MILLING

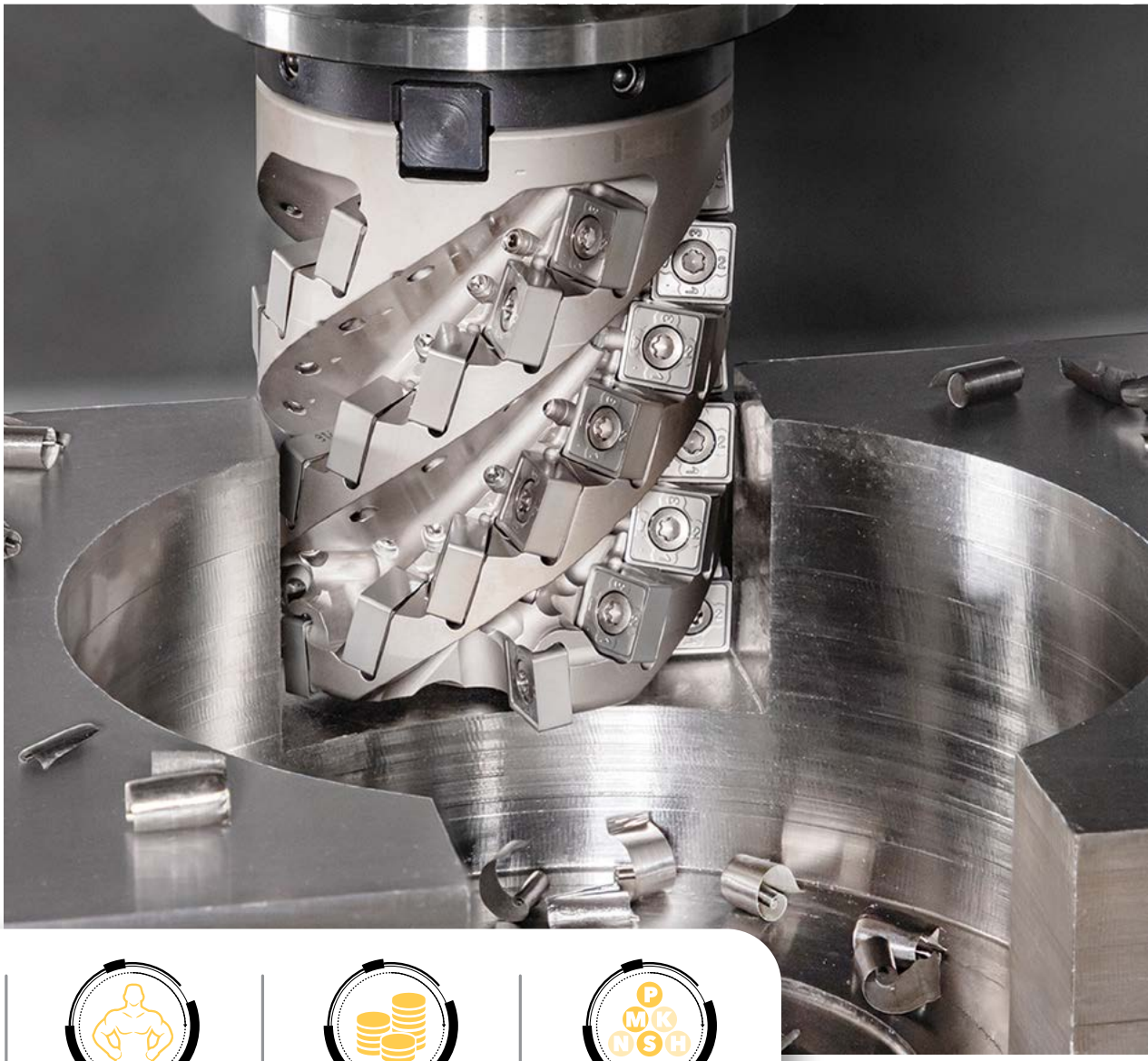
08-2024

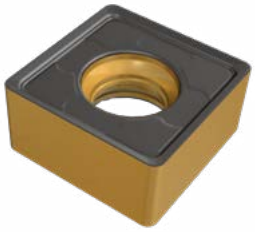
MARCH 2024

METRIC/IMPERIAL

NPA

New Product Announcement





Extremely Robust Cutter Structure

Cost Effective Tool Lines

For Steel, Stainless steel and Titanium

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ISCAR

QUICKXFLUTE

A New Family of Indexable Extended Flute Cutters for High Efficiency and Cost-Effectiveness

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Highlights

Cost-Effective Indexable Extended Flute Cutters for Achieving High Metal Removal Rates in Rough Milling Of Challenging Engineering Materials

ISCAR introduces an innovative family of 90-degree extended flute cutters featuring double-sided indexable square inserts sized 13. These cutters are specifically optimized for high-efficiency rough milling of the following engineering materials:
- Steel (ISO P group of application)
- Stainless steel (ISO M)
- High temperature superalloys and titanium (ISO S)

