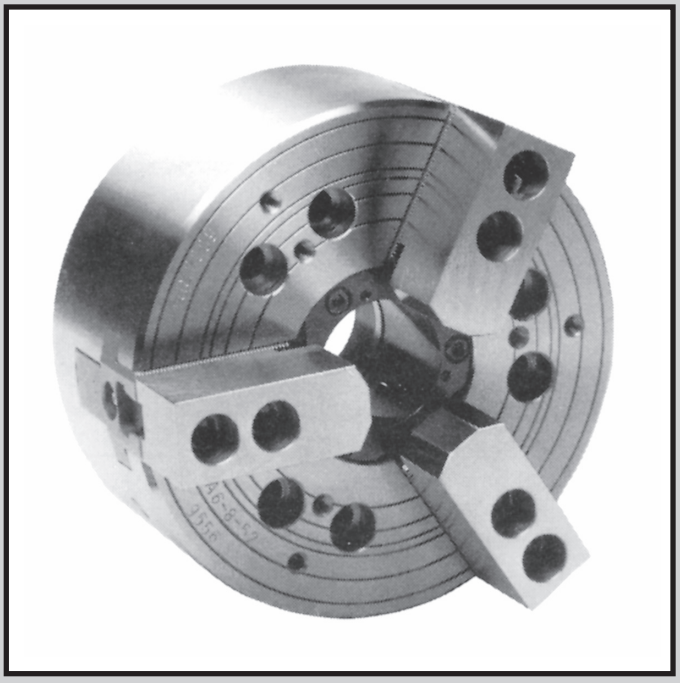
OPERATION MANUAL

ZA TYPE SERIES

HYDRAULIC POWER OPERATED CHUCKS



LOGANSPORT MATSUMOTO CO.

1-1 PRELUDE

Thank you for choosing the “MMK” brand hydraulic power chuck (ZA SERIES). Through the use of this operation manual, you will learn to use the power chuck correctly. This will in turn lead to an increase in productivity for your products.

1-2 SAFETY INFORMATION

In order to avoid accidents and operate on the safest level possible, we have indicated safety precautions with this symbol ⚠

PRIOR TO OPERATION, PLEASE READ THIS MANUAL CAREFULLY.

The majority of accidents, without exception, are caused by a lack of following the fundamental rules of safety that pertain to repairing, handling, maintenance and inspection. Prior to operation, you should carefully read the precautions and warnings in this manual. You should not proceed with repairing, handling, maintenance or inspection before fully understanding the rules of safety laid out in this manual. The safety messages are classified as follows:

We will assume no responsibility for any accidents caused by disobeying these precautions.

⚠ DANGER	This safety message is used to identify danger areas which could cause serious injury or death.
⚠ WARNING	This safety message warns the individual of places where dangerous situations, which could lead to serious injury or death, may occur. This safety message helps to prevent one from encountering the ⚠ DANGER areas.
⚠ CAUTION	This safety message means that there is a possible chance of being injured or seriously damaging the machine or chuck.
⚠ ATTENTION	This safety message means that there is a chance of damaging the machine and/or shortening the machine life.

It is impossible to predict all of the dangerous environments pertaining to repairing, handling, maintenance, and inspection of the power chuck. Therefore, the warnings contained in this manual may not be complete for all environments.

When you proceed with repairing, handling, maintenance or inspection in a way not explained in this manual, the necessary safety considerations are your own responsibility. Please order all parts of products, including the standard hardware articles from LOGANSPORT MATSUMOTO COMPANY.

We will not take responsibility for any troubles encountered by customers who are not using original Matsumoto parts.

Your local distributor and/or LOGANSPORT MATSUMOTO COMPANY

Address:

Phone:

- SEND IN WARRANTY CARD

2 SAFETY

Safe operation is necessary for uninterrupted production. Please read and follow the fundamental safety procedures carefully.

DANGER	(1) Never open or close the chuck while the spindle is running.	The workpiece may be thrown from the chuck causing serious machine and/or bodily injury.
	(2) When inspecting, exchanging or fixing the chuck, cut off the source of electricity.	Unexpected machine movement may cause bodily injury.
	(3) Never exceed the RPM limit of the chuck.	Grip force of the chuck decreases when RPM increases. The workpiece may be thrown from the chuck causing serious machine and bodily injury.

WARNING	(1) Never run the spindle without closing the machine door.	You may come in contact with the revolving chuck, or damage the jaw.
	(2) The supply and pressure to the cylinder should be restricted so as not to overpower the chuck.	Chuck life is shortened. Parts and bolts may break. Clamp power is reduced suddenly.
	(3) The mounting bolts should be torqued with torque wrench. The torque is shown on pg. 17 chart 8.	The chuck may be damaged causing the workpiece to be thrown.
	(4) Lubricate the chuck at least once in 8 hours use.	Lack of grease causes a decrease in grip force and the workpiece could be thrown.
	(5) The size of the top jaw should be within the range of the grip force table. Concerning the height of standard top jaw, you may operate the top jaw under the lower hydraulic pressure. The relation between top jaw height and thrust of cylinder should be referred to in FIG. 15 through FIG. 25.	
	(6) Longer workpieces need to be machined in conjunction with either a steady rest of tailstock.	To avoid chatter and poor part quality. More importantly, to avoid the workpiece being thrown from the chuck.
	(7) Never modify the master jaw or body while on the machine.	The chuck will distort and become damaged.
	(8) Whenever possible, Matsumoto chucks should be used in conjunction with Matsumoto cylinders.	For optimal jaw force, jaw stroke, and performance.

⚠ WARNING	(9) Never operate machinery while under the influence of alcohol or cautionary types of medication.	Mishandling and unstable motion can occur.
	(10) Do not operate machinery with gloves, necktie or long hair.	Any of these things may become caught in the revolving chuck.

⚠ ATTENTION	(1) When removing the chuck from the machine, use the eyebolt or hanging belt.	
	(2) When clamping the workpiece, be careful not to get your fingers caught in the chuck. After the revolution of the chuck has come to a complete stop, you may handle the workpiece.	

CAUTIONS FOR CUSTOMERS

- In order to avoid danger, the operator should also take into consideration the features of workpieces; such as size, weight, shape, cutting speed, feed and depth of cut of each machine tool in use.
- The allowable maximum speed for each specified workpiece should be determined by the user and should be based upon the necessary grip force. This speed may not exceed the maximum rotating speed of the chuck.
- For special top jaws, users should calculate the dynamic grip force for the workpiece by using the charts in the manual.
- Use a static grip force analyzer, periodically, to monitor the gripping ability of the chuck, thus avoiding the unexpected throwing of a workpiece due to grip force loss.
- Reduce the working force for each machine to avoid overpowering the special parts holding chuck.
- Logansport Matsumoto Company will not be held responsible for accidents caused by untrained operators.

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PRIOR TO STARTING OPERATION, PLEASE READ THIS OPERATION MANUAL THOROUGHLY AND COMPLETELY.

