

Vision Inspection Machine Proposal

Automation division
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www.inkok.co.kr

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1.1 Machine Summary : Development Purpose

➤ Development Purpose

- End users can inspect the cutting tool with Vision Solution exactly, and can manufacture with maintaining equational quality so that end users can get the improvement of the quality and productivity.
- With the automation of inspection system, end users also can reduce labor cost than before.

➤ Inspection Target

- Endmill

➤ Inspection List

- Lower Flute Chipping, Side Flute Chipping Inspection (Square and Ball)
 - > Standard, Special
- Length Measurement, Length Inspection
- Diameter Mixing Inspection
- Point Flute Quantity Inspection

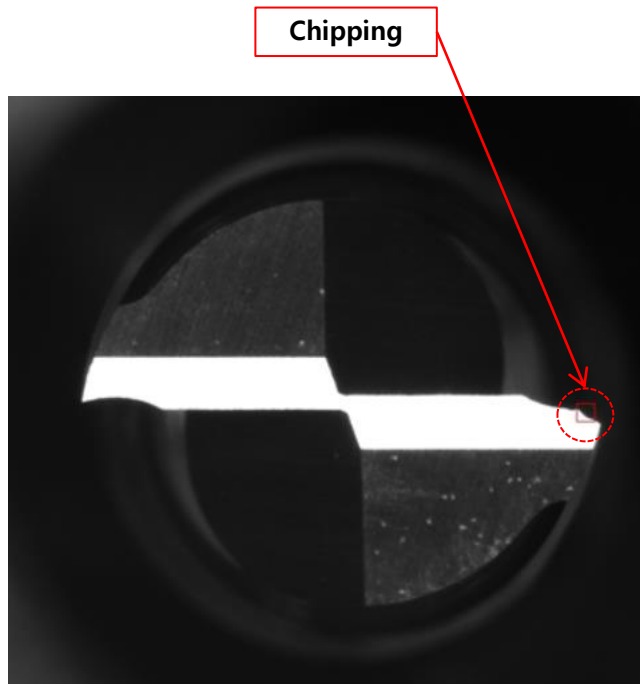
1.2 Machine Summary : Inspection Range

➤ Inspection Range

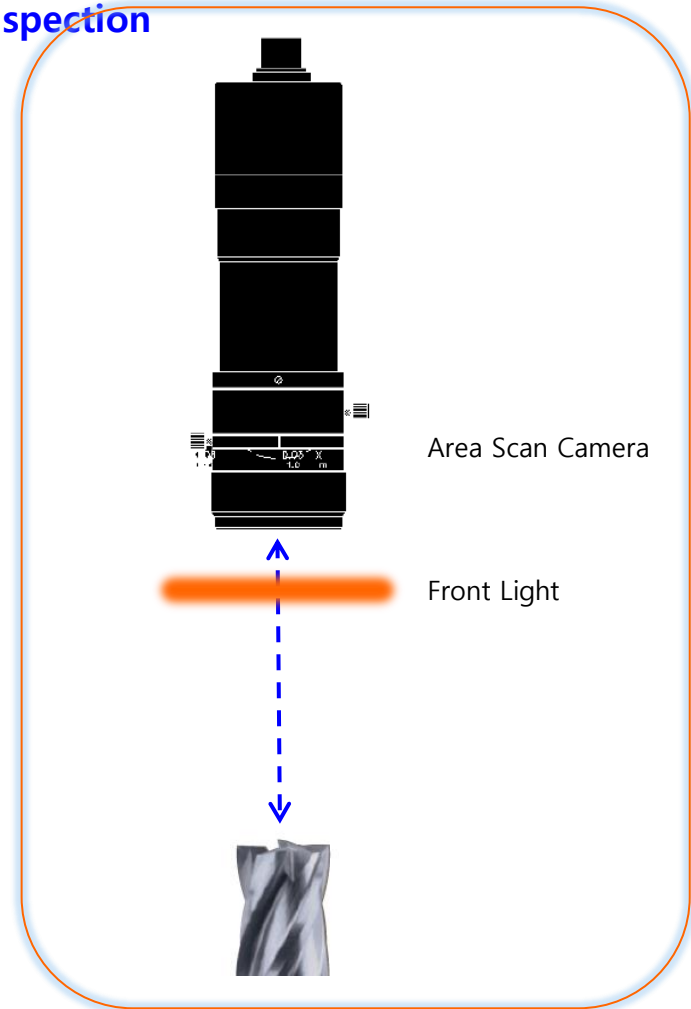
Div.		Specification	Remark
Target Item	Material	Stainless Steel, Tungsten Carbide, Endmill	
	Diameter	Φ1 ~ Φ3	Shank and Flute Dia
	Flute Quantiy	1F, 2F, 3F, 4F, 5F, 6F, 7F, 8F	
Chipping Size	Upper Flute	Min. 30um	Square, Ball
	Side Flute	Min. 30um	Square, Ball
Length	Length	40 ~ 80mm	±0.1mm
Diameter	Tolerance	±2 μm	Shank and Flute Dia

2.1 Target Inspection : Chipping

- Square upper flute Chipping Inspection
 - Multi Flute Quantity (1F, 2F, 3F, 4F, 5F, 6F, 7F, 8F) Inspection
 - Min. Inspection Chipping Size : 30um



