



**CONSTRUCTION**  
ATTACHMENTS, INC.  
PROUDLY MADE IN THE USA

# OPERATORS MANUAL

# HYDRAULIC BREAKER

DESIGNED FOR AIDING IN CONSTRUCTION AND DEMOLITION OF CONCRETE STRUCTURES,  
ROCKS, ASPHALT, ETC.



FOR SKID STEER LOADERS, COMPACT EXCAVATORS, TRACTOR LOADER BACKHOES, AND  
MID/LARGE EXCAVATORS

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This Breaker Operator's Manual is not intended to serve as a supplement to the Operator's Manual of the machine and should be read together with it. Keep this manual together with the Operator's Manual of the machine, in the cab, so that it is always at hand. Replace it immediately, if it is lost.

Many hours are spent on design and production to make equipment that is as efficient and safe as possible. The accidents which occur in spite of this, are mostly caused by the human factor. A safety conscious person and well maintained equipment make a safe, efficient and profitable combination. **Therefore, read the safety regulations and follow them.**

We continually strive to improve our products and to make them more efficient through changes to their design. We retain the right to make these changes without committing ourselves to introducing these improvements on products which have already been delivered. We also retain the right to change data and equipment, as well as instructions for service and maintenance without prior notice.

Be sure you are thoroughly familiar with the positions and functions of all instruments and controls of the machine, along with the instructions in the appendix and the Operator's Manual before using the equipment or before service and maintenance is carried out.



### **WARNING!**

The symbol above appears at various points in the manual together with a warning text. It means: Warning, be alert! Your safety is involved! It is the obligation of the operator to make sure that all warning decals are in place on the machine and that they are readable. Accidents may otherwise occur.



### **WARNING!**

Do not operate this Breaker and do not carry out any maintenance until you thoroughly study and understand the contents of this manual.

## **Installation inspection**

An installation inspection must be carried out after the breaker has been installed on the machine. During the installation inspection certain specifications (working pressure, oil flow, etc.) are checked so that they are within given limits. Contact an authorized dealer.

## **Spare parts order**

When you need parts or some information concerning maintenance of your equipment, contact your local dealer.



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### Presentation

The breaker is a hydraulically powered breaker. It can be used on any machine with the proper machine weight, hydraulic flows and meets necessary mechanical installation requirements. The unit functions by repeatedly raising a steel piston and driving it down onto the head of a removable breaking tool.

No additional pressure accumulators are necessary since the integrated pressure accumulator absorbs hydraulic pressure peaks. The impact energy of the breaker is almost constant and independent of the machine's hydraulic system.

### Removal from packaging

- Remove all strapping from the packaging.
- The wooden frames and boxes can be recycled.
- Check that the breaker is in good condition and that there is no visible damage.
- Check that all ordered parts and accessories have been enclosed with the product.

Some options may be provided by your local dealer like installation kits; including hoses and mounting bracket.

### Lifting instructions



#### **WARNING!**

**Ensure that no person(s) are near the breaker when it is lifted. If the breaker falls down there is a risk of personal injuries.**

Use a hoist when lifting the breaker or component parts, to avoid back injury. Make sure all chains, hooks, slings, etc., are in good condition and of the correct capacity. Be sure that the hooks are positioned correctly. Lifting devices must safely carry the working weight of the breaker, see the specification chapter. Place chains or slings, as shown in the illustration, to lift the breaker. Always check the balance of the breaker by lifting it a few centimeters. If the breaker is well balanced it may be lifted higher.



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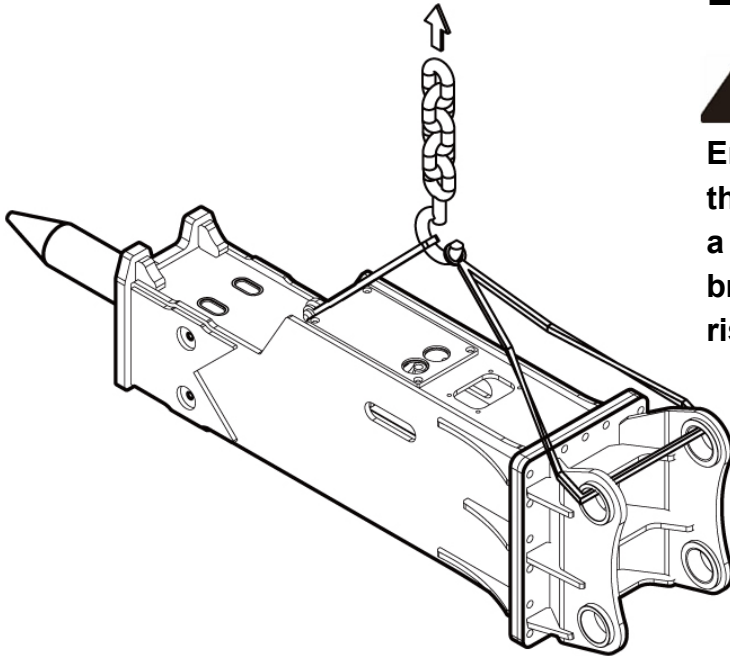
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## Lifting eyes



### WARNING!

Ensure that lifting eyes are fully tightened to the housing before using them for lifting. If a lifting eye is not properly tightened it may break. If the breaker falls down there is a risk of personal injuries.



Lifting eyes on the breaker housing are intended only for handling the breaker. It is not allowed to use the breaker or its parts for lifting other products.

**IMPORTANT!** Always remove the lifting eyes and replace them with a blanking screw before operating the breaker.







**IMPORTANT!** Always be sure that the lifting eyes are in good condition before re-using them. Damaged lifting eyes must not be re-used.

Follow the safety instructions for lifting equipment, see section safety.





### Plates and Decals

Reference	Image Content	Signs
Hearing protection must be worn.	Head wearing ear protection	
Consult manual for proper service procedures.	Technical manual	
Keep away the breaking area while the breaker works.	A working breaker with diagonal slash	
Inject grease into the hole with grease gun periodically.	Grease gun	
"HIGH PRESSURE" is charge prior to disassembly.	Accumulator, Back head	
Keep away as the breaker is so "HOT"	High temperature	



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## Safety

All mechanical equipment can be hazardous if operated without due care or correct maintenance. Most accidents involving machine operation and maintenance are caused by failure to observe basic safety rules or precautions.

An accident can often be avoided by recognizing potentially hazardous situations before an accident occurs.

Since it is impossible to anticipate every possible circumstance that might involve a potential hazard, the warnings in this guide and on the machine are not all inclusive. If a procedure, tool, working method or operating technique not specifically recommended by the manufacturer is used, you must satisfy yourself that it is safe for you and others. Also ensure that the breaker will not be damaged or made unsafe by the method of operation or maintenance procedures you choose.

Safety is not just a matter of responding to the warnings. When working with the breaker, always pay attention to what hazards there might be and how to avoid them. Do not work with this attachment until you are sure that you can control it.

Do not start any job until you are sure that you and those around you will be safe.



### **WARNING!**

**Read the following warning messages carefully. They inform you of different hazards and how to avoid them. If proper precautions are not taken you or others could be seriously injured.**

### **Operator's manual**

- Read and understand the Operator's Manual.
- The machine operator must be thoroughly familiar with how to operate and maintain the breaker and should preferably undergo required training on the breaker.
- The machine operator must follow the rules and recommendations given in this Manual and the Carrier's Operator's Manual of the machine, but also pay attention to any statutory and national regulations or specific requirements or risks that apply to the work site.

### **Care and alertness**

- All the time working with the breaker, take care and stay alert. Always be careful. Always be alert for hazards. The possibility of a serious or even fatal accident is increased when you are under the influence of alcohol or drugs.





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### **Clothing**

- Suitable clothing for safe handling should be worn.
- Use a hard hat, safety glasses, protective shoes and gloves and an approved respirator (dust mask) or other protective articles when required.

### **Training**

- You and others can be killed or injured if you perform unfamiliar operations without practicing them first. Practice away from the job site, in a clear area.
- Keep other persons away. Do not perform new operations until you are sure you can do them safely.

### **Communication**

- Bad communication can cause accidents. Keep people around you informed of what you will be doing. If you will be working with other persons make sure they understand any hand signals you will be using.
- Work sites can be noisy. Do not rely only on spoken commands. See the signal diagram in the Operator's Manual of the machine.

### **Work site**

- Work sites can be hazardous. Inspect the site before working on it.
- Check for potholes, weak ground, hidden rocks, etc. Check for utilities (electric cables, gas and water pipes, etc.). Mark the positions of underground cables and pipes if you will be breaking the ground.

### **Banks and trenches**

- Banked material and trenches can collapse. Do not work too close to banks and trenches where there is a danger of collapse.

### **Safety barriers**

- Unguarded equipment in public places can be dangerous. Place barriers around the machine to keep people away.

### **Flying chips of rock**

- Protect yourself and your neighborhood against flying chips of rock. Do not operate the breaker or the machine if someone is too close.
- Keep windows and doors closed during operation. Only machines with enclosed cab may be used for breaker operation. For skid steers, special application (demolition door) must be fitted when operating.



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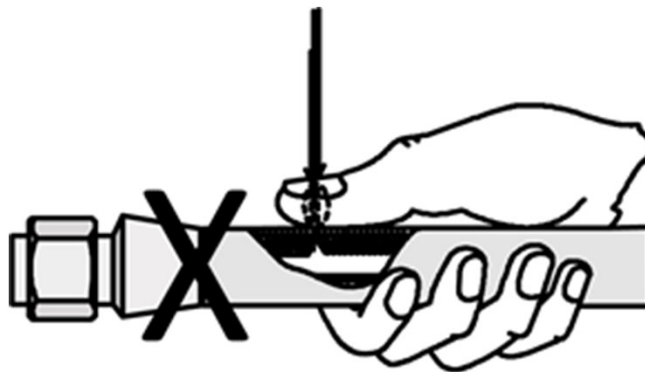
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### Equipment limits

- Operating the breaker beyond its design limits can cause damage. It can also be dangerous. For breaker specifications, see section specification.
- Do not try to enhance the performance of the breaker by unapproved modifications.

### Hydraulic pressure

- Hydraulic oil at system pressure can injure you. Before disconnecting or connecting hydraulic hoses, turn off the engine, operate the controls to release pressure trapped in the hoses and wait 10 minutes. During the operation, keep persons away from the hydraulic hoses.
- Fine jets of hydraulic oil at high pressure can penetrate the skin. Do not use your fingers to check for hydraulic oil leaks. Do not put your face close to suspected leaks. Hold a piece of cardboard close to suspected leaks and then inspect the cardboard for signs of hydraulic oil. If hydraulic oil has penetrated your skin seek medical treatment immediately.
- There might be pressurized oil trapped inside the breaker even if it is disconnected from the machine. Be aware of possible blank firing while greasing or removing and installing breaker tools.



Never use your hand when looking for leaks since oil under high pressure may penetrate your skin.

### Pressure accumulators

- The breaker incorporates one or two pressure accumulators. The accumulators are pressurized even when there is no hydraulic pressure to the breaker. Attempting to remove or dismantle the accumulators without first releasing the pressure can cause injury or death. Do not try to dismantle pressure accumulators, contact an authorized dealer.



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### **Lifting equipment**

- You can be injured if you use faulty lifting equipment. Make sure that the lifting equipment is in good condition. Make sure that the lifting tackle complies with all local regulations and is suitable for the job. Make sure that the lifting equipment is strong enough for the job and you know how to use it.
- Do not use the breaker, or any of its parts, for lifting. Contact an authorized dealer to find out how to lift with your machine.
- Never leave a lifted breaker, or any other lifted load, unattended.
- Follow the lifting instructions, see page 4.

### **Spare parts**

- Use only genuine spare parts. Use only genuine tools with hydraulic breakers.
- The use of non-genuine or counterfeit parts may damage the breaker and will void the breaker warranty.

### **Equipment condition**

- Defective equipment can injure you and others. Do not operate equipment which is defective or has missing parts.
- Make sure the maintenance procedures in this manual are completed before using the product.

### **Repairs and maintenance**

- Do not try to do repairs or any other maintenance work you do not understand.

### **Modifications and welding**

- Non approved modifications can cause injury and damage. Contact your local dealer for advice before modifying the breaker. Do not attempt to weld the breaker. If in doubt, contact a D&A dealer. Note that welding of the breaker tools will render them useless and make the warranty void.

### **Metal splinters**

- You can be injured by flying splinters when driving metal pins in and out. Use soft faced breaker or drifts to remove and fit metal pins, such as pivot pins.
- Always wear safety glasses.



## Operating instructions

### Recommended use

The breaker is designed to be used for breaking concrete, road surface or asphalt, hard or frozen ground. It is also suitable for light trenching and benching applications or for ground compacting. It can also be used for breaking small and soft boulders

### Breaker selection

Description	CAL 225	CAL 450	CAL 500	CAL 650	CAL 750	CAL 850
Primary breaking						
Secondary breaking						
Hard rock removal						
Soft material and rock removal	●	●	●	●	●	●
Demolition				●	●	●

Description	CAL 1000	CAL 1200	CAL 2200	CAL 3200	CAL 4500
Primary breaking					
Secondary breaking					●
Hard rock removal			●	●	●
Soft material and rock removal	●	●	●	●	
Demolition	●	●	●	●	●

Description	CAL 6000	CAL 8000	CAL 11000	CAL 18000
Primary breaking	●	●	●	●
Secondary breaking	●	●	●	
Hard rock removal	●	●	●	
Soft material and rock removal				
Demolition				

Note : Please consult with the dealer when selecting breaker model for your applications.



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## Operating conditions

### Principle of installation

The breaker is installed on the machine much in the same manner as installing a bucket or other attachments.

The breaker is connected to the hydraulic system of the machine through a breaker circuit. If the machine is already equipped with such a circuit, only suitable hoses and fittings are required. If the machine does not have a suitable circuit for running the attachment, one must be ordered from a D&A dealer. This may require more complex installation, including new piping and additional valves such as directional valve and pressure relief valve.

### Operating temperature

The operating temperature is  $-20^{\circ}\text{C}$  to  $+80^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$  to  $+176^{\circ}\text{F}$ ) for CAL 225- CAL 18000. If the temperature is below the range, the breaker and tool have to be preheated before any operations can begin, in order to avoid breaking the accumulator's membrane and the tool. During operation they will remain warm.

**NOTE!** The temperature of the hydraulic oil must be monitored. Ensure that oil grade and oil temperature together will guarantee a correct oil viscosity.

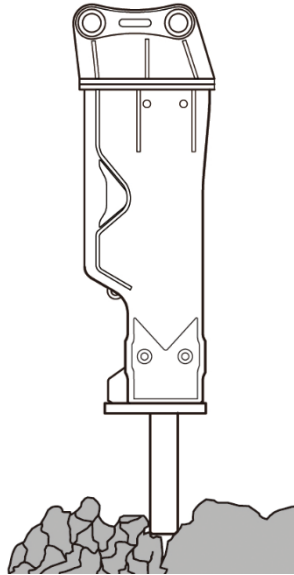
### Principles of breaking

To increase the working life of the breaker, pay particular attention to correct working methods and how to choose the correct tool for the job. There are essentially two ways of breaking with a hydraulic breaker.



