



Productivity Inc®

15150 25th Avenue North, Minneapolis, MN 55447-1981  
Phone 763-476-8600 Fax 763-476-4092  
For Service: MN 763-476-4191 IA 319-632-4288 NE 402-330-2323  
Visit us at: [Hwww.productivity.comH](http://www.productivity.com) Productivity is ISO 9001:2000 Certified

### ***Makino a51 PRE-INSTALLATION CHECKLIST – Rev 1/2009***

Installation of your new Makino a51 can be smooth and rapid if preparations are made prior to the delivery of your machine. Any questions regarding machine installation should be directed to our service department for clarification. We hope this checklist will aid in a rapid installation of your new machine. **NOTE: The following must be completed prior to our service technician arriving at your facility to install the new machine.**

- Power Requirements for your machine: 240v/3ph/48kVa\*\* 240v/225Amp (Main Circuit Breaker)  
**NOTE: \*\*93kVa (including options) See Makino Installation Manual or contact our Service Department for complete information or questions. Machine is a dual-voltage machine and comes with a transformer.** Proper voltage per machine specifications should be ready at machine site. **Do NOT power up the machine.**
- Customer should furnish and have available the proper supply and types of lubricants required for machine operation. **See enclosed Makino Installation Manual for specifics – any questions should be directed to our Service Department at the above locations.**

ITEM	CAPACITY	FLUID TYPE
Coolant	118 Gallons (may vary with type/size of tank ordered – check Manual for specifics)	Water Soluble, Synthetic

**You will need to have Coolant on hand at the time of installation. Contact our Service Department with any questions.**

- Air lines should be routed to the machine location and operational for proper air pressure.

Air Supply: 72-115 psi and 15.9 cfm (22.9 cfm with optional air blow) of DRY air supplied through a minimum supply pipe of 3/4" diameter with no reducers or nozzles.
---

- Machine location should be planned to allow enough room for access panels to be opened and serviced with ease. A minimum of 36" clearance is required around the machine for operator and maintenance access.
- Weight requirements should be checked to insure that the surface below the machine will have sufficient strength for support and stability. The machine must be set on a solid, sound and stable, steel bar-reinforced concrete slab poured directly on the grade. In general, the 6" concrete floor on industrial buildings is suitable for machine placement.
- **The Makino a51 can be moved with either a forklift or crane\*\*\*. Upon arrival of your machine, uncrate and immediately check for visible damage. SEE ATTACHED FOR SHIPPING DIMENSIONS.**

**\*\*\*NOTE: LIFTING EQUIPMENT, ROPES, SHACKLES, LIFTING BARS, LIFTING BEAMS, ETC. ARE OPTIONAL EQUIPMENT AND ARE NOT PROVIDED WITH THE MACHINE. ITEMS MUST BE PURCHASED PRIOR TO MACHINE DELIVERY. CHECK WITH YOUR RIGGER TO SEE IF THEY HAVE ANY OF THESE ITEMS.\*\*\***

- Remove as much preservative from the machine as possible without having to power up (tables – slides, pulleys, etc.). We recommend mineral spirits to clean. Apply oil when finished to prevent rust.

## *Approximate Machine Shipping Dimensions*

*(Note – they may vary slightly – we will provide you with a Bill of Lading copy with actual dimensions at time of shipment. Refer to your Makino Installation Manual for exact floor space/layout dimensions/requirements on the Chip Conveyor/Tank and any other optional peripherals purchased with your new machine.)*

### *Makino a51, 60-Tool ATC Machine*

SHIPPING WEIGHT	SHIPPING DIMENSIONS OF MACHINE
17,000# (machine 60ATC)	140" L x 89" W x 98" H (60ATC machine CRATED)
2,310# (Chip Conveyor)	94" L x 43" W x 70" H (Chip Conveyor crated)
1,102# (Accessories)	81" L x 29" W x 87" H (Crated Box)
728# (Accessory)	39" L x 30" W x 92" H (skidded)
700# (transformer)	3' L x 3' W x 4' H (skidded – shipped separately from Makino in Ohio)
<b>See Makino Installation Manual for floor space/layout dimensions, depending upon your configuration.</b>	

### *Makino a51, 134-Tool ATC Machine*

SHIPPING WEIGHT	SHIPPING DIMENSIONS OF MACHINE
20,062# (machine)	151" L x 111" W x 113" H (machine CRATED)
4,850# (134 ATC)	70" L x 76" W x 124" H (134ATC Crated)
2,227# (Chip Conveyor)	112" L x 47" W x 70" H (Chip Conveyor/Coolant Tank crated)
529# (Accessories)	35" L x 32" W x 82" H (Crate)
441# (Accessory)	39" L x 21" W x 10" H (Crate)
449# (Accessory)	38" L x 38" W x 39" H (Crate)
700# (transformer)	3' L x 3' W x 4' H (skidded – shipped separately from Makino in Ohio)
<b>See Makino Installation Manual for floor space/layout dimensions, depending upon your configuration.</b>	

### *Makino a51, 219-Tool ATC Machine*

SHIPPING WEIGHT	SHIPPING DIMENSIONS OF MACHINE
19,621# (machine)	150" L x 108" W x 102" H (machine CRATED)
14,550# (219 ATC)	162" L x 133" W x 113" H (219 ATC Crated)
6,173# (Chip Conveyor)	101" L x 72" W x 125" H (Chip Conveyor/Coolant Tank crated)
2,205# (Accessories)	96" L x 47" W x 70" H (Crate)
3,858# (Accessory)	154" L x 48" W x 33" H (Crate)
882# (Accessory)	67" L x 49" W x 33" H (Crate)
1,698# (Accessory)	78" L x 66" W x 25" H (Crate)
700# (transformer)	3' L x 3' W x 4' H (skidded – shipped separately from Makino in Ohio)
<b>See Makino Installation Manual for floor space/layout dimensions, depending upon your configuration.</b>	

**PLEASE FORWARD THIS TO THE APPROPRIATE PERSON. THANK YOU.**

# 1 Outline

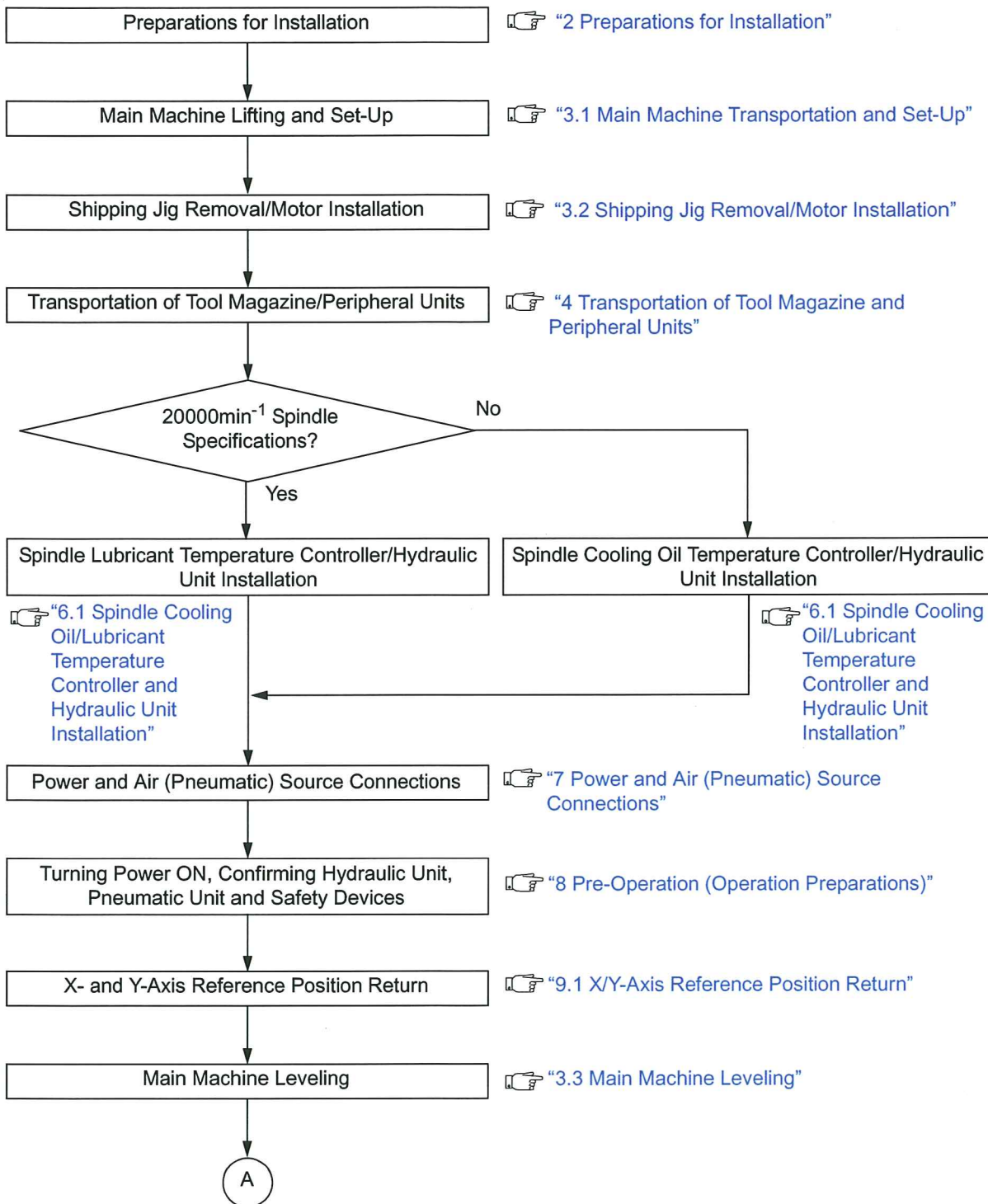
## 1.1 Preface

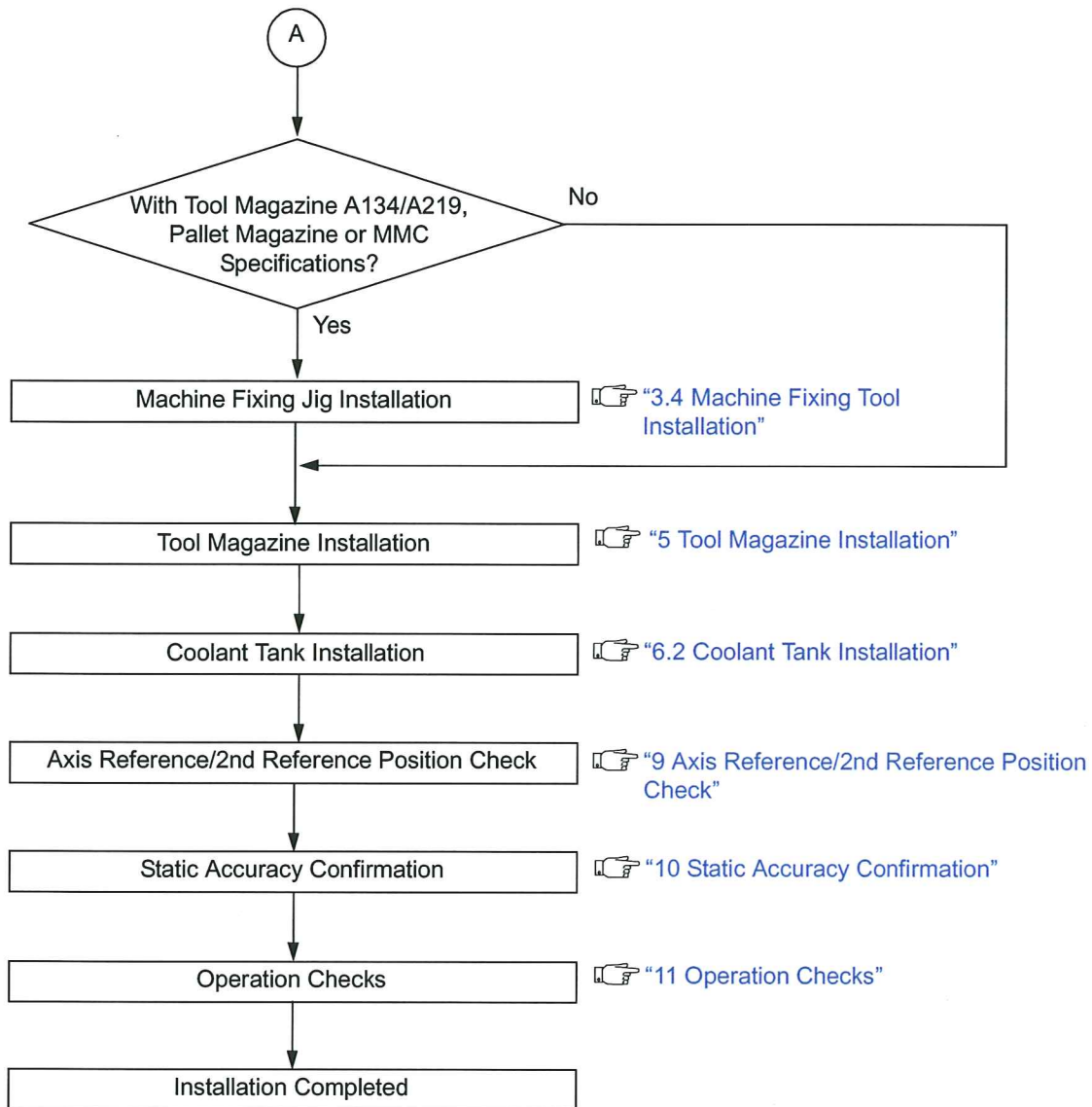
"Preparations for Installation and Installation" describes the necessary preparations and required conditions for installation, machine and peripheral unit installation procedures, and confirmation/checks required after installation.

