

New High Performance ***Solid Carbide Tools***



DORMER

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Solid Carbide *High Performance*

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Application Material Groups



Solid Carbide *High Performance*

MP-X Drills for Multi-Application drilling across a wide range of materials

MATERIAL

Micrograin carbide for an excellent combination of hardness and toughness, resulting in high wear resistance and longer tool life.

LENGTH

Available in a choice of short (DIN 6537 K) and long (DIN 6537 L) lengths and in both solid design and with internal coolant holes.

COATING

Multi-layer Titanium Aluminium Nitride (TiAlN) coating gives:

- * Improved stability of cutting edges.
- * Outstanding wear protection.
- * High hardness properties.
- * High toughness and oxidation stability.
- * Resulting longer tool life and higher productivity.

FLUTE GEOMETRY

Strong web design gives excellent cross-sectional strength and facilitates chip evacuation.

RANGE

R453 3.00 - 20.00 mm 1/8 - 3/4"

R454 3.00 - 16.00 mm 1/8 - 3/4"

R457 3.00 - 20.00 mm 1/8 - 3/4"

R458 3.00 - 16.00 mm 1/8 - 3/4"

MP-X



POINT GEOMETRY

140° point angle with good centring capabilities and low thrust force design, suited to multi-application drilling.

COOLANT FEED

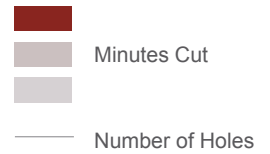
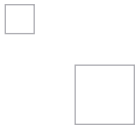
Available with internal coolant holes to improve cutting efficiency and chip evacuation, resulting in higher productivity.

SHANK

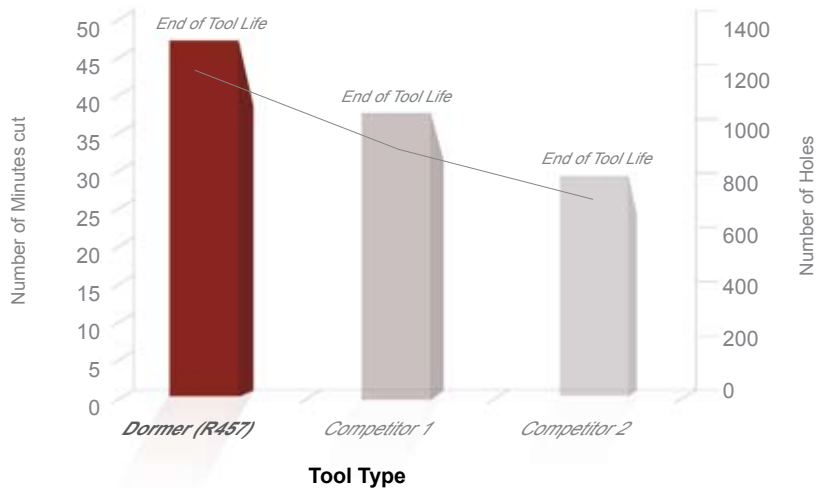
To DIN 6535 HA.



TestResults

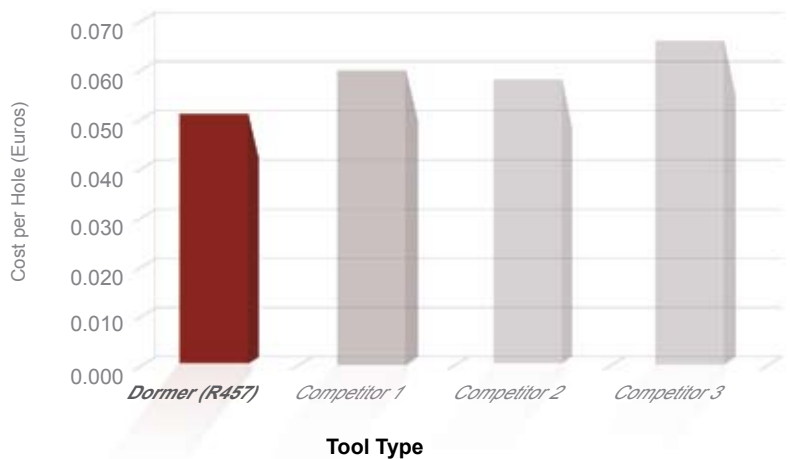


Tool Life Comparison in Alloy Steel (P20), AMG 1.5
Ø 8.0mm, Cutting Depth 3 x Ø



Tested against two competitor equivalent drills, the R457 drilled an average of 30% more holes than the nearest competitor in P20 (AMG 1.5) Alloy Steel material, running at 75m/min / 0.2mm/rev, Dormer's recommended conditions on this application.

Cost per Hole Comparison in Alloy Steel (P20), AMG 1.5
Ø 8.0mm, Cutting Depth 3 x Ø



The graph shows that the cost per hole on the three competitor equivalent drills averaged between 14% and 30% higher than for R457 in P20 (AMG 1.5) Alloy Steel material, running at the company recommended conditions over a period of 30 minutes.

