MACHINING CENTER

VS40/50/60

INSTRUCTION MANUAL

APC

SEIKI - SEICOS ∑16M/18M

OB-2781-1-8001-E-1-01

18 Edition 1.01 02-2001

Hitachi Seiki Deutschland
Werkzeugmaschinen GmbH

CONTENTS

1. OUTLINE AND FEATURES

This APC (automatic pallet changer) unit is based on “hydraulic unit less” system realized by VS series standard model, and is featured by its ECO, ECO (ecology and economy) specifications with high speed and high reliability. It enables men to relieve from periodic maintenance of hydraulic oil required by the conventional system and to reduce the running cost.

1-1 Configuration

1-1-1 Saddle (Pallet Table)

For the pallet clamp/unclamp action, high pressure (about 40kgf/cm^2) hydraulic power converted from compressed air amplified by air hydro-unit is used. Use of air pressure for the purpose requiring high power such as pallet clamp unit has hitherto been generally considered unsuitable, however, this problem has been solved by converting air pressure energy into hydraulic pressure.

1-1-2 APC Main Unit

For the APC main unit, rotary arm type exchange system is adopted. The relative movement of a rotary arm driven by an inverter motor and two lines of groves on the pallet runs the system. Compared with the conventional hydraulic system, this system enables smoother and quicker pallet change and, furthermore, higher reliability is achieved with simple construction by reducing the number of parts nearly to a half.

1-1-3 Splash Cover

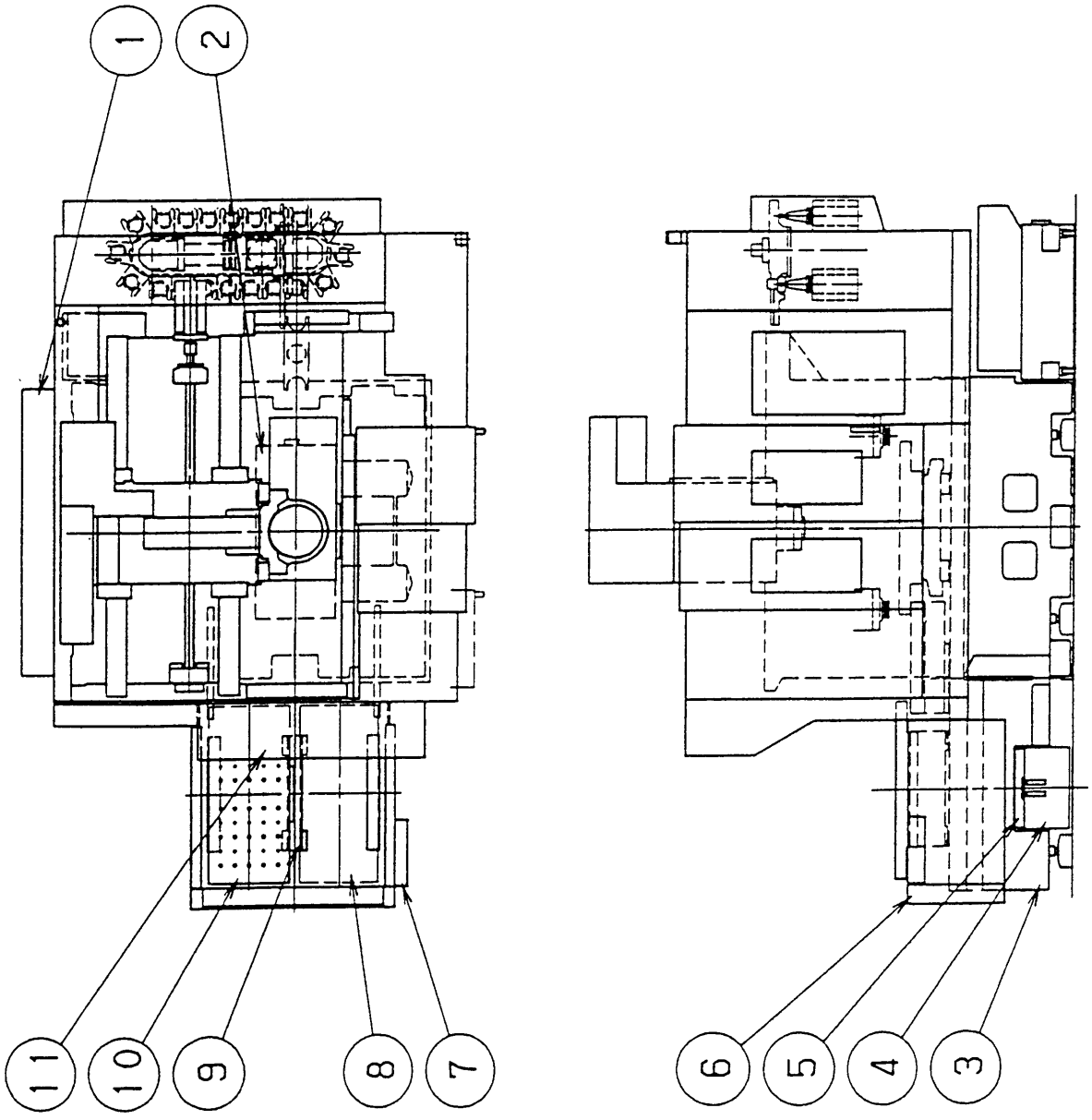
The processing area is covered with splashguard up to the ceiling as a fully enclosed space. The processing area is separated from the APC rearranging area by an automatic shutter driven by an electric motor for protection against the splash of coolant and chips.

1-2 Name of Each Section

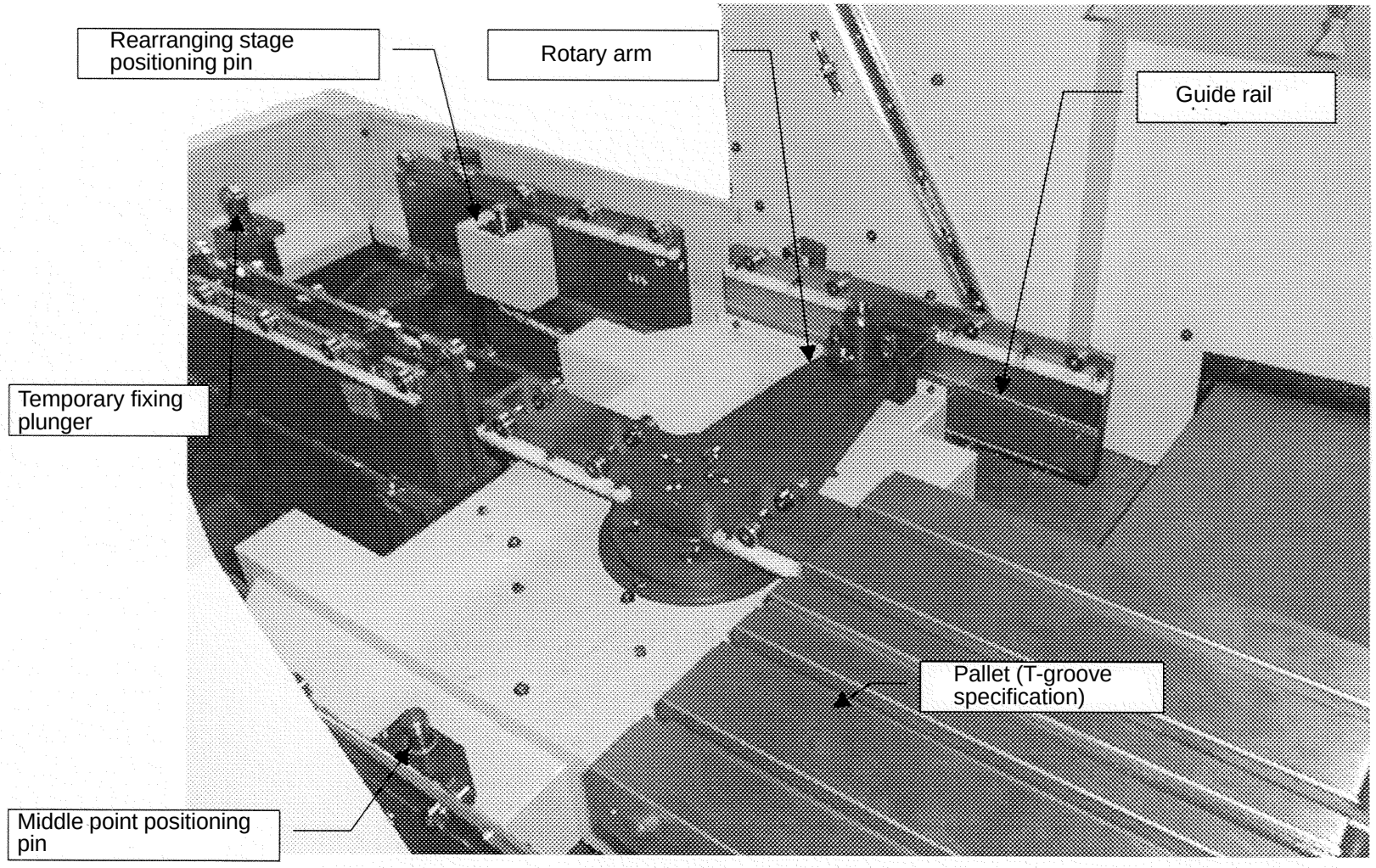
1-2-1 Whole Machine

No.	Name
11	Automatic door
10	Left pallet
9	Pallet guide
8	Right pallet
7	APC individual operation panel
6	Guard
5	Chip box
4	Coolant tank
3	Base
2	Saddle
1	Air hydro-unit

APC : Option

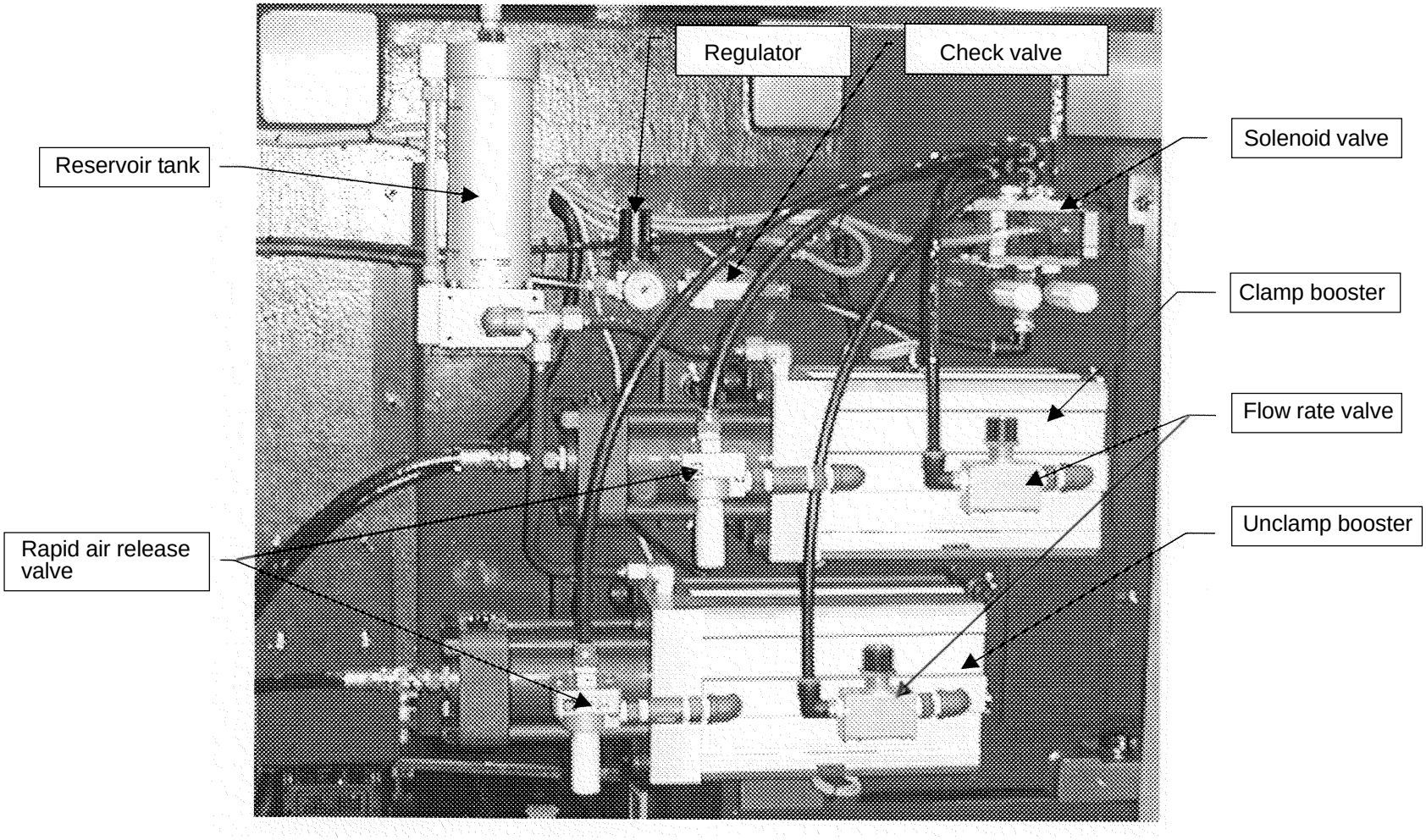


Name of Each Part of APC Unit



* The photograph is taken with the left pallet removed for convenience of explanation of explanation.

Name of Each Part of Air Hydro-unit



* Photograph shows the air hydro-unit at the back of the machine proper. The cover is detached for convenience of explanation.

2. SPECIFICATION

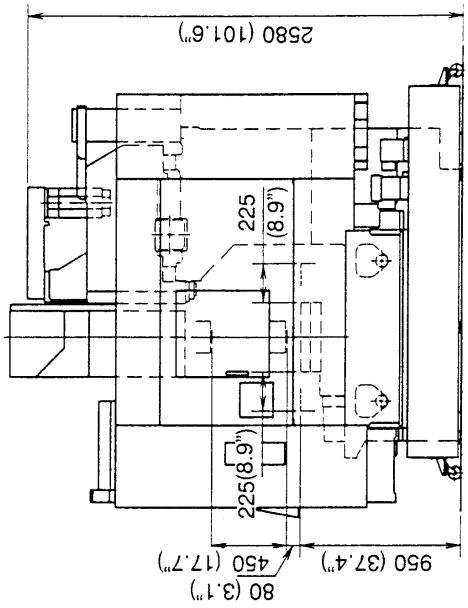
2-1 Table of the Specifications

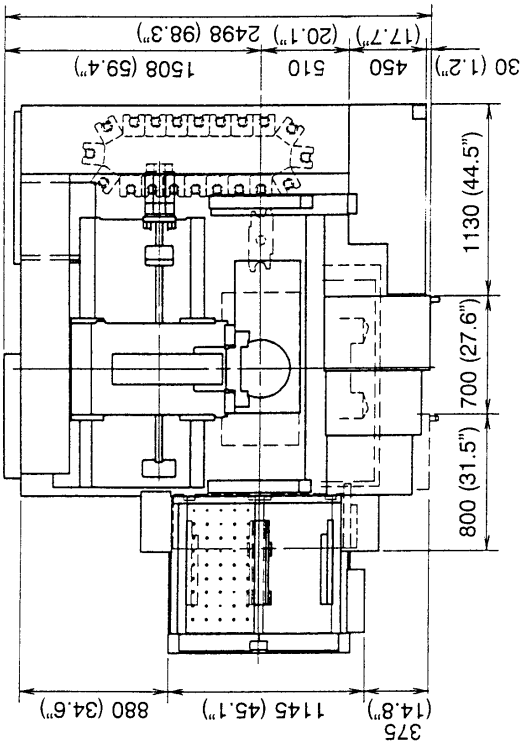
		VS40	VS50	VS60
Pallet size	mm	800 × 400	1000 × 450	1200 × 560
Contour of pallet top (Type 1)		M16 × P80	M16 × P80	M16 × P100
(Type 2)		18mm T-grove × 3	18mm T-grove × 4	18mm T-grove × 5
No. of pallet		2	2	2
Max. loading capacity of pallet	kg	250	400	750
Pallet clamping power	kg	1850	3700	3700
Distance from spindle end to	mm	80 ~ 530	100 ~ 550 (Type 1)	130 ~ 580
pallet top surface	mm	60 ~ 510	80 ~ 530 (Type 2)	130 ~ 580
Changing system		Rotary arm type parallel shuttle	Rotary arm type parallel shuttle	Rotary arm type parallel shuttle
Distance from floor level to	mm	950 (Type 1)	1000 (Type 1)	1020 (Type 1)
pallet top surface	mm	970 (Type 2)	1020 (Type 2)	1020 (Type 2)
Machine weight (gross)	kg	8300	9200	12300

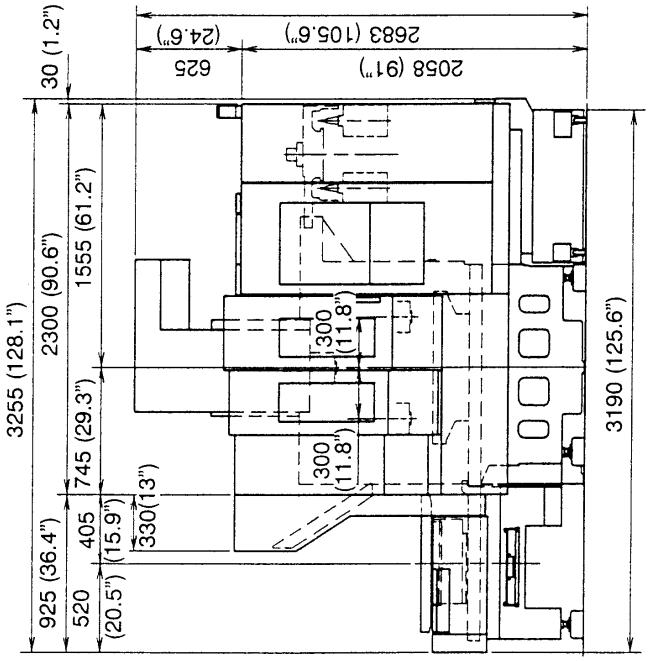
2-2 Main Dimension Diagram

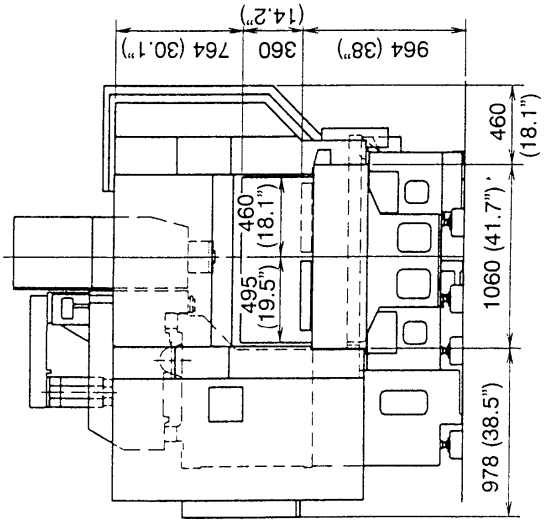
VS40

Dimension : metric (mm)
Inch (”)



