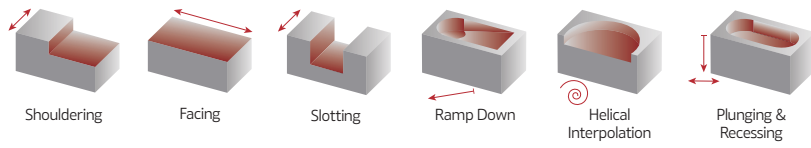


High Performance Milling for Aluminum Alloys



palbit[®]
TOOLING SOLUTIONS EXPERTS
SINCE 1916

PalbitUSA.com

PILOT
Precision Products

ALUPRO
XD90-15 | XD90-22

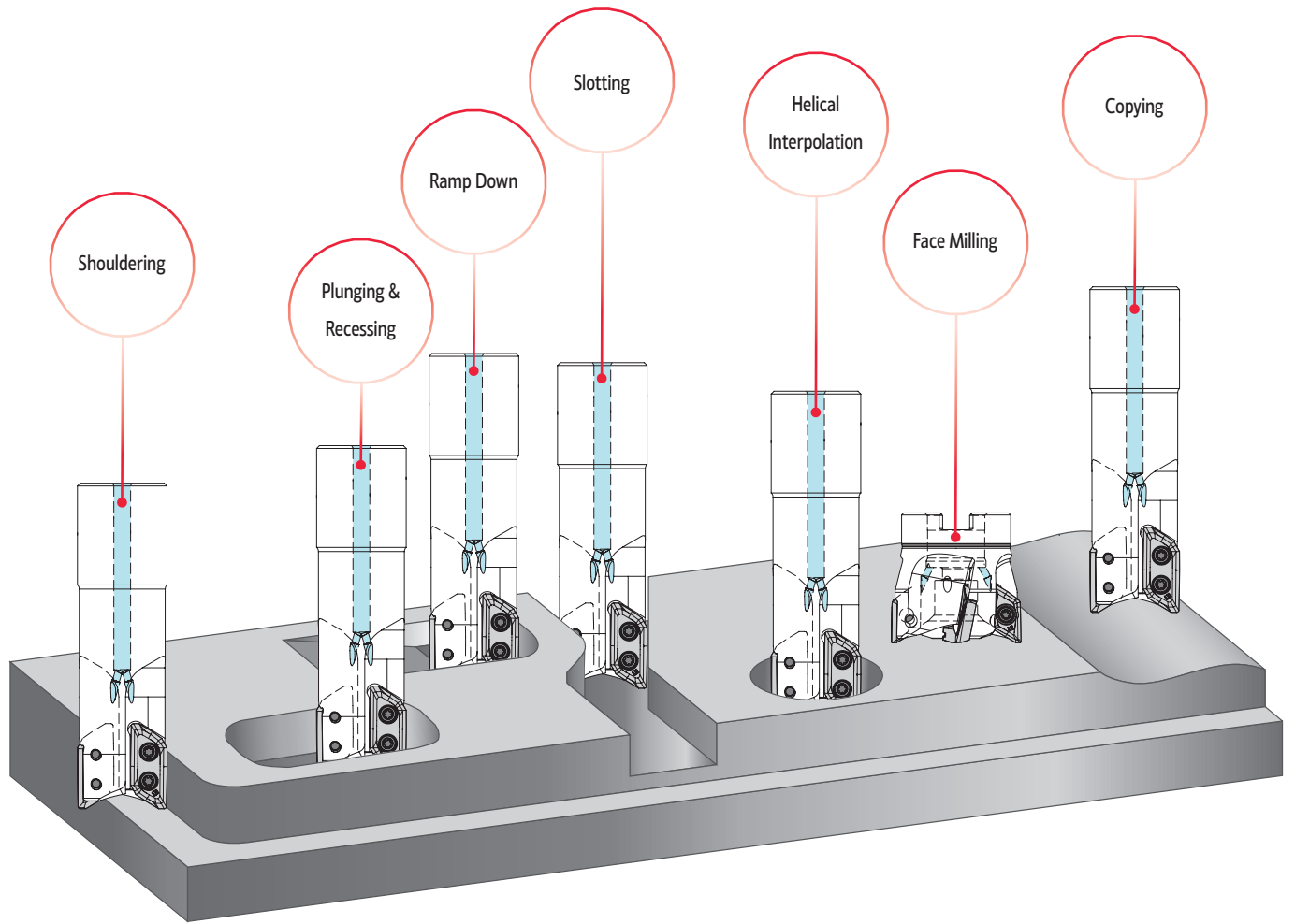


90° Geometry on Milling Operations

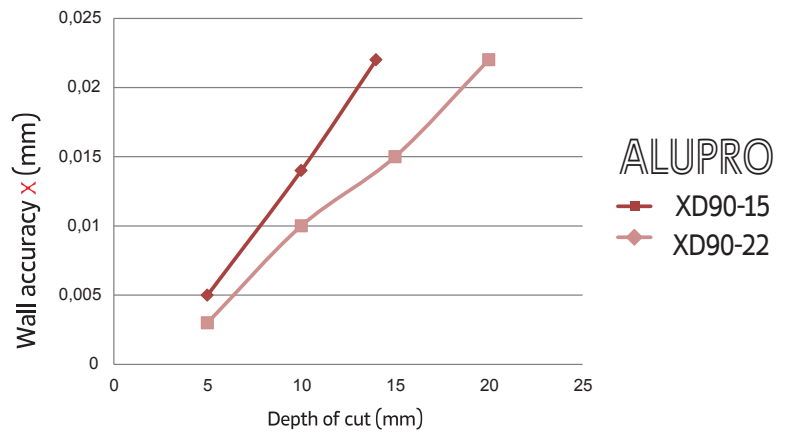
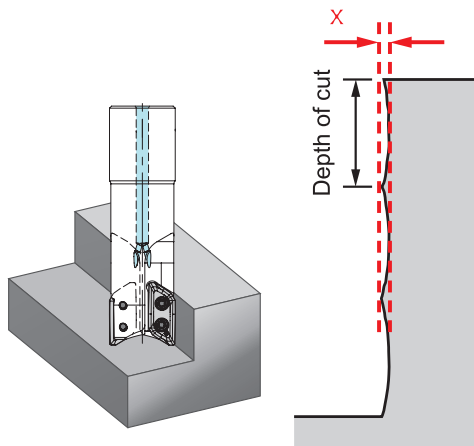
Arbor & Cylindrical

SINCE 1916

MULTIFUNCTIONAL TOOL



WALL ACCURACY



