

INSERT GRADES

CUTTING MATERIALS: HARDMETALS

In Germany hardmetal is often referred to colloquially as Widia, the trade name given to a sintered hardmetal cutting material which Krupp first brought onto the market in 1926.

Sintered hardmetals are made by powder metallurgy and in the most simple case consist of Tungsten Carbide (WC) as a source of hardness, and Cobalt (CO), which is primarily responsible for toughness. Titanium Carbide and/or tantalum carbide or niobium carbide are added to improve high-temperature properties. This applies particularly to oxidation resistance, hot hardness, elevated-temperature strength and diffusion resistance in the presence of iron-base alloys. Hardmetals attain their final properties at sintering temperatures of around 1500° C.

COATED HARDMETALS (ISO group HC)

Highest wear resistance and good toughness can be combined by appropriate coating techniques. The preferred process for hardmetal is Chemical Vapour Deposition. In the CVD process extremely hard, thin layers of coating material (e.g. TiC, TiN, Al₂O₃) are deposited on tougher hardmetal substrates at temperatures of around 1000° C. Multi-layer coatings can reach a thickness of up to 15µm.

The new Widaselect coated grade is a multi-layer coating (TiN-TiCN-Al₂O₃-ZrCN) applied by the Moderate Temperature CVD process at temperatures around 800°C, MTCVD retains the toughness of the substrates and the high speed capabilities which are prevalent with CVD coatings.

A more recently developed coating technique is the advanced Plasma-CVD (PCVD) process, by which hardmetals can be coated at much lower temperatures of around 500° C. PCVD offers a very tough coating with high lubricity and has excellent resistance to built-up edges.

The much longer life and higher cutting speeds attainable through coating, boost cost-efficiency and productivity. Inventory requirements are also reduced thanks to the wider range of applications for coated grades.

UNCOATED HARDMETALS (ISO group HW)

The conventional uncoated hardmetals comprise a variety of mature grades. They are still employed frequently in milling but to a relatively small extent in turning and drilling. Their applications mainly include operations involving light cuts requiring sharp cutting edges and operations demanding very high toughness. Uncoated hardmetal grades are also used on nonferrous metals and nonmetallic materials.

In most steel and cast iron applications coated hardmetals are preferred because they offer much longer life and/or higher cutting speeds and thus permit more cost effective production.

CERMETS (ISO group HT)

Cermets are hardmetals based on Titanium Carbontride (TiCN) with a nickel binder. They display high strength at elevated temperatures and great resistance to oxidation. They offer outstanding cutting edge strength and are particularly suitable for finishing operations at high cutting speeds, producing excellent surface finishes.

Coated Turning Grades:

TN5015 (HC-K15)

Combines high wear resistance with good toughness properties and high strength. This grade consists of 6% cobalt WC/Co and the new generation medium and high temperature coating capped with ZrCN outer layer. Proven in turning grey and spheroidal cast iron, both dry and with cutting fluid.

TN5020 (HC-K20)

This multilayer grade (TiN-TiCN-Al₂O₃) offering high resistance to abrasion and oxidation, combines high cutting edge stability with excellent wear resistance which results in optimal production, reliability and increased productivity even in interrupted cuts. Proven in ductile and nodular cast iron and can be used dry or with cutting fluid.

For Turning/Boring Applications WIDASELECT Coated Grades TN7000 & TN8000 Series Grades are a multi-layer coating (TiN-TiCN-Al₂O₃-ZrCN) applied by the Moderate Temperature CVD process, which provides extra toughness and improved transverse rupture strength over conventional coated grades.

TN7005 (HC-P05)

Highly wear-resistant grade for finishing at high speeds with reduced depths of cut & low feeds. Used in turning steel, cast steel and also 400 Series stainless steel. This grade has a substrate for high temperature resistance and compressive strength, and the advanced new generation coating.

TN7010 (HC-P10)

Preferred grade with excellent wear resistance for medium chip loads at high cutting speeds in plain carbon, alloy and 400 Series stainless steels. The substrate provides high shock resistance and compressive strength.

TN7015 (HC-P15)

First choice for light to medium rough-turning steel and cast steel, including 400 Series stainless steel. Offers outstanding wear resistance and fracture toughness for varying depths of cut in casting and forging scale; interrupted cutting possible. Also has modified edge zone and new generation coating.

TN7025 (HC-P25)

Preferred grade for general roughing of steel and cast steel, providing high wear resistance and good toughness; also including interrupted cuts. This grade offers the new generation coating, a particularly fracture resistant substrate, and a binder-rich edge zone.

TN7035 (HC-P35)

Extremely tough grade for heavy-duty turning of steel and cast steel with severely interrupted cuts. The fracture resistant substrate with high binder edge zone and new generation coating, unite to provide excellent wear and toughness.

TN8025 (HC-M25)

New multilayer coated grade with an extremely tough substrate, ideal for turning high alloy steels, cast steels, especially austenitic (300 & PH series) stainless steels. The new grade is mainly targeted at light to heavy rough turning applications, but it can also be used to turn very soft or gummy steels with or without cutting fluid. TN8025 is ideal for wet or dry machining.

