okada 150

OKADA HYDRAULIC BREAKERS

PARTS LIST

(Applicable S/N: B2101**** and after)

Active
Innovat.
Young
Original
Network

OKADA

210114WJ

- Contents of Parts List -

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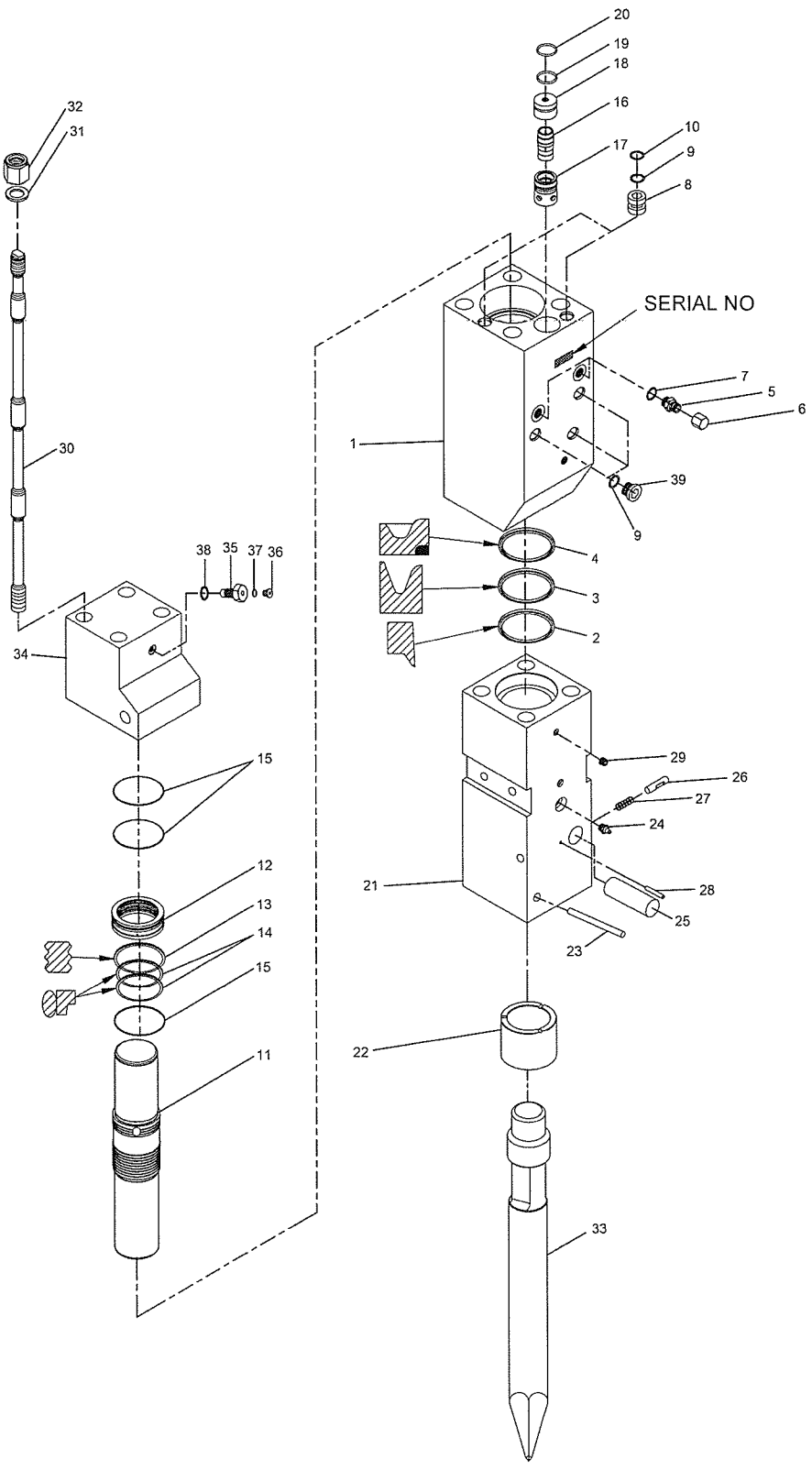
Breaker body Exploded view

okada150



Breaker Body Parts List

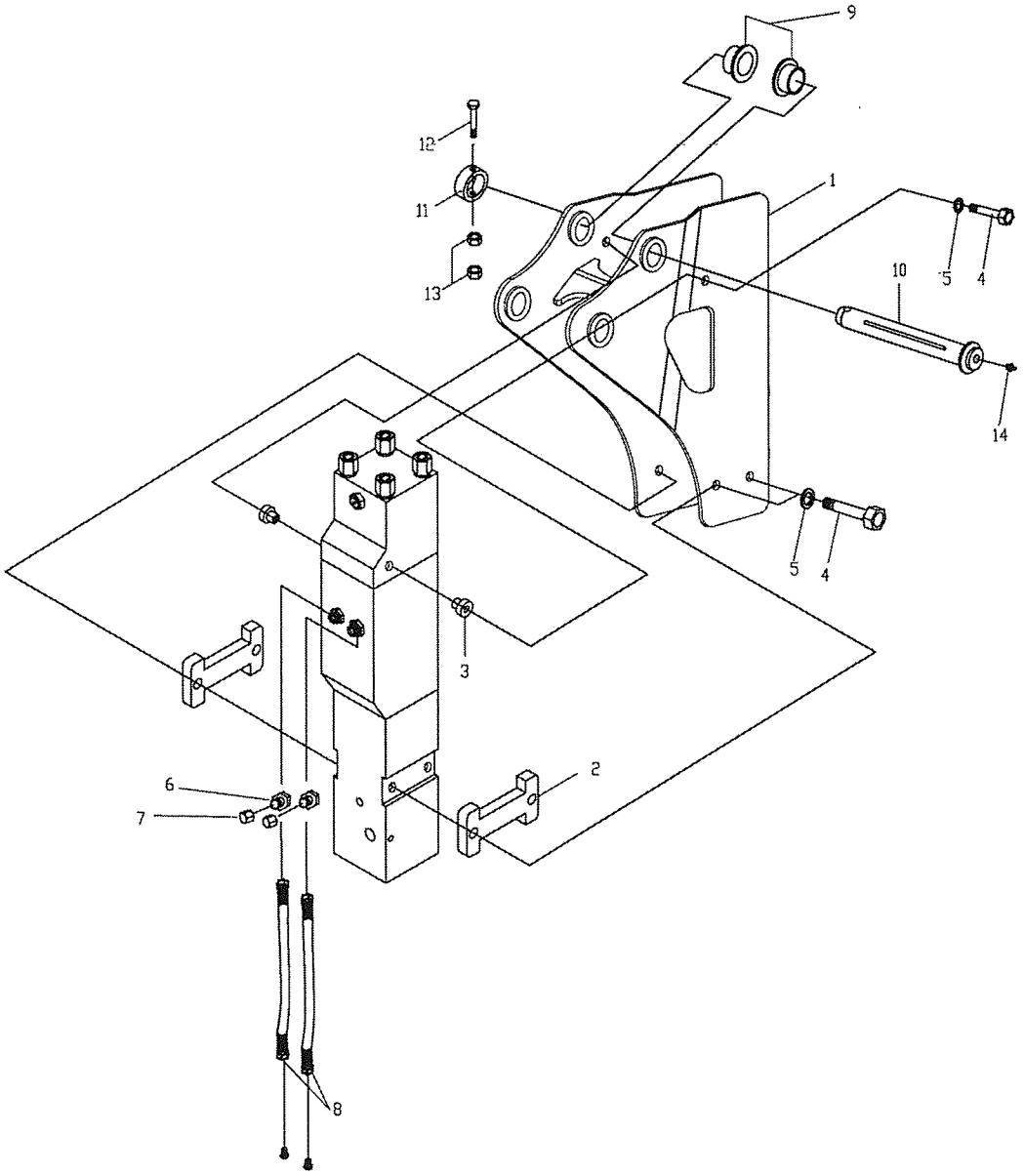
okada150

No.	Parts No.	Part Name	Q'ty	Remarks
1	HB015A0010	Cylinder	1	
2	HB015A0020	Dust seal	1	
3	HB015A0030	U-packing	1	
4	HB015A0040	Buffer-ring	1	
5	HB015H0061	Adapter	2	
6	HB015H0071	Dust cap	2	
7	HB260A0100	O-ring	2	
8	HB015A0080	Plug	2	
9	HB260A0120	O-ring	5	
10	HB015A0100	Back up ring	2	
11	HB015A0110	Piston	1	
11	HB015A011A	Piston	1	S/N 345 and after
12	HB015A0120	Cylinder sleeve	1	
13	HB015A0130	X-ring	1	
14	HB015A0140	Step seal	2	
15	HB150A0230	O-ring	3	
16	HB025A0150	Valve	1	
17	HB025A0160	Valve liner	1	
18	HB025A0170	Valve plug	1	
19	HB025A0180	O-ring	1	
20	HB025A0190	O-ring	1	
21	HB015A0210	Front cap	1	
22	HB015A0220	Front cap bushing	1	
23	HB015A0230	Spring pin	1	
24	HB025A0260	Grease nipple	1	
25	HB015A0250	Chisel set pin	1	
26	HB015A0260	Shaft	1	
27	HB025A0290	Spring	1	
28	HB025A0300	Pin	1	
29	HB260A0370	Plug	1	
30	HB015A0300	Side rod	4	
31	HB015A0310	Back nut washer	4	
32	HB015A0320	Back nut	4	
34	HB015A0340	Back cap	1	
35	HB260A0450	Gas valve	1	
36	HB260A0470	Cover cap	1	
37	HB260A0480	O-ring	1	
38	HB260A0460	O-ring	1	
39	HB260A0110	Plug	3	

No.	Parts No.	Part Name	Q'ty	Remarks
33	HB015AP330	Point chisel	1	
33	HB015AX330	Cross cut chisel	1	
33	HB015AE330	Flat end chisel	1	
	HB025A1010	Valve assy	1	15,16,17,18,19
	HB015A1020	Side rod assy	4	27,28,29
	HB260A1040	Gas valve body assy	1	32,33,34
	HB015A10C0	Seal kit	1	2,3,4,7,9,10,13,14,15,19,20,37,38
				130225

Bracket Exploded View

okada150 Horizontal bracket



Parts List

okada150 Horizontal bracket

No.	Parts No.	Part Name	Q'ty	Remarks
1	HB015H0010	Bracket	1	
2	HB015H0020	Bottom holder	2	
3	HB015H0030	Upper holder	2	
4	HB015H0040	Bolt	6	
5	HB015H0050	Spring washer	6	
6	HB015H0061	Adapter	2	
7	HB015H0071	Dust cap	2	
8	HB015H0080	Hydraulic hose	2	
9	HB015H0090	Bracket pin bush	4	
	HB015H0150	Bracket pin bush, SK09	4	
	HB015H0160	Bracket pin bush, ZX10	4	
	HB015H0170	Bracket pin bush, U-10	4	
	HB015H0180	Bracket pin bush, PC10	4	
10	HB015H0100	Bracket pin	2	25mm
11	HB015H0110	Bracket pin collar	2	
12	HB015H0120	Bolt	2	
13	HB015H0130	Nut	4	
14	HB025A0260	Grease nipple	2	
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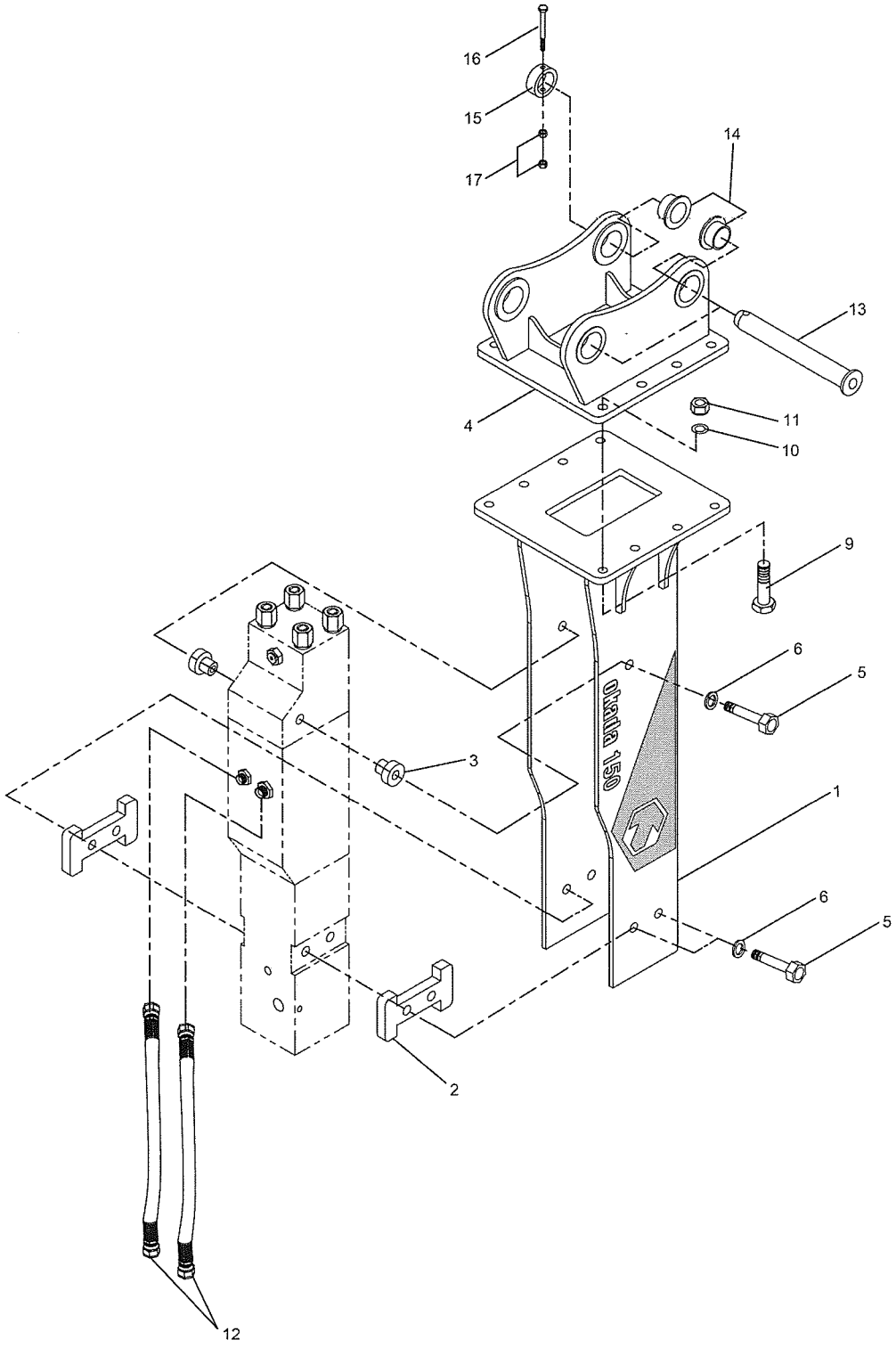
Bracket Exploded View

okada150 Vertical bracket



Parts List

okada150 Vertical bracket

No.	Parts No.	Part Name	Q'ty	Remarks
1	HB015B0010	Bracket	1	
2	HB015H0020	Bottom holder	2	
3	HB020H0030	Upper holder	2	
4	HB015B0040	Top bracket	1	
5	HB015B0050	Bolt	6	
6	HB015B0060	Spring washer	6	
9	HB015B0090	Bolt	8	
10	HB015B0100	Spring washer	8	
11	HB015B0110	Nut	8	
12	HB015H0081	Hydraulic hose, NSF09	2	
13		Pin	2	
14		Bushing	4	
15		Collar	2	
16	HB015H0120	Bolt	2	
17	HB015H0130	Nut	4	
				210114

okada Series

OKADA Hydraulic Breakers

General Instruction Manual and Maintenance Guide for Owners and Operators

OKADA

[201104]

Thank you very much for purchasing an OKADA Hydraulic Breaker. These hydraulically operated, gas-assisted breakers have been developed by a highly experienced team of engineers. Reflecting many strength and durability improvements, these hydraulic breakers are composed of the minimum number of parts to ensure powerful, trouble-free operation.
Proper handling, maintenance and inspection are crucial in order to obtain the optimum performance for the longest possible period of time.
Carefully read this instruction Manual before using the hydraulic breaker to ensure satisfactory results. If you have any questions, please feel free to contact either one our agents or us directly.
When replacing parts, be sure to use only genuine OKADA parts. Using other than genuine OKADA parts could seriously impair the performance and durability of your hydraulic breaker.6

Visit OKADA AIYON website: **http://www.okada-aiyon.com/**

- Safety -

Safety

1. Introduction

Virtually all accidents occur as result of handling or operating a machine without observing fundamental safety rules.

Before starting handling, operation, servicing, and storing of the machine, carefully read this Manual and the Operation Manual for the carrier (excavator, backhoe, skid steer, etc.) until you are certain you thoroughly understand the explanations in the manuals.

The hazard indications shown in this Manual and those affixed to machines are used as follows:

DANGER

This icon alerts the operator of the possibility of a fatal accident or serious injury that could result if this sign is ignored and the machine is operated incorrectly.

WARNING

This sign alerts the operator of death or serious injury that can result if this sign is ignored and the machine is operated incorrectly.

CAUTION

This sign alerts the operator of injuries or property damage that can result if this sign is ignored and the machine is operated incorrectly.

IMPORTANT

This sign alerts the operator that the machine can be damaged or its life can markedly decrease if this sign is ignored and the machine is operated incorrectly.

For each operation, a description is given the Safety Section. Note, however, that it is impossible for our company to predict all potential hazards that might occur in all conditions and circumstances. Consequently, the Danger, Warning, Caution, Important, and other indications affixed to machines do not cover all situations that might occur.

2. Foreword

This Manual explains precautions that must be taken when using this product so that it can be operated safety and efficiently.

Before beginning to use your hydraulic breaker, carefully read this manual and be sure you thoroughly understand how to use it.

The hydraulic breaker is an attachment mounted on a carrier (excavator, backhoe, skid steer, etc). It is therefore imperative that users read and understand the Operation Manual for the carrier as well.

3. People make the difference

People who use or operate hydraulic breaker must be:

COMPETENT

- **Physically** Must have good vision, hearing, coordination, and be capable of safely performing all functions required for machine operation.
- **Mentally** Must be able to understand and apply established rules, regulations, and safe practices. Be alert, using good judgment for safety to themselves and others. Desire to do their job correctly and in a responsible manner.
- **Emotionally** Must be calm and capable of withstanding stress and make accurate judgments concerning their own physical and mental condition.
- **Trained** Must have read and understood the operator's instructional manual, the load rating chart if applicable, hand signals chart and warning decals, and maintenance aspects of the machine.
- **Licensed** Must be licensed if required by law.

⚠WARNING

Careless operation of this hydraulic breaker can cause serious or fatal injuries.

Operators and maintenance personnel must thoroughly read this Manual and the Operation Manual for the carrier before starting operation or maintenance work.

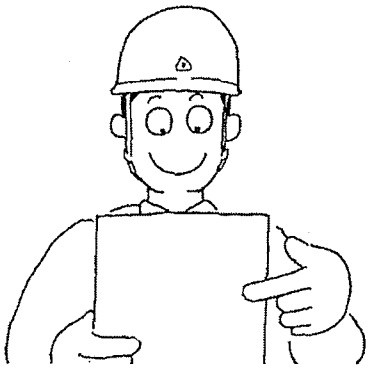
Keep this Manual near the hydraulic breaker as a handy reference guide. All personnel are advised to read it at periodical intervals.

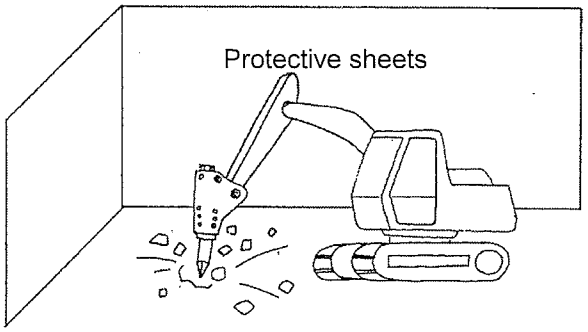
- Always keep this manual handy, and read it repeatedly.
- If this Manual should be lost or damaged, promptly place an Manual together with the machine.
- When you transfer the hydraulic breaker, be sure to hand over the Manual together with the hydraulic breaker.
- As a result of continuous improvements, the current hydraulic breaker could differ in detail specification from hydraulic breakers sold in the past. If you have any questions in this regard, please ask our Company or a distributor.

4. Basic precautions

Strictly follow safety rules!

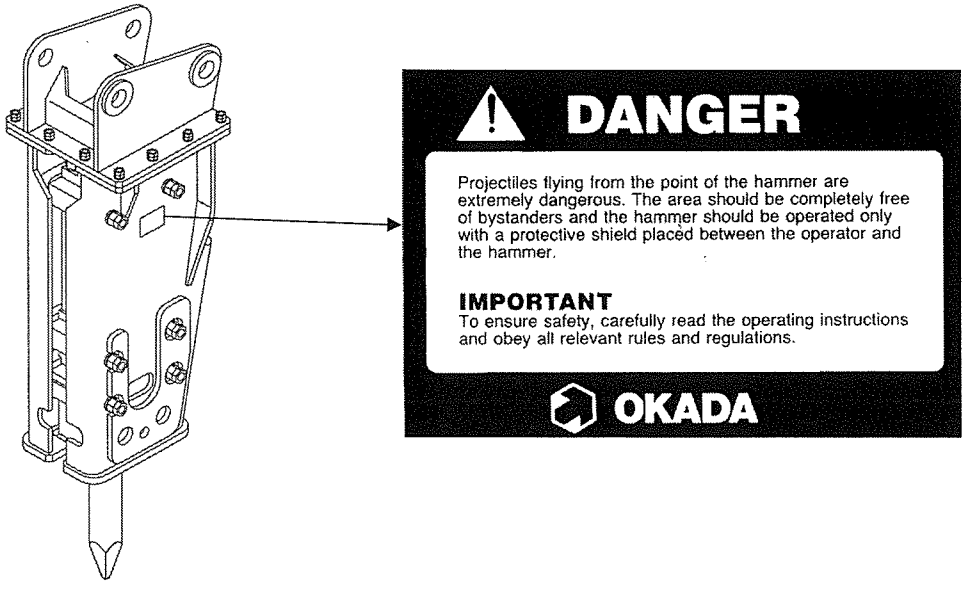
- This hydraulic breaker must only operated by personnel who have received sufficient advance training to ensure they are able to safely and effectively operate the equipment.
- Maintenance must only be performed by maintenance personnel who have received sufficient advance training.
- When operating the hydraulic breaker on streets or other locations where there are bystanders or vehicle traffic, use protective sheets or the like to enclose the worksite and thereby prevent debris from flying out.
- When a guide is used while performing joint work, etc., always strictly follow the predetermined signals the guide gives.





