

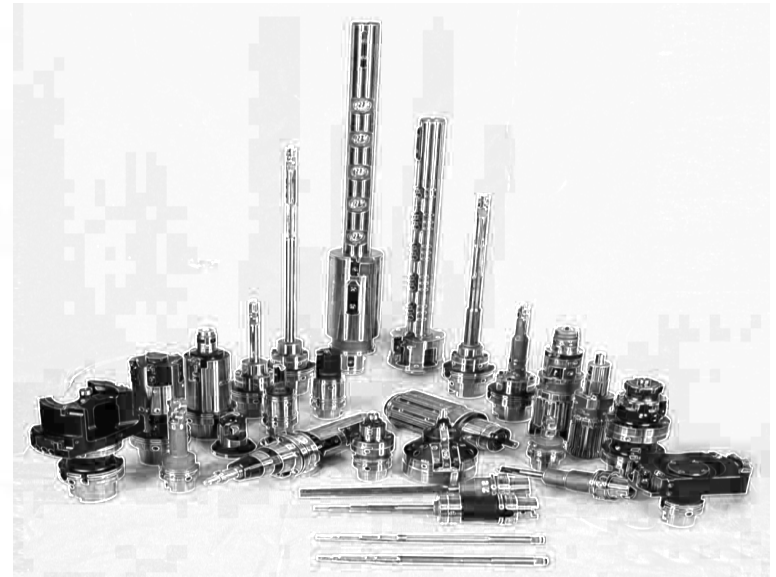
HANBOO ENGINEERING



HANBOOENGINEERING



Renovation ideals With Customers
Renovation ideals With
Hanboo engineering



Domestic Customers

AUTOMOBILE COMPANY

- ✓ HYUNDAI MOTOR COMPANY
- ✓ KIA MOTORS CORPORATION
- ✓ GM KOREA COMPANY
- ✓ SSANGYONG MOTOR COMPANY
- ✓ RENAULT SAMSUNG MOTOR COMPANY

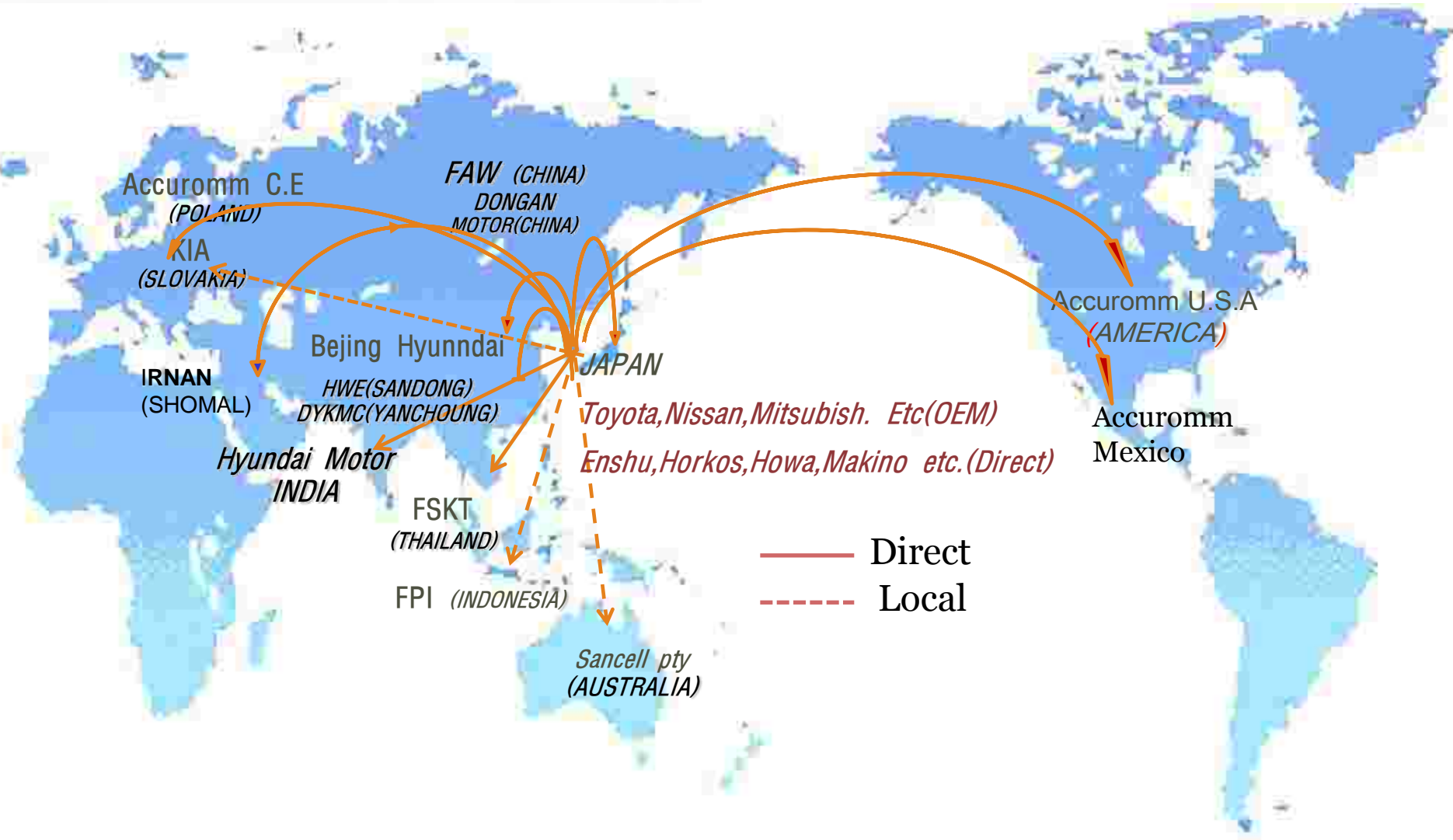
MACHINE TOOL COMPANY

- ✓ H.M.C MACHINE TOOL DIVISION
- ✓ HYUNADI WIA COPORATION
- ✓ DOOSAN INFRACORE
- ✓ HWACHEON MACHINERY WORKS CO.,LTD.
- ✓ A-IL CO., LTD

COOPERATION COMPANY

- ✓ HYUNDAI POWERTEC.
- ✓ DAESEUNG PRECISION CO.,LTD.
- ✓ DRAXION CO., LTD
- ✓ DAEDONG CO.,LTD
- ✓ DAERIM C & C CO.,LTD.
- ✓ NEO OTO.CO., LTD
- ✓ DONG BO CO., LTD

Overseas Customers



Project tooling performance(1/3)

USER	PLANT	ENGINE	YEAR	MACHINE MAKER	WORK	TOOL
HYUNDAI	ULSAN	A2	2011	WIA	C/HEAD	
		KAPPA	2011	工機部	C/BLOCK	
				WIA	C/HEAD	
		R	2007.11	工機部 WIA	CYL-BLOCK	
				WIA	CYL-HEAD	
				NTC		
		GAMMA 1,2, & New U	2017	工機部	C/BLOCK	
				WIA	C/HEAD	
				YASUNAGA	CON-ROD	
	CHINA Chungching	KAPPA ENGINE	2016	WIA	CYL-HEAD CYL-BOCK	
	INDIA	KAPPA - U ENG	2012 ~2013	NTC	CYL-BLOCK	
				HYUNDIA -WIA	CYL-HEAD	
	ASAN	NU & New NU	2018	WIA/HMC Machine	C-HEAD	
					C-BLOCK	

Project tooling performance(2/3)

USER	PLANT	ENGINE	YEAR	MACHINE MAKER	WORK	REMARKS
HYUNDAI	ASAN	THETA2 &THEATA3	2018	WIA/HMC Machine	C-HEAD	
					C-BLOCK	
	U.S.A ALABAMA	THETA2,3 & GAMMA1	2018 ~2019	WIA/HMC Machine	C-HEAD	
					C-BLOCK	
KIA	HWASUNG	GAMMA 1,2	2016 ~2017	WIA	C-BLOCK	
					C/HEAD	
		NU & + NEW U	2011 ~2014 (増設) 2017 (U)	HYUNDAI -WIA	C-BLOCK	
					C-HEAD	
		NU & + NEW NU	2018	WIA	C-BLOCK	
					C-HEAD	
		THETA2 &THEATA3	2018	WIA/HMC Machine	C-BLOCK	
					C-HEAD	
		NEW R	2018 ~2019	WIA/HORKOS	C-BLOCK	
					C-HEAD	
	INDIA	KAPPA & GAMMA	2018 ~2019	WIA/HMC Machine	C-BLOCK	
					C/HEAD	

Project tooling performance(3/3)

USER	PLANT	ENGINE	YEAR	MACHINE MAKER	WORK	TOOL
KIA	CHINA Yomsung	GAMMA	2012 ~2013	HYUNDAI -WIA	C-BLOCK	
		KAPPA	2015			
	KAWNG MYONG	KAPPA	2015	WIA / HMC 工機部 (NTC)	C/HEAD C/BLOCK	
현대 WIA	SANDONG Eengine #3	GAMMA & KAPPA	2016 ~2017	WIA	C-BLOCK	
					C/HEAD	
	SANDONG Eengine #4	NU	2014 ~2015	WIA	C/BLOCK	
					C/HEAD	
	SEUSAN Eengine# 1	KAPPA	2015	HYUNDAI -WIA	C/HEAD	
					C/BLOCK	
	SEUSAN Eengine# 2	U,R,A,θ ,New U	2015~ 2017	HYUNDAI -WIA	C/HEAD	
C/BLOCK						
MEXICO	GAMMA2	2018	HYUNDAI -WIA	C/BLOCK		
				C/HEAD		
				TPS KOREA	C/BLOCK	

Total Tooling Process (1/2)

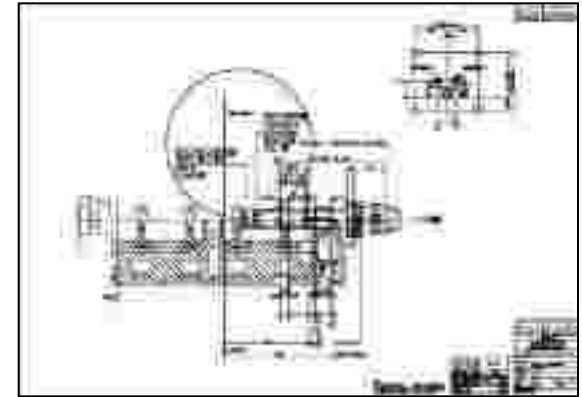
Machine



Work



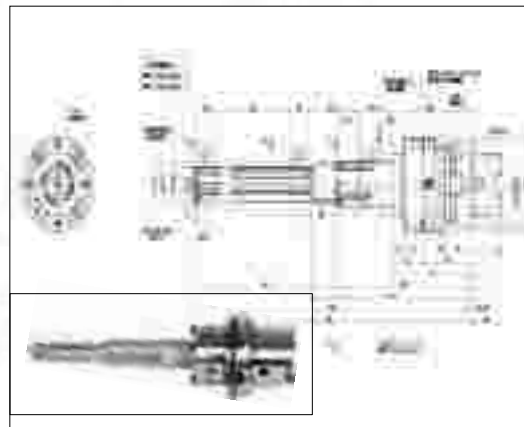
Process sheet



Fixture



Tooling



Technical meeting



Total Tooling Process (2/2)

Tool design



NC programing



Tool product



Try-out



Work inspection



Inspection Report



Tooling & Program Processing

Research & Development



NC Programing



Tool Design



CAM Programing



Advanced Product System

CNC Multiple Lathe



NC
Milling



Wire & EDM



6Axis Tool Grinder



Quality Inspection

Preset measuring
& setting (Boring tool)



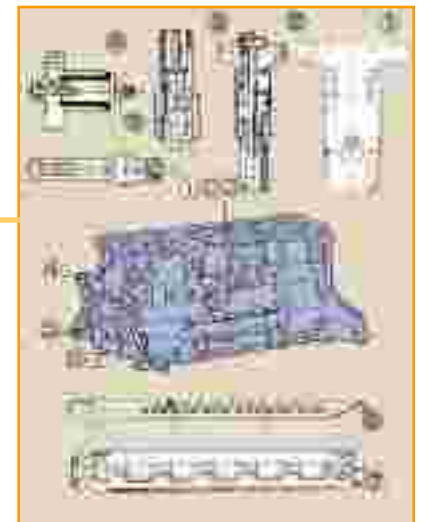
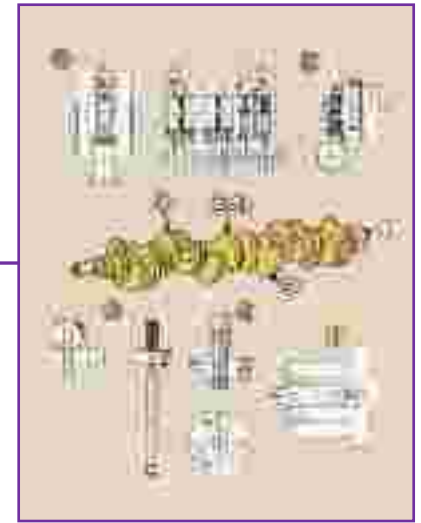
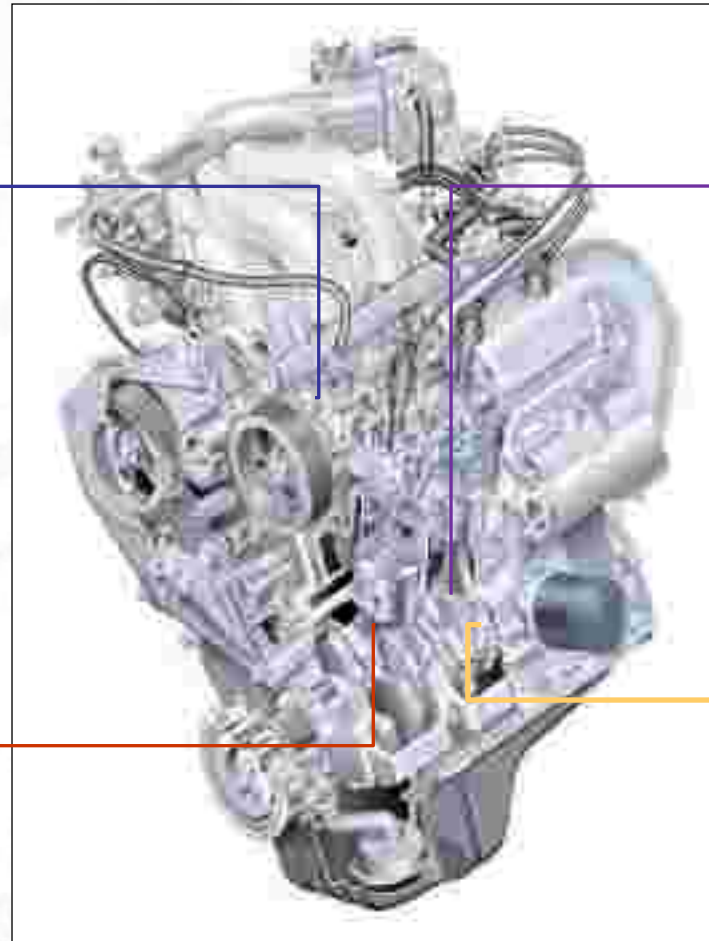
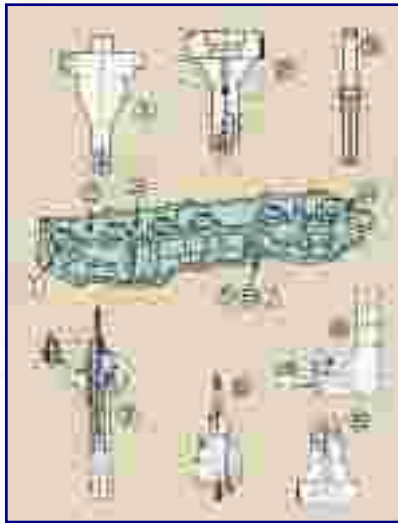
Auto Measuring
Helicheck (Cutting tool)



