Welcome!

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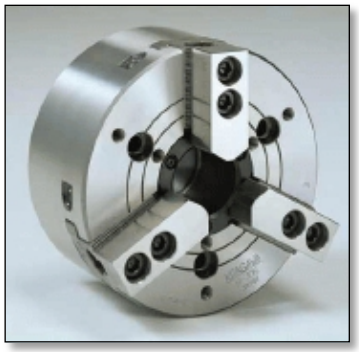
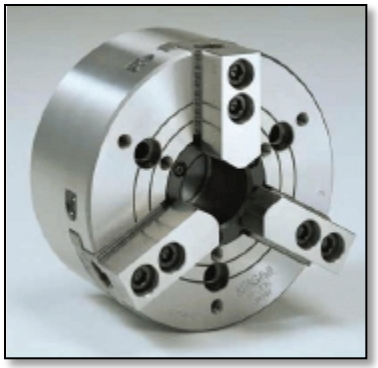
REDEFINING PRODUCTIVITY™

Chucks 101



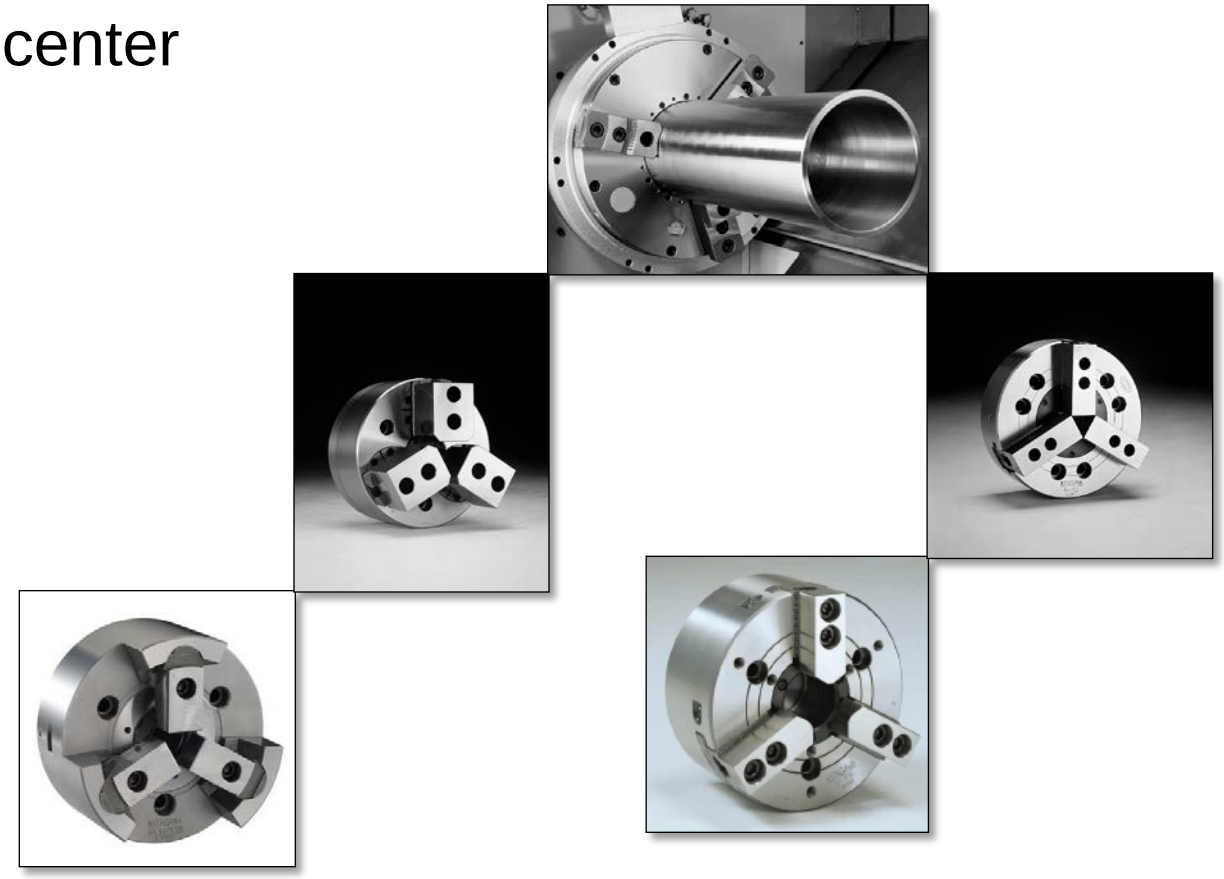

Agenda

- Types of Chucks
- Spindle Data Sheet
- Grip Force
- Maintenance



Types of Chucks

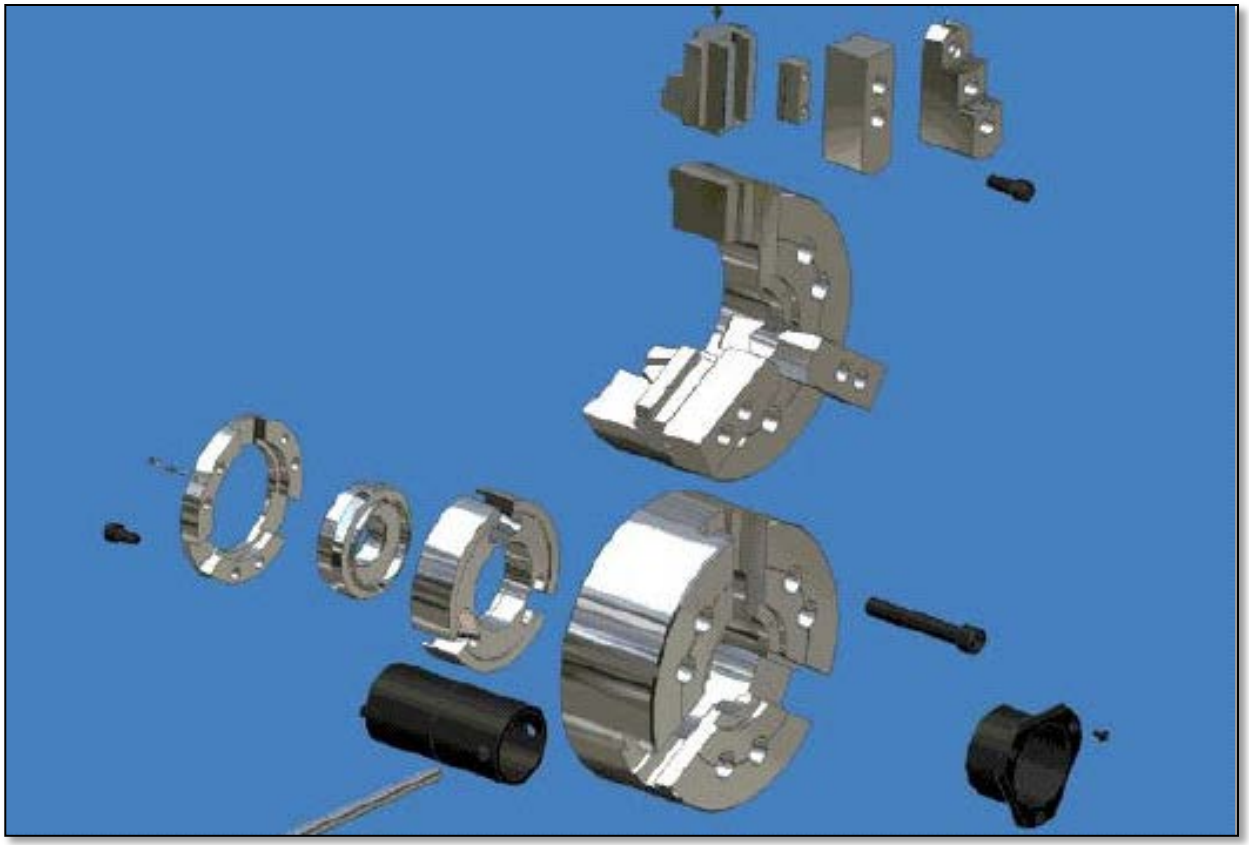
- Thru-hole style
- Closed center
- Wedge
- Lever



