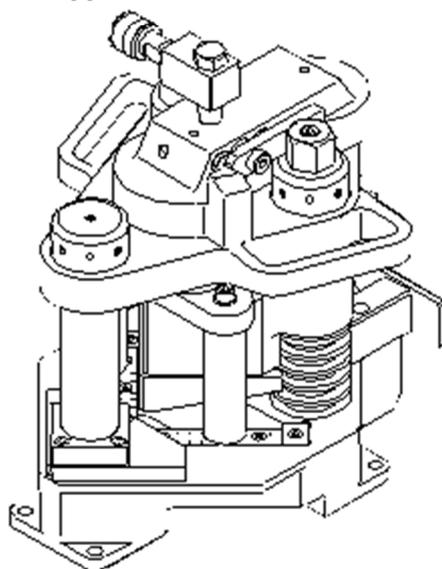
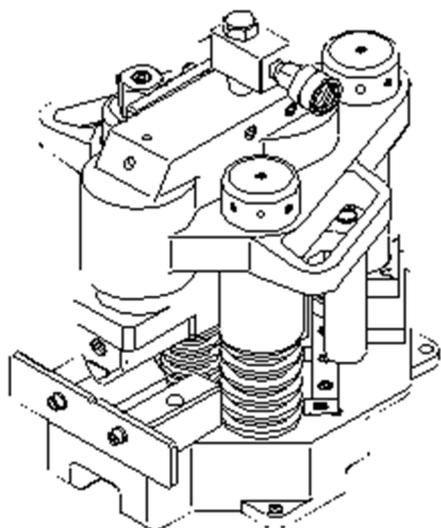


# FM-30

OPERATION & MAINTENANCE MANUAL

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# 1. FOR SAFE USE

There are two illustration remarks used in this operation manual in order to use the machine correctly or prevent you or other people from danger and injury or damage to property. Be sure to read this manual thoroughly and understand their indications and meanings as mentioned below.

 <b>WARNING</b>	As the result of improper use or operation in disregard of the indications, dangerous states may happen, causing the risk of death or serious injury.
 <b>CAUTION</b>	As the result of improper use or operation in disregard of the indications, it will cause the possibility of slight or medium degree of injury or material damage only.

## Cautions when installed

 <b>WARNING</b>	
<ul style="list-style-type: none"> <li>■ <b>Install the equipment on a flat place for better balance.</b></li> </ul>	<p>Do not install it on a shakable table or slant and unstable place, causing injury by falling.</p> <ul style="list-style-type: none"> <li>■ <b>Do not work in a place where it is liable to cause ignition or explosion.</b></li> </ul> <p>Do not use in a place where there is flammable fluid or gas.</p>

 <b>CAUTION</b>	
<ul style="list-style-type: none"> <li>■ <b>Do not expose the unit to rainwater and humidity and therefore please use it in a place where dust is as little as possible.</b></li> <li>■ <b>Do not expose the unit to the direct rays of the summer sun.</b></li> <li>■ <b>If the pump is used outdoors in the extremely cold regions, use a protection cover against the cold.</b></li> </ul>	

## Cautions when in use.

### WARNING

- **Do not disassemble or alter the unit.**  
Do not disassemble the unit including a pump except for such components as oil feeding plug as instructed for working. Especially, do not change pressure set at a relief valve. Otherwise, it will cause insufficient pressing force, damage of press frame or working tools.
- **Avoid any condition which could create an electrical hazard.**  
Do not pull out power supply plug with a wet hand. Use a grounded outlet or a plug adaptor with a grounding attachment in order to protect the operator from electric shock.  
Do not operate the unit hard by an electric welder or on materials or machine parts which are grounded.
- **Recommend to use Model UP-35RH-FL or UP-45SVG-FL hydraulic pump.**  
These pump units are rated at 68.6Mpa(700 kgf/cm<sup>2</sup>) pressure. Other makes with different specifications will cause too much or too little pressing force resulting in damage of a frame or tools.

### CAUTION

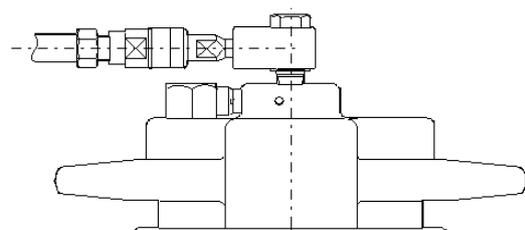
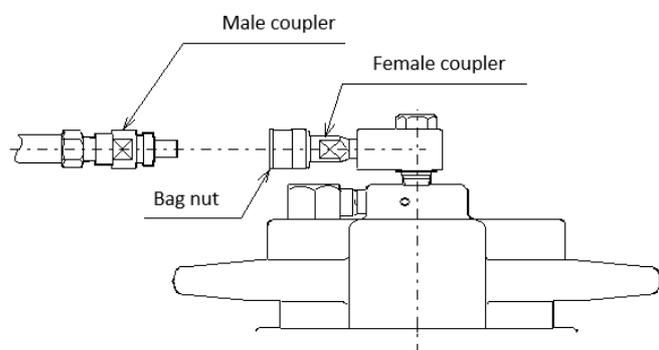
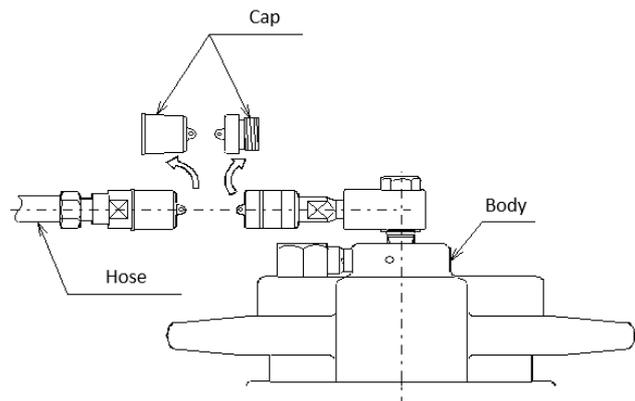
- **Do not work beyond capacity.**  
Processing beyond capacity will result in defectiveness.
- **Processing must be done alone.**  
It is dangerous to work together with several persons.
- **Voltage of hydraulic pumps will be AC110V or 220V 50/ 60 Hz single phase.**  
Your line voltage must be the same as the voltage your pump is wire for (e.g. 220 volt pump plugged into 220/230 volt power source.). Use on wrong voltage, especially plugged into lowered voltage will cause motor burning or heating. Be careful on voltage drop when used with generators.
- **Disconnect the power supply, keeping a grip on a power plug before performing repairs or maintenance.**
- **Extension cords of 1.25 mm<sup>2</sup> or sufficient gauge and 10M length must be used to avoid voltage drop or damage of the solenoid valves and electric motors.**

## Cautions when in use.

### ⚠ CAUTION

- Coupling connections need only be tightened securely and leak-free as follows:  
Disconnect the power supply before connecting couplers.

