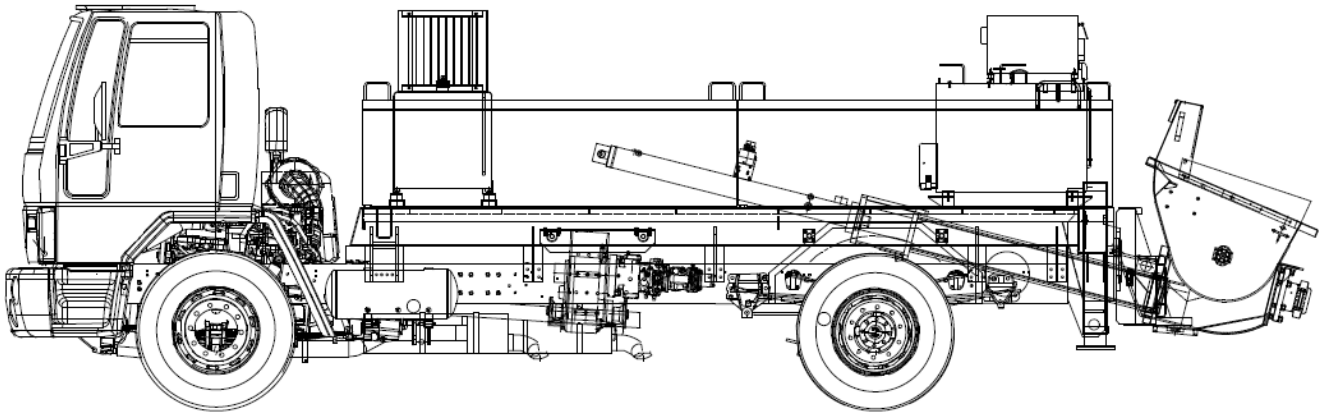
ELP MOLI

OPERATION MANUAL



User Manual No. : H2970184

Apply :

Introduction

This manual describes handling and maintenance process for correct maintenance and management to keep optimal condition of the equipment and maximize the life of the equipment.

Read the methods of stability, operation and management and understand each structure thoroughly to ensure the capability of the equipment before operation.

We are not responsible for any accident happens not following this manual. Safety regulations and environment regulations of each country must be observed.

Finally, the contents of this manual is subject to change for the improvement of the quality of the product, and please contact A/S Center if you find any error, miswriting and if there is any question.

2010. 12. .

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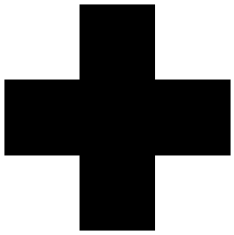


Chapter 1 Safety Guidelines

1.1. Security General

Security of Safety

This book contains basic safety-related items.「⚠ **Caution**」mark is attached to the items to keep in order to secure safety.

You are requested to be well aware of the caution mark attached to the equipment and keep safety operation in mind. The safety-related cautions do not mean the prediction of danger attended to operation・inspection・maintenance conducted in all kinds of circumstances. Therefore, the caution marks attached to the instruction manual and equipment do not contain all of safety, but limited to operation・inspection・maintenance of a pump truck. In addition, in case of operation・inspection・maintenance not stated in this book, an operator should be responsible for all necessary considerations regarding safety.

Safety Considerations Symbol Mark

This symbol mark indicates「Safety Considerations」
When you see this mark in the book or amid caution plate of the equipment, you are requested to pay attention to safety.
You should take a precautionary measure in accordance with the descriptions for safe operation and right management.

HDO1001I

Signal Terms

Signal Terms are index indicating items to be taken into consideration in securing safety for men and dealing with the equipment. In accordance with the extent of danger affecting the human body, it's graded into 「Danger」, 「Warning」, 「Caution」and「Importance」. Along with the safety considerations symbol, they indicate the following situation respectively.

⚠ **[Danger]: In case of being deemed fatal or imminent serious injury in wrong handling**

⚠ **[Warning]: In case of being deemed fatal, potential serious injury, high frequency of wound or property damage in wrong treatment**

⚠ **[Caution]: In case of being apprehensive of trouble due to wrong treatment, although there are few possibility of being injured, or being deemed potential property damage**

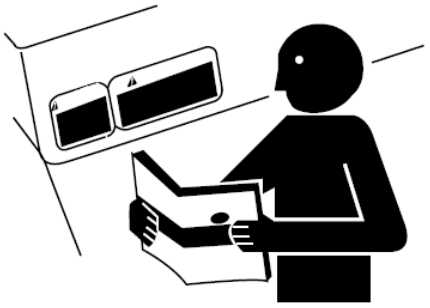
⚠ **[Importance]: In case of shortening or damaging user's life in wrong treatment**

Qualifications for operation

Those who intend to operate an equipment need to get a heavy machine operator's license from the city・province

Basic Cautions

- Be well aware of the cautions stated in this book and equipment.
- Keep always the caution plate clean
- In case of brakeage or loss, give an order to the nearest sales branch or service parts agency of the Company
- Operation of equipment needs a fixed qualification
- Remember the right way of operation・working
- Keep the equipment always normal. Do not reconstruct the equipment at random. It might cause loss of safety and falloff of durability.
- The chapter of「Safety」contains the basic items for safety. Besides the items stated in this book, pay close attention to the safety.



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Prohibition of Reconstruction of Equipment

- Reconstruction of the equipment without consent of the Company might cause a problem in safety
- In case of reconstruction, you need to consult with the Company's branch. The Company does not take the responsibility of the personal accident or disorder owing to not permitted reconstruction.

Safe Outfit

- When working, you need to take outfit fitting for the job, including safety devices such as helmet
- Do not wear loose clothing and accessories, as they might be caught by a lever or other projections.
- Distracted operation might cause a significant accident. Do not use a radio or music headphone in order to keep safety.

HDO1003I

When boarding and alighting, Rail・Scaffolding are required

- Pay attention to fall
- When boarding on and alighting from the equipment, make sure to stand keeping the front part of the body face the equipment.
- Use the rail or scaffolding and always keep the body sustained with three or more supports.
- Do not hold the operation device by mistake.
- Do not jump up or down even though the equipment stands still.
  Do not board on or alight from the working equipment.
- Platform, scaffolding, and rails might be slippery due to oil and water.
  In such cases, promptly wipe up with a cloth.

HWBO1001

Cautions while dealing with oil

- Fuel, oil and fats, and anti-freezing solution are dangerous due to their strong inflammability.
  Pay attention to the fire, as they are inflammable..
  ① Keep away from the fire during fueling! Never smoke!
  ② Turn off the engine during fueling.
  ③ Oiling should be done in the open.
- Keep the inflammable oil and fats including oil in the well-ventilated place, away from the fire
- Keep the equipment clean, so that foreign substances and greases may not be attached
- Do not pile up oily dust-clothes. They might ignite spontaneously.

HDO1005I

Prevention against Burn

- Pay attention to keep the skin away from high-temperature coolant or steam.
- During operating, a coolant of engine, radiator and heater pipes is high temperature or steam. Turn the engine off, and wait till the engine and radiator cool down, before inspection・repair. Especially pay attention to the coolant right after stopping engine, as it is high temperature・pressurized
- Unfasten the radiator's cap slowly as pulling internal pressure out, after the coolant cools off.
- Pay attention not to be burned by hot oil.
- While operating, the temperature of engine oil or gear oil and hydraulic oil is rising, along with the engine, hose, piping and other parts. Inspect and repair after the oil and parts cool down
- Oil tank is pressurized. Prior to uncap, make sure to stop the engine. Initially uncap a little bit after cooling down the oil, to eliminate internal pressure thoroughly, before open fully.

HDO1006I

HDO1007I

Pay attention to the asbestos dust

- When dealing with the asbestos-contained parts, make sure not to inhale dust from it. It might damage the lungs
- Brake pad, brake band, lining, clutch plate and gasket might contain asbestos
- Asbestos used for such parts is inserted by resin or the other method. Therefore, ordinarily the asbestos do not disperse in the air.

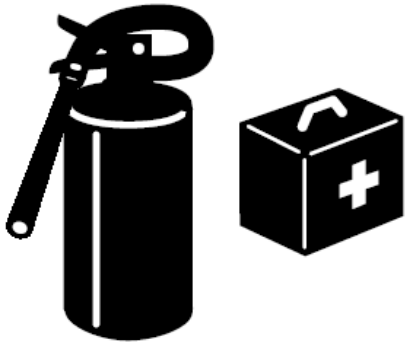
HDO1008I

Anti-scattering of Asbestos dust

- In the event of dealing with the parts which are potential to contain asbestos, keep the following descriptions in mind.
  – Do not clean up with pressured air.
  – Do not grind.
  – While cleaning up, use a vacuum cleaner if possible.
  – If not, make the asbestos-contained part wet by oil or water.
  – Prevent the third party from approaching during working.

Required First-aid kit・Fire extinguisher

- Prepare for the potential injury or fire.
- keep first-aid kit and fire extinguisher ready. Especially, you need to learn about how to use the fire extinguisher.
- Make note of emergency contact number of hospital, ambulance and fire station.



HDO1009I

Prevention of Injury due to Working devices

- Make sure not to put your body parts such as hand or arm in the mobile part between working devices and vehicles or cylinder. When the working devices start, it might cause bad accident due to changed interval.

Prevention of Fire

- Piled up inflammable substances such as wood pieces, fallen leaves, and papers in an engine room should be removed.
- Check the leakage of fuel, lubricant and oil, and repair the leak.
- Check the place of installation and usage of fire extinguisher.

HDO1015I

Checking of Operation Room

- Do not keep the spare parts or tools in the operation room. They might damage a lever and switches and cause an accident. Keep them in a tool box.
- Wipe clean oil or snow attached to lever, scaffolding and handle.

Provision against Noise

In case of being exposed to noises for long, it might cause hearing impairments. In order to prepare for the continuous or unexpected noises, wear the protective outfit such as earplug.

HDO1016I

Pay attention to Indoor working・Waste

- The waste gas of engine is poisonous. When operating・working indoor, pay attention to the following items.
- Open the door to let fresh air in.
- An exhaust pipe should be extended to the outside for discharge.

ARO1770L

Take notice of Light

- Check whether the lamp is installed fitting for the working conditions, along with its lighting.

Cautions during starting engine

- Prior to start an equipment, make sure that there's no person or obstacle.
- When the caution label is attached to the operation lever, do not start engine.
- Only operator may access or operate the equipment.

Security of Wide Field of Vision

- In case of working in a dark place, prepare working light・head lamp, and install lighting at need.
- In case of having a narrow field of view due to mist, snow and rain, stop working until securing visibility with which safe operation is possible.

Working on the snow or ice

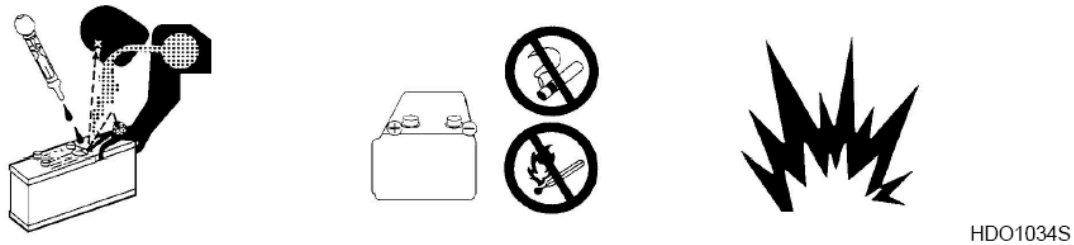
- In case of working on the snow・ice, the equipment might slide down even a slight slope horizontally. Keep tractive driving in low speed, and avoid sudden start, sudden stop or turn.
- Pay attention to the piled up snow on the side road after snow-removing work, since there might be something inside the snow.

Working on the Unstable ground

- Abstain from working on the edge of a cliff・under a precipice・near deep ditch. The equipment might be reversed or fall off due to its weight and vibration. Especially, the ground is unsafe after heavy rain or blasting.
- After laying earth on the ground, or around the digging holes, the equipment might be reversed due to the weight and vibration of the equipment.
- Especially, in case of working in the place in potential danger of falling-stone, the equipment and operator might be badly damaged.

Cautions of Battery Treatment

- Sulphuric acid-contained battery electrolyte burns the skin or clothes. In case the clothes or skin is stained with electrolyte, immediately wash it away with water.
- If the electrolyte gets into the eyes, it might cause loss of eyesight. When the electrolyte gets into the eyes, immediately wash it away with lots of water and take medical treatment.
- In case of taking electrolyte by mistake, immediately take lots of water or milk, fresh egg or vegetable edible oil and medical treatment.
- When dealing with a battery, make sure to wear safety glasses.
- As a battery might explode due to leak of hydrogen gas, keep the fire such as the light of a cigarette away, and do not make a spark.
- Check the battery after turning the engine off.
- Do not have metallic tools attached between both poles of battery, it make a cause of a short-circuit.
- When installing or removing battery, check (+) and (-) terminals.
- Make sure to fix the battery terminal. Loose terminal might cause a spark.



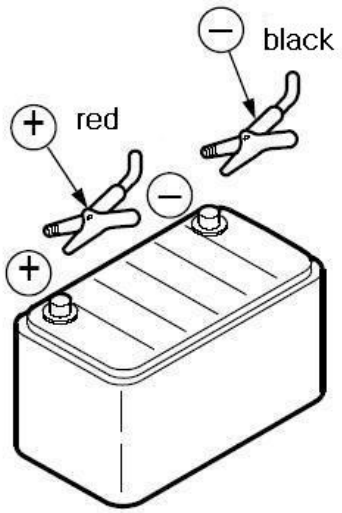
HDO1034S

Cautions during starting with Booster Battery

- When starting with the booster battery, be sure to wear safety glasses.

When installing with other equipment,

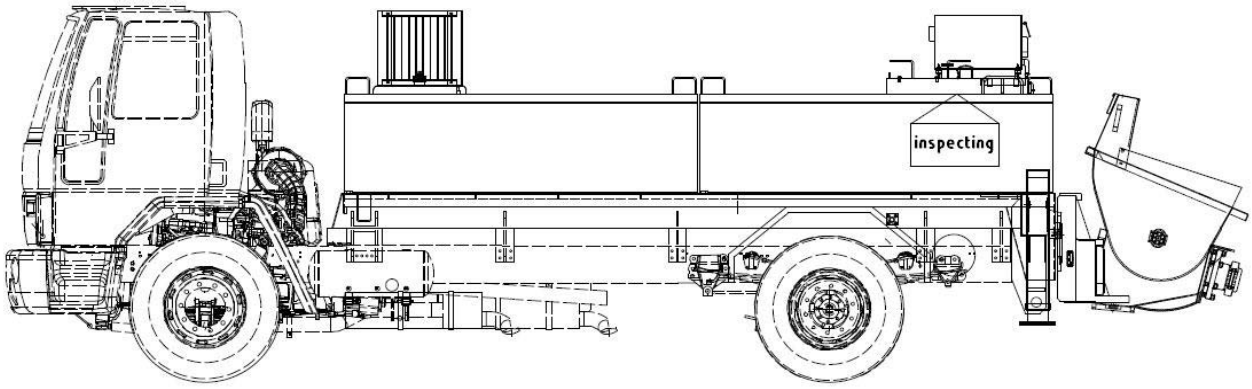
- Do not have two equipments touched..
- When connecting booster cable, connect to (+) terminal first, when disconnecting, take earth or (-) terminal first..
- In case a tool is touched between (+) terminal and the body of a car, it might be dangerous due to a spark.
- Do not connect (+) terminal to (-) terminal directly, connect (+) to (+), and (-) to (-).
- When starting by connecting an earthing conductor to the upper frame, it might generate a spark, so have the earthing conductor as far away from a battery as possible.



HDO1035I

Warning mark during inspection and repair

- In the event non-mechanic starts engine and operates a working lever during inspection and repair, it might cause a significant accident. Attach the warning mark saying “under inspection・repair” on the operating panel or working lever.



Usage of Appropriate Tool

- As it is very dangerous to use damaged or inferior tool, use the proper tool fitting for the repair.

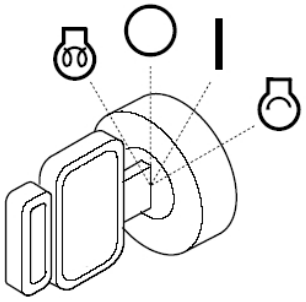
HDO1036I

Regular Exchange of Safety Parts

- Fire-related parts stated below need to be regularly exchanged.
  – Fuel system: fuel hose.
  – Oil system: pumping discharge hose, cylinder line hose.
- The foregoing parts need to be exchanged regularly even though they are normal. They get weaker as time goes by.
- In case something is wrong within the fixed period, make an exchange or repair.

Stop the engine during inspection・repair

- Park the equipment on the even and hard ground and stop the engine before inspect and repair.
- When repairing by starting engine such as cleaning the inner part of the radiator, two mechanics are required. One person needs to locate on the operating panel and stop the engine at need. In addition, pay attention not to touch the unnecessary lever. Mechanic should pay attention not to have the body or clothes touched to the moving machinery parts.



HDO1038I

Cautions during fueling

- As fuel・oil spilt over the equipment might have an operator slip or cause a fire, immediately wipe clean.
- Be sure to cap the fuel・oil.
- Do not clean the parts with fuel
- Have the fuel・oil refueled in a well-ventilated place.

HDO1005I

Water level of Radiator's coolant

- When supplying the coolant to the radiator, stop the engine and fill up after the radiator completely cools down.
- Prior to uncap, remove the internal pressure as unfastening a cap slowly.

HDO1039I

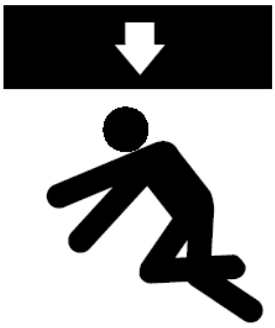
Usage of Anti-Blast Lighting

- When checking fuel, oil, coolant and electrolyte, use the anti-blast lightings. If not, it might be ignited to blast.

HDO1040I

Repair of the lower part of equipment

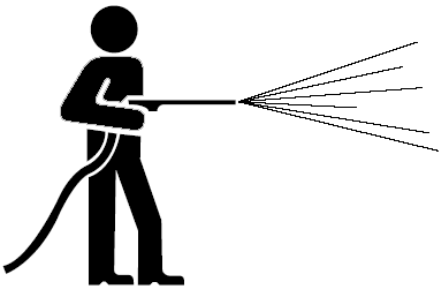
- Prior to fix or repair the lower part of equipment, have all the movable devices located on the ground or the lowest position.
- Make sure to set up a wooden tire prop and prevent the equipment from moving.
- When the equipment is not fully supported, never make a repair on the lower part of the equipment.



HDO1042I

Always keep the equipment clean

- Overspilled oil, grease or foreign substances might have people slip. Always keep the equipment clean.
- If the water gets into the electric system, it might cause an error in operating. Do not make a water or steam cleaning for various sensors, connectors, and the inner part of operating panel.



HDO1043I

Do not touch the moving part.

● In case of working near the spinning part, pay attention not to have the body parts caught in a machine.

HDO1044I

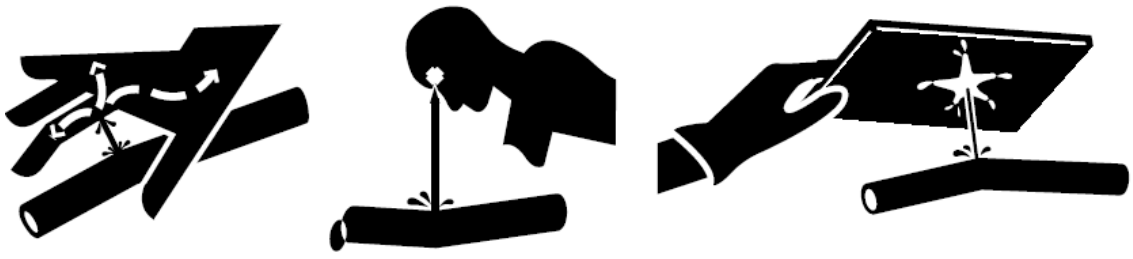
Cautions for high-pressure oil

● If high-pressure oil such as fuel touches the skin or gets into the eyes, it might cause a serious injury of loss or sight.

① Prior to take off a hydraulic part and piping, remove the remained pressure. Prior to put pressure, make sure to check the joint.

② Leakage of high-pressure oil might be checked by using corrugated cardboard or wooden plate. Be sure not to have your hands or each part of the ship touched directly to high-pressure oil.

③ In case of touching high-pressure spouting oil, immediately take medical treatment. In case oil is penetrated into the skin, tissue may be damaged without eliminating it within hours.



HDO1045I

Prevention of Fire

- Hose and piping
  - Leakage of inflammable fluid might cause a fire. Check whether the hose or pipe leaks oil.
  - Check whether there is loose or lost plug, twisted hose, worn-out hose or piping.
- Electric cable and wiring
  - Check everyday whether there is loose, hardened, damaged electric cable or wiring, since short might cause a fire.
  - Keep the whole joint clean.

HDO1046I

Prevention of Battery Blast

- Hydrogen gas generated from a battery might cause blast. Pay attention to the following descriptions.
  - ① Never make a spark, or light a match near battery.
  - ② Never inspect the battery by making short for both poles with metal piece. Be sure to use a voltmeter or hydrometer.
  - ③ Do not charge the frozen battery. It might blast. The frozen battery needs to be heated up to over 16℃.

HDO1047I

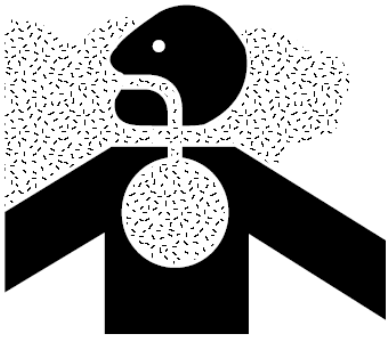
Cautions during checking・repairing hydraulic system

- Lower the legs on the even place and have the cylinder circuit not pressured before repair.
- Be sure to stop the engine.
- As the oil・lubricant becomes high-temperature・high pressure right after operating, start repairing after the temperature of each part goes down. Even after the temperature falls, there's remaining pressure in the circuit, so have your body not face forward when unloosing plug, screw and hose, and remove the remaining pressure as slowly unloosing.
- When checking・repairing hydraulic circuit, be sure to deflate an oil tank and remove the pressure.
- Even after deflating an oil tank, remaining pressure exists in a hydraulic circuit. Handle each lever twice or more to remove the remaining pressure.
- When separating high-pressure hoses, check whether O-ring is damaged, and make an exchange if it is damaged.
- After exchanging and cleaning oil filter element, strainer, and after repairing, exchanging hydraulic devices, disjointing hydraulic piping, deflate a circuit.
- In case of oil shortage in an oil tank, never start engine.
- It's dangerous to inspect・repair turning motor and driving motor on a slope. It is because the equipment might move due to gravity

HDO1048I

Prior to weld or heat, take the coating off

- Avoid noxious smoke or dust.
- When welding, soldering, or heating with a torch on the side of coating, harmful smoke is generated. Conduct outdoors or in well-ventilated place.
- Take the coating off before weld or heat.
- In case of taking the coating off with a grinder, wear a mask not to inhale dust.
- In case of using a solvent, wipe with soapy water or water prior to welding. Keep the solvent away from a fire.
  Wait for more than 15 minutes after taking the coating off, before weld or heat.



HDO1008I

Do not heat hydraulic devices or piping

● When heating hydraulic devices or piping or the surroundings, inflammable steam or atomizing might generate and be ignited. Pay attention to the following items.

① In case of welding or gas cutting pipes or tube containing inflammable fluid, it might cause a fire. Wipe clean the inflammable fluid in advance with non-inflammable solvent.

② Do not heat the hydraulic devices or piping or the surroundings by welding, soldering and torch.

③ Direct heating of pressured piping or rubber hose might cause bursting. Install fire brakes.

HDO1049I

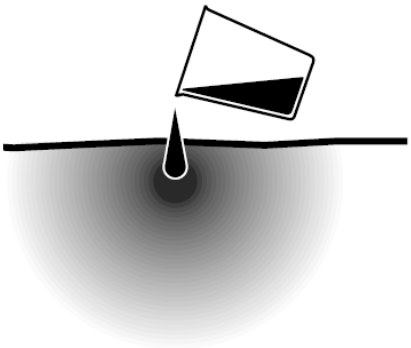
Disposal of Waste

● When extracting waste from the equipment, put it in a container.

● Do not throw away wastes at random, since it destroys environment.

● Do not have the waste flow out on the ground, or dump on the river or lake.

● In case of throwing away oil, fuel, coolant, brake fluid, solvent, filter, battery, and other noxious substances, comply with the prescribed rules and regulations. (「Industrial Waste Disposal Act」)



HDO1050I

1) Always carry the operation manual on the equipment to be well acquainted with it any time.

<Caution> This equipment always involve danger while using.

HDO1001I

1) Operator needs to be well aware of the manual and keep recording necessary items.

2) Operator should comply with the instructions stated in the manual. The Company does not guarantee and take the responsibility in case your equipment is not operated or maintained by the manual.

3) Inappropriate operation might cause the following damage.

(1) Scattering of concrete or other chemicals might have the eyes hurt.

(2) In case of disjointing the hydraulic piping connections without pre-eliminating hydraulic from accumulator, the eyes might be injured due to oil spouting.

(3) Internal pressure due to the breakage of coupling, pipe line or loose assembly might cause damage.

(4) It is dangerous to touch the electric wires (high-tension wire).

(5) When connecting an electric motor to the equipment, pay attention to the joint or damaged wire coating, in order to avoid an electric shock.

(6) If the equipment is not level with the ground, it might be reversed.

(7) If not fully deflating hydraulic oil, it might cause disorder of swing and support legs.

(8) Disaster might be resulted from partial separation of pipe line or loosen fitting and coupling.

(9) Unexpected boom working or turn might hurt a worker.

(10) When a boom crosses the workplace rotating, the remaining concrete might fall down to have workers injured, even if the pump stopped.