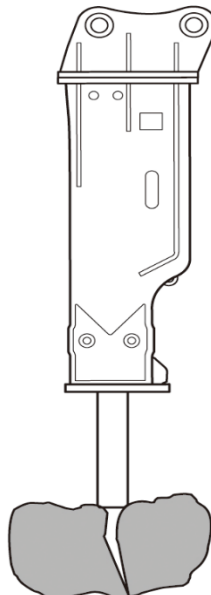
## Penetrative breaking (or cutting)

In this form of breaking, a moil point or chisel tool is forced into the material. This method is most effective in soft, layered or plastic, low abrasive materials.



## Impact breaking

With impact breaking, the material is broken by transferring very strong mechanical stress waves from the tool into the material. The best possible energy transfer between the tool and the object is achieved with a blunt tool. Impact breaking is most effective in hard, brittle and very abrasive materials. The use of a tool in hard material will cause the sharp edge to wear very quickly. Impact breaking.





## Choosing tools

A selection of standard and special tools to suit each application is available. The correct type of tool must be selected to get the best possible working results and the longest working life for the tool. Choosing the best tool type for an application may require some testing. The tool selection available depends on breaker model. Contact an authorized dealer for more information on choosing tools.

See section operation to select the tool.

## Adjuster valve to control impact blows

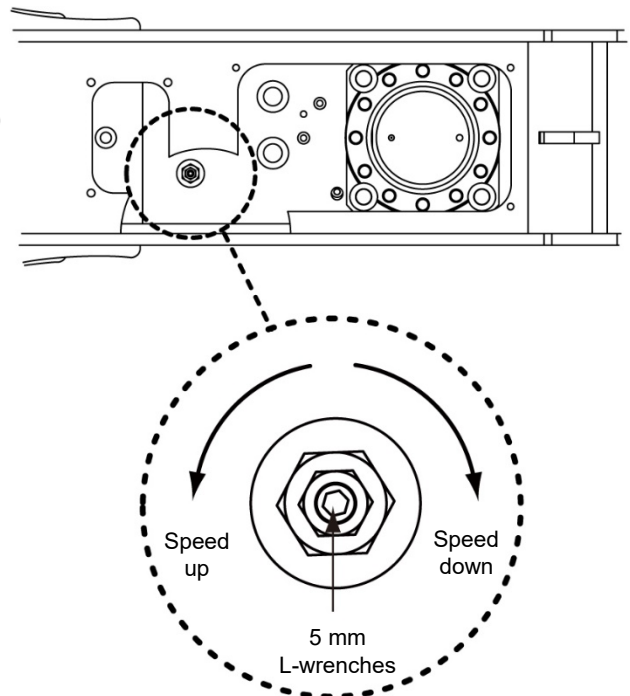
The BPM of the breaker is adjusted by the oil flow of the carrier by reducing pressure in the control valve (CAL 225 – CAL18000).

### Job condition for stroke adjustment :

- At secondary job of lime stone and soft rock, high speed is more productivity.
- At primary and hard rock breaking job, power (low speed) outputs more

The blows of breaker can be adjusted with following procedure.

1. Release the nut of adjuster.
2. High speed (Low power):  
turn adjuster to counter-clockwise. (turn 2 cycle)  
  
Low speed (High power):  
turn adjuster to clockwise. (fully tighten)
3. Tighten the nut of adjuster after setting.





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## Special conditions of use

If the breaker is to be used in conditions that differ from normal breaking or demolition work conditions, such as: tunnel application, foundry cleaning, underwater operations, operations in extremely low or high temperatures, use of special hydraulic oils, other special conditions, it may require modifications to attachment, special operating techniques, increased maintenance or special wear items.

In case of use in special conditions, contact a Authorized dealer for instructions.

**IMPORTANT!** The breaker as a standard assembly must not be used under water. If water fills the space where the piston strikes the tool, a strong pressure wave is generated and the breaker may be damaged.

## Underwater operation

The latest breaker models can be modified for underwater operations for only short periods. The operating principle in underwater breaking is to conduct pressurized air through a built-in channel to the space below the piston. The air pressure prevents water entering the breaker. The breaker as a standard assembly must not be used under water. If water fills the space where the piston strikes the tool, a strong pressure wave is generated and the breaker may be damaged.

The wear resistance of the breaker parts is considerably lower under water than in normal use. This is caused by corrosion and by the abrasive effect of mud in water. After starting underwater breaking, the breaker must be inspected regularly, for example after every half hour operation. Adapt the inspection intervals to the working conditions.

In underwater applications, the productivity of a hydraulic breaker is considerably lower than in normal work. This is caused by:

1. The breaking object is not visible to the operator. This causes misalignment between the tool and the object and unnecessary idle strokes.
2. The breaker must be inspected and greased more often than in normal situations.
3. The breaker must always be completely serviced after working on underwater job sites.

**For further information on underwater operation, contact an authorized dealer.**





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### 1. Safety fist

- When leaving the carrier, lower the breaker to the ground and turn the engine off.
  - Never attach a cable or sling to the breaker to hoist a load. Doing so is extremely dangerous.
  - Remove the tool before transporting the breaker.
  - Keep all people and equipment away from the breaker during operation. Rock flying from the breaker can cause serious accident.
  - A safety screen is recommended to protect the operator from flying chips of rock. Keep windows and doors closed during operation.
- Only machines with enclosed cab may be used for breaker operation.  
Machines with canopy version (open cab) should not be used with a breaker.
- Do not use the breaker to sweep the ground of debris. This may damage the breaker and the housing will wear quickly.

### 2. Prior inspection

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

### 3. Attaching the breaker

- When attaching the breaker, the assistant is required who must be instructed by an excavator driver. All directions, signals etc. must agreed on beforehand.
- The breaker should only be attached to an excavator with sufficient load capacity. If the excavator is too light it may become unstable under load and fall over.
- Do not touch any parts when the boom is moving.
- Check the pressure relief valve on the hydraulic system.
- Do not run any hydraulic lines through the driver's cab. These lines may start to leak or even burst. During operation, the hydraulic oil becomes very hot. Never touch the breaker.
- If the breaker is connected to an attachment bracket, special care must be taken to ensure that the attachment bracket does not sustain any damage.

### 4. Fitting / removing the tool

- Always wear protective glasses and helmet when fitting or removing the tool.
- Metal splinters may chip off when the spring dowel sleeves are broken into pieces.
- Never use your fingers to check alignment of the recesses on tool to the slots for the retaining bars.
- The tool shank must be well lubricated during operation. Regular visual inspections during operation are recommended. The greasing intervals are different for the breaker models and vary with the working conditions.

See section service and maintenance.



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### Equipment limits

- Prevent persons from staying in the risk zone when operating the breaker. The operator is responsible to determine the risk zone. The operator must make sure that it is safe for persons to stay outside the risk zone.
- If the noise level exceeds 90 dB(A), all workers in the immediate area, including the driver of carrier, must wear hearing protection.
- Stop the breaking immediately if any one moves into the danger area, which is much larger for breaker operation than for excavator operation due to the risk of flying rock splinters.
- Check the oil temperature constantly. Temperature of the hydraulic oil must never exceed 80°C/176°F. If higher temperatures are measured in the tank, oil cooler must be fitted.
- At temperatures lower than minus 20°C/68°F, the breaker should not be put into operation with cold hydraulic oil, the seals in the breaker may be damaged. Have the engine warmed up and moving the boom to higher temperature before operating the breaker.
- Only approved hydraulic oils should be used.
- Do not operate the breaker with the hydraulic cylinders fully extended or fully retracted. Damage to the machine may result.
- When operating the breaker, make sure that it does not make contact with the machine or the hydraulic lines.
- Do not apply too much or too little feed force on the breaker.
  - Too much: Stabilizer leg feet are lifted from the ground or tracks are completely lifted from the ground.
  - Too little: Tool does not stay firmly against material to be broken and machine starts to shake.
- Keep the tool perpendicular to the object at all times. If the object moves or its surface breaks, correct the angle immediately.
- Do not let the tool move outwards from the breaker without resistance when it penetrates. Keep the feed force on the breaker steady and aligned with the tool while breaking.
- Do not strike in one spot for more than 15 seconds at a time. If the object does not break, or if the tool does not penetrate, stop the breaker and change the position of the tool. Working too long in one spot will create stone dust under the tool. Dust dampens the impact effect and produces heat.
- Stop the breaker quickly. Do not allow the breaker to fire with no pressure on the tool (dry fire). Frequent idle strokes will damage the breaker.
- To use the breaker most efficiently when breaking, concentrate on small steps from the outer edge of the working area towards the middle.
- When breaking hard or frozen ground, use the benching method. Start with clearing a small area from the edge. Then continue by breaking material towards the open area.
- When breaking concrete, hard or frozen ground, never pry with the tool. The tool may break. Tool failures caused by prying are not covered by warranty.



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## Operating

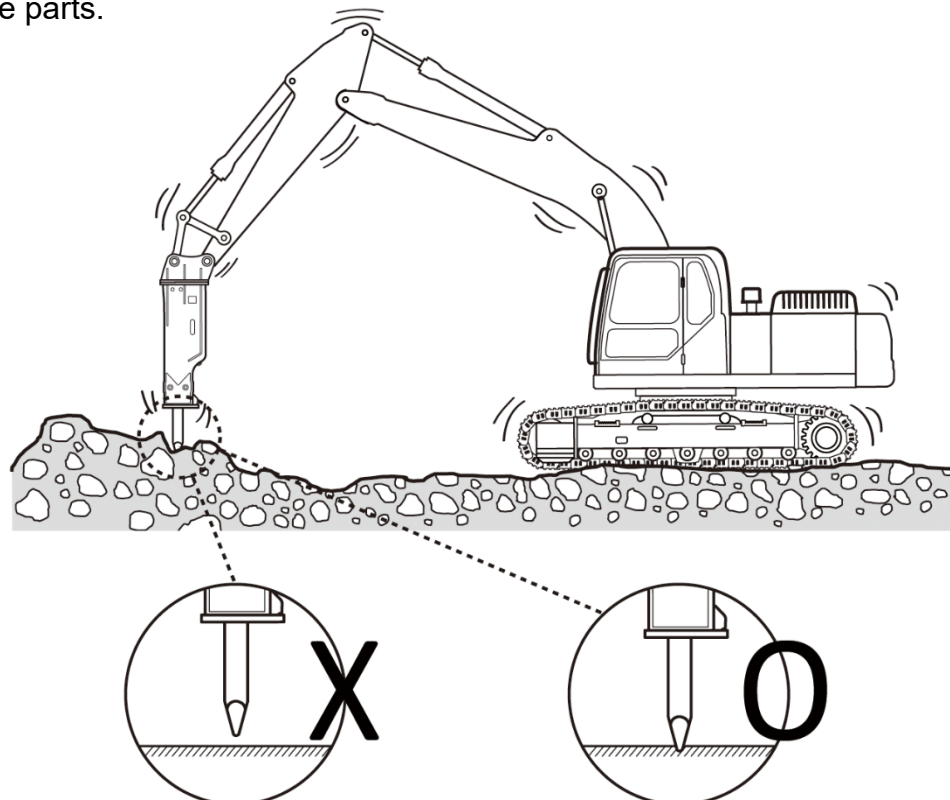
First of all, precautionary measures should be taken to the rule out the risk of accident.

- Only operate the hydraulic breaker from the driver's seat in the excavator cab.
- Close the front screen / splinter guard on the drivers cab to avoid injury from flying rock splinters.
- Wear ear protection to prevent hearing impairment. Anyone in the immediate vicinity of breaker operations should also wear ear protection.
- Switch off the hydraulic breaker immediately if any one moves into the danger zone, which is within a radius of at least 7 meters (23 FT) around the hydraulic breaker. Depending on the application greater distances may have to be observed.

## Proper way of operation

### 1. Proper thrust

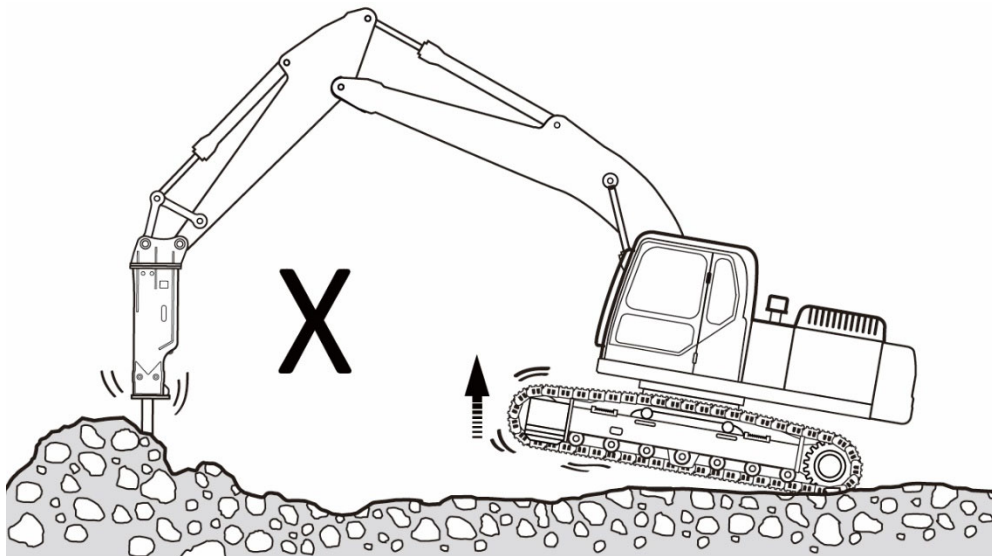
To break effectively, a proper thrust force has to be applied to the breaker. If a thrust is insufficient, impact energy of the piston is not efficient enough for breaking rocks. Then, the breaking force is transferred to the breaker body, arm and boom of the carrier etc. to result in damage of those parts.



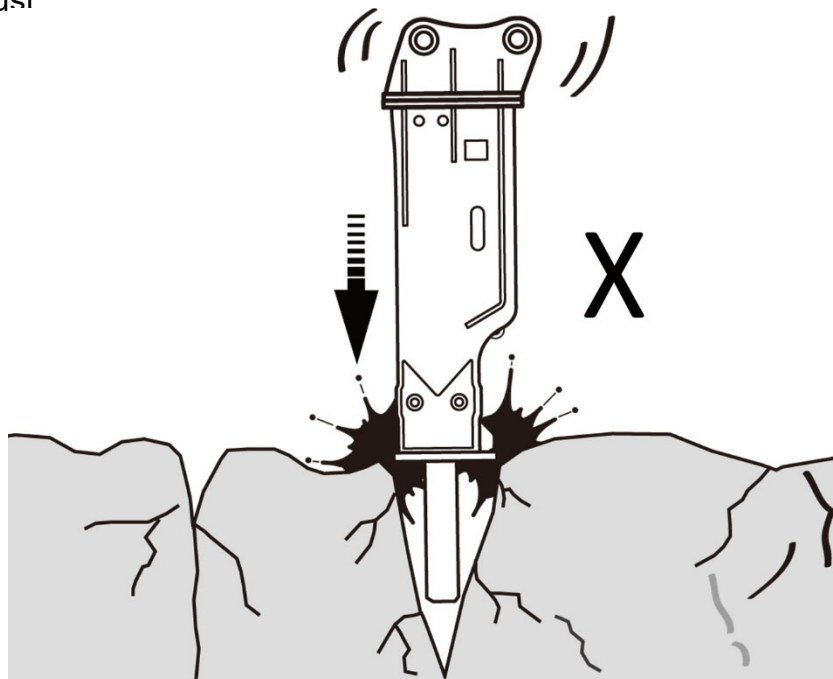


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On the other hand, if a thrust is excessive or breaking is performed with boom of the carrier raised, the machine may suddenly tilt toward the movement, rocks are broken and the breaker body may violently hit against rocks to result in damage.



