☆Please be sure to hand it over to the customer using.

☆The customer using should read it before use.

HITACHI
Inspire the Next

Hitachi Electric Chain Hoist

L series

L-type (single speed)
LN-type (dual speed)
LS-type (single phase)

Service Manual

Original version

- This instruction manual explains the handling of Hitachi L-type Electric chain hoist in details so please ensure to read over it until the end and use it correctly. Facility managers and workers who will use the equipment should read this manual.
- This instruction manual describes the items specific to the L-type Electric chain hoist. The attached "Electric chain hoist owner's manual" describes the general handling method of Electric chain hoists, so read the manuals together and use them correctly.
- When the installation/operation/maintenance are inappropriate, the electric chain hoist cannot be used smoothly, and may cause unexpected troubles and accidents.
- After reading, please carefully store all the manuals together and utilize these during maintenance and inspection.
- Please note that we do not guarantee Electric chain hoists that are remodeled.

Safety Precautions

Improper use of the Electric Chain Hoist may result in generation of a falling load, electric shock, orother dangerous state. Before installation, mounting, running, operation, and maintenance and inspection, always thoroughly read this instruction manual and use the equipment correctly.
Use the equipment after gaining knowledge of the equipment, safety information, and precautions.
This Operation Manual uses the designations “DANGER”, “WARNING”, and “CAUTION” to classify safety precautions.

[Explanation of Warning Display Ranks]

⚠DANGER : This is a dangerous situation that if not avoided, poses immanent death or serious injury.

⚠WARNING : This is a dangerous situation that if not avoided, could lead to death or serious injury.

⚠CAUTION : This is a dangerous situation that if not avoided, could lead to minor as semi-serious injury or that could cause property damage.

In addition, even items designated **⚠CAUTION** may be linked to serious results depending on the conditions. In any case, since the contents are important, always observe them.

[Explanation of Prohibited and Instruction Symbols]

: This shows something that is prohibited (something that must not be done).
For example,when a flame is prohibited, the symbol  is shown.

: This shows an instruction (something that must be done).
For example, when the device must be grounded, the symbol  is shown.

*After reading, always store this manual where it can be read by those who use it.

Table of Contents

1. Introduction

⚠ WARNING

- This instruction manual describes items specific to the L-type Electric chain hoist.
- Regarding the safety precautions on using the Electric chain hoist, and when doing the mounting, installation, maintenance and inspection, in addition to this instruction manual, please ensure to read the separate volume "Hitachi Electric chain hoist Owner's Manual and observe all the cautionary notes.

1-1. Confirmation of the product and accessories

Checklist for the product and accessories

Please check the following before use.

(1) Whether or not the product arrived as ordered. Please check the tag on the product. At that time, please take note of the product number (MFG. No), which will be useful for later inquiries.

(2) Whether or not the body is deformed or damaged due to accidents during transportation.

(3) Whether the accessories are present. (Please use the checklist)

Accessories list

Service Manual (this manual)	1
Owner's Manual	1
Chain gauge	1

1-2. About the contents of the instruction manual

The contents of this instruction manual are subject to change without notification and without any legal responsibility on our part.

1-3. About guarantee

- Within the warranty period (within one year after delivery), provided the equipment is used in accordance with the cautionary notes given in the instruction manuals, on body labels etc., and provided the cause of the fault or breakage lies in our design, manufacturing or materials etc., we will repair it free of charge.
- Even within the warranty period, repair charges may apply for the following situations:
  1. The fault is caused by the failure to adhere to the usage method and cautionary notes stated in the instruction manual of this product
     (1) When used at a duty factor or start frequency above the set usage limit
     (2) When used with a load exceeding the rating
     (3) When the product or accessories had been remodeled
     (4) When used in severe environments exceeding the product specifications
  2. When used by someone without the required education or qualification prescribed by laws or regulations
  3. When used without the routine checks or periodic inspections stipulated by laws and regulations
  4. Fault or damage caused by fire, earthquake, lightning strike or other natural disasters
  5. When used without exchanging the consumable parts such as the brake, electromagnetic contactor etc.
  6. A fault of this product caused by another equipment used in combination with this product
- Since we do not guarantee for secondary damages such as lost production due to the failure of this product, when such situation is anticipated, please prepare an auxiliary machine in advance or consult our sales office.

2. Product specifications

2-1. Standard specification

Machine type		Electric chain hoist L-series
Power supply		L-type, LN-type (3phase) : 220V / 380-415V 50Hz, 346V 50Hz, 220-230 / 440-460V 60Hz LS-type (1phase) : 200-220V 50Hz, 220-240V 50Hz, 110V 60Hz, 220V 60Hz
L-type (single speed)	500kg	0.63kW (50Hz), 0.75kW (60Hz)
	250kg	0.45kW (50Hz), 0.55kW (60Hz)
	150kg	0.38kW (50Hz), 0.45kW (60Hz)
LN-type (dual speed)	500kg	0.63 / 0.16kW (50Hz), 0.75 / 0.19kW(60Hz)
	250kg	0.45 / 0.11kW (50Hz), 0.55 / 0.14kW (60Hz)
	150kg	0.38 / 0.10kW (50Hz), 0.45 / 0.11kW (60Hz)
LS-type (single phase)	500kg	0.30kW (50Hz), 0.35kW (60Hz)
	250kg	0.25kW
Operating voltage		AC24V
Electric power feeding method		Cabtire cable power supply
Protection structure		IP54
Chain (mm)		ϕ6.3 (diameter) × 19.1 (pitch)
Environment	Ambient Temperature	-10ºC ~ 40ºC (no freezing)
	Humidity	90% or less (no condensation)
Classification		ISO : M4, FEM : 1Am
Noise level		75dB or less (A scale : measured at 1m away from the hoist)
Color		Orange (Munsell : 2.5YR 6/12)

- In the special circumstances shown below, the standard specifications cannot be used, so please contact us separately.
  1. When using in acidic, alkaline, salty or in corrosive gas environments.
  2. When the ambient temperature exceeds 40°C or the humidity exceeds 90%.
  3. When using in an organic solvent or an explosive dust environment, which has danger of explosion or flammability.

2-2. Rated specification

Machine type		Intermittent periodic rating (at 63% load factor)	
		Duty factor	Start frequency
L-type (single speed)		40% ED	240starts/h
LN-type (dual speed)	High-speed	20% ED	60starts/h
	Low-speed	10% ED	120starts/h
LS-type (single speed, single phase)		25% ED	150starts/h

2-3. Speed specification

Unit : m / min

Machine type		Hoisting speed (50Hz / 60Hz)		
		150kg	250kg	500kg
L-type (single speed)		14.4 / 17	10.0 / 12.0	7.2 / 8.5
LN-type (dual speed)	High-speed	14.4 / 17	10.0 / 12.0	7.2 / 8.5
	Low-speed	3.6 / 4.3	2.5 / 3.0	1.8 / 2.1
LS-type (single speed, single phase)			5.0 / 6.0	3.6 / 4.3

2-4. Motor specification

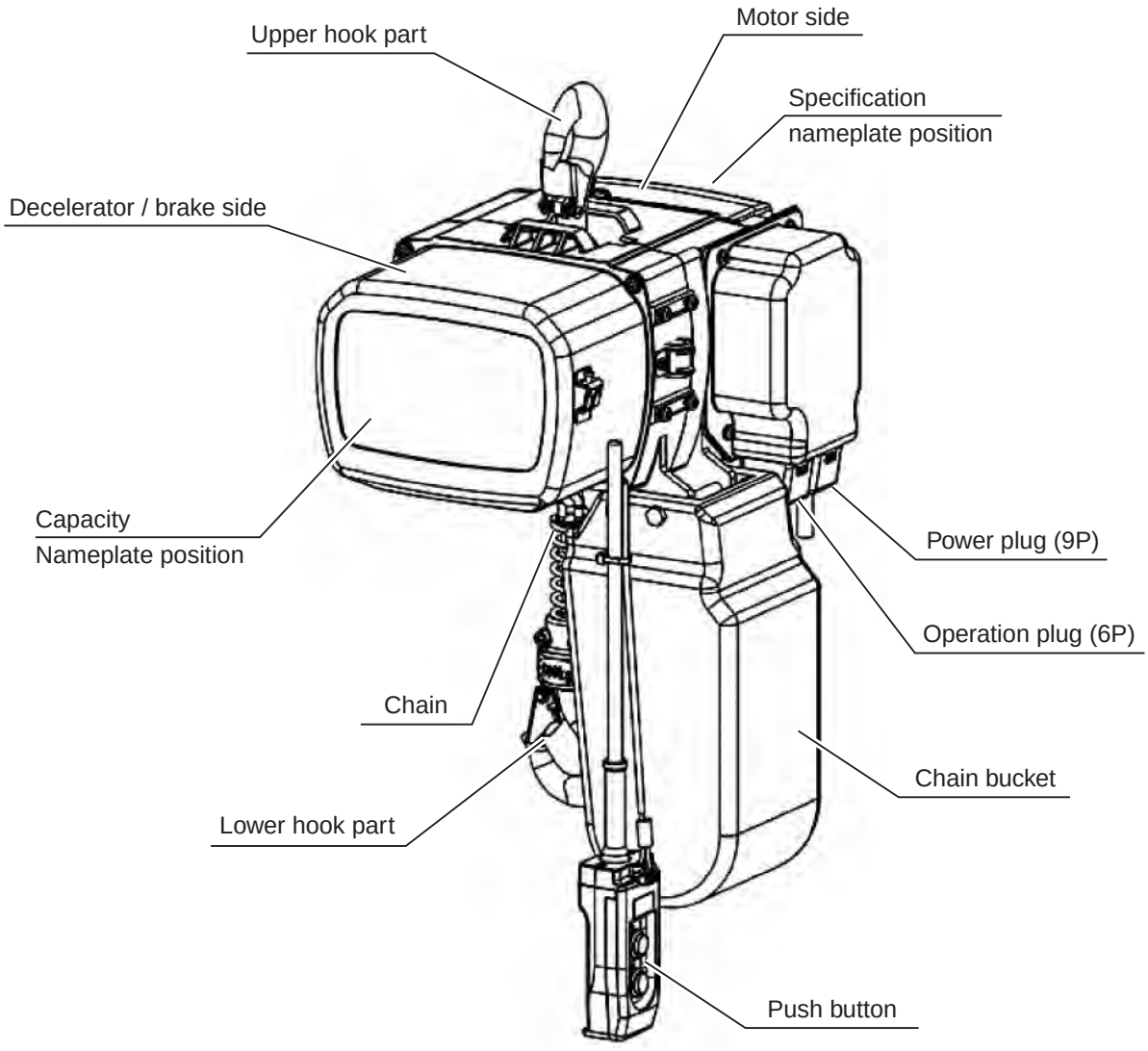
Machine type	Motor insulation class
L-type	Class E
LN-type	Class F
LS-type	Class E

2-5. Approximate weight

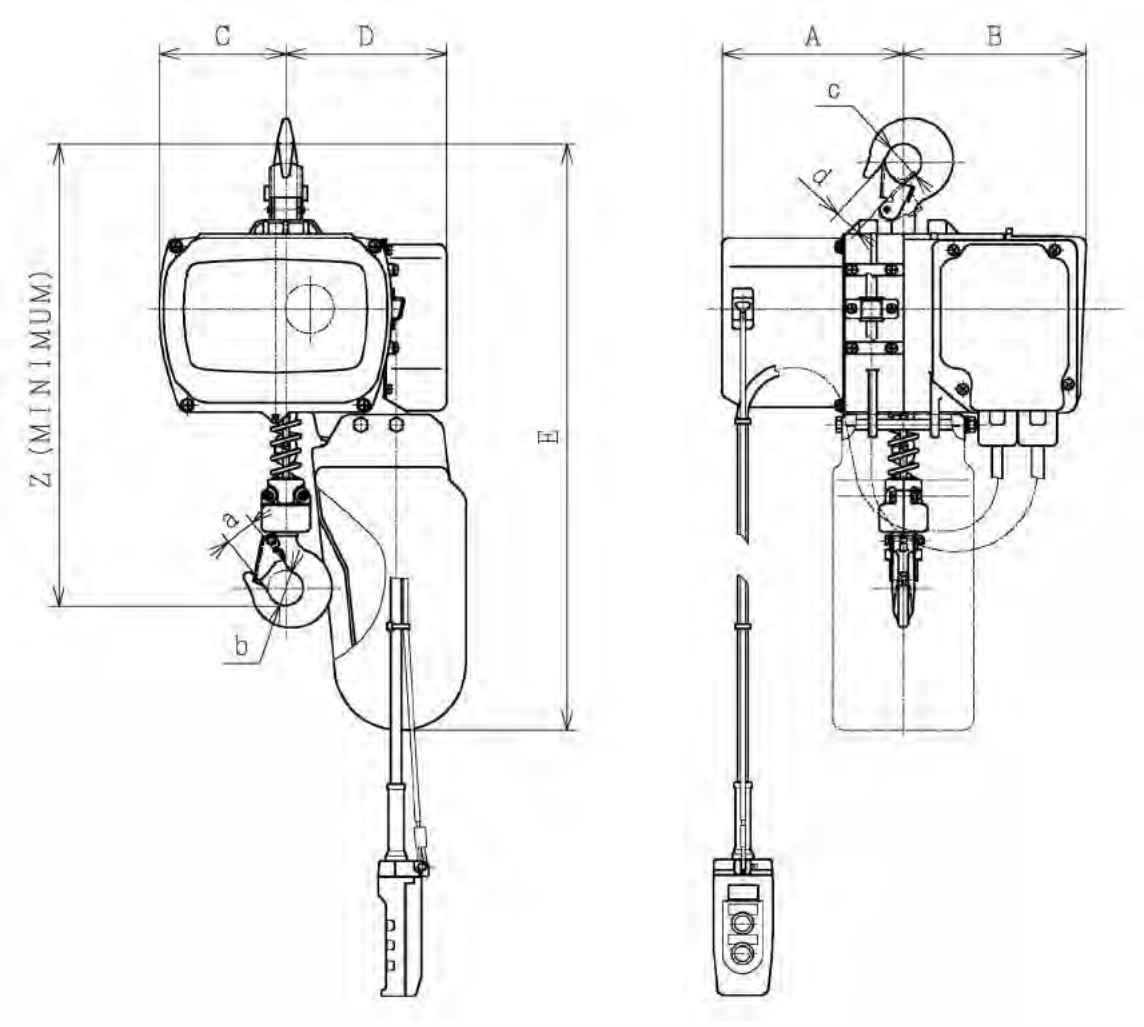
Unit : kg

Capacity	150 - 500kg		150 - 500kg	
	Low lift	High lift	Low lift	High lift
L-type	29	32	33	36
LN-type	32	35	36	39
LS-type	34	37	35	38
Function	Standard Model		With Emergency Stop	

2-6. Product view



2-7. Outer dimensions



Dimension (mm)

	L-type	LN-type	LS-type
Z	468		
A	181	183	181
B	182	210	
C	125		
D	165	185	165
D'	200		
E	584		
a	27		
b	35		
c	35.5		
d	27		

D' : With Emergency Stop Device

3. Mounting method

Please refer to the mounting method that is described in the separate volume "Hitachi Electric chain hoist Owner's Manual". If you have any questions about mounting, please contact our sales office or distributor. Please ask a specialist for the construction work.