Square Endmill



Optical Configuration

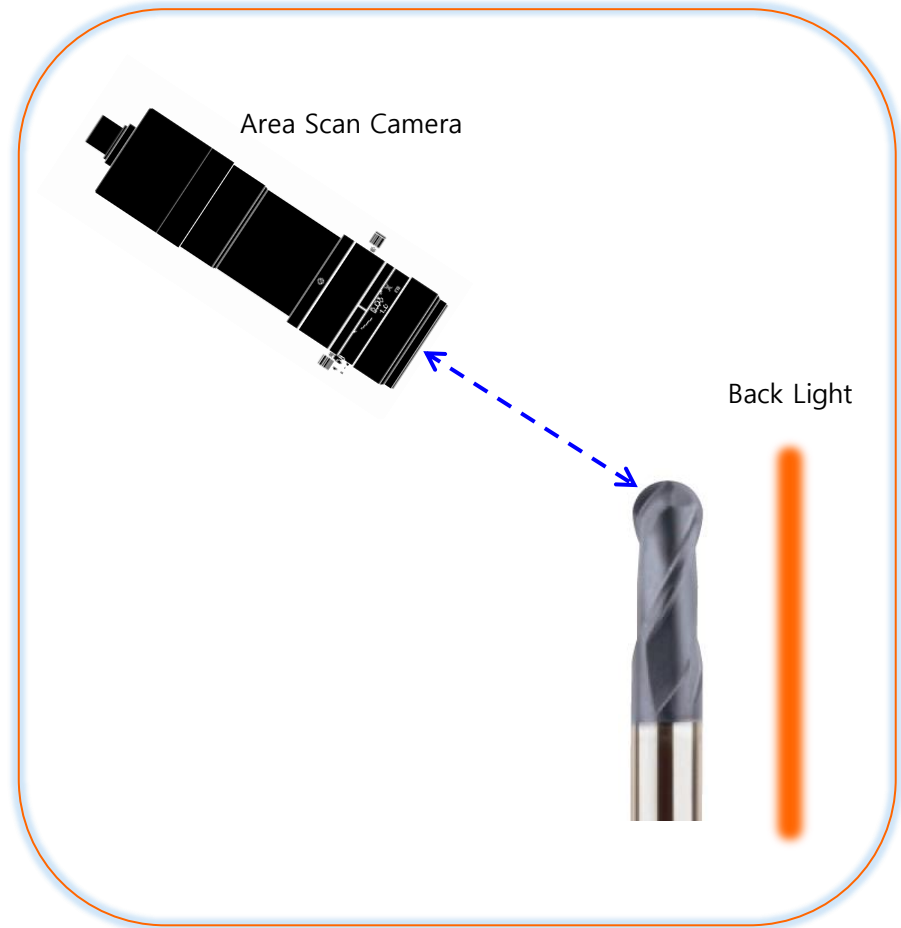
2.2 Target Inspection : Chipping

➤ Ball Flute Chipping Inspection

- Multi Flute Quantity (1F, 2F, 3F, 4F, 5F, 6F, 7F, 8F) Inspection
- Min. Inspection Chipping Size : 30um



Ball End mill



Optical Configuration

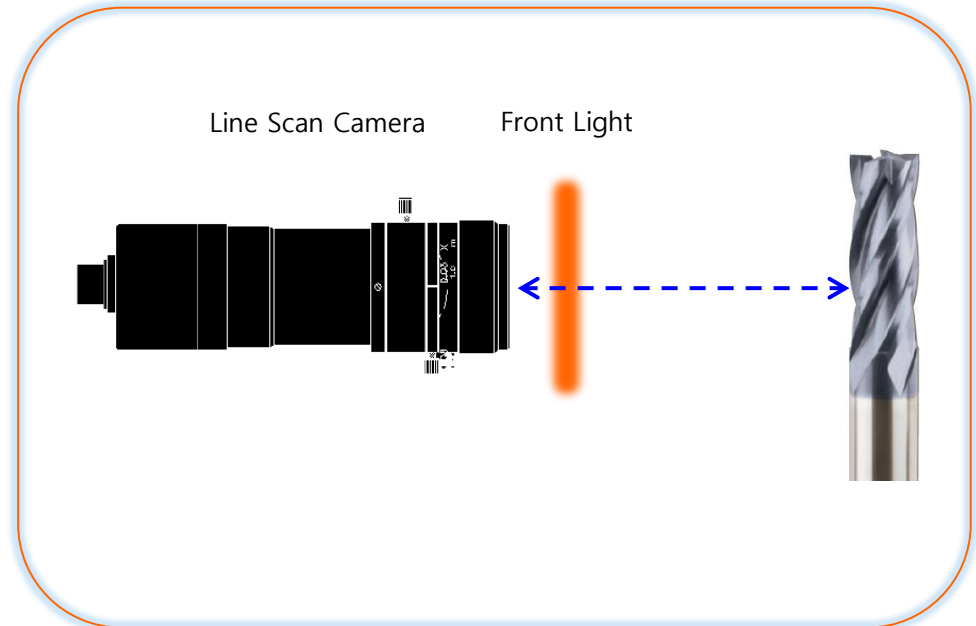
2.3 Target Inspection : Chipping

- Side flute Chipping Inspection
 - Multi Flute Quantity (1F, 2F, 3F, 4F, 5F, 6F, 7F, 8F) Inspection
 - Min. Inspection Chipping Size : 30um

