FUJITEC

INSTRUCTION MANUAL

Screw Fastening Stand【 NSSE 】

Chapter of machine

Model ST-3310S

FUJITEC

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FUDOC-010410

At this time our sincere thanks for your purchase of the Fujitec "NSSE" Screw Fastening Stand(ST-3310S).
To ensure safe operation, please read this instruction manual carefully before use.
Also be sure to always read the "Safety Precautions" before attempting use.
Keep this instruction manual in a secure location and consult if unclear about machine handling, operation or maintenance.

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Safety precautions

Always follow the instructions below

To ensure correct operation, always read these "Safety precautions" before attempting to use the machine.
The following cautionary points are "Warnings" and "Cautions" intended to prevent unforeseen accidents that are a hazard to the operator and others around him as well as causes of material damage or loss.
These contain important information for maintaining safety, so comply with them at all times.

■ The following cautionary notes are grouped according to the hazard level in terms of injury and material damage that may occur if not used correctly.

 WARNING	**indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.**
 CAUTION	**indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury or damage to the equipment.**

■ Points you should comply with are grouped according to the following symbols.
(The following are examples.)

	**This symbol indicates a caution or warning you must heed.**
	**This symbol indicates a prohibited action.**
	**This symbol indicates a mandatory action**

⚠ WARNING

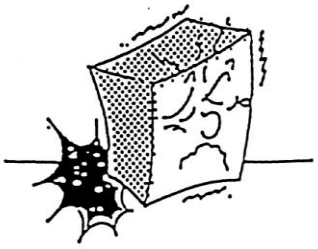
	●Do not alter or modify any part of this unit. Only authorized repair personnel are allowed to disassemble or repair this unit. Attempting this on your own may cause fire, electrical shock, or injury. Note: Consult your dealer if repairs are needed.
	●Do not damage the power cord or plug. Do not forcefully bend, pull, twist, or bundle the cord. Do not lay heavy objects on it or allow pinching or crushing. Neglecting this may cause injury, fire or electrical shock.
	●Do not use if the power cord or plug is worn or damaged or the plug is loosely inserted in the socket. Neglecting this point may cause electrical shock or fire.
	●Do not use a power source that is not 100 V AC. Neglecting this may cause electrical shock or fire.
	●Ground the power supply securely. Electrical shock may result if not properly grounded.

⚠ CAUTION

	●Do not use near watery or water spray locations. Equipment breakdowns may occur if used in locations exposed to water/water spray, extremely low or high temperatures, or high humidity.
	●Do not use under abnormal conditions. If the unit heats up or you notice an abnormal condition, then immediately stop operating the unit and send it out for inspection and repair. Failure to do so could cause breakdown or injury.
	●Do not install in locations where vibrations occur. Installing the unit in a location subject to vibrations may damage the control board. It might also cause smoke emission or fire
	●Inspect and service the feeder periodically Failure to inspect and service the feeder will prevent it from delivering full performance. This may also cause feeder breakdowns.

2. Unpacking

The screw fastening stand NSSE is a combination of precision machinery and electronic devices, and therefore the package must be moved and stored with extreme care.



■ Before install, move the package system as close as possible to the install site with a crane.

■ Unpack from the top of package

3. Installation

When the installation environment of the screw fastening machine and control unit is poor, the system will perform insufficiently, causing unexpected trouble. Follow each chapter item and secure the proper environment for installment.

3－1 Installation area of the screw fastening machine and control unit

■ Area in the range of 0～40℃ surrounding temperature and 35%～90% humidity, where there is no dewing.
■ Area where there is no dust or soot.
■ Area where there is no flammability or corrosive gases.
■ Area for easy inspection and disassembly.
■ Area where electric noises do not enter.

3－2 Installing the controller

■ The vent holes on the controller side prevent the temperature within the controller from rising. Do not ever stop up the vent holes, for this will cause incorrect controller action.
■ For the reduction of installation space, the controller is of a vertical configuration of optimum vertical-type design. For this reason, installing the controller sideways will decrease component life and cause trouble to occur. Please use in the vertically set state.

3－3 Connecting the cables

CAUTION

It is dangerous, and connect the cable, after removing the power supply and the air source.

■ Connecting the HEAD cable

Connect the HEAD cable to I/02.

（Do not connect to connectors other than the one designated.）

■ Connecting the Electric screwdriver cable

Connect the Electric screwdriver cable to M.OUT.

■ Connecting the power supply cable

Connect to AC100V 50/60Hz.

（Do not connect to power sources other than AC100V, or the cable will damage.）

■ Connecting air equipment

NOTE：Use 0.5MPa（5Kgf/cm²）dry air for the air pressure source.

a)Insert the air hose（outer diameter φ8, inner diameter φ5）

b)Insert the opposite side of the air hose to the filter regulator

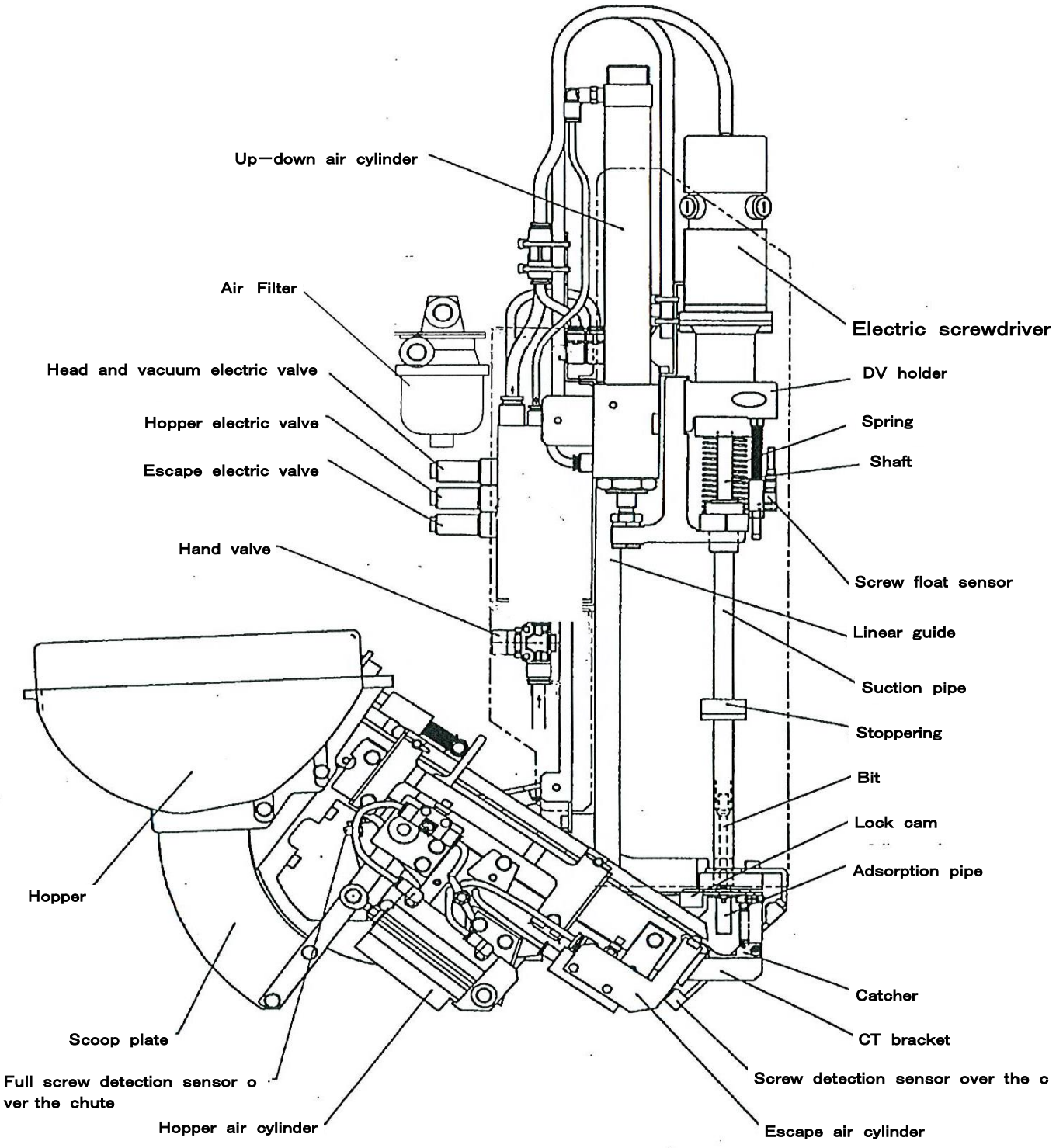
c)Connect the factory air pressure source and the filter regulator with the air hose（outer diameter φ8, inner diameter φ5）

d)Rotate the filter regulator knob to 0.5MPa graduation.