If breaking is performed under such a condition, vibrations may also be transmitted to the tracks. Therefore, breaking in such a manner should be avoided to also protect the tracks. Further, during breaking, always take care of applying a thrust to the breaker. Do not breaker without proper applied thrust

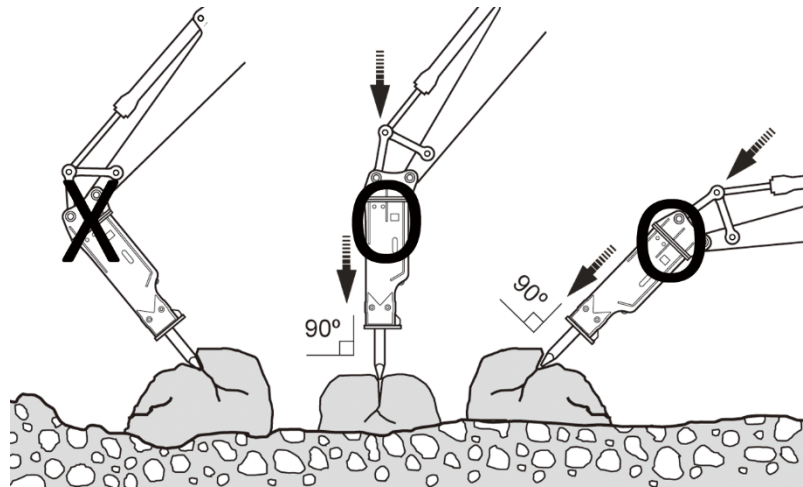




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## 2. Direction of thrust

Apply a thrust in a straight line with the tool place the tool on a rock with the breaking side as vertically as possible. If the breaking side is oblique, the tool may slip during breaking to cause the tool and piston to be broken, or seized. When breaking, select the point of a rock on which breaking can be performed at the correct angle.

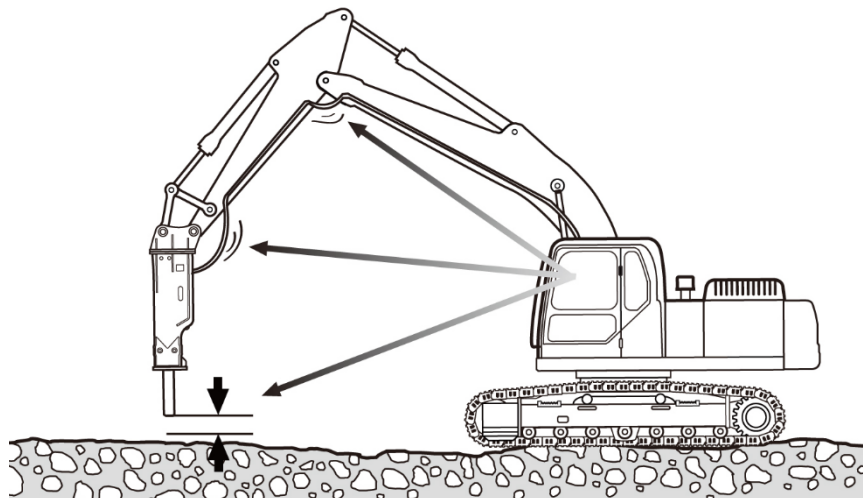


## Precaution for operation

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

**Stop the operation as soon as the hoses vibrate excessively.**

Check to see if the high and low pressure hoses of the breaker vibrate excessively. If that, the accumulator may be defective and then contact with the service shop appointed by dealer in your territory for repair. Further check oil leakage at the hose fitting points, if oil leaks, retighten them. Visually inspect whether there is a surplus of tool, during operation as illustrated (See below). If not, the tool must be seized in the front head. Disassemble the front head, and inspect the components and repair or replace defective parts.





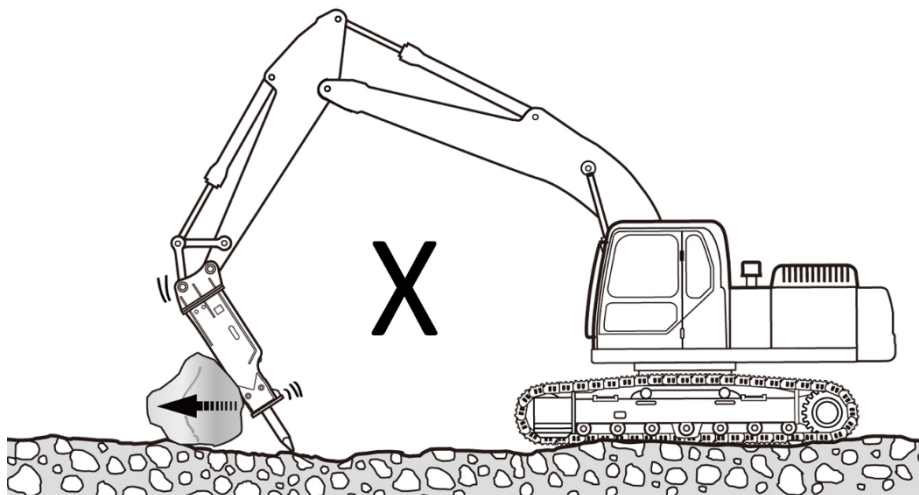
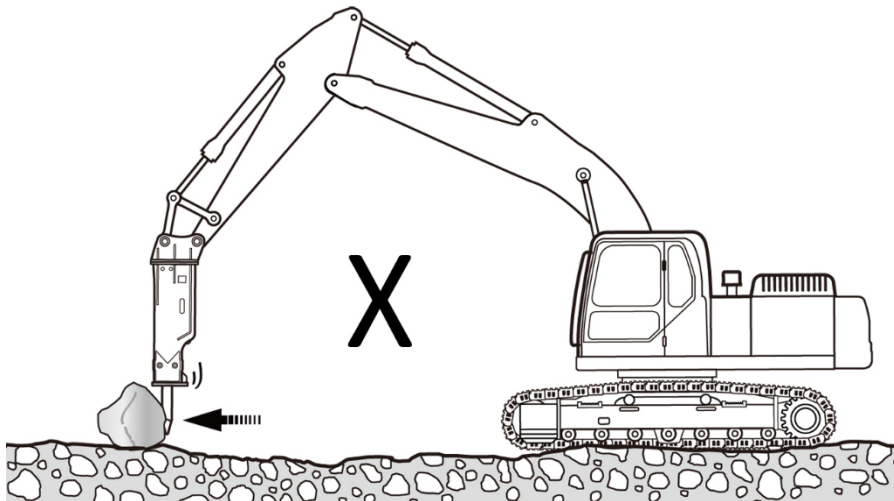
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## Stopping (Avoid idle breaking)

As soon as rocks are broken, stop the breaking. If idle breaking is continued, the accumulator may be damaged, the through bolts loosened or broken and, further more, the carrier also affected adversely. When a proper thrust is not applied to the breaker or the tool used as a lever, the state of idle breaking will be brought. (In idle breaking, the breaking sound is not normal.)

## Never use to move the rocks

As shown on the picture, do not roll or throw down a rock with the end of the tool or the side of the bracket using the oil pressure for the carrier's boom, arm, bucket, swing or traveling because the bolts of breaker may be broken, the bracket damaged, the tool broken or scuffed, and the boom or arm damaged. Avoid moving rocks. Especially, never travel the machine with the tool in a rock.

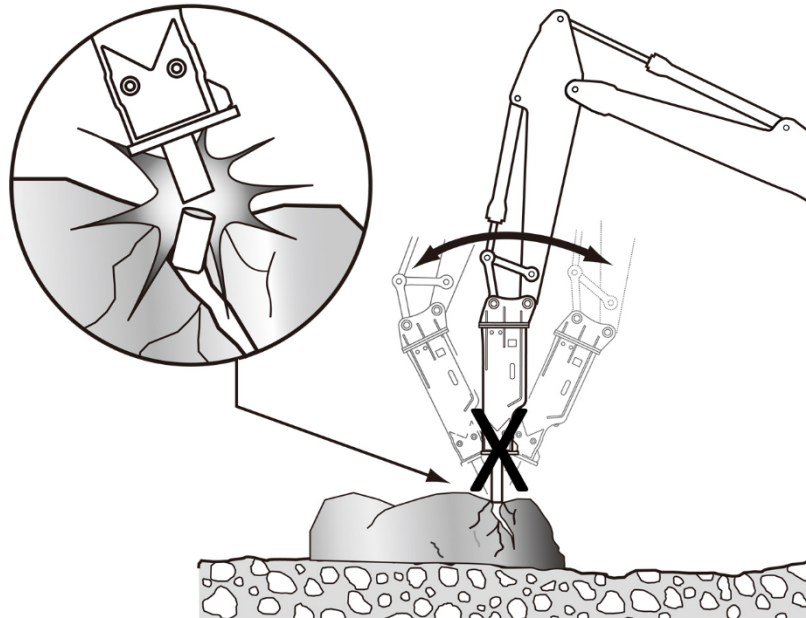




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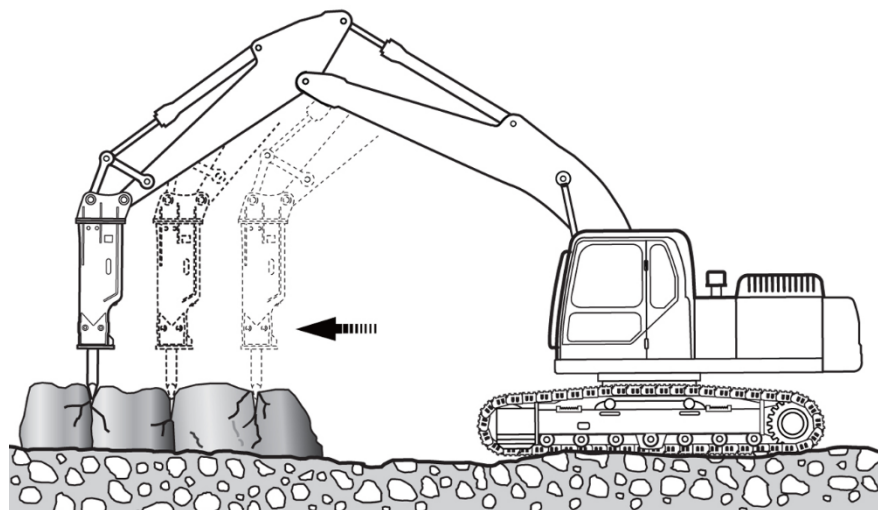
## Never lever with the breaker

Never attempt to use the hydraulic breaker as a crowbar, as this will cause the working tool to break.



## Never breaking exceeds 30 seconds

In harder material, do not break in the same place to exceed 30 seconds. Change the point of impact on material to be broken. The length of time breaking raises the oil temperature and can result in the damage of the accumulator and can cause the tool to be excessively worn.



## On a hard, large rock, start breaking at the end point. (Advance)

Beginning to break at the crack or the end will enable even a big rock to be broken comparatively easily. Advancing in large steps will not improve working results. Advancing in small steps is more effective.



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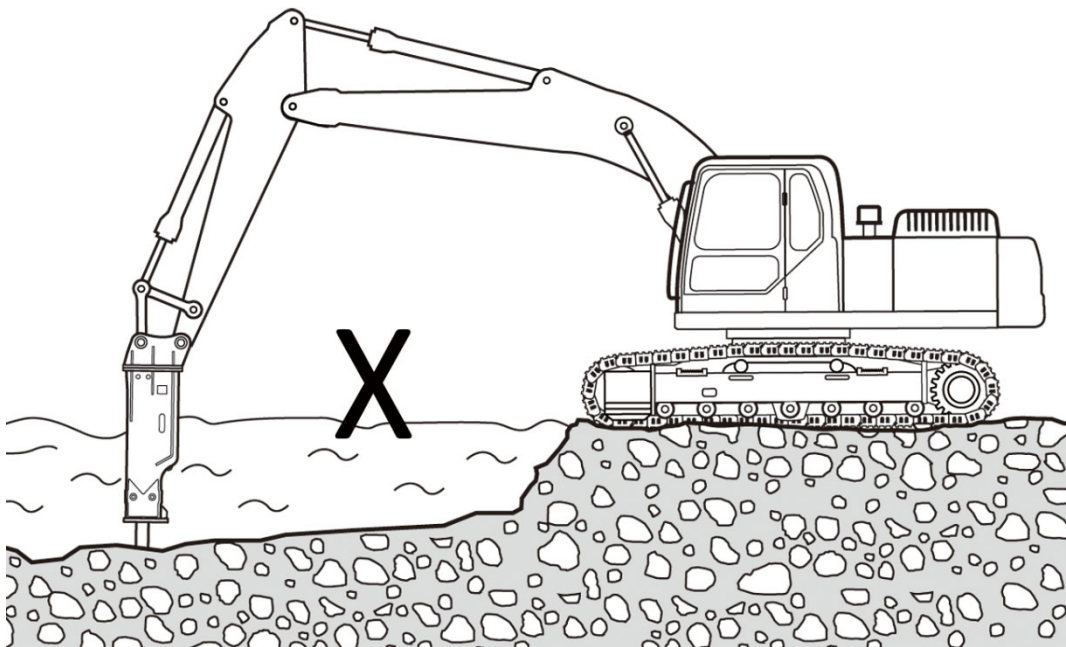
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## **Operate the breaker at a proper engine speed**

Breaker works at the specified engine speed. Raising the engine speed to highest rpm levels does not increase the breaking force but raises the oil temperature that result damages in internal components of breaker. To adjust proper engine speed, please refer to carrier operating manual.

## **Never be used in or under water also in mud without prior conversion**

If water were to penetrate the percussion chamber, each blow would create a pressure wave. These pressure waves would cause irreparable damage to the stripper and seals on the hydraulic breaker, and in addition the lower percussion piston zone would rust. Water could also penetrate the carrier's hydraulic system. In order to avoid damage to the hydraulic breaker, a special kit developed for operating for under water.



