Hydraulic breaker operation and maintenance.

The Professionals' Lubricants

Olipes

Contents

Hydraulic breaker operation and maintenance.

Choosing the type of pointer

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1. CHOOSING THE TYPE OF POINTER

You must select the correct type of pointer or spear to achieve the best working results and guarantee a long useful life of the pointer.

1. Flat tip.

- For igneous rock such as granite and metamorphic rock into which it is not possible to penetrate.
- Rock detonated by explosives.

2. Chisel and cone tip.

- For sedimentary rock such as that from the quarry and weak metamorphic rock into which is it possible to penetrate.
- Concrete / Cement.
- Finishing works on surfaces.

Hydraulic breaker operation and maintenance.

Breaking principles

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2. BREAKING PRINCIPLES

There are two basic principles of how a hydraulic breaker breaks:

1. Breaking by penetration or cutting.

Through this form of breaking, the tip of the pointer, be it cone or chisel, is forced to penetrate inside the material. This method is more effective on soft, laminated or low abrasive materials.

2. Breaking by impact.

- In a breaking by impact, the material is broken by a very great stress caused by the pointer transmitting the impact energy of the breaker, breaking the structure of the material.
- The way to transfer the maximum amount of energy to a material is through a flat or blunt pointer.
- Breaking by impact is most effective on hard and abrasive materials.

Hydraulic breaker operation and maintenance.

Prior to operations

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3. PRIOR TO OPERATIONS

1. Prepare the carrier machinery like you would for a normal excavation work.

- Move the carrier machinery to the required position.
- Apply the parking brake.
- Put the gears in neutral.
- Unlock the boom (1st arm that is attached to the machinery).

2. Set the machinery at the recommended RPM.

3. Place the pointer against the work surface at 90° (perpendicular).

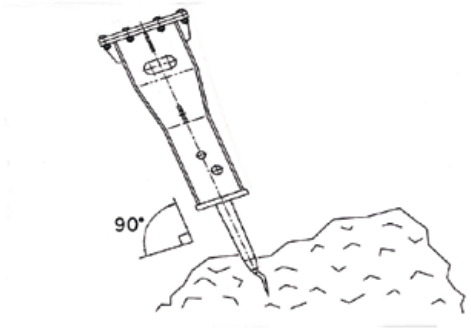
- You must avoid no-load blows at all costs as well as working at an angle other than 90° (± 10 %).
- Incorrect working methods can lead to damage and failure of the breaker operation.

4. Use the first arm of the excavator (Boom) to firmly press the breaker against the object.

You must not hit the material with the breaker whilst moving the boom with speed.

5. Start the breaking work.

6. Do not let the pointer come out of the breaker when it is penetrating, you must always load with the boom descending from the breaker.



7. Keep the pointer around 90° at all times.

- If the object moves and the slope of the surface changes, also change the slope of the breaker immediately.
- Maintain strength and alignment on the pointer.

8. Stop hammering quickly.

When the breaker breaks the material, you must stop immediately to avoid no-load blows as this significantly damages the breaker.

9. Do not work in a single cycle for more than 15 seconds.

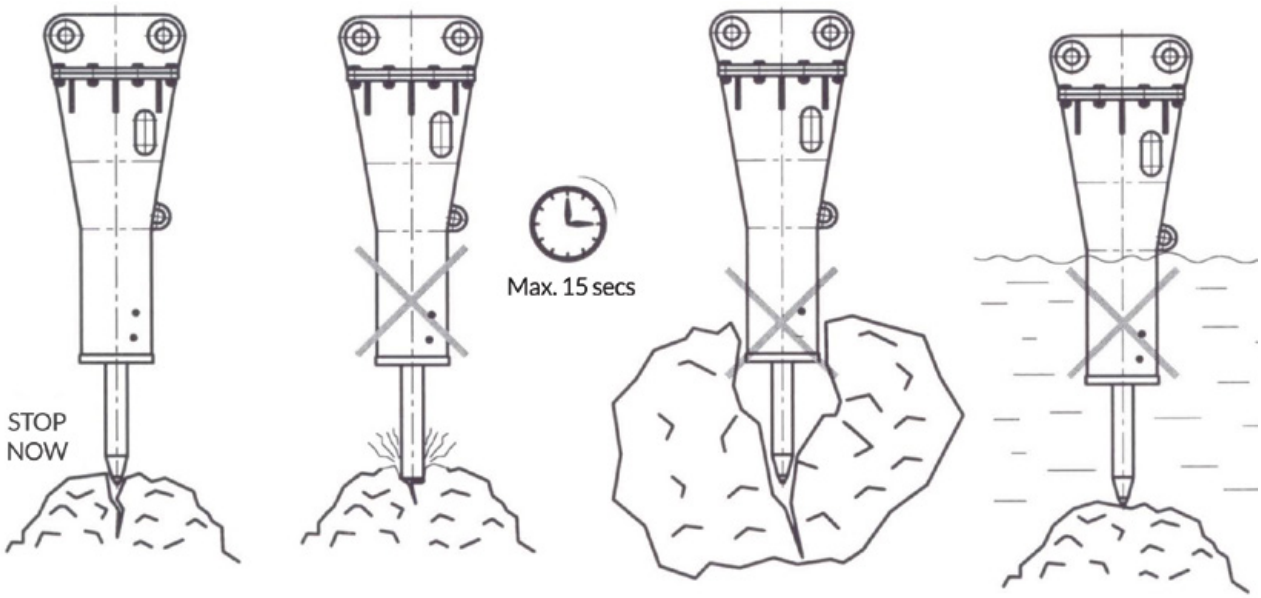
If an object has not broken after 15 seconds, change position and restart the process. Holding it for a longer time leads to overheating, which will cause a “mushroom head” effect on the pointer.

10. When breaking concrete, hard or frozen ground, never hit and push or pull at the same time.

- This action may cause the pointer to break.
- Penetrating into hard rock may cause the pointer to bend. Stop hammering if you suddenly encounter resistance under the pointe.

OPERATING TEMPERATURE

The operating temperature of the oil should be between -20 °C and +80 °C. If the temperature is lower, the breaker and pointer must be preheated before starting works to avoid damage to the membrane of the accumulator and the pointer. During operation, it should remain at a relatively high temperature.



Hydraulic breaker operation and maintenance.

Operating a hydraulic breaker

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4. OPERATING A HYDRAULIC BREAKER

PRECAUTIONS

Operating a hydraulic breaker poses a risk to people, as particles are being blasted that may cause injury to people who are in the immediate vicinity of the operation, with the machine operator potentially being the first injured. Therefore, the machinery must have a protection screen fitted on the cabin to prevent this risk.

During operation, all people who are in the immediate area, including the driver of the excavator, must wear hearing and respiratory protection, unless the operator has a conditioned cabin.

