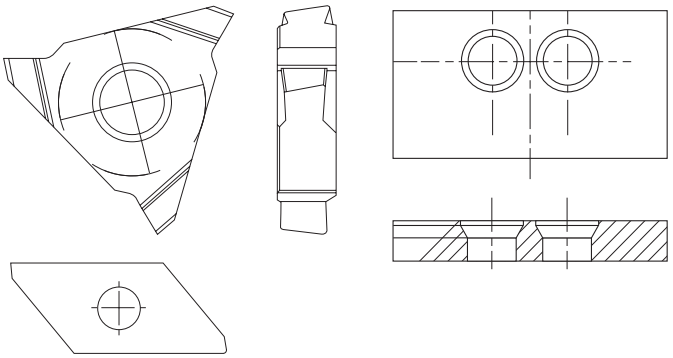
## CUSTOMER VALUE

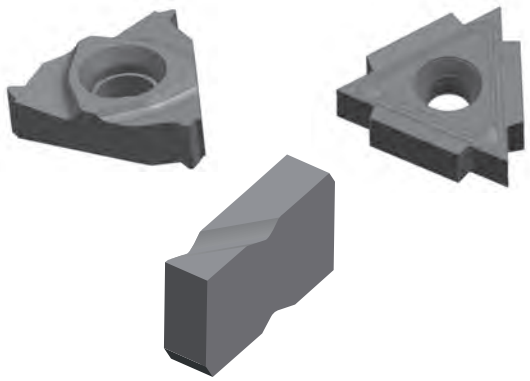
- Standard grade assortment
- Premium materials
- Optimized manufacturing methods
- Global support
- Possibility to eliminate or reduce finishing operations
- Exceptional dimensional control (tolerance & finish).

## CO-DEVELOPMENT OF NEW PRODUCTS

- On-site project reviews
- Experienced design team
- Technical lab available to conduct performance tests
- Professional project management
- State-of-the-art manufacturing equipment
- Full R&D support
- Collaboration universities and technical institutes.







## ADVANCED PRODUCT OFFERING

- Complex 3D & 2D geometries
- Near net shapes
- Comprehensive grade offering
- World class quality control
- As pressed or finished ground
- Multi-axial cross hole capabilities.

# HYPERION BLANKS FOR ALL APPLICATION AREAS

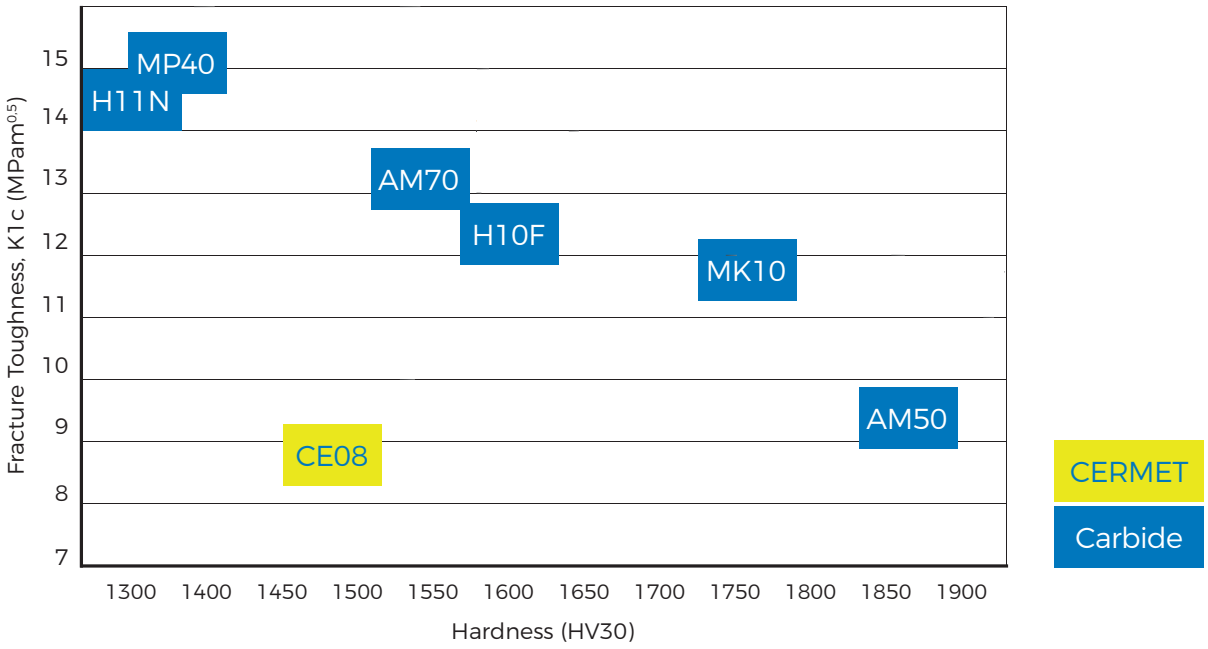
## APPLICATION AREAS

- Threading
- Parting
- Grooving
- Milling
- Drilling
- Reaming
- Sawing.

