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Productivity Inc®

Makino S33-S56 PRE-INSTALLATION CHECKLIST – *Rev 02/2009*

Installation of your new Makino S33-S56 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 to install your new machine.***

- Power Requirements for your machine: 230v or 460v, 3 ph, 40 kVa
  A 3-phase power source, with stable voltage regulation (+/-10%), a ground of 25 ohms or less and a 125A breaker must be provided. Proper voltage per machine specifications should be ready at machine site. ***Do NOT power up the machine. (See also the Makino Pre-Installation Manual for additional information.)***

- Customer should furnish and have available the proper supply and types of lubricants required for machine operation.

ITEM	CAPACITY	FLUID TYPE
Coolant	79.2 gal	Water Soluble, Synthetic
Makino Spindle Oil	12 gal	Mobil Velocite #3
See Makino Lubrication Instruction Chart for details on fluids in the Installation Manual.		

NOTE: The machine will come with Makino Spindle Oil in the machine. You will need Coolant on hand at the time of installation. Contact our Service Department if you have any questions

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

72-116 psi @ 14.13 cfm of DRY air supplied through a minimum supply pipe of ½" 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/maintenance access.***

- Weight requirements should be checked to insure that the foundation 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 generally suitable for machine placement.

- ***The Makino S33 or S56 are best moved using a Fork Lift. See Makino Install/Delivery documentation for lifting instructions. **NOTE 1: LIFTING EQUIPMENT, ROPES, SCHACKLES, LIFTING BARS, LIFTING BEAMS, ETC. ARE OPTIONAL EQUIPMENT AND ARE NOT PROVIDED WITH THE MACHINE. ITEMS MUST BE PURCHASED PRIOR TO MACHINE DELIVERY IF LIFTING WITH OVERHEAD/CRANE. Upon arrival of your machine, uncrate and immediately check for visible damage.***

SHIPPING WEIGHT	SHIPPING DIMENSIONS OF MACHINE
16,090# (**S33** mach)	114" L x 90" W x 103" H (**S33** Machine skidded/wrapped, w/Chip Conveyor)
661# (accessory)	89" L x 49" W x 43" H (crate/accessory)
330# (accessory)	31" L x 27" W x 36" H (Transformer – ships separately from Makino)
15,873# (**S56** mach)	119" L x 91" W x 100" H (**S56** Machine skidded/wrapped, w/Chip Conveyor)
827# (accessory)	130" L x 48" W x 72" H (crate/accessory)
728# (accessory)	31" L x 28" W x 31" H (Transformer – ships separately from Makino)
132# (accessory)	53" L x 39" W x 20" H (accessory crate)
860# (accessory)	42" L x 34" W x 70" H (accessory crate)
See Makino Installation Manual for machine layout/floor space requirements.	

- **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.**

3. Specifications

3.1 Introduction

This chapter contains the specifications for the machine's main components (units), the general arrangement of the machine, floor plan dimensional drawings, Makino Pro 5 control, tooling and various optional features. The outline view of S-Series machine is shown in Figure 3.2.1a and Figure 3.2.1b.
The specifications indicated are subject to change without prior notice as part of continuous design improvement and market requirements.

Information Subject to Change

Every effort is made to ensure the accuracy of the data presented in this chapter at the time of its publication. Machine & control specifications are subject to change without prior notification as part of continuous design improvement and market requirements. For the exact machine specific details please refer to the specifications for which your machine has been ordered and supplied.

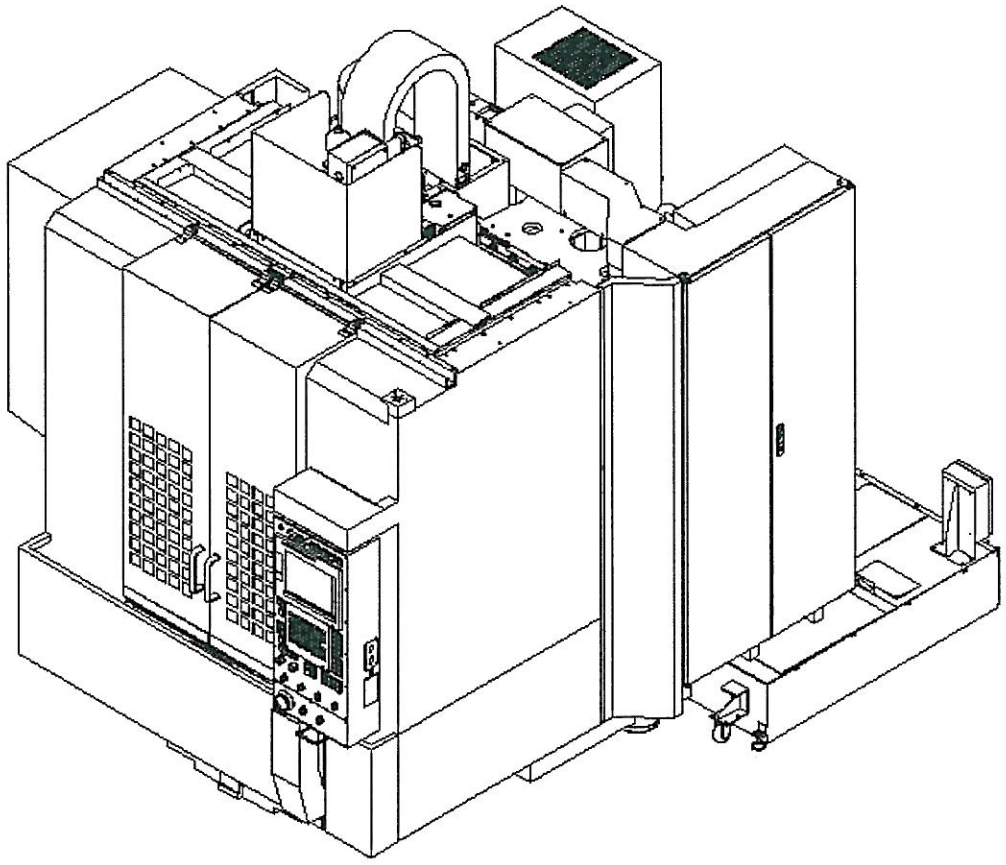

Figure 3.2.1a: S33/S56 Machine General View

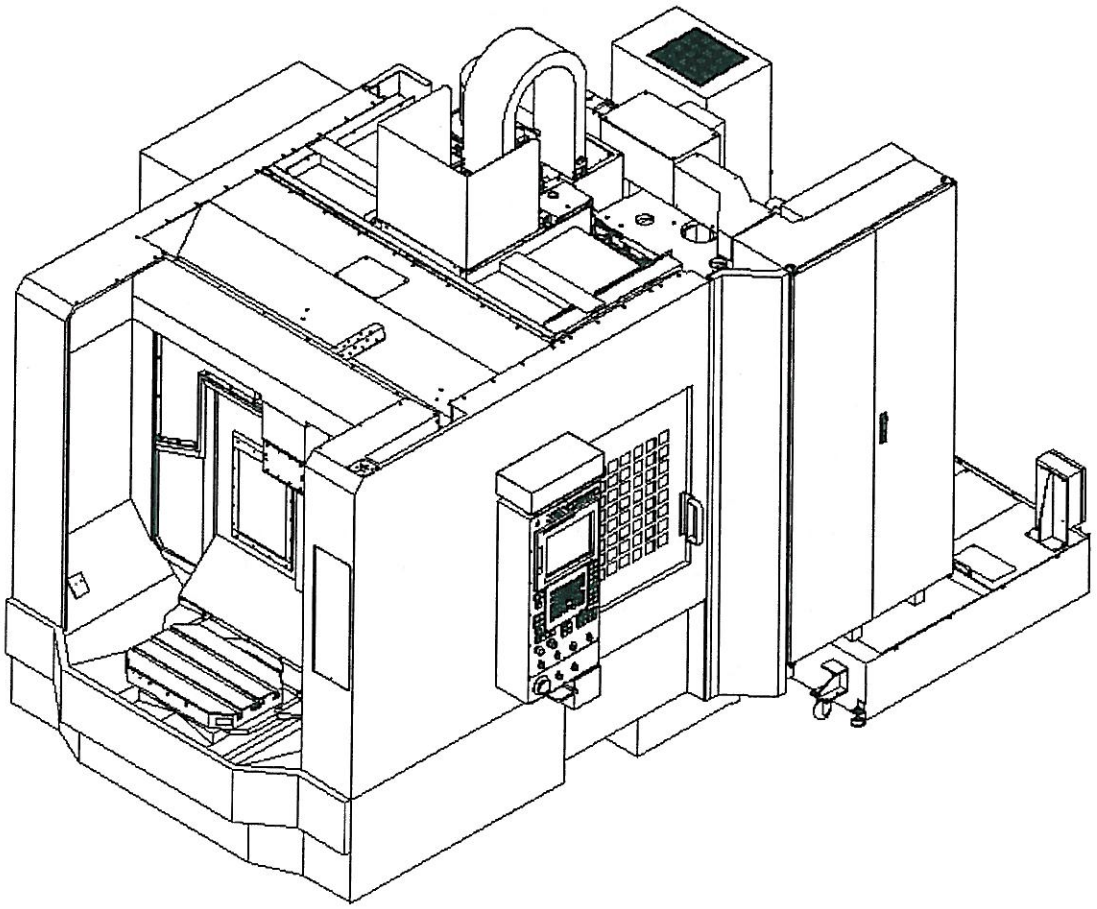

Figure 3.2.1b: S33 APC Machine General View

3.2 Mechanical and Electrical Specification

The table below outlines the brief general machine specification.

MACHINE STROKES				
Axes Travel X, Y, Z (S33 & S33 APC)	650x500x450	mm	25.59x19.68x17.72	in
Axes Travel X, Y, Z (S56)	900x500x450	mm	26.77x19.68x17.72	in
Table Top to Spindle Face	150 ~ 600	mm	5.9 ~ 23.63	in
Pallet Top to Spindle Face (S33 APC)	120 ~ 570	mm	4.72 ~ 22.44	in

MACHINE TRAVERSE RATES				
Rapid Transverse X, Y, Z	40	m/min	1574.8	in/min
Axis Feed Rate	1~40000	mm/min	1 ~ 1574.8	in/min

TABLE/PALLET				
Size of Table (S33)	850x500	mm	33.46x19.68	in x in
Size of Table (S56)	1000x500	mm x mm	39.37x19.68	in x in
Size of Pallet (S33 APC)	600x400	mm x mm	13.23x15.75	in x in
Table Load Capacity (S33 & S56)	650	kg	1433	lbs
Pallet Load Capacity (S33 APC)	400	kg	882	lbs
Maximum Work Size on Table (S33)	850x500x450	mm x mm x mm	33.46x19.68 x17.72	in x in x in
Maximum Work Size on Table (S56)	1000x500x450	mm x mm x mm	39.37x19.68x17.72	in x in x in
Maximum Work Size on Pallet (S33 APC)	600x400x420	mm x mm x mm	26.77x15.75x16.56	in x in x in
T-Slot Size	18H8	mm	0.70866H8	in
T-Slot Pitch	100	mm	3.94	in
Tapped Hole Size	M16		-	