Chipping



Side flute endmill inspection

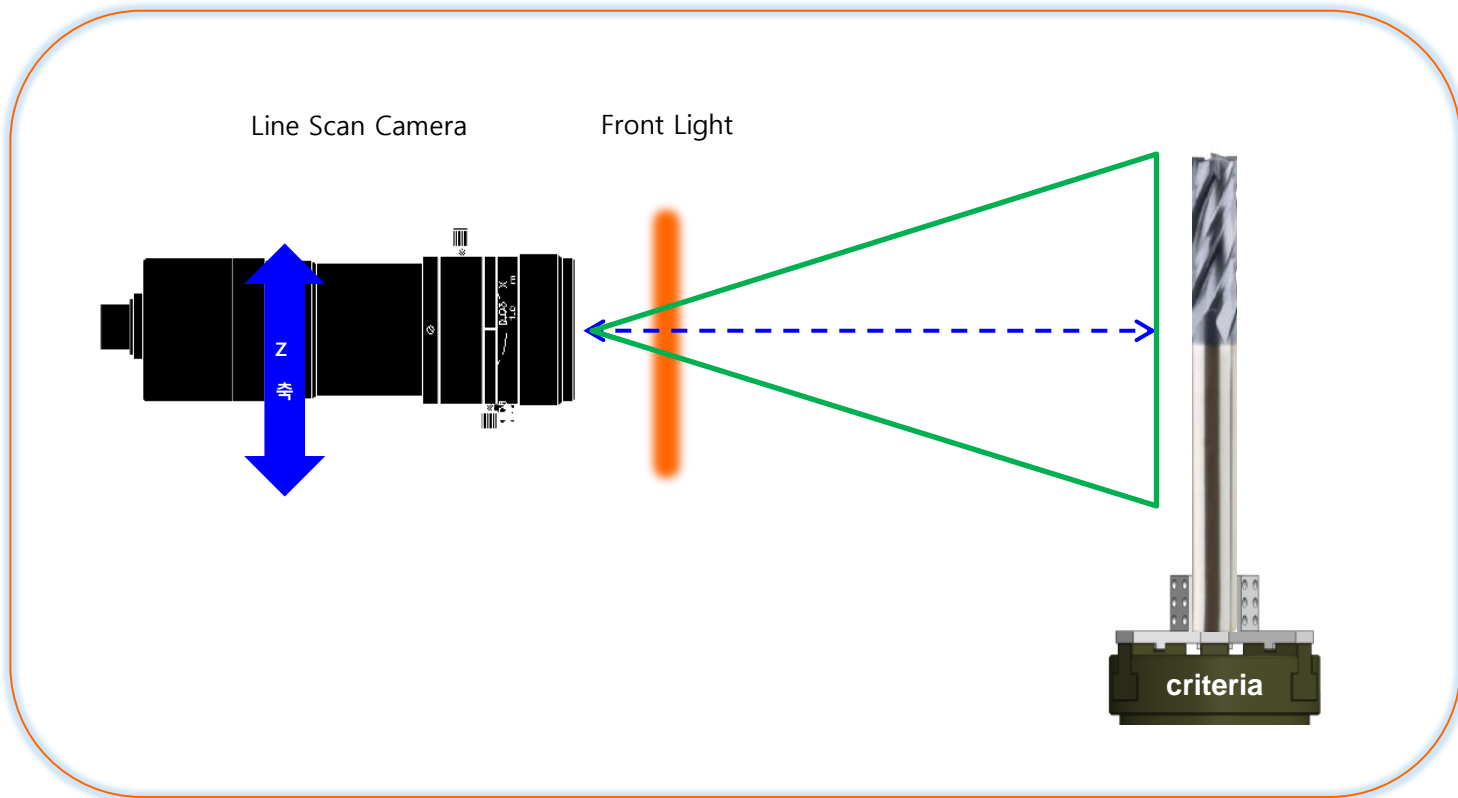


Optical Configuration

2.4 Target Inspection : Length Measurement Inspection

➤ Length Measurement Inspection

- Length Range : 30 ~ 120mm
- Tolerance : $\pm 0.1\text{mm}$



Optical
Configuration

2.5 Target Inspection : Point Flute Quantity Inspection

➤ Flute Quantity Inspection

- 1F, 2F, 3F, 4F, 5F, 6F, 7F, 8F Flute quantity inspection
- NG Distinction Inspection : Distinction by model, by type

➤ Angle Inspection

- 3 degree twist inspection of flute
- NG Distinction Inspection : Distinction by model, by type