CUSTOMER **BENEFITS**

- * **High productivity** and consistent tool life.
- * **Exceptional value** with no compromise on quality.
- * **Multi-application drilling across a wide range of materials**, including Carbon and Alloy steels, Stainless steels, Cast Iron, non-ferrous metals - Aluminium & Magnesium alloys & Copper.
- * **Excellent hole quality.**
- * **Reduced tooling costs.**
- * **Easy to re-grind.**
- * **Reduced stock-holding** – one drill machines many materials.

Solid Carbide *High Performance*

CDX-Inox Drills for Stainless Steel and exotic materials for drilling to 3 x D (R567) and up to 5 x D (R563)

CDX-Inox

COOLANT FEED

When drilling at high speeds in stainless steel and exotic materials, internal coolant is essential for optimum performance and to counter the work hardening which would otherwise occur. Internal coolant reduces the high cutting temperatures generated and assists the chip breaking process.

TiAIN-TOP COATING

Newly improved TiAIN-Top multi-layer coating resists built-up edge and allows the drill to operate at high speeds and feeds.

POINT GEOMETRY

The positive point geometry together with the smooth curved design of the cutting edge results in a uniform wear pattern and therefore an increase in tool life. The 140° point design allows for excellent centring and ensures that thrust force is low.

MARGIN

The margin has a thin design to reduce the contact with the hole surface - consequently, work hardening is reduced.

RANGE

R563 3.00 - 20.00 mm, 1/8 - 3/4"

R567 3.00 - 20.00 mm, 1/8 - 3/4"



R563



R567

MATERIAL

Micrograin carbide.

SHANK

To DIN 6535 HA.

LENGTH

To DIN 6537K (R567) and 6537L (R563).

FLUTE GEOMETRY

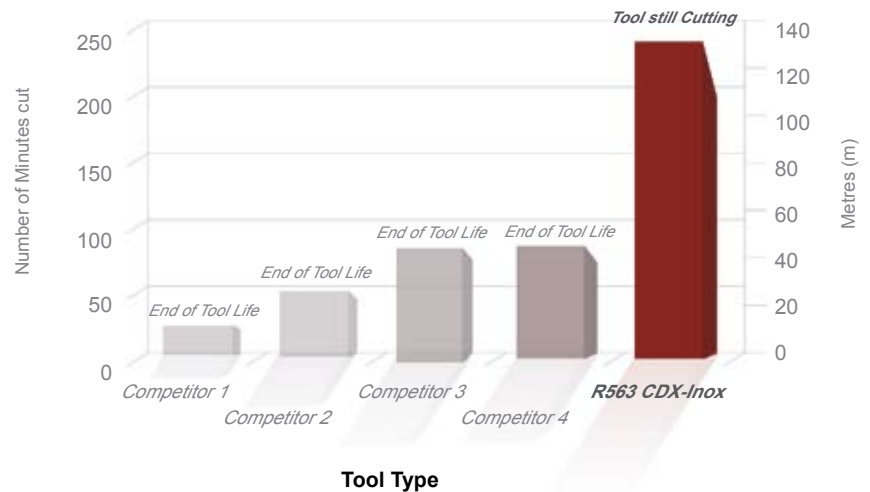
The strong web design offers excellent cross-sectional strength which allows the tool to perform at high feed rates, resulting in high productivity. Heat is transferred away from the hole producing a trouble-free machining operation.

CUSTOMER **BENEFITS**

- * **High productivity** and consistent tool life when drilling in stainless steel, titanium alloys and nickel alloys to depths of up to 3 x D (R567) and up to 5 x D (R563).
- * **Significant reduction of “built-up edge.”**
- * **Reduction of work hardening** of hole surface.
- * **Consistent quality** of surface finish and good hole tolerance.
- * **Excellent chip management** and evacuation gives efficient machining and reduced machine downtime.
- * **Low thrust force** at high penetration rates.
- * **Improved tool life.**

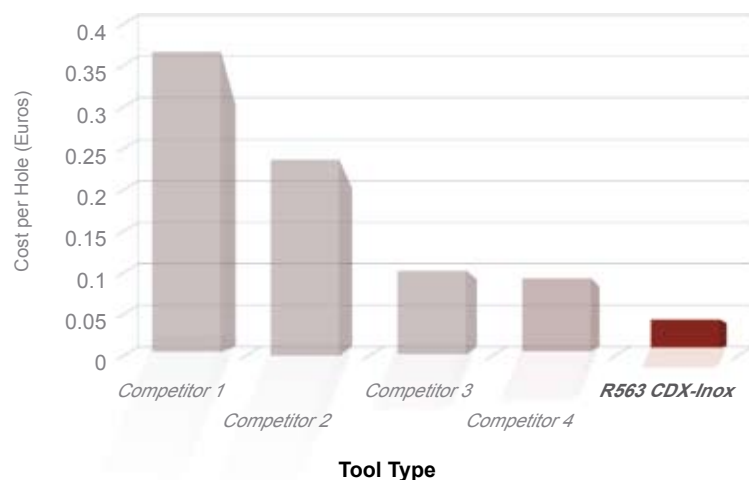
TestResults

R563 Tool Life in Minutes Cut and in Metres vs Competitors in Stainless Steel 316L (AMG 2.2), Ø 8.0 mm



Tested against four competitor equivalent drills, the R563 drilled an average of 175% more metres than the nearest competitor in 316L (AMG 2.2) Stainless Steel material, running at 65m/min / 0.2 mm/rev, Dormer's recommended conditions on this application.