ZA HYDRAULIC CHUCK PARTS NAME AND LIST

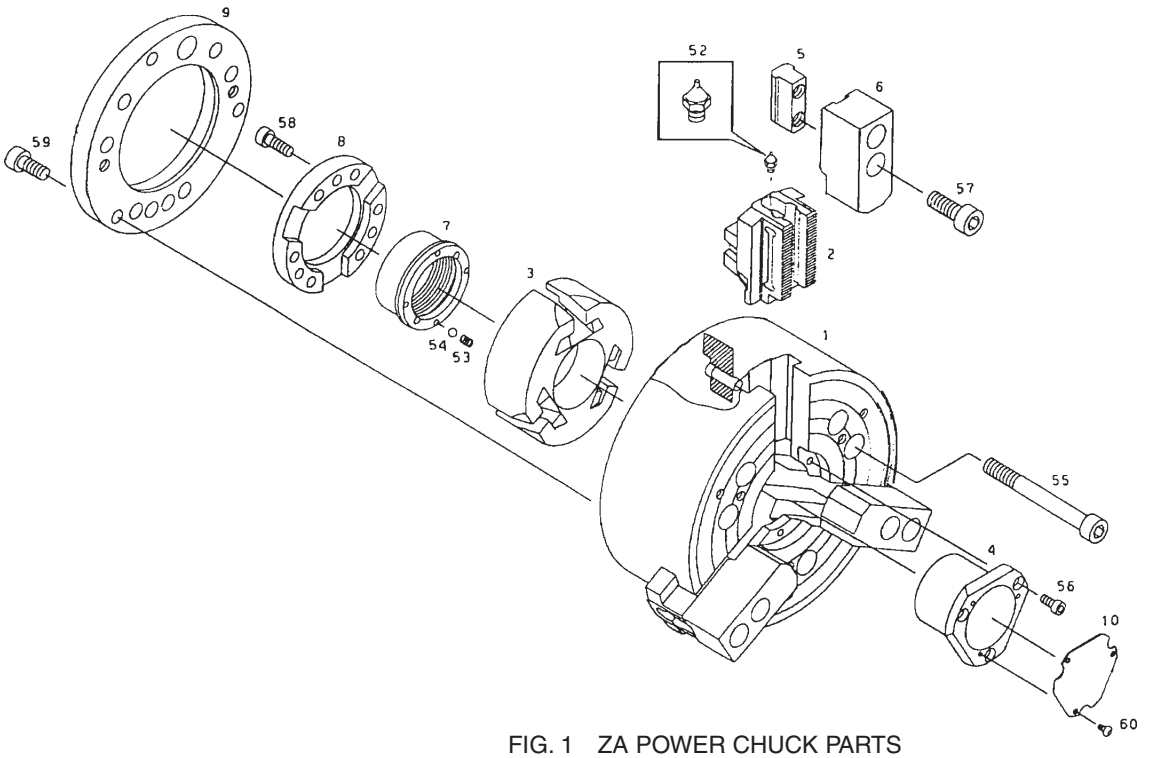


FIG. 1 ZA POWER CHUCK PARTS

TABLE 1. POWER CHUCK PARTS LIST

No.	Part Name	No.	Part Name
1	Chuck Body	52	Grease Fitting
2	Master Jaw	53	Compression Spring
3	Jaw Shifter	54	Steel Ball
4	Cover	55	Chuck Mounting Screw
5	Jaw Nut	56	Cover Screw
6	Soft Jaw	57	Soft Jaw Screw
7	Draw Nut	58	Thrust Plate Screw
8	Thrust Plate	59	Rear Plate Screw
9	Rear Mounting Plate	60	Cover Lid Screw
10	Cover Lid		

5-1 THE TABLE OF SPECIFICATIONS

TABLE 2. THE TABLE OF SPECIFICATIONS BY MODEL

	Chuck Model			Z-4-21	Z-5-34	ZA5-6-46	ZA6-8-52	ZA6-8-66	ZA8-10-66
	Item		Unit	Specification	Specification	Specification	Specification	Specification	Specification
1	Outside Diameter		mm	110	135	165	210	215	254
2	Thickness (Not Incl. Top Jaw)		mm	54	58	90	104	107	123
3	Through Hole Diameter		mm	21	34	46	52	66	66
4	Jaw Stroke (In Diameter)		mm	5.4	5.4	5.8	7.6	7.6	9
5	Shifter Stroke		mm	10	10	13	17	17	20
6	Grip Diameter*	Max.	mm	99	122	148.5	189	193.5	228.6
		Min	mm	3	35.7	24	54	36	24.6
7	Maximum RPM (At Maximum Grip Force).		rpm	7200	7000	6000	5000	4400	4000
8	Maximum Grip Force		kg f	2400	3000	4800	8000	8000	11000
9	Balance Grade		G	16	16	10	10	10	10
10	Weight		kg f	4.1	5.5	13	23.5	25.5	38.5
11	GD2		kg/m^2	0.025	0.048	0.18	0.5	0.59	1.34
12	Maximum Draw Bar Pull		kg f	1210	1500	2250	2750	3100	4350
13	Mounting Bolt Patter Radius		mm	35.3	82.55	104.8	133.35	66.675	85.7
14	Chuck Mounting Bolts			3-M10*50	M10*55	6-M10*90	6-M12*90	6-M12*110	6-M16*125
15	Draw Tube Thread			M25*P1.5	M40*P1.5	M55*P1.5	M60*P1.5	M72*P1.5	M76*P1.5
16	Applied Cylinder			ZKP100/24-10	ZKP100/24-10	ZKP125/46-13	ZKP150/52-17	ZKP150/66-17	ZKP170/6-25

** When gripped with standard jaw*

	Name of Unit			ZA8-10-75	ZA8-12-85	ZA8-12-93B	ZA11-15-120	ZA11-18-120
	Item		Unit	Specification	Specification	Specification	Specification	Specification
1	Outside Diameter		mm	254	305	305	381	457
2	Thickness (Not Incl. Top Jaw)		mm	123	135	124	165	165
3	Through Hole Diameter		mm	75	85	93	120	120
4	Jaw Stroke (In Diameter)		mm	9	9	9	11.3	11.3
5	Shifter Stroke		mm	20	20	20	25	25
6	Grip Diameter*	Max.	mm	228.6	274.5	274.5	342.9	411.3
		Min	mm	26.5	50	43	75	93
7	Maximum RPM (At Maximum Grip Force).		rpm	4000	3200	3000	2500	2000
8	Maximum Grip Force		kg f	11000	14000	14000	18000	18000
9	Balance Grade		G	10	10	10	6.3	6.3
10	Weight		kg f	38.5	70	65	124	180
11	GD2		kg/m^2	1.34	3.25	3	10.11	19.9
12	Maximum Draw Bar Pull		kg f	4350	5100	6100	7000	7000
13	Mounting Bolt Pattern Radius		mm	85.7	85.7	85.7	117.5	117.5
14	Chuck Mounting Bolts			6-M16*125	6-M16*135	6-M16*35	6-M20*170	6-M20*170
15	Draw Tube Thread			M85*P2.0	M93*P2.0	M103*P2.0	M130*P2.0	M130*P2.0
16	Applied Cylinder			ZKP170/75-25	ZKP205/85-25	ZKP195/93-20	ZKP230/120-30	ZKP230/120-30

** When gripped with standard jaw*

5-2 THE RELATION BETWEEN GRIP FORCE AND RPM's

5-2-1 CONCERNING THE GRIP FORCE

The power chuck holds the workpiece with grip force produced with energy from the hydraulic cylinder. Grip force changes due to the centrifugal force of the chuck jaws. The grip force decreases as the spindle RPM's increase. This is shown in FIG. 3, the grip force diagram.

5-2-2 GRIP FORCE MEASUREMENT

(1) The top jaw is "mmk" standard soft jaw.
(2) The supplied grease is "mmk" recommended grease (refer to pg. 25, table 10).
(3) The top jaw mounting bolts should be torqued (refer to pg. 17, table 8).
(4) The draw bar pull is at the maximum allowable.
(5) The hydraulic unit must supply 20 liters/min. to hydraulic actuator for maximum draw bar pull.

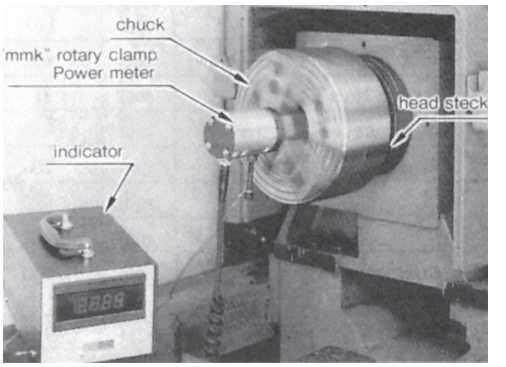


FIG. 2 THE MEASURING WAY OF CLAMPING POWER

(6) The correct way to measure in grip force is shown in FIG. 2.