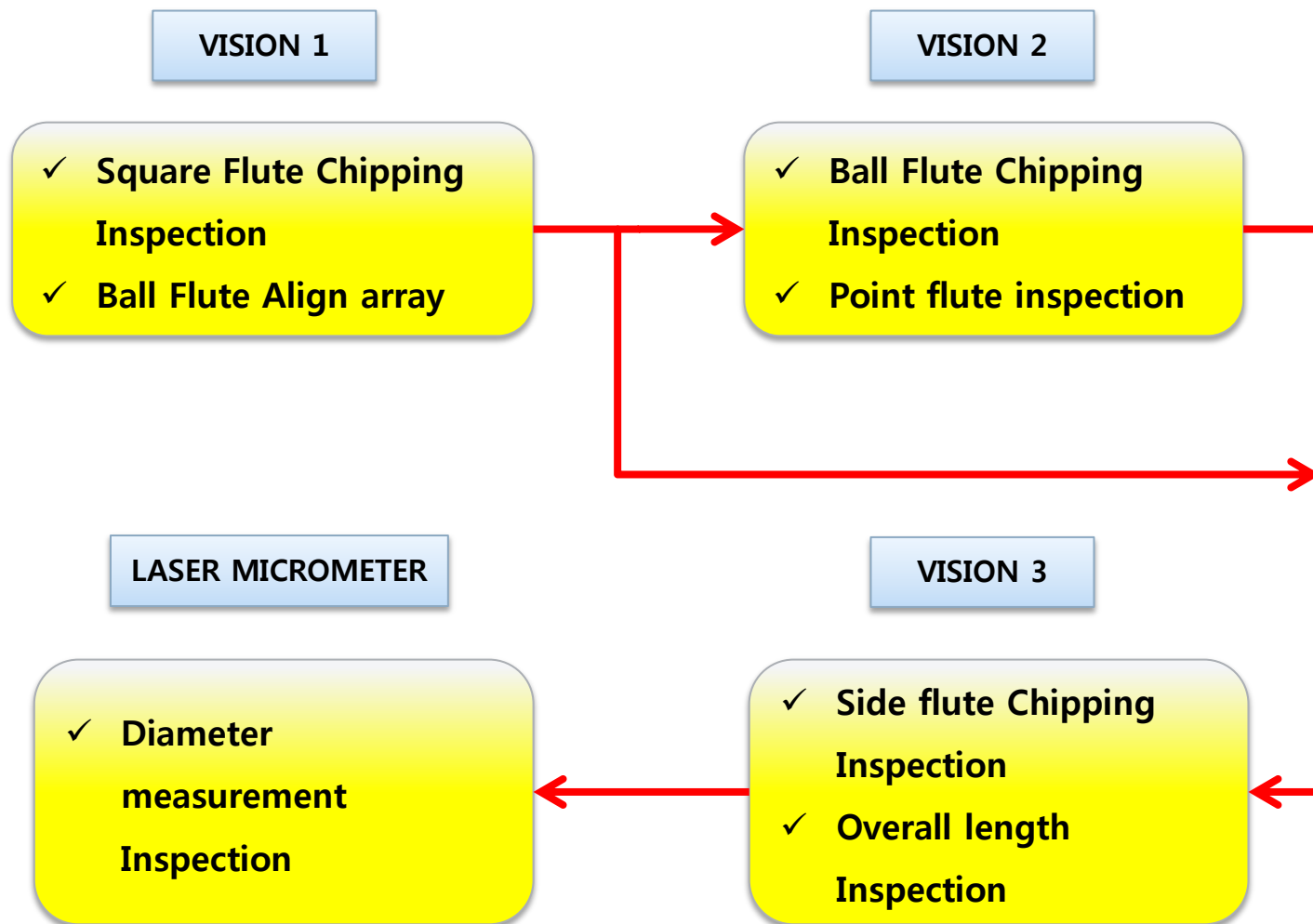
➤ Helix Angle Inspection

- NG Distinction Inspection : Distinction by model, by type

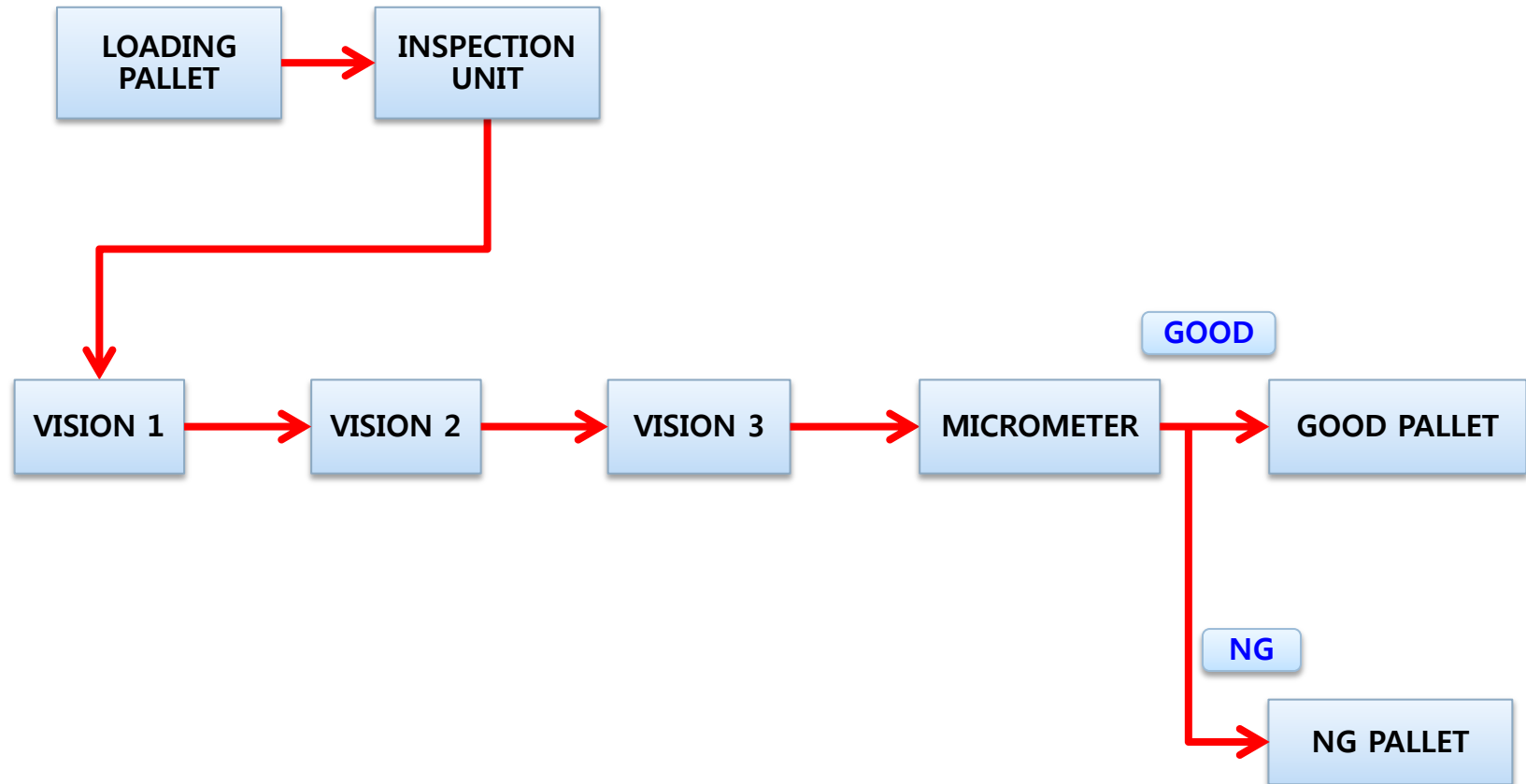
➤ Unequal division

- NG Distinction Inspection : Distinction by model, by type

3.1 Process : Inspection Procedure



3.2 Process : Machinery Procedure



3.3 Process : Tact time

➤ Sequence & Tact Time : **20sec (Square Endmill)**

- Loading/Unloading Time is the standby of Inspection time.

NO	Process	Process Sequence	Tact Time (sec)	Stroke	Process Tact Time(sec)
1	Loading	Loading Gripper Down to Pallet	1	Cylinder	8
2		End mill Grip	1	Air Chuck	
3		Loading Gripper Z Axis Up	1	Cylinder	
4		Loading Gripper Move to Chuck	1	10mm	
5		Loading Gripper Z Axis Down	1	Cylinder	
6		Chuck Clamp	1	Rotary Chuck	
7		Loading Gripper Unclamp	1	Air Chuck	
8		Loading Gripper Z Axis Up	1	Cylinder	
9	Inspection	Move to Vision 1 Position	1	250mm	20 (Tact Time)
10		Vision 1 Inspection (Square)	2	-	
11		Move to Vision 2 Position	1	250mm	
12		Vision 2 Inspection (Side)	5	-	
13		Move to Vision 3 Position	1	250mm	
14		Vision 3 Inspection	3	-	
15		Move to Unloading Position	1	-	
16		Unloading Gripper Z Axis Down to Chuck	1	Cylinder	
17		Unloading Gripper Grip	1	Air Chuck	
18		Chuck Unclamp	1	Rotary Chuck	
19		Unloading Gripper Z Axis Up	1	Cylinder	
20		Move to Loading Position	2	-	
21	Unloading	Move to Unloading Pallet	1	-	4
22		Unloading Gripper Z Axis Down	1	Cylinder	
23		Unloading Gripper Unclamp	1	Air Chuck	
24		Unloading Gripper Z Axis Up	1	Cylinder	

4.1 LAYOUT

➤ Layout

- Size : 2,440(W) x 1,610(D) x 2,000(H)