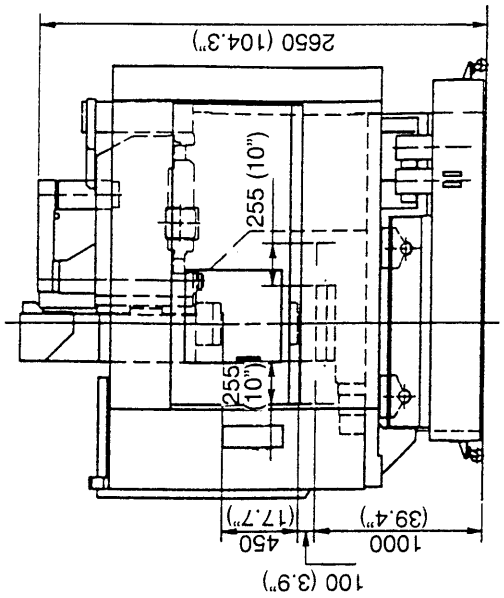


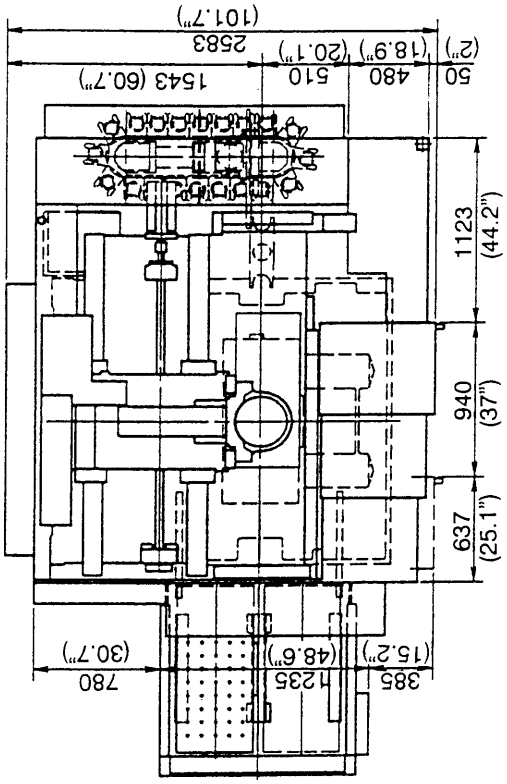


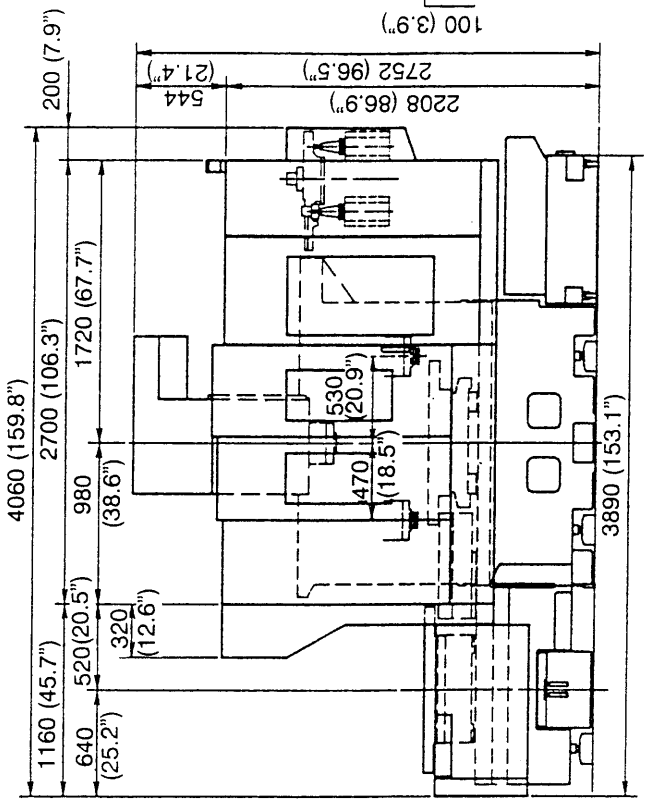


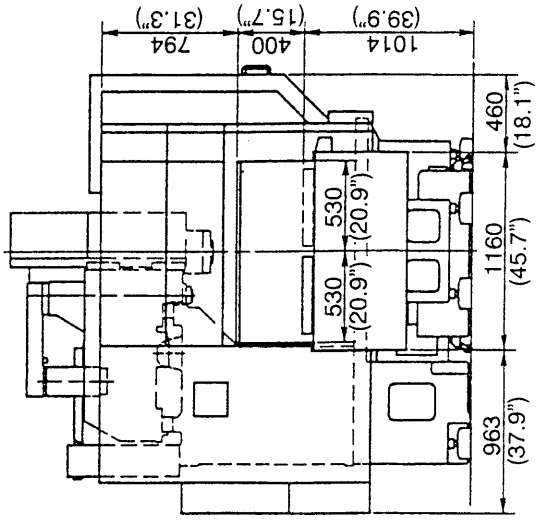
VS50

Dimension : metric (mm)
Inch (”)



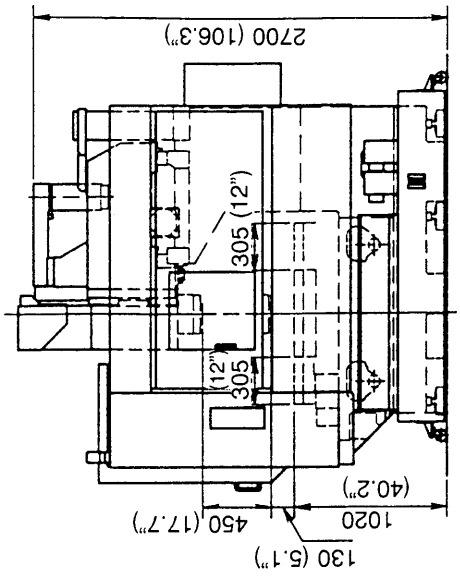


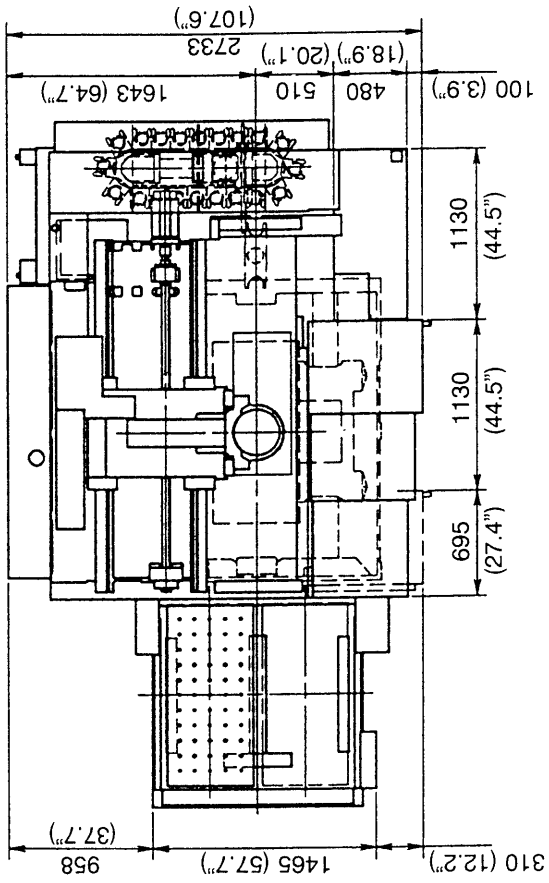


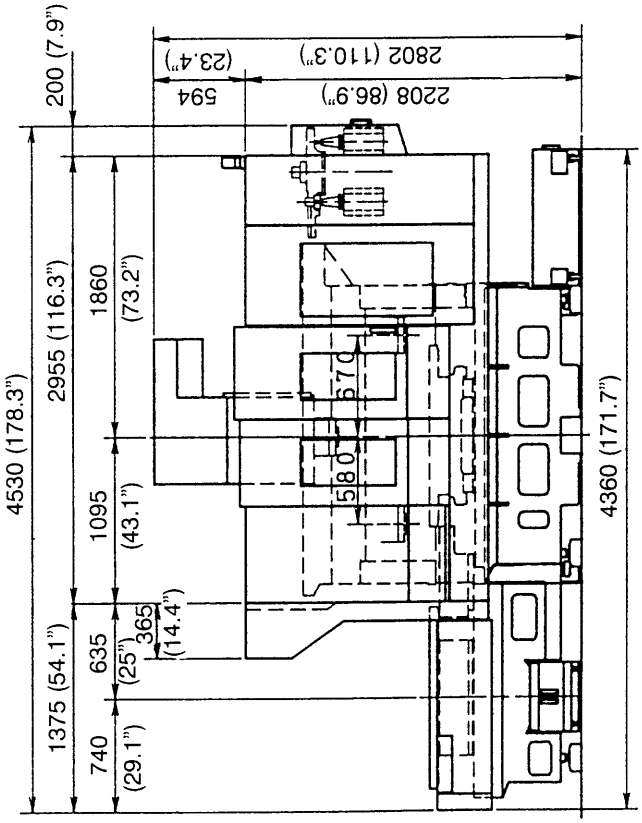


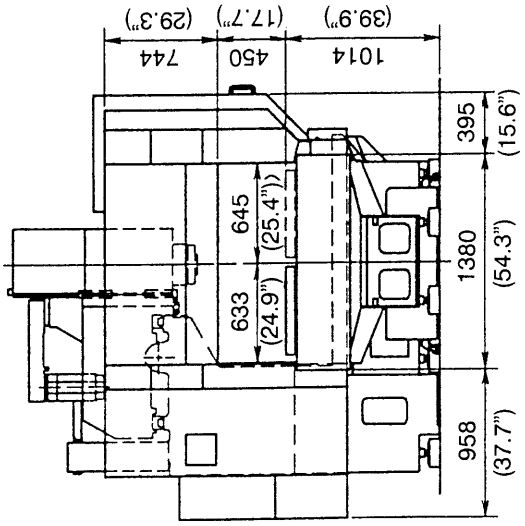
VS60

Dimension : metric (mm)
Inch (”)





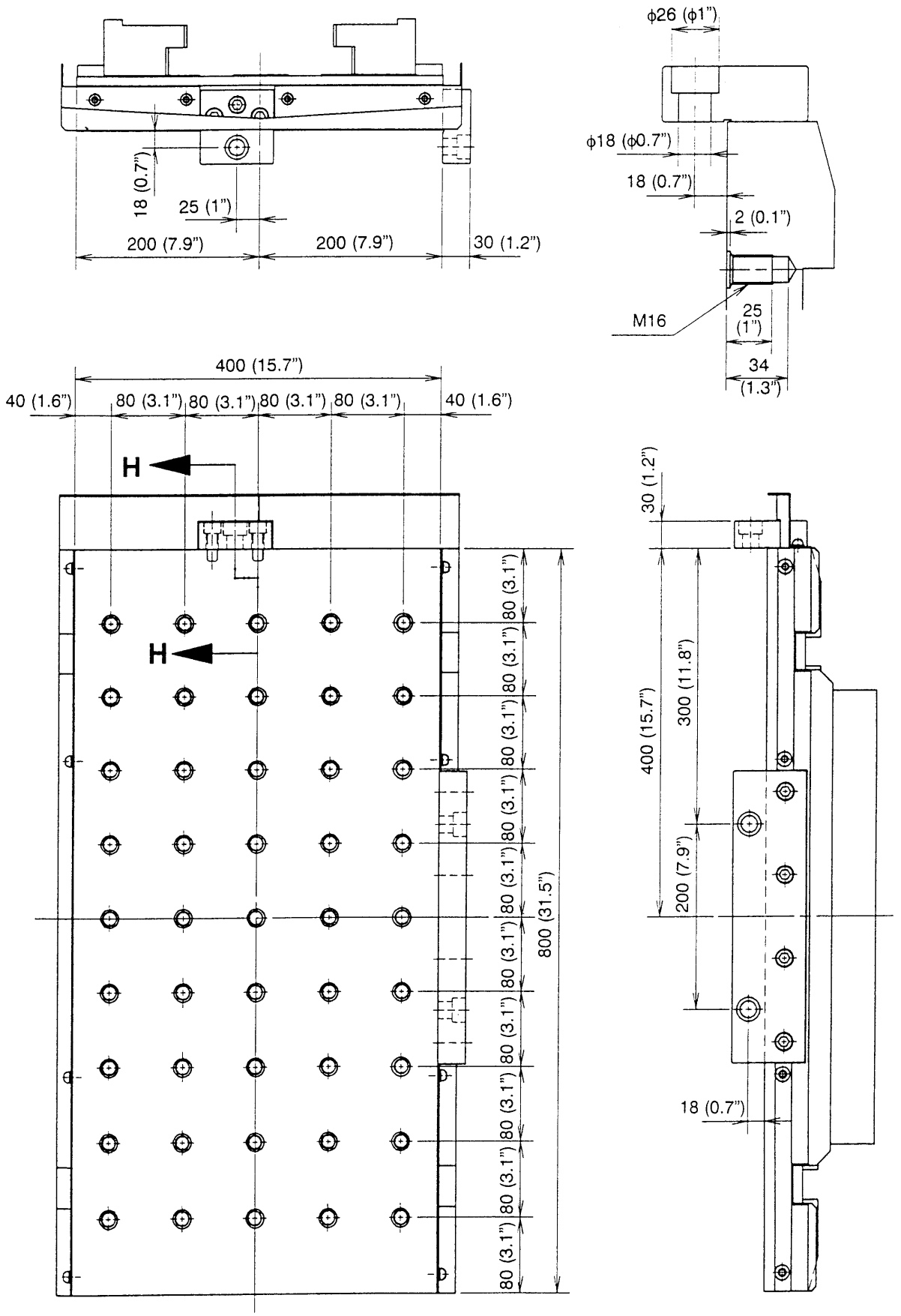




2-3 Pallet Dimension Diagram

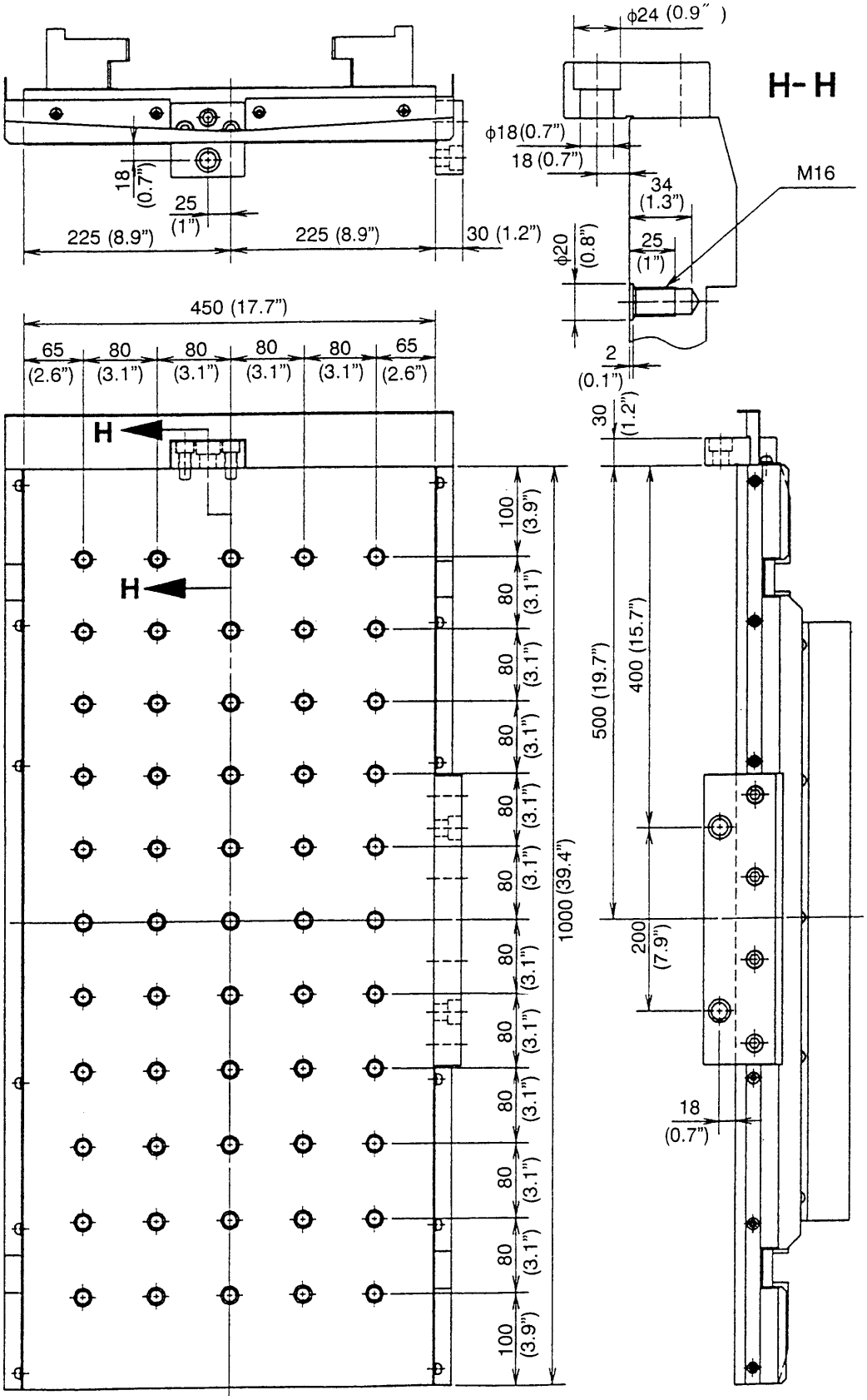
VS40 Pallet Tapping Hole Specification

Dimension : metric (mm)
Inch (”)



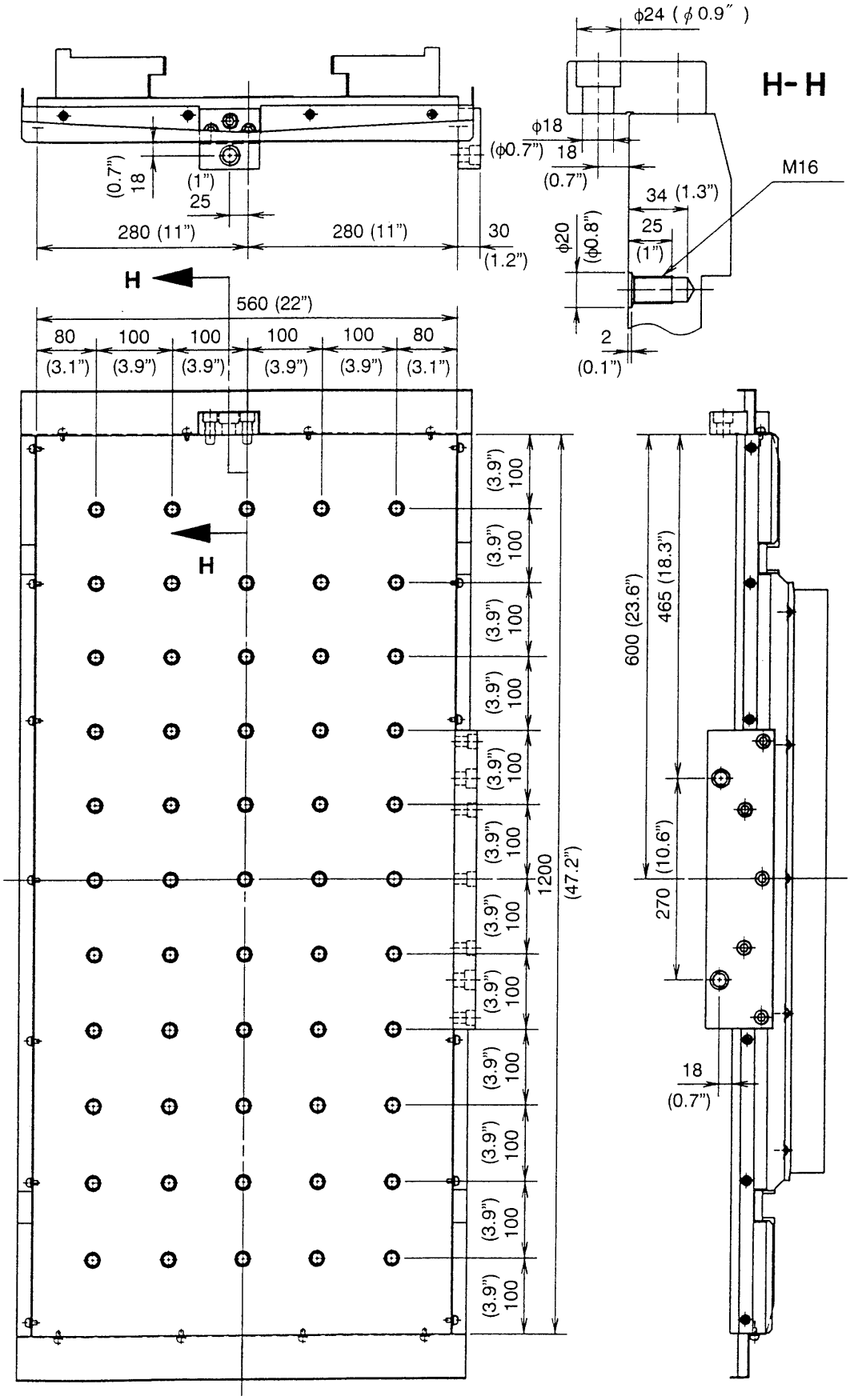
VS50 Pallet Tapping Hole Specification

Dimension : metric (mm)
Inch (″)