Cost per Hole Comparison in Stainless Steel 316L (AMG 2.2) Ø 8.0 mm



The graph shows that the cost per hole for the competitors equivalent drills is up to 12 times higher than cost hole for R563, running at Dormer's recommended cutting conditions to end of tool life.

Solid Carbide *High Performance*

CDX-DH Drill for Deep Hole Drilling to 8 x D, R570



CDX-DH



R570

ACM™ FLUTE GEOMETRY

Dormer's ACM™ (Advanced Chip Management) flute geometry optimises flute volume and breaks the chips into small, manageable pieces to ensure efficient chip evacuation in deep hole applications, reducing machine downtime. ACM ensures consistent forces throughout the drilling cycle.

POINT GEOMETRY

Specially designed 140° point allows for excellent centring and ensures that thrust force is low.

MATERIAL

Micrograin carbide.

LENGTH

The extra length enables drilling depths of up to 8 x D to be achieved without the need for pecking throughout the full diameter range of 3 – 16mm and 1/4" – 5/8".*

SHANK

To DIN 6535 HA.

RANGE

R570 3.00 - 16.00 mm, 1/4 - 5/8"

SUPER-FLOW COATING

The new Super-Flow coating has been developed to optimise performance of the CDX-DH drill, offering:

- * Specialist surface treatment to assist chip evacuation.
- * Greater stability of cutting edges.
- * Outstanding wear resistance.
- * High hardness and toughness properties and oxidation stability.
- * Exceptional chip evacuation capabilities on all recommended materials.

Tool life and productivity are significantly increased as a result of the new Super-Flow coating.

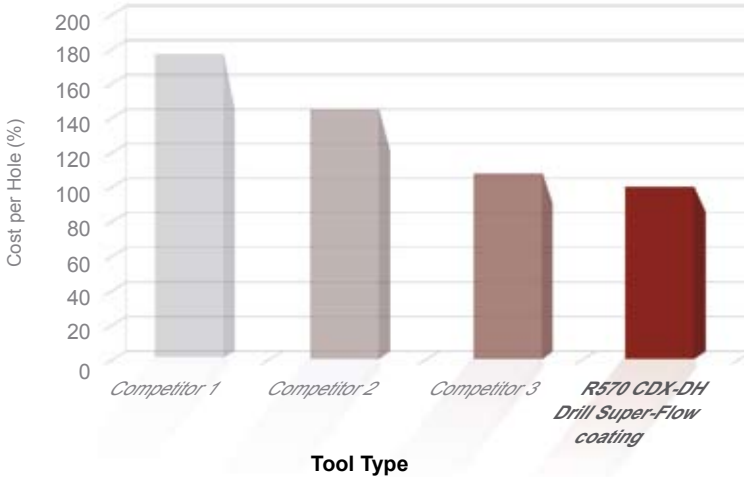
COOLANT FEED

Internal coolant holes ensure that coolant is delivered directly to the tip of the drill, cooling the cutting area and efficiently evacuating the chips from the hole. This allows for high feeds and speeds, resulting in high productivity and lower cost per hole.

- * **Further incremental sizes and sizes for drilling up to 12 x D are available on request.**

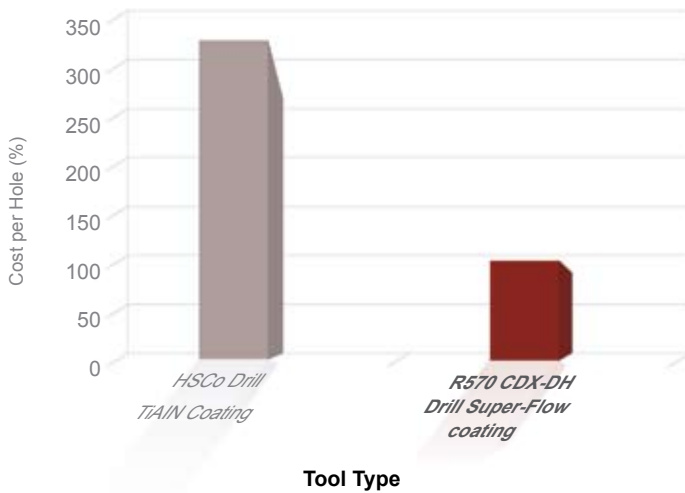
TestResults

Cost per Hole Comparison in Alloys Steel (P20) AMG 1.5 Ø 8.0mm,
Cutting Depth 8 x Ø (30 mins)



The graph shows the cost per hole of Dormer's R570 CDX-DH drill against three competitors equivalent drills, running at each company's recommended cutting conditions over a period of 30 minutes.

HSCo Drill vs R570 Cost per Hole Comparison in Alloy Steel
(P20) AMG 1.5 Ø 8.0 mm, Cutting Depth 8 x Ø (30 mins)



The graph shows that a significant reduction in cost per hole can be achieved by using Dormer's R570 CDX-DH drill compared to the HSCo TiAlN coated drill.