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

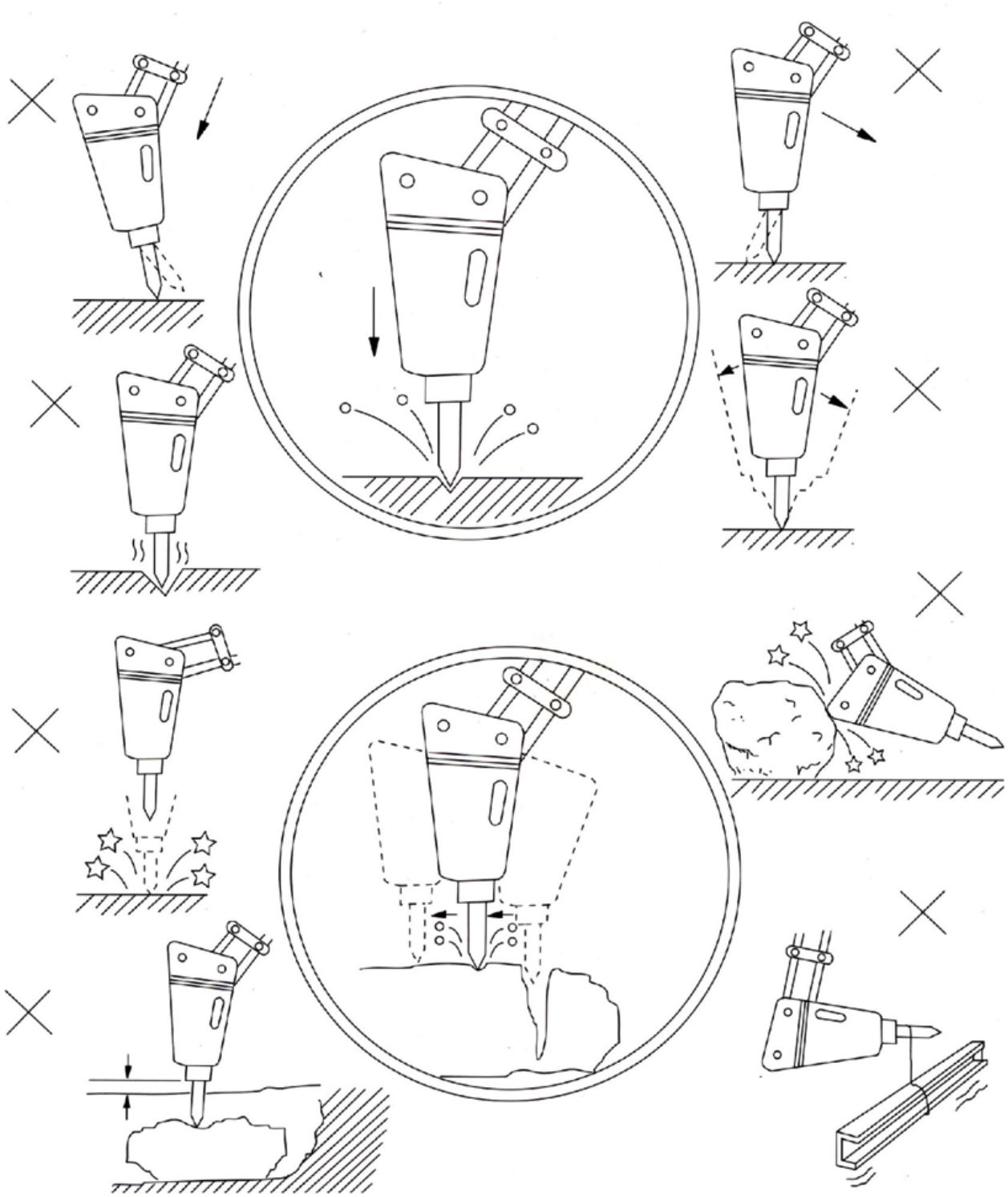
Hydraulic breaker operations should be stopped immediately if anyone goes into the danger area, as there is a risk of rock fragments being blasted.

When a hydraulic breaker is in operation, the operation of the excavator is governed by the excavator manufacturer's safety regulations. Ensure that all modifications are done properly and only use the breaker when its installation is complete.

Do not operate whilst under the influence of any drugs or alcohol. Consult the leaflets of any medication you are taking, if necessary.

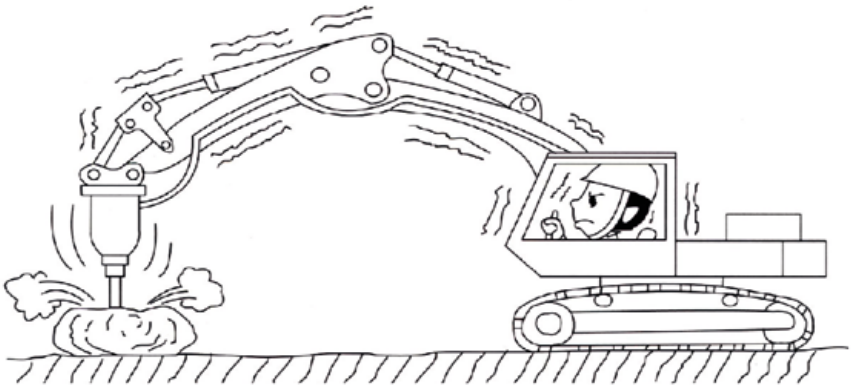
When performing maintenance and repairs to the hydraulic breaker, safe working conditions must be established.

Method for operating hydraulic breakers

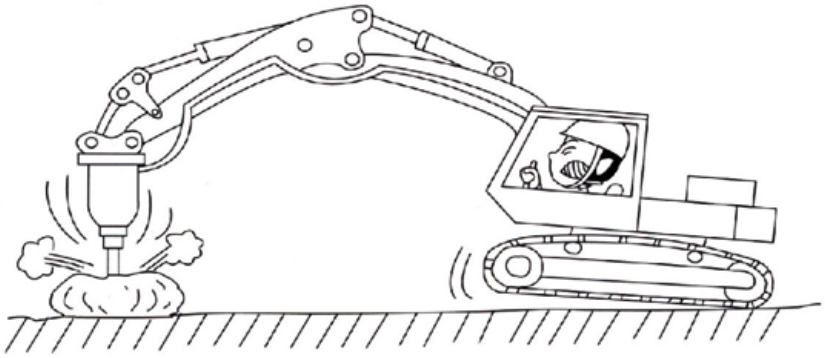


1. Appropriate force.

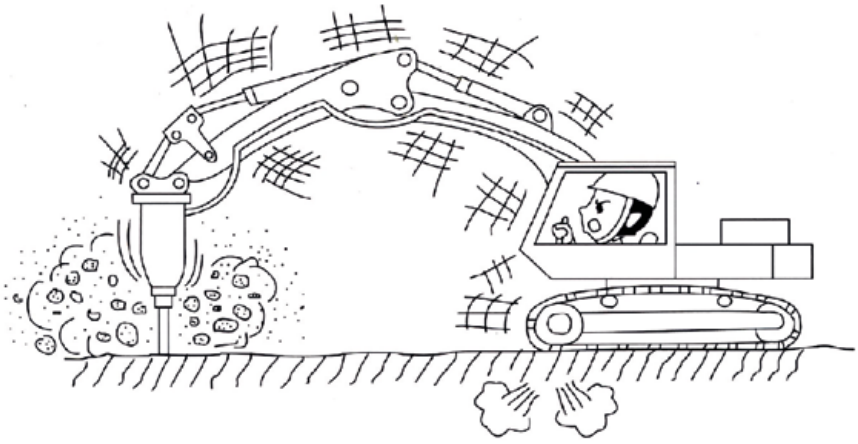
To break efficiently, an appropriate thrust force must be applied to the breaker. If the force is insufficient, the hammering energy of the piston will not be efficient enough to break rocks, thus transferring the force of the breaker to its body, arm and supports of the machinery base, etc., which may cause damage to those parts thereof.



On the other hand, if the machinery is excessively supported in such a way that it rises and is supported by the breaker, when the rock fractures, the machinery descends at great speed generating a big impact between the fractured rock and the breaker, which may even affect the machinery. If the hammering is performed under these conditions, the vibrations may also be transmitted to the traction belts of the excavator, so it should be avoided.