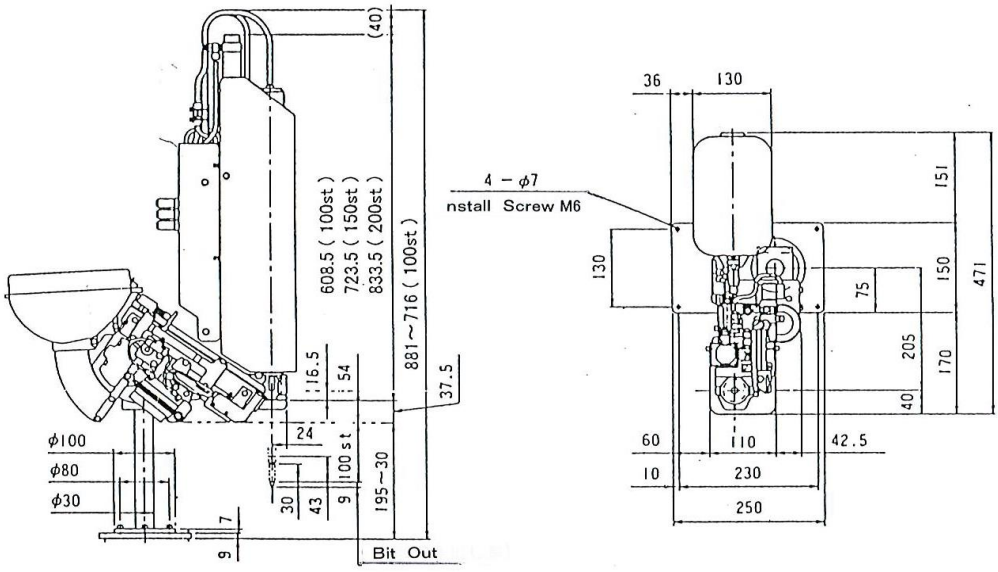
e)Rotate the hand valve knob to the right and turn the air supply

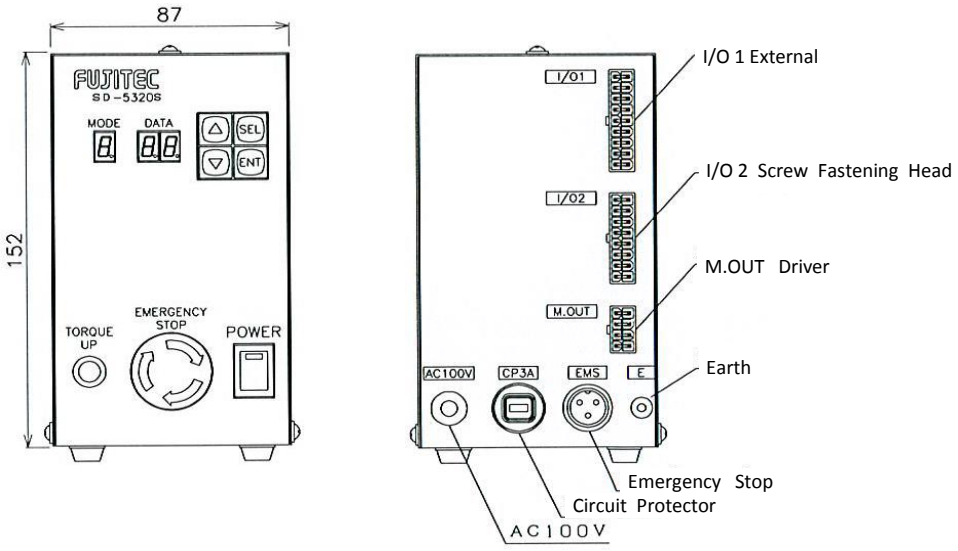
4. Part Identification and Features

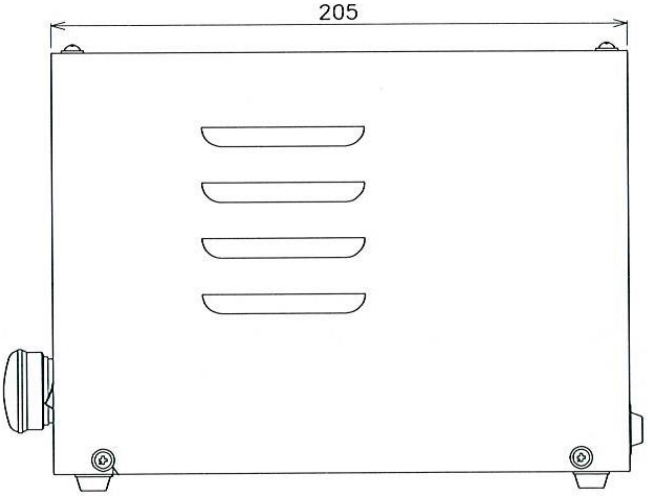
4－1 Screw fastening Head/Screw cassette



4－2 2 Size the Body and Controller







5. Adjustment

Screwfastening stand NSSE will be fully adjusted based on customer's specific requirement before shipping, it is not necessary of readjustment at customersite. Customer can re-adjust each part of screwfastening head as follows, if customer want to change the screw. However it is not possible to adjust over the range which is limited by torque range of loading screwdriver and apply screw of screw feeding unit.

5－1 Changing screw

Adjustment part		Reference value of adjustment
Screw Cassette (Adjustment completed)	Height of head regulating plate	Height of screw head ＋ 0.5mm
	Height of gate	Height of screw head ＋ 0.5mm
	Escapement	Adjust to be able to separate a screw each applying the screw diameter
	Upper limit sensor	Set up turning ON(LED OFF)when screws are full on chute
	Screw detection sensor(option)	Set up turning ON(LED OFF)when screw is on catcher
Position of screw driver		Adjust the point of screw and the edge of suction pipe, fitting screw and bit
Position of screw floating sensor		Set up turning ON(LED OFF)when bit is 1mm(quantity of screw float)distance from fastening point
Position height sensor		(option)
Head down limit stopper(option)		Fix stopper to linear guide and correct lower limit of bit

5－2 Parts adjustment

■ Adjusting the screw floating sensor

The sensor detects screw floating by recognizing the relative position between the bit and the suction pipe.

①Loose the properly fasted screw to make into a screw floating state (Screw floating of 1mm when the screw floating judgment is set at 1mm)

②Rotate the hand valve knob to the right, and turn off the air supply.

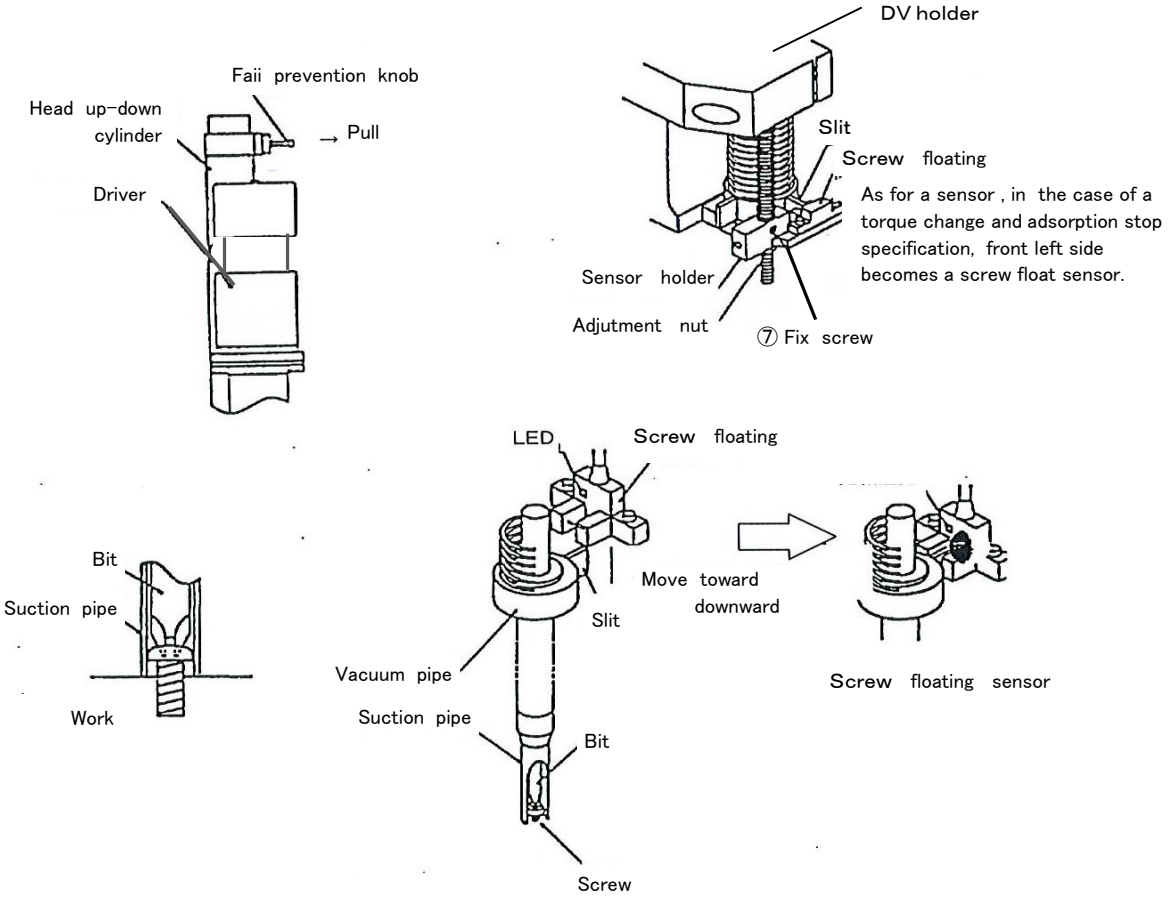
③ While pulling the drop prevention knob to the left, and turn off the air supply.

④Lift the suction pipe and fit the bit and cross slot of the screw head firmly, with the suction pipe and workpiece touching.

⑤Loosen the fixed screw of the sensor holder, and adjust to screw floating sensor ON.
Sensor ON(position where the LED turns OFF)with the adjustment nut.
Firmly fasten the fixed screw at that position.

⑥Return the up／down axis to the original state.
Lift the up／down axis until you hear a click(sound of locking).

