

INSTRUCTION MANUAL

AIR HOIST

EHLK-1TS

EHLK-2TW

WARNING

- Never use the air Hoist for lifting or lowering people.
- Supply this manual to the user.
- Read this manual before installation, operation, or maintenance.
- Keep this manual available.

ENDO KOGYO CO., LTD.

 ENDO

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SAFETY ALERT SYMBOL AND ALERT SIGNS

Please read this manual carefully and follow its instructions.

The SAFETY ALERT SYMBOL (), WARNING, CAUTION, and NOTE carry special messages.



This SAFETY ALERT SYMBOL is used to call your attention to items or operations that could be dangerous to you or other persons using this equipment.

Please read these messages and follow these instructions carefully.



WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury, damage or destruction of the equipment and others.

NOTE

NOTE indicates a special instruction in operation or maintenance.

Scope of warranty and liabilities for the equipment

1. We will repair or replace the product free of charge if a failure due to manufacturing defects occurs under proper usage during the warranty period. For details, contact us or your dealer.
2. The warranty will be void in the following cases:
 - 1) Change in ownership.
 - 2) Repair, adjustment, or modification performed by a party other than the manufacturer, agents, or dealers.
3. The warranty period is one (1) year from the date of purchase except for consumables.
4. Repairs applicable to any of the following shall be charged even during the warranty period:
 - 1) Failure/damage caused by incorrect use.
 - 2) Failure/damage caused by use of non-genuine parts.
 - 3) Failure/damage caused by fire, earthquake, natural disaster, or other unexpected incident.
 - 4) Incident caused by fall, shock, negligence, or by inadequate storage.
 - 5) Failure/damage caused by use of parts or other equipment that are not included in this product.
 - 6) Replacement of consumables.
 - 7) Usage in violation of dangers or cautions stipulated in this Instruction Manual or the warning labels.
 - 8) Failure/damage caused by any reason that is not attributable to the manufacturer.
5. Warranty exclusions such as mechanical loss.

Either during or after the warranty period, mechanical loss, damage to anything other than our product(s), or other duties incurred on you/your customer as a result of the failure of our product(s) are outside the scope of the warranty.

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Important

- Before installing or operating the air hoist, carefully read and understand all of the instructions in this manual in order to avoid accidents as a consequence of incorrect handling .
- All of the people who will install, operate or maintain the hoist, should read this manual.
- After reading, keep this manual available for maintenance and inspections.
- Be sure to abide by trade associations', local and national rules and regulations relating to safety.
- Strictly obey the contents described in this manual.



I. WARNING - READ THESE INSTRUCTIONS

If the hoist is not used correctly, a serious accident may occur, such as dropping the load or the hoist itself. Observe the following instructions for safe operation.

- The following safety precautions should be posted in a conspicuous location
1. General Handling
 - Anyone who operates a hoist must know and observe the safety rules and regulations.
 - Do not operate the hoist unless the contents of this manual and warnings on the caution plate are completely known.
 - Only allow qualified people to operate a hoist. Do not operate a hoist without being qualified and familiar with the safety rules, etc.
 - Install the hoist properly and carefully.
 - Be sure to check the hoist before each shifts, and inspect it periodically.
 2. Operation and Handling
 - Never lift a load greater than the rated capacity of the hoist.
 - Never use the hoist for lifting or lowering people, and never stand on a suspended load.
 - Never operate the hoist if it has damage or has a malfunction.
 - Never operate the hoist with the load chain in any of the following conditions:
 - 1) Twisted, kinked or deformed.
 - 2) When elongation or the reduction of diameter exceeds the service limits.
 - 3) Cracked, damaged or corroded.
 - 4) Improperly engaged on the chain wheel.
 - Never carry loads over people.
 - Be certain there are no objects in the way of a load or hook when moving the hoist.
 - Always stand clear of the load.

Never walk under a suspended load, and keep out of its area of projection.
Never place hands, feet, etc., under or between suspended loads.
 - Never leave a load suspended for any extended period.
 - Never use the load chain as a sling.
 - Never use a load chain as a ground for welding.

Do not attach a welding electrode to the hoist or sling chain.
 - Never use the upper and lower limit switches as means of stopping a hoist - these are emergency devices only.
 - Before each shift, check the hoist for wear or damage. Check brakes, load chain, limit switches, etc.

- Stretched, worn or damaged hooks should be discarded.
Do not attempt to repair it, just replace it with the new hook.
Do not use the hook with a damaged or malfunctioning hook latch.
- Be sure that all slings are correctly positioned on, or attached to the load hook.
- Never splice a hoist chain by inserting a bolt between links or by any other means.
- Do not force a load chain or hook into place by hammering, and never insert the point of the hook into a chain link.
- Always operate the hoist carefully during lifting and lowering operations.
Do not start suddenly, do not stop suddenly, and do not reverse the hoist suddenly.
- Never lock the push button switches.
The hoist must be operated by the operator himself/herself at all times.
- Never operate the hoist when the load block is not centered under the hoist.
Do not pull a load at an angle. Move the hoist over the loads' center of gravity before lifting the load.
- Ease the slack out of the load chain when starting a lift.
Do not jerk the hoist. Carefully take up the slackened load chain.
- Always keep the load chain clean and well lubricated.
Do not drag the load chain or hook on the floor.
- Be careful the suspended load does not touch the nearby structure or power lines, etc.
- Be careful the hoist or trolley does not collide with the I-beam stopper or the structure.
- Do not swing the load or load block when moving the hoist.
- When moving a load with trolley, do not push the load chain but push the load itself.
Do not pull the load.
- Pay attention to the load at all times when operating the hoist.
- Keep the load block overhead when not in use.
- Do not operate the hoist if you are not physically fit to do so.
The operator must have good hearing, vision and depth perception.
- Do not lift any single load with 2 or more hoists.
- Properly secure an outdoor hoist before leaving it unattended.
- Be sure to protect a hoist from rain and water.

3. Maintenance and Alterations

- Never alter the hoist or accessories.
- Be sure to shut off the air supply before performing any maintenance work on the hoist.
- Periodically, inspect the hoist thoroughly and replace worn or damaged parts.
- Always employ qualified or well trained personnel for inspection and maintenance.
- Only use genuine parts.
- Follow the lubrication instructions.
- Never operate the hoist without lubricator and filter.
- The air pressure must never exceed 0.6 MPa {6 kgf/cm², 85 psi} .
- Do not do anything if you have any questions about the hoist, please do not hesitate to contact the dealer from whom you purchased the hoist, or the nearest dealer shop.

II . Specifications

Model	Rated Load t	Standard Lift m	Air Pressure MPa {kgf /cm ² }	Lifting Speed m/min	Air Consumption m ² /min (normal)	Chain Size x falls	Mass for 1m chain kg/m	Air Inlet Rp	Hose Size mm (in.)	Mass kg
EHLK-1TS	1	3	0.6 {6}	5.3	1.5	7.1x1	1.1	1/2	12.5 (1/2)	38
EHLK-2TW	2	3	0.6 {6}	2.6	1.5	7.1x2	1.1	1/2	12.5 (1/2)	46

III. Checks and Cautions before Installation

Checks before Installation

- Check the delivered hoist is what you ordered (check the name plate).
- Check there was no damage to the hoist during transportation.
- Check the pressure of the available air supply corresponds to the working air pressure of the hoist.

CAUTION

- Do not install and leave the hoist outdoors.
If it is necessary to use the hoist outdoors, be sure to make a shelter with a roof for housing the hoist.
- Under hostile environments such as high temperature, high humidity, acidic, corrosive and/or extremely dusty atmospheric conditions, the mechanical parts of the hoist may be seriously damaged (for example, corroded).
Therefore, frequently check the hoist is maintained in normal condition at all times.
- Never use the hoist at a temperature below -10°C.

IV. Installation

1. Installation

- Make certain the hoist is properly installed.
- A little extra time and effort in doing so can contribute a lot toward preventing accidents and helping you get the best service possible.
- Always make certain the supporting member from which the hoist is suspended is strong enough to support the weight of the hoist plus the weight of the maximum rated load, etc.

The supporting member for the hoist should have successfully passed an inspection for the applicable safety standard.

- Check Hook (Top hook) is correctly rigged onto the supporting member and Hook latch is correctly closed.
- Do not use a supporting member that suspends the hoist at an angle.

WARNING

Never suspend the hoist as shown in Fig. 1 (Top hook on a I-beam flange). Otherwise, it could result in dropping the hoist and personal injury or death.

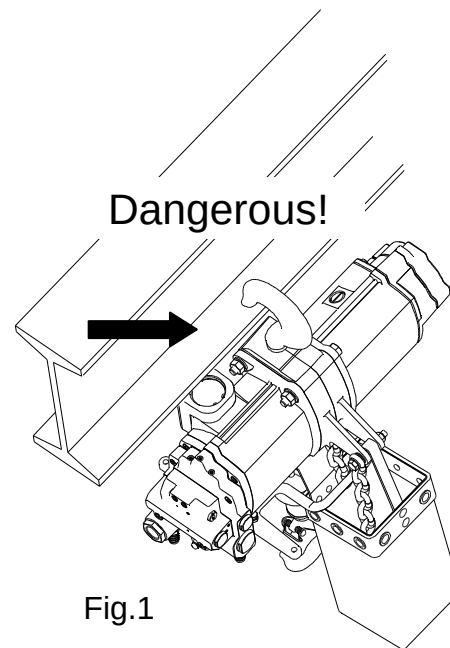


Fig.1

2. Before Air Connection

- Check sufficient air can be supplied to the operating area of the hoist. Compare the air supply from the compressor to the air consumption of the hoist (See Chapter II "Specifications"). For a pipe of excessively small diameter or of great length, the pressure drop can become large enough to prevent the specified performance.
- Use an air hose whose inside diameter is at least 12.5 mm (1/2 in.).
- Before connecting the air hose or pipe to the hoist, be sure to flush or blow out with air to prevent the invasion of foreign matters (dust, etc.) into Air motor.
- Compressed air supplied to the hoist should be free from moisture or foreign matter. Install an air filter to eliminate them from air supply.
- The hoist is designed to operate within a working pressure range 0.4 ~ 0.6 MPa {4 - 6 kgf/cm²} .

Keep the maximum working pressure smaller than 0.6 MPa.

If necessary, use an air regulator for reducing air pressure.

- Install a lubricator to feed lubricant to Air motor. See Chapter IX-1 " Lubrication". (Do not operate the hoist without lubricant.)
- Connect the air filter, regulator and lubricator as close to the hoist as possible.
- When the air hose is connected to the hoist, pour about 10 drops of lubricant into the connecting port of the hoist. (See Chapter IX "1.(6) Recommended Lubricants".)
- Install a dump valve (drain valve) at the lowest point in the piping

V. Check after Installation and Test Run

1. Load Chain

- In case of more than one chain falls, Bottom hook may be sometimes be rotated between two chain falls. This causes Load chain to be twisted (See Fig. 2). Before operation, check for and correct any twisting of Load chain.

WARNING

Using the hoist when the Load chain is twisted could result in damage to the hoist or failure of the Load chain, causing personal injury or death.
Be sure the Load chain is in the correct position.

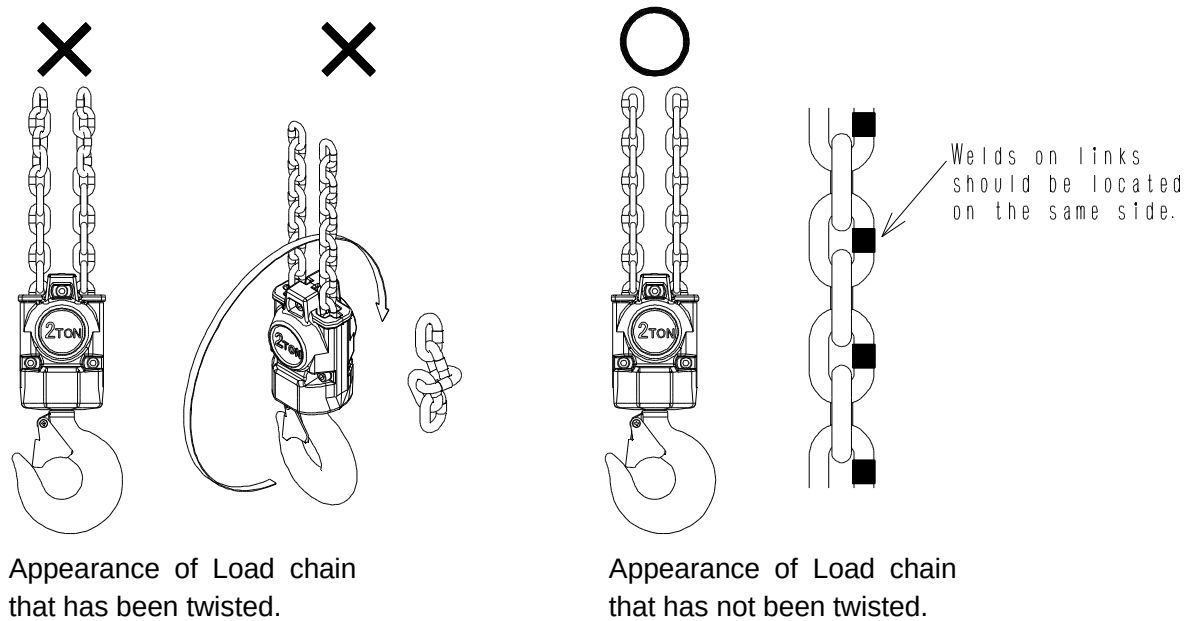


Fig.2

- Check that the welds on Load chain are faced away from the center of Chain wheel (See Fig. 3).

