

TECHNICAL INFORMATION
for
LB9 CNC LATHE

Information No. 1416-LB9
(November 1987)

OKUMA MACHINERY WORKS LTD.

TECHNICAL INFORMATION

for

LB9 CNC LATHE

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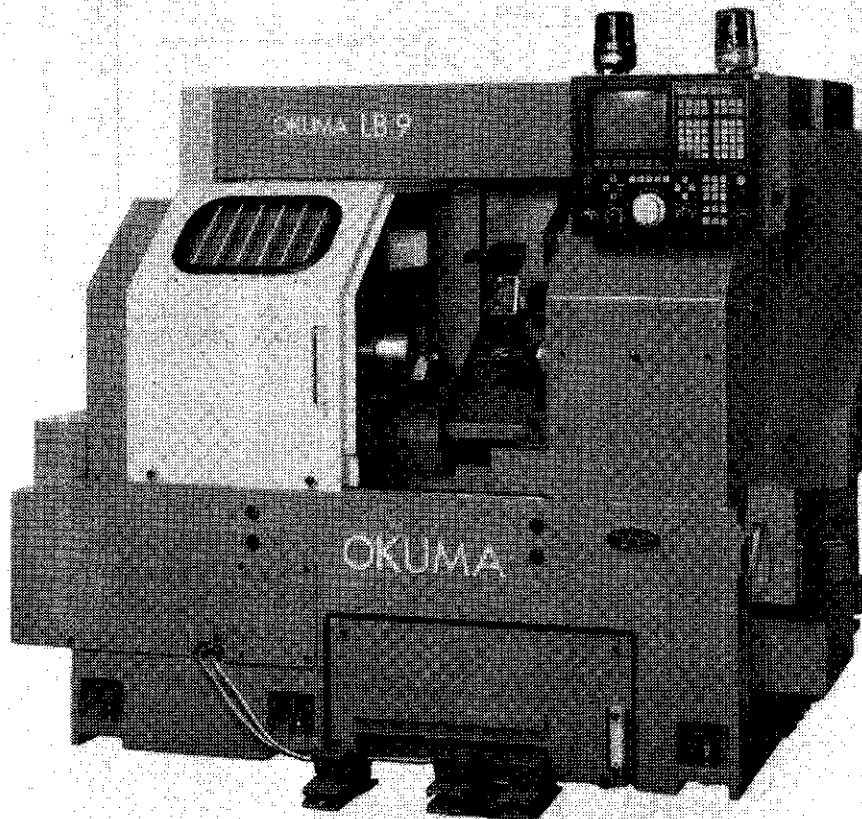
Note: To avoid any confusion over the use of the letter "O (oh)" and figure "0 (zero)" in this manual, the numerical value "0 (zero)" is expressed as "Ø" if there is any possibility of misunderstanding.

1. GENERAL

1-1. SALES POINT

Sister machine of LB12 and LB15

High speed, high power and high grade in a compact package



- (1) LB series feature--high speed--is more advanced meeting the size of new model
- (2) Improved accuracy
- (3) Save floor space required
- (4) Streamlined package with high power
- (5) Compatibility to smaller lot production
Approach to reduced cost

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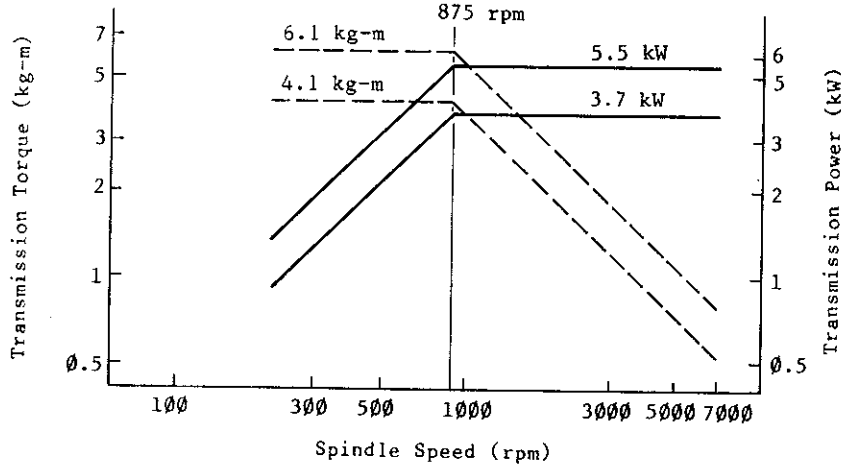
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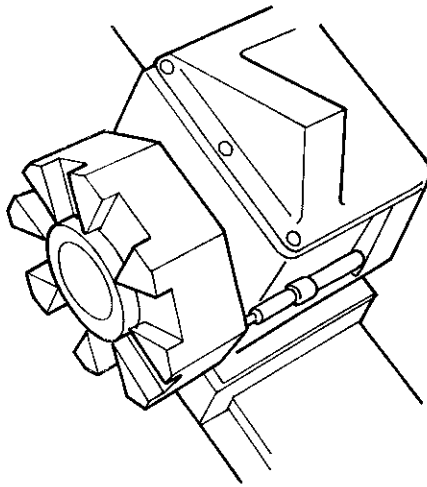
1-1-2

- (1) LB series feature--high speed--is more advanced meeting the size of new model

Spindle Speed: Max. 7,000 rpm (optional)

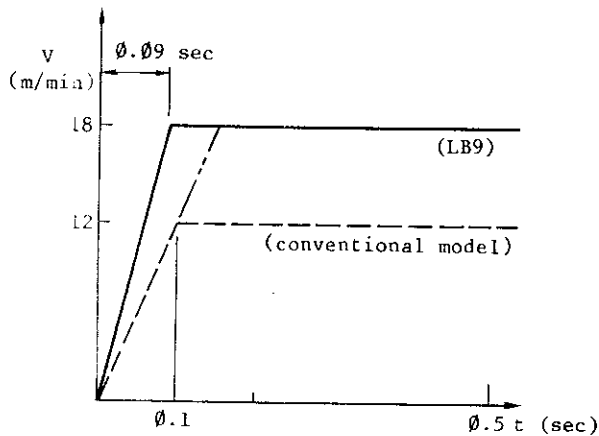


Turret Index: 0.3 sec/index



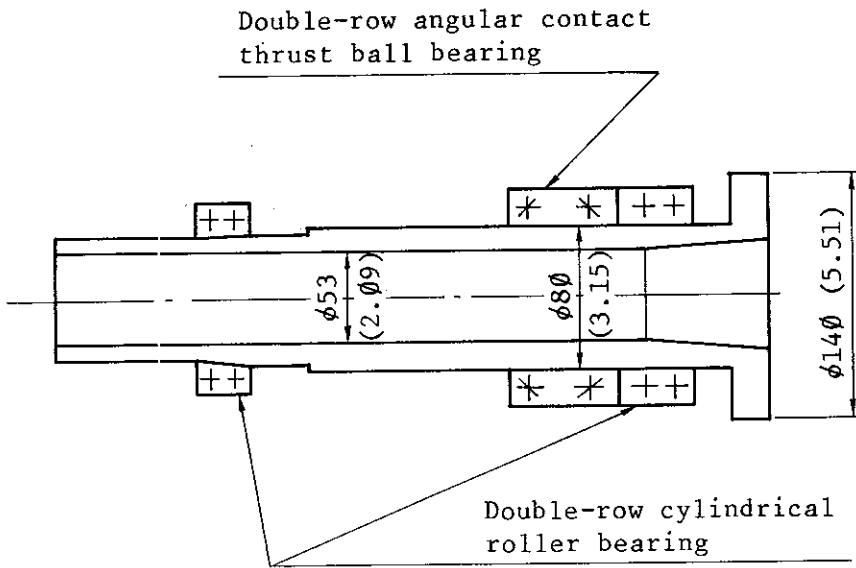
- * Shorter path
- * Cam type rotation mechanism
- * $\phi 150$ mm ($\phi 5.91$ in.) Curvic coupling

Rapid Feedrate: Z-axis: 18 m/min (709 ipm)
X-axis: 12 m/min (472 ipm)



(2) Improved Accuracy

Low-Vibration Spindle:

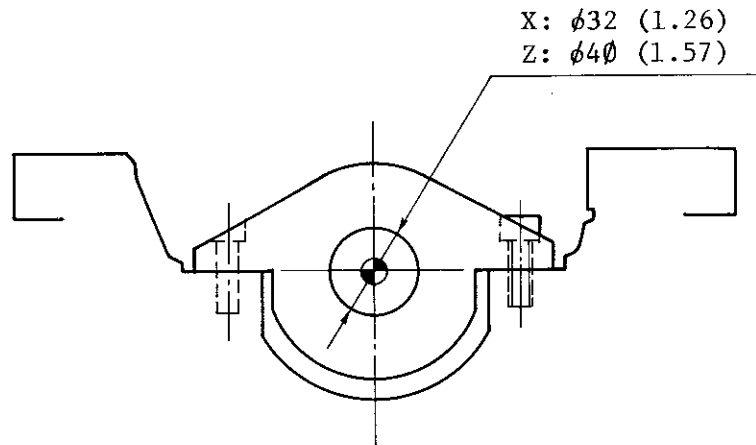


* Gearless

* Non-contact type magnetic pulse generator

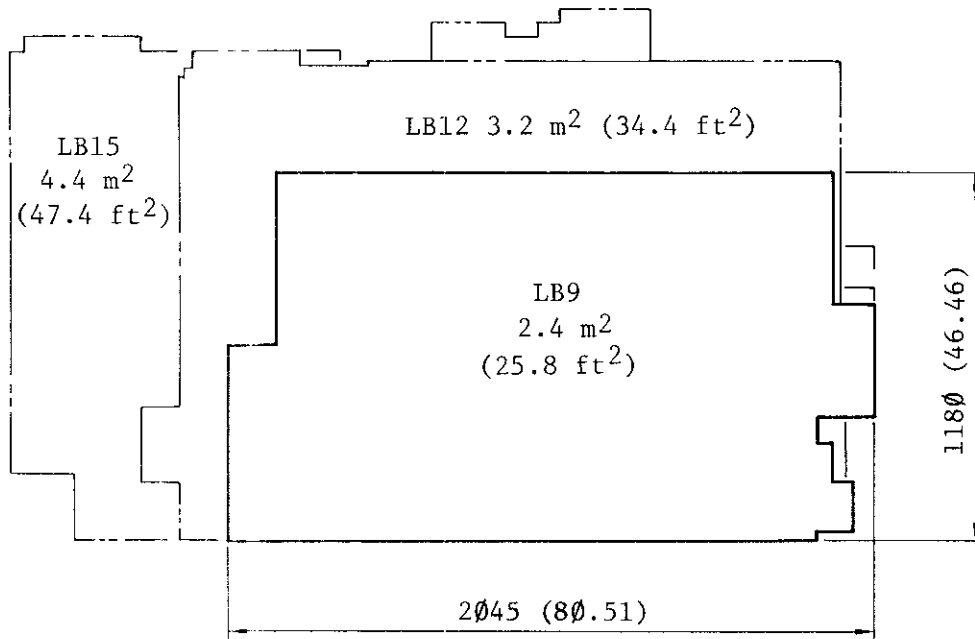
Section View of Spindle

Zero-Center Bracket:



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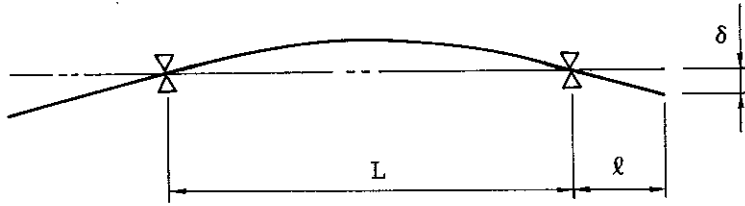
(3) Less floor space required



The machine requires the smallest floor space in the same class.

(4) Streamlined Package with High-power

Powerful Spindle:

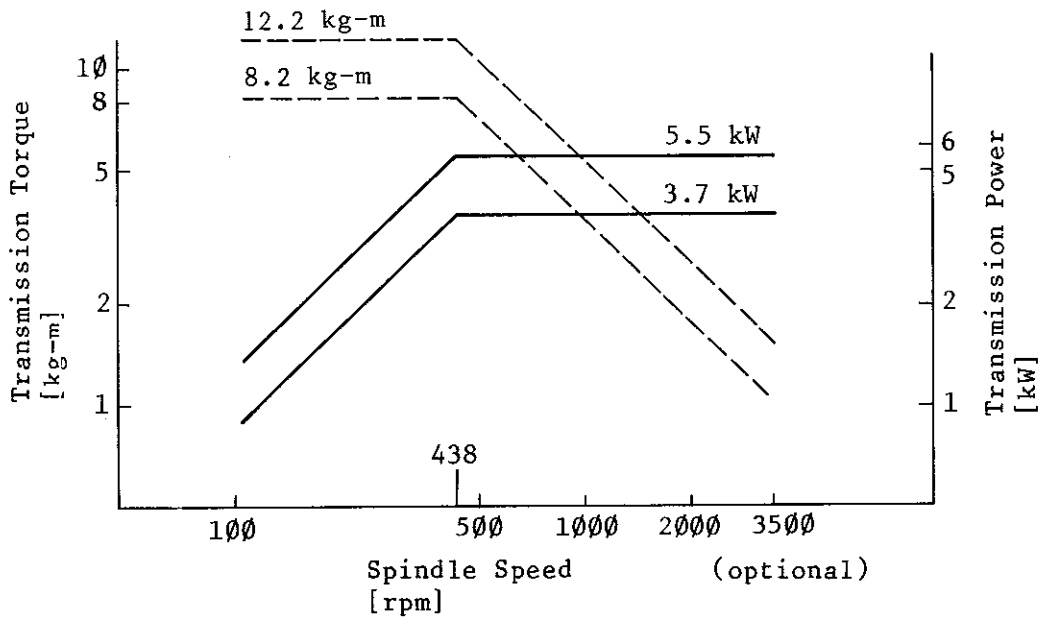


L: Optimum span
ℓ: Minimum projection
δ: Deflection is minimized.

Chuck: 7 inches (option: 8 inches)

Wide range VAC motor: 5.5/3.7 kW (7.5/5 hp)
Constant power range 1:8

Full power cutting possible for $\phi 100$ mm workpiece

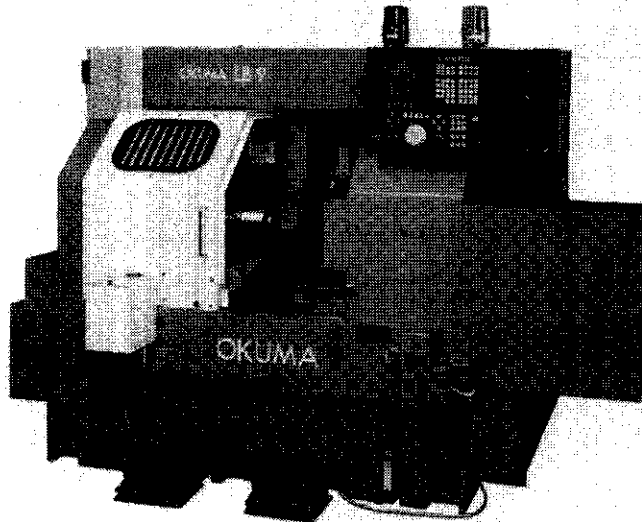


1-2. MAJOR FEATURES

(1) Sub Spindle Specifications

- a) Compatibility to smaller lot production
Approach to reduced cost

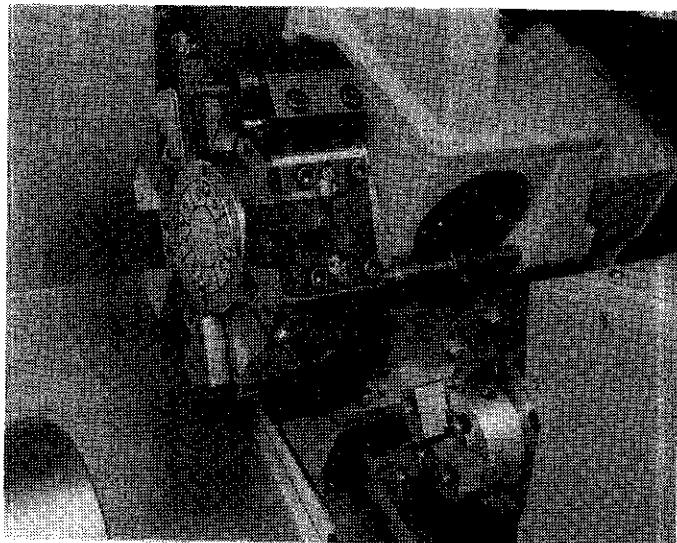
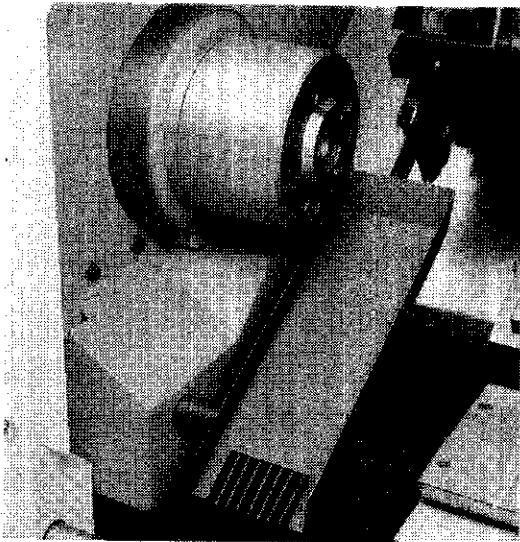
The First Model -- Real Bar Work Machine
From Bar Material to Finished Part



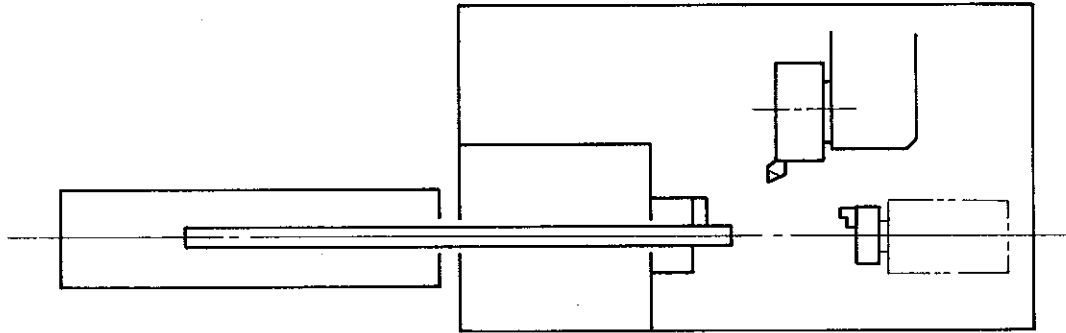
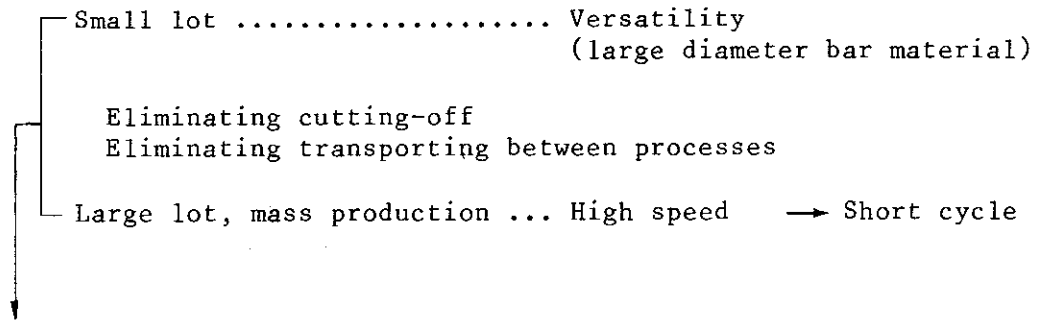
Sub spindle $\phi \sim 3,000$ rpm

High speed bar feeder Max. 7,000 rpm

Parts catcher



Bar Machine



Bar Feeder

- * Single bar feed
- * Multi-bar feed
- * Higher speed → Oil support
- * Simplified setup → Continuous feed of irregular shape bar material

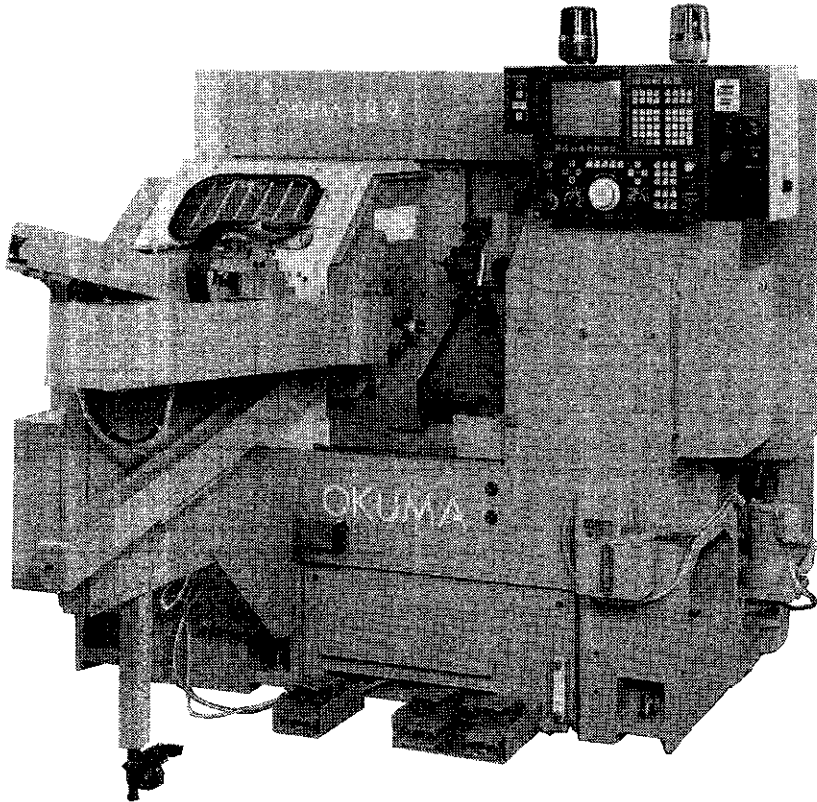
Machine

- * Not influenced by bar feed vibration → High rigidity
- * Bar material machining capacity → Large spindle spec.
- * Hole machining → Z-axis thrust
- * Cutting-off → High rigidity, high speed cutting-off capacity
- * Work catcher → Parts catcher
- * Back machining → Sub spindle

(2) Simplified Loader Specification

- a) Compatibility to smaller lot production
Approach to reduced cost

The Second Model -- Simplified loader with high performance



By limiting the applications, loader cost is drastically lowered:

Workpiece size: $\phi 80$ mm ($\phi 3.15$ in.) x 40 mm (1.57 in.) L
Stock capacity: 10 pcs.

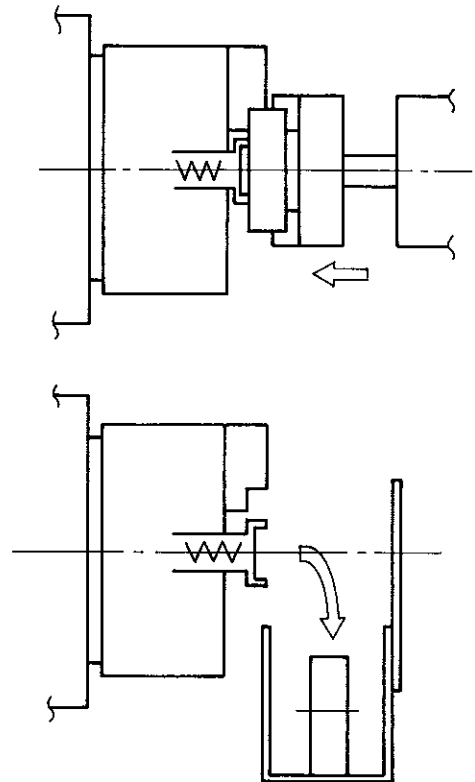
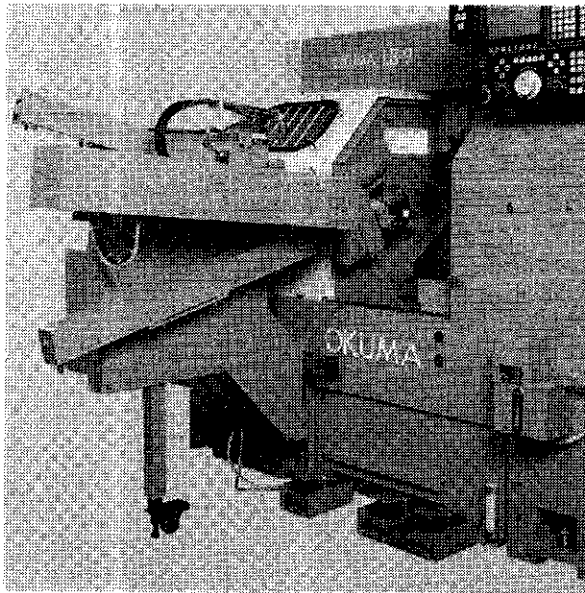
Low cost:

Easy retrofitting

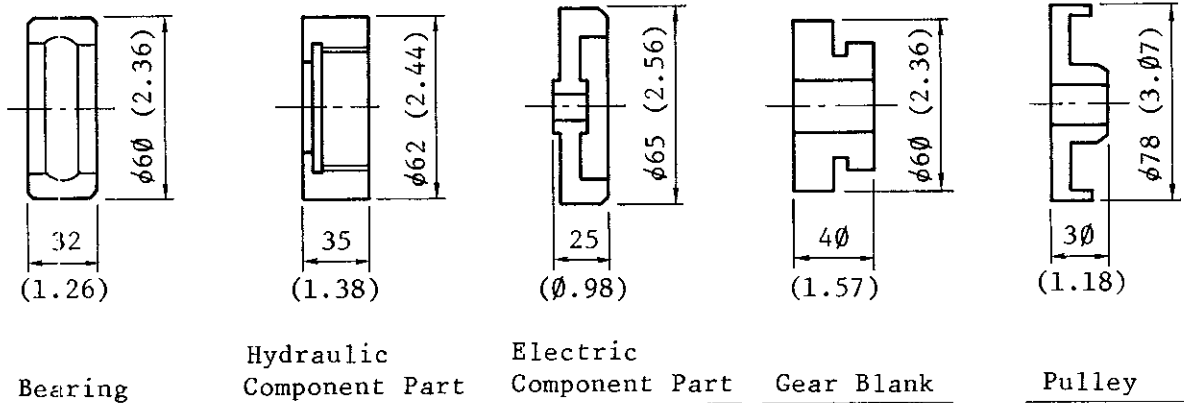
b) Simple construction loader for chucker

TARGET: High Performance to Cost Ratio
Simplified loader
Simplified installation

Only for Round-shape Workpieces



Objective Workpiece Examples



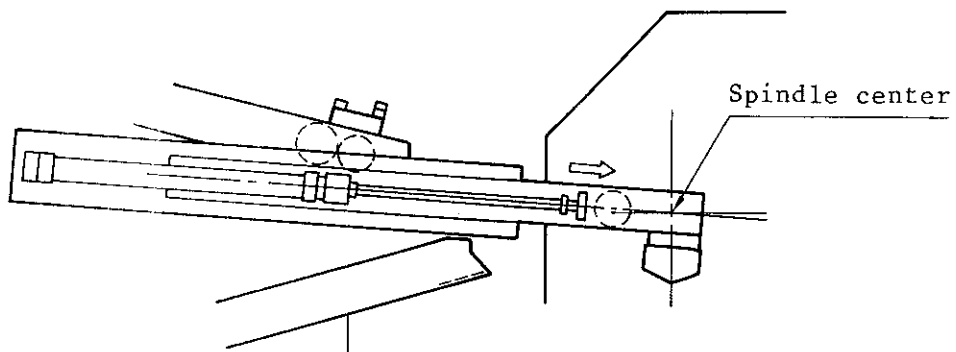
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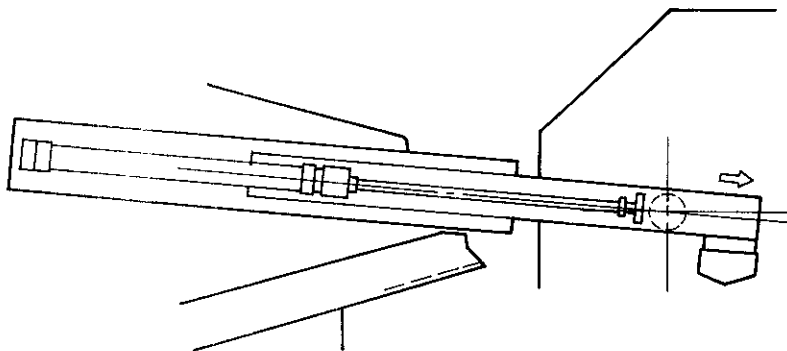
Loader action:

Loading time	5.5 sec
No. of stored workpieces	$\phi 8\phi$ mm (3.15 in.) x 1 ϕ
Workpiece dimensions	Max. $\phi 8\phi$ mm x 4 ϕ mm (L) (3.15 in. x 1.57 in.)
Workpiece weight	Max. 2 kg (4.4 lb)

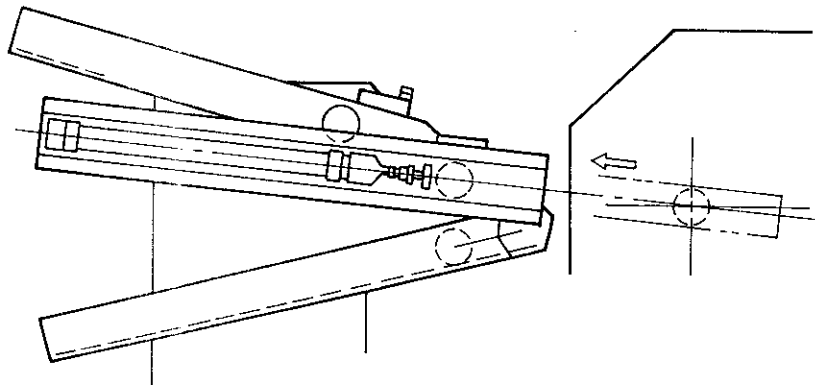
1) Unloading



2) Loading



3) Ejection/standby position



TECHNICAL INFORMATION

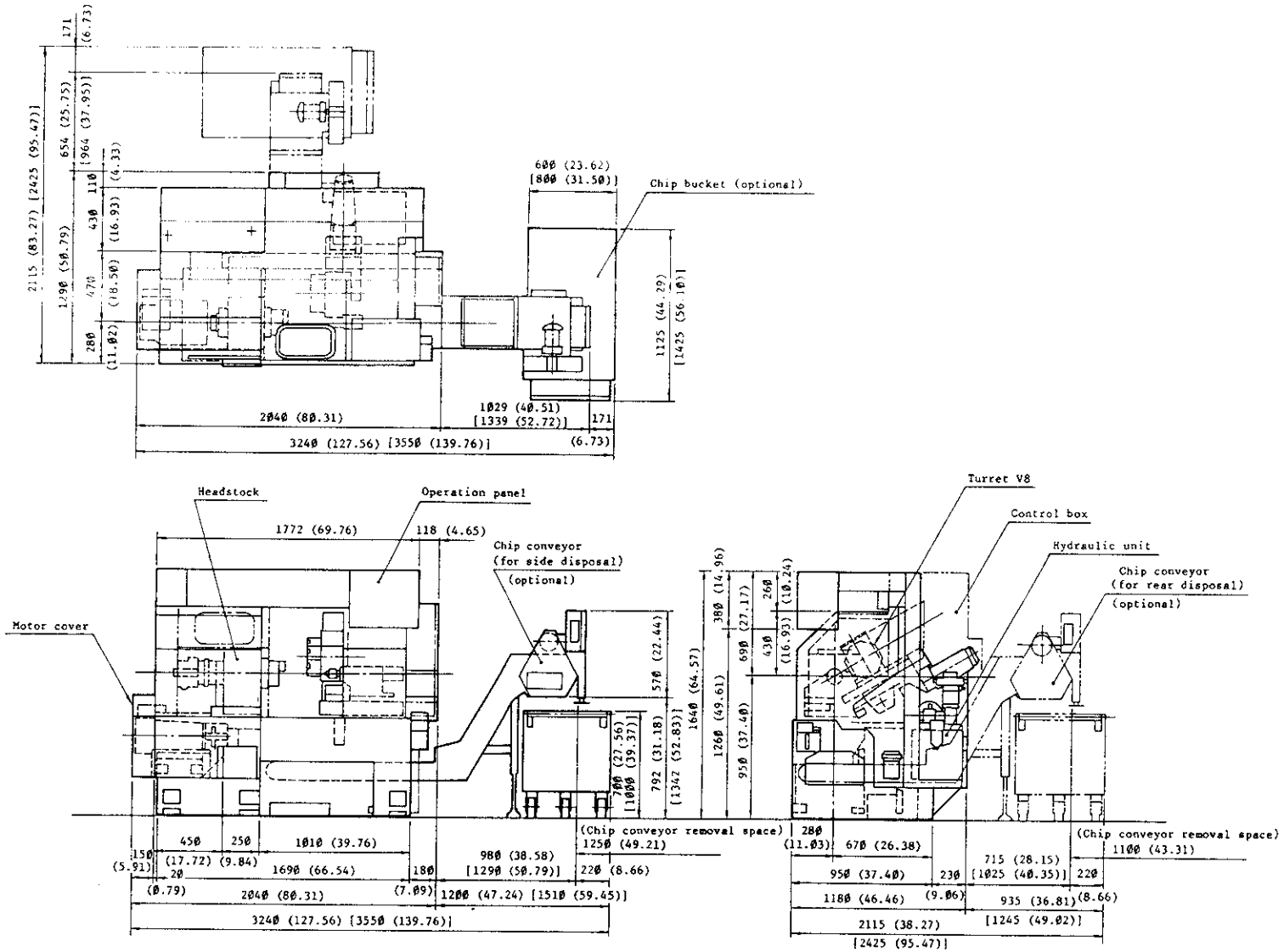
INFORMATION NO.
1416-LB9
2-1-1

2. SPECIFICATIONS

2-1. MACHINE SPECIFICATIONS

	Unit		
Machine Model		LB9T	LB9C
Capacity		2	
No. of controlled axes		2	
Swing over carriage	mm (in.)	$\phi 280$ ($\phi 11.02$)	
Max. turning dia. x length	mm (in.)	$\phi 150$ x 120 ($\phi 5.91$ x 4.72)	$\phi 150$ x 250 ($\phi 5.91$ x 9.84)
Distance between centers	mm (in.)	-	250 (9.84)
Spindle			
Spindle dia.	mm (in.)	$\phi 80$ ($\phi 3.15$)	
Through-hole dia.	mm (in.)	$\phi 53$ ($\phi 2.09$)	
Spindle nose type		$\phi 140$ ($\phi 5.51$) flat	
Taper hole		$\phi 60$ ($\phi 2.36$) 6° taper	
No. of spindle speed ranges		Infinitely variable	
Spindle speed range	rpm	150 - 5,000 (optional: 105 - 3,500 210 - 7,000)	
Carriage (Z-axis)			
Travel	mm (in.)	270 (10.63)	
Rapid feedrate	mm/min (ipm)	18,000 (709)	
Cutting feedrate	mm/rev (ipr)	$\phi .01$ - 1,000.00 ($\phi .0001$ - 39.37)	
Cross-slide (X-axis)			
Travel	mm (in.)	120 (4.72) [80 (3.15) + 40 (1.57)]	
Rapid feedrate	mm/min (ipm)	12,000 (472)	
Cutting feedrate	mm/rev (ipr)	$\phi .01$ - 1,000.00 ($\phi .0001$ - 39.37)	
Turret			
Type		V8	
Tool size: OD	mm (in.)	$\square 20$ ($\square 3/4$)	
ID	mm (in.)	$\phi 32$ ($\phi 1-1/4$)	
Tailstock			
Tailstock spindle dia.	mm (in.)	-	$\phi 55$ ($\phi 2.17$)
Taper hole		-	MT No. 4
Travel	mm (in.)	-	80 (3.15)
Motor			
Main motor	kW (hp)	Wide range VAC 5.5/3.7 (7.5/5) (30 min./cont. rating)	
Carriage feed (Z-axis)	kW (hp)	1.5 (2)	
Cross-slide feed (X-axis)	kW (hp)	1 (1.3)	
Hydraulic oil pump	kW (hp)	1.5 (2)	
Centralized lubrication pump	kW (hp)	$\phi .017$ ($\phi .0227$)	
Coolant pump	kW (hp)	$\phi .18$ ($\phi .24$)	
Floor Space Required	mm (in.)	1,180 x 2,040 (46.46 x 80.31)	
Net Weight	kg (lb)	2,600 (5,720)	2,700 (5,940)

2-2. GENERAL VIEW

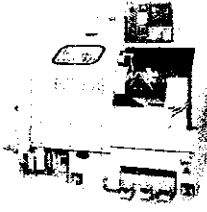
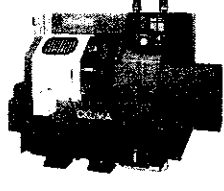
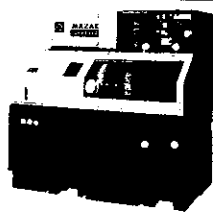


* Dimensions in () are for type H chip conveyor.

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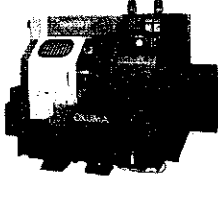

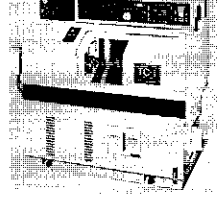
INFORMATION NO.
1416-LB9
2-3-1

2-3. COMPARISON CHART

	Unit	Okuma	Okuma	Yamazaki Mazak
Maker		Okuma	Okuma	Yamazaki Mazak
Model Name		LB8	LB9	QT8
Appearance				
No. of Controlled Axes		2	2	2
Capacity				
Max. turning dia. (swing)	mm (in.)	ø100 (ø3.94)	ø150 (ø5.91)	ø160 (ø6.30)
Max. turning length	mm (in.)	200 (7.87)	With tailstock: 120 (4.72) Without tailstock: 250 (9.84)	250 (9.84)
Standard turning dia.	mm (in.)		ø100 (ø3.94)	ø100 (ø3.94)
Standard turning length	mm (in.)			
Chuck dia.		6"	7" (optional: 8")	6"
Bar dia. (collet dia.)	mm (in.)		ø42 (ø1.65)	
Spindle				
Spindle nose type		A2-5	ø140 (ø5.51) flat	A2-5
Through-hole dia.	mm (in.)	ø45 (ø1.77)	ø53 (ø2.09)	ø50 (ø1.97)
Spindle dia.	mm (in.)	ø80 (ø3.15)	ø80 (ø3.15)	
Spindle speed range	rpm	130 - 3,000 200 - 4,500	- 5,000 optional: - 3,500/7,000	45 - 4,500 optional: 60 - 6,000
No. of spindle speed ranges		Infinitely variable	1 step	Infinitely variable
X-axis				
Travel	mm (in.)	145 (5.71)	80 + 40 (3.15 + 1.57)	
Rapid feedrate	m/min (ipm)	5 (197)	12 (472)	12 (472)
Z-axis				
Travel	mm (in.)	250 (9.84)	270 (10.63)	
Rapid feedrate	m/min (ipm)	10 (394)	18 (709)	24 (945)
Turret				
Type		V6	V8	V8 (V12)
Index time	sec	1.5	0.3	0.28
Tool size	mm (in.)	□19 (ø.75) ø25 (ø0.98)	□20 (ø.79) ø32 (ø1.26)	□20 (ø.79) ø32 (ø1.26)
Tailstock				
Tailstock spindle dia.	mm (in.)	ø40 (ø1.57)	ø55 (ø2.17)	ø50 (ø1.97)
Taper hole		MT No. 3	MT No. 4	MT No. 3
Travel	mm (in.)	60 (2.36)	80 (3.15)	75 (2.95)
Hydraulic Oil				
Tank	liter (gal)		40 (10.6)	
Pump	kW (hp)		1.5 (2)	
Coolant				
Tank	liter (gal)		60 (15.9)	100 (26.4)
Pump	kW (hp)	0.18 (0.240)	0.18 (0.240)	0.18 (0.240)
Main Motor	kW (hp)	DC 5/7.5 (6.7/10)	Self-priming type (AC 3.7/5.5 (5/7.5) (wide range 1:8)	Immersion type AC 3.7/5.5 (5/7.5)
Floor Space Required	mm (in.)	1,960 x 1,650 (77.17 x 64.96)	1,180 x 2,045 (46.46 x 80.51)	
	m ² (ft ²)	3.23 (34.77)	2.4 (25.8)	2.0 (21.5)
Workpiece Weight	kg (lb)	2,800 (6,160) With tailstock: 3,000 (6,600)	2,600 (5,720) With tailstock: 2,700 (5,940)	2,570 (5,654) With tailstock: 2,600 (5,720)
NC Unit		OSP500	OSP500L-G	MAZATROL CAM-2
Price				
Option		V8		
Remark				Maintenance at front

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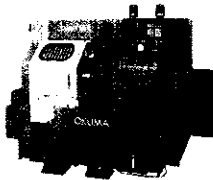
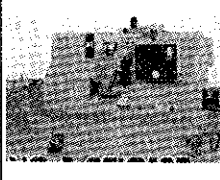
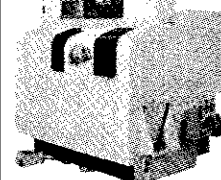
	Unit	Okuma	Mori	Takizawa
Maker		Okuma	Mori	Takizawa
Model Name		LB9	SL-θ	TC-1
Appearance				
No. of Controlled Axes		2	2	2
Capacity				
Max. turning dia. (swing)	mm (in.)	φ150 (φ5.91)	φ190 (φ7.48)	φ180 (φ7.09)
Max. turning length	mm (in.)	With tailstock: 120 (4.72) Without tailstock: 250 (9.84)		260 (10.24)
Standard turning dia.	mm (in.)	φ100 (φ3.94)	φ100 (φ3.94)	φ100 (φ3.94)
Standard turning length	mm (in.)		180 (7.09)	
Chuck dia.		7" (optional: 8")	6"	6"
Bar dia. (collet dia.)	mm (in.)	φ42 (φ1.65)	φ33 (φ1.30)	φ8 - φ32 (φ0.31 - φ1.26)
Spindle				
Spindle nose type		φ140 (φ5.51) flat	A2-5	φ140 (φ5.51) flat
Through-hole dia.	mm (in.)	φ53 (φ2.09)	φ43 (φ1.69)	φ45 (φ1.77)
Spindle dia.	mm (in.)	φ80 (φ3.15)	φ80 (φ3.15)	φ80 (φ3.15)
Spindle speed range	rpm	- 5,000 optional: - 3,500/7,000	- 4,500/6,000	45 - 4,500 optional: 32 - 3,200 63 - 6,300
No. of spindle speed ranges		1 step	Infinitely variable	
X-axis				
Travel	mm (in.)	80 + 40 (3.15 + 1.57)	125 (4.92)	+90 (3.54)
Rapid feedrate	m/min (ipm)	12 (472)	4 (157)	10 (394)
Z-axis				
Travel	mm (in.)	270 (10.63)	195 (76.77)	
Rapid feedrate	m/min (ipm)	18 (709)	8 (315)	20 (787)
Turret				
Type		V8	V8	V8
Index time	sec	0.3		
Tocl size	mm (in.)	□20 (0.79) φ32 (φ1.26)	□20 (0.79) φ25 (φ0.98)	□20 (0.79) φ32 (φ1.26)
Tailstock				
Tailstock spindle dia.	mm (in.)	φ55 (φ2.17)	φ40 (φ1.57)	φ50 (φ1.97)
Taper hole		MT No. 4	MT No. 3	MT No. 3
Travel	mm (in.)	80 (3.15)	45 (1.77) Thrust: 100 kg (220 lb)	100 (3.94)
Hydraulic				
Tank	liter (gal)	40 (10.6)		40 (10.6)
Pump	kW (hp)	1.5 (2)		0.75 (1)
Coolant				
Tank	liter (gal)	60 (15.9)		100 (26.4)
Pump	kW (hp)	0.18 (0.240) Self-priming type		0.25 (0.333) Self-priming type
Main Motor	kW (hp)	(AC 3.7/5.5 (5/7.5) (wide range 1:8)	AC 3.7/5.5 (5/7.5) optional: AC 5.5/7.5 (7.5/10)	5.5 (7.5) optional: 7.5 (10)
Floor Space Required	mm (in.) m ² (ft ²)	1,180 x 2,045 (46.46 x 80.51) 2.4 (25.8)	1,200 x 1,615 (47.24 x 63.58) 1.9 (20.5)	1,020 x 1,570 (40.16 x 61.81) 1.8 (19.4)
Workpiece Weight	kg (lb)	2,600 (5,720) With tailstock: 2,700 (5,940)	2,300 (5,060)	2,100 (4,620)
NC Unit		OSP500L-G	MFNC-L1, 2, 3	
Price				
Option				
Remark			70° slant	

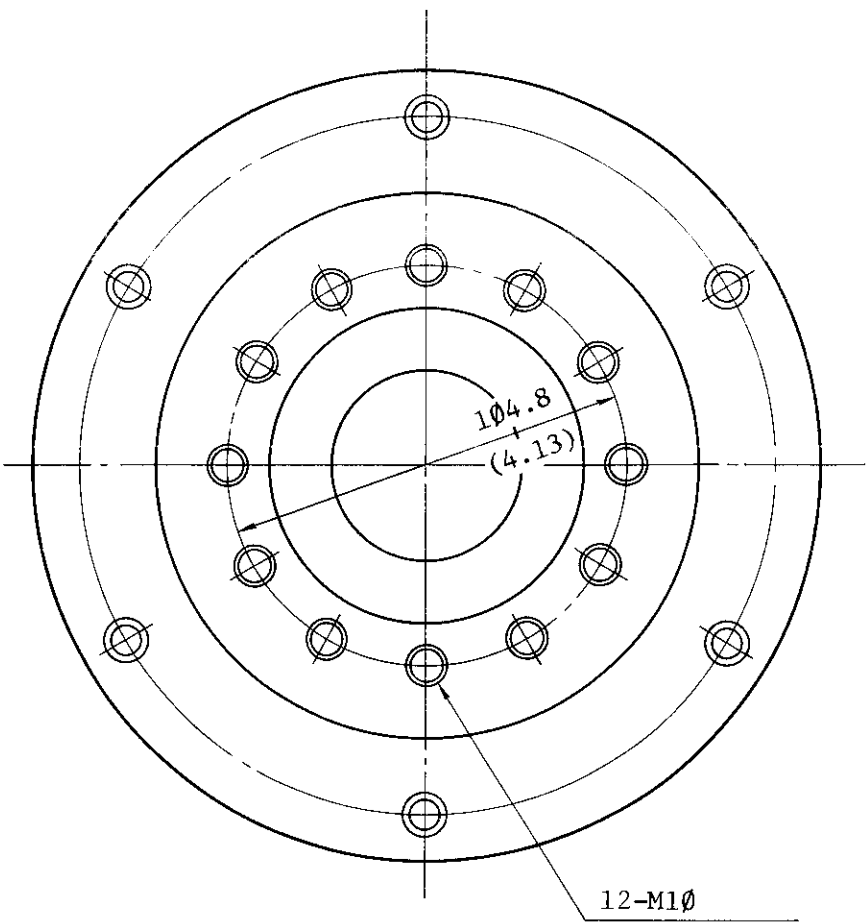
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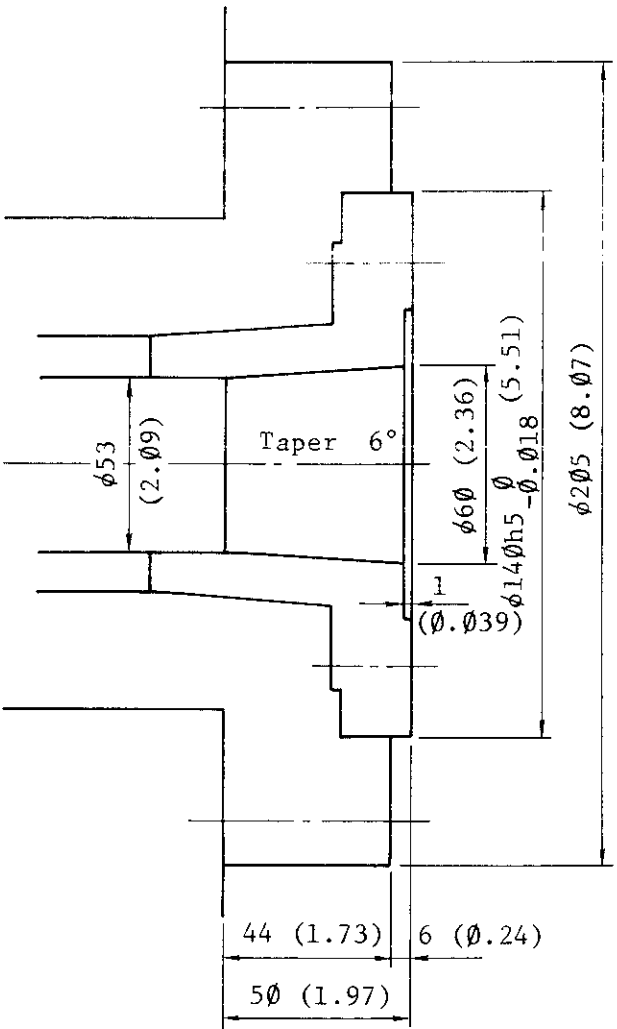
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2-3-3

	Unit	Okuma	Miyano	Nakamura Tome
Maker		Okuma	Miyano	Nakamura Tome
Model Name		LB9	JNC-I-35 C165 C200	TMC15
Appearance				
No. of Controlled Axes		2	2	2
Capacity				
Max. turning dia. (swing)	mm (in.)	φ150 (φ5.91)	φ204 (φ8.03) [445 (17.52)]	φ180 (φ7.09)
Max. turning length	mm (in.)	With tailstock: 120 (4.72) Without tailstock: 250 (9.84)	C165: 310 (12.20) C200: 345 (13.58)	260 (10.24)
Standard turning dia.	mm (in.)	φ100 (φ3.94)		
Standard turning length	mm (in.)			
Chuck dia.		7" (optional: 8")	φ165 (φ6.50)	6"
Bar dia. (collet dia.)	mm (in.)	φ42 (φ1.65)	φ35 (φ1.38)	φ34 (φ1.34)
Spindle				
Spindle nose type		φ140 (φ5.51) flat	A2-5	A2-5
Through-hole dia.	mm (in.)	φ53 (φ2.09)	φ46 (φ1.81)	φ47 (φ1.85)
Spindle dia.	mm (in.)	φ80 (φ3.15)		φ80 (φ3.15)
Spindle speed range	rpm	- 5,000 optional: - 3,500/7,000	L: 25 - 2,500 M: 40 - 4,000 H: 50 - 5,000	112 - 4,500 optional: 75 - 3,000 157 - 6,000
No. of spindle speed ranges		1 step		Infinitely variable
X-axis				
Travel	mm (in.)	80 + 40 (3.15 + 1.57)	147 (5.79)	110 (4.33)
Rapid feedrate	m/min (ipm)	12 (472)	8 (315)	12 (472)
Z-axis				
Travel	mm (in.)	270 (10.63)	C165: 345 (13.58) C200: 345/305 (13.58/12.01)	270 (10.63)
Rapid feedrate	m/min (ipm)	18 (709)	9 (354)	24 (945)
Turret				
Type		V8	V8 (width across flats; 200 (7.87))	V8
Index time	sec	0.3	0.5	0.2
Tool size	mm (in.)	□20 (φ.79) φ32 (φ1.26)	□20 (φ.79) φ32 (φ1.26) φ25 (φ0.98)	□20 (φ.79) φ25 (φ0.98)
Tailstock				
Tailstock spindle dia.	mm (in.)	φ55 (φ2.17)		φ50 (φ1.97)
Taper hole		MT No. 4	MT No. 3	MT No. 3
Travel	mm (in.)	80 (3.15)	Thrust: 560 kg (1,232 lb)	80 (3.15)
Hydraulic				
Tank	liter (gal)	40 (10.6)		
Pump	kW (hp)	1.5 (2)	1.5 (2)	1.5 (2)
Coolant				
Tank	liter (gal)	60 (15.9)	120 (31.7)	90 (23.8)
Pump	kW (hp)	0.18 (0.240) Self-priming type	0.18 (0.240)	0.18 (0.240) Self-priming type
Main Motor	kW (hp)	(AC 3.775.5 (5/7.5) (wide range 1:8)	AC 5.5/7.5 (7.5/10)	5.5 (7.5) optional: 7.5 (10)
Floor Space Required	mm (in.) m ² (ft ²)	1,180 x 2,045 (46.46 x 80.51) 2.4 (25.8)	1,640 x 2,640 (64.57 x 103.94) 4.3 (46.3)	1,250 x 1,800 (49.21 x 70.87) 2.2 (23.7)
Workpiece Weight	kg (lb)	2,600 (5,720) With tailstock: 2,700 (5,940)	3,500 (7,700)	2,300 (5,060)
NC Unit		OSP500L-G	F-3TC	F-0T
Price				
Option				
Remark			45° slant	



3-2. SPINDLE NOSE DIMENSIONS

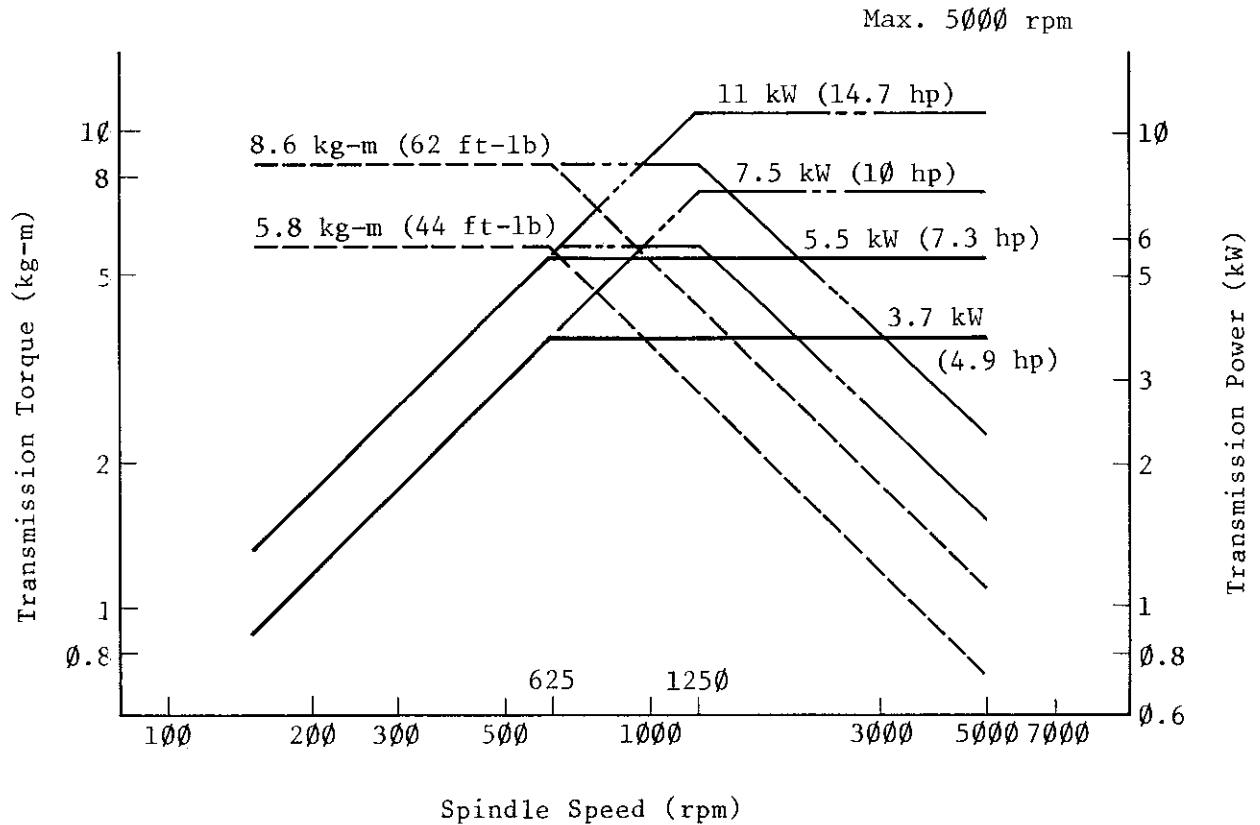


TECHNICAL INFORMATION

INFORMATION NO.
1416-LB9
3-3-1

3-3. POWER TRANSMISSION DIAGRAM

(1) 5,000 rpm Specification (Single Spindle Speed Range)



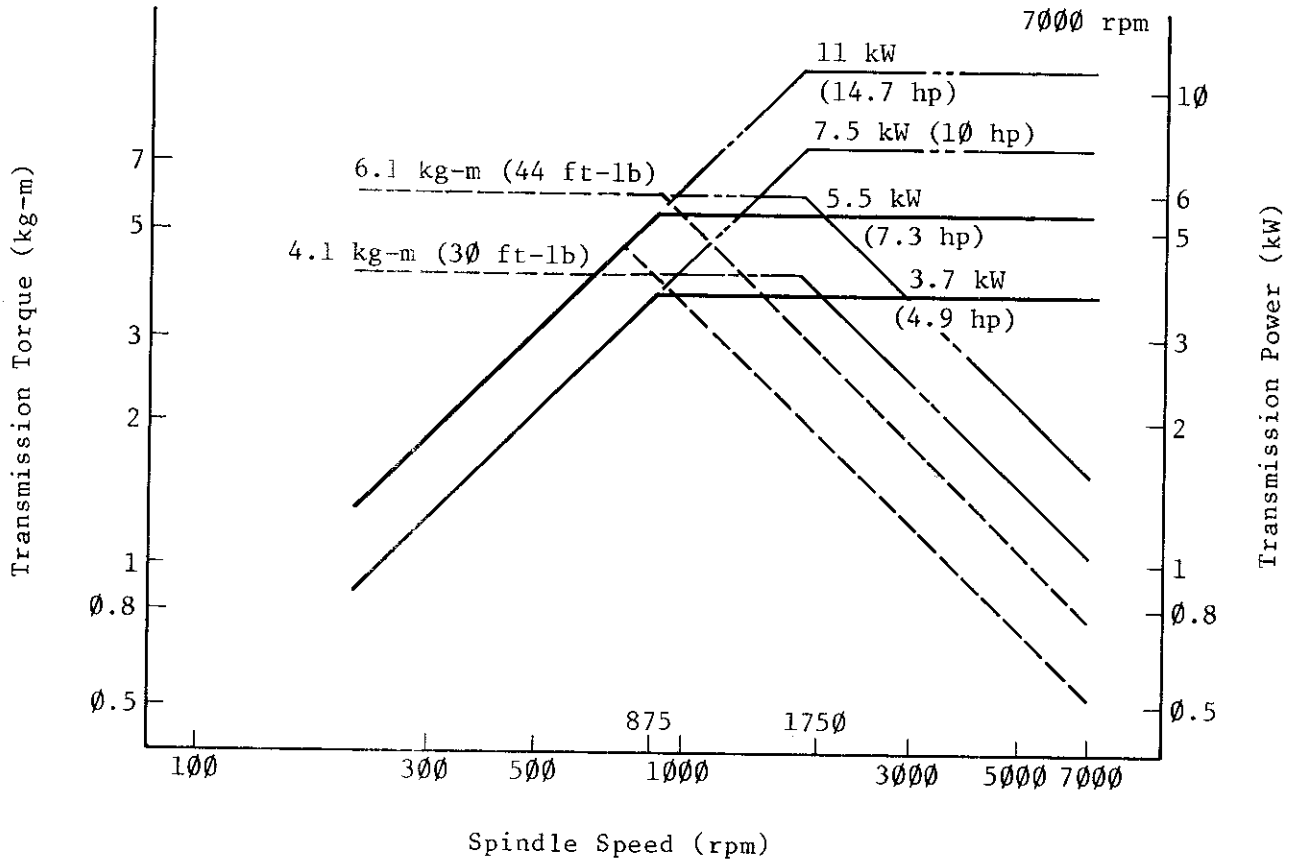
Note: High power cutting (11/7.5 kW (15/10 hp)) in the high speed range is possible.