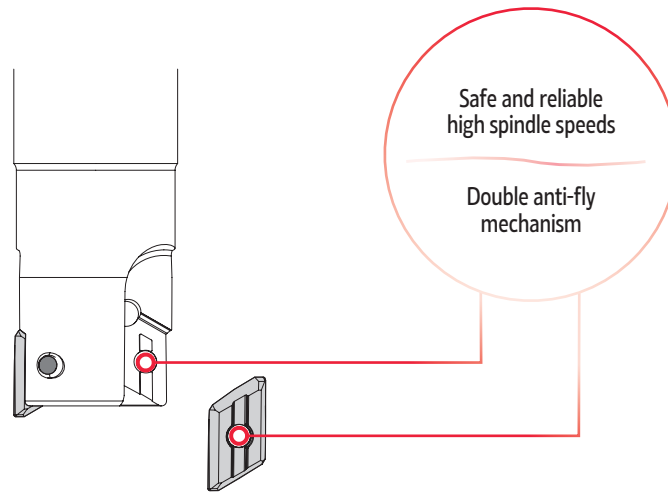
MAIN FEATURES

Cutters

Excellent multi-functional milling tool for non-ferrous materials.

- High-speed milling can be achieved due to double screw clamping & anti-fly system.
- High accuracy cutters to prevent vibrations at high speeds.

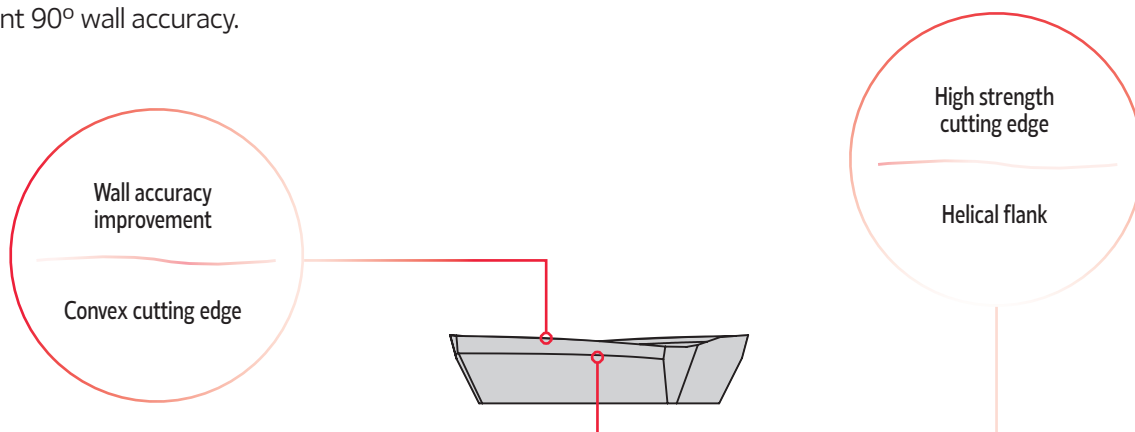
Anti-fly system



Inserts

High rake angle geometry that provides a good surface finish and low cutting force.