SPINDLE HEAD 12,000 rpm (standard)					
Spindle Speed Range	120 ~ 12000 (ASPAC) / 130 ~ 13000 (US)				rpm
Spindle Power 15min/cont	22/18		kW	29.5/24.14	hp
Maximum Torque (15min/cont)	117/95		Nm	1035.5/840.8	lbf-in
Spindle Nose	MAS 403-BT40 / DIN 69871-A40 / JIS B6339-40T				
Spindle Oil Cooling System	Jacket Cooling				
Tool Clamp Force	8800 ±5%		N	1978 ±5%	lbf
SPINDLE HEAD 20,000 rpm (optional)					
Spindle Speed Range	200 ~ 20000				rpm
Spindle Power (30min/cont)	15/11		kW	29.5/24.14	hp
Maximum Torque (5min/cont)	32/19		Nm	283.2/168.2	lbf-in
Spindle Nose	MAS 403-BT40 / DIN 69871-A40 / JIS B6339-40T / HSK-A63				
Spindle oil cooling system	Core Cooling				
Tool Clamp Force	BT40	8800 ±5%	N	1978 ±5%	Lbf
	HSK	17600 ±5%		3957 ±5%	

ATC		
No. of Tools	20 / 30 (option)	
Tool Change Time	1.3 (tool to tool)	sec
Max. Tool Diameter	114 / 76.2 (ATC20 / ATC30) 130 (with alternate pocket empty)	mm
Max. Tool Length	300	mm
Max. Tool Weight	8	kg

APC		
No. of Pallets	2	
Changing Method	Hydraulic Driven Rotary Arm	
Pallet Change Time	7	sec

PNEUMATIC SUPPLY				
Min. Pressure	5	kg/cm^2	71	lbs/in^2
Consumption	0.4	m^3/min	106	gal/ min

POWER SUPPLY		
200/220 V	3 phase, 50/60 Hz	40 KVA

EQUIPMENT POWER CHART				
Spindle (12K)	22/18	kW	29.5/24	hp
Spindle (20K)	15/11	kW	20.1/14.7	hp
Axis Feed - X-axis	4.2	kW	5.6	hp
Axis Feed - Y-axis	4.2	kW	5.6	hp
Axis Feed - Z-axis	4.2	kW	5.6	hp
ATC Magazine	0.5	kW	0.7	hp
Spindle Cooler (12K)	1.6	kW	2.1	hp
Spindle Cooler (20K)	3.07	kW	4.1	hp
Coolant Pump - Nozzle Coolant/ Work Washing Gun	0.925	kW	1.2	hp
Coolant Pump - Coolant Flush	0.925	kW	1.2	hp
Coolant Pump - Shower Coolant	0.925	kW	1.2	hp
Coolant Pump - Through Spindle Coolant – 1.5Mpa	2.2	kW	3.0	hp
Coolant Pump - Through spindle Coolant – 3.0Mpa	3.7	kW	4.7	hp
Chip Conveyor - Lift Up Type	1.1	kW	1.5	hp
Chip Conveyor - Central Trough Screw Type	0.25	kW	0.3	hp
Hydraulic Unit	1.5	kW	2.0	hp

CUTTING CHIP DISPOSAL OPTIONS			
Reservoir Capacity		300 l	79.2 gal.
Nozzle Coolant	Pressure	0.2 MPa	29 psi
	Volume	80 l/min.	23.8 gal/min.
Coolant Flush	Pressure	0.2 MPa	29 psi
	Volume	80 l/min.	23.8 gal/min.
Through Spindle Coolant	Pressure	1.5 MPa	217 psi
	Volume	13 l/min.	3.4 gal/min.
Overhead Shower	Pressure	0.2 MPa	29 psi
	Volume	80 l/min.	23.8 gal/min.
Work Wash Gun	Pressure	0.2 MPa	29 psi
	Volume	80 l/min.	23.8 gal/min.

SIZE OF MACHINE				
Machine Height	3063	mm	120.6	in
Size of Required Floor Space:				
Standard (W x D)	2445x3430	mm	96.2x135.0	in
With APC (W x D)	2445x4244	mm	96.2x167.1	in
Machine Weight:				
Standard	7500	kg	16,534	lbs
With APC	8500	kg	18,739	lbs

3.3 Makino Professional 5 and Control Specifications

Axes control
Number of simultaneous controllable axes
Optional max. no. of simultaneous controllable axes
Input command
Automatic recognition of EIA RS244 / ISO0840 tape code
Max. programmable dimension
Absolute/incremental programming G90, G91
Decimal point/calculator type decimal programming
Programming plane selection G17, G18, G19
Least input increment
Inch/metric conversion G20, G21
Interpolation
Positioning G00
Linear interpolation G01
Circular interpolation G02, G03
Exponential interpolation G02.3, G03.3
Polar coordinate interpolation G12.1, G13.1
Cylindrical interpolation (require rotary table) G07.1
Helical interpolation G02, G03
Involute interpolation G02.2, G03.2
Hypothetical axis interpolation G07
Conical/spiral interpolation G02, G03
NURBS interpolation G06.2
Feed
Cutting feedrate clamp : F direct command
Cutting feedrate override%
F 1-digit code feed (F1 ~ F9)
Jog override
Dwell (per second) G04
Feedrate override cancel M48/M49
Program Memory, Edit
Program number search
Sequence number search
Parity check (horizontal & vertical)
Part program storage memory - 160m/320m/640m/1280m/2560m
Number of registerable program – 63/125/200/400/1000

Part program editing
Background editing
Extended part program editing
Operation, Display
Automatic operation (memory)
Machining time stamp
Clock, calendar function
Run-hour and part count display
Dynamic graphic display
DNC operation
MDI unit standard full key
12.1" color LCD
Manual pulse generator on Operator panel
I/O Functions
Data Input/Output interface - Channel 1 (RS-232C) / Channel 2 (RS-232C)
S,M,T Function
Miscellaneous (auxiliary) function M x-digit
Spindle speed direct S-code
Tool function
Tool Compensation
Tool offset pairs – 64/99/200/400/499/999/
Tool offset memory B (Geometry/wear)
Tool offset memory C (Geometry/wear, cutter/tool length)
Tool offset
Cutter compensation B
Cutter compensation C G41, G42/G40
Coordinates
Reference position return G28
Reference position return check G27
2nd reference position return G30
3rd/4th reference position return G30
Floating reference position return G30.1
Machine coordinate system selection G53
Workpiece coordinate system selection G54 ~ G59
Workpiece coordinate system preset G92.1

Addition of workpiece coordinate system - 48 pairs G54.1 (P1 ~ P48)
Addition of workpiece coordinate system - 300 pairs G54.1 (P1 ~ P300)
Automatic return from reference position G29
Coordinates
Local coordinates setting G52
Work coordinate system setting G92
Machine coordinate selection
Manual reference position return
Operation support
Label skip
Additional block skip - 9 blocks
Manual absolute ON and OFF
Auxiliary function lock
Tool length measurement
Help function
Machine lock
Data protection key
Mirror image for X-axis and Y-axis M21, M22/M23
Block skip
Optional stop M01
Program stop M00
Z-axis feed neglect
Follow up
Sequence number comparison and stop
Program restart
Dry run
Single block
Manual handle interruption
Skip G31
High-speed skip
Programming support
Normal direction control G41.1, G42.1/G40.1
Gentle normal direction control
Polar coordinate command G15/G16
Chamfering / corner R
Programmable data input (offset, parameter) G10
Sub program call (4 folds nested)

Custom macro B (82 common variables)
Addition of custom macro common variables #100 ~ #199
Addition of custom macro common variables #500 ~ #999
Interruption type custom macro
Canned cycles for drilling
Small-hole peck drilling cycle
Circular interpolation by R programming
Scaling G51/G50
Coordinate system rotation G68, G69
Programmable mirror image G51.1/G50.1
Rigid tapping G84.2, G84.3, M135
Programming support
Playback
Tapping mode G63
Cutting mode G64
Exact stop mode G61
Exact stop G09
Machine Accuracy Compensation
Backlash compensation
Stored pitch error compensation
Single direction positioning G60
Safety and Maintenance
Interlock
Self-diagnosis function
Alarm history display
Emergency stop
Stored stroke check 1
Professional 5
GI control
GI.3 control
Data server
Super GI control
Adaptive control function (AC)
Spindle load monitoring function (SL)
Tool life monitoring function (TL)
Direct spare tool exchange function

One touch switches
Alarm recovery guidance
Display of LS and SOL position & relevant signals
PMC alarm history display
Scheduled maintenance prompt

The specifications indicated are subject to change without prior notice as part of continuous design improvement and market requirements. For the exact machine specific details, please refer to the specifications for which your machine has been ordered and supplied.

3.4 General View and Dimensional Drawings

Different important views and machine dimensional drawings for different options of S-Series machine are outlined in this chapter. Figure 3.4.1a shows the machine general view and assemblies for S-Series machine without APC (S33 and S56) and Figure 3.4.1b for S33 (APC) machine.