(11) Loosen support legs might have a vehicle move when pumping, which might cause an accident.

(12) If the conveying pipe is opened under pressurized state, it might cause an accident.

(13) Keep away from an agitator.

(14) Workers might slip on the place stained by oil or grease.

(15) Do not get a hand into a coolant box while pump piston working.

(16) You might fall to the ground hooked by electric cable, hose, and reinforcing agent.

(17) When a mixer truck accesses an equipment, an accident might occur

(18) An accident might be resulted from the partial separation of unstable conveying line.

(19) Maximum pumping pressure should not exceed the numerical value stated in the table for specifications of equipment.

1.1 Observance Items for Equipment Operation

⚠ **[Caution] Do not operate the equipment until getting sufficient education and experiences within the range of self-safety operation.**

Qualifications: 1) Adult over 28

2) Those who are healthy in the body and mind

3) Those who learned about how to operate and maintain pump equipment.

Do not remove or change a safety device, or use it in abnormal way.

Pump equipment needs to be checked all prior to working.

If a vehicle gets out of order due to inexperienced inspection, it brings a lot of loss and takes a lot of time to restart the pump equipment.

1.2 Main Safety Rules

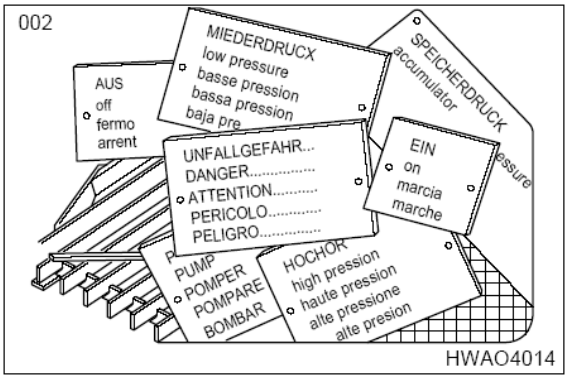
1.2.1 General Items

1) This equipment needs to be operated and maintained in accordance with the operation・repair manual issued by the Company.

2) Concrete pump needs to be used in accordance with the operation・repair manual issued by the Company, and you need to keep the manual in the vehicle.

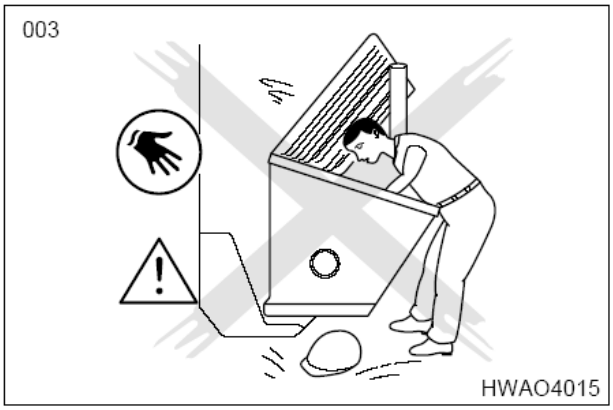
3) As all the moving devices contain riskiness and linked to worker's life, do not remove or change them. (Figure 002)

002



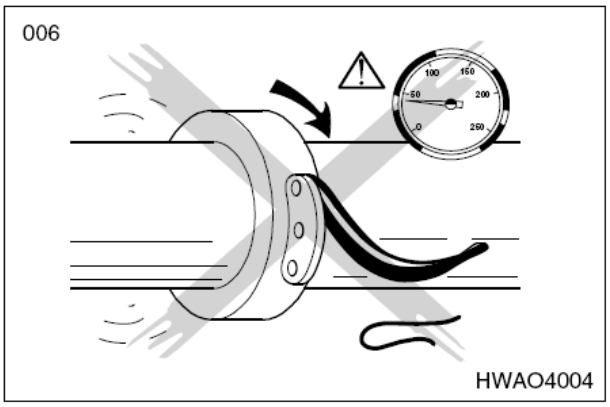
⚠ **[Danger] While the machine is working, do not remove the protective device (e.g: water box cover etc.) or adjust a safety device at your option. Do not open an agitator grid during working. (Figure 003)**

003



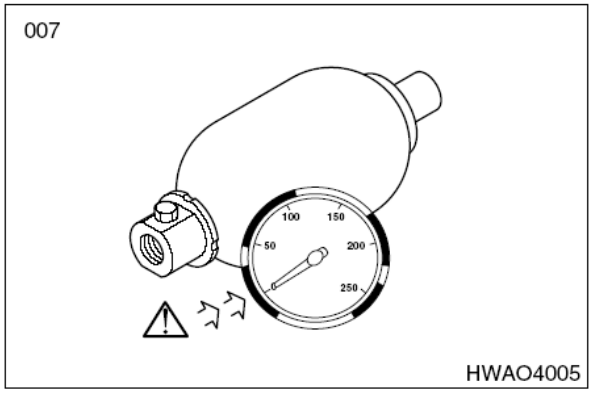
4) Concrete pump and machinery equipment need to be checked every 500 hours for safe working, and inspected by a specialized service factory at least once a year.

⚠ **[Caution] Do not open or kick the pipe while it is pressurized inside. (Figure 006)**
Prior to open the pipe, have it back-pumping always.

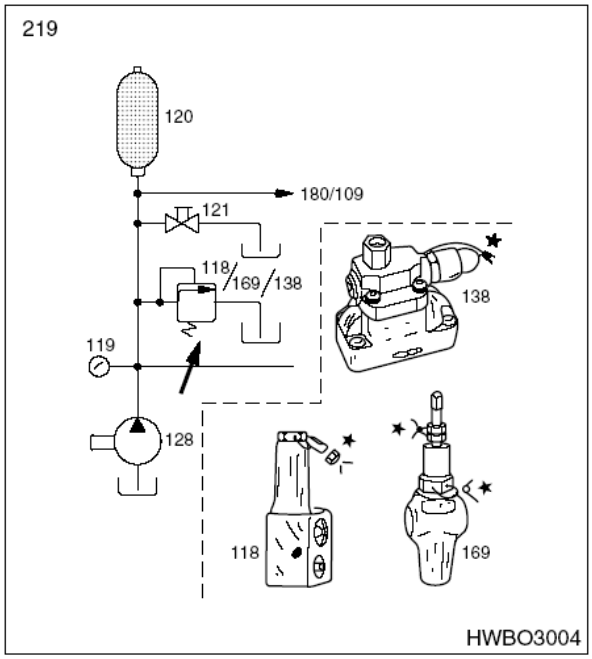


5) In case of the pressure on the outlet of concrete pump is over 85bar, check the following items incidentally.(in case of not using a placing boom)

A. Use the genuine parts. Use a high-pressure pipe for from 85bar to 130bar, and special pipe for more than 130bar.
B. After casting about 2000㎥, test water pressure of pipe and coupling. Have the test pressure set 30% higher than the maximum pressure.
C. Replace regularly coupling, seal and pipe elbow. (within every 10000㎥)

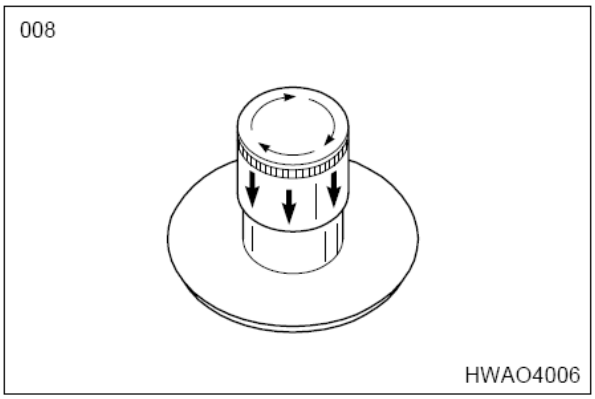


Do not get your hand in a supply device of concrete, transmitter, water box, and hopper. In case the equipment is working or fails, do not hold a change valve or movable device. If there is an accumulator, have the engine stop and remove the pressure from the accumulator. (Figure 007) Pay attention to the cautions attached to the hopper, and be careful when opening grid.

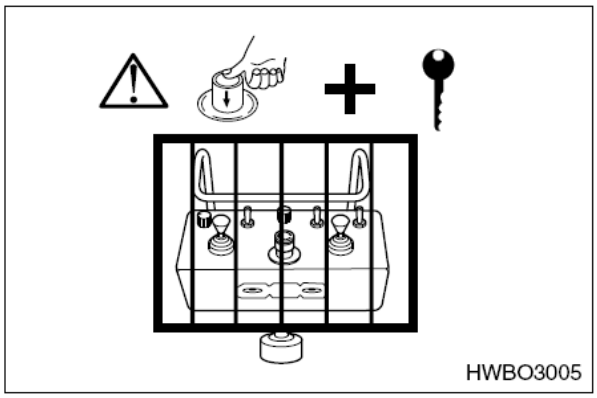


⚠ **[Caution]** Do not change the accumulator circuit. Removal of a safety valve or change of hydraulic Pipe is never allowed. (Figure 219)

6) Equipment operator needs to connect plug, in case of wired remote controller, and to always carry with having switch on, in case of wireless controller. This is the way how to have an emergency switch start. Equipment can be movable again, by unloosing the emergency switch button to return to normal working. (Figure 008. Turn toward the direction of an arrow.)



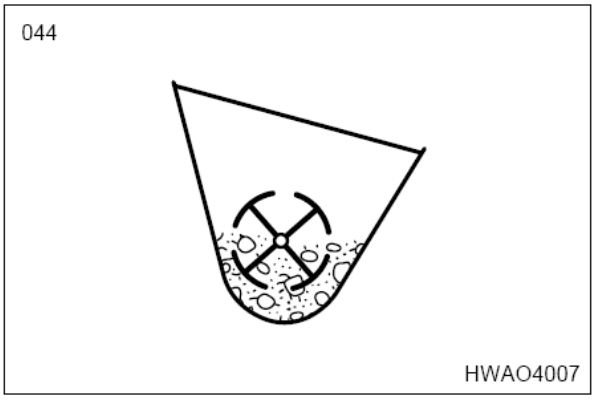
7) While stopping pumping or repairing, unplug the wired controller, have the wireless controller's switch off, get the emergency switch on, and keep it in an operation room or tool box, so that no one could use it.



8) When boarding on and alighting from equipment, use the genuine ladder.

9) Keep stairs, passage, controller and checking devices clean and away from pollutant, oil, snow and ice etc.

10) In order to prevent concrete from scattering due to sucked air, always have the concrete full up to the upper part of an agitator shaft.



11) When cleaning the conveying line, usage of pressurized air might cause an accident. Always clean with water.

12) Maximum conveying pressure should not exceed the pressure stated in the specifications.

14) Items of cooperation

(1) Record all the information regarding the accident.

(2) Any disaster should be reported to a supervisor or inspector along with the relevant data.

Summary of Safety Regulations

Consider the safety! Safety accident might occur without notice, and it is avoidable and preventable.

Although it is simple, it's disposed to be overlooked.

<Caution> This equipment always involve danger while using.

HDO1001I

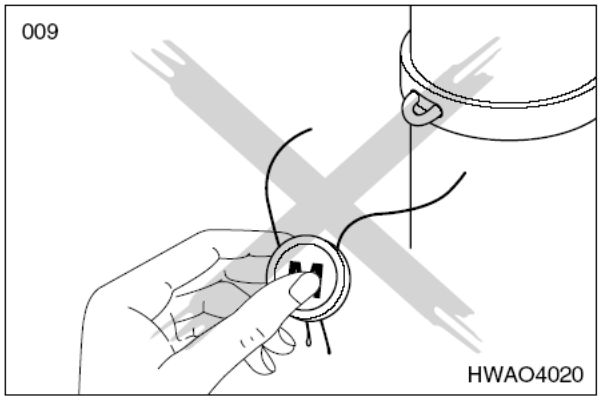
1) Keep the safe distance around the high-tension wire.
   (At least 5m away from electric wire)
2) Only certified worker may operate.
3) Only certified mechanic may repair.
4) Equipment should be installed level with the ground.
5) Check whether there is an obstacle around the machinery.
6) On a passage
   – Do not operate pump or boom.
   – Use a barricade.
7) Do not clean up or apply grease during working.
8) Prior to go to the workplace, check the equipment.
9) Record the items requiring service.
10) Keep the safety sign or operation guideline well-informed.
11) Do not reconstruct the safety devices.
12) Keep the tire pressure.
13) safety outfit including helmet.
14) Unqualified person is not allowed to access.

Outline of Safe Operation

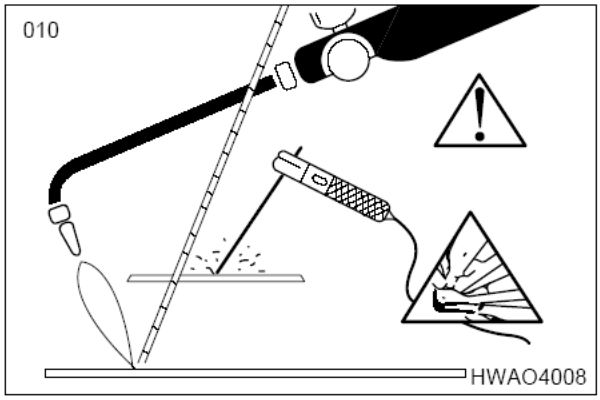
1) Worker needs to be well aware of the manual prior to operate the equipment.
2) Only permitted person is allowed to access the equipment.
3) Do not reconstruct or remove safety equipment.
4) If an error occurs, stop operating and repair at once.
5) Conduct an electrical and manual manipulation only in good condition.
6) Never stand on the grid of hopper.
7) Pay attention not to touch a hopper or concrete valve while working.
8) This equipment is controllable by wired/wireless remote controller, and able to start any time.
9) When having a narrow field of view, an assistant is required.
10) When the safe operation is interrupted, stop until it is corrected.
11) Check the level of equipment and set a wooden support under outrigger, if the condition of ground is bad.
12) Secure the extended area of outrigger.
13) Do not have the electric wire with current touched to the equipment.
14) Keep at least 5m away from the electric wire.
15) When the wind is strong, stop working.
16) In case of using additional pipeline, install a support.
    Use proper coupling according to the concrete pressure.
17) Prior to open coupling, remove the pressure from the concrete pipeline by back-pumping.
18) Have a trained person clean up the concrete line with water.
    Make sure to use a ball catcher at the end of line.
19) Wear a safety hat around the workplace, and it’s better to wear safety glasses.
20) Remote controller is not allowed to be touched by anyone.

1.2.2 Maintenance & Repair

Equipment needs to be checked by regularly.
Throttle and pressure limiting valve are set when delivered.
Do not remove a seal mark from a safety valve. (Figure 009)



1) Services for support member, support leg, mounting frame, pump parts, and pressurized parts are to be done by a specialized service factory. (Figure 010) Especially, the part designed as an oil tank needs to be handled very carefully, since it is explosive.



⚠ **[Caution] Prior to electric welding, be sure to take off the plug from battery and control box. Conduct welding after cutting off the electric wire from accessories such as receiver of wireless controller or FFH controller (Amplifier).**

2) When inspecting equipment, turn the engine off and remove the pressure from hydraulic devices and line.

3) Accumulator-related devices need to be operated only after removing pressure from accumulator. Accumulator's circuit is not allowed to be changed in any case.
4) Prior to work on pressure valve, cylinder or hydraulic line, be sure to support the equipment not being swayed.
5) When replacing electrical equipment, air pressure and hydraulic components, and check the circuit diagram or manual's data (pressure, voltage) and use the genuine parts.

6) When dismantling components, record the location. Components list is helpful for accurate assembly.
7) Prior to clean up with water, steam jet (high-tension cleaner) or in other way, cover the place which is not allowed to be polluted by foreign substances. Especially, pay attention to the electric motor and switch box. Do not have water or steam jet face toward man or electrical equipment.

1.2.3 Observance Items for Workplace Environment

1) Operator needs to use the equipment in the place with good watching near the workplace. If a wide field of view is not secured, an assistant is required.
2) In case of working on the common passage or public places, isolate the workplace. (Figure 013)
3) Workers need to wear always individual protective devices in the workplace. (Helmet, goggles, mask, gloves etc.) (Figure 014)
4) Persons unrelated to the work are not allowed to get into the workplace.

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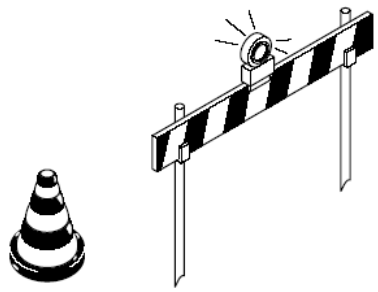

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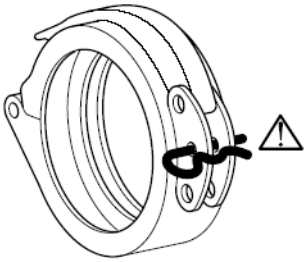
1.2.4 Installation of Equipment

1) Pin a coupling so that it would not open during working. (Figure 016)
2) Prior to work, check each joint.
3) Prior to start pumping, check the joint of hose and coupling.
4) When the equipment has to be installed inevitably on a slope, support the equipment with a triangle wedge and completely unfold an outrigger. (Figure 017)
5) Have the equipment keep a safe distance from an obstacle, and crane and building etc.
6) Make sure to install the equipment on the hard ground. Keep a sufficient distance, since the pressurized support legs might fall down on a slope, puddle, and ditch.
7) Be sure to check whether the ground is solid, if not, use wooden supports crossing each other. (Figure 020)
8) Make the equipment level. The part losing oil might sink, so re-adjust the level and always turn off the shut-off coke.
9) Keep checking support while casting concrete, and readjust at need. In accordance with the working location, the level might not be maintained.
10) Keep the level of equipment, maximum permissible angle is 3°. If the angle becomes wider, stability of equipment drops. Extend the cylinder of outrigger as much as necessary.

016



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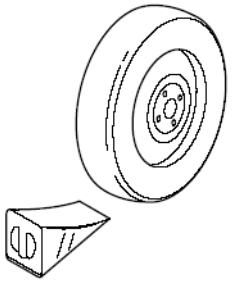

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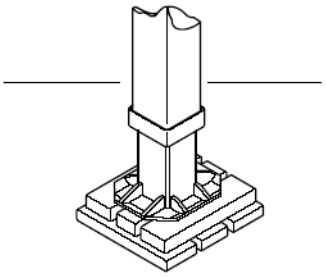

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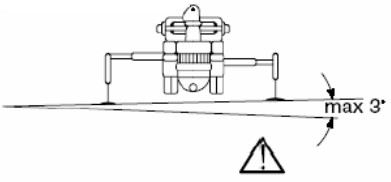

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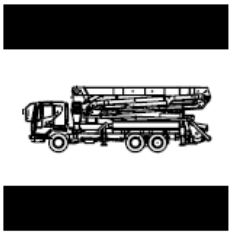
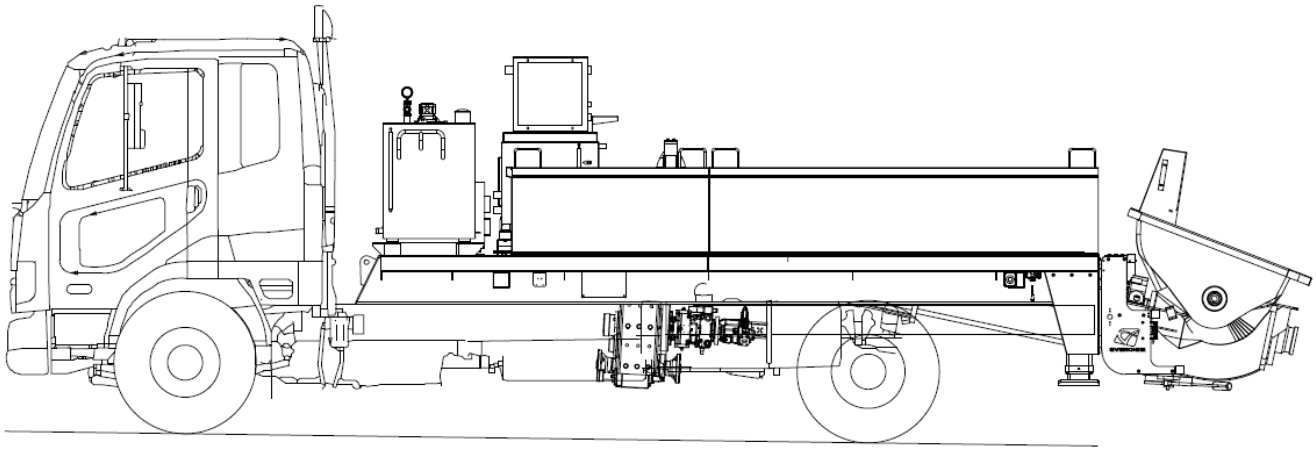


Chapter 2 Specifications for Equipment & Outline

2. Specifications for Equipment & Outline

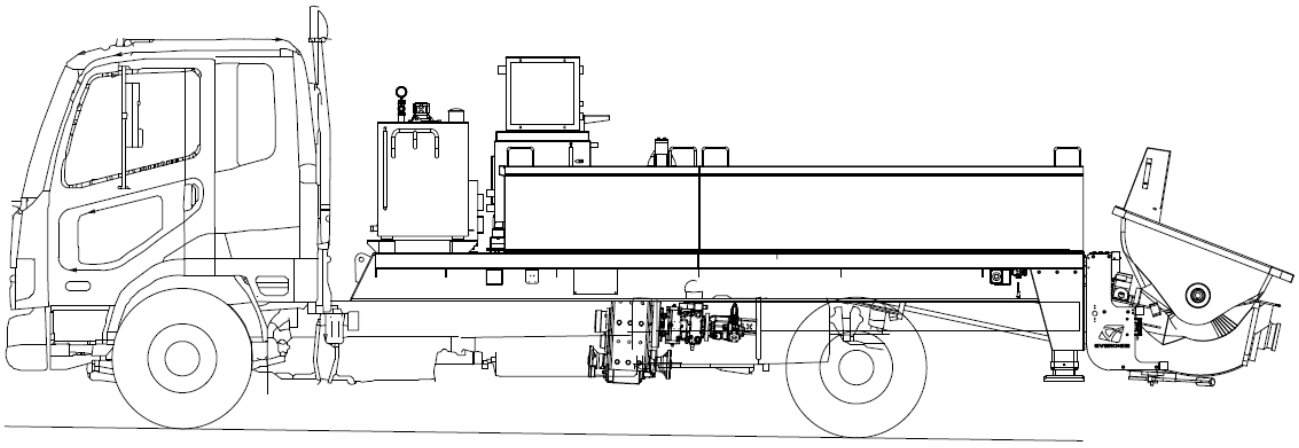
2.1 Specifications for Equipment

2.1.1. ELP570 MOLI



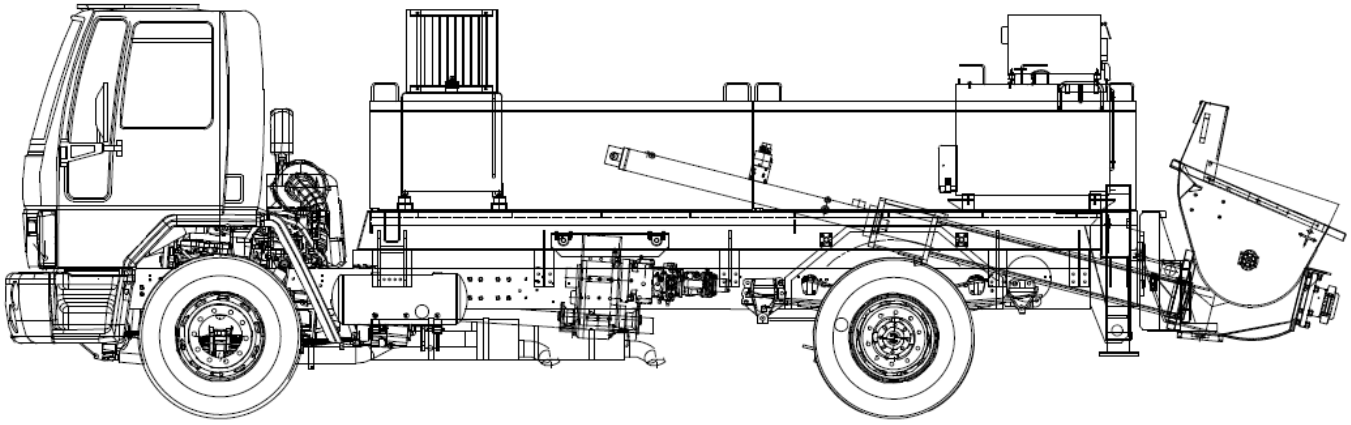
Model		ELP570
Chassis	Drive Type	4 x 2
		PTO
	Engine Power(ps)	150~
Performance	Standard	50 ㎥/h
	Max. Theory Discharge Capacity	50 ㎥/h
	Max. Concrete Discharge Pressure	65 bar
	Permissible slump length for Pressure feed	8 ~ 25 cm
	Max. aggregate bulk for Pressure feed	Max. 40mm
Concrete Pump	Cylinder Caliber x Stroke	180 x 1,000
	Drive Cylinder x Stroke	100(63) x 1,000
	Mine Pump	A4VG71 71cc/rev
	Hopper Capacity	0.40 ㎥
	Hydraulic Control Device	FFH 시스템
	Change Valve	S1812