In the following section, the sequence of preparation for installation and actual installation work is shown in a flowchart. For details of each item, refer to the respective chapter and section.

To ensure safety of personnel and prevent damage to the machine, be sure to read this chapter and the previous "Safety" carefully and understand it thoroughly prior to installation.

## 1.2 Installation Flow





## 2 Preparations for Installation

### 2.1 Confirmation of Preparations for Installation

Perform the following preparations to ensure all installation conditions are satisfied prior to machine installation. For details, refer to the respective section in this chapter.

- Preparation of Set-Up Area  ["2.2 Preparation of Set-Up Area"](#)
- Preparation of Transport Route  ["2.3 Preparation of Transport Route"](#)
- Set-Up Conditions  ["2.4 Set-Up Conditions"](#)
- Preparation of Foundation  ["2.5 Recommended Foundation"](#)
- Preparation of Electric Source  ["2.6 Air and Power Sources"](#)
- Preparation of Air Source  ["2.6 Air and Power Sources"](#)
- Preparation of Transportation Equipment  ["2.7 Preparation of Transportation/Installation Equipment"](#)
- Preparation of Required Manpower for Installation  ["2.8 Required Manpower for Installation"](#)
- Safety Precautions and Other Confirmation  ["2.9 Inspection Prior to Installation and Precautions During Installation"](#)



Check List for Installation Preparation

 [Table 2.1](#)

Table 2.1 Check List for Installation Preparation

Check	Item
	Preparation of Set-Up Area
	Preparation of Transport Route
	Set-Up Conditions
	Preparation of Foundation
	Preparation of Electric Source
	Preparation of Air Source
	Preparation of Transportation Equipment
	Preparation of Air Dryer



### 2.2 Preparation of Set-Up Area

Refer to the figures in this section that show the general view and floor plan for respective machine specifications to confirm space requirements and prepare the required set-up area.

Note the following:

- When lifting the machine body using a crane, the total lifting height required is 3700mm.
- The maintenance area is the maintenance space required after installation.
- The maintenance area varies depending on the type of tool magazine and conveyor specifications:

Tool Magazine A40/A60 and Left-Discharge Conveyor

 [Figure 2.1](#), [Figure 2.2](#)

Tool Magazine A99 and Left-Discharge Conveyor

 [Figure 2.3](#), [Figure 2.4](#)

Tool Magazine A134/A219 and Left-Discharge Conveyor

 [Figure 2.5](#), [Figure 2.6](#)

Tool Magazine A40/A60 and Rear-Discharge Conveyor

 [Figure 2.7](#), [Figure 2.8](#)

Tool Magazine A99 and Rear-Discharge Conveyor

 [Figure 2.9](#), [Figure 2.10](#)

Tool Magazine A134/A219 and Rear-Discharge Conveyor

 [Figure 2.11](#), [Figure 2.12](#)

**General View: Tool Magazine A40/A60 and Left-Discharge Conveyor**

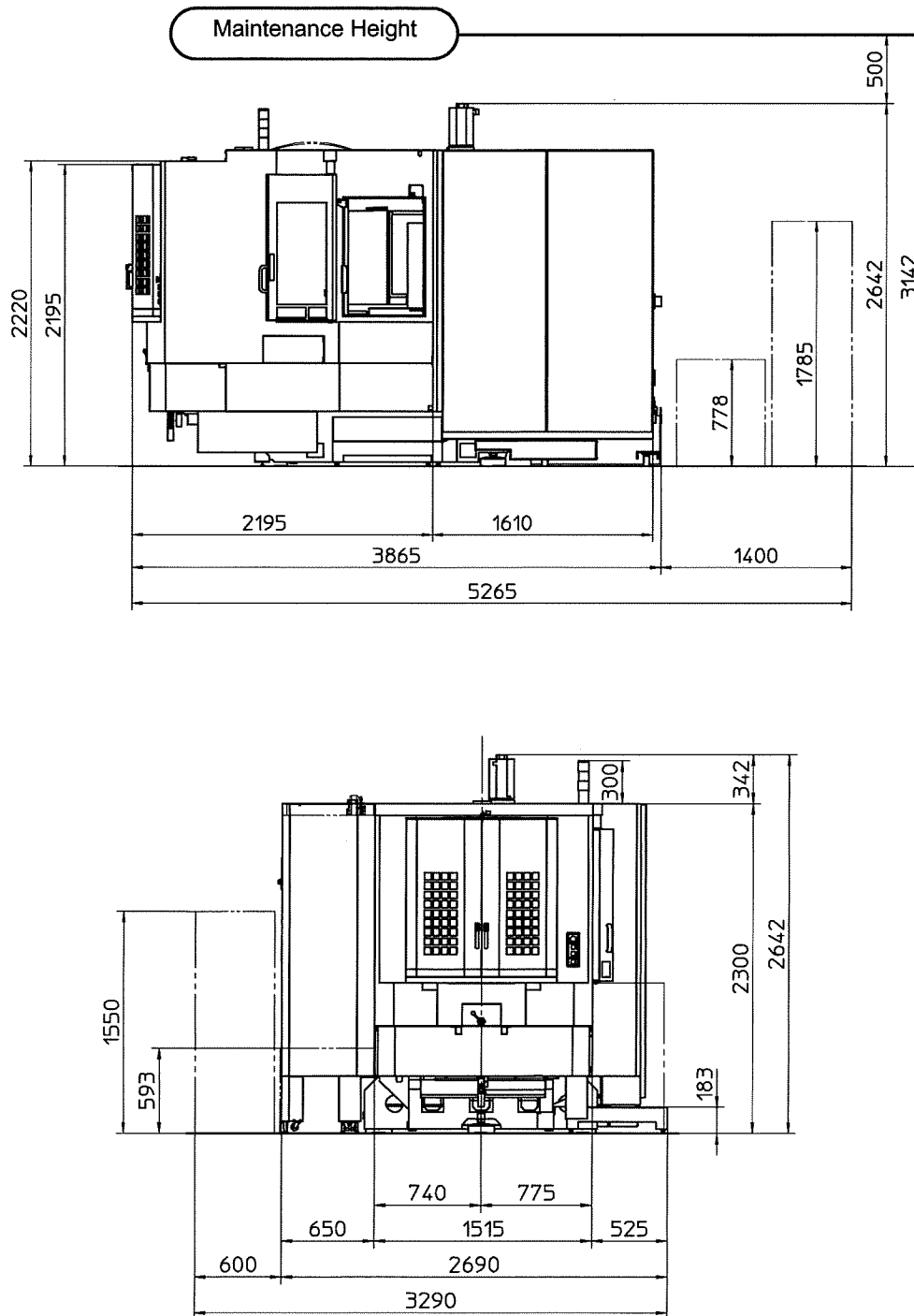
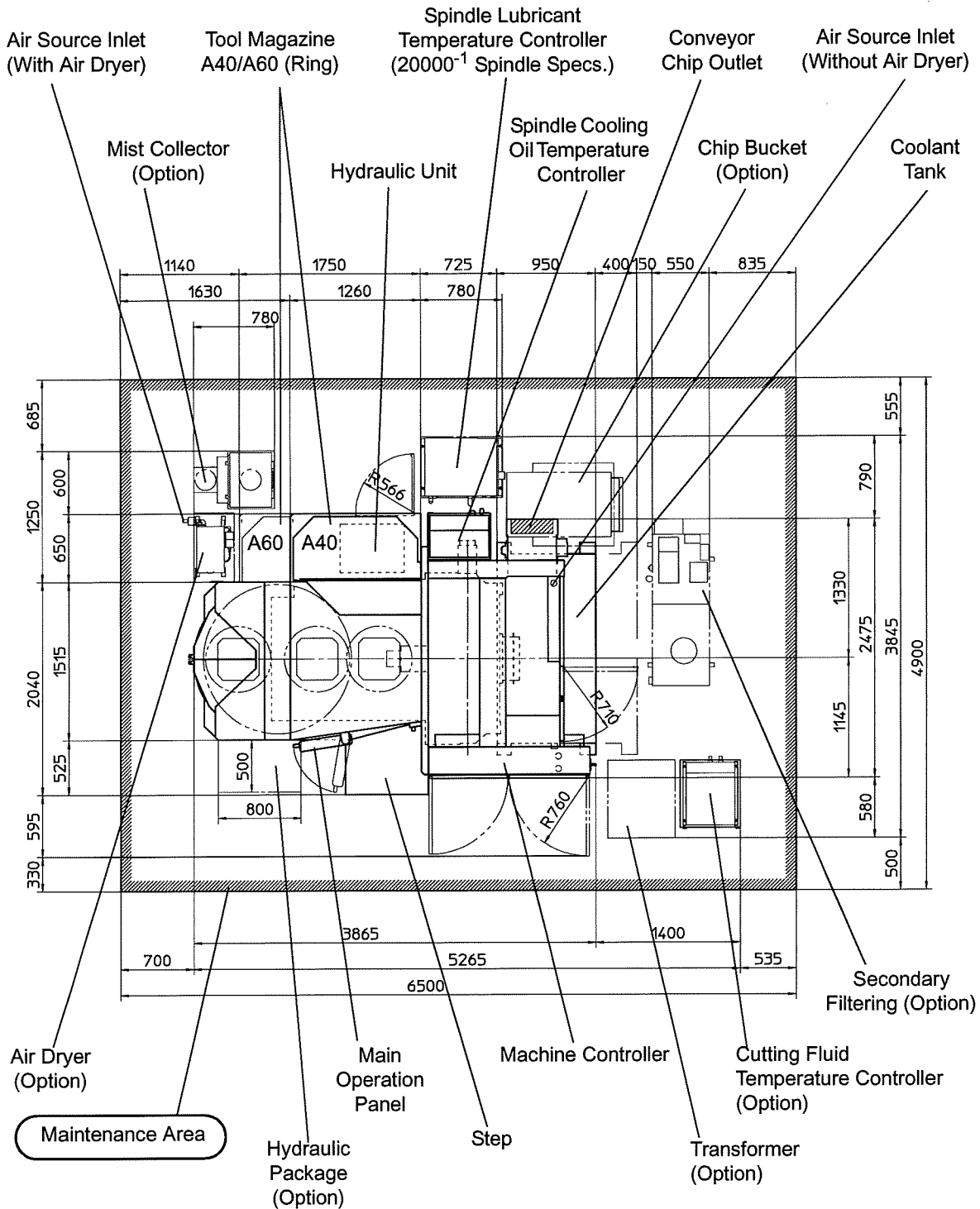


Figure 2.1 Side and Front View of Machine  
(Tool Magazine A40/A60 and Left-Discharge Conveyor Specs.)



**Floor Plane: Tool Magazine A40/A60 and Left-Discharge Conveyor**



2 Preparations for Installation

Figure 2.2 Floor Plane (Top View of Machine)  
(Tool Magazine A40/A60 and Left-Discharge Conveyor Specs.)

**General View: Tool Magazine A99 and Left-Discharge Conveyor**

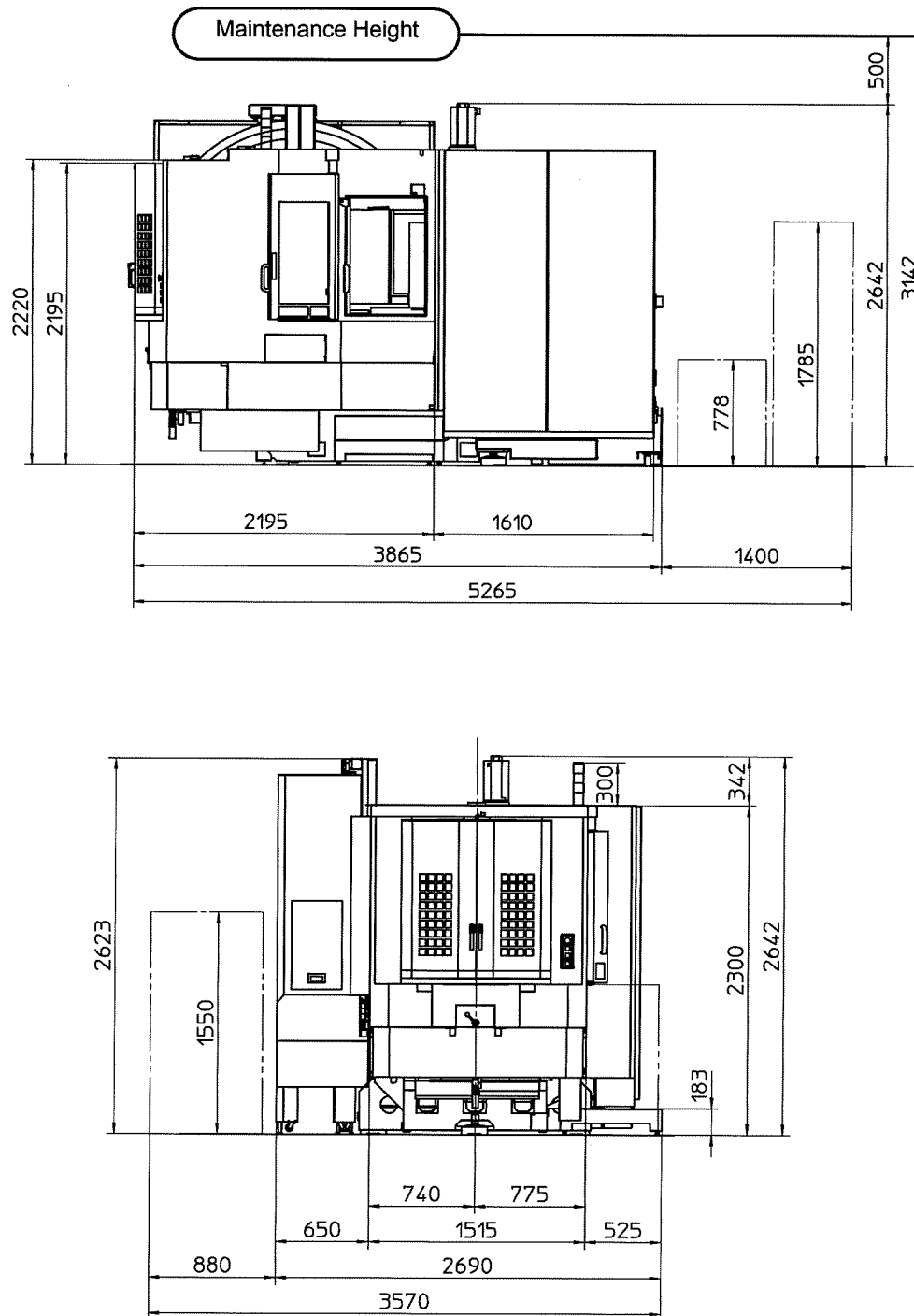


Figure 2.3 Side and Front View of Machine  
(Tool Magazine A99 and Left-Discharge Conveyor Specs.)