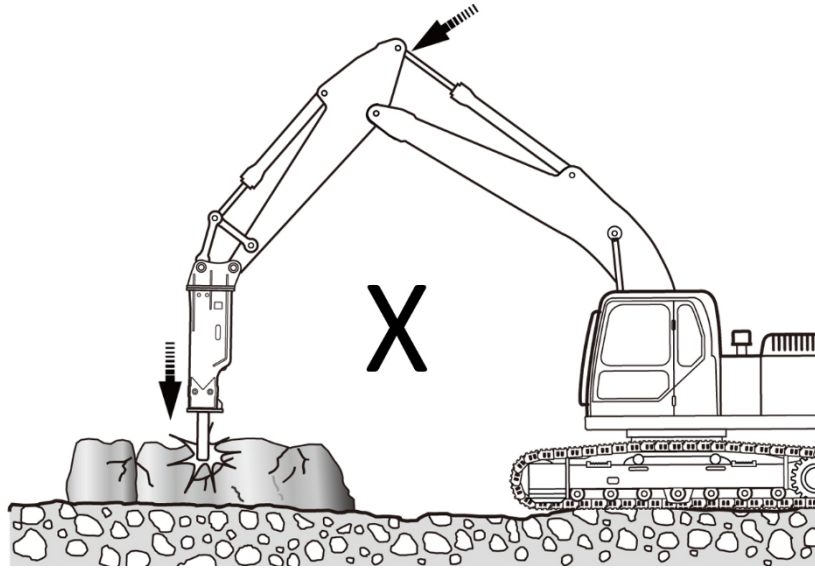




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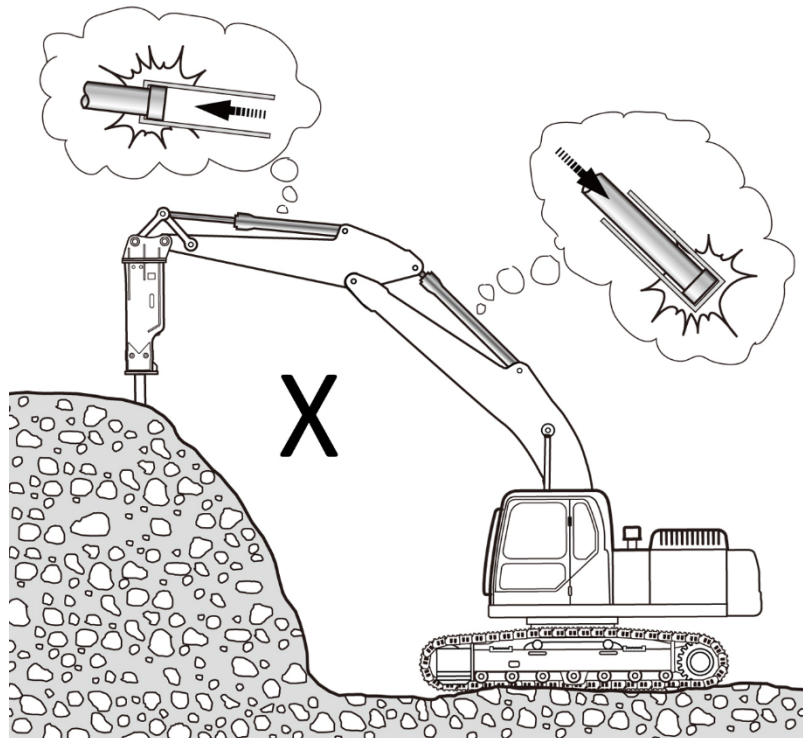
## Never use breaker as a sledge

Before starting up, rest the breaker on the ground. Never attempt to use the breaker and excavator boom as a sledge hammer to break material. This will damage parts of the carrier.



## Never break with the cylinders of carrier extended to the end of stroke

The excavator can receive damage if the breaker is operated with the cylinders of carrier stretched to the end.

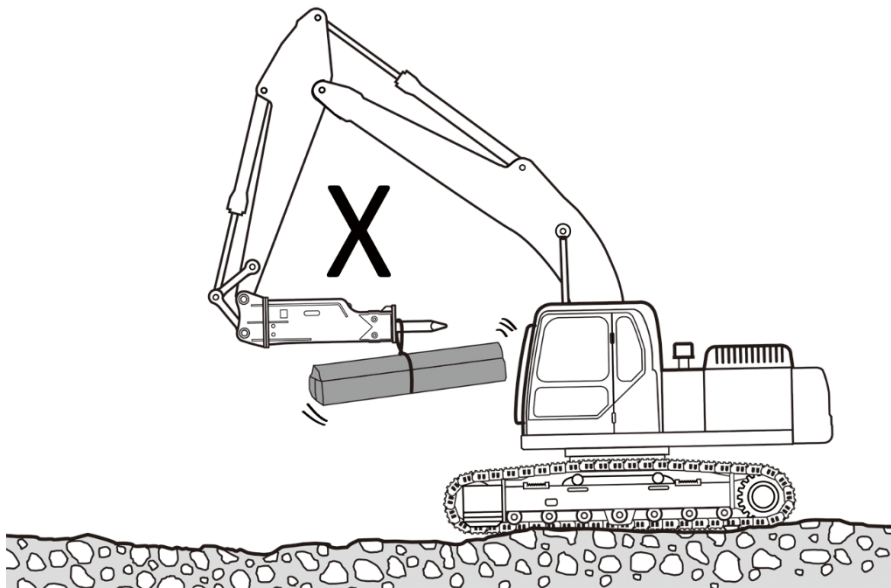




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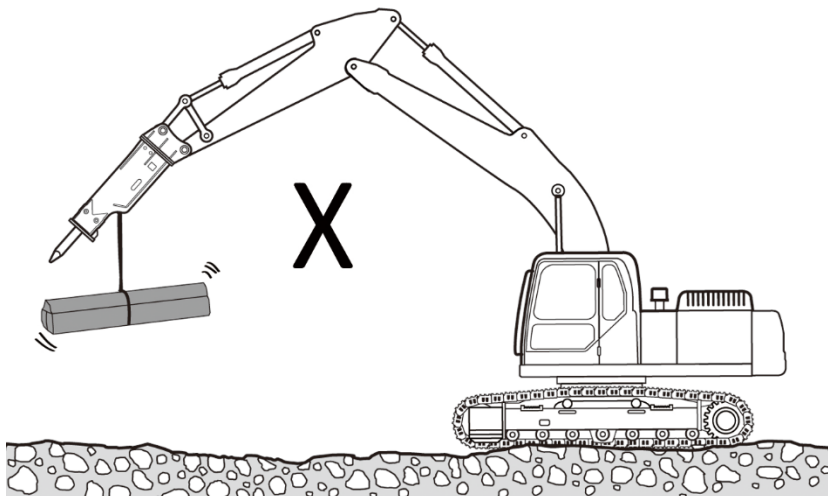
## Needs Warming up the carrier in winter

If the breaker is operating with low oil temperature in winter, the piston & seals may easily be damaged. It is required that warming up the engine of carrier from five to twenty minutes and moving the boom. Oil temperature must reach to min. 30°C/86°F.  
(Refer "Operator's Manual of Carrier")



## The Effects of Blank Firing

If the breaker is operated without the tool being pressed against a solid material (known as 'blank firing') both the breaker and the tool can be damaged. Damage can be caused to the breaker by the internal shocks which develop in the hydraulic components. Blank firing also causes rapid wear to the tool retainer pin and the tool itself. Typically, damage is in the form of heavily burred edges on the tool and retainer pin as shown. Such damage is usually not repairable and therefore adds extra (and unnecessary) costs and delays to the job.



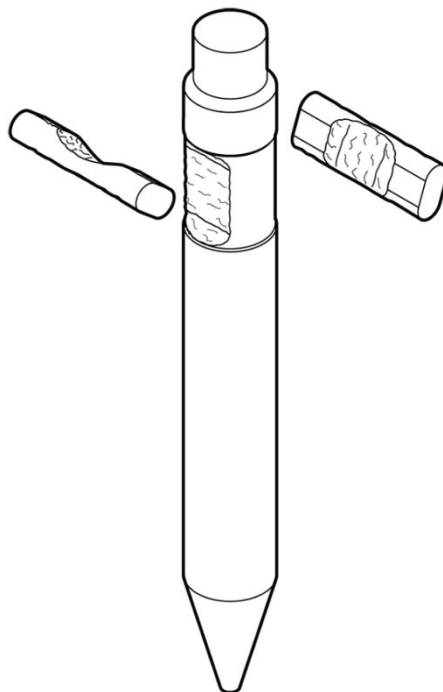
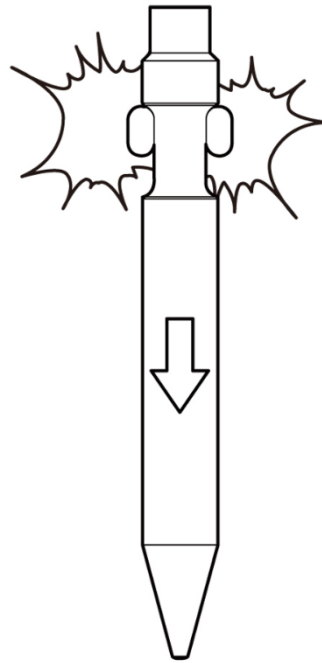
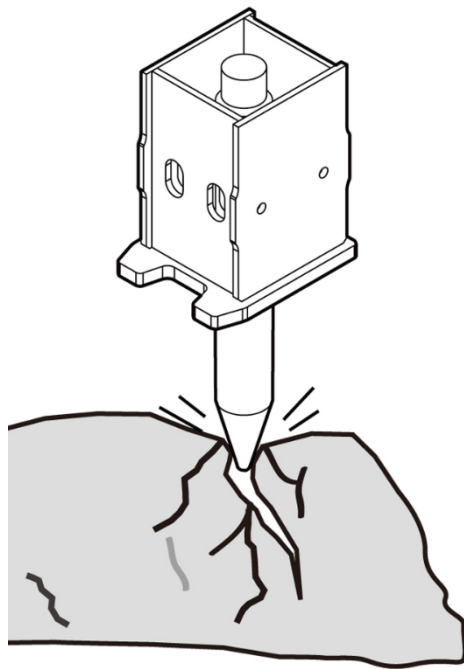


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## To prevent blank firing:

- **NEVER** operate the breaker without a tool.
- **NEVER** operate a breaker unless the tool is pressed against a solid surface.
- Stop the breaker just before the tool breaks through the material.





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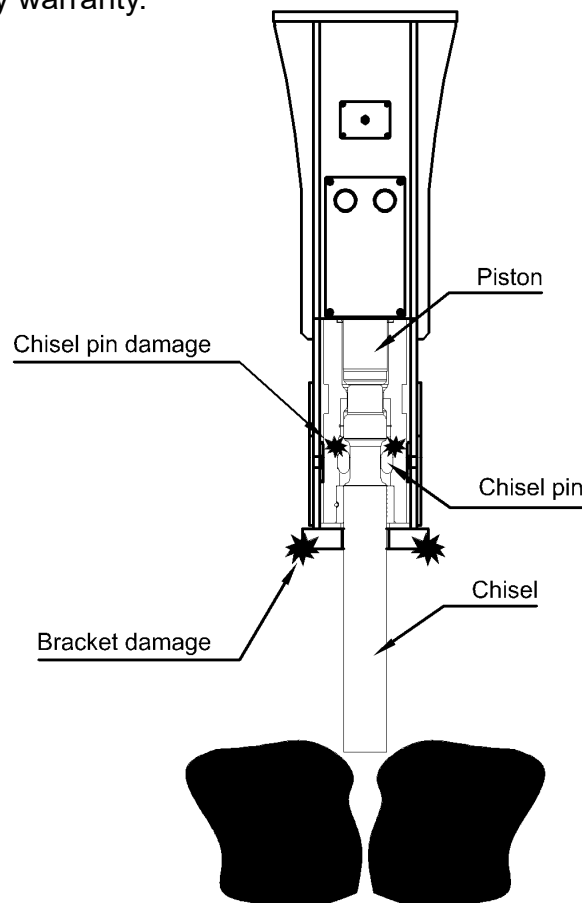
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## How to operate breaker in secondary rock breaking operation.

The reason why chisel pin easily damaged during operating in quarry is that the chisel (Hammer tool) hits chisel pin continuously during the breaker operation. Follow the instruction be low for correct method of secondary rock breaking operation.

1. Press the pedal just for only one stroke of breaker in a moment. (Small size rock 50cm~80cm, 19.7"~31.5"). This is important.
2. Use the Blunt (Flat end point) chisel.
3. Do not lift up the front track of excavator.
4. Lower the engine below 1500 rpm to slow down blows (bpm).
5. It makes longer life of chisel pin if you follow above instruction #1~4 accordingly as it reduces damages on chisel pin by reducing hit of chisel (hammer tool).
6. It also prevents the bottom of bracket from wearing because it reduces the number of hits between bottom bracket & rock.
7. It is okay to stroke (5~10) repeatedly if it is breaking big rocks. (Bigger than 1 meter or 3 ft)

\*\*\* If operator does not follow the instruction above, chisel pin and the front head (Body) will be damaged early. In this case, any warranty claim will not be covered by our warranty. Also, the second damage of Front Head (Body) will be developed by broken chisel pin and it is also not covered by warranty.





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### **Auto-Stop**

Blank firing occurs when operator keeps pressing the breaker pedal after object is completely broken. The impact energy is conveyed directly to through bolts, tool pin and other parts and can cause of damage to tool pin, through bolt and other parts.

Auto-Stop mode of breaker has been designed to stop operation only after one time extra hitting when piston works beyond its working range and then high pressure connects directly with the return line through the groove located in the large diameter of the piston. I.E. It stops operation after one time hitting.

Auto-Stop system proved its efficiency through actual operation at the job sites.

However, in case of secondary breaking operation at the stone quarry or mine especially breaking object is small in size, breaking objects are broken after 1~2 time hitting and then it becomes blank firing condition.

Therefore, operator requires special care to know the following instructions to prevent earlier unnecessary tool breakage.

- Use Blunt type breaker tool
- Operator must stop hitting operation immediately after breaking object is broken.

### **Working in high-temperature conditions**

The temperature of the hydraulic oil must be monitored to ensure it does not exceed 80°C/176°F. If higher temperatures are measured in the tank, oil cooler must be fitted. Only use hydraulic oils of sufficient viscosity. In summer and tropical climates, the minimum requirement is a hydraulic oil type ISO VG 68 HV.

(Refer to page 38)



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### Working in low-temperature conditions

The temperature down to 20°C/68°F below freezing there are no special regulations, 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°C/32°F, the hydraulic breaker can start up. Leave the motor and the pumps of the excavator running while operating the breaker.

#### **Please note:**

The hydraulic breaker and excavator do not operate to full capacity until the oil temperature has reached at least 60°C/140°F.



#### **WARNING!**

**Feeding hydraulic oil to an extremely cold hydraulic breaker will cause internal stresses in the unit resulting in its failure. If the breaker is used without preheating the hydraulic oil, the breaker seals may fracture and the diaphragm in the high-pressure accumulator may tear. (Please observe the excavator manufacturer's regulations.)**

### Key points in use tools

Follow these warning to prevent of failure or crack on the tool and holder bush.

