

Elevator Modernization Products from Hitachi that Meet Diverse Customer Needs

There are approximately 900,000 elevators and escalators in use in Japan as of 2020. Among Hitachi products alone, this total includes around 35,000 elevators or escalators that have been in use for more than 25 years and are coming due for replacement, a number that continues to increase each year. Because this aging equipment varies so widely in terms of its installation conditions, product model, use, and what customers want from modernization, Hitachi has developed an extensive range of modernization packages that can meet the requirements of each and every site. Hitachi intends to continue offering flexible options for elevator and escalator modernization that meet diverse customer needs in order to provide a safe and comfortable environment for all elevator and escalator users by improving quality assurance and safety for existing elevators or escalators.

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1. Introduction

As buildings have become taller, with a greater diversity of user needs and the introduction of laws mandating barrier-free accessibility, elevators and escalators have become an essential part of the infrastructure for getting up and down these buildings. Of the approximately 900,000 elevators and escalators currently in use in Japan⁽¹⁾, many are now coming due for replacement after more than 25 years of use, having been installed during the building boom that followed the country's late-80s economic bubble.

This replacement involves more than just the modernization of aging machinery, with it also being important to add value to buildings through the provision of greater safety, security, and comfort to users. This includes compliance with the latest safety standards, which are stricter now than

when the equipment was installed, improving resilience to natural disasters such as the earthquakes and typhoons that have become more prevalent in recent years, upgrading energy efficiency, and enhancing visual appearance.

This article describes the range of packages available from Hitachi for meeting the diverse customer needs for modernizing aging elevators and escalators.

2. Control Modernization Package for Traction Elevators

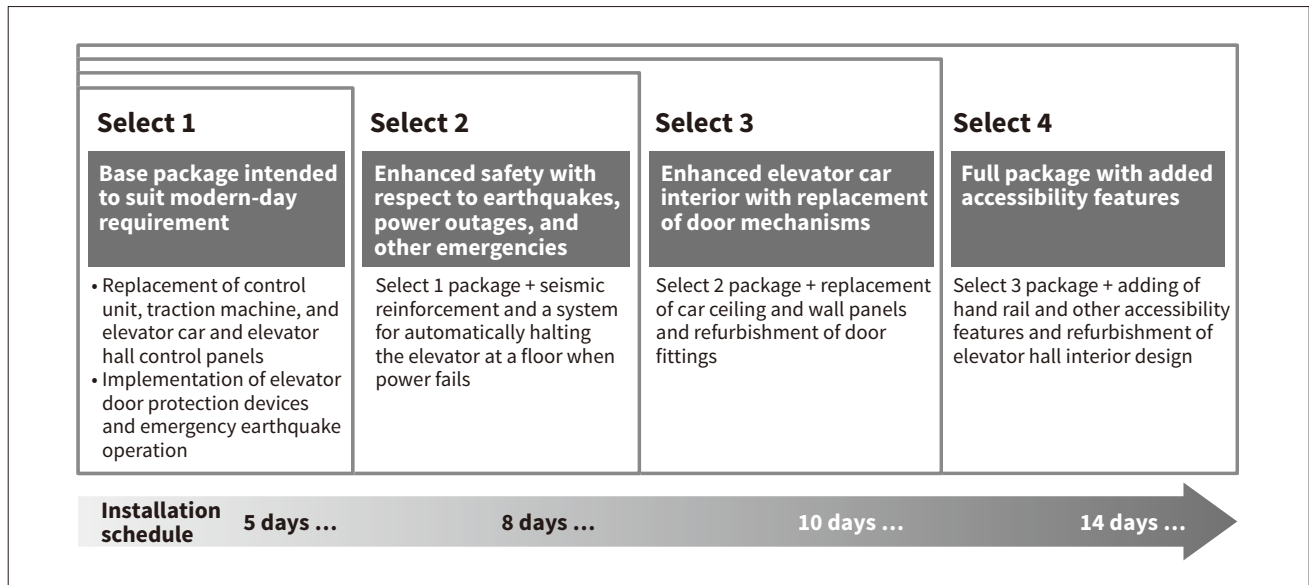
2.1

Product Concept

Hitachi announced a control modernization package for standard traction elevators in December 2012⁽²⁾ to meet customer needs and to use elevator modernization as a way to increase the overall asset value of a building. The package

