INSTRUCTION MANUAL

AIR MOTOR TROLLEY

MTH-1T-5

⚠WARNING

- Never use the TROLLEY for lifting or transporting people.
- Supply this manual to the user.
- Read this manual before installation, operation, or maintenance.
- Read the AIR HOIST instruction manual when using the TROLLEY with the HOIST.
- Keep this manual available.

ENDO KOGYO CO., LTD.

ENDO

HM-10031c

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Copyright and liabilities

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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.

CONTENTS

1. ⚠ Safety Instructions

If the hoist or the trolley is not used correctly, a serious accident may occur, such as dropping the load.
For correct use, carefully read this manual before installation, operation, maintenance or inspection.
Have full knowledge of equipment, safety information and instructions before using the hoist and the trolley.
* After reading, keep this manual where trolley users can access easily.

1.1 General Instructions

⚠ WARNING

- Never use the trolley for lifting/lowering or transporting people. Never lift a load near people nor carry a load over people.
- Before installing, operating, maintaining or inspecting the trolley, carefully read and understand all of the instructions in this manual in order to avoid accidents as a consequence of incorrect handling.
- Keep this manual available for all of the people who will install, operate or maintain the trolley.
- Always check the supporting structure for the hoist and the trolley has enough strength.
  The customer has the responsibility for this.
- Read the air hoist instruction manual when using the trolley with the hoist.

1.2 Instructions for Safe Operation

If there is any conflict between the instructions in this manual and safety rules of your company, give priority to ones which are more strict than others.

1.2.1 General Handling

⚠ WARNING

- Never operate the trolley unless the contents of this manual and the caution plate (warning label) are completely known.
- Never operate the hoist nor sling a load without being qualified. Never allow non-qualified persons to do so.
- Never remove or deface any name plates, caution plates or warning labels which are attached to the trolley.
- Always check the trolley before each work shift, and inspect it periodically.
- Never operate the hoist or the trolley if you are not physically fit to do so.
  The operator must have good hearing, vision and depth perception.
- When any instruction signs put on the push button switches such as "EQUIPMENT BEING INSPECTED" or "DO NOT RUN", never operate the hoist or the trolley until the sign is removed by the designated person.

1.2.2 Installation

⚠ WARNING

- Always employ specialists or well trained persons for installation.
- Never install the hoist or the trolley in any environments which is out of specifications. For example, the hoist and the trolley should not be exposed to rain or water.
- Always install stoppers at the ends of the rail for traveling or traversing.
- Always check the supporting structure for the hoist and the trolley has enough strength.
- Make the hoist able to swing freely when using the trolley with the hoist.

1.2.3 Air Pressure

⚠ WARNING

- Always keep the working air pressure no greater than 0.6MPa {6kgf/cm^2} .

1.2.4 Operation and Handling

⚠ WARNING

- Never lift a load greater than the rated capacity of the trolley.
  * The rated capacity is marked on the trolley body.
- Never stand on a suspended load.
  Never use the trolley for transporting people.
- 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 operate the hoist or the trolley when anyone is in the traveling area of the load.
- Always check there are no objects in the way of the load or the load hook of the hoist when moving the hoist.
- Never carry a load over people.
- Never leave a load suspended for any extended period.
- Always pay attention to the load at all times when operating the hoist or the trolley.
- Never swing the load or the load hook of the hoist when moving the hoist or the trolley.
- Never use the upper and lower limit switches of the hoist as a means of stopping the hoist. They are for emergency stop only.
- Never pull a load at an angle.
  Never lift a load when the load hook of the hoist is not over the load's center of gravity.
  * Always move the hoist over the loads' center of gravity before lifting.
- Never use the wire rope of the hoist as a sling nor allow it to touch structures having a sharp edge.
- Never do earth lifting (lifting locked loads).

- Never turn over a suspended load.
  * Always employ special equipment in case of turn over work.
- Always check movement of the push button switches before operation.
  Never operate the hoist or the trolley if the push button switches do not move smoothly.
- Stop the hoist or the trolley immediately when operating directions are contrary to the indications marked on the push button switches.
- Always check operation of the brake before using the hoist or the trolley.
  Never use the hoist or the trolley if the brake does not work well.
- Never operate the hoist or the trolley when damaged or abnormal sound/ vibration occurs.
- Never operate the hoist or the trolley when the wire rope or the load chain of the hoist is in any of the following conditions:
  Wire rope; ① Kinked, deformed or corroded.
  ② The number of broken wires or the reduction of diameter reaches the service limit.
  Load chain; ① Twisted, kinked, deformed, damaged, cracked or improperly engaged on the chain wheel.
  ② The elongation or the reduction of diameter reaches the service limit.
- Never perform cutting work on a suspended load.
- Never perform electrowelding work on a suspended load.
- Never use the wire rope or the load chain of the hoist as a ground for welding.
- Never attach a welding electrode to the wire rope or the load chain of the hoist.
- Never lift any single load with 2 or more hoists.
- Never lock the push button switches.
  * The hoist and the trolley must be operated by the operator himself/ herself at all times.

⚠ CAUTION

- Never use the hook of the hoist with a damaged or malfunctioning hook latch.
- Always operate the hoist and the trolley carefully during lifting and lowering operations.
  Never start, stop or reverse the hoist or the trolley suddenly.
- Never allow the suspended load to touch the nearby structure or power lines, etc.
- Never jerk the hose of the push button switches nor catch it on the nearby structure.
- Never allow the hoist or the trolley to collide with the stopper on the I-beam (rail) or the structure.
- Never use the load chain of the hoist as a sling.
- Never allow the load chain of the hoist to touch structure having a sharp edge.
- Never allow the suspended load or the slings to touch the chain bucket of the hoist.
- Always check the load hook of the hoist can swivel smoothly before operating the hoist.
- Always position the slings at the center of the load hook.

- When starting to lift, stop the hoist once as the wire rope or the load chain of the hoist becomes tensioned.
  * Never jerk the hoist. Carefully take up the slackened wire rope or load chain.
- Always check the load-lifting height of the hoist is enough for required work.

1.2.5 Maintenance, Inspection and Alterations

⚠ WARNING

- Never alter the trolley, hoist or their accessories.
- Always use genuine parts for replacement.
- Never cut or splice the load chain of the hoist.
- Always shut off the air supply before carrying out maintenance, inspection or repair.
- Always employ specialists or well trained persons for maintenance, inspection and repair.
- Always remove the load from the trolley before maintenance, inspection or repair.
- Always disassemble the trolley on the floor.
- If any problems are detected during maintenance or inspection, never use the hoist and the trolley but correct and repair the problems immediately.
- Periodically, inspect the hoist and the trolley thoroughly and replace any worn or damaged parts.
- Stretched, worn or damaged hooks should be discarded.
  Never attempt to repair it, just replace it with a new hook.
- Always put up an instruction sigh ("EQUIPMENT BEING INSPECTED", "DO NOT OPEN THE VALVE", etc.) before carrying out maintenance, inspection or repair.
- Never do anything if you have any questions about the hoist or the trolley, please do not hesitate to contact your dealer or us.

⚠ CAUTION

- Follow the lubrication instructions.
- Never operate the hoist without lubricator and filter.

2. Product Description

2.1 Names of Main Parts

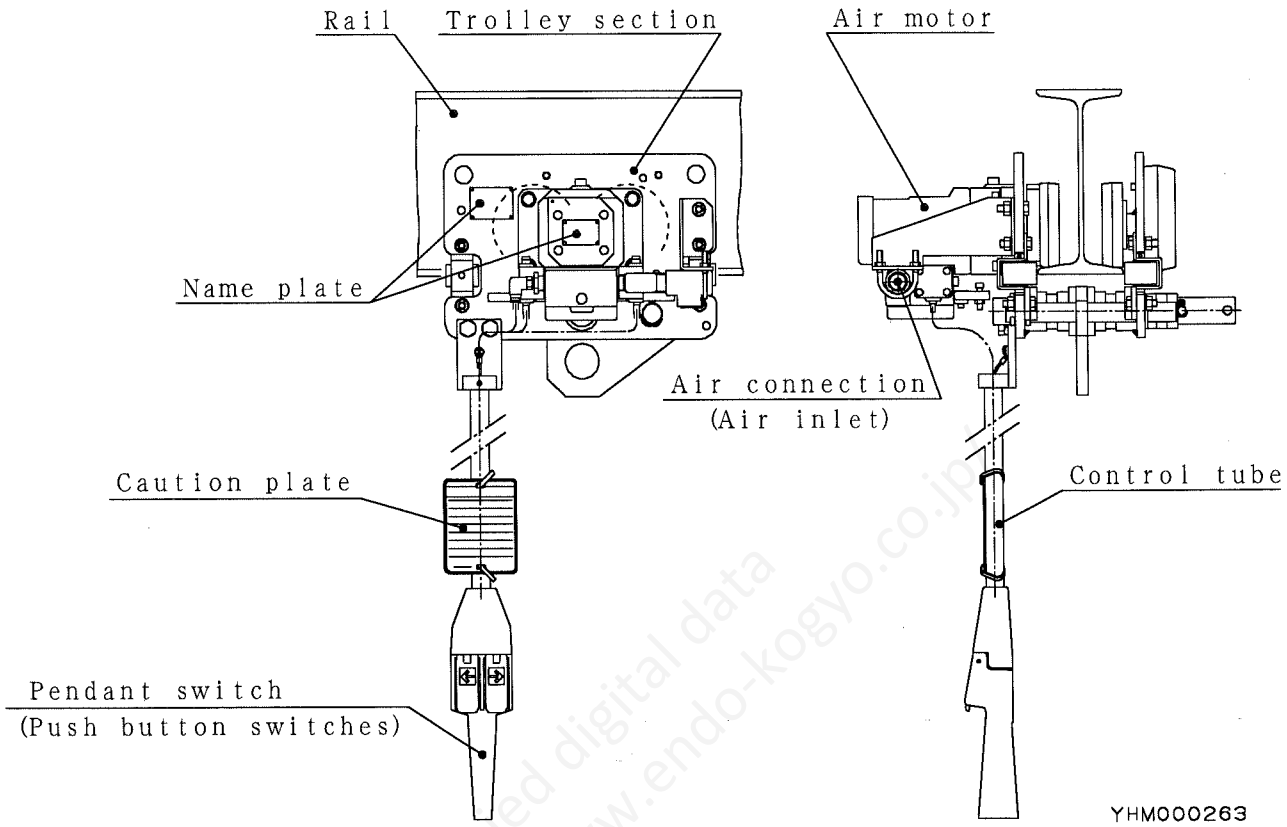


Fig. 1

2.2 Specifications

Model	MTH-1T-5		
Rated load kg	1000		
Air pressure MPa {kgf/cm²}	0.4 {4}	0.5 {5}	0.6 {6}
Traveling speed m/min	20	25	28
Air consumption m³/min [normal]	0.55	0.60	0.65
Rail width mm	75	100・125	
Minimum radius for curve mm	3500	800	
Air connection	Rc 1/2		
Mass kg	Approx. 35		

Working conditions

Application area : Indoor and normal atmospheric conditions

Temperature range: - 10℃ to + 50℃

3. Checks and Instructions before Installation

3.1 Checks of the Product

- Check the delivered trolley is what you ordered (check the name plate).
- Check there was no damage or deformation on the trolley during transportation.

3.2 Instructions on Working Conditions

⚠ WARNING

■ Never install or use the trolley under the following conditions:

- Low temperature below - 10℃, high temperature above + 50℃ or high humidity above 90%
  * The parts will be seriously damaged, and strength deterioration will occur, causing danger.
- Acidic, salty or other corrosive atmospheres
  * The parts will rust or be seriously damaged, and strength deterioration will occur, causing danger.
- Weathered area directly catching rain or snow
  * The parts will rust and malfunction, and strength deterioration will occur, causing danger.
- Dusty atmosphere
  * Cause of malfunction.

■ Under hostile environments, the mechanical parts of the trolley may be seriously damaged.
Therefore, frequently check the trolley is maintained in normal conditions at all times.

■ When using the trolley outdoors, always make a shelter with a roof for protecting the trolley against rain and snow to prevent inner parts from rust.

4. Installation

⚠ WARNING

Always employ specialists or well trained persons for installation.

4.1 Check of Supporting Structure

⚠ WARNING

Always check the supporting structure for the trolley has enough strength.
The customer has the responsibility for this.

4.2 Preparation of Rail for Trolley

When using an I-beam as a rail, install the I-beam according to Table 1 and Figure 2.

■ Table 1 shows the allowable maximum span depending on the dimensions of the I-beam and the rated load.
  * "Span" means a distance between two supports for the I-beam.

■ Contact your dealer or us when using an I-beam not shown in Table 1.

Table 1 Allowable maximum span Unit:m

Dimensions of I-beam (mm) H × B × t_1 × t_2	Rated load (ton)		
	1/4	1/2	1
125× 75×5.5×9.5	3.9	3.0	2.2
150× 75×5.5×9.5	4.7	3.7	2.7
180×100× 6 ×10	6.4	5.1	3.9
200×100× 7 ×10	7.1	5.8	4.4
250×125×7.5×12.5	9.9	8.4	6.6
250×125× 10×19	10.7	9.4	7.7

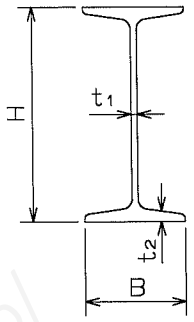


Fig. 2 YHM000185

* Above table is based on the following calculation: sag／span ≦ 1／800

4.3 Adjustment of Trolley Width

The trolley width has been adjusted to fit an I-beam width of 125 mm before shipment.
Adjust the trolley width for other I-beam widths before installation.
The trolley width can be changed by moving Spacers(17).
Referring to Table 2 and Figure 3, adjust the trolley width using the following procedure.

