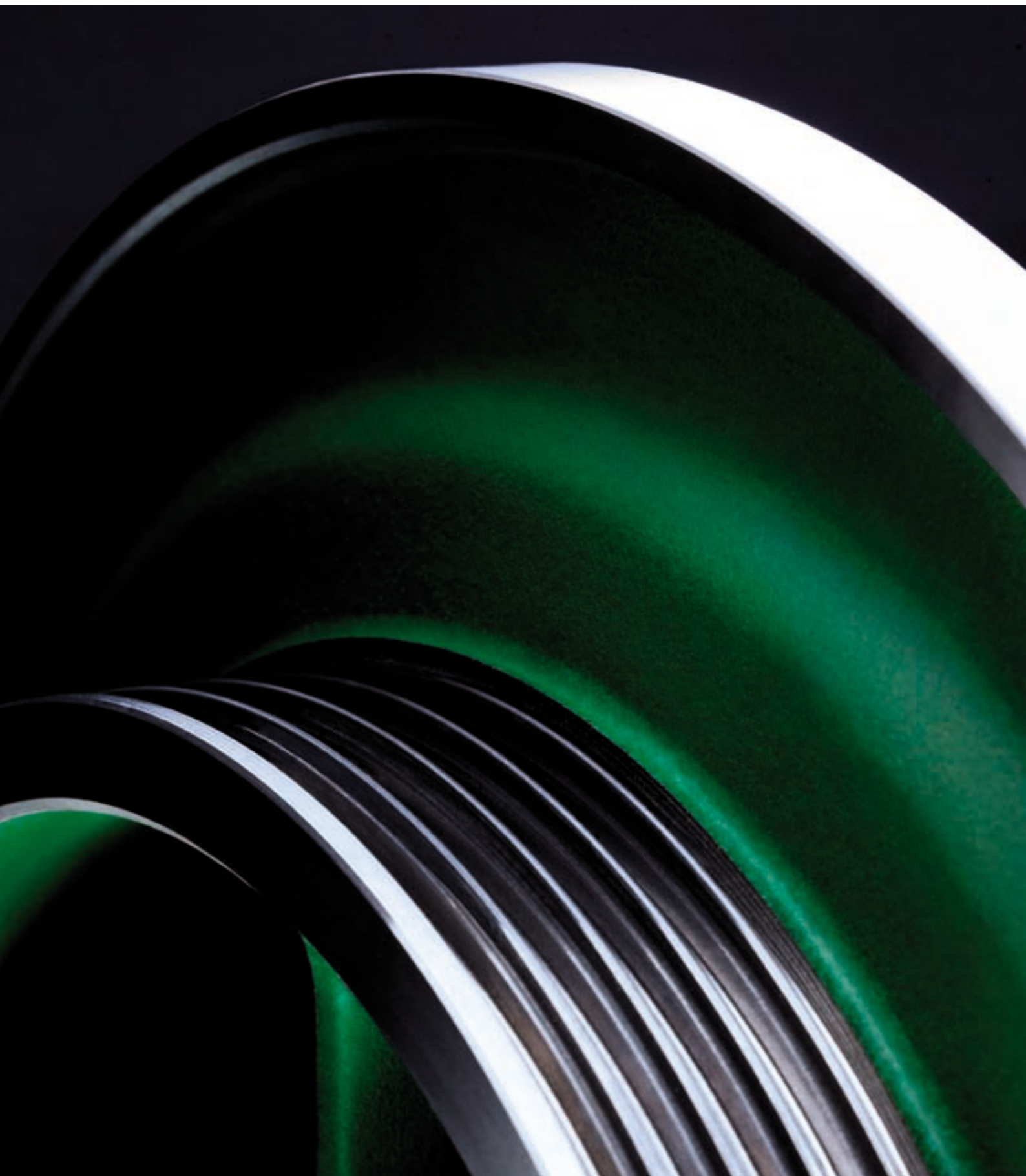


KONE TMS9900 GA Group Control System

FACT SHEET



KONE TMS9900 GA Group Control – Exclusive Brain Power

At the core of the KONE Control System lies the KONE TMS9900 GA technology that has driven KONE's success with its Alta high-rise buildings solutions.