3-1. Precautions for mounting

⚠ WARNING

Mounting and use under the following conditions are extremely dangerous. Please avoid.

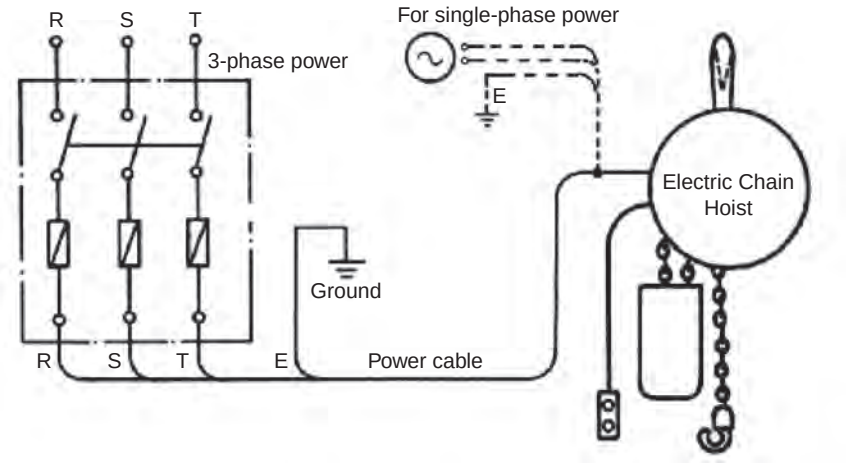
- Places where the strength necessary for the mounting cannot be maintained
- Places where the temperature goes lower than -10°C or higher than 40°C, or where the humidity exceeds 90%
- Places with a lot of acids or salts
  * It will cause severe wear and tear of the parts, and there is a risk of injury from falling loads caused by mechanical failure etc.
- Places with organic solvents or explosive dust.
  * There is a danger of ignition, explosion etc.
- Places subject to direct weather, such as wind, rain or snow.
  * There is a risk of injury from electric shock or mechanical failure from rust, which can lead to falling loads.
- Places with a lot of general dust.
  * There is a risk of injury due to abnormal operation etc.

3-2. Electric wiring

⚠ WARNING

Before connecting the power source to the Electric Chain Hoist, verify that the power source voltage matches the power requirement of the product.

- Power source connection (Please provide the distribution panel to be used.)
  (1) Always connect the power source through a distribution panel (1 main power switch).
  (2) Perform the electric wiring shown in the figure.
  (3) Connect the ground wire (green / yellow) of the power cable to ground.



When hoisting operation with no load was checked, in the following cases, the power connection is probably reversed (reversed phase): Movement are performed opposite the pushbutton signal.
* In this case, turn off the power and then switch the connection of the power cable T and R terminals.

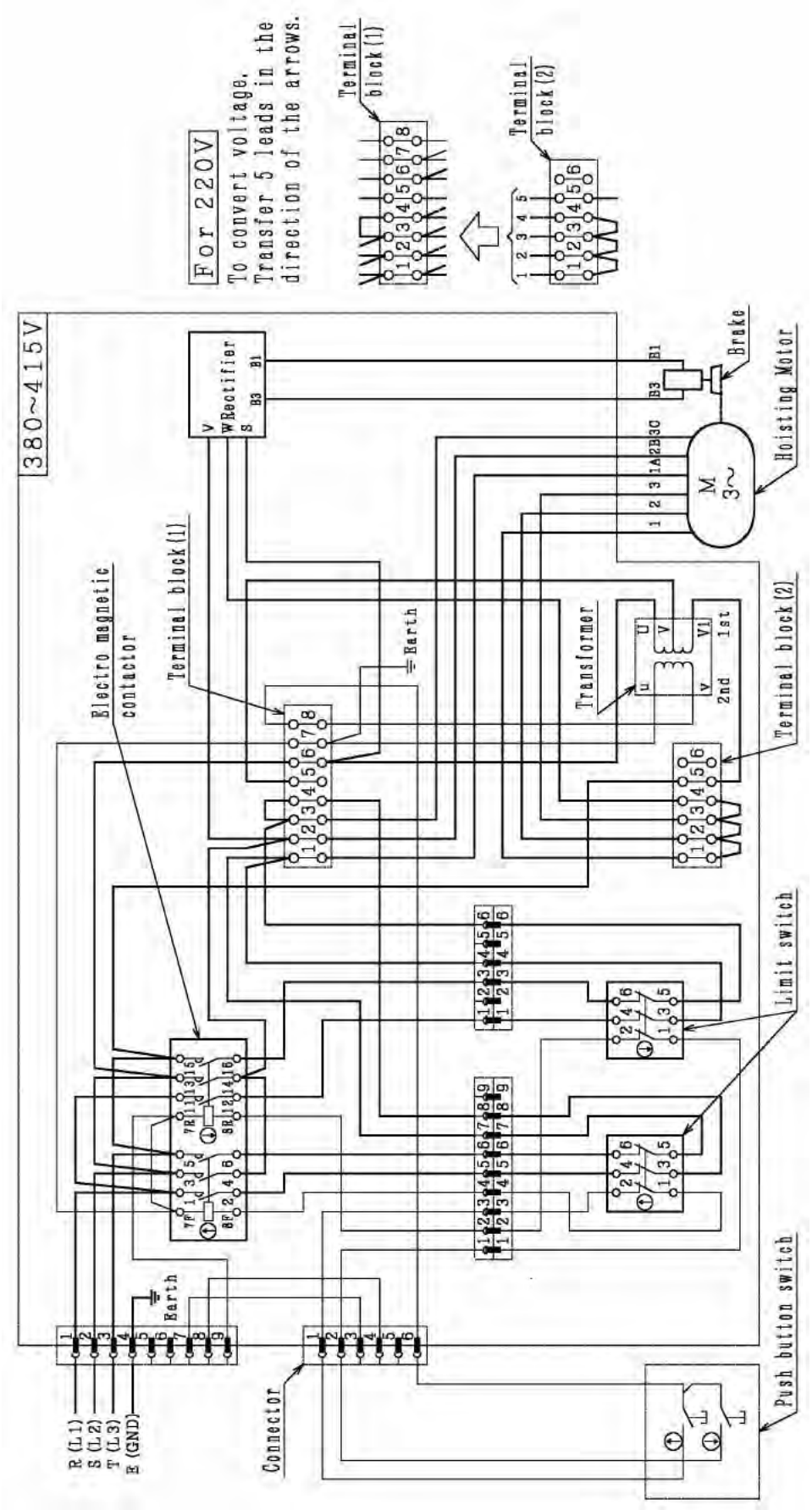
⚠ WARNING

Always perform grounding work. Also, install a leakage circuit breaker in the electric path in addition to ground.
* To prevent electric shock accidents if by chance there should be electricleakage.

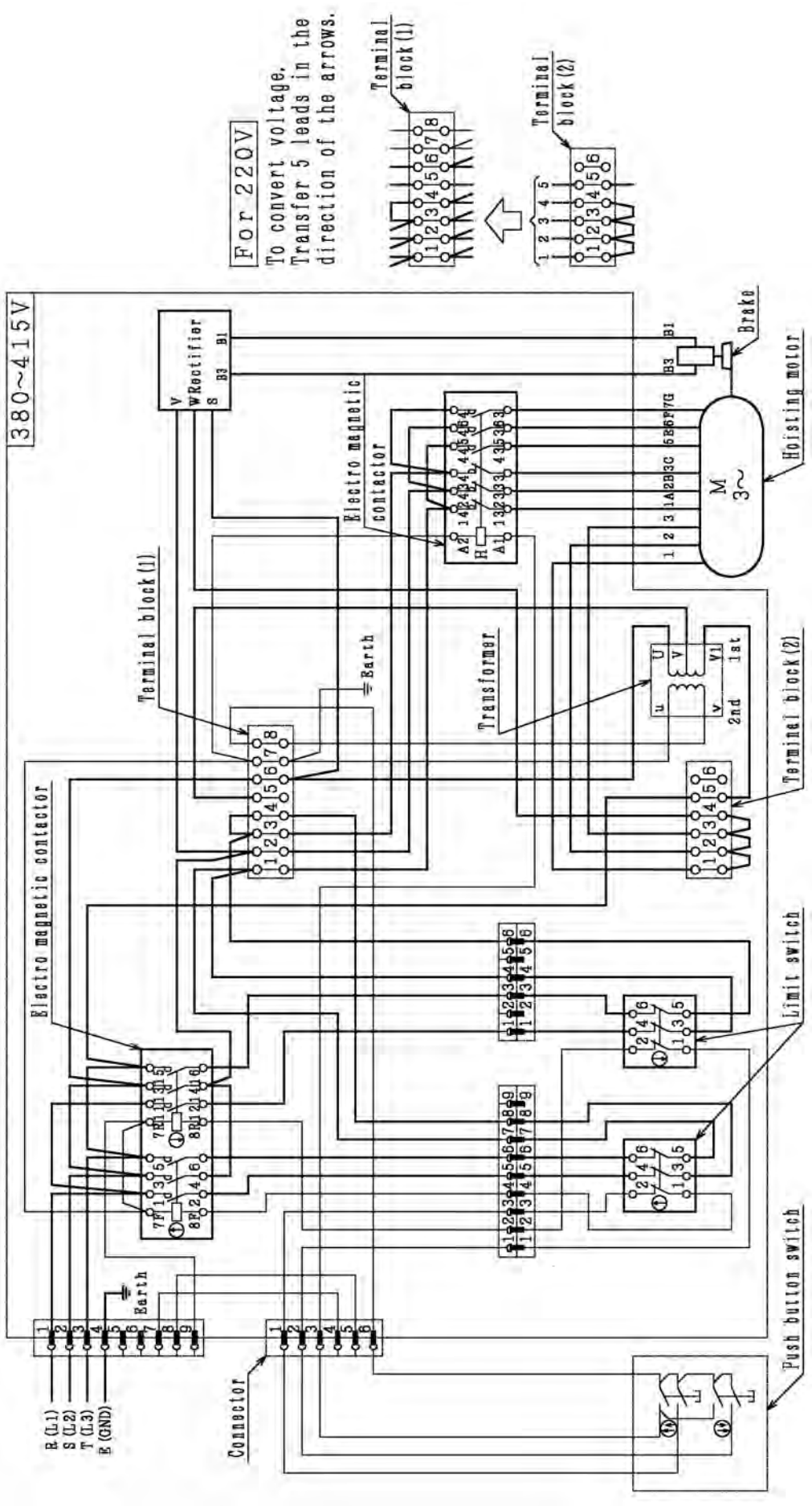
1. Power supply
   We recommend cable feeding for the power supply.
2. Mounting location
   (1) In the case of a suspended-type Electric chain hoist, please remove the paint and rusts from the above before of mounting.
   (2) In the case of a transverse trolley-attached Electric chain hoist, since it is grounded by contact of the trolley wheels and the rail, do not paint the contact surface. Also, rust preventive paint is applied to the wheels of the trolley during shipment from the factory, so please remove it from areas that come in contact with the rails.
3. Please ensure to connect the wiring of the power supply (R, S, T) to the Electric chain hoist through the distribution board (main power switch). The distribution board to be used should be organized by the customer.

