

Riveting Machine

US-70 vol.11

Instruction Manual for Riveting Machine US-70

Rivetronics

Riveting Machine Safety Precautions

- In order to use your Rivetronics Riveting Machine properly, be sure to read through and obtain a thorough understanding of the information contained in the safety precautions booklet and operating instruction manual before attempting to use or operate the equipment. Failure to do so could result in accident or injury, and may contribute to shortening the life or reducing the power of the riveting machine.
- This booklet contains information concerning safety and proper use of the riveting machine. For details concerning handling and operation, see the riveting machine's operating instruction manual.
- You should keep this booklet and the operating instruction manual for your reference.



Safety Precautions

The precautions contained in this booklet should be observed in order to protect the equipment from damage while ensuring your safety as well as the safety of others. The precautions are categorized and labeled as "DANGER!", "WARNING!" or "CAUTION!" according to the severity and likelihood of damage or injury that could be incurred by failure to observe the corresponding warnings. All items concerning safety are important and must be observed.

	DANGER! Situation which is likely to occur and which could result in death or injury if safety precautions are not observed.
	WARNING! Situation which could potentially result in death or injury if safety precautions are not observed.
	CAUTION! Situation which could potentially result in bodily injury or equipment damage if safety precautions are not observed.

Symbols

The symbols used to signify the type of precaution to be observed are as described below. Be sure to read through and obtain a thorough understanding of the contents before proceeding.

	Indicates a precaution involving "DANGER!", "WARNING!" or "CAUTION!"
	Indicates an action which is prohibited.
	Indicates a procedure which must be carried out without fail.



DANGER !

	Placing your hand or fingers underneath the head could result in injury. Be sure to take the proper precautions while the riveting machine is in operation.
	Do not open the door of the control box except when absolutely necessary. Doing so could result in electric shock. If you have to open the door, be sure to turn off the power and unplug the machine before doing so.



WARNING !

	The riveting machine should be firmly secured to the floor or workbench. If not, the machine could be accidentally knocked over, resulting in injury. We cannot guarantee that the riveting machine will not be damaged in the event of such an accident.
	Do not use power source or voltage other than those specified for that particular model. Using an improper power source could result in equipment damage or fire.
	Do not allow the wiring to be damaged. A short at a damaged portion could melt the cable and start a fire.
	Do not allow the riveting machine to get wet. Moisture can damage the machine, and could result in electrical shock or fire.
	In order to guard against fire or malfunction caused by faulty or improper repair, the riveting machine must not be disassembled or repaired by anyone other than a qualified professional. When repair becomes necessary, contact your nearest Rivetronics dealer.
	Do not touch the switches, etc., with wet hands. Doing so could result in electrical shock.



CAUTION !

	Turn off the power before changing the head, insert or tools in order to ensure that the riveting machine is not accidentally actuated while doing so.
	Be sure to remove the head and check the motor's direction of rotation before performing test operation after setting up or moving the machine. If the motor turns in reverse, the head could come off, resulting in damage or injury.
	Do not place your fingers or any other objects in the turning part of the motor while it is running. Doing so could result in injury or equipment damage.
	The operating voltage for each model is factory-set. Be sure the setting does not become inadvertently changed. Using at a higher setting could result in equipment damage.
	Be sure to firmly connect wiring and connectors. Poor contact could cause the machine to malfunction or result in damage.
	When replacing worn or damaged parts, be sure to use only Rivetronics genuine parts. Replacing with substitutes could result in equipment damage. Treat discarded machines and parts as industrial waste.
	In the event of an accident or if the riveting machine becomes broken or damaged, immediately turn off the power and cease operation. For repairs, contact your Rivetronics dealer.

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■ Introduction

We thank you for adopting Yoshikawa's Riveting Machine US-70.

The US-70 is an excellent machine manufactured based on our experience and research over many years as a dedicated manufacturer of riveting machines.

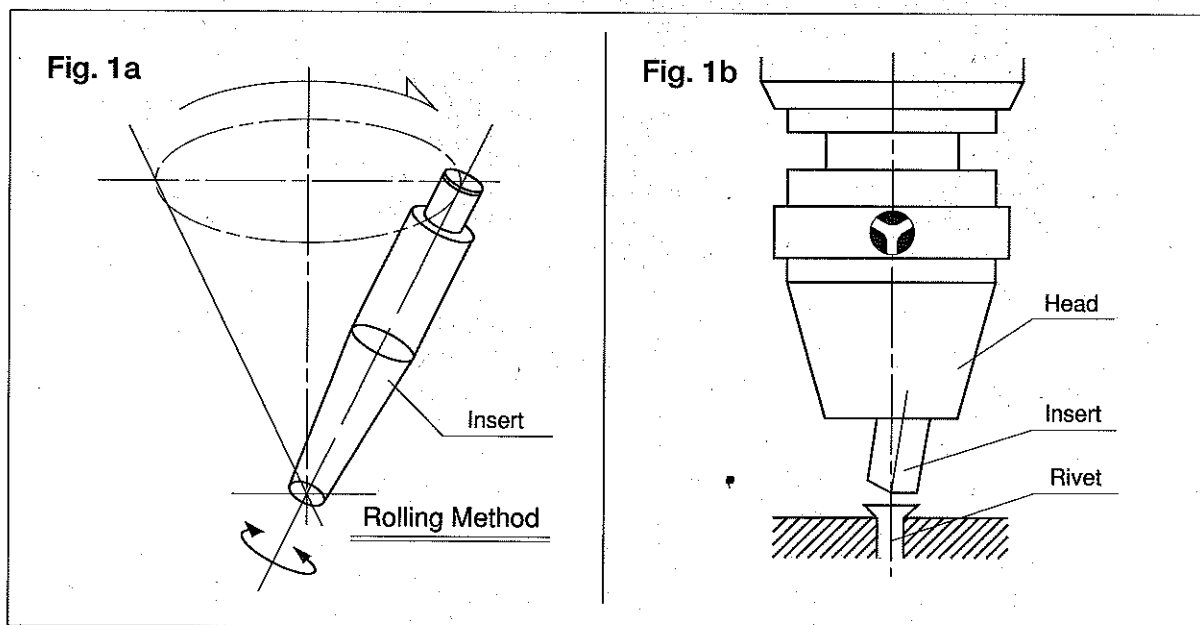
This manual provides instructions and key points for the maintenance and operation of the machine. Wrong handling may cause an unexpected accident or failure. Read through this manual before use and handle the machine correctly.

Kindly give this manual to the operator and direct him to keep the manual.

Operational Principle

A head which spins together with the spindle is attached to the end of a hydraulic cylinder and an insert is inserted into the head so that the insert can revolve round the rotational axis of the head at an angle to the rotational axis. Since the insert itself rotates freely, the insert can stand still irrespective of head rotation.

(Refer to Fig. 1b.)



The insert usually rotates together with the head, but it stops rotation when it comes into contact with a rivet end and swings around the rivet end as if sliding over the surface of an inverted cone. (Refer to Fig. 1a.)

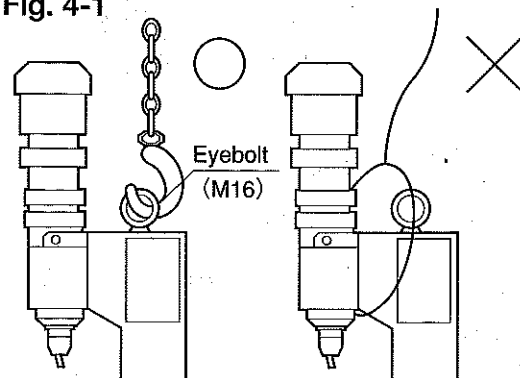
The end of the insert comes into contact with the rivet at a point on the surface of the end at first. The point contact grows to a line contact with the descent of the cylinder. The length of the contact line finally develops equal to the radius of the rivet point. A surface is shaped by the revolution of a contour, and the rivet end is formed to a flat point, round point, pan point, etc. according to the shape of the insert end.

The rivet is upset little by little by the movement of the contact contour line between the rivet and the insert to form a point, finishing riveting.



1. Installation and Ambient Conditions

Fig. 4-1



1-1 Installation

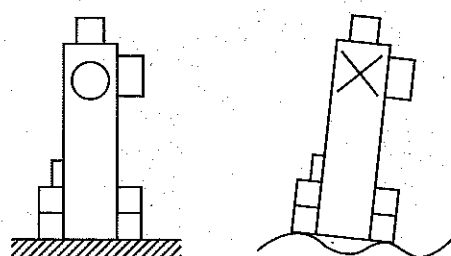
1) Carrying (Fig. 4.1)

To carry the machine, hoist it by material handling equipment with a capacity of 500 kg or over, using the eyebolt (M16) provided on the machine column. Weight of US-70 = 335 kg

Danger !

- When hoisting the machine, do not apply ropes etc. to other locations than specified.
- If hoisting equipment or tools are not available, contract a forwarding agent about carrying. Do not carry the machine in an easy-going method.

Fig. 4-2



2) Installation (Fig. 4.2)

a) Preparation

The machine should be installed on a flat floor. Provide an installation location or a dedicated machine base beforehand.

b) Fixing (Fig. 4.3)

Secure the machine firmly with anchor bolts etc. using the two anchor bolt holes (diameter 17 mm) provided on the machine bed.

Danger !

- If the floor is rough and not stable, the machine may be fallen down by an earthquake etc.

Fig. 4-3

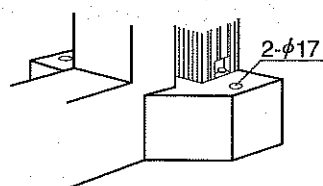
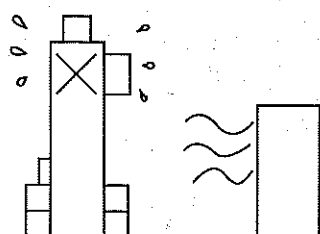


Fig. 5



1-2 Ambient Conditions (Fig. 5)

Operate or stow the machine at the ambient conditions outlined below.

Ambient Condition	Requirement
Temperature	0°C ~ +50°C
Humidity	90%RHmax. (No condensation)
Storage temperature	-10°C ~ +50°C
Storage humidity	90%RHmax. (No condensation)
Atmosphere	Indoor (to be protected from the direct rays of the sun) free from corrosive or flammable gases, heavy oil mist and dust

Danger !

- Do not locate the machine near a flame, or a fire may be caused.