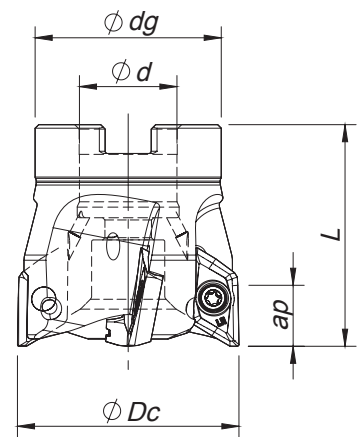
- Sharp cutting edge to produce good chip flow and reduce build-up edge.
- High helical angle offers cutting edge strength.
- Excellent 90° wall accuracy.



Specifications

Geometry: 90° milling operations.

- Cutter diameters:
 - Cylindrical (C): Ø 0.75 till Ø 1.50
 - Arbor Mounting (A): Ø 1.50 till Ø 5.00
- Workpiece materials: Aluminum & Other Non-ferrous Alloys



Arbor Mounting
 $K_r=90^\circ$ | $\gamma_p=+11^\circ$

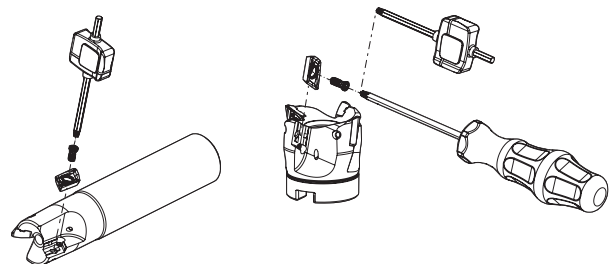
Order code	Reference		Dimension (in)					Specifications			Insert radius	Stock
			ϕDc	ϕd	ϕdg	L		Cutter Type	Max ap (in)	rpm max		
181104600	XD90 D1.50-A.500/2.00-03-15	3	1.500	0.500	1.440	2.000	0.66	A	0.551	29 000	0.016~0.126	
181104700	XD90 D2.00-A.750/2.00-04-15	4	2.000	0.750	1.772	2.000	0.88	A	0.551	24 000	0.016~0.126	
181104800	XD90 D2.50-A.750/2.50-05-15	5	2.500	0.750	2.205	2.500	1.54	A	0.551	21 000	0.016~0.126	
181104900	XD90 D3.00-A1.00/2.50-05-15	5	3.000	1.000	2.874	2.500	2.42	A	0.551	19 000	0.016~0.126	
181105000	XD90 D4.00-A1.50/2.50-06-15	6	4.000	1.500	3.180	2.500	4.41	A	0.551	16 000	0.016~0.126	

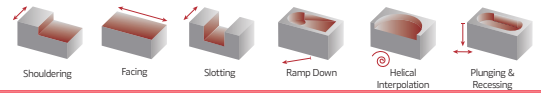
Stock item

Available Upon Request (see page A-10)

SPARE PARTS

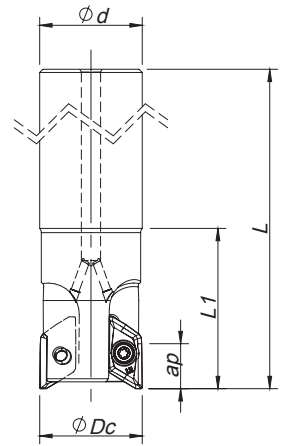
Cutter ϕDc	Insert Screw	Key (Torx)	Order separately	
			Key (Torx - lbf/in)	Torque Value
XD90-A-15 - 1.50-3.00	P0400900	XT15	DT1530	26.6
XD90-A-15 - 4.00	P0400900	PT15	DT1530	26.6
XD90-C-15 - 0.75-1.00	P0400803	XT15	DT1530	26.6
XD90-C-15 - 1.25-1.50	P0400900	XT15	DT1530	26.6





Cylindrical Shank

$K_r=90^\circ$ | $\gamma_p=+6^\circ \sim +11^\circ$



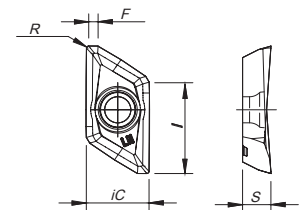
Order code	Reference		Dimensions (in)					Specifications			Insert radius	Stock
			ØDc	Ød	L	L1		Cutter Type	Max.ap (in)	rpm max		
181105100	XD90 D0.75-C0.75/6.00-01-15	1	0.750	0.750	6.000	2.000	0.44	A	0.591	40 000	0.016~0.126	
181105200	XD90 D1.00-C1.00/6.00-02-15	2	1.000	1.000	6.000	2.000	0.88	A	0.591	38 000	0.016~0.126	
181105300	XD90 D1.25-C1.25/6.00-02-15	2	1.250	1.250	6.000	2.000	1.54	A	0.591	33 000	0.016~0.126	
181105400	XD90 D1.50-C1.50/6.00-03-15	3	1.500	1.500	6.000	2.000	3.08	A	0.591	29 000	0.016~0.126	

Stock item

Available Upon Request (see page A-10)

Inventory maintained. To be replaced by new item.

