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INTRODUCTION

■ First of all thank you for purchasing our hydraulic breakers.

■ HYUNDAI have developed/supplied state-of-the-art excavators as well as hydraulic attachments for over two decades, and our products have been playing a major role in quarries and various construction sites, such as building disassembly, breaking up roads, housing land development, sewage system and so on.

■ This manual has come out for your understanding of products and its safe operation.
It contains safety guide, maintenance information, proper operating method, technical data and etc., which are useful in installing, operating and maintaining our products with various kinds of wheel or tracked type excavators, back-hoes and skid-steer loaders.

■ HYUNDAI have manufactured various attachments with precious and updated technology and well skilled work-manship, for example, hydraulic breakers are made up of a small number of parts with simple structure and excellent maintenance.

■ Excellent durability, reliability, and trouble-free operation resulted from the above features, and they give you much more profit and good performance for your job.

■ Although we make our products that we can be proud of, if you are not accustomed to operating properly, there may be unexpected accidents or disorders, consequently the performance and efficiency of the products will be dropped down sharply. So you must read this manual carefully and thoroughly to keep operating well and the products need to be maintained periodically and operated correctly for good condition.

■ First of all, you ought to read and study this manual for your safety. It will inform you of hazards and how to avoid them. If you have questions about the products and manual, please contact us or our agents. Every time you want to replace any of the spare parts, please make sure you use HYUNDAI genuine parts. We do not guarantee any damages, disorders, and injuries caused by your mistake.

■ We wish you get more profits with our products and thank you again for your purchasing.

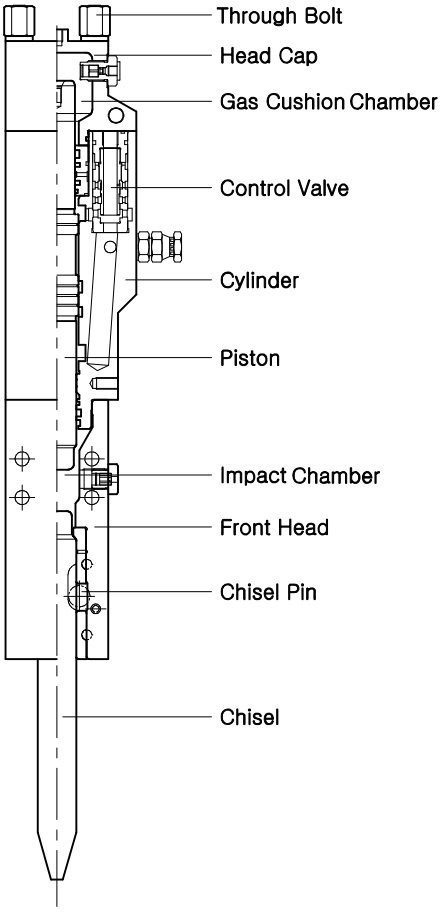
1 Products & Structure

1.1 HDB Series Breaker

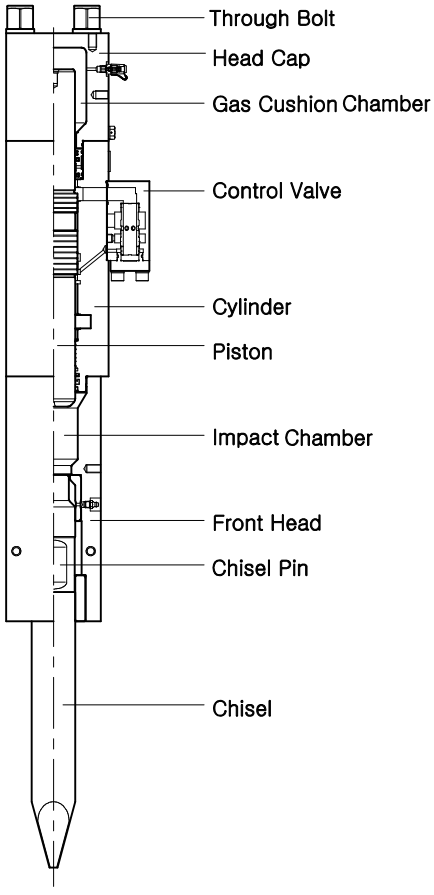
1) Products

HDB10, HDB20 : Internal Control Valve Type
HDB40, HDB50, HDB70, HDB90, HDB140, HDB180, HDB210 : Non Accumulator type
HDB230, HDB250, HDB300, HDB360, HDB450, HDB650, HDB800 : Accumulator type

2) Structure

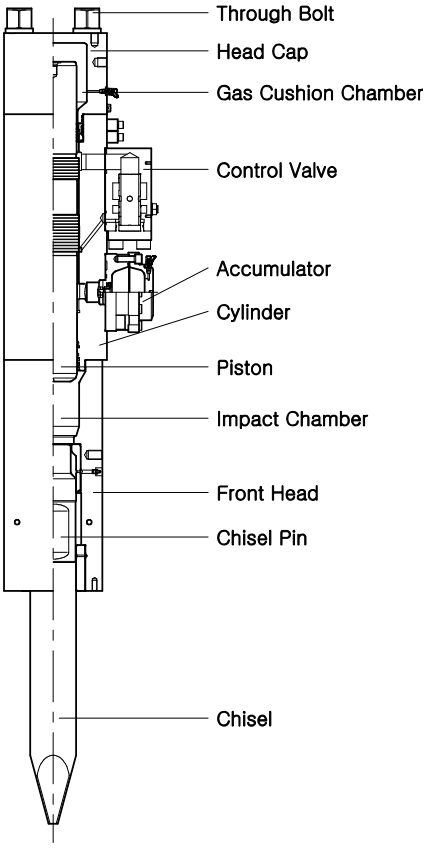


INTERNAL CONTROL VALVE TYPE



NON ACCUMULATOR TYPE

a) The HDB Series breaker consists of four main sections : cylinder, control valve, front head and head cap.
b) The cylinder contains a moving piston which strikes the chisel.
c) Four through bolts are assembled to hold the cylinder and head cap together with front head.
d) A control valve is assembled to the cylinder and regulates piston movement.
e) Accumulator compensates for working oil flow in the hydraulic circuit and prevents pulsation.
f) Chisel pins inside the front head prevent the chisel from coming out.



ACCUMULATOR TYPE

NOTE

The accumulator, head cap and cylinder are the most critical parts in the breaker. Therefore, they should be disassembled and reassembled in the service shop appointed by us in your territory.

2 Specification & Suitable Equipment

2.1 Specification of Breakers

Item		HDB10	HDB20	HDB40	HDB50	HDB70	HDB90	HDB140
Operating Weight (w/Top Box BKT.)	Kg	115	150	224	333	431	614	929
	lb	253	330	493	734	950	1354	2048
Overall Length w/STD. MTG. BKT.)	mm	1110	1239	1408	1603	1805	1981	2225
	Inch	43.7	48.8	55.4	64.1	71.1	78.0	87.6
Overall Length (w.o/MTG. BKT.)	mm	973	1090	1258	1419	1591	1760	1962
	Inch	38.3	42.9	49.5	55.9	62.6	69.3	77.2
Impact Power	J	140	220	680	820	1040	1100	2160
	ft.lb	96	155	494	605	767	811	1593
Chisel Out Dia.	Mm	40	45	62	70	78	85	105
	Inch	1.6	1.8	2.4	2.8	3.1	3.3	4.1
Chisel Length	Mm	420	500	610	730	806	850	975
	Inch	16.5	19.7	24.0	28.7	31.7	33.5	38.4
Setting Pressure	Kgf/cm^2	150	150	150	170	180	190	190
	psi	2134	2134	2134	2418	2560	2702	2702
Working Pressure	Kgf/cm^2	70~110	80~120	100~140	100~140	100~140	100~140	120~160
	psi	996~1565	1138~1707	1422~1991	1422~1991	1422~1991	1422~1991	1707~2276
Oil Flow	lpm	15~30	20~40	30~50	30~55	45~80	50~100	90~110
	gpm	4.0~7.9	5.3~10.5	7.9~13.2	7.9~14.5	11.9~21.1	13.2~26.5	23.8~29.1
Blow Rate	BPM	600~1200	600~1200	500~1000	350~900 (450~1000)	350~900 (450~1000)	300~700 (550~950)	350~550 (500~750)
Head Cap N_2 Gas Pressure	Kgf/cm^2	12	12	12	12	12	12	12
	psi	171	171	171	171	171	171	171
Suitable Exca.	ton	0.5~1.5	1~2.5	3~4.5	3~8	5~8	6~9	10~15
	lb	1102~3307	2205~5512	6614~9921	6614~17637	11023~17637	13228~19842	22046~33069

2 Specification & Suitable Equipment

HDB180	HDB210	HDB250	HDB300	HDB360	HDB450	HDB650	HDB800
1209	1738	2165	2832	2937	3713	4380	5625
2665	3832	4773	6243	6475	8186	9656	12401
2455	2764	2898	3200	3200	3595	3766	4059
96.7	108.8	114.1	126.0	126.0	141.5	148.3	159.8
2153	2395	2526	2790	2790	3173	3271	3505
84.8	94.3	99.4	109.8	109.8	124.9	128.8	138.0
2350	3110	5580	7150	7150	9980	12265	14310
1733	2294	4116	5274	5274	7361	9046	10554
120	135	145	150	155	165	180	200
4.7	5.3	5.7	5.9	6.1	6.5	7.1	7.9
1165	1250	1280	1400	1400	1650	1500	1700
45.9	49.2	50.4	55.1	55.1	65.0	59.1	66.9
210	210	210	210	210	210	240	250
2987	2987	2987	2987	2987	2987	3414	3556
120~170	130~170	140~180	140~180	140~180	140~180	150~190	150~190
1707~2418	1849~2418	1991~2560	1991~2560	1991~2560	1991~2560	2134~2702	2134~2702
100~140	110~160	150~210	180~250	180~250	200~280	280~400	322~454
26.4~37.0	29.1~42.3	39.6~55.5	47.6~66.0	47.6~66.0	52.8~74.0	74.0~105.7	85.1~119.9
350~550 (500~850)	350~500 (450~600)	250~350 (300~450)	200~350 (300~480)	200~350 (300~480)	200~300 (250~350)	250~420 (300~500)	231~374 (298~484)
12	11	11	11	11	11	16	11
171	156	156	156	156	156	228	156
16~20	18~25	22~29	26~32	28~36	40~50	42~81	55~100
35274~44092	39683~55116	48502~63934	57320~70548	61729~79366	88185~110231	92594~178574	121254~220462

2.2 Suitable Excavators

Breaker Model	Ton	Excavator Model
HDB10	0.5~1.5	1.6 ton
HDB20	0.8~1.5	1.6 ~ 2.7 ton
HDB40	3~4.5	3.5 ton
HDB50	3~8	5.5 ~ 6.0 ton
HDB70	5~8	5.5 ~ 6.0 ton
HDB90	6~9	8.0 ton
HDB140	10~15	14 ~ 14.2 ton
HDB180	16~20	16 ~ 18 ton
HDB210	18~25	21 ~ 23.5 ton
HDB250	22~29	25 ~ 26 ton
HDB300 HDB360	26~36	29 ~ 38 ton
HDB450	40~55	48 ton
HDB650	42~81	52 ton
HDB800	65~150	80 ton

2.3 Breaker Impact Energy/Setting Pressure

Model	Impact Energy	Setting Pressure
	J	kgf/cm^2
HDB10	140	150
HDB20	220	150
HDB40	680	150
HDB50	820	170
HDB70	930	180
HDB90	1100	190
HDB140	2160	190
HDB180	2350	210
HDB210	3110	210
HDB250	5580	210
HDB300	7150	210
HDB360	7150	210
HDB450	9980	210
HDB650	12265	240
HDB800	14310	250

3 Principle of operation

3.1 Operation

1) Piston Rises 2) Valve Rises 3) Piston Descends 4) Impact

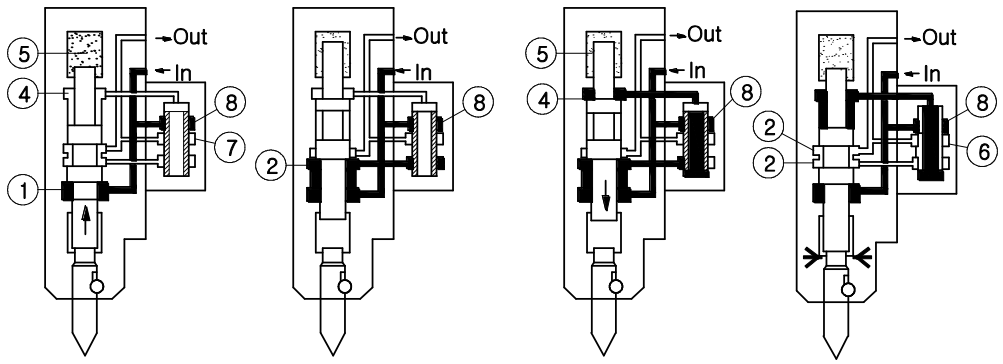


Fig. 3-1

1) Piston rises

When the high pressure enters, the chamber is ① faced with the lower side of th e piston ⑧which changes the direction of flow. Then, the chamber work together with the low pressure circuit ② to reverse piston movement. The force applied t o the lower side becomes greater than that of the upper side. Gradually the pisto n goes upward. Piston compresses the gas sealed in the gas chamber.

2) Valve rises

As the piston rises, the oil flows into chamber ② & ⑥. As a result, the valve sta rts rising because of the difference in area between the upper and lower faces of t he valve.

3) Piston descent

When the valve rises and is connected with ⑧, the high pressure enters into cha mber ④ for piston reversion, and the piston starts descending due to the differe nce in area between the upper and lower faces receiving same pressure. As the piston comes down, its descending speed is accelerated by the pressure of gas in the gas chamber.

4) Impact

The accelerated piston strikes chisel. While descending of piston, the middle of portion of piston reaches to chamber ② and then the pressure in chamber ⑥ su pporting the valve becomes less and the oil goes through into chamber ②, ③ to be changed into the low pressure. At the same time, chamber ⑧ remains alway s high pressure. The valve, therefore, lowers.

5) Continuous striking

Upon completion of the valve descending process, the state shown in first sectio n of Fig.3-1 is created to allow continuous striking with the chisel.

4 General Information

1) Usage of breaker

HDB Series breakers are designed to work in quarries, various construction sites, such as building disassembly, breaking up roads, housing land development, sewage system and so on. The chisel selection is dependent on working material in accordance with chisel appearance. Generally blunt type is for granite or gneiss, excessive hard rock and not splitting work. And moil or wedge is for sandstone and weak metamorphic rock into which chisel penetrate or on specially hard rocks or reinforced concrete. Wedge point is used for civil engineering works and breaking fiat rocks.

2) Serial number

The breaker serial number stamped on main body is important for repairing or ordering spare parts. We make our products very preciously under stern quality control, when the products run out of order, the number must be presented to our shop to maintain or repair them.

Therefore, you have to keep in memory the serial number for specific breaker, which usually locates in the main body center or side of breaker.

3) Clothing

You can be injured if you do not wear proper clothing. Loose clothing can get caught in a machine. Wear protective clothing to suit the job. For example you have to wear a safety helmet, safety shoes, safety glasses, well-fitting overalls, ear-protectors, industrial gloves and breathing protector. Please, do not wear a necktie or scarf and keep long hair restrained.

4) Lifting equipment

Improper lifting equipment can cause you injury. You should know how to use lifting equipment and the equipment should be strong enough for your job. Make sure that lifting equipment is in good condition, suitable for the job and complies with all local regulations and relevant laws.

5) Safety

This manual is a guide for safe operation and maintenance. Before installing, operating or maintaining the products, you must read this manual carefully and always keep the manual with the breaker.

6) Operation

You should be a skilled operator of the carrier machine to use breaker correctly. Do not use or install the breaker until you can drive the carrier machine. Please do not rush learning the job, take your time and learn carefully.

7) Hydraulic System

The impact energy of the breaker is constant and independent of the carrier's hydraulic system. Although you stop the excavator, the rest of the oil pressure is still getting into the breaker and operates the breaker. Hydraulic fluid at system is dangerous. Before disconnecting or connecting hydraulic hoses, stop the carrier engine and release pressure trapped in the hoses, gas chamber. Do not touch the hot parts. And if system contains accumulator, depressurize system before maintenance. When leaving equipment please put the equipment lowered and engine off.

8) Practice

If you carry out unfamiliar operations without practice, you and others can be seriously injured. Practice should do on a clean area, and keep other people out. If you perform new operation, you are sure you can do them safely.

9) Communications

Poor communications can cause accidents. Work site is usually noisy, so do not rely on spoken commands. If you will be working with other people, make sure they understand your hand signals. Keep people around you away, and Inform of what you will be doing.

10) Work site

Before you work, check for potholes, weak ground, hidden rocks etc., and mark the position of underground utilities such as electric cables, water or gas pipes, etc, if you will be breaking an object near to them. Banked material and trenches are dangerous area too Please do not work close enough to banks and trenches where there is a danger of collapse And dangerous area must be clear of bystanders at all time.

11) Safety barriers

In public places, or when your visibility is reduced, place barriers around the machine to keep people away. If there is no safety barriers, you have to obtain the working area of excavators to operate safely.

12) Equipment limits and condition

Never operate the equipment beyond its limits, If you do, it can cause damage, and also be dangerous. And do not try to upgrade the breaker's performance by unapproved modifications. Defective breaker can injure you or others. Do not operate an equipment which is defective or has missing parts. Make sure all maintenance procedures are completed before use.

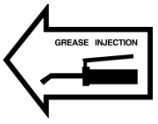
And obey all laws and regulations of the work place and equipment. Please do not operate at abnormal high temperature and use only the completely assembled breakers.

13) Repairs and maintenance

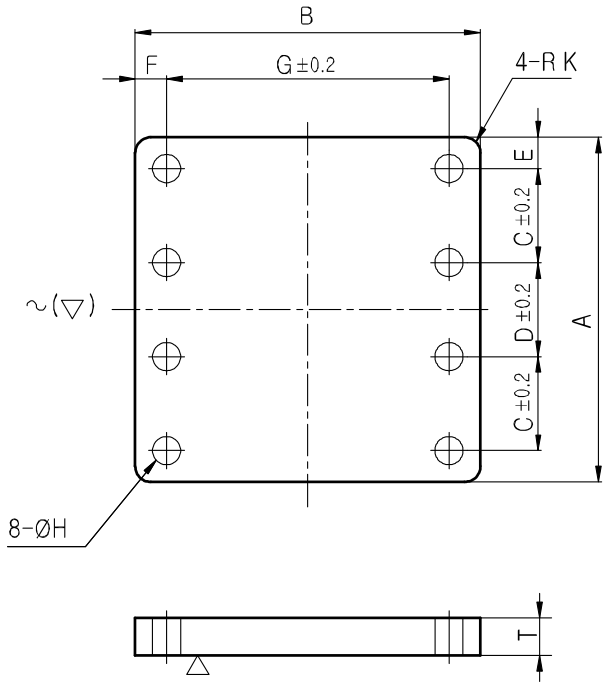
Do not try to do repairs or any other maintenance you do not understand. When you need to replace old part for new one, please contact your HYUNDAI Service center for advice. Service and repairs are only to be made by authorized person nel. And do not operate the breaker underwater as a standard assembly, otherwis e it will be damaged. Please remove tool during transport of breaker and breaker from carrier during transport. Finally safety decals must be checked and replace d if necessary.

The products are suitable to major heavy excavators and construction work. As y ou know, the construction site is always dangerous, thus you should be alert for hazards. Death or serious injury result from improper use, repair, or maintenance. Finally, if there is anything you do not understanding, ask your HYUNDAI Service center for advice. Never assume anything you do not understand. And only routi ne maintenance listed in manual may be done by operator.