- The new family of cutters provides manufacturers with a productive and cost-effective solution, ensuring high-quality machining parameters. These cutters enable significantly increased productivity and are primarily intended for milling hard-to-cut materials when producing high-value components, particularly critical-duty loaded parts in the Aerospace and Heavy Industries. The versatile cutting geometry of the new extended flute cutters (EFC) ensure efficient milling of a wide range of engineering materials.
- The indexable inserts are made from various carbide grades to optimize machining for a specific material type.
- The EFC are available with one-body shell mill with a central bore design configurations.
- The cutter is designed with an optimized flute geometry to improve the cutter's dynamic behavior. The shape and volume of the flutes are determined to find a compromise between cutter rigidity and the necessity to provide effective chip flow when milling at high metal removal rate (MRR) with substantial radial engagement.
- The new cutters feature an inner coolant supply option.

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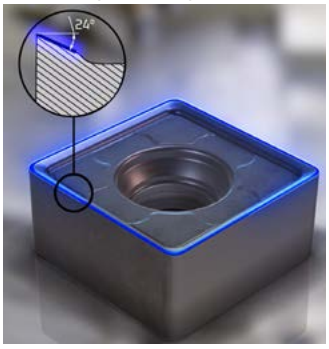
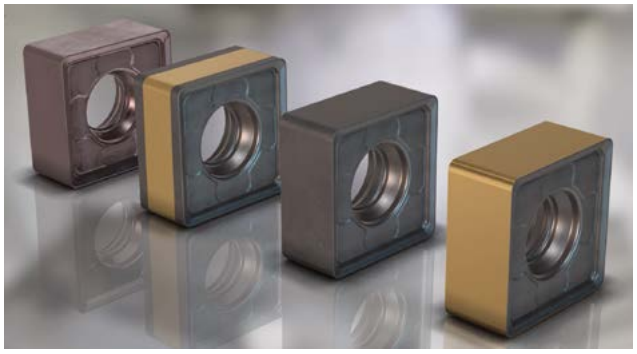
Insert Features

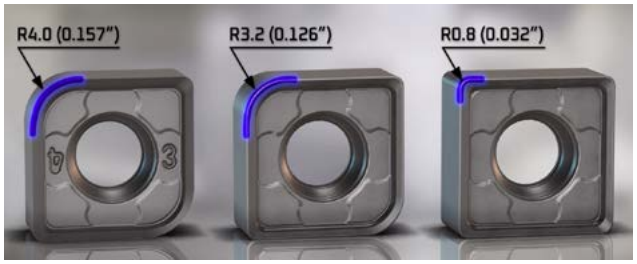
- Double-sided square inserts with 8 indexable right-hand cutting edges.
- The new inserts feature a High Positive (HP) chip-former with special edge preparation, ensure versatile cutting geometry for productive milling of steel, stainless steel, high temperature superalloys and titanium.



- The new inserts are available in ISCAR's advantageous MT CVD coated IC5820 and PVD coated IC830, IC840, and IC882 carbide grades, featuring a post-coating treatment. Additionally, there are inserts that are made from the latest PVD coated IC716 carbide grade, which has been developed specifically for high-performance machining titanium and titanium alloys.



- The inserts are available with corner radii of 0.8 (.0315"), 3.2 (.126") and 4 mm (.1575")



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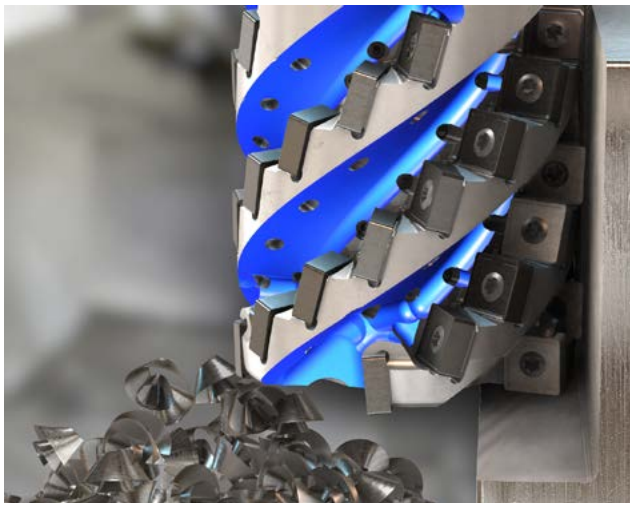
Extended Flute Cutter Body's Features

- A unique flute geometry improves vibration resistance, especially during the entry and exit of the workpiece, providing better milling stability and enabling increased cutting data to enhance productivity.



- The use of high-pressure pinpointed coolant, with replaceable nozzles and face frontal outlets, facilitates the direct supply of coolant to the cutting zone. This increases the cooling and lubrication effect, contributing to effective chip control.