XDGX 15M5...



(1) Geometry code	ISO Reference	N		Dimensiones (in)					Cutter Type
		UNC	10	iC	S	I	R	F	
1111624	XDGX 15M504 PDFR-LN			0.441	0.197	0.630	0.016	0.059	A
1111625	XDGX 15M508 PDFR-LN			0.441	0.197	0.630	0.031	0.043	A
1111626	XDGX 15M512 PDFR-LN			0.441	0.197	0.630	0.047	0.028	A
1111627	XDGX 15M516 PDFR-LN			0.441	0.197	0.630	0.063	0.016	A
1111628	XDGX 15M520 PDFR-LN			0.441	0.197	0.630	0.079	0.008	A
1112154	XDGX 15M530 PDFR-LN			0.441	0.197	0.630	0.118	0.024	A
1111629	XDGX 15M532 PDFR-LN			0.441	0.197	0.630	0.126	0.024	A

First choice

Stock item

Available Upon Request (see page A-11)

Insert order code = (1) Geometry Code + (2) Grade Code

ALUPRO XD90-15

RECOMMENDED CUTTING CONDITIONS

SHOULDERING							
ISO	PSM	Material	HB (Brinell)	Vc (sfm)	Width of Cut ae (mm)	Depth of Cut ap (in)	Feed fz(in/t)
				PH0910			
N	10	Aluminium and Non Ferrous	30-130	1148-9840	≤ 25% ØDc	≤0.197	0.014 - 0.016
						0.197 - 0.394	0.012 - 0.014
						0.394 - 0.591	0.010 - 0.012
					< 50% ØDc	≤0.197	0.014 - 0.016
						0.197 - 0.394	0.012 - 0.014
						0.394 - 0.591	0.010 - 0.012
					≤ 75% ØDc	≤0.197	0.012 - 0.014
						0.197 - 0.394	0.010 - 0.012
						0.394 - 0.591	0.008 - 0.010

SLOTING							
ISO	PSM	Material	HB (Brinell)	Vc (sfm)	Width of Cut ae (mm)	Depth of Cut ap (in)	Feed fz(in/t)
				PH0910			
N	10	Aluminium and Non Ferrous	30-130	1148-9840	100% ØDc	≤0.197	0.010 - 0.014
						0.197 - 0.394	0.008 - 0.012
						0.394 - 0.591	0.006 - 0.010

(Note 1) Cutting conditions $a_e/D_c=70\%$.

(Note 2) It's possible for vibration to occur in certain cases. Please reduce depth of cut and/or reduce cutting conditions in these cases:

- When using long shank;
- When using long tool overhang with arbor type;
- When application has poor clamping rigidity or when using a low rigidity machine.

(Note 3) Use internal coolant supply

OPERATIONAL GUIDE

- The maximum allowable revolutions are shown in Table 1. Ensure that the cutter operates under the maximum allowable revolutions. The maximum allowable revolutions for safety purposes are determined in accordance with ISO 15641 (Milling Cutters for High-Speed Machining: Safety Requirements)

Table 1 - Maximum allowable revolutions:

ØDc	Ø0.750	Ø1.000	Ø1.250	Ø1.500	Ø2.000	Ø2.500	Ø3.000	Ø4.000
RPM (min ⁻¹)	40 000	38 000	33 000	29 000	24 000	21 000	19 000	16 000

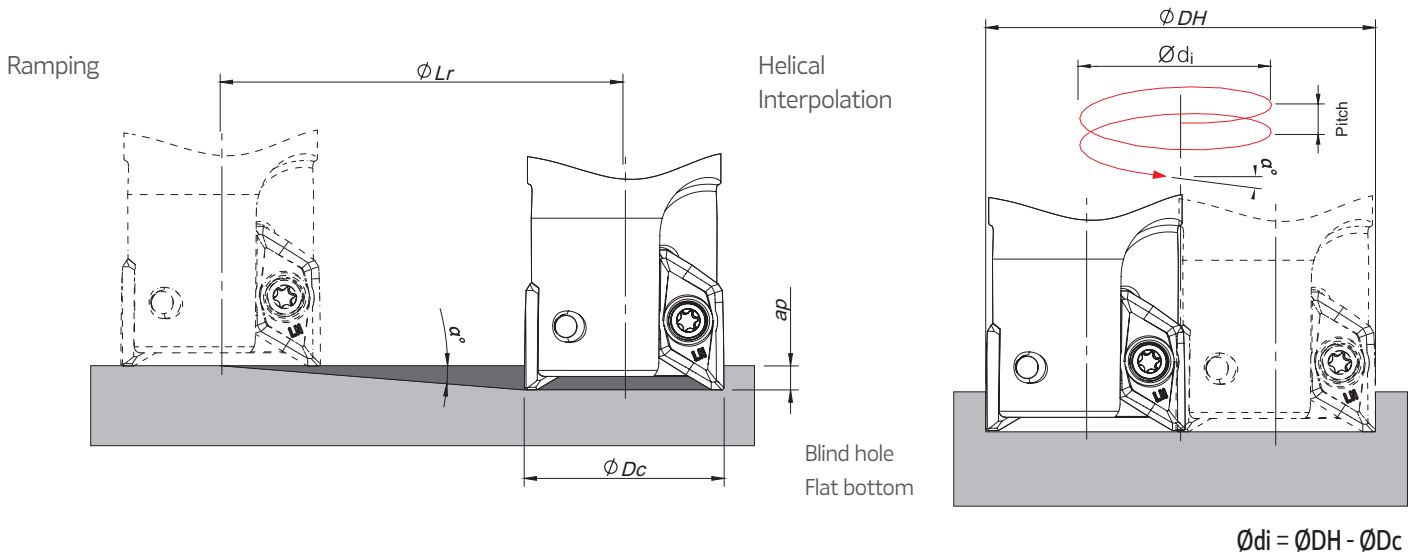
- When operating at the maximum allowable spindle speed, if the speed is equal to or higher than the values shown in Table 2, it is recommended that the balance quality (with arbor or chuck) meet ISO 1940 specifications.

