

Striker Hydraulic Breaker



TNB-08M	TNB-6E	TNB-141LU
TNB-1M	TNB-6.5E	TNB-151LU
TNB-2M	TNB-7E	TNB-190LU
TNB-3M	TNB-100	TNB-220LU
TNB-4M		TNB-230LU
TNB-5M		TNB-310LU
TNB-6M		TNB-400LU

SERVICE MANUAL

Unsafe use of this machine may cause serious injury or death. Operators and maintenance personnel must read this manual before operating or maintaining this machine. This manual should be kept near the machine for reference and periodically reviewed by all personnel who will come into contact with it.

TOKU AMERICA, INC.

No.2

DELIVERY INSTRUCTIONS

1 . INTRODUCTION

The TNB Hydraulic Breaker is an attachment.

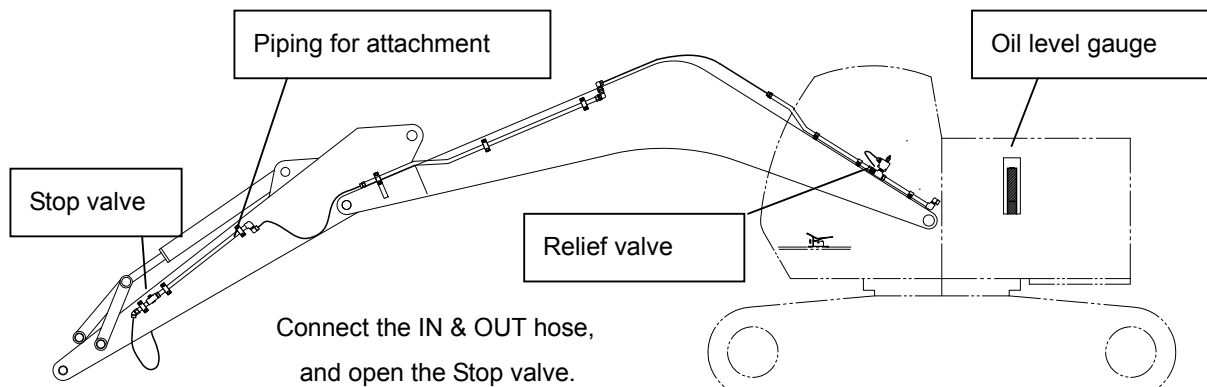
In order to operate the TNB Hydraulic Breaker to its full performance level, it is necessary to handle, maintain and operate the hydraulic breaker properly. If this is not performed the life of the Hydraulic breaker will be shorten dramatically and will lead to breakdowns.

When delivering the Hydraulic Breaker to the customer, it is necessary that the precaution points are explained to the customer in detail.

Using this manual, adjust and perform final checks accordingly. Later, explain to the customer about operation and maintenance for the hydraulic breaker properly.

2. BEFORE OPERATING THE TNB HYDRAULIC BREAKER, THE DELIVERY PERSONAL OR INSTRUCTOR SHOULD EXPLAIN ABOUT THE PERFORMANCE, CONDITIONS & SETTINGS FOR THE EXCAVATOR.

- 1) Has the hydraulic oil and filter been changed.
- 2) Perform the flushing for the hydraulic breaker (attachment) as shown in the drawing below. Referring to the chart below, proceed as advised.



Excavator	Piping	Flushing & Hammering time
New	Manufacturer's genuine piping	Over 5 mins.
New	Piping installed later (aftermarket)	Over 30 mins.
Used	Manufacturer's genuine piping	Over 5 mins.
Used	Piping installed later (aftermarket)	Over 30 mins.

- 3) Has the hydraulic oil been filled to the upper level of the tank (Boom on the excavator should be lowered)
- 4) Has the relief valve pressure setting and pump performance been checked.

- 5) Referring to the hydraulic breaker matching manual for excavators, if it has a Breaker mode (B-Mode), set to the Breaker mode. For excavators that have computerized flow adjustment, please make sure the maximum flow is set so that it does not exceed the maximum flow of the hydraulic breaker.
 - With regards to the adjustment of the computer, please have Maker's service perform this adjustment.
- 6) With regards to excavators which do not have computerized flow adjustment, please refer to Sec. 7 of this manual. In this case the throttle position must be set for the TNB hydraulic breaker and a sticker must be applied at this position.
- 7) Checking the following areas; Lock nut for the relief valve, lock nut for the cable, split pin on the rod, bolts and nuts on the piping flanges hydraulic hose adapters. All of the above must be secured and tighten.
- 8) To check and confirm the movement of the hoses.

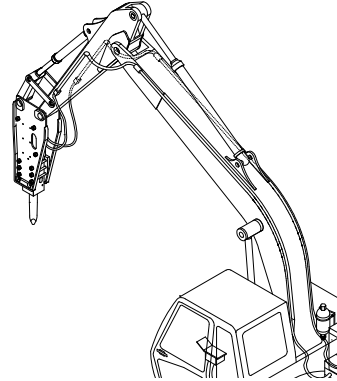
3. AFTER THE TNB HYDRAULIC BREAKER HAS BEEN MOUNTED, PERFORM A TEST RUN.

- 1) When assembling the chisel, grease should be applied to the outside diameter.
- 2) Stand the hydraulic breaker up and press the chisel into the breaker before grease up.
- 3) If the hydraulic breaker is disassembled or assembled at a service facility, it will be necessary to release all air and slowly supply hydraulic oil to the unit. (In this case lower the throttle position for the breaker, press on the operating pedal about 5-6times, then operate the breaker at half throttle)

The operating time from removing the air to the preparation time is shown in the chart below.

Excavator	Air removal time	Seal recovery time	Preparation time	Preparation time
		(See Caution 1)		
New unit	2 mins.	5 mins.	Less than 50% Throttle 10 mins.	At 70% Throttle 20 mins.
After the hose has been removed	2 mins.	5 mins.	Less than 50% Throttle 10 mins.	At 70% Throttle 20 mins.
After the Breaker has been repaired	4 mins.	10 mins.	Less than 50% Throttle 10 mins.	At 70% Throttle 20 mins.

Caution 1) During the process of seal recovery, make sure the hydraulic breaker does not impact when depressing the operating pedal. Also, when performing the above exercise, refer to the sketch below by standing the hydraulic breaker vertically.



4. THE DELIVERY PERSONAL OR INSTRUCTOR SHOULD EXPLAIN THE FOLLOWING POINTS TO THE CUSTOMER (MAINTENANCE STAFF OR OPERATOR)

- 1) The basic structure and mechanism for the TNB Hydraulic Breaker.
(Using the Instruction Manual)
- 2) The new hydraulic piping for the hydraulic breaker attachment and also the hydraulic circuit. (Operation, High pressure hose, change valve, piping and relief valve etc)
- 3) Explanation concerning the operation, maintenance, wear parts and precaution points for the TNB Hydraulic Breaker.
 - a) Inspection and re-tightening of nuts and bolts (Especially after 10 hours of operation)
 - b) Exchanging the hydraulic oil at every 600 hours of operation, in case the operating rate of the breaker is 100%.
Exchanging the oil filter at every 150 hours of operation, in case the operating rate of the breaker is 100%.
 - c) Do not use a standard hydraulic breaker for underwater usage.
 - d) Procedures in greasing the chisel (Press the chisel into the breaker before greasing)
 - e) Operate the breaker vertically straight (A bending or prying action will during impact will break the chisel)
 - f) Procedures for how to change the chisel.
 - g) How to store the breaker properly.
 - h) Agency of wear parts at an early stage and changing the parts accordingly. (Chisel, retainer pins, retainer pin stopper, retainer pin stopper plug and hoses etc.)
- 4) Operation hour of the breaker on the first day should stay within 80% of the normal operating hours.

5. EXPLANATION ON TROUBLE SHOOTING

1) Terminology

- a) Does not impact This means the breaker does not operate.
- b) Erratic blows Breaker impacts without consistency.
- c) Impacts but power is weak . . The normal impact strength is not transmitted to the breaker.
- d) Oil leakage, Oil ooze

“ Oil leakage ” is when the hydraulic oil leaks out continuously for several hours.

“ Oil ooze “ is when hydraulic oil is noticed after disassembly/assembly of the breaker within about 200 hours. The areas where you may notice this oil is around the mating areas, bolts and washers. Or when the oil is unable to dry and dust is on the area and is unable to clear up or dry. In this case, this is not abnormal.

- At times oil leaking from the hose adapter may drip onto the hydraulic breaker body making it look like oil is leaking. Take caution.

2) Explain using the Troubleshooting guide section in the Operation, Maintenance and Parts Manual.

3) Explain the Warranty clause for the Hydraulic breaker.

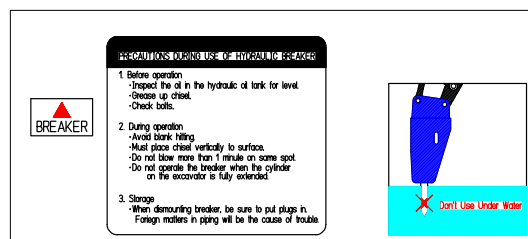
4) Periodic Maintenance

After operating the hydraulic breaker for 600 hours or 6 months, perform a check up for the breaker. Just like your vehicle, periodic inspection and maintenance is a key factor in keeping your hydraulic breaker operating for a long time.

6. FINAL INSPECTION SHOULD BE PERFORMED

The stickers

- 1) Memo the Excavator Model
- 2) Memo the hour meter for the excavator
- 3) Apply the stickers to the appropriate areas.



7. ITEMS WHICH SHOULD BE GIVEN TO THE CUSTOMER

- 1) Instruction Manual
- 2) Tool Box (Explain the items which are in the tool box)

Explain how to open and close the stop valve when removing or mounting the breaker. Also about the hose adapter plugs for the hose and for the excavator.

Take caution to avoid any foreign materials into the system through the hose and hose adapters.

DISASSEMBLY & ASSEMBLY INSTRUCTIONS

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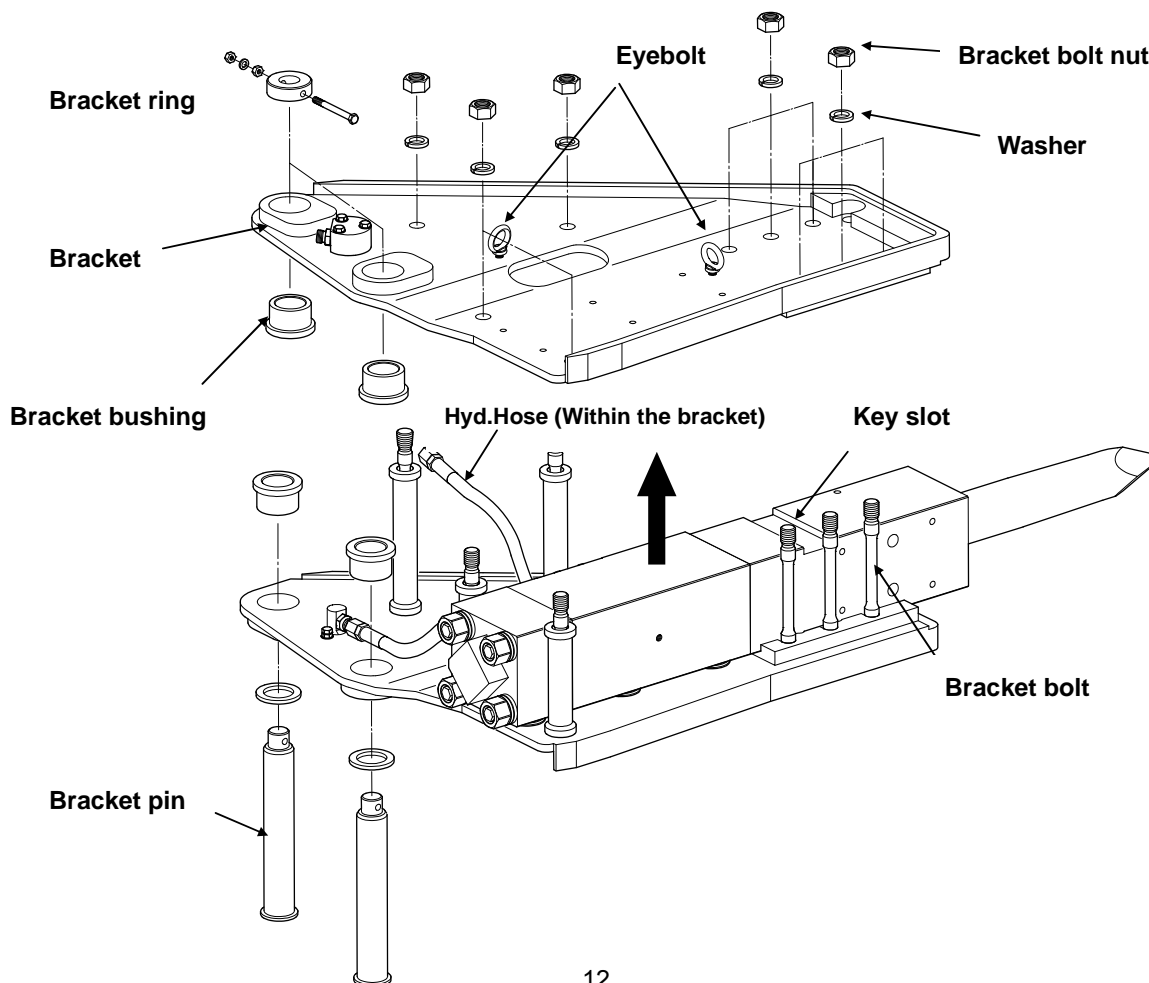
1. Cleaning the Breaker and Bracket

To prevent any material from entering the breaker, before replacing parts or overhauling the breaker remove all dirt and foreign material from the breaker and bracket.

2. Disassembly of the Bracket

2 – 1. Side Mount Bracket

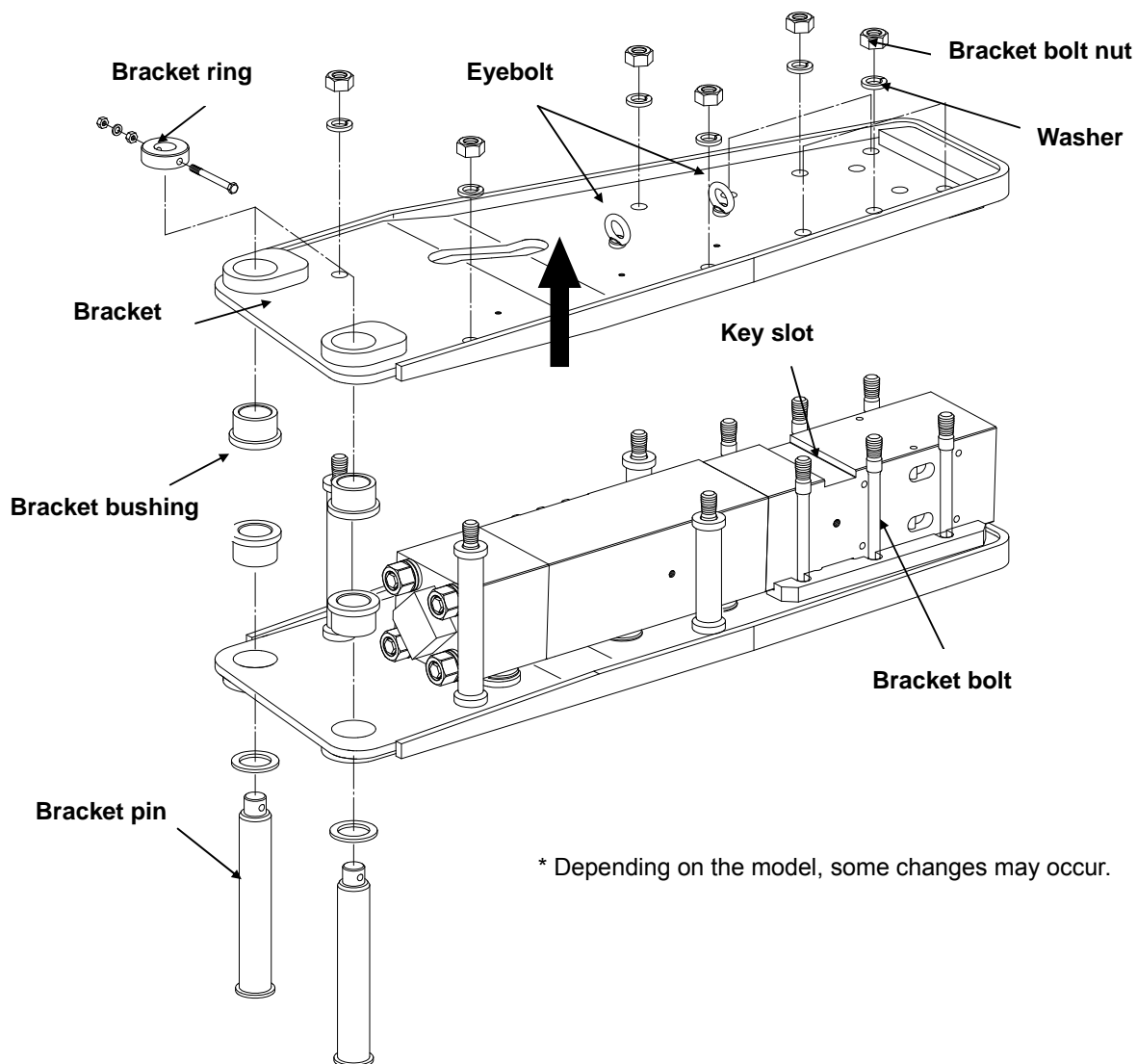
- 1) Remove the bracket pin and bracket bushing. At this time remove the chisel from the breaker.
- 2) If there are hoses in the bracket, loosen and remove the hoses on the swivel side.
- 3) With the bracket bolt nut side of the bracket plate facing up, loosen the bracket bolt nut and remove.
- 4) Fit the “Eyebolt” onto the top of the plate and lift up the plate straight up.
- 5) Remove the breaker body the same as the above manner.
- 6) When assembling, perform this procedure in the opposite direction. But please note when the breaker is being assembled into the bracket, make sure the bracket key plates fits into the breaker key slot properly.



* Depending on the model, some changes may occur.

2 – 2. 1 PC Top Mount Bracket

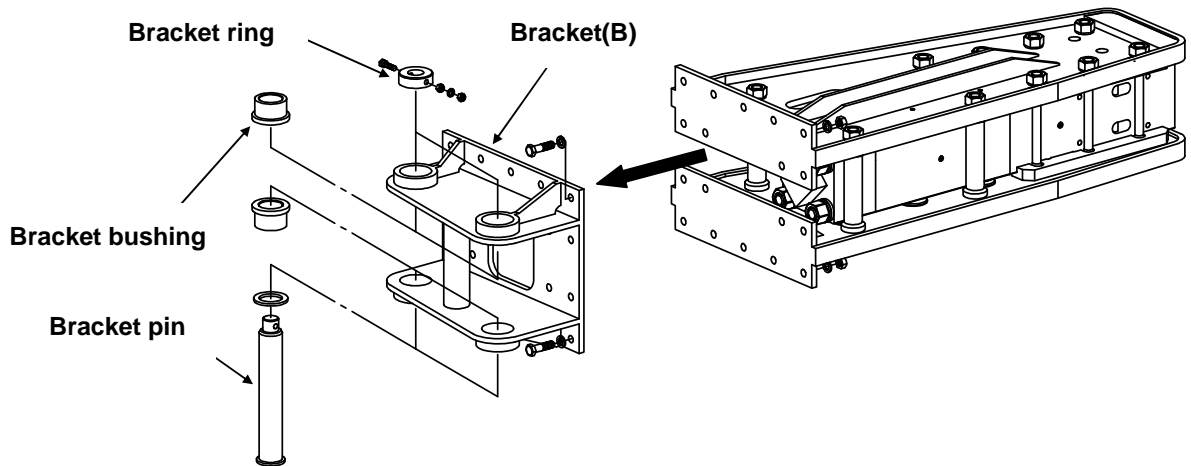
- 1) Remove the bracket pin and bracket bushing. At this time remove the chisel from the breaker.
- 2) With the bracket bolt nut side of the bracket plate facing up, loosen the bracket bolt nut and remove.
- 3) Fit the “Eyebolt” onto the top of the plate and lift up the plate straight up.
- 4) Remove the breaker body the same as the above manner.
- 5) When assembling, perform this procedure in the opposite direction. But please note when the breaker is being assembled into the bracket, make sure the bracket key plates fits into the breaker key slot properly.



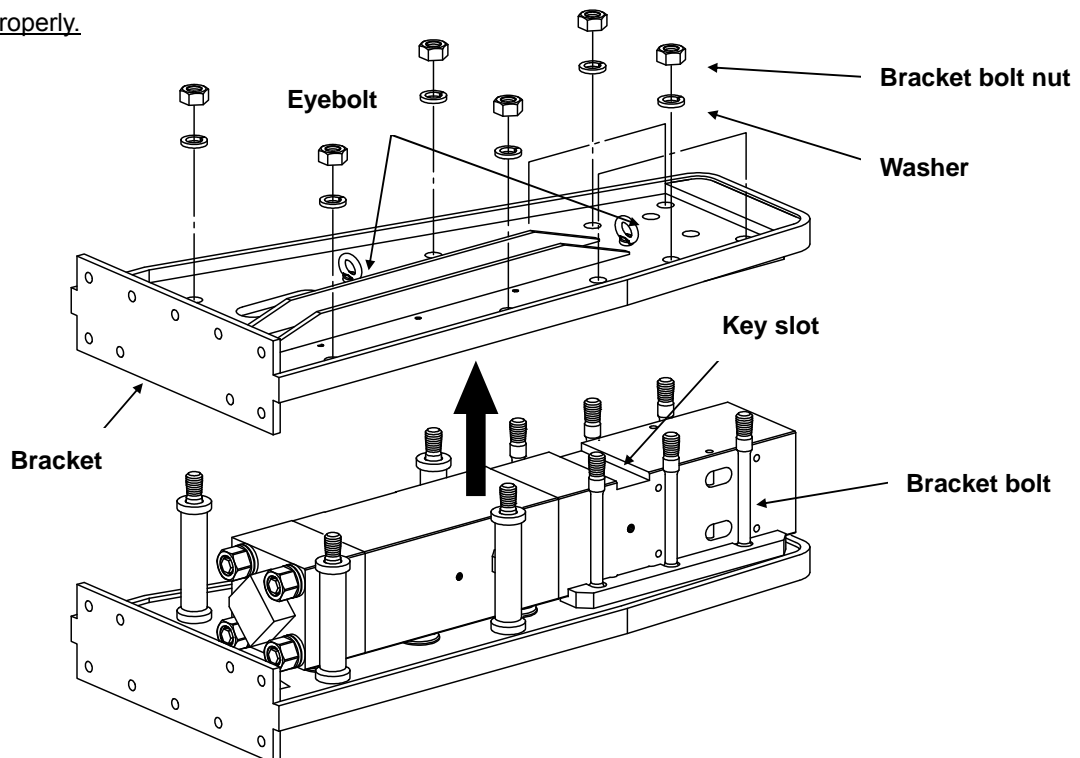
* Depending on the model, some changes may occur.

2 – 3. 2 PC Top Mount Bracket

- 1) Remove the bracket pin and bracket bushing. At this time remove the chisel from the breaker.
- 2) Loosen the bolt of bracket (B) and remove the bracket (B).



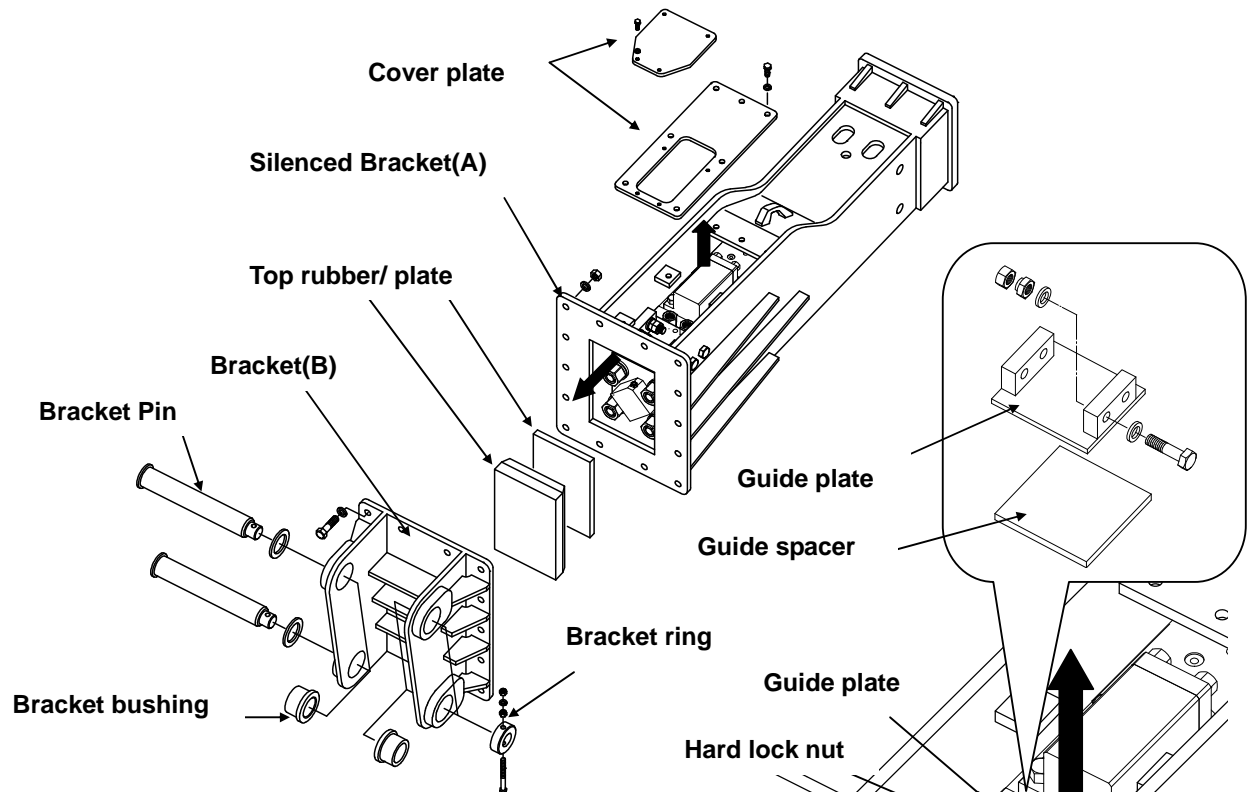
- 3) With the bracket bolt nut side of the bracket plate facing up, loosen the bracket bolt nut and remove.
- 4) Fit the “Eyebolt” onto the top of the plate and lift up the plate straight up.
- 5) Remove the breaker body the same as the above manner.
- 6) When assembling, perform this procedure in the opposite direction. But please note when the breaker is being assembled into the bracket, make sure the bracket key plates fits into the breaker key slot properly.



* Depending on the model, some changes may occur.

2 – 4. Silenced Bracket

- 1) Remove the bracket pin and bracket bushing. At this time remove the chisel from the breaker.
- 2) Loosen the hex bolt and nut, and remove the bracket (B), top rubber and cover plate.



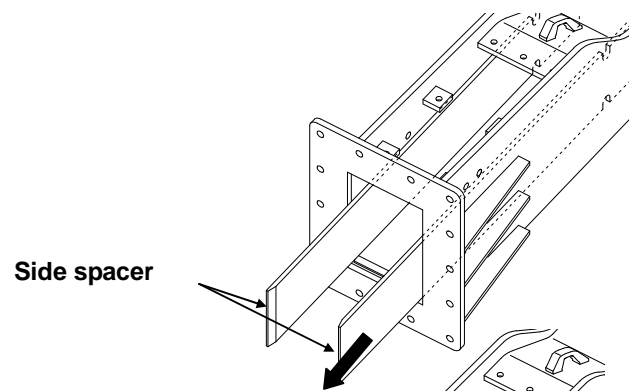
- 3) Loosen the hard lock nut and remove the guide plate and guide spacer.

Remove the hydraulic hose and fit the hose plug to prevent any material from entering the breaker.

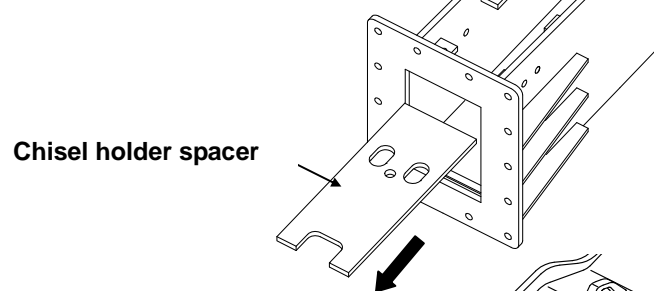
- 4) Assemble the "Eyebolt" and pull out the breaker using a wire rope.

Eyebolt

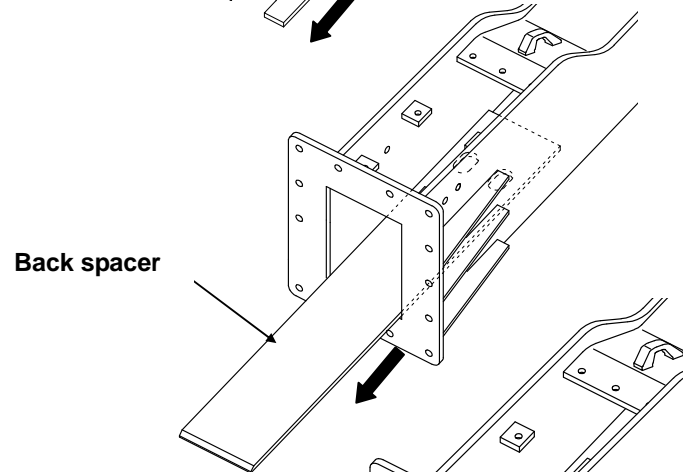
5) Pull out the side spacer.



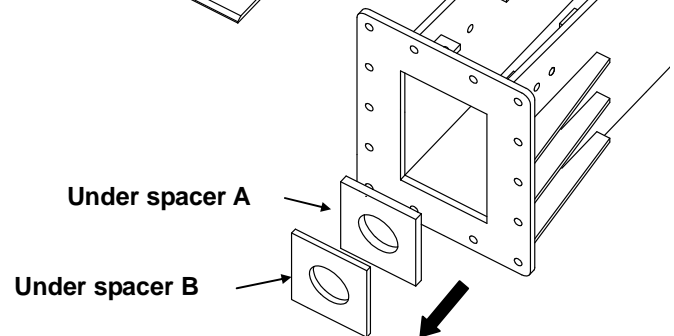
6) Pull out the chisel holder spacer.



7) Pull out the back spacer.



8) Pull out the under spacer A & B.



9) When assembling, perform this procedure in the opposite direction.

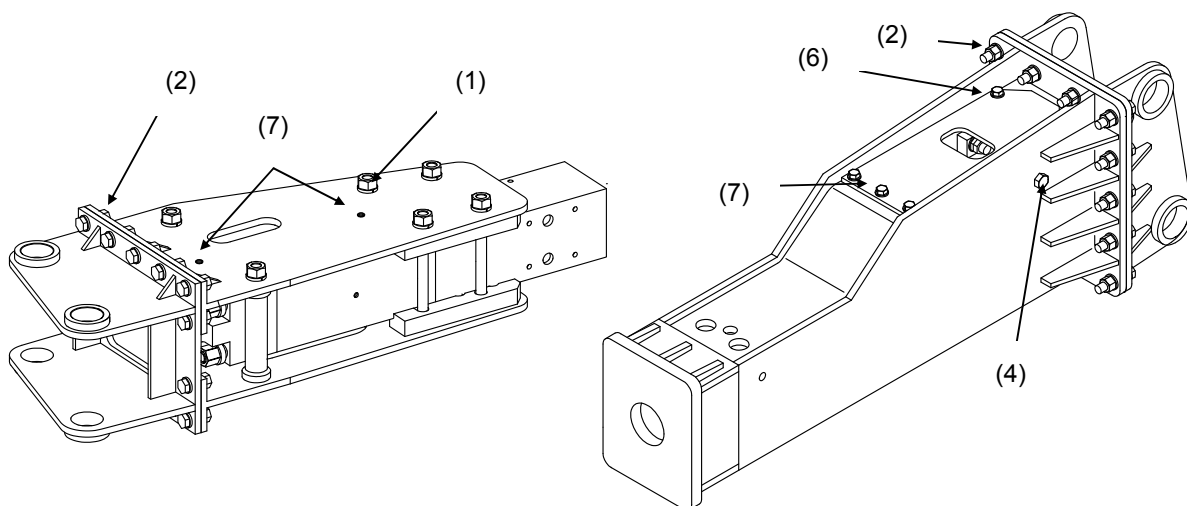
But please assemble the chisel holder spacer after assembling the side spacer.

(Assembly procedure of the spacer is 8), 7), 5), 6))

* Depending on the Model, some changes may occur.