2.1.2. ELP770 MOLI



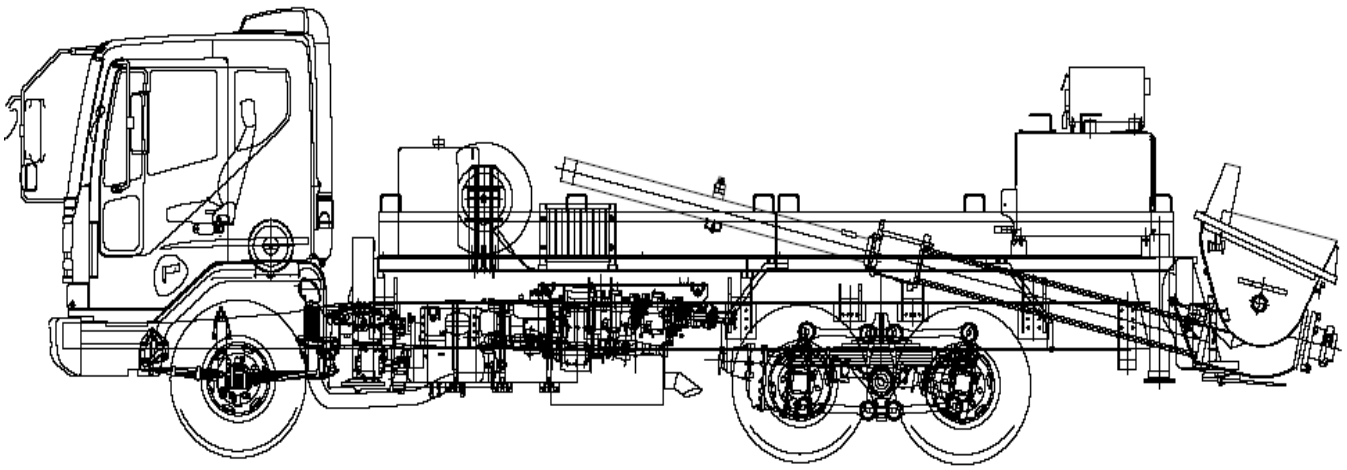
Model		ELP770
Chassis	Drive Type	4 x 2
		PTO
	Engine Power(ps)	200~
Performance	Standard	70 ㎥/h
	Max. Theory Discharge Capacity	70 ㎥/h
	Max. Concrete Discharge Pressure	65 bar
	Permissible slump length for Pressure feed	8 ~ 25 cm
	Max. aggregate bulk for Pressure feed	Max. 40mm
Concrete Pump	Cylinder Caliber x Stroke	180 x 1,200
	Drive Cylinder x Stroke	100(63) x 1,200
	Mine Pump	A4VG125 125cc/rev
	Hopper Capacity	0.40 ㎥
	Hydraulic Control Device	FFH 시스템
	Change Valve	S1812

2.1.3. ELP970 MOLI



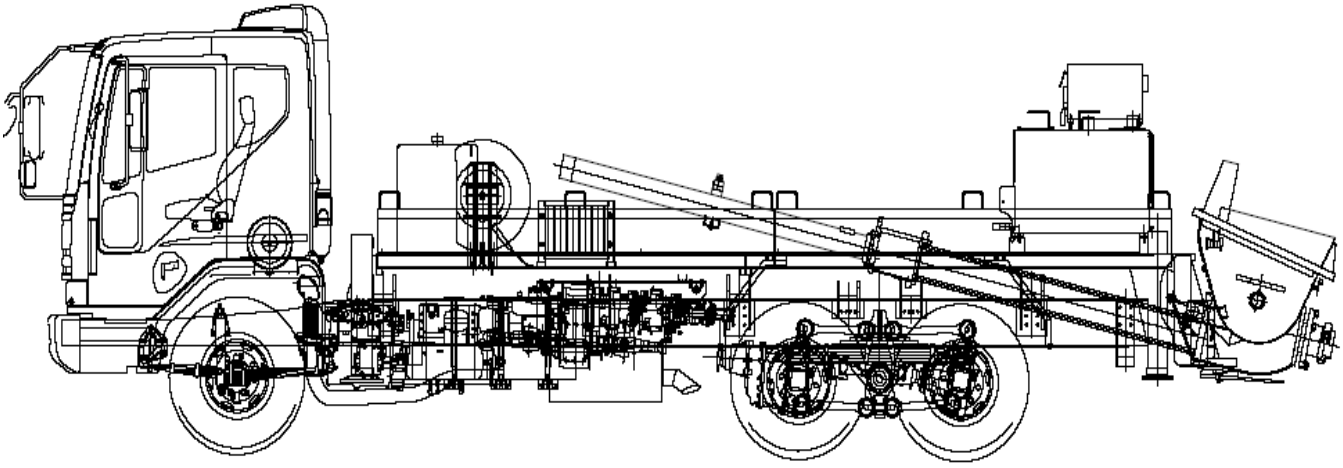
Model		ELP970
Chassis	Drive Type	4 x 2
		PTO
	Engine Power(ps)	220 ~
Performance	Standard	90 ㎥/h
	Max. Theory Discharge Capacity	90 ㎥/h
	Max. Concrete Discharge Pressure	71 bar
	Permissible slump length for Pressure feed	8 ~ 25 cm
	Max. aggregate bulk for Pressure feed	Max. 40mm
Concrete Pump	Cylinder Caliber x Stroke	200 x 1,400
	Drive Cylinder x Stroke	110(63) x 1,400
	Mine Pump	A4VG125 125cc/rev
	Hopper Capacity	0.40 ㎥
	Hydraulic Control Device	FFH 시스템
	Change Valve	S2015

2.1.4. ELP1212 MOLI



Model		ELP1212
Chassis	Drive Type	6 x 4
		PTO
	Engine Power(ps)	340 ~
Performance	Standard	120 ㎥/h
	Max. Theory Discharge Capacity	120 ㎥/h
	Max. Concrete Discharge Pressure	115 bar
	Permissible slump length for Pressure feed	8 ~ 25 cm
	Max. aggregate bulk for Pressure feed	Max. 40mm
Concrete Pump	Cylinder Caliber x Stroke	200 x 2,100
	Drive Cylinder x Stroke	140(80) x 2,100
	Mine Pump	A4VG125 x 2 125cc/rev x 2
	Hopper Capacity	0.40 ㎥
	Hydraulic Control Device	FFH 시스템
	Change Valve	S2015

2.1.5. ELP15000 MOLI



Model		ELP15000
Chassis	Drive Type	6 x 4
		PTO
	Engine Power(ps)	400 ~
Performance	Standard	110 ㎥/h
	Max. Theory Discharge Capacity	110 ㎥/h
	Max. Concrete Discharge Pressure	220 bar
	Permissible slump length for Pressure feed	8 ~ 25 cm
	Max. aggregate bulk for Pressure feed	Max. 40mm
Concrete Pump	Cylinder Caliber x Stroke	200 x 2,100
	Drive Cylinder x Stroke	160(90) x 2,100
	Mine Pump	A4VG180 x 2 180cc/rev x 2
	Hopper Capacity	0.40 ㎥
	Hydraulic Control Device	FFH 시스템
	Change Valve	S2015H

2.2. Property

2.2.1. **Free Flow Hydraulic System (FFH System)**

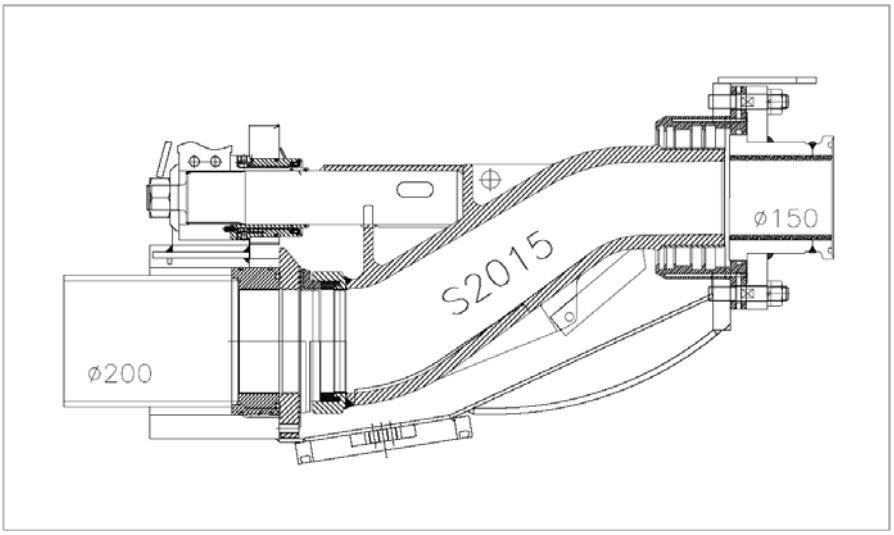
1) FFH (Free Flow Hydraulic) System fitting for large volume pumping was applied.
2) Abrasion and noise of pumping were reduced by installing SN valve reducing Peck pressure generated when changing stroke.
3) There are few pressure loss, since there is no valve between hydraulic pump and hydraulic cylinder.
4) Equipment is simple and service is easy to get.
5) The temperature of hydraulic oil is slow to rise, and a small quantity of oil required.

2.2.2 **Concrete Cylinder & Hydraulic Cylinder**

1) Concrete cylinder made by a large caliber with 1600mm of stroke, Ø 200mm of diameter, is able to pump lots of concrete.
2) The inner part of cylinder has good function and durability due to the chrome plating after precision processing.

2.2.3 **Change Valve**

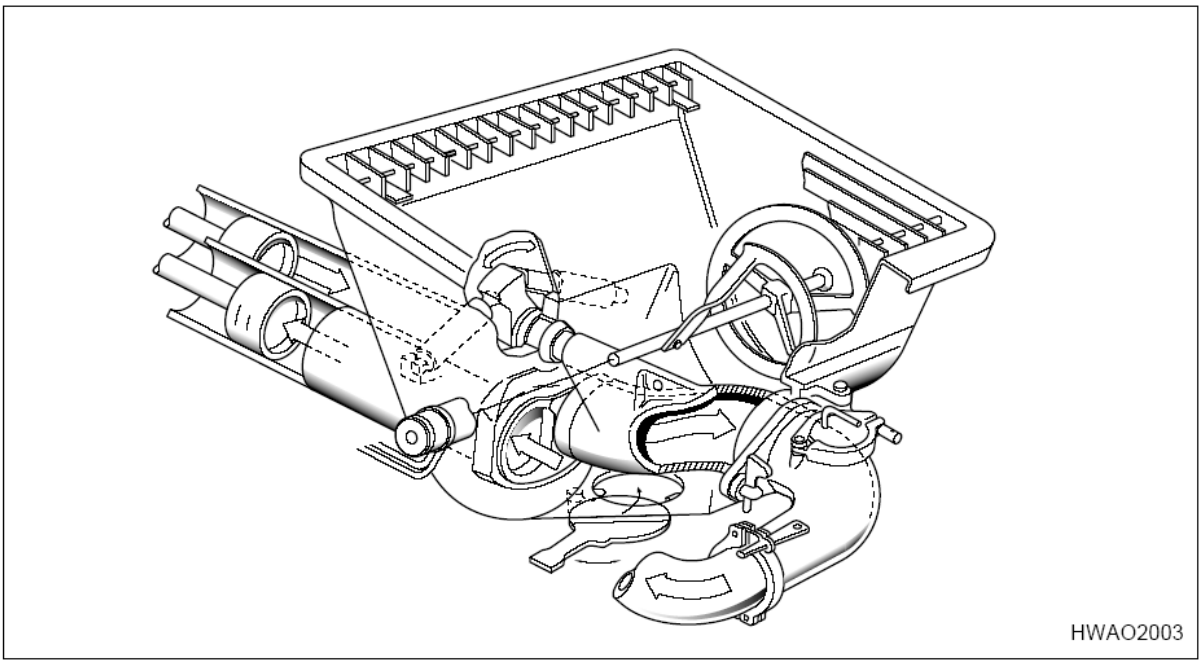
1) S-valve type
2) From inlet (Ø200) to outlet (Ø120: 5”), there is less rate of diameter reduction and gentle curves maintained, there is less loss of pressure and pumping is smooth although aggregate is big.
3) Small residual quantity of concrete eccentric within the valve keeps the turn of valve fast, concrete fluctuation less, reciprocating motion precise, concrete output fixed, which result in excellent performance.
4) As the pipe’s diameter is regularly reduced from the whole length within S-valve, the whole surface within the valve is evenly worn away. It has high durability with anti-abrasion.
5) It automatically blocks interval between S-valve and abrasion plate, raises conveying efficiency, with automatic ring installed.
6) It’s easy to clean and replace valve.



2.2.4 **Hopper & Agitator**

1) Hopper has large capacity of 0.60㎥. As its shape is changed into a gentle round type, the ratio of indraft is raising and it's easy to remove the residual oil after working.

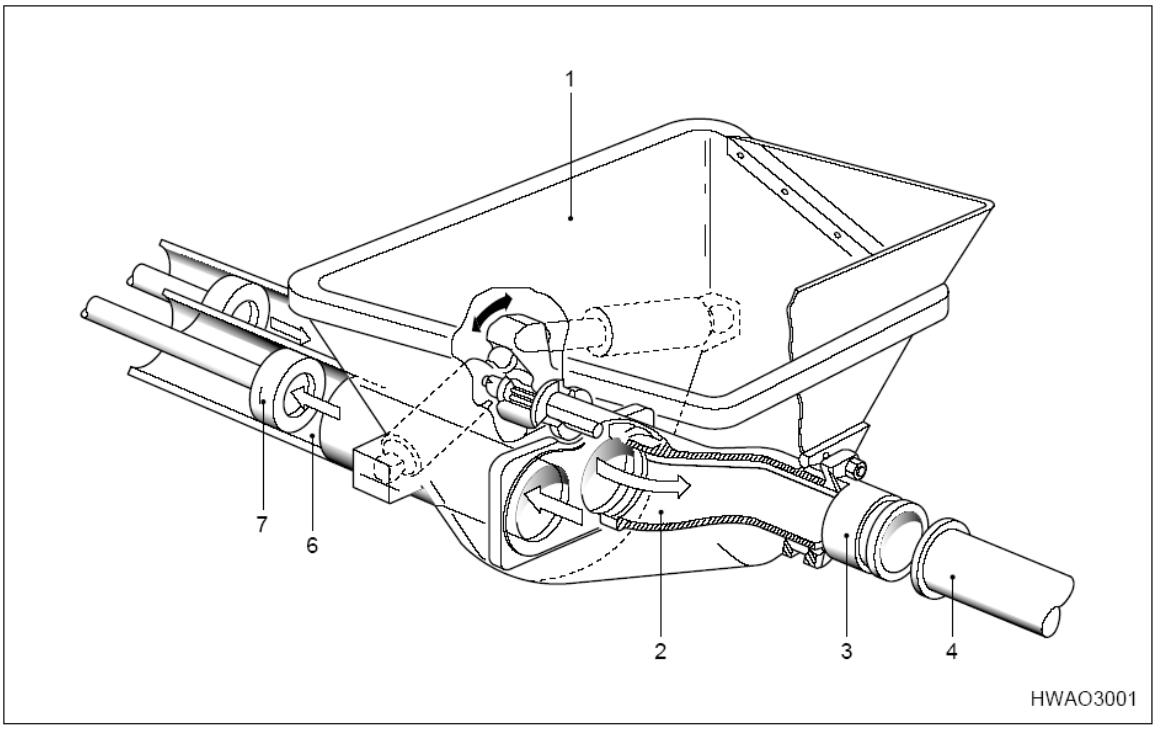
2) Agitator is designed to raise the efficiency of indraft with two wings attached. As it is driven by independent hydraulic motor on left・right, intensive agitation is possible.



2.3 Pump System

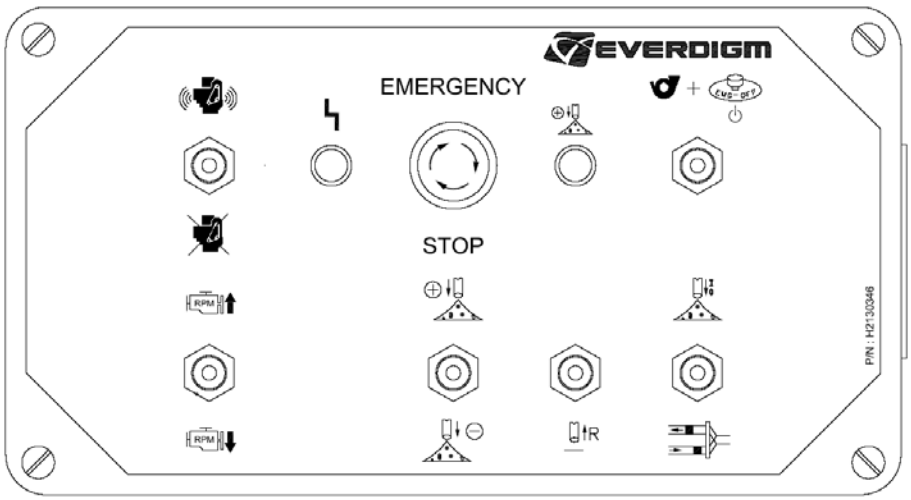
When the pump of equipment is driven by engine, it can be operated by central control devices or remote controller. Output is adjustable voluntarily as requested. Like the following figure, piston (7) is advancing toward the arrow direction and having the concrete contained in a hopper (1) sucked in by a delivery cylinder (6). At this time, another piston aside is advancing toward the opposite direction, and pushing the concrete within cylinder out through S-valve (2) to the pressure feed pipe. When the piston (7) arrives at the end part of the cylinder, it is automatically moving forward other direction (the opposite direction of the arrow of the figure), S-valve (2) is also moving toward the piston (7), and have the concrete pushed by piston (7) get into the pressure feed pipe. Like this, as two cylinders repeat pushing and pulling, they are pumping concrete in the hopper (1).

When the foregoing piston (7) changes the direction, the concrete in the conveying pipe gets back to the hopper(1), which is back-pumping. Back-pumping is used for cleaning conveying pipe or breaking through the Blocked hole.



<Figure 1>

2.4 Cable Control :



	Pumping Rate +		RPM +
	Pumping Rate -		RPM –
	Pumping Rate On/Off		Change-Over Control
	Return Control		Malfunction
	Start Motor		Horn + Emergency Off
	Stop Motor		Indicator Light

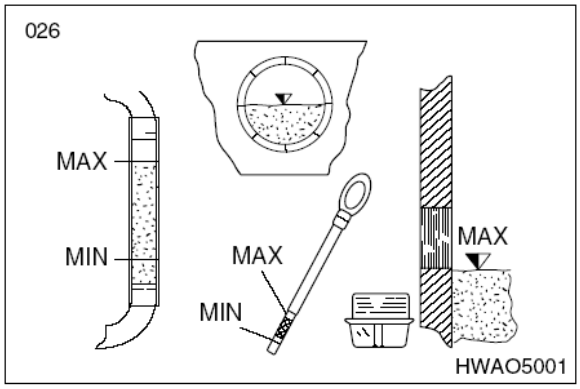
Chapter 3 How to Operate

3. How to Operate

3.1 Trial Run of Equipment

3.1.1. General Outline

1) Operator needs to be well aware of the property and usage of the equipment, in order to prevent an accident and damage.
2) User has to prohibit an outsider from getting into the working area, and always check the safety.



3.1.2. Trial Run

1) Trial run should be done prior to operate in the workplace.
2) Check all of coolant, hydraulic oil and fuel, and replenish at need. (In this case, conduct on flatland) (Figure026).
3) While the concrete pump is operating, coolant should be filled up. (Even though the water might freeze)
4) Until the temperature of equipment goes up for the proper operation, operate engine by 800 ~ 1200rpm.
5) Getting proper temperature, turn the switch of concrete pump and agitator ON. Working speed of the engine needs to go up till 1200rpm. While working, be sure to shut the hopper grid.
6) Have the concrete piston operate by raising the engine speed. If the temperature of equipment is low, have the concrete piston move slowly. (Figure 028)

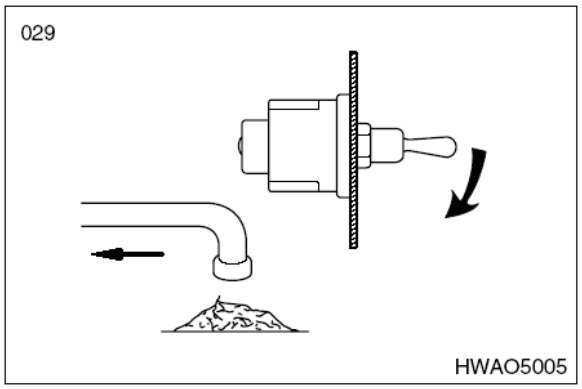
⚠ **[Caution] If the temperature of the open air is under 5 ˚C, have all the functions (support leg & pumping) start slowly. When the temperature of hydraulic oil goes up to the proper one (40˚C), operate in normal speed.**

3.1.3. **Inspection of Operation Function**

1) As changing the engine speed, or setting output motor on various locations, observe whether the piston and change valve are correctly changed

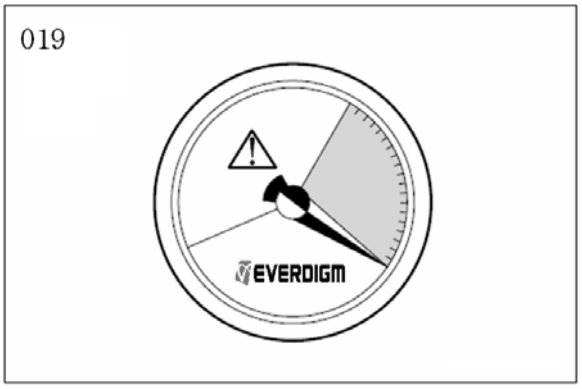
2) Drive cylinder has a function of automatic stroke compensation. However, check the stroke in accordance with the item 3).

3) When pressing back-pumping switch in the state of low piston speed, the piston gets to change a stroke immediately. (Figure 029) Normal oil pressure generated during short time of changing stroke is 300~350bar.



4) Set the engine speed at maximum (2,200rpm), and turn off the output controller before check the stroke time. Check whether the time of 10 strokes is fitting for the standard.

5) Check the vacuum gauge (136) in the suction filter (140). (Figure 030,031)

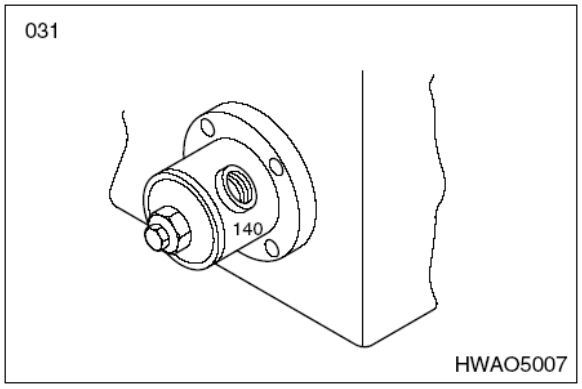


6) Check the function of switch ON/OFF.

7) Check the function of subsidiary equipment such as water pump for cleaning and compressor.

8) Check whether there's loss of nitrogen gas from an accumulator at lease once a week after trial run. If there is not a loss of gas, recheck about three months later. If it's good state, it's enough to check once a year.

※(Charge pressure when being delivered: 90bar)



9) Accumulator charges hydraulic oil by an assistant pump until the pressure gauge is higher indicated by 10~20% than preliminary charge pressure. Then, have the hydraulic oil be jetted from an accumulator slowly for the pressure correction. Looking at the pressure gauge during spouting, upon reaching the preliminary charge pressure from accumulator, the index of pressure gauge will fall down to “0”. (Figure 007)

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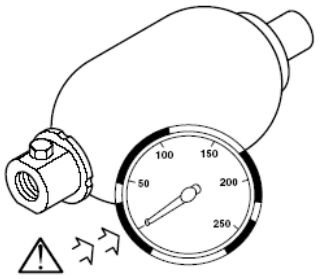

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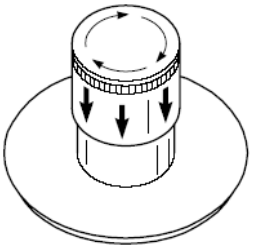
10) Check the Emergency-off function prior to pumping.

(1) Set “Pump ON (piston is working)” first, start pumping at over 1200rpm.

(2) Operate Emergency-off switch. (Figure 008)

(3) Pumping should be stopped, and engine rpm will return to 800rpm automatically.

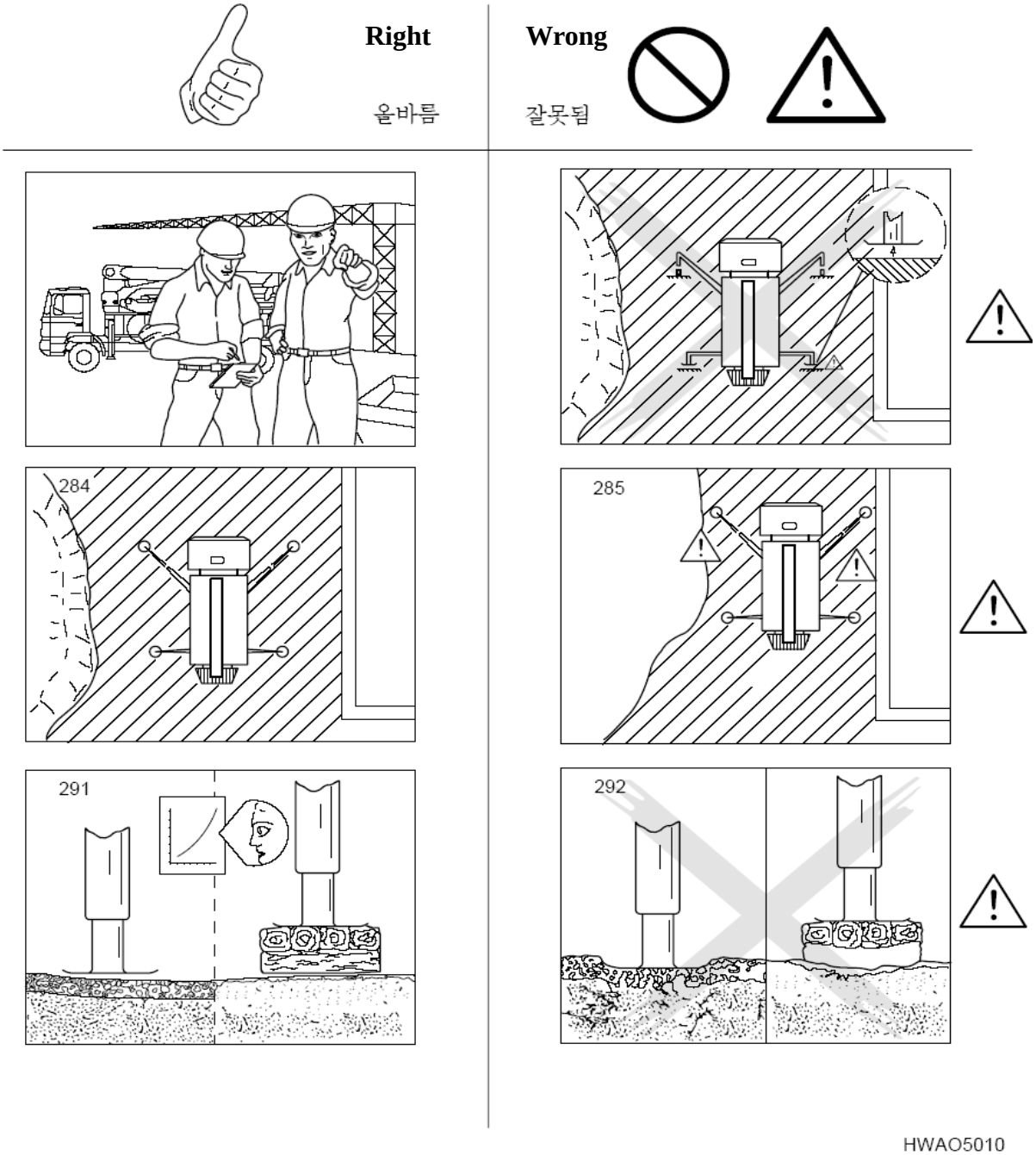
008



HWAO4006

3.1.3. . Attentions while installing Outrigger

- Operator takes the responsibility of the safety of equipment. Check whether the equipment is well-located.
- Support leg should be completely extended.
- Check whether the ground is sufficiently solid.
- Make sure to use a wooden support.
- Be sure to secure safe distance of equipment from a ditch and puddle. For reference, the distance from the outside leg to a puddle is recommended to be kept more than the depth of a puddle.
- It's dangerous to support even with a prop on a puddle.

