

SMART
MACHINE TOOL

NX7000

**Installation
Packet**

1. INSTALLATION

1.1 Foundation

WARNING



CUSTOMERS ARE RESPONSIBLE FOR FOUNDATION & GROUTING.

SUCCESSFUL FOUNDATION AND GROUTING WORKS ARE CRITICAL FOR MAINTAINING THE ORIGINAL MACHINE ACCURACY FOR A LONG PERIOD OF TIME.

DETAILS OF FOUNDATION & GROUTING ARE SPECIFIED ON THE NIIGATA FOUNDATION DRAWINGS SUBMITTED TO YOU IN ADVANCE.

IF YOU ARE NOT COMFORTABLE WITH THESE JOBS, CONSULT WITH YOUR LOCAL SPECIALIST OR CONTRACTOR.

FOUNDATION CONCRETE CURES IN A LONG TIME AND FOUNDATION LEVEL CHANGES GRADUALLY.

CHECK MACHINE LEVEL PERIODICALLY AND RELEVEL, IF NECESSARY.

1.2 Ambient Conditions

If you have a freedom of choice for the installation location, please avoid following locations which are unfavorable to make the most of the M/C:

- (1) Locations with excessive temperature variation such as direct sun shines, near furnaces / heat exchangers and air blow outlet.

Preferable ambient conditions are as follows.

- Ambient temperature: 5°C ~ 40°C
(Average temperature in 24 hours: 35°C or less)
- Humidity: 50% or less (40°C), 90% or less (20°C)

Note: Refer to JIS B6015 for more detailed information. Please keep in mind that severe ambient conditions affect M/C accuracy and life time.

- (2) Dusty area affected by cutting chips, dirty oil or coolant from other machines. M/C slide ways and electrical components are susceptible or damaged and/or their lives shortened.

- (3) Soft soil

If bearing capacity of the soil is not enough, drive bearing piles to establish bearing capacity of 68.6kN/m² or more. Refer to the "FOUNDATION DRAWING" submitted or filed in the INSTRUCTION MANUAL.

- (4) Near vibration source (another M/C or units)

In case you cannot avoid vibration from other sources, apply anti-vibration foundation and /or separation grooving around the M/C foundation to shut out vibration to the M/C.

- (5) Other cautions

- 1) Secure enough room for operator setup jobs around the APC and ATC magazine.
- 2) Secure door opening space for the main control panel, oil supply and maintenance space for the lubrication unit, pneumatic unit, spindle cooler and hydraulic unit.
- 3) Secure approx. 500 mm area from the air inlet of the spindle cooler for free airflow.
- 4) Secure enough space to move out the coolant tank or chip bucket for maintenance and cleaning.

1.3 Ground Fault Circuit Breaker

IN CASE YOU INSTALL A GROUND FAULT CIRCUIT BREAKER ON YOUR POWER SUPPLY LINES TO THE M/C, PLEASE SELECT ONE WITH FUNCTIONING CAPACITY 200 mA OR MORE.

1.3.1 Leakage Current of Machining Centers

HIGH FREQUENCY LEAKAGE CURRENT is flowing from the motor windings, power cables or amplifiers for spindle and axis drive motors because of PWM inverter control on Niigata machining centers, even though power source current is not leaked, If capacity of the leakage breaker is low, it may trip with high frequency leakage current regardless no actual leakage.

Niigata's M/Cs are equipped with 200mA capacity breaker.

If you are going to install a leakage breaker on the power supply lines to the M/C, please select one with 200mA or more ratings.

1.3.2 Importance of the Grounding job

Proper grounding connection is critical for safety of operators, maintenance engineers and those who might physically touch the M/C.

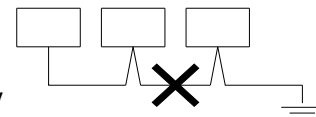
If improper grounding connection between the M/C and earth is provided, the ground fault circuit breaker does not trip even though actual leakage current is output. Also high frequency leakage current will not be carried away to the ground.

If an operator or other people touch the M/C with improper grounding, it can leak through human body. It is quite dangerous.

Grounding work is the customer's responsibility at the time of M/C installation.

1.4 Preparations for M/C Installation and Safety

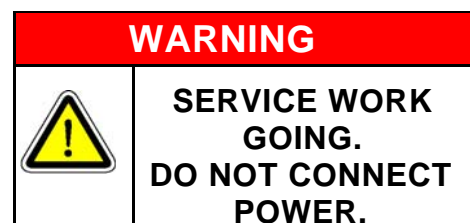
Please refer to the foundation drawings, submitted in advance, to arrange and provide primary electric power and pneumatic sources at timely manner.



- (1) To avoid electric shock, connect grounding wires individually to each grounding terminal in the control cabinet and the grounding rod.
- (2) Power source connection must be executed by authorized personnel. In power wire connection, electric power from your factory side must be shut OFF.

NEVER CONNECT POWER UNTIL WIRE CONNECTIONS COMPLETION AND SECURING HUMAN BODY SAFETY.

- (3) Stand warning board(s) to notify electric wire connections or grounding works in progress to other people.
- (4) If you plan to move / reinstall the M/C, contact Niigata for proper procedures to avoid accidents.
- (5) In crane and / or forklift operations and other hoisting, working must be executed by authorized personnel.
- (6) Check wire ropes, shackles, and lifting apparatuses before using whether their capacities are suitable for M/C mass.
- (7) In M/C lifting, check no other operator or people around the M/C.



1.5.3 Parts to be Dismantled in Machine Lifting

- Spindle cooling unit ⑪ (remove the piping.)
- Hydraulic unit ⑫
- ATC magazine cover ⑬
- Two (2) round top covers of splash guard ⑧

1.5.4 Fixing of Movable Parts

- (1) In transportation, prepare wooden supports or fixtures to securely fix the saddle ③, table ④ and spindle head ⑤.

(Because linear motion bearings are adopted on each axis, frictional resistance is minimal and external forces influence stability of fixed axis units.)