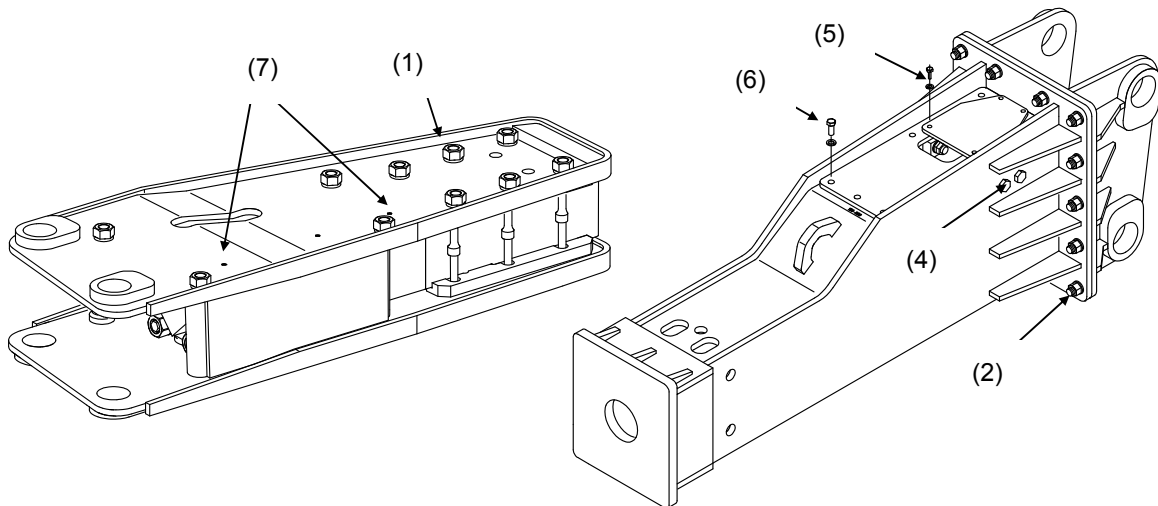
2 – 5. Assembly / Disassembly chart for the Bracket

	Model	TNB	08M	1M	2M	3M	4M	5M	6M	6E
(1) Bracket bolt/nut	Width across flats (mm)	24	27	30	30	32	36	41	46	
	Bolt size (mm)	(M16)	(M18)	(M20)	(M20)	(M22)	(M24)	(M27)	(M30)	
	Torque (Ft. Lb./N·m)	130/176	188/255	253/343	253/343	304/412	433/588	650/882	723/980	
(2) 2PC bracket bolt/nut	Width across flats (mm)	24	24	24	24	24	24	30	30	
	Bolt size (mm)	(M16)	(M16)	(M16)	(M16)	(M16)	(M16)	(M20)	(M20)	
	Torque (Ft. Lb./Nm)	140/190	140/190	140/190	140/190	140/190	140/190	273/370	273/370	
Silenced bracket bolt/nut	Width across flats (mm)	24	24	24	24	24	24	30	30	
	Bolt size (mm)	(M16)	(M16)	(M16)	(M16)	(M16)	(M16)	(M20)	(M20)	
	Torque (Ft. Lb./N·m)	140/190	140/190	140/190	140/190	140/190	140/190	273/370	273/370	
(3) Hyd. hose IN/OUT	Width across flats (mm)	19	27	27	27	27	27	27	36	
	Size (inch)	3/8	1/2	1/2	1/2	1/2	1/2	1/2	3/4	
	Torque (Ft. Lb./Nm)	36/49	43/59	43/59	43/59	43/59	43/59	43/59	87/118	
(4) Guide bolt/nut	Width across flats (mm)	19	24	24	24	24	24	24	30	
	Bolt size (mm)	(M12)	(M16)	(M16)	(M16)	(M16)	(M16)	(M16)	(M20)	
	Torque (Ft. Lb./N·m)	56/76	140/190	140/190	140/190	140/190	140/190	140/190	273/370	
(5) Gas valve cover plate	Width across flats (mm)	-	-	-	-	-	-	-	-	17
	Bolt size (mm)									(M10)
	Torque (Ft. Lb./Nm)									32/44
(6) Control valve plate	Width across flats (mm)	17	17	19	19	19	19	19	19	24
	Bolt size (mm)	(M10)	(M10)	(M12)	(M12)	(M12)	(M12)	(M12)	(M12)	(M16)
	Torque (Ft. Lb./Nm)	32/44	32/44	56/76	56/76	56/76	56/76	56/76	56/76	140/190
(7) Eyebolt for Top/Side brackt Eyebolt for Silenced bracket	Bolt size (mm)	M8	M8	M8	M12	M12	M12	M12	M12	M12
	Bolt size (mm)	M10	M10	M12	M12	M12	M12	M12	M12	M16
(8) Eyebolt for cylinder cover	Bolt size (mm)	M8	M8	M8	M12	M12	M12	M12	M12	M12
(9) Eyebolt for chisel holder	Bolt size (mm)	-	-	-	M12	M12	M12	M12	M12	M12
(10) Eyebolt for cylinder	Bolt size (mm)	M8	M8	M8	M12	M12	M12	M12	M12	M12



2 – 5. Assembly / Disassembly chart for the Bracket

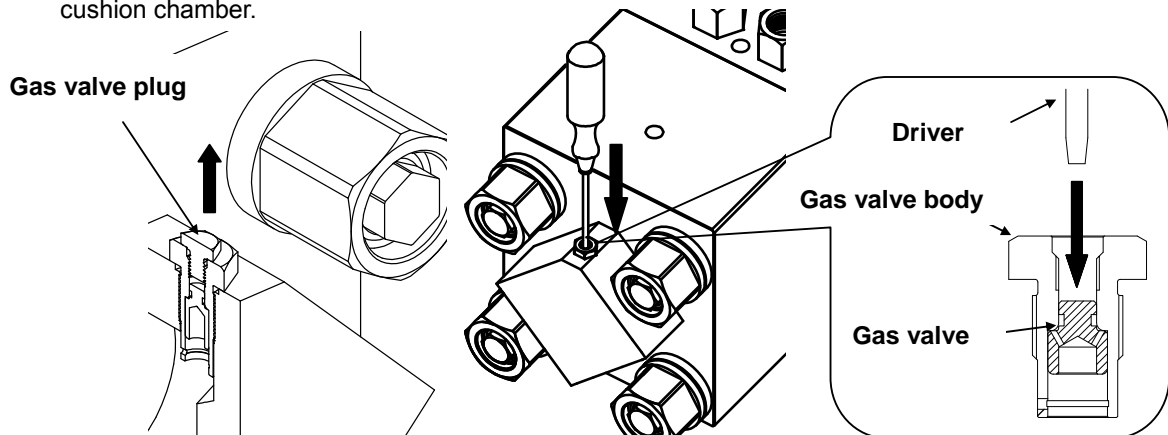
	Model TNB	6.5E	7E	100	141 LU	190 LU	220 LU	310 LU	400 LU
					151 LU		230 LU		
(1) Bracket bolt/nut	Width across flats (mm)	46	55	55	60	65	75	75	90
	Bolt size (mm)	(M30)	(M36)	(M36)	(M39)	(M42)	(M48)	(M48)	(M60)
	Torque (Ft. Lb./Nm)	723/980	1012/1372	1012/1372	1192/1617	1445/1960	2024/2744	2024/2744	3614/4900
(2) 2PC bracket bolt/nut	Width across flats (mm)	30	30	30	36	46	46	60	60
	Bolt size (mm)	(M20)	(M20)	(M20)	(M24)	(M30)	(M30)	(M39)	(M39)
	Torque (Ft. Lb./Nm)	273/370	273/370	273/370	480/650	930/1260	930/1260	2140/2900	2140/2900
Silenced bracket bolt/nut	Width across flats (mm)	30	30	30	36	46	46	60	60
	Bolt size (mm)	(M20)	(M20)	(M20)	(M24)	(M30)	(M30)	(M39)	(M39)
	Torque (Ft. Lb./Nm)	273/370	273/370	273/370	480/650	930/1260	930/1260	2140/2900	2140/2900
(3) Hyd. hose IN/OUT	Width across flats (mm)	36	36	36	41	41	41	50	50
	Size (inch)	G3/4	G3/4	G3/4	G1.	G1.	G1.	G1-1/4	G1-1/4
	Tightening torque (Nm)	87/118	87/118	87/118	101/137	101/137	101/137	123/167	123/167
(4) Guide bolt/nut	Width across flats (mm)	30	30	30	36	46	46	46	46
	Bolt size (mm)	(M20)	(M20)	(M20)	(M24)	(M30)	(M30)	(M30)	(M30)
	Torque (Ft. Lb./Nm)	273/370	273/370	273/370	480/650	930/1260	930/1260	930/1260	930/1260
(5) Gas valve cover plate	Width across flats (mm)	19	19	19	19	19	19	19	19
	Bolt size (mm)	(M12)	(M12)	(M12)	(M12)	(M12)	(M12)	(M12)	(M12)
	Torque (Ft. Lb./N-m)	56/76	56/76	56/76	56/76	56/76	56/76	56/76	56/76
(6) Control valve plate	Width across flats (mm)	24	24	24	24	24	30	30	30
	Bolt size (mm)	(M16)	(M16)	(M16)	(M16)	(M16)	(M20)	(M20)	(M20)
	Torque (Ft. Lb./Nm)	140/190	140/190	140/190	140/190	140/190	273/370	273/370	273/370
(7) Eyebolt for Top/Side bracket Eyebolt for Silenced bracket	Bolt size (mm)	M12	M20	M20	M20	M24	M24	M30	M30
	Bolt size (mm)	M16	(Hook)	(Hook)	(Hook)	(Hook)	(Hook)	(Hook)	(Hook)
(8) Eyebolt for cylinder cover	Bolt size (mm)	M20	M20	M20	M20	M24	M24	M30	M30
(9) Eyebolt for chisel holder	Bolt size (mm)	M20	M20	M20	M20	M24	M24	M30	M30
(10) Eyebolt for cylinder	Bolt size (mm)	M12	(M20)	M20	M20	M24	M24	M30	M30



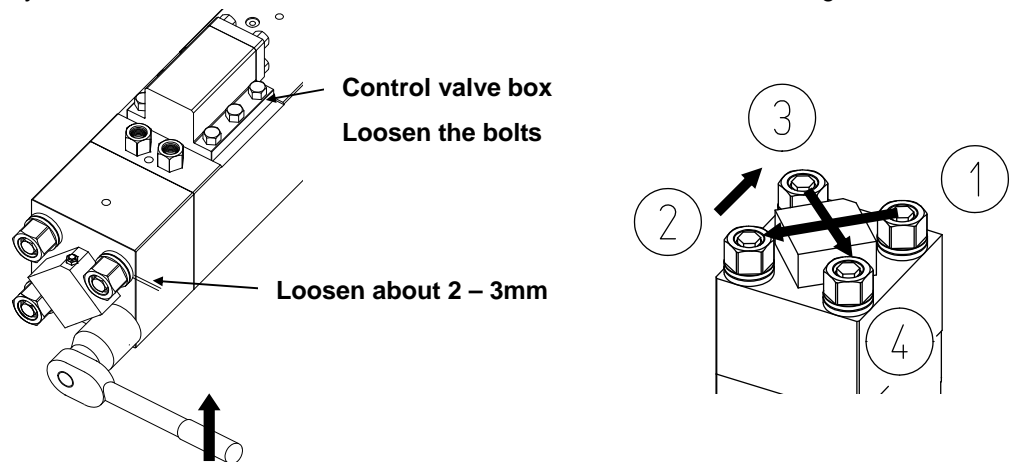
3. Disassembly of the Hydraulic Breaker

3 – 1. Work table and set up of the Breaker

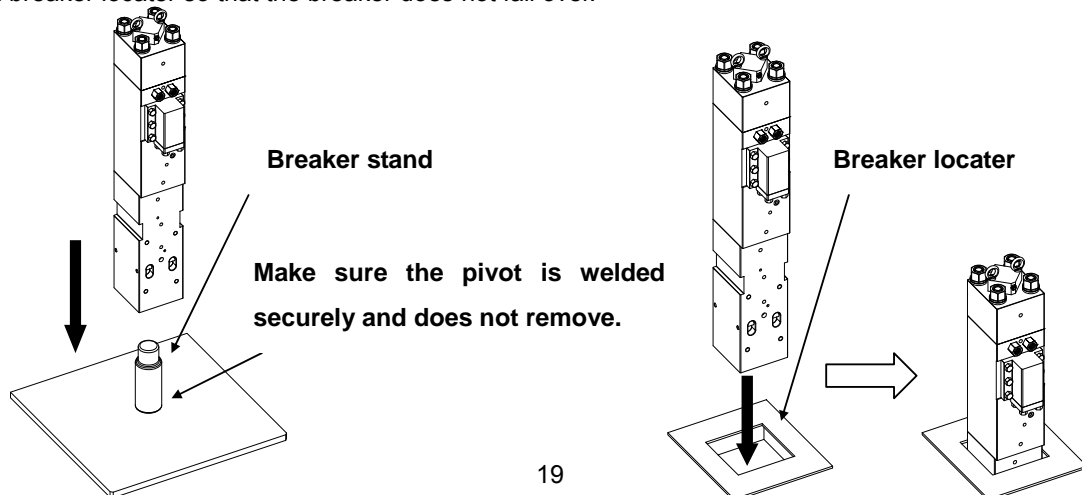
- 1) Remove the gas valve plug from the gas valve on the cylinder cover of the breaker.
- 2) Using a tool such as a screwdriver, push the valve in and completely remove all of the gas from the cushion chamber.



- 3) Before removing the side bolt nut, first loosen the bolts on the control valve box.
- 4) Secure the hydraulic breaker, loosen the side bolt nut about 2-3mm from the fastening surface.



- 5) Fit the "Eyebolt" onto the cylinder cover and lift the breaker up. Lower the breaker onto a breaker stand or a breaker locator so that the breaker does not fall over.

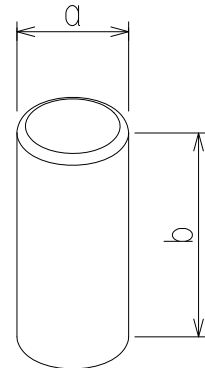


Reference chart of pivot size

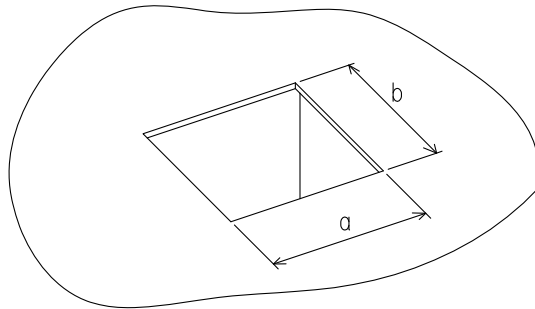
Model	TNB	08M	1M	2M	3M	4M
a (in./mm)		1.37/35	1.57/40	1.77/45	2.16/55	2.36/60
B (in./mm)		4/100	5/125	5.7/145	7.08/180	7.87/200

Model	TNB	5M, 6M	6E	6.5E	7E, 100
a (in./mm)		2.75/70	3.54/90	3.54/90	4.33/110
b (in./mm)		/200	/225	/240	/280

Model	TNB	141LU 151LU	190LU	220LU 230LU	310LU	400LU
a (in./mm)		5.11/130	5.3/135	5.5/140	6.1/155	6.7/170
b (in./mm)		13.8/350	13.8/350	13.8/350	16.5/420	18/460



Reference chart of the hole size



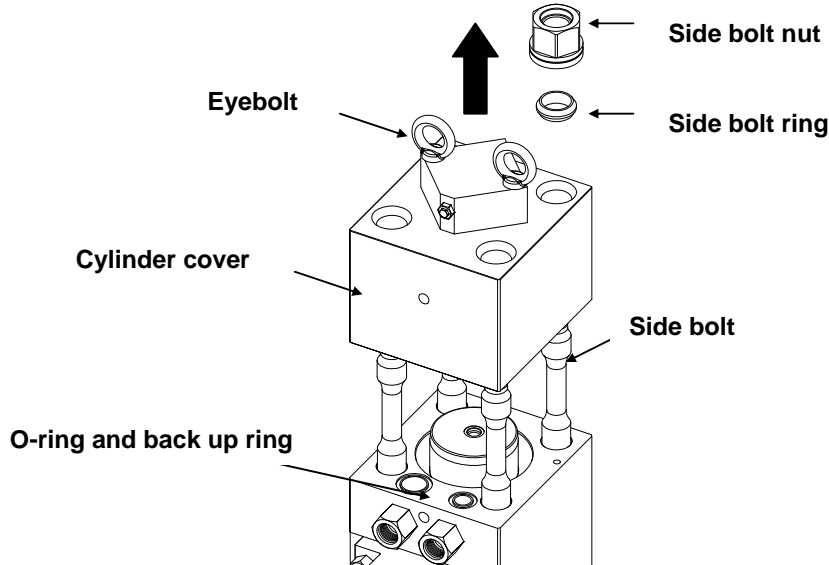
Model	TNB	08M	1M	2M	3M	4M	5M
a (in./mm)		3.5/90	4.13/105	4.7/120	5.5/140	6/150	6.3/160
b (in./mm)		/105	/115	4.7/120	5.5/140	6/150	6.3/160
Depth (in./mm)		8.6/220	9/230	9.4/240	11/280	12.6/320	13.77/350

Model	TNB	6M	6E	6.5E	7E	100
a (in./mm)		6.5/165	7/180	8/200	9/230	9.4/240
b (in./mm)		6.5/165	7/180	8/200	9/230	9.4/240
Depth (in./mm)		13.77/350	19/380	16.5/420	20/500	20/500

Model	TNB	141LU 151LU	190LU	220LU 230LU	310LU	400LU
a (in./mm)		10.6/270	11.2/285	12/300	13/330	14.2/360
b (in./mm)		10.6/270	11.2/285	12/300	13/330	14.2/360
Depth (in./mm)		25.2/640	25.6/650	26.4/670	30.7/780	33/840

3 – 2. Side Bolt Nut / Cylinder Cover

Remove the side bolt nut and the ring, lift the cylinder cover up. At this time, re-confirm that the gas in the cushion chamber is completely removed. If gas remains in the cushion chamber, the cylinder cover may pop up and can be dangerous. (⚠ CAUTION; Take special care with the O-ring and back up ring between the cylinder and cylinder cover mating areas.)



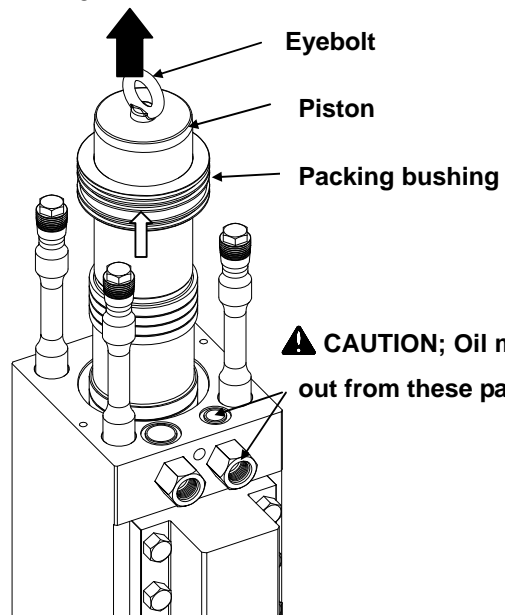
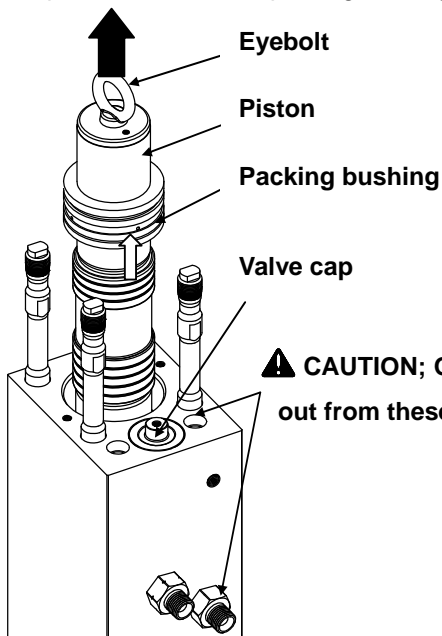
⚠ CAUTION; When removing the side bolt ring, be careful not to damage the side bolt threads.

3 – 3. Piston

TNB-08M – 5M

TNB-6M – 400LU

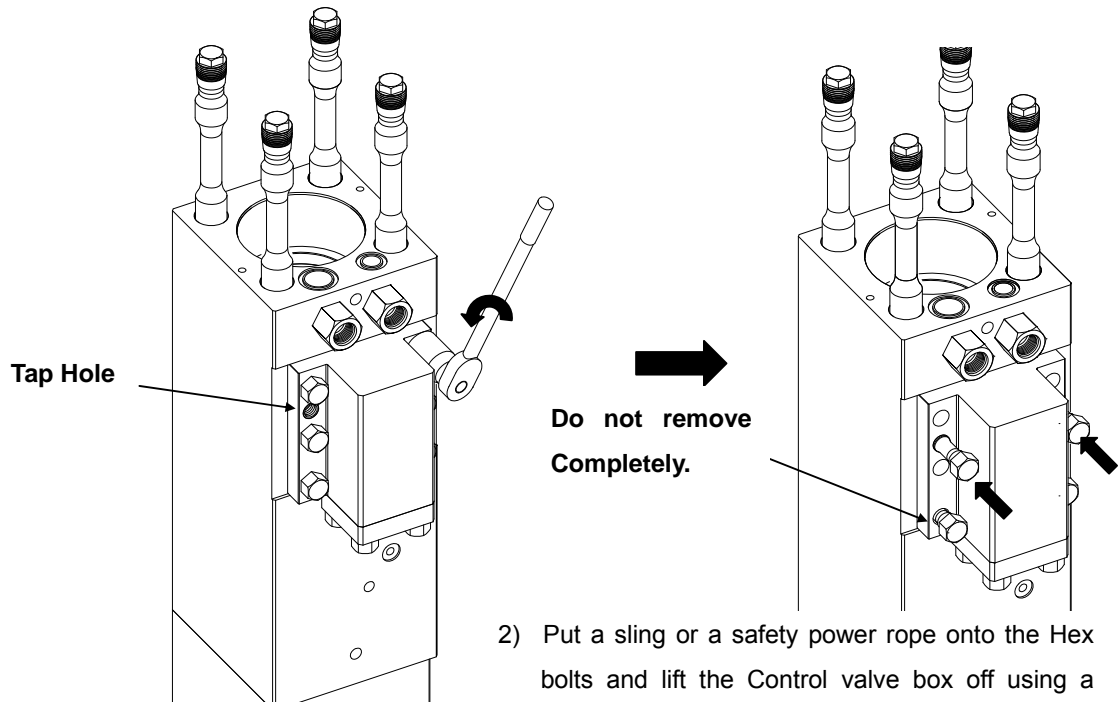
Fit an “Eyebolt” to the piston and lift straight up. At this time, the packing bushing will also be removed with the piston. Remove the packing bushing from the piston using a rubber hammer.



3 – 4. Control Valve Box & Valve

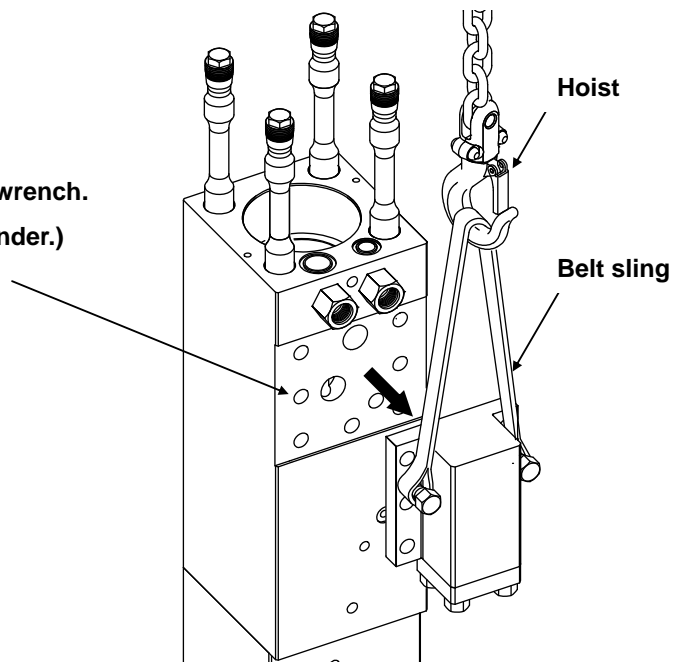
TNB-6M – 400LU

- 1) Remove the bolts which mount the Control valve box. Using two of them, screw them into the tap hole of the Control valve box. During this procedure do not remove the bottom two bolts. (This is to prevent the control valve from falling.)



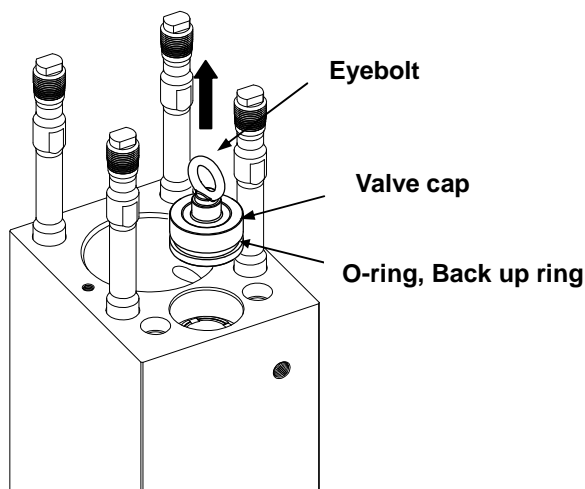
- 2) Put a sling or a safety power rope onto the Hex bolts and lift the Control valve box off using a crane or hoist.

**Do not loosen the bolts using an Impact wrench.
(The Helisert may come out from the cylinder.)**



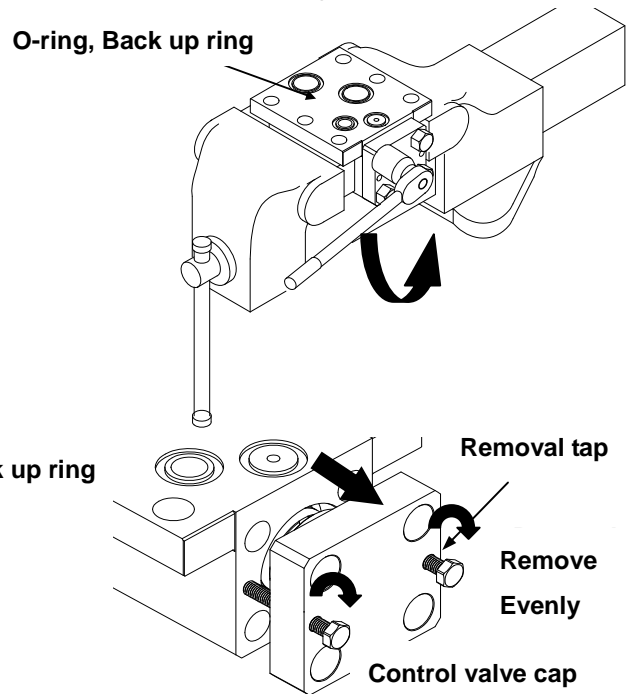
TNB-08M – 5M

Secure the cylinder so that it does not move. Assemble an “Eyebolt” to the valve cap and remove.

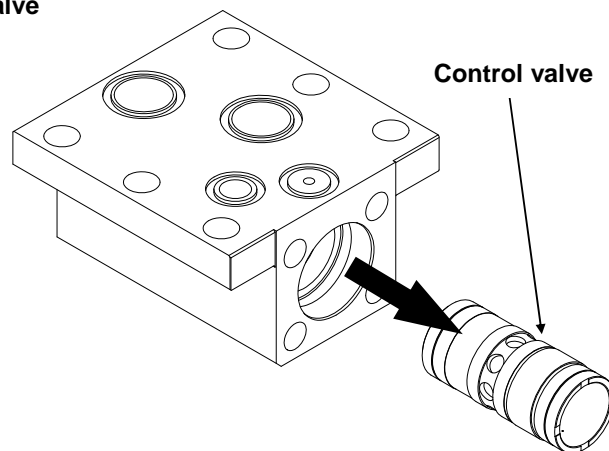
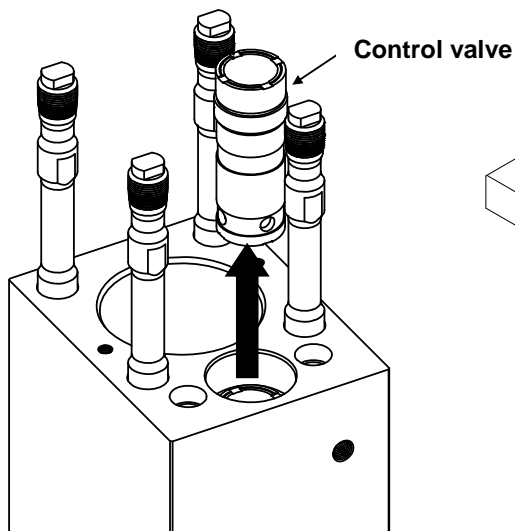


TNB-6M – 400LU

- 3) Put the control valve onto a vice and secure. Loosen the hex bolt on the valve cap. Then using a removal tap, screw the removal bolt in and remove the valve cap.



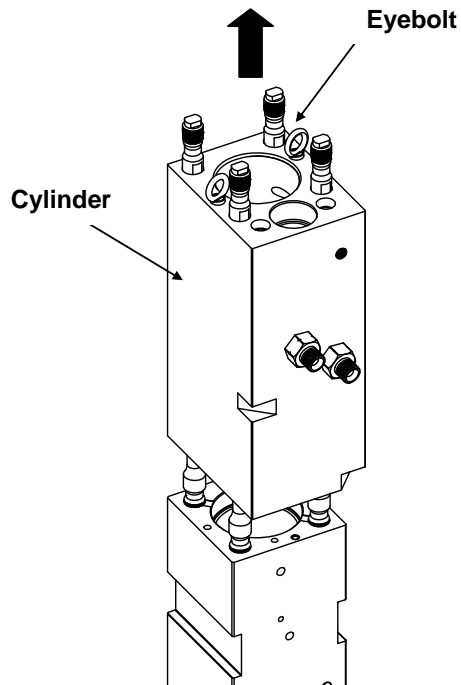
After removing the valve cap, the control valve can be seen. If seizure or pickup has not developed, the control valve can be moved by hand from the control valve box. If seizure or pickup has developed, using the valve hole or groove, pull the valve out from the control valve box.



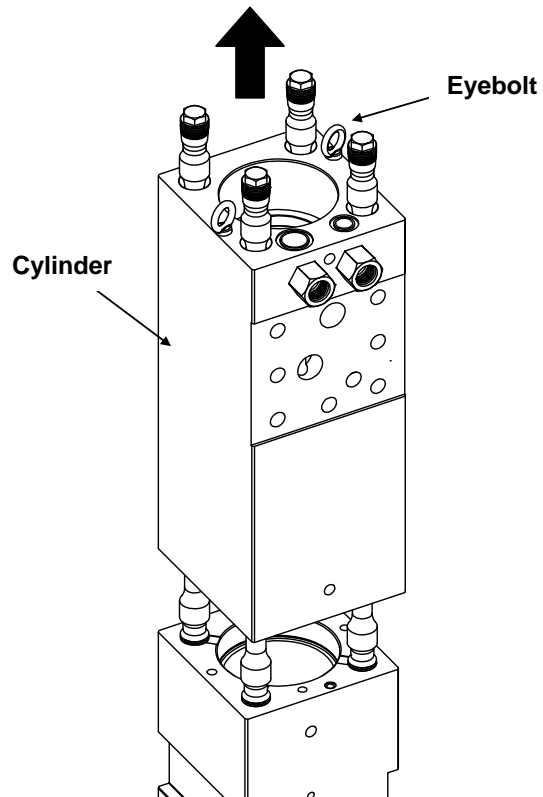
3 – 5. Cylinder

TNB-08M – 5M

Assemble “Eyebolts” to the cylinder and lift up.

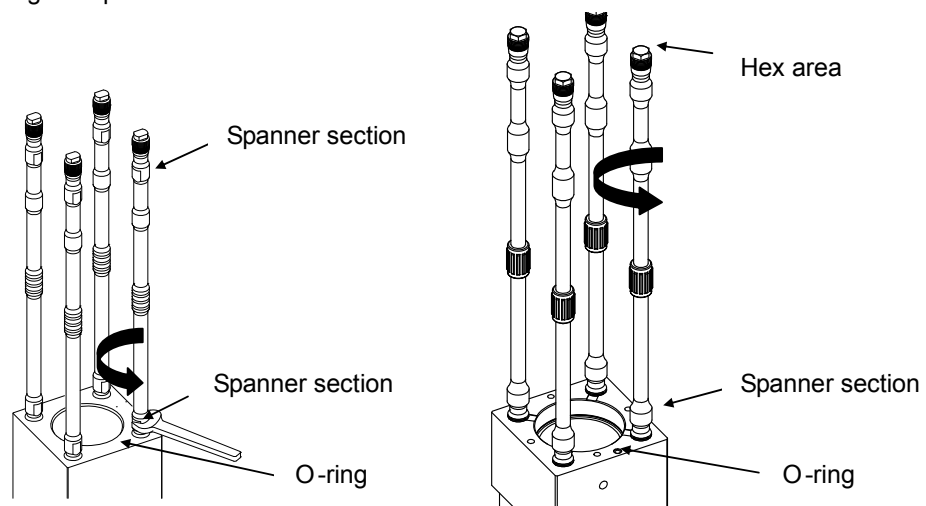


TNB6M – 400LU



3 – 6. Side Bolt

After removing the cylinder, secure the chisel holder so that it does not move. Using a spanner, loosen the Side bolt by turning the spanner at the root of the side bolt.



- When re-using a side bolt, be careful not to damage the spanner and thread areas.

3 – 7. Hose Adapter

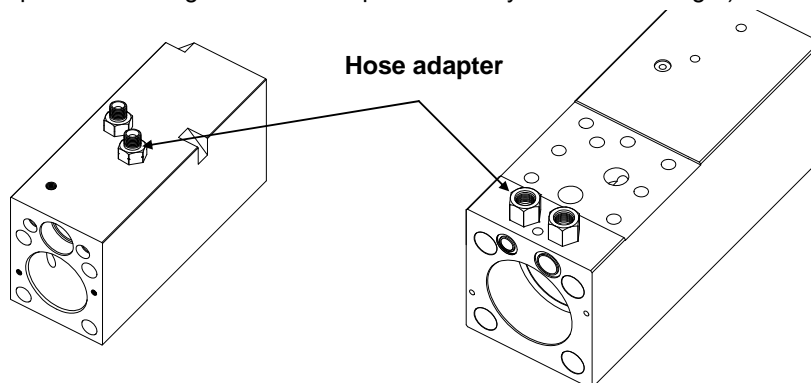
TNB-08M – 5M

TNB-6M – 400LU

Disassemble the hose adapters using an Impact wrench.

(Make sure the O-ring and hose adapters are not damaged or deformed. Check for any scratches or damage.

If damaged replace the O-ring and Hose adapter. This may cause oil leakage.)

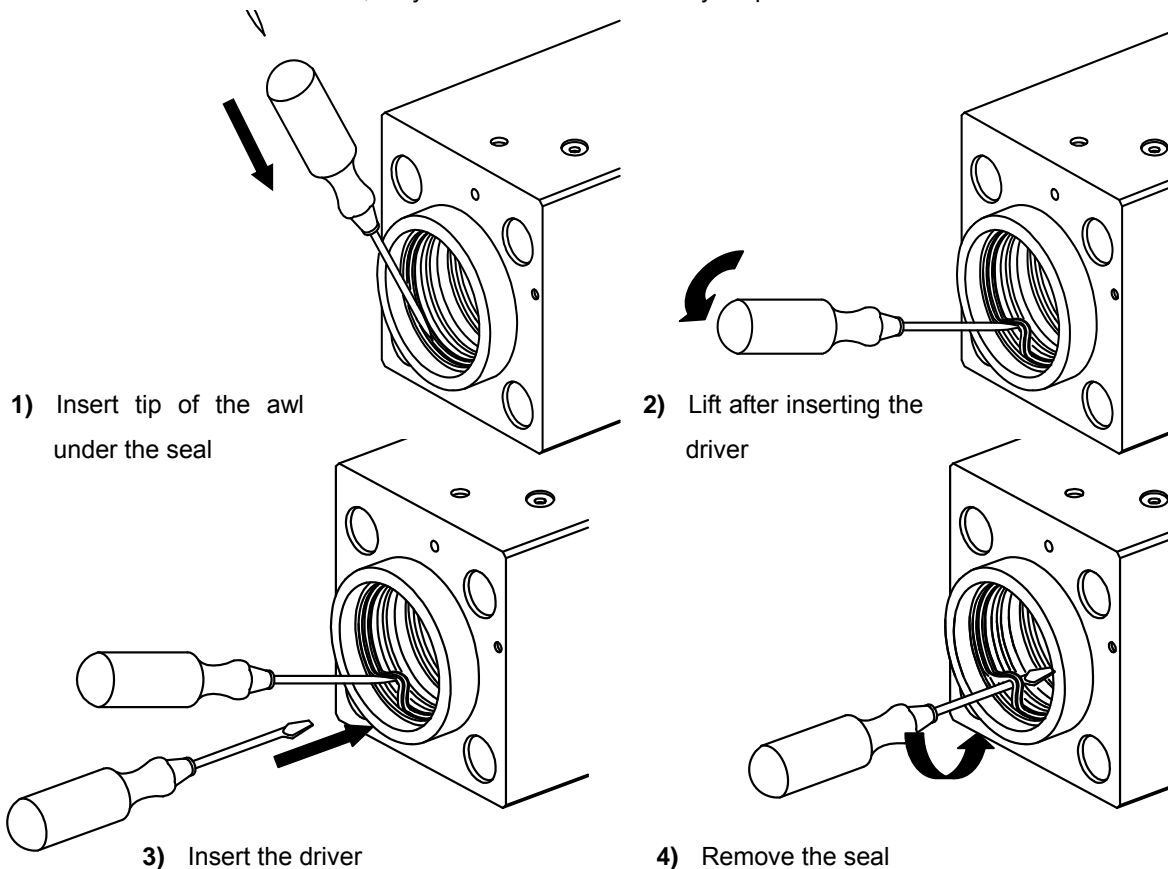


3 – 8. Removal of the Seals

Using a screw driver remove the seals in the bottom of the cylinder and also the seals in the packing bushing.

