

Maintenance Manual for Elevator Door Operators

Contents

1. Introduction
2. Maintenance of door operator
3. General precautions
 - 3.1 Safety symbols
 - 3.2 Precautions after inspection and maintenance
 - 3.3 Service parts
4. Inspection items and standard intervals
 - 4.1 Car door operator
 - 4.2 Landing door operator
5. Details on inspection items
 - (1) Tightening torque for belt holder
 - (2) Checking belt tension and alignment
 - (3) State of interlocking belt
 - (4) Interlocking chain tension
 - (5) Interlocking rope tension
 - (6) Interlocking rope wire breakage
 - (7) Clearance between upthrust roller and rail
 - (8) Car-door close detection switch
 - (9) Landing door interlock device

Maintenance of Elevator Door Operator

1. Introduction

The scope of this maintenance manual covers the main components of elevator door operators that may greatly compromise the safety of users and cause serious accidents if malfunctions or insufficiently managed.

Elevator door operators need to be inspected and maintained periodically by competent maintenance persons. If used without proper maintenance, they may not be able to deliver the performance we expect. The components specified in this manual are particularly critical for safety of users and maintenance persons. Please formulate the appropriate maintenance plan in accordance with this manual.

For maintenance of Mitsubishi Electric elevators, we recommend that you sign a maintenance contract with our official distributor. To contact our official distributor, please visit our website:

www.mitsubishielectric.com/elevator/network/index.html.

This manual describes important items that need to be checked with particular care in performing basic maintenance.

The owner of the installation and operation manager must request the maintenance organization to perform maintenance in accordance with this manual.

2. Maintenance of door operator

The main components of elevator door operators described in this manual refer to the critical parts that may cause serious accidents involving users if their functions and states are improperly maintained. Because the way in which the state of the elevator changes varies depending on the operation time and installation environment, the maintenance activity must be performed to maintain the appropriate state at all times.

This document describes items that must be checked in performing basic maintenance for the main components of elevator door operators mentioned above.




3. General precautions

This manual summarizes important maintenance information for competent maintenance persons who carry out basic elevator maintenance. The competent maintenance persons shall understand and observe the instructions thoroughly.




3.1 Safety symbols

Safety symbols below represent the degree of hazard that would arise should the provided instructions be neglected. The definitions of the symbols are as follows.

(1) Definitions of danger, warning, and caution symbols

Symbol	Description
 Danger	Indicates an imminently hazardous situation which, if not observed, will result in death or serious injury.
 Warning	Indicates a potentially hazardous situation which, if not observed, could result in death or serious injury.
 Caution	Indicates a potentially hazardous situation which, if not observed, may result in injury or damage to the elevator equipment.

(2) Definitions of precaution symbols





Symbol	Description
	Indicates a mandatory action.
	Indicates a prohibited action.
	Warns of electricity. (This symbol reminds workers to take care to avoid coming into contact with live-wire portions.)

3.2 Precautions after inspection and maintenance

(1) Fault



If any fault has been found during inspection and/or maintenance, take appropriate measures immediately.

- 1) Take the elevator out of service until the fault is repaired. Report the state to the operation manager.
- 2) Record the detail of fault, replacement, and repair in the Work Log, and maintain it permanently.
- 3) If any abnormality has been found during inspection, and replacement, repair or adjustment by Mitsubishi Electric Corporation is required, please contact our official distributor.

 Caution	<ul style="list-style-type: none"> While the elevator is out-of-service, be sure to take measures to prevent anyone from entering the area. Use the Mitsubishi Electric's genuine parts for replacement. If there is any problem with the product, contact our official distributor.
--	--

(2) Restoration



- 1) Restore any screws, covers, or other parts loosened or removed during inspection and/or maintenance to the original state.
- 2) If no abnormality has been found during inspection and/or maintenance, confirm the safety and restore the elevator to the automatic (normal) operation.

 Caution	 Before resuming the automatic (normal) operation, check that there is no problem with elevator operation by first running the car manually, followed by stopping the car at every floor in automatic (normal) operation, and then running the car from the top to the bottom floor in automatic (normal) operation at the end.
--	---

3.3 Service parts

For supply of parts, contact our official distributor.





Please note that we may not be able to supply some parts depending on when the product was produced and the condition of the equipment. In such case, we recommend modernization of your product.

 Caution	 This manual is subject to change without notice. Before starting maintenance, visit the URL below to check the latest manual. www.mitsubishielectric.com/elevator/maintenance/index.html
--	--

4. Inspection items and standard intervals

Follow the table shown below to check the state of each part. If any abnormality is found as the result of the inspection, replace the part(s) concerned.

	Item	Description	Interval (standard)
Car door operator	Belt and pulley	[Interlocking belt] - Check that the fixed portions of belts and pulleys are not loosened. [Details 5. (1)] - Check the belt tension and how the belt is wound around the pulley. [Details 5. (2)] - Check that no cracks, wear, and other abnormalities are present on the belt. [Details 5. (3)] - Check that no significant looseness, wear, and rust are present on the shaft and bearing portions.	12 months
	Link	- Check that the individual bolts are not loosened. - Check that no significant looseness, wear, and rust are present on the shaft and bearing portions.	4 months
	Interlocking chain	- Check that the individual bolts are not loosened. - Check the chain tension. [Details 5. (4)] - Check that no elongation, cracks, kinks, and other abnormalities are present on the chain. - Check that no significant looseness, wear, and rust are present on the shaft and bearing portions.	4 months
	Interlocking rope and pulley	- Check that the individual bolts are not loosened. - Check the rope tension. [Details 5. (5)] - Check that no breakages, wear, kinks, and other abnormalities are present on the rope. [Details 5. (6)] - Check that no significant looseness, wear, and rust are present on the shaft and bearing portions.	4 months
	Door hanger	- Check that the individual bolts are not loosened. - Check that no significant looseness, wear, and rust are present on the shaft and bearing portions of the hanger rollers. - Check that the clearance between the upthrust roller and the rail is within the standard range. [Details 5. (7)]	4 months
	Door shoe	- Check that the individual bolts are not loosened.	12 months
	Car-door close detection switch	- Check that the switch is attached and adjusted to be within the standard range. [Details 5. (8)] - Check that the elevator does not start in the door opened state.	4 months 12 months
Landing door operator	Interlocking rope and pulley	Same as the car	4 months
	Link	Same as the car	4 months
	Door hanger	Same as the car	4 months
	Door shoe	Same as the car	12 months
	Door closer	- Check that the doors automatically close. <u>Weight type</u> - Check that the individual bolts are not loosened. - The clearance between the stopper and the pulley needs to be 2.5 mm or less. <u>Link type</u> - Check that no significant looseness, wear, and rust are present on the shaft and bearing portions. <u>Spirator type</u> - Check that the rope does not overlap when it is being wound around the drum. - Check that the mounting bolts are not loosened. - Check that there is no oil leakage.	4 months
	Interlock	- Pull the fully closed doors two or three times in the opening direction and check that the door stays absolutely shut. - Check that no significant looseness, wear, and rust are present on the shaft and bearing portions. - Check that the gap and engaged area between the latch and the hook are in the specified values. [Details 5. (9)] - Check that the elevator does not start in the door opened state.	4 months 12 months

