FUJITEC

FLEX-NX Series

FLEX-NX252
FLEX-NX102
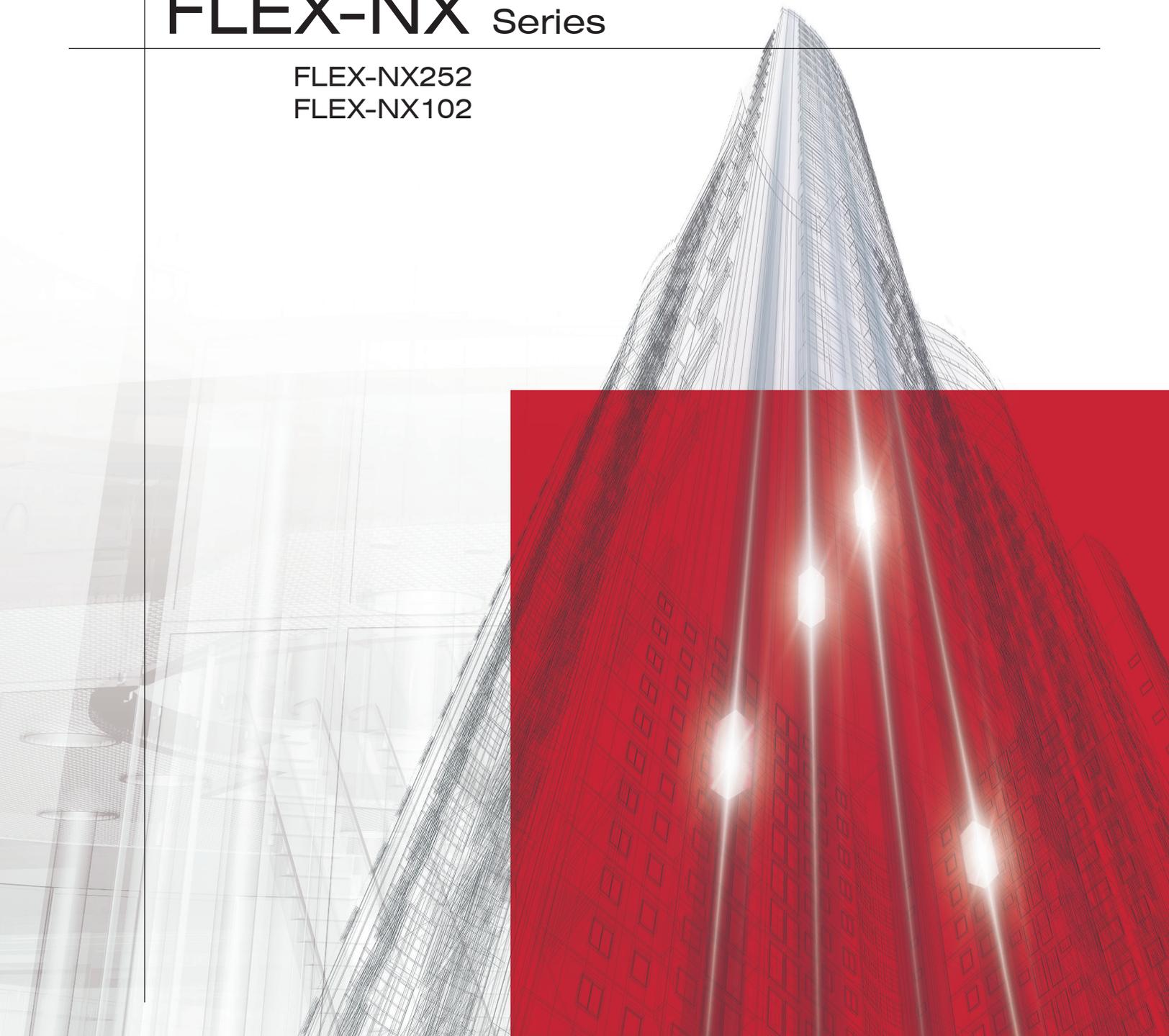
Elevator Group Supervisory Control System
FLEX-NX Series

Elevator Group Supervisory Control System Improved! Passenger wait times shortened.