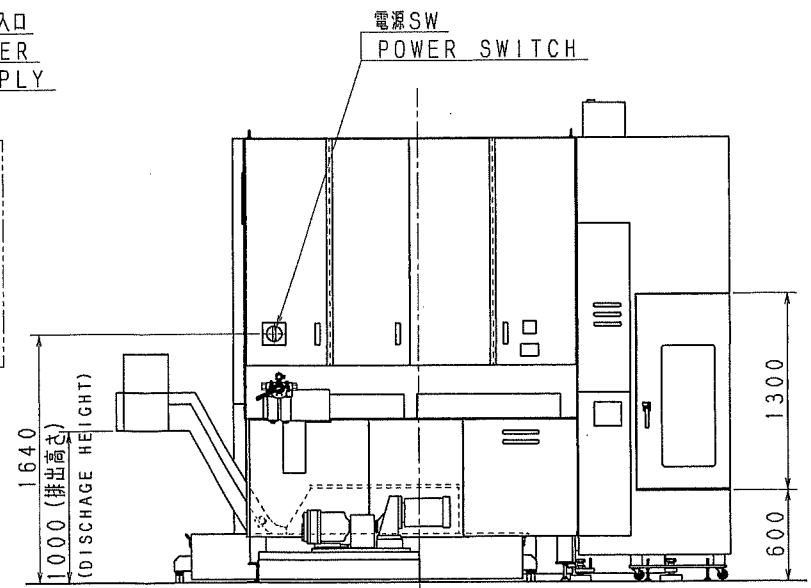
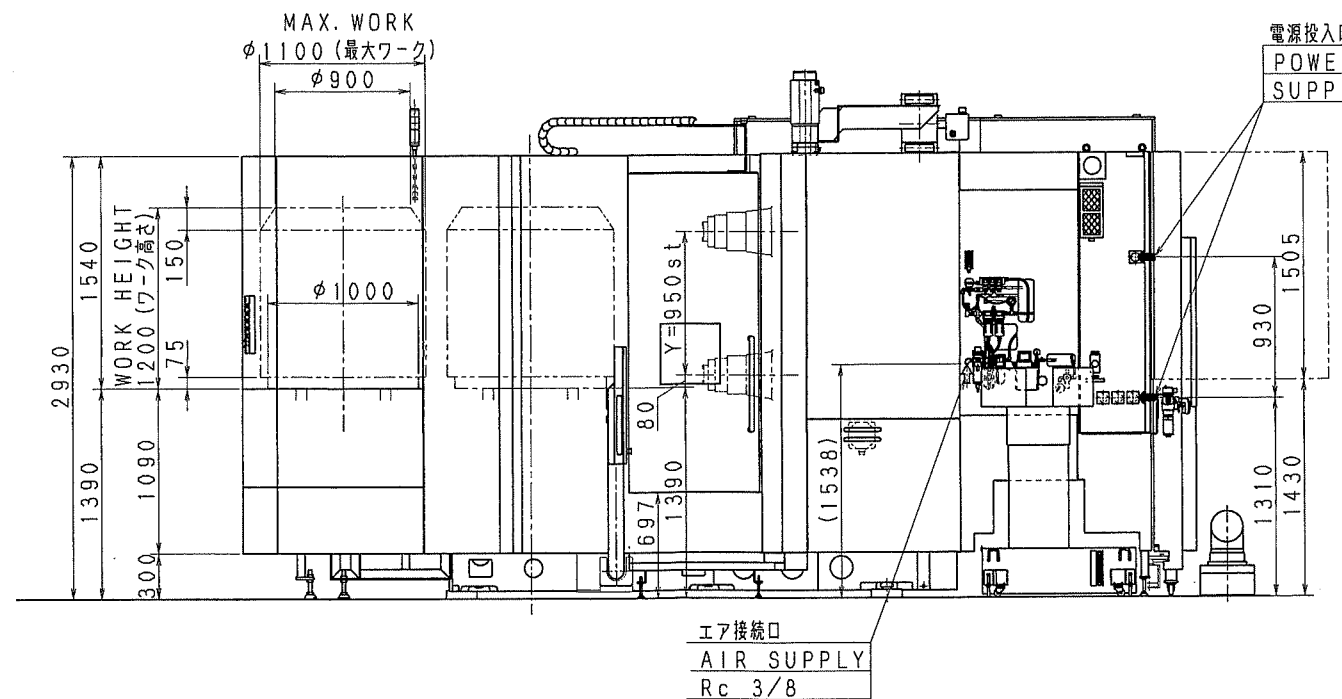
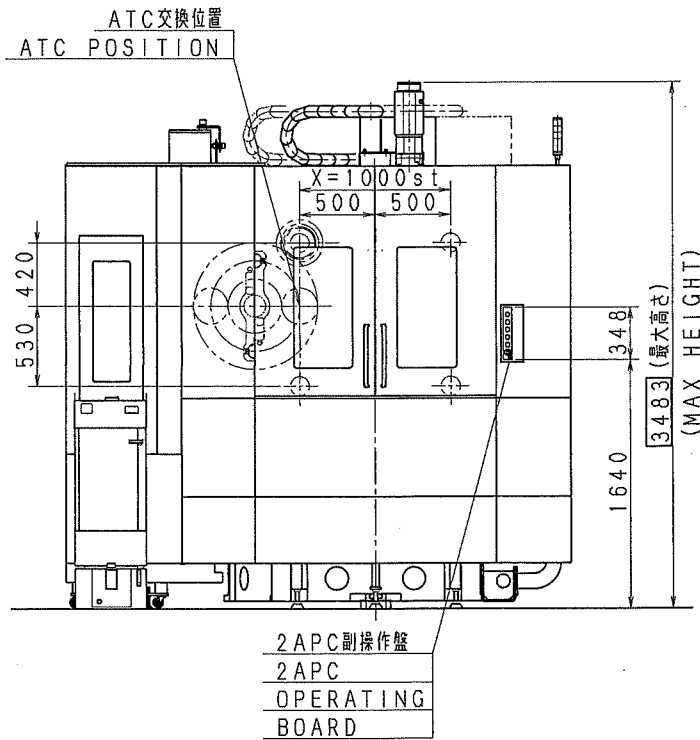
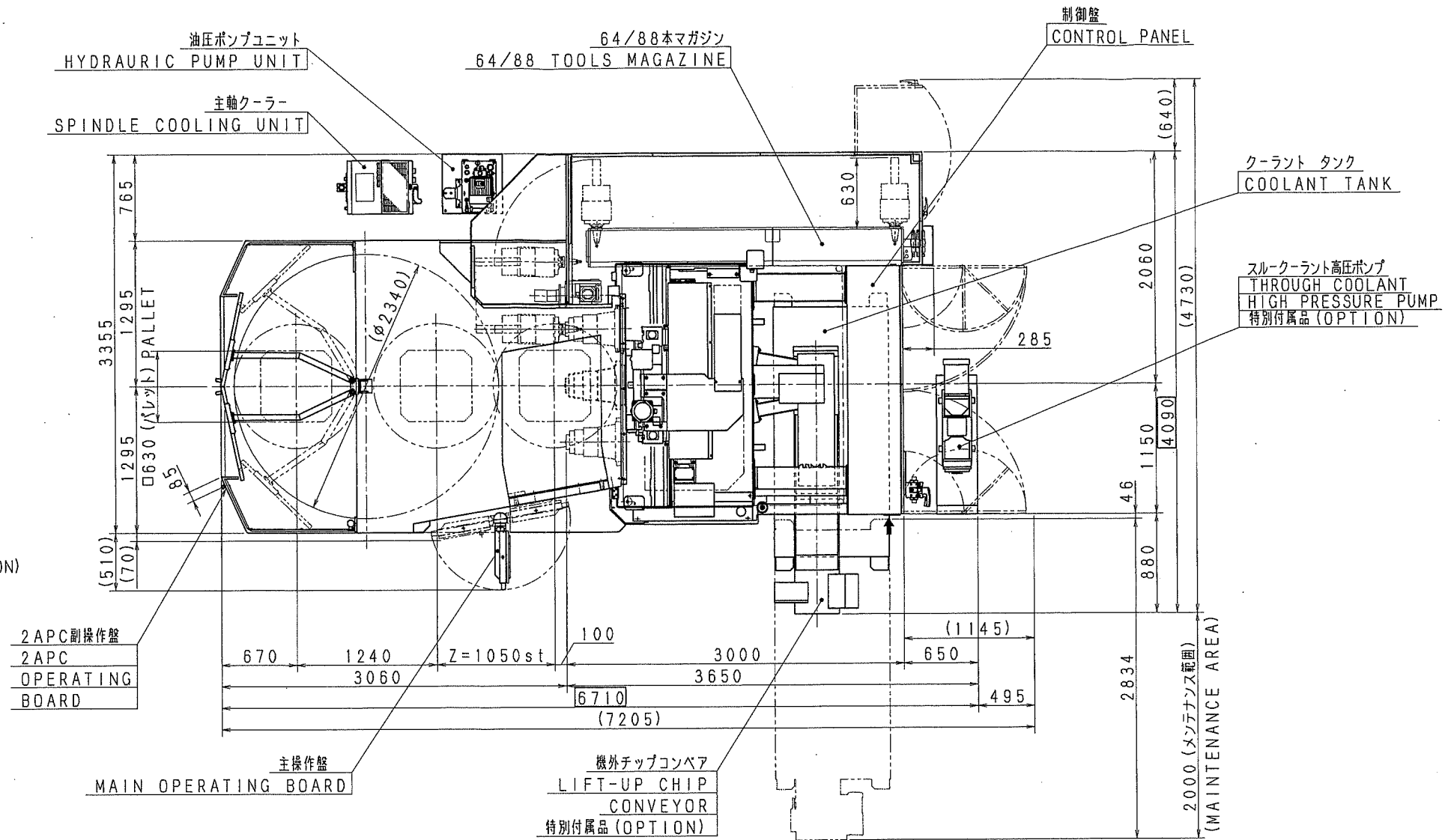
- (2) Fix the ATC swing arm with ropes or the like.
- (3) Fix the saddle ③ at the center in the lateral direction, table ④ in the column direction, and spindle head ⑤ in the downward direction.