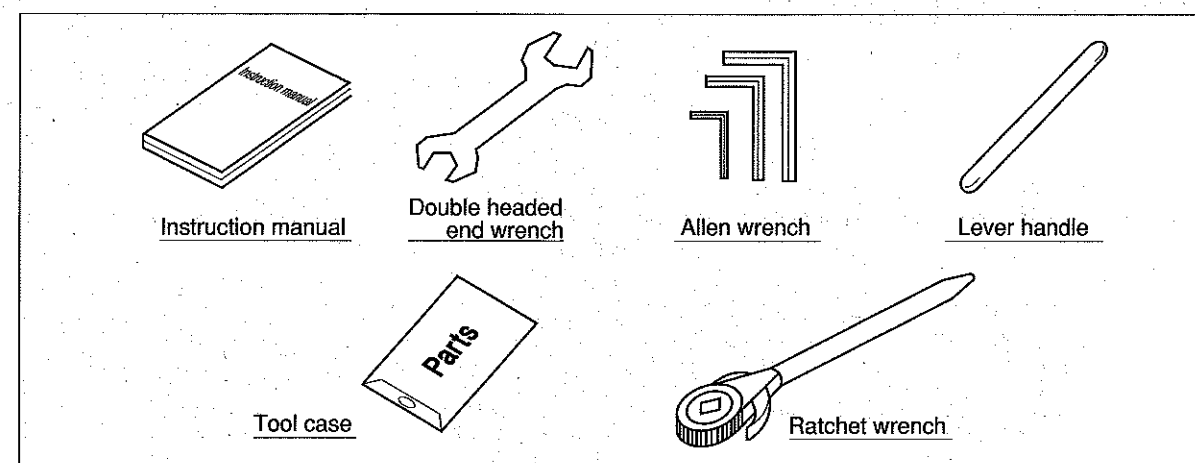
Accessories

The following tools etc. are supplied with the machine. Confirm them.

US-70 and -70E Accessories

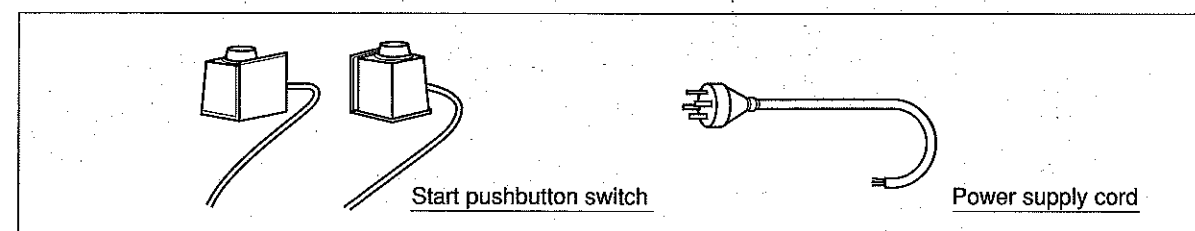
● Contained in Packaging Case

Instruction manual	1 copy
Double headed end wrench 17x19	1 pc
Allen wrenches 3,6,8	1 set
Lever handle 8-mm dia.x200	1 pc
Tool case	1 bag
Ratchet wrench, 10-mm square socket for US-70E only	1 pc



● Mounted on Machine

Start pushbutton switch (with bracket)	2 sets
Power supply cord, 5 m with 3-pole 4-wire grounding	1 pc

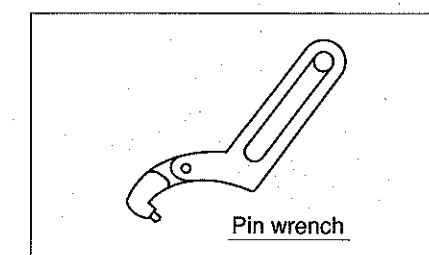


● Head Accessory

The following accessory is furnished when the machine is purchased together with optional heads and inserts.

Pin wrench	5.5-mm dia.x200 or 8-mm dia.x300	1 p
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* The size is dependent on the type of the head. Refer to the separate head list.

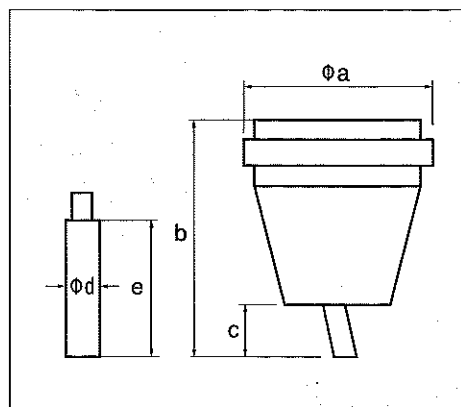




Standard Heads and Inserts (Options)

Standard Heads

The standard heads and inserts compatible with the model US-70 riveting machine are shown below.



Standard Head Table

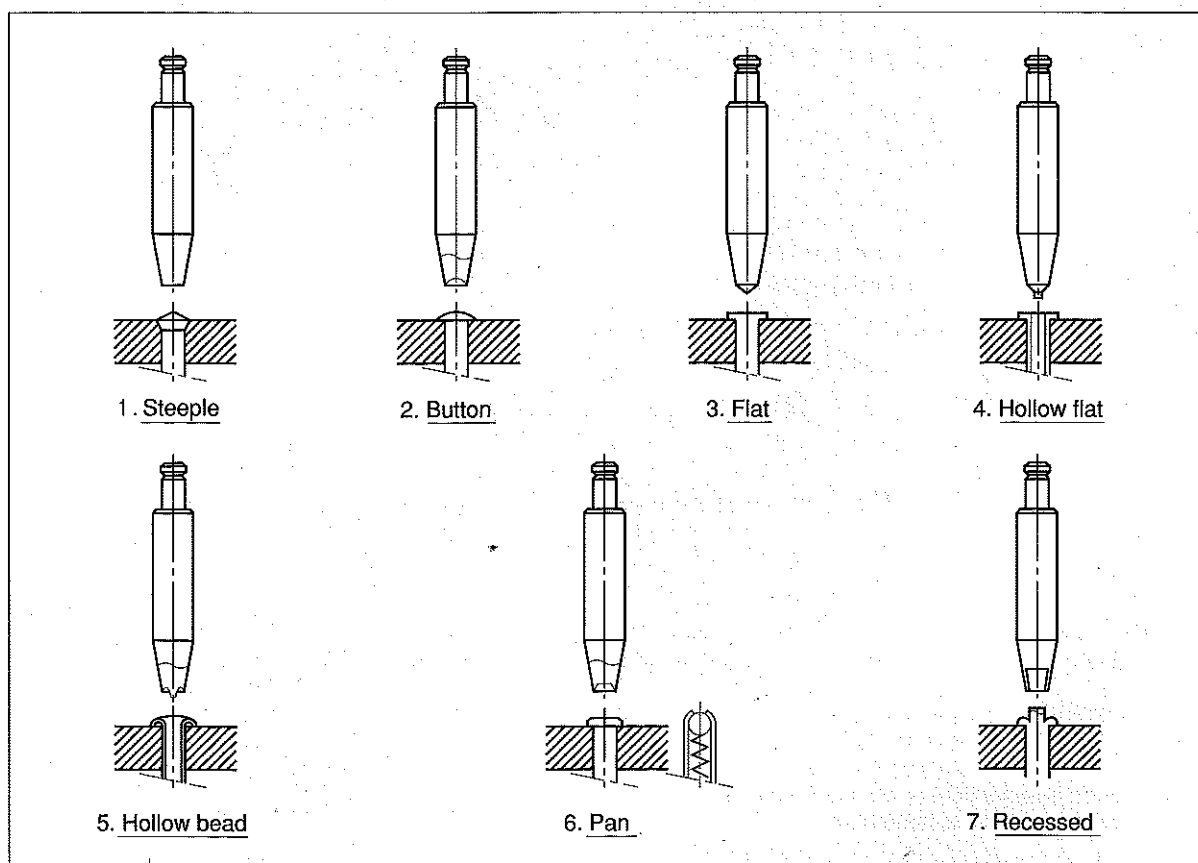
Head Model No.	a	b	c	ϕd	e	Pin Wrench
U-715	56	81	15	15	43	$\phi 5.5 \times 200$
U-725	56	104	38	15	66	$\phi 5.5 \times 200$
U-21	85	122	30	20	75	$\phi 8 \times 200$
U-214	85	146	54	20	100	$\phi 8 \times 200$

Many other types of heads suiting various applications are also available.

Inserts

Rivet point shapes are roughly classified to the following 7 types.

The basic dimensions such as the diameter and the length of the insert depend on the point formed. However, the requirements for the rivet such as forming dimensions and material should be given to us beforehand.



Options

In addition to the accessories, extra options suiting various purposes are offered.

Jigs and Tools

Name	Model No., Specifications	Qty
Anvil	25-mm dia.x30 (SKD-11)	1
Anvil base	For US-70 (with washers)	1
T bolt set	M12x48, M12 cap nut	2 ea
T nut M10	For US-70	2
T nut M12	For US-70	2
Grease gun	With M6 mouth piece with grease filled	1

Control Switches

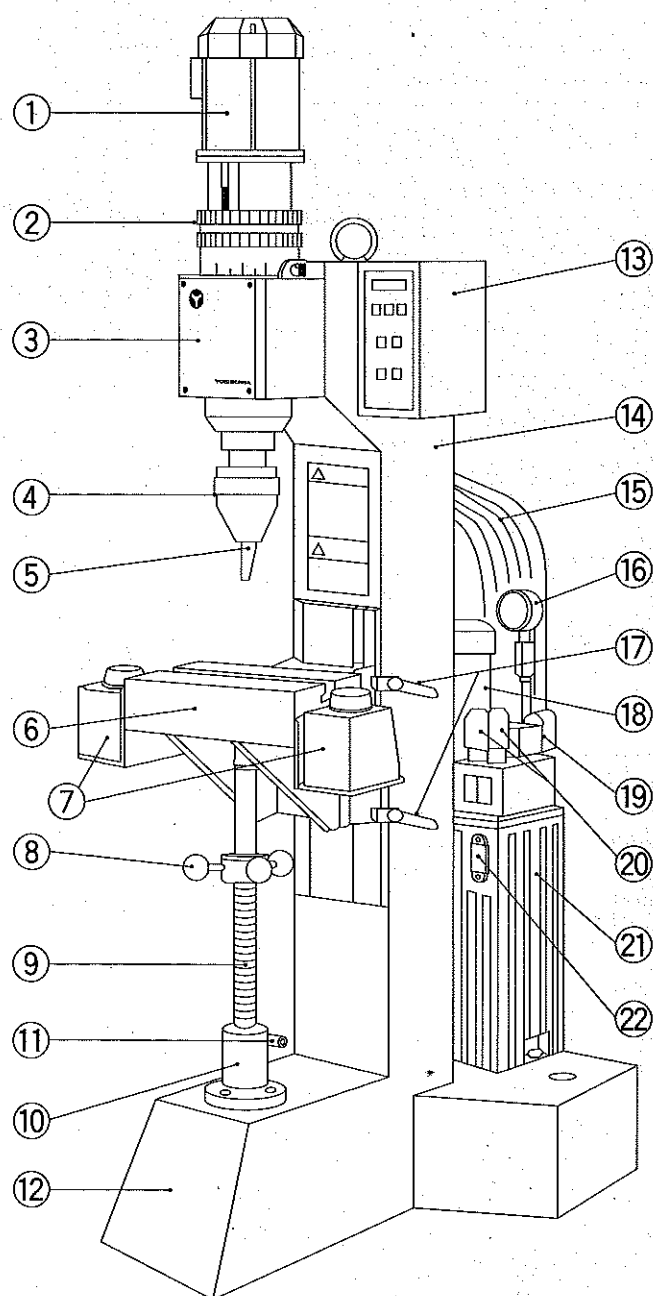
Name	Model No., Specifications	Qty
Emergency stop pushbutton	30-mm dia. mushroom type, push return type	1
Foot switch *1	With cover	1

*1 Mis-operation is very dangerous in riveting using the foot switch. Your purchasing order of the foot switch should be accompanied by your statement to the effect that you will provide working environments and train the operator so that the foot switch shall be operated safely.