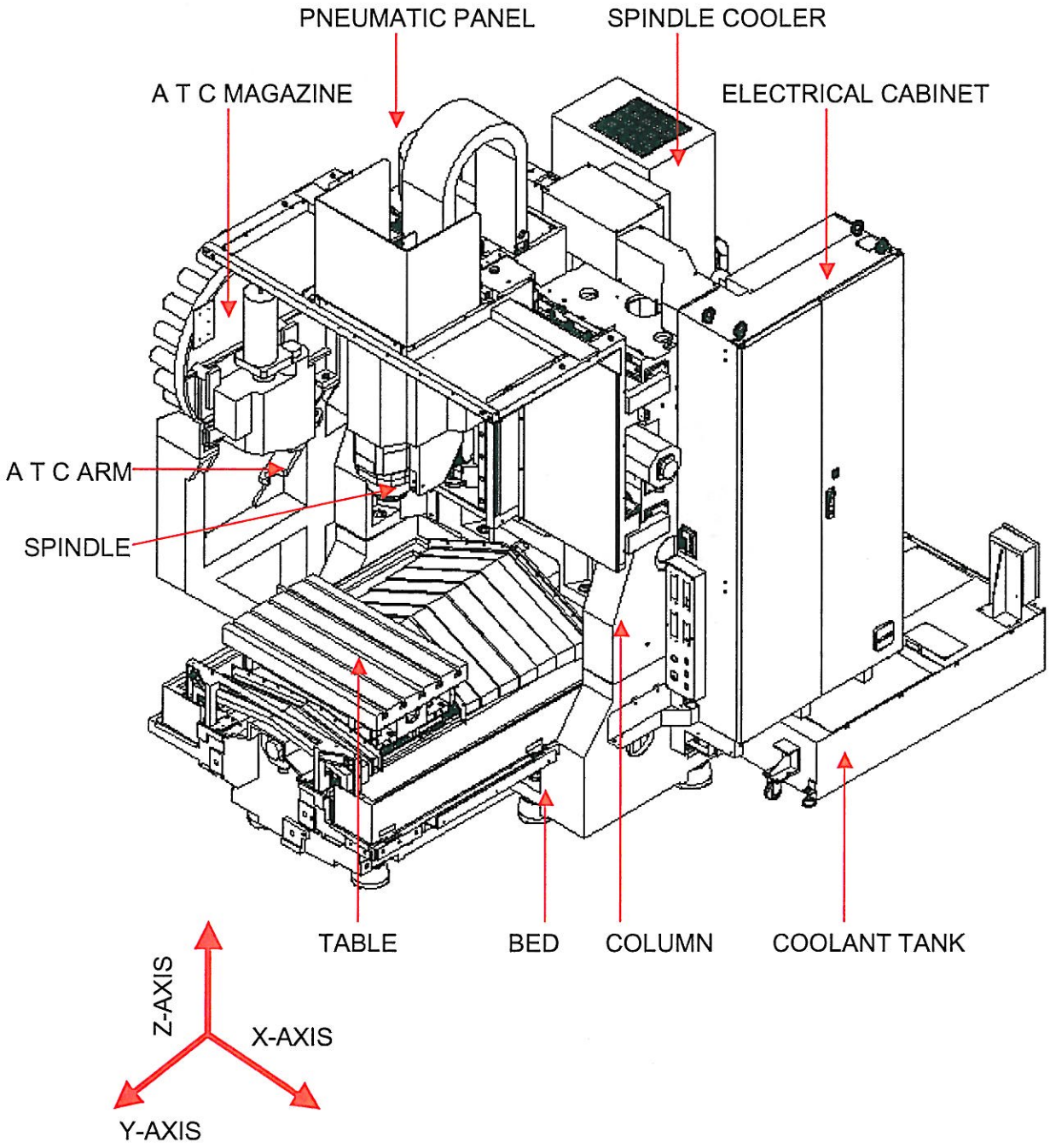

Figure 3.4.1: S33/S56 General View

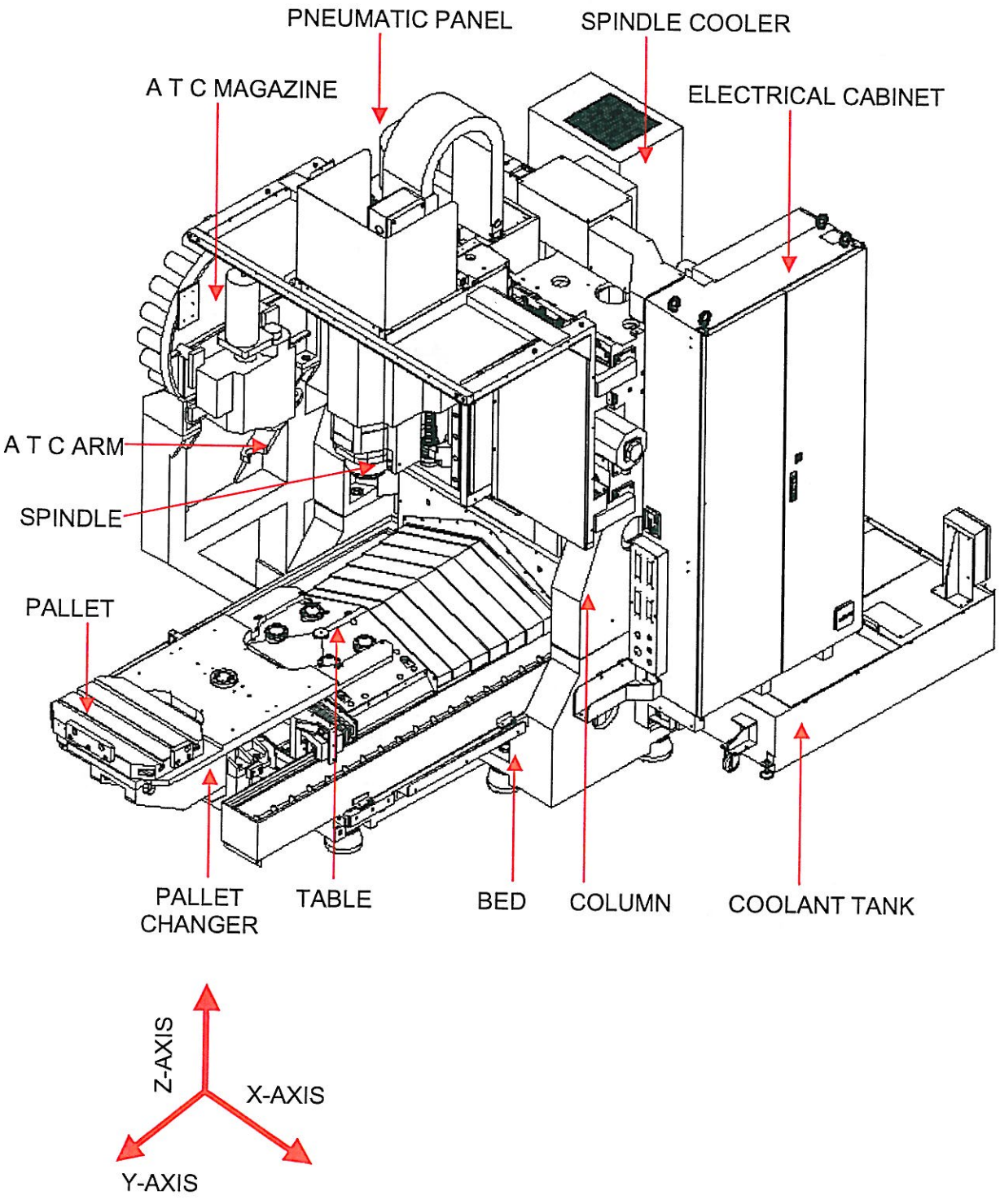

Figure 3.4.2: S33 APC General View

Table 3.4.1 S-Series general view and dimensional drawings for different options

S/N	Description	Figure Number
1	S33 Floor Layout (Coolant Tank Chip Tray without Options)	3.4.3
2	S33 Front and Side View	3.4.4
3	S56 Floor Layout (Coolant Tank Chip Tray without Options)	3.4.5
4	S56 Front and Side View	3.4.6
5	S33 APC Floor Layout (Coolant Tank Chip Tray without Options)	3.4.7
6	S33 APC Front and Side View	3.4.8
7	S33 Floor Layout (Left LUCC without Options)	3.4.9
8	S33 Floor Layout (Left LUCC with Options)	3.4.10
9	S56 Floor Layout (Left LUCC without Options)	3.4.11
10	S56 Floor Layout (Left LUCC with Options)	3.4.12
11	S33 APC Floor Layout (Left LUCC without Options)	3.4.13
12	S33 APC Floor Layout (Left LUCC with Options)	3.4.14
13	S33 Work Area	3.4.15
14	S56 Work Area	3.4.16
15	S33 APC Work Area (2 pages)	3.4.17

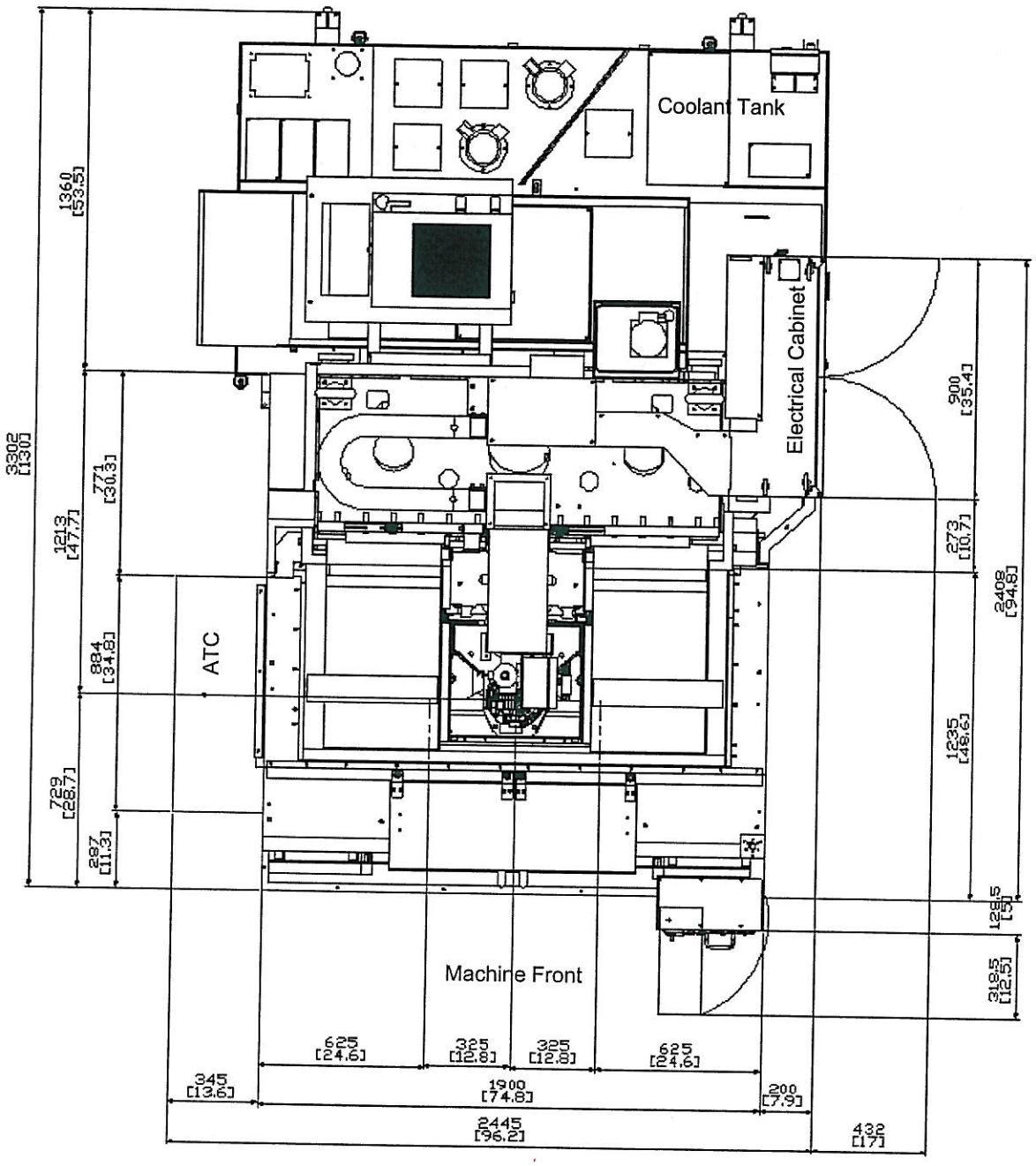

Figure 3.4.3: S33 Floor Layout (Coolant Tank Chip Tray without Options)