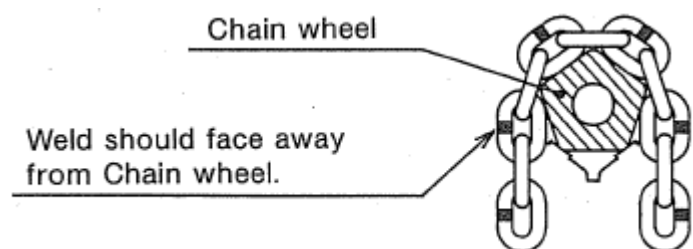


Fig.3

2. Hoisting Operation

At the initial operation, repeat up/down operations several times in low speed, then go to the full-speed operation. Adjust the speed by adjusting the pushing force on buttons. At this point, check that the lubricator feeding lubricant to Air motor. (See Chapter IX "1. Lubrication".)

3. Hoisting and Lowering Limit Switches

Slowly lift Load hook (Bottom hook) to the upper limit. At this point, Control lever is pushed up by Load hook so that the hoist is stopped automatically.

Next, slowly lower Load hook to the lower limit. Control lever is lifted up by Load chain so that the hoist is stopped automatically. Ensure these operations are carefully carried out (See Fig. 4)

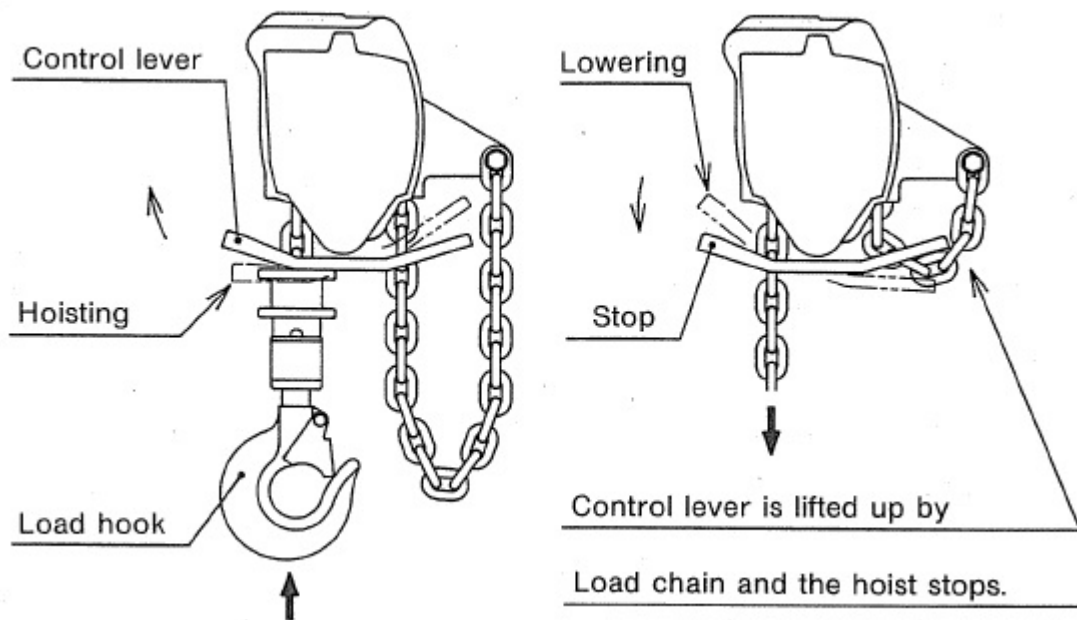


Fig.4

4. Over load protection

Over load protection is controlled by pressure of the compressed air.

The adjustment is to set to activate at approximately 125% of rated load capacity

Even when the overload protection is activated, down operation is available. The hoist should be unloaded and change to rated load.

The overload protection can also be activated when it takes the impact load.

- Switch the up and down operation suddenly.
- Inching motion
- Lifting the load by full speed even the slack chain is still loose

When the overload protection is activated by impact load, do down operation to reset it. Then you can operate ordinary again

VI. OPERATION – Proper Operation and caution

⚠ CAUTION : Only allow qualified people to operate the hoist.

1. Never exceed the rated load of the hoist.

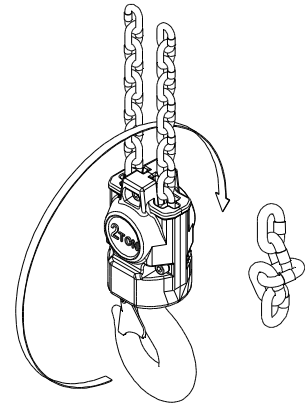
Never lift a load greater than the rated load.

Otherwise, the hoist may be damaged or the suspended load may drop, causing serious danger.

2. Before operating the hoist, check the condition of Load chain.

See Chapter V "Load chain " and See Chapter IX "2. (2) Inspection of Load Chain and Service Limit".

- Never operate the hoist if Load chain is twisted, kinked, damaged or worn. Otherwise, the hoist may be damaged or the suspended load may drop, causing serious danger.
- Do not operate the hoist if Load chain is stained or unlubricated. Otherwise, Load chain will wear out, making the hoist operation dangerous.

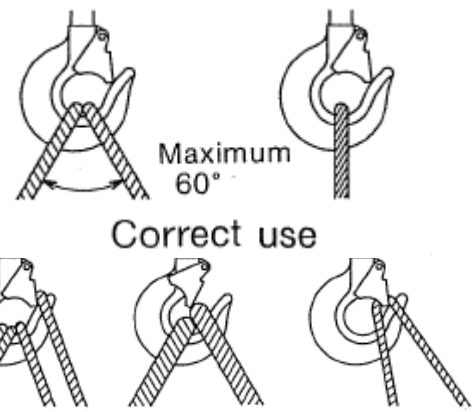


Never twist !

3. Properly hang the slings (suspension fastenings).

Position the slings at the center of the Load hook saddle.

- Incorrect positioning of the slings can cause the load to drop. Always hang the sling securely to avoid slipping.
- Never use Load chain as a sling. Otherwise, Hook and Load chain may be damaged or the suspended load may drop, causing serious danger.
- Discard Hook if stretched or damaged. Do not attempt to repair it, just replace it with a new Hook. When Hook latch is damaged or malfunctioning, do not use. Otherwise, the sling may slip from Hook or the suspended load may drop.
- Use the appropriate sling according to the weight and shape of the load.



Correct use

Incorrect use



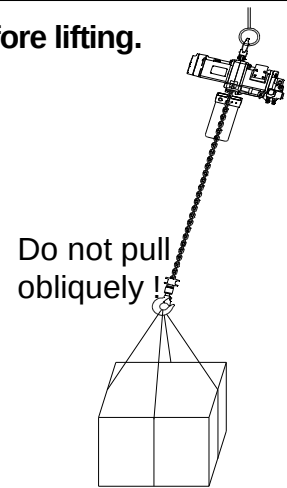
Never use !



Never repair !

4. Move the hoist over the loads' center of gravity before lifting.

- Do not pull a load at an angle. Otherwise, the load may slip on the floor or swing when lifted, causing serious danger. In addition, the hoist may possibly be damaged.



5. When starting to lift, stop hoist once as Load chain becomes tensioned.

- Carefully take up the slackened Load chain.
Thereby, lift-off shock can be reduced, while preventing the hoist from damage.
- Stop once and check the condition of the sling.
 - Check the balance of the load by slightly moving or lifting the load.

6. Carefully lift and lower the load without swinging.

- Do not lift or lower with the load swinging. Even if there is no load, do not swing Load hook. Otherwise, Load chain may be damaged due to the irregular winding or the suspended load may drop.
- Be careful Load hook or the suspended load does not touch the structure, etc. Otherwise, the hoist may be damaged or the suspended load may drop due to abnormal shock.

7. Stop lifting or lowering before Upper or Lower limit switches are activated.

- Never use Upper and Lower limit switches as means of stopping the hoist. Otherwise, Control lever may become worn or deformed, causing failure in an emergency.

8. Employ 1 hoist for hoisting and lowering.

- Do not lift any single load with 2 or more hoists.
The air hoist is different from the electric hoist, hoisting speed varies depending on the weight of the load, pressure or flow rate of supplied air, etc.
Therefore, 2 hoists can not be operated at the same speed.
When this is done, a dangerous situation will occur, as the load is applied to only one hoist, creating overloading.

9. Carefully traverse the trolley to prevent the load from swinging.

- When moving the load with the trolley, do not push Load chain but push the load itself. Do not pull the load.
- Do not pull the trolley by pulling Control hose. Otherwise, an operating mistake may occur and the tube may be damaged.
- When traversing the trolley, be careful that the trolley does not collide with the I - beam stopper. Otherwise, excessive shock may cause the suspended load to drop or the hoist to be damaged.

10. Correctly operate the hoist.

- Do not reverse the hoist suddenly. When reversing, stop lifting or lowering once.
Do not start suddenly, do not stop suddenly.
Otherwise, shock may occur and the hoist may be damaged.
- Smooth operation for lifting and lowering is very important.
- Never lock the push button switches.
Otherwise, the hoist can not be operated in an emergency, causing serious danger.
- After operation, do not let go of the push button switch panel until it has been centered below the hoist.
Otherwise, The panel may swings and hit something, causing a operating mistake or damage.

11. Be sure to unload all the loads on the floor.

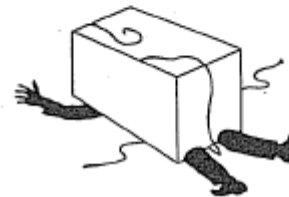
- Never leave a load suspended.
This is a serious hazard for any person near the suspended load.

12. Carefully choose a safe position for operation and check the surroundings.

- Never walk under a suspended load or in the traveling area of the load.
Serious danger if the load drops.
- Never stand on a suspended load.
The suspended load is very unstable, causing a person or the load to drop.
- Never carry a load over people.
Serious danger if the load drops.
- Before operating the hoist, be sure to check that no one is in the traveling area of the load.



**Never walk under
the suspended load !**



VII. Checks before Operation (At the beginning of each shift)

Be sure to execute the following checks at the beginning of each shift.

If there is anything unusual noticed, do not use the hoist until the problem has been corrected.

Never operate the hoist if damaged or malfunctioning.

At least the following items should be checked:

1. Check before Start up

- (1) Check Load chain is not twisted, kinked, damaged, or worn.
Wear or damage on the chain can not be detected by casual or formal observation.
See Chapter V "1.Load Chain" and Chapter IX "2.(2) Inspection of Load Chain and Service Limit".
- (2) Keep Load chain clean and well lubricated.
- (3) Check Load hook is not stretched or damaged and Hook latch is in the normal position.
- (4) Check Chain wheel in Hook block rotates smoothly (See Fig. 5).
- (5) Check the support bearing of Load hook is not damaged, and swivels easily and smoothly.
- (6) Check the trolley wheels track the rail properly and the wheels and rail are not worn.
- (7) Check that the lifting sling (suspension fastening) is not damaged or worn.

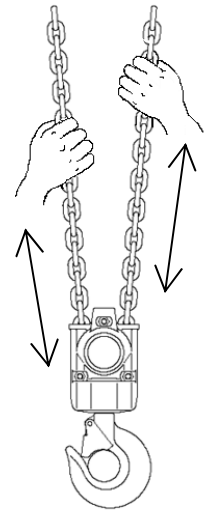


Fig.5

2. Check by Idling Operation

- (1) Check the push button switches can be easily operated and the up/down operation are correct as indicated.
 - Check hoisting speed can be changed from low to high speed by controlling the pushing force on the push button switches.
- (2) Check Load chain flows freely and smoothly into and out of Chain wheel and there is no noise indicative of binding or other malfunctions.
- (3) Check Upper and Lower limit switches function correctly.
See Chapter V "3. Hoisting and Lowering Limit Switches".
- (4) Check the hoist is not abnormally noisy or vibrating.

3. Check by Load Operation

- (1) Lift the rated or near the rated load a few inches off the floor and check ability of braking system to stop and hold the load without excessive drift.
- (2) Check Load chain flows freely and smoothly into and out of the Chain wheel and that there is no audible clicking or other evidence of binding or malfunction.
- (3) Check the hoist is not abnormally noisy or vibrating.

VIII. Periodic Inspections

Be sure to periodically inspect the hoist for safe operation.