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Tool Diameter Range
Metric sizes:
63 and 80 mm

Imperial sizes:
2.5” and 3.0”

Applications

- The new indexable extended flute cutters (EFC) are optimized for rapid stock removal when roughing, especially when machining challenging high-strength steel, stainless steel, and aerospace materials like high-temperature superalloys and titanium.
- Typical applications of the EFC are milling deep square shoulders and wide edges in manufacturing aircraft structural components like airframes, landing gear elements, engine parts etc.
- Also, the EFC are suitable for rough machining large-sized slots by trochoidal milling method.

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For Steel, Stainless steel and Titanium

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Cutting recommendations for the S890 complete line

- The table below defines initial feed rates
- For initial cutting speeds refer to ISCAR's recommendations for carbide grades

Calculating cutting feed rate:

$f_z = f_{z0} \times K_{ef} \times K_s$ where

f_{z0}, f_{r0} - Basic feed (Table 1),

K_{ef} - Engagement factor (Table 2),

K_s - Stability factor (Table 3)

Metric system (Table 1) Material Groups

Based on ISO 513 and VDI 3323 standards

ISO	Material		Condition	Tensile Strength [N/mm²]	Kc1(1) [N/mm²]	mc(2)	Hardness HB	Material Group No.	f_{z0} [mm/t]
P	non-alloy steel and cast steel, free cutting steel	<0.25% C	annealed	420	1350	0.21	125	1	0.20
		≥0.25% C	annealed	650	1525	0.22	190	2	
		<0.55% C	quenched and tempered	850	1675	0.24	250	3	
		≥0.55% C	annealed	750	1675	0.24	220	4	
			quenched and tempered	1000	1900	0.24	300	5	
	low alloy and cast steel (less than 5% of alloying elements)		annealed	600	1775	0.24	200	6	0.18
			quenched and tempered	930	1675	0.24	275	7	
				1000	1725	0.24	300	8	
				1200	1800	0.24	350	9	0.16
	high alloyed steel, cast steel and tool steel		annealed	680	2450	0.23	200	10	0.15
			quenched and tempered	1100	2500	0.23	325	11	
	stainless steel and cast steel		ferritic / martensitic	680	1875	0.21	200	12	0.14
			martensitic	820	1875	0.21	240	13	
M	stainless steel and cast steel		austenitic, duplex	600	2150	0.20	180	14	0.18
S	high temperature alloys	Fe based	annealed		2600	0.24	200	31	0.18
			hardened		3100	0.24	280	32	0.17
		Ni or Co based	annealed		3300	0.24	250	33	0.18
			hardened		3300	0.24	350	34	0.16
			cast		3300	0.24	320	35	0.16
	titanium alloys		pure	400	1160	0.24	190	36	0.20
			alpha+beta alloys, hardened	1050	1245	0.24	310	37	0.18

steel
stainless steel
superalloys and titanium

(1) Specific cutting force for 1 mm² chip section.
(2) Chip thickness factor.

(Table 2) Engagement factor K_{ef}

a_e/D	Up to 0.2	Over 0.2 to 0.25	Over 0.25 to 0.4
Kef	1.1	1	0.8

a_e - Width of cut
D - Cutting diameter

(Table 3) Stability factor K_s

Stability	High	Moderate	Poor
Ks	1	0.9	0.7

QUICKXFLUTE

Cutting recommendations for the S890 complete line

- The table below defines initial feed rates
- For initial cutting speeds refer to ISCAR's recommendations for carbide grades

Calculating cutting feed rate:

$f_z = f_{z0} \times K_{ef} \times K_s$ where

f_{z0}, f_{r0} - Basic feed (Table 1),

K_{ef} - Engagement factor (Table 2),

K_s - Stability factor (Table 3)

Imperial system (Table 1) Material Groups

Based on ISO 513 and VDI 3323 standards

ISO	Material		Condition	Tensile Strength [ksi]	Kc1(1) [ksi]	mc(2)	Hardness HB	Material Group No.	f_{z0} [ipt]
P	non-alloy steel and cast steel, free cutting steel	<0.25% C	annealed	61	196	0.21	125	1	0.008
		≥0.25% C	annealed	94	221	0.22	190	2	
		<0.55% C	quenched and tempered	123	243	0.24	250	3	
		≥0.55% C	annealed	109	243	0.24	220	4	
			quenched and tempered	145	276	0.24	300	5	
	low alloy and cast steel (less than 5% of alloying elements)		annealed	87	257	0.24	200	6	0.007
			quenched and tempered	135	243	0.24	275	7	
				145	250	0.24	300	8	
				174	261	0.24	350	9	0.006
	high alloyed steel, cast steel and tool steel		annealed	99	355	0.23	200	10	0.006
			quenched and tempered	160	363	0.23	325	11	
	stainless steel and cast steel		ferritic / martensitic	99	272	0.21	200	12	0.006
			martensitic	119	272	0.21	240	13	
M	stainless steel and cast steel		austenitic, duplex	87	312	0.20	180	14	0.007
S	high temperature alloys	Fe based	annealed		377	0.24	200	31	0.007
			hardened		450	0.24	280	32	0.007
		Ni or Co based	annealed		479	0.24	250	33	0.007
			hardened		479	0.24	350	34	0.006
			cast		479	0.24	320	35	0.006
	titanium alloys		pure	58	247	0.24	190	36	0.008
			alpha+beta alloys, hardened	152	306	0.24	310	37	0.007

steel

stainless steel

superalloys and titanium

(1) Specific cutting force for .0016 in^2 chip section.