Table 2 - Maximum revolutions when balancing with the arbor or chuck has not been achieved:

ØDc	Ø0.750	Ø1.000	Ø1.250	Ø1.500	Ø2.000	Ø2.500	Ø3.000	Ø4.000
RPM (min ⁻¹)	15 000	12 000	9 500	8 500	7 600	6 800	6 000	5 400

- When setting the spindle speed, take into consideration the maximum allowable revolutions of arbor or chuck.
 - Use the specified set bolt when using the arbor type with internal coolant supply.

RAMPING AND HELICAL INTERPOLATION



ϕD_c	Ramping			Helical Interpolation		
				Diameter for Blind Hole. Flat Bottom Face (1)		Max Pitch/Rev.
	Max Ramp a°	Max a_p	Min Lr	ϕDH_{min}	ϕDH_{max}	
0.750	23	0.551	1.299	1.342	-	0.551
				-	1.421	0.551
1.000	21	0.551	1.436	1.842	-	0.551
				-	1.921	0.551
1.250	15	0.551	2.057	2.342	-	0.551
				-	2.421	0.551
1.500	10	0.551	3.126	2.842	-	0.551
				-	2.921	0.551
2.000	8	0.551	3.922	3.842	-	0.551
				-	3.921	0.551
2.500	6	0.551	5.244	4.842	-	0.551
				-	4.921	0.551
3.000	4	0.551	7.883	5.842	-	0.551
				-	5.921	0.551
4.000	2.5	0.551	12.625	7.842	-	0.520
				-	7.921	0.530

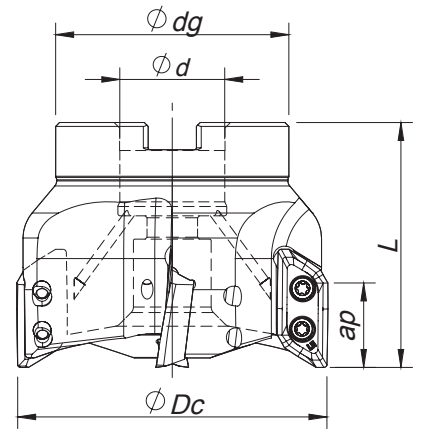
(1) using insert radius 0.031 in.

Note: During helical interpolation do not exceed maximum pitch.

When using different insert radius to calculate the ϕDH_{min} and ϕDH_{max} use the equation below:

- Minimum Diameter: $\phi DH_{min} = 2 \times (\phi D_c - (R \text{ corner radius} + F \text{ width of edge wiper}))$

- Maximum Diameter: $\phi DH_{max} = 2 \times (\phi D_c - R \text{ corner radius})$



Arbor Mounting
 $K_r=90^\circ$ | $\gamma_p=+7^\circ$

Order code	Reference		Dimensions (in)					Specifications			Insert radius	Stock
			ϕDc	ϕd	ϕdg	L		lbs	Arbor Type	Max ap (in)		
181079500	XD90 D2.00-A.750/2.00-03-22	3	2.000	0.750	1.772	2.000	0.98	A	0.846	30 000	0.031~0.126	
181079600	XD90 D2.50-A1.00/2.00-03-22	3	2.500	1.000	2.205	2.000	1.41	A	0.846	25 000	0.031~0.126	
NEW 181072600	XD90 D3.00-A1.00/2.00-04-22	4	3.000	1.000	2.205	2.000	1.82	A	0.846	23 000	0.031~0.126	
181071700	XD90 D3.00-A1.00/2.50-04-22	4	3.000	1.000	2.205	2.500	2.96	A	0.846	23 000	0.031~0.126	
181079700	XD90 D4.00-A1.25/2.50-05-22	5	4.000	1.250	2.874	2.500	5.43	A	0.846	19 000	0.031~0.126	
181138600	XD90 D4.00-A1.50/2.50-05-22	5	4.000	1.500	3.000	2.500	5.43	A	0.846	16 000	0.031~0.126	
181079800	XD90 D5.00-A1.50/2.50-06-22	6	5.000	1.500	3.180	2.500	6.72	A	0.846	30 000	0.031~0.126	