3-3. Connection diagram

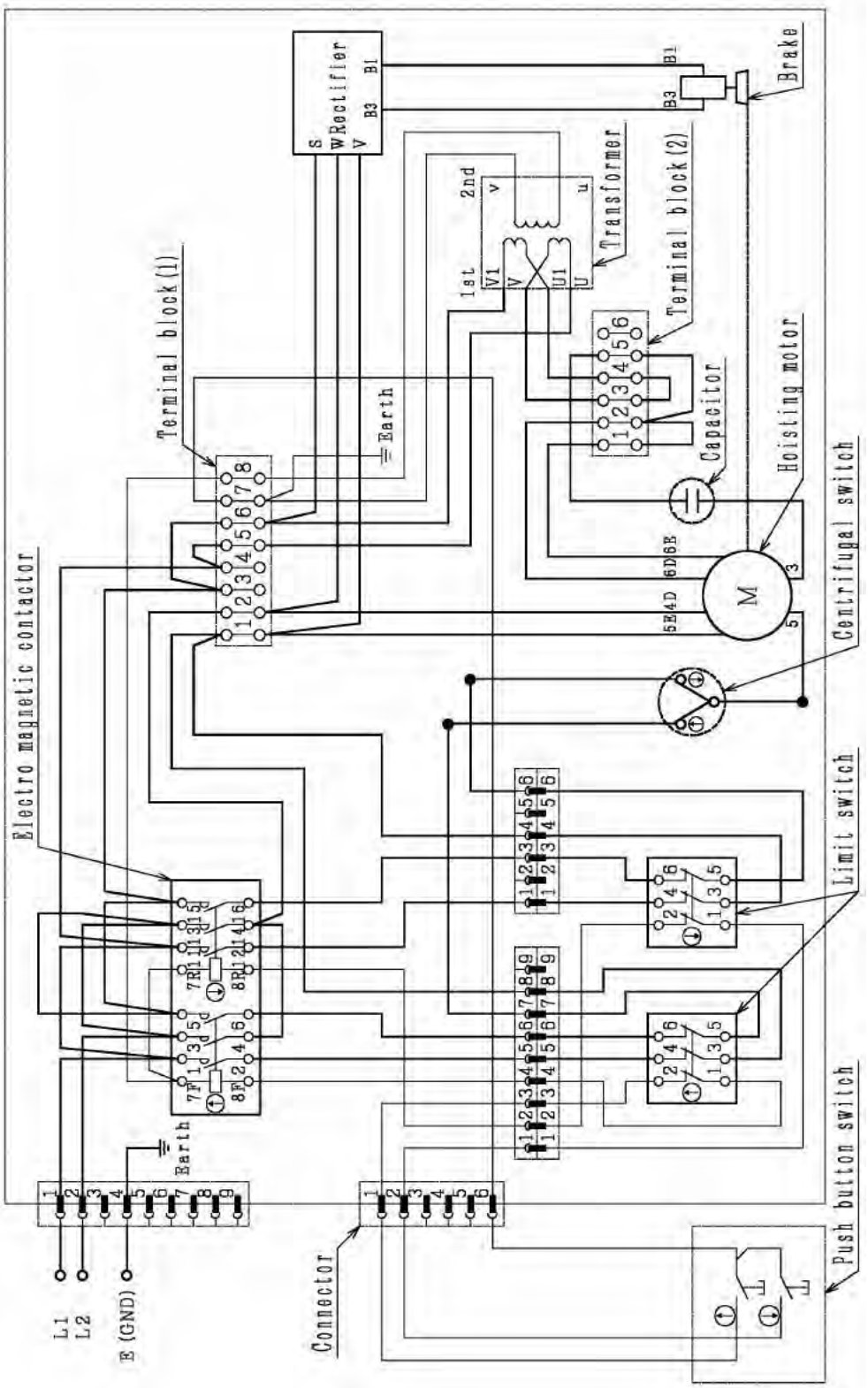
(1) L-type (single speed) wiring diagram



(2) LN-type (dual speed) wiring diagram



(3) LS-type (single phase) wiring diagram



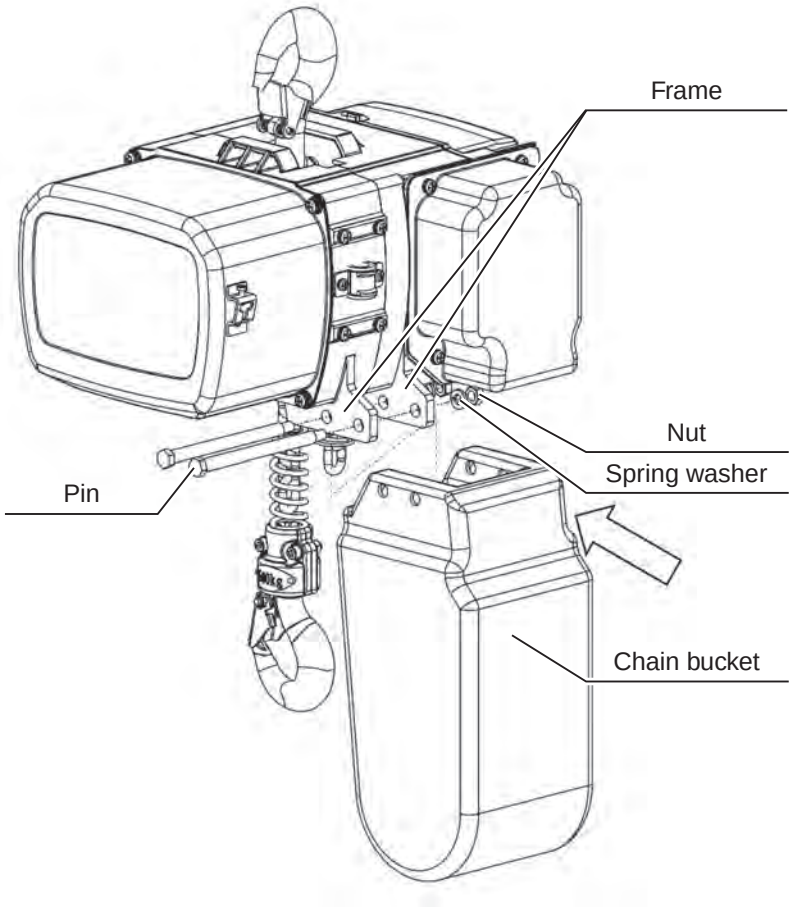
4. Installation steps

4-1. About attaching the Chain Container

Please attach the Chain Container as follows.

(1) Align the hole positions of the Chain Container and the body frame and insert the two pins attached to the frame.

(2) Tighten the nuts with spring washers in between.



⚠ DANGER

- Please ensure that the bolts and nuts are fitted securely without slack or miss. There is a risk of serious accidents from the fall of the Chain Container.

4-2. About the installation of cables

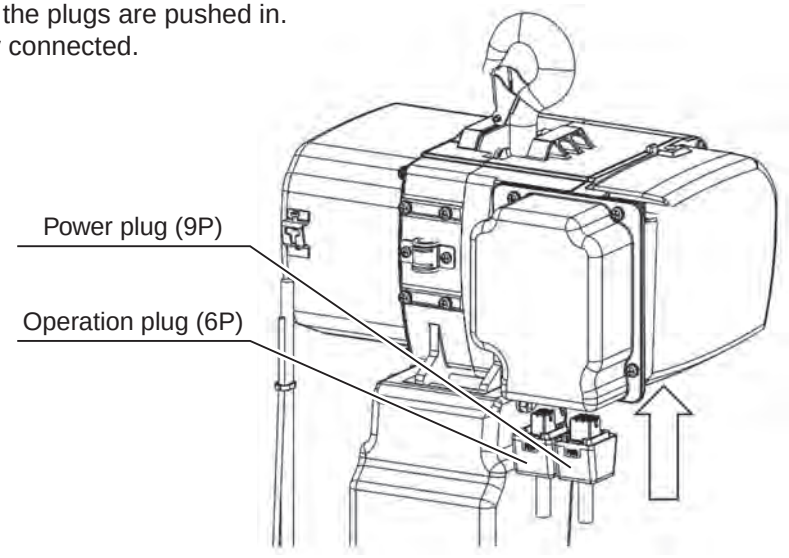
Please install the power cable and the push-button cable as follows.

(1) Check whether the plug is 9P (for power supply) or 6P (for operation).

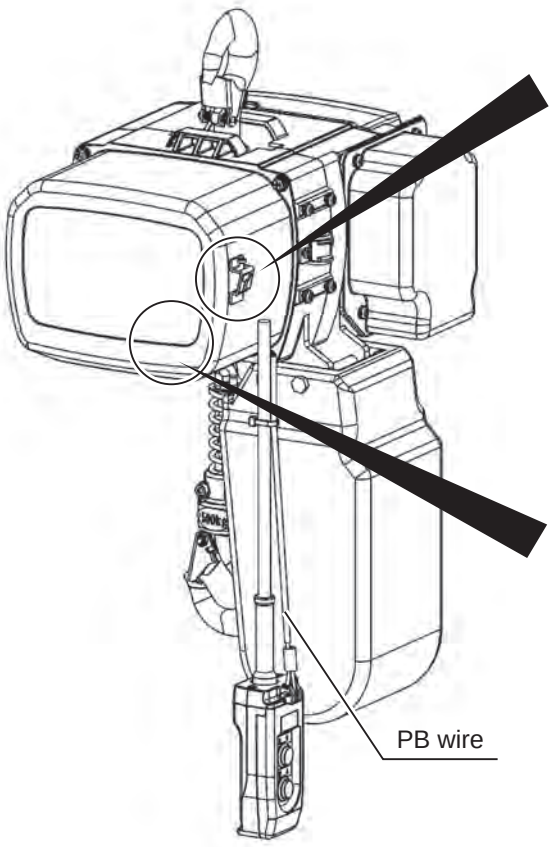
(2) Push the plugs into the switch part as shown in the figure below.

* There will be a "clicking" sound when the plugs are pushed in.

(3) Pull the plugs lightly to ensure it is fully connected.

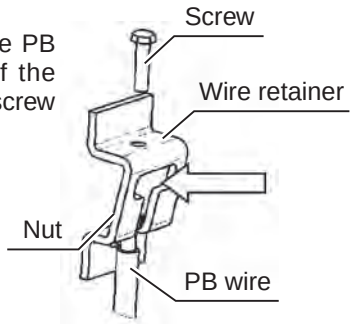


(4) Fix the cables as shown in the figure below.



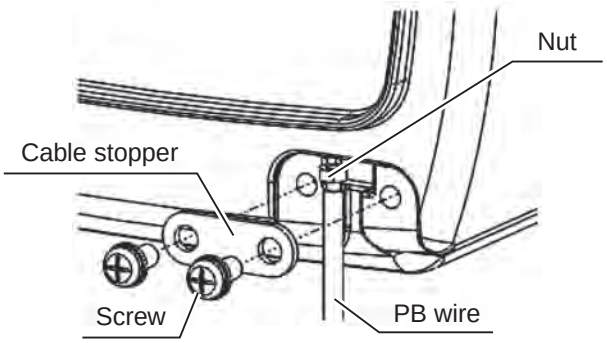
In case of L-type (single speed),
LS-type (single speed, single phase)

Insert the nut at the tip of the PB wire into the corner hole of the wire retainer and tighten the screw to prevent its detachment.



In the case of LN-type (dual speed)

Insert the nut at the tip of the PB wire into the corner hole at the bottom right of the cover and tighten the screw with the cable stopper to prevent its detachment.



5. Cautions for use

⚠ CAUTION

- When it operates in the opposite direction to the push-button operation, switch the phase sequence of the power supply or review the motor wiring and operation input wiring referring to the connection diagram.

1. After installing the Electric chain hoist, please ensure to do a trial run following the attached "Hitachi Electric chain hoist Owner's Manual".

2. Please avoid sudden reverse rotation (plugging) or excessive small motions (inching). These will put an excessive load on the contacts of the motor and the electromagnetic contactor and decrease the product life.

3. If operated exceeded the ratings, the temperature of various parts of the Electric chain hoist will rise above the allowable limit, causing burnout of the motor and shortening the lifetime of the mechanical parts. Even when using over a short time in a concentrated manner, please do not exceed the prescribed start frequency and duty factor for each model.
   Example) When using the L-type (single speed) for 15 minutes in a concentrated way, set the start frequency at 60 times / 15 minutes or less, and duty factor at 40% ED or less.

   - The start frequency is the number of times the push-button switch is pressed per hour (including inching).
   - Calculate the duty factor using the following formula.

$$\text{Duty factor (\%)} = \frac{\text{In the hour when the Electric chain hoist is used the most, the total time (minutes) the motor is powered}}{\text{60 (minutes)}} \times 100$$

6. Maintenance and inspection

⚠ WARNING

- When performing maintenance and inspection, ensure that the Electric chain hoist power is shut off, and more than 5 minutes have passed since.
  * There is a risk of electric shock and injury from the unexpected operation of the Electric chain hoist.

- When carrying out maintenance and inspection, ensure to remove any load beforehand.
  * There is a risk of injury due to falling loads etc.
- Ensure that the main body of the Electric chain hoist has cooled sufficiently.
  * There is a risk of burns.

- While performing maintenance and inspection, ensure to display to that effect (“under inspection” or “Do not power on” etc.)
  * There is a risk of electric shock and injury from the unexpected operation of the Electric chain hoist.

6-1. Daily inspection

⚠ DANGER

- Ensure to perform routine checks before using.
- In case of an abnormality, stop using immediately, and use only after taking appropriate remedies referring to the section "General causes of malfunction and measures" in the "Hitachi Electric chain hoist Owner's Manual".
  * It is very dangerous to use in a state of abnormality, which can lead to an accident, so do not operate.

6-2. Inspection before starting work

- Confirmation of operation without load
  (1) Whether or not the push-button operation is smooth and working correctly as displayed.
  (2) Whether or not there is any abnormality in the motion of the Electric chain hoist and the stopping distance when it is stopped.
  (3) Whether or not there is any unusual sound (abnormal noise), vibration or smell.

- Confirmation of operation under the rated load.
  Whether or not the braking effectiveness is good.
  * Please judge this from the amount of slip after braking when stopped after performing a hoisting operation with the rated load.
  * When the amount of slip is large compared to normal, an adjustment of the brake is necessary.

