

High-Speed milling tool for Aluminum

Pro-V Mill

KORLOY
TECH-NEWS



- Increased productivity due to high speed capability
- Excellent surface finish and perpendicularity with high-precision products
- Satisfactory clamping force of inserts by the use of the key shape

The Premium High-Speed Milling Tool for Aluminum

Pro-V Mill

KORLOY introduces a new premium milling product line for aluminum, **Pro-V Mill**. Development of this product has allowed high speed capability in aluminum machining, leading to an immense increase in productivity.

The huge impact given during high speed machining would change the position of the insert and cause tool breakage consequently. And the existing clamping method was not able to endure this impact. To overcome this kind of limit, a new clamping system has been applied. This new clamping method features enhanced clamping force at high speeds, providing reliable machining stability even when inserts get a shock.

KORLOY applied a new key to key slot clamping system to our new product, Pro-V Mill, in order to increase the clamping force. With stable cutting performance at high speed, it remarkably improves productivity and surface finish compared to the existing products. Furthermore, the rake surface of the insert was treated with a mirror-like finish to avoid built-up edge issues. Various nose radius inserts are available to meet the needs of different applications.

Combined with the highly lubricative **DLC grade PD1010**, Pro-V Mill can improve the surface finish and product life.



Advanced productivity

- Higher table feed due to increased rpm

Improved surface finish

- Enhanced surface roughness and perpendicularity due to high speed capability

Excellent clamping stability

- Strong clamping force at high speeds
- Reduced vibrations and noises

Code System

Shank Type

PAV	C	M	050	R	22	4	XD19	A
Pro-V Mill	Type C: Cutter	Arbor type M: Metric A: Inch None: Asia	Machining Dia. Ø 300: Ø 300 mm	Oil hole and hand R: right hand, oil holes NR: right hand, without holes	Internal Dia. Ø 22: 22 mm	No. of teeth 4: 4 teeth	Applicable insert XD19: XDET19	Insert nose R ≤ A: R 3,2 mm ≥ B: R 4,0 mm

Shank Type

PAV	S	032	R	2	C	32	150	XD19	A
Pro-V Mill	Type C: Shank	Machining Dia. Ø 032: Ø 32 mm	Oil hole and hand R: right hand, oil holes NR: right hand, without holes	No. of teeth 2: 2 teeth	Shank type C: Cylinder W: Weldon	Shank Dia. Ø 32: 32 mm	Overall length 150: 150 mm	Applicable insert XD19: XDET19	Insert nose R ≤ A: R 3,2 mm ≥ B: R 4,0 mm

Tooling System

HSK63A	PAV	050	R	4	C	100	XD19	A
Arbor	Pro-V Mill	Machining Dia. Ø 050: Ø 50 mm	Oil hole and hand R: right hand, oil holes NR: right hand, without holes	No. of teeth 4: 4 teeth	Shank type C: Cylinder W: Weldon	Overall length 100: 100 mm	Applicable insert XD19: XDET19	Insert nose R ≤ A: R 3,2 mm ≥ B: R 4,0 mm

Cutter Features

The combined clamping system of the key to key slot structure and simple screw-on type ensures strong clamping force.

→ Stable Machining
Prevention of insert breakage

Avoiding uplifting problems of insert due to axial acute-angle clamping of cutters.

