which improves a dangerous work by overhead crane

180°Rotator for upper die PAT.P.

For press machine

Pascal

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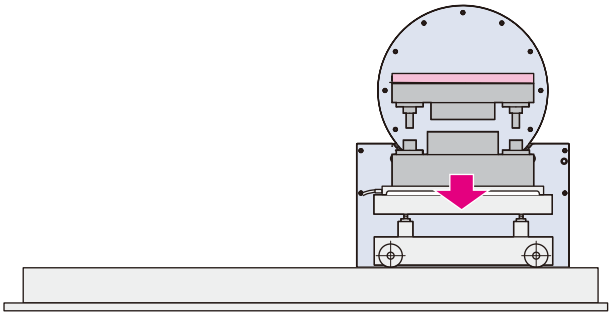
Safe separation, rotation and docking

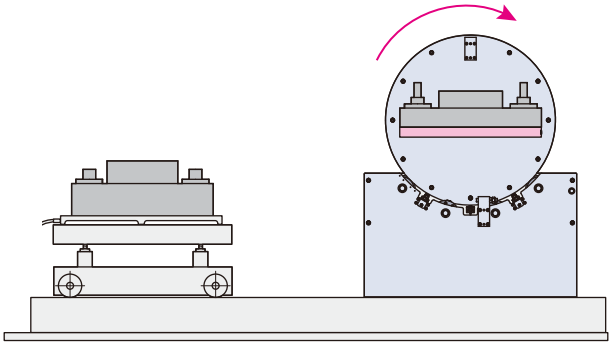
Die separation

Die can be separated securely by the magnet clamp.



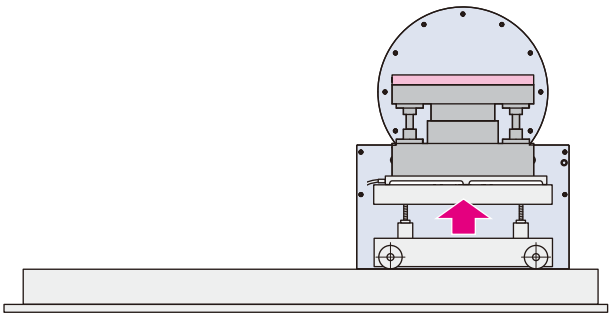
Die rotation

Upper die can be rotated easily.



Die docking

Uppper and lower dies can be engaged smoothly.



model **SMP**

The dies can not assembled smoothly by using overhead crane.

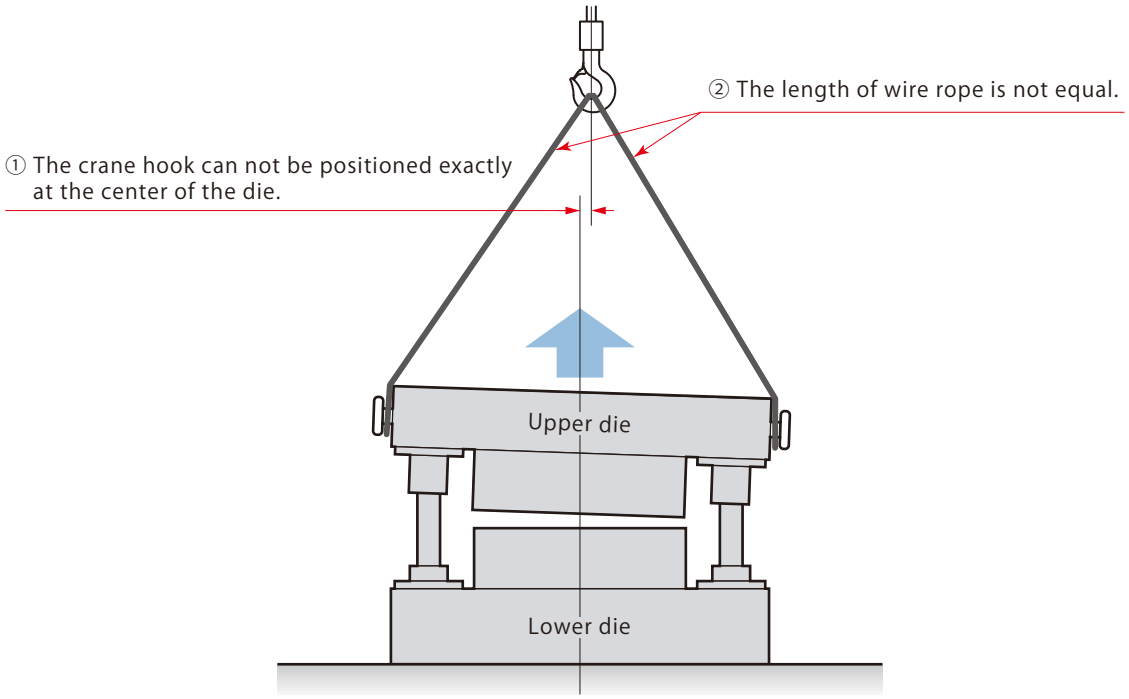
① In case the upper die is lifted by overhead crane and separated from the lower die, the crane hook can not be aligned precisely with center of the die.

② Due to the structure of crane hook and die hook, wire rope will not be equal and the upper die can not be lifted horizontally.

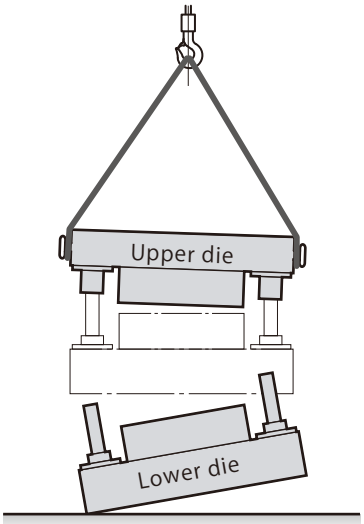
③ When the gravity of upper die is not at the center, the die inclines largely.

As the upper die is lifted under this state, the guide post is bitten and the die can not be pulled out smoothly from the guide.

An skilled operator needs to take the die apart by hammering or delicate operation of overhead crane.

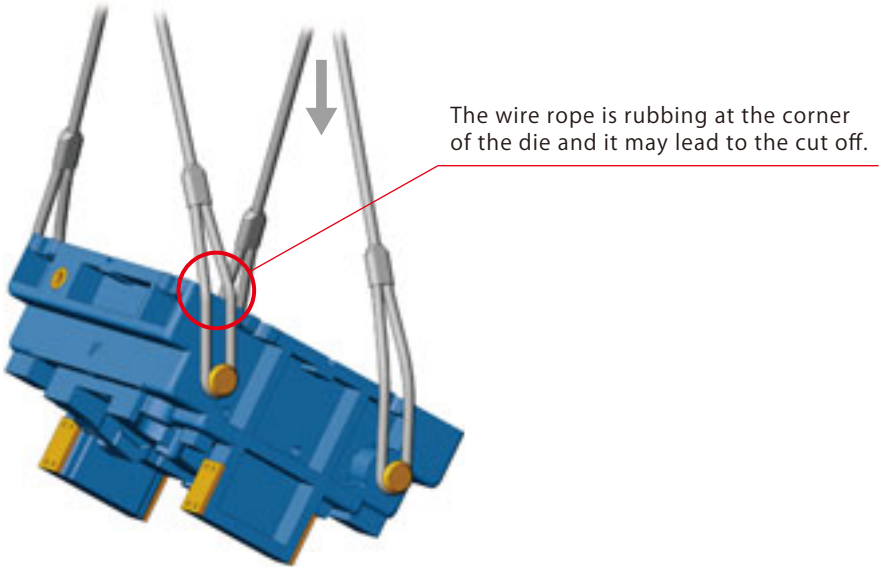


It is quite dangeours for an operator to wind the wire rope by overhead crane to lift both of upper and lower die being still engaged.