1.5.5 Lifting Condition

- The ATC magazine ⑥, control panel ⑩, and splash guard ⑧ can be lifted as assembled with the machine body.

<仕様>
 パレット上最大積載質量: 1200kg
 ツールマガジン: チェーン式
 工具収納本数: 64/88本
 工具最大長さ: 630mm
 工具最大質量: 30kg
 パレットチェンジャ: ダイレクト回転式
 パレット枚数: 2枚
 機外チップコンベア (特別付属品): ヒンジパン (横出し H=1000)
 スルークーラント高圧ポンプ (特別付属品)
 機械質量: 23600kg

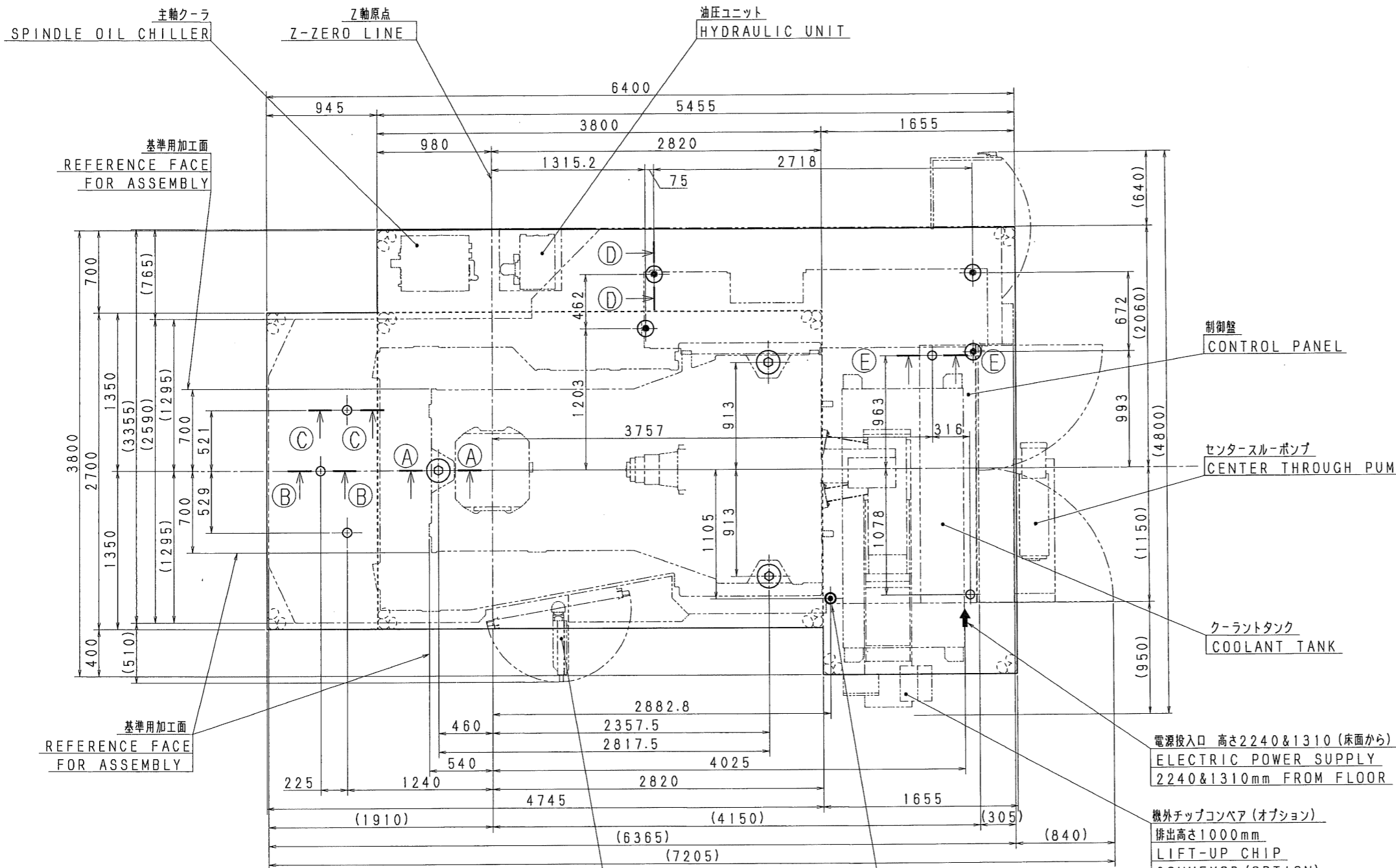
<SPECIFICATION>
 PALLET LOADING CAPACITY : 1200 kg
 TOOL MAGAZINE : CHAIN TYPE
 TOOL STRAGE CAPACITY : 64 / 88 TOOLS
 MAX. TOOL LENGTH : 630 mm
 MAX. TOOL MASS : 30 kg
 PALLET CHANGER : DIRECT ROTARY TYPE
 NUMBER OF PALLET : 2
 LIFT-UP CHIP CONVEYOR (OPTION) : HINGE-PAN (SIDE H=1000)
 THROUGH COOLANT HIGH PRESSURE PUMP (OPTION)
 MACHINE MASS : 23600 kg