→ Reduced vibrations
and excellent surface finish

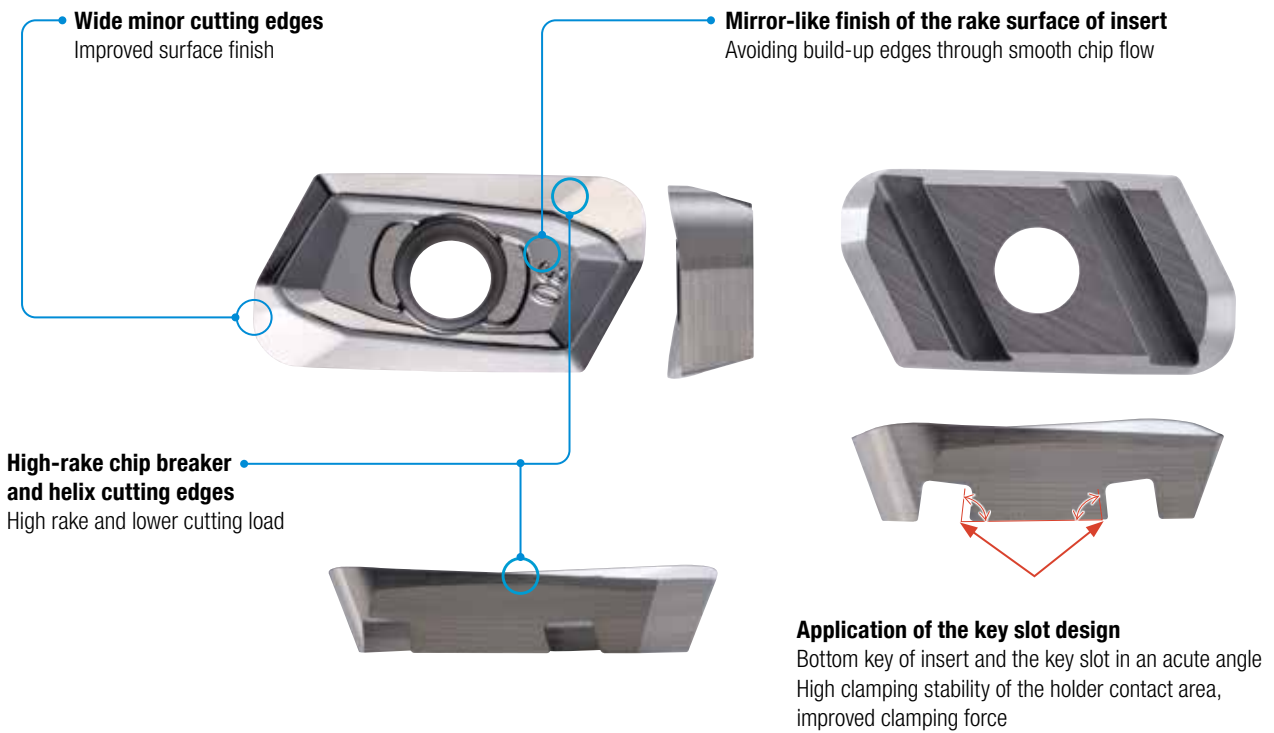


Screw-on clamping
New screw shape



Insert clamping area
Stable clamping force due to the key to key slot structure

Axial acute-angle clamping
Inhibition of the axial force

Insert Features



Chip Breaker Features

Chip Breaker	Cutting-edge	Application	Eigenschaften
 MA	 	Non-ferrous metals	Ensuring satisfactory machining quality with the application of mirror-like cutting edges optimized for aluminum machining

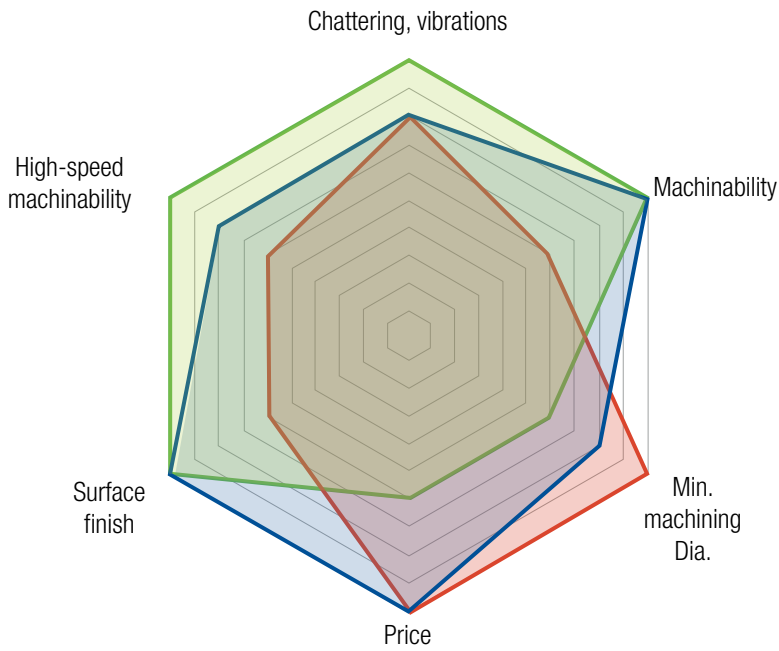
Recommended Cutting Conditions

Workpiece		Grade	vc (m/min)	Max. ap (mm)
N	Aluminum	Si ≤ 5%	H01	1300 (500 - 2200)
			H05	1000 (300 - 1700)
		Si ≤ 10%	PD1005	1500 (500 - 3000)
			PD1010	1200 (300 - 2200)
				17

The recommended cutting conditions above are a general guideline. Their details may vary depending on the machining method of users and other conditions.