Auto Measuring
Microscope (Bite & Tip)

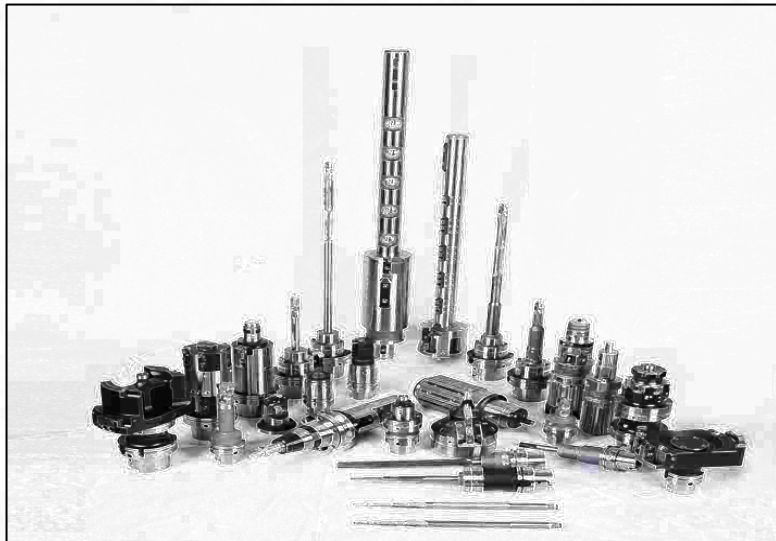


Machining parts



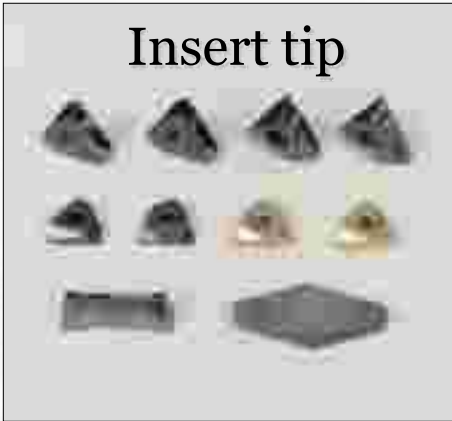
Total tooling products (1/2)

Special boring tool



Total tooling products (2/2)

Insert tip



Bite



Diamond Reamer



Special DRILL & REAMER(for ABS)



ABOUT TOOLS (1/3)



1. Cylinder Block Tooling
2. Cylinder Head Tooling
3. Connecting Rod Tooling
4. Crank Shaft/Cam Shaft Tooling

ABOUT TOOLS (2/3)



5. Transmission Case Tooling

6. Control Valve Body Tooling

7. Transmission Gear Tooling

ABOUT TOOLS (3/3)

8. Steering Rack Housing Tooling

9. Brake Caliper Tooling

10. Cutting Tools



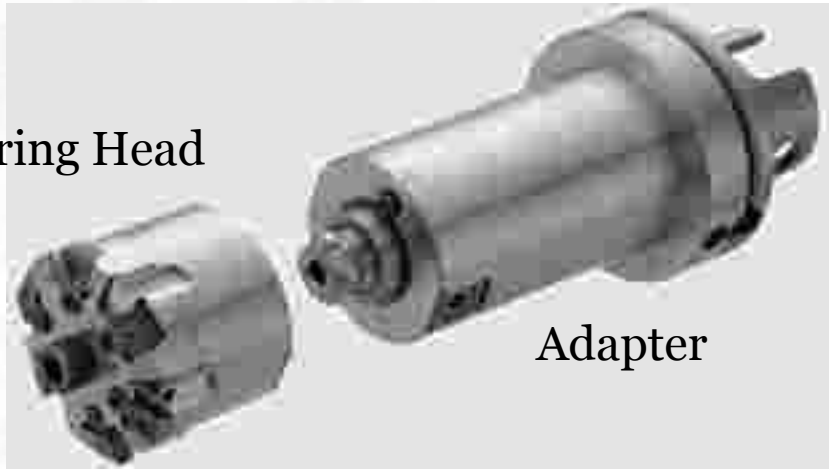
1. Cylinder Block Tooling



1. Cylinder Block Tooling

1) Cylinder Bore Rough Boring HOLDER

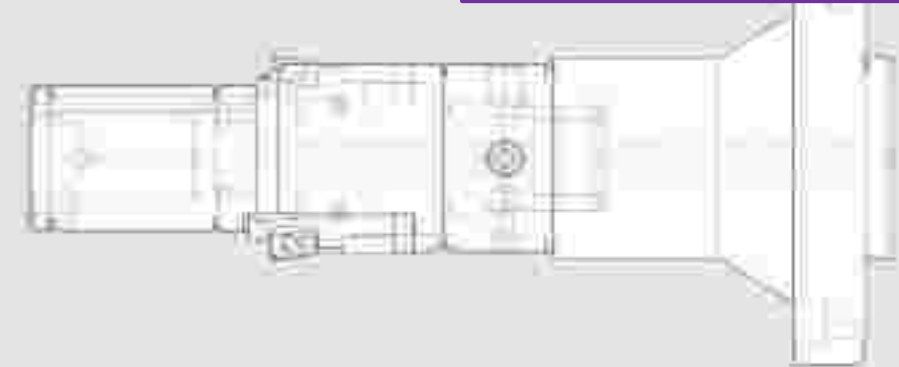
Boring Head



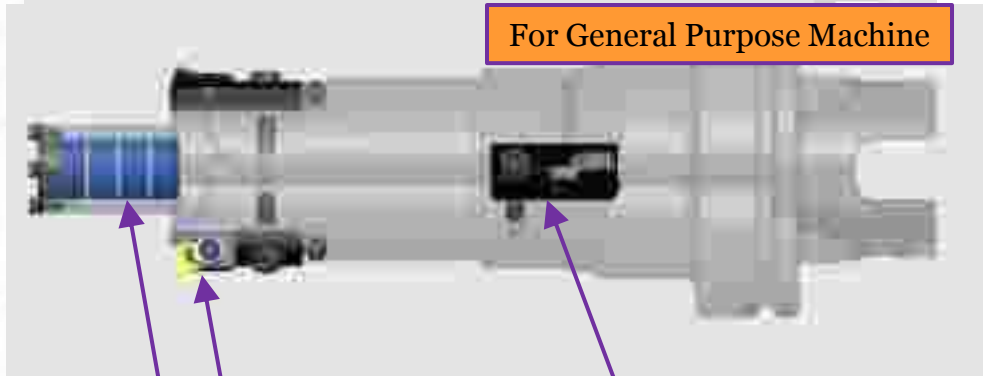
1. Cylinder Block Tooling

2) Cylinder Bore Semi Finish Boring HOLDER

For Special Purpose Machine



For General Purpose Machine



Damper

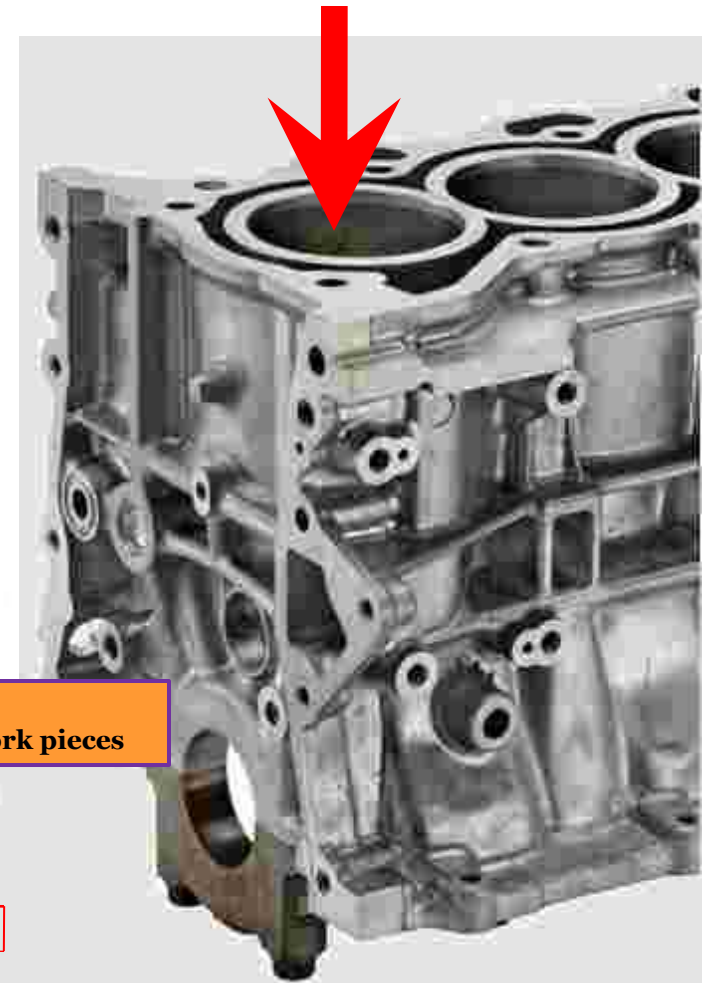
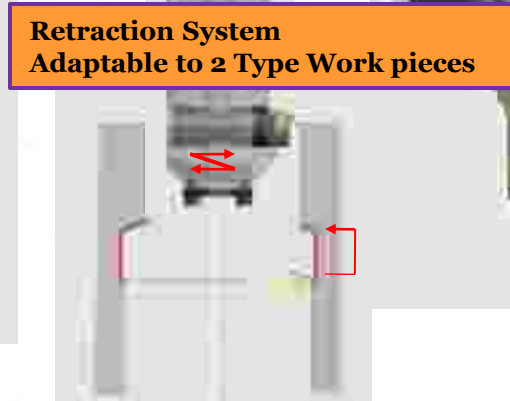
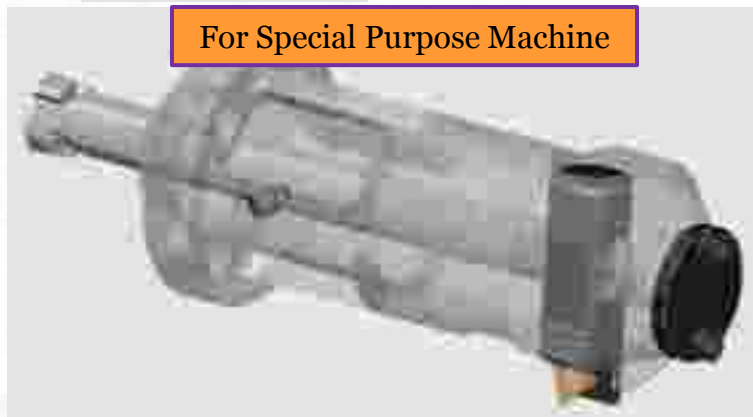
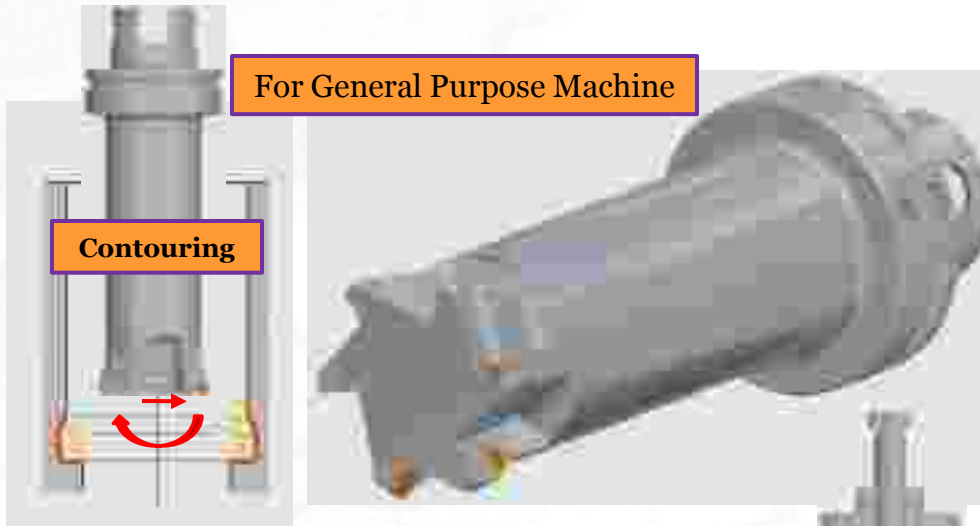
Semi-Finish