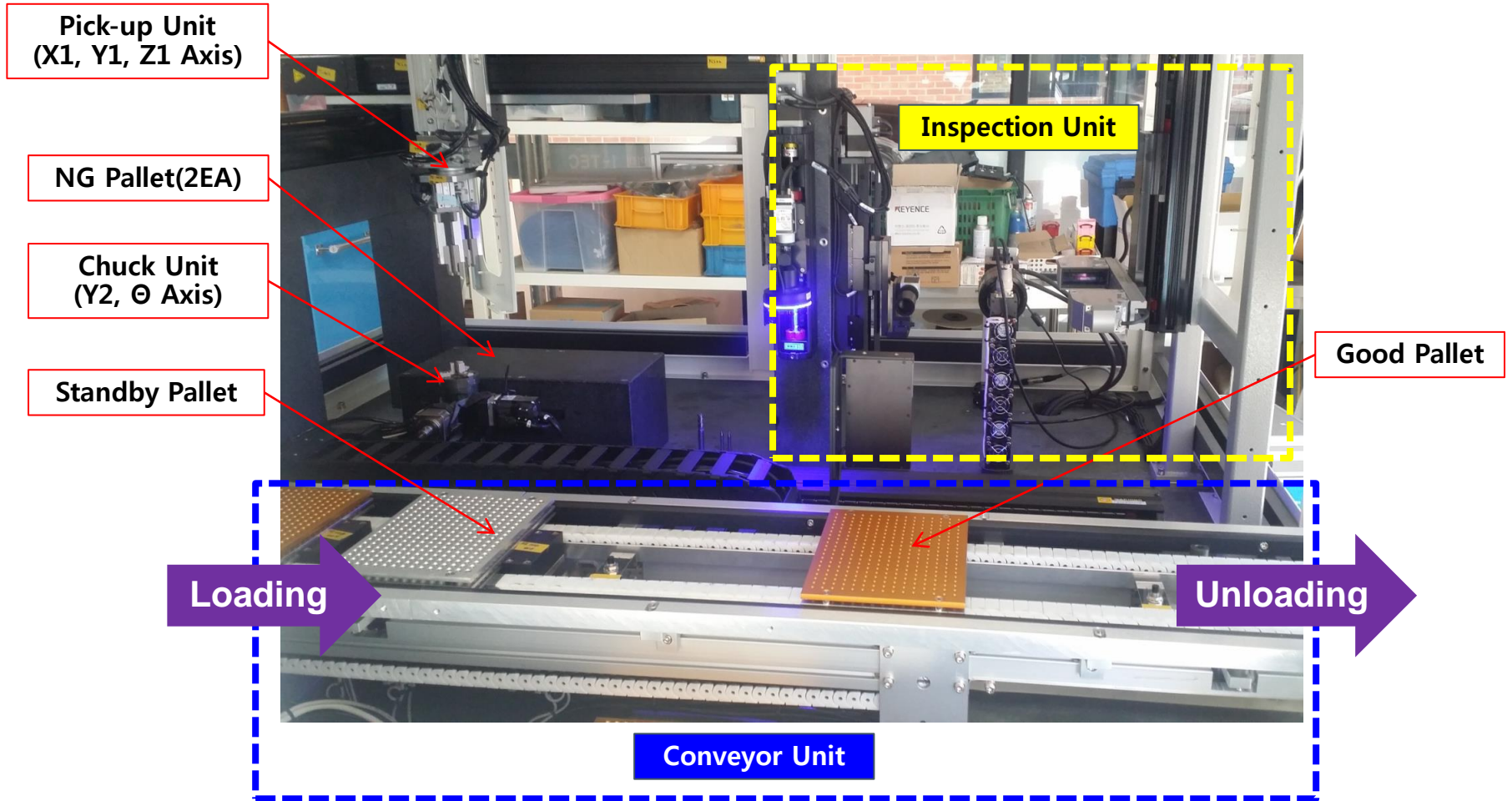
4.2 SYSTEM SPECIFICATIONS

ITEM		SPEC	REMARK
Layout	Size	2,440(W) x 1,610(D) x 2,000(H)	Included Conveyor
System	Pick-up Unit	X1 Axis, Y1 Axis, Z1 Axis	3 Axis Servo
	Chuck Unit	Y2 Axis, Θ Axis(Chuck)	2 Axis Servo
	Inspection Unit	Z2, Z3, Z4, Z5 Axis	4 Axis Servo
	Conveyor Unit	Pallet Auto Input & Output	
Inspection	Vision 1	acA2500-14gm (Basler, 2592x1944)	Min. 50um(Upper)
	Vision 2	acA2500-14gm (Basler, 2592x1944)	Min. 50um(Ball)
	Vision 3	raL12288-66K (Basler 1x12288)	Min. 50um(Side)
Control	Controller	PC Control	
	Operating Panel	22" Touch Monitor	
Utility	Electric Power	220V x 3Phase x 60Hz	
	Pneumatics	5 Kg/cm ²	

※ Vision 광학계 구성은 성능 구현을 위해 사양이 변경될 수 있음.

4.3 MAIN UNIT

➤ Main Unit

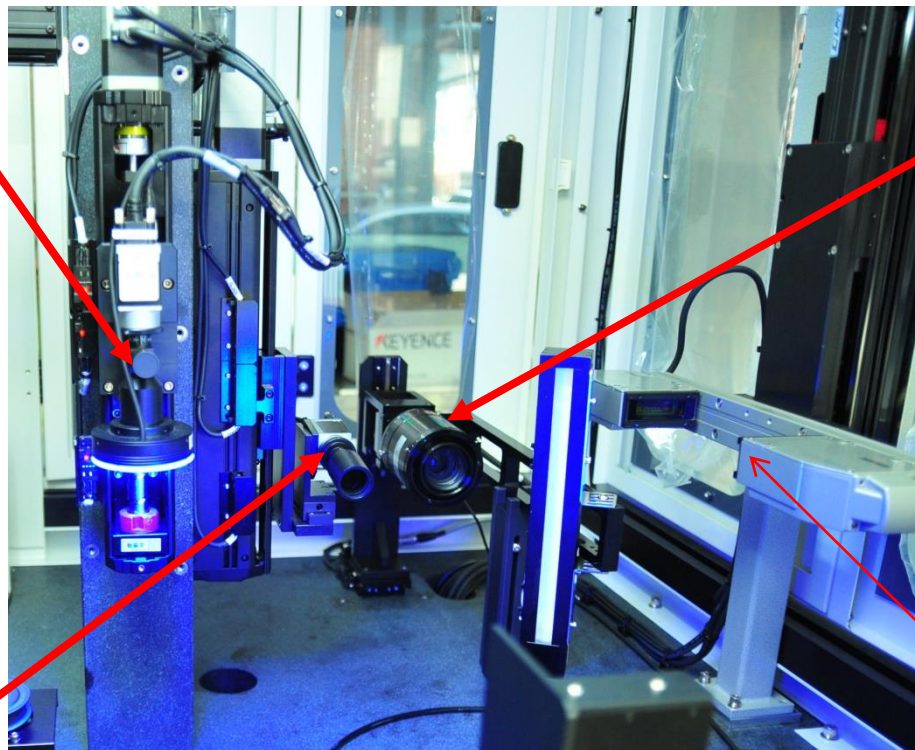


4.4 Layout : INSPECTION UNIT

➤ Vision Unit

Vision 1

- Square Flute Chipping Inspection
- Ball Flute Align Array
- Z Axis Robot
- Area Scan Camera