Uncoated Turning Cermet Grades:

TTI-15 (HT-P10)

Primary cermet grade for semifinish and finish-turning of steels and nodular cast iron at medium to high cutting speeds and feeds of up to .008". Good anti-welding properties. Apt for machining stainless steel.

Uncoated Turning Grades:

TTX (HW-P10)

Wear-resistant hardmetal for light to medium-duty machining of steel materials.

TTM (HW-P25)

Balanced wear-resistance and toughness properties for medium-duty steel machining operations. Preferred hardmetal grade with a wide use of applications in milling all steel and long-chipping iron materials.

TTR (HW-P35)

Tough hardmetal for the rough-machining of steel, cast steel and stainless steels under unfavorable operating conditions. Low cutting speeds, high feeds.

THM (HW-K15)

A grade displaying high toughness and strength, for general machining operations on short-chipping ferrous materials, nonferrous metals and alloys as well as plastics. Very good edge strength and sharpness.

Coated Turning Aluminum Grades:

HCK10 (HC-K10)

Fine-grain WCCo carbide with uniform microstructure and extremely hard coating. Low wear and good anti-welding properties result in longer tool life.

INSERT GRADES

Uncoated Turning Aluminum Grades:

W1090 (HW-K10)

The geometry AL1 in grade W1090 can be used to turn and thread cast aluminum and to machine light alloys and nonferrous metals, refractory metals (Mo, TZM), plastics, GFRP, resin-bonded paper, carbon and fine ceramics.

W1095 (HW-K15)

Use when difficult-to-machine low-silicon aluminum alloys, wrought alloys and extrusions is needed. Ideal for other materials such as copper alloys, molybdenum and plastics. Even finishing of stainless steels is possible. Use where very low cutting forces are needed.

Coated Grooving Grades:

TC706 (HC-P25-P45; M30-M45)

Semi-finishing to roughing of alloy steels, carbon steels, stainless steels, cast, malleable and nodular irons; substructure of this grade has been modified to increase edge strength and coating resilience.

T541 (HC-P25-P45; M30-M40; K25-K35)

Tough, durable TiN PVD coating over an unalloyed substrate. Developed for cutting high temperature alloys, most stainless steels and titanium alloys at low to moderate speeds. Unique resistance to mechanical and thermal shock and build-up.

T321 (HC-P10-P20; M10-M25; K05-K20)

PVD coated grade with excellent wear resistance and edge strength. First choice for grooving of steel and nodular cast iron with high-cutting speed.

T323 (HC-P10-P20; M10-M20; K05-K20)

A PVD TiAlN coating over a very deformation-resistant unalloyed, carbide substrate. The T323 grade is ideal for finishing to general machining of most workpiece materials at higher speeds. It also performs well machining hardened and short chipping materials.

T013 (HC-P20-P40; M15-M30; K15-K35)

A PVD TiAlN coated grade with a tough, ultra-fine grain unalloyed substrate. For general purpose machining of most steels, stainless steels, high temperature alloys, titanium, irons and non-ferrous materials. Speeds may vary from low to medium, and will handle interruptions and high feed rates.

TK15 (HC-P15)

This has a Ceramic Al-O-On multi-layer coating, combined with carbide and nitride layers, deposited on a relatively tough and wear resistant sintered carbide substrate.

TN35 (HC-P30)

A TiC/TiCN/TiN mult-layer coating on a tough C5 sintered carbide substrate. This insert offers optimum flank and crater wear resistance.

TN200 (HC-P20)

CVD coated grade with excellent wear resistance and edge strength. First choice for grooving of steel and nodular cast iron with high-cutting speed.

TN7525 (HC-P25)

CVD coated grade with excellent wear resistance and edge strength. First choice for grooving of steel and nodular cast iron with high-cutting speed.

TN7535 (HC-P35)

CVD coated grade with superb toughness properties and good wear resistance. First choice of parting at low to medium cutting speed. Well suited also for grooving under unfavourable conditions.

TN8025 (HC-M25)

This grade is the first in the 8000 group to combine a heat and fracture-resistant substrate with specially smooth new generation coating.

TPC25 (HC-P25)

Similar to TPC35, this grade developed from the CVD coating process. This special process permits the coating of inserts at temperatures of app. 1/2 (400° to 700° C.) that of conventional CVD coated inserts.

TPC35 (HC-P35)

This grade was developed from the plasma CVD coating process. This special process permits the coating of inserts at temperatures of app. 1/2 (400° to 700° C.) that of conventional CVD coated inserts.

Coated Grooving Cermet Grades:

TTC4010 (HT-P10-P20; M10-M20; K10-K20)

PVD TiCN coated cermet with high wear resistance and long tool life for high speed finishing, semi-finishing and semi-roughing of steels, stainless steels and nodular cast iron.

Uncoated Grooving Grades:

TQ23 (HW-K10)

For finish to light rough machining of aluminum, high temperature alloys, stainless steels, irons, plastics and other nonmetals.

THM (HW-K15)

Proven grade for cast iron, all non-ferrous and non-metals.

TTM (HW-P25)

Balanced toughness and wear for general machining of all types of steel.