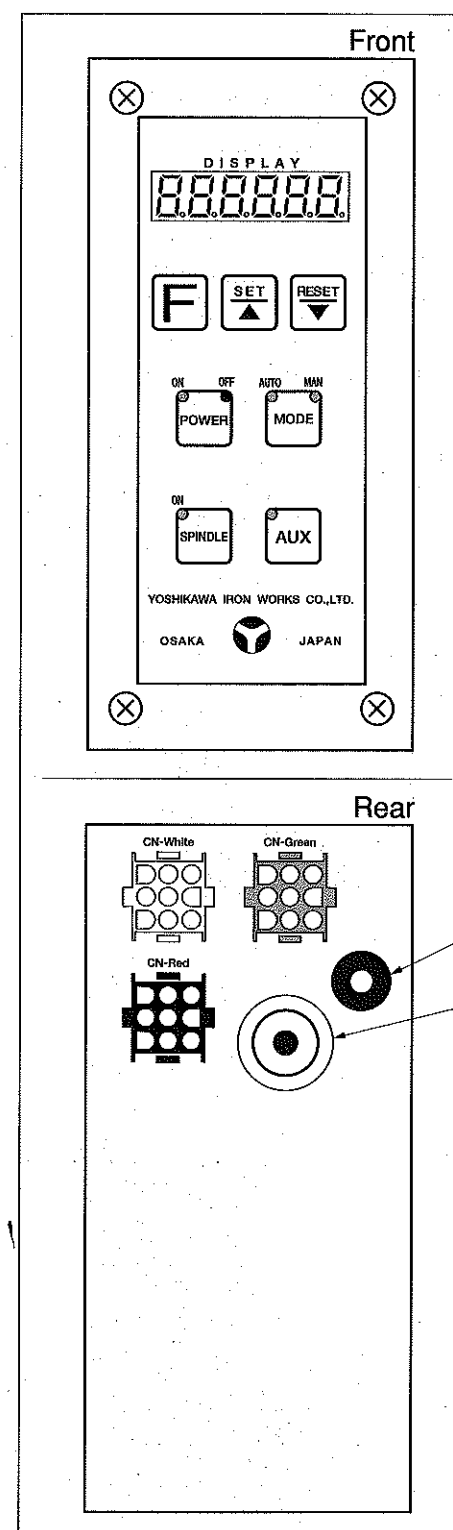
Names of Parts

(Fig.6)



- ① Spindle motor
- ② Stroke adjusting ring
- ③ Cylinder
- ④ Head (Options)
- ⑤ Insert (Options)
- ⑥ Table
- ⑦ Both-hand operating pushbutton switch
- ⑧ Table up-down handle
- ⑨ Table up-down screw
- ⑩ Table up-down stand
- ⑪ Lock bolt
- ⑫ Bed
- ⑬ control panel
- ⑭ Column
- ⑮ Hydraulic hose
- ⑯ Pressure gage
- ⑰ Table clamp handle
- ⑱ Hydraulic pump motor
- ⑲ Solenoid valve
- ⑳ Relief valve
- ㉑ Hydraulic fluid reservoir
- ㉒ Oil level gage

Names of Parts on Control Panel



DISPLAY
888888

Display
Indicates counts or set values.

F

Function key
Selects a function by pressing together with other key.

SET
▲

Set/up key
Sets a function or increments a value indicated.

RESET
▼

Reset/down key
Resets a function or a counter, or decrements a value indicated.

POWER

Power supply switch
Turns on or off the machine and indicates power on or off.

MODE

Operation mode selector switch
Selects an operation mode, automatic or manual.

SPINDLE

Spindle on/off switch
Turns on or off the spindle.

AUX

Auxiliary switch
Turns on or off an auxiliary unit manually if installed.

Caution !

- Do not operate the switches on the control panel with a sharp tool such as a screwdriver, as the control panel is made of a film sheet.

Power supply cord inlet port

Start switch cable inlet port

CN-white Spindle motor power cable, LS signal

CN-Green External auxiliary input/output signal

CN-red Hydraulic pump motor power cable, SOL output signal

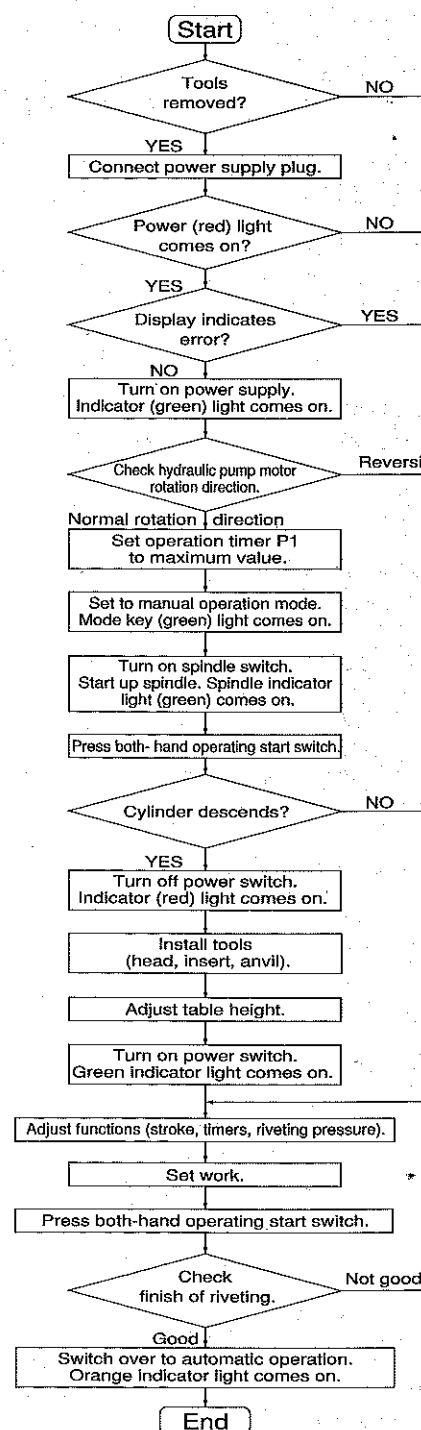
Caution !

- Wiring and maintenance of the controller shall be made by an electric engineer.
- Do not disassemble or modify the controller, or it may cause an accident or a failure.



2. Operation Preparation

2-1 Operation Flow Chart



Caution !

Check the level gage before starting operation to make sure that hydraulic fluid is filled to specification.

○ Remove tools (head, insert, and anvil) for safety.

○ Disconnect power supply plug and check power source. Reconnect power supply plug.

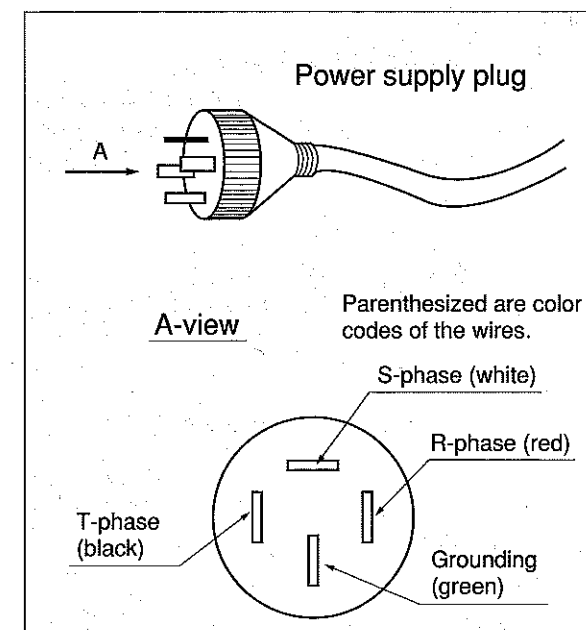
○ If Err-** is indicated, press  key to initialize controller.

○ Turn off power supply. Disconnect power supply plug, and reverse connections of two wires (red and black) in plug.

○ Turn off power supply and disconnect power supply plug. Check start switch connection or controller function setting.

2-2 Power Supply Connection

The power supply cord supplied with the riveting machine is provided with a three pole, four-wire grounding plug. Connect the plug to a three-phase 200-V $\pm$ 10% 50/60 Hz service outlet.



Warning !

Ground the machine. Otherwise, there is a fear of electric shock or mis-operation of the control components.

1) Check of Power Source

If power supply is applied, the OFF indicator light (red) of  switch comes on. If the light does not come on, check the power source.

2) Error Indication

If **Err-**** is shown on the controller display when power supply is applied, press  key. The memory is initialized and the error message is cleared.

As far as the error message is shown, the machine can not be turned on. The controller must be reset.

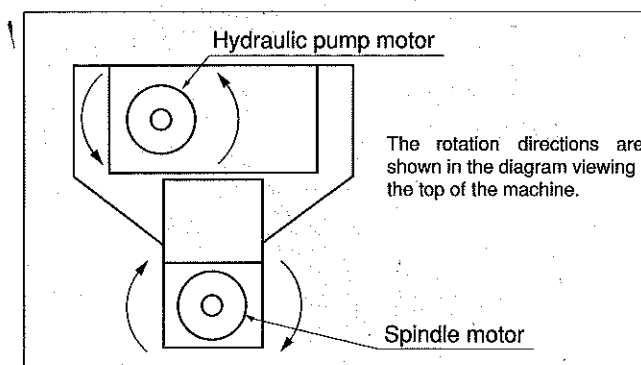
2-3 Machine On/Off

1) Turning on Machine

Press  switch on the control panel. The ON indicator light (green) comes on and the machine is turned on. Another press of the switch turns off the machine and the OFF indicator light comes on.

2) Check of Motor Rotation Direction

The spindle motor and the hydraulic pump motor of the riveting machine US-70 are wired so that they generally spin in the normal direction when the plug is connected to the service outlet. However, if the phase sequence of the power source is reversed, the two motors reverse and the tools may come off. Coming off of the tools, the head in particular, is dangerous. The tools should be removed before applying power supply. If reverses, the hydraulic pump may be damaged. Turn off the POWER switch immediately, disconnect the plug, and interchange the connections of two (red and black) of the three wires in the plug.