Through Hole

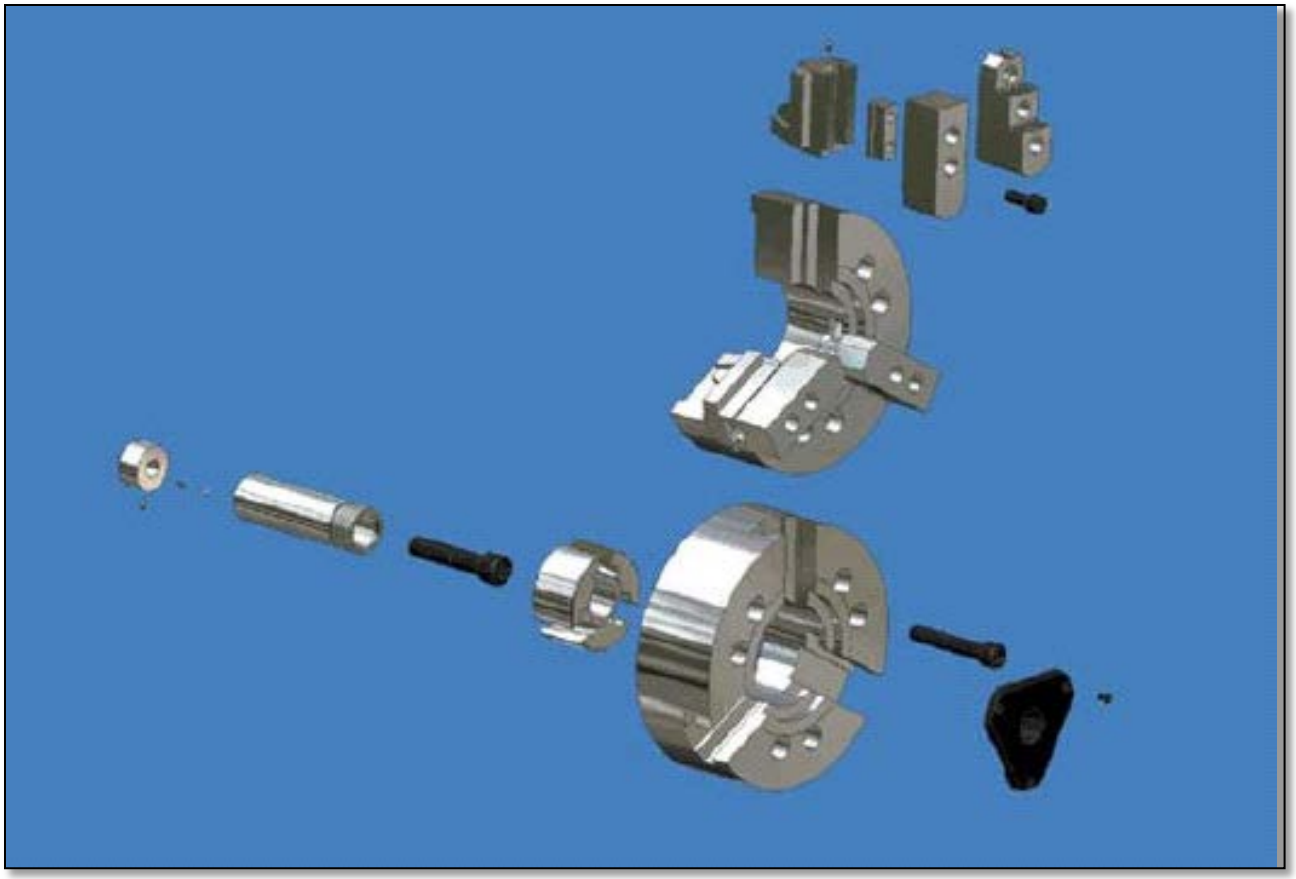
- Bar feed
- Chucker work
- Accurate
- Durable
- High speed

- High grip force
- Wide range of application
- Most common
- Body is high grade alloy steal
- All-wear surfaces are hardened and ground

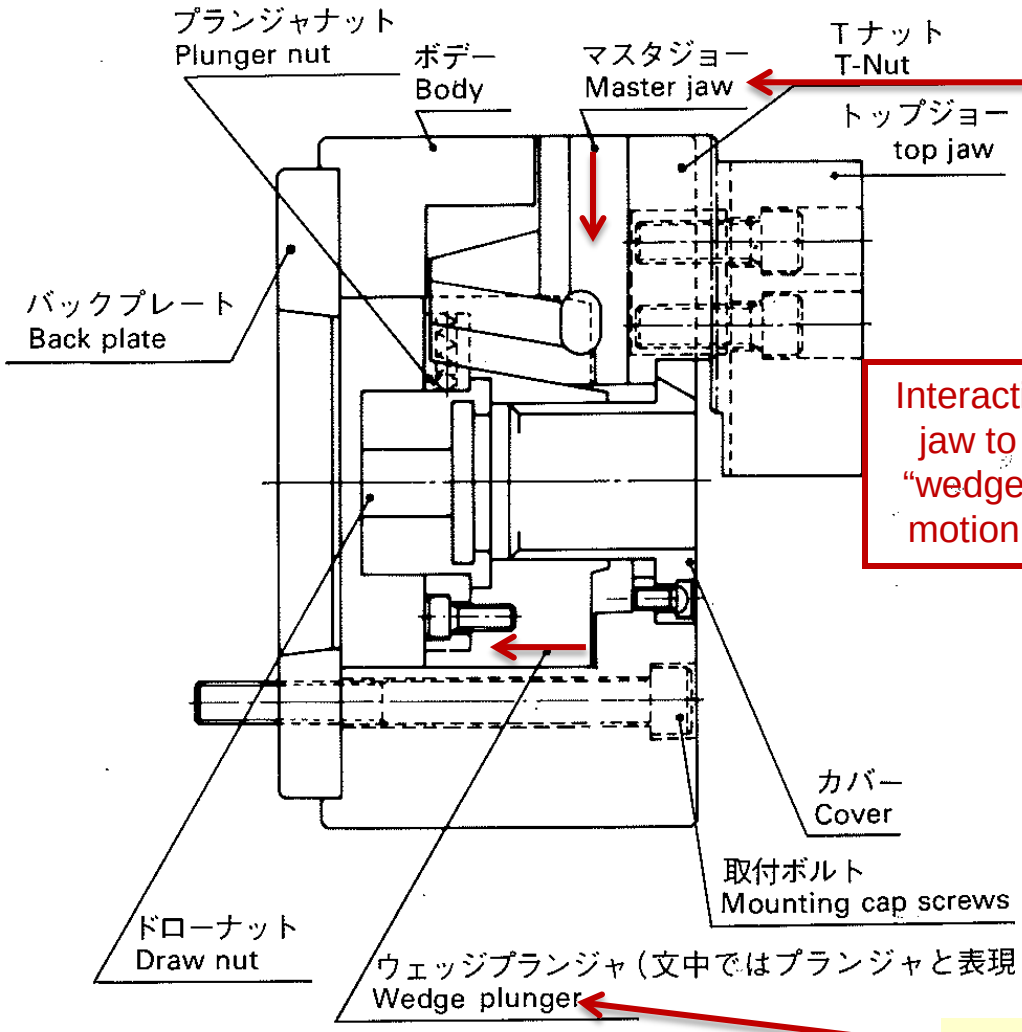


Closed Center Style

- Accurate
- Durable
- High speed
- High grip force
- Wide range of application
- Body is high grade alloy steal
- All-wear surfaces are hardened and ground