Coated Threading Grades:

PTC2 (HC-P10-P35; M20; K10-K20)

General purpose PVD coated grade for a wide application range offering good wear resistance at higher surface speeds, while reducing build-up on the cutting edge. Particularly successful in stainless steel.

STC2 (HC-P05-P25; M10; K05-K20)

Multilayer coated grade with extra wear resistance, which enables higher cutting speeds under good conditions. Suitable for difficult tensile steels and aerospace type materials.

Uncoated Threading Grades:

K20 (HW-K15-K25)

Standard uncoated grade for threading cast iron. Combines good abrasive wear resistance and toughness. Suitable for brass, aluminum, plastics and non-ferrous metals, but also for stainless steel and aerospace materials at slower cutting speeds.

P30 (HW-P25-P35)

General purpose uncoated grade of steel. A well balanced grade for a wide range of materials and medium conditions.

HSS

General purpose high speed steel for difficult applications, slow speeds or poor conditions. Suitable for all materials.

Coated Drilling Grades:

TN5515 (HC-K15)

A multilayer grade (TiN-TiCN-Al₂O₃) exhibiting high wear resistance and high edge strength. The preferred choice for turning cast iron materials with light to medium chip sections. High metal-removal rates. Also used for semi-finishing steel.

TN7015 (HC-P15)

A multilayer grade (TiN-TiCN-Al₂O₃-ZrCN) exhibiting high wear resistance and high edge strength. ZrCN layer provides compressive force to resist cracking. Excellent wear resistance and toughness. First choice for drilling steels at high speeds. High metal-removal rates. Also used for semi-finishing steel.

TPC35 (HC-P35)

A multilayer grade (CVD-TiN) well suited for unfavourable conditions with outstanding toughness. The preferred choice for turning cast iron, steel, and stainless steel materials with light to medium chip sections. High metal-removal rates. Coolant recommended.

Uncoated Drilling Grades:

THM (HW-K15)

A multilayer grade (TiN-TiCN-Al₂O₃) exhibiting high wear resistance, good toughness and sharp edges. The preferred choice for turning cast iron, nonferrous metals and high-temp alloys for materials with light to medium chip sections. Coolant is recommended.

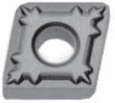
CHIPBREAKER GEOMETRIES

Indexable inserts for ISO clamping system P

A comprehensive program of advanced chipbreaker geometries for a wide range of applications. Main application OD turning, secondary applications large diameter ID turning. Inserts with double-sided geometries are particularly cost-efficient as they provide twice the number of cutting edges, thus greatly increasing insert and tool life.

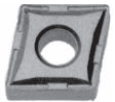
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Double-sided geometries



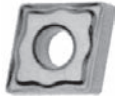
-22 (FPR Range: .002" - .008")

Geometry for finish turning, producing smooth, accurate surfaces. Very good chip control, especially at low cutting depths.



-4 (FPR Range: .002" - .008")

Semifinishing geometry for light to medium-duty steel machining. Reduced back forces thanks to adjusted inclination angle, therefore also particularly suitable for positive, vibration-prone parts.



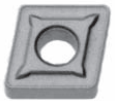
-48 (FPR Range: .005" - .016")

For medium-duty turning operations. Soft cutting chipbreaker geometry. Used to advantage in applications producing varying chip sections, e.g. profile turning (copy turning). Good dimensional accuracy. Ideally suitable for soft steel materials and stainless steels.



-49 (FPR Range: .006" - .024")

Geometry for medium to rough turning. Outstanding chip control thanks to specially configured chipbreaker element in corner area, good chip forming even with low cutting depths.



-5 (FPR Range: .008" - .031")

Geometry with wide range of applications from medium-duty to light roughing operations. Outstanding chip control. High edge strength, hence suitable for interrupted cuts, forging skin or scale. As well as steel, preferred geometry for all cast iron materials such as grey, malleable and nodular cast iron.



-AP (FPR Range: .004" - .016")

Excellent geometry for medium to high performance finishing.



-CT (FPR Range: .005" - .020")

Unique geometry especially designed for outward copy turning. Provides excellent chip control where others produce long curls.



-SL (FPR Range: .008" - .024")

Used for medium to light roughing operations. It provides excellent results on steel and difficult to machine materials like high alloy titanium and aluminum, thanks to its ability to resist chip deformation.



-SM (FPR Range: .004" - .024")

Ideal for medium-duty machining of tough work materials, especially austenitic (300 & PH series) stainless steels and chrome-nickel alloys as used in the aerospace industry. This geometry is designed to minimize adhesion of these particularly gummy materials.

Single-sided geometries



-65 (FPR Range: .010" - .039")

Rough turning geometry with chip control capability extending down into the medium-duty range. Positive rake angles provide lower cutting forces, thus reducing power requirements. Primarily used on low-tensile and austenitic stainless steels.



-8 (FPR Range: .016" - .063")

Very stable cutting-edge geometry for heaviest chip sections and highest material removal rates. Wide chip control range. Also used for interrupted cut operations and applications involving high cutting edge loading. (depth of cut up to .630", feeds up to .030")

CHIPBREAKER GEOMETRIES

Indexable inserts for ISO clamping system S

Complete line with geometries for positive insert styles, particularly in the smaller size range. Main application ID turning, secondary application OD turning.