CUSTOMER **BENEFITS**

- * **Deep drilling** in "one hit" to 8 x diameter - no pecking required - reduction in machining time.
- * **Fast and efficient chip evacuation** leading to high productivity and reduced cost per hole.
- * **High quality finish**, good hole tolerance.
- * **Consistent forces.**
- * **Improved tool life** leading to a reduction in machine downtime.
- * **Exceptional levels of performance** in steel, stainless steel, cast iron, copper, aluminium and other materials.

Footnote: Machining time taken into account

For Dimensional information, see page 83 of the **Dormer Carbide Catalogue 07**

Solid Carbide *High Performance*

End Mills, Unequal Helix, for Stainless Steel and exotic alloys, S256

MATERIAL

Micrograin carbide.

LENGTH

Medium cut length.

SHANK

To DIN 6535HA.

X-CEED COATING

X-CEED coating is a mono-layer coating, exhibiting high hardness properties and resistance to abrasion, even at extremely high cutting speeds. This results in longer tool life and high productivity.

UNEQUAL HELIX

- * The unequal design of the helix results in a decrease in tool vibration, to give the best surface finish on the workpiece, superior edge quality due to lack of chipping on the tool and therefore increased tool life.
- * Minimises tool deflection, resulting in greater positional accuracy of the tool in relation to the workpiece.
- * Greater axial and radial depths can be achieved at high cutting parameters.
- * The unequal helix angles have been calculated specifically for optimum machining of Stainless Steel and exotic materials.

RANGE

S256 2.00 - 20.00 mm



TAPERED WEB

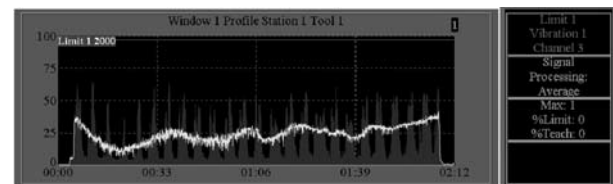
The special tapered design of the web combines the benefits of maximum rigidity with maximum space for efficient chip removal.

CHAMFER

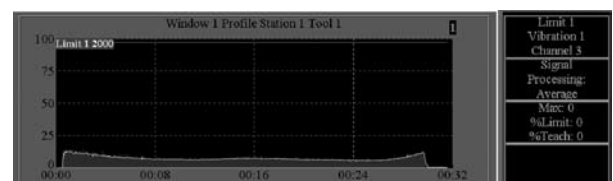
Reinforcement of the chamfer and the rake angle creates a strong geometry which reduces chip problems even in hostile working conditions.

TOOL VIBRATION ON THE S256 COMPARED TO A MAIN COMPETITOR'S EQUIVALENT TOOL

MAIN COMPETITOR'S TOOL

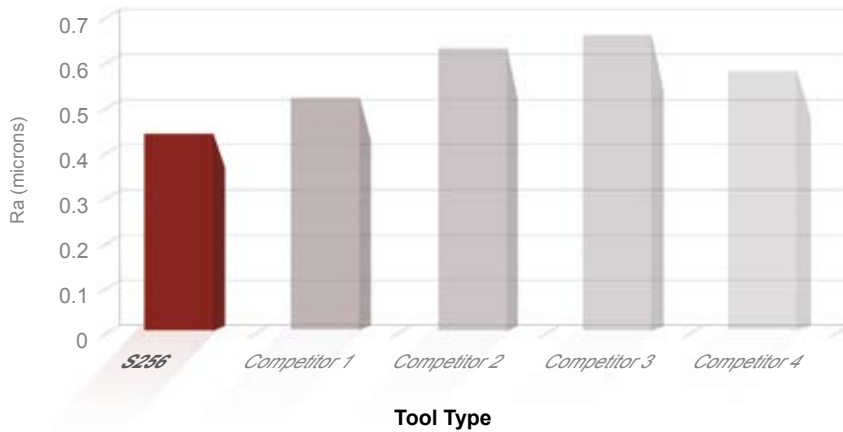


S256



TestResults

Surface roughness, cutting length 0.4 m

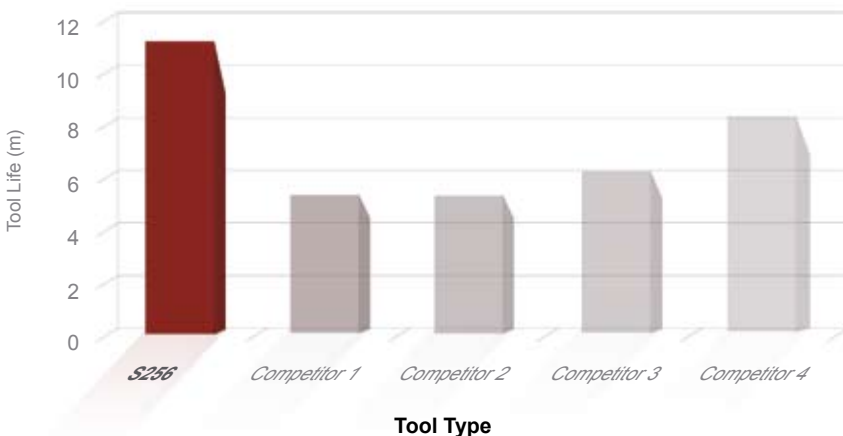


The graph shows the difference in surface roughness of the component between S256, 12 mm and equivalent competitor end mills during finishing operation in a climb milling system in AMG 2.2, AISI 304 at Dormer recommended cutting parameters.