⚠ WARNING

Never use the hole Ⓑ for adjusting the trolley width.
It is for installation work only and doesn't have enough strength, it will cause personal injury if used.

- 1) Remove Split pin(22) which is temporarily fixed on Pin(21), and remove Pin(21).
- 2) Remove Frame(11), Spacers(17), Spacers(18), Spacers(19) and Hanger plate (20) from Shaft(13).
- 3) Attach Spacers(17) to Shaft(13) according to Table 2 and Figure 3, and attach Spacers(18), Spacers(19) and Hanger plate(20).
- 4) Attach Frame(11) on Shaft(13).
- 5) Insert Pin(21) into the hole Ⓐ of Shaft(13), and fix with Split pin(22).

NOTE:

- When installing the trolley from the rail end, securely bend Split pin(22).
- When installing the trolley on the middle of the rail, slightly bend Split pin(22) to avoid slipping out.

Table 2 Rail width and number of spacers(17)

Rail width (mm)	Number of spacers(17)		
	Ⓒ	Ⓓ	Ⓔ
75	0	0	5
100	1	1	3
125	2	2	1

(Note) Contact us if your rail width is not shown above.

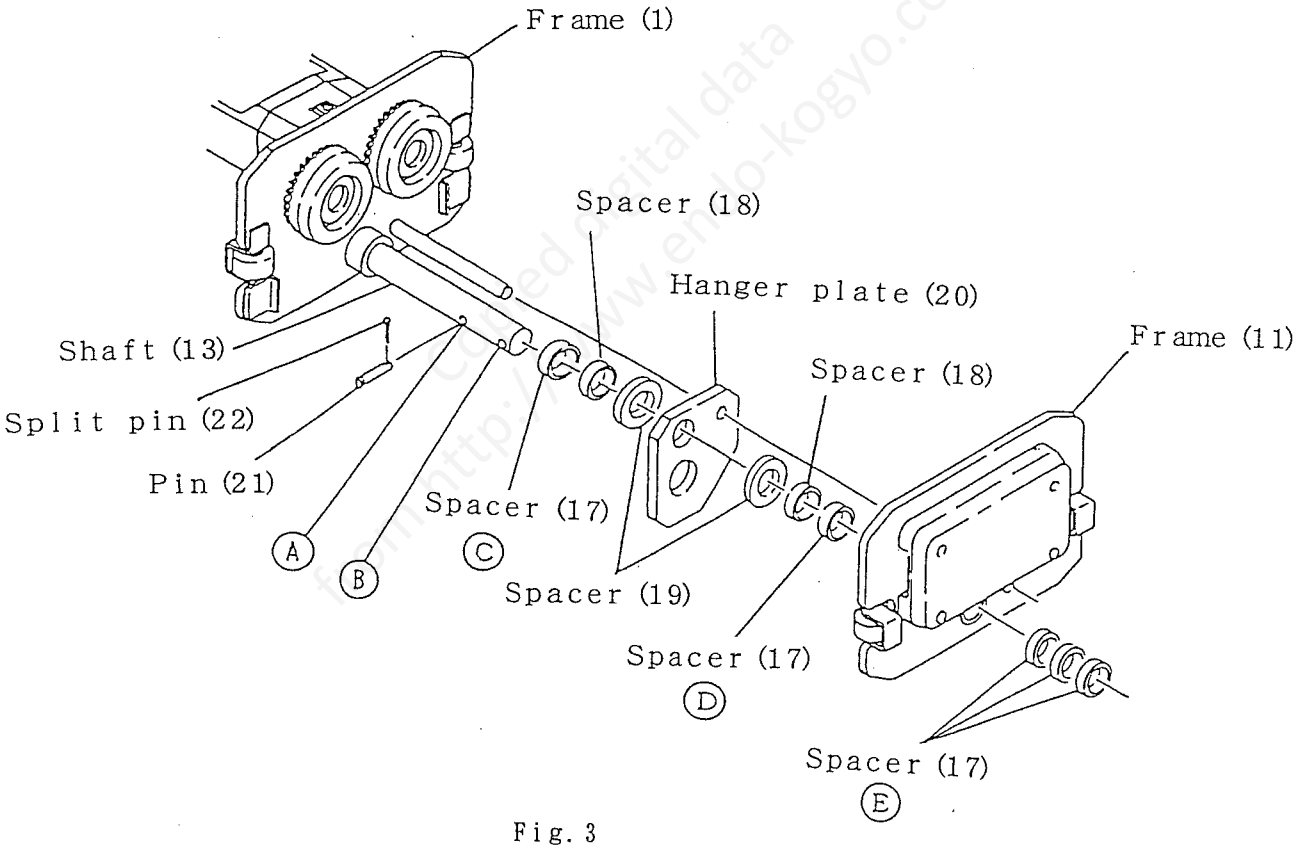


Fig. 3

4.4 Installation of Trolley on Rail

■ When installing the trolley from the rail end:
(1) Remove the stopper from the rail end and install the trolley.
(2) Install the stopper at the rail end and fix securely.

■ When installing the trolley on the middle of the rail (See Figures 3 and 4):
- 1) Remove Split pin(22) from Pin(21).
- 2) Remove Pin(21) from the hole Ⓐ and inset it into the hole Ⓑ of Shaft(13). Attach Split pin(22) to pin(21), and slightly bend Split pin(22) to avoid slipping out.
- 3) Widen the distance between Frame(1) and Frame(11), and put the wheels of Frame(1) on the rail.
- 4) While keeping the wheels of Frame(1) on the rail, push Frame(11) and put the wheels of Frame(11) on the rail.
- 5) Remove Split pin(22) from Pin(21).
  Remove Pin(21) from the hole Ⓑ and inset it into the hole Ⓐ of Shaft(13).

⚠ WARNING
Never operate the trolley while Pin(21) being inserted into the hole Ⓑ. The hole Ⓑ is for installation work only and doesn't have enough strength, it will cause personal injury if operated.

- 6) Fix Pin(21) with Split pin(22).
  Securely bend Split pin(22).

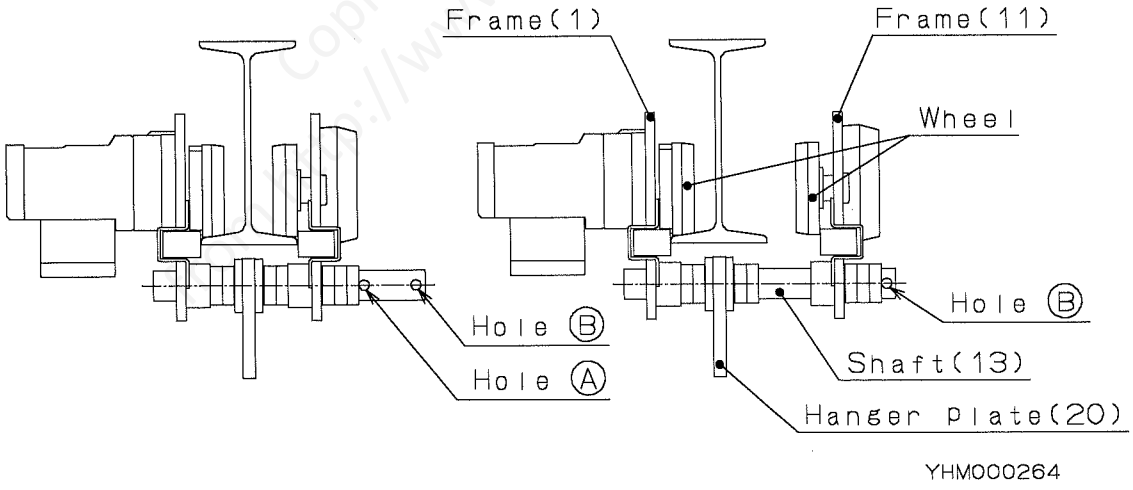


Fig. 4

4.5 Installation of Stoppers at Rail Ends

> **⚠ WARNING**
> Always install stoppers at the rail ends to prevent the trolley from falling.

- Prepare stoppers according to Table 3 and Figure 5.
  Decide the mounting position depending on the wheel size.
- Install the stoppers so the wheels on both sides touch the stoppers at the same time.
- Painting the stoppers with the color different from the rail is recommended to call attention for avoiding collision.

Table 3 (mm)

Rail width	Dimensions of equal leg angle	Dimension E	Size of bolts and nuts
75	50×50×6	35	M12
100	50×50×6	45	M12
125	50×50×6	50	M12

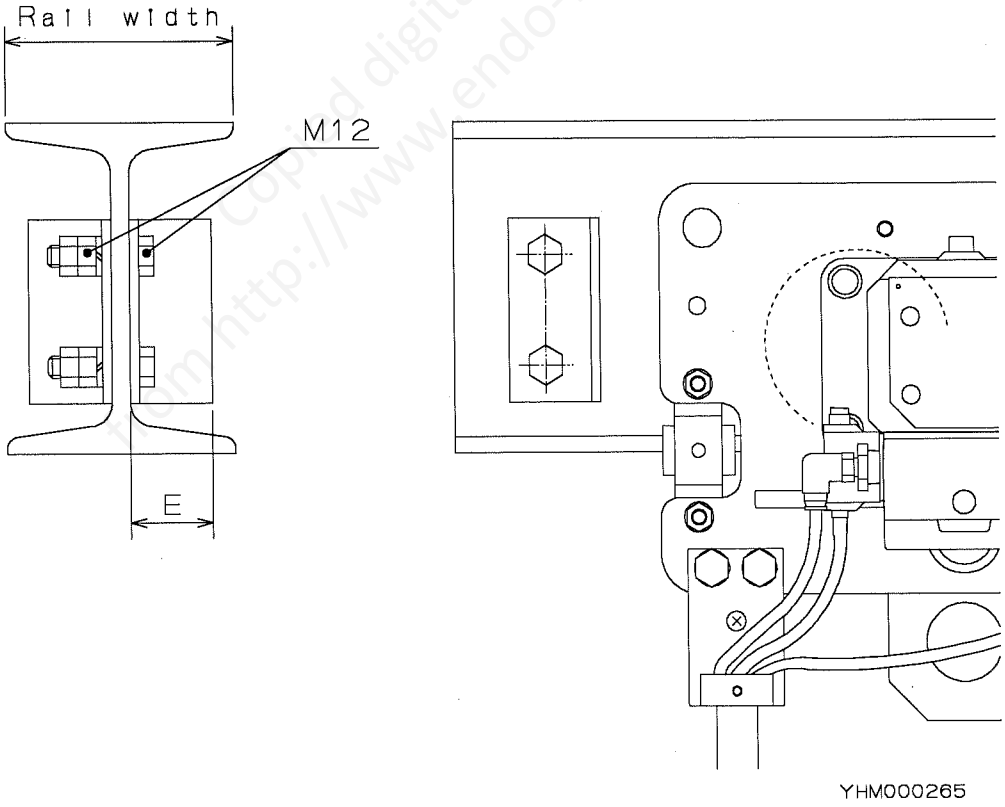


Fig. 5

4.6 Installation of Pendant Switch

■ When using the trolley with the Endo hoist and controlling them with the four-buttons pendant switch (see Figure 6.):

(1) Remove Cover(B) from Valve housing(A) of the hoist.
(2) Remove Cover(D) from Cylinder holder(C).
(3) Install Cylinder(E) and Cylinder holder(C) together with Cover(F) on Valve housing(A).
(4) Connect the control tubes after installing the hoist.
Refer to Section 4.8 "Air Connection".