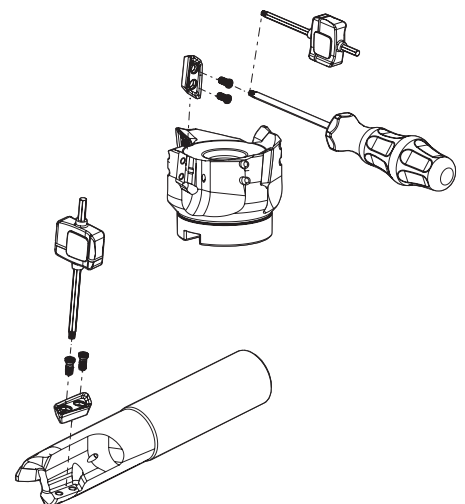
Stock item

Available Upon Request (see page A-10)

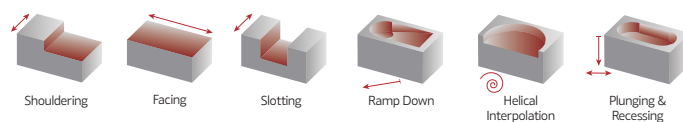
Inventory maintained. To be replaced by new item.

SPARE PARTS

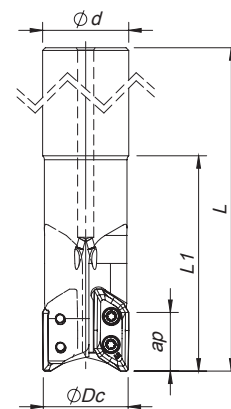
Cutter ϕDc	Insert Screw	Key (Torx)	Order separately	
			Key (Torx - lbf/in)	Torque Value
XD90-A-22 - 2.00-3.00	P0401200	XT15	DT1530	26.6
XD90-A-22 - 4.00-5.00	P0401200	PT15	DT1530	26.6
XD90-C-22 - 1.25-1.50	P0401200	XT15	DT1530	3,0



ALUPRO XD90-22
XDGX



Cylindrical Shank
 $K_r=90^\circ$ | $\gamma_p=+6^\circ$



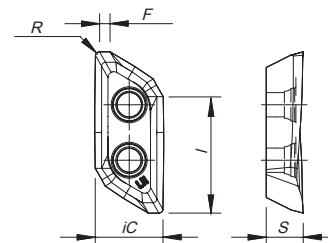
Order code	Reference		Dimensions (in)					Specifications			Insert radius	Stock
			ØDc	Ød	L	L1		Arbor Type	Max ap (in)	rpm max		
181069900	XD90 D1.25-C1.25/6.69-02-22	2	1.250	1.250	6.693	3.150	1.67	A	0.846	41 000	0.031~0.126	
181079900	XD90 D1.50-C1.50/6.69-02-22	2	1.500	1.500	6.693	3.150	1.82	A	0.846	36 000	0.031~0.126	
181138700	XD90 D1.50-C1.25/8.00-02-22	2	1.500	1.250	8.000	3.000	1.82	A	0.846	41 000	0.031~0.126	

Stock item

Available Upon Request (see page A-10)

Inventory maintained. To be replaced by new item.

XDGX 22M7..



Geometry code	ISO Reference	N	Dimensiones (in)					Cutter Type
		UNC	iC	S	I	R	F	
(1)	(2) Grade code	10						
		PH0910						
1111618	XDGX 22M708 PDFR-LN		0.512	0.276	0.866	0.031	0.079	A
1111619	XDGX 22M716 PDFR-LN		0.512	0.276	0.866	0.063	0.047	A
1111620	XDGX 22M720 PDFR-LN		0.512	0.276	0.866	0.079	0.031	A
1111621	XDGX 22M732 PDFR-LN		0.512	0.276	0.866	0.126	0.024	A

First choice

Stock item

Available Upon Request (see page A-11)

Insert order code = (1) Geometry Code + (2) Grade Code

ALUPRO XD90-22

RECOMMENDED CUTTING CONDITIONS

SHOULDERING							
ISO	PSM	Material	HB (Brinell)	Vc (sfm)	Width of Cut ae (mm)	Depth of Cut ap (in)	Feed fz(in/t)
				PH0910			
N	10	Aluminum and Non-Ferrous	30-130	1148-9840	≤ 25% ØDc	≤0.197	0.014-0.016
						0.197 - 0.394	0.012-0.014
						0.394 - 0.591	0.010-0.012
						0.591 - 0.787	0.008-0.010
					< 50% ØDc	≤0.197	0.014-0.016
						0.197 - 0.394	0.012-0.014
						0.394 - 0.591	0.010-0.012
						0.591 - 0.787	0.008-0.010
					≤ 75% ØDc	≤0.197	0.012-0.014
						0.197 - 0.394	0.010-0.012
						0.394 - 0.591	0.008-0.010
						0.591 - 0.787	0.006-0.008