詳細設計により寸法が変更になる場合があります。
 The size might be changed by a detailed design.

(参) 4116A07450	No.	変更内容 REVISION	指示票No. SHEET No.	承認 APPD.	照査 REV.	担当 CHD.	日付 DATE
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材質 MATERIAL	質量 MASS (kg)	熱処理 HEAT TREATMENT	硬度 HARDNESS	尺度 SCALE	MACHINE	UNIT
				1:25	NX7000	
承認 APPD.	照査 REV.	担当 CHD.	製図 DWG.	日付 DATE	図名 TITLE	
阿部 芳司	伊庭 伊庭	伊庭 伊庭	伊庭 伊庭	19/12/09	スガタズ (P2-T64/88)	
					GENERAL VIEW (P2-T64/88)	
					図番 DWG. No.	
					4 1.56.A0.0 1.20. 1/1	



- 記事
- 下記工事を貴社で行って下さい。
 - 基礎工事
 - 電源から制御盤までの配線及びつなぎ込み
 - 空圧源から機械本体までの配管及びつなぎ込み
 - コンクリート容量: 約12.9m³
 - 地耐力が49kN/m²以下の場合には杭打ちを行って下さい。
 - 機械質量: 23600 kg
 - 主軸冷却装置が直射日光や熱気を受けない様にして下さい。
(主軸冷却装置のみを自由に動かすことは出来ませんのでご注意ください。)
 - 本図は基礎及びレベリング部寸法を示すのを目的として弊社標準仕様で描いており、貴社仕様は盛り込んでいない場合があります。貴社仕様を加味した寸法につきましては別途提出の平面図もしくは姿図を御参照下さい。

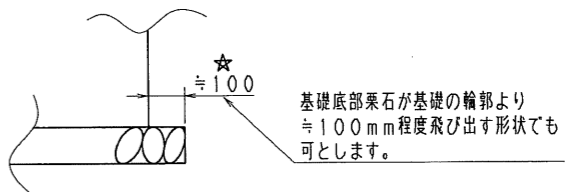
仕様

- 機械高さ: 3483mm
- ツールマガジン: チェーン式 64/88本
- パレットチェンジャー: リフト&ターン式2APC

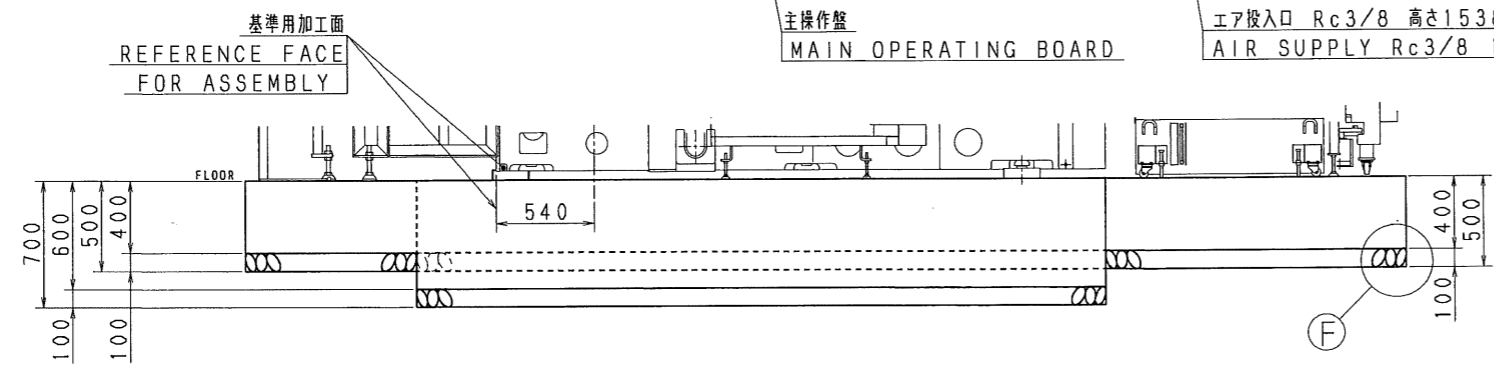
- Notes
- The following works should be provided by the customer.
 - Foundation works.
 - Electrical wiring and connection from the customer's power supply to the machine or the transformer.
 - Air piping and connection from the customer's source to the machine.
 - Volume of concrete is approximately 12.9 m³.
 - Bearing piles should be driven into soils if ground bearing capacity is 49 kN/m² or less.
 - Mass of machine is approximately 23600 kg.
 - Direct sunshine and heating up locations must be avoided for the machine and especially spindle cooling unit.
 - The purpose in this drawing is to show dimensions of foundation and leveling parts. This drawing is in standard specification and includes a few options, but might not include the customer's specification (s) nor option (s).

Specification

- Machine height: 3483 mm
- Tool magazine: Chain type 64/88 tools
- Pallet changer: Lift & turn type 2APC



★ Mark)
DETAIL F



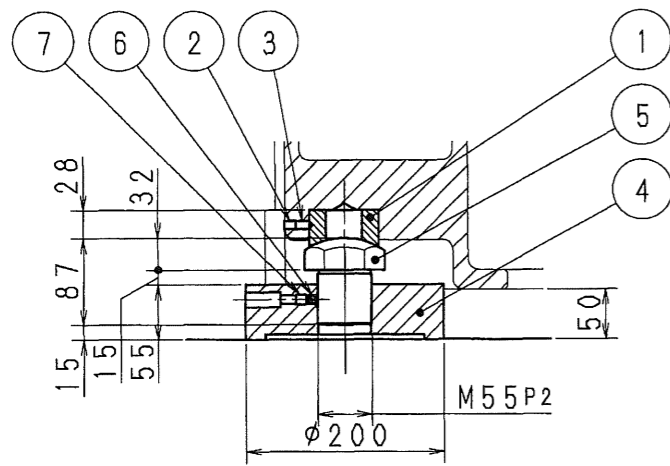
詳細設計により寸法が変更になる場合があります。
The size might be changed by a detailed design.