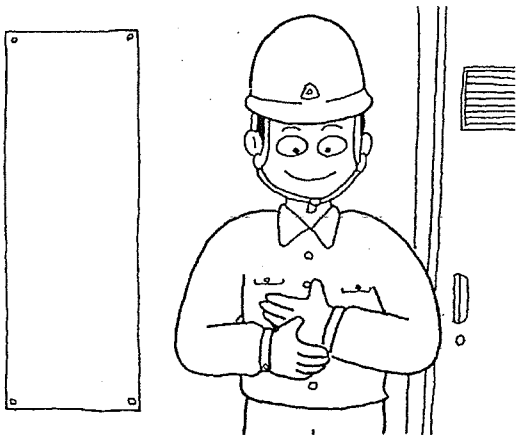
About safety labels

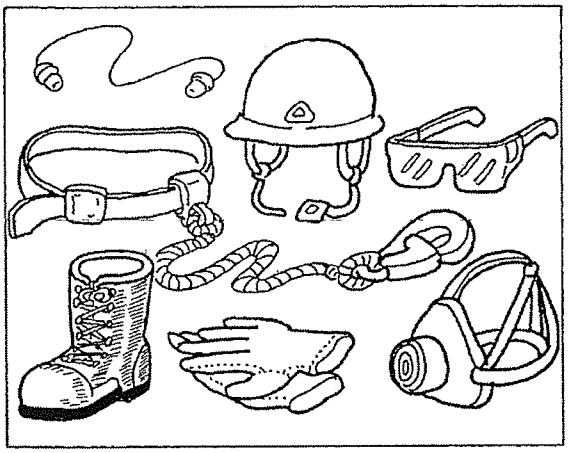
- Read the safety labels affixed on the hydraulic breaker and be sure you thoroughly understand each label.
- Keep safety labels clean at all times and ensure that they are in clear view.
- If the safety label should peel off or become abraded and blurred, order a replacement label from our company or one of our distributors.



Wear appropriate work clothes and always use necessary safety equipment

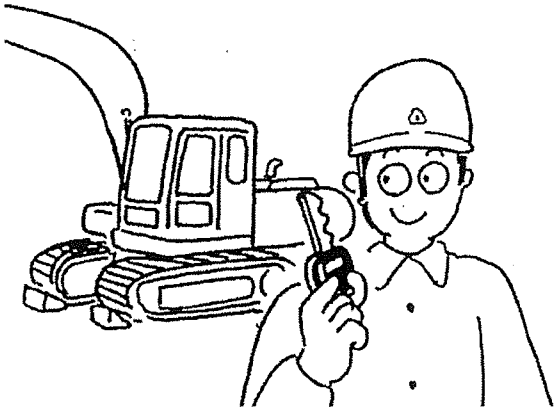
- Do not wear baggy clothes, jewelry, or other items that could be caught by levers or other machine parts, or oil-stained clothing that can easily catch fire.
- Wear a hard hat, safety shoes, a dust-proof mask, ear mufflers, and work gloves. Broken rocks, concrete pieces, and metal splinters can become projectiles, possibly causing serious injury.





When leaving the operator's seat

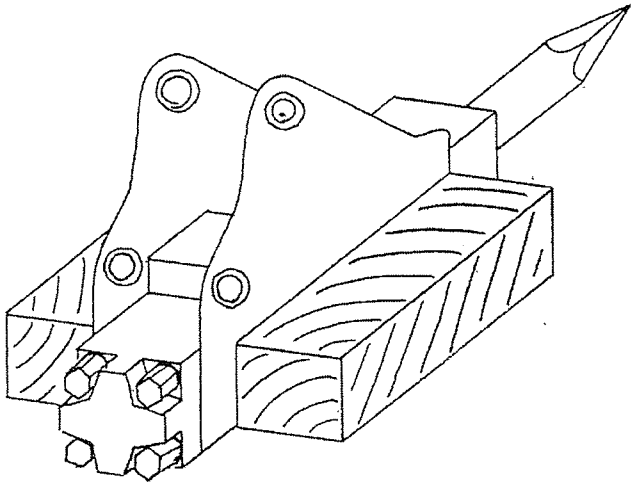
- Before leaving the operator's seat, firmly lower the hydraulic breaker and then shift the carrier safety lock lever to the LOCK position. If you happen to touch the travel lever or swing control lever, the unit could abruptly start moving, possibly causing a serious injury.
- When leaving the driver seat, firmly lower the hydraulic breaker, stop the engine, and lock all keys. Always return the key to the supervisor.

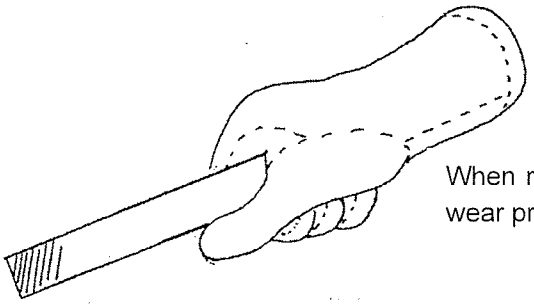


5. Precautions to note upon installation or removal

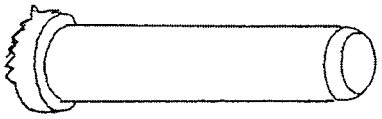
Preparations prior to operation

- Make sure that installation of the hydraulic breaker on the carrier and removal from the carrier is only performed on a level, spacious area of hard ground. Serious injury could occur if a person were to become trapped between the machine and a solid mass.
- Using wooden props or the like, firmly prop the hydraulic breaker up to keep it from turning sideways, which could cause serious injury.
- Operations must only performed by a well-trained worker, and safe operation must be ensured by making the work site inaccessible during work hours.
- When the hydraulic breaker, bracket pin, or bucket pin have sharp burrs, be sure to remove them before starting operation. Failure to remove burrs or the like could cause injury.



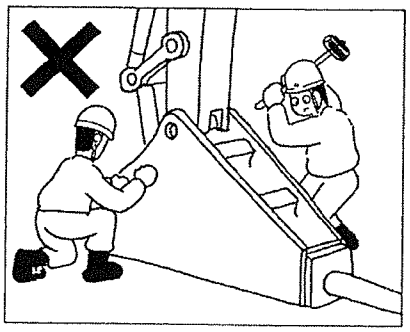


When removing burrs, always wear protective gloves.



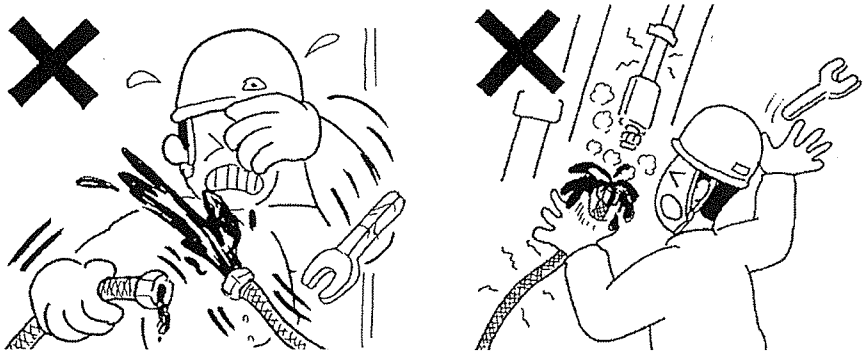
Bracket pin area

- During operation, do not insert your hand or fingers in the hydraulic breaker bracket pin hole. Your hand or fingers could be caught inside, causing serious injury.
- During operation, do not touch the hydraulic breaker bracket or carrier arm.
- Do not insert a bar or the like in the hydraulic breaker bracket pin hole in a forcible attempt to align it with the carrier arm bucket pin hole. The bar, etc. could snap back and hit someone, causing serious injury.
- Wipe the bracket pin well to remove grease or oil before starting operation. The bracket pin could slide down, causing serious injury.
- When striking the bracket pin, always wear a hard hat, safety goggles, safety shoes, dust-proof mask, ear mufflers, and protective leather gloves. Make sure there are no bystanders around. Metal chips could scatter, causing serious eye injury.



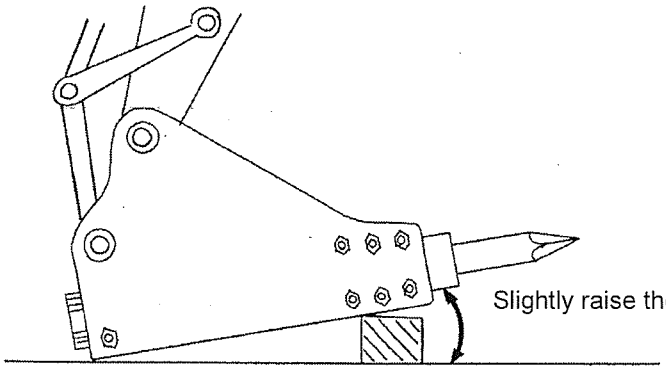
Precautions to note when installing or removing hydraulic hoses

- Be sure to tighten the hydraulic hose fittings to the correct torque. If the hydraulic hose is improperly mounted, the hydraulic oil could blow out, causing serious injury.
- Before disconnecting the hydraulic hose, securely close the stop valve. When disconnecting the hydraulic hose joint, avoid facing the joint, then loosen it gently and slowly while releasing the internal pressure. If hot hydraulic oil blows out and enters the eye, loss of sight could occur. Refer to Table 1 on page 50 for details of the tightening torque of hydraulic hoses.



Precautions to note when replacing chisels

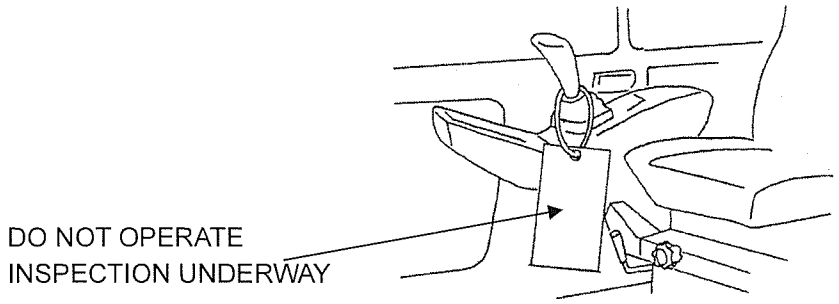
- Before attaching a chisel, raise the hydraulic breaker front cap side slightly from ground level, and place a wooden block under the front. Leave the rear end in contact with the ground so that the unit is stabilized. If upon removal the chisel set pin falls and hits a person, serious injury could occur.
- When attaching the chisel, do not handle the chisel where the chisel set pin retaining site meets the shank. You could get your hands or fingers trapped between the chisel and front cap, resulting in serious injury.



6. Precautions to note when performing inspection

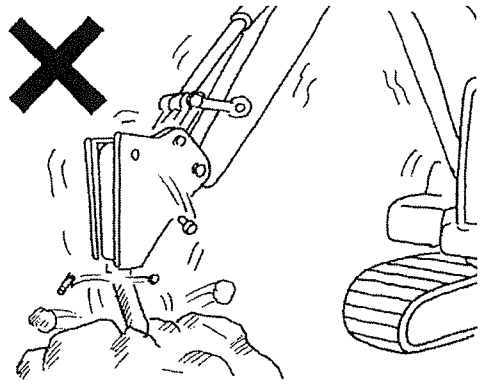
Inspecting the equipment

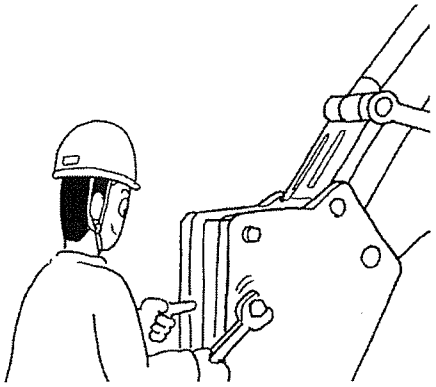
- Before performing inspection, lower the hydraulic breaker in a spacious hand-ground area, and check that the carrier's safety lock lever is in the LOCK position. If the carrier starts moving during inspection, serious injury could occur.
- Never climb on the boom arm of the carrier. You could slip and fall, causing serious injury.
- Before inspection, suspend an "INSPECTION UNDERWAY" label from the operation lever. If someone unaware that an inspection is underway were to operate the machine, serious injury could occur.



Action to take when a problem is noted

- If bolts, nuts, and pins are loose, the hydraulic breaker could fall off and cause severe injury. If bolts and nuts are found loose, tighten them with the proper torque. If pins have fallen off or are damaged, replace them with new ones.
- If cracks are found on the hydraulic breaker bracket or the carrier, promptly repair the cracks. Never operate the machine with the cracks uncorrected. If the hydraulic breaker or hydraulic carrier arm should fall at the cracked point, serious injury could occur.





Safety

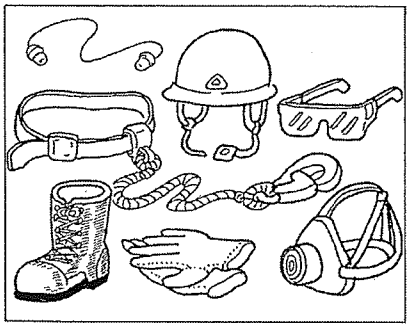
⚠ DANGER

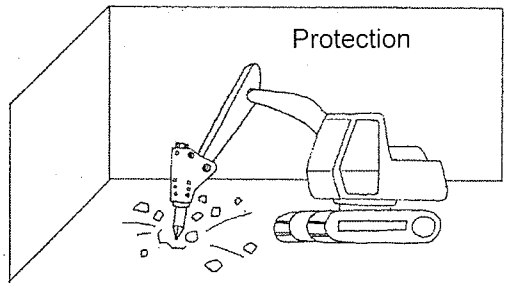
- The accumulator is filled with high-pressure nitrogen gas. Incorrect handling could cause injury.
- Use special care in handling the accumulator, and never attempt to disassemble it under any circumstances. If the accumulator or back cap is filled with any other gas than nitrogen gas, an explosion could occur, causing serious injury.
- Do not use any gas except nitrogen gas in the accumulator or back cap. There is a danger of explosion.
- Do not attempt to weld the accumulator or back cap, and keep away from sources of open flame.
- When discarding an accumulator, the gas must be removed beforehand. Contact Okada or the distributor for gas removal.
- For repairs, contact Okada or the distributor.

7. Precautions related to usage

Precautions related to safety aids

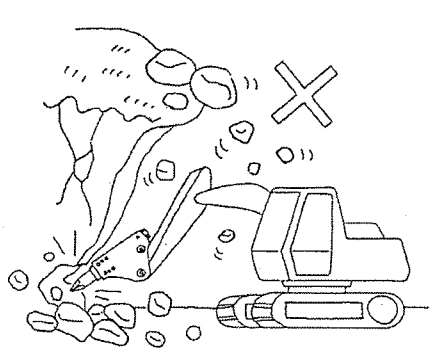
- When operating the hydraulic breaker, always wear work clothes suitable for the job. Avoid baggy clothes or ornaments that can become caught in control levers or other machine parts, causing serious injury.
- When operating the hydraulic breaker, always wear a hard hat, safety goggles, safety shoes, dust-proof musk, ear mufflers, and protective leather gloves. Flying debris, noise, etc. could cause considerable injuries.
- Wrap the carrier cab with a protection cover. Use laminated, coated sheet glass or other safety glass for the cab windows.
- Broken materials could fly up, possibly causing serious injury.
- Encircle the work site with protection sheets to prevent rocks from flying out. Keep the site inaccessible to bystanders and structures.

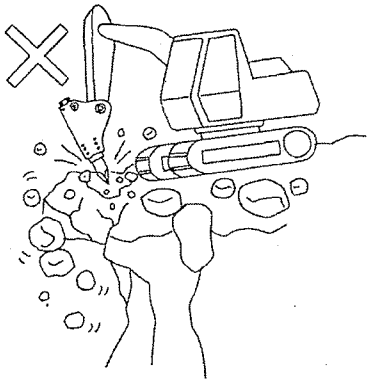




Precautions related to work site environments

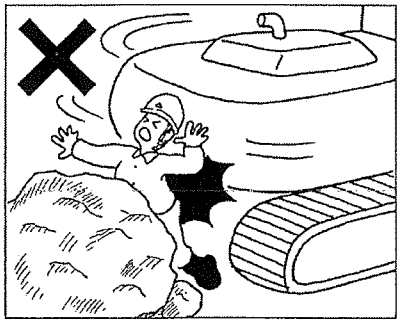
- Do not operate the hydraulic breaker under a cliff or near a cliff ledge. Hydraulic breaker vibrations could cause landslides or falling rocks, leading to serious injury.
- Do not operate the hydraulic breaker on soft ground or on unstable ground strewn with rocks, concrete blocks, etc. Such environments could cause the carrier to tip over, causing serious injury.





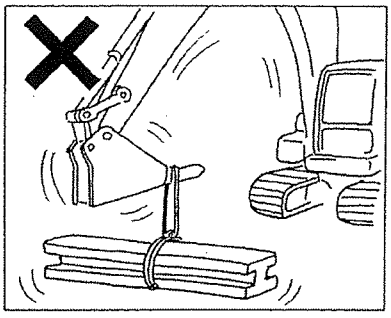
Precautions related to carrier turning

- Do not turn the carrier with the boom or arm extended. This could cause the carrier to tip over, causing serious injury.
- Before swinging the arm or traveling, check for obstacles around the work site; and use the horn, etc., to sound a warning signal. Failure to take such precautions could result in an accident where a person is caught or struck by the carrier.



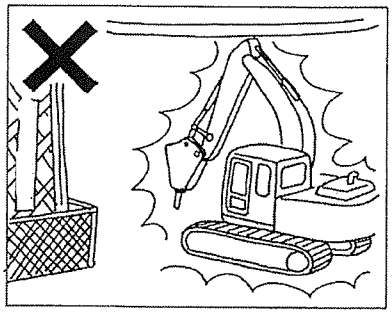
Precautions related to crane work

Do not perform crane work with the hydraulic breaker unit attached. This condition could cause the carrier to tip over, causing serious injury.



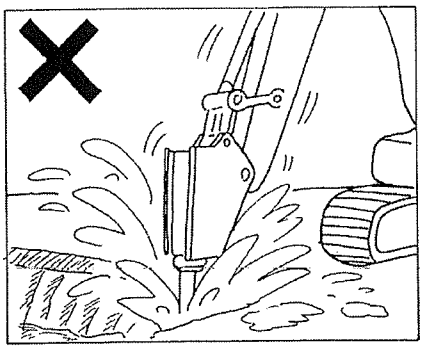
Precautions related to electric shock

Where aerial wires exist near the work site, consult the power company concerned and follow its instructions. The hydraulic breaker and carrier are made of conductive materials and could cause serious injury if brought into contact with electrical wires.



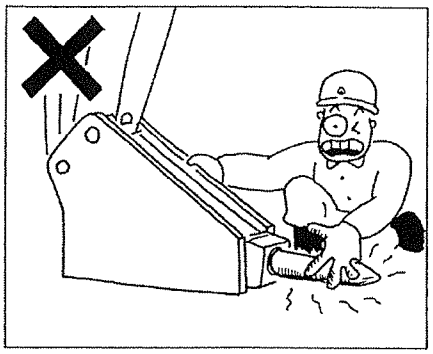
Precautions related to gas pipes

Before operation, check the site to see that no gas pipes or water pipes are buried underground. Occasionally, incidents occur where the hydraulic breaker strikes or deflects gas pipes, which could result in gas explosions with serious injury.



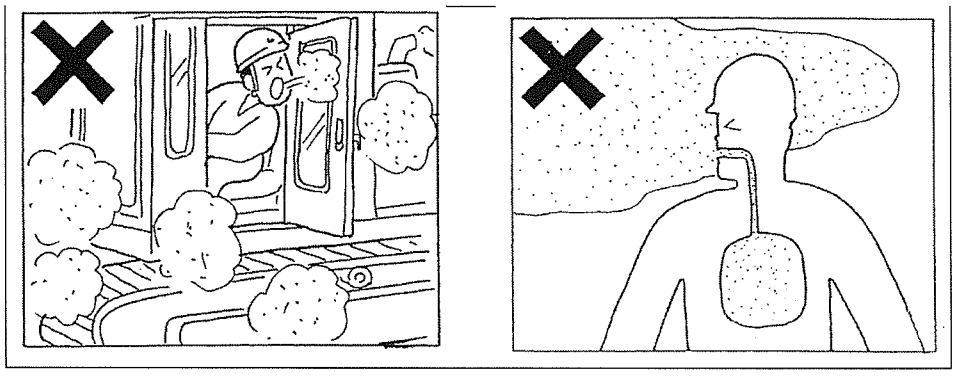
Precautions related to burns

Do not touch the chisel just after completion of work. The chisel is still hot and could cause burns if touched.



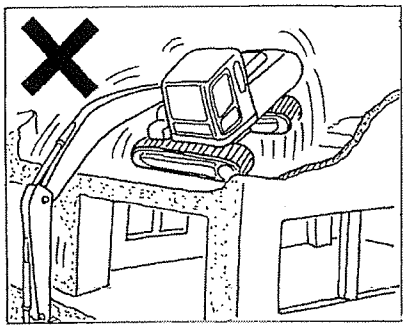
Precautions related to dust

Dust and dirt can be scattered around when crushing structures. Use water sprinkling to keep the dust down. Breathing in asbestos fibers could lead to lung cancer. Avoid inhaling the scattering dust.



