MA0947PHG

INSTRUCTION MANUAL

model：HG-A97-212

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Preface

This manual provides detailed information about how to safely and correctly use the power chuck (HG-A97-212 type) for a lathe.
Before starting to use this power chuck, read this manual carefully and always follow the instructions and warnings in **"Important Safety Precautions"** and **"Precautions for Use"** at beginning of the manual. Failure to follow these precautions could result in a serious accident.

Terms and Symbols Used for Safety Messages

In this manual, precautions for handling that are considered especially important are classified and displayed as shown below depending on the damage of risk including the seriousness of the harm that could result. Please sufficiently understand the meanings of these terms and follow the instructions for safe operation.

Safety Alert Symbol

The triangle is the safety alert symbol used to alert you to potential safety hazards that could result in injury or death.

DANGER	**Indicates a hazardous situation which, if you not avoided, will result in death or serious injury.**
WARNING	**Indicates a hazardous situation which, if you not avoided, could result in death or serious injury.**
CAUTION	**Indicates a hazardous situation which, if you not avoided, could result in minor or moderate injury.**
NOTICE	**Indicates instructions which, if not avoided, could result in damage to the equipment or a shortened work life.**

Liability and How to Use this Manual

This product is suitable for gripping a workpiece on the lathes or rotary tables. This product is equipped with the jaws to clamp the workpiece and they operate by means of a rotary cylinder. For any other applications, please contact us.
Our company will not assume responsibility for injury, death, damage, or loss resulting from not following the instructions in this manual.

There are countless things that cannot or should not be done, and it is impossible to cover all of them in this manual.
Therefore, do not perform any actions unless they are specifically allowed in this manual. If any questions related to safety arise about operation, control, inspection and maintenance which are not specified in this manual, please confirm them with our company or distributor before performing them.

Guarantee and Limitation of Liability

The guarantee period of this product is 1 year after delivery.
Use the parts delivered by Kitagawa Iron Works for all the parts including consumable parts. We will not assume responsibility for injury, death, damage, or loss caused by usage of parts not manufactured by Kitagawa Iron Works. Additionally, if parts other than genuine parts manufactured by Kitagawa Iron Works are used, this guarantee will be completely invalid.

The chuck and cylinder from Kitagawa Iron Works should be used together. If you must use a part not made by Kitagawa, check with us or our distributor to be sure it is safe to do so. We will not be responsible for injury, death, damage or loss caused by use of a chuck or cylinder made by another company unless this use has been approved by Kitagawa or its distributor.

Important Safety Precautions

Important safety precautions are summarized below. Please read this section before first starting to use this product.

DANGER **Failure to follow the safety precautions below will result in serious injury or death.**

Turn off main power supply before attaching, inspecting or replacing chuck, and before adding oil.

For All Users

- The chuck may start rotation suddenly, and a part of the body or clothing may be caught.

Close door before rotating spindle.

For All Users

- If the door is not closed, you may touch the rotating chuck or the work may fly out, which is very dangerous. (In general, the safety interlock function which allows rotation only when the door is the manual mode or the test mode)

During spindle rotation, do not turn off hydraulic pump power supply and do not operate switching valve.

For All Users

- Cutting off hydraulic pressure causes a drop in the gripping force which could result in the work being released and flying out.
- Operating the manual switching valve or solenoid valve will lead to a drop of hydraulic pressure.

Do not allow the rotation speed of the chuck to exceed the maximum allowable speed limit.

For All Users

- The rotation speed of the chuck exceeds the rotation speed limit, this is very dangerous as the chuck and work will fly out.

The input force of the chuck (piston thrust, pulling force of the draw pipe) must not exceed the allowable maximum input force.

For All Users

- Input must match the specification of the chuck.
- Adjust the hydraulic pressure to the cylinder so that the input force, which determines the gripping force of the chuck, does not exceed.
- Excessive input force can lead to breakage of the chuck, which is very dangerous, as the chuck can work can be damaged and fly out.

When gripping a work with the chuck, do not get fingers or hands become caught.

For All Users

- This could cause crushed or cut fingers and hands.

When the protrusion of the work is long, support it with the steady rest or center.

For All Users

- If the protrusion is long, the tip of the work can turn and the work fly out.

Determine the gripping force required for processing by the machine tool manufacturer or user, and check that the required gripping force is provided before processing.

For All Users

- Adjust the hydraulic pressure to the cylinder to obtain the required gripping force. If the gripping force is insufficient, this is dangerous as the work will fly out.

Use of a chuck and cylinder that cannot be used together safely may cause the cylinder to break at high pressure resulting in the chuck and work flying out.

For All Users

- Check that the chuck and the cylinder are in the “safe combination” when using at high pressure with our company or the distributor. Especially when the cylinder of our company and a high pressure chuck of other company are combined, confirmation is necessary.
- If one of the abnormal events shown below occurs during operation, immediately stop the machine and consult with our company or the distributor.
  - The work slips.
  - Loss of accuracy.
  - The work begins to chatter.
  - The machine's vibration significantly increases.
  - The griping force does not rise even if hydraulic pressure is raised.