Figure 1 — Concept Behind Modernization Package for Traction Elevators

Along with offering a range of modernization options to choose from based on budget, timeframe, and other requirements, Hitachi also supplies the latest elevators that are safe, secure, and comfortable, including by addressing the problem of parts availability and adding safety functions in response to public demand.



is intended to satisfy public demand for safety and security and has the following features (see **Figure 1**).

(1) Compliance with latest safety standards

In addition to compliance with the current building code, standard features include fitting traction machines with double redundant braking as well as ministerial approved elevator door protection devices and emergency earthquake operation that is able to sense preliminary tremors. Another standard feature, provided to ensure that everyone can feel confident about using the elevator, is a multi-beam door sensor with a signal that blinks to indicate when the door is about to close.

(2) Enhanced economics, visibility, and usability

The economics of elevator operation is improved by the use of the latest inverter control and light-emitting diode (LED) ceiling lights for energy efficiency. Similarly, visibility, and usability are enhanced by equipping elevator cars with 8.4-inch color liquid crystal displays (LCDs) for floor indication and by the use of high-contrast buttons with embossed text on the control panel.

(3) Improved resilience to natural disaster

A range of protective features are available to minimize the damage caused by disasters, including seismic reinforcement to improve earthquake resilience, a system for automatically halting the elevator at a floor in the event of a power failure, and measures for preventing water damage from typhoons. Moreover, the availability of cutting-edge maintenance services means that a rapid response can be provided if any damage does occur.

(4) “Select” plans available to suit different customer needs

A range of mirrors, handrails, and horizontal control panels designed for ease-of-use by wheelchair users, the

elderly, and children are available for sites such as housing complexes or welfare and other public facilities. The package is structured in a way that allows customers to choose what they need based on their requirements and budget, with options available for enhanced safety, aesthetic redesign, and improved accessibility.

2. 2

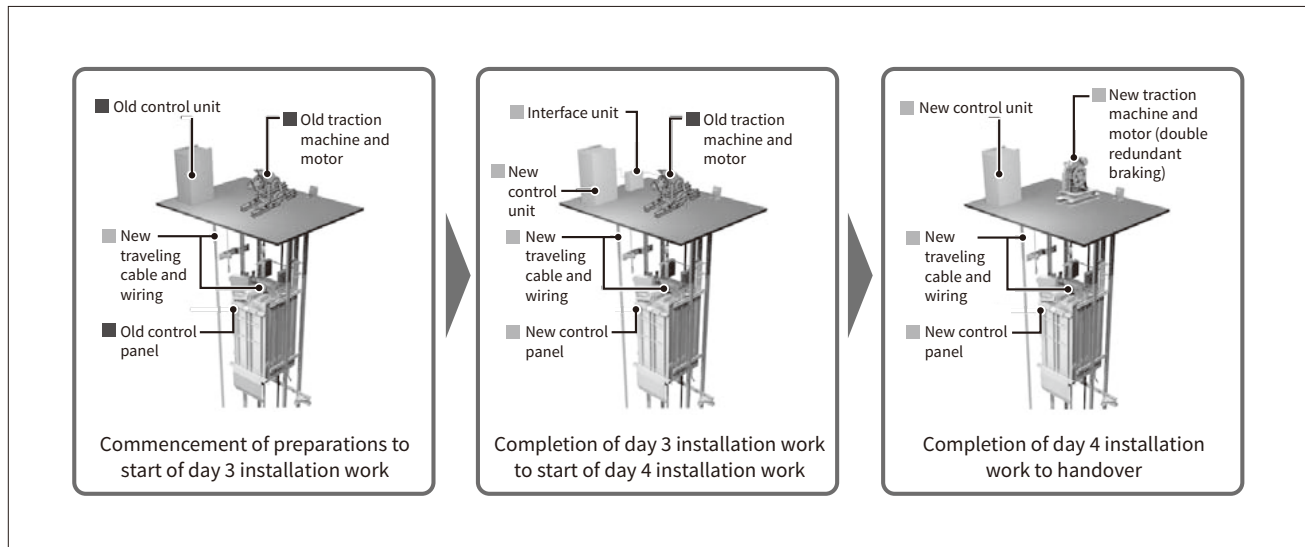
Modernization Work Able to Proceed without Service Interruption