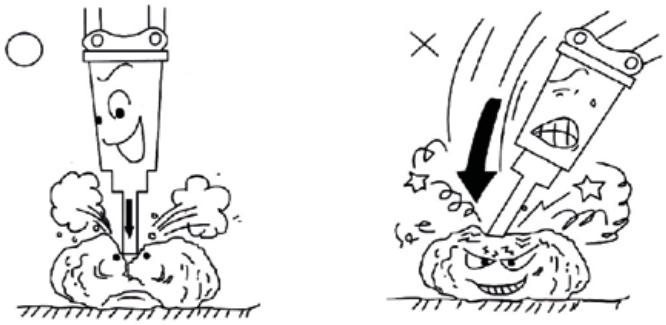


When working with the breaker, always apply the necessary force so that it does not cause excessive vibrations to the excavator.



2. Instructions for applying a correct force.

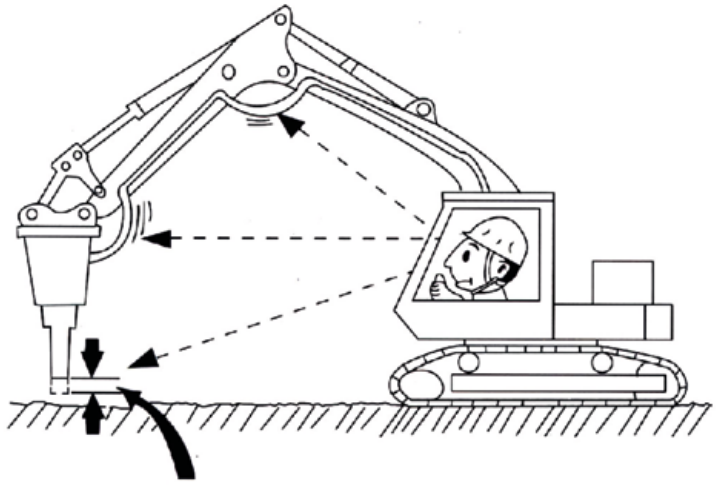
Apply force in a straight line with the pointer. The breaker should always be positioned as perpendicularly as possible against the work surface. If the breaker is oblique to the surface, the pointer may slip during operation and cause both it and the piston to break. When starting operations, you must select the appropriate point based on the rock to be broken, so that the hammering can be performed stably.



3. Precautions for the operation.

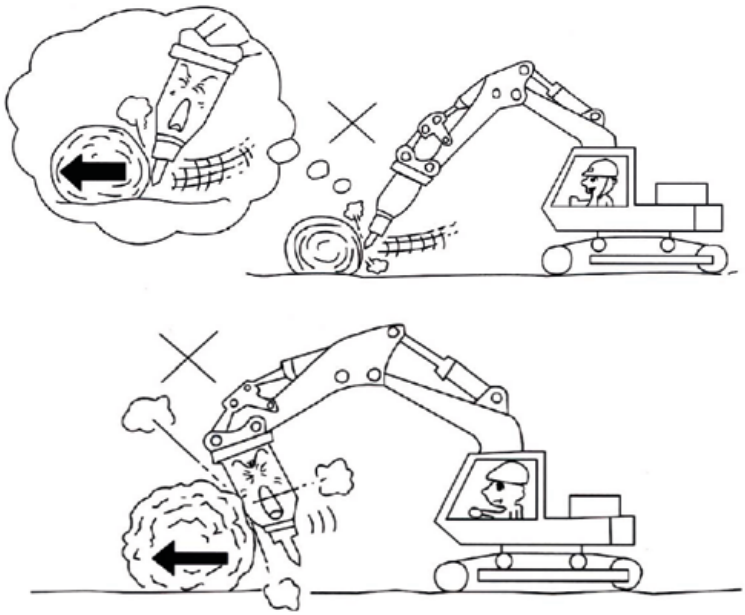
The operator must pay attention to the following points during operation:

a) Stop operations immediately when they feel that the vibration of the hoses is excessive. Check if excessively high or low pressure is the cause of their excessive vibration. If so, the accumulator may be faulty, or the N_2 chamber may have low pressure, so they should contact the closest technical service centre. They should also check for the existence of oil leaks in the hose connections; if there is dripping, re-tighten them. They should also inspect whether the pointer slides normally inside the breaker during operations, as shown in the following figure. If the movement is not correct, the pointer may be obstructed by burrs on its body, therefore it must be extracted from the breaker to be inspected, along with the bushings and pointer lock, after which any faulty parts must be repaired or replaced.

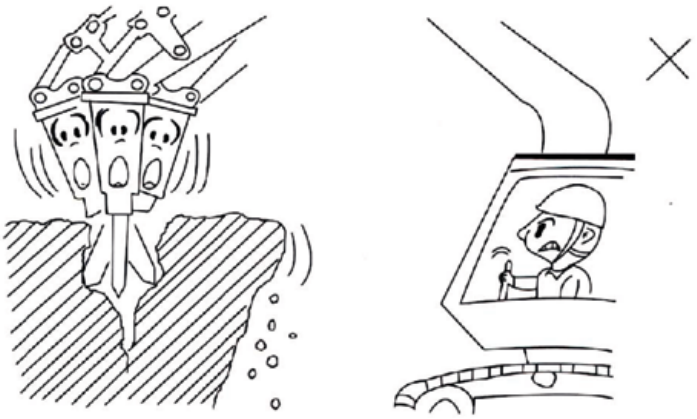


b) Stop immediately (avoid no-load blows). As soon as the rocks break, stop the breaker. When performing no-load blows, the accumulator may become damaged, the pointer locks may break and the base of the machinery may also be affected. When the appropriate force is not applied to the breaker, or the pointer is not applied against the rock, the no-load state will be transmitted to the entire structure (the sound changes when performing no-load blows).

c) Do not move the rocks. As shown in the following figure, do not roll or pull rocks down with the tip of the pointer or body of the breaker by using hydraulic pressure that is applied through any of the arm pistons or turning or moving with the machinery, because the pointer lock on the breaker may become damaged, as well as the support, the pointer may break or be scratched and the boom or main arm may suffer major damage. The general movement of rocks should be avoided, and above all, never drive the machine with a rock on the pointer.

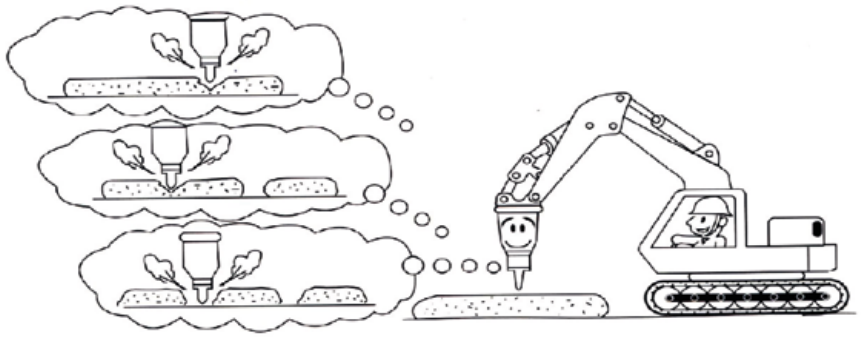


d) Do not use the pointer as a lever. When trying to break a rock using the pointer as a lever, as shown in the following figure, screws and the pointer may break.

