AIR DRIVING UNIT FOR PRESSURE
FOLLOW-UP MECHANISM ELEMENT

ZH-50

OPERATION MANUAL

AMADA®

Z06M0871E-06

Thank you for purchasing our Air Driving Unit for Pressure Follow-Up Mechanism Element **ZH-50**.
This operation manual describes its method of operation and precautions for use.
Read this operation manual carefully prior to use. Store appropriately for ready reference.

Contents

1. Special Precautions

(1) Safety Precautions

Before using, be sure to read this operation manual to operate this machine correctly. This operation manual may include some items that do not correspond to your use. However, you are kindly requested to read only the items related to your use.

- These precautions are shown for safe use of our products and for prevention of damage or injury to operators or others. Be sure to read each of them, since all of them are important for safety.
- The meaning of the words and symbols is as follows.

DANGER

Denotes operations and practices that may imminently result in serious injury or loss of life if not correctly followed.

WARNING

Denotes operations and practices that may result in serious injury or loss of life if not correctly followed.

CAUTION

Denotes operations and practices that may result in personal injury or damage to the equipment if not correctly followed.

These symbols denote “prohibition”.
They are warnings about actions out of the scope of the warranty of the product.

These symbols denote actions which operators must take.

Each symbol represents the contents that give notice of DANGER, WARNING, or CAUTION to the operator.

DANGER

Do not disassemble, repair, or modify this machine in any case.

Otherwise, an electric shock or injury will occur. When internal inspection or repair is required, make contact with us.

WARNING

Do not put your hands between the electrodes.

When welding, keep your fingers and hands away from the electrodes.

Do not touch any welded part or electrodes during welding and just after welding finished.

The welded part of a workpiece, electrodes and electrode holder are very hot. Do not touch them; otherwise you may be burnt.

Apply the specified power supply.

Application of a voltage out of the specified range can cause fire and electric shock.

Stop the operation if any trouble occurs.

Continuous operation after occurrence of a trouble such as burning smell, abnormal sound, abnormal heat, smoke, etc. can cause electric shock and fire. If such a trouble occurs, immediately consult us or your distributor.

Persons with pacemakers must stay clear of the welding machine.

The welding machine generates a magnetic field and has effects on the operation of the pacemaker while it is turned on. A person who uses a pacemaker must not approach the welding machine or walk around the welding shop while the welding machine is in operation, without being permitted by his/her doctor.

Wear protective glasses.

If you look at the surface flash and expulsion directly during welding, your eyes may be damaged.

1. Special Precautions

CAUTION

Do not splash water on the product.

Water splashed over the electric parts can cause electric shock and short circuits.

Do not give excessive force to connecting cables.

Do not bend, pull, or pinch any cable forcibly. If the cable is damaged, it will cause an electric shock, short circuit, or firing.

Connect the specified cables securely.

Cables of insufficient current-carrying capacities and loose connections can cause fire and electric shock.
If the welding cable is not connected completely, a spark will occur.

Install the product on firm, level surface.

If the product falls or drops, injury may result.

Keep combustible matter away from the welding machine.

Do not put any combustible material around the welder. Surface flash and expulsion can ignite combustible matter.

Do not cover the product with a blanket, cloth, etc.

If such a cover is used, it may be overheated and burn.

Keep a fire extinguisher nearby.

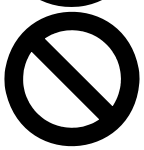
Keep a fire extinguisher in the welding shop in case of fire.

Maintain and inspect the product periodically.

Maintain and inspect the product periodically, and repair any damage near by before starting operation. Tighten the welding cable connecting section periodically.

Protective gear must be worn.

Put on protective gear such as protective gloves, long-sleeve jacket, leather apron, etc. Surface flash and expulsion can burn the skin if they touch the skin.



Do not use this product for purposes other than welding.

Use of this product in a manner other than specified can cause electric shock and fire.

When outage occurs, be sure to turn off the power supply.

After a recovery from the outage, the machine may be started or powered suddenly, resulting in an injury.

(2) Precautions for Handling

- Set the cylinder cover on when operating the cylinder to avoid fingers to be caught in the cylinder stopper.

- In this machine, the linear guide (linear bushing) is used vertically. Accordingly, grease or oil may drip, but this is not an accident. In particular, when a new machine is used, lots of grease of oil will drip. In this case, wipe it off properly during machine operation. If grease or oil sticks on the weldment, this may cause a defect.

- Do not install this product in the following:
  - Damp places where humidity is higher than 90%,
  - Dusty places,
  - Places where chemicals are handled,
  - Places where corrosive gas is generated,
  - Places near a high noise source,
  - Hot or cold places where temperatures are above 40°C or below 5°C, and
  - Areas where water will be condensed.

- Clean the outside of the product with a soft, dry cloth or one wet with a little water. If it is very dirty, use diluted neutral detergent or alcohol. Do not use paint thinner, benzine, etc., since they can discolor or deform the product.

- Between electrodes, do not put such a material other than the weldment as tool and screw. Otherwise, the welding electrode will be damaged or a spark will occur. When performing maintenance for this machine as a result of replacement of electrodes, turn off the power supplies of the welder and control device in advance.

- Do not put a screw, a coin, etc., in the product, since they can cause a malfunction.

- Be sure to install the screws, which were removed for maintenance of this machine, in their original positions. If they are installed in different positions, this machine will be damaged or go wrong.

- Operate the product according to the method described in this operation manual.

2. Features

☐ All-round unit suitable for diversified production workshops

This model is applicable to your various production environments in the range of manual operation machine to labor-saving automatic machine.

☐ Applicable to various welding by combining with pressure follow-up mechanism

By combining with our pressure follow-up mechanism, this model is applicable to various welding method; direct welding, indirect welding, or series welding.