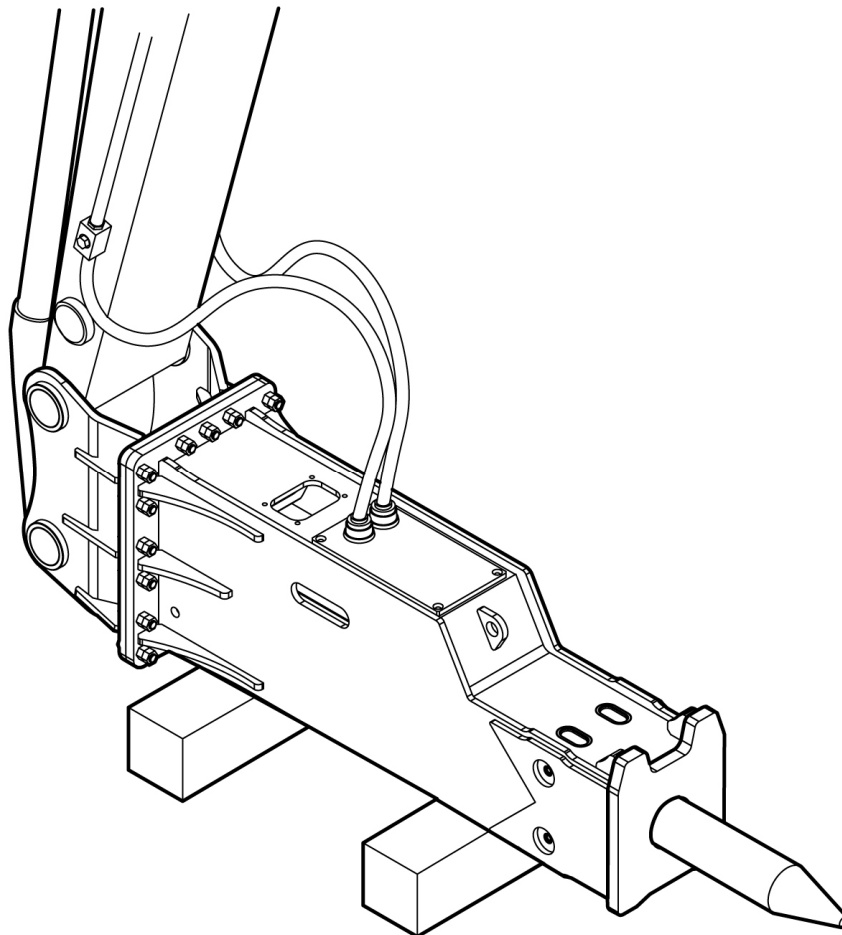
- Avoid lifting, twisting and hitting.
- Avoid getting wet in the rain.
- Avoid getting injured from hitting between the tools or to other hard things.
- Avoid heating.



### Removal & installation of the breaker

#### **WARNING!**

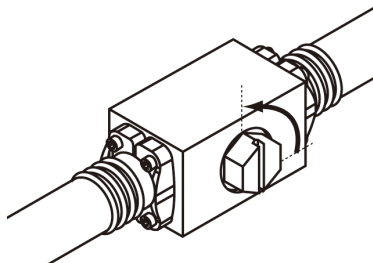
- The assistant must be instructed by the excavator operator and all signals and directions agreed upon beforehand.
- The breaker should only be attached to an excavator with sufficient load capacity. If the excavator is too light, it may become unstable under load and fall over.
- Do not touch any parts when the boom is moving.
- Collect any oil which leaked out and dispose of it correctly.
- Check that the pressure relief valve on the hydraulic system has been approved by the relevant authorities.
- Check that the hydraulic lines which connect the carrier to the breaker.
- Allow breaker to cool before. It may cause burns.
- Never use your fingers to check the alignment.



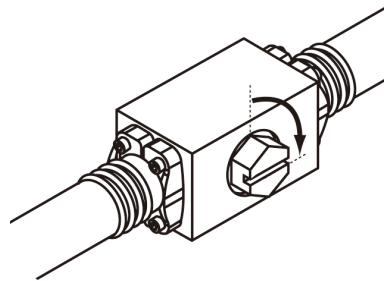


## Remove the breaker

1. Remove the hydraulic hose connected with the stop valve on the boom and the breaker.
2. Close off the hose and the stop valve with caps in the toolbox.
3. Replace the breaker and the bracket by the bucket in the same order of the bucket replacement.
4. Follow the reverse order when installs the breaker.

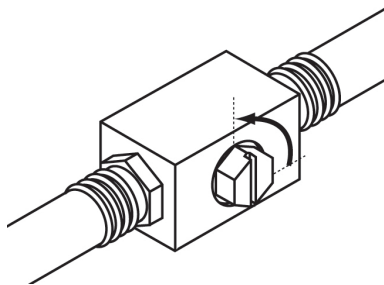


Closing

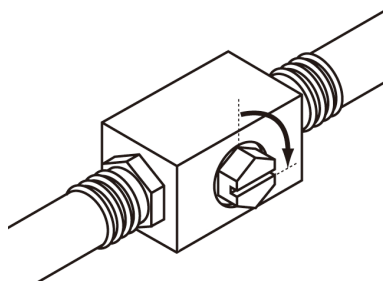


Opening

## Opening and closing of the stop valve (Split type)



Closing



Opening

## Opening and closing of the stop valve (Coupling type)



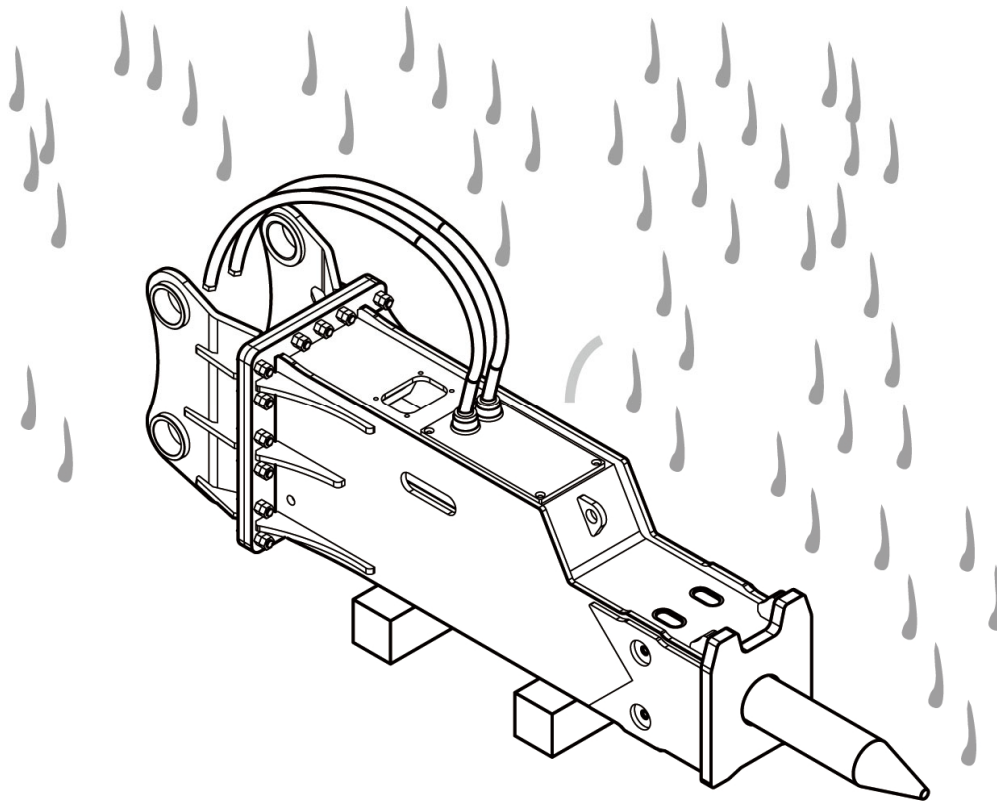


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## Storage maintenance

1. Be sure to shut the caps of the dismantled breaker's hoses.
2. Avoid getting wet in the rain. Preserve inside or put on the tie with covering.
3. Apply enough grease to the tool.



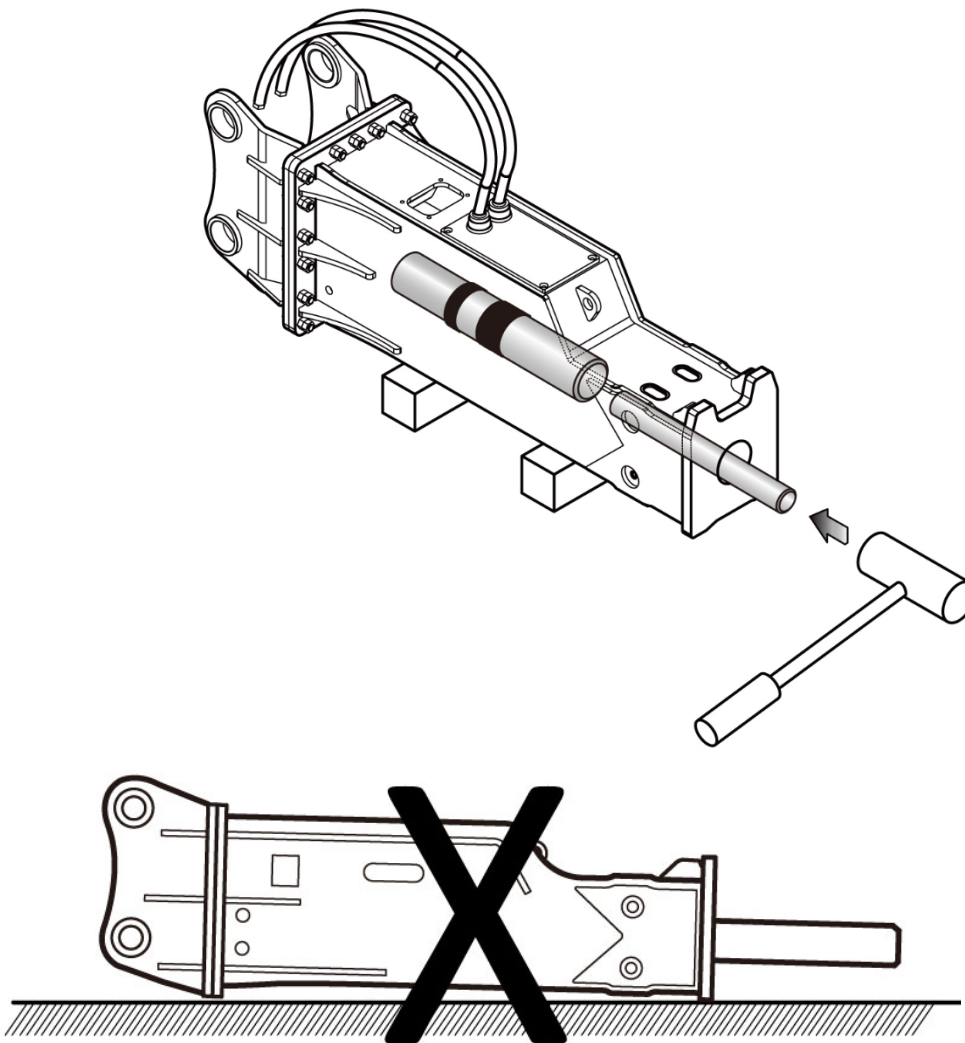


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Follow these to prevent getting rust on the piston for long term storage:

- The storage area must be dry.
- The storage temperature must not be lower than -20°C (-4°F)
- Dismount the tool from the bottom bush.
- Deflate the nitrogen gas of head cap completely from the gas valve of head cap.
- Push up the piston with a wooden tool through the bottom bush.
- Let the residuary gas pressure out of head cap.
- Apply grease to the inside of bottom bush and tool then attach to the bottom bush.
- Connections must be sealed with clean plugs to prevent oil leakage and dirt from getting into couplings.
- **The breaker must be stored in a vertical position.**
- Make sure the breaker cannot fall.





# CONSTRUCTION

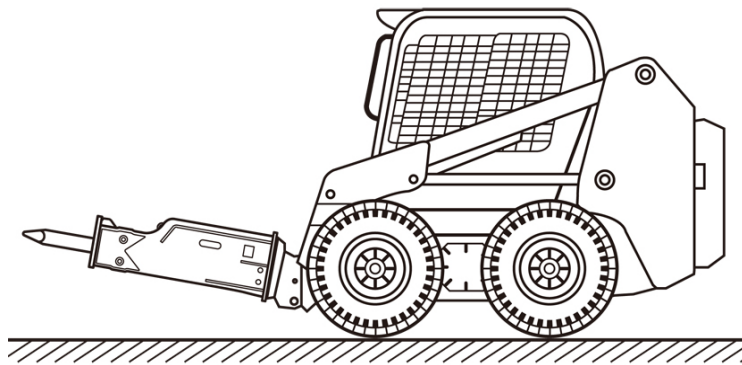
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### Traveling position

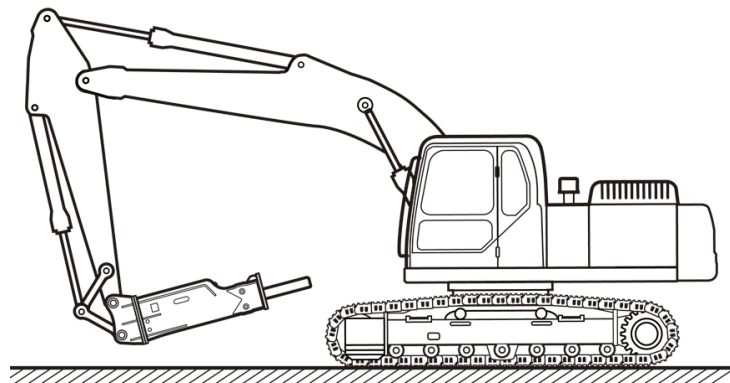
Ensure that the breaker is not too close to the backhoe boom, when traveling with a backhoe loader.

Lower the loader arm and tilt the breaker fully backwards when traveling with a skid steer.



Skid Steer Loader with breaker in traveling position

Ensure that the breaker is not too close to the cab window and that it does not point at it when traveling with an excavator.



Excavator / Compact excavator with breaker in traveling position



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### Service and maintenance

The breaker is a precision made breaker. Therefore, great care and cleanliness should be taken when handling any of the hydraulic components. Dirt is the worst enemy in hydraulic systems.

Handle the parts carefully and remember to cover any cleaned and dried parts with a clean lint-free cloth. Do not use anything other than purpose designed materials for cleaning hydraulic parts. Never use water, paint thinners or carbon tetrachloride.

### Service intervals

**NOTE!** The times given refer to the machine hours while the breaker is operated.

#### Every 3 hours

1. Grease the tool shank and the tool bushes.
2. Check hydraulic oil temperature, all lines and connections as well as impact efficiency and smoothness of operation.
3. Tighten loose connections.

#### Every 10 hours or at least once a week

1. Remove the tool pins and the tool and check their condition. Grind the burrs away if necessary.
2. Check the tool and lower tool bush to verify that the tool has received sufficient grease. Grease more frequently, if necessary.

#### Every 50 hours or at least once a month

1. Check tool pin, the tool shank and tool bushes for wear. If out of specification, replace tool pin, the tool and bush. See page 43~51 for wear limitation. Upper bush must be changed every twice of changing bottom bush.
2. Check the hydraulic hoses. Replace if necessary. Do not let dirt get into the breaker or hoses.

#### Every 600 hours to 3000 hours

Replace the concerned parts according to the table on page 36~37.



### Maintenance parts replacement recommendation

1. The parts below are expendable parts and need to be replaced as following chart  
CAL 225 ~ CAL 2200

Description	600 hours	1200 hours	1800 hours	2400 hours
Seals	●	●	●	●
Tool pin*	●	●	●	●
Bottom damper*		●		●
Bottom bush*	●	●	●	●
Hydraulic hose**		●		●
Diaphragm	●	●	●	●
Accumulator body bolt			●	
Stopper pin*			●	
Shell pad*			●	
Upper damper*			●	
O-ring of gas valve set			●	
Through bolt set			●	
Upper bush*				●

- Note: 1. Please replace the parts at operating hours listed on chart.  
 2. \* Please replace the parts according to the wear limit guide. See page 43 and 51.  
 3. \*\* Check the hose condition and replace if necessary.  
 4. Hours : Breaker operating hours. (The operating hours are excavator's operating hours that include breaker's installation and operating hours.)