5-2-3 MAXIMUM CHUCK SPEED (RPM)

(1) RPM is at its maximum when dynamic grip force is reduced to 1/3 of the static grip force. (Centrifugal force of master jaw and top jaw reduced grip force.)
(2) Published data based on Wr of "mmk" standard soft jaw.
(Wr = weight x radius of rotation at jaw center of gravity.)
(3) The draw bar pull is at the maximum for chuck.
* At maximum RPM, the grip force should be larger than the cutting force, and grip force must not reach zero.
(4) The top jaw should not extend beyond the circumstances of the chuck.
(5) The master jaw should be in the middle of the stroke.

WARNING

(1) The grip force varies greatly depending upon the height and weight of the top jaw, and the lubrication of the chuck, master jaws, and jaw shifter.
   a) Gripping at the top of tall top jaws creates a leverage condition in the master jaw ways and reduces the chuck's grip force ability.
   b) Heavy (large) top jaws create higher centrifugal forces as spindle RPM's increase, thereby reducing the chucks and grip force applied.
   c) Insufficient lubrication reduces the chuck's ability to generate grip force.
   *Therefore, it is necessary to check the state of maintenance periodically.
(2) Heavy cutting forces at high spindle RPM's create minimal grip force and workpiece may be thrown from chuck.
(3) Insure that the actuator produces sufficient draw bar pull and the RPM maximum is as great as the chuck.
(4) For I.D. gripping the static grip force should be reduced to 1/3 or less.

* For the measurement of grip force, we recommend “mmk” ROTARY CLAMP METER “SG-60(40)”. Refer to the specifications on page 8, table 3.

ATTENTION

(1) When using a 2 jaw chuck, never operate with the draw bar pull greater than 2/3 of the maximum allowable draw bar pull for the 3 jaw version of the same model chuck.
(2) Do not use the chuck with the top jaws loose.

5-2-4 HOW TO READ THE GRIP FORCE DIAGRAM

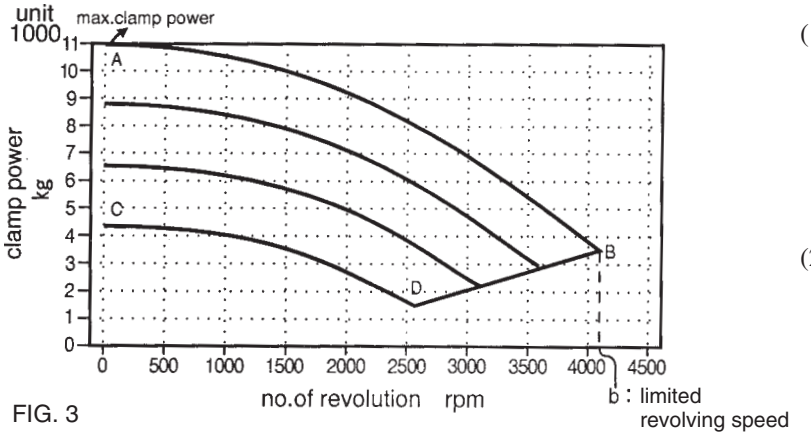


FIG. 3

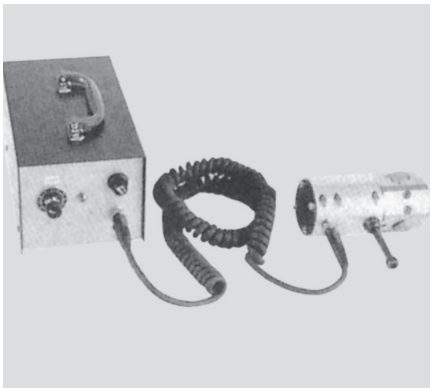
(1) Lines AB & CD are grip force curves.
   a) AB is maximum allowed for chuck.
   b) CD is example selected by user for lighter grip force. (e.g. Thin wall part)
(2) Point A is maximum allowed static grip force. Increasing the RPM it reaches point B, maximum RPM. Note the grip force at this time is 1/3 of the point A value. (1/3 of the static grip force has been set as minimum allowed dynamic grip force.)
(3) Point C shows a lighter static grip force selected by user (e.g. due to thin wall parts). Increasing the RPM it reaches point D, maximum RPM.
(4) Line BD determines maximum RPM for all grip forces selected between points A & C.
(5) Point D must never be zero or less.

REFERENCE

The specifications for “mmk” grip force meter. DG-60(40)

TABLE 2. THE GRIP FORCE METER SPECIFICATIONS

ITEMS		CONTENTS
Rotary Sensor Part	Size	Cylindrical ø60x125mm
	Wt.	1.7 kg
Measuring Part	Size	120x120x225mm
	Wt.	1.6 kg
Electric Source		AC100V±10%50/60Hz 8VA
Temperature Range		0-50˚C
Humidity Range		Below 85% RH(refuse dew)
Measuring Range	Clamp Power	0-12 ton
	Max. allowed RPM	600 RPM



FEATURES

(1) Small size, lightweight
(2) Few adjustments, easier to use
(3) Measures RPM and clamp power at the same time
(4) Bright and easy to read digital display