Cutting force: Within 1.5 mm² (16.15 ft²) for steel

TECHNICAL INFORMATION

INFORMATION NO.
1416-LB9
3-3-2

(2) 7,000 rpm Specification (Single Spindle Speed Range) (optional)



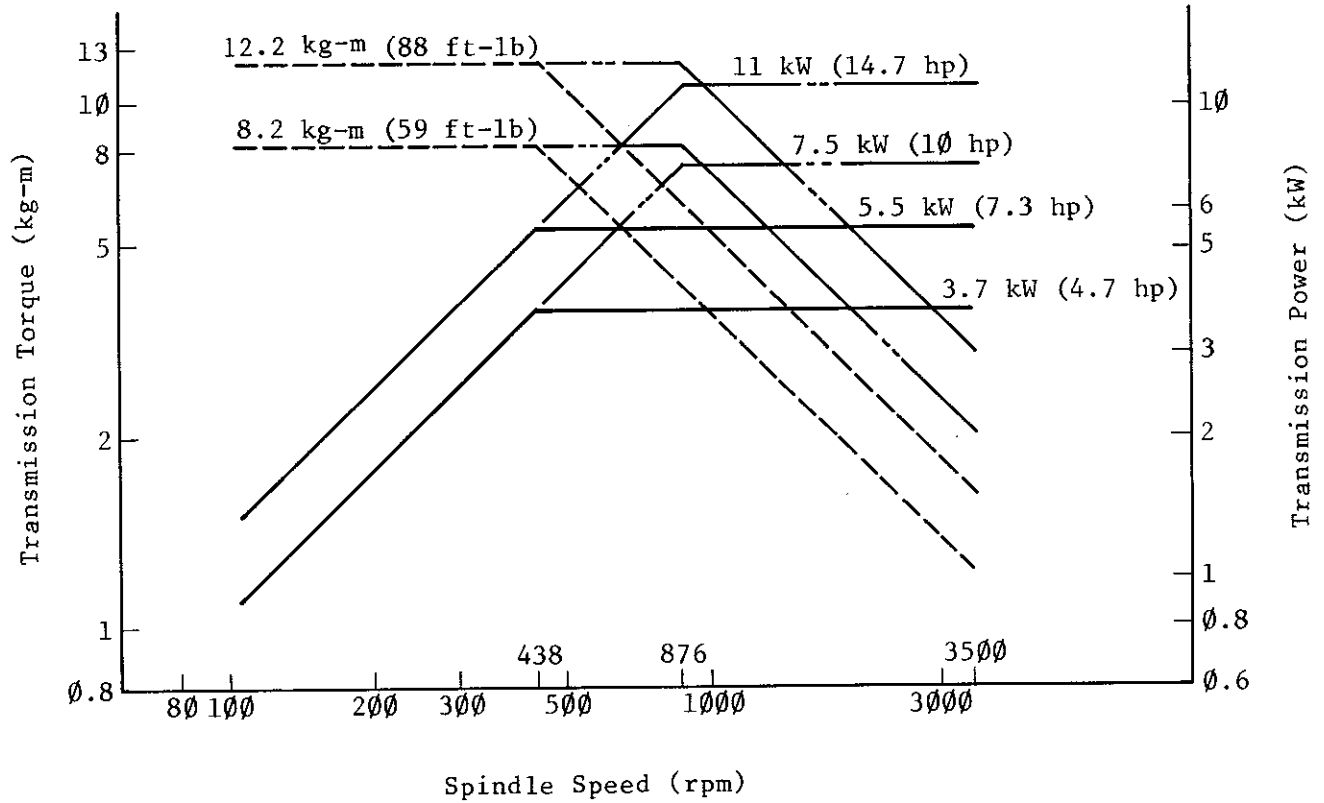
Note: High power cutting (11/7.5 kW (15/10 hp)) in the high speed range is possible.

Cutting force: Within 1.5 mm² (16.15 ft²) for steel

TECHNICAL INFORMATION

INFORMATION NO.
1416-LB9
3-3-3

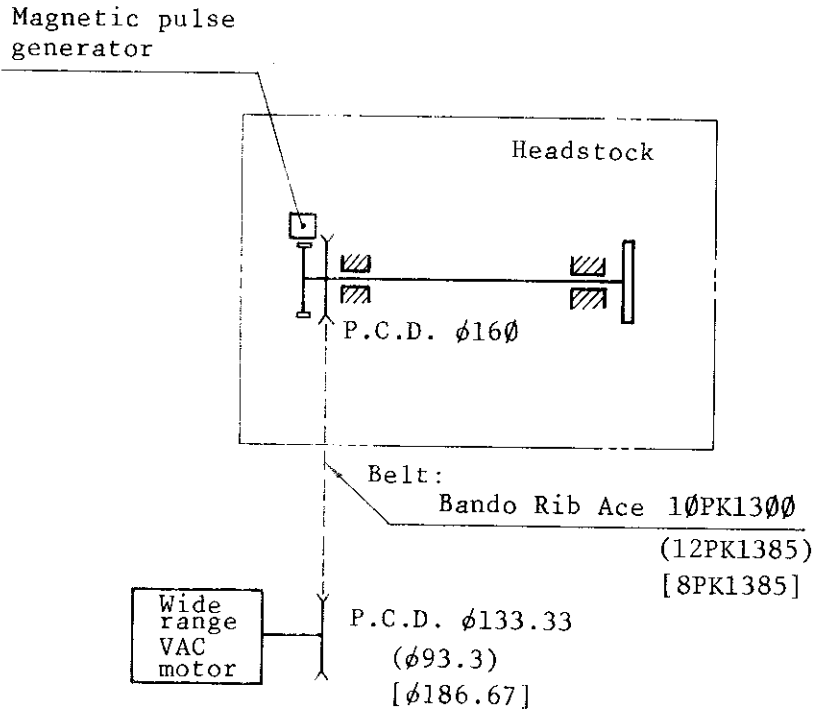
(3) 3,500 rpm Specification (Single Spindle Speed Range) (optional)



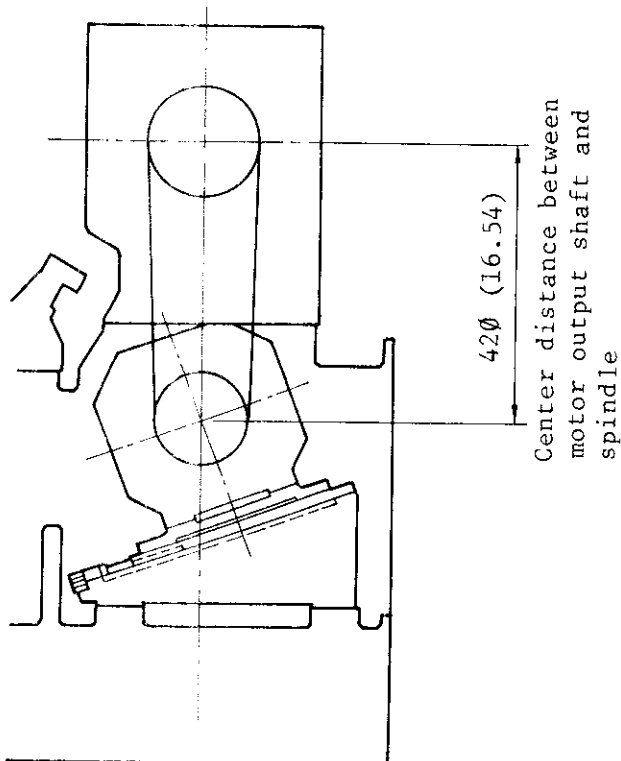
Note: High power cutting (11/7.5 kW (15/10 hp)) in the high speed range is possible.

Cutting force: Within 1.5 mm² (16.15 ft²) for steel

3-4. HEADSTOCK MECHANISM



* (): Spindle speed 3,500 rpm specification
[]: Spindle speed 7,000 rpm specification

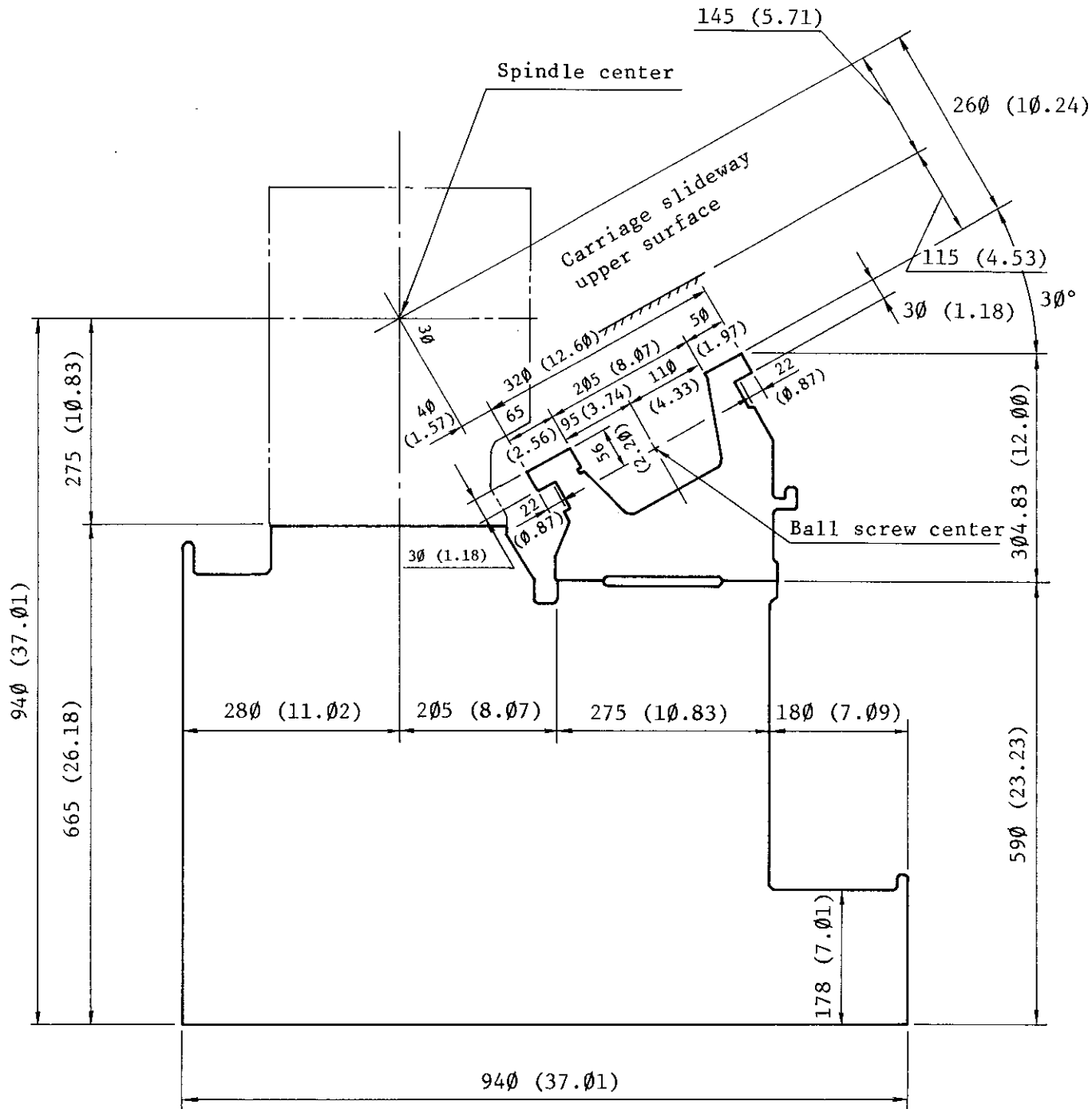


TECHNICAL INFORMATION

INFORMATION NO.
1416-LB9
4-1

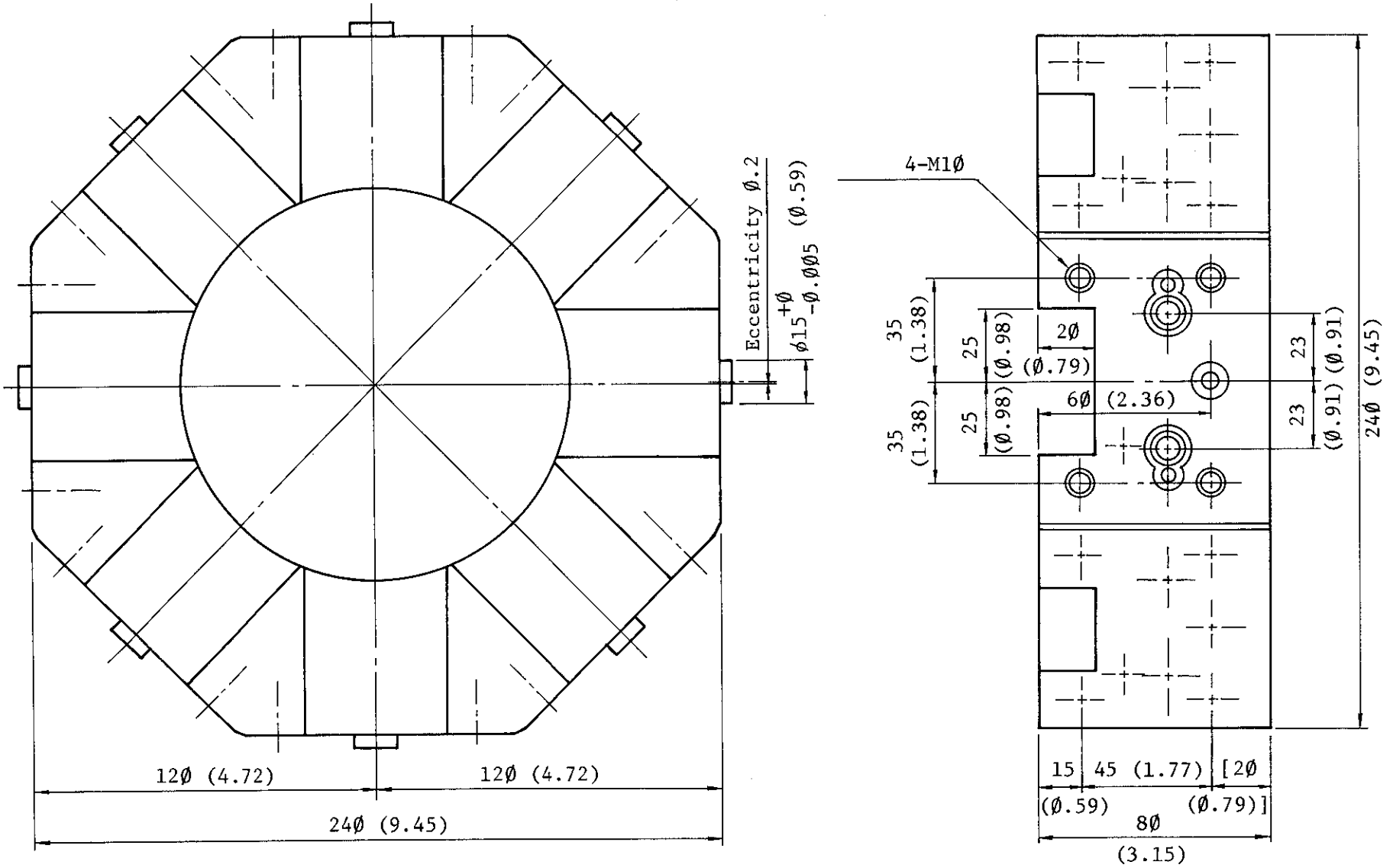
4. BED AND BASE

4-1. BED CROSS SECTION DIMENSIONS

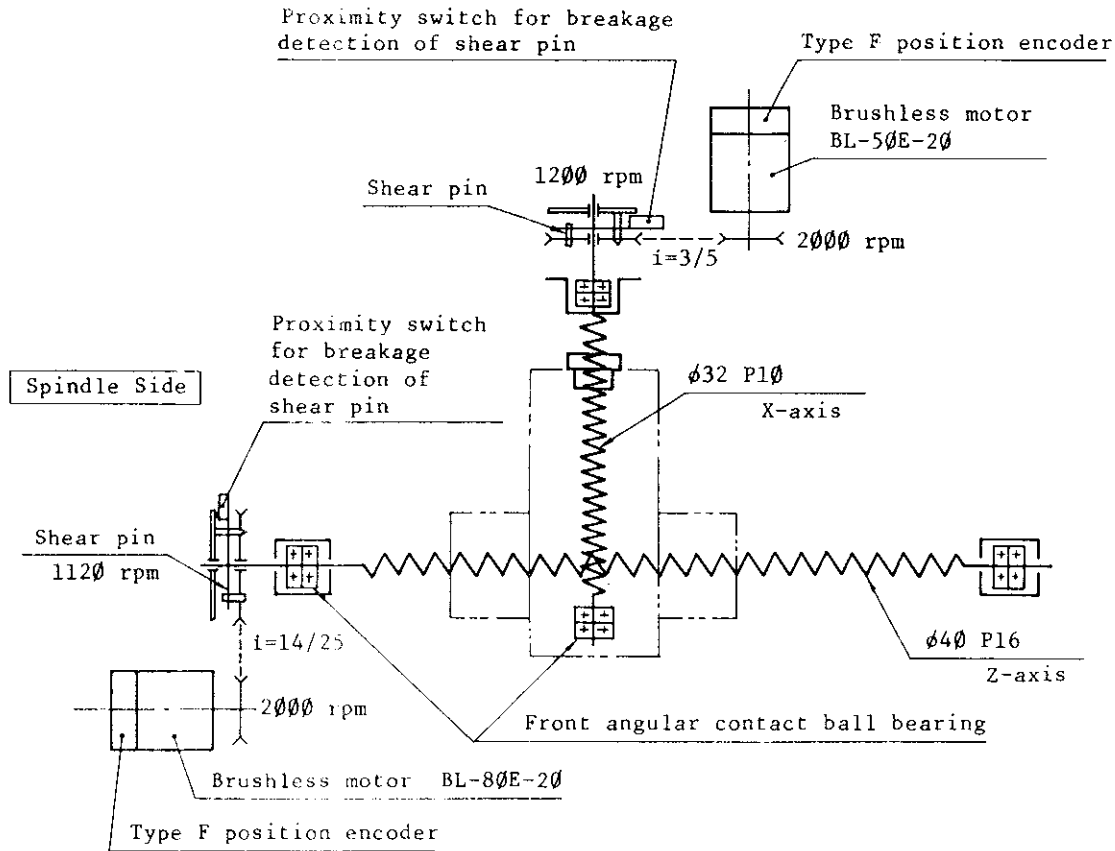


5. TURRET

5-1. V8 TURRET DIMENSIONS



5-2. SERVO MECHANISM



Safety Device:

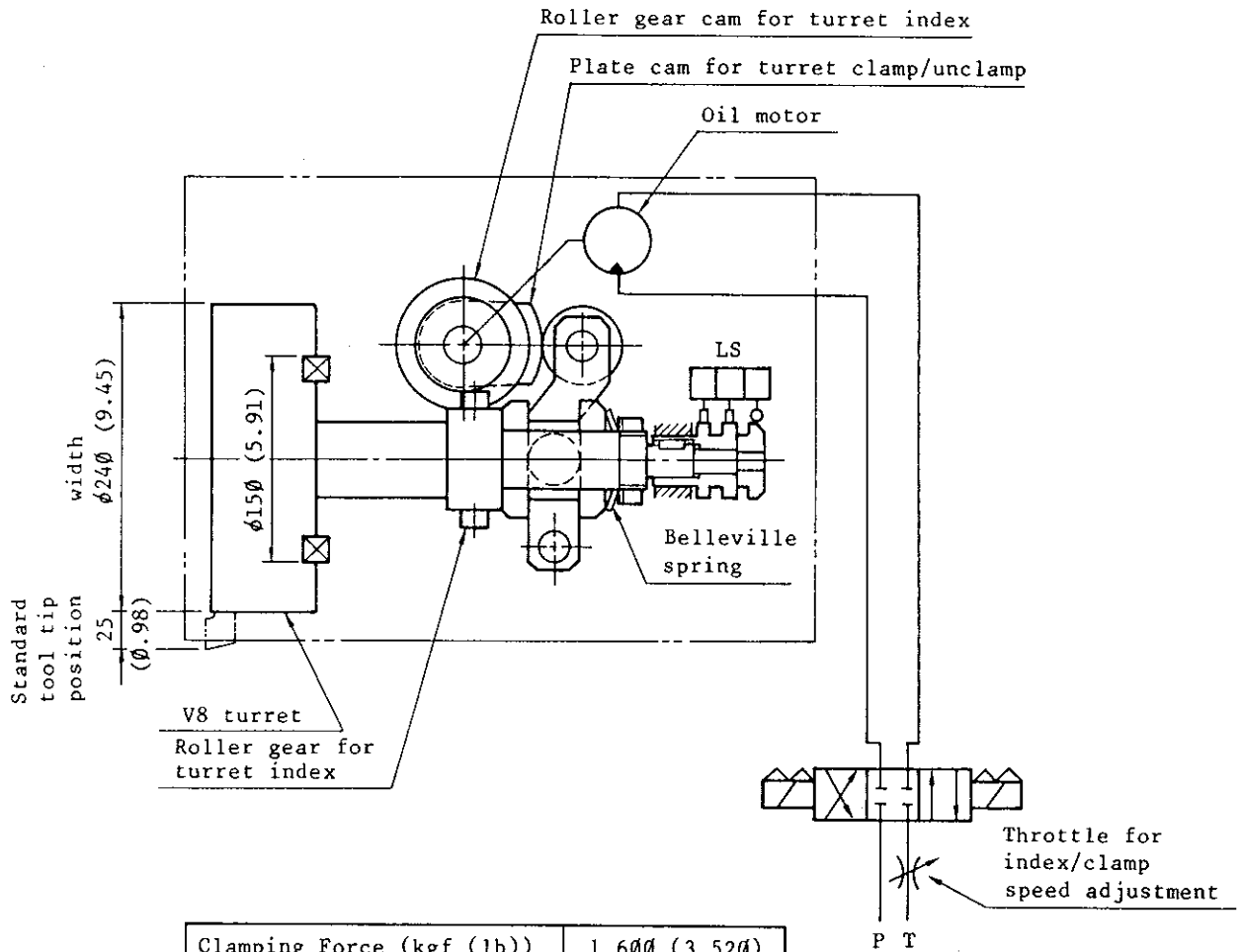
To protect the ball screws and the turret from heavy load due to interference, a shear pin is used in axis drive mechanism.

	X-axis	Z-axis
Brushless Servomotor	1 kW (1.3 hp)	1.5 kW (2.0 hp)
Reduction Ratio	3/5	14/25
Rapid Feedrate	12,000 mm/min (472 ipm)	18,000 mm/min (709 ipm)
Effective Thrust	Up : 331 kg (728 lb) Down: 451 kg (992 lb)	323 kg (711 lb)

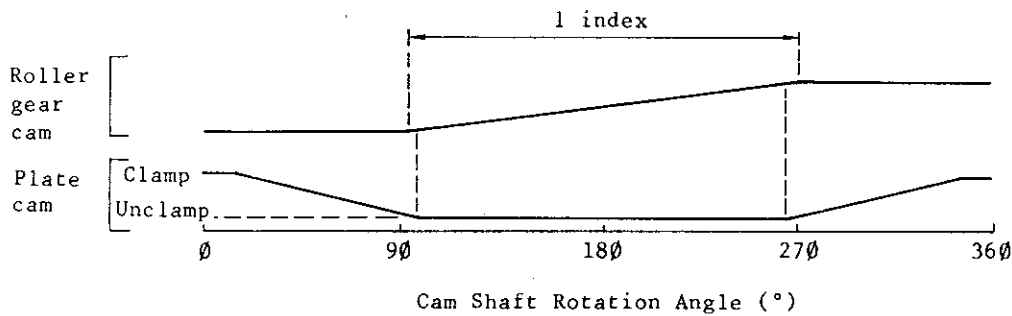
Note: Effective thrust

Thrust which can be used to cutting; thrust necessary to feed mechanical element (cross-slide, saddle, etc.) is excluded.

5-3. TURRET INDEXING AND CLAMPING MECHANISM



Clamping Force (kgf (lb))	1,600 (3,520)
Coupling Dia./No. of Teeth	150 (5.91)/16
Index Time	0.3 sec/station



TECHNICAL INFORMATION

INFORMATION NO.