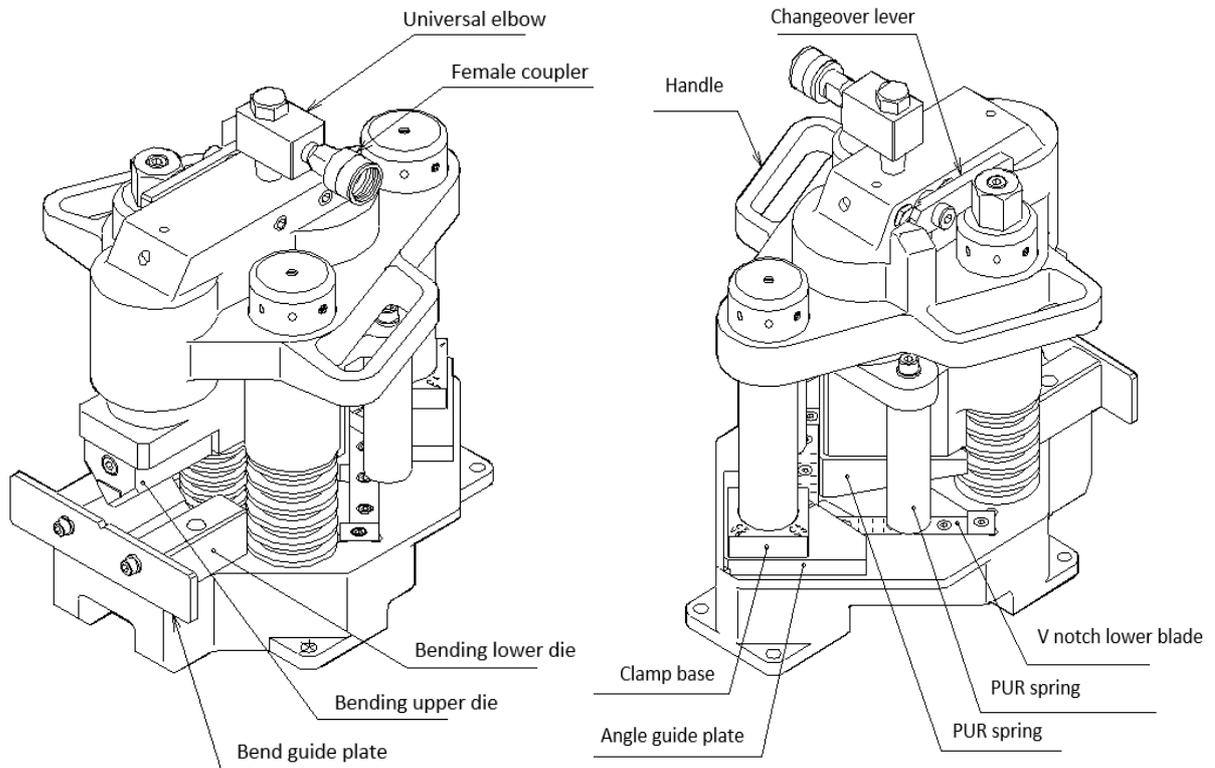
- ① Remove coupler caps. Confirm if there is no dust slicked on connection parts.
- ② Insert a male coupler deep into a female coupler.
- ③ Turn a bag nut of the female coupler and tighten it securely
- ④ Confirm it the couplers have been tightened properly.
- ⑤ In order to disconnect the connected coupler, firstly retract the cylinder. Turn the bag nut to loosen and pull it and remove the coupler set.



**After the couplers are removed, put the caps on the couplers to protect from dust.**

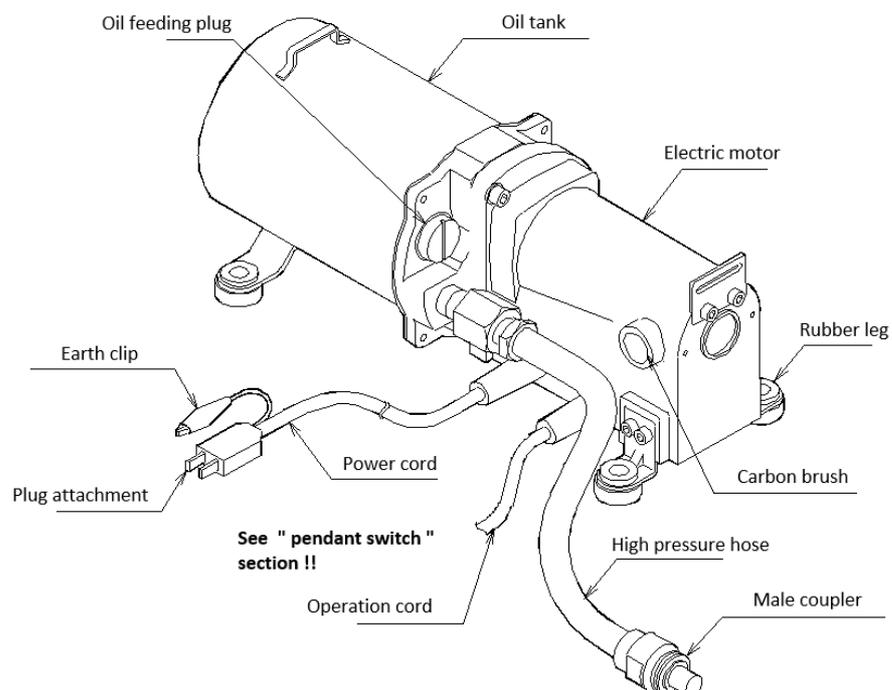
## 2. COMPONENTS' NAMES

### ■ Model FM-30 angle forming machine



### ■ Model UP-35RH-FL motor-driven hydraulic pump

This manual shows UP-35 RH- FK only, We also have UP-45 SVG-FL (450W high speed one). If you are interested in it, please contact us.



### 3. PREPARATION BEFORE WORKING

Read and carefully follow these instructions. Most problems with new equipment are caused by improper operation or installation.

#### 3-1) Confirmation of the products

Carefully inspect the machine upon arrival. The carrier, not the manufacture, is responsible for any damage resulting from shipment.

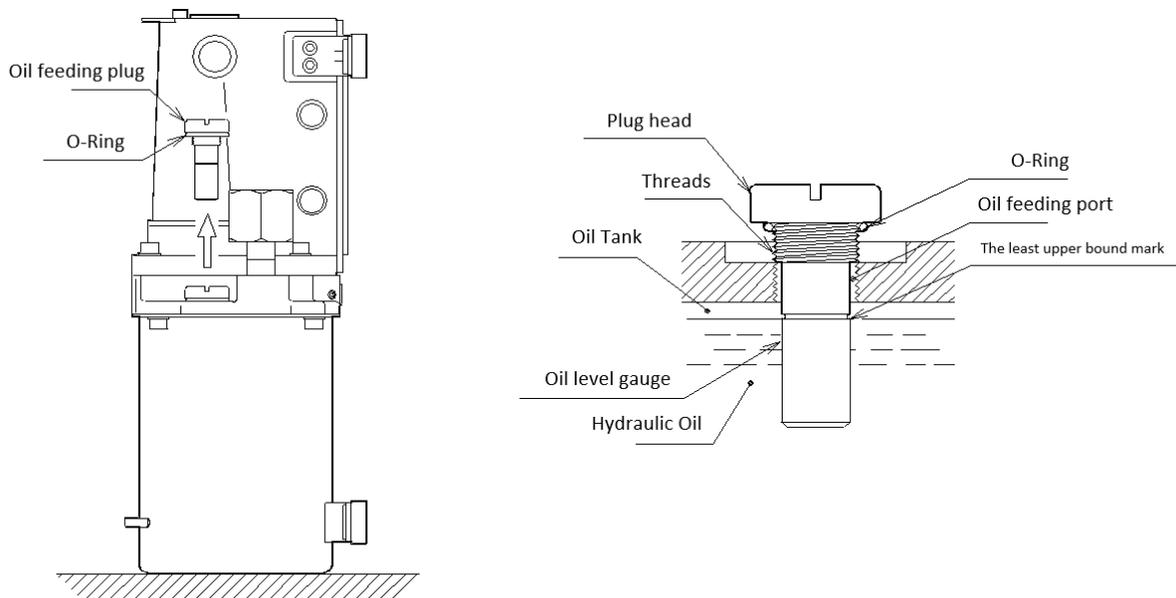
#### 3-2) Confirmation of pump voltage

Voltage of a motor-driven hydraulic pump is AC 110V or 220V (50/60Hz) single phase. Use a grounded outlet or a plug adaptor with a grounding attachment to protect the operator from electric shock.

#### 3-3) Confirmation of working oil. When working efficiency has been lowered, there is something abnormal about the pump unit.

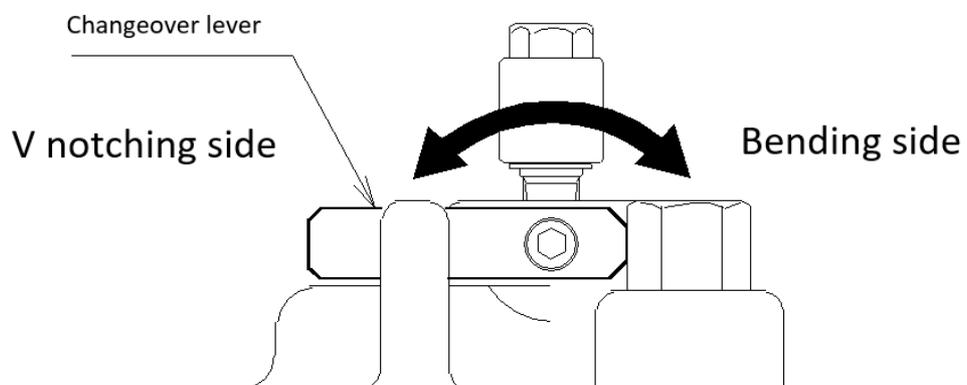
In case of lowering of working efficiency and/or happening of anything abnormal, one of the possible causes is considered shortage of oil quantity. The pump has been shipped with oil in the reservoir. Fulfil the following steps and confirm if oil volume in the reservoir is sufficient.