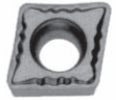
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Geometries



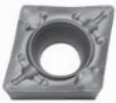
-2 (FPR Range: .002" - .008")

Sharp-edged geometry for finish machining. Good chip control with very small chip sections. Turning with high dimensional accuracy and smooth surface finishes. Inserts with .008" corner radius precision-ground on all sides.



-41 (FPR Range: .003" - .013")

Preferred cutting-edge geometry for light to medium-duty machining operations. Low cutting forces and reduced power requirements thanks to positive rake angle. Good chip control over a wide range. Also used on short-chipping cast iron materials.



-67 (FPR Range: .007" - .031")

Geometry providing chip control in the medium duty range. Positive rake reduces cutting forces and power consumption. Can also be used on low-strength and stainless steels.



-MU (FPR Range: .003" - .013")

The designation -MU stands for medium, universal turning, covering both rough machining with medium chip loads and finish machining with low chip loads.



.CMT. (FPR Range: .005" - .020")

Supplementary geometry with stabilized cutting edge for medium chip sections. Used particularly in operations that make high demands on toughness or involve interrupted cuts.

Round inserts



RCMT.../RCMX...

Round RCMT/RCMX inserts in diameters from .236" to 1.260" for straight turning, facing and profile turning. Mainly used at small cutting depths and high feeds up to approximately 0.1 x dia.

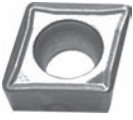


RCMT...-43

The new -43 geometry is designed for use in turning, facing and contouring, including both roughing and finishing. It is ideal for machining alloy, carbon and stainless steels. Applications of this free-cutting geometry lie in the following ranges: feeds f_{max} 0.1 x D, depths of cut $a_{p max}$ 0.4 x D.

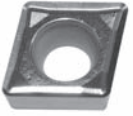
CHIPBREAKER GEOMETRIES

Aluminum inserts



-AL1

AL1 can be used for turning cast aluminum, light alloys, non-ferrous metals, high-melting metals, plastics, glass fiber reinforced plastics, laminated board, carbon and fine ceramics.



-AL2

AL2 is used in the machining of generally difficult-to-machine aluminum alloys with low Si contents, wrought alloys and extrusions. AL2 achieves optimum results even on difficult-to-machine materials.



-AL3

AL3 has even more positive geometry for cost-effective machining of aluminum, non-ferrous metals and plastics. The very positive chipbreaker and extremely sharp cutting edges result in optimum part finishes together with low cutting forces and short chips. Even finishing of steel, stainless and gray iron is possible in conjunction with the coated grade HC-K10.

TwinGroove

Modern grooving inserts with two cutting edges for wide range of uses. All grooving inserts are precision sintered and matched in geometry and grade to the specific requirements of grooving.



-U

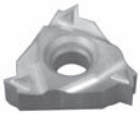
For general use in grooving and parting. Broad positive middle groove with strengthened cutting points and stabilizing side walls.



-M

For grooving and parting, but particularly for profiles, straight turning, recessing and chamfering.

Threading inserts

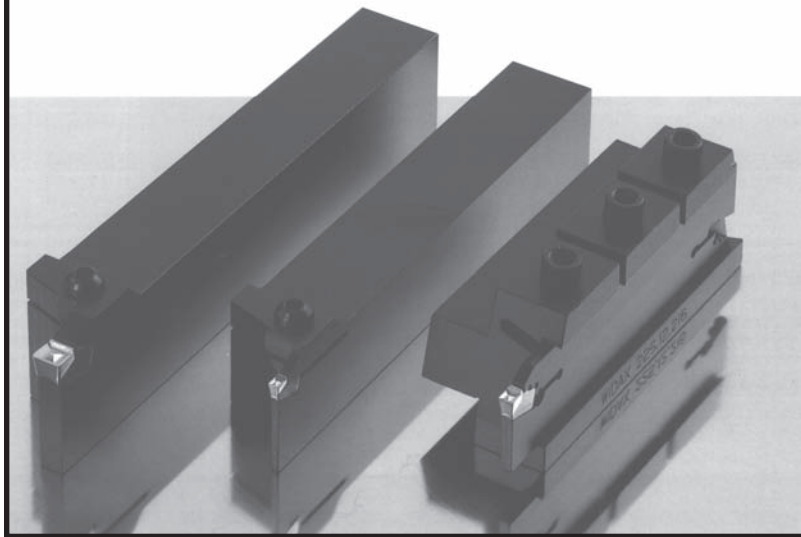


-TD

Tear Drop chipbreaker for improved chip control, time savings and increased both tool life and productivity.

PROGROOVE INSERT GEOMETRIES

ProGroove, the grooving and parting system, offering unrivalled versatility and performance.



- Available in widths from 2 to 8 mm
- Inserts are precision sintered with tight tolerances and a reproducible cutting edge positioning
- Stabilized cutting edges; small corner radii
- Effective chip breaker geometries offering good chip control and good chip evacuation with wide range of uses
- Insert shape enables the toolholder to secure and positively lock in place



-U

-U

For grooving and parting operations and has universal uses such as light cutting action thanks to a positive chipbreaker groove. Available in a left-hand and right-hand style, with a 6° front angle, or parting operations.