In the case of processing a significant unbalanced work, lower the rotation speed.

For All Users

- Unbalanced work generates dangerous centrifugal forces and the work could fly out.

That grip a work in the center of the stroke.

For All Users

- When gripping near the stroke end, the work may not be gripped sometimes according to the deviation, etc., of the gripping part allowance of the work, and this is dangerous as the work will fly out.

Always tighten the bolts at the specified torque. If the torque is insufficient or excessive, the bolt will break, which is dangerous as the chuck or work will fly out. Use the bolts attached to the chuck, and do not use bolts other than these.

For All Users

- If the torque is insufficient or excessive, the bolt will break, which is dangerous as the chuck or work will fly out.
- Fix the lathe spindle or the chuck when you tighten bolts. Your hand could slip and get injury when you work without fixing the spindle.
- You cannot control the torque by a hex key. You must use a torque wrench for torque control.

Specified torque for socket head cap screw

Bolt size	Tightening torque	
M4	3.8	N・m
M5	7.5	N・m
M6	13	N・m
M8	33	N・m
M10	73	N・m
M12	107	N・m
M14	171	N・m
M16	250	N・m
M20	402	N・m

- **Tightening torque is moment of force when you tighten a bolt. Tightening torque= F×L.**

Provide sufficient strength for the draw pipe.
Provide sufficient screw depth for the draw pipe.
Firmly tighten the draw pipe.

For Machine Tool Manufactures

- If the draw pipe break, the gripping force is instantly lost and this is dangerous as work will fly out.
- If the screw depth of the draw pipe is insufficient, the screw will break and the gripping force will be lost instantly, and this is dangerous as work will fly out.
- If the engagement of the screw of the draw pipe is loose, vibration may occur resulting in breakage of the screw. If the screw breaks, the gripping force will be lost instantly, which is dangerous as the work will fly out.
- If the draw pipe is unbalanced, vibration occurs, the screw is broken and the gripping force will be lost instantly, which is dangerous as the work will fly out.

Use a cylinder with a lock valve (safety valve, check valve) incorporated in case of sudden hydraulic pressure drop due to blackout, malfunction of the hydraulic pump, etc. Further, use a solenoid valve with a circuit that retains the gripping position when no current is carried.

For Machine Tool Manufactures

- If the hydraulic pressure suddenly drops due to blackout or malfunction of the hydraulic pump, etc., this is dangerous as work will fly out.
- Lock valve retains the hydraulic pressure inside the cylinder temporarily, when the hydraulic pressure suddenly drops due to blackout or malfunction of the hydraulic pump, etc.

Important Safety Precautions

WARNING **Failure to follow the safety precautions below could result in serious injury or death.**

Do not modify the chuck in a way not permitted by the manufacturer.

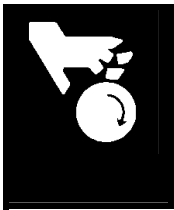
For All Users

- It may not only break the chuck but the chuck and the work may fly out, which is dangerous.
- If you attach a locator or jig on the chuck body surface, only process work in an acceptable range

Periodically supply adequate grease. Turn off power before adding grease.

For All Users

- Insufficient grease supply lowers the gripping force, causes operation failure due to lower hydraulic pressure, lowers the gripping precision, and causes abnormal wearing and seizing, etc.
- This is dangerous as the work could fly out from a drop in the gripping force.



Do not operate the machine after drinking alcohol or taking medication.

For All Users

- Dangerous since these lead to operation mistakes and misjudgment.

Do not operate the machine wearing gloves, a necktie, and other loose clothing or jewelry.

For All Users

- Dangerous since it will be caught.

Do not grip a chuck with a chuck.

For All Users

- Because it is easy to confuse the specifications of each chuck and the protrusion become long and is apt to raise rotation speed, it is apt to exceed the specifications of the base chuck. The chuck may break and the chuck or work could fly out.