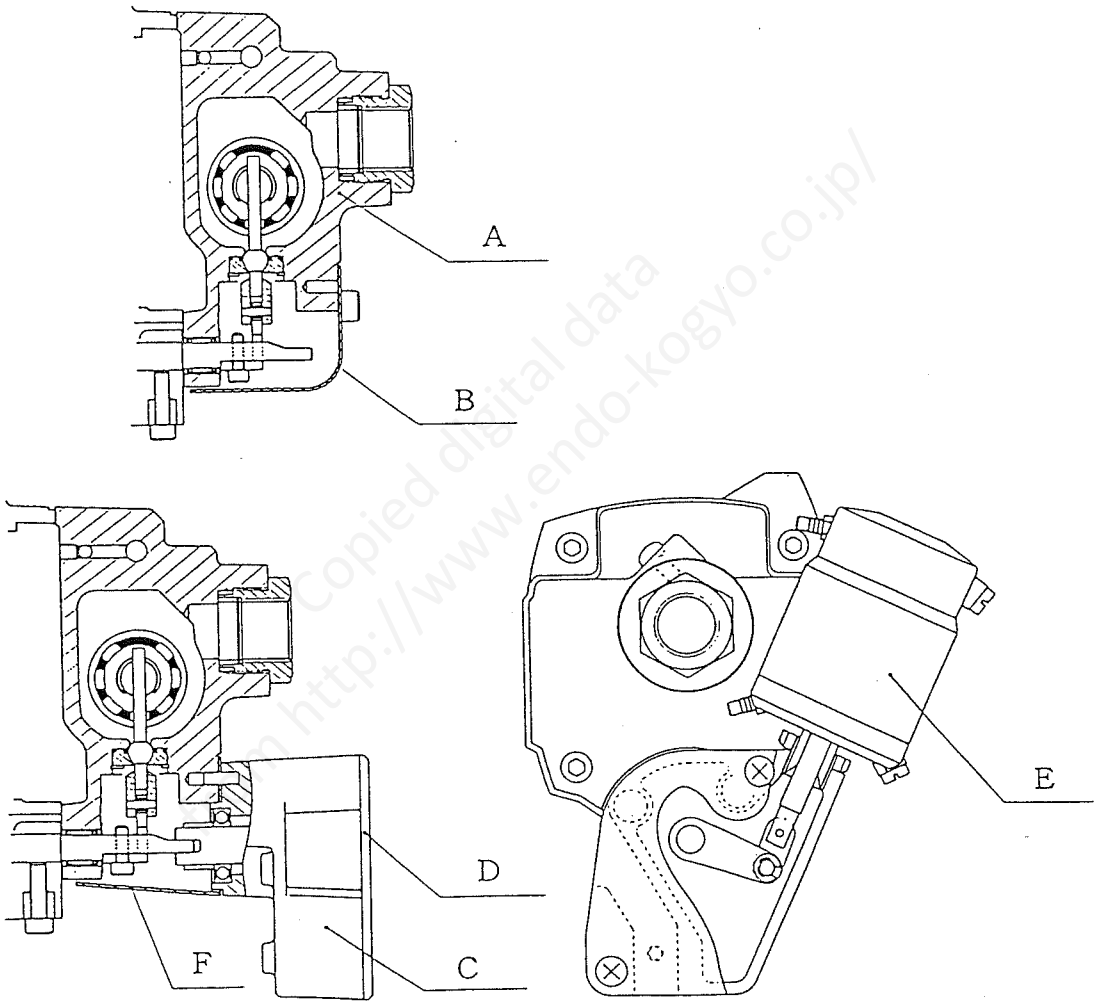


Fig. 6

■ When controlling the trolley and the hoist with the individual two-buttons pendant switches:

Install the pendant switch for the hoist according to the instruction manual of the pendant switch.

4.7 Checks and Instructions before Air Connection

⚠ WARNING

The trolley and the hoist are designed to operate within a working air pressure range of 0.4～0.6 MPa {4～6 kgf/cm²}.
Always keep the working air pressure no greater than 0.6 MPa.
If necessary, use an air regulator for reducing air pressure.

- Check sufficient air can be supplied to the operating area of the trolley. When using the trolley with the hoist, also check sufficient air can be supplied to the hoist.
  Compare the air supply from the compressor to the air consumption of the trolley and the hoist.
  For a pipe of excessively small diameter or of great length, the pressure drop can become large enough to prevent the specified performance.

- When using the trolley alone, use an air hose whose inside diameter is at least 9.5 mm (3/8 inches).
  When using the trolley with the hoist, use an air hose whose inside diameter is at least 12.5 mm (1/2 inches).

- Before connecting the air hose or pipe to the trolley or the hoist, be sure to flush out or blow out with air to prevent the invasion of foreign matter (dust, etc.) into the air motors.

- Compressed air supplied to the trolley and the hoist should be free from moisture or foreign matter.
  Install an air filter to eliminate them from air supply.

- Install a lubricator to feed lubricant to the air motors.
  See Chapter 8, Section 8.1 "Lubrication".
  (Do not operate the trolley and the hoist without lubricant.)

- Connect the air filter, regulator and lubricator as close to the trolley and the hoist as possible.

- When the air hoses are connected to the trolley and the hoist, pour about 10 drops of lubricant into the air connections of the trolley and the hoist.
  (See Chapter 8, Section 8.1 (4) "Recommended Lubricants".)

- Install a dump valve (drain valve) at the lowest point in the piping.

4.8 Air Connection (See Figure 7)

(1) Connect the hose to the trolley and the hoist, and fix the hose with the hose clips.
Pay attention to the mounting directions of the trolley and the hoist.

(2) Install the pendant switch in the following manner:

a. Insert the control tube compl. into the bracket, and fix with the set screw.
When installing the four-buttons pendant switch, remove the spacer from the bracket before installation.
When installing the individual two-buttons pendant switches for the trolley and the hoist, install the pendant switch for the hoist according to the instruction manual of the pendant switch.

b. Connect the nylon tubes to the trolley and the hoist according to the difference of colors.

c. Run the nylon tubes along the hose from the trolley to the hoist, and band the nylon tubes and the hose with the convex belts.
Do not tighten the convex belts too tight.

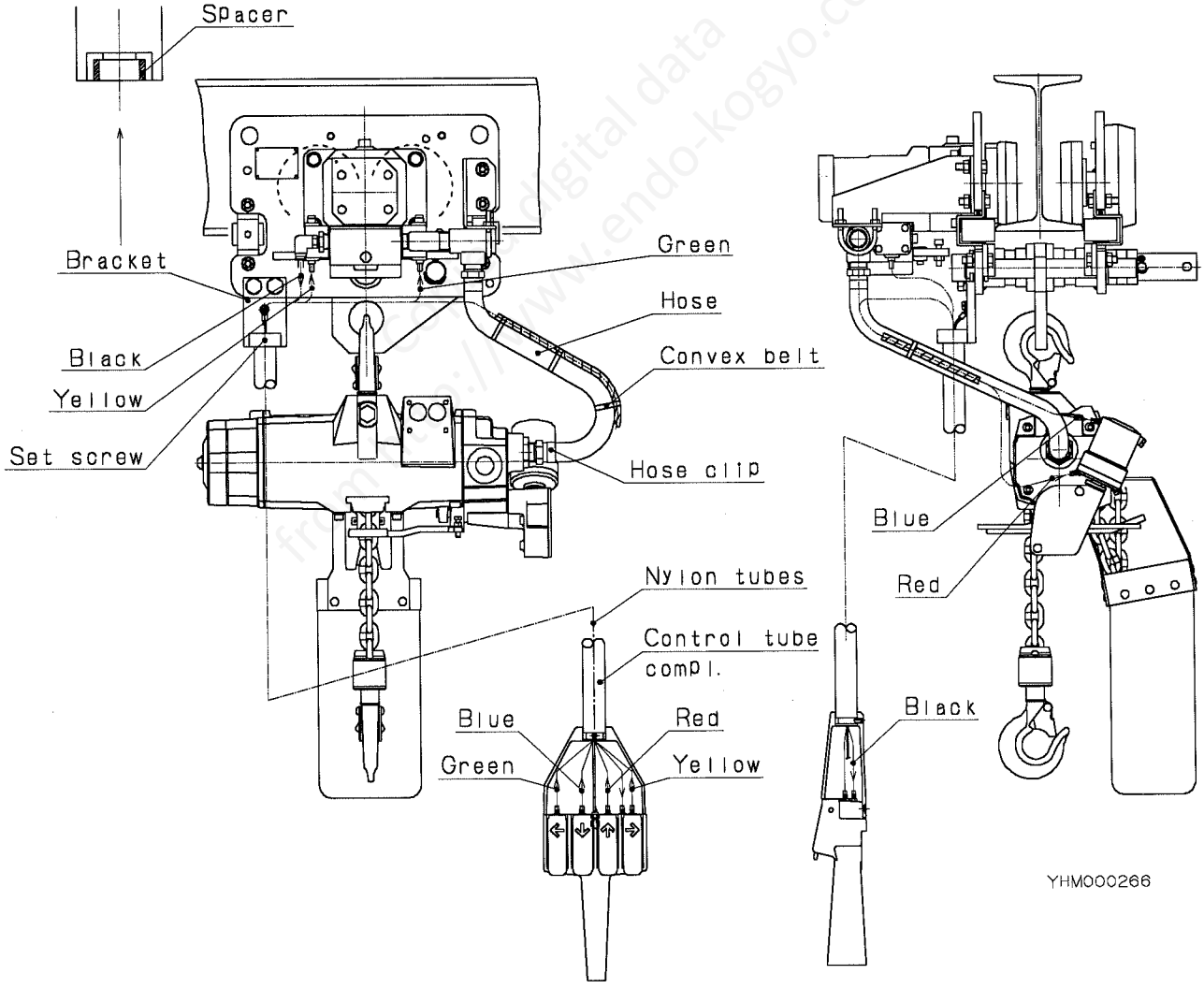


Fig. 7

5. Checks after Installation and Test Run

5.1 Check of Stoppers

Check the stoppers are installed at the rail ends.

5.2 Check of Load Chain of the Hoist

Check the conditions of the load chain of the hoist according to the air hoist instruction manual.

5.3 Check of Hoisting Operation and Hoisting/Lowering Limit Switches of the Hoist, and Check of Traveling Operation of the Trolley

Check the following under a non-loading condition:

- Check the push button switches for correct operation.
  Push the button and check the operating direction of the trolley or the hoist is correct. If incorrect, the connection of the nylon tubes is wrong. Connect the nylon tubes correctly according to Chapter 4, Section 4.8 "Air Connection".
  Check all the buttons for lifting, lowering, and traveling.
  The arrows on the buttons indicate the traveling directions of the trolley viewed from the air motor side as shown in Figure 7.
- Repeat up/down operations of the hoist several times at low speed, then go to the full-speed operation.
  Check the speed can be changed from low to high speed by controlling the pushing force on the push button switches.
- Check the hoisting/lowering limit switches of the hoist function correctly according to the air hoist instruction manual.
- Repeat forward/backward operations of the trolley several times at low speed, then go to the full-speed operation.
  Check the speed can be changed from low to high speed by controlling the pushing force on the push button switches.
- Check the lubricator is feeding lubricant to the air motor while operating the trolley or the hoist.
  (See Chapter 8, Section 8.1 "Lubrication".)
- Run the trolley over the entire length of the rail to check the condition of the rail and the length of air hoses.

5.4 Load Test

- Lift the rated load a few inches off the floor and check braking ability of the hoist to stop and hold the load without excessive drift.
  Then run the trolley forward and backward, and check braking ability of the trolley.
  Run the trolley over the entire length of the rail to check the condition of the rail.
- Lift 125 % of the rated load and check the operation.
  This test should be performed for the safety check concerning the trolley, the hoist, the rail, etc.

6. Checks before Operation

⚠ WARNING

- Always execute the following checks at the beginning of each work shift.
- If a malfunction occurs during the operation of the hoist or the trolley, stop operation immediately and take the necessary steps to rectify the problem.
  Never operate the hoist and the trolley if damaged or malfunctioning.
  This is a serious hazard and could result in personal injury or death.
- Always execute checks before each work shift for the hoist according to the air hoist instruction manual.

6.1 Check before Start up

(1) Check the frames of the trolley are not deformed.
(2) Check the wheels and the rollers of the trolley are not worn.
(3) Check the wheel teeth are greased.
(4) Check the hanger plate, on which the hoist is installed, is not damaged or worn.
(5) Check bolts, nuts and split pins, which are visible from outside, are not missing or loose.
(6) Check the rail is not damaged.
Check the stoppers are not missing or deformed.

6.2 Check by Idling Operation

(1) Check the push button switches can be easily operated and the traveling directions of the trolley are correct as indicated.
Check the traveling speed can be changed from low to high speed by controlling the pushing force on the push button switches.
(2) Check the trolley is not abnormally noisy or vibrating.

6.3 Check by Load Operation

(1) Lift the rated or near the rated load a few inches off the floor, then run and stop the trolley to check braking ability of the trolley.
(2) Check the trolley is not abnormally noisy or vibrating.

7. Periodic Inspections

⚠ WARNING

- Always put up an instruction sigh ("EQUIPMENT BEING INSPECTED", "DO NOT RUN", etc.) on the push button switches before carrying out inspections.
- Periodically, inspect the trolley thoroughly and replace any worn or damaged parts.
- Always shut off the air supply before carrying out inspections.
  Exceptions are checks or inspections of the push button switches, brake, etc., during that the trolley should be operated.

- Preparing a special table for inspection is recommended.

■ Monthly Inspection

Inspect the trolley at least once a month. Correct and repair any problems which are detected.

- Required interval for inspection depends on the operating environment, operating frequency, and loading conditions of the trolley. Therefore, make the inspection interval shorter according to your operating condition.
- For inspection items and methods, see Chapter 8, Section 8.2 "Inspection".

■ Annual Inspection - Disassembly is required

Completely disassemble the trolley at least once a year for inspection and maintenance. Correct and repair any problems which are detected.

- Required interval for inspection depends on the operating environment, operating frequency, and loading conditions of the trolley. Therefore, make the inspection interval shorter according to your operating condition.
- For inspection items and methods, see Chapter 8, Section 8.2 "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.

8. Maintenance and Inspection

⚠ WARNING

- Never alter the trolley, hoist or their accessories.
- Always remove the load before maintenance, inspection or repair. Exception is an inspection of brake, etc.
- Always put up an instruction sigh ("EQUIPMENT BEING INSPECTED", "DO NOT OPEN THE VALVE", etc.) before carrying out maintenance, inspection or repair.
- Always shut off the air supply before carrying out maintenance, inspection or repair. Exceptions are checks or inspections of the push button switches, brake, etc., during that the trolley should be operated.
- Always employ specialists or well trained persons for maintenance, inspection and repair.
- Always disassemble the trolley on the floor.
- Always use genuine parts for replacement.
- Replace any parts damaged or worn beyond its service limit.
- Always execute the idling test and the rated load test after disassembling the trolley for maintenance or inspection. See Section 8.2 (12) "General Operation Inspection".
- For maintenance, inspection and repair of the hoist, see the air hoist instruction manual.