☐ Most suitable for precision welding

The model is provided with a wide linear guide and adopts an integrated frame structure, thereby attaining high accuracy and high rigidity.

☐ Lots of options applicable to any shape of weldment

- Combination with our pressure follow-up mechanism

The customer can select an optimum model for your welding in the abundant lineup.

- Options/accessories

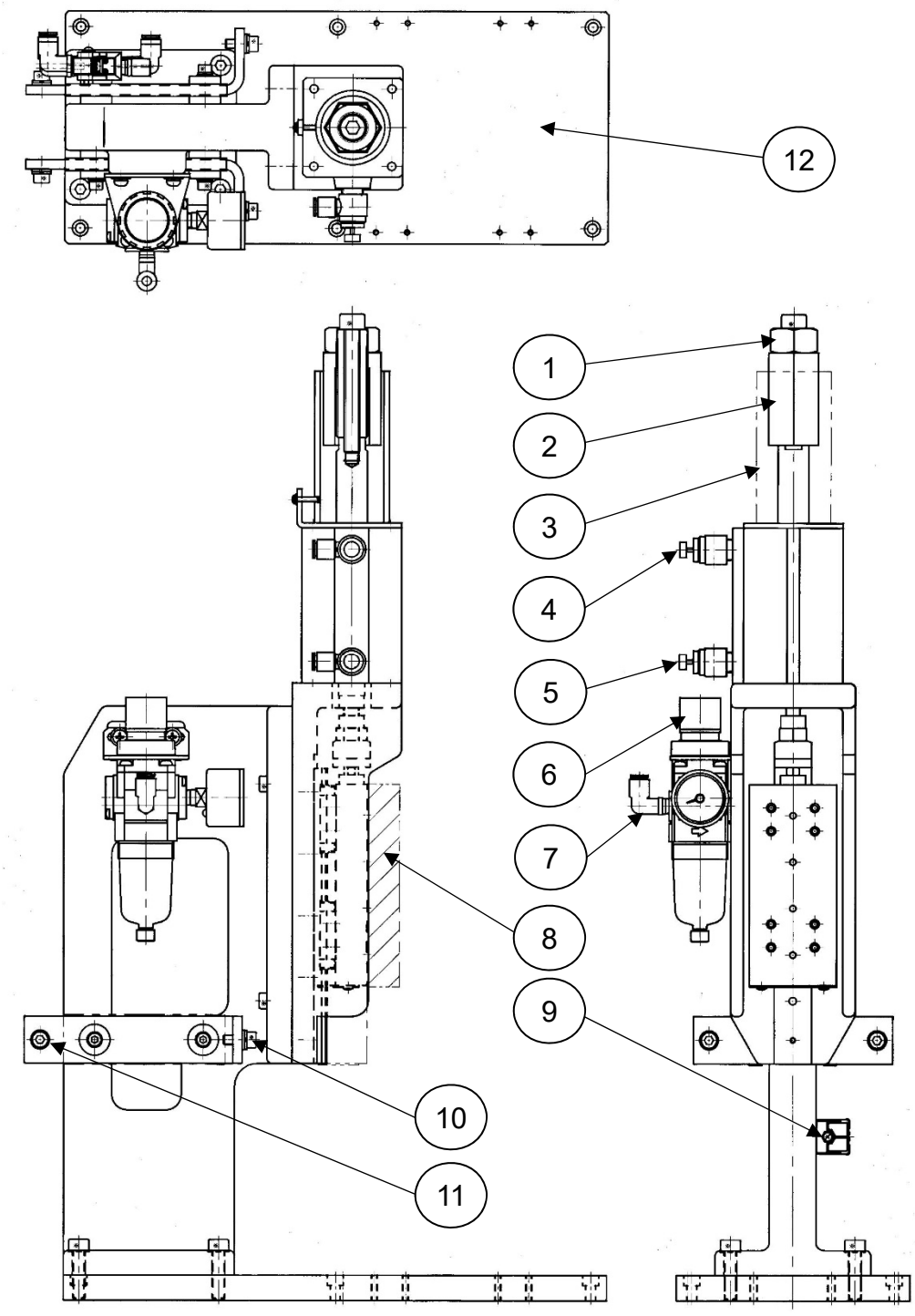
The machine can be combined with the precision lower holder (selectable electrode diameter) for direct welding and the welding cable (ounce copper plate) for high using ratio.

- Others

A preset holder to simplify projection allowance at replacement of electrodes and base-less specifications for mounting an automatic machine can be adopted for the machine.

3. Name and Functions of Each Section

(1) Explanation of Each Part



3. Name and Functions of Each Section

(1) Cylinder stopper fixing nut

Tighten this nut to fix the cylinder stopper after the cylinder stroke adjustment. (Use a spanner with 32-mm across flats.)

⚠ **CAUTION** Be sure to fix the cylinder stopper during use. Otherwise, the machine will be damaged.

(2) Cylinder stopper

Adjust the cylinder stroke by moving up and down this part. Set this in consideration of the pressure allowance. (Adjusting range: 0 to 50 mm)

(3) Safety cover

This cover avoids fingers to be caught in the cylinder stopper.

⚠ **CAUTION** Be sure to mount this cover during operation. Otherwise, an injury will occur.

(4), (5) Speed controller

This speed controller is used to adjust the operation speed. (4) is used when moving up and (5) is when moving down. (It has been adjusted before shipment. Be sure to lock it after re-adjustment.)

⚠ **CAUTION** Avoid excessively fast stroke. Otherwise, screws will be loosened or parts will be damaged by impact and vibration.

(6) Regulator

This regulator is used to adjust the pressure of the compression air to be supplied to cylinder. (Adjusting range: 0.3 to 0.7 MPa)

(7) Air connection joint

Connect the air-supplying hose of the primary side. (Refer to page 9.)