1. Structural drawing and Parts list

1－1. Structural drawing

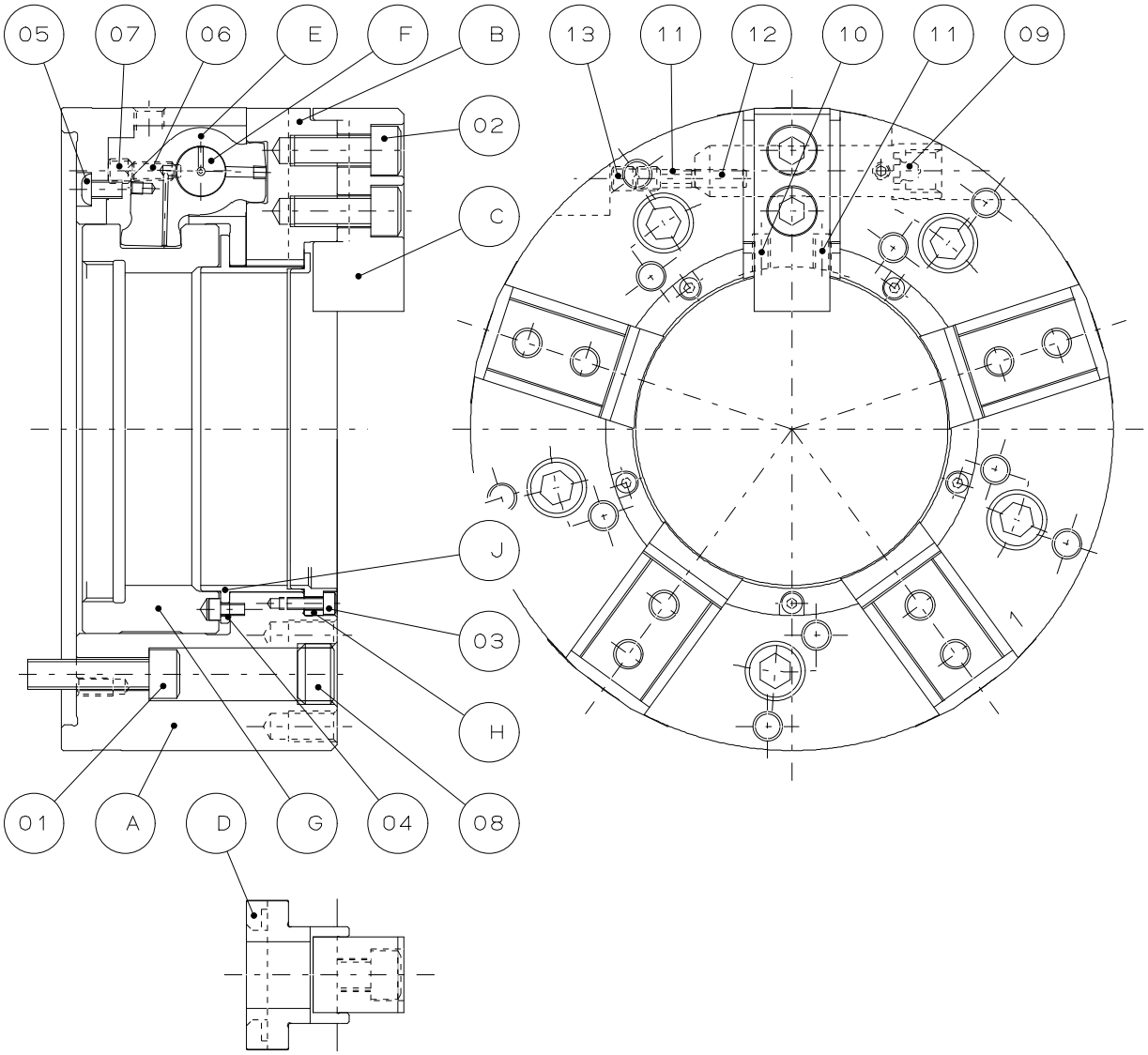


Fig.1

1－2. Parts list

Table 1

No.	Part name	Quantity	No.	Part name	Quantity
A	Body	1	04	Socket head cap screw M4×8	5
B	Master jaw	5	05	Socket head cap button screw M6×12	5
C	Soft jaw	5	06	Set screw half dog point M6×16	5
D	Spacer	10	07	Set screw flat point M8×8	5
E	Lever	5	08	Set screw flat point M20×16	5
F	Lever pin	5	09	Grease nipple A M6	5
G	Plunger	1	10	spring (blue)	5
H	Cover A	1	11	spring (yellow)	10
J	Cover B	1	12	Parallel pin φ6×18	5
01	Socket head cap screw M10×40	5	13	Set screw flat point M8×8	10
02	Socket head cap screw M10×25	10			
03	Socket head cap screw M4×12	5			

2. Specifications

Table 2

SPECIFICATIONS	
PLUNGER STROKE	2 mm
JAW STROKE (IN DIA)	3 mm
MAX PERMISSIBLE INPUT FORCE	85 kN (8769 kgf)
MAX STATIC GRIPPING FORCE	87 kN (8871 kgf)
MAX STATIC GRIPPING FORCE	2000 min^{-1}
mass	20 kg
MOMENT OF INERTIA	0.135 $Kg \cdot m^2$
DYNAMIC GRIPPING FORCE AT MAX SPEED	76 kN (7749 kgf)
OPERATING CYLINDER	F2511HS15A
MAX PERMISSIBLE OIL PRESS	2.9 MPa ($30.0 kgf/cm^2$)
GRIPPING DIA.	φ82～φ102

ABOVE SPECE:
·WITH STD SOFT BLANK TOP JAWS
·GRIPPING CENTER HIGHT IS ON CHUCK SURFACE.
·DYNAMIC GRIPPING FORCE IS THEORETICAL VALUE WHEN MAX SPEED.