- Before inspection, shut off the air supply completely.
- Preparing a special table for inspection is recommended.

Monthly Inspection

Inspect the hoist at least once a month. Correct and repair all of the problems which are detected.

- Required interval for inspection depends on the operating environment, operating frequency, and loading conditions of the hoist.
Therefore, make the inspection interval shorter according to your operating condition
- For inspection items and methods, see Chapter IX "2. Inspection" .

Annual Inspection - Disassembly is required

Completely disassemble the hoist at least once a year for inspection and maintenance. Correct and repair all of the problems which are detected.

- Inspect the hoist yearly or every 1000 hours of operation, whichever is shorter.
If daily operation time exceeds 5 hours, inspect the hoist every 6 months.
However, the required interval for inspection also depends on the operating environment and loading conditions of the hoist.
Therefore, make the inspection interval shorter according to your operating condition.
- For inspection items and methods, see Chapter 9 "2. Inspection" .

Service Limit of Parts

If any part is found to be worn beyond its service limit in the monthly, annual, or other inspections, never reuse it.

For the monthly and annual inspections, carefully read "Inspection Manual".

IX. Maintenance and Inspection

1. Lubrication

(1) Air motor

- To prevent Air motor from dry operation, continuously lubricate by a lubricator.
- Adjust the lubricator so that lubricant is fed at a rate of 6~8 drops per 1 m³ of air during hoist operation.
- Periodically check the oil level in the lubricator, and replenish if necessary.
Do not allow the oil level to go below the indicated line.
- Periodically eliminate drain water deposited in a bowl of an air filter.

(2) Reduction Gear

- The reduction gear has been greased before shipment.
- Replace grease in the reduction gear when the hoist is disassembled for maintenance or inspection. Daily lubrication is not required.
- Required quantity of grease is 180 cm³ (180 mL).
Lubricate 60 cm³ (60 mL) respectively in each gear stage.

(3) Load Chain

- Always keep Load chain and the chain anchor pin clean and well lubricated.
- Before installation, initial operation, be sure to lubricate Load chain.
Even if operating with no load, lubricate Load chain.
- Periodically coat Load chain with lubricant to minimize wear on Load chain or Chain wheel. Poorly lubricated Load chain will wear out quickly, making the hoist operation dangerous.
- Determine the lubrication interval according to the operating frequency and the loading conditions.
- Before reapplying lubricant, completely clean Load chain.
Lubricate in the no-load condition.
- If a suspended load is close to the rated load, continuously monitor the condition of Load chain and reapply lubricant if necessary.
- Use heavy gear oil, for example, "Shell Omala Oil 680", etc.

(4) Hook Block, Load Hook

- Every time when the hoist is disassembled for inspection, maintenance, or replacement of Load chain, lubricate the support bearing (Steel ball) of Load hook.

(5) Brake Part

- Each time the hoist is disassembled for inspection, maintenance or repair, completely clean the inner mechanism and reapply lubricant.
For lubricating position, see Chapter 9 " Inspection of Brake and Service Limit".
- For lubricant, use lithium saponified silicon grease corresponding to the No.2 class of NLGI (National Lubrication Grease Institute).
For example, use "Molykote Grease 33".

(6) Recommended Lubricants

The following table shows the recommended lubricants.

Always use the same type or equivalents recommended by the oil manufacturer.

Manufacture	Air motor (Lubrication)	Reduction gear (Incl. bearing of Reduction gear)	Other bearings
Exxon Mobil	Mobil DTE Light	Mobilux EP0	Mobilux EP2
Cosmo Oil	COSMO ALLPUS32	COSMO GREASE DYNAMAX EP No.0	COSMO GREASE DYNAMAX EP No.2
JX Nippon Oil & Energy	FBK OIL RO32	EPNOC GREASE AP(N)0	EPNOC GREASE AP(N)2
Shell	Tellus Oil S2 M32	Alvania Grease EPR0	Alvania Grease EP2

2. Inspection

☐ CAUTION

- Be sure to shut off the air supply before inspection.
- Always disassemble the hoist on the floor.
- Always use original genuine parts for replacement.
- Always employ qualified or well trained personnel for inspection and maintenance.

(1) Inspection of Hook and Service Limit

- If any of the following conditions apply to the inspected Hook, never reuse, always replace with a new Hook.

Never repair Hook.

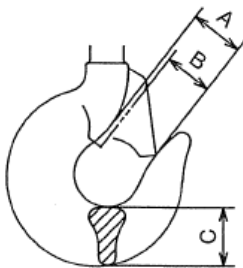
- Hook opening is visibly stretched, or opening dimension is different from the specified.
- Hook is deformed or cracked

Carefully check for any bends or cracks on the hook shank.

- Wear on the hook saddle, where the lifting sling (suspension fastening) rests, exceed the service limit.
- Hook latch is damaged or malfunctioning.

- Major Dimensions of Hook and Wear Limit

For hook opening dimensions A and B, measure Hook before use, as a reference for later inspections.



(mm)

Model		Standard dimension		C	
		A	B	Standard dimension	Service Limit
EHLK-1TS	Top hook	35.5	33	36.5	34
	Bottom hook	31.5	29	31	28.6
EHLK-2TW	Top hook	35.5	33	36.5	34
	Bottom hook	35.5	33	36.5	34

(2) Inspection of Load Chain and Service Limit

Clean Load chain using solvent so any damage can be located.
The inspection should be carried out on each link of Load chain.
Never use acidic solvent.

■ Never use Load chain having any one of the following defects.

Replace it with a new Load chain.

Never repair Load chain.

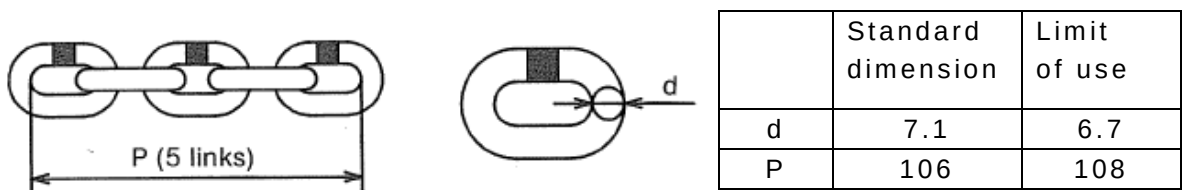
- Flaws or cracks. In particular, carefully check the welds on the links and end links which are connected to the main body or Load hook (Hook holder).
- Deformed or corroded.
- Stretch exceeds the service limit.
- Reduction of diameter exceeds the service limit.

■ Limit of Stretch and Wear

For dimensions P and d, measure the entire working length of Load chain.

Pay special attention to the links which engage Chain wheel when the load is at the upper or lower limit. If the hoist is always used for the same lifting distance, wear on these links will be about two to four times that of others links.

For dimension P, measure the length of 5 links while tensing Load chain as shown in the figure below.



- When any number of links in the working length reaches or exceeds the service limit, replace the entire chain.

■ Replacement Parts and Maintenance after Inspection

- Never use a new Load chain with a worn Chain wheel.
Replace Load chain and Chain wheel at the same time.
- See Chapter X I "Replacement of Load Chain".
- **Always use a manufacturer's genuine replacement chain.**
Never use any other chain.
- Always coat Load chain with lubricant after inspection or upon replacement.
See Chapter IX "1. Lubrication".

(3) Inspection of Brake and Service Limit

Disassemble the brake and inspect the lining and component parts.

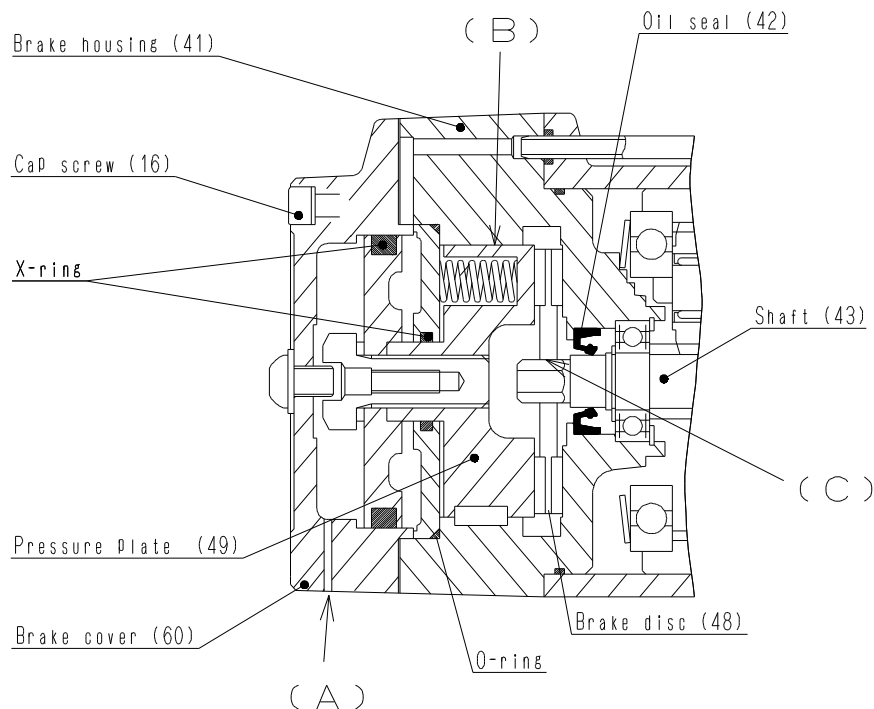
■ Disassembly of Brake

For details, see Chapter XIII "1. Procedures of Disassembly".

- Loosen Cap screws(16) sequentially by 1/6 turns, and remove Brake cover(60).
- Check grease from the reduction gear has not leak through Oil seal(42) when removing Brake disc(48) from Brake housing(41).
- If grease leakage is found, remove Brake housing(41).
Loosen cap screws sequentially by 1/6 turns.
- Clean each parts.

NOTE:

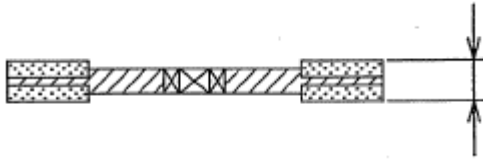
- Never use solvent when cleaning Oil seal(42), X-rings(53),(56) or O-rings(23),(40),(54).
- If oil adheres to the lining, wipe off with a cloth wetted with solvent.
- Be careful to prevent solvent or foreign matters entering the air circuit of the brake.



■ Inspections should be performed on all parts, checking cracks, flaws, deformation and wear. In particular, check the following items:

- Does wear on the lining exceeds the service limit?
- Is Spring (51) decayed, cracked or flawed?
- Are there any pressed marks or cracks at engaged part (C) between Brake disc (48) and Shaft (43)?
- Is air exhaust hole (A) on Brake cover (60) open?
- Are there flaws, deformation or wear on Oil seal (42) and X-rings (53),(56)?
- Are there any flaws on the shaft surface where Oil seal (42) rests?

■ Wearing Limit of Lining



Standard dimension	Limit of use
7.5	5.5

■ Solution

- Replace cracked, flawed, deformed or worn parts.
- Replace Oil seal(42), if grease has leaked from the reduction gear.
Wipe up any grease adhering to the lining, etc., by using a cloth wetted with solvent.
If Shaft(43) is worn or flawed, replace it with new one.
- Replace Brake disc(48) if wear on the lining exceeds the service limit.
Even if wear is close to the service limit but not exceeding, replacement is recommended.
- Replace Springs(51) at the same time as Brake disc(48).
- Replace all Springs(51) at the same time.

■ Assembly

- See Chapter XIII "2. Reassembly" for assembling procedure.
- Apply "Molykote Grease 33" to the sliding surface of X-rings(53),(56), sliding surface (B) of Pressure plate(49) and Brake housing(41), and engaged part (C) between Brake disc(48) and Shaft(43) before assembly. (See Chapter IX "1. Lubrication").
- Thinly coat the sliding surface (B) of Pressure plate(49) and engaged part (C) of Shaft(43) with grease.
- Brake is self-adjust system. Therefore adjustment is not required.

(4) Inspection of Chain Wheel

- Are there any visible indents from Load chain on the pocket of Chain wheel?
- Is there any deformation, or cracks?
Carefully check the filleted and connected sections of the shaft.
- Are Bearings damaged or worn?
Those which do not rotate smoothly (feels rugged when manually rotated) are beyond their service limit.
- Replace Chain wheel at the same time as Load chain.

(5) Inspection of Hook Holder and Hook Block

■ EHLK-1TS

- Is there any deformation, cracks, or indents on Hook holder?
Carefully check the part where Load chain is attached.
Is there any wear or indents on the raceway surface of Steel ball?
- Are there any pressed marks, deformation, flaws, cracks, or corrosion on the chain anchor pin?
- Is Ring deformed?
Is there any play when Ring is fitted in the groove?
- Are there any cracks on Steel balls?