In the past, a shutdown of at least five days has been required to complete a traction elevator modernization. If a building has only one elevator, having it out of service for such a long time is very inconvenient for users. Hitachi has received considerable feedback asking whether these shutdowns can be shortened or the work done without halting elevator operation at all.

In response, Hitachi has developed new working practices that provide flexibility as to when work is carried out, thereby eliminating any continuous shutdowns lasting more than two days (see **Figure 2**). The development of a new interface unit that maintains compatibility between a newly installed control panel and existing traction machine makes it possible to keep the elevator working in this configuration, and this in turn makes it possible to replace the control panel and traction machine at different times. By rescheduling and subdividing the entire work schedule on this basis, work plans can be put together flexibly, taking account of the patterns of elevator use at the site (daytime on weekdays, holidays, and so on). This makes it possible for the work to proceed in such a way that unobstructed use of the elevator is maintained even in the midst of the work program⁽⁵⁾.

Figure 2 — Overview of Modernization Package for Traction Elevators with Interface Unit

The diagrams show how an interface unit is used in the control unit and traction machine replacement work.



Since its launch in 2012, the traction elevator modernization package has enjoyed positive market feedback for its concept and its ability to provide scheduling flexibility. Cumulative total sales as of the end of March 2020 had reached approximately 25,000 elevators.

3. Application to Wide Variety of Aging Elevators

While most of the elevators dealt with by the modernization package when it was first launched were of the standard traction type, demand for made-to-order elevators increased following Japan's late-80s economic bubble due to taller buildings and an increasing requirement for high capacity. Since then, however, the scope has expanded to include a wider range of different elevators, with standard hydraulic elevators that do not require a roof-top machine room and therefore are able to comply with height restrictions on low-rise buildings becoming more common. This has

led Hitachi to expand the range of modernization options it offers to suit different building uses and the changing nature of pre-existing elevators.

3.1

Control Modernization for Made-to-order Elevators

Made-to-order elevators are supplied for a wide variety of buildings and uses, including office buildings, factories, and warehouses. Past practice for modernizing these elevators has been to assess each project individually and plan the work accordingly. Unfortunately, this was sometimes complicated by the inability to install a new traction machine in the machine room due to weight or space constraints.

In response to this situation, Hitachi made use of features developed for use in its modernization package for standard elevators, developing a new small and lightweight gearless traction machine that was compatible with legacy machines (see **Figure 3**) and formalizing the range of