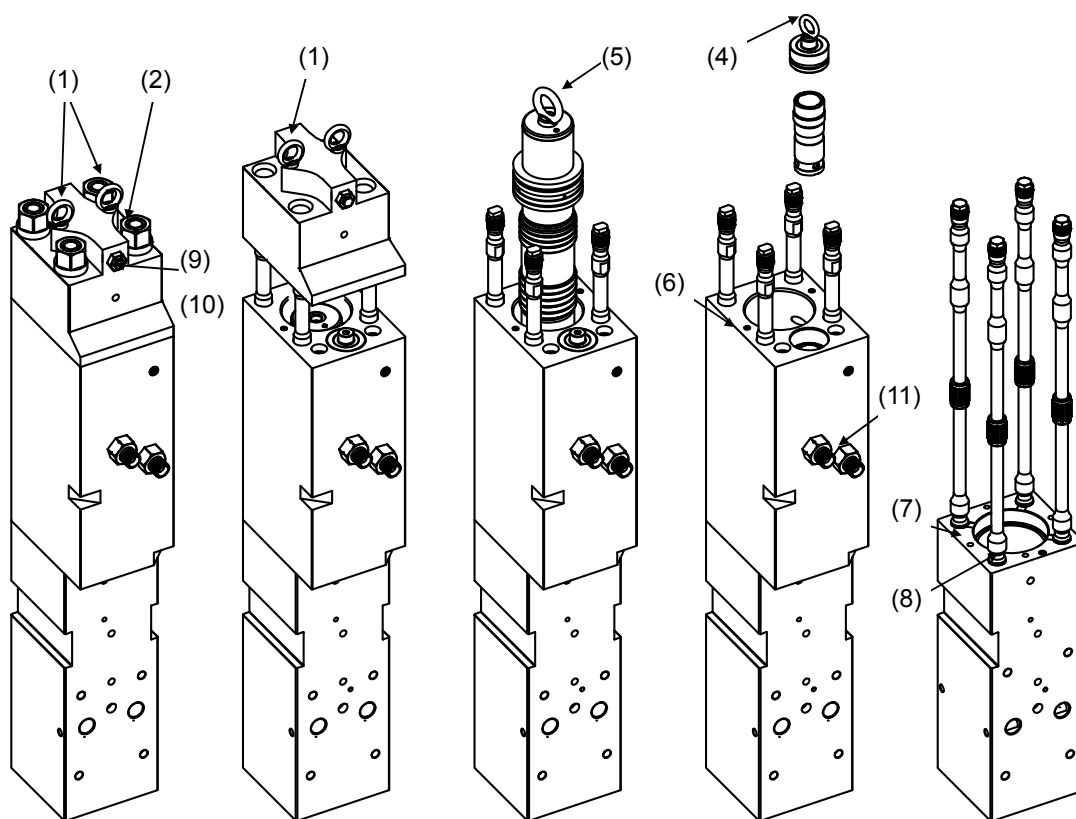
These seals are the oil seal, dust seal, slide ring, O-ring and gas seal.

Once the seal have been removed, they cannot be re-used. Always replace it with new ones.



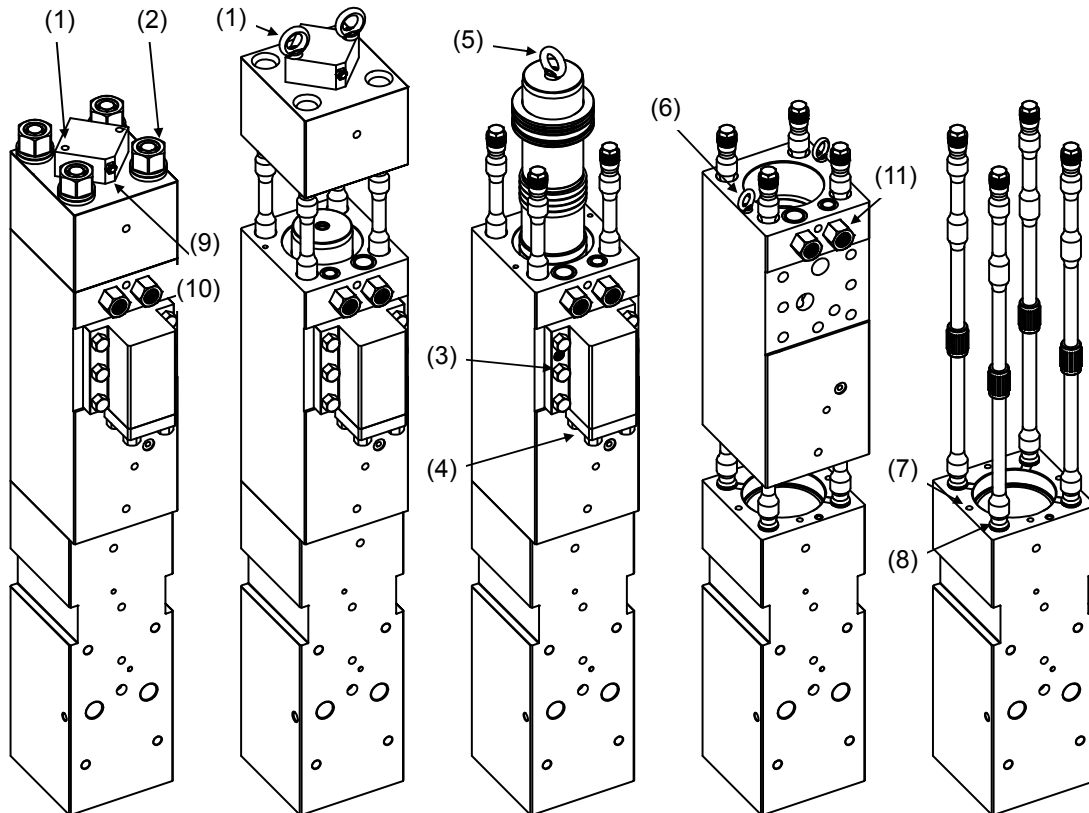
3 – 9. Assembly / Disassembly chart for the Hydraulic Breaker

	Model	TNB	08M	1M	2M	3M	4M	5M
(1) Eyebolt for cylinder cover	Bolt size	(mm)	M8	M8	M8	M12	M12	M12
(2) Side bolt nut	Width across flats (mm)		24	27	32	32	32	36
	Torque (Ft. Lb. / Nm)		160/216	217/294	325/441	325/441	398/539	470/637
(3) Control valve box bolt	Width across flats (mm)		-	-	-	-	-	-
(4) Eyebolt for valve cap	Bolt size	(mm)	M8	M8	M8	M8	M8	M12
(5) Eyebolt for piston	Bolt size	(mm)	M8	M8	M8	M12	M12	M12
(6) Eyebolt for cylinder	Bolt size	(mm)	-	M8	M8	M8	M8	M12
(7) Eyebolt for chisel holder	Bolt size	(mm)	-	-	-	(M12)	(M12)	M12
(8) Side bolt Top/Bottom	Width across flats (mm)		11/13	11/17	11/19	11/19	13/19	17/21
	Torque (Ft. Lb. / Nm)		57.5/78	72/98	87/118	87/118	108/147	144/196
(9) Gas valve plug	Width across flats (mm)		13	13	13	13	13	13
	Torque (Ft. Lb. / Nm)		9/12	9/12	9/12	9/12	9/12	9/12
(10) Gas valve body	Width across flats (mm)		22	22	22	22	22	22
	Torque (Ft. Lb. / Nm)		61/83	61/83	61/83	61/83	61/83	61/83
(11) Hose adapter	Width across flats (mm)		27	32	32	32	32	32
	Torque (Ft. Lb. / Nm)		180/245	325/441	325/441	325/441	325/441	325/441



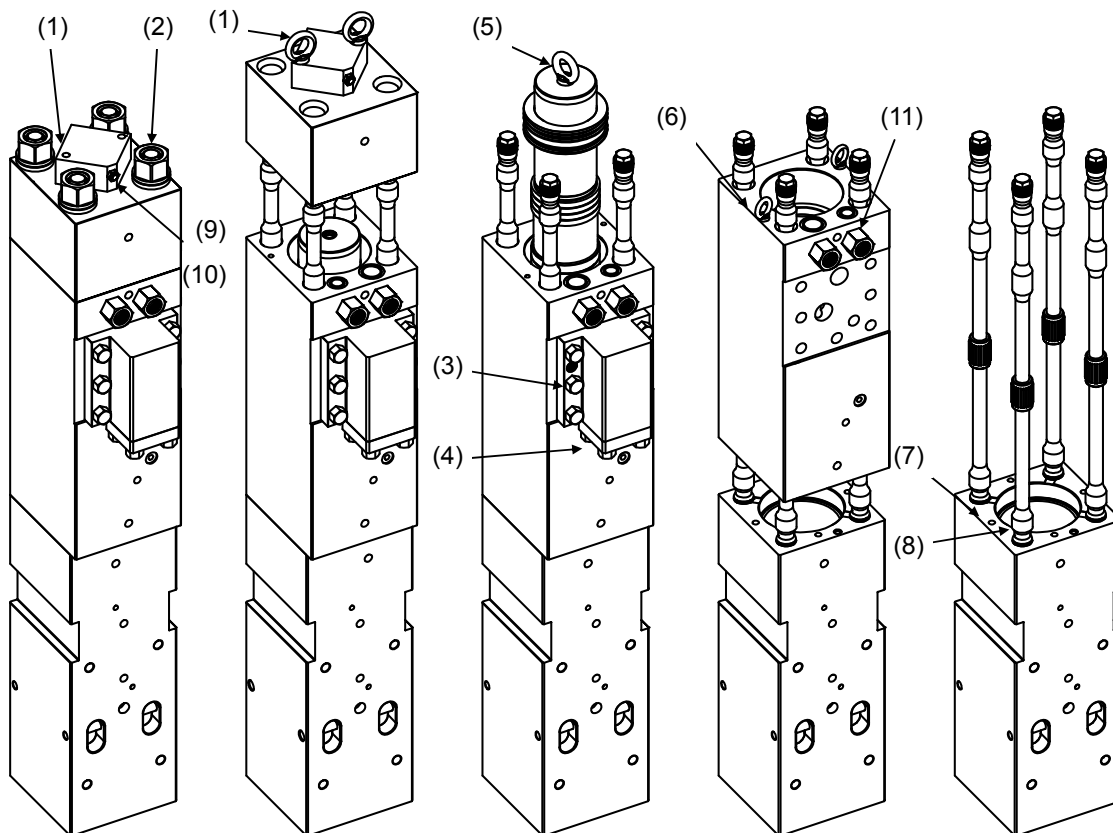
3 – 9. Assembly / Disassembly chart for the Hydraulic Breaker

	Model	TNB	6M	6E	6.5E	7E	141 LU
(1) Eyebolt for cylinder cover	Bolt size (mm)	M12	M12	M20	M20	M20	
(2) Side bolt nut	Width across flats (mm)	41	41	46	55	70	
	Torque(Ft.Lb./Nm)	722/980	722/980	940/1274	1445/1960	1662/2254	
(3) Control valve box bolt	Width across flats (mm)	22	27	27	27	32	
	Torque(Ft.Lb./N·m)	182/274	325/441	325/441	325/441	542/735	
(4) Eyebolt for valve cap	Bolt size (mm)	M8 x30	M8 x30	M8 x30	M8 x30	M10 x40	
(5) Eyebolt for piston	Bolt size (mm)	M12	M12	M12	M20	M20	
(6) Eyebolt for cylinder	Bolt size (mm)	M12	M12	M12	M12	M12	
(7) Eyebolt for chisel holder	Bolt size (mm)	M12	M12	M12	M12	M16	
(8) Side bolt Top/Bottom	Width across flats (mm)	17/24	17/24	22/27	27/30	32/36	
	Torque(Ft.Lb./Nm)	180/245	180/245	217/294	361/490	433/588	
(9) Gas valve plug	Width across flats (mm)	13	13	13	13	13	
	Torque(Ft. Lb./Nm)	9/12	9/12	9/12	9/12	9/12	
(10) Gas valve body	Width across flats (mm)	22	22	22	22	22	
	Torque(Ft.Lb./Nm)	61/83	61/83	61/83	61/83	61/83	
(11) Hose adapter	Width across flats (mm)	32	41	41	41	50	
	Torque(Ft.Lb./Nm)	325/441	398/539	398/539	398/539	433/588	



3 – 9. Assembly / Disassembly chart for the Hydraulic Breaker

	Model TNB	100	151 LU	190 LU	220 LU	310 LU	400 LU
					230 LU		
(1) Eyebolt, cylinder cover	Bolt size (mm)	M20	M20	M24	M24	M30	M30
(2) Side bolt nut	Width across flats (mm)	55	70	75	80	80	90
	Torque (Ft. Lb./Nm)	1445/1960	1662/2254	2096/2842	2602/3528	2602/3528	4192/5684
(3) Control valve box bolt	Width across flats (mm)	32	32	41	41	46	46
	Torque (Ft. Lb./Nm)	542/735	542/735	650/882	650/882	940/1274	940/1274
(4) Eyebolt for valve cap	Bolt size (mm)	M10 x40	M10 x40	M12 x50	M12 x50	M16 x60	M16 x60
(5) Eyebolt for piston	Bolt size (mm)	M20	M20	M24	M24	M30	M30
(6) Eyebolt for cylinder	Bolt size (mm)	M12	M12	M16	M16	M16	M20
(7) Eyebolt, chisel holder	Bolt size (mm)	M12	M16	M16	M16	M16	M20
(8) Side bolt Top/Bottom	Width across flats (mm)	27/30	32/36	36/41	36/46	36/46	46/55
	Torque (Ft. Lb./Nm)	361/490	433/588	578/784	650/882	650/882	867/1176
(9) Gas valve plug	Width across flats (mm)	13	13	13	13	13	13
	Torque (Ft. Lb./Nm)	9/12	9/12	9/12	9/12	9/12	9/12
(10) Gas valve body	Width across flats (mm)	22	22	22	22	22	22
	Torque (Ft. Lb./Nm)	61/83	61/83	61/83	61/83	61/83	61/83
(11) Hose adapter	Width across flats (mm)	41	50	50	50	60	60
	Torque (Ft. Lb./Nm)	398/539	433/588	433/588	433/588	470/637	470/637



4. TNB plugs torque chart

⚠ CAUTION; If the breaker is normal condition, do not disassemble the choke plug.

4. **TNB Plugs Torque chart**

Caution; If the breaker is in normal condition, do not disassemble the choke plug.

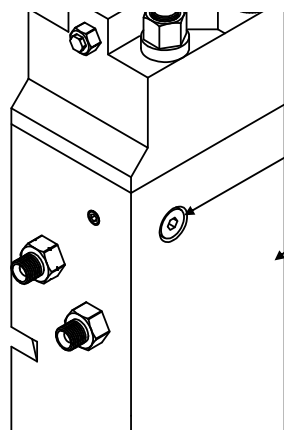
Torque (Ft.Lb./Nm)

(1) Plug	PT1/8	14.75/20
(2) Plug	PT1/4	36/49
(3) Plug	PT3/8	87/118
(4) Plug	PT1/2	180/245
(5) Plug	PT3/4	325/441
(6) Plug	PT1"	433/588
(7) Plug	PT1-1/4	542/735

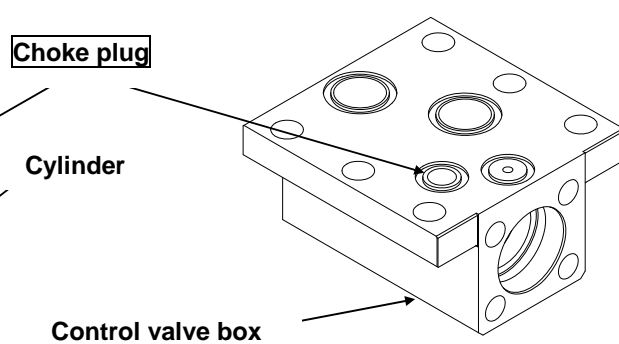
Model	TNB	08M	1M	2M	3M	4M	5M	6M	6E	6.5E	7E
Torque (Ft.Lb./Nm)											
Choke plug		51/69	51/69	51/69	51/69	51/69	72/98	144/196	144/196	144/196	144/196
Plug		(1) (3) (4)	(1) (4) (5)	(1) (2) (3) (5)	(1) (2) (4) (5)	(1) (2) (4) (5) (6)	(1) (2) (4) (6)	(1) (2) (4) (6)	(4) (6)	(4) (7)	(1) (2) (4)

Model	TNB	100	141LU	151LU	190LU	220LU	230LU	310LU	400LU
Torque (Ft.Lb./Nm)									
Choke plug		217/294	217/294	217/294	217/294	217/294	217/294	289/392	289/392
Plug		(1) (2) (4)	(1) (2) (4)	(1) (2) (4)	(2) (4)	(2) (4)	(2) (4)	(2) (4)	(2) (4)

TNB-08M – 5M



TNB-6M – 400LU



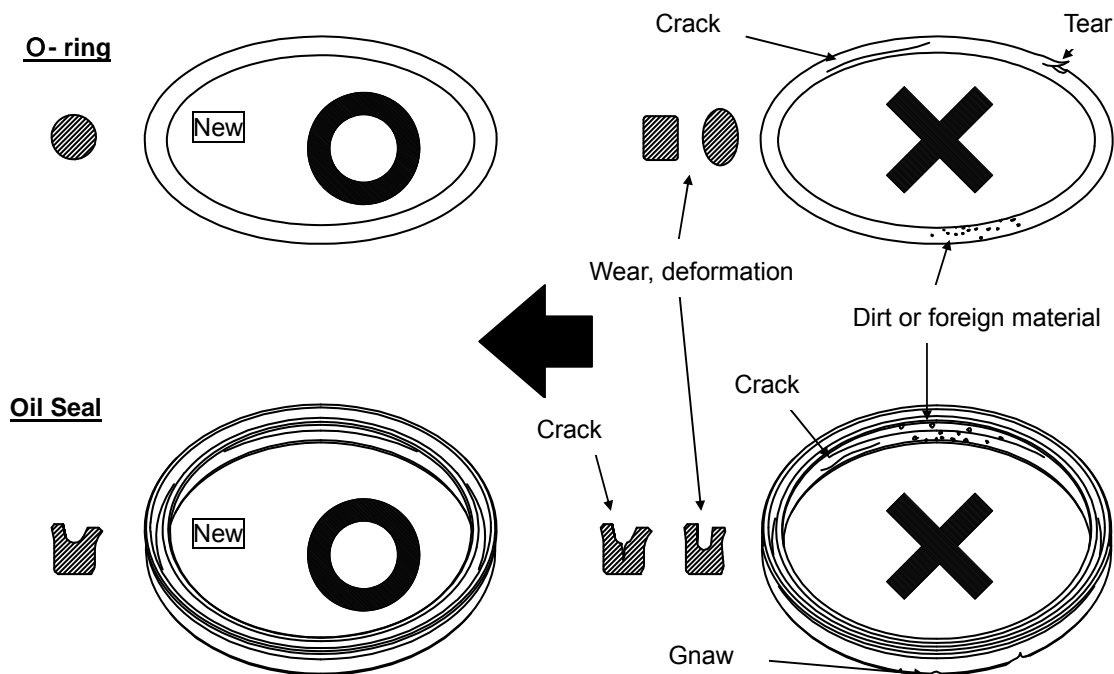
5. Inspection and Repair of the Hydraulic Breaker

5 – 1. Seals

With the seals assembled in the breaker, check for wear, deformation or scratches.

Even small scratches may cause oil leakage from the breaker.

When the breaker is disassembled after 600 hours of operation, all seals should be changed.



5 – 2. Chisel Bushing

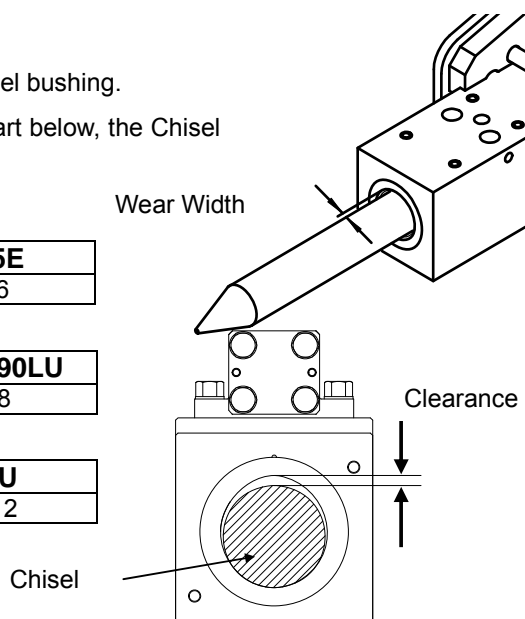
Inspect the clearance between the chisel (New) and chisel bushing.

If the clearance exceeds the allowance shown in the chart below, the Chisel bushing should be replaced.

Model	TNB	08M-6M	6E-6.5E
Wear Width (in./mm)		.157/4	.250/6

Model	TNB	7E-100	141LU-190LU
Wear Width (in./mm)		.275/7	.315/8

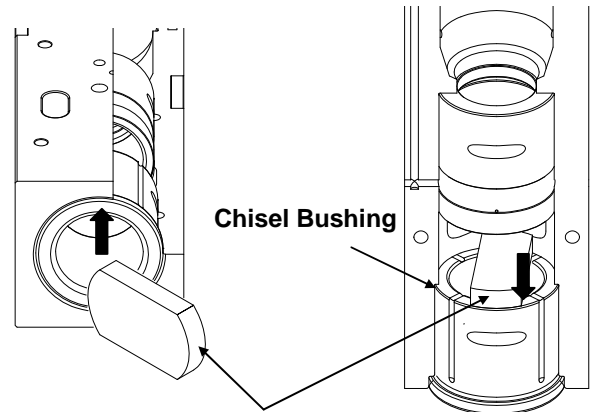
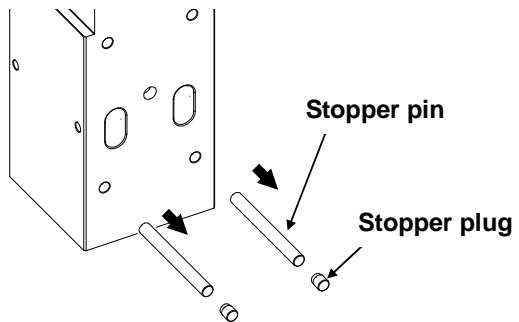
Model	TNB	220LU-310LU	400LU
Wear Width (in./mm)		.393/10	.472/12



5 – 2 – 1. How to change the Chisel Bushing

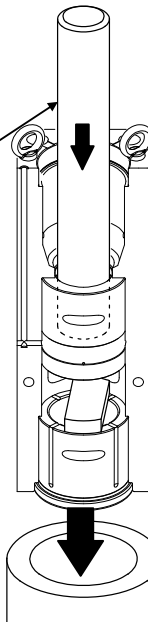
1) Remove the stopper plug and stopper pin.

2) Place the chisel bushing removal jig (A) in the correct position. Then position removal jig (B). Place the Removal bar on top removal jig (A).



Place **Bushing Removal jig (A)** on top of the Chisel bushing so that it does not fall.

Set the Removal bar in place



Bushing Removal jig (B)

(in./mm)

Dimensions required for the Chisel Bushing removal jigs & steel bar.

Model	TNB	08M	1M	2M	3M	4M	5M,6M
Chisel Bushing Removal Jig (A)	O.D (in./mm)	-	2.16/55	2.3/60	2.75/70	2.9/75	3.5/90
	Width (in./mm)	-	1.18/30	1.57/40	2/50	2/50	2.36/60
	Thick (in./mm)	-	.63/16	.63/16	.78/20	1/25	1/25
Chisel Bushing Removal Jig (B)	O.D (in./mm)	5.5/140	5.5/140	6.3/160	8/200	8/200	8.6/220
	I.D in./mm))	3.15/80	3.15/80	3.4/88	3.7/96	4.25/108	4.6/118
	Length (in./mm)	3.54/90	3.54/90	4/100	4.7/120	4.7/120	5/130
Chisel Bushing Removal Bar	O.D (in./mm)	1/25	1.18/30	1.4/36	1.8/46	2/50	2.16/55
	Length (in./mm)	As required					

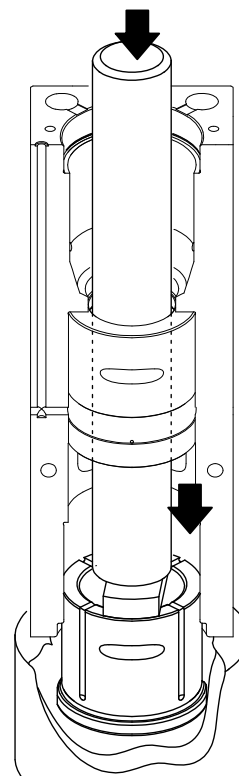
Dimensions required for the Chisel Bushing removal jigs & steel bar.

Model	TNB	6E, 6.5E	7E,100
Chisel Bushing Removal Jig (A)	O.D (in./mm)	4.33/110	5/130
	Width (in./mm)	2.75/70	3.54/90
	Thick (in./mm)	1.18/30	1.57/40
Chisel Bushing Removal Jig (B)	O.D (in./mm)	10/250	12/300
	I.D (in./mm)	5.4/138	7.3/185
	Length (in./mm)	6/150	8/200
Chisel Bushing Removal Bar	O.D (in./mm)	2.55/65	3.54/90
	Length (in./mm)	As required	

Model	TNB	141LU 151LU	190LU	220LU 230LU	310LU	400LU
Chisel Bushing Removal Jig (A)	O.D (in./mm)	6/150	2.2/55	6.3/160	7/180	8/200
	Width (in./mm)	4/100	4/100	4.3/110	4.3/110	4.7/120
	Thick (in./mm)	1.7/45	1.7/45	2/50	2/50	2/50
Chisel Bushing Removal Jig (B)	O.D (in./mm)	14/350	14/350	14/350	16/400	16/400
	I.D (in./mm)	8.2/210	8.2/210	8.2/210	10.6/270	10.6/270
	Length (in./mm)	8.6/220	8.6/220	8.6/220	10/250	10/250
Chisel Bushing Removal Bar	O.D (in./mm)	4.3/110	4.3/110	4.7/120	4.7/120	5/130
	Length (in./mm)	As required				

- 3) Using a press, push the removal bar down and this will remove the bushing.
(Force of 100 t is needed)

⚠ CAUTION; During a press operation, the operating load is very high. Proceed carefully.



5 – 2 – 2. How to remove the Chisel Bushing when a press is not available (Example) For TNB-151LU

1) Prepare the following tools and material.

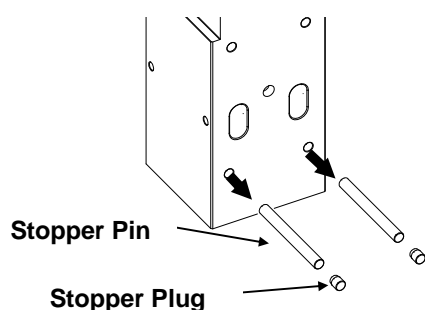
I) Sledge Hammer 2 pcs

II) Welder 1 unit

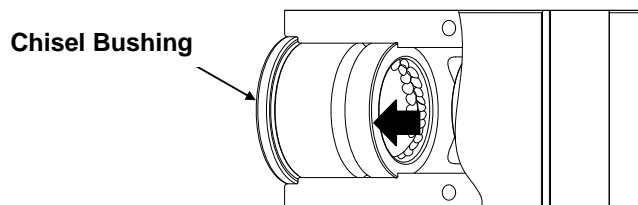
III) Steel Bar A) t25 x 65 x 700 (in./mm) 2 pcs (The size depends on the model)

B) t25 x 65 x 600 (in./mm) 1 pc (The size depends on the model)

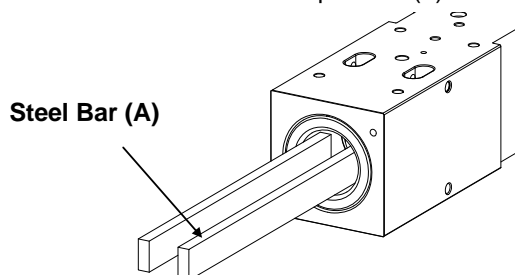
2) Remove the stopper pin and Stopper pin plug.



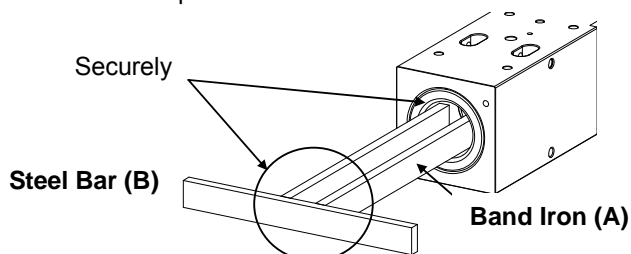
3) From the back section of the chisel holder, Weld from the back towards the front I layers.
(Do not weld the steel bar (A) at this time.)
Insert the steel bar at least /70 (in./mm) in



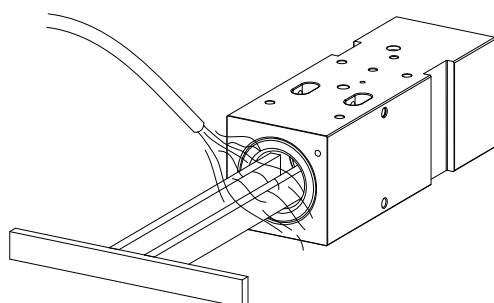
4) Position the steel bar (A), and set weld only.
Then continue to weld in process (3).



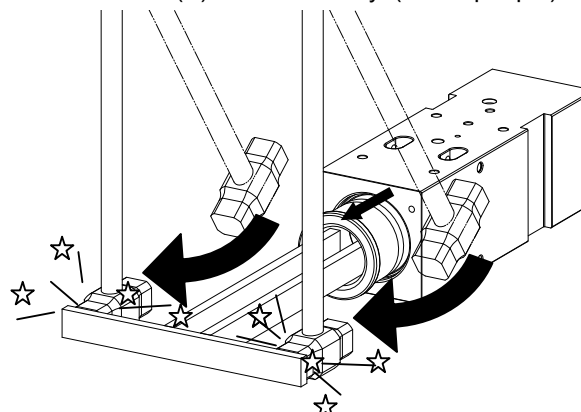
5) After welding steel bar (A), weld steel bar (B) securely to band iron (A) so that a figure T is developed.



6) Apply water to the chisel bushing quickly.
And quench the bushing.



7) Using the 2 sledge hammers, Hit both sides of steel bar (B) simultaneously. (Use 2 people)



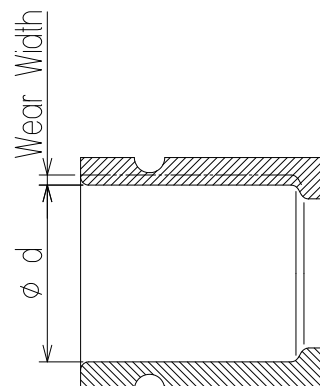
5 – 3. Chisel Holder Bushing

Confirm that the wear of the chisel holder bushing is within the chart shown below. If the wear exceeds the limits, the chisel holder bushing should be replaced.

Model	TNB	08M-3M	4M-6M
Wear Width (in./mm)		.06/1.5	.08/2

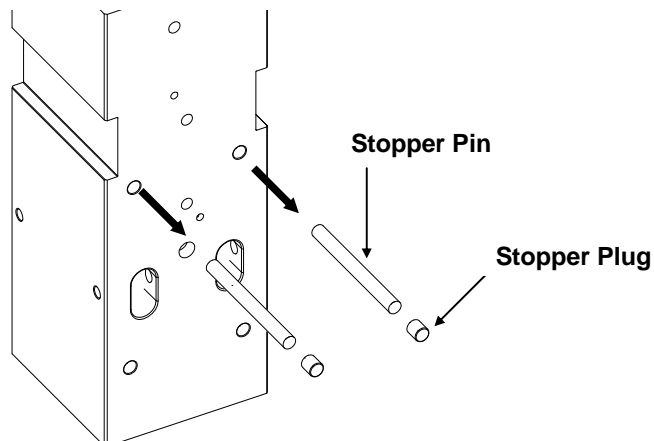
Model	TNB	6E-6.5E	7E-100
Wear Width (in./mm)		.098/2.5	.138/3.5

Model	TNB	141LU-190LU	220LU-310LU	400LU
Wear Width (in./mm)		.160/4	.196/5	.25/6

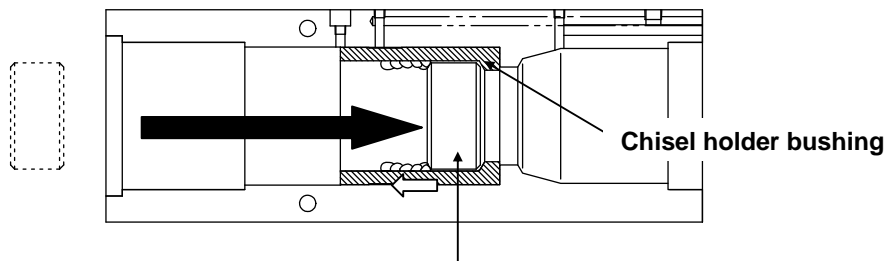


5 – 3 – 1. How to change the Chisel Holder Bushing

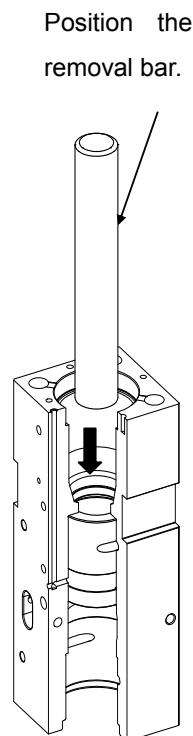
- 1) Remove the stopper pin and stopper plug.



- 2) Choose the correct size removal tool and place the removal tool. And, weld the removal tool, then place the steel bar as following shown.

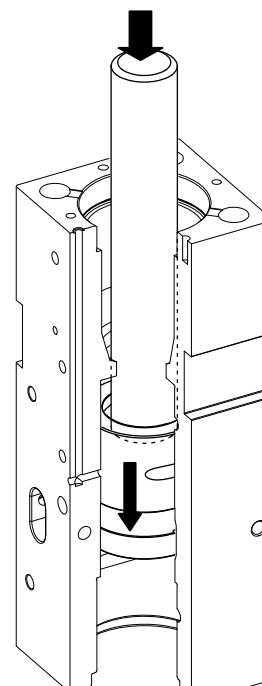


Insert the removal tool as shown in the diagram above and weld.



- 3) Remove the chisel holder bushing using a press machine.
(Pressure needed is approx. 100 ton)

⚠ CAUTION; During a press operation, the operating load is very high. Proceed carefully. Also, always remove the chisel bushing first before removing the chisel holder bushing.