Chamfer



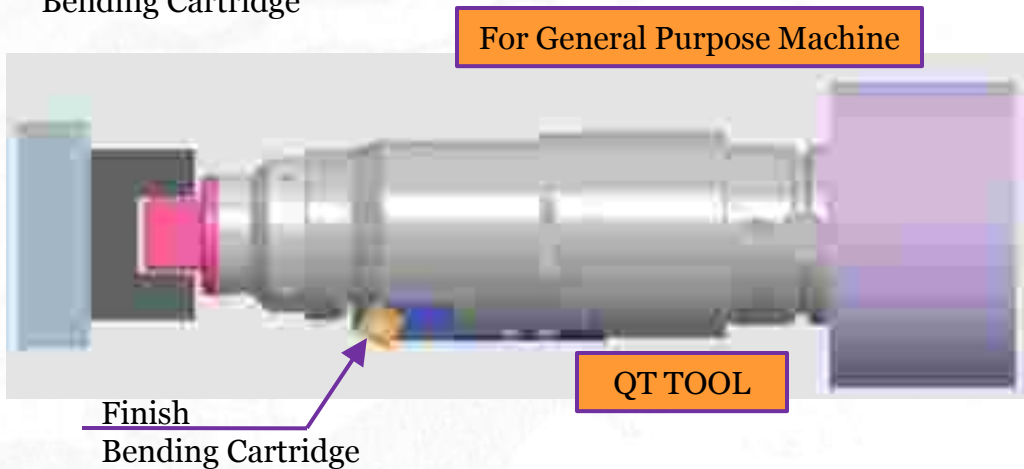
1. Cylinder Block Tooling

3) Cylinder Bore Under-Cut Boring



1. Cylinder Block Tooling

4) Cylinder Bore Finish Boring HOLDER



QT TOOL



QT TOOL



Work (Example)

【Cylinder Block】

Cylinder Bore



【Connecting Rod】



Process of Auto Adjusting

« Auto Adjusting Cycle »

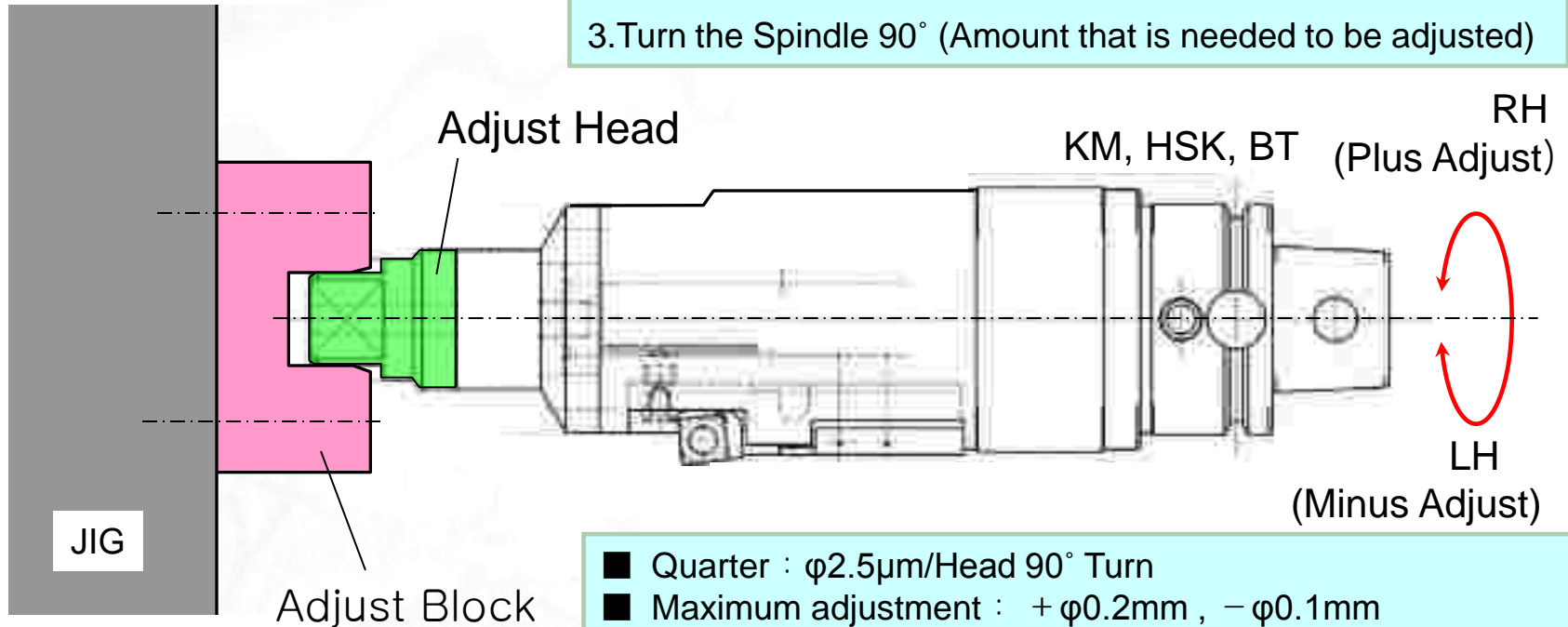
1. Main Spindle Orientation

(Available at the location of ATC)

2. Insert the Head to Adjust Block

(Recommendation: $F=300$ mm/min)

3. Turn the Spindle 90° (Amount that is needed to be adjusted)



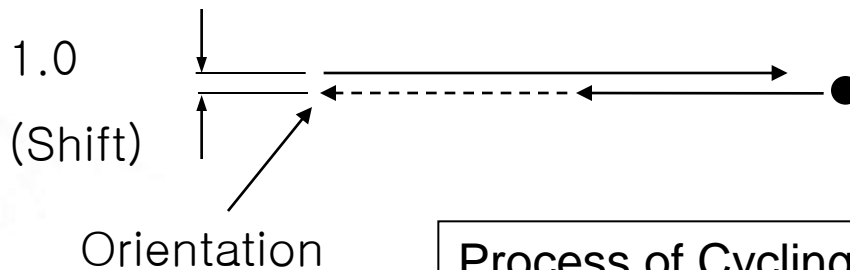
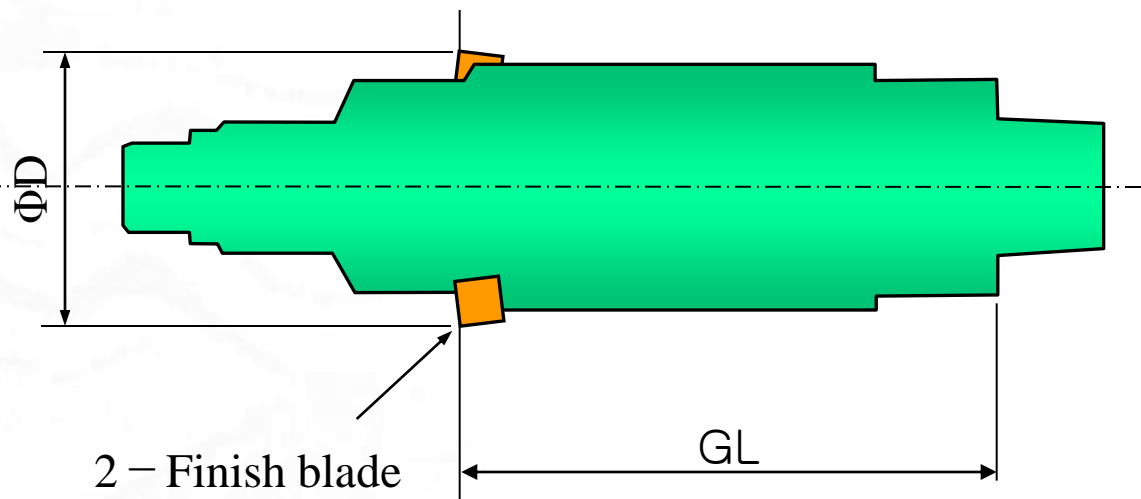
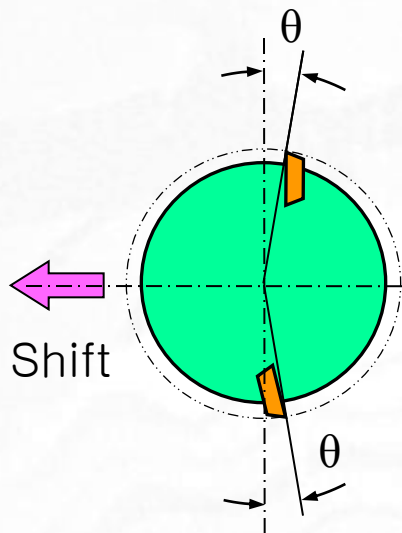
- Quarter : $\phi 2.5\mu\text{m}/\text{Head } 90^\circ \text{ Turn}$
- Maximum adjustment : $+\phi 0.2\text{mm}$, $-\phi 0.1\text{mm}$
- Permissible revolution : 6,000rpm
- ※ Position of the Spindle must be fixed when it is inserted
- ※ Spindle Machine needs the function of the Quarter!

Feed Layout

Finish 2 blade

Purpose :

Improvement of roundness by Balance Cut



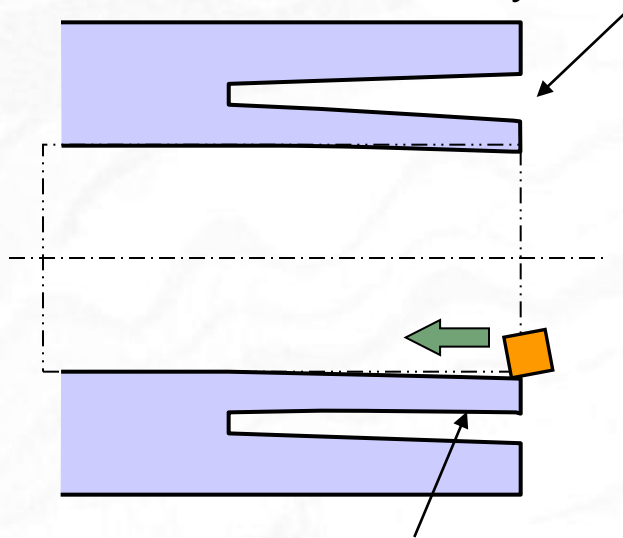
Process of Cycling

Effect of Balance Cut

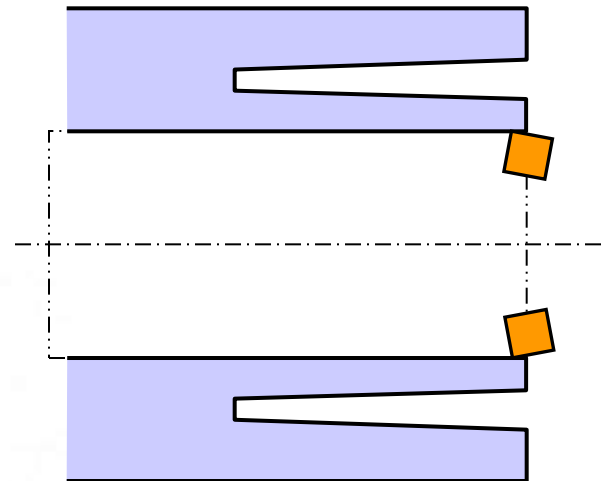
Case of Cylinder Bore

1 blade

Way of Open Deck, Work

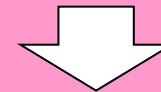


2 blade

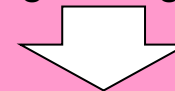


Due to the cutting resistance, the Work can be changed and the shape can get worse easily.

In a good state of Roundness Straightness



Minimum of Honing cutting resistance

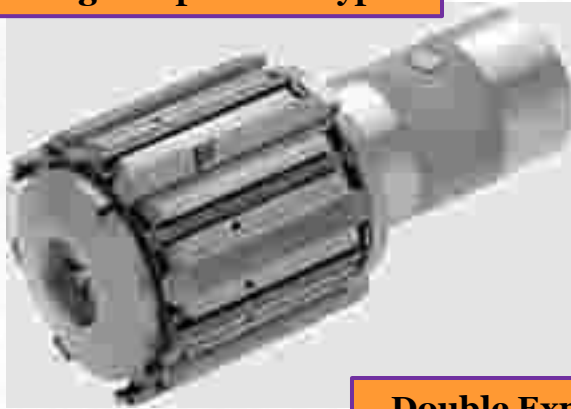


Reduction of Honing processing time

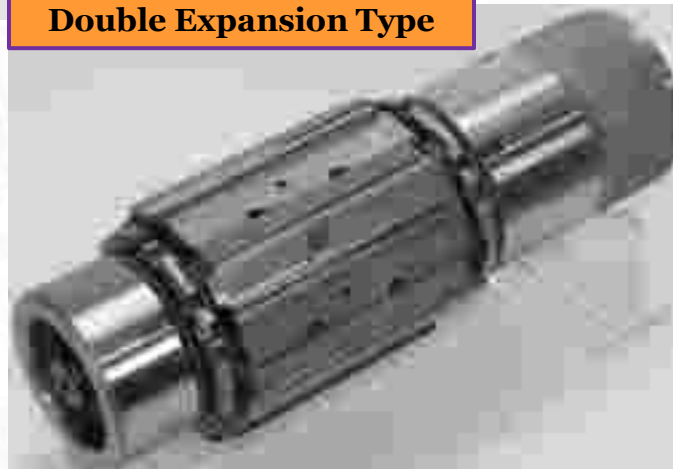
1. Cylinder Block Tooling

5) Cylinder Bore Honing HOLDER

Single Expansion Type



Double Expansion Type

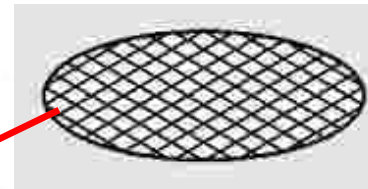


HONING

HONING HOLDER

Purpose

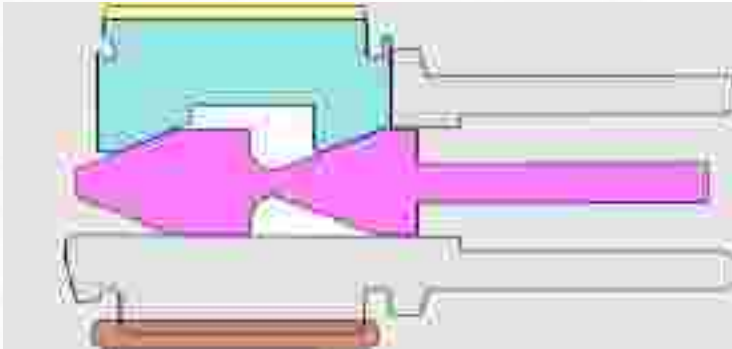
- To secure the High precision and Cylindricity of Bore
- To generate CROSS ANGLE