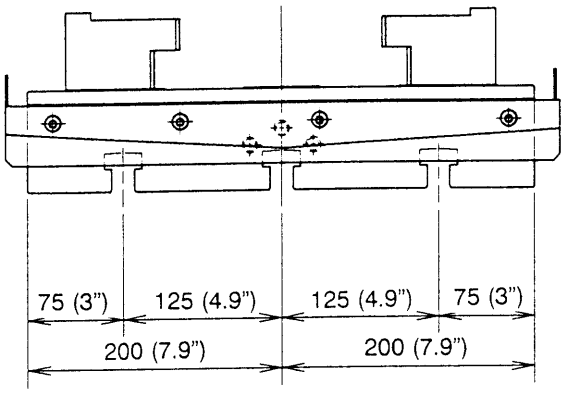
VS60 Pallet Tapping Hole Specification

Dimension : metric (mm)
Inch (″)

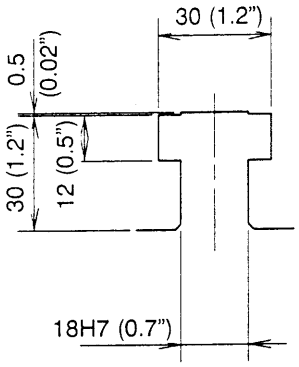


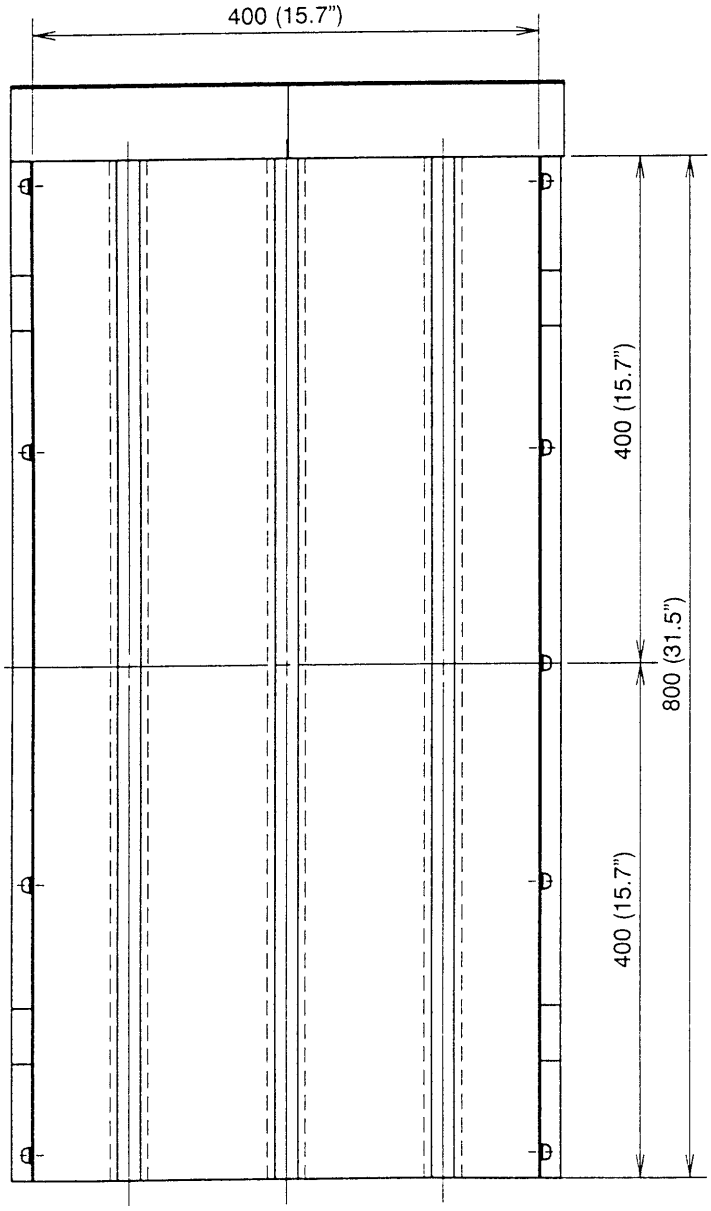
VS40 Pallet T-groove Specification

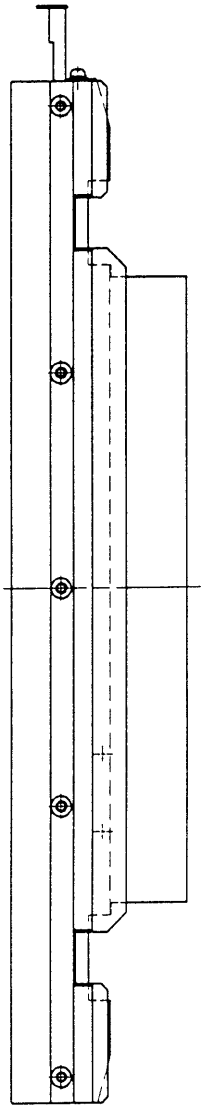
Dimension : metric (mm)
Inch (”)



Detail of T-grove



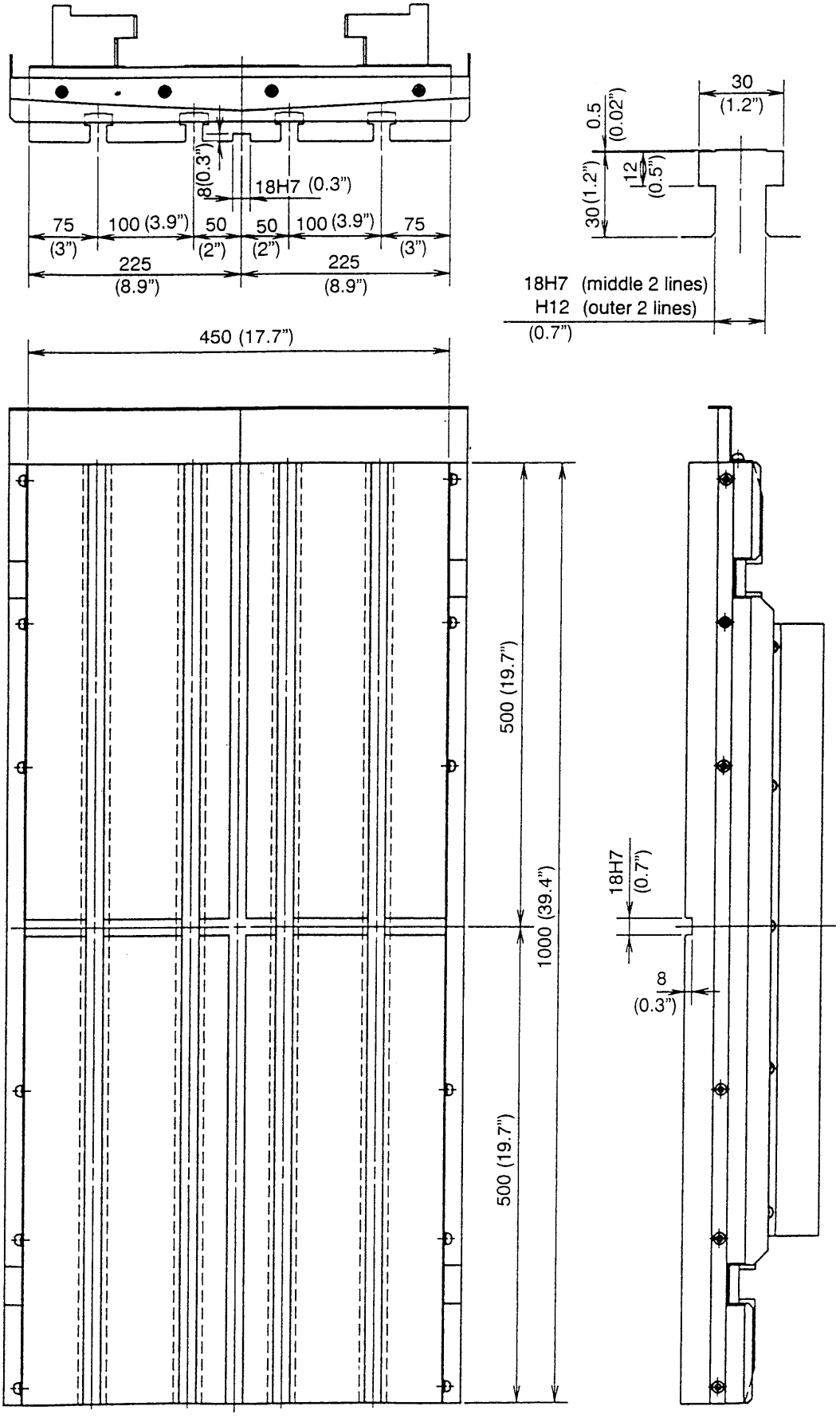




VS50 Pallet T-groove Specification

Dimension : metric (mm)
Inch (”)

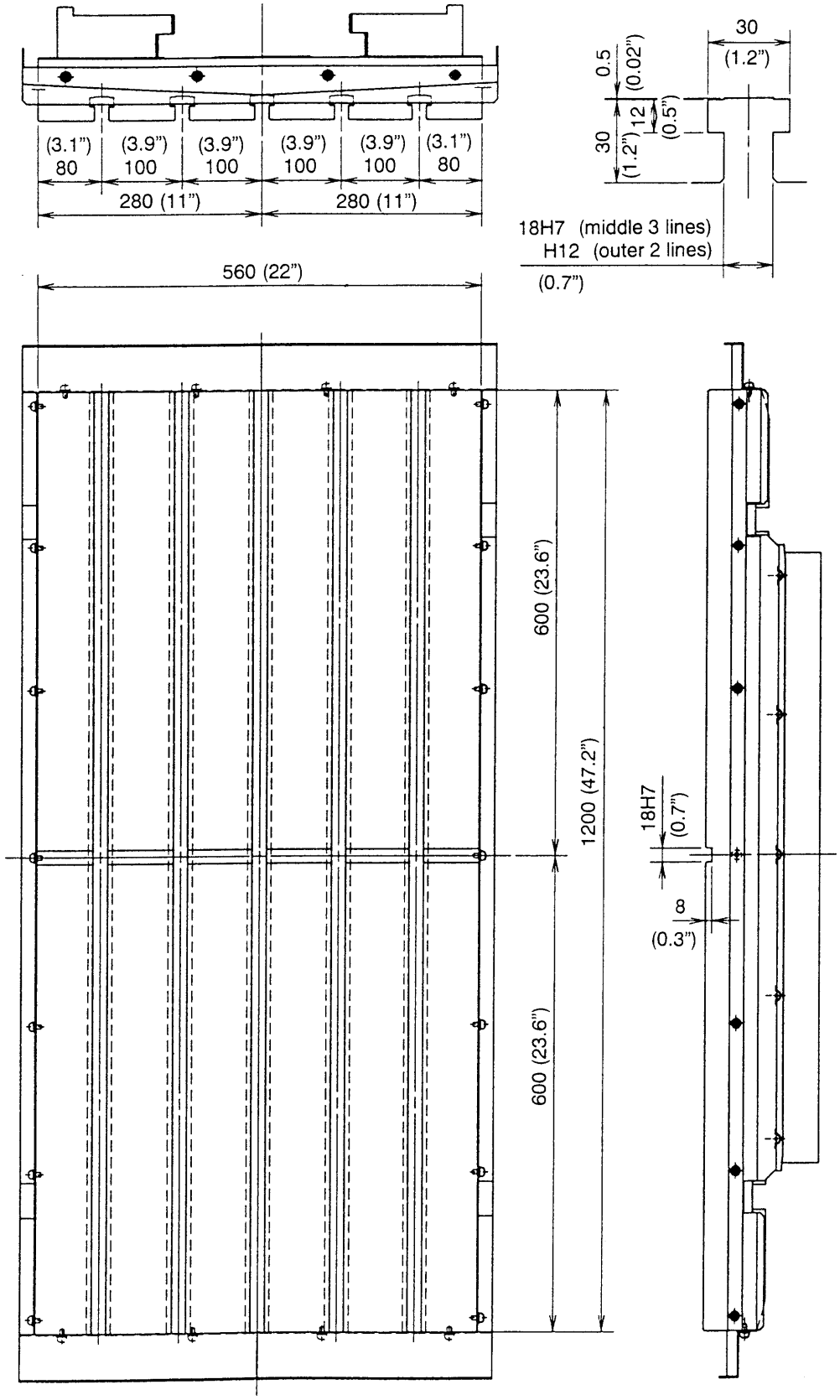
Detail of T-grove



VS60 Pallet T-groove Specification

Dimension : metric (mm)
Inch (”)

Detail of T-grove

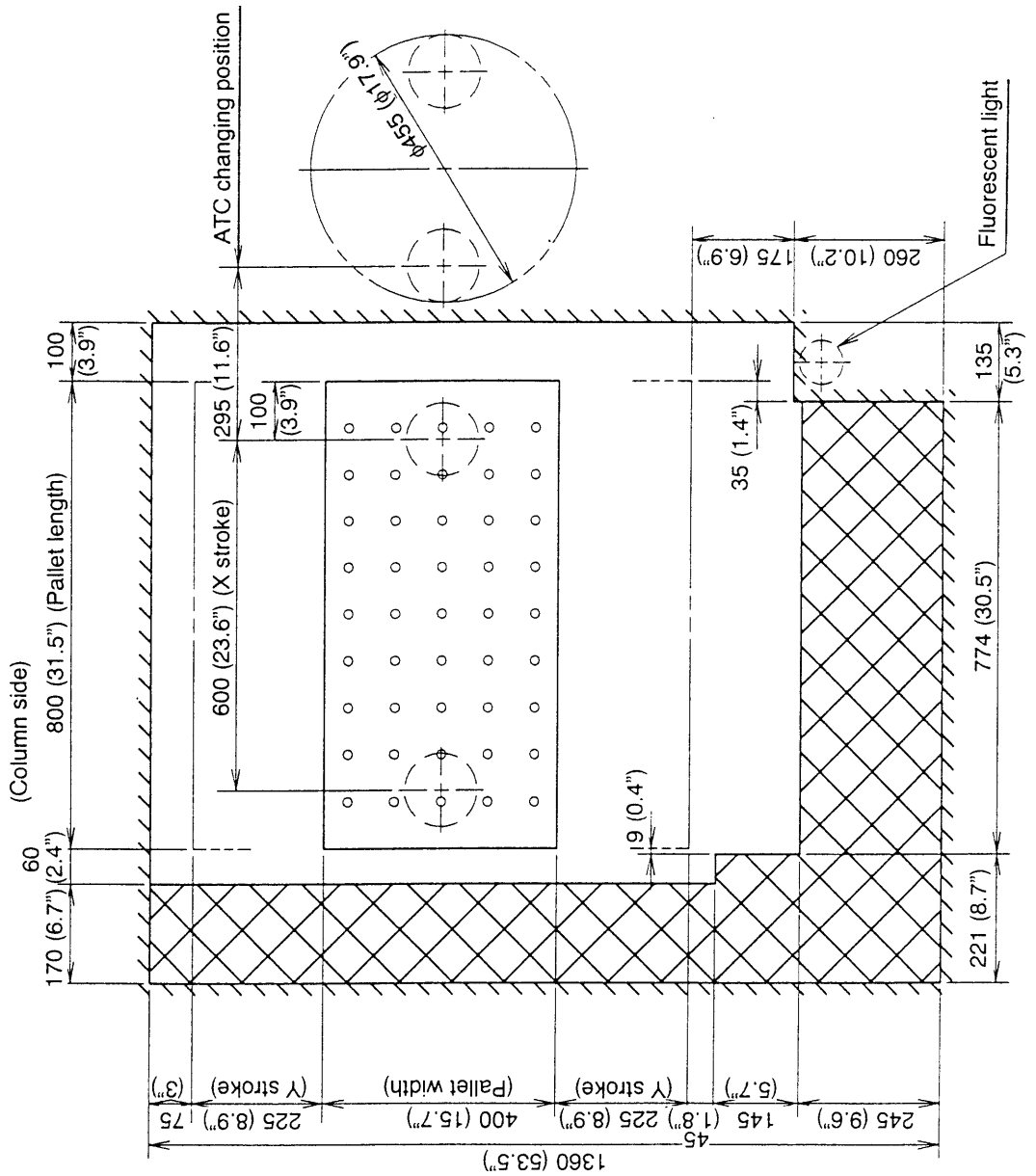


2-4 Workpiece Interference Range

Workpiece interference range diagram (VS40: 20/30 tool ATC)

Plane

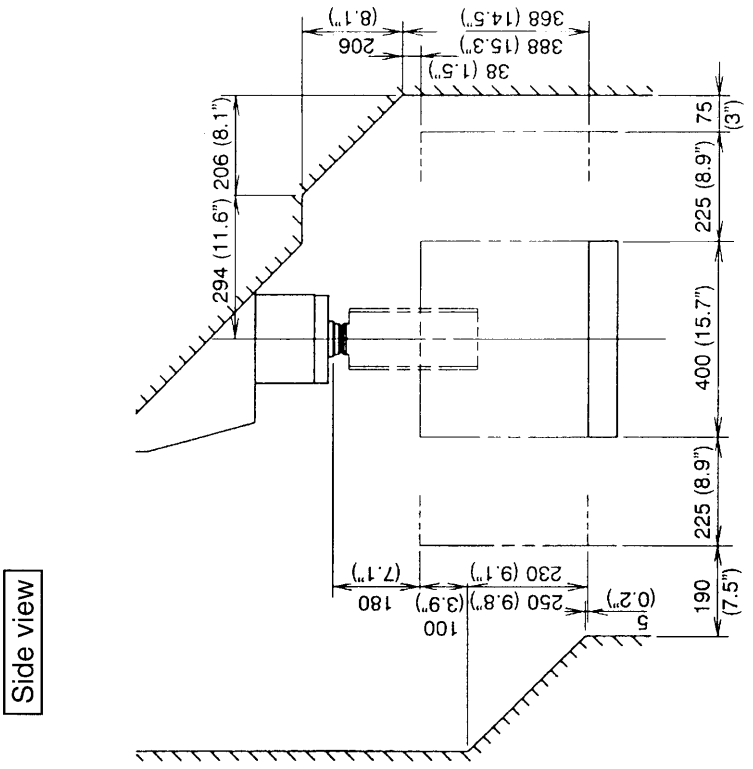
Dimension : metric (mm)
Inch (")



***Note**: Interference area*

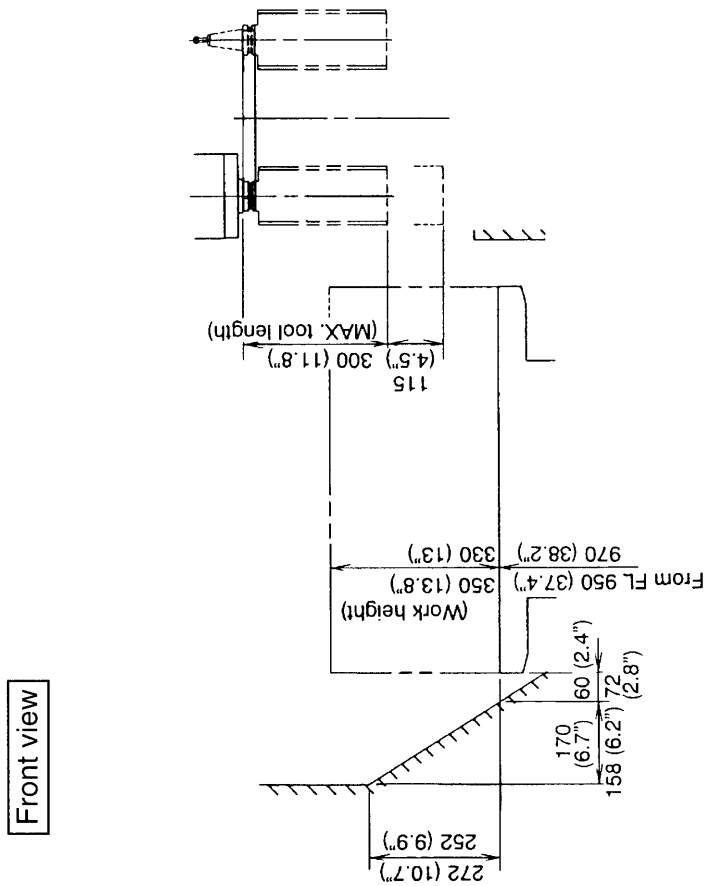
Range in which interference may occur depending on the height of work.
(Refer and confirm with the front and side view of interference range on the next page.)