5-2-5 GRIP FORCE GRAPHS FOR VARIOUS CHUCK MODELS

FIG. 4 Z-4-21

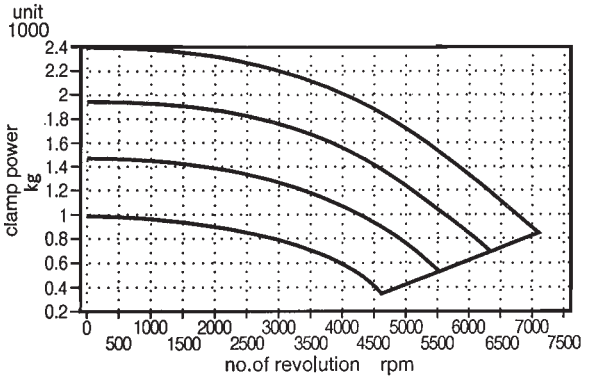


FIG. 5 Z-5-34

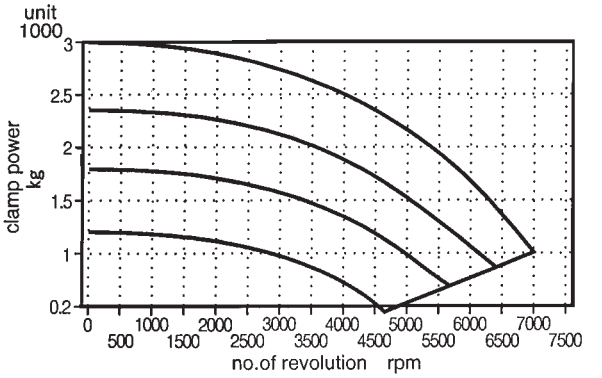


FIG. 6 ZA5-6-46

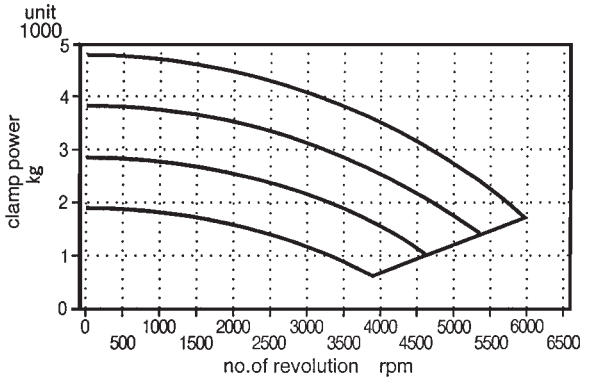


FIG. 7 ZA6-8-52

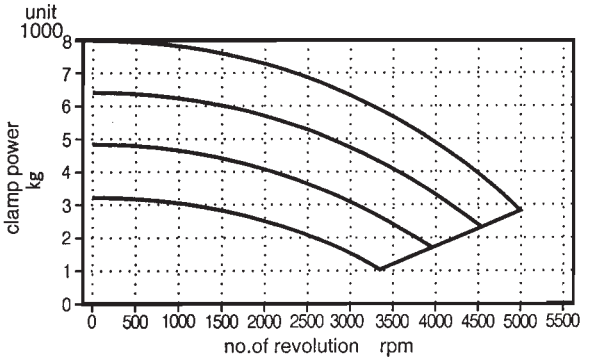


FIG. 8 ZA6-8-66

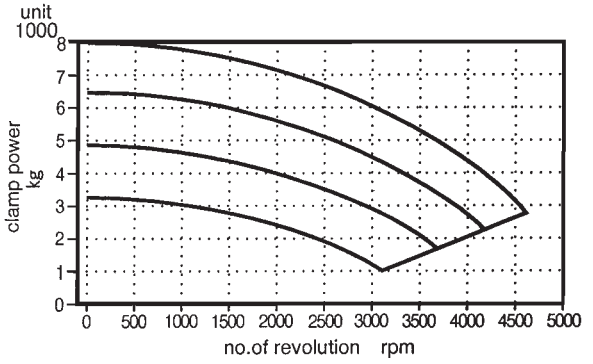


FIG. 9 ZA8-10-66

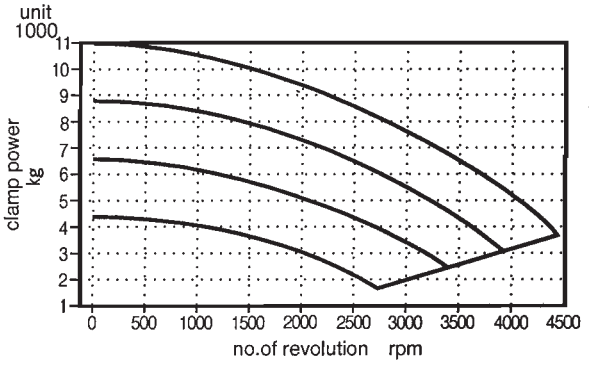


FIG. 10 ZA8-10-75

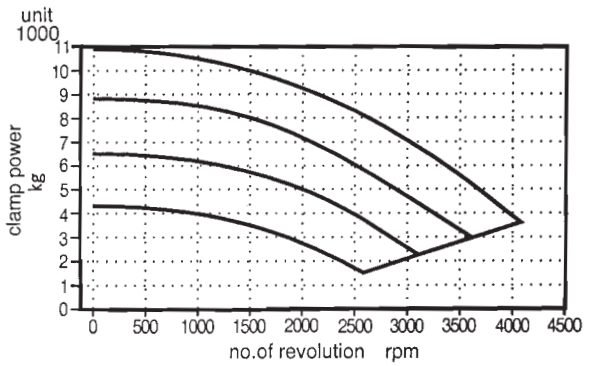


FIG. 11 ZA8-12-85

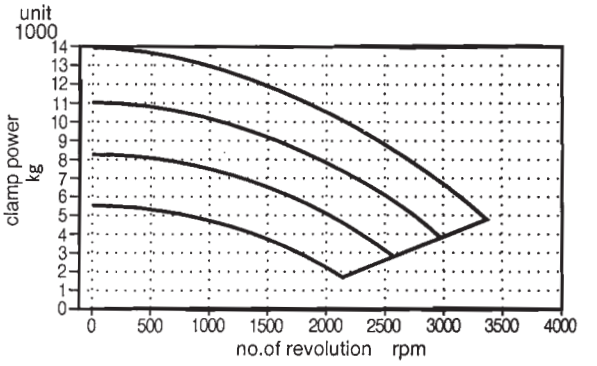


FIG. 12 ZA11-15-120

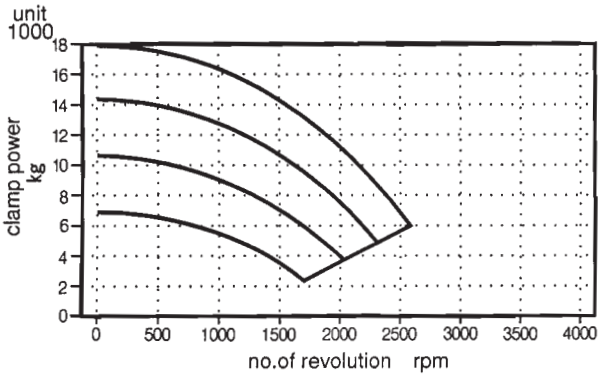


FIG. 13 ZA11-18-120

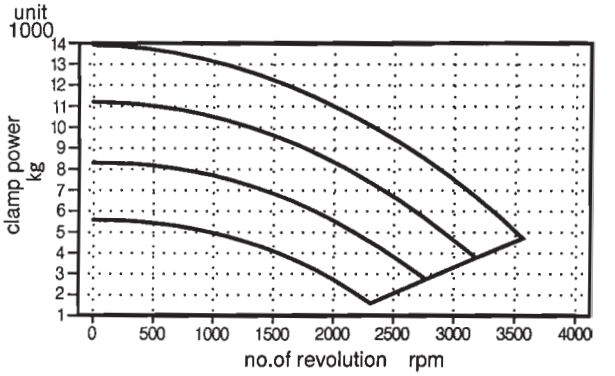
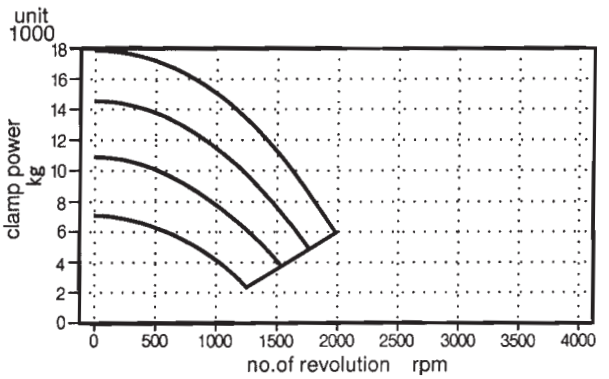


FIG. 14 ZA8-12-93B



5-3 THE RELATION BETWEEN TOP AND LOSS OF GRIP FORCE

With higher spindle RPM's the centrifugal force of the revolving top jaw increases, thus reducing grip force. Therefore, please check closely the conditions of clamping and cutting.

WARNING

When using tall soft top jaws (i.e., taller than standard soft top jaws), cylinder pressure must be reduced to avoid deflection of chuck body at master jaw ways.