Always use the trolley correctly for safety and getting the best service.

8.1 Lubrication

(1) Air Motor

- To prevent the air motor from dry operation, continuously lubricate using a lubricator.
- Adjust the frequency and volume of lubrication at the lubricator so that one drop of lubricant might fall off from the nozzle when the trolley works with no load at one meter traverse 3 times.

● Periodically check the oil level in the lubricator, and replenish if necessary.
Never allow the oil level to go below the indicated line.
● Periodically remove drain water deposited in the air filter bowl.

> **⚠ CAUTION**
> **Always shut off the air supply before putting lubricant in the lubricator.**

(2) Reduction Gear Unit

● The reduction gear has been greased before shipment.
Replace grease in the reduction gear when the trolley is disassembled for maintenance or inspection. Daily lubrication is not required.
● Required quantity of grease is 40 cm^3 (40 mL).

(3) Brake Unit

● Each time the trolley is disassembled for inspection, maintenance or repair, completely clean the inner mechanism and reapply lubricant.
For lubricating position, see Chapter 8.2 (1) "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".

(4) Recommended Lubricants

The following table shows the recommended lubricants.
Always use the same type or equivalents recommended by the oil manufacturer.

Manufacturer	Air motor (Lubricator)	Reduction gear and Bearings
Exxon Mobil	Mobil DTE Light	Mobilux EP2
Cosmo Oil	COSMO ALLPUS32	COSMO GREASE DYNAMAX EP No.2
JX Nippon Oil & Energy	FBK OIL RO32	EPNOC GREASE AP(N)2
Shell	Tellus S2 M32	Alvania Grease EP2

8.2 Inspection

(1) Inspection of Brake and Service Limit

Disassemble the brake and inspect the lining and component parts.

■ Disassembly of Brake (See Figure 8)

- 1) Loosen Cap screws(44) sequentially by 1/6 turns, and remove Brake cover(40).
- 2) Remove Brake disc(27) from Brake case(26).
Check lubricant in the air motor has not leaked through Oil seal(23) when removing Brake disc(27).

- 3)If lubricant leakage is found, remove Brake case(26).
- 4)Clean each part.

NOTE:

- ●Never use solvent when cleaning Oil seal(23), X-rings, or O-ring(34).
- ●If oil adheres to the lining, wipe off with a cloth wetted with solvent.
- ●Be careful to prevent solvent or foreign matter entering the air circuit of the brake.

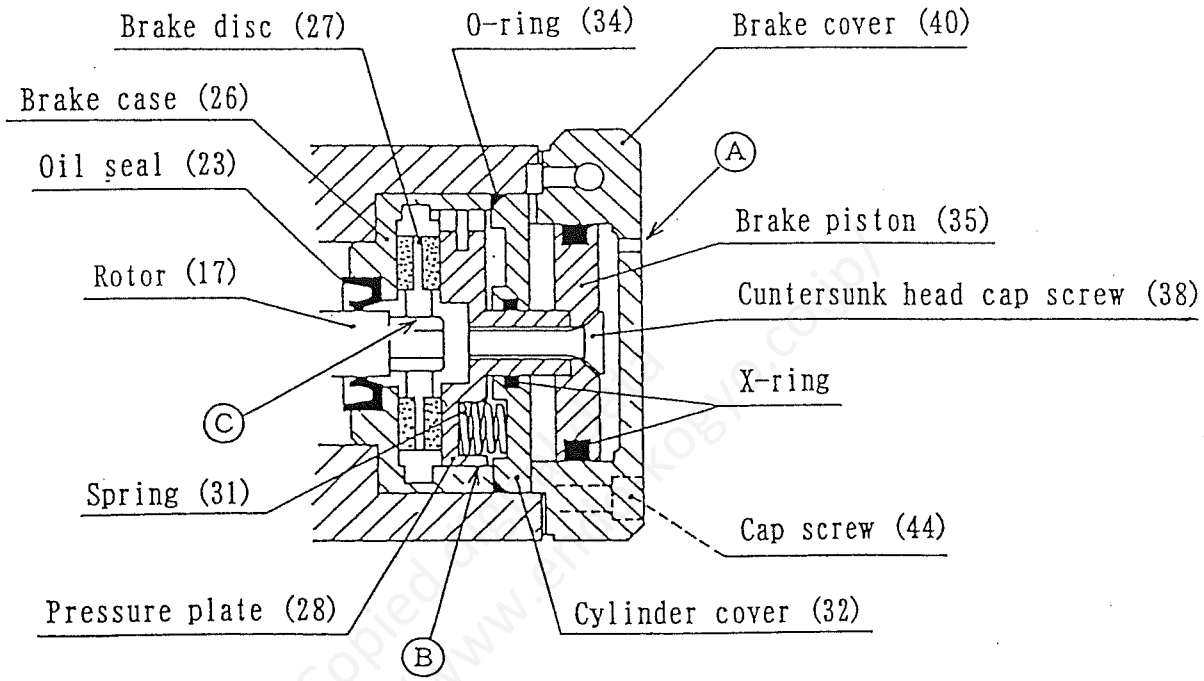
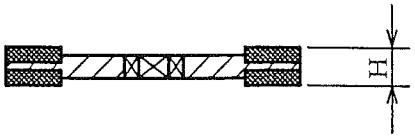


Fig. 8

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

- ●Does wear on the lining reach the service limit?
- ●Are Springs(31) decayed, cracked or flawed?
- ●Are there any pressed marks or cracks at the engaged part ©between Brake disc(27) and Rotor(17)?
- ●Is the air exhaust hole Ⓐ on Brake cover(40) open?
- ●Are there flaws, deformation or wear on Oil seal(23) or X-rings? Are there any flaws on the rotor surface where Oil seal(23) rests?

■ Wear Limit of Lining



(mm)

	Standard dimension	Service Limit
H	7.5	5.5

■ Solution

- ● Replace cracked, flawed, deformed or worn parts.
- ● Replace Oil seal(23), if lubricant has leaked from the air motor. Wipe up any oil adhering to the lining, etc., by using a cloth wetted with solvent. If Rotor(17) is worn or flawed, replace it with a new one.
- ● Replace Brake disc(27) if wear on the lining reaches the service limit. Even if wear is close to the service limit but not reaching, replacement is recommended.
- ● Replace Springs(31) at the same time as Brake disc(27).
- ● Replace all Springs(31) at the same time.

■ Reassembly

- ● See Chapter 10, Section 10.2 "Reassembly" for reassembling procedure.
- ● Apply "Molykote Grease 33" to the sliding surface of X-rings, the sliding surface Ⓑ of Pressure plate(28) and Brake case(26), and the engaged part Ⓒ between Brake disc(27) and Rotor(17) before assembly. (See Section 8.1 "Lubrication".)
- ● Thinly coat the sliding surface Ⓑ and the engaged part Ⓒ with grease.
- ● The brake is a self-adjust system. Therefore adjustment is not required.

(2) Inspection of Pendant Switch

- ● Is the control tube damaged, or is the connection part loose?
- ● Is the protection tube broken or bent?
- ● Do the push buttons correctly return to the neutral position after being pushed?
- ● Is there any damage to the switch case?
- ● Are the retaining rings missing, or are the bolts loose?

(3) Inspection of Valve (Main Valve)

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

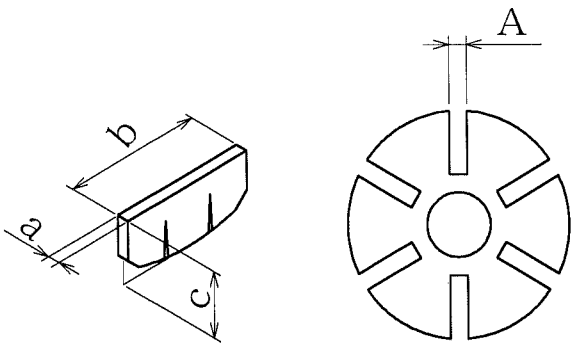
(4) Inspection of Air Motor

■ Replace parts which show the following conditions:

- ● The vanes are warped (curved), seized or cracked. Wear on the vanes reaches the service limit.
- ● The side face of the rotor is gouged or seized.
- ● The vane slot of the rotor is worn beyond the service limit or is narrower than the standard dimension.
- ● The rotor is cracked, or there is a visible indent or deformation on the engaged part with the brake disc.
- ● The end plate is gouged or seized, or the surface is rough due to wear.
- ● Abnormal wear, flaw or corrosion is found on/in the cylinder.
- ● The bearings are damaged, worn, or do not rotate smoothly (feels rugged when manually rotated).
- ● The silencer is clogged.

■ Wear Limit of Vane and Rotor

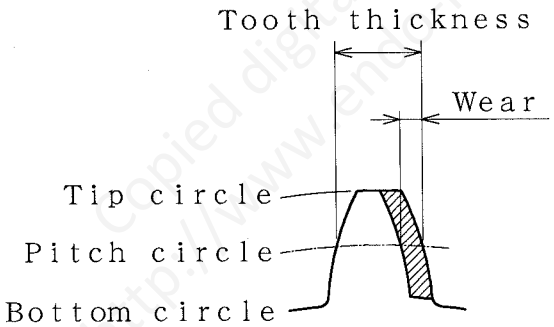
(mm)



	Standard dimension	Service Limit
A	3.3	3.7
a	3.0	2.7
b	32.0	31.5
c	13.7	13.0

(5) Inspection of Reduction Gear Unit

- Is any part deformed or cracked?
- Are the bearings damaged or worn?
  Those which do not rotate smoothly (feels rugged when manually rotated) are beyond their service limit.
- The wear limit of the gear on the pitch circle should be within 10 % of the original dimension of tooth thickness.



(6) Inspection of Frames

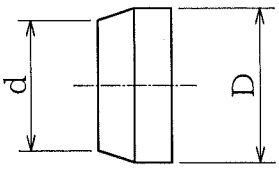
- Are the frames deformed, cracked or corroded?
  Carefully check welded portions.
  If deformation of the frame is visible, replace the frame with a new one.
- Check the distance between the tops of the two frames.
  If the distance is greater than the original one, replace the frames with new ones.
- Are the bolts loose?

(7) Inspection of Wheels

- Are the wheels rotate smoothly?
  Those which do not rotate smoothly (feels rugged when manually rotated) are beyond their service limit.
- Are the retaining rings missing?
- Are the wheels abnormally worn, or does wear on the wheel surface reach the service limit?
- Eccentricity of the wheel surface diameter should be within 0.8 mm.

■Wear Limit of Wheel Surface

(mm)



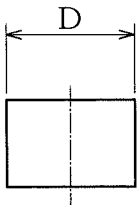
	Standard dimension	Service Limit
d	91.5	87.5
D	95.0	91.0

(8) Inspection of Rollers

- Are the rollers rotate smoothly?
- Does wear on the roller surface reach the service limit?
- Are the bolts loose?

■Wear Limit of Roller Surface

(mm)



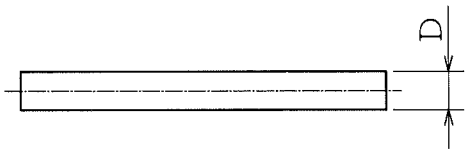
	Standard dimension	Service Limit
D	38.0	37.0

(9) Inspection of Shaft

- Is the shaft bent, flawed, cracked or corroded?
- Are the fixing bolts and the pins deformed or corroded?
- Are the split pins worn or corroded?
  If the split pin is missing, insert a new one and bend it securely.
- Does wear on the shaft reach the service limit?

■Wear Limit of Shaft

(mm)

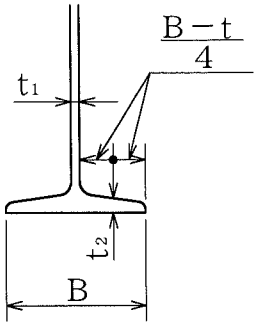


	Standard dimension	Service Limit
D	31.0	29.0

(10) Inspection of Rail

- Is the flange of the rail deformed?
- Are the welded portions cracked or corroded?
- Are the stoppers deformed or damaged?
- Are the mounting bolts for the rail and the stoppers loose?
- Does wear on the rail reach the service limit?

■Wear Limit of Rail



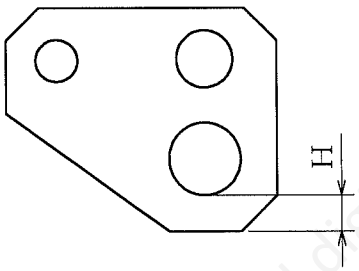
	Service Limit
B	95% of original
t_2	90% of original

(11) Inspection of Hanger Plate

- Is the hanger plate deformed, cracked or corroded?
- Does wear on the hanger plate reach the service limit?

■Wear Limit of Hanger plate

(mm)



	Standard dimension	Service Limit
H	20.0	17.0

(12) General Operation Inspection

After completing the inspections described in the foregoing sections, reassemble the whole unit according to Chapter 10, Section 10.2 "Reassembly" and inspect as follows:

■Idling Test

- Check the push button switches can be easily operated and the traveling directions of the trolley are correct as indicated.
- Check the traveling speed can be changed from low to high speed by controlling the pushing force on the push button switches.
- Check the trolley is not abnormally noisy or vibrating.