With an increase in the number of high-rise buildings, large-scale facilities, tower apartments and condominiums, elevators are the core transportation mode in these structures. Consequently, a rapid and accurate traffic control system is essential for elevators to respond to complicated and heavy traffic demand. Fujitec has further advanced its Elevator Group Supervisory Control System by concentrating on the development of leading-edge technologies.

As a result, the new generation system utilizes optimal group supervisory control functions, such as the Virtual Passenger Optimization Method, which controls elevator traffic by forecasting the distribution of all future passengers and the Destination Reservation Guidance System (an optional specification with additional charges), which enhances the transport efficiency by registering the destination floors in advance.

FLEX-NX Series Applications

Recommended Applications

Number of Elevators	Number of Stops	
	5 to 10	11 to 16
2 units	FLEX-NX102	
3 units	FLEX-NX102	
4 units	FLEX-NX252	
5 units	FLEX-NX252	
6 units	FLEX-NX252	

Applicable Scope

|	FLEX-NX252	FLEX-NX102	
CARS	2 to 8	2 to 3	4
STOPS	up to 63	up to 64	up to 16

Virtual Passenger Optimization Method

The system predicts traffic demand in the entire building, including passengers expected to arrive later. The average wait time can be reduced by up to 10%*.

In conventional group supervisory control systems, elevator calls are assigned by using a predicted response time from the hall call registration to the arrival of an elevator as the evaluation index. The predicted response time, however, only equals the waiting time of the person who first registered a hall call. Ideally, it is necessary to evaluate the waiting times of all passengers, including future users that arrive at the stop. Fujitec has newly employed the Virtual Passenger Optimization Method, which virtually calculates the long-range waiting time of each passenger, based on extrapolated passenger arrival rates by travel direction at each floor, from past learned data in order to execute the group supervisory control.

The system probabilistically extrapolates the number of passengers who arrive later at a stop where a hall call had already been registered or passengers who arrive at a stop where no hall call had been registered and then the system comprehensively calculates the passenger waiting time. With such a design, it is possible to accurately reflect and predict the traffic situation of the whole building for the elevator traffic control, thereby enabling a reduction in the average daily waiting time for all passengers by up to 10%.

Compared to our conventional products. The value is based on validated results from a simulation that reproduced daily passenger traffic in a high-rise condominium. For office buildings, the average waiting time will be reduced by up to 5%. The reduction in the average passenger waiting time may differ depending on the elevator system configuration or on traffic conditions.

Average Daily Waiting Time

Legend:
- ● Conventional GSC System
- ■ Virtual Passenger Optimization

Y-axis: AVG WAITING TIME (sec.) — 0, 5, 10, 15, 20, 25, 30, 35
X-axis: TIME — 6:00, 9:00, 12:00, 15:00, 18:00, 21:00

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Incorporating a Neuro Group Supervisory Control