3. Relationship between gripping force and rotation speed

3－1. Maximum static gripping force

The static gripping force is the gripping force when the chuck is at a stop.
The power chuck has a mechanism to convert input force (piston thrust force, draw pipe drawing force) from the cylinder to gripping force. Therefore, the gripping force when the allowable maximum input force becomes the maximum static gripping force.
However, the gripping force is different depending on the state of grease lubrication, grease in use, height of the jaw, etc. The maximum static gripping force specified in the specification is the value under the following conditions:

- The Kitagawa standard soft jaw is used as the jaw.
- The attaching bolts of the soft jaw are tightened at the specified torque.
- The numerical values are obtained with the Kitagawa gripping force meter . The gripping position of the gripping force meter is at a position the chuck surface.
- CHUCK GREASE PRO is used.
- A variable displacement pump with the discharge volume of 20 liters/min or more is used as the hydraulic source. The pressure is set by the pressure control equipment of the pump itself, or the pressure reduction valve equipped separately.

3－2. Allowable maximum rotation speed

In the case of outside diameter gripping, when the chuck is rotated, the gripping force lowers due to the centrifugal force of the top jaw. The centrifugal force is different depending on the mass of the top jaw and the barycentric position as well as the rotation speed. The allowable maximum rotation speed specified in the specification is the value under the following conditions:

- The Kitagawa standard soft jaw is used.
- Grip the gripping force meter in the center of the jaw stroke.
- The gripping position of the gripping force meter is at a position the chuck surface(Theoretical value).

DANGER

To avoid serious accidents caused by the chuck or work flying out:

- **Determine the gripping force required for processing by the machine tool manufacturer or user, and check that the required gripping force is provided before processing. The gripping force of the chuck must not exceed the maximum static gripping force.**
- **Determine the rotation speed required for processing by the machine tool manufacturer or user based on the gripping force required for the processing. The rotation speed at this point must not exceed the allowable maximum rotation speed.**

3－3．Relationship between gripping force and rotation speed

As the rotation speed becomes higher, the centrifugal force of the jaw increases and the gripping force lowers. The curves displayed in Fig. 2 shows relationships between the rotation speed and the centrifugal force when using the standard soft jaw. The centrifugal force differs significantly depending on the size and shape of the top jaw and the attaching position, therefore, when the rotation speed is high, actual measurement using a Kitagawa gripping force meter is required.

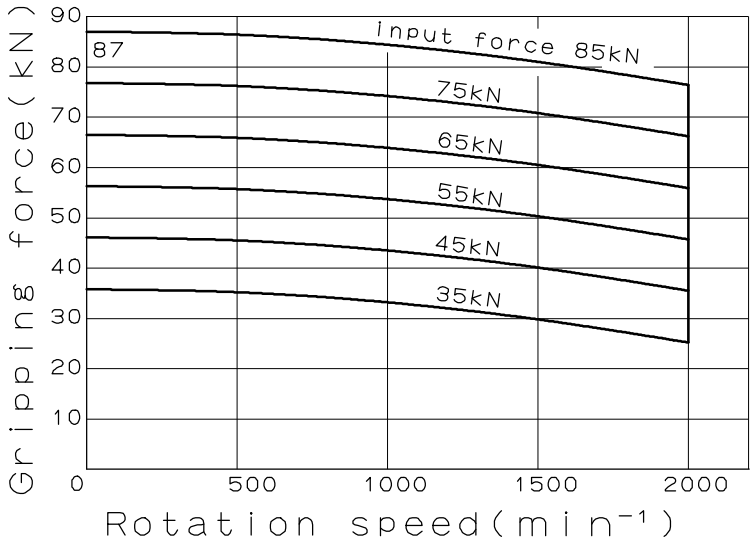


Fig.2

DANGER

- **In the case of processing a considerably unbalanced work, lower the rotation speed. The work will fly out and this is dangerous.**
- **Vibration is generated if there is unbalance due to the work and the jig, etc. Vibration decreases process precision and shortens the working life of the chuck, even possibly breaking it. Correct the unbalance by using a balance weight, etc., or lower the rotation speed for use.**
- **In the case of heavy cutting at high rotation speed, vibration is easily generated in the same manner as the unbalance of the chuck, therefore, set the cutting conditions appropriate for the dynamic gripping force and machine rigidity.**

3－4. Relationship between gripping part center height, static griping force and input force / Relationship between top jaw mass moment and gripping force loss

If the gripping part center height of the used top jaw is higher than the chuck surface, a large load is applied to the master jaw, rever, jaw attaching bolts, etc. To prevent these parts from being broken, it is necessary to use the machine by using a lower input force than the allowable maximum input force.