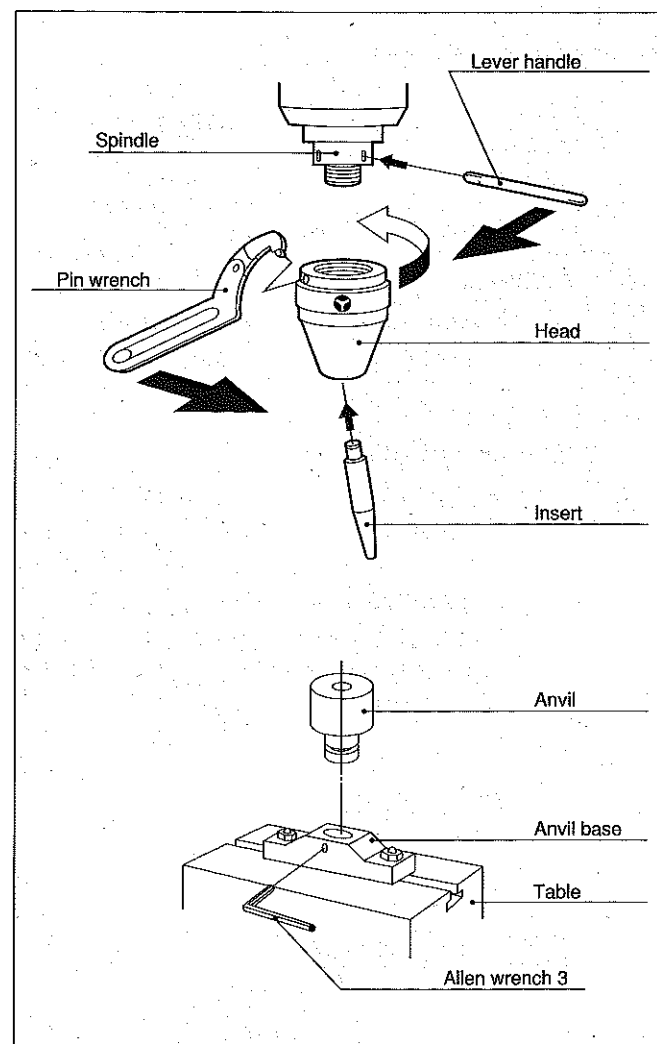


Danger !

- Connect or disconnect the power supply plug holding the plug and do not pull the cord. Do not place an object on the cord also. Otherwise, open wire or short circuit may be caused.
- Do not insert a finger or other object in the gap of the motor cover, or injury or motor failure may be caused.



2-4 Riveting Tool Setting



Set the jigs and tools necessary for riveting in the following steps.

1) Head (Options)

Screw the head on to the spindle end. Insert the lever handle into the spindle as illustrated and hold it by one hand. Hook the pin wrench on the head and hold it by the other hand. Fasten the head to the spindle firmly by the two hands.

2) Insert (Options)

Put the insert in the head till feeling a click.

Caution !

- Install the head and the insert firmly, or they may come off when the machine is operated.
- To remove the insert on completion of riveting, leave it on the head for a while because it is heated hot by operation with a fear of getting burnt.

3) Anvil (Extra Option)

Insert the anvil in the anvil base and fasten it with the set screw(M6).

(Install the special jig with T-nuts, extra options.)

Danger !

Disconnect the power supply plug to install the jig to the riveting machine. Injury may be caused by mis-operation if power supply is applied.

Caution !

The anvil and the anvil base are extra options and require alignment as with the special jig.

3. Adjustment

3-1 Stroke Adjustment

Machine Adjustment

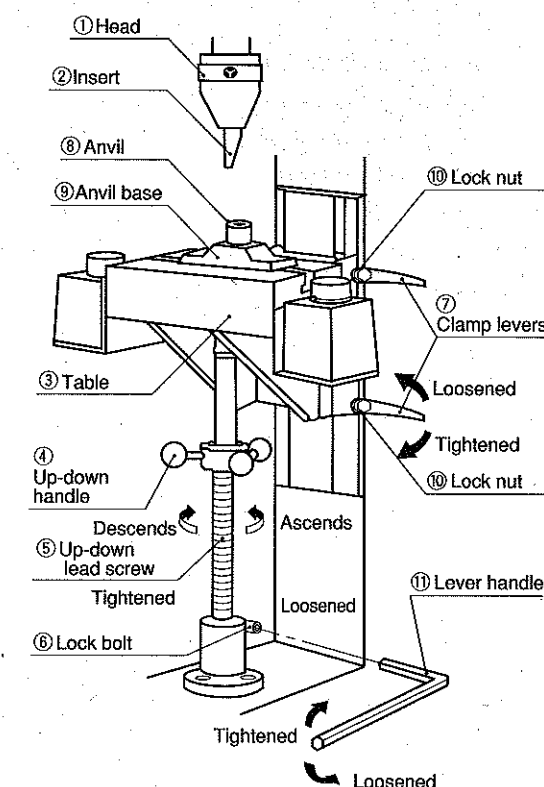
Stroke, riveting pressure, and pressure applying time are three principal factors dominating the quality of riveting.

Adjust the three factors in the following steps for satisfactory riveting.

Caution !

Turn the spindle motor switch off and make sure that the spindle is standing still, before adjusting table height.

Fig. 7.1



1) Table Height Adjustment (See Fig. 7.1.)

a. Unclamping Table

Loosen the lock nuts ⑩ of the two clamp levers ⑦, upper and lower, and loosen the clamp levers.

b. Unlocking Up-down Lead Screw

Loosen the lock bolt ⑥ of the up-down lead screw stand with the attached hex. wrench 8 ⑪.

c. Raising or Lowering Table

Turn the up-down handle ④ to adjust the height of the table so that the distance between the anvil or jig and the insert shall be enough for easily mounting or dismounting a work.

However, the distance shall not exceed the stroke (50 mm) of the cylinder, or riveting is disabled.

d. Locking Table

On completion of positioning the table, tighten the clamp levers ⑦ firmly and fasten the lock nuts to secure the table.

e. Locking Up-down Lead Screw

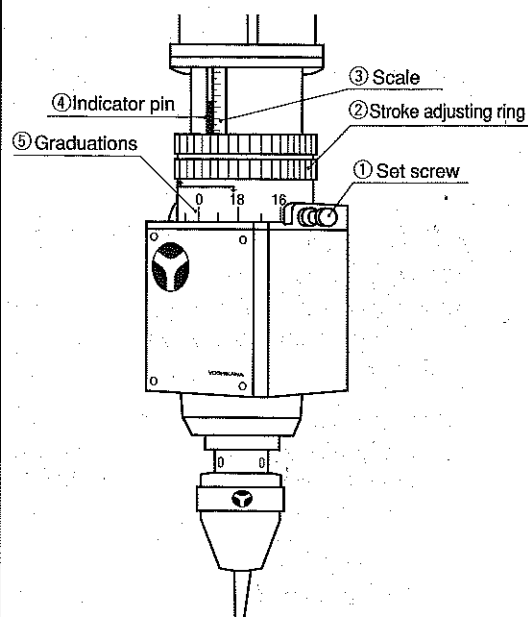
Turn the up-down handle ④ counter-clockwise (in the direction of raising the table) to eliminate a play of the lead screw ⑤ and lock the lead screw.

Tighten the lock bolt ⑥ at the root of the lead screw ⑤ with the hex. wrench 8 ⑪.

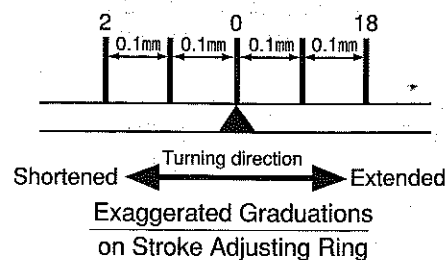
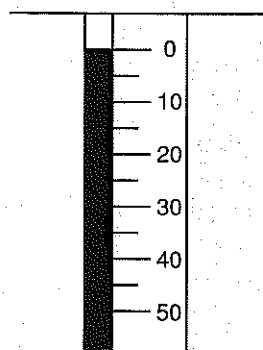
Align the anvil ⑧ and the anvil base ⑨ or the special jig etc., extra options, with the head ① and insert ②, prior to table height adjustment.



Fig. 7.2



Scale



2) Cylinder Stroke Adjustment

(Refer to Fig. 7.2.)

a. Unlocking Adjusting Ring

Loosen the set screw ①.

b. Stroke Adjustment

Adjust the stroke by turning the adjusting ring ② right or left. The stroke is extended by turning right and shortened by turning left. The stroke is changed 2 mm by one turn. The stroke is indicated by the scale ③ of 0~50 mm, graduated at a basic length unit of 1 mm, and the indicator pin ④ above the adjusting ring, and also by the graduations ⑤ on the lower part of the adjusting ring at a basic length unit of 0.1 mm.

c. Locking Adjusting Ring

On completion of adjusting the stroke, tighten the set screw to lock the ring.

3) Caution on Stroke Adjustment

To adjust the stroke, extend the stroke gradually starting with about 0 on the scale.

The insert, anvil, etc. may be damaged if the machine is idled with a long stroke.

3-2 Riveting Pressure Adjustment

Caution! ⑥

Do not tamper with the relief valve (red) because it is factory adjusted. The machine may fail if operated exceeding the pressure setting.

Fig. 7.3

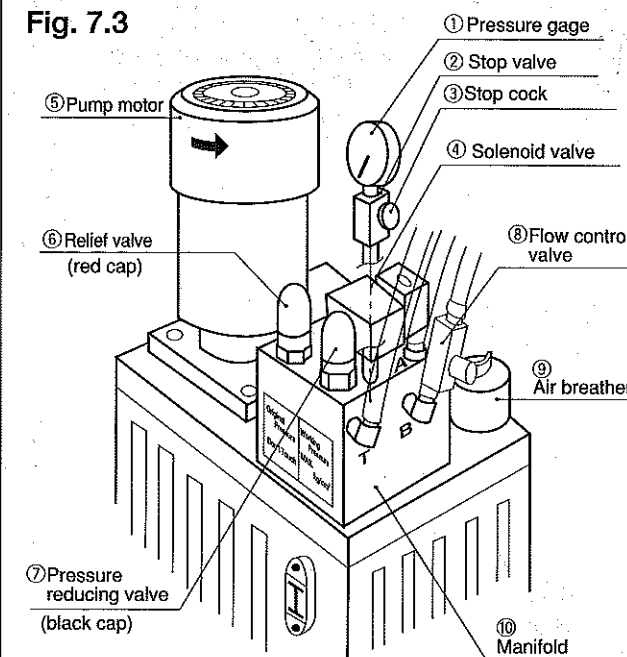
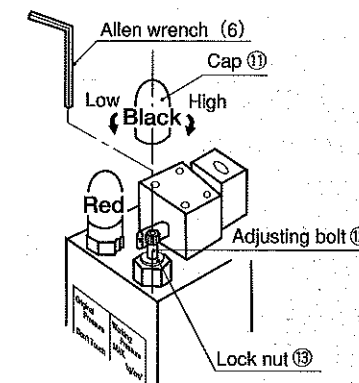


Fig. 7.4



Adjust riveting pressure optimum according to the following steps, because the pressure has a dominant effect on the finish of works and the operation time.

The hydraulic pressure of the power unit is regulated by the relief valve (red) to a maximum pressure dependent on the type of the machine so that the pressure shall not exceed the capacity of the machine.