■ EHLK-2TW

- Is there any deformation or cracks on Hook case?
Carefully check the part where the support bearing of Load hook is attached.
- Are there any cracks on Hook rings?
- Are Bearings damaged or worn?
Those which do not rotate smoothly (feels rugged when manually rotated) are beyond their service limit.
- Are Bolts loose?

(6) Inspection of Casing (Main body Case • Gear housing • Motor housing)

- Are there any flaws, cracks, or deformation?
Carefully check the part where Top hook and the chain anchor pin are installed.
- Is there excessive wear on the contact surface from Load chain?
- Are there any pressed marks, deformation, flaws, cracks or corrosion on the chain anchor pin? Is Split pin in place?
- Has Bolt, which fixes the dead end of Load chain (end link on the non-loading side), dropped or is it loose?
- Are Bolts loose?

(7) Inspection of Pendant Control

- Is Control hose damaged, or is the connection part loose?
- Does the push button correctly return to the neutral position after being pushed?
- Is there any damage to Switch case?
- Are Bolts loose?

(8) Inspection of Valve (Main Valve)

- Is there any deformation or cracks on Control lever?
- Is the tightening bolt loose?
- Does Control lever quickly return to the neutral position after being pushed up or pulled down?
- Is Cover deformed?

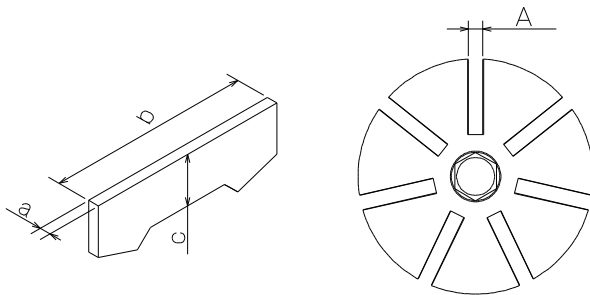
Clogging of Strainer in Adapter at the inlet port may reduce hoist performance.
Therefore, clean Strainer periodically.

(9) Inspection of Air Motor

■ Replace parts which show the following conditions:

- Vanes are warped (curved), seized or cracked.
Wear on Vanes exceeds the service limit.
- Side face of Rotor is gouged or seized.
- The vane slot of Rotor is worn beyond the service limit of is narrower than the standard dimension.
- Rotor is cracked, or there is a visible indent or deformation on the contacting surfaces between Rotor and Coupling.
- End plate is gouged or seized, or the surface is rough due to wear.
- Abnormal wear, flaw or corrosion is found on/in Cylinder.
- Bearings are damaged, worn, or do not rotate smoothly (feels rugged when manually rotated).
- Silencer is clogged.

■ Wearing Limit of Vane and Rotor



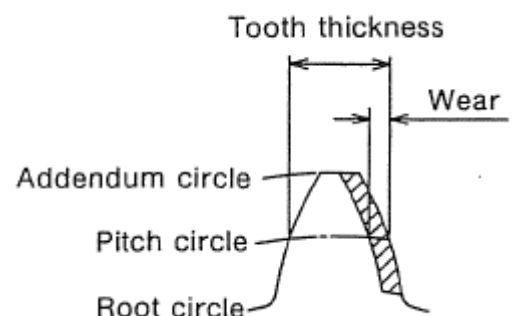
	Standard dimension	Limit of use
A	3.5	3.9
a	3.2	2.9
b	60.0	59.5
c	15.0	14.0

(10) Inspection of Coupling

- Are there any cracks, visible indents or deformation on the internal hexagon part?

(11) Inspection of Reduction Gear Part

- Are there any shavings, burrs, marks, or deformation on the engaged parts at each end of Shaft?
- Is any part deformed or cracked?
- Are Bearings damaged or worn?
Those which do not rotate smoothly (feels rugged when manually rotated) are beyond their service limit.
- Wear limit of Gear on the pitch circle should be within 10 % of the original dimension of tooth thickness. However, the limit for the first stage should be 5 %.



(12) Inspection of Chain Bucket

- Is there excessive wear on fabric Chain bucket?
- Are the mounting bolts loose?
- Is there any dust or foreign matters in Chain bucket?
- Chain bucket should be large enough to contain entire Load chain.

(13) Inspection of Trolley

- Are the mounting bolts for the I-beams stopper (rail stopper) loose?
- Check the trolley wheels track the rail properly.
Is the rail excessively worn?
- Are the trolley wheels or the side rollers damaged or worn?
- Check all supporting members are not deformed, cracked or worn.

(14) Inspection of Lifting Slings

- Is the cable kinked, worn or flawed?
- Is the sling chain worn (reduction of diameter) or cracked?
Is the pitch of the sling chain stretched?
- Is hook, shackle, or ring deformed, cracked or worn?

(15) General Operation Inspection

After completing the inspections described in the foregoing sections, reassemble the whole unit according to Chapter XIII "2. Reassembly" and inspect as follows:

■ Idling

- Check that the push button switches can be easily operated and that up/down operation is correct as stopper indicated.
- Check that hoisting speed can be changed from low to high speed by controlling the pushing force on the push button switches.
- Check that Load chain flows freely and smoothly into and out of Chain wheel and there is no noise indicative of binding or other malfunctions.
- Check Upper and Lower limit switches function correctly.

See Chapter V "3. Hoisting and Lowering Limit Switches".

- Check the hoist is not abnormally noisy or vibrating.

■ Rated Load Test

- Check for malfunctions while lifting and lowering.
Operate the hoist at least twice through the full range.
- Lift the rated load a few inches off the floor and check ability of braking system to stop and hold the load without excessive drift.
- Check Load chain flows freely and smoothly into and out of Chain wheel and that there is no audible clicking or other evidence of binding or malfunction.
- Check there is no significant reduction in the hoist performance.
- Check the hoist is not abnormally noisy or vibrating.
- Be alert to unusual visible or audible signs which may indicate a defect.
Do not operate the hoist until are defects have been determined and corrected.

3. Storing the Hoist

If the hoist is to be stored for a long time, supply lubricating oil type rust preventive oils (class2) ,through the air inlet port and run the hoist at low speed for several seconds. Store the hoist in a dry location.

4. Troubleshooting



CAUTION:

If a malfunction occurs during the operation of the hoist, stop operating immediately and take the necessary steps to rectify the problem. Careless repairs can cause damage to the hoist or personal injury. Therefore, be careful but thorough when making repairs.

The following table shows the probable causes and solutions of common malfunctions.

Malfunctions	Main causes	Solution
Motor does not run. Slow rotation or no rotation of Motor.	• Insufficient air pressure. • Supplied air volume is insufficient. • Inner diameter of pipe is too small. • Strainer in Adapter at air inlet port is clogged. • Silencer is clogged. • Powder or dust in Motor. • Vanes have been enlarged due to moisture or long term storage. • Vanes are burned due to the dry operation. • Vanes are worn or damaged. • Main valve does not open. • Control lever is bent or damaged. • Brake does not release. • Reduction gear: Incorrect assembly. Or gears, bearings, etc., are worn or damaged.	• Increase air pressure. • Increase compressor output. • Replace pipe with a large inside diameter. • Clean Strainer. • Replace with new Silencer. • Clean Motor then lubricate. Clean air filter and replace filter element. • Replace Vanes. Discharge drain water from air filter. Or clean air filter and replace filter element. • Clean Motor and polish Vanes Replace Vanes if required. Supply oil to lubricator or clean lubricator. • Replace Vanes. • Tighten connecting bolt on the respective part. or disassemble and check. • Replace Control lever. • Clean air circuit of the brake. Thereafter, perform leakage test. • Disassembly and check. Replace the worn or damaged parts.
Brake does not work sufficiently.	• Lining is worn. • Oil adheres to lining. • Air exhaust hole on Brake cover is clogged. • Main valve does not return to the neutral position.	• Replace with new Brake disc. • Clean. Replace oil seal if required • Clean. See Chapter IX "2.(3) Inspection of Brake and service Limit". • Check the operation system, e. g., bending of Control lever. Disassemble and check Valve housing if required.

X. Adjustment of Operating Limit of Control Lever

Control lever(147) has been adjusted before shipping so it touches Motor housing(62), physically stopping Control lever before Main valve reaches the operating limit position. This prevents Main valve from overloading.

■ Re-adjust Control lever for each lifting and lowering direction in the following manner



CAUTION: Before readjustment, be sure to shut off the air supply.

1. Loosen Hex. nut(151), and screw Hex. head bolt(150) completely into Control lever(147).
2. Loosen Hex. head bolt(150) until it touches Motor housing(62) while Control lever(147) is being pulled down.
3. Release Control lever(147), and loosen Hex. head bolt(150) another 1 turn, then lock Hex. head bolt(150) with Hex. nut(151).

XI. Replacement of Load Chain

Chain wear or damage can not be detected by casual observation.

Inspect Load chain according to Chapter IX "2.(2) Inspection of Load Chain and Service Limit". Always use a manufacturer's genuine replacement chain. Never use any other chain.

1. For Single Chain Fall Hoist: EHLK-1TS, Method 1 (See Fig. 6)

-1) Remove old Load chain. See Chapter XIII"1. Procedures of Disassembly".

CAUTION

: When removing old Load chain, do not place your hands in an area where they may be injured. Be sure to shut off the air supply after removing old Load chain.

-2) Loosen Cap screws(16) sequentially by 1/6 turns, and remove Brake cover(60).

Remove Pressure plate(49), Cylinder cover(52), and Brake piston(55) in a body from Brake housing(41) to expose Shaft(43).

-3) Pass a steel wire through Casings(6),(14).

Attach the end link of new Load chain to the steel wire on the loading side "A".

-4) Pull Load chain into Casing by pulling the steel wire.

The first link must be a standing link [link perpendicular to Chain wheel(9)].

NOTE : The weld must face away from the center of Chain wheel(9).

Check also the subsequent standing links have the weld facing outwards.

-5) Rotate Shaft(43) by hand to feed Load chain through the hoist.

-6) When the first link comes out, pass it through the middle of Control lever (147), then fix to hoist with Hex. head bolt(156), Plain washer(154), and U-nut(157) without twisting Load chain.

WARNING :

Make certain there are no twists on the non-loading side of Load chain between Chain wheel(9) and the end link. Using the hoist with Load chain is twisted could result in damage to the hoist or the Load chain breaking, causing personal injury.

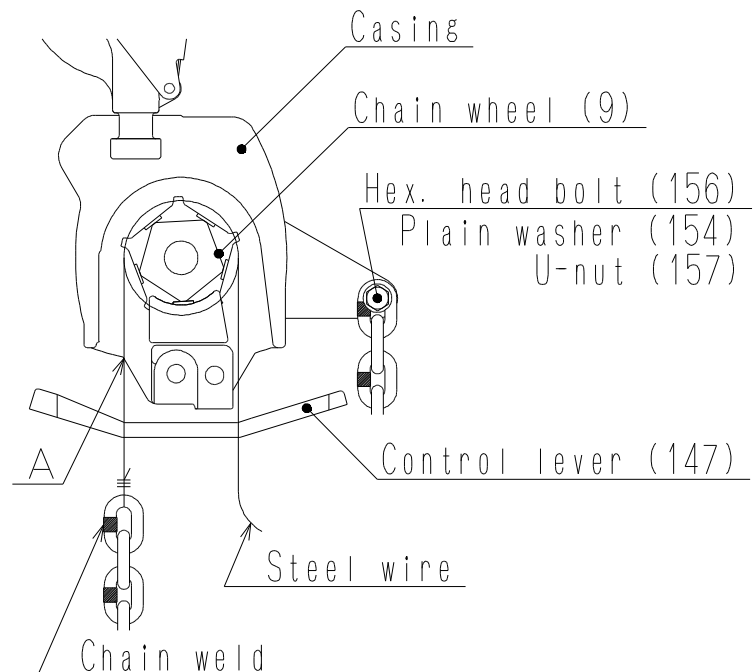


Fig.6

- 7) Insert the end link of Load chain on the loading side into Hook holder(169), and fix with Pin(173). Then attach Ring(174).
 - 8) Clean the brake parts and inspect them before reassembling.
 - 9) Lubricate Load chain according to Chapter IX "1. Lubrication".
 - 10) Run Load hook (Bottom hook) up and down several times under power with no load to make certain Load chain is running smoothly over Chain wheel.
- There must be no apparent binding or evidence of malfunctioning.
2. For Double Chain Fall Hoist: EHLK-2TWK, Method 1 (See Fig. 6 & 7)

⚠ WARNING :

The replacement chain for the double Chain fall hoist must have an odd number of links.

- 1) Feed Load chain through Chain wheel(9) in the same manner of steps -1)~6) for Single Fall Hoist (EHLK-1TS), and fix the end link to hoist with Hex. head bolt(156), Plain washer(154), and U-nut(157).

⚠ WARNING :

Make certain that there are no twists on the non-loading side of the Load chain between Chain wheel(9) and the end link. Using the hoist when the Load chain is twisted could result in damage to the hoist or the Load chain breaking, causing personal injury.