- ① Confirm if the cylinder pistons have been retracted fully.
- ② Disconnect the power supply.
- ③ Erect the pump (UP-35RH-FL) oil tank down as sketched next page.
- ④ Turn the oil feeding plug counter-clockwise with a screwdriver and remove the plug. Be careful you do not miss an O-ring.
- ⑤ Clean the oil gauge of the removed the plug with a cloth and put it in again, without screwing in, to see an oil level.
- ⑥ If oil level is high up to the marking of the gauge, it is O.K. But, if the oil has got low replenish oil.
- ⑦ After normal oil quantity has been confirmed, replace the oil feeding plug by screwing in. Do not overtighten plug to avoid damage of the O-ring.

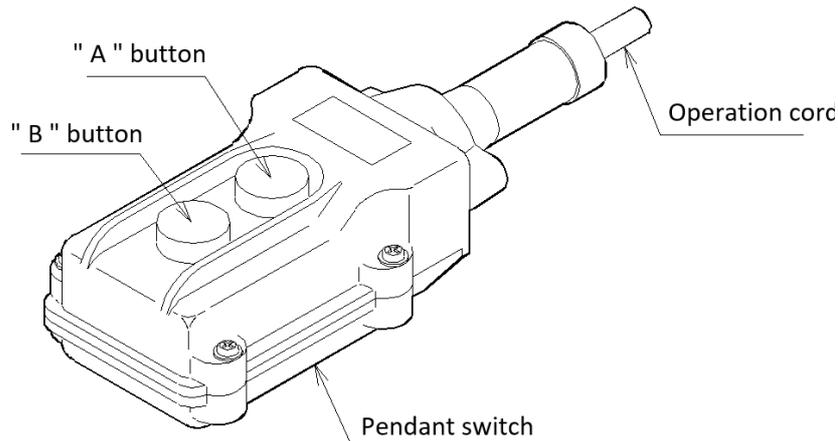


## 4. HOW TO OPERATE

- a) Bring the change -over lever down in a direction you want to work (one is V notching side and the other is bending side.). For example, If the lever is brought down in bending side direction, you are ready to operate the cylinder of the bending unit.



- b) Depress "A" button of the pendant switch to run the pump motor and go down the upper die for forming. If the button is released, the motor stops and the die also stops at that position.
- c) After processing ( cutting or bending) is over, depress "B" button to retract the upper die. The standard type pump does not allow the die to stop on the way at retracting stroke. Contact us for such specially designed pumps.



## 5. MAINTENANCE

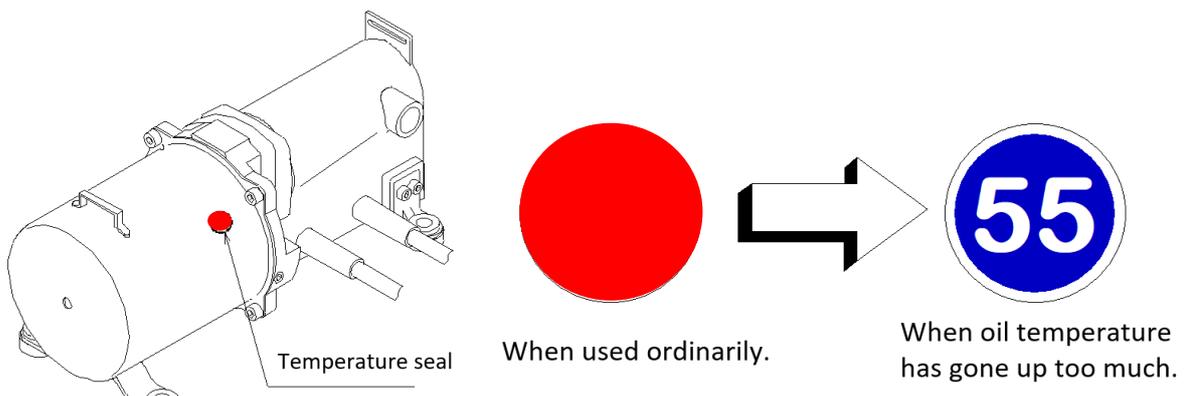
### 5-1) Hydraulic working oil

#### a) Type

Use only an approved, high-grade hydraulic oil (ISO 32 cSt).

#### b) Temperature

Proper temperature available is max. 55°C. If color of temperature seal fitted on the oil tank changes, it indicates that oil temperature rises over 55°C. At that time, stop working until temperature goes down properly. Even if "55" marking disappears, do not operate the pump for the time being.



### c) Exchange of hydraulic oil

The frequency of oil changes will depend upon the general working conditions, severity of use, and overall cleanliness and care given the pump. One year or 300 hours (working time) of use is considered as a standard oil change interval. Change oil as follows;

- ① Retract the cylinder fully and disconnect the power supply.
- ② Disconnect the quick coupler.
- ③ Erect the pump (UP-35RH-FL) oil tank down.
- ④ Turn the oil feeding plug counter-clockwise and remove it. Be careful you do not miss the O-Ring.
- ⑤ Remove the oil fully. If necessary, clean the inside of the reservoir and fill with a suitable flushing oil. Rinse the filter clean.
- ⑥ Refill the reservoir with new oil. The proper oil level is the same as the marking of the oil level gauge (oil feeding plug). Refer to [3-3 Confirmation of working oil, Page [5]
- ⑦ Screw the oil feeding plug in. be careful about the O-Ring and overtightening.
- ⑧ Clean all the areas around the oil feeding plug and oil port of the pump. After refilling, air may accumulate in the pump or hydraulic system. This air will cause the cylinders to respond in an unstable or slow manner. Remove this air, referring to [5-4 Bleeding air from the system, Page 9]

### 5-2) High pressure hose

Since high pressure hoses might have been deteriorated after long use, it is recommended that hoses will be exchanged every two years. Required hoses are rated at 68.6Mpa (700 kgf/cm<sup>2</sup>) or over and with fitting threads of PT3/8.

Avoid any condition which could damage the hose and impair the pump's performance. Never allow the hose to kink, twist or bend so tightly that the oil flow within the hose is blocked or restricted. Periodically inspect the hoses for signs of wear. Never use a defective hose with any pressurized equipment.

Apply two layers of Teflon tape to the external threads to seal hydraulic connections. Tighten the connections in accordance with the following tightening torque table. Do not overtighten the connections. When reconnected, firstly remove surviving tapes left on the threads, which should not enter into hydraulic system.