Wedge Style

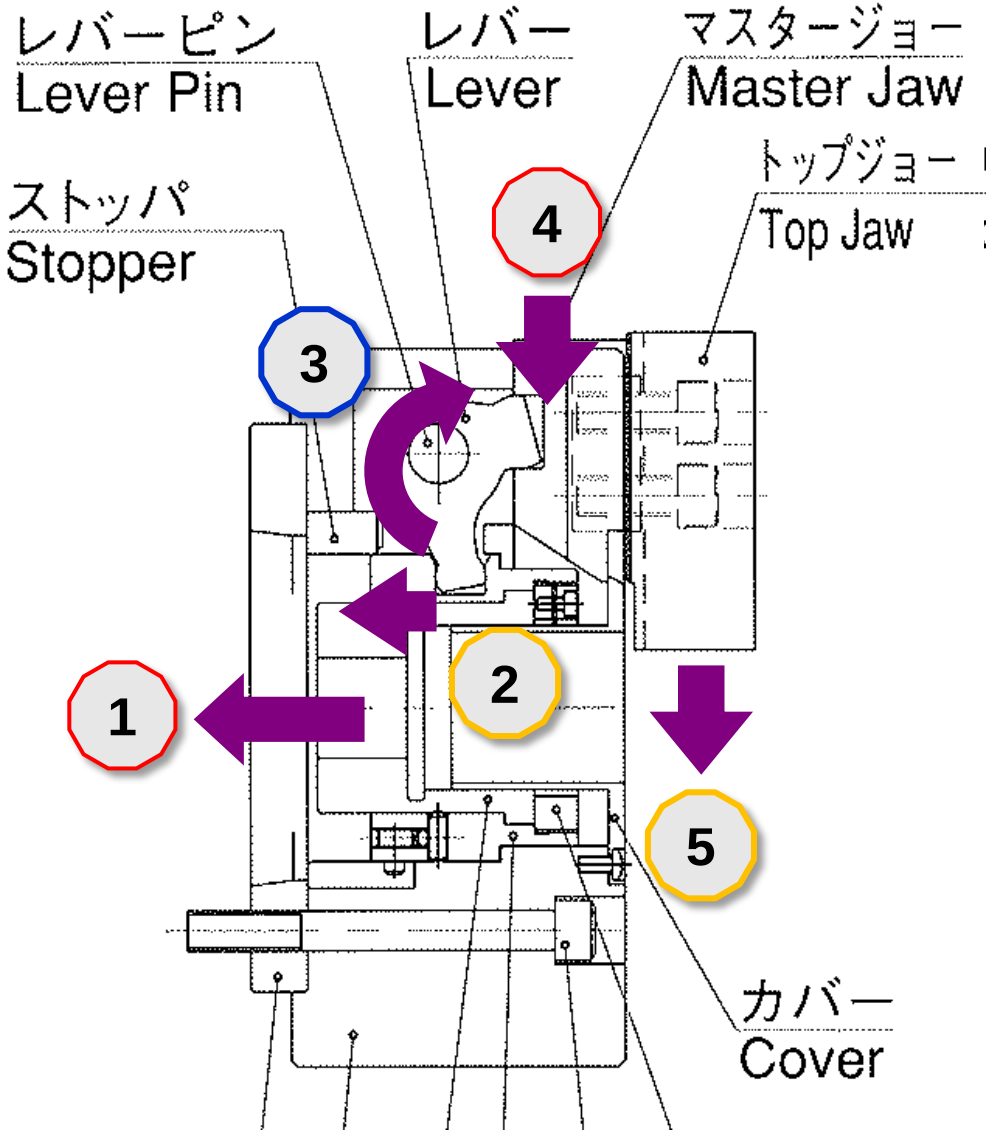


Master Jaws

Interaction between angle on master jaw to angle on wedge plunger. 2 “wedge” surfaces interacting to give motion and mechanical advantage.

Wedge Plunger

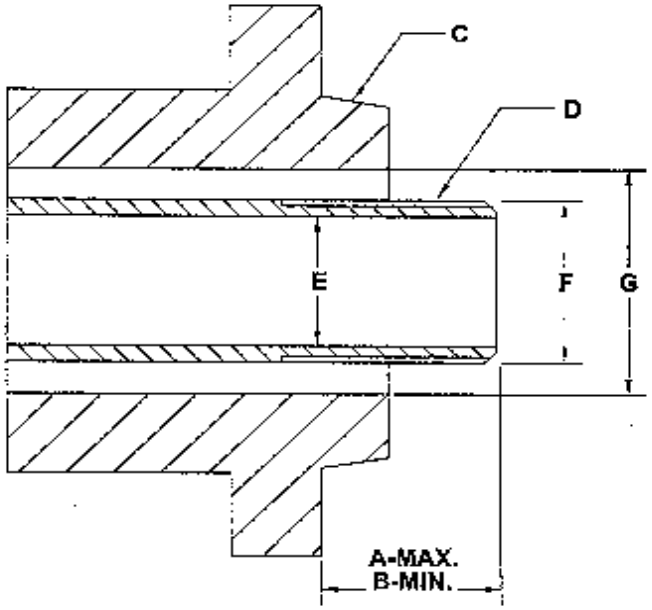
Lever Style


レバーピン
Lever Pin
レバー
Lever
マスタージョー
Master Jaw
トップジョー
Top Jaw
ストッパ
Stopper
4
3
2
1
5
カバー
Cover

Spindle Data Sheet

KITAGAWA

Data Required To Machine Draw Tube Adapter



Machine:
MAKE _____
MODEL _____

Chuck:
MAKE _____
MODEL _____

Actuator:
MAKE _____
MODEL _____

A-MAX. (TUBE EXTENDED)
_____

B-MIN. (TUBE RETRACTED)
_____

C- SPINDLE TYPE AND SIZE
_____

D- DRAW TUBE THREAD DATA
1 - DIAMETER OF THREAD
_____
2 - PITCH _____
3 - INTERNAL OR EXTERNAL
_____
4 - LENGTH OF THREAD
_____

E- DRAW TUBE I.D. _____
F- DRAW TUBE O.D. _____
G- SPINDLE I.D. _____

Spindle Data Sheet – Why?

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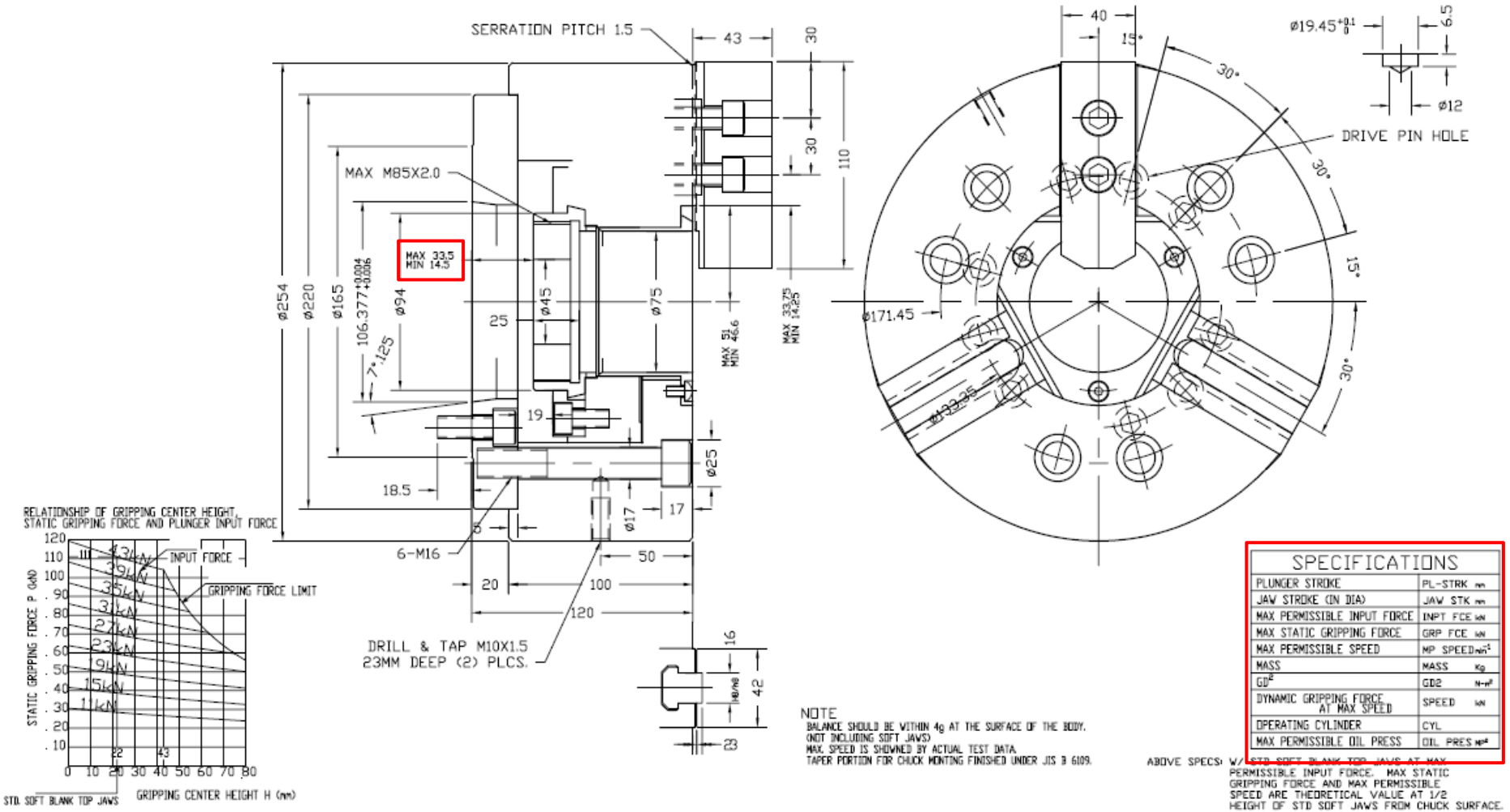