Additionally, if the top jaw is larger and heavier, the centrifugal force generated at the top jaw will increase. It is necessary to examine the dynamic gripping force considering the centrifugal force and to use the machine at a rotation speed that can withstand the cutting force.

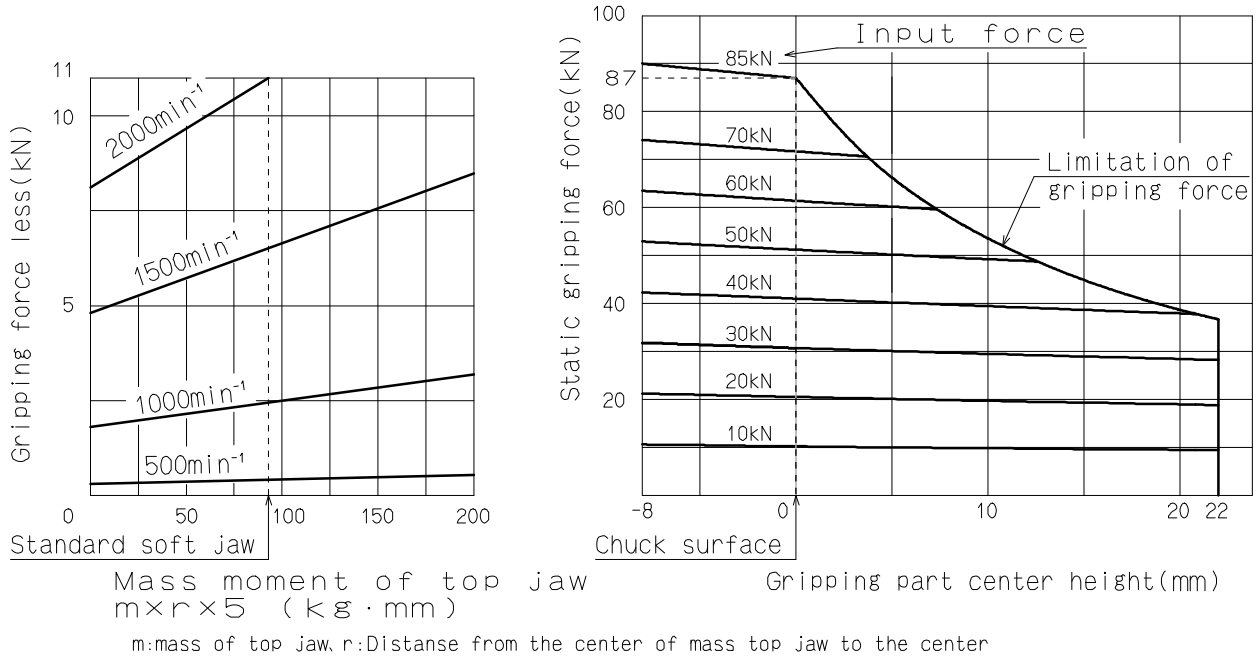
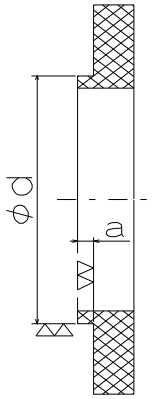
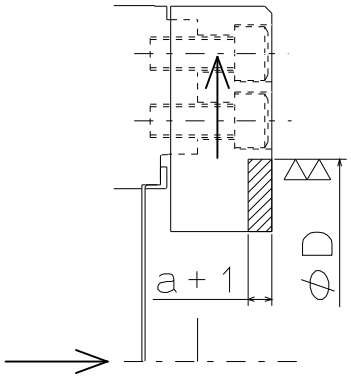
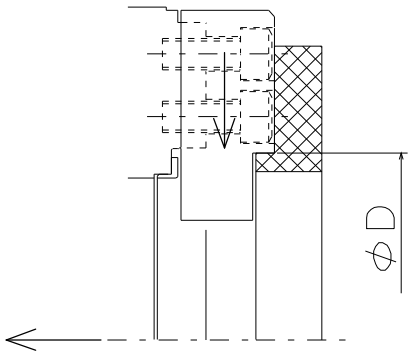


Fig.3

DANGER

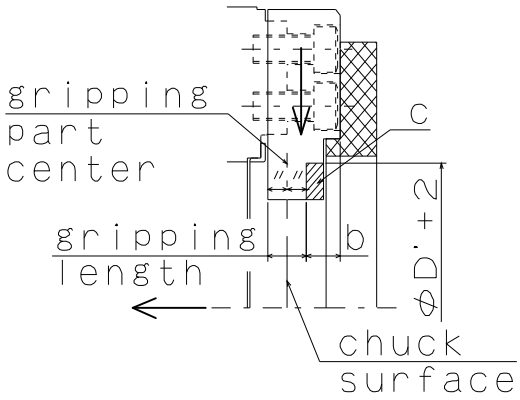
- **Keep the height of the top jaw within the range of the gripping force limit table. (Refer to Fig.3)**
- **If the gripping part center height of the used top jaw is higher than the chuck surface, use it at the input force (piston thrust force, draw pipe drawing force) specified in the gripping force limit table. If it is used without lowering the input, the chuck will break and this is dangerous as the chuck and work will fly out.**