 Danger	<p> Due to the risk of falling into the hoistway during the inspection, take the necessary safety measures before the operation.</p> <p> Since there is a risk of equipment malfunction/damage or serious accident, other than when operating manually, shut off the power supply in advance as necessary.</p> <p> Since there is a risk of equipment malfunction/damage or serious accident, change the AUTO/HAND (NORMAL/INSPECTION) switch of the car operating device on car top to the HAND (INSPECTION) position.</p>
---	--

4.1 Car door operator (belt-driven type, link-driven type, and chain-driven type)

*For the inspection items of each component number, see section 5.

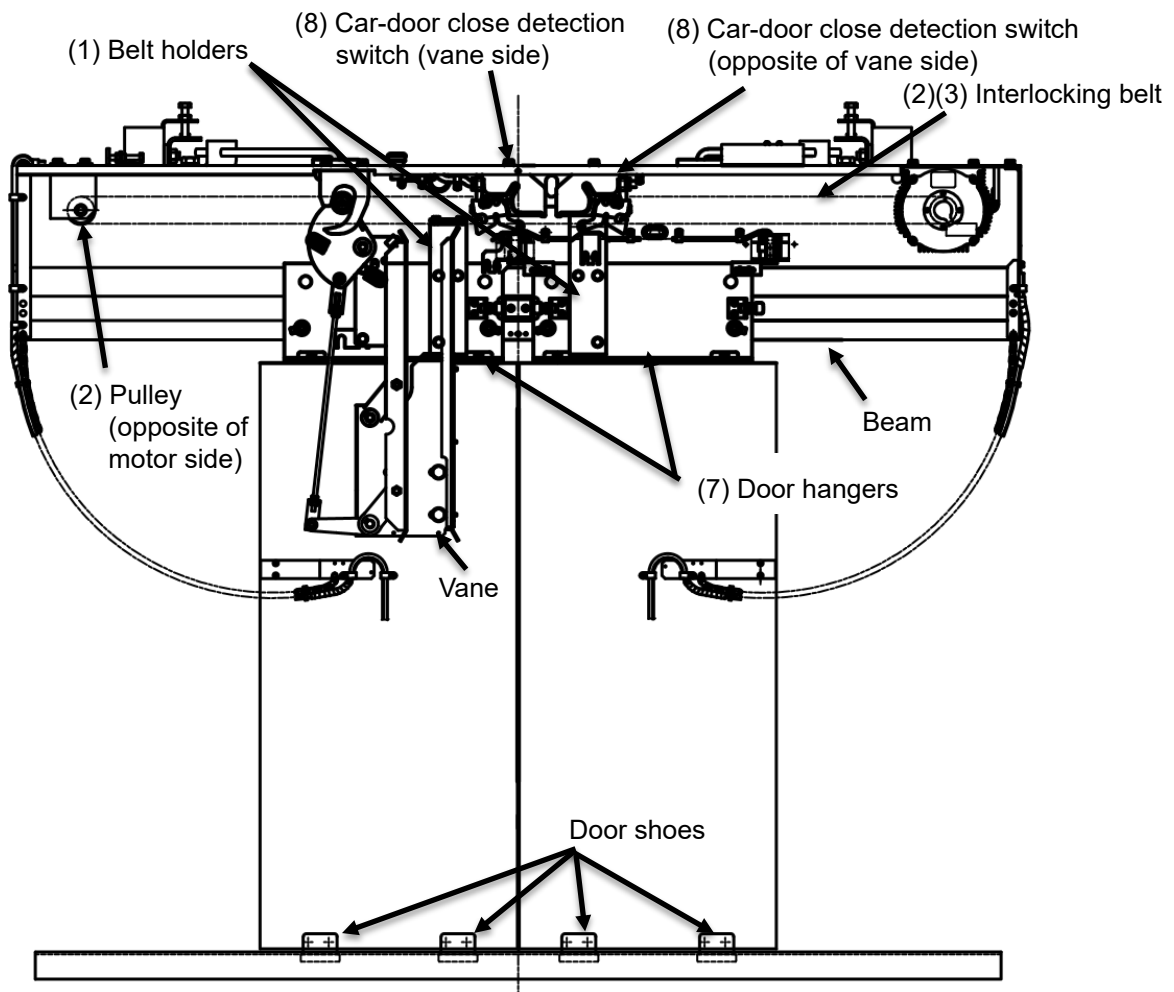


Fig. 4-1 Car door operator type 1 (belt-driven type)