14) Imperative Action Signal

No.	Referent	Image content	Example
1	Hearing protection must be worn	Head wearing An ear protection	
2	Consult manual guide for Proper service procedures.	Technical Manual	
3	Keep away from the Breaking area while the Breaker works	A working breaker with Diagonal slash	
4	Inject grease into the hole With grease gun periodically	Grease gun	

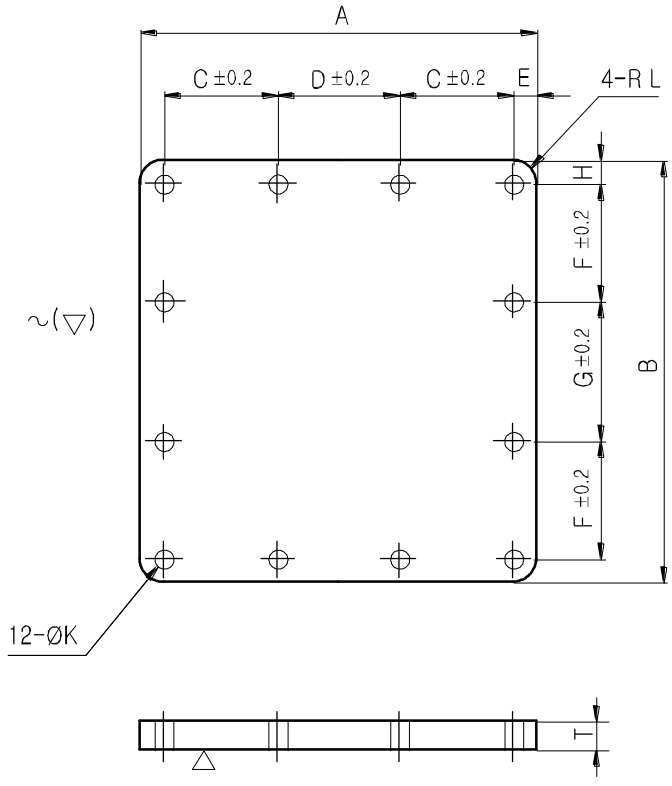
5 Mounting Bracket Plate Dimension



(Unit:mm)

Model	T (Before machined)	T (machined)	A	B	C	D	E	F	G	H	K	Material
HDB10	19	16	220	220	60	60	20	20	180	18	10	SM490A
HDB20	19	16	318	298	78	120	21	21	256	18	20	
HDB40	19	16	316	302	80	114	21	21	260	22	20	
HDB50	19	16	365	380	85	135	30	30	320	22	25	
HDB70	19	16	400	355	100	140	30	30	295	22	25	
HDB90	22	19	435	425	90	165	45	30	365	24	25	

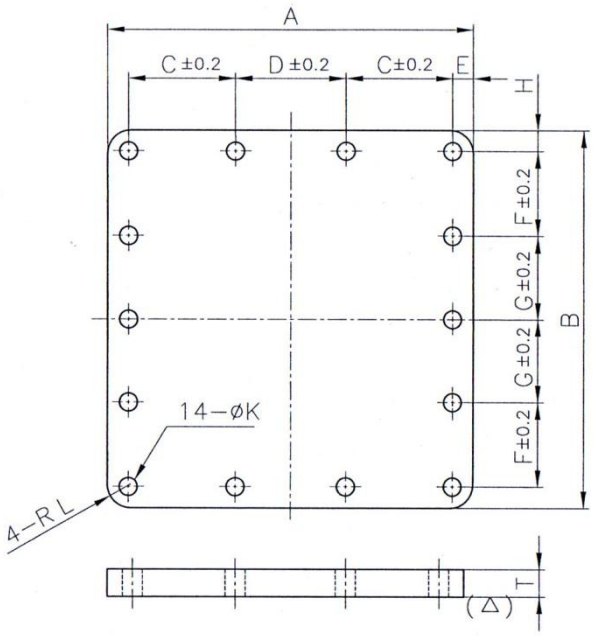
5 Mounting Bracket Plate Dimension



(Unit:mm)

Model	T (Before Manchined)	T (machined)	A	B	C	D	E	F	G	H	K	L	Material
HDB140	25	22	455	538	130	135	30	140	198	30	24	30	SM490A
HDB180	25	22	540	605	145	180	35	155	225	35	33	30	

5 Mounting Bracket Plate Dimension

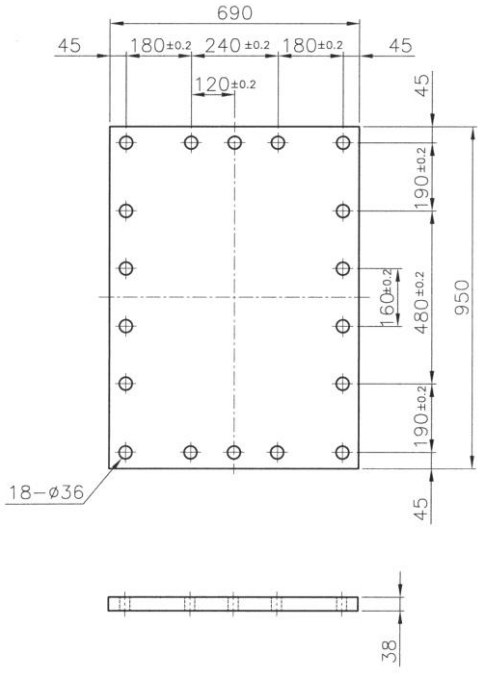


(Unit:mm)

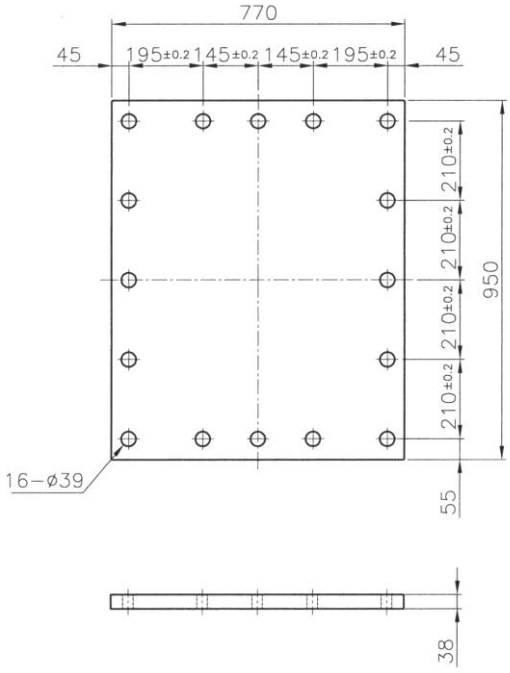
Model	T (Before machined)	T (machined)	A	B	C	D	E	F	G	H	K	L	Material
HDB210	32	29	570	665	160	180	35	160	137.5	35	33	40	SM490A
HDB250	35	32	635	700	190	186	34.5	175	140	35	33	40	
HDB300 HDB360	38	35	700	760	210	200	40	185	155	40	39	45	
HDB450	40	37	740	805	220	220	40	192.5	170	40	39	50	

5 Mounting Bracket Plate Dimension

(Unit:mm)



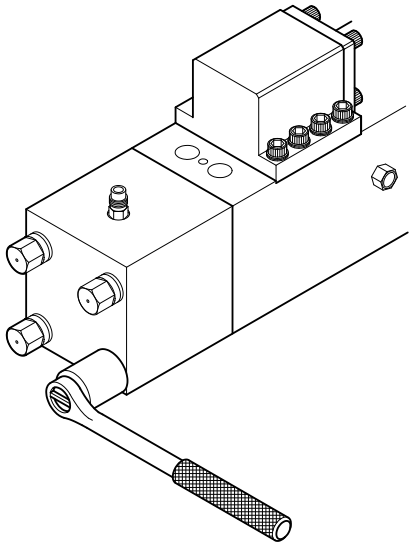
<HDB650>



<HDB800>

6 Torque

Before starting work, check all the bolts' tightness and also be sure to retighten loose bolts to the specified torque referred in the manual.
The procedure of tightening torque of each bolts is as follows.

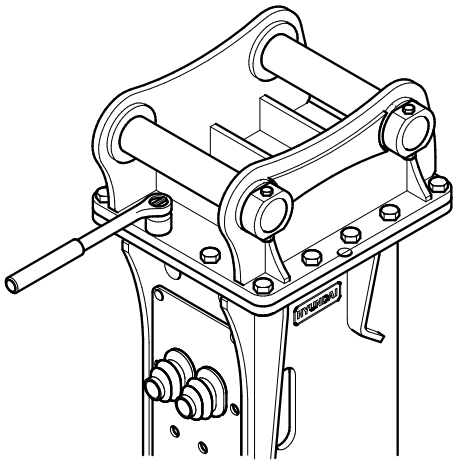


1) Through Bolt

Model	HDB10	HDB20	HDB40	HDB50	HDB70	HDB90	HDB140
Part No.	B01210052	B02210052	B03510052	B05610056	B05710111	B07310064	B09410072
Torque (Kg-m)	30	35	50	50	120	150	160

Model	HDB180	HDB210	HDB250	HDB300	HDB360	HDB450	HDB650	HDB800
Part No.	B18710250	B23510820	B25410290	B36610530	B36610530	B50510350	B60110371	B70110151
1Torque (Kg-m)	190	300	470	540	540	580	580	700

6 Torque



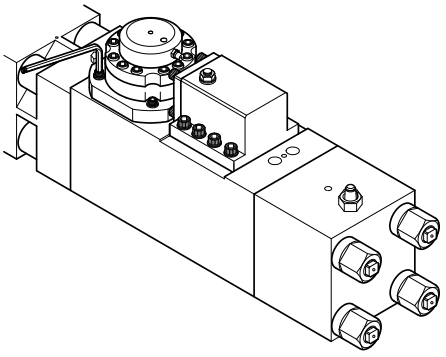
2) Top Mounting Bracket Bolt

Model	HDB10	HDB20	HDB40	HDB50	HDB70
Spec.	M16 x P2.0 x 60	M16 x P2.0 x 60	M20 x P2.5 x 65	M20 x P2.5 x 65	M20 x P2.5 x 65
Part No.	013019-160604	013019-160604	013019-200654	013019-200654	013019-200654
Torque (Kg-m)	20	20	40	40	40

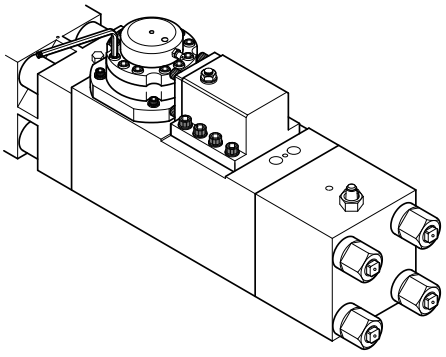
Model	HDB90	HDB140	HDB180	HDB210
Spec.	M22xP2.5x75	M22xP2.5x80	M30xP3.5x90	M30xP3.5x110
Part No.	013019-220754	013019-220804	013019-300904	0139019-301104
Torque (Kg-m)	55	55	150	150

Model	HDB250	HDB300	HDB360	HDB450	HDB650	HDB800
Spec.	M30xP3.5x110	M36xP4.0x130	M36xP4.0x130	M36xP4.0x130	M33xP3.5x120	M36xP4.0x120
Part No.	013019-301104	013019-361304	013019-361304	013019-361304	013019-331204	013019-361204
Torque (Kg-m)	150	250	250	250	200	250

6 Torque



Acc. Body Bolt



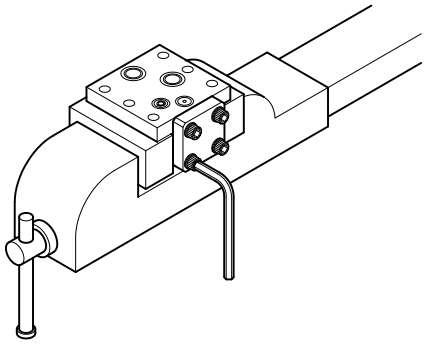
Acc. Cover Bolt

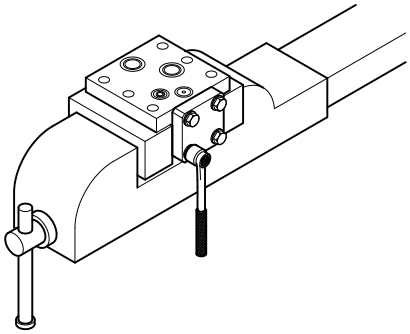
3) Accumulator Bolt

Model	HDB250		HDB300, HDB360, HDB450	
	Acc. Cover Bolt	Acc. Body Bolt	Acc. Cover Bolt	Acc. Body Bolt
Spec.	M18 x P1.5 x 50	M24 x P2.0 x 60	M20 x P2.0 x 55	M30 x P2.0 x 70
Part No.	013020-180504	013020-240604	013029-200554	013020-300700
Torque (Kg-m)	40	100	55	195

Model	HDB650, HDB800	
	Acc. Cover Bolt	Acc. Body Bolt
Spec.	M24 x P2.0 x 65	M39 x 3.0 x 90
Part No.	013020 - 240654	013020 - 390900
Torque (Kg-m)	110	190

6 Torque





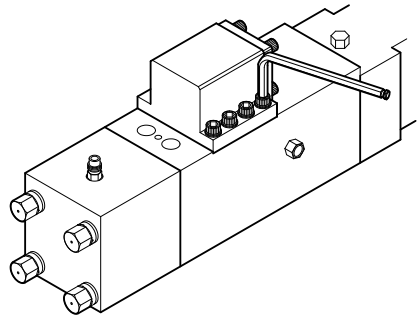
4) Valve Cap Bolt

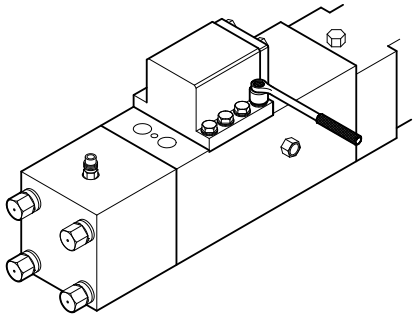
Model	HDB40	HDB50	HDB90	HDB140
Spec.	M12x30	M16xP1.5x40-30S	M16xP1.5x45-35S	M20xP1.5x45-35S
Part No.	013029-120304	013020-160404	013020-160454	013020-200454
Torque (Kg-m)	10	30	30	60

Model	HDB180	HDB210	HDB250	HDB300
Spec.	M20xP1.5x45-35S	M24xP2.0x50	M24xP2.0x55	M30xP2.0x65
Part No.	013020-200454	013036-240500	013036-240550	013036-300650
Torque (Kg-m)	60	60	60	120

Model	HDB360	HDB450	HDB650	HDB800
Spec.	M30xP2.0x65	M30xP2.0x65	M30XP2.0X70	M30XP2.0X70
Part No.	013036-300650	013036-300650	013036-300700	013036-300700
Torque (Kg-m)	120	120	120	120

6 Torque





5) Valve Case Bolt

Model	HDB40	HDB50	HDB70	HDB90	HDB140
Spec.	M12x40	M16xP1.5x40-30S	M16xP1.5x40-30S	M20xP1.5x50	M20xP1.5x55-50S
Part No.	013029-120404	013020-160404	013020-160404	013020-200504	013020-200554
Torque (Kg-m)	10	30	30	60	60

Model	HDB180	HDB210	HDB250	HDB300
Spec.	M20xP1.5x60-55S	M24xP2.0x60	M24xP2.0x65	M30xP2.0x80
Part No.	013020-200604	13036-240600	013036-240650	013036-300800
Torque (Kg-m)	60	60	60	120

Model	HDB360	HDB450	HDB650	HDB800
Spec.	M30xP2.0x80	M30xP2.0x80	M30xP2.0x80	M33XP3.5x90
Part No.	013036-300800	013036-300800	013036-300800	013036-330900
Torque (Kg-m)	120	120	120	130

7 Operation

CAUTION

Close the front screen or splinter protection on the driver's cab to prevent possible injury from flying rock splinters during operation.

During the operation, every person in the surrounding area, including the excavator driver, must wear ear protector and breathing protection.

The hydraulic breaker should be operated from the driver's seat and should not be put into operation until both the excavator and the breaker are in the correct position.

Stop the hydraulic breaker immediately if someone goes into the surrounding area, which is much larger for breaker operation than for excavator operation due to the risk of flying rock.

When working with a Hydraulic bleaker, operation of the excavator is governed by the excavator manufacturer's safety regulations.

Make sure all the adjustments are properly made, and use only the completely assembled breaker.

Do not operate while under the condition of any drugs and alcohol.

When exiting the carrier and mating maintenance and repairs, insure stable work condition and equipment should be lowered.

HDB Series Breaker Operation Method

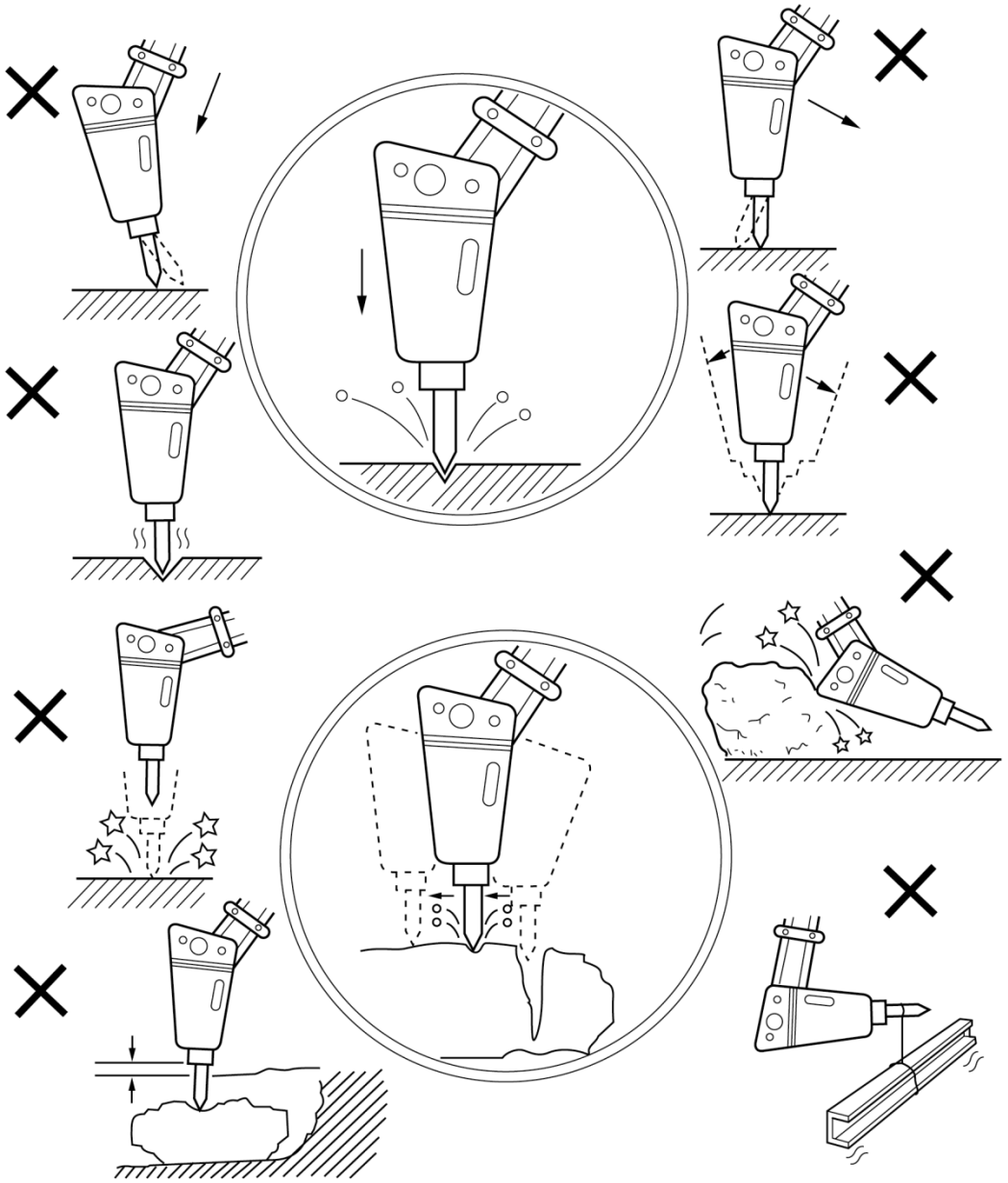


Fig. 7-1

1) Proper thrust

To break effectively, a proper thrust force has to be applied to the breaker. If a thrust is insufficient, the hammering energy of the piston will not be sufficient fo r breaking rocks. Then, the hammering force is transferred to the breaker body, arm and boom of the base machine, etc. to result in damage.