AI Machining Tool Selection Guide

■ Pro-V Mill ■ Pro-X Mill ■ Pro-A Mill



Pro-V Mill

Aluminum high-speed machining up to $vc = 3000$ m/min



Pro-X Mill

Aluminum high-speed machining up to $vc = 2000$ m/min



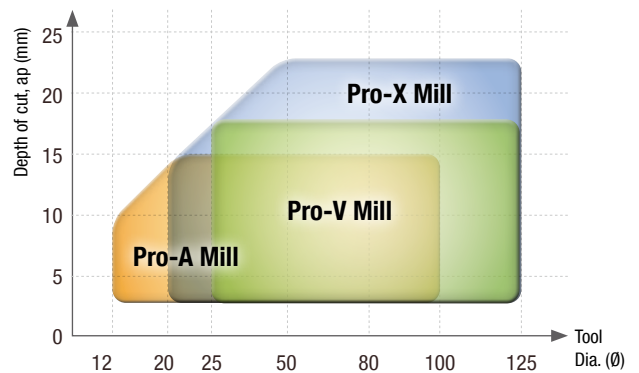
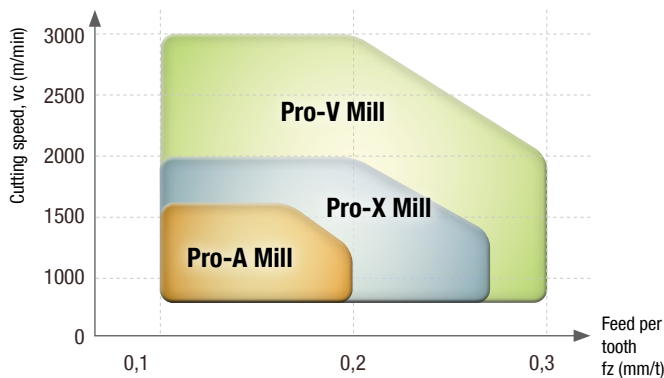
Pro-A Mill

Small diameter machining



Name	Chattering, vibrations	High-speed machinability	Machinability	Surface finish	Min. machining Dia.	Price
Pro-V Mill	★★★★★	★★★★★	★★★★★	★★★★★	★★	★★
Pro-X Mill	★★★	★★★	★★★★★	★★★★★	★★★	★★★★★
Pro-A Mill	★★	★★	★★	★★	★★★★★	★★★★★

Application Range



Grades Selection Guide

Uncoated carbide grade (H01/H05) fine alloy structure suitable for cutting, with excellent wear resistance and toughness.

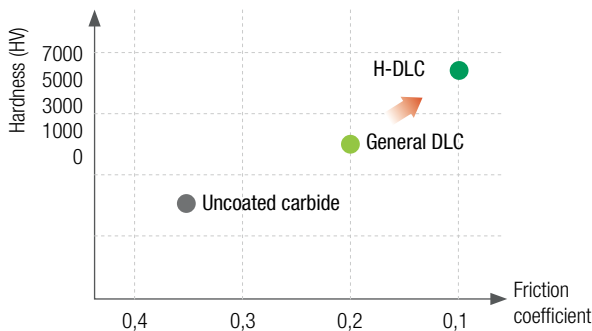
DLC Grade (PD1005/PD1010) application of DLC coating with high hardness and reduced friction for high speed and superior surface roughness.

PD1005 for high speed, outstanding surface finish in the continuous cutting of general non-ferrous metals.

PD1010 provides stable and exceptional tool life when machining of non-ferrous metals with high hardness or interrupted machining.

Workpiece		ISO	Application range
N	Aluminum, Copper	N05	
		N10	H01
	Aluminum alloy	N15	
		N20	H05, PD1005
	Al-Si-alloy	N25	
		N30	PD1010

Hard H-DLC coating



Application of DLC (Diamond Like Carbon) coating technology with high hardness and reduced friction. Improved machinability and machining quality due to maximized wear resistance and lubrication. Stable and long tool life due to substrate optimized for workpieces. Suitable for machining of non-ferrous metal such as aluminum, Al-Si alloy, and copper.

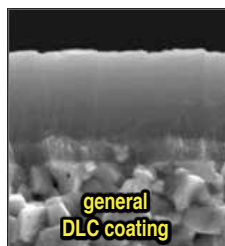
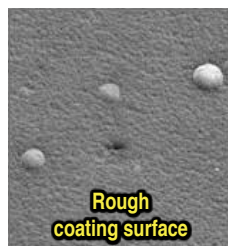
Hard H-DLC coating

- DLC = Diamond Like Carbon
- Amorphous carbon coating with physical properties similar to those of diamonds
- High hardness and lubrication ideal for nonferrous metal machining
- with a high probability of build-up edge occurring



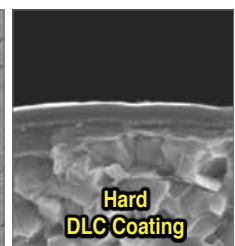
General DLC

- Hardness of coating: 3000 HV
- Friction coefficient: < 0,25



Hard DLC

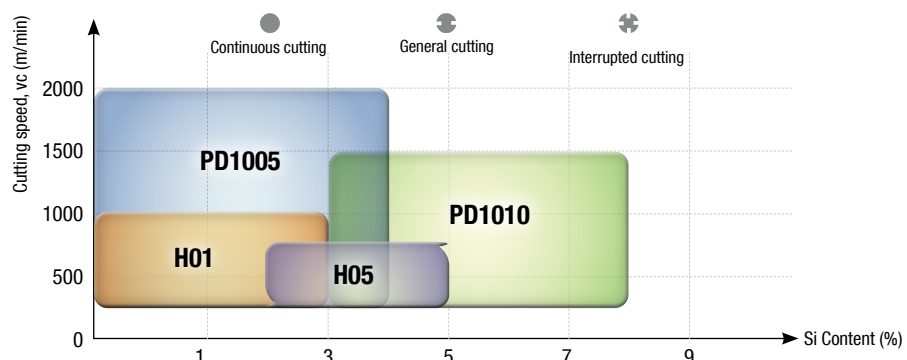
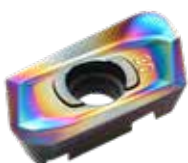
- Hardness of coating: 6500 HV
- Friction coefficient: < 0,15