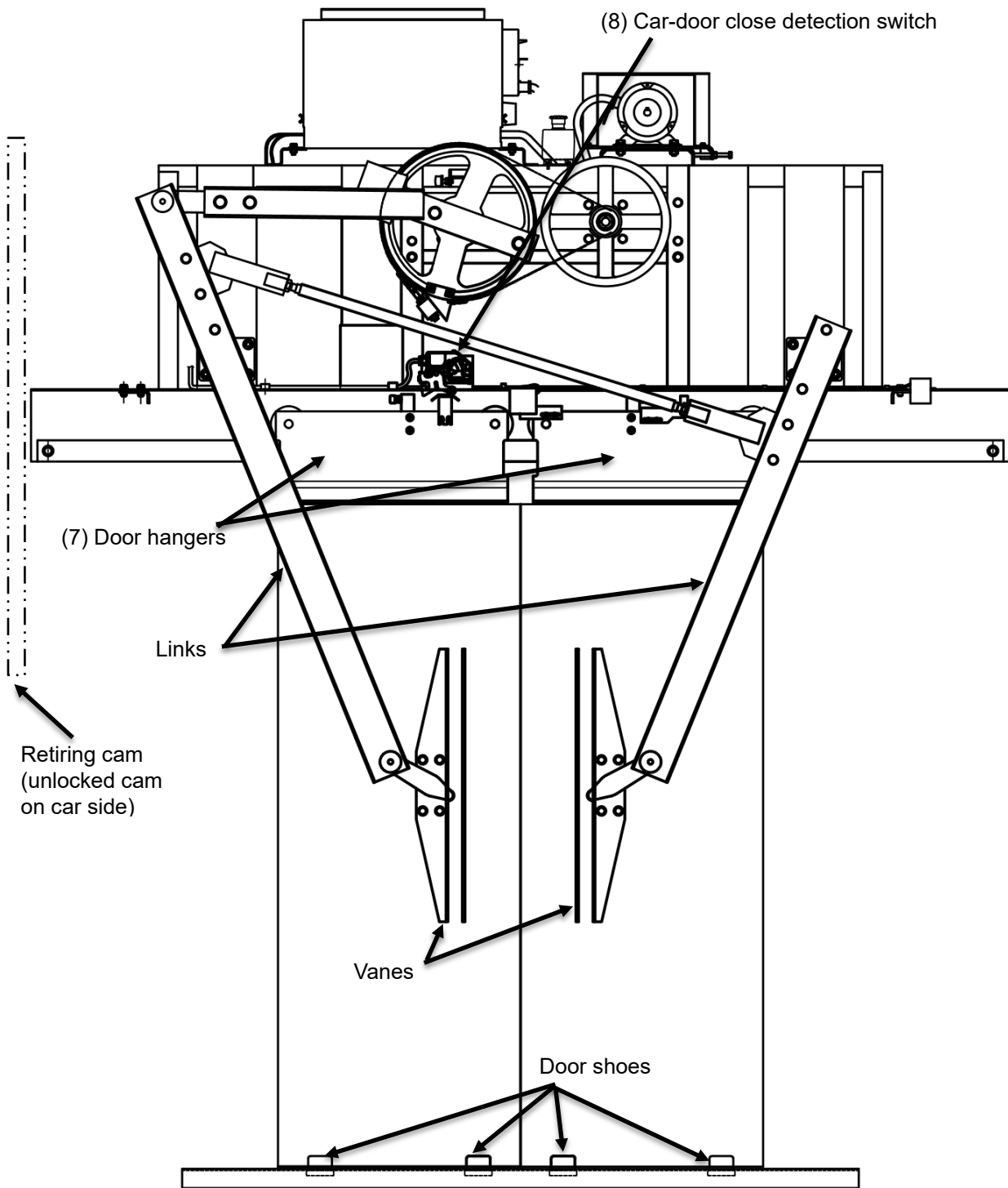


Fig. 4-2 Car door operator type 2 (link-driven type)

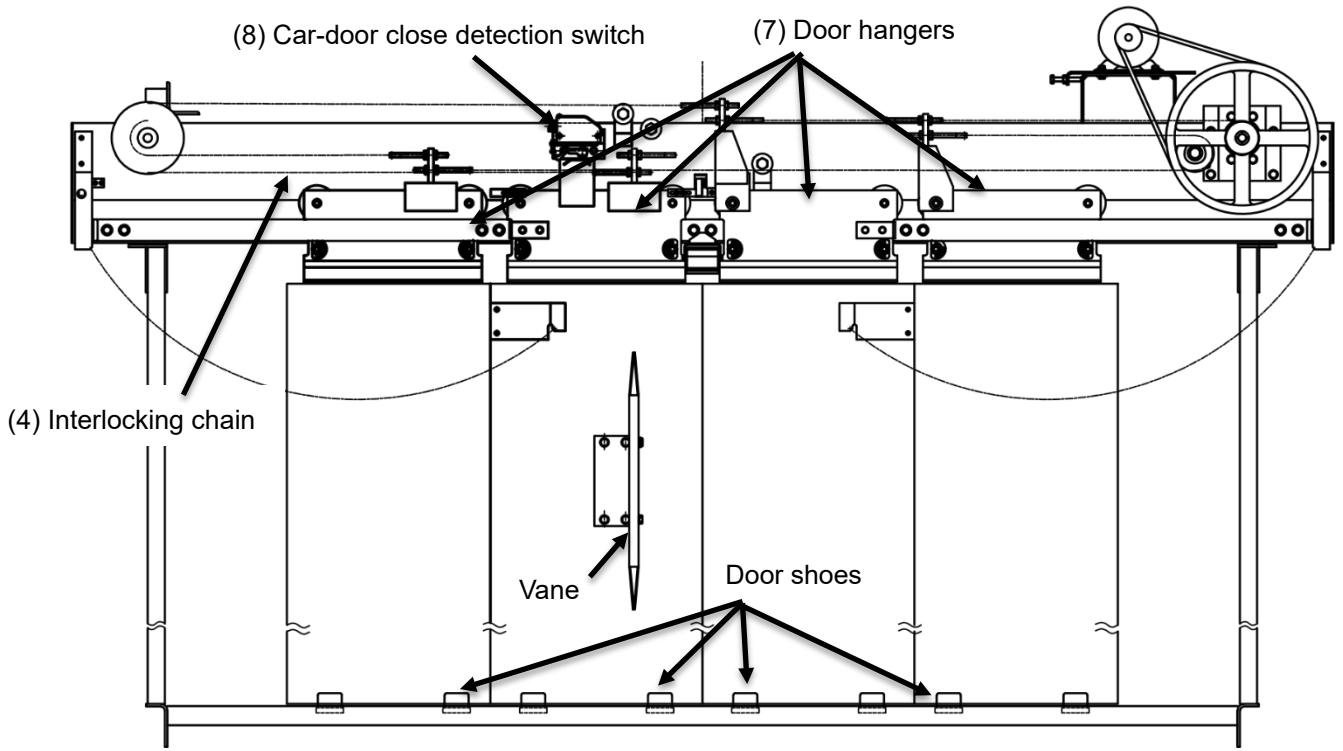


Fig. 4-3 Car door operator type 3 (chain-driven type)

4.2 Landing door operator (weight-closer type, link-closer type, and spirator type)

*For the inspection items of each component number, see section 5.