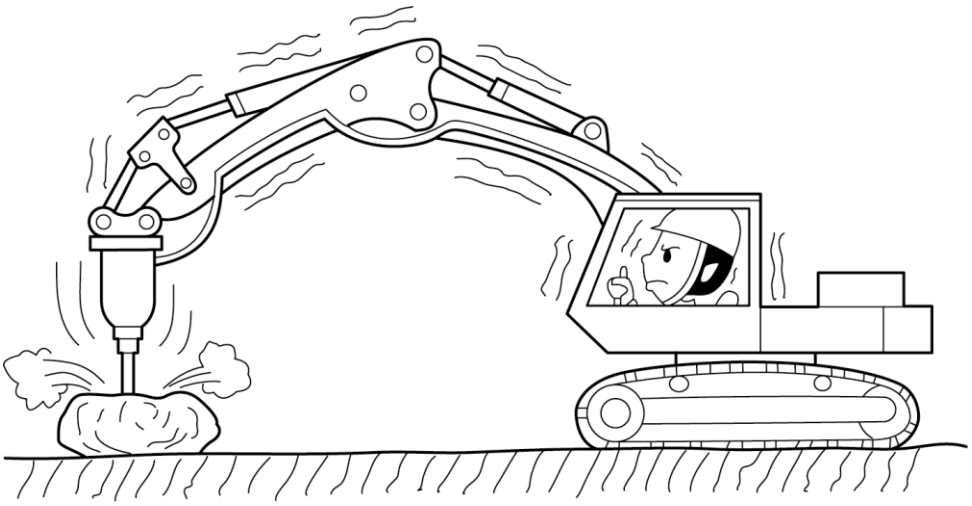


Fig. 7-2

On the other hand, if the thrust force is excessive or when breaking is performed with boom of the base machine raised, the machine may suddenly tilt toward th e moment, rocks are broken and the breaker body may violently hit against rocks to result in damage. If hammering is performed under such a condition, vibratio ns may also be transmitted to the tracks, therefore, hammering in such a manne r should be avoided to also protect the tracks.

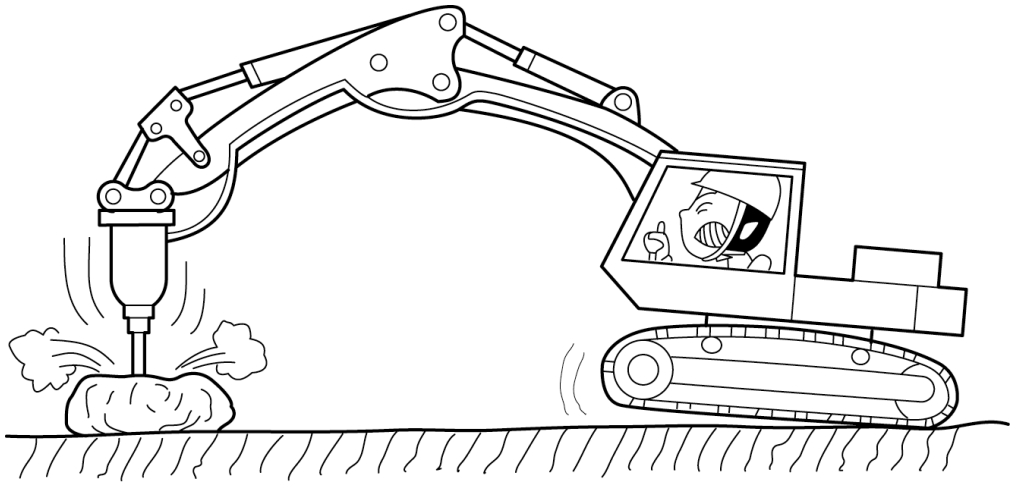


Fig. 7-3

Further, during hammering, always keep in mind of applying a proper thrust to th e breaker.

Do not hammer without proper applied thrust.

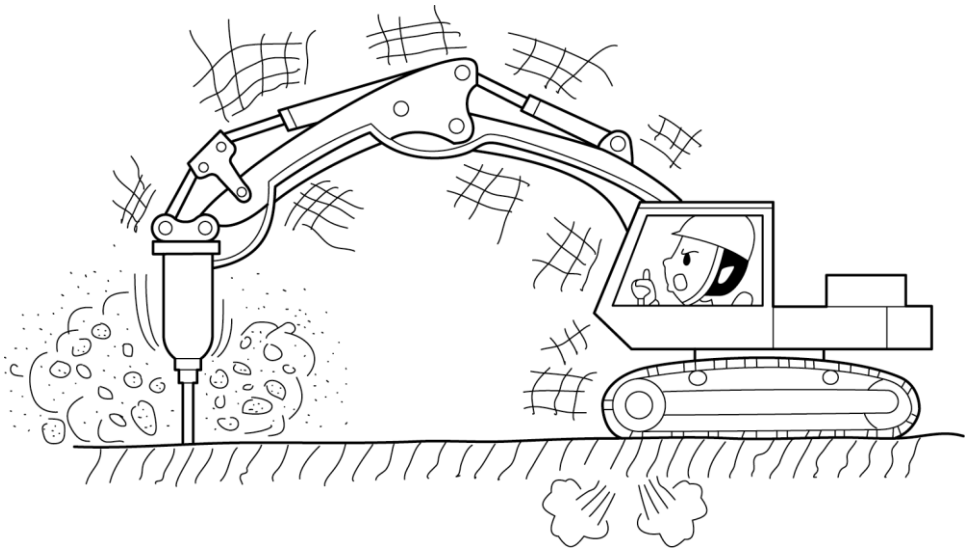


Fig. 7-4

2) Direction of thrust

Apply a thrust in a straight line with the tool. Place the tool on a rock wi th the hammering side as vertically as possible. If the hammering side is oblique, the tool may slip during hammering, causing the chisel and piston to break, or seized. When breaking, select the point of a rock on which hammering can perfo rm stably and fully stabilize the chisel to the hammer.

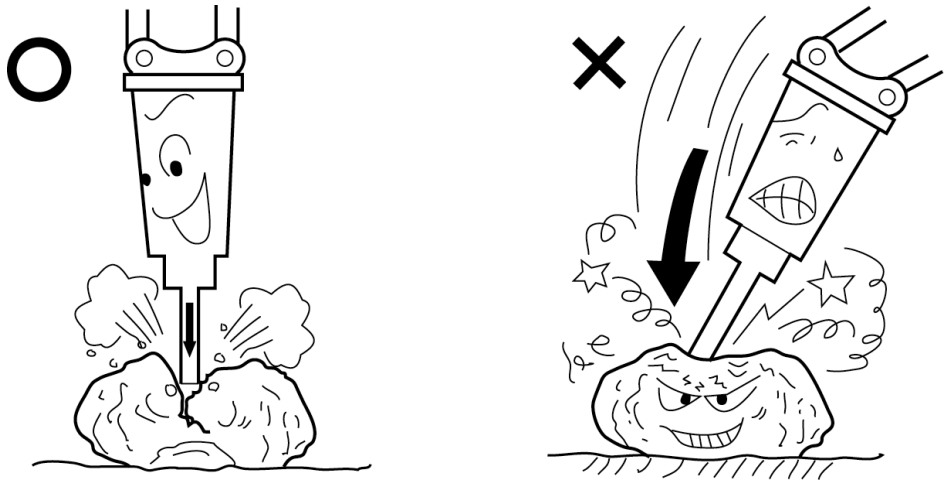


Fig. 7-5

3) Precaution for operation

The operator should pay attention to the following points during operation.

a) Stop the operation as soon as the hoses vibrate excessively.
Check to see if the high and low pressure hoses of the breaker vibrate exces si-vely.
If so, the accumulator may be defective and then contact with the service sh op appointed by us in your territory for disassembly and repair. Further check oil leakage at the hose fitting points, if oil oozes, re-tighten them.
Visually inspect whether there is a surplus of tool appearance, during operati on as illustrated in Fig. 7-6.
If not, the tool must be seized in the front head.
Disassemble the front head, and inspect the components and repair or repla ce defective parts.

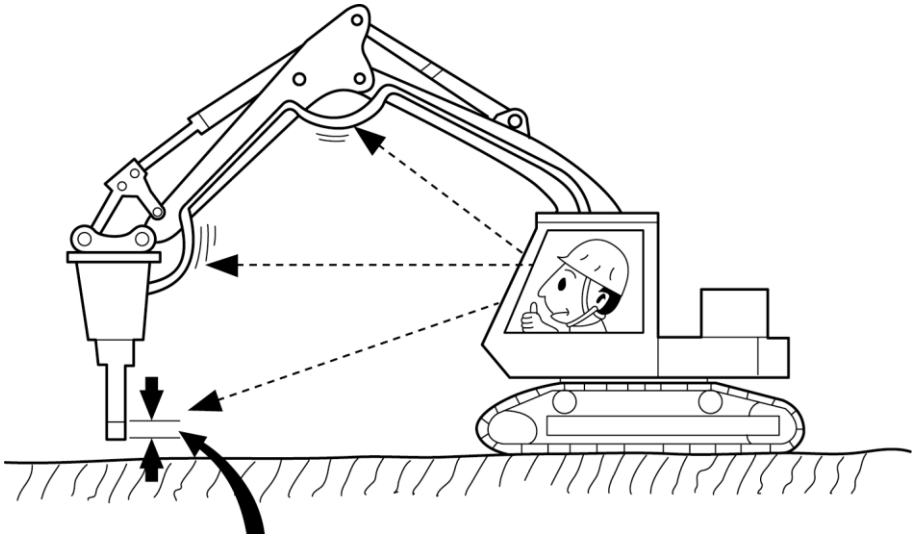


Fig. 7-6

b) Stopping (Avoid idle hammering to the utmost)
As soon as rocks are broken, stop hammering.
If idle hammering is continued, the accumulator may be damaged, the bolts l oosened or broken and, furthermore, the base machine may also be affected. When a proper thrust is not applied to the breaker or the chisel used as a le ver, the state of idle hammering will be brought. (In idle hammering, the ham mering sound changes.)

c) Do not move rocks.
As shown on Fig. 7-7 and Fig. 7-8, do not roil or throw down a rock with t he end of the chisel or the side of the bracket using the oil pressure for the base machine boom, arm, bucket, swing or traveling because the bolts of br eaker may be broken, the bracket damaged, the chisel broken or scuffed, an d the boom or arm damaged.
Avoid moving rocks. Especially, never travel the machine with the tool in a rock.

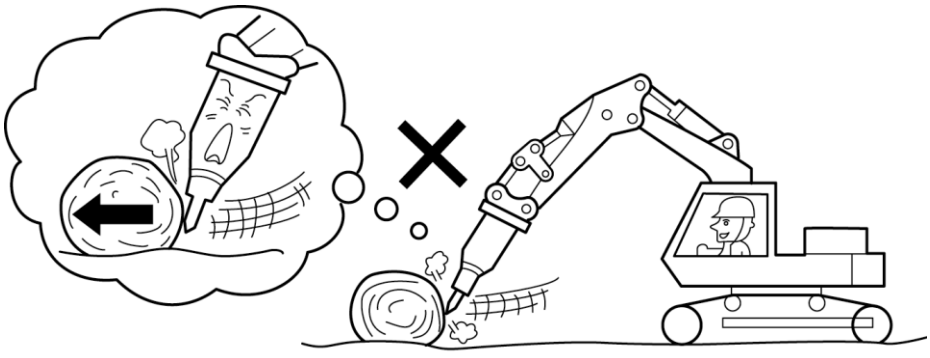


Fig. 7-7

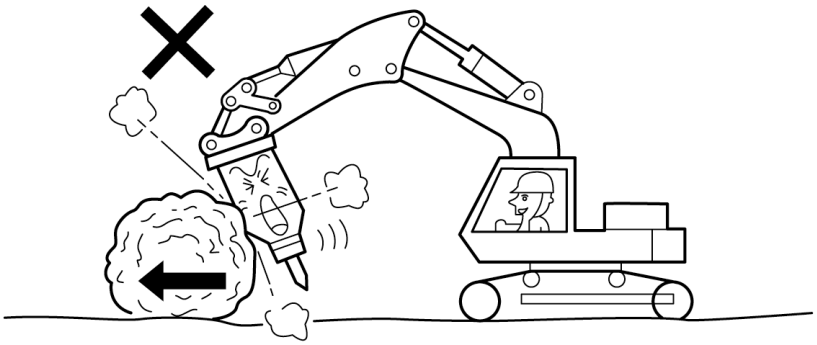


Fig. 7-8

d) Do not use the tool as a lever.

When a rock is broken by using the tool as a lever as showed, the bolts and chisel may be broken.

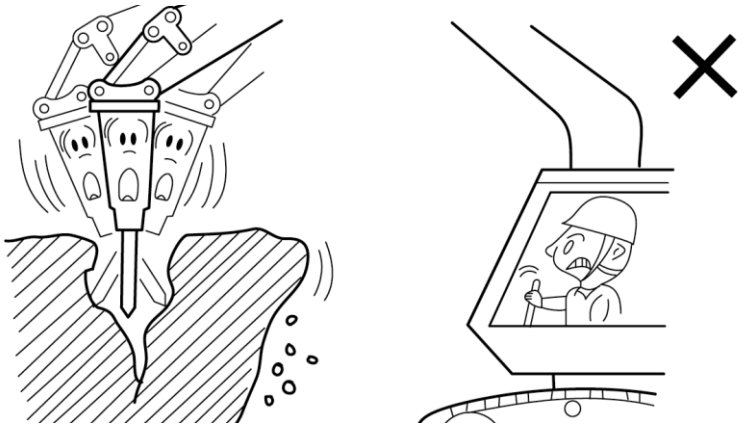


Fig. 7-9

e) Do not continue to hammer for more than 30 seconds on a same point.

When rocks are hard, do not hammer the same place for such a long time t o exceed one minute but change the point to be hammered.

The long time hammering raises the oil temperature to result in the damaged accumulator and cause the chisel to be excessively worn.

f) On a hard, large rock, start breaking at the end point.
Beginning to hammer at the crack or the end will enable even a big rock to be broken comparatively easily.

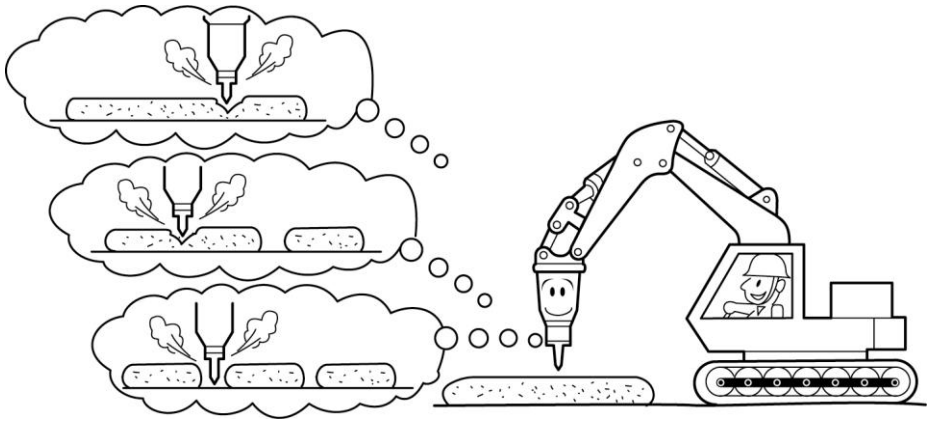


Fig. 7-10

g) Operate the breaker at a proper engine speed.
Break rocks at the specified engine speed. Raising the engine speed more th an necessary does not increase the hammering force but raises the oil tempe rature to result in the damaged equipment.

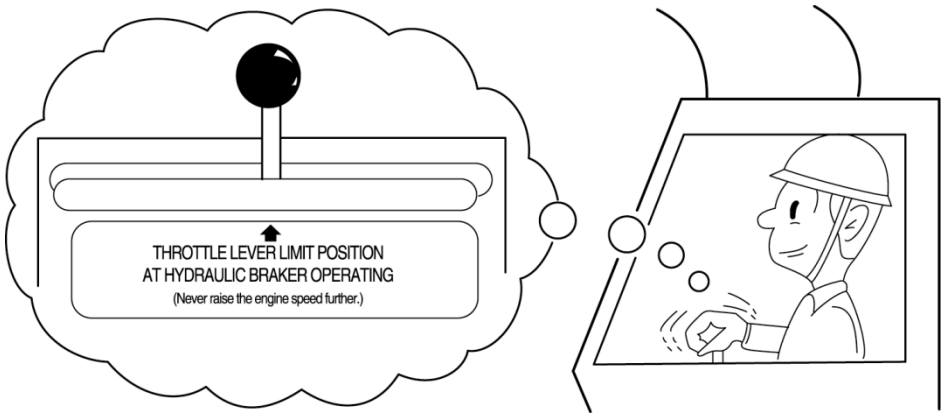


Fig. 7-11

h) Do not operate the breaker in water and mud.

Do not operate the breaker in water and mud. If not, the piston or the similar components may be rusted to result in the permanently damaged breaker. In case of operation in or under the water, buy underwater operation kit separately.

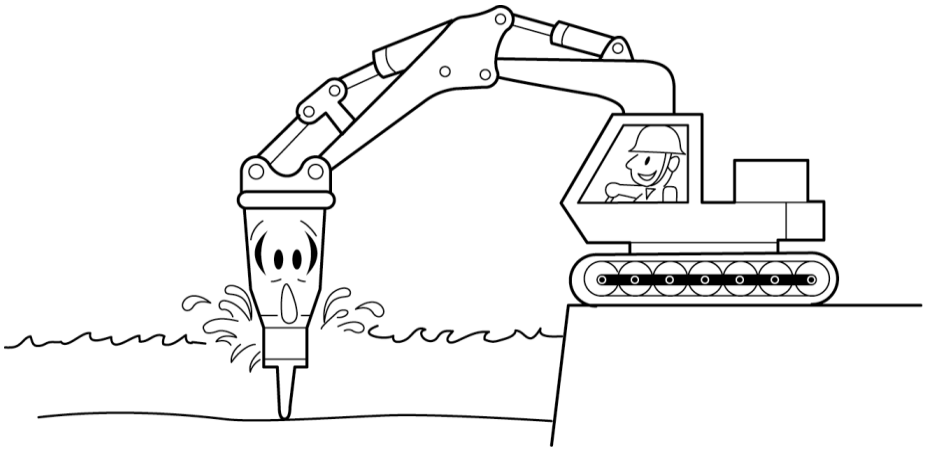


Fig. 7-12

i) Do not allow the breaker to fall to a rock.

An excessive force may be applied to the breaker or the base machine, and so this will cause each part of the base machine to be damaged.