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CAL 3200 ~ CAL 18000

Description	500 hours	1000 hours	1500 hours	2000 hours
Seals	●	●	●	●
Tool pin*	●	●	●	●
Bottom damper*		●		●
Bottom bush*	●	●	●	●
Hydraulic hose**		●		●
Diaphragm	●	●	●	●
Accumulator body bolt			●	
Stopper pin*			●	
Shell pad*			●	
Upper damper*			●	
O-ring of gas valve set			●	
Through bolt set			●	
Upper bush*				●

- Note: 1. Please replace the parts at operating hours listed on chart.  
 2. \* Please replace the parts according to the wear limit guide. See page 43 and 51.  
 3. \*\* Check the hose condition and replace if necessary.  
 4. Hours : Breaker operating hours. (The operating hours are excavator's operating hours that include breaker's installation and operating hours.)

2. It is recommended for end user to prepare spare parts such as tool, tool pin, stopper pin, rubber plug, through bolt and hoses which are easily damaged or worn.

3. The above chart is intended as guideline only and varies according to the carrier's condition, the operator's skill and the place of usage.

### Service intervals in special applications

The service interval is considerably shorter in special applications such as: breaker tunneling, scaling, foundry cleaning, underwater use, etc. In special applications, contact a CAL dealer for the correct service intervals.



### Washing the attachment

When using the breaker, dirt (mud, rock powder, etc.) can become attached to it. Wash the outside of the breaker with a steam washer before sending it to the workshop. Otherwise, dirt can cause difficulties in disassembly and assembly.

**IMPORTANT!** Plug the pressure and return line before washing the product or else dirt can enter into it and cause damage to the components.

### Oil & lubrication

Breaker required proper viscosity of hydraulic oil & grease as below when using oil extremely cold or hot weather. Lubricate to the contact faces in the lower breaker part between the working tool and the wear bushes.

Hydraulic oil		Grease	
High temperature	Low temperature	Normal temperature	Low temperature
ISO VG 68 HV (61.2 ~ 74.8 cst)	ISO VG 46 HV (41.4 ~ 51.6 cst)	*NL Gi No. 2 (265 ~ 295) 15°C and over	**NL Gi No. 0 (355 ~ 385) 15°C and under

\* Please use MOS2 grease inclusive of molybdenum.

\*\*Please use MOS-L grease inclusive of molybdenum

### Problems due to incorrect hydraulic oil viscosity in the breaker:

#### Oil too thick

- Difficult start up
- Stiff operation
- Breaker strikes slowly
- Risk of cavitation in pumps and in the hydraulic breaker
- Sticky valves
- Filter bypass opens, impurities in the oil are not removed

#### Oil too thin

- Efficiency losses (internal leaks)
- Damage to gaskets and seals, leaks
- Accelerated wearing of parts, because of decreased lubrication efficiency
- Breaker strikes irregularly and slowly
- Risk of cavitation in pumps and in the hydraulic breaker



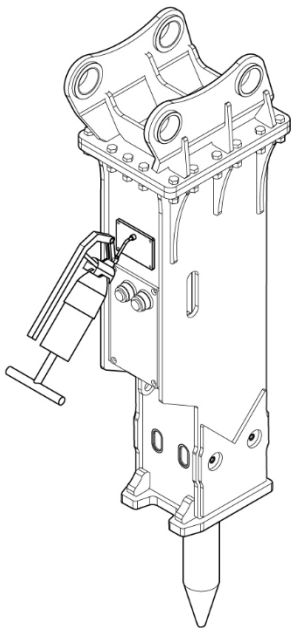
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## Correct greasing

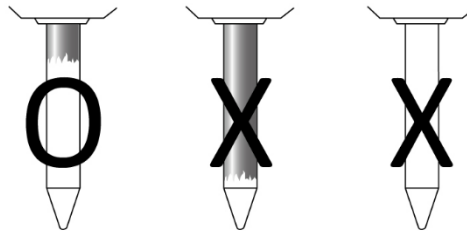
While greasing, the breaker must be standing upright and resting on the tool to ensure that the grease will penetrate downwards between the tool and the bushes. Turn off the engine and wait 10 minutes for the oil pressure to drop inside the breaker.

**IMPORTANT!** Do not fill the space between the piston and the tool with grease. A lower piston seal failure can result and the breaker will subsequently leak oil.



## IMPORTANT!

Make sure that the tool is kept fully up in its housing during greasing, to prevent grease filling the cavity between the piston and the tool.



## Grease gun application

Model	No. of Pump / 3 hour		cc / 3 hour		cc / day	
	Multi grease	Mo2 grease	Multi grease	Mo2 grease	Multi grease	Mo2 grease
CAL 225-1200	35	30	55	40	150	100
CAL 1200-3200	55	45	85	65	230	170
CAL 3200-4500	65	50	100	75	270	200
CAL 4500-8000	85	65	125	95	330	250
CAL 8000-11000	100	75	150	115	400	300
CAL 11000-18000	140	100	205	150	550	400





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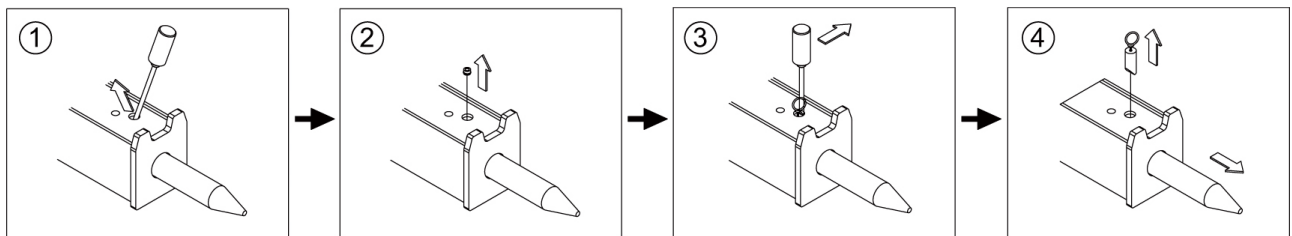
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Tool

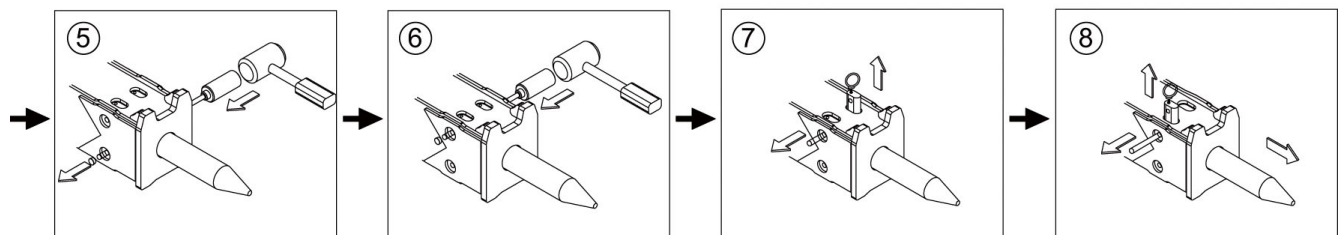
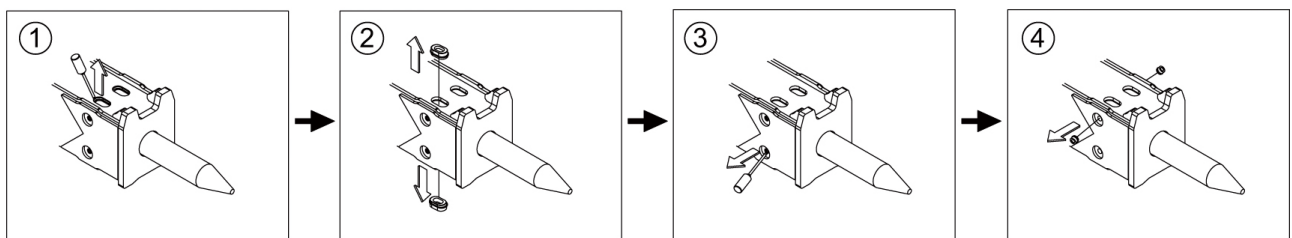
## **WARNING!**

For safety reason, the carrier must be switched off before performing the following work.

- Never use your fingers to check whether the recesses on the working tool shaft are aligned to the slots for the tool pin.
- Always wear protective glasses when fitting or removing the tool, since metal splinters may fly off when breaking out the stopper pins.
- Clean away any dirt adhering to the working tool in the insert zone.
- Lubricate to the contact faces in the lower breaker part between the working tool and the wear bushes.
- The tool should only be fitted correctly.



CAL 225 – 500, CAL 1000, CAL 1200

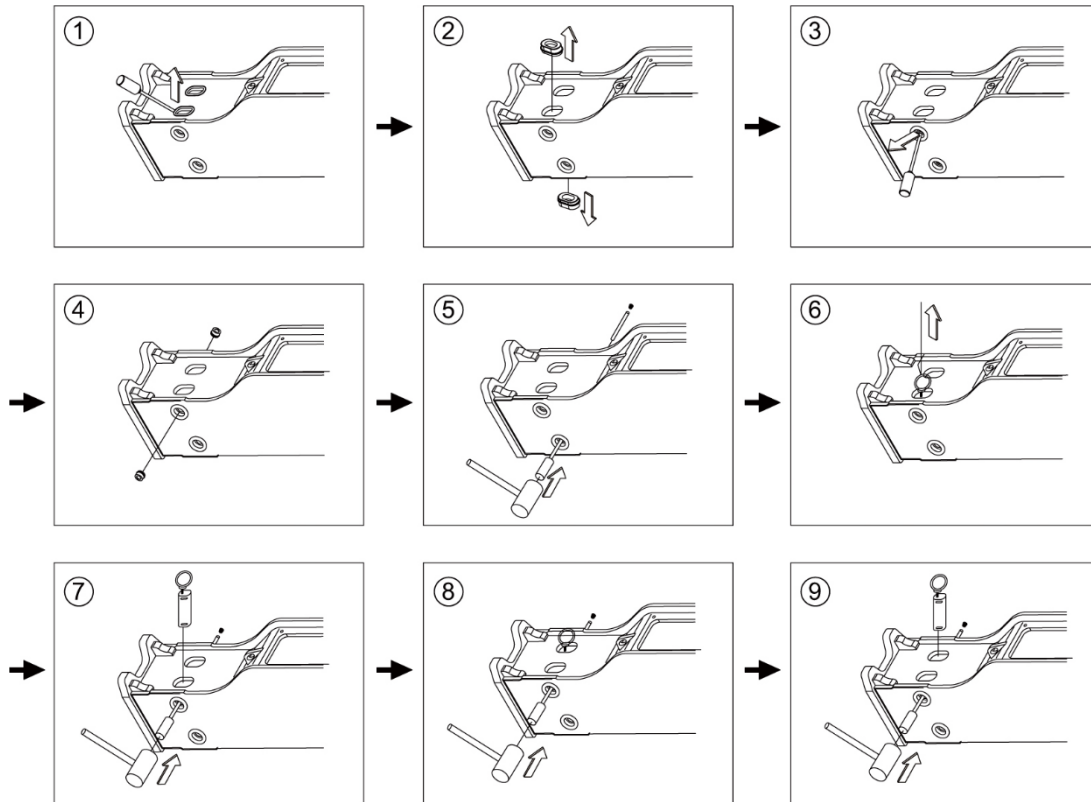


CAL 850, CAL 2200, CAL 3200



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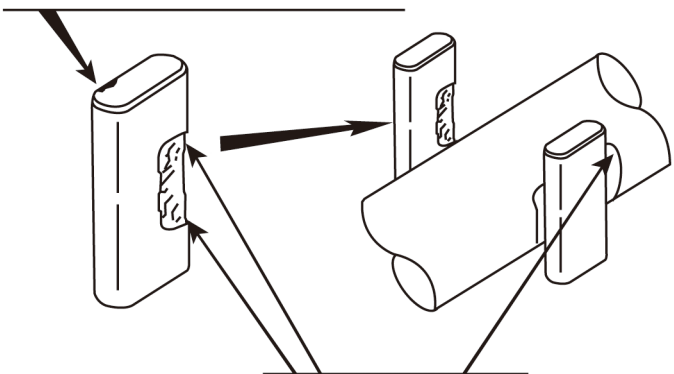


CAL 2200 – CAL 18000

### Replacement of the tool

- CAL 225 ~ CAL 500, CAL 1000, CAL 1200 : Push the spring pin back into the hole is being spring with the pin punch.
- CAL-850, CAL 2200 ~ CAL 18000 : Knock the stopper pin & rubber plug of the upper for tool pins out with breaker and pin punch. Take the tool pin out by using a pin punch to push the tool pin out from under of he breaker. Replace the new tool after removed.

When changing tool pin direction, place pin with this surface on tool side



Remove burrs and swelling with grinder or the like



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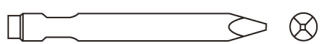
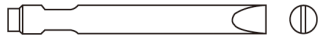
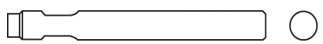
## Tool pin

When each tool pin is excessively deformed, it is difficult to replace tool. Therefore, every 100 to 150 hours of operation, change the face of each pin

**NOTE!** When one of the 2 tool pins has been damaged and so is replaced with new one, the rest pin should be turn around so that its reverse faces the tool.

## Tool selection

By rock type		Asphalt	Concrete	Lime Stone	Sand Stone	Granite	Basalt
	Moil	●	●	●	●	●	●
	Chisel	●	○	●	○	○	○
	Blunt					●	●

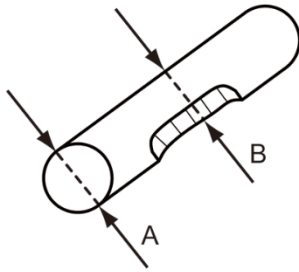
By job application		Primary breaking	Secondary breaking	Hard rock removal	Soft material & rock removal	Demolition
	Moil	●		●	●	●
	Chisel	○		○	●	●
	Blunt		●			○

- Note : 1. ● Highly recommended  
 2. ○ Selectively applicable  
 3. Please consult with the dealer when selecting tools.