1416-LB9

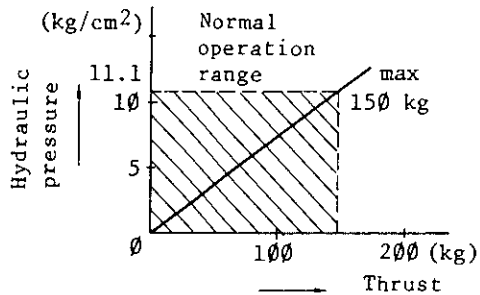
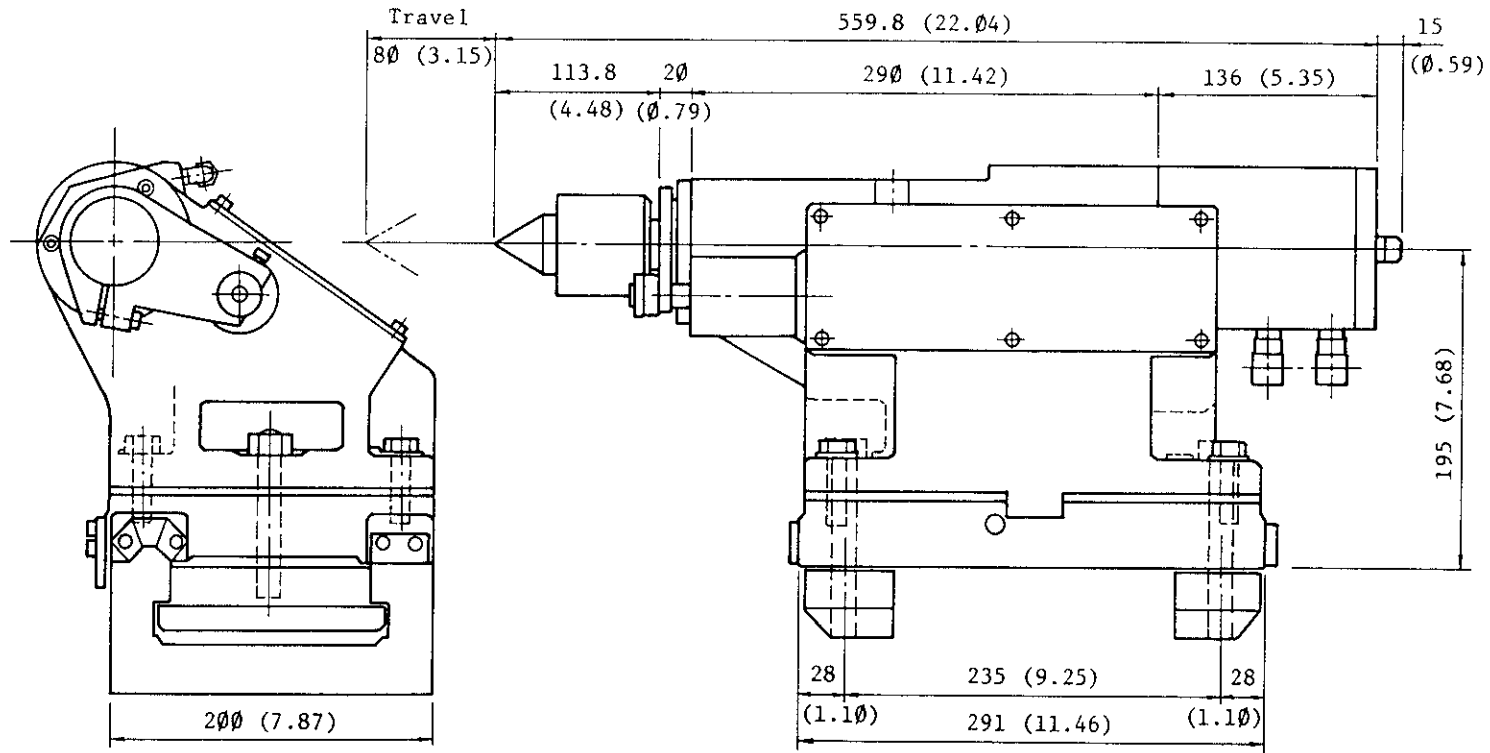
5-4

5-4. MECHANICAL CONSTANT FACTORS

CONTROLLED AXIS		X-axis	Z-axis
SERVOMOTOR			
Type of motor		BL-motor (Okuma) BL-5ØE-2Ø BL-8ØE-2Ø	
Output	kW (hp)	1 (1.3)	1.5 (2.0)
Rated speed	rpm	2,000	
Max. speed	rpm	1,200	1,120
Rated torque	kg-cm (ft-lb)	49 (4)	73 (5)
Max. torque	kg-cm (ft-lb)		
Inertia of rotor	$\times 10^{-2}$ kg-cm-S ²	1.48	3.66
Wave ratio		1.0	
Effective torque	kg-cm (ft-lb)	49 (3.54)	73 (5.28)
BALL SCREW			
Outer diameter	mm (in.)	32 (1.26)	40 (1.57)
Pitch	mm (in.)	10 (Ø.39)	16 (Ø.63)
Supporting method		Fixed support	
LOADED CONDITION			
Weight of slide	kg (lb)	120 (264)	250 (550)
Travel of slide	mm (in.)	120 (4.72)	270 (10.63)
Friction coefficient			
RAPID TRAVERSE RATE			
Rapid feedrate	mm/min (ipm)	12,000 (472)	18,000 (709)
Motor speed	rpm	2,000	
Ball screw speed	rpm	1,200	1,120
GEAR RATIO			
Motor to ball screw		3/5	14/25
Motor to position encoder		1/1	
CONSTANT CONVERTED FOR M-AXIS			
Starting torque	kg-cm (ft-lb)	Up : 17.2 (1.2) Down: 4.4 (Ø.3)	
Non-loaded torque	kg-cm (ft-lb)	Up : 13.9 (1.0) Down: 1.1 (Ø.1)	
Inertia	$\times 10^{-2}$ kg-cm-S ²	3.873	4.775
EFFECTIVE THRUST			
	kg (lb)	Up : 331 (728) Down: 451 (992)	323 (711)

6. HYDRAULIC TAILSTOCK

6-1. TAILSTOCK DIMENSIONS



Item	Specification	Remark
Revolving Center	MT No. 4	
Sleeve Stroke	80 mm (3.15 in.)	
Sleeve Dia.	φ55 mm (φ2.17 in.)	
Max. Thrust	150 kg (330 lb) [at 11.1 kg/cm ² (157.8 psi)]	Adjust with hydraulic unit at the rear of the machine

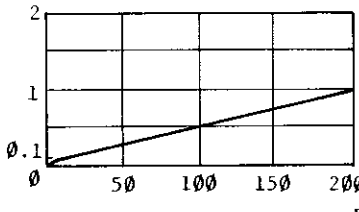
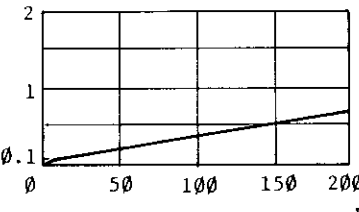
Tailstock sleeve IN/OUT confirmation limit switch is optionally available.

TECHNICAL INFORMATION

INFORMATION NO.
1416-LB9
7-1

7. PERFORMANCE DATA

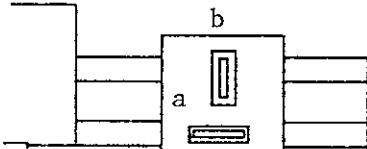

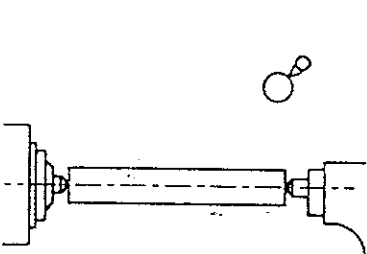
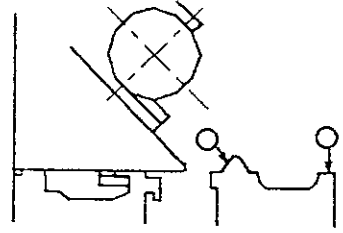
7-1. OPERATION TIME MEASUREMENT DATA

Spindle Speed Specification		5,000 rpm Specification		7,000 rpm Specification		
1	Spindle start and stop time (sec)	Spindle Speeds (rpm)	Start	Stop	Start	Stop
	(with standard chuck) B-07	$\varnothing \longleftrightarrow 500$				
		$\varnothing \longleftrightarrow 1,000$				
		$\varnothing \longleftrightarrow 1,500$				
		$\varnothing \longleftrightarrow 2,000$	1.3	1.0	1.2	1.0
		$\varnothing \longleftrightarrow 2,500$	1.9	1.7		
		$\varnothing \longleftrightarrow 3,000$	2.4	2.2	2.1	2.0
		$\varnothing \longleftrightarrow 3,500$	3.0	2.9		
		$\varnothing \longleftrightarrow 4,000$	3.8	3.6	3.0	2.9
		$\varnothing \longleftrightarrow 4,500$	4.5	4.4		
		$\varnothing \longleftrightarrow 5,000$	5.5	5.4	4.4	4.4
		$\varnothing \longleftrightarrow 6,000$			6.0	5.9
		$\varnothing \longleftrightarrow 7,000$			8.1	8.0
2	Spindle speed range change time (sec)	/	--	--		
3	Spindle speed change time during spindle rotation (sec)	In Units of 500 rpm				
		In Units of 100 rpm				
4	Turret indexing time (sec)	Turret Type	V8			
		1 Index	$\varnothing.3$			
		n Index	$\varnothing.3 \times n$			
		Index in Shortest Path	By parameter setting (standard specification)			
5	Rapid feed time (sec)	X-axis (12 m/min (472 ipm))	Z-axis (18 m/min (709 ipm))			
						

TECHNICAL INFORMATION

INFORMATION NO.
1416-LB9
7-2-1

7-2. TEST CHART

Type of Machine; LB9		Nominal Size;		Serial No. of Machine;		
ACCURACY TEST					Date; _____	
Unit; mm						
No.	Item		Illustration	Tolerance OKUMA STD	Measure- ment	JIS
1	Straight- ness of bed slideways (Bed level)	a Z-axis direction (in verti- cal plane)		$\phi.02/m$		$\phi.04/m$
		b X-axis direction (in verti- cal plane)		$\phi.02/m$		$\phi.04/m$
		c Z-axis direction (in hori- zontal plane)		$\phi.005$		$\phi.01$
2	Parallelism of bed slideways			$\phi.01$		$\phi.02$

TECHNICAL INFORMATION

INFORMATION NO.
1416-LB9
7-2-2

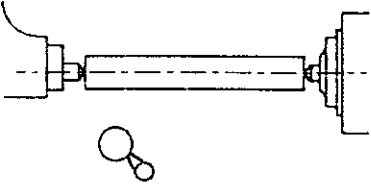
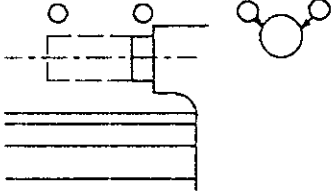

(NO)

No.	Item	Illustration	Tolerance OKUMA STD	Measure- ment	JIS
3	Spindle nose for true running (Spindle nose runout)		0.005		0.01
4	Spindle for axial slip (Cam action of spindle)		0.005		0.015
5	Spindle center runout		0.007		0.015
6	Taper of spindle for true running (Spindle taper hole runout)	at end of spindle nose		0.005	0.01
		at free end of test bar		0.01 per 200	0.02 per 300
7	Parallelism between spindle axis and upper saddle movement	a in vertical plane		0.007 per 200	0.01 per 300
		b in horizontal plane		0.005 per 200	0.01 per 300
8	Perpendicularity between spindle axis and upper cross-slide movement		0.005 per 100		0.02 per 300
			to face concave only		

TECHNICAL INFORMATION

INFORMATION NO.
1416-LB9
7-2-3

(NO)

No.	Item	Illustration	Tolerance OKUMA STD	Measure- ment	JIS
9	Vertical alignment of headstock and tailstock centers		$\phi.02 - \phi.04$		$\phi.02$
		high at tailstock			
10	Parallelism between saddle movement and tailstock spindle centerline	a in vertical plane 	$\phi.006$ per 80		$\phi.02$ per 150
		b in horizontal plane 	$\phi.005$ per 80		$\phi.01$ per 150

Note 1: Z-axis direction means a direction parallel with the spindle centerline and also a direction perpendicular with the X-axis.

Note 2: "In vertical plane" of test items 1, 7 and 10 means a spindle centered plane perpendicular with the cross-slide ways and also the "In horizontal plane" means a spindle centered plane parallel with the cross-slide ways.

Note 3: Test item are applied only for the machine having a corresponding functions and equipment.

Note 4: Each measurement shall be done under normal condition of machine before warming-up running.

Note 5: Tolerance and measurement values of test item 1 are maximum reading difference of spirit level and are followed in accordance with JIS B6202 standards.

Assembled by; _____ Inspected by; _____

Checked by; _____

Production Department

Inspection Department

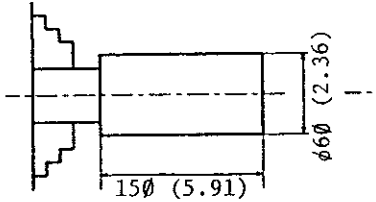
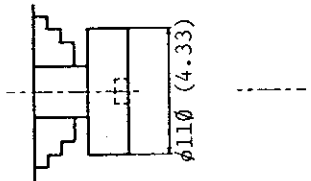
OKUMA MACHINERY WORKS LTD.

TECHNICAL INFORMATION

INFORMATION NO.

1416-LB9

7-2-4

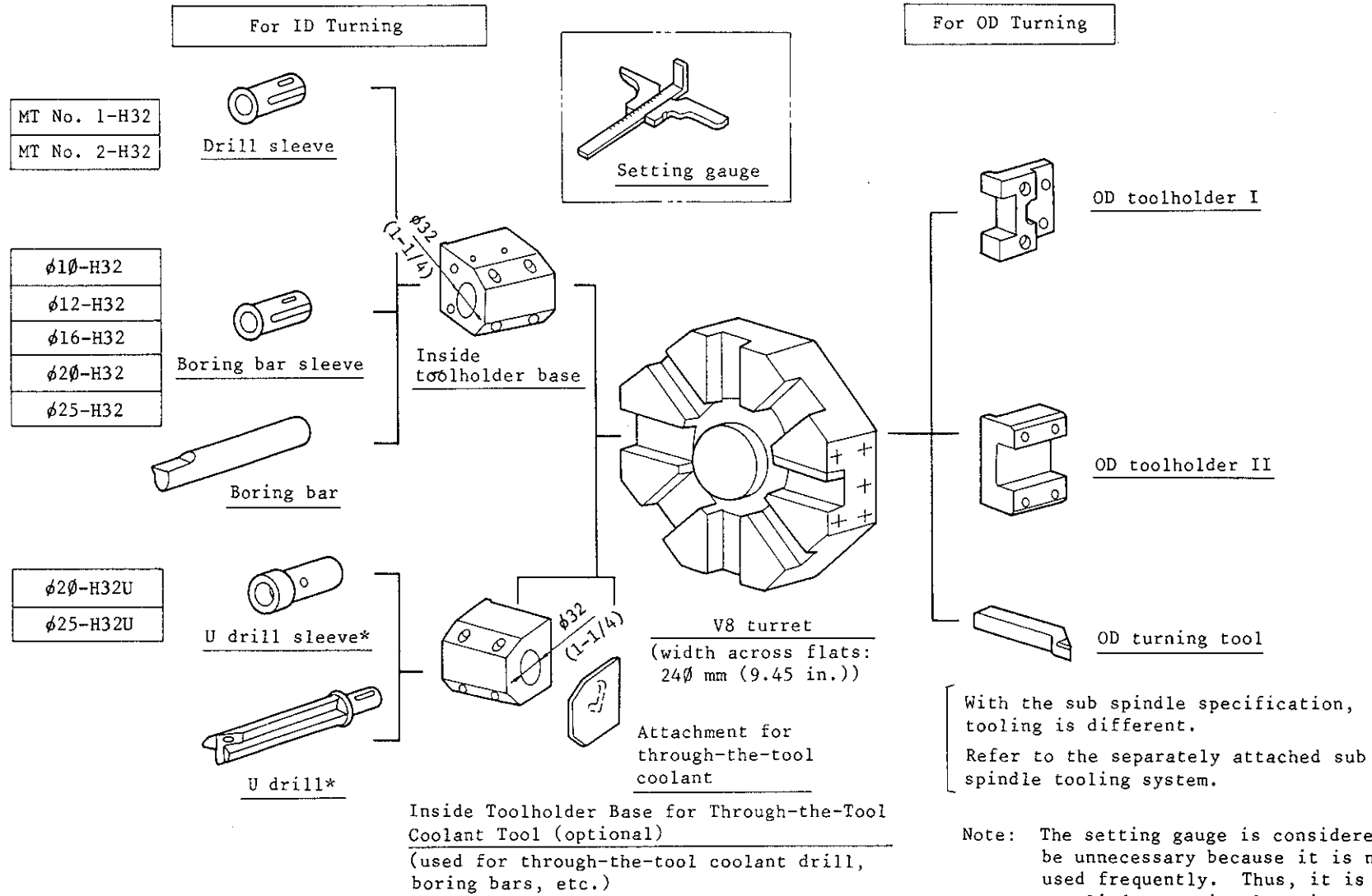
WORKING ACCURACY TEST						Unit; mm	
No.	Item and Illustration	Swing over bed	OKUMA STD		Measurement	JIS	
			Roundness	Cylindricity		Roundness	Cylindricity
1	Outside turning  (Cutting conditions) Cutting tool ; Carbide tip (0.4R) Material ; BsB Spindle speed; 2000 rpm Cutting speed; Approx. 375 m/min Feedrate ; 0.05 mm/rev	500 and under	0.005	0.008	Roundness	0.01	0.015
		Over 500 to 750	0.006	0.009		0.012	0.018
		Over 750 to 1000	0.007	0.01	Cylindricity	0.014	0.02
		Over 1000 to 1500	0.008	0.013		0.016	0.025
2	Facing  (Cutting conditions) Cutting tool ; Carbide tip (0.4R) Material ; BsB Spindle speed; 1000 rpm Cutting speed; Approx. 345 m/min Feedrate ; 0.05 mm/rev	Swing over bed	OKUMA STD		Measurement	JIS	
			Flatness			Flatness	
		500 and under	0.005			0.02	
		Over 500 to 750	0.01			0.02	
		Over 750 to 1000	0.01			0.02	
Over 1000 to 1500	0.015			0.03			

Note 1: Measure the diameter at 3 points (center and both end) within the 4 planes with the angular interval of approximately 45 degrees containing the axis then find the maximum value of 4 diameters for each measured point and maximum value shall be the measured value of roundness. Then find the maximum difference in the 3 diameters within each of the same plane be measured value of cylindricity.

Note 2: In two direction perpendicular to each other on the finished surface find the difference of the distance between the finished surface and the datum level. The largest value is converted to the value of the center point of the end surface of the workpiece and that value shall be the measured value of the flatness.

8. TOOLING

8-1. TOOLING SYSTEM



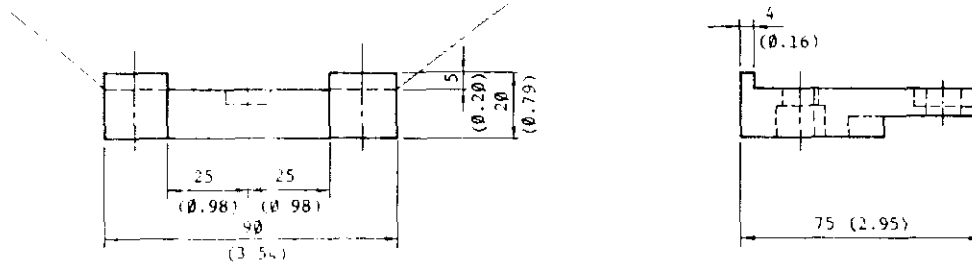
U drill is a commercial product name for Sandvik drills.
 When drills other than U drills are required, specify the drill name.

With the sub spindle specification, tooling is different.
 Refer to the separately attached sub spindle tooling system.

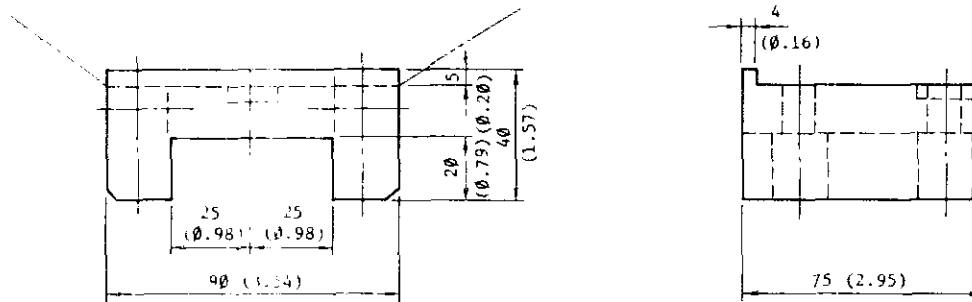
Note: The setting gauge is considered to be unnecessary because it is not used frequently. Thus, it is supplied as optional equipment. (Tool offset data can be read by using the OSP's calculation function.)

8-2. TOOLHOLDERS

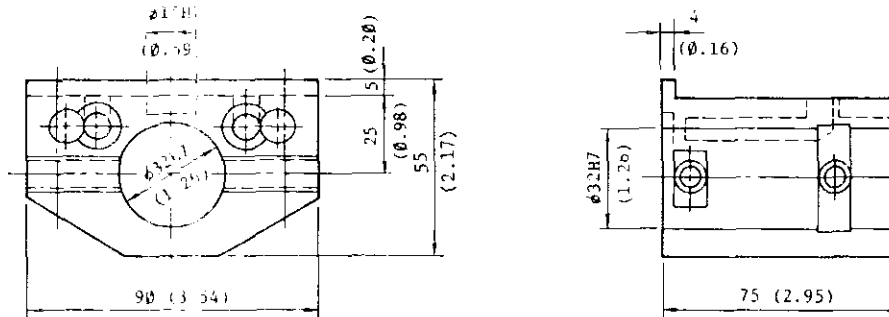
OD Toolholder Type I-M



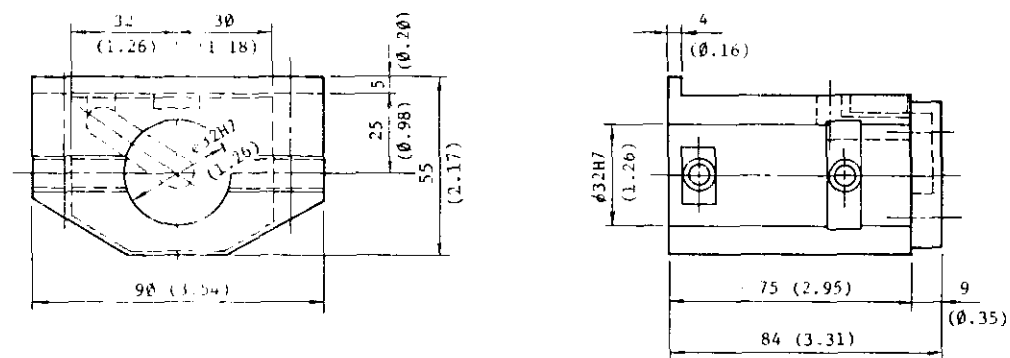
OD Toolholder Type II-M



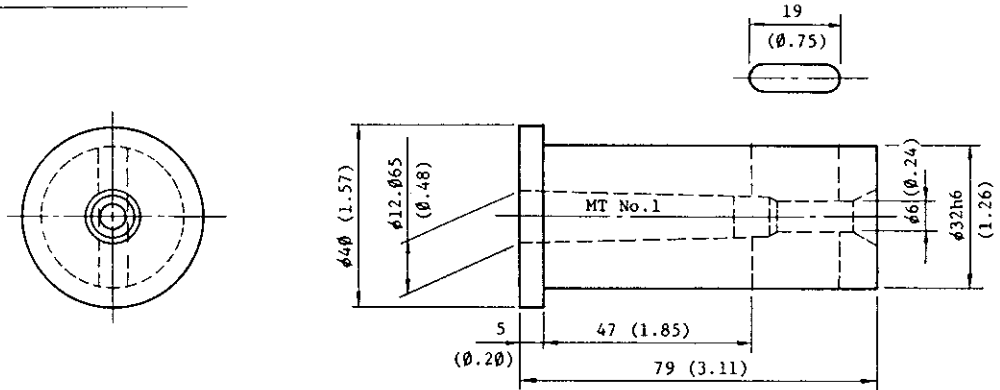
ID Toolholder Base



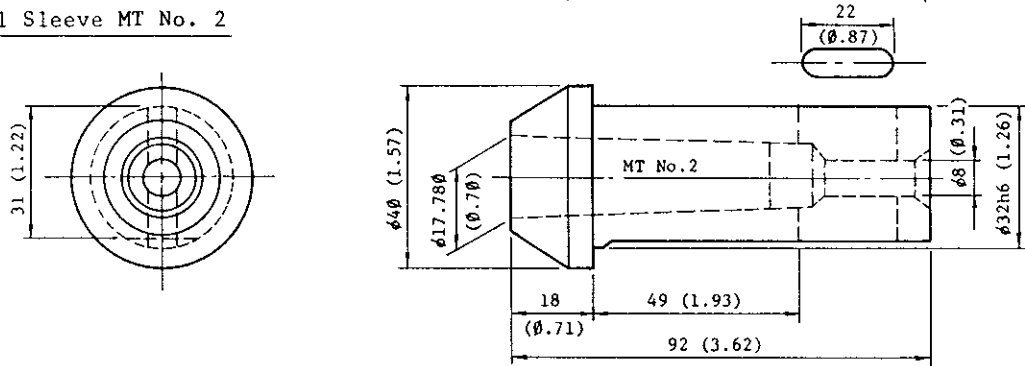
ID Toolholder Base (for Drill)



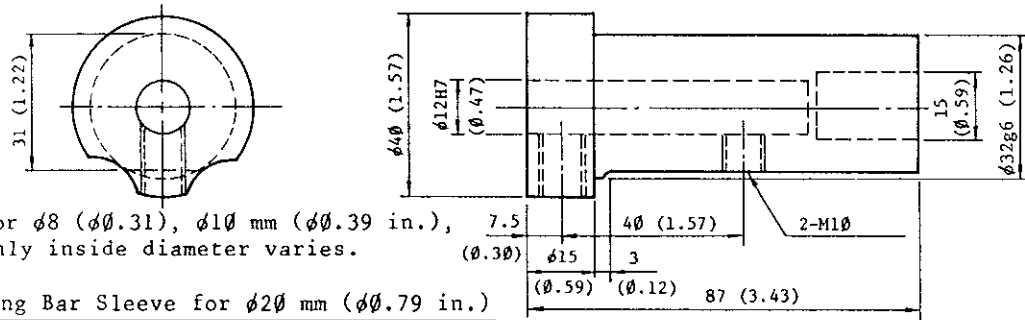
Drill Sleeve MT No. 1



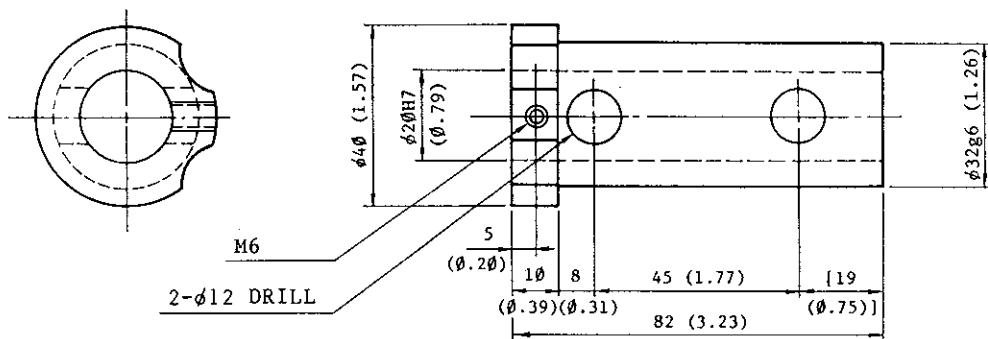
Drill Sleeve MT No. 2



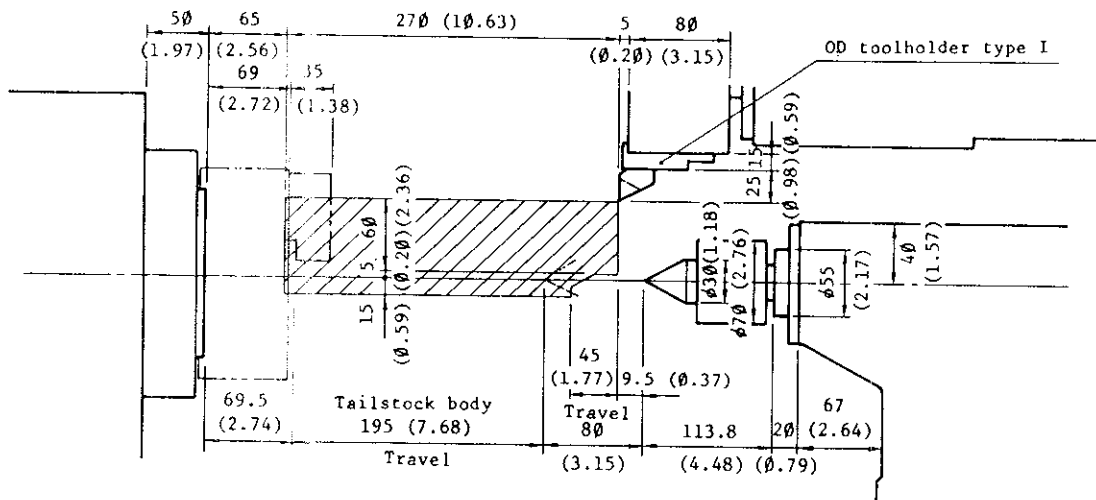
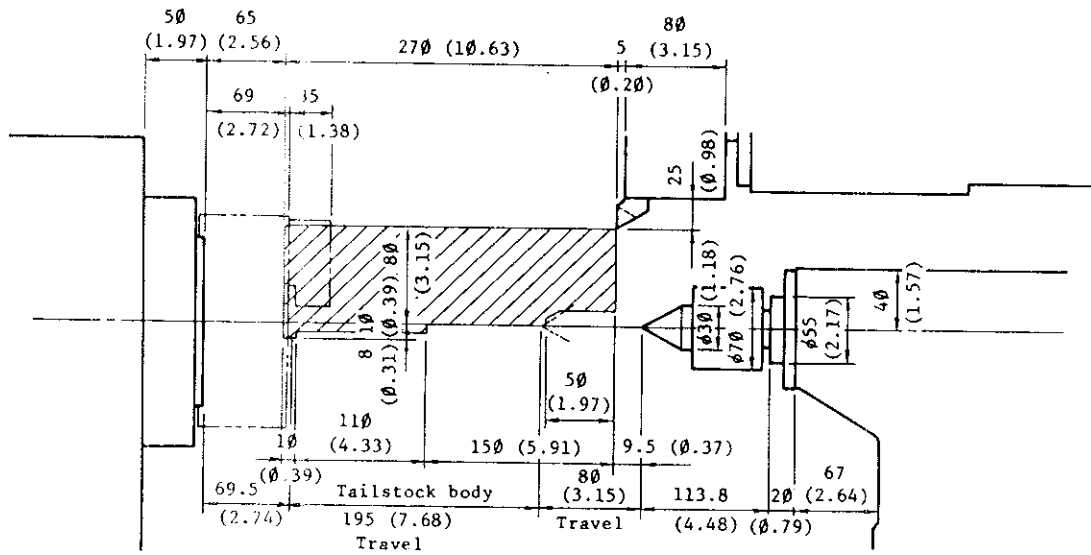
Boring Bar Sleeve for 12 mm (0.47 in.)