- 2) Pass a steel wire through Hook case (178). Attach the end link of Load chain on the loading side to the steel wire.
- 3) Make certain that Load chain is straight, then feed Load chain through Hook case(178) by pulling the steel wire.

NOTE:

The first link must be a standing link [link perpendicular to Chain wheel (179)]. The welds on all standing links must face away from the center of Chain wheel.

- 4) Keep Load chain at the loading side straight, fix the end link to the position "B" of Casing by using Pin(163) and Split pin(164). Be sure to bend the ends of Split pin (164) after installation.

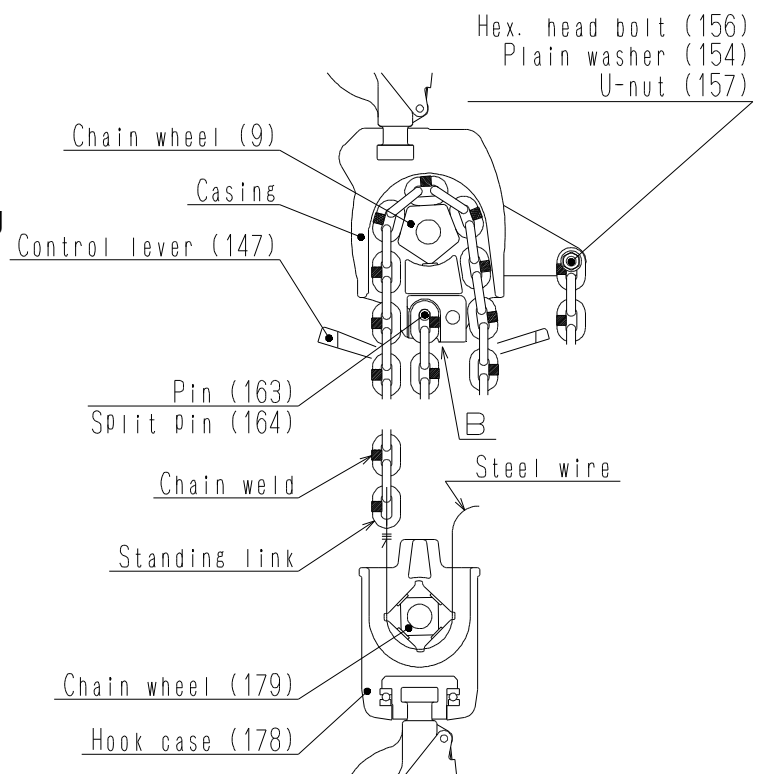


Fig.7

⚠ WARNING :

Make certain there are no twist on the loading side of the Load chain between the hoist and Hook block (Hook case). Using the hoist when the Load chain is twisted could result in damage to the hoist or the Load chain breaking, causing personal injury. See Chapter V "1. Load Chain"

- 5) Clean the brake parts and inspect them before reassembling.
 - 6) Lubricate Load chain according to Chapter **IX "1. Lubrication"**.
 - 7) Run Load hook (Bottom hook) up and down several times under power with no load to make certain Load chain is running smoothly over Chain wheel.
- There must be no apparent binding or evidence of malfunctioning.

3. Method 2 (See Fig. 8)

WARNING

: The replacement chain for the double chain fall hoist (EHLK-2TW) must have an odd number of links. When replacing the Load chain, do not place your hands in an area where they may be injured. Always shut off the air supply before cutting Load chain, removing or fixing the end link of Load chain, or loosening or tightening the bolt.

- 1) • For Single Chain Fall Hoist:
Disconnect the end link of Load chain from Hook holder(169).
- For Double Chain Fall Hoist: EHLK-2TW
Remove Pin(163), disconnect the end link of Load chain from Casing(6), (14), and withdraw Load chain from Hook case(178)(Hook block assembly).
- At this stage, do not remove Load chain from the hoist.
- 2) Using an abrasive wheel, etc., cut a portion of the second link from the end (i.e. the first flat link) as shown in Fig. 8.

NOTE:

Do not distort the link in any manner. otherwise Load chain will not pass over Chain wheel.

- 3) Connect new Load chain to old Load chain by hooking the end of new Load chain onto the cutaway link.
The first link of new Load chain must be a standing link [link perpendicular to Chain wheel(9)].

NOTE:

The weld must face away from the center of Chain wheel(9). Check also that the subsequent standing links have the weld facing away. Slowly operate the hoist in the lifting direction, feeding out old Load chain, leaving new Load chain on the Chain wheel(9).

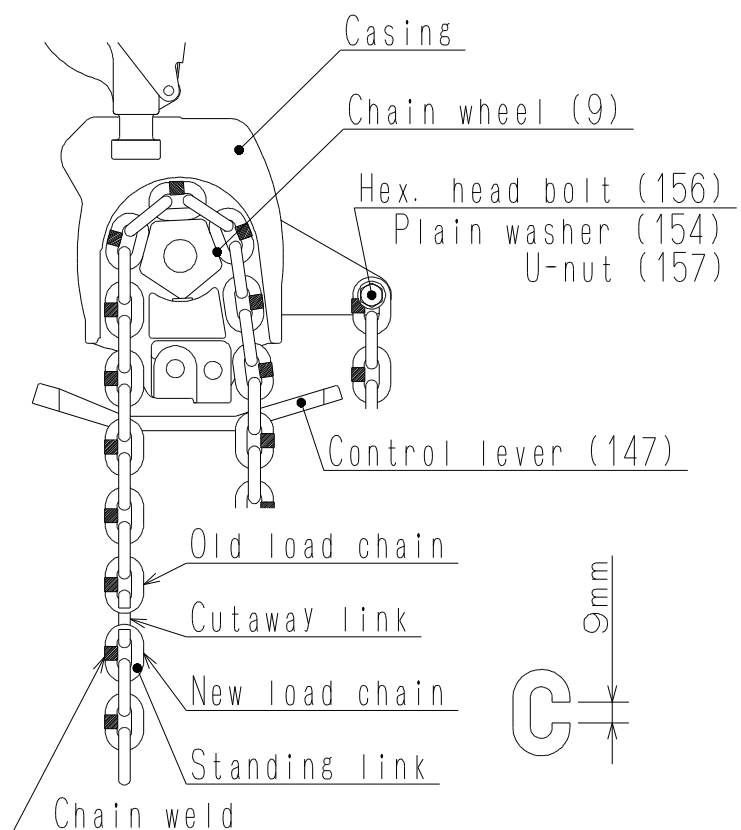


Fig.8

- 4)When the end link of new Load chain comes out, pass it through the middle of Control lever(147), then fix to hoist with Hex. head bolt(156), Plain washer(154), and U-nut(157) without twisting Load chain.

WARNING

: Make certain there are no twist on the non-loading side of the Load chain between Chain wheel(9) and the end link. Using the hoist when the Load chain is twisted could result in damage to the hoist or the Load chain breaking, causing personal injury.

- 5)For Single chain Fall Hoist :EHLK-1TS
Insert the end link at the loading side into Hook holder (169), and fix with Pin (173). Then attach Ring (174).
- 6)For Double chain Fall Hoist : EHLK-2TW
- 1.Pass a steel wire through Hook case(178) . Attach the end link of Load chain on the loading side to the steel wire.
 - 2.Make certain that Load chain is straight, then feed Load chain through Hook case(178) by pulling the steel wire.

NOTE:

The first link must be a standing link [link perpendicular to chain wheel (179)].
The weld on the standing links must face away from the center of chain wheel.

3. Keep Load chain on the loading side straight, fix the end link to the position "B" of Casing by using Pin(163) and Split pin(164) after installing.

WARNING :

Make certain there are no twists on the loading side of the Load chain between the hoist and Hook block (Hook case). Using the hoist when the Load chain is twisted could result in damage to the hoist or breaking Load chain breaking, causing personal injury. See Chapter V "1. Load Chain".

- 7)Lubricate Load chain according to Chapter IX **"1. Lubrication"**.
- 8)Run Load hook (Bottom hook) up and down several times under power with no load to make certain Load chain is running smoothly over Chain wheel.
There must be no apparent binding or evidence of malfunctioning.

XII. Overload protection adjustment



WARNING :

The load adjustment must be set during operating the hoist.
You must take particular care.

Re-adjustment of the load must be necessary after disassembling the over load valve.
Perform the following procedure:

- 1) Suspend the hoist on the supporting member which supports both the hoist's weight and the rated capacity load weight in safe.
- 2) Supply compressed air to the hoist (acceptable range is 0.4 to 0.6 Mpa)
- 3) The bolt (124) must be adjusted clockwise until it stops.
- 4) Attach the capacity load and check that ordinary operation is available.
Also check the overload protection is not activated during this operation. If the overload protection is activated, adjust bolt (124) anticlockwise 1/4 turn at one time. Then try to up operation. Keep doing this adjustment until the overload protection is not activated.

NOTE: Impact load makes adjustment wrong.
Do not take impact load during this adjustment.

- 5) Attach 125% of the capacity load, check the overload protection is activated.
If the overload protection is no activated, adjust bolt (124) clockwise 1/4 turn at one time.
Then try to up operation . Keep doing this adjustment until the overload protection is activated.

After the 5) adjustment, re-check the overload protection is not activated doing up operation with capacity load.

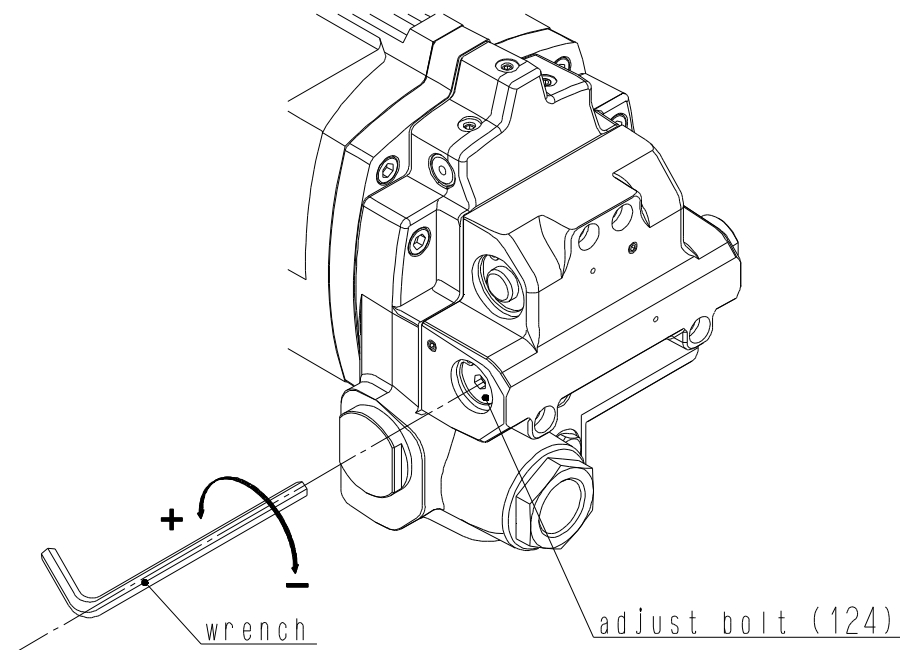


Fig.9

XIII. Disassembly and Reassembly

CAUTION

- Be sure to shut off the air supply before disassembly or reassembly.
- Place the hoist on the floor before disassembly or reassembly.
- Careless mistakes during maintenance may cause damage to the hoist or personal injury. Therefore, take care during maintenance.
- Always employ qualified or well trained personnel for maintenance.
- Whenever grasping a part in a vise, always use copper-covered vise jaws to protect the surface of the part and help prevent distortion.

1.Procedures of Disassembly

Referring to the disassembly drawing (on Page 39), disassemble the hoist as the following procedure:

- 1) Remove the hoist from the supporting member.

WARNING

Release a load, shut off the air supply, disconnect the piping, then remove the hoist. If this is neglected, serious danger will occur.

- 2) Remove Link chain(161),(162) (Load chain).
 - (1) Remove Hex. head bolt(156) and disconnect the dead end of Link chain from the hoist.
 - (2) Suspend the hoist at about 1.5 m high using a crane, etc., and connect the temporary piping. Pressure of the air supply should be 0.4 ~ 0.6 MPa {4 ~ 6 kgf/cm², 60 ~ 85 psi }.
 - (3) Slowly operate the hoist in the lowering direction and remove Link chain from the hoist.

CAUTION

Link chain drops down at the moment it is disengaged from Chain wheel. So be careful.

