

SALES MANUAL

HT Series CNC Lathe

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CNC SLANT BED LATHE

52/76/92HT/HTL Series

The Microcut HT series CNC Lathe offers an exceptional combination of standard features in a rugged, affordable compact package. This machine with greater speed, power, accuracy and durability over competitors provides you highest possible return on investment.

Six models of this line for selection – 52HT, 52HTL, 76HT, 76HTL, 92HT, and 92HTL. 52HT/HTL is built with an ASA A2-6 spindle with 2.05" (52mm) through draw tube capacity and a maximum spindle speed of 4,500 rpm. 76HT/HTL is built with an ASA A2-8 spindle with 3.03" (77mm) through draw tube capacity and a maximum spindle speed of 3,000 rpm. 92HT/HTL is built with an ASA A2-8 spindle with 3.58" (91mm) through draw tube capacity and a maximum spindle speed of 2500 rpm. Two cutting length of 750mm (HT) and 1250mm (HTL) are available for choice.

A fast turret provides quick rotation time for the bidirectional 12-station turret and hydraulic turret as well as Programmable tailstock is standard accessories. Living tool, C-axis, bar feeder, chip conveyor, and parts catcher are available for complex parts and automatic production.



Fig. 1 Model 76HT Lathe with Fanuc Oi-TD controller

(chip conveyor, parts catcher, tool probe shown on the photo are optional accessories)



INDEX

1. MACHINE IMAGE	4
2. MAIN FEATURES	5
3. MAIN SPECIFICATIONS	6
4. DIMENSIONAL DRAWINGS	8
4.1 Layout Drawing	8
4.2 Foundation Drawing	8
4.3 Interference drawings	8
4.1 Layout Drawing	8
4.2 Foundation Drawing	9
4.3 Interference drawings	10
5. SPINDLE POWER & TORQUE CHARTS	16
5.1 52-HT/HTL – Fanuc 11/15kw spindle motor (standard)	16
5.2 52-HT/HTL – Fanuc 15/18.5kw spindle motor (option)	17
5.3 76-HT/HTL – Fanuc 15/18.5kw spindle motor (standard)	17
5.4 76-HT/HTL – Fanuc 18.5/22kw spindle motor (option)	18
5.5 92-HT/HTL – Fanuc 18.5/22kw spindle motor (standard)	18
5.6 92-HT/HTL – Fanuc 22/30kw spindle motor (option)	19
6. TOOLING SYSTEM	20
6.1 52/76-HT/HTL : Turret 8 station standard disc (Metric 25mm tooling)	21
6.2 52/76-HT/HTL : Turret 8 station standard disc (Imperial 1” tooling)	22
6.3 92-HT/HTL : Turret 8 station standard disc (Metric 32mm tooling)	23
6.4 92-HT/HTL : Turret 8 station standard disc (Imperial 1-1/4” tooling)	24
6.5 52/76/92-HT/HTL : Turret 12 station standard disc (Metric 25mm tooling)	25
6.6 52/76/92-HT/HTL : Turret 12 station standard disc (Imperial 1” tooling)	26
6.7 52/76/92-HT/HTL : Turret 8 station VDI40 disc	27
6.8 52/76/92-HT/HTL : Turret 12 station VDI40 disc	28
7. MACHINE CONSTRUCTION	29
7.1 Wide selection of spindle bar (draw tube) capacity (51 mm, 75mm & 91mm) ..	30
7.2 Headstock design for easy heat dissipation	30
7.3 Heavy table loading capacity	30
7.4 One piece rigid design with 45° slant bed	31
7.5 All box ways structure performs great machine rigidity	31
7.6 Hydraulic chuck fitting	31
7.7 Hydraulic oil pressure detection device	32
7.8 Oil leakage monitoring system	33
7.9 Handy scrapped and turcite B on bearing surface	33

7.10 8 or 12 positions hyd. turret with fast turret indexing	33
7.11 Tailstock rapid positioning driven by saddle	34
7.12 Programmable tailstock body & Quill movement	34
7.13 Bright working room provides good visibility	34
7.14 CE declaration of conformity for EU countries	35
7.15 Fully CNC package -- control and motors	35
8. COMPARISON TABLE	36
9. CUTTING REPORT	37
10. GEOMETRY TEST	38
11. STANDARD ACCESSORIES	43
12. OPTIONAL ACCESSORIES	44
12.1 Soft jaw 8"/10"/12"	44
12.2 Tool holder package for standard turret	44
12.3 Bigger hydraulic chuck	44
12.4 Collet unit	44
12.5 Various size of Collets	45
12.6 C-axis	45
12.7 Power turret Baruffaldi TBMA-200 turret (VDI40/12T)	45
12.8 Live tool holders (Taiwanese made)	46
12.9 Auto parts catcher	46
12.10 Tool probe (Automatic & Manual)	46
12.11 Bar feeder interface	46
12.12 Bar feeder	47
12.13 EMC	47
12.14 Heat exchanger for electric cabinet	47
12.15 High pressure 20 bar coolant through tool	47
12.16 Power transformer	48
12.17 Extra for Fanuc OiTD controller with 10.4" LCD display and Manual Guide i ..	48
12.18 Fagor Service Contract for 24 months	48
13. Controller Function List	49
13.1 FANUC	49
13.2 FAGOR 8055i FL	60
13.3 SIEMENS	62

1. MACHINE IMAGE

Microcut/Challenger HT series Slant Bed lathes offer large swing capacity with max cutting diameter 484mm and long cutting length of 1250mm available. 45 degree rigid one-piece casting offer high rigidity construction for heavy loading.

Numerous options allow maximum productivity in manufacturing. All these advantages of HT series ensure success and opens up new opportunities in the market.

The wide applications include various fields such as automobile, medical, educational, military and general machining shops. Most of the major controllers are available.

Fig. 2 shows Model 76HT with 750mm length and Fanuc controller.



Fig. 2 Model 76HT with Fanuc controller
(options: chip conveyor, parts catcher, tool probe)

2. MAIN FEATURES

- Wide selection of spindle bar capacity, 51 mm, 75mm & 90mm
- Headsock design for easy heat dissipation
- Heavy table loading capacity
- One piece rigid design with 45° slanted bed
- Hydraulic chuck fitting preparation;
- Anti oil leakage of lubrication monitoring system
- Hydraulic oil pressure detection device
- All box ways structure performs great machine rigidity
- Handy scrapped and turcite B on bearing surface
- 8 or 12 positions hyd. turret with fast indexing
- Tailstock rapid positioning driven by saddle
- Programmable tailstock and quill movement
- Clear machining room ensure easy chip cleaning
- CE declaration of conformity for EU countries
- Fully CNC package -- control and motors

3. MAIN SPECIFICATIONS

Table 1 Main specifications

Features	Description	Unit	52HT/HTL	76HT/HTL	92HT/HTL
Capacity	Swing over bed	mm	600		
	Swing over cross slide	mm	450		
	Max. cutting diameter	mm	485	485	450
	Max. cutting length	mm	750 / 1250		
	Bar capacity (hyd. Chuck cylinder)	mm	51	75	90
	Slant bed degree	degree	45		
	Max. workpiece weight (with tailstock)	kgs	1000		
Travel	X axis travel	mm	305		
	Z axis travel	mm	750 / 1250		
Spindle	Spindle nose		A2-6	A2-8	A2-8
	Spindle through hole dia.	mm	66	92	105
	Spindle speed	rpm	4500	3000	2500
	Spindle front bearing inner dia.	mm	100	130	140
	Spindle motor-standard	kW	Fagor:12/18.5 Fanuc:11/15 Siemens:17/22.5	Fagor:17/25 Fanuc:15/18.5 Siemens:22/30	Fagor:22/33 Fanuc:18.5/22 Siemens:28/38
	Spindle motor-option(Fanuc)	kW	15/18.5	18.5/22	22/30
	Hydraulic chuck size	mm/inch	200/8	250/10	305/12
	Hydraulic pressure- max.	kgf/cm ²	40		
Turret	Turret type		Hydraulic	Hydraulic	Hydraulic
	Tool no.		8/12	8/12	8/12
	Boring bar dia.	mm	40	40	50
	Square tool holder	mm	25x25	25x25	32x32
Live Tooling (optional)	Tool shank diameter		VDI40	VDI40	VDI50
	Square tool holder		25x25	25x25	32x32
	Power rating	kW	3.7	3.7	3.7
	Maximum speed	rpm	4000	4000	4000

Features	Description	Unit	52HT/HTL	76HT/HTL	92HT/HTL
Axes	X axis ballscrew		Ø36xP12-C3		
	X axis rapid feed	M/min.	24		
	Z axis ballscrew		Ø 50xP12-C3		
	Z axis rapid feed	M/min.	24		
Axes force	X axis	Nm	Fagor: 17.3; Siemens: 16; Fanuc: 22		
	Z axis	Nm	Fagor : 27.3; Siemens: 27; Fanuc : 22		
Motor	X axis servo motor	kW	3		
	Z axis servo motor	kW	4		
	Coolant pump motor	Hp	1		
	Chip conveyor motor	Hp	1/4		
	Hydraulic pump motor	kW	1.5		
	Lubrication pump motor	w	30		
Accuracy	Positioning accuracy	mm	+/-0.005/300		
	Repeatability accuracy	mm	+/-0.005		
Tailstock	Tailstock quill dia.	mm	90		
	Tailstock travel	mm	600		
	Quill taper		MT5		
	Quill travel	mm	120		
Coolant	Max. coolant pressure	kg/cm ²	10		
	Max. coolant flow	L/min	58 (50Hz) / 66 (60Hz)		
	Coolant pump	w	620 (50Hz) / 910 (60Hz)		
Lubrication	Distributor type		Resistance type		
	Tank capacity	L	2		
	Pump motor	w	12		
	Pump flow rate	L/min	0.13		
	Max. pump pressure	kg/cm ²	15		
Hydraulic	Tank capacity	L	70		
Miscellaneous	Length without Chip conveyor		3175 / 3675		
	Length with Chip conveyor		4309 / 4809		
	Width		1811		
	Height	mm	2030		
	Machine weight	kg	5700/7200		
	Floor space (with chip	mm	4114x2423 / 4614x2423		

	conveyor)				
Features	Description	Unit	52HT/HTL	76HT/HTL	92HT/HTL
Total power consumption		kva	Fagor:50 Fanuc:35 Siemens:35		Fagor:70 Fanuc:50 Siemens:35

* Specifications are subject to change without notice.

4. DIMENSIONAL DRAWINGS

In this chapter, the dimensional drawings are given as below:

4.1 Layout Drawing

4.2 Foundation Drawing

4.3 Interference drawings

4.1 Layout Drawing

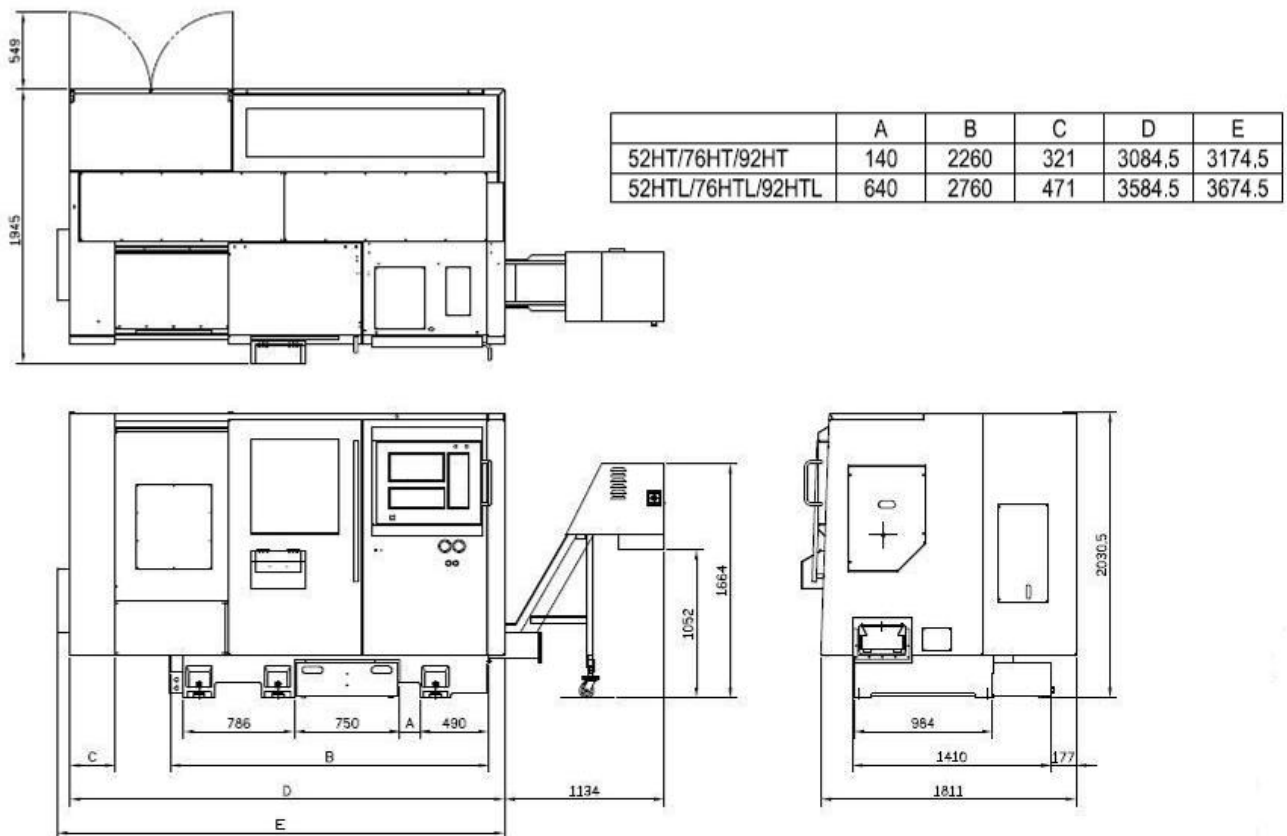


Fig. 3 Machine layout drawing with chip conveyor (option)

4.2 Foundation Drawing

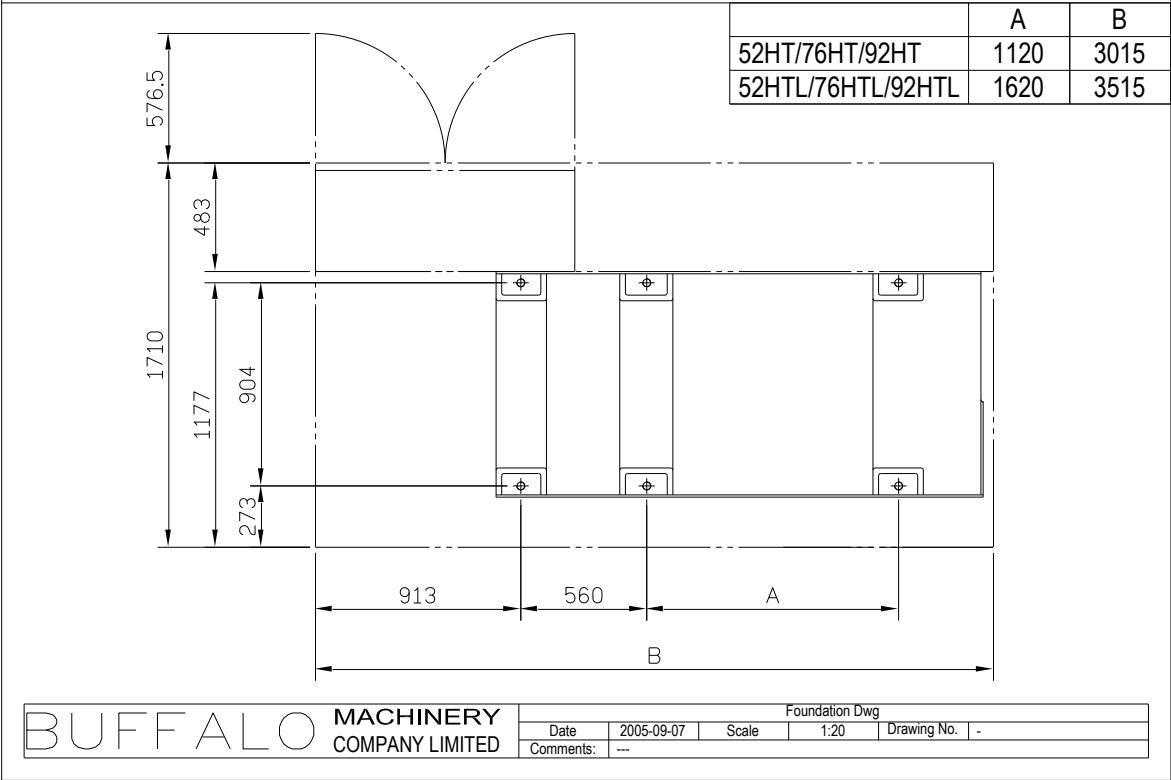


Fig. 4 Foundation drawing

4.3 Interference drawings

4.3.1 52/76-HT/HTL w/LS-200 8 position turret (standard type disc)

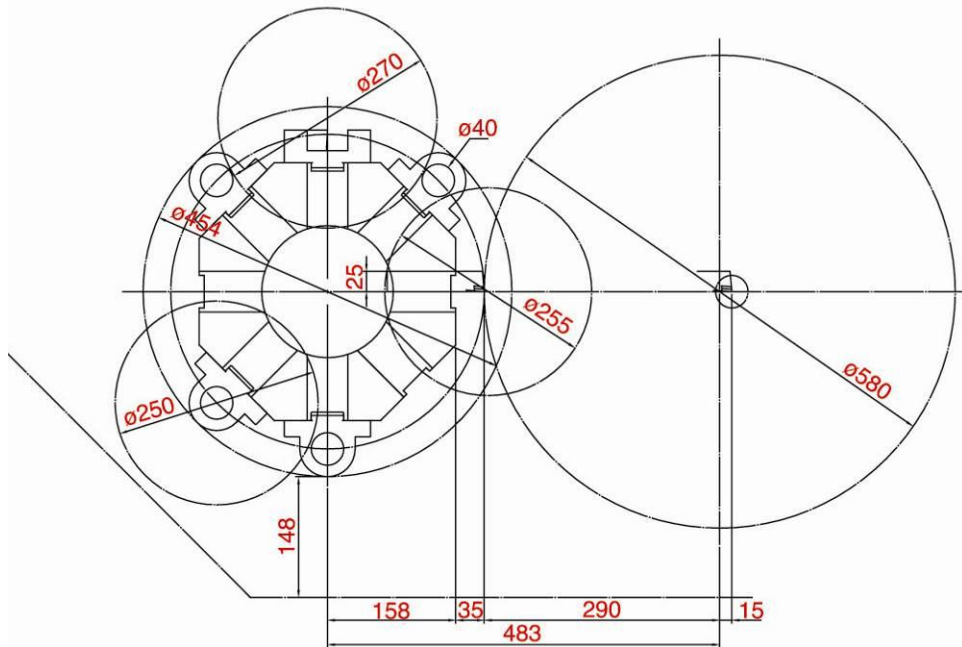


Fig.5 52/76-HT/HTL w/LS-200 8 position turret (standard type disc)

	C	Chuck
52HT	143	8"
76HT	163	10"