FLEX-NX 252
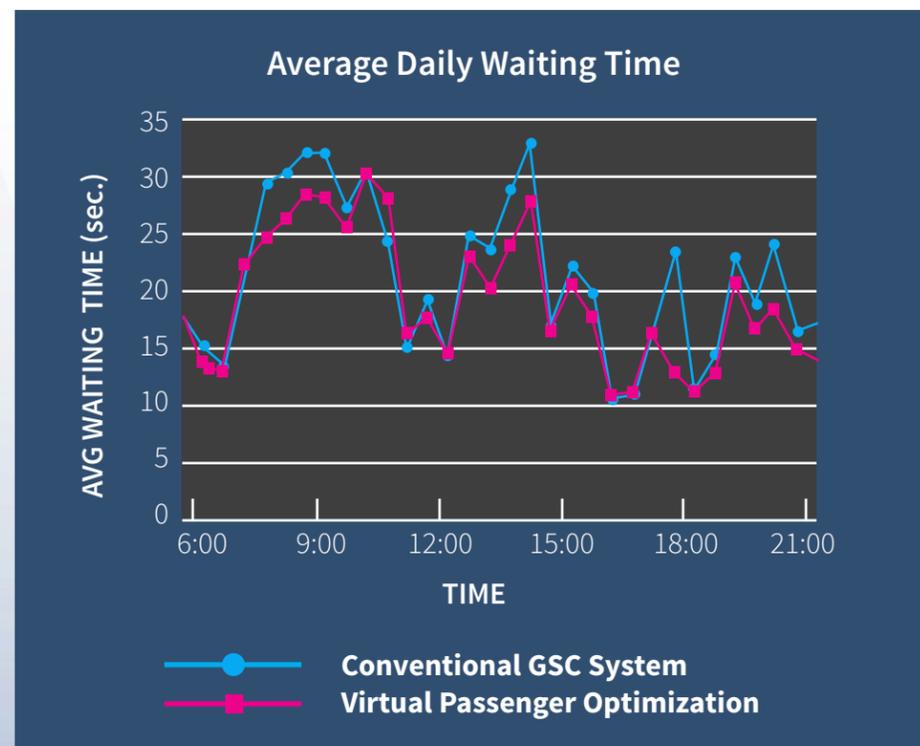
The FLEX-NX252 is an Elevator Group Supervisory Control (GSC) System that is well-suited for large-scale buildings. The FLEX-NX252 GSC System consists of the Intelligence Computer, which incorporates the Neuro GSC, the Fuzzy GSC and the Virtual Passenger Optimization Module, along with two supervisory computers providing high-speed processing and high reliability.

FLEX-NX 252

GSC SYSTEM

INTELLIGENT COMPUTER

- NEURO GSC
- FUZZY GSC
- VIRTUAL PASSENGER

SUPERVISORY COMPUTER 1

SUPERVISORY COMPUTER 2

ELEVATOR CONTROLLER

ELEVATOR CONTROLLER

ELEVATOR CONTROLLER
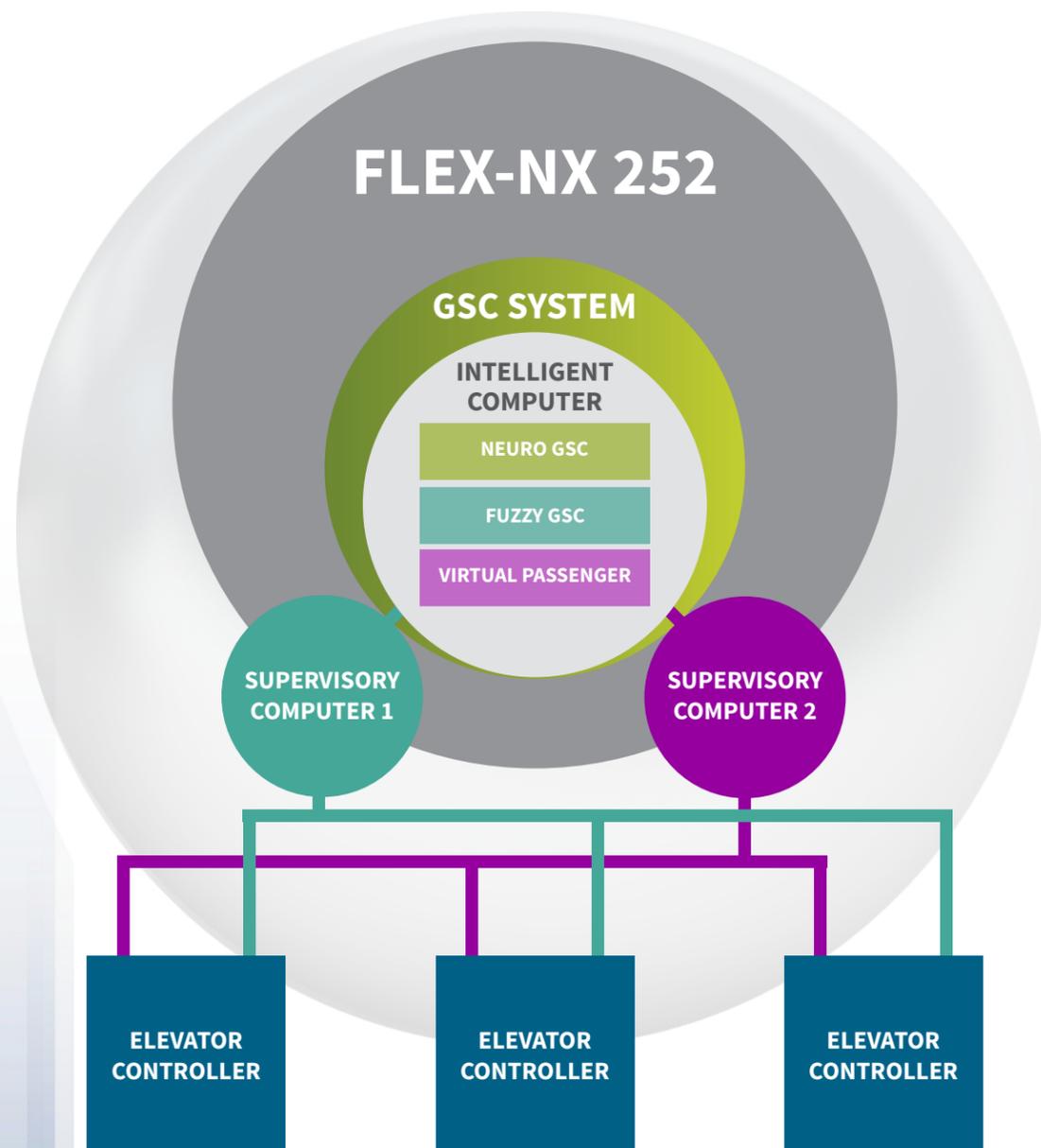
Advanced Neuro Group Supervisory Control