Application Guideline for Grade

Recommended grades according to Si content (%) for aluminium alloys

PD1005 / PD1010



Performance Evaluation

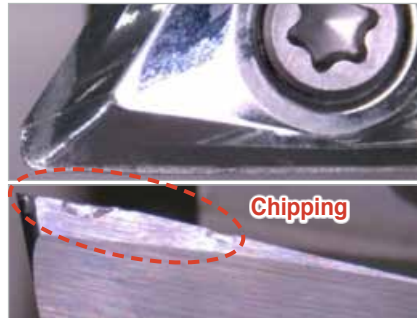
Evaluation of chipping resistance

Workpiece	AlZn5.5MgCu(ISO) / 7075(AISI) · rectangular Tube (300x200x100mm)	
Cutting conditions	$v_c = 3560 \text{ m/min}$ · $f_z = 0,2 \text{ mm/t}$ · $a_p = 15 \text{ mm}$ · $a_e = 20 \text{ mm}$ · Wet	
Machining method	Shouldering	
Tools	Insert XDET190508PEFR-MA (H01)	Holder BT40-PAV063R-4-100-XD19-A

Increased wear Evaluation of chipping resistance resistance of inserts due to stable clamping even in interrupted machining at high speeds.

→ **Longer tool life**

The cutting-edge design minimizes cutting resistance and reduces cutting noises and vibrations.



Existing products



Pro-V Mill

Improved chipping resistance

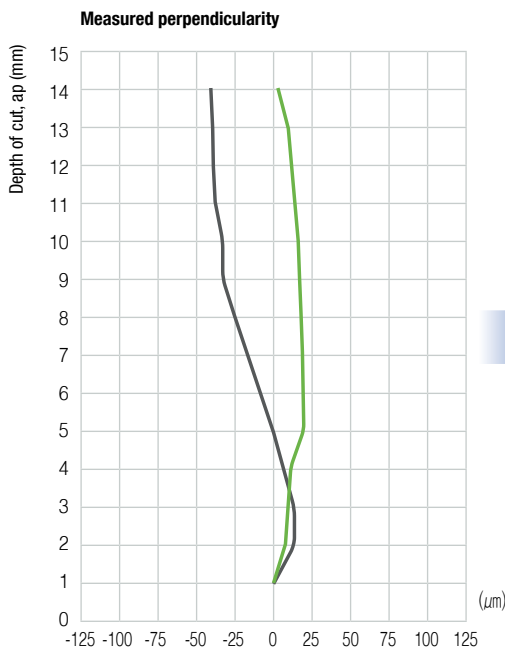
Perpendicularity Evaluation

Workpiece	AlZn5.5MgCu(ISO) / 7075(AISI) · rectangular Tube (300x200x100mm)	
Cutting conditions	$v_c = 1000 \text{ m/min}$ · $f_z = 0,12 \text{ mm/t}$ · $a_p = 15 \text{ mm}$ · $a_e = 10 \text{ mm}$ · Wet	
Machining method	Perpendicularity and shoulder surface finish checked after a single pass of 15 mm	
Tools	Insert XDET190508PEFR-MA (H01)	Holder PAVS032R-2C32-150-XD19-A

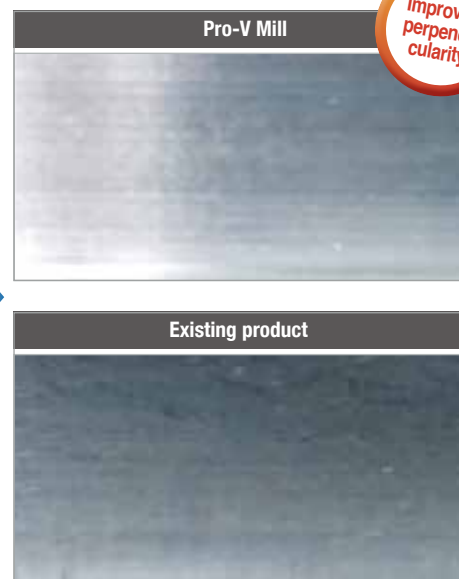
More stable clamping enables more stable machining.