	A	B
52HT/76HT	750	650
52HTL/76HTL	1250	1150

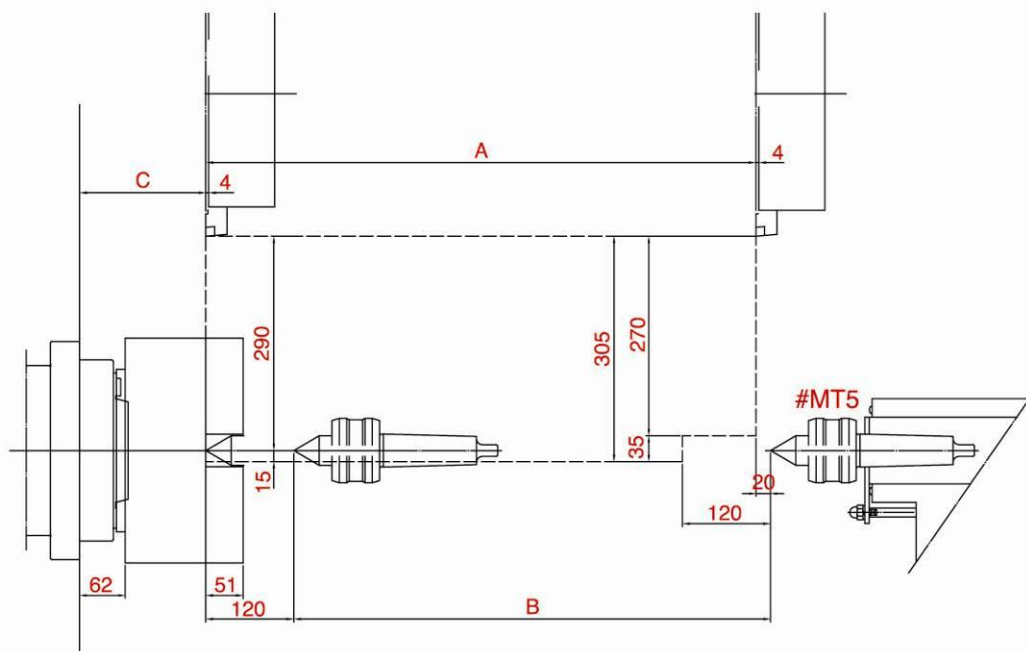


Fig.6 52/76-HT/HTL w/LS-200 8 position turret (standard type disk)

4.3.2 92-HT/HTL w/LS-200 8 position turret (standard type disc)

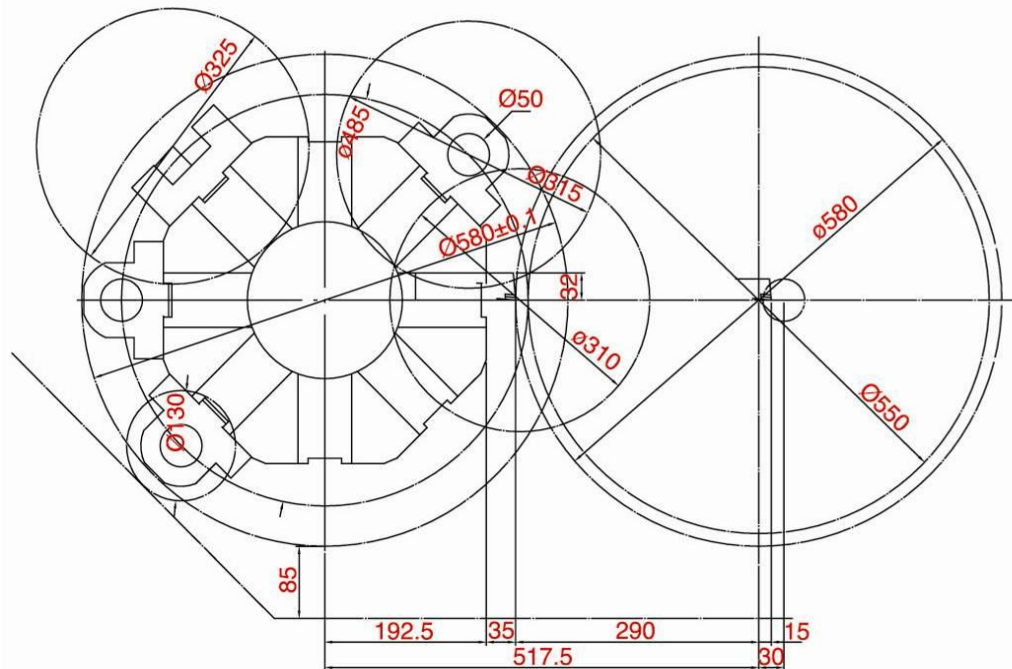


Fig.7 92-HT/HTL w/LS-200 8 position turret (standard type disc)

	C	Chuck
92HT	172	12"

	A	B
92HT	750	650
92HTL	1250	1150

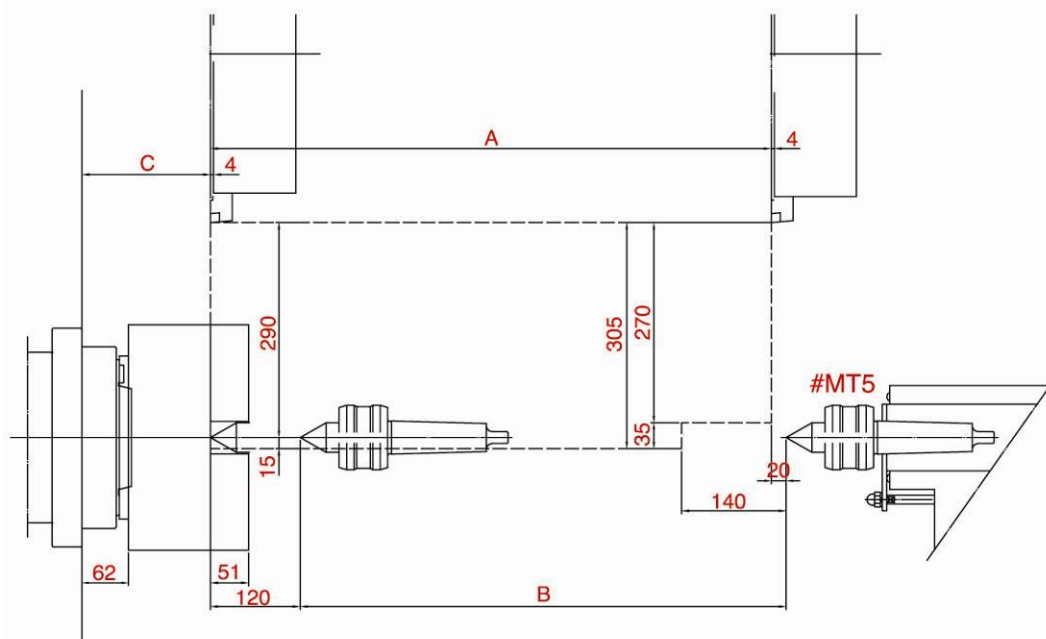


Fig.8 92-HT/HTL w/LS-200 8 position turret (standard type disk)

4.3.2 52/76/92-HT/HTL w/LS-200 12 position turret (standard type disc)

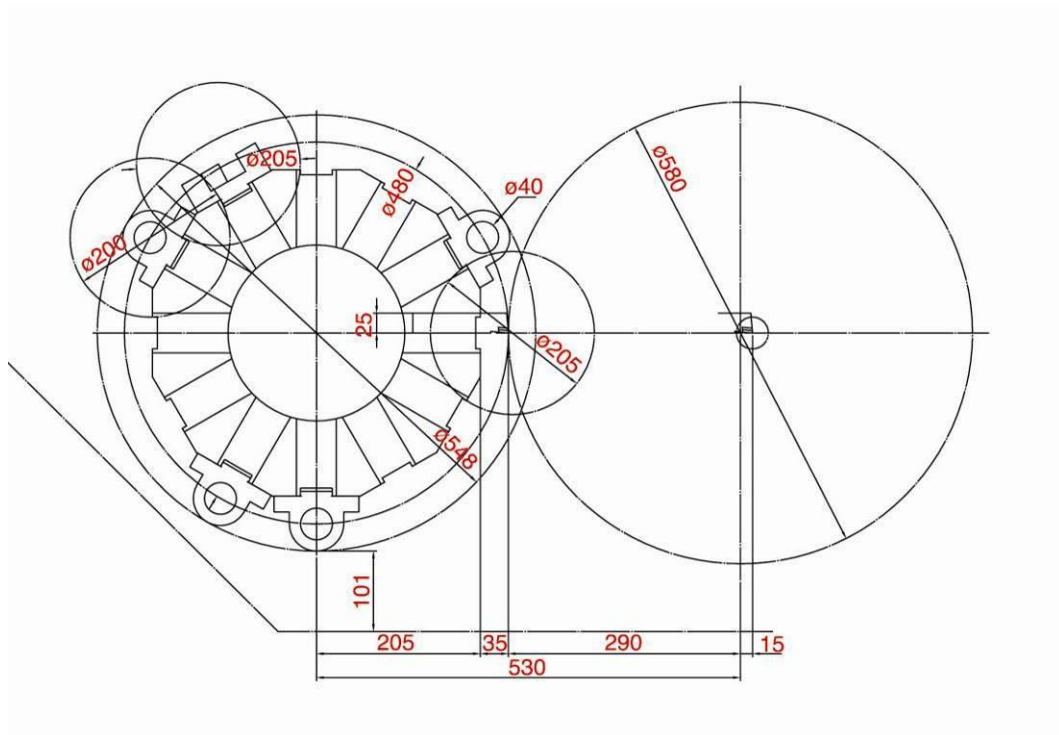


Fig.9 52/76/92-HT/HTL w/LS-200 12 position turret (standard type disc)

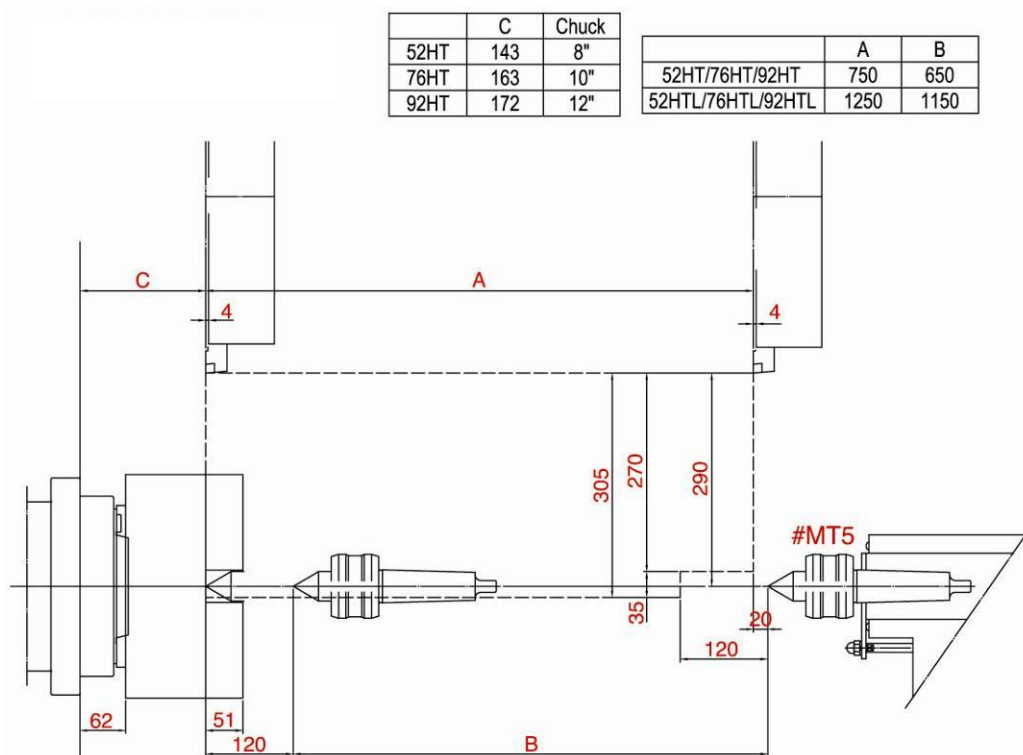


Fig.10 52/76/92-HT/HTL w/LS-200 12 position turret (standard type disc)

4.3.4 52/76-HT/HTL w/LS-200 8 position turret (VDI40 type disc)

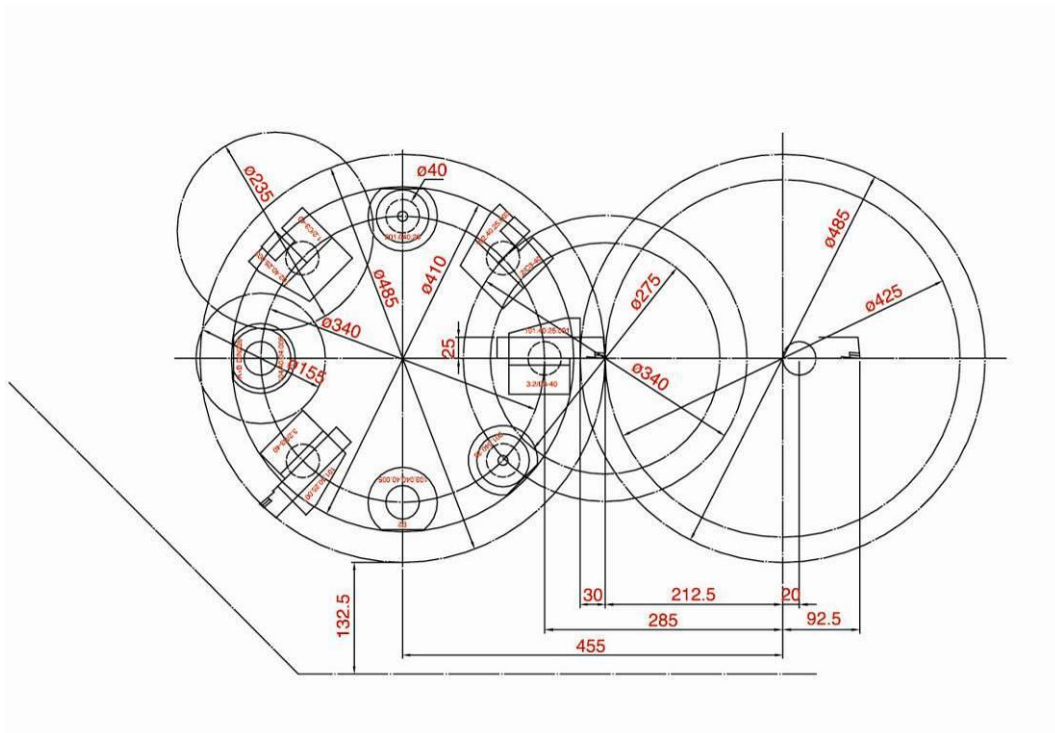


Fig.11 52/76/92-HT/HTL w/LS-200 8 position turret (VDI40 disc)

	C	Chuck
52HT	143	8"
76HT	163	10"

	A	B
52HT/76HT	750	650
52HTL/76HTL	1250	1150

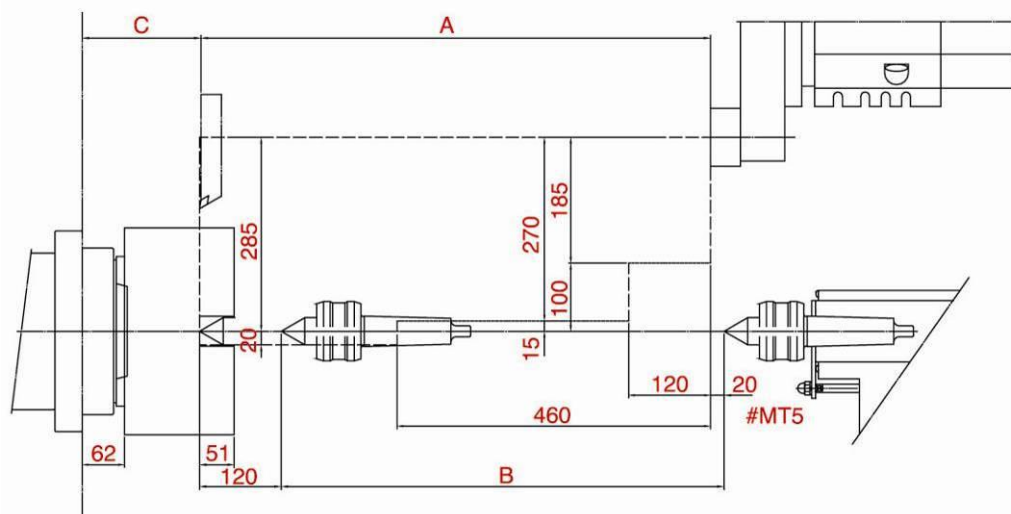


Fig.12 52/76/92-HT/HTL w/LS-200 8 position turret (VDI40 disc)

4.3.5 92-HT/HTL w/LS-200 8 position turret (VDI50 type disc)

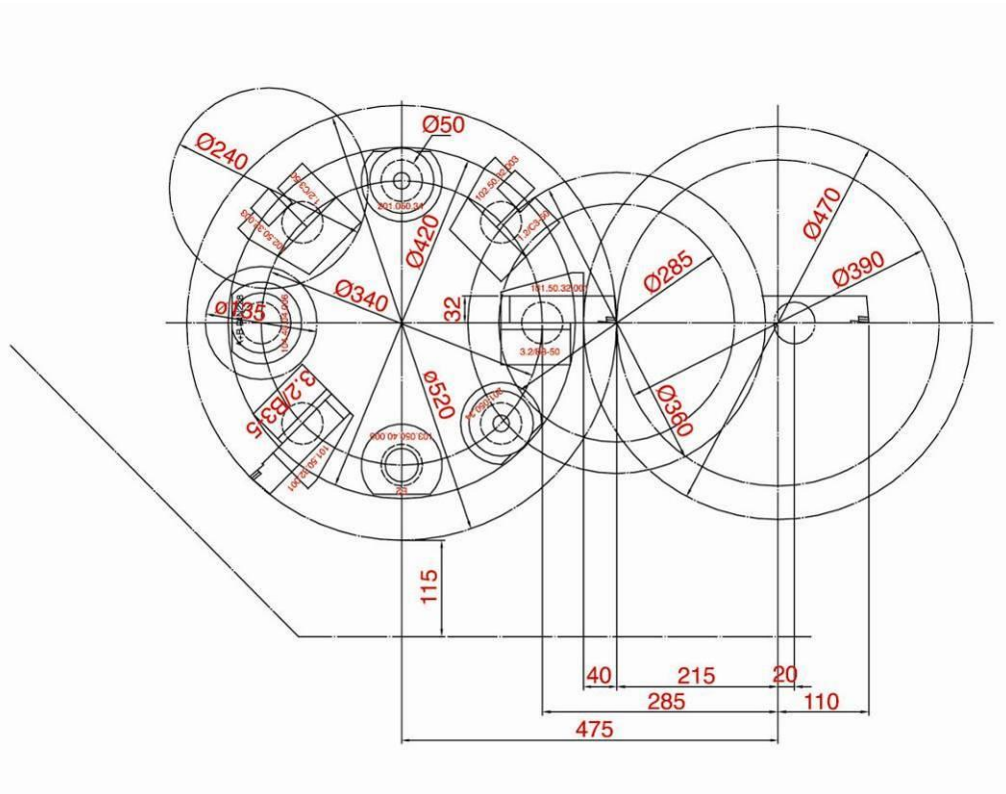


Fig.13 92-HT/HTL w/LS-200 8 position turret (VDI50 disc)