-M

-M

For grooving operations and varying widths of cuts. Good chip control even on difficult-to-machine materials. This insert has an added chip-breaker for lighter chip loads.



-S

-S

For low-burr parting with straight flanks and smooth surface finishes. Its neutral design is recommended for grooving and parting of slender workpieces, that is, diameters < 1.25" and thin walled tubes.



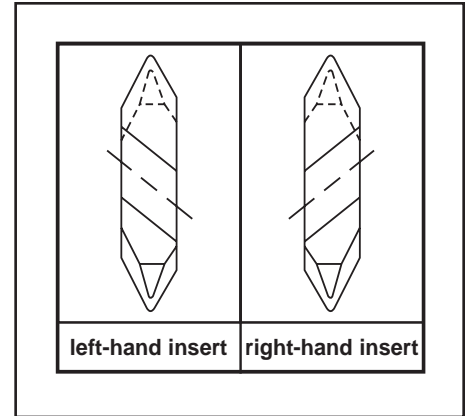
-R

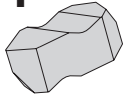
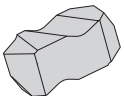
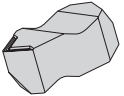
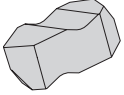
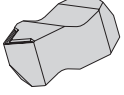
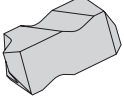

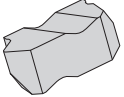
-R

Full round inserts for profiling, grooving and copy turning. This insert has very good chip control, for a broad general use.

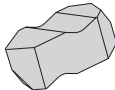
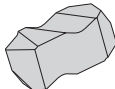
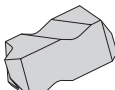

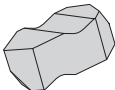


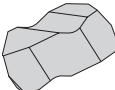

ProNotch Threading Insert Styles

- All ProNotch threading inserts are precision ground to provide accurate edge location and secure locking of the insert in the toolholder pocket.
- ProNotch threading and grooving inserts can be used in either toolholders or boring bars.
- All non-cresting type threading inserts can be used for either external or internal applications. All cresting type inserts are designed specifically for external use.
- Right-hand ProNotch toolholders use right-hand inserts. Left-hand ProNotch toolholders use left-hand inserts.
- Right-hand ProNotch boring bars use left-hand inserts. Left-hand ProNotch boring bars use right-hand inserts.



insert style	thread form	rake angle	cresting	tpi range (pitch in mm)		application
				external	internal	
60° Partial Profile						
PT 	60°V UN class 2 ISO 6g/6H	neutral	no	size 2=8 - 36 (.70 - 3.00) size 3=6 - 20 (1.25 - 4.00) size 4=4 - 20 (1.25 - 6.25)	size 2=7 - 20 (1.25 - 3.50) size 3=5 - 12 (2.00 - 5.00) size 4=4 - 12 (2.00 - 6.25)	general purpose • a popular threading insert style for general use • provides satisfactory performance in most applications
PTP 	60°V UN class 2 ISO 6g/6H	5° positive	no	size 2=8 - 36 (.70 - 3.00) size 3=6 - 20 (1.25 - 4.00) size 4=4 - 20 (1.25 - 6.25)	size 2=7 - 20 (1.25 - 3.50) size 3=5 - 12 (2.00 - 5.00) size 4=4 - 12 (2.00 - 6.25)	general purpose • ground positive rake reduces cutting forces • recommended for threading aluminum and difficult-to-machine materials
PT-C 	60°V UN class 2 ISO 6g/6H	10° positive chip control	no	size 2=8 - 36 (.70 - 3.00) size 3=6 - 20 (1.25 - 4.00) size 4=4 - 20 (1.25 - 6.25)	size 2=7 - 20 (1.25 - 3.50) size 3=5 - 12 (2.00 - 5.00) size 4=4 - 12 (2.00 - 6.25)	general purpose with chip control • threading insert with chip control and positive cutting action • especially helpful for internal threading operations
PTN 	60°V UN class 2 ISO 6g/6H	neutral	no	size 3=6 - 11 (2.50 - 4.00) size 4=4.5 - 11 (2.50 - 5.50)	size 3=6 only (4.00 only) size 4=4.5 - 6 (4.00 - 5.50)	coarse pitches • larger nose radius than general purpose inserts • promotes longer tool life
PTN-C 	60°V UN class 2 ISO 6g/6H	10° positive chip control	no	size 3=6 - 11 (2.50 - 4.00) size 4=4.5 - 11 (2.50 - 5.50)	size 3=6 only (4.00 only) size 4=4.5 - 6 (4.00 - 5.50)	coarse pitches with chip control • positive cutting action • larger nose radius than general purpose inserts • promotes longer tool life
PTF 	60°V UN class 2 ISO 6g/6H	neutral	no	size 2=14 - 44 (.60 - 1.75) size 3=10 - 44 (.60 - 2.50) size 4=10 - 44 (.60 - 2.50)	size 2=12 - 24 (1.00 - 2.00) size 3=9 - 24 (1.00 - 2.50) size 4=9 - 24 (1.00 - 2.50)	fine pitches, close to shoulder operations • smaller nose radius than general purpose inserts • use this style insert only when required for the operation
PTK 	60°V UN class 2 ISO 6g/6H	5° positive	no	size 2=14 - 44 (.60 - 1.75) size 3=10 - 44 (.60 - 2.50) size 4=10 - 44 (.60 - 2.50)	size 2=12 - 24 (1.00 - 2.00) size 3=9 - 24 (1.00 - 2.50) size 4=9 - 24 (1.00 - 2.50)	fine pitches, close to shoulder operations • ground positive rake • smaller nose radius than general purpose inserts • use this insert only when required for the operation
60° American UN						
PTC 	60°V UN class 2	neutral	yes	each insert produces a specific tpi	each insert produces a specific tpi	cresting style for UN inch threads • offers the best possible tool life for the application • produces the best surface finish, and accurate thread depth