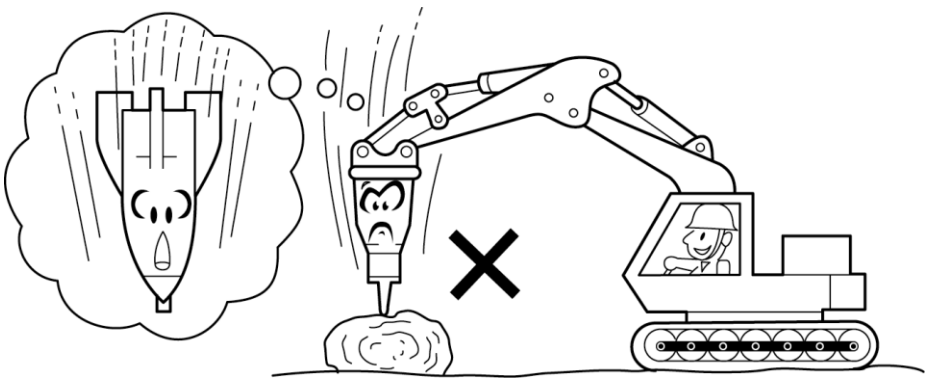


Fig. 7-13

j) Do not hammer with the cylinders extended to the end of stroke.

When a rock is broken with base machine cylinder moved to the end, (the cy linder extended or retracted fully), the cylinder and each part of the base ma chine may be damaged.

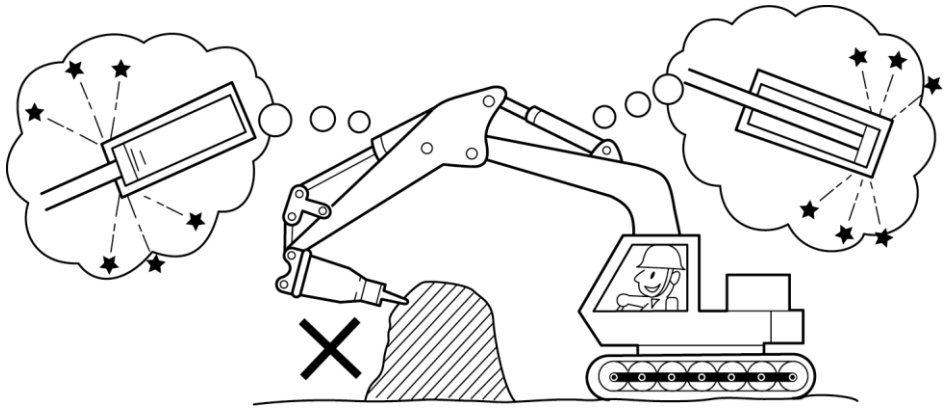


Fig. 7-14

k) Do not sling an object with the breaker

Do not install a wire to the breaker, bracket and chisel for slinging an object, The breaker, bracket and chisel may be damaged, further, such an action is very dangerous in operation.

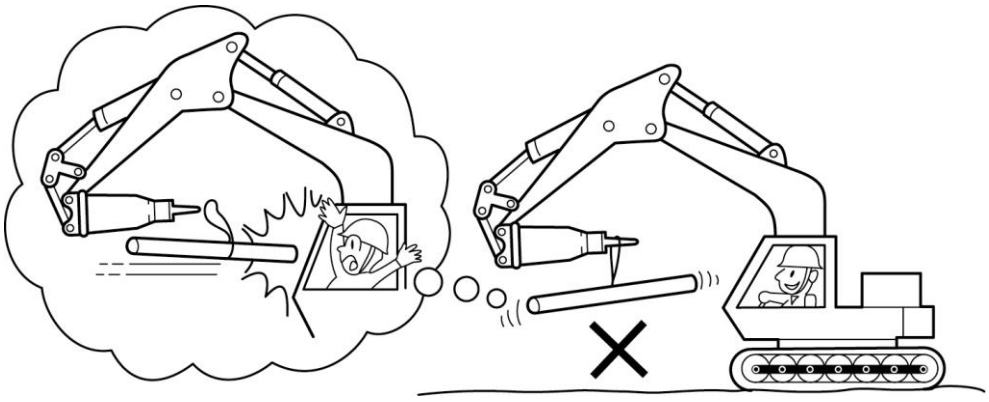


Fig. 7-15

l) The boom of the excavator or arm can be damaged if not operated correctly. Please be aware of the location of the Breaker's chisel while operating the breaker.

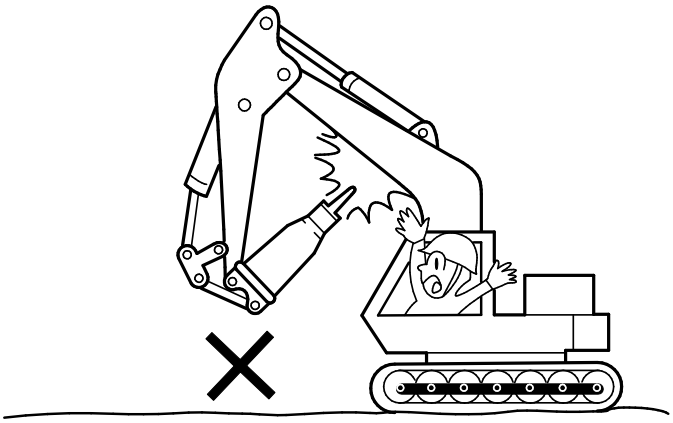


Fig. 7-16

m) Especially, in winter, warm up the base machine engine from five to twenty minutes and then operate the breaker. Warm up the engine according to 'Inst ruction Book for Base Machine'.
If the breaking operation is done at low oil temperature without warming up t he engine, the breaker parts such as the piston and seals may be damaged.

4) Re-tightening the bolts and nuts.

As the breaker, side bolts, nuts, pipe and hose fittings may be loosened due to vibration, check for looseness before starting the operation and after finishing th e operation.
When those parts begin loosening, re-tighten to the specified torque referring to chapter 6 for the torque values.

5) Repairing the tool

When a tool is used for many hours, it may be worn or got burs. In such a case, remove them with a grinder.
Further, when the chisel end is worn, the chisel may also slip easily.
Therefore, it is advisable to grind smooth. However, as the chisel is repaired ma ny times, the hardened layer is removed and the chisel easily worn.
In such a case, replace with new chisel.

6) Advance

When you start breaking a rock, you should select a point on which the rock will be broken away at least in 30 seconds.
If the operating will not be in that case, the advance must be either reduced or r estarted at a different point.

7) Angle of operation

Chisel should always be at right-angle to the surface of the material.
If not, the hydraulic breaker wears more quickly, eventually leading to permanent damage.

8) Breaker rocking

Gently rocking the hydraulic breaker backward and forward (max.5°) allows dust to escape, but it will dampen the percussive power of the chisel.
However, rocking at angles greater than 5° may cause bending strain resulting in damage to chisel and hydraulic breaker.

9) Never use as a crowbar.

Using the hydraulic breaker as a crowbar may cause chisel breakage.

10) Never drive chisel into the material

If the advance is too much and the breaker is not rocked to release the dust, chisel will be driven into the material, causing the tip to glow red hot and become soft.

11) Never hack with the breaker and chisel

12) Never lift or transport loads with the hydraulic breaker.

13) Never use the hydraulic breaker in or under water.

If water penetrates the percussion chamber of the hydraulic breaker, a pressure wave builds up with each stroke which will damage the stripper and the seals of the breaker and cause the lower part of the piston to rust.
For underwater applications, even if only the lower breaker part is submerged, specially adapted breaker models must be used.

Please note :

Breaker can be adapted for underwater use. When needed, please contact HYUNDAI dealers or HYUNDAI service center.

14) Working in high-temperature conditions

Check the oil temperature constantly to ensure it does not exceed 80℃.
If higher temperature are measured in the tank, an oil cooler must be fitted.
Only use hydraulic oils with adequate viscosity.
In summer and in countries with a tropical climate, the minimum requirement is a hydraulic oil of type H-LP 68.

15) Working in low-temperature conditions

There are no special regulations for temperature down 20℃. At temperatures below minus 20℃, the hydraulic oil must be warmed up before operating.
This is achieved by

- ▣ Starting up the excavator motor
- ▣ Moving the boom

This raises the oil temperature. Once it has risen above 0℃, the hydraulic breaker can be started up. Leave the motor and the pumps of the excavator running during breaker in work.

7 Operation

Please note :

The hydraulic breaker and excavator do not begin to perform at full capacity until an operating temperature has been reached at 60℃.

IMPORTANT

When working in temperature conditions lower than 20℃ below zero, the hydraulic breaker should not be put into situation Which the hydraulic Oil is Still cold.
Operating the breaker with cold hydraulic oil may cause the seats in the hydraulic breaker to be broken and the diaphragm in the high-pressure accumulator to be torn. Observe the excavator manufacturer's regulations.

16) Care and maintenance schedule

During the shift	Daily	Weekly	Every 2 weeks	As required
Lubricate the chisel every 2 hours	Tighten screw connections (during first 50 operating hour)	Tighten screw connections	Check chisel for wear	Replace bent and squashed pipes
Check lubricating nipple is OK	Check hydraulic lines for leaks	Check adapter pins for wear	Check lower wear bush for wear	Replace any damaged hoses
	Check pipe clamps still fit correctly	Check locking bolts on retaining bars for tight fit	Check breaker bracket for wear	
	Check adapter and bracket	Check impact surface of chisel for fracture		
	Check gas pressure	Check chisel for burrs		
		Check retaining bars for burrs		
		Check impact surface of piston for dents etc.		
		Check for oil leaks in the breaker and in the machine.		

a) Check for loose bolts and nuts
As the HDB Series breaker is a percussion equipment, the bolts and nuts ca n easily become loosened, which is the cause of severe damage to several c omponent parts.

Thus, check torque periodically on the basis of the table shown in chapter 7.

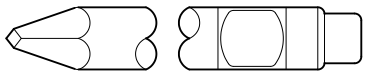
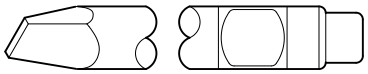
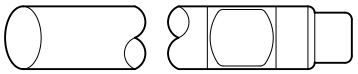
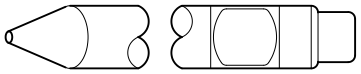
Note : It is essential to check all bolts and nuts after the first 10−15 hours of a ctual operation.

b) Check oil quantity in tank and keep hydraulic oil clean.
Make sure there is a sufficient amount of oil in the tank at all times. If the h ydraulic oil is dirty, the valve and piston will be operated improperly.

− Periods of change Hydraulic Oil : every 600 hrs.(*1)
Line oil filter : every 100 hrs.(*2)

*1 : **Conventional hydraulic oil**
*2 : **Hyundai genuine long life hydraulic oil**

17) Type of chisel and major application

Type of chisel	Shape	Applications
Moil point		Multipurpose applications, including breaking of extra hard rock, hard stone, and reinforced concrete, as well as excavation of bedrock, etc.
Wedge point		Concrete breaking, excavation of bed rock, operation on the face of slope, excavation of ditches, etc.
Blunt chisel		Secondary breaking in quarries, boulder breaking, concrete breaking and slab breaking, etc.
Conical point		Multipurpose applications, including breaking of extra hard rock, hard stone and reinforced concrete, as well as excavation of bedrock, etc.

18) Lubrication of chisel

Insufficient lubrication to the chisel causes the short life of the front cover, chise l pins and chisel.

At the end of every 2 hours of actual operation, lubricate the chisel with the follo wing amount of grease using a grease gun.

Before greasing, firmly press chisel into front head. When the breaker is equippe d with a new chisel, apply grease first and then mount chisel.

CAUTION

Only nitrogen should be used in the gas chamber.
When putting the hydraulic breaker into operation for the first time the tests and settin gs described in this section must first be made.

Model	HDB10 HDB20 HDB40 HDB50 HDB70 HDB90	HDB140 HDB180	HDB210 HDB250	HDB300 HDB360	HDB450	HDB650 HDB800
Grease gun application (No. of Pumps)	20	25	30	35	40	45

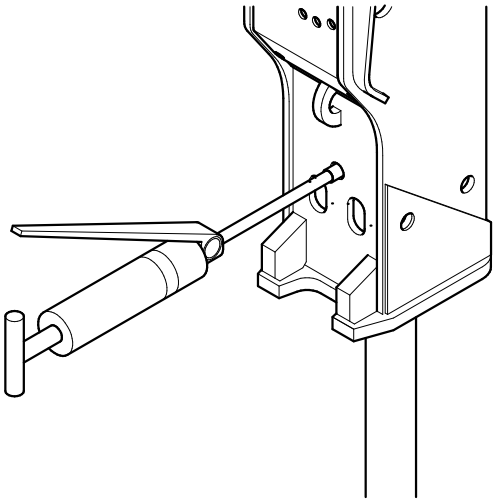


Fig. 7-17

Hydraulic oils and grease recommended for hydraulic breaker.

Grade / Maker	Hydraulic oil		Grease
	In hot weather	In cold weather	NLGI No.2
	ISO VG 68	ISO VG 46	
Shell	Shell Tellus oil 68	Shell Telius oil 46	Shell Alvania EP2
Esso	Nuto H68	Nuto H46	Lithian EP2
Mobil	Mobil DET26	Mobil DTE 25	Mobilplex 48

Note : When using oil extremely cold or hot weather, it must be selected according to the application. Contact us or the service shop.

IMPORTANT

For preference, HYUNDAI chisel paste should used for lubrication, but the minimum req uirement is a high-performance friction bearing grease with molybdenum sulphide.

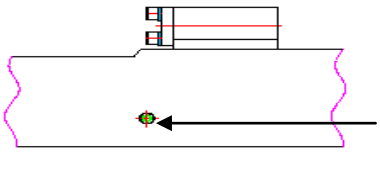
CAUTION

Chisel should only be fitted in the way described here.
Never use your fingers to check the alignment of the recesses in chisel to the oblong holes for the locking bars.
Always wear protective glasses when fitting or removing chisel since metal chips may fl y off when the pins are hammered out.

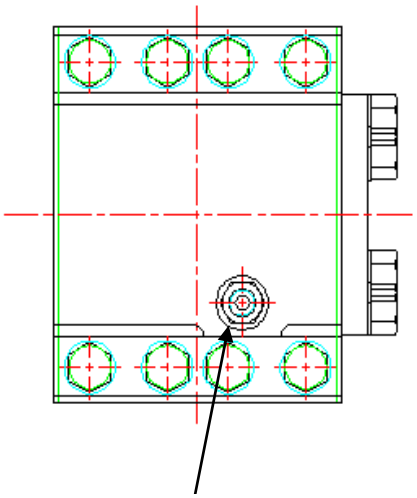
19) 2 Stroke selector system (TPC)

HDB series provides the 2 STAGE STROKE selector as standard for HDB50 to H DB450 and the stroke can be chosen as the manual via selector.

The standard stroke and short stroke can be chosen according to job site.



2 stroke selector
(HDB50 ~ HDB180)



2 stroke selector
(HDB210 ~ HDB450)

2 stroke selector
(HDB650~ HDB650)

Stroke setting instruction

1) Long Stroke : lock the selector adjuster via clockwise (right direction). Factory standard setting as lock status.(turn 3 rounds back after unlock)
2) Short Stroke : unlock the selector adjuster 3 rounds via anticlock wise (left direction).

20) Auto control valve (ABF) : HDB50, HDB70, HDB90, HDB140, HDB180, HDB210, HDB230, HDB250, HDB300, HDB360, HDB450

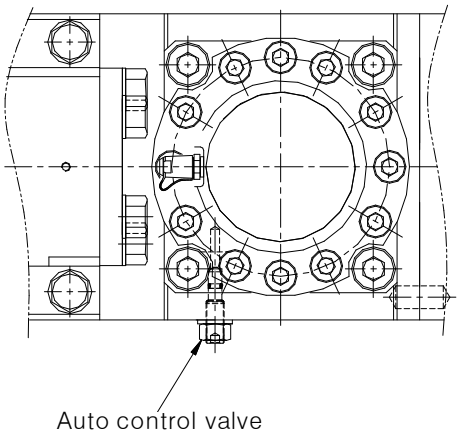
Auto control valve is located on side of cylinder and can be used to control the power supply to the anti blank firing.

When the valve is completely turned off, anti blank firing is not operational.

To operate anti blank firing, lock nut of valve is turned counter clockwise, 3 tim es around (HDB360, HDB450 : 5 times) from the closed position.

And then tighten the lock nut.

Anti blank firing is set up to operate at the time of delivery from HYUNDAI.



WARNING

Do not attempt to assemble or disassemble the main body before reading through this chapter of the manual.

8 Disassembling & Assembling

8.1 Disassembling

1) Put the body on wooden supports of the equivalent size. => Fig. 8-1.

2) Release N_2 gas from the head cap. If not released, it would be very dangerous. => Fig. 8-2.

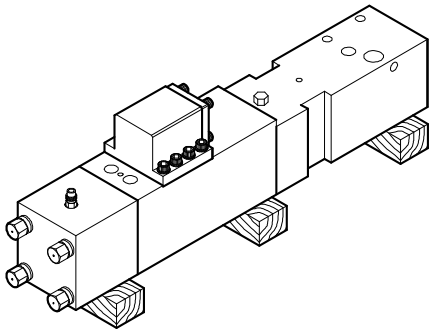


Fig. 8-1

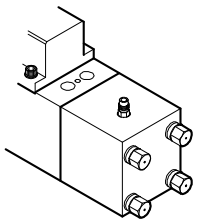


Fig. 8-2

3) Disassemble nuts of through bolts from the main body (Refer to disassembling o rder in Fig. 8-3).

4) Disassemble head cap using hoist or chain block. => Fig. 8-4.

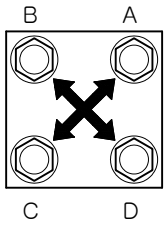
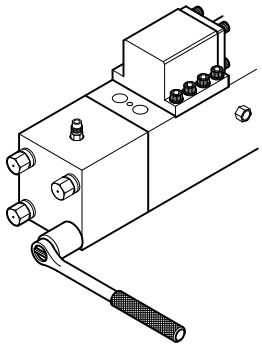


Fig. 8-3



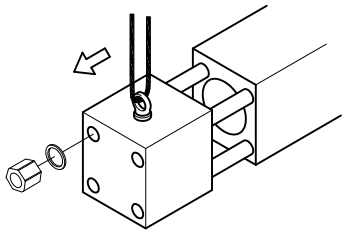


Fig. 8-4

5) Disassemble cylinder with eye bolt using chain block or hoist to the arrowed/pointed direction. => Fig. 8-5.

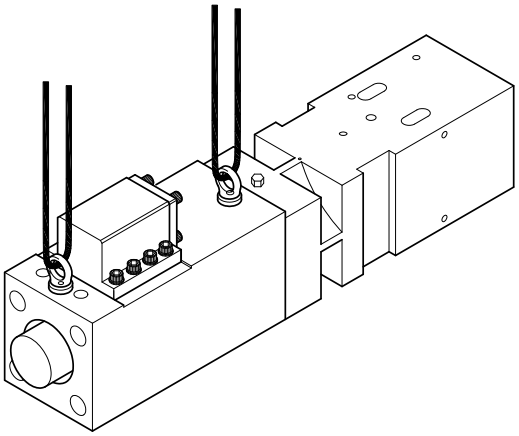


Fig. 8-5

6) Disassemble piston with eye bolt toward upper vertically, using chain block or hoist to the arrowed/pointed direction. => Fig. 8-6.

7) Loose and disassemble the through bolt from front head in screwing out the quadrangle part with bottom nut by using HDB standard spanner. => Fig. 8-7.