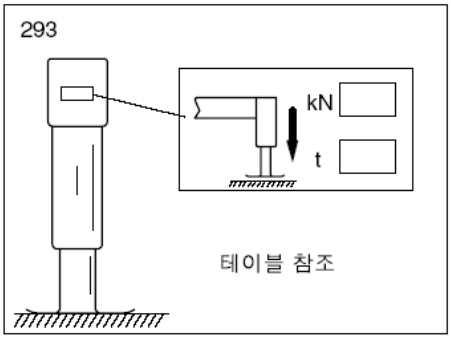


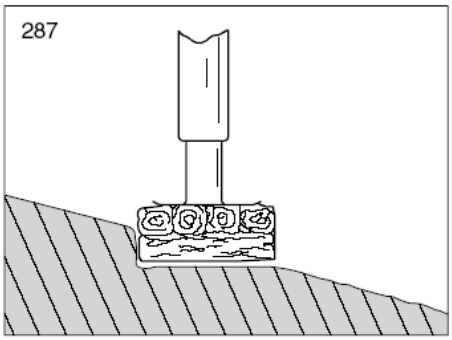
Right

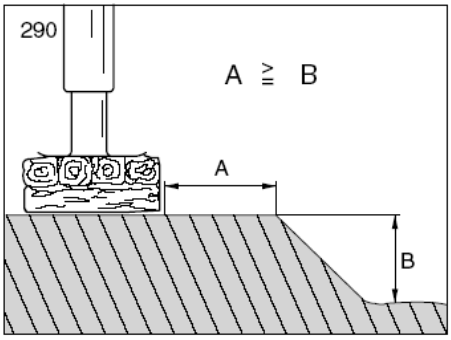
올바름

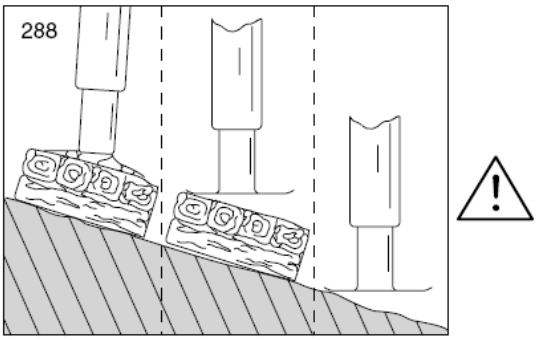
Wrong

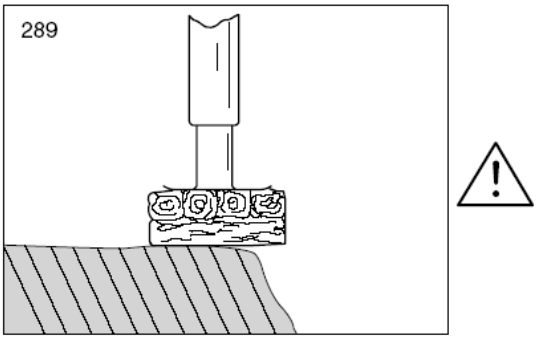
잘못됨

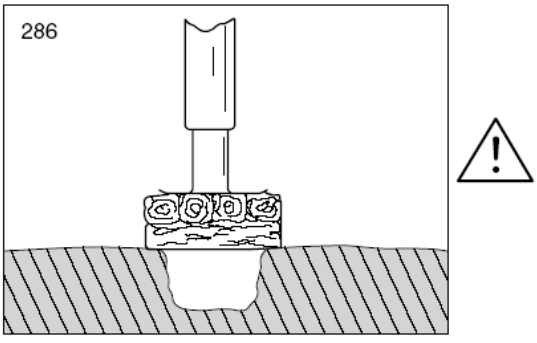












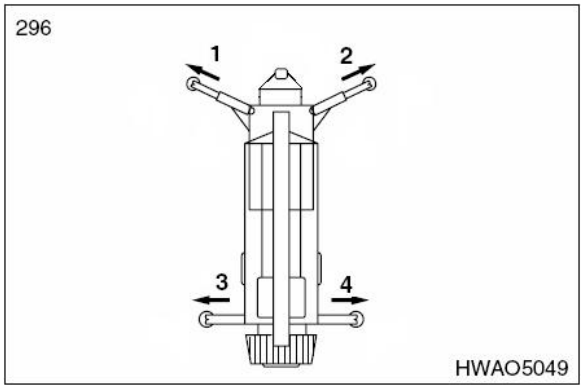
HWAO5011

3.2. Installation of Equipment

3.2.1. Installation of Support Leg

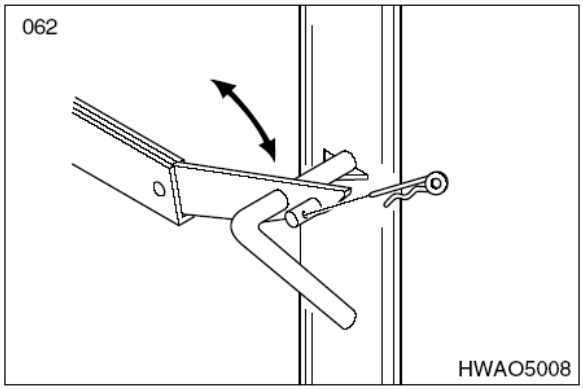
1) Prior to install equipment, be well aware of the safety regulations of Chapter 4.

2) Equipment should be installed carefully on the solid ground. At need, support with two props under the support leg crossing each other.



3) Unlocking locking device (manual, if exist)
Prior to unfold or extend support leg, all locking devices should be unlocked. (Figure 62)

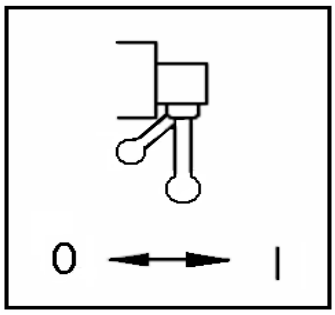
(1) Pull out spring pin.
(2) Pull a locking device lever backward.



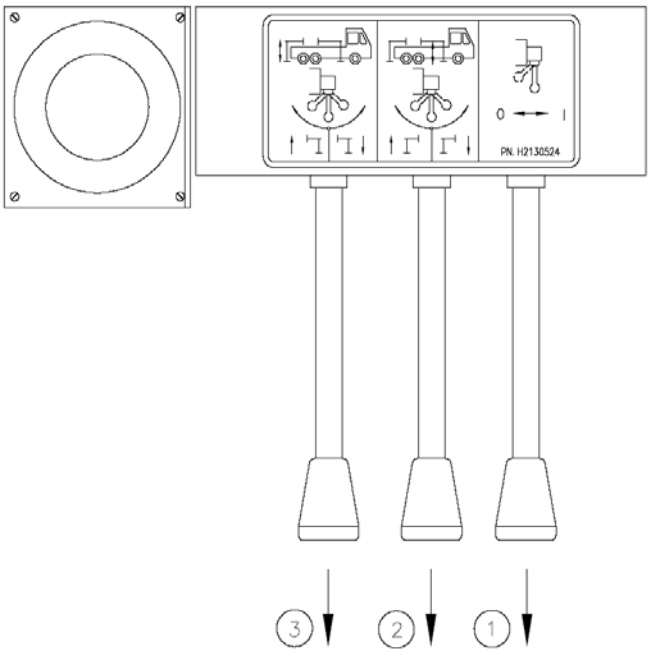
⚠ **[Caution] Have the support leg operate so that the equipment would be lifted about 5cm from the ground.**

⚠ **[Caution] Prior to drive, be sure to fold the support leg!**

4) Like the figure 006, move the lever toward the leg and operate the leg with a leg control lever.
(Lower lever is an agitator operating lever)



(Figure 006)



5) Like the above figure, in numerical order of control lever, leg operates within the left figure.

3.2.10. **Disorder notice through indication lamp of concrete pump**

1) Working of no.1, no.3 red lamp (Figure 472,382,473)

Effect: Concrete pump stops, and pumping is impossible

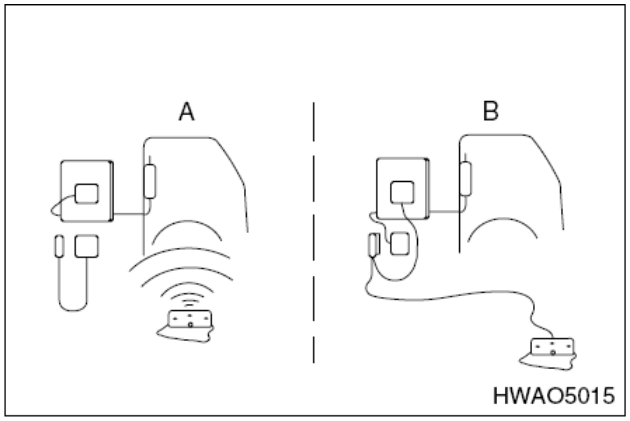
Cause 1: Preliminary option of electric option switch (Figure 474) is not located on the center.

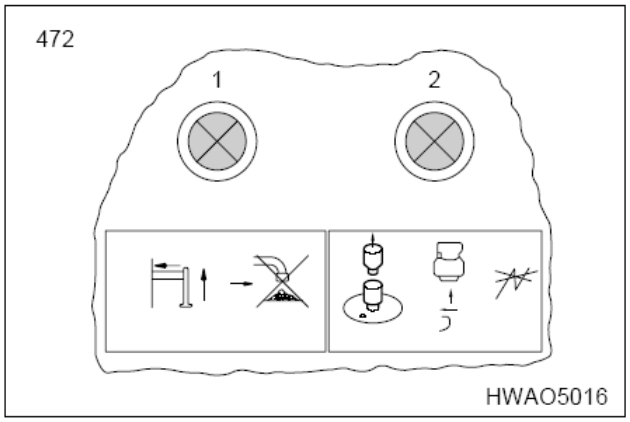
Measure 1: Set the electric option switch on the center.

Cause 2: Electrical combination of preliminary option circuit of support leg.

Measure 2: Check the circuit with an electric circuit diagram.

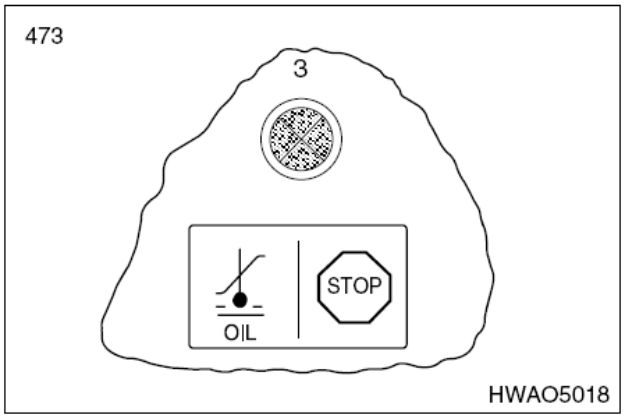
Emergency: Although it depends on the hydraulic pump control type, unplug from ON/OFF hydraulic valve, or operate the switch-over valve manually. Adjust the pump conveying amount with a control valve.





2) Working of no.2, no.3 red lamp (Figure 472,382,473)

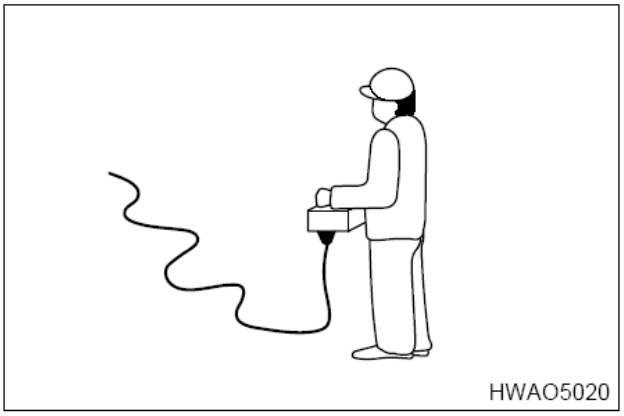
Effect: Concrete pump stops, and pumping is impossible. Engine speed drops to no-load rotation.



● **In case of operating by wired remote control**

Cause 1: When an emergency stop button of equipment or remote controller is pressed. (Figure 008)

Measure 1: Undo the emergency stop button of equipment or remote controller. (Figure 008)


HWAO5020

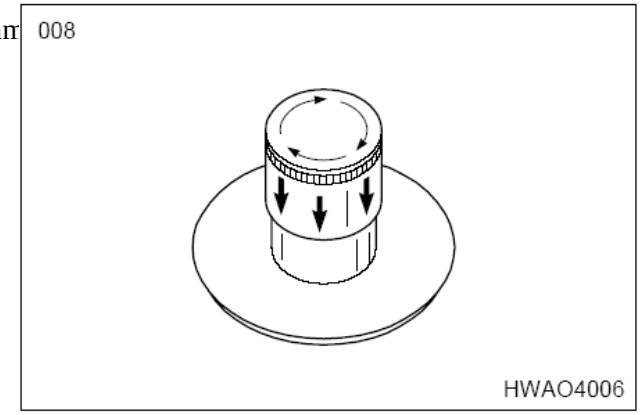
Cause 2 : Due to the entanglement of emergency stop loop, electric connection between remote controller and equipment switch box is faulty.

Measure 2: Put a plug in again.

Cause 3: Electrical defect of emergency stop circuit.

Measure 3: Check the circuit with an electric circuit diagram

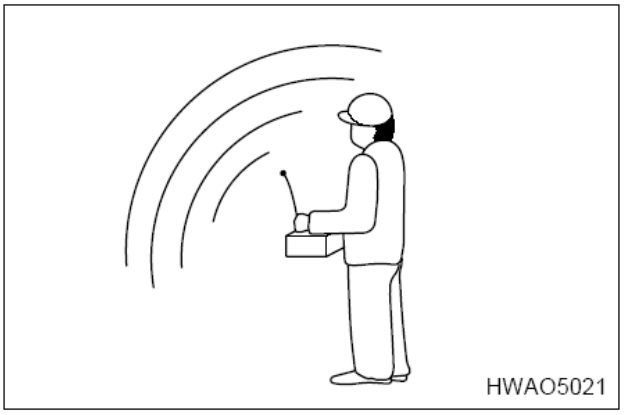
008


HWAO4006

● **In case of operating by wireless remote control**

Cause 1: When an emergency stop button of equipment or wireless remote controller is pressed. (Figure 008)

Measure 1: Undo the emergency stop button of equipment or wireless controller. (Figure 008)


HWAO5021

Cause 2: Due to the entanglement of emergency stop loop, electric connection between wireless receiver and equipment switch box is faulty.

Measure 2: Put a plug in again.

Cause 3: Battery of wireless controller is used up.

Measure 3: Replace the battery.

Cause 4: Electrical defect of emergency stop circuit.

Measure 4: Check the circuit with an electric circuit diagram.

Cause 5: Interfered by the outside transmitter or uncompleted wireless controller

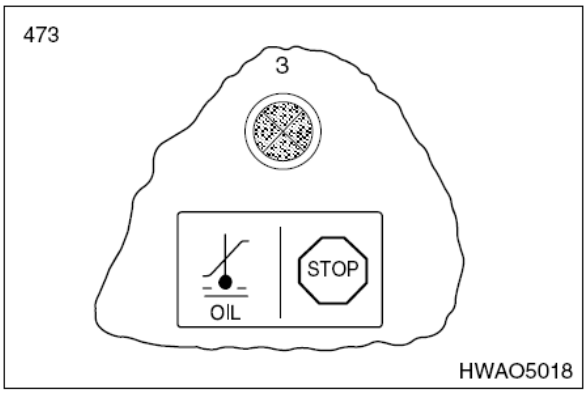
Measure 5: Use the wired remote controller. Separate the wireless control receiver in the equipment switch box and connect to the wired control cable.

Emergency: Although it depends on the pump hydraulic control type, unplug from ON/OFF hydraulic valve, or operate the switch-over valve manually. Adjust the pump conveying amount with a control valve.

Engine Speed: Adjust with a manual engine control bar (or cable).

⚠ **[Caution] After calling off an emergency, check whether the electric working is accurate.**

3) Working of no.3 indication lamp (Figure 473)



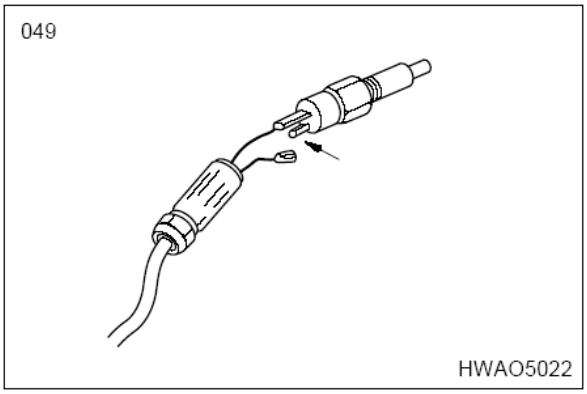
Effect: Concrete pump stops, and pumping is impossible

Cause 1: Temperature of hydraulic oil goes up to 90℃

Measure 1: Replace water in a coolant box with cooling water, and check the function of oil freezer.
Reduce the volume of conveying.

Cause 2: Electric option switch for support leg is not located on the center.

Measure 2: Refer to item 1).



Cause 3: Emergency stop function is working.

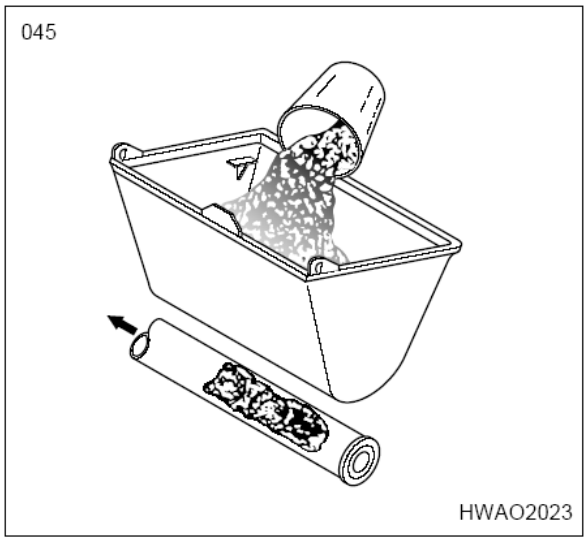
Measure 3: Refer to item 2).

Emergency: Take the cable off from the W terminal of 90℃ hydraulic oil temperature sensor. (Figure 049)

⚠ **[Caution] After an emergency, reconnect the cable.**
In case of keeping using without connecting cable,
equipment might be damaged due to failure of detecting overheating.

3.3 Order of Pumping

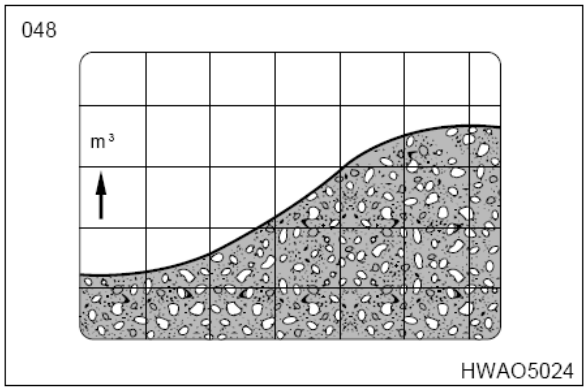
Prior to star pumping, be sure to start warming-up for hydraulic system.



3.3.1. . Start pumping

1) Prior to start pumping, put two sponge balls into pipelines so that slurry (mixture of cement and water) would be well applied to the inner part of pipeline. (Figure 045) Operate an agitator, and put 3~4 buckets of slurry into a hopper. After operating pump, pour the well-mixed concrete into the hopper, and have it operate slowly until the concrete will be out from the end hose. Draw back the sponge balls. (Figure 045)

⚠ **[Caution] Do not operate higher than the given maximum conveying.**



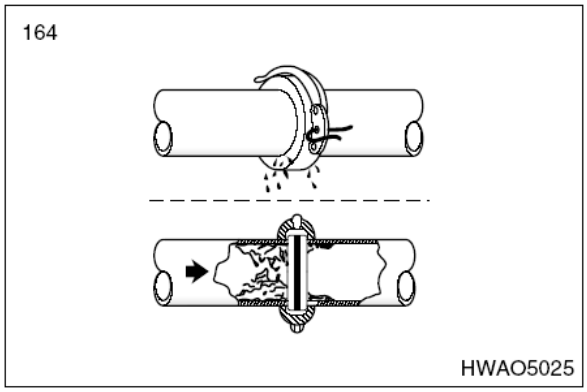
2) As new pipe and long pipeline have significant resistance, lubricous the inner part of pipeline enough before start pumping.

3) After several times of pumping stroke, turn the agitator's switch on.

4) the drum of mixer truck rotate fast for complete mixture of concrete.

5) Pour the concrete into the hopper and keep pumping. In case the inner part of delivery line gets rusty, output might increase gradually after several ㎥ of casting. (Figure 048)

6)) If blocking is occurred, return the concrete fast to the hopper to remix. Until the delivery cylinder and trunk are correctly changed automatically, do not return to the pumping location. Then, start pumping carefully.



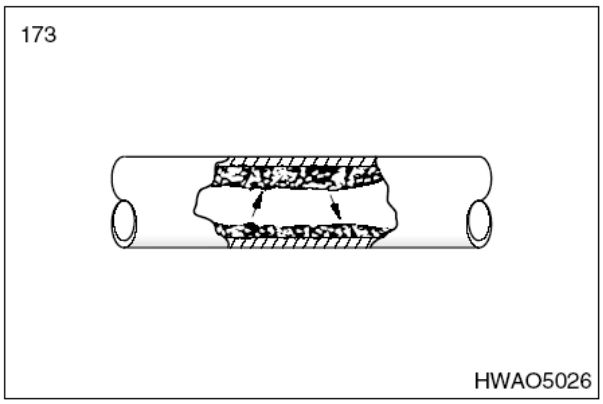
7) Presumptive Cause of Blocking.

. Too thin slurry (lubrication film)

. Insufficient lubricant

. Leakage of concrete from the conveying pipe

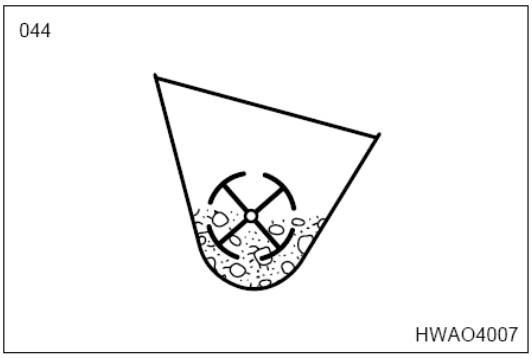
. Leak of change valve (Figure 164)
. Hardened concrete in the change valve and conveying pipe (Figure 173)
. Inappropriate mixture of concrete



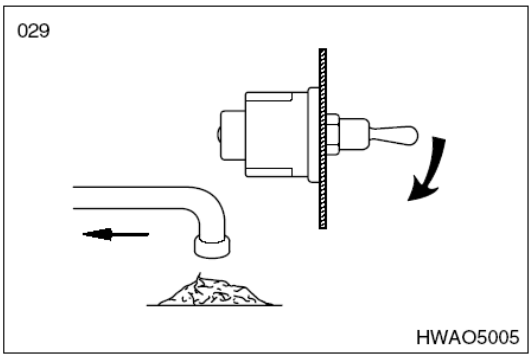
3.3.2. Observance Items for Pumping (Pumping)

⚠ **[Caution] Thick mixture and low quality sand (rubble, excessive sand) drop the suction efficiency of conveying cylinder, which results in reducing the pumping quantity. In this case, reduction of conveying speed raises the rate of suction.**

1) When the concrete having bad affect on pumping performance is in the hopper, agitator shaft is always seen. If the low-quality concrete (e.g.: extremely stiff, bad mixture, low-quality lightweight concrete) is filled up only the lower edge of agitator shaft, delivery becomes easy. (Figure 044)
In such way, air is sucked into the delivery cylinder along with the concrete, and the concrete serves for an air stopper for delivery. It might be a main cause of blocking.