1) Preparation (Refer to Fig. 7.3.)

a. Extension of Operation Time

Extend the time setting of the operation timer (P1) so that the pressure gage ① can be read easily. (About 9 sec or over)

b. Turning on Pressure Gage

Loosen the stop cock ③ of the pressure gage to operate the pressure gage ①.

c. Preparation of Operating Pressure Reducing Valve

Remove the black cap ⑦ of the pressure reducing valve and loosen the lock nut ⑬ with the wrench (19).

(To remove the cap, insert the blade of the flat screwdriver in the gap and pry the cap up.)

d. Flow Adjustment

To descend the cylinder fast, turn the knob of the flow control valve to extreme counterclockwise position.

2) Pressure Adjustment

(Refer to Fig. 7.4.)

a. Check of Riveting Pressure

To check the current pressure setting, press the both-hand operating push-button switch to lower the cylinder and read the pressure gage.

Pressure is indicated after the cylinder has reached the bottom in idle run. If the pressure gage can not be read, repeat the starting up procedure.

b. Pressure Setting

Adjust pressure by turning the adjusting bolt with the Allen wrench (6).

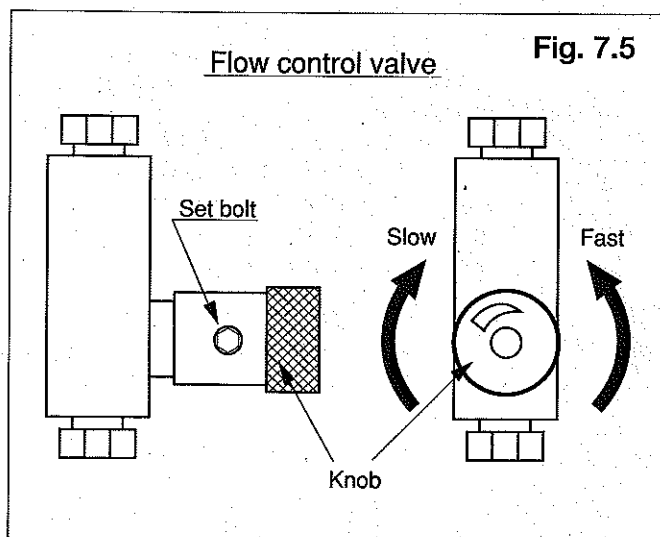
Pressure is increased by turning clockwise and decreased by turning counterclockwise.

c. Caution after Adjustment

On completion of adjustment, tighten the lock nut ⑬ and put back the cap ⑪. Close the cock ③ of the stop valve ② of the pressure gage with the pointer at 0 (no load).



3-3 Speed Adjustment



1) Adjustment of Descending Speed (Refer to Fig. 7.5.)

A flow control valve is provided for adjusting the descending speed of the cylinder in riveting. Turn the knob clockwise to slow down and counterclockwise to speed up.

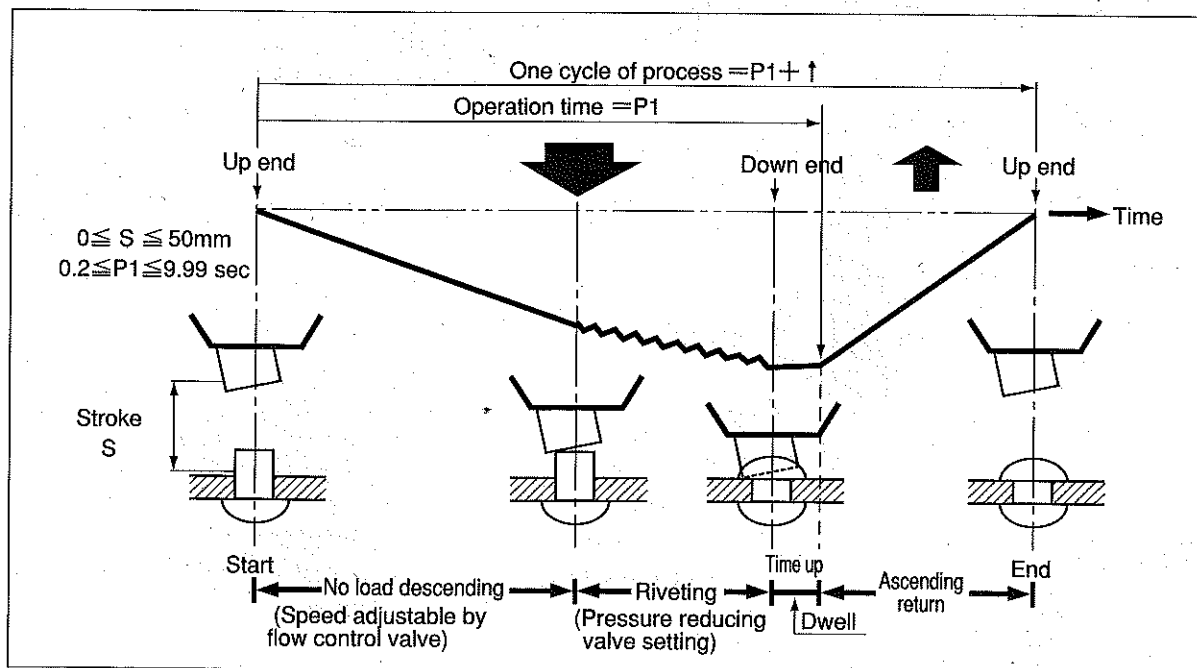
Adjust the speed depending on the type of the work.

On completion of adjustment, fasten the set screw to lock the knob.

3-4 Operation Timer Adjustment

Operation time required for riveting is dependent on the material and shape of rivet (work), cylinder stroke, speed, and pressure. Find out an optimum time by riveting actually.

The procedure of setting the timer is outlined in Para. 4-2 2).



4. Operating Procedure of Controller

4-1 Operation of Panel

1) Power Supply

If power supply is turned on, the red LED of the key is lit up. Warning or an error number is indicated on the display in the case of a controller input error or a CPU error. (Refer to Para. 4-2-4) Failures for the details.)

2) Machine On/Off

Turning On/Off from Control Panel

Press the key. The green LED comes on and the machine is turned on (the hydraulic pump motor runs). The machine is turned off by another press of the key.

Control by External Signal (Option)

Closing the external power-supply-on input signal (across ON and GND) turns the machine on and opening it turns the machine off.

⚠ Caution !

- ⊙ If the external power-supply-off signal (across OFF and GND) is opened, the machine can not be turned on because the off signal takes precedence over key operation and the external ON signal.
- ⊙ Avoid frequent turning on and off the machine, or the machine may fail.

3) Mode Selection (AUTO-MAN)

Each time the key is pressed, the mode is changed from AUTO to MAN or MAN to AUTO. The mode is also changed by closing the external mode signal (across MODE and GND).

However, since the manual mode has precedence over the automatic mode during riveting operation, change from AUTO to MAN is possible but change from MAN to AUTO is not possible until riveting is finished.

4) Spindle ON/OFF

Each time the key is pressed, the spindle is turned on or off.

If the spindle interlock function (F04) is turned on, the spindle remains motionless even if the key is turned on (green LED is lit), but starts up with the starting up of riveting.

5) Auxiliary ON/OFF (Option)

If the optional auxiliary cylinder, etc. is installed, it is turned on or off each time the key is pressed in the manual mode of the machine.

6) Input of External Riveting Enable Signal (IL)

Riveting is disabled when the IL signal (across IL and GND) is opened. If the starting signal is turned on in the OFF condition, is indicated on the display.

The display turns to the ordinary condition when the IL signal is turned on but restarting is not admitted unless the start signal (SW1 and 2) is turned off once.

7) Input of External Emergency Stop Signal (STP)

If the STP signal (across STP and GND) is opened, power supply is turned off on the spot, and also is indicated on the display. Power on is not workable until the STP signal is closed.



4-2 Display

888888 usually indicates count values but serves also as a riveting timer, function setting, or LS monitor and an error indicator.

1) Counter Setting

I) 6-Digit Output Counter (0~999999)

Each time on normal completion of one riveting cycle (start to P1 time up), 1 is added. Reading returns to 0 if 999999 is exceeded. The count value is stored in the memory and not cleared by turning off power supply.

Remarks : If the start signal is turned off before the time up of the operation timer (P1) in the manual mode, count is not made.

II) Counter ON/OFF Setting and Resetting

If the  key is pressed once when the display shows a count value, the count function is turned off and the display shows . If the  key is pressed, the count function is turned on indicating the current count value.

*The counter ON/OFF setting is memorized and held even after power supply is turned off.

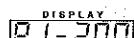
Counter Resetting

To reset the count to 0, continue to press the  key for about 2 seconds.

2) Timer Setting

Continue to press the  key for 3 seconds with power supply turned on, and the display will show

 *1



Timer setting 0.00~9.99 sec (in steps of 0.01 sec)
Timer No. 0~9 10, types (on extra option machine)

Timer No.

Timer type	No.	Specification
Riveting timer	P1	Standard
	P3	Option (F08) Function of selecting from 4 timers
	P5	
	P7	
Quick traverse *2	P2	Standard
	P4 *	Option (F08) Function of selecting from 4 timers
	P6	
	P8	
End signal timer	P9	Standard
Testing intermittent timer *3	P0	

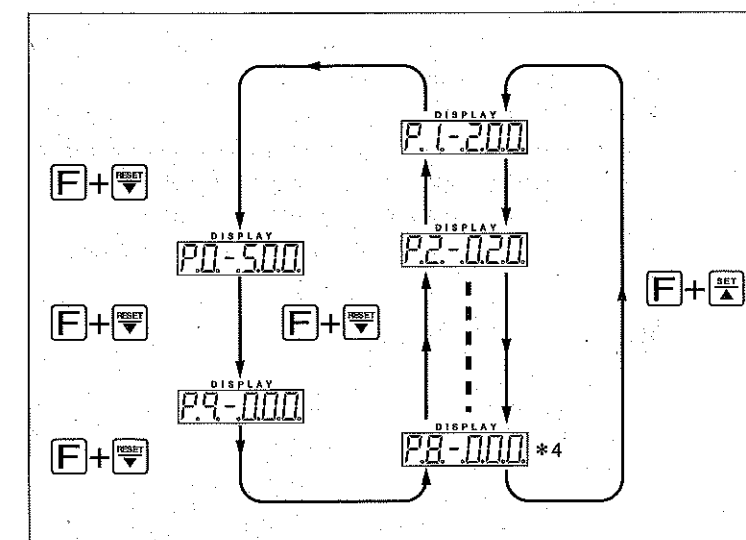
*1 P1-2.00 is a default value.

*2 Selectable two speeds (Option).

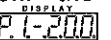
*3 The timer P0 is intended for factory shipping test and can not be used for other purpose.

I) Selection of Timer No.