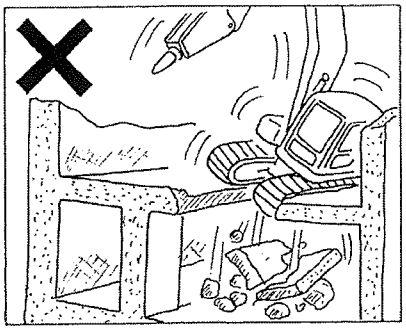
Avoid carrier work perpendicular to the crawler track

Perform carrier work in the fore and aft directions of the carrier. Work can become unstable when performed at a position perpendicular to the crawler track, possibly causing serious injury.



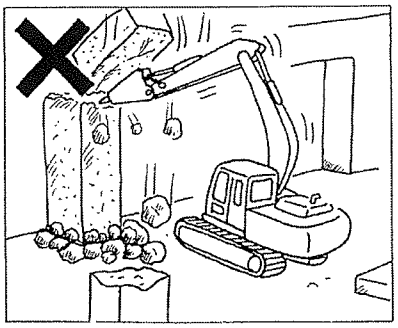
Pay attention to floor strength

When operating the hydraulic breaker in a building, make sure the floor is strong enough. The carrier weight compounded by hydraulic breaker impact could cause the floor to collapse, causing serious injury.



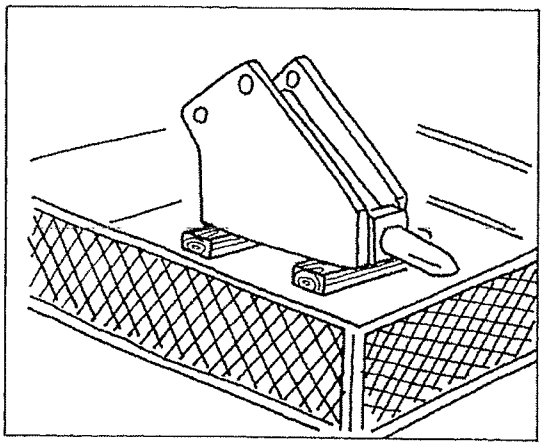
Beware of falling objects

When operating the hydraulic breaker in a building, be aware of the direction in which a beam, etc., might fall. In dismantling work, a beam or other object could fall in an unexpected direction, causing serious injury.



8. Precautions related to storage

When removing the hydraulic breaker from the carrier for storage, maintain the hydraulic breaker so that it will not tip over, In addition, ensure that the storage location is inaccessible. If the hydraulic breaker were to tip over, pinning a person, serious personal-injury accident could occur.



PRECAUTIONS WHEN USING HYDRAULIC BREAKERS

SAFETY FIRST

- When leaving the carrier, lower the hydraulic breaker to the ground and turn the engine off.
- Never attach a cable or sling to the hydraulic breaker to hoist a load. This is extremely dangerous.
- Remove the chisel before transporting the hydraulic breaker.
- Keep all people and equipment away from the hydraulic breaker during operation. Rocks flying from the hydraulic breaker can cause serious accidents.

PRIOR INSPECTION

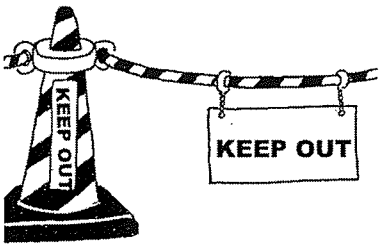
- Check that there is sufficient hydraulic oil and that it is not contaminated.
- Check that hoses, bolts, and nuts are secure.
- Grease the shank part of the chisel.

THINGS TO AVOID

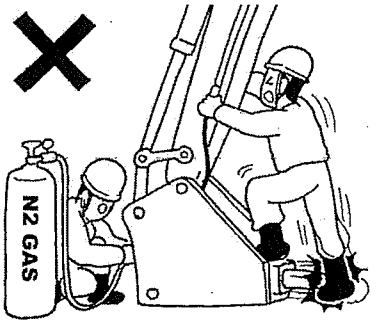
- Do not use the hydraulic breaker in water (special specifications are available for underwater work).
- Do not operate the hydraulic breaker when the carrier cylinders are located at the stroke end.
- Do not use any gas other than nitrogen gas in the gas cushion chamber and accumulator.

⚠ WARNING

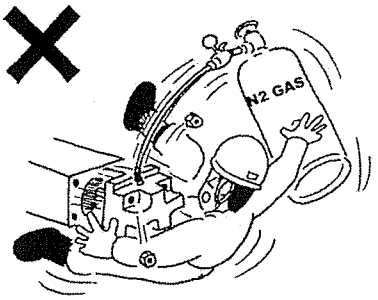
- Keep all people and equipment away from the hydraulic breaker during operation. Rocks flying from the hydraulic breaker can cause serious accidents.



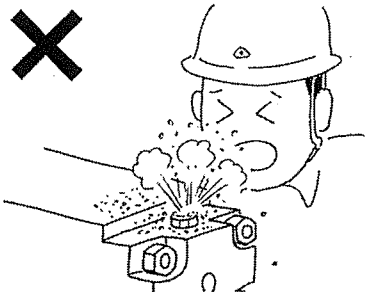
- Use care when replacing the chisel, to avoid popping it out too quickly.



- When filling the back cap or accumulator with nitrogen gas, the chisel could pop out. Do not stand in front of the chisel to avoid accidents.



- When disassembling or repairing the hydraulic breaker, the back cap could pop out due to gas pressure. This is very dangerous. Be sure to release the gas from the back cap before disassembly. Before filling the back cap with gas, be sure to completely tighten the side rod.



- When replacing the gas valve, the gas valve body could pop out due to gas pressure. Be sure to completely release the internal gas before replacing the gas valve.

- Contents -

Specifications

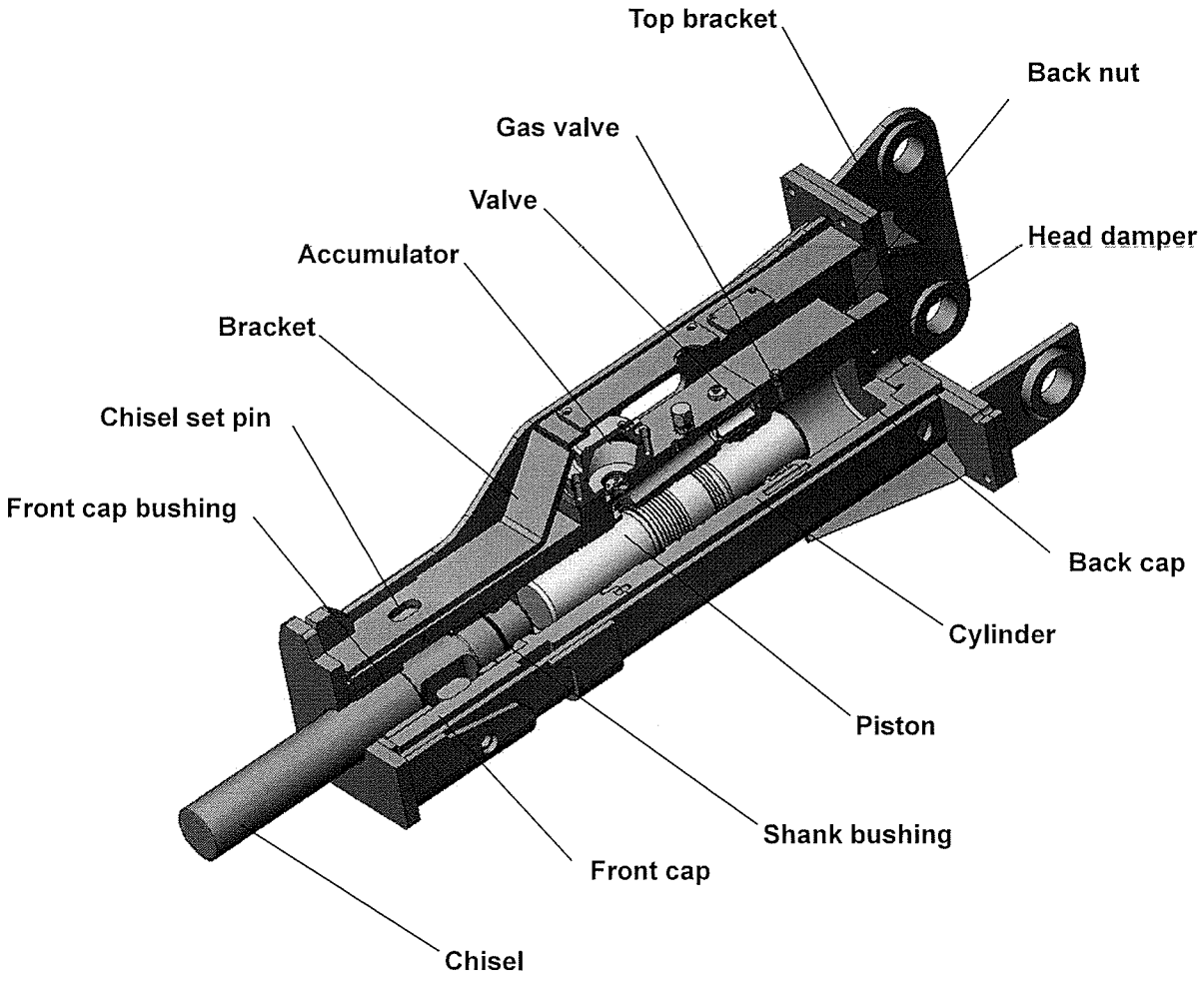
		Unit	okada 150	okada 200	okada 250	okada 400	okada 650	okada 800	okada 900	okada 1000	okada 1300	okada 1500	okada 2000	okada 2600	okada 3200	okada 3600	okada 4200	okada 6000
Operating weight*	Vertical bracket	kg	76	94	138	187	328	393	495	577	830	1043	1231	1650	1989	2610	2900	3950
		lb	167	207	304	411	722	865	1091	1269	1826	2295	2714	3630	4385	5742	6393	8690
	Horizontal bracket	kg	55	80	105	165	225	260	—	—	—	830	—	1585	—	2410	—	3780
		lb	121	176	231	363	496	573	—	—	—	1830	—	3494	—	5313	—	8333
Overall length	Vertical bracket	mm	1117	1124	1203	1443	1580	1647	1898	2131	2219	2305	2419	2700	2967	3024	3209	3627
		inch	43.97	42.12	47.36	56.81	62.20	64.84	74.72	83.89	87.36	90.74	95.23	106.29	116.81	119.05	126.34	142.79
	Horizontal bracket	mm	907	979	978	1252	1315	1342	—	—	—	1969	—	2293	—	2564	—	3013
		inch	35.7	38.5	38.5	49.29	51.77	52.83	—	—	—	77.52	—	90.28	—	100.94	—	118.62
Tool diameter		mm	40	40	45	57	70	75	80	90	95	105	115	135	145	150	155	169
		inch	1.57	1.57	1.77	2.24	2.76	2.95	3.15	3.54	3.74	4.13	4.53	5.31	5.71	5.91	6.1	6.9
2nd relief setting pressure		MPa	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6
		bar	172	172	172	172	172	172	172	172	206	206	206	206	206	206	20.6	206
		psi	2500	2500	2500	2500	2500	2500	2500	2500	3000	3000	3000	3000	3000	3000	3300	3000
Working pressure range		MPa	6-13	9-12	9-12	9-12	11-16	12-17	14-17	14-17	14-19	14-19	14-19	14-19	16-19	14-19	15-19	15-19
		bar	60-130	90-120	90-120	90-120	110-160	120-170	140-170	140-170	140-190	140-190	140-190	140-190	160-190	140-190	150-190	150-190
		psi	870-1890	1300-1740	1300-1740	1300-1740	1600-2320	1740-2465	2030-2465	2030-2465	2030-2755	2030-2755	2030-2755	2030-2755	2275-2755	2030-2755	2170-2750	2170-2755
Oil flow		lpm	12-25	12-25	15-30	23-70	30-65	35-75	45-100	50-110	75-120	65-100	85-120	120-175	127-178	180-250	170-238	230-310
		gpm	3.2- 6.6	3.2- 6.6	4.0-7.9	6.1-18.5	7.9-17.2	9.2-20	12-26	13-29	20-32	17-26.4	22-33	32-46	33-47	48-66	44.9-62.9	61-82
Carrier output flow range		lpm	12-30	13-40	15-42	30-70	35-70	40-110	56-120	70-135	70-140	80-140	120-180	140-210	150-260	208-290	220-315	280-350
		gpm	3.2-8	3.4- 10.6	4-11	8-18	9.2-18	11-29	15-32	18-36	18-37	21-37	31-48	37-55	39-67	55-77	58-83	74-92
Blow rate		bpm	930-1300	800-1400	550-1000	600-1500	600-1100	400-920	400-1100	350-1000	350-900	400-900	320-700	350-600	270-500	300-500	230-470	230-500
2 speed control function		—	—	—	—	—	—	—	—	○	○	○	○	○	○	○	○	○	○
Back cap gas pressure		MPa	1-1.2	1-1.2	1-1.2	1-1.2	1-1.2	1-1.2	1-1.2	1-1.2	1-1.2	1.3-1.5	1.3-1.5	1.3-1.5	1.4-1.6	1.3-1.5	1.3-1.5	1.3-1.5
		bar	10-12	10-12	10-12	10-12	10-12	10-12	10-12	10-12	10-12	13-15	13-15	13-15	14-16	13-15	13-15	13-15
		psi	145-180	145-180	145-180	145-180	145-180	145-180	145-180	145-180	145-180	190-220	190-220	190-220	199-228	190-220	190-220	190-220
Accumulator gas pressure		MPa	—	—	—	—	—	—	—	3.9-4.9	5.4-5.9	5.4-5.9	5.4-5.9	5.4-5.9	5.4-5.9	5.4-5.9	5.4-5.9	5.4-5.9
		bar	—	—	—	—	—	—	—	39-49	54-59	54-59	54-59	54-59	54-59	54-59	54-59	54-59
		psi	—	—	—	—	—	—	—	566-711	782-853	782-853	782-853	782-853	782-853	782-853	782-853	782-853
Carrier machine weight range		ton	0.7-1.5	1.0-2.0	1.2-2.5	1.5-4.0	3.0-6.5	4.5-8.0	4.5-9.0	6.0-10	8.0-13	9-15	12-20	18-26	24-32	25-36	28-42	37-60
		lb	1540-3300	2200-4400	1760-5500	3300-8800	6600-14300	9900-17600	9900-19800	13200-22000	17600-27500	19800-33000	39700-44000	39700-52900	52900-66100	55100-79400	61700-92600	81571-132277

[201104]

The operating weight varies depending on the type of bracket and the base machine.

- The specifications above are subject to change without notice.
- "Carrier output flow range" is carrier's set oil flow with no load and "Oil flow" is oil flow supply during breaker hammering.
- The performance data vary depending on the base machine.
- The kill function for Anti-blank firing system which is equipped on okada1300.

Names of main parts

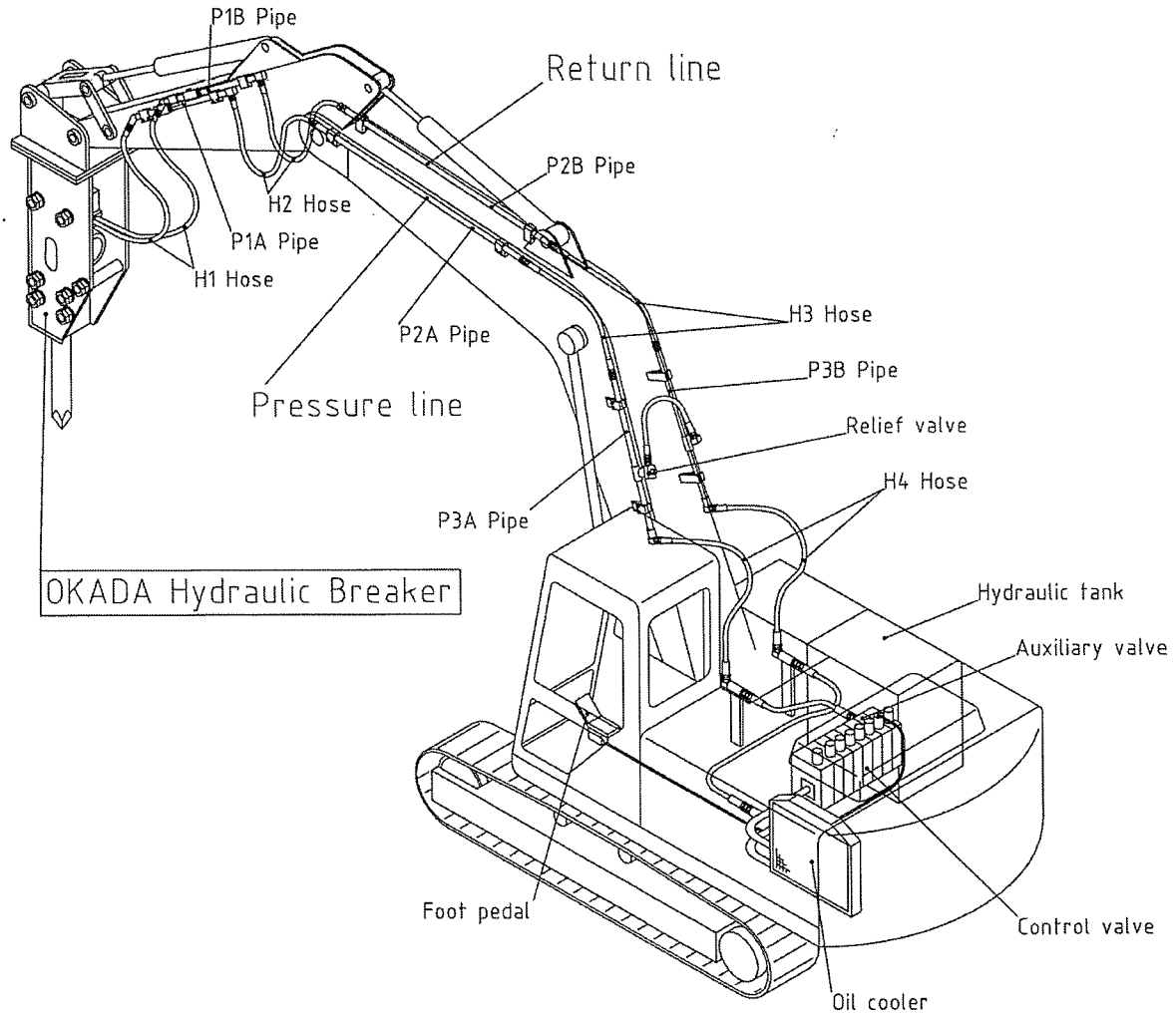


Note: The above model is okada2600. The shape and location vary depending on the model.

Installation

◆ Piping Diagram

Piping for the hydraulic excavator used with the hydraulic breaker is arranged as shown below.



◆ Inspection and adjustment of piping

The following inspection and adjustments must be performed before installation of the hydraulic breaker to ensure maximum performance of the hydraulic breaker and carrier, and to prevent serious malfunctions.

1) Flushing

Before turning on the engine, be sure to check the following.

a) Check whether the installed hydraulic circuit is correct.
b) Check the hydraulic oil tank. If necessary, refill it to the specified range.
c) If a change over valve was added between the pumps and the existing control valve, loosen the adjusting screw for the added relief valve to a moderate value.

Connect both piping tips at the edge of the arm as shown in Fig. 1 below, and open the stop valves for both the pressure and return line as shown in Fig. 2 below.
When the engine for the carrier has sufficiently warmed up, reduce the engine speed to minimum and operate the foot pedal to let the high-pressure oil flow through the hydraulic breaker circuit. At this time, check for oil leakage or other problems on the carrier.
After confirming the piping condition, step up the engine speed to piping, then after the hydraulic oil temperature has warmed up, accelerate the engine speed to maximum.
Perform flushing for at least 30 minutes.

Important — Do not leave the operating pedal on for more than 5 minutes continuously at a time. During flushing, periodically step off the operating pedal and let the hydraulic apparatus rest for about 1 minute.

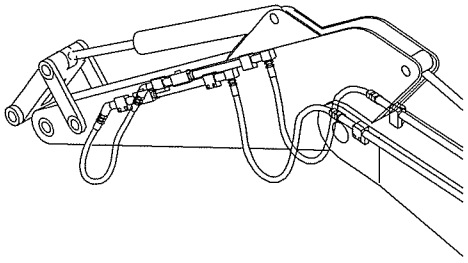


Fig. 1 Connection of hose for flushing.

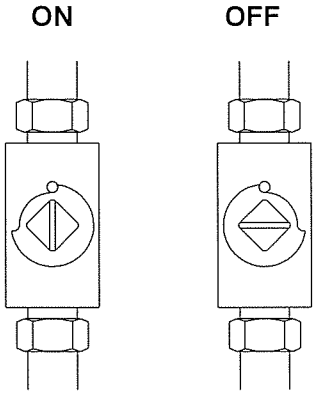


Fig. 2 Stop valve ON/OFF status

2) Procedure for setting pressure and flow

Important — Checking and adjusting pressure and flow is mandatory each time a breaker is installed on a carrier. Improper flow can seriously hinder the performance of the breaker, void the warranty and or cause severe damage to not only the breaker but also the carrier machine.

A: Incase you have a flow meter

(1) Flow meter is to be hooked up in place of the attachment. The high pressure line (cab side) at the front end of the stick will connect to the inlet side of the flow meter. The return line at the opposite front end of the stick will connect to the outlet of the flow meter.

(2) Open both stop valves.

(3) If your flow meter has a restriction knob, run it out counter clockwise so no restriction is applied.

(4) Set the Carrier to B or Breaker mode, if it has the option, then run carrier until hydraulic oil reaches operating temperature.