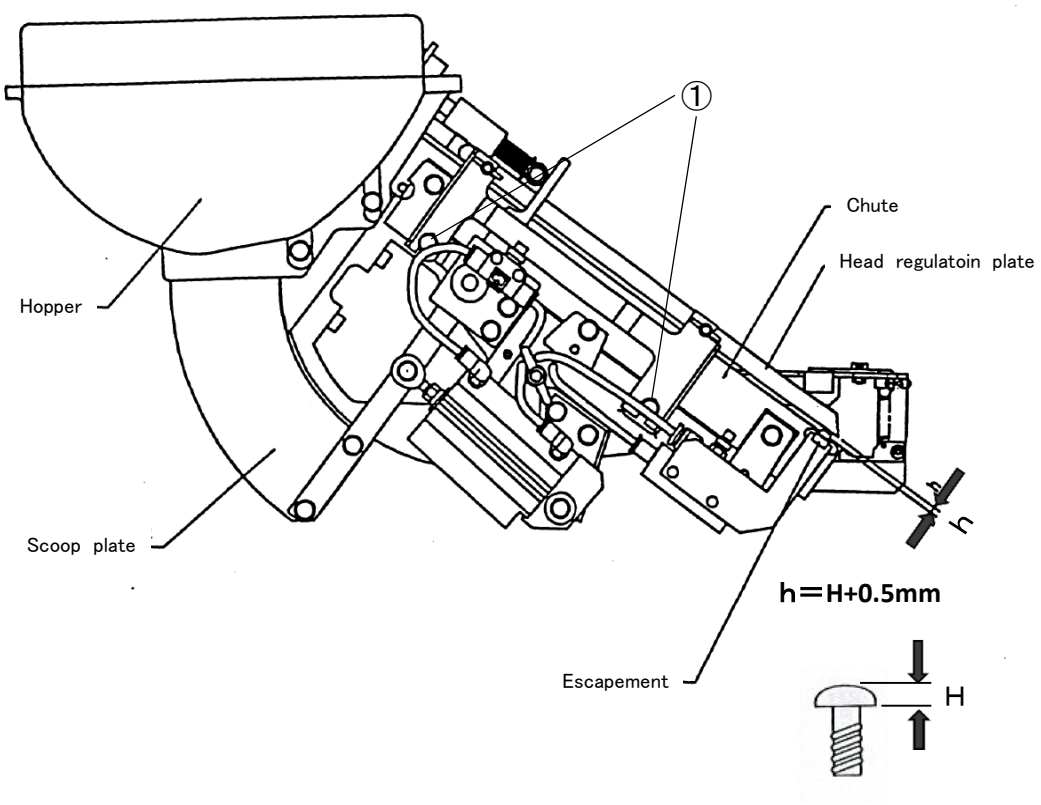
⑦ Rotate the hand valve knob the left, and turn the air ON.



■ Adjustment of screw feed unit

Adjustment was normally carried out before shipment, however if readjustment is required, for example screw change, follow the adjustment procedure.
(It may cause machine trouble if procedure is not followed.)

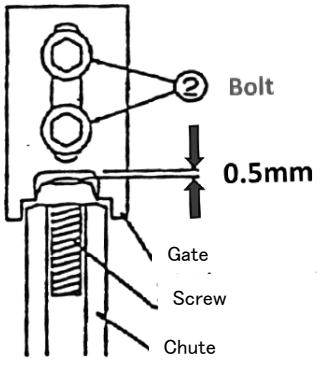
・Height adjustment of head regulating plate
After losing bolt of hexagon socket head①, adjust the position of head regulating plate for arrow direction as 0.5mm interval with head of screw.



■ Height adjustment of gate

After losing bolt of hexagon socket head②, adjust the position of gate for arrow direction as 0.5mm interval with head of screw.

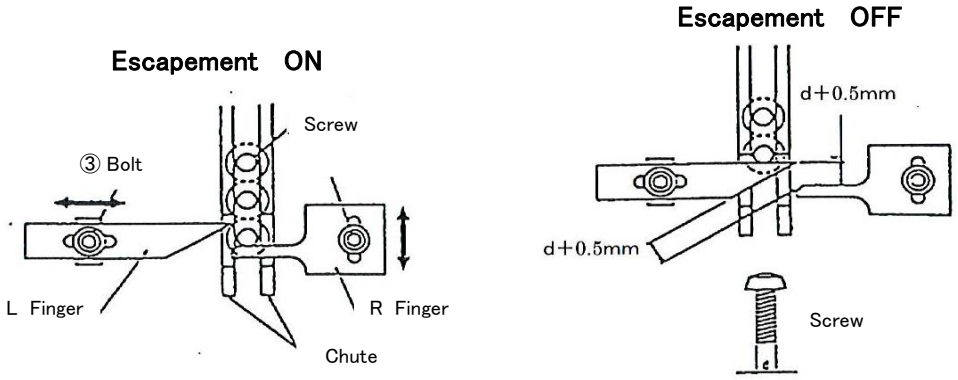
Drawing Front



■ Adjustment of escapement

After losing bolt of hexagon socket head③④, adjust the position of L and R finger for arrow direction as the escapement feeds and isolate screw smoothly when escapement moves.

Figure from top—view



■ Adjustment of full screw detection sensor

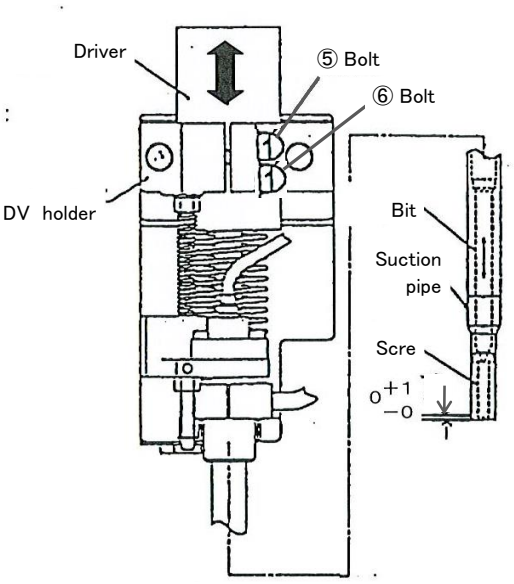
Full screw detection sensor, detects screw on the chute and if there is no screw on the chute, the sensor functions to move the scoop plate in order to feed screw on the chute, if the chute is full of screw, the heads will be stopped of screws block the light of the sensor and the scoop plate.

■ Adjustment of screwfastening driver position

1. Adjust the position of driver vertically according to the length of the screw, in order to put a screw into the suction pipe.

2. After losing bolt of hexagon socket head ⑤ which fixed driver in the DV holder, adjust the position screwfastening driver vertically in order to set the point of the screw and the edge of suction pipe at the same level. This will be the pipe at the same level. This will be the

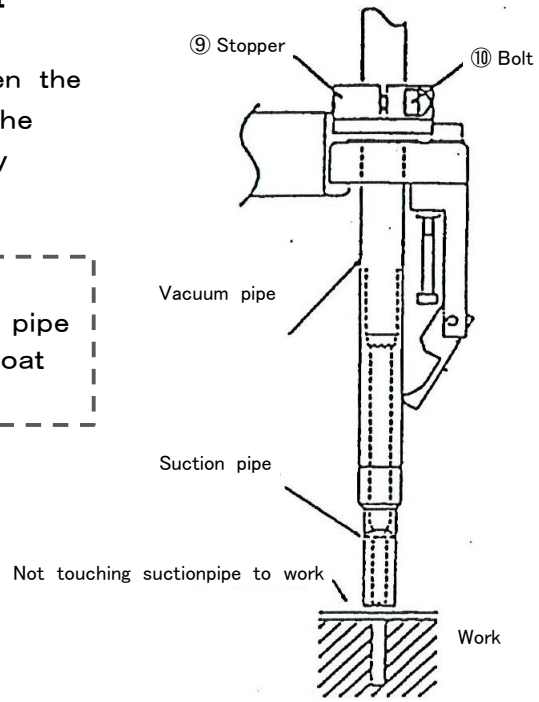
3. bolt of ⑥ is a bolt to expand it when the diameter shut too much. When the bolt of ⑤ is tightened more than the necessity, the holder might be damaged.



■ Adjustment of suction pipe height

In case of keeping interval between the suction pipe and workpiece, fix the stopper ⑨ to suction pipe ⑩ by bolt of hexagon head.

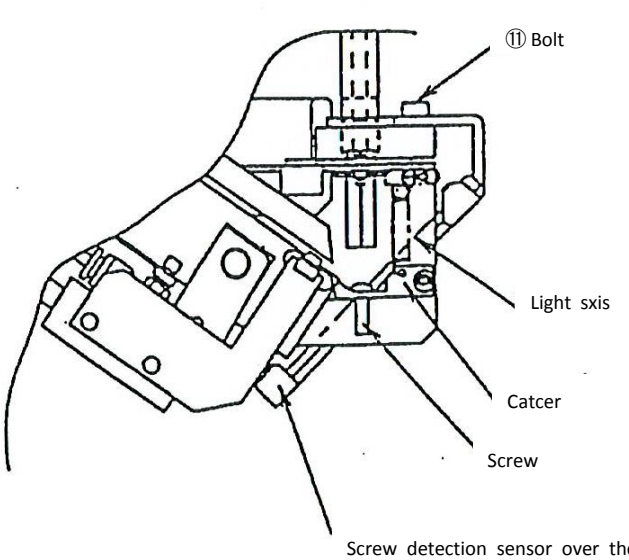
Notice
When the stopper of the suction pipe is used, the accuracy of screw float judgment cannot be guaranteed.



■ Screw detection sensor over the catcher(option)

a)This sensor detects screw on the catcher and controls head down and re-trying escapment.

b)Adjust the position of the sensor with bolt of hexagon head ⑪, if there is no screw on the catcher, to set the sensor turning OFF(LED ON) and if there is a screw on the catcher, turning the sensor ON (LED OFF).



Screw detection sensor over the catcher

■ Adjustment of head lower limit stopper

With this stopper, physical limit of positioning screw head(downward range) is controlled.