2) In case of stopping work for a while, remove the pressure by 2~3 strokes back-pumping within the delivery line. Remove the remaining pressure from the delivery pipe. (Figure 029)



3) As too watery concrete might be a cause of aggregate separation, have the water level in the hopper as low as possible while stopping work.

4) In case of stopping work for long time, start back-pumping concrete to the hopper, remix and make a casting.

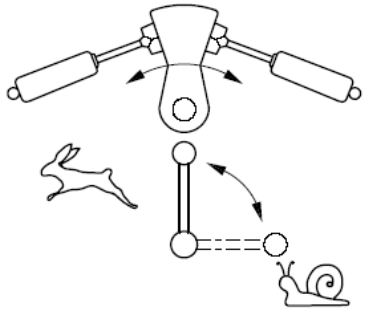
5) In case of stopping work for long time, turn the engine off in order to prevent vibration causing separation of concrete. Have the concrete circulate by back-pumping after pumping concrete every 10~15 minutes.

6) In case of casting concrete with low water absorption on a high-rise building, do not make pumping stopped. When restarting casting after a rest, keep back-pumping until the change tube (e.g.: “S” tube) is completely changed at the end of both sides. Make a pumping only when the change tube is completely changed.

7) Air pocket (air mixing) in the delivery line is risky due to abrupt emission of compressed air and pour out concrete explosively from the end of delivery line. Air pocket is resulted from air mixture when the concrete is not sufficiently filled in the hopper.

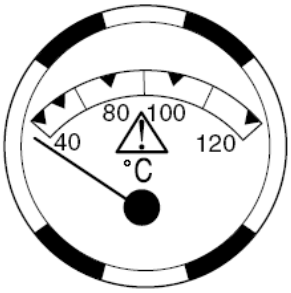
8) In case of pumping concrete with low viscosity, damping valve should be closed (snail mark), if not, the change tube would abruptly operate. In case the concrete with high viscosity or change tube does not reach the end part, damping valve should be opened. (rabbit mark) (Figure 298)

298



HWAO5027

046



HWAO5028

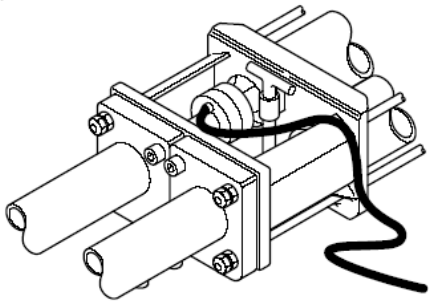
3.3.3. **Observance Items for Pumping (Equipment)**

1) Do not operate engine exceeding the fixed number of rotations. If not, over-rotation of hydraulic pump might happen.

2) Keep the stroke right.

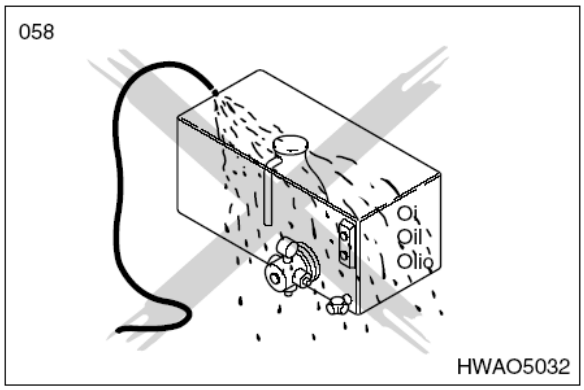
3) In the event that the temperature of hydraulic oil exceeds 80℃ due to excessive pumping in an inevitable situation, replace the coolant in the water tank with a cool water. (Figure 046,047)
If the temperature keeps rising even after changing coolant, repeat replacing coolant continually.
And take a measure for the cause of overheating.
In case the cooling fan would not operate even when exceeding 85℃, operate manually.

047



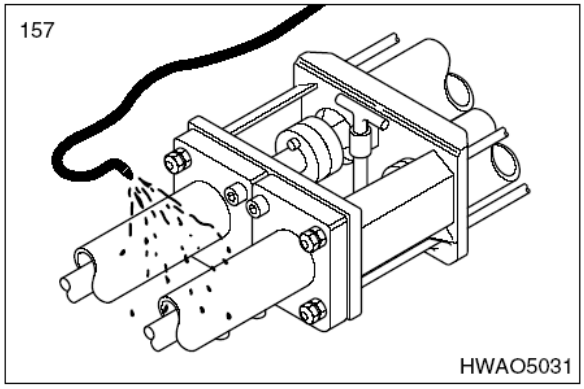
HWAO5029

4) Never sprinkle water on the hydraulic tank in any case. It might cause generating water in the oil tank due to condensation of air, and damage the function of pump. (Figure 058) When the cooling is required more, additional sprinkle of water on a drive cylinder may raise the cooling efficiency, in a makeshift.



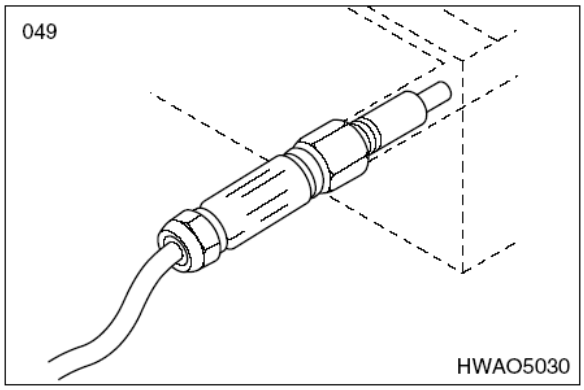
⚠ **[Caution]**

Never cool with seawater or water containing salt. Salt would destroy the chrome film of conveying cylinder and have a bad effect on hydraulic system.



5) Pump is designed to be turned off automatically when the temperature of hydraulic oil exceeds 90℃, and the red warning light on the switch box is lighted.
In case of overheating,

. turn the pump switch off. (Green light fails)
. Do not turn the engine off, and keep operating oil cooler.
. Exchange the coolant.
. When the red warning light fails, operate the pump switch and start pumping slowly in the state of reduced output.
. After completing pumping, take a measure for the cause of overheating of oil.
. Temperature sensor is in the control block. (Figure 049)



6) After pumping, have the engine rotate by about 1200rpm, prior to stop the machine.

7) Always set the engine speed at more than rattling speed (800rpm).

8) Check whether the delivery pipe is set in right way when pumping.
Have the power of axis direction acting on the delivery pipe not strike the change tube.

9) In case the equipment sways a lot during casting, check whether the outrigger is steadily supported.
Re-check and make it firm at need.

10) Always pay attention to the over-load.
– Over-loaded equipment might cause injury and accident.
In such case, manufacturer may not guarantee the responsibility.

11) In case the equipment moves or operates of itself (including safety valve of cylinder and oil leakage of check valve), do not hesitate to contact the service center to get it repaired.

3.4 Cleaning

This is the way how to clean concrete pump, hopper and delivery line after working.

Be well aware of the following descriptions.

. For the initial one month since purchasing equipment, clean all the painted part with water or water with 5bar of maximum pressure. Never add strong cleaning agent.

. One month later, paint is completely congealed, and then steam jet or other devices are available.

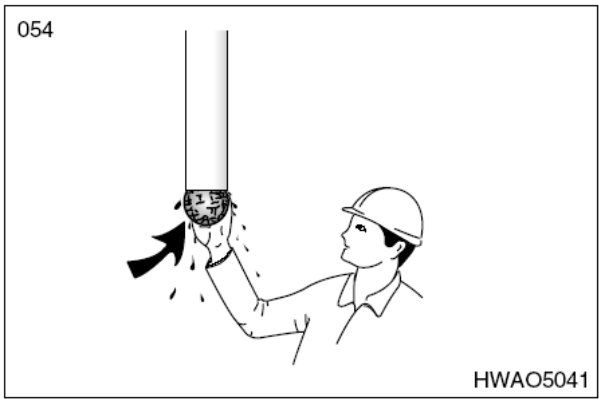
. In case the equipment is stained by seawater or salt-contained water, immediately wash away with clean water. As the remote controller is not waterproof, keep it in the operation seat. Switch box needs to be well-protected.

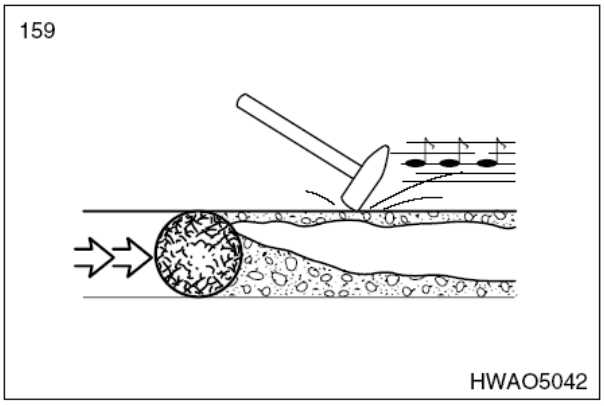
3.4.1. Suction Cleaning

1) Keep pumping until the conveying cylinder is emptied up to the upper part, before turn the pump off.

2) Put the wet sponge balls for cleaning into the tip hose. (Figure 054)

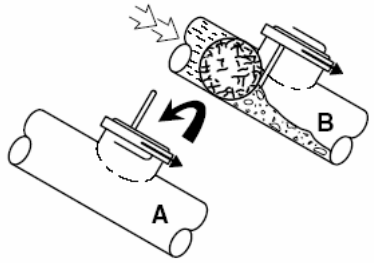
3) Return the sponge balls to the hopper by back-pumping. Tap slightly on the pipeline around sash with a hammer, and have the sponge balls reach up to the part on which hammer is tapped. (Figure 159) (It is easy to identify by means of the sound in tapping a hammer.) Then, turn the pump off.





4) Lift the cover of cleaning mouth in the change tube. Reverse the cover of cleaning mouth and get the handle inside to let in again, before start back-pumping slowly. (Figure 158)

044

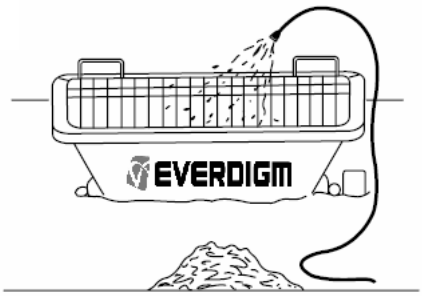


5) After back-pumping the remaining concrete, turn the pump off, life the cover of cleaning mouth, and take the sponge balls out.

6) The delivery pipe longer than 36m needs double cleaning.

7) In case the grid has a safety device, upon opening the grid, agitator and change tube will stop. Therefore, close the grid during cleaning for a while, operate the change tube, and open the grid again to clean. Grid should be jointed by fixed bolt during cleaning.

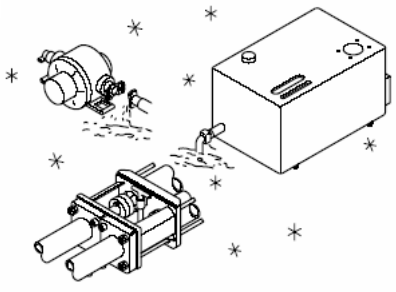
045



8) Open a flap on the bottom of hopper, and take the remaining concrete out. Carefully clean by operating change tube, hopper, delivery cylinder, water tank and water pump. (Figure 057)
After completely cleaning equipment, sprinkle slightly mixture of oil and gasoline on the hopper.

9) In case of potential freezing, completely empty water tank and water pump. (Figure 025)
Water tank needs to be emptied while pump is not used. (e.g.: weekends, holidays)

046



3.4.2. **Water Cleaning**

1) Prior to back-pumping, empty the hopper as much as possible by pumping. Then, remove pressure from the delivery line by back-pumping once or twice, and turn the pump off.

2) Open the hopper bottom to let the remaining concrete out, life the cover of cleaning mouth with change tube or flap elbow.

3) Set the switch on “back-pumping” and operate pump. Put the water hose with spray nozzle fixed into the cleaning mouth downward, and sprinkle water carefully. (Figure 160) When the change tube is changed, clean agitator, hopper and all the parts to which concrete adhered with the water hose.

4) Put 2~3 wet sponge balls into the cleaning mouth and close tightly. Stop up the hopper bottom and fill the hopper fully with water. (Figure 161)

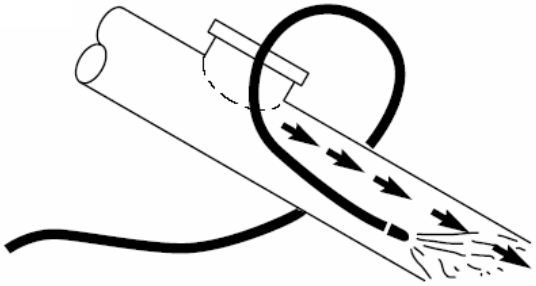
5) Start pumping. Unfold the delivery line straightly. Too long delivery line means insufficient volume of water, so stop pumping prior to suck the air, and fill the hopper fully with water. Then, keep pumping until sponge balls get out from the end hose.

6) Fold the boom and set the pump as “back-pumping.”

7) In case the grid has a safety device, upon opening the grid, agitator and change tube would stop. Therefore, close the grid during cleaning for a while, operate the change tube, and open the grid again to clean. Grid should be jointed by fixed bolt during cleaning.

8) Open the flap on the hopper bottom and take the remaining water out. Clean the change tube, hopper and delivery cylinder with high-pressured water. After cleaning completely, sprinkle mixture of oil and gasoline on the equipment. (Figure 161)

047



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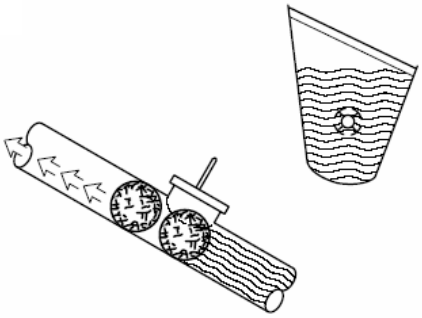
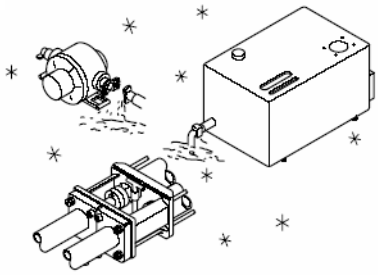


049

9) In case of potential freezing, completely empty water box, water tank and water pump. (Figure 025) Water tank needs to be emptied while the equipment is not used for long time. (in case of weekends or starting work the next day)

10) While cleaning, pay attention not to damage a sealing rubber of agitator. (Figure 242)

050



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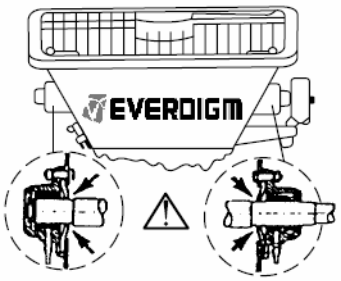
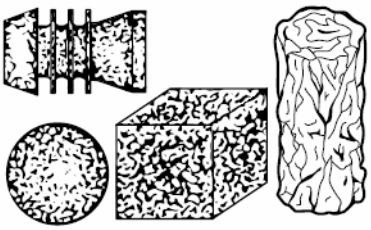


Caution : Cleaning sponge (balls, square) and cement bag drawn in Figure 056 are used for other several cleaning methods.

052



Cautions while cleaning with air pressure

It's dangerous to clean with air pressure.

Refrain from cleaning with air pressure if possible.

Chapter 4 Regular Checking

4. Regular Checking

Regular Checking for each parts										
First service after 100 hours of operating(S); daily(D), after minimum 10 hours of operating; weekly(W); once a year(Y); if necessary(N)			First service	Day	Week	Year	If necessary	Working Hour	
Part		Check List						500	1000
General		Check concrete pump by specialist				×		×	
		Check torque of screw connection part	×						
		Check emergency function			×				
		Check rubber plug Switching folk			×				
		Check engine oil and fuel filter						×	
Oil Tank		Check level of hydraulic oil		×					
		Discharge condensational water		×					
		Change Oil						×	
		Clean gutter						×	
Filter		Change suction filter	×				×		
		Clean screen and filter	×				×	×	
		Check boom filter		×					
		Clean flow filter (if have)						×	
Water Pump		Clean suction filter						×	
		Change plastic roller	×			×		×	
Compressor		Change oil – agitator gearbox	×			×		×	
Engine coupling		Check torque of connection part				×			
Change Tube		Check the state of abrasion		×			×	×	
		Insert grease into drive field		×					
		Check swivel lever and torque of bolt	×				×	×	
Core Pump		Check a bolt of space flange, re-fasten at need.	×					×	
		Coolant discharge	×			1/2			
Expanding fitting		Inspection with the naked eye (leakage)	×						
the parts to which concrete adheres		check the state of abrasion		×			×		
		Change					×		
Hopper		Insert grease into a bearing of mixer shift		×					
		Check function of agitator switch		×					
Agitator		Fasten bolt			×				
Radiator		Cleaning		×				×	
Conveying Line		check the state of abrasion		×			×	×	
		Check pipe coupling		×			×		

4.1 The period of checking.

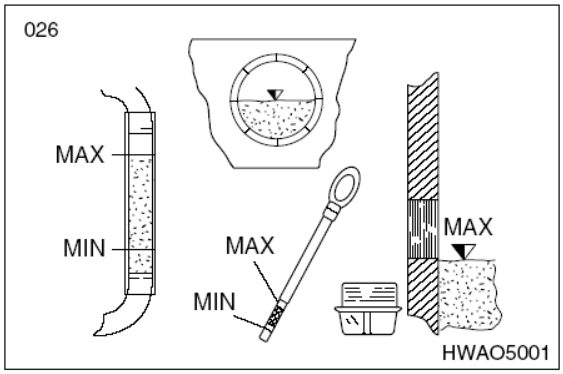
4.1.1. **Outline**

Refer to the period of regular checking.

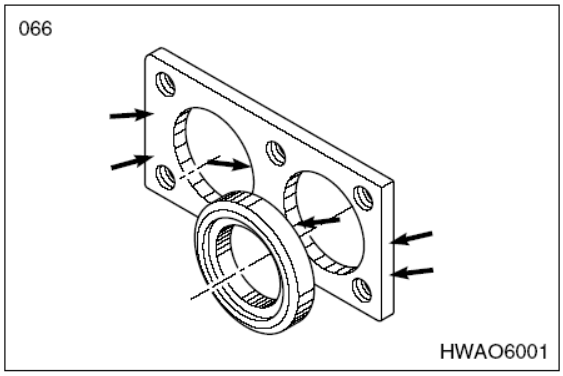
1) Inspection needs to follow the manufacturer's guideline related to pump as well as engine.
2) After repairing or checking, make sure to follow the safety rules stipulated in Chapter 1 "Safety Guidelines" and Chapter 3 "How to operate."
3) The prescribed period of inspection is based on the state of normal working and abrasion. In case of bad condition in pumping, frequency of checking needs to be increased.
4) Concrete pump and delivery line need to be checked by specialist after 500 hours of working or at least once a year, in regard to its operation safety. (Refer to Chapter 1)

4.1.2. **Daily Checking Items**

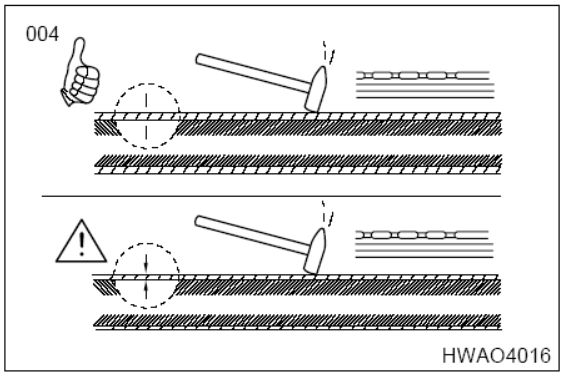
1) Check the hydraulic oil, fuel and water level, and fill up at need. (Figure 026) At this time, make the equipment level. Prior to start working, open the drain cock in the lower part of hydraulic oil tank to let the pollutant out. When the oil is seen, turn off the drain cock.



2) Check the parts and pipes to which concrete adheres, and change the worn parts. (Figure 066)



3) Check the permissible thickness of concrete delivery pipe by tapping with a hammer, or measuring by a thickness measuring tool, and change the worn parts. (Figure 004) For the minimum thickness, refer to Item 4.2 "Minimum thickness and operation pressure of delivery line."
4) Insert grease into a bearing of 양쪽 mixer shift in the hopper. (For this part, grease needs to be inserted several times during rest every day. But, central lubricating supply type does not need to insert grease.)



5) After cleaning, open the flap elbow and check the wear of the inner part of S-pipe with the naked eye. It's possible to check the state of abrasion as lighting the inside with a torch. And, check the abrasion plate, too.

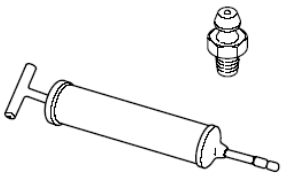
6) After pumping and cleaning, check a gap between change tubes and wear plate. (Figure 068) If the gap is over 3mm, readjust it according to Item 4.6.3 "Adjustment of Change Tube."

7) Apply grease on the pipe bearings.

8) Check the leakage of hydraulic line and screw fitting.

9) Carefully clean the hydraulic oil freezer.

071



HWAO6002

⚠ **[Caution] Pollutant of a freezer might cause overheating.**

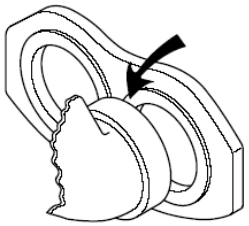
10) Check the safety switch of agitator. (if any)

11) After cleaning, apply grease on the seal and coupling of rotary joint between pressure pipe and delivery pipe.

12) (In accordance with the instructions attached to the equipment) Lubricous a lubrication point of stroke change cylinder.

13) Re-tighten the bolt of vibrator weekly. (Optional)

068

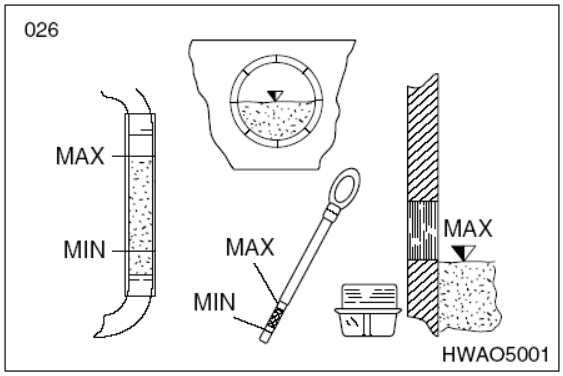


HWAO6003

4.1.3. After initial 100 hours of operating

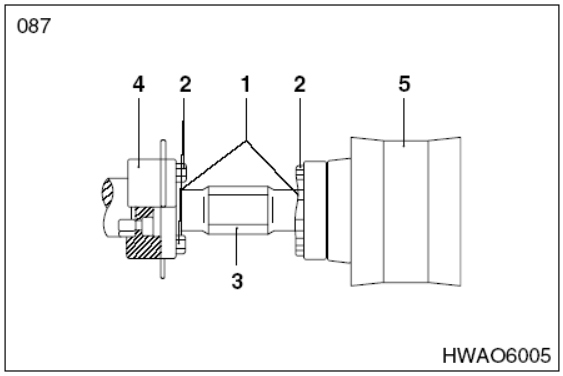
1) Conduct the foregoing items to check everyday.

2) When the engine is fully warmed up, replace oil of all transmissions and compressors. (Figure 026)



3) Clean all of filter, screen, and boom filter in the hydraulic circuit. Clean the bar magnet and change a filter cartridge. (Refer to the order of Item 10)

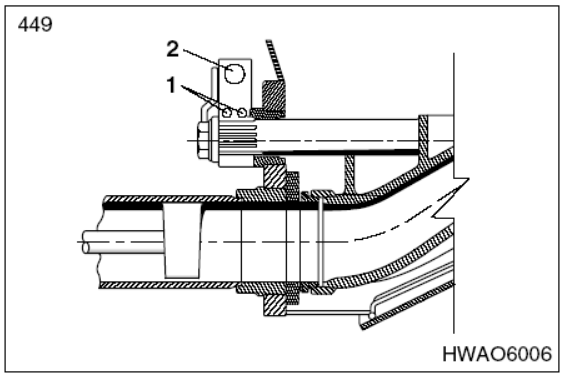
4) Check all the screw joints according to Item 4.5 "Torque Table."



5) Apply grease on the whole part of lubrication.
It is necessary every week as well as initial service.

6) In case of damaging locking wire (1), reassembly bolt(2) in spacer flange (3) between conveying piston (5) and rod flange. (Figure 087)

7) At the maximum pump speed, check the stroke time without concrete. The stroke time stated in the specification table is the one of maximum output.



8) Check the tightening torque of screw (1) in a swing lever (2). (Figure 449)
Tightening torque is 21Kg.m.

9) How to replace suction filter cartridge and clean bar magnet

⚠ **[Caution] Bar magnet should be a genuine part.**

(The item number of components required is recorded in a fitter housing.)

How to change a suction filter cartridge

◎ Set an oil container under the filter head.

◎ Clean filter head with fuel and gasoline. (Figure 072)

◎ Pull out a hexagon bolt by 20mm: The state of blocking filter suction part.(Figure 073)

◎ Turn the sealing cap out.

◎ Pull out completely filter cartridge, and separate it from a bar magnet. (Figure 075)

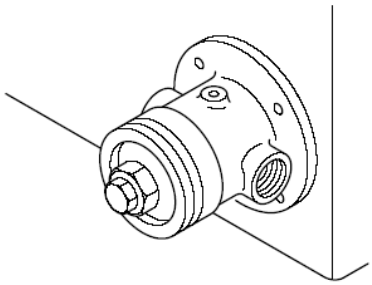
◎ Clean a bar magnet and change a filter cartridge.

◎ Reassemble them in a reversed order.