(5) Run carrier up to full throttle, press foot pedal to start breaker circuit. Have a fellow technician observe *max oil flow* with no restriction applied, this is you're *Carrier Output Flow*. Also, observe the *Back Pressure* with no restriction applied, you should always be under 2.0 MPa (20 bar, 300 psi) of back pressure. Release the foot pedal and record the max flow and max back pressure on your *Warranty Registration form* that is included in the manual.
Note: If *Back Pressure* is over 2.0 MPa (20 bar, 300 psi), make sure your return line dumps straight to the tank on excavator. If return dumps straight to tank and back pressure is still too high, look for other restriction such as a partially closed ball valve, couplers, clogged return filter or undersized plumbing.

(6) To set your *Circuit Relief Valve (Secondary Relief Valve),* run the engine back up to full throttle and press down on the breaker pedal. Next, turn the restriction knob on the flow meter in clock wise to increase restriction to the point where the relief valve is fully open and zero flow is observed. Set relief to specification.

(7) This is optional to set and record *Internal Oil Flow* to PQ characteristic, back off the restriction knob on the flow meter to 10 MPa (100 bar, 1500 psi) and record flow. Do the same at 12 MPa (120 bar, 1750 psi), 14 MPa (140 bar, 2000 psi), 16 MPa (160 bar, 2320 psi), 18 MPa (180 bar, 2610 psi) and maximum. Record flow results and mail it in to Okada.

(8) Disconnect the flow meter and connect the hoses to the breaker. Attach the pressure gauge to inlet line thorough tee connection as shown in Fig. 3. Operate the breaker and observe the *Working Pressure*. It must be or adjustments need to be made. If the working pressure is higher than specified limits, lower the *Oil Flow* until *Working Pressure* comes into range.

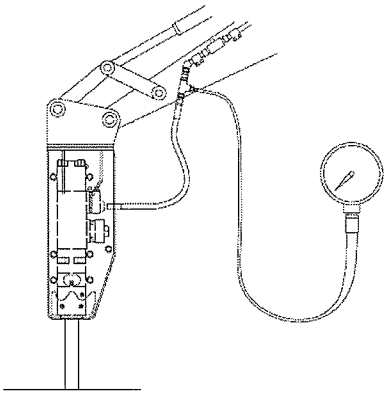


Fig. 3

B: In case you do not have a flow meter

(1) Set the Carrier to Breaker mode or suitable flow mode, if it has the option, then run carrier until hydraulic oil reaches operating temperature. If your carrier does not have suitable mode for the hydraulic breaker, ask your carrier's dealer to configure the breaker mode.

(2) Install the pressure gauge at the front end of the high pressure line pipe on the arm as shown in Fig. 4. Accelerate the engine speed to maximum. Step on the foot pedal, then measure the hydraulic pressure and set the circuit pressure at the specified value by adjusting the secondary relief valve added to the hydraulic breaker pressure line.
Check again to see whether the existing pressure is higher than the specified value for the hydraulic breaker, add the relief valve to the piping and reduce the pressure for the hydraulic breaker.

Note: Refer to page 26 regarding the relief valve set pressure.

CAUTION

Never adjust the fixed main relief valve on the carrier to reduce the hydraulic pressure. Do not touch the main relief value even if the existing pressure is lower than the specified pressure for the hydraulic breaker.

(3) Measure the *Back Pressure* as shown in Fig. 5, you should always be under 2.0 MPa (20 bar, 300 psi) of back pressure.
Note: If *Back Pressure* is over 2.0 MPa (20 bar, 300 psi), make sure your return line dumps straight to the tank on excavator. If return dumps straight to tank and back pressure is still too high, look for other restriction such as a partially closed ball valve, couplers, clogged return filter or undersized plumbing.

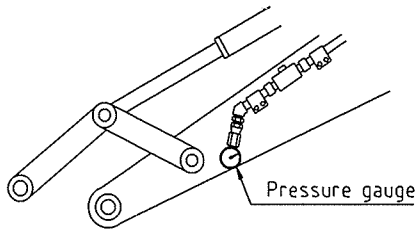


Fig. 4

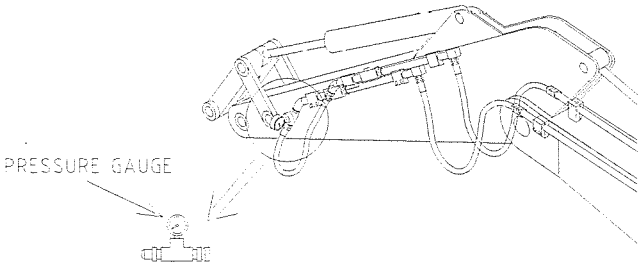


Fig. 5

	Unit	okada 150	okada 200	okada 250	okada 400	okada 650	okada 800	okada 900	okada 1000	okada 1300	okada 1500	okada 2000	okada 2600	okada 3200	okada 3600	okada 4200	okada 6000
Recommended carrier output flow set at *1	lpm	20	30	30	50	60	80	100	120	120	120	150	190	190	260	260	280
	gpm	5.3	8	8	13.2	15.9	21.1	26.4	31.7	31.7	31.7	40	50.2	50.2	68.7	68.7	73.9
Carrier relief valve set at	MPa	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6
	bar	172	172	172	172	172	172	172	172	206	206	206	206	206	206	206	206
	psi	2500	2500	2500	2500	2500	2500	2500	2500	3000	3000	3000	3000	3000	3000	3000	3000
Working pressure range	MPa	6.0-13.0	9.0-12.0	9.0-12.0	9.0-12.0	11.0-16.0	12.0-16.6	14.0-17.0	14.0-17.0	14.0-18.0	14.0-18.0	14.0-19.0	16.0-19.0	16.0-19.0	16.0-19.0	15.0-19.0	15.0-19.0
	bar	60-130	90-120	90-120	90-120	110-160	120-166	140-170	140-170	140-180	140-180	140-190	160-190	160-190	160-190	150-190	150-190
	psi	870-1890	1300-1740	1300-1740	1300-1740	1600-2320	1740-2400	2030-2470	2030-2470	2030-2610	2030-2610	2320-2755	2320-2755	2320-2755	2320-2755	2175-2755	2175-2755
Carrier output flow range	lpm	12-30	13-40	15-42	30-60	35-70	40-110	56-120	70-135	70-140	80-140	120-180	140-210	150-260	208-290	270-400	280-350
	gpm	3.2-8	3.3-10.6	4-11	8-16	9.2-18.5	11-29	15-32	18-35	18-35	21-37	32-48	37-55	39-57	55-77	71-105	74-92
Piping inner diameter	inch	1/2	1/2	1/2	1/2	1/2	1/2 or 3/4	3/4	3/4	3/4	3/4	1	1	1	1	1	1.2

[201104]

- The specifications above are subject to change without notice.
- The performance data vary depending on the base machine.
- "Carrier output flow" is carrier's set oil flow with no load.

*1 Comply with recommendation of carrier's manufacturer when the numbers differ.

3) Other checks

Check that all functions (electric devices, hydraulic actuator operations, etc.) are operating correctly. Also check the hydraulic oil level and for possible deterioration or contamination.

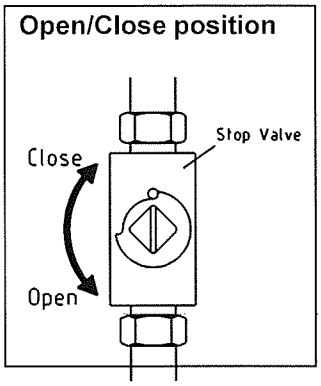
Important

This inspection and adjustment procedure is particularly essential for first-time installation of the hydraulic breaker on the carrier.

Handling

1. Preparation before starting

(1) Check the hydraulic oil level and refill if necessary. Be sure to use the same kind of hydraulic oil.
(2) Confirm that the stop valves are fully open.
(3) Check that the screwed connections of the hoses, bolts, and nuts are tight. Retighten these if loose.
(4) Grease the shank part of the chisel.
(Use 5 to 6 strokes from a grease gun to force grease into this part.)
(5) Run the carrier for about 10 minutes to warm up the machine. Start operation only after the oil temperature has risen.



Recommended working oil temp. range	50 to 80 °C 122 to 176 °F

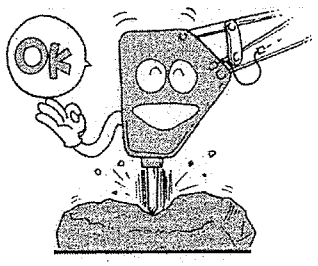
2. Running-in

For the first one hour of hydraulic breaker use, position the chisel perpendicular to the material to be broken, apply pressure downwards and during the running in period operate the machine at half engine speed.

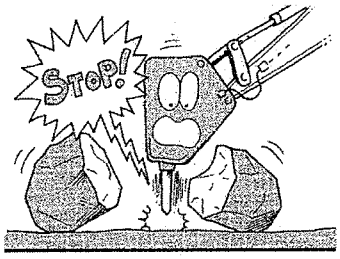
Note: Do not tilt the chisel during the running-in period.

3. Precautions during operation

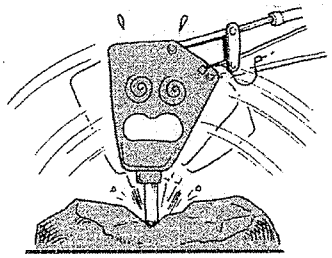
- Position the chisel on the targeted material firmly to push up the piston, then apply pressure to start hammering.
- When the material shatters, stop hammering immediately.
- Avoid using the chisel as a lever or ripper and hitting any object against the chisel.
  Caution: Forcefully prying the material with the chisel could cause the chisel to break.
- If the chisel is no longer penetrating the material, change the hammering position. Do not hammer the material continuously for more than 30 seconds at one spot. Otherwise, the chisel will heat up and the oil temperature will rise abnormally, which could lead to trouble.
- Never immerse the front cap of the hydraulic breaker in water or sludge.

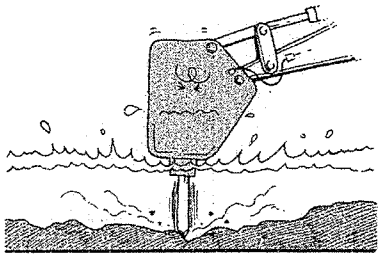


Apply pressure continuously.



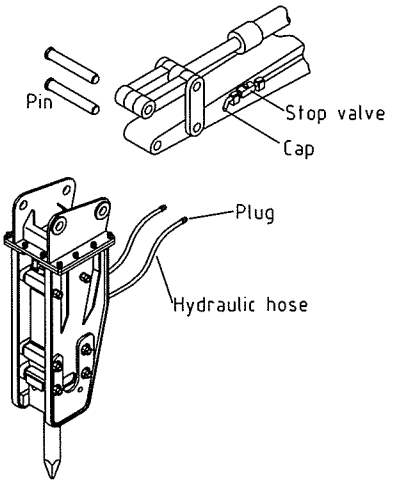
Stop immediately when material shatters.


Do not pry.


Do not immerse in water or sludge.

4. Installing and removing the hydraulic breaker

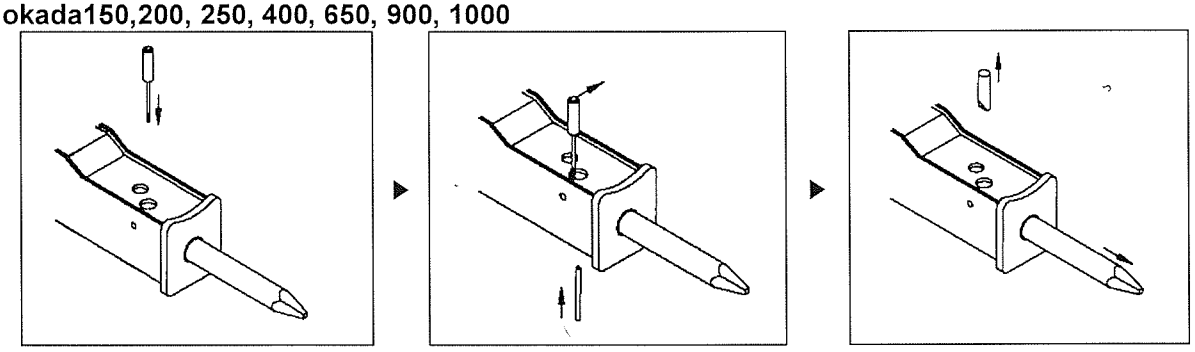
(1) Remove the two pins on the bucket and replace the bucket.
(2) To operate the bucket without using the hydraulic breaker, close the stop valve on the carrier's arm (turn the valves off) and disconnect the hoses connecting the stop valves to the hydraulic breaker.
(3) Be sure to blind the disconnected hoses. Intrusion of sand and mud into the hydraulic hoses and pipes could cause trouble.



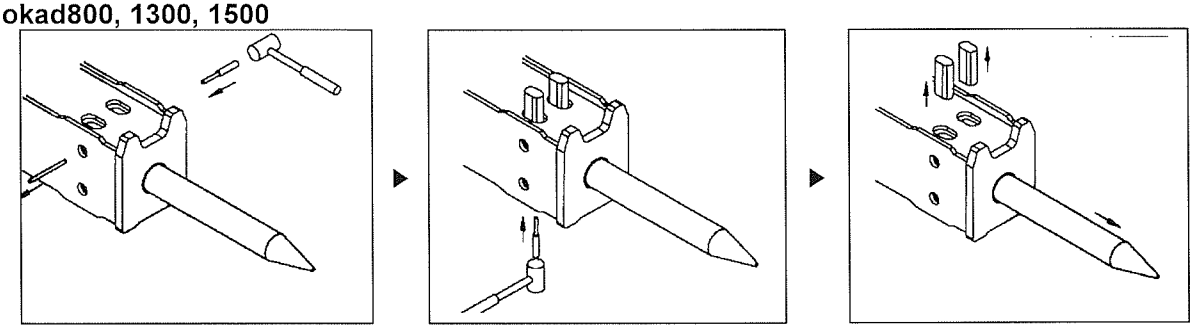
5. Changing the chisel

(1) okada150, 250, 400, 650, 900, 1000
Push the pin back into the hole with the pin punch or finger.
okada800, 1300, 1500, 2600, 3200, 3600, 4200, 6000, 8000
Knock the shaft retainer & shaft out using a hammer and pin punch.
(2) Take the chisel set pin out by using a pin punch by pushing the chisel set pin out from the back of breaker.
(3) Replace a new chisel after removed. The chisel is heavy, so careful attention needed.

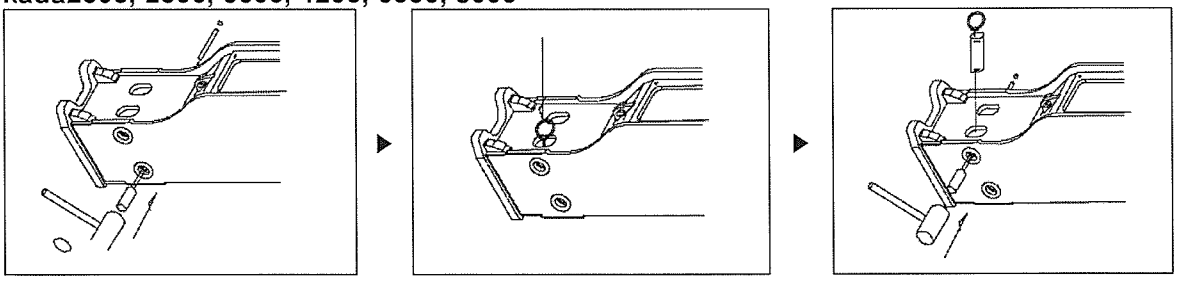
okada150,200, 250, 400, 650, 900, 1000

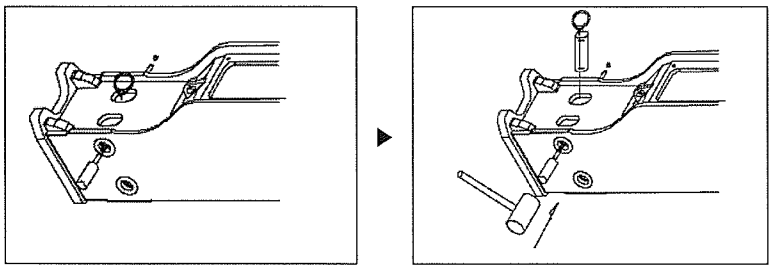


okad800, 1300, 1500



okada2000, 2600, 3600, 4200, 6000, 8000

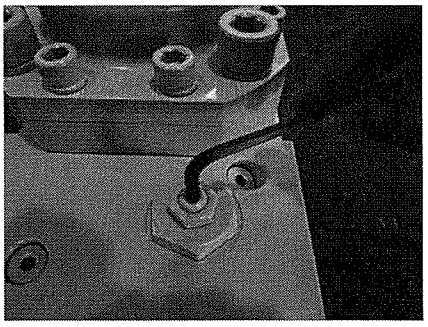




6. Adjuster control method Model: okada900, 1000, 1300, 1500, 2000, 2600, 3200, 3600, 4200, 6000, & 8000

1. Loosen the lock nut of adjuster.
2. Low frequency (Ultrahigh power) → High frequency (High power)
   Turn the adjuster 720 degree to counter-clockwise from the end of stroke.
   Note: the adjuster has been preset at low frequency (Ultrahigh power) mode.

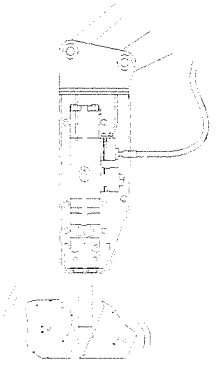
   High frequency (High power) → Low frequency (Ultrahigh power)
   Tighten the adjuster to the end of stroke.
3. Tighten the lock nut of adjuster after setting.



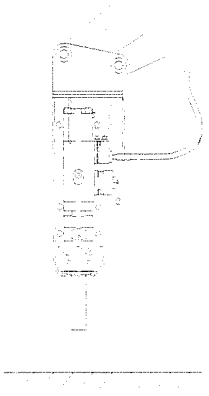
8. okada800, 1300, 1500, 2000, 2600, 3200, 3600, 4200, 6000, & 8000 auto stop system

Auto stop system has been designed for these models in order to stop operation only after once or twice of extra hitting when the piston works beyond its working range and then high pressure connects directly with the return line through the groove located in the large diameter of the piston. I.E. It stops operation after once or twice hitting.

For example, when the auto stop system works,



When the rock was shattered.



When the hydraulic breaker was held in the air.

Maintenance and inspection

1. Inspection of hydraulic oil and filter element

(1) A carrier installed with the hydraulic breaker uses the engine and the hydraulic oil more severely than does a carrier alone. Therefore, the hydraulic oil deteriorates more quickly, which can cause trouble for the hydraulic breaker. Deteriorated or contaminated oil must be replaced with fresh oil as specified. Do not use low-grade or regenerated oil.
- Here is a simple method for determining the oil condition. Lack of viscidity or viscosity and formation of air bubbles indicate badly deteriorated oil. A blackish brown appearance and emission of offensive odors are also proof of deterioration. In such cases, the oil must be changed immediately.
- When changing the oil, remove all the oil from the inside of the tank and the hydraulic cylinder, then thoroughly clean the interior of the tank. Do not add new oil to the existing oil. Be sure to replace all the oil.

(2) Take care to prevent foreign matter from intruding into the hydraulic oil. Allow no foreign matter to enter the hoses and nipples during disconnection and connection of the hoses when changing the hydraulic breaker and bucket. Intrusion of sand or other foreign matter in the hydraulic oil can cause serious damage. Filters must be cleaned or replaced at periodic intervals.

(3) Always replenish with the same hydraulic oil in order to maintain the correct volume of oil. Using the hydraulic breaker with insufficient oil will cause oil deterioration. In addition, air intrusions can cause cavitations. All of these factors could lead to trouble in the hydraulic breaker.

(4) Avoid using the hydraulic breaker at an oil temperature above 80°C (176°F). The recommended working temperature range is from 50 to 80°C (122 to 176 °F). Check that the cooler fins are not clogged and keep them clean. Soiled fins will impair the operation of the oil cooler.

(5) Intrusion of water into the hydraulic oil causes problems. When not using the hydraulic breaker, be sure to store it indoors. Also, remove the drains from the tank at periodic intervals.

Change of hydraulic oil	Every 600 hours
Change of filter element	Every 100 hours
Change of engine oil and engine oil filter	To excavator manufacturer's specification

Note: If deterioration or contamination is serious, perform replacement as soon as possible even if the specified replacement period has not been reached.

2. Tightness of bolts and nuts

(1) Before starting work, check all the bolts and nuts for tightness, including the side rod nuts of the hydraulic breaker, the accumulator set bolts, the valve cap bolts, and the front bolt nuts of the bracket. Also be sure to retighten any loose bolts and nuts to the specified torque. Using the hydraulic breaker with loose bolts and nuts will lead not only to oil leakage but also to damage of the screw threads and bolt breakage. These can also cause defective operation.

(2) For the first 2 days of use, use suitable torque wrenches every 4 hours to retighten the bolts and nuts of all components and sections..

(3) At first, refer to the attached tightening torque chart (page 50) to lightly tighten the bolts and nuts. Screw them alternately and diagonally until all the bolts and nuts are tightened to the uniform torque.

3. Greasing the unit

Every 2 hours of each day's operation, use a grease gun to grease up through the grease nipple on the side of the front cap.

- If the chisel sliding surface becomes dry under severe operation condition, refill grease.
- For greasing, press the grease gun according to the following table.