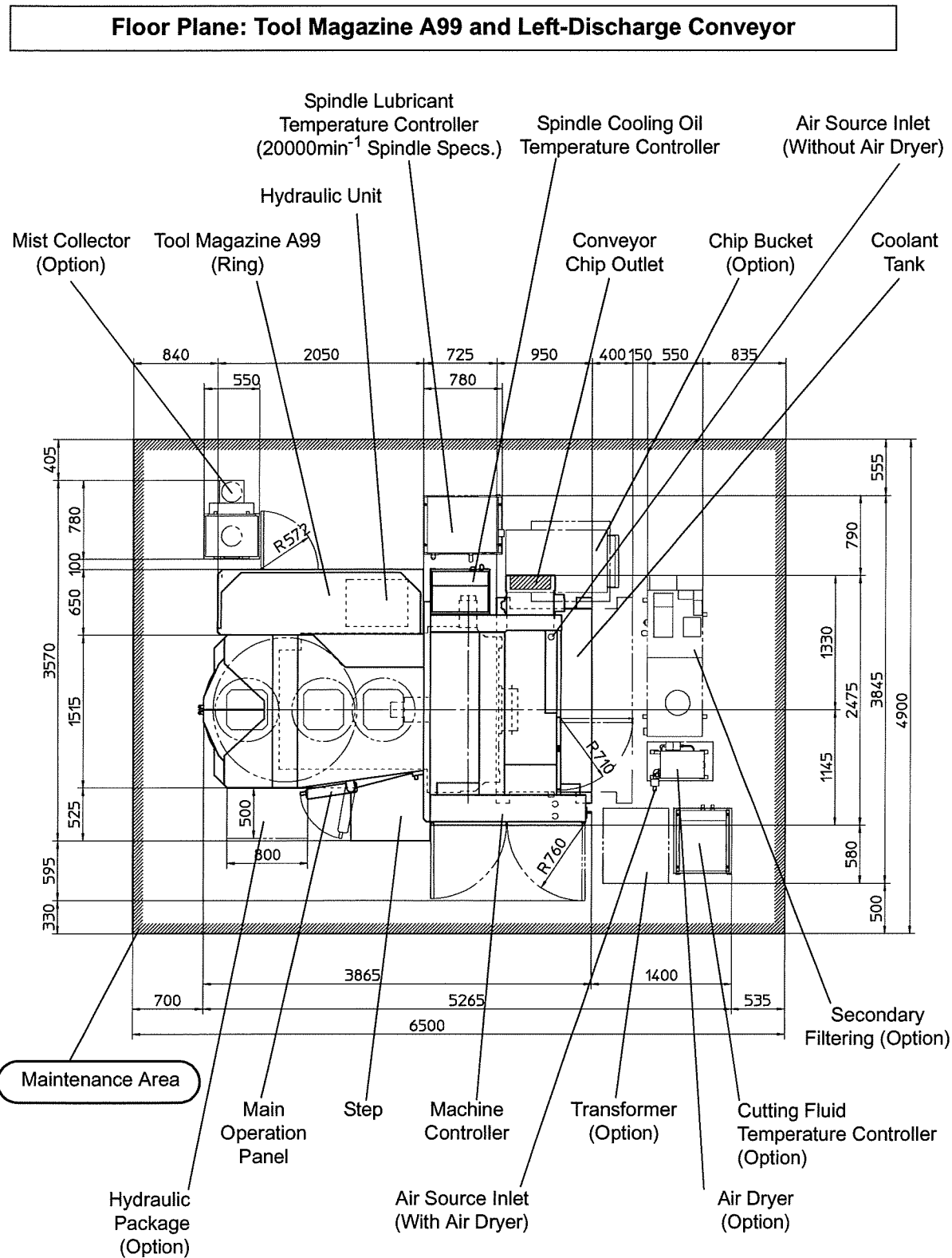


Figure 2.4 Floor Plane (Top View of Machine)  
(Tool Magazine A99 and Left-Discharge Conveyor Specs.)

**General View: Tool Magazine A134/A219 and Left-Discharge Conveyor**

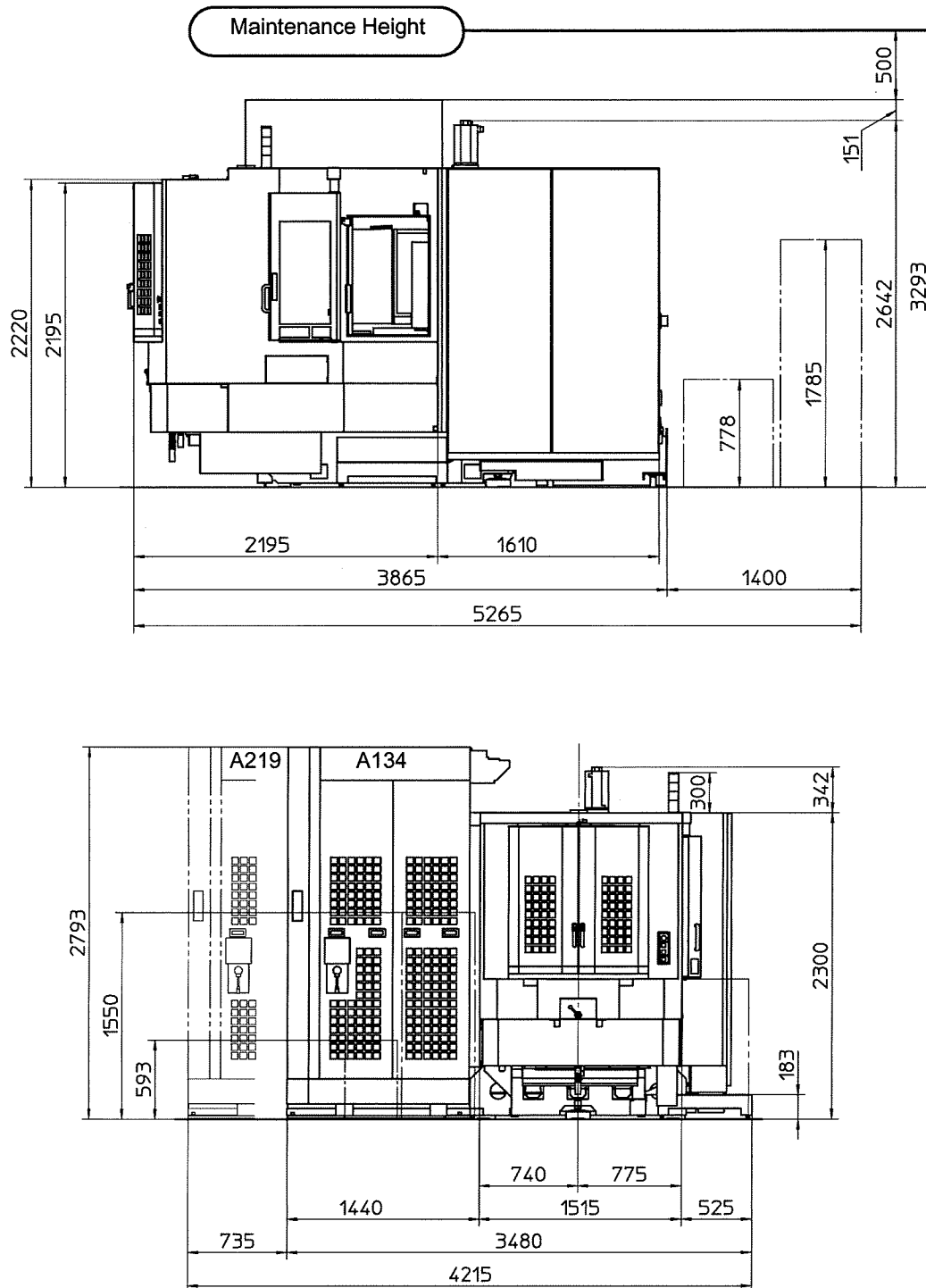


Figure 2.5 Side and Front View of Machine  
(Tool Magazine A134/A219 and Left-Discharge Conveyor Specs.)

**Floor Plane: Tool Magazine A134/A219 and Left-Discharge Conveyor**



(Tool Magazine A134/A219 and Left-Discharge Conveyor Specs.)