SPECIFICATIONS	
PLUNGER STROKE	PL-STRK mm
JAW STROKE (IN DIA)	JAW STK mm
MAX PERMISSIBLE INPUT FORCE	INPT FCE kN
MAX STATIC GRIPPING FORCE	GRP FCE kN
MAX PERMISSIBLE SPEED	MP SPEED min⁻¹
MASS	MASS kg
GD²	GD2 N-m²
DYNAMIC GRIPPING FORCE AT MAX SPEED	SPEED kN
OPERATING CYLINDER	CYL
MAX PERMISSIBLE OIL PRESS	OIL PRES MPa

NOTE
BALANCE SHOULD BE WITHIN 4g AT THE SURFACE OF THE BODY.
(NOT INCLUDING SOFT JAWS)
MAX. SPEED IS SHOWNED BY ACTUAL TEST DATA.
TAPER PORTION FOR CHUCK MONTING FINISHED UNDER JIS B 6109.

ABOVE SPECS: W/ STD SOFT BLANK TOP JAWS AT MAX. PERMISSIBLE INPUT FORCE. MAX STATIC GRIPPING FORCE AND MAX PERMISSIBLE SPEED ARE THEORETICAL VALUE AT 1/2 HEIGHT OF STD SOFT JAWS FROM CHUCK SURFACE.

UNLESS SPECIFIED ALL THREADS FOR DRAW BAR CLASS 6G
ALL OTHER THREADS UNLESS SPECIFIED CLASS 4H

GENERAL TOLERANCE (W/O INDICATION)			
DIMENSION	CASTG OF CASTING	SHT MTL WORKG	FORGNG
1 > 4	±0.1	±0.3	±0.5
4 < 16	±0.2	±0.5	±0.7
16 < 63	±0.3	±0.7	±0.9
63 < 250	±0.5	±1.2	±1.5
250 < 1000	±0.8	±2.0	±2.5
1000 < 2000	±1.0	±2.5	±3.5
2000 < 5000	±1.5	±3.5	±5.0

SURFACE FINISH		GEOMETRIC TOLERANCE			
MARK	RMAX	DESCRIPTION	SYM	DESCRIPTION	SYM
▽▽▽▽	0.8S	STRAIGHT	—	PARALLELISM	//
		FLATNESS	▱	PERPENDICULARITY	⊥
▽▽▽	6.3S	CIRCULARITY	○	ANGULARITY	∠
		CYLINDRICITY	⌭	POSITION	⌖
▽▽	25S	LINE PROFILE	⌒	CONCENTRICITY	◎
		SURFACE PROFILE	⌓	SYMMETRY	⌯
▽	100S	RUNOUT	↗	DATUM	▲

UNLESS OTHERWISE SPECIFIED ALL DIMENSION ARE IN MILLIMETERS
NOTATION SYMBOLS ARE PER ANSI Y14.5M – 1994
THIRD ANGLE PROJECTION

KITAGAWA NORTHTECH workholding, inc.

SAFETY FACTOR

UNLESS SPECIFIED: (ALL RADII – 1mm) (ALL CHAMFERS – 1mm) (BREAK ALL SHARP CORNERS)

REVISIONS

NO.	E.C.N.	DATE	BY	DESCRIPTION

APPROVED MATERIALS:

USE WITH ITEMS:

TWO JAW 10" POWER CHUCK
61P-23-1971
B210A0600

DRAWN BY: KIW
CHK'D:
TRACED:
SCALE: 1/2
DATE: 1/24/97
APP'D:
DWG NO: B210A0600

Specifications

Specifications / Model	Thru-Hole mm	Gripping range mm Max.	Gripping range mm Min.	Jaw Stroke (diameter) mm	Plunger Stroke mm	Max. Draw Bar Pull Force kN (kgf)	Max. Gripping Force kN (kgf)	Max. Speed min⁻¹ (r.p.m)	Net Weight with Soft top jaws kg	Moment of inertia kg·m²	Matching Cylinder	Max. pressure MPa(kgf/cm²)	Matching Hard top jaw	Matching Soft top jaw
B204	26	110	7	5.4	10	14 (1428)	28.5 (2906)	8000	4	0.007	F0933H	2.80 (28.6)	HB04N1	SB04N1
B205	33	135	12	5.4	10	17.5 (1784)	36 (3671)	7000	6.7	0.018	F0933H	3.43 (35.0)	HB04N1	SB05N1
B206	45	169	16	5.5	12	22 (2243)	57 (5812)	6000	11.9	0.058	S1246	2.8 (28.6)	HB06B1	SB06L1A
B208	52	210	13	7.4	16	34.8 (3549)	86 (8769)	5000	22.3	0.170	S1552	2.65 (27)	HB08A1	SB08B1
B210	75	254	31	8.8	19	43 (4385)	111 (11319)	4200	34.5	0.315	S1875	2.7 (27.5)	HB10A1	SB10B1
B212	91	304	34	10.6	23	55 (5608)	144 (14686)	3300	55.3	0.738	S2091	2.7 (27.5)	HB12N1	SB12N1
B215	100	381	50	10.6	23	98 (9993)	249 (25391)	2800	116	2.20	F2511H	3.3 (33.7)	HB15N1	SB15N1

1) MECHANICAL ADVANTAGE = MAX GRIP FORCE/MAX DRAWBAR PULL FORCE:

5812(Kgf)/2243(Kgf)=2.59(Kgf) MECHANICAL ADVANTAGE

2) CYLINDER STROKE MUST EQUAL OR EXCEED CHUCK PLUNGER STROKE

3) JAW STROKE IS ON DIAMETER. TO GET STROKE PER JAW DIVIDE BY 2:

5.5mm/2 = 2.75mm STROKE PER JAW

You can find this information for all our chucks at www.kitagawa.com

What Affects Grip Force?

- **Speed (RPM) Of Chuck:**
  As speed increases grip force decreases.

- **Jaw Height**:
  As the gripping center height increases the grip force decreases.