材質 MATERIAL	質量 MASS (kg)	MACHINE	UNIT
熱処理 HEAT TREATMENT	硬度 HARDNESS	NX7000	
承認 APPD. 照査 REV.	担当 CHD. 製図 DWG.	尺度 SCALE	図名 TITLE
伊藤 晋一	伊藤 伊庭	1:20	スエツケズ (P2-T64/88)
		日付 DATE	FOUNDATION DWG. (P2-T64/88)
		19/11/05	番 号 DWG. No.
(株) ニイガタマシンテクノ NIIGATA MACHINE TECHNO CO., LTD.			4 1.5 6. A 0.0 1.9 0. 1/2

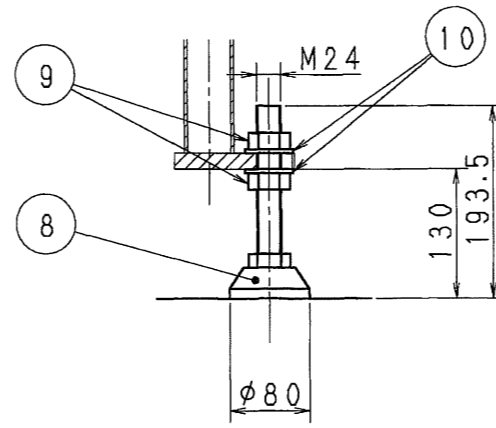
機外チップコンベヤ横出し、ヒンジパン排出高さ1000mm

(参) 4116A07460

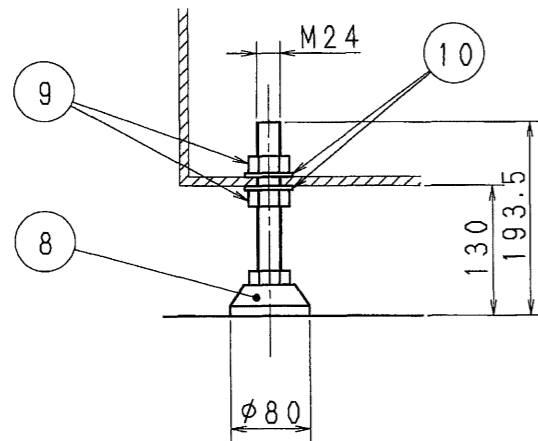
No.	変更内容 REVISION	指示票No. SHEET No.	承認 APPD.	照査 REV.	担当 CHD.	日付 DATE



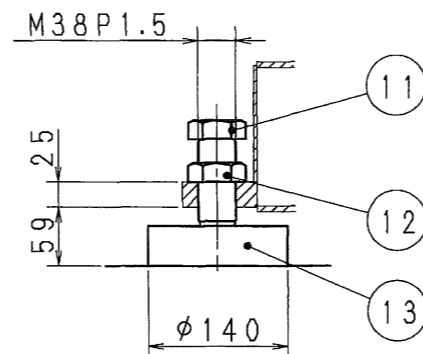
①-① 断面 3ヶ所
SECTION ①-① 3pts



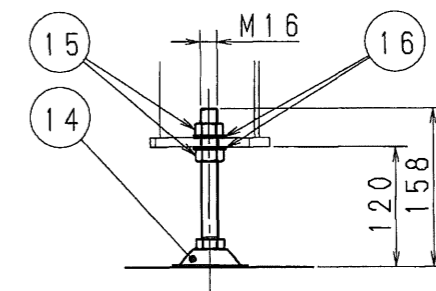
②-② 断面 1ヶ所
SECTION ②-② 1pts



③-③ 断面 2ヶ所
SECTION ③-③ 2pts



④-④ 断面 4ヶ所 (T64/88ATC)
SECTION ④-④ 4pts



⑤-⑤ 断面 2ヶ所
SECTION ⑤-⑤ 2pts

据付用部品 (Installation parts)

No.	部品名 (Part name)	個数 (Q'ty)			部品コード (Code No.)
		本機用 for M/C	ATC機用 for ATC	APC機用 for APC	
1	カラ (Collar) $\phi 70 \times 35$	3			4650670325A
2	トメネジヒラ (Hex. socket set screw with flat point) M8 \times 12	3			51208012
3	トメネジヒラ (Hex. socket set screw with cone point) M8 \times 16	3			51268016
4	レベルングシート (Leveling sheet) $\phi 200 \times 55$	3			4676A00880
5	レベルングボルト (Leveling bolt) M55P2 \times 55	3			4650670117
6	シュー M10ヨウ (Shoe for M10) ($\phi 8 \times 10$)	3			4650672321
7	トメネジヒラ (Hex. socket set screw with flat point) M10 \times 12	3			51210012
8	レベルアジャスタ (Level adjuster) KC-275-B-12		3		4985010139
9	ナット (Hex. nut) M24		6		52130240
10	ワッシャ (Plain washer) M24		6		57022240
11	レベルングボルト (Leveling bolt) S38		4		4046414217
12	レベルングナット (Leveling nut) S38		4		4046414531
13	レベルングシート (Leveling sheet) 38		4		4046415112A
14	レベルアジャスタ (Level adjuster) KC-275-A-2	2			4985010529
15	ナット (Hex. nut) M16	4			52130850
16	ワッシャ (Plain washer) M16	4			57022160

材質 MATERIAL	質量 MASS (kg)	図章	MACHINE NX7000	UNIT
熱処理 HEAT TREATMENT	硬度 HARDNESS	尺度 SCALE 1:5	図名 TITLE	
承認 APPD.	照査 REV.	担当 CHD.	製図 DWG.	日付 DATE
阿部	吉岡	伊庭	伊庭	19/11/05
(参) 4116A07460			スエツケズ (P2-T64/88)	
No. 変更内容 REVISION			FOUNDATION DWG. (P2-T64/88)	
指示用 SHEET No.			図番 DWG. No.	
承認 APPD. 照査 REV. 担当 CHD. 日付 DATE			(株) ニイガタマシンテクノ NIIGATA MACHINE TECHNO CO., LTD.	
			4 1.5 6. A 0.0 1.9 0. 2/2	