SLOTING							
ISO	PSM	Material	HB (Brinell)	Vc (sfm)	Width of Cut ae (mm)	Depth of Cut ap (in)	Feed fz(in/t)
				PH0910			
N	10	Aluminum and Non-Ferrous	30-130	1148-9840	100% ØDc	≤0.197	0.010-0.014
						0.197 - 0.394	0.008-0.012
						0.394 - 0.591	0.006-0.010
						0.591 - 0.787	0.004-0.008

(Note 1) Cutting conditions $a_e/D_c=70\%$.

(Note 2) It's possible for vibration to occur in certain cases. Please reduce depth of cut and/or reduce cutting conditions in these cases:

- When using long shank;
- When using long tool overhang with arbor type;
- When application has poor clamping rigidity or when using a low rigidity machine.

(Note 3) Use internal coolant supply.

OPERATIONAL GUIDE

- Only use the inserts and parts provided by Palbit with this tool. Use of the correct insert clamp screws is especially important to ensure overall tool safety. Do not use damaged or worn clamp screws.
- When tightening the clamp screws, follow the order in Figure 1. The recommended torque value is 3.5Nm.
- The maximum allowable revolutions are shown in Table 1. Ensure that the cutter operates under the maximum allowable revolutions.

The maximum allowable revolutions for safety purposes are determined in accordance with ISO 15641

(Milling Cutters for High-Speed Machining: Safety Requirements).

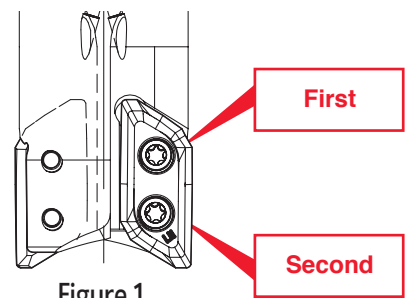


Figure 1

Table 1 - Maximum allowable revolutions:

ØDc	Ø1.250	Ø1.500	Ø2.000	Ø2.500	Ø3.000	Ø4.000	Ø5.000
RPM (min ⁻¹)	41 000	36 000	30 000	25 000	23 000	19 000	16 000

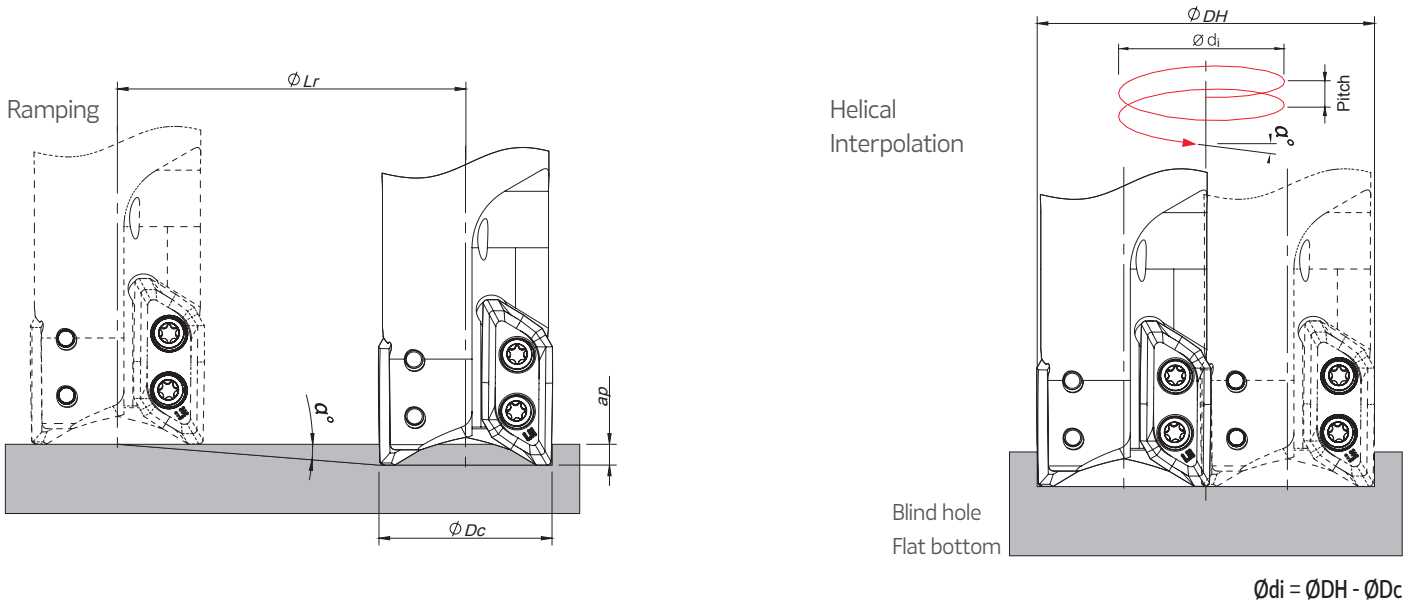
- When operating at the maximum allowable spindle speed, if the speed is equal to or higher than the values shown in Table 2, it is recommended that the balance quality (with arbor or chuck) meet ISO 1940 specifications.