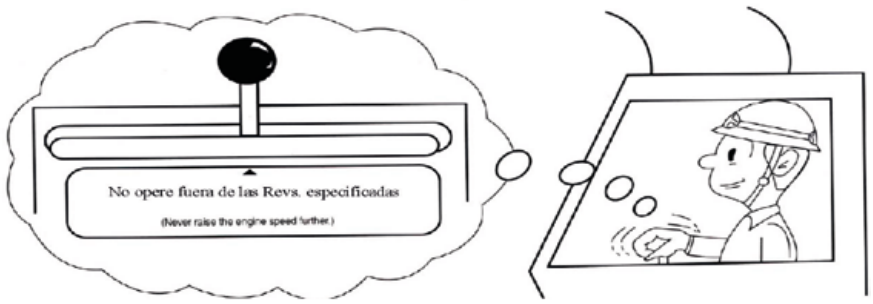


e) Do not continue hammering for more than 15 seconds. When the rocks are too hard, do not hammer in the same place for more than 15 seconds. In this case, it will be necessary to change the hammering point. When hammering for a long time (more than 15 seconds on the same point), the oil temperature rises and this may damage the membrane of the accumulator or generally affect the performance of the breaker, as at higher temperatures the seals lose their efficiency and start to leak internally, which will also cause the pointer to overheat at the tip and form a “mushroom head”.

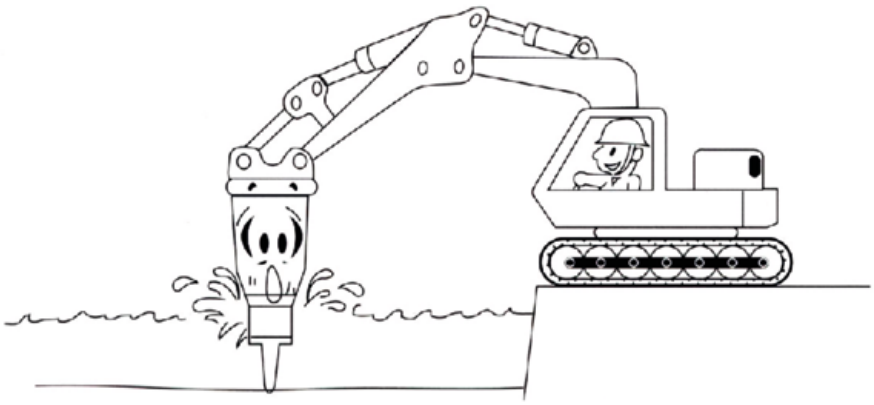
f) As a normal process for attacking rocks, start by breaking the end part. In this way, you will continue to another portion that will then become the end part and so on, making it a relatively easy activity.



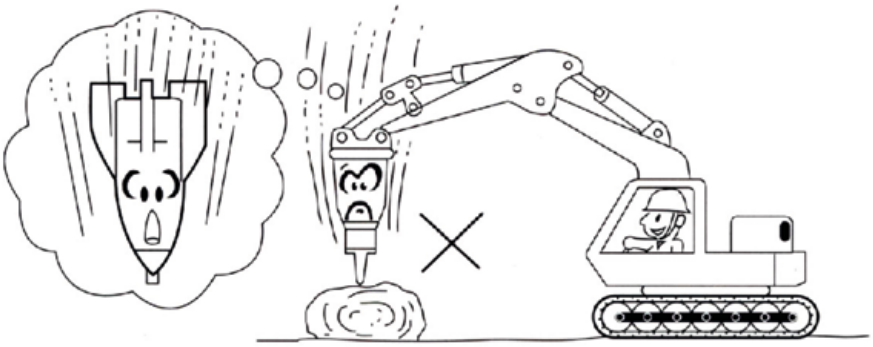
g) Operate the breaker with the motor at the appropriate revolutions. The motor should always be operated at the revolutions specified for the breaker. Increasing the revolutions of the motor to more than what is specified will not increase the impact energy or the breaker, but rather increase the temperature of the oil and this will consequently cause damage to the equipment.



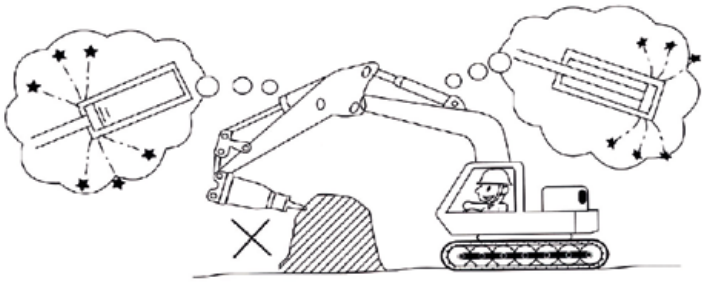
h) Do not operate the breaker in water and/or mud. If you do, the piston and other components may rust and cause permanent damage to the breaker. If you need to operate under water, ask your distributor to integrate this feature into your breaker, which is requested independently, in addition to the specific recommendations for working under these conditions.



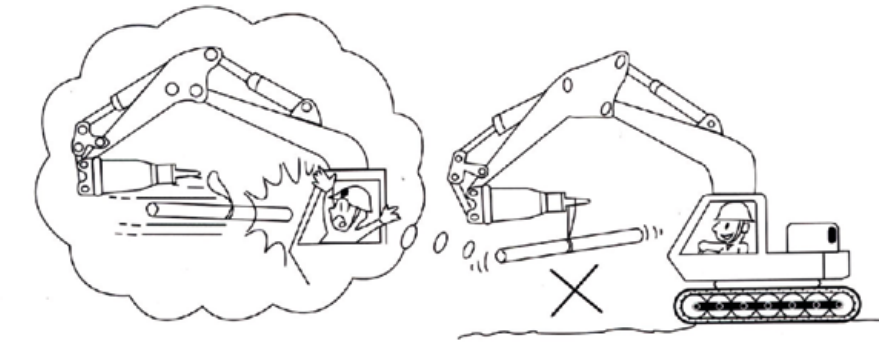
i) Never drop or launch the breaker against the rock. Excessive force together with the impact may cause permanent damage to the breaker and the machinery.



j) Do not hammer with the plug of any piston completely extended or retracted. When a rock is fractured whilst the plug of a piston on the carrier machinery is completely extended or retracted, the cylinder and other parts of the base machinery may become damaged.



k) Do not use the breaker as a crane. Do not use cables attached to the breaker to lift objects. The breaker, support and pointer may become damaged, and this action may be extremely dangerous for the cabin operator or even for third parties in the event of an accidental movement of the load.



l) In exceptionally cold places, the motor of the machinery must warm up for 5 to 20 minutes and then, after having heated the hydraulic oil, the breaker operation can begin. To heat the motor of the machinery, you must always consider the instructions indicated in the operating and service manual of the carrier machinery. If the breaker operation is performed with the oil at a low temperature without heating the motor, certain parts of the breaker, such as the piston and seals or retainers, may become damaged very easily.

4. Re-tighten screws and nuts.

In the breaker, tensioning screws, nuts, pipes and hose connections can become loose due to vibrations. Regularly inspect these points to detect any elements that are loose, and always do so before starting the breaker operation. When loose parts

are detected, re-tighten with the torque specified in the corresponding chapter of the Operating and Maintenance Manual for the torque values.

5. Repairing the pointer.

When a pointer is used for many hours, it may become worn or burred. If this is the case, remove them with the appropriate tool. Moreover, when the tip of the pointer is very worn (rounded), it may slip easily, so it is advisable to resharpen it to achieve a new tip. As the pointer is repaired, its hardened layer is lost, so it will have a short life with its new tip and will need to be resharpened or replaced with a new one. On the other hand, it is possible to continue using a pointer that has worn on its tip, understanding that the possibility of slipping, which is accentuated in a pointer with a blunt tip, does not detract from lower productivity in most cases, so you can continue using it until its performance is greatly diminished.