**General View: Tool Magazine A40/A60 and Rear-Discharge Conveyor**

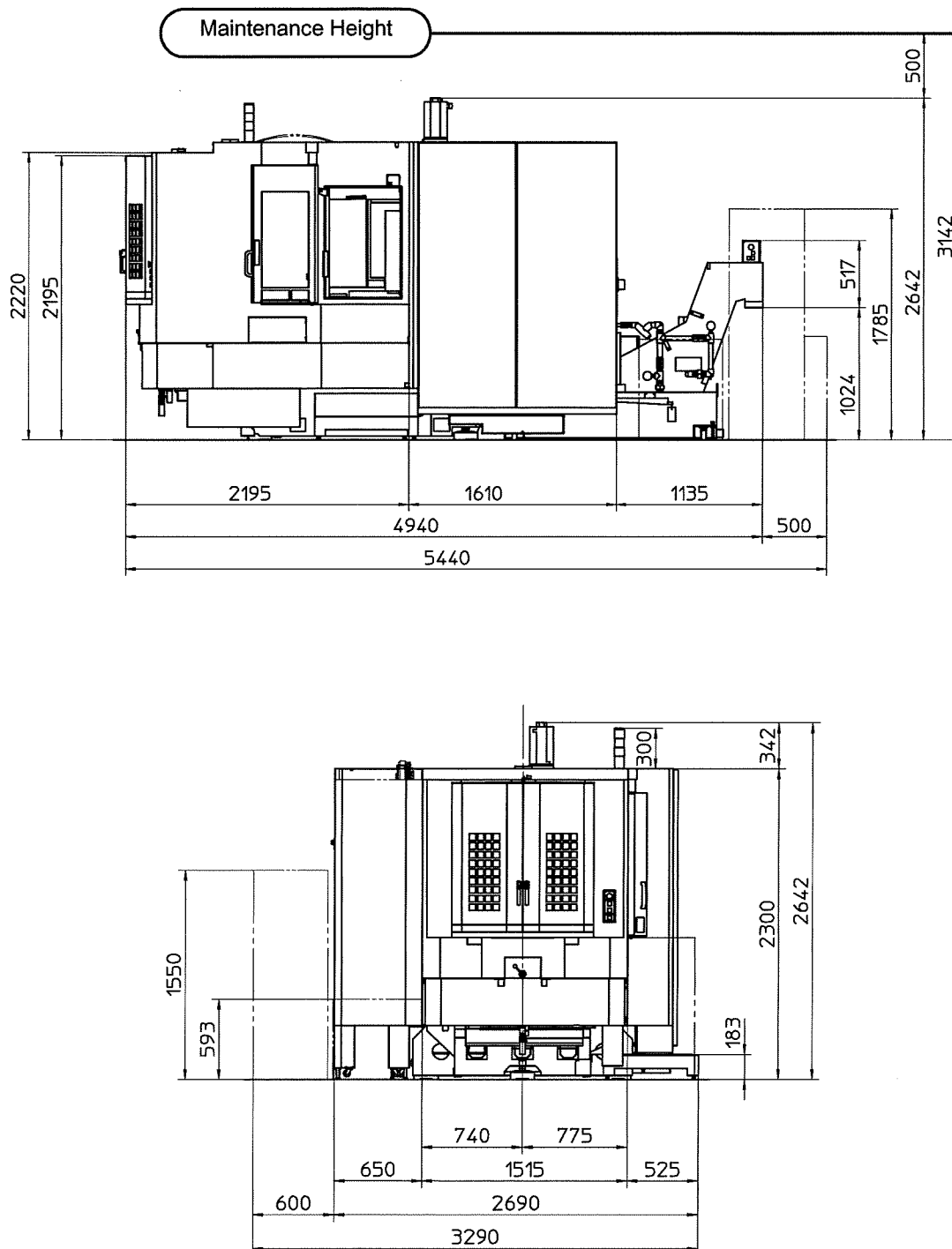
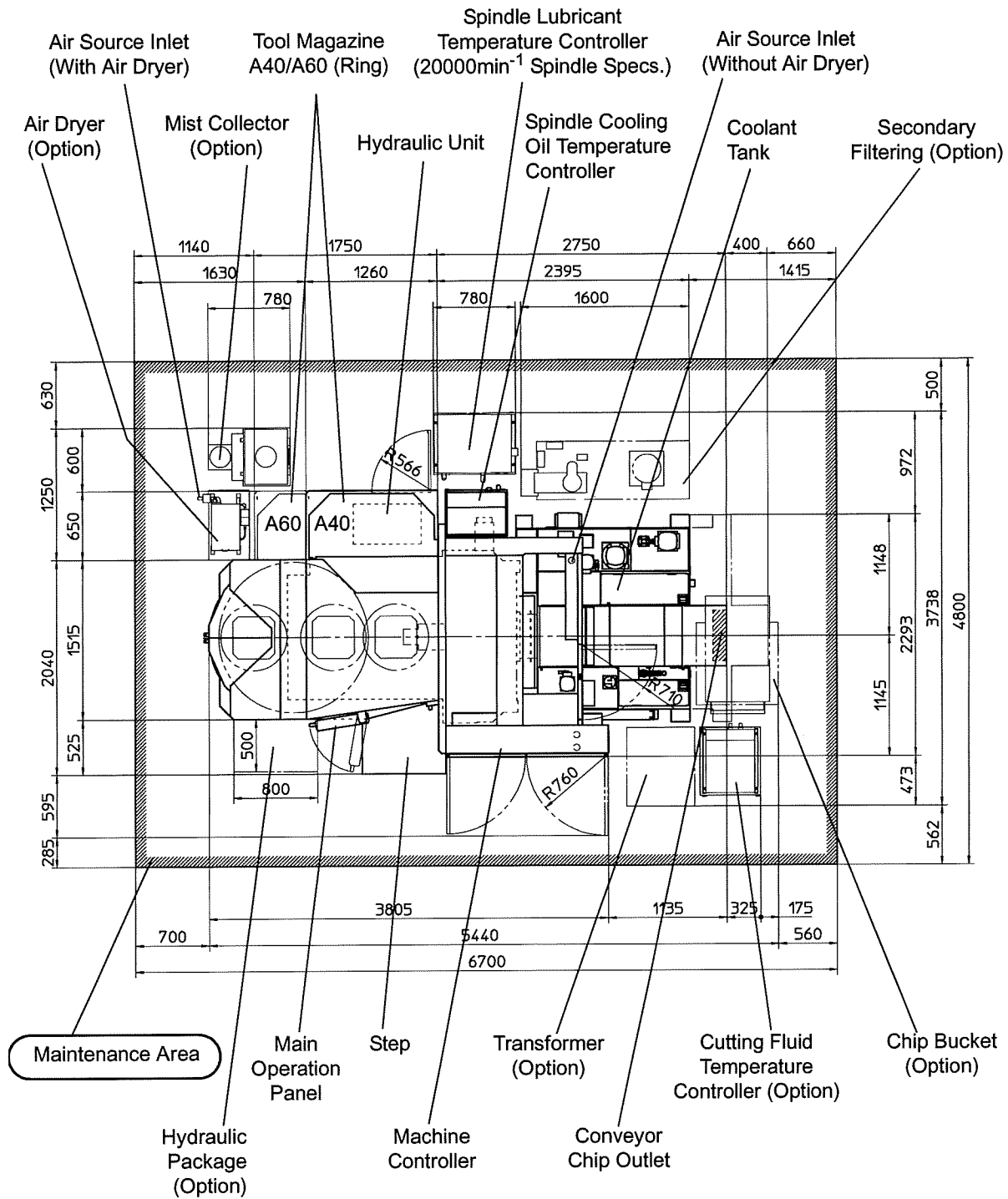


Figure 2.7 Side and Front View of Machine  
(Tool Magazine A40/A60 and Rear-Discharge Conveyor Specs.)

**Floor Plane: Tool Magazine A40/A60 and Rear-Discharge Conveyor**



2 Preparations for Installation

Figure 2.8 Floor Plane (Top View of Machine)  
(Tool Magazine A40/A60 and Rear-Discharge Conveyor Specs.)



**General View: Tool Magazine A99 and Rear-Discharge Conveyor**

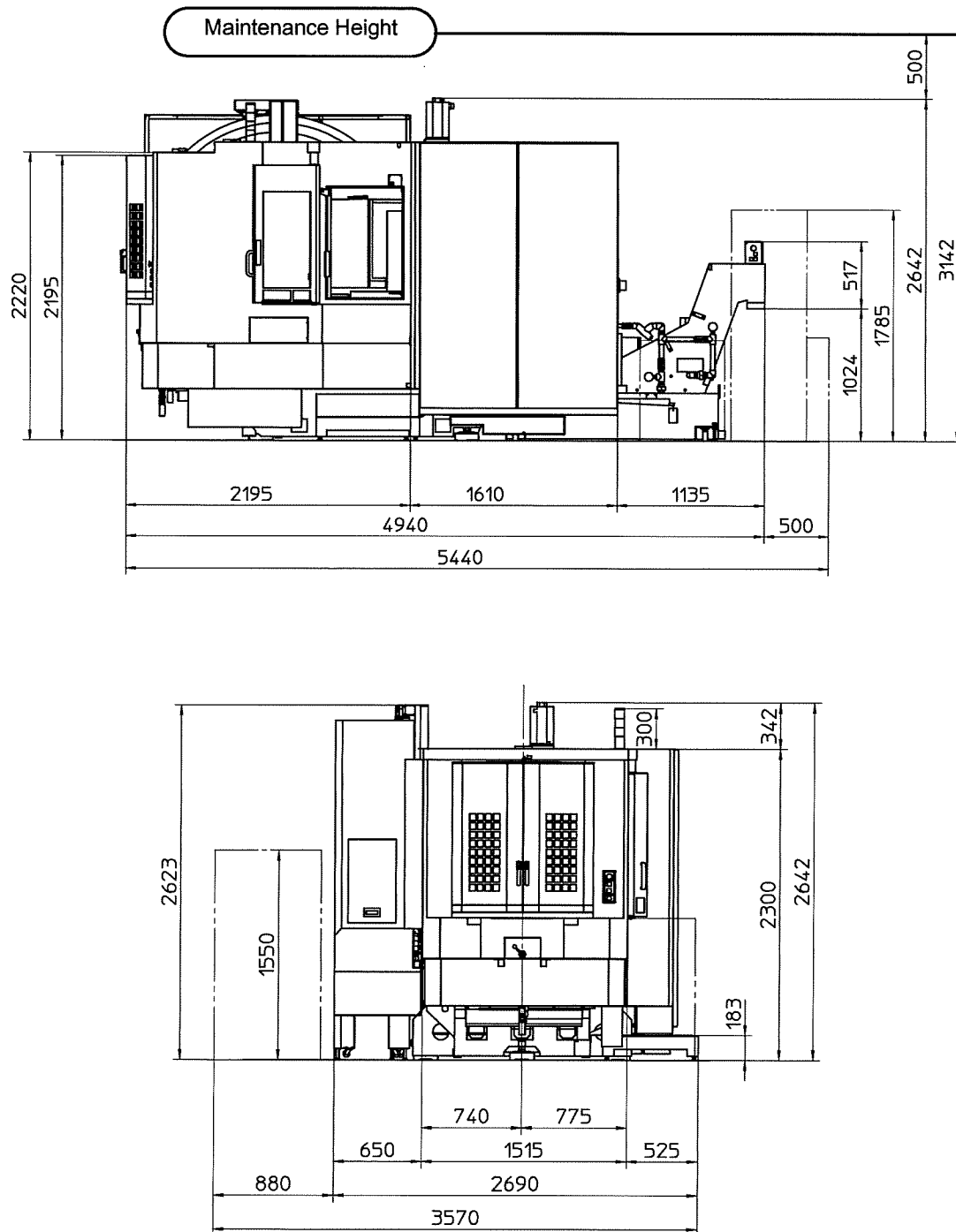


Figure 2.9 Side and Front View of Machine  
(Tool Magazine A99 and Rear-Discharge Conveyor Specs.)

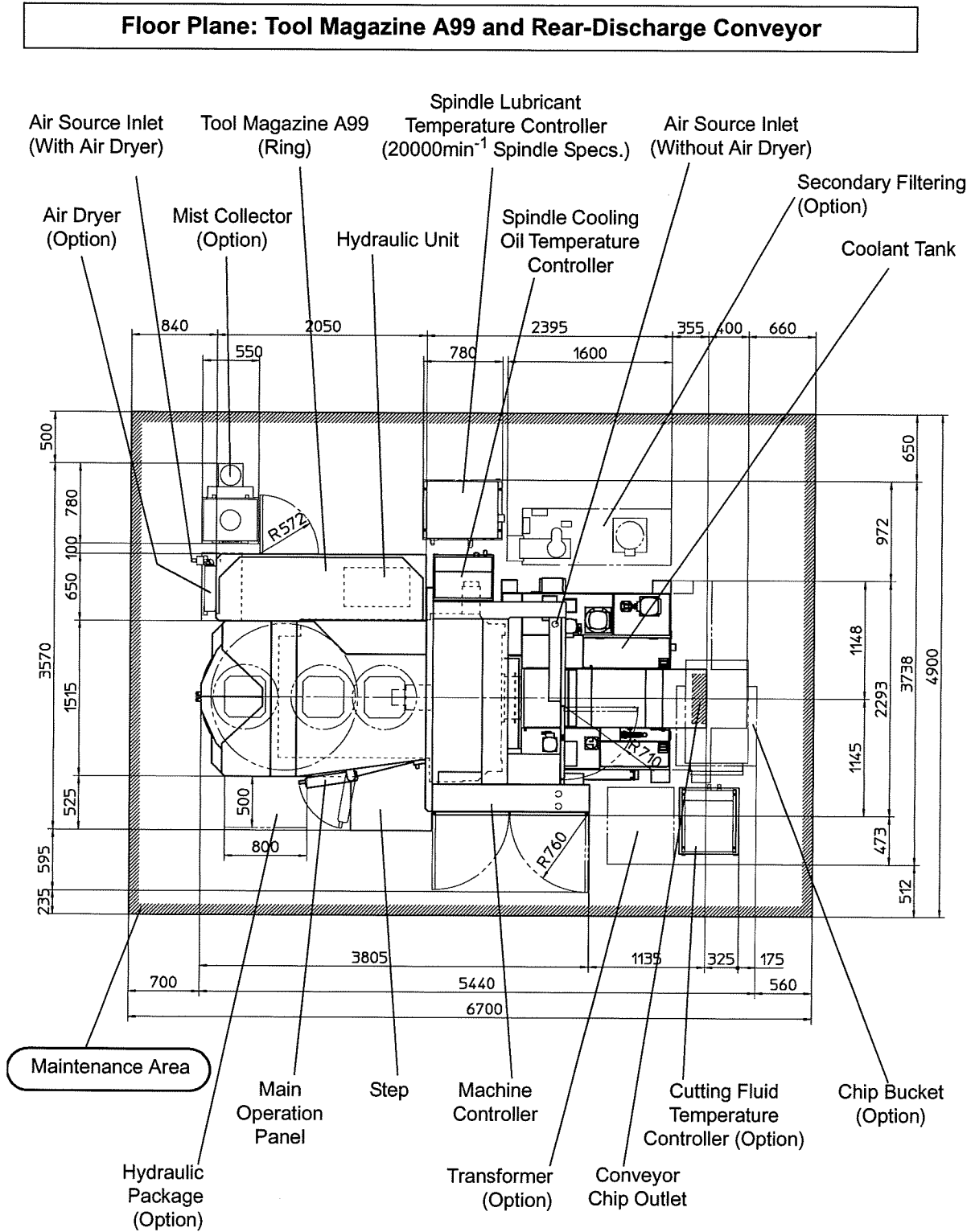


Figure 2.10 Floor Plane (Top View of Machine)  
(Tool Magazine A99 and Rear-Discharge Conveyor Specs.)