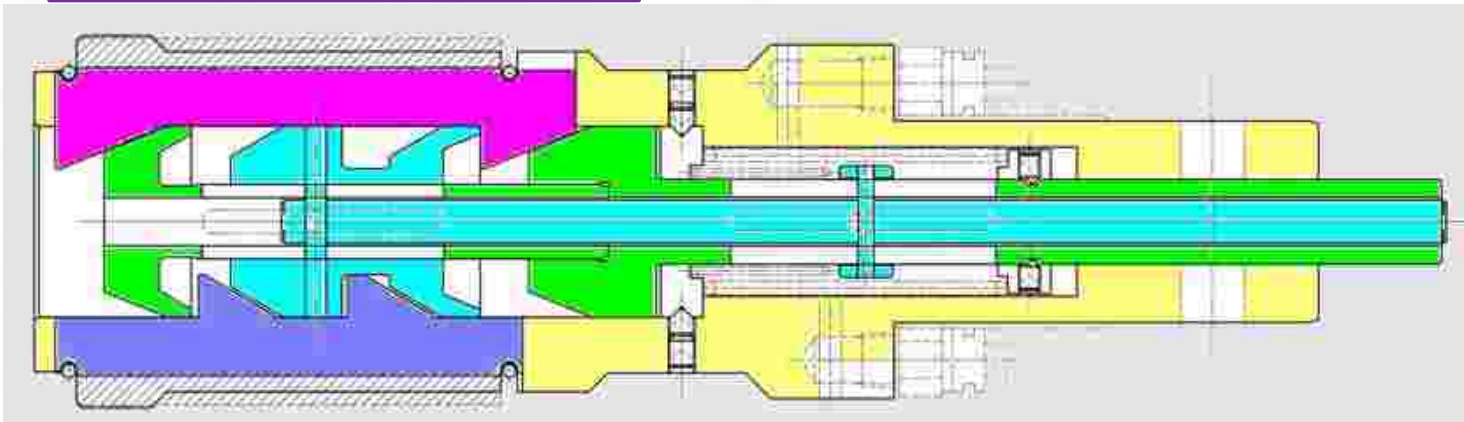
CROSS ANGLE

HONING

Single Expansion Type

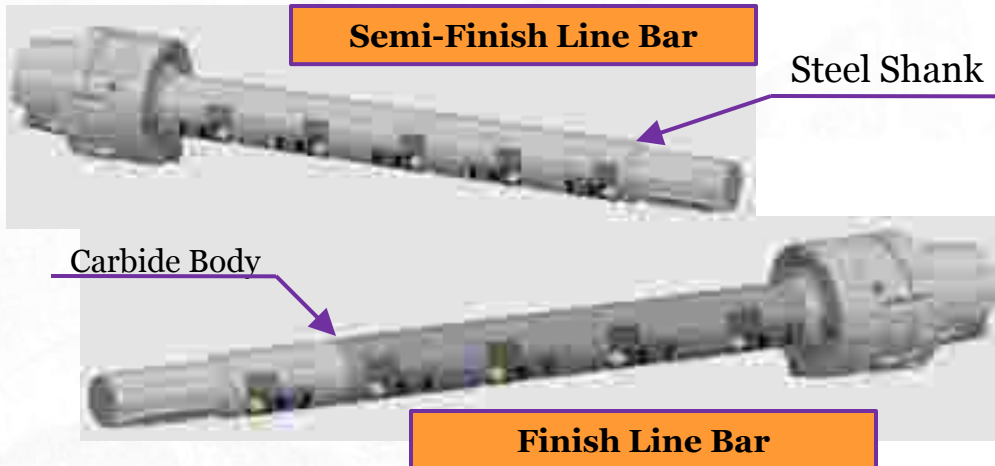


Double Expansion Type

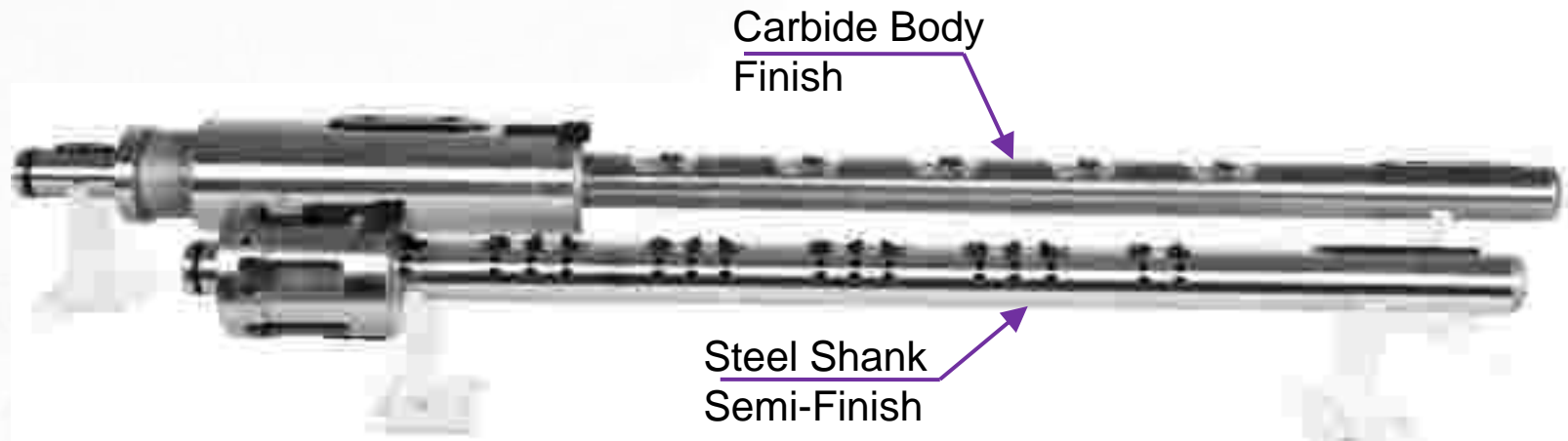


1. Cylinder Block Tooling

6) Crank Bore HOLDER



Crank bore Tool

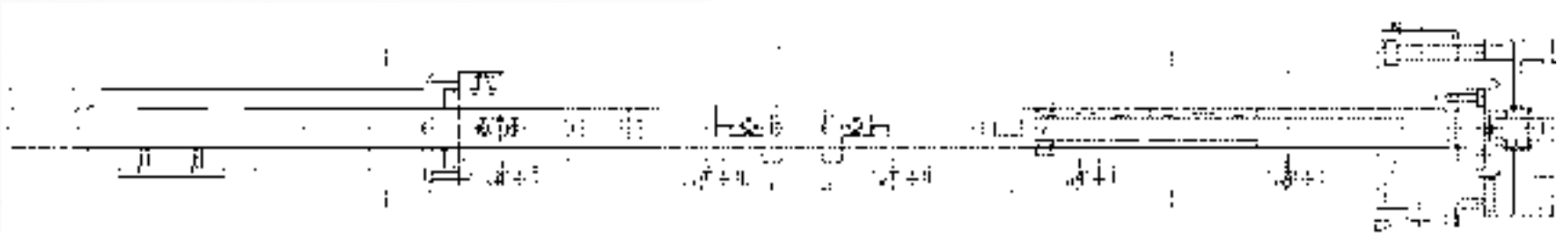


ROUGH

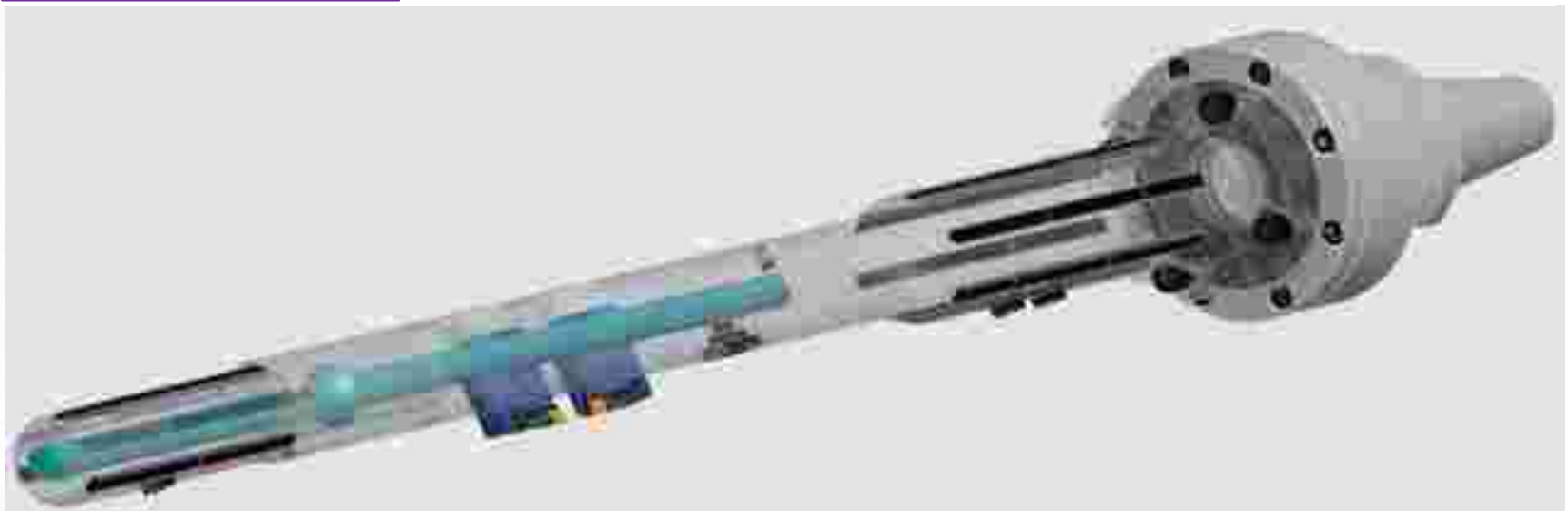
FINISH

Crank bore Tool

H社 T** Eng.