This system is an advanced Group Supervisory Control System which automatically learns control rules suited to traffic conditions in various building through a neural network. The neural network is modeled after human brain functions and is capable of learning the optimal elevator car assignments by itself. Adoption of the Neuro GSC System will substantially improve the accuracy of the advance notice of approaching elevators.

Further Reduction in Passenger Waiting Time

With the adoption of the Virtual Passenger Optimization Method, which probabilistically extrapolates the passenger waiting time including passengers expected to arrive at a stop in the future, the prediction accuracy in the group supervisory control will be enhanced, thereby further reducing the waiting time.

Flexibly Responding to In-Building Changes

There is no need to modify the program even if the traffic demand fluctuates as a result of a change of tenants or the relocation of tenants to other floors in the building. The neural network incorporates a self-learning ability that automatically executes updates while keeping elevators in operation, even if an unexpected circumstance arises.

Reliable Multiple Backup Systems

Normally, the Neuro Supervisory Control is implemented while the Intelligence Computer and the Supervisory Computer I are working together. In addition, as a backup system, the Neuro Supervisory Control can continue operations by working with the Supervisory Computer II, should the Supervisory Computer I fail.

Neuro Group Supervisory Control

The Neuro Group Supervisory Control System consists of the Fuzzy GSC and the Neuro GSC. The Fuzzy GSC determines which elevator car is assigned to a call by utilizing the knowledge of the group supervisory control expert and the Neuro GSC checks the car assigned by the Fuzzy GSC to determine if there is another more suitable car.

When a hall call is generated, the Fuzzy GSC recommends a suitable elevator car, based on the statistical-analysis learning function, knowledge database, and the waiting-time evaluation index that is extrapolated by the Virtual Passenger Optimization Module, and then the Fuzzy GSC sends the data to the Neuro GSC.

In the Neuro GSC, checks are made to the call-assigned cars by using the neural network that acquires knowledge in the same way as the human brain. In this way, the most suitable elevator car is assigned while the two GSCs are complementing and cooperating with each other.