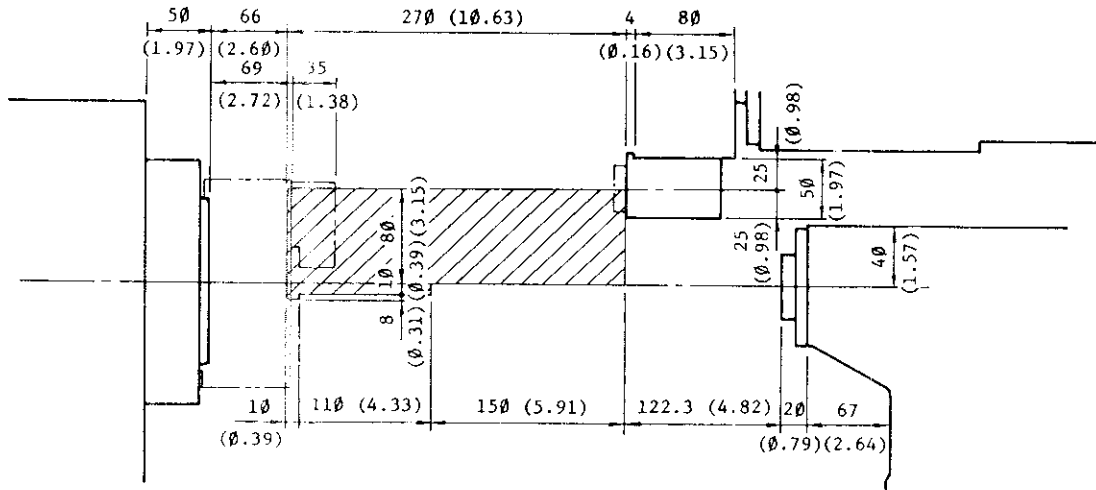
Boring Bar Sleeve for 20 mm (0.79 in.)



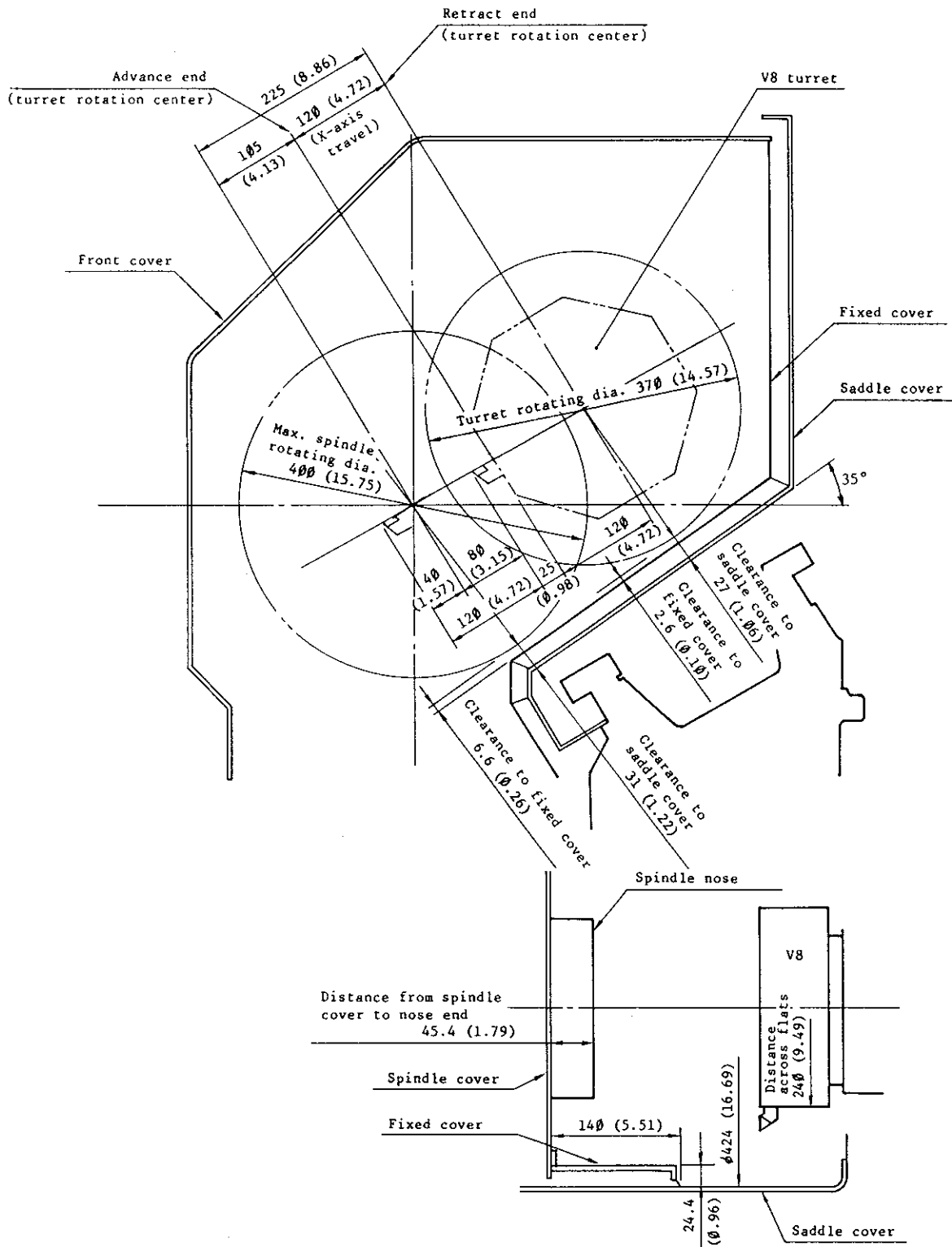
9-2. WORKING RANGE WITH TAILSTOCK



When Revolving Center is Removed:

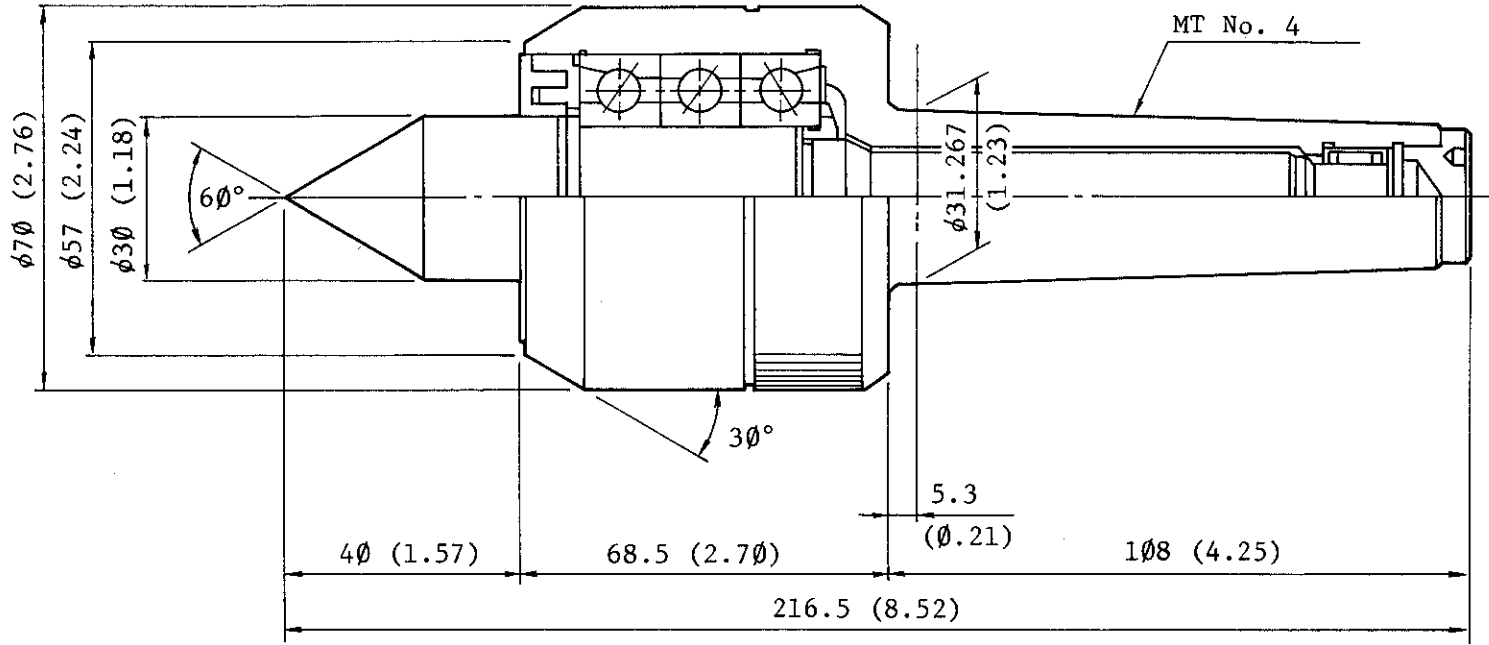


9-3. TURNING RANGE



10. ACCESSORIES AND EQUIPMENT

10-1. LIVE CENTER

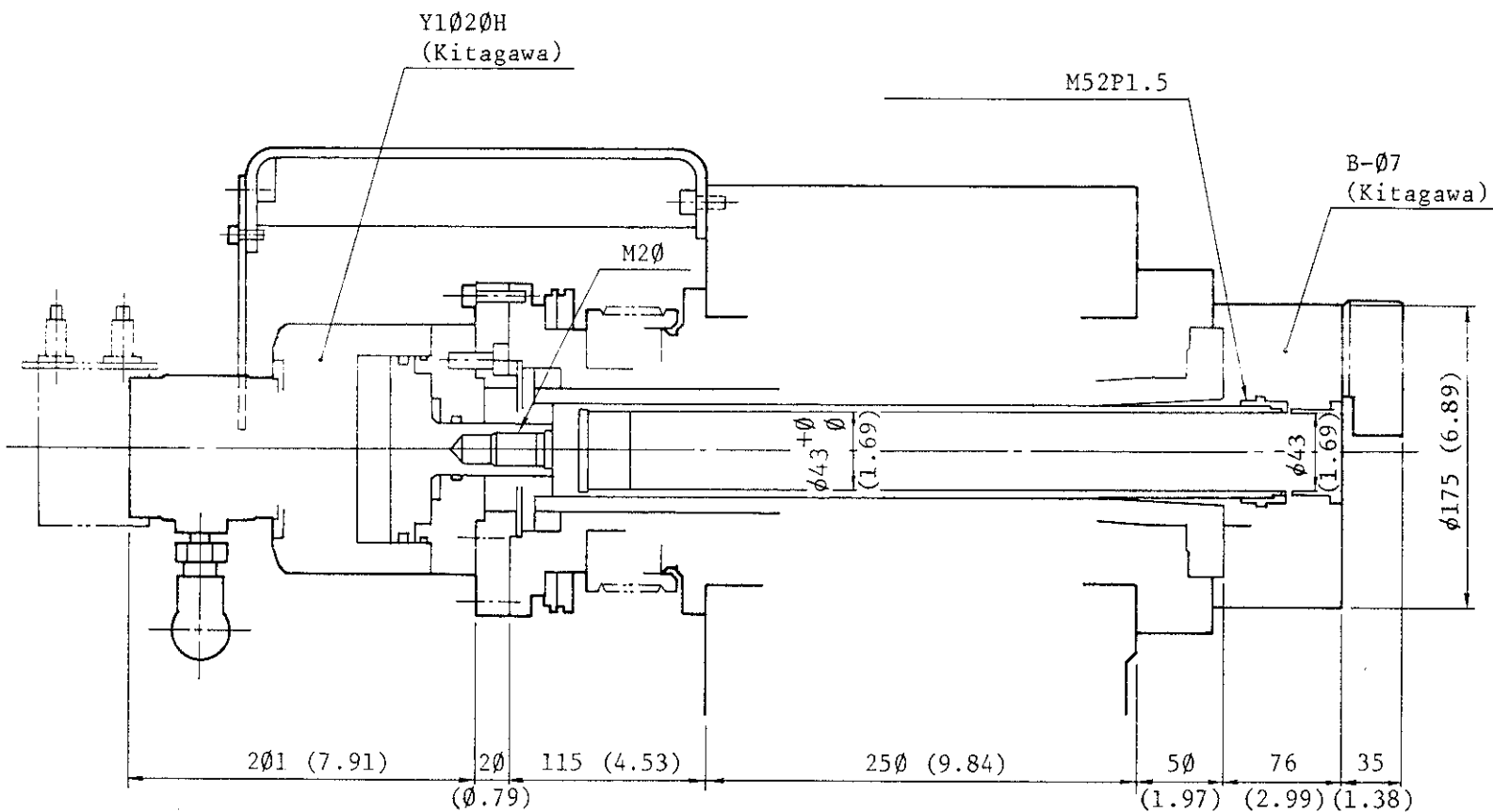


NC Type 70 Revolving Center No. 4 (Futamura)

Load (kg (lb))	Spindle Speed (rpm)												
	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000
Radial	253 (557)	221 (486)	200 (440)	186 (409)	175 (385)	165 (363)	160 (352)	153 (337)	145 (319)	143 (315)	140 (308)	135 (297)	130 (286)
Thrust	303 (667)	265 (583)	240 (528)	223 (491)	210 (462)	200 (440)	190 (418)	184 (405)	175 (385)	172 (378)	165 (363)	162 (356)	155 (341)

Allowable Load Table (kg) Assumed Life Time: 2,000 Hr

1Ø-2. HOLLOW TYPE POWER CHUCK INSTALLATION DIAGRAM (B Specification)



Rotary Hydraulic Cylinder with Lock

Hollow Type Power Chuck

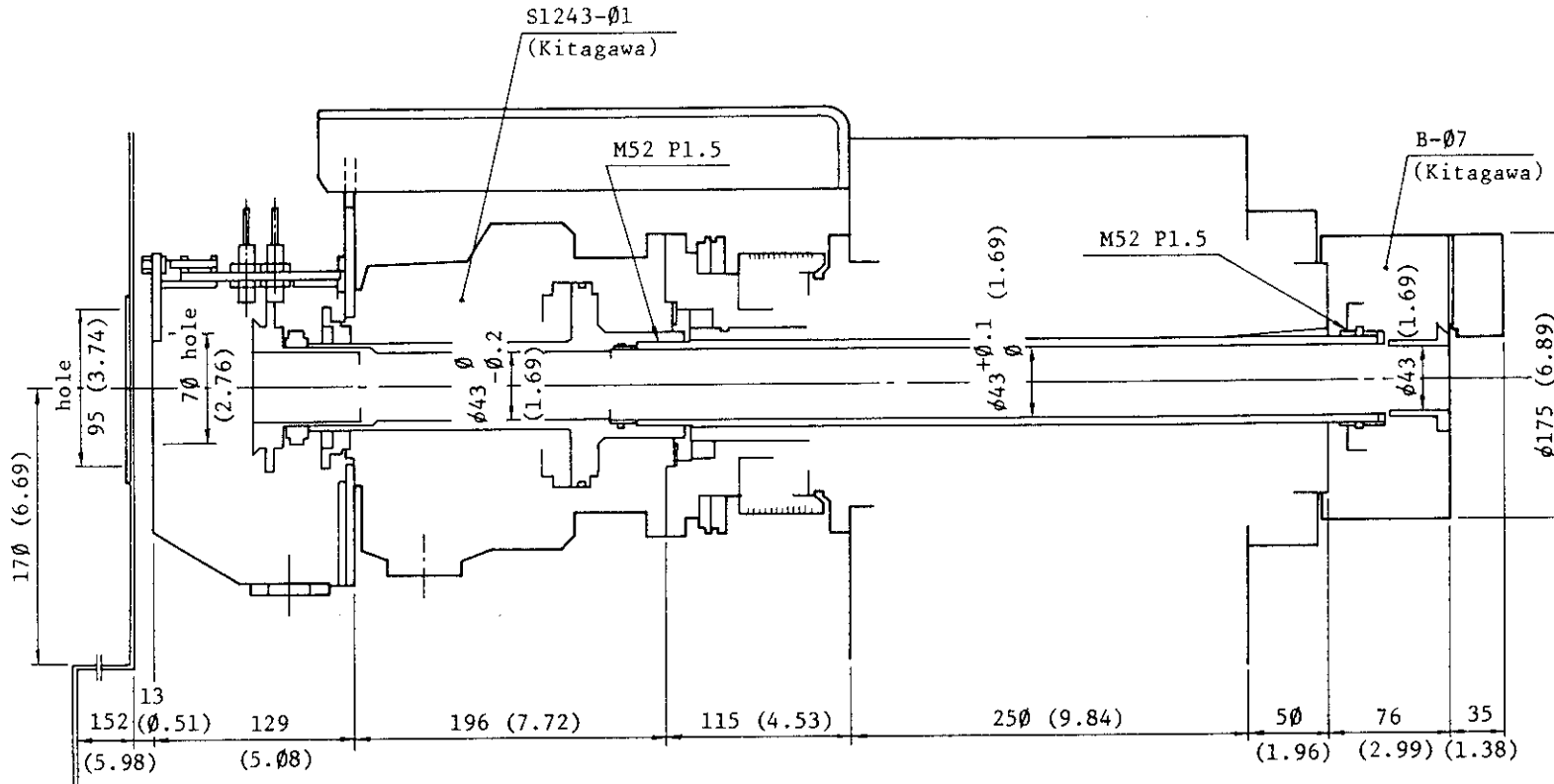
Type	Y1Ø2ØH
Cylinder Bore	1Ø5 mm (4.13 in.)
Piston Stroke	2Ø mm (Ø.79 in.)
Piston Thrust (at 4Ø kg/cm ²)	Push: 3,ØØØ kgf (6,6ØØ lb) Pull: 2,8ØØ kgf (6,16Ø lb)
Max. Speed	6,ØØØ rpm
Max. Pressure	4Ø kg/cm ² (569 psi)
Weight	7.5 kg (16.5 lb)

Type	B-Ø7
Max. Speed	5,ØØØ rpm
Chuck Weight	13.5 kg (29.7 lb)
Jaw Stroke (in Dia.)	Ø5.5 mm (Ø0.22 in.)
Allowable Thrust	2,ØØØ kgf (4,4ØØ lb) (at 28 kg/cm ²)
Clamping Force/Jaw	1,7ØØ kgf (3,74Ø lb)
Max. Pressure	28 kg/cm ² (398 psi)

Standard chuck kit: B kit

10-3. HOLLOW TYPE POWER CHUCK INSTALLATION DIAGRAM

Gripping confirmation sensors are optional.



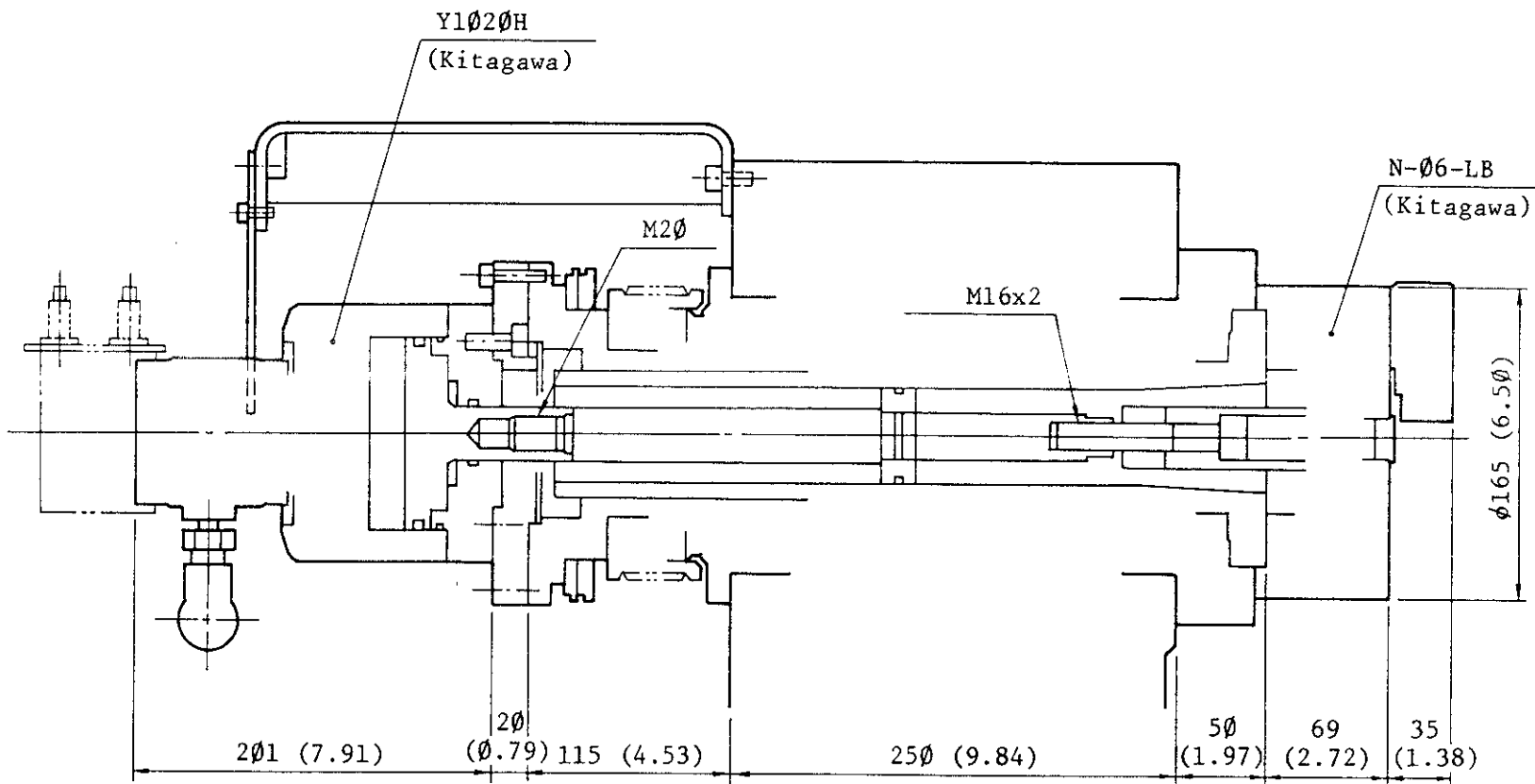
Rotary Hydraulic Cylinder with Lock

Hollow Type Power Chuck

Type	S1243-01
Cylinder Bore	170 mm (6.69 in.)
Piston Stroke	129 mm (5.08 in.)
Piston Thrust	3,700 kgf (8,140 lb) (at 40 kg/cm ²)
Max. Speed	7,000 rpm
Max. Pressure	40 kg/cm ² (569 psi)
Weight	15.5 kg (34.1 lb)

Type	B-07
Max. Speed	5,000 rpm
Chuck Weight	13.5 kg (29.7 lb)
Jaw Stroke (in Dia.)	55.5 mm (2.19 in.)
Allowable Thrust	2,000 kgf (4,400 lb) (at 22 kg/cm ²)
Clamping Force/Jaw	1,700 kgf (3,740 lb)
Max. Pressure	22 kg/cm ² (313 psi)

10-4. SOLID TYPE POWER CHUCK INSTALLATION DIAGRAM



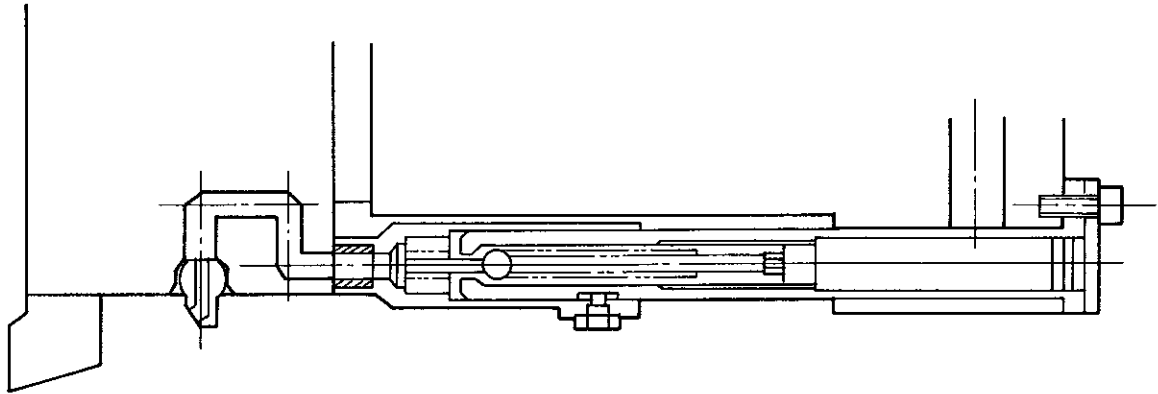
Rotary Hydraulic Cylinder with Lock

6" Power Chuck

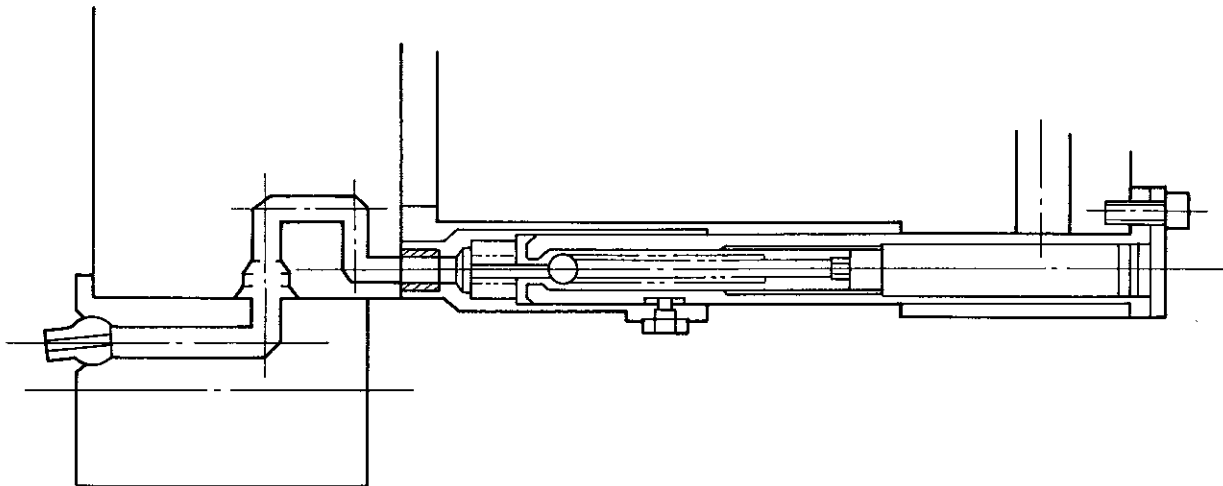
Type	Y1020H
Cylinder Bore	105 mm (4.13 in.)
Piston Stroke	20 mm (0.79 in.)
Piston Thrust (at 40 kg/cm ²)	Push: 3,000 kgf (6,600 lb) Pull: 2,800 kgf (6,160 lb)
Max. Speed	6,000 rpm
Max. Pressure	40 kg/cm ² (569 psi)
Weight	7.5 kg (16.5 lb)