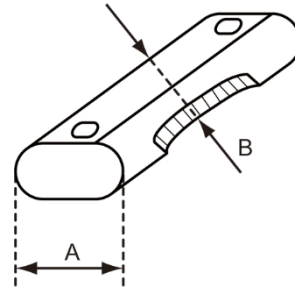


## Tool pin wear limits

CAL 225 – CAL 500,  
CAL 1000 - CAL 1200



CAL 850,  
CAL 2200 – CAL 18000



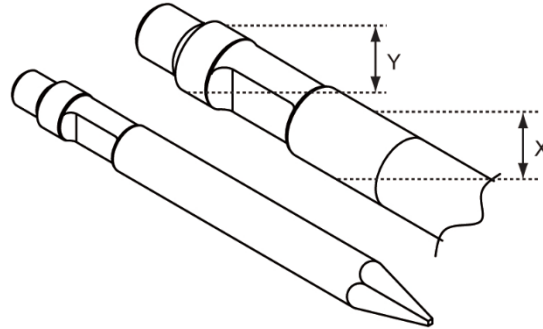
Model	Standard value (A)		Wear limits (B)	
	mm	inch	mm	inch
CAL 225	25	0.98	23	0.91
CAL 450-500	30	1.18	28	1.10
CAL 650-750	36	1.42	34	1.34
CAL 850	42	1.65	40	1.57
CAL 1000-1200	37.5	1.48	35.5	1.40
CAL 2200	50	1.97	47	1.85
CAL 4500	80	3.15	77	3.03
CAL 6000	95	3.74	92	3.62
CAL 8000	97	3.82	94	3.70
CAL 11000	100	3.94	96	3.78
CAL 18000	137	5.39	132	5.20



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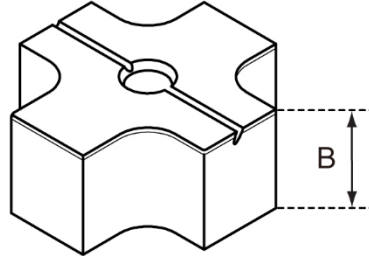
## Tool wear limits



Model	Standard value		Wear limits (X)		Wear limits (Y)	
	mm	inch	mm	inch	mm	inch
CAL 225	45	1.77	43	1.69	41	1.61
CAL 450	57	2.24	55	2.17	53	2.09
CAL 500	57	2.24	55	2.17	53	2.09
CAL 650	70	2.76	68	2.68	66	2.60
CAL 750	70	2.76	68	2.68	66	2.60
CAL 850	75	2.95	73	2.87	71	2.80
CAL 1000	80	3.07	78	3.07	76	2.99
CAL 1200	90	3.46	88	3.46	86	3.39
CAL 2200	105	4.13	103	4.06	101	3.98
CAL 3200	125	4.84	123	4.84	121	4.76
CAL 4500	135	5.31	133	5.24	131	5.16
CAL 6000	150	5.91	148	5.83	146	5.75
CAL 8000	155	6.10	153	6.02	151	5.94
CAL 11000	175	6.89	172	6.77	170	6.69
CAL 18000	205	8.07	202	7.95	200	7.87

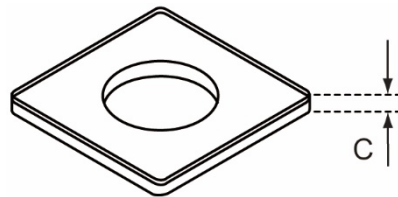


### Upper damper wear limits



Model	Standard value		Wear limits (B)	
	mm	inch	Mm	inch
CAL 225 ~ 500	54	2.13	52	2.05
CAL 650 ~ 1200	78	3.07	75	2.95
CAL 2200	100	3.94	96	3.78
CAL 3200	110	4.33	106	4.17
CAL 4500 ~ 11000	125	4.92	121	4.76
CAL 18000	147	5.79	142	5.59

### Bottom damper wear limits



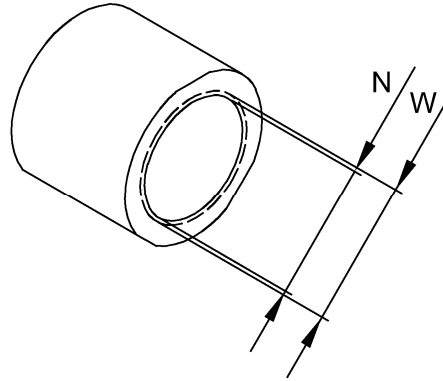
Model	Standard value		Wear limits (C)	
	mm	inch	mm	inch
CAL 225 ~ 3200	20	0.79	18	0.71
CAL 4500 ~ 11000	25	0.98	22	0.87
CAL 18000	35	1.38	31	1.22



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## Bushing wear limits



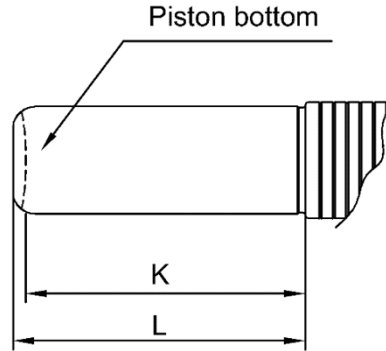
Model	Unit	Bottom bushing		Upper bushing	
		Standard (N)	Wear limits (w)	Standard (N)	Wear limits (w)
CAL 225	MM (INCH)	45(1.77)	48(1.89)	45(1.77)	50(1.97)
CAL 450		57(2.24)	60(2.36)	57(2.24)	62(2.44)
CAL 500		57(2.24)	60(2.36)	57(2.24)	62(2.44)
CAL 650		70(2.76)	73(2.87)	70(2.76)	75(2.95)
CAL 850		75(2.95)	78(3.07)	75(2.95)	80(3.15)
CAL 1000		80(3.15)	84(3.31)	80(3.15)	86(3.39)
CAL 1200		90(3.54)	94(3.70)	90(3.54)	96(3.78)
CAL 2200		105(4.13)	109(4.29)	105(4.13)	111(4.37)
CAL 3200		125(4.92)	129(5.08)	125(4.92)	131(5.16)
CAL 4500		135(5.31)	140(5.51)	135(5.31)	142(5.59)
CAL 6000		150(5.91)	156(6.14)	150(5.91)	158(6.22)
CAL 8000		155(6.10)	162(6.38)	155(6.10)	164(6.46)
CAL 11000		175(6.89)	182(7.17)	175(6.89)	184(7.24)
CAL 18000		205(8.07)	213(8.39)	205(8.07)	215(8.46)



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## Piston wear limits



Model	Unit	Standard(N)	Wear limits(w)
CAL 225	MM (INCH)	150(5.91)	149(5.87)
CAL 450		175(6.89)	174(6.85)
CAL 500		168(6.61)	167(6.57)
CAL 650		177(6.97)	176(6.93)
CAL 850		210(8.27)	209(8.23)
CAL 1000		218(8.58)	217(8.54)
CAL 1200		246(9.69)	245(9.65)
CAL 2200		273(10.75)	272(10.71)
CAL 3200		291(11.46)	289(11.38)
CAL 4500		311(12.24)	309(12.17)
CAL 6000		353(13.90)	351(13.82)
CAL 8000		363(14.29)	361(14.21)
CAL 11000		455(17.91)	453(17.83)
CAL 18000		513(20.20)	511(20.12)

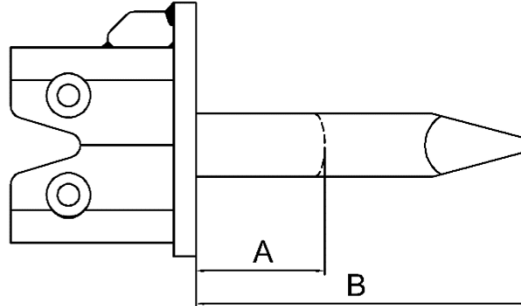




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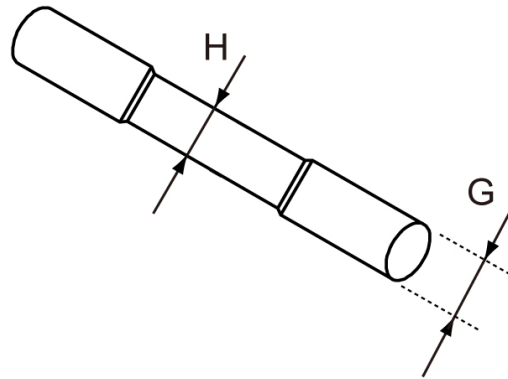
## Chisel wear limits



Model	Unit	Standard(N)	Wear limits(w)
CAL 225	MM (INCH)	292(11.49)	200(7.87)
CAL 450		324(12.75)	
CAL 500		376(14.80)	
CAL 750		358(14.09)	250(9.84)
CAL 850		367(14.44)	
CAL 1000		454(17.87)	
CAL 1200		530(20.86)	
CAL 2200		552(21.73)	
CAL 3200		599(23.58)	350(13.77)
CAL 4500		674(26.53)	400(15.74)
CAL 6000		662(26.06)	450(17.71)
CAL 8000		703(27.67)	500(19.68)
CAL 11000		842(33.14)	550(21.65)
CAL 18000		965(37.99)	



### Stopper pin wear limits



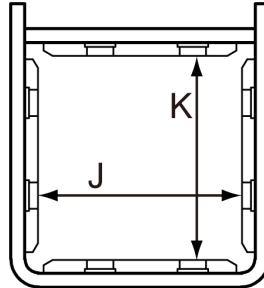
Model	Standard diaphragm (G)		Wear limits (H)	
	mm	inch	mm	inch
CAL 225 ~ 500	10	0.39	8	0.31
CAL 850	15	0.59	13	0.51
CAL 1000 ~ 1200	10	0.39	8	0.31
CAL 2200 ~ 4500	17.5	0.69	15.5	0.61
CAL 6000 ~ 8000	21.5	0.85	19.5	0.77
CAL 11000 ~ 18000	27.5	1.08	25.5	1.00



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## Shell pad wear limits



Model	Standard value		Wear limits (J)		Standard value		Wear limits (K)	
	mm	inch	mm	inch	mm	inch	mm	inch
CAL 225	106	4.17	109	4.29	106	4.17	109	4.29
CAL 450	112	4.41	115	4.53	112	4.41	115	4.53
CAL 500	114	4.49	117	4.61	135	5.31	138	5.43
CAL 650	132	5.20	135	5.31	142	5.59	145	5.71
CAL 750	152	5.98	155	6.10	162	6.38	165	6.50
CAL 850	152	5.98	155	6.10	162	6.38	165	6.50
CAL 1000	167	6.57	170	6.69	172	6.77	175	6.89
CAL 1200	177	6.97	180	7.09	177	6.97	180	7.09
CAL 2200	222	8.74	225	8.86	222	8.74	225	8.86
CAL 3200	252	9.92	255	10.04	252	9.92	255	10.04
CAL 4500	272	10.71	275	10.83	272	10.71	275	10.83
CAL 6000	302	11.89	305	12.01	302	11.89	305	12.01
CAL 8000	322	12.68	325	12.80	322	12.68	325	12.80
CAL 11000	342	13.46	345	13.58	342	13.46	345	13.58
CAL 18000	408	16.06	411	16.18	422	16.61	425	16.73

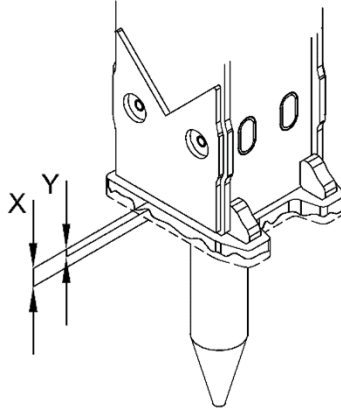


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## Bracket wear limits

Top box type bracket



Model(Box type)	Unit	Standard(X)	*Wear limits(Y)
CAL 225V ~ 2200V	mm (inch)	25 (0.98)	15 (0.59)
CAL 3200V ~ 4500V		40 (1.57)	20 (0.79)
CAL 6000V ~ 8000V		50 (1.97)	25 (0.98)
CAL 11000V ~ 18000V		80 (3.15)	40 (1.57)

\*If bottom plate is excessively worn out of wear limits, new bottom plate should be additionally welded.



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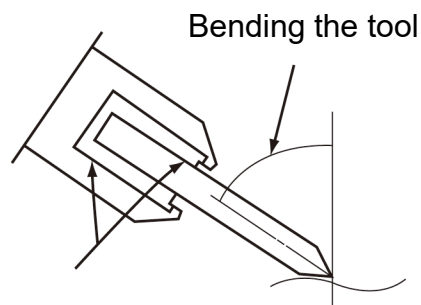
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## Cause of tool damage

1. Continuous side pressure due to leverage, incorrect driving angle and using the breaker to pull the heavy objects.
2. Blank fire leading to the damage on the tool pin.
3. Low temperature causing the tool to be more susceptible to fatigue failure.
4. Overheating of tool by the friction caused by improper lubrication and excessive bending.
5. Excessive wear of bottom bush making piston blow on the top face of the tool by inclined direction causing the damage on the tool head as well as on the bottom of the piston.

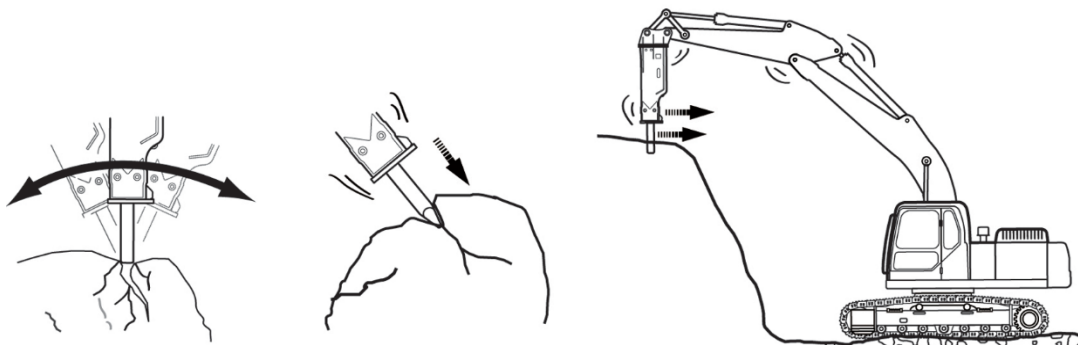


## Bending by high pressure



High pressure and friction bending surface of tool shank

## Examples of mis-handling





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### Specifications

Description		Unit	225	450	500	650	750
Operating weight*	Top mounting type	kg	120	140	187	260	310
		lb	265	309	412	573	683
Overall length	Top mounting type	mm	1,135	1,259	1,450	1,513	1,597
		inch	44.69	49.57	57.09	59.57	62.87
Tool diameter		mm	45	57	57	70	70
		inch	1.77	2.24	2.24	2.76	2.76
Operating pressure		kg/cm <sup>2</sup>	90~120	90~120	90~120	110~165	110~165
		Psi	1,280~ 1,700	1,280~ 1,700	1,280~ 1,700	1,565~ 2,350	1,565~ 2,350
Oil flow		lpm	12~25	19~38	23~70	29~65	29~65
		gpm	3.17~ 6.60	5.02~ 10.03	6.07~ 18.48	7.66~ 17.17	7.66~ 17.17
Blow rate	Low speed	bpm	550~ 1,000	450~ 1,000	600~ 1,500	380~ 1,000	380~ 1,000
	High speed	bpm	—	—	—	—	—
Back head gas pressure		kg/cm <sup>2</sup>	10~14	10~14	14~16	10~14	10~14
		Psi	142~199	142~199	199~228	142~199	142~199
Accumulator gas pressure		kg/cm <sup>2</sup>	—	—	—	40~50	40~50
		Psi	—	—	—	569~711	569~711
Suitable carrier		ton	0.8~2.5	1~3	1.5~4.0	3~6.5	3~6.5
		lb	1,760~ 5,500	2,200~ 6,600	3,300~ 8,800	6,600~ 14,300	6,600~ 14,300