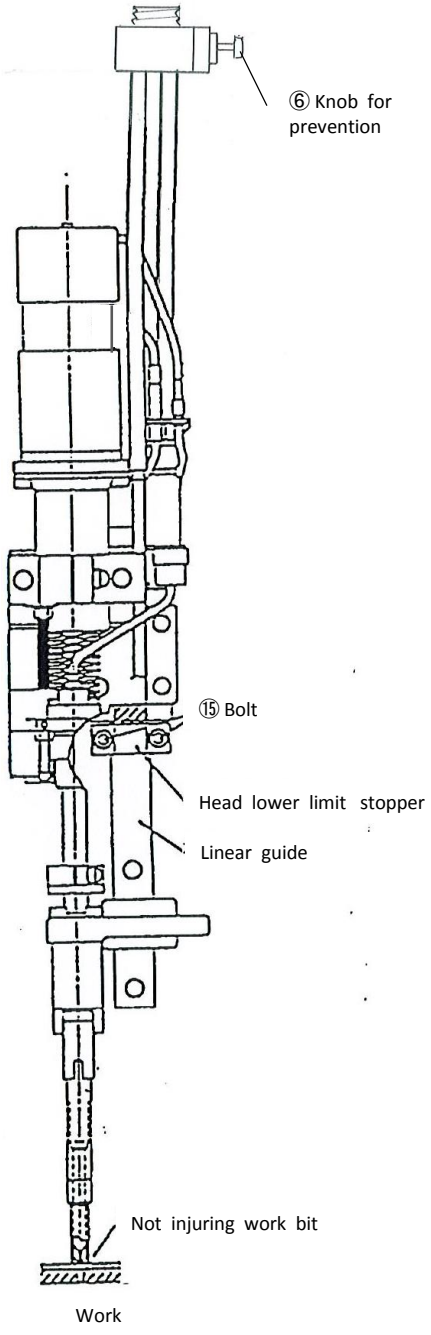
1. Rotate the hand valve knob to the right, and turn off. (air supply)

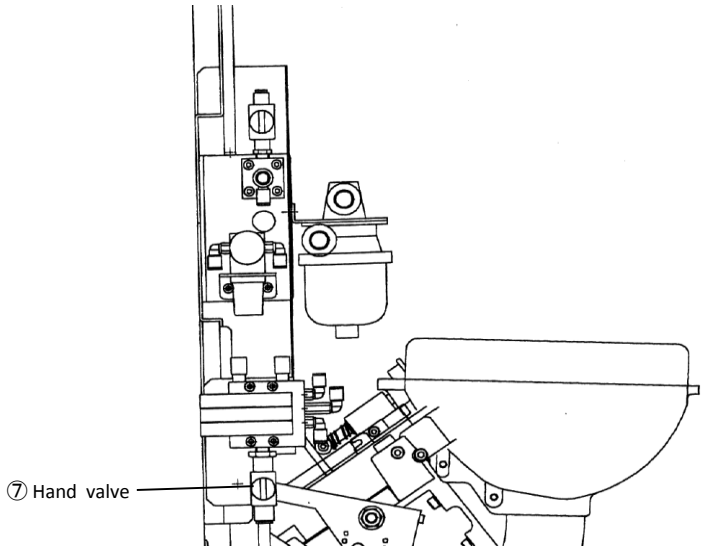
2. As pulling the fall prevention knob of up／down cylinder ⑥, hold and move the DV holder down.

3. Fix stopper to linear guide with the bolt of hexagon head ⑮, as moving down the head in order to set the bit in target position.

4. Return the up／down axis to the original state. Lift the up／down axis until you hear a click. (sound of pulse)

5. Rotate the hand ⑦、valve knob to the left, and turn air ON.





5－3 Maintenance

■ **Maintenance, inspection and replacement of the consumable items.**

The machine life depends on constant inspection and replacement of consumables so inspect the robot periodically and replace consumable parts as soon as they are require to replace.

CAUTION

Turn off the switch of the controller when inspection or replacement of consumables is performed.
Draw out plug of power supply cable of the controller from outlet when replacement of motor brush or other operation regarding maintenance around the motor is premed.
Keep following procedure and safe operation.

Consumable part list

Consumable parts		Inspection parts	
Screw fastening head	Bit	Screw fastening head	Vacuum filter
	Suction pipe		Filter regulator
	Vacuum pipe		
	Catcher		
Screw fastening driver	Motor brush		
Screw feeder	Gate		
	Chute		
	Finger		

※ Refer to the parts list which is enclosed with the robot, when you order a consumable part, specification of robot must be provided because consumable part number is different each robot setup.

■ Replacement of consumables

Release air pressure to 0 MPa with turning the knob of the filter regulator, when you replace part in the screw feeder unit or the screw fastening head.

Some of the operations at the replacement need to keep the screw fastening head down, in this case, move the screw fastening head down with following procedure and keep air pressure at 0 MPa.

- Move down the unit which can move in the screw fastening head, as pulling the fall prevent knob in the up−down cylinder.
  If the unit moves from upper limit, the fall prevent knob is unlocked so that the unit can move, even though the fall prevent knob returns.

- Move the unit to the upper limit in the screw fastening head, when the operation is finished. If the unit reaches the upper−limit, the fall prevent knob is locked with a click.

- Rotate the hand valve knob to the left, and supply air.

■ Procedure of the suction pipe replacement

Remove the suction pipe

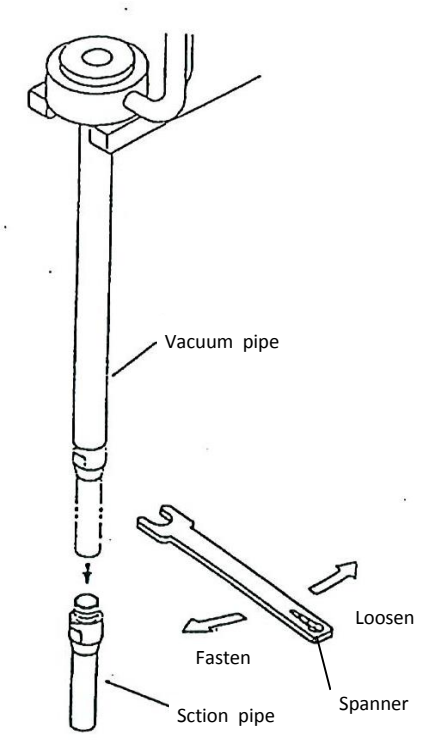
Remove the suction pipe by turning it at its "D−shap" part with wrench as follows.

Note

The suction pipe attaches vacuum pipe with left turn thread.

Attach the suction pipe

after screwing new suction pipe the vacuum pipe by hand, fasten the suction pipe tightly by turning it at "D−shape" part with wrench as follows. "



■ Procedure of bit replacement

Remove the bit

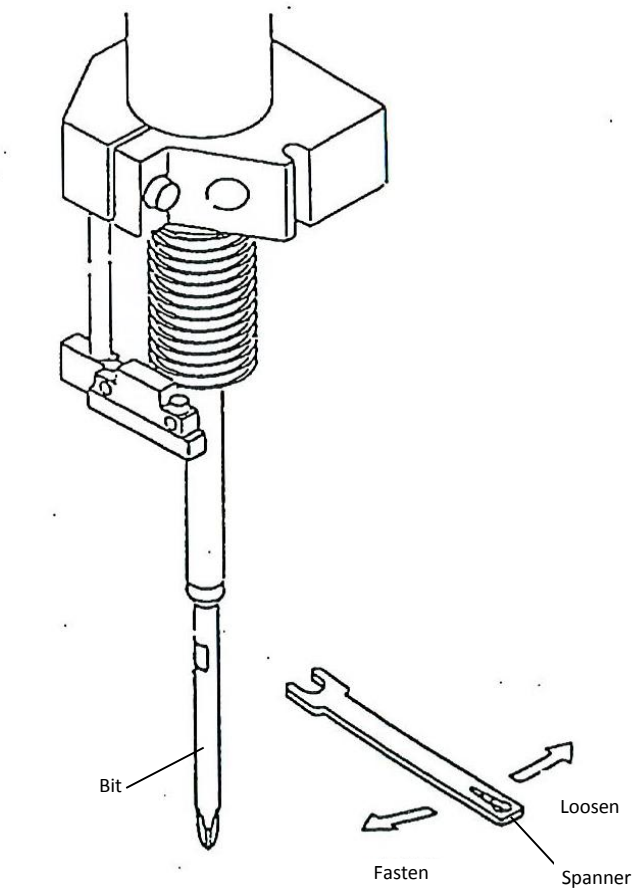
- Fix the out－put shaft with using the universaljoint which is formed in the out－put shaft under the work compression spring with bar.

- Remove the bit by turning it at its “D－shape” part with wrench as fixing the output shaft as follows.
  The bit thread is right turn.

Attach the bit

- After screwing new bit to the out－put shaft by hand, fasten the bit tightly by turning it at its “D－shape” part with wrench as follows.

- Remove the bar which is used to fix the out－put shaft.