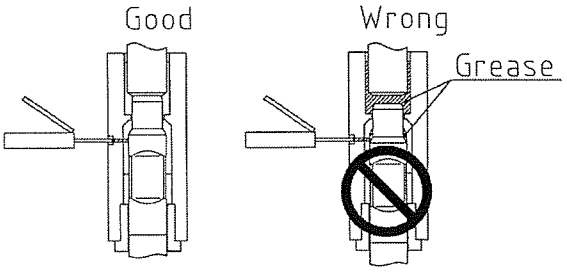
okada 150, 200, 250, 400, 650, 800	Approx. 5 strokes of grease gun
okada900, 1000, 1300, 1500, 2000	Approx. 10 strokes
okada2600, 3200, 3600, 4200, 6000	Approx. 15 strokes
okada8000	Approx. 30 strokes

Note: While greasing, stand the hydraulic breaker up-right and set the chisel at the shank bottom to ensure that the grease will be supplied between the chisel and the bushes. Do not fill up the space between the piston and chisel with grease, since it could damage the dust seal or lead to defective hammering.

Specified grease

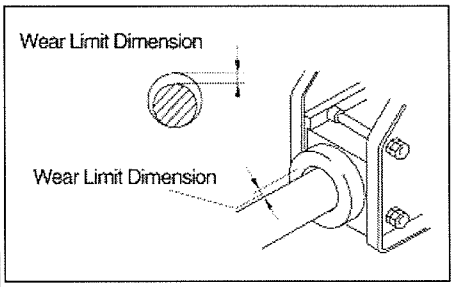
Type	Lithium grease
	Water resistant
Dropping point	170°C ~ 200°C
	338°F ~ 392°F
Max. working temperature	130°C
	266°F
Grade (thickness)	NLGI 00, 0, 1. 2

[100107]



4. Wear limit dimension of parts

When the clearance between the chisel and Holder bush becomes large, it is strongly recommended to replace these parts to prevent from wear. Exceeding the following value may damage other component parts, such as the piston and cylinder.



Model	okada	150-800	900-1500	2000	2600	3200	3600	4200	6000
Wear	mm	3	4	5	5	5	6	7	7
limit	inches	0.12	0.16	0.20	0.20	0.20	0.24	0.28	0.28

[201020]

Measure at 10mm inside of the bottom side of the front cover and it cannot be used (unusable) if the maximum measurement exceeds the wear limits stipulated in the above table.

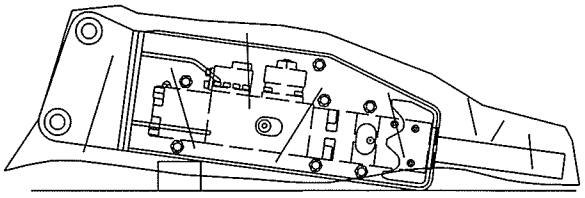
Note: If the striking surface of the piston and chisel has been sunk or damaged, the piston and chisel must be replaced.

5. Precautions to observe when handling chisels

(1) While the chisel can sufficiently withstand shocks in the vertical direction, it is likely to break if subjected to impacts applied in a lateral direction or to prying. To avoid breaking the chisel, adjust the carrier arm so that the chisel can move straight down.
(2) Chisel are prone to brittleness in extremely low temperatures. In cold areas, avoid operating at full capacity for the first few minutes of operation. Also, avoid leaving the chisel outdoors at night, and protect it with vinyl sheet.
(3) The chisel could break from deep indentations caused by hitting, or from deep rusting.
(4) The shank part of the chisel could heat up due to sliding action between the shank bushing, causing oil depletion that can result in premature wear. Make it a practice to grease it up regularly.
(5) Continued use of a chisel with a worn tip can degrade crushing performance and also lead to breakage of the chisel. Make sure that the chisel edge is kept sharp at all times.
(6) Quenching the chisel could cause breakage. Avoid using it such situations where it could plunge into nearby pools of water after crushing rocks, etc.

6. Storage precautions

(1) After the hydraulic breaker is removed from the excavator:
- Firmly close and cap the stop valves of the excavator and plug the hydraulic hoses.
- Grease and store the breaker indoors or completely cover it with a plastic sheet or other protective material. Do not leave the breaker outdoors in the rain.



(2) If the hydraulic breaker is not to be used for a long period of time:
- Release all gas from the gas cushion chamber. Press the piston from the front cap side into the cylinder.
- Apply hydraulic oil to the lower part of the piston and grease the chisel shank.

Note: Any failures due to lack of above procedures are not covered by warranty, and are sure to shorten the life of breaker.

7. Procedure for inspecting cushion chamber gas pressure of okada series

The nitrogen gas pressure, however, will decrease over time and use, resulting in reduced blowing force. When the blowing force is reduced, check the pressure of nitrogen gas in the back cap.

Note 1: When filling the gas, hammer must be lying flat and the chisel should not be pushed or contacted.
Note 2: The specified pressure on the specification sheet is the pressure of 20°C (68°F). If the temperature is cold or hot, please charge the gas referring "N2 (Nitrogen) gas pressure by temperature" table on page 51.

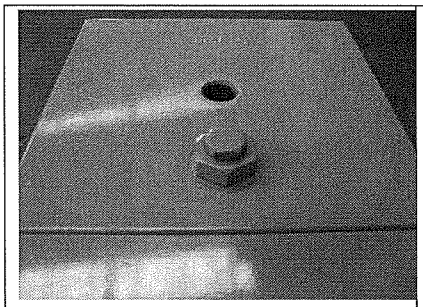
☞ Must put the cap on gas cylinder to avoid damage to valve of gas cylinder and check the valve of gas has closed while keeping. Especially, do not expose the gas to the sun for a long time.

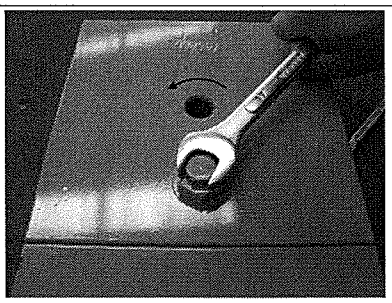
Back cap gas charging pressure

Model		okada150-1300	okada1300-8000
Back capN2 gas pressure range	MPa	1.0-1.2	1.3-1.5
	bar	10-12	13-15
	psi	142-170	190-220

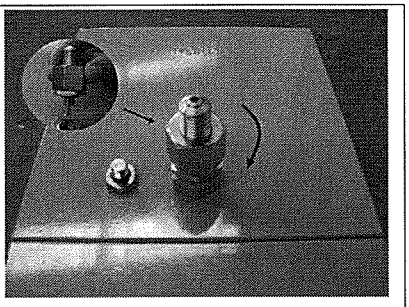
(@ 20°C, 68°F)

How to check Nitrogen gas in the back cap (Gas charging kit type-A)

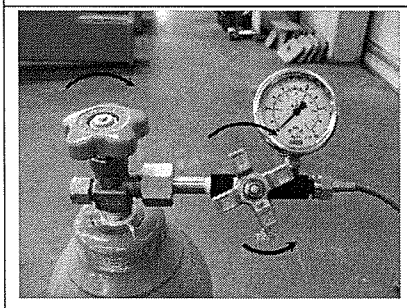




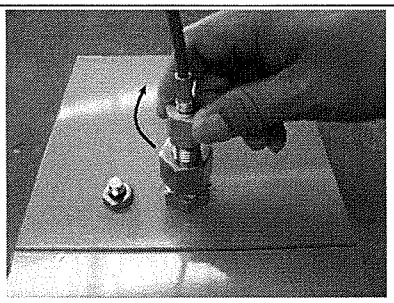
1. Remove the cover cap.



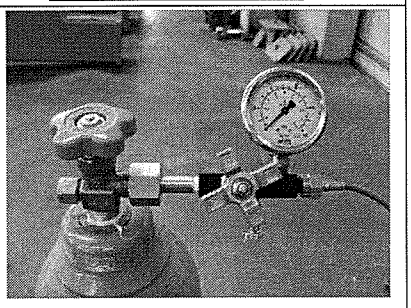
2. Connect the charging adaptor into the gas valve. If the adaptor already connected with gas hose, the adaptor will not fit on the inlet.



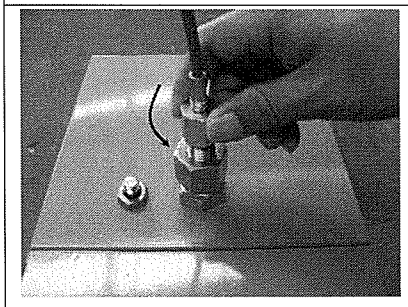
3. Check if the main valve and drain valve are firmly closed.



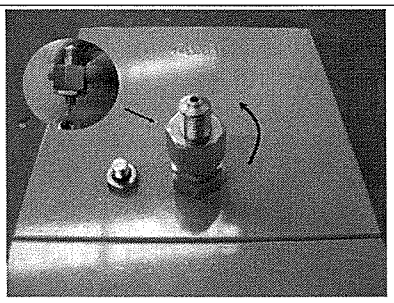
4. Connect the hose into the charging adaptor.



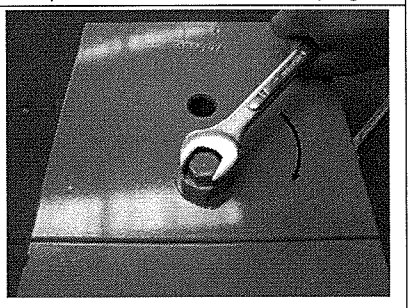
5. Read gas pressure from the gauge. If it shows lower pressure than the specified pressure, charge Nitrogen gas according to the procedure on the next page.



6. Disconnect the hose from the adapter.

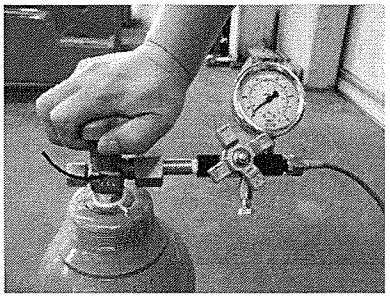
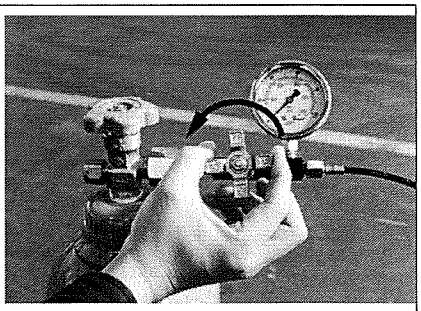
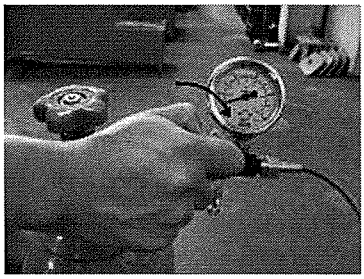
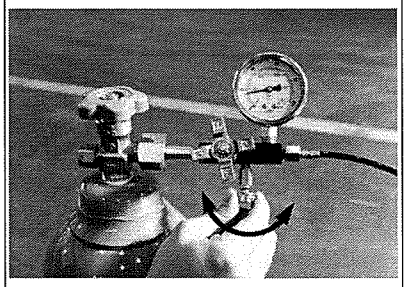
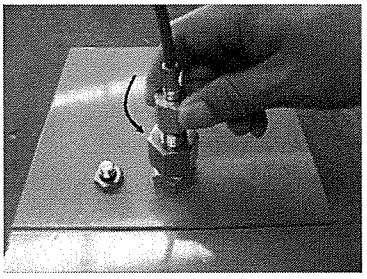
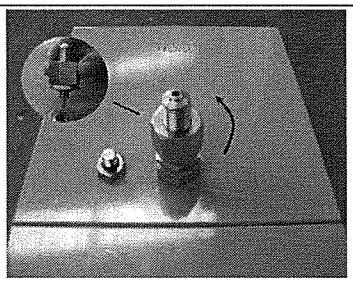
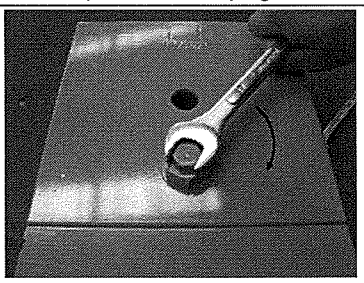


7. Disconnect the adaptor form the gas valve.

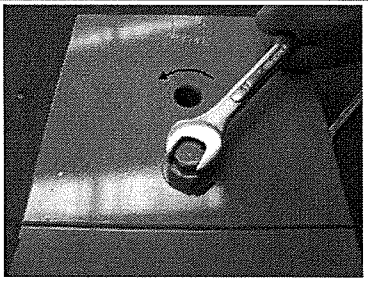


8. Tighten the cover cap into the gas valve.

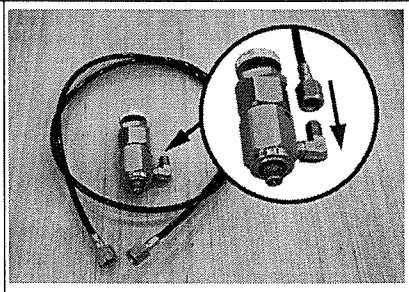
How to Charge Nitrogen gas into the back cap (Gas charging kit type-A)

Blank Take the same procedure as shown in #1 to #4 on previous page.	 1. Open the valve of gas cylinder slowly.	 2. Open the main valve slightly, and charge the N2 gas into the back cap gradually. Set the gas pressure a little higher than specified pressure.
 3. Close the main valve and the valve of gas cylinder.	 4. Adjust the N2 gas pressure at the specified pressure by drain valve. * Check the appropriate gas pressure by the temperature on page 51.	 5. Disconnect the hose from the adaptor.
 6. Disconnect the adaptor form the gas valve.	 7. Tighten the cover cap into the gas valve.	Blank

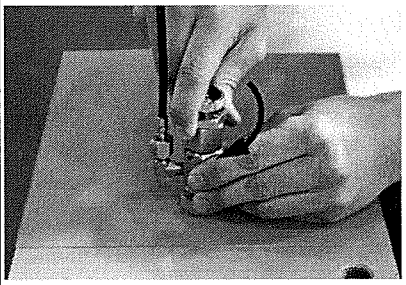
How to check Nitrogen gas in the back cap (Gas charging kit type-B)



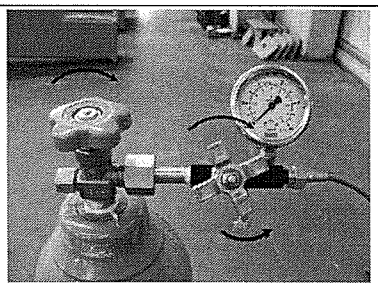
1. Remove the cover cap.



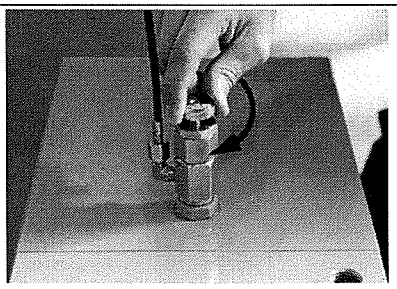
2. Connect the hose to the adaptor.



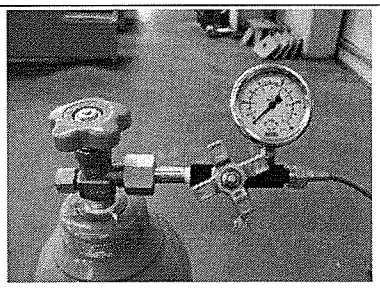
3. Connect the adaptor to the gas valve by tightening the middle part of the adaptor.



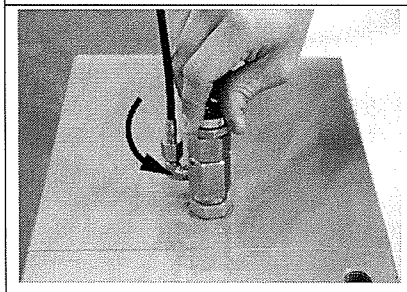
4. Check if the main valve and drain valve are firmly closed.



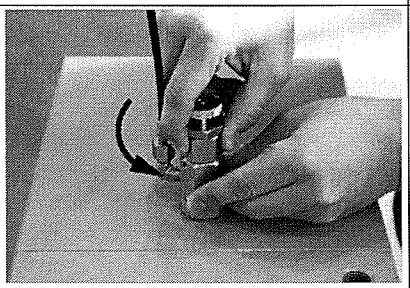
5. Tighten the top part of the gas charging adaptor to open the gas valve.



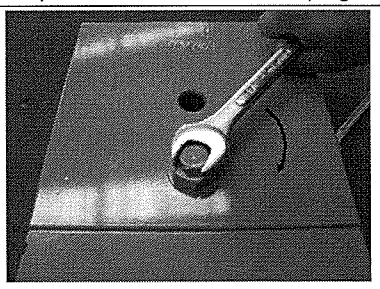
6. Read gas pressure from the gauge. If it shows lower pressure than the specified pressure, charge Nitrogen gas according to the procedure on the next page.



7. Loosen the top part of the gas charging adaptor to close the gas valve.

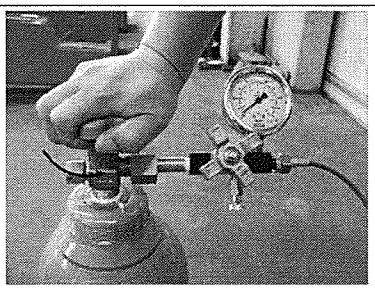
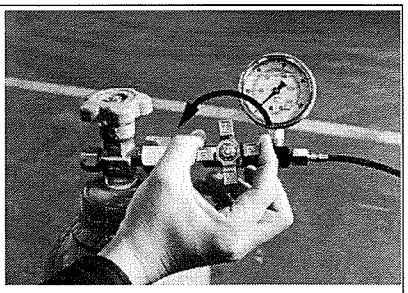
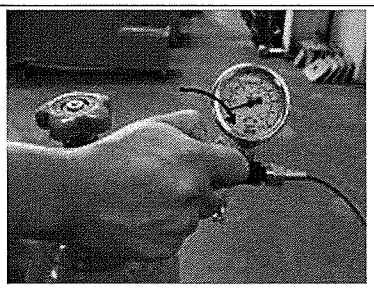
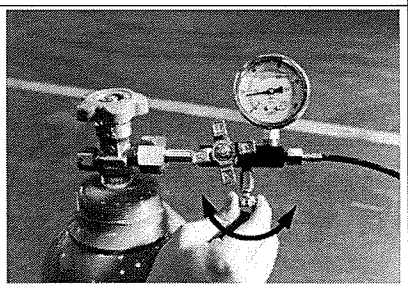
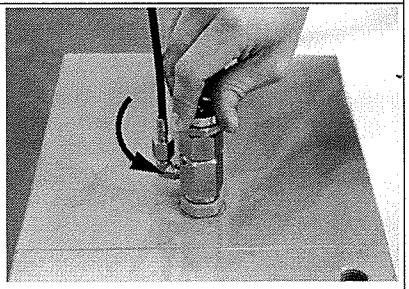
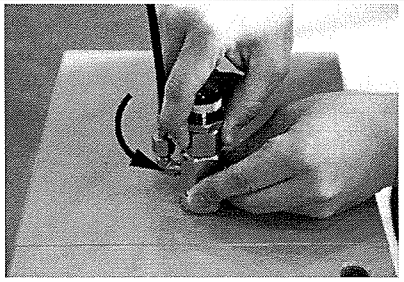
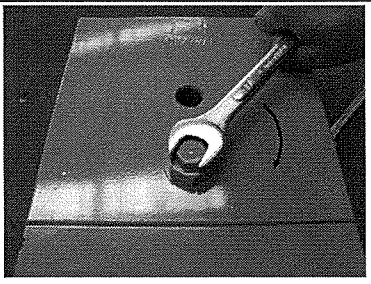


8. Disconnect the adaptor form the charging valve.



9. Tighten the cover cap into the gas valve.

How to Charge Nitrogen gas into the back cap (Gas charging kit type-B)

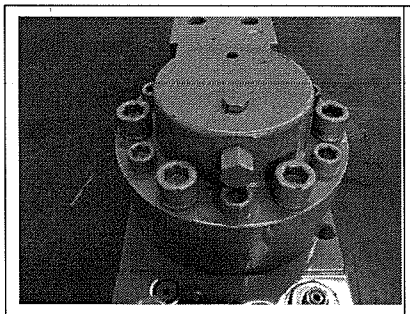
Blank Take the same procedure as shown in #1 to #4 on previous page.	 1. Open the valve of gas cylinder slowly.	 2. Open the main valve slightly, and charge the N2 gas into the back cap gradually. Set the gas pressure a little higher than specified pressure.
 3. Close the main valve and the valve of gas cylinder.	 4. Adjust the N2 gas pressure at the specified pressure by drain valve. * Check the appropriate gas pressure by the temperature on page 51.	 5. Loosen the top part of the gas charging adaptor to close the gas valve.
 6. Disconnect the adaptor form the gas valve.	 7. Tighten the cover cap into the gas valve.	Blank

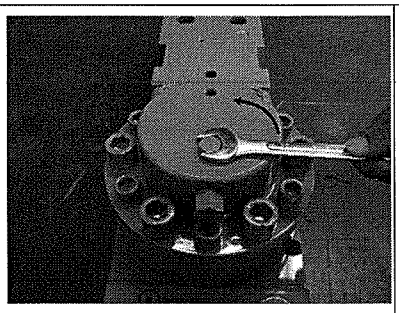
☐ **Accumulator gas charging pressure**

Model		okada1000	okada1300-8000
Built-in accumulator N_2 gas pressure	MPa	3.9-4.9	5.4 - 5.9
	bar	39-49	54 - 59
	psi	566-711	780 - 850

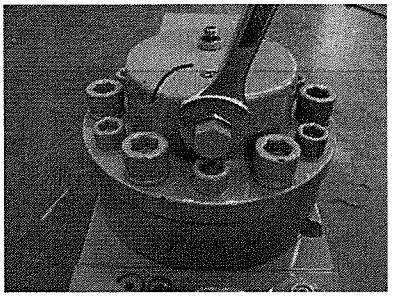
(@ 20°C, 68°F)

How to check Nitrogen gas in the accumulator (Gas charging kit type-A)

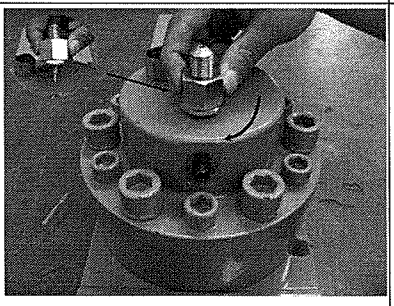




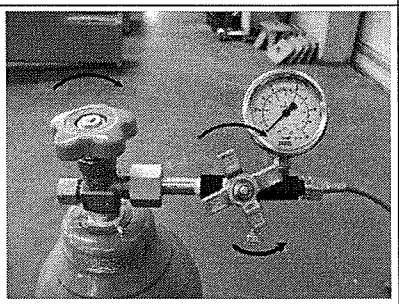
1. Disconnect the cover cap.



