

## BALL NOSE CUTTING SYSTEM FOR 3-D CONTOUR MILLING



### Diameters:

.375", .500", .625", .750",  
1.000", 1.250"

### Body Styles:

Steel bodies (straight & tapered)

Carbide bodies (straight)

Modular bodies (Top-On style)

### Insert Styles:

NQHG - Ballnose

GQHG - Backdraft

### Insert Grades:

IN2005 - General Purpose

IN2006 - General Purpose/Hard Milling

IN2504 - High Hardness Materials

IN2530 - High Temperature Alloys

IN05S - Aluminum / Non-ferrous

### Applications:

Die & Mold

Aero Space

General Purpose



The 12A5, 12A8 and 12A9 series ball nose and back draft tools are the newest editions to the Ingersoll Die & Mold contour milling offering. This exciting new technology is packed with features to deliver performance and productivity.

- Ultra Stable clamping system and excellent repeatability
- Through-the-tool coolant, delivered to the cutting edge
- Premium ground cutter bodies
- Versatile milling grades, including IN2504, for high hardness materials (58Rc & above)!

### COOLANT-THROUGH INSERTS



Ball Nose



Back Draft Blade

**PRODUCT  
ANNOUNCEMENT**

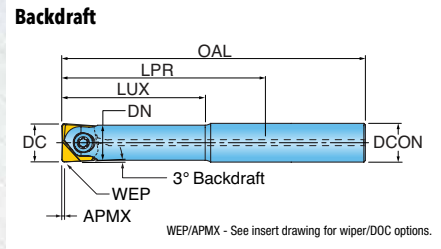
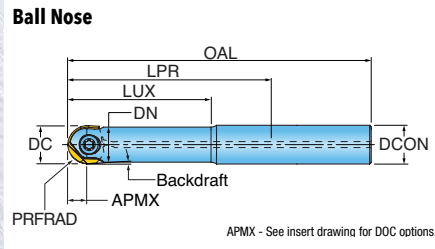
**UPDATE**

**2019**



**SERIES 12A9**

**STEEL CUTTER BODIES**



Part Number	DC Cutting Dia.	PFRAD Profile Radius	DN Neck Dia.	DCON Shank Dia.	LUX Usuable Length Max.	LPR Protruding Length	OAL Overall Length	ZEFF Effective Cutting Edges	CSP Coolant
12A9F-03017S4R01	0.375	0.187	0.35	0.500	1.85	4.22	6.00	2	Yes
12A9H-05019S4R01	0.500	0.250	0.46	0.500	1.92	5.22	7.00	2	Yes
12A9K-06015S6R01	0.625	0.312	0.59	0.625	1.58	6.09	8.00	2	Yes
12A9M-07018S7R01	0.750	0.375	0.71	0.750	1.85	6.00	8.00	2	Yes
12A9R-10018S1R01	1.000	0.500	0.96	1.000	1.81	5.34	8.00	2	Yes
12A9S-12030S9R01	1.250	0.625	1.17	1.250	3.03	9.56	11.81	2	Yes

**HARDWARE**



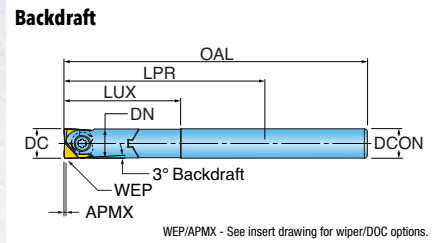
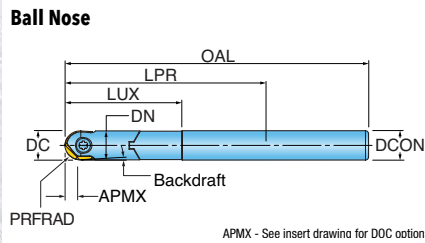
	Insert Screw	Driver	Torx Driver
12A9F-03017S4R01	SM30-083-B1	DS-TP10S	-
12A9H-05019S4R01	SM40-106-B1	DS-TP15S	-
12A9K-06015S6R01	SM50-139-B1	-	DS-T20T
12A9M-07018S7R01	SM60-167-B1	-	DS-T25T
12A9R-10018S1R01	SM70-210-B1	-	DS-T25T
12A9S-12030S9R01	SM80-250-B1	-	DS-T30T