(2) Chip thickness factor.

(Table 2) Engagement factor K_{ef}

a_e/D	Up to 0.2	Over 0.2 to 0.25	Over 0.25 to 0.4
Kef	1.1	1	0.8

a_e - Width of cut

D - Cutting diameter

(Table 3) Stability factor K_s

Stability	High	Moderate	Poor
Ks	1	0.9	0.7

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a_p/a_e (axial d.o.c./radial d.o.c.)
f_z=0.15 (mm/t) / 0.006 (ipt)
v_c=50 (m/min) / 164 (sfm)

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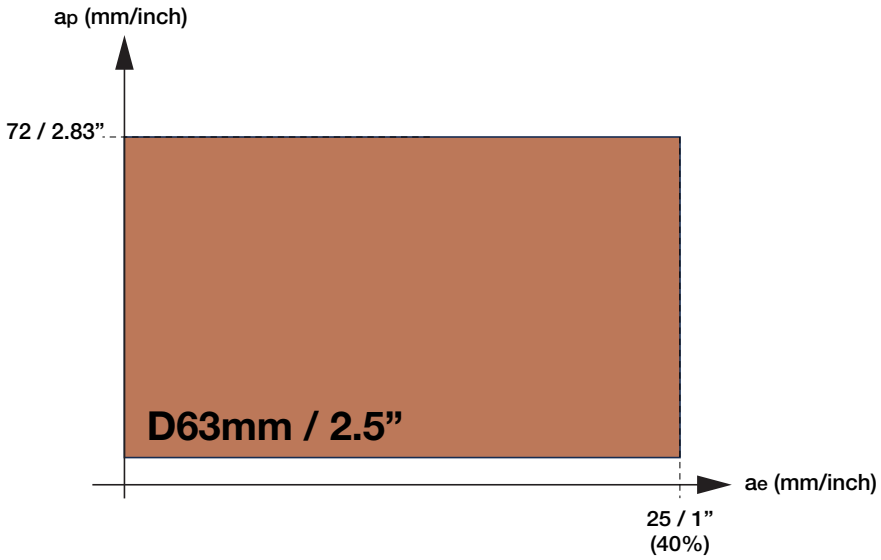

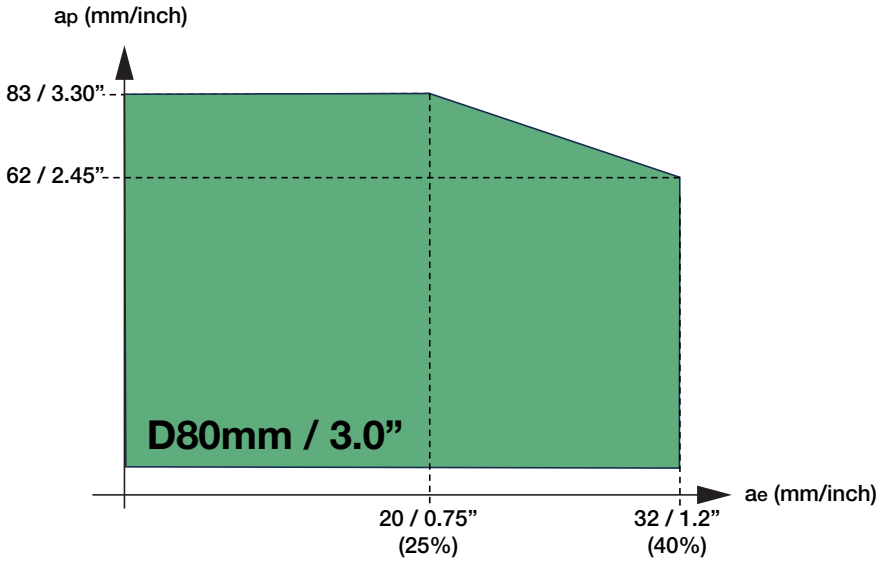

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Benefits

- **Superior Metal Removal Rates:** ISCAR's new indexable extended flute cutters (EFC) are engineered to deliver the highest metal removal rates, maximizing machining efficiency.
- **Cost-Effectiveness:** ISCAR is committed to providing cost-effective solutions without compromising performance. The new line features a cost-beneficial insert design with 8 indexable cutting edges, offering a compelling cost-per-edge ratio. This allows achieving high metal removal rates while optimizing production costs.
- **High Standards and Quality:** The new family is specifically designed to meet the rigorous requirements of the aerospace industry. Achieve impeccable quality to meet the highest standards demanded for airframe structural parts and critical components. ISCAR's tools set new industry benchmarks for machining high-strength steel, stainless steel, high-temperature superalloys and titanium.
- **Durability:** The EFC design concept ensures maximum stability even under heavy cutting forces when machining challenging materials. This results in enhanced tool life, even under aggressive machining conditions.
- **Versatility:** The new family offers a wide selection of insert carbide grades, it provides highly efficient milling solutions for various applications.