	C	Chuck
92HT	172	12"

	A	B
92HT	750	650
92HTL	1250	1150

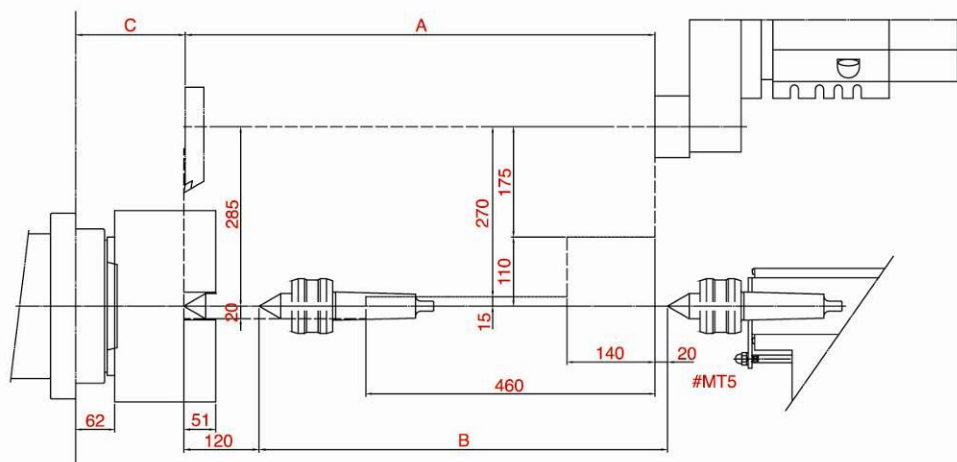


Fig.14 92-HT/HTL w/LS-200 8 position turret (VDI50 disc)

4.3.6 52/76/92-HT/HTL w/LS-200 12 position turret (VDI40 type disc)

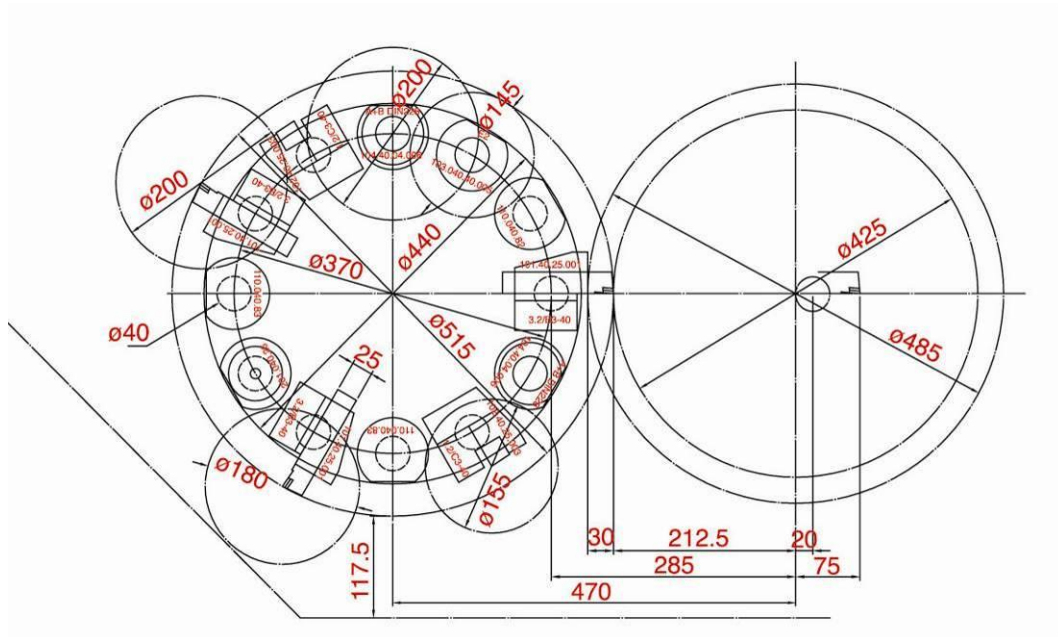


Fig.15 52/76/92-HT/HTL w/LS-200 12 position turret (VDI40 disc)

	C	Chuck
52HT	143	8"
76HT	163	10"
92HT	172	12"

	A	B
52HT/76HT/92HT	750	650
52HTL/76HTL/92HTL	1250	1150

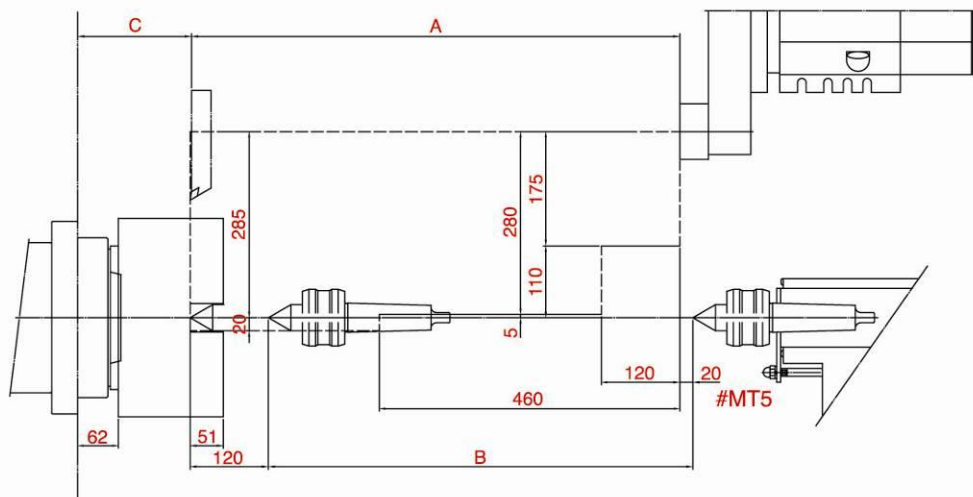


Fig.16 52/76/92-HT/HTL w/LS-200 12 position turret (VDI40 disc)

5. SPINDLE POWER & TORQUE CHARTS

Various controllers are available – FANUC, FAGOR, SIEMENS or HEIDENHAIN. Below are spindle power and torque charts for Fanuc controller. Wide-range motor Fanuc α P spindle motors are used on HT series. The feature of such motor gives full power at very low speed 500rpm. With mechanical two step gear ratio, machine get full power at 375rpm.

5.1 52-HT/HTL – Fanuc 11/15kw spindle motor (standard)

5.2 52-HT/HTL – Fanuc 15/18.5kw spindle motor (option)

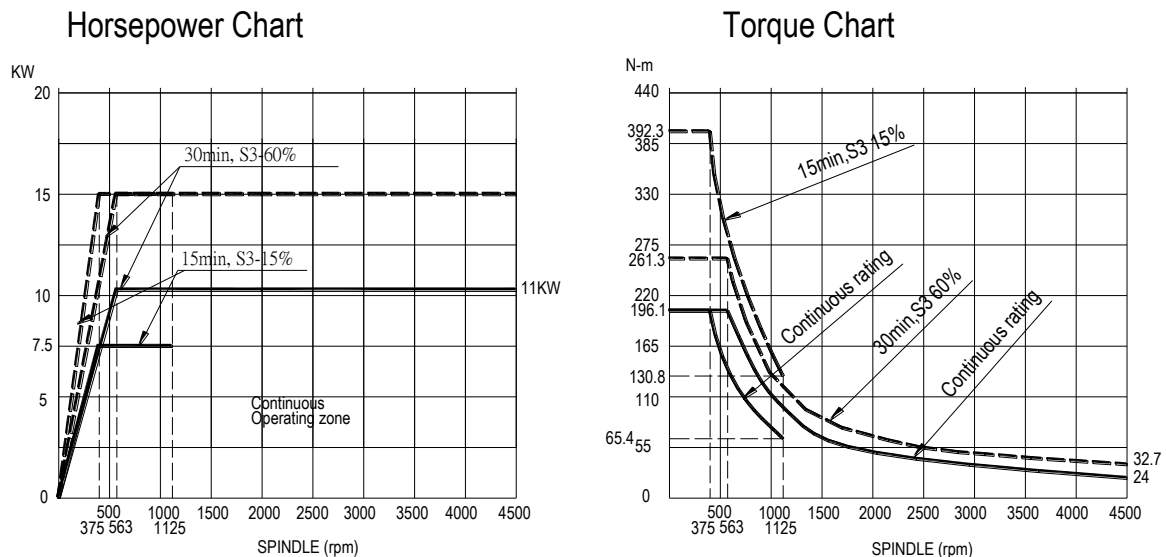
5.3 76-HT/HTL – Fanuc 15/18.5kw spindle motor (standard)

5.4 76-HT/HTL – Fanuc 18.5/22kw spindle motor (option)

5.5 92-HT/HTL – Fanuc 18.5/22kw spindle motor (standard)

5.6 92-HT/HTL – Fanuc 22/30kw spindle motor (option)

5.1 52-HT/HTL – Fanuc 11/15kw spindle motor (standard)

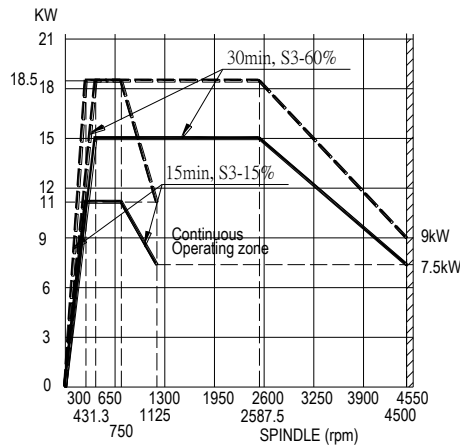


Torque / Horsepower Chart Data			
Spindle Taper	ISO A2-6	Spindle Motor	FANUC α P22/6000i
	-	Motor Output	11/15KW
	-	Gear Ratio	-
Spindle Speed	4500 RPM	Pulley Ratio	3/4

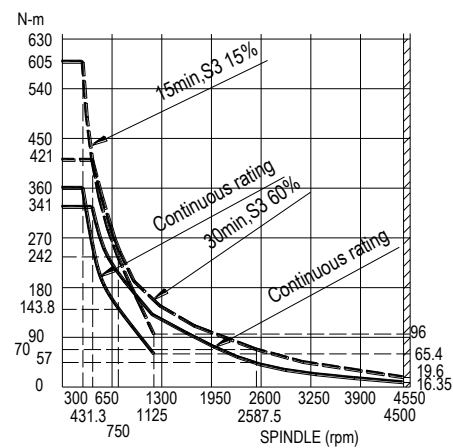
Fig. 17 52-HT/HTL – Fanuc 11/15kw spindle motor (standard)

5.2 52-HT/HTL – Fanuc 15/18.5kw spindle motor (option)

Horsepower Chart



Torque Chart

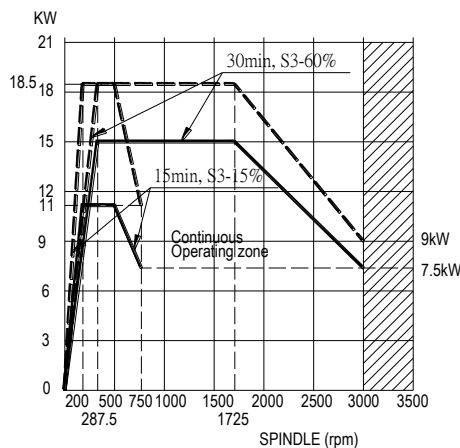


Torque / Horsepower Chart Data					
Spindle Taper	ISO	A2-6	Spindle Motor	FANUC αP30/6000i	
		-	Motor Output	15/18.5	
		-	Gear Ratio	-	
Spindle Speed	4500 RPM		Pulley Ratio	3/4	

Fig. 18 52-HT/HTL – Fanuc 15/18.5kw spindle motor (option)

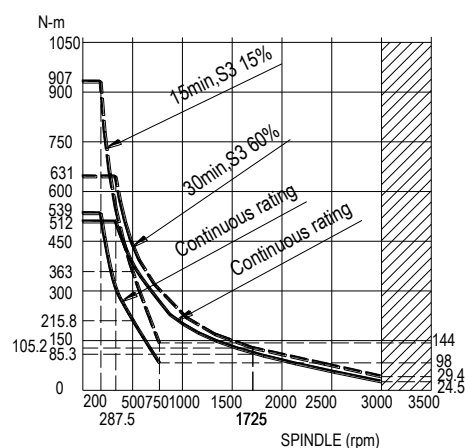
5.3 76-HT/HTL – Fanuc 15/18.5kw spindle motor (standard)

Horsepower Chart



High-speed winding output (Δ connection)

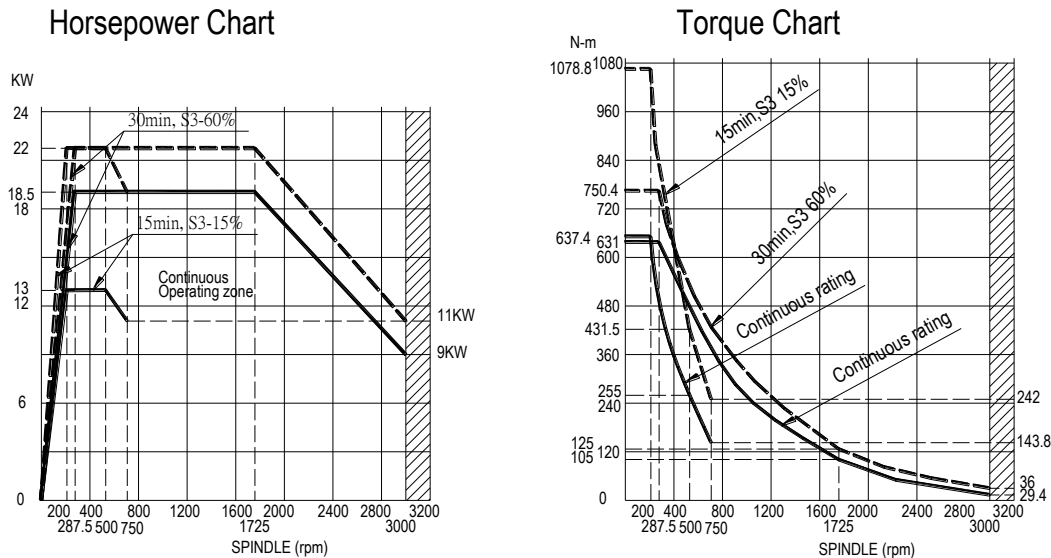
Torque Chart



Torque / Horsepower Chart Data					
Spindle Taper	ISO	A2-8	Spindle Motor	FANUC αP30/6000i	
		-	Motor Output	15/18.5KW	
		-	Gear Ratio	-	
Spindle Speed	3000 RPM		Pulley Ratio	1:2	

Fig.19 76-HT/HTL – Fanuc 15/18.5kw spindle motor (standard)

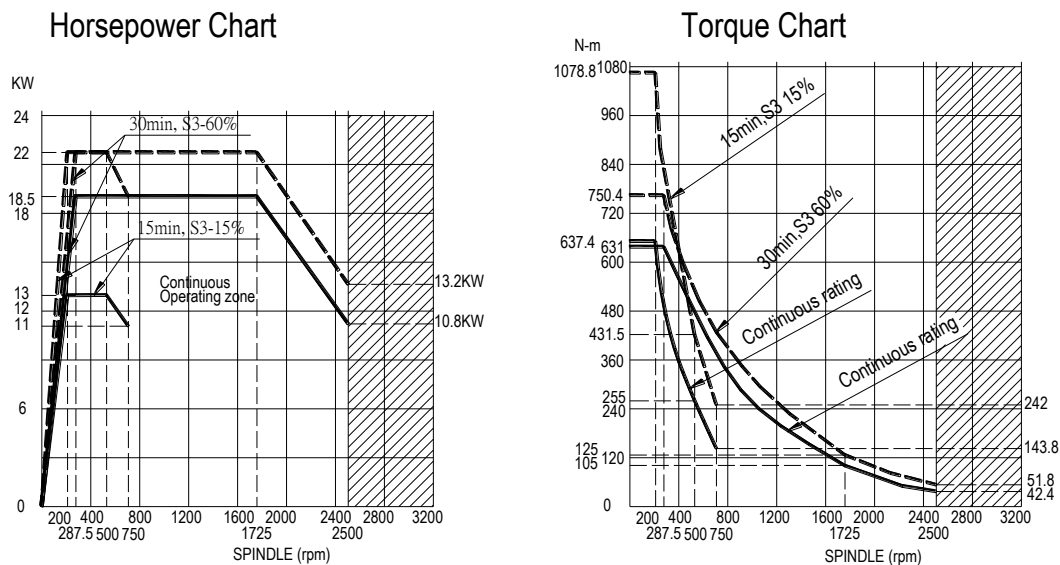
5.4 76-HT/HTL – Fanuc 18.5/22kw spindle motor (option)



Torque / Horsepower Chart Data				
Spindle Taper	ISO	A2-8	Spindle Motor	FANUC αP40/6000ip
		-	Motor Output	18.5/22KW
		-	Gear Ratio	-
Spindle Speed	3000 RPM		Pulley Ratio	1/2

Fig. 20 76-HT/HTL – Fanuc 18.5/22kw spindle motor (option)

5.5 92-HT/HTL – Fanuc 18.5/22kw spindle motor (standard)



Torque / Horsepower Chart Data				
Spindle Taper	ISO	A2-8	Spindle Motor	FANUC αP40/6000ip
		-	Motor Output	18.5/22KW
		-	Gear Ratio	-
Spindle Speed	2500 RPM		Pulley Ratio	1/2

Fig. 21 92-HT/HTL – Fanuc 18.5/22kw spindle motor (standard)

5.6 92-HT/HTL – Fanuc 22/30kw spindle motor (option)

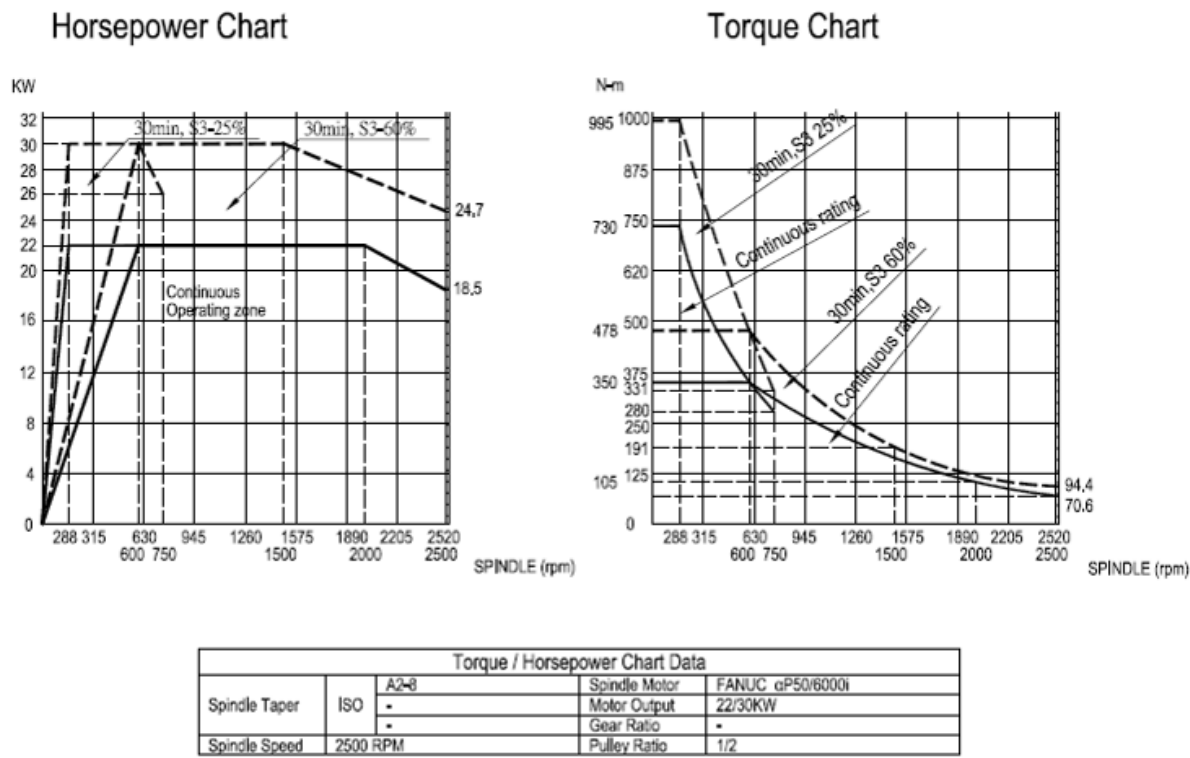


Fig. 22 92-HT/HTL – Fanuc 22/30kw spindle motor (option)



6. TOOLING SYSTEM

Wide selection of tooling system is available, please refer to the drawing as below.