The rotation of upper die(for press machine) is very dangerous.

When turning over the die, reversing work from the horizontal direction to vertical direction by dual overhead crane will damage a wire rope by being scraped at corner of the die and will cut off the wire rope. As wire ropes are inspected visually by operators, damage is overlooked and mold fall accidents or fatal accidents occur due to cutoff /bounce of wire ropes.

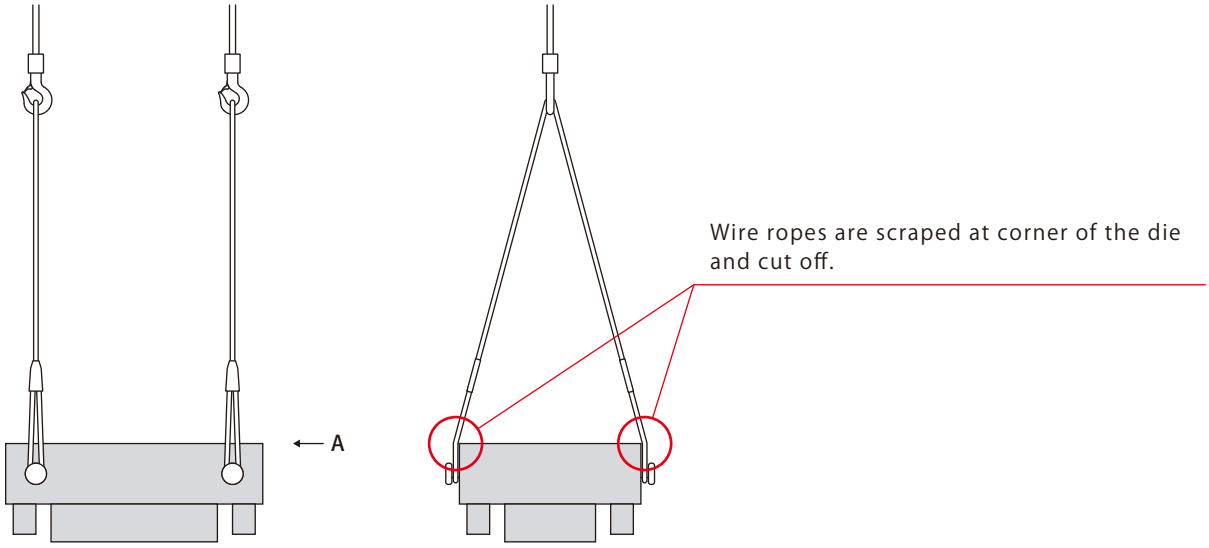


Most of crane manufacturers prohibit users from rotating the die since the overhead crane opeation itself is dangerous. Just in case an fatal accident happens due to the reversing work of die against the manufacturers warning, the employer will be responsible for any loss and damage.

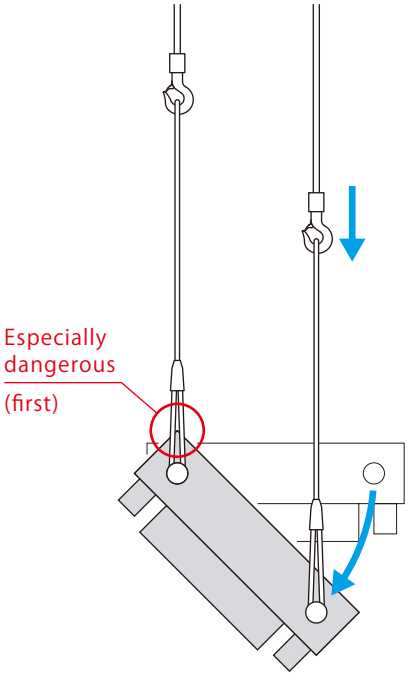
Industrial Safety and Health Act requires the employer to take necessary measures for preventing potential dangers due to machines, instruments and other equipments, to ensure the safety of employees. In addition, Labor Contract Act also requires the employer to pay due regard to the employee in order to ensure safety of his body and life.

In view of the growing interest in corporate responsibility to management of industrial accident lately, increasing number of companies are introducing a safer rotating equipment. Under such circumstances, the employer needs to realize that he may be subject to sever penalities just in case an accident occurs during die rotating work.

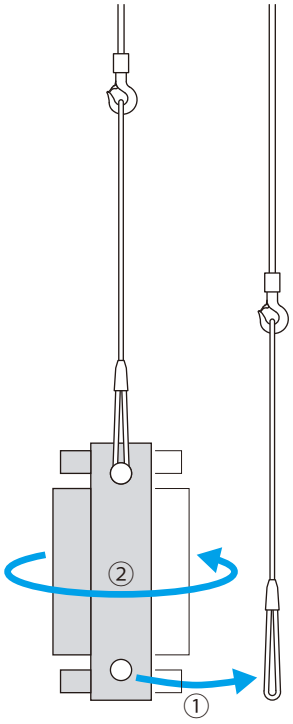
① Lift up the upper die by a pair hoist.
(The pair hoist is originally designed for lifting a lightweight load quickly.)



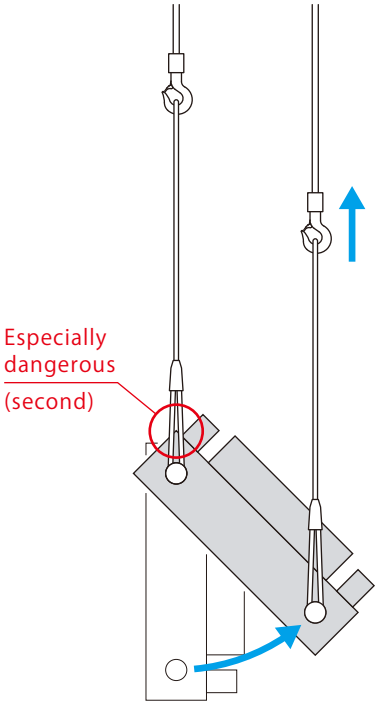
② When a wire rope goes over the corner of die, it is scraped strongly.



③ One side of wire ropes is removed and die is turned over 180°.



④ The wire rope goes over the corner of die again and it is scraped twice.