6-3. Periodic voluntary inspection

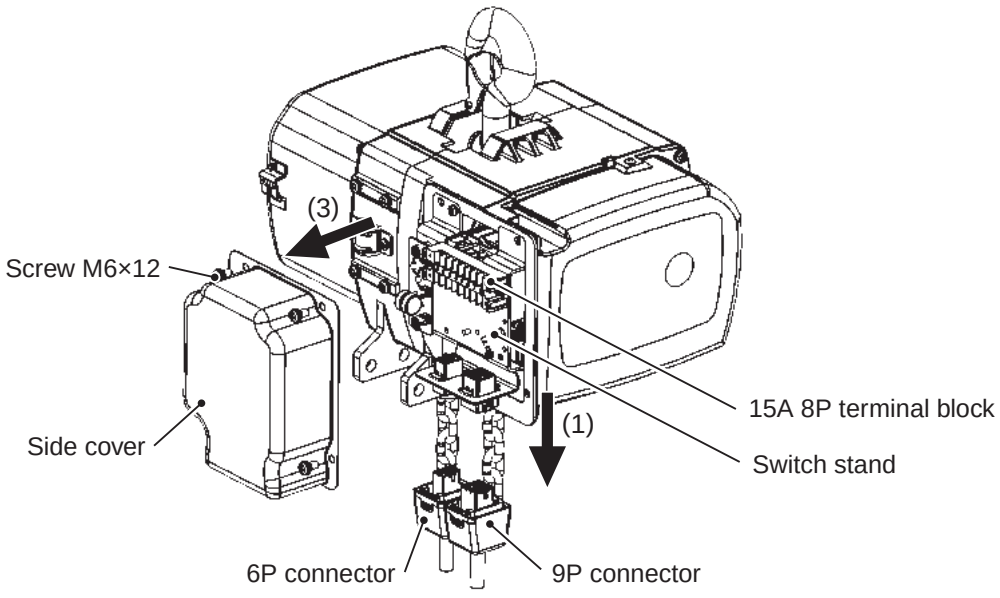
⚠ DANGER

- In order to use the Electric chain hoist safely and to fully utilize its functions, ensure to carry out periodic voluntary inspections.
  * Conduct the monthly voluntary inspection at least once a month, and the annual voluntary inspection at least once a year.
- The voluntary inspection should be carried out by a person with expertise commissioned by the business operator.
  * There is a risk of accident due to falls, abnormal operation etc.

- If any consumable part is found to have exceeded the standards of usage limits in the monthly, annual voluntary inspections or any other inspections, or if any other abnormality is found, stop use until the issue is addressed.
  * Using with abnormalities may lead to electric shocks and fall accidents, which are extremely dangerous. Ensure to take appropriate measures such as adjustment or replacement.
- Never use other than genuine Hitachi parts for replacement.
  * There is a risk of injury due to electric shocks or falls for breakage of parts.

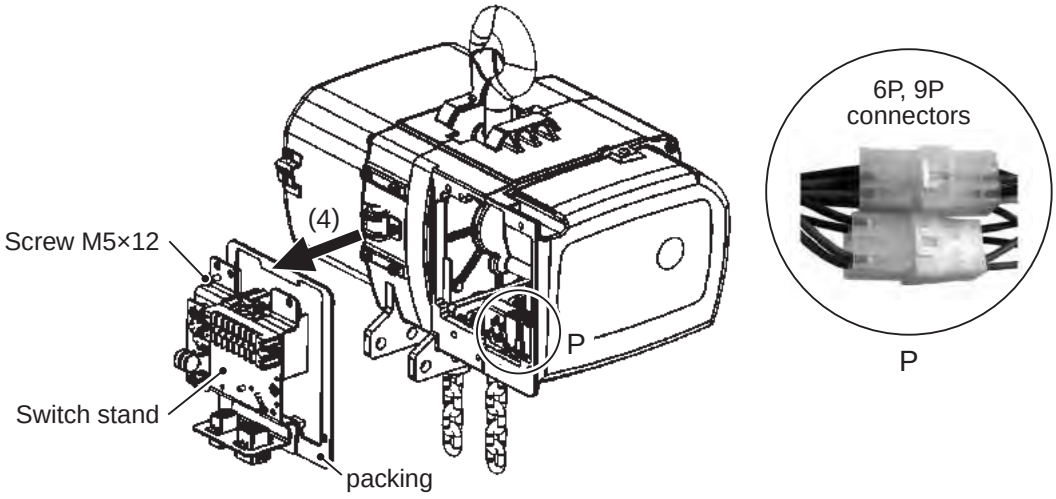
6-4. Disassembly / Assembly

1. Disassembly of the housing and the rotor
   (1) Remove the 6P connector and 9P connector from the main unit.
   (2) To unplug, pull out the plug while pushing out the stopper of the plug receptacle with a screwdriver etc.
   (3) Remove 4 screws (M6×12) and remove the side cover.

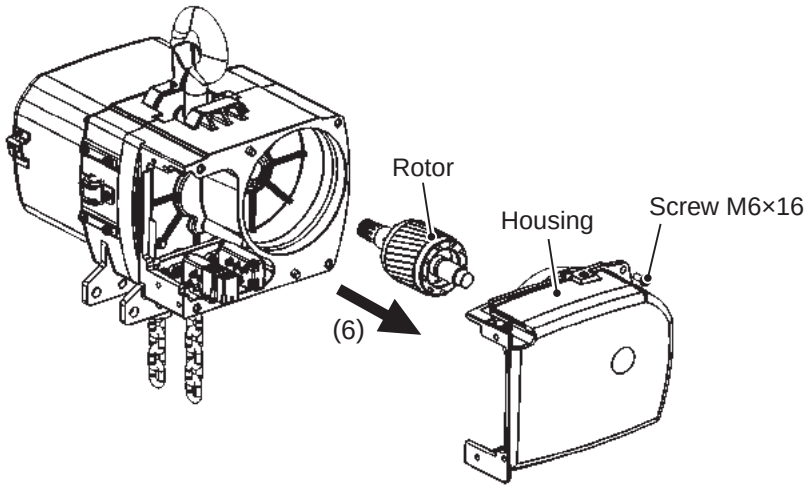


   (4) To remove the switch stand, remove all the motor wires, transformer wires, and brake wires connected to the terminal block.
   * The switch stand cannot be completely removed unless the wires other than the motor wires are also removed.

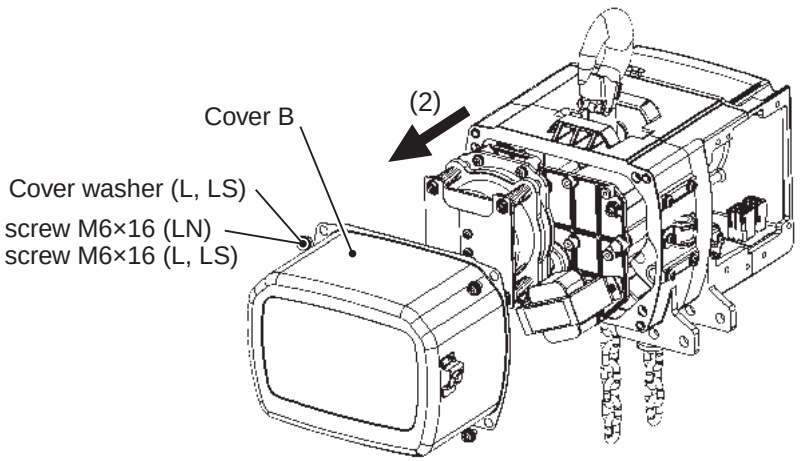
(5) Remove the one M5×12 screw, then remove the switch stand and the packing.
(6) Detach the 6P connector and the 9P connector from the inside (part P) of the main body.



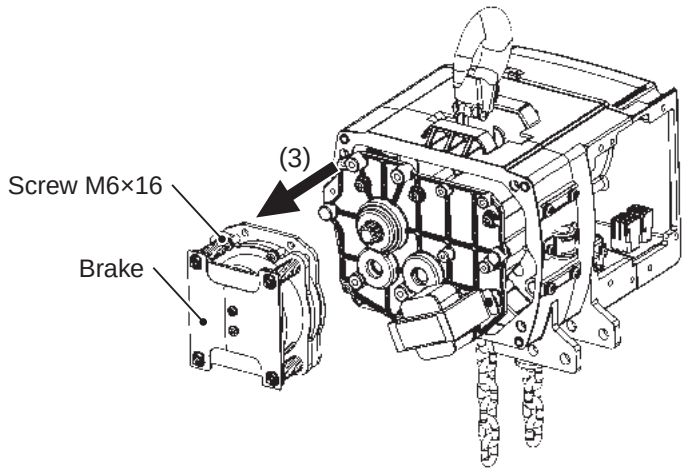
(7) Remove 4 screws (M6×16) and remove the housing and the rotor.



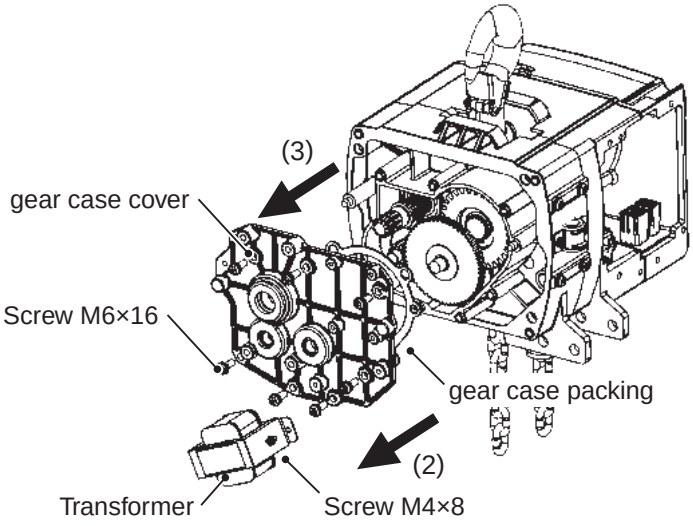
2. How to disassemble the brake
(1) Disassemble by the same procedure mentioned up to step (4) of '1. Disassembly of the housing and the rotor'.
(2) Remove 4 screws (M6×12) and 4 cover washers, only the 4 M6×16 screws in case of LN-type, and remove the cover B.



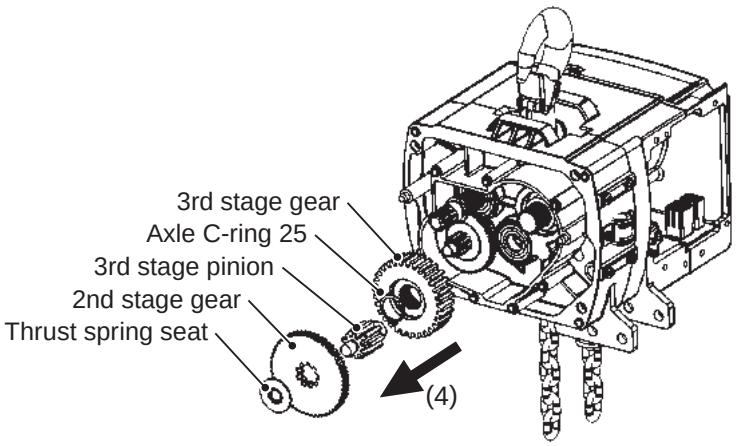
(3) Remove 4 screws (M6×16) and remove the brake.



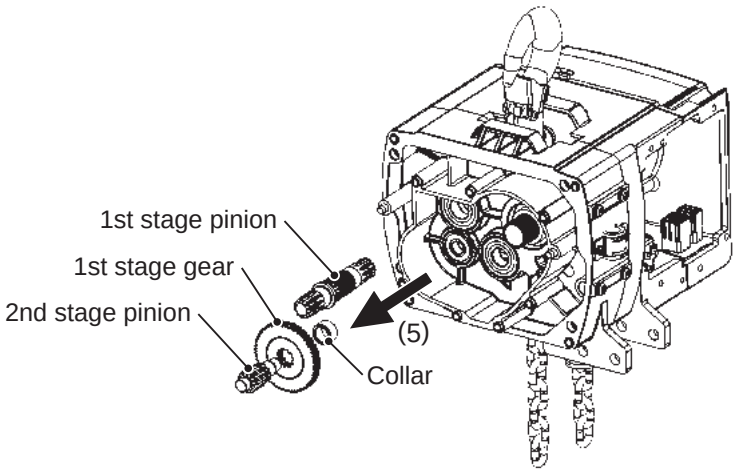
3. How to disassemble the gear
   (1) Disassemble by the same procedure up to step (3) of the above-mentioned '2. How to disassemble the brake'.
   (2) Remove two screws (M4×8) and remove the transformer.
   (3) Remove 7 screws (M6×16) and remove the gear case cover and gear case packing.



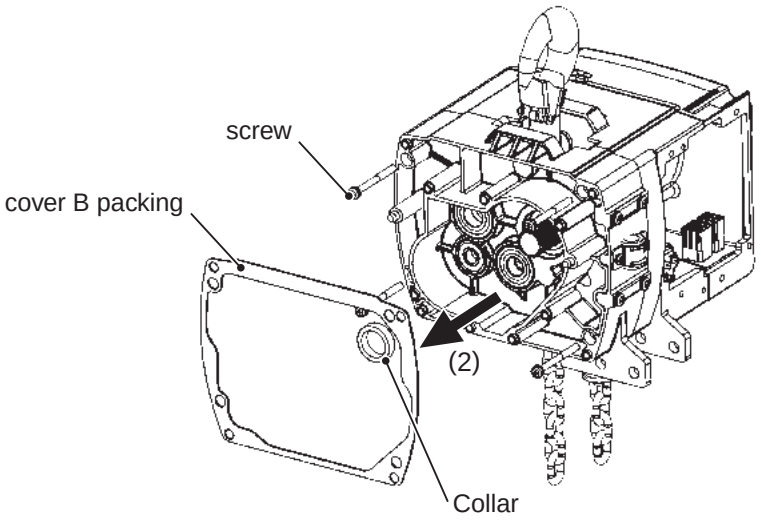
(4) Remove the thrust spring seat, 2nd stage gear, 3rd stage pinion, axle C-ring 25, 3rd stage gear.