Type	N-06-LB
Max. Speed	5,000 rpm
Chuck Weight	13 kg (29 lb)
Jaw Stroke (in Dia.)	8.5 mm (0.33 in.)
Allowable Thrust	1,800 kgf (3,960 lb) (at 26 kg/cm ²)
Clamping Force/Jaw	1,750 kgf (3,850 lb) (at 1,800 kgf thrust)
Max. Pressure	26 kg/cm ² (370 psi)

10-5. COOLANT SUPPLY METHOD



Tools Directly Clamped on Turret

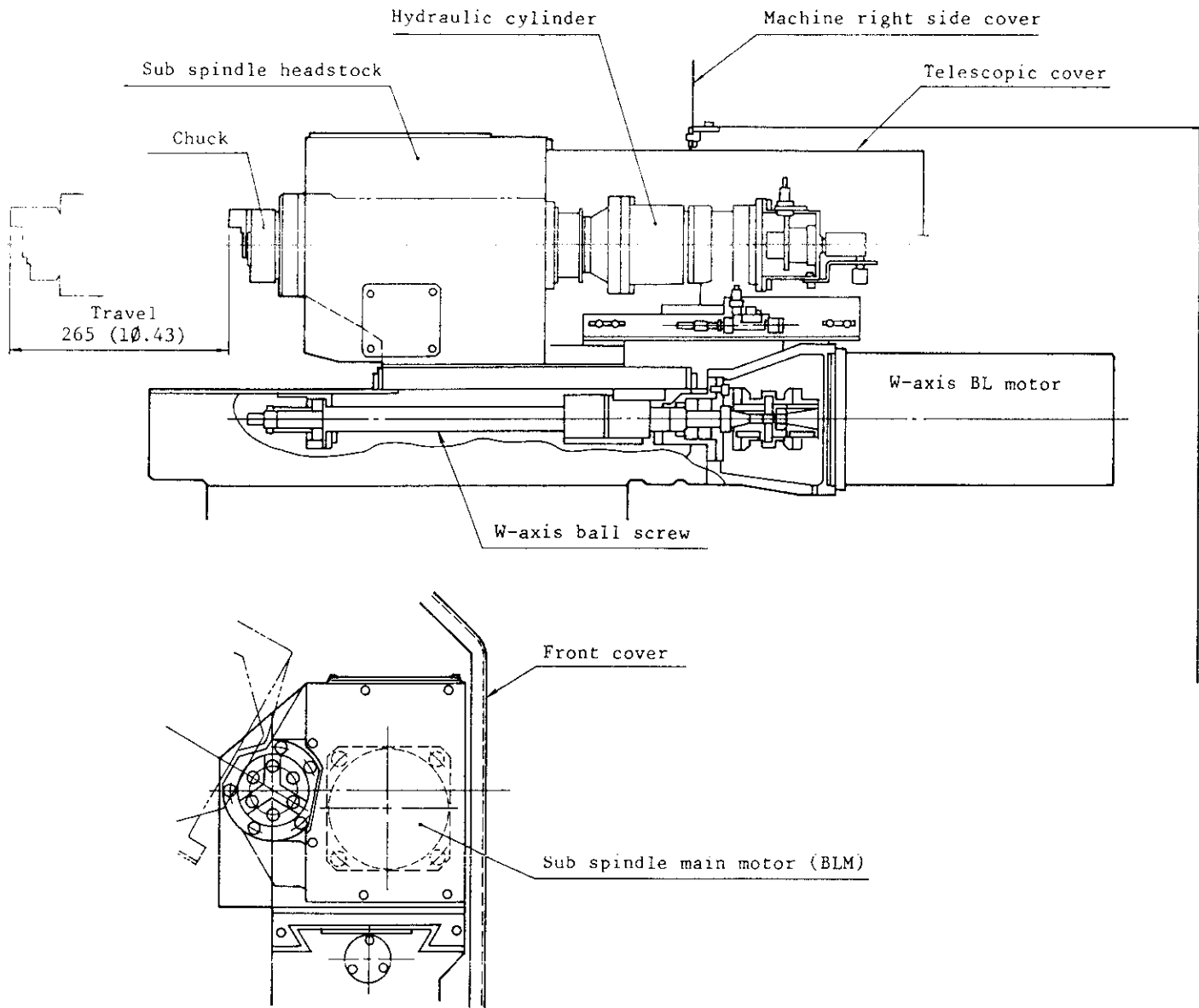


ID Toolholder Base

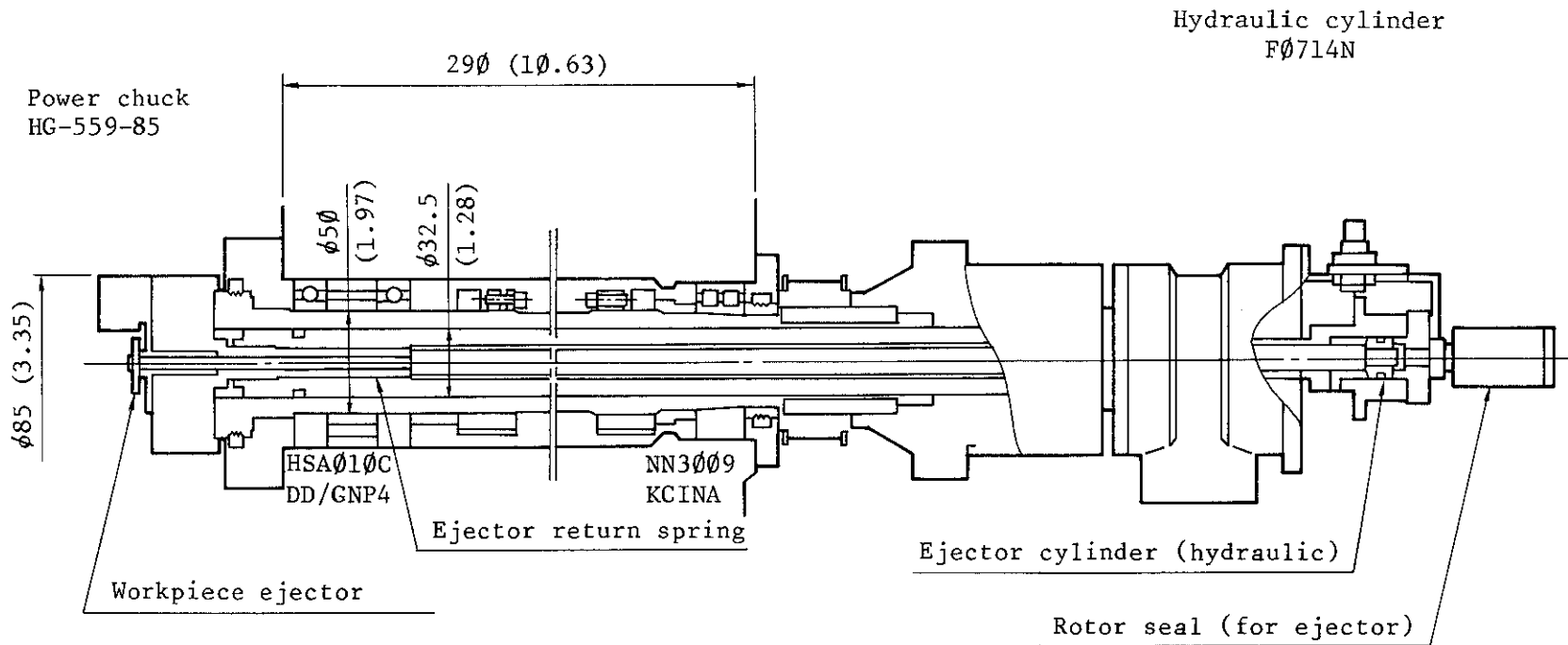
Nozzles are located at two places so that both normal and inverse tools can be used for any type of tooling (direct mount tools, OD toolholder I, II, ID toolholder base).

1Ø-6. SUB SPINDLE

(1) Overall View



(2) Sub Spindle Chuck



ø85 mm (ø3.35 in.) Hollow Type Power Chuck

Rotary Hydraulic Hollow Cylinder with Lock

Type	Kitagawa HG-559-85
Max. Speed	3,000 rpm
Chuck Weight	2.5 kg (5.5 lb)
Jaw Stroke (in Dia.)	ø3 mm (ø0.12 in.)
Allowable Thrust	310 kgf (682 lb) (at 10 kg/cm ²)
Clamping Force/Jaw	218 kgf (480 lb)
Max. Pressure	10 kg/cm ² (142 psi)

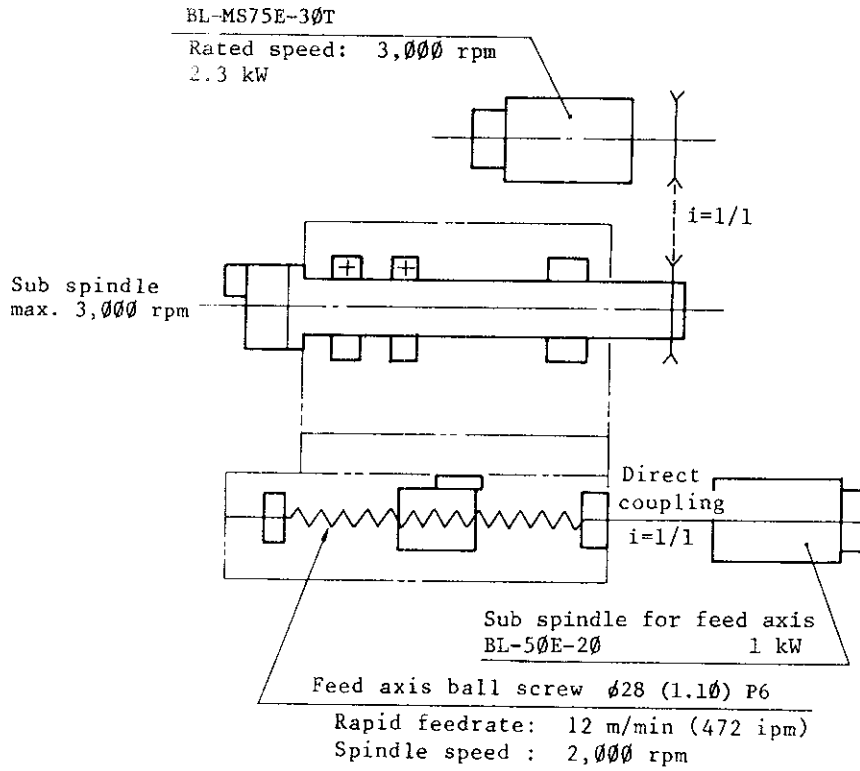
Type	Kitagawa F0714N
Cylinder Bore	70 mm (2.76 in.)
Piston Stroke	7 mm (ø.28 in.)
Piston Thrust	740 kg (1,628 lb) (at 25 kg/cm ²)
Max. Speed	12,000 rpm
Max. Pressure	25 kg/cm ² (356 psi)
Weight	5.2 kg (11.4 lb)

TECHNICAL INFORMATION

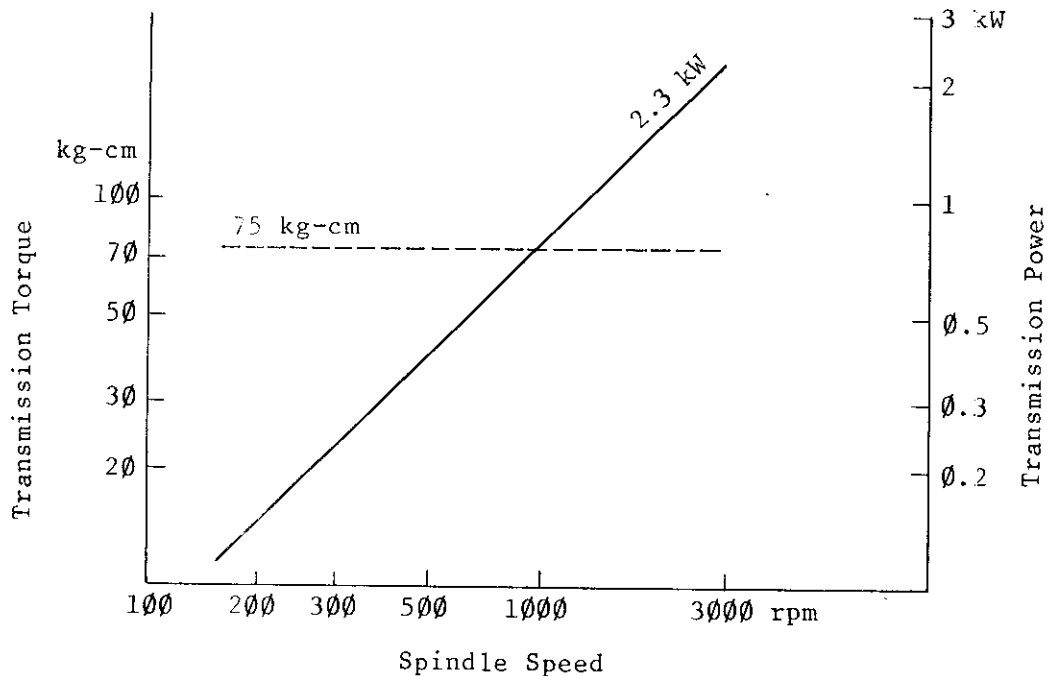
INFORMATION NO.
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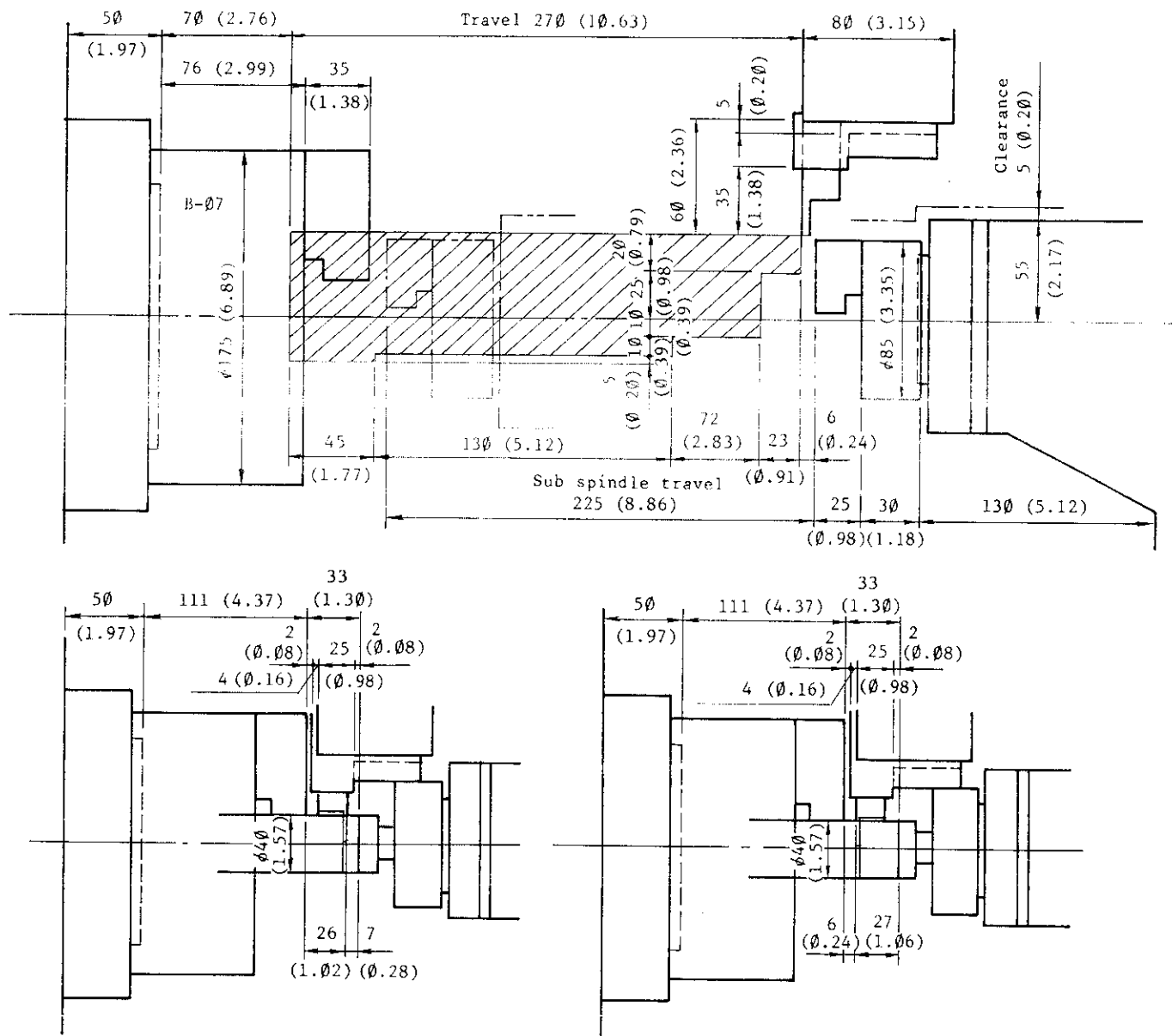
(3) Mechanical Diagram and Power Transmission Diagram

a) Mechanical diagram



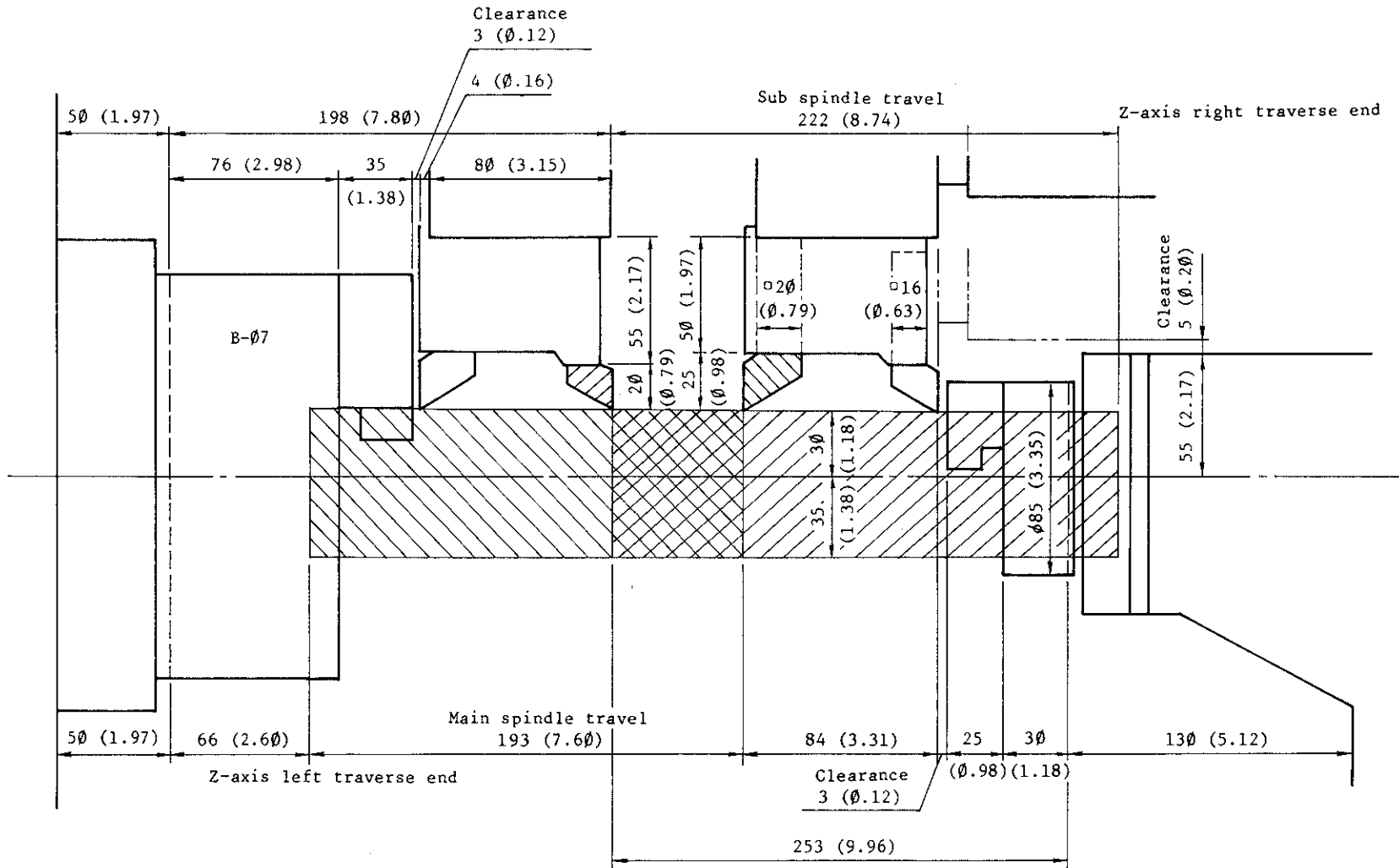
b) Power transmission diagram





* To machine a narrow width workpiece, set the cutting tool as illustrated above.

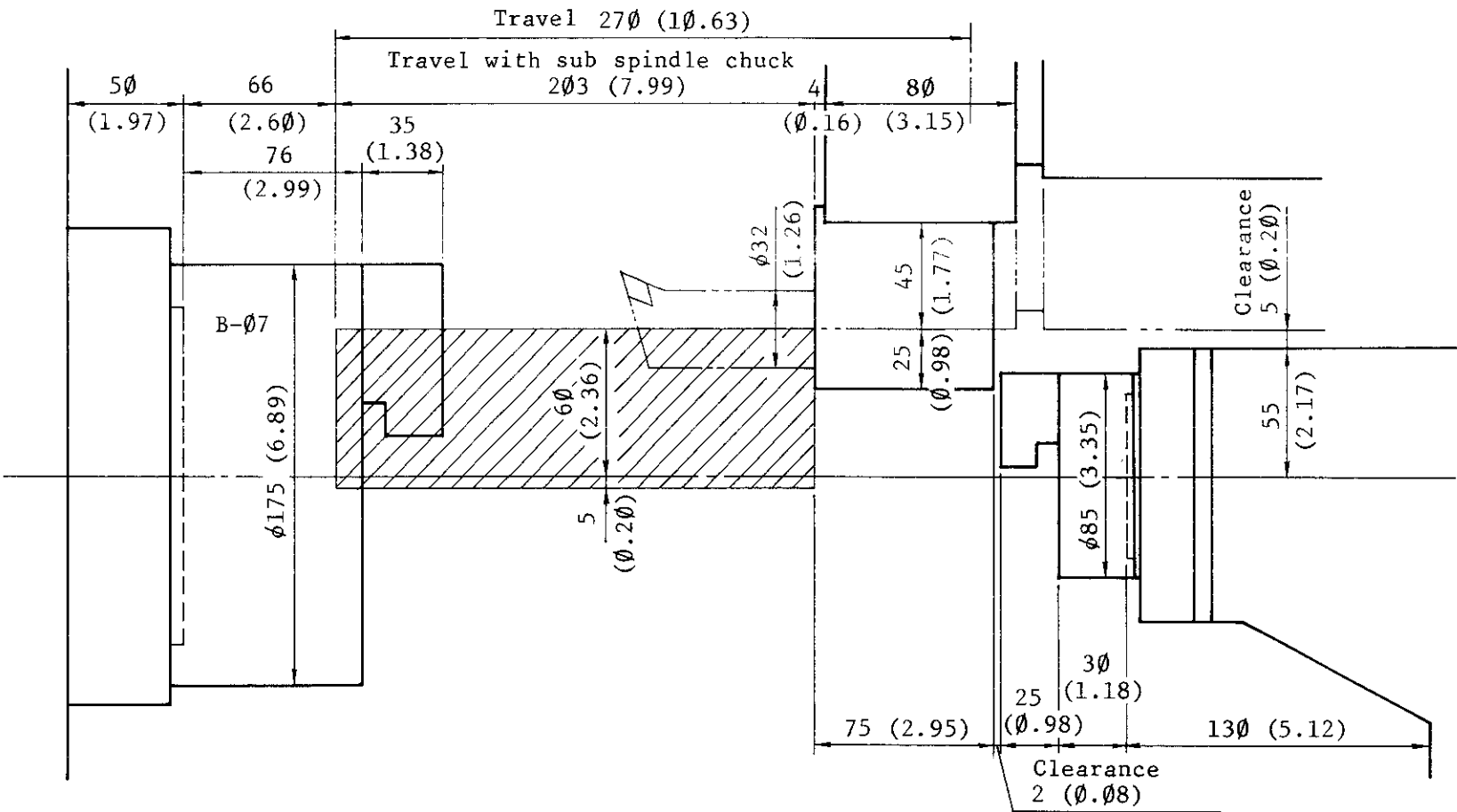
OD Toolholder Type I - Tool Interference