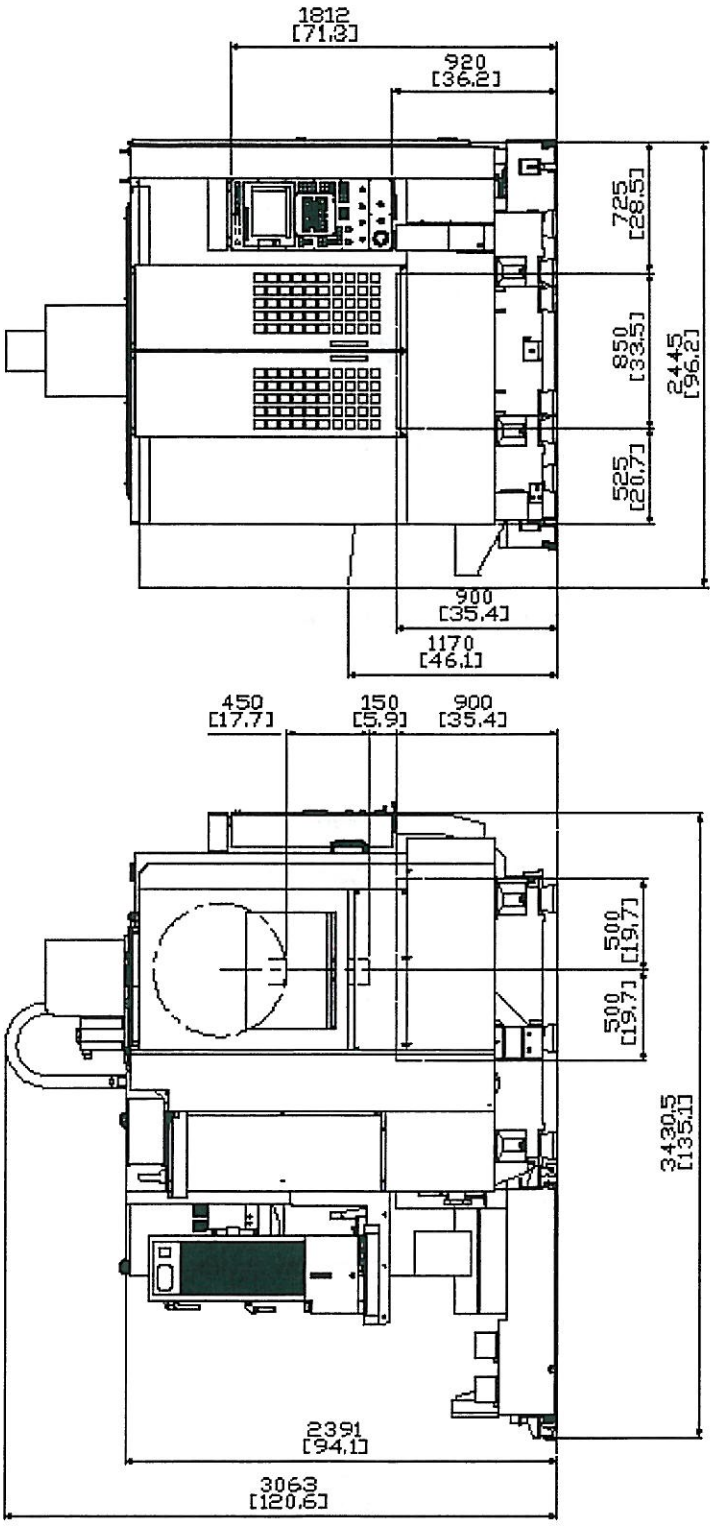

Figure 3.4.4: S33 Front and Side View

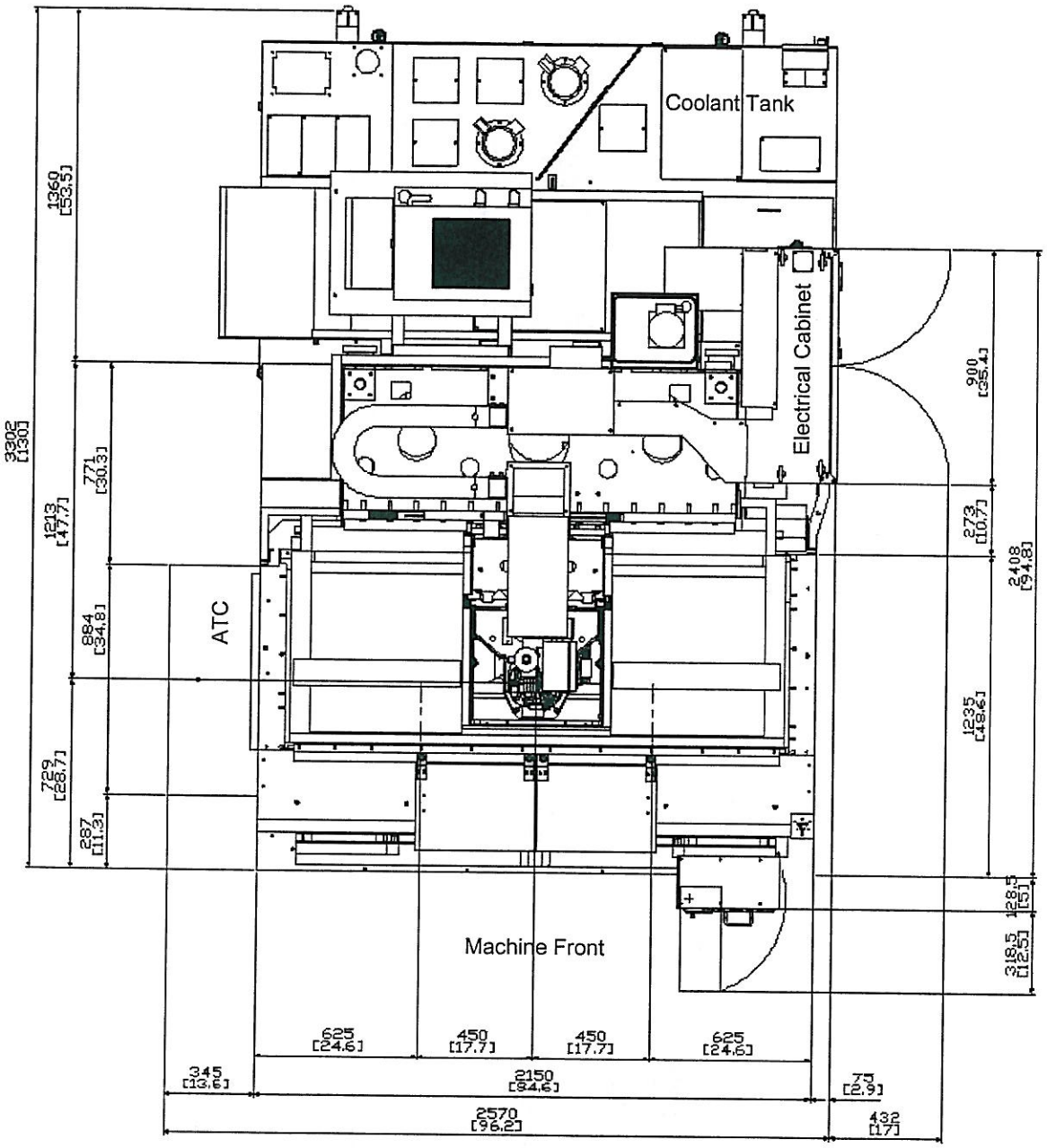

Figure 3.4.5: S56 Floor Layout (Coolant Tank Chip Tray without Options)