■Rated Load Test

- Check for malfunctions while traveling.
  Run the trolley at least twice over the entire length of the rail.
- Lift the rated load a few inches off the floor, then run and stop the trolley to check braking ability of the trolley.
- Check there is no significant reduction in the traveling performance.
- Check the trolley is not abnormally noisy, vibrating, or heating.

8.3 Storing the Trolley

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

8.4 Troubleshooting

⚠ WARNING

If a malfunction occurs during the operation of the trolley, stop operation immediately and take the necessary steps to rectify the problem.
Never operate the trolley if damaged or malfunctioning.
This is a serious hazard and could result in personal injury or death.

⚠ CAUTION

Careless repairs can cause damage to the trolley or personal injury.
Therefore, be careful but thorough when making repairs.

The following table shows probable causes and solutions of common malfunctions.
If any malfunctions not shown below happen, contact your dealer or us.

Malfunction	Main Causes	Solution
Motor does not run. Slow rotation or no rotation of Motor.	● Insufficient air pressure. ● Supplied air volume is insufficient. ● Inside diameter of pipe is too small. ● 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 larger inside diameter. ● 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. Lubricate Vanes. 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 Brake. Thereafter, perform leakage test. ● Disassemble and check. Replace the worn or damaged parts.
Brake does not work sufficiently.	● Lining is worn. ● Oil on 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 8, Section 8.2 (1) "Inspection of Brake and Service Limit". ● Check the operation system, eg., bending of Control lever. Disassemble and check Valve housing if required.

9. Adjustment of Speed and Operating Limit of Control Lever (See Figure 9)

Control lever(77) has been adjusted before shipping so it touches Gear housing(1), physically stopping Control lever before the main valve reaches the operating limit position.
This prevents the main valve from overloading.
Readjust Control lever(77) or adjust the traveling speed in the following manner if required:

■ Readjust Control lever for each forward and backward direction in the following manner:

> **⚠ WARNING**
> **Always shut off the air supply before readjustment.**

- 1) Screw Cap screw(78) completely into Control lever(77).
- 2) Loosen Cap screw(78) until it touches Gear housing(1) while Control lever(77) is being pulled down.
- 3) Release Control lever(77), and loosen Cap screw(78) another 1 turn, then lock Cap screw(78) with Hex. nut(79).

■ Adjustment of speed

Traveling speed can be reduced, if required, by readjusting the operating limit of Control lever.
To reduce speed, turn Cap screws(78) counterclockwise.

> **⚠ WARNING**
> **Always shut off the air supply before turning Cap screws(78).**
> **Otherwise, the trolley will move during adjustment, causing danger.**

To recover traveling speed, adjust Control lever in the same manner as preventing the main valve from overloading.

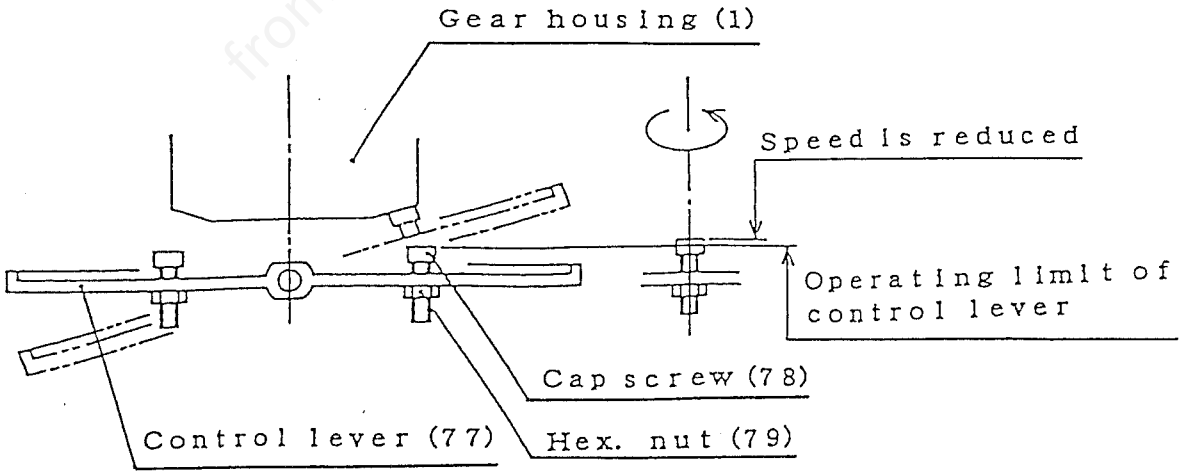


Fig. 9

10. Disassembly and Reassembly

⚠ WARNING

- Always shut off the air supply before carrying out disassembly or reassembly.
- Always disassemble or reassemble the trolley on the floor.
- Always employ specialists or well trained persons for disassembly and reassembly.

⚠ CAUTION

- Careless work can cause damage to the trolley or personal injury. Therefore, take care during disassembly and reassembly.
- Before reassembly, thoroughly clean all disassembled parts and check for cracks, flaws, deformation and wear.
- Never use acidic solvents for cleaning.
- Replace any damaged or excessively worn parts. Also replace burred or damaged screws.

10.1 Procedures of Disassembly

NOTE

- Whenever grasping a part in a vice, always use copper-covered vice jaws to protect the surface of the part and help prevent distortion.

Referring to the disassembly drawings (on Pages 34 and 37), disassemble the trolley using the following procedure.
When replacing the worn part, only disassemble the necessary part for replacement.

- 1) Remove the trolley from the rail.

⚠ WARNING

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

- 2) Disassemble the trolley section referring to the disassembly drawing (on Page 34).
  Cap screws(36) which are fixing Weight(34) are stuck with adhesive.
  If it is tight, do not apply excessive force. In this case, heat the threaded portion of Cap screw(36) to about 200℃ using a burner, etc., then remove before it becomes cool.
  Do not remove Weight(34) unless it is required.
- 3) Disassemble the air motor section referring to the disassembly drawing (on Page 37).
  ① Loosen Cap screws(96) and remove the air motor section from the frame.
  ② Loosen Cap screw(59) and remove Control lever(77).
  ③ Loosen Cap screws(76), and remove Silencer case(73), Silencer(74) and Support(75).

④Loosen Cap screws(71) and remove Valve housing(46).

- 4) Valve housing assembly(46～70)
  ①Loosen Cap screws(70), and Remove Valve covers(65), Valve pistons(63) and Cover(60) from both sides of Valve housing(46).
  ②Loosen Cap screw(59) which is fixing Lever(57), and remove Shaft(56) and Lever(57).
  ③Remove Valve cone(50), Springs(52), Sleeves(53) and Bolts(54) together.
  ④Loosen Bolt(55) and remove Liner(49).
  NOTE: Do not remove Liner(49) except when O-rings(51) or Liner(49) itself is required to be replaced.
- 5) Brake unit(26～44)
  ①Loosen Cap screws(44) sequentially by 1/6 turns, and remove Brake cover(40).
  ②Loosen Countersunk head cap screw(38), and remove Lock washer(37), Brake piston(35), Cylinder cover(32) and Springs(31).
  ③Remove Pressure plate(28) and Brake disc(27).
  NOTE: Check lubricant in the air motor has not leaked through Oil seal(23) when removing Brake disc(27).
  ④Remove Brake case(26).
  ⑤In case of disassembling the shuttle valve (Plug(42) and Ball(41)): Remove Spring pin(43), screw a bolt(M4, p=0.7) into Plug(42), heat Plug(42) to about 200℃ using a burner, etc., then remove Plug(42) before it becomes cool.
  NOTE: Plug(42) is sealed with sealant.
  Do not disassemble it unless it is required.
  If it is disassembled, replace Plug(42) and Ball(41) with new ones.
- 6) Loosen Cap screws(25) and remove Gear housing(1) from Motor housing(11).
- 7) Reduction gear unit(1～9)
  ①Remove Ball bearing(9), Planet shaft(5), Internal gear(4) and Ball bearing(2) from Gear housing(1).
  ②Remove Pins(8), and remove Gear wheels(6) from Planet shaft(5).
- 8) Loosen Cap screws(24) sequentially by 1/6 turns, remove Motor cover(22), and remove the air motor unit.
- 9) Air motor unit(12～20)
  ①Remove End plate(13) and Spacer(14) from the reduction gear side of Rotor(17).
  Remove Retaining ring(16) and Ball bearing(15).
  NOTE: Keep End plate(13) and the other parts disassembled from the reduction gear side together until reassembly.
  ②Remove Cylinder(18) and Vanes(20).
  ③Place Rotor(17) with End plate(13) on the brake side facing downward (see Figure 10), and check Rotor rotates smoothly.
  If smoothly rotating, do not remove Rotor(17) from End plate(13).
  NOTE: End plate(13) on the brake side and Rotor(17) are fitted using an interference fit.
  Do not disassemble Rotor(17) unless it is required.

④ If disassembly is required, remove Rotor(17) from End plate(13) by using a jig and hand press.

NOTE: Keep End plate(13) and the other parts disassembled from the brake side together until reassembly.
Take care not to mix them with the parts disassembled from the reduction gear side.

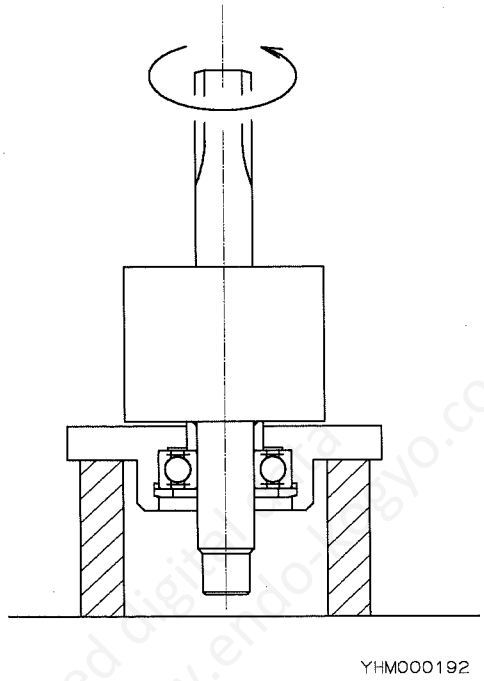


Fig. 10

10. 2 Reassembly

NOTE

- Never use solvents to clean rubber parts, such as O-rings, etc., or plastic parts.
- Whenever grasping a part in a vice, always use copper-covered vice 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 into a bearing recess.
- Always press against the stamped end of a needle-type bearing when pressing the bearing into a bearing recess.

Reassemble the trolley in reverse order of disassembly and pay attention to the following points:

- 1) Always replace Split pins(16), (22), (41) with new ones when removed.
See the disassembly drawing for the trolley section (on Page 34).

- 2) Assembling direction for Retaining rings (See Figure 11)
  Set up Retaining rings so the non-chamfered face bears the load.
  NOTE: Assembling direction for Retaining rings(16) is an exception.
  See Subsection - 5) "Air motor unit".

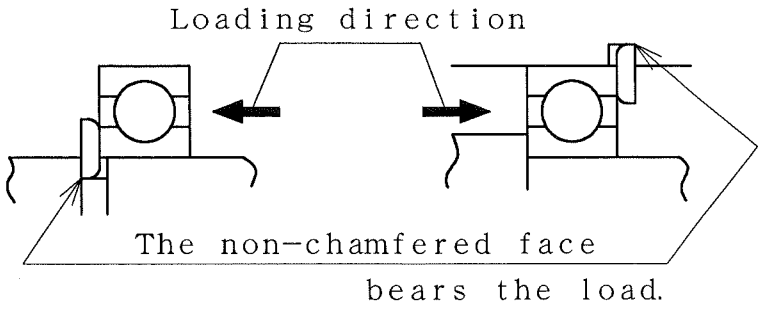


Fig. 11

- 3) Stick Cap screws(36) for fixing Weight(34) with adhesive.
  See the disassembly drawing for the trolley section (on Page 34).
  ① Degrease Cap screws(36) and the tapped holes of Frame(11) using solvent.
  ② Apply adhesive to the threads of Cap screws(36) and tighten Cap screws(36).
  Use "Loctite 262" or equivalents as adhesive.

- 4) Reduction gear unit(1～9)
  See the disassembly drawing for the air motor section (on Page 37).
  For lubrication volume and types of grease, see Chapter 8, Section 8.1 "Lubrication".
  ① Install Ball bearing(2) in Gear housing(1).
  ② Install Internal gear(4) in Gear housing(1).
  Fit Lock screw(3) into the cut portion of Internal gear(4).
  ③ Press Needle bearings(7) into Gear wheels(6), and lubricate Needle bearings(7) with grease.
  ④ Mount Gear wheels(6) on Planet shaft(5).
  For mounting direction, see Figure 12.

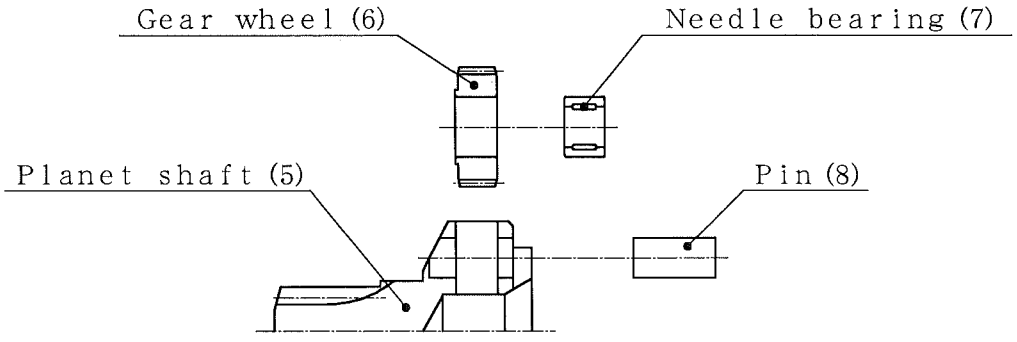


Fig. 12

⑤ Install Planet shaft(5) in Gear housing(1), and lubricate the gear portion of Planet shaft(5).
⑥ Install Ball bearing(9).