Dimension : metric (mm)
Inch (")

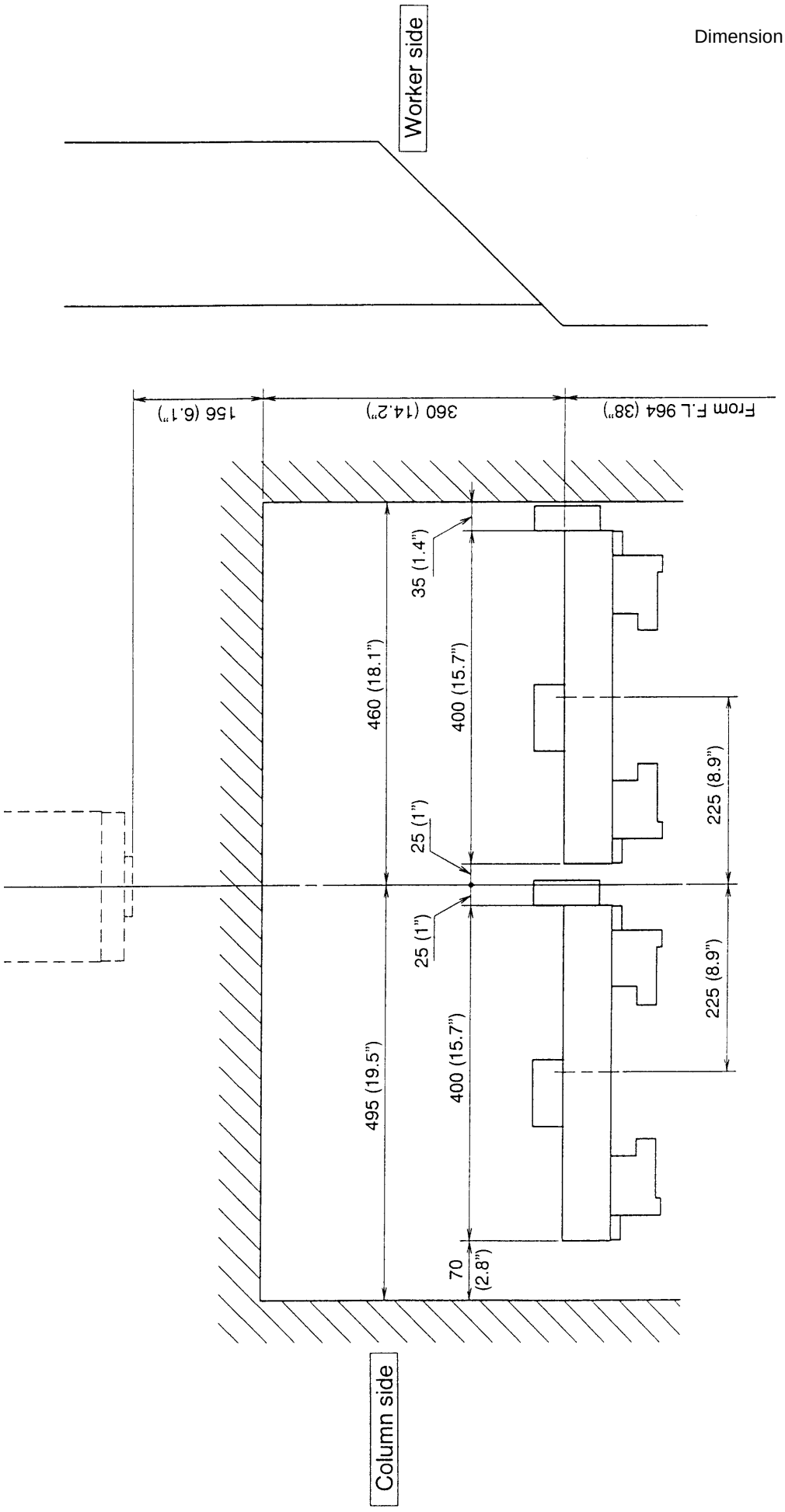


Upper stage: Bolt pallet

Lower stage: T-grove pallet



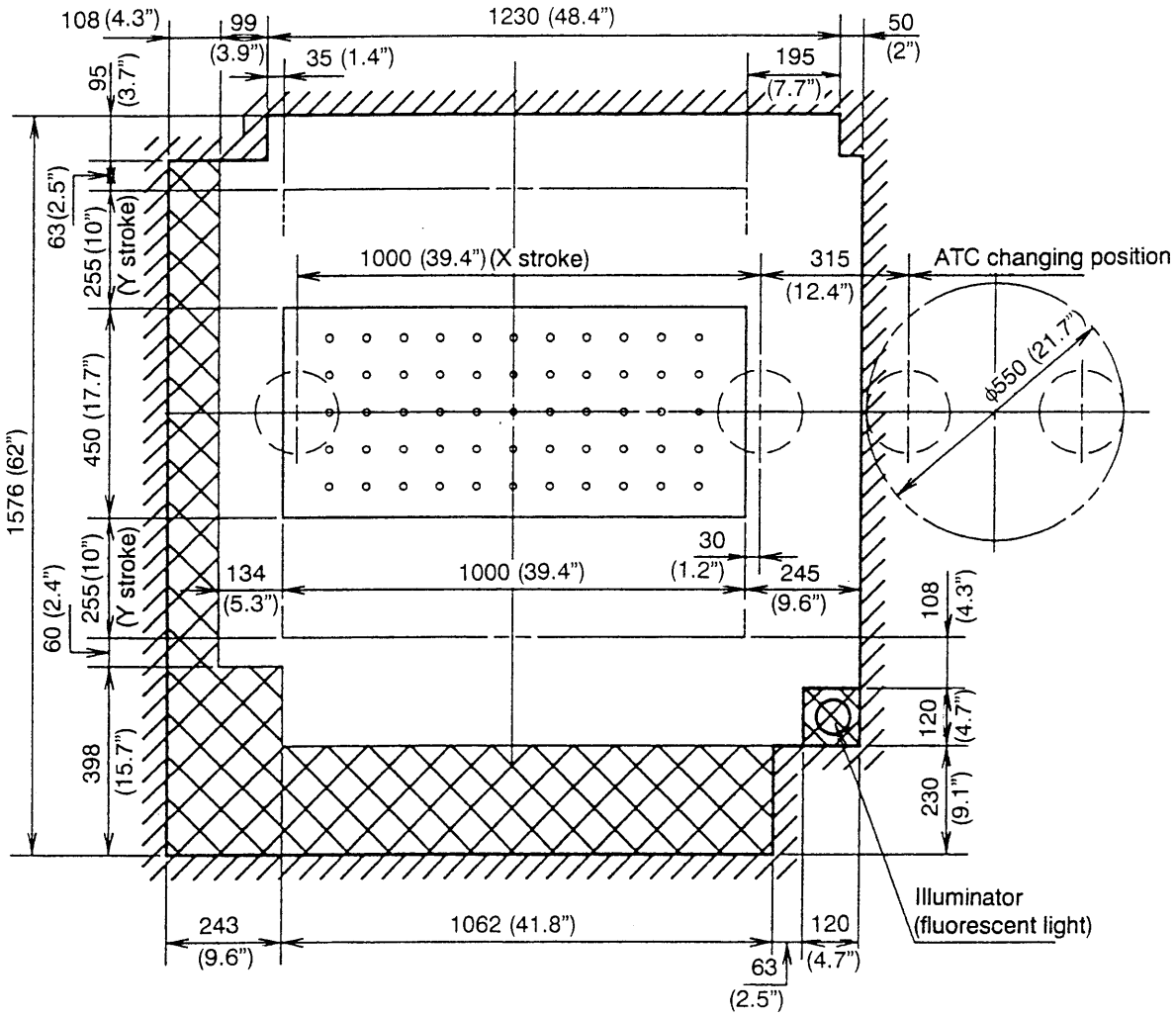
Dimension : metric (mm)
Inch (”)



Workpiece interference range diagram (VS50)

Dimension : metric (mm)
Inch (")

Plane



Note: *Interference area*

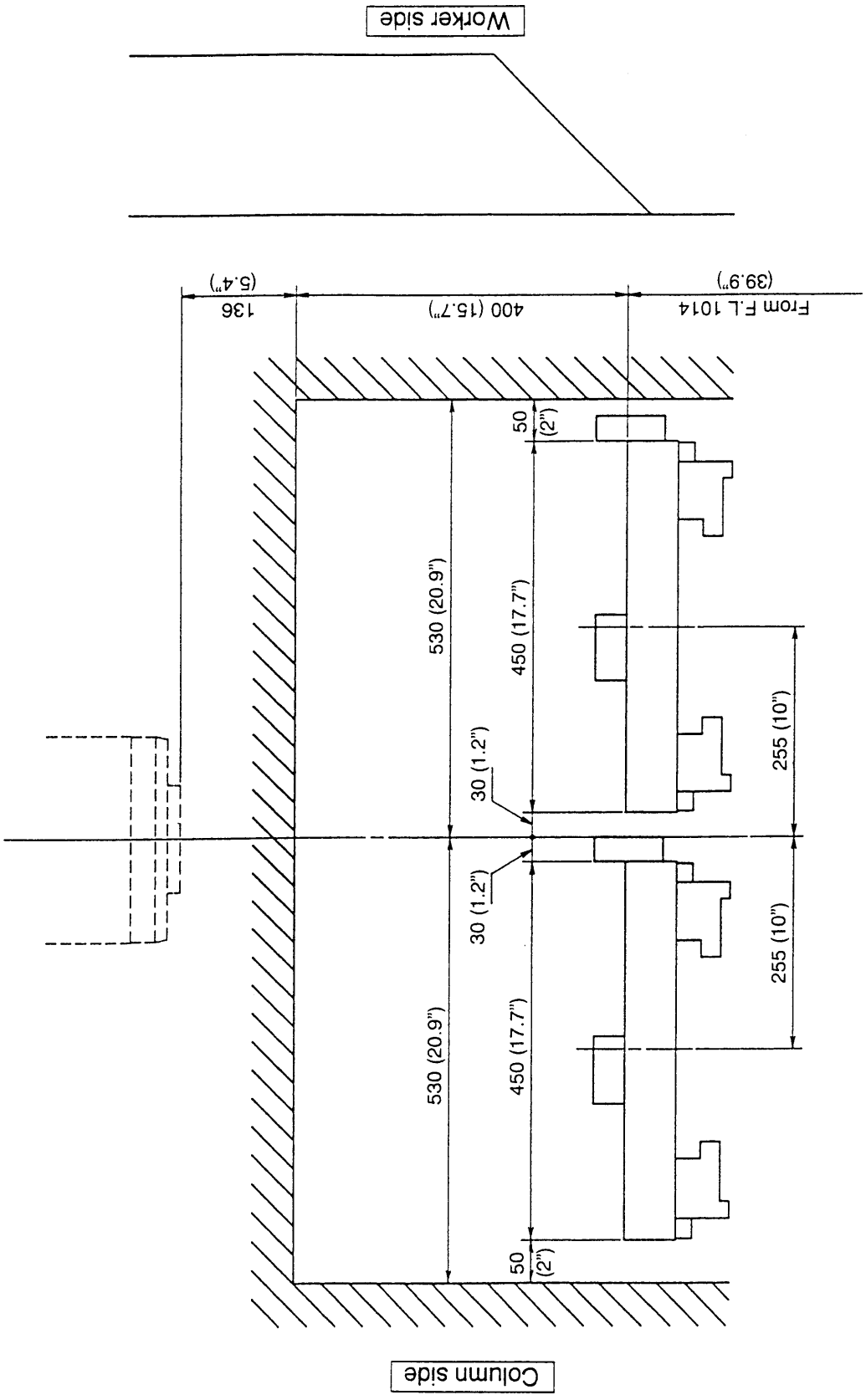
Range in which interference may occur depending on the height of work.
(Refer and confirm with the front and side view of interference range on the next page.)

Upper stage: Bolt pallet

Lower stage: T-grove pallet

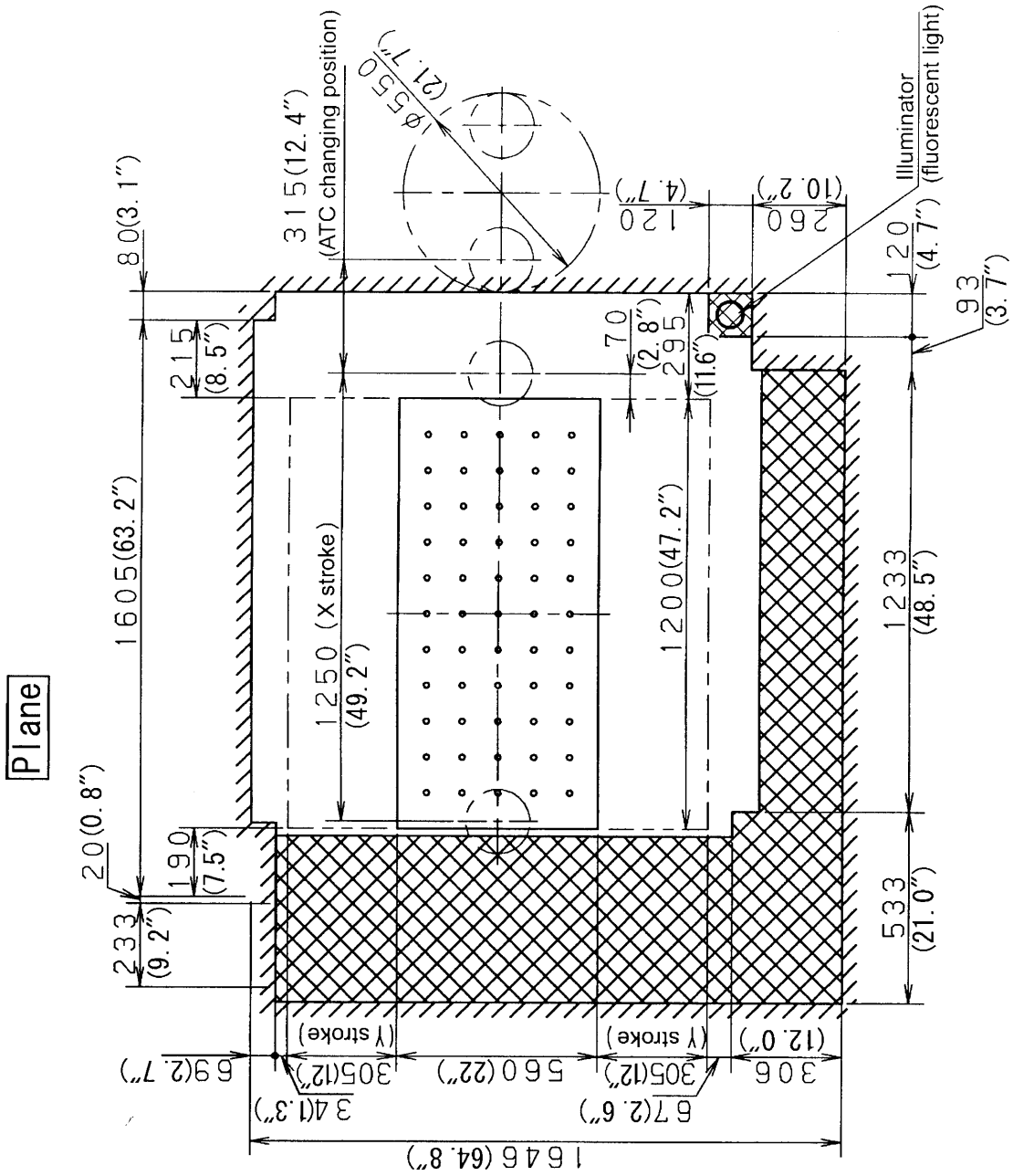
Dimension : metric (mm)
Inch (")

Dimension : metric (mm)
Inch (")



Workpiece interference range diagram (VS60)