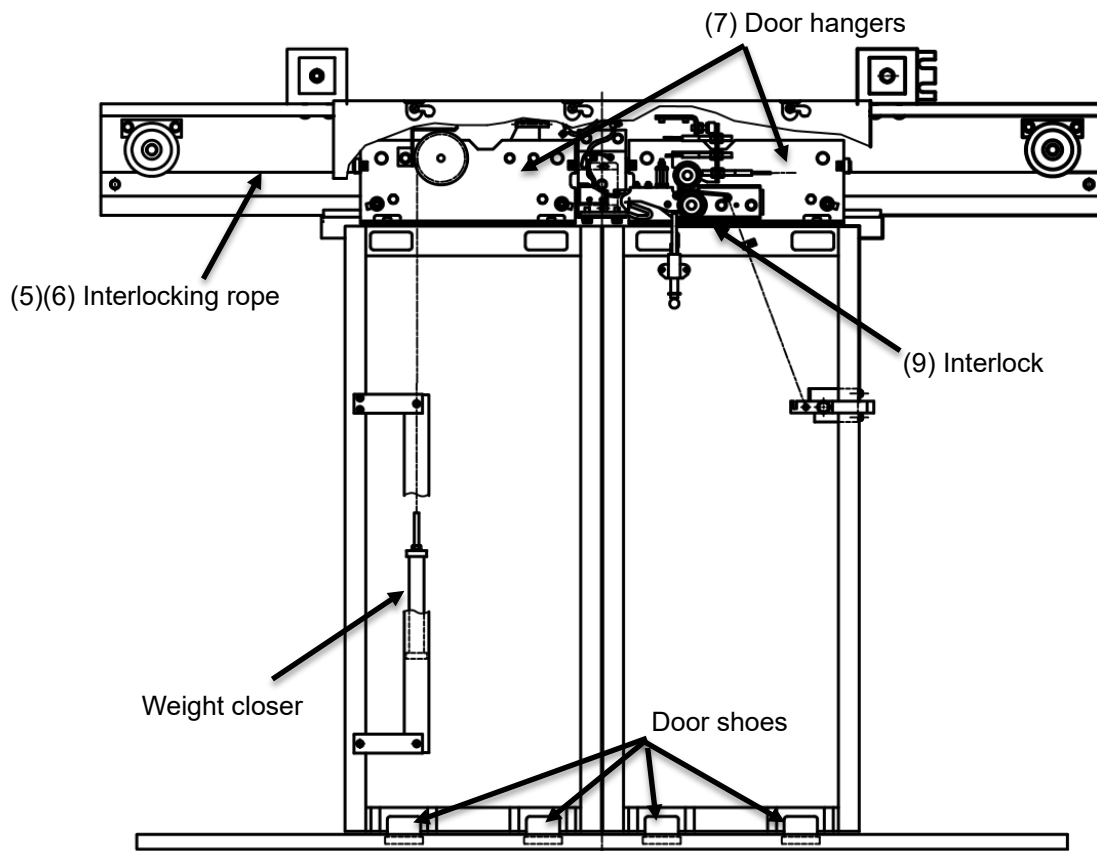


Fig. 4-4 Landing door operator type 1 (weight-closer type)

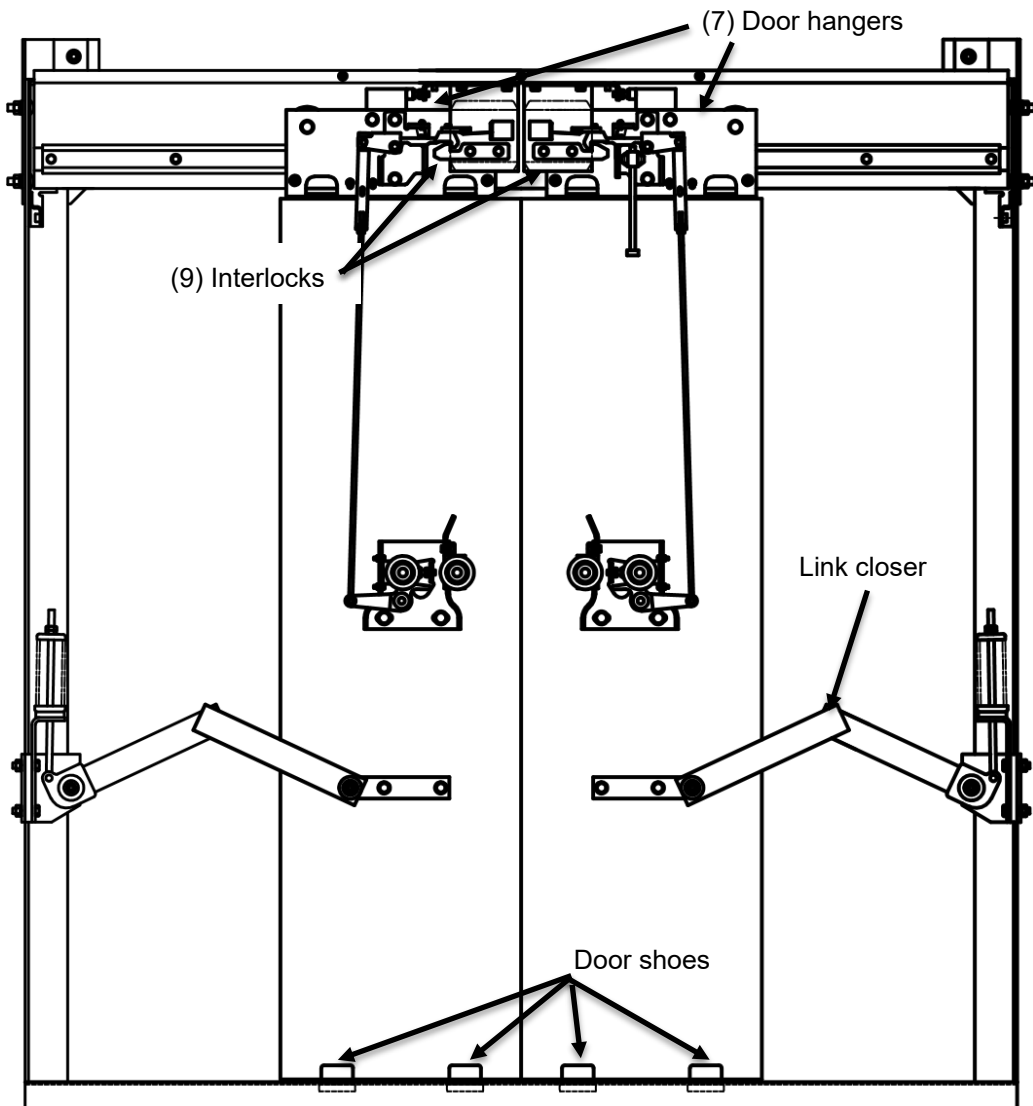


Fig. 4-5 Landing door operator type 2 (link-closer type)