- (4) After shutting off the air supply, disconnect the piping and lower the hoist onto the floor.
- 3) Remove Chain bucket(185).
- 4) For Double Fall Hoist: EHLK-2TW Remove Pin(163), remove Link chain.
- 5) Remove Button head cap screw(155)
Stand the hoist with Brake cover(60) facing downwards and Valve housing(117) upwards. Support Hook(1) to prevent the hoist from falling down, e.g., by jack.
- 6) Remove Cap screw(145),(146), and Valve housing(117).
- 7) Valve housing unit(117~144)
 - (1) Remove set screw(126).
 - (1) Remove Retaining ring(127), and Bolt(124), and stopper(122), and Spring(121).
 - (2) Screw the bolt (M3 P=0.5) into Spool(118) and remove.
 - (3) Remove Cap (125), (136).
 - (4) Remove Retaining ring(135), and Cap(133), and Spool(130), and Spring(137)

- 8) Loosen Cap screws(115),(116) , and remove Valve housing(83).
- 9) Valve housing unit(83~114)
 - (1) Remove Cap (87), and screw the bolt (M4 P=0.7) into Spool(85) and remove.
 - (2) Remove Retaining ring (109), and Cap (108).
 - (3) Remove Button head cap screw (104), and Bolt (106)
 - (4) Remove Shaft (103), and lever (102)
 - (5) Remove Cap (98), and Spring(97), and Valve cone(96).

NOTE: Do not remove Liner(93) except when O-ring(94) or Liner(93) itself is required to be replaced .Plug(90) and Set screws(91),(92) are fixed with sealant. Do not disassemble them unless it is required. If they are disassembled, replace Ball(89) and Plug(90) with new ones.

- (6) When disassembling the shuttle valve [Ball(89) and Plug(90)]:
First remove Bolt(95) and Liner(93), and screw the bolt (M4 p=0.7) into Plug(90). Next, heat Set screw(92) and Plug(90) to about 200 °C using a burner, etc., and remove Set screw(92), then withdraw Plug(90) by pulling the bolt before they become cool.
- 10)Loosen Cap screws(82) sequentially by 1/6 turns, and remove Spacer (81).
- 11)Screw Cap screws(116) into the tap hole of End plate(75), and remove Air motor.
Remove Coned disc spring(68).
- 12)Air motor unit(69 ~ 78)
 - (1) Keep Air motor vertically using a vise, be grasping its connecting section to the Coupling(61).
 - (2) Remove Countersunk head cap screw(78) and remove End plate(75).

NOTE: Countersunk head cap screw(78) is fixed with adhesive. If it is tight, do not apply excessive force. In this case, heat Countersunk head cap screw to about 200°C using a burner, etc., then remove before it becomes cool.

- (3) Remove Vanes(73), and Spring(74), and Cylinder(75).
- (4) Take off Rotor(71) from the vise.
Place Rotor(71) with End plate(69) facing downward as shown in Fig. 10, and check Rotor rotates smoothly.
If smoothly rotating, do not remove Rotor (71) from End plate(69).

NOTE:

End plate(69) and Rotor(71) are adjusted with suitable clearance by means of Ball bearing(70) in End plate.
Do not disassemble Rotor(71) unless it is required. Each part is fitted using an interference fit.

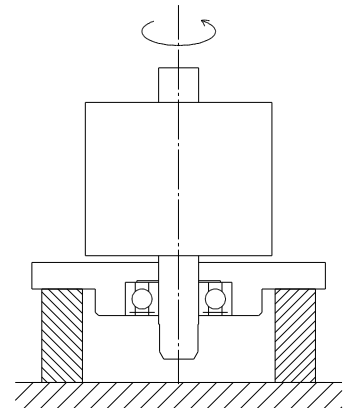


Fig.10

- (5) If disassembly is required, remove Rotor (71) from Ball bearing(70) in End plate(69) by using a jig and hand press.

- 13) Loosen Hex. head bolt(64) sequentially 1/6 turns, remove Motor housing(62).
- 14) Withdraw Pipe(79) toward Valve housing(83) side.
Remove Coupling(61).
- 15) Turn the hoist upside down so the mounting side of Motor housing(62) is facing downwards and Brake cover(60) is facing upward, and place them on a block (jig) to prevent Shaft(43) from thrusting up At this point, be careful not to separate Casings(6),(14) from Gear housing (32). The thickness of the block is required to be about 20 mm.
- 16) Brake unit(48~60)
 - (1) Loosen Cap screws(16) sequentially by 1/6 turns, remove Brake cover(60).
 - (2) Remove Bolt(58), remove Brake piston(55) and Cylinder cover(52).
 - (3) Remove Pressure plate(49) and Brake disc(48).

NOTE: Check grease from the reduction gear has not leaked through Oil seal(42) when removing Brake disc(48) from Brake housing(41).

- 17) Loosen Cap screws(47) sequentially by 1/6 turns, remove Brake housing(41) and Shaft(43) together.
- 18) Remove Retaining ring(46), and Shaft(43) and Ball bearing(44) together from Brake housing (41).
- 19) Remove Coned disc spring(39), Ball bearing(31), Gear wheels(37), Planet shaft(36), Internal gear(35), Coned disc springs(34), and Gear wheel(24).
- 20) Lift up Gear housing(32) and remove.

NOTE: Lock screw(33) is sealed with sealant.
Do not remove unless a problem is found such as damage on Gear housing(32) or Lock screw itself.

- 21) Remove Ball bearing(31), Internal gear(30), and Planet shaft(25).
Remove Pin(28) and Gear wheel(26) from Planet shaft(25).
- 22) Remove Gear wheel(24), Internal gear(22), and Planet shaft(17).
Remove Pin(21) and Gear wheel(19) from Planet shaft(17).
- 23) Remove Cap screw(16).
Separate Casing(6) and Casing(14), and remove Hook(1) and Chain wheel(9).

2. Reassembly

NOTE

- Before reassembly, thoroughly clean all disassembled parts and check for cracks,
- flaws, deformation and wear.
- Never use acidic solvent for cleaning.
- Replace any damaged or excessively worn parts.
Also replace burred or damaged screws.
- Never use solvents to clean rubber parts, such as O-ring, X-ring, Oil seal, etc., or plastic parts.
- Do not clean shielded Ball bearings(8), (11), (44), (181).
If they are contaminated with foreign matter, replace them.
- Always replace the split pin with a new one at reassembly.
- Whenever grasping a part in a vise, always use copper-covered vise jaws to protect the surface of the part and help prevent distortion.
- Always press on the inner ring of a ball-type bearing when installing the bearing on a shaft.
- Always press on the outer ring of a ball-type bearing when pressing the bearing in a bearing recess.
- Always press against the stamped end of a needle-type bearing when pressing the bearing into a bearing recess.

Referring to the disassembly drawing (on Page 39), reassemble the hoist using the following procedure:

- 1) Assembling direction for Retaining ring (See Fig. 11)
Set up Retaining ring so that the non-chamfered face bears the load.

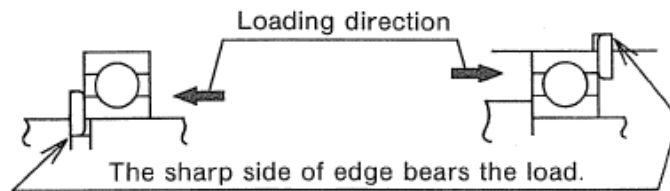


Fig.11

- 2) Hook unit(1~ 5), (165 ~ 168)
- (1) Degrease the internal threads of Pin(4) and Screws(5) using solvent.
 - (2) Attach Hook latch(2), Spring(3) and Pin(4) on Hook(1).
Apply adhesive to the internal threads of Pin(4) and tighten Screws(5).
Use Loctite 262 or equivalents as adhesive.
 - (3) Attach Hook latch(166), Spring(167) and Rivet(168), and rivet the end of Rivet(166).
- 3) Casing unit(6~16)
- (1) Install Ball bearing(11) and Oil seal(10) into Chain wheel(9).
 - (2) Install Spring pin(13) into Chain guide(12) so both ends of Spring pin protrude same amount from each face of Chain guide.
 - (3) Press Ball bearing(8) into Casing(6) using a hand press.
Using the inner ring of Ball bearing(8) in Casing(6), for support, press Chain wheel(9) into Ball bearing using a hand press.
Install Chain guide(12) on Casing(6) using the space of Chain wheel pocket.
 - (4) Install Hook(1), and place Casing(14) on Casing(6).
Using the outer ring of Ball bearing(8) in Casing(6) for support, press Ball bearing(8) into Casing(14) using a hand press.
 - (5) Tighten Cap screw(16) with the torque of 13.7~15.2 N·m { 1.40~1.55 kgf·m }

- 4) Set up Casing so that Casing(14) is facing downward and Casing(6) is facing upward. Install Pins(7) into Casing(6).
- 5) Place Casing(6),(14) on a block (jig) to prevent Shaft(43) from touching the workbench during its installation. The thickness of the block is required to be about 20 mm.
- 6) Reduction gear unit
 - (1) For lubrication volume and types of grease, see Chapter IX "1. Lubrication".
 - (2) Lubricate Needle bearings(20),(27),(38) and Ball bearings(29),(31) with grease individually when assembling.
 - (3) Press Bushing(18) and install Gear wheels(19) to Planet shaft(17), and install them into Casing (6).
 - (4) Install Internal gear(22) and O-ring(23), and lubricate the gear portion with grease.
 - (5) Press Bushing(18) into Gear wheel(24), then install them into Planet shaft (17).
 - (6) Fix Gear wheels(26) and Ball bearing(29) to Planet shaft(25), and install them onto Planet shaft(17).
 - (7) Install Internal gear(30), and lubricate the gear portion with grease. Install Ball bearing(31).
 - (8) Degrease Lock screw(33) and the setting position on Gear housing(32) using solvent. Apply sealant to the bearing surface of Lock screw(33) and tighten it with a torque of $20 \sim 25 \text{ N} \cdot \text{m}$ $\{2.0 \sim 2.5 \text{ kgf} \cdot \text{m}\}$. (See Fig. 12) Use Loctite 510 or equivalents as sealant.
 - (9) Attach Gear housing(32) from above.
 - (10) Install Internal gear(35), Gear wheel(24), Coned disc springs(34), Planet shaft(36), Gear wheels(37) and Ball bearing(31) in this order. See Fig. 13 for the setting direction of Coned disc springs(34) and Gear wheels(37).

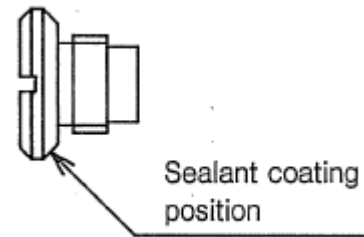


Fig.12

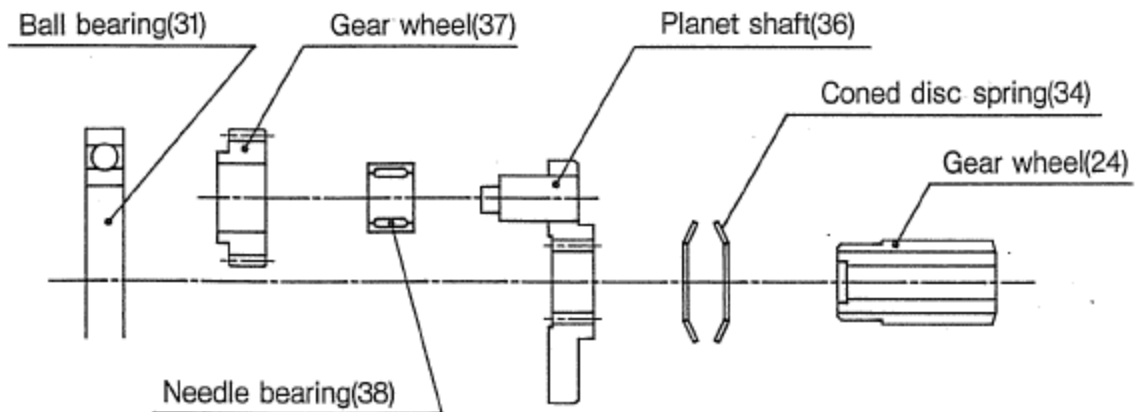


Fig.13

- (11) Lubricate with grease, and install Coned disc spring(39).
- (12) After installing Shaft(43) in Brake housing(41), they should be installed together in Gear housing(32).
- 7) Install Oil seal(42) in Brake housing(41).
- 8) Install Ball bearing(44) and Retaining ring(45) onto Shaft(43), then install them in Brake housing(41). At this point, be careful not to damage Oil seal(42). Install Retaining ring(46) in Brake housing(41).