**General View: Tool Magazine A134/A219 and Rear-Discharge Conveyor**

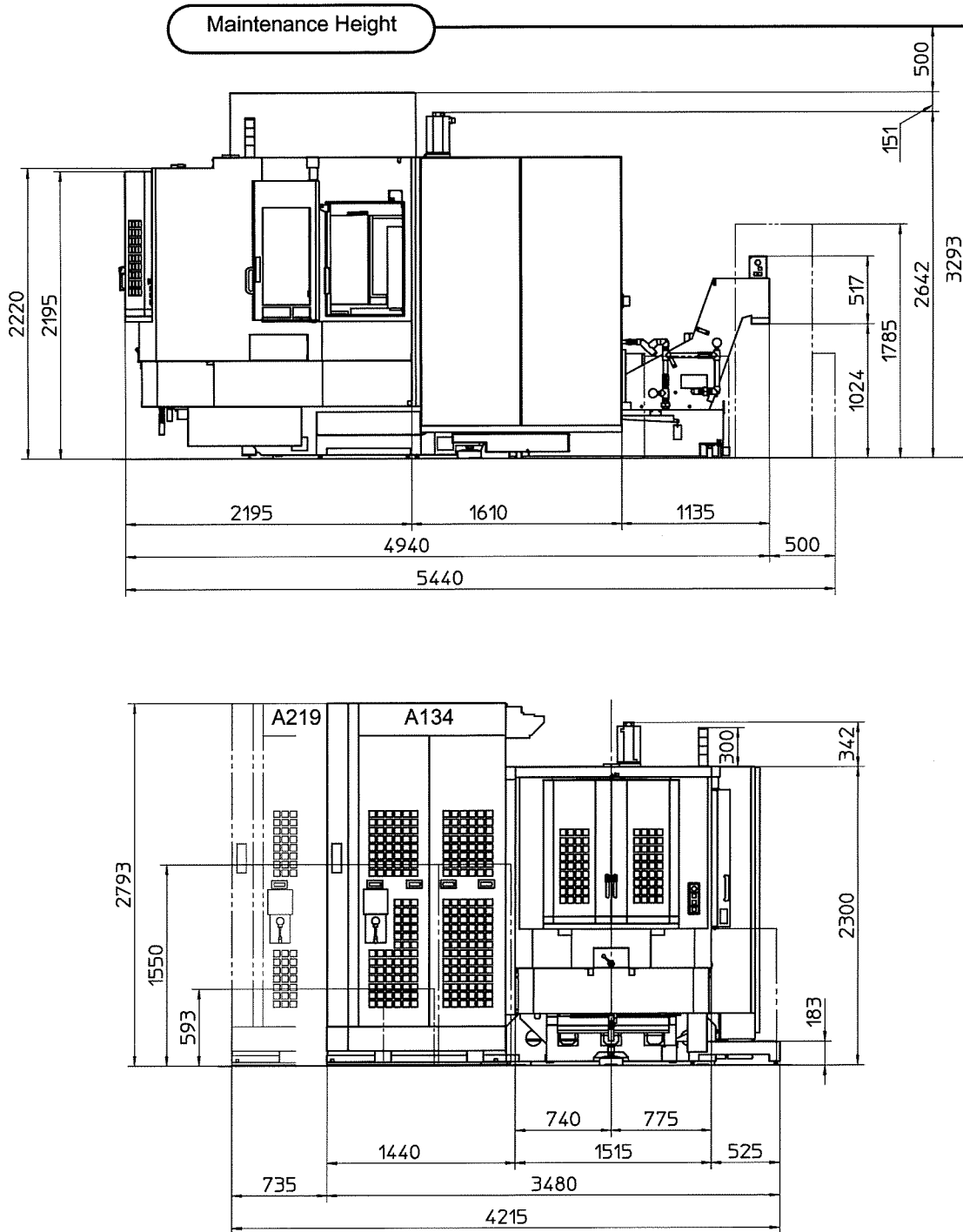


Figure 2.11 Side and Front View of Machine  
(Tool Magazine A134/A219 and Rear-Discharge Conveyor Specs.)

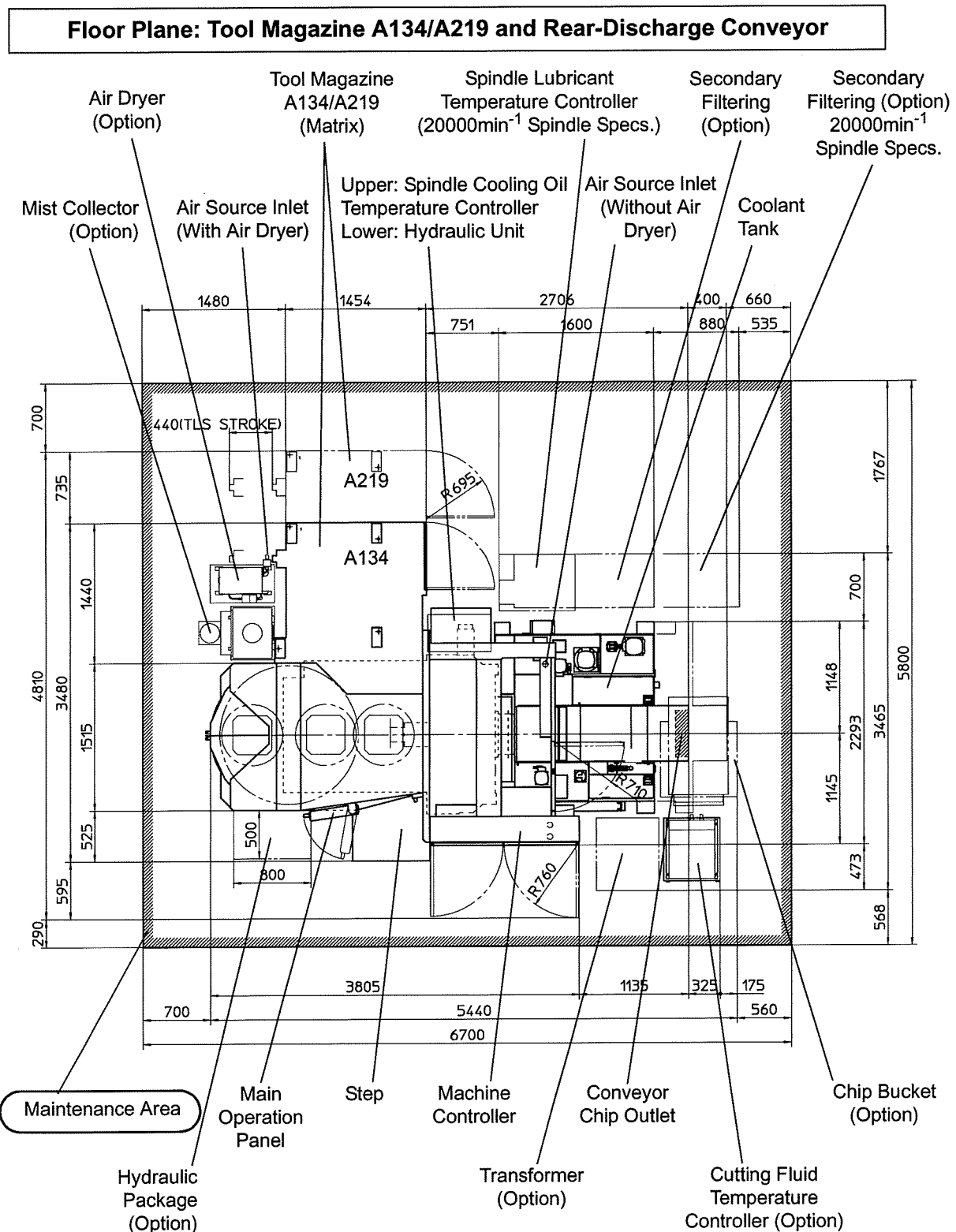



Figure 2.12 Floor Plane (Top View of Machine)  
(Tool Magazine A134/A219 and Rear-Discharge Conveyor Specs.)

## 2.3 Preparation of Transport Route

Prepare the machine transport route (adequate space for transporting machine), referring to the machine size shipment dimensions.

For Tool Magazine A40/A60/A99:  Table 2.2, Figure 2.13

The tool magazine A40/A60/A99 (ring) is assembled onto the machine prior to shipment.

Table 2.2 Machine Size Shipment Dimensions (Tool Magazine A40/A60/A99)

Item	Height	Height With Lifting Equipment (  NOTE)	Width	Depth
Machine when transported by truck (Tool Magazine A40)	2642mm	3700mm	2260mm	3865mm
Machine when transported in container (Tool Magazine A40)	2300mm	3700mm	2144mm	3865mm
Machine when transported by truck (Tool Magazine A60)	2642mm	3700mm	2260mm	3865mm
Machine when transported in container (Tool Magazine A60)	2413mm	3700mm	2144mm	3865mm
Machine when transported by truck (Tool Magazine A99)	2642mm	3700mm	2391mm	3865mm
Machine when transported in container (Tool Magazine A99)	2642mm	3700mm	2144mm	3865mm





For Tool Magazine A134/A219  Table 2.3, Figure 2.13, Figure 2.14

The tool magazine A134/A219 is not installed onto the machine prior to shipment.

Table 2.3 Machine Size Shipment Dimensions (Tool Magazine A134/A219)

Item	Height	Height With Lifting Equipment (  NOTE)	Width	Depth
Machine when transported by truck	2642mm	3700mm	2260mm	3865mm
Machine when transported in container	2300mm	3700mm	2122mm	3865mm
Tool Magazine A134	3795mm	3795mm	1440mm	1454mm
Tool Magazine A219	2795mm	3795mm	2175mm	1454mm

## Lifting of Units

- Tool Magazine A134/A219 (Matrix)  [Figure 2.14](#)
- Spindle Cooling Oil Temperature Controller (Other than 20000min<sup>-1</sup> Spindle Specs.)  [Figure 4.3](#)
- Spindle Lubricant Temperature Controller (20000min<sup>-1</sup> Spindle Specs.)  [Figure 4.3](#)
- Coolant Tank  [Figure 4.4](#)

## NOTE:

When lifting the main machine using a crane, the necessary total height required to provide adequate lifting space is 500mm plus the height with the lifting equipment.

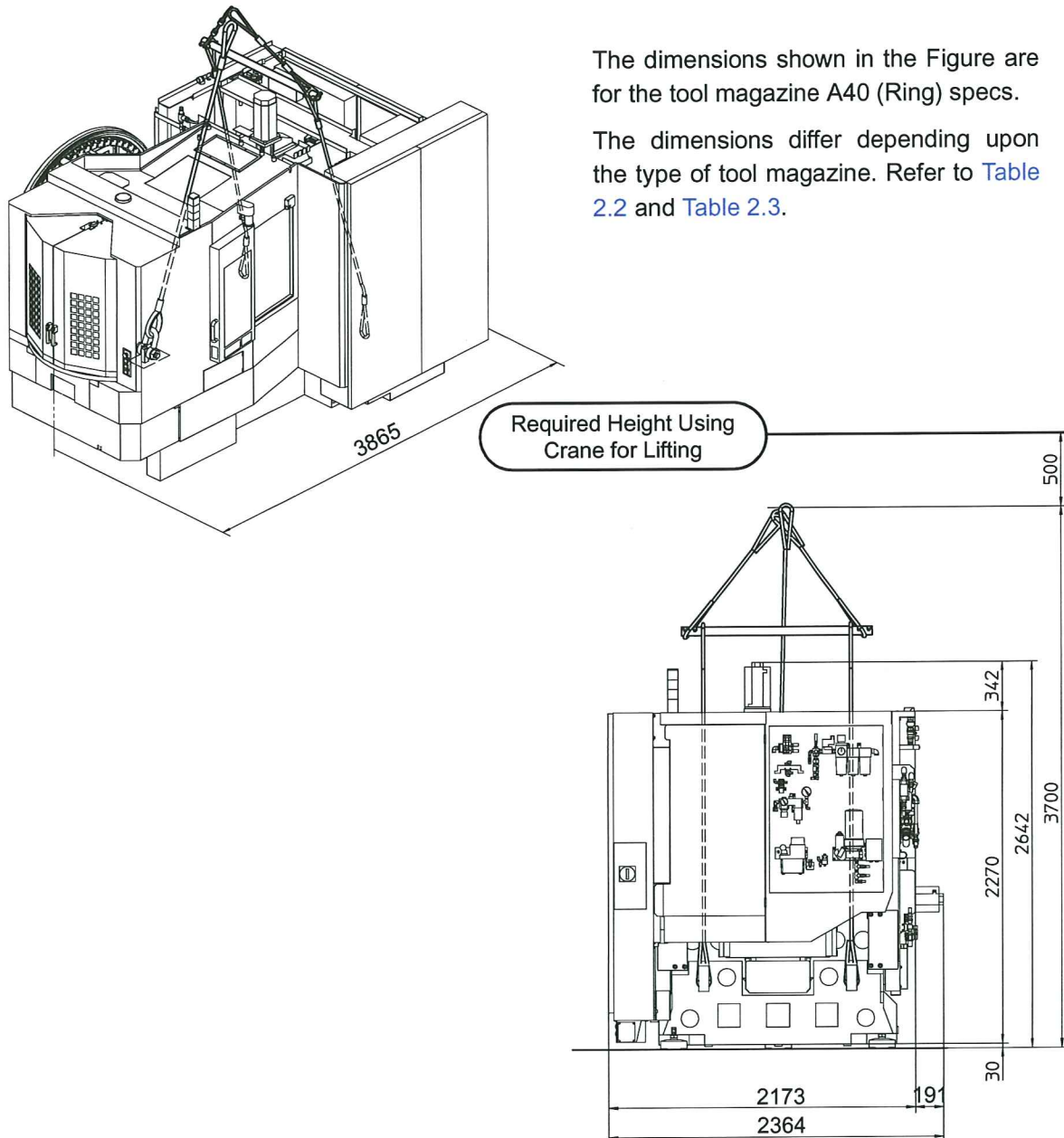


Figure 2.13 Lifting of Main Machine When Transported

**Tool Magazine A134/A219 (Matrix)**

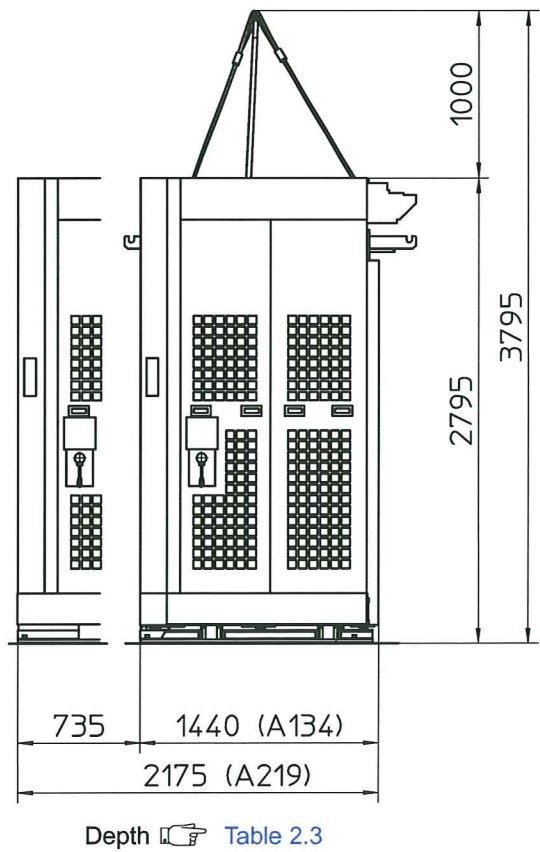


Figure 2.14 Lifting of Tool Magazines (Matrix) When Transported



## 2.4 Set-Up Conditions

Confirm the following set-up location and environmental conditions prior to machine set-up.