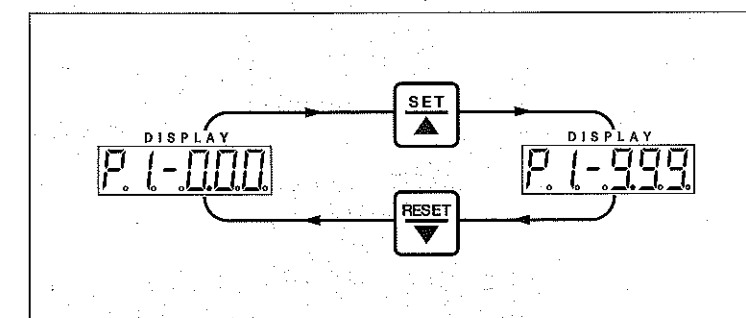
P0 and P9 can be selected only by decrementing from P1.



II) Timer Value Setting

Set a value desired with the  key incrementally or  key decrementally in steps of 0.01 sec from the default timer value  indicated on the display.

Continue to press the  or  key, and the value is successively varied slowly for a while and then rapidly.



III) Entering Timer Value

Continue to press the  key for 3 seconds to end setting, and the display turns to the counter mode. Setting is also automatically ended if the key is not operated for 20 seconds after setting.

Remarks : Riveting can be carried out while the display is in the timer setting mode but the count value is not incremented.

3) Monitor Function

I) LS Monitor



LS1

LS2*5

ON or OFF of the limit switches LS1 (down end) and LS2 (up end) can be monitored with the decimal points of the 6th and 1st digits of the counter mode display.

ON = Bright, OFF = Dark

*4 P3 through to P9 timers can be shown only on the extra option machine.

*5 If the up end limit switch LS2 is not installed, the LS2 signal is short-circuited and the decimal point is bright all the time.



4) Error Indication

The display shows an error code or message in the case of controller internal failure, external emergency stop, or machine failure.

Error indication (memory error) is made only when the power supply is turned on.

If an error occurs, press the  key to initialize the error data and turns off the indication. Power supply can not be turned on unless the error data is initialized.

Power supply is turned off when an error message is indicated.

Power supply can not be turned on unless the error cause is removed and the indication is cleared.

■ List of Error Indications

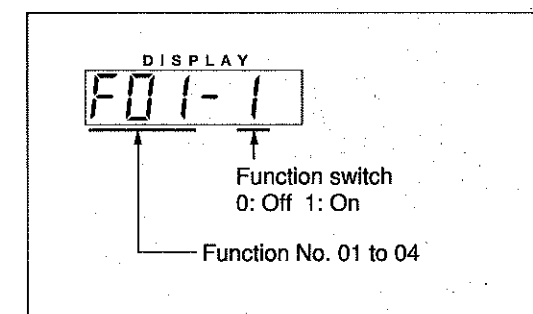
Indication	Description	Remedy
Err-01	Memory data error	Press the  key to initialize the data.
Err-10	Count value error	
Err-11	Timer P1 data error	
Err-12	Timer P2 data error	
Err-13	Timer P3 data error	
Err-14	Timer P4 data error	
Err-15	Timer P5 data error	
Err-16	Timer P6 data error	
Err-17	Timer P7 data error	
Err-18	Timer P8 data error	
Err-19	Timer P9 data error	
Err-20	Version data error	
Err-21	Function data error	
OL-1	Hydraulic pump motor overload	Remove cause of overload and reset thermal relay 1.
OL-2	Spindle motor overload	Remove cause of overload and reset thermal relay 2.
E Stop	Emergency stop *	Reset external emergency stop.
Sb-1	Start input 1 short to GND	Remove cause of short-circuit.
Sb-2	Start input 2 short to GND	Remove cause of short-circuit.

*Timer P0 data error is automatically reset.

4-3 Function Setting

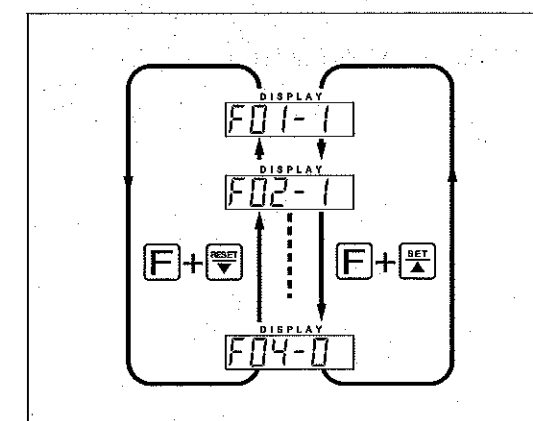
The following functions are selectable.

F No.	Function	Description
F01	Start input signal 1 (SB1) enabled *6	Start signal from SB1 is admitted.
F02	Start input signal 2 (SB2) enabled	Start signal from SB2 is admitted.
F03	Key operation memorizing	Status of mode and spindle key is memorized.
F04	Synchronous spindle run	Spindle spin is synchronized with riveting.



1) Function Selection and Setting

Press the  key while pressing the  key, and power supply is turned on and the display indicates as illustrated below. (Default option)



I) Selection of Function No.

Each time the  key and the  or  key are pressed, the function No. is incremented or decremented.

II) Setting of Function Switch

Press the  key to set "1" for turning the function on.

Press the  key to set "0" for turning the function off.

*6 F01 and F02 are fixed to "1" (on) and the setting can not be changed.



2) Key Lock

The keys except for the  key can be locked to avoid misoperation or mis-setting of the control panel.

I) Indication of Key Locked Condition

When the keys are locked, the green indicator light of the  key flashes when power supply is turned on, and the red indicator light when power supply is turned off. When the keys are unlocked, each indicator is lit steadily.

II) Key Locking and Unlocking

Locking : When the POWER key is not locked and the OFF LED is lit up, key locking is set by holding down the  and  keys for 5 seconds until the ON LED (green) flashes.

Unlocking : When power supply is turned on and the keys are locked, press the  key for about 5 seconds, and the keys are unlocked and the OFF LED (red) flashes.

Remarks : Five seconds is a rough guide. Confirm locking or unlocking according to whether the indicator is steady or flashes.

3) Memory Initialization

Press the  and  key at the same time for 3 seconds to initialize all the memory data to default values. This does not affect the function setting. The values set last are held.

The default values of each memory are shown below.

Memory		Default Value
Counter		0
Counter on/off		ON
Key lock on/off		OFF
Mode (auto/man)		MAN
Spindle (on/off)		OFF
Timer	P0	5.00
	P1	2.00
	P2	0.20
	P3	0.00
	P4	0.00
	P5	0.00
	P6	0.00
	P7	0.00
	P8	0.00
	P9	1.00



Caution !

The memories can not be initialized if the keys are locked.

Maintenance of Head

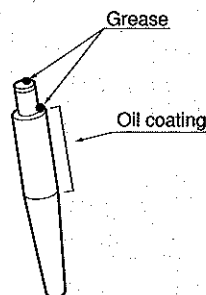
The head incorporates bearings for carrying the insert. If the lubricant in the head is used up or the bearings are worn out, intended finish of riveting is not obtained.

Carry out maintenance such as lubrication at regular intervals to secure satisfactory finish always.



Danger !

● It is very dangerous if the machine is operated by mistake during maintenance. Must disconnect the power supply plug before starting maintenance.



◎Relubrication

Lubricate the head every week (every approx. 50 operation hours) as a rough guide.

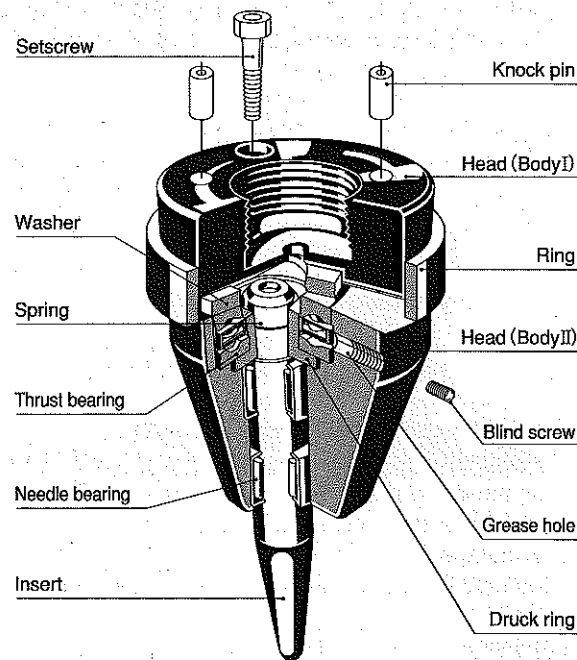
The following two types of lubricants are recommended.

Grease: Lithium grease (Alvania 2)

Oil : Class 3 petroleum lubricating oil
(e.g. T&D-S from BIRL)

Coat the upper end of the insert with a little amount (0.2 cc) of grease. If excessive amount of grease is applied, spin of the insert may get worse deteriorating the finish of riveting, if the rivet diameter is small (5 mm or less).

If the rivet diameter is small (5 mm or less), coat the entire insert with lubricating oil.



◎Spare Parts

The parts used in the head are all expendable. They need be replaced at regular intervals.

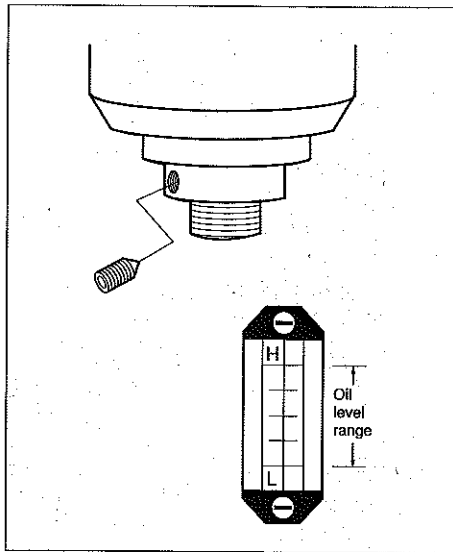


Maintenance of Machine

Comply with the following instructions to maintain the ability of the riveting machine over many years.

⚠ Danger !

- It is very dangerous if the machine is operated by mistake during maintenance. Must disconnect the power supply plug before starting maintenance.



1) Lubrication of Spindle Section

Lubricate the spindle section every six months (approx. 1,500 operation hours) as a rough guide though the relubrication frequency depends on the operating frequency of the machine.

◎ Lubrication Procedure

As shown in the left illustration, a lubrication port is provided at the lower portion of the spindle. Remove the plug and screw the mouth piece of the grease gun in the port. An amount of grease supplied by one stroke of the grease gun handle is adequate.

- Grease : Lithium grease (Alvania 2)
- Grease gun: Our recommendation (extra option)

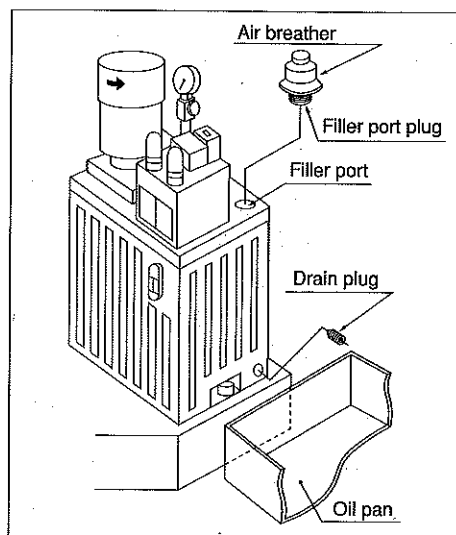
2) Exchange of Hydraulic Fluid

Empty the reservoir of the hydraulic unit and fill fresh hydraulic fluid yearly.