- 9) Install O-ring(40) into Gear housing(32).
Install O-ring(23) onto Brake housing(41), and install them into Gear housing (32).
Tighten Cap screws(47) sequentially by 1/6 turns.
- 10) Brake unit(48~60)
 - (1) When assembling, apply "Molykoto grease 33" to the sliding surfaces and engaged parts of each part. For coating positions, see Chapter IX "2.(3) Inspection of Brake and Service Limit". For details of grease, see Chapter IX "1. Lubrication".
 - (2) Be careful grease, etc., does not adhere to the Brake disc (48) lining.
 - (3) Install X-rings(53) and (56) to Cylinder cover(52) and Brake piston(55) respectively.
 - (4) Install Pressure plate(49), Keys(50), Springs(51) and Cylinder cover(52) in Brake housing(41). Fix Brake piston(55) onto Pressure plate(49) by tightening Bolt(58) with a torque of $90 \sim 100 \text{ N} \cdot \text{m}$ $\{9.2 \sim 10.2 \text{ kgf} \cdot \text{m}\}$.
 - (5) Remove Pressure plate(49) and Brake piston(55) together from Brake housing(41).
 - (6) Insert Brake piston(55) into Brake cover(60).
At this point, be careful not to damage X-ring(56).
 - (7) Install Brake disc(48), O-ring(54), Gasket(59) and Pressure plate(49) and Brake cover(60) together into Brake housing(41). Tighten Cap screws(16) sequentially by 1/6 turns.
- 11) Turn the hoist upside down so Brake cover(60) is facing downward and the mounting side of Motor housing(62) is facing upward. At this point, be careful not to separate Casings(6),(14) from Gear housing (32). Support Hook(1) to prevent the hoist from falling down, e.g., by jack. Install Coupling(61).
- 12) Install Needle bearing(63), into Motor housing(62).
- 13) Fix Motor housing(62) to Casings(6),(14), with Hex. head bolt(64), Plain washer(65), CD-washer(66) and Hex. nut(67). Tighten Hex. head bolt(64) with a torque of $61 \sim 66 \text{ N} \cdot \text{m}$ $\{6.2 \sim 6.7 \text{ kgf} \cdot \text{m}\}$.
- 14) Air motor unit(69 ~ 78)
 - (1) Press Ball bearing(70) into the bearing recess on each End plate(69),(75) using a jig and hand press (See Fig. 14).

NOTE:

End plates are fitted to Ball bearing using an interference fit. Replace End plate if the interface between End plate and Ball bearing is loose (no interference).

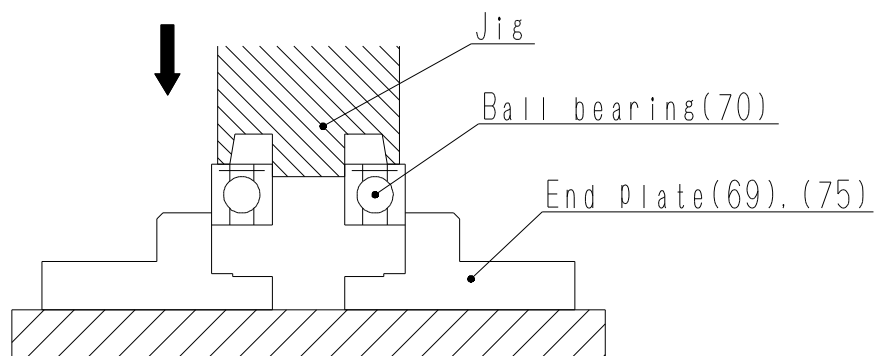


Fig.14

- (2) Using the inner ring of Ball bearing(70) in End plate(69) for support, press Rotor(71) into Ball bearing using a jig and hand press.
Adjust the clearance between End plate(69) and Rotor(71) to 0.02~0.03 mm with End plate facing downwards while subjected to the mass of Rotor. (See Fig. 15)
 If Rotor(71) is not assembled properly, Rotor end will not be parallel to End plate(69), hence the clearance will be unsymmetrical.
 So be careful when assembling.

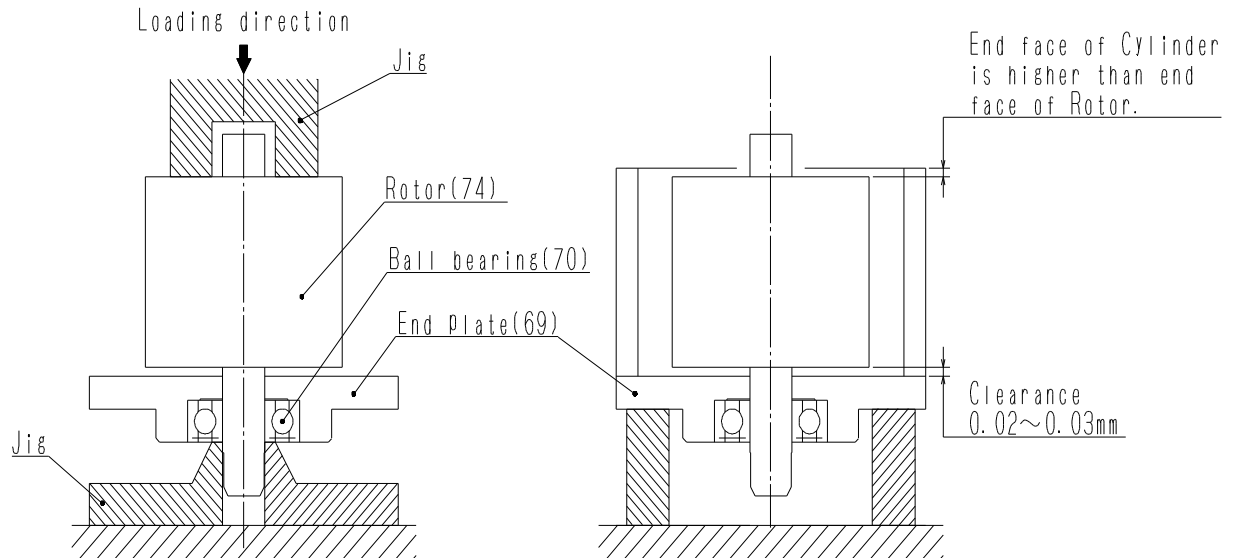


Fig.15

- (3) Degrease the internal thread of Rotor(71), Washer(77) and Countersunk head cap screw(78) using solvent.
- (4) Install Cylinder(72), making certain the end face of Rotor(71) does not protrude from the end face of Cylinder(75) (See Fig. 15).
- (5) Install Vane(76) into each vane slot on Rotor(71), and slightly lubricating the vane portion. Next, apply oil thinly on the end face of Rotor(71) and the outer face of the $\phi 12$ shaft [End plate(75) side]. (Use the same oil used in the lubricator.)
- (6) Install Spring pin(76) into End plate(75) so both ends of Spring pin protrude the same amount from each face of End plate.
- (7) Install End plate(75). Apply adhesive to the internal thread of Rotor(71) and tighten Washer (77) with Countersunk head cap screw(78). Use Loctite 222 or equivalents as adhesive.
- 15) Install Coned disc spring(68) and Air motor into Motor housing(62).
- 16) Insert Pipe(81) into Motor housing(62), and install O-ring(40) on Pipe(79).

- 17) Valve housing unit(83 ~ 114)
 - (1) Treat Liner(93) and Valve cone(96), carefully, as even a small flaw will render them useless.
 - (2) Degrease Plug(90), Set screws(91),(92), Adapter(114) and their setting portions on Valve housing(83) using solvent.
 - (3) Insert Ball(89) into Valve housing(83). Apply sealant to the outer face of Plug(90), and insert Plug(90) into Valve housing(83) so the $\varnothing 4$ hole of Plug(90) [hole perpendicular to longitudinal direction of Plug] aligns with Set screw(92) tapping hole on Valve housing(83). Use Loctite 510 or equivalents as sealant.
 - (4) Install Strainer(113) in Adapter(114). Apply sealant (Loctite 510) to the Adapter(114) surface which contacts with the Valve housing(83) and set screw(91),(92), then screw into Valve housing.
 - (5) Install Needle bearing(63).
 - (6) Apply oil to O-rings(94), and place then onto Liner(93).
(Use the same oil used in the lubricator.) Insert Liner(93) into Valve housing(83) so the oblong hole of Liner aligns with the set hole of Lever(102).
- 18) Place Gasket(80) onto Motor housing(62), and install Valve housing(83). Tighten Cap screws(82) sequentially by 1/6 turns.
- 19) Insert Shaft(103). At this point, sequentially install , O-ring(100), Lever(102) and Control lever(147). Tighten Cap screws(104),(148) with a torque of 13.7~15.2 N·m {1.40~1.55 kgf·m} .
- 20) Adjust the operating limit of Control lever(147). This adjustment is necessary to prevent the parts of Main valve from overloading. See Chapter 10 "Adjustment of Operating Limit of Control Lever".
- 21) Bottom hook unit (141~150): EHLK-1TS
 - (1) Install Hook(141) in Hook holder(145), and insert eight Steel balls(146).
 - (2) Install Washer(147), and Sleeve(148).
 - (3) Insert the end link of Link chain(135) into Hook holder(145), and fix with Pin(149). Attach Ring(150).
- 22) Hook block unit(176~184): EHLK-2TW
 - (1) Install Thrust bearing(176) onto Hook ring(177) so the inner ring (ring with small inside diameter) is engaged with Hook ring.
 - (2) Install Hex. nut(184) in Hook case(178) with the chamfered face of outer periphery facing inwards.
 - (3) Tighten Cap screws(182) with a torque of 31~35 N·m {3.2~3.5 kgf·m} .
- 23) Install Link chain. See Chapter 11 "Replacement of Load Chain".
- 24) Install Chain bucket(185).

XIV. Parts List

Remarks When Purchasing Parts

- Specify part No., part name and model name of the hoist
- State SER. NO. (product No.) clearly if attached.
- Parts without part Nos. can not be supplied individually.
Please purchase a set or complete unit.

■ How to read parts list

Ref No.	Parts No.	Quantity		Description
		EHLK-1TS	EHLK-2TW	
—	LHP000265	1	1	Hook compl.
1	—	1	1	—Hook
—	LHP000266	1	1	—Hook latch set
2	—	1	1	—Hook latch
3	—	1	1	—Spring
4	—	1	1	—Pin
5	—	2	2	—Screw
—	LHP000267	1	1	Casing set
6	—	1	1	—Casing
14	—	1	1	—Casing
7	P2H400040	4	4	Pin
8	KA60103104	2	2	Ball bearing
—	LHP000286	1	1	Chain wheel set

The mark shows the range of set or the completed unit.

■ PARTS LIST EHLK-1TS, EHLK-2TW AIR HOIST

Ref. No.	Part No.	Quantity		Description	Ref. No.	Part No.	Quantity		Description
		EHLK -1TS	EHLK -2TW				EHLK -1TS	EHLK -2TW	
—	LHP000265	1	1	Hook compl.	46	KA40210032	1	1	Retaining ring
1	—	1	1	—Hook	47	KA00910620	5	5	Cap screw
—	LHP000266	1	1	—Hook latch set	• 48	LHP000085	1	1	Brake disk
2	—	1	1	—Hook latch	49	P2H300191	1	1	Pressure plate
3	—	1	1	—Spring	50	P2H400394	2	2	Key
4	—	1	1	—Pin	• —	LHP000086	1	1	Spring set
5	—	2	2	—Screw	51	—	8	8	—Spring
—	LHP000267	1	1	Casing set	52	P2H300192	1	1	Cylinder cover
6	—	1	1	—Casing	• 53	P2H400324	1	1	X-ring
14	—	1	1	—Casing	• 54	KA50200800	1	1	O-ring
7	P2H400040	4	4	Pin	55	P2H300193	1	1	Brake piston
8	KA60103104	2	2	Ball bearing	• 56	P2H400325	1	1	X-ring
—	LHP000286	1	1	Chain wheel set	57	KA32411421	1	1	CD-washer
9	—	1	1	—Chain wheel	58	P2H400395	1	1	Bolt
• 10	P2H400046	1	1	—Oil seal	• 59	P2H300340	1	1	Gasket
• 11	KA60103014	1	1	Ball bearing	60	P2H200096	1	1	Brake cover
12	P2H300268	1	1	Chain guide	61	P2H400599	1	1	Coupling
13	KA42410622	2	2	Spring pin	62	P2H100030	1	1	Motor housing
15	KA32410621	7	7	CD-washer	63	P2H400099	1	1	Needle bearing
16	KA00910635	5	5	Cap screw	64	P2H400090	3	3	Hex. head bolt
17	P2H200110	1	1	Planet shaft	65	KA30211000	6	6	Plain washer
18	P2H400594	2	2	Bushing	66	KA32411021	3	3	CD-washer
—	LHP000268	1	1	Gear wheel set	67	KA20161000	3	3	Hex. nut
19	—	3	3	—Gar wheel	68	P2H300263	1	1	Coned disc spring
• 20	P2H400595	3	3	—Needle bearing	—	LHP000272	1	1	Air motor compl.
21	P2H400596	3	3	Pin	—	LHP000273	1	1	—End plate set
22	P2H200111	1	1	Internal gear	69	—	1	1	—End plate
• 23	KA50201000	2	2	O-ring	70	KA60104011	1	1	—Ball bearing
24	P2H300335	2	2	Gear wheel	71	P2H200116	1	1	—Rotor
25	P2H200112	1	1	Planet shaft	72	P2H200117	1	1	—Cylinder
—	LHP000269	1	1	Gear wheel set	• —	LHP002327	1	1	—Vane set
26	—	3	3	—Gear wheel	73	—	7	7	—Vane
• 27	P2H400597	3	3	—Needle bearing	74	—	7	7	—Spring
28	P2H400598	3	3	Pin	—	LHP000275	1	1	—End plate set
29	KA60107080	1	1	Ball bearing	75	—	1	1	—End plate
30	P2H200113	1	1	Internal gear	70	KA60104011	1	1	—Ball bearing
31	KA601107110	2	2	Ball bearing	76	KA42410316	1	1	—Spring pin
32	P2H100028	1	1	Gear housing	77	P2H400542	1	1	—Washer
33	P2H400359	1	1	Lock screw	78	KA01310512	1	1	—Countersunk head cap screw
34	P2H300337	2	2	Coned disc spring	79	P2H402834	1	1	Pipe
35	P2H200114	1	1	Internal gear	• 80	P2H300342	1	1	Gasket
36	LHP000270	1	1	Planet shaft	81	P2H200268	1	1	spacer
—	LHP000271	1	1	Gear wheel set	82	KA00910620	4	4	Cap screw
37	—	3	3	—Gear wheel	—	LHP002320	1	1	Valve housing assembly
• 38	P2H400139	3	3	—Needle bearing	—	LHP002318			—Valve housing assembly
39	P2H300339	1	1	Coned disc spring	83	P2H200265	1	1	—Valve housing
• 40	KA50100060	2	2	O-ring	• 84	P2H301356	1	1	—Gasket
41	P2H100029	1	1	Brake housing	85	P2H402849	1	1	—Spool
• 42	P2H400514	1	1	Oil seal	• 86	P2H402850	2	2	—O-ring
43	P2H200115	1	1	Shaft	87	P2H402851	1	1	—Cap
• 44	KA60103022	1	1	Ball bearing	• 88	KA50200180	1	1	—O-ring
• 45	KA40110015	1	1	Retaining ring	89	P2H400032	1	1	—Ball

We recommend that you stock parts indicated by a bullet (•).