PT, NPT size	Tightening Torque N-m (kgf-m)
1/8	13 – 14 (1.3 – 1.4)
1/4	30 – 40 (3.0 – 4.0)
3/8	60 – 70 (6.0 – 7.0)
1/2	100 – 110 (6.0 – 7.0)

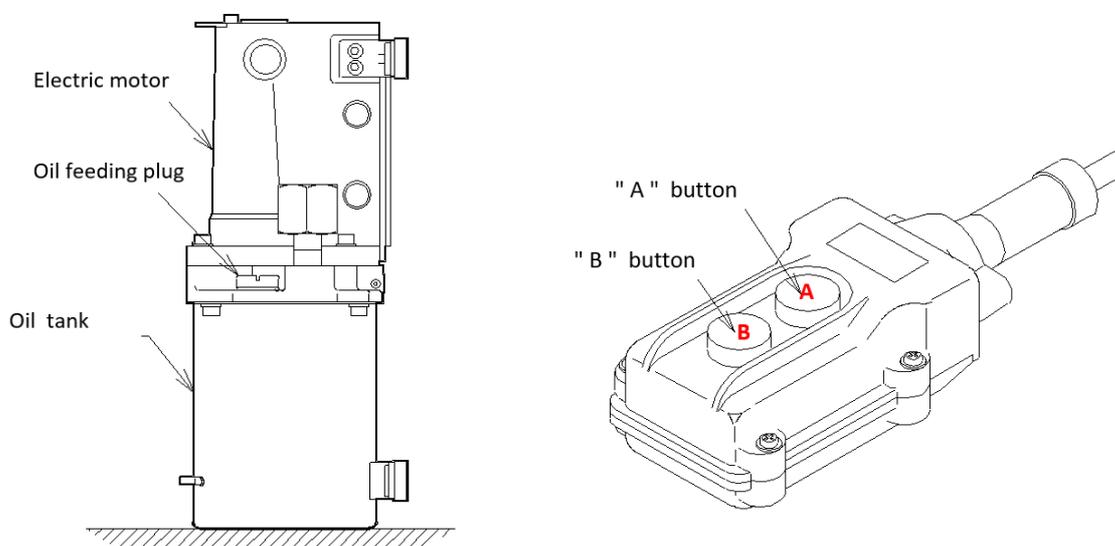
### 5-3) Couplers

Recommend to use our standard Nittoh couplers. If it is not available, choose 70Mpa hydraulic couplers for both pump side and FN30 side. Couplers must be the same type.

### 5-4) Bleeding air from the system

After changes of hydraulic oil and/or hydraulic hoses, air may accumulate in the system if the reservoir oil level had been permitted to get too low. This air will cause the cylinder to respond in an unstable or slow manner or the pump to build up required pressure. In this case, take the following steps.

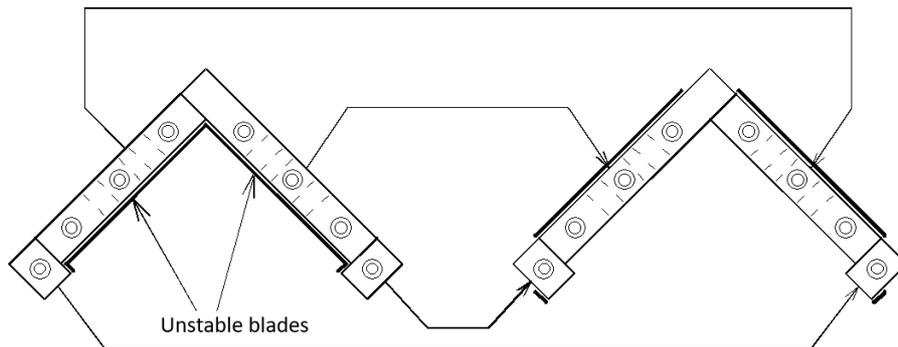
- ① Disconnect the coupler.
- ② Check oil quantity. Refer to [3-3 Confirmation of working oil, Page 5].
- ③ Even if a trouble has been solved by adding oil to the reservoir, erect the pump (UP-35RH-FL) the oil tank down as sketched and depress both "A" and "B" button of the pendant switch intermittently and alternately.



5-5) Substitution of cutting blades and re-polishing

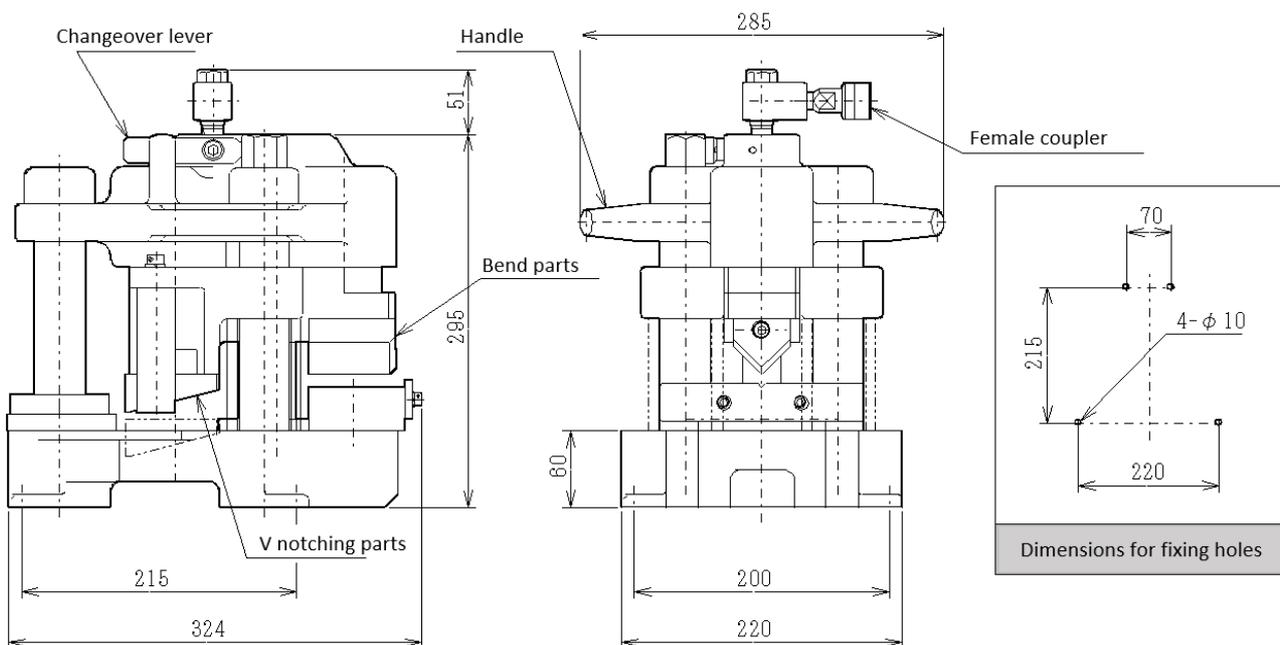
In case cutting sharpness of V notching lower blades have been dull, sharpness can be restored one time by rotation of the blades as per the arrows as sketched below. The blades which have been rotated one time are no longer used and must be exchanged.

There is the possibility that sharpness of V notching upper blades can be restored by re-polishing. Contact us if desired.



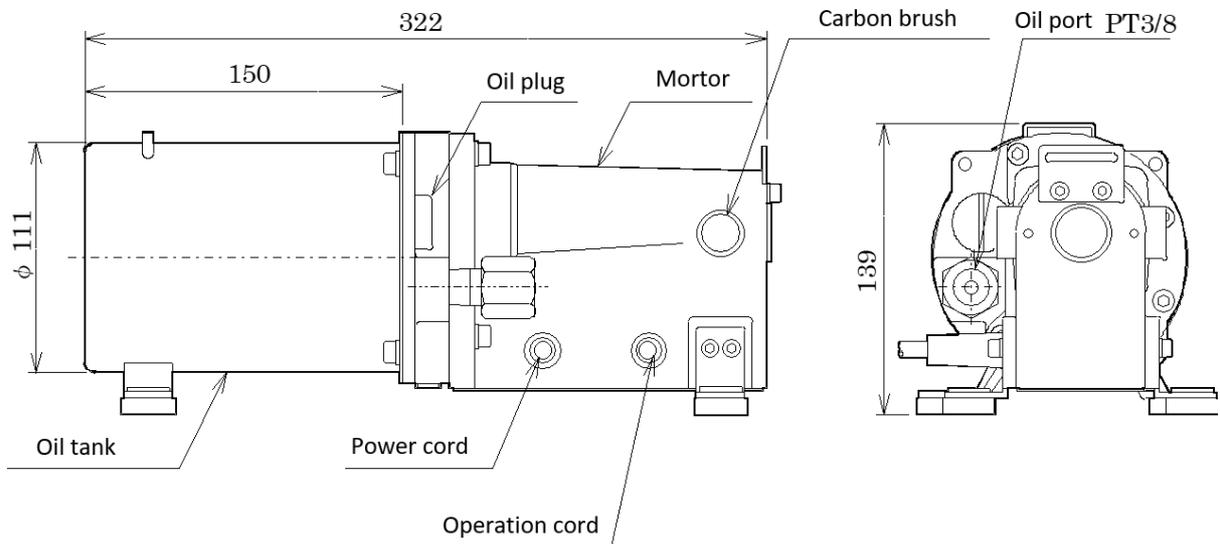
## 6. MAIN SPECIFICATIONS

■ Model FM-30 angle forming machine



Model	Hydraulic Cylinder			Frame	Weight kg
	Output	Max. Pressure	Stroke	Outer dimensions	
	TON	Mpa(kgf/cm <sup>2</sup> )	mm	mm	
FM-30	23(V)+ 17(B)	68.6 (700)	30	285(W) x 316 (D) x 295 (H)	50