PRONOTCH THREADING INSERT STYLES

insert style	thread form	rake angle	cresting	tpi range (pitch in mm)		application
				external	internal	
60° UNJ						
PJ 	60°V UNJ class 3	neutral	no	each insert produces a specific tpi	use a class 2 insert, then finish bore the minor diameter	UNJ external threads • close tolerance on nose radius to control thread root radius • meets or exceeds SPEC MIL-S-8879C
PJP 	60°V UNJ class 3	5° positive	no	each insert produces a specific tpi	use a class 2 insert, then finish bore the minor diameter	UNJ external threads • ground positive rake • close tolerance on nose radius to control thread root radius • meets or exceeds SPEC MIL-S-8879C
PJF 	60°V UNJ class 3	neutral	no	each insert produces a specific tpi	use a class 2 insert, then finish bore the minor diameter	UNJ external threads, fine pitches, close to shoulder • close to shoulder applications • close tolerance on nose radius to control thread root radius • meets or exceeds SPEC MIL-S-8879C
PJK 	60°V UNJ class 3	5° positive	no	each insert produces a specific tpi	use a class 2 insert, then finish bore the minor diameter	UNJ external threads, fine pitches, close to shoulder • ground positive rake • close to shoulder applications • close tolerance on nose radius to control thread root radius • meets or exceeds SPEC MIL-S-8879C
API						
PD 	API 60°V	neutral	no	each insert produces a specific tpi	each insert produces a specific tpi	API rotary shouldered connections- tapered • for thread forms: V-.038R, V-.040 and V.050
Acme Threads						
PA 	29° Acme	neutral	no	each insert produces a specific tpi	each insert produces a specific tpi	Acme threads • strong ProNotch design does not allow the insert to move in the pocket during this type of threading operation, which places high cutting forces on the insert
PAS 	29° Acme	neutral	no	each insert produces a specific tpi	each insert produces a specific tpi	Stub Acme threads • strong ProNotch design does not allow the insert to move in the pocket during this type of threading operation, which places high cutting forces on the insert
American Buttress						
PTB-A 	52° American Buttress with radius	neutral	no	size 2 = 16 - 20 size 3 = 8 - 16 size 4 = 4 - 6	size 2 = 16 - 20 size 3 = 8 - 16 size 4 = 4 - 6	7° pressure flank leading • strong ProNotch design does not allow the insert to move in the pocket during this type of threading operation, which places high cutting forces on the insert
PTB-B 	52° American Buttress with radius	neutral	no	size 2 = 16 - 20 size 3 = 8 - 16 size 4 = 4 - 6	size 2 = 16 - 20 size 3 = 8 - 16 size 4 = 4 - 6	45° pressure flank leading • strong ProNotch design does not allow the insert to move in the pocket during this type of threading operation, which places high cutting forces on the insert
Specials						
	—	—	—	—	—	made to your order • let our expert design team and manufacturing personnel make the insert required for your application, including special API thread forms.

INSERT SELECTION

Turning Applications

Insert selection is mainly based on the characteristics of the insert and the requirements of the application. Performance aspects and cost considerations should be taken into account in the selection process together with the cutting material grade.

Insert Shape

In general, inserts with larger corner angles should be preferred to those with smaller angles in the following order:

S (90°), C and W (80°), T (60°), D (55°),

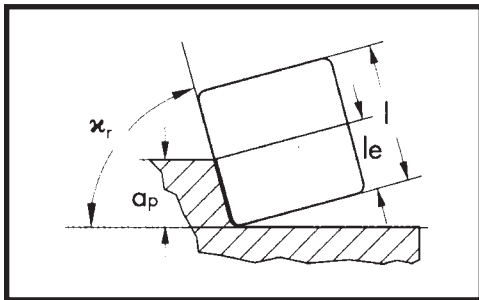
Where applicable, the trigon shape (W 80°) should be preferred to the C insert as more cutting edges are available. Round inserts of shape R are an alternative to S inserts, and may also be suitable for use in form turning.

Two-sided negative-rake inserts which are usable on both sides, doubles the usable cutting edges, thus are more cost-effective than one-sided negative-rake inserts.

Positive rake inserts offer advantages in ID turning operations and for thin-walled parts and soft work materials.