Estimate sizes for the Chisel Holder Bushing removal bar and section material dimensions

	Model	TNB	08M	1M	2M	3M	4M	5M
Bushing Removal bar	Diameter for holder bushing removal bar (mm)		-	1.57 40	1.8 46	1.8 46	2 50	2.55 65
	Diameter for holder bushing removal tool (in./mm)		1.57 40	1.77 5	2 50	2.16 55	2.36 60	3 75
	Length as required							

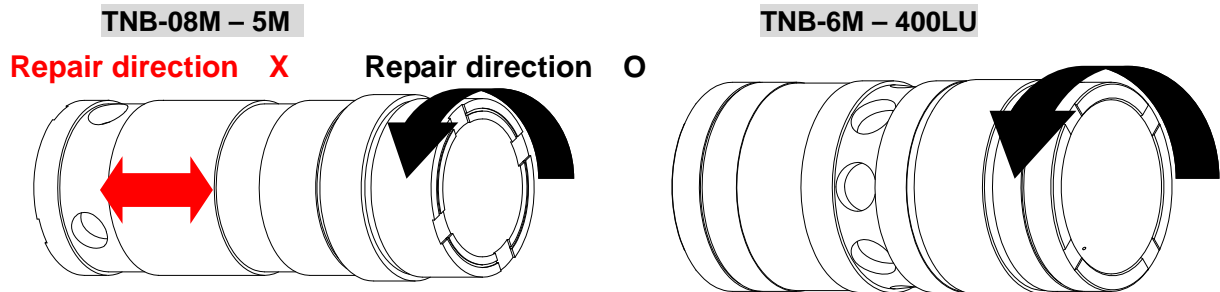
	Model	TNB	6M	6E	6.5E	7E	100
Bushing Removal bar	Diameter for holder bushing removal bar (in./mm)		2.55/65	2.55/65	2.55/65	3.54/90	4.05/103
	Diameter for holder bushing removal tool (in./mm)		3/75	3.54/90	3.54/90	4.33/110	4.33/110
	Length as required						

	Model	TNB	141LU 151LU	190LU	220LU 230LU	310LU	400LU
Bushing Removal bar	Diameter for holder bushing removal bar (in./mm)		4.64/118	4.84/123	5.23/133	5.43/138	5.82/148
	Diameter for holder bushing removal tool (in./mm)		5.11/130	5.5/140	5.5/140	6.3/160	7.0/180
	Length as required						

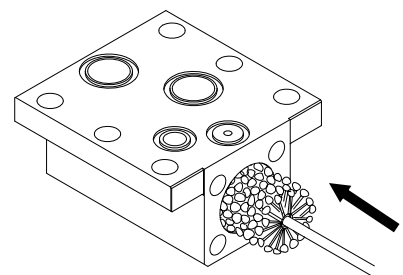
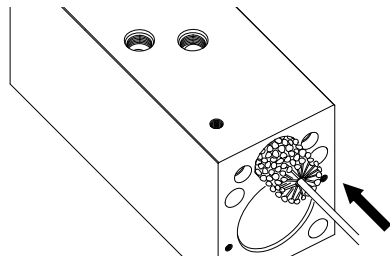
5 – 4. Control Valve / Control Valve Box

Inspect the control valve for seizure or pick up marks. If the seizure marks are small, use a fine oil stone or water paper (#400 - #800) to repair the markings.

If seizure has developed on the control valve or control valve box, repair accordingly. When repairing the valve box using a flex-hone, operate for about 10 secs. Do not exceed the operating time of 10 secs. (Also use the correct diameter flex-hone as shown in the chart below.)

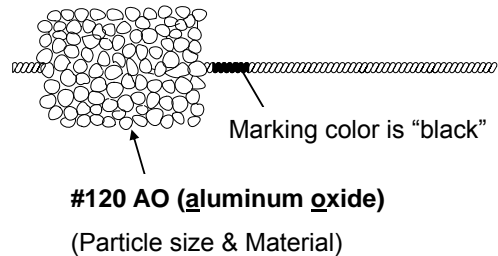


If the seizure marks are deep and extensive, the control valve and control valve box should be replaced.



BREAKER Model	FLEX-HONE Model	Appropriate Size (in./mm)
TNB-08M	BC-25	.94-1.06/24-27
TNB-1M	BC-31.8	1.18-1.29/30-33
TNB-2M TNB-3M	BC-35	1.29-1.41/33-36
TNB-4M TNB-5M TNB-6M	BC-41	1.49-1.69/38-43
TNB-6E TNB-6.5E TNB-7E	BC-51	1.88-2.04/48-52
TNB-100 TNB-141LU TNB-151LU	BC-60	2.28-2.40/58-61
TNB-190LU TNB-220LU TNB-230LU	BC-76	2.83-3.07/72-78
TNB-310LU TNB-400LU	GB-89	3.22-3.50/82-89

Flex-hone

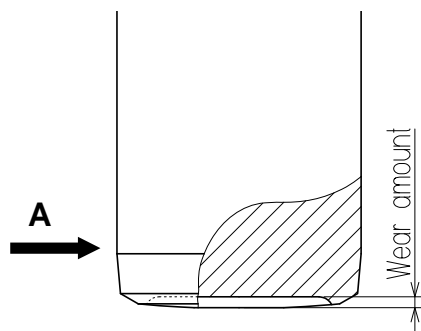


* When performing a flex-hone operation, always use a grinding fluid.

When the grinding balls wear on the flex-hone and the fiber thread begin to appear, replace with a new one.

5 – 5. Piston

Periodically inspect the amount of deformation at the impact area of the piston. If the amount of wear at the impact area of the piston exceeds the limits shown in the chart, the piston must be replaced.



* If the piston wears beyond the limits shown in the chart and the piston is not replaced as shown the diagram on the left, Area A will swell and it may become difficult to remove the piston from the cylinder.

As a result the piston should be replaced according to the chart limits.

Model	TNB	08 – 6M	6E, 6.5E	7E, 100
Wear (in./mm)		.04/1	.06/1.5	.078/2

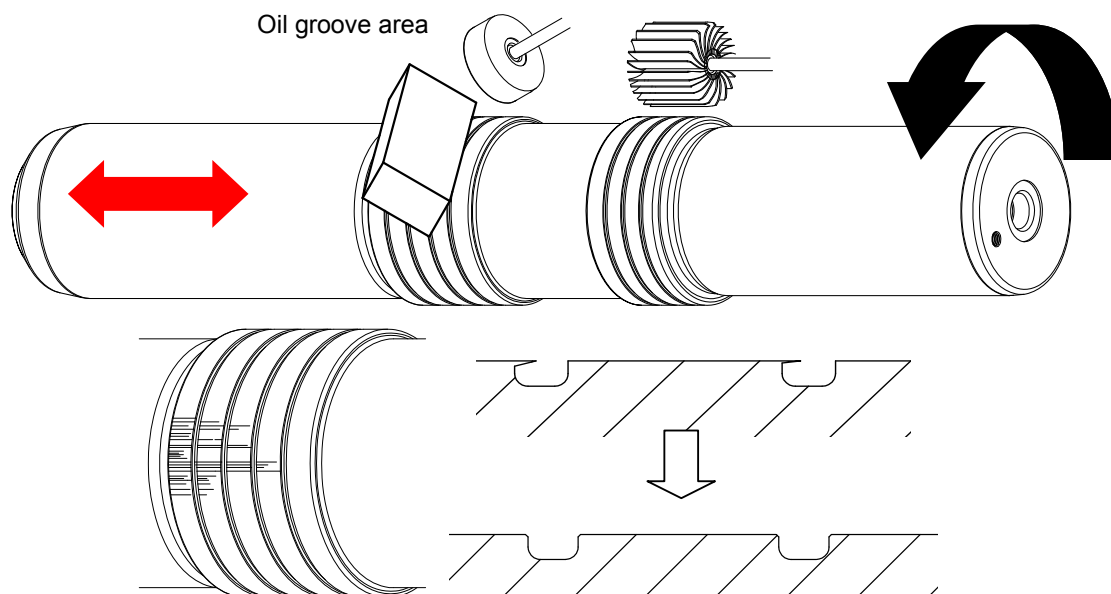
Model	TNB	141LU – 190LU	220LU – 400LU
Wear (in./mm)		.078/2	.118/3

Inspect the piston for seizure marks or pickup. If the large diameter seizure marks are small, they can be repaired using an oil stone, paper or flap wheel with spindle (#400 - #800).

If seizure develops where burrs are visible use the corner of the oil stone or grinding wheel to clean out the burrs. Please also make sure the mating parts such as cylinder are also repaired accordingly.

Repair direction X

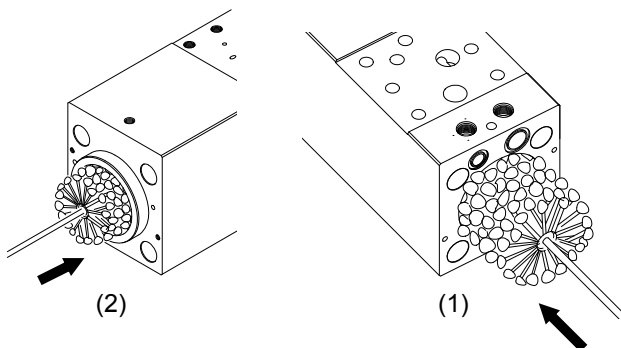
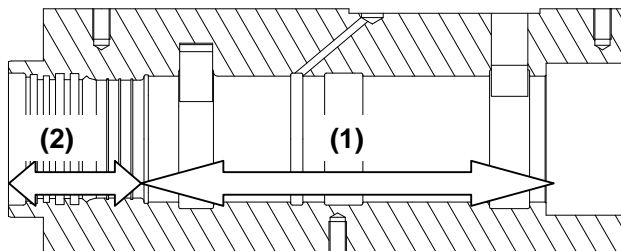
Repair direction O



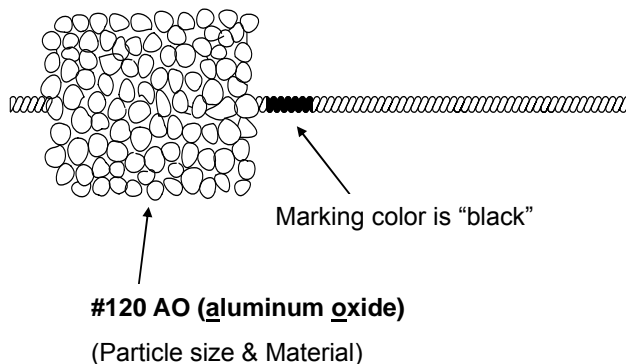
5 – 6. Cylinder

Please also repair the seizure in the cylinder by flex-hone. Please make sure not to grind inside of the cylinder by flex-hone more than 10 secs. (Make sure the size of Flex-hone is appropriate size to repair.)

BREAKER Model	FLEX-HONE Model	Appropriate Size (in./mm)
TNB-08M	(1) BC-45	1.69-1.89/43 - 48
	(2) BC-41	1.49-1.69/38 - 43
TNB-1M	(1) BC-57	2.08-2.28/53 - 58
	(2) BC-51	1.89-2.04/48 - 52
TNB-2M	(1) BC-64	2.44-2.56/62 - 65
	(2) BC-60	2.28-2.40/58 - 61
TNB-3M	(1) BC-76	2.83-3.07/72 - 78
TNB-4M	(2) BC-70	2.60-2.80/66 - 71
TNB-5M	(1) GB-83	3.0-3.26/76 - 83
TNB-6M	(2) BC-76	2.83-3.07/72 - 78
TNB-6E	(1) GB-95	3.50-3.74/89 - 95
	(2) GB-89	3.22-3.50/82 - 89
TNB-6.5E	(1) GB-105	3.74-4.13/95 - 105
	(2) GB-89	3.22-3.50/82 - 89
TNB-7E	(1) GBD-114	4.33-4.56/110 - 116
	(2) GBD-114	4.33-4.56/110 - 116
TNB-100	(1) GBD-140	5.11-5.51/130 - 140
	(2) GBD-127	4.72-5.51/120 - 130
TNB-141LU	(1) GBD-140	5.11-5.51/130 - 140
	(2) GBD-140	5.11-5.51/130 - 140
TNB-151LU	(1) GBD-165	6.30-6.70/160 - 170
	(2) GBD-152	5.51-6.70/140 - 160
TNB-190LU	(1) GBD-165	6.30-6.70/160 - 170
	(2) GBD-152	5.51-6.70/140 - 160
TNB-220LU	(1) GBD-165	6.30-6.70/160 - 170
	(2) GBD-152	5.51-6.70/140 - 160
TNB-230LU	(1) GBD-190	7.08-7.48/180 - 190
	(2) GBD-165	6.30-6.70/160 - 170
TNB-310LU	(1) GBD-190	7.08-7.48/180 - 190
	(2) GBD-165	6.30-6.70/160 - 170
TNB-400LU	(1) GBD-203	7.48-8.07/190 - 205
	(2) GBD-190	7.08-7.48/180 - 190



Flex-hone



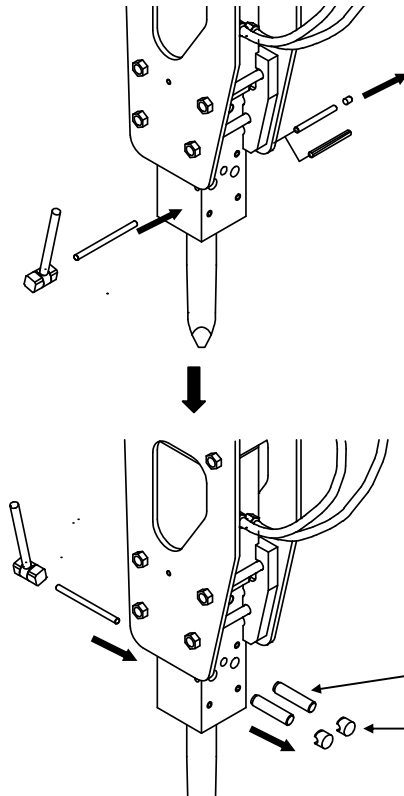
* When performing a flex-hone operation, always use a grinding fluid.

When the grinding balls wear on the flex-hone and the fiber thread begin to appear, replace with a new one.

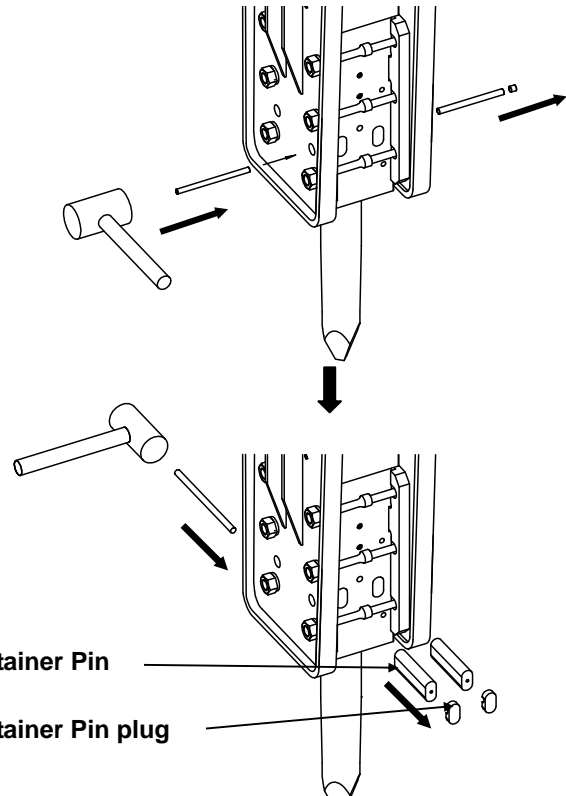
5 – 7. Retainer Pin

Remove the retainer pin and check for any abnormalities.

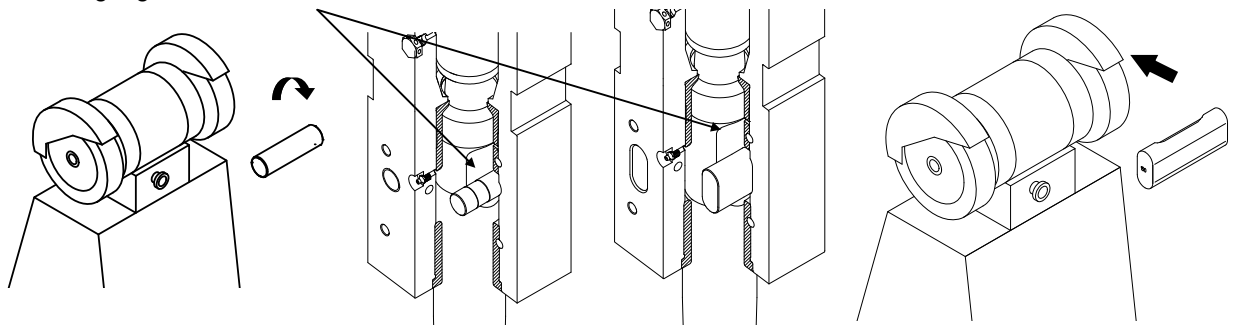
TNB-M Series, E Series, 141LU



TNB-100 – 400LU



If the retainer pins have swelled, this may lead to retainer pin breakage. In this case, remove the swelling by using a grinder at an early stage. If swelling occurs where the retainer pin contacts the chisel, repair these areas using a grinder also.



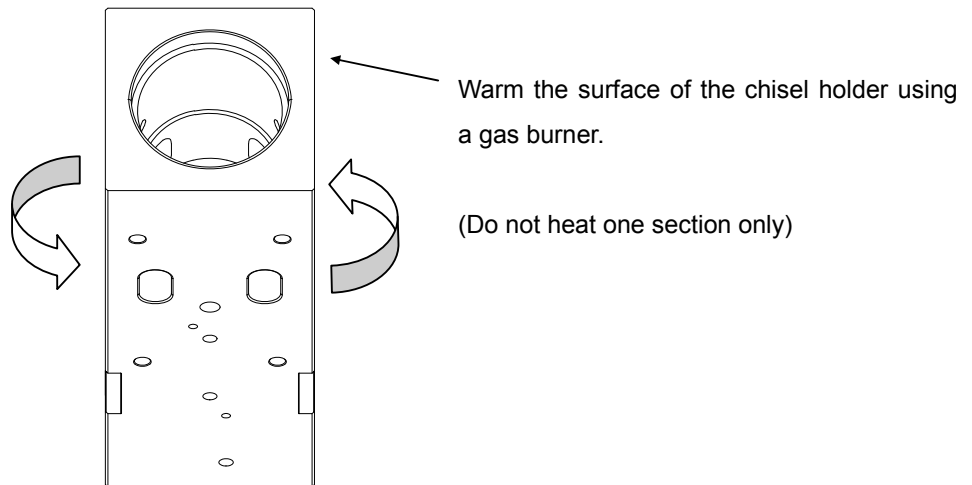
- * For best durability results for the retainer pins, after the rock or demolition material is broken, release your foot from the pedal as early as possible to reduce the amount of blank blows. Also, the retainer pin wears in diameter more than 2mm, the retainer pin should be replaced with new one. Not replacing the retainer pin will lead to breakage of the retainer pin and may be dangerous.

6. Assembly of the Hydraulic Breaker

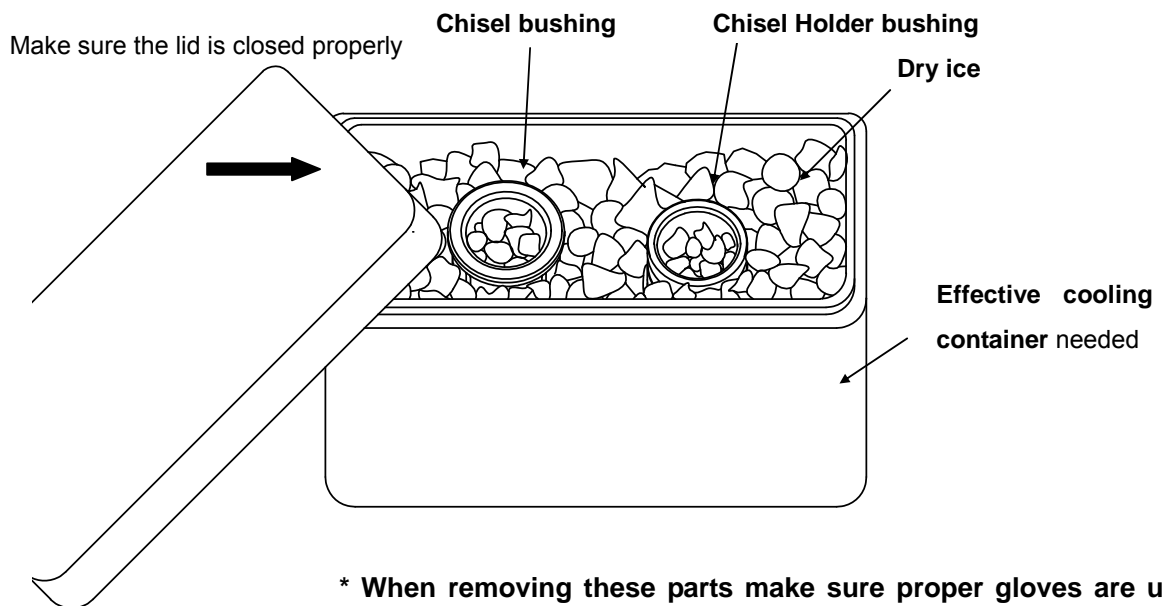
6 – 1. Chisel Holder Bushing / Chisel Bushing

Before assembling the chisel holder bushing and chisel bushing,

- a) Using a gas burner, warm up the surface of the chisel holder for about 30 minutes. (Bring the temperature of the chisel holder to about 200°C (392°F) and confirm with the thermometer.)



- b) Using Dry ice blocks, cool the chisel holder bushing and chisel bushing for about 6-8 hours.
(To about -50°C (-58°F) - -60°C (-76°F))

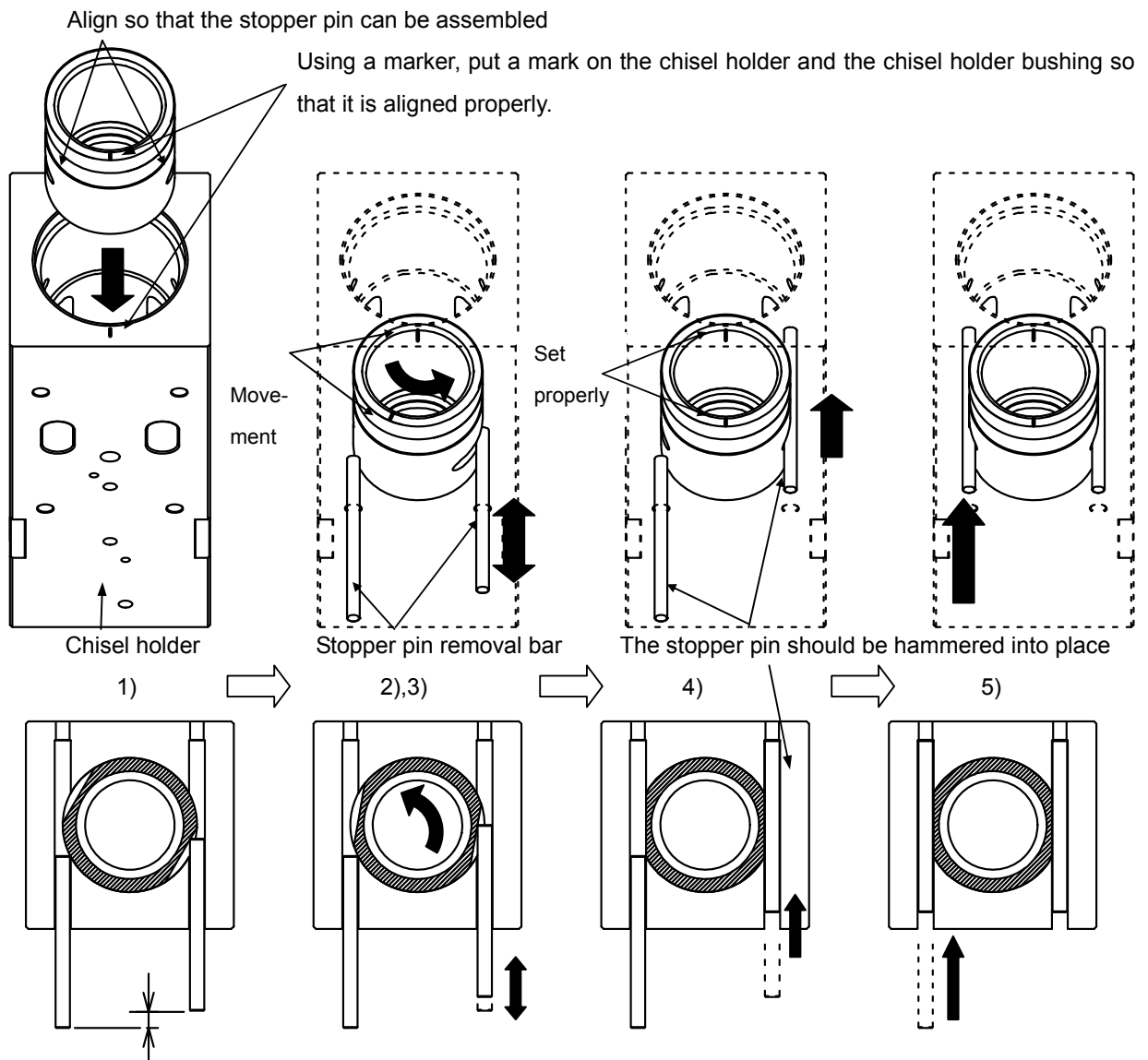


*** When removing these parts make sure proper gloves are used.
(Do not handle with bare hands.)**

6 – 1 – 1. Chisel Holder Bushing

- 1) Drop the chisel holder bushing into the chisel holder. Before assembling the holder bushing, using a marker position where it will be assembled so that it does not have to be adjusted when the pins are assembled.
- 2) Assemble both stopper pin removal bar at the same time. The pin which has been assembled the deepest should be moved back and forth for positioning.
- 3) The chisel holder bushing should rotate inside, and the pin should be assembled to the deepest position.
(The position should be set at this time)
- 4) Remove the stopper pin removal bar and hammer the stopper pin into its position.
- 5) Assemble the other stopper pin to its deepest position.

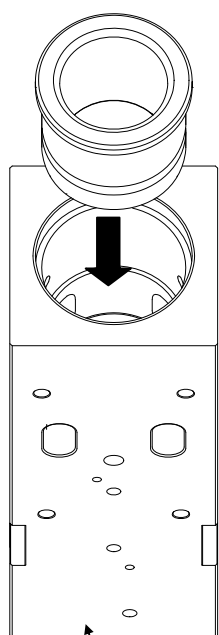
*** The chisel holder has been heated. Be careful not to burn yourself.**



6 – 1 – 2. Chisel Bushing (TNB-08M – TNB-151LU)

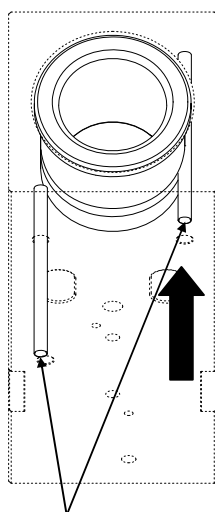
- 1) Drop the chisel bushing into the chisel holder.
- 2) Assemble both stopper pin removal bar at the same time. (The position should be set at this time)
- 3) Remove the stopper pin removal bar and hammer the stopper pin into its position.
- 4) Assemble the other stopper pin to its deepest position.

*** The chisel holder has been heated. Be careful not to burn yourself.**



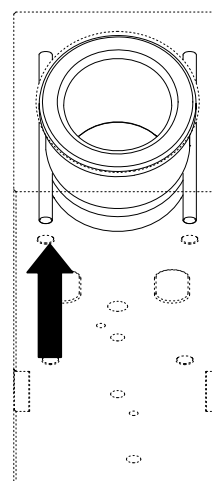
Chisel holder

1)



Stopper pin removal bar

2),3)



Stopper pin

(Use a hammer to assemble in place)

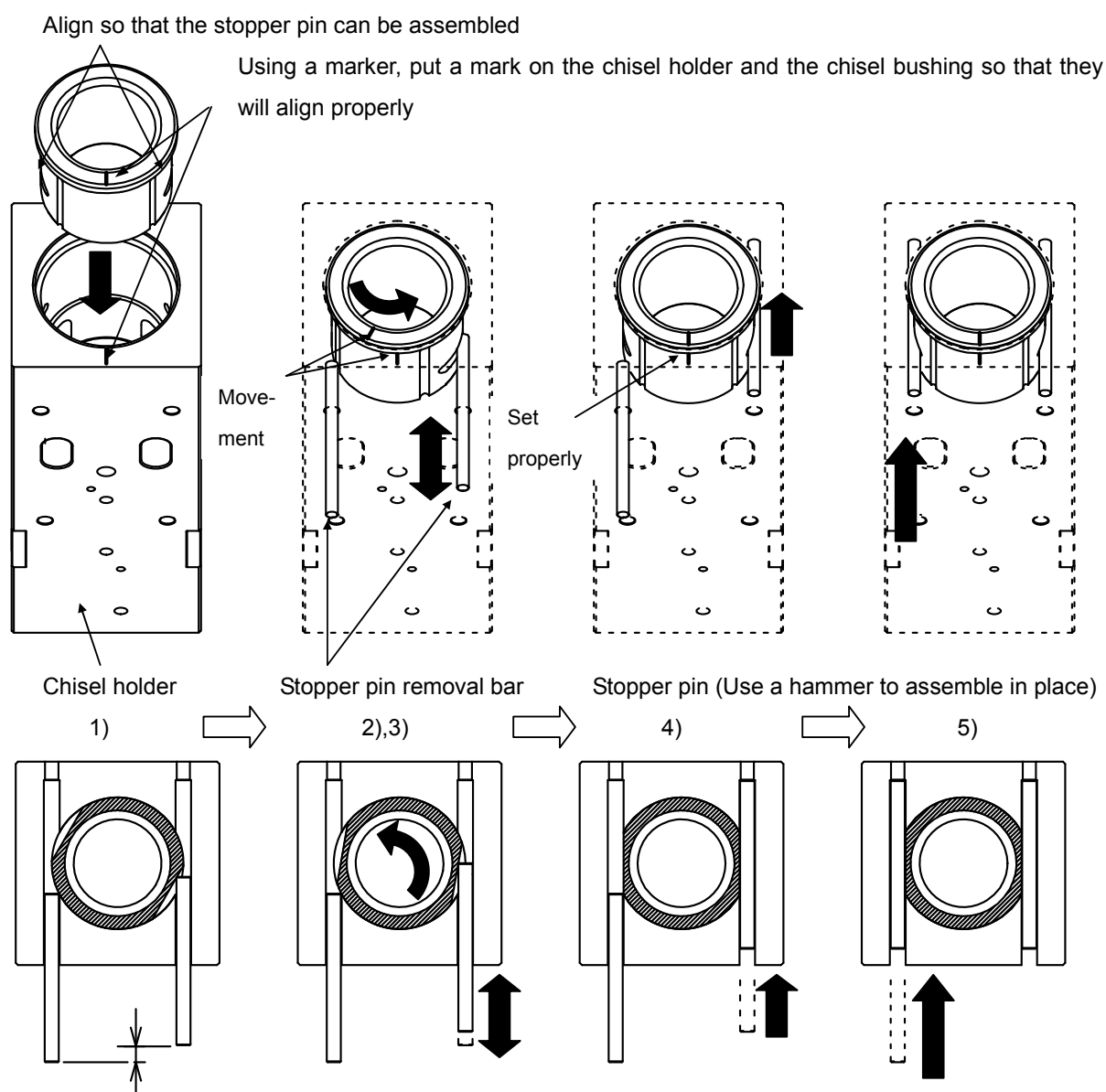
4)



6 – 1 – 2. Chisel Bushing (TNB-190LU – TNB-400LU)

- 1) Drop the chisel bushing into the chisel holder. Before assembling the chisel bushing, using a marker position where it will be assembled so that it does not have to be adjusted when the pins are assembled.
- 2) Assemble both stopper pin removal bar at the same time. The pin which has been assembled the deepest should be moved back and forth for positioning.
- 3) The chisel bushing should rotate inside, and the pin should be assembled to the deepest position. (The position should be set at this time)
- 4) Remove the stopper pin removal bar and hammer the stopper pin into its position.
- 5) Assemble the other stopper pin to its deepest position.

*** The chisel holder has been heated. Be careful not to burn yourself.**

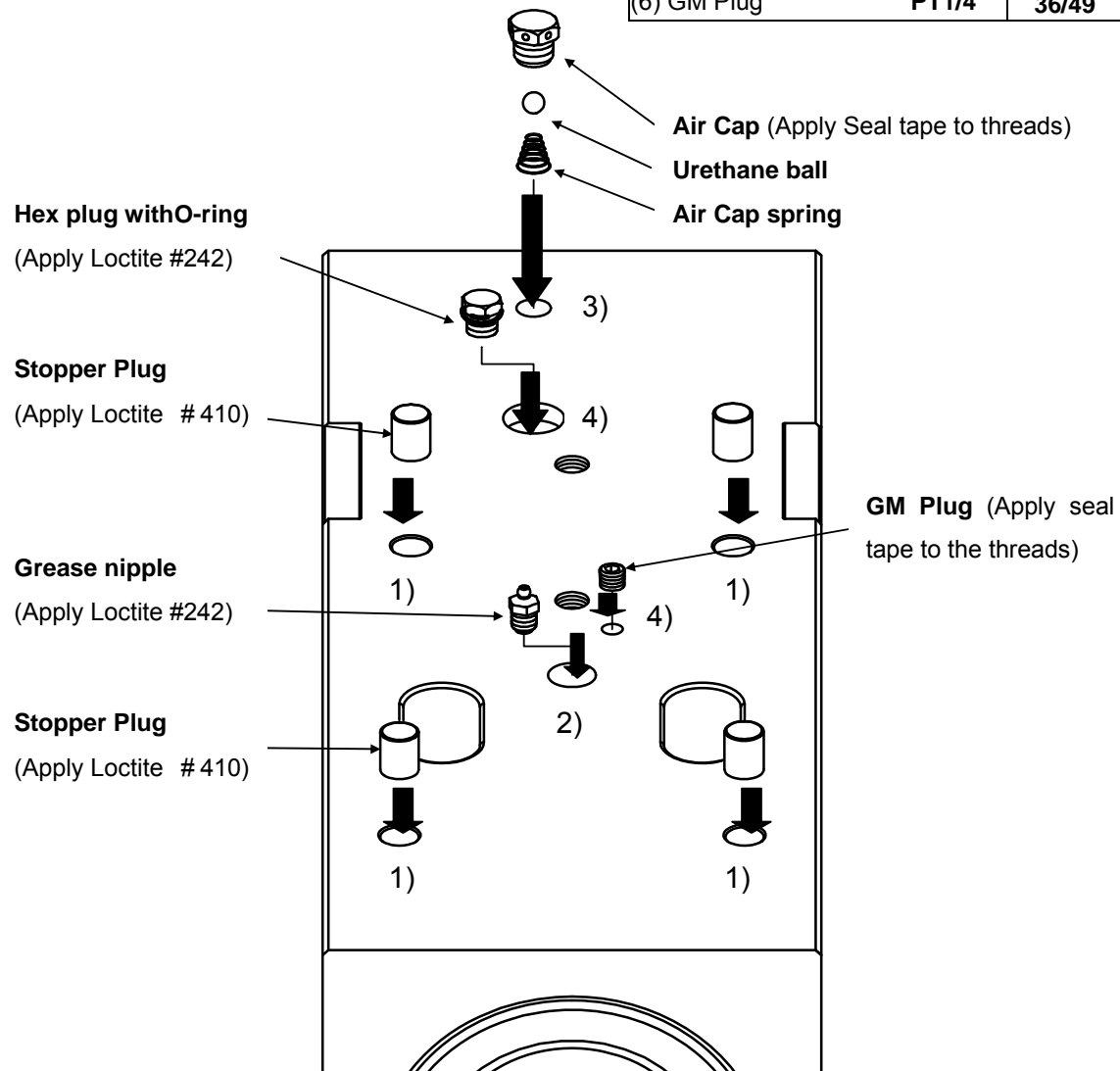


6 – 2. Chisel Holder

- 1) After making sure the chisel holder is back to room temperature, apply “Loctite #410” to the stopper plug and hammer the part into place.
- 2) Apply “Loctite #242” to the Grease Nipple thread section and assemble into place.
- 3) Assemble the Air cap spring, Urethane ball as shown in the diagram below, then apply seal tape to the thread section of the Air cap thread and assemble.
- 4) Assemble the hex plug with O-ring and GM plug. The tightening torque chart is shown below.