6. Smart operation.

To start breaking a rock, you must select a point where the rock should fracture within 15 seconds. If you do not achieve your objective in 15 seconds, you must stop hammering and start at a different point. This does not necessarily mean that productivity is decreased, as the fact that the rock has not opened does not mean that it has not fractured and, like with a block of ice, the pointer must be applied several times along a fracture plane that allows us, after 3 or 4 attempts, to break open the rock along this plane.

7. Operating angle.

The pointer must always be at a right angle against the surface of the material to be fractured. If not, all parts of the hydraulic breaker will wear much quicker, which may cause damage to it.

8. Breaking rocks.

When we are performing a hammering operation, we must gently move the hydraulic breaker back and forth a maximum of 5º, allowing the hydraulic breaker to settle so that it does not get stuck due to being deviated from the penetration line of the pointer, which generally deviates when the fracture takes place. This will also be the time to stop hammering in order to avoid no-load blows.

9. Never use the breaker as a crane.

Using the hydraulic breaker as a lever may cause the pointer to break and cause major damage to the different elements of the breaker.

10. Never insert the pointer inside the material.

f the penetration of the pointer is too quick and the breaker is not releasing dust from the rocks and no fracture occurs, the pointer will enter the material, raising the temperature of the pointer to red, thereby causing the loss of thermal treatment, which makes it become soft and also causes the typical “mushroom head” to form.

11. Never try to cut or hit with the breaker pointer.

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

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

If water enters the hammering chamber of the hydraulic breaker, each blow will form a pressure wave that will cause damage as the lower seals of the breaker are pulled out. There is also a risk of corrosion in the lower part of the piston. For applications under water, even if only the bottom of the breaker is submerged, you must use breakers that have been properly prepared for this activity and follow the recommendations indicated by the manufacturer.

Please bear in mind that:

A breaker can be adapted for use underwater. When necessary, please contact the distributors of your breaker or the closest technical service centre.

14. Working in high temperature conditions.

Constantly check the temperature of the oil to ensure that it does not exceed 80 °C, if it is higher, you will probably have to install an additional cooler to the machinery. Only use hydraulic oils with the right viscosity and preferably with a high viscosity index (VI) to reduce the variation in viscosity with changes in temperature. In summer and in warm areas, the minimum requirement is a MAXIFLUID 68 HLP type hydraulic oil.

15. Working in low temperature conditions.

There are no special recommendations for working at a temperature below -20 °C. At temperatures below -20 °C, you must ensure that you use the right hydraulic oil, generally one with low viscosity and a high viscosity index. Additionally, the hydraulic oil must be heated before operating; this is achieved by:

- Starting the motor of the excavating machinery (5-20 minutes).
- Moving the arm (boom) without any load and without hammering.

This will raise the temperature of the oil. Once the oil reaches the right temperature (minimum +20 °C), start the breaker operation with the motor of the machinery at low revolutions in order to start circulating the oil through the breaker but do not operate with it; this will cause it to heat up so that the first impacts are not caused with the breaker cold. 2 or 3 minutes later, the machinery will be able to revolve at the corresponding level.

To avoid the oil cooling down quickly in environments with temperatures below 0 °C, leave the excavator's motor and pumps running, even during periods when the breaker operation is stopped.

Please bear in mind that:

The hydraulic breaker and excavator do not start operating at full capacity until the operating temperature reaches +60 °C.

Important

When working in oil temperature conditions below +20 °C, you should not operate with the hydraulic breaker. Operating the breaker with cold hydraulic oil may cause the seals on the hydraulic breaker to break and the diaphragm in the high-pressure accumulator to tear. Always follow the instructions of the carrier machinery manufacturer and the breaker manufacturer.

16. Care and maintenance programme.

During the shift	Daily	Weekly	Every 2 weeks	When required
Manually lubricate the pointer every 2 hours with MAXIGRAS COMPLEX PICK	Re-tighten the screws and connections (during the first 50 hours of operation)	Re-tighten screws and hydraulic connections	Check the pointer for wear (check the wear limit to avoid damage to the breaker)	Replace bent and squashed pipes
Check that the lubrication elements are in good condition.	Check the hydraulic lines for leaks	Check the bolts that attach the breaker to the machine for wear (check their condition)	Check the state of wear of the lower bushing. If the limit has been reached, change it	Replace any damaged hose
In automatic greasing systems, check the MAXIGRAS COMPLEX M or EP grease level	Check that the pipes, tubes, hoses and fittings are correctly attached	Check the retaining bolt of the pointer locks for a possible loss of plugs	Check the breaker support for wear	
	Inspect the breaker coupling and support	Check the impact surface of the pointer for any fractures		
	Check the nitrogen gas pressure (if you have direct access to the charging valve without the need for disassembly)	Check the pointer to see if there are any burrs that must be removed		
		Check pointer locks for burrs		
		Check the impact surface of the piston for any damage		
		Check that there are generally no oil leaks in the breaker or the machinery		

a) Check for possible losses of screws and nuts. As the hydraulic breaker is a percussion equipment, screws and nuts can loosen easily, which may cause significant damage to various parts and components. Because of this, check the tightening torque of screws and nuts regularly with the data shown in the Operating and Maintenance manual.

Note: It is essential that all screws and nuts are checked after the first 5-10 hours of operation.

b) Check the oil level in the tank and keep the hydraulic oil clean. Ensure that there is enough oil in the tank at all times.

If the hydraulic oil is dirty, the valve and piston will operate improperly.

- Hydraulic oil analysis periods: every 600 hours.
- Hydraulic oil change periods: every 1,000– 2,000 hours.
- Filter in the oil line: check every 100 hours and replace if necessary.

17. Lubrication of the pointer.

An insufficient lubrication of the pointer causes a short life of the front bushing and of the pointer itself. At the end of each period and after every 2 hours of operation, the pointer should be lubricated with MAXIGRAS COMPLEX PICK grease using an injector or pump. Before greasing, firmly press the pointer against the ground with the machinery so that it is inserted as far as it will go.

If the pointer is new, then it must also be lubricated around the perimeter of the

insertion head with MAXIGRAS COMPLEX PICK when inserting it. To find out the amount of grease required by each model, consult the Operating and Maintenance Manual for your breaker.

In breakers equipped with an automatic greasing system from the machinery, the MAXIGRAS COMPLEX M or MAXIGRAS COMPLEX EP grease level in the grease container or deposit will be checked daily to ensure that the level of grease is dropping in proportion to the working hours. If it can be seen that the grease level is not dropping, check the correct operation of the pumping element and replace it if there is a loss of pressure in the line. Check that the pointer remains greased. Check the condition of the hydraulic hoses carrying the grease up to the pointer.

Precaution: Danger of explosion

Only use nitrogen in the gas chamber. When the hydraulic breaker is put into operation for the first time, the tests and parameters described in this section must have been applied.

Hydraulic oils and greases recommended for hydraulic breakers

Hydraulic oil		
Conditions	**In hot weather**	**In cold weather**
High severity	MAXIFLUID POC-55 (1)	
	MAXIFLUID 68 HVI or 68 HV or 68 BBO (2)	MAXIFLUID 46 HVSC or 46 HVI or 46 HV or 46 BBO (2)
Medium severity	MAXIFLUID 68 HVLP	MAXIFLUID 46 HVLP
Low severity	MAXIFLUID 68 HLP	MAXIFLUID 46 HLP

(1) MAXIFLUID POC-55 is a multi-grade hydraulic fluid with reinforced anti-wear (AW) and EP capabilities. Meeting the standards of Poclain, it offers maximum protection for the hydraulic pump and breaker, working under severe conditions in all types of weather.

(2) MAXIFLUID 46 AND 68 BBO are high-performance biodegradable synthetic hydraulic fluids. You should confirm with the supplier of your machinery and breaker that both pieces of equipment accept these types of fluids.