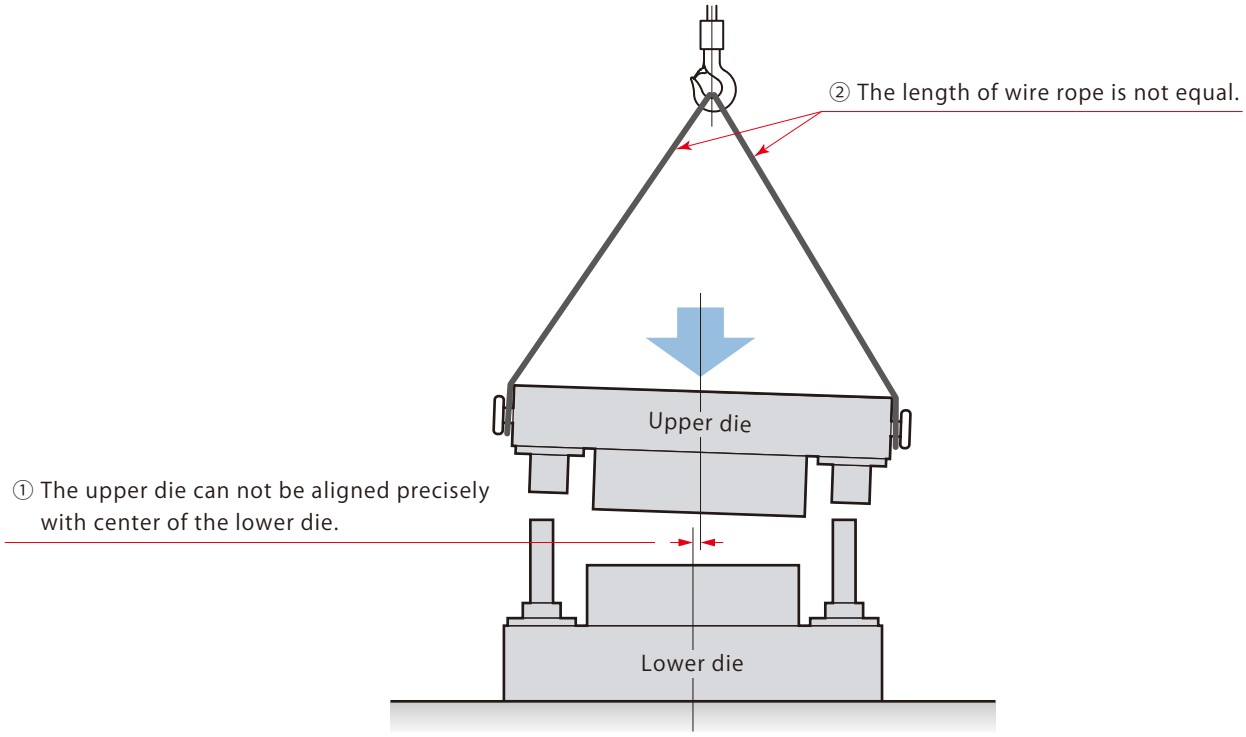
The dies can not assembled smoothly by using overhead crane.

① In case the upper die is lifted and mounted on the lower die by overhead crane, the upper die can not be aligned precisely with center of the lower die.

②Due to the structure of crane hook and die hook, wire rope length will not be equal and the upper die can not be laid down horizontally.

③ When the gravity center of upper die is displaced, the die inclines largely.

As the upper die is mounted on the lower die under this state, the guide post is scraped and the upper die can not be fitted in the lower die smoothly. A skilled worker needs to mount the die by hammering or delicate operation of overhead crane.

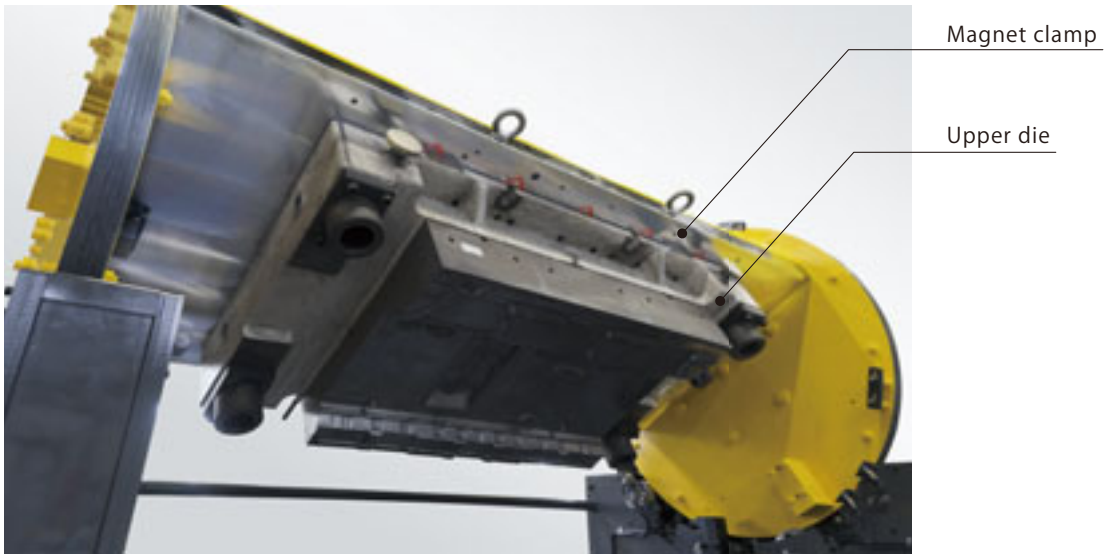


180° Rotator for upper die has been developed according to strong needs of customers.

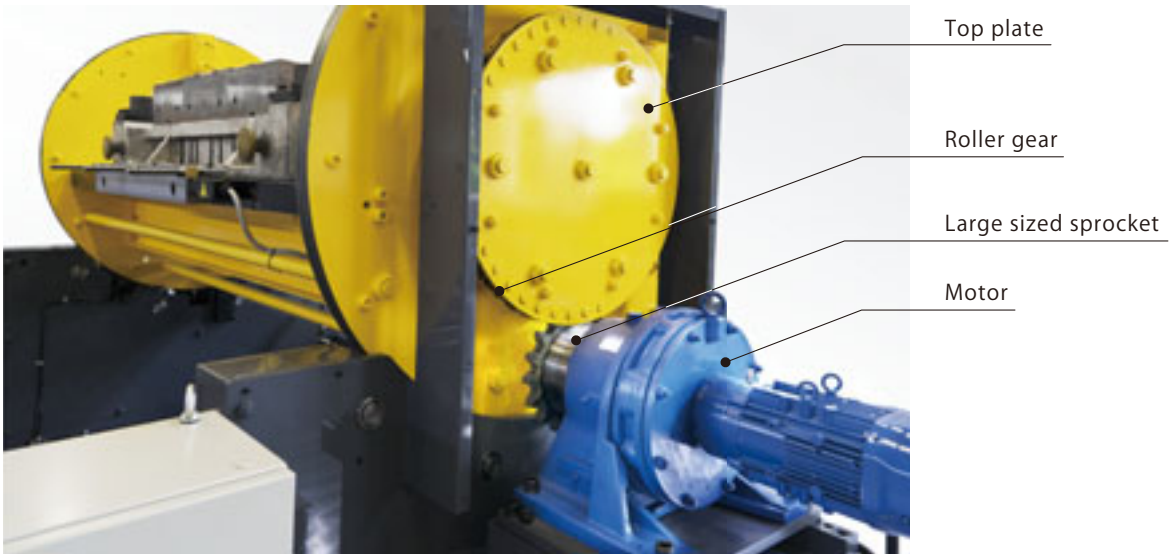
- The die can be rotated 180° securely compared to overhead crane.
- It is compact sized, economical and easy to introduce compared with a die spotting machine with turnover function.
- The magnet clamp being installed on the rotator as standard enalles the die easily and quickly by one touch operation without standardizing the die size or adapter plate.

Note: This photo shows a prototype.
The protection covers are removed to take photos.

The 180°rotation of upper die is completed in 40 sec.



The top plate is rotated by rigid roller gear and large sized sprocket.