Radial depth (mm) $0.1 \times D = 1.2$ mm

Axial depth (mm) $1.5 \times D = 18$ mm

Tool Life (m)



The graph shows the tool life of the S256, 12 mm against equivalent competitor end mills during finishing operation in a climb milling system in AMG 2.4, 17-4PH, up to a maximum of 0.2 mm wear.

Radial depth (mm) $0.5 \times D = 6$ mm

Axial depth (mm) $2 \times D = 24$ mm

CUSTOMER **BENEFITS**

- * **Exceptional performance** when milling in Stainless Steel and exotic materials across a wide range of applications, from roughing to finishing.
- * **Reduced tool vibration** gives a smooth surface finish on the workpiece and prevents chipping on the tool to maintain superior edge quality.
- * **Efficient chip removal**, therefore reduced machine downtime.
- * **Optimum balance** of wear resistance and toughness, for improved tool life.
- * **High cutting rake angle** to give extremely sharp cutting edge, whilst maintaining the strength of the tool, results in exceptional performance and increased tool life.
- * **Reduction in built-up edge** problems associated with machining in these materials.
- * **Tight shank tolerance (h6)** to enable use in shrink-fit and hydraulic holding systems.

Solid Carbide *High Performance*

Cutters for Aluminium, suitable for High Speed Machining S140/S142

MATERIAL

Micrograin carbide.

LENGTH

Medium and long cut length.

SHANK

To DIN 6535HA.

SURFACE TREATMENT

Extremely highly polished surface finish, to reduce the coefficient of friction between the surface of the tool and the chips produced during the milling operation. As a result, a smooth and fast chip evacuation and high productivity are achieved.

GEOMETRY

- * Specifically developed narrow cylindrical land with highly polished surface finish to reduce tool vibration and minimise chipping problems. Tool life is extended and an excellent surface finish on the component is achieved.
- * Flute design is optimised to give optimum chip space for fast chip evacuation, to achieve maximum levels of productivity.
- * Helix angle and high rake angle chosen to maximise productivity and tool life.

CHAMFER

End teeth reinforced by a small corner radius of 0.15mm, to optimise performance in aluminium and its alloys. Alternative corner radius available – please contact your local sales company.

RANGE

S140 2.00 - 20.00 mm

S142 2.00 - 20.00 mm



S142



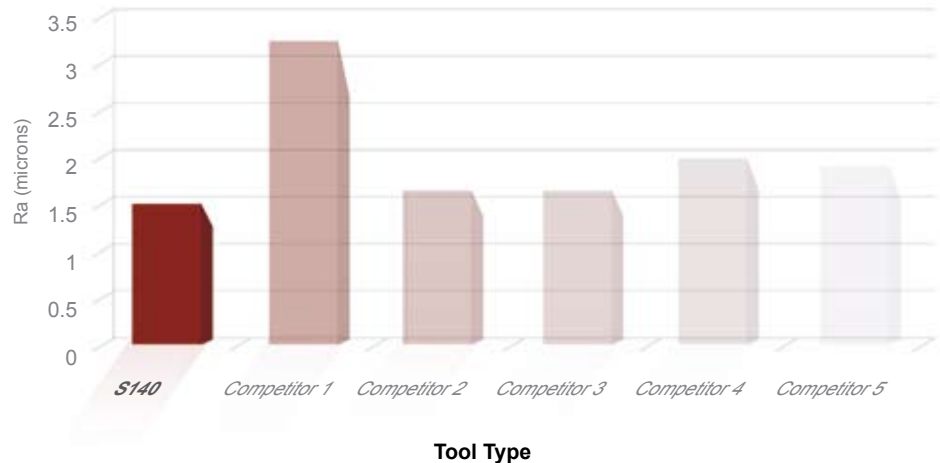
S140

CUSTOMER **BENEFITS**

- * S140 (medium cut length) slot drills specially designed for slotting and contouring in **almost all kinds of aluminum alloys** as well as thermoplastics.
- * S142 (long cut length) gives exceptional performance in “**super-finishing**” applications and is also recommended for contouring and finishing in the above materials. Can achieve **4 x D axial depth**.
- * **High productivity.**
- * Particularly suited for the precision operations often associated with **mould/die** and **aerospace** applications.
- * **Enhanced tool life** as a result of optimum balance between wear resistance and toughness.
- * Suitable for **High Speed Machining (HSM)**.
- * **Reduction in built-up edge** problems associated with machining in these materials.
- * Corner radius on end teeth leading to more stress resistant corners on the component being machined.