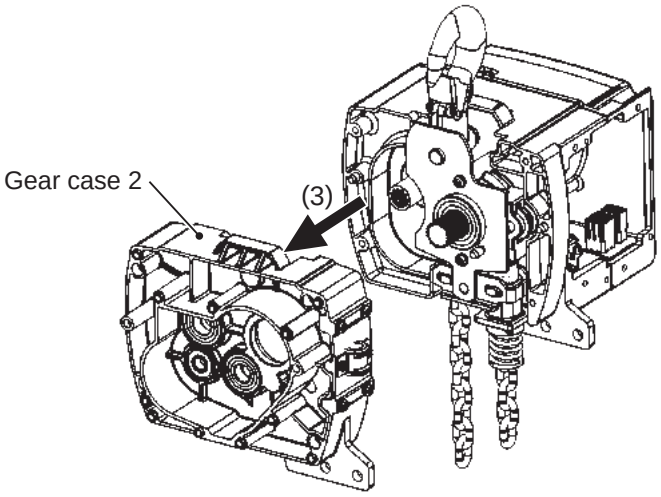
(5) Remove the 2nd stage pinion, 1st stage gear, collar and 1st stage pinion.



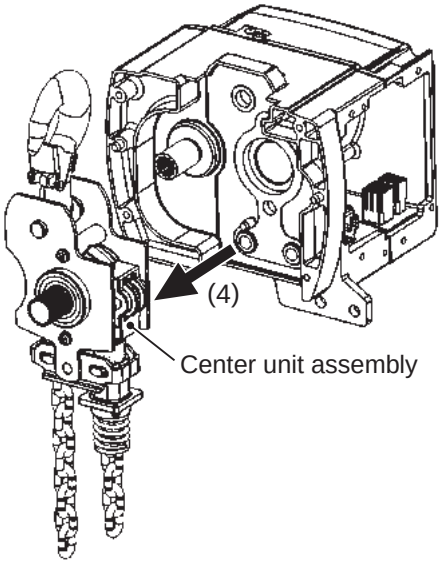
4. How to disassemble the upper hook and the sprocket
   (1) Please disassemble following up to step (5) of the above-mentioned '3. How to disassemble the gear'.
   (2) Remove the cover B packing, collar, screws (×4).



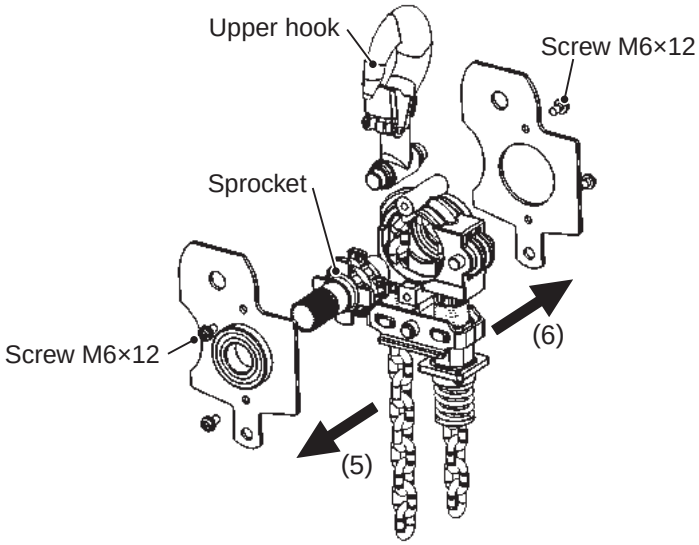
(3) Remove the gear case 2.



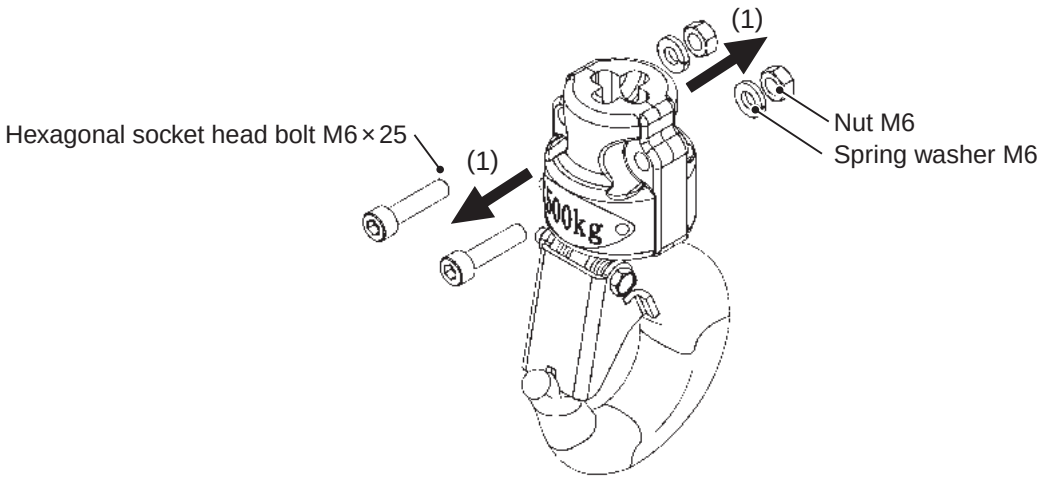
(4) Remove the center unit assembly.



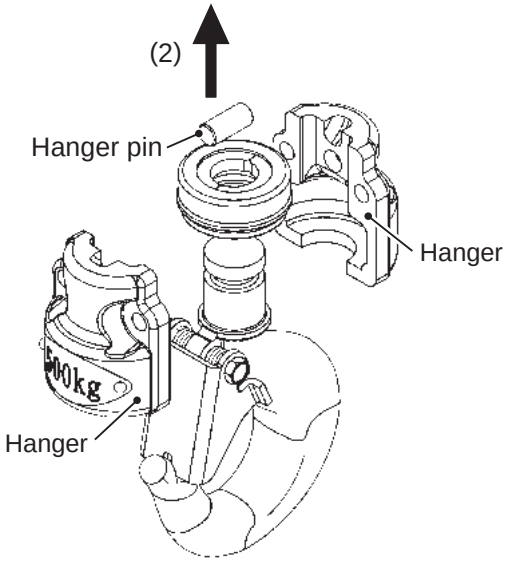
(5) Remove 4 screws (2 on each side, M6×12) and remove the upper hook and the sprocket.



5. How to disassemble the lower hook
   (1) Remove 2 hexagonal socket head bolts (M6×25), nuts (M6) and spring washers (M6) each.



   (2) Remove the chain, hangers and hanger pin.



6-5. Inspection of the electromagnetic brake

Please refer to ‘Figure 1’ and check the wear and operation status of each part. The brake gap is set to an appropriate value at shipment, however, it will become larger due to wear of the lining etc. with use. When the slip amount from the time of releasing the push-button to when the hoisted load stops, exceeds the limit given in ‘Table 1’, please adjust.

Table 1: Appropriate slip value and limiting slip value (mm)

Appropriate slip value	5 - 15mm
Limiting slip value	20mm

Table 2 : Electromagnetic brake gap (mm)

Appropriate gap	0.3 - 0.5
Limiting gap	1.0

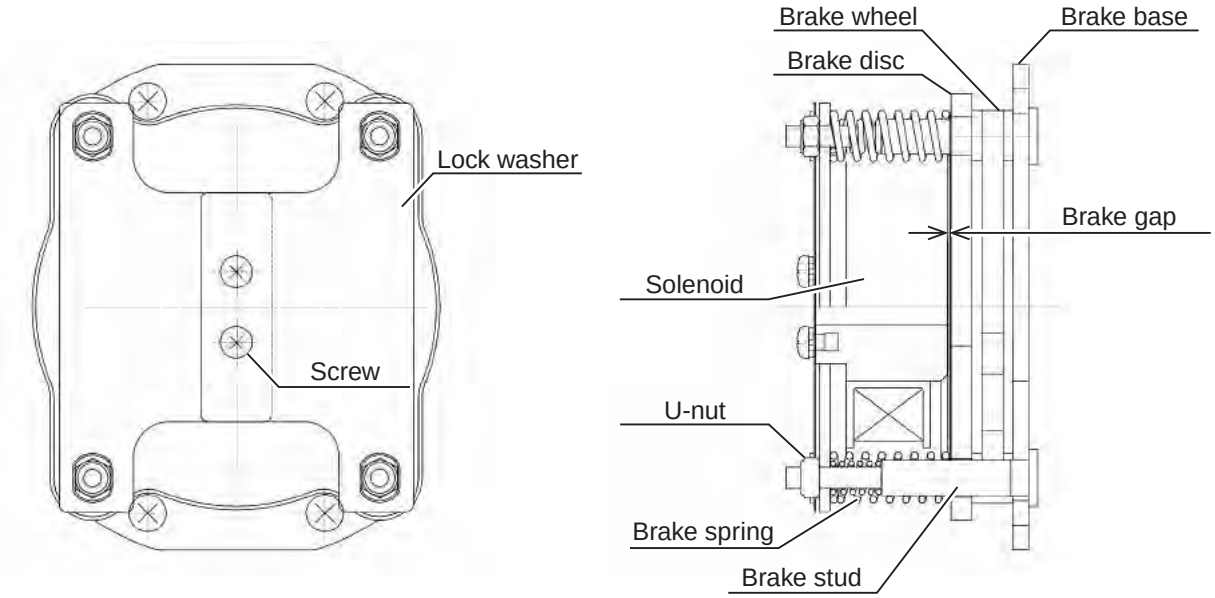


Figure 1 : Structure of the brake

6-6. Adjustment of the electromagnetic brake gap

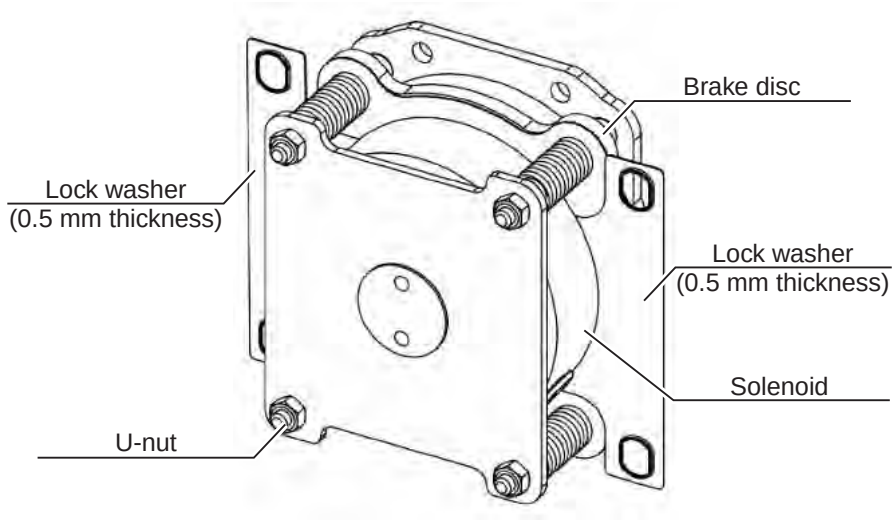


Figure 2: How to adjust the brake gap

Follow the procedure below to adjust to the appropriate gap (0.5 mm) when the brake gap crosses it, approaching or even crossing the limit gap (1.0 mm).

(1) Remove the screws and remove the lock washer.
(2) Insert between the solenoid and the brake disc as shown in ‘Figure 2’.
(3) Tighten the 4 U-nuts evenly.
(4) Since the thickness of the lock washer is 0.5 mm, when there is no "play" with the lock washer inserted, the brake gap will be set to 0.5 mm.
(5) Return the U-nut slightly (about 1/6 of a turn) and pull out the lock washer.
    * The U-nut is tightened by 1.0 mm with one revolution
(6) Return the lock washer to its original position as shown in ‘Figure 1’ and tight with the screws.

* Measure the thickness dimension H of the brake wheel, and if it exceeds the value in ‘Table 3’, replace it.

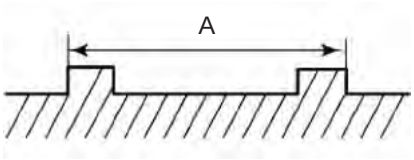
Table 3: Wear limit of the brake wheel (mm)

Initial dimension	11.4
Wear limit	9.0

6-7. How to inspect the hook

1. Inspection of cracks and wear and usage limit of the hook opening
   When checking the upper and lower hooks, if the following situations are confirmed, please do not use in that state and ensure to replace the hook.
   (1) The opening of the hook has increased.
   (2) There is a crack.
   (3) The wear of the parts that come into contact with steel or the hanging bracket etc. exceeds the limiting value.

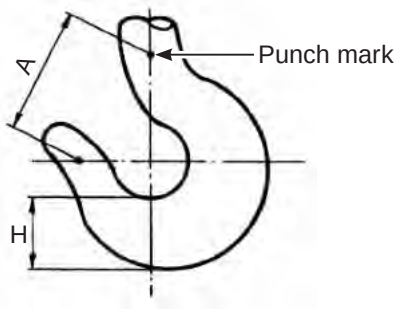
2. Opening dimensions of the hook and limiting wear amount
   Measure the opening size (dimension between punch marks) and wear amount of the hook. Ensure to replace when the following conditions are not satisfied.
   (1) Opening dimensions of the hook
   Measure the dimension A between the punch marks and compare it with the value measured before using the product to ensure there is no deformation.
   * Measure the dimension A between punch marks as follows.