Chuck Model	Standard Top Jaw Mass-Moment (3 pcs. in total) mr(kg-mm)	Chuck Model	Standard Top Jaw Mass-Moment (3 pcs. in total) mr(kg-mm)
Z-4-21	17.7	ZA8-10-75	253.8
ZA5-5-34	25.2	ZA8-12-85	465.8
ZA5-6-46	46.8	ZA8-12-93	552.3
ZA6-8-52	119.6	ZA11-15-120	1078.9
ZA6-8-66	124.3	ZA11-18-120	1424.9
ZA8-10-66	275.9		

FIG. 15 Z-4-21

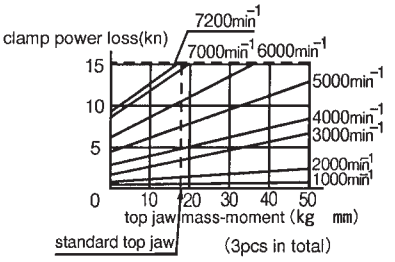


FIG. 16 ZA5-5-34

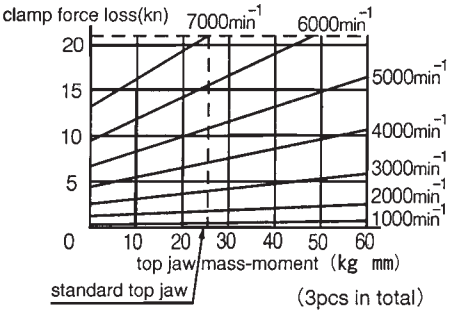


FIG. 17 ZA5-6-46

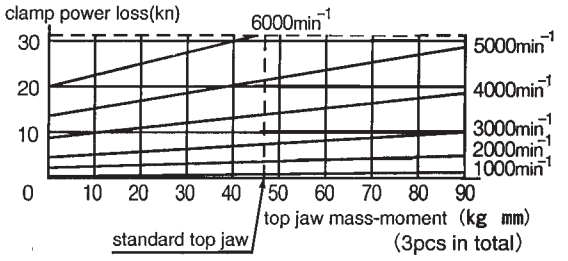


FIG. 18 ZA6-8-52

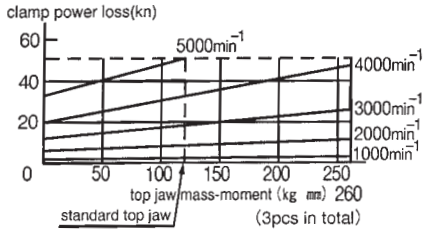


FIG. 19 ZA6-8-66

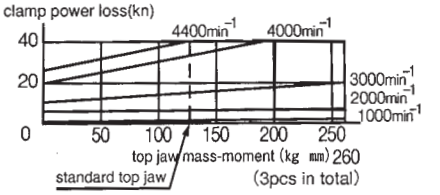


FIG. 20 ZA8-10-66

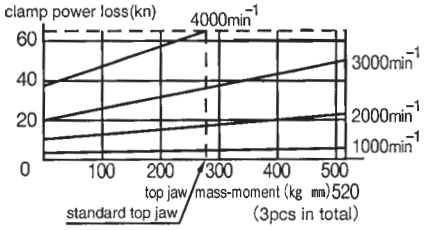


FIG. 21 ZA8-10-75

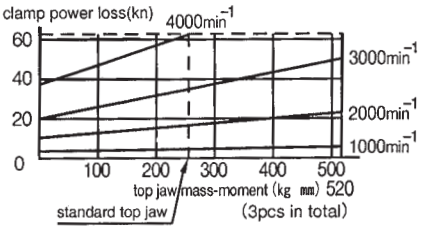


FIG. 22 ZA8-12-93

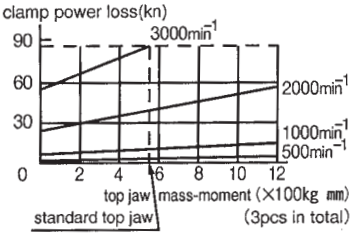


FIG. 23 ZA8-12-85

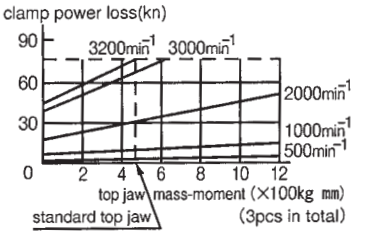


FIG. 24 ZA11-15-120

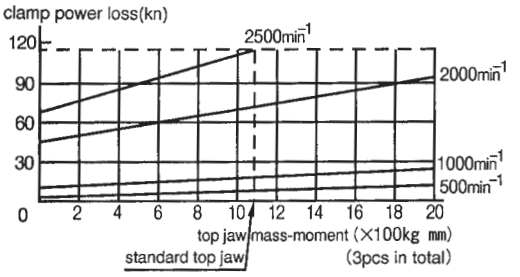
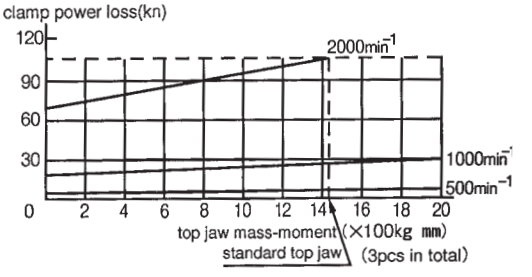


FIG. 25 ZA11-18-120



5-4 THE RELATION BETWEEN WORKPIECE CONTACT POINT AND CYLINDER DRAW BAR FORCE

WARNING

The workpiece grip point must not be higher (from the face of the chuck) than that of the standard top jaw height. If it must be set in a higher position, reduce the cylinder draw bar force in inverse proportion to the height of the clamping position. Operating without reducing the cylinder draw bar force may cause the workpiece to be thrown.

TABLE 5. TOP JAW HEIGHT OF CHUCK MODELS
(Note: Hydraulic pressures are only for "MMK" hydraulic actuator models shown. Other models and other manufacturer actuators will generate different draw bar forces.)

Chuck Model	Standard Height of Top Jaw H(mm)
Z-4-21	32
ZA5-5-34	32
ZA5-6-46	32
ZA6-8-52	42
ZA6-8-66	42
ZA8-10-66	50