4. Forming soft jaw with outside diameter gripping

1. Preparation of the ring for forming • Prepare the ring for forming. The surface roughness of the ring inside diameter and part to locate in jaw front surface are to be approximately 25s, and make a shape with a sufficient thickness which does not distort. • Recommended gripping dia. φd＝φ119、 a＝6	
2. Process of the ring gripping part for forming • Operate the switch valve and maximize the opening of the jaw. • Then, process the φD part (part to grip the ring for forming). Set the dimension φD so that gripping near the center of the jaw maximum stroke (diameter) is possible. • φD = φd + (jaw maximum stroke/2)	
3. Gripping of the ring for forming • By operating the switch valve, grip the ring for forming in the φD part. At this time, grip by pressing the ring on the jaw front surface in order for the ring not to be tilted. Repeat chucking several times to stabilize the ring. • Set the hydraulic pressure during forming the same as during processing of the work, or slightly higher. • When the ring distorts, lower the hydraulic pressure or change the ring into a shape which does not easily distort.	

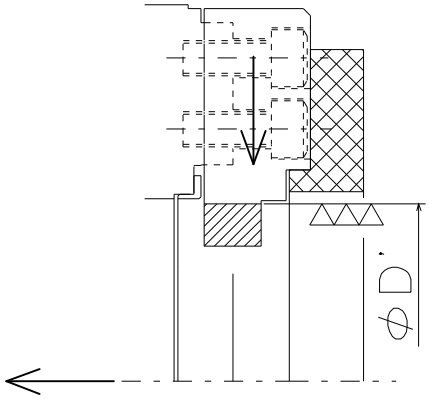
4. Adjustment of gripping part center height

- When gripping a work, cut down the c-section gripping center so that the surface of the chuck.
  If using standard soft jaw, the b-section dimensions will be 14mm.
  Processed to while holding the ring.



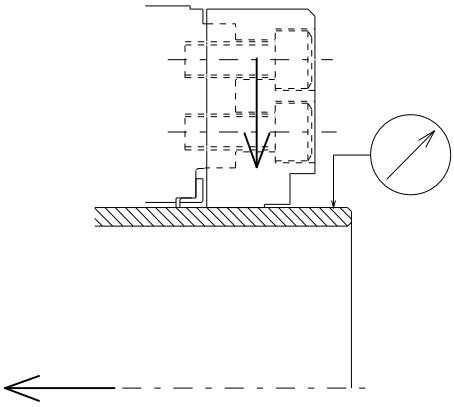
5. Forming

- Process the gripping part (dimension φD') of the work in the state that the ring is kept gripped. The φD' part is to be approximately the same diameter (H7) as the diameter of the gripping part of the work, and process to be surface roughness at 6s or less.



6. Trial cutting

- Remove the ring for forming and grip the work to check the jaw stroke.
- Implement trial cutting to check the process precision and that there is no slip, etc.



5. Attachment of chuck

- Turn off the main power of the machine before starting work.
- Read the following disassembling procedures with reference to page 11,12.
- Always tighten the bolts at the specified torque.

① Attach the cylinder and draw-pipe to the spindle. Move 2 to 3 times at low pressure (0.4 MPa) and set the piston at the forward end and turn off the power supply.

② If the fixture is attached to the chuck, please remove in advance.

③ Use an eyebolt when attaching the chuck to the machine. Screw the draw pipe to the plunger [G] by turning the spindle.

④ If it is set to 0.5mm between the draw pipe and plunger, loosen the draw pipe and back 1/4 turn from the spindle position is screwed. Please fix chuck to spindle with socket head cap screws（M10×40）[01] then. It can be a gap of 0.5mm between the plunger[G] and draw pipe, as shown in FIG 4. Amount to rotate the spindle from the position screwed by gaps that set will change.

If it is set to 1.0mm between the draw pipe and plunger, loosen the draw pipe and back 1/2 turn from the spindle position is screwed.

If it is set to 1.5mm between the draw pipe and plunger, loosen the draw pipe and back 3/4 turn from the spindle position is screwed.

⑤ To make sure that it is allowed to stroke the cylinder, jaw stroke of the provisions have been obtained.

⑥ If jaw stroke is short, loosen the socket head cap screws（M10×40）[01], loosen the screw by 1/5 rotation of the spindle, fix chuck to spindle with socket head cap screws（M10×40）. Please check the jaw stroke then.

Jaw stroke will increase by 0.3mm to loosen the screw by 1/5 rotation of the spindle. Please note Jaw stroke to be no larger than 1.5mm.