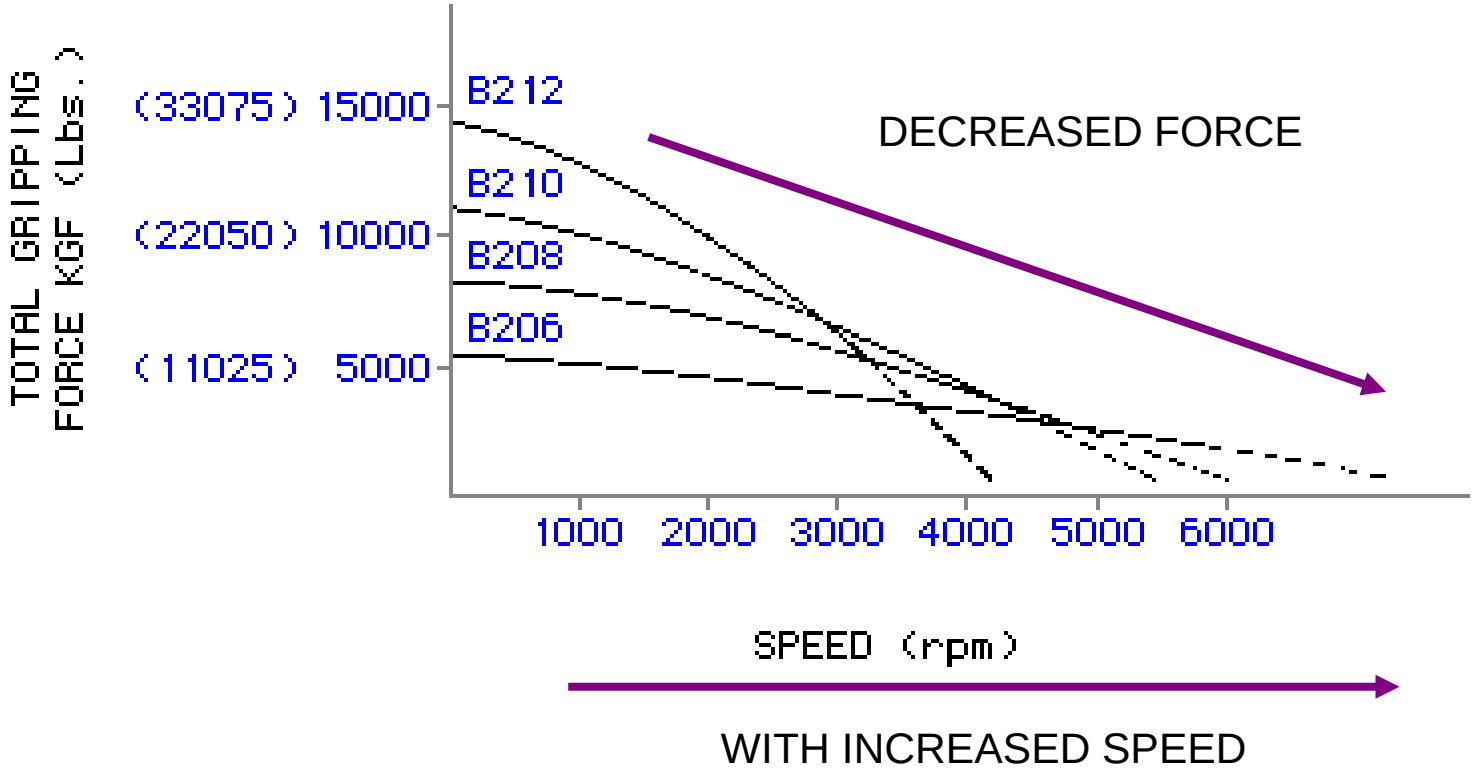
- **Jaw Mass**:
  As the mass of the top jaw increases the grip force decreases.

- **Chuck Condition**:
  If the chuck has damage or excessive wear grip force can be impacted.

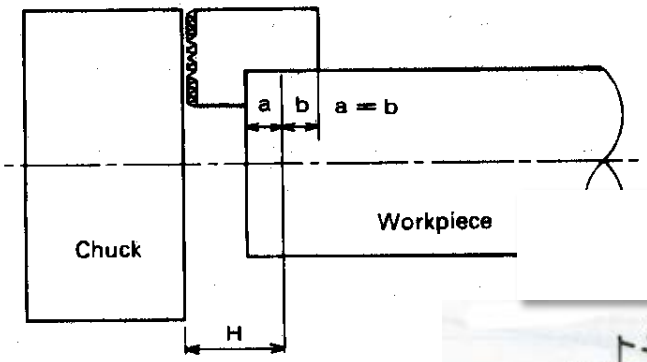
- **Lubrication**:
  Proper chuck lubrication can increase grip force up to 50%.

*Grip force and maximum rpm ratings are based on using Kitagawa soft jaws

Grip Force Loss

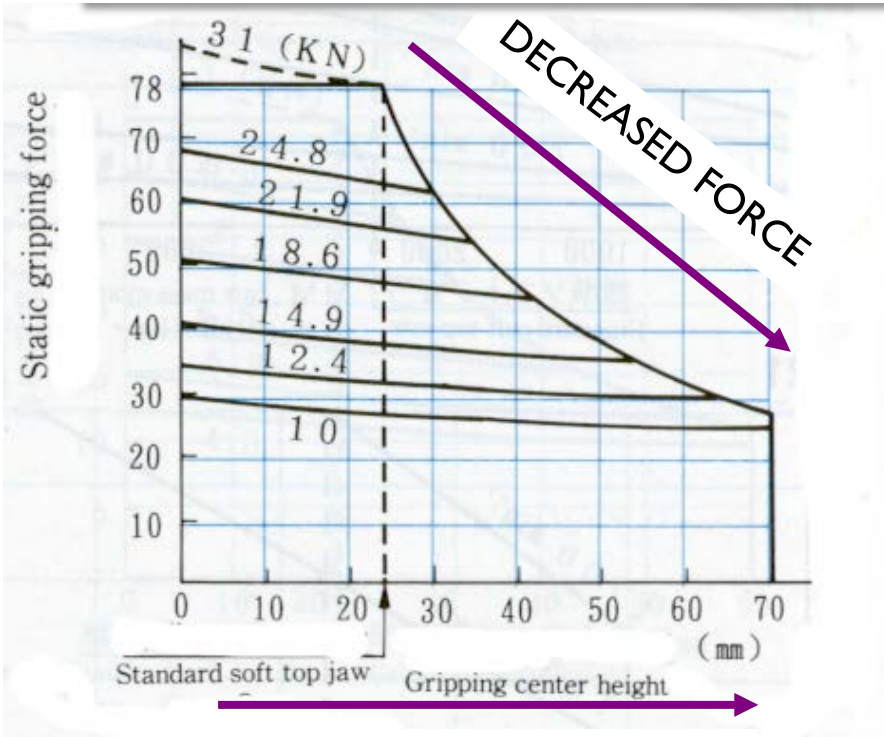


Grip Force Loss



G : Mass center of top jaw
m: Mass of top jaw (One jaw)
r : Distance up to chuck center
H : Gripping force center height

Jaw Height vs. Grip Force



WITH INCREASED HEIGHT

Maintenance

Section to be Lubricated	Grease Used	Lubrication Cycle
Apply grease from the grease nipple at the periphery end of each master jaw with a grease gun.	Kitagawa Chuck-EEZ® or Chuck Grease Pro®	Once per day. However, when the machine is operated at high speed rotation, or a large amount of water soluble cutting oil is used, more lubrication is needed according to service conditions.

To maintain the chuck for a long period of time, it is necessary to lubricate the chuck on a regular basis. Inadequate lubrication causes malfunction at low hydraulic pressure, reduces gripping force, affects gripping accuracy and causes wear and seizure. Consequently, securely lubricate the chuck.

Greasing the chuck not only lubricates, but also helps remove contamination from the chuck. Proper lubrication can prevent the loss of up to 50% grip force.

How Chuck-EEZ® Works

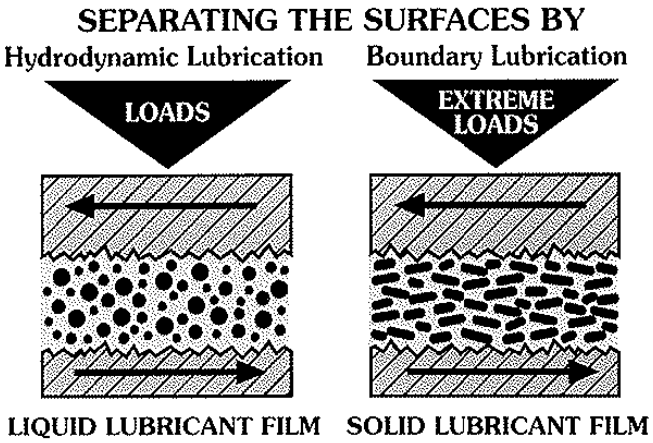


Fig. 1 Diagram illustrating the separation of surfaces by thin liquid and solid film.

All metal surfaces, regardless of how smooth they appear to the naked eye, are not really smooth at all. Observing them under a high powered microscope, they project a cross section of saw-toothed irregularities, as illustrated in figure 2. These metal surface asperities complicate the laws of hydrodynamics in that they can poke through an oil film and cause lubrication failure.