- 5) Air motor unit(12～20)

See the disassembly drawing for the air motor section (on Page 37).

NOTE: Take care not to mix End plates(13), Retaining rings(16), Ball bearings(15) and Spacers(14) which are kept separately when disassembled.

① Set up Retaining rings(16) so the chamfered face bears the load. The non-chamfered face contacts Ball bearing(15) (see Figure 13).

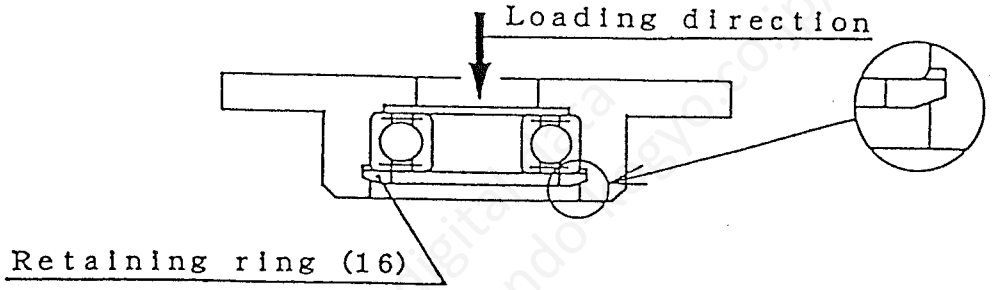


Fig. 13

② Install Spacers(14) so the larger chamfered end contacts Rotor(17) (see Figure 14).

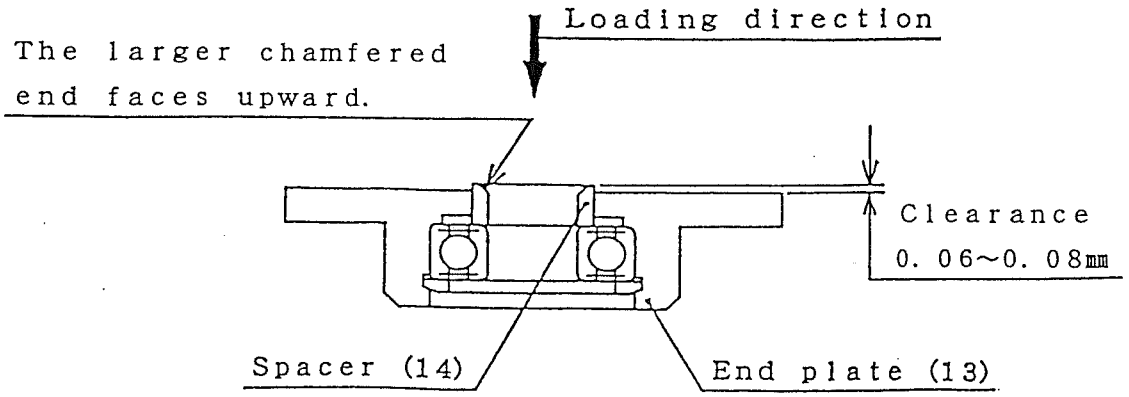


Fig. 14

③ If Ball bearing(15) or Retaining ring(16) is replaced with a new one, measure a projection of Spacer(14) from the End plate(13) surface after reassembling.
Apply the force of approx. 25 N {2.5 kgf} on Spacer(14) for about 10 seconds while the retaining ring side of End plate facing downward. Then release the force and measure the projection.
Allowance for the projection is 0.06～0.08 mm (see Figure 14).
If the measuring result is grater than the allowance, grind Spacer(14).
If the measuring result is smaller than the allowance, replace Ball bearing and Retaining ring again.
Never grind End plate.

> It is recommended to order End plate, ball bearing and Retaining ring together. Specify the part number of End plate set when ordering.
> In this case, the projection is already inspected before shipment.

④ When inserting Rotor(17) into Ball bearing(15) on the brake side End plate(13), use the inner ring of Ball bearing for support and press Rotor(17) by hand press until Rotor(17) contacts Spacer(14).
If Rotor(17) is not assembled properly, Rotor will not be vertical to End plate(13), hence the clearance will be unsymmetrical. So be careful when assembling.
⑤ Install Cylinder(18) with the Spring pin(19) side facing to End plate(13) on the brake side.
⑥ Install Vane(20) into each vane slot of Rotor(17), and slightly lubricate the vane portion.
Next, apply oil thinly on the end face of Rotor(17).
(Use the same oil used in the lubricator.)
⑦ Install End plate(13) on the reduction gear side.

- 6) Install the air motor unit in Motor housing(11).
At this time, fit Spring pin(19) of the air motor unit into its mounting hole on Motor Housing(11).
- 7) Install Coned disc spring(21) and Motor cover(22), and fix with cap screws(24). Tighten Cap screws(24) sequentially by 1/6 turns.
NOTE: Be careful not to damage Oil seal(23) by the gear portion of Rotor(17) when installing Motor cover(22).

- 8) Install O-ring(10) into Gear housing(1), then install Gear housing on Motor housing(11).

- 9) Brake unit(26～44)
① When assembling, apply "Molykoto grease 33" to the sliding surfaces and engaged parts of each part.
For coating positions, see Chapter 8, Section 8.2 (1) "Inspection of Brake and Service Limit".
For details of grease, see Chapter 8, Section 8.1 " Lubrication".
② Be careful grease, etc., does not adhere to the lining of Brake disc(27).
③ Install Oil seal(23) in Brake case(26), then install them in Motor housing(11).
④ Install Brake disc(27).
⑤ Attach Key(30) on Pressure plate(28), then install them in Brake case(26).

⑥Attach X-rings(33) and (36) to Cylinder cover(32) and Brake piston(35) respectively.

⑦Install Springs(31) into Brake case(26), and install Cylinder cover(32) into Motor housing(11).
Install Brake piston(35) on Pressure plate(28), and fix with Countersunk head cap screw(38).

⑧Remove Pressure plate(28) and Brake piston(35) together from Moter housing(11).

⑨Degrease Plug(42) and its setting position on Brake cover(40) using solvent.
Install Ball(41).
Apply sealant to Plug(42), then insert Plug into Brake cover(40) and fix with Spring pin(43).
NOTE: Apply sealant thinly on the outer face of the top of Plug(42). Apply sealant a little more on the edge between ϕ10 and ϕ12 cylindrical bodies and on the surface of ϕ12 cylindrical body. Use "Loctite 510" or equivalents as sealant.

⑩Install Brake piston(35) into Brake cover(40).
At this point, be careful not to damage X-ring(36).

⑪Install O-ring(34) and Gasket(39) on Motor housing(11).
Then install Pressure plate(28) and Brake cover(40) together on Motor housing(11).
Tighten Cap screws(44) sequentially by 1/6 turns.

-10) Valve housing assembly(46～77)

①Treat Liner(49) and Valve cone(50) carefully, as even a small flaw will render them useless.

②Attach O-rings(51) to Liner(49) and apply oil.
(Use the same oil used in the lubricator.)
Insert Liner(49) into Valve housing(46) so the oblong hole of Liner faces to Lever(57) and the ϕ4 hole faces to the tapped hole of Valve housing where Bolt(55) will be set.
Check the ϕ4 hole of Liner(49) aligns with the tapped hole of Valve housing(46), then fix Liner with Bolt(55).

③Install Springs(52), Sleeves(53) and Bolts(54) in Valve cone(50), then insert Valve cone(50) into Liner(49).

④Install Shaft(56) and Lever(57) into Valve housing(46), and fix with CD-washer(58) and Cap screw(59).

⑤Attach Mini Y-packings(61) and O-rings(62) to Covers(60), and apply oil.
(Use the same oil used in the lubricator.)

⑥Attach X-rings(64) to Valve pistons(63), and apply "Molykote Grease 33".
For details of grease, see Chapter 8, Section 8.1 (3) "Brake Unit".

⑦Install Covers(60), Valve pistons(63) and Valve covers(65) to Valve housing(46).

⑧Install Valve housing(46) on Motor housing(11).

⑨Install Silencer(74) and Support(75) on Silencer case(73), then install them on Valve housing(46).

⑩Install Control lever(77) on Shaft(56), and fix with CD-washer(58) and Cap screw(59).

-11) Install the air motor section on the trolley section, and fix securely with Plain washers(94), CD-washers(95) and Cap screws(96).

11. Parts List

Remarks When Purchasing Parts

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

■ How to read parts list

Ref. No.	Part No.	Quantity	Description
—	LHP000057	1	Brake cover compl.
40	P2H200071	1	－Brake cover
—	LHP000117	1	－Shuttle valve set1
41	—	1	－－Ball
42	—	1	－－Plug
43	—	1	－－Spring pin
44	KA00910525	4	Cap screw

The mark indicates the range of the set or the complete unit.

■ PARTS LIST MTH-1T-5 TROLLEY SECTION

1999. 05. 13

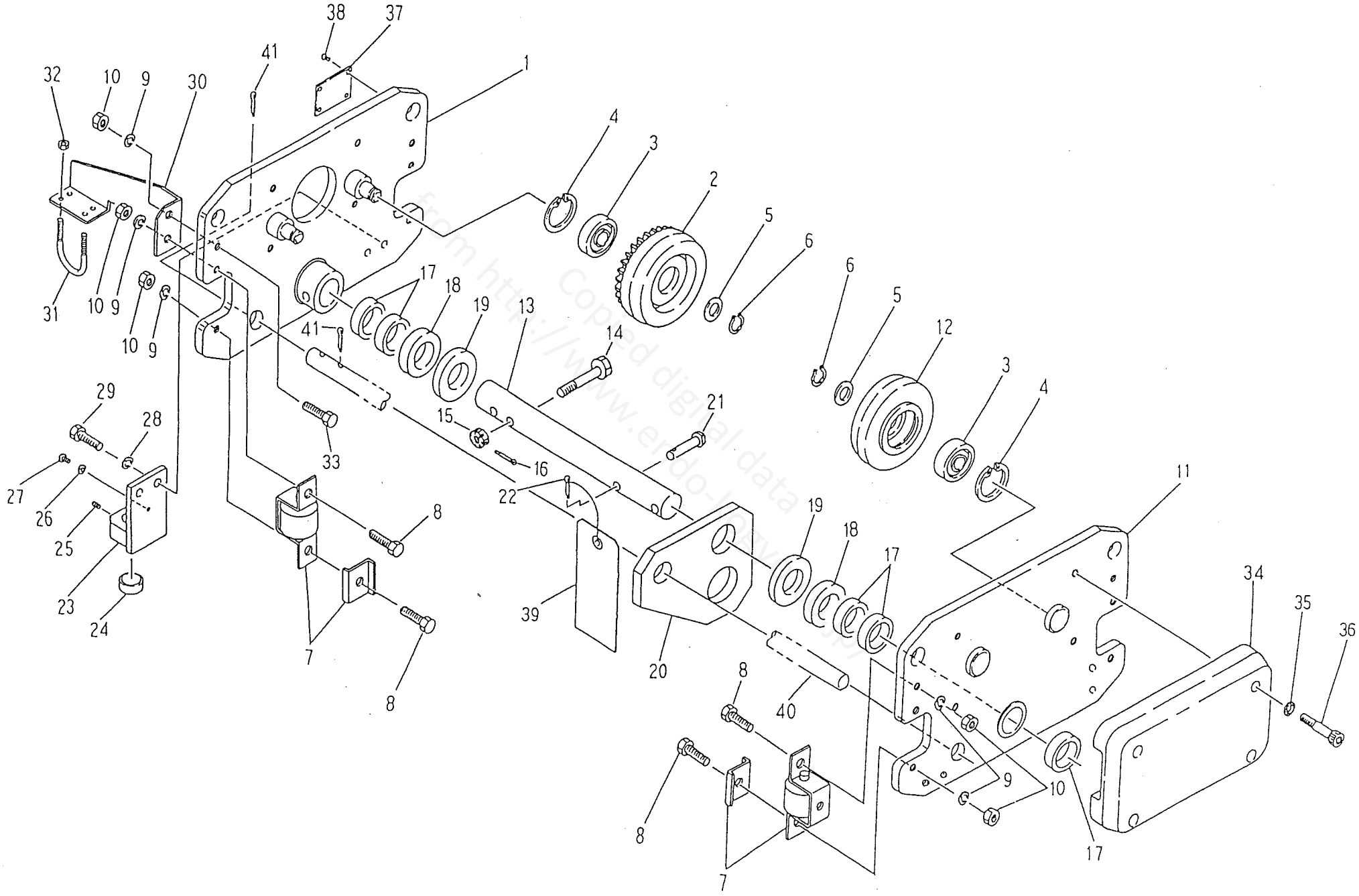
Ref. No.	Part No.	Quantity	Description
1	P2H200764	1	Frame
–	LHP001101	2	Wheel compl.
2	–	2	–Wheel
3	KA60105022	2	–Ball bearing
4	KA40210042	2	–Retaining ring
5	P2H400280	4	Washer
6	KA40110015	4	Retaining ring
7	LHP001103	4	Roller set
8	P2H401524	8	Hex. head bolt
9	KA31110800	9	Spring washer
10	KA20110800	9	Hex. nut
11	P2H300765	1	Frame
–	LHP001102	2	Wheel compl.
12	–	2	–Wheel
3	KA60105022	2	–Ball bearing
4	KA40210042	2	–Retaining ring
13	P2H400927	1	Shaft
14	P2H400283	1	Bolt
15	KA23121005	1	Hex. slotted nut
● 16	KA42129818	1	Split pin
17	P2H400282	5	Spacer
18	P2H401501	2	Spacer
19	P2H400152	2	Spacer
20	P2H401484	1	Hanger plate
21	P2H401503	1	Pin
● 22	KA42120420	1	Split pin
23	LHP001081	1	Bracket
24	P2H400156	1	Spacer
25	KA16110508	1	Set screw
26	KA30220500	1	Washer
27	KA10120508	1	Machine screw
28	KA31111000	2	Spring washer
29	KA00111025	2	Hex. head bolt
30	P2H300763	1	Bracket
31	P2H400356	1	U-bolt
32	KA25520602	2	U-nut
33	KA00110830	1	Hex. head bolt
34	P2H100017	1	Weight
35	KA32410821	4	CD-washer
36	KA00910842	4	Cap screw
37	P2H401505	1	Name plate
38	KA14519803	4	Drive screw
39	P2H300140	1	Tag
40	P2H401506	1	Shaft
● 41	KA42120536	2	Split pin

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

Parts without a part number cannot be supplied individually.