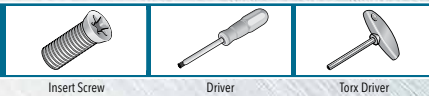
**SERIES 12A5**

**SOLID CARBIDE CUTTER BODIES**



Part Number	DC Cutting Dia.	PFRAD Profile Radius	DN Neck Dia.	DCON Shank Dia.	LUX Usuable Length Max.	LPR Protruding Length	OAL Overall Length	ZEFF Effective Cutting Edges
12A5F-03015S8R01	0.375	0.187	0.36	0.375	1.50	4.44	6.00	2
12A5H-05015S4R02	0.500	0.250	0.48	0.500	1.50	2.22	4.00	2
12A5H-05015S4R01	0.500	0.250	0.48	0.500	1.50	5.22	7.00	2
12A5K-06018S6R02	0.625	0.312	0.61	0.625	1.88	2.09	4.00	2
12A5K-06018S6R01	0.625	0.312	0.61	0.625	1.88	5.09	7.00	2
12A5M-07022S7R02	0.750	0.375	0.73	0.750	2.25	2.00	4.00	2
12A5M-07022S7R01	0.750	0.375	0.73	0.750	2.25	5.00	7.00	2

**HARDWARE**



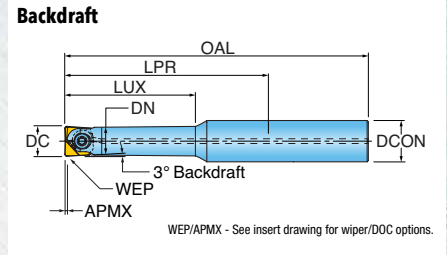
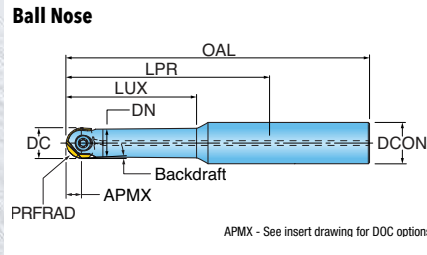
	Insert Screw	Driver	Torx Driver
12A5F-03015S8R01	SM30-083-B1	DS-TP10S	-
12A5H-05015S4R02	SM40-106-B1	DS-TP15S	-
12A5H-05015S4R01	SM40-106-B1	DS-TP15S	-
12A5K-06018S6R02	SM50-139-B1	-	DS-T20T
12A5K-06018S6R01	SM50-139-B1	-	DS-T20T
12A5M-07022S7R02	SM60-167-B1	-	DS-T25T
12A5M-07022S7R01	SM60-167-B1	-	DS-T25T





**SERIES 12A8**

**STEEL, TAPER CUTTER BODIES**



Part Number	DC Cutting Dia.	PFRAD Profile Radius	DN Neck Dia.	DCON Shank Dia.	LUX Usuable Length Max.	LPR Protruding Length	OAL Overall Length	ZEFF Effective Cutting Edges	CSP Coolant
12A8F-03013S4R01	0.375	0.187	0.34	0.500	1.35	1.72	3.50	2	Yes
12A8F-03018S4R01	0.375	0.187	0.34	0.500	1.88	4.22	6.00	2	Yes
12A8H-05025S4R01	0.500	0.250	0.41	0.625	2.50	4.09	6.00	2	Yes
12A8M-07035S7R01	0.750	0.375	0.67	0.750	3.50	5.50	7.50	2	Yes