# APPLICATIONS OVERVIEW

| GRADES | APPLICATIONS |
|---|---|
| H10F | Market leading wide application grade and first choice in most cases. Provides consistency and reliability in almost any application. Optimize with coatings and edge preparations for different applications in ISO P,M,K,N,S 10-30 range. Excellent in thread turning and thread milling. |
| AM50 | Increased hardness with maintained good toughness. Optimized performance in stainless steel and hardened steel. |
| AM70 | Improved reliability in difficult applications. Optimized solution for milling ISO M materials and titanium alloys. |
| MP40 | P Grade: Reliable, traditional grade for ISO P materials, coated and uncoated. |
| MK10 | P Grade: High speed turning and threading. High edge strength at elevated temperatures. |
| CE08 | CERMET used in optimized bearing steels machining. |
| H11N | Economy grade for shim seats/anvils for high strength and rigidity. |

# HYPERION GRADES PROPERTIES - TOUGHNESS VS HARDNESS




| | H10F | AM50 | AM70 | MK10 | H11N | MP40 | CE08 |
|---|---|---|---|---|---|---|---|
| HV30 | 1590 | 1870 | 1560 | 1755 | 1300 | 1390 | 1550 |
| Hra | 92.1 | 93.7 | 91.6 | 93 | 89.2 | 90.3 | 91.7 |
| K1c, | 12.7 | 9.7 | 13.2 | 12 | 15 | 15 | 8.8 |

While selection greatly depends on actual conditions such as operation type, stability, geometry, edge preparation, coating, work material and machining parameters, the following can serve as a guideline:

## TOUGHER GRADE

- Shock and chipping resistant

**TYPICAL APPLICATIONS**

- Stainless steel, titanium, super alloys, roughing, interrupted cuts and low cutting speeds

## HARDER GRADE

- Wear-resistant and less edge deformation

**TYPICAL APPLICATIONS**

- Hardened steel, die & mold, small part machining, stable conditions and finishing

# ISO MATERIAL CLASSIFICATION

| ISO | CMC No. | MATERIAL | | | SPECIFIC CUTTING FORCE $K_c$ 0.4 | HARDNESS BRINELL HB |
|---|---|---|---|---|---|---|
| | | | | | N/MM² | HB |
| P STEEL | 01.1 | UNALLOYED STEEL | C = 0.1-0.25% | | 2000 | 125 |
| | 01.2 | | C = 0.25-0.55% | | 2100 | 150 |
| | 01.3 | | C = 0.55-0.80% | | 2200 | 170 |
| | 02.1 | LOW-ALLOY STEEL (alloying elements ≤5%) | Non-hardened | | 2150 | 180 |
| | 02.12 | | Ball bearing steel | | 2300 | 210 |
| | 02.2 | | Hardened and tempered | | 2550 | 275 |
| | 02.2 | | Hardened and tempered | | 2850 | 350 |
| | 03.11 | HIGH-ALLOY STEEL (alloying elements >5%) | Annealed | | 2500 | 200 |
| | 03.21 | | Hardened tool steel | | 3900 | 325 |
| | | | | | | |
| | 06.1 | STEEL CASTING | Unalloyed | | 2000 | 180 |
| | 06.2 | | Low-alloy (alloying elements ≤5%) | | 2100 | 200 |
| | 06.3 | | High-alloy (alloying elements >5%) | | 2650 | 225 |