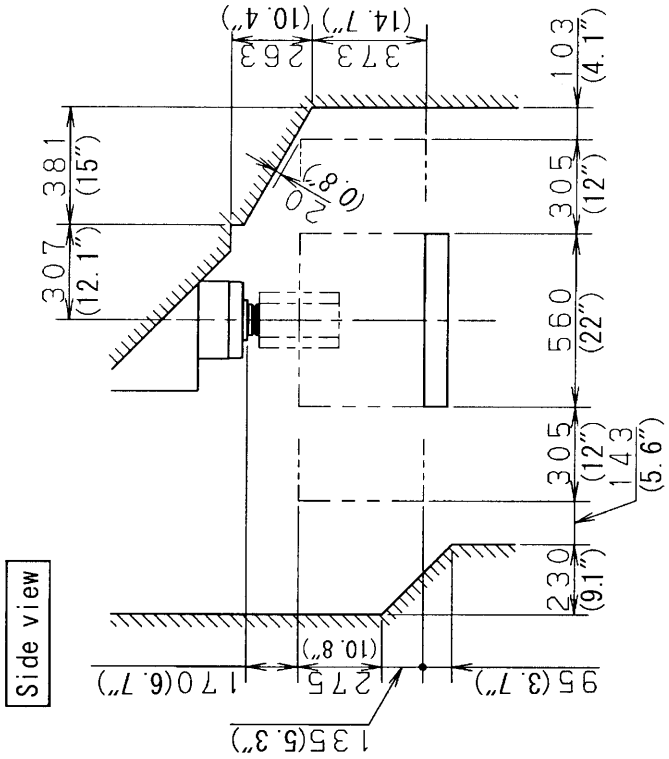
Dimension : metric (mm)
Inch (″)

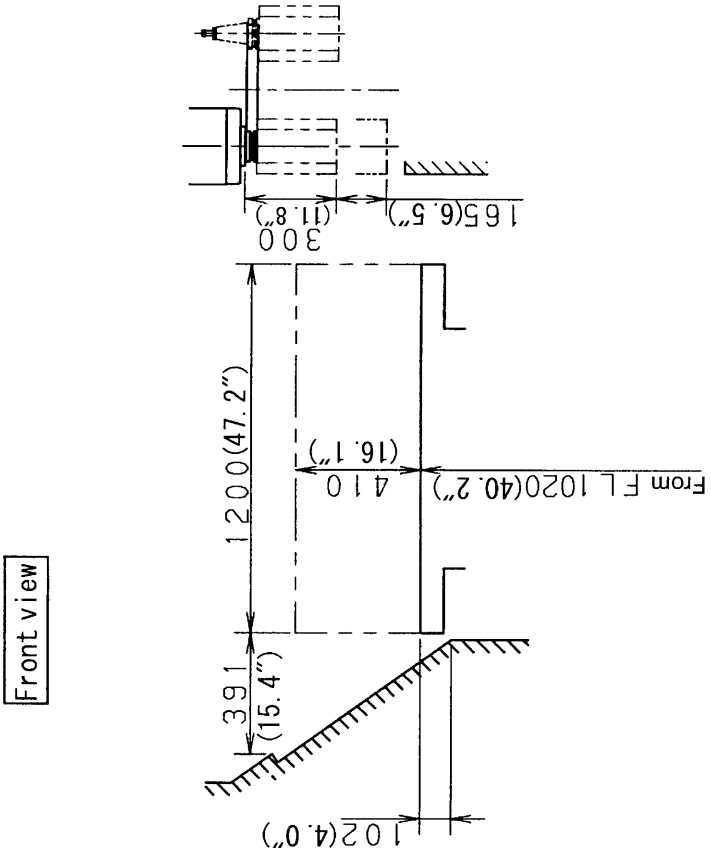


Note: *Interference area*

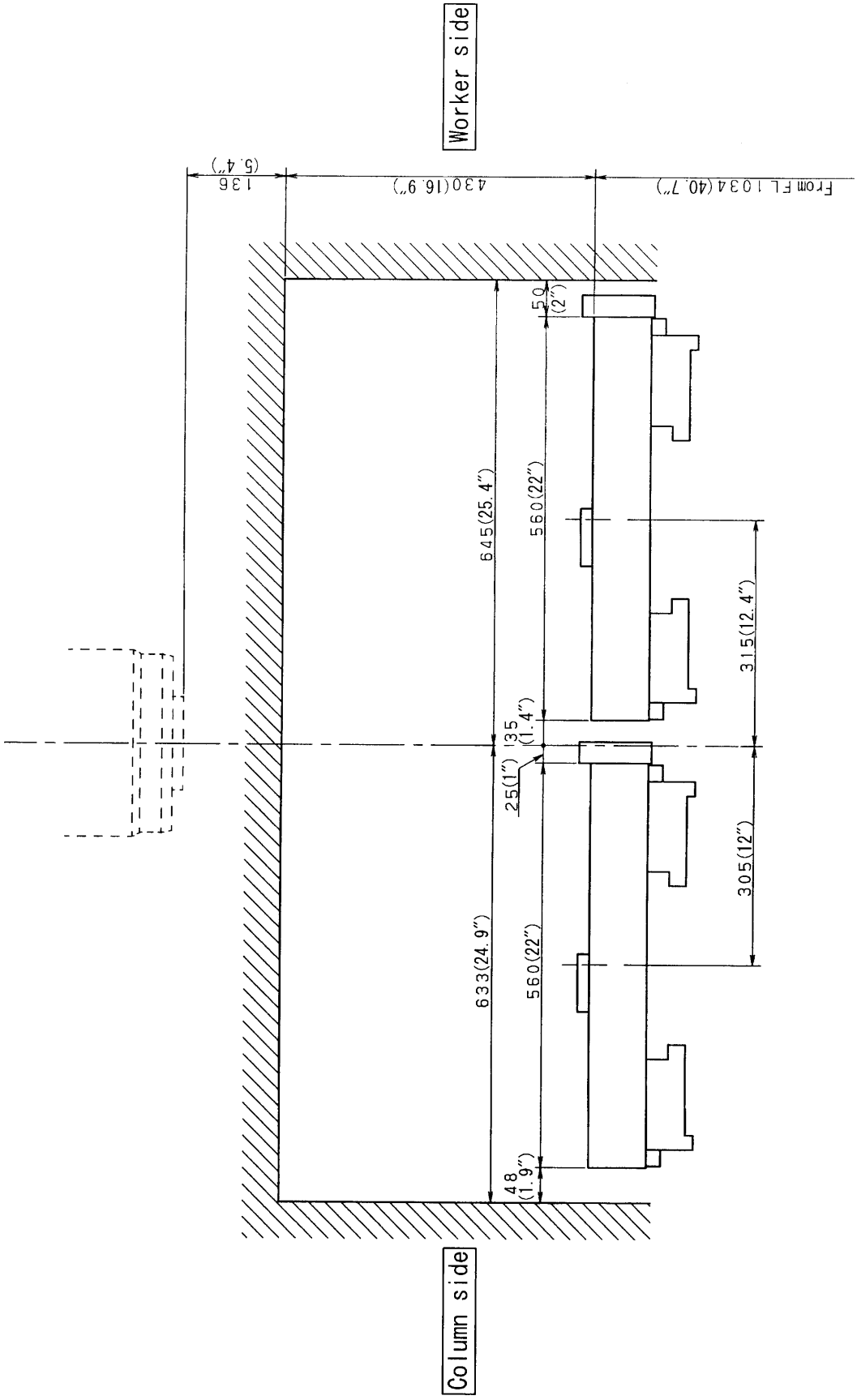
Range in which interference may occur depending on the height of work.
(Refer and confirm with the front and side view of interference range on the next page.)

Dimension : metric (mm)
Inch (″)





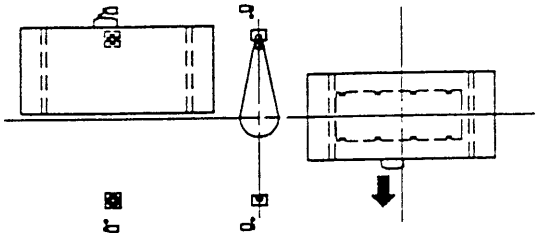
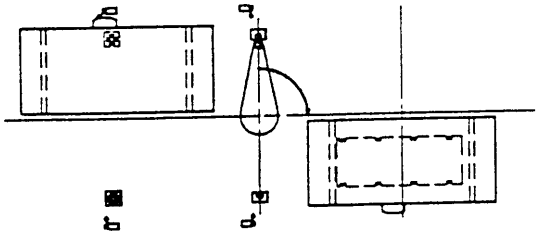
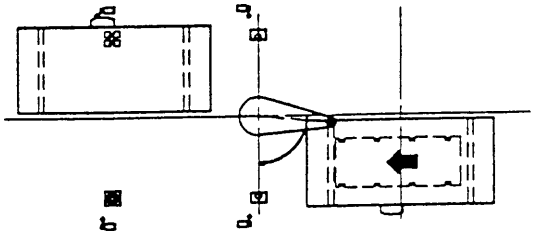
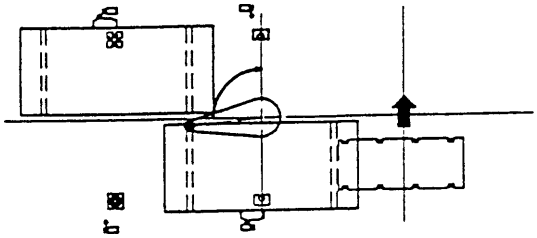
Dimension : metric (mm)
Inch (″)

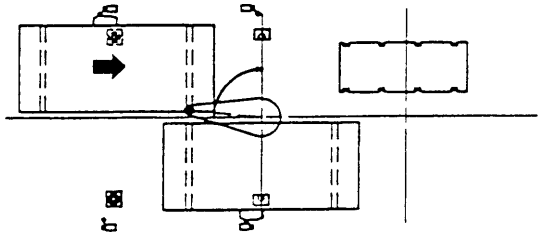
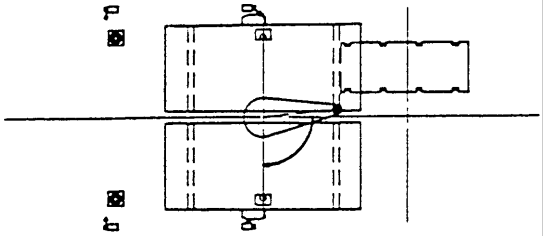
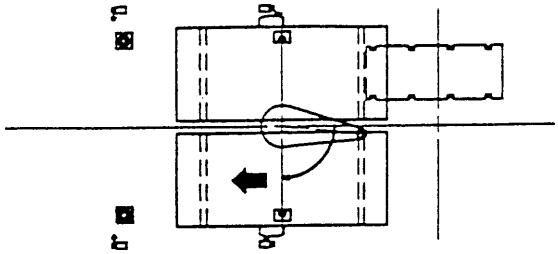
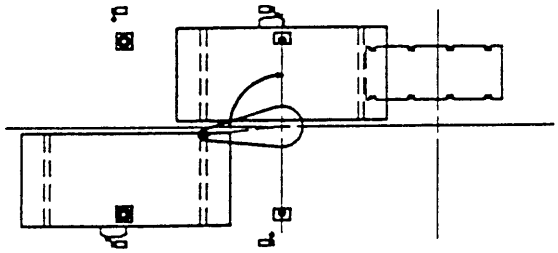
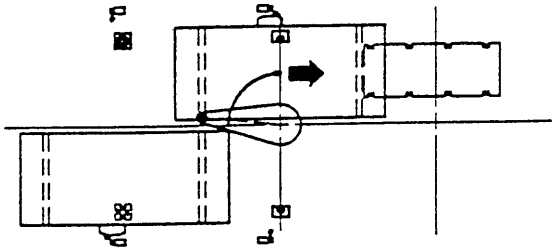
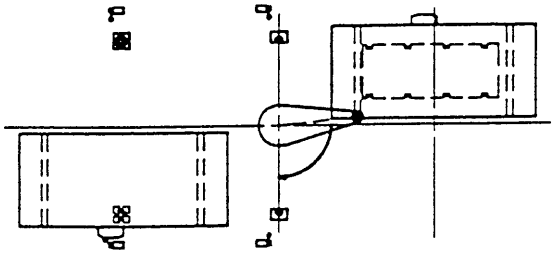


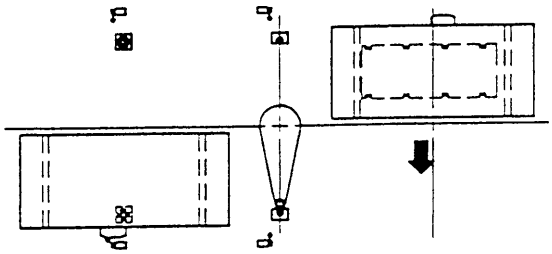
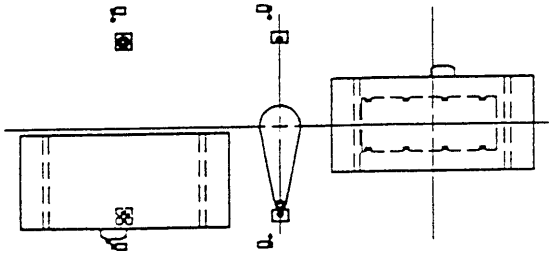
3. OPERATION

3-1 Operation Procedure

***Note**: The action diagram shows the operation cycle of the left pallet shifting from the APC rearranging stage into inside the machine and the right pallet out from inside the machine to the APC rearranging stage. The operation of the right pallet → left pallet progresses with the cycle [12] → [1] .*

	APC rearranging stage / Inside machine	Rearranging stage stopper	Center stopper	End position limit SW No	A	B
[1]		Out	Return / Out	692	ON	OFF
		Return		693	OFF	OFF
[2]		Return	Return / Out	692	ON	OFF
		Return		693	OFF	OFF
[3]		Return	Out / Return	692	ON	OFF
		Return		693	OFF	OFF
[4]		Return	Out / Return	692	ON	OFF
		Return		693	OFF	ON

	APC rearranging stage / Inside machine	Rearranging stage stopper	Center stopper	End position limit SW		
				No	A	B
[5]		Return	Return / Out	692	ON	OFF
		Return		693	OFF	ON
[6]		Return	Return / Out	692	OFF	ON
		Return		693	OFF	ON
[7]		Return	Out / Return	692	OFF	ON
		Return		693	OFF	ON
[8]		Return	Out / Return	692	OFF	ON
		Return		693	ON	OFF
[9]		Return	Return / Out	692	OFF	ON
		Return		693	ON	OFF
[10]		Return	Return / Out	692	OFF	OFF
		Return		693	ON	OFF

	APC rearranging stage	Inside machine	Rearranging stage stopper	Center stopper	End position limit SW		
					No	A	B
[11]			Return		692	OFF	OFF
			Return		693	ON	OFF
[12]			Return		692	OFF	OFF
			Out		693	ON	OFF

3-2 Individual Movement (At MDI or Maintenance Mode)

In case of execution of individual movement for test running or adjustment of maintenance etc., operate a unit as follows.

1. Set a mode to the MDI.
2. Set the Y axis to the 3rd reference point by G91 G30 P3 Y0.
   Or, set the Y axis to the 4th reference point by G91 G30 P4 Y0.
   Confirm if the “APC POSITION” lamp on the main operation panel is lit at this time.
3. Turn on the maintenance mode switch in the control cabinet.
   An alarm lamp goes on and off.
4. M codes to be used for individual movement are as follows.
5. Input M9△△ then start.

M code	Motion
M906	Shutter open
M907	Shutter close
M903	Pallet unclamp
M902	Pallet clamp

6. Operate the right and left side pallet fix pin by the push button on the APC operation panel.

Caution

Be specially careful not to perform any erroneous operation.

3-3 Treatment at Power Failure or Emergency Stop

If power failure or emergency stop occurs during machine operation, a ready condition of machine operation including the NC unit will be lost and also mostly memory and movement command become clear condition. Therefore, after restoration from power failure or emergency stop condition, the machine can not be operated without preparation of ready condition of the NC unit and machine by fixed procedure.
About the restoration after emergency stop, carry out a restoration work after confirmation of removing a cause of emergency stop.
When the ready button is pressed, pay attention to the part under operation immediately before a power failure may be moved until remaining movement is completed according to a condition of the hydraulic circuit.

[1] Visually check (position of axis is not checked) and ensure that Y-axis is located on the pallet conveying position.
[2] Solve the cause of trouble such as the “half-way stop”.
[3] Reset the machine by performing each individual operation in the maintenance mode.

For the resetting method, refer to the above 3-2 Single individual operation.

Restoration after emergency stop during APC operation

[1] Press the operation preparation button to bring the system into status of operation standby.
[2] Select the manual mode (feed, zero return) or the MDI mode.
[3] Confirm that the blinking light of the original position return button on the APC operating panel is ON and press the button. Then the APC motion will start automatically in the direction to allow restoration.
[4] On the way of restoration, when it comes to a status where the Y-axis is movable, the APC movement stops.
[5] Select the MDI mode and, at the same time, confirm the contents of the alarm message.
[6] According to the message, move the Y-axis to the third or fourth original point.
[7] Press again the original position restoration button on the APC operating panel. The remaining action will start thereby the pallet is moved onto the table and the original position is restored to complete the whole action.

D413.3 APC limit switch is abnormal. (In case of requiring repairs of APC maintenance M910)

When APC relevant limit becomes abnormal, APC operation cannot be executed in the normal way. If it is operated with a defective limit switch, there are risks of damaging the machine. Be sure to replace the defective limit switch or make necessary repairs and confirm the normal function of the switch before executing any restoration work.

X0004.0	LS693B	LS at original position of right pallet.
X0003.7	LS693A	LS at middle point of right pallet
X0008.0	LS692B	LS at original position of left pallet
X0007.7	LS692A	LS at middle point of left pallet
X0008.1	LS39A	LS at pallet carrier arm original position

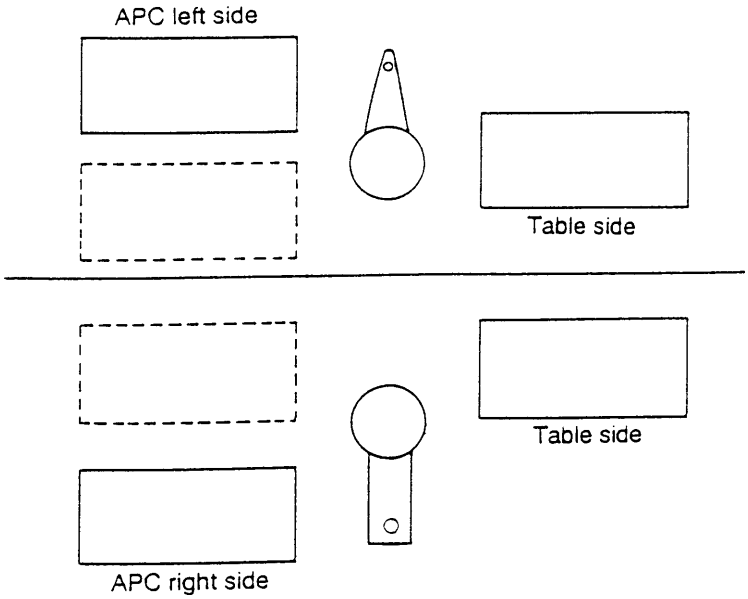
(LS is OFF at original position)

Confirm the ON/OFF condition of limit switch by diagnosis.

APC maintenance M910 (APC arm manual operation mode)

- Select the maintenance mode.
  Put the maintenance switch on the control board ON, or execute M998.
- Execute M910.
  APC door open and pallet unclamp are automatically executed and the system is brought into the maintenance mode.
- The pallet fixing pin button on the APC operating panel changes to APC carrier arm inching button.
  Left pull out = Arm left turn
  Right pull out = Arm right turn
- As the interlocking function is ignored for this arm inching operation, the movement of the arm should be carefully watched visually. Any arm movement forcibly operated may cause to machine damages.

- There are two original positions of the APC arm.



When pallet is on the left side of APC, the arm original position is to the direction as shown by the sketch on the left.