Table 2.4 Set-Up Conditions

Set-Up Location and Environmental Conditions	
Ambient Temperature	10°C to 40°C (Optimum Temp: 20±1°C)
Relative Humidity	RH 35% to 70% (No Condensation)
Temperature Fluctuation	Less than 1°C/30 minutes (Range which does not influence machining.)
Well-illuminated	
Free from direct sunlight	
Dust-free	
Available space for storing raw materials, finished workpiece and tools	
Available space for maintenance work	
Adequate space around machine to open doors completely	
Required electrical power sources	
A level foundation strong enough to support the weight of the machine	
Appropriate distance from factory air ducting/inlets (Air Flow)	

## 2.5 Recommended Foundation

Construct an appropriate foundation, referring to [Table 2.5](#), [Table 2.6](#), [Figure 2.15](#) and [Figure 2.16](#).

Table 2.5 Recommended Foundation

Symbol *	Item	Description
-	Ground Resistance	5 ton/m <sup>2</sup> or above
-	Foundation Thickness	300mm
a	Machine Support Point	3 points
-	Machine Fixing Tool	3 points
b	Jet Anchor for Machine	6 points (M16: Jet Anchor)
c	Insulated Foundation from Surrounding Vibration	Small crushed stone
e	Jet Anchor for Tool Magazine A134 (Matrix)	4 points (M16: Jet Anchor)
f	Jet Anchor for Tool Magazine A219 (Matrix)	4 points (M16: Jet Anchor)
-	Foundation Reinforcing Bar	Vertical and Horizontal: $\phi 22\text{mm}$ (  <a href="#">NOTE 1</a> )
-	Recommended Concrete	FC180 standard and above (  <a href="#">NOTE 1</a> )
-	Rubble	Medium or large size crushed stones
-	Leveling Concrete Thickness	50mm (  <a href="#">NOTE 1</a> )
A	Concrete Weight of Foundation for Machine (Tool Magazine A40/A60/A99)	7.1tons
D	Concrete Weight of Foundation for Tool Magazine A134 (  <a href="#">NOTE 1</a> )	0.9ton
E	Concrete Weight of Foundation for Tool Magazine A219 (  <a href="#">NOTE 1</a> )	0.9ton

Indicates symbol (\*) used in [Figure 2.15](#) and [Figure 2.16](#).

NOTE:


- 1 These values are reference/recommended values.
- 2 When the machine is equipped with tool magazine A99 (ring), a support leg is required.
- 3 Machine fixing tools must be used to secure the machine to the floor when installing a matrix magazine, pallet magazine or MMC ( ["3.4 Machine Fixing Tool Installation"](#)).
- 4 Dimensions indicated in this foundation drawing are minimum requirements for a good solid installation foundation. The foundation drawings on the following pages show only the recommended values.
- 5 As this machine operates at high-speeds, vibration generated by machine operation may affect the surrounding area, depending upon the foundation and ground conditions. Consult a professional civil engineer to determine the final foundation dimension requirements as they vary according to the actual ground conditions and possible influence on the surrounding area.

Table 2.6 Foundation Area by Machine Specs.

Foundation Area	Machine Specifications
A	Foundation for Machine and Tool Magazine A40/A60/A99 (Ring)
A+D	Foundation for Machine and Tool Magazine A134 (Matrix)
A+D+E	Foundation for Machine and Tool Magazine A219 (Matrix)

**Tool Magazine A40/A60/A99 and Left-/Rear-Discharge Conveyor**

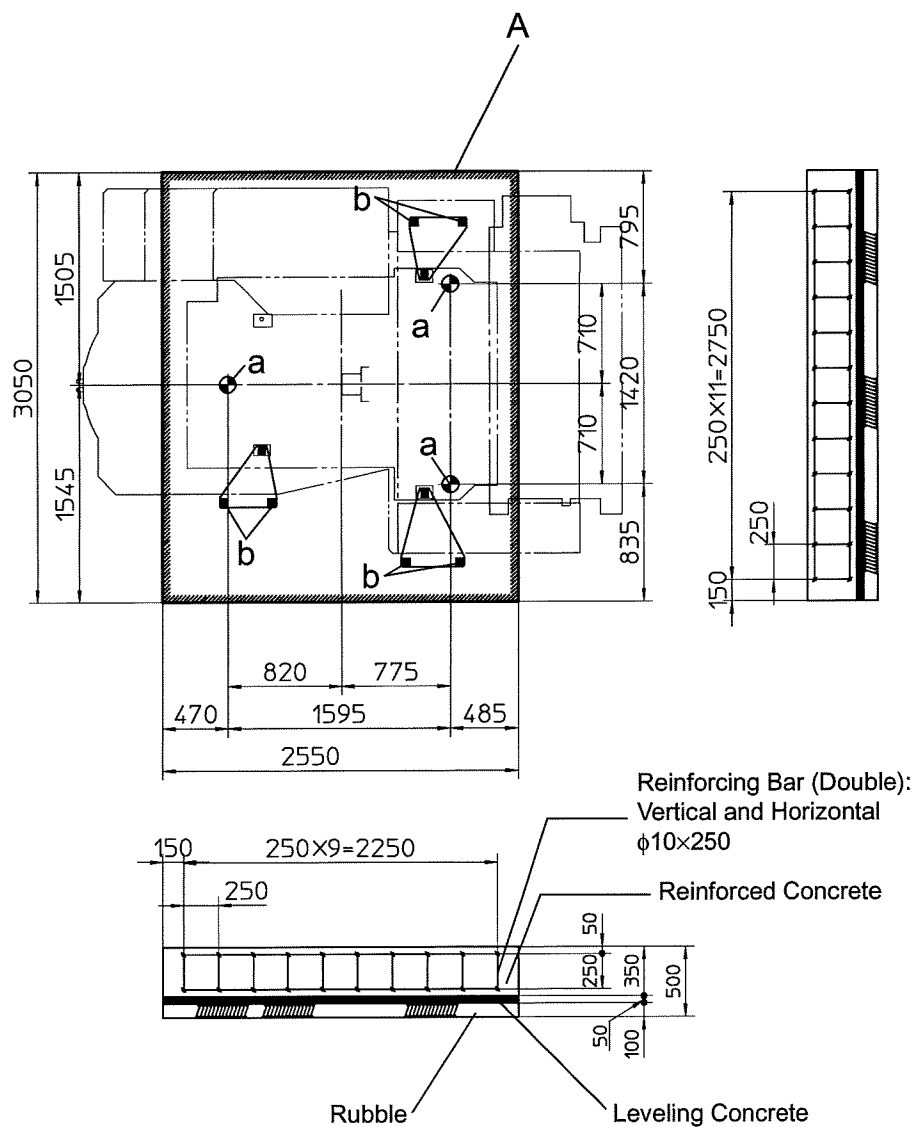


Figure 2.15 Foundation Drawing  
(Tool Magazine A40/A60 /A99 and Left-/Rear-Discharge Conveyor Specs.)

**Tool Magazine A134/A219 and Left/Rear-Discharge Conveyor**

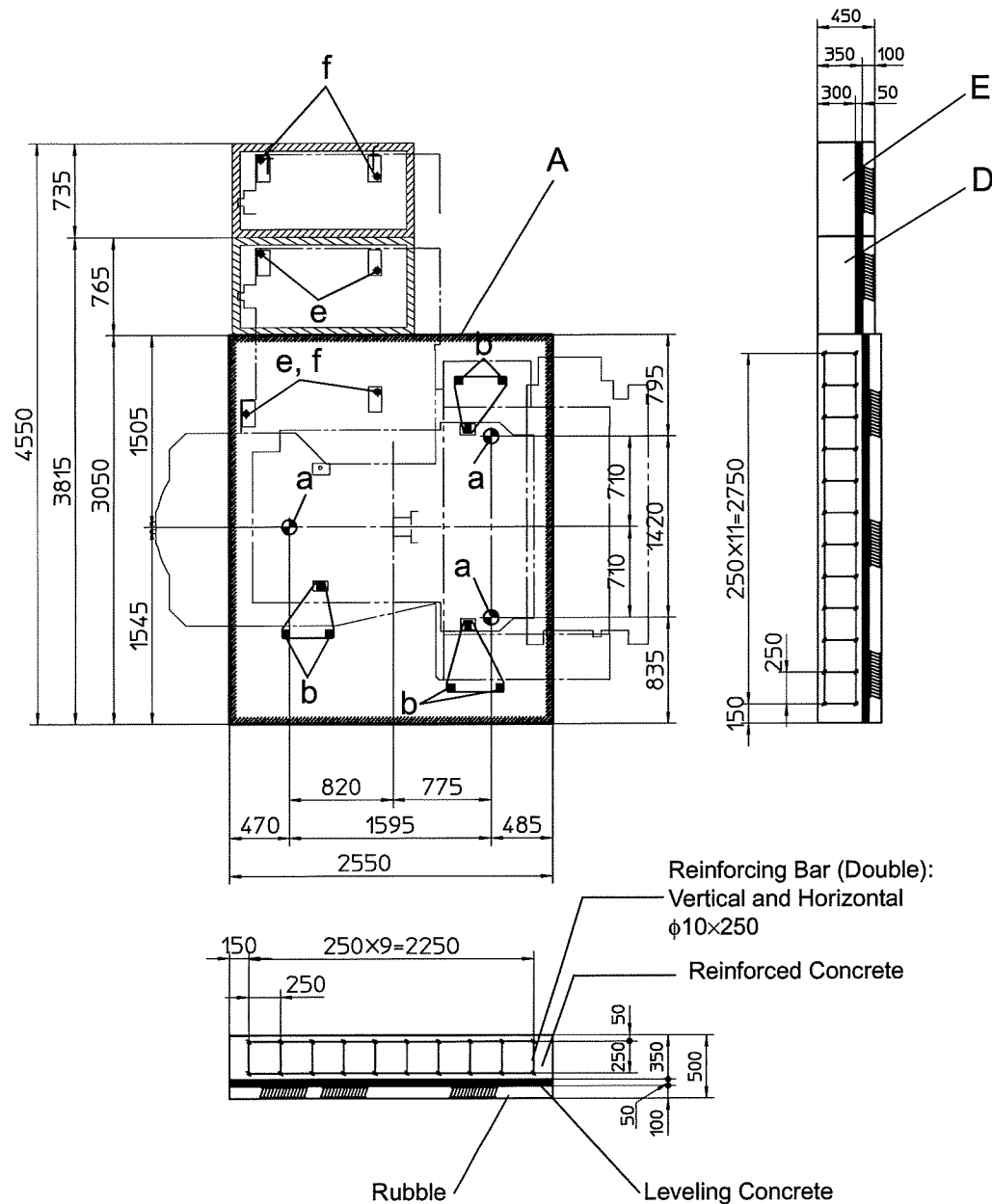


Figure 2.16 Foundation Drawing  
(Tool Magazine A134/A219 and Left-/Rear-Discharge Conveyor Specs.)