(8) Follow-up mechanism mounting plate

This part is used to mount our V-type follow-up mechanism. (Refer to page 8.)

(9) Terminal block

Connect signal lines from the welding power supply or other devices such as pressure signal, SV signal and cylinder sensor signal. (Refer to page 10.)

(10) M6 screw to supply power (from the electrode holder side)

Connect the welding cable from the electrode holder when mounting our follow-up mechanism.

(11) M6 screw to supply power (from the transformer or power supply side)

Connect the welding cable from the welding transformer or welding power supply.

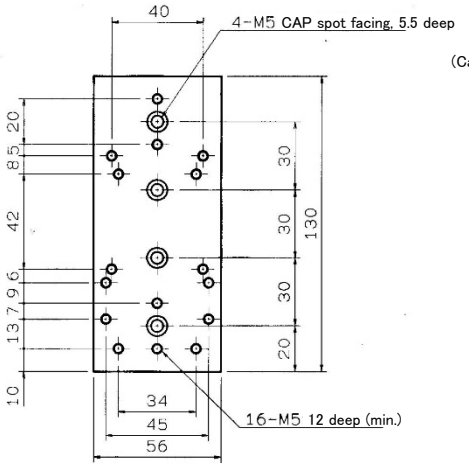
(12) Base

This base is used to fix this machine or mount our options. (Refer to page 9.)

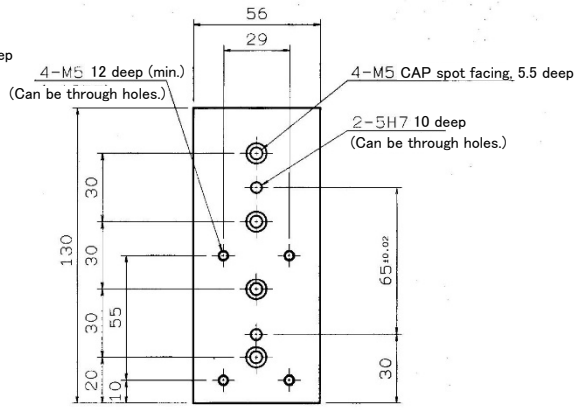
(2) Follow-Up Mechanism Mounting Plate

This part is used to various mount follow-up mechanisms.

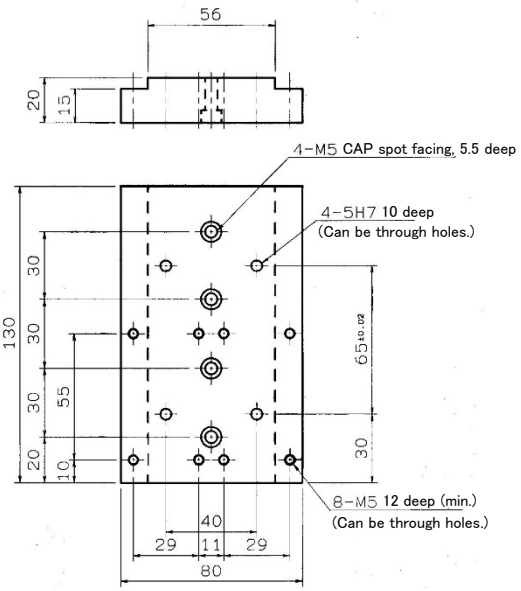
For V-type (standard) : t25



For VPW-M : t20



For VTW-M : t20



Model-corresponding table

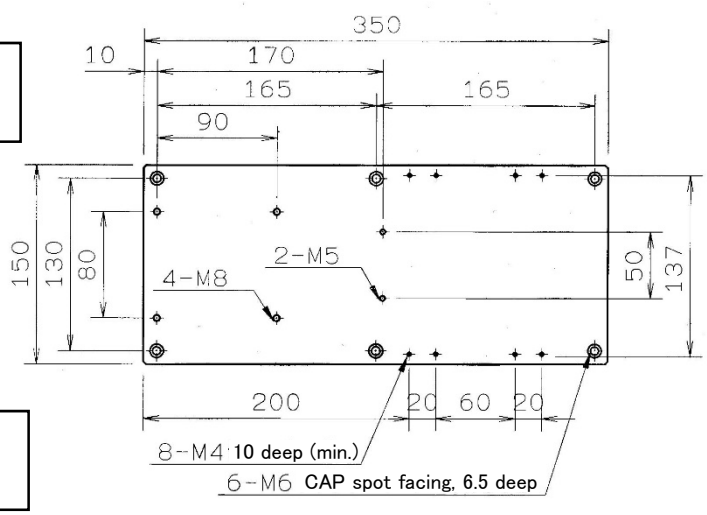
Part name	Supported follow-up mechanism	Remarks
V-type mounting plate	VP-M	
VPW-M mounting plate	VP(D)W-M	
VTW-M mounting plate	VT(D)W-M	

4. Installation and Connection

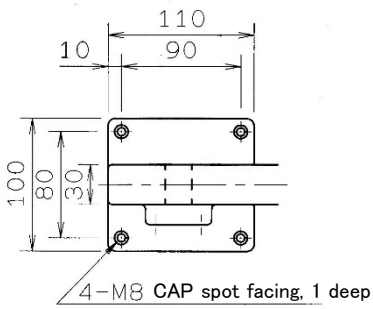
(1) Installation

When fixing the welding head (frame), perform drilling by referring to the following drawings.

Example fixing of standard base



Example direct fixing of frame

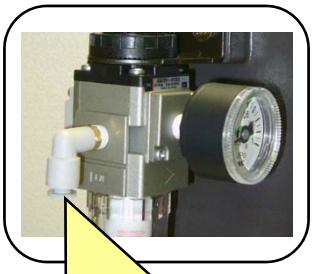


⚠ CAUTION

Fix this machine on a firm and flat surface for use. If not fixed, an injury may result due to falling or the welding quality may be lowered.