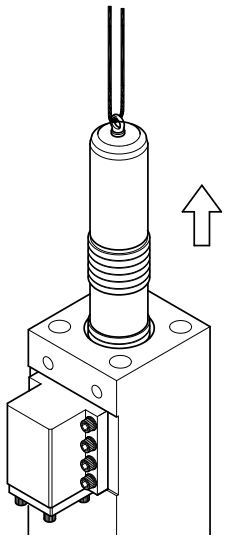


Fig. 8-6

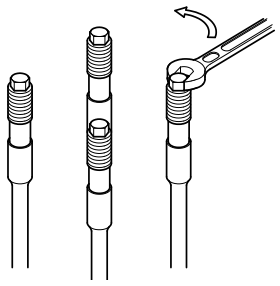
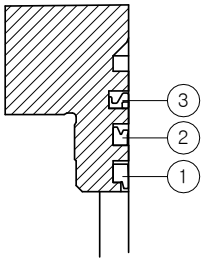
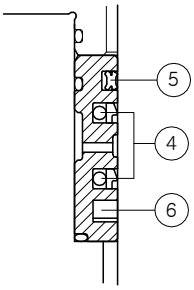


Fig. 8-7

8) Removal of seals & rings

Using a screw driver carefully, remove dust seal, u-packing, buffer ring, step seal and quad-ring from the lower section of the cylinder and cylinder bush.

Please note that once seals and rings are removed, they should not be used again.

Model	Cylinder	Cylinder Bush	Part Name
HDB10 HDB20 HDB40 HDB50 HDB70 HDB90 HDB140 HDB180 HDB210 HDB250 HDB300 HDB360 HDB450 HDB650 HDB800			① Dust Seal ② U-Packing ③ Buffering Ring Set (Buffering + Back up ring) ④ Step Seal ⑤ Gas ring ⑥ Buffer Seal (HDB210 ~HDB800)

9) Disassembly of control valve

Clamp control valve case in a vice and loosen hex-head bolts of valve cap.

Then, remove valve cap by using the tap for disassembly.

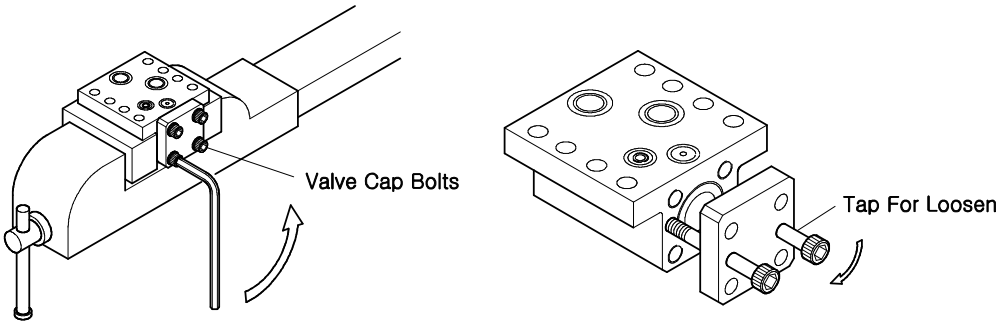


Fig. 8-8

Valve can be seen after the removal of valve cap.
In the absence of seizure, valve can be withdrawn with ease.

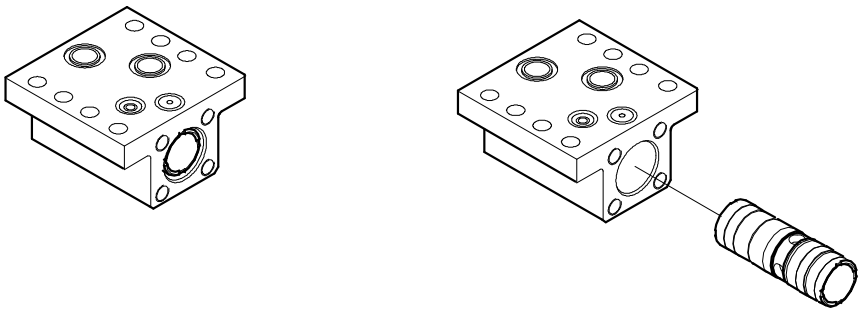


Fig. 8-9

10) Inspection

a) Seals

While seals are still in their original position, check for scratches and deform ation.

Do not remove to check. Even a small scratch will lead to oil leakage.

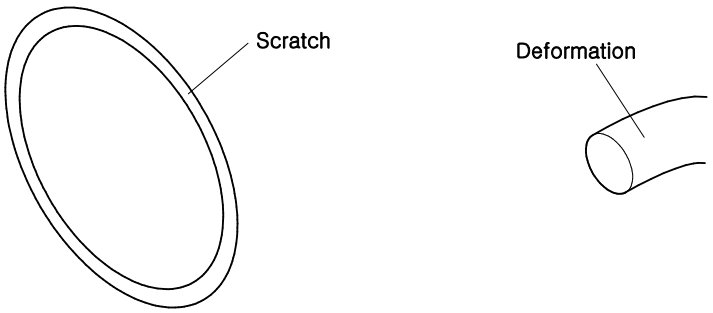


Fig. 8-10

Note : Change all seals every 800 working hours.

b) Control valve

Inspect valve for signs of seizure or scuffing.
If marks left by the seizure are even small, polish by using a fine oil stone.

The corresponding marks on the mating side of box or cap should be remov ed in the same manner.

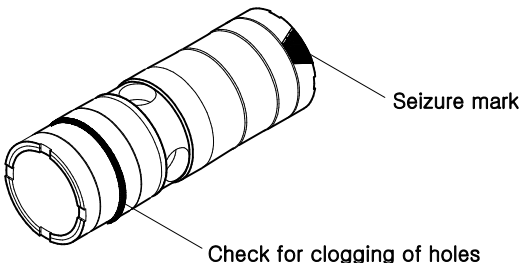


Fig. 8-11

If seizure etc., are excessive, replace immediately with a new control valve as sembly.

c) Piston

Periodically the lower end of piston deformation must be checked.

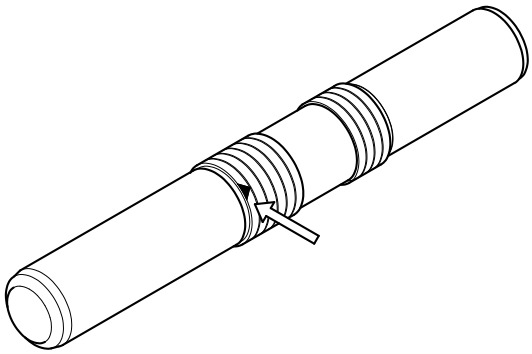


Fig. 8-12

Check piston for seizure marks and scuffing.

If such marks are small and on the section with the largest diameter, remove by polishing with an oil stone.
Corresponding marks on the mating part should also be treated in the same manner.

8.2 Assembling

1) Seal assembly

Using a brash, lubricating oil should be applied to seal grooves when assembling seals.

CAUTION

Much care should be taken when assembling seals.

2) Assembly of chisel bush and chisel holder bush.

a) Disassemble stop pin.

b) Disassemble front cover (Sliding).

※ Disassemble front cover (Tight) using welding machine.

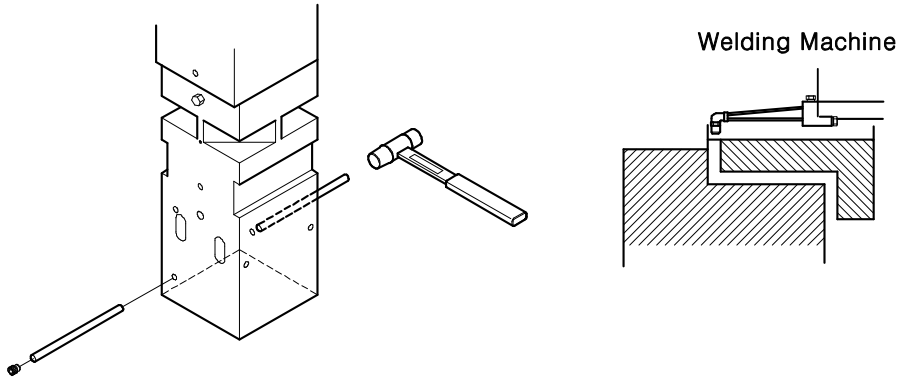


Fig. 8-13

c) Set chisel holder in front cover.

d) Assemble stop pin

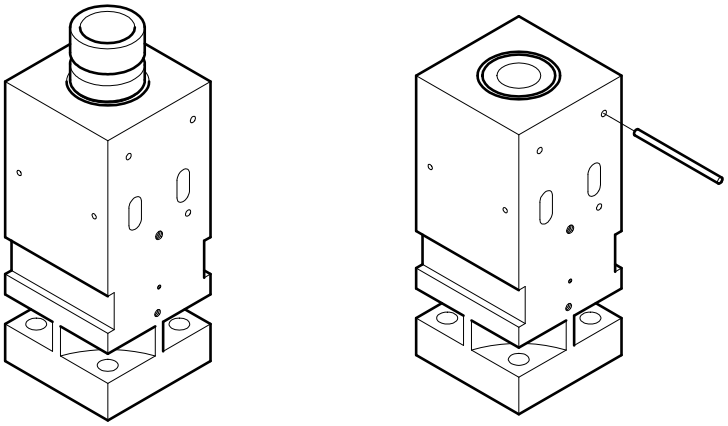


Fig. 8-14

3) Assembly of control valve

a) Wash parts including seals thoroughly with new cleansing oil.

After washing, flush off the cleansing oil with clean compressed air to dry it.

Dust and other foreign matter will originate seizure and scratches to give serious damage to the breaker.

b) Assemble valve into valve box, with the direction as shown under.

c) Apply clean hydraulic oil to the grooves for o-ring on the valve cap, and then insert o-ring and back up ring, and assemble into valve box.
Due to light press-fit, tighten 4 bolts uniformly to prevent buffing.

d) Clamp valve box in a vice and tighten bolts according to their specified torque referring to **chapter 6.**

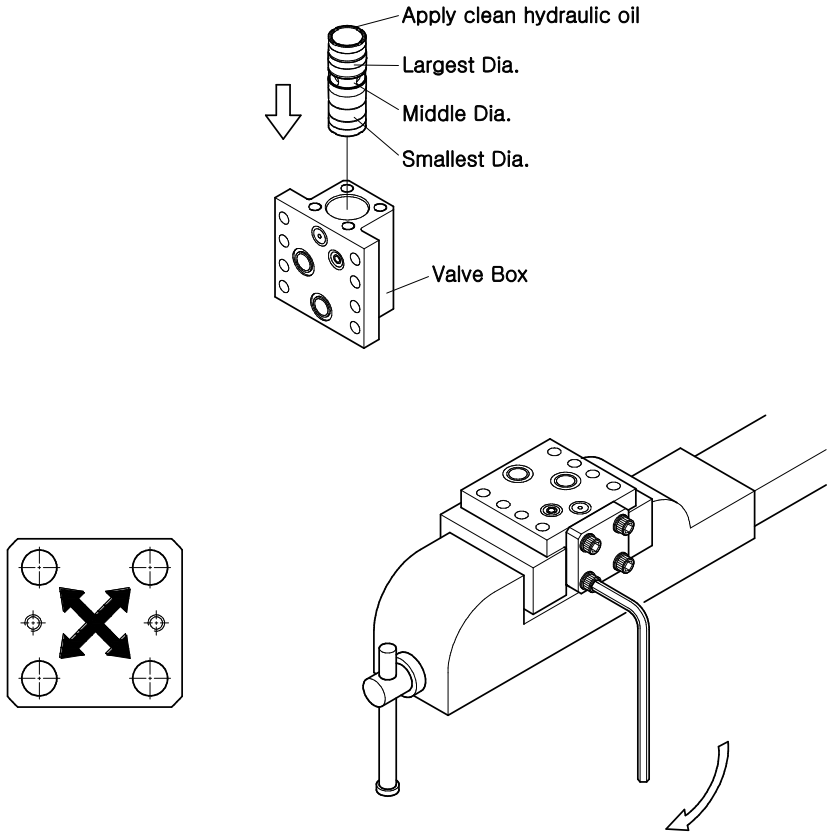


Fig. 8-15

4) General assembly.

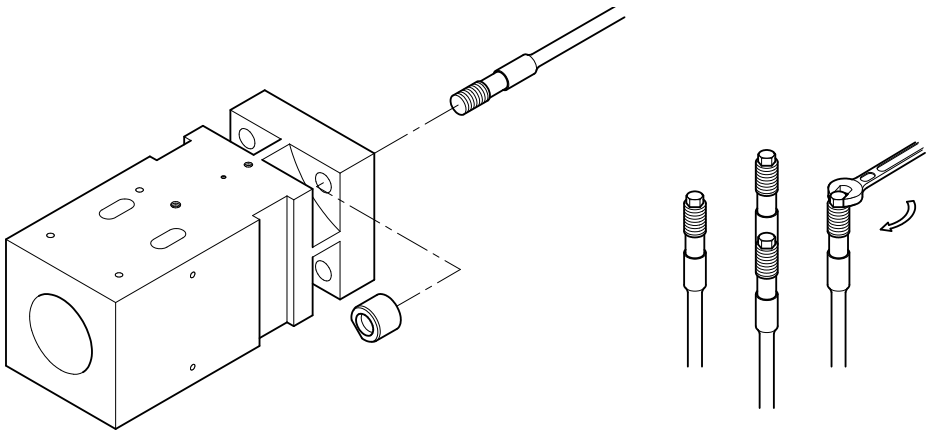
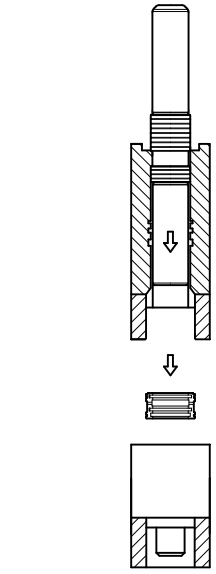
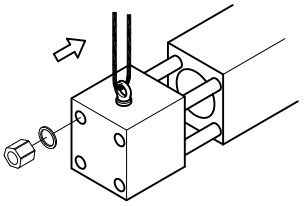


Fig. 8-16

a) Assemble through bolts to front head with bott om nut.
b) Assemble cylinder.
c) Lubricate piston thoroughly and slowly assemb le piston and packing bush. Confirm the direc tion of seals of cylinder and cylinder bush.
d) Using a rubber hammer, assemble the cylinder bush into the cylinder.
e) Assemble front cover.
f) Tighten through bolt nuts to their specified tor que.
g) Assemble removed gas valve body and pour t he hydraulic oil into cushion chamber. (50~15 0cc)
h) Tighten gas valve body to its specified torque.
i) Assemble hose adapter.
IN – with orifice
OUT – without orifice





5) Disassembling bracket

a) Remove bracket pins.
b) Put breaker down so that the side bolt nuts are facing up.
c) Loosen and remove the side bolt nuts.
d) Lift the upper plate up and remove.
e) Remove breaker body from the lower plate.
To assemble bracket, perform the above procedure in the reverse manner.
Precaution must be taken to fit the bracket plates into the key grooves.

Note : Refer to the torque table on chapter 6 for proper nut settings.

6) Replacement of Tool

a) Remove stop pin with steel bar.

b) Disassemble chisel pin, at this time be careful of sudden falling down.

c) Put out chisel with care not to fall.

d) When disassembling or assembling, please refer to chapter 6 for torque of bolts.

9.1 Breaker Lifting Point

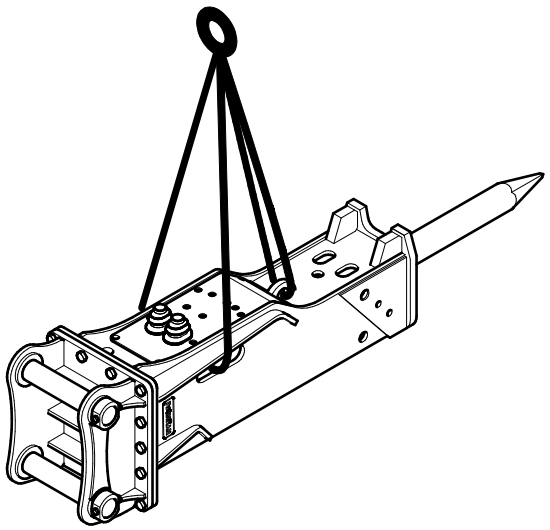


Fig. 9-1

1) Breaker Lifting Point

Model	Weight(Kg)	Allowed load of Lifting Part(Kg)
HDB10	80	220
HDB20	116	220
HDB40	210	1550
HDB50	300	2640
HDB70	430	3200
HDB90	550	5820
HDB140	900	7680
HDB180	1300	12800
HDB210	1800	12800
HDB250	2200	12800
HDB300	2750	12800
HDB360	2830	12800
HDB450	3700	14900
HDB650	4100	21000
HDB800	5900	21000

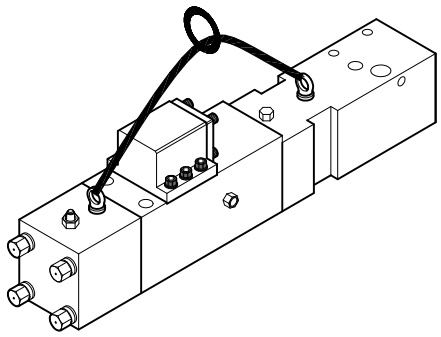


Fig. 9-2

2) Suitable Eye Bolt for Breaker main Body

Model	Weight(Kg)	Specification	Allowed load (Kg)
HDB10	55	M12	220
HDB20	65	M12	220
HDB40	110	M12	220
HDB50	180	M16	450
HDB70	243	M16	450
HDB90	280	M16	450
HDB140	520	M20	630
HDB180	650	M24	950
HDB210	1010	M30	1500
HDB250	1150	M30	1500
HDB300	1400	M30	1500
HDB360	1400	M30	1500
HDB450	1630	M36	2300

9.2 Installation into excavator

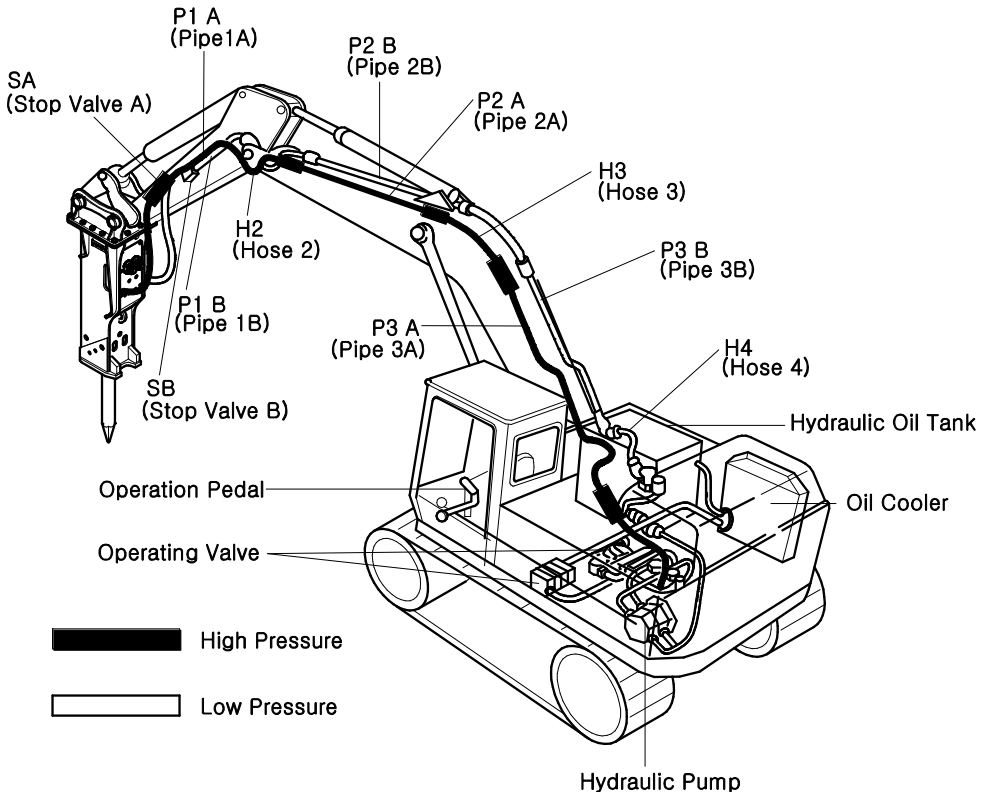


Fig. 9-3

- Put the breaker on wooden square bars laid on the flatted ground.