Before starting the day's job, check the level gage and make sure that the oil level is in a range shown in the left illustration. If the level is below the L limit line, add fluid to specification.

⚠ Danger !

- Do not drain nor fill hydraulic fluid near an exposed flame, or a fire may be caused.
- If hydraulic fluid is reduced in a short period, fluid may be leaking. Turn off the machine immediately.



◎ Procedure of Hydraulic Fluid Exchange

Place an oil pan to receive waste oil and remove the drain plug located at the lower part of the reservoir to drain hydraulic fluid entirely from the reservoir.

Caution: Dispose the drained hydraulic fluid as industrial waste.

- Put back the drain plug. Remove the filler port plug (air breather) and fill fresh hydraulic fluid up to the H limit line of the level gage. (The drain port shall be sealed before putting back the drain plug.)
- On completion of filling, screw in the filler port plug tightly.

◎ Recommended Hydraulic Fluid

Turbine oil #32 or equivalents (Hydraulic #32 from Idemitsu Oil Co.
Tellus oil #32 from Shell Oil Co.
FB oil RA #32 from Japan Oil Co.)
Reservoir capacity 10 ltr.

Daily Inspection

Carry out the inspection outlined below before starting the day's operation to maintain stable finish of riveting and detecting a machine failure early.

◎ Check before Power On

Item	Procedure	Key Point
Head	Turn insert by fingers to make sure that it turns smoothly.	Clean inside of head or replace bearings if turns heavy or sticks.
Insert	Ensure that insert end is free from plating dust or swarf.	If not removable by wiping with cloth, grind insert end. <u>Do not remove by file etc.</u>
Hydraulic unit	Check level gage on side wall of reservoir if enough.	If fluid is reduced rapidly, leakage is suspected. Repair.

◎ Power On Check

Operating pressure	Open stop valve and idle run to check if pressure gage reading is to specification.	Before idle run, make sure that there is no foreign object between insert and anvil or jig.
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■ Trouble Shooting

Machine trouble	Cause		What to do
Machine not turned on	Power off indicator (red) LED	Off	1. Power supply interrupted
		Off	2. Power supply plug not connected
		Off	3. Fuse blown out
		On	1. Error message on display
		On	2. Control equipment failure
Head remains motionless	1. Spindle switch in off position		Turn on.
	2. Single-phase power supply		Correct to 3-phase power supply.
	3. Motor failure or coupling in cylinder broken		Replace or repair.
Cylinder not ascending when power supply is turned on	1. Low pressure setting		Adjust pressure.
	2. Pump motor reversing		Reverse two wire connections.
	3. Single-phase power supply		Correct to 3-phase.
Riveting cylinder not descending	1. Low riveting pressure setting		Adjust pressure.
	2. Flow control valve closed		Adjust speed.
	3. Stroke set to 0		Adjust stroke.
	4. Operation timer setting short		Set operation timer optimum.
	5. Solenoid valve faulty		Replace or repair.
	6. Pressure reducing valve faulty		Replace or repair.
	7. Low fluid level in hydraulic unit		Refill.
	8. Hydraulic pump faulty		Replace or repair.
	9. Packing in cylinder faulty		Replace or repair.
Head stops when riveting	1. Bearing in head faulty		Replace or repair.
	2. Bearing in spindle section faulty		Replace or repair.
	3. Single phasing		Correct to three phases.
Poor riveting			
Scatter of finish	1. Stroke adjusting screw and table clamp loosened		Check lock screw, nut.
	2. Anvil or jig not matching rivet		Correct jig etc.
Burrs produced	1. Cylinder descends excessively		Adjust cylinder stroke.
	2. Insert end shape improper		Correct insert.
	3. Caulking allowance of work excessive		Correct work.
	4. Riveting center misaligned		Align.
Rough point surface	1. Swarf on insert end		Clean, or repair.
	2. Grease in head excessive		Wash and fill adequate amount of grease.
	3. Bearing in head faulty		Check and replace bearing.
Riveting failure	1. Low riveting pressure		Increase pressure.
	2. Bearing in head faulty		Inspect, replace bearing.
	3. Rivet turning with insert		Improve anvil or jig.
	4. Rivet material hard		Machine capacity insufficient

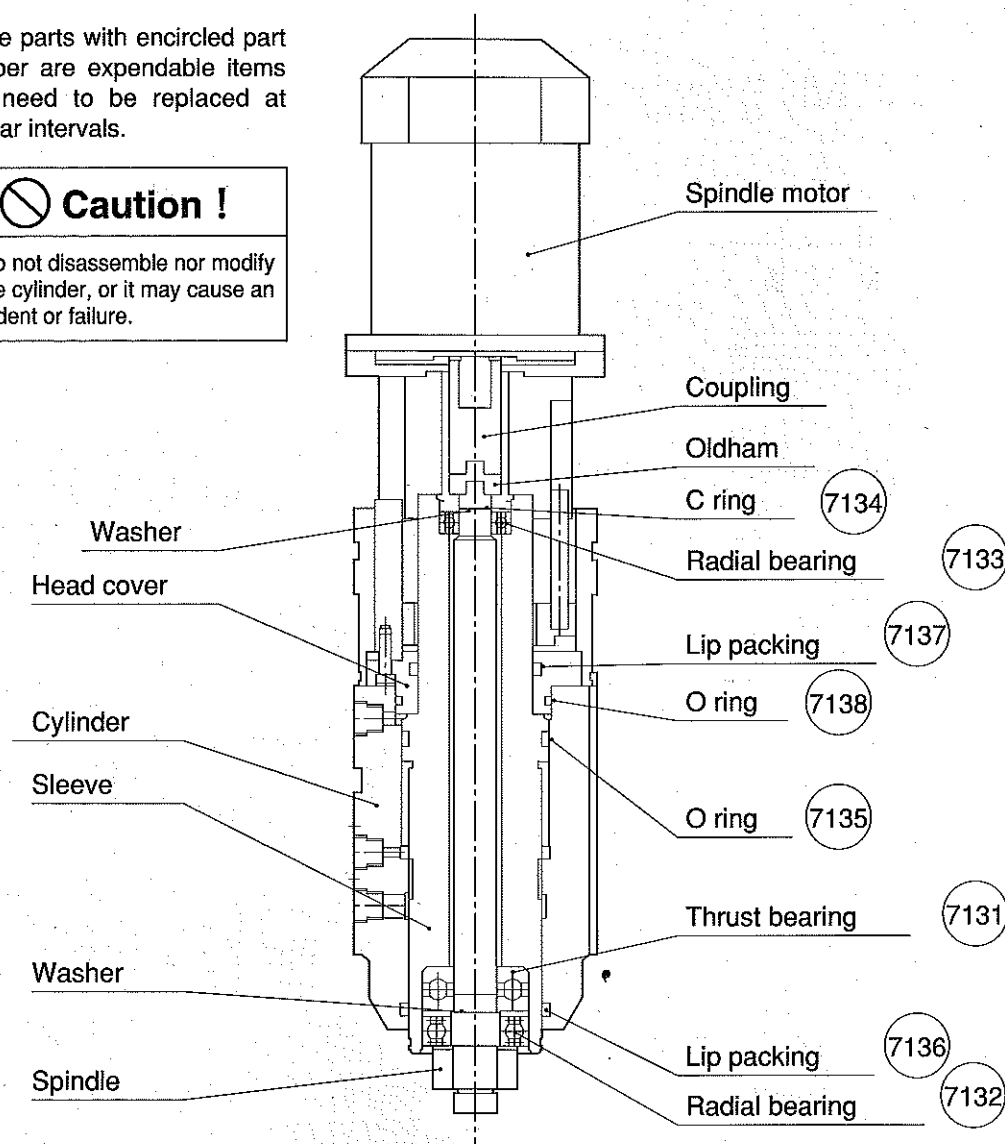
◎ Refer to the corresponding descriptions in the text for adjusting procedures.

■ Cross-sectional Diagram of Cylinder

○ The parts with encircled part number are expendable items and need to be replaced at regular intervals.

Caution !

● Do not disassemble nor modify the cylinder, or it may cause an accident or failure.

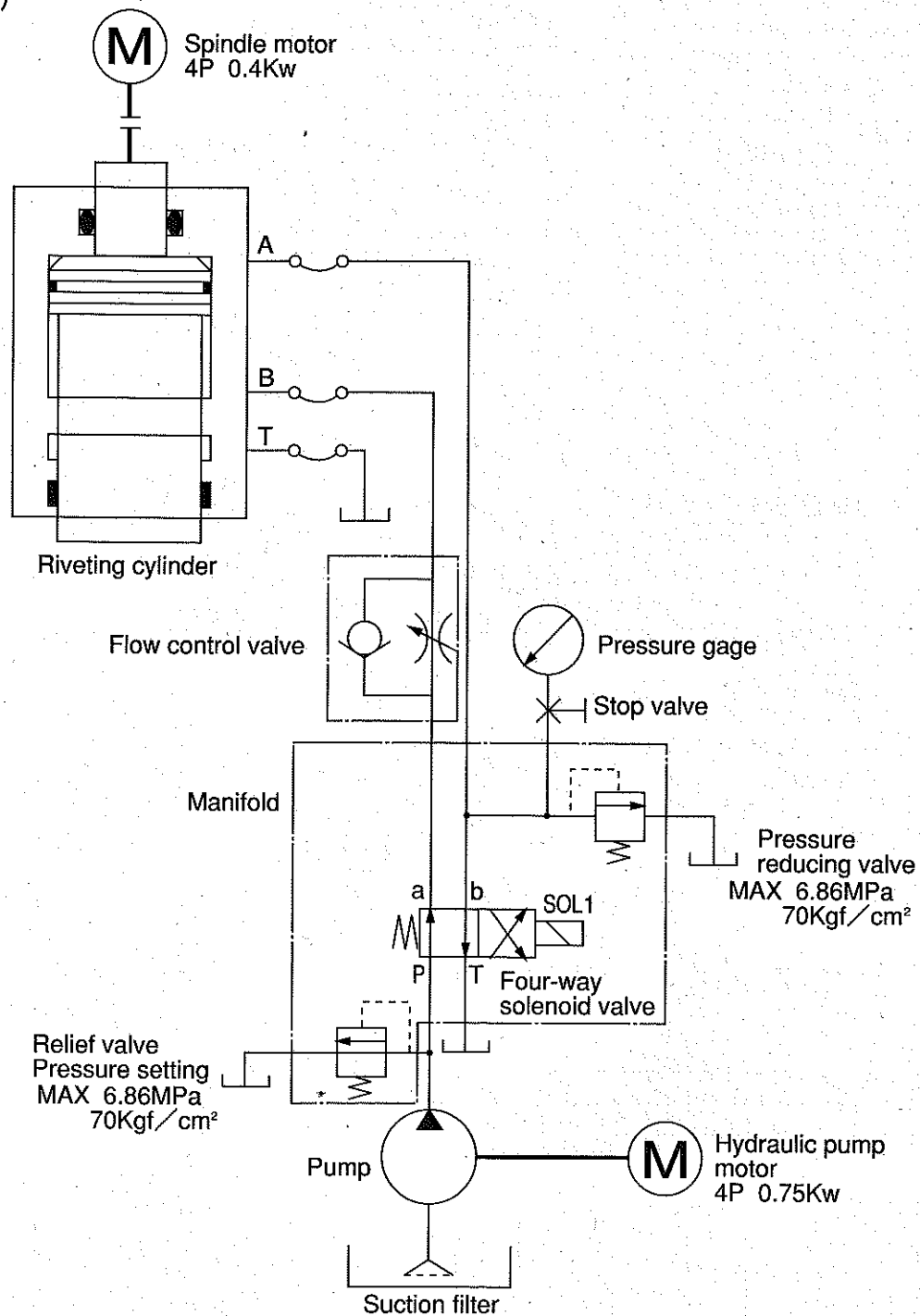


Part No.	Part	Model No./Spec
7132	Radial bearing	# 6206LLU
7133	Radial bearing	# 6004LLU
7131	Thrust bearing	# 51405
7136	Lip packing	SKY75
7137	Lip packing	SKY67
7135	O ring	G85
7138	O ring	P75
7134	External C ring	# 20