Table 2 - Maximum revolutions when balancing with the arbor or chuck has not been achieved:

ØDc	Ø1.250	Ø1.500	Ø2.000	Ø2.500	Ø3.000	Ø4.000	Ø5.000
RPM (min ⁻¹)	9 500	7 600	6 000	4 800	3 800	3 000	2 400

- When setting the spindle speed, take into consideration the maximum allowable revolutions of arbor or chuck.
- Use the specified set bolt when using the arbor type with internal coolant supply.

RAMPING AND HELICAL INTERPOLATION



$$\phi_{di} = \phi_{DH} - \phi_{Dc}$$

ϕ_{Dc}	Ramping			Helical Interpolation		
				Diameter for Blind Hole, Flat Bottom Face (1)		Max Pitch/Rev.
	Max Ramp a°	Max a_p	Min Lr	ϕ_{DHmin}	ϕ_{DHmax}	
1.250	19.0	0.827	2.401	2.303	-	0.827
				-	2.421	0.827
1.500	13.0	0.827	3.581	2.803	-	0.827
				-	2.921	0.827
2.000	9.0	0.827	5.220	3.803	-	0.827
				-	3.921	0.827
2.500	7.0	0.827	6.734	4.803	-	0.827
				-	4.921	0.827
3.000	5.0	0.827	9.450	5.803	-	0.770
				-	5.921	0.800
4.000	4.0	0.827	11.824	7.803	-	0.827
				-	7.921	0.827
5.000	3.0	0.827	15.776	9.803	-	0.790
				-	9.921	0.810

(1) using insert radius 0.031 in.

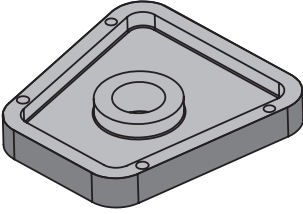
Note: During helical interpolation do not exceed maximum pitch.

When using different insert radius to calculate the ϕ_{DHmin} and ϕ_{DHmax} use the equation below:

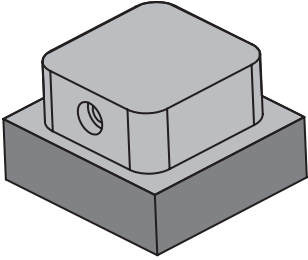
- Minimum Diameter: $\phi_{DHmin} = 2 \times (\phi_{Dc} - (R \text{ corner radius} + F \text{ width of edge wiper}))$

- Maximum Diameter: $\phi_{DHmax} = 2 \times (\phi_{Dc} - R \text{ corner radius})$

Improved Productivity and Tool Life/Shortened Machining Time

ALUPRO XD90-15		G-ALSi5Mg (3.2341)	
<p>Plunging & Recessing</p> <p>Dc = 1.00 in 2 flutes Vc = 2952 sfm (n = 11275 min⁻¹) fz = 0.0078 in/t (Vf = 225.2 in/min) ap x ae = 0.315 x 0.787 in Wet XDGX 15M508 PDFR-LN (PH0910)</p>			
XD90-15		<div style="background-color: red; color: white; padding: 5px; display: inline-block;">9 workpieces done</div>	
Competitor A		<div style="background-color: gray; color: white; padding: 5px; display: inline-block;">4 workpieces done</div>	
<p>[Competitor A]</p> <p>Dc = 1.00 in 2 flutes Vc = 2460 sfm (n = 9397 min⁻¹) fz = 0.0078 in/t (Vf = 225.2 in/min) ap x ae = 0.197 x 0.590 in</p>		<p>[User Comments]</p> <p><i>"Compared with conventional products, tool rigidity is high, obtaining an excellent surface finish as well as cutting performance."</i></p>	

+44%
Productivity

ALUPRO XD90-22		G-ALSi5Mg (3.2341)	
<p>Shouldering</p> <p>Dc = 1.25 2 flutes Vc = 3280 sfm (n = 10022 min⁻¹) fz = 0.0078 in/t (Vf = 225.2 in/min) ap x ae = 0.590 x 0.315 in Wet XDGX 22M708 PDFR-LN (PH0910)</p>			
<p>[User Comments]</p> <p><i>"With this solution, we achieved excellent results in wall accuracy of under 0.000394 in."</i></p>			



TOOLING SOLUTIONS EXPERTS

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XD90-15 | XD90-22

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