⚠ [Caution]

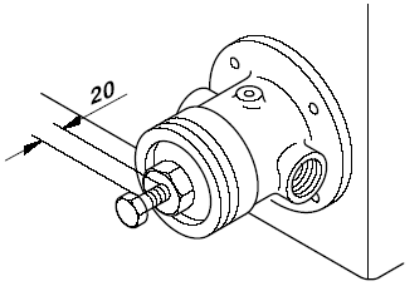
Never forget tightening hexagon bolt completely.
If not, oil shortage might happen in the suction line of hydraulic pump.

072



HWAO6007

073



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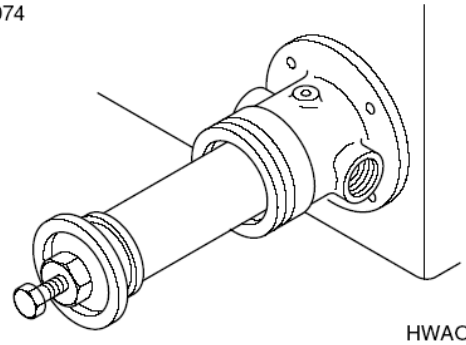
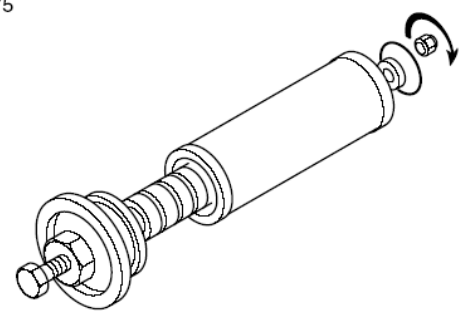
074



HWAO6009

075



HWAO6010

How to change a suction filter cartridge:

◎ Set an oil container under the filter head.

◎ Have a hexagon nut (1) loose, turn a lid leftward and pull out the whole cartridge. (Figure 026)
Stop valve in the filter automatically prevents oil from flowing.

◎ Separate a hexagon nut (3), turn a filter cartridge (4) leftward and separate it from the lid (2) and bar magnet (5) (Figure 207)

◎ Wipe the bar magnet (5) with a cloth. (Figure 207)

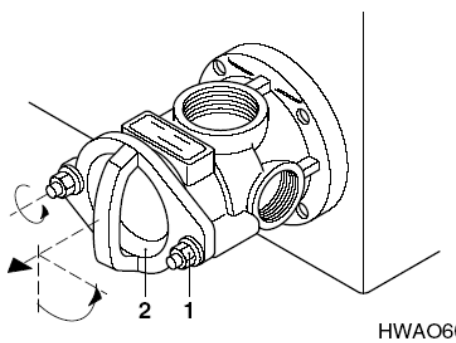
◎ Change a cartridge (4).

◎ Change a filter insert paper.

◎ Check the O-ring and immediately change a damaged one.

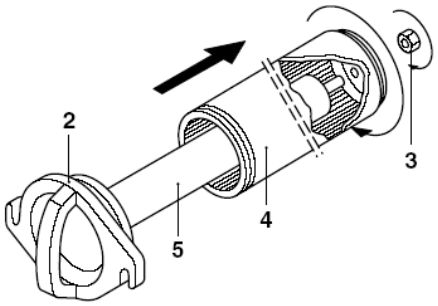
◎ Reassemble them in a reversed order.

206



HWAO6011

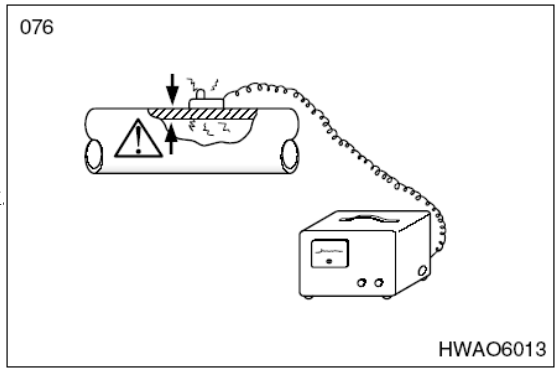
207



HWAO6012

4.1.4 After every 500 hours of working

1) Conduct all the items to check stated in Chapter 4.
2) Concrete pump and delivery pipeline need to be checked by a specialist.
3) Replace oil in an agitator gear box and hydraulic oil tank. Clean up a drainage box under the hydraulic oil tank. Use recommended hydraulic oil.
4) Clean a filter and screen in a circuit.
5) Clean a suction filter of water pump, and replace a plastic roller at need.
6) Check the wear of change tube by using a thickness measuring tool in the state of removing pressure.
Thickness should be more than 5mm. (Figure 076)



4.1.5. After every 1000 hours of working

1) Conduct all the foregoing items to check.

2) Have a specialist of manufacturer check all of machinery and hydraulic parts.

3) Check whether all the safety devices operate in normal way.

4.1.6. How to check the screw fittings

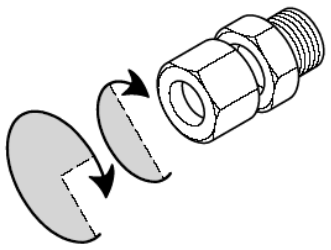
1) In case of oil leakage during working, re-tighten only by 1/2~3/4 round. (Figure153)

2) In case of additional oil leakage, make a whole exchange of intermediate joint of hydraulic pipe and fittings. When exchanging a high-tension hose pipes, tighten naturally as having fitting not be interfered, or the foreign substances (dust, oil remains) not inserted.

3) In case of bulk head fitting, make sure to insert a lock washer and completely tighten.

4) When connecting hoses, check whether O-ring and seal in the fitting of hose are normal, and exchange hose if the seal or O-ring is damaged.(at need)

153



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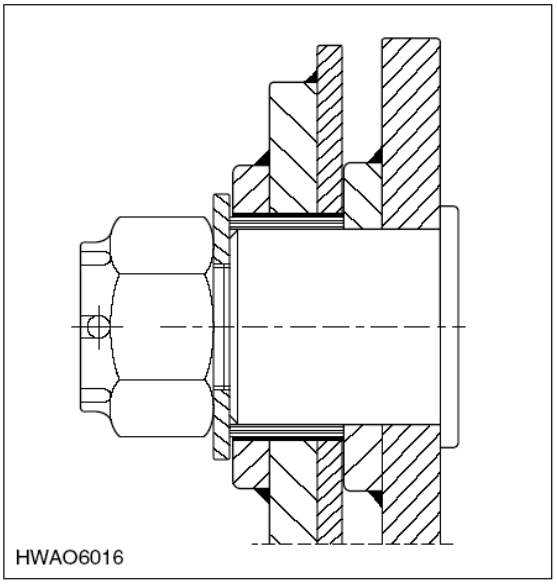


HWAO6016

4.1.7. How to check pin support

Tighten a hexagon castle nut of pin support in the joint of an arm unit with a fixed torque, when it is fifty hours after trial run. Then, check the bolt seat at least every six months or whenever checking boom, and re-tighten a hexagon castle nut at need.

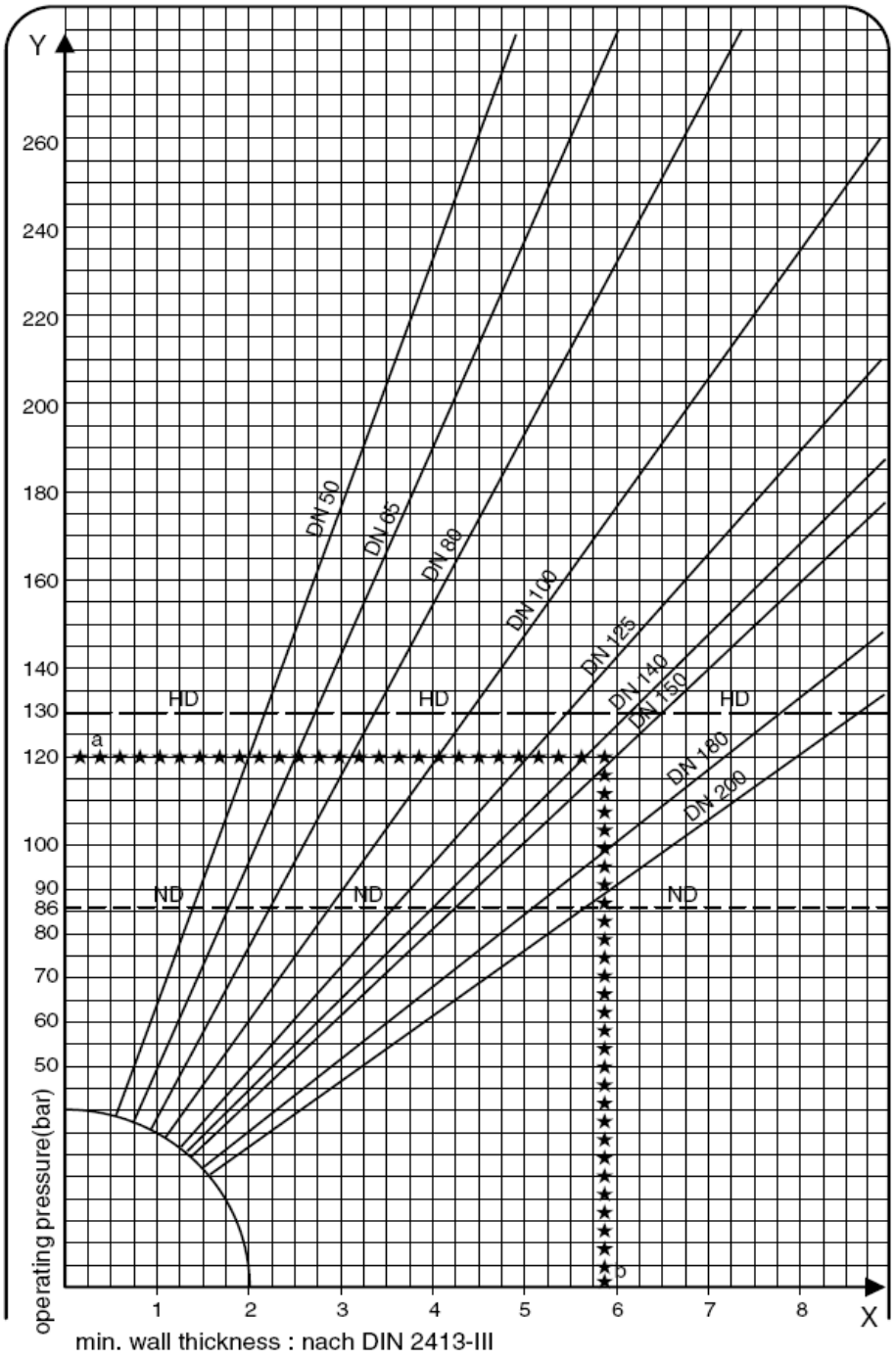
Boom	Screw	Wrench	Torque
M16/13	M	80	900
M24 Ru.Z M26R. M28Ru.Z			
M31Z	M	95	120
M36-3	M	115	150
M38-3			

4.2 Minimum thickness of Delivery pipe and Operation Pressure

Example of calculating minimum thickness: Working pressure = 120bar, diameter = 150mm,

ND=low pressure, HD=high pressure, BP= working pressure, DN=diameter

moving toward the right hand from 120bar of Y-axis, diameter is 150mm, therefore, finding the location meeting the line of DN150, going downward and finding the location of point meeting X-axis, it results in 5.8mm. That is, the minimum permissible thickness of pipe in this case is 5.8mm.



HWAO6017

4.3 Recommended Oil and Grease

Oiling Position		Standard	ESSO	SHELL	MOBIL	GULF	TOTAL
Intermediate Gear Box, Agitator Gear Box	Summer	SAE 90	GP- D90	SPIRAX 0 EP 9	MOBILUBE GX85W-90A HD85W-90A	-	-
	Winter	SAE 80	GP- D80	SPIRAX SPIRAX MA80W		-	-
Hydraulic Fluid		HLP 46	NUTO H46	TELLUS 46	DTE 25 AW 46	HARMONY ZS 46	AZOLLA ZS 46
GREASE		-	ESSON (Multi purpose grease)	RETINAX A	MOBIL-GREASE MP MOBILUX EP2	-	-

※ Different standard oil or even the same company's oil with different standard is not allowed to be supplemented or mixed in any case.

4.4. **Volume of Oiling**

1) Agitator gear box: 0.5ℓ

2) Hydraulic oil tank: Refer to the specification table because it depends on the model.

3) Inner part of system: Concrete pump hydraulic system (except hydraulic oil tank)

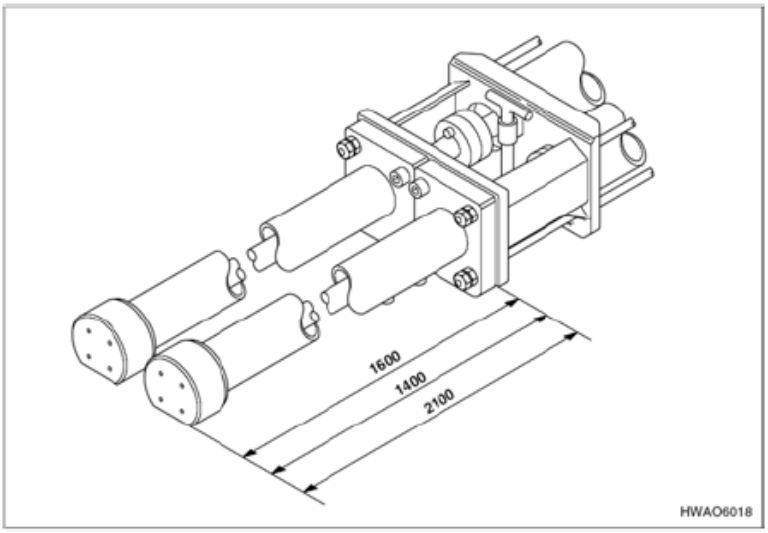
1000mm Stroke : 40ℓ

1200mm Stroke : 50ℓ

1400mm Stroke : 60ℓ

1600mm Stroke : 75ℓ

2100mm Stroke : 95ℓ



4) Diameter of delivery pipe 125mm: about 12ℓ

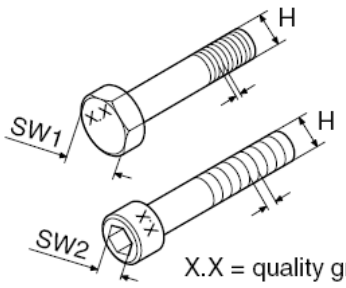
4.5 **Torque Table**

Tightening torque is always determined by screw friction and class of screw, and its size is indicated on a level face of bolt head. (Figure079)

1) Fixed torque of meter screw

Size				Quality Class			
M	**H**	**SW1**	**SW2**	**6.9**	**8.8**	**10.9**	**12.9**
M4	**0.7**	**7**	**3**	**2.4**	**7.9**	**4.1**	**4.9**
M5	**0.8**	**8**	**4**	**5.0**	**6.0**	**8.5**	**10**
V6	**1.0**	**10**	**5**	**8.5**	**10**	**14**	**41**
M8	**1.25**	**13**	**6**	**21**	**25**	**35**	**41**
M10	**1.5**	**17**	**8**	**41**	**49**	**69**	**83**
M12	**1.75**	**19**	**10**	**72**	**86**	**120**	**145**
M14	**2.0**	**22**	**12**	**115**	**135**	**190**	**230**
M16	**2.0**	**24**	**14**	**180**	**210**	**795**	**355**
M18	**2.5**	**27**	**14**	**245**	**290**	**405**	**485**
M20	**2.5**	**30**	**17**	**345**	**410**	**580**	**690**
M22	**2.5**	**32**	**17**	**465**	**550**	**780**	**930**
M24	**3.0**	**36**	**19**	**600**	**710**	**1000**	**1200**
M27	**3.0**	**41**	**19**	**890**	**1050**	**1500**	**1800**
M30	**3.5**	**46**	**22**	**1200**	**1450**	**2000**	**2400**
M8 x 1	**1.0**	**13**	**6**	**23**	**27**	**38**	**45**
M10 x 1	**1.0**	**17**	**8**	**44**	**52**	**73**	**88**
M12 x 1	**1.0**	**19**	**10**	**76**	**90**	**125**	**150**
M14 x 1.5	**22**	**12**	**125**	**150**	**21**	**250**	
M16 x 1.5	**24**	**14**	**190**	**225**	**315**	**380**	
M24 x 2	**2.0**	**36**	**19**	**650**	**780**	**1100**	**1300**
M20 x 2	**2.0**	**46**	**22**	**1350**	**1600**	**2250**	**2700**

079



HWAO6019

Unit is N·m (10N·m = 1Kg·m)

2) Automatic caution rotary ring screw-shaped fitting (Figure 080, 081) (In this case, tighten once by hand and do again by 1/4 round like the following table)

Size			Fig.	Torque
Dia	SW3	Model	No.	Nm(=0.1kg·m)
8	14	8LLM	080	20
8	19	8LR		50
12	22	12LM		90
12	22	12LR		90
15	24	15LM		90
15	27	15LR	081	110
15	27	15L/M		110
18	27	18LM		110
25	41	25SM		200
25	41	25SR		200
30	50	30SM		300

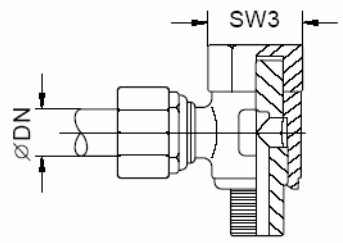
3) Other major tightening torque

(It is unrelated to the foregoing torque table)

In regard to bearing flange of mixer shaft and temperature sensor

: 3Kg.m cross member of Figure 097, refer to the components' list or contact the Company's service center.

071



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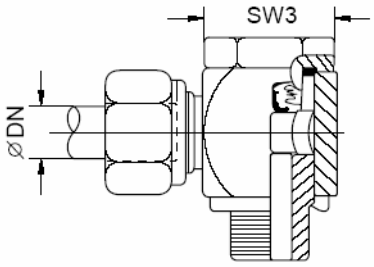

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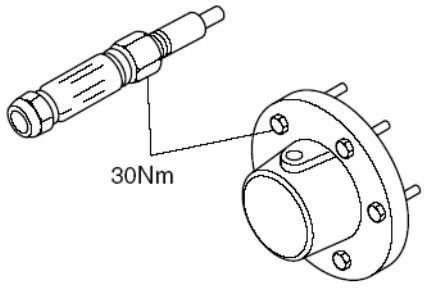

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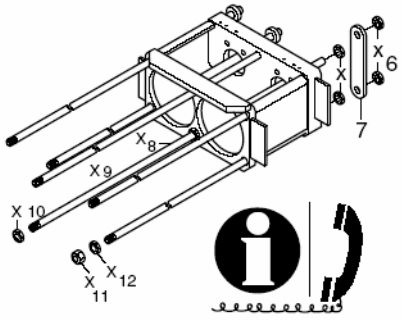


4.6 Exchange and Adjustment of Wear Parts

4.6.1. Change of Conveying Piston

1) Removal of No.2 Conveying Piston

(1) Operate a piston rod so that a spacer flange (3) should be completely seen. (Figure 085)

(2) Let a coolant out, turn the pump and engine off, operate an emergency switch, before take the cover of coolant box off. (Figure 086)

(3) Pull a lock wire (1) out, loosen a bolt (2) (Figure 087) or clamp ring (2) (Figure 088), take a spacer flange (3) off.

(4) Have the engine start, turn the pump on, and have the rod flange (4) move slowly toward the conveying cylinder. (Figure 089)

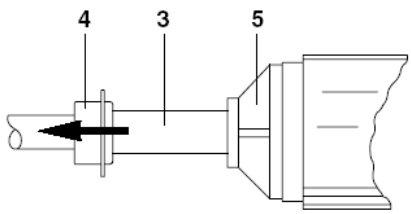
(5) Turn the pump and engine off and press an emergency stop button.

(6) Connect the bolt(2) to a clamp ring(2) between conveying piston (5) through the hole of rod flange (4).(Figure 088)

(7) Turn the engine and pump on. Pull out the conveying piston completely from the conveying cylinder by "back-pumping." (Figure 090)

(8) Turn the pump off first, and stop the engine. Press an emergency stop button. Loose screw fitting or clamp ring and take the conveying piston out from the coolant box. At need, let the water out.

085



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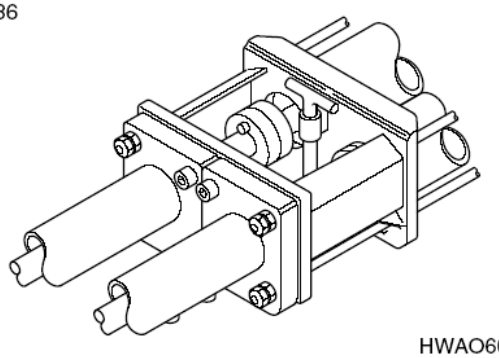
086



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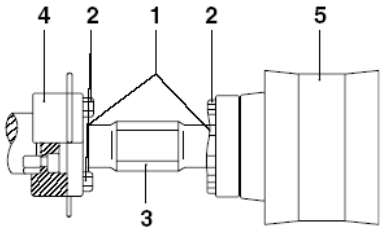


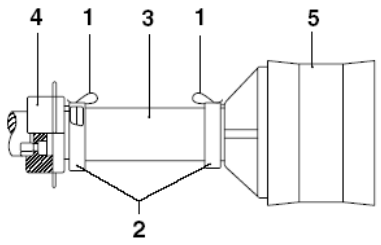
HWAO6005

⚠ [Caution]

In case the diameter of conveying piston is 230mm, it's possible to take out only after rounding by 90° in a coolant box

(9) Remove the remaining concrete on the front part of rod flange.

088



HWAO6026

2) Assembly of No.2 Conveying Piston

(1) Remove foreign substances stained on the edge of conveying cylinder. At this time, pay attention not to damage the chrome layer

(2) Apply grease thickly on the wall of new conveying piston and cylinder.

(3) Connect new conveying piston (5) to a rod flange (4) with a bolt (2) (Figure 089) or clamp ring (2) (Figure 088).

(4) Operate engine and turn the pump on. Push the conveying piston (5) into a conveying cylinder (6) maximum, in order to take the clamp ring off. (Figure 089).

(5) Turn the pump off first, stop engine and operate an emergency stop button. Disjoint a joint (2) (Figure 089) or clamp ring (2) (Figure 088).

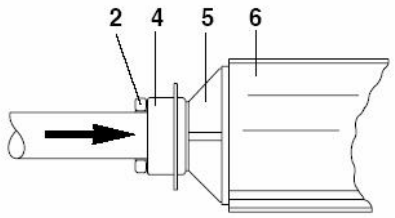
(6) Have the engine start, and set the pump switch on back-pumping. Take the rod flange out backward.

(7) Turn the pump off first, stop engine and operate an emergency stop button. Connect a spacer flange (3) to a rod flange (4).

(8) Operate engine and turn the pump on. Transfer a rod flange (4) to the vicinity of conveying piston (5). (Figure 091)

(9) Turn the pump off first, stop engine and operate an emergency stop button. Rearrange spacer flange (3) at need, connect to the conveying piston (5).
In case of bolt-typed joint, tighten a bolt according to the torque table, and re-tighten with a locking wire.

089



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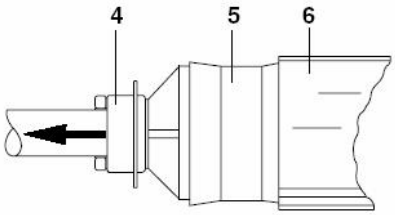

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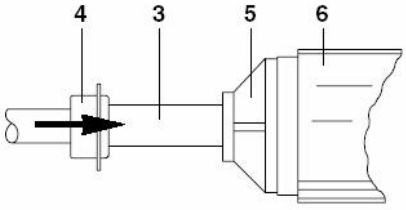

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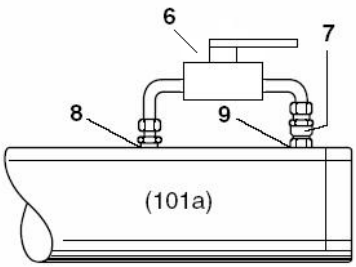
3) Disjoint and Assembly of No.1 Conveying Piston

The way to exchange No.1 conveying piston is same as No.2. But, in order to set the piston rod at the edge, you have to lock the check valve (6). Valve is fixed open when the equipment is forwarded. After exchanging conveying piston, fix the check valve (6) open.
Conduct the stroke inspection in accordance with the item of “Function Inspection.” in Chapter 4.

092



HWAO6030

4.6.2. . Exchange of wear parts (S-Pipe)

Stop the engine. In case there's a compressor, remove pressure completely from the compressor and lock the Shut-Off Cock.

Exchange of spectacle wear plate, wear ring and pressure ring

1) Disjoint

(1) Take the mounting plate (1) out, and pull out the flange of change cylinder toward the outside of ball socket (4) of change lever (2).

(2) Separate the grid of agitator.

(3) Loose a clamp bolt (3), and turn the control bolt (5) several round toward the direction of counterclockwise.

(4) Push S-pipe (9) to the side of pressure ring (12).

(5) Remove a spectacle wear plate-only bolt and take the spectacle plate (7) out by turning slightly.

2) Assembly

(1) Remove grease from the spectacle wear plate (7), and apply sealing compound which is fresh. Prior to this work, set O-ring (20) for spectacle wear plate (7).

(2) Apply grease on a pressure ring (11) and wear ring (10), and assemble like S-pipe (9).

(3) Remove grease from the spectacle wear plate (7), fix a joint bolt on the inside wall of hopper.

(4) Tighten No.5 control bolt on the wear ring (10) and spectacle wear plate (7), but have No.11 pressure ring not twisted.