■ Procedure of the vacuum pipe replacement

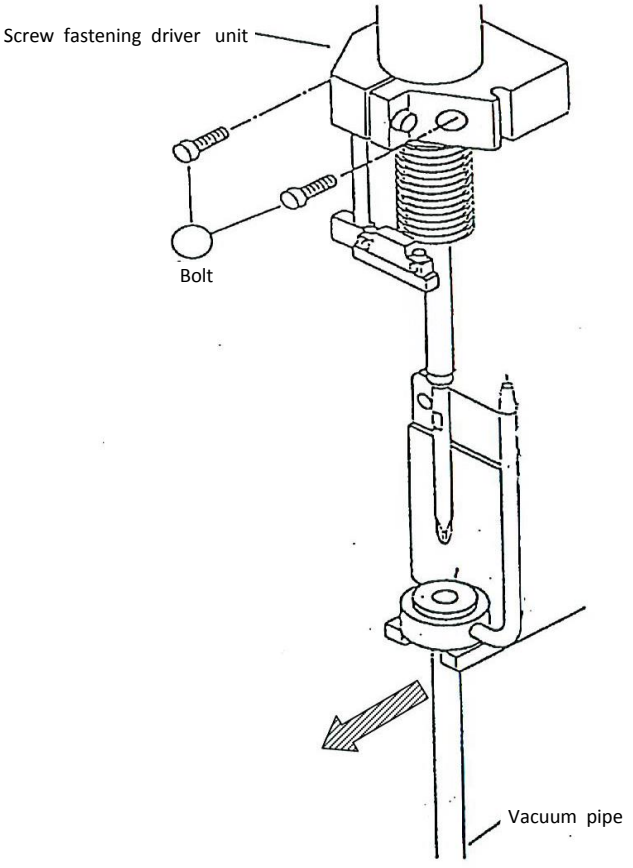
Remove the vacuum pip

- Remove the connectors 1, of the screw fastening driver.
- Remove the air hose from the vacuum pipe.
- Remove the bolts which connect the screw fastening head by lifting it up and rotating it for the direction which is indicated in the drawing.
- Remove the suction pipe from the vacuum pipe(refer "Remove suction pipe").

Attach the vacuum pipe

- Attach new vacuum pipe with a reverse procedure mentioned above.

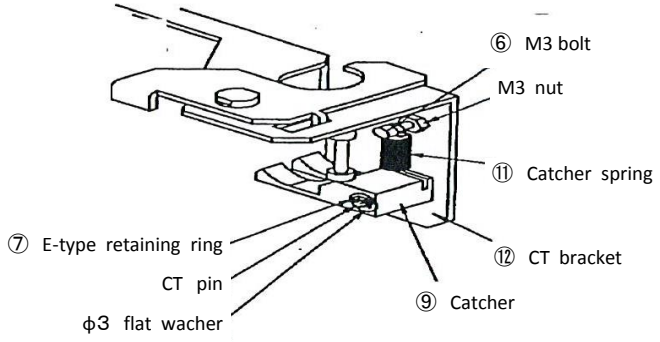
(Remove vacuum pipe)



■ Procedure of catcher replacement

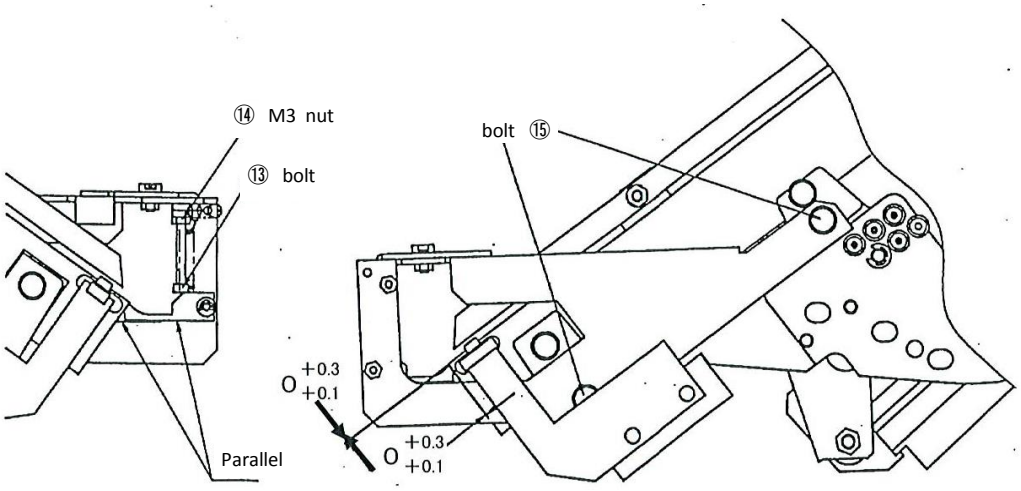
Remove the catcher

- Loosen M3 nut ⑤ and remove M3 screw ⑥.
- Remove E-type retaining ring ⑦, and remove φ 3 washer ⑧.
- Pull out catcher set ⑨ towards you.
- Insert a new catcher set ⑨ into CT pin ⑩. Insert
- φ 3 washer ⑧, and fasten with E-type retaining ring ⑦.
- Put M3 screw ⑥ through the catcher nut's catcher spring ⑪ hole, and fix into CT bracket ⑫ with two M3 nuts ⑤.



Adjustment of catcher mounting position

- Horizontal adjustment of catcher.



- Loosen with M3 nut ⑭, and adjust with M3 screw ⑬ so catcher is parallel to CT bracket.
- Loosen M5 screw ⑮, adjust to M5 screw fastening position, and fasten with M5 screw ⑮.

■ Inspection and replacement of the brush of the screw fastening driver

Inspection

Inspection item	Inspection period	Replacement limit	Inspection means
Wear	Every 100 million screw fasten	Less than 5mm in total length	Take out from the motor

Caution for brush inspection and replacement

Use gloves at the inspection or the replacement but never touch brushes or brush fitting with oil or moisture contaminated gloves.

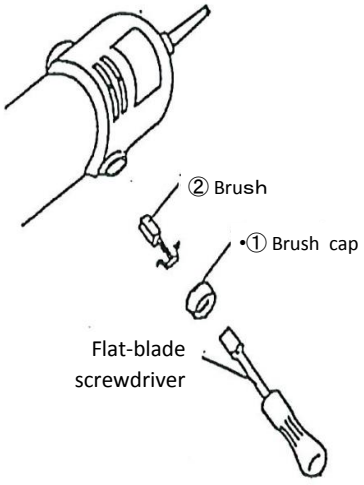
Avoid touching brushes directly with bare hands as this may cause insulation defects.

Do not allow foreign matter into the brush holder during the operation.

Remove the brushes

Remove brush caps ①、②. and pull brushes from brush holders.

Remember which end of the brush goes up so that not replaced backwards.



Inspection and cleaning of the brushes

Inspect the brushes which are taken out, and replace if total length is less than 5mm or worn to about V groove.

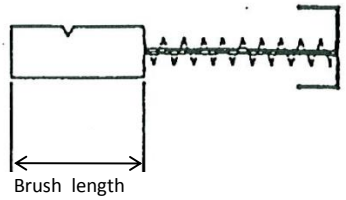
Replace all the brushes(2), even if one brush is less than 5mm.

Vacuum brush particles from the inspection hole or the brush holder hole using a vacuum pump, vacuum cleaner as rotating the motor axis by hand.

Attach the brush

Attach the brushes and the brush caps, by a reverse procedure above mentioned. (Removing the brushes)

Rotate the motor axis manually and check that the brush moves smoothly within the brush holder. If it gets caught anywhere, clean within the holder again and remount the brush.



■ Daily inspection and cleaning

Inspect and clean the following unit periodically.

Daily cleaning

Unit	What to clean
Vacuum filter	Remove dust and stain
Filter regulator	Drain the filter bowl
Cassette	Loose the fixing screw

※Inspection item

Inspection that the filter is not clogged. It causes the filter vacuum failure, if the filter is clogged, so clean it up faithfully.

Weekly cleaning

Unit	What to clean
Head(chute, hopper, catcher)	Remove dust, stain and metallic particles
Covers(controller, head)	

※Remove dust or metallic particles from each surface of the unit by using clean cloth dampened with alcohol.

Monthly cleaning and greasing

Unit	What to clean
Detector(head unit)	Remove dust and stain／Drain water
Linear guides(head unit)	

Unit	Grease type (manufacturer)	Lubrication amount and method
Linear guides	ALBANIA Ep2(shell) or corresponding products	Apply lightly to rail

※Remove the covers for head unit, remove dust and lubricate according to the above lubrication table.

Clean of the vacuum filter

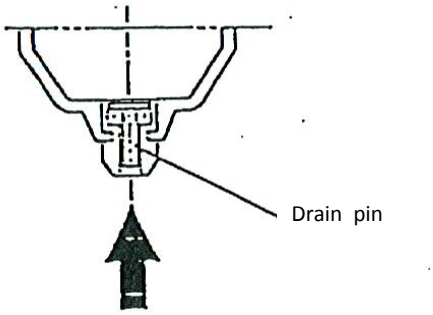
Remove the cover by removing the screw at bottom.
Remove the filter element in the main body by loosing the hexagon stay.
After removing the disk in the center of the filter, take out the filter and blow the dust away with compressed air.
Clean the main body and the disk with a cloth dampened with alcohol.

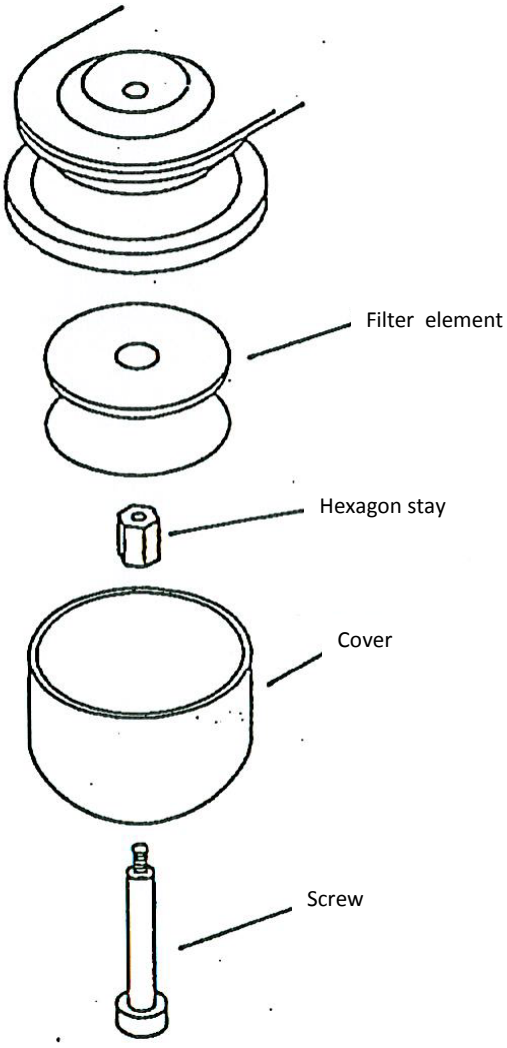
Filter regulator draining

- Drain the water from the filter regulator with pushing the pin in the drain cock toward the direction in the drawing below.