■ Model UP-35RH-FL motor-driven hydraulic pump



Model	Elec. Motor (50/60Hz)				Pump Performance				Reservoir		weight
	Insulation Kind Type	Volt (V) AC	Output kw(HP)	Rotation rpm	Max. Pressure Mpa (kgf / cm <sup>2</sup> )		Flow liter / min		Capacity liter	Usable liter	kg
					2nd	1st	2nd	1st			
UP-35RH-FL	" E " Commutator	100 Single Phase	0.35 ( 1/3 )	2000	64.8 (,700)	0.98 (,10)	0.2	2	1.0	0.8	7.5

## 7. TROUBLE SHOOTING

★ Motor does not run	<ol style="list-style-type: none"> <li>1) No power supply</li> <li>2) Cut off electric circuit</li> <li>3) Defective pendant switch</li> <li>4) Carbon brushes are worn down</li> <li>5) Defective motor</li> </ol>	<ol style="list-style-type: none"> <li>1) &amp; 2) Check line voltage</li> <li>3) Replace defective parts</li> <li>4) Replace when brushes are worn down to 6mm</li> <li>5) Repair or replace</li> </ol>
★ Abnormal noise of motor (slow rotation, roaring)	<ol style="list-style-type: none"> <li>1) Voltage drop</li> <li>2) Bad contact of electric circuit</li> <li>3) Damage of mortor or pump</li> </ol>	<ol style="list-style-type: none"> <li>1) Remove causes of voltage drop</li> <li>2) Check the line</li> <li>3) Repair or replace</li> </ol>
★ Motor runs, but tools does not work	<ol style="list-style-type: none"> <li>1) Shortage of working oil</li> <li>2) Air accumulated in system</li> <li>3) Damage of pump (filter getting blocked, blocked, damage of solenoid valve or relief valve and others)</li> <li>4) Damage of a cylinder</li> <li>5) Damage or bad connection (looseness) of a quick coupler</li> </ol>	<ol style="list-style-type: none"> <li>1) Replenish oil</li> <li>2) Remove air</li> <li>3) Cleaning of filter, repair or replace</li> <li>4) Repair or replace</li> <li>5) Retighten or repair quick couplers</li> </ol>
<p>★ Tools work, but required process can not be done.</p> <p>Tools work, but it takes too many times</p>	<ol style="list-style-type: none"> <li>1) Voltage drop</li> <li>2) Air accumulated in system</li> <li>3) Damage of pump (filter getting blocked, of solenoid valve or replief valve and</li> <li>4) Wear of tools</li> <li>5) Over-capacity</li> <li>6) Rise of oil temperature (over 55°C)</li> </ol>	<ol style="list-style-type: none"> <li>1) Remove causes of voltage drop</li> <li>2) Remove air</li> <li>3) Cleaning of filter, repair or replace</li> <li>4) Repolishing or exchange</li> <li>5) Check specifications</li> <li>6) Remove causes or cool hydraulic oil</li> </ol>
★ Upper dies does not retract, or slow retraction	<ol style="list-style-type: none"> <li>1) Damage of slenoid valve</li> <li>2) Bad connection (looseness) of a quick coupler</li> <li>3) Damage of a pendant switch</li> <li>4) Damage of a cylinder</li> </ol>	<ol style="list-style-type: none"> <li>1) repair or replace</li> <li>2) Retighten or repait quick couplers</li> <li>3) repair or replace</li> <li>4) repair or replace</li> </ol>
★ Oil leakage	<ol style="list-style-type: none"> <li>1) Seal damage of pump, cylinder, quick coupler</li> <li>2) Damage of hydraulic hose</li> </ol>	<ol style="list-style-type: none"> <li>1) replace damaged seals</li> <li>2) replace hoses</li> </ol>
★ Short circuit	<ol style="list-style-type: none"> <li>1) damage of electric cord</li> <li>2) Bad insulation of electrical components</li> </ol>	<ol style="list-style-type: none"> <li>1) replace damaged cords</li> <li>2) Check electric components</li> </ol>

## 8. HOW TO WORK

Never put your hand in the inside of the unit frame in use,.

Be sure that operator who operate the pendant switch must operate the pendant switch, watching processing parts.

Do not process beyond the given capacity.

Min. Processing capacity	75 x 75x 6mm thickness for both angle steel (SS400) and / or stainless steel (SUS304)
Min. processing capacity	40 x 40x 3mm thickness for angle steel

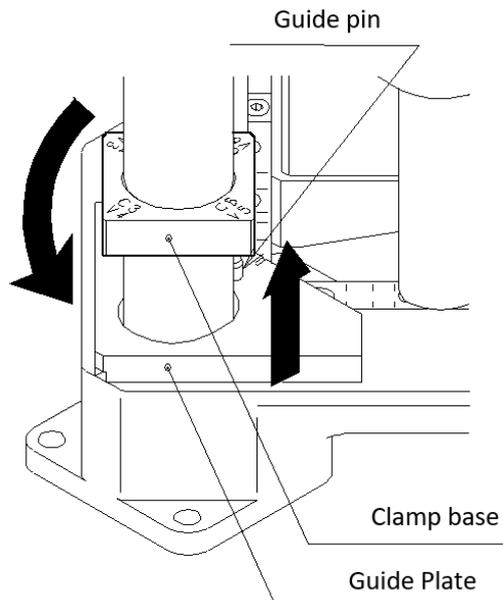
This FM-30 angle forming machine can handle the following processing.

<b>V notching unit</b>
(1) V notching (2) 90° corner cutting (3) Edge thickness cutting (4) 45° corner cutting (5) Corner cutting
<b>Bending unit</b>
(6) 90° bending
<b>Optional Punching unit (interchangeable with bending unit)</b>
(7) Punching (11mm to 18mm dia.)

### ◆ Setting of a clamp base before processing

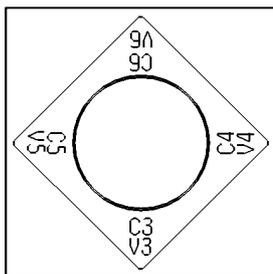
In case V notching unit is used, a clamp base is needed to set before setting a work piece, depending upon kind and steel thickness of the work piece.

If the coming explanations of [Set the clamp base] appear, follow the instructions.



An example of a work piece having 6mm thickness is given here.

- ① Raise a clamp base right above to take off from the locking guide pin which is fitted on the guide plate.
- ② Turn the clamp base so as to position the marking “V6” at just this side.
- ③ Bring the clamp base down and after adjusting the guide plate fix it on the pin of the guide plate. Be sure that the clamp base keeps in touch with the guide plate.