## 2.6 Air and Power Sources

Table 2.7 Air and Power Sources

Item	Description			
Electrical Source	AC200/220V ± 10% 50/60Hz ± 2%			
Maximum Power Consumption	48kVA (Standard) Approx. 93kVA (including options)			
Total Power Requirement	The actual power requirements are shown below: 48×0.6 = 29kVA (Standard) 93×0.6 = 56kVA (including options)			
Circuit Breaker	225A			
Power Cable	60mm <sup>2</sup> or more (600V insulated cables specified by JIS C3307) or 38mm <sup>2</sup> or more (600V-flame-retardant poly-flex insulated cables made by HITACHI cable SP39-10021J)			
Ground	Ground resistance 100Ω			
Ground Cable	30mm <sup>2</sup> or more (600V insulated cables specified by JIS C3307)			
Air Source	– 0.5~0.8MPa – 410L/min: ANR (Standard condition) – Dew point temperature: -20°C or less  NOTE: Clean air (free from solvent and iron rust) is required.  Equivalent to the grade ISO2.5.2 specified by ISO8573-1 (equivalent to JIS B 8392-1) - Max. particles number/1m <sup>3</sup> : Below 10 (diameter: 0.001< x ≤ 0.005mm) - Max. particles number/1m <sup>3</sup> : Below 1000 (diameter: 0.0005< x ≤ 0.001mm) - Max. particles number/1m <sup>3</sup> : Below 1000000 (diameter: 0.0001< x ≤ 0.0005mm) - Dew point at max. pressure: Below 7°C (Absolute Pressure: 0.8MPa) - Max. oil concentration: 0.1mg/m3 or less  NOTE: The machine requires the above air quality. The air filters are installed as a standard feature. Periodic maintenance must be performed to maintain an optimum air supply. When maintenance of the filters is neglected, filter pollution and damage to the filter may occur in a short period of time.  Required Air Flow (L/min: ANR)			
		Standard	Using Through Spindle Air Frequently	With Air Blow
	Standard (without scale)	410	600	660
	With Scale	460	690	750
	Air Dryer	Must be ordered except when prepared by customer.		
Air Filter	5μm + 0.3μm + water remover			

## Preparations for Installation

### Air and Power Sources

#### NOTE:

The air quality varies according to the factory circumstances. Use a particle counter to confirm that the air quality values satisfy the required values.

The air quality specified by ISO 8573-1 (equivalent to JIS B 8329-1) is recommended.

Earth Connecting Point  
Terminal Size: M8

Electric Power Source  
Connection Point  
Terminal Size: M8

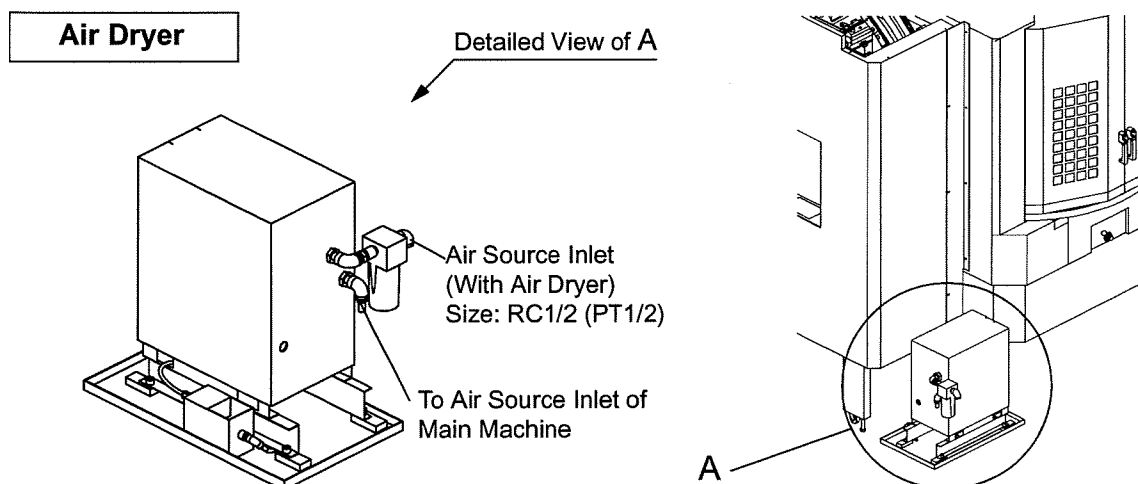
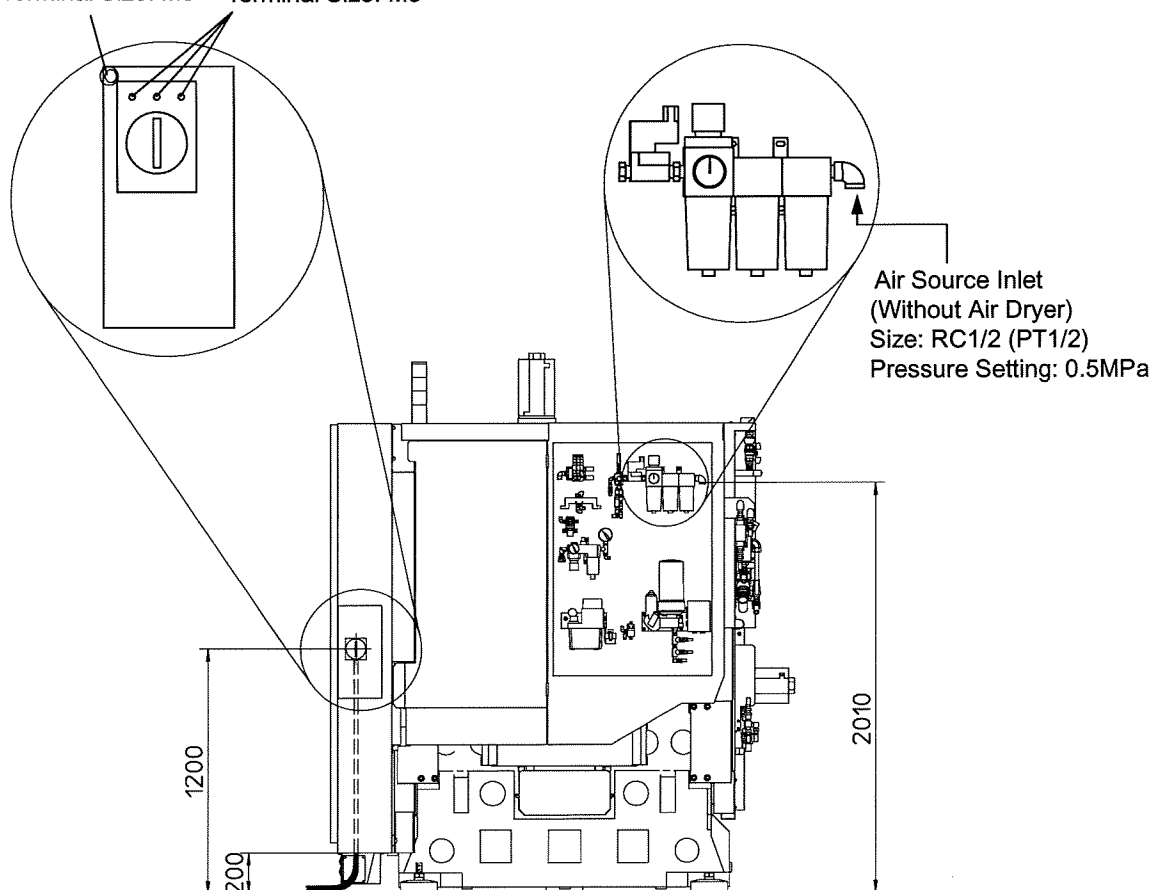


Figure 2.17 Power Source Connection Point and Air Source Inlet (With Air Dryer)

## 2.7 Preparation of Transportation/Installation Equipment

Prepare equipment such as a crane, fork lift truck, and casters/rollers, capable of supporting the size and withstanding the weight of the machine prior to machine transportation.

If the required transportation equipment cannot be prepared, contact your Makino service representative for further assistance.

Table 2.8 Required Equipment

Parts/Tools To Be Prepared
Transfer Equipment: Crane, Forklift, Lifting Equipment
Necessary Tools: Tools supplied standard with the machine
Measurement Tools: Precision Level, Indicator

Table 2.9 Machine Weigh

Item	Weight
Machine (Without Tool Magazine)	7400kg
Machine (Tool Magazine A40)	7600kg
Machine (Tool Magazine A60)	7800kg
Machine (Tool Magazine A99)	8500kg
Tool Magazine A134	2100kg
Tool Magazine A219	2700kg
Spindle Cooling Oil Temperature Controller (Ring Magazine and other than 20000min <sup>-1</sup> Spindle Specs.)	95kg
Spindle Lubricant Temperature Controller (20000min <sup>-1</sup> Spindle Specs.)	280kg
Spindle Cooling Oil Temperature Controller and Hydraulic Unit (Matrix Magazine and other than 20000min <sup>-1</sup> Spindle Specs.)	160kg
Hydraulic Unit (Ring Magazine Specs., Matrix Magazine and 20000min <sup>-1</sup> Spindle Specs.)	60kg
Coolant Tank Left Discharge (Through-Spindle 1.5MPa/Without Workpiece Cleaning Gun and Cutting Fluid Temperature Controller: Standard)	370kg
Coolant Tank Left Discharge (Through-Spindle 3.0MPa/Without Workpiece Cleaning Gun and Cutting Fluid Temperature Controller)	420kg
Coolant Tank Left Discharge (Through-Spindle 7.0MPa/Without Workpiece Cleaning Gun and Cutting Fluid Temperature Controller)	437kg
Coolant Tank Rear Discharge (Through-Spindle 1.5MPa/Without Workpiece Cleaning Gun and Cutting Fluid Temperature Controller: Standard)	610kg
Coolant Tank Rear Discharge (Through-Spindle 3.0MPa/Without Workpiece Cleaning Gun and Cutting Fluid Temperature Controller)	660kg
Coolant Tank Rear Discharge (Through-Spindle 7.0MPa/Without Workpiece Cleaning Gun and Cutting Fluid Temperature Controller)	677kg
* Add 13kg to coolant tank weight listed above when installing a workpiece cleaning gun or cutting fluid temperature controller.	



## 2.8 Required Manpower for Installation

The following table shows the minimum required manpower, time and the number of days for installation of the a51 machine. Prepare/reserve manpower necessary for installation by referring to the table below.

This work schedule may change for different installation environments and machine options.

Table 2.10 Work Schedule

Work Item	Required Manpower	Required Time (hrs/person)	Required Day (day/person)
Machine Installation	1	22	3
Tool Magazine A134/A219	2	4	1
Spindle Cooling Oil Temperature Controller and Hydraulic Unit (Other than 20000min <sup>-1</sup> Spindle Specs.)	1	1	1
Spindle Lubricant Temperature Controller and Hydraulic Unit (20000min <sup>-1</sup> Spindle Specs.)	1	1	1
Coolant Tank	1	4	1
Operation Checks After Installation	1	4	1

## 2.9 Inspection Prior to Installation and Precautions During Installation

The previous “Safety” chapter describes safety precautions for machine operation, maintenance and inspection in general. Read the “Safety” chapter thoroughly prior to installation.

This section specifically describes safety precautions for installation as well as what needs to be checked when performing installation. Read and understand this section and the “Safety” precautions thoroughly and observe the safety precautions to ensure safety.

### 2.9.1 Inspection Prior to Installation

Confirm the following points prior to installation work:

- Inspect for any machine damage.
- Check all attachments and accessory units with the shipping and packing check list.

### 2.9.2 Handling of Heavy Components

#### A Unassisted Lifting

Avoid lifting of heavy machine components by one person alone. Lift them with the help of two or more persons according to the circumstances. Use mechanical equipment such as a crane, electric forklift stacker, pallet trolley or chain block, depending on the requirements.

#### B Lifting with a Crane

The breakage of rope during the lifting of heavy components can result in the balance of heavy components being lost, and them falling. The falling of heavy components may cause irreparable damage to the components and may result in serious injury or death. Pay careful attention to the following points:

- Forklifts must always be operated by qualified personnel only.
- Do not attempt to enter the area under the lifted machine. Exercise extreme caution for the lifted machine while it is being transferred.
- Safety helmets and shoes must be worn at all times.
- All hook and linking tasks required for crane lifting must be performed by only qualified personnel.
- Use the crane within the range of its rated capacity.
- Use specialized tools where prescribed.
- Confirm the weight of the component to be lifted. Then, considering the presumed position of the center of gravity, attach wires guaranteed to carry the weight of the component and lift slowly, keeping the weight as stable as possible.
- Clearly indicate off-limit zones and keep all unauthorized personnel from entering these areas.

#### **C Forklift Lifting**

When using a forklift to carry heavy components, there is the danger of the load falling from the forks or overturning the forklift. Pay careful attention to the following points:

- Safety helmets and shoes must be worn at all times.
- Forklifts must always be operated by qualified personnel only.
- Use the forklift within the range of its rated capacity.
- Widen the forks as much as possible to allow the weight to be raised to be stable at as convenient a height as possible.
- Do not attempt to balance an un-balanced load with extra personnel riding on the opposite side of the forklift.
- When lifting a component with a forklift, stay out of the area for which entrance is prohibited.

#### **2.9.3 Working at Elevated Locations**

---

When working at high locations, falling can result in serious injury. Pay careful attention to the following points:

- Safety helmets and shoes must be worn at all times.
- Use stable steps or a stepladder. Do not stand on a pail, or cans or boxes stacked on top of each other.
- Extreme care should be taken to avoid slipping on oily surfaces, etc. and ensure stable working positions when performing tasks using both hands freely.
- Use a safety rope when performing tasks on the splashguard.

#### **2.9.4 Working in Confined Spaces**

---

When working in low or confined spaces, take care to avoid striking your head, shoulders or arms, or catching clothing on protruding machine parts. Proper work attire, a safety helmet and shoes must be worn at all times.

#### **2.9.5 Working in Groups**

---

When working in combination, lack of communication when turning ON the main power or operating the machine may result in death due to accidents such as electric shock, falling, or being caught between moving parts. Pay careful attention to the following points:

- Confirm the location and tasks being performed by other personnel and give a clearly audible warning when starting to operate the machine.
- Display clear work description warnings and signs in front of the crane operation panel, the main power switch and the main operation panel etc. so that the content of work can be understood.