**HARDWARE**



Insert Screw

Driver

Torx Driver

12A8F-03013S4R01	SM30-083-B1	DS-TP10S	-
12A8F-03018S4R01	SM30-083-B1	DS-TP10S	-
12A8H-05025S4R01	SM40-106-B1	DS-TP15S	-
12A8M-07035S7R01	SM60-167-B1	-	DS-T25T



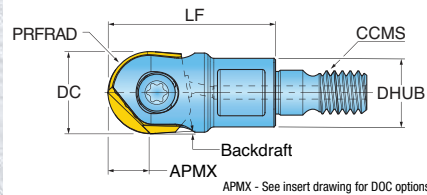


## SERIES 12A9

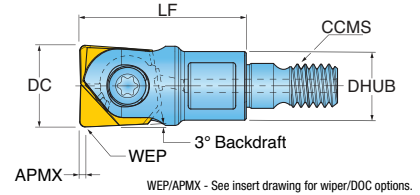
### MODULAR STEEL CUTTER BODIES (TOP-ON STYLE)



#### Ball Nose



#### Backdraft



Part Number	DC Cutting Dia.	PFRAD Profile Radius	LF Functional Length	CCMS Connection Code	DHUB Hub Dia.	ZEFF Effective Cutting Edges	CSP Coolant
12A9F-03011X5R01	0.375	0.187	1.00	TopOn M08	0.51	2	Yes
12A9H-05011X4R01	0.500	0.250	1.00	TopOn M06	0.48	2	Yes
12A9H-05011X5R01	0.500	0.250	1.00	TopOn M08	0.51	2	Yes
12A9K-06015X5R01	0.625	0.312	1.25	TopOn M08	0.51	2	Yes
12A9M-07016X6R01	0.750	0.375	1.25	TopOn M10	0.71	2	Yes
12A9M-07021X7R01	0.750	0.375	1.50	TopOn M12	0.83	2	Yes
12A9R-10023X7R02	1.000	0.500	1.50	TopOn M12	0.82	2	Yes
12A9R-10023X7R01	1.000	0.500	1.50	TopOn M12	0.97	2	Yes
12A9R-10023X8R02	1.000	0.500	2.38	TopOn M16	1.14	2	Yes
12A9S-12063X8R01	1.250	0.625	2.50	TopOn M16	1.14	2	Yes

## HARDWARE



Insert Screw



Driver



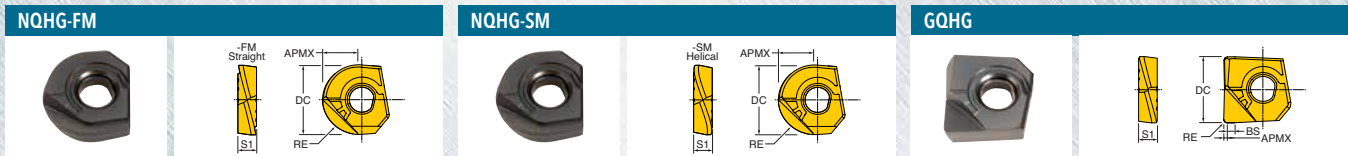
Torx Driver

Part Number	Insert Screw	Driver	Torx Driver
12A9F-03011X5R01	SM30-083-B1	DS-TP10S	-
12A9H-05011X4R01	SM40-106-B1	DS-TP15S	-
12A9H-05011X5R01	SM40-106-B1	DS-TP15S	-
12A9K-06015X5R01	SM50-139-B1	-	DS-T20T
12A9M-07016X6R01	SM60-167-B1	-	DS-T25T
12A9M-07021X7R01	SM60-167-B1	-	DS-T25T
12A9R-10023X7R02	SM70-210-B1	-	DS-T25T
12A9R-10023X7R01	SM70-210-B1	-	DS-T25T
12A9R-10023X8R02	SM70-210-B1	-	DS-T25T
12A9S-12063X8R01	SM80-250-B1	-	DS-T30T