When pallet is on the right side of APC, the arm original position is to the direction as shown by the sketch on the left

- Adjust the pallet position and the arm original position to coincide.
- Exit from the maintenance mode.
- Put the maintenance switch on the control board OFF, or execute M999 to exit from the maintenance mode.
- By releasing the maintenance mode, the APC maintenance mode is also released.

3-4 APC Program

Example 1) Without pallet check (M60)

Oxxxx

•

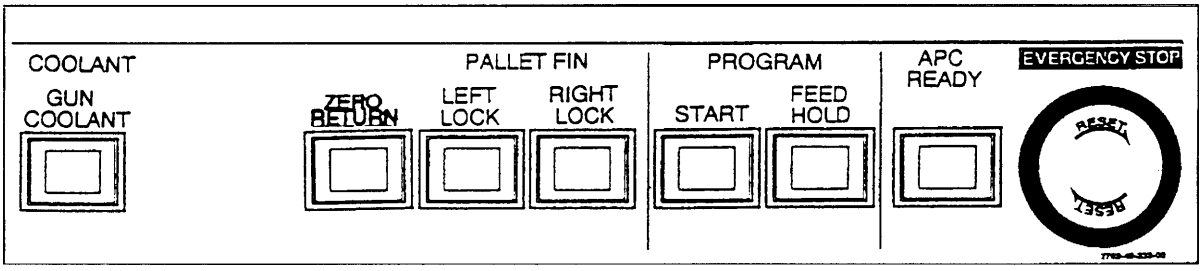
•

•

M60 ..... Use a macro program. Execute APC by calling O9001. (Carry in the pallet at the outside into the machine.)

NOTE *[1] If M60 is used at a machining program, carry in the outside pallet into the machine without pallet check and enter a machining.*

[2] Confirm the transfer preparation completion lamp of the APC operation panel before execution of M60.



Example 2) Program for pallet check (M157, M158)

```
Oxxxx
M36 ..... Automatic start OFF
N1 (R-PALLET IN)
M98 P93 (R-PALLET IN)  ──→  O93 (R-PALLET IN SUB)
•                           G91 G28 Z0 M15
•                           M163
•                           G91 G30 P4 Y0
•                           M157 ..... Pallet carry out
M98 ..... Machining         G91 G30 P3 Y0
•           program         M158 ..... Pallet carry in
•                           M99
•
M01
N2 (L-PALLET IN)
M98 P94 (L-PALLET IN)  ──→  O94 (L-PALLET IN SUB)
•                           G91 G28 Z0 M15
•                           M163
•                           G91 G30 P3 Y0
M98 Pxxxx ..... Machining   M157 ..... Pallet carry out
•           program         G91 G30 P4 Y0
•                           M158 ..... Pallet carry in
•                           M99
•
M01
M35 ..... Automatic start ON
M30
```

When transfer preparation is ON, execute a heading by M30 and start a machining again by carring out the automatic start.

4. TRANSPORTATION AND INSTALLATION OF THE MACHINE

4-1 Transportation of the Machine

As the construction of this machine is a type that the machine is integrated with the electric appliances, the machine can be transported only by removing the power cord. As to the fixing method of the moving sections and the lifting work, proceed as shown in Fig. 4-1.

4-1-1 Precautions for Lifting Work

Since the lifting work is one of the important set-up works when the machine is transported, sufficient care should be taken. As the machine is transported through lifting works by means of a crane or a chain block, the specific cautions for the lifting work are described in the below.

(1) Use wire ropes with a diameter not less than 14mm (0.6”).
(2) Put pads on the sections with acute angle in order to protect the machine and the wire rope.
(3) The machine is required to be lifted in a horizontal positions of the under surface of the bed, and it is undesirable that the pallet changer side may become lower.
(4) Do not use rusted wires, untwisted wires or wires of which cor cable is broken.
(5) When lifting up the machine, wind up the wires gradually, and when the wire ropes are tightened, stop lifting once to chick the lifting condition. Then, when the machine is lifted up from the floor, check again if the lifting cable is normal, and then lift the machine to the required height. When lowering the machine, the machine should be lowered slowly. Then, lower the machine onto the floor.

4-1-2 Precautions for Lifting Work by a Forklift

(1) Select a forklift of which capacity is sufficient for the machine weight.
(2) When operating the forklift, be sure to work together with a supervisor for checking the lifting work so that the projected sections of the machine periphery may not be damaged.
(3) When driving the forks under the machine, use the cast grooves for inserting the forks that are located at the left and right sides of the machine base.
(4) When lifting the machine, be sure to proceed provisional lifting work to check the gravity of the machine both in the front and back direction and in the left and right direction so that the machine may be lifted at the stablest position.

Fig. 4-1 Figure of transportation (VS40)

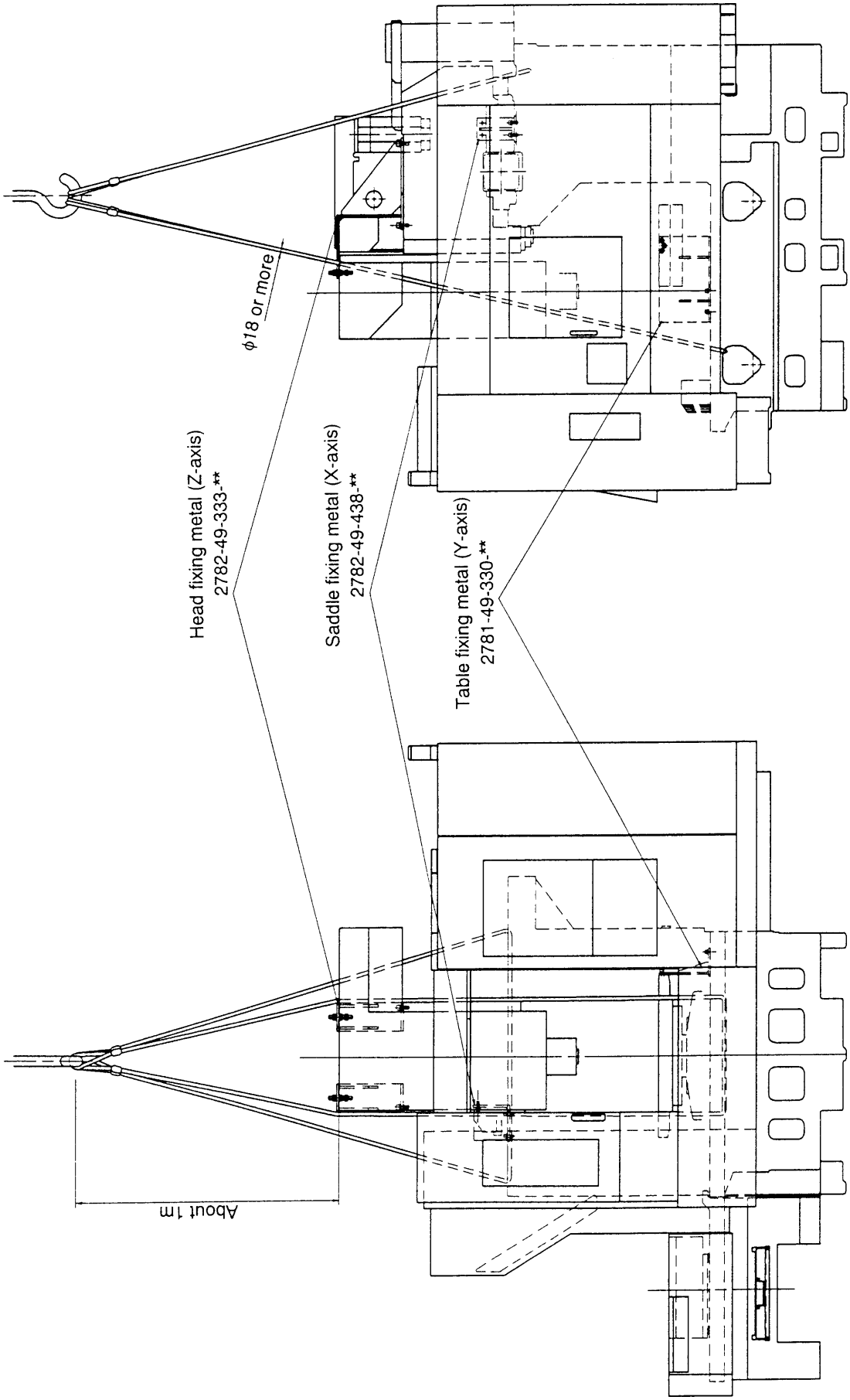


Figure of transportation (VS50)

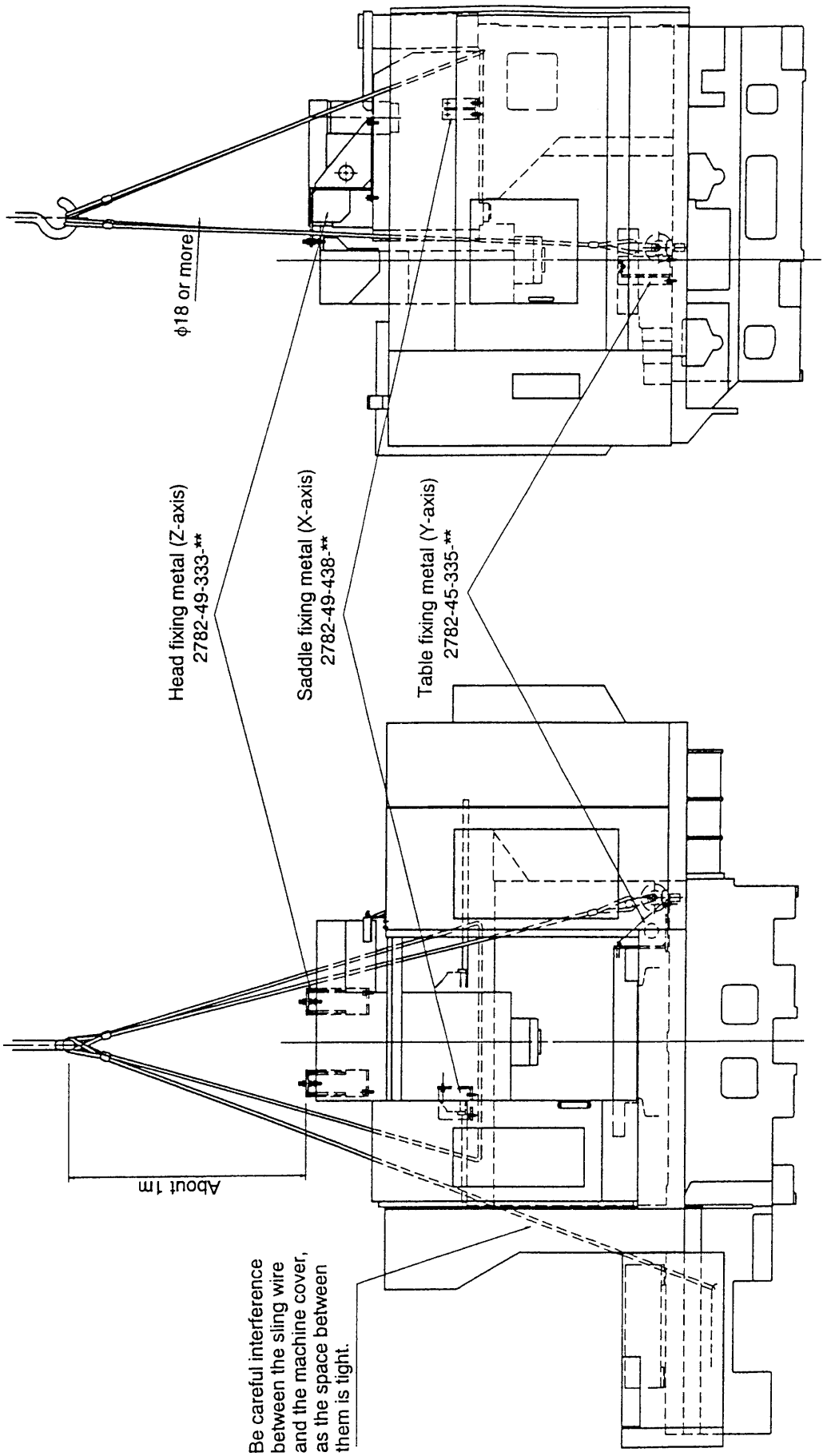
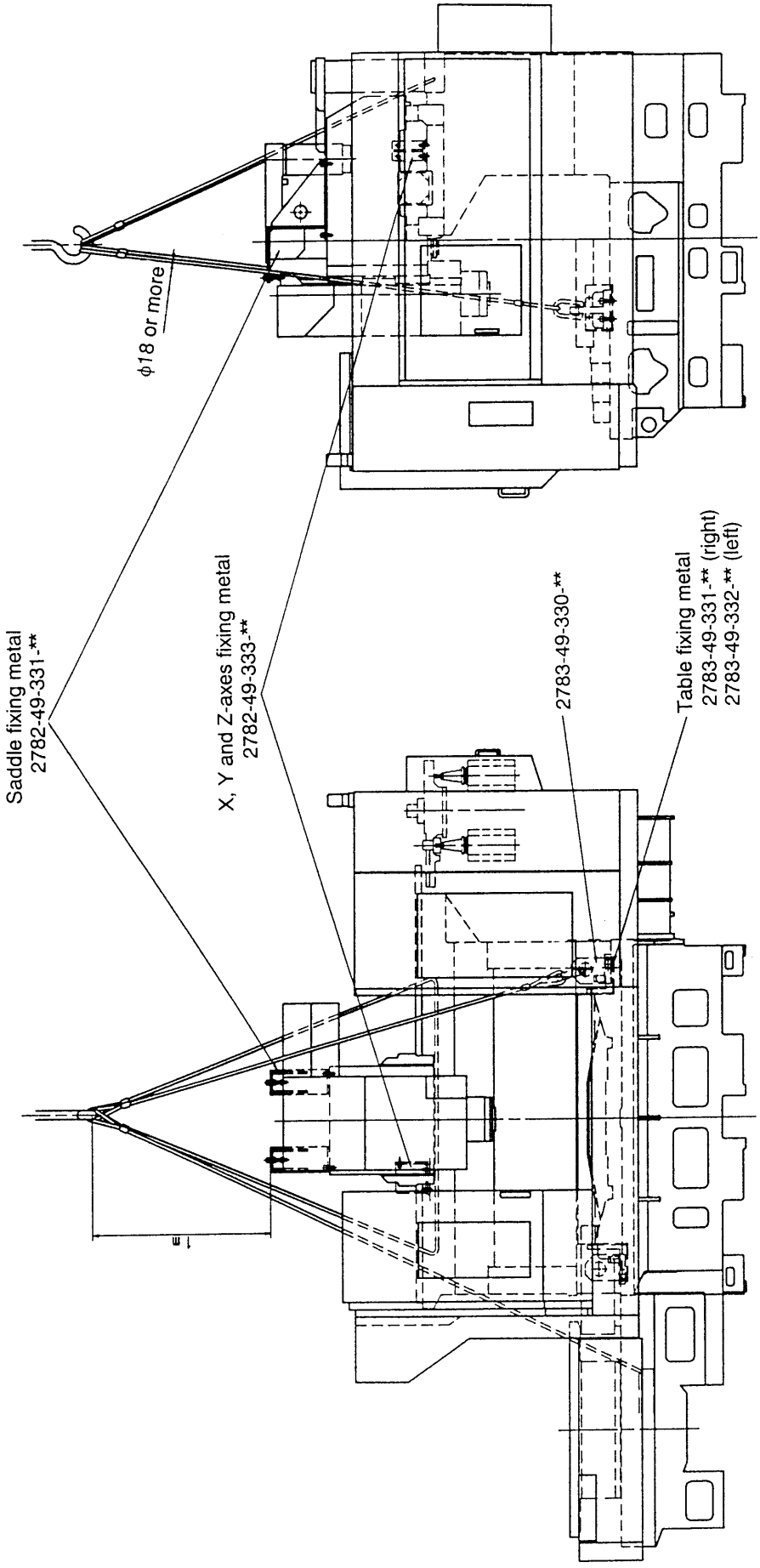


Figure of transportation (VS60)



4-2 Environment for Machine Installation

Pay full attention to a room temperature, dust, vibrations, etc. in order to make use of the primary performance of the machine. Needless to say that high accuracy cannot be obtained in the environment where the room temperature greatly changes. Just a slight change of the room temperature partly affects the machine. Be fully careful of effects heat transfer from the direct sunshine, vent, heating unit, and so on.

Under the environment where the air is polluted so much by dust, etc., the sliding sections and electric devices of the machine are greatly affected in their service lives.

Particularly, electronic devices related to controls are susceptible to dust and humidity.

Install the machine in the environment as clean as possible.

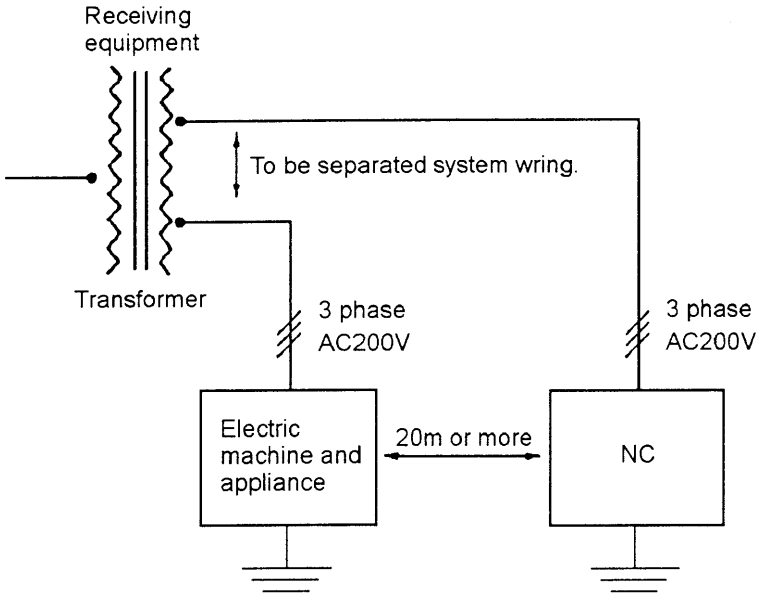
Also, the machine must be installed at a place free from vibrations caused by other machines.

In case that electric machines and appliances generating high frequency noise are installed near by NC machines, or newly erected keep to the following precautions.

1. Example of the electric machines and appliances generating high frequency noise.
   (1) Arc welding machines
   (2) Resistance welding machine
   (3) High frequency drying machine
   (4) Electric discharge machine
   (5) Others
2. Installation norm of NC machines
   (1) Power supply line
   The power supply line (AC200V) of NC cabinet shall be separated line with that for electric machines and appliances. If impossible, connect the line at the point more than 20m apart from the point where the power supply for electric machines and appliances is connected.
   (2) Installation place of NC
   NC shall be installed more than 20m apart from electric machines and appliances.
   (3) Earth of NC
   The earth of NC shall be grounded within 5m from the NC separating from the ground of electric machines and appliances, and grounded at not more than 100Ω)
   The thickness of earth wire shall be not less than 1.25mm^2.

3. Example of installation of NC Machine

The installation state of NC and electric machine and appliances are illustrated as under.



Grounding: Class 3 grounding work within 5m
(Grounding resistance of 100Ω or below.
Wire size of 1.25mm² or above.)

4-3 Construction of Foundation

To make the machine exibit its performance fully, construct the foundation for machine installation with a bearing capacity of soil of 5 tons/m^2 or more. For the foundation drawing and required floor dimensions, refer to Fig. 4-2.