6.1 52/76-HT/HTL : Turret 8 station standard disc (Metric 25mm tooling)

6.2 52/76-HT/HTL : Turret 8 station standard disc (Imperial 1" tooling)

6.3 92-HT/HTL : Turret 8 station standard disc (Metric 32mm tooling)

6.4 92-HT/HTL : Turret 8 station standard disc (Imperial 1-1/4" tooling)

6.5 52/76/92-HT/HTL : Turret 12 station standard disc (Metric 25mm tooling)

6.6 52/76/92-HT/HTL : Turret 12 station standard disc (Imperial 1" tooling)

6.7 52/76/92-HT/HTL : Turret 8 station VDI40 disc

6.8 52/76/92-HT/HTL : Turret 12 station VDI40 disc

6.1 52/76-HT/HTL : Turret 8 station standard disc (Metric 25mm tooling)

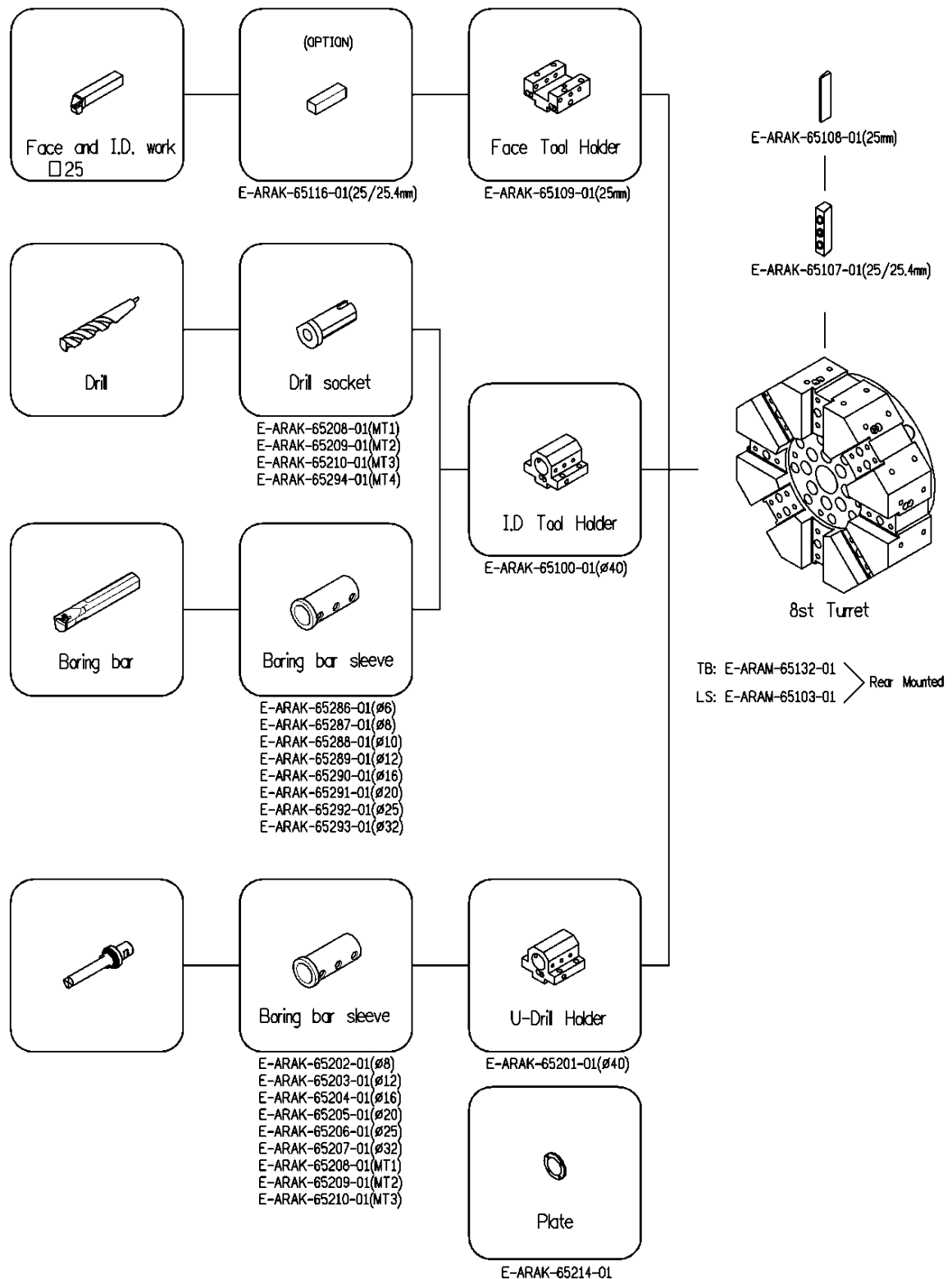


Fig. 23 52/76-HT/HTL : Turret 8 station standard disc (Metric 25mm tooling)

6.2 52/76-HT/HTL : Turret 8 station standard disc (Imperial 1" tooling)

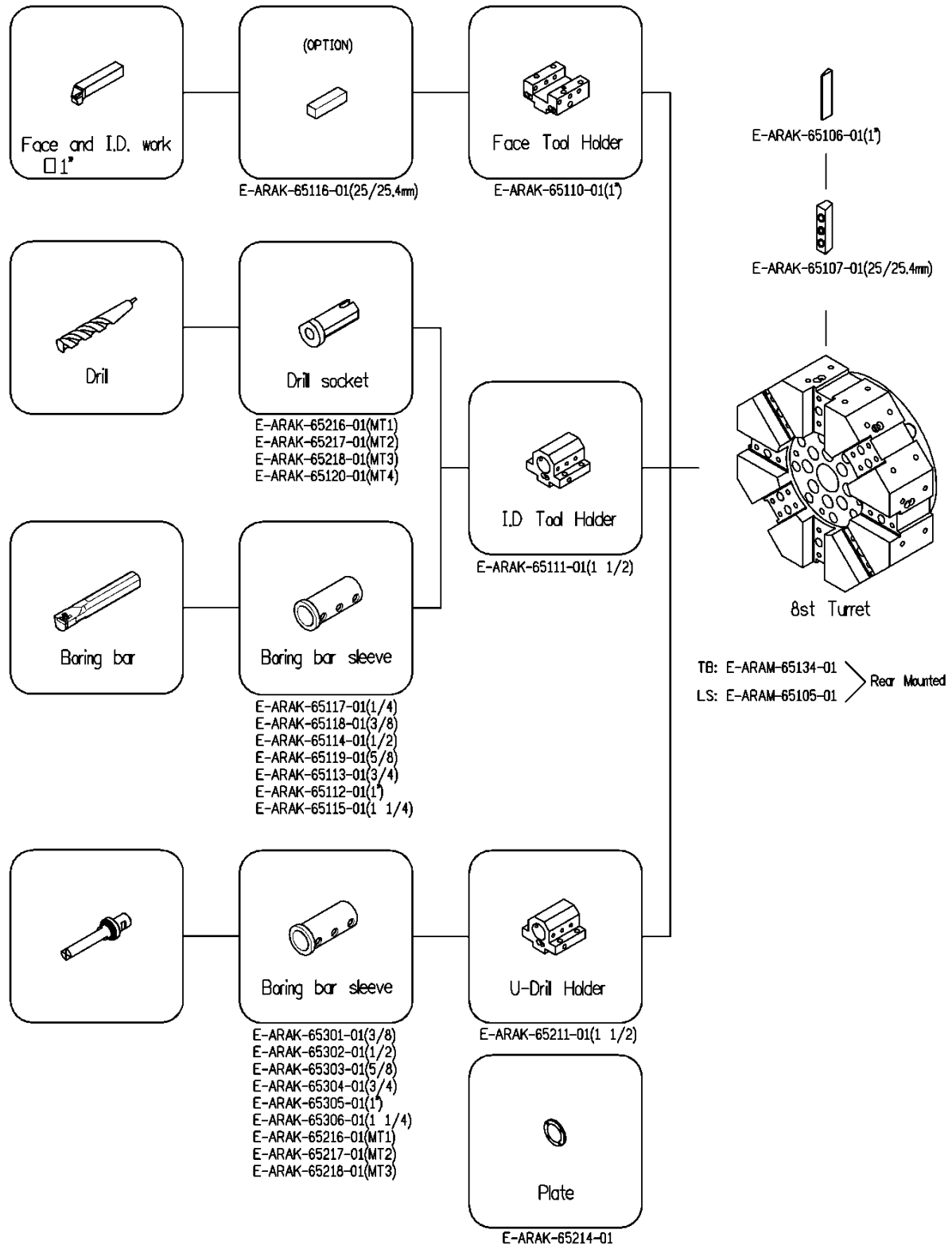


Fig. 24 52/76-HT/HTL : Turret 8 station standard disc (Imperial 1" tooling)

6.3 92-HT/HTL : Turret 8 station standard disc (Metric 32mm tooling)

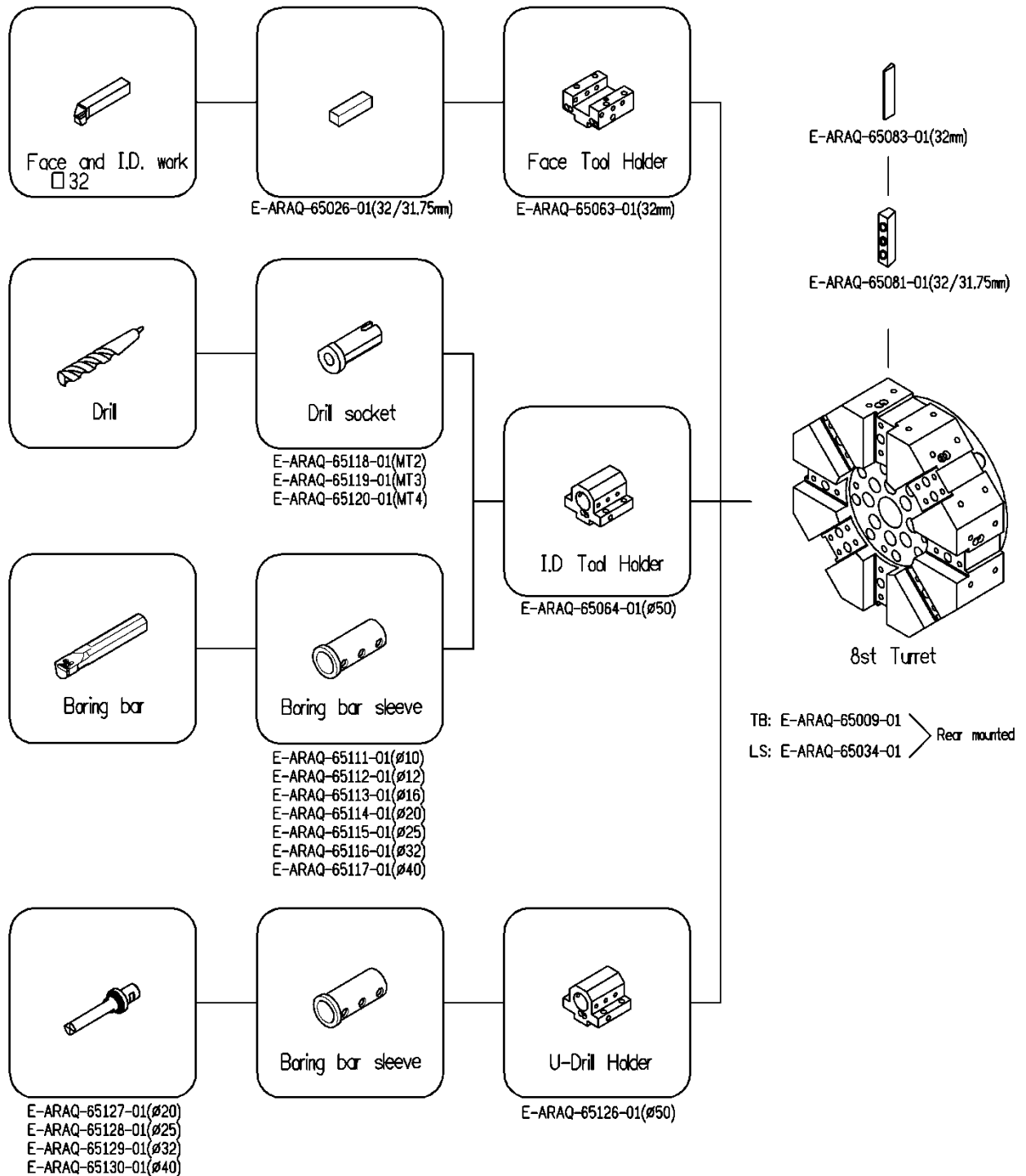


Fig. 25 92-HT/HTL : Turret 8 station standard disc (Metric 32mm tooling)

6.4 92-HT/HTL : Turret 8 station standard disc (Imperial 1-1/4" tooling)

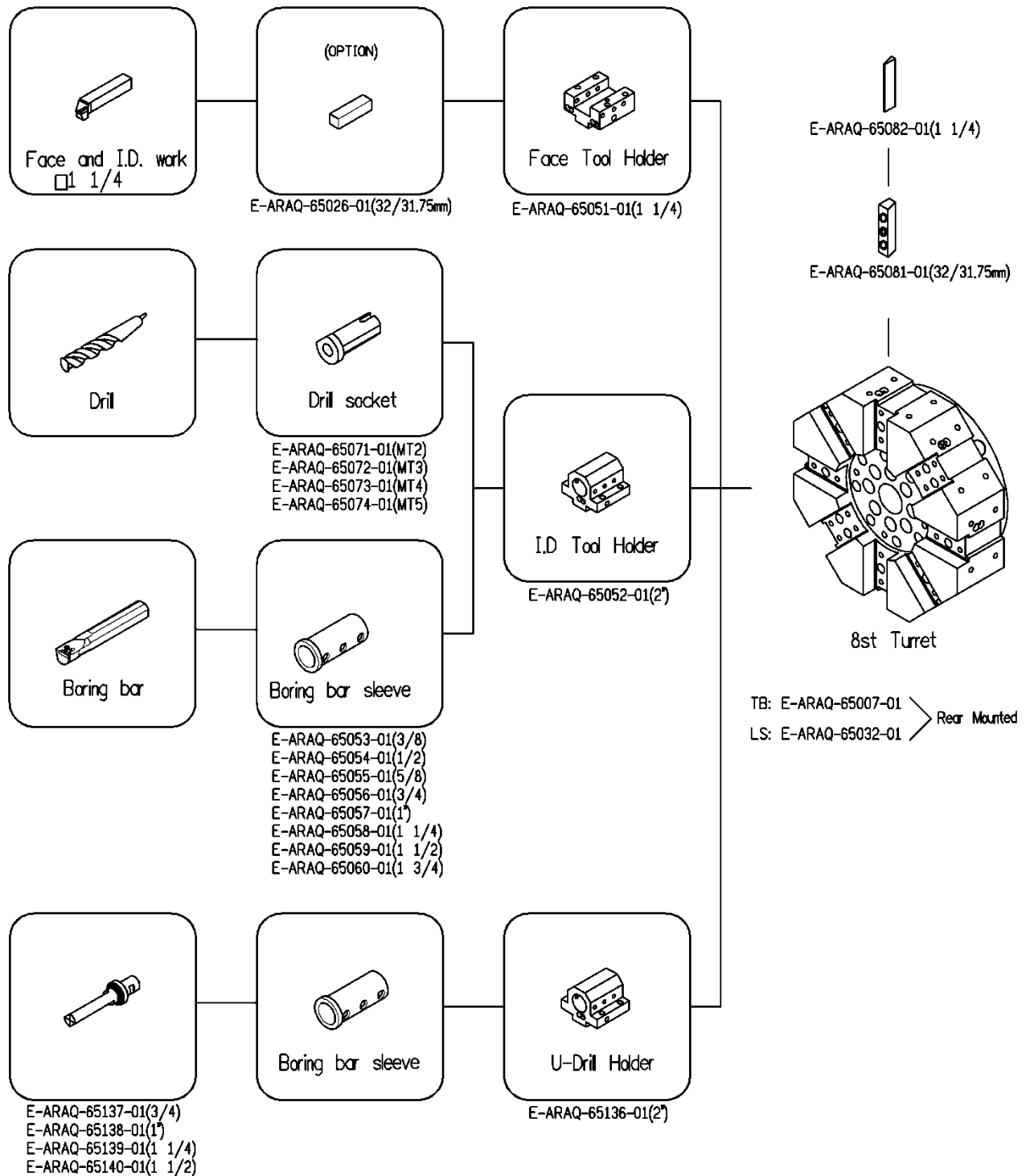


Fig. 26 92-HT/HTL : Turret 8 station standard disc (Imperial 1-1/4" tooling)

6.5 52/76/92-HT/HTL : Turret 12 station standard disc (Metric 25mm tooling)