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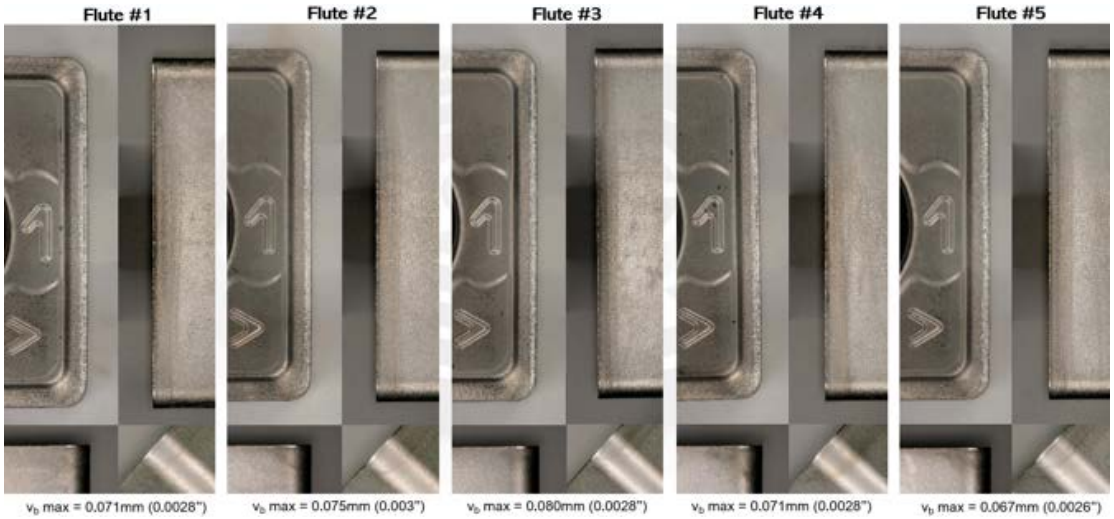
APPENDIX-TEST REPORTS - PHASE 1

Cutting Parameters	QUICKXFLUTE
Cutter	S890 SM D3.-4-5-1.25-13HP
Insert	S890 SNMU 130608HP IC716
Dc [mm] / [inch] / Zeff	76.2 / 3.0" / 5
v_c [m/min] / [sfm]	40 / 131
f_z [mm/t] / [ipt]	0.2 / 0.008"
a_p [mm] / [inch]	50 / 1.97"
a_e [mm] / [inch]	16 / 0.63" (21%)
Cutting length [m]/[feet]	**5m/16.4feet (10pass)**
Target	**Tool life**

Top-Edge, Wiper-Radius: Row #1 inserts



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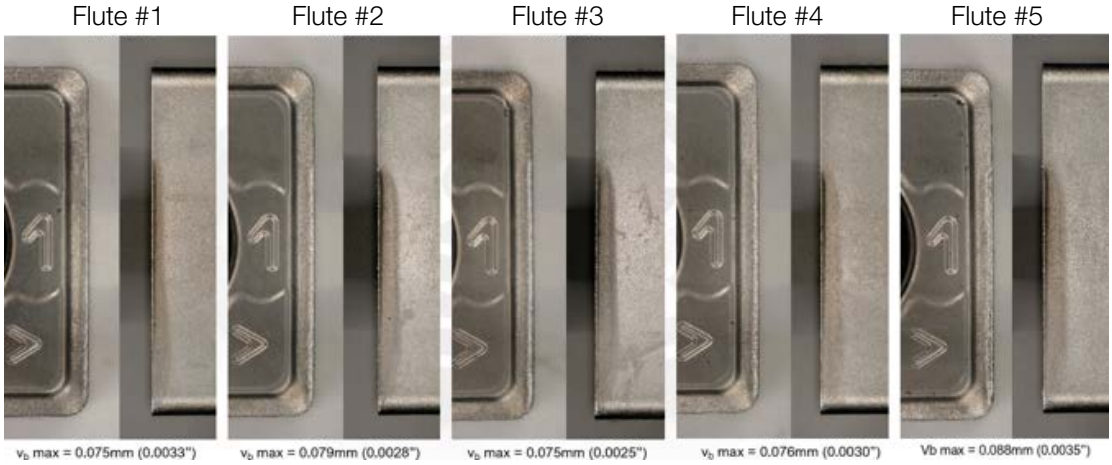
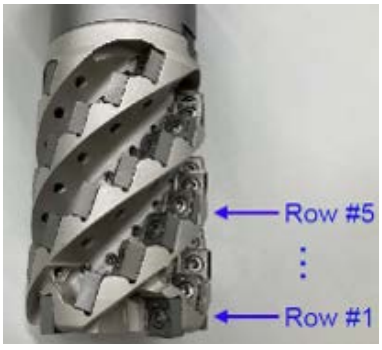
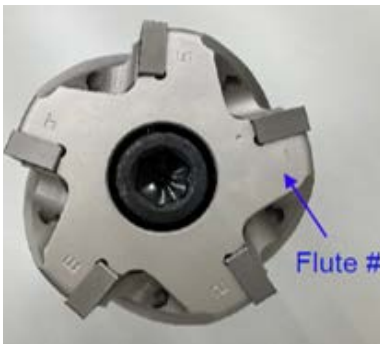
Top-Edge Wiper-Radius: Row #5 inserts







*The cutter entered and exited the workpiece using the roll in / roll out method.