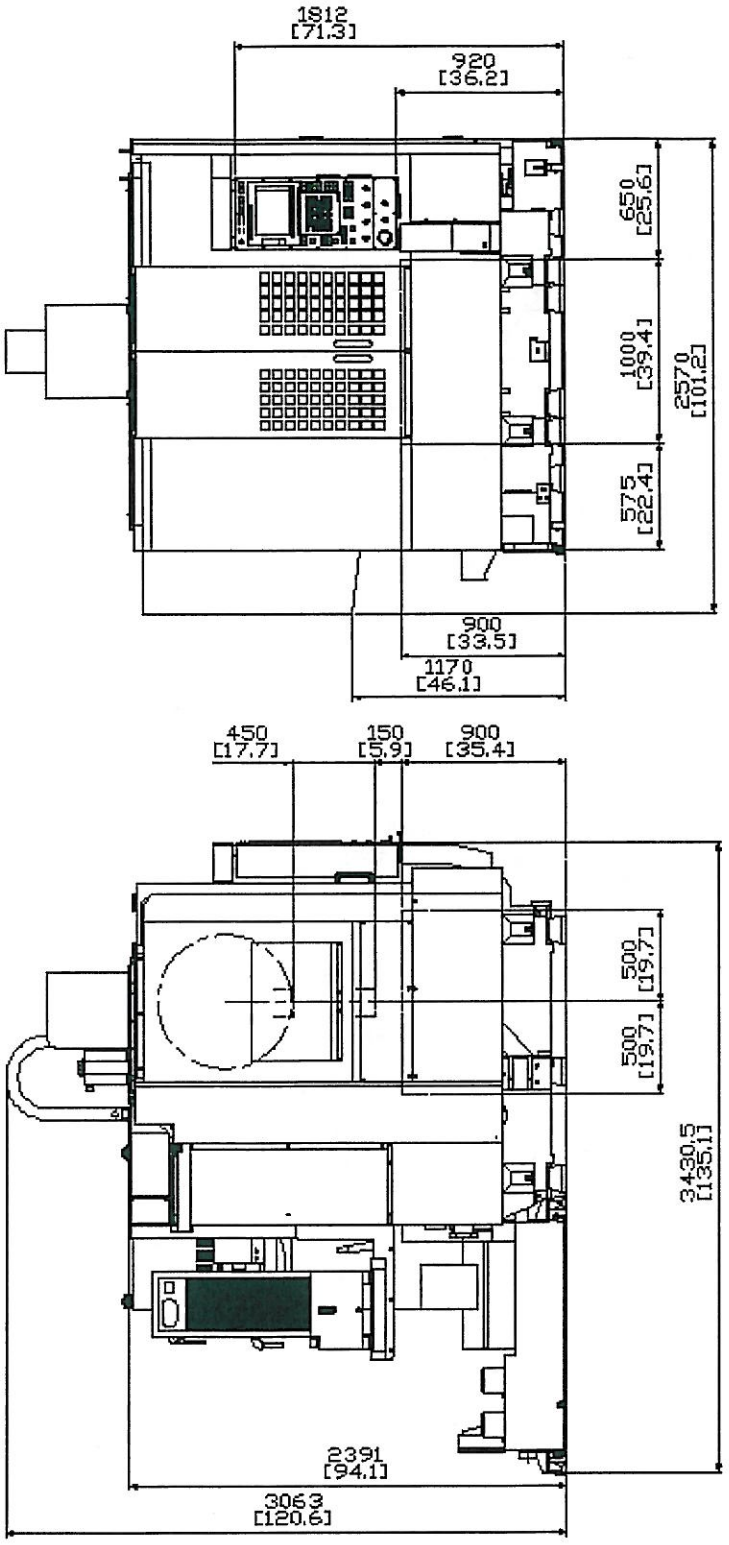

Figure 3.4.6: S56 Front and Side View

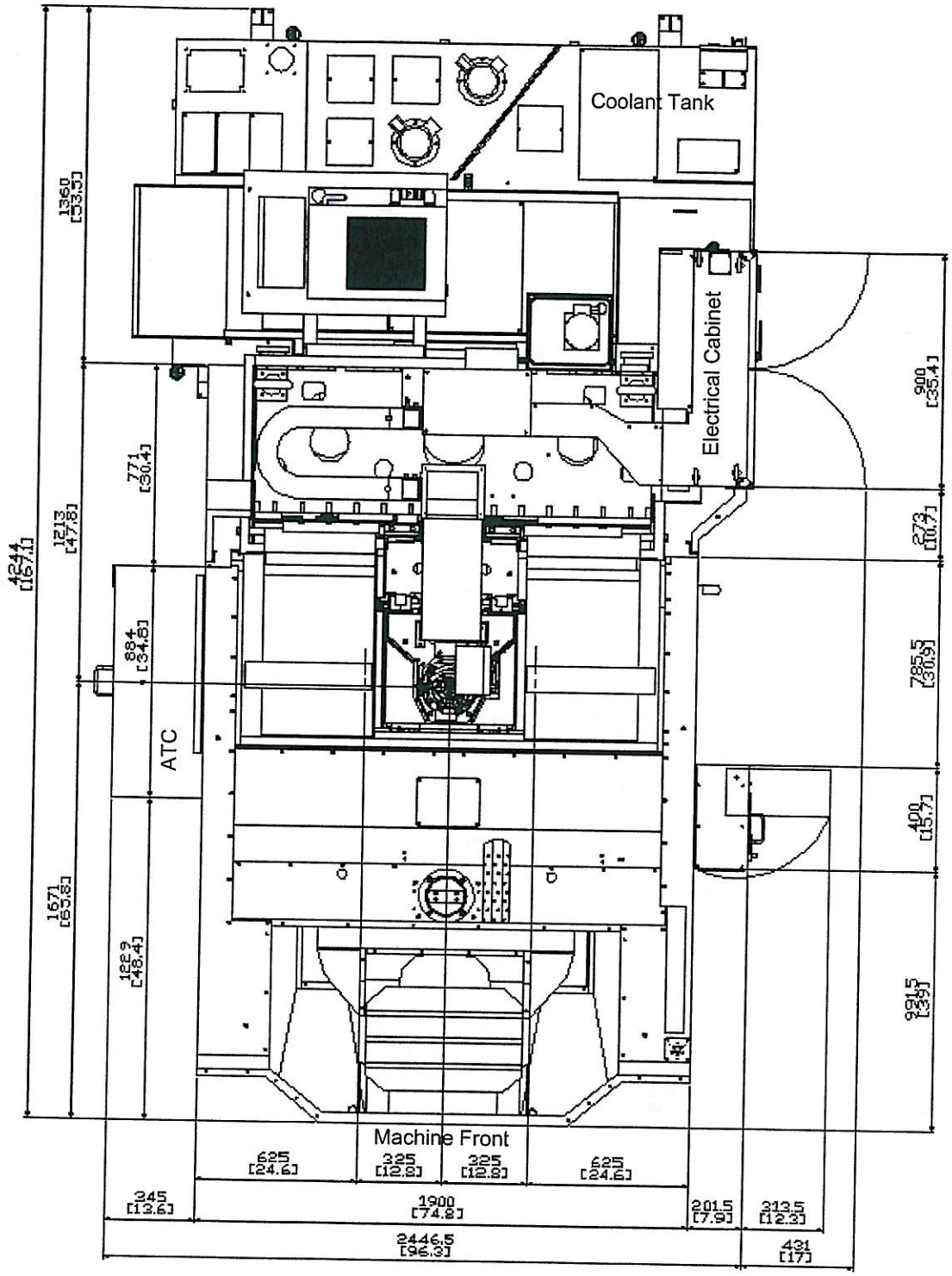

Figure 3.4.7: S33 APC Floor Layout (Coolant Tank Chip Tray without Options)

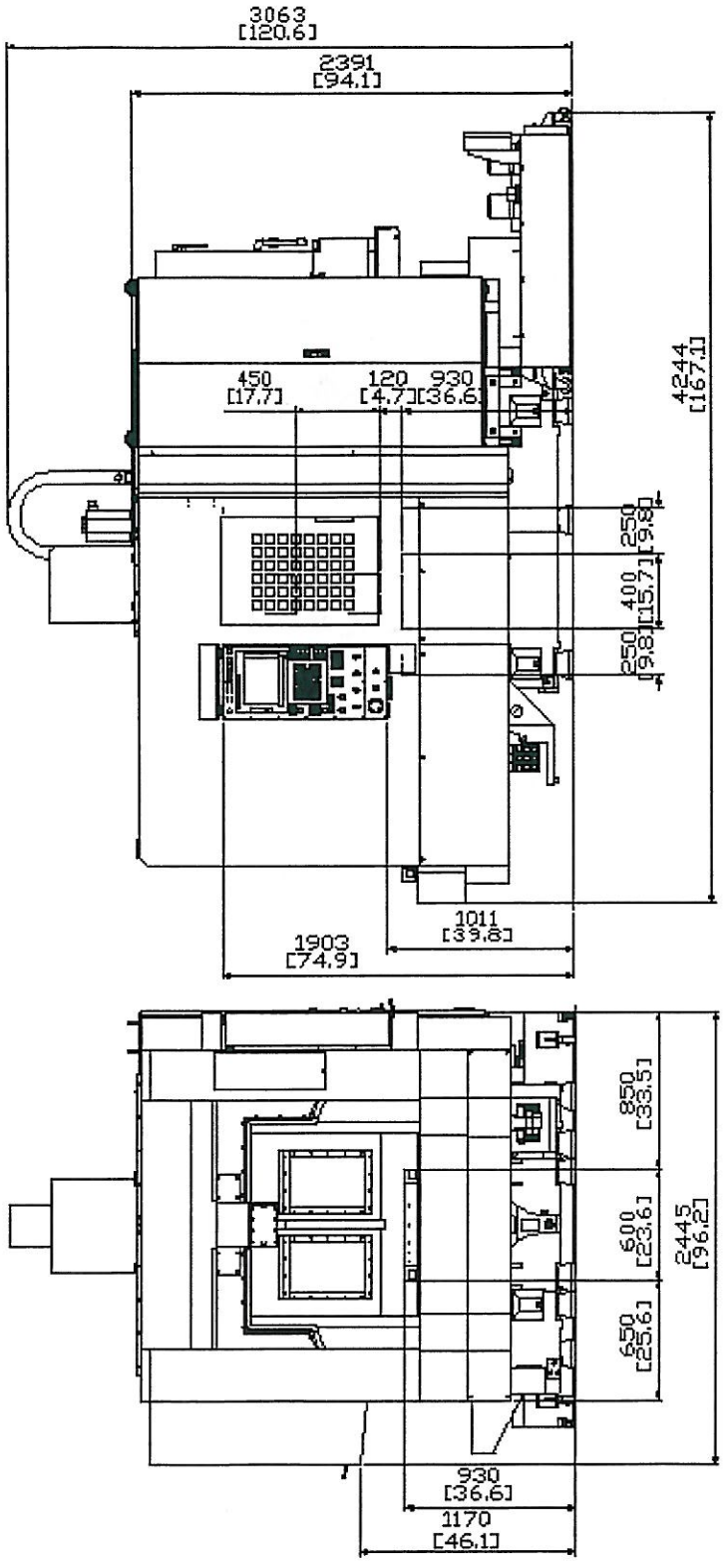

Figure 3.4.8: S33 APC Front and Side View

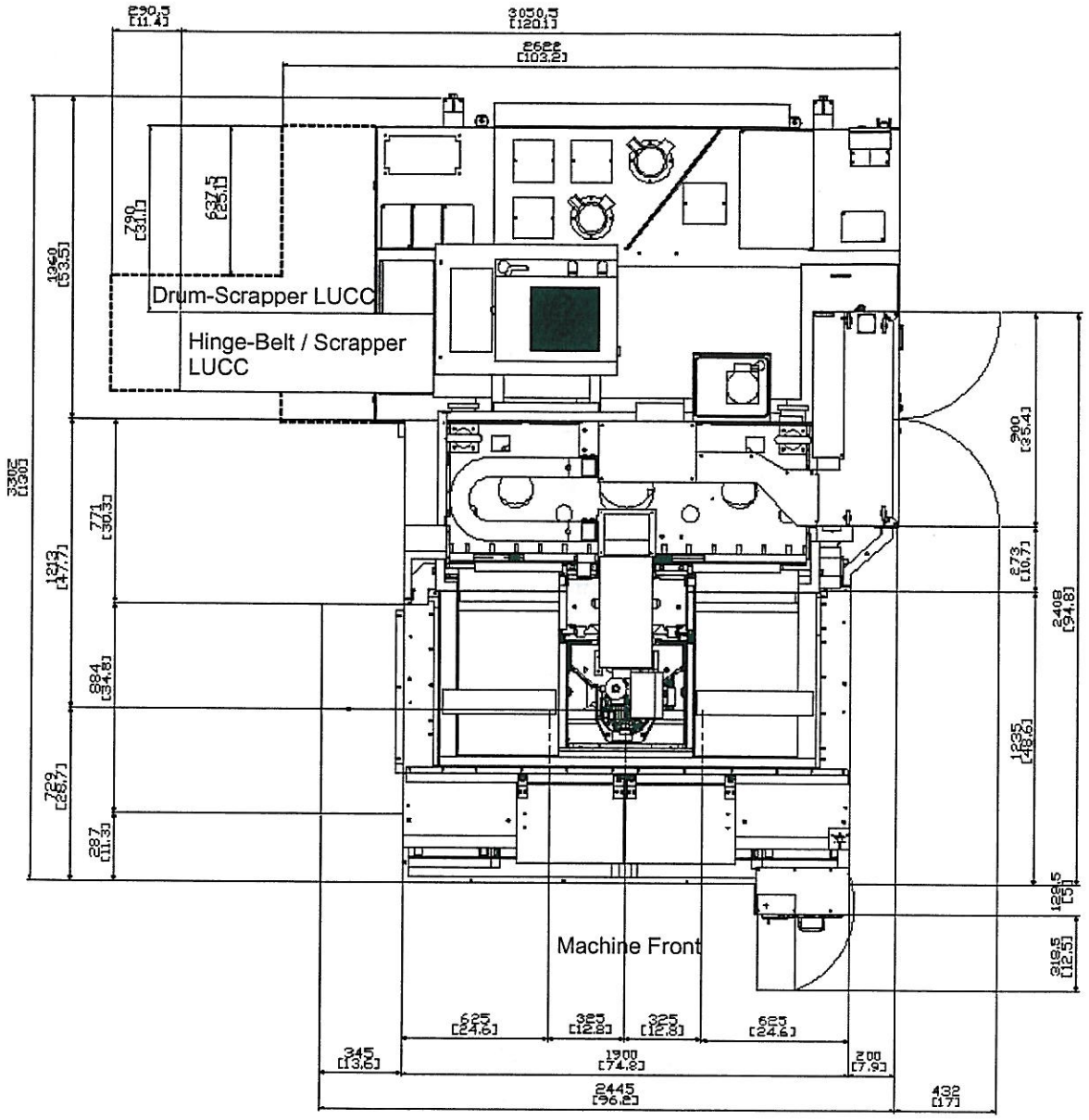

Figure 3.4.9: S33 Floor layout (Left LUCC without Options)