**INSERTS**



Part Number	DC Cutting Dia.	Application	RE Profile Radius	BS Wiper Length	APMX Depth of Cut Max.	S1 Thickness	Grade	IN2005	IN2006	IN2504	IN2530	IN055
NQHG090200R-FM	0.375	Ball Nose, coolant through	0.188	-	0.188	0.106	•	•				
NQHG120300R-FM	0.500	Ball Nose, coolant through	0.250	-	0.250	0.126	•	•			•	
NQHG150400R-FM	0.625	Ball Nose, coolant through	0.312	-	0.312	0.165	•	•				
NQHG190500R-FM	0.750	Ball Nose, coolant through	0.375	-	0.375	0.205	•	•			•	
NQHG250600R-FM	1.000	Ball Nose, coolant through	0.500	-	0.500	0.244	•	•			•	
NQHG310700R-FM	1.250	Ball Nose, coolant through	0.625	-	0.625	0.283	•	•				
NQHG090200R-SM	0.375	Ball Nose, coolant through	0.188	-	0.188	0.106	•	•	•			•
NQHG120300R-SM	0.500	Ball Nose, coolant through	0.250	-	0.250	0.126	•	•	•	•		•
NQHG150400R-SM	0.625	Ball Nose, coolant through	0.312	-	0.312	0.165	•	•	•			
NQHG190500R-SM	0.750	Ball Nose, coolant through	0.375	-	0.375	0.205	•	•	•	•		•
NQHG250600R-SM	1.000	Ball Nose, coolant through	0.500	-	0.500	0.244	•	•	•	•		•
NQHG310700R-SM	1.250	Ball Nose, coolant through	0.625	-	0.625	0.283	•	•	•			
GQHG090208R01	0.375	Backdraft Blade, coolant through	0.031	0.039	0.031	0.106	•	•	•			
GQHG120308R01	0.500	Backdraft Blade, coolant through	0.031	0.039	0.031	0.126	•	•	•			
GQHG120316R01	0.500	Backdraft Blade, coolant through	0.062	0.039	0.062	0.126	•	•	•			
GQHG150408R01	0.625	Backdraft Blade, coolant through	0.031	0.039	0.031	0.165	•	•	•			
GQHG150416R01	0.625	Backdraft Blade, coolant through	0.062	0.039	0.062	0.165	•	•	•			
GQHG190508R01	0.750	Backdraft Blade, coolant through	0.031	0.039	0.031	0.205	•	•	•			
GQHG190516R01	0.750	Backdraft Blade, coolant through	0.062	0.039	0.062	0.205	•	•	•			
GQHG190532R01	0.750	Backdraft Blade, coolant through	0.125	0.039	0.125	0.205	•	•	•			
GQHG250608R01	1.000	Backdraft Blade, coolant through	0.031	0.039	0.031	0.244	•	•	•			
GQHG250616R01	1.000	Backdraft Blade, coolant through	0.062	0.039	0.062	0.244	•	•	•			
GQHG250632R01	1.000	Backdraft Blade, coolant through	0.125	0.039	0.125	0.244	•	•	•			



**FM** insert for finishing, semi-finishing and when abusive cutting conditions are present.

**SM** insert has a very free cutting helical milling geometry that is well suited for hard milling and favorable cutting conditions.