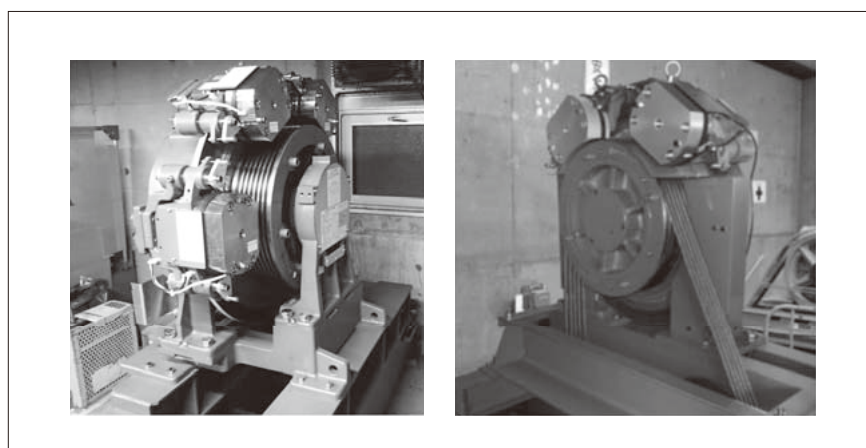


Figure 3 — Gearless Traction Machine Used Exclusively for Modernization Projects

The photograph on the left shows the MS135R-CJ traction machine used for made-to-order traction elevators and on the right shows the MF100R2-CJ traction machine used for standard traction elevators.

available options for control modernization to include a new package for made-to-order elevators⁽³⁾.

This new package was intended for modernizing legacy elevators with various different site conditions and uses. The base package involves installing a new inverter-based control unit and a traction machine with double redundant braking, with a range of additional options that include enhanced safety, emergency operation modes, earthquake resilience, and aesthetic redesign. Customers are able to choose from these based on their budget and installation schedule preferences.

3.2

Modernization Package for Standard Hydraulic Elevators

Hydraulic elevators were installed in large numbers from the late 1980s through to the 1990s because of the flexibility they provide for building layout, not requiring a machine room on top of the building and so less likely to be affected by issues such as height restrictions.

Installation cost and the length of time the elevators are out of service have been disincentives for the modernization of hydraulic elevators in the past, with the only available options being either full or semi-full replacement with a new machine-room-less traction elevator. Accordingly, Hitachi has developed a new range of modernization options for hydraulic elevators that feature short installation time and from which customers can choose on the basis of their budget. The main features are as follows:

(1) Semi-full replacement with reuse of entrance fittings

Hitachi has developed a new option with a short installation period that utilizes existing landing-side door fittings and door drive mechanisms on all floors. This was achieved by creating an interface between the door drive mechanism on the new elevator car and the reused landing-side door fittings in order to make as much use as possible of existing equipment, as is done for the control modernization of traction elevators (see **Figure 4**). By saving on the cost of materials such as all of the landing-side door panels and by eliminating the associated removal and installation work, this cuts the cost by 15% compared to the previous semi-full replacement package and shortens the installation time by 20%.

(2) Control modernization with lower cost and shorter installation time

For those customers unable to proceed with modernization due to restrictions on taking elevators out of service during installation or where the existing installation does not have enough space for the equipment required by a machine-room-less elevator, Hitachi offers a control modernization package that retains the hydraulic elevator but replaces key equipment, including a new inverter-based control unit and motor. This significantly reduces the cost and installation time by retaining existing fittings such as elevator entrances and cars wherever possible.

(3) Select package for hydraulic elevators

The modernization package for standard hydraulic elevators combines options (1) and (2) above with the existing full replacement and semi-full replacement packages and is structured in a way that it allows customers to choose what