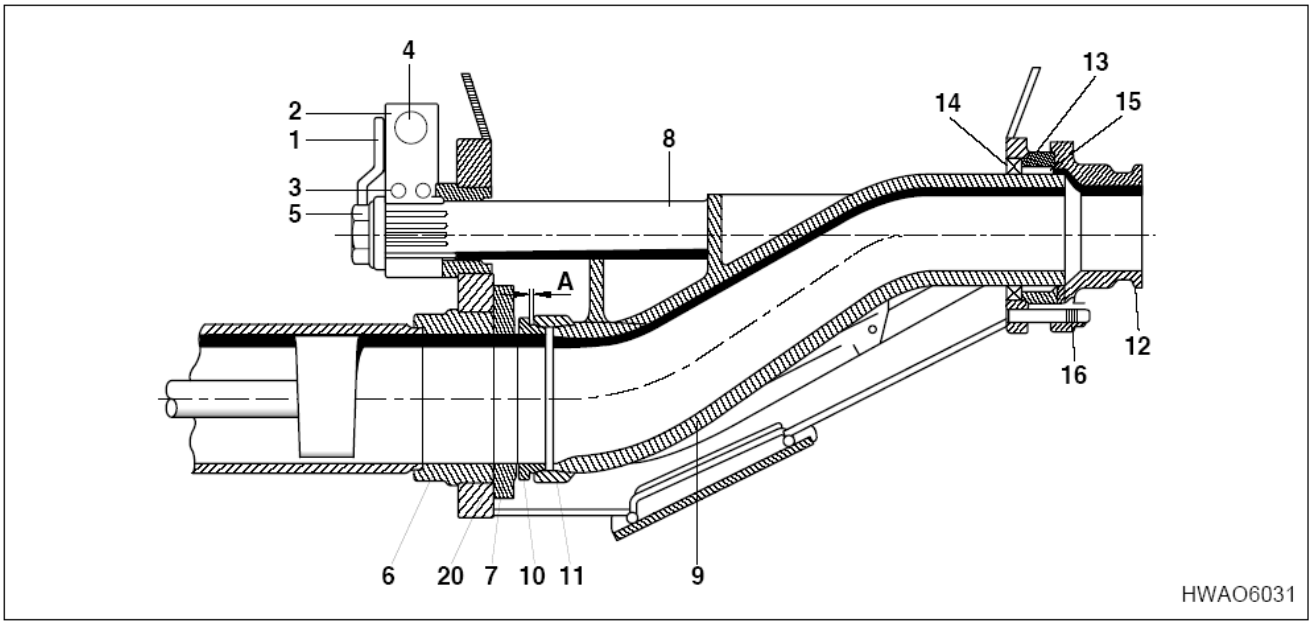
(5) Measure a break "A" between wear ring (10) and S-pipe (9). The distance should be 3~5mm. If not, the width of pressure ring (11) needs to be changed.

(6) Fasten a control bolt (5) until S-pipe (9) would not move any more.
(In order to turn the change tube, about 25Kg.m is required, along with about 300mm of iron bar.)

⚠ **[Caution] In accordance with the production tolerance and the state of No.11 pressure ring, the distance "A" is about 1~3mm when "S" pipe is correctly adjusted.**

(7) Fasten a clamp bolt (3) to 21Kg.m, insert into the inner part of ball socket (4) of flange switch change lever of change cylinder.

(8) Insert a mounting plate (1) in the bolt. (Control bolt should be level.) Locking pin of mounting plate should not be bent or worn. If not, a ball might come out from the socket.



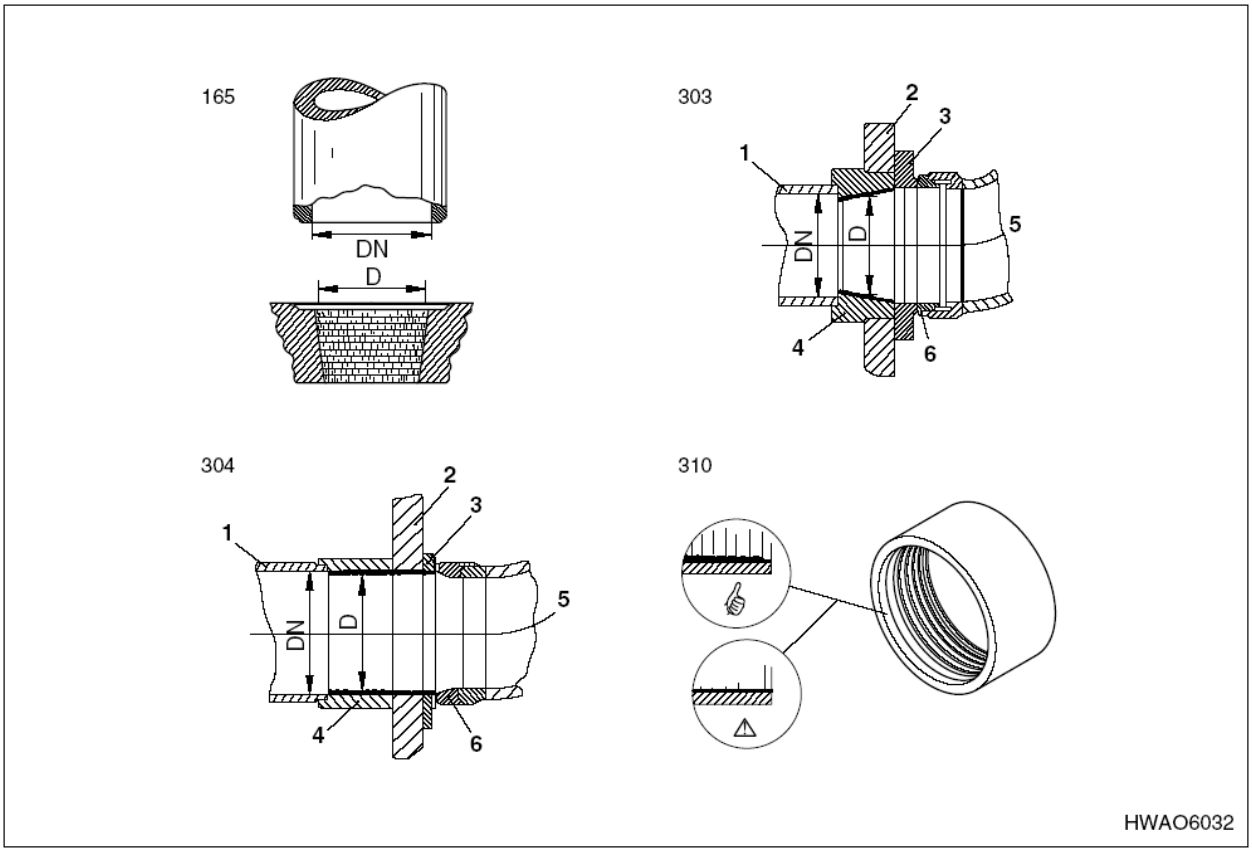
4.6.3 Adjustment of Change Tube (S-Pipe)

Stop the engine, remove the pressure completely from a compressor (accumulator), and lock Shut-Off Cock. Loose clamp bolt (3), and conduct according to Item 4.6.2.

● **Reproduction and Exchange of Intermediate Ring**

In the figure 165, in case diameter D is less than a nominal diameter DN of conveying cylinder by under 2mm, reproduce an intermediate ring.

Cylinder diameter (mm) : ND Nominal dimension	Intermediate ring diameter (mm) : D The maximum wear limit	Recommended diameter (mm) : D After welding a surface
230	228	220
200	198	190
150	148	140
120	118	110
100	38	90



1. Delivery cylinder
2. Hopper
3. Wear plate
4. Intermediate ring
5. “S” pipe
6. Wear ring

4.6.4. Method of Lubrication

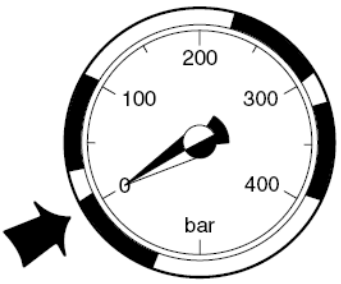
1) Like as correct adjustment of change tube, usage of recommended lubricant (hydraulic oil and grease) extends the life of bearing.

2) The applying point of grease is based on the Item 4.1 “Period of inspection”

3) The part of bearing and seal should be checked after 5000㎥ or 100 hours of working, but when the cement-colored oil-grease mixture or slurry (concrete mixture)leaks from a bearing, exchange is required in advance.

4) After checking, apply loctite on a bearing bush, in order to prevent a bush from moving toward the axis.

098



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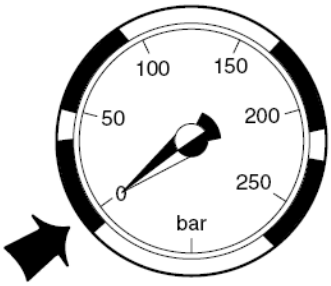

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4.6.5. Exchange of Hydraulic Hose line

1) The durability of hydraulic hose depends on sun, heat, high pressure and change of load.

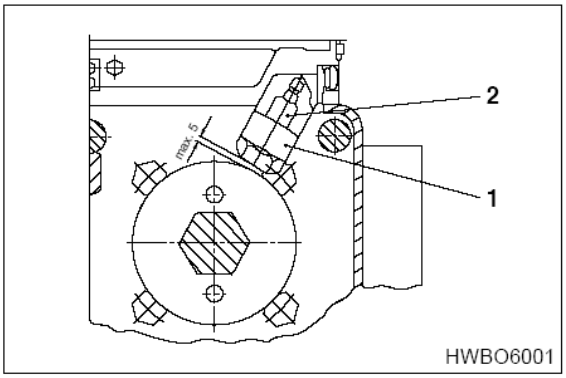
2) If the hydraulic hose is too dried, or has split or leakage, immediately exchange it.

⚠ **Safety Accident: When exchanging hoses, you must remove the oil pressure. (Figure 098)**
The pressure of hydraulic oil should be “0”

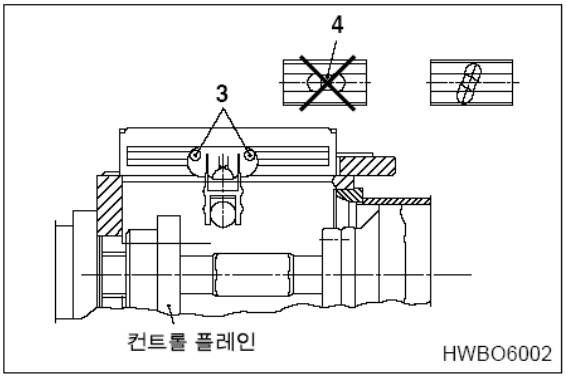
4.6.6. Adjustment of Inductive Proximity Switch

[Caution]

Refer to the Safety Rules of Chapter 1. Stop the engine, remove pressure completely from the right compressor, and lock the Shut-Off Cock.



1) Remove the protective grid of water box.
2) Loosen the bolt (1), and adjust the distance between the sensor of proximity switch and metal pipe (Flange of Delivery piston) within maximum 5mm.
3) Re-fasten the bolt (1).



A. Adjustment of Stroke Change point

1. Loosen the bolt (3) and adjust the distance of "X" (Refer to the table)

[Caution]

The stroke change for this pump is easily completed, and there's no impact.
If not, extend the distance of "X"

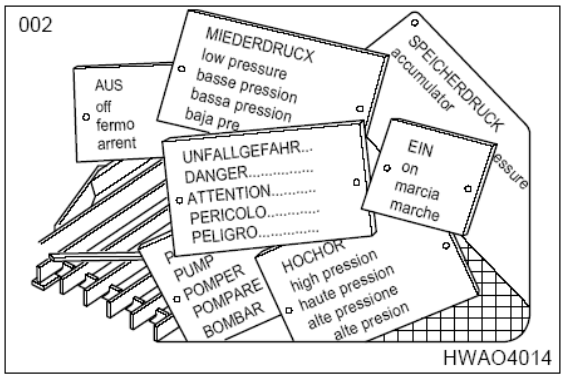
When the concrete or ice is piled up on the metal plate (Flange of Delivery piston), it might cause an error of proximity switch.

Hydraulic Connection	Cylinder - Ø	
	110	140
Head side	140±10	170±10
Rod side	140±10	170±10

2. Re-fasten the bolt (3) to 10N.m.

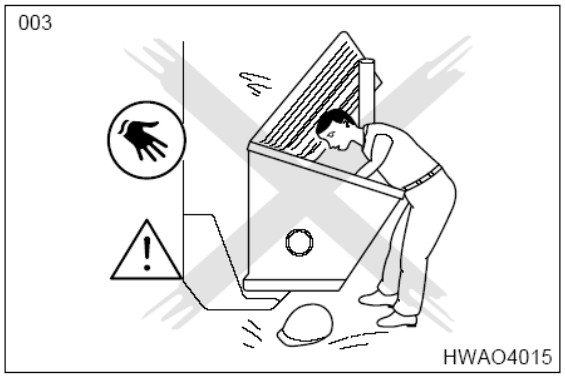
4.6.7. **Summary of the most important safety rules**

1) For safety and preventing an accident, do not remove all devices such as identification tag, protective cover (grid, etc.) and alarming sign, or reconstruct them. (Figure 002)

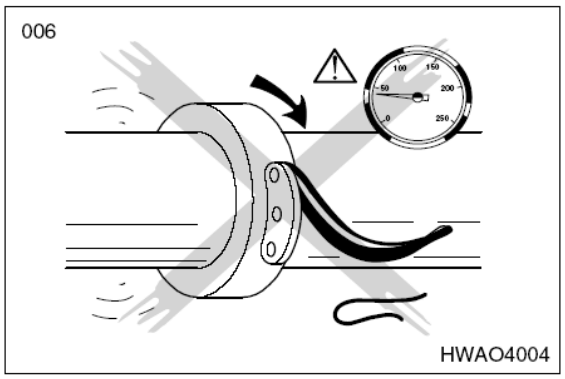


2) Workers must wear protective devices (helmet, goggle, mask, gloves) in every workplace. (Figure 014)

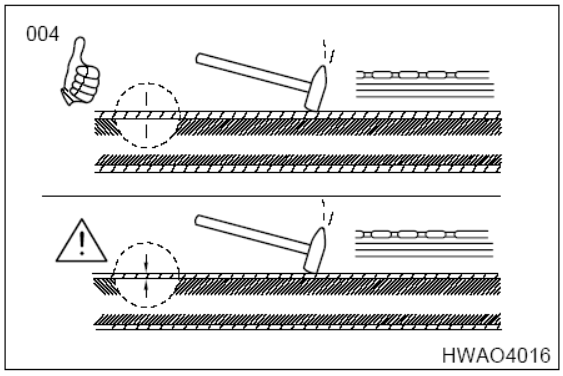
3) Do not work without hopper grid. In case of having to work for the inside part of hopper, stop the engine and take the starting key out. And, do not put your hand into the conveying cylinder. (Figure 003)



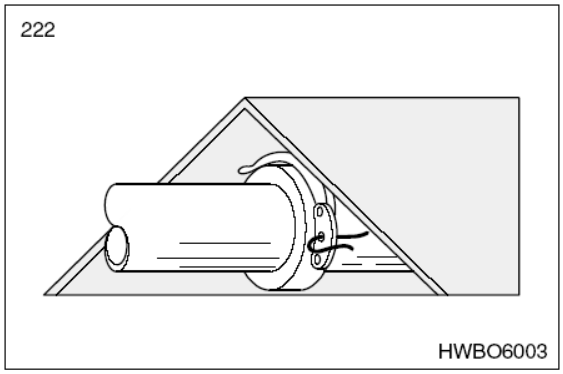
4) Whenever opening or tapping the delivery line, make sure to wear the protective equipment and check whether the pressure is removed. (Figure 006)
Always make back-pumping once or twice.
When opening the delivery pipe, conduct on the side of pipe. Have anyone other than the persons concerned not to access the equipment.



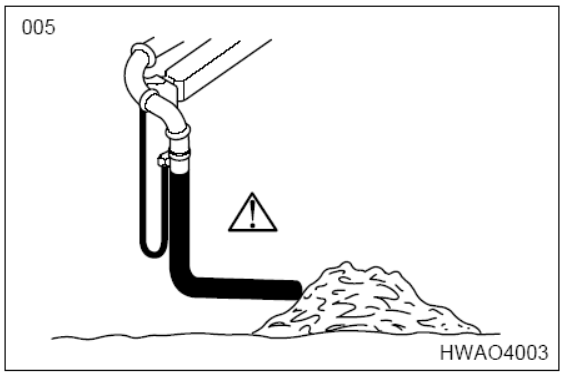
5) Change the wear part at need, by tapping delivery line everyday or measuring the wear with a thickness measuring device. (Figure 004)



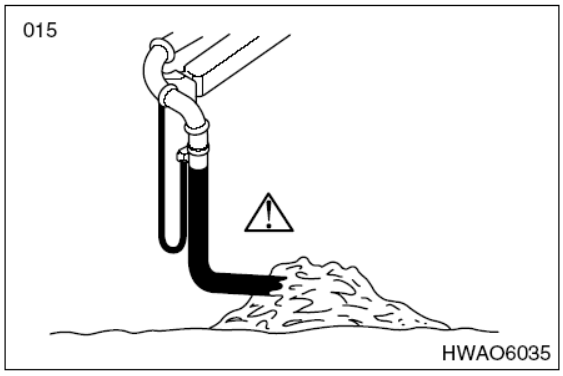
6) Set the wooden or metal protective net on the delivery pipe within 3m from an operator. (Figure 222) Conduct the water level test at maximum pressure periodically.



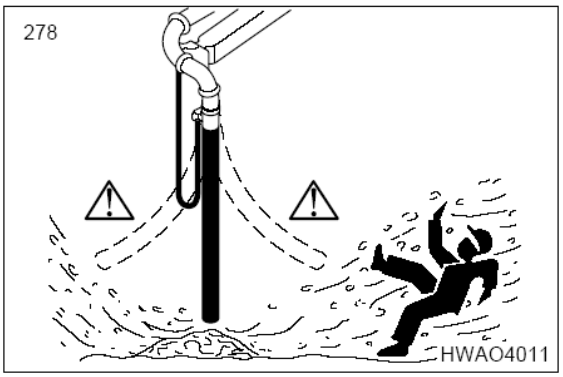
7) When casting concrete, pay attention not to bend the tip hoses. It might raise the possibility of an accident. (Figure 005)



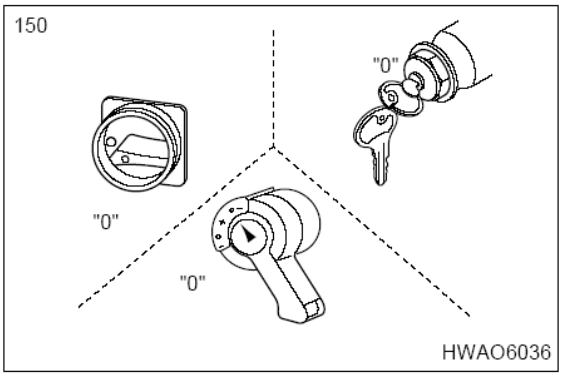
8) Do not try unfolding the bent tip hoses straightly by using high pressure. Do not put the hose into concrete. (Figure 015)



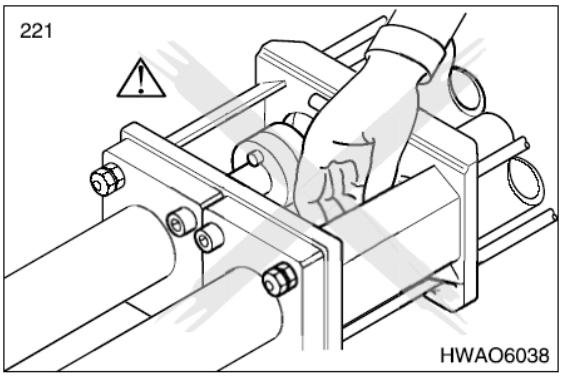
9) When starting pumping after being blocked, keep the workers away from the equipment. Let the tip hose as it is until the concrete is emitted from the tip hose.



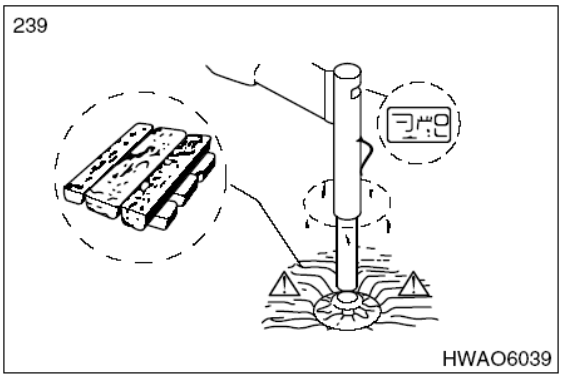
10) Prior to open an electric control box, make sure to turn the main switch off. (Figure 150) When repairing the part of high voltage transport current, request to the specialized service center.



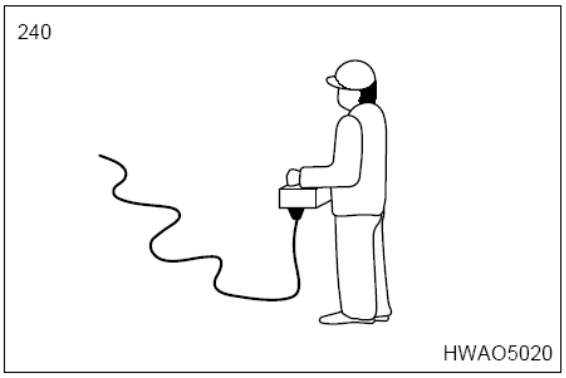
11) Do not put your hand into the water tank (coolant) during working, and set the safety net.
Turn the engine off and remove the pressure from accumulator when checking.



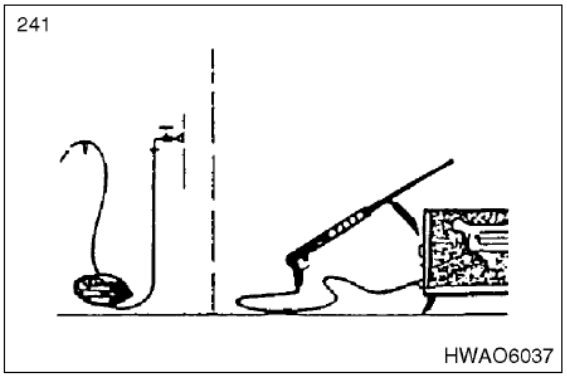
12) When setting up the support leg, firmly support with a wooden prop or the solid ground. (Figure 239)



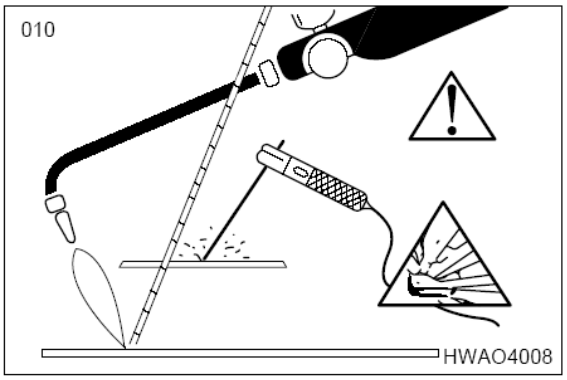
13) Carry always a remote controller with so that anyone should not touch it. Damaged cable might cause a short of electricity. (Figure 240)



14) Keep the equipment clean, and not stained by oil. It might cause an accident due to slip. (Figure 241)



15) When welding a support member, request to the service center and especially pay attention to when welding hydraulic oil tank. (It might blast.) (Figure 010)



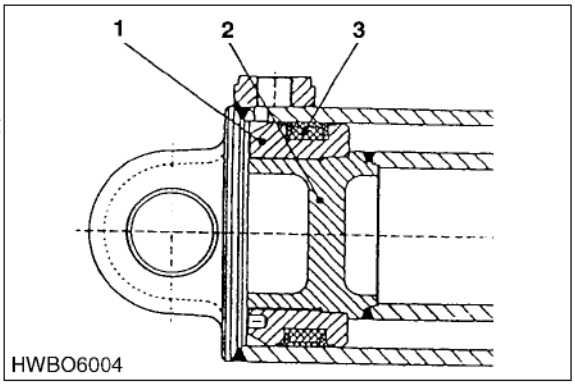
4.6.8. Piston Checking

☞ This description is available for all kinds of piston with stick safety devices. For repairing, it's necessary to disjoint a piston and replace adhesives with new things.
The seal in the guide bush needs to be replaced.

1) Disjointing

(1) Prior to disjoint a piston (1), take off all seals.

(2) Add heat until getting piston loose. When the piston cools again, it is reusable after wiping out carefully



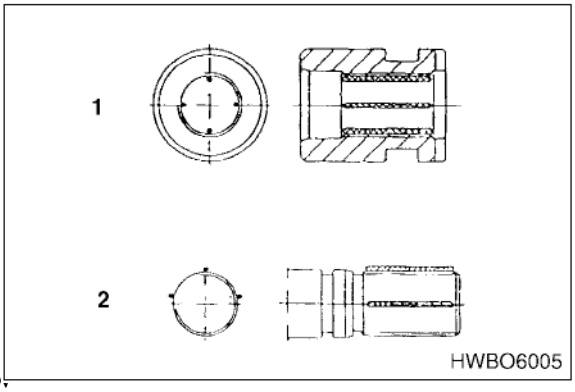
⚠ **[Caution] Never have a piston be heated more than 200℃. If it's not getting loose for initial heating, do it again after cooling.**

2) Assembly

(1) Prior to assemble a piston, clean the piston rod (2), oil of piston screw part (1), and dusts with a proper cleaner. Acetone or similar thing is good for cleaning, but never use oil or alkali solvent.

(2) Apply adhesives on the piston rod and screw part of piston.

- Apply four drops of adhesives on the inside screw part of piston (1) at 90℃ interval.
- Apply three drops of adhesives on the outside screw part of piston rod (2) at 90℃ interval.



(3) Insert a piston slowly into the piston rod by fixed torque (left table). Too much adhesives might leak from the rear of piston. Remove the leaked adhesives with a clean cloth.

Piston fasten moment	
Ø Piston rod (mm)	Moment fasten (Nm)
30	120
40	150
50	200
60	200

(4) Insert a new seal (3).

[Caution] As adhesives are congealed at least three hours later, operate cylinder thereafter.