TestResults

Surface roughness, cutting length 45 m

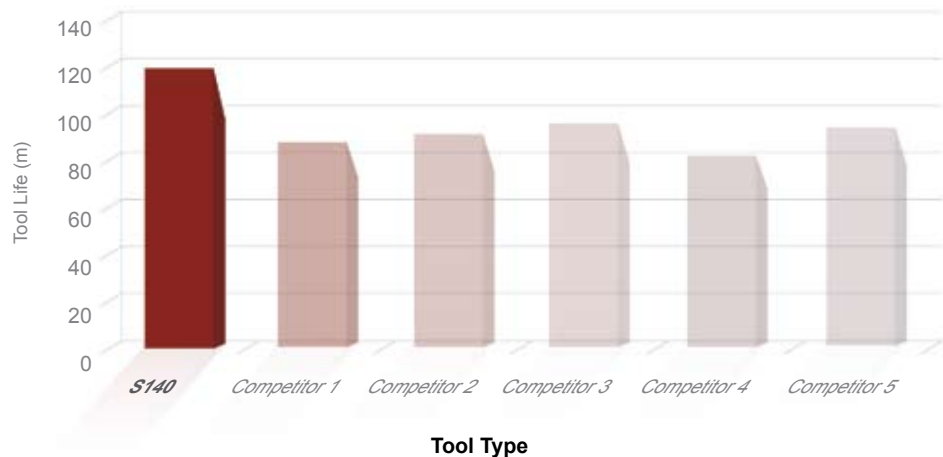


The graph shows the difference in surface roughness of the component between S140 10 mm and equivalent competitor cutters during slotting operation in a AMG 7.2, AI7075 at Dormer recommended cutting parameters.

Radial depth (mm) 1,0 x D = 10 mm

Axial depth (mm) 0,5 x D = 5 mm

Tool Life (m)



The graph shows the tool life of the S140, 10 mm against equivalent competitor cutter during contouring operation in a climb milling system in AMG 7.2, AI 7075, with average wear of 0.5 mm (testing 5 of each tool) at Dormer recommended cutting parameters.

Radial depth (mm) 0,5 x Ø = 5 mm

Axial depth (mm) 1 x Ø = 10 mm

Solid Carbide *High Performance*

Straight flute, Spiral flute and Forming Taps

Straight flute taps for through and blind holes in short chipping materials, in Metric (T101) and Metric Fine (T120) Thread Forms

- * The straight flute geometry allows excellent performance when threading both through and blind holes in short chipping materials such as Cast Iron and high alloyed Aluminium, including high silicon Aluminium.
- * Internal coolant optimises the effective delivery of coolant to the cutting edge and facilitates chip evacuation.
- * The high toughness properties of the micrograin carbide base material and the TiAlN-Top coating allow these taps to be operated at high speeds, leading to higher productivity and longer tool life when compared to HSS taps.

Spiral flute taps with 15° spiral for blind holes in short chipping abrasive materials, in Metric Thread Form (T105/T106)

- * Designed for threading in blind holes, the low helix (15° spiral) facilitates chip evacuation from the hole in short chipping difficult-to-machine, abrasive materials, such as Cast Iron and high silicon Aluminium.
- * The chip evacuation process is further enhanced by the addition of the internal coolant feature on the T106 tap.
- * The high toughness properties of the micrograin carbide base material allows these taps to be operated at high speeds, leading to higher productivity and longer tool life when compared to HSS taps.

Forming taps for through and blind holes, in Metric Thread Form (T115/T116)

- * Forming taps enable a chip-free operation and a strong thread in both through and blind holes.
- * Designed in particular for use in Steel, Stainless Steel and Aluminium.
- * Internal coolant feature on the T116 tap optimises the effective delivery of the coolant to the cutting edge.
- * The high toughness properties of the micrograin carbide base material and the hardness and toughness of TiCN coating enhance the taps' wear resistance properties, leading to high productivity and long tool life when compared to HSS taps.
- * Forming taps can be operated at higher speeds than thread cutting taps, allowing even higher productivity.
- * Forming taps often give a longer tool life when compared to thread cutting taps.
- * Forming taps have a highly stable design which gives a lower risk of tap breakage.
- * Forming taps give an improved surface finish on the thread, compared to thread cutting taps.

RANGE

T101 M5 - M16

T115 M3 - M10

T105 M3 - M12

T120 M8 - M14

T116 M5 - M12

T106 M5 - M12



T115



T105

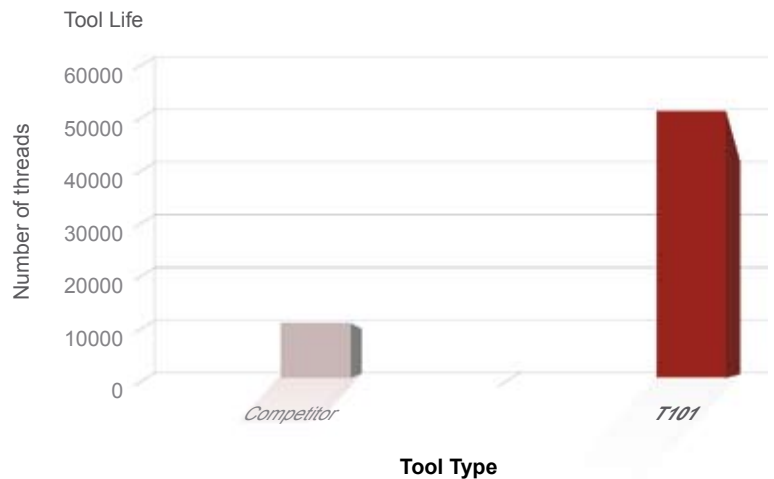


T101

CUSTOMER **BENEFITS**

- * Designed to achieve **high productivity and long tool life** in specific materials and key applications, in particular Cast Iron, high alloyed Aluminium, low alloyed steels and Stainless Steel.
- * Internal coolant options available for each tap geometry to **enhance the chip evacuation** and optimise effective delivery of coolant to the cutting edge resulting in longer tool life.