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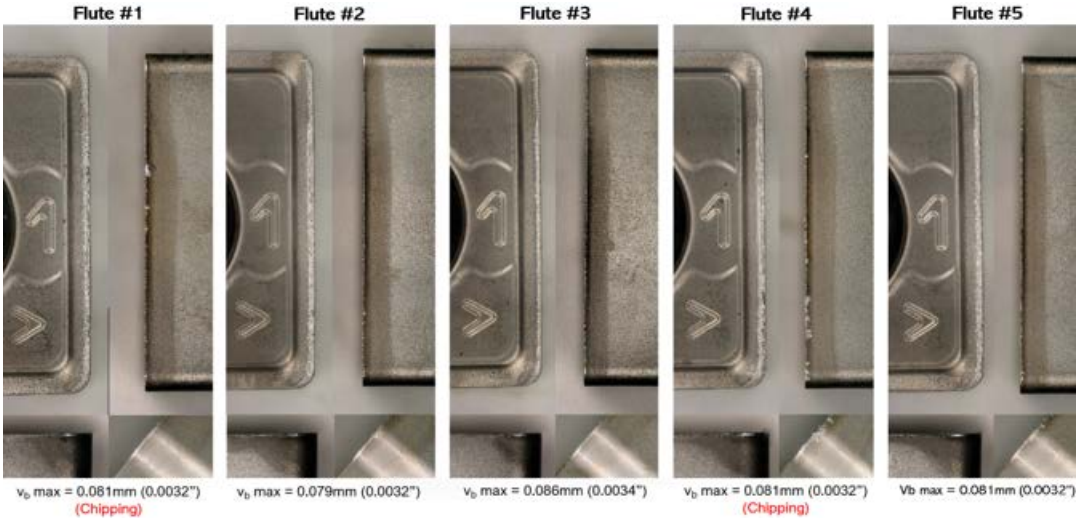
TEST REPORT - PHASE 2

Cutting Parameters	QUICKXFLUTE
Cutter	S890 SM D3.-4-5-1.25-13HP
Insert	S890 SNMU 130608HP IC716
Dc [mm] / [inch] / Zeff	76.2 / 3.0" / 5
v_c [m/min] / [sfm]	40 / 131
f_z [mm/t] / [ipt]	0.2 / 0.008"
a_p [mm] / [inch]	50 / 1.97"
a_e [mm] / [inch]	16 / 0.63" (21%)
Cutting length [m]/[feet]	**10m/32.8feet (20pass)**
Target	**Tool life with target of Cutting length**

Top-Edge Wiper-Radius: Row #1 inserts



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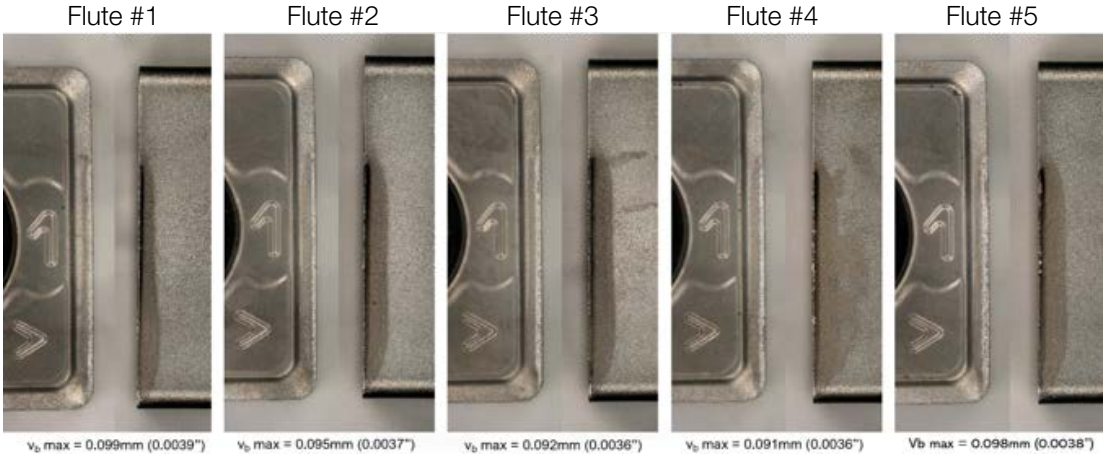
Top-Edge Wiper-Radius: Row #5 inserts