< DATA > Markings on the clamp base

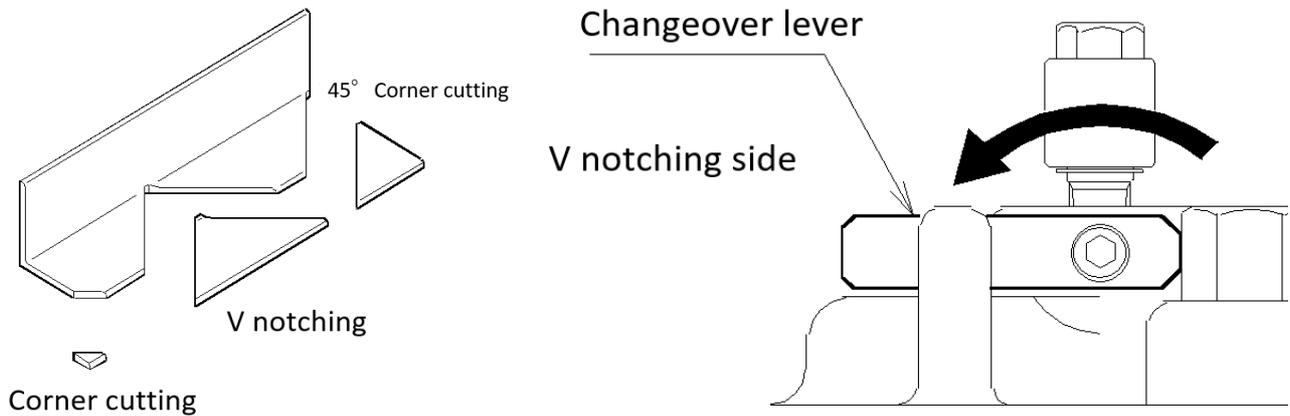
**Type of processing.**

C : 90° Corner cutting

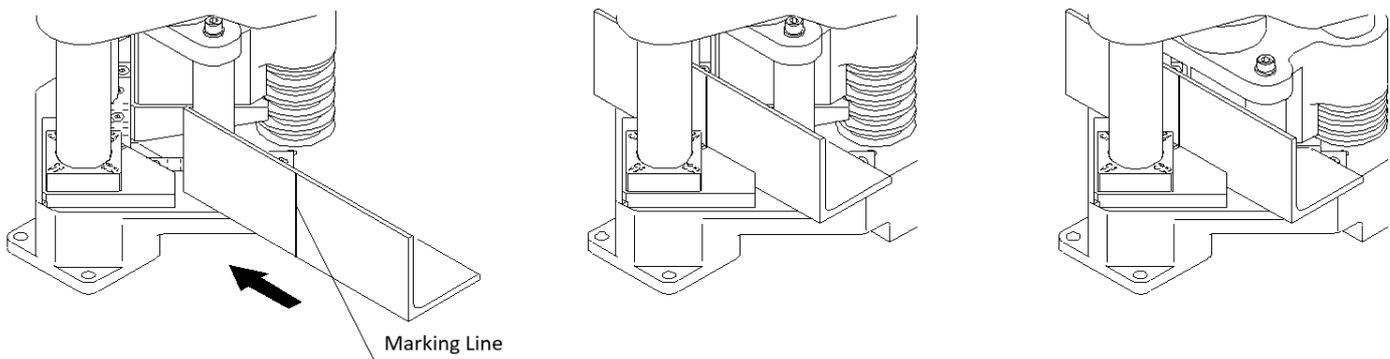
V : V notching

3 / 4 / 5 / 6 : Thickness (mm) of work pieces

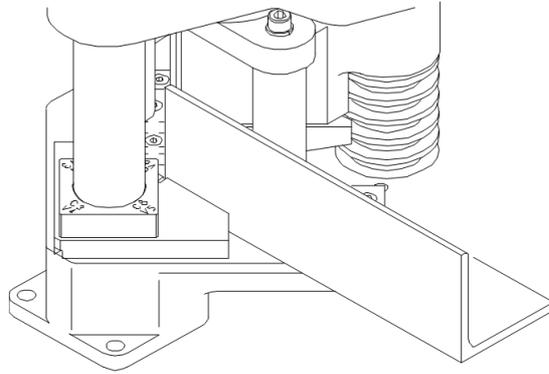
◆ V notch processing, 45° corner cutting and corner cutting



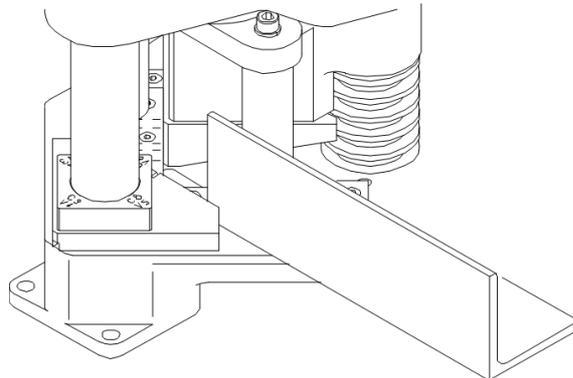
- ① Bring down the changeover lever of the body horizontally to the V notching side as per the above sketch.
- ② Set the clamp base.
- ③ Give a making line on a work piece where you want to V notch.
- ④ Insert the work piece into sideways and along the guide plate between the upper and lower blades.
- ⑤ Set the making line with the center mark of the guide plate.
- ⑥ Depress “ A “ button of the pendant switch to operate the pump. The “ A “ button is released to stop an approaching upper blade. Keeping depressing “ A “ button to finish cutting. After cutting is over, release the button.
- ⑦ Depress “ B ” button to retract the upper blade.



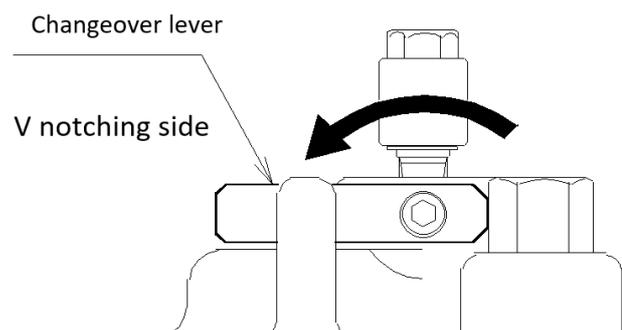
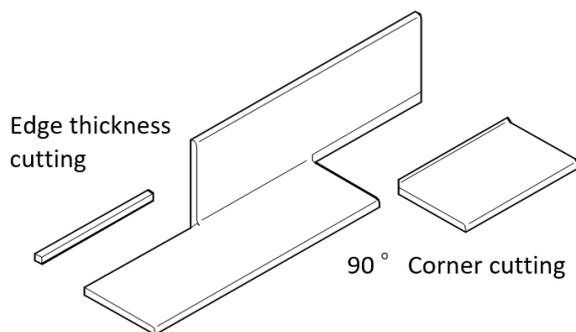
- ⑧ In the same way, if the work piece is inserted into the center of the upper blade and is pressed, 45° corner cutting is carried out.



- ⑨ Similarly, when the material is inserted and caught a little on the upper blade, corner cutting is possible.

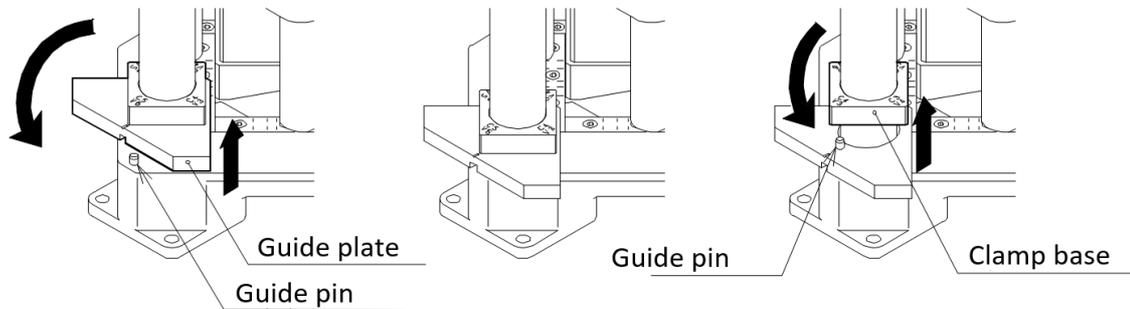


### ◆ 90° corner cutting and edge thickness cutting

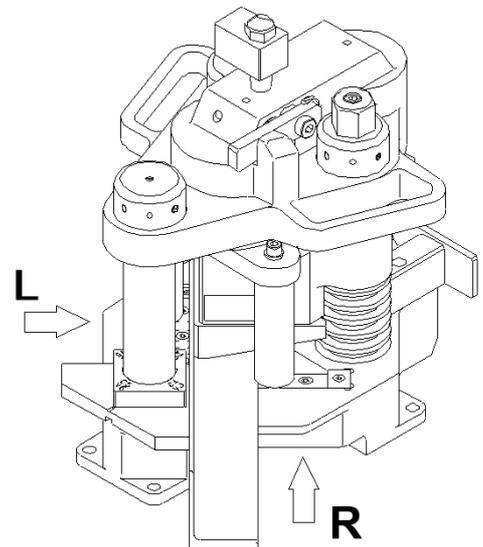


Raise the guide plate and take it off from the locking pin of the body unit.