Niigata Horizontal Machining Center NX7000

1. Machine specifications		Standard	Options	A	E	Q
1.6 Automatic pallet changer						
1) Direct rotary type(Front center)		<input checked="" type="checkbox"/> 2APC (Manual Idle pallet rotation)	<input type="checkbox"/> 6APM <input type="checkbox"/> 8APM <input type="checkbox"/> 10APM <input type="checkbox"/> 12APM <input type="checkbox"/> Load/unload station Manual indexing, R-2 pos. <input type="checkbox"/> 2APC for FMS			
1.7 Controlled axes	XYZaxis Baxis	<input type="checkbox"/> Pulse coder <input type="checkbox"/> Pulse coder	<input checked="" type="checkbox"/> Scale feedback <input checked="" type="checkbox"/> Scale feedback			
1.8 Motors						
1) Spindle drive motor		<input checked="" type="checkbox"/> AC30kW /25kW (12000rpm) (30 min) / (continuous rating)				
2) Feed motors	X / Z axis	<input checked="" type="checkbox"/> AC7.0kW (α iF30/4000)				
	Y axis	<input checked="" type="checkbox"/> AC9.0kW (α iF40/3000FAN)				
	B axis	<input type="checkbox"/> AC1.8kW (1°) (β iS12/3000)	<input checked="" type="checkbox"/> AC4.0kW (NC table) (α iF22/3000)			
3) Hydraulic pump motor		<input checked="" type="checkbox"/> AC2.2kW				
4) ATC	Tool changer drive	<input checked="" type="checkbox"/> AC1.8kW (β iS12/3000)				
	Magazine drive	<input type="checkbox"/> AC3.0kW (60chain type) (β iS22/3000)	<input checked="" type="checkbox"/> AC2.5kW (64chain type) (β iS22/2000) <input type="checkbox"/> AC2.5kW(88chain type) (β iS22/2000) <input type="checkbox"/> AC3.0kW (126chain type) (β iS30/2000)			
5) Internal chip conveyor drive motor		<input checked="" type="checkbox"/> AC0.2kW×2				
※ On other motor, refer Item 3 (special machine accessories).						
1.9 Power sources						
1) Electrical power supply	±10%	<input type="checkbox"/> AC 200V <input type="checkbox"/> 50Hz / <input checked="" type="checkbox"/> 60Hz	<input type="checkbox"/> 380V <input checked="" type="checkbox"/> 220V			
2) Frequency		<input checked="" type="checkbox"/> 67 kVA	<input type="checkbox"/>			
3) Power supply required(Apparent Power)						
・Wire for power supply 80mm ² ×3 wires ・Ground(earth) wire 38mm ² or more×1 wire ※ Wiring from customer's power supply to control cabinet/transformer of the machine is required to be prepared by customer.						
4) Compressed air supply		<input checked="" type="checkbox"/> 0.5MPa or more				
・Required air volume 500L/min (at atmospheric pressure) shall be supplied consecutively.						
1.10 Tank capacity						
1) Hydraulic oil tank capacity		<input checked="" type="checkbox"/> 20 liters				
2) Lubricant tank capacity for spindle bearing		<input checked="" type="checkbox"/> 1.8 liters				
3) Spindle cooler tank capacity		<input checked="" type="checkbox"/> 50 liters				
4) Coolant tank capacity		<input type="checkbox"/> 450 liters (In case of External chip conveyor w/ Discharge direction; Back)	<input checked="" type="checkbox"/> 540 liters (In case of External chip conveyor w/ Discharge direction; Side)			

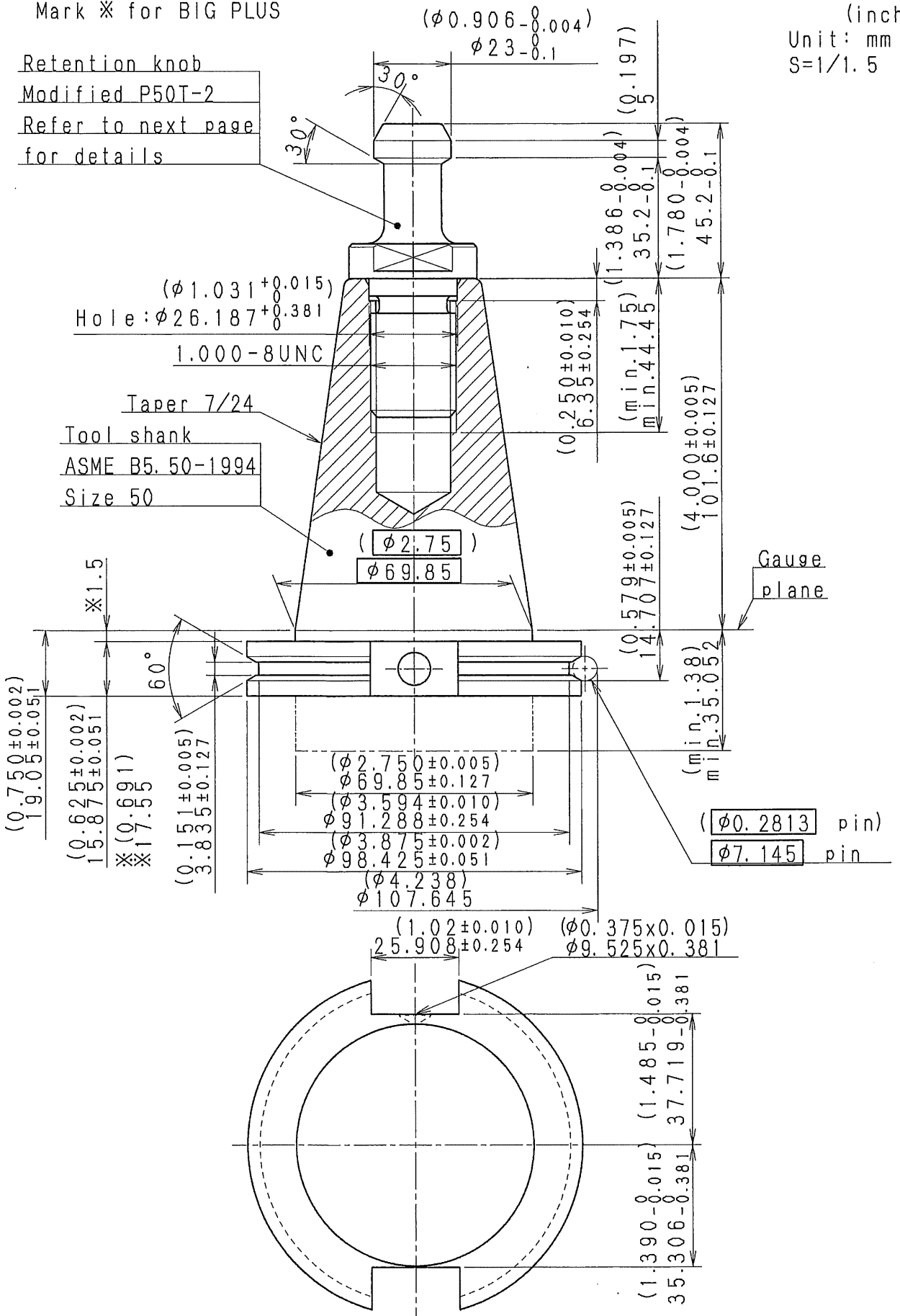
TOOL SHANK AND RETENTION KNOB

(CAT50·P50T-2) (1/2)
(BIG PLUS)