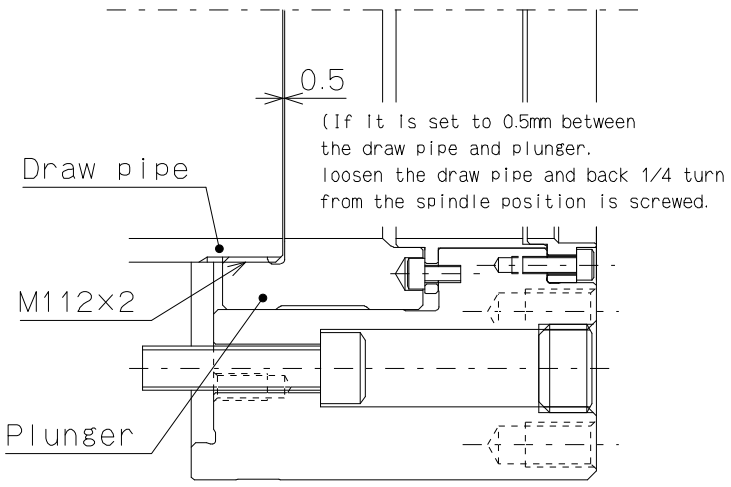


Fig.4

6. Usage

In the case of attaching the locator and the jig on the chuck surface, use the taps specified in Fig. 5.

If you are installing a jig to tap hole of the chuck surface, please install a 58N · m tightening torque of the socket head cap screw.

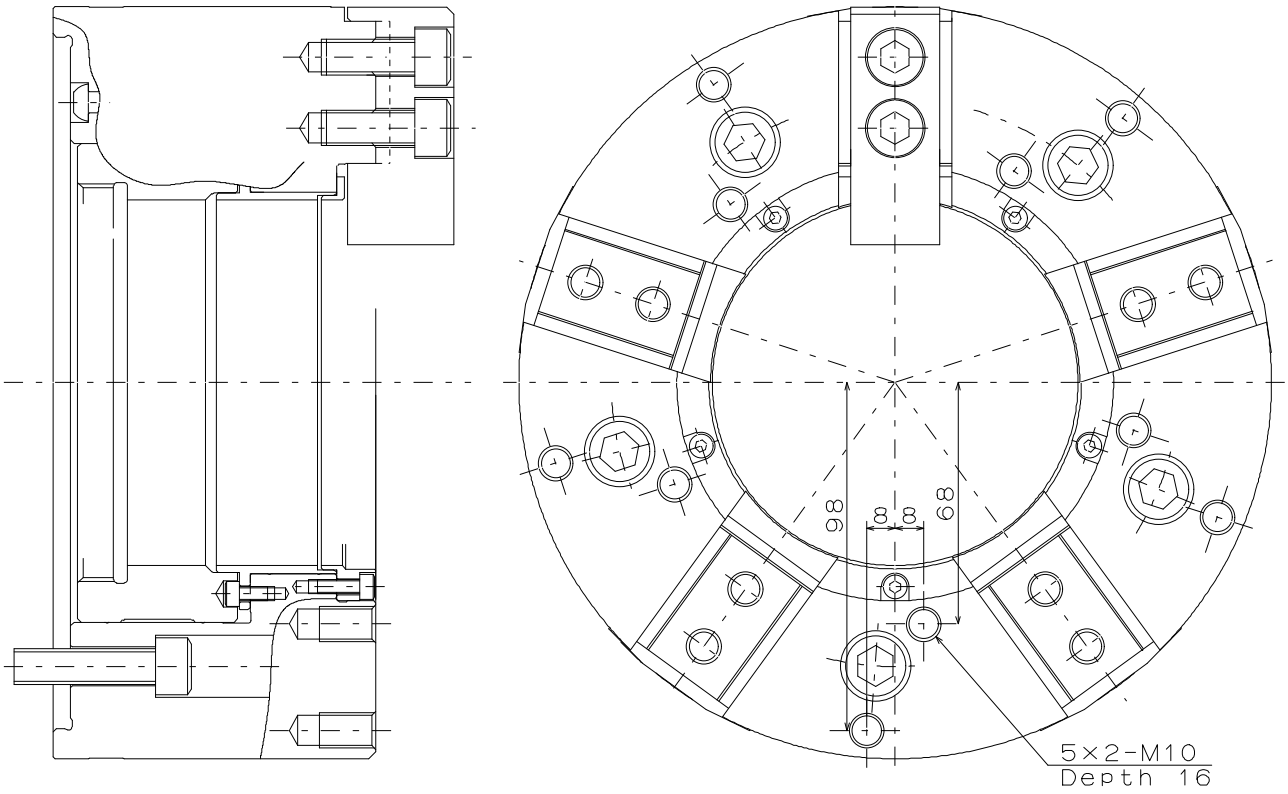


Fig.5

DANGER

- **The chuck can not be modified. This will not only break the chuck but the chuck and work may fly out, which is dangerous.**
- **Attach the locator or the jig with bolts which have sufficient strength due to centrifugal force. The locator or the jig may fly out, and this is dangerous.**

7. Periodic Inspection

- Add grease at least once a day.
- Fully stroke the jaw before starting work or upon supplying grease, and check that the jaw is inside the appropriate stroke area.
- Always clean the chuck body or the sliding surface using an air gun, etc., at the end of work.
- Check that the bolts of each part are not loosened at least once every 3 months.
- Disassemble and clean at least once every 6 months or every 100,000 strokes (once every 2 months or more for cutting cast metal).