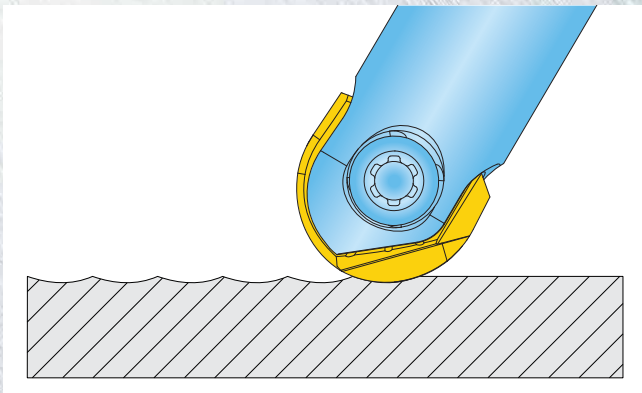
## OPERATING GUIDELINES

FinishBall - Series 12A9, 12A5, 12A8					IN2005	IN2006	IN2504	IN2530	IN055	Coolant
Material		Brinnell Hardness	SFM	Feed per Insert						
Aluminum	6061-T6, 7075-T6	-	1000 - 8000	.003 - .006	2				1	Yes
Cast Iron	Gray	150 - 250	500 - 1200	.002 - .006	1					No
	Nodular		400 - 800							
Steel	Low Carbon 1018, 8620	150 - 250	600 - 1200	.002 - .006	1					No
	High Carbon F-6180	250 - 400*	400 - 600	.002 - .005	3	2	1			
	Alloyed Steel 4140	150 - 300	400 - 800		1	2				
	Tool Steel P20 - H13	Up to 460*			3	2	1			
Stainless Steel	300 Series, 304, 316	-	400 - 800	.002 - .005	2	3		1		No
	400 Series 15-5 PH, 17-4 PH	Up to 320	500-1000							Yes
	13-8 PH	-	200 - 400							
Nickel Alloys	Inconel 600, 706, 718, 903, Hastelloy	75-120	75-120	.002 - .004	2	3		1		Yes
Titanium	6AL-4V	-	80 - 150	.002 - .005	2	3		1		Yes

\*58 Rc & Above use **IN2504**

Note: Feed and speed recommendations are starting operating parameters. They are only guidelines from which further optimization should take place. Operating parameters are influenced by many machining variables. These variables may cause for reductions in feeds and speed or dramatic increases. Additionally, DOC and WOC may need to be revised to optimize the tools performance.

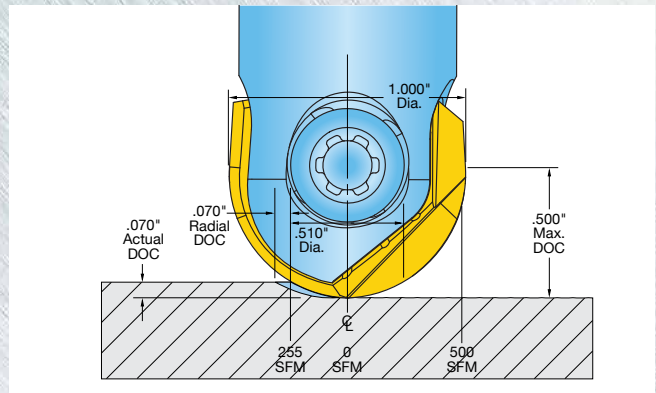
## PROGRAMMING TIPS



"Sturz" milling, or tilting the axis of the spindle to move the axial center of a ball nose end mill out of the cut, greatly reduces the cutting forces being generated on the nose insert. This shift also relocates the weakest cutting edge geometry out of the way. When allowable in an application "Sturz" milling substantially increases tool life and the quality of finish.

### Programming Tips:

- Minimize tool stick out (shortest L/D ratio allowable)
- Use tool holders that offer the least amount runout.
- Maximize rigidity for the work piece and tool setup.
- Use free flowing toolpath that promotes constant chip load
- Avoid cutting conditions that create large radial milling engagements
- Always climb cut
- Use good stock entry techniques (arc-in, ramping)
- Use correct insert geometry and grade



In this example, the SFM is 500 with a 1.000" ball nose diameter. The effective cutting diameter is .510"; at which point, the SFM is 255. The RPM must be increased to 3745 in order to achieve 500 SFM at the .510" effective cutting diameter.

### To calculate effective diameter:

$$D_t = 2 \times \sqrt{R^2 - (R - D)^2}$$

$D_t$  = True Cutting Diameter (in.)

$R$  = Radius (in.)

$D$  = Depth of Cut (in.)