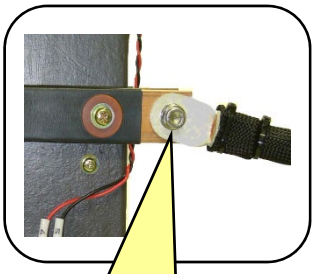
(2) Connection

Primary-side air piping



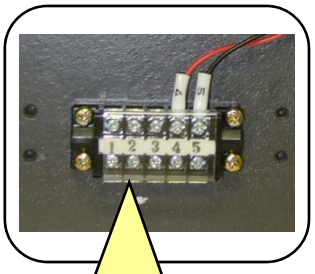
Connect the air tube with external diameter of ϕ 6. Use PT1/8 at replacement of joint.

Secondary-side welding cable wiring



Connect the welding cable.

Signal line wiring



Connect signal cables. (Refer to page 10.)

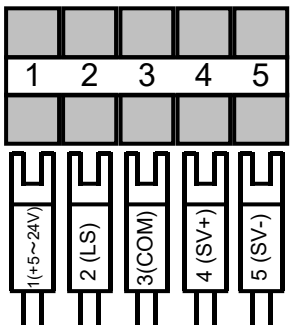
(3) Terminal Block Connection Diagram

Precautions on connection

- For connection to a terminal block, we recommend you to use our dedicated cable (between the power supply and ZH).

- For wiring to another control device (other than our product), check the specifications of the sensor, solenoid valve, etc. and then perform wiring operations.

Standard wiring for mounting V-type follow-up mechanism (5-terminal)



1: For power supply for the pressure sensor (+5 to 24 V DC). * Note 1: For connection of the micro switch specification

2: For connecting the pressure signal line.

3: For connecting the COM line for the pressure sensor.

4: For connecting the head driving SV signal line. (+24 V DC)

5: For connecting the head driving SV signal line. (-24 V DC)

6: For power supply for the cylinder sensor (+24 V DC).

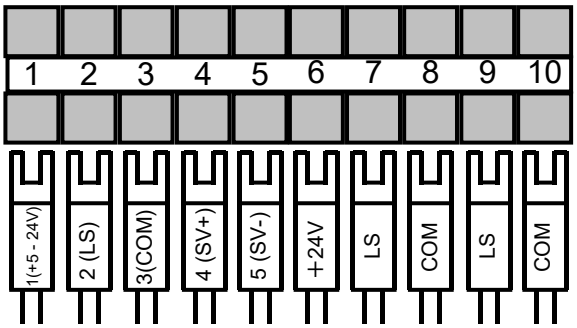
7: For connecting the cylinder sensor signal line. (Up end side)

8: For connecting the COM line for the cylinder sensor. (Up end side)

9: For connecting the cylinder sensor signal line. (Down end side)

10: For connecting the COM line for the cylinder sensor. (Down end side)

Cylinder sensor additional wiring (10-terminal)



Note1:

When you select a micro switch in the pressure sensor specification of our follow-up mechanism, do not connect any line to terminal 1.

5. Operating Method

(1) Introduction

We recommend you to use this machine (ZH-50) in combination with our pressure follow-up mechanism as a set.

To obtain the performance of the pressure follow-up mechanism fully, read the "Operation manual for the pressure follow-up mechanism element" attached to the pressure follow-up mechanism together with this operation manual.

(2) Stroke Adjusting Method

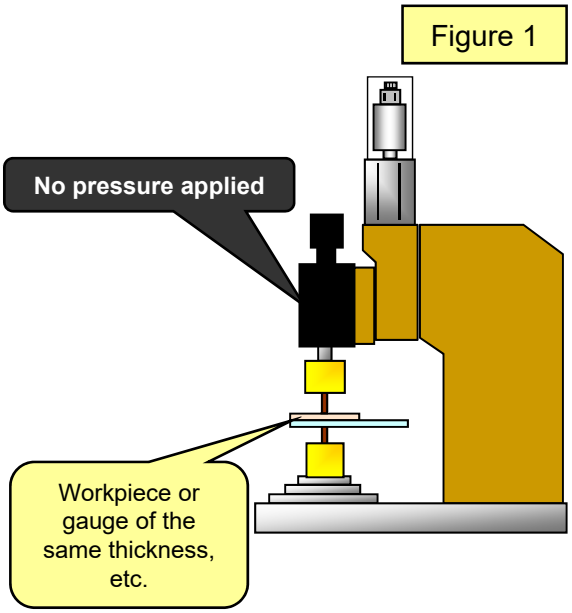
(1) Remove the safety cover.

(2) Adjust the depressurization knob of the regulator to make the air pressure 0 MPa.

(3) Place a weldment (hereinafter referred to as workpiece) or something of the same thickness (gauge, etc.) between electrodes.

(4) Lower the pressure follow-up mechanism by self-weight and make the end of upper electrode contact with the welded surface of workpiece. (Refer to Figure 1.)

Figure 1



⚠ CAUTION

Take care not to apply pressure at this time.

(5) In a state of (4), adjust the clearance between the cylinder end face and the cylinder stopper to 2.5±0.5 mm and fix it with the cylinder stopper.
Inserting a 2.5-mm gauge etc. in thickness into the clearance makes operations easy. (Refer to Figure 2.)

By this adjustment, a proper pressure allowance (page 13) can be obtained. (Refer to Figure 3.)

(6) Remove the workpiece or something of the same thickness (gauge, etc.), and then adjust the pressure of the regulator to the specified pressure. (Refer to page 14.)

(7) After this adjustment, be sure to mount the safety cover.