FIG. 26 Z-4-21

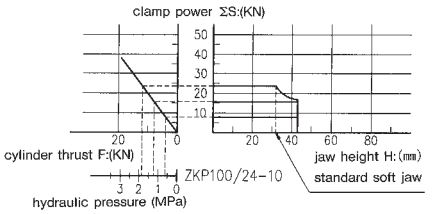


FIG. 27 ZA5-5-34

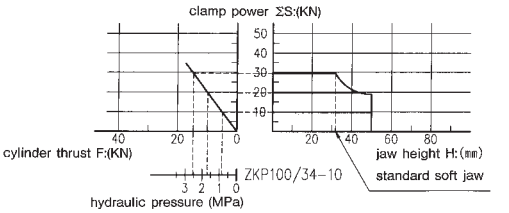


FIG. 28 ZA5-6-46

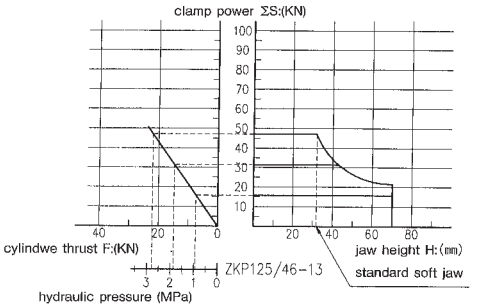


FIG. 29 ZA6-8-52

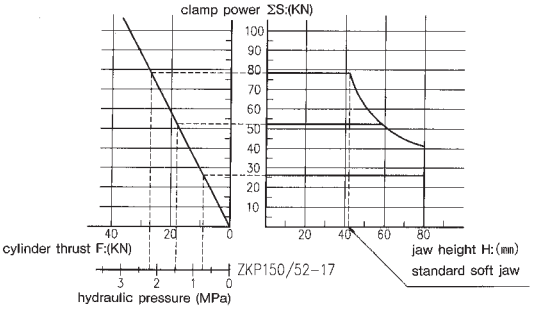


FIG. 30 ZA6-8-66

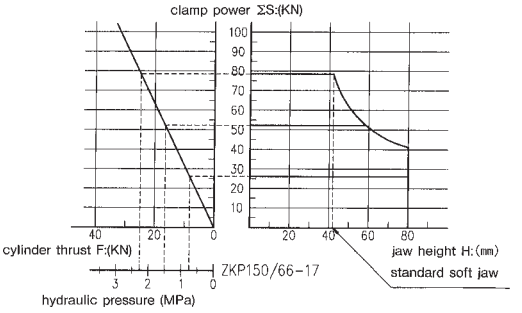


FIG. 31 ZA8-10-66

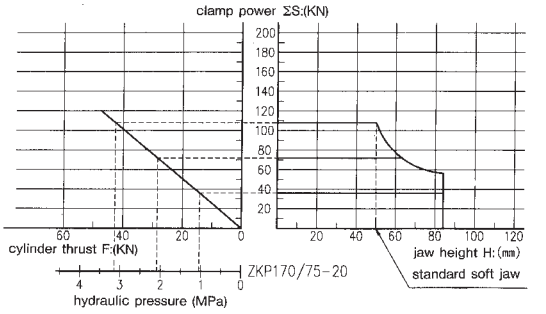


FIG. 32 ZA8-10-75

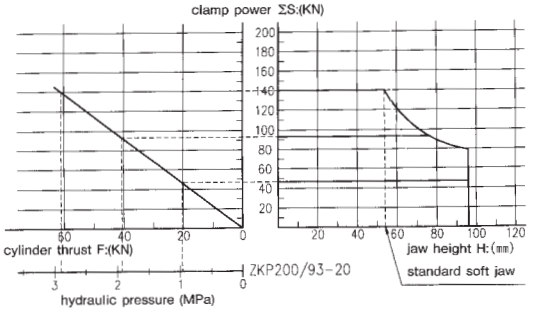


FIG. 33 WORK CLAMP REFERING FIGURE.

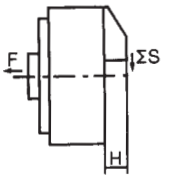


FIG. 34 ZA8-12-85

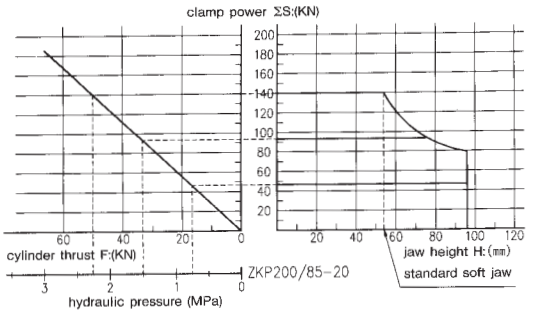


FIG. 35 ZA8-12-93

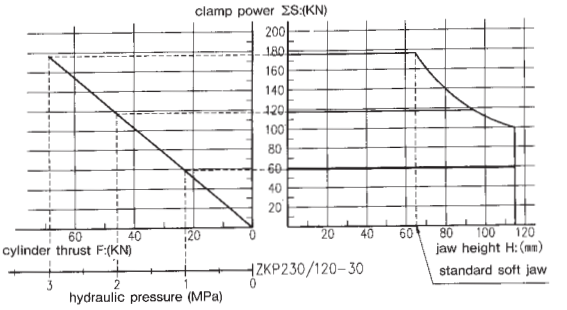
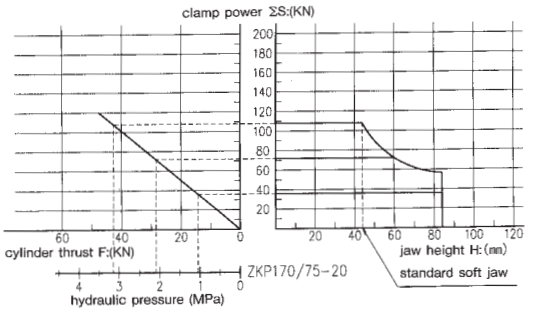


FIG. 36 ZA11-15-120
ZA11-18-120



5-5 ALLOWABLE WORKPIECE WEIGHT

SEE TABLE 6.
The allowable chuck clamp weightWkg. should be referred to on Table 6.

FIG. 37 CHUCK CLAMP REFERENCE FIGURE

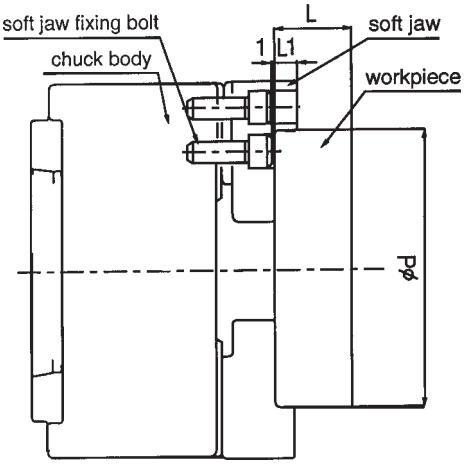


TABLE 6. MAXIMUM CLAMPING WEIGHT TABLE

Type Name	Max. Grip Dia. dmm	Jaw Grip Length Llmm	Max. Workpiece Wt. Wkg
ZA5-6-46	165	11	16.4
ZA6-8-52	210	12	28.9
ZA8-10-75	254	14	49.4
ZA8-12-93	305	18	91.5
ZA11-15-120	381	22	174.5
ZA11-18-120	457	22	251.1

6 INSTALLING THE CHUCK

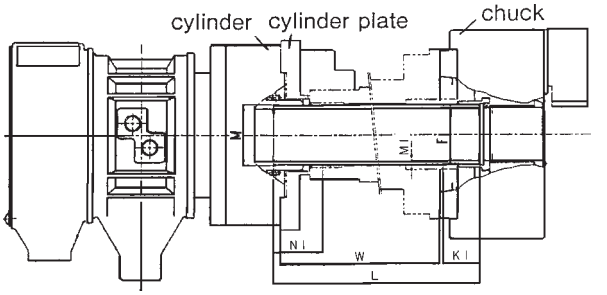
6-1 OPENING THE CRATE AND INSTALLATION PREPARATIONS

(1) Remove the products from the crate carefully and check the accessories.
(2) Wipe off the rust proof oil and clean the unit. At this time, be careful not to allow things such as dust, cutting chips, water and so on to enter into the power chuck and hydraulic cylinder.
(3) Be careful not to nick or dent the steel. The special alloy steel is ground after heat treatment, then finished before assembly.
(4) The environment with the least amount of dust and best available ventilation should be used for opening the crate.

6-2 MANUFACTURE OF DRAW TUBE

Manufacture the draw tube as the following size table.

FIG. 38 DRAWING OF MANUFACTURE OF DRAW TUBE



WARNING

The draw tube thickness must remain constant. Variations in thickness could cause loss of grip force and the workpiece could possibly be thrown.

ATTENTION

(1) A loose draw tube nut may cause vibration and reduce the grip force.
(2) Draw tube O.D. should be same or greater than the thread diameter of the nut. To assure the strength of the tube, use material having the tensile strength which exceeds 380 MPa (39kg f/mm^2).
(3) The concentricity of the draw tube and threads should be 0.05mm or less.

6-3 INSTALLING THE CHUCK TO THE SPINDLE

(1) Remove the soft jaws.
(2) Remove cover lid to gain access to draw nut.
(3) If necessary remove cover to gain access to draw nut wrench slots. (There are models which allow for the removal of the cover and cover lid at the same time.)
(4) Check to confirm that there is neither rust nor any nicks on the spindle and chuck mounting surface. If any are found, they must be repaired.
(5) Lower the cylinder pressure below 5 kg/cm2 (as low as possible) and move the draw tube forward. The draw tube should be in the most forward position.

CAUTION Please follow the cylinder operation manual.

(6) Lift the chuck with the eyebolt and align the center of the chuck with the spindle. Rotate the spindle to align with the drive button hole.
(7) Do not allow grease on the threads of the draw tube or chuck draw nut.
(8) Engage the draw tube with the chuck draw nut. Use the "T" handle draw nut wrench (from accessory package) and turn draw nut clockwise until it fully engages the draw tube thread.

WARNING Inadequate length thread engagement may cause threads to strip or break. This reduces grip force suddenly and may throw the workpiece.

(9) Apply and torque the chuck mounting bolts, then remove the lifting eyebolts.
(10) The chuck mounting bolts should be screwed in evenly. (Unequal torque causes vibration of the chuck.) The mounting bolts should be torqued to the standard torque specification.