TestResults



The graph shows that the number of threads produced by a T101 Solid Carbide M8 tap is over 5.5 times greater than that of a competitor's HSS-E powder metallurgy TiAlN-coated tap in AMG 3.2, GG-25. Productivity on the T101 is 75% higher, as it can be run at significantly higher speeds. Test criteria is 2 x D; both taps have internal coolant.

Vc T101 70m/min.

Vc Competitor's HSS-XP TiAlN coated tap 40m/min.

Solid Carbide

High Performance

R457 R458



■ Excellent for Application

● Good for Application

Example

125 = Peripheral speed in metres/minute +/- 10%

W = Feed range

HM	HM
TIAIN	TIAIN
DIN 6537 K	DIN 6537 K
3xD	3xD
DIN 6535 HA	DIN 6535 HA
140°	140°

3.00 - 20.00 3.00 - 3/4

NEW 2006.11 NEW 2006.11

Application Material Groups (AMG)			Hardness HB	Tensile Strength N/mm ²	4	4
1. Steel	1.1 Magnetic soft steel	<120	<400	■125W	■125W	
	1.2 Structural Steel / case carburising steel	<200	<700	■115W	■110W	
	1.3 Plain Carbon steel	<250	<850	■110W	■90W	
	1.4 Alloy steel	<250	<850	■95V	■80V	
	1.5 Alloy steel/ Hardened and tempered steel	>250 <350	>850 <1200	■75V	■60V	
	1.6 Alloy steel/ Hardened and tempered steel	>350	>1200 <1620	■65U	■50U	
	1.7 Alloy steel Hardened	49-55HRC	>1620			
	1.8 Alloy steel Hardened	55-63HRC	<1960			
2. Stainless Steel	2.1 Free machining Stainless Steel	<250	<850	■55V	●45U	
	2.2 Austenitic	<320	<1100	■35V	●40T	
	2.3 Ferritic + Austenitic, Martensitic	<300	<1000	●30U	●35T	
	2.4 Precipitation Hardened	>320 <410	>1100 <1400			
3. Cast Iron	3.1 Lamellar graphite	<150	<500	■110W	■90W	
	3.2 Lamellar graphite	>150 <300	>500 <1000	■110W	■90W	
	3.3 Nodular graphite/ Malleable Cast Iron	<200	<700	■80V	■70V	
	3.4 Nodular graphite/ Malleable Cast Iron	>200 <300	>700 <1000	■80V	■70V	
4. Titanium	4.1 Titanium, unalloyed	<200	<700	■55V	●50U	
	4.2 Titanium, alloyed	<270	<900	■45V	●40U	
	4.3 Titanium, alloyed	>270 <350	>900 <1250	■40U	●35T	
5. Nickel	5.1 Nickel, unalloyed	<150	<500			
	5.2 Nickel, alloyed	<270	<900			
	5.3 Nickel, alloyed	>270 <350	>900 <1200			
6. Copper	6.1 Copper	<100	<350	■125W	■100V	
	6.2 β-Brass, Bronze	<200	<700	■220W	■200V	
	6.3 α-Brass	<200	<700	■220W	■200V	
	6.4 High Strength Bronze	<470	<1500	■100V	●80U	
7. Aluminium Magnesium	7.1 Al, Mg, unalloyed	<100	<350	■250W	■225W	
	7.2 Al alloyed, Si<0.5%	<150	<500	■250W	■225W	
	7.3 Al alloyed, Si>0.5%<10%	<120	<400	■200V	■180V	
	7.4 Al alloyed, Si>10% Whisker reinforced Al-alloys, Mg alloys	<120	<400	■150V	■120V	
8. Synthetic Materials	8.1 Thermoplastics	---	---			
	8.2 Thermosetting plastics	---	---			
	8.3 Reinforced plastic materials	---	---			
9. Hard Materials	9.1 Cermets (Metal-ceramics)	<550	<1700			
10. Graphite	10.1 Standard graphite	---	<100			



HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM
TiAlN	TiAlN	TiAlN Top	TiAlN Top	Super Flow	Coated			TiAlN Top			TiCN	TiCN	TiAlN Top
DIN 6537 L	DIN 6537 L	DIN 6537 H	DIN 6537 L	DIN 6537 L	DIN 6527	DIN 6527	DIN 6527	DIN 371c10 376a12	DIN 371c10 376a12	DIN 371c10 376a12	DIN 2174	DIN 2174	DIN 374
<5XD	<5XD	3xD	<5XD	8XD				6HX	6H	6H	6HX	6HX	6HX
DIN 6535 HA	DIN 6535 HA	DIN 6535 HA	DIN 6535 HA	DIN 6535 HA	DIN 6535 HA	DIN 6535 HA	DIN 6535 HA	2.5xD	2xD	3xD	3xD	3xD	2.5xD
140°	140°	140°	140°	140°	h10	h10	h10	C 2-3	C 2-3	C 2-3	C 2-3	C 2-3	C 2-3
		S.P.	S.P.	S.P.	λ 30°	λ 30°	λ 30°	U 11°	U 11°	U 11°			U 11°
					HSM	HSM	HSM						