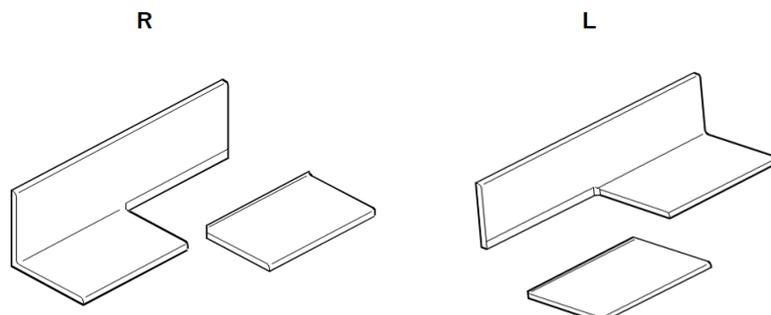
- ② Rotate the guide plate by 180° and lower and lock it on the pin of the body unit. Be careful that the plate does not float.



- ③ Set the clamp base (judgement from the marking C of the clamp base).
- ④ Insert the work piece along the guide plate.
- ⑤ As the upper blade is graduated in mm, set the end of the work piece at length you want to cut. Max. length available one time is 69mm. In case longer cutting than 69mm is needed apply an additional cut after the 1st 69mm (for SUS, length must be below 30mm).

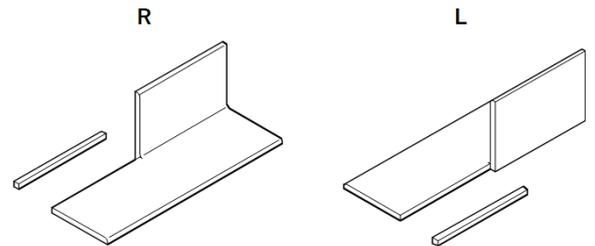
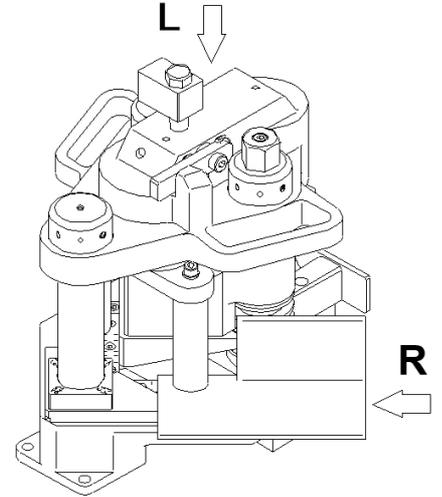


- ⑥ Depress “ A “ button of the pendant switch to actuate the pump to start processing. When the button is released, the cylinder stops processing. When the button is released, the cylinder stops one the way. Keep depressing until cutting is over.
- ⑦ Depress “ B “ button to retract the upper blade.
- ⑧ If the work piece is inserted from right 45° direction [R], the angle is cut as per the left sketch, and when it is inserted from the left 45° direction[L], it is cut like the right sketch.

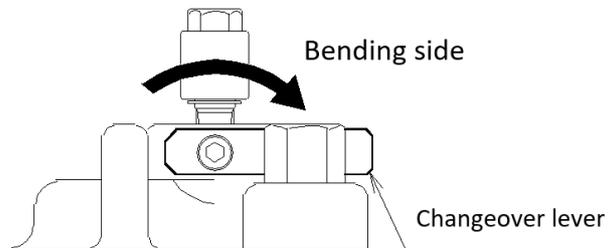
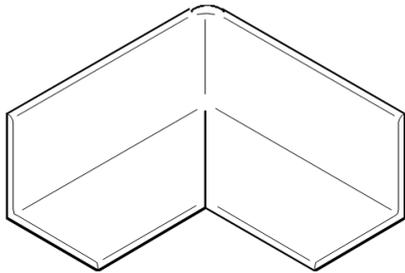


◆ Edge thickness cutting is done only after 90° corner cut is made.

- ① Let the guide plate face as per the sketch .
- ② Set the clamp base (judgment from the marking V of the clamp base)
- ③ Insert the working piece from the right back direction [R] and ram the verticality part of the work piece against the upper blade.
- ④ Depress the “ A ” button to start the pump. The upper blade stops on the way with the “ A ” button released. Keep depressing the “ A ” button until cutting is finished. After cutting is over, release the “ A ” button.
- ⑤ Retract the upper blade by depressing “ B ” button.
- ⑥ When the work piece is inserted from the right back direction [R] it is cut as per the left sketch, and if inserted from the left back direction [L], it is cut as per the right sketch.

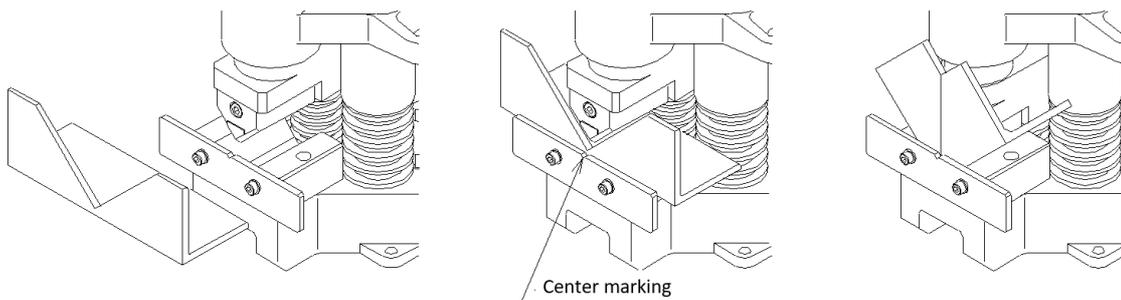


## ◆ Bending processing



- ① Bring down the changeover lever of the body horizontally to the bending side as per the above right sketch.
- ② Insert the V notched work piece from the front of the bending unit and press toward you against the guide plate.
- ③ Set the center of the V notch at the center marking of the guide plate.
- ④ Depress the “ A ” button to advance the upper die gradually. Approach the die just before the work piece and confirm if the centers coincide exactly.
- ⑤ If centering has been confirmed, depress the “ A ” button to advance the die further. Press the work piece to the end and keep pressing for 3 minutes.
- ⑥ Depress the “ B ” button to retract the die.

**Remarks: Do not press button without loading work pieces. Otherwise, dies will cause damage.**



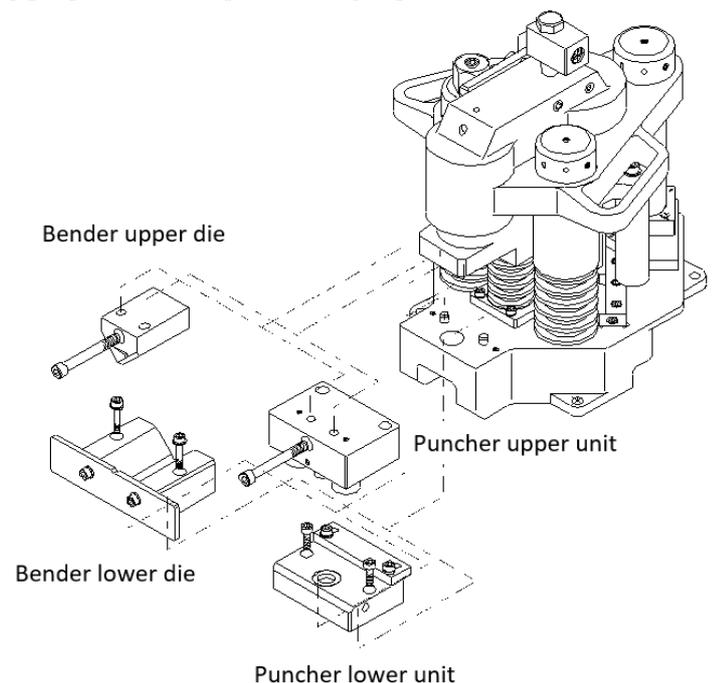
## ◆ Punching processing

This P-75 punching unit and punched & dies are optional items. Punches & dies available are 11mm, 13mm, 14mm, 15mm, 18mm dia. for round punching and 11mm x 16.5mm and 14mm x 18mm dia. for oblong punching. This punching unit is exchangeable with the bending unit.