- Take care to keep the level of water below the upper limit in the filter regulator.

- Replace the plug when has completely drained.





Replacing the screw cassette

(Screw Fastening robot, one axis stand screw Fastening machine, and sharing)

Parts for replacement

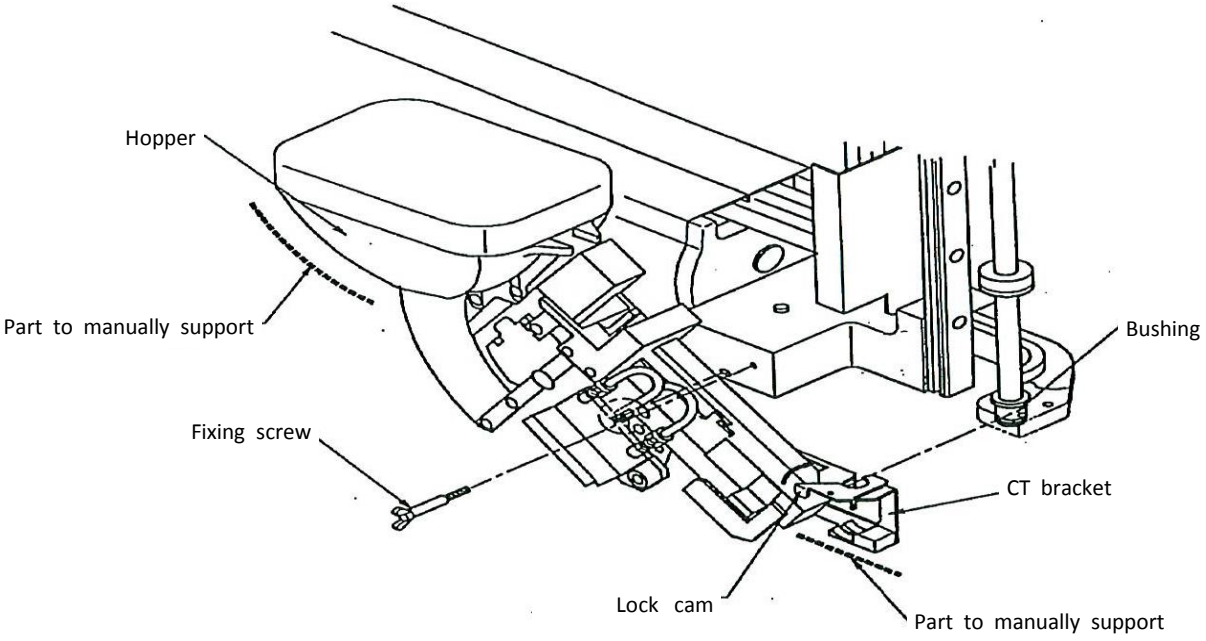
Part	Necessary condition for replacement
Screw Cassette	Replace per every screw
Suction pipe bit	Replacement is unnecessary if screw type (headshape, axis diameter) is similar and under head length is standard (8to25mm)

Here, we only explain on cassette feeder replacement. For suction pipe and bit replacement, refer to "Expendables Replacement".

NOTE: Parts replacement varies for cassette feeders with special screws and for special screw fastening heads. Please inquire for details. (Please indicate the work NO. , production No. , and screw specifications recorded on the machine body.)

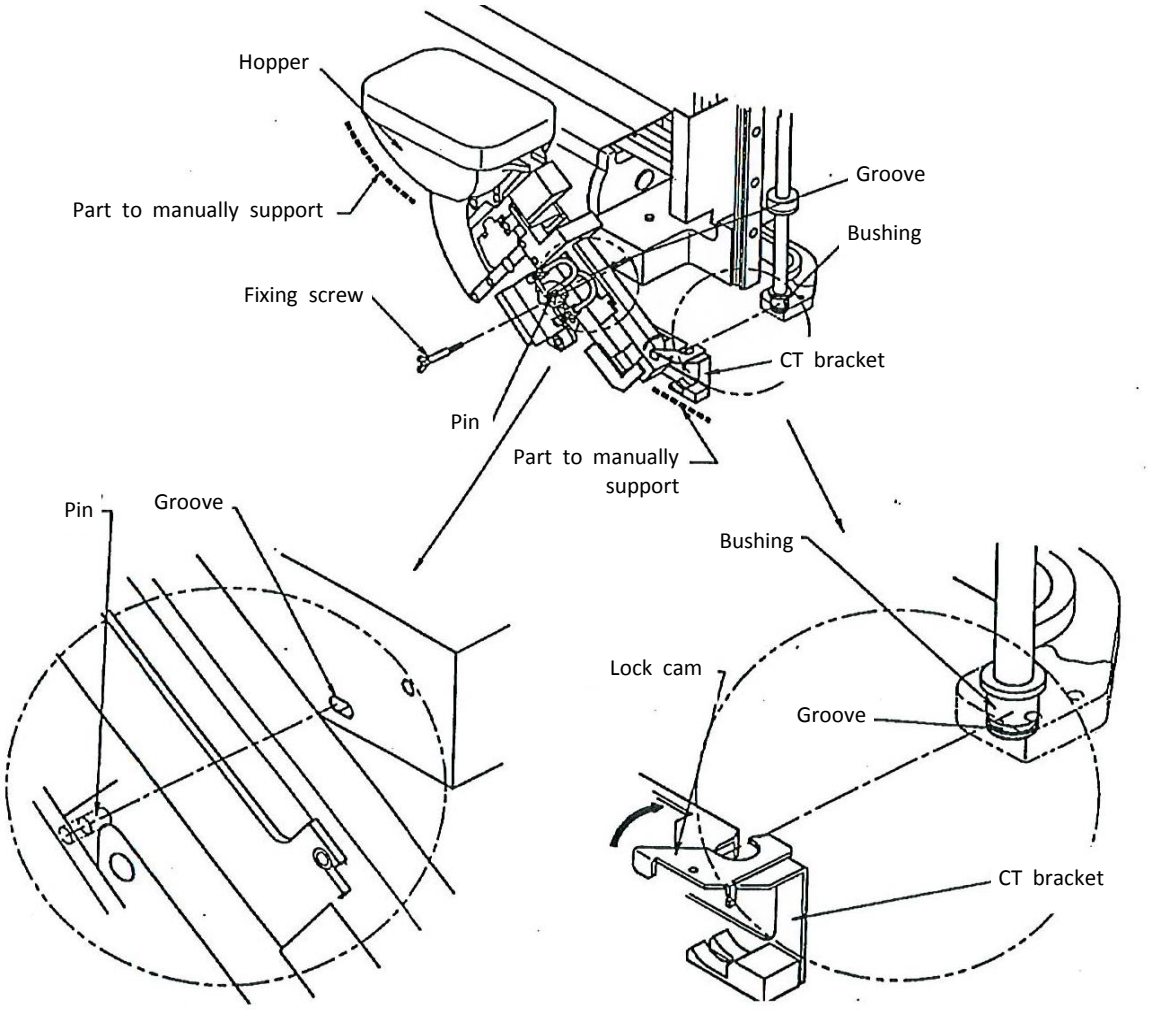
■ Screw cassette removal

- Turn off controller power.
- Rotate the hand valve knob to the left, and decrease air supply.
- While manually supporting the hopper, rotate fastening screw to the left and completely loosen.
- While manually supporting the underside of the CT bracket, push in lock cam knob and pull out screw cassette towards you.
- Place on specified stand for storage.



■ Screw cassette installation

- While manually supporting the underside of the hopper and CT braket, lift up from the table.
- Match CT bracket groove to bushing groove and insert.
- Match pin to groove and insert
- Tighten fixing screw. (Lightly push hopper back and forth, and confirm stability.)
- Rotate hand valve knob to the right, and supply air. Check for air leaks at this time, if air is leaking, rotate hand valve knob to the left to decrease air supply, and retighten fixing screw after completely loosening screw once.



NOTE: If fastening is difficult, tighten screw while lightly moving the hopper back and forth.

6. Option Specification

6－1 Temporary fastening specifications

■ **Action explanation**

Screw fastening completes when the screw floating sensor turns ON.

■ **Screw fastening error conditions**

When the screw floating sensor does not turn ON within the screw fastening prediction time, screw slip error occurs.

6－2 Catcher screw presence detection attachment

■ **Action specification**

Searches or screws in the catcher before proceeding into screw fastening. If there are no screws, it activates escapement and then reconfirms.

■ **Screw fastening error**

When the screws are not supplied even after working the escapement 3 times without the screws, error displays and screw empty error occurs.

6－3 3 Height switchover 2 stage fastening

■ **Action specifications**

When the fixing torque is high and close to the fasteing torque, the fast and high torque fasten at the first stage and switch over to the aimed torque near arrival.

（Valid for tapping screw and TAPTITE screw to fasten into aluminum die cast.）

■ Screw fastening error is the same as in standard conditions.