| ISO | CMC No. | MATERIAL | | | SPECIFIC CUTTING FORCE $K_c$ 0.4 | HARDNESS BRINELL HB |
|---|---|---|---|---|---|---|
| | | | | | N/MM² | HB |
| M STAINLESS STEEL | 05.11 | STAINLESS STEEL | Non-hardened | | 2300 | 200 |
| | 05.12 | -Bars/forged | PH-hardened | | 3550 | 330 |
| | 05.13 | Ferritic/martensitic | Hardened | | 2850 | 330 |
| | | | | | | |
| | 05.21 | STAINLESS STEEL | Austenitic | | 2300 | 180 |
| | 05.22 | -Bars/forged | PH-hardened | | 3550 | 330 |
| | 05.23 | Austenitic | Super austenitic | | 2950 | 200 |
| | | | | | | |
| | 05.51 | STAINLESS STEEL | Non-weldable | ≥0.05% C | 2550 | 230 |
| | 05.52 | -Bars/forged | Weldable | <0.05% C | 3050 | 260 |
| | | Austenitic-ferritic | | | | |
| | | (Duplex) | | | | |
| | 15.11 | Stainless steel - Cast | Non-hardened | | 2100 | 200 |
| | 15.12 | Ferritic/martensitic | PH-hardened | | 3150 | 330 |
| | 15.13 | | Hardened | | 2650 | 330 |
| | 15.21 | Stainless steel - Cast | Austenitic | | 2200 | 180 |
| | 15.22 | Austenitic | PH-hardened | | 3150 | 330 |
| | 15.23 | | Super austenitic | | 2700 | 200 |
| | 15.51 | Stainless steel - Cast | Non-weldable | ≥0.05% C | 2250 | 230 |
| | 15.52 | Austenitic-ferritic | Weldable | <0.05% C | 2750 | 260 |
| | | (Duplex) | | | | |

# ISO MATERIAL CLASSIFICATION

| ISO | CMC No. | MATERIAL | | SPECIFIC CUTTING FORCE $K_c$ 0.4 | HARDNESS BRINELL HB |
|---|---|---|---|---|---|
| | | | | N/MM² | HB |
| **K** CAST IRON | 07.1 | MALLEABLE CAST IRON | Ferritic (short chipping) | 940 | 130 |
| | 07.2 | | Pearlitic (long chipping) | 1100 | 230 |
| | 08.1 | GREY CAST IRON | Low tensile strength | 1100 | 180 |
| | 08.2 | | High tensile strength | 1150 | 220 |
| | 09.1 | NODULAR SG IRON | Ferritic | 1050 | 160 |
| | 09.2 | | Pearlitic | 1750 | 250 |
| | 09.3 | | Martensitic | 2700 | 380 |

| ISO | CMC No. | MATERIAL | | SPECIFIC CUTTING FORCE $K_c$ 0.4 | HARDNESS BRINELL HB |
|---|---|---|---|---|---|
| | | | | N/MM² | HB |
| **N** NON-FERROUS METALS | 30.11 | ALUMINUM ALLOYS | Wrought and coldworked | 500 | 60 |
| | 30.12 | | Non-aging | 800 | 100 |
| | | | Wrought or wrought and aged | | |
| | 30.21 | ALUMINUM ALLOYS | Cast, non-aging | 750 | 75 |
| | 30.22 | | Cast or cast and aged | 900 | 90 |
| | 30.41 | ALUMINUM ALLOYS | Cast, 13-15% Si | 950 | 130 |
| | 30.42 | | Cast, 16-22% Si | 950 | 130 |
| | 33.1 | COPPER AND COPPER ALLOYS | Free cutting alloys, ≥1% Pb | 700 | 110 |
| | 33.2 | | Brass, leaded bronzes, ≤1% Pb | 700 | 90 |
| | 33.3 | | Bronze and non-leaded copper incl. | 1750 | 100 |
| | | | Electrolytic copper | | |

# ISO MATERIAL CLASSIFICATION

| ISO | CMC No. | MATERIAL | | SPECIFIC CUTTING FORCE $K_c$ 0.4 | HARDNESS BRINELL HB |
|---|---|---|---|---|---|
| **S** HEAT RESISTANT MATERIAL | | HEAT RESISTANT SUPER ALLOYS | | $N/MM^2$ | HB |
| | 20.11 | IRON BASE | Annealed or solution treated | 3000 | 200 |
| | 20.12 | | Aged or solution treated and aged | 3050 | 280 |
| | 20.21 | NICKEL BASE | Annealed or solution treated | 3300 | 250 |
| | 20.22 | | Aged or solution treated and aged | 3600 | 350 |
| | 20.24 | | Cast or cast and aged | 3700 | 320 |
| | 20,31 | COBALT BASE | Annealed or solution treated | 3300 | 200 |
| | 20,32 | | Aged or solution treated and aged | 3700 | 300 |
| | 20,33 | | Cast or cast and aged | 3800 | 320 |
| | | TITANIUM ALLOYS[1] | | | Rm[2] |
| | 23,10 | Commercial pure (99.5% Ti) | | 1500 | 400 |
| | 23,21 | α, near α and α+β alloys, annealed | | 1700 | 950 |
| | 23,22 | α+β alloys in aged cond., β alloys, annealed or aged | | 1700 | 1050 |