- Set the nitrogen gas pressure in head cap of breaker in accordance with the specific value of the breaker.

- Please refer to chapter 10 for the specific values.
  When necessary, please consult with our A/S person or authorized personnel.

- In case of the breaker with accumulator, set the gas pressure in accumulator at 52Kgf/cm^2.
  (HDB250, HDB300, HDB360, HDB450, HDB650, HDB800)

- Adjust relief valve in order to control the setting pressure for breaker after clo sing stop valve of excavator.

  Please refer to chapter 2 to set pressure values.

- If excavator does not have a relief valve for breaker, please attach it to equi pment and control the setting pressure.

- Stick to excavator with two bracket pin, fasten bolt and nut together with sto p ring.
  During assembling, be careful of keeping the straightness of both pin bush a nd hole of excavator using hand signals.

- Open the union cap of stop valve and connect hoses of breaker.

- At this time, the residuary oil in pipes is subject to flow out, so prepare an e mpty box to take the oil.

- Open stop valve and operate breaker after warming up enough.

- Check the operating pressure and number of blow, if less blows, check the f low rate.

- Check oil leakage from connecting area such as pipes, hoses and fittings.
  If there is leakage, please re-tighten or replace seals.

- Pay attention to grease injection into chisel, if needed, inject again.

- If the excavator has quick link system, please stick a breaker to excavator in accordance with installation method of link maker.

- After completing all of the above, please fill in the delivery report to send us.

- When dismounting, the procedures are reversal of the method of assembly.

9.3 HYUNDAI Excavator Breaker Mode & User Mode Setting

HYUNDAI Breaker Model	HYUNDAI Excavator		
	Model	ATTACH TOOL	Remarks
		Max Flow(lpm)	
HDB140	R140LC-9	100	
HDB140	R140W-9	100	
HDB140	R145CR-9	100	
HDB180	R160LC-9	130	
HDB180	R170W-9	130	
HDB180	R180LC-9	130	
HDB210	R210W-9	143	
HDB210	R220LC-9S	170	
HDB210	R210LC-9	170	
HDB250	R250LC-9	170	
HDB250	R260LC-9S	180	
HDB300	R290LC-9	214	
HDB300	R300LC-9S	220	
HDB300	R320LC-9	230	
HDB360	R330LC-9S	230	
HDB360	R380LC-9	245	
HDB450	R480LC-9	300	
HDB650	R520LC-9	300	
HDB800	R800LC-9	420	

9.4 Installation precaution

When the bucket and breaker operation are performed alternately, the hydraulic breaker is connected to the base machine with the two hydraulic hoses and two pins, therefore the bucket and breaker can easily be replaced by each other.
However as the hydraulic circuit is easily apt to be damaged by contamination, remove and install to the following procedures with care.

1) Select a level ground where it is free from mud, dust and dirt. A service shop is most recommended.
   After moving the base machine to a proper place, stop the engine and turn off the main switch.
   Further, if the hydraulic tank of base machine may be pressurized, bleed pressurized air from the oil tank. At this time, the base machine is positioned as shown Fig. 9-4, the breaker and bucket can easily be replaced.

2) Turn the stop valve installed to the end of the arm 90° to prevent hydraulic oil from flowing out. See Fig. 9-5

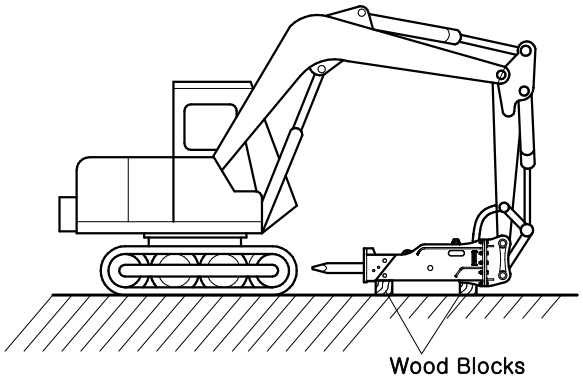


Fig. 9-4

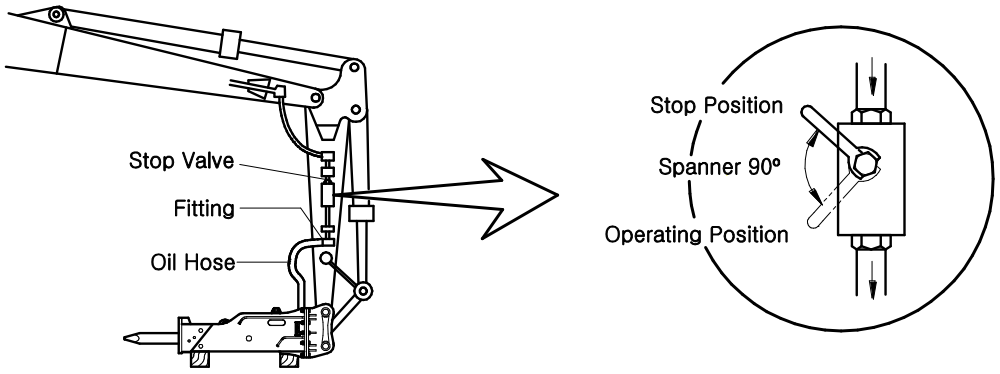


Fig. 9-5

3) Loosen the hydraulic hose fittings on the arm side.
At this time, as a small amount of oil flows out, collect it in an empty container.

4) To prevent mud, dust and dirt from entering the oil hoses and fittings, install an d tighten union cap and 60° elbow adapter provided for this purpose. Then, to p revent the hoses from being covered with mud, put them together with a wire or the like.
The followings are for HDB210.

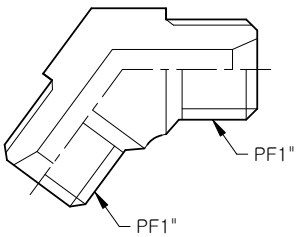


Fig. 9-6

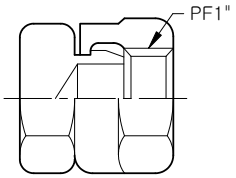


Fig. 9-7

This adapter is used for connecting low pressure hose and high pressure hose.
Plug the fittings on the arm side with this cap to keep the dust not to enter the fittings when the bucket is working.

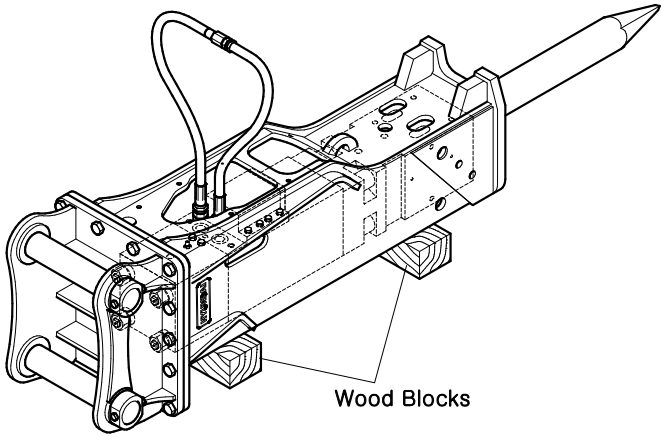


Fig. 9-8

5) Pull out the pins on the bucket link and arm side and then the breaker can be r emoved.

Replace with a bucket and continue operation.

When placing the hydraulic breaker outdoor, put wood blocks under the breaker a nd then cover with waterproof canvas or something similar.

Further, when the breaker is not used for any length of time, wash the exterior, grease each part and then store it indoor.

6) To install the breaker, reverse the removal procedures. As the hoses and the end s of the fittings are dirty due to the bucket or other operations, be sure to wash them.

Light oil or cleaning fluid is recommended for cleaning.

9.5 Hydraulic system

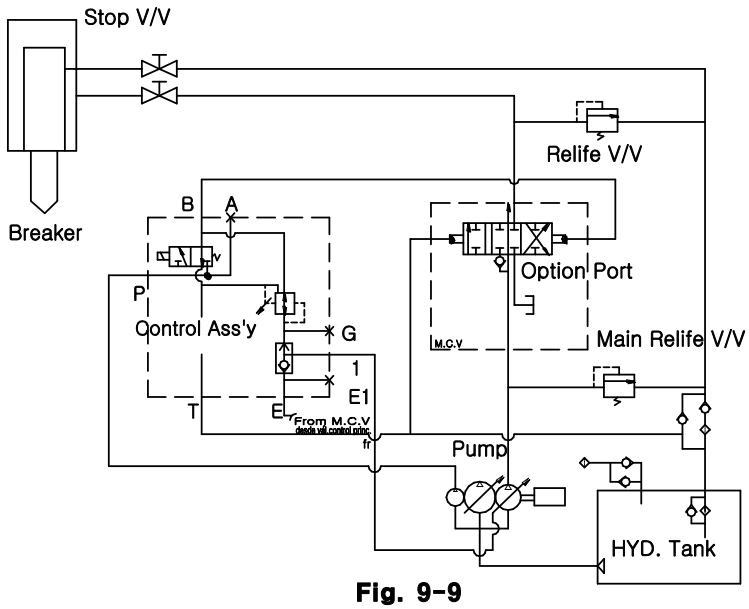


Fig. 9-9

1) Proper input oil flow

You have to attach a package valve for breaker or equivalent valve to control out put flow from pump so as to acquire appropriate number of blows and reduce p eak pressure to control output flow.

Class	Pressure	Output flow	Number of blows	Compen. Pressure
5 Ton Exca.	–	40–60LPM	450 ± 50 BPM 450 ± 50 golpes/min.	–
13 Ton Exca.	16 ± 1 bar	80–100LPM	450 ± 50 BPM 450 ± 50 golpes/min.	320bar
22 Ton Exca.	18 ± 1 bar	130–150LPM	350 ± 50 BPM 350 ± 50 golpes/min.	300bar
28 Ton Exca.	18 ± 1 bar	170–190LPM	350 ± 50 BPM 350 ± 50 golpes/min.	320bar
32 Ton Exca.	18 ± 1 bar	190–210LPM	330 ± 50 BPM 330 ± 50 golpes/min.	320bar

2) Pressure pulse

a) Pump to Breaker input line

■ Average operating pressure of pump

Indispensable condition

The average value of operating pump pressure is much less than that of com pensating pressure.

Purpose : Prevent an abrasion of regulator and swash plate supporter of pump

■ Outlet pressure pulse of pump(Pmin. to Pmax.)

Indispensable condition

Pressure displacement is within 800bar in 1 cycle of blow except an instanta neous peak pressure within 10m/s.

Purpose : Acquiring durability of pump

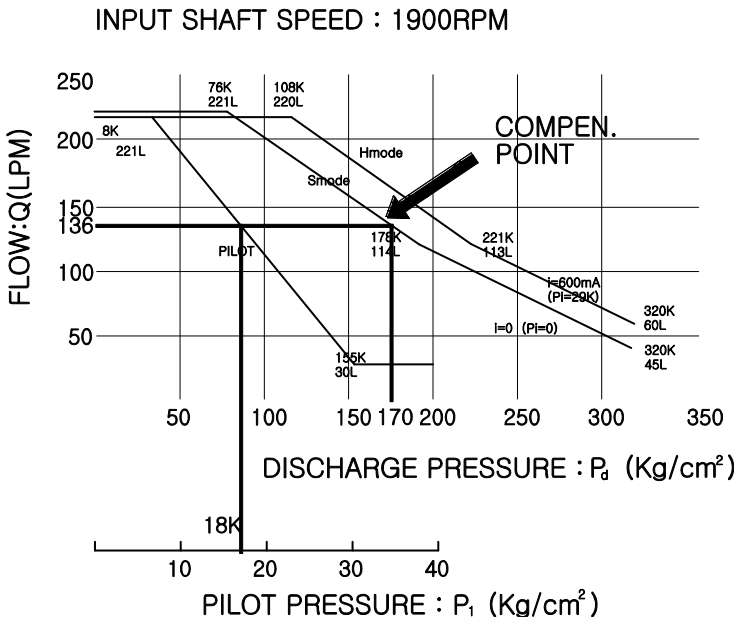


Fig. 9-10

■ Outlet pressure pulse of pump (Pmin.)

Indispensable condition In datum point of average operating pressure an inst antaneous peak pressure drop to negative pressure direction is within 40 bar, when measuring pressure at supply line.

Purpose : Acquiring durability of pump

■ Pressure pulse (Pmin, Pump.& Pmin, Breaker)

Indispensable condition

On operating breaker, minimum value of peak pressure of pump outlet is hig her than that of breaker inlet or so. (Pmin, Pump. ≥ Pmin, Breaker)

Purpose : Checking control valve load and protecting valves.

■ Inlet pressure pulse of breaker (Pmin, Breaker)
Indispensable condition
On operating breaker, minimum value of peak pressure of breaker inlet keep on higher than diaphragm precharge pressure (60bar) or so.
(Pmin, Breaker ≥ 60bar)
Purpose : Protecting hydraulic components as to achieve efficiency of diaphr agm.

b) Outlet of breaker
Indispensable condition

Maximum peak pressure is below 5 bar at inlet of cooler.
If you want to satisfy that, you can add accumulator, which is more than pre charge 10bar, and volume 1.4 liter, choose enough size of return pipe, 1" t o 20 ton excavator, and 1 1/4".
Purpose : Protecting oil cooler

c) Attachment
Indispensable condition

Attach special relief valve for breaker with fast response and big capacity
Purpose : Protect hydraulic system, pump, control valve, etc.

9.6 Piping system

1) Caution on piping
Indispensable condition

a) On welding seat screw, avoid welding from end of boom to 10mm inner area.

b) Total welding length of seat screw is acquired at least more than 150mm incl uding total circumference length.

c) Use pipe clamp which is forged or made by machine.

Purpose : Protect pipings of boom

2) Layout of return pipe
Indispensable condition

a) Return oil must go through full flow filter of tank.
(When equipping special hydraulic filter for breaker, filter element is below 10㎛)

b) Return oil must go through oil cooler.
Purpose : Protect overheat of oil and trouble of hydraulic components cause d by contamination of hydraulic system.

9.7 Hose & Tube pipe size

Model	HDB10	HDB20	HDB40	HDB50	HDB70	HDB90	HDB140
Inner Diameter (mm)	12.7	12.7	12.7	12.7	12.7	19.1	19.1
(inch)	1/2"	1/2"	1/2"	1/2"	1/2"	3/4"	3/4"

Model	HDB180	HDB210	HDB250	HDB300	HDB360	HDB450	HDB650 HDB800
Inner Diameter (mm)	25.4	25.4	31.8	31.8	31.8	31.8	31.8
(inch)	1"	1"	1 1/4"	1 1/4"	1 1/4"	1 1/4"	1 1/4"

9.8 Hose & Tube fitting torque

Nominal Size(mm)	6.3	9.5	12.7	19.1	25.4	31.8	31.8	50.8
TORQUE(Kg-m)	5	10	12	24	28	34	42	50

9.9 Method of adjusting impact blows

The blows of Breaker is adjusted by oil flow of excavator, and oil flow of excavator i s controlled by reducing pressure valve in control valve at breaker line.
If you want more blows, you can set reducing pressure much less, otherwise, much more.

10.1 Cylinder group

As the cylinder group is extremely important part, rough handling will cause malfuncti on of the breaker.
When performing maintenance service the high attention should be paid.

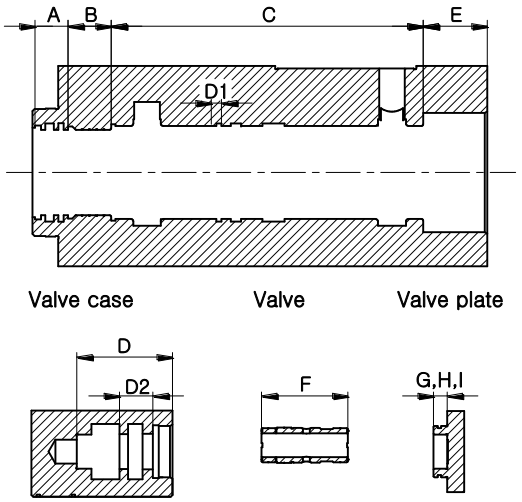


Fig. 10-1

a. Cylinder & Valve case
Check the slide parts A, B and C for flaws. If there are scuffing flaws, finish the surface to be smooth with a buffing grinder, If there are flaws in the part D, fini sh the surface with sandpaper, #800−#1200. Never apply buffing by the grinder to the part D1. the buffing grinder can be used only in case of that the part D2 is scuffed so badly that it is hard to deburr the scuffed part by the sandpaper.
Remove the burr with the buffing grinder slightly, and then finish the face wit h the sandpaper.
The part E can be finished by the buff with the grinder.
After finishing by the buff and sandpaper is accomplished, cut the edge of e ach groove.

b. Piston
If the slide face is scuffed, repair it by finishing with buffing grinder and san dpaper, #800− #1200.
If the face is scuffed deeply, remove the burr fully and finish it to be smooth.

c. Valve
In case of the scuffing in the circumference F of the valve, remove it with the s andpaper, #800−#1200. If the part F is extremely damaged, replace the valve.

d. Valve plate
In case of scuffing of the inner diameter parts G, H and I, finish them by b uffing with the grinder.

10.2 Caution on using the buffing grinder

a. Cylinder

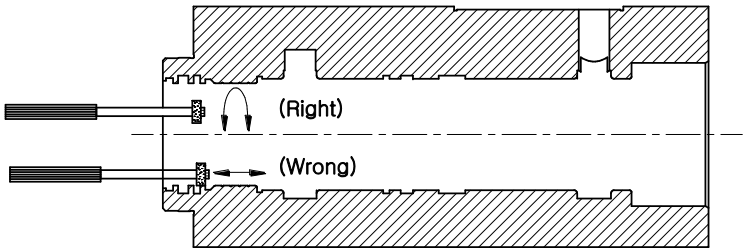


Fig. 10-2

b. Piston

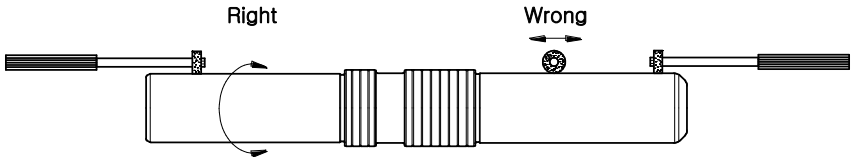


Fig. 10-3

c. Cylinder bush

When using the buffing grindstone, apply the grinder correctly to the circumference.
If the grinder is led straight ahead, circularity will be spoiled. Wash t he parts after finishing them.