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TEST REPORT

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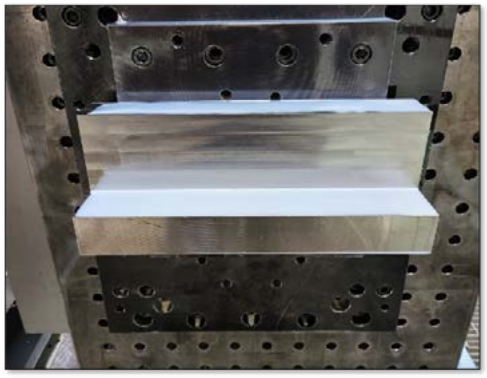
Cutting Parameters	QUICKXFLUTE
Cutter	S890 SM D3.-4-5-1.25-13HP
Insert	S890 SNMU 130608HP IC716
Target	Preformance (measured by servo guide)



Test #	Dc [mm] [inch]	v_c [m/min] [sfm]	f_z [mmpt] [ipt]	n [rpm]	v_f [mm/min] [inch/min]	a_p [mm] [inch]	a_e [mm] [inch]	a_e% [%]	MRR [cm³/min] [in3/min]	h_{max} [mm] [inch]	Cutting length [mm] [inch]	Cutting time [min]	Spindle load [%]	Notes
1	76.2	60	0.101	251	127	50	3.81	5	24.1	0.044	350	2.761	9.00%	Smooth Sound
	3	197	0.004		5	1.969	0.15		1.5	0.0017	13.8			
2	76.2	60	0.101	251	127	50	7.62	10	48.3	0.061	350	2.761	9.20%	Smooth Sound
	3	197	0.004		5	1.969	0.3		2.9	0.0024	13.8			
3	76.2	60	0.101	251	127	50	11.43	15	72.4	0.072	350	2.761	9.20%	Smooth Sound
	3	197	0.004		5	1.969	0.45		4.4	0.0028	13.8			
4	76.2	60	0.101	251	127	50	15.24	20	96.6	0.081	350	2.761	11.80%	Smooth Sound Insert in row 5 DOC damaged
	3	197	0.004		5	1.969	0.6		5.9	0.0032	13.8			
5	76.2	60	0.101	251	127	50	19.05	25	120.7	0.087	350	2.761	14.40%	Smooth Sound
	3	197	0.004		5	1.969	0.75		7.4	0.0034	13.8			
6	76.2	60	0.117	251	147	50	19.05	25	139.9	0.101	350	2.384	16.30%	Smooth Sound
	3	197	0.0046		5.8	1.969	0.75		8.5	0.004	13.8			
7	76.2	60	0.117	251	147	50	19.05	25	139.9	0.101	350	2.384	16.40%	Smooth Sound
	3	197	0.0046		5.8	1.969	0.75		8.5	0.004	13.8			
8	76.2	50	0.117	209	122	50	19.05	25	116.5	0.101	350	2.863	17.00%	Smooth Sound
	3	164	0.0046		4.8	1.969	0.75		7.1	0.004	13.8			
9	76.2	50	0.117	209	122	50	22.86	30	139.7	0.107	350	2.863	20.00%	Smooth Sound
	3	164	0.0046		4.8	1.969	0.9		8.5	0.0042	13.8			

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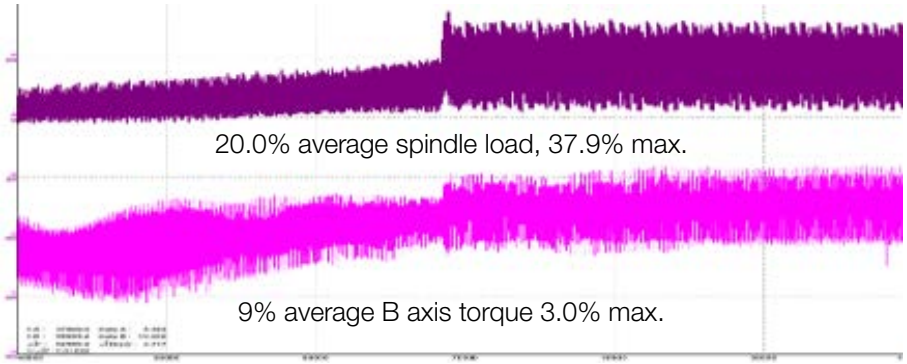
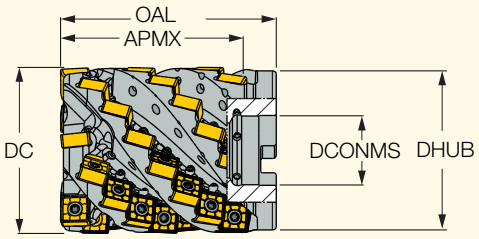


QUICKXFLUTE

S890 SM

Extended Flute Cutters Carrying Double-Sided Square Inserts with 8 Cutting Edges

https://www.iscar.com/eCatalog/Family.aspx?fnum=5089&mapp=ML&GFSTYP=M&srch=1



M E T R I C

Designation	DC	APMX	NOF(1)	DCONMS	CICT(2)	OAL	DHUB	Arbor	kg
S890 SM D63-71-4-27-13	63.00	71.00	4	27.00	32	92.00	60.00	A	1.50
S890 SM D80-83-5-32-13	80.00	83.00	5	32.00	40	100.00	78.00	A	1.89

- When using inserts with a corner radius of above 3.2mm, the pockets in the first row of the tool body should be modified to accommodate larger insert corners.