6－4 Torque up 2 stage fastening

■ The first stage and the second stage in two set torques are set.

■ Action specifications

To reduce the inertia energy of the motor, fasten in low torque during arrival and increase to fasten in the aimed torque.

（Valid for small screws, etc.）

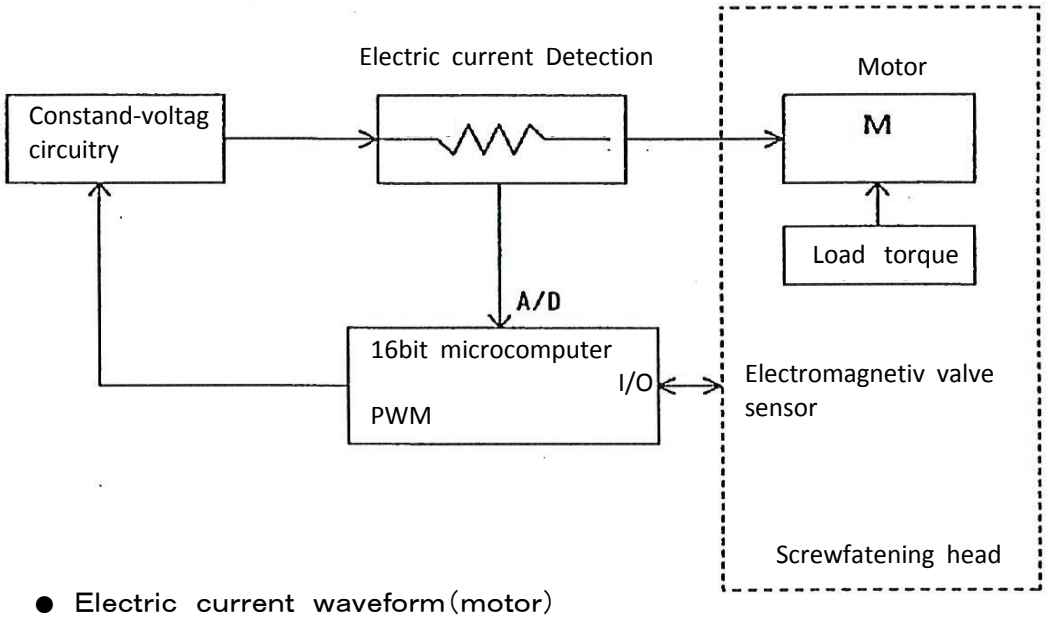
■ Screw fastening error is the same as in standard conditions.

7. Appendix

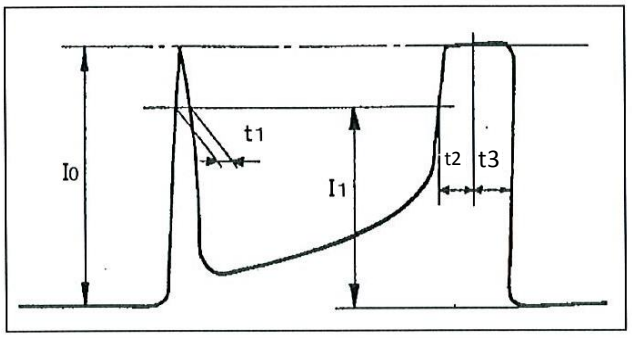
7－1 Action principles of the screw fastening machine

■ Action principle diagram of the controller

● Block diagram



● Electric current waveform(motor)



Io : Motor start-up current
I1 : Detection current(0.75Io)
t1 : Current delay time (50msec)
t2 : Delay time(t2＞t1)

● Action principle
The load current of the motor which increases along with screw fastening is compared to the previously set value, and when this reaches the same level, the motor is stopped.

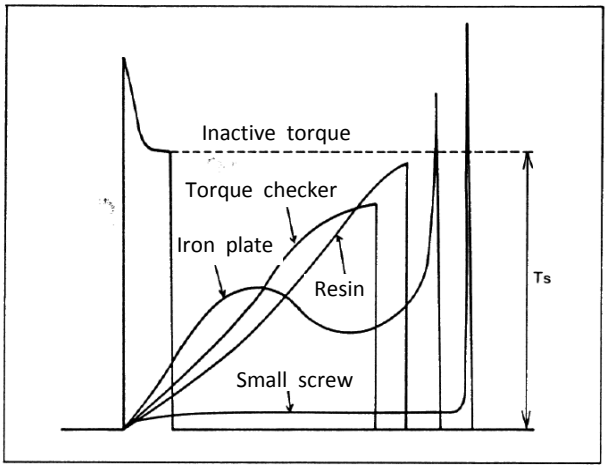
● Since the motor is direct current, the load current and output torque are proportional.

● Set the time so the starting current of motor start－up does not stop the motor.

7－2 2 Theory of the electric screwdriver torque

■ Relationship of active／inactive torques

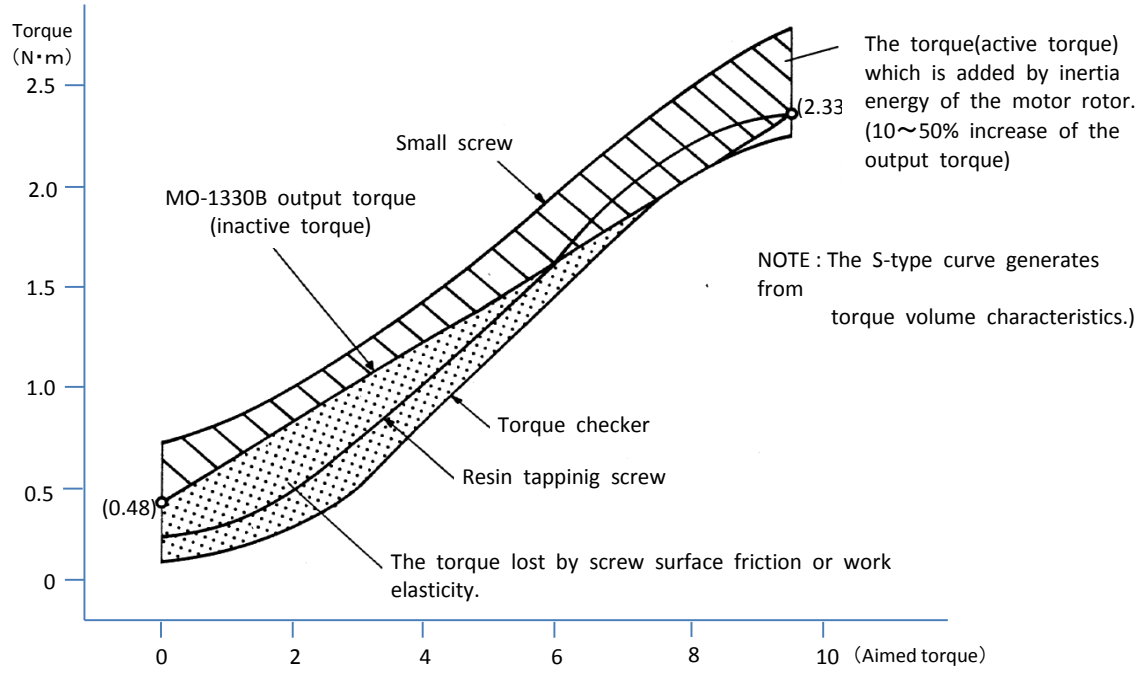
Depending on screw types (iron tapping, resin tapping, small screw) and differences in torque measurement methods, torque generation varies, as shown on the chart at right, even if using the same electric screwdriver. The relationship of sizes is not uniform, but generally is as follows:



Torque checker value ≦ Resin tapping ≦ Ts ≦ Iron tapping Small screw

■ Relationship between the output torque (inactive torque) and the actual fastening torque (active torque)

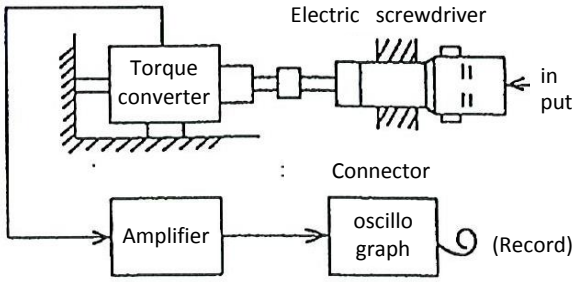
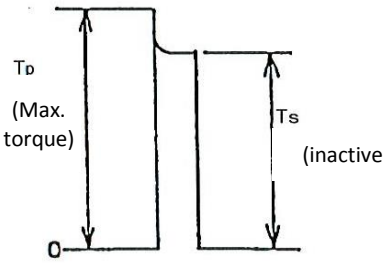
(Ex: For MO-1330B)



7－3 Measurement methods of the electric screwdriver torque

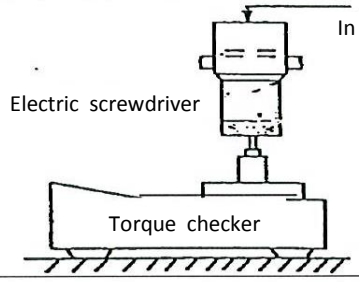
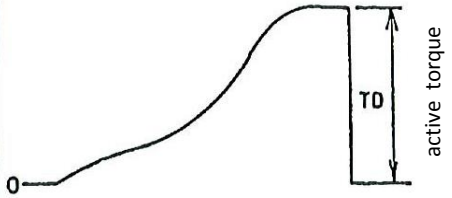
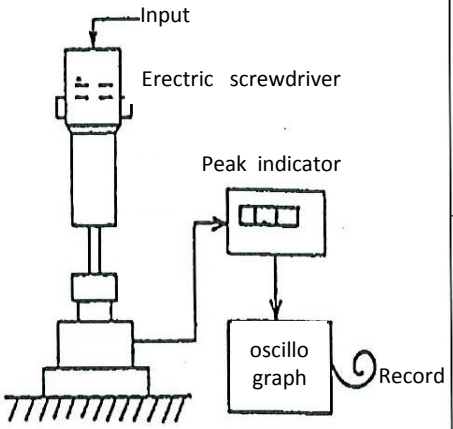
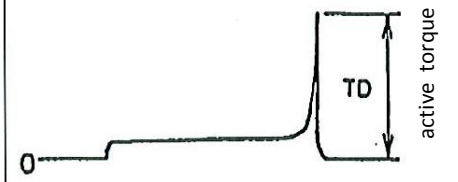
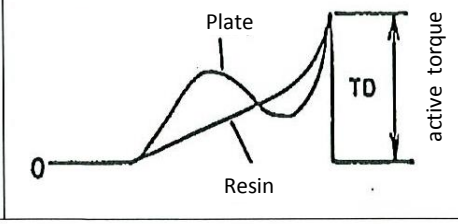
■ **Definitions of active and inactive torques**

※Inactive torque (output torque)：Torque acquired from electrical energy from motors. (Stall torque of motor)

Type	Measurement Method	Torqur Waveform
inactive rorqur (TS)		

※Active torque (fastening torque)：Torque generated during actual screw fastening.