When ordering spare parts, specify the part number (not the reference number), description and model name of the trolley.

■ MTH－1T－5



■ PARTS LIST AIR MOTOR SECTION

1999. 05. 13

AIR MOTOR GM-1A LHP001071

Ref. No.	Part No.	Quantity	Description
1	P2H100197	1	Gear housing
2	KA60103064	1	Ball bearing
3	P2H400138	1	Lock screw
4	P2H200042	1	Internal gear
5	P2H200198	1	Planet shaft
–	LHP000059	1	Gear wheel set
6	–	2	–Gear wheel
● 7	P2H400139	2	–Needle bearing
8	P2H400088	2	Pin
9	KA60107100	1	Ball bearing
● 10	KA50200900	1	O-ring
11	P2H100015	1	Motor housing
12	KA42410412	1	Spring pin
–	LHP000347	1	Air motor compl.
–	LHP000055	2	–End plate set
13	–	2	––End plate
14	–	2	––Spacer
15	KA60103014	2	–– Ball bearing
16	P2H400044	2	––Retaining ring
17	P2H200044	1	–Rotor
18	P2H200045	1	–Cylinder
19	KA42410418	1	–Spring pin
12	KA42410412	1	–Spring pin
● –	LHP000056	1	–Vane set
20	–	6	––Vane
21	P2H300030	1	Coned disc spring
22	P2H200046	1	Motor cover
● 23	P2H400046	2	Oil seal
24	KA00910516	4	Cap screw
25	P2H400150	4	Cap screw
26	P2H200047	1	Brake case
● 27	LHP000052	1	Brake disc
28	P2H300108	1	Pressure plate
29	KA42410212	1	Spring pin
30	P2H400141	1	Key
● –	LHP000111	1	Spring set
31	–	5	–Spring
32	P2H300109	1	Cylinder cover
● 33	P2H400143	1	X-ring
● 34	KA50200530	1	O-ring
35	P2H300110	1	Brake piston
● 36	P2H400144	1	X-ring
37	KA33320600	1	Lock washer
38	KA01310620	1	Countersunk head Cap screw
● 39	P2H300111	1	Gasket
–	LHP000057	1	Brake cover compl.
40	–	1	–Brake cover
–	LHP000117	1	–Shuttle valve set
41	–	1	––Ball
42	–	1	––Plug
43	–	1	––Spring pin
44	KA00910525	4	Cap screw
● 45	P2H300114	1	Gasket
–	LHP000401	1	Valve housing assembly
46	P2H100016	1	–Valve housing
● 47	KA50100080	2	–O-ring
48	P2H400145	2	–Needel bearing
–	LHP000402	1	–Valve set
49	–	1	––Liner
50	–	1	––Valve cone
● 51	KA50200180	4	––O-ring
52	P2H400058	2	––Spring
53	P2H400059	2	––Sleeve
54	P2H300042	2	––Bolt
55	P2H400057	1	–Bolt
56	P2H300116	1	–Shaft
57	P2H400160	1	–Lever
58	KA32410420	1	–CD-washer
59	KA00910412	1	–Cap screw
60	P2H300117	2	–Cover
● 61	P2H400060	2	–Min Y-packing
● 62	KA50200240	2	–O-ring
63	P2H300044	2	–Valve piston
● 64	P2H400061	2	–X-ring
65	LHP000060	2	–Valve cover
● 66	P2H400214	4	–Seal
67	P2H400222	2	–Silencer
68	P2H400223	2	–Bolt
69	P2H400257	2	–Nipple
70	P2H400230	8	–Cap screw
71	KA00910642	4	Cap screw
● 72	P2H300242	1	Gasket
73	P2H200050	1	Silencer case
74	P2H400146	1	Silencer
75	P2H400147	1	Support
76	KA00910418	4	Cap screw
77	P2H200051	1	Control lever

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

Parts without a part number cannot be supplied individually.

When ordering spare parts, specify the part number (not the reference number), description and model name of the trolley.

Ref. No.	Part No.	Quantity	Description
78	P2H400064	2	Cap screw
79	KA20110600	2	Hex. nut
58	KA32410420	1	CD-washer
59	KA00910412	1	Cap screw
80	P2H400148	1	Bushing
81	P2H400267	1	Elbow
82	P2H401509	1	Name plate
83	KA14549803	4	Drive screw

OTHER PARTS (NOT INCLUDED IN AIR MOTOR GM-1A)

91	P2H400153	1	Nipple
92	KA80712100	1	Tee
93	P2H400159	1	Plug
94	KA30220800	4	Plain washer
95	KA32410821	4	CD-washer
96	P2H400158	4	Cap screw

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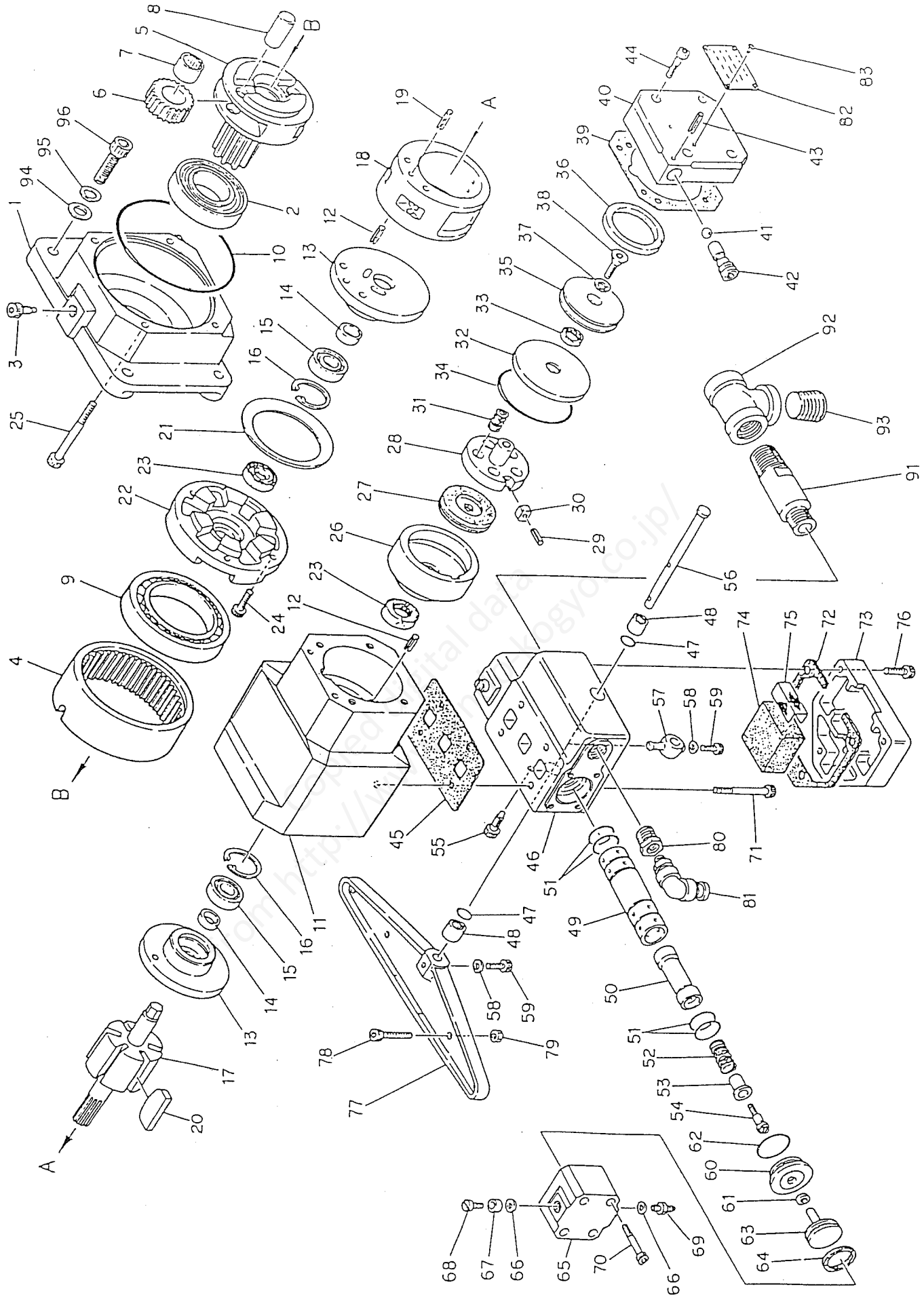
■ G M − 1 A