Hydraulic Circuit Diagram

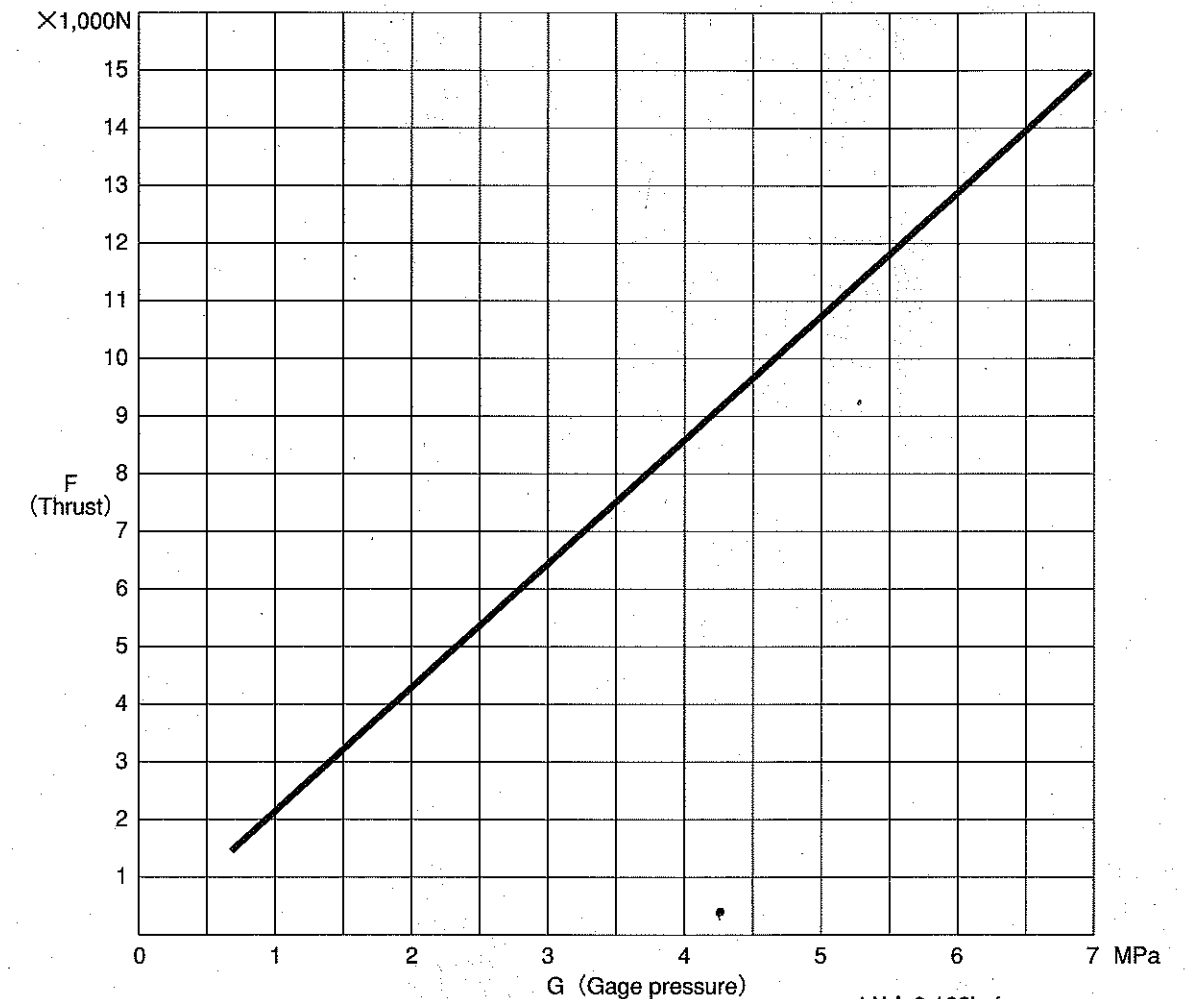
(Fig. 8)



Thrust—Operating Pressure Line Diagram

(Fig. 9)

Pressure Line Diagram



Thrusts for Various Rivet Materials

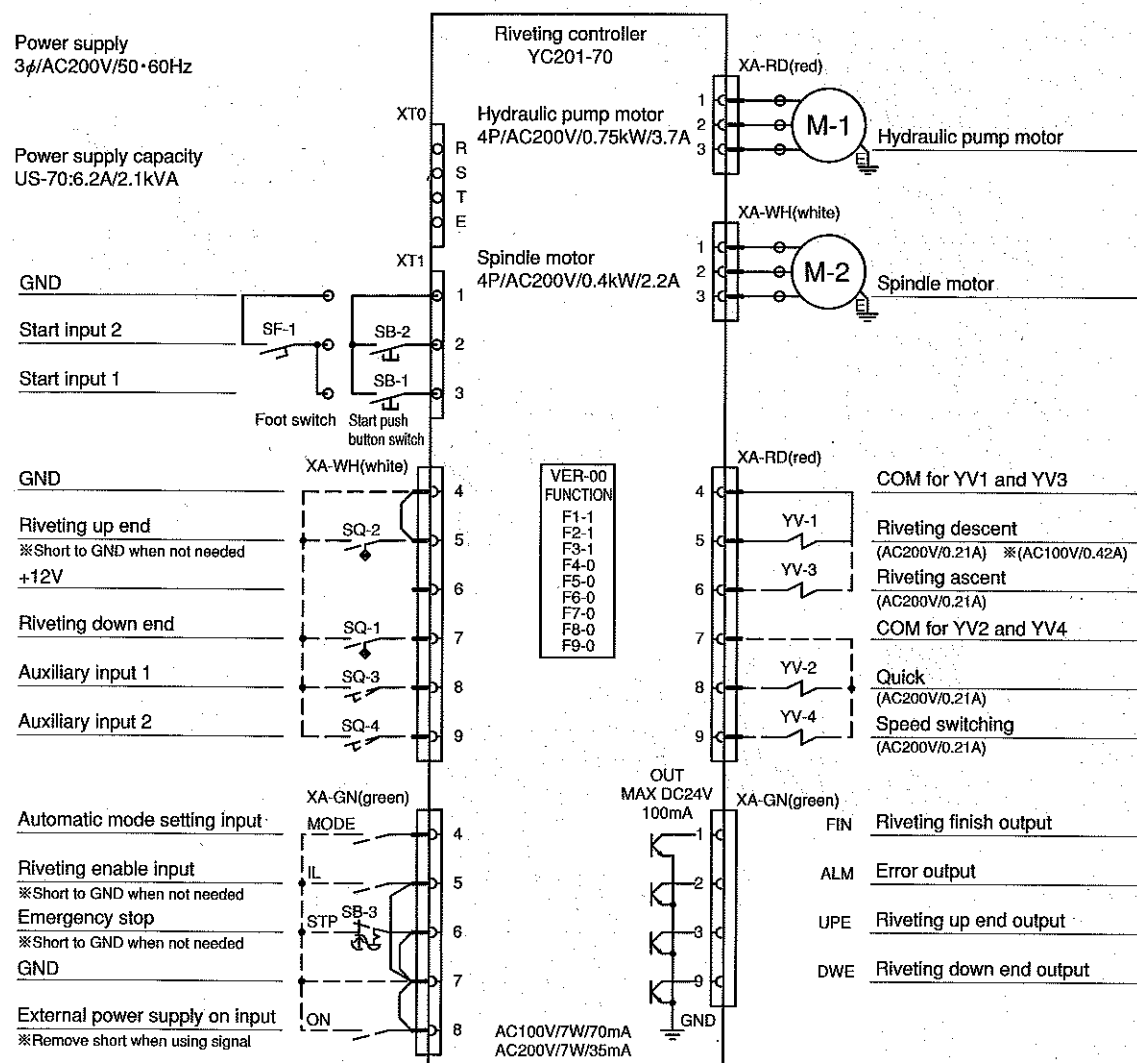
Unit $\times 1,000 \text{ N}$

Rivet dia mm	3	4	5	6	7	8	9	10	12	13
Material										
Mild steel	3	4	5	6	8	10	12			
Stainless steel	4	5	6	8	12	15				
Brass	2.5	3.5	4	5	6	7	9	10	12	14

Remarks: The above thrusts are reference values presuming that the insert shape is flat, the rivet is solid, and the upsetting allowance = rivet dia. $\times 1/3$. Riveting pressure to be adopted shall be adjusted each time.



Electric Circuit Diagram



Input and Output Specifications

Power supply		AC200V 50/60Hz
Allowable voltage fluctuation		$\pm 10\%$
Fuse		5A glass tube
Operating temperature		-10 $\sim$ +50 $^{\circ}$ C No condensation
Auxiliary power supply		Across +12V and GND DC12V 100mA
Input	Contact input	(Photo coupler isolation) x 10 Max. off current 0.8 mA Min. input pulse width 80 ms
Output	For SOL	SSR x 2 Load voltage rating AC100 $\sim$ 240V Max. current rating 2 A (Min. 0.1 A)
	Finish output	Open collector
	Error output	Max. current rating 100mA
Riveting up/down end output		Max. voltage rating DC24V

In the diagram, XA-RD, WH, GN show connector color codes, and numerals 1~9 indicate pin numbers at the portions marked $\angle$.

Recommended external connection parts

$\angle$ section Universal MATE-N-LOCK connector 9P plug
model No. 1-480706-0 from AMP Ltd.

Pin connectors
model No. 350705-1 from AMP Ltd.

XT0 section Crimp terminals
model No. 2Y-3.5 equivalents from NICHIFU Co., Ltd.

XT1 section Crimp terminals
model No. 1.25Y-3 equivalents from NICHIFU Co., Ltd.

Controller Component Layout Diagram