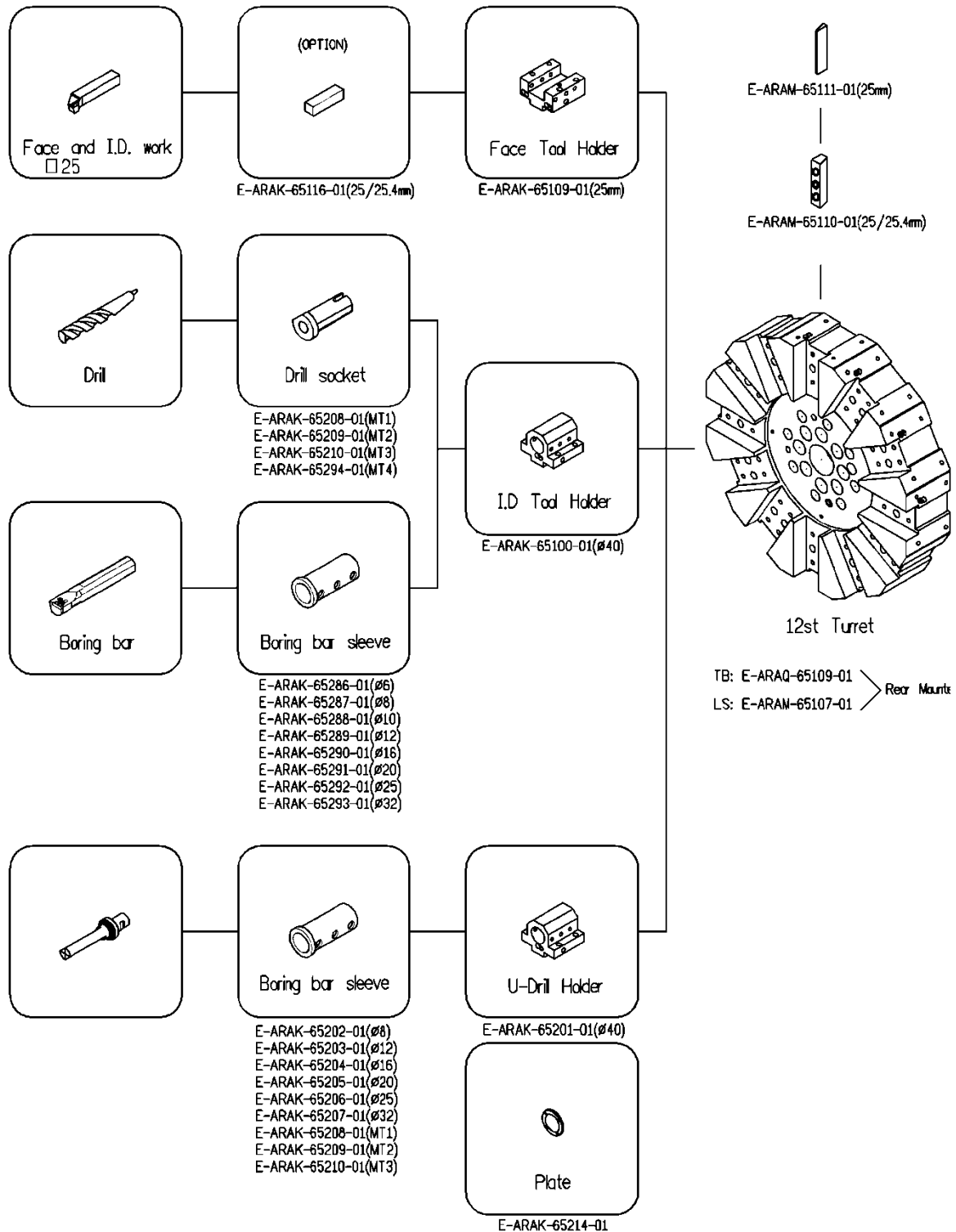


Fig. 27 52/76/92-HT/HTL : Turret 12 station standard disc (Metric 25mm tooling)

6.6 52/76/92-HT/HTL : Turret 12 station standard disc (Imperial 1" tooling)

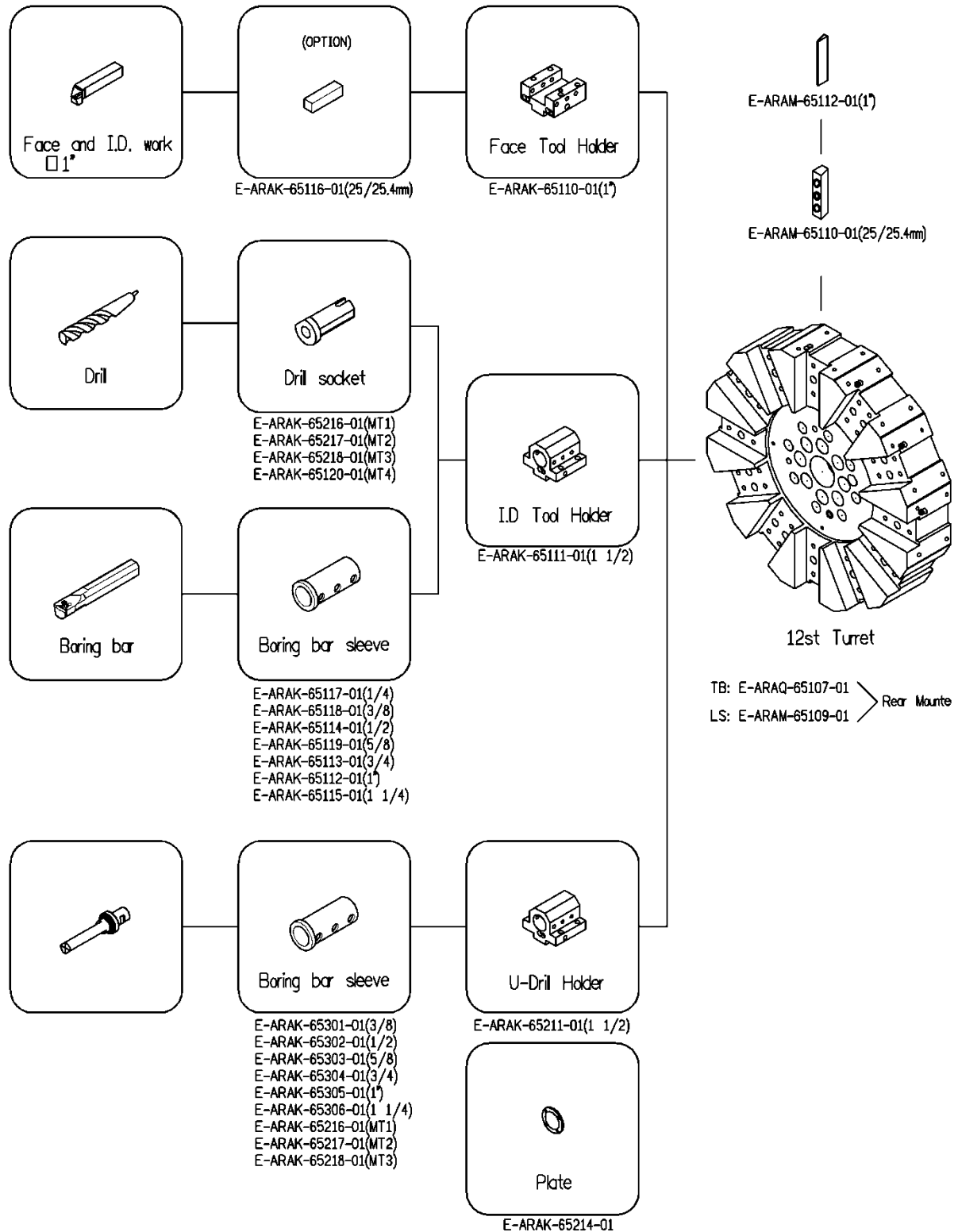


Fig. 28 52/76/92-HT/HTL : Turret 12 station standard disc (Imperial 1" tooling)

6.7 52/76/92-HT/HTL : Turret 8 station VDI40 disc

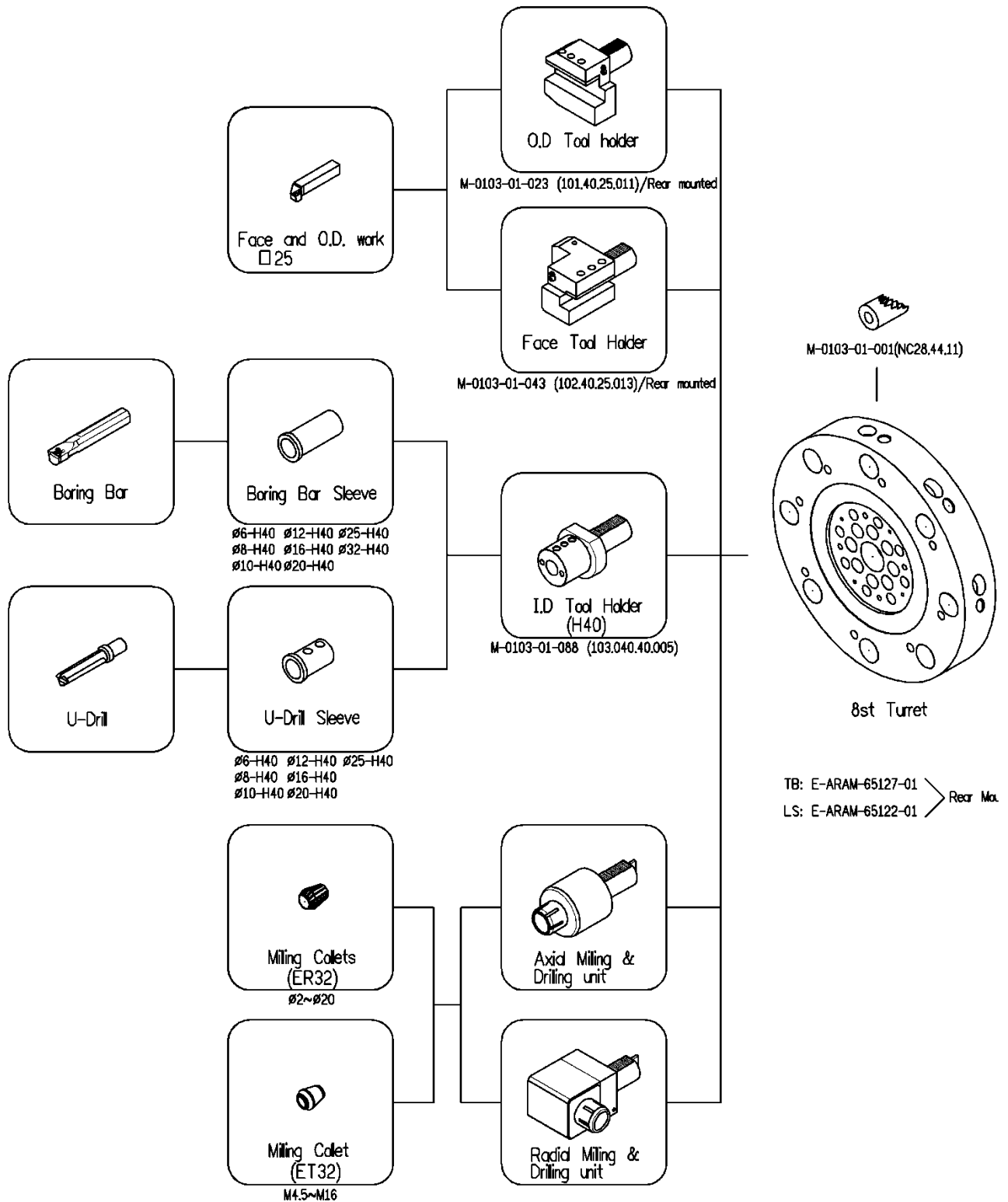


Fig. 29 52/76/92-HT/HTL : Turret 8 station VDI40 disc

6.8 52/76/92-HT/HTL : Turret 12 station VDI40 disc

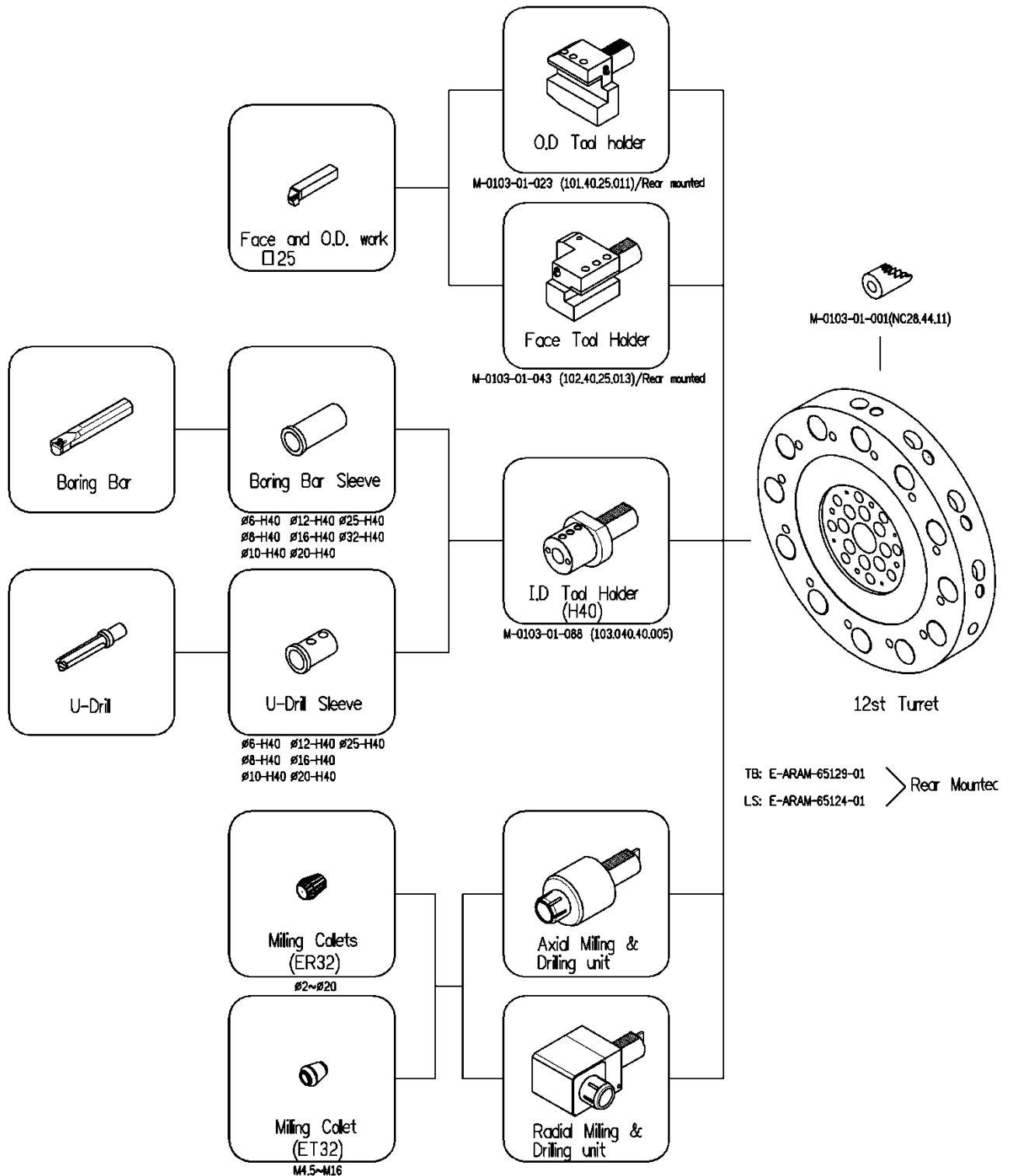


Fig. 30 52/76/92-HT/HTL : Turret 12 station VDI40 disc

7. MACHINE CONSTRUCTION

In this chapter, the construction of machine is introduced. The machine is designed for easy operation, prompt loading & unloading for the work-piece and tools, and convenient chip clean. Following sections are as below.

- 7.1 Wide selection of spindle bar capacity (51 mm, 75mm & 91mm)
- 7.2 Headstock design for easy heat dissipation
- 7.3 Heavy table loading capacity
- 7.4 One piece rigid design with 45° slanted bed
- 7.5 All box ways structure performs great machine rigidity
- 7.6 Hydraulic chuck fitting preparation
- 7.7 Hydraulic oil pressure detection device
- 7.8 Anti oil leakage Lubrication monitoring system
- 7.9 Handy scrapped and turcite B on bearing surface
- 7.10 8 or 12 positions hyd. turret with fast turret indexing
- 7.11 Tailstock rapid positioning driven by saddle
- 7.12 Programmable Tailstock Body & Quill movement
- 7.13 Clear machining room ensure easy chip cleaning
- 7.14 CE declaration of conformity for EU countries
- 7.15 Fully CNC package -- control and motors

7.1 Wide selection of spindle bar (draw tube) capacity (51 mm, 75mm & 91mm)

7.2 Headstock design for easy heat dissipation

7.3 Heavy table loading capacity

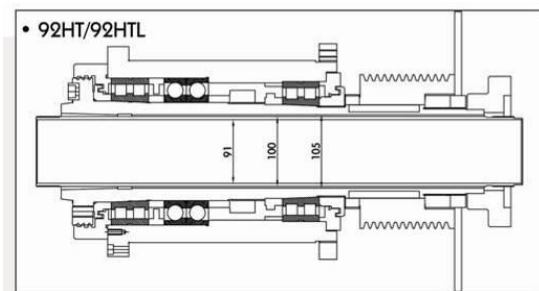


Fig. 31 92HT/HTL spindle

Usually, the bar size of work-piece ranges between 50, 55, 70, 75, 90mm. So the Microcut HT provides a larger draw tube capacity (51 mm, 75mm & 91mm) than those sizes to meet every choice.

The heavy cutting duty cartridge type spindle (see Fig. 31) is supported by a double row of cylindrical (NN) roller bearings in the front and rear, with duplex angular thrust bearings in between. The NN roller bearings feature a large contact surface which ensures the highest rigidity for heavy loads and superior surface finishes.

The cartridge design of headstock (see Fig. 32) allows easy spindle replacement.



Fig. 32 Heavy cutting duty headstock

The spindle bearing with grease lubrication ensures its lifetime.

The front NN roller bearing is the fix end, and the rear is the floating end. So the spindle thermal expansion will extend backward to the end and thermal deformation is erased.

The headstock is Meehinate casting. Ribs outside can increase the surface area for better heat dissipation.

7.4 One piece rigid design with 45° slant bed

7.5 All box ways structure performs great machine rigidity



Fig. 33 Rear side of bed



Fig. 34 Front side of bed

7.6 Hydraulic chuck fitting

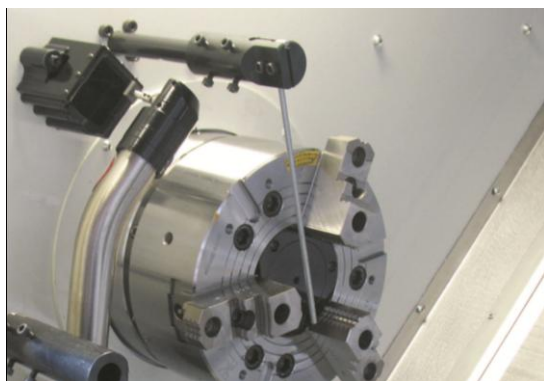


Fig. 35. HT fit with 3-jaw hydraulic chuck,
tool settter

The is made as 45° slant bed enables easy chip falling and quick chip removal. Fig 33. shows the rear view of bed.

The slant bed machine is excellent for mass production.

Besides the larger slant degree saves the floor space.

All guideways are wide rectangular type for high rigidity and stability.

One piece design bed ensures rigidity for heavy duty cutting and eliminate thermal deformation (Fig. 34 shows the front view of bed.)

The bed is Meehanite licensed casting with hardness HB170~180 and has been treated dynamically and stress released. It assures the highest vibration-free rigidity and prevents deformation during heavy cutting. The surface of bed way is hardened (HRC48-52) by heat treatment.

For automatic production, hydraulic chuck is standard. Fig. 35 shows HT with 3-jaw hyd. chuck and tool probe. The 52HT, 76HT and 92HT fits with 8", 10", 12" hyd chuck respectively as standard, and available to enlarge one size bigger of the chuck on each model.