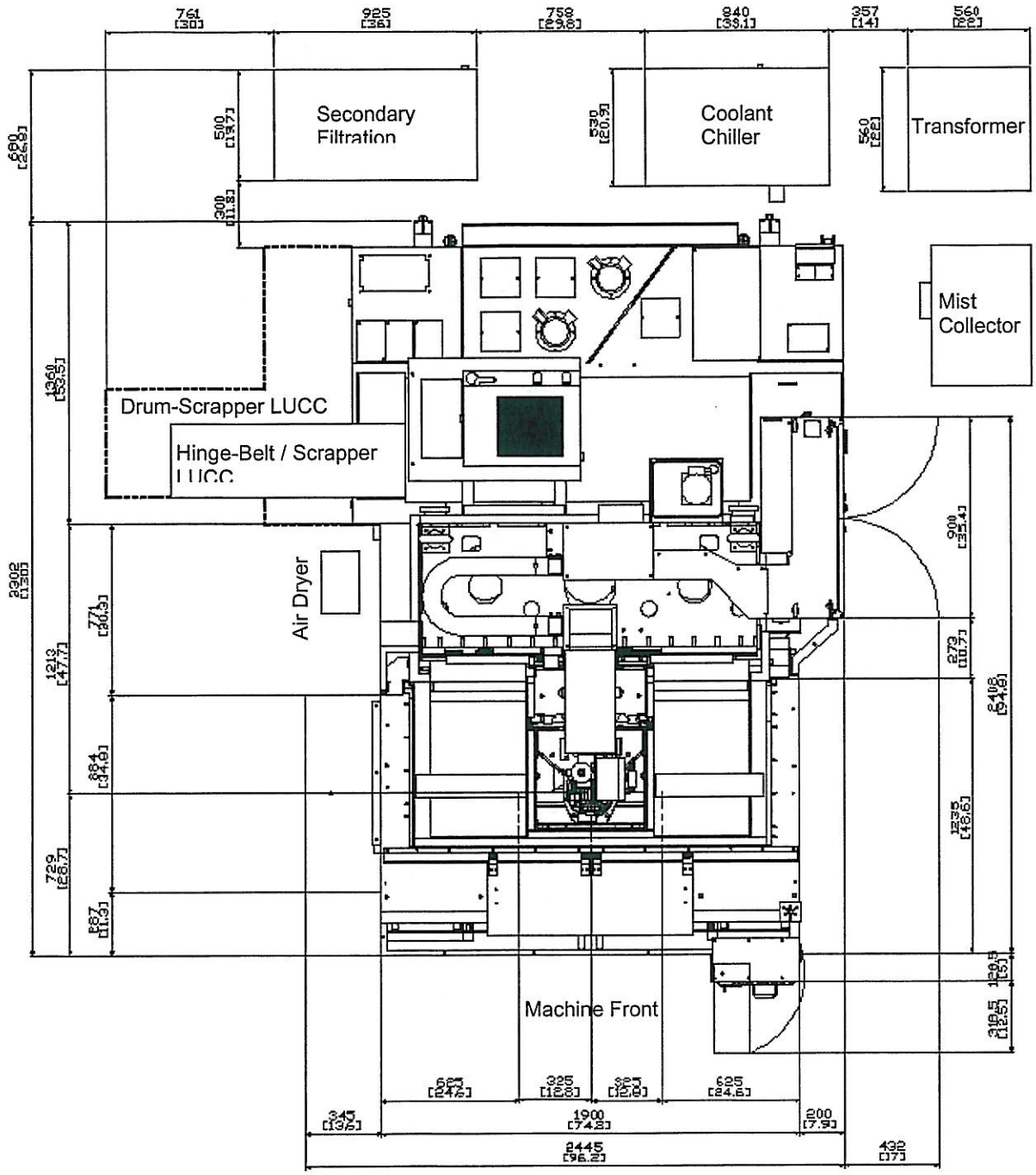

Figure 3.4.10: S33 Floor Layout (Left LUCC with Options)

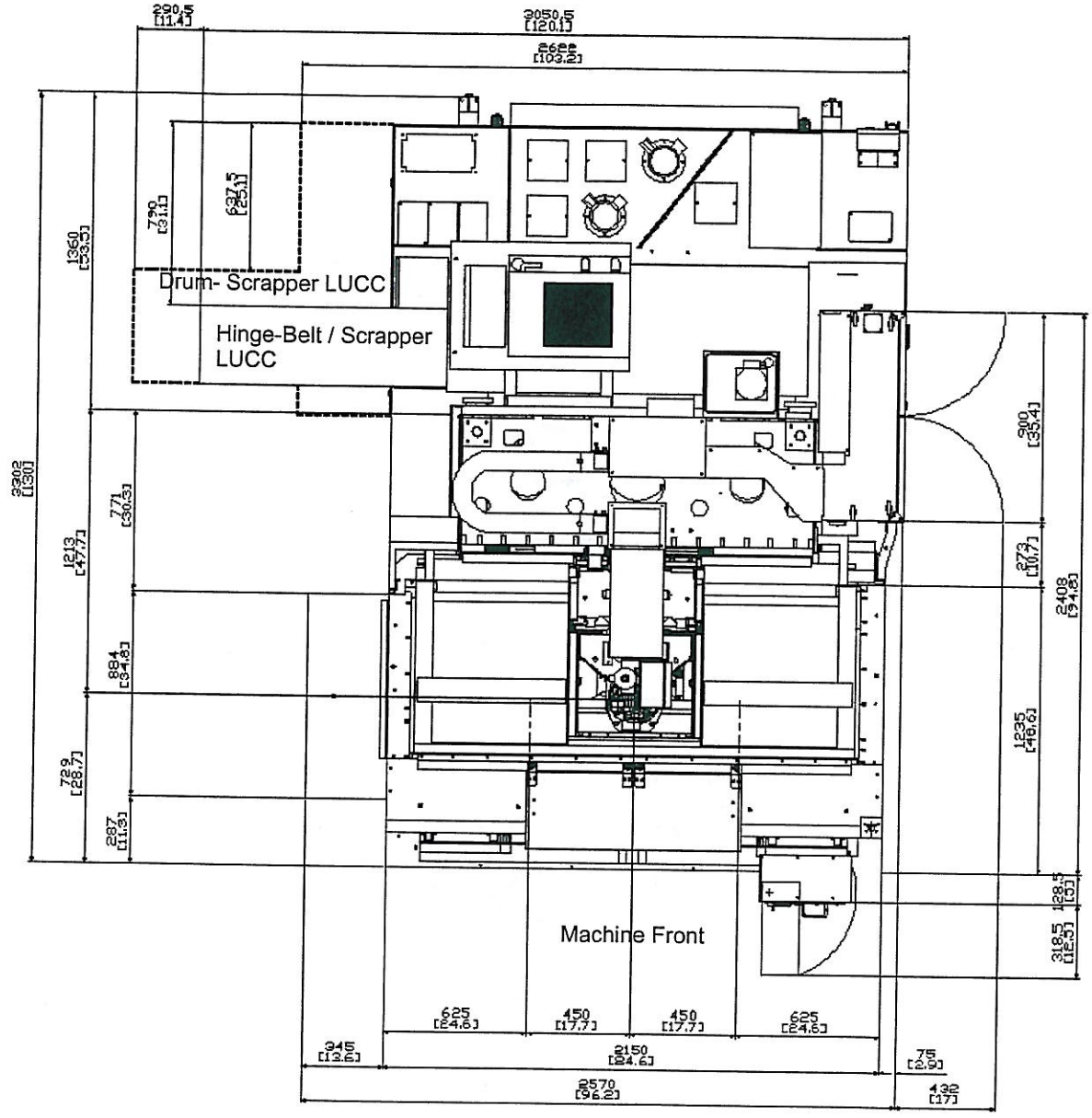

Figure 3.4.11: S56 Floor Layout (Left LUCC without Options)

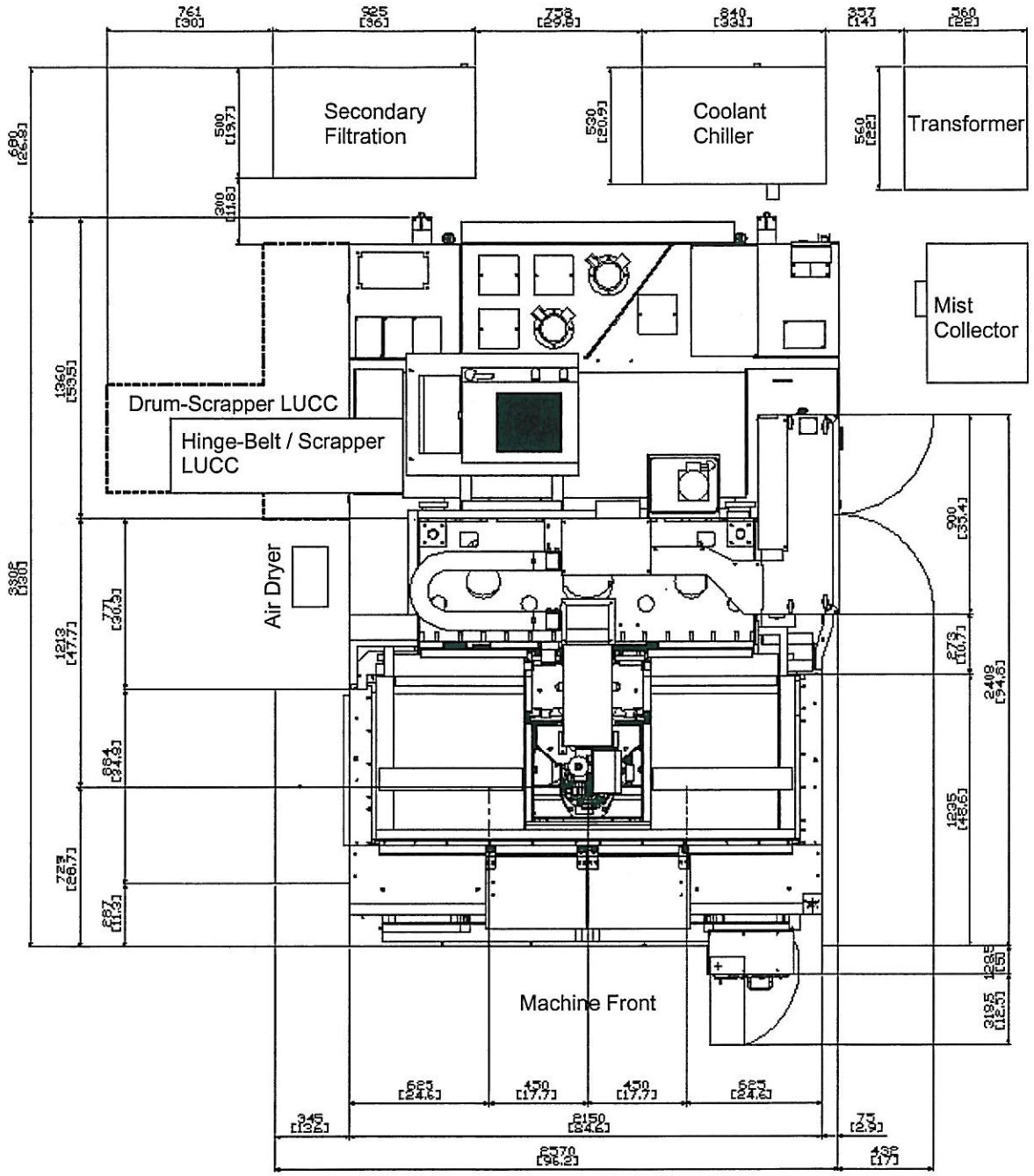

Figure 3.4.12: S56 Floor Layout (Left LUCC with Options)