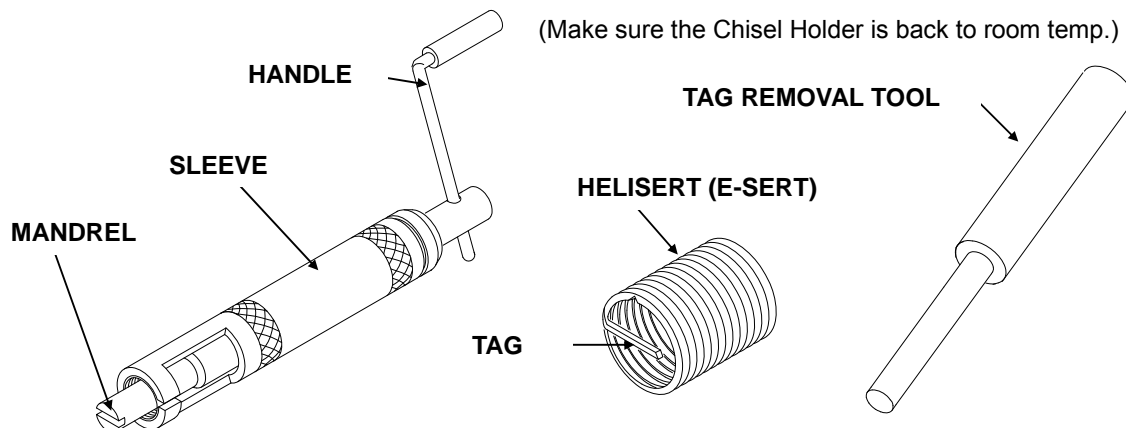
Torque **Ft. Lb./N·m**

(1) Grease Nipple	PT1/8	14.75/20
(2) Grease Nipple	PT1/4	28.7/39
(3) Air Cap	PT1/2	144.5/196
(4) Hex Plug with O-ring	PF1/4	28.7/39
(5) GM Plug	PT1/8	14.75/20
(6) GM Plug	PT1/4	36/49

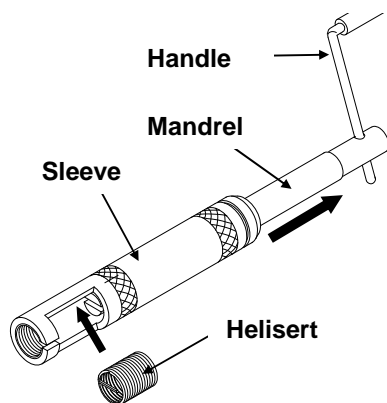


6 – 2 – 1. How to insert the Helisert

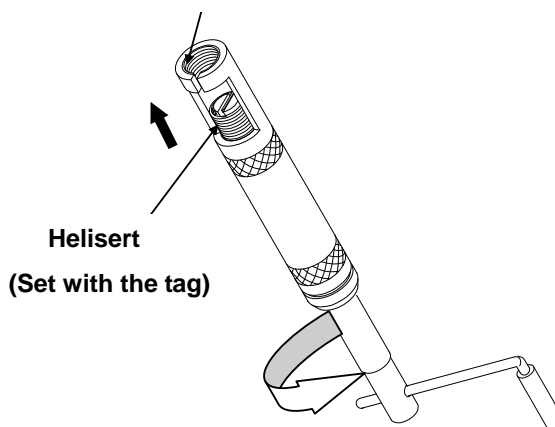
(Make sure the Chisel Holder is back to room temp.)



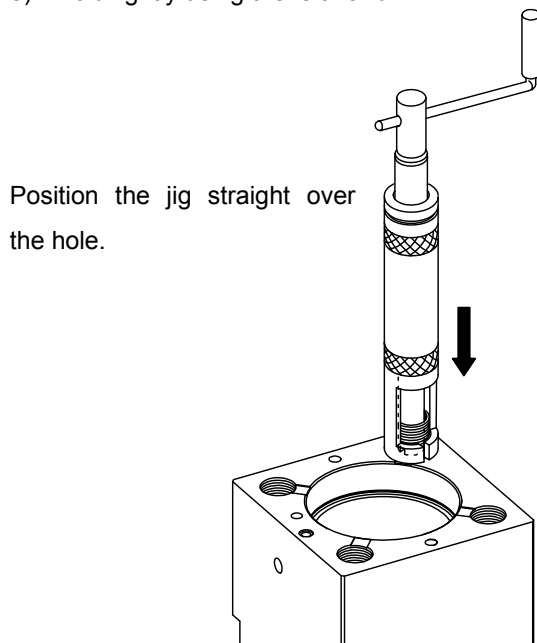
- 1) From the sleeve window, set the tip of the Mandrel into the tag. Turn the handle facing up.



- 2) Turn the Helisert into the sleeve so that it stops 1-2 threads the front end of the sleeve.

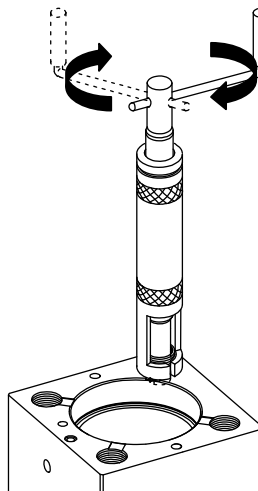


- 3) Hold lightly using the left hand.

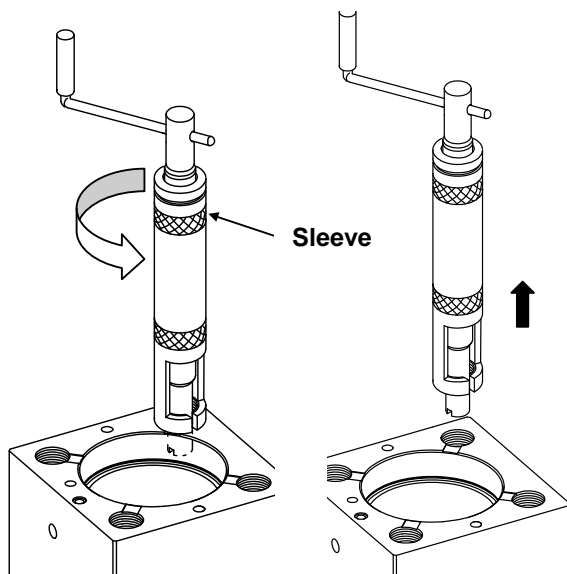


Position the jig straight over the hole.

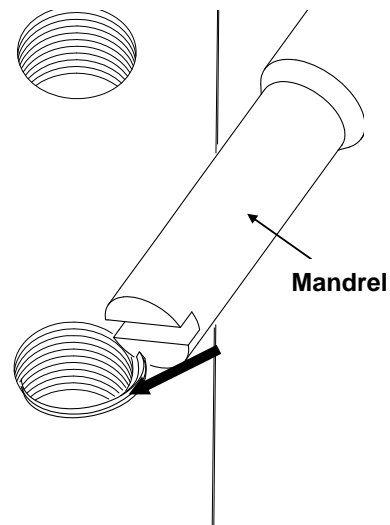
- 4) Do not press the tag. (A pulling up action is needed) Place the thread on top of the hole and turn the handle in the right (clock wise) direction.



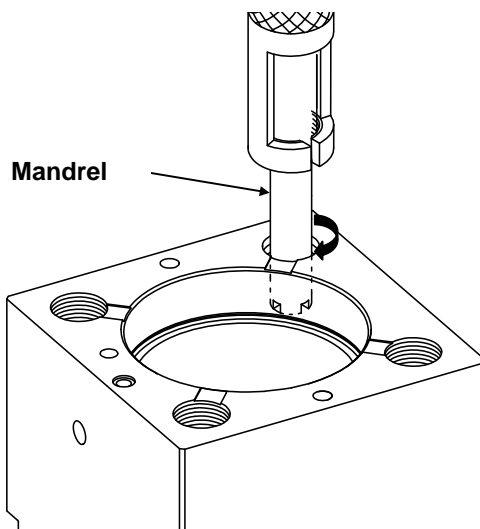
5) When the helisert is completely in the chisel holder, turn the sleeve towards the left and remove the sleeve from the Helisert.



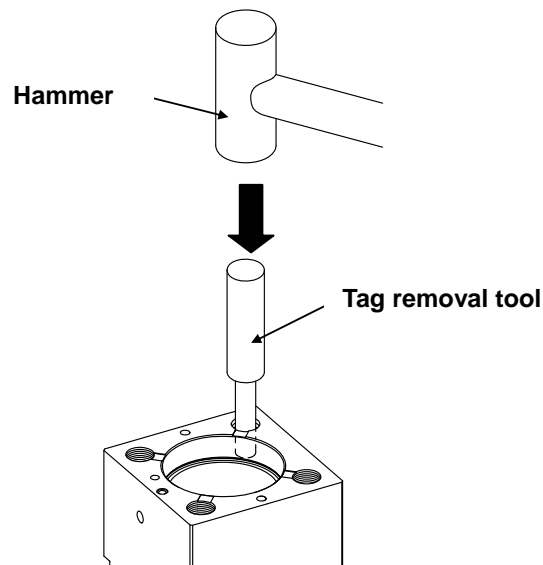
6) Push in any remains from the helisert by using the front tip of the Mandrel.



7) Using the front tip of the Mandrel, put the helisert into the hole by one thread.



8) Using the front tip of the Tag removal tool. Please the tool on the tag and using a short blow remove the tag from the Helisert.



⚠ CAUTION; When turning the handle, always turn in the right direction (Clockwise). Turning in the left hand direction will break the tag off, and will not be able to assemble the helisert.

Helisert Thread Sizes

	Model	TNB	08M	1M	2M, 3M	4M	5M
Helisert Insertion Tool	Chisel Holder (Side bolt area)		M16 P=1.5	M18 P=1.5	M20 P=1.5	M22 P=1.5	M24 P=2

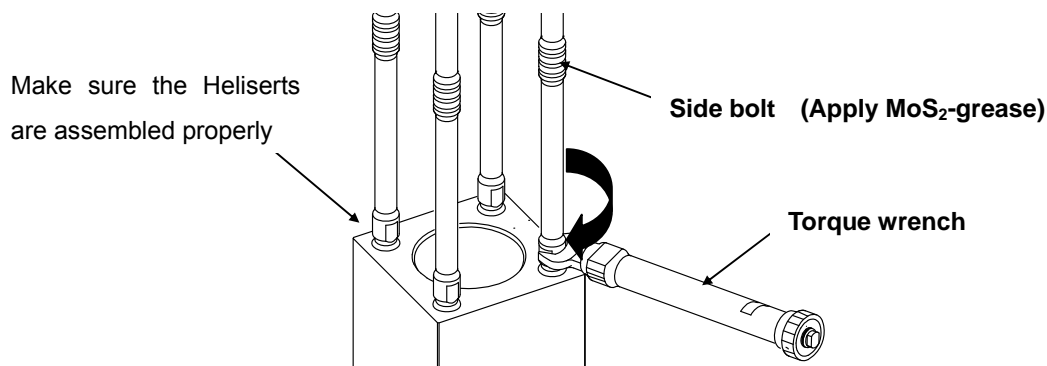
	Model	TNB	6M, 6E	6.5E	7E, 100
Helisert Insertion Tool	Chisel Holder (Side bolt area)		M27 P=2	M30 P=2	M36 P=3

	Model	TNB	141LU 151LU	190LU	220LU 230LU	310LU	400LU
Helisert Insertion Tool	Chisel Holder (Side bolt area)		M42 P=3	M48 P=3	M52 P=3	M52 P=3	M64 P=4

6 – 3. Side Bolt

Apply anti-seize lubricant (MoS₂-grease) or equivalent Brands to the thread area of the side bolt. Assemble the side bolt into the chisel holder at the specified torque.

(Refer to page 26, **3-9. “Assembly / disassembly chart for the Hydraulic Breaker”** which indicates the torque settings.)



Apply a small amount of grease to the rod area of the side bolt and rubber area.

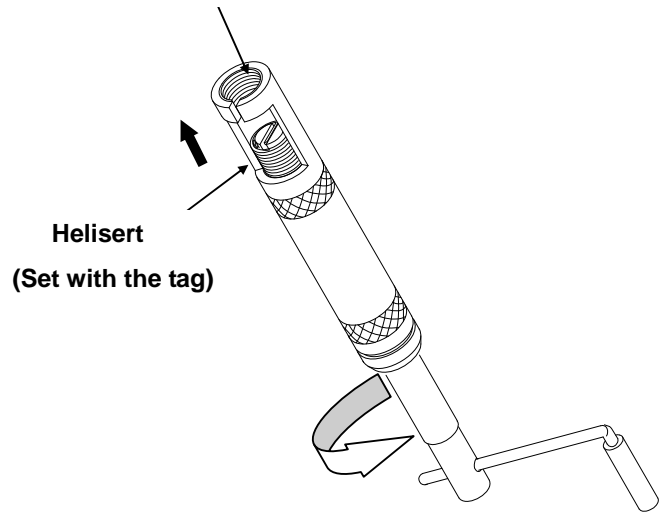
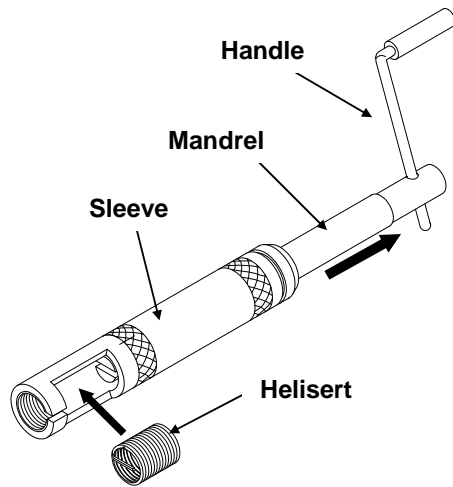
This will allow easier assembly of the cylinder.

*** During assembly of the side bolts into the chisel holder, you may experience some difficulties. In this case check the thread section of the side bolts for deformation and also check for any deformation of the helisert. Foreign particles also may have entered the area. Do not force the side bolt into place. Remove the side bolt and check for any problems.**

6 – 4. Cylinder

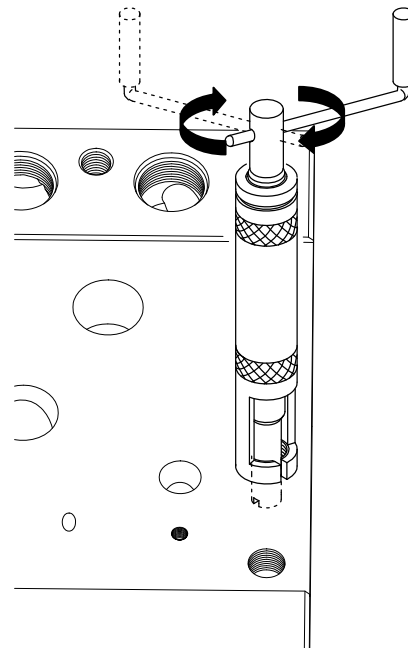
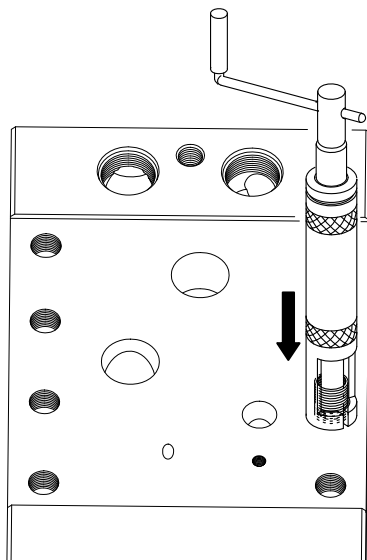
Proceed as shown below to assemble the Heliserts into the Cylinder.

- 1) From the sleeve window, set the tip of the Mandrel into the tag. Turn the handle facing up.
- 2) Turn the Helisert into the sleeve so that it stops 1-2 threads the front end of the sleeve.

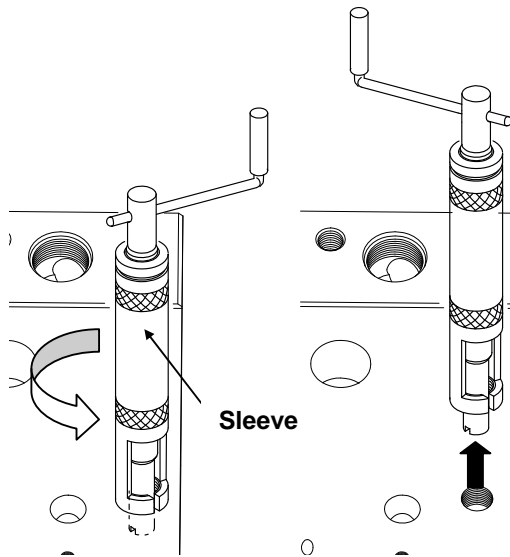


- 3) Hold lightly using the left hand.
- 4) Do not press the tag. (A pulling up action is needed) Place the thread on top of the hole and turn the handle in the right (clock wise) direction.

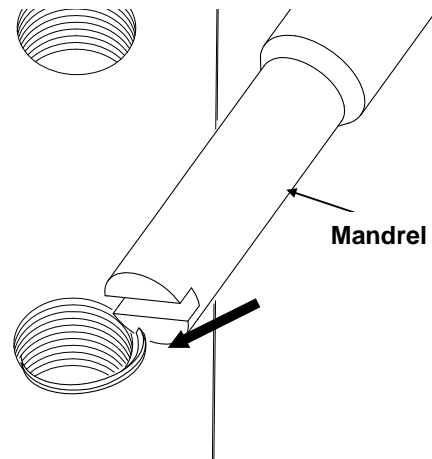
Position the jig straight over the hole.



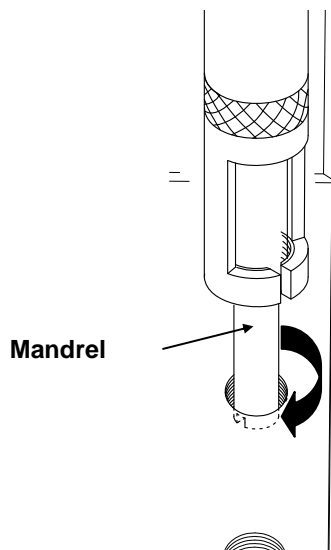
- 5) When the helisert is completely in the cylinder, turn the sleeve towards the left and remove the sleeve from the helisert.



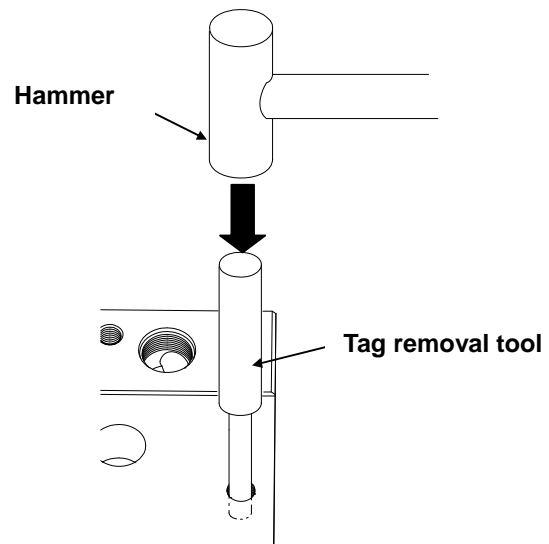
- 6) Push in any remains from the helisert by using the front tip of the Mandrel.



- 7) Using the front tip of the Mandrel, put the helisert into the hole by one thread.



- 8) Using the front tip of the Tag removal tool, place the tool on the tag and using a short blow remove the tag from the helisert.



⚠ CAUTION; When turning the handle, always turn in the right direction (Clock-wise). Turning in the left hand direction will break the tag off, and you will not be able to assemble the Helisert.

Helisert Thread Sizes

	Model TNB	6M	6E	100
			6.5E	
			7E	
Helisert Insertion Tool	Cylinder (Control valve box area)	M16 P=1.5	3/4 -16 UNF	M24 P=2

	Model TNB	141LU	190LU	310LU
		151LU	220LU	400LU
			230LU	
Helisert Insertion Tool	Cylinder (Control valve box area)	M24 P=2	M30 P=2	M33 P=3

*** Helisert is not used on the breakers from TNB-08M to TNB-5M.**

Reasons for the Helisert to come out

- 1) Bolts were attempted to be removed when the breaker is still hot.
- 2) Bolts were not washed properly or anti-seize lubricant was not applied to the thread.
- 3) When removing the bolt, even though the bolt was difficult to remove, it was forcefully removed.

Countermeasures

- 1) Before loosening the bolts, make sure the breaker has cooled off before starting.
- 2) Bolts should be washed before assembly and always apply an anti-seize (MoS₂-grease) to the threads before assembly.
- 3) If the bolt becomes hard to remove, do not remove forcefully, Put the spanner on the bolt and attempt to remove when hammering the head of the bolt.

When assembling or removing bolts, proceed as stated above.

After the Helisert has been assembled,

Apply a lubricant to the seal grooves evenly.

Apply a lubricant to the seals.

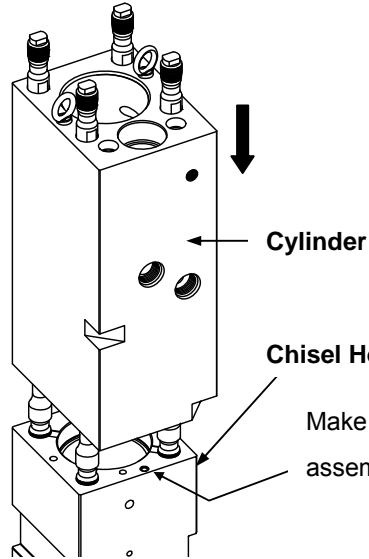
Before assembling the seals, confirm the direction of assembly referring to the parts list.

Before assembling the seals, make sure all of the seals are clean and free of foreign items.

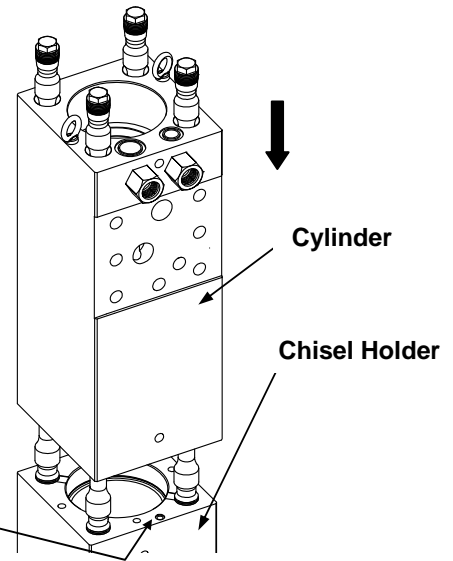
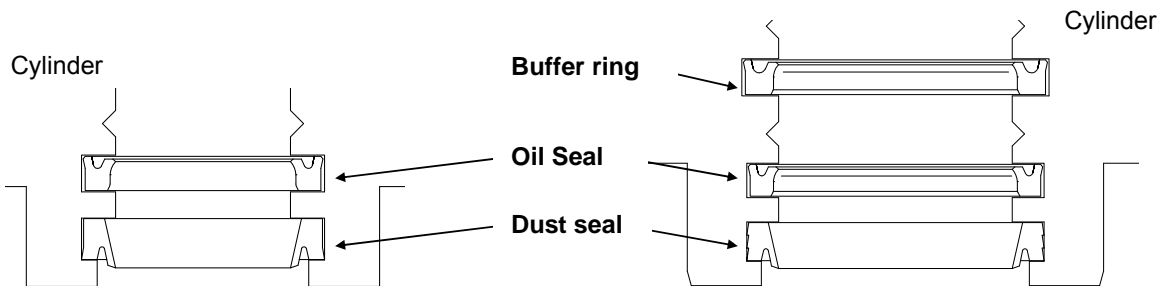
TNB-08M – 5M**TNB-6M – 400LU**

Assemble the cylinder onto the chisel holder. (Before assembly, re-confirm the seal direction)

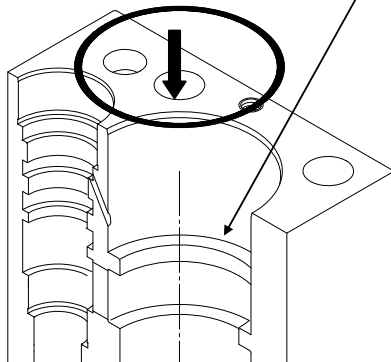
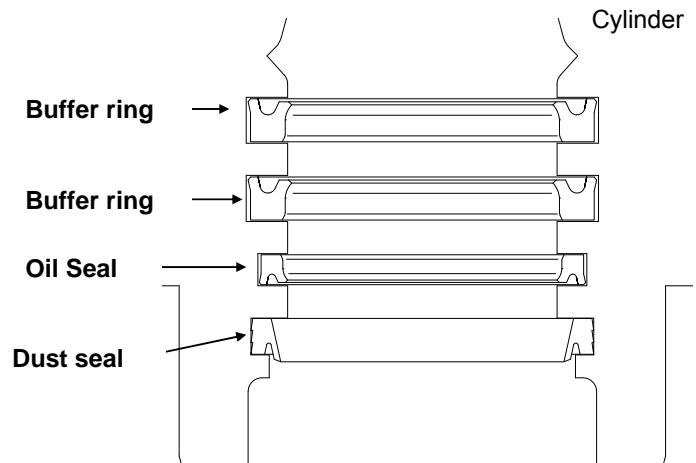
At this time, press down until the cylinder is flush with the surface of the chisel holder.



Make sure the O-ring is assembled correctly

**TNB-08M – 6.5E****TNB-7E, 100**

* For the TNB-2M - 100 make sure the O-ring (hardness-Hs90) is in place before putting in the piston.

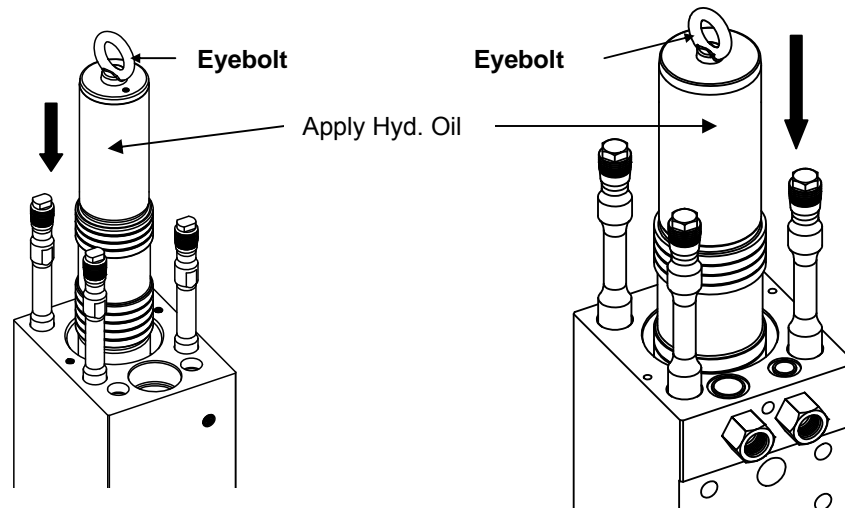
**TNB-141LU – 400LU**

6 – 5. Piston

TNB-08M – 5M

TNB-6M – 400LU

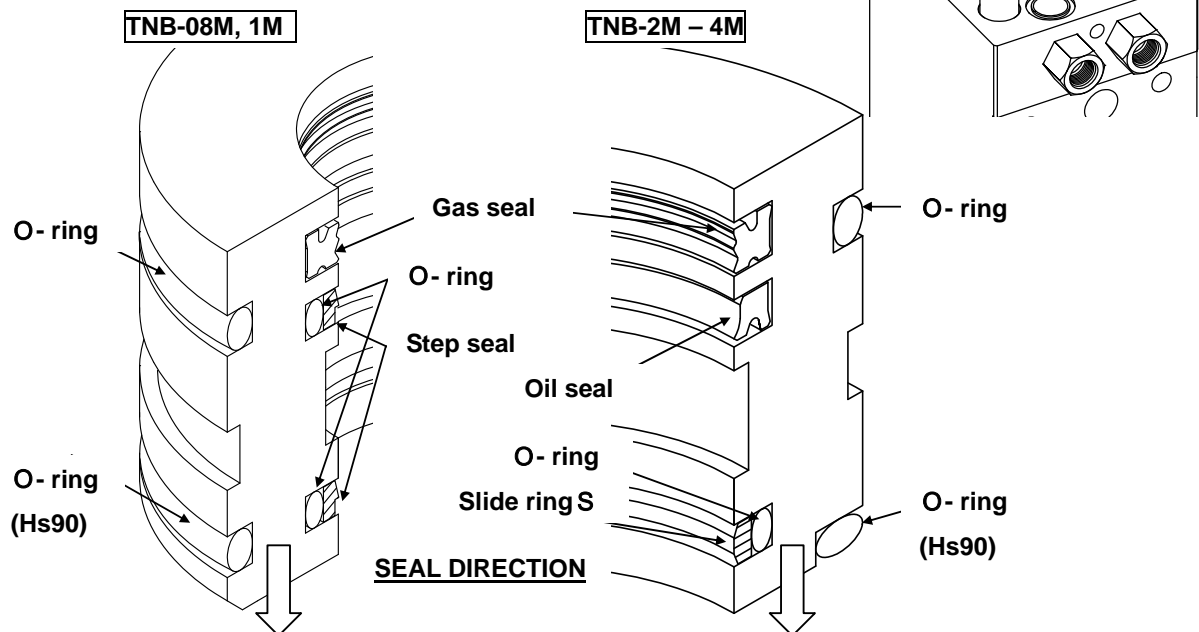
Apply Hydraulic oil to the piston and assemble the piston into the cylinder.

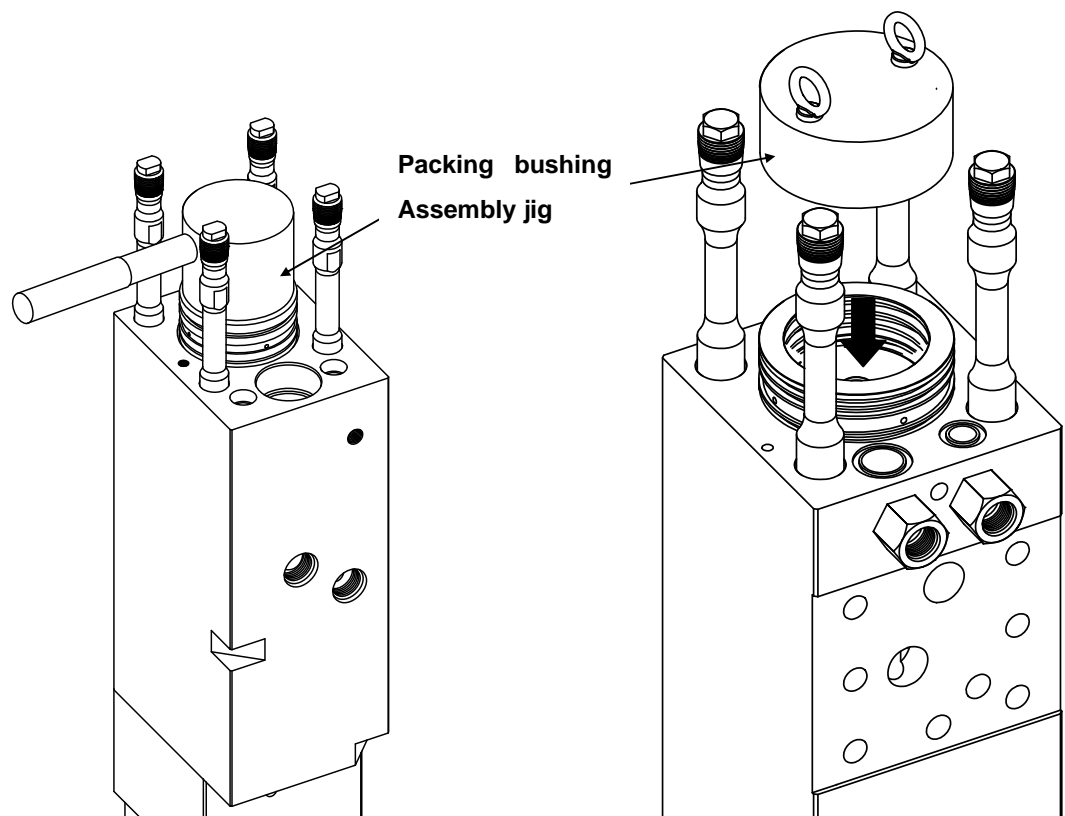
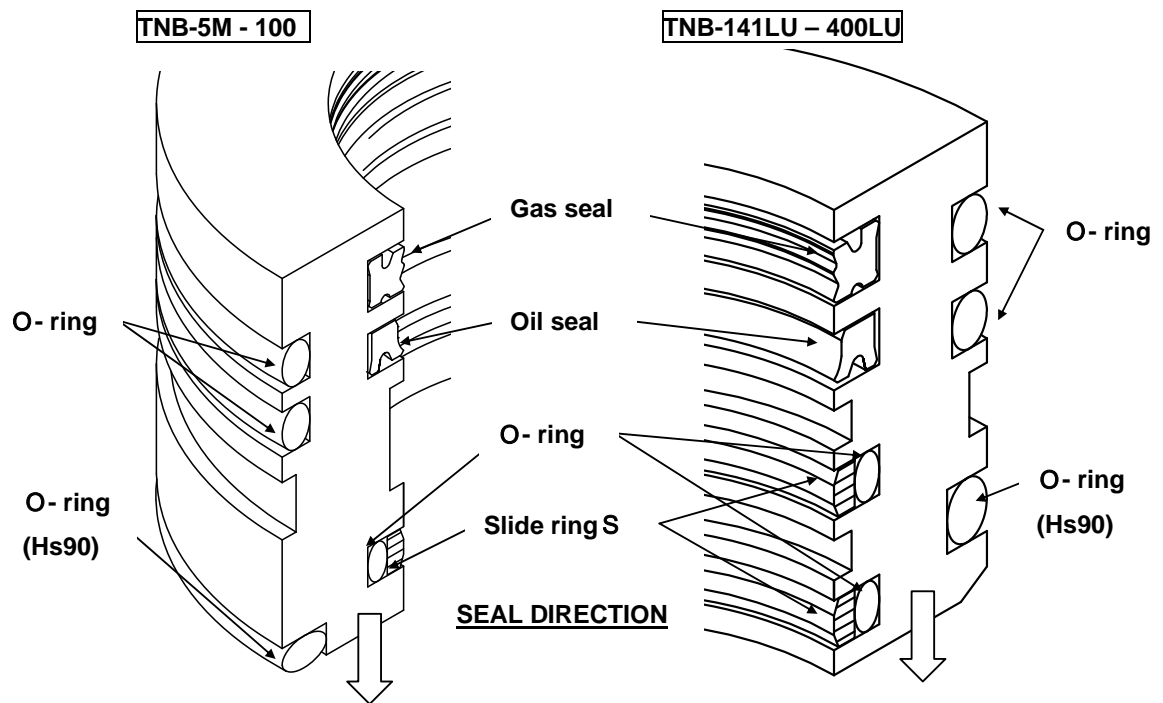


6 – 6. Packing Bushing

Using a rubber hammer, or a Packing bushing assembly jig & a hammer, assemble the Packing bushing straight into the Cylinder.
(Before assembling the packing bushing into cylinder, check the seal direction)

Please refer to the Parts Manual for the seal direction.