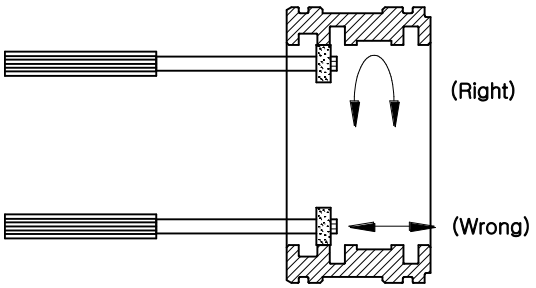
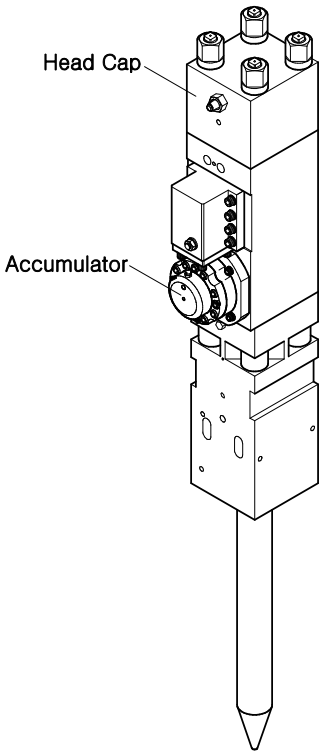


Fig. 10-4

10.3 Accumulator

CAUTION

ONLY FILL WITH N_2 GAS!
GAS CHARGE PRESSURE : 52 Kgf/cm^2 at 20℃
THIS VESSEL CONTAINS HIGH PRESSUR GAS.
REMOVE REMAINING GAS COMPLETELY BEFORE DISASSEMBLY.



10.4 Charging nitrogen gas into gas chamber

The pressure in gas chamber may defer in accordance with the model of excavator used. In case the gas pressure is too high, the oil pressure will rise which may result in ov erheating of the hydraulic oil and irregular blow.
If the pressure is too low, the impact power will decrease. The pressure in gas cham ber should be set according to the pressure table as follows:

1) Method of charging N_2 gas in the gas chamber.

WARNING

The only gas permitted for charging the accumulator is nitrogen N_2.
The use of other gas is extremely dangerous and may cause the accumulator to explode.

IMPORTANT

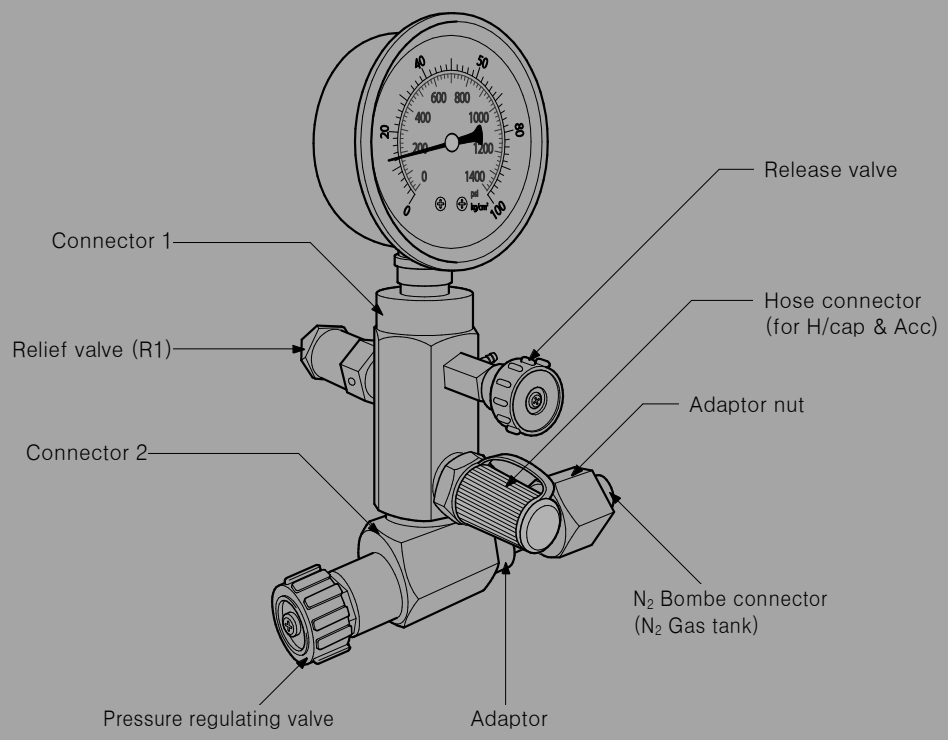
Use only the hose nozzle to relieve the pressure:
Using nails, screwdrivers or similar objects would damage the filling valve.

WARNING

Warning Notice for N_2 gas regulator

1. Be sure to keep regulator handle (H1) always closed. You must check the handle (H1) is closed before opening N_2 bombe. Careless or haste openin g of bombe may cause charging kit explosion. Your high attention is re quired.
2. Release N_2 bombe valve very slowly with care. You will pay attention to all ow the high pressure gauge rise slowly.
3. Avoid facing the regulator when connecting N_2 bombe and charging kit. Pl ease Keep it mind high pressure device might cause explosion accident an d physical damage if they are handled without high attention.
4. Keep fastening handle and tools always around you.
5. You must use the N_2 charging kit for N_2 charging purpose. This charging k it is designed only for charging N_2 gas.
6. Safety release valve was designed to bypass excessive pressure than 80kg f /cm^2 ±5. It will open automatically to flow away overwhelming pressure w ith noise, which is a normal function. Please keep the draining hole clean not to interupt releasing action.
7. Check points and maintenance.
   1) Check internal valve leakage.
   2) Check pressure gauges operate normally.
   3) Check adaptor nut thread is damaged or not.
   4) Check if there is a dent on adaptor.
8. High presurue occurs in operation of charger and relief valve functions alo ng with noise but it is normal operation.

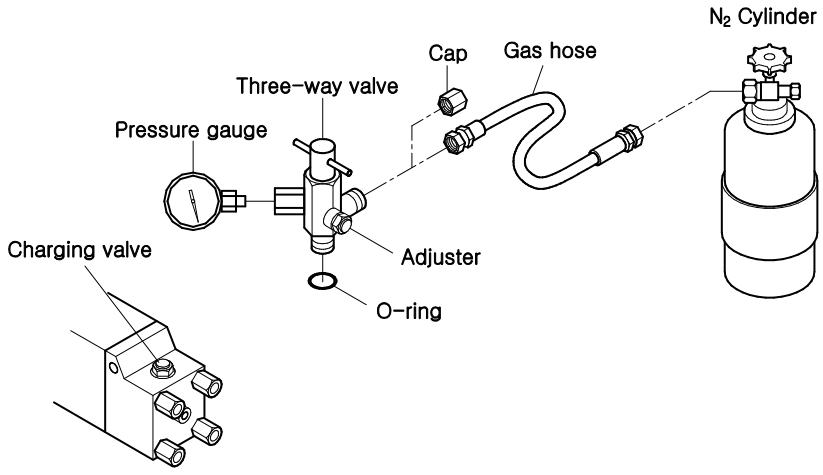
If you find any abnormal status like gas leakage after checking the above poin ts, visit HYUNDAI service center to repair the damaged or replace it with new genuine parts.


Release valve
Connector 1
Hose connector
(for H/cap & Acc)
Relief valve (R1)
Adaptor nut
Connector 2
N_2 Bombe connector
(N_2 Gas tank)
Pressure regulating valve
Adaptor

CHARGING NITROGEN GAS INSTRUCTION

■ **Use Model : HDB10, HDB20**

When the breaker is delivered, charge the Head Cap with N_2 gas as following proced ure and operate the Breaker.



Inspection of nitrogen(N_2) gas into Head Cap.

Warning

Be sure to check the surroundings of machine for safety before starting maintenance.
Never use other than N_2 gas for charging in back head.
Do not approach front of Tool, when charging in back head with N_2 gas.
When Back head is charged, breaker Tool would be come out.

1) After installing pressure gauge on three-way valve, turn handle of three-way valv e counterclockwise.

2) Connect gas hose N_2 gas cylinder.

3) Install three-way valve to charging valve on Head Cap after removing plug from breaker (Ensure that O-ring are installed on three-way valve).

4) Connect the other end of gas hose to three-way valve.

5) Turn handle of N_2 gas cylinder counterclockwise to open and slowly turn handle of three-way valve clockwise to set charging pressure.

6) Turn the handle of three-way valve counterclockwise, and then turn handle of N_2 gas cylinder clockwise to close.

Notice : For N_2 gas sealing pressure, refer in Fig. 7.

7) Close cap of three-way valve after gas hose is relieved from three-way valve.

8) Recheck charging pressure into Head Cap as turning handling of three-way valve clockwise.

Notice : When gas charging in Head Cap has been completed by following procedur e 1) through 8), discount three-way valve from charging valve of Head Cap after turn handle of three-way valve counterclockwise.

But, if it is needed to adjust pressure of gas in Head Cap by following proc edure 9) through 13) mentioned below.

9) Disconnect gas hose from three-way valve.

10) Install three-way valve on charging valve completely.

11) When turning handle of three-way valve clockwise, gas pressure in Head Cap is indicated on pressure gauge.

12) If gas pressure is low, perform operations 1) through 8) again. Repeat until gas pressure rises to specified pressure.

13) If gas pressure is excessive, slowly turn adjuster of three-way valve counterclock wise, then gas pressure leaks from Head Cap, When correct amount of gas pres sure is shown, close adjuster clockwise.

When gas pressure is excessively high, breaker will not operate.

Ensure that gas pressure is at specified pressure and O-ring in three-way valve is installed.

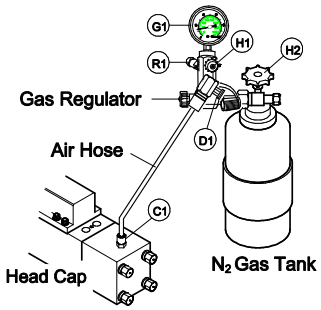
(Unit:kgf/cm^2)

Model	HDB10-9	HDB20-9	HDB30-9
Head Cap Gas Pressure	16.5	16.5	16.5

■ **Charging HEAD CAP with N_2 Gas**

■ **Use Model(Para modelos): HDB10, HDB20, HDB40, HDB50, HDB70, HDB90, HDB140, HDB180, HDB210, HDB250, HDB300, HDB360, HDB450, HDB650, HDB800**

You must check nitrogen gas pressure before operation even though the machine 's gas has been set from the factory for the best performance. You need to che ck gas pressure every 2 weeks.



C1 : GAS VALVE- HEAD CAP
D1 : DRAIN VALVE- HEAD CAP
G1 : GAS GAUGE- HEAD CAP & ACCUMULATOR
H1 : HANDLE- GAS REGULATOR
H2 : HANDLE- N_2 GAS TANK
R1 : RELIEF VALVE- N_2 GAS TANK

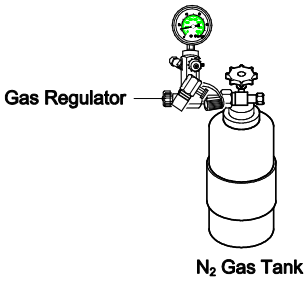


Fig 1

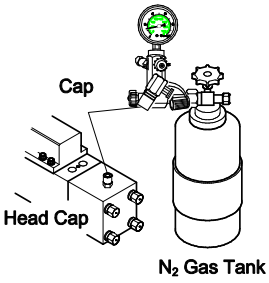


Fig 2

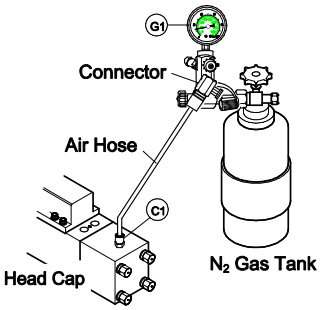
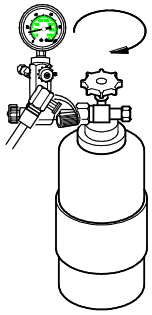


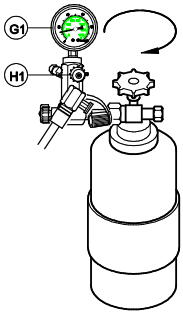
Fig 3

1. Connect gas regulator with N_2 gas tank. (Fig. 1)
2. Remove the gas valve cap and the connector cap on the gas regulator. (Fig. 2)
3. Connect the air hose to the gas valve(C1) on head cap and connector on the gas regul ator. (Fig. 3)
4. Check whether the gas pressure(See gauge-G1) is correct or not according to 'N_2 Gas Pressure Table' below. (Fig. 3)



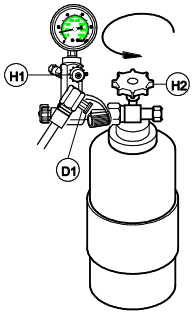
N_2 Gas Tank

Fig 4



N_2 Gas Tank

Fig 5



N_2 Gas Tank

Fig 6

4.1 If you found more N_2 gas according to 'N_2 Gas Pressure Table' you should release some gas by following the process below.

Release some gas by turning drain valve (D1) counter-clockwise so that h ead cap has only recommended gas pressure. (Fig. 4)

4.2 If you found less N_2 gas according to 'N_2 Gas Pressure Table' you should add some gas by following the process below.

4.2.1 Turn the handle (H2) clockwise on N_2 Gas tank. (Fig. 4)

4.2.2 Insert the regulator handle (H1) into the gas regulator body first, then t urn the handle clockwise until indicator (gauge G1) moves. (Fig. 5)

4.2.3 Pump N_2, gas by turning handle (H1) clockwise on the gas regulator according to 'N_2. Gas Pressure Table' and stop pumping N_2 gas wh en gas gauge(G1) indicates recommended gas pressure by turning h andle(H2) counter-clockwise on the N_2 gas tank. (Fig. 5, 6)

Release N_2 gas in gas regulator by opening drain valve (D1). (Fig. 6)

5. Remove the air hose and close the gas valve cap.
6. Make sure that there is no N_2 gas leakage by performing test.

(If you see soap bubble after applying liquid soap on the gas valve, N_2 gas is le aking)

(Unit: kgf/cm^2)

Model	HDB10	HDB20	HDB40	HDB50	HDB70	HDB90	HDB140	HDB180
Head Cap Gas Pressure	12	12	12	12	12	12	12	12

(Unit: kgf/cm^2)

Model	HDB210	HDB250	HDB300	HDB360	HDB450	HDB650	HDB800
Head Cap Gas Pressure	11	11	11	11	11	11	11

Ref.) Depands on the temperature of Head Cap surface.

(Unit: kgf/cm^2)

Temperature(℃)	Pressure			
	A	B	C	D
−10	8.1	9.9	10.8	14.8
0	8.4	10.2	11.2	15.4
10	8.7	10.6	11.6	15.9
20	9.0	11.0	12.0	16.5
30	9.3	11.4	12.4	17.1
40	9.6	11.8	12.8	17.6
50	9.9	12.1	13.2	18.2
60	10.2	12.5	13.6	18.8
70	10.5	12.9	14.0	19.3
80	10.8	13.3	14.5	19.9

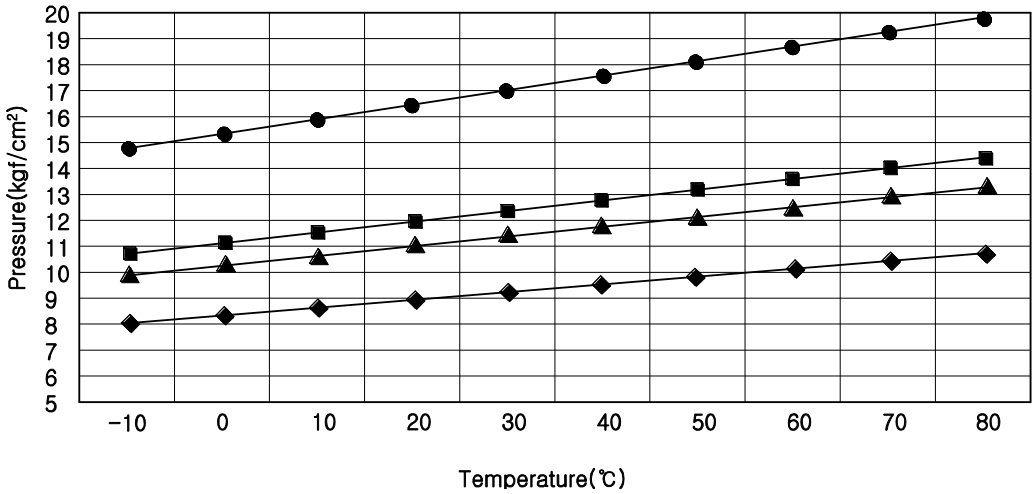


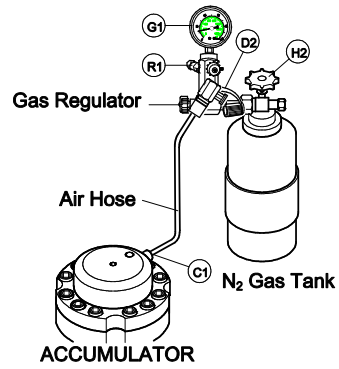
Fig. 7

CHARGING NITROGEN GAS INSTRUCTION

■ Charging Accumulator with N_2 Gas

■ Use Model : HDB250, HDB300, HDB360, HDB450, HDB650, HDB800

You must check nitrogen gas pressure before operation even though the mac hine's gas has been set from the factory for the best performance. You need to check gas pressure every 2 weeks.



C1 : GAS VALVE- ACCUMULATOR
D2 : DRAIN VALVE- ACCUMULATOR
G1 : GAS GAUGE- HEAD CAP & ACCUMULATOR
H2 : HANDLE- N_2 GAS TANK
R1 : RELIEF VALVE- N_2 GAS TANK

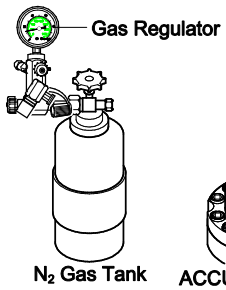


Fig 1

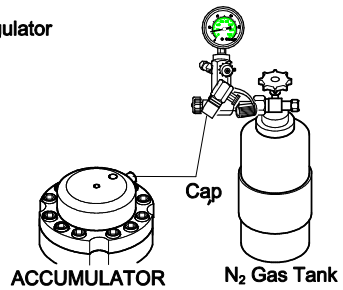


Fig 2

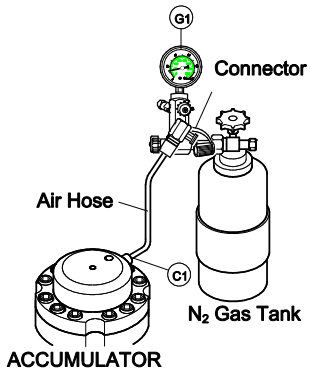
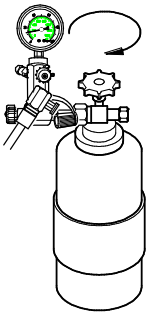


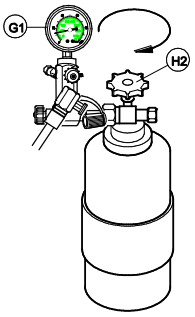
Fig 3

1. Connect gas regulator with N_2 gas tank. (Fig. 1)
2. Remove the gas valve cap and the connector cap on the gas regulator. (Fig. 2)
3. Connect the air hose to the gas valve (C1) on Accumulator and connector on the ga s regulator. (Fig. 3)
4. Check whether the gas pressure (See gauge-G2) is correct or not according to ' N_2 Gas Pressure Table' below. (Fig. 3)



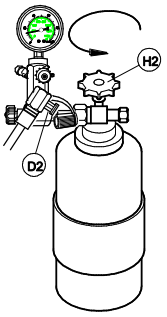
N_2 Gas Tank

Fig 4



N_2 Gas Tank

Fig 5



N_2 Gas Tank

Fig 6

4.1 If you found more N_2 gas according to 'N_2 Gas Pressure Table' you should release some gas by following the process below.