Mark ※ for BIG PLUS

(inch)
Unit: mm
S=1/1.5

Retention knob
Modified P50T-2
Refer to next page
for details



作成: 伊庭
照査: 吉田
承認: 阿部
2019/11/14
4665S41516 (1/2)

TOOL SHANK AND RETENTION KNOB

(CAT50·P50T-2) (2/2)
(BIG PLUS)

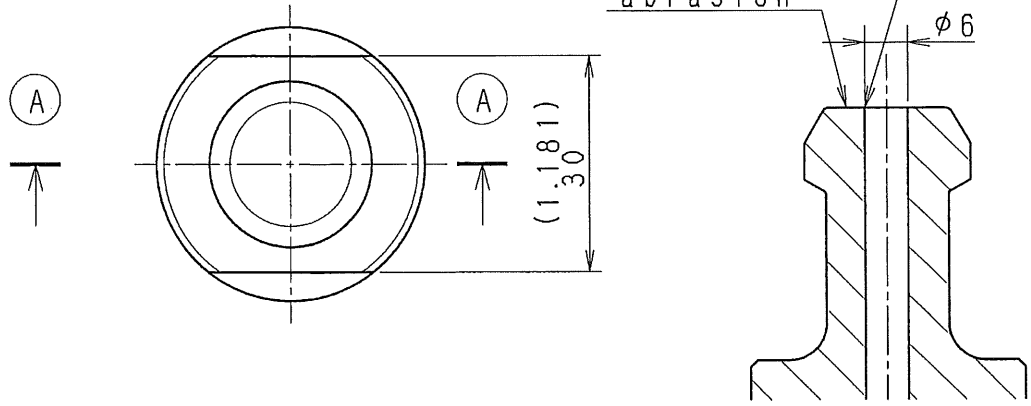
Retention knob : Modified P50T-2 (P50T-2 is based on JMTBA's
Technical sheet 21-1988 (same as abolished MAS 403))

(inch)

Unit: mm
S=1/1

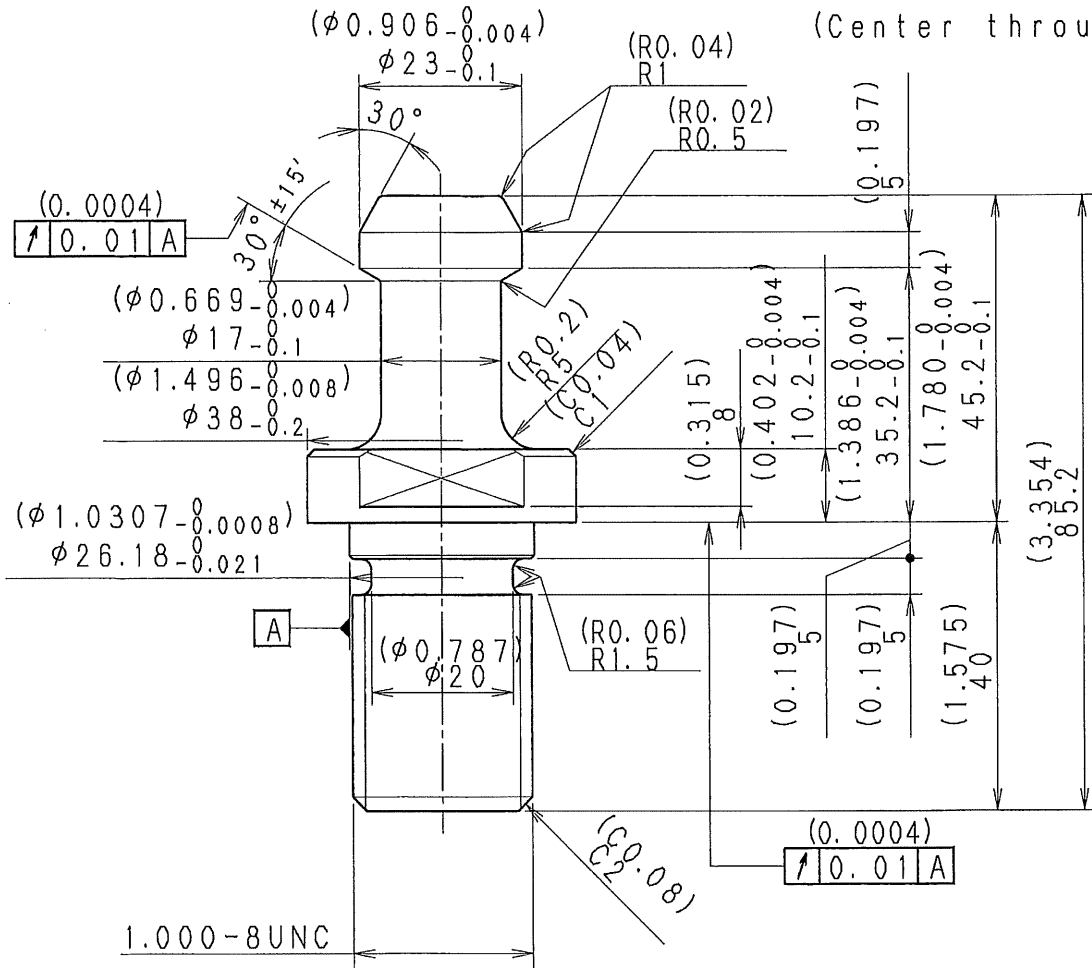
Must not
chamfer

End face
abrasion



①—① 断面

(Center through type)



作成: 伊庭
照査: 吉田
承認: 阿部
2019/11/14
4665S41516 (2/2)