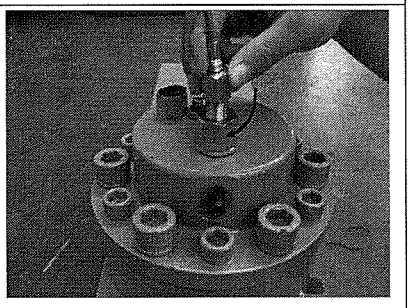
2. Disconnect the cap.



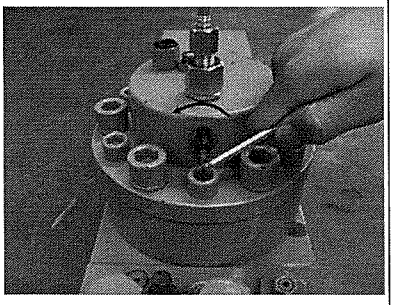
3. Connect the charging adaptor into the inlet.



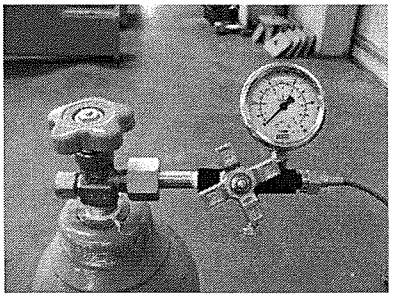
4. Check if these three valves are fully closed.



5. Connect the hose into the charging adaptor.



6. Loosen the screw counter-clockwise.

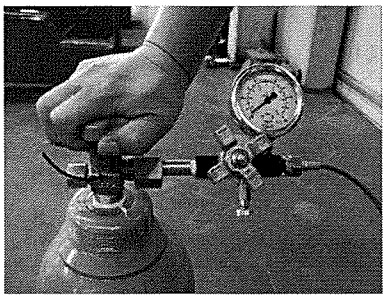
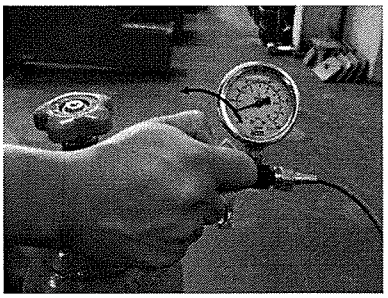
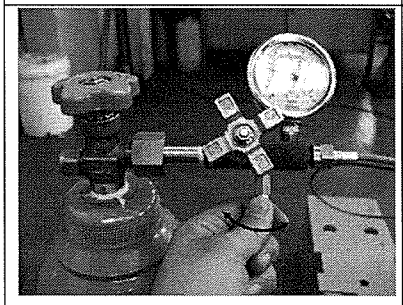
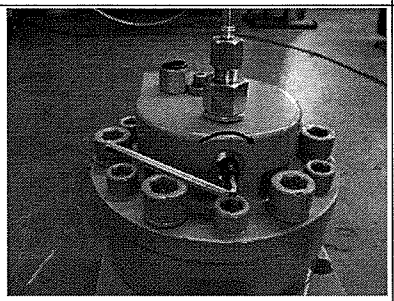
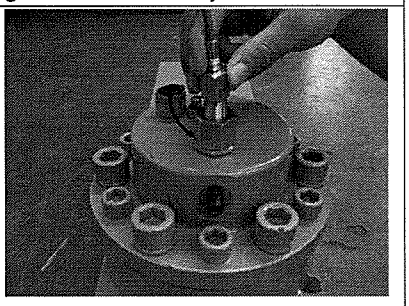
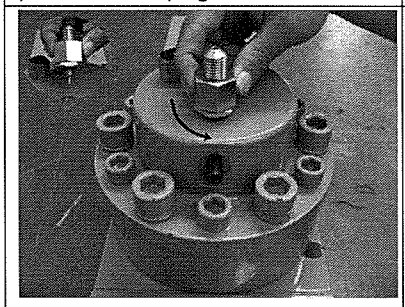
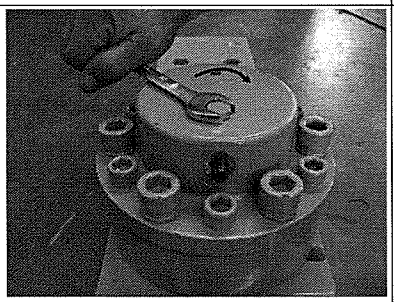
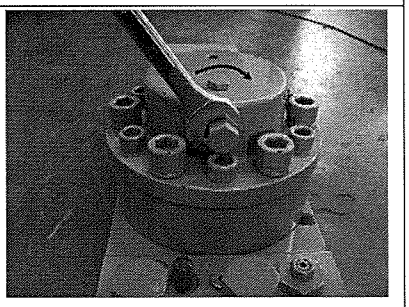


7. Read gas pressure from the gauge. If the pressure is lower than the specified pressure, charge Nitrogen gas according to the procedure on the next page.

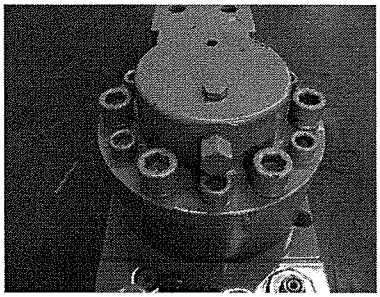
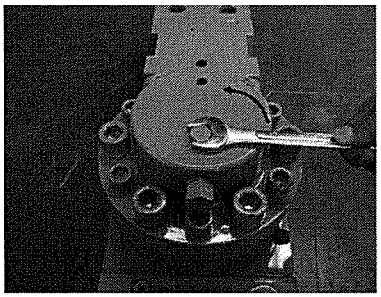
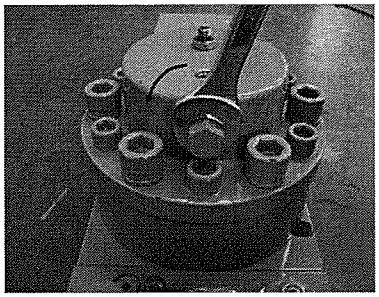
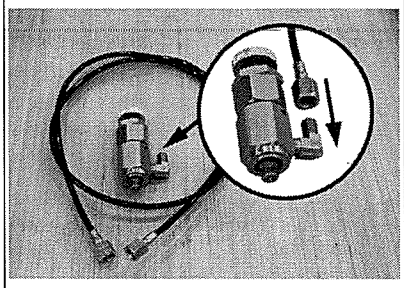
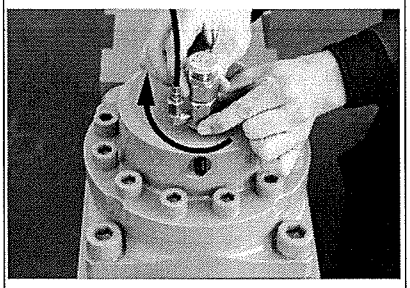
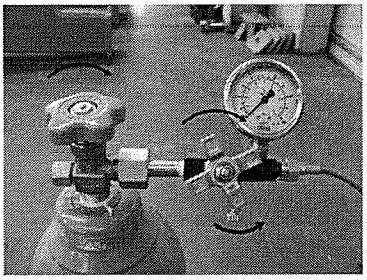
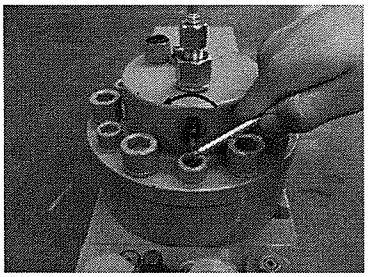
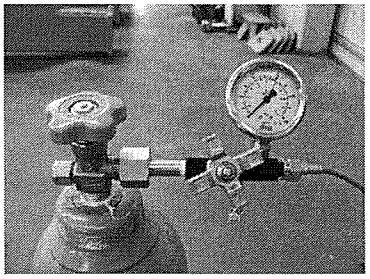
Blank

Remove the gas pressure gauge in reverse procedure.
(Please refer #11 in next page)

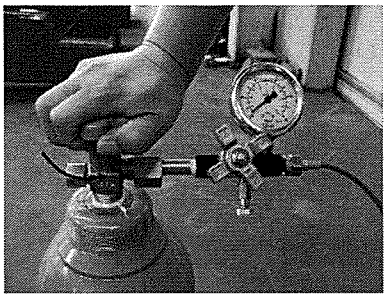
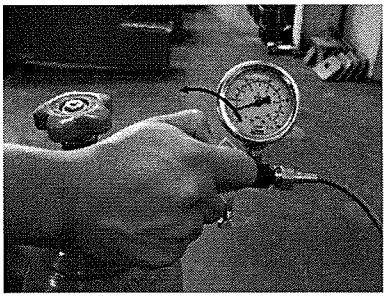
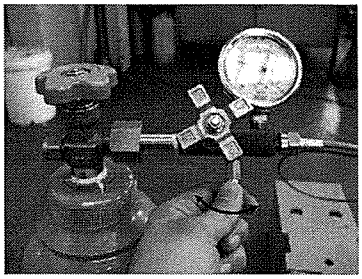
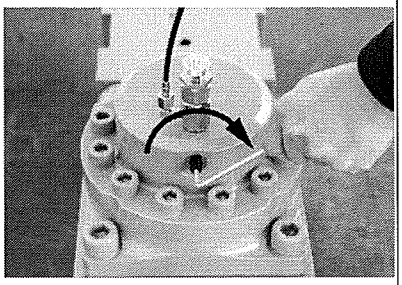
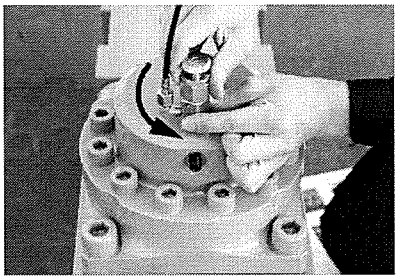
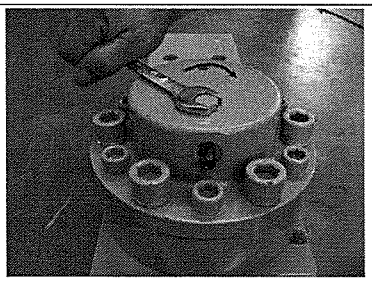
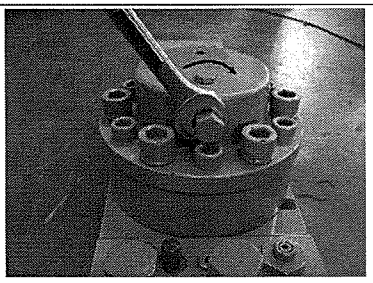
How to Charge Nitrogen gas into the Accumulator (Gas charging kit type-A)

Blank Take the same procedure as shown in #1 to #7 in former page.	 8. Open the valve of gas bottle.	 9. Open the 3-way valve slowly and charge the sufficient quantity of gas which is 0.2MPa higher than appropriate value of page 35. After that, close the valves of gas bottle & 3 way valve.
 10. Control the proper pressure by opening the drain valve as photo. * Charge the gas considering the temperature in the area. * Check appropriate gas pressure on page 52.	 11. Tighten the screw to close the valve.	 12. Disconnect the hose from the adapter. * Loosen the hose gradually as there is residual gas inside the hose.
 13. Disconnect the charging adaptor from the inlet.	 14. Tighten the cover cap.	 15. Tighten the cap.

How to check Nitrogen gas in the accumulator (Gas charging kit type-B)

	 1. Disconnect the cover cap.	 2. Disconnect the cap.
 3. Connect the hose to the adaptor.	 4. Connect the adaptor to the inlet of the accumulator.	 5. Check if these three valves are fully closed.
 6. Loosen the screw counter-clockwise.	 7. Read gas pressure from the gauge. If the pressure is lower than the specified pressure, charge Nitrogen gas according to the procedure on the next page.	Blank Remove the gas pressure gauge in reverse procedure. (Please refer #11 in next page)

How to Charge Nitrogen gas into the Accumulator (Gas charging kit type-B)

Blank Take the same procedure as shown in #1 to #7 in former page.	 8. Open the valve of gas bottle.	 9. Open the 3-way valve slowly and charge the sufficient quantity of gas which is 0.2MPa higher than appropriate value of page 35. After that, close the valves of gas bottle & 3 way valve.
 10. Control the proper pressure by opening the drain valve as photo. * Charge the gas considering the temperature in the area. * Check appropriate gas pressure on page 67.	 11. Tighten the screw to close the valve.	 12. Remove the adaptor from the inlet.
 13. Tighten the cover cap.	 14. Tighten the cap.	Blank

Routine and periodic inspection

Part	Check Item	Countermeasure	Frequency
Grease nipple(s)	Grease-up	okada150-800: 5 strokes okada900-3600: 10 stroke	Every 2 hours
All bolts and nuts	Tightness	Retighten	Everyday
Chisel set pin(s)	Wear or damage	Replace	Everyday
Flange plugs for retainers	Tightness	Retighten	Everyday
Hydraulic oil	Insufficiency, deterioration or contamination	Replenish or replace	Everyday
		Replace	Every 600 hours *2
Bracket	Wear or damage	Repair or replace	Every 1 month or 100 hours *1
Chisel	Wear or damage	Repair or replace	Every 1 month or 100 hours *1
Hydraulic oil filter		Replace	Every 100 hours *2
Back cap N_2 gas	Gas pressure	Charge N_2 gas	Every 3 months or 300 hours *1
Shank bushing	Wear or damage	Remove flaws or replace	Every 3 months or 300 hours *1,*3
Front cap bushing	Wear or damage	Remove flaws or replace	Every 3 months or 300 hours *1,*3
All seals		Replace	Every 12 months or 1000 hours *1 (okada150 – 3600) Every 6 month or 500 hours*1 (okada6000 – 8000)
Valve	Flaws on the sliding surface	Repair flaws	Every 12 months or 1000 hours *1
Cylinder	Flaws on the inner surface, loosen plug	Repair flaws, retighten	Every 12 months or 1000 hours *1
Cylinder sleeve	Flaws on the inner surface	Repair flaws	Every 12 months or 1000 hours *1
Piston	Flaws on the inner surface	Repair flaws	Every 12 months or 1000 hours *1
Accumulator bladder		Replace	Every 12 months or 1200 hours *1
Bottom damper		Replace	Every 12 months or 1200 hours *1
Pad		Replace	Every 18 months or 1800 hours *1
Upper damper		Replace	Every 18 months or 1800 hours *1

*1 Take steps, whichever comes first. These hours show the operation hours of carrier machine.
*2 As prescribed by the carrier machine manufacturer. These hours show the operation hours of hydraulic breaker.
*3 Refer to the "Wear limit dimension of parts" for visual decision.
- Shorten the inspection and replacement frequency if the breaker is repeatedly used continuously for many hours.
- The numbers above are not to assure the lifetime of each part.

Troubleshooting

1. Major causes and suggested remedies for poor starting

	MAJOR CAUSES	SUGGESTED REMEDIES
Hydraulic breaker	Increase in sliding resistance of piston owing to U-packing damage.	Replace the U-packings.
	Increase in sliding resistance of piston owing to natural hardening of U-packings occurring in low winter temperature.	Push the chisel and stroke the piston.
	Damage to valve, valve box, or valve box sleeve.	Repair the shallow flaws with an oil stone and abrasive paper. Replace it if the flaws are deep.
	Damage in the sliding areas between the cylinder and piston.	Repair the flaws with an oil stone and abrasive paper.
Carrier	Neglect in opening the stop valve or keeping the stop valve closed.	Fully open (turn on) stop valve or repair valve.
	Insufficient hydraulic pressure or discharge owing to damage to the secondary relief valve.	Repair or replace parts.
	Improper selection and damage of the directional valve.	Repair or replace.
	Clogging by foreign matter in the piping.	Disassemble and remove foreign matter.

Note: Remove scratches on the surface of valve using grinding paper. Do not use an oil stone.

2. Main causes and suggested remedies for occasional stopping during operation

	MAJOR CAUSES	SUGGESTED REMEDIES
Hyd. Breaker	Damage to cylinder, piston, cylinder sleeve, valve, valve box, or valve box sleeve.	Repair flaws with an oil stone and abrasive paper. (Unless damage is mended quickly, the parts become irreparable.)
Carrier	Use of carrier when oil temperature is above 80°C (176°F).	Avoid using the carrier above 80°C(176°F). Do not rev up the engine more than required.
	Clogging by foreign matter in the piping	Disassemble and remove the foreign matter.

3. Major causes and suggested remedies for irregularity in operation

	MAJOR CAUSES	SUGGESTED REMEDIES
Hyd. breaker	Improper pressure of gas sealed in the gas cushion chamber.	Regulate the nitrogen gas pressure to proper pressure.
	Shank bushing worn beyond limit.	Replace shank bushing.
	Damage to cylinder, piston, cylinder sleeve, valve, valve box, or valve box sleeve.	Remove flaws with an oil stone and abrasive paper.
	Insufficient gas pressure of accumulator, or damaged bladder. Replace the bladder if big tremor can be seen of high-pressure line hose.	Recharge nitrogen gas or replace the bladder.
Carrier	Lack of hydraulic oil.	Replenish with the same oil.
	Deterioration or contamination of hydraulic oil.	Replace all oil with fresh oil.
	Defective operation or improper set pressure for the main relief valve and secondary relief valve.	Send the main relief valve to the manufacturer's designated service factory for adjustment. Regulate the secondary relief valve to correct the set pressure. Or repair or replace the damaged spring, seat, valve or piston.
	Insufficient discharge and pressure owing to a hydraulic pump malfunction.	Send the carrier pump to the manufacturer's designated service factory for repair.
	Use of carrier while oil temperature has risen abnormally above 80°C (176°F).	Avoid using the carrier above 80°C (176°F).

4. MAIN CAUSES AND SUGGESTED REMEDIES FOR A DECREASE IN NUMBER BLOWS AND IMPACT FORCE

	MAJOR CAUSES	SUGGESTED REMEDIES
Hydraulic breaker	Improper pressure of the sealed gas.	Regulate the sealed gas to the correct pressure.
	Shank bushing worn beyond limit.	Replace the shank bushing.
	Wear beyond limit, damage or deformation of the striking surface of the piston, and the shank section, impact receiving surface and tip of chisel.	Replace the piston or chisel (use only genuine parts).
	Damage or wear to cylinder, piston, cylinder sleeve, valve, valve box, or valve box sleeve.	Repair flaws with an oil stone or polishing paper or replace.
	Insufficient gas pressure of accumulator or damaged bladder. Replace the bladder if big tremor can be seen of high-pressure line hose.	Recharge nitrogen gas or replace the bladder.
Carrier	Half opening of stop valve.	Fully open the valve.
	Clogging by foreign matter in the piping.	Disassemble and remove foreign matter.
	Lack of hydraulic oil.	Replenish with the same hydraulic oil.
	Deterioration or contamination of hydraulic oil.	Replace all oil with fresh oil.
	Defective operation or improper set pressure for the main relief valve and secondary relief valve.	Send the main relief valve to the manufacturer's designated service factory for adjustment. Regulate the secondary relief valve to correct the set pressure. Or repair or replace the damaged spring, seat, valve or piston.
	Insufficient discharge and pressure owing to a hydraulic pump malfunctioning.	Send the carrier pump to the manufacturer's designated service factory for repair.
	Use of carrier when oil temperature is above 80°C (176°F).	Avoid using the hydraulic breaker if the oil temperature is above 80°C (176°F).
	Disorderly operation of pressure valve in the tank, and clogging of cooler fins or filter elements.	Send these parts to the manufacturer's designated service factory for repair or replacement.
	Improper selection and damage of directional valve.	Repair or replace.

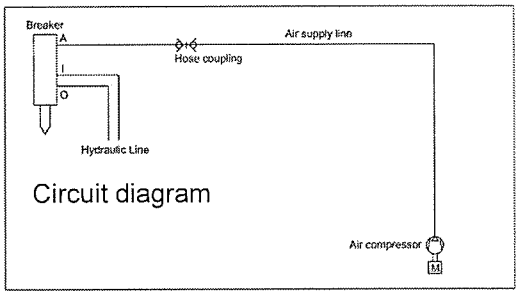
EARLY WEAR AND DAMAGE OF PARTS

MAJOR CAUSES	PLACES
Lack, deterioration, or contamination of hydraulic oil, or use of regenerated oil.	Damage or formation rust on the cylinder, piston, valve, valve box, and cylinder sleeve. Damage or wear of relief valves, pump, or operating valve.
Intrusion of foreign matter during mounting or dismounting of the hyd. breaker, insufficient oil flushing after installation of piping, or intrusion of drain muck in the hydraulic oil tank.	Damage to the sliding parts between the cylinder and piston, and the sliding parts of the valve. Damage to the U-packings, clogging of the filter elements, or damage to the relief valves
Abnormal rise of oil temperature.	Deformation or hardening of the U-packings and O-rings.
Insufficient greasing.	Damage and wear of shank bushing, the shank section of the chisel, and front cap bushing.
Loosening of screwed parts owing to insufficient or uneven tightening.	Wear and breakage of bolts, or gas leakage.
Excessive prying of chisel during operation.	Damage to the cylinder and piston, wear of the shank bushing, and front cap bushing, or failure of chisel or side rod.
Continuous blowing for more than 30 seconds	Breakage of bolts, wear of chisel or damage of relief valves and pump, and striking surface of piston.
Underwater use of a hyd. breaker with standard specification	Embrittlement of U-packings, damage to the cylinder and piston (contamination of hydraulic oil or damage to the hydraulic apparatus of the carrier).