Greases	
Conditions	**All weather**
High severity, manual lubrication	MAXIGRAS COMPLEX PICK
High severity, centralised lubrication	MAXIGRAS COMPLEX M
Medium severity	MAXIGRAS 46
Low severity	MAXIGRAS C45 EP

Note: When using the oil in extremely cold or hot weather, it must be selected in accordance with the application. For more information, contact the OLIPES Technical Support Service (sat@olipes.com) or our closest distributor. Always follow the instruction manual of the carrier machinery based on the ambient temperature and oil temperature during operation. Respect the heating times of the motor and hydraulic oil before operating the breaker.

IMPORTANT

It should preferably be greased with MAXIGRAS COMPLEX-PICK copper grease, specially designed for lubricating pointers, however, failing that, the high-quality anti-friction MAXIGRAS COMPLEX-M grease can be used, which is also excellent for bolts, especially in breakers lubricated with automatic greasing systems by CIAPONI, VOGËL, LINCOLN, BEKA-MAX, etc., mounted on to the machinery. In these cases of lubrication with automatic greasing systems, it can even be lubricated with MAXIGRAS COMPLEX-EP (high performance grease and high drop point) in medium severity operations and with MAXIGRAS 46 or C45 EP in medium/low severity operations. In these cases, it is recommended to lubricate manually and directly on the hydraulic breaker with MAXIGRAS COMPLEX-PICK, at least once every 8 hours of operation, or every time a work cycle ends.

PRECAUTION

Never use your fingers to check the alignment of the holes in the breaker head when inserting the pointer locks. Always wear protective goggles when placing or changing the pointer, as metal shavings may be thrown out when inserting the locks.

Hydraulic breaker operation and maintenance.

Problems related to the pointers

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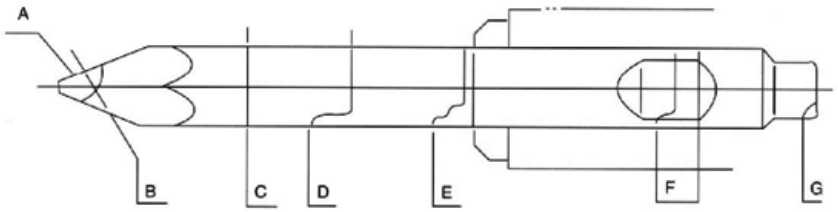
5. Problems related to the pointers

Different types of breakage can occur in the pointers, the cause of which can be determined by analysing their physiognomy and the point at which the break occurs:



A) The pointer may lose part of the tip in normal operation; if the pointer has a chisel tip, the result is considered due to normal use; on the contrary, if the pointer has a pencil tip, it is considered a material failure. Outcome: Apply guarantee.

B) When a pointer shows oblique wear, this is the result of an abnormal operation. Outcome: Operating error. Do not apply guarantee.

C) When the pointer breaks cleanly, into a perfect circular section, where there are no material defects or bubbles trapped inside, it was due to stress concentration points or to having worked in cold temperatures with the machinery in full power. Result: Operating error. Do not apply guarantee.

D) When the pointer breaks in the middle third of its length and, as a result, a fin occurs at the exit of the fracture, this is due to a major bending stress, generally caused in principle by a failure point that favours the fracture, which is generally caused by normal operations, so it is advisable never to apply forces that cause the pointers to bend. Outcome: Operating error. Do not apply guarantee.

E) This type of fracture is the most common and is caused by operations in which a lever effect is applied to the fractured material to be separated from the main block. The problem occurs when rocks that apparently have already been released from the main block are supported by lateral rocks, which prevents them from separating and consequently the pointer fractures due to the great effort. Outcome: Operating error. Do not apply guarantee.

F) Breakage caused by no-load blows. Outcome: Operating error. Do not apply guarantee.

G) Fracture of part of the pointer impact head, caused by the piston hitting the perimeter of the head. This is caused by continuing to use a pointer or the bushings of a breaker when they have already reached the end of their useful life and in the process of deterioration, and this causes an excess clearance that translates into an inclined position of the pointer with respect to the piston. When this is impacted, the piston consequently applies a lot of energy to a very small surface portion of the pointer head, and this then causes the fracture or detachment of this portion or a “mushroom head” simply forms that causes other types of problems, such as the partial jamming of the pointer in the body. Outcome: Operating error due to overuse. Do not apply guarantee.

1. Causes and consequences that affect the pointers:

The purpose of this guide is to clarify the causes of damage to the pointers and thus ensure that the operator, being aware of the causes of damage, avoids them as far as possible.

1.1 Bending or breaking of the pointers due to an improper operation.

Comment: The operator maintains the operation with the pointer in a vertical position over rocks that have just fractured, whereby from that moment the pointer is no longer applied at 90 degrees. (Operating error).

1.2 Normal wear due to operations.

Comment: The use is influenced by the conditions of the ground. (Normal operating conditions).

1.3 Softening of the tip due to keeping the breaker in the same point for a long time and forming a "mushroom head".

Comment: Do not operate the breaker for more than 15 seconds in the same point. (Operating error).

1.4 Spalling of the pointer tip.

Comment: This is caused by ground conditions where there are very different hardnesses on which the pointer tip rests, causing the breakage of a small portion of the pointer tip. (Normal operating conditions).

1.5 The pointer breaks in two.

Comment: This tends to occur when the pointer has been resharpened and subsequently a thermal treatment is applied and/or it is repaired by welding. (Result: normal due to a change in the original conditions of the part).

1.6 Damage to the impact area of the pointer.

Comment: This is due to the excessive use of the pointer and/or the bushings or sockets (wear greater than 8 mm). See the previous figure in points B, D, E, F and G. (Result: normal due to overuse).

1.7 Clean breakage in the middle of the pointer lock area.

Comment: This has two main causes: the first is caused by manufacturing defects (apply guarantee) and the second by no-load impacts that tear off the part of the body in the same area (operating error; do not apply guarantee).

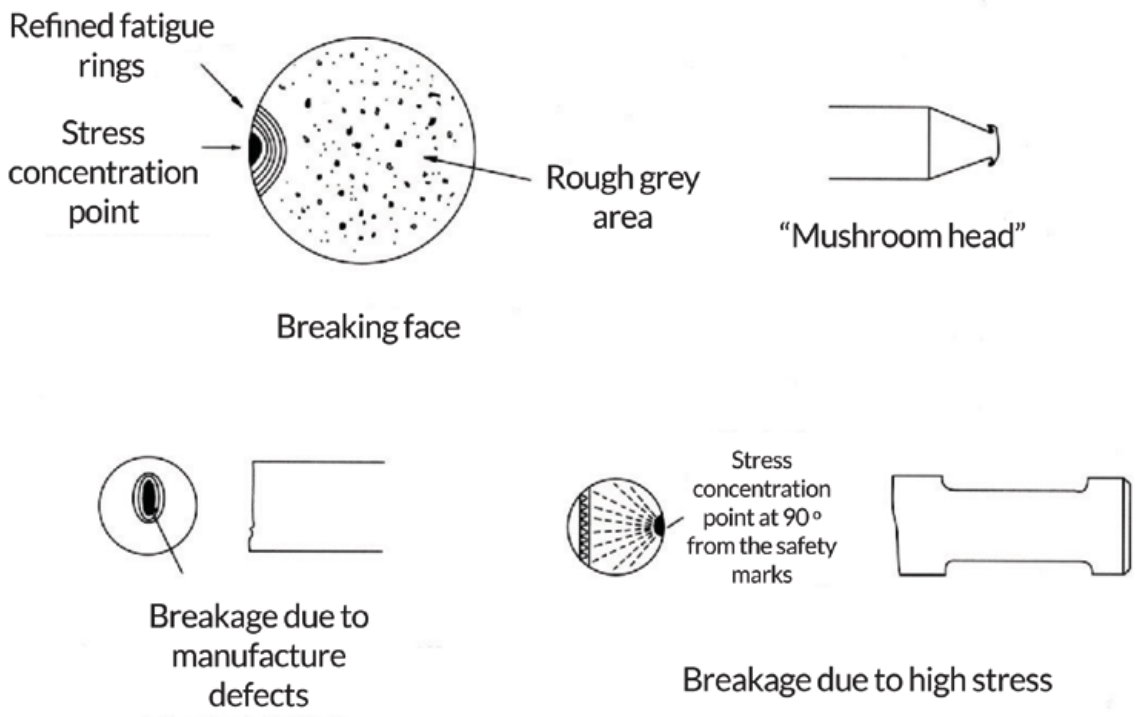
1.8 Breakages according to the previous figure in point F.