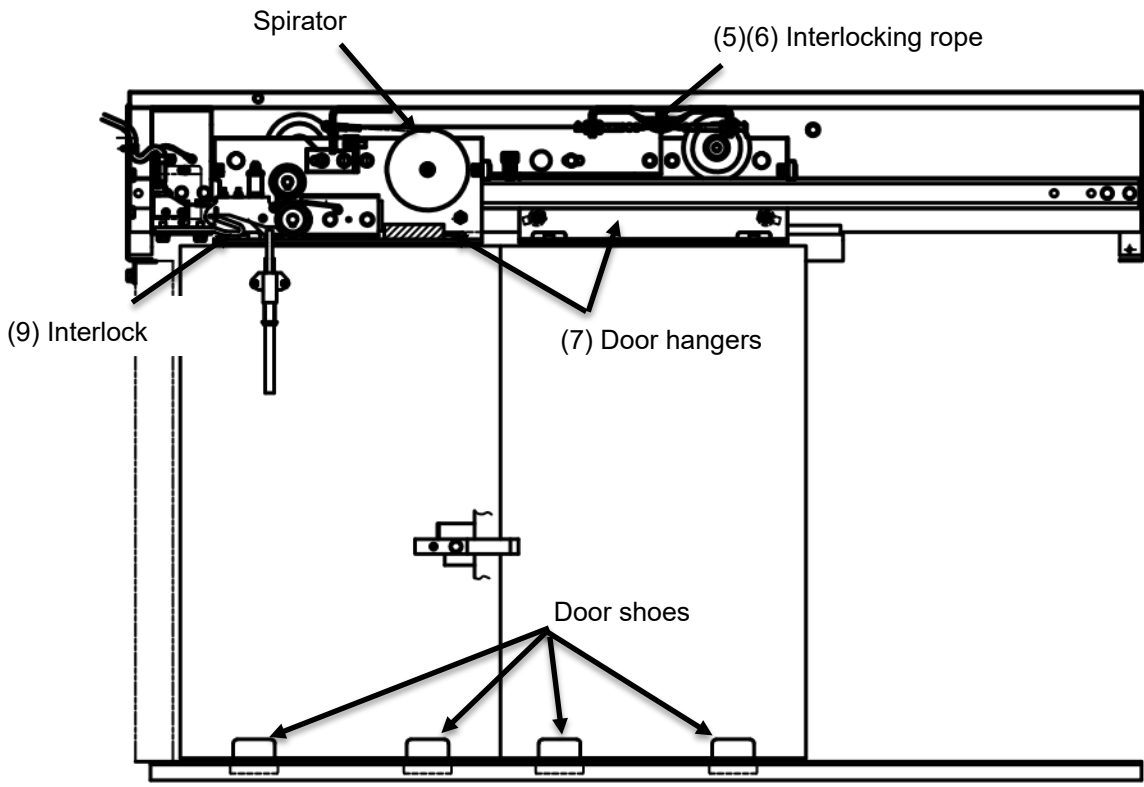


Fig. 4-6 Landing door operator type 3 (spirator type)

5. Details on inspection items

(1) Tightening torque for belt holder

The toothed belt is fixed with bolts (at belt holder) as shown in the figure below. Maintain the tightening torque of bolts within the range of 3 to 4 N·m.

*Check for retightening with a torque of 3 to 4 N·m at least every 12 months.

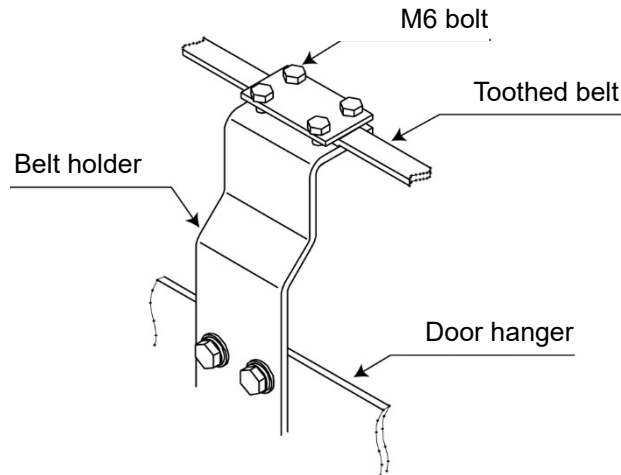


Fig. 5-1

(2) Checking belt tension and alignment

(a) The belt tension needs to be maintained within the range below. Measure the tension at the center of the belt with the doors fully opened.

(b) Adjust the alignment using the fixing bolts on the pulley mounting plate so that the belt rotates straight around the pulleys. The adjustment is required especially when there is a squeaking noise in the belt and the flange and a large amount of abrasion powder is formed due to strong contact between the belt and the flange.

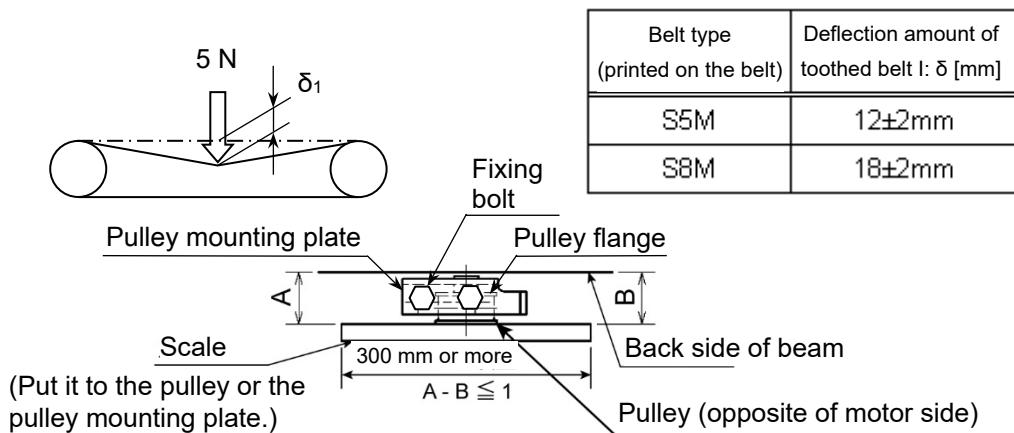


Fig. 5-2

(3) State of interlocking belt

Cracks, wear, deformation, and other abnormalities must not be present on the belt. Replace the belt if there is any crack or wear on the belt as shown in the figure below.

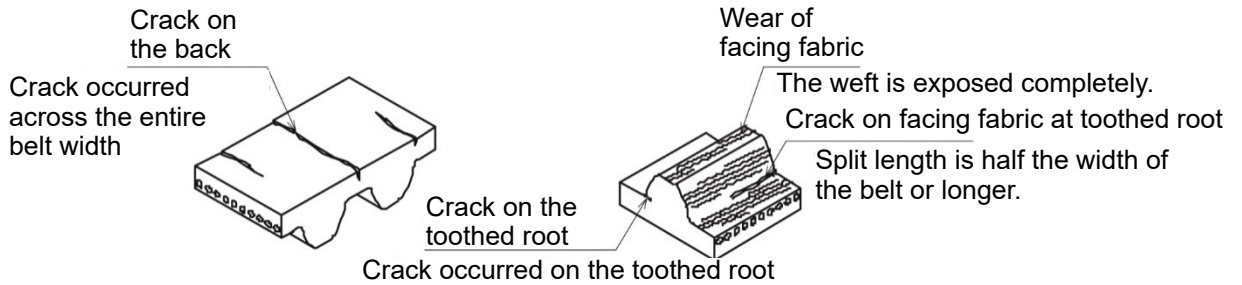


Fig. 5-3

(4) Interlocking chain tension

The interlocking chain tension must be maintained within the range shown below. Measure the tension at the center of the chain with the doors fully opened.