WARNING

(1) The mounting bolts should have sufficient strength and be torqued to the standard torque specification.
(2) The top jaw mounting bolts should be installed with the standard torque. Too little or excessive screw torque causes loosening of bolts or chuck damage. It may also cause the workpiece to be thrown. Please refer to the screw torque table.

TABLE 8. CLAMP TORQUE TABLE

Bolt Size	Clamp Torque N-m (kg f-m)	Bolt Size	Clamp Torque N-m (kg f-m)
M8	38.2(3.90)	M14	171.0(17.40)
M10	72.2(7.40)	M16	226.0(23.00)
M12	107.0(10.90)	M20	402.0(44.00)

(11) As in ITEM 8, insert the mounting wrench and turn clockwise to fully engage (bottom).
(12) Cycle the chuck (i.e., open and close), confirming that the chuck is running smoothly. Then stop it at the full open position. (Master jaws have reached the circumference of the chuck.)

ATTENTION	Careless operation of the hydraulic or pneumatic pressure circuit during the chuck mounting operation may result in personal harm.

(13) Insert the mounting wrench and turn the screw counter clockwise, thus assuring the clearance between the chuck body and shifter be zero. From this position, turn 1/3 to 2/3 revolutions to create a clearance of about 0.5mm. Turn wrench gather direction to the nearest rotary stop (click).
(14) Mount the lid. Confirm that the master jaw and lid do not interfere with each other.
(15) Mount the lid cover.
(16) After completing the installation, the eyebolt must be removed.

WARNING	Remove the eyebolt.

7-1 TRIAL RUNNING

After installing the chuck, please confirm the following point proceeding with the trial run.

(1) Did any of the mounting screws loosen?
(2) Is the chuck lubricated sufficiently?
(3) Is the actuator unit stroke (push-pull) correct with the chuck open-close?
(4) Is the hydraulic pressure adjusted to below 5 kg/cm2?
(5) Is the spindle set in low speed?
(6) After confirming the points above, stroke to actuator 2 or 3 times (i.e., open and close chuck).
(7) Slowly increase the hydraulic pressure to maximum recommended. Check for oil leakage and other disorders.
(8) Check the movement of the chuck jaws.
(9) Start the spindle at slow RPM setting.
(10) Slowly increase the RPM of the spindle and confirm whether or not any disorder exists. After confirming the points above and you have not found any trouble, proceed with further operation.

WARNING

* When insufficient balancing exists, the vibration may cause dangerous conditions resulting in bodily harm and machine damage, dangerous accidents may occur.

8-1 MOUNTING THE SOFT JAW

8-1-1 The top jaw to the chuck. Prior to doing so, clean the surfaces on the master jaw, top jaw and T-nut.

8-1-2 Locate the top jaw appropriate to the diameter of the workpiece and engage the serrations.

WARNING

(1) Locating the top jaw so that any portion of it extends beyond the circumference of the chuck body may cause the master jaw or T-nut to crack and break. This becomes very dangerous during operation.
(2) Locate top jaw so that the master jaw is in approximate mid-stroke when workpiece is gripped.

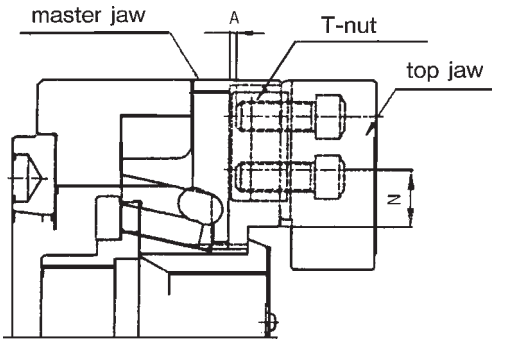
8-1-3 After locating the top jaw, assemble the T-nut and tighten the screws. Torque should conform to TABLE 8.

WARNING

(1) Do not start the spindle when T-nut screws are loose! The top jaw may be thrown.
(2) Torque screws to standard torque specifications. If torque is less than that recommended in TABLE 8, the top jaw of workpiece may be thrown. If torque is too high, the jaw becomes deformed, causing breakage of top jaw or workpiece.

8-1-4 Two mounting screws are used per top jaw, and the engagement depth into T-nut is within 2mm of the bottom surface, out from the bottom surface of the T-nut. Assure that the screw does not protrude.

FIG. 39 TOP JAW MOUNTING FIGURE



WARNING

(1) If the top jaw is mounted with only one screw, both the top jaw and the screw are in danger of breaking. The shallow screw depth of the T-nut causes it to break. Also, when the screw is protruding out from the bottom surface of the T-nut, the top jaw cannot be secure even if you torque the bolt. Failing to torque both screws will cause the top jaw or workpiece to be thrown during machining operation due to the irregular shapes of parts such as castings and torquings, the gripping may vary.

(2) When gripping the workpiece near the end of the jaw stroke, insufficient gripping power may throw the workpiece.

8-2 THE BORING OF SOFT JAWS

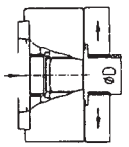
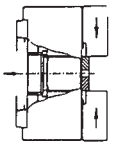
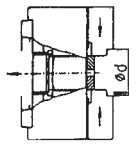
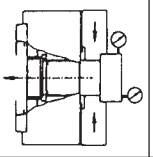
8-2-1 Proper selection of top jaw location and serration is important for accuracy of chuck performance.

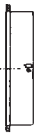
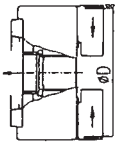
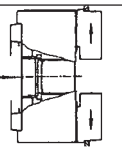
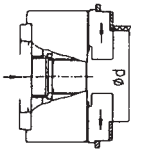
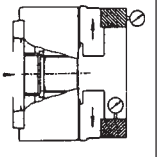
8-2-2 Clamping at midpoint of jaw stroke is important for chuck performance. The internal mechanism is most stable and greatest bearing surface for highest gripping force.

8-2-3 PROCEDURE FOR BORING TOP JAWS

Refer to TABLE 9. THE PROCEDURE FOR SOFT JAW BORING (pg. 22)

TABLE 9. THE PROCEDURE OF SOFT JAW FORMATION

The Case of Outside Diameter Clamp		
1		Prepare the plug for formation.
2		Operating the solenoid valve, open the master jaw in max.
3		Forming the part of OD (clamping position of plug formation).
4		Clamp the plug in the part of OD.
	CAUTION	When clamping the plug and ring, be careful not to get fingers caught in it.
5		While clamping the plug, form the workpiece clamping part. The machining accuracy is H7 and roughness is 6s.
6		The settled pressure in forming is approximately the same as machining the workpiece in forming.
7		After forming, clamp the workpiece and confirm the jaw stroke.
8		After trial cutting, confirm the machining accuracy.
9		The fitting of clamping surface should be clamped as in two (2) positions on the outer diameter and face end.

The Case of Outside Diameter Clamp		
1		Prepare the ring for formation.
2		Operating the solenoid valve, close the master jaw in min.
3		Forming the part of OD (clamping position of ring formation).
4		Clamp the formation ring in the part of OD. Be careful not to drop this ring.
5		While clamping the ring, form the workpiece clamping part. The machining accuracy is H7 and roughness is 6s.
6		The settled pressure in forming is approximately the same as machining the workpiece in forming.
7		After forming, clamp the workpiece and confirm the jaw stroke.
8		After trial cutting, confirm the machining accuracy.
9		The fitting of clamping surface should be clamped as in two (2) positions on the outer diameter and face end.

9 THE PRECAUTIONS OF DAILY RUNNING OPERATION

After you have finished fixing the top jaw, and prior to real operation, please read these articles and enforce them strictly during daily operation. We take no responsibility for any accidents caused by disobeying these directions.