Parts without part numbers van not be supplied separately.

When ordering spare parts , specify part number (not the reference number), description sand model of the hoist.

Ref. No.	Part No.	Quantity		Description	Ref. No.	Part No.	Quantity		Description
		EHLK -1TS	EHLK -2TW				EHLK -1TS	EHLK -2TW	
90	P2H400604	1	1	--Plug	•141	KA50200090	1	1	--O-ring
91	KA16110506	1	1	--Set screw	•142	KA50200060	1	1	--O-ring
92	KA16310508	2	2	--Set screw	•143	KA50200050	4	4	--O-ring
93	P2H301357	1	1	--Liner	144	KA16110506	6	6	--Set screw
• 94	KA50200200	5	5	--O-ring	145	P2H400189	2	2	-Cap screw
95	P2H401966	1	1	--Screw	146	KA00910542	2	2	-Cap screw
96	P2H402852	1	1	--Valve cone	147	P2H100032	1	1	-Control lever
97	P2H402853	2	2	--Spring	148	KA00910625	1	1	-Cap screw
98	P2H402854	2	2	--Cap	149	KA32410621	1	1	-CD-washer
• 99	KA50200260	2	2	--O-ring	150	P2H400882	2	2	-Hex. head bolt
•100	KA50100100	1	1	--O-ring	151	KA20110600	2	2	-Nut
101	P2H400099	1	1	--Needle bearing	152	KA30220500	1	1	-Washer
102	P2H402855	1	1	--Lever	153	KA10120510	1	1	-Machine screw
103	P2H301358	1	1	--Shaft	154	KA30210800	4	4	washer
104	KA01710616	1	1	--Button head cap screw	155	KA01710812	1	1	Button head cap screw
105	KA32410621	1	1	--CD-washer	156	KA00160848	1	1	Hex. head bolt
106	P2H402856	1	1	--Bolt	157	KA25520802	1	1	U-nut
•107	KA50200060	1	1	--O-ring	158	P2H301361	1		Name plate
108	P2H401972	1	1	--Cap	159	P2H301362		1	Name plate
109	KA40210022	1	1	--Retaining ring	160	KA14549803	4	4	Drive screw
110	P2H400137	2	2	--Plug	LINK CHAIN				
111	P1R400325	3	3	--Hose nipple					
112	P2H402857	1	1	--Filter					
113	LHP000264	1	1	--Strainer					
114	P2H400391	1	1	--Adapter					
115	KA00910625	2	2	--Cap screw	•161	P2H300291	1	—	Link chain
116	KA00910635	2	2	--Cap screw	•162	P2H300292	—	1	Link chain
—	LHP002319	1	1	-Valve housing assembly	163	P2H300346	—	1	Pin
117	P2H200266	1	1	--Valve housing	164	KA42120320	—	1	Split pin
118	P2H402858	1	1	--Spool	EHLK-1TS, BOTTOM HOOK				
•119	KA50100110	2	2	--O-ring					
•120	KA50100125	1	1	--O-ring					
121	P2H402859	1	1	--Spring					
122	P2H402860	1	1	--Stopper					
123	KA50100140	1	1	--O-ring					
124	P2H402861	1	1	--Bolt					
•125	KA50100030	1	1	--O-ring					
126	KA16310516	1	1	--Set screw					
127	KA40210020	1	1	--Retaining ring					
•128	KA50200180	1	1	--O-ring					
129	P2H402862	1	1	--Cap					
130	P2H402863	1	1	--Spool					
131	P2H402864	1	1	--Mini Y-packing					
•132	KA50100040	2	2	--O-ring					
133	P2H402865	1	1	--Cap					
•134	KA50200220	1	1	--O-ring					
135	KA40210024	1	1	--Retaining ring					
136	P2H402866	1	1	--Cap					
137	P2H402867	1	1	--Spring					
138	P2H402868	1	1	--Nozzle					
•139	KA50200040	1	1	--O-ring					
140	P2H400244	1	1	--Insert					

We recommend that you stock parts indicated by a bullet (•).

Parts without part numbers van not be supplied separately.

When ordering spare parts , specify part number (not the reference number), description sand model of the hoist.

Ref. No.	Part No.	Quantity		Description
		EHLK -1TS	EHLK -2TW	

EHLK-2TW, HOOK BLOCK				
—	LHP000280	—	1	Hook block assembly
—	LHP000265	—	1	—Hook compl.
1	—	—	1	—Hook
—	LHP000266	—	1	—Hook latch set
2	—	—	1	—Hook latch
3	—	—	1	—Spring
4	—	—	1	—Pin
5	—	—	2	—Screw
•176	KA60401090	—	1	—Thrust bearing
—	LHP000281	—	1	—Hook ring set
177	—	—	2	—Hook ring half
—	LHP000282	—	1	—Hook case set
178	—	—	2	—Hook case half
—	LHP000283	—	1	—Chain wheel set
179	—	—	1	—Chain wheel
180	—	—	1	—Shaft
181	KA60104044	—	2	—Ball bearing
182	KA00980835	—	3	—Cap screw
183	KA32410821	—	3	—CD-washer
184	KA20160800	—	3	—Hex. nut

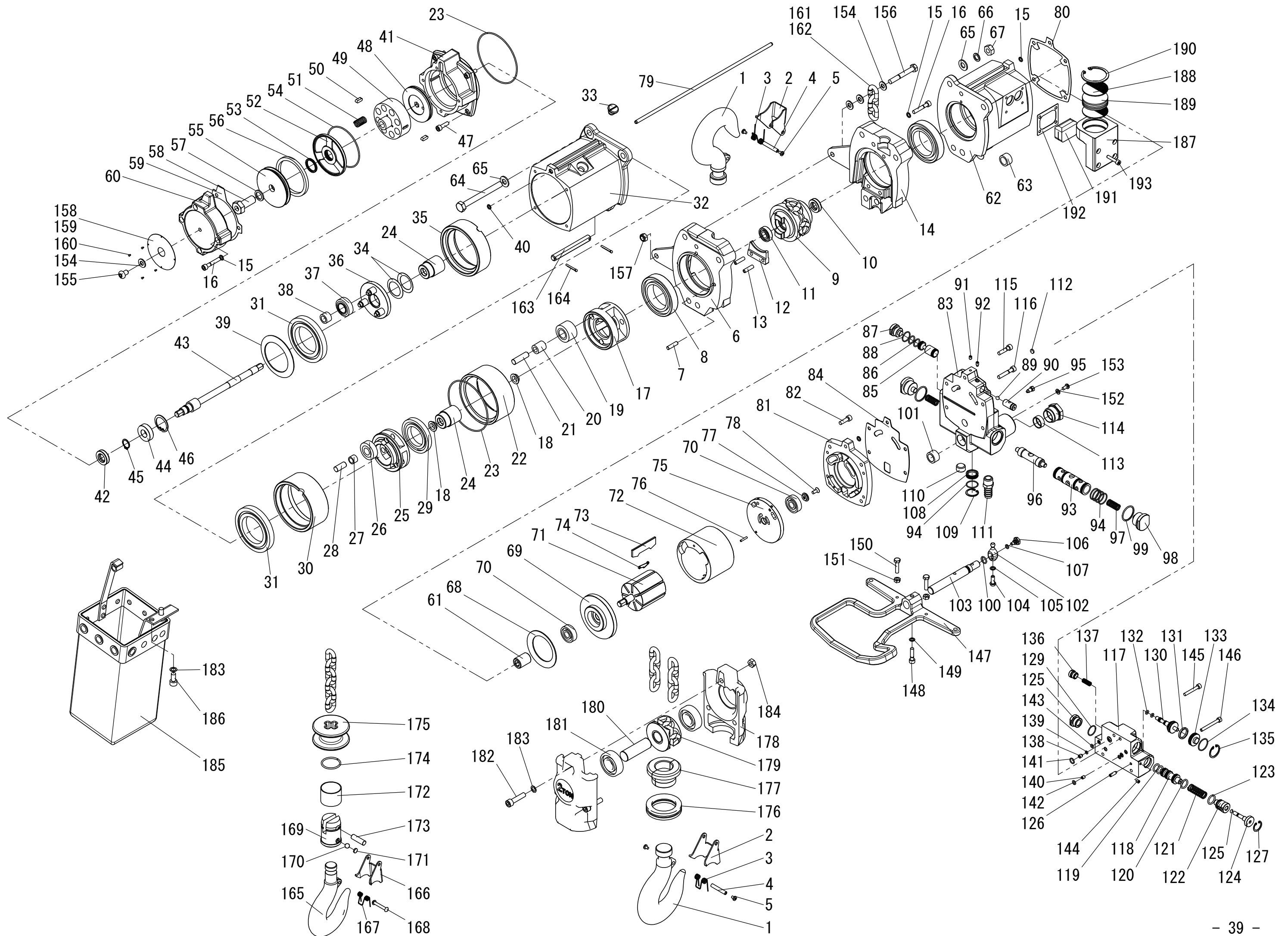
CHAIN BUCKET				
185	LHP000284	1	1	Chain bucket (for 6m chain)
186	KA00910816	2	2	Cap screw
183	KA32410821	2	2	CD-washer

EXHAUST MUFFLER				
—	LHP002315	1	1	Exhaust muffler
187	P2H301355	1	1	—Muffler
188	P2H402845	2	2	—Support
189	P2H402846	3	3	—Silencer
190	KA40210047	1	1	—Retaining ring
191	P2H402847	1	1	—Silencer
•192	P2H400836	1	1	—Gasket
193	KA00910525	4	4	—Cap screw

We recommend that you stock parts indicated by a bullet (•).

Parts without part numbers van not be supplied separately.

When ordering spare parts , specify part number (not the reference number), description sand model of the hoist.



■PARTS LIST PENDANT SWITCH

Ref. No.	Part No.	Quantity	Description
—	LHP002323	1	Pendant switch
1	P2H200267	1	—Valve body
2	PHH402869	2	—Spool
•3	KA50100125	6	—O-ring
4	P2H402870	2	—Spring
5	P2H301359	1	—Liner
•6	KA50200220	3	—O-ring
7	P2H402871	1	—Spool
•8	KA50200125	3	—O-ring
9	P2H400293	1	—Spring
10	P2H402872	1	—Cap
11	P2H400938	1	—Emergency stop button
12	P2H301360	1	—Plate
13	P2H402873	1	—Push button
14	P2H402874	1	—Push button
15	KA42410328	2	—Spring pin
16	KA00910416	4	—Cap screw
17	P1R400325	3	—Hose nipple
18	P2H400137	1	—Plug
19	P2H402875	1	—Pipe
20	P2H402584	1	—Grip
21	P2H402876	1	—Support
22	P2H400296	1	—Silencer
23	P2H402877	1	—Set screw
—	LHP002322	1	Hose set
24	P2H401175	2	—Hose
25	P2H402879	1	—Hose
26	P2H400583	6	—Hose clip
27	LHP002321	1	—Wire rope set
28	P2H400201	2	—Cable tie
29	P2H300274	1	Caution plate
28	P2H400201	2	Cable tie

We recommend that you stock parts indicated by a bullet (•).

Parts without part numbers van not be supplied separately.

When ordering spare parts , specify part number (not the reference number), description sand model of the hoist.

■ PENDANT SWITCH