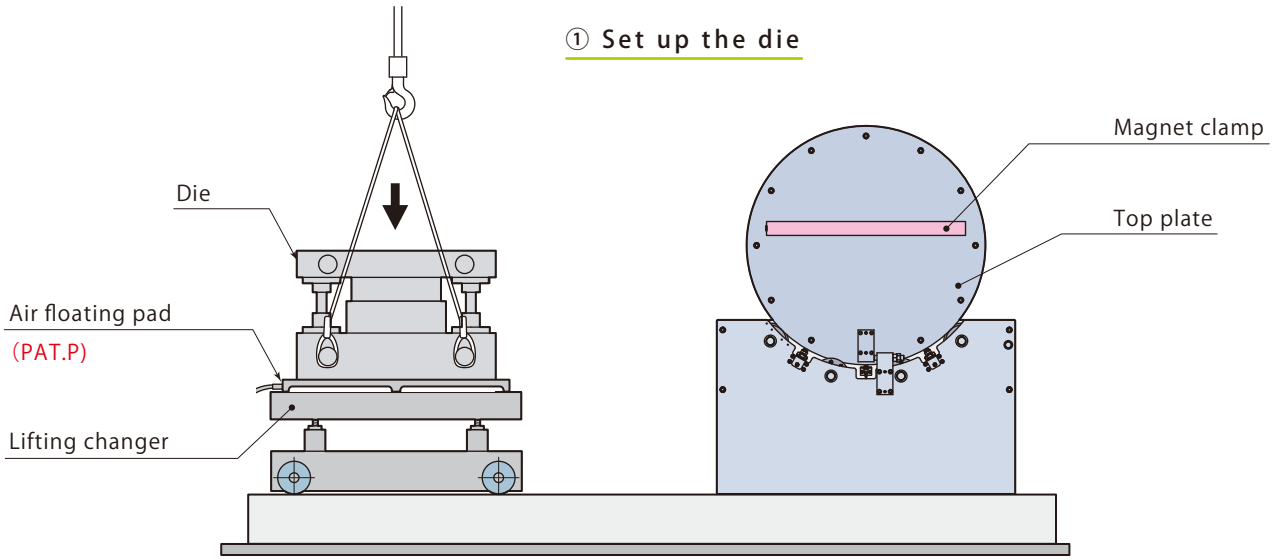


180° Rotator for upper die

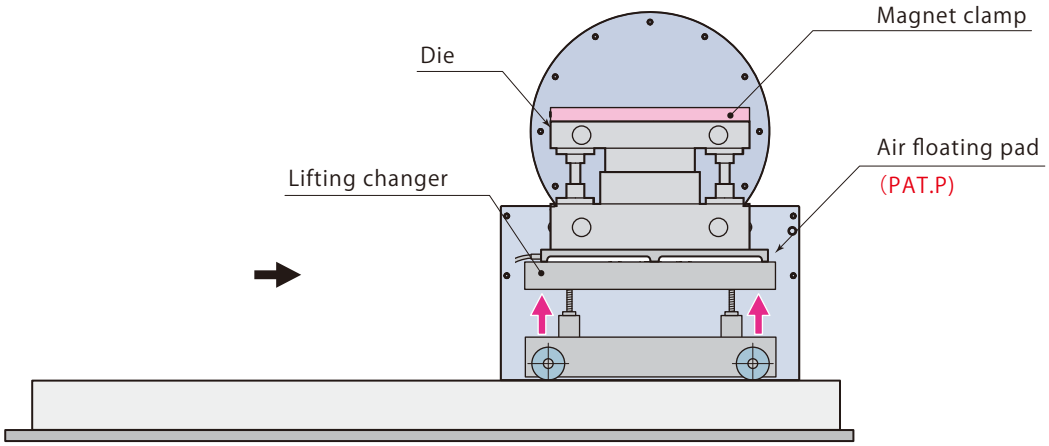
Model	Outer dimension of top plate	Die width	Die length	Upper die weight
SMP10	ø1200	1000 mm	1600 mm 2000 mm	2 ton
SMP16	ø1800	1600 mm	2000 mm 2500 mm	3 ton
SMP20	ø2200	2000 mm	4000 mm	6 ton

● The max. die weight varies depending on motor capacity. Contact Pascal for the details.

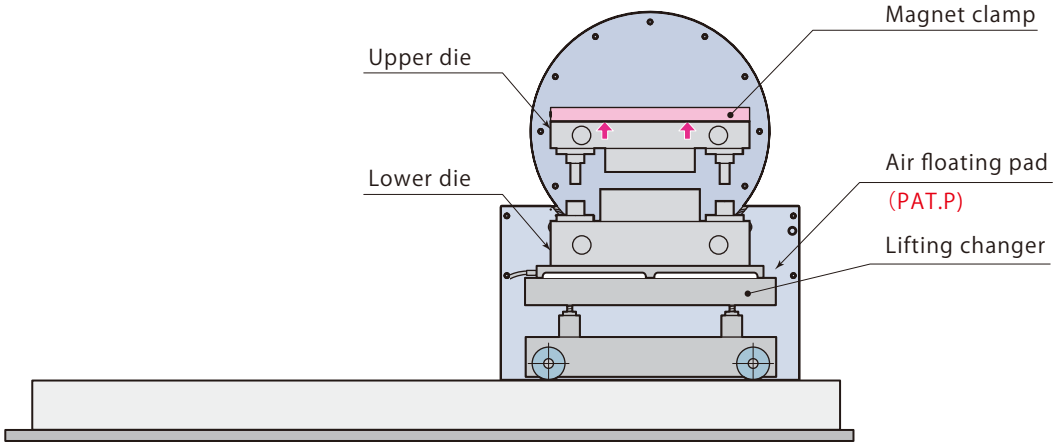
① Set up the die



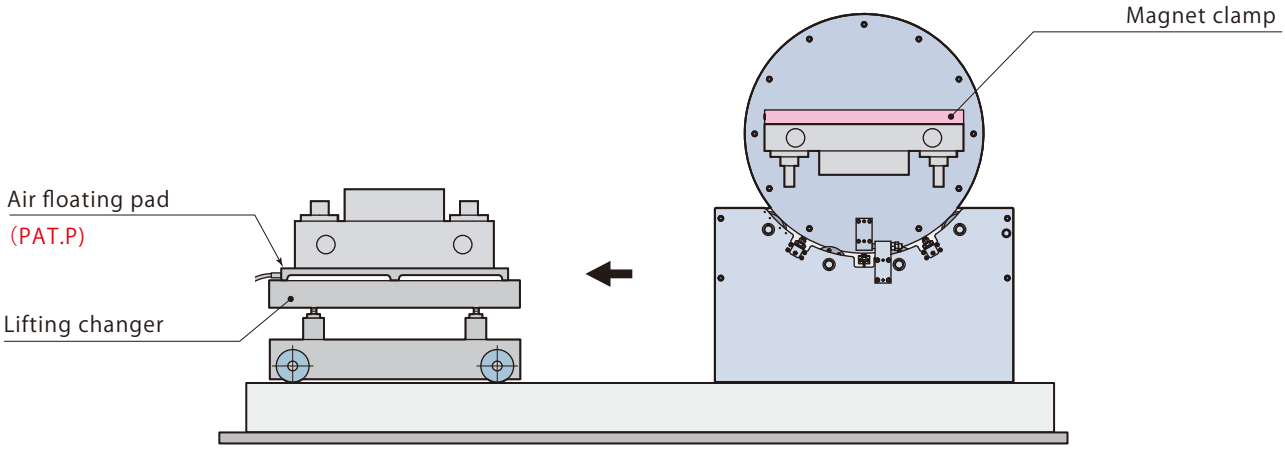
②Move the die forward. Confirm if the die perfectly contacts with the magnet clamp.