Underwater application

1. Preparation before installation
   - Never use the standard type hydraulic breaker under water. Otherwise, both the carrier and the hydraulic breaker will be damaged severely.
   - Modify the hydraulic breaker according to the Fig. 1 and install underwater piping kit in the carrier.
     Note: Ask your dealer for the underwater piping kit.

     Note : Port size of A
     okada800-1500 = PFO09 (BSPP3/8")
     okada2600 = PFO13 (BSPP1/2")
     okada3600 = PFO19 (BSPP3/4")



Circuit diagram

   - Use a suitable air compressor according to the following table.

	okada800-1500	okada 2000 - 4200	okada6000, 8000
Compressor output	18.4 kW (25HP) or larger	25.8 kW (35HP) or larger	55.2 kW (75HP) or larger
Air pressure	0.5 - 0.6 MPa (5 - 6 bar, 73 - 87 psi)	0.5 - 0.6 MPa (5 - 6 bar, 73 - 87 psi)	0.6 – 0.7 MPa (6 – 7 bar, 87 – 102 psi)

[201020]

   - Install the air piping and then measure the air pressure at the hydraulic breaker port to determine that it is 0.3 - 0.4 MPa (3 - 4 bar, 44 - 58 psi). Adjust the pressure at the air compressor if necessary.

2. Notice before operation
   - Adjust the N_2 gas pressure in the back cap of the hydraulic breaker according to the following table.

		okada800-1300	okada1500-4200	okada6000, 8000
Under Water application	MPa	1.3 - 1.5	1.6 - 1.8	1.6 – 1.8
	bar	13 – 15	16 - 18	16 – 18
	psi	185 – 213	230 - 260	230 – 260
Standard	MPa	1.0 - 1.2	1.3 - 1.5	1.6 – 1.5
	bar	10 – 12	13 – 15	13 – 15
	psi	142 – 170	190 - 218	190 – 218

[201020]

   - For underwater work, after completion of each day's operations, all parts marked below should be thoroughly cleaned, caulked, greased, and sprayed with an anti-rust preventive solution for protection, as shown in the figure below


Caulking


Greasing


Spraying

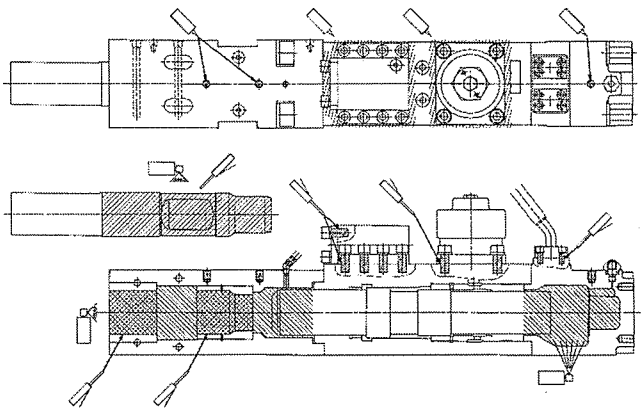


Fig. 1

• Recommendations for anti-rust

Caulking	Silicon caulking
Greasing	Sumico Moly HD Grease No. 2 or equivalent
Spraying	Sumico TFP Spray or equivalent

- Apply grease to the bucket pins.
- Prepare an oil fence in case of oil leakage.

3. Notice during operation
   - Supply air before immersing the hydraulic breaker in the water.
   - If oil leaks from the hydraulic breaker during operation, stop the operation immediately and check all seals and hoses for damage or loose fittings. After inspection or repair of parts, perform the above anti-rust procedure.
   - If water is intruding into the cylinder, stop the operation immediately, dismantle the hydraulic breaker, and perform integral repair. Moreover, when the underwater work is no longer required, perform a complete overhaul.
   - For general operating procedure, refer to the Precautions during operation on page 24.

4. Notice after operation
   - Do not stop supplying air after an operation.
   - After underwater working, perform hammering on the ground for at least 10 minutes at vertical position.
   - Remove the chisel and chisel set pin(s). Wipe moisture from them and from the inner face of the front cap, and then spray and grease as specified.
   - If water is intruding into the cylinder, stop the operation immediately, dismantle the hydraulic breaker, and perform integral repair. Moreover, when the underwater work is no longer required, perform a complete overhaul.

5. Notice during storage
   - Spray anti-rust on the lower part of the piston and inner surface of the front cap.
   - For long term storage, release all gas from the gas cushion chamber. Press the piston from the front cap side into the cylinder according the procedure shown on page 32.
   - Completely cover the unit with a plastic sheet or other protective material.
   - Never leave the hydraulic breaker outdoors.

6. Other
   - When unscrew any thread, apply the anti-rust preventive solution as described above.
   - Periodically inspect both the hydraulic breaker and the carrier. Use those inspections to check for intrusion of water into the hydraulic oil.
   - Be sure to release moisture from the air compressor through the air tank drain port. Moisture in the air could cause serious problem to the hydraulic breaker.

Chisel Warranty Guide

The purpose of this guide is to enable you to advise your customers regarding the correct application of OKADA Chisels and to assist you in resolving complaints immediately as they occur.
When a chisel has apparently failed to provide satisfactory service life, a visual inspection often quickly resolves the cause, saving transport costs and frustration if a warranty is rejected.

How a Chisel Breaks Rock and Concrete

When the piston strikes the top of a chisel, it sends a compressive stress wave down to the working end of the chisel. Provided the chisel is in contact with the rock or concrete targeted for breaking, it is this compressive stress wave that fractures the rock. Immediately following the compressive stress wave, a tensile stress wave is formed due to the piston lifting from the top of the chisel. This cycle of compressive and tensile stresses flowing down the chisel is repeated for each hammer blow.
Obviously, anything that interferes with the 'strength' of the compressive stress wave during service, for example 'free running' or bending of the chisel due to leverage, will result in loss of hydraulic breaker efficiency of up to 80% and possible fatigue failure of the chisel itself.

Cause and Effect of Fatigue

The continuous cycle of compressive and tensile stresses in the chisel, even under correct operating conditions, creates fatigue stress in the chisel that can lead to fatigue failure of the chisel before it is worn out. Again, anything that interferes with the cycle of compressive and tensile stresses will also increase the level of fatigue stress being applied to the chisel and thus increase the risk of early fatigue failure of the chisel.

1. The main cause of increased fatigue stress in the chisel is any form of side pressure during service that causes the chisel to bend like a lever, using the incorrect driving angle, or attempting to break ground by pulling the machine, all of that are detrimental to the life of a chisel and should be avoided (see Figure 1).

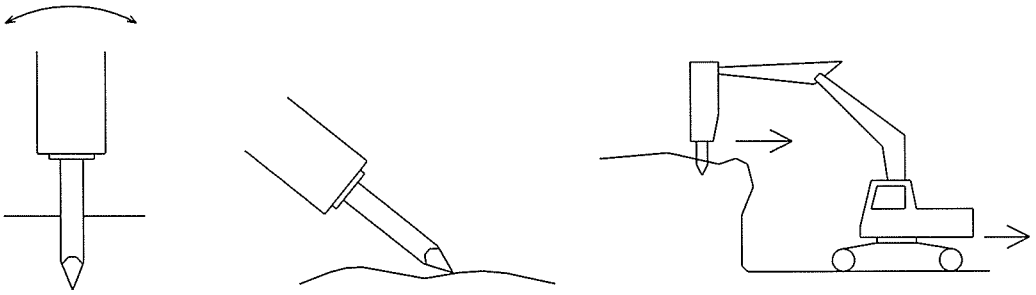


Fig. 1

Remember, the hydraulic power available in the machine far exceeds the strength of a chisel if it is being used incorrectly and can "snap the chisel like a carrot "

2. Other causes of increased fatigue stress in a chisel include:
   a) 'Free running'
   In general this is any situation where the piston strikes the top of the chisel, but the chisel tip is not in proper contact with the rock or concrete to be broken. This includes jobs where the chisel slides off the work or when break-through of thin concrete slabs or boulders occurs.

b) Cold
Low temperature can cause a chisel to be more susceptible to fatigue failure. Chisels should be warmed before use.
c) Mechanical and thermal damage
Any form of damage to the surface of a working tool renders it more liable to fatigue failure. Thus all care must be exercised to prevent accidental gouging, or contact welding ('galling' or 'pick up') due to contact between the chisel and the bushings through lack of lubrication or excessive bending (see Figure 2)

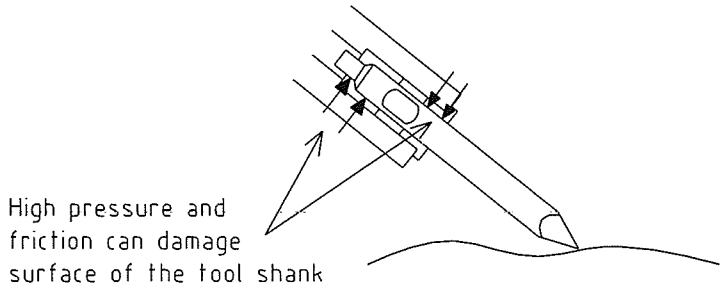
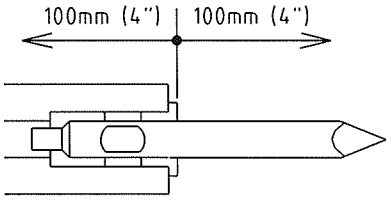


Fig. 2

d) Lubrication
Care must be taken to avoid metal to metal contact that, as a result of galling or pick-up, cause deep damage marks that, in turn, lead to the formation of fatigue cracks and eventual failure of the chisel. Ensure that the shank of the chisel is well lubricated before positioning it in the hydraulic breaker. The specified grease shown in this manual is recommended.
e) Corrosion
Since a rusty chisel is more likely to suffer fatigue failure, keep chisels well greased and sheltered from the weather when not in use.

Chisel Fatigue Failure
Chisel fatigue failure will generally occur approximately 100 mm (4") either side of the chuck front face (see Figure 3) or through the chisel set pin flat.
Another slightly less common failure area is approximately 200 mm (8") from the chisel tip, depending on the nature of use.
The fracture face itself will normally exhibit a semi circular polished area with the remainder being a rougher appearance (see Figure 4).



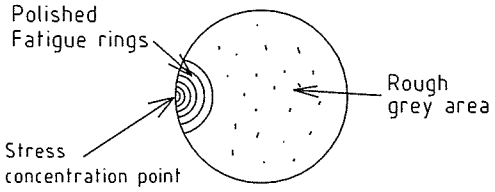


Fig. 3 **Fig. 4**

The polished semi-circular area in Figure 4 is the fatigue area and generally starts from a damage mark or other stress raiser on the outside of the chisel and spreads inwards. The fatigue area slowly widens until the stresses being applied to the chisel cause sudden failure of the remaining section.

Generally, the size of the fatigue area indicates the level of stress applied to the chisel, i.e. the smaller the fatigue area, the higher the stress level, although it must be borne in mind that once initiation of a fatigue crack has taken place, it requires a lower stress level to cause it to grow.

Typical Failures (guide to warranty claims)

OKADA AIYON chisels are manufactured from first class materials and then heat treated to produce a wear-resistant chisel. Thus when a chisel has apparently failed to give a satisfactory service life, a brief visual inspection can often give a quick indication of the cause.

Fig. 5. Typical fractures caused by excessive bending of the chisel. Warranty claims rejected.

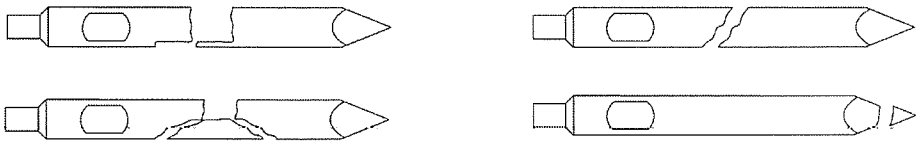


Fig. 5

Fig. 6. Typical of high stress fracture, usually caused by using the machine to 'pull'. Warranty claims rejected.

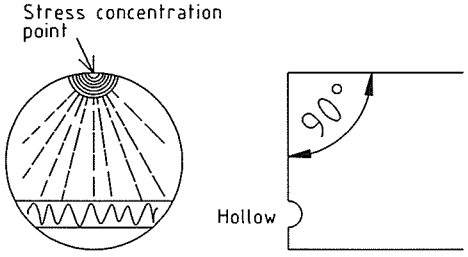


Fig. 6

Fig. 7. Typical fracture caused by levering chisel while buried in the burden. Warranty claims rejected.

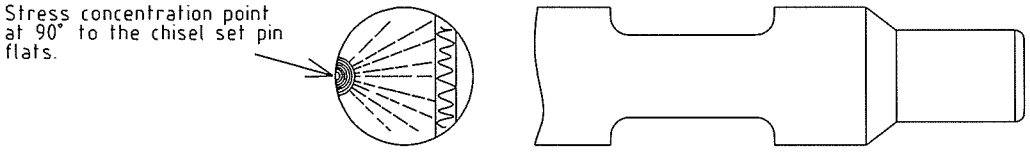


Fig. 7

Wear

Wear is influenced by ground conditions, but as a general guide the following applies:

Fig. 8. Blunt tools worn more than 1/3 diameter or moil points and chisels worn back more than 51 mm (2") of working end classed as reasonable life. Warranty claims rejected.

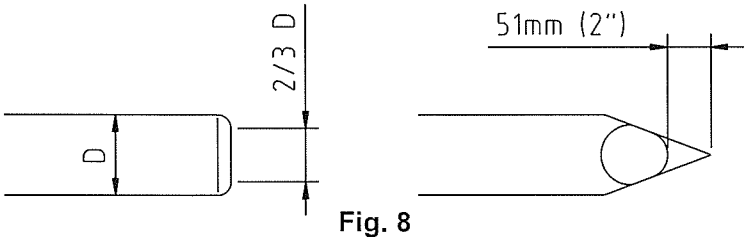
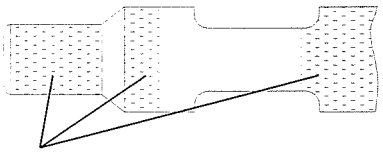


Fig. 8

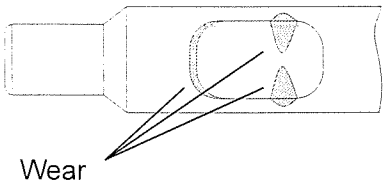
Fig. 9. Typical scratches (seizure, galling) caused by leverage, incorrect hammering angle, or lack of lubricants. Warranty claims rejected.



Scratches, seizure, galling

Fig. 9

Fig. 10. Typical wear caused by repeated dry firing, and repeated continuous hammering more than 1 minute at one spot. Warranty claim rejected.



Wear

Fig. 10

Fig. 11. Mushrooming; this is caused by driving the point into hard dense material for too long a period of time without penetration. This generates intense heat, softening the point, thus causing it to 'mushroom'. This is not a manufacturing fault. Warranty claims rejected.

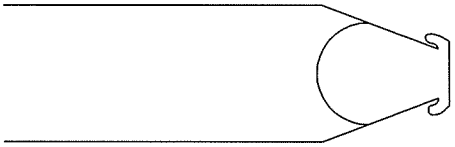


Fig. 11

Fig. 12. Note fatigue lines originate from internal point, not outer diameter. Very rare failure type due to steel defect. 100% warranty accepted other than the core moil point chisels.

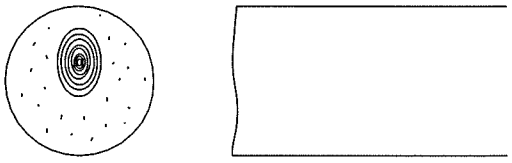
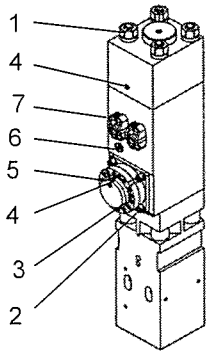


Fig.12

Tightening torque chart

& Wrench sizes



HS: Hexagon socket

Model	Unit	1 Side rod back nut	2 Acc. set bolt	3 Cap screw	4 Cover cap	5 Cap	6 Lock nut	7 Clamp bolt	Top mount bolt
okada150	**N·m**	**294**	**N/A**	**N/A**	**69**	**N/A**	**N/A**	**N/A**	**440**
	ft·lb	217	N/A	N/A	51	N/A	N/A	N/A	324
	Wrench	27	N/A	N/A	17	N/A	N/A	N/A	27
okada200	**N·m**	**294**	**N/A**	**N/A**	**69**	**N/A**	**N/A**	**N/A**	**440**
	ft·lb	217	N/A	N/A	51	N/A	N/A	N/A	324
	Wrench	27	N/A	N/A	17	N/A	N/A	N/A	27
okada250	**N·m**	**294**	**N/A**	**N/A**	**69**	**N/A**	**N/A**	**N/A**	**440**
	ft·lb	217	N/A	N/A	51	N/A	N/A	N/A	324
	Wrench	27	N/A	N/A	17	N/A	N/A	N/A	27
okada400	**N·m**	**440**	**N/A**	**N/A**	**69**	**N/A**	**N/A**	**N/A**	**440**
	ft·lb	324	N/A	N/A	51	N/A	N/A	N/A	324
	Wrench	30	N/A	N/A	17	N/A	N/A	N/A	27
okada650	**N·m**	**490**	**N/A**	**N/A**	**69**	**N/A**	**N/A**	**N/A**	**440**
	ft·lb	361	N/A	N/A	51	N/A	N/A	N/A	324
	Wrench	36	N/A	N/A	17	N/A	N/A	N/A	27
okada800	**N·m**	**490**	**N/A**	**N/A**	**69**	**N/A**	**N/A**	**N/A**	**440**
	ft·lb	361	N/A	N/A	51	N/A	N/A	N/A	324
	Wrench	36	N/A	N/A	17	N/A	N/A	N/A	27
okada900	**N·m**	**931**	**N/A**	**N/A**	**69**	**49**	**69**	**N/A**	**440**
	ft·lb	687	N/A	N/A	51	36	51	N/A	324
	Wrench	46	N/A	N/A	17	22	19	N/A	27
okada1000	**N·m**	**931**	**440**	**245**	**69**	**49**	**69**	**N/A**	**440**
	ft·lb	687	324	181	51	36	51	N/A	324
	Wrench	46	14	12	17	22	19	N/A	27
okada1300	**N·m**	**1274**	**588**	**343**	**69**	**49**	**69**	**N/A**	**980**
	ft·lb	940	433	251	51	36	51	N/A	723
	Wrench	55	17 HS	14 HS	17	22	19	N/A	36
okada1500	**N·m**	**1568**	**588**	**343**	**69**	**49**	**69**	**N/A**	**980**
	ft·lb	1156	433	251	51	36	51	N/A	723
	Wrench	60	17 HS	14 HS	17	22	19	N/A	36
okada2000	**N·m**	**2352**	**833**	**343**	**69**	**49**	**69**	**N/A**	**980**
	ft·lb	1736	615	251	51	36	51	N/A	723
	Wrench	65	19 HS	14 HS	17	22	19	N/A	36
okada2600	**N·m**	**2646**	**1080**	**490**	**69**	**49**	**69**	**N/A**	**980**
	ft·lb	1951	796	361	51	36	51	N/A	723
	Wrench	70	19 HS	14 HS	17	22	19	N/A	36
okada3200	**N·m**	**3284**	**1080**	**637**	**69**	**49**	**69**	**N/A**	**2450**
	ft·lb	2385	796	470	51	36	51	N/A	1807
	Wrench	75	19	17 HS	17	22	19	N/A	55
okada3600	**N·m**	**3724**	**1764**	**637**	**69**	**49**	**69**	**196**	**2450**
	ft·lb	2746	1300	469	51	36	51	145	1807
	Wrench	75	22 HS	17 HS	17	22	19	14 HS	55
okada4200	**N m**	**3822**	**1764**	**637**	**69**	**49**	**69**	**196**	**2450**
	ft lb	2818	1300	470	51	36	51	145	1807
	Wrench	80	22 HS	17 HS	17	22	19	14 HS	55
okada6000	**N·m**	**6076**	**1764**	**637**	**69**	**49**	**69**	**196**	**2450**
	ft·lb	4481	1300	469	51	36	51	145	1807
	Wrench	95	22 HS	17 HS	17	22	19	14 HS	55

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N_2 (Nitrogen) gas pressure by temperature

N_2 gas pressure into the back cap

		-20℃(-4°F)	0℃(32°F)	**20℃(68°F)**	40℃(104°F)
okada150	MPa	0.86 - 1.2	0.9 - 1.3	**1.0 - 1.2**	1.1 - 1.5
	bar	8.6 - 12	9.3 - 13	**10.0 - 12.0**	10.7 - 15
	psi	125 - 175	135 - 189	**145 - 174**	155 - 217
okada200	MPa	0.86 - 1.2	0.9 - 1.3	**1.0 - 1.2**	1.1 - 1.5
	bar	8.6 - 12	9.3 - 13	**10.0 - 12.0**	10.7 - 15
	psi	125 - 175	135 - 189	**145 - 174**	155 - 217
okada250	MPa	0.86 - 1.2	0.9 - 1.3	**1.0 - 1.2**	1.1 - 1.5
	bar	8.6 - 12	9.3 - 13	**10.0 - 12.0**	10.7 - 15
	psi	125 - 175	135 - 189	**145 - 174**	155 - 217
okada400	MPa	1.21 - 1.4	1.3 - 1.5	**1.0 - 1.2**	1.5 - 1.7
	bar	12.1 - 14	13.0 - 15	**10.0 - 12.0**	15.0 - 17
	psi	175 - 200	189 - 216	**145 - 174**	217 - 248
okada650	MPa	0.86 - 1.2	0.9 - 1.3	**1.0 - 1.2**	1.1 - 1.5
	bar	8.6 - 12	9.3 - 13	**10.0 - 12.0**	10.7 - 15
	psi	125 - 175	135 - 189	**145 - 174**	155 - 217
okada800	MPa	0.86 - 1.0	0.9 - 1.1	**1.0 - 1.2**	1.1 - 1.3
	bar	8.6 - 10	9.3 - 11	**10.0 - 12.0**	10.7 - 13
	psi	125 - 150	135 - 162	**145 - 174**	155 - 186
okada900	MPa	0.86 - 1.0	0.9 - 1.1	**1.0 - 1.2**	1.1 - 1.3
	bar	8.6 - 10	9.3 - 11	**10.0 - 12.0**	10.7 - 13
	psi	125 - 150	135 - 162	**145 - 174**	155 - 186
okada1000	MPa	0.86 - 1.0	0.9 - 1.1	**1.0 - 1.2**	1.1 - 1.3
	bar	8.6 - 10	9.3 - 11	**10.0 - 12.0**	10.7 - 13
	psi	125 - 150	135 - 162	**145 - 174**	155 - 186
okada1300	MPa	0.86 - 1.0	0.9 - 1.1	**1.0 - 1.2**	1.1 - 1.3
	bar	8.6 - 10	9.3 - 11	**10.0 - 12.0**	10.7 - 13
	psi	125 - 150	135 - 162	**145 - 174**	155 - 186
okada1500	MPa	1.1 - 1.3	1.2 - 1.4	**1.3 - 1.5**	1.4 - 1.6
	bar	11 - 13	12 - 14	**13.0 - 15.0**	14 - 16
	psi	163 - 188	176 - 203	**189 - 218**	201 - 232