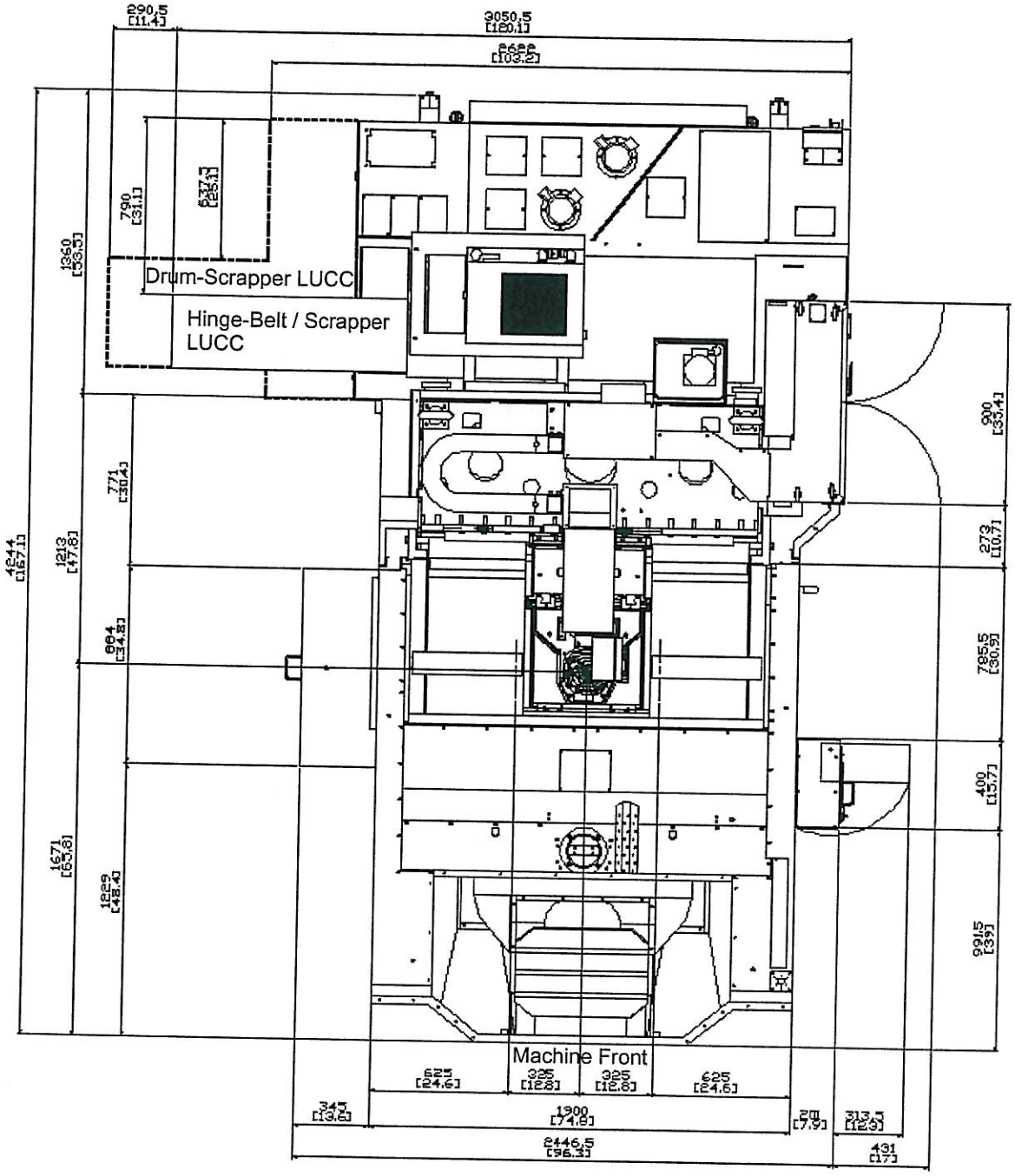

Figure 3.4.13: S33 APC Floor Layout (Left LUCC without Options)

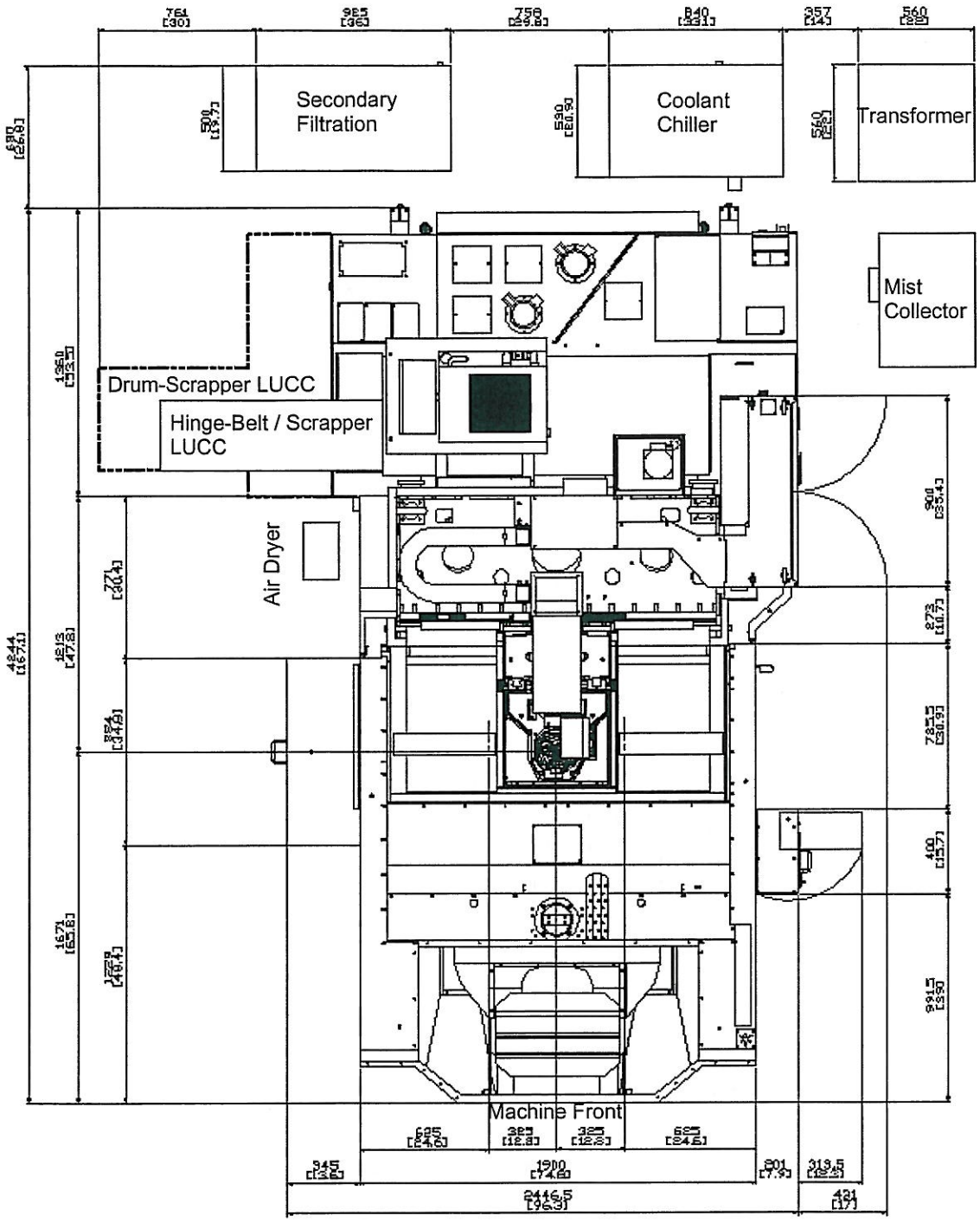

Figure 3.4.14: S33 APC Floor Layout (Left LUCC with Options)