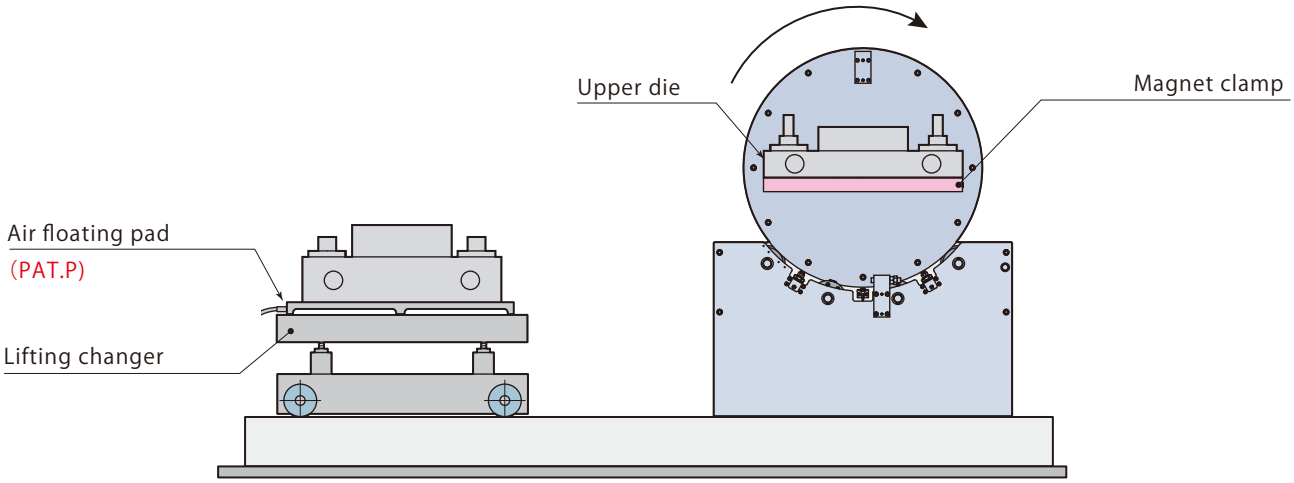
③ Turn ON the magnet clamp. Move down the lower die.



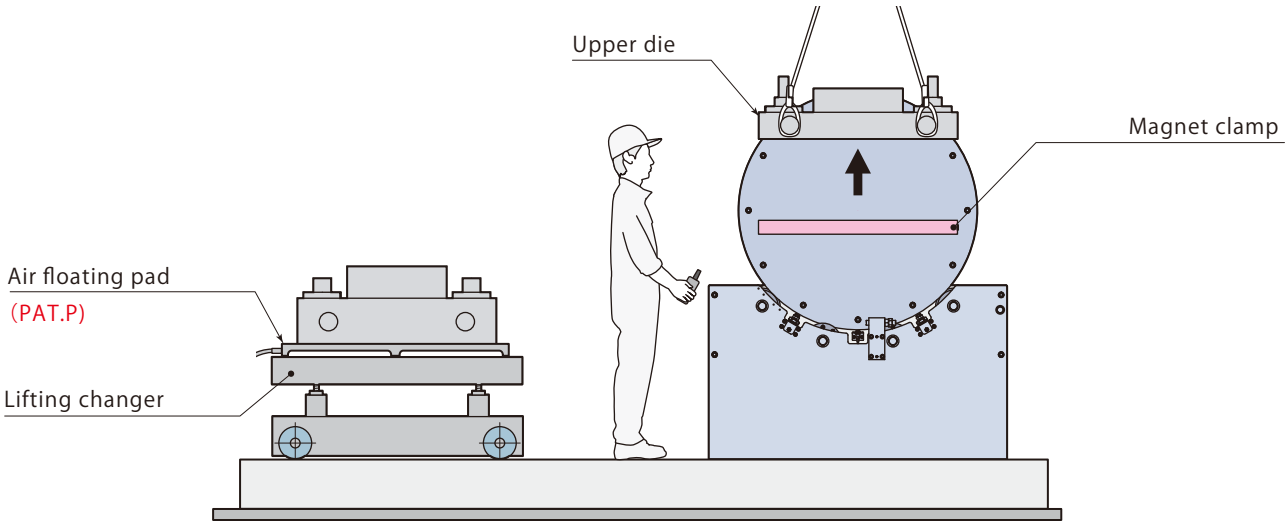
④ Move the lifting changer backward.



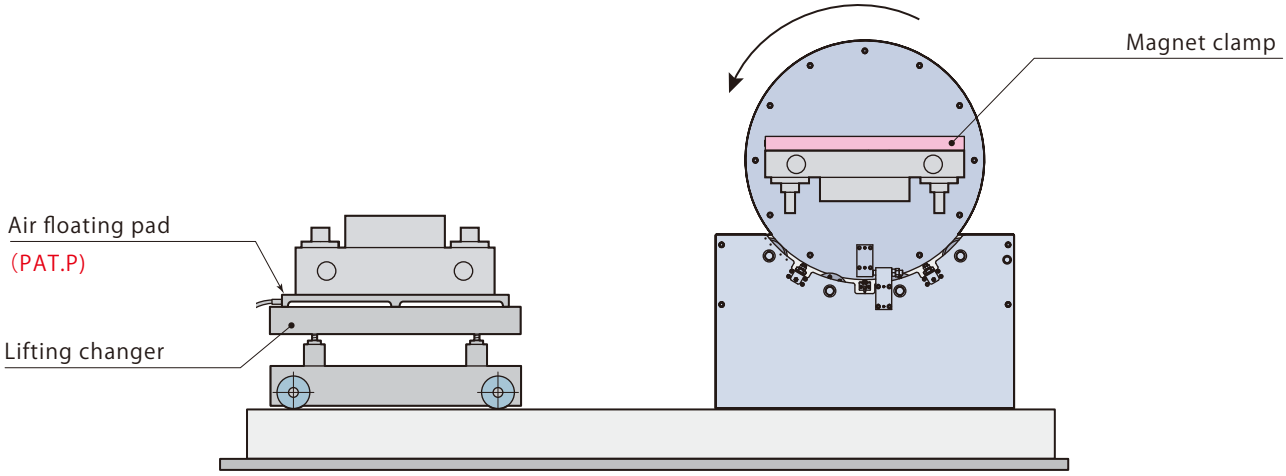
⑤Turn the top plate 180° and stop at a horizontal position.



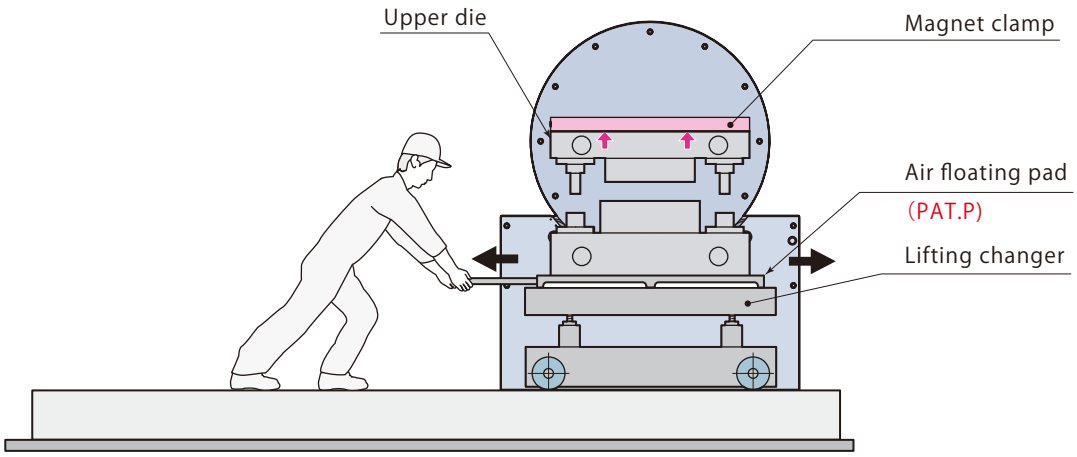
⑥Turn OFF the magnet clamp. Unload the upper die.