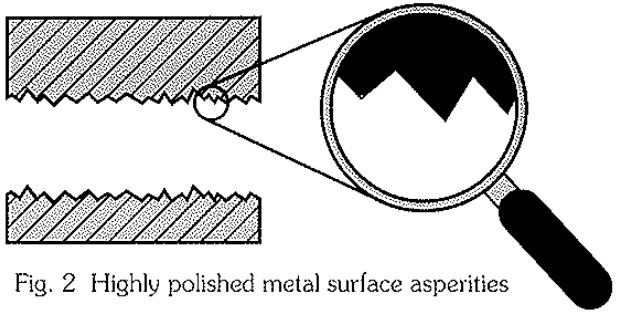


Fig. 2 Highly polished metal surface asperities

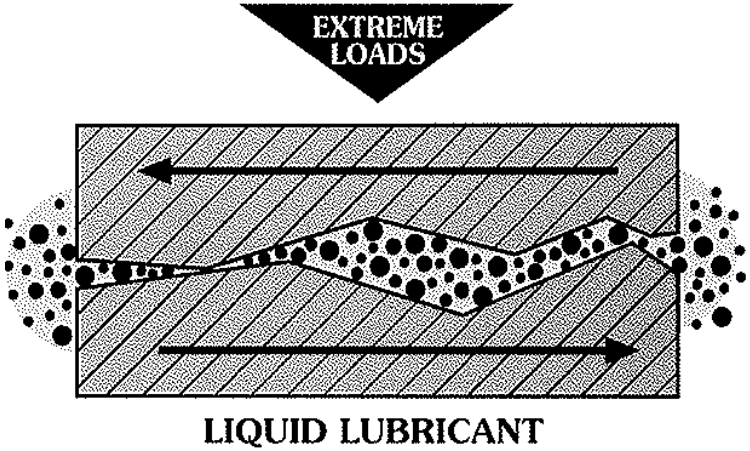


Fig. 4 Hydrodynamic lubrication failure due to inadequate speed and loads.

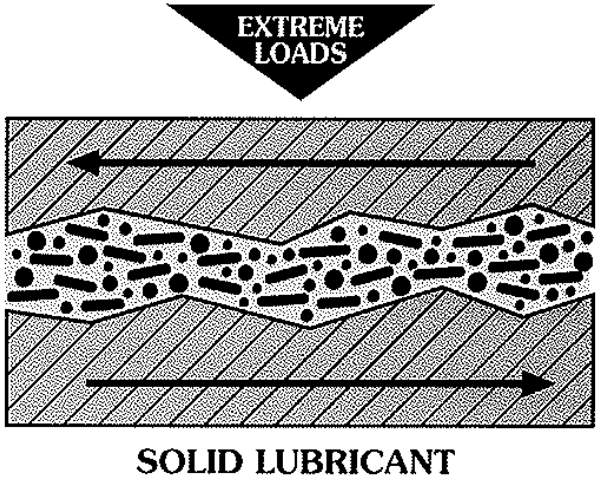
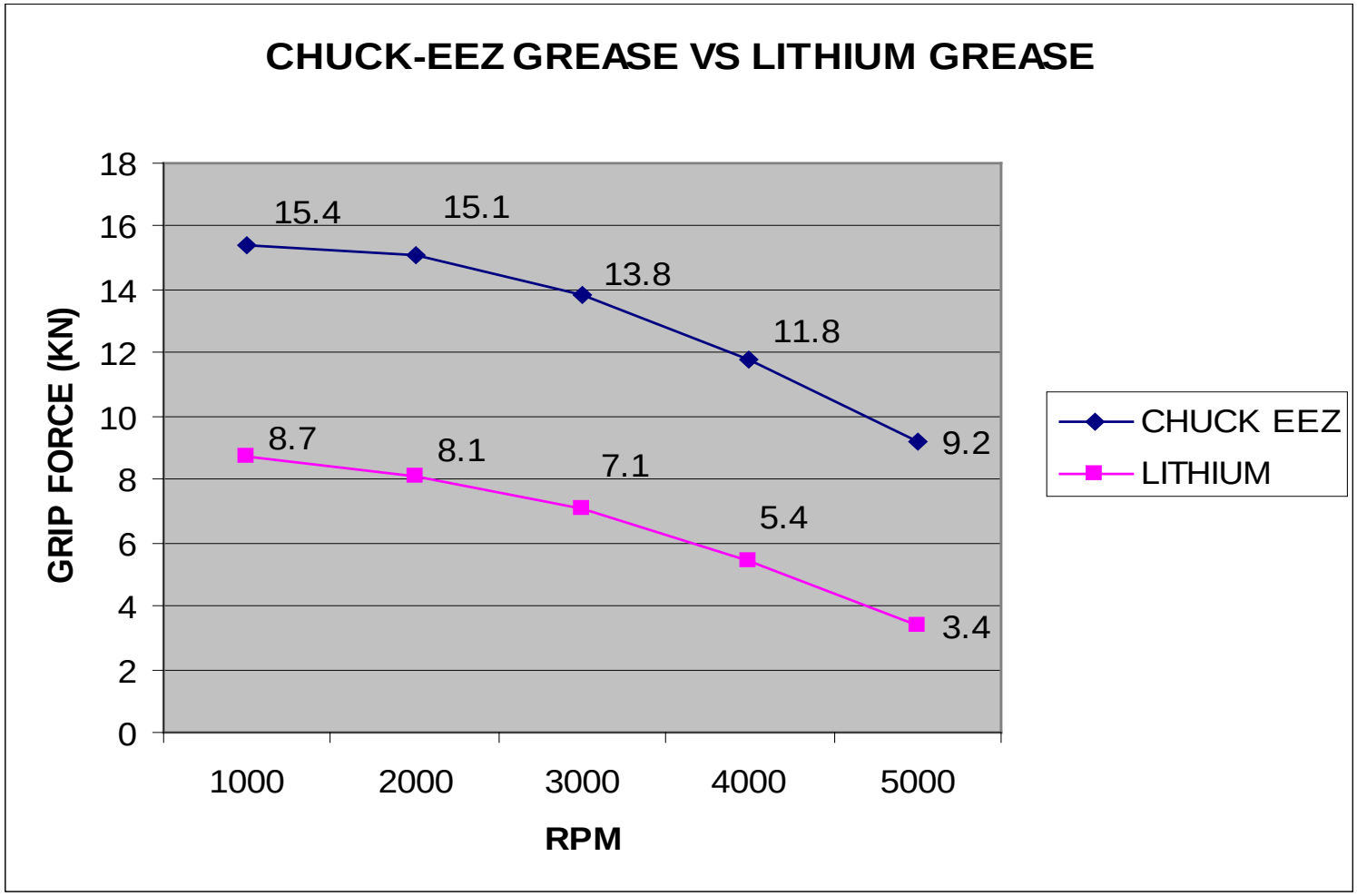


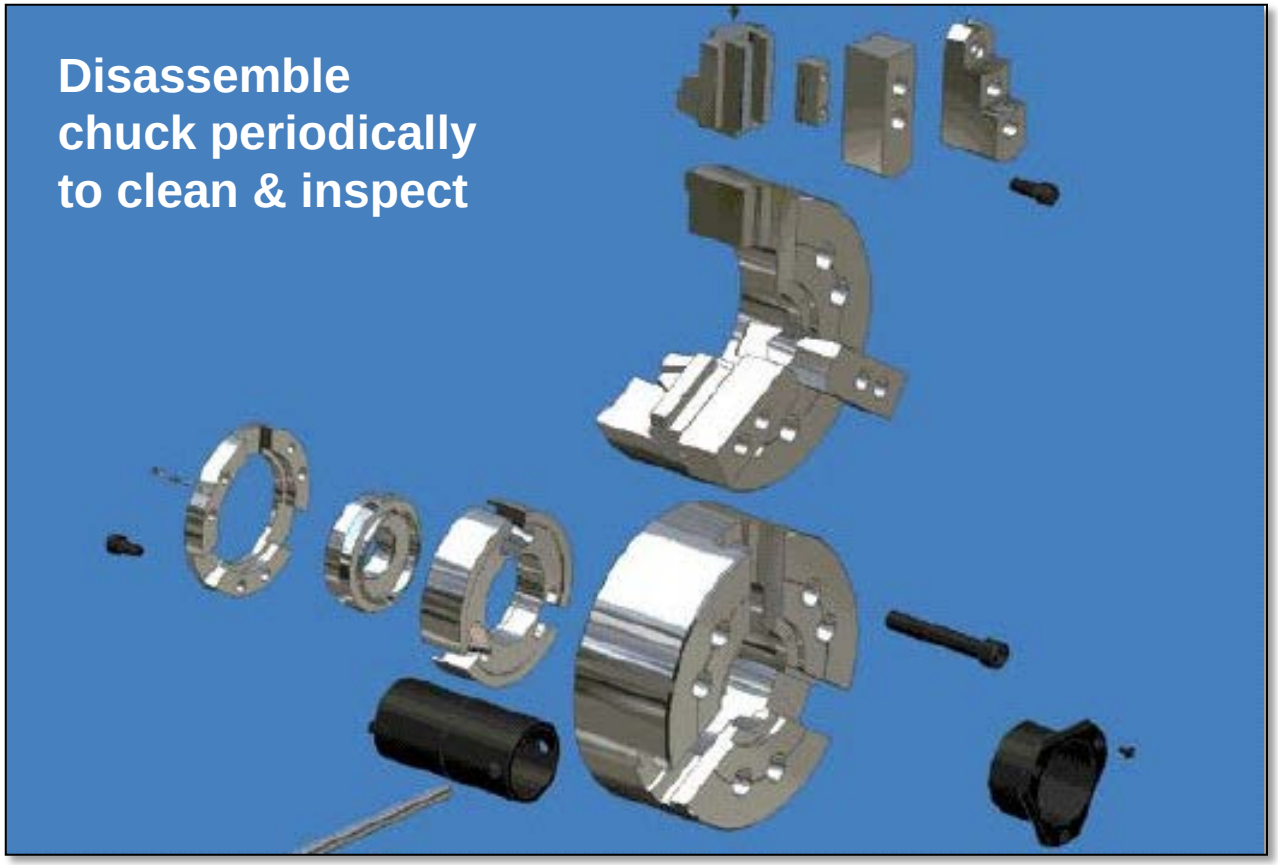
Fig. 5 A boundary lubricant prevents metal to metal contact under conditions of high loads and slow speeds.