Well-suited for small-size buildings with a relatively small amount of traffic

FLEX-NX 102

FLEX-NX 102

GSC SYSTEM

SUPERVISORY COMPUTER

ELEVATOR CONTROLLER

ELEVATOR CONTROLLER

ELEVATOR CONTROLLER
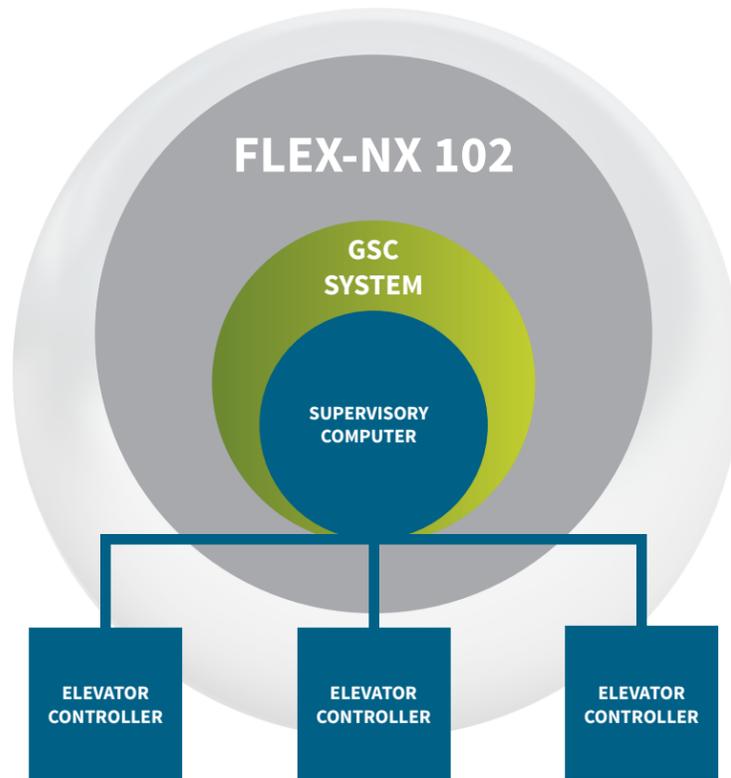
* The FLEX-NX102 provides efficient elevator services under pre-scheduled management.

Multiple, Reliable Backup Systems

Normally, the fuzzy supervisory control is implemented while the Intelligence Computer and the Supervisory Computer I are working together. In addition, as a backup system, the fuzzy supervisory control can continue operations by working with Supervisory Computer II, should the Supervisory Computer I fail. The system includes a system backup function with service floors assigned to each elevator to continue operation.

Selecting the Elevator Car with Minimal Waiting Time

When a hall call occurs, the system selects an elevator car that can respond to the call in the minimum amount of time based on the current positions and the travel directions of the cars.

Even if the operational status of the elevator cars changes thereafter, the system will flexibly deal with the changes and reassign the car with minimal waiting time, thereby offering efficient service.

FLEX-NX Series Specifications

SPECIFICATION	FLEX-NX252	FLEX-NX102
Virtual Passenger Optimization Method	●	—
Destination Reservation Guidance System	■	—
Neuro Assignment	●	—
Self-Correction Initital Learning	●	—
Online Adaptive Learning	●	—
Statistical Analysis Learning	●	—
Self-Diagnostic Capability	●	—
Fuzzy Group Supervisory Control	●	—
Arrival Interval Control	●	—
Announcement of Serving Car	●	—
Up-Peak Operation	●	■
Lunch Time Operation	●	—
Down-Peak Operation	●	■
Off-Peak Operation	●	■
Zoning for Express Operation	■	—
Transfer of Dispatch Floor	■	—
Separation of Out-of-Order Elevator	●	●
Independent Operation	●	●
Parking Operation	■	■
VIP Operation	■	■
Operation with Non-Uniform Car Stops	●	●
Call Assignment Backup	●	—
Machine Room PC Terminal	●	—
Network Remote Terminal	■	■

Features of FLEX-NX Series

Standard Specifications

Virtual Passenger Optimization Method[1]

This function probabilistically calculates passenger waiting time, including those future passengers expected to arrive, and enhances the prediction accuracy of the waiting time in the group supervisory control, thereby reducing the passenger waiting time.

Neuro Assignment[1]

This function updates the program with the self-learning ability of the Neuro GSC and assigns a hall call to the most suitable elevator. This greatly enhances the accuracy of an advance notice of car arrival.

Self-Correction Type Initial Learning[1]

While letting the system learn by adding updates to the Fuzzy GSC's recommendations, the Neuro GSC automatically develops a group supervisory control algorithm which is more efficient than that of the Fuzzy GSC.