⑦ Turn ON the magnet clamp. Turn the upper die 180° .

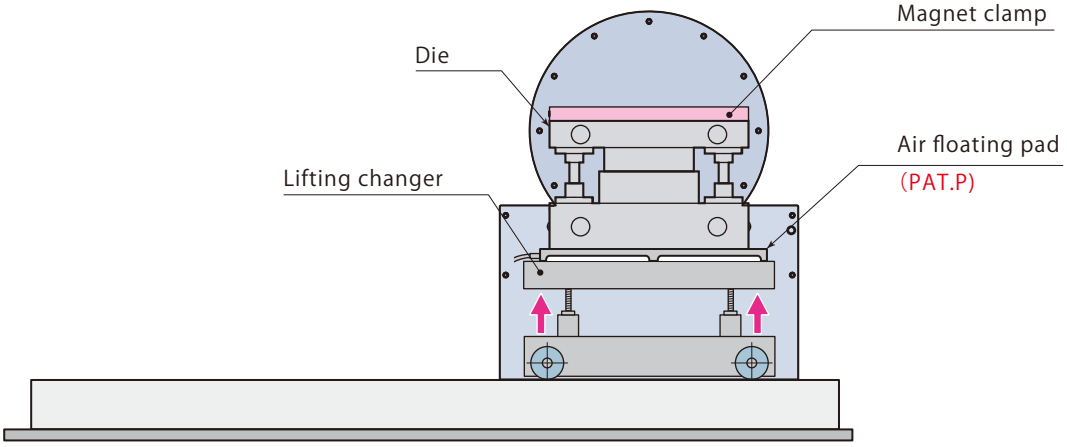


⑧ Move the lower die forward. Position by floating pad.

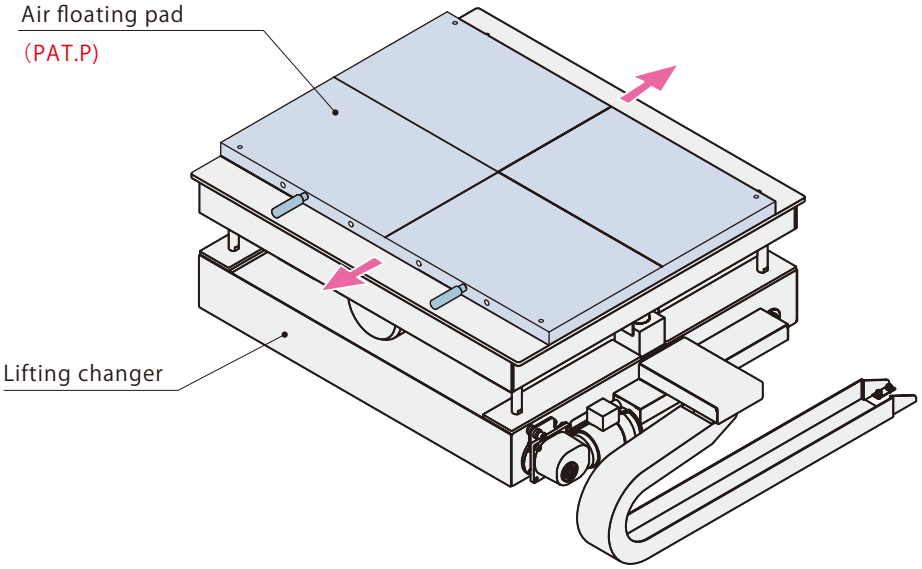


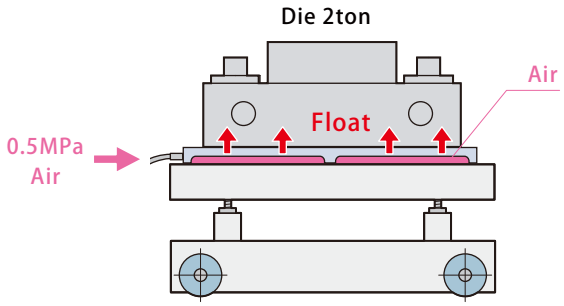
⑨ Move up the lower die.

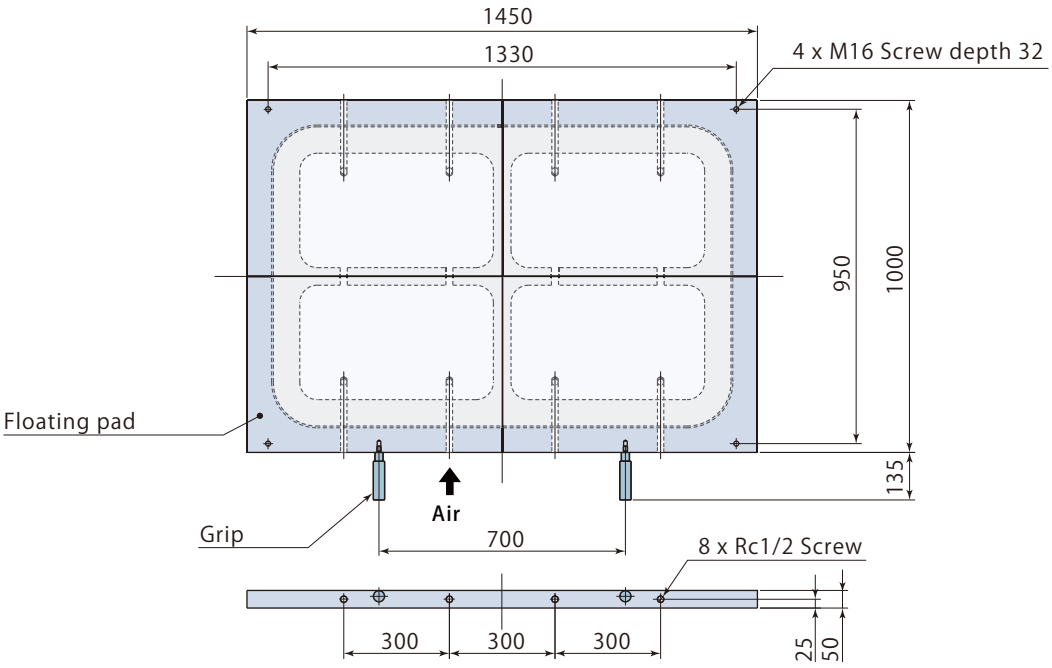
Make the lower die perfectly contact with upper die and Turn OFF the magnet clamp.