(1) Number of flutes

(2) Number of inserts

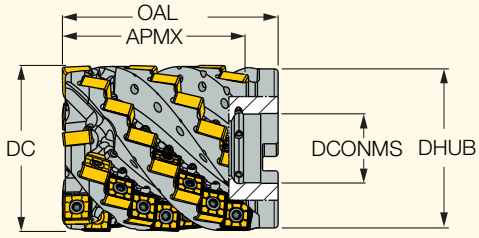
Spare Parts

Designation	Screw	T-Handle	Nozzle Screw	Screw 1
S890 SM D63-71-4-27-13	SR 10513105-L10.5	SW6-T-SH	NOZZLE 1.2 569102604 L5.5	SR M12X80DIN912
S890 SM D80-83-5-32-13	SR 10513105-L10.5	SW6-T-SH	NOZZLE 1.2 569102604 L5.5	SR M16X84DIN912

S890 SM

Extended Flute Cutters Carrying Double-Sided Square Inserts with 8 Cutting Edges

https://www.iscar.com/eCatalog/Family.aspx?fnum=5090&mapp=ML&GFSTYP=I&srch=1



I N C H

Designation	DC	APMX	NOF(1)	CICT(2)	OAL	DCONMS	DHUB	Arbor	Lbs
S890 SM D2.5-2.8-4-100-13	2.500	2.8000	4	28	3.550	1.000	2.410	A	2.29
S890 SM D3.-3.3-5-1.25-13	3.300	3.3000	5	40	3.900	1.250	2.880	A	3.97

- When using inserts with a corner radius of above 0.126", the pockets in the first row of the tool body should be modified to accommodate larger insert corners.

(1) Number of flutes

(2) Number of inserts

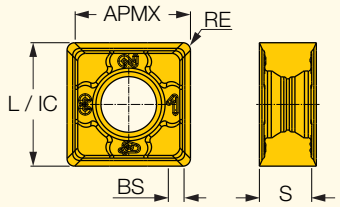
Spare Parts

Designation	Screw	T-Handle	Nozzle Screw	Screw 1
S890 SM D2.5-2.8-4-100-13	SR 10513105-L10.5	SW6-T-SH	NOZZLE 1.2 569102604 L5.5	SR-NF50-250
S890 SM D3.-3.3-5-1.25-13	SR 10513105-L10.5	SW6-T-SH	NOZZLE 1.2 569102604 L5.5	SR UNF 5/8X3.2 B18.3

QUICKXFLUTE

S890 SNMU 1306HP

Double-Sided Square Inserts with 8 Cutting Edges for Machining High Temperature Alloys Steels (HTAS)
https://www.iscar.com/eCatalog/Family.aspx?fnum=5088&mapp=ML&GFSTYP=M&srch=1

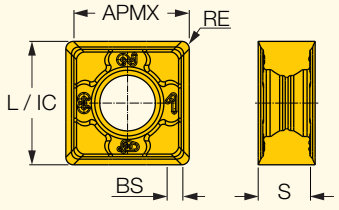


M E T R I C

Designation	Dimensions IC	S	APMX	BS	RE	Tough ↔ Hard IC882	IC840	IC716	IC830	IC5820	Recommended Machining Data a_p (mm)	f_z (mm/t)
S890 SNMU 130608HP	13.00	5.00	12.20	11.40	0.80	●	●	●	●	●	1.00-12.20	0.07-0.20
S890 SNMU 130632HP	13.00	5.00	12.20	9.00	3.20		●	●			3.40-12.20	0.07-0.20
S890 SNMU 130640HP	13.00	5.00	12.20	8.20	4.00		●	●			4.20-12.20	0.07-0.20

S890 SNMU 1306HP

Double-Sided Square Inserts with 8 Cutting Edges forMachining High Temperature Alloys Steels (HTAS)
https://www.iscar.com/eCatalog/Family.aspx?fnum=5088&mapp=ML&GFSTYP=I&srch=1



I N C H

Designation	Dimensions IC	S	APMX	BS	RE	Tough ↔ Hard IC882	IC840	IC716	IC830	IC5820	Recommended Machining Data a_p (inch)	f_z (inch/t)
S890 SNMU 130608HP	.512	.197	.480	.449	.0315	●	●	●	●	●	.039-.480	.0028-.0079
S890 SNMU 130632HP	.512	.197	.480	.354	.1260		●	●			.134-.480	.0028-.0079
S890 SNMU 130640HP	.512	.197	.480	.323	.1575		●	●			.165-.480	.0028-.0079

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