☞ Use only adhesives recommended by the Company, and order by the following item number.
Adhesives: RED 100H
Item number: 63348.00

4.6.9. Vacuum Gauge

1) Cut the end part of safety device (1) after setting.

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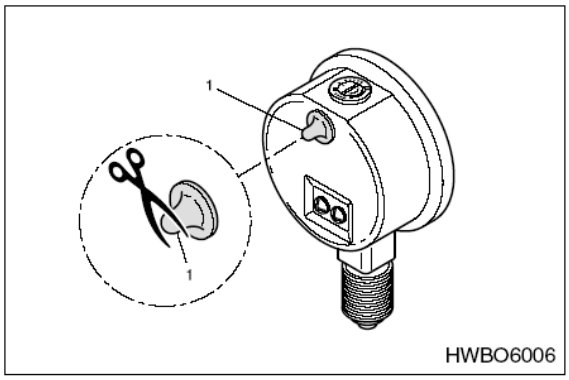
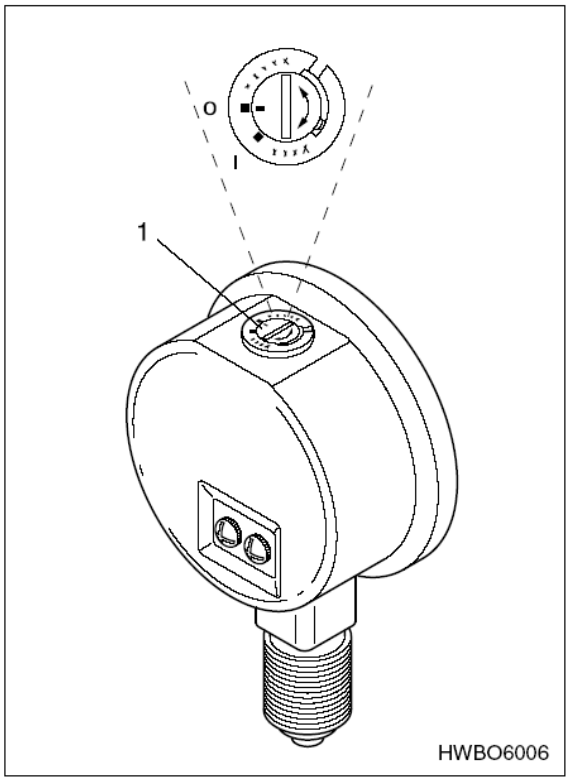


2) After setting, open by turning lever and remove safety device (1).



Chapter 5 How to check disorder and take a measure

5. How to check disorder and take a measure

5.1 How to check disorder and take a measure for FFH equipment

5.1.1. **References while repairing**

1) Select a place with good supply of electricity, in which drive of electric motor is fully conducted, and have an experienced person check the hydraulic device.

2) Preliminary parts required for each controller and wasting parts used frequently for electric devices need to be prepared.

3) In case of failing in analyzing causes of disorder, even though taking a measure in accordance with the way how to check disorder stated, request to the Company's service center at any time.

4) Refer to the attached hydraulic and electric devices circuit diagram.

108

109

5.1.2. **In case the delivery piston is not working**

Cause 1: Pump switch is not on.

Measure : Turn the pump switch in the switch box on. Then, green lamp is lighted up.

Cause 2: Hydraulic oil is insufficient.

Measure : Replenish hydraulic oil.

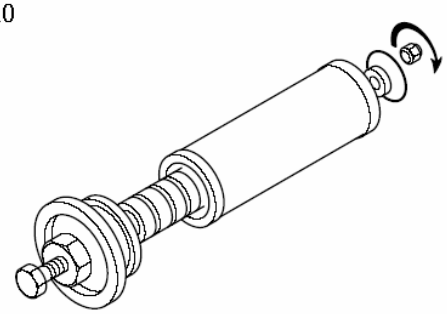
Cause 3: Vacuum gauge (136) is on the red area due to the filthy suction filter.

Measure : Clean or exchange the filter cartridge (141) according to Chapter 6 "How to check." (Figure 75)

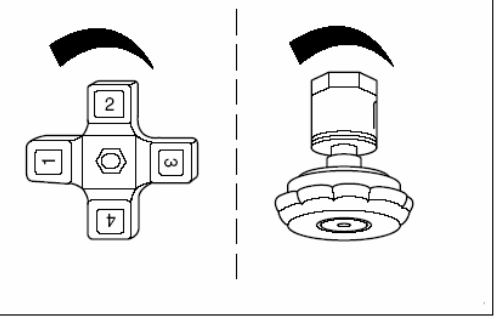
Cause 4: Hydraulic oil is too cold.

Measure : Keep warming up until the temperature of hydraulic oil reach the normal one. As setting the output volume required by pressure gauge (0~100bar), pump is electrically connected and starts pumping.

110



111



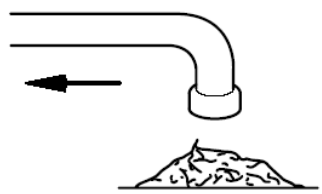
Cause 5: The end of piston is blocked.

Measure : Press back-pumping switch or stroke change switch. (Figure 006)

Cause 6: The number of engine rotation did not reach 1,200 rpm, minimum operating speed of pump.

Measure : Raise the speed of engine.

006



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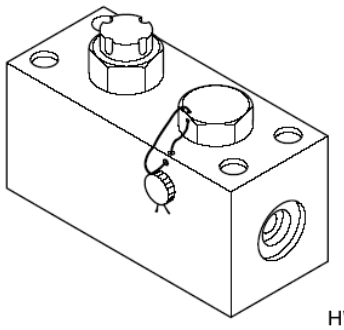
5.1.3. **In case the hydraulic pump is not working**

Cause 1: High pressure limiting valve (138) got filthy.

Measure : Loosen a valve cap with a spanner by 2~3 rounds, and turn off again. This is for cleaning up microscopic substances. (Figure 198)

198



HWBO7002

Cause 2: Low pressure limiting valve (116) got filthy.

Measure : Take the same measure as presumptive cause 1.

Cause 3: Pressure limiting valve (116) for feed and hydraulic pump adjustment got filthy.

Measure : Take the same measure as presumptive cause 1.

Cause 4: Hydraulic pump (127) does not generate pressure (12bar) at “S” joint.

Measure : Check the feed and hydraulic pump and replace at need.

Cause 5: Pump pressure controller (183) is not closed.

Measure : Open the seat side of control piston, and move a piston by hand to let the piston push out microscopic foreign substances.

Cause 6: A feed in hydraulic pump and pump control-only pressure limiting valve got filthy.

Measure : Unfasten a pressure limiting valve and let it move manually, before check whether there are microscopic foreign substances.

Cause 7: A pilot valve (103a) driven by electricity is not connected. This valve serves for a shut-off valve at a neutral position.

Measure : Check the valve and clean up. Test the operation of solenoid and exchange at need.

Cause 8: Feed check valve (138) is polluted or not working.

Measure : Turn the valve cartridge toward counterclockwise direction, and check its operation and the state of sealing.

Cause 9: Even though the foregoing causes were checked, feed pressure is not formed at M2-5 point.

Measure : Check the feed and main pump and replace at need.

Cause 10: Remote control is not working.

Measure : Turn off the output volume controller (125).

5.1.4. **In case the performance of pump is unsatisfactory**

Cause 1:Pressure of high-tension limiting valve (138) is not controlled properly. (Refer to a circuit diagram)

Measure : Block at the end of cylinder in accordance with Item1.4 “Inspection of Operating function.”
In case the pump is not working, look at the following presumptive cause 1.
Set the pressure to the fixed one by inserting Shim

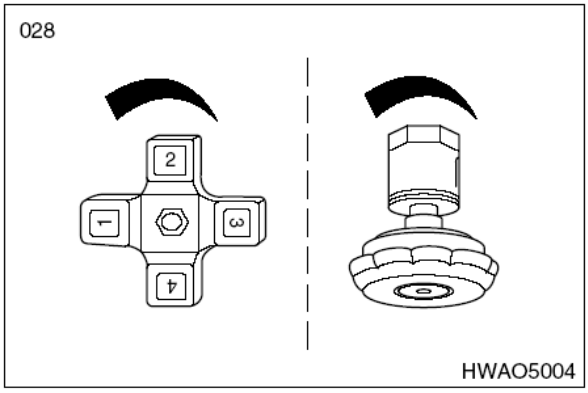
Cause 2: High pressure limiting valve in a pump control pressure controller (183) is not controlled properly.

Measure : Take a measure according to the presumptive cause 1. Set the fixed pressure by adjusting screw.

Cause 3: The square plate of hydraulic pump (127) cannot be controlled for pumping.

Measure : Turn off the output volume controller (125). (Figure 028)

028



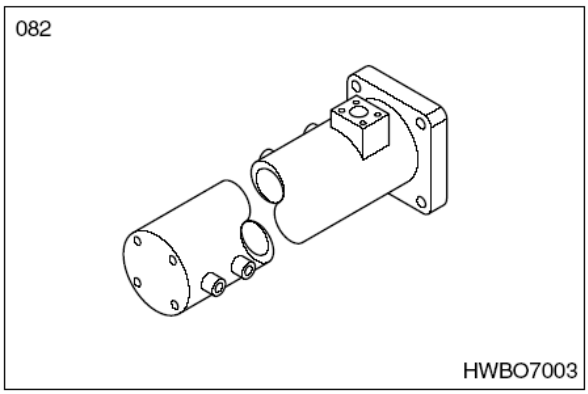
Cause 4: There’s leak from a suction line or air is inserted into hydraulic oil.

Measure : Repair the leaking part. Start air-bleeding for pump and overall system.

Cause 5: Drive cylinder (101) or piston ring is damaged or worn. Replace it.

Measure : Replace it. (Figure 082)

082



Cause 6: Low pressure limiting valve (139) is opened.

Measure : Loosen a valve cap with a spanner by 2~3 rounds, and turn off again. This is for cleaning up microscopic substances.

Cause 7: Stroke time is too short. (Stroke shortens)

Measure : Adjust a stroke. (Item 4.2.3) Adjust switch fork.

Cause 8: Pressure limiting valve (116) for feed and pump adjustment got filthy.

Measure : Refer to the Item1.4 “Inspection of Operating function.”

Cause 9: Bi-direction flushing valve with low pressure cartridge (139) is damaged or polluted.

Measure : Turn the limiting screw toward counterclockwise direction, and check the movement of piston. If it would not move, exchange the valve.

5.1.5. In case the stroke of pump is not automatically changed

Cause 1: Hydraulic oil is insufficient.

Measure : Replenish it.

Cause 2: Fuse 2FB81 is disconnected.

Measure : Exchange the fuse.

Cause 3: A limit switch is too far away from or too close to switch fork.

Measure : At the maximum stroke time, adjust the cylinder so that the stroke would be changed at the right front of the edge.

Cause 4: A joint terminal of limit switch gets rusty or loosens.

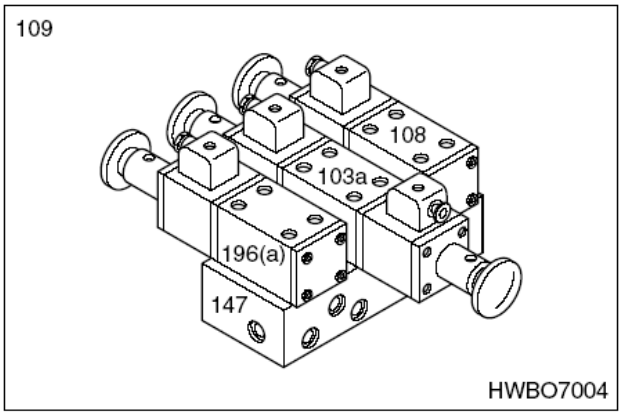
Measure : Clean the joint terminal and re-fasten.

Cause 5: Step relay 2K238 in a switch box is damaged.

Measure : Switch the stroke. As opening a switch box, you may listen to and see definitely relay is switching. If not, replace it.

Cause 6: Back-controlling valve (108) is out of order.

Measure : Check the switch manually, along with power supply and solenoid. (Figure 109,118)

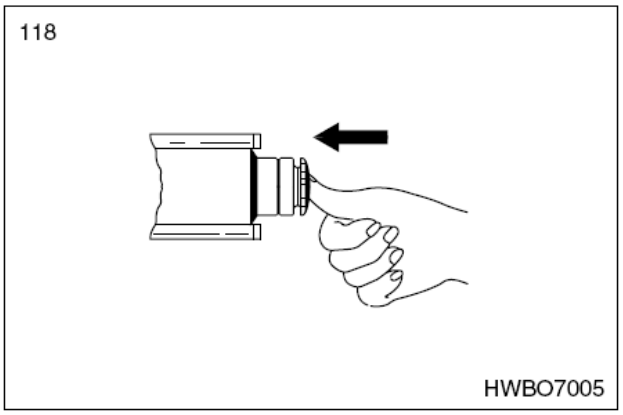


Cause 7: Stroke change valve (103) is not working due to microscopic dust or disorder.

Measure : Press manual button several time, and start back-pumping by 2~3 strokes. Check the solenoid and its joint. (Figure 118)

Cause 8: Change tube is changed but delivery piston is not changed.

Measure : Check whether “SN” instant pressure reduction valve gets filthy, and the pump control pressure M7 for hydraulic pump (127). If the pump control pressure is not generated, hydraulic pump circuit has a problem, therefore, replace a hydraulic pump.



Cause 9: A stroke change valve (103a) which transfers oiling pressure pump to right or to left side by adjusted pressure is blocked by minute pollutant.

Measure : Press a manual button leftward and then rightward, conduct back-pumping 2~3 times. Check the solenoid and its joint.

Cause 10: Adjustment unit of hydraulic pump is damaged.

Measure : Exchange it.

Cause 11: The equipment would not work even after checking the foregoing items, it's a defect of wiring going from switch box to equipment.

Measure : Check it with a resistance tester.

5.1.6. In case an agitator is not working

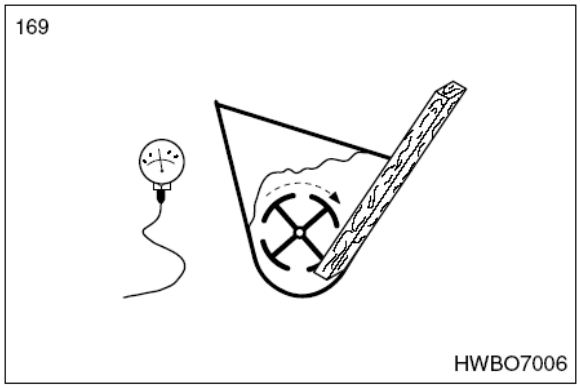
Cause 1: Safety valve setting is too low or polluted by dust.

Measure : Drive in a wedge with a thick wood stick so that an agitator would not turn, check the setting pressure, set it to the standard value, and clean up at need.

Cause 2: Agitator's driving motor is worn out.

Measure a: As same as the measure of presumptive cause 1

Measure b: Check the volume of leak and exchange at need.



5.1.7. In case the change tube is not changed or moving

Cause 1: Proportional control stroke change valve (103) is not moving due to minute pollutant or disorder.

Measure : Check the proportional control stroke change valve, and whether its slip is free. (Figure 018)

Cause 2: Change tube is too fastened.

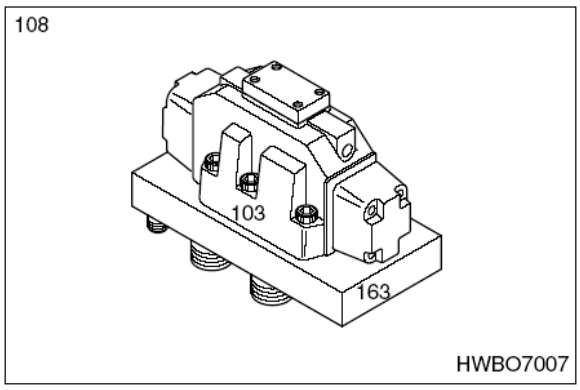
Measure : Refer to Item 4.6.3 "Adjustment of change tube," to adjust property.

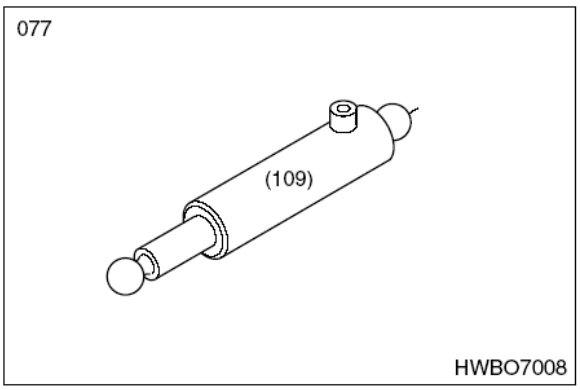
Cause 3: Change tube cylinder is out of order.

Measure : Check the piston seal and exchange it at need. (At time of leakage, figure 077)

Cause 4: As the pebbles fill the swing part of change tube up, concrete is piled up under the hopper.

Measure : Occasionally remove it by stroke change and back-pumping, Clean the hopper at need.





Cause 5: Accumulator's pressure is insufficient.

Measure : Turn off the accumulator output valve (121).

Cause 6: Accumulator loading valve (118) lost its function.

Measure : If it would not work even after tapping on the valve with a hammer several times, turn it with a spanner several times. Adjust it again. (average 190bar)

Cause 7: Orifice in the shut-off valve (181) is locked.

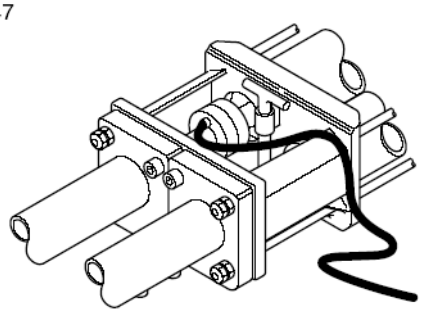
Measure : In order to raise the switch power of change tube, open the orifice

⚠ **[Caution] Prior to check the accumulator's circuit, always open the output valve (121) to remove the pressure.**

Cause 8: Accumulator circuit-only pump (128) is worn out

Measure : Replace it.

047



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5.1.8. In case the hydraulic oil gets too hot

Cause 1: Water in a coolant box is not sufficient.

Measure : Supply it. (Figure 47)

Cause 2: A coolant gets too heated

Measure : Replace it with new water.

Cause 3: Due to low-quality concrete and high speed of delivery, pump is operated at the maximum pressure area (350bar).

Measure : Reduce the pump speed and raise the quality of Concrete.

Cause 4: When transmitting long distance, the pressure is continually at the maximum.

Measure : Use a delivery pipe with longer diameter.
For example, if it is 100mm, replace it with 125mm.

Cause 5: Due to the pumping trouble, pressure is too high.

Measure : Remove the obstacle and check the concrete.

Cause 6: A cooler (132) gets filthy, and cooling fan is not working.

Measure : Clean up and check the joint and voltage of 55℃ temperature sensor.

Cause 7: High pressure limiting (138) is too low adjusted.

Measure : Set the cylinder at the edge, and conduct according to Item 1.4 "Inspection of operating function" and Item 5.1.4 "In case the pump performance is not satisfactory."

098

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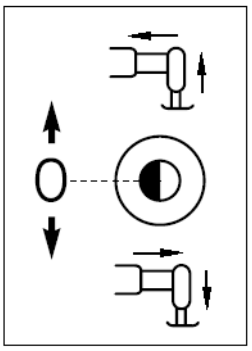
117



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Cause 8: Outrigger operation is not selected properly.

Measure : Switch the choice lever toward the direction of outrigger.

Cause 9: As the feed check valve of high pressure limiting valve (138) in the hydraulic pump (127) is opened too fast, the pressure gets lowered.

Measure : Turn the cartridge toward the counterclockwise direction to check, and exchange it at need.

Cause 10: Due to the disorder of bi-direction check valve (197), a flux is switched from A to B direction, and when the cylinder is blocked, pressure is hardly generated at the high-pressure gauge.

Measure : Replace the valve

5.1.9. **Pump cannot conduct back-pumping.**

Cause 1: Switch S3 (S1) is damaged and green lamp is not lighted on.

Measure : Exchange the switch.

Cause 2: Alternating relay is out of order.

Measure : When pressing switch S3 (S1), green lamp is lighted on, and relay should be switched from a point of contact 87a to 87. If not, replace relay 9K3.

Cause 3: Microscopic foreign substances are inserted into a back-controlling valve (108) spool.

Measure : Press the switch several times and clean or replace the valve at need.

Cause 4: Cable joint gets loose.

Measure : Fasten the terminal 4 in the switch box, back-controlling valve and alternating relay 9K3 terminal.

Cause 5: Back-pumping is not operated by a remote controller.

Measure : Set the back-controlling switch 3S226 of control cabinet on a neutral position. (Green lamp dies out)
Only when the switch in the switch box is off, back-pumping is possible by a remote controller.
When letting go off the button, pump is automatically set on “pumping.”
Exchange the push button. Look at “In case the green lamp is not lighted on” of the following.

5.1.10. In case a thermometer is not working normally

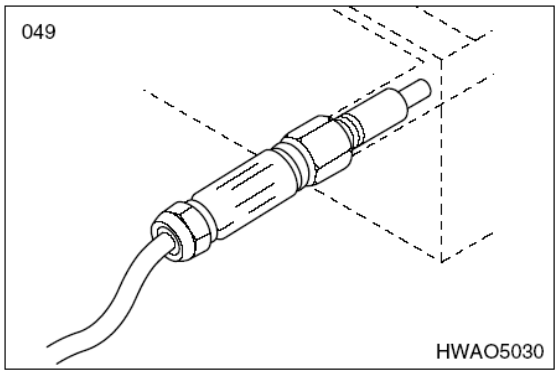
Cause 1: Fuse 3F82 in the switch box is damaged.

Measure : Exchange the fuse.

Cause 2: Temperature sensor is out of order.

Measure : Replace it. (Figure 049)

⚠ **[Caution] While replacing, make sure to connect to the housing. (Do not use a plastic cover and adhesives, but use a bronze washer)**



Cause 3: Defect of terminal parts.

Measure : Replace them.

5.1.11. In case the green lamp is not lighted on

Cause 1: Main switch of vehicle is not on.

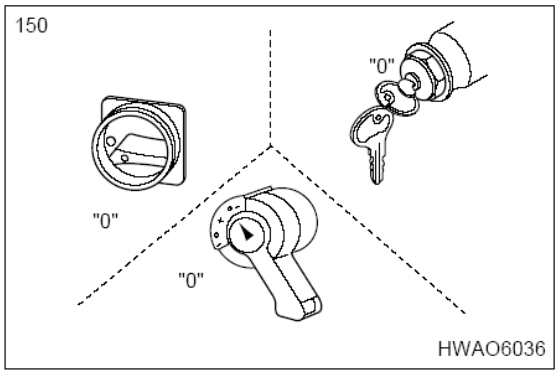
Measure : When the switch is on, H1 lamp is lighted on. (Figure 150)

Cause 2: Electric cable is damaged.

Measure : Check the terminal and replace the electric wires at need.

Cause 3: When the operation lamp is not lighted on even though the power is supplied, the lamp is out of order.

Measure : Replace the lamp.



5.1.12. Pump is not set on ON/OFF by a remote controller

Cause 1: The function of 3K2 relay in the control box is inferior.

Measure : Check the point of relay and whether the sound of switching is heard. Replace it at need.

Cause 2: Defect of 3F82 fuse in the switch box.

Measure : Exchange the fuse.

Cause 3: Inferior operation of electrical stroke change valve (103a)

Measure : Check the joint of wiring and solenoid, and exchange it at need.

Cause 4: Defect of push-button.

Measure : Replace it.

Cause 5: Defect of remote control wiring.

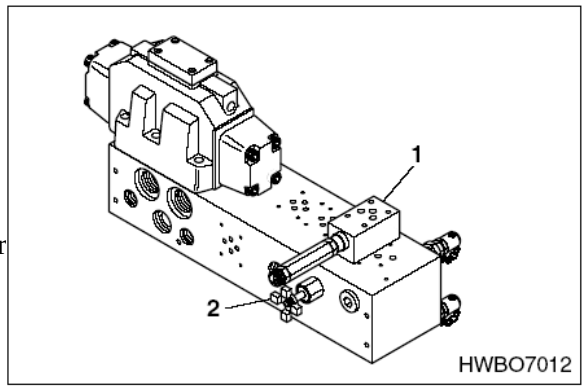
Measure : Repair.

5.1.13. Output volume control device

1) Function

Output control device (1) is a valve controlled electrically. In a normal operation, output control device is controllable by "Output +/-" button remotely.

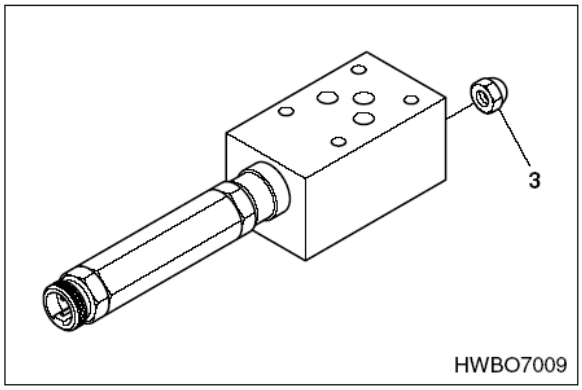
☞ In a normal operation, the needle shut-off valve (2) must be opened. If the control device gets out of order valve could be by-passed, and the output volume is controllable by a needle shut-off valve. (Manual)



To open by-pass, do it as follows.

. Unfasten a cap nut (3).

. Then, when a set screw (slot screw) is seen, turn it to the end.



⚠ **[Caution] By-pass operation is for an emergency while working. Upon finishing the work, immediately exchange the defected part.**

2) Correct measure for a defect

If the output volume is not controllable, it can be treated by finding out a cause of defect in accordance with the following check.

☞ In order to check, a pressure gauge (0~40bar) and voltage measuring instrument are required.
The pressure gauge should be connected to M8 point (4). If the usage of measuring point is difficult, it is allowed to connect to (5) position.