1. Machine specifications		Standard	Options	A	E	Q
1.6 Automatic pallet changer 1) Direct rotary type(Front center)		<input checked="" type="checkbox"/> 2APC (Manual Idle pallet rotation)	<input type="checkbox"/> 6APM <input type="checkbox"/> 8APM <input type="checkbox"/> 10APM <input type="checkbox"/> 12APM <input type="checkbox"/> Load/unload station Manual indexing, R-2 pos. <input type="checkbox"/> 2APC for FMS			
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2) Feed motors	X / Z axis	<input checked="" type="checkbox"/> AC7.0kW (α iF30/4000)				
	Y axis	<input checked="" type="checkbox"/> AC9.0kW (α iF40/3000FAN)				
	B axis	<input type="checkbox"/> AC1.8kW (1°) (β iS12/3000)	<input checked="" type="checkbox"/> AC4.0kW (NC table) (α iF22/3000)			
3) Hydraulic pump motor		<input checked="" type="checkbox"/> AC2.2kW				
4) ATC	Tool changer drive	<input checked="" type="checkbox"/> AC1.8kW (β iS12/3000)				
	Magazine drive	<input type="checkbox"/> AC3.0kW (60chain type) (β iS22/3000)	<input checked="" type="checkbox"/> AC2.5kW (64chain type) (β iS22/2000) <input type="checkbox"/> AC2.5kW(88chain type) (β iS22/2000) <input type="checkbox"/> AC3.0kW (126chain type) (β iS30/2000)			
5) Internal chip conveyor drive motor		<input checked="" type="checkbox"/> AC0.2kW×2				
※ On other motor, refer Item 3 (special machine accessories).						
1.9 Power sources 1) Electrical power supply $\pm 10\%$		<input type="checkbox"/> AC 200V <input type="checkbox"/> 50Hz / <input checked="" type="checkbox"/> 60Hz	<input type="checkbox"/> 380V <input checked="" type="checkbox"/> 220V			
2) Frequency		<input checked="" type="checkbox"/> 67 kVA	<input type="checkbox"/>			
3) Power supply required(Apparent Power) •Wire for power supply 80mm ² ×3 wires •Ground(earth) wire 38mm ² or more×1 wire ※ Wiring from customer's power supply to control cabinet/transformer of the machine is required to be prepared by customer.						
4) Compressed air supply •Required air volume 500L/min (at atmospheric pressure) shall be supplied consecutively.		<input checked="" type="checkbox"/> 0.5MPa or more				
1.10 Tank capacity 1) Hydraulic oil tank capacity		<input checked="" type="checkbox"/> 20 liters				
2) Lubricant tank capacity for spindle bearing		<input checked="" type="checkbox"/> 1.8 liters				
3) Spindle cooler tank capacity		<input checked="" type="checkbox"/> 50 liters				
4) Coolant tank capacity		<input type="checkbox"/> 450 liters (In case of External chip conveyor w/ Discharge direction; Back)	<input checked="" type="checkbox"/> 540 liters (In case of External chip conveyor w/ Discharge direction; Side)			

PACKING LIST

DATE :

PAGE: 1/1

REF. NO.

N7-P2-NCCT64-F31i-B

(SERIAL NO.)

PACKAGE NO. NOS. & STYLE	NET WEIGHT (KGS)	GROSS WEIGHT (KGS)	DIMENSION (LxWxH cm)		MEASUREMENT (M3)
ITEM NO.	DESCRIPTION			QUANTITY	

Shipping Mark

P/O NO. :

N7

C/NO. : NIIGATA- 1 - 5

G/W : KGS

MADE IN JAPAN

NIIGATA- 1 (STEEL CASE)	21,570	23,720	673	x	323	x	382	83.039
		L x W x H cm						
1-1	MACHINE BODY	650	300	343	機械本体(パレット1枚付)		1 set	
	MODEL : N7	(SERIAL NO.)						
1-2	NUMERICAL CONTROL				NC装置		1 set	
	MODEL : FANUC F31i-B	(AK53172)						
1-3	STANDARD ACCESSORIES				標準付属品		1 set	
1-4	OPTIONAL ACCESSORIES				特別付属品		1 set	
1-5	INSTALLATION KIT				据付部品		1 set	
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NIIGATA- 2 (WOODEN CASE)	1,200	1,450	325	x	147	x	217	10.367
2-1	COVER				カバー		1 set	
3	INSTRUCTION MANUAL				取扱説明書		1 set	
5-1	CHIP CONVEYER & COOLANT TANK (540L)				機外コンベア&クーラントタンク		1 set	
4-3	PALLET				パレット		1 set	
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NIIGATA- 3 (WOODEN CASE)	200	320	147	x	89	x	172	2.250
4-1	SPINDLE COOLING DEVICE				主軸クーラー		1 set	
4-2	HYDRAULIC UNIT				油圧ユニット		1 set	
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NIIGATA- 4 (WOODEN CASE)	400	570	325	x	189	x	142	8.722
2-2	ATC COVER				ATCカバー		1 set	
<hr/>								
NIIGATA- 5 (WOODEN CASE)	390	560	325	x	189	x	142	8.722
2-2	ATC COVER				ATCカバー		1 set	
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TOTAL	23,760	26,620						113.100

NX7000 OIL TABLE (P2-T60&T64&T88, 12000 or 8000 min⁻¹ SPINDLE)

Units or locations for oil supply	Q'ty	Supply method	ISO 3448 Viscosity Grade	JIS B6016 Mark of oils and lubricants	JXTG Nippon Oil & Energy	EXXON MOBIL		SHELL
						ESSO	MOBIL	
Spindle cooling unit	50L	Automatic circulation	ISO VG10	FC10	SUPER MULPAS DX 10	SPINESSTIC 10	MOBIL VELOCITE OIL No.6	SHELL TETRA OIL 10 SP
Spindle oil-air lubricating unit	1.8L	Auto supply (Non-collect)	ISO VG32	FC32	FBK OIL RO32	TERESSO 32	MOBIL DTE OIL LIGHT	SHELL TELLUS S2 M 32
XYZ-axes ball screws and Linear motion bearings ☆	700cm ³	Auto supply (Non-collect)			Maker : LUBE Special grease LHL-X100-7 (700ml of cartridge type)			
1° table NC table	10.0L 6.0L	Oil bath	ISO VG150	CKC150	BONNOC TS150	SPARTAN EP150	MOBIL GEAR 629	SHELL OMALA S2 G 150
CAM changer	11.0L	Oil bath			GEAR GRAND GL-5 80W-90	MOBILUBE HD80W-90		SHELL GELCO MULTI GEAR
Tool magazine Swing guide rail	20cm ³	Grease application			EPINOC GREASE AP(N)2	BEACON EP2	MOBILUX EP2	SHELL ALVANIA EP GREASE 2
Sprocket wheel and tool pot chains on tool magazine	100cm ³	Grease application		XBCEB2				
Pneumatic lubricator (Oiler)	0.13L	Auto supply (Non-collect)	ISO VG32	HM32	SUPER MULPAS DX 32	NUTO HP32	MOBIL DTE 24	SHELL TELLUS S2 M 32
Hydraulic pump unit	20L	Tank						

☆ The dedicated grease, which is high liquidity, is used on X, Y, Z axes ball screws and liner guide way. Grease other than the specified product must not be used. Otherwise these may break.