Semi-Finish Line Bar
+
Trust Facing



Etc. Crank bore Tool

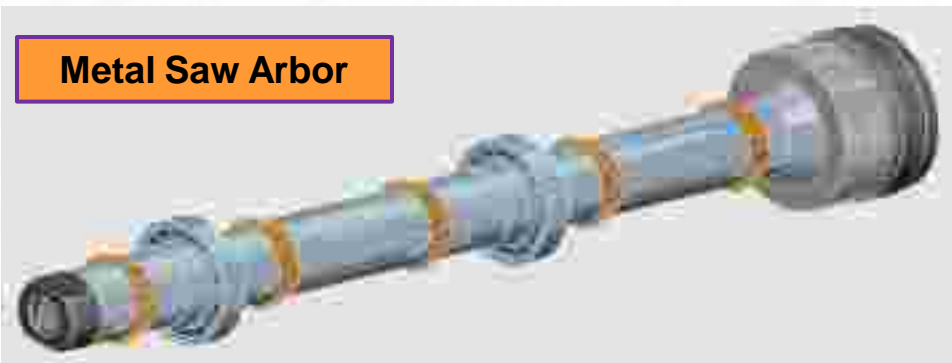
Side Cutter Arbor



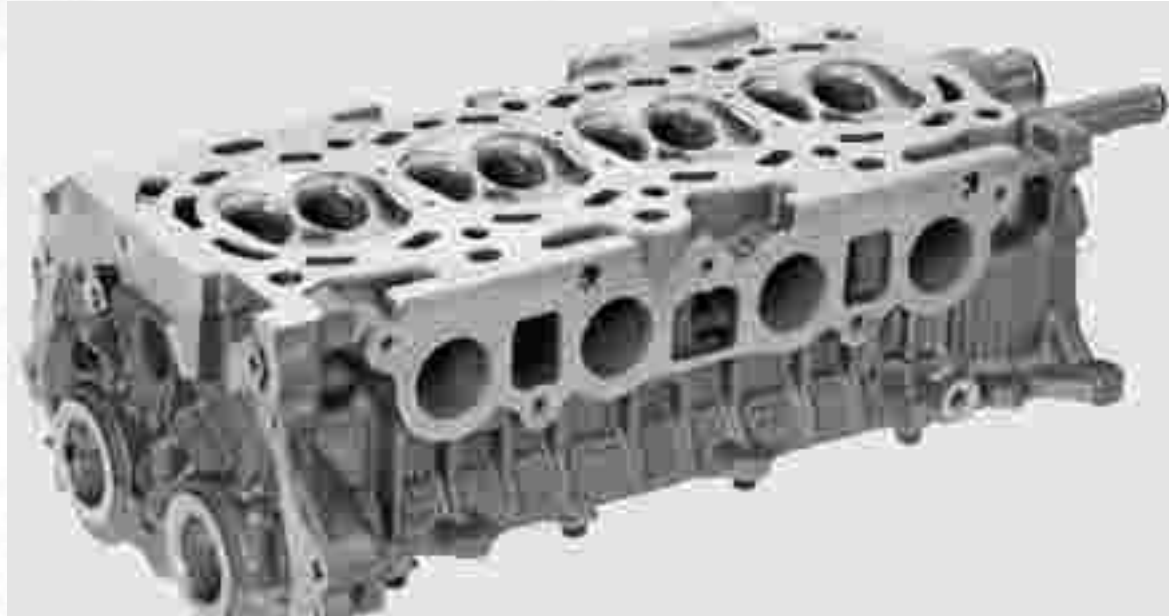
Broach Holder



Metal Saw Arbor

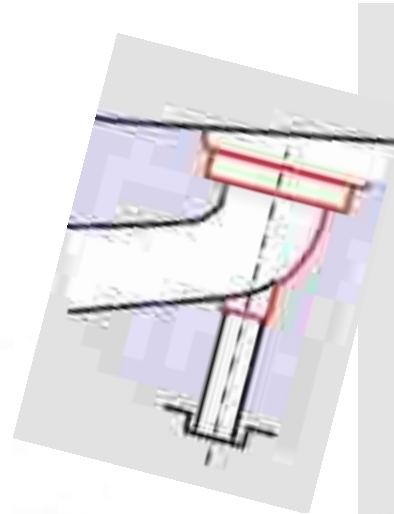
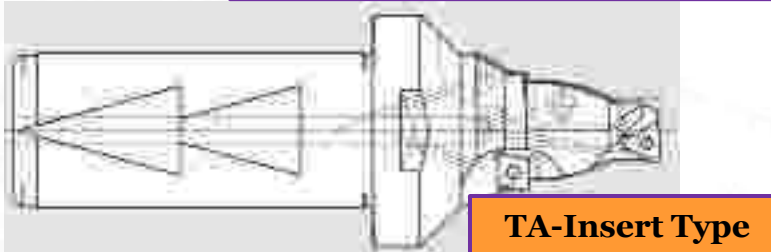
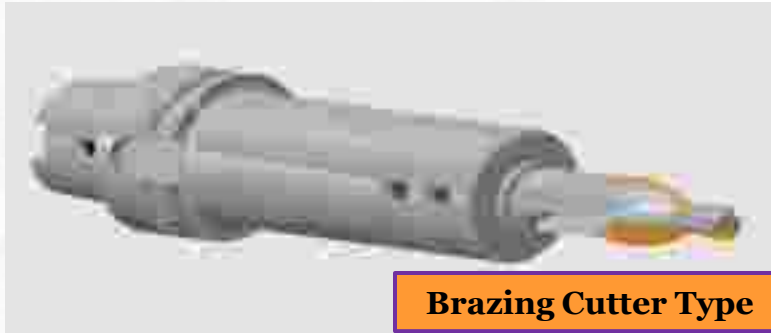


2. Cylinder Head Tooling



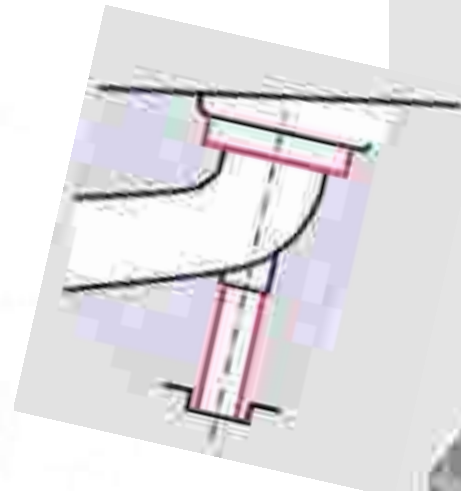
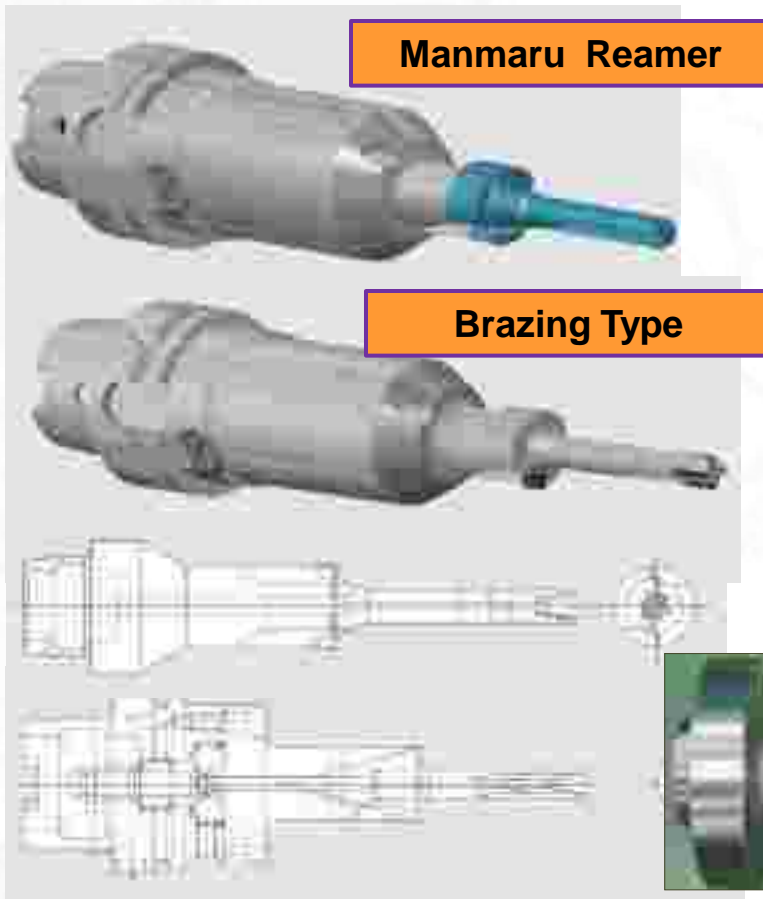
2. Cylinder Head Tooling

1) Valve Guide/Seat Rough / Port Cutter



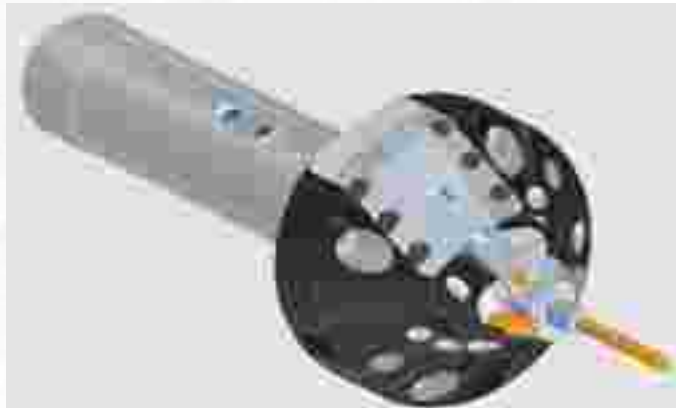
2. Cylinder Head Tooling

2) Valve Guide/Seat Finish Reamer (Cutting Edge 1~6)

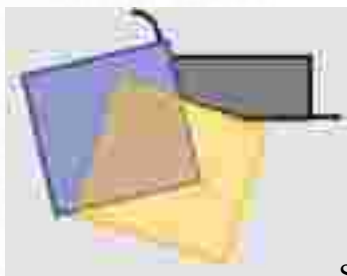


2. Cylinder Head Tooling

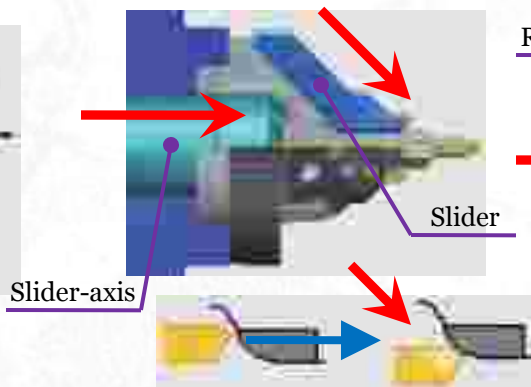
3-1) Valve Guide/Seat Finish (Traverse Type - For Special Purpose Machine)



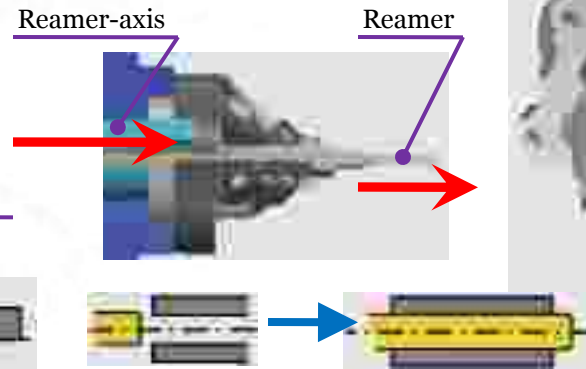
1st Process :
2 Chamfers
by Plunge Cutting



2nd Process :
45° Chamfer
By Traverse Cutting



3rd Process :
Valve Guide Hole Finish
by Reamer



Valve Seat

Valve Guide Hole



2. Cylinder Head Tooling

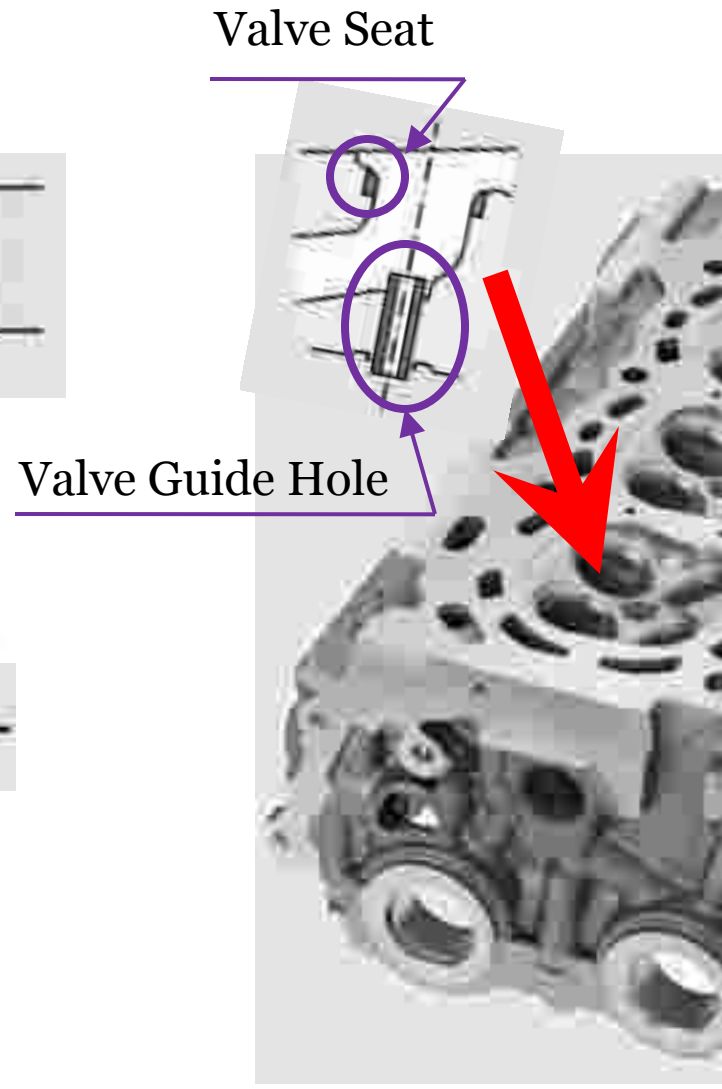
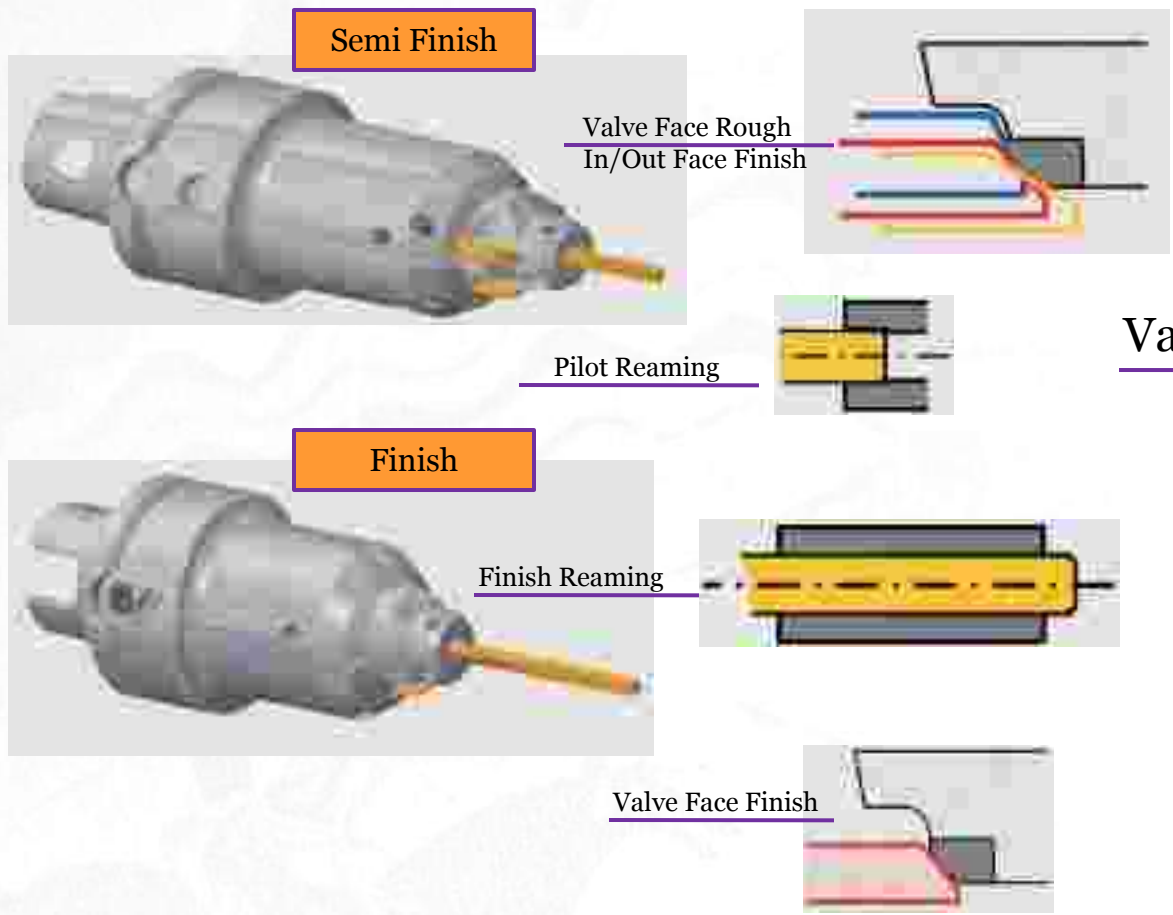