→ **Improved perpendicularity**

■ Pro-V Mill ■ Existing product

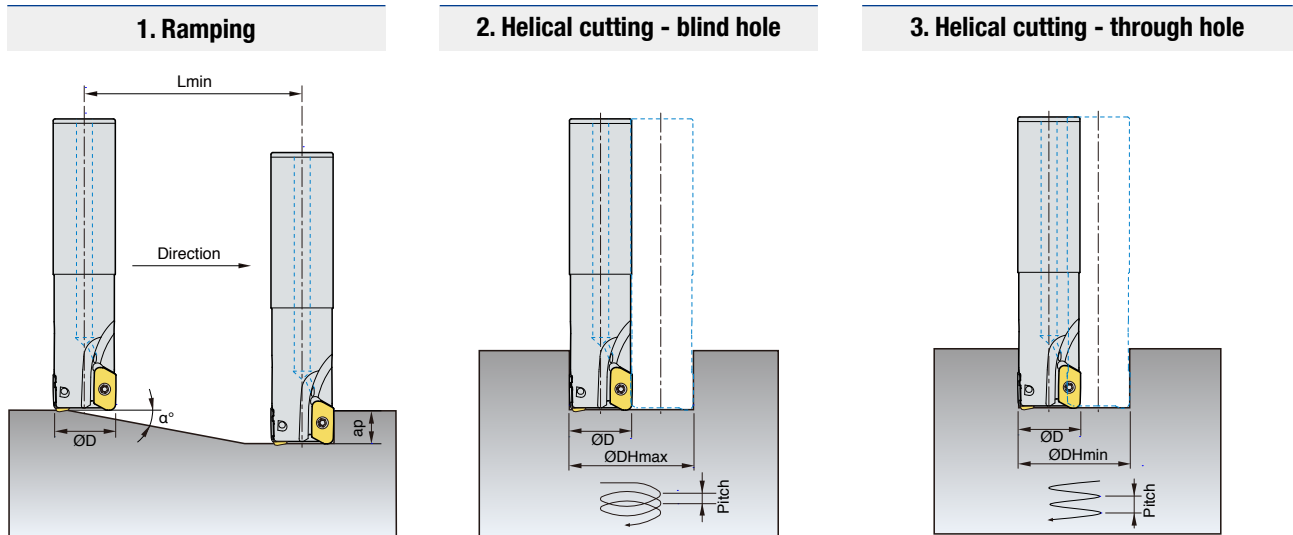


Shoulder surface roughness



Improved perpendicularity

Ramping and Helical Cutting



Limits following Nose R 3.0 standard

(mm)

Tool Dia. $\varnothing D$	1. Ramping		2. Helical cutting - blind hole				3. Helical cutting - through hole	
	Max. rake angle α°	L_{min}	Min. machining Dia. $\varnothing DH_{min}$	Max. pitch	Max. machining Dia. $\varnothing DH_{max}$	Max. pitch	Min. machining Dia. $\varnothing DH_{min}$	Max. pitch
25	15,0	59	41	13,0	44	15,5	27	2,0
32	10,0	99	55	11,0	58	12,5	41	4,5
40	7,0	142,5	71	10,5	74	11,5	57	6,0
50	5,0	200	91	10,0	94	10,5	77	6,5
63	3,0	286	117	9,2	120	9,5	103	7,0
80	2,6	385	151	9,0	154	9,5	137	7,3
100	2,0	501	191	9,0	194	9,0	177	7,6
125	1,5	668	241	8,5	244	8,5	227	7,5

- When ramping and helical milling, table feed, v_f (mm/min) should be lower than 70% of the recommended cutting conditions.
- When helical milling, Max. pitch, DH_{max} should be lower than max. depth of cut, ap .
- When ramping, the depth of cut should be lower than max. depth of cut, ap .


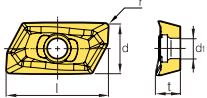
$$L_{min} = ap / \tan(\alpha^\circ) \text{ (mm)}$$

L_{min} : Min. length of ramping


ap : Depth of cut

α° : Rake angle in ramping

Applicable Inserts


Designation	Coated		Uncoated		Dimension (mm)					Insert shape	Figure
	PD1005	PD1010	H01	H05	l	d	t	r	d1		
XDET 190504PEFR-MA	N	N	N	N	22	11,3	5,04	0,4	4,5	 	
190508PEFR-MA					22	11,3	5,00	0,8	4,5		
190512PEFR-MA					22	11,3	5,00	1,2	4,5		
190516PEFR-MA					22	11,3	4,99	1,6	4,5		
190520PEFR-MA					22	11,3	4,97	2,0	4,5		
190524PEFR-MA					22	11,3	4,95	2,4	4,5		
190530PEFR-MA					22	11,3	4,93	3,0	4,5		
190532PEFR-MA					22	11,3	4,92	3,2	4,5		
190540PEFR-MA					21	11,3	4,85	4,0	4,5		
190550PEFR-MA					21	11,3	4,81	5,0	4,5		

Cutter

Designation	Image	A.A.	Diameter range	Insert	Depth of cut ap	Application				
						Facing	Shouldering	Slotting	Copying	Ramping Helical
PAVCM-A		90°	Ø40 - Ø125	XDET19	17 mm	●	●	●	●	●


- Type A uses Insert Nose R 0.4-3.2, and Type B uses Nose R 4.0 - 5.0
- * When using a spindle at high speed, please check the balance of tool and use it after replacing with the new screw.