Vision 2

- Ball Flute Chipping Inspection
- Area Scan Camera

Vision 3

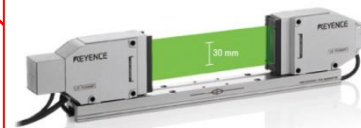
- Side Flute Chipping Inspection



Line Scan Camera

Micrometer

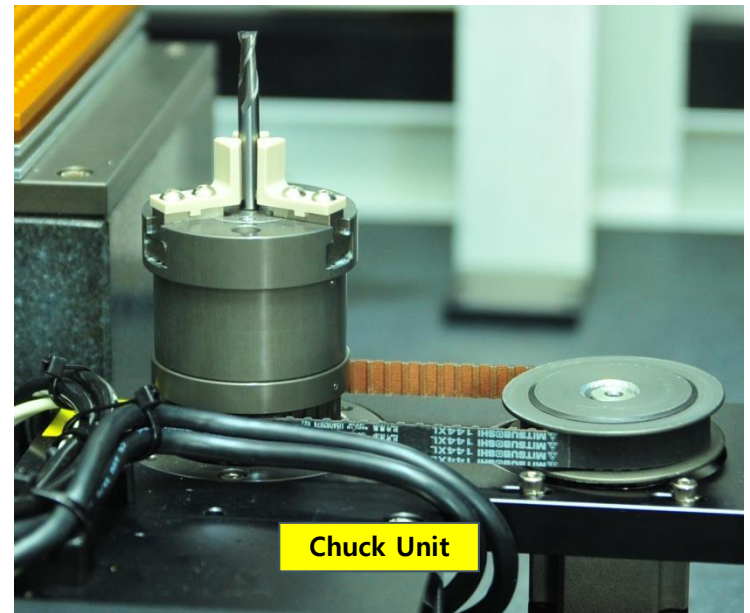
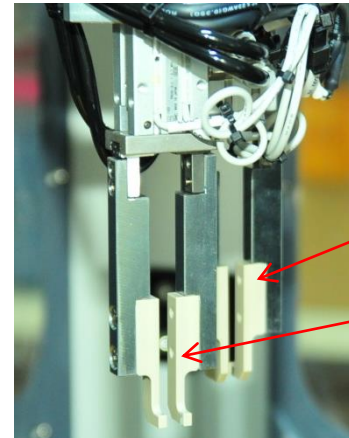
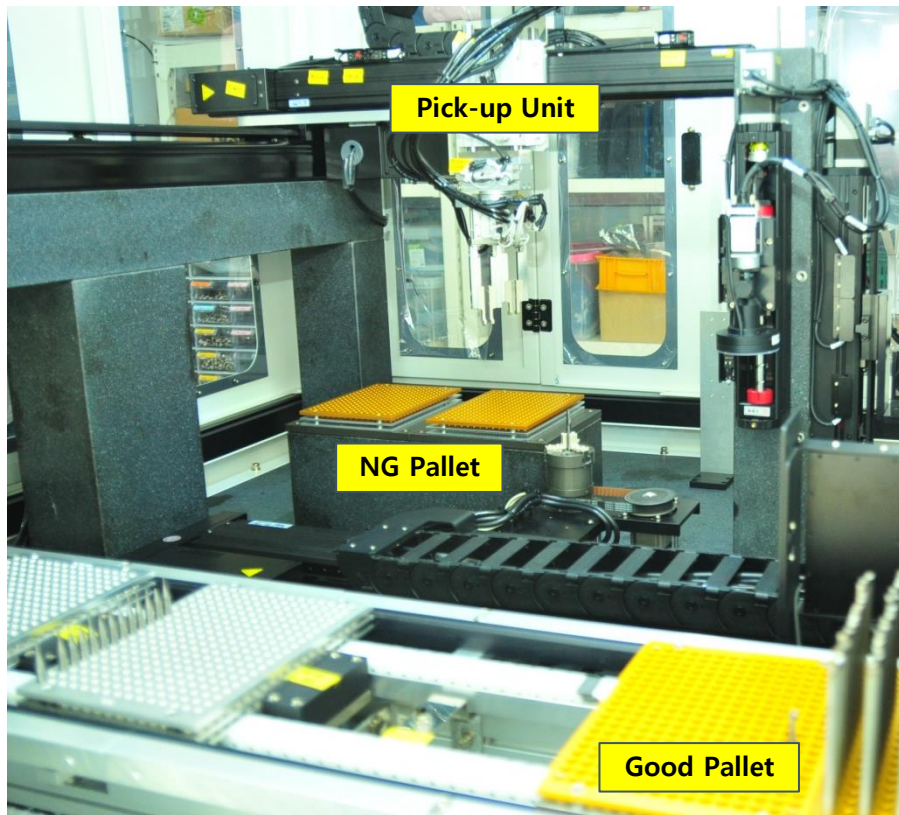
- Diameter inspection device



Micrometer

4.5 Configuration : PICK-UP UNIT

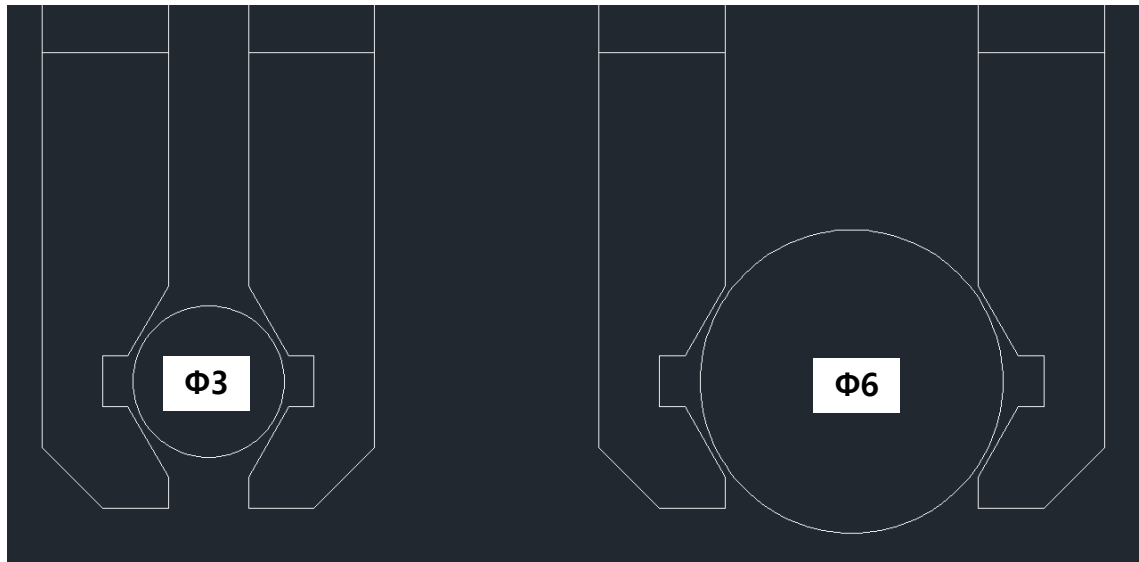
- Pick-up & Chuck Unit
 - Gripper 1(Input), Gripper 2(Output)
 - Gripper 180° Rotation