If a pointer breaks before the front bushing or socket has a wear greater than 8 mm.

Comment: Caused by manufacturing defects. (Apply guarantee). Breakage and abnormal use in area F, caused by no-load blows.

Comment: Operating error.

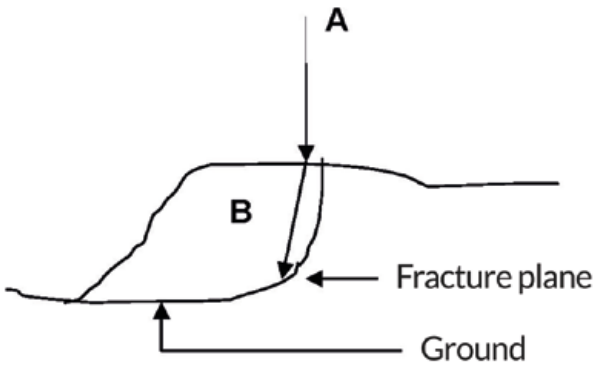
OTHER ASPECTS RELATED TO BREAKAGES IN POINTERS



Effect that causes an improper operation of the hydraulic breaker

First Application:

A: The pointer is applied perpendicularly to the ground. Condition: Correct

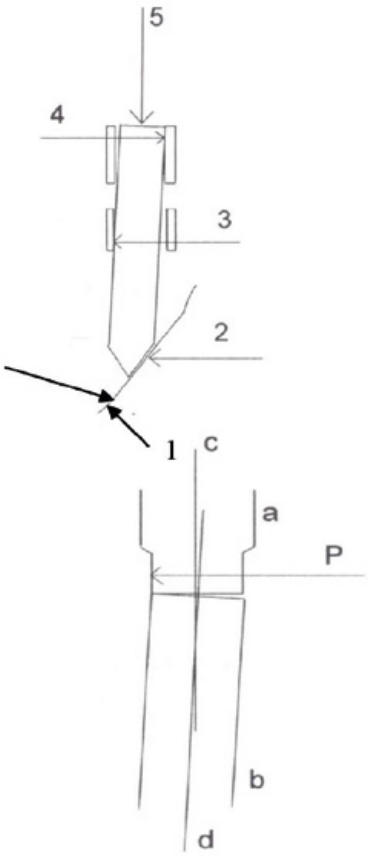


Second Application

B: As the pointer continues to penetrate, the terrain fractures according to the fracture plane, which is almost never vertical.

Condition: Operating error

1. The fracture plane exerts an action on the pointer, tilting it.
2. This generates a horizontal force on the pointer.
3. This consequently applies pressure to the lower bushing or socket.
4. Due to the force of the machinery, the breaker does not move and this generates force in the upper bushing or socket.
5. The action of the piston coupled with forces 3 and 4 cause accelerated wear in the bushings or sockets.



Effect produced:

- Striking head of the piston.
- Body of the pointer.
- Vertical axis of the piston.
- Inclined axis of the pointer.
- Horizontal force that generates when the pointer is not aligned with the piston, initially it hits an edge of the pointer but it also ends up facing the piston and the horizontal force is generated that shakes the cylinder with each impact, colliding with it.

Hydraulic breaker operation and maintenance.

Problems and solutions guide

Olipes

6. Problems and solutions guide

If any of these problems present themselves, try the following solutions:

Problem	Solutions
The breaker does not work	Check shut-off valves or instant fittings, if any.
	Check that the pressure and return hoses are not installed backwards.
	The breaker control valve on the machinery does not open. Check.
	Check the limiter settings.
	Check the return line restriction.
	Broken beams.
	If the fault was not located, take the breaker to the workshop or technical service.
Irregular operation, full impact power	Check flow and pressure.
	Check the limiter settings.
	Check the return line restriction.
	Broken beams.
	If the fault was not located, take the breaker to the workshop or technical service.
Irregular operation, without impact power	Check flow and pressure.
	Check the limiter settings.
	Broken beams.
	Check accumulator load.
	Check membranes of the accumulator.
	If the fault was not located, take the breaker to the workshop or technical service.
High impact speed	Check the flow of oil in the machinery.
	If the fault was not located, take the breaker to the workshop or technical service.
Low impact speed	Check the flow of oil in the machinery.
	Check the limiter settings.
	Check accumulator load.
	Check the return line restriction.
	If the fault was not located, take the breaker to the workshop or technical service.

Vibrations in hoses	Check accumulator load.
	Broken hose clamps.
	Hoses are too long.
	Broken shock-absorbing studs.
	If the fault was not located, take the breaker to the workshop or technical service.
Heating of the oil	Insufficient cooling. Check coolers.
	Low viscosity of the hydraulic oil.
	Check the pressure limiter settings.
	Unsuitable hoses. Check with the specifications.
	If the fault was not located, take the breaker to the workshop or technical service.
Problem	**Solutions**
Excessive vibration	Loose cap screws.
	Rapid wearing of the connection.
	If the fault was not located, take the breaker to the workshop or technical service.
Leaks	Check hoses, flanges, connection plugs, etc...
	Leak from the hose connecting to the breaker makes the leak appear to be at the bottom of the breaker: the hose needs to be replaced.
	Oil leak from the seal in the liner caused by a breakage of the tensioning screw.
	Oil leak from the seals due to exceeding their useful life.
	Leak caused by high pressure in the return.
	If the fault was not located, take the breaker to the workshop or technical service.
Excessive wear in the lower socket	The breaker is not suitable for the machinery.
	Incorrect use of the breaker.
	Improper maintenance.
	Damaged greasers.
	Unsuitable grease.
	Damaged dust seals.
	Check the flow of oil in the machinery.
	If the fault was not located, take the breaker to the workshop or technical service.

Wear in the retaining fasteners	Incorrect use of the breaker.
	Pointer not suitable for its application.
	If the fault was not located, take the breaker to the workshop or technical service.
Damage to the framework or side plates	Loose screws.
	Incorrect use of the breaker.
	If the fault was not located, take the breaker to the workshop or technical service.
Frequency (blows per minute)	When working on soft rock, it is better to use high frequency and low impact power.
	When working on hard rock, it is better to use low frequency and high impact power.
Operating pressure	When the operating pressure is high, the hydraulic breaker may become damaged very quickly by overpressure and a malfunction of the control valve due to the lowering speed of the piston being too fast.
	The operating pressure in hot areas should be lower than in cold areas. In this case, with this measure, the impact power is not reduced.