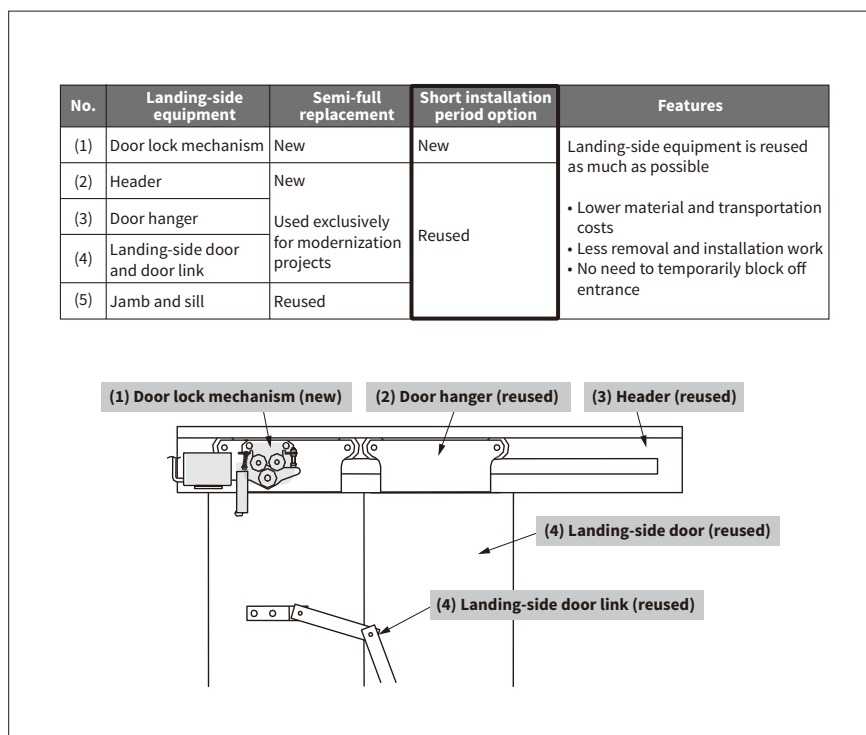


Figure 4 — Overview of Semi-full Replacement and Short Installation Period Option for Standard Hydraulic Elevators

The table lists the existing equipment able to be reused to shorten the installation period and the diagram shows the landing-side door mechanism as seen from inside the shaft.

Table 1 — Overview of Modernization Package for Standard Hydraulic Elevators

The package is structured in a way that it allows customers to choose what they want based on factors such as the type of building, budget, and acceptable shutdown length.

Select package	Description	Installation period
Select 4 Full replacement	Removal of all parts and replacement with latest machine-room-less traction elevator	31 days minimum
Select 3 Semi-full replacement	Reuse of built-in features (jamb, sill, etc.). Removal of other parts and replacement with latest machine-room-less traction elevator	24 days minimum
Select 2 (new option) Semi-full replacement (Short installation period)	Reuse of built-in features and door mechanisms (all floors). Removal of other parts and replacement with latest machine-room-less traction elevator	19 days minimum
Select 1 (new option) Control modernization	Replaces control unit and other key items of equipment while retaining hydraulic elevator	6 days minimum

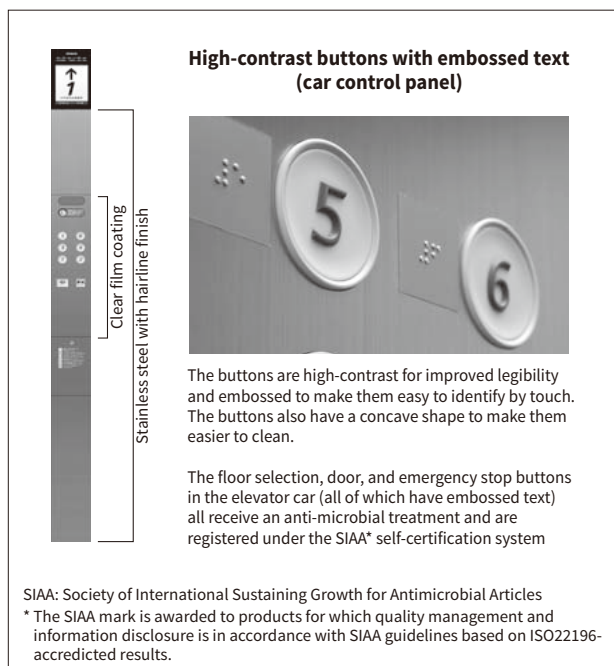
they want based on factors such as the type of building, budget, and acceptable shutdown length⁽⁴⁾ (see **Table 1**). These products expand the range of ways in which modernization can be done and it is anticipated that, along with meeting diverse customer needs, they will also encourage the modernization of hydraulic elevators, an area where progress to date has been slow.