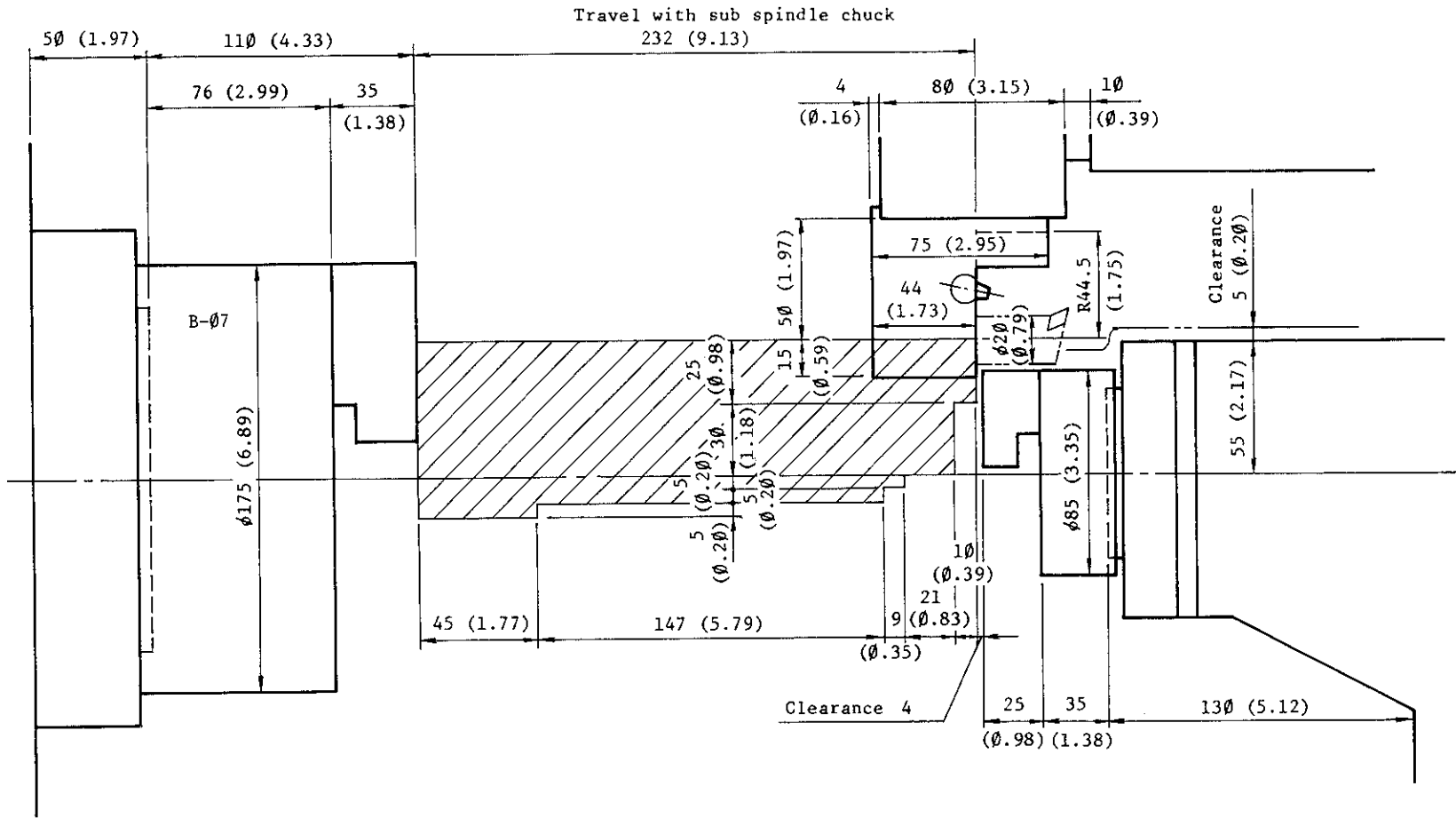
OD Toolholder Type III/IV (for Machining on Both Ends)

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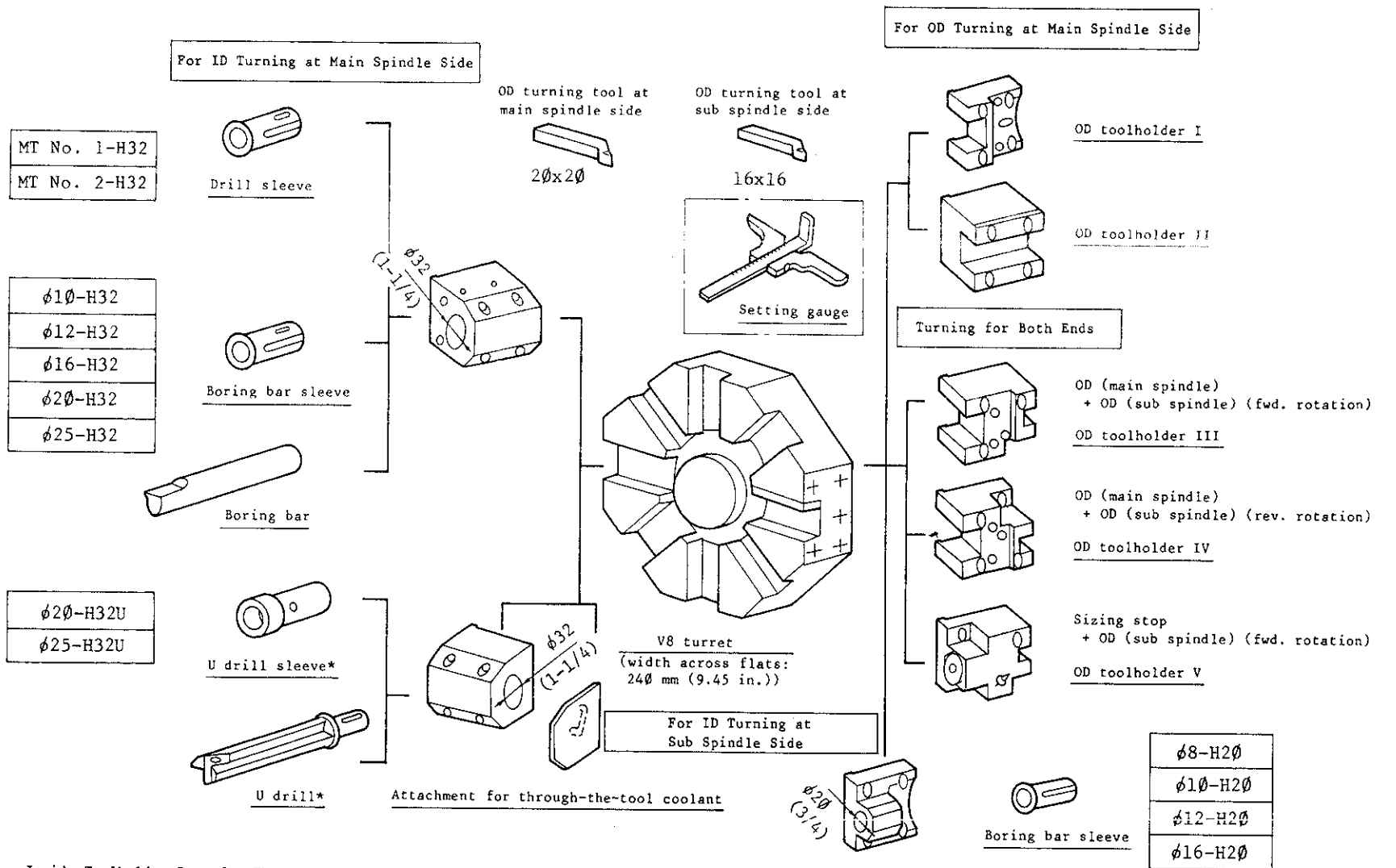
ID Toolholder Base (for Sub Spindle at Main Spindle Side)



* Max. projection amount of boring bar: 40 mm (1.57 in.)

ID Toolholder Base (for Sub Spindle at Sub Spindle Side)

(5) Tooling System



Inside Toolholder Base for Through-the-Tool Coolant Tool (optional)
(used for through-the-tool coolant drill, boring bars, etc.)

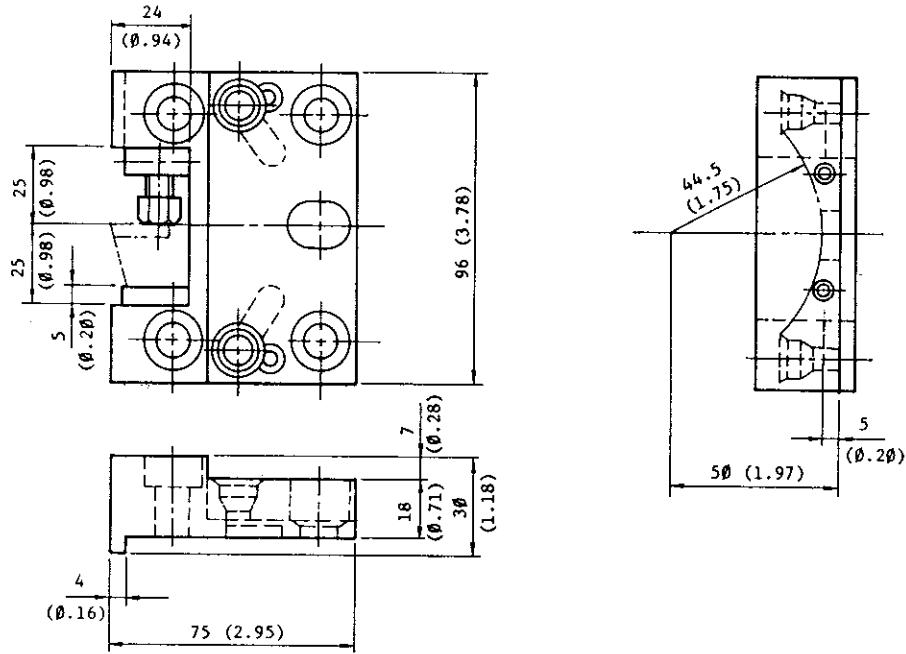
Note: U drill is a commercial production name for Sandvik drills.
When drills other than U drills are required, specify the drill name.

Note 1: Sub spindle tooling differs from LB9 tooling.

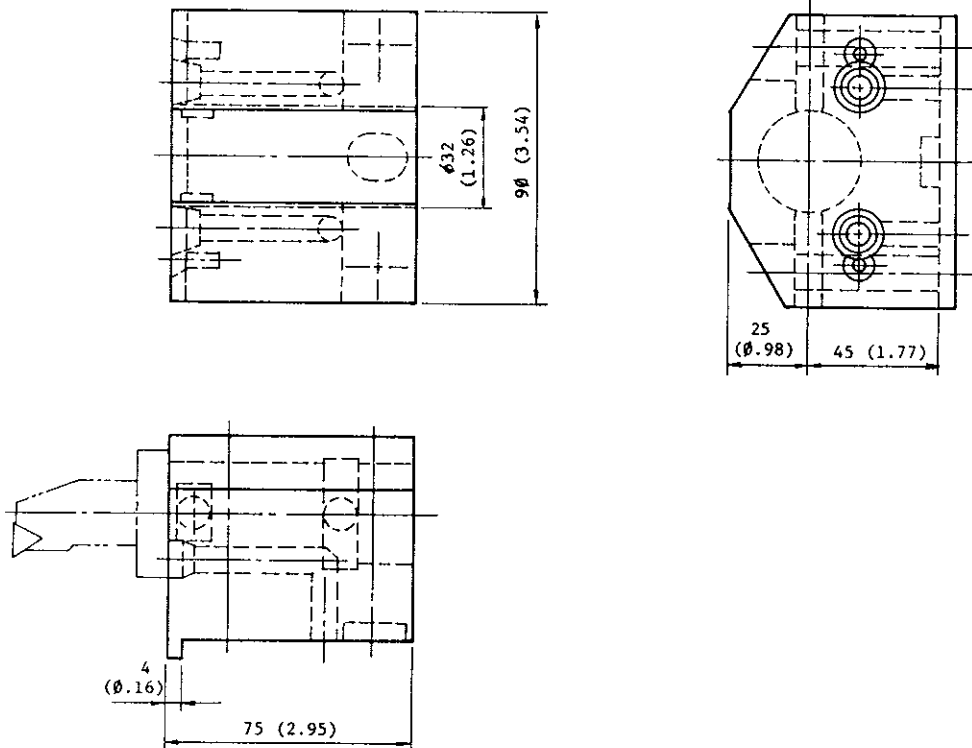
Note 2: The setting gauge is considered to be unnecessary because it is not used frequently. Thus, it is supplied as optional equipment.
(Tool offset data can be read by using the OSP's calculation function.)

(6) Toolholders

OD Toolholder Type I



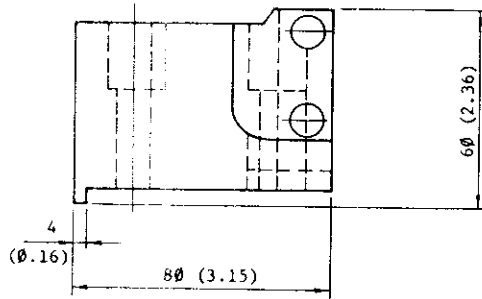
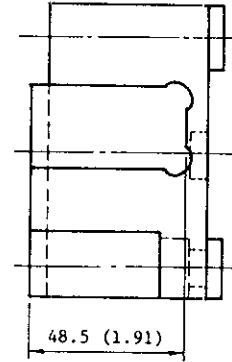
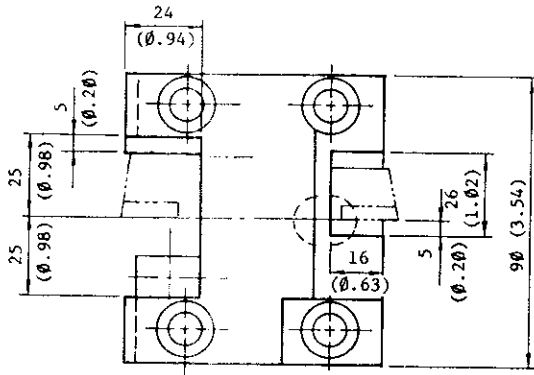
ID Toolholder (at Main Spindle Side)



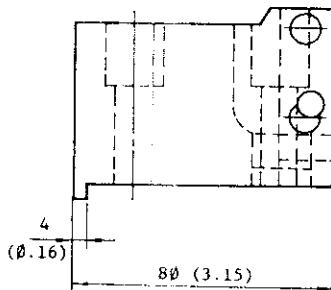
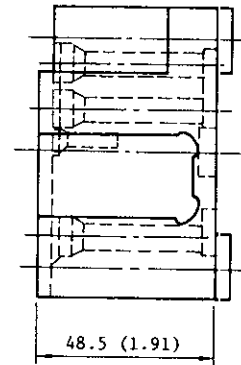
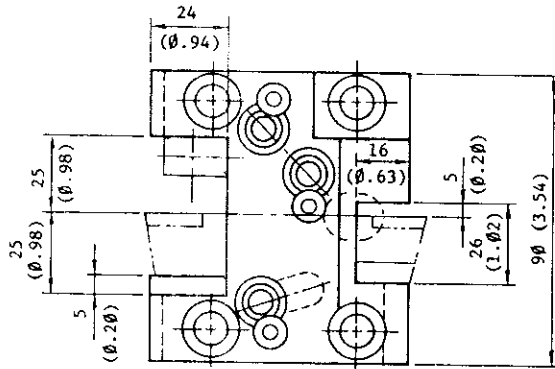
TECHNICAL INFORMATION

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OD Toolholder Type III



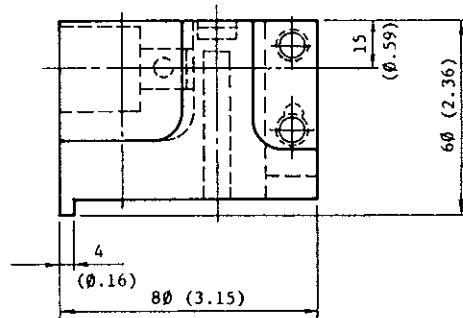
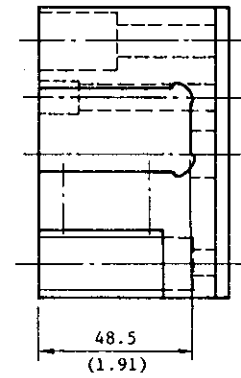
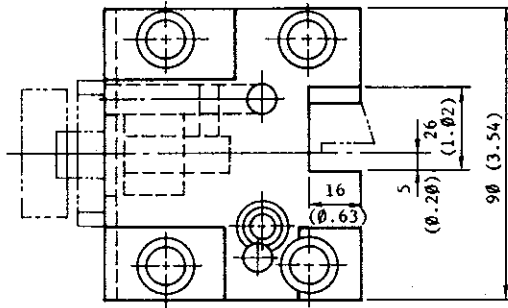
OD Toolholder Type IV



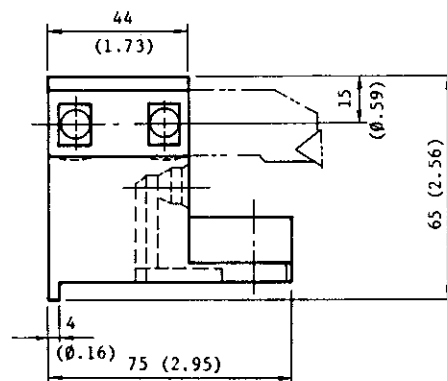
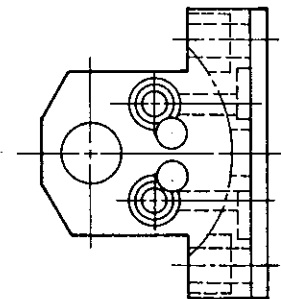
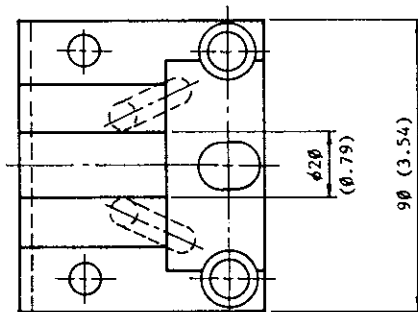
TECHNICAL INFORMATION

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OD Toolholder Type V

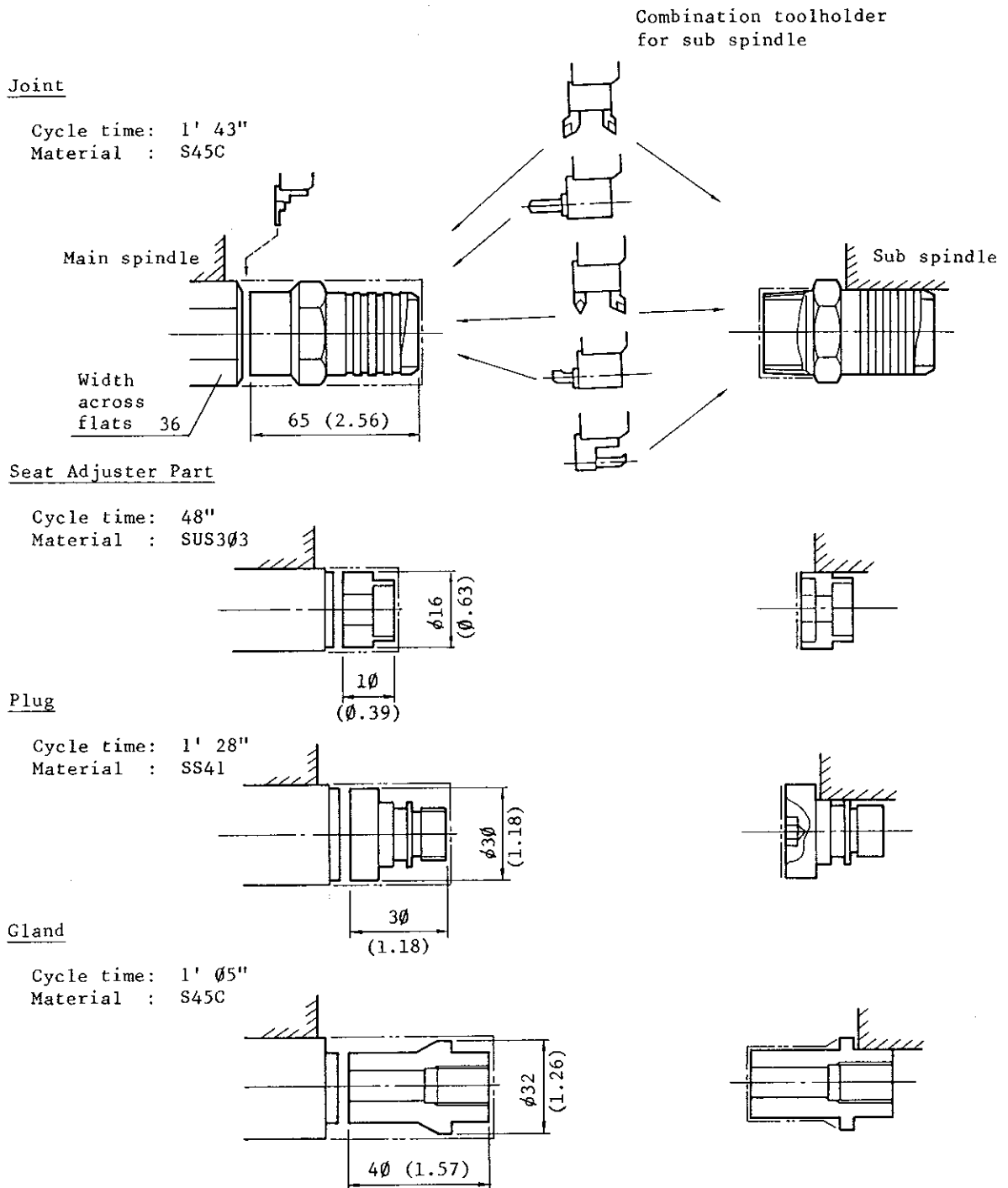


Back End Tooling ID Toolholder



(8) Bar Work Examples using Sub Spindle

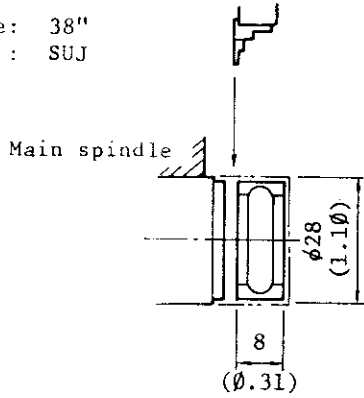
a) Hydraulic/pneumatic component part



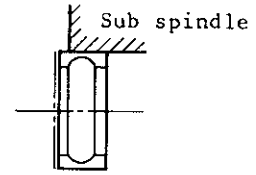
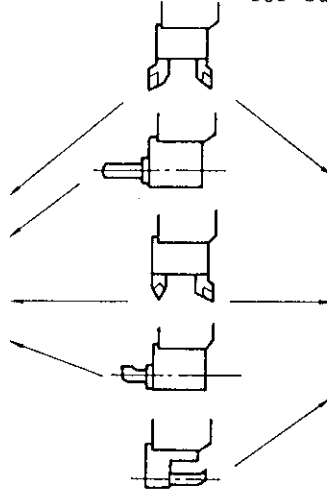
b) General machine component part

Bearing Outer Race

Cycle time: 38"
Material : SUJ

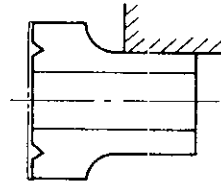
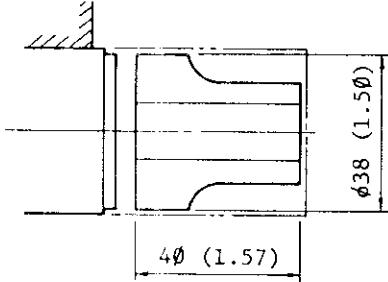


Combination toolholder
for sub spindle



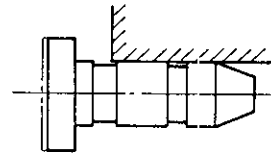
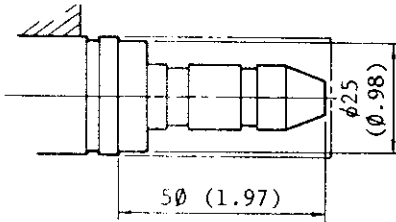
Valve Guide

Cycle time: 58"
Material : SCM21



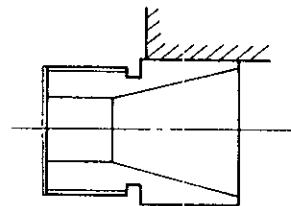
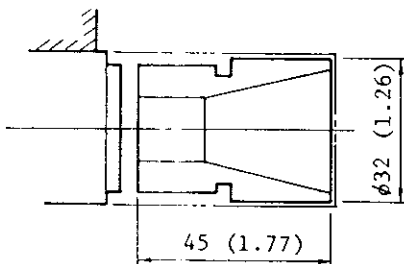
Guide Pin

Cycle time: 52"
Material : SCM415

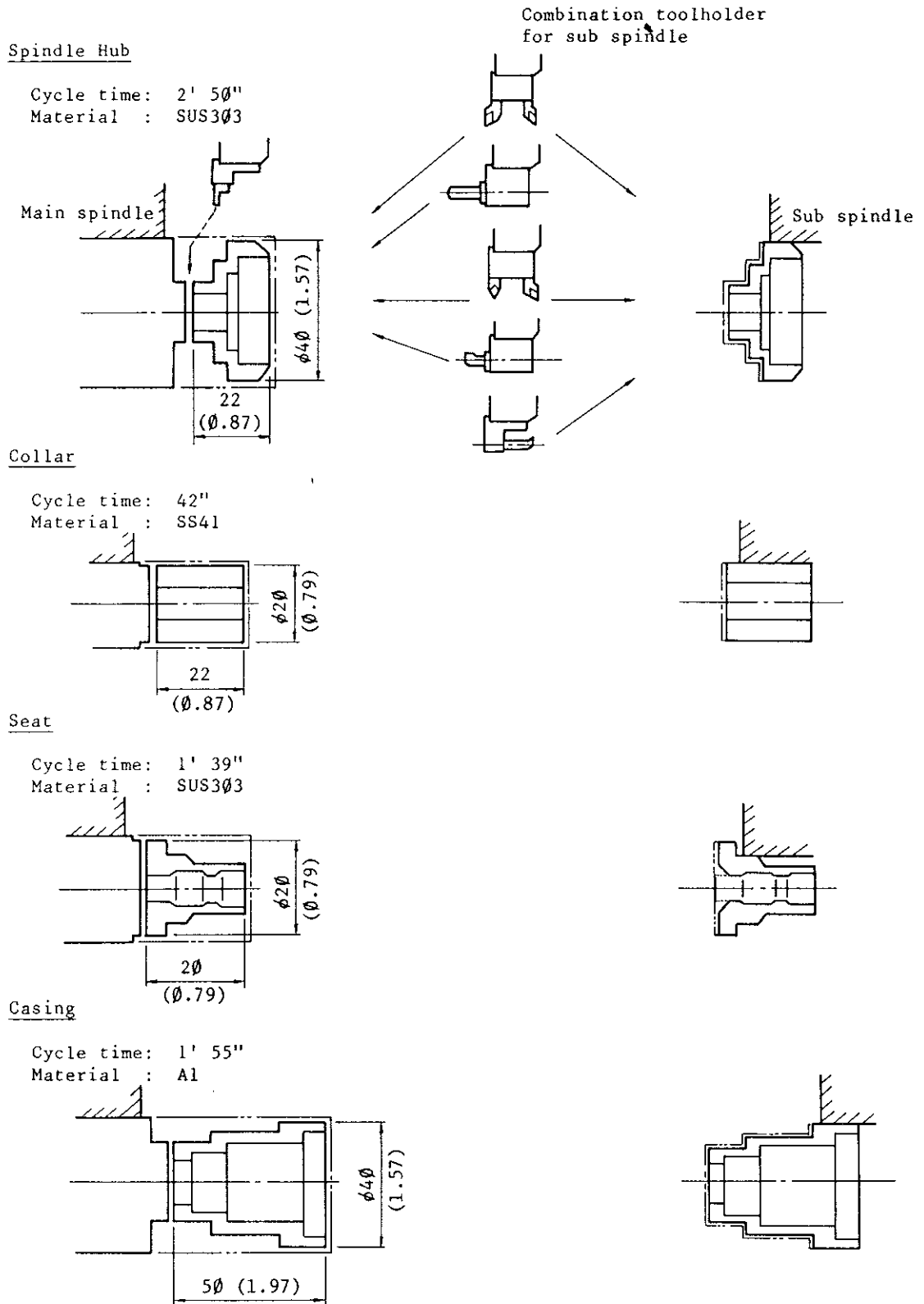


Socket

Cycle time: 1' 26"
Material : SKD



c) Home appliance component part



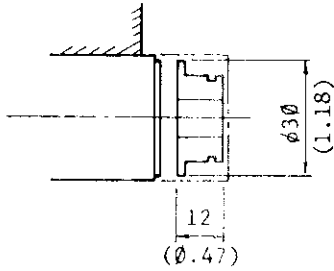
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10-6-17

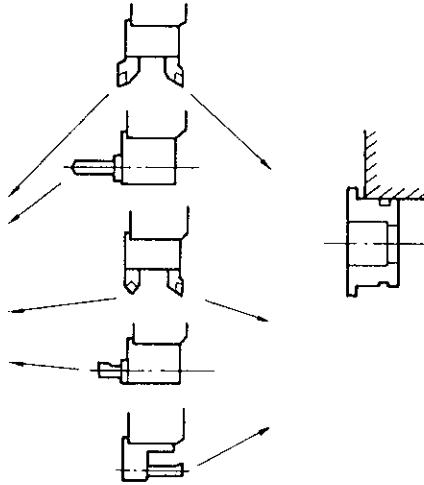
d) Automobile part

Orifice

Cycle time: 1' 05"
Material : Stainless

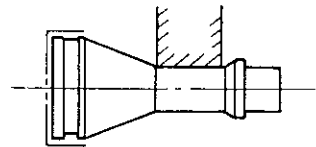
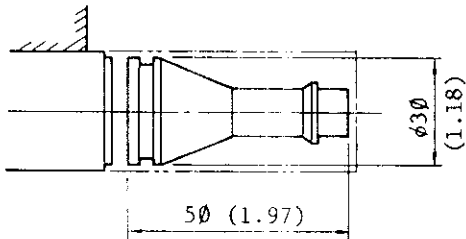