   2) Thickness dimension of the hook
   Measure the thickness dimension H of the hook and compare it with the value measured before using the product to ensure it is 95% or more of the original value.
   * The A and H dimensions in the table below are standard values at the time of production.

unit: mm

A		50
H	Upper hook	24
	Lower hook	21

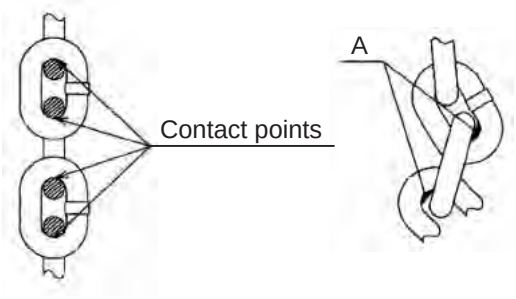


3. Slack of hook installation bolts, nuts, split pins etc. and the presence of dropping offs
   The bolts, nuts and split pins should not have slack or any dropping offs ; they must be affixed securely.

4. Deformation or metal fittings preventing detachment
   The metal fittings are not deformed or have not dropped off. The bolts, nuts, springs do not have slack or dropping off, and they are securely affixed.

6-8. How to inspect the chain

1. Confirmation and application of the chain lubricant



(1) Since it is difficult for the lubricant oil to reach the contact points of the chains in the load-hoisting state, please apply lubricating oil to the chain contact points A in a state when the chain is slackened.

(2) After the application, wind up and down the chain along the whole head for 2.3 times, and apply the lubricant such that it can also reach the contact points between the chains.

(3) When usage frequency is high, we recommend applying the lubricant periodically about once a week.

(4) Please use Shell Tona S3 M220 (Hitachi genuine parts: part code 836492) as the lubricating oil.

2. Elongation, wear limit

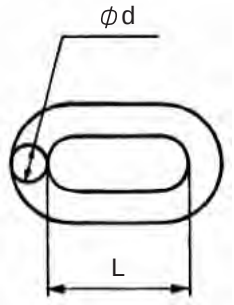
(1) That the inner length dimension L of the chain is greater than the value in the table below due to wear and elongation. (The wear and elongation of the inner length is 5% or more from the original dimension)

(2) The diameter d of the link falls below the value in the table below due to wear (wear of not less than 10% of nominal diameter)

* When there is a sever chain, also verify the wear condition of the sprocket and sprocket guide at the same time.

unit : mm

Chain Diameter	Usage limit dimension	
	ϕd	L
ϕ6.3	5.7	20



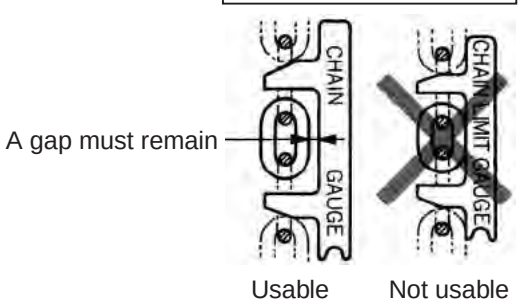
3. Measurement of wear and elongation by the limit gauge

(1) Using the attached limit gauge, measure the wear and elongation using the two measuring methods of pitch and wire diameter, as shown in the figure below.

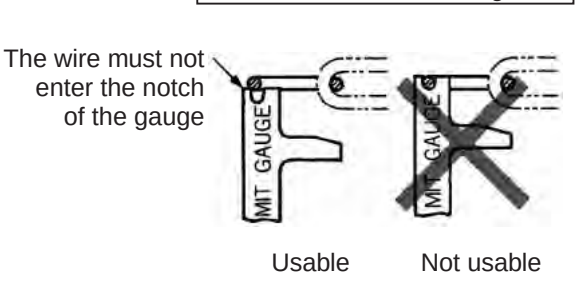
(2) Perform measurements on all the chains, and if one is judged not usable, please exchange it.
* If a worn or elongated chain is continued to be used, there is a danger of it breaking.

(3) When incorporating in an automatic machine etc. and using it to wind up/down a constant head length, please conduct focused and more frequent checks on the chains' meshing with the sprocket and surrounding when the machine is stopped.

Pitch measurement



Measurement of the line gauze



4. Others

(1) No scratches or other harmful defects allowed.

(2) No attached foreign matter is allowed.

6-9. Inspection of the push-button switch

Please check the push-button switch in the following way with the power shut off. Exchange when an abnormality is found.

(1) Does the pushbutton switch work correctly?
(2) Are there damage or cracks in the case, cover etc.?
(3) When the cover is removed, is there any screw loosening or an abnormality in the lead wires?
(4) Is there any foreign matter in it or are the contacts abnormally worn?

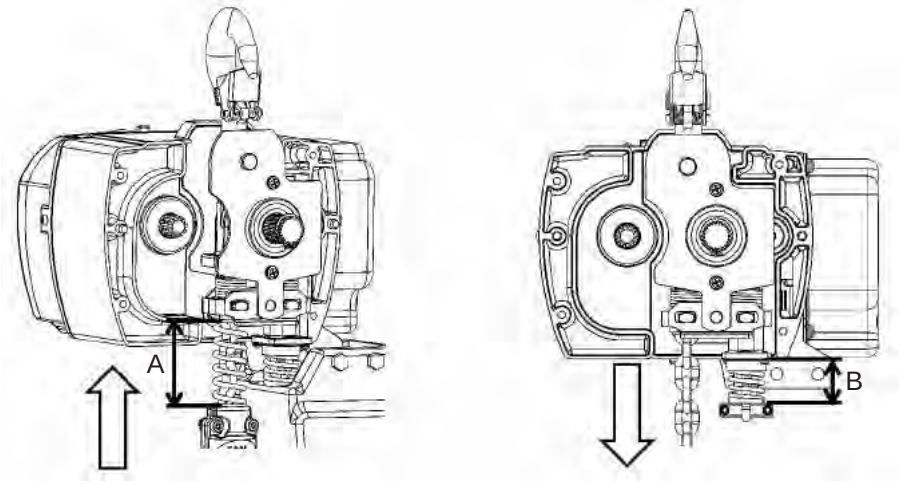
6-10. Inspection of the limit switch

1. Regarding the limit switch (upper / lower limit stop device), please perform the following inspection.
   (1) The limit switch must operate reliably at the upper and lower limits.
   (2) The limit lever is not deformed, and it operates smoothly.
   (3) The limit spring is not deformed or dropped off.
   * Please be careful with dropping off when particularly assembling after disassembly.

2. Confirmation of hoist margin and lowering margin
   When the hoist margin and lowering margin (deviation from the original spring dimensions when the limit switch kick in) is lower than the specification, there is a risk of the brake slippage becoming larger or the limiting spring getting deformed, which may lead to serious accidents due to excessive force being applied to the main body or on the limit lever during the operation of the limit switch.

Hoist margin	50mm or more
Lowering margin	3mm or more

- How to check hoist and lowering margin
  (1) Measure the A and B dimensions of the point where the limit switch stopped at the upper limit and the lower limit.



* The above figure shows the cover removal status.

Unit : mm

(2) From the measured A and B dimensions and the H dimension (original limit spring dimension) shown on the right table, calculate the hoist and lowering margin by the following calculation formula.

Hoist margin = A - H, Lowering margin = B - H

Rated load	H
500kg, 250kg	22.5
150kg	44

3. Confirm contact wear
   (1) Remove the housing and take out the limit switch in state of shutting off power from the Electric chain hoist.
   (2) Examine through the side hole of the limit switch and check the condition of wear and discoloration of the contacts.
   * If there is abnormality in the contact, please exchange the limit switch.

6-11. Inspection of the gears

When checking the reduction gear, please check the lubrication by oil or grease, teeth contact, meshing state etc. visually in addition to measuring the wear amount of both the gears. Please refer to 'Table 1' and 'Table 2' for the wear limit.

Table 1: Gear wear criteria

		Wear limit
Gear	1st stage pinion, 1st stage gear	5% or less of the full thickness tooth thickness on the pitch circle
	Others	Not more than 10% of the original tooth thickness on the pitch circle
Coupling part (shaft, hole)		

Table 2: Wear limit of gear (over pin (ball) method)

Category	Part Name:	Rated load (kg)	Original dimension (mm)	Pin diameter (mm)	Wear limit (mm)
Gear	1st pinion	150	35.00	2	34.74
		250	25.51	2	25.26
		500	22.47	2	22.22
	1st gear	150	58.40	2	58.13
		250	67.75	2	67.48
		500	70.83	2	70.60
	2nd pinion	Shared	21.53	3	20.91
	2nd gear	Shared	87.90	3	87.36
	3rd pinion	150, 500	30.80	5	30.02
		250	32.89	4	32.30
	3rd gear	150, 500	83.60	5	82.64
		250	79.26	4	78.42
Spline	1st pinion (Both ends)	Shared	20.86	3	20.36
	Motor pinion	Shared	21.27	3	20.62

Table 3: Wear limit of gear (method for measuring tooth thickness)

Category	Part Name:	Rated load (kg)	Original dimensions (mm)	Number of teeth	Wear limit (mm)
Gear	1st pinion	150	10.723	4	10.655
		250	7.691	3	7.620
		500	7.686	3	7.613
	1st gear	150	19.949	7	19.881
		250	22.982	8	22.917
		500	25.947	9	25.884
	2nd pinion	Shared	7.028	2	6.793
	2nd gear	Shared	25.048	6	24.876
	3rd pinion	150, 500	11.841	2	11.428
		250	9.540	2	9.274
	3rd gear	150, 500	26.959	4	26.583
		250	21.091	4	20.825
Spline	1st pinion (Both ends)	Shared	10.723	7	10.518
	Motor pinion	Shared	6.6897	2	6.676

6-12. Inspection of the sprocket

Inspection method :

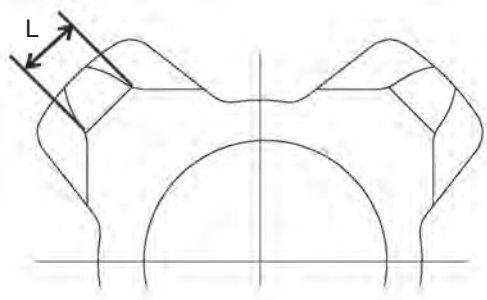
(1) Determine the wear condition of the chain seat.

(2) Check for abrasion and any collapsing of the tooth portion.

Judgment criteria:

(1) There is no abnormal wear.

(2) There is no abnormal wear or collapsed part.



Worn parts of the sprocket

Unit : mm

	Original dimensions	Wear limit
L	5.9	5.3

7. Oil

⚠ WARNING

- Please use only pure gear oils for lubrication as the movements of the mechanical brake and slip clutch may be affected resulting in performance degradation if lubricant oils other than pure gear oils are used. Please replace old gear oil early as continued use of old gear oil may hasten gear wear and result in noise.
- When replacing the gaskets with new ones, the gear oils may spread initially but this will not progress further as the gaskets are swelling-type gaskets.

The oiling criteria are shown in the table below. As these are applicable for standard use only, a suitable oiling method needs to be established after checking the actual usage condition.

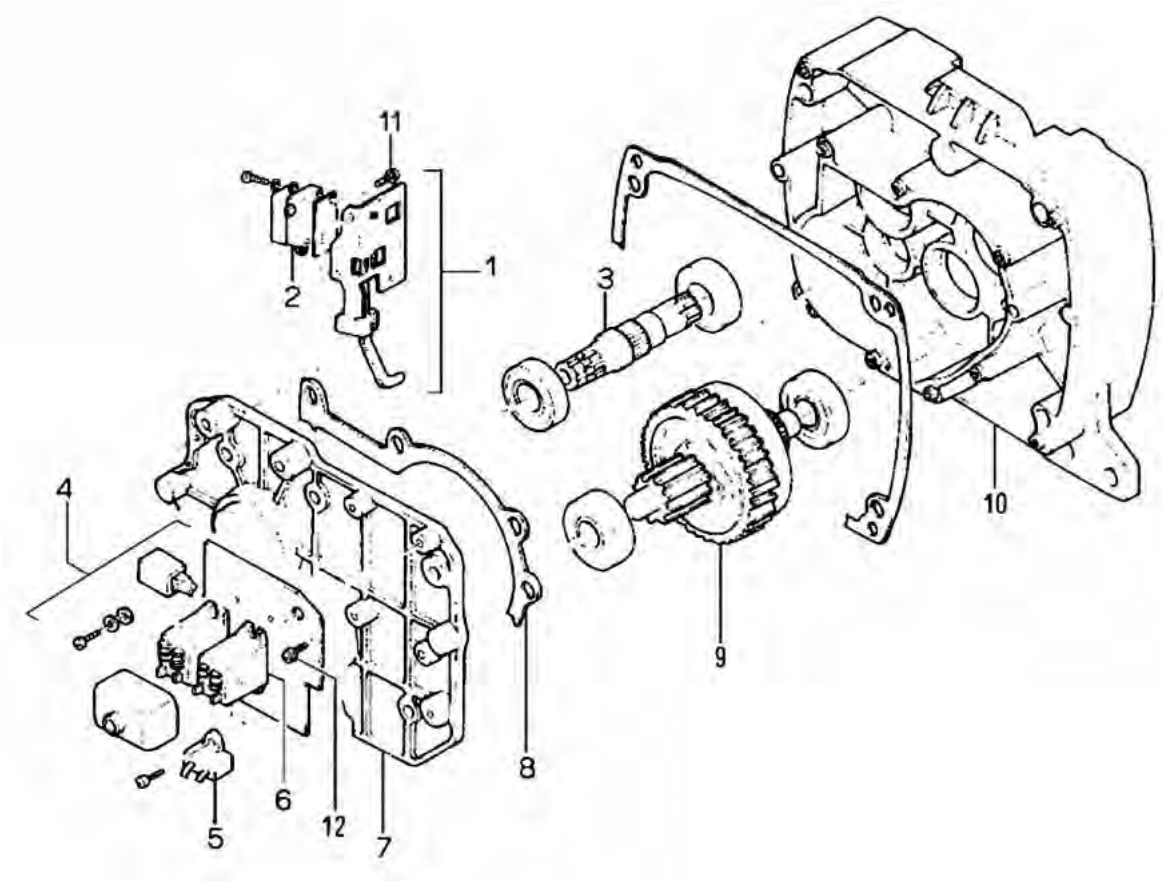
Oiling Location		Type of Oil	Application Amount	Volume	Oiling Criteria
Upper / Lower hook assembly	Hook thrust bearing	EPINOC grease No.1 (JXTG Nippon Oil & Energy corp.) or NIPPECO SEP No.1 (NIPPECO LTD.)	About 3g	Twice a year	
	Suspention pin		Enough to cover the surface	Once a year	
Coupling		Moly PS grease No.2 (Sumico Lubricant co LTD.) or CALFOREX EP No.2 (NIPPECO LTD.)	About 10g	Once a year	
Reduction gear		Moly PS grease No.2 or NIPPECO SEP No.1 (NIPPECO LTD.)	About 80g	Twice a year	Apply to teeth
Limit lever (ball / pin surface)		Moly PS grease No.2	Enough to cover the surface	Once a year	
Chain		Tonna Oil S3 M 220 (Parts code: 836492)	About 30g	Once a week	Apply to meashing part
Rolor		Moly PS grease No.2	About 1g	Once a year	

* When filling or changing oil, wipe old grease and iron dust before putting in new grease.
* Wipe as needed when oil separated from grease accumulates on the cover or other parts.