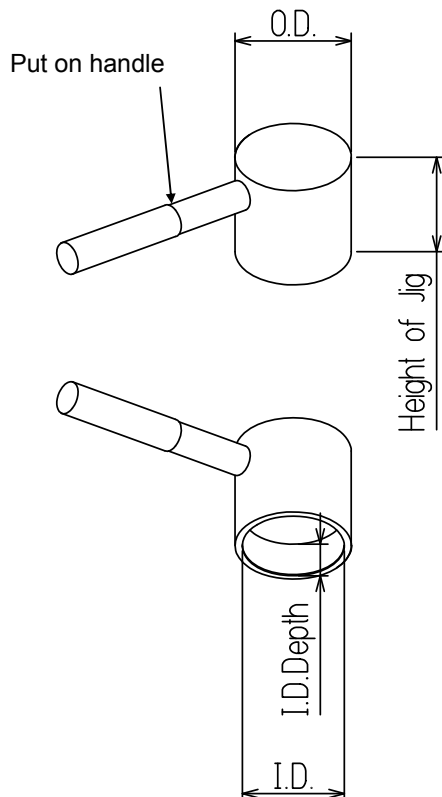
Jig dimensions for assembly of Packing Bushing

	Model	TNB	08M	1M	2M	3M	4M
Packing	O.D	(in./mm)	2.16/55	2.55/65	2.95/75	3.34/85	.196/5
Bushing	I.D	(in./mm)	1.89/48	2.28/58	2.60/66	2.99/76	2.99/76
Assembly Jig	I.D DepthxHeight of jig	(in./mm)	.60x2.16 15x55	.78x2.36 20x60	.78x2.36 20x60	.78x2.55 20x65	.78x2.75 20x70

	Model	TNB	5M, 6M	6E, 6.5E	7E	100
Packing	O.D	(in./mm)	3.74/95	4.33/110	5.51/140	6.0/150
Bushing	I.D	(in./mm)	3.34/85	3.74/95	4.72/120	5.23/133
Assembly Jig	I.D DepthxHeight of jig	(in./mm)	.78x2.95 20x75	.78x2.0 20x50	1.0x 25x55	1.0x2.16 25x55

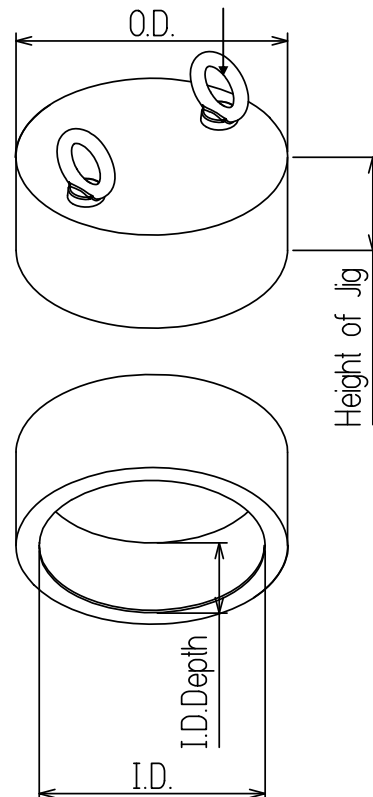
	Model	TNB	141LU 151LU	190LU	220LU 230LU	310LU	400LU
Packing	O.D	(in./mm)	6.7/170	7.08/180	7.78/190	7.87/200	8.66/220
Bushing	I.D	(in./mm)	5.7/145	6.1/155	6.49/165	7.08/180	7.67/195
Assembly Jig	I.D DepthxHeight of jig	(in./mm)	1.0x2.16 25x55	1.18x2.36 30x60	1.18x2.36 30x60	1.18x2.36 30x60	1.18x2.36 30x60

TNB-08M – 6M



TNB-6E – 400LU

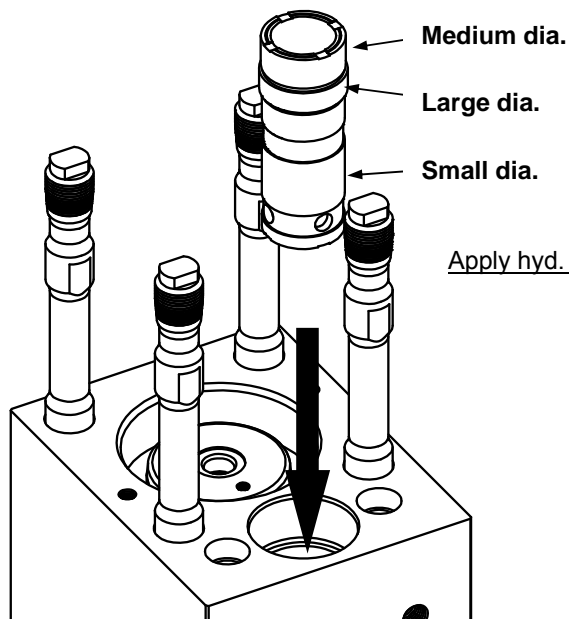
Fit the “Eyebolts” into 2 places which do not interfere with the hammering area.



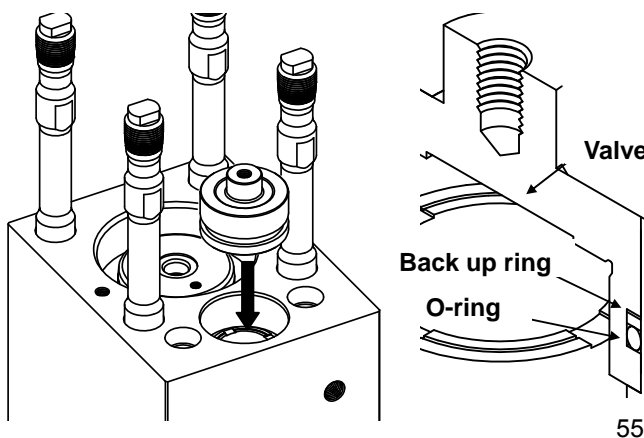
6 – 7. Control Valve

TNB-08M – 5M

- 1) As shown in the diagram below, the small diameter side of the valve is assembled into the cylinder first.

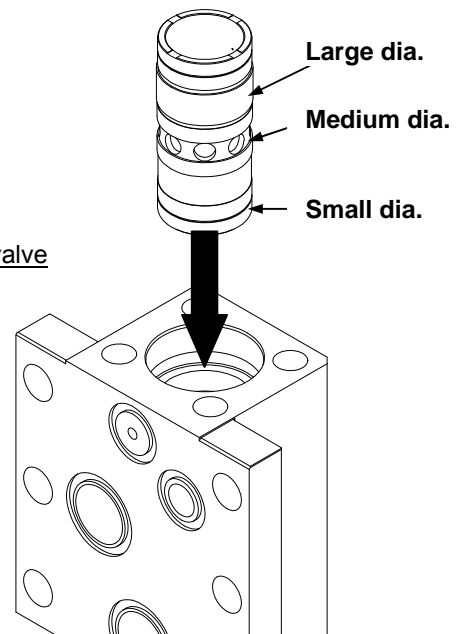


- 2) Apply fresh hydraulic oil to the valve cap O-ring groove and also to the O-ring and back up ring. Then, assemble these parts into the cylinder. The assembly is a light press fit, as a result assemble the part using a rubber hammer and assemble the part straight into the bore. (Not uneven)

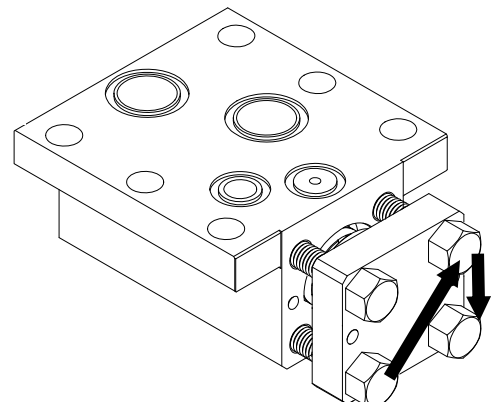


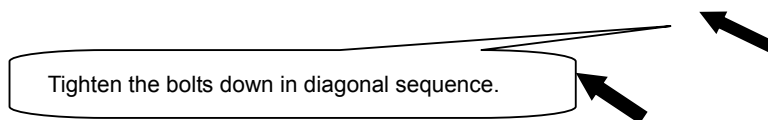
TNB-6M – 400LU

- 1) As shown in the diagram below, the small diameter side of the valve is assembled into the valve box first.



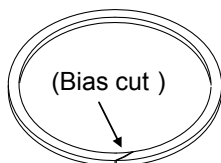
- 2) Apply fresh hydraulic oil to the valve cap O-ring groove and also to the O-ring and back up ring. Then, assemble these parts into the valve box. The assembly is a light press fit, as a result, does not assemble the valve cap on an angle into the valve box. Please use the 4-bolts to tighten the valve cap down onto the valve box evenly.



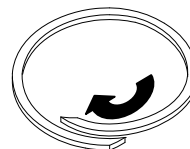


When assembling the valve cap, make sure the O-ring and back up ring are not damaged or cut.

How to assemble the back up ring;
(Bias-cut and spiral cut)



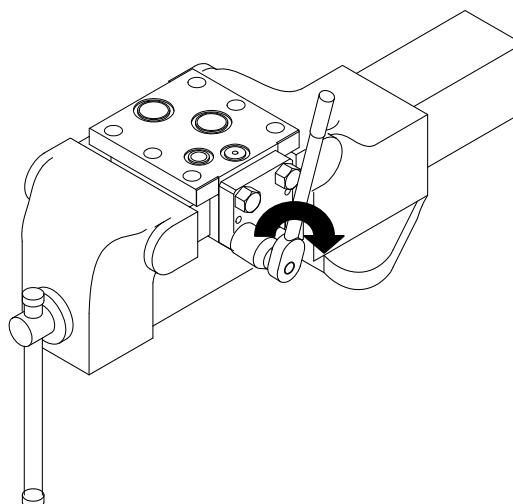
When assembled as shown above, the diameter may larger and lead to damage or over riding of the ring.



As a result, before assembly make the ring smaller as shown above and this will prevent the ring from over riding.

TNB-6M – 400LU

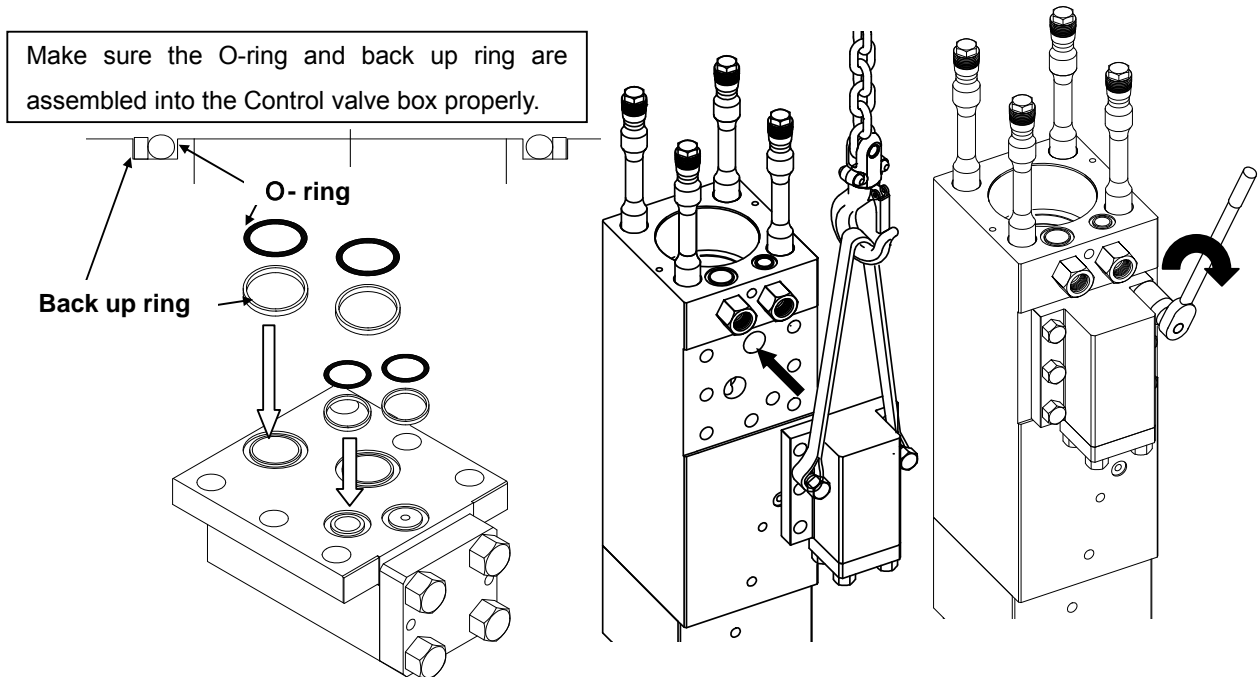
- 3) Put the valve box into a vice. Tighten the 4-bolts to the correct torque value in a diagonal sequence referring to the torque chart on page 27 (3-9. **Assembly / Disassembly chart for the Hydraulic Breaker**)



- 4) After tighten the bolts to the proper torque level, using your finger check to make sure that the control valve moves freely.
(Make sure dirt or other foreign matter does not enter the valve inside.)

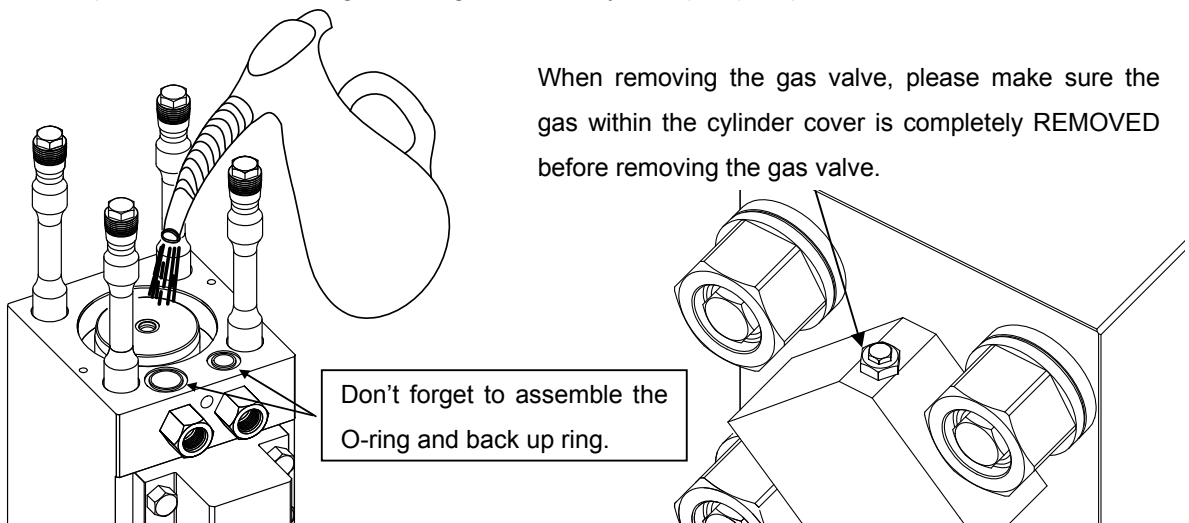
6 – 8. Control Valve Box

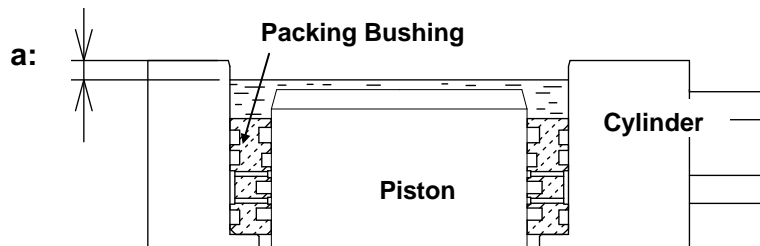
Assemble the Control valve box onto the cylinder and tighten the bolts according to torque chart (3). (Refer to page 26 in the manual for the torque values under **3-9. Assembly / Disassembly chart for the Hydraulic Breaker** section.)



6 – 9. Filling Breaker with Hydraulic Oil

After assembling the Packing bushing, in order to protect the seals, apply hydraulic oil into the cylinder as shown in the drawing. When applying the hydraulic oil into the cylinder cover, apply the oil through this port. Please note, after filling the oil into the cylinder cover, clean the thread area of this port and apply loctite #242 or equivalent Brands and tighten the gas valve body to 83(N·m) torque.





Hydraulic Oil volume for assembly (Recommended amount)

Model	TNB	08M	1M	2M, 3M, 4M	5M	6M
a: Top of cylinder to oil level (in./mm)		.196/5	.196/5	.196/5	.196/5	.196/5
Oil volume (oz/cc)		.67/20	.84/25	1.0/30	2.0/60	2.2/65

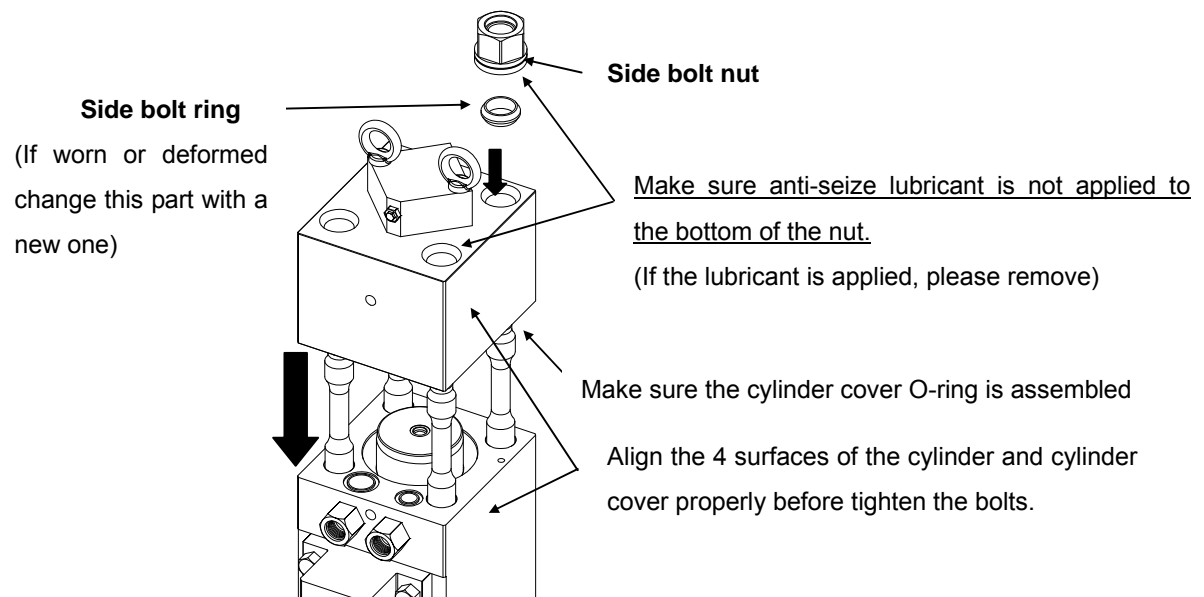
Model	TNB	6E, 6.5E	7E	100
a: Top of cylinder to oil level (in./mm)		.196/5	.393/10	.393/10
Oil volume (oz/cc)		2.36/70	5.07/150	6.07/180

Model	TNB	141LU 151LU	190LU	220LU 230LU	310LU	400LU
a: Top of cylinder to oil level (in./mm)		.393/10	.393/10	.393/10	.393/10	.393/10
Oil volume (oz/cc)		9.12/270	10.1/300	10.7/320	11.8/350	17.6/520

6 – 10. Cylinder Cover / Side Bolt Nut

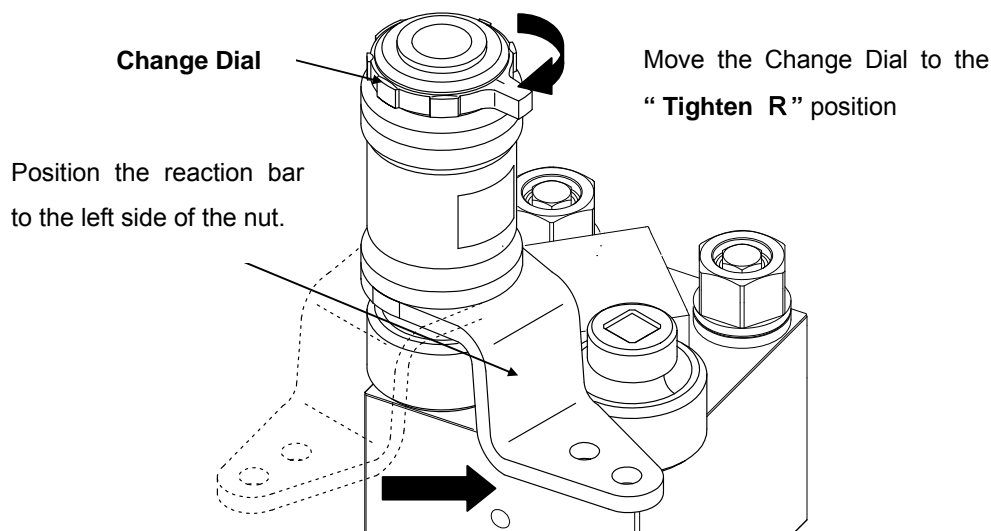
- 1) Assemble the cylinder cover onto the breaker and assemble the side bolt rings.
- 2) Apply anti-seize lubricant (MoS₂-grease) or equivalent Brands to the side bolt threads and tighten the side bolt nuts with the specified torque chart.

The torque chart is on page 26 section “3-9.Assembly / Disassembly chart for the Hydraulic Breaker.”

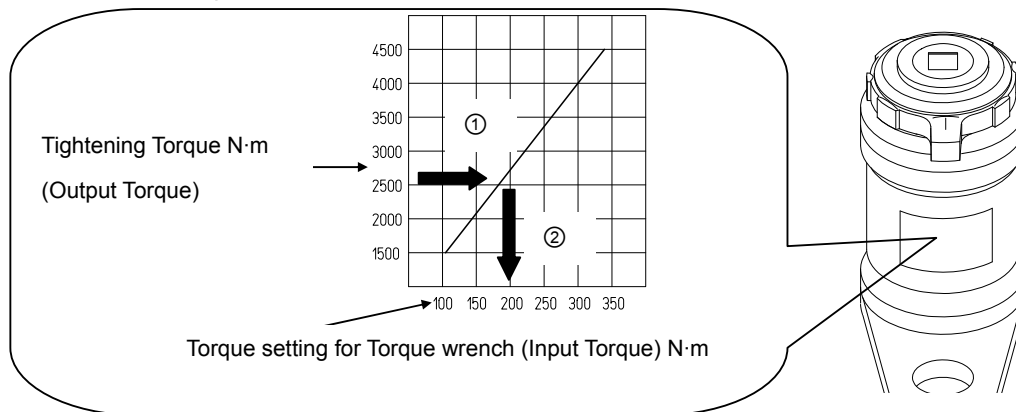


6 – 10 – 1. How to use the torque multiplier

- 1) Tighten the side bolt nut using an impact wrench. (Do not use the torque multiplier.)
- 2) Put the reaction bar on the left side of the nut, which is being tightened. Adjust the “ Change dial ” and set to the “ Tighten R ” position.



- 3) Each breaker bolt has a specified tightening torque (Output torque), calculate the required torque needed for the torque wrench, which is used on the torque multiplier (Input torque). There are 2 methods to calculate the torque values. The first method is to use the chart shown on the Power Wrench.



The second method is to use the following formula;

$$\boxed{\text{Out put torque}} = \boxed{\text{Input torque}} \times \boxed{\text{Magnification for the wrench}} \text{ from this formula}$$

$$\boxed{\text{Input torque}} = \boxed{\text{Output torque}} \div \boxed{\text{Magnification for the wrench}}$$

$$T = W \div 13.6$$

At this point T : The torque setting for the torque wrench (Input torque)

W : The tightening torque setting for the bolt (Output torque)

13.6 : Magnification of the torque multiplier (It will vary depending on the power wrench model)

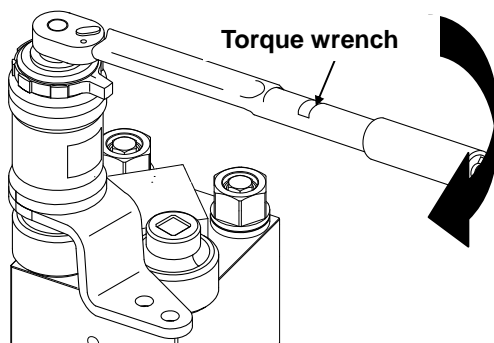
(Calculation Example) For tighten a Side Bolt Nut for a TNB-151LU

The tightening torque for the side bolt nut for a TNB-151LU according to the TNB Specification chart is 2254 (N·m). As a result, we can calculate as follows;

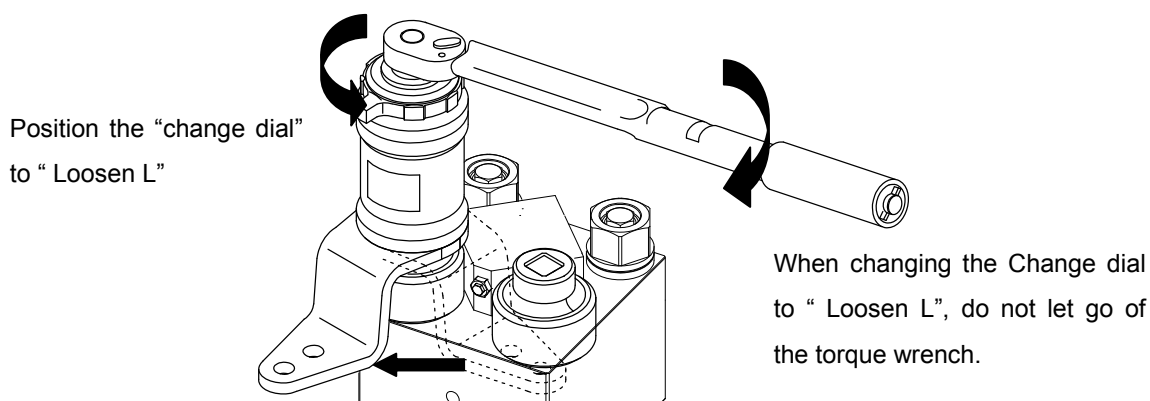
$$T = 2254 \div 13.6$$

$$= \underline{166 \text{ (N·m)}}$$
 Thus, the torque wrench torque setting will be 166 (N·m)

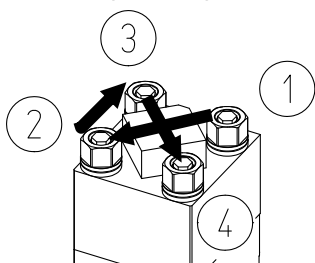
- 4) Put the torque wrench onto the torque multiplier and turn in the right hand direction (Clockwise).



- 5) When the set torque value is reached the torque wrench will make a “click” sound. After this sound is made, turn slightly in the right direction and “hold” in its position, then switch the “change dial” on the torque multiplier to the “**Loosen L**” setting. This will free the reaction to the torque wrench. When the reaction is freed, do not carelessly release the torque wrench. The torque wrench may swing around quickly and may result in injury and is dangerous. Also, during this operation, do not position yourself in the moving diameter of the torque wrench.



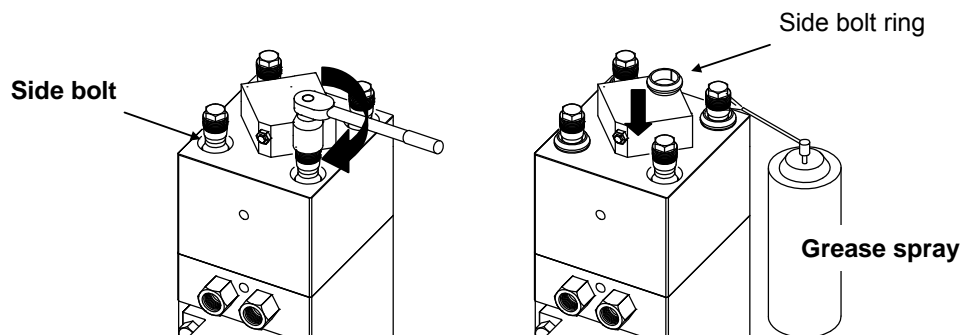
- 6) Use the torque multiplier in a diagonal, and tighten the nuts in the same way.



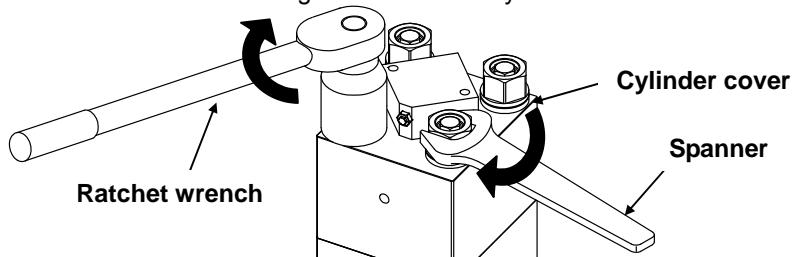
⚠ CAUTION; THE torque multiplier IS A PRECISION TOOL, MAKE SURE THE “CHANGE DIAL SWITCH” IS CORRECTLY PUT INTO THE “R” & “L” POSITION.

6 – 10 – 2. Alternative Method of Tightening The Side Bolt Nuts

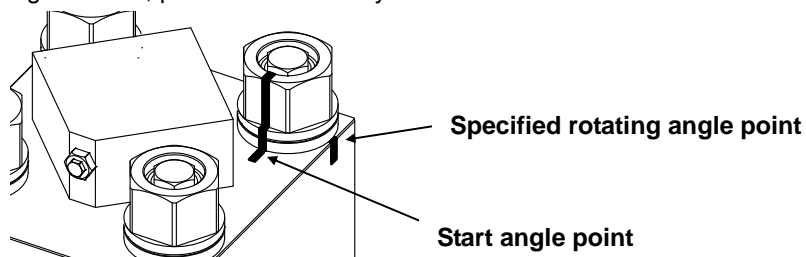
- 1) Screw the side bolt into the chisel holder with the specified torque.
- 2) Put the side bolt rings into the side bolts.
- 3) Apply the grease spray to the thread area of the side bolts.



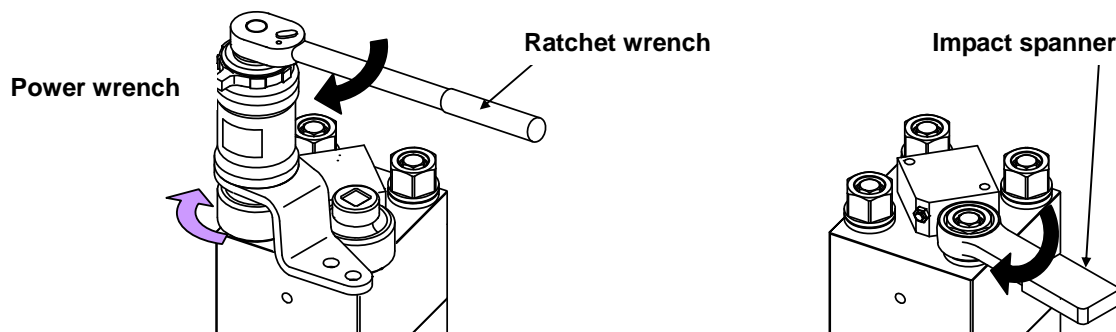
- 4) Using a socket and ratchet wrench or a spanner, tighten the side bolt nuts. And then make sure the side bolt nuts are firm enough seated on the cylinder cover.



- 5) Using a marker, put a mark on the cylinder cover and the side bolt nuts.

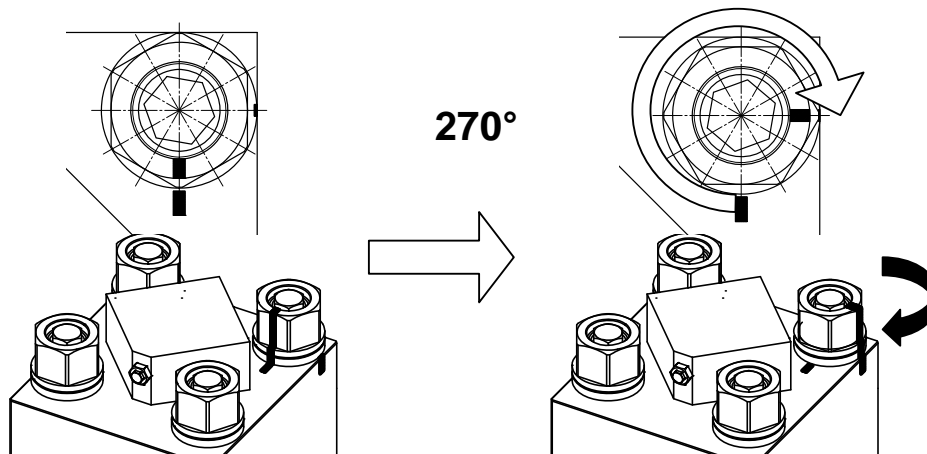


- 6) Using a power wrench and a ratchet wrench or an impact spanner, rotate the nut to the specified rotating angle.

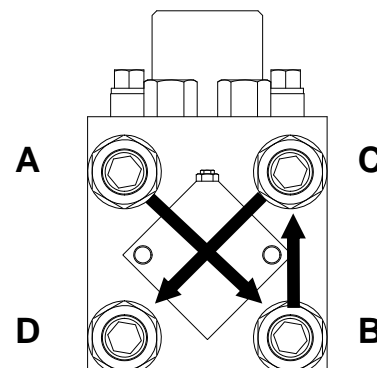


The angles shown below are provided for each side bolt nut to firmly pre-tighten and seat on the cylinder cover by spanner before starting the above process.

Model	Rotating angle (Degree)	Tightening Toruque (Ft. Lb./N-m)	Width across flats (mm)
TNB-08M	270°	160/216	24
TNB-1M	270°	217/294	27
TNB-2M TNB-3M	300°	325/441	32
TNB-4M	330°	397/539	32
TNB-5M	150°	470/637	36
TNB-6M	270°	723/980	41
TNB-6E	240°	723/980	41
TNB-6.5E	270°	940/1274	46
TNB-7E	180°	1445/1960	55
TNB-100	210°	1445/1960	55
TNB-141LU TNB-151LU	210°	1662/2254	70
TNB-190LU	240°	2096/2842	75
TNB-220LU	270°	2602/3528	80
TNB-230LU	240°	2602/3528	80
TNB-310LU	270°	2602/3528	80
TNB-400LU	180°	4192/5684	90



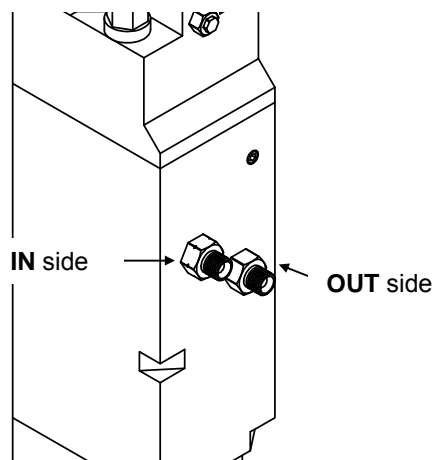
- 7) Tighten the side bolt nuts in the following sequence (A – B – C – D). Make sure the 4 side bolt nuts are tightened equally.



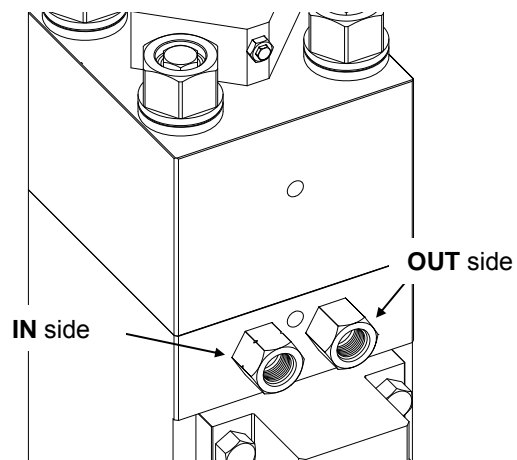
6 – 11. Hose Adapter

Assemble the hose adapters. The “IN” side has the throttle, and the “OUT” adapter doesn’t have the throttle.
Please assemble correctly. (Refer to the torque chart on page 26)

TNB-08M – 5M

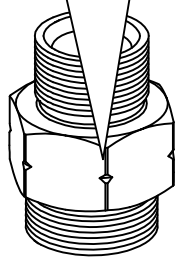


TNB-6M – 400LU

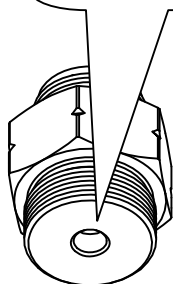


IN Side

On the “IN” side is a Cut mark.

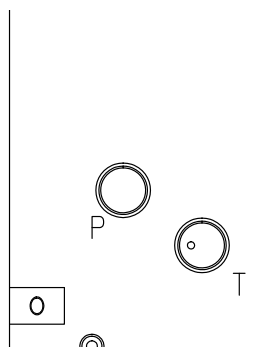
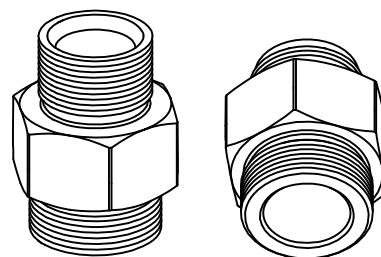


Throttle is located in the inside diameter.