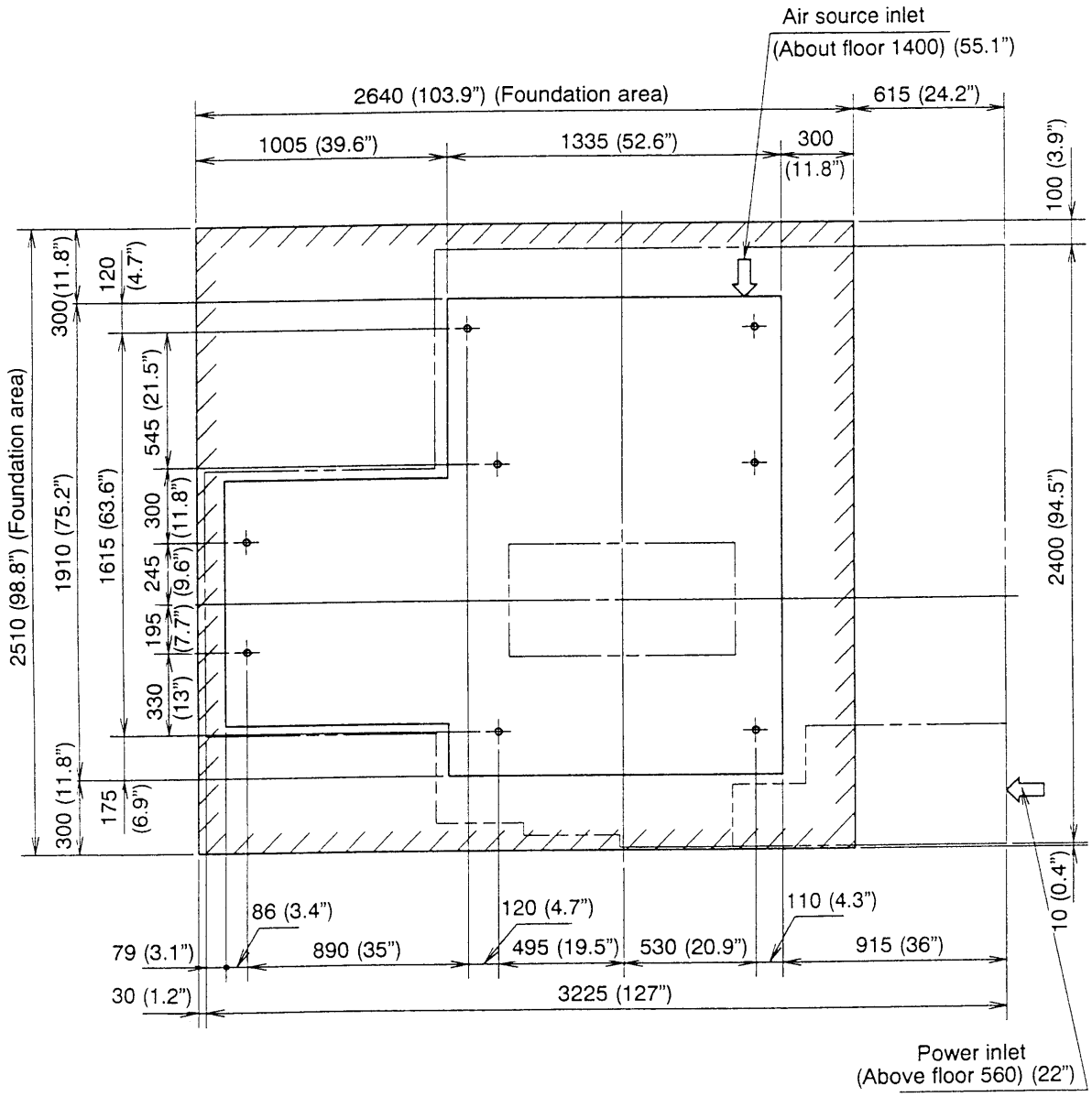
Fig. 4-2 Foundation layout diagram for the machine with APC (VS40)

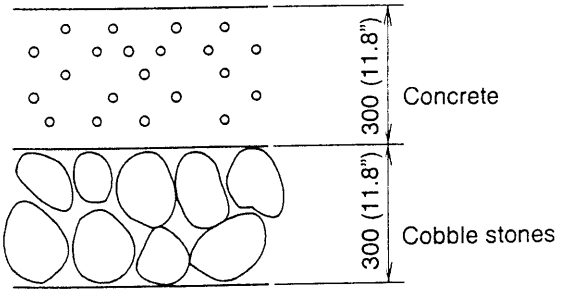
Note *1) The resistivity of ground should be 5 ton/m² or more and the thickness of foundation, 300mm (11.8") or more.*

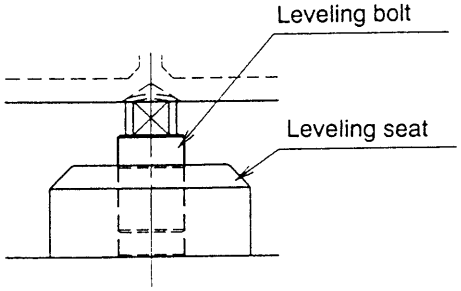
2) The range of foundation should be 300mm (11.8") or more around the circumference of bed.

3) When installing anti-vibration ditch, install along the circumference of foundation.

Dimension : metric (mm)
Inch (")







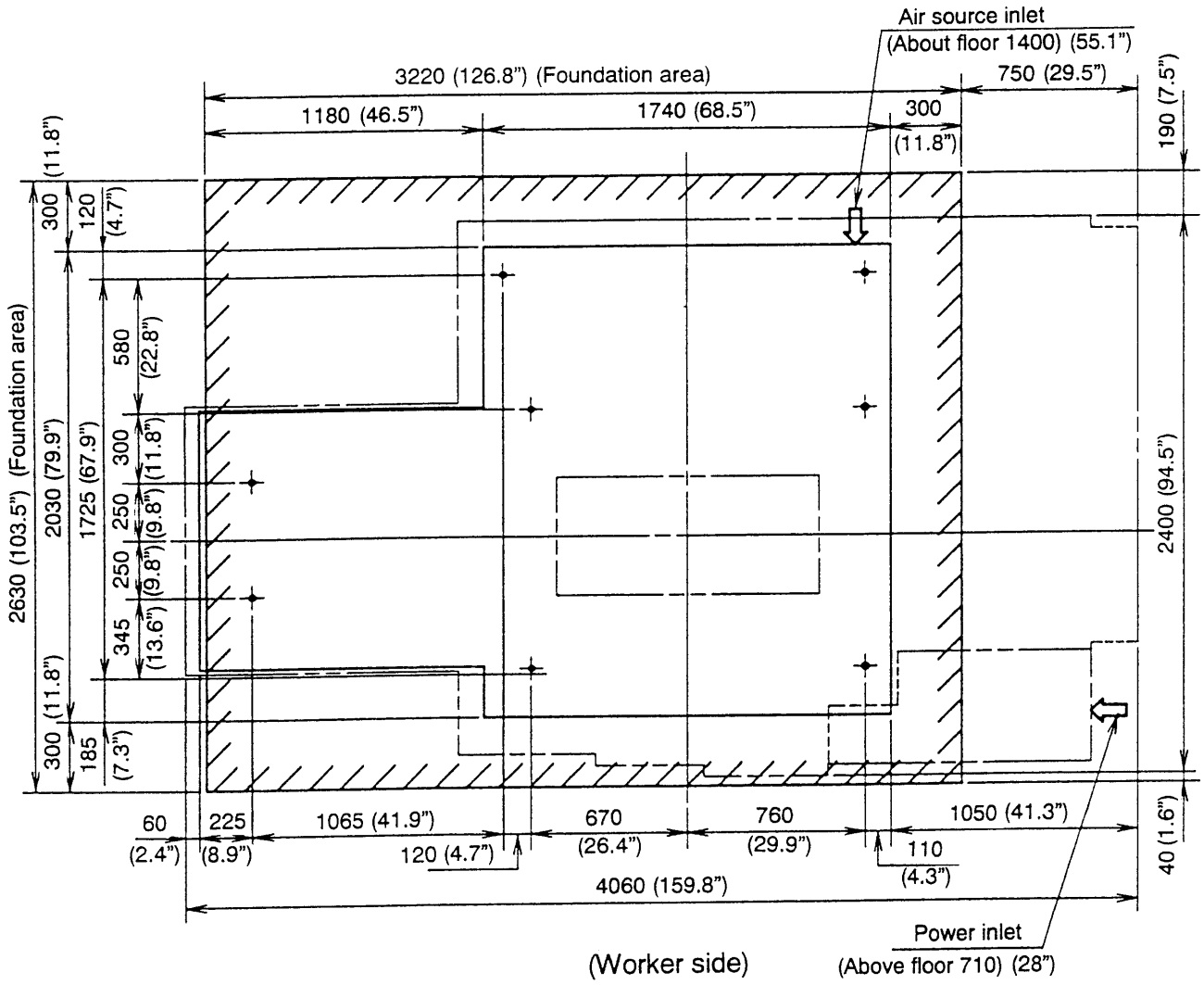
Foundation layout diagram for the machine with APC (VS50)

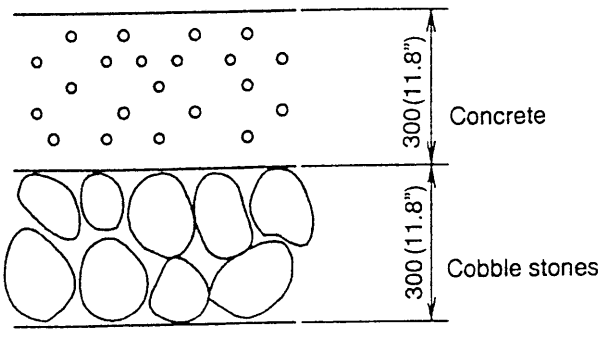
Note *1) The resistivity of ground should be 5 ton/m² or more and the thickness of foundation, 300mm (11.8") or more.*

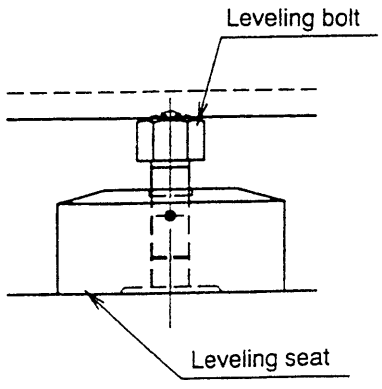
2) The range of foundation should be 300mm (11.8") or more around the circumference of bed.

3) When installing anti-vibration ditch, install along the circumference of foundation.

Dimension : metric (mm)
Inch (")







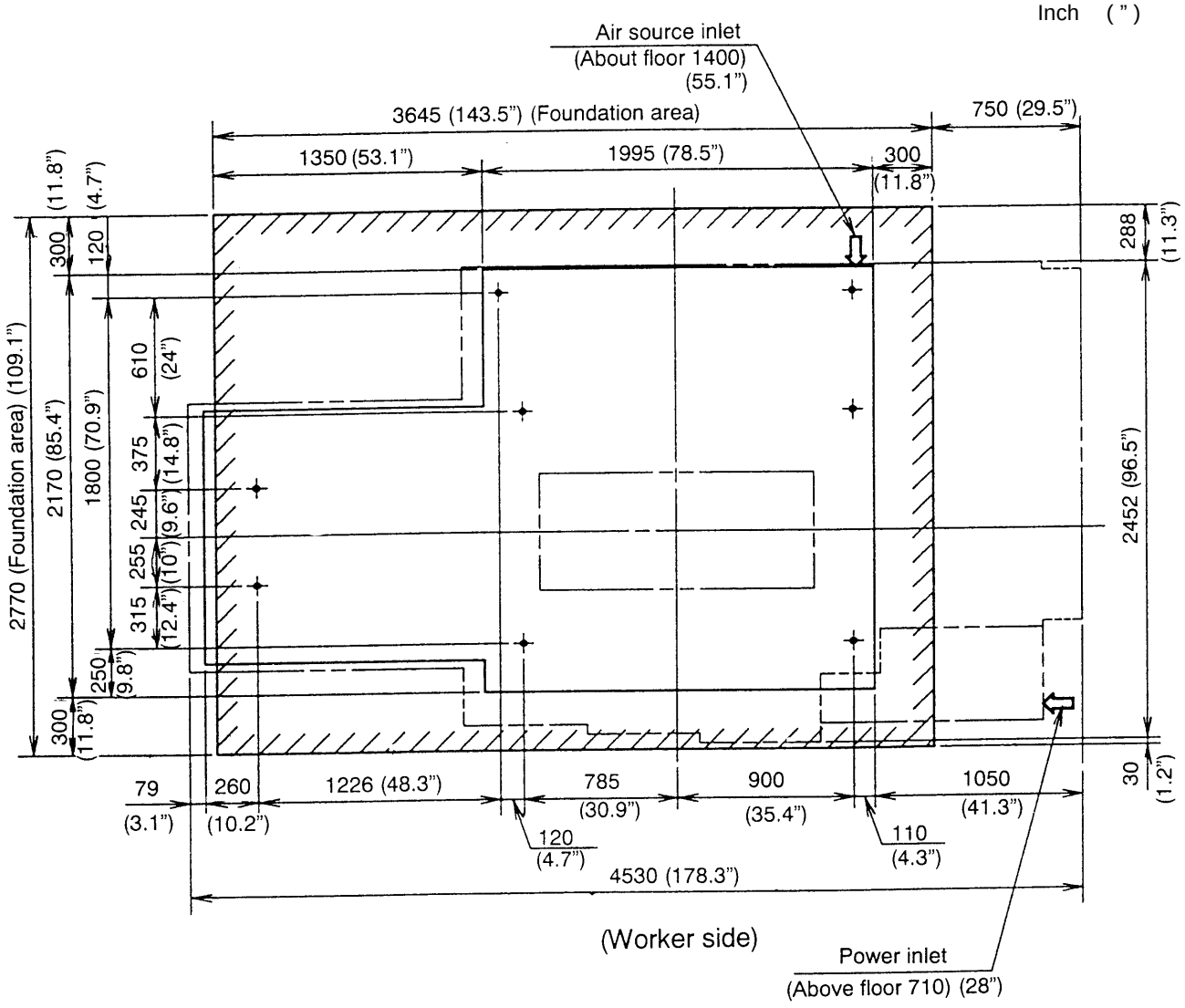
Foundation layout diagram for the machine with APC (VS60)

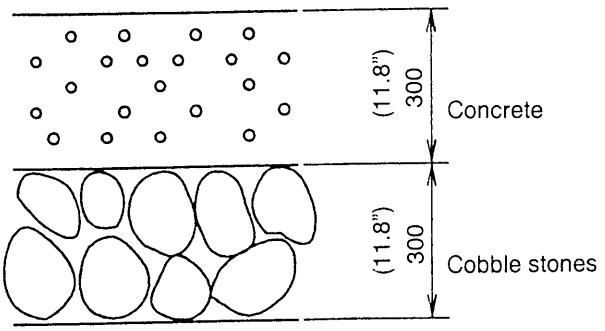
Note *1) The resistivity of ground should be 5 ton/m² or more and the thickness of foundation, 300mm (11.8") or more.*

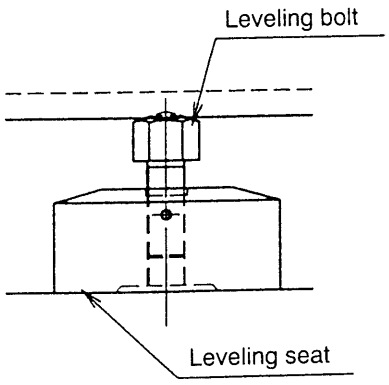
2) The range of foundation should be 300mm (11.8") or more around the circumference of bed.

3) When installing anti-vibration ditch, install along the circumference of foundation.

Dimension : metric (mm)
Inch (")







4-4 Installation of Machine

4-4-1 Preparation for Installation

(1) Preparation Items

Item	VS50/60			VS40/50/60		
Spindle specification	4500		10000	12000	12000 High power	20000
Primary power capacity (KVA)	25		40	18	36	31
Main fuse (A)	100		150	100	125	125
Power line thickness (Min. mm^2)	38		60	22	50	50
Grounding wire resistance 100Ω or less (3rd Class) (Min. mm^2)	8		8	8	8	8
Cutting oil (ℓ)	420					
(Air supply) Pressure (MPa {Kgf/cm^2})	0.5 (5)					
Capacity (ℓ /min. ANR)	100					
Machine side piping	RC1/4 or 3/8 ” hose					

Note *1) When installing a leakage circuit breaker with source power Select the rated sensitivity of 200mA.*

2) Grounding is to conform to the 3rd Class standard (100Ω or less). Do not make wire connection with constructional iron frame.

a) Electric wiring

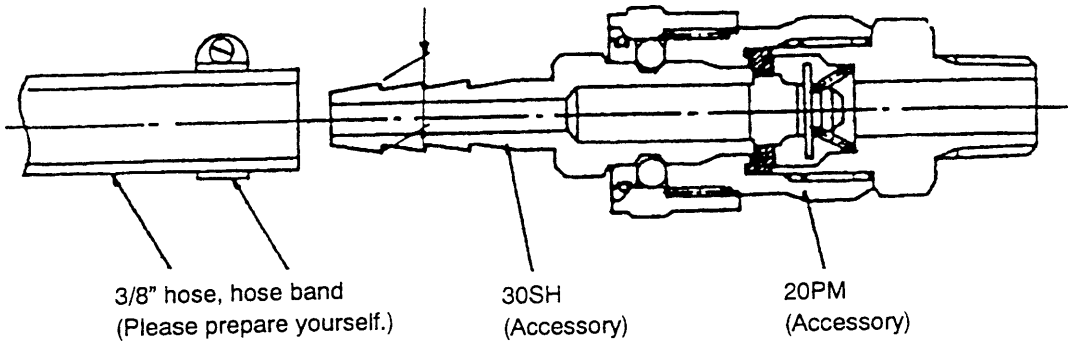
Wiring provided for this machine connects between the machine proper and its attachments only. The user is kindly requested to prepare wiring from the supply power source to the control cabinet. Although an electric wire used for this purpose slightly differs depending on a distance from the power source to the control cabinet, it is necessary to connect with the one whose sectional area is 22mm^2 (0.87”) or more.

b) Pneumatic source

Since this machine requires supply of compressed clean air for blowing off chips and cleaning the spindle hole and tool shank part also for pallet clamp/unclamp pneumatics and other use, prepare air source of a proper capacity. (pressure: 0.5MPa {5kgf/cm^2} or higher, flow rate:100 ℓ /min; ANR, tank capacity of compressed air source; 40 ℓ or larger)

This pneumatic source must be naturally free from dust contained in the air and oversaturated moisture. Due to a nature of the air, as the air temperature of the pneumatic source increases higher than the temperature of the machine proper, it is cooled on the machine proper side and causes water drops more easily. If moist air is injected, it may rust the spindle hole and tool shank, thus having ill effects on machining accuracy and a cutting surface. Therefore, the better, the lower the air temperature of the pneumatic source is. When there is a great temperature difference, attach an air dryer between the pneumatic source and the machine.