A floating pad being actuated by air is provided to position the heavey die by hand







Mass	510 g

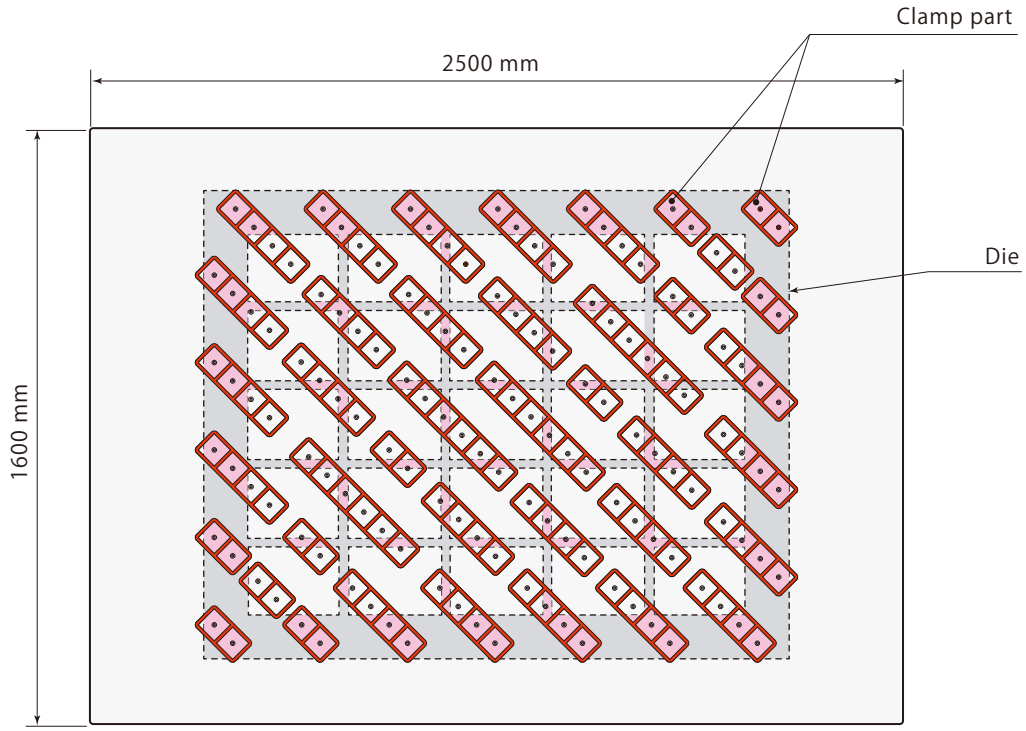
Voids on the die

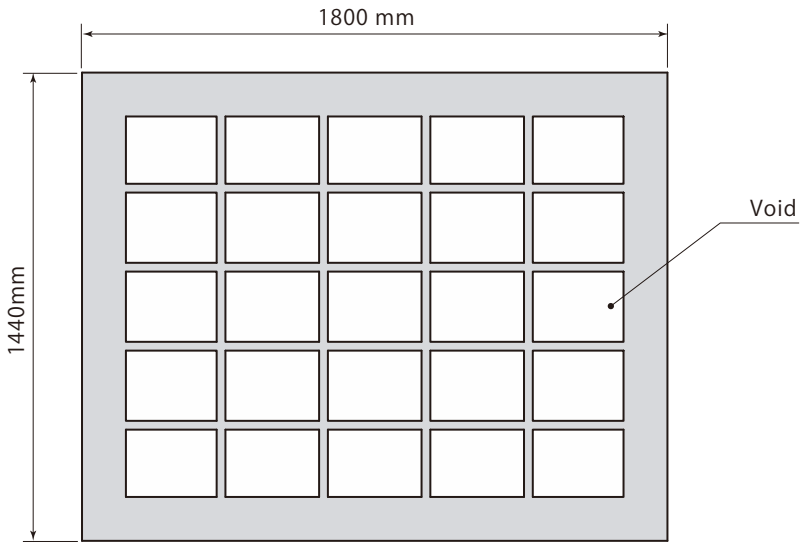
In case there are voids on the die,
the magnet clamp cores are mounted obliquely to gain the clamping force more. (PAT.P)

Plate size 2500 mm×1600mm

Die size 1800 mm×1440mm Mass 2 ton

Effective clamping force 509 kN (25.4 times of die weight)





Upper die face

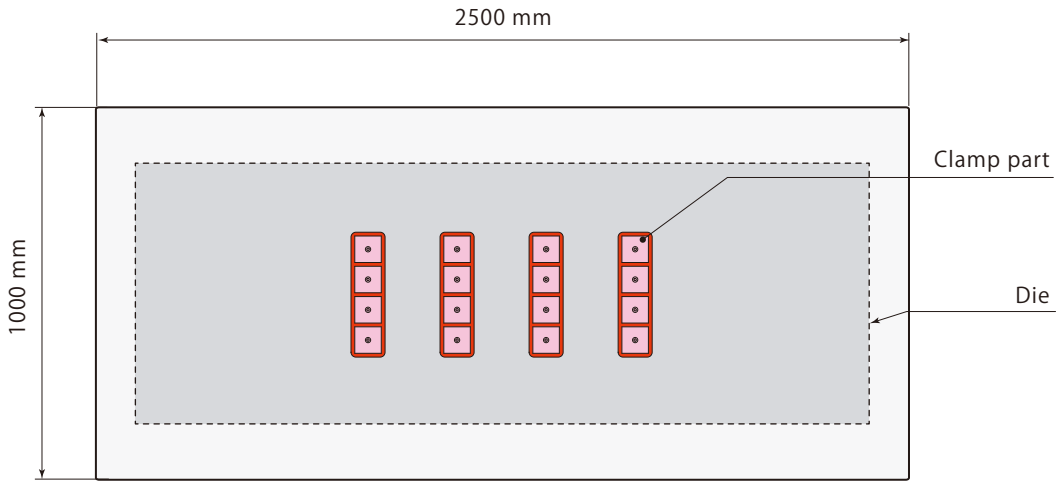
No voids on the die

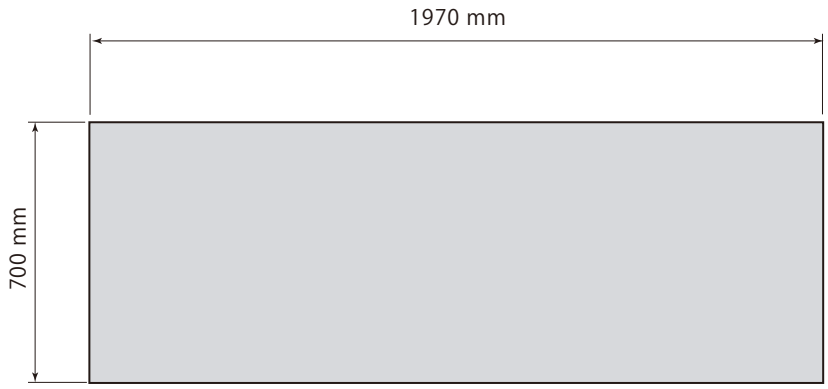
In case there are no voids on the upper die face,
the magnet clamp cores are mounted at the standard position.

Plate size 2500 mm×1000mm

Die size 1970 mm×700mm Mass 1.5 ton

Effective clamping force 117 kN (7.8 times of die weight)





Upper die face

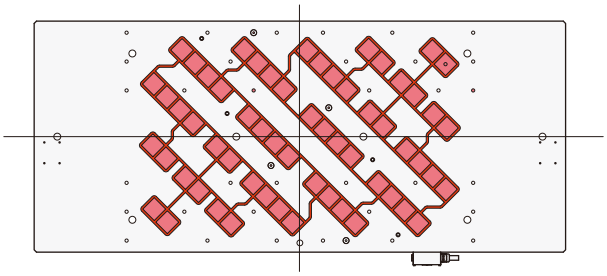
Calculate "support mounting criteria" for the die with voids.

$$\text{Support mounting criteria} = \frac{\text{Magnetic force}}{\text{Die weight}} = \frac{F \cdot \alpha}{W} < 20$$

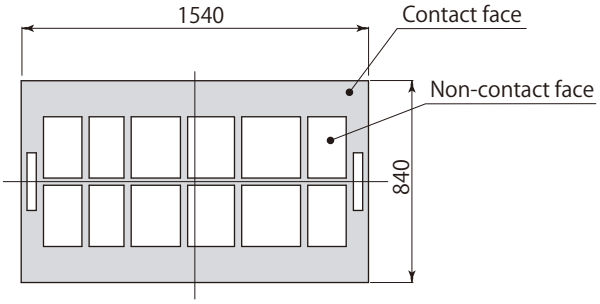
If the value is less than 20, mount the support.