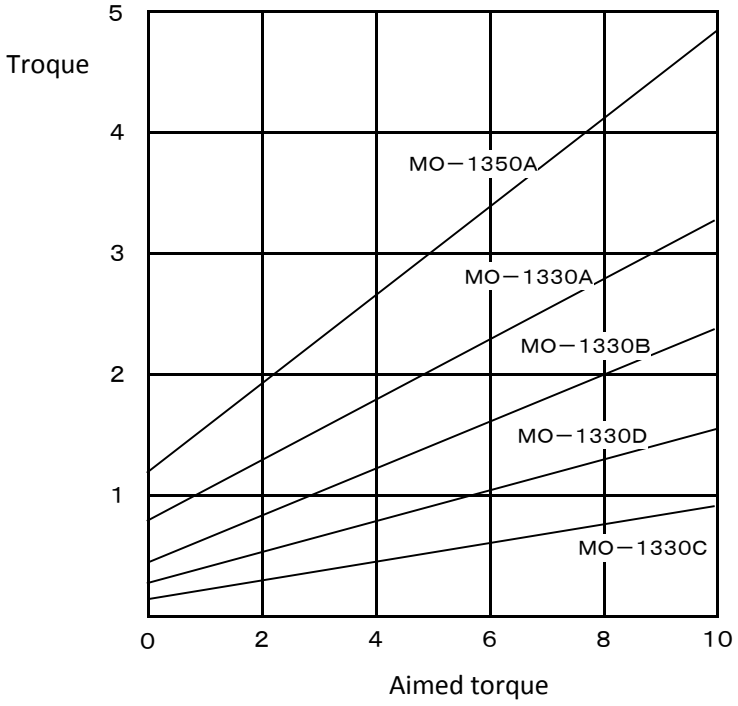
(Torque from the inertiaenergy of the motor added to the motor stall torque)

Type		Measurement Method	Torqur Waveform
active torque (TD)	Torqur checker		
	Active screw fastening		・Small screw  ・Tapping screw 

7－4 Electric Screwdriver Specification List

MODEL		PUTPUT TORQUE (N･m)	NO LOAD ROTATION (r･p･m)
MO－1330	A	0. 73～3. 20	130～450
	B	0. 48～2. 33	170～640
	C	0. 16～0. 90	590～2050
	D	0. 27～1. 55	280～1060
MO－1350	A	1. 19～4. 80	130～450

【 Torque chart 】



【Note】

Because the torque diagram is a theory value, it is somewhat ..actual goods.. different from.
The tightening torque changes according to the size and the material etc. of the screw.
Please set the set torque with the tightening material.

7－5 Appicable screw size

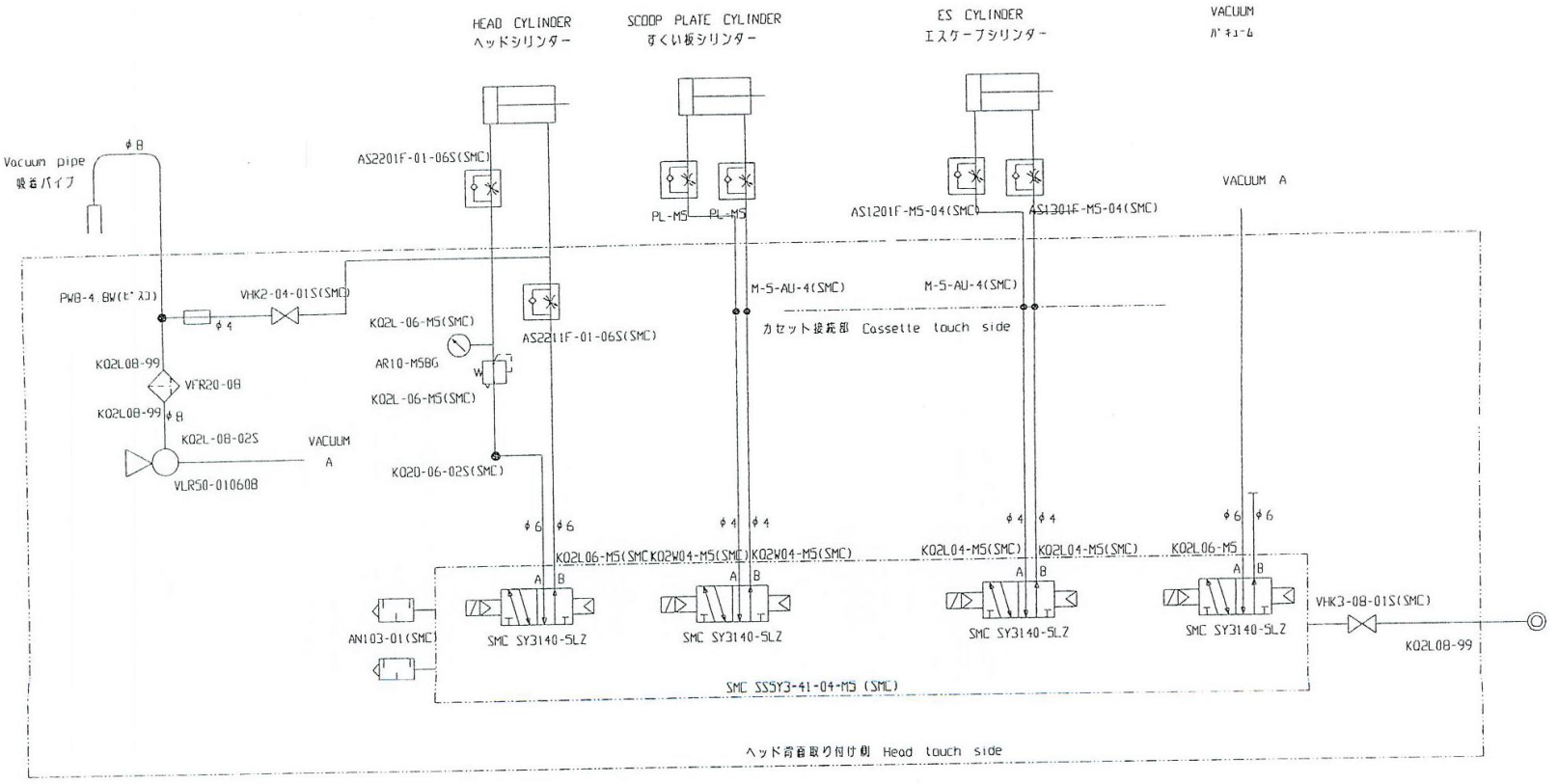
■ Specification of screw

Appicable screw

Screw type		Small screw , tapping screw									Sems screw					
Screw Head Shapes		Pan	Round	Flat	Fillister	Flat	Oval	Bindin	Brazier	Truss	Pan	Roud	Flat	Fillster	Bindin	Brazier
Screw Head Categories		A				B_1		B_2		C	A				B	
shank diameter(d)		2.5			3			4			5		2.5		3	
head shapes		A	B_1	B_2	C	A	B_1	B_2	C	A	B_1	B_2	C	A	B_1	B_2	A	B_2	A	B_2	A	B_2	A	B_2
head diameter(D)		4.5	5	5.5	5.7	5.5	6	6.4	6.9	7	8	8.5	9.4	9	10	10.6	4.5	5.3	5.5	6.7	7	7	9	10.3
head diameter tolerance		0 −0.4				0 −0.5								0 −0.6			0 −0.4		0 −0.5				0 −0.6	
Spring-washer diameter		———				———				———				———			4.8	4.8	5.5	5.5	7	7	8.5	8.5
Spring-washer thickness		———				———				———				———			0.6		0.7		1.0		1.3	
Screw nominal length(ℓ)	Min	5	6	5	5	5	6	6	6	6	8	6	8	8	10	8	6	8	6	10	8	10	10	12
	Max	25				30											25		30					

Note

※ This list is an aim. Please consult about details.



材料：			処理：	数量：
R 1/1	日付 13.05.10		名称： Air circuit (NSSE Standard)	
設計	製図	検図	承認	P/N 90 - 00 - 000 -
fujita	fujita			

sheet A3. scale 1/1

FUJITEC

Part No.	
Date of Purchase	Yr. Mo. Dy.
Dealer where purchased	Telephone ( ) —

FUJITEC

1-10-6 Ryoke, Naka-ku, Hamamatsu, Shizuoka, 430-0852, Japan

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