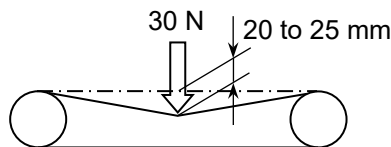


Fig. 5-4

(5) Interlocking rope tension

The interlocking rope tension must be maintained within the range shown below. Measure the tension at the center of the rope with the doors fully opened.

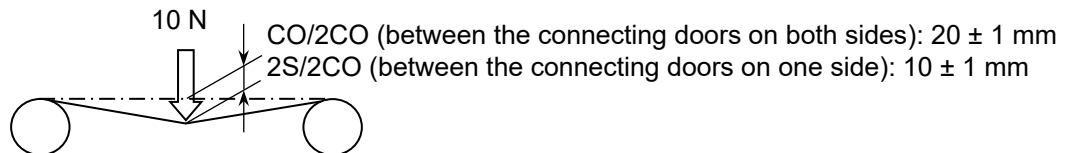
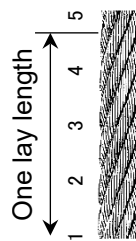


Fig. 5-5

(6) Interlocking rope wire breakage

Check the state of interlocking rope wire breakage.



Note:
If 17 or more wires are cut in one lay, replace the interlocking rope.

Fig. 5-6

(7) Clearance between upthrust roller and rail

The clearance between the upthrust roller of the door hanger and the door rail must be maintained between 0.1 and 0.3 mm.

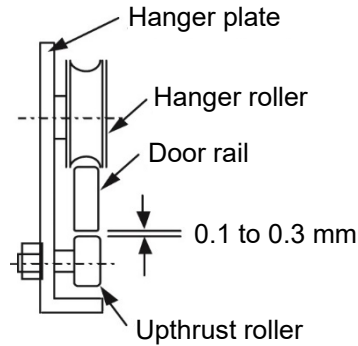


Fig. 5-7

(8) Car-door close detection switch

There must be no change in the operating point and installation condition or any other abnormality.

(a) Switch operating point

Door type	Operating point
CO, 2CO (Center-open type)	9 ± 1 mm (vane side) 15 ± 2 mm (opposite of vane side)* immediately before the car doors are fully closed
2S, 3S (Side-open type)	9 ± 1 mm immediately before the car doors are fully closed

*Only for the belt-driven type with two switches

(b) Switch operation with door fully closed

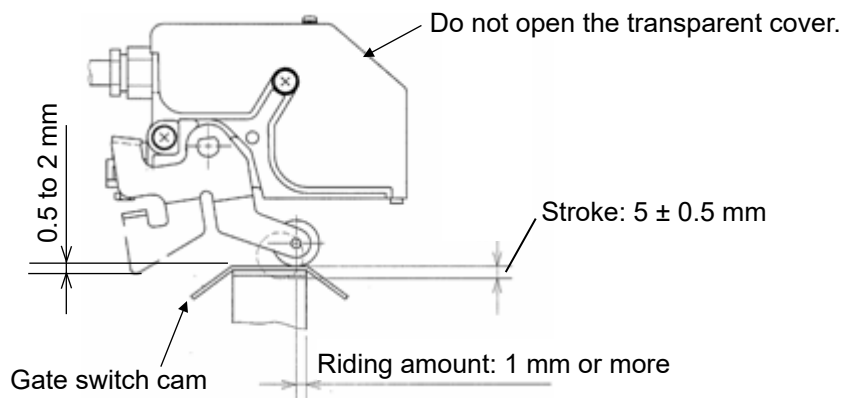


Fig. 5-8

(9) Landing door interlock device

Check that the switch operation when the doors are fully closed is as shown in the figure below.

*Check the type of landing door interlock device by looking at the appearance of the device actually installed.

(a) Type 1 (IL-3X type (*The letter X represents a number.))

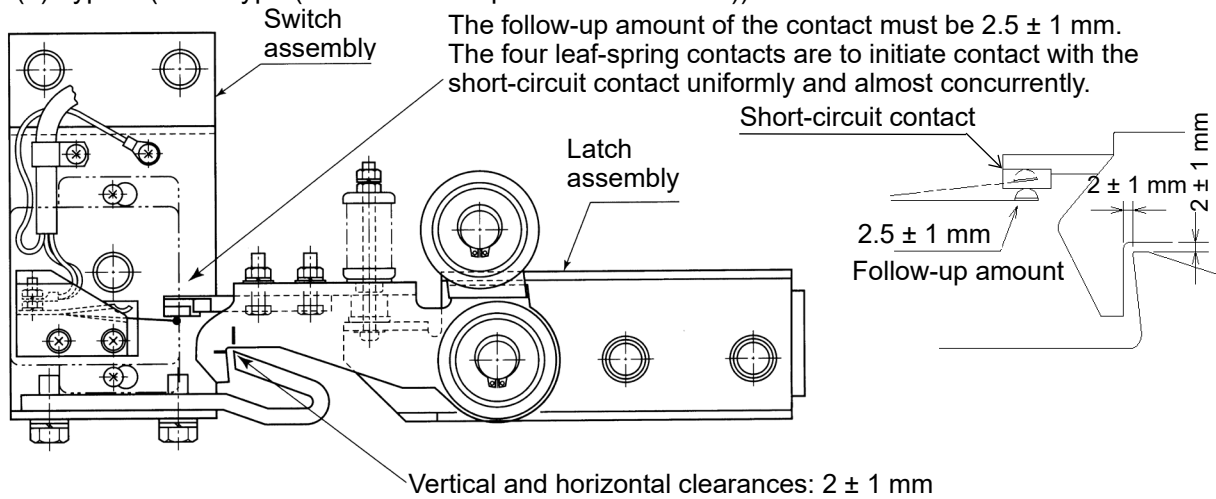


Fig. 5-9

(b) Type 2 (IL-2X type (*The letter X represents a number.))