An air coupler 30SH + 2OPM (NITTO KOKI make) is attached to the machine. Please prepare a 3/8" hose and hose band by yourself and connect it.



c) Oil supply

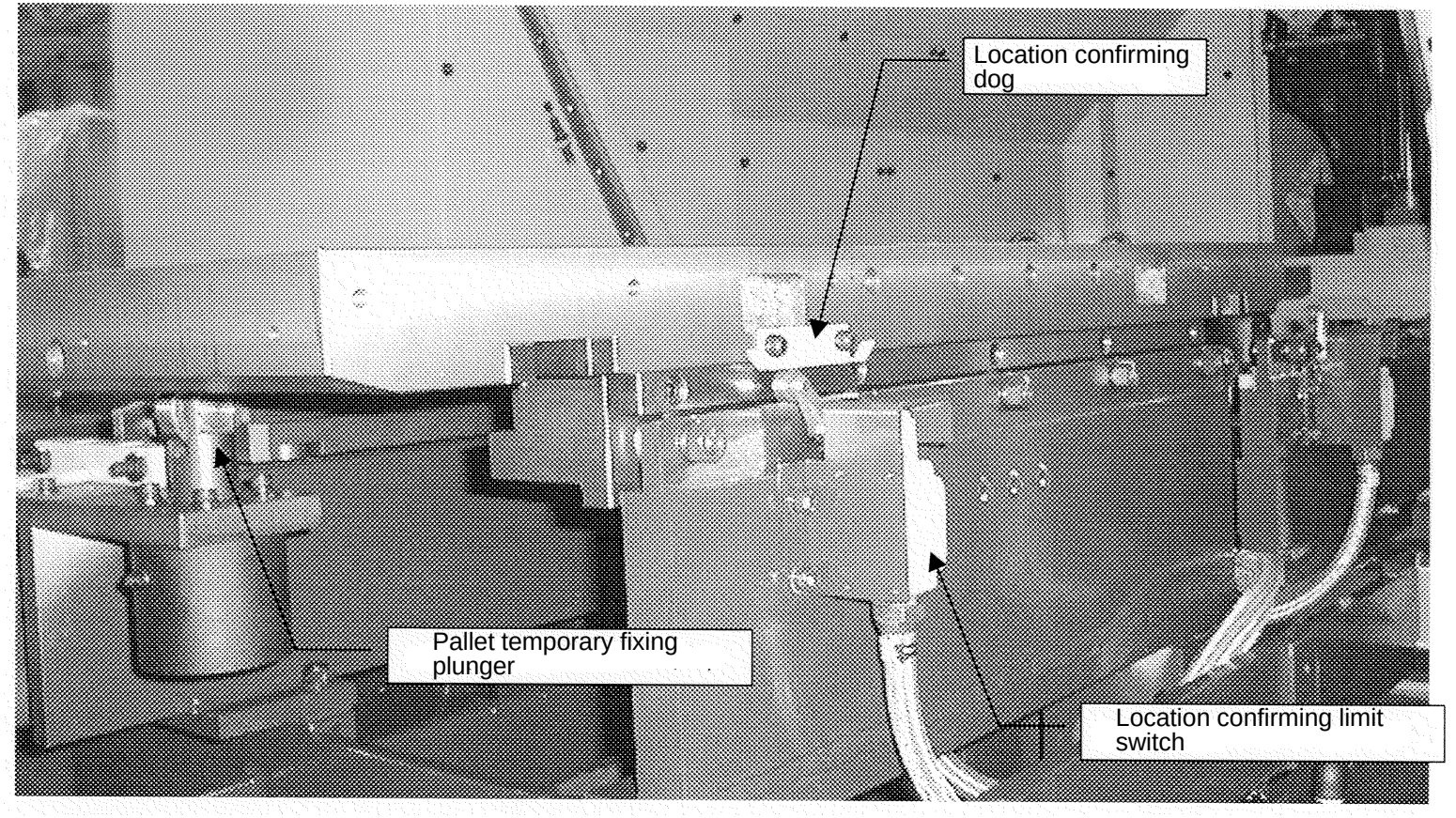
Usually there is no need of supplying oil, however, when it becomes necessary for some reason, pay full attention to the following points.

1. Supply specified oil by specified amount. Do not supply a different type of oil or over the specified amount. Otherwise, the machine may malfunction.
2. Clean an oil inlet port in advance lest dust, etc. should enter inside.
3. When supplying the oil, use a filter to prevent foreign substances from entering inside the tank.
   When the filter is not available, use a wire net of 150 mesh or more.
4. Whenever you supply the oil, use new one. Do not mix with reproduced or old oil.
5. Even when opening a new oil can, do not use all oil in it, but leave some unused. This is necessary to eliminate moisture and deposits.

Caution at Time of Mounting Pallet

Mount a pallet at each work rearranging position in such a way that the phase of the location confirming dog on the side of the pallet and the location confirming limit switch matches.

***Note**: APC does not work, when the pallet is mounted on the work rearranging position where the phase of the dog and the limit switch mismatches.*



* The photograph is taken with the side cover of pallet removed for convenience of explanation.

5. INSPECTION AND ADJUSTMENT

5-1 Daily Inspection

The following maintenance should be performed by the operator. The maintenance and adjustment are important matters in order to prevent the machine from occurring failure, and to operate the machine efficiently.

5-1-1 Checks Before Daily Operation

(1) Whether oil in the lubrication oil tank is sufficient.
(2) Clean every operation panel.
(3) Whether there is any leakage of oil or air.
(4) Cleaning of the spindle hole, tool magazine grip and ATC double arm part.
(5) Remove chips and swarfs on the covers for the slideways and the rollers for transportating the pallets.
(6) Whether oil in the in the reservoir tank of the air hydro-unit part.
(7) Whether the cooling fan for the control cabinet is rotating.
(8) Whether there is any abnormal sound or vibration.
(9) Whether any alarm messages such as battery alarm etc. are displayed on the CRT.

5-1-2 Monthly Checks

(1) Power voltage check
Check whether secondary voltage of the main breaker is within ±10% of the specific value. (200/220V 50/60Hz)
(2) Clean the cooling fans and fins on the inside and outside of the power control cabinet.
(3) Checking and cleaning of each part of the ATC arm.
(4) Checking of the condition of the pallet carrier and cleaning.
(5) Clean the inside of the coolant tank.

5-1-3 Checking Item Every 3 Months

(1) Check the machine and measure and compensate backlash of every screw section of the machine.
(2) Measure and correct the level of the machine.
(3) Check the looseness of the movable sections and the clamping sections of the doors and covers.

5-2 Diagnosis No.

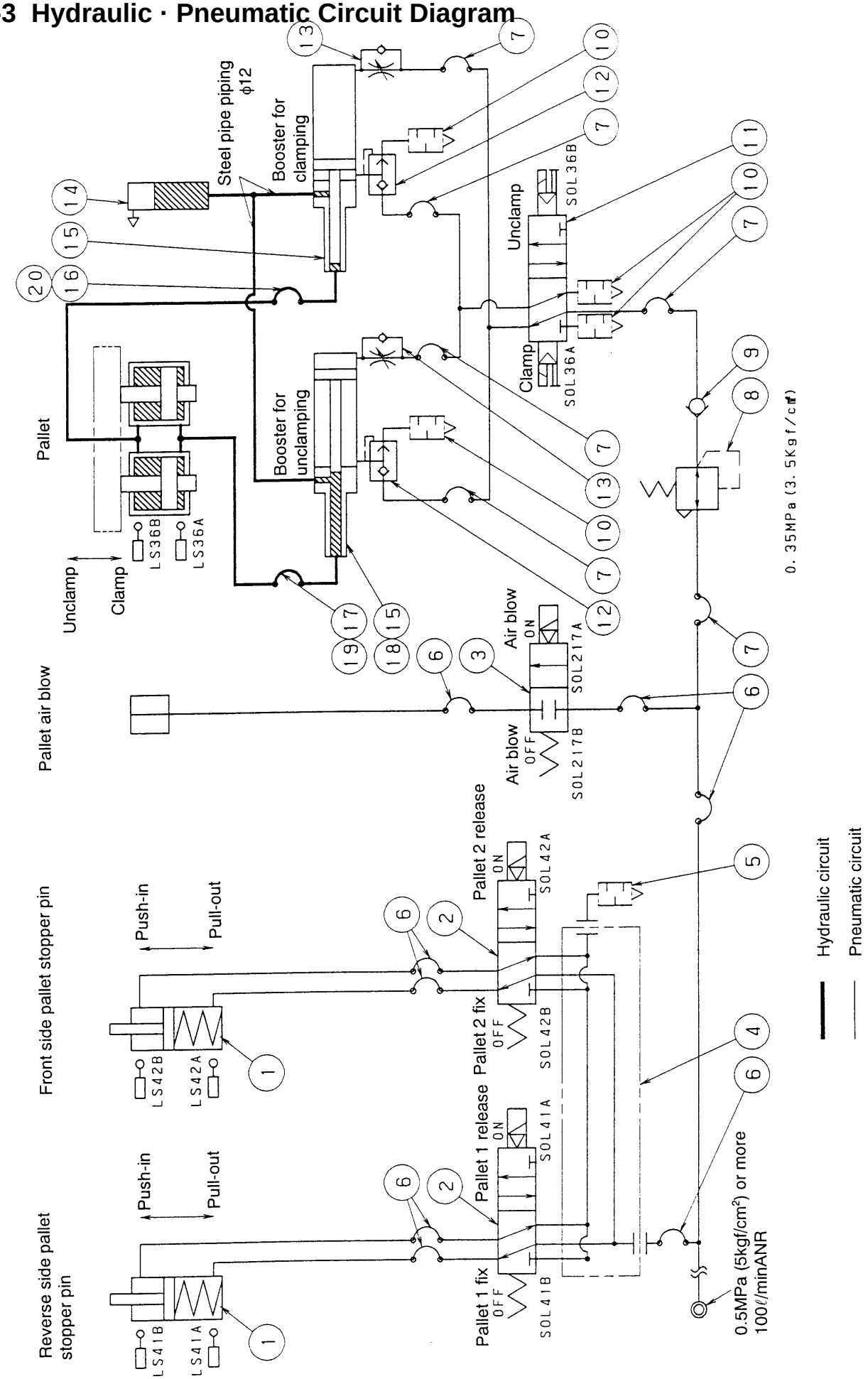
(1) In case of SEICOS Σ18M/Σ16M

OPER/MAINT → F4 system R 2. Diagnosis INPUT → 1 (In/Out signal) INPUT

1. In/Out signal → F6 X contact X △△△ can be seen.
   F7 Y contact Y ❑❑❑ can be seen.

Items	(Device) No.			
Shutter open	(MS-42)	Y0009.3	(LS37A)	X0009.4
Shutter close	(MS-41)	Y0009.2	(LS37B)	X0009.5
APC arm carrier right turn (Inverter motor normal revolution)	(R133)	Y0013.3		
APC arm carrier left turn (Inverter motor reverse revolution)	(R134)	Y0013.4		
Right side pallet positioning pin in			(LS42B)	X0000.3
Right side pallet positioning pin pull out	(SOL42A)	Y0005.2	(LS42A)	X0000.2
Left side pallet positioning pin in			(LS41B)	X0000.6
Left side pallet positioning pin pull out	(SOL41A)	Y0005.4	(LS41A)	X0000.5
Pallet unclamp	(SOL36B)	Y0008.6	(LS36B)	X0000.1
Pallet clamp	(SOL36A)	Y0008.5	(LS36A)	X0000.0
Right pallet at the original position			(LS693B)	X0004.0
Left pallet at the original position			(LS692B)	X0008.0
Right pallet at mid-position			(LS693A)	X0003.7
Left pallet at mid-position			(LS692A)	X0007.7
APC arm at the original position			(LS39A)	X0008.1
Carriage standby complete	(Lamp)	Y0015.2	(Button)	X0007.3

5-3 Hydraulic · Pneumatic Circuit Diagram



Parts List

No.	Code	Part of name	Model	Maker	Type
1	04-999116702	Cylinder	RSDQA50-20B-A73-XA6	SMC	VS40/50/60
2	04-999116719	Solenoid valve	VF1130-1DZ-01	SMC	VS40/50/60
3		Solenoid valve	VT307-1DZ-02-F	SMC	VS40/50/60
4	04-999116726	Manifold	VV5F1-30-021	SMC	VS40/50/60
5	04-999118173	Silencer	AN303-03	SMC	VS40/50/60
6	04-190413110	Nylon tube	TS0806B	SMC	VS40/50/60
7	04-999043930	Nylon tube	TS1209B	SMC	VS40/50/60
8	04-999017719	Regulator	AR2000-02BG	SMC	VS40/50/60
9		Check valve	AK4000-02	SMC	VS40/50/60
10	04-999046647	Silencer	AN103-01	SMC	VS40/50/60
11		Solenoid valve	VFR4210-1DZ-03	SMC	VS40/50/60
12	04-999080733	Quick exhaust valve	AQ3000-03	SMC	VS40/50/60
13		Flow meter	AS5000-03	SMC	VS40/50/60
14	04-999115736	Reservoir tank	CCT63-100	SMC	VS40/50/60
15	2782-00-406-00	Booster	CDQ2L140-180-XB4-X	SMC	VS50/60
16	04-999050147	Hose assembly	P105-9*240CM FU-FU Without WB	SHONAN	VS40/50
17	04-999105120	Hose assembly	P105-9*214CM FU-FU Without WB	SHONAN	VS40/50
18	2781-00-402-00	Booster	CDQ2LH140-P6024-9	SMC	VS40
19	04-999123317	Hose assembly	P105-9*260CM FU-FU Without WB	SHONAN	VS60
20	04-999034677	Hose assembly	P105-9*254CM FU-FU Without WB	SHONAN	VS60

5-4 Expendable Parts List

No.	CODE NO.	PRODUCT NAME	MODEL	VOLUME	MAKER	REMARKS
PALETTE TABLE						
1	02-999033894	Proximity switch	E2E-X3D1-N-5M	2	Omron	VS40/50/60
2	03-821120020	Roller follower	NA2204LL	1	NTN	VS40/50/60
3	03-913114200	Bush	70B-1420	2	Oiles	VS40/50/60
4	03-999028169	Cam follower	CF-SFU-10-1	8	IKO	VS40/50
5	03-999028169	Cam follower	CF-SFU-10-1	10	IKO	VS60
6	04-190413110	Nylon tube	TS0806B	4	SMC	VS40/50/60
7	04-824440100	Packing	SKY-80	4 2	Sakagami	VS50/60 VS40
8	04-851101410	Dust seal	DKI142457	1	NOK	VS40/50/60
9	04-999043930	Nylon tube	TS1209B	2	SMC	VS40/50/60
10	04-999050147	Hose assembly	P105-9*240CM FU-FU Without WB	1	Shonan	VS40/50
11	04-999105120	Hose assembly	P105-9*214CM FU-FU Without WB	1	Shonan	VS40/50
12	04-999117882	Packing	SPG 110	2 1	NOK	VS50/60 VS40
13	04-999117899	O-ring	GS155 (Circle 3.1) NBR	4 3	Shoritsu	VS50/60 VS40
14	2782-00-406-00	Booster	CDQ2L140-180-XB4-X	2	SMC	VS50/60
15	2782-00-407-00	Air equipment VS50 complete set	Air equipment complete set for palette table	1	SMC	VS40/50/60
16	2782-00-538-01	Telesco cover	VS50 APC for Y-axis 580 stroke	1	Enomoto	VS50
17	2782-00-539-00	Slide cover	VS50 APC for Y-axis	1	Enomoto	VS50
18	2782-10-439-01	Spring/C coil	SWPA	1		VS40/50/60
19	2782-10-441-10	Shoe		2		VS40/50/60
20	04-999034677	Hose assembly	P105-9*260CM FU-FU Without WB	1	Shonan	VS60
21	04-999123317	Hose assembly	P105-9*254CM FU-FU Without WB	1	Shonan	VS60
22	2783-00-505-00	Telesco cover	VS60 APC for Y-axis 680 stroke	1	Enomoto	VS60
23	2783-00-506-00	Thread cover	VS60 APC for Y-axis	1	Enomoto	VS60
24	2781-00-522-00	Telesco cover	VS40 APC for Y-axis 450 stroke	1	Bellows	VS40
25	2781-00-523-01	Slide cover	VS40 APC for Y-axis	1	Bellows	VS40

APC

No.	CODE NO.	PRODUCT NAME	MODEL	VOLUME	MAKER	REMARKS
1	02-341200610	Limit switch	1LS1-J	4	Yamatake	VS40/50/60
2	02-999033894	Proximity switch	E2E-X3D1-N-5M	1	Omron	VS40/50/60
3	03-662094000	Angular ball bearing	6209ZZ	2		VS40/50/60
4	03-662160000	Angular ball bearing	6216	2		VS40/50/60
5	03-821120020	Roller follower	NA2204LL	2	NTN	VS40/50/60
6	03-913120200	Bush	70B-2020	4	Oiles	VS40/50/60
7	03-999009449	Cam follower	CF12UU With nut	37 29	THK	VS50/60 VS40
8	04-999055249	Seal ring	OV-195*205*5 Joint type	1	Nihon uni seal	VS40/50/60
9	04-999116702	Cylinder	RSDQA50-20B-A73-XA6	2	SMC	VS40/50/60
10	04-999116719	Solenoid valve	VF1130-1DZ-01	2	SMC	VS40/50/60
11	04-999118647	Oil seal	SC9512013 AC3994E0	1	NOK	VS40/50/60
12	2782-10-439-01	Spring/C coil	SWPA	2		VS40/50/60
13	2782-80-441-10	Shoe		10		VS50/60
14	2781-80-435-01	Shoe		10		VS40
15	03-999028169	Cam follower	CF-SFU-10-1	8	IKO	VS40
APC COVER						
1	02-341201450	Proximity switch	SL1-A	2	Yamatake	VS40/50/60
2	2782-00-546-00	Roller chain	RS35.K1 Attachment 75 links Special hole	1	Tsubakimoto chain	VS50
3	2783-00-507-00	Roller chain	RS35.K1 Attachment 81 links Special hole	1	Tsubakimoto chain	VS60
4	2782-75-356-10	Wiper	WP-34	1		VS40/50
5	2782-75-369-00	Wiper	WP-34	1		VS50
6	2782-75-470-00	Wiper	HSW-1	1		VS50
7	2782-75-471-00	Wiper	HSW-1	1		VS50
8	2782-75-472-00	Wiper	HSW-1	1		VS50
9	2782-75-473-00	Wiper	HSW-1	1		VS50
10	2783-75-339-00	Wiper	WP-34	1		VS60
11	2783-75-340-00	Wiper	WP-34	1		VS60
12	2783-75-440-00	Wiper	HSW-1	1		VS60
13	2783-75-441-00	Wiper	HSW-1	1		VS60
14	2783-75-442-00	Wiper	HSW-1	1		VS60

No.	CODE NO.	PRODUCT NAME	MODEL	VOLUME	MAKER	REMARKS
15	2783-75-443-00	Wiper	HSW-1	1		VS60
16	2782-00-575-00	Roller chain	RS35.K1 Attachment 95 links Special hole	1	Tsubakimoto chain	VS50
17	2782-75-372-00	Wiper	WP-34	1		VS50
18	2782-75-373-00	Wiper	WP-34	1		VS50
19	2781-00-525-00	Roller chain	RS35 K1 Attachment 69 links Special hole	1	Tsubakimoto chain	VS40
20	2781-75-350-00	Wiper	WP-34	1		VS40
21	2781-75-452-00	Wiper	HSW-1	1		VS40
22	253-00	Wiper	HSW-1	1		VS40
23	2781-75-454-00	Wiper	HSW-1	1		VS40
24	2781-75-455-00	Wiper	HSW-1	1		VS40

MACHINING CENTER

VS40/50/60

APC

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