Figure 2

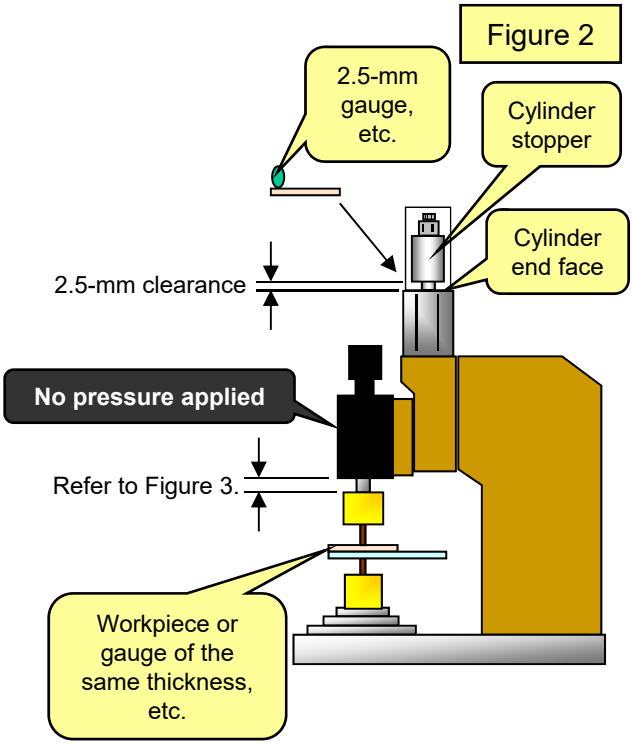
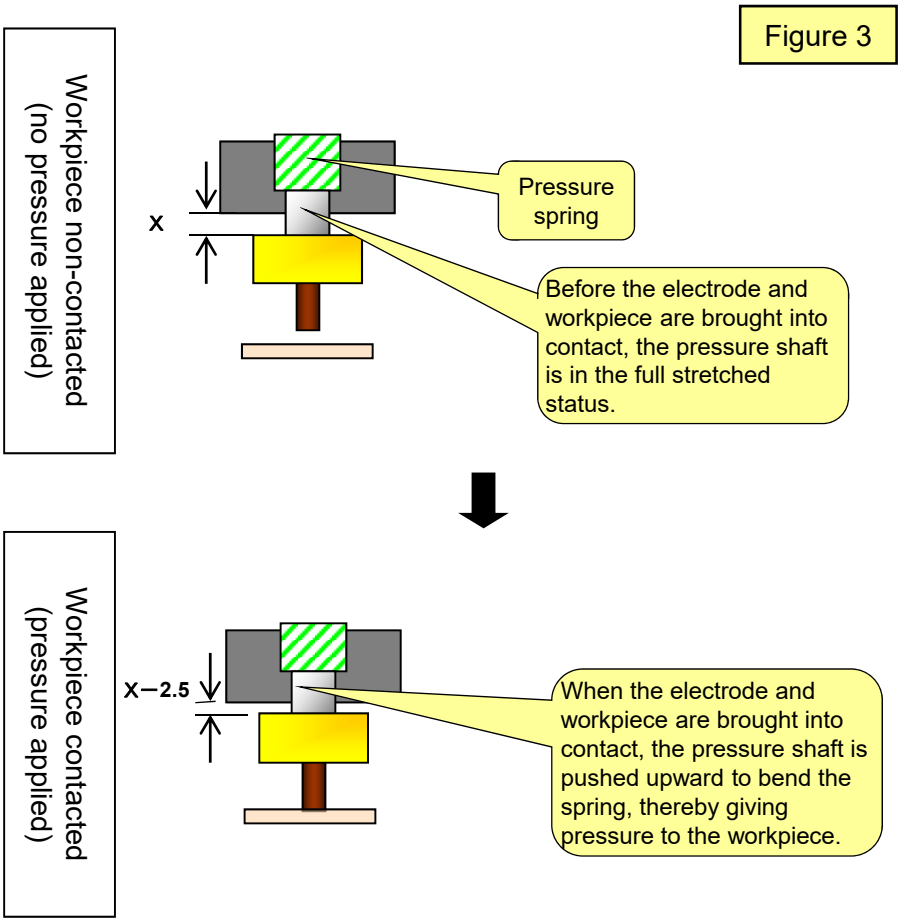


Figure 3



(3) Electrode Projection Allowance, Stroke, and Pressure Allowance

● Electrode projection allowance

Determine the electrode projection allowance out of the electrode holder by taking interference with the workpiece, operational convenience, etc. into consideration.

<Example of general electrode projection allowance>
When using a copper type electrode with an electrode diameter of ϕ 5 $\rightarrow$ 5 to 30 mm

⚠ CAUTION

When a high-resistance electrode of tungsten or molybdenum type is used, the heat generation amount at the end is changed by electrode projection allowance. Be careful about projection allowance management at replacement of electrode.

● Head stroke

Determine the head up/down stroke according to the pressure allowance of the pressure follow-up mechanism. (Refer to page 12.)

⚠ CAUTION

Make sure that the head stroke does not cause interference with the workpiece (that the workpiece can be taken out) when the head goes up.

● Pressure allowance

The deflection amount of the pressure spring in our follow-up mechanism (V-type series) is called "pressure allowance."
Our follow-up mechanism is designed so as to obtain proper pressure when the spring is bent 2.5 mm. (Refer to Figure 3 on page 12.)
Operate the machine in the pressure allowance range of 2.0 to 3.0 mm.

⚠ CAUTION

When the pressure allowance goes below 2.0 mm, a stable pressure signal may not be obtained or pressure shortage may occur.
When the pressure allowance exceeds 4.0 mm, the internal mechanism of the pressure follow-up mechanism may be damaged.