Traverse Type



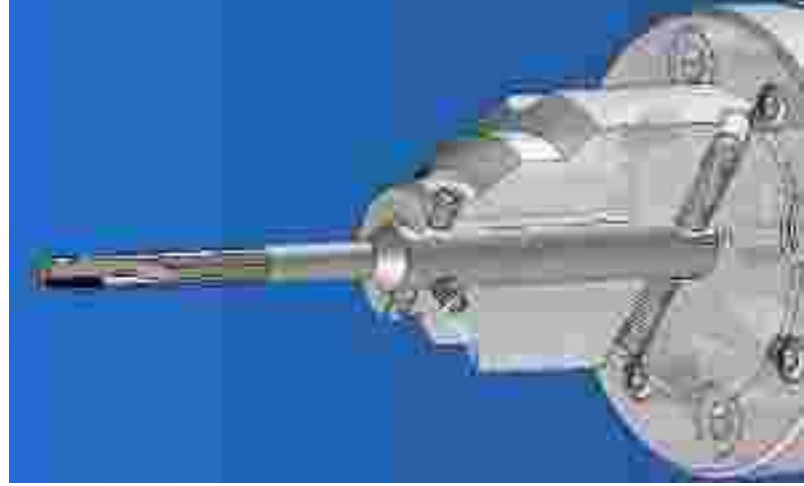
2. Cylinder Head Tooling

3-2) Valve Guide/Seat Finish (Plunge Type - For General Purpose Machine)

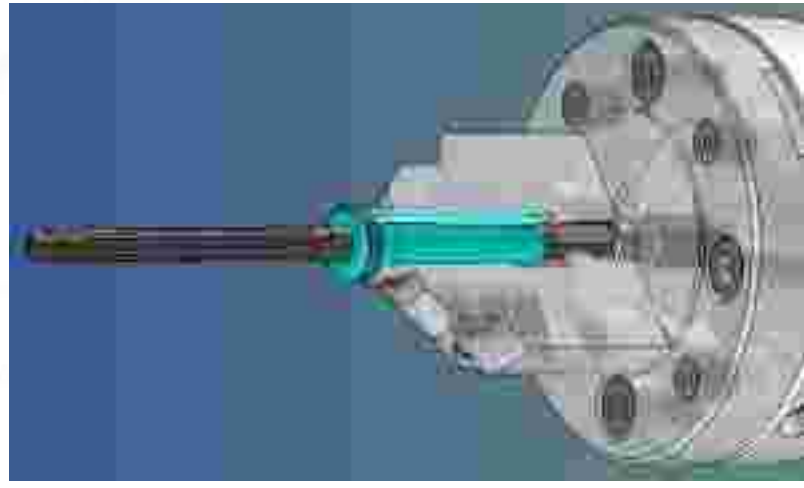
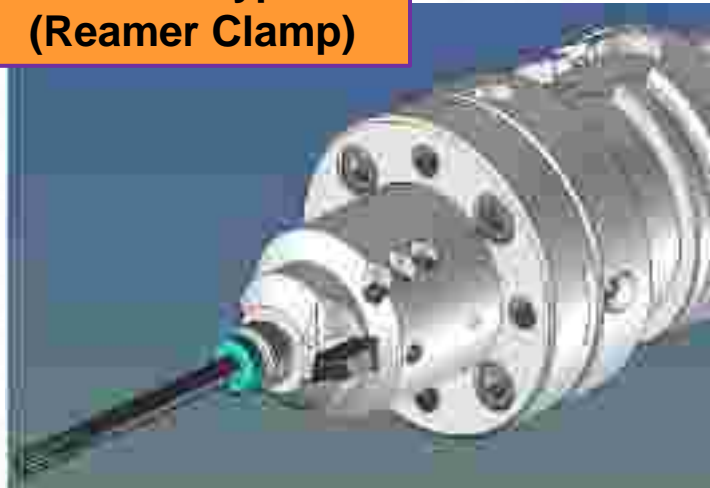


Valve- FINISH TOOL

**Side Lock Type
(Reamer Clamp)**



**Collet Type
(Reamer Clamp)**

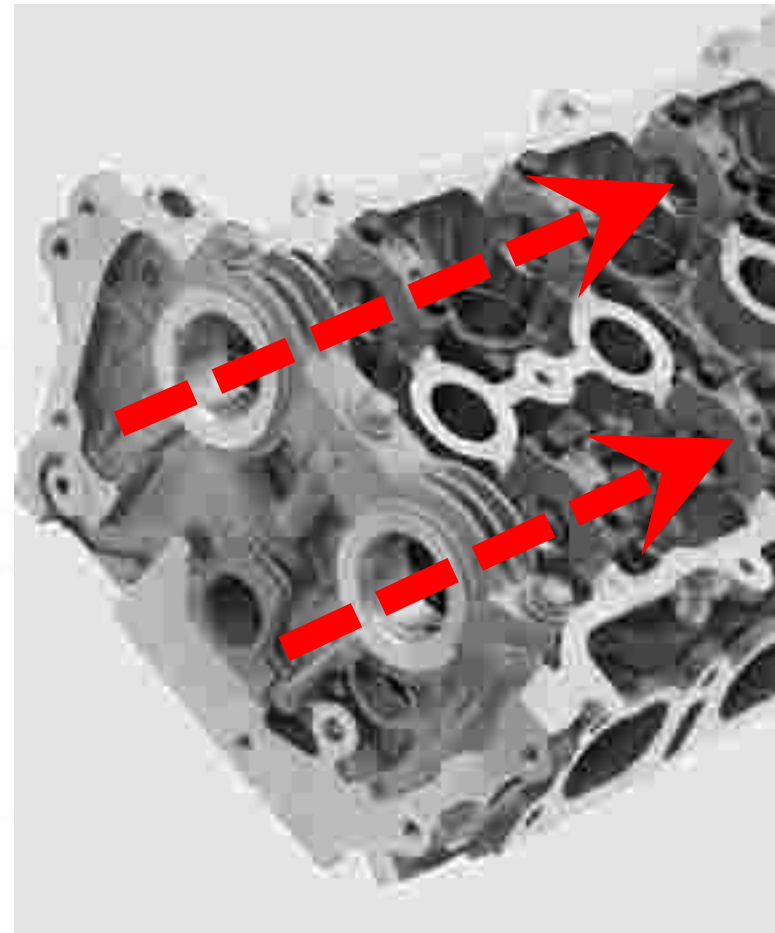


2. Cylinder Head Tooling

4) Cam Finish Line Boring HOLDER



GB-TOOL



Feature of GB TOOL

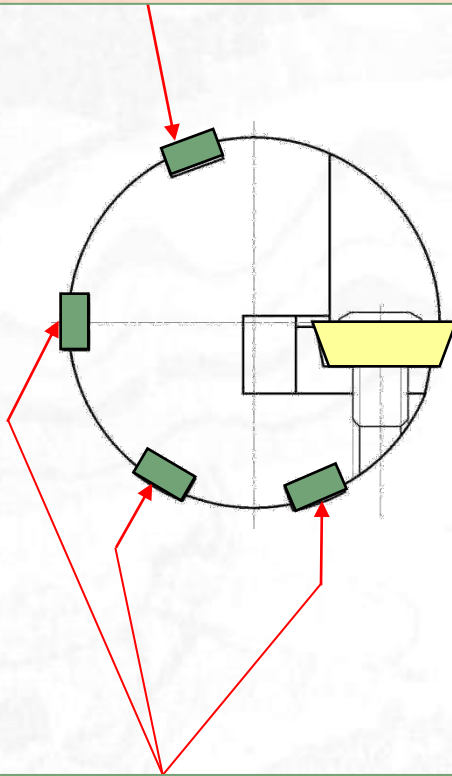
1. GUIDE PAD supports high precision and high efficiency & Fine adjustment of each parts
2. Reduction of RUNNING COST due to the THROW AWAY INSERT TIP



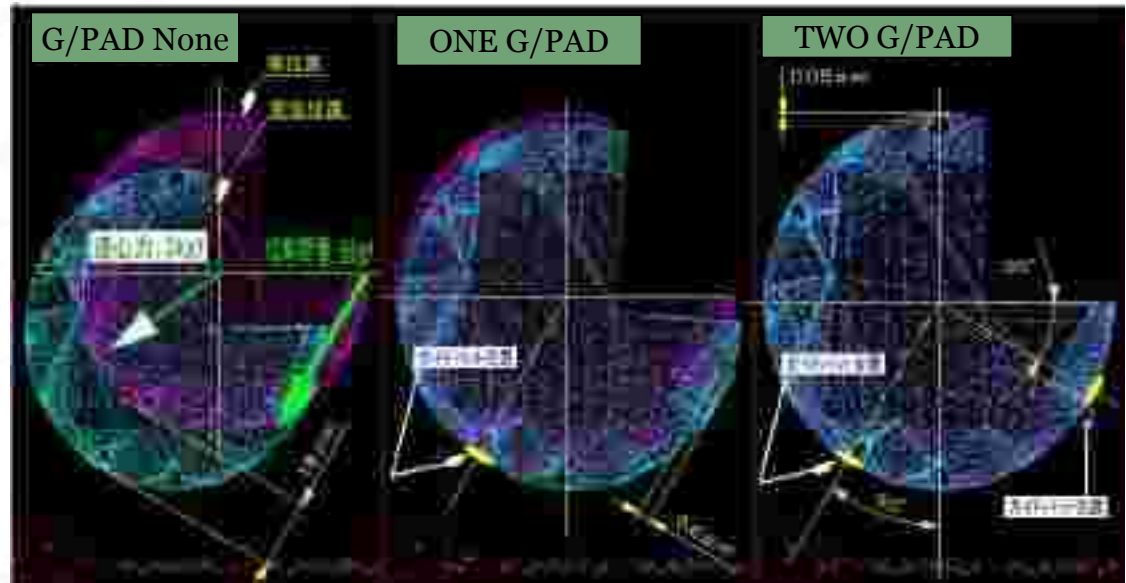
Arrangement of GUIDE PAD

TOOL Diameter	Φ16mm
Cutting weight	6Kgf
Revolution	3000rpm

Confirmation PAD of GUIDE diameter

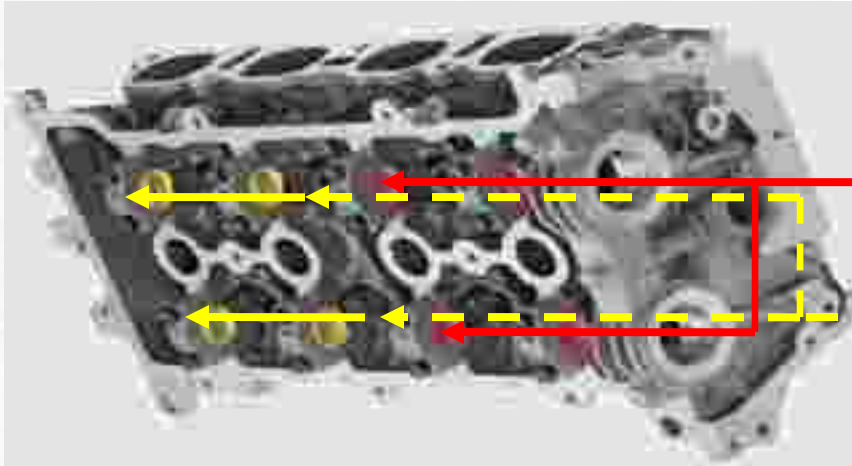


Example of Cutting TOOL Displacement



GUIDE: Prevention of TOOL displacement

Machining Example (Cylinder Head)



Short Tool



Long Tool

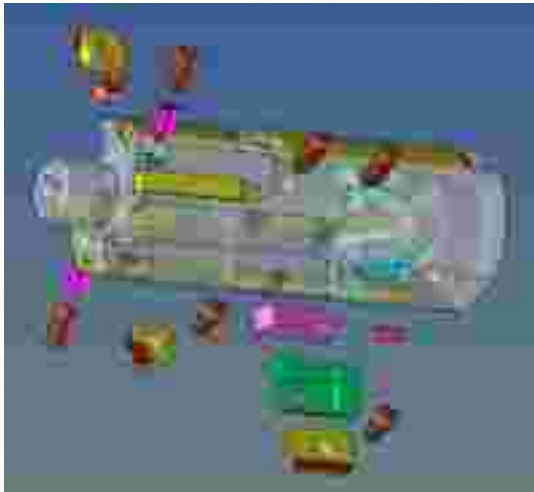
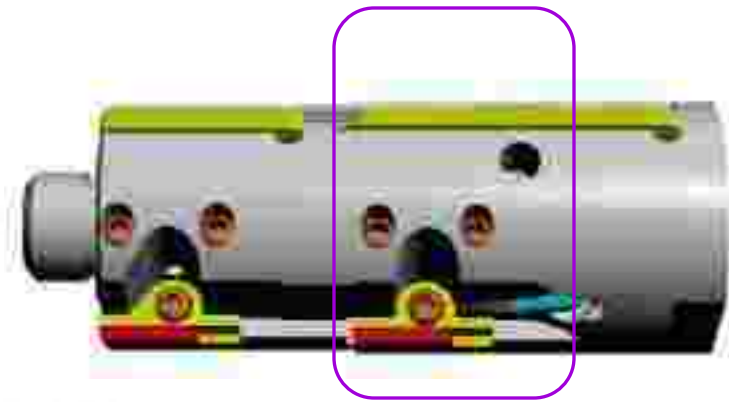
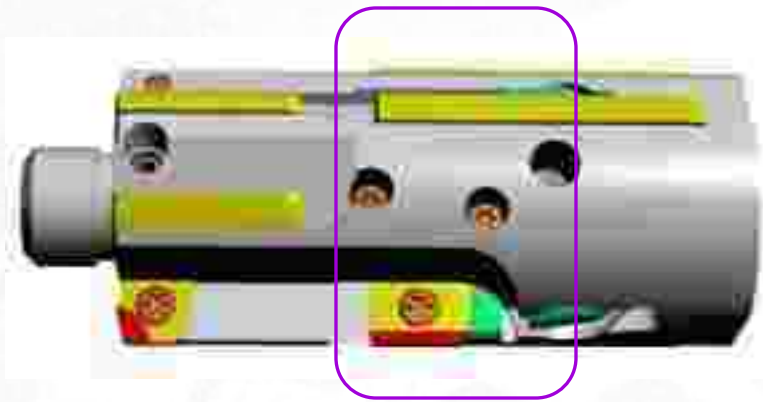