(1) 45-60° entering angle, positive cutting geometry and coolant should be used. (2) Rm = ultimate tensile strength measured in MPa.

| ISO | CMC No. | MATERIAL | | SPECIFIC CUTTING FORCE $K_c$ 0.4 | HARDNESS BRINELL HB |
|---|---|---|---|---|---|
| **H** HARDENED MATERIAL | | | | $N/MM^2$ | HB |
| | 04.1 | HARD STEEL | Hardened and tempered | 3250 | 45 HRC |
| | | Extra hard steel | Hardened and tempered | 5550 | 60 HRC |
| | 10,1 | CHILLED CAST IRON | Cast or cast and aged | 2800 | 400 |

# WEAR BEHAVIOR OF CARBIDE TOOLING

## ISO **P** 85-450 HB

All type of steels unalloyed, alloyed and cast steel with exception of steel with austenitic structure.

### MACHINABILITY CHARACTERISTIC

Chip control is relatively easy and exhibits good machinability.
Built up edges (BUE), material smearing tendency and heat zone increases with medium and high alloys (>10%).

### WEAR PROCESS

All materials in this group have typical crater and flank wear.
Generally thermal, chemical and mechanical wear processes are equally balanced.
Cutting edge needs to withstand plastic deformation for low alloyed and higher alloys steels.

*The machinability of materials varies, depending on alloying elements, heat treatment and manufacturing process.

## ISO **M** 120-450 HB

Stainless steel austenitic, austenitic-ferrite steel and cast steel (Duplex).

### MACHINABILITY CHARACTERISTIC

Machinability decreases with increase in alloying elements and exhibits high cutting forces and BUE.
Work hardening of material can result in strong adhesion and BUE.

### WEAR PROCESS

Cutting edges are exposed to a great deal of heat, notch wear and BUE are common.
Plastic deformation, followed by crater and abrasive wear.

*The machinability of materials varies, depending on alloying elements, heat treatment and manufacturing process.

## ISO **K** 150-480 HB

Grey cast iron (GCI), cast iron with spheroidal graphite, malleable cast iron (MCI), nodular cast iron (NCI), compacted graphite iron (CGI) and austempered ductile iron (ADI).

### MACHINABILITY CHARACTERISTIC

Cast iron is, contrary to steel, a short-chipping type of material and low cutting forces.
GCI and MCI are quite easy to machine, while NCI, CGI and ADI are more difficult.

### WEAR PROCESS

Thermal and mechanical loads from segmented chips induce crater and abrasive wear.
BUE can be problem with nodular types which can lead to tool edge problem.

*The machinability of materials varies, depending on alloying elements, heat treatment and manufacturing process.

# WEAR BEHAVIOR OF CARBIDE TOOLING

## ISO **N** 15-430 HB

Aluminum and other non-ferrous metals (copper, brass, bronze).

### MACHINABILITY CHARACTERISTIC

Non-ferrous metals are softer metals, such as aluminum, copper, brass etc., relatively easy chip control if alloyed.
Abrasive machining with increase in Si-content.
Generally low cutting forces and high cutting speeds, long tool life can be expected for inserts with sharp edges.

### WEAR PROCESS

Mechanical wear dominates over chemical wear.
Attrition, fracture and micro chipping of tool edges occur.
Higher silicon content aluminum materials experience BUE while machining.

*The machinability of materials varies, depending on alloying elements, heat treatment and manufacturing process.

## ISO **S** 85-745 HB

Heat resistant super alloys (iron, nickel and cobalt based), titanium and titanium alloys.

### MACHINABILITY CHARACTERISTIC

They are sticky, create built-up edge, work harden, and generate heat.
They are very similar to the ISO M area but are much more difficult to machine, and reduce the tool life of the tool edges.

### WEAR PROCESS

Plastic deformation, followed by crater and abrasive wear.
Severe mechanical and chemical wear processes occur.
High temperatures result in material smearing and poor chip formation cause severe problems.

*The machinability of materials varies, depending on alloying elements, heat treatment and manufacturing process.

## ISO **H** 45-75 HRC

Hardened steel and hardened cast iron and chilled cast iron.

### MACHINABILITY CHARACTERISTIC

The hardness makes them difficult to machine with high cutting forces.
The materials generate heat during cutting and are very abrasive for the cutting edge.

### WEAR PROCESS

High thermal and mechanical loads form fracture and deformation occurs.

*The machinability of materials varies, depending on alloying elements, heat treatment and manufacturing process.

# NOTES

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