W：Upper die weight15kN　F：Attraction force of magnet200kN　α：Coefficient for the material0.8（FCD）

Support mounting criteria Calculation example



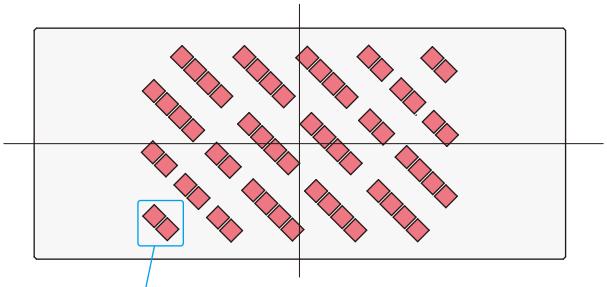
Magnet plate lower face



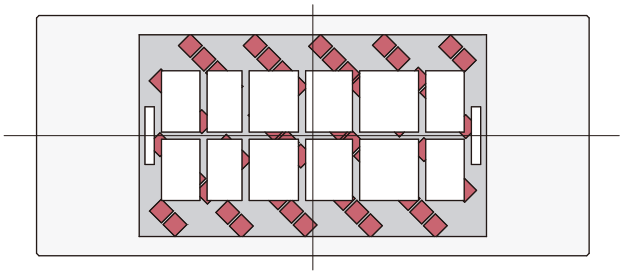
Upper die face

Contact area of upper die：694501mm²

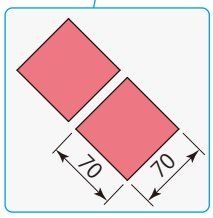
Upper die area：1293600mm² ＝ 53.7%



Magnet core layout



Contact area of magnet cores ＝ 144241 mm²



Area of magnet core

＝ 70×70 ＝ 4900 mm²

force of one magnet core

＝ 7.35 kN

Quantities of contacted magnet cores ＝ $\frac{144241\ \text{mm}^2}{4900\ \text{mm}^2}$ ＝ 29.44 cores

Attraction force of magnet ＝ 29.44×7.35 ＝ 216 kN ≒ 200 kN

Calculation formula　　Support mounting criteria

$$\frac{F \cdot \alpha}{W} = \frac{200 \times 0.8}{15} = \frac{160}{15} = 10.67$$

Mount a support.

→ See next page

W：Upper die weight　F：Attraction force of magnet

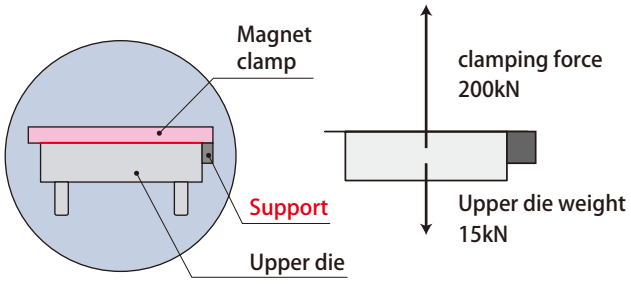
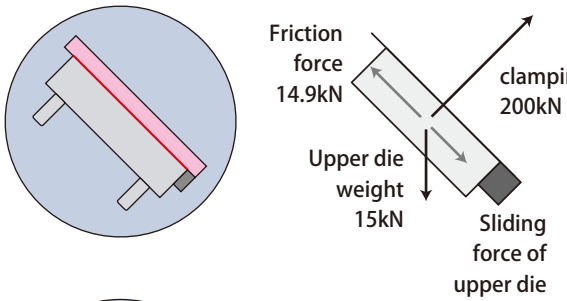
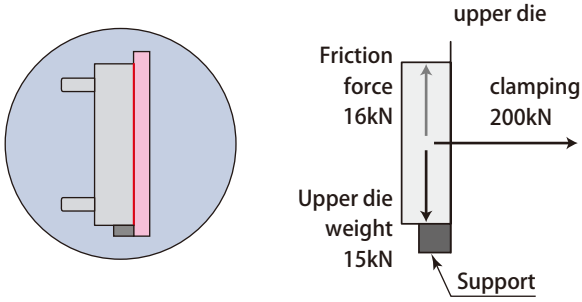
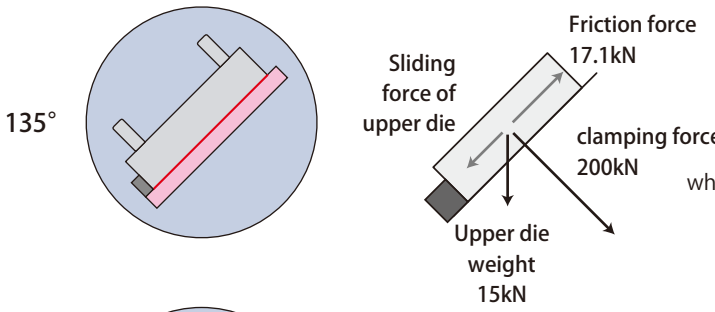
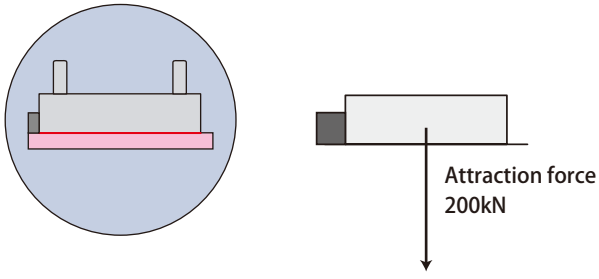
α：Coefficient for the material0.8（FCD）

Safety factor becomes infinite at every angle by mounting a support.

$$\text{Safety factor} = \frac{\text{Friction force}}{\text{Sliding force of upper die}} = \frac{F \cdot \alpha \cdot \mu}{W \cdot \sin\theta}$$

F : Attraction force of magnet200kN
α : Coefficient for the material0.8 (FCD)
μ : Friction coefficient0.1~0.2 (Actual measured value) *
W : Upper die weight15kN θ : Rotation angle

* Although the actual measured value is 0.2, 0.1 is applied to the calculation for safety purpose.

Rotation angle	Rough drawing	Calculation formula	Safety factor
0°		$\frac{200\times0.8-15}{0} = \infty$	
45°		$\frac{(200\times0.8-15\times0.707)\times0.1}{15\times0.707} = \frac{14.9}{10.6} =$ when the support is installed $\frac{(200\times0.8-15\times0.707)\times0.1}{0} =$	1.41 ∞
90°		$\frac{200\times0.8\times0.1}{15\times1} = \frac{16}{15} =$ At installation of support $\frac{200\times0.8\times01}{0} =$	1.07 ∞
135°		$\frac{(200\times0.8+15\times0.707)\times0.1}{15\times0.707} = \frac{17.1}{10.6} =$ when the support is installed $\frac{(200\times0.8+15\times0.707)\times0.1}{0} =$	1.61 ∞
180°		$\frac{200\times0.8+15}{0} = \infty$	

Pascal
corporation

Itami, Hyogo, Japan 664-8502
TEL. +81-72-777-3333 FAX. +81-72-777-3520

Chicago, U.S.A.	TEL. +1-847-427-1234
Stuttgart, Germany	TEL. +49-711-782-850-0
Dalian, China	TEL. +86-411-8732-2988
Shanghai, China	TEL. +86-21-5263-4122
Changwon, Korea	TEL. +82-55-274-0971
Bangkok, Thailand	TEL. +66-2173-5855

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CERTIFICATE OF APPROVAL ISO9001

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