Fig. 36 Hydraulic pressure switch, hydraulic gauge and chart position

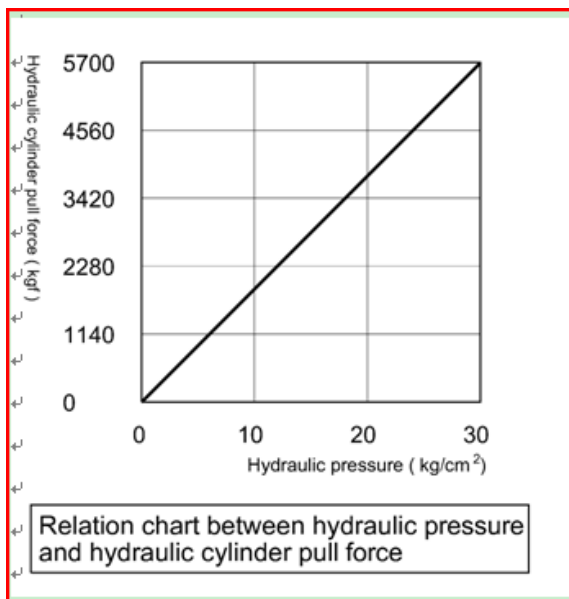


Fig. 37 Relation chart between hydraulic pressure and pull force

The hydraulic pressure could be adjusted by the switches under control panel (see red mark in Fig. 36).

Fig. 37 shows the Relation chart between hydraulic pressure and pull force. and Fig. 38 shows "Relation chart between pull force and clamping force

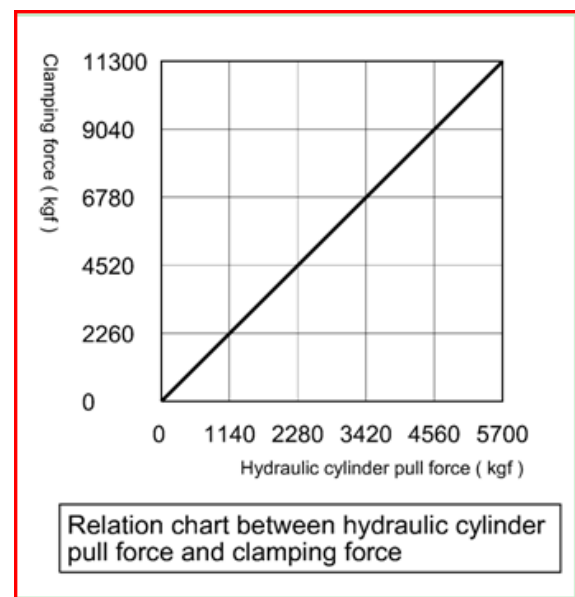


Fig. 38 Relation chart between pull force and clamping force

7.7 Hydraulic oil pressure detection device



Fig. 39 Hydraulic tank

The chuck, turret (LS type) and tailstock are driven by the hydraulic power (hydraulic unit is shown as Fig. 39). A sensor on the hyd. tank can detect the oil pressure. Alarm will occur if it's lower than 10kg/cm².

7.8 Oil leakage monitoring system



Fig. 40 Lubrication unit

A resistance type lubrication unit shown as Fig.40. A float switch can detect the volume of oil. If the oil level is lower than the set level, an abnormal signal and a buzzer will alarm automatically. This will prevent further damage to machine and service expense.

To ensure the oil in the pipe when machine stops running, a checked valve is added on the outlet of oiler to prevent oil from returning to the unit.

7.9 Handy scrapped and turcite B on bearing surface



Fig. 41 Carriage plated with Turcite B

All bearing and carriage surfaces are coated and hand scraped with Turcite B (see Fig.41), allowing fast axis movement under minimized friction. The scraping standard is 1 bearing point contains 1 mm², 16 points/inch².

7.10 8 or 12 positions hyd. turret with fast turret indexing



Fig. 42 Hydraulic type turret w/standard disc

The hydraulic turret (see Fig. 42) with mechanical cam features high indexing accuracy and fast tool change.

Turret rotation is driven by motor for high torque output and maximum stability.

The clamping/unclamping is driven through hydraulic power, assuring smooth motion and allowing heavy duty machining.

Tool to tool change time: 0.35 sec,
180 degrees change time: 1.2 sec.

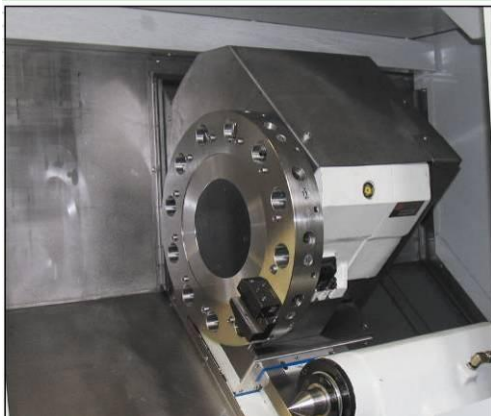


Fig. 43 Hydraulic type turret w/VDI disc

The turret is available with standard type 8 or 12 stations and VDI type disc (see Fig. 43).

7.11 Tailstock rapid positioning driven by saddle

7.12 Programmable tailstock body & Quill movement



Fig. 44 Tailstock

Heavy duty design of tailstock (see Fig. 44) performs rigidity and programmable tailstock can be activated via program or controlled directly by the operator with standard foot pedal, allowing the operator load/unload the work-piece by himself and saving the labor cost.

And the clamp pressure could be set according to the size of work-piece & material.

7.13 Bright working room provides good visibility



Fig. 45 Full enclosure & large window

Automatic door controls the machine door automatically via pneumatic cylinder and can be operated by program.

With a robotic loader, machine will run automatically in 24 hours running at most efficient productivity.

The enlarged window (see Fig.45) allows more visibility into the working area.

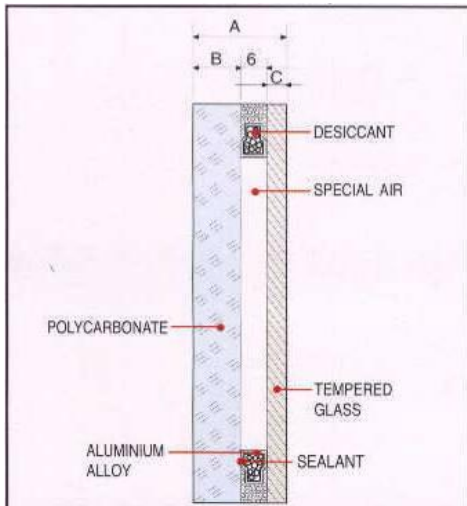


Fig. 46 Safety window

7.14 CE declaration of conformity for EU countries

7.15 Fully CNC package -- control and motors



Fig. 47 Electrical cabinet w/Fanuc control

The window material (see Fig.46) is made from Polycarbonate (P.C) and safety glass which is confirmed to meet the safety regulation.

The CE marking certifies that a product meets EU (European Community) consumer safety, health and environmental requirements. All Microcut machine are produced according to CE regulations, and shipped with CE Declaration of Conformity for EU countries.

Inside the electrical cabinet (see Fig. 47), all the components and wires are with parts number & wire number marked, as well as the number stuck on corresponding position. The technicians could do the maintenance according to the electrical diagram in the operation manual.

The advantage of complete CNC package (including CNC controller, axes motors & drivers) ensures the best stability of CNC quality and quick service from the CNC supplier.

8. COMPARISON TABLE

Table 2 comparison table

Brand		MICROCUT	Dxxxxn	Vxxxxr	Gxxxxxy
Model		52HT	PUMA 300B	VII-20	GA-2000
Capacity					
Max. swing	mm	600	590	590	580
Max. cutting diameter	mm	485	399	360	350
Max. cutting length (with chuck)	mm	750 / 1250	647	510	309/624/1204
Slant bed degree	degree	45	45	30	30
Travel					
X axis travel	mm	305	280	220	205
Z-axis travel	mm	750 / 1250	680	510	350
Spindle					
Spindle nose		A2-6	A2-8	A2-6	A2-6
Draw tube bore	mm	52	51	52	51
Spindle speed	rpm	4500	3500	4200	4800
Spindle motor - standard	kw	11/15	18.5/22	11/15	11/15
Hydraulic chuck size	mm	200	254	200	200
Turret					
Turret type		Hydraulic	Hydraulic	Hydraulic	Hydraulic
Tool no.		8/12	10	10	10/12
Tool allowance	mm	25X25			
Accuracy					
Positioning accuracy	mm	±0.005/300			±0.005
Repeatability accuracy	mm	±0.0025			±0.003
Miscellaneous					
Machine weight	kg	5700	5697	4200	3500

CONCLUSION:

1. Microcut lathe offers longer turning length
2. Microcut machine is much more heavy duty which can be seen from machine weight

9. CUTTING REPORT

TURRET: VDI40 12T

TOOL HOLDER: SANDVIK / MCLNL 2525 M12

MODEL / SPINDLE MOTOR: 52HT / ailp 30/6000

MATERIAL(std./code): JIS / S45C

HARDNESS(HRC or HB): 150HB

TEST CONDITIONS

Table 3 Cutting test condition

ITEM	TOOL	DIA. Mm	VC(m/min)	Ap*Ae(mm)	Feed (mm/rev)
1	SANDVIK CNMG 12 04 08-PR4035	247	224	4	0.2
2	SANDVIK CNMG 12 04 08-PR4035	239	232	5	0.15
3	SANDVIK CNMG 12 04 08-PR4035	230	230	3	0.3

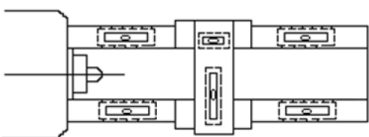
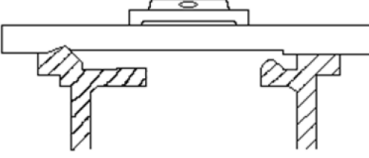
Table 4 Cutting test result

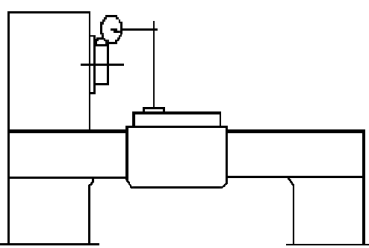
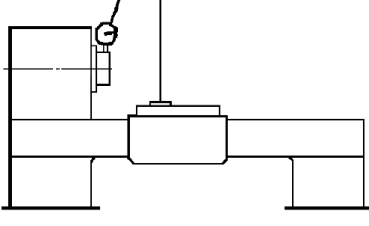
ITEM	SPINDLE LOADING	TEST CURRENT	metal remove cm3/min
	S: X: Y: Z:	S: X: Y: Z:	
1	S:71% X: 15% Y: Z:40%	S:32A X:1A Y: Z:0.4A	182
2	S:75% X: 18% Y: Z:43%	S:36A X:0.48A Y: Z:0.2A	174
3	S:76% X: 14% Y: Z:36%	S:32A X:0.2A Y: Z:0.2A	207

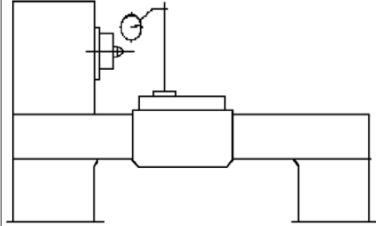
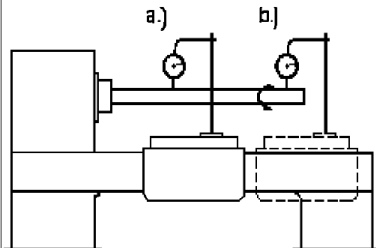
10. GEOMETRY TEST

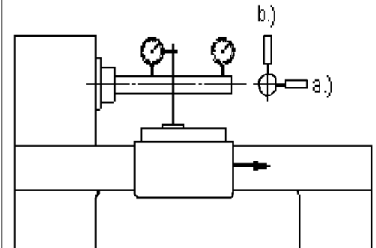
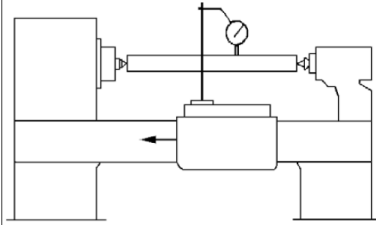
The geometrical accuracy is tested according to the ISO 1708:1989 standard and the repeatability and positioning accuracy is tested according to the ISO230-2:2006.

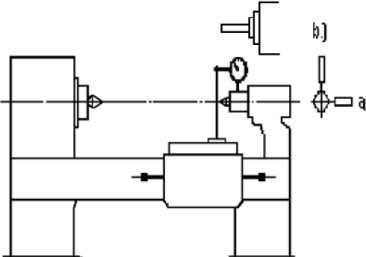
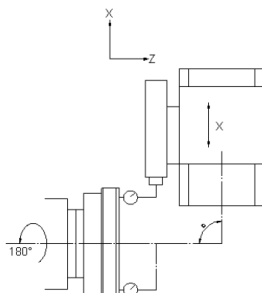
Table 5 Geometrical tolerance test

No.	Diagram	Object	Precision lathe	Other lathe		Result	
			Metric (mm)	Metric (mm)			
			$D_a < 500$ and $DC < 1500$	$D_a < 800$	$800 < D_a < 1600$		
G1	 a)  b)	A - BED Verification of leveling of slide ways a) Longitudinal verification : Straightness of slide ways in the vertical plane	$DC < 500$ 0.01 (convex)	$DC < 500$ 0.01 (convex)	$DC < 500$ 0.015 (convex)		
			$500 < DC < 1000$ 0.015 (convex) local tolerance **) 0.005 over any measured length of 250	$500 < DC < 1000$ 0.02 (convex) local tolerance **) 0.0075 over any measured length of 250	$500 < DC < 1000$ 0.03 (convex) local tolerance **) 0.01 over any measured length of 250		
			$1000 < DC < 1500$ 0.02 (convex) Local tolerance **) 0.005 over any measured length of 250	$DC > 1000$ For each 1000 increase in distance between center beyond 10000, add to the corresponding preceding tolerance : 0.01 (convex) Local tolerance **) 0.015 over any measured length of 500	$DC > 1000$ For each 1000 increase in distance between center beyond 10000, add to the corresponding preceding tolerance : 0.02 (convex) Local tolerance **) 0.02 over any measured length of 500		
		b) Traverse verification : Slide ways shall be in the same plane	Variation in level : 0.03/1000	Variation in level : 0.04/1000	Variation in level : 0.04/1000		

No.	Diagram	Object	Precision lathe	Other lathe		Result	
			Metric (mm)	Metric (mm)			
			$D_a < 500$ and $DC < 1500$	$D_a < 800$	$800 < D_a < 1600$	H1	H2
G2		C –Headstock Spindle Measurement of camming of the face plate resting surface.	0.01 including periodic axial slip	0.02 including periodic axial slip	0.02 including periodic axial slip		
G3		Measurement of run-out of spindle nose centring sleeve.	0.007	0.01	0.015		

No.	Diagram	Object	Precision lathe	Other lathe		Result	
			Metric (mm)	Metric (mm)			
			D _a < 500 and DC < 1500	D _a < 800	800 < D _a < 1600	H1	H2
G4		Measurement of run-out of Headstock centre.	0.01	0.015	0.02		
G5		Measurement of run-out of Axis of centre: a) at the spindle nose of the housing; b) at a distance from the spindle nose equal to D _a /2 or not more than 300mm (12in)1).	a) 0.005 b) 0.015 for a measuring length of 300 0.01 for a measuring length of 200 0.005 for a measuring length of 100	a) 0.01 b) 0.02 for a measuring length of 300	a) 0.015 b) 0.05 for a measuring length of 500		

No.	Diagram	Object	Precision lathe	Other lathe		Result	
			Metric (mm)	Metric (mm)			
			D _a < 500 and DC < 1500	D _a < 800	800 < D _a < 1600	H1	H2
G6		Checking of parallelism of spindle axis to carriage longitudinal movement on a length equal to D _a /2 or a maximum equal to 300mm (12in) 1): a) in the horizontal plane; b) in the vertical plane.	a) 0.01/300 frontwards b) 0.02/300 upwards	a) 0.015/300 frontwards b) 0.02/300 upwards	a) 0.03/500 frontwards b) 0.04/500 upwards		
G7		E – Centres Checking of difference in height between headstock centre and tailstock centre.	0.02 Tailstock centre higher Than headstock centre	0.04 Tailstock centre higher Than headstock centre	0.06 Tailstock centre higher Than headstock centre		

No.	Diagram	Object	Precision lathe	Other lathe		Result	
			Metric (mm)	Metric (mm)			
			$D_s < 500$ and $DC < 1500$	$D_s < 800$	$800 < D_s < 1600$	H1	H2
G8		D – Tailstock Checking of parallelism of the axis of the outside of tailstock sleeve to carriage movement: a) in the horizontal plane. b) in the vertical plane.	a) 0.01/100 frontwards b) 0.015/100 upwards	a) 0.015/100 frontwards b) 0.02/100 upwards	a) 0.02/100 frontwards b) 0.03/100 upwards		
G9		Checking the squareness between the workhead spindle (Direction of error $\alpha \cong 90^\circ$)	0.01	0.015	0.015		

Reference: ISO1708:1989(E)

All machines are approved by laser equipment (see Fig. 40) and it meets repeatability accuracy at $\pm 0.005\text{mm}$ and positioning accuracy at $\pm 0.005\text{mm}$. The laser test reports are shown as Fig. 48 & 49.

A 24-hours free run is done by a complete function test programs before all the geometrical test.