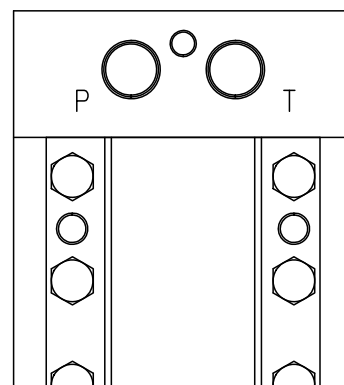


OUT Side

No throttle

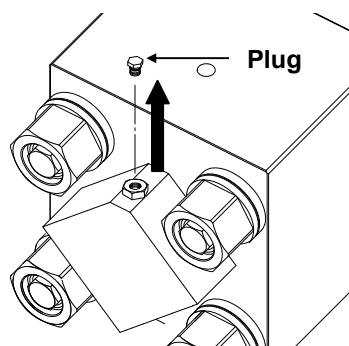


The cylinder has “P” & “T”
Punched marks engraved beside the ports
The I N side adapter shows “P” and the O U T side adapter shows “T”.

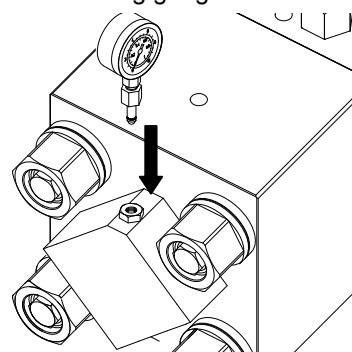


6 – 12. Checking & Re-charging the Cushion Chamber with Nitrogen Gas

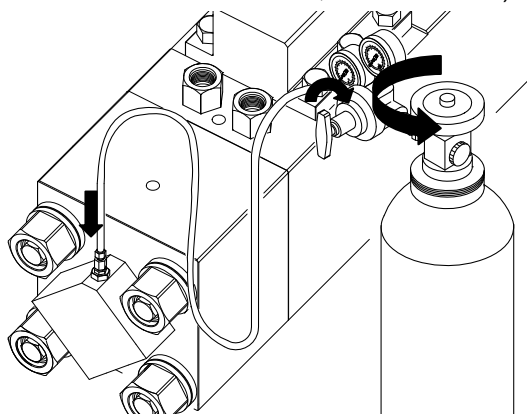
1) Remove the gas valve plug.



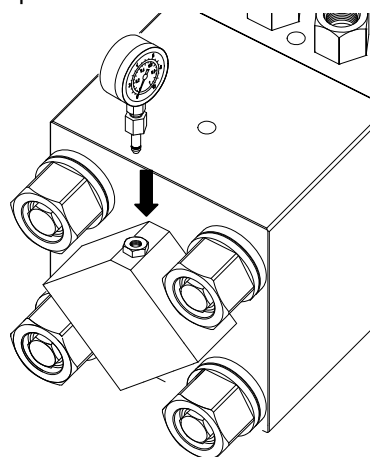
2) Check the gas pressure by pushing in the measuring gauge as shown.



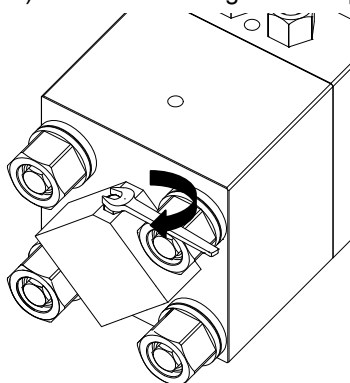
3) If the gas pressure is below the recommended level, recharge the gas. (charge the gas slightly above the recommended level, ± 0.1 PSI/MPa.)



4) Using the measuring gauge, lower the pressure to the set value.



5) Assemble the gas valve plug to $\frac{1}{12}$ (Ft. Lb./N·m)



*** Do not use any other gas except Nitrogen.**

Model	TNB	08M – 5M	6M
Nitrogen Gas Pressure (PSI/MPa)		118/0.8	145/1.0

Model	TNB	6E – 141LU	151LU	190LU – 400LU
Nitrogen Gas Pressure (PSI/MPa)		118/0.8	162/1.1	118/0.8

7. Mounting the Hydraulic Breaker onto a Excavator

Before operation, warm up both the excavator and the hydraulic breaker. This will remove the air pockets in the hydraulic circuit.

7 – 1. Measuring Pressure (P) and Flow (Q)

Measuring P – Q is the relationship between Flow x Pressure

P : Pressure

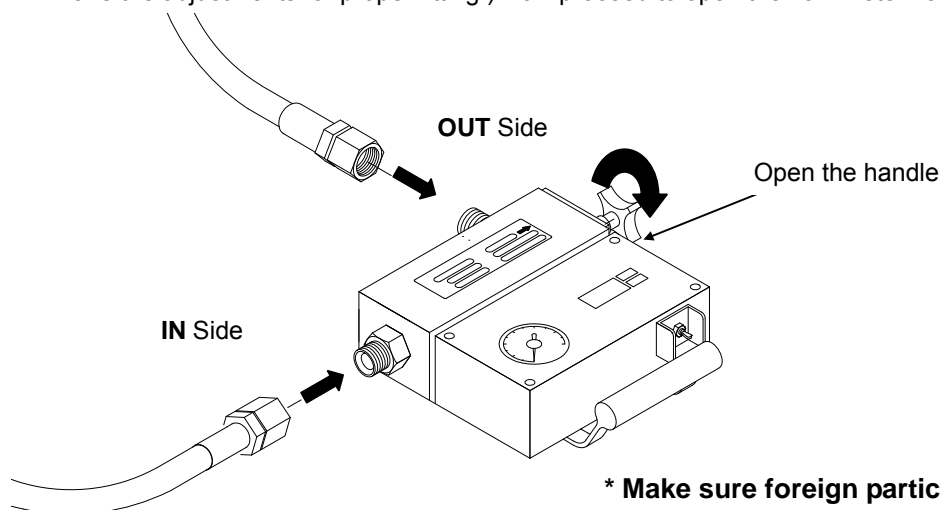
Q : Quantity

7 – 2. Purpose of Measuring P & Q

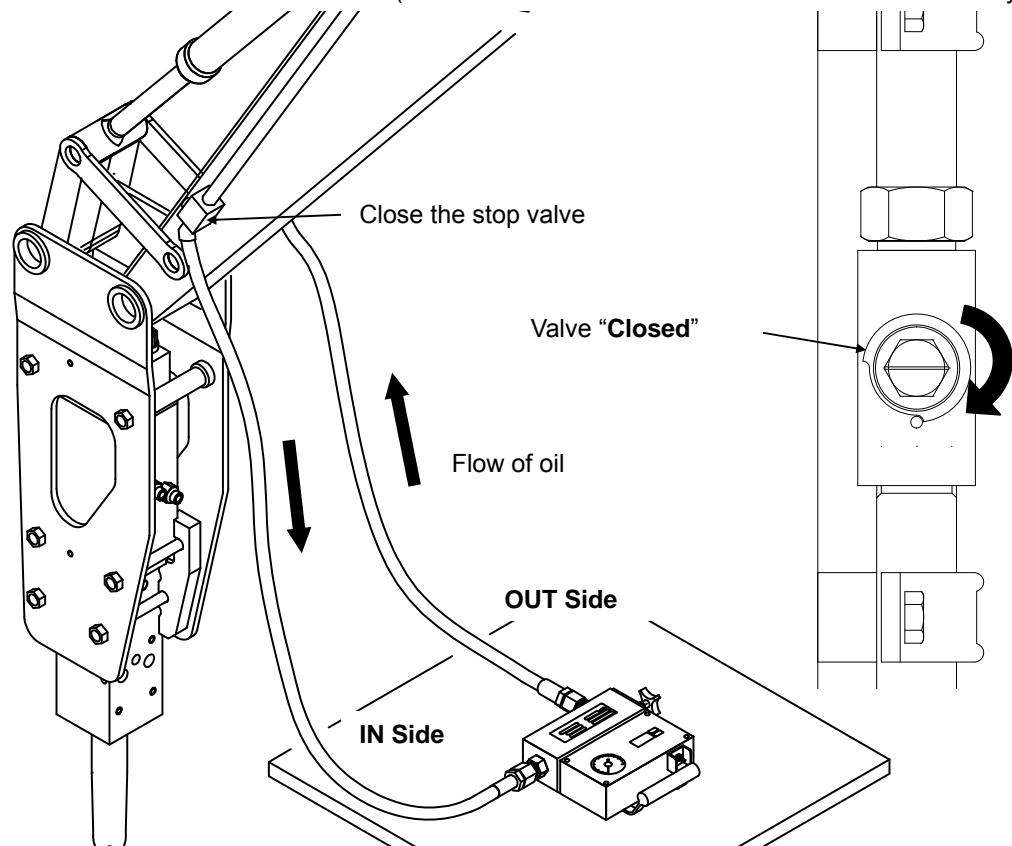
- 1) Before mounting the Hydraulic Breaker onto the excavator, first check the flow and pressure to confirm that the pump performance will meet the requirements for the Hydraulic Breaker. Also, to check for any drop in the pump performance for the excavator. In these cases the P x Q should be measured and evaluated.
- 2) In order to set the relief valve for the Hydraulic Breaker.
- 3) In order to set the throttle position for the Hydraulic Breaker.

7 – 3. How to Measure P - Q

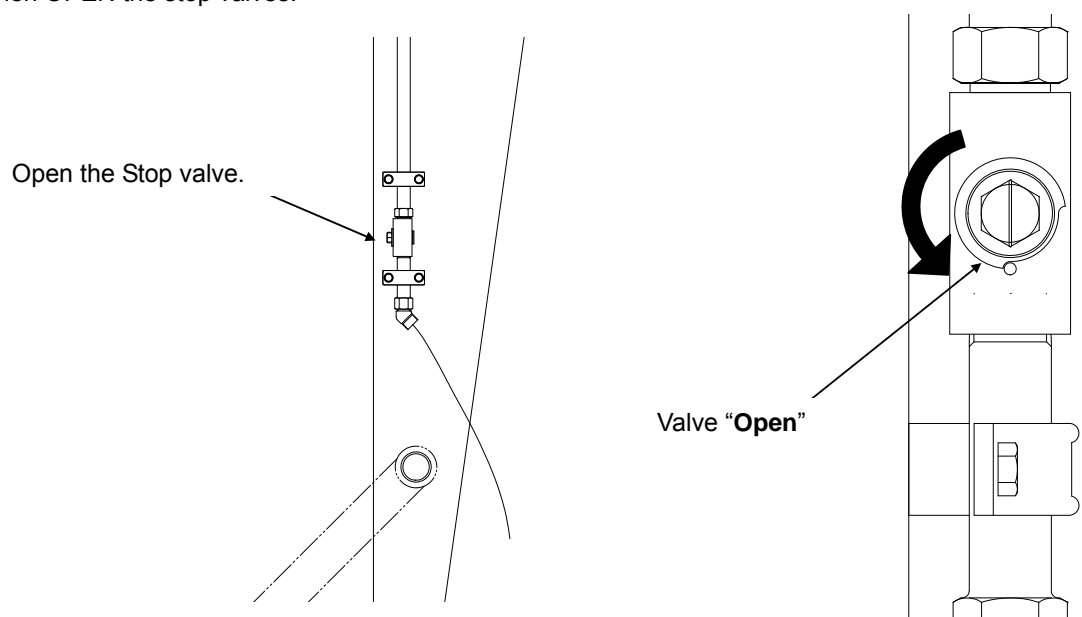
- 1) Prepare two hydraulic hoses that will be used when operating the hydraulic breaker. Attach these hoses to the IN and OUT port of the Flow meter. (If the hose adapter does not fit, use an adapter to make the adjustments for proper fitting.) Now proceed to open the flow meter handle.



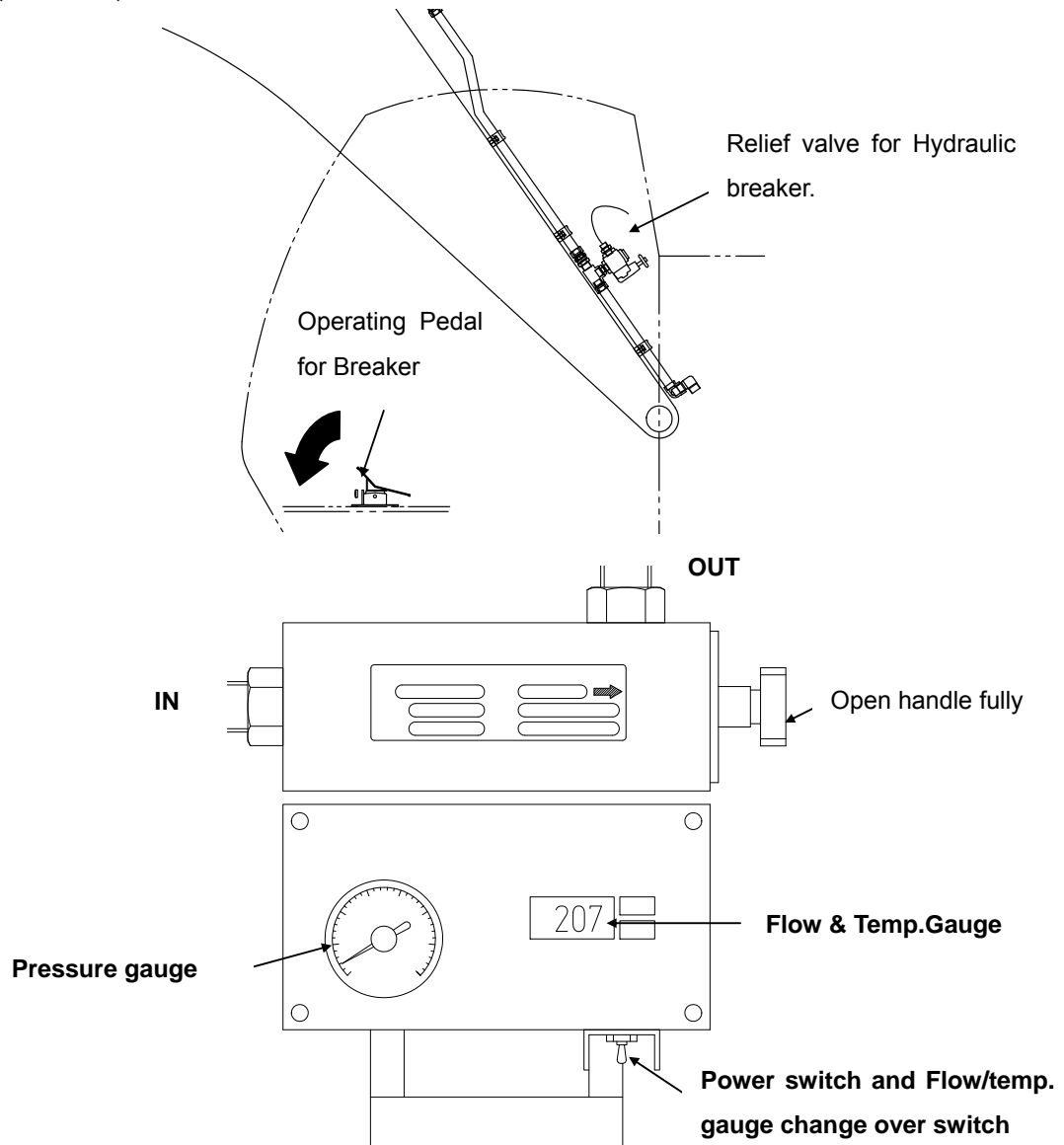
- 2) After confirming that the Stop valve at the end of the arm on the excavator is “Closed” Connect the hoses from the flow meter to the excavator. (Make sure the IN & OUT hoses are connected correctly)



- 3) After everything is connected, make sure all connections are secure tighten. Then OPEN the stop valves.



- 4) Start up the engine, position the throttle lever or dial to the MAX.position and Press down on the operating pedal. The pressure indicated on the pressure gauge is the backpressure for the piping (resistance).



P - Q Measurement chart

Back pressure (MPa) (Pressure gauge reading when handle is open fully)

P(MPa)		5	7.5	10	11	12	13	14	/15	16	17	18	19	20	21
Q															

Indicate the flow reading when the handle is open fully.

Back pressure **(PSI)** (Pressure gauge reading when handle is open fully)

P(PSI)	↓	725	1087	1450	1595	1740	1885	2030	2175	2320	2465	2610	2755	2900	3045
Q	↑														

Indicate the flow reading when the handle is open fully.

- 5) With the throttle fully opened and the pedal in the ON position, adjust the handle on the flow meter so that the pressure and flow meet according to the P - Q chart. When the handle is fully closed (The flow meter will show " 0 ") the reading on the pressure gauge will be the relief valve pressure for the hydraulic breaker. This procedure should be performed by two people signaling each other as you proceed.

P – Q Measurement charts (Sample charts)

(Example) When Mounting a TNB-151LU

TNB-151LU Specifications are Pressure (PSI/MPa) 2030 - 2610/14 – 18

Flow (GPM/L/min.) 42.1 – 52.6/160 – 200

Throttle position for the breaker; Pressure (PSI/MPa) 2465/17 at Flow (GPM/L/min.) 52.6/160

Excavator A: Measurement data

P (MPa)	1.7	5	7.5	10	11	12	13	14	15	16	17	18
Q (l/min.)	220	217	213	210	204	197	190	185	175	148	71	0

P (PSI)	246	725	1087	1450	1595	1740	1885	2030	2175	2320	2465	2610
Q (gpm)	58	57	56	55	53.6	51.8	50	48.6	46	39	18.6	0

Excavator B: Measurement data

P (MPa)	4.8	5	7.5	10	11	12	13	14	15	16	17	18	19	20	21
Q (l/min.)	203	202	199	195	194	193	191	186	179	172	165	158	82	17	0

P (PSI)	696	725	1087	1450	1595	1740	1885	2030	2175	2320	2465	2610	2755	2900	3045
Q (gpm)	53.4	53.1	52.3	51.3	51	50.7	50.2	48.9	47.1	45.2	43.4	41.5	21.5	4.4	0

Excavator C: Measurement data

P (MPa)	1.7	5	7.5	10	11	12	13	14	15	16	17	18	19	20	21
Q (l/min.)	199	195	191	186	182	178	174	167	161	158	156	146	78	15	0

P (PSI)	246	725	1087	1450	1595	1740	1885	2030	2175	2320	2465	2610	2755	2900	3045
Q (gpm)	52.3	51.3	50.2	48.9	47.8	46.8	45.7	43.9	42.3	41.5	41	38.4	20.5	3.9	0

Excavator D: Measurement data

P (MPa)	2	5	7.5	10	11	12	13	14	15	16	17	18	19	20	21
Q (l/min.)	245	243	240	236	232	228	226	223	220	217	212	208	186	81	0

P (PSI)	290	725	1087	1450	1595	1740	1885	2030	2175	2320	2465	2610	2755	2900	3045
Q (gpm)	64.5	64	63.1	62.1	61	60	59.4	58.6	57.8	57.1	55.8	54.7	48.9	21.3	0

Excavator A → The relief valve setting is too low. Increase the relief valve setting. After the adjustments have been made, re-measure the P x Q. If the flow can be obtained, the TNB-151LU can be mounted to this machine.

Excavator B → The flow is acceptable but the back pressure is too high. Check and inspect the breaker piping circuit and the filter for any abnormalities.

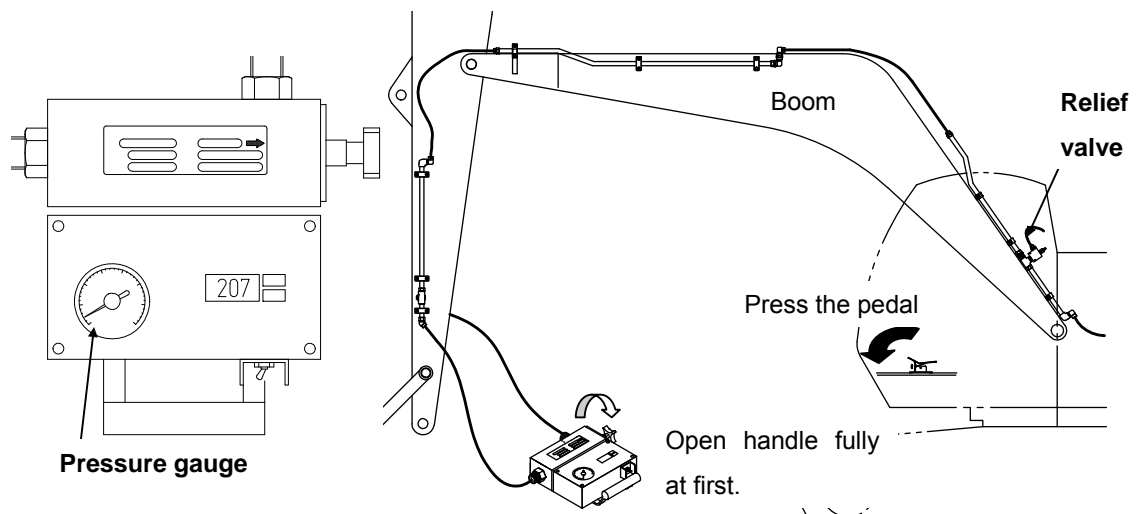
Excavator C → Flow is low. The breaker can be operated at the lower specification level but the impact energy may lack in performance.

Excavator D → Data is good. Set the throttle lever to the hydraulic breaker position.

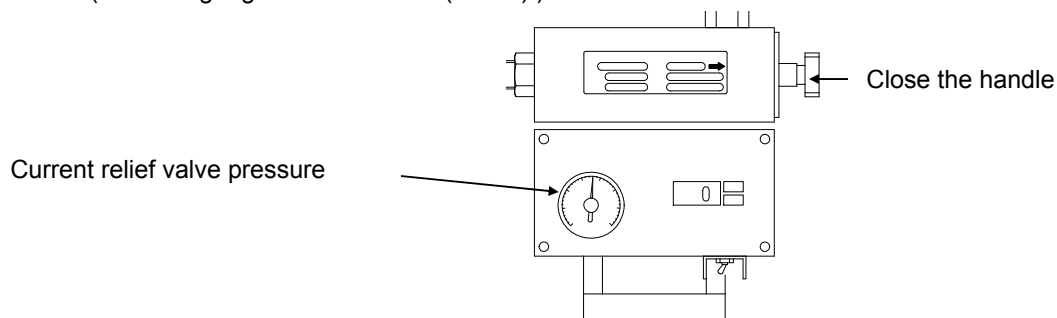
7 – 4. How to set the Hydraulic Breaker Relief Valve

Proceed as follows when setting the hydraulic breaker relief valve.

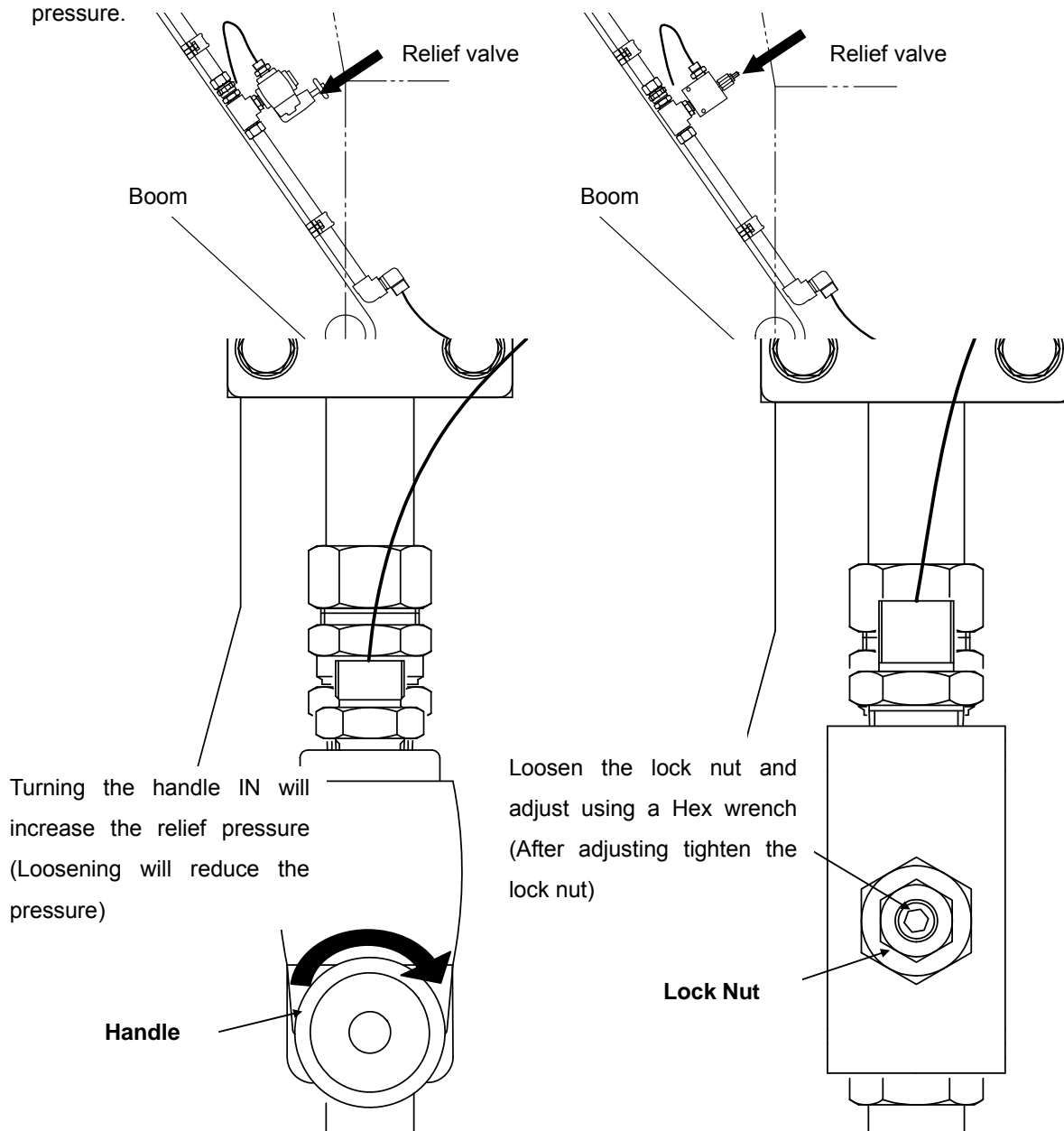
- 1) Refer to page 66; **7 – 3. How to measure the P – Q Following points 1) – 3)**
- 2) Start up the engine, position the throttle lever or dial to the MAX.position and Press down on the operating pedal. The pressure indicated on the pressure gauge is the backpressure for the piping (resistance).



- 3) At this point, close the handle completely. The reading on the pressure gauge is the relief pressure at this time. (The flow gauge will show “0” (L/min.))



- 4) Referring to the other chart, set the relief valve for the hydraulic breaker based on the operating pressure.



Metric Data Tables (English Tables on Next Page)

Model	TNB	08M	1M	2M	3M	4M	5M
Line relief pressure (MPa) * The difference between the set Pressure and cracking pressure is 4(MPa)		18	19	20	20	21	21
Breaker operating pressure (MPa)		6 - 13	7 - 14	8 - 15	10 - 15	10 - 16	10 - 16
Breaker throttle position	Pressure (MPa)	10	10	12	12	13	13
	Flow (l/min.)	20	23	25	35	40	45
Piping size (inch)		3/8	1/2	1/2	1/2	1/2	1/2
Stop valve (inch)		1/2	1/2	1/2	1/2	1/2	1/2
Hose adapter size (inch)		3/8	1/2	1/2	1/2	1/2	1/2

Model	TNB	6M	6E	6.5E	7E	100	141LU
Line relief pressure (MPa) * The difference between the set Pressure and cracking pressure is 4Mpa		21	21	22	22	22	22
Breaker operating pressure (MPa)		10 - 16	10 - 16	11 - 17	12 - 17	12 - 17	13 - 17
Breaker throttle position	Pressure (MPa)	14	13	13	13	14	16
	Flow (l/min.)	60	60	80	80	120	140
Piping size (inch)		3/4	3/4	3/4	3/4	(1") 3/4	1"
Stop valve (inch)		3/4	3/4	3/4	3/4	(1") 3/4	1"
Hose adapter size (inch)		1/2	3/4	3/4	3/4	(1") 3/4	1"

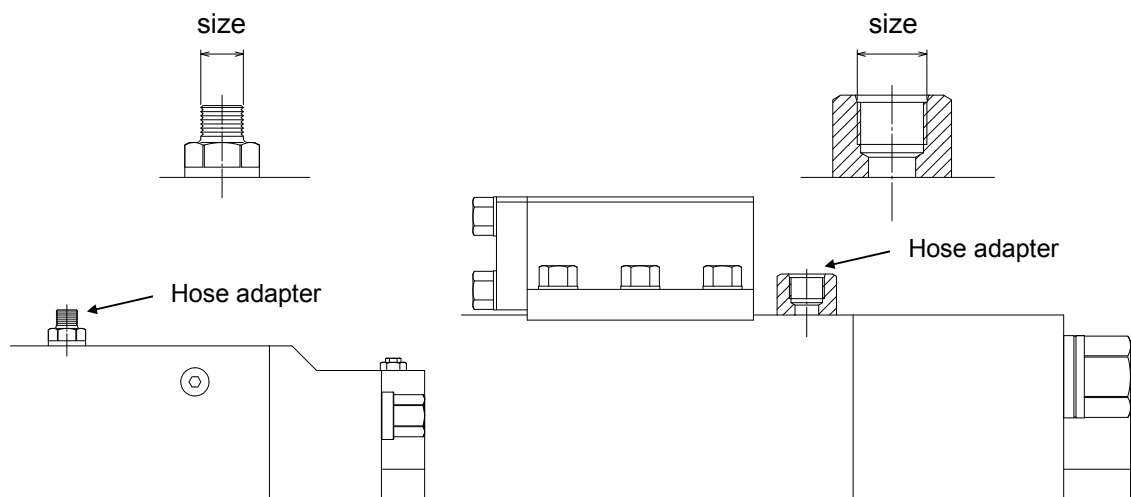
Model	TNB	151LU	190LU	220LU	230LU	310LU	400LU
Line relief pressure (MPa) * The difference between the set Pressure and cracking pressure is 4Mpa		23	23	22	23	23	23
Breaker operating pressure (MPa)		14 - 18	14 - 18	13 - 17	13 - 18	14 - 18	14 - 18
Breaker throttle position	Pressure (MPa)	17	16	16	17	17	17
	Flow (l/min.)	160	180	200	210	270	330
Piping size (inch)		1"	1"	1"	1"	1-1/4	1-1/4
Stop valve (inch)		1"	1"	1"	1"	1-1/4	1-1/4
Hose adapter size (inch)		1"	1"	1"	1"	1-1/4	1-1/4

English Data Tables

Model	TNB	08M	1M	2M	3M	4M	5M
Line relief pressure (PSI) * The difference between the set Pressure and cracking pressure is 580 PSI		2610	2755	2900	2900	3045	3045
Breaker operating pressure PSI		870-1885	1015-2030	1160-2175	1450-2175	1450-2320	1450-2320
Breaker throttle position	Pressure PSI	1450	1450	1740	1740	1885	1885
	Flow GPM	5.2	6	6.5	9.2	10.5	11.8
Piping size (inch)		3/8	1/2	1/2	1/2	1/2	1/2
Stop valve (inch)		1/2	1/2	1/2	1/2	1/2	1/2
Hose adapter size (inch)		3/8	1/2	1/2	1/2	1/2	1/2

Model	TNB	6M	6E	6.5E	7E	100	141LU
Line relief pressure (PSI) * The difference between the set Pressure and cracking pressure is 580 PSI		3045	3045	3190	3190	3190	3190
Breaker operating pressure PSI		1450-2320	1450-2320	1595-2465	1740-2465	1740-2465	1885-2465
Breaker throttle position	Pressure PSI	2030	1885	1885	1885	2030	2320
	Flow GPM	15.8	15.8	21	21	31.5	36.8
Piping size (inch)		3/4	3/4	3/4	3/4	(1") 3/4	1"
Stop valve (inch)		3/4	3/4	3/4	3/4	(1") 3/4	1"
Hose adapter size (inch)		1/2	3/4	3/4	3/4	(1") 3/4	1"

Model	TNB	151LU	190LU	220LU	230LU	310LU	400LU
Line relief pressure (PSI) * The difference between the set Pressure and cracking pressure is 580 PSI		3335	3335	3335	3335	3335	3335
Breaker operating pressure PSI		2030-2610	2030-2610	1885- 17	1885-2610	2030-2610	2030-2610
Breaker throttle position	Pressure PSI	2465	2320	2320	2465	2465	2465
	Flow GPM	42	47.3	52.6	55.2	71	86.8
Piping size (inch)		1"	1"	1"	1"	1-1/4	1-1/4
Stop valve (inch)		1"	1"	1"	1"	1-1/4	1-1/4
Hose adapter size (inch)		1"	1"	1"	1"	1-1/4	1-1/4

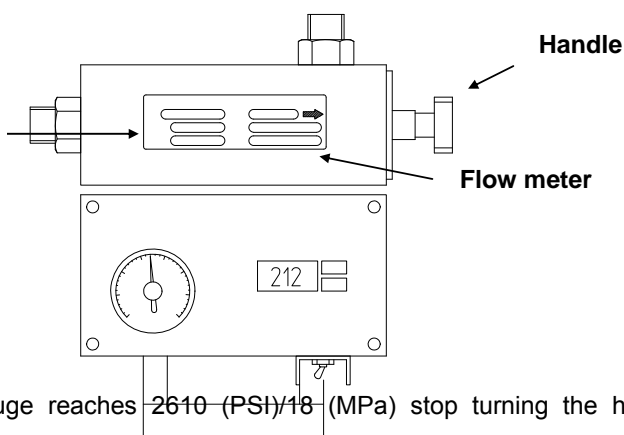


7 – 5. How to set the Hydraulic Breaker Throttle Position (Example) For setting a TNB-151LU

Set the throttle lever for the hydraulic breaker as follows;

- 1) Press the hydraulic breaker pedal and turn the flow meter handle until the Pressure meter reaches about 2610 (PSI) 18 (MPa)

By turning the handle, make sure the pressure gauge shows 2610 (PSI) 18 (MPa)



- 2) When the pressure gauge reaches 2610 (PSI)/18 (MPa) stop turning the handle and adjust the excavator throttle down until it reaches 42.1 (GPM)/160 (l/min.). Reducing the throttle, the pressure will also fall. As a result, it will be necessary to adjust the flow meter to 42.1 (GPM)/160 (l/min.) and 2465 (PSI)/17 (MPa) pressure. This can be performed by adjusting the handle on the flow meter and the throttle lever on the excavator.