Type of Oil	PART No.
NIPPECO SEP No.1	813872
Moly PS grease No.2	850089
Tonna Oil S3 M220	836492

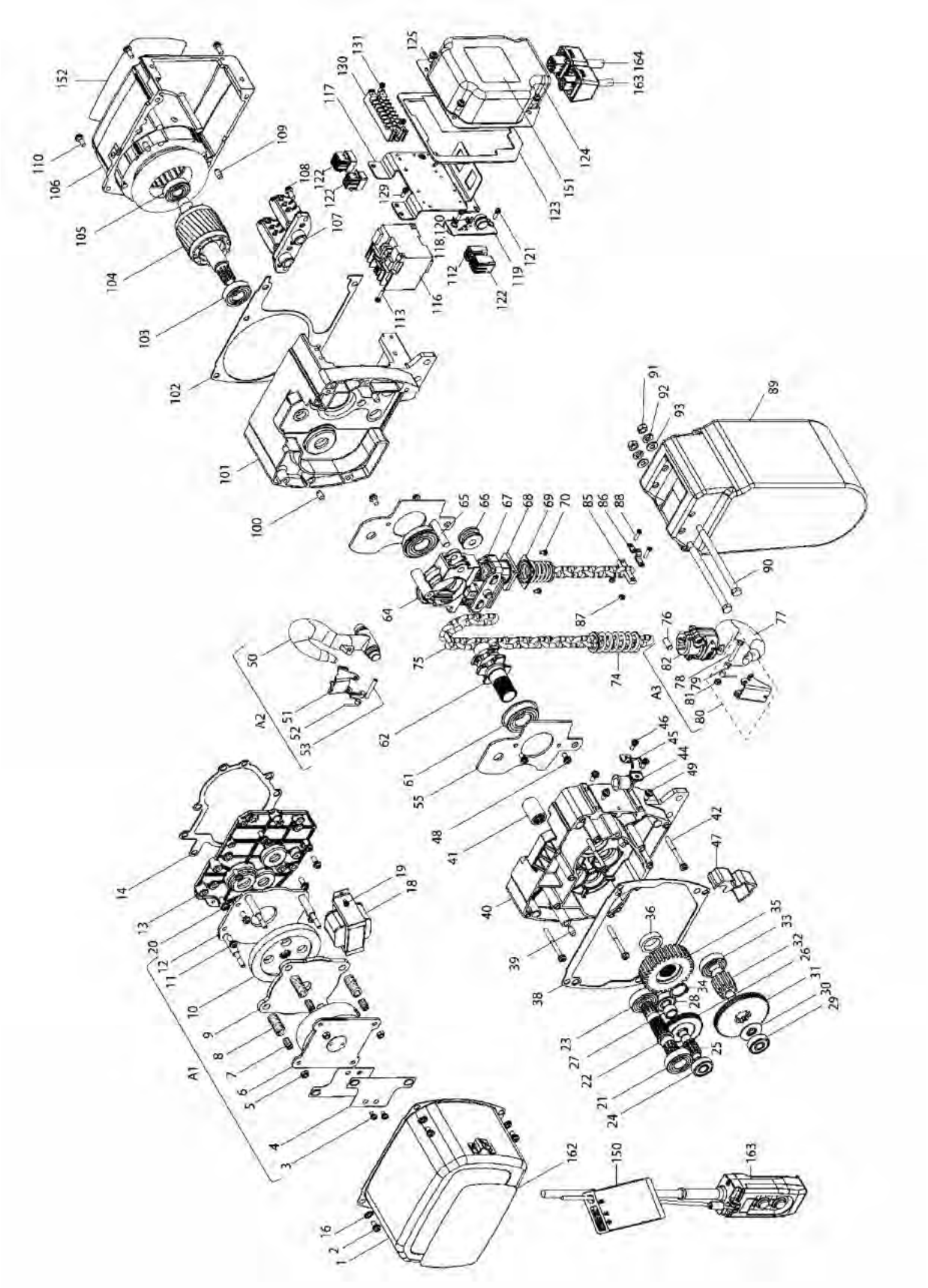
8. Part list

Part list for OVERLOAD PREVENTION UNIT

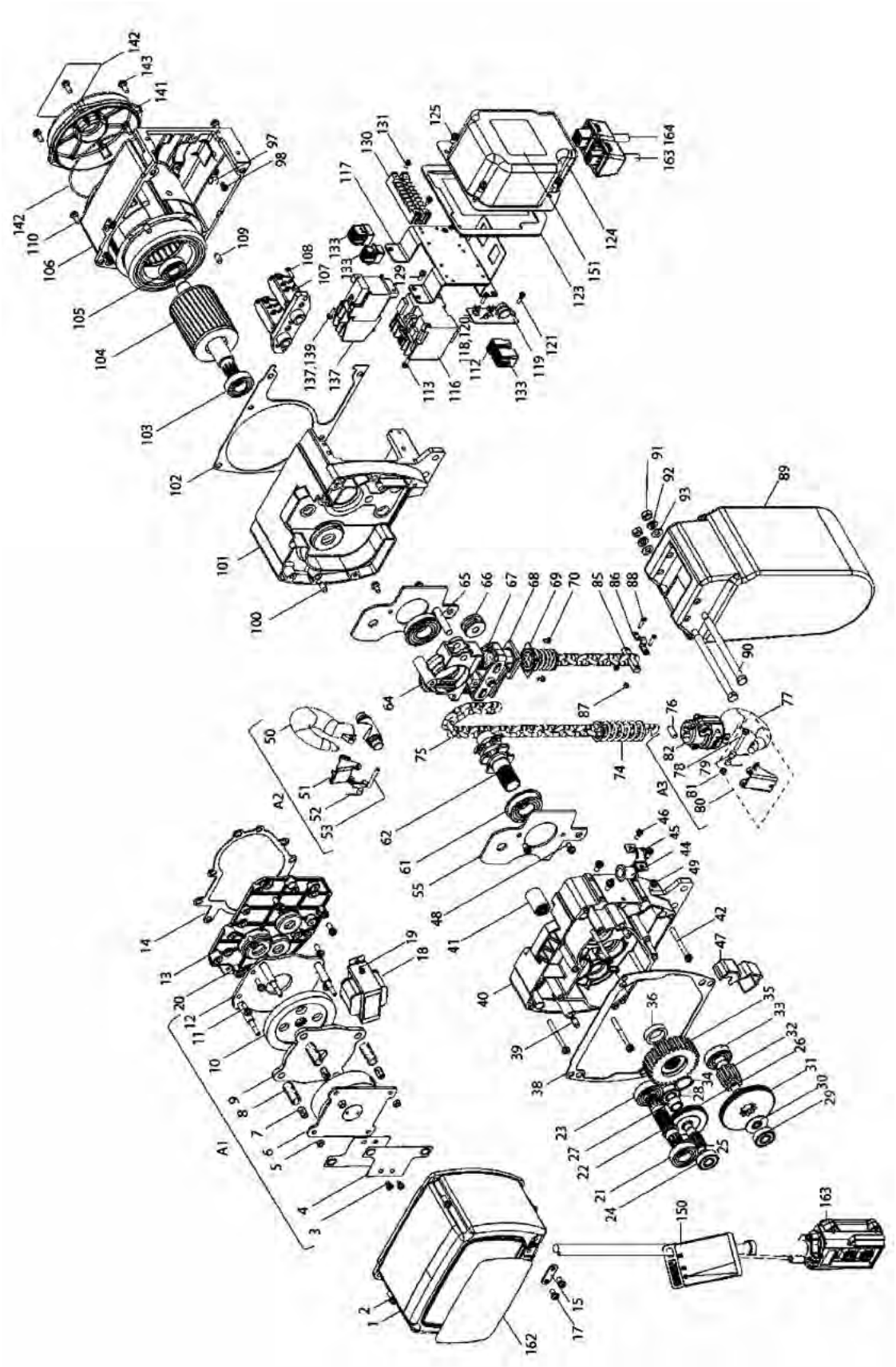


ITEM No.	PART No. DRAWING No.	PART NAME	QUANTITY		REMARKS
			1/2L(H) 1/2LN(H) 1/2LS(H)	1/4L(H) 1/4LN(H) 1/4LS(H)	
1	812940	OL STAND ASS'Y	1	1	
2	870503	MICRO SWITCH	1	1	
3	812943	OL 1ST PINION	1		L, LS MODEL
〃	812944	OL 1ST PINION		1	L, LS MODEL
〃	812943	OL 1ST PINION	1	1	LN MODEL
4	812942	RELAY ASS'Y	1	1	
5	812077	ME CAPACITOR	1	1	
6	871287	RELAY	2	2	
7	812939	GEAR CASE COVER	1	1	
8	812934	G PACKING (OL)	1	1	
9	812946	OL 2P ASS'Y	1		L, LS MODEL
〃	812945	OL 2P ASS'Y		1	L, LS MODEL
〃	812948	OL 2P ASS'Y	1		LN MODEL
〃	812936	OL 2P ASS'Y		1	LN MODEL
10	813364	GEAR CASE (OL)	1	1	
11	-	PAN HEAD SCREW M5x8	2	2	
12	-	PAN HEAD SCREW M4x6	2	2	