7-2. Grease lubrication

1. Position to lubricate

- Lubricate using a grease gun from the grease nipple on the body periphery part. Supply grease when the jaw is open. After lubrication, repeat opening and closing the jaw several times without gripping work.

2. Grease to use

- Use the designated grease specified in Table 7. If grease other than the designated grease is used, sufficient effect may not be obtained.

Table 7

Genuine product	CHUCK GREASE PRO	Kitagawa genuine product (Kitagawa distributor of each country)
Conventional product	Kitagawa chuck grease	Conventional product
	Molykote EP Grease	TORAY Dow Corning (only inside Japan)
	Chuck EEZ grease	Kitagawa-Northtech Inc. (North American region)
	MOLYKOTE TP-42	Dow Corning (Europe, Asian region)
	Kluberpaste ME31-52	Kluber lubrication (worldwide)

WARNING

- **To keep the chuck running in the best condition for a long time, adequate grease lubrication is necessary. Insufficient grease lubrication causes a drop in the gripping force, operation failure at low hydraulic pressure, drop in gripping precision, abnormal wearing, seizing, etc. The work will fly out due to a drop in the gripping force and this is dangerous.**

7-3. Disassembling

Disassembling procedures

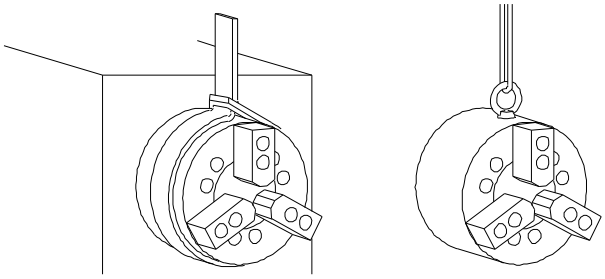
Read the following disassembling procedures with reference to page 11,12.

① Turn off the main power of the machine before starting work.
② If the fixture and jaw are attached to the chuck, please remove in advance.
③ Please loosen the socket head cap screws（M10×40）[01] while hanging at eye bolts chuck. Then, loosen the connection with the draw pipe by turning the spindle, remove the chuck from the spindle.
④ Loosen the socket head cap screws（M4×12）[03] and remove the cover A [H].
⑤ Loosen the set screw flat point（M8×8）[13] and remove the spring(yellow) [11] and parallel pin (φ6×18) [12].
⑥ Loosen the set screw flat point（M8×8）[07] and set screw half dog point（M6×16）and remove the rever pin [F].
⑦ Please remove the socket head cap button screws（M6×12）[05].
⑧ Please remove the master jaw [B] and the spring(blue) [10] and the spring(yellow) [11] to the outer periphery side of the chuck..
⑨ Please remove the rever [E] to the chuck front side.
⑩ Remove the plunger [G] to the chuck rear side.
⑪ Loosen the socket head cap screws（M4×8）[04] and remove the cover B [J].

Assemble again while sufficiently coating the recommended grease in the reverse procedures of disassembling. At this time, pay sufficient attention so as not to make a mistake in the jaw numbers. Always tighten the bolts at the specified torque.

⚠ CAUTION

- **Use an eyebolt or a hanging belt when attaching and detaching the chuck to and from the machine, as there is a danger of injury or damage if the chuck drops.**



Chuck size (inch)	Eyebolt
8	M10

WARNING

- **Remove the eyebolt or the belt without fail after using. If the chuck is rotated with the eyebolt, etc., attached, they may fly out and this is dangerous.**
- **Disassemble and clean the chuck at least once every 6 months or every 100,000 strokes (once every 2 months or more for cutting cast metal). If cutting powder or other substances stagnate inside the chuck, it will lead to insufficient stroke and a drop in the gripping force, and this is dangerous as the work will fly out. Check each part carefully and replace any part that is worn or cracked.**
- **After inspection, apply sufficient grease in the designated areas and reassemble.**
- **After assembling, measure the gripping force according to the method on page 13, and check that the specified gripping force is obtained.**
- **If you stop the machine for a long period of time, remove the work from the machine. If you don't, the work can drop due to a drop in the hydraulic pressure or the cylinder can stop or malfunction.**
- **If you stop the machine or store the chuck for a long period of time, add grease to prevent rust.**

http://www.mta.kiw.co.jp

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