● Operation management

Normally, determine the electrode projection allowance first, and then adjust the head stroke. At replacement of electrode after the above adjustment, adjust the electrode projection allowance again to the value same as that before replacement.
To perform this electrode projection allowance management, an electrode projection allowance gauge or a removable type holder (preset holder) for the electrode mounting section is used. These methods are very effective.
It is an important point for pressure management to keep the electrode allowance on a certain level at precision stop welding. Accordingly, we recommend you to prepare a work process manual conforming to your management rules.

(4) Service Air Pressure

It is recommended that the service air pressure is twice or more than use welding force (Note 1) which can be obtained from the cylinder logic thrust table shown below. Use the supply pressure in the range of 0.3 to 0.7 MPa.

● Cylinder logic thrust table

Unit: N

Tube inner dia. (mm)	Rod dia. (mm)	Pressure-receiving area (mm^2)	Supply pressure (MPa)				
			0.3	0.4	0.5	0.6	0.7
ϕ 50	ϕ 20	1649.3	**495**	**660**	**825**	**990**	**1155**

* 1 N ≒0.102 kgf 1 MPa ≒10.2 kgf/cm^2

Note 1: “Use welding force” means the force required to welding.

⚠ **CAUTION**

The attached solenoid may not work with 0.2 MPa or less.

(5) Maintenance Management

Lubricate to bearing according to the conditions, in order to demonstrate the best ability of the machine.

● Recommended lubricant agent

Grease: Lithium type (JIS 2)
Urea type (JIS 2)
Oil: Commingled sliding face or turbine (ISO VG 32 to 68)

6. Product Specifications

(1) Specifications

1	Driving system	Air cylinder type
2	Use fluid	Dry air (0.2 to 0.7 MPa)
3	Use thrust	495 N (0.3 MPa) to 1155 N (0.7 MPa)
4	Use speed	50 to 200 mm/s
5	Cylinder stroke	0 to 50 mm (excluding pressure allowance)
6	Supported follow-up mechanism	VP-M, VP(D)W-M, VT(D)W-M
7	Solenoid valve	5 ports and 2 position valves (single solenoid valve)
8	Weight	15 kg

(2) Component List

Standard component list			
No.	Part name	Manufac-turer	Model, part, or drawing number
1	LM guide	THK	2SRS12WMUU+190LM
2	Thin cylinder	SMC	CDQ2WB50-50DZ
3	Floating joint	SMC	JA25-10-150
4	Filter regulator	SMC	AW20-01BG-A
5	Solenoid valve (24 V)	SMC	SYJ7120-5L-01
6	Rail-type terminal block (5 terminals)	IDEC	BD7-MB5

Optional component list			
1	Non-contact automatic switch (3-line type)	SMC	D-M9NVL
2	Rail-type terminal block (10 terminals)	IDEC	BD7-MB10

(3) Functional Options

Follow-up mechanism mounting plate (Refer to optional mounting plates on page 8.)	Used when a mounting plate other than the V-type mounting plate (standard) is selected.
Raising plate (1 set (2 pcs.))	Spacer between ZH-50 and base plate. The body can be raised 50 mm.
XYθ holder (precision type lower electrode holder with a water cooling hole) (Refer to Fig. 1.)	Like the slide holder, this holder is used at direct welding. The XYθ (vertical/horizontal/inclination) directions can be finely adjusted. As an electrode diameter, ϕ5, ϕ8 or ϕ12 can be selected.
Laminated copper foil specification (Refer to Fig. 2.)	This specification is for a case where a laminated copper foil for a high using ratio is installed. This specification must be specially ordered. Consult with us when required.
Welding cable on special order (Refer to Fig. 3.)	A cable on special order can be manufactured according to the customer's use. You are requested to give us instructions about cable specifications (thickness sq, length, insulation specification, and terminal hole diameter) in the table shown on page 17.

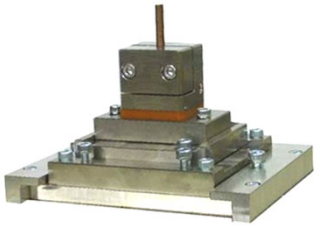


Fig. 1

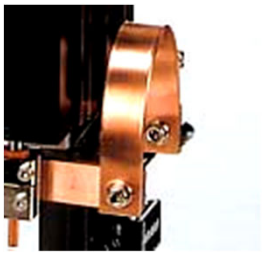
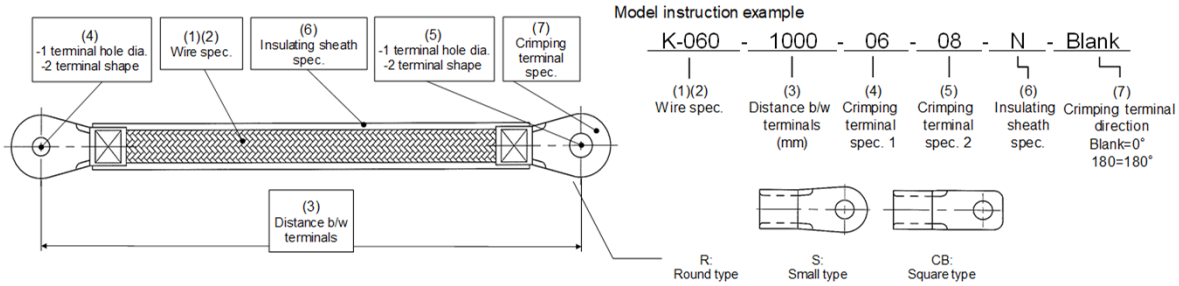