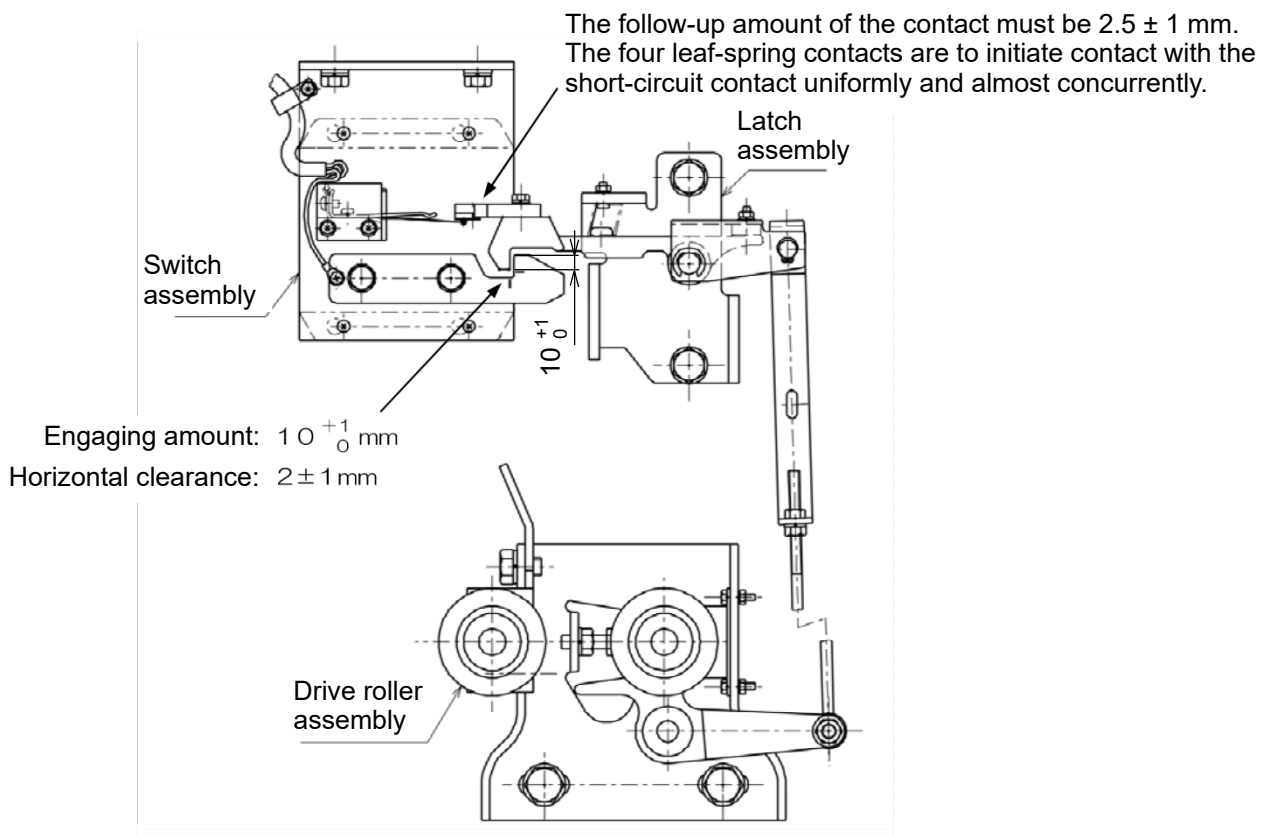
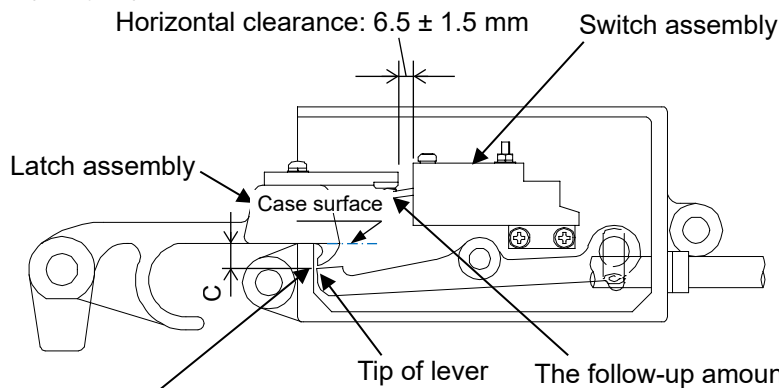


Fig. 5-10

(c) Type 3 (B2 type)

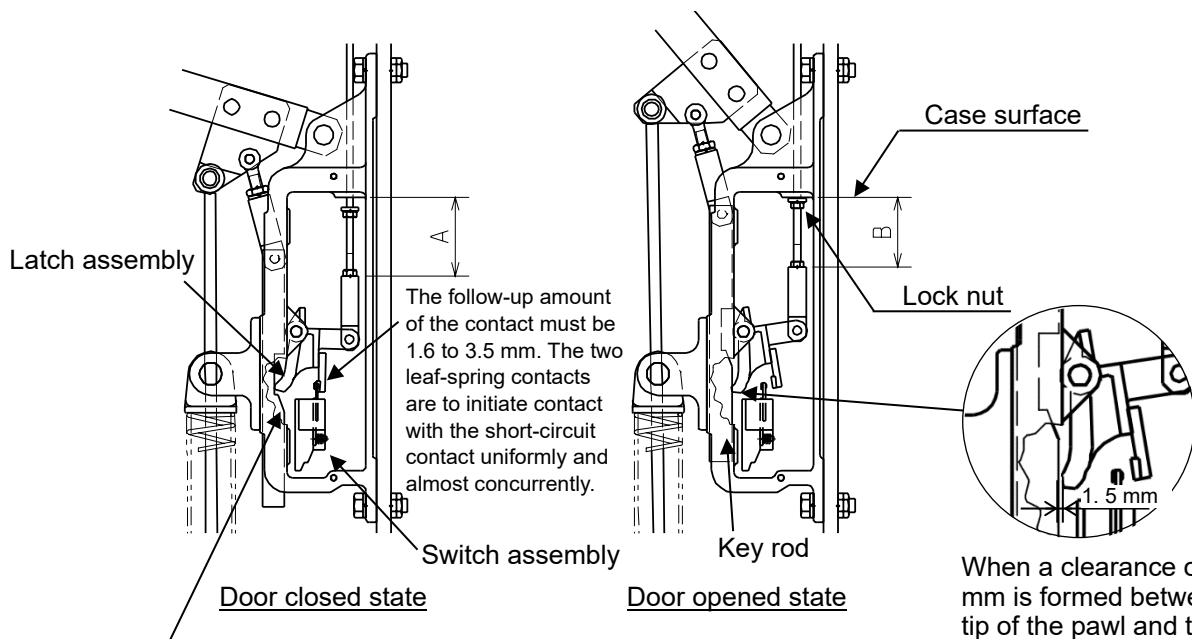


- The horizontal clearance (allowance) must be 3 ± 1.5 mm and the hooking allowance in the engagement portion between the latch and the case must be 8 mm or more.
- When the retiring cam (unlocked cam on the car side) presses the rollers, the tip of the lever is moved higher by 3 mm from the case surface, and when the retiring cam is excited, the dimension C (height from the tip of the lever to the case surface) becomes 9.5 ± 1 mm.

The follow-up amount of the contact must be 1.6 to 3.5 mm. The two leaf-spring contacts are to initiate contact with the short-circuit contact uniformly and almost concurrently.