The breaker manufacturer or pointer supplier may determine causes different to the faults, failures or problems described herein. These tables should only be used as a reference for detecting problems and especially for avoiding them, and they are not intended to replace the recommendations of the manufacturer of the machinery, breaker or pointers in each case.

Hydraulic breaker operation and maintenance.

Appendix

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7. Appendix

HYDRAULIC BREAKERS

BASIC CONCEPTS

Despite the fact that the first hydraulic breakers were made decades ago, the models that exist today still closely resemble those early models.

Although the basic principles of the operation of a hydraulic breaker and the corresponding tool (pointer or spear) consist of transforming the machinery's hydraulic power into mechanical impacts, the practical method varies depending on the manufacturer.

Most hydraulic breakers have components in common:

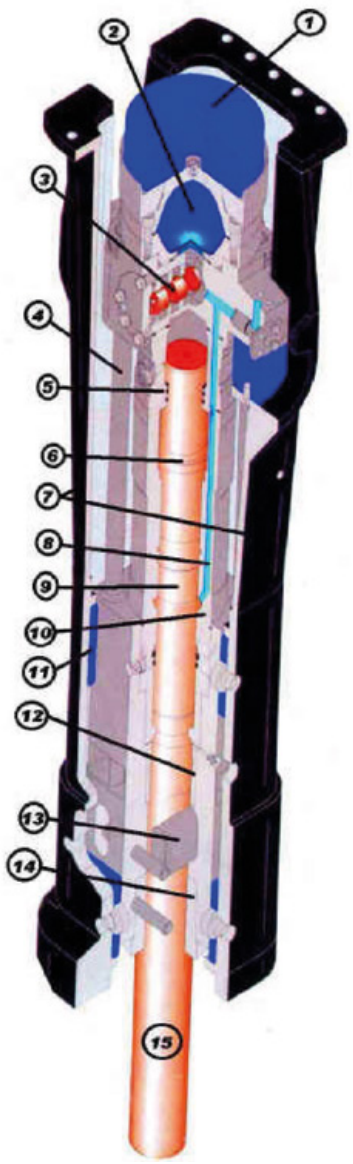
- Distribution valve: Controls the piston movements.
- Gas accumulator or membrane: Restores energy.
- Cylinder or body: Allows the piston to slide.
- Piston: Produces the hammering movement.

By operating principle, hydraulic breakers can be divided into the following types:

- **High pressure:** The breaker accelerates the piston with the help of a membrane-type high-pressure accumulator.
- **High pressure + gass:** In addition to a high-pressure accumulator, it has a nitrogen accumulator around the piston head; this receives part of its energy from the gas and part from the accumulator.
- **Gas pressure:** The breaker only restores energy with a gas accumulator.
- **Low pressure:** The breaker has an independent pressure circuit that is regulated with a control valve.

COMPONENTS

Below we will see components and features, using a high-pressure breaker as an example.



1. Shock absorber: Prevents recoil and absorbs shock impacts against the machinery and the breaker.
2. Accumulator: This generally has a membrane-type diaphragm.
3. Hydraulic valves: They control the hydraulic pressure.
4. Beams: They hold the main components together and aligned.
5. Seal carriers: They are used to place the seals that prevent leaks.
6. Hydraulic brake: Cushions no-load blows and avoids metal-to-metal contact between the liner and the piston.
7. Framework: Protects the components from external impacts whilst supporting the entire assembly.
8. Oil lines: They allow oil to travel internally.
9. Piston: Produces the movement and power that is transmitted to the pointer or spear.
10. Liner: Controls the piston movements.
11. Wear plates: They are situated in the four corners of the power cell and their mission is to cushion impacts and reduce noise.
12. Upper socket: This serves to guide the upper part of the pointer or spear and align it with the piston.
13. Retaining fastener: Holds the pointer or spear in place during the operation of the tool.
14. Lower socket: Guides the lower part of the spear but is subject to significant wear. It is convenient that it is easy to change.
15. Pointer or spear: This is the element that creates the impact against the material. This is generally the component that needs to be changed most often.

FEATURES

WEIGHT

Working weight of the breaker:

- Total weight in working order. Includes anchor bracket and standard tool.

Weight of the machinery:

- Working weight of the excavator or backhoe loader.
- If the machinery is very small, production will be adversely affected and the machinery itself could become damaged.

- If the machinery is very heavy, it would damage the breaker.
- The ideal ratio of excavator weight to hammer weight is 14 : 1, but it is acceptable within the following limits: 10 : 1 to 20 : 1.

IMPACT FREQUENCY

The impact frequency depends on:

- Oil flow.
- Hardness of the material that will be broken.
- Temperature.
- Viscosity of the oil..

WORKING PRESSURE

The working pressure depends on:

- Setting of the pressure control valve.
- Pressure of the accumulator.
- Oil flow.

BACK PRESSURE

Back pressure directly affects working pressure:

- If the back pressure rises, the working pressure also rises; if the back pressure is very high, the breaker may stop.

Back pressure also depends on:

- The resistance of the return line.
- The pressure in the hydraulic tank.

ADJUSTING THE PRESSURE LIMITER

Limiting valve of the breaker line:

Its setting must be at least 30 bar higher than the working pressure plus the pressure drop in the return line.

- It must remain closed during normal operation.
- It is only a safety device: it should never be used to regulate the flow.
- It only works if the working pressure is too high.

It only acts when:

- The machinery starts up when cold.
- The breaker is not working correctly.
- The oil flow is too high.
- The back pressure is too high.

OIL FLOW

The oil flow must always be within the operating pressure range of the breaker:

- An insufficient flow reduces efficiency.
- An excessive flow would damage the breaker.

IMPACT ENERGY

Kinetic energy of the piston when striking the tool:

E (joules) = (m * s^2) / 2

m: piston mass (kg)

s: piston speed (m/s)

The maximum speed is currently between 10 and 11 m/s, this speed is limited by the current resistance of the steel and the dimensions of the piston.

POWER – EFFICIENCY

Eff = Pout / Pin.

Pout (Kw) = (joules x blows/min.) / 60.000.

Pout (Power output) = Impact energy x Impact frequency.

Pin (Kw) = (bar x l/min.) / 600.

Pin (Power input) = Working pressure x Oil flow.

From this it can be deduced that, for an optimal performance adaptation, the resulting Eff (Power - Efficiency) must have parameters between 0.7 and 0.9.

LINE DIMENSIONS

The manufacturer's instructions must always be followed. What you can see here is only a general guideline valid for a specific manufacturer, according to the data provided by it:

Flow (l/min.)	Pressure line	Return line
0-50	½"	½"
50-76	½"	½"
76-90	¾"	¾"
90-110	¾"	1"
110-170	1"	1"
170-210	1 ¼"	1 ¼"
210-340	1 ¼"	1 ½"
340-390	1 ½"	1 ½"
390-490	1 ½"	2"
490-740	2"	2"

- Smaller lines can be used with the lowest flow rates, but it is advisable to increase the return line.
- Check the connections to the breaker, the instant fittings are unsuitable if they open the passage completely.
- As the diameter of the line decreases, the resistance increases and consequently the oil heats up, with the consequent loss of pressure.

TEMPERATURE AND VISCOSITY OF THE OIL

The maximum permitted temperature depends on the degree of viscosity of the oil.

Permitted viscosity:

15...100 cSt (Centistokes). The right viscosity will be determined by the Maintenance Manual of the carrier machinery, taking into account the ambient temperature limits and the working conditions. If in doubt, consult OLIPES' Technical Support Service (sat@olipes.com).

The temperature can never:

Exceed +80° C

Be lower than -20° C

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C/ Aluminio, 2-3. P. Empresarial Borondo
28510 Campo Real. Madrid (Spain)

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