Fig. 48 Laser test

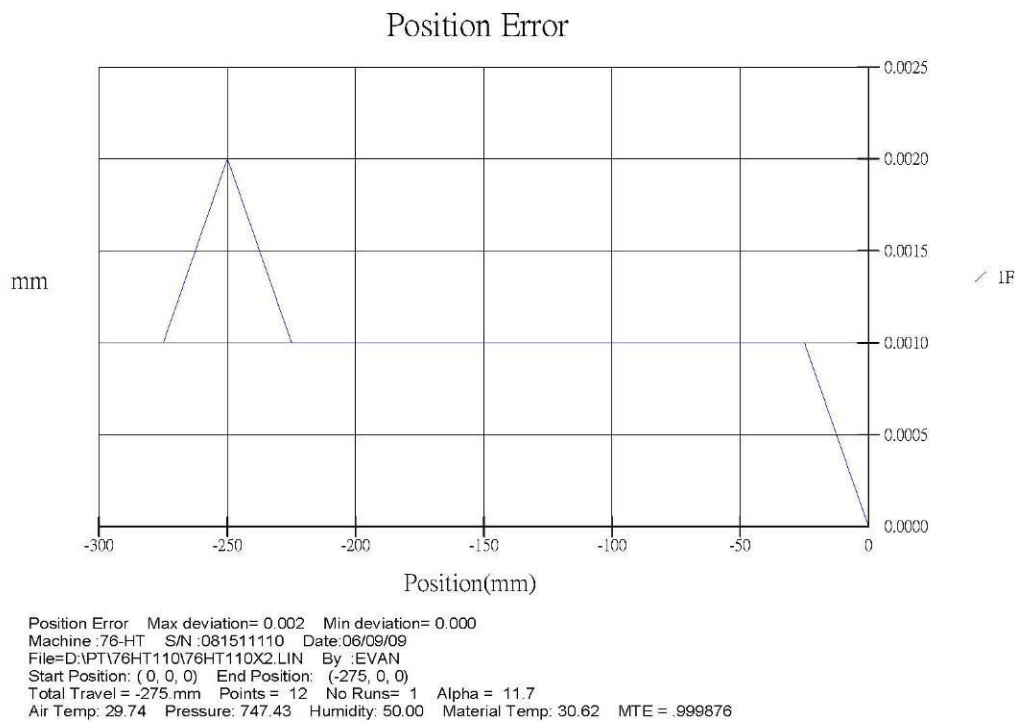


Fig.49 Laser test report for X-axis of 76HT

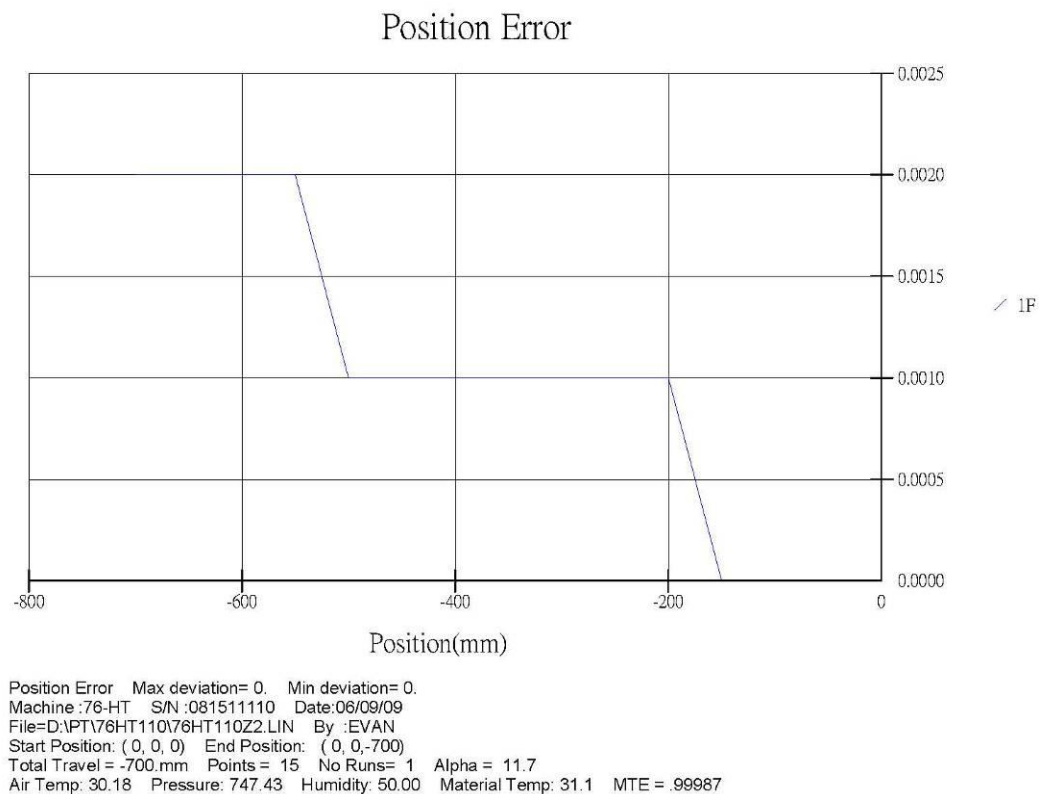


Fig.50 Laser test report for Z-axis of 76HT

11. STANDARD ACCESSORIES

* CNC controllers available as below:

Fagor 8055i/A TC, see Fig. 51

Fanuc 0iTD with Manual Guide 0i, see Fig. 52

Siemens 802D SL with manual machine plus function, see Fig. 53

Heidenhain 620, see Fig. 54



Fig. 51 Fagor 8055i FL



Fig. 52 Fanuc 0iTD



Fig. 53 Siemens 802D SL

- * Hydraulic turret 8 or 12 stations, standard type disc
- * High pressure cooling system
- * Hydraulic 3-jaw chuck with hard jaw & soft jaw
- * Auto lubrication system
- * Work lamp
- * Programmable tailstock
- * M30 program stop light
- * Hydraulic unit
- * Fully enclosed splash guard with interlock safety device
- * Auto lock/unlock door
- * Control panel
- * Tool set & box, level pads, operation manual & part list
- * CE declaration of conformity for EU countries

12. OPTIONAL ACCESSORIES

12.1 Soft jaw 8"/10"/12"

8" for 52-HT/HTL

10" for 76-HT/HTL

12" for 92-HT/HTL

Refer to Fig. 54



Fig. 54 Soft jaw

12.2 Tool holder package for standard turret

8 of Gib & Spacer

2 of Facing toolholder

3 of Boring bar holder

1 of Boring bar holder with coolant through toolholder

1 ea Sleeve 12mm, 16mm, 20mm, 25mm, MT3

1 ea Sleeve for coolant through toolholder 20mm, 25mm

12.3 Bigger hydraulic chuck

Standard hydraulic chuck size is 8" on 52HT/HTL, 10" on 76HT/HTL, and 12" on 92HT/HTL. It is available to enlarge the hydraulic chuck to 10" on 52HT/HT, 12" on 76HT/HTL, and 15" on 92HT/HTL on request.

12.4 Collet unit

The collet chuck enables the clamping of small workpiece on bar feeder for automatic turning.

Fig. 55 shows the collect unit. Collet chuck is easily retrofitted after shipment since it use same cyliner and draw tube as hydraulic chuck.

Fig.56 shows the collet chuck installation drawing.



Fig. 55 Collet chuck

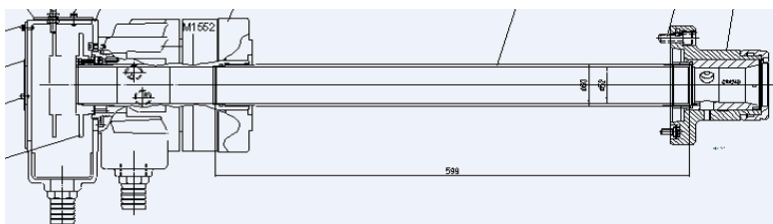


Fig. 56 Collet chuck installation drawing

12.5 Various size of Collets

A wide selection of collets size from 1mm to 65mm for users.

Collets photo is shown as Fig. 57.



Fig. 57 Collets

12.6 C-axis

One hydraulic braking disc is installed to control the action of C-axis shown as Fig. 58. CNC controller is upgraded and the spindle servo motor provides higher resolution to achieve the accuracy at 0.001°.



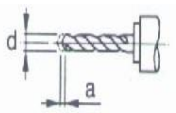
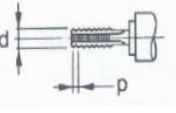
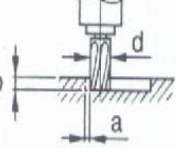
Fig.58 C-axis

12.7 Power turret Baruffaldi TBMA-200 turret (VDI40/12T)

Indicative cutting capacity (with fit motors)

Workpiece material : 600N/square mm steel

Cutting tool materials: HSS

Twist drilling dxa [mm]x[mm]		M20*0.20
Tapping dxa [mm]x[mm]		M16*2
Slot milling dpxa [mm]x[mm]x[mm]		25*14*40

The fig. 59 shows the TBMA turret.



Fig.59 TBMA turret w/live tooling

12.8 Live tool holders (Taiwanese made)

Axial live tool holder
 Radial live tool holder
 Seat back Radial live tool holder
 Fig. 60 shows the tool holders



fig. 60 live tool holder

12.9 Auto parts catcher

Auto parts catcher, refer to Fig. 61. When the machine with bar feeder, an auto parts catcher works together with it and make machine run automatically.



Fig. 61 Auto parts catcher

12.10 Tool probe (Automatic & Manual)

Manual or Automatic toolprobe for fast tool setting
 Renishaw HPMa type (automatic)
 Renishaw HPPA type (manual), see Fig. 62



Fig.62 Manual tool probe

12.11 Bar feeder interface

Includes extra I/O module, internal wiring for bar feeder prepared for PRO or Fedek bar feeder.
 Fig. 63 shows the connector for bar feeder.

(Contact MICRO CUT first if any request for other brand bar feeder)



Fig.63 Interface for bar feeder

12.12 Bar feeder

Model DH-65L (Fedek brand) or V-65LE (PRO brand), shown as Fig. 64

Bar dia. 5-65mm, max. length 1,550mm

(Contact MICROCUT first if any request for other capacity)

Spindle reduction tubes are available on request.
A spindle reduction tube to fix small dia. Dimension is required according to the workpiece size.



Fig. 64 Bar feeder

12.13 EMC

EMC (electromagnetic compatibility) (see Fig. 65) includes EMI (electromagnetic interference) and EMS (electromagnetic susceptibility), preventing the interference from outside electromagnetic and the electromagnetic interference to the other equipment.



Fig. 65 EMC

12.14 Heat exchanger for electric cabinet

Heat exchanger (see Fig. 66) keeps the temperature inside the electric cabinet the same as room temperature.



Fig. 66 Heat exchanger

12.15 High pressure 20 bar coolant through tool

Suitable for better chip removes on deep hole or better finish for workpiece material like stainless steel.

Fig. 67 shows coolant through tool with coolant through function.

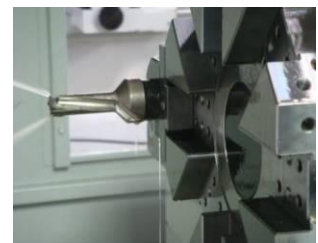


Fig. 67 Coolant through tool
w/ 20 bar high pressure pump

12.16 Power transformer

For Fanuc controller & voltage except 220V
For Siemens, Fagor, Heidenhain controller & voltage except 400V
The transformer is shown as Fig. 68



Fig. 68 Transformer

12.17 Extra for Fanuc 0iTD controller with 10.4" LCD display and Manual Guide i

10.4" LCD display for Fanuc is available on request. When it's 10.4" LCD, refer to Fig. 69, Fanuc manual guide i is standard to get which gives more conversation function for operator.



Fig. 69 Fanuc 10.4" monitor

12.18 Fagor Service Contract for 24 months

In all territories where Fagor has either a subsidiary or a service center. Contract among other terms and conditions will provide free labour for solving of problems related to Fagor's products and due to manufacturer faults.

13. Controller Function List

13.1 FANUC

√	○:STANDARD ●: STANDARD OPTION ☆:OPTION —:NOT AVAILABLE *: FUNCTION INCLUDE IN ANOTHER OPTION Δ:NEW ADD		
√	NO.	ITEM	FANUC 0iTD
√	CONTROLLED AXIS		
√	▲	MAX. CONTROLLER AXES (NC AXES)	8(2-path)/5(1-path)
√		MAX. SPINDLE AXES (NC AXES)	2/3(option)
√	▲	SIMULTANEOUSLY CONTROLLED AXES	4
	▲	Cs CONTOURING CONTROL	○
	▲	SIMPLE SYNCHRONOUS CONTROL 1 PAIR	○
		ANGULAR AXIS CONTROL	☆
√	▲	TANDEM CONTROL	○
√		TANDEM DISTURBANCE ELIMINATION CONTROL	☆
√		TORQUE CONTROL	○
		POLE POSITION DETECTION FUNCTION	☆
√		CONTROL AXIS DETACH	○
		LEAST INPUT INCREMENT (INCREMENT SYSTEM)	○
		INCREMENT SYSTEM 1/10(0.0001mm/0.0001deg/0.00001inch)	○
√		INCREMENT SYSTEM 1/100(0.00001mm/0.00001deg/0.000001inch)	○
		FLEXIBLE FEED GEAR (OPTION DMR)	○
√	▲	DUAL POSITION FEEDBACK	☆
	▲	HRV CONTROL (HRV2)	○
√	▲	HRV CONTROL (HRV3)	○A
	▲	INCH/METRIC CONVERSION (G20,G21)	○
		INTERLOCK	○
		MACHINE LOCK	○
		EMERGENCY STOP	○
		OVERTRAVEL	○

		STORED STROKE CHECK 1	○
		STORED STROKE CHECK 2,3 (G22,G23)	○
		STROKE LIMIT CHECK BEFORE MOVE	○
		CHUCK AND TAILSTOCK BARRIER	○
	▲	MIRROR IMAGE	○
		FOLLOW-UP	○
		SERVO OFF/MECHANICAL HANDLE FEED	○
		CHAMFERING ON/OFF	○
√	▲	INTERFERENCE CHECK BETWEEN 2-PATH	☆(2-path)
√	▲	INTERFERENCE CHECK FOR ROTARY AREA	—
√		UNEXPECTED DISTURBANCE TORQUE DETECTION(異常負荷検出)	○
√		POSITION SWITCH	○
√	▲	LINER SCALE I/F WITH ABSOLUTE ADDRESS REFERENCE MARK	☆
		LINER SCALE I/F EXPANSION WITH ABSOLUTE ADDRESS REFERENCE MARK	☆
√		TEMPORARY ABSOLUTE COORDINATE SETTING	☆
√	▲	DUAL CHECK SAFETY	☆A
√	OPERATION		
		AUTOMATIC OPERATION (MEMORY)	○
		MDI OPERATION	○
		DNC OPERATION	○
		DNC OPERATION WITH MEMORY CARD	○
		SCHEDULE FUNCTION	○
		PROGRAM NUMBER SEARCH	○
√		SEQUENCE NUMBER SEARCH	○
√		SEQUENCE NUMBER COMPARISON AND STOP	○
√	▲	PROGRAM RESTART	○
√		MANUAL INTERVENTATION AND RETURN	○
		WRONG OPERATION PREVENTION	○
√		RETRACTION FOR RIGID TAPPING	☆
		BUFFER REGISTER	○
		DRY RUN	○
		SINGLE BLOCK	○

		JOG FEED	○
		MANUAL REFERENCE POSITION RETURN	○
		REFERENCE POSITION SETTING WITHOUT DOG	○
		REFERENCE POSITION SETTING WITH MECHANICAL STOPPER	○
		REFERENCE POSITION RETURN SPEED SET	○
		REFERENCE POSITION SHIFT	○
		MANUAL HANDLE FEED 1 UNIT	○
√		MANUAL HANDLE FEED 2 β-UNITS	○
		MANUAL HANDLE FEED RATE (X1,X10,X100,X1000)	○
√		MANUAL HANDLE INTERRUPTION	○
√		MANUAL HANDLE I/F FOR I/O LINK β	☆
		JOG AND HANDLE SIMULTANEOUS MODE	○
√		MANUAL HANDLE RETRACE	☆
√		MANUAL HANDLE FEED 2 UNITS	○
√	INTERPOLATION		
√	▲	Nano interpolation	○
		POSITION (G00)	○
√		EXACT STOP MODE(G61)	○
√		EXACT STOP(G09)	○
		LINER INTERPOLATION (G01)	○
		CIRCULAR INTERPOLATION (G02/G03)	○
		DWELL (G04)	○
√	▲	POLAR COORDINATE INTERPOLATION (G12.1,G13.1)	○
√	▲	CYLINDRICAL INTERPOLATION (G07.1)	○
√	▲	HELICAL INTERPOLATION	☆
√		THREADING,SYNCHRONOUS CUTTING (G33)	○
	▲	MULTIPE THREADING	○
		THREADING,RETRACT(G33)	○
		CONTINUOUS THREADING	○
	▲	VARIABLE LEAD THREADING	○
		POLYGON TURNING	○
		POLYGON MACHINING WITH TWO SPINDLE	○
		SKIP FUNCTION (G31)	○
√		MULTIPE-STEP SKIP (G31)(FOR GRINDING MACHINE)	☆

√		HIGH-SPEED SKIP (G31)	☐
√		TORQUE LIMIT SKIP	☐
		REFERENCE POSITION RETURN (G28)	☐
		REFERENCE POSITION RETURN CHECK (G27)	☐
		2ND REFERENCE POSITION RETURN (G30)	☐
√		3RD/4TH REFERENCE POSITION RETURN	☐
√	▲	BALANCE CUTTING	☆(2-path)
√	▲	GENERAL PURPOSE RETRACT	☐
√	FEED FUNCTION		
√		RAPID TRAVERSE RATE (MAX. 240 m/min,1um)	☐
√	▲	RAPID TRAVERSE RATE (MAX. 100 m/min,0.1um)	☐
		RAPID TRAVERSE OVERRIDE(F0,25,50,100%)	☐
		FEED PER MINUTE	☐
		FEED PER REVOLUTION (G98,G99)	☐
		TANGENTIAL SPEED CONSTANT CONTROL	☐
		CUTTING FEED CLAMP	☐
		Automatic Acceleration/Deceleration (rapid:linear,cutting:exponential)	☐
√	▲	RAPID TRAVERSE BELL-SHAPED ACCELERATION/DECELERATION	☐
√	▲	LINEAR ACCELERATION/DECELERATION AFTER CUTTING FEED INTERPOLATION	☐
		FEEDRATE OVERRIDE (0~254%)	☐
		JOG OVERRIDE (0~655.34%)	☐
		OVERRIDE CANCEL	☐
		ERROR DETECTION	☐
√		EXTERNAL DECELERATION	☐
√	▲	ADVANCE PREVIEW CONTROL (LOOK-AHEAD 1 BLOCKS)	☆
		HIGH SPEED PROCESSING	
		OPTIMUM ACCELERATION/DECELERATION FOR RIGID TAPPING	☆
√	?	RAPID TRAVERSE BLOCK OVERLAP	☐
√	PROGRAM INPUT		
		TAPE MODE (EIA RS244/ISO840)	☐

		LABEL SKIP	☐
		PARITY CHECK (HORIZONTAL AND VERTICAL PARITY)	☐
		CONTROL IN/OUT	☐
		OPTIONAL BLOCK SKIP (1)	☐
√		OPTIONAL BLOCK SKIP (9)	☐
		MAX. PROGRAMMABLE DIMENSION (±8-DIGIT)	☐
		PROGRAM NUMBER 04-DIGIT	☐
√	?	EXTERNAL MEMORY AND SUB PROGRAM CALLING FUNCTION	☐
		SEQUENCE NUMBER (N5-DIGIT)	☐
		ABSOLUTE/INCREMENTAL PROGRAMMING (G90,G91)	☐
		DECIMAL POINT PROGRAMMING/POCKET CALCULATOR TYPE DECIMAL POINT PROGRAMMING	☐
		INPUT UNIT 10 TIME MULTIPLY	☐
		DIAMETER/RADIUS PROGRAMMING (X AXIS)	☐
		PLANE SELECTION (G17,G18,G19)	☐
		ROTARY AXIS DESIGNATION	☐
		ROTARY AXIS ROLL-OVER	☐
		COORDINATE SYSTEM SETTING	☐
		AUTOMATIC COORDINATE SYSTEM SETTING	☐
		WORKPIECE COORDINATE SYSTEM (G52~G59)	☐
√		WORKPIECE COORDINATE SYSTEM PRESET	☐
		DIRECT INPUT OF WORKPIECE ORIGIN OFFSET VALUE MEASURED	☐
√		MANUAL ABSOLUTE ON AND OFF	☐
√		DIRECT DRAWING DIMENSION PROGRAMMING	☐
√		G CODE SYSTEM (A)	☐
√		G CODE SYSTEM (B/C)	☐
√		CHAMFERING/CORNER R	☐
√	▲	PROGRAMMABLE DATA INPUT (G10)	☐
		PROGRAMMABLE PARAMETER INPUT	☐
		SUB PROGRAM CALL (M98,M99)	☐
√	▲	CUSTOM MACRO B	☐
√	▲	ADDITION OF CUSTOM MACRO COMMON	☐