Release some gas by turning drain valve (D2) counter-clockwise so that Accumulator has only recommended gas pressure. (Fig. 4)

4.2 If you found loss N_2 gas according to 'N_2 Gas Pressure Table' you should add some gas by following the process below.

4.2.1 Make sure that there is No regulator handle connected with the gas regulator. (Fig. 4)

4.2.2 Turn the handle (H2) clockwise on N_2 Gas tank. (Fig. 5)

4.2.3 Pump N_2 gas by turning handle(H2) clockwise on the N_2 gas tank according to 'N_2 Gas Pressure Table' and stop pumping N_2 gas when gas gauge(G2) indicates recommended gas pressure by turning handle(H2) counter-clockwise on the N_2 gas tank. (Fig. 5, 6)

Release N_2 gas in gas regulator by opening drain valve (D2). (Fig. 6)

5. Remove the air hose and close the gas valve cap.

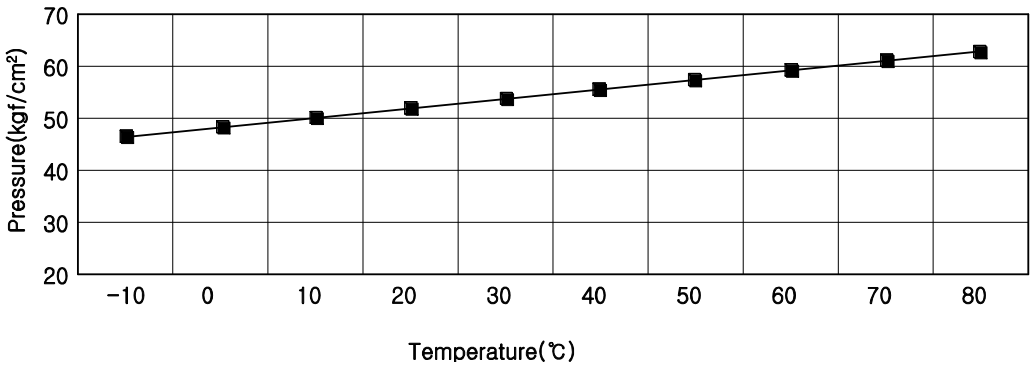
6. Make sure that there is no N_2 gas leakage by test. (If you see soap bubble after applying liquid soap on the gas valve, N_2 gas is leaking)

(Unit: kgf/cm^2)

Model	HDB250	HDB300	HDB360	HDB450	HDB650	HDB800
Accumulator Gas Pressure	52	52	52	52	52	52

Temperature(℃)	Pressure(kgf/cm^2)
−10	46.7
0	48.5
10	50.2
20	52.0
30	53.8
40	55.5
50	57.3
60	59.1
70	60.9
80	62.6

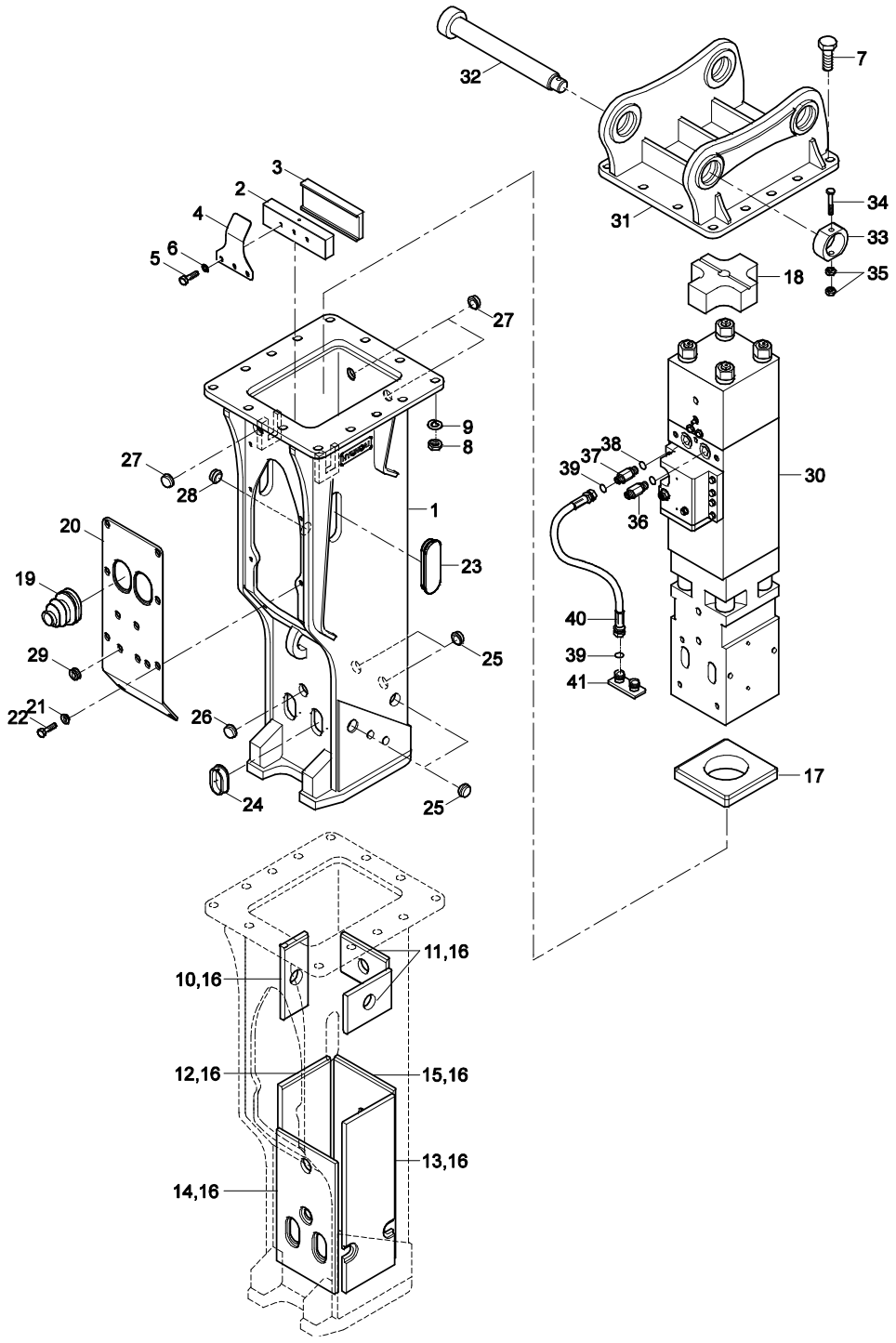
Ref.) Depends on the temperature of Accumulator surface.



10.5 Assembly and Disassembly of Top Box Bracket Breaker

1) Insert o-ring No.16 into the groove of plug on the top box bracket No.1.
2) Assemble Damper plate to the bracket.
3) Set bottom damper No.17 at the bottom area of bracket.
4) Assemble main body No.30 into the bracket.
5) Assemble upper clamp sets (No2, 3, 4, 5, 6) to the bracket.
6) Put upper damper No.18 on the main body.
7) Assemble bulk cap with bolt, washer, and nut.
8) Assemble front Urethane cover and rubber plugs (No.19~29) on the bracket. (Only Low Noise Option Bracket)
9) Insert bracket pin into the pin hole and assemble stop ring No.33 with bolt No.34 and nut No.35.
10) To disassemble bracket perform the above procedure in the reverse manner.

Note : Refer to the torque chart in the manual for proper bolt setting.


32
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29
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41
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11,16
10,16
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13,16
14,16

10.6 Wearing parts

a. When damaged or worn, your attention is highly required to exchange these items.
   - Chisel
   - Front cover, must be removed at the service shop
   - Chisel pins
   - Stopper pin, chisel pin stopper
   - Rubber plug, chisel pin stopper plug
   - Hydraulic seals
   - Side bolts
   - Hydraulic hoses
   - MC Nylon Plate
   - Upper Damper
   - Bottom Damper

b. We recommend the user to stock wearing parts, such as chisel, chisel pins, chisel pin stopper, rubber plugs, bolts and hydraulic hoses.

c. Replace hydraulic seals every 600 hours of actual operation.

d. Chisel pin

   - When each chisel pin is excessively deformed, it is difficult to replace the chisel.
     Therefore, every 100 to 150 hours of operation, change the face of each pin which comes in contact with the chisel. The two faces of each pin can be used. If the chisel you use is not the genuine part, we can not guarantee the breaker parts for their good performance.

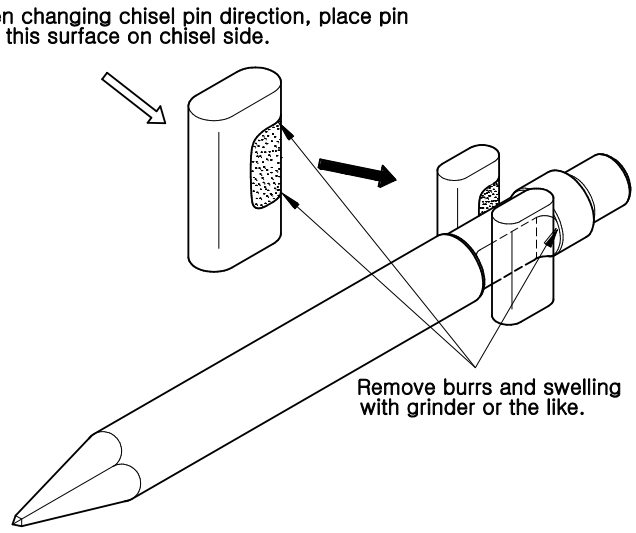

Fig. 10-8

- When replacing each part, check each part for wear, breakage, scoures, etc., especially, after removing burrs and swelling on chisel pins.
- Replace chisel after grinding the worn parts of front head and chisel pin. Insert a new chisel pin after grinding the scuffed parts of front head in use.

10.7 Wear limit of chisel and front cover

When the clearance between the chisel and front cover 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 pist on and cylinder.

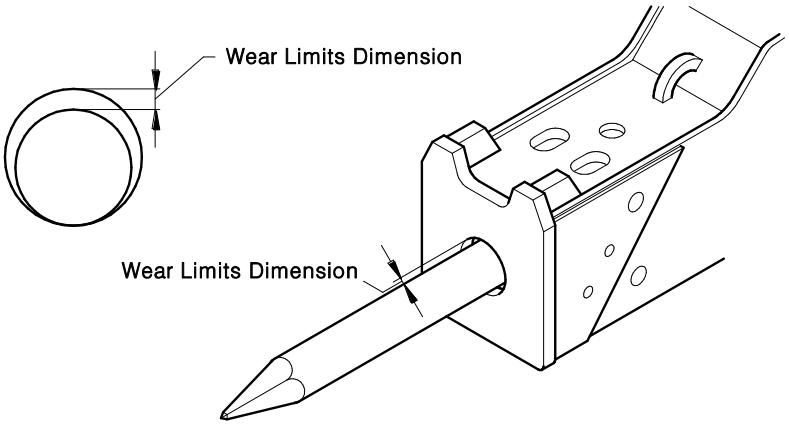

Fig. 10-9

(Unit: mm)

Model	HDB10	HDB20	HDB40	HDB50	HDB70	HDB90	HDB140
Wear limit Dimensions	4	4	4	4	5	5	5

(Unit: mm)

Model	HDB180	HDB210	HDB250	HDB300	HDB360	HDB450	HDB650	HDB800
Wear limit Dimensions	6	6	7	9	9	9	10	11

10.8 Caution for long term storage

- Store breaker in dry area with small temperature difference.
- The tool should be removed and nitrogen gas should be released.
- The lower end of piston should be greased.
  Tool and bushing should be coated with anticorrosive.
- When you can not grease, the tool must be pulled up toward upper side and the n piston should be in cylinder.
- Fittings at excavator and main body are sealed with union cap to prevent contam inator from getting into pipes.
- As well as possible, breaker should be put erectly, If not, put the breaker on wo oden square bars on the flat ground.
- If the breaker is laid on the wooden square bars for more than 6 months, please check all seals in cylinder and corrosion bolts before operation.

1) Storage method

Term	Measure
Every 3 months	Change up side down the body for good state of seal.
Every 6 months	Check the internal cylinder & corrosion condition.

2) Before operating

Term	Measure
Every 3 months	Check seals
Every 6 months	Check seals & corrosion states

CAUTION

If the breaker is laid on the wooden square bars more than 6 months, please check all seals in cylinder and corrosion bolts before operation.

10.9 Oil and filter

a. Oil

- The oil for breaker can be used the same of excavator.
- When the breaker operates continuously, the temperature of the oil will rise, please check at the moment the viscosity of oil.
- If oil viscosity is too high, they may cause stiff operation, irregular strikes, ca vitation in the pumps and sticky valves.
- If oil viscosity is too low, working efficiency drops down due to internal leaka ge, seals or gasket damage for heating.
- Working oil should be refilled earlier than bucket working during breaker worki ng, because contaminated oil bring disorder of hydraulic parts, breaker, exca vator and results lowering efficiency.
- Refill oil after 250 hours when first installation and refill every 500 hours.

b. Line filter

- Oil filter is for removing impurities from the hydraulic oil since they decrease expectancy life of components and cause seizure and clogged line.
- Change line filter after 50 hours after first installation and replace it every 12 5 hours.
- Contaminator may enter the hydraulic line during oil changes and refilling, wh en parts are repaired or serviced and due to parts wear.
- When installing oil filter, it should comply with quality rated to maximum work ing pressure and flow capacity.

c. Oil cooler

- The purpose of oil cooler is to cool down the heated oil due to compression and flowing.
- If oil temperature rises too high during operating breaker, you should replace the original oil cooler or install an auxiliary oil cooler to maintain a proper oil temperature.

10.10 Troubleshooting guide

a. Oil leakage

Even if oil leaks, there is no need replacing parts at all times. Check the followi ng points listed in the below. The user can check the remedy before calling deal er.

	Area of oil leakage	Condition	Causes & Remedies
A	Between the tool and front Cover	A large amount of oil is leaking. Check if it comes from oil or grease (small amount of oil leakage is a normal symptom.)	Seals are damaged. Replace.
B	Surface of breaker	Oil leaking from the valve case & hose adapter portion.	Loose breaker hoses and bolts. Re-tighten.
C	Valve case & cap bolts	Oil leakage from reassembly of valve after overhaul.	Normal : During assembly from lubrication oil & anti-rust oil applied.
D	Between main valve & surface of cylinder	Oil leakage from reassembly of breaker after overhaul.	Normal : clean oil check If seal is damaged, loosen bolts. Replace with new seals
E	Between cylinder and head cap	Oil leakage.	Loose through bolts nut. Re-tighten.
		Oil leakage.	Replace damaged o-ring.
F	Between cylinder and front Head	Oil is leaking.	Loose plugs assembled on the surface of cylinder re-tighten. Replace damaged seals.

b. Poor operation of breaker

Condition	Major cause	Remedies
Does not impact	Oil temperature is too low.	Oil temperature must reach to min. 30℃.
	Main valve does not operate properly.	Check breaker operating button in a cabin.
	Pressure in head cap and setting pressure of relief valve is low.	Check pressure of nitrogen gas and relief valve.
	Poor performance of hydraulic pump.	Contact excavator manufacturer immediately.
Irregular blows It operates normally at the beginning	Oil temperature increased due to lack of hydraulic oil.	Supplement of hydraulic oil.
	Pressure in head cap too high.	Check gas pressure.

Condition	Major cause	Remedies
	Relief valve is set too low.	Check pressure of relief valve.
	Not enough down pressure on tool.	Apply enough down pressure with arm or boom of base machine.
	The clearance between the tool and front cover are too large.	Check the clearance between tool and front cover.
	Wear on top of tool.	Disassemble tool to check.
	Poor performance of hydraulic pump and back pressure are too high.	Have excavator manufacturer check piping.
	Foreign material inside main valve.	Disassemble and clean.
	Seizure of piston & cylinder.	Overhaul and check.
Lack of blow power	Low gas pressure in head cap.	Check gas pressure.
Lack of blow	Gas pressure is too high.	Check gas pressure.
	Not enough down pressure on tool.	Apply enough down pressure with arm and boom.
	Setting pressure of relief valve is too low.	Check pressure of relief valve.
	Poor performance of hydraulic pump.	Have excavator manufacturer check.
	Operating pressure is too high.	Check setting pressure.

c. Malfunctions

Prerequisites for the normal operation and long life of hydraulic breakers of HDB Series :

- Supply of rates (pressure P and flow rate Q) to hydraulic breakers of this series.
- Use of clean hydraulic oil
- Proper operation as per operating & maintenance manual.

Dealer concerned are requested to take prompt actions when they receive trouble reports from their customers. Skilled technicians of our dealer should grasp condition of troubles exactly and set forth adequate counter measures by checking their possible causes.

The repair of minor troubles would be better entrusted to customers, and appropriate steps should be taken if their causes cannot be detected.

The following tabulation on the causes and countermeasures of troubles may help for a good disposition of troubles encountered.

Item	Conditions	Cause	Countermeasure
Main body	Breaker will not work.	Insufficient power (P x Q). Insufficient down pressure on tool. Clogged piping. Seizure of breaker. filling-up of hydraulic oil in head cap. Lack of hydraulic oil. Potencia insuficiente (P x Q).	Check power. Proper instructions. Check and repair. Repair or replace worn parts. Replace seals. Refill oil.
	Stop hammering or erratic action in approx 30-90min operation Erratic hammering inflow of operating oil to head cap.	Insufficient power (P x Q). Clogged piping. Too high pressure in head cap. Damaged seals. Inflow of large volume of grease to impact chamber. Potencia insuficiente (P x Q).	Check power. Check and repair. Adjust. Replace seals. Remove grease Instruct greasing method.
	Breakage of tool	Use of hammering tool in bent condition. Use of tool as a lever move rocks with tool.	Apply down force in tool direction. Check if any excessive play on arms, links & pins.
	Melting of tool point.	Long time continuous hammering in one place.	Relocate.
	Clacking of tool Point.	Full power operation from the outset.	Low speed operation for first 30 minutes.
	Difficulty In attaching and removing tool pin.	Deformation of tool pin.	Poor Inspection.
	Excessive plays between bracket and breaker body.	Loose side bolts.	Re-tighten bolts.
	Premature wear of front cover.	Lack of grease.	Proper instruction.
	Low number of blow.	Insufficient power (P x Q). Insufficient down pressure on tool. Too high pressure in head cap.	Check power. Adequate instructions. Adjust to specified gas pressure.

Item	Conditions	Cause	Countermeasure
Main body	Weak Impact force.	Pressure drop In head cap. Insufficient down pressure on tool Insufficient power (P x Q). Breakage of tool in front head.	Recharge nitrogen gas. Proper instruction. Check power. Replace tool and check piston.
	Oil leakage input & output section between control valve & cylinder between tool and front cover between head cap & cylinder.	Loose joints & damage on o-ring & back up ring. Loose bolts & damage on o-ring & back up ring. Wear or damage of oil seals. Damage on hollow plugs or loose through bolt nuts.	Re-tighten joints replace. O-ring & back up rings. Re-tighten bolts replace. O-ring & back up ring. Replace oil seals. Replace hollow plugs & re-tighten through bolt nuts.
Base machine and piping	Running a curve when equipped with breaker.	Wrong set pressure on relief valve.	Check and increase set pressure on slow side.
	Rapid increase In oil temperature.	Poor heat radiation of base machine. Premature wear of pump. Clogged piping.	Change setting for breaker. Repair or replace pump.
	Hose pulsation on the supply side.	The amount of oil flow is tool low.	Check oil flow.
	Hose pulsation on the return side.	Gas pressure is too low or high.	Adjust gas pressure.
	Poor positioning tool to rocks.	Large play In the side direction of arm and link or pin and bushing lead to premature wear.	Repair tool liable to breaker.
	Emulsification of hydraulic oil.	Entering of water into oil.	Immediately replace hydraulic oil.