Cutting edge length

The size of an indexable insert is governed by maximum depth of cut a_p , the cutting edge angle α_r and by insert shape and geometry.



a_p = depth of cut

α_r = cutting edge angle








l_e = effective cutting edge length (depth of cut)

l = insert cutting edge length

With cutting edge angles from 75° to 105° the effective cutting edge length is roughly equal to the maximum depth of cut. In outward facing, particularly form turning (copying), the effective cutting edge angle is reduced. Because of the lower thickness of cut, it is possible to use greater cutting edge lengths than stated.

INSERT SELECTION

Maximum effective lengths l_e of cutting edges of turning inserts:

Geometry	Insert Shape						
							
-2, -22	0.3 x l	0.3 x l	0.2 x l	0.2 x l	--	--	--
-4, -41, -48	0.5 x l	0.5 x l	0.3 x l	0.3 x l	--	0.4 x l	--
..MT., -49, -5, -65, -8	0.7 x l	0.7 x l	0.5 x l	0.5 x l	0.2 x l	0.5 x l	0.4 x d

Corner radius

The insert corner radius determines the strength of the cutting point, the maximum admissible feed and the surface finish of the workpiece.

Ground rule : *Select the largest possible corner radius.*

Roughing

The following minimum radii, depending on feed, are recommended for rough turning:





$$\text{feed } f \leq .63 \times r$$

for insert shapes **C** and **S**

$$\text{feed } f \leq .4 \times r$$

for insert shapes **D** and **T**

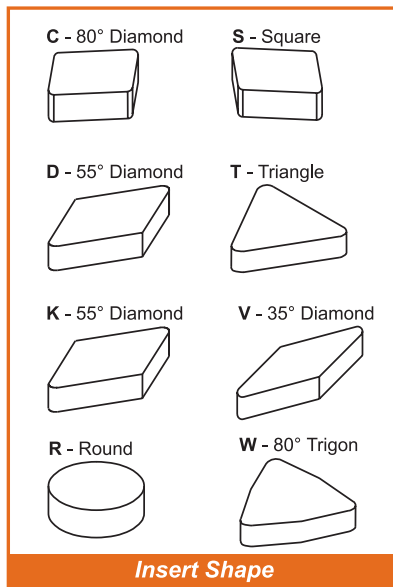
Recommended maximum feeds (based on cutting edge angles of 75° to 105°)

Insert shape	max feed f [ipr] for radius r				
	.015	.031	.047	.063	.094
 	.010	.020	.030	.039	.059
 	.006	.012	.020	.025	.038

Note:

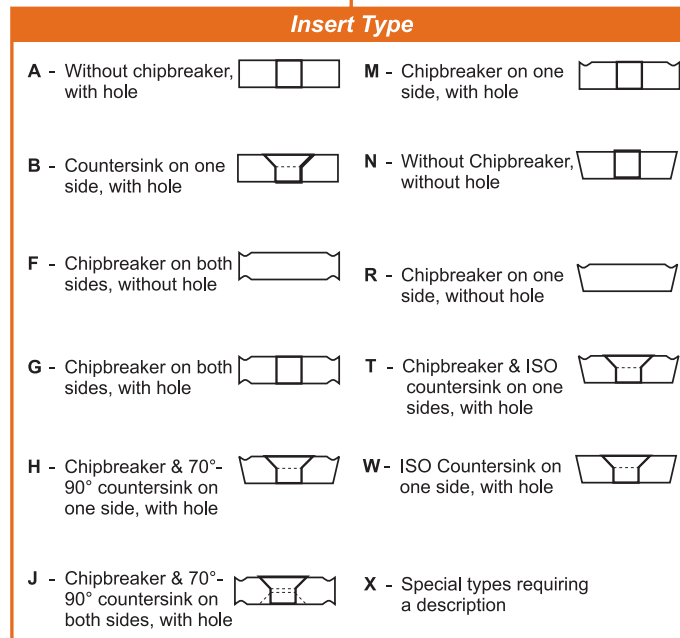
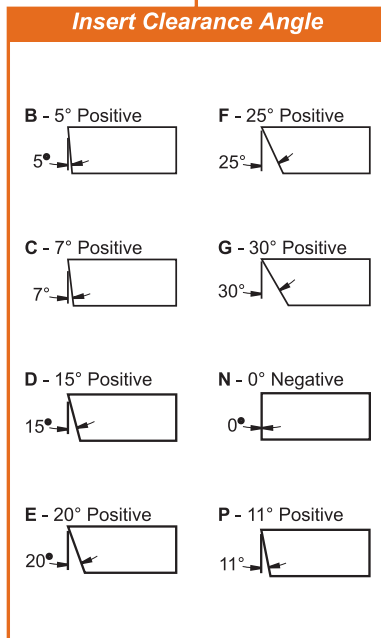
Higher feed values are possible under favourable conditions. Under non-rigid conditions lower values should be applied to smaller radii selected, especially if vibrations occur. Larger radii are generally recommended for cast iron, cast steel and interrupted cuts.