- Circularity : **3 μ m**
- Roughness : **Rz3.2**
- Hole Dia. Accuracy : **IT7**
- Cutting Speed 200~300m/min
Feed Rate 0.1~0.2mm/rev
Internal coolant
Coolant concentration : 5% or more
- Cylinder Head/Cam hole, Steering Housing
- Easy setting by using dedicated setting gauge (sold separately)



- Setting gauge(sold separately)

GB TOOL Insert Adjust Pattern



1. Finish Edge Seat Adjust Type



2. Finish Edge Direct Adjust Type

3. Connecting Rod Tooling

1) Small End Hole

UP Boring Holder + Drilling



Contouring(Chamfer)



Finish Boring (Cartridge Holder)



Plunge



Finish Boring (BITE Holder)



Connecting Rod

3. Connecting Rod Tooling

2) Large End Hole

UP Boring Holder + Drilling



Contouring(Chamfer)



Micro-Adjust Holder



Plunge



Sliding Holder

Honing Head



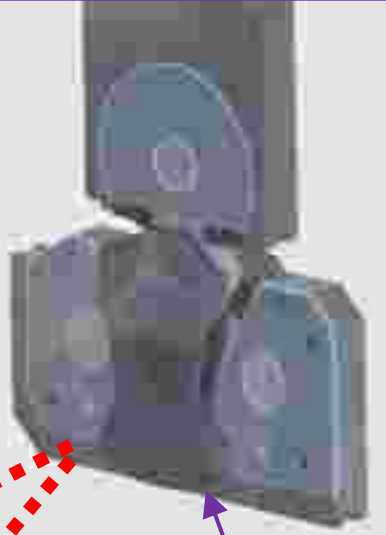
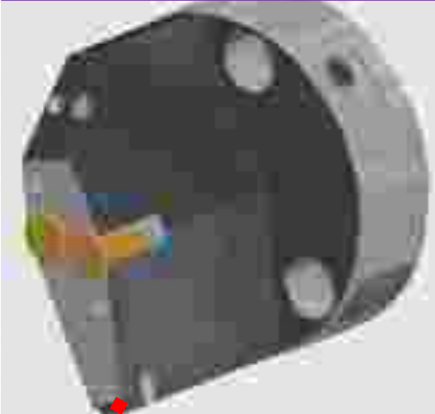
Connecting Rod

4. Crank Shaft/Cam Shaft Tooling

Pin Roller Holder
For Journal Thrust Wall Facing

Fillet Roller Holder
For Pin / Journal Groove

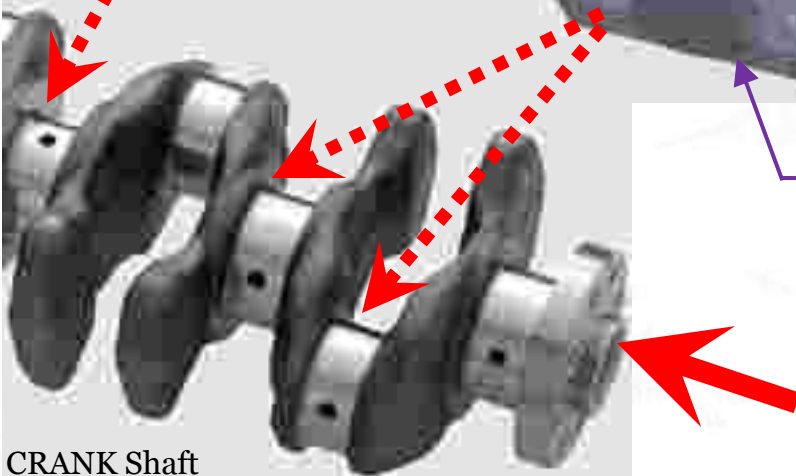
Centering Holder



For Special purpose machine For Quick Change



For General purpose machine



CRANK Shaft



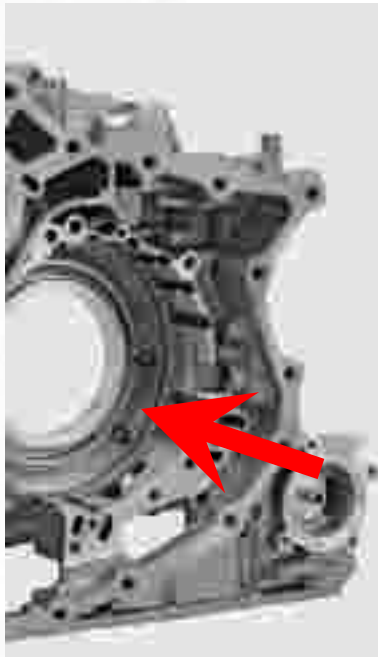
CAM Shaft

5. Transmission Case Tooling

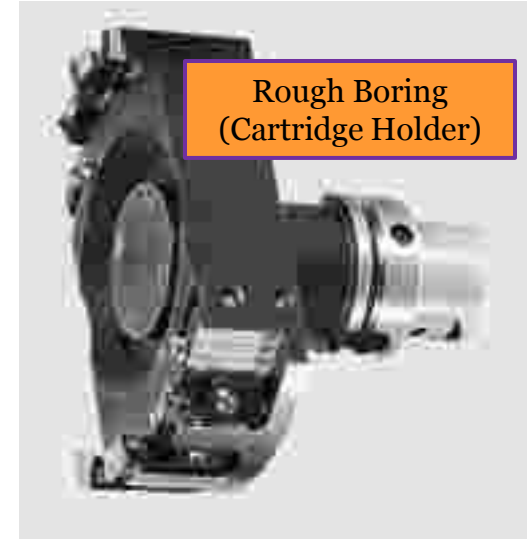
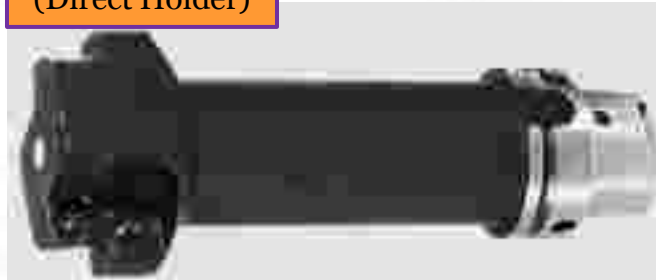


5. Transmission Case Tooling

1) Rough Boring



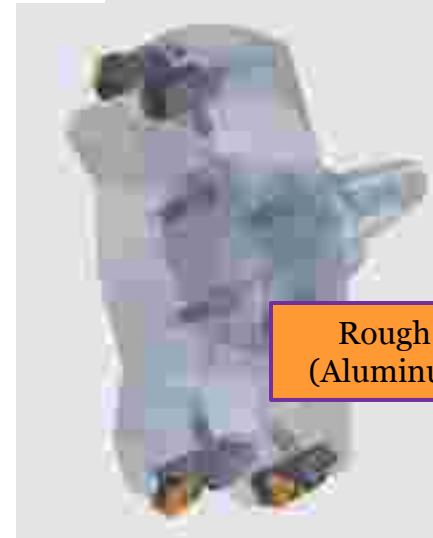
Rough Boring
(Direct Holder)



Rough Boring
(Cartridge Holder)



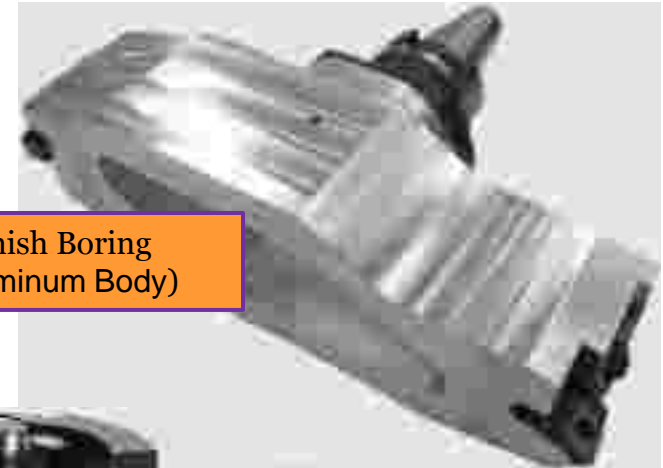
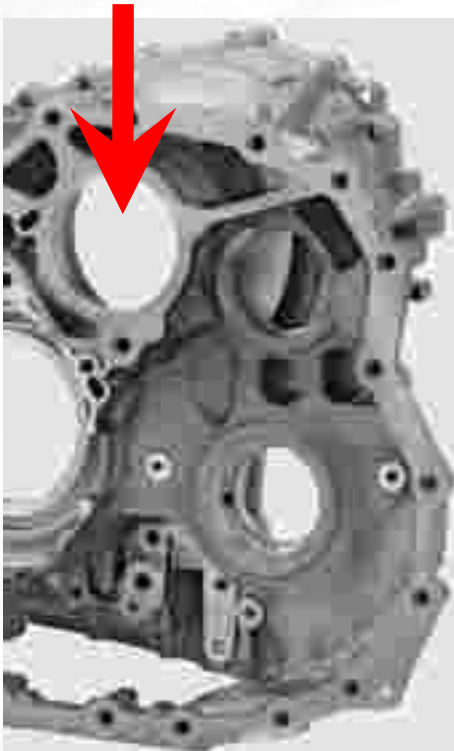
BH TOOL
(Blade Hive Tool)



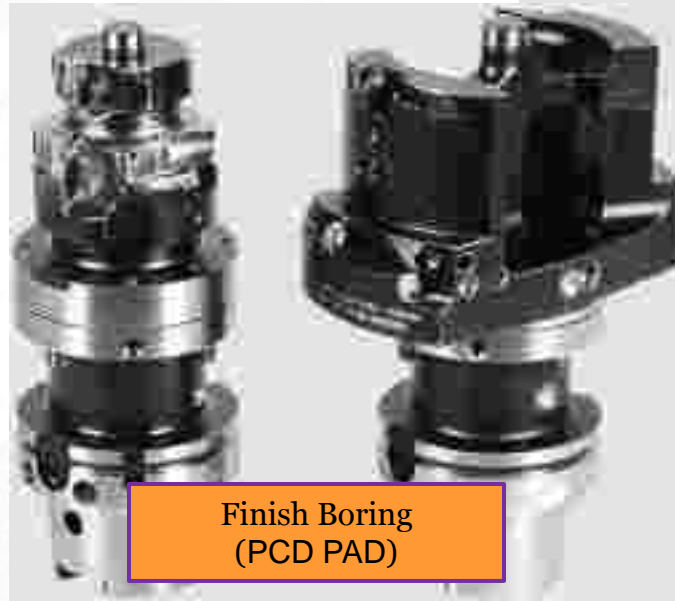
Rough Boring
(Aluminum Body)

5. Transmission Case Tooling

2) Finish Boring



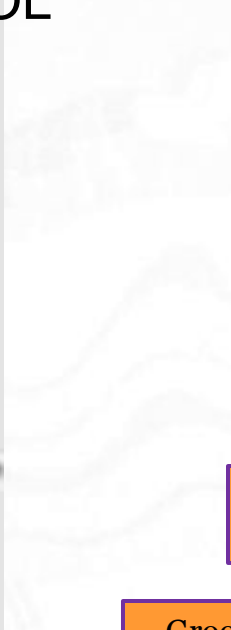
Finish Boring
(Aluminum Body)



Finish Boring
(PCD PAD)

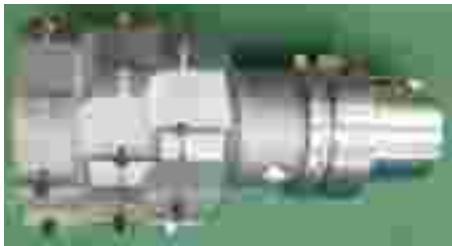
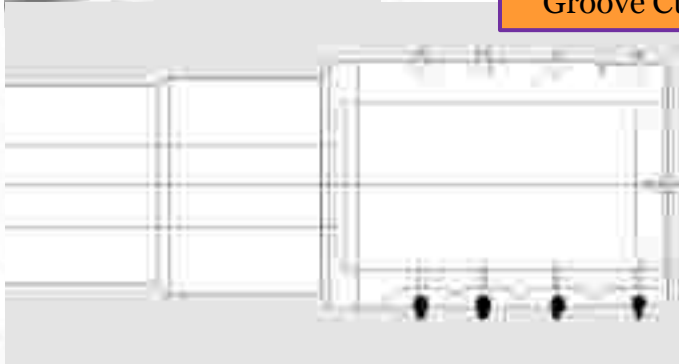
5. Transmission Case Tooling

3) Etc. TOOL



DIC ENDMILL
(ENDMILL + Rough Boring)

Groove Cutter



Combination Type
(Indexable Inserts + Multiple Drill)



G7X Drill
(IT7 Tolerance)