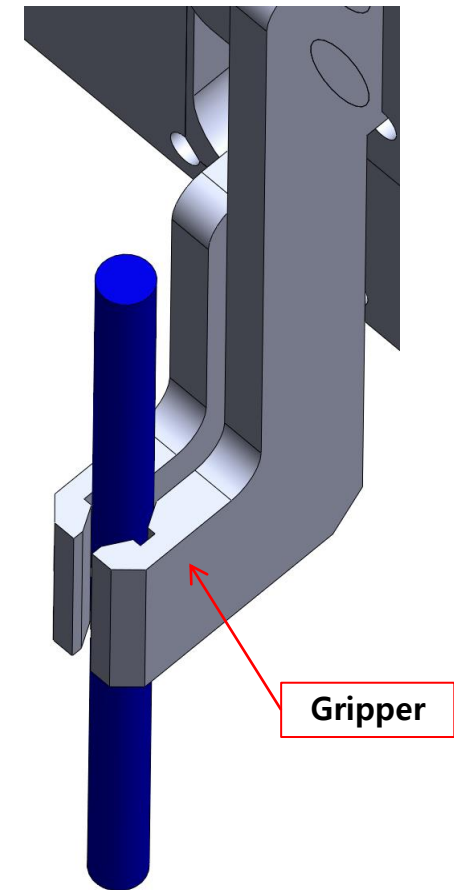
4.6 Configuration : PRODUCT GRIP

➤ Gripper Grip

- Endmill is gripped by Gripper
- $\Phi 3 \sim \Phi 6$ Endmills use one Gripper.

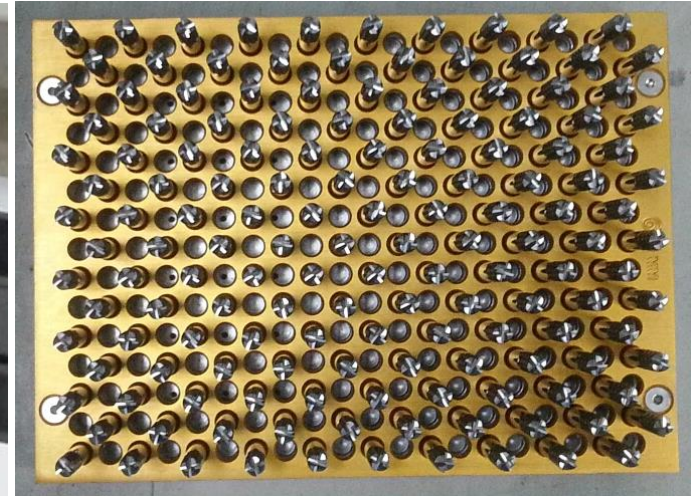
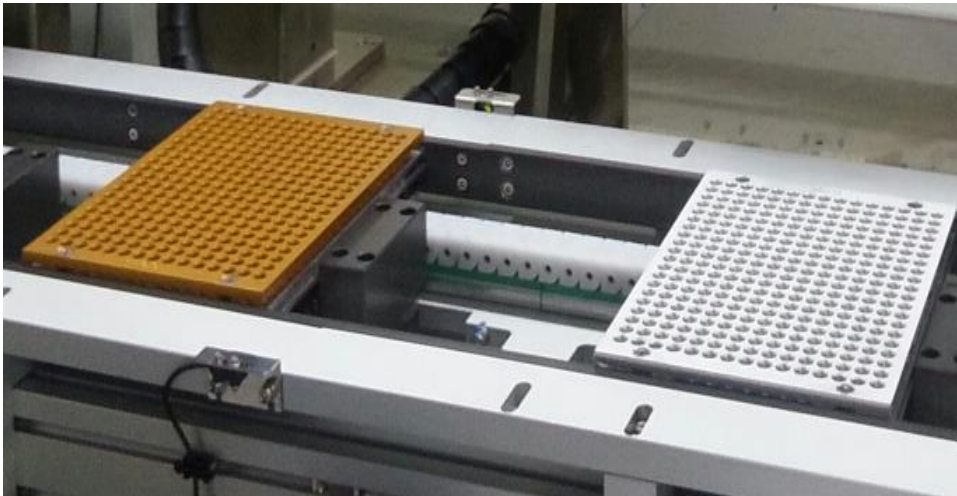
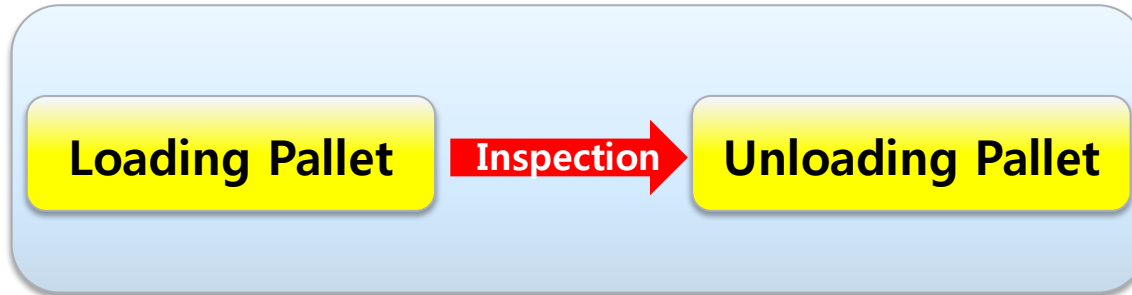


One Gripper



4.7 Configuration : PALLET

- Pallet to Pallet
 - Walter AI Pallet



4.8 Configuration : OPERATING PANEL

➤ Operating Panel



Touch Screen

4.9 Configuration : MICROMETER

➤ Diameter Micrometer(Optional)