Grip Force Comparison



With CHUCK-EEZ Grease you have more grip force at 5000 RPM than lithium grease has at 0 RPM

Periodic Disassemble



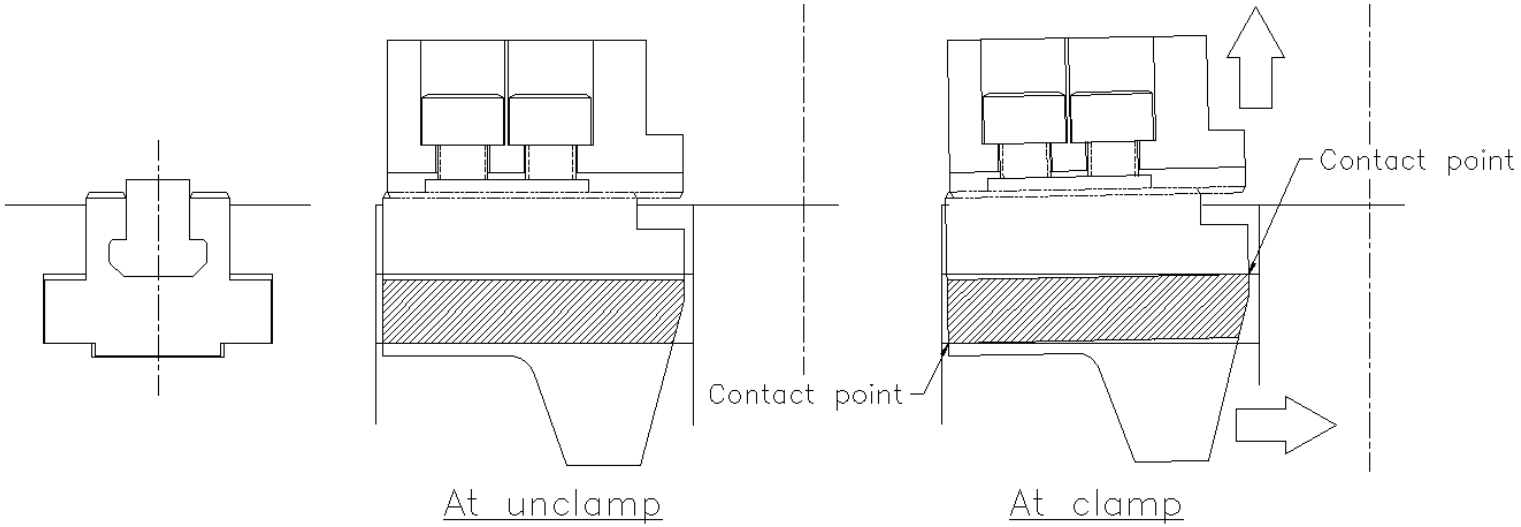
BENEFITS:

- Increase chuck life
- Safety
- Decrease unplanned downtime
- Maintain chuck performance & accuracy

Jaws

- **Jaw Lift**: Sliding jaw chucks will impart a slight lift when they clamp.
- **Forming Soft Jaws**: Form soft jaws under clamp load
- **T-Nut Position**: There is a maximum front and back position.
- **Potential Problems With Aftermarket Jaws**: If the serrations are not made correctly it can cause wear issues and grip force problems.

Jaw Lift in Sliding Jaw Chucks



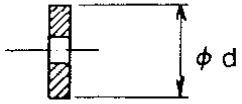
The sliding jaw style power chucks open and close when the master jaws slides along the wedge plunger's fitted slots. OD clamping is illustrated in the above figure. The master jaws move until the top jaws touch the work piece. However, there is a gap between the master jaw tabs and the wedge plunger's slots. In order for the master jaws to make contact with the wedge plunger, the jaws will tilt when the work piece is gripped. The inner top and outer bottom of the master jaws tab will contact the dovetail grooves (slot) in the wedge plunger.

<u>The amount of lift up is increased by the following conditions:</u>

- High gripping force
- Taller jaws (high gripping center height)
- Small gripping diameter

Forming Soft Jaws – Sliding Jaw Chucks

Step 1

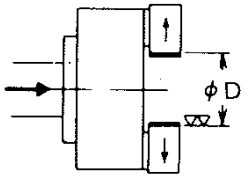


- Prepare the plug for forming.
  Forming outer dia. of plug is limited to ▽▽▽ finishing. Ensure the plug is strong with a suitable wall thickness.

Note) It is necessary to prepare different size plugs in advance.

Note) It is recommended to tap the center hole of plug and insert the bolt.

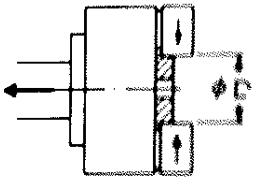
Step 2



- Open the master jaw fully by operating the valve.
- Next, set ϕ D dimension to grip around the middle of the maximum jaw stroke.

  Plug dia. : ϕ d ϕ D ≒ ϕ d + Max. jaw stroke ÷ 2

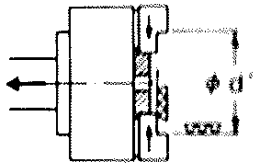
Step 3



- Grip the plug in ϕ D part with the valve.
  Check that the plug is full against the chuck face.

Note) Repeat chucking several times to ensure the plug is correct.

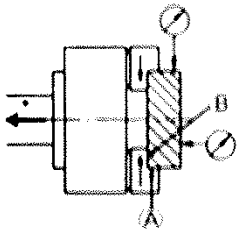
Step 4



- Form the part ϕ d' for gripping the workpiece with the plug still gripped. Machine the part ϕ d' to the same diameter (H7) as the workpiece and surface roughness less than 6S.
- Set the gripping pressure for the jaws to be approximately the same as when the workpiece is gripped.