		VARIABLES(#100-199,#500-999)	
		MACRO VARIABLES COMMON WITH BOTH 2 PATH	○(2-path)
√	▲	INTERRUPTION TYPE CUSTOM MACRO	○
		CANNED CYCLE (G73~G89)	○
		MULTIPLE REPETITIVE CYCLE	○
		MULTIPLE REPETITIVE CYCLE II (POCKET PROFILE)	○
√	▲	CANNED CYCLE FOR DRILLING	○
	▲	CIRCULAR INTERPOLATION BY R PROGRAMMING	○
		MIRROR IMAGE FOR DOUBLE TURRET	○
		TAPE FORMAT FOR FANUC SERIES 10/11	○
√	▲	MACRO EXECUTER	☆4/2MB/512KB
√		C LANGUAGE EXECUTER	☆6/4/2MB
		COORDINATE SYSTEM SHIFT	○
		DIRECT INPUT OF COORDINATE SYSTEM SHIFT	○
√	▲	CANNED CYCLE FOR GRINDING(FOR GRINDING MACHINE)(G75~G79)	☆
√		PATTERN DATA INPUT	○
√		CONVERSATIONAL PROGRAMMING WITH GRAPHIC FUNCTION	○
√	CONVERSATIONAL PROGRAMMING FUNCTION FOR LATHE		
√	OPERATION GUIDANCE FUNCTION FOR GENERAL PURPOSE LATHE		
√	▲	MANUAL GUIDE (FOR 1 PATH LATHE)	S/☆(8.4")
√	INTEGRATED OPERATION & PROGRAMMING GUIDANCE FUNCTION		
		MANUAL GUIDE I	S/☆(10.4") /—(8.4")
√	OPERATION GUIDANCE FUNCTION FOR COMPOUND MACHINE		
√	TURN MATE i		☆
√	AUX/SPINDLE FUNCTION		
		AUXILIARY FUNCTION (M8-DIGIT)	○
√		2ND AUXILIARY FUNCTION (B8-DIGIT)	○
		AUXILIARY FUNCTION LOCK	○
		HIGH-SPEED M/S/T/B INTERFACE	○
√		WAITING FUNCTION	○(2-path)
		MULTIPLE COMMAND OF AUXILIARY FUNCTION (3)	○
		SPINDLE SPEED FUNCTION	○

		SPINDLE SERIAL OUTPUT	●
		CONSTANT SURFACE SPEED CONTROL (G96,G97)	○
		SPINDLE OVERRIDE (0~254%)	○
		ACTUAL SPINDLE SPEED OUTPUT	○
		1ST SPINDLE ORIENTATION	○
		1ST SPINDLE OUTPUT SWITCHING FUNCTION	○
√		SPINDLE SYNCHRONOUS CONTROL	○
√		MULTI SPINDLE CONTROL	○
√	▲	SPINDLE POSITIONING	○
√	▲	RIGID TAPPING (G84)	○
√		SPINDLE SPEED FLUCTUATION DETECTION (G25,G26)	○
		SERVO/SPINDLE SYNCHRONOUS CONTROL(LIVE TOOL CONTROL WITH SERVO MOTOR)	☆
√		SPINDLE ANALOG OUTPUT	●
		SPINDLE GEAR SELECTION	*
		2ND SPINDLE ORIENTATION	○
		2ND SPINDLE OUTPUT SWITCHING FUNCTION	○
√	TOOL FUCTION/ TOOL COMPENSATION		
		TOOL FUNCTION (T7+1/T6+2 DIGITS)	○
√	▲	TOOL OFFSET PAIRS (MAX.)	200(☆) /64(○)
		COMMON OFFSET MEMORY BETEWEEN EACH PATH	○(2-path)
√		TOOL OFFSET (G45~G48)	○
		Y AXIS OFFSET	○
	▲	TOOL NOSE RADIUS COMPENSATION (G40~G42)	○
		TOOL GEOMETRY/WEAR COMPENSATION	○
√	▲	TOOL MANAGEMENT FUNCTION 64 PAIRS	☆
√	▲	TOOL MANAGEMENT FUNCTION 240 PAIRS	☆
√	▲	TOOL MANAGEMENT FUNCTION 1000 PAIRS	☆
		TOOL MANAGEMENT EXPANSION B	☆
		TOOL OFFSET VALUE COUNTER INPUT	○
		AUTOMATIC TOOL OFFSET	○
		DIRECT INPUT OF TOOL OFFSET VALUE MEASURED	○
		DIRECT INPUT OF TOOL OFFSET VALUE MEASURED B	○

√	▲	TOOL LIFE MANAGEMENT	○
		AUTOMATIC ALTERATION OF TOOL POSITION COMPENSATION	☆
√		EXTENDED TOOL LIFE MANAGEMENT	○
ACCURACY COMPENSATION FUNCTION			
		BACKLASH COMPENSATION	○
		BACKLASH COMPENSATION FOR EACH RAPID TRAVERSE AND CUTTING FEED	○
		SMOOTH BACKLASH COMPENSATION	☆
√		STORED PITCH ERROR COMPENSATION	○
√	▲	BI-DIRECTION PITCH ERROR COMPENSATION	☆
√	▲	INCLINATION COMPENSATION	☆
HOBGING/ELECTRONIC GEAR BOX			
√	EDITING OPERATION		
√	▲	PART PROGRAM STORAGE LENGTH (MAX.)1M=400byte,1K=1000byte	2560M (1M,option 2-path) 1280M(512k,A-std.) /800M(320k,B-std.)
√	▲	NUMBER OF REGISTER PROGRAMS (MAX.)	400
		PART PROGRAM EDITING	○
√		EXTENDED PART PROGRAM EDITING	○
		PROGRAM PROTECT	○
√	▲	PLAY BACK	○
√	▲	BACKGROUND EDITING	○
√	▲	MEMORY CARD PROGRAM EDITING/OPERATION	☆
√	▲	DATA SERVER EDITING/OPERATION	☆
√		PASSWORD FUNCTION	○
√	SETTING&DISPL AY		
		STATUS DISPLAY	○
		CLOCK FUNCTION	○
		CURRENT POSITION DISPLAY	○
		PROGRAM DISPLAY (PROGRAM NAME 31 CHARACTERS)	○

		PARAMETER SETTING AND DISPLAY	○
√		ALARM DISPLAY	○
√		ALARM HISTORY DISPLAY	○
√		OPERATION MESSAGE HISTORY DISPLAY	○
√		OPERATION HISTORY DISPLAY	○
√	▲	REMOTE DIAGNOSTIC	*
√	▲	RUN HOUR AND PARTS COUNT DISPLAY	○
		ACTUAL CUTTING FEEDRATE DISPLAY	○
		DISPLAY OF SPINDLE SPEED AND T CODE AT ALL SCREENS	○
√		DIRECTORY DISPLAY OF FLOPPY CASSETTE	○
		OPTIONAL PATH NAME DISPLAY	○(2-path)
		OPERATION MONITOR SCREEN	○
		SERVO SETTING SCREEN	○
		SPINDLE SETTING SCREEN (ONLY FOR αi series)	*
		SERVO WAVEFORM DISPLAY	○
		MAINTENANCE INFORMATION SCREEN	○
√		SOFTWARE OPERATOR'S PANEL	○
√		SOFTWARE OPERATOR'S PANEL GENERAL PURPOSE SWITCH	○
√		SOFTWARE OPERATOR'S PANEL GENERAL PURPOSE SWITCH EXPANSION	○
		MACHINE OPERATION MENU	☆
√	▲	MULTI-LANGUAGE DISPLAY	○
√	▲	DYNAMIC DISPLAY LANGUAGE SWITCH	○
		DATA PROTECTION KEY	○
√	▲	PROTECTION OF DATA AT EIGHT LEVEL	☆
		ERASE CRT SCREEN DISPLAY	○
		PARAMETER SETTING SUPPORTING SCREEN	○
√	▲	MACHINE CONDITION SELECTING FUNCTION	☆
√	▲	HELP FUNCTION	○
		SELF-DIAGNOSIS FUNCTION	○
		PERIODIC MAINTENANCE SCREEN	○
		DISPLAY OF HARDWARE AND SOFTWARE CONFIGURATION	○

√	▲	GRAPHIC FUNCTION	S/☆
√	▲	DYNAMIC GRAPHIC DISPLAY	S/☆(8.4")
√		TROUBLE DIAGNOSIS	○
		MACHINE ALARM DIAGNOSIS	☆
		DIRECTORY DISPLAY AND PUNCH FOR EACH GROUP	○
√	DATA IN/OUT		
√	▲	READER/PUNCHER INTERFACE (CH1)	○
√		READER/PUNCHER INTERFACE (CH2)	○
√		EXTERNAL TOOL OFFSET	○
√		EXTERNAL MACHINE ZERO POINT SHIFT	○
√	▲	EXTERNAL MESSAGE	○
√		EXTERNAL DATA INPUT	○
		EXTERNAL KEY INPUT	○
		EXTERNAL WORKPIECE NUMBER SEARCH (9999)	○
		EXTERNAL PROGRAM NUMBER SEARCH	○
√	▲	MEMORY CARD INPUT/OUTPUT	○
√	▲	SCREEN HARD COPY	○
√	▲	POWER MATE CNC MANAGER	○
√	▲	EXTERNAL I/O DEVICE CONTROL	○
√	▲	ONE TOUCH MACRO CALL	☆
√	▲	AUTOMATIC DATA BACKUP	☆
√	▲	DATA SERVER	☆(ATA 1GB)
√	▲	FAST DATA SERVER BOARD(高速乙太網路介面)	☆
√	▲	DNC 2 CONTROL	☆
		EXTERNAL PROGRAM INPUT	○
√	INTERFACE FUNCTION		
√	▲	EMBEDDED ETHERNET	○
√	▲	ETHERNET (ETHERNET BOARD IS REQUIRED)	☆TCP/IP
√	▲	PROFIBUS-DP (MASTER/SLAVE)	☆
√	▲	DEVICENET (MASTER/SLAVE)	☆
		FOCAS2/HSSB PORT2 FUNCTION	—
√	▲	FL-NET	☆
		ROBOT CONNECTION FUNCTION	☆
√	OTHERS		
√	▲	COLOR LCD DISPLAY UNIT	●

√	▲	8.4"LCD/MDI(COLOR)	●
√	▲	10.4"LCD/MDI(COLOR)	●
	PMC SYSTEM		
√	▲	PMC BASIC INSTRUCTION SPEED PER STEP	0.033us(A:PMC)/5us(B;PMC/L)
√	▲	PMC MAX. STEP NUMBER LADDER	24000/5000
	▲	EXTENDED PMC LADDER INSTRUCTION FUNCTION	☆
√	▲	FUNCTION BLOCK FUNCTION	☆
		I/O LINK EXPANSION 3RD CHANNEL	☆(A)
		ANALOG SERVO ADAPTER	●
√	NOTE		
√	▲	MAX. CUTTING FEEDRATE(M/min) (for short consecutives 1mm long)	7.5
√	?▲	LOOK-AHEAD BLOCKS (G08)(MAX.)	0(std.)
√	?▲	BLOCK PROCESS TIME (BPT msec)	8
√	▲	BPT=8ms (60000ms/8ms=7500mm/min)	
√	▲	PCMCIA CARD ATTACHMEN	—
√	?▲	RISC BOARD	—
√	?▲	FOR HIGH-SPEED PROCESSING	—
√	▲	Servo motor Max. pulse	$1.6 \times 10^7 / 10^6$
√	▲	α servo motor pulse : standard - 65536, ☆ Option : 10^6	
√	▲	αi servo motor pulse : standard - 10^6 , ☆ Option : 1.6×10^7	
√	▲	bi servo motor pulse : standard - 130000,	

13.2 FAGOR 8055i FL

Hardware	8055i FL/Power
TFT screen	10.4"
RAM Memory	256K/ 1M
Solid state disk	512M/ 2G CF
Ethernet	Basic
USB connections	1 on front panel
RS232/RS422	Basic
Mouse	No
Touch Screen	No
Machine config.	
max Execution Channel	1
Max. NC Axes	7
Max. Spindles	2
Part Zero	22
Kinematics	Limited
Inclined Plane Movement	Basic
RTCP(Rotaional tool center point)	Option
Synchronized spindles	No
Gantry control	Option
Tool	
Tool Offset	255
Tool life Monitoring	Option
Tool Geometry compensation	Basic
Tool Measure cycles	Basic
Compensation function	
Bidirection leadcrew compensation	Basic
Cross compensation	Basic
Dual feedback management	Basic

Display & Simulation	8055i FL/Power
clock & part counter	Basic
Machining time estimate	Basic
simulation in selected planes	Basic
simulation in 3D	Basic
simulation in High Definition Graphics	No
Zoom in simulation	Basic
PC Simulation Software	no
Edit & Programming	
Conversational cycles	Basic
C axis conversation in T	Option
Y axis conversation in T	Option
Path handwheel	Basic
Teach-in editing	Basic
DXF converter	Basic in PC
Profile Editor	Basic
DNC	Basic
Software features	
Tele-diagnosis	Option
Rigid tapping	Basic
Volumetric compensation FVC	No
Dual Purpose	No
IEC 61131 Language	No
Multi-axis management	No
File Encryption	No
Performance	
BPT (ms)	3.5 ms / 1ms (power)
Look Ahead (Blocks)	100 /200 (power)
Jerk control	Basic
Feed forward/ AC forward	Basic
Contour control FFWD	Advanced G51
Servo position loop time	-
Servo current loop time	62.5 us

13.3 SIEMENS

• STD, ○ OPT, ◎ HW, --- N/A # STD, [#] Opt.Max, (#) HW		• STD, ○ OPT, ◎ HW, --- N/A # STD, [#] Opt.Max, (#) HW	802DSL
Specification	M/T pro	Specification	M/T pro
System Configuration		Non-perpendicular Y axis for turning	---
Axis/Spindle/Positioning Axis	5	Concatenated transformations	---
Max Spindle	2	Master/Slave for drives	○
Max Simutaneous Axis	4	HSC	
Max Machining Channel	1	Block Processing Time(ms)	9
CNC User Memory	3M	Velocity/Current loop cycle(μs)	125
Axis Function		Floating point accuracy(bits)	80
JERK limitation	•	Look ahead block	100
Separate feed for corners & chamfers	•	Spline interpolation (Compressor)	•
Programmable accelaration	•	Advanced Surface	---
Follow-up mode	•	Multiple machining parameters set	•
Travel to fixed stop with force control	---	Execute from exteranl CF card	•
Tangential control	•	Execute from exteranl USB drive	•
Pair of synchronized Axes(Gantry)	○	Execute from network drive folder	•
Spindle Function		Operation Mode	
5 Gear stages	•	<i>JOG Mode</i>	
Automatic gear stage selection	•	Metric/Inch switchover	•
Oriented spindle stop	•	Manual Work/Tool Measurement	•
Constant cutting speed	•	'Auto Work/Tool Measurement	•
Changover to axis mode	•	<i>MDA Mode</i>	
Interpolate with servo axis	•	Program save	•
Constant thread pitch cutting	•	Graphical cycle support	•
Variable thread pitch cutting	•	Teachin	•
Multiple thread cutting	•	<i>Automatic MODE</i>	
Rigid tapping	•	Overstore	---
Interpolation/Coupling		DRF Offset	---
3D Circular interpolation	•	Block search	•
Helical interpolation (2D+2)	•	<i>REPOS(back to contour)</i>	
NURBS interpolation	---	Manual operation	---
Polynomial interpolation	---	Program control	•
Involute interpolation	---	Handwheel override	---
Machining on end face	•	Handwheel contour control	---
Machining on peripheral surface	•	Online help	•
Multi-edge/Polygon turning	---	Screen saver	---
Inclined axis	---	Access level	8

• STD, ○ OPT, ◎ HW, --- N/A # STD, [#] Opt.Max, (#) HW		• STD, ○ OPT, ◎ HW, --- N/A # STD, [#] Opt.Max, (#) HW	
Specification	M/T pro	Specification	M/T pro
Operation Language		Axis/spindle replacement	---
English	•	Setpoint exchange	---
German	•	Part programs in NCU, max	99
Japanese	---	Workpieces on NCU, max	---
Chinese, Simplified	•	Job lists	---
Chinese, Traditional	•	Part programs on CF card	•
French	•	Part programs on USB device	•
Italian	•	Part programs on network drive	•
Korean	•	Templates for part , workpiece	---
Portuguese/Brazilian	•	Programming Support	
Spanish	•	Access to system variables	○
Czech	•	Synchronized actionis numbers	---
Danish	---	High speed synchronized actions	---
Dutch	•	Access drive variables	○
Finnish	•	Asynchronous subroutines (ASUB)	•
Hungarian	•	Interrupt routines with fast retraction	---
Polish	•	Animated cycle support (programGUIDE)	•
Romanian	•	Animated machining step support (ShopMill/ShopTurn)	---
Roussian	•	Geometry processor for contour	•
Swedish	•	Animated elements	---
Slovak	---	Drill/Mill technology cycles	•
Turkish	•	Turning technology cycles	•
CNC Programming Language		Free contour machining(with island)	---
Programming language (DIN66025)	•	Residual material detection	---
Programming language (High-level)	•	Access protection for cycles	•
Online ISO dialect interpreter	•	DXF contour converter (CAD Reader)	○
Subroutine levels/Interrupt routines	8/0	2D simulation (finished part)	•
Skip block levels	1	3D simulation 1 (finished part)	---
Inverse time feedrate	•	Realtime simulation of machining	•
User R parameters	300	Realtime 3D simulation of machining	---
Global program variables	•	Work Offset	
Global/local user variables	•	Number of basic frames,max	1
Indirect programming	•	Number of settable frames(G54~)	6
Macro technique	•		
Incline surface cycle(CYCLE800)	---		

• STD, ○ OPT, ◎ HW, --- N/A # STD, [#] Opt.Max, (#) HW	
Specification	M/T pro
Zero/work offsets, programmable	•
Zero/work offsets, external (PLC)	•
Tool	
Operation with tool management	---
Tool magazines, max	1
Number of tool/edge, max	128/128
Tool/magazines data list	•
Tool naming with readable text	---
Loading and unloading tool	---
Monitoring of tool life and part count	•
Sister tool management	---M/•T
Unambiguous D number structure	---
H/D separation	---
3D tool radius compensation	---
Tool carrier with orientation capability	---
Look-ahead of contour violations	•
Error Compensation	
Feedforward-velocity loop	•
Feedforward-acceleration loop	---
Backlash compensation	•
Leadscrew error compensation	•
Measuring system error	•
Sag compensation, multi-dimensional	○
Bidirectional leadscrew compensation	---
Temperature compensation	•
Friction compensation	•
PLC Functions	
Fixed cycles time for PLC (ms)	9
Reaction time to process events(ms)	9
Ladder steps memory configuration	12000
Digital inputs, max	216
Digital outputs, max	144

• STD, ○ OPT, ◎ HW, --- N/A # STD, [#] Opt.Max, (#) HW	802DSL
Specification	M/T pro
Analog inputs, max	---
Analog outputs, max	---
PLC alarms/messages, max	128
Bit memories (bytes)	384
DB, max numbers	---
Timers, number	64
Counters, number	64
Subroutines	64
Cyclic FB servo synchronous	---
Online ladder display	•
Online ladder edit	---
Communications	
Fast Ethernet Ports	•
Network drives, max	H:\~Z:\
External PROFINET network	---
Remote control system (local network)	•
Remote control system (internet)	•
Special Functions	
Auto servo turning	---
User screen development	○
Service planner	---
Bidirection SMS message transfer	---
Open architecture	---

Service & Quality Built Our Business



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