Fig. 2

Fig. 3

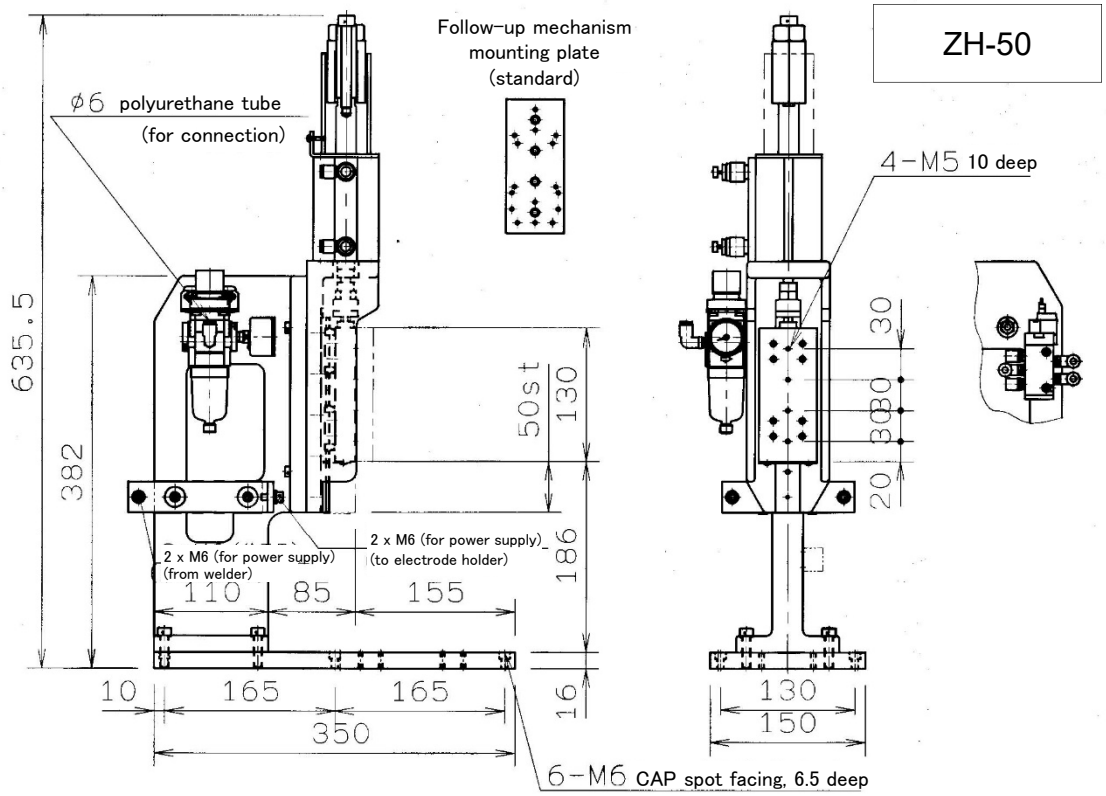
(4) Welding Cable

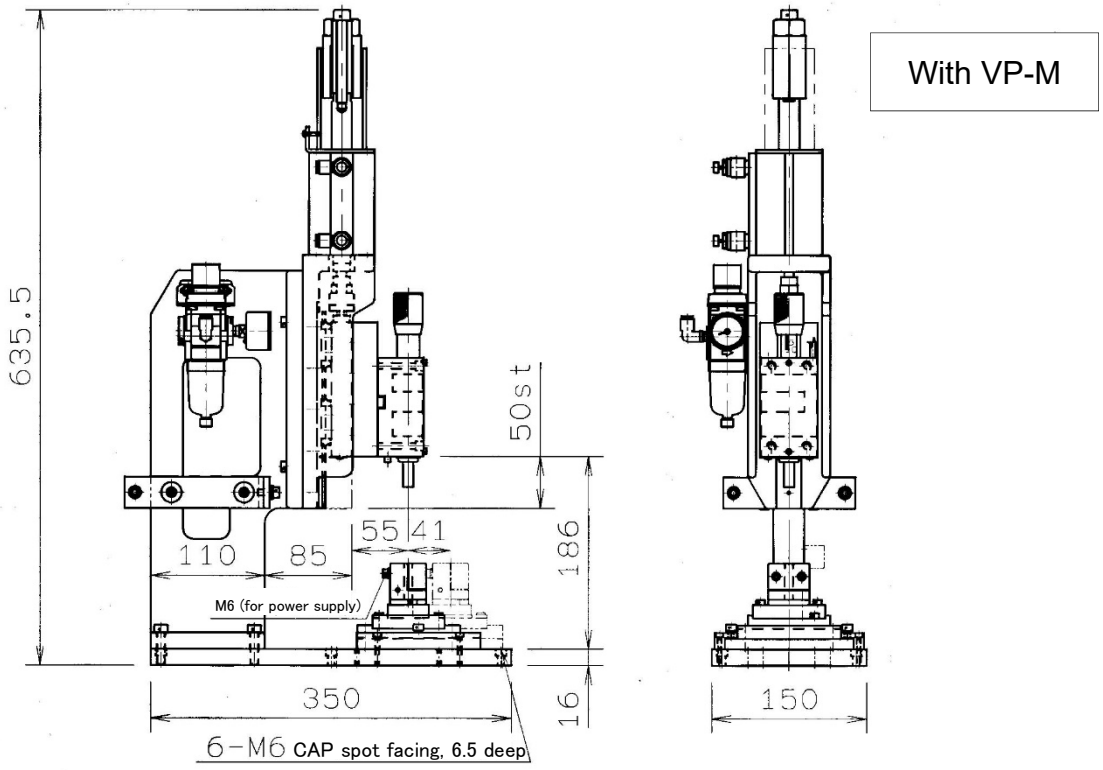
Secondary conductor specification selection table