		-20℃(-4°F)	0℃(32°F)	**20℃(68°F)**	40℃(104°F)
okada2000	MPa	1.1 - 1.3	1.2 - 1.4	**1.3 - 1.5**	1.4 - 1.6
	bar	11 - 13	12 - 14	**13.0 - 15.0**	14 - 16
	psi	163 - 188	176 - 203	**189 - 218**	201 - 232
okada2600	MPa	1.1 - 1.3	1.2 - 1.4	**1.3 - 1.5**	1.4 - 1.6
	bar	11 - 13	12 - 14	**13.0 - 15.0**	14 - 16
	psi	163 - 188	176 - 203	**189 - 218**	201 - 232
okada3200	MPa	1.1 - 1.3	1.2 - 1.4	**1.3 - 1.5**	1.4 - 1.6
	bar	11 - 13	12 - 14	**13.0 - 15.0**	14 - 16
	psi	163 - 188	176 - 203	**189 - 218**	201 - 232
okada3600	MPa	1.1 - 1.3	1.2 - 1.4	**1.3 - 1.5**	1.4 - 1.6
	bar	11 - 13	12 - 14	**13.0 - 15.0**	14 - 16
	psi	163 - 188	176 - 203	**189 - 218**	201 - 232
okada4200	MPa	1.1 - 1.3	1.2 - 1.4	**1.3 - 1.5**	1.4 - 1.6
	bar	11 - 13	12 - 14	**13.0 - 15.0**	14 - 16
	psi	163 - 188	176 - 203	**189 - 218**	201 - 232
okada6000	MPa	1.1 - 1.3	1.2 - 1.4	**1.3 - 1.5**	1.4 - 1.6
	bar	11 - 13	12 - 14	**13 - 15**	14 - 16
	psi	163 - 188	176 - 203	**189 - 218**	201 - 232

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N_2 gas pressure into accumulator

		-20℃	0℃	**20℃**	40℃
		-4°F	32°F	**68°F**	104°F
okada1000	MPa	3.3 - 4.3	3.6 - 4.6	**3.9 - 4.9**	4.1 - 5.3
	bar	33 - 43	36 - 46	**39 - 49**	41 - 53
	psi	479 - 624	522 - 667	**566 - 711**	595 - 769
okada1300	MPa	4.7 - 5.1	5.0 - 5.5	**5.4 - 5.9**	5.8 - 6.3
	bar	47 - 51	50 - 55	**54 - 59**	58 - 63
	psi	676 - 739	730 - 797	**783 - 856**	836 - 914
okada1500	MPa	4.7 - 5.1	5.0 - 5.5	**5.4 - 5.9**	5.8 - 6.3
	bar	47 - 51	50 - 55	**54 - 59**	58 - 63
	psi	676 - 739	730 - 797	**783 - 856**	836 - 914
okada2000	MPa	4.7 - 5.1	5.0 - 5.5	**5.4 - 5.9**	5.8 - 6.3
	bar	47 - 51	50 - 55	**54 - 59**	58 - 63
	psi	676 - 739	730 - 797	**783 - 856**	836 - 914
okada2600	MPa	4.7 - 5.1	5.0 - 5.5	**5.4 - 5.9**	5.8 - 6.3
	bar	47 - 51	50 - 55	**54 - 59**	58 - 63
	psi	676 - 739	730 - 797	**783 - 856**	836 - 914
okada3200	MPa	4.7 - 5.1	5.0 - 5.5	**5.4 - 5.9**	5.8 - 6.3
	bar	47 - 51	50 - 55	**54 - 59**	58 - 63
	psi	676 - 739	730 - 797	**783 - 856**	836 - 914
okada3600	MPa	4.7 - 5.1	5.0 - 5.5	**5.4 - 5.9**	5.8 - 6.3
	bar	47 - 51	50 - 55	**54 - 59**	58 - 63
	psi	676 - 739	730 - 797	**783 - 856**	836 - 914
okada4200	MPa	4.7 - 5.1	5.0 - 5.5	**5.4 - 5.9**	5.8 - 6.3
	bar	47 - 51	50 - 55	**54 - 59**	58 - 63
	psi	676 - 739	730 - 797	**783 - 856**	836 - 914
okada6000	MPa	4.7 - 5.1	5.0 - 5.5	**5.4 - 5.9**	5.8 - 6.3
	bar	47 - 51	50 - 55	**54 - 59**	58 - 63
	psi	676 - 739	730 - 797	**783 - 856**	836 - 914

[201020]

Tightening to

Unit conversion table

Length

m	cm	in	ft	yd
1	100	39.37	3.281	1.094
0.01	1	0.3937	0.03281	0.01094
0.0254	2.540	1	1/12	1/36
0.3048	30.48	12	1	1/3
0.9144	91.44	36	3	1

Area

m^2	in^2	ft^2	yd^2
1	1550	10.76	1.196
$0.6452X10^{-3}$	1	1/144	1/1296
0.09290	144	1	1/9
0.8361	1296	9	1

Cubic volume

m^3	c.c. (cm^3)	in^3	yd^3	L(litter)	gal (UK)	gal (US)
1	10^6	$6.102X10^4$	1.308	1000	220.0	264.2
10^{-6}	1	$6.102X10^{-2}$	$0.1308X10^{-5}$	0.001	$0.220X10^{-3}$	$0.2642X10^{-3}$
$0.1639X10^{-4}$	16.39	1	1/46656	0.01639	$0.3605X10^{-2}$	1/231
0.7646	$7.646X10^5$	46656	1	764.5	168.2	201.99
0.001	1000	61.02	$1.308X10^{-3}$	1	0.2200	0.2642
$0.4546X10^{-2}$	4546	277.4	$5.945X10^{-3}$	4.546	1	1.201
$0.3785X10^{-2}$	3785	231	$4.951X10^{-3}$	3.785	0.8327	1

Weight

kg	oz	lb	ton (metric)	ton (UK)	ton (US)
1	35.27	2.205	0.001	$0.9842X10^{-3}$	$0.1102X10^{-2}$
$0.6480X10^{-4}$	$0.2286X10^{-2}$	1/7000	$0.6480X10^{-7}$	$0.6378X10^{-7}$	$0.7143X10^{-7}$
0.02835	1	1/16	$0.2835X10^{-4}$	$0.2790X10^{-4}$	1/32000
0.4536	16	1	$0.4536X10^{-3}$	1/2240	1/2000
1000	35274	2205	1	0.9842	1.102
1016	35840	2240	1.016	1	1.12
907.2	32000	2000	0.9072	0.8929	1

Pressure

Pa (N/m^2)	bar	kgf/cm^2	psi	atm	Torr (mmHg)
1	10^{-5}	$0.1020X10^{-4}$	$0.1450X10^{-3}$	$0.9869X10^{-5}$	$0.7501X10^{-2}$
10^{-3}	10^{-8}	$0.1020X10^{-7}$	$0.1450X10^{-6}$	$0.9869X10^{-8}$	$0.7501X10^{-5}$
10^{5}	1	1.020	14.50	0.9869	750.1
$9.807X10^{4}$	0.9807	1	14.22	0.9678	735.6
$6.895X10^{3}$	0.06895	0.07031	1	0.06805	51.71
101325	1.01325	1.033	14.696	1	760
133.3	$0.1333X10^{-2}$	$0.1360X10^{-2}$	0.01934	1/760	1

Temperature

K	°C	°F
t	t-273.15	$(t-273.15)\ ^{9}/_{5}+32$
t+273.15	t	$t\ ^{9}/_{5}+32$
$(t-32)\ ^{5}/_{9}+273.15$	$(t-32)\ ^{5}/_{9}$	t
$t\ ^{5}/_{9}$	$t\ ^{5}/_{9}-273.15$	t-459.67

Power

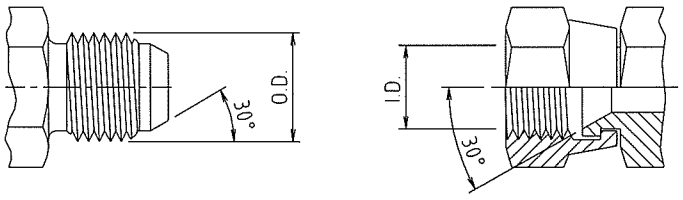
PS	HP	KW	kgf·m/sec	Kcal/h
1	0.986	0.736	75.0	633
1.01	1	0.746	76.1	642
1.36	1.34	1	102	860

Torque

J (N·m)	kgf·m	ft·lb
1	1.0197X10-1	7.3746X10-1
9.80665	1	7.2346
1.35552	1.3822X10-1	1

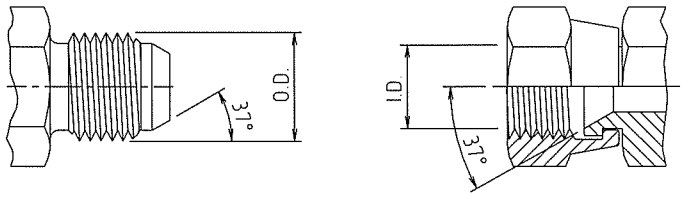
Thread standard

○ JIS B 8363 Parallel Pipe Threads (PF)



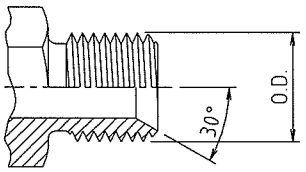
OKADA size	Inch size	Thread	Male thread O.D.		Female thread I.D.	
			mm	inch	mm	inch
NPF03	1/8	1/8-28	9.7	0.38	8.6	0.34
NPF06	1/4	1/4-19	13.2	0.52	11.4	0.45
NPF09	3/8	3/8-19	16.7	0.66	15.0	0.59
NPF13	1/2	1/2-14	21.0	0.83	18.6	0.73
NPF19	3/4	3/4-14	26.4	1.04	24.1	0.95
NPF25	1	1-11	33.2	1.31	30.3	1.19
NPF32	$1^1/_4$	$1^1/_4$-11	41.9	1.65	39.0	1.54
NPF38	$1^1/_2$	$1^1/_2$-11	47.8	1.88	44.8	1.76
NPF50	2	2	59.6	2.35	56.7	2.23

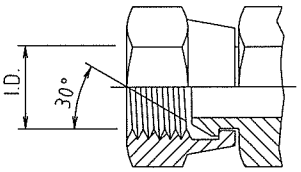
○ SAE J514, 37° Flare



OKADA size	JIC size	Inch size	Thread	Male thread O.D.		Female thread I.D.	
				mm	inch	mm	inch
UNF03	2	1/8	5/16-24	7.9	0.31	6.9	0.27
UNF06	4	1/4	7/16-20	11.2	0.44	9.9	0.39
UNF09	6	3/8	9/16-18	14.2	0.56	12.9	0.51
UNF13	8	1/2	3/4-16	19.0	0.75	17.0	0.67
UNF15	10	5/8	7/8-14	22.3	0.88	20.3	0.80
UNF19	12	3/4	$1^1/_{16}$-12	26.9	1.06	24.9	0.98
UNF25	16	1	$1^5/_{16}$-12	33.3	1.31	31.0	1.22
UNF32	20	$1^1/_4$	$1^5/_8$-12	41.4	1.63	39.1	1.54
UNF38	24	$1^1/_2$	$1^7/_8$-12	47.7	1.88	45.5	1.79
UNF50	32	2	$2^1/_2$-12	63.5	2.50	61.2	2.41

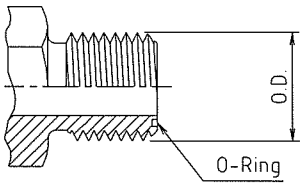
○ **JIS B 8363 Parallel Pipe Threads (PF)**
○ **British Standard Pipe - BSPP**

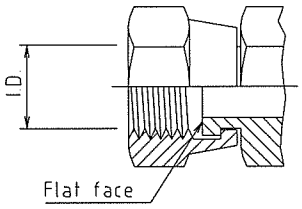




OKADA size	Inch size	Thread	Male thread O.D.		Female thread I.D.	
			mm	inch	mm	inch
NSF03	1/8	1/8-28	9.7	0.38	8.6	0.34
NSF06	1/4	1/4-19	13.2	0.52	11.4	0.45
NSF09	3/8	3/8-19	16.7	0.66	15.0	0.59
NSF13	1/2	1/2-14	21.0	0.83	18.6	0.73
NSF19	3/4	3/4-14	26.4	1.04	24.1	0.95
NSF25	1	1-11	33.2	1.31	30.3	1.19
NSF32	$1^1/_4$	$1^1/_4$-11	41.9	1.65	39.0	1.54
NSF38	$1^1/_2$	$1^1/_2$-11	47.8	1.88	44.8	1.76
NSF50	2	2	59.6	2.35	56.7	2.23

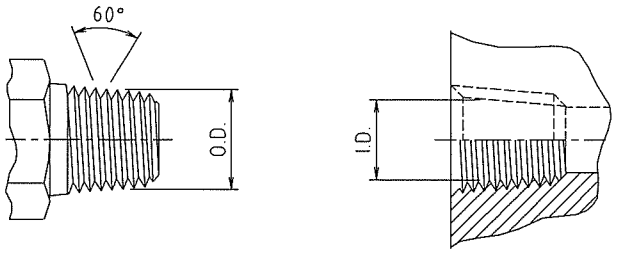
○ **SAE J1453 O-Ring Face Seal**





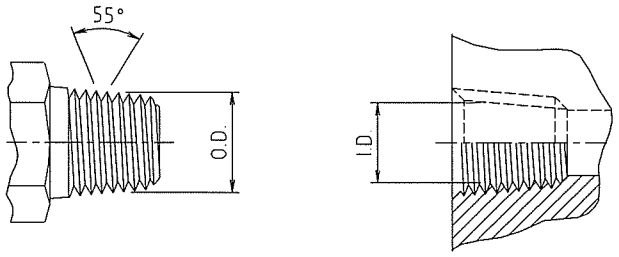
OKADA size	Inch size	Thread	Male thread O.D.		Female thread I.D.	
			mm	inch	mm	inch
ORS06	1/4	9/16-18	14.2	0.56	12.9	0.51
ORS09	3/8	11/16-16	17.3	0.68	16.0	0.63
ORS13	1/2	13/16-16	20.6	0.81	19.0	0.75
ORS15	5/8	1-14	25.4	1.00	23.6	0.93
ORS19	3/4	$1^3/_{16}$-12	30.0	1.18	27.8	1.10
ORS25	1	$1^7/_{16}$-12	36.6	1.44	34.5	1.36
ORS32	$1^1/_4$	$1^{11}/_{16}$-12	42.7	1.68	40.6	1.60
ORS38	$1^1/_2$	2-12	50.8	2.00	48.8	1.92

○ **JIS B 8363 Tapered Pipe Threads (PT)**
○ **British Standard pipe - BSPT**



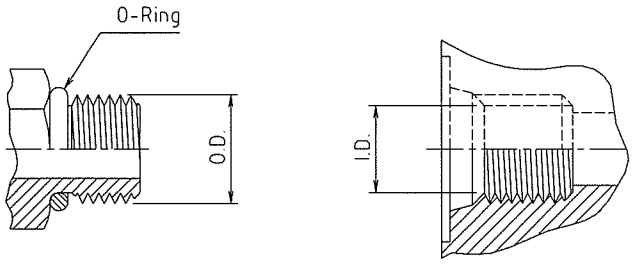
OKADA size	Inch size	Thread	Male thread O.D.		Female thread I.D.	
			mm	inch	mm	inch
PT03	1/8	1/8-28	9.7	0.38	8.6	0.34
PT06	1/4	1/4-19	13.2	0.52	11.4	0.45
PT09	3/8	3/8-19	16.7	0.66	15.0	0.59
PT13	1/2	1/2-14	21.0	0.83	18.6	0.73
PT19	3/4	3/4-14	26.4	1.04	24.1	0.95
PT25	1	1-11	33.2	1.31	30.3	1.19
PT32	$1^1/_4$	$1^1/_4$-11	41.9	1.65	39.0	1.54
PT38	$1^1/_2$	$1^1/_2$-11	47.8	1.88	44.8	1.76
PT50	2	2	59.6	2.35	56.7	2.23

○ **American Dry seal Pipe Threads (NPT)**



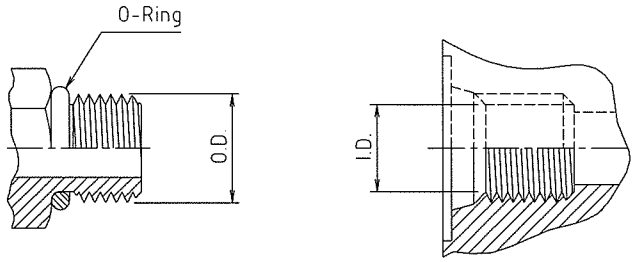
OKADA size	Inch size	Thread	Male thread O.D.		Female thread I.D.	
			mm	inch	mm	inch
NPT03	1/8	1/8-27	10.3	0.41	9.4	0.37
NPT06	1/4	1/4-18	13.7	0.54	12.4	0.49
NPT09	3/8	3/8-18	17.3	0.68	15.7	0.62
NPT13	1/2	1/2-14	21.3	0.84	19.3	0.76
NPT19	3/4	3/4-14	26.9	1.06	24.9	0.98
NPT25	1	1-$11^1/_2$	33.3	1.31	31.5	1.24
NPT32	$1^1/_4$	$1^1/_4$-$11^1/_2$	42.2	1.66	40.1	1.58
NPT38	$1^1/_2$	$1^1/_2$-$11^1/_2$	48.3	1.90	46.2	1.82
NPT50	2	2-$11^1/_2$	60.4	2.38	57.9	2.28

○ JIS B 2351 Parallel Pipe Threads (G)



OKADA size	Inch size	Thread	Male thread O.D.		Female thread I.D.	
			mm	inch	mm	inch
PFO03	1/8	1/8-28	9.7	0.38	8.6	0.34
PFO06	1/4	1/4-19	13.2	0.52	11.4	0.45
PFO09	3/8	3/8-19	16.7	0.66	15.0	0.59
PFO13	1/2	1/2-14	21.0	0.83	18.6	0.73
PFO19	3/4	3/4-14	26.4	1.04	24.1	0.95
PFO25	1	1-11	33.2	1.31	30.3	1.19
PFO32	$1^1/_4$	$1^1/_4$-11	41.9	1.65	39.0	1.54
PFO38	$1^1/_2$	$1^1/_2$-11	47.8	1.88	44.8	1.76
PFO50	2	2	59.6	2.35	56.7	2.23

○ SAE J514, Straight Thread O-Ring Boss



OKADA size	Inch size	Thread	Male thread O.D.		Female thread I.D.	
			mm	inch	mm	inch
UNFO03	1/8	5/16-24	7.9	0.31	6.9	0.27
UNFO06	1/4	7/16-20	11.2	0.44	9.9	0.39
UNFO09	3/8	9/16-18	14.2	0.56	12.9	0.51
UNFO13	1/2	3/4-16	19.0	0.75	17.0	0.67
UNFO15	5/8	7/8-14	22.3	0.88	20.3	0.80
UNFO19	3/4	$1^1/_{16}$-12	26.9	1.06	24.9	0.98
UNFO25	1	$1^5/_{16}$-12	33.3	1.31	31.0	1.22
UNFO32	$1^1/_4$	$1^5/_8$-12	41.4	1.63	39.1	1.54
UNFO38	$1^1/_2$	$1^7/_8$-12	47.7	1.88	45.5	1.79
UNFO50	2	$2^1/_2$-12	63.5	2.50	61.2	2.41

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IMPORTANT

OKADA

OKADA AIYON CORPORATION
4-1-18 KAIGAN-DORI MINATO-KU
OSAKA 552-0022 JAPAN

OKADA WARRANTY REGISTRATION

DATE ____ / ____ / ____

ATTACHMENT MODEL : ____ SERIAL NO. ____

DATE OF SHIPMENT : ____ / ____ / ____

DATE OF FIRST PLACED INTO SERVICE : ____ / ____ / ____

CARRIER MACHINE MODEL : ____ HOUR METER READING : ____ Hr

2nd RELIEF SET PRESSURE : ____ MPa WORKING PRESSURE : ____ MPa

OIL FLOW TO ATTACHMENT: ____ L/min N_2 GAS IN BACK CAP : ____ MPa

USER NAME : ____

ADDRESS : ____

COUNTRY ____ E-MAIL : ____

CATEGORY OF BUSINESS : ☐ CONTRACTOR, ☐ QUARRY, ☐ DEMOLITION, ☐ RENTAL

OTHERS ( )

DISTRIBUTOR NAME : ____

ADDRESS : ____

PERSON IN CHARGE ____

This form must be returned to OKADA AIYON within 15 days from date of sale by facsimile, mail or E-mailing to begin warranty coverage.

OWR103

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