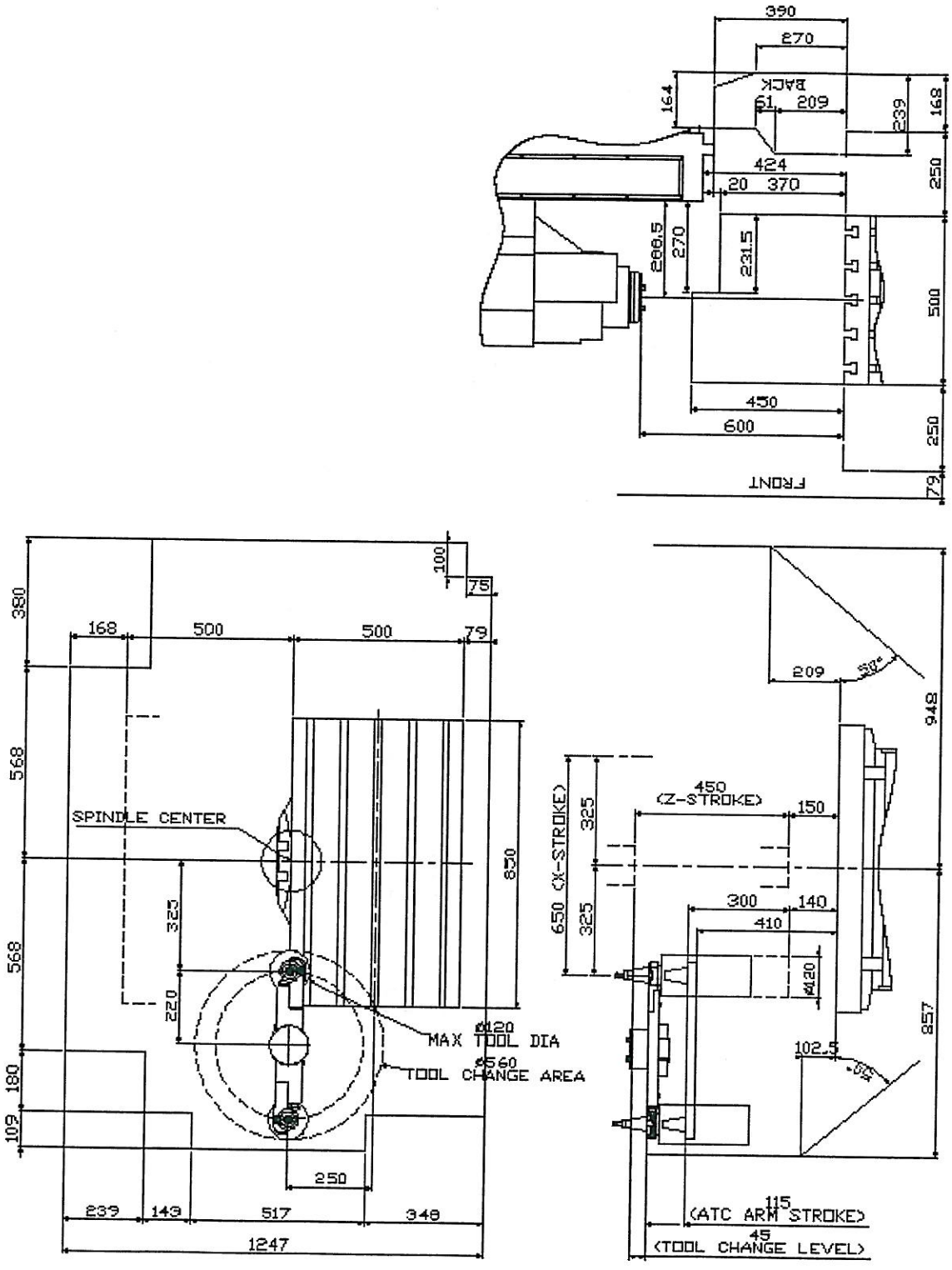

Figure 3.4.15: S33 Work Area

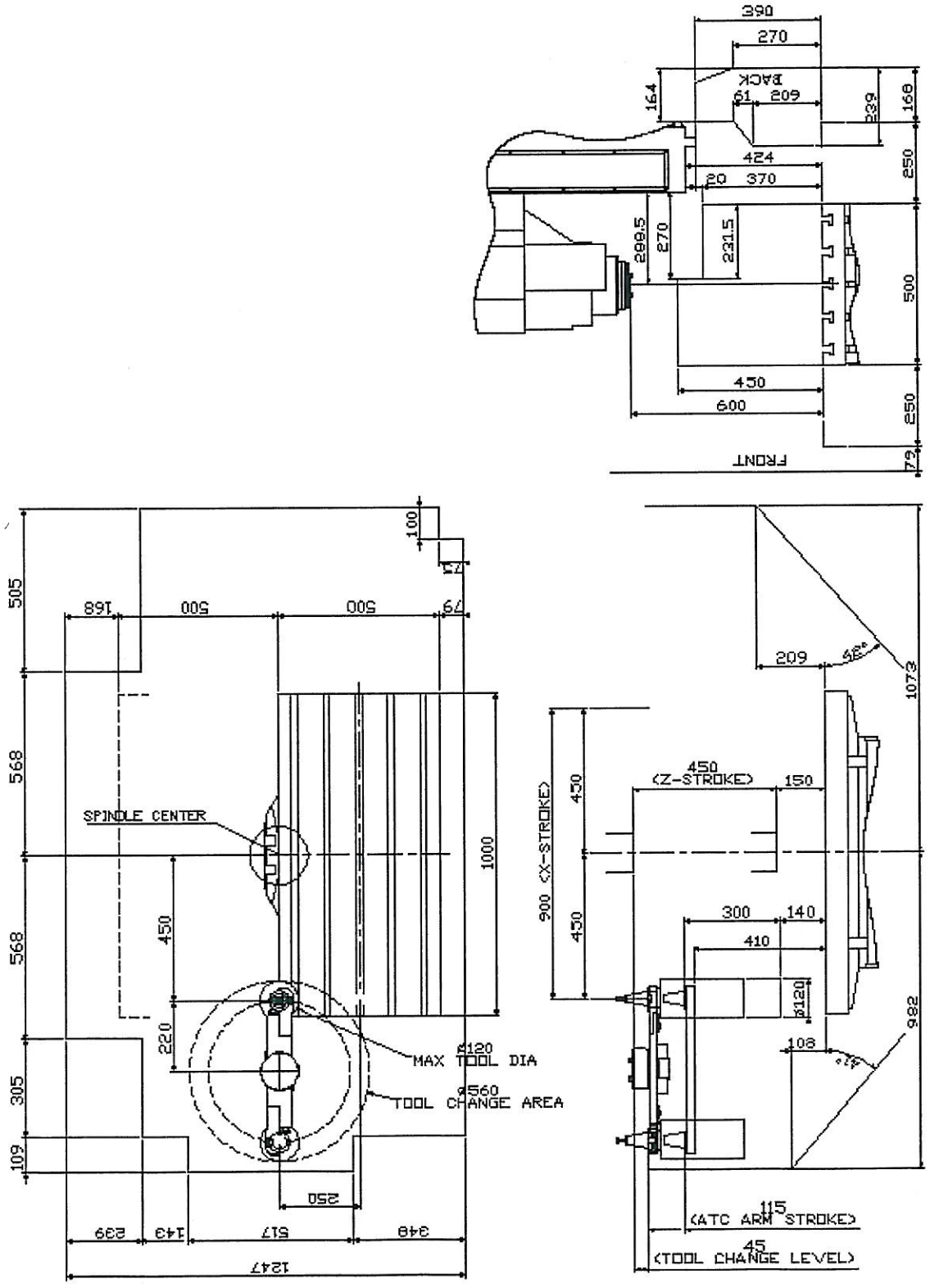

Figure 3.4.16: S56 Work Area

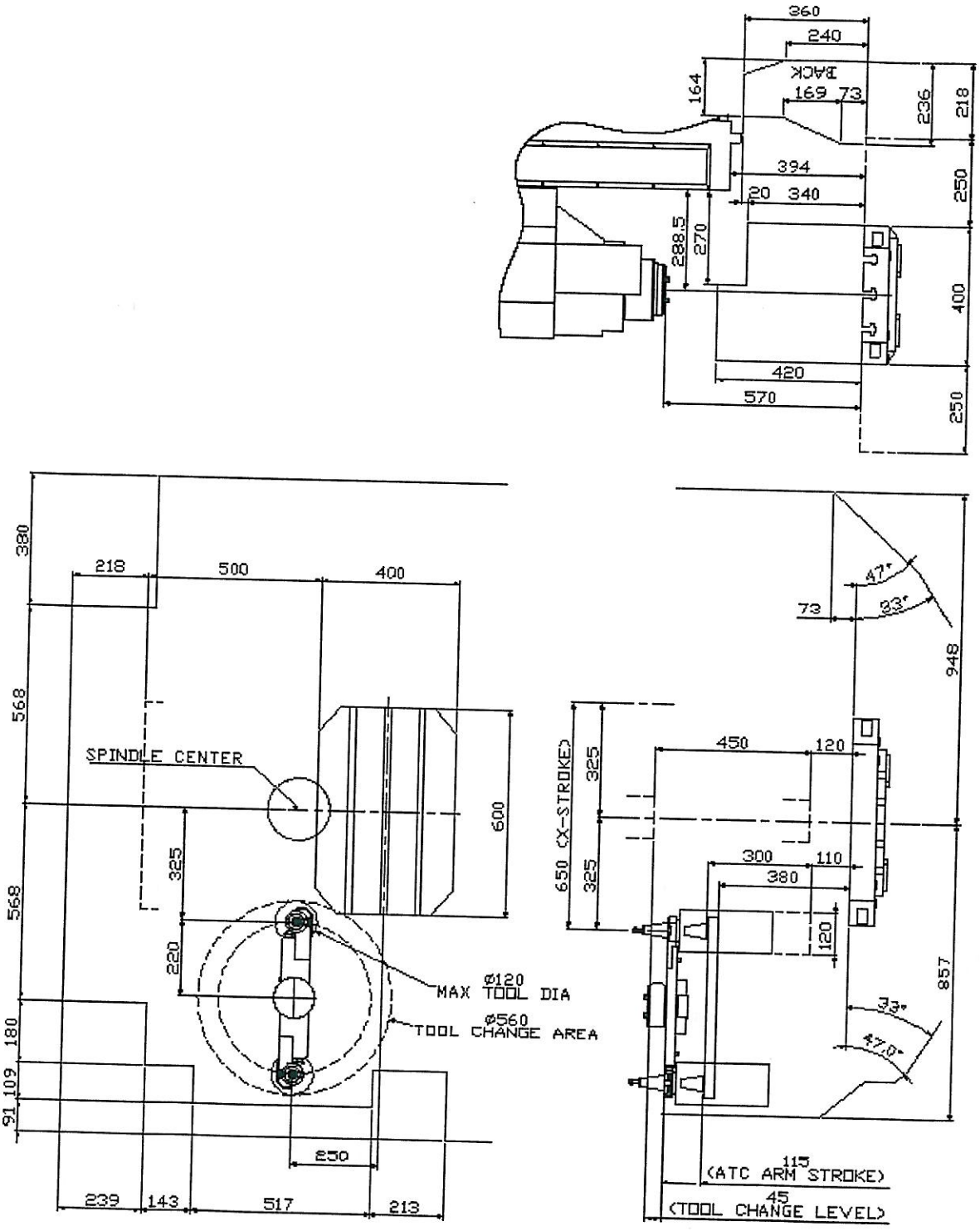

Figure 3.4.17a: S33 APC Work Area (1/2)

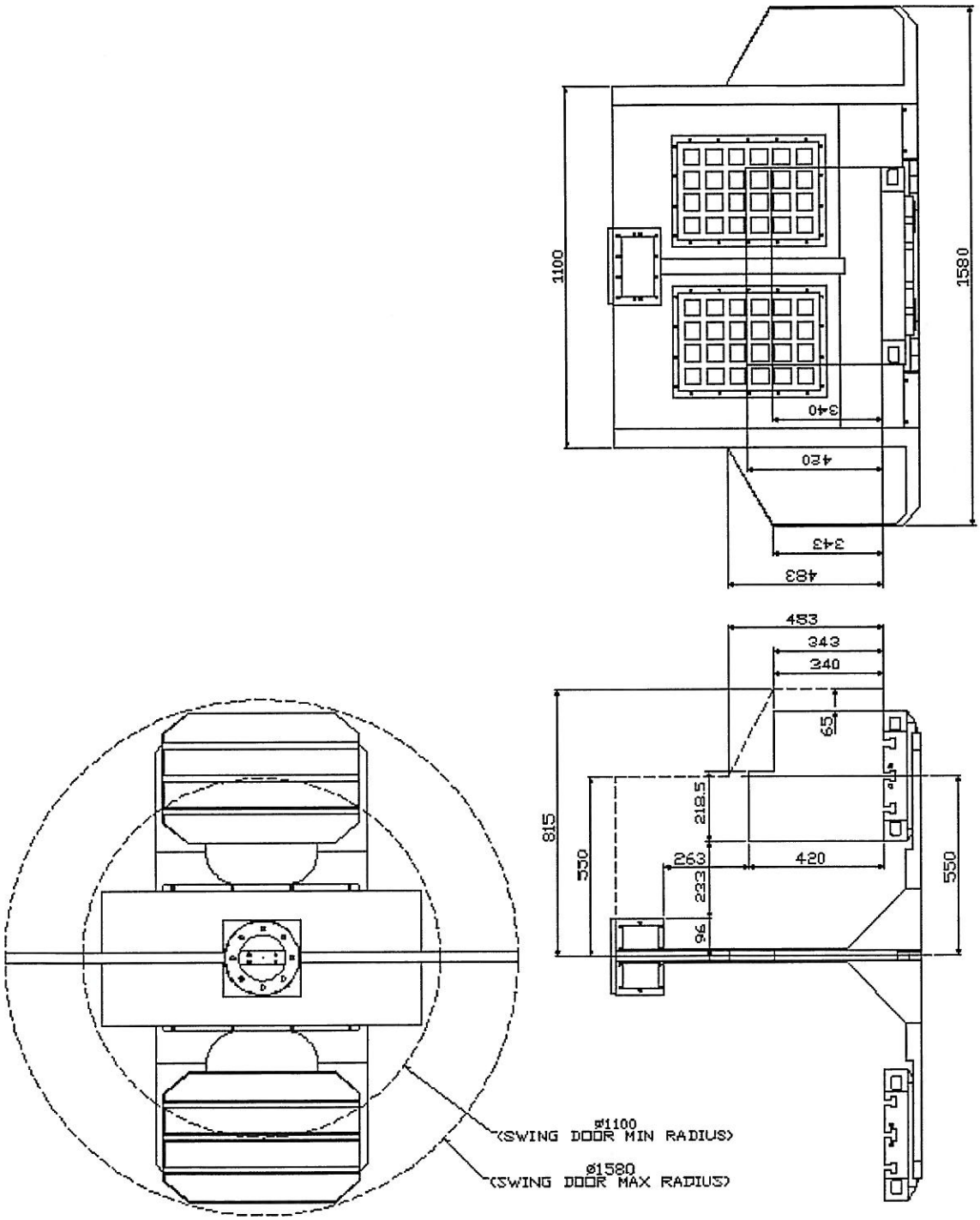

Figure 3.4.17b: S33 APC Work Area (2/2)