INSERT STANDARD DESIGNATIONS

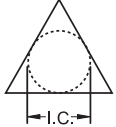


	I.C.	T
A	±.001	.001
C	±.001	.001
E	±.001	.001
F	±.0005	.001
G	±.001	.005
H	±.0005	.001
J	±.002-.005	.001
K	±.002-.005	.001
L	±.002-.005	.001
M	±.002-.004	.005
N	±.002-.004	.001
U	±.005-.010	.005

Insert Tolerances



INSERT STANDARD DESIGNATIONS

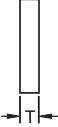


(I.C.) shown in 1/32 inch increments on inserts less than 1/4 inch I.C.

(I.C.) shown in 1/8 inch increments on inserts 1/4 inch and over

1.5 = 3/16 4 = 1/2
1.8 = 7/32 5 = 5/8
2 = 1/4 6 = 3/4
2.5 = 5/16 8 = 1.0
3 = 3/8

Insert I.C. Size

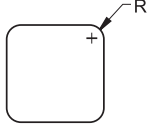


(T) shown in 1/32 inch increments on inserts less than 1/4 inch I.C.

(T) shown in 1/16 inch increments on inserts 1/4 inch and over

2 = 1/16 3 = 3/16
1.5 = 3/32 3.5 = 7/32
2 = 1/8 4 = 1/4
2.5 = 5/32 5 = 5/16


Insert Thickness





(R) shown in 1/64 inch increments


0 = Sharp Point
0.5 = 1/128 4 = 1/16
1 = 1/64 5 = 5/64
2 = 1/32 6 = 3/32
3 = 3/64 8 = 1/8

Insert Radius

E - Honed (Rounded)


F - Sharp


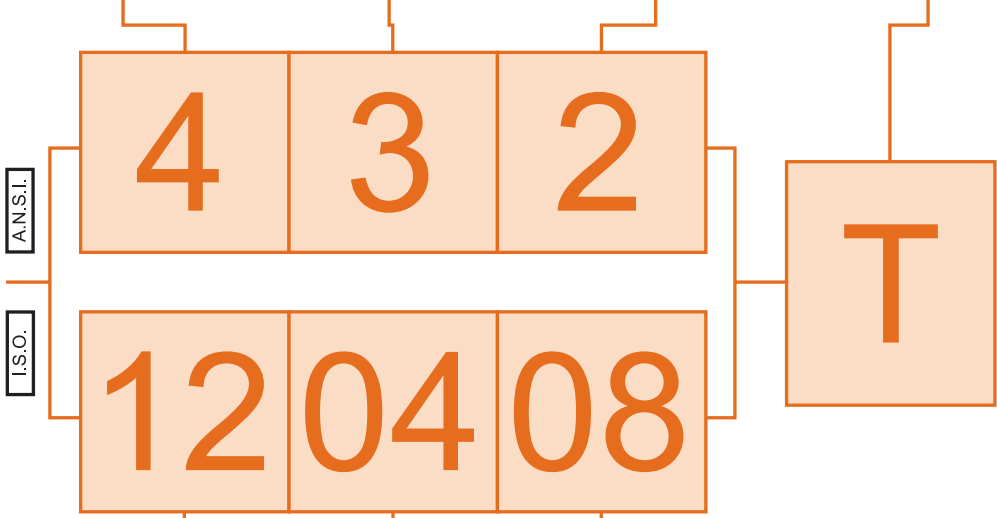
S - Chamfered & Honed


T - Chamfered (Neg. Land)


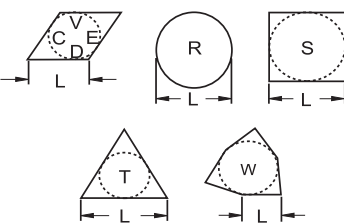
R - Ground chipformer Right hand

L - Ground chipformer Left hand

Cutting Edge




Insert Cutting Edge Length



I.C.	Cutting Edge Length By Shape (mm) designated using insert shape symbol								
	Inch	Metric	C	D	R	S	T	V	W
5/32	03,97	—	—	—	—	—	06	—	—
1/4	06,35	06	07	—	—	—	11	11	04
3/8	09,53	09	11	09	09	16	16	16	06
1/2	12,70	12	15	12	12	22	22	22	08
5/8	15,88	16	19	15	15	27	—	—	—
3/4	19,05	—	—	19	19	33	—	—	—
1.0	25,40	—	—	—	25	—	—	—	—

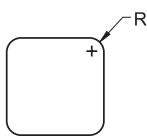
Insert Thickness



(T) shown in 1 mm increments, single integers are to be preceded by a 0

Metric	Inch
01 = 1,59mm	1/16
T1 = 1,98mm	5/64
02 = 2,38mm	3/32
03 = 3,18mm	1/8
T3 = 3,97mm	5/32
04 = 4,76mm	3/16
06 = 6,34mm	1/4
07 = 7,94mm	5/16
09 = 9,52mm	3/8

Insert Radius



(R) shown in 1/10 mm increments

Metric	Inch
00 = Sharp Point	—
02 = 0,2mm	1/128
04 = 0,4mm	1/64
08 = 0,8mm	1/32
12 = 1,2mm	3/64
16 = 1,6mm	1/16
24 = 2,4mm	3/32
32 = 3,2mm	1/8
00 = Round insert inch	—
M0 = Round insert metric	—