Online Adaptive Learning[1]

This function adjusts Neural Nets automatically so that the most suitable call assignments will be given according to traffic situations specific to each building.

Statistical Analysis Learning[1]

The passenger arrival frequency and corresponding car calls for each of the daily specified time periods are analyzed and stored as long-term learning statistical data, later the stored data is utilized to predict traffic demands.

Self-Diagnostic Capability[1]

The expert system monitors the neuro assignments. In case of a failure, the Neural Nets are automatically rebuilt.

Fuzzy Group Supervisory Control[1]

Efficient group supervisory control utilizes Artificial Intelligence (AI) and incorporates the know-how of the group supervisory control experts.

Arrival Interval Control[1]

Door open times are finely adjusted. Elevators are kept running at equal intervals to improve the accuracy of advance notice of a car's arrival, especially during rush hours, thus reducing waiting times.

Immediate Announcement of a Serving Car[1]

At the press of a hall button, a hall lantern and a chime will immediately notify people waiting at the landing which car will serve the call.

[1] Not applicable to FLEX-NX102.

Up-Peak Operation[1,2]

To cope with a concentration of passengers at the main or lobby floor during up-peak periods, the FLEX-NX252 automatically adjusts the arrival intervals for elevators to provide efficient service, thus improving transport efficiencies.

Lunch Time Operation[1]

This function provides efficient elevator services during the first half of a lunch time period by distributing the call assignments in order to prevent load bypassing. During the second half of the period, preferential services are provided to the floors where calls are concentrated.

Down-Peak Operation[2]

This function provides efficient elevator services to improve transport efficiency during down-peak periods when many passengers are traveling to the main floor.

Off-Peak Operation[2]

During off-peak periods, the FLEX-NX252 allows an elevator that has served all its assigned calls to return to the main floor, and it automatically distributes other elevators throughout the building to efficiently respond to future hall calls. The number of operating elevators is restricted to save energy. The FLEX-NX100 allows elevators that have served all the assigned calls to be distributed to predetermined floors to effectively respond to future calls.

Separation of an Out-of-Order Elevator

An elevator that is not working properly will automatically be separated from the group, while the remaining elevators continue efficient operations under group supervisory control.

Independent Operation

A specified car can operate separately from the group to perform an independent operation, in which case it responds only to car calls.

Operation with Non-Uniform Car Stops

When service zones of elevators are different, that is, the number of car stops is not uniform for each car and specified cars are required to serve the roof and basement floors, the group supervisory control will remain in effect.
Elevator services may deteriorate in this operation mode.

Call Assignment Backup

The basic call assignment function is maintained even when the main GSC functions are out of order or under inspection.

Machine Room PC Terminal[1]

Functions such as monitoring and traffic data collection are available from a PC terminal located in the machine room.

[1] Not applicable to FLEX-NX102.
[2] Optional specification with additional charges for FLEX-NX102.

Features of FLEX-NX Series

Destination Reservation Guidance System[1]

Inputting the destination floor in advance with the Destination Floor Registration Panel optimizes elevator car assignments for destination floors, thereby improving the transport efficiency during busy periods such as up-peak periods.

Zoning for Express Operation[1]

During up-peak periods, for instance, when traffic demands greatly increase, service floors are divided into two groups – higher and lower sections – and two groups of cars are designated to serve each of the zones, thereby enhancing the transport capability.

Transfer of Dispatch Floor[1]

The dispatch floor can be switched over, for instance, to a basement floor during up-peak traffic periods, and to the lobby floor during inter-floor traffic periods.

Parking Operation

Activating the parking switch, which is provided for each elevator in the security room or other location, automatically shuts down any desired elevator.

VIP Operation

One of the group-controlled elevators can be separated from group control for independent operation. This is usually operated with a special push button provided at a pre-selected floor or at the information desk in the lobby. When the VIP Operation is completed, the elevator will be automatically restored to group-controlled operation.

Network Remote Terminal

Linking the machine room PC terminal to the LAN enables functions such as monitoring, traffic data collection and data analysis in the building, along with further advance command functions. Also, multiple groups of elevators can be monitored for control.

[1] *Not applicable to FLEX-NX102.*

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