GK Multiple Drill

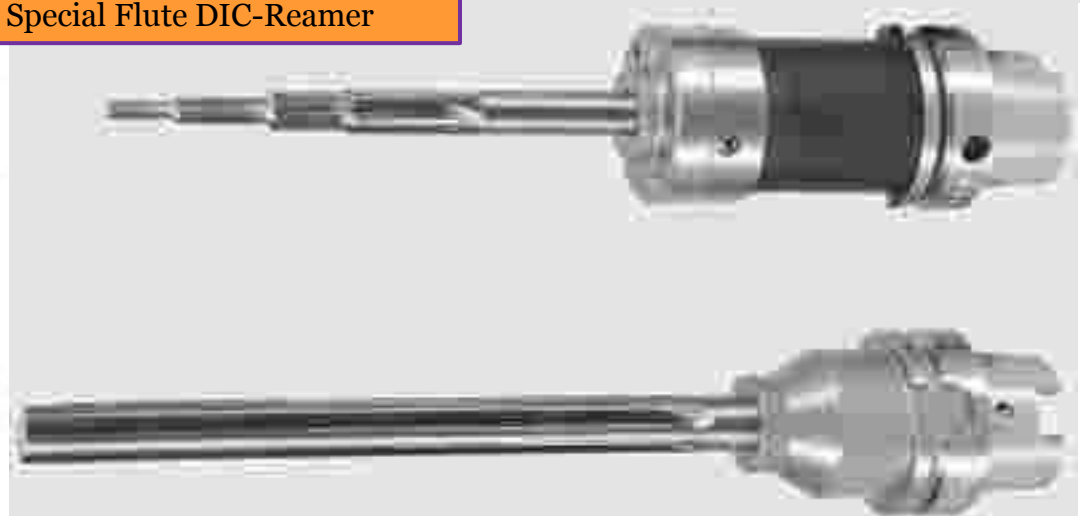
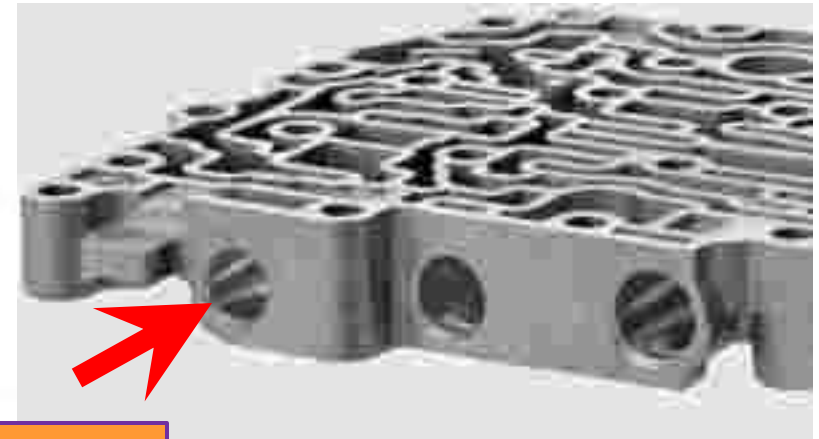


6. Control Valve Tooling

1) Spool Hole Finishing



Special Flute DIC-Reamer



6. Control Valve Tooling

2) Hole Drilling

Multiple Step Drill



7. Transmission Gear Tooling



Honing Head
($\Phi 15.3\sim$)



Hob Arbor



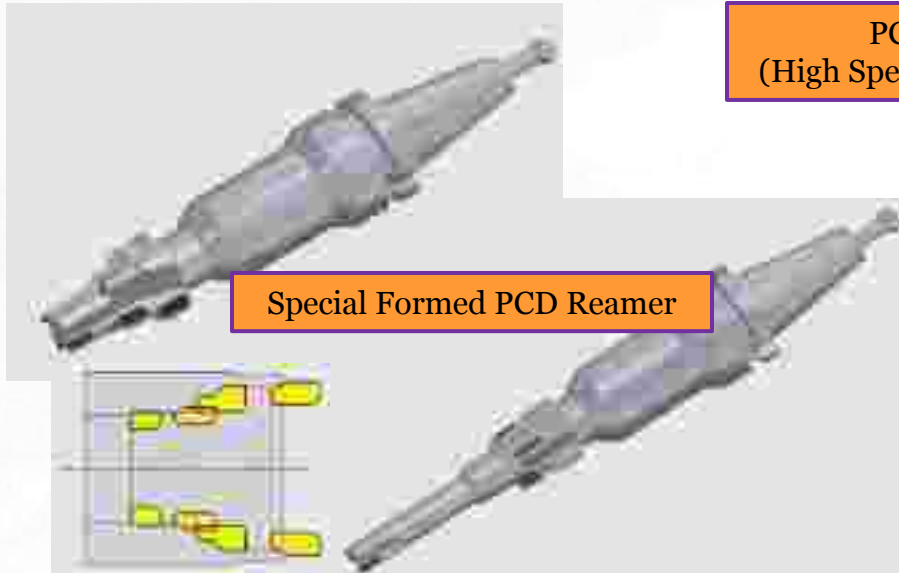
Multiple-Edge Holder

8. Steering Rack Housing Tooling

PCD Reamer
(High Speed and High Feed)



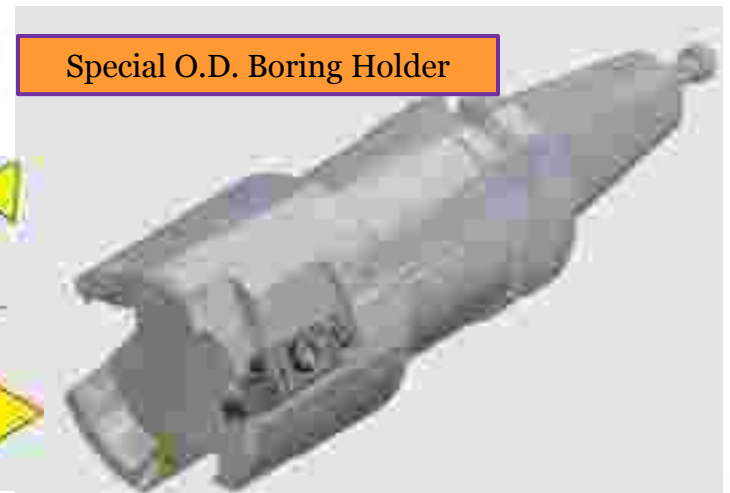
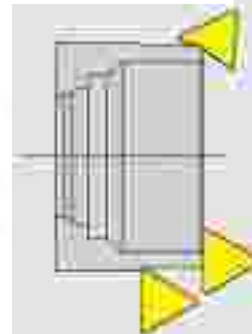
Special Formed PCD Reamer



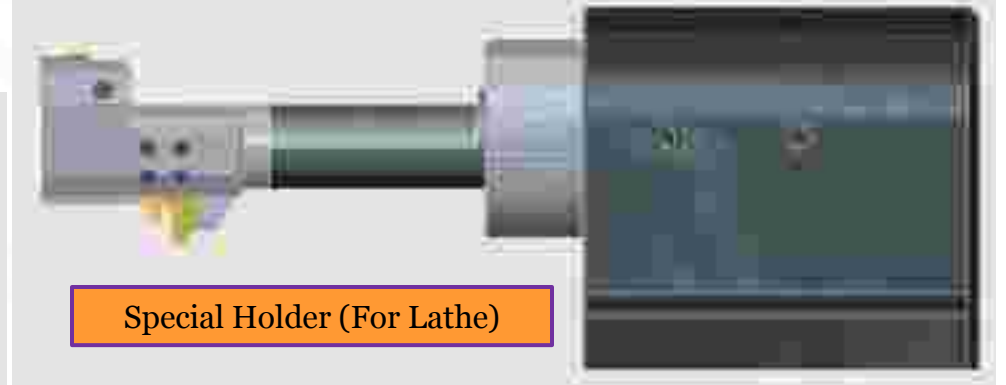
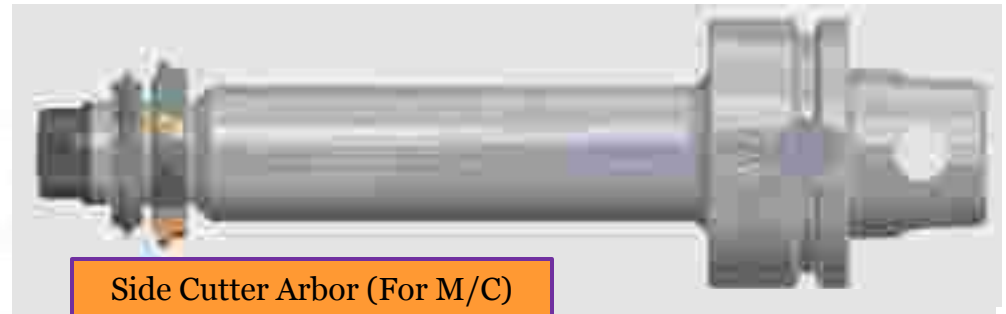
GB Tool
(High Precision)



Special O.D. Boring Holder



9. Brake Caliper Tooling



10. Cutting Tools

General cutting



For Aluminum



For Steel & Cast Iron



GK Drill



TWIST Drill



GIX Drill



TFS Drill

One Shot cutting



G7 Drill



GD Drill



GF Drill

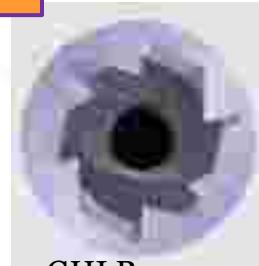
High Efficiency & High Accuracy cutting



GP Drill



TFH Drill



GHI Reamer



1 Edge Reamer



Manmaru Reamer

10. Cutting Tools

1) GK Drill

(1) Characteristics

- ① Good Straightness
- ② Special shape available as requested

(2) Cutting Condition (Standard)

- ① Cutting Speed (m/min): 50~240
- ② Feed Rate (mm/rev): 0.02~0.04*Drill Dia.

For Aluminum



For Steel & Cast Iron



2) TFS Drill (Low Resistance Cutting Edge)

(1) Characteristics

- ① Outstanding chip discharging
- ② Long Tool Life

(2) Cutting Condition (Standard)

- ① Cutting Speed (m/min): 50~120
- ② Feed Rate (mm/rev): 0.03~0.05*Drill Dia.

10. Cutting Tools

3) G7 Drill (Power of Special Edge)

(1) Characteristics

- ① One-Shot Finish IT7
- ② Drill+Reamer+Guide

(2) Cutting Condition (Standard)

- ① Cutting Speed (m/min): 50~150
- ② Feed Rate (mm/rev): 0.1~0.2

For Aluminum



4) GP Drill (Low Resistance Cutting Edge)

(1) Characteristics

- ① High Speed Cutting
- ② One-Shot Finish IT8

(2) Cutting Condition (Standard)

- ① Cutting Speed (m/min): 50~400
- ② Feed Rate (mm/rev): 0.01~0.02*Drill Dia.

For Aluminum



10. Cutting Tools

5) TFH Drill (Low Resistance Cutting Edge)

(1) Characteristics

- ① High Efficiency Cutting
- ② Feed: 15% of Drill Dia.

(2) Cutting Condition (Standard)

- ① Cutting Speed (m/min): 60~400
- ② Feed Rate (mm/rev): $0.15 \times \text{Drill Dia.}$

For Aluminum



6) GHI Drill (High Stiffness Cutting Edge)

(1) Characteristics

- ① High Efficiency Cutting
- ② Excellent Circularity
- ③ Coating : TiALN , ALCrN

(2) Cutting Condition (Standard)

- ① Cutting Speed (m/min): 20~100
- ② Feed Rate (mm/rev): 0.2~0.6

For Cast Iron



10. Cutting Tools

7) GIX Drill (Low Resistance Cutting Edge)

(1) Characteristics

- ① High Efficiency Cutting
- ② High Precision
- ③ Coating : TiALN , ALCrN

(2) Cutting Condition (Standard)

- ① Cutting Speed (m/min):60~160
- ② Feed Rate (mm/rev): 0.04*Drill Dia.

For Cast Iron



8) GF Drill (Power of Special Edge)

(1) Characteristics

- ① One-Shot Finish IT8
- ② Drill+Reamer+Reamer
- ③ Coating : TiALN , ALCrN

(2) Cutting Condition (Standard)

- ① Cutting Speed (m/min):20~100
- ② Feed Rate (mm/rev):0.05~0.3

For Cast Iron



10. Cutting Tools

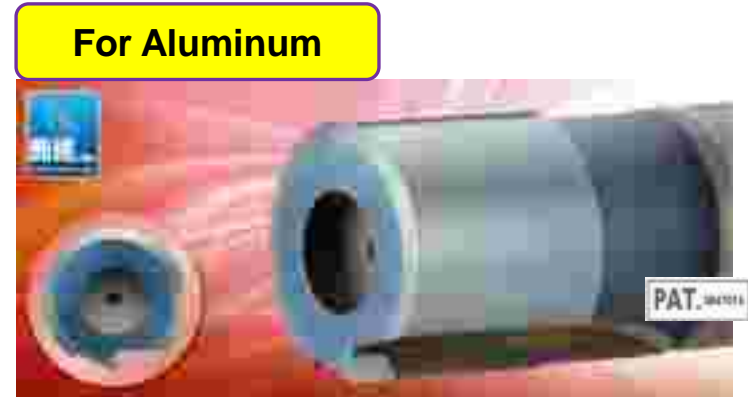
9) Manmaru Reamer (All-Round Guide)

(1) Characteristics

- ① Good Guide performance
- ② Good Circularity

(2) Cutting Condition (Standard)

- ① Cutting Speed (m/min): 40~400
- ② Feed Rate (mm/rev): 0.05~0.2



FUJI SEIKO GROUP GLOBAL NETWORK

C-max GROUP (Global Network)

Making full use of our global network, our company is paving the way to the future.

Providing the best possible services of quality, cost and delivery time and supporting our customers worldwide. We are committed to providing the best possible services to our customers. We are committed to providing the best possible services to our customers. We are committed to providing the best possible services to our customers.



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Thank you!