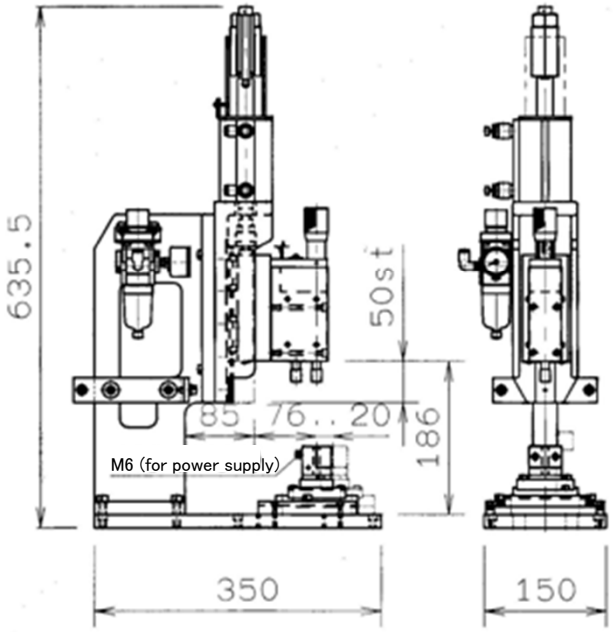
Secondary conductor specification (Filled items in the following table are recommended.)																									Remarks		
Name	Basic spec. Wire's (1) type (2) cross section		(3) Distance b/w terminals (mm) Unit of 100mm Fixed to 4-digit		Crimping terminal on both sides (4) terminal with smaller hole to (5) bigger hole order														(6) Insulating sheath			(7) Mounting direction of crimping terminal Blank=0° 180=180 °	Available dimension		Mounting crimping terminal nominal
					R4	R5	S5	R6	S6	R8	S8	CB8	R10	S10	CB10	R12	Nylon sleeve	Heat shrinkable tube	Silicone tube		Min. cable length (mm)	Max. cable length (mm)	
					04	05	05K	06	06K	08	08K	08C	10	10K	10C	12	N	G	S				
Carbon wire (round wire)	K-008	-	****	-	○	○	×	○	×	○	×	×	○	×	×	×	○	×	○	-	200	3000	8sq
	K-014		****		×	○	×	○	×	○	×	×	○	×	×	×	○	○	○		200		14sq
	K-022		****		×	○	○	○	○	○	×	×	○	×	×	×	○	○	○		200		22sq
	(K-008×3)		****		×	○	○	○	○	○	×	×	○	×	×	×	○	○	○		200		
	(K-008×4)		****		×	○	○	○	○	○	○	×	○	×	×	×	○	○	○		200		38sq
	(K-008×5)		****		×	○	○	○	○	○	○	×	○	×	×	×	○	○	○		200		
	K-038		****		×	○	○	○	○	○	○	×	○	×	×	×	○	○	○		200		
	K-060		****		×	×	×	○	○	○	×	×	○	×	×	○	○	○	○	○	200		60sq
	(K-038×3)		****		×	×	×	○	×	○	×	○	○	×	×	○	○	○	×	Blank= same direction	300		100sq
	(K-038×4)		****		×	×	×	×	×	○	×	○	○	×	○	○	○	○	×		300		150sq
	(K-060×3)		****		×	×	×	×	×	○	×	×	○	○	×	○	○	○	×		300		200sq
Flat braid copper wire (flat wire)	H-022		****		×	○	○	○	○	○	×	×	○	×	×	×	○	○	×		200		22sq
	H-030		****		×	○	○	○	○	○	○	×	○	×	×	×	○	○	×		200		38sq
	H-050		****		×	×	×	○	○	○	×	×	○	×	×	○	○	○	×		200		60sq
	H-100		****		×	×	×	○	×	○	×	○	○	×	×	○	○	○	×		300		
	(H-022×4)		****		×	×	×	○	×	○	×	○	○	×	×	○	○	○	×		300		100sq
	(H-030×3)		****		×	×	×	○	×	○	×	○	○	×	×	○	○	○	×		300		
	(H-050×2)		****		×	×	×	○	×	○	×	○	○	×	×	○	○	○	×		300		
	H-150		****		×	×	×	×	×	○	×	○	○	×	○	○	○	○	×		300		150sq
	(H-050×3)		****		×	×	×	×	×	○	×	○	○	×	○	○	○	○	×		300		
	H-200		****		×	×	×	×	×	○	×	×	○	○	×	○	○	○	×		300		200sq
	(H-050×4)		****		×	×	×	×	×	○	×	×	○	○	×	○	○	○	×		300		

7. Outline Drawings

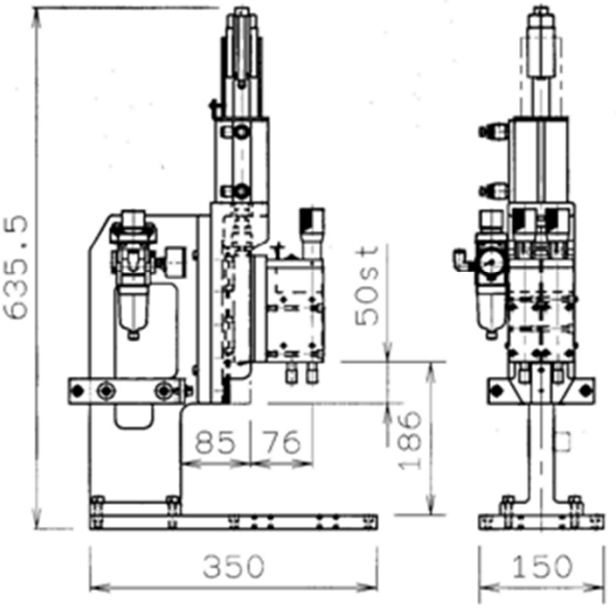




With VPW-M



With VTW-M



7. Outline Drawings