4. Improvements to Visual Design

There are rising calls from building owners and users of existing elevators for finger mark prevention and anti-microbial measures. While improving visual appearance has long been part of its modernization package for traction elevators, Hitachi is now taking extra steps to deal with these issues and improve design.

Figure 5 — Example Elevator Car Control Panel

Areas around the buttons that come into contact with users’ fingers are coated with a clear film that is resistant to finger marks. The high-contrast buttons have embossed text and anti-microbial properties.



Stainless steel faceplates have been a standard feature of control panels (the part of an elevator most frequently touched by users), and among the common complaints from customers is that the appearance of elevators that have only just been refurbished is soon tarnished by finger marks left by the oils on users’ hands and fingers. In response, Hitachi has taken steps to address visual design as well as improve customer satisfaction through measures that include switching to materials that are resistant to finger marking. The main actions are as follows:

(1) Use of anti-microbial buttons

The control panels in the elevator car and elevator hall use high-contrast buttons with embossed text for better legibility and ease-of-use. They are also given an anti-microbial treatment to ease the concerns of users (see **Figure 5**).

(2) Improved cleanliness of elevator car control panel

The areas around the control panel buttons in the elevator car are coated with a clear film that is resistant to finger marks and has excellent environmental and contamination proofing properties, this being the region most frequently touched by user’s hands. Additional clear coating of the stainless steel surfaces (excluding around the buttons) is also available as one of the Select options, combining anti-microbial properties with resistance to finger marking.

(3) Improved appearance of elevator hall control panel

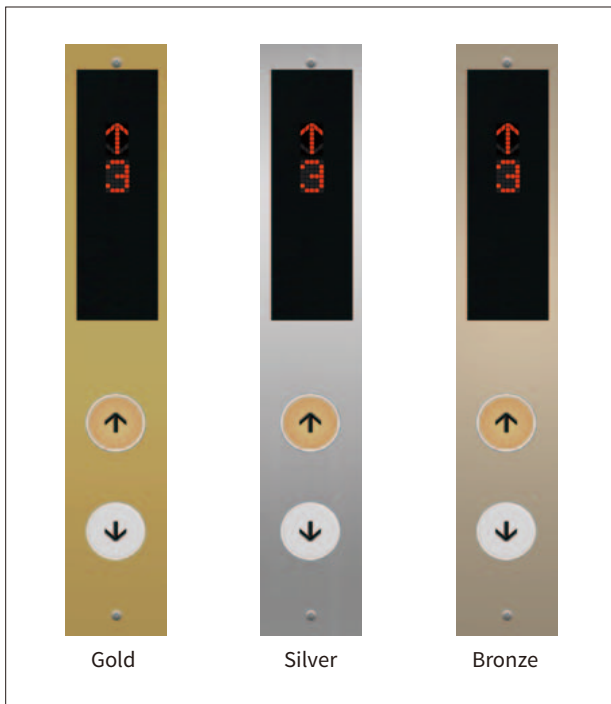
The stainless steel with hairline finish that was previously used for the face plates has been replaced with an aluminum face plate that is resistant to finger marking. The visual appearance is also enhanced by a choice of gold, silver, and bronze color variations to suit the building’s color scheme and interior design (see **Figure 6**).

5. Conclusions

This article has described Hitachi’s core range of products for elevator modernization. As of March 2020, approximately 35,000 of the Hitachi elevators or escalators operating in Japan were coming due for replacement, with a wide variation in product models, uses, and what customers want from modernization. The range of models to be dealt with

Figure 6 — Example Elevator Hall Control Panel

Visual appearance is enhanced by an aluminum face plate that is resistant to finger marking.



will be further complicated in the future as machine-room-less traction elevators also come due for replacement, with the requirements for elevators and escalators expected to become even more diverse due to changes in societal conditions such as those associated with the coronavirus pandemic.

Hitachi intends to continue providing safe and comfortable environments for all building users through the modernization of elevators and escalators in ways that meet diverse customer needs.

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