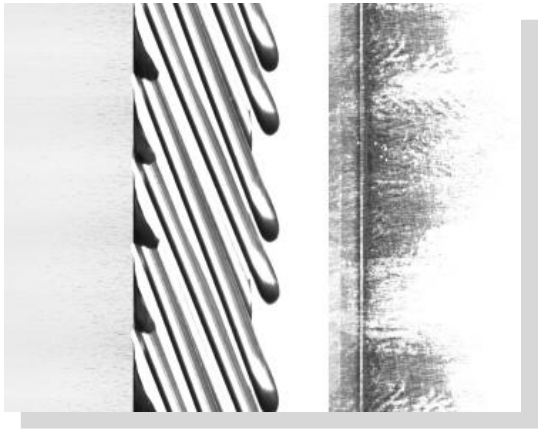


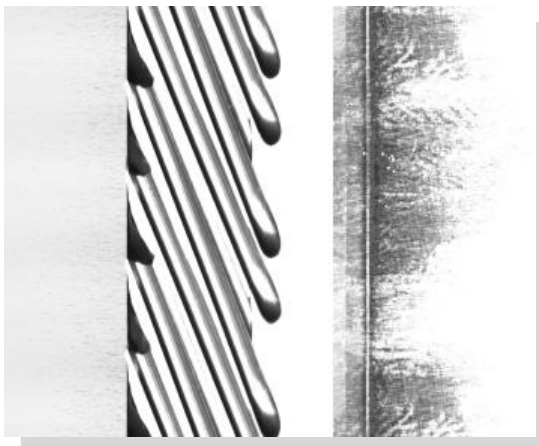
- Model : LS-7030(KEYENCE)



Model		LS-7030(KEYENCE)
Type		Standard
Division		Laser device and monitor
Measurement Range		0.3~30 mm
Min. Measurement		0.3 mm
The distance of sender and receiver of lazer		160 ±40 mm
Luminous Source		GaN Green LED
CCD Scanning Zone		Approximately 33 mm
Measurement Precision		±2 μm
Repeatable Precision		±0.15 μm
Sampling Cycle		2,400/sec
Monitor		OK
Milieu Interieur	Protection	IP64
	Circumstance Degree	0~+50°C
	Circumstance Humidity	35%~85%RH


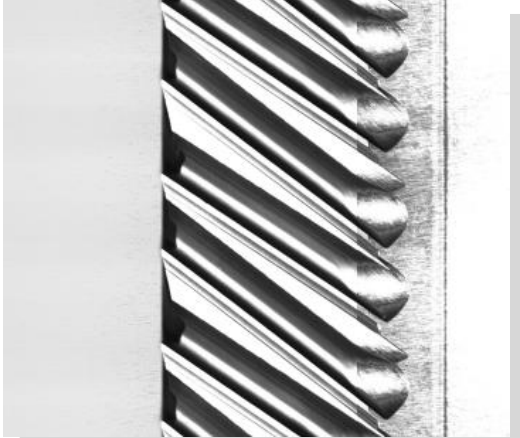

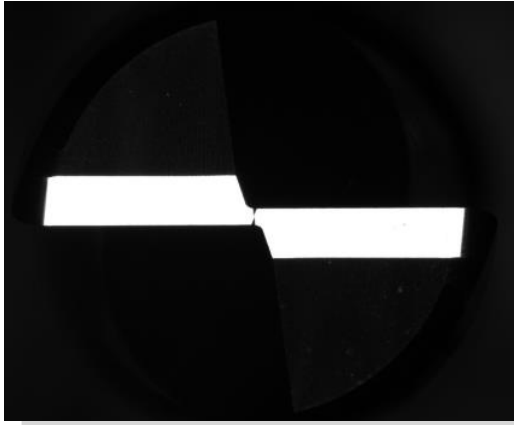
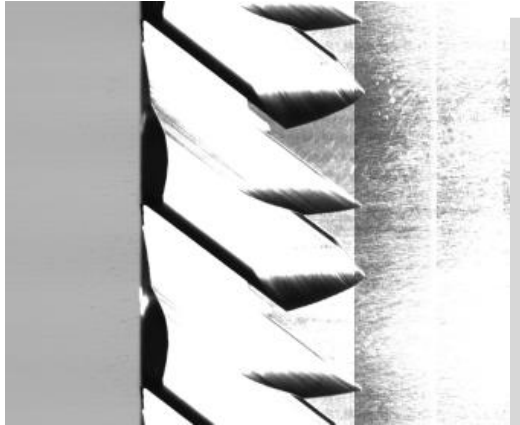
5.1 Inspection Result of Cutting Tool with Coating

➤ 엔드밀 코팅별 제품

코팅 색상	제품	밀날 검사 이미지	옆날 검사 이미지
금색 (Gold)			
청색 (Blue)			



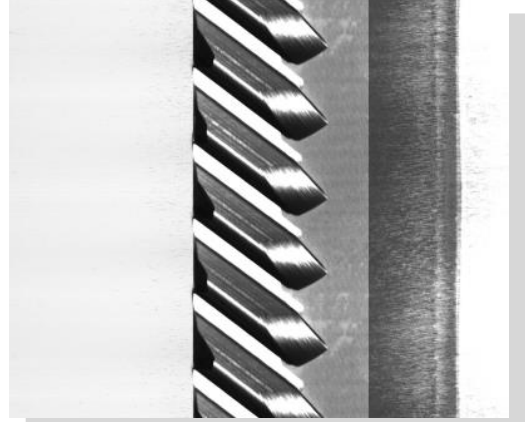

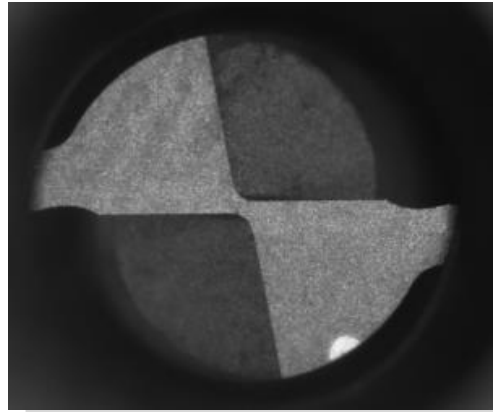

5.1 Inspection Result of Cutting Tool with Coating

▶ 엔드밀 코팅별 제품

코팅 색상	제품	밑날 검사 이미지	옆날 검사 이미지
은색 (Silver #1)			
은색 (Silver #2)			

5.1 Inspection Result of Cutting Tool with Coating

➤ Coating Endmill

Coating Color	Product	Flute Image	Side Flute
Black			
Dark Black			

5.2 Inspection Result of Cutting Tool with Coating

Coating Color	Possible or not	Remark
Gold	Possible	It need to be more brighter lighting than machine light.
Blue	Possible	
Silver #1	Possible	
Silver #2	Possible	
Black	Possible	
Dark Black	not	The surface and border of the flute are not uniform.

Thanks You