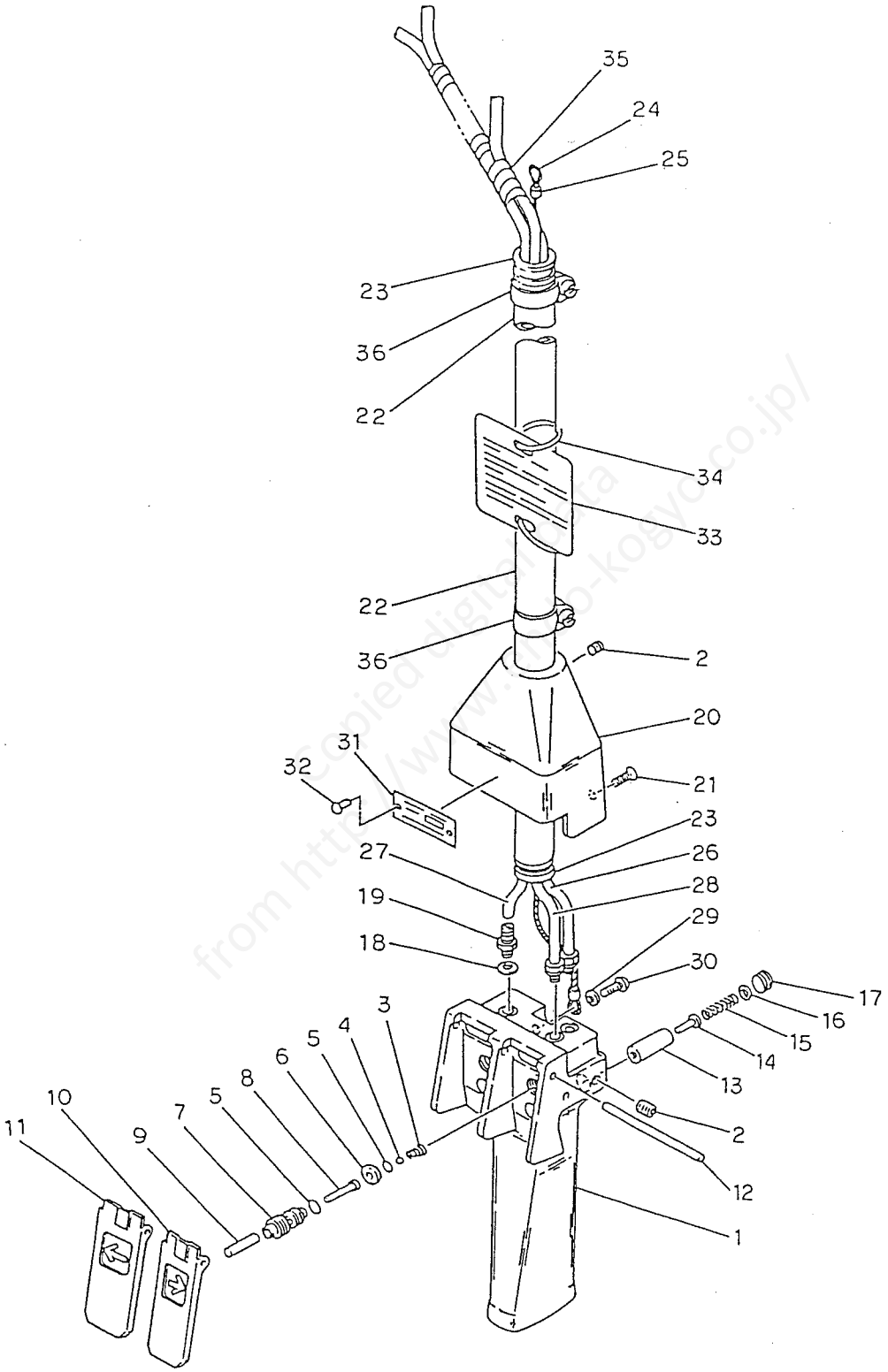
■ PARTS LIST PCS-3 PENDANT SWITCH

1998.10.29

Ref. No.	Part No.	Quantity	Description
—	LHP000015	1	Control valve assembly
1	P2H100018	1	—Valve housing
2	KA16110508	2	—Set screw
3	P2H300158	2	—Spring
4	KA63100304	2	—Steel ball
● 5	KA50100080	4	—O-ring
6	P2H400247	2	—Seat
7	P2H300159	2	—Liner
8	P2H400248	2	—Pin
9	P2H400249	2	—Valve knob
—	LHP000223	1	—Push button set
10	—	1	——Push button (R)
11	—	1	——Push button (L)
12	P2H400251	1	—Pin
13	LHP000053	2	—Buffer spool complete
14	—	2	——Spring case
—	—	2	——Spool
15	—	2	——Spring
16	—	2	——Retaining ring
17	P2H400256	2	—Set screw
● 18	P2H400214	4	—Seal
19	P2H400257	3	—Nipple
20	P2H200059	1	—Valve cover
21	KA10220510	2	—Machine screw
—	LHP000014a	1	Control tube complete
22	—	1	—Protection hose
23	—	2	—Inner
24	—	1	—Wire rope
25	—	2	—Lock tube
26	—	1	—Nylon tube (black)
27	—	1	—Nylon tube (green)
28	—	1	—Nylon tube (yellow)
36	KA86100022	2	—Hose clip
29	KA30220500	1	Plain washer
30	KA10120510	1	Machine screw
31	P2H300123	1	Name plate
32	KA14549803	2	Drive screw
33	P2H300274	1	Caution plate
34	P2H400465	2	Convex belt
35	P2H400126	1	Spiral tube

We recommend that you stock parts indicated by a bullet (●).
Parts without a part number cannot be supplied individually.
When ordering spare parts, specify the part number (not the reference number), description and model name of the trolley.

■ P C S − 3



■ PARTS LIST　PCS-41・PCS-42　PENDANT SWITCH

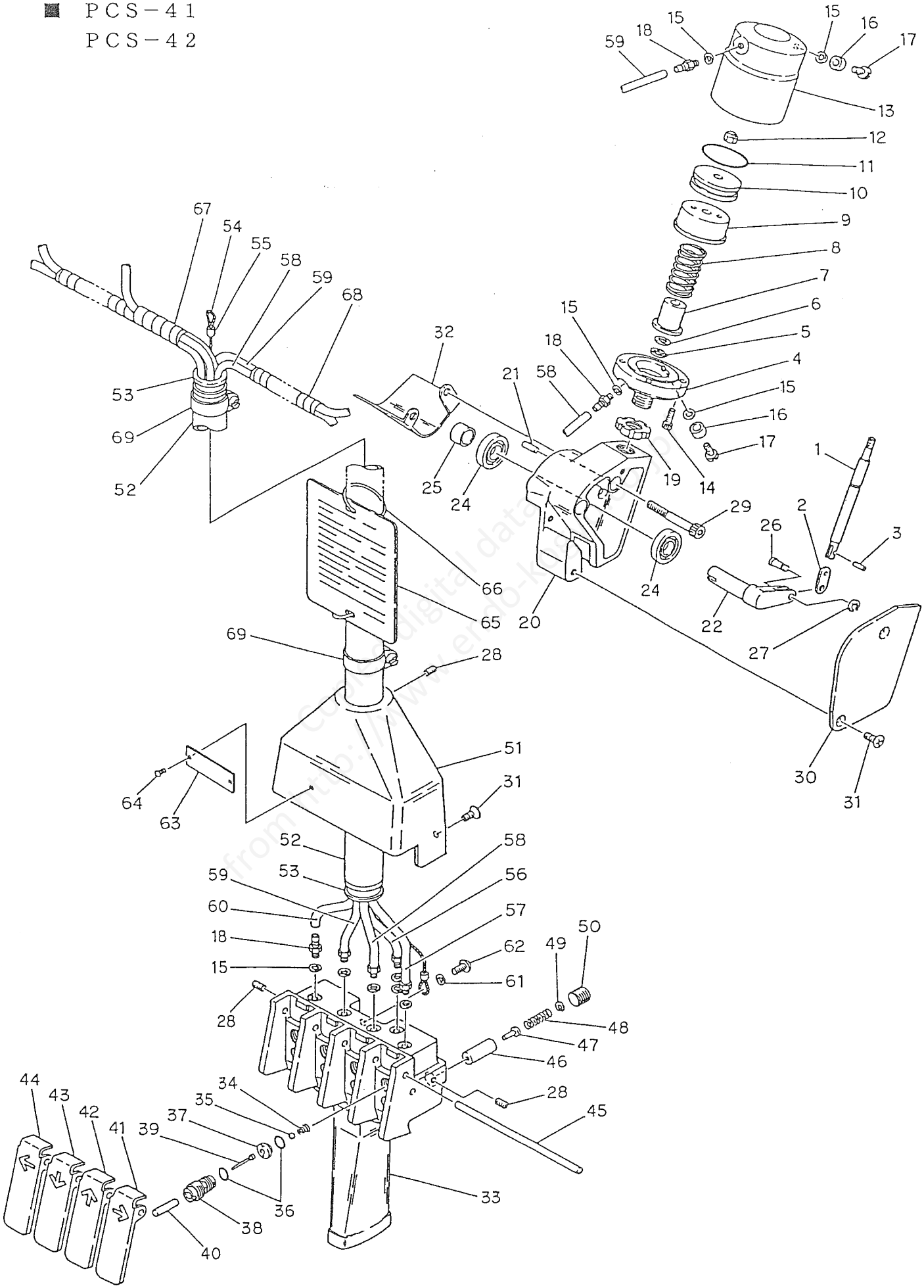
2018.01.26

Ref. No.	Part No.	Quantity PCS-41	Quantity PCS-42	Description
-	LHP002590	1	-	Cylinder assembly
-	LHP002591	-	1	Cylinder assembly
-	LHP000202	1	-	-Cylinder compl.
-	LHP000203	-	1	-Cylinder compl.
1	P2H400215	1	1	--Piston rod
2	P2H400224	1	-	--Link
2	P2H400208	-	1	--Link
3	P2H400865	1	1	--Pin
4	P2H300157	1	1	--Cylinder cover
● 5	KA40110007	1	1	--Retaining ring
6	P2H400216	1	1	--Ring
7	P2H400217	1	1	--Spacer
8	P2H400218	1	1	--Spring
9	P2H400219	1	1	--Spacer
10	P2H400220	1	1	--Piston
● 11	KA50100315	1	1	--O-ring
● 12	P2H400221	1	1	--Lock nut
13	P2H300156	1	1	--Cylinder
14	KA00910410	4	4	--Cap screw
● 15	P2H400214	4	4	--Seal
16	P2H400222	2	2	--Silencer
17	P2H400223	2	2	--Bolt
18	P2H400257	2	2	--Nipple
19	KA64101002	1	1	--Bearing nut
-	LHP002592	1	-	-Cylinder holder compl.
-	LHP002593	-	1	-Cylinder holder compl.
20	P2H200058	1	-	--Cylinder holder
20	P2H200057	-	1	--Cylinder holder
21	KA43200412	1	1	--Parallel pin
22	LHP000076	1	-	--Shaft
22	P2H300150	-	1	--Shaft
23	P2H400265	1	-	--Spacer
24	KA60102012	2	-	--Ball bearing
24	KA60103032	-	2	--Ball bearing
25	P2H400165	1	-	--Sleeve
25	P2H400209	-	1	--Sleeve
26	P2H400228	1	1	--Pin
27	KA40310040	1	1	--Retaining ring
29	KA00910642	2	-	--Cap screw
29	KA00910844	-	2	--Cap screw
30	P2H300162	1	-	--Cover
30	P2H300152	-	1	--Cover
31	KA10220510	2	2	--Machine screw
32	P2H400229	1	-	-Cover
32	P2H300151	-	1	-Cover

Ref. No.	Part No.	Quantity PCS-41	Quantity PCS-42	Description
-	LHP000013	1	1	Control valve assembly
33	P2H100013	1	1	-Valve housing
28	KA16110508	3	3	-Set screw
34	P2H300158	4	4	-Spring
35	KA63100304	4	4	-Steel ball
● 36	KA50100080	8	8	-O-ring
37	P2H400247	4	4	-Seat
38	P2H300159	4	4	-Liner
39	P2H400248	4	4	-Pin
40	P2H400249	4	4	-Valve knob
-	P2H000278	1	1	-Push button set
41	-	1	1	--Push button (R)
42	-	1	1	--Push button (U)
43	-	1	1	--Push button (D)
44	-	1	1	--Push button (L)
45	P2H400118	1	1	-Pin
-	LHP000053	4	4	-Buffer spool compl.
46	-	4	4	--Spring case
47	-	4	4	--Spool
48	-	4	4	--Spring case
49	-	4	4	--Retainig ring
50	P2H400256	4	4	-Set screw
● 15	P2H400214	6	6	-Seal
18	P2H400257	5	5	-Nipple
51	P2H200040	1	1	-Valve cover
31	KA10220510	4	4	-Machine screw
-	LHP000012	1	1	Control tube compl.
52	-	1	1	-Protection hose
53	-	2	2	-Inner
54	-	1	1	-Wire rope
55	-	2	2	-Lock tube
56	-	1	1	-Nylon tube (black)
57	-	1	1	-Nylon tube (yellow)
58	-	1	1	-Nylon tube (red)
59	-	1	1	-Nylon tube (blue)
60	-	1	1	-Nylon tube (green)
69	KA86100300	2	2	-Hose clip
61	KA30220500	1	1	Plain washer
62	KA10120510	1	1	Machine screw
63	P2H300271	1	-	Name plate
63	P2H300272	-	1	Name plate
64	KA14549803	2	2	Drive screw
65	P2H300273	1	1	Caution plate
66	P2H400465	2	2	Convex belt
67	P2H400126	1	1	Spiral tube
68	P2H400313	1	1	Spiral tube

We recommend that you stock parts indicated by a bullet(●).
Parts without a part number cannot be supplied individually .
When ordering spare parts, specify the part number(not the reference number), description and model name of the trolley.

■ PCS－41
PCS－42

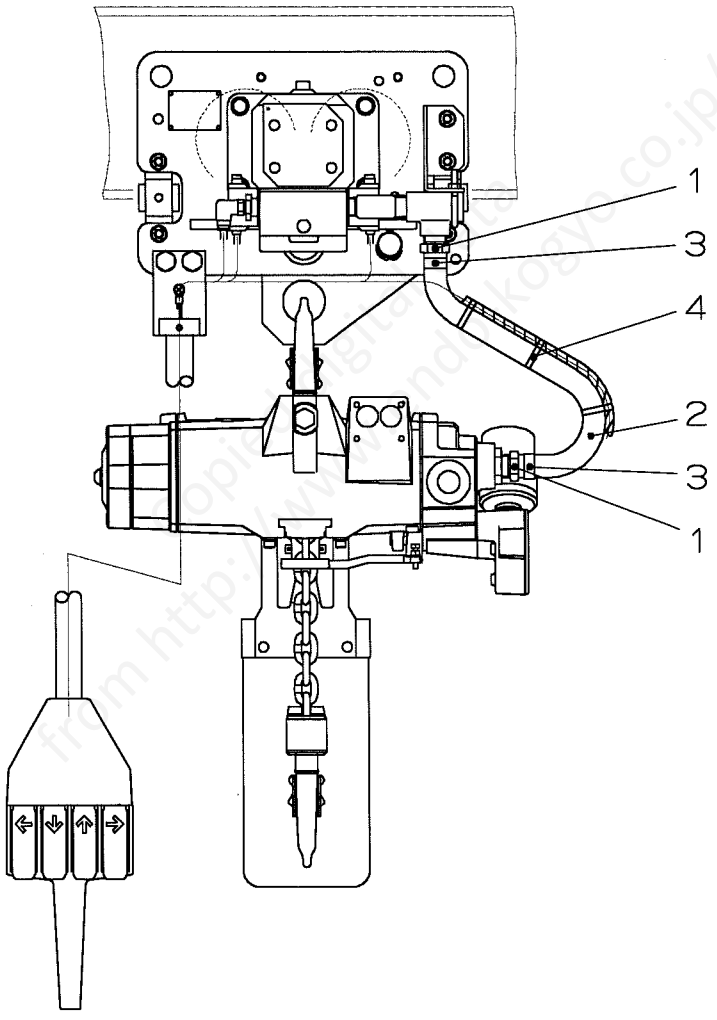


■ PARTS LIST PIPING PARTS SET

(MTH-1T-5, EHL-025TS/EHL-05TS/EHL-1TW)

2015.02.27

Ref. No.	Part No.	Quantity	Description
1	P2H300174	2	Nipple
2	P2H400314	1	Hose
3	KA86100250	2	Hose clip
4	P2H400201	3	Convex belt



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