Shank



Designation	Image	A.A.	Diameter range	Insert	Depth of cut ap	Application				
						Facing	Shouldering	Slotting	Copying	Ramping Helical
PAVS-A		90°	Ø25 - Ø40	XDET19	17 mm	●	●	●	●	●

- Type A uses Insert Nose R 0.4-3.2, and Type B uses Nose R 4.0 - 5.0
- * When using a spindle at high speed, please check the balance of tool and use it after replacing with the new screw.

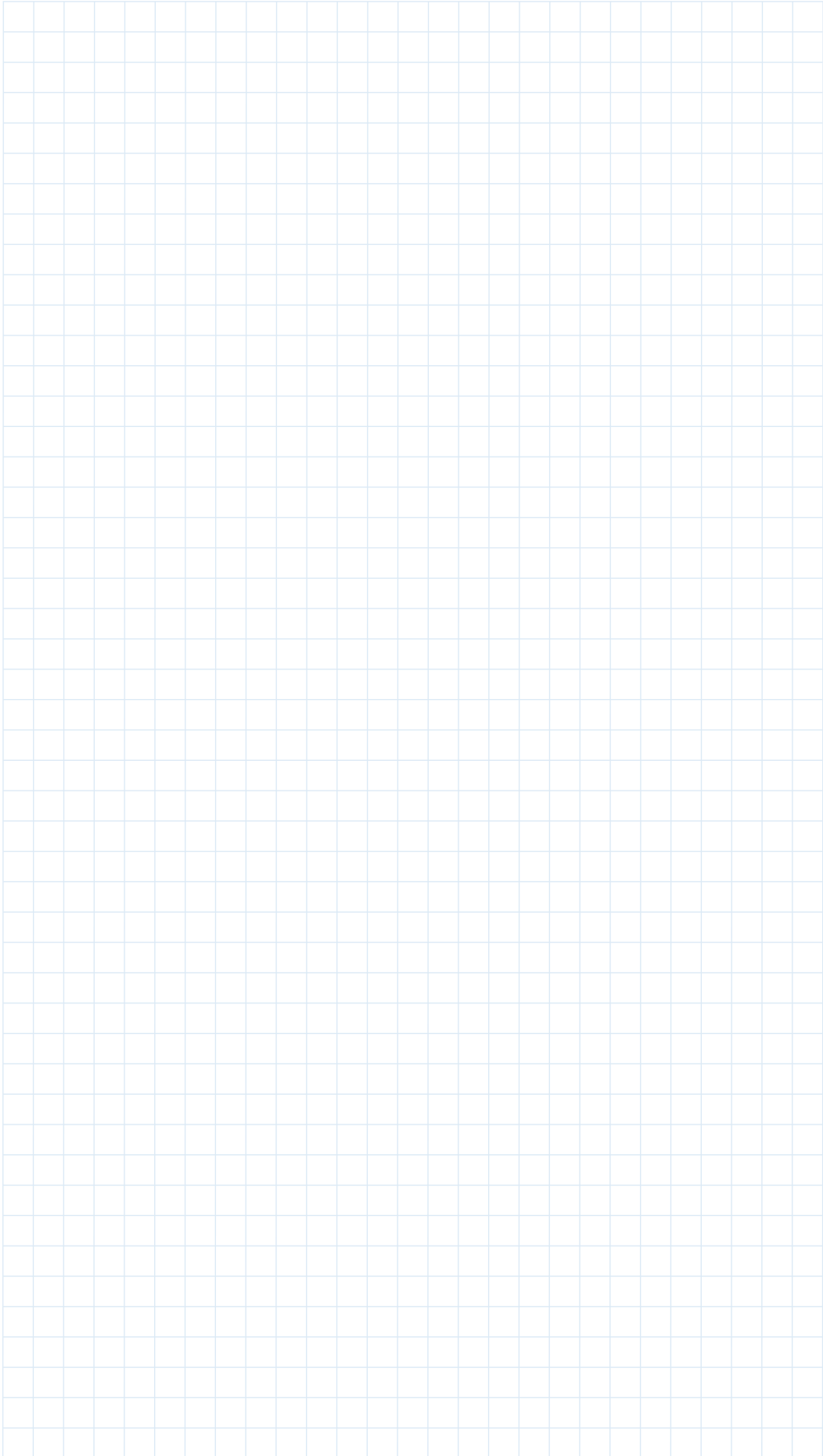
Modular

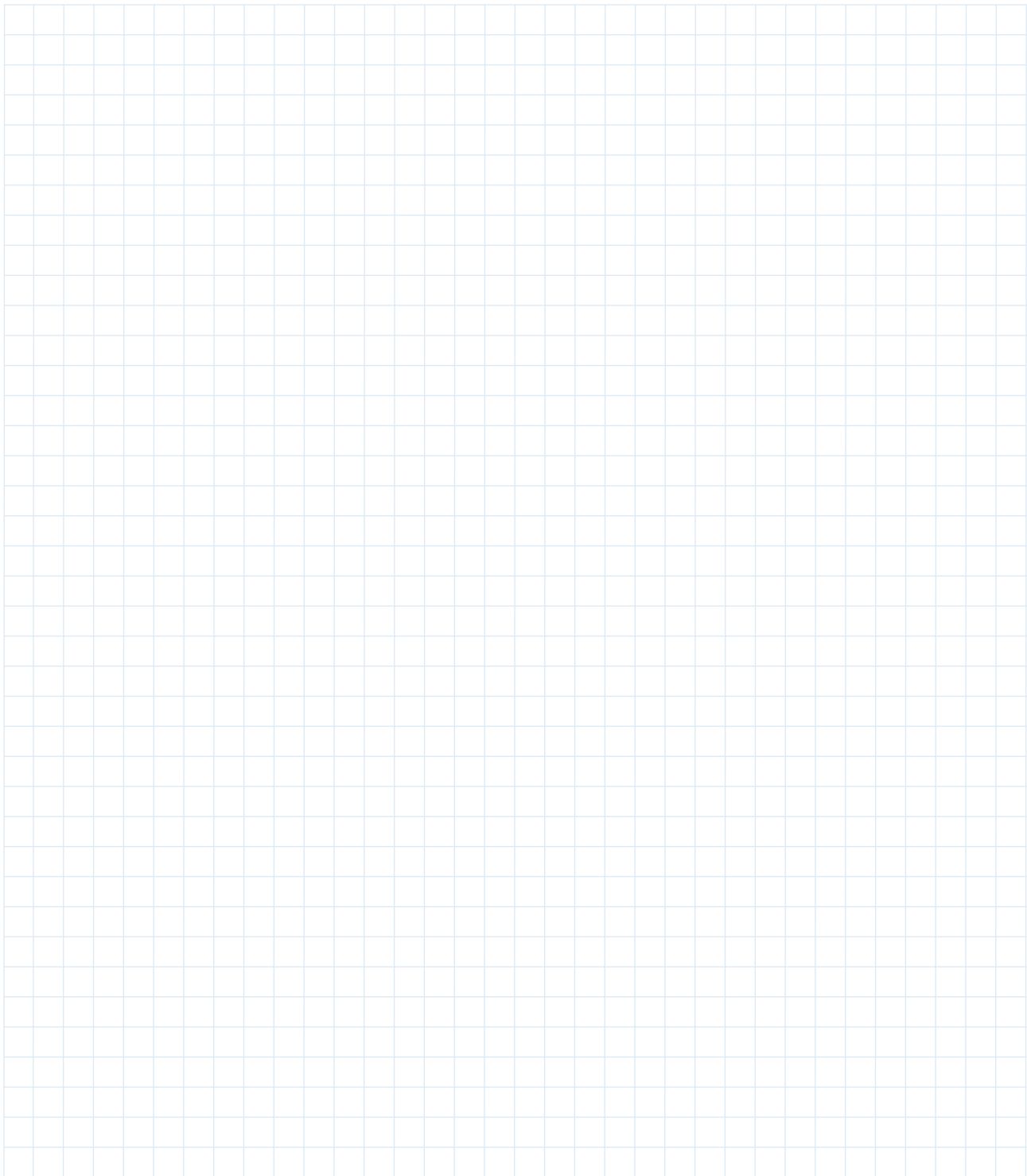
Designation	Image	A.A.	Diameter range	Insert	Depth of cut ap	Application				
						Facing	Shouldering	Slotting	Copying	Ramping Helical
HSK63A-PAV		90°	Ø32 - Ø50	XDET19	17 mm	●	●	●	●	●