High-speed call allocation

The high-speed TMS9900 GA call allocation process consists of four stages:

- Passenger flows are recorded, identified and measured for short-term and daily traffic statistics.
- Artificial intelligence is used to learn the traffic and generate forecasts for each weekday.
- Based on this knowledge a fuzzy logic module generates detailed models of the prevailing traffic patterns.
- The measured traffic data and the momentary prevailing traffic patterns, together with actual drive time and stop time data, are then processed by the Genetic Algorithm.

The result is optimised dispatching decisions and landing call allocations in all traffic situations, including the most complex and demanding mixed traffic. This includes incoming, outgoing and inter-floor traffic components.

Enhanced group control

TMS9900 GA ensures minimum passenger waiting times as the Genetic Algorithm selects the best dispatching solution for all traffic situations. Artificial intelligence and fuzzy logic further enhance traffic forecasting and traffic recognition patterns.

Comparisons show a reduced waiting time of 50% over conventional relay systems, which means long waiting times cease to exist. Many pre-programmed options are available to suit unique building applications. A central computer carries out over 100 self-checks every second.

Ideal for tall buildings

The TMS9900 GA control system is designed to optimise dispatching for ALL traffic conditions, even in the tallest buildings.

Benefits in a nutshell

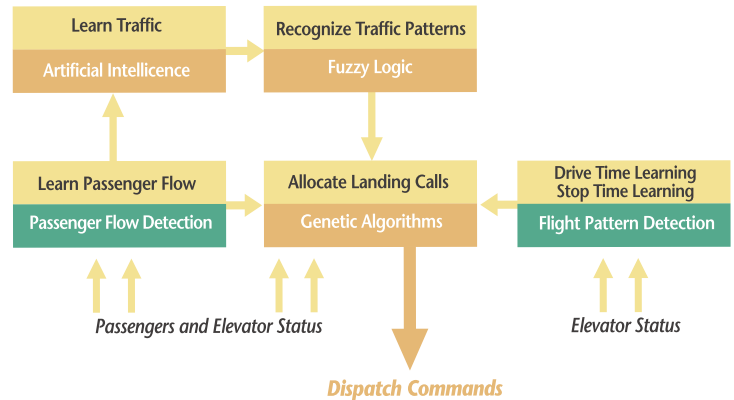
- Improved passenger service
- On average 15% shorter passenger waiting times
- Shorter maximum waiting times
- Enhanced travel comfort
- Less crowded cars
- Extended equipment service life
- Equalised use of elevators

Range of group operational features

These include:

- Extremely quick response to hall calls
- Ability to prioritise response to length of calls
- Optimised call handling across elevators within a group, ensuring that the elevator best suited to serve a call is dispatched

- Ability to securely lock out cars within the group for specific landings
- Ability to sense heavy demand during non-peak periods, and support needs with immediate service
- Ability to learn building/tenant use patterns to ensure waiting time for an elevator is minimised.



The best Genetic Algorithm

The control principle is adopted from natural selection. Evolution is simulated in the computer's memory using genetic operators like "selection", "crossover" and "mutation" applied to chromosomes. Only the best chromosomes and genes survive, which means that the best routes of each generation are selected. This evolutionary process over 100 generations produces the best genes for the prevailing conditions.

Exclusive traffic handling expertise

KONE group control is suitable for elevator group sizes up to 8 cars, with a maximum of 64 floors. The group control system provides building-specific flexibility, with on-site adjustable functions and sophisticated calculation techniques to automatically adapt elevator group operation according to the prevailing passenger traffic situations, minimising both passenger waiting and travel times. Special group operational features are also available such as prioritising individual floors; optimising call handling across elevators serving different floors within the same group; and security locking of car/landing calls.

Enhanced Spacing Principle

The group control system, through its unique Enhanced Spacing Principle (ESP), effectively eliminates elevators from "bunching", thereby greatly reducing passenger waiting times and ensuring smooth and uniform elevator service.

ESP combines call response data with car position, load and directional information to make its allocations. Calls that become in danger of waiting too long are identified immediately and cars are rerouted to address them. The result is a significant reduction in waiting and on-board times for passengers; balanced elevator service throughout the building and efficient response to sudden peak demands at a particular floor.