GeN2 Mod

Modernisation reinvented

Pulse™ system

Automatic and continuous control of the integrity of the steel cords

More reliability, greater safety

The Pulse™ system, patented by Otis, continually monitors the status of the steel cord belts to ensure optimum safety. This technological breakthrough represents a significant advance compared with traditional inspection methods.

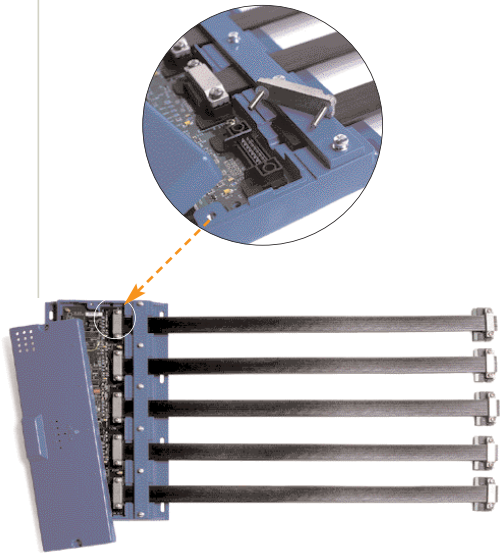
GeN2™ Mod Pulse™ system

ADVANTAGES

Continuous monitoring of the belts 24 hours a day, 7 days a week to ensure ongoing safety and reliability.

Elimination of lift downtime required for manual and visual inspection of the traction cables.

Establishing a precise preventive maintenance programme thanks to the maintenance alerts.



CHARACTERISTICS

The Pulse system electronically detects any anomaly in the polyurethane-coated flat steel belts. This preventive maintenance increases the reliability of the technicians' inspections by eliminating downtime for corrective maintenance.

The Pulse system uses cutting-edge technology to permanently monitor the status of the steel cords, 24 hours a day, 7 days a week. As such, it eliminates the service downtime previously required to allow visual inspection of the cables during maintenance.

Instead of manually detecting wear and malfunctions, as is the case with traditional inspection, the electronic Pulse system is installed on the fixed attachment point of the belts in the machine room.

The electrical resistance of each cord is proportional to its cross-sectional area, which provides a means of measuring the remaining service life.

The Pulse system constantly monitors these resistances to determine when the belts need to be replaced. The steel cords are individually monitored by sensors inserted into the belt to make electrical contact with each cord.

The continuous monitoring checks the internal and external integrity of the belts and triggers an automatic alert in the event of a problem.

This system also includes an alarm that is triggered when the belts reach their service life limit.

The Pulse system offers various information signaling options:
- on lifts not equipped with a remote monitoring system (REM), diodes signal the need to replace the belts one year in advance,
- on lifts equipped with REM, this information is also relayed by the REM system which sends alerts to OTIS LINE.

These alert messages can thus be used to schedule maintenance work.

In the event of an untimely alarm, the car continues to the selected floor level, stops, and opens its doors.

The malfunction of the lift is then relayed automatically by the REM remote monitoring system.

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GeN2™ Mod

GeN2 Modernisation.
Pioneering technology that redefines an industry.

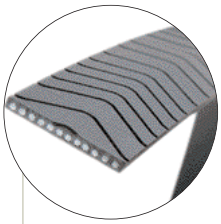
GeN2 Mod

Modernisation reinvented

Flat belt

Versatility and flexibility

The GeN2™ Mod concept combines