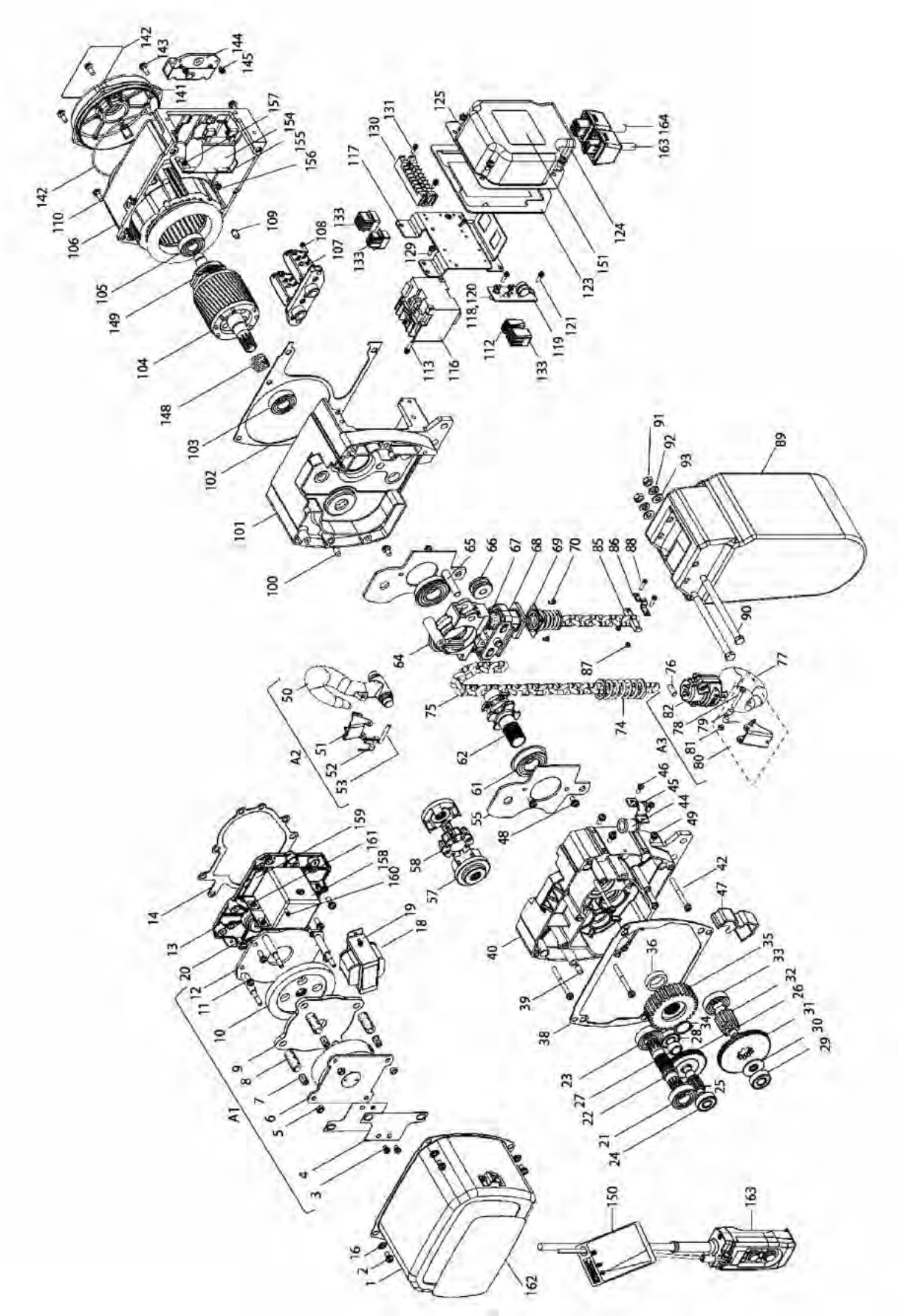
Bill of material of L-type



Bill of material of LN-type



Bill of material of LS-type



Part list for L / LN / LS

S/No.	Part code	Part name	Qty per system			type			Remarks
			150kg	250kg	500kg	L	LN	LS	
1	812866	Cover B	1	1	1	○		○	
〃	812901	〃	1	1	1		○		
2		Screw AM6×12	4	4	4	○		○	
〃		Screw AM6×16	1	4	4		○		
A1	812803	Brake Ass'y (3φ:200V 50/60Hz, 220V 60Hz) (3φ:220/380-415V 50Hz) (3φ:346V 50Hz) (1φ:220-240V 50/60Hz)	1	1	1	○	○	○	Includes S/No 3-12
〃	813525	Brake Ass'y (3φ: 220-230/440-460V 60Hz)	1	1	1	○	○		Includes S/No 3-12
〃	812913	Brake Ass'y (1φ:100V 50/60Hz)		1	1			○	Includes S/No 3-12
3		Screw AM5×8	2	2	2	○	○	○	
4	812809	Lock Washer	2	2	2	○	○	○	
5	851008	U nut M6	4	4	4	○	○	○	
6	812808	Brake solenoid (3φ : 200V 50/60Hz, 220V 60Hz) (3φ : 220/380-415V 50Hz) (3φ : 346V 50Hz) (1φ : 220-240V 50/60Hz)	1	1	1	○	○	○	
〃	812929	〃 (3φ : 220-230/440-460V 60Hz)	1	1	1	○	○		
〃	812914	〃 (1φ :100V 50/60Hz)		1	1			○	
7	812807	Spring	4	4	4	○	○	○	
8	812806	Brake spring	4	4	4	○	○		
〃	812928	Brake spring		4	4			○	
9	812805	Brake disk	1	1	1	○	○	○	
10	813354	Brake wheel	1	1	1	○	○	○	
11		Screw AM6×16	4	4	4	○	○	○	
12	812804	Brake base assembly	1	1	1	○	○	○	
13	812802	Gear case cover	1	1	1	○	○	○	
14	812801	Gear case packing	1	1	1	○	○	○	
15	812831	Cable stopper		1	1		○		
16	812877	Cover washer	4	4	4	○		○	
17		Screw AM6×12	2	2	2		○		
18	871133	Transformer assembly (220/380-415V)	1	1	1	○	○		
〃	871251	〃 (110-120/220-240V)		1	1			○	
〃	871261	〃 (220-230/440-460V 60Hz)	1	1	1	○	○		
〃	871915	〃 (100V 50/60Hz)		1	1			○	
〃	812867	〃 (200V 50/60Hz, 220V 60Hz)	1	1	1	○	○		
〃	871162	〃 (346V 50Hz)	1	1	1	○	○		
19		Screw WM4×8	2	2	2	○	○	○	
20		Screw AM6×16	7	7	7	○	○	○	
21		BB6004ZZ	1	1	1	○	○	○	
22	813361	1st pinion			1	○	○	○	
〃	813362	〃		1		○	○	○	
〃	813885	〃	1			○	○		
23		BB6004ZZ	1	1	1	○	○	○	

S/No.	Part code	Part name	Qty per system			type			Remarks
			150kg	250kg	500kg	L	LN	LS	
24		BB6201DDU	1	1	1	○	○	○	
25	812799	2nd pinion	1	1	1	○	○	○	
26	812882	1st gear			1	○	○	○	
〃	812798	〃		1		○	○	○	
〃	813886	〃	1			○	○		
27	812797	Collar	1	1	1	○	○	○	
28		BB6201DDU	1	1	1	○	○	○	
29		〃	1	1	1	○	○	○	
30	871285	Thrust sp washer	1	1	1	○	○	○	
31	812834	2nd gear	1		1	○	○	○	
〃	812778	〃		1		○	○	○	
32	812835	3rd pinion	1		1	○	○	○	
〃	812776	〃		1		○	○	○	
33		BB6203ZZ	1	1	1	○	○	○	
34		C ring 25	1	1	1	○	○	○	
35	812836	3rd gear	1		1	○	○	○	
〃	812777	〃		1		○	○	○	
36	812800	Collar	1	1	1	○	○	○	
37									
38	812810	B cover packing	1	1	1	○	○	○	
39	812843	Knock pin	2	2	2	○	○	○	
40	813363	Gear case	1	1	1	○	○	○	
41	812007	Coupling	1	1	1	○	○		
42	813908	Screw for case	4	4	4	○	○	○	
43									
44	811062	Packing	1	1	1	○	○	○	
45	811063	Cable stopper	1	1	1	○	○	○	
46		Screw M5×12	2	2	2	○	○	○	
47	813850	Packing for lead	1	1	1	○	○	○	
48		Screw AM6×12	4	4	4	○	○	○	
49		Screw AM6×12	4	4	4	○	○	○	
A2	812879	Upper hook assembly	1	1	1	○	○	○	
50	812880	Upper hook	1	1	1	○	○	○	
51	811140	Stopper A	1	1	1	○	○	○	
52	812830	Hook spring A	1	1	1	○	○	○	
53	811141	Spring pin 5×36AW	1	1	1	○	○	○	
54									
55	812966	Center frame	2	2	2	○	○	○	
56									
57	812916	Coupling	-	2	2			○	
58	871256	Coupling assembly	-	1	1			○	
59									
60									
61		BB6205DDUNR	2	2	2	○	○	○	Off the shelf goods
62	813887	Sprocket (6.3)	1	1	1	○	○	○	
63									
64	812967	Sprocket guide	1	1	1	○	○	○	
65	812790	Roller shaft	1	1	1	○	○	○	
66	839773	Roller	1	1	1	○	○	○	
67	812968	LS spring	2	2	2	○	○	○	
68	812969	Limit lever assembly		1	1	○	○	○	Includes S/N 69-70

S/No.	Part code	Part name	Qty per system			type			Remarks
			150kg	250kg	500kg	L	LN	LS	
68	813888	Limit lever assembly	1			○	○		Includes S/N 69-70
69	812970	Limit spring assembly		1	1	○	○	○	
〃	813889	〃	1			○	○		
70		Screw AM4×8	2	2	2	○	○	○	
71									
72									
73									
74	812825	Limit spring	1	1	1	○	○	○	
75	813520	BK link chain (6.3)	1	1	1	○	○	○	Transaction unit 200m
〃	813228	Nickeled chain (6.3)	1	1	1	○	○	○	Transaction unit 30m
A3	813890	Lower hook assembly (500kg)			1	○	○	○	Includes S/N 76-82
〃	813891	〃 (250kg)		1		○	○	○	〃
〃	813892	〃 (150kg)	1			○	○	○	〃
〃	813893	〃 (490kg)			1	○	○	○	〃
76	812826	Chain stopper (6.3)	1	1	1	○	○	○	
77		Lower hook	1	1	1	○	○	○	
78	813894	Latch bolt	1	1	1	○	○	○	
79	812830	Latch spring	1	1	1	○	○	○	
80	813896	Latch assembly	1	1	1	○	○	○	Includes S/N 78-79
81	812460	U nut M5	1	1	1	○	○	○	
82		Hunger assembly	1	1	1	○	○	○	
84									
85	839710	Chain stopper	1	1	1	○	○	○	
86	812533	Retainer	1	1	1	○	○	○	
87	812409	U nut M4	2	2	2	○	○	○	
88		Screw M4×16	2	2	2	○	○	○	
89	813897	Chain bucket Lx							
90	813898	Bucket pin	2	2	2	○	○	○	
91		Nut M8	2	2	2	○	○	○	
92		Spring washer M8	2	2	2	○	○	○	
93		End washer M8	2	2	2	○	○	○	
95									
96									
97	812903	Clip	1	1	1		○		
98		Screw AM5×8	1	1	1		○		
99									
100	812843	Knock pin	2	2	2	○	○	○	
101	812861	Housing	1	1	1	○	○	○	
102	812784	Cover packing	1	1	1	○	○	○	
103		BB6004ZZ	1	1	1	○	○	○	
104	812843	Rotor assembly (L)	1	1	1	○			
〃	812911	〃 (LN)	1	1	1		○		
〃	812923	〃 (LS)		1	1			○	
105		BB6203ZZ	1	1	1	○	○		
〃		BB6202VV		1	1			○	
106	813916	L housing assembly	1	1	1	○			220/380-415V 50Hz
〃	813917	LN housing assembly	1	1	1		○		
〃	812937	LS Housing assembly		1	1			○	

S/No.	Part code	Part name	Qty per system			type			Remarks
			150kg	250kg	500kg	L	LN	LS	
106	813899	L Housing assembly			1	○			220V 50/60Hz, 220V60Hz
〃	813900	L Housing assembly		1		○			
〃	813901	L Housing assembly	1			○			
〃	813902	LN Housing assembly			1		○		
〃	812906	LN Housing assembly		1			○		
〃	812912	LN Housing assembly	1				○		
〃	812918	LS Housing assembly			1			○	100V 50Hz
〃	812924	LS Housing assembly			1			○	100V 60Hz
〃	812918	LS Housing assembly		1				○	100V 50/60Hz
107		Limit switch assembly	1	1	1	○	○	○	
108		Screw AM6×16	2	2	2	○	○	○	
109	812843	Knock pin	2	2	2	○	○	○	
110		Screw AM6×16	4	4	4	○	○	○	
111									
112	812975	6P connecter assembly	1	1	1	○			
〃	813907	〃	1	1	1		○		
113		Screw WM4×16	2	2	2	○	○	○	
114									
116	813515	Contactor (HMU12)	1	1	1	○	○	○	
117	812998	Switch stand	1	1	1	○		○	
〃	813237	〃	1	1	1		○		
118	812873	Collar	2	2	2	○	○	○	
119	812871	Rectifier assembly	1	1	1	○	○	○	
120	812872	Bushing	2	2	2	○	○	○	
121		Screw WM4×16	2	2	2	○	○	○	
122	812976	Connector assembly	1	1	1	○			
123	812876	Packing	1	1	1	○	○	○	
124	812875	Side cover	1	1	1	○		○	
124	813235	〃	-	1	1		○		
125		Screw AM6×12	4	4	4	○	○	○	
126									
127									
128									
129		Screw AM5×12	1	1	1	○	○	○	
130	854709	15A8P terminal block	1	1	1	○	○	○	
〃	812071	15A6P terminal block	1	1	1	○	○	○	
131		Screw WM4×12	2	2	2	○	○	○	
132									
133	812977	Connector assembly (LN)	1	1	1		○		
〃	812978	Connector assembly (LS)		1	1			○	
〃	812922	9P connector assembly (LS)		1	1			○	
135									
136									
137	813234	Contactor (MUFR5-6)	1	1	1		○		
138		Screw AM4×16	2	2	2		○		
139		End washer M4	2	2	2		○		
140		L wiring diagram seal	1	1	1	○			
〃		LN wiring diagram seal	1	1	1		○		
〃		LS wiring diagram seal	1	1	1			○	
141	812909	End bracket	1	1	1		○		
〃	812920	〃		1	1			○	

S/No.	Part code	Part name	Qty per system			type			Remarks
			150kg	250kg	500kg	L	LN	LS	
142	812947	Packing	1	1	1		○	○	
143		Screw AM6×16	1	4	4		○	○	
144	811328	Direction switch		1	1			○	
145		Screw WM4×10		2	2			○	
147									
148	812094	Thrust spring		1	1			○	
149	871253	Centrifugal switch		1	1			○	
150		Caution label	1	1	1	○	○	○	
152		Specification nameplate	1	1	1	○			
〃		〃	1	1	1		○	○	Not shown
153	813027	Chain gage (6.3)	1	1	1	○	○	○	
154	813366	Capacitor A		1	1			○	
155	813367	Capacitor base A		1	1			○	
156		Screw AM5×8		1	1			○	
157		Screw WM4×10		2	2			○	
158	813368	capacitor B		1	1			○	
159	813369	Capacitor base B		1	1			○	
160		Screw A4×10		2	2			○	
161		Screw A4×10		4	4			○	
162	813903	Capacity nameplate (500kg)			1	○	○	○	
〃	813904	〃 (490kg)			1	○	○	○	
〃	813905	〃 (250kg)		1		○	○	○	
〃	813906	〃 (150kg)	1			○	○	○	
163	812193	2PB assembly (3m)	1	1	1	○		○	
〃	812194	2PBH assembly (6m)	1	1	1	○		○	
〃	812534	2PBN assembly (3m)	1	1	1		○		
〃	812535	2PBNH assembly (6m)	1	1	1		○		
164	812192	Power cable assembly	1	1	1	○	○		
〃	812559	〃 (LS)		1	1			○	

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