<How to exchange processing units>

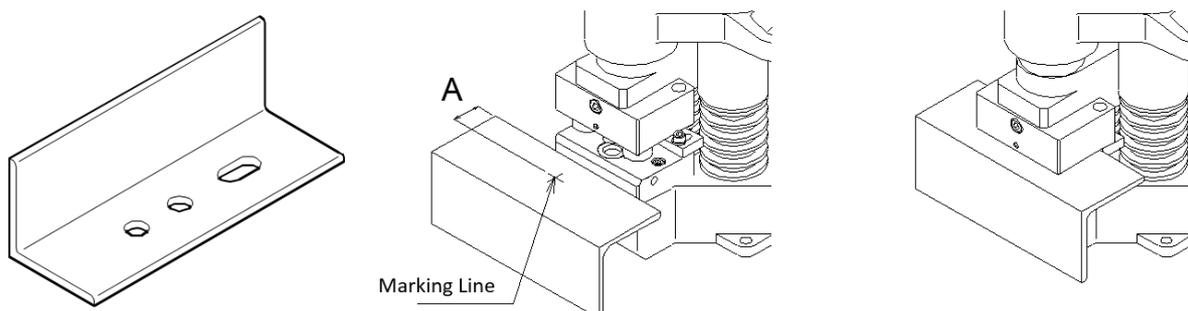
**Always disconnect the power supply before making preparations or performing repairs.**

- ① Remove the bolt (M8) of the bending upper die to take off the upper die. As the die drops as it is, support it with a hand and take it off.
- ② Loosen the bolt (M6 x 30, 2 pcs.) of the bending lower die and take off the power die.
- ③ Set the puncher lower unit to the standard pin and tighten it with bolts (M6 x 29, 2 pcs.)
- ④ Set the puncher upper unit to the standard pin and tighten it with a bolt (M8).



<How to punch out>

- ① Insert a work piece between a punch and die, and after positioning, depress "A" button of the pendant switch to punch out.
- ② Depress "B" button to retract the upper punch.
- ③ When the same work pieces having "A" dimension are punched out continuously, it is convenient to adjust a stopper plate for punching. Range of adjustment ("A" dimension) is 22mm to 34mm. After adjustment, tighten the set screws.



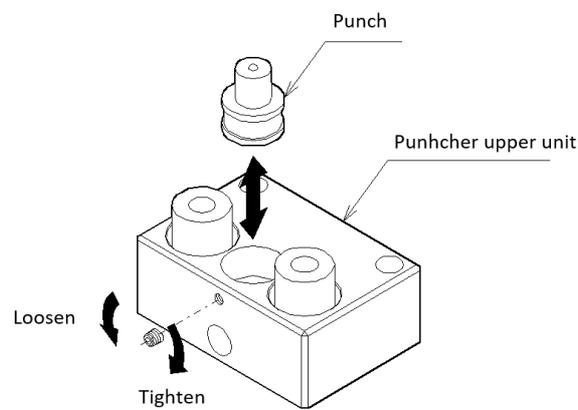
<How to exchange punches and dies>

### ● Exchange of punches

- ① Loosen the stopper screw counter-clockwise by two rotation.
- ② Take the punch off and insert the required punch in the port.

**Remarks :** In case of an oblong punch, be careful about direction of the oblong hole.

- ③ Be sure that there is no dust on the insert parts.
- ④ Tighten the stopper screw firm by turning clockwise.



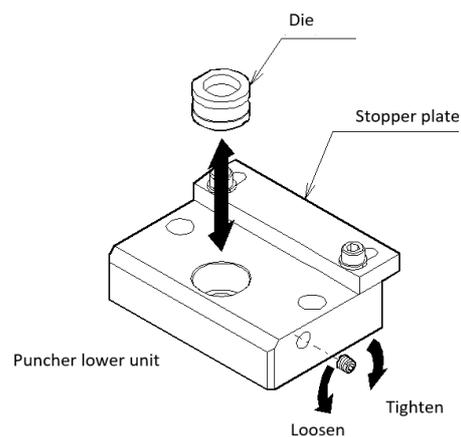
### ● Exchange of dies

- ① Loosen the stopper screw.
- ② Take the punch off and insert the matching die.
- ③ The smaller dia. surface is the top of the die. converse of die set will cause the punch to bite into the work piece and do not come out.

**Remarks :** In case of an oblong hole, be careful about direction of the oblong hole.

- ④ Tighten the stopper screw firm.

**Remarks :** Never mix up the sizes of different punches and dies.



● How to make a formwork frame by cutting and bending at four point

Determine length of the materials and V notched positions according to the following methods of calculation with reference to the table below. However, there may be differences in dimensions due to materials, tensile strength, etc.

$$\begin{aligned}
 A' &= A - 2(R + t) + \alpha \\
 B' &= B - 2(R + t) + \alpha \\
 C' &= C - (R + t) + \beta \\
 D' &= D - (R + t) + \beta \\
 L &= 2A' + B' + C' + D'
 \end{aligned}$$

SS400 steel angles

Thick(t)	Bend radius.	Both side bend. constant	One side bend. constant
(t)	(R)	(α)	(β)
3	1	2.3	1
4	1	3.8	2
5	1	3.5	2
6	1	3.3	2

SUS304 stainless steel angles

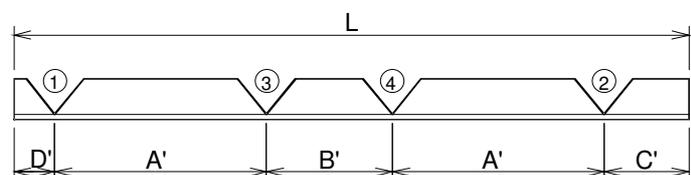
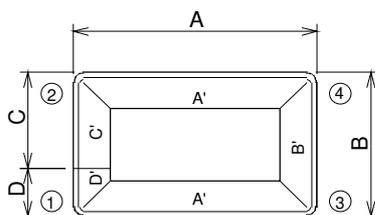
Thick(t)	Bend radius.	Both side bend. constant	One side bend. constant
(t)	(R)	(α)	(β)
3	1	1.3	0.5
4	1	2.5	1
5	1	1.8	1
6	1	1.5	1

[Calculation Example]

In case material is angle steel SS400 and

A=500mm, B=300mm, C=20mm, D=100mm and t=6mm

$$\begin{aligned}
 A' &= 500 - 2(1 + 6) + 3.3 = 489.3 \\
 B' &= 300 - 2(1 + 6) + 3.3 = 289.3 \\
 C' &= 200 - (1 + 6) + 2 = 195 \\
 D' &= 100 - (1 + 6) + 2 = 95 \\
 L &= 2 \times 489.3 + 289.3 + 195 + 95 = \mathbf{1557.9mm}
 \end{aligned}$$



When processing a frame, please process in order of 1 to 4. If 3, 4 is processed first, the frame cannot be made.

## 9. WARRANTY

### 9-1) Warranty period

Within 365 days from the end of production month for general defect / failure.  
i.e. If a customer purchase a pump on January 1, 2019, the warranty period is until January 31, 2020.

### 9-2) Warranty condition

All NITTOH products and parts, with the exception mentioned below, are warranted against defects in materials and workmanship, which results in damage to products and parts. This warranty shall cover repair and/or replacement of the products or components/parts free of charge. To qualify for warranty consideration, return the NITTOH product, freight prepaid, to a NITTOH factory. Refer to the NITTOH STANDARD EXPRESS WARRANTY for the details.

### 9-3 Warranty exceptions

No warranty claim will be accepted for damage or breakdown arising for any of the following reasons.

“Abuse or improper use, fair wear and tear, faulty or negligent operation, improper storage, chemical/ electrical influences or climatic or other effects which cannot be related specially to faults in manufacture”

No liability is accepted for packing seals, springs, and/ or the like, and the following:

- Ⓒ Alterations or remodeling on the products undertaken by the purchasers without any prior notice and agreement to NITTOH.
- Ⓒ Severe and very highly frequent use, deviating from product specifications.
- Ⓒ Damage due to faulty installation or assembly by purchasers or third parties.
- Ⓒ Damage from natural disaster.
- Ⓒ Damage from such accidents as fire, submersion, dropping, etc.