Fig. 5-11

(d) Type 4 (B3 type)

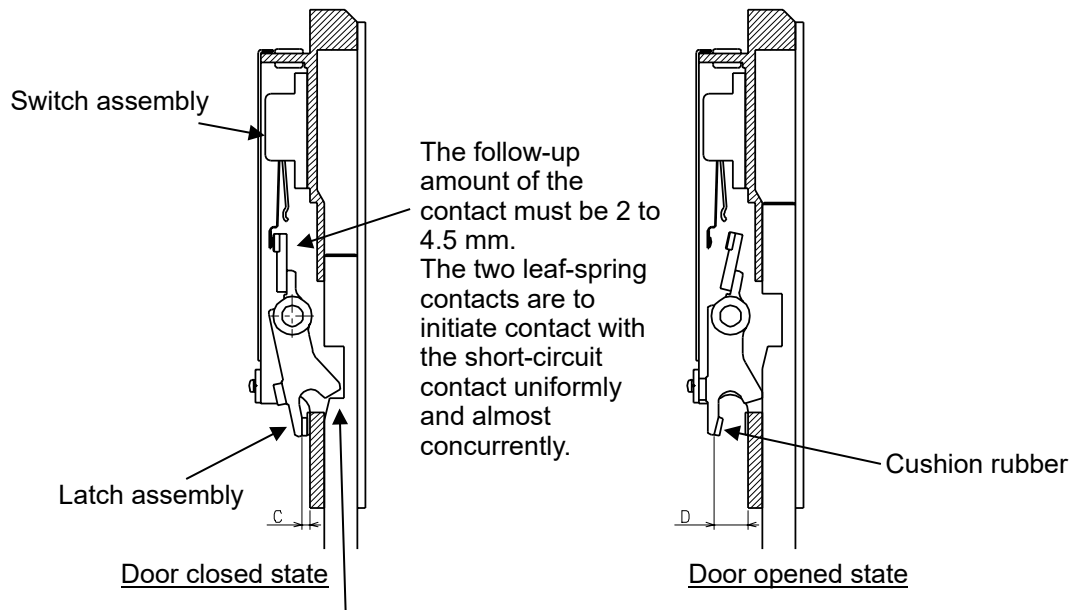


- To check the allowance in the latch portion, move the landing door in the doors fully closed state in the door opening direction by hand. The clearance during the movement must be 6 to 9 mm.
- To check the hooking allowance in the engagement portion, measure the dimension A in the door closed state and the dimension B in the door opened state respectively. The value of A minus B must be 6.5 mm or more.

When a clearance of 1.5 mm is formed between the tip of the pawl and the inner front surface of the key rod, fix the lock nut at the position where the lock nut touches the case surface.

Fig. 5-12

(e) Type 5 (IL-1X type (*The letter X represents a number.))



- To check the allowance in the latch portion, move the landing doors in the door fully closed state in the door opening direction by hand. The clearance during the movement must be 5 to 7 mm.
- To check the hooking allowance in the engagement portion, measure the dimension C in the door closed state and the dimension D in the door opened state respectively. The value of D minus C must be 11 mm or more.

Fig. 5-13

(f) Type 6 (EE-E2 type)

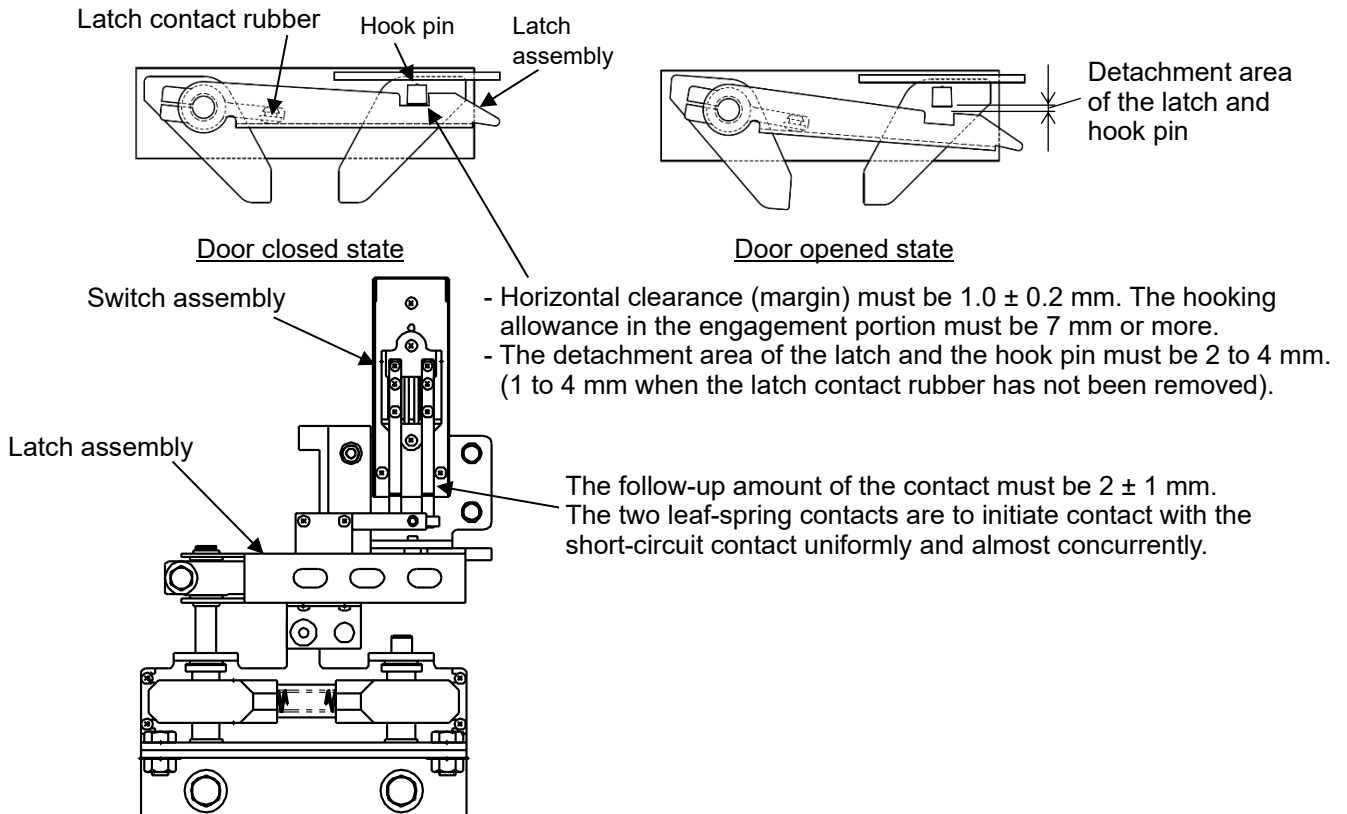


Fig. 5-14