(1) In cold regions or in the winter season, rotate the spindle in low speed as you proceed with warming up.
(2) In the morning, prior to starting operation, feed oil into the cylinder. Also, repeat the changing motion 2 or 3 times and lubricate the bearings in the hydraulic cylinder. (It is necessary to proceed with these steps before starting up the spindle revolution.)

WARNING

Prior to operation, confirm that the necessary pneumatic or hydraulic pressure is supplied to the cylinder.

(3) Change the pressure setting in accordance with the workpiece shape and cutting conditions. Clamping of thin shaped parts which cause a high pressure setting may deform the workpiece.
(4) The T-nut used for fixing the soft jaw of the power chuck should be set to avoid breaking away from the master jaws.
(5) High speed running of the chuck reduces clamp power. Therefore, please refer to article 5-2-5 and the clamp power diagram (pgs. 9, 10), and safely activate the cutting operation.
(6) When the machine rests for a long period of time, remove the workpiece from the chuck.

WARNING

Leaving the workpiece in a clamped state may result in it falling and damaging the machine.

9-1 THE PRECAUTIONS FOR USAGE

WARNING

(1) Grip force will change in response to a change in soft jaw.
(2) Do not use heavier soft jaw than standard jaw.
(3) In the case of an unbalanced workpiece, as the centrifugal force caused by eccentricity of mass activates to the jaw, operate in low speed.
(4) Using another maker's soft jaw is dangerous because it results in innaccuracy. Due to master jaw deformation by bad engagement or lack of clamp power, the workpiece will be thrown.
(5) Do not use a top jaw which has a different serration than the master jaw.
(6) Prior to operation, confirm that the top jaw and locator do not interfere with each other in low speed revolution. Interference causes the two to collide with each other, which may lead to breakage.

9-2 THE PRECAUTIONS FOR OPERATION

WARNING

(1) Unless the protective cover has been placed over the machine completely, breakup of the workpiece can cause injury.
(2) If the back end surface of the workpiece is apart from the locator end surface of the chuck, the revolving center of the workpiece inclines to the revolving center of the chuck, the wrought material having gate or burr pushes out, or the depth of cut comes over the intended value, the workpiece will be thrown.
(3) You must build up the safety cover or barricade so that no one can ever reach around the revolving part.

ATTENTION

Jigs and locators should be fixed with bolts strong enough to protect against breakage due to the centrifugal force.

10-1 MAINTENANCE AND INSPECTION, CLEANING

The main cause of a decrease in chuck life is insufficient lubrication. The chuck should be lubricated with the pressure durable grease from the grease nipples on each master jaw. It should be applied every 8 hours. When using the water soluble cutting oil, increase the number of supply times. The recommended grease is as follows.

TABLE 10. THE RECOMMENDED GREASE TABLE

KYODO SEKIYU	RESONIC M1
SHELL OIL	LETINACS AM
THREE BOND	THREE BOND 1901
NOK CLEWVER	ARTENP Q NB50

For others, we recommend GREASE in LITHIUM SYSTEM containing 5% DISULPHIDE MOLIBDENUM.

WARNING

(1) In order to use the chuck in its best condition for a long period, it is important to supply the lubricating oil. Insufficient lubrication causes disorder, reduction of clamp power, extraordinary wear and seizure, and so on. These factors lead to the reduction of clamp power and cause the workpiece to be thrown.
(2) Using inadequate oil not only brings about rapid wear and lack of clamp power, but also throws the workpiece during cutting operation.

10-1-2 The chuck should be taken apart and cleaned once every half year. The abstract of break up and assembly is described in the following. At the same time, inspect the disorders of other parts.

ATTENTION

The chuck should be taken apart and cleaned once every half a year. (For casting parts, once every 2 months.)

10-1-3 The accumulated cutting chips, dust on the jaw fixed in groove, and serration should be removed and cleaned properly.

10-1-4 Accumulated chips and so on cause trouble of movement for the hollow type power chuck and cylinder. They must be cleaned thoroughly.

10-1-5 At the completion of operation, clean the chuck surface thoroughly.

WARNING

Accumulated chips inside the chuck reduce clamp power and produce lack of jaw stroke. This causes the workpiece to be thrown.

10-2 MAINTENANCE (ABSTRACT OF BREAK-UP & ASSEMBLY)

10-2-1 Remove the chuck from the machine spindle.

10-2-2 Take apart the chuck. (Refer to the construction figure and parts list table on pg. 6).

(1) Take off bolt 59.
(2) Take off rear plate 9. Utilizing two taps for the jack, record the rear plate fixed position. (There are drive pin holes in the rear of the third jaw.)
(3) Take off safety pin 11, utilizing the tap in the rear side of the chuck.
(4) Draw off receive plate 8, draw screw 7 and shifter 3 at once, holding the draw screw.
(5) Take off bolt 58. Be careful not to lose steel ball 54, or compression coil spring 53 between the draw screw and shifter.
(6) Take out the master jaw.

As above, the break-up is complete.

10-2-3 Assembly of the chuck.

(1) Fix the master jaw. Match the jaw number on the chuck body with the jaw number on the master jaw.
(2) Coat with grease the outside of the draw screw which contacts the receive plate.
(3) Assemble the receive plate with the draw screw.
(4) Put the compression coil spring and steel ball into the shifter, and fix the draw screw with the receive plate as covering.
(5) Screw up bolt 58.
(6) After screwing up the bolts, confirm that the draw screw could be easily turned by hand. At the same time, confirm that the ratchet stop actuates with the action of the steel ball, with the sound of “click, click”.
(7) Put the shifter into chuck body 1. As “1” is marked in front of the shifter, fix this groove with the first master jaw. Sufficiently coat grease around the shifter.
(8) Drive in the safety pin.
(9) Be careful of the direction of the rear plate fixing.
(10) Fix bolt 59.

As above, the assembly is complete.

11-1 THE CAUSES OF DISORDER AND TROUBLE AND THEIR COUNTER MEASURE TABLE

TABLE 11. DISORDER, TROUBLE CAUSES COUNTER MEASURE TABLE

Disorder Phenomena	Causes	Counter Measure
Insufficiency of stroke	Contains too much cutting chips. Loosening of draw tube.	Break up and clean. Take out the draw tube and reclamp.
Master jaw motion is slow or it does not move.	Seizure on sliding surface of master jaw.	Supply oil, break up and repair, or exchange parts.
Slippage of clamped workpiece.	Lack of master jaw stroke.	When clamping the workpiece, set the master jaw in the middle of the stroke.
	Lack of clamp force.	Confirm that the settled oil pressure is correct.
	Formed diameter of top jaw does not match the workpiece diameter.	Following the correct method, reform the cut again.
	Too much cutting force.	Following specifications, check the cutting conditions.
	Lubrication on the master jaw sliding surface has dried up.	Supply oil and actuate open and close motion.
	Revolution is too high.	Slow down the revolution until you get the suitable clamp power.
Inaccuracy.	Run out of circumference of chuck.	Confirm run out of circumference and face end reclamp.
	Fixed dusts on the jaw serration part.	Cleaning.
	Insufficient clamp of top jaw fixing bolts.	Reclamp with regular torque.
	Incorrect forming of top jaw.	Check that the forming plug is parallel to the chuck end face. Confirm oil pressure at forming time, and surface roughness of formed part.
	Top jaw height is too high and the top jaw bolts are deformed or elongated.	Lower the top jaw height.
	Over clamp force, deformed the workpiece.	Slow down clamp force and check cutting conditions.

THE HYDRAULIC POWER CHUCK ACCESSORIES

	NAME		
1	Rotary Table	1	
2	Standard Soft Jaw	3	
3	Soft Jaw Fixing T-Nut	3	} set with chuck body
4	Soft Jaw Fixing Bolt	6	
5	Chuck Fixing Bolt	6	
6	Wrench with Hexagonal Hole for Chuck Fixing Bolt and Soft Jaw Fixing Bolt	} each 1	

MEMO

MEMO

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