3.00 - 20.00 3.00 - 3/4 3.00 - 20.00 3.00 - 20.00 3.00 - 16.00 2.00 - 20.00 2.00 - 20.00 2.00 - 20.00 M5 - M16 M3 - M12 M5 - M12 M3 - M10 M5 - M12 M8 - M14


NEW 2006.11 NEW 2006.11 NEW 2007.10 NEW 2007.04 NEW 2007.04 NEW 2007.10 NEW 2007.10 NEW 2007.10 NEW 2007.10 NEW 2007.10 NEW 2007.10 NEW 2007.10 NEW 2007.10




4 4 6 6 8 10 12 12 14 14 14 14 14 14





■125V	■125V			■135V	■245B						■60	■60		1.1
■115V	■110V			■120V	■205B						■60	■60		1.2
■110V	■90V			■110U	■160B						■55	■55		1.3
■95V	■80V			■100U	■160B						■45	■45		1.4
■75V	■60V			■80U	■120B						■30	■30		1.5
■65U	■50U			■55T	■98B									1.6
					●65A									1.7
														1.8
■55V		■120W	■110V	■75V	■120A						■30	■30		2.1
■35V		■75V	■65V	■35V	■100A						■25	■25		2.2
●30U		■50V	■50U	●30U	■80A						■25	■25		2.3
		■50V	■50U		■60A						●18	●18		2.4
■110W	■90W			■120W	●205B			■70	●50	●50			■70	3.1
■110W	■90W			■120W	●120B			■30	●20	●20			■30	3.2
■80V	■70V			■80V	■120B			●35	■30	■30			●35	3.3
■80V	■70V			■80V	■105B			●25	■30	■30			●25	3.4
■55V	●50U	■80X	■50V		■205B									4.1
■45V	●40U	■75W	■45U		■105B									4.2
■40U	●35T	■50V	■35U		■65B									4.3
		■70X	■50U		■205B						■45	■45		5.1
		■50V	■35U		■40A						■20	■20		5.2
		■30U	■25U		■32A									5.3
■125W	■100V			●125V	■400C						●30	●30		6.1
■220W	■200V			●220V	■400C									6.2
■220W	■200V			●220V	■400C									6.3
■100V	●80U			●100U	■65B			●10					●10	6.4
■250W	■225W			●285W	■950C	■800A	■650A				■85	■85		7.1
■250W	■225W			■285W	■950C	■1000A	■800A			■50	■50	■95	■95	7.2
■200V	■180V			■190V	■610C	■1000A	■800A		●60	■40	■40	■80	■80	7.3
■150V	■120V			■95V	■330B				■50	■35	■35			7.4
					●330C	■280A	■240A							8.1
					■330C				●35	■30	■30			8.2
					■330B				●25	■20	■20			8.3
					●9A									9.1
									●30					10.1

Solid Carbide

High Performance

 Fn	Ø									
	3mm	4mm	5mm	6mm	8mm	10mm	12mm	15mm	16mm	20mm
T	0.040	0.050	0.060	0.070	0.090	0.110	0.130	0.160	0.170	0.190
U	0.070	0.080	0.090	0.107	0.140	0.170	0.200	0.223	0.230	0.240
V	0.100	0.115	0.130	0.153	0.200	0.250	0.280	0.310	0.320	0.340
W	0.130	0.150	0.170	0.200	0.260	0.330	0.380	0.418	0.430	0.450
X	0.150	0.180	0.210	0.250	0.330	0.420	0.480	0.533	0.550	0.580
mm/rev +/- 25%										

		S256	fz	Ø mm mm/z ± 25%												
				2	3	4	5	6	8	10	12	14	16	18	20	
S256		S256	$\updownarrow 1,5$ $\leftrightarrow 0,1$	A	0.010	0.020	0.030	0.040	0.045	0.050	0.060	0.075	0.080	0.090	0.100	0.120
				B	0.015	0.030	0.040	0.055	0.065	0.075	0.090	0.110	0.120	0.130	0.150	0.170
				C	0.015	0.030	0.040	0.055	0.085	0.100	0.120	0.140	0.150	0.170	0.200	0.220
S256		S256	$\updownarrow 1$ $\leftrightarrow 0,5$	A	0.003	0.005	0.008	0.010	0.013	0.020	0.027	0.035	0.040	0.050	0.055	0.060
				B	0.004	0.008	0.012	0.015	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
				C	0.005	0.010	0.015	0.020	0.025	0.040	0.050	0.065	0.080	0.090	0.105	0.120

		S140 / S142	fz	Ø mm mm/z ± 25%											
				2	4	6	8	10	12	14	16	20			
S140		S140	$\updownarrow 1,5$ $\leftrightarrow 0,1$	A	0.013	0.033	0.049	0.065	0.081	0.088	0.101	0.130	0.163		
S140 S142#		S140 S142#	$\updownarrow 1,5$ $\leftrightarrow 0,5$	A	0.020	0.050	0.075	0.100	0.125	0.135	0.155	0.200	0.250		
S142#		S142#	$\updownarrow 4$ $\leftrightarrow 0,5$	A	0.017	0.042	0.063	0.083	0.105	0.113	0.130	0.167	0.208		

#az = 0.6





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