Parts

ØD	Screw 	Wrench 
Ø40 - Ø125	PTKA0408-A	TW15S

Notes





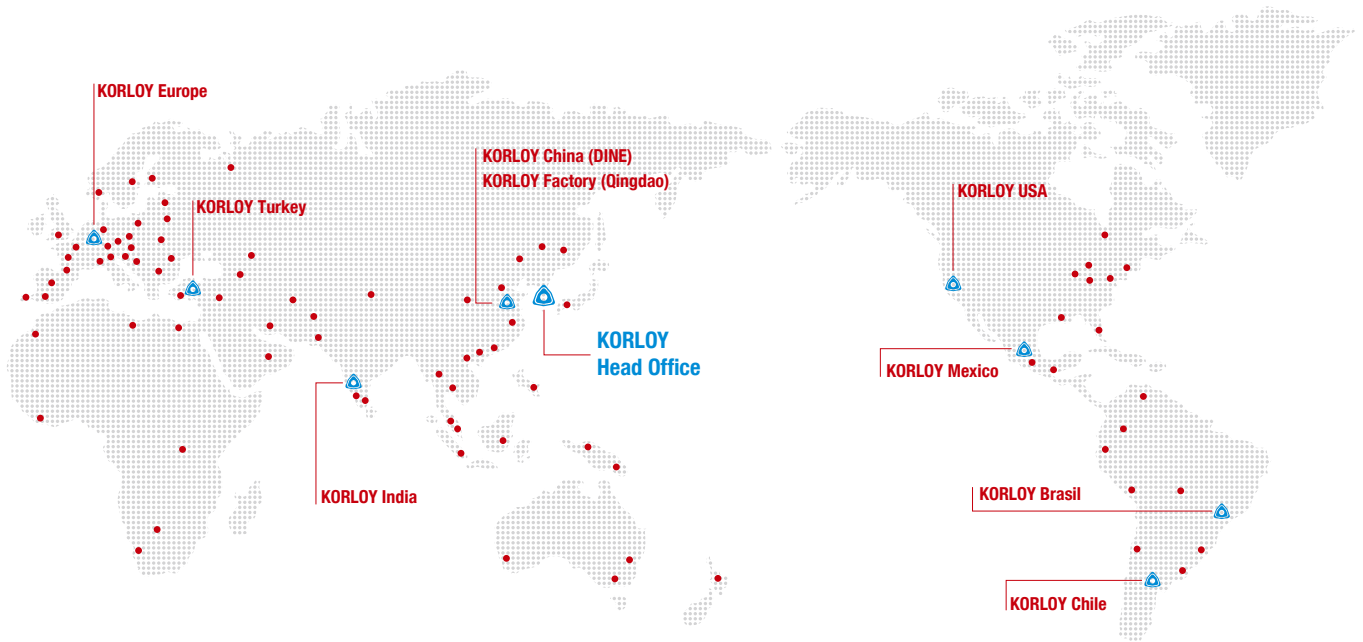
⚠ For the safe metalcutting

- Use safety supplies such as protective gloves to prevent possible injury while touching the edge of tools.
- Use safety glasses or safety cover to hedge possible dangers. Inappropriate usage or excessive cutting condition may lead tool's breakage or even the fragment's scattering.
- Clamp the workpiece tightly enough to prevent its movement while its machining.

Properly manage the tool change phase because the inordinately used tool can be easily broken under the excessive cutting load or severe wear, and it may threat the operator's safety.

- Use safety cover because chips evacuated during cutting are hot and sharp and may cause burns and cuts. To remove chips safely, stop machining, put on protective gloves, and use a hook or other tools.

- Prepare for fire prevention measures as the use of the non-water soluble cutting oil may cause fire.
- Use safety cover and other safety supplies because the spare parts or the inserts can be pulled out due to centrifugal force while high speed machining.



KORLOY Network

Head Office

Holystar B/D, 326, Seocho-daero,
Seocho-gu, Seoul, 06633, Korea,
Web: www.korloy.com

Cheongju Factory

55, Sandan-ro, Heungdeok-gu,
Cheongju-si, Chungcheongbuk-do,
28589, Korea

Jincheon Factory

54, Gwanghyewonsandan 2-gil,
Gwanghyewon-myeon, Jincheon-gun,
Chungcheongbuk-do, 27807, Korea

R & D Institute Seoul

Holystar B/D, 326, Seocho-daero,
Seocho-gu, Seoul, 06633, Korea

R & D Institute Cheongju

55, Sandan-ro, Heungdeok-gu,
Cheongju-si, Chungcheongbuk-do,
28589, Korea

Gurgaon Factory

Plot NO.415, Sector 8, IMT Manesar,
Gurgaon 122051, Haryana, India

KORLOY AMERICA

620, Maple Avenue, Torrance,
CA 90503, USA

KORLOY BRASIL

Av. Aruana 280, conj.12, WLC,
Alphaville, Barueri, CEP06460-010,
SP, Brasil

KORLOY CHILE

Av. Providencia 1650, Office 1009,
7500027 Providencia-Santiago, Chile

KORLOY INDIA

Ground Floor, Property No. 217, Udyog
Vihar Phase 4, Gurgaon 122016,
Haryana, India

KORLOY TURKEY

Serifali Mahallesi, Burhan Sokak NO: 34
Dudullu OSB/Umraniye/Istanbul, 34775,
Turkey

KORLOY MEXICO

Calle R. M. Clemencia Borja Taboada
522, Jurica Acueducto, 76230 Juriquilla,
Qro. Mexico

KORLOY EUROPE

Gablonzer Str. 25-27,
D-61440 Oberursel, Germany
Tel. +49-6171-27783-0
Fax +49-6171-27783-59
Mail: info@korloyeurope.com
Web: www.korloyeurope.eu

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