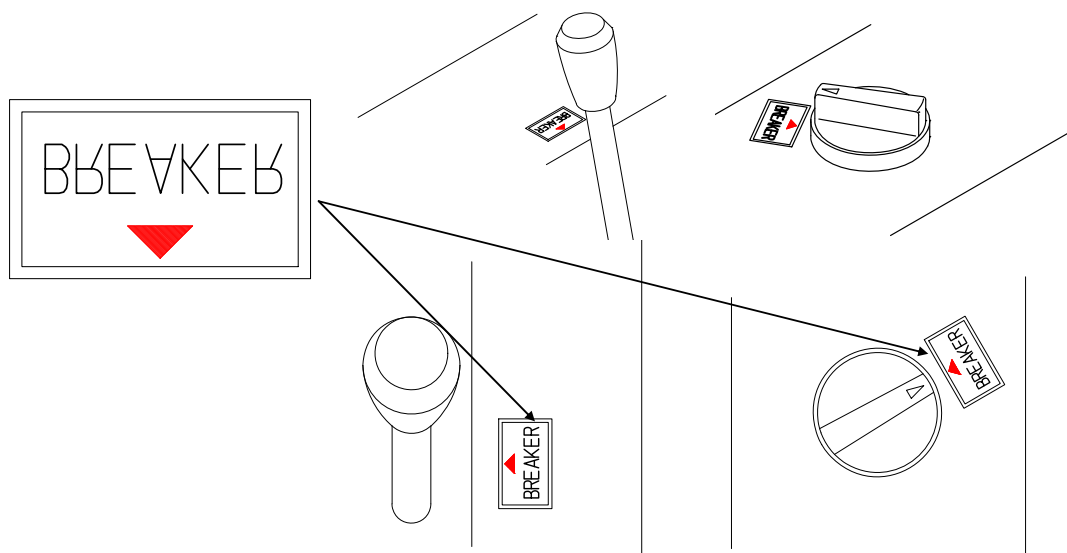
Metric Data Table

P (MPa)	2	5	7.5	10	11	12	13	14	15	16	17	18	19	20	21
Q (l/min.)											160				

English Data Table

P (PSI)	290	725	1087	1450	1595	1740	1885	2030	2175	2320	2465	2610	2755	2900	3045
Q (GPM)											42.1				

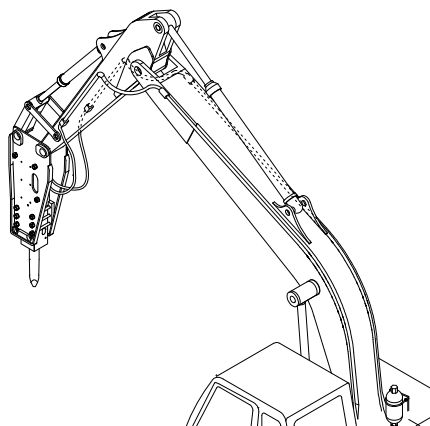
- 3) When the throttle position is determined, please the decal below to that location.



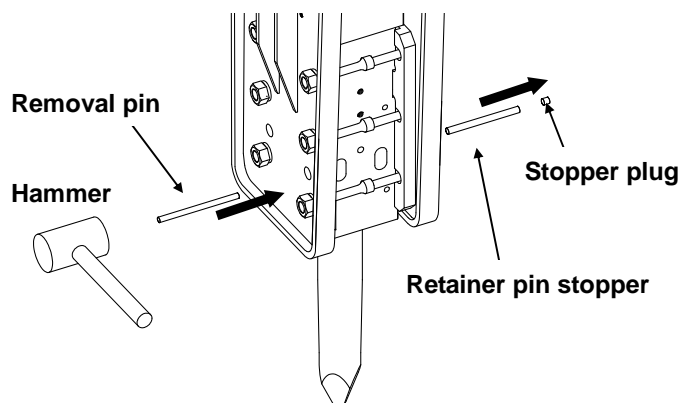
8. Removal / Assembly of the Chisel

8 – 1. Removal of the Chisel

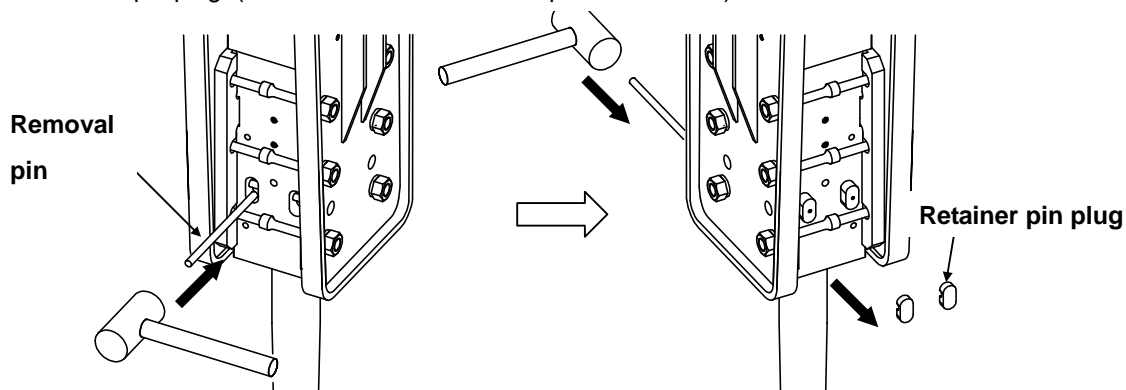
- 1) Place the breaker in a flat stable area, and turn the engine off.



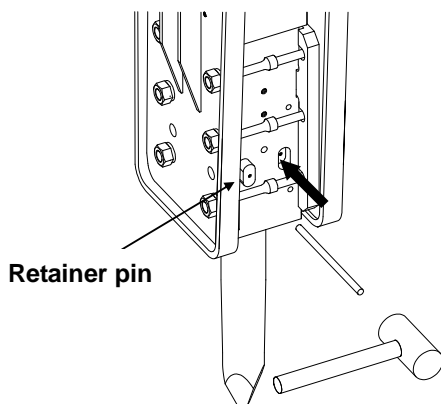
- 2) Hammer out the retainer pin stopper plug and retainer pin stopper using the retainer pin removal tool.



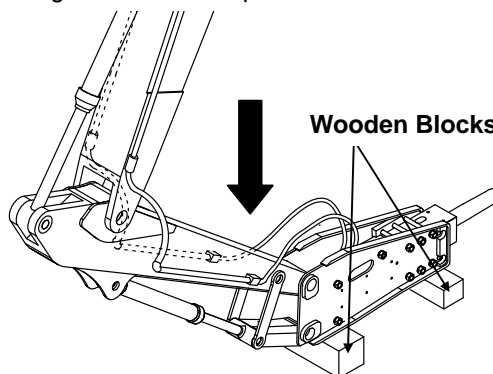
- 3) Push the retainer pin plug from the opposite side by using the chisel pin removal tool and remove the retainer pin plug. (Do not remove the retainer pins at this time)



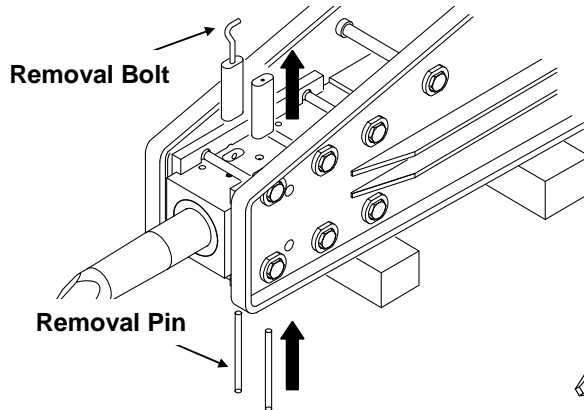
- 4) Put the retainer pins into the Chisel holder.



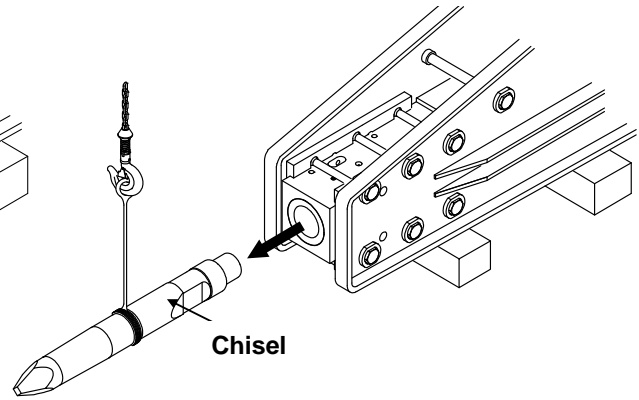
- 5) Start up the engine, and curl the breaker up placing it on blocks as shown below. Turn the engine off after this process.



- 6) As shown in the diagram below remove the retainer pins from the bottom, or using the tap holes pull the retainer pins out with the retainer pin removal tool.

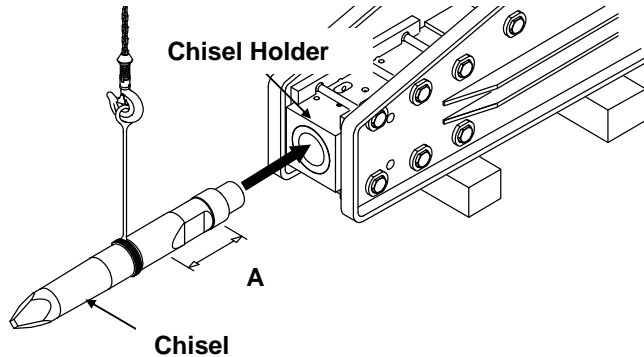


- 7) Put a sling to the mid-section of the chisel and lift the chisel using a hoist. Remove the chisel from the breaker. Be careful when using the hoist.

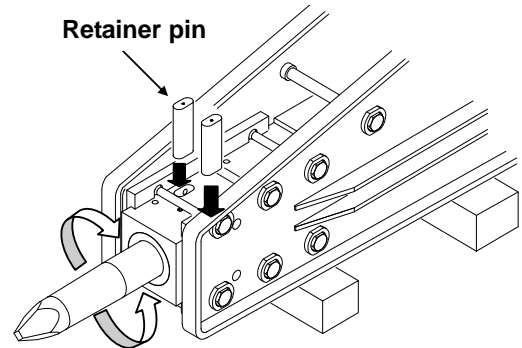


8 – 2. Assembly of the Chisel

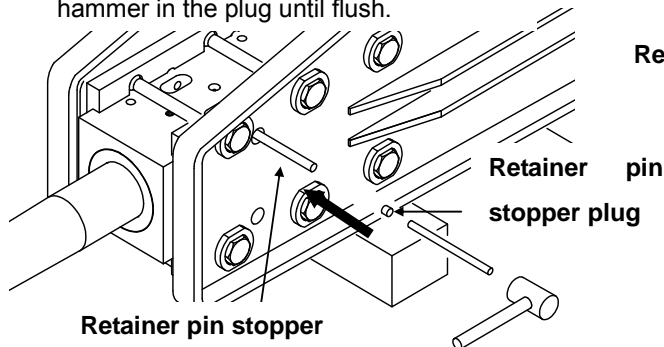
- 1) Place the breaker as shown in the diagram below and apply grease to section A. Lift the chisel using a hoist and insert the chisel into the chisel holder.



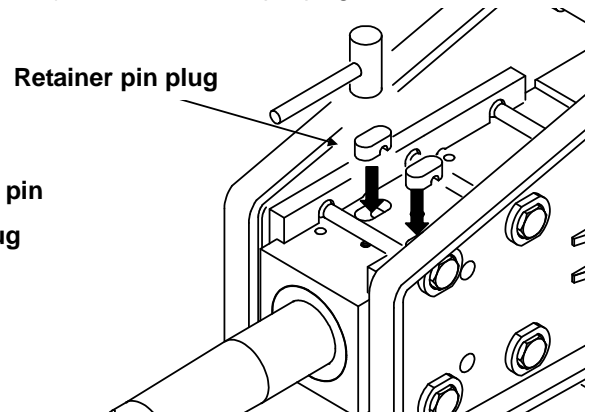
- 2) Align the chisel slots accordingly and assemble the retainer pins.



- 3) Assemble the retainer pin stopper, and hammer in the plug until flush.

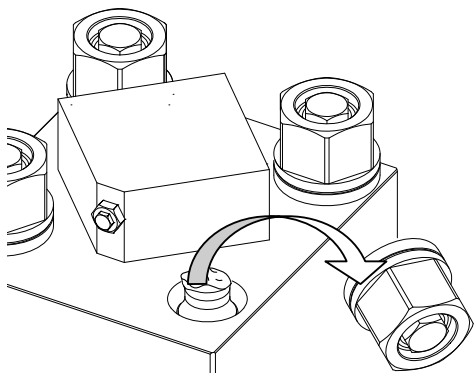


- 4) Set the retainer pin plug.

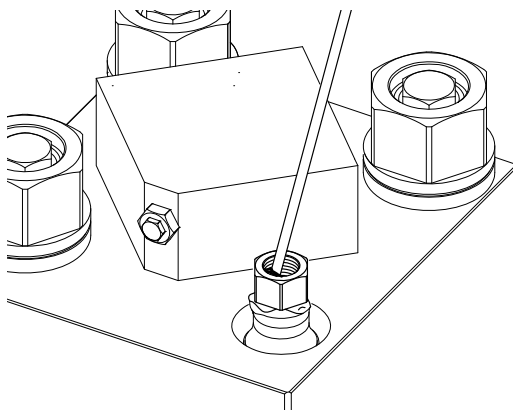


9. Special Work

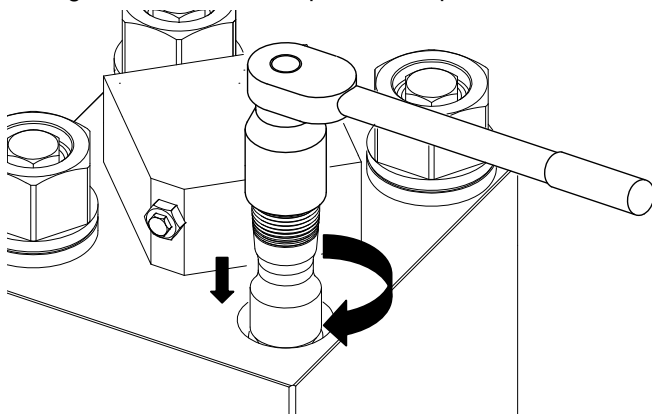
9 – 1. How to change the Side Bolt when broken



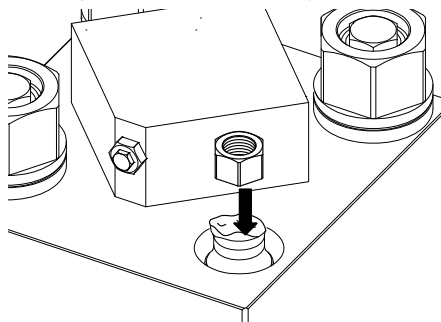
- 2) Weld the Side bolt to the inside section of the nut.



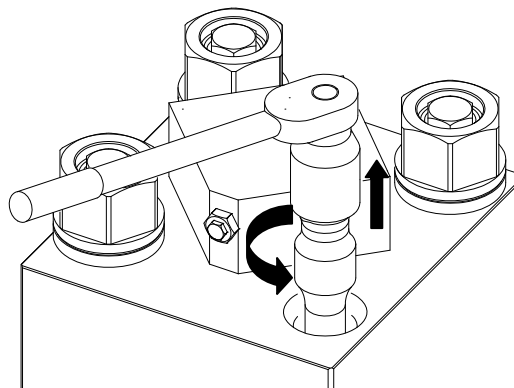
- 4) Apply anti-seized grease (MoS₂-grease) to the thread area of the new side bolt and tighten the bolt to the specified torque.



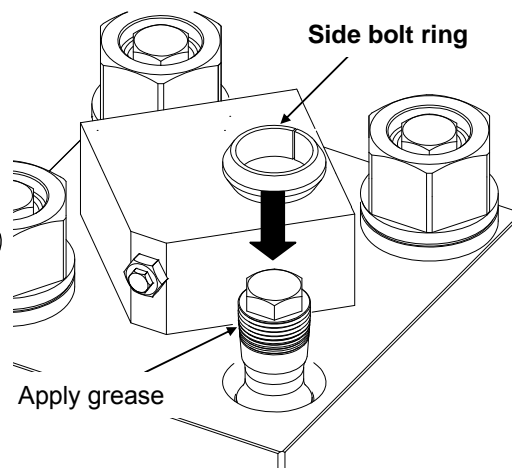
- 1) Place the Hex 32 nut on the top of the broken side bolt horizontally. (The size of Hex nut depends on the model.)



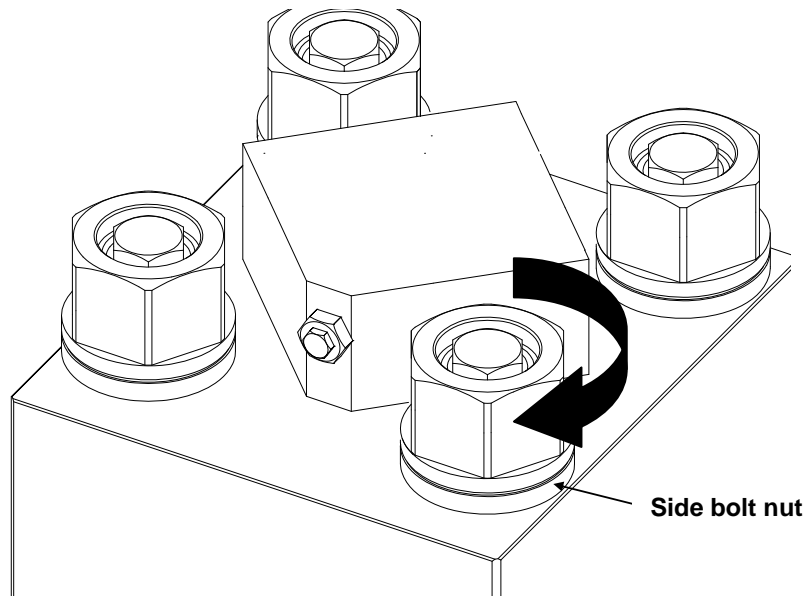
- 3) After making sure the weld has cool off, Loosen the broken side bolt and remove the broken side bolt from the breaker.



- 5) Assemble the side bolt ring.



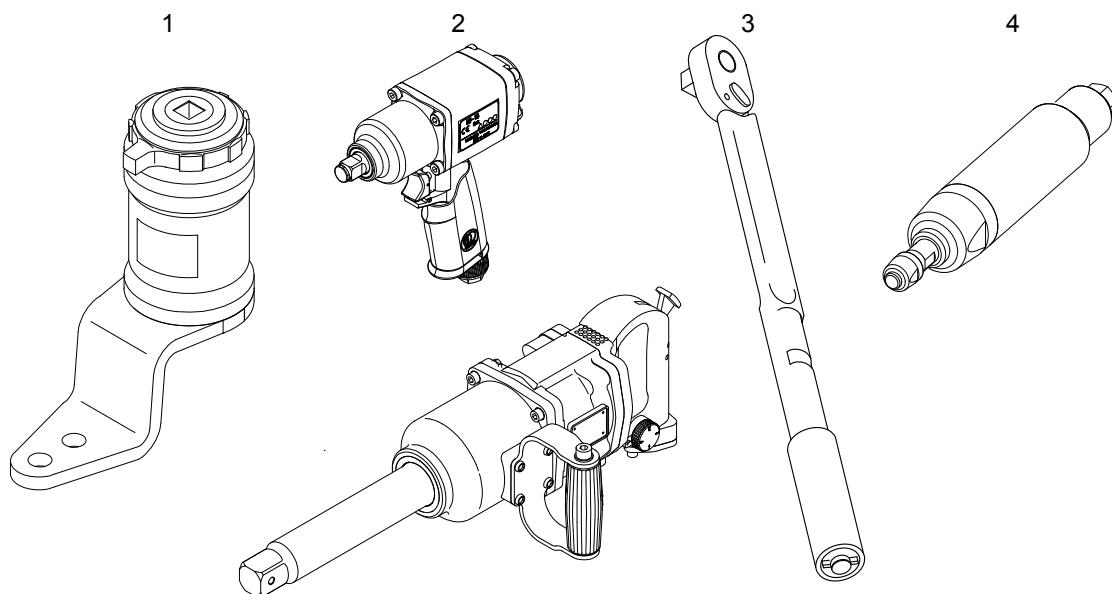
- 6) Tighten the side bolt nut to the correct torque value by power wrench.



⚠ CAUTION ; Please note, changing only one side bolt may result in breakage of the others in a short period of time. It is recommended to change all 4 side bolts even when one bolt only is broken. Checking of the torque levels periodically after changing all side bolts, 4 pcs is also necessary.

10. Hydraulic Breaker Disassembly / Assembly Tools chart (For reference)

Sym No.	Description	Note
1	Torque Multiplier	Side bolt nut
2	Impact Wrench	Bracket bolt nut etc.
3	Torque Wrench	
4	Air Grinder	
5	Air Drill	
6	Grinding Wheel with Spindle	
7	Flap Wheel with Spindle	Piston, cylinder, valve etc
8	Wire Brush	Cylinder cover etc
9	Flex hone	Cylinder, control valve box
10	Emery paper (Abrasive paper)	#400, #800
11	Oil stone	#400, #800
12	Hex Socket for Impact Wrench	1/2Hex, 3/4Hex, 1"Hex
13	Ratchet Wrench	1/2Hex, 3/4Hex, 1"Hex
14	Extension bar	1/2Hex, 3/4Hex
15	Spanner	
16	Impact Spanner	Refer to nut size
17	MoS ₂ -grease (Anti-seize agent)	To apply to threads
18	Hydraulic Oil	For piston and valve assembly
19	Lubricating agent	For seal assembly
20	Anti-corrosive spray	
21	Loctite	#242, #410
22	Helisert Insertion tool	Chisel holder, cylinder
23	Tag removal tool	
24	Eye bolt	M8, M12, M16, M20, M24, M30
25	Seal Tape	Plug



TROUBLESHOOTING GUIDE

FOREWARD

In order to operate the TNB Breaker at its specified performance level and to prolong the life of the breaker, the following preconditions must be met.

- 1. The correct power source (Pressure (P) & Flow (Q)) must be supplied to the breaker.**
- 2. A clean supply of hydraulic oil**
- 3. Based on the Operating Manual, proper inspection and operating methods must be used.**

Based on the above 3 points, when a customer advises a problem, it can be solved promptly and efficiently.

When information is received, find out the problem and conditions, inspect for the possible causes and the proper countermeasures must be taken.

Depending on the problem, the solution can be very simple.

Most of these problems can be solved by the customer (Operator and maintenance staff) but if the cause cannot be determined, ask about the problem in detail and apply the necessary countermeasures.

When the breaker is delivered to the customer (Operator and maintenance staff) it is helpful to explain in detail about the basic inspection, wear parts and maintenance points about the breaker so that the customer will be able to understand these procedures.

The following information is a guide to solve some of the problems which may occur during operation of the breaker.

HYDRAULIC BREAKER TROUBLESHOOTING

Date _____

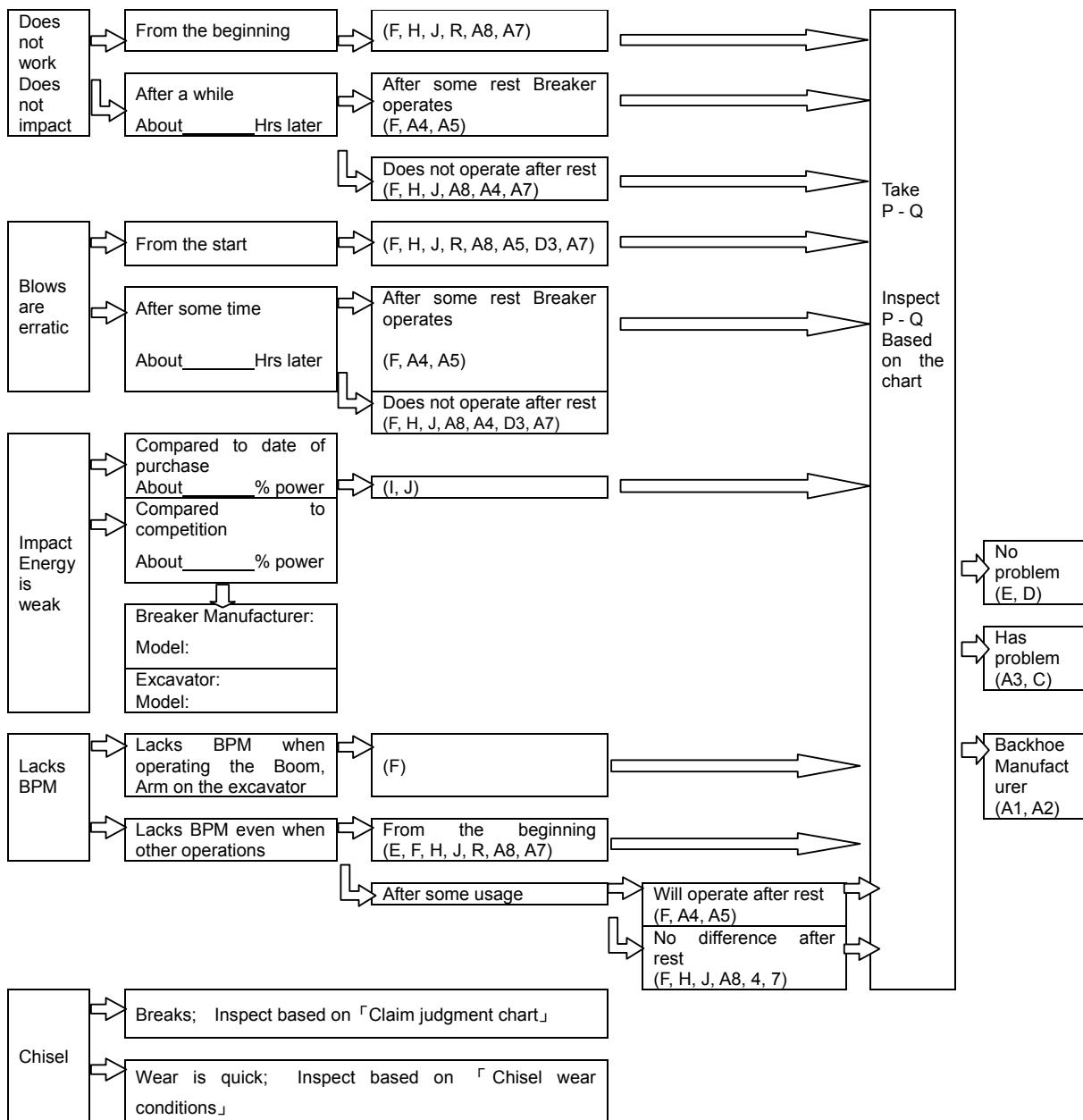
Company Name _____ Model TNB _____ Maker's name _____

Name _____ Ser.No. _____ Model _____

Customer Name _____ Delivery date _____ Ser.No. _____

Hour Meter _____ hr.

* Inspection points A - R



Failure Phenomenon	Presumed Cause	Action	Item
HYDRAULIC BREAKER			
1. Does not impact or Stopped impacting	Lack of P - Q	Inspect and measure	A
	Clog in piping or pump problems	Measure, Inspect, Repair	C
	Seizure within the breaker	Repair, Replace parts	D
	Cylinder cover filled with hyd. oil	Replace seals	E
	Lack of hyd. oil in tank (system)	Inspect, Refill	
	Stop valve is not turned ON	Open stop valve	
2. The breaker stops Impacting after 30 - 90 min. of operation or the breaker starts to blow erratically	Lack of P - Q	Measure and Inspect.	A
	Clog in piping or Pump problems	Measure, Inspect, Repair	C
	Nitrogen gas pressure is too high	Adjust	F
3. Erratic blows	Hyd.oil in the cylinder cover	Change seals	G
	A large amount of grease has entered the impact chamber	Remove grease, instruct method for greasing	H
4. Lacks BPM	Lacks P x Q	Measure	A
	Chisel not pushed in far enough	Inspect	B
	Nitrogen gas pressure is too high	Adjust	F
5. Impact energy is low	Reduction in Nitrogen gas pressure	Inspect, Re-fill	I
	Chisel not pushed in far enough	Inspect	B
	Lack of (P – Q)	Measure	A
	Chisel broken inside the chisel holder	Change chisel, Inspect piston.	J

Failure Phenomenon		Presumed Cause	Action	Item
6.	Oil leakage			
	a) From IN, OUT port area	Loose hose adapter, O-ring damage	Re-tighten, replace O-ring	K
	b) From Control valve and matching surface of cylinder.	Loose bolt, O-ring or back up ring damage.	Re-tighten, replace	
	c) From chisel and Chisel bushing	Wear of damage of the oil seal	Replace seal(s)	L
	d) From cylinder cover and cylinder	Loose side bolt nut Damage of O-ring or back up ring	Retighten, or Replace the O-ring or back up ring.	
PARTS RELATED				
1.	Breakage of chisel	Due to operation of the Breaker used in prying or applying a bending action to the chisel.	Operate the breaker with the chisel straight into the material.	M
		Also wear of arm, link and pin parts	Repair, Replace	
2.	Melting of chisel	Impacting the breaker in the same place for a long time	Change position. Do not impact breaker in same location for more than 30 sec.	N
3.	Breakage of tip portion of the chisel.	Full power usage from the beginning of operation	Operate breaker slowly for about 30 min.	
4.	Unable to assemble the Retainer pin	Deformation of the Retainer pin or chisel	Inspection, repair or replace	O
5.	Looseness between the Bracket and the body of the breaker	Loose bracket bolt(s)	Re-tighten	P
		Wear of the bracket	Repair	
6.	Excessive wear of the chisel bushing.	Not enough grease Operating the breaker with a bending or prying action.	Instruct according to the operation manual	


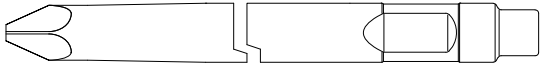
Failure Phenomenon	Presumed Cause	Action	Item
EXCAVATOR OR PIPING RELATED			
1. After installation of the piping, the excavator does not move straight forward.	Difference in the Relief valve set pressure	Check the Relief valve set pressure Increase the slower side of the relief valve pressure	
2. The hydraulic oil temperature increases rapidly.	Problems in cooling mechanism for the excavator.	Change the settings for the breaker. (Reduce throttle position etc)	
	Problem with pump	Repair or replace pump	Q
	Clog in piping		C
3. Difficulty in pin pointing the demolition material	Excessive wear in the width of the arm and link. Also, wear of the pins and bushing. Wear of the bracket	Inspection, Repair, or replace * Chisel may break easily.	
4. Deterioration of the hydraulic oil	Water is entering the system.	Immediately change the hydraulic oil.	
5. Engine RPM reduces quickly.	Lack of engine out put	Reduce gas pressure. Reduce the throttle position	
	The engine performance has reduced.	Ask the service dealer to inspect.	
	The hydraulic oil temp.is too low.	Warm up the hydraulic oil.	

ITEM	DESCRIPTION	MEASURES
A	Lack of P (Pressure) x Q (Flow)	Measure (To be performed by the Service dealer)
	1. Reduction in pump performance	* Occurs with used machines which have gear pumps.
	2. Reduction in engine performance	Measure (Same as above)
	3. Poor setting of the relief valve or foreign matter has entered the relief valve	Disassemble and inspect. Damaged or if broken must be replaced or clean
	4. Lack of Hydraulic oil	Add hydraulic oil
	5. Deterioration of hydraulic oil	Change the hydraulic oil
	6. Wear of change valve leading to Oil leakage.	Replace the change valve part. * Occurs when the Hydraulic breaker is used often.
	7. Clogged breaker piping	Back pressure will increase. Check starting from the pump side. Refer to Item C for the filter and check valve.
	8. Lack of stroke for the change valve	Adjust to the correct stroke length
	9. Poor throttle position setting	Reset the throttle position for the breaker
B	Lack of pressing in the chisel	The lack of pressing in the chisel into the breaker will not allow the power to transmit to the chisel ↓ If the chisel is pressed into the breaker correctly the breaker will operate normally.
C	Clog in piping	The return filter is clogged (Filter located in the tank) (Replace every 100 hours of operation) Check to make sure that no foreign items are caught inside the check valve.

ITEM	DESCRIPTION	MEASURES																																						
C	Friction within the piping is large	Back pressure with no load. Estimation of normal levels. (Measured at the breaker)																																						
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Check for any leakages from the pipe or hose.																																								
D	Seizure within the Hydraulic Breaker																																							
	1. Lack of flushing and hammering after installation of the piping	Control valve area or piston seizure problems. Control valve seizure normally occurs after start up of the breaker. Thereafter the piston may develop seizure disassemble and repair. Re-flush and perform hammering (More than 30 min.)																																						
	2. When changing the bucket to the breaker, foreign material entering the breaker through the hose adapters.	Occurs when changing the bucket frequently. When changing attachments, be careful not to let foreign material enter the breaker.																																						
	3. When the chisel bushing wears excessively.	When the chisel impact area is slanted and the piston hits the chisel, seizure may occur with the piston. Or when the impact area of the chisel becomes damaged and the retainer pin breaks. * Change the chisel bushing immediately.																																						

ITEM	DESCRIPTION	MEASURES
D	Seizure within the Hydraulic Breaker	
	Control valve, Piston and Cylinder seizure repair 1) For light pickup (scratches) use an oil stone or water paper for repair 2) For deep scratches or pick up on the lower section of the piston (Area where seals move), since the seals move in the area, piston must be replaced	
E	Hydraulic oil fills up the cylinder cover	Piston cannot move This develops due to wear of the oil and gas seals. The seals should be replaced.
F	Nitrogen gas pressure is too high	The operating pressure increases, and the relief valve is triggered. Flow will be reduced and the operating temperature will increase * The excavator pump performance may also reduce the gas pressure.
G	Hydraulic oil enters the cylinder cover	When the Oil seal and Gas seal wear, Hydraulic oil will slowly enter the cylinder cover. ↓ The volume of gas may also decrease, as a result the gas compression ratio will increase and will eventually increase the operating pressure. ↓ The relief valve is actuated, the flow will reduce, and the temperature of the oil will increase. As a result the breaker may operate erratically.
H	Grease enters the impact chamber in the chisel holder	When the piston is moving up, the operating pressure will increase and the relief valve will actuate and the flow will decrease. * When removing the grease from the impact chamber, first remove the gas from the cylinder Push the piston from the lower point up into the cylinder cover and remove the grease from the Impact chamber. When greasing, stand the breaker up and press the chisel into the breaker. Then grease.

ITEM	DESCRIPTION	MEASURES
I	Reduction in Nitrogen gas pressure	Reduction in piston speed during decent (Reduction in impact energy) ↓ Re-charge Nitrogen gas * If Nitrogen gas cannot be re-charged, replace the gas seal.
J	Breakage of the Chisel within the chisel holder	The normal impact energy does not transmit to the tip of the chisel and the BPM has decreased. May also lead to retainer pin breakage
K	Oil leakage	“ Oil leakage ” means when hydraulic oil leaks out of the breaker continuously for several hours. “ Oil ooze ” is when hydraulic oil is noticed after disassembly/assembly of the breaker within about 200 hours. The areas where you may notice this oil is around the mating areas, bolts and washers. Or when the oil is unable to dry and dust is on the area and is unable to clear up or dry. In this case, this is not abnormal.
L	Oil leakage from between the chisel and the chisel bushing	When Hydraulic oil is flowing out all around the chisel diameter. In this case, this is abnormal. * The oil seal should be replaced. If seizure has developed on the piston, it must be repaired. If the seizure is deep in the lower area of the piston, the piston should be replaced. * If a standard breaker is used underwater, the oil seal will become damaged and the may develop seizure marks.

ITEM	DESCRIPTION	MEASURES
M	Chisel breakage	<p>Breakage straight across</p>  <p>Breakage with a step</p>  <p>* Do not put a bending force onto the chisel.</p>
N	Chisel tip melting	<p>Impact energy becomes heat energy at the tip of the chisel. The tip will become red hot and will begin to melt.</p> <p>* For hard to tough rocks, do not operate the breaker in the same spot for more than 30 seconds.</p>
O	Difficulty in assembling the Retainer pins	<p>The retainer pin becomes deformed inside the chisel holder. In this case the chisel may also have deformed.</p> <p>↓</p> <p>Repair or replace.</p>
P	Loosening of the Bracket	<p>Loosening will call for more loosening. It is best to re-tighten the bolts as early as possible. When the bracket or bracket bushing has excessive wear, repair or replace the part.</p>
Q	Increase in hydraulic oil temperature due to wear within the pump	<p>Occurs with gear type pumps which have excessive wear.</p> <p>The oil does not work and leaks, changing to heat and increases the oil temperature.</p>
R	Hydraulic oil temperature is too low.	<p>Occurs in the winter when the outside temp. is low. Warm up the machine so that the hydraulic oil is above 35°C.(95°F)</p>