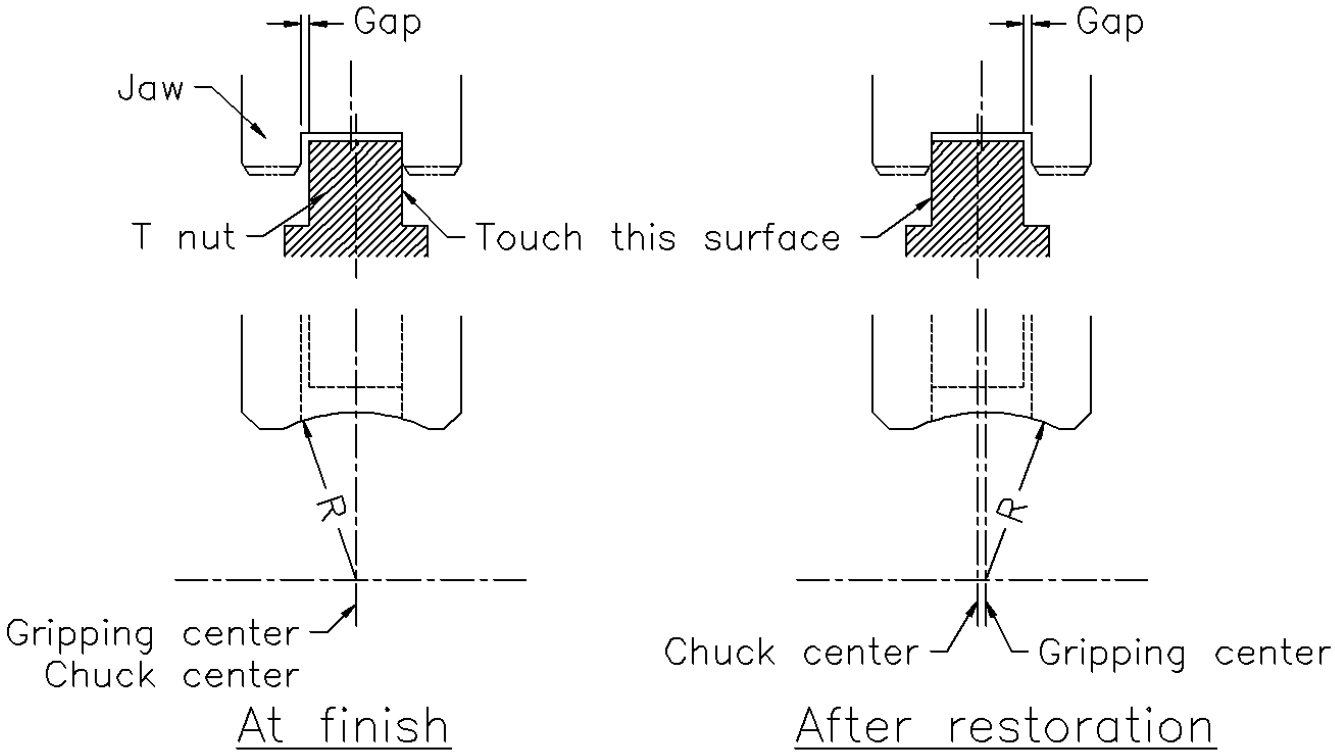
Note) If the plug is distorted, reduce the pressure or alternatively use a stronger plug with additional wall thickness.

Step 5



- After forming jaws, grip the workpiece to check the jaw stroke.
- Perform trial cutting to inspect machining accuracy, etc.
- For checking jaw seating face (A) release component and rotate workpiece 90°, grip again and check end face (B).

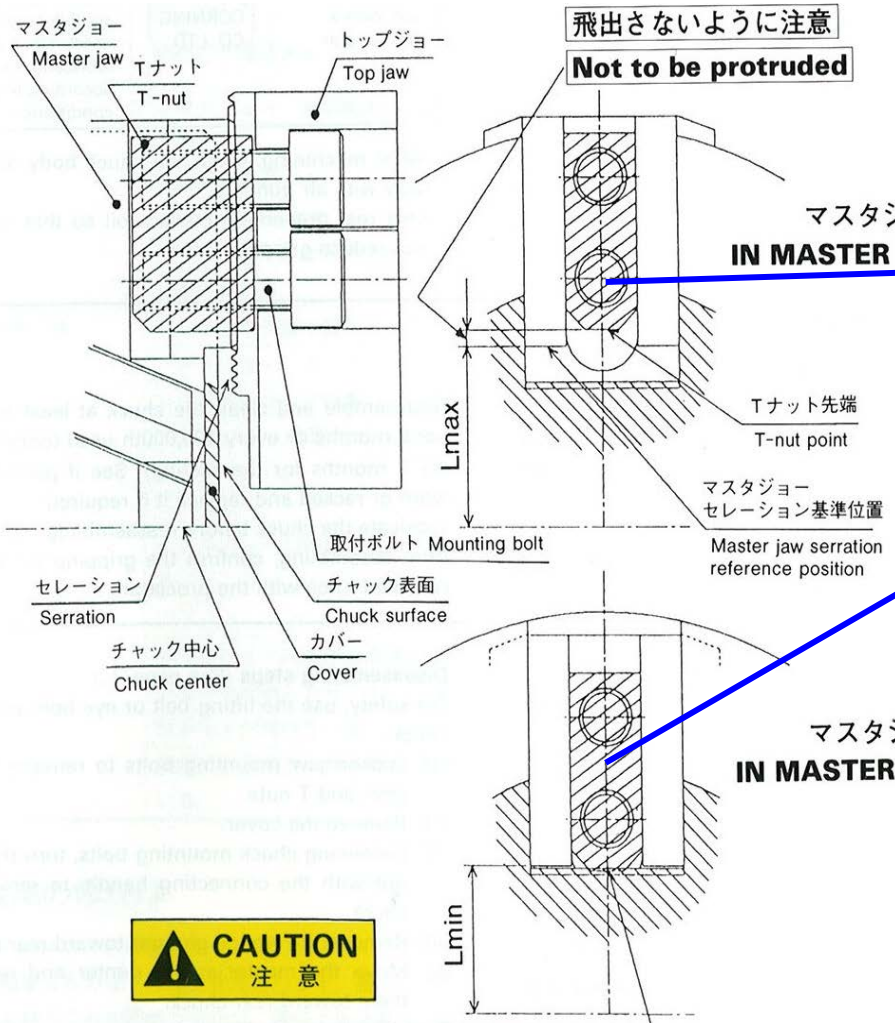
Reform Soft Jaws After Removal – Why?

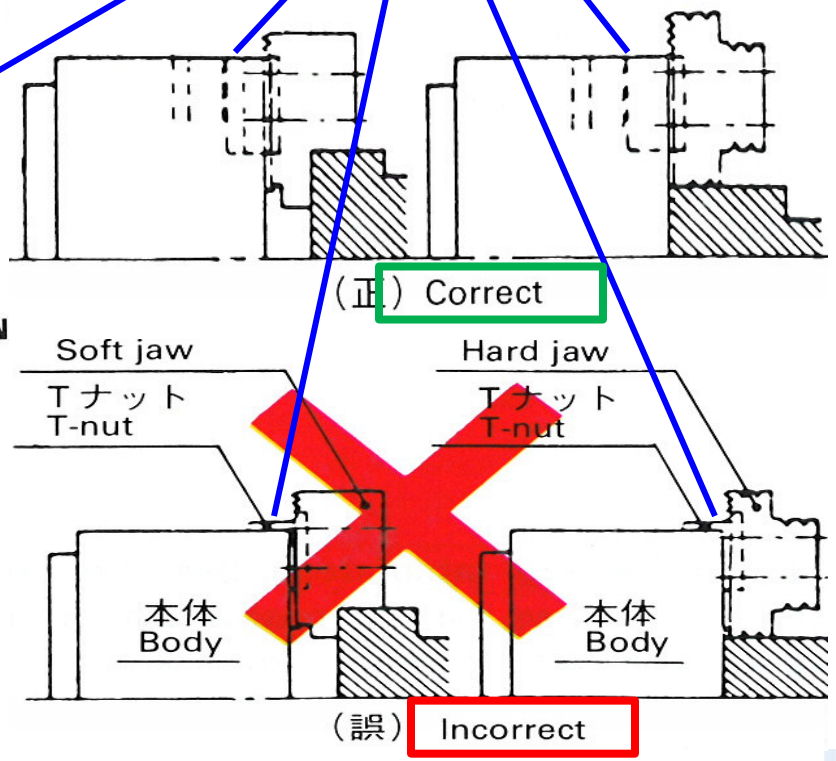


Even if you re-mount the top jaws that were made on the chuck at the same position, the gripping accuracy will most likely be worse than before the removal occurred. If you need the accuracy to remain the same as before, you will need to re-cut these jaws on the chuck.

The above figure shows the worst case scenario: Top jaws were finished touching the right-hand side of t-nuts (left side of the figure). Then, they were detached and re-installed touching the left-hand side of the t-nuts. Since there is a gap between the t-nut and the top jaws, the position of the top jaws is not completely the same. This is the cause for the deterioration of accuracy.

T-Nut Positioning





Contact Us!

Learn more about CHUCKS!

Read about safe operations, troubleshooting, mounting steps, maintenance and inspection procedures at:
http://kitagawa.com/knowledge-base/typical-chucks/

More Questions?
Call us at 800.222.4138