### 2.9.6 Work Requiring Machine Operation

---



- Some installation procedures can only be performed by moving the machine. Ensure adequate precautions are taken at all times.
- Turn OFF the power supply except for some inspections that must be performed with the power ON.
- Perform “Lockout/Tagout” to prevent accidental operation of the machine by another person.

## 3 Main Machine Installation

### 3.1 Main Machine Transportation and Set-Up

Confirm the following points prior to installation work:

- Inspect for any machine damage.
- Check all attachments and accessory units with the shipping and packing check list.



- Keep the machine level.
- Lift no higher than necessary.
- Prevent impact with nearby objects.
- Do not remove the shipping jig prior to installation of the machine.
- All procedures are to be performed in pairs, and clear communication maintained at all times, to ensure operator safety.

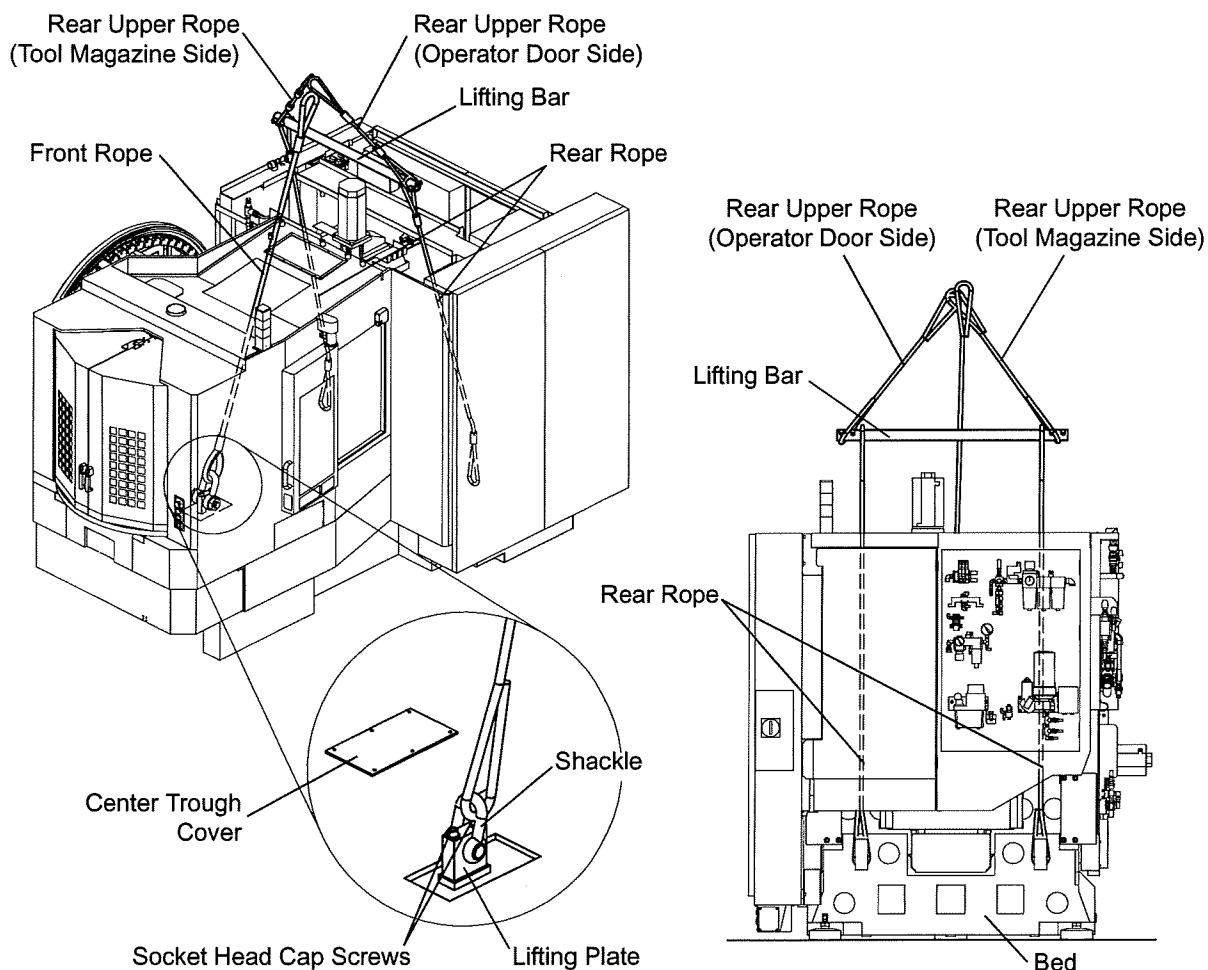


Figure 3.1 Lifting of Main Machine

**Parts/Tools To Be Prepared (Lifting/Transportation): For Tool Magazine A40/A60/A99**

Name	Part No.	Q'ty
Front Rope	21M74B705=1	ÇP
Rear Rope	21M74A702	2
Rear Upper Rope (Operator Door Side)	T13M-0734E	1
Rear Upper Rope (Tool Magazine Side)	T13M-0272E	1
Lifting Plate	T27M74AA701	1
Socket Head Cap Screw	Z271B1114130	2
Washer	Z275A1101400	2
Shackle	Z259B7240000	1
Lifting Bar	T13M-0269D	1

**Parts/Tools To Be Prepared (Lifting/Transportation): For Tool Magazine A134/A219**

Name	Part No.	Q'ty
Front Rope	21M74B705=1	1
Rear Rope	21M74A702	2
Rear Upper Rope (Operator Door Side)	T13M-0272E	1
Rear Upper Rope (Tool Magazine Side)	T13M-0272E	1
Lifting Plate	T27M74AA701	1
Socket Head Cap Screw	Z271B1114130	2
Washer	Z275A1101400	2
Shackle	Z259B7240000	1
Lifting Bar	T13M-0269D	1

**Parts/Tools To Be Prepared (Installation)**



Name	Part No.	Q'ty
Leveling Base	13M30B209	3
Leveling Bolt	13M30B424	3
Flat Point Set Screw	Z272A1112020	3
Protective Metal	13M30B703=1	3
Shaft (only Tool Magazine A99)	27M30C2021	1
Shaft Holder (only Tool Magazine A99)	Z392C1800001	1
Coil Spring (only Tool Magazine A99)	Z392F1840060	1
Washer (only Tool Magazine A99)	Z275A1102000	1
Adjuster Pad (only Tool Magazine A99)	Z392O1916130	1
Plate (only Tool Magazine A99)	27M30C2022	2

### 3.1.1 Main Machine Lifting and Set-Up

---

#### **Main Machine Lifting and Set-Up Procedure**

 [Figure 3.1](#), [Figure 3.2](#), [Figure 3.3](#)

- 1) Remove the top cover.
- 2) Remove the center trough cover.
- 3) Secure the lifting plate to the main machine (bed) with the two socket head cap screws and washers.
- 4) Mount the ropes to the lifting bar as shown in [Figure 3.1](#).
- 5) Lift the assembled lifting equipment using a crane, and move it near the main machine.
- 6) Insert the front rope from the top cover into the machining chamber side.
- 7) Mount the front rope onto the shackle and secure the shackle to the lifting plate.
- 8) Mount the two rear ropes to the bed on the rear side of machine.
- 9) Place the three leveling bases ( [Figure 3.8](#)) in which a leveling bolt is mounted on each of the three machine support points on the foundation.
- 10) Lift the machine carefully using a crane and place it as shown in [Figure 3.2](#).
- 11) Confirm the height between the floor and the main machine is 30mm~35mm ( [Figure 2.13](#)).

This completes the main machine lifting and set-up procedure.

Next, remove the lifting equipment ( ["3.1.2 Lifting Equipment Removal"](#)).



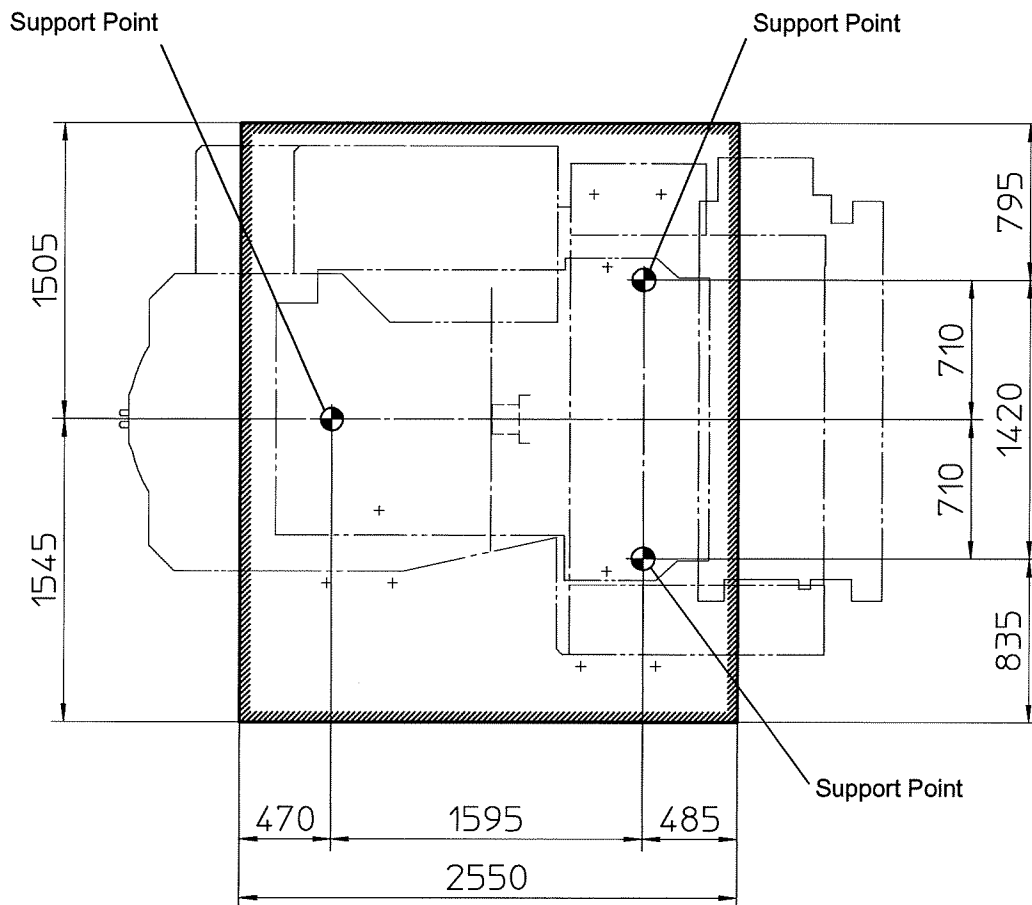


Figure 3.2 Main Machine Installation

### 3.1.2 Lifting Equipment Removal

---

#### Removal Procedure [Figure 3.1](#), [Figure 3.3](#)

- 1) When the main machine is placed on the foundation as specified, perform the main machine lifting and set-up procedure in step 3–8 in reverse order to remove the ropes from the main machine.
- 2) Lift the assembled lifting equipment using a crane, and move it outside of the main machine.
  - Take precautions to prevent the front rope from hitting the ceiling window [2] of the machining chamber.
  - Take precautions to prevent the rear rope from hitting the parts inside of the column chamber.
- 3) Mount the center trough cover.
  - Mount the gasket on the center trough cover and apply silicon to prevent coolant leakage.
- 4) Mount the top cover [1].

This completes the lifting equipment removal procedure.

Next, remove the shipping jigs (  ["3.2 Shipping Jig Removal/Motor Installation"](#) ).

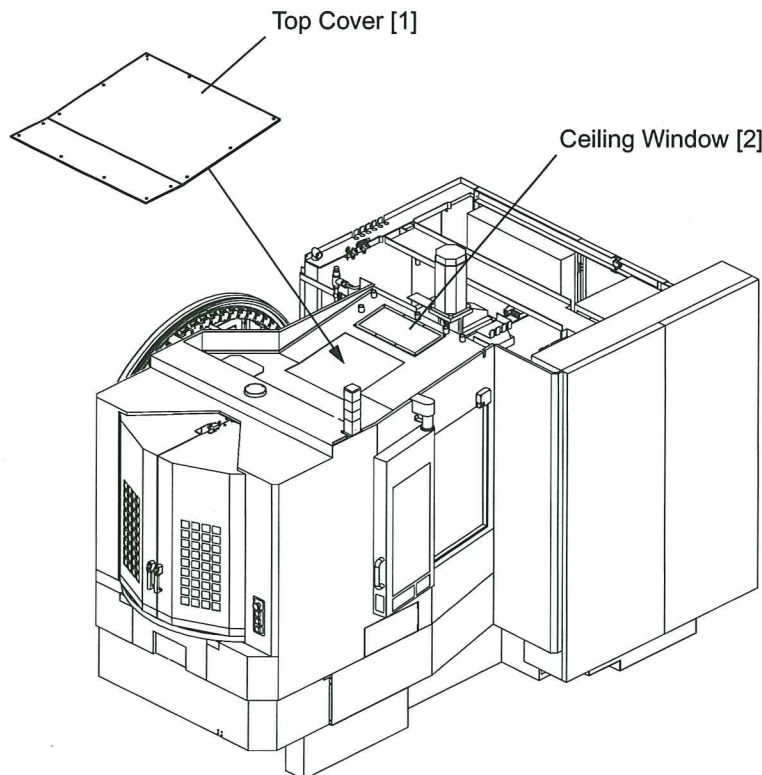


Figure 3.3 Lifting Equipment Removal