Combination toolholder
for sub spindle



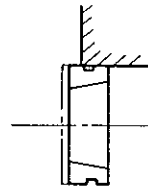
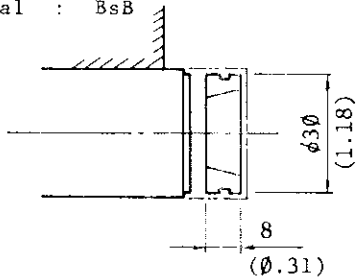
Shaft

Cycle time: 1' 30"
Material : SCM4



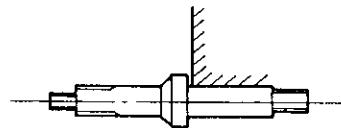
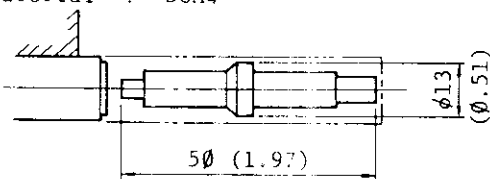
Bushing

Cycle time: 48"
Material : BsB



Bolt

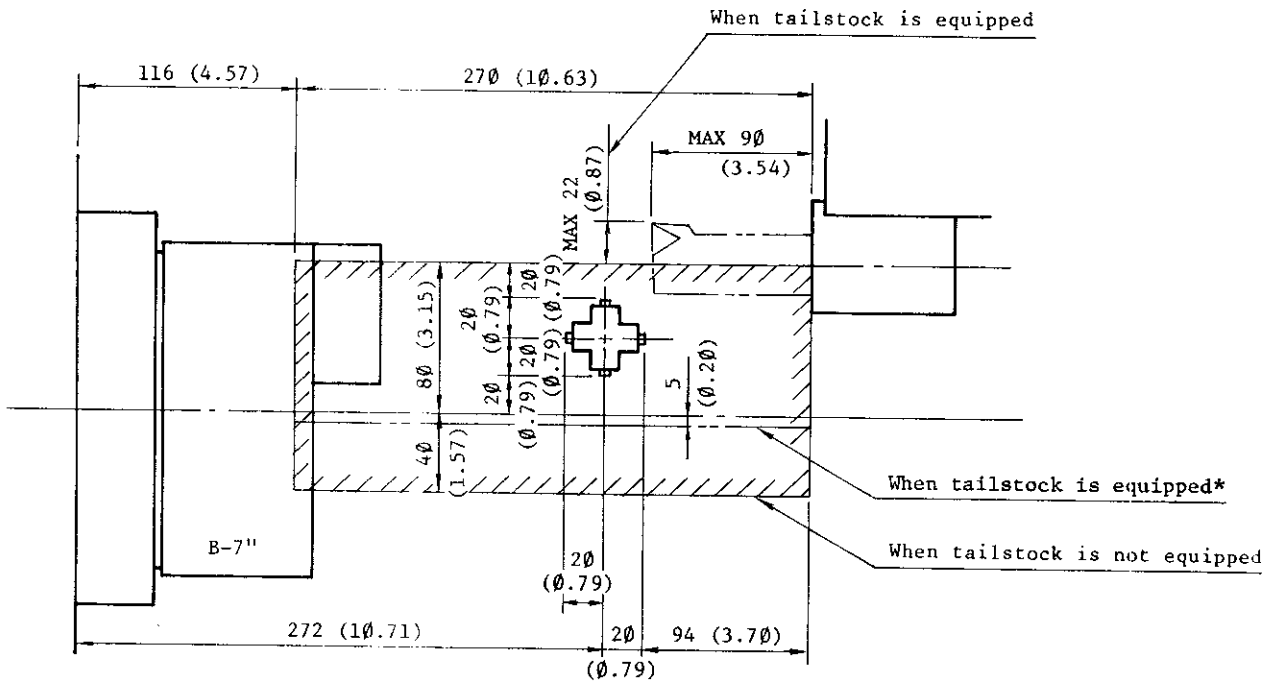
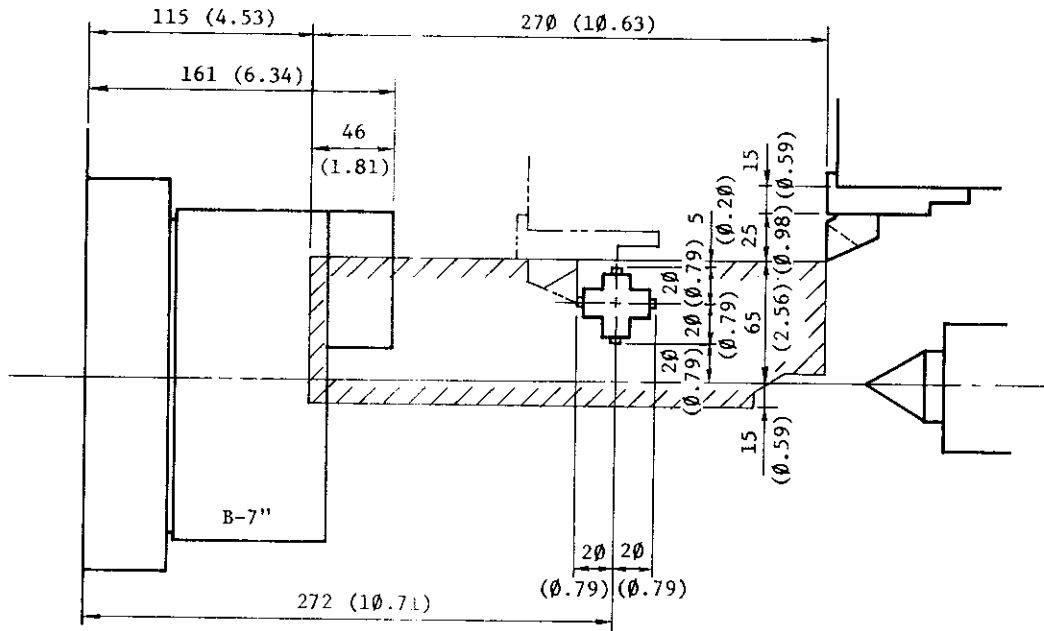
Cycle time: 53"
Material : SCM4



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(2) Longitudinal Interference Diagram



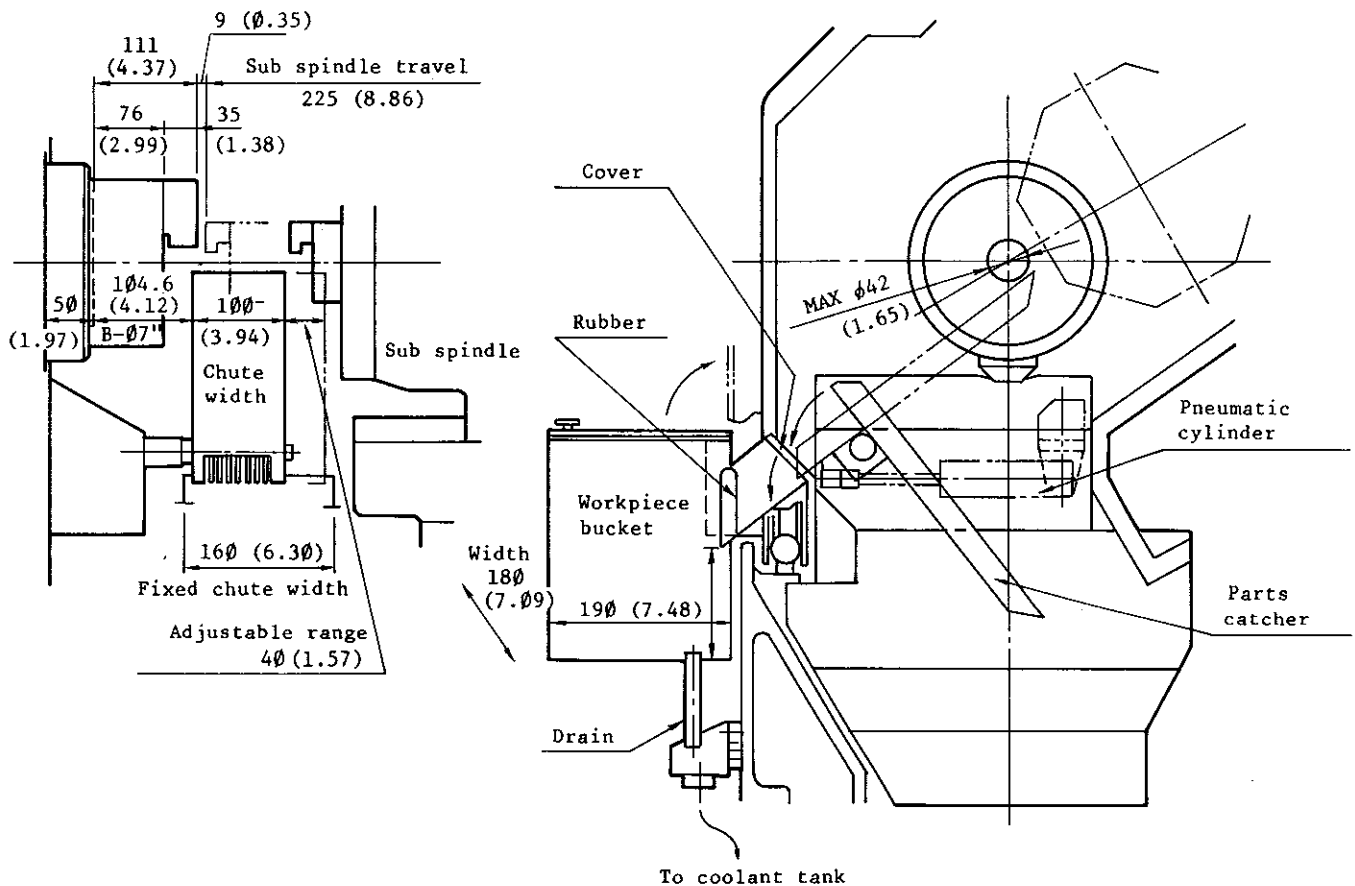
* Working range when the tailstock body is retracted to the retraction end, with the revolving center removed

10-8. PARTS CATCHER

The swing arm type parts catcher is used for automatic ejection of finished workpieces from the machine. Material is supplied by the bar feeder or other automatic material loading equipment. After machining is completed, the workpiece is cut off and received by the parts catcher, which carries it outside the machine.

Workpiece	Max. $\phi 42$ ($\phi 1.65$) x 8ϕ (3.15) (L) $\phi .9$ kg (1.98 lb)
Drive	Air cylinder (Air source: 4 kg/cm^2 (57 psi))
Command	
Parts catcher up	M77: parts receiving position
Parts catcher down	M76: standby position
Operation Time	Approx. 1 sec for parts catcher up or down

Configuration:



TECHNICAL INFORMATION

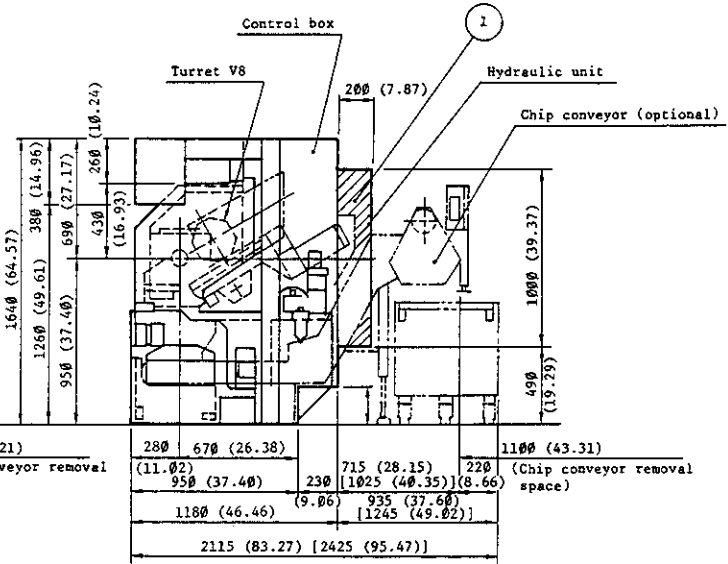
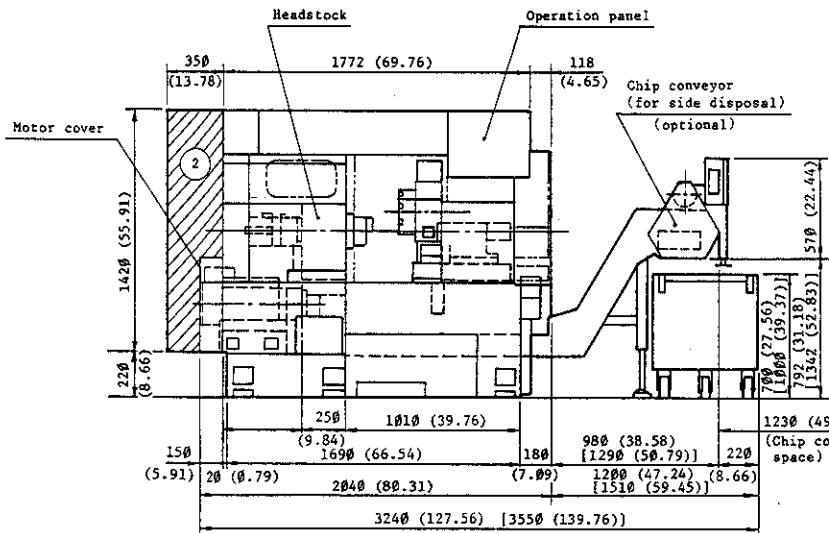
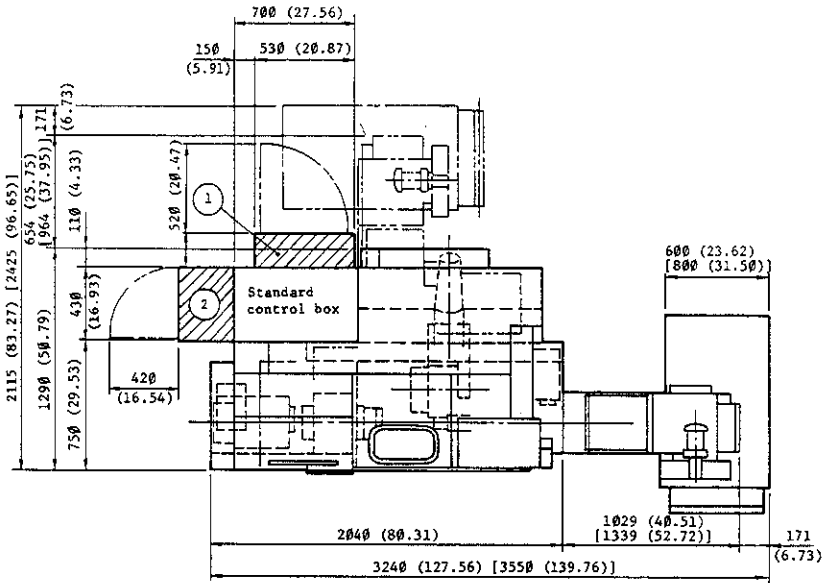
INFORMATION NO.
1416-LB9
10-9-1

10-9. MODIFICATION TO CONTROL BOX DUE TO ADDITION OF OPTIONAL FUNCTIONS

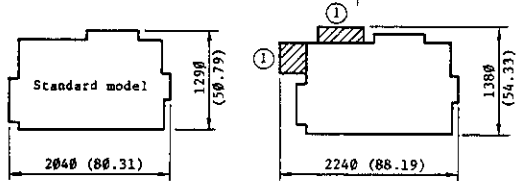
Because the standard control box of LB9 is designed to the minimum size to minimize floor space. Therefore, control boxes are added to the side and rear of the machine for the machine with optional specification.

The location to add the control box is illustrated below according to the optional specifications/functions to be added.

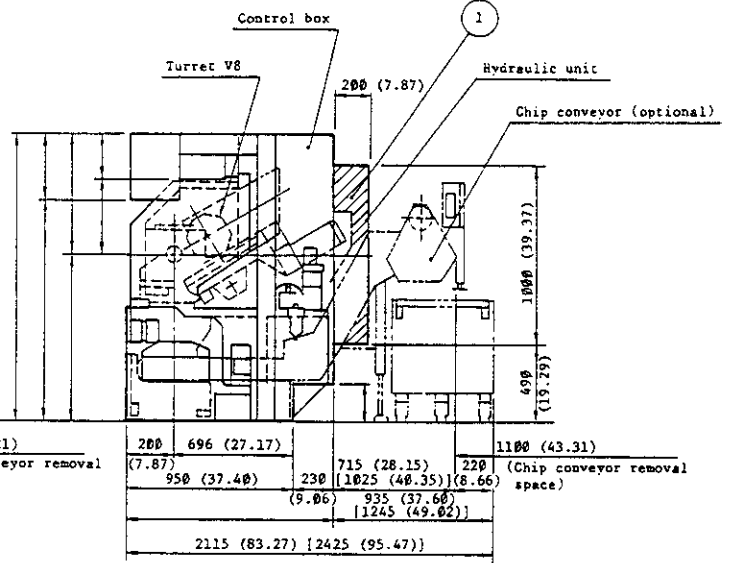
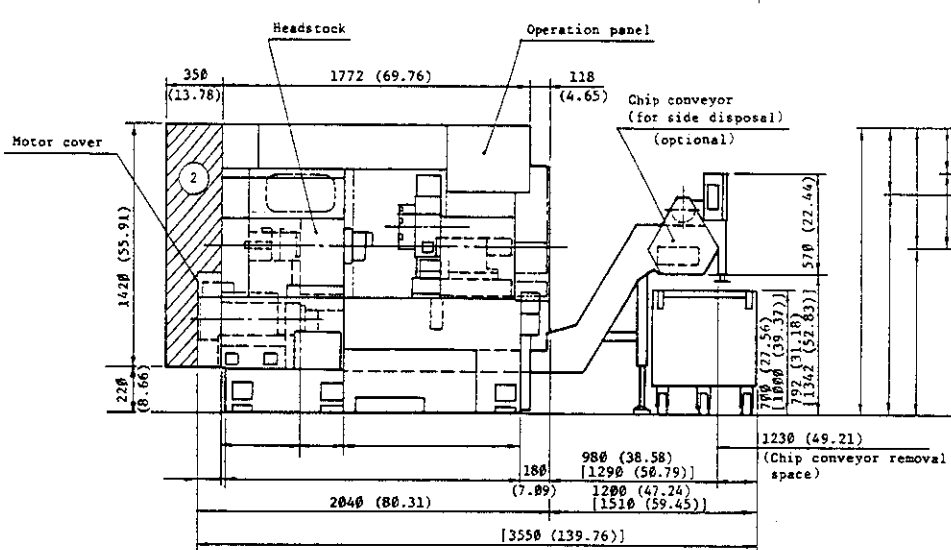
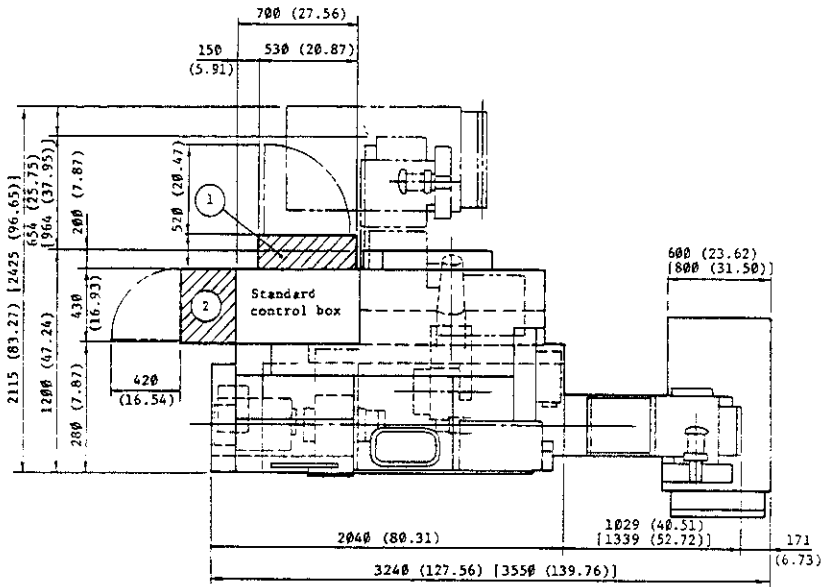
Major Specifications	Control Box Location
Simplified loader	(1)
Bar feeder	
Hommel kit	
Parts catcher	
Bar feeder + Parts catcher	
Simplified loader + Parts catcher	
Loader interface	
Spare M codes (2 sets)	
Automatic door open/close	
User task 2 (with I/O variables)	
Sub spindle	(2)
Robot	
OGL	
Sub spindle + Hommel kit	(1) + (2)
Sub spindle + Robot	Not determined



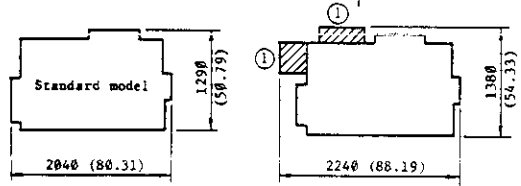
Floor Space Comparison



* Dimensions in () are for type H chip conveyor.



Floor Space Comparison

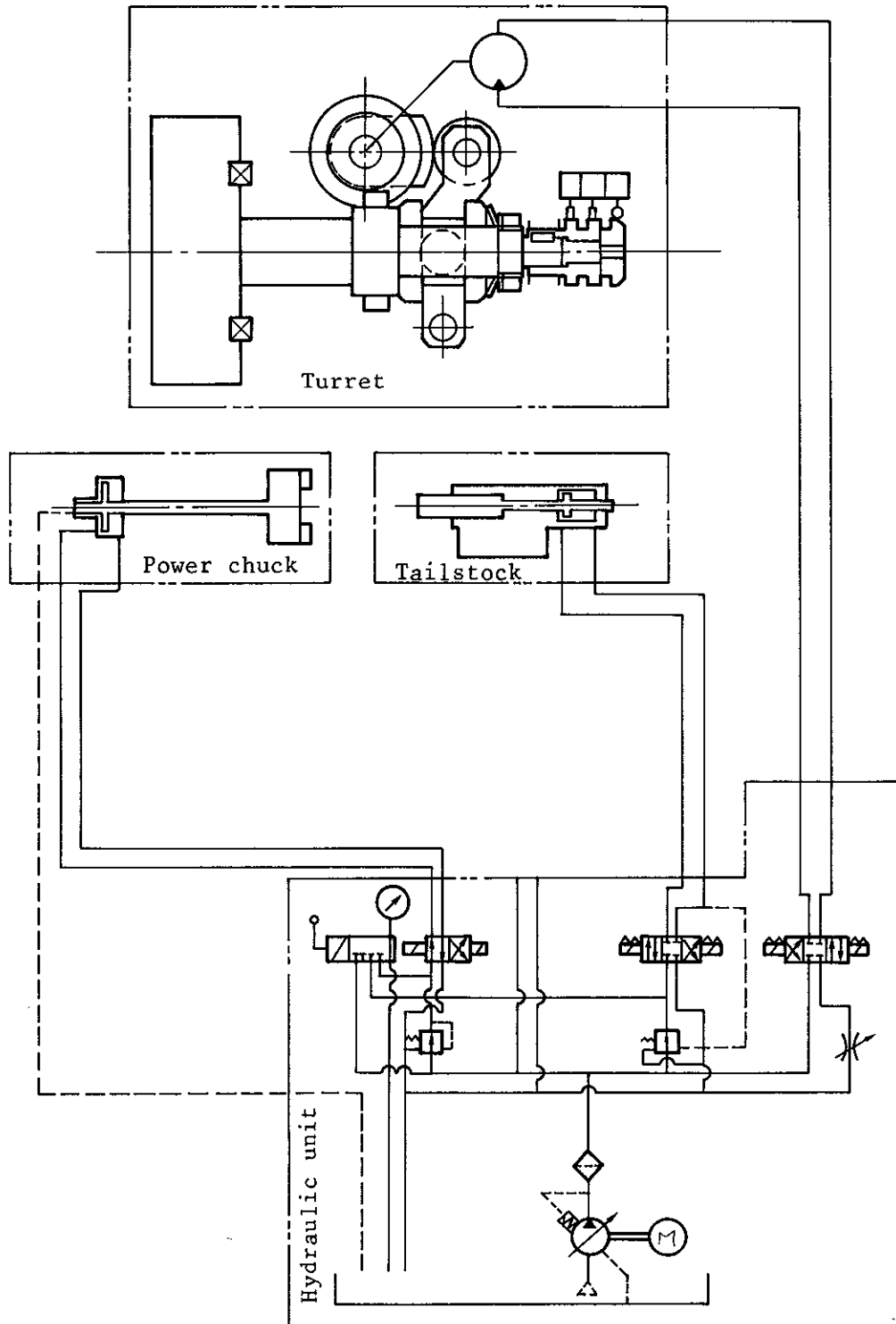


* Dimensions in () are for type H chip conveyor.

TECHNICAL INFORMATION

11. INSTALLATION DATA

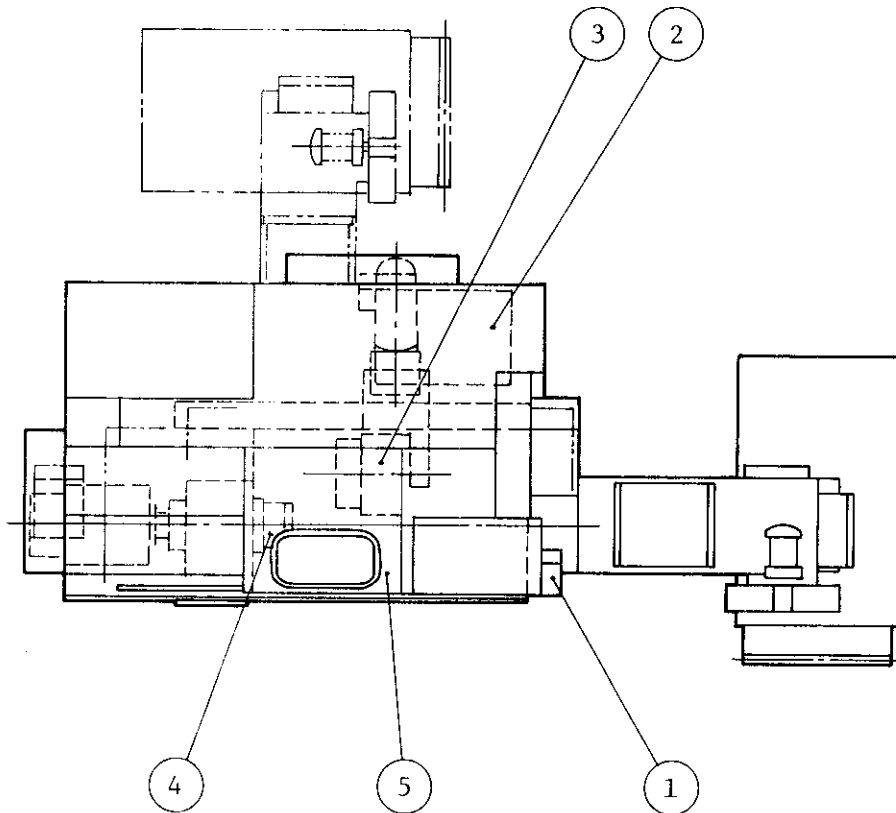
11-1. HYDRAULIC CIRCUIT DIAGRAM



TECHNICAL INFORMATION

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11-2

11-2. LUBRICATION CHART



No.	Oiling Points	Quantity	Oil Used (MAS)	Remarks
1	Slideway centralized lubrication	2 liter (\emptyset .5 gal)	Slideway lubrication oil G68	As needed
2	Hydraulic power unit	4 \emptyset liter (1 \emptyset .6 gal)	Hydraulic fluid HL32	In 1 month after initial installation Every 6 months after that
3	Turret	1.6 liter (\emptyset .42 gal)	Cam lubrication oil CC15 \emptyset	In half a month after initial installation Every 6 months after that
4	Chuck jaw	As needed	Grease XM2	Every day when cleaning
5	Coolant tank	6 \emptyset liter (15.9 gal)	Water-soluble coolant Hi-chip NP2212 (Taiyu)	As needed (6 months)