Note : 1. \* Operating weight excluding quick coupler and pins



### Specifications

Description		Unit	850	1000	1200	2200	3200
Operating weight*	Top mounting type	kg	330	495	545	900	1,450
		lb	728	1,091	1,202	1,984	3,197
Overall length	Top mounting type	mm	1,639	1,894	2,062	2,234	2,522
		inch	64.53	74.57	81.18	87.95	99.29
Tool diameter		mm	75	80	90	105	125
		inch	2.95	3.15	3.54	4.13	4.92
2nd relief setting pressure**		kg/cm <sup>2</sup>	NA	NA	NA	210	210
		Psi	NA	NA	NA	3,000	3,000
Operating pressure		kg/cm <sup>2</sup>	120~165	140~170	140~170	140~190	150~190
		Psi	1,700~ 2,350	1,990~ 2,420	1,990~ 2,420	1,990~ 2,700	2,130~ 2,700
Oil flow		lpm	34~76	38~85	42~94	68~119	95~131
		gpm	8.98~ 20.07	10.03~ 22.45	11.09~ 24.83	17.96~ 31.43	25.09~ 34.60
Blow rate	Low speed	bpm	380~ 900	400~ 800	350~ 700	350~ 550	320~ 500
	High speed	bpm	—	600~ 1,100	490~ 1,000	600~ 900	400~ 650
Back head gas pressure		kg/cm <sup>2</sup>	16~18	10~14	10~14	10~14	14~16
		Psi	228~256	142~199	142~199	142~199	199~228
Accumulator gas pressure		kg/cm <sup>2</sup>	40~50	40~50	40~50	55~60	55~60
		Psi	569~711	569~711	569~711	782~853	782~853
Suitable carrier		ton	4.5~8	4.5~8	6~10	10~15	16~22
		lb	9,900~ 17,600	9,900~ 17,600	13,200~ 22,000	22,000~ 33,000	35,200~ 48,500

Note : 1. \* Operating weight excluding quick coupler and pins

2. \*\* 2nd relief valve pressure guide based on carrier



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### Specifications

Description		Unit	4500	6000	8000	11000	18000
Operating weight*	Top mounting type	kg	1,800	2,400	2,700	3,800	7,000
		lb	3,968	5,291	5,952	8,378	15,432
Overall length	Top mounting type	mm	2,775	3,016	3,085	3,580	4,256
		inch	109.25	118.74	121.46	140.94	167.56
Tool diameter		mm	135	150	155	175	205
		inch	5.31	5.91	6.10	6.89	8.07
2nd relief setting pressure**		kg/cm <sup>2</sup>	210	210	230	210	250
		Psi	3,000	3,000	3,300	3,000	3,570
Operating pressure		kg/cm <sup>2</sup>	160~190	160~190	160~190	150~190	170~210
		Psi	2,275~2,700	2,275~2,700	2,275~2,700	2,130~2,700	2,420~3,000
Oil flow		lpm	119~161	154~204	170~238	204~272	350~420
		gpm	31.43~42.53	40.41~53.89	44.90~62.87	53.89~71.85	92.46~110.95
Blow rate	Low speed	bpm	340~450	250~380	230~400	230~330	280~350
	High speed	bpm	420~550	300~450	270~470	270~500	320~520
Back head gas pressure		kg/cm <sup>2</sup>	14~16	14~16	14~16	14~16	10~14
		Psi	199~228	199~228	199~228	199~228	142~199
Accumulator gas pressure		kg/cm <sup>2</sup>	55~60	55~60	55~60	55~60	55~60
		Psi	782~853	782~853	782~853	782~853	782~853
Suitable carrier		ton	20~26	25~36	28~42	40~60	60~100
		lb	44,100~57,300	55,100~79,400	61,700~92,600	88,200~132,300	132,300~220,500

Note: 1. \* Operating weight excluding quick coupler and pins  
 2. \*\* 2nd relief valve pressure guide based on carrier





### Skid steer loader specifications

Description		Unit	650	850	1000
Operating weight*	Top mounting type	kg	336	480	526
		lb	741	1,058	1,160
Overall length	Top mounting type	mm	1,582	1,648	1,872
		inch	62.28	64.88	73.70
Tool diameter		mm	70	75	80
		inch	2.76	2.95	3.15
Operating pressure		kg/cm <sup>2</sup>	110~190	120~190	140~190
		Psi	1,560~2,700	1,700~2,700	1,990~2,700
Oil flow		lpm	35~70	40~80	45~90
		gpm	9.24~18.48	10.16~20.32	11.88~23.76
Blow rate	Low speed	bpm	380~1,000	380~900	400~800
	High speed	bpm	—	—	600~1,100
Back head gas pressure		kg/cm <sup>2</sup>	10~12	10~12	10~12
		Psi	142~170	142~170	142~170
Accumulator gas pressure		kg/cm <sup>2</sup>	75	75	75
		Psi	1,065	1,065	1,065
Suitable carrier		ton	3~6.5	4.5~8	4.5~8
		lb	6,600~14,300	9,900~17,600	9,900~17,600

Note: 1. \* Operating weight excluding quick coupler and pins



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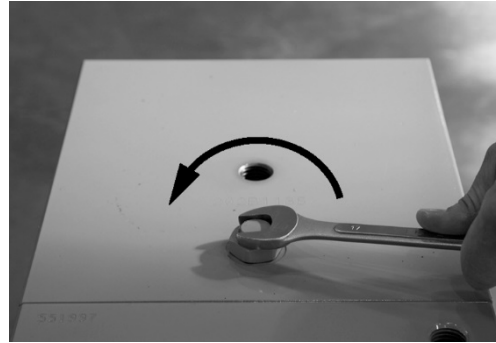
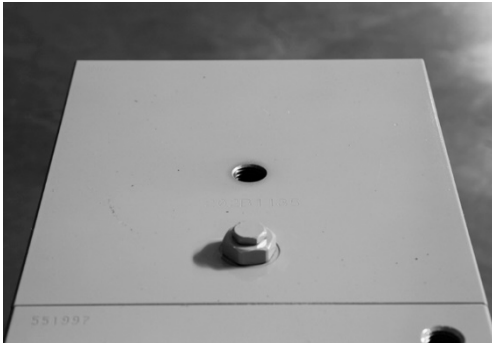
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## Torque Specs

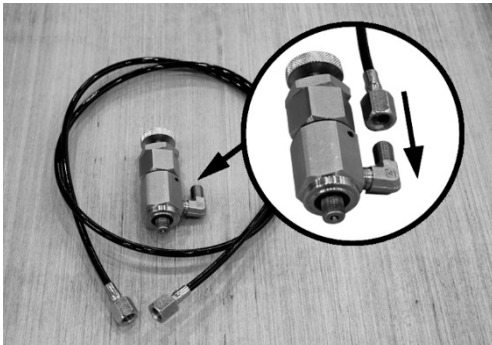
Model	Unit	Through bolt	Top mounting bolt	Acc'body bolt	Acc' Covers bolt	Acc' Filling Valve cap
CAL 225 ~ 450V	kg.m N.M Lb-ft	30 294 217	45 440	None	None	None
CAL 500V	kg.m N.M Lb-ft	40 392 289	45 440	None	None	None
CAL 650V	kg.m N.M Lb-ft	50 490 361	45 440	45 440	14 137	5 49
CAL 750V	kg.m N.M Lb-ft	50 490 361	45 440	45 440	14 137	5 49
CAL 850V	kg.m N.M Lb-ft	50 490 361	45 440	45 440	14 137	5 49
CAL 1000V	kg.m N.M Lb-ft	95 931 687	45 440	45 440	14 137	5 49
CAL 1200V	kg.m N.M Lb-ft	95 931 687	45 440	45 440	14 137	5 49
CAL 2200V	kg.m N.M Lb-ft	160 1,568 1,157	100 980	60 588	35 343	5 49
CAL 3200V	kg.m N.M Lb-ft	270 2,646 1,953	100 980	110 1,078	35 343	5 49
CAL 4500V	kg.m N.M Lb-ft	330 3,234 2,387	100 980	110 1,078	50 490	5 49
CAL 6000V	kg.m N.M Lb-ft	380 3,724 2,748	250 2,450	180 1,764	65 637	5 49
CAL 8000V	kg.m N.M Lb-ft	390 3,822 2,820	250 2,450	180 1,764	65 637	5 49
CAL 11000V	kg.m N.M Lb-ft	620 6,076 4,484	250 2,450	180 1,764	65 637	5 49
CAL 18000V	kg.m N.M Lb-ft	790 7,742 5,714	250 2,450	180 1,764	65 637	5 49



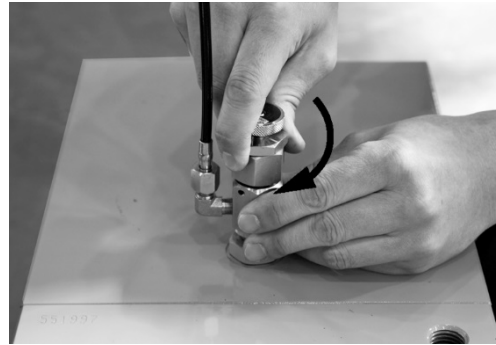
## How to charge nitrogen gas into the back head



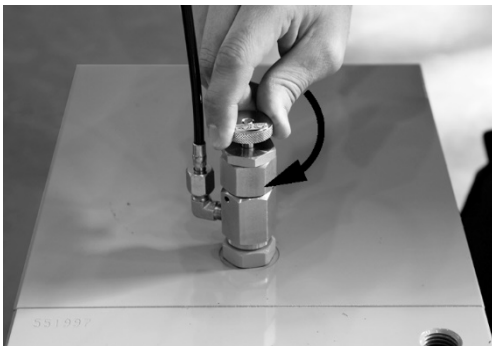
1. Open the valve cap.



2. Connect the adaptor to the hose



3. Assemble the adapter to the inlet by tightening the middle of the adapter.



4. Loosen the top of the adapter to insert the gas .



5. Check the gas bottle valve and 3-way which were closed.



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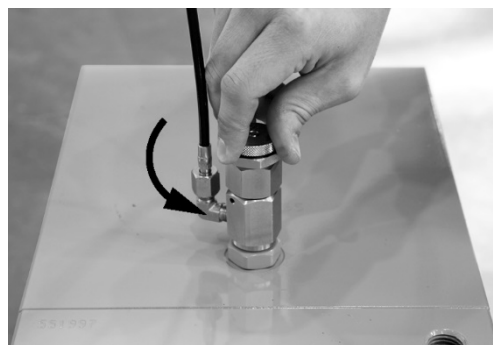
6. Open the valve slowly. Beware of gauge damage if opening quickly.



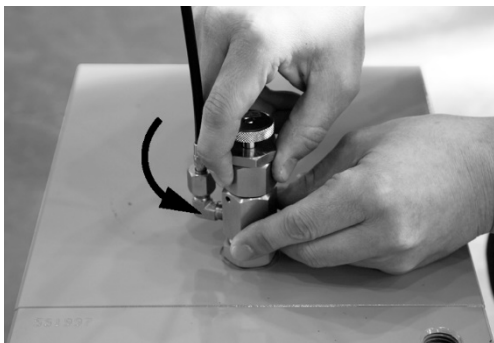
7. Open the 3-way valve slowly and charge the gas (20 kg/cm<sup>2</sup>). After that, Close the valve



8. Control the proper pressure (12~16 kg/cm<sup>2</sup>) opening the drain valve as photo indicates. \*Charge the gas considering the temperature in the area.



9. Close the inlet by tightening the top of adapter.



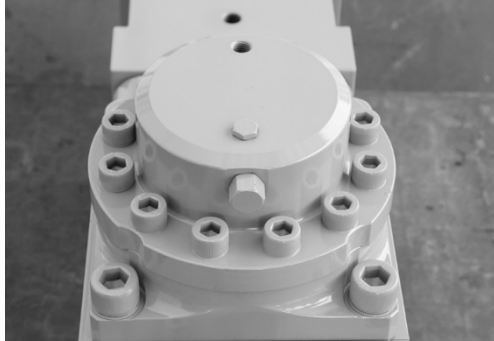
10. Disconnect the adaptor form the charging valve.



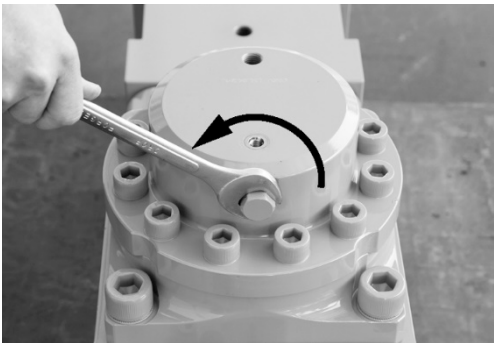
11. Close the cap into the charging valve.



### How to charge nitrogen gas into the accumulator (CAL-2200 to CAL-18000 models)



1. Open the valve cap.



2. Open the needle cap.



3. Connect the hose to the adapter.



4. Connect the adapter to the inlet of the accumulator.

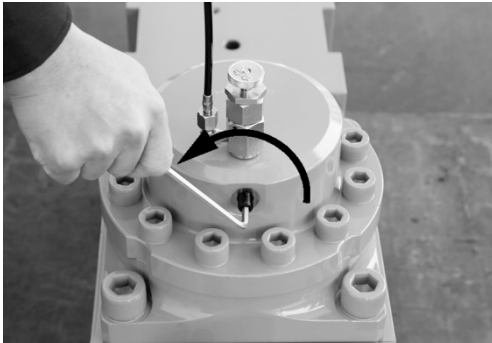


5. Make sure the gas bottle valve and 3-way valve are closed.



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6. Turn the needle round.



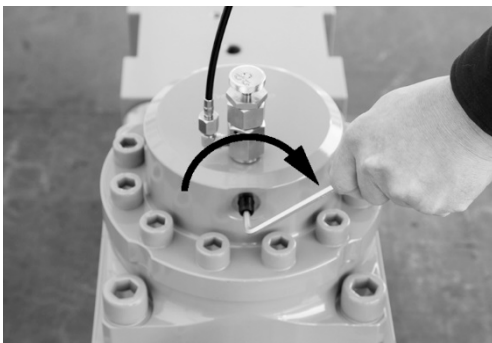
7. Open the valve slowly. Beware of gauge damage if opening quickly.



8. Open the 3-way valve slowly and charge the gas (65 kg/cm<sup>2</sup>). After that, close the valve.



9. Control the proper pressure (55~60 kg/cm<sup>2</sup>) by opening the drain valve as photo indicates. \*Charge the gas considering the temperature in the area.



10. Close needle.

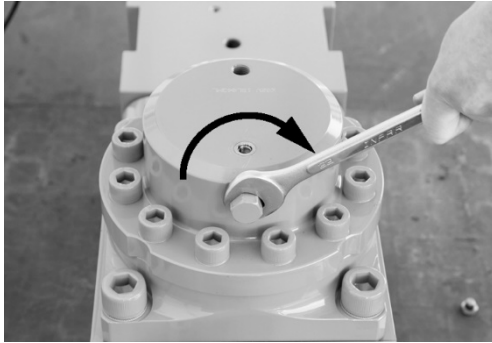


11. Disconnect the charging the adapter



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12. Connect the needle cap.



13. Connect the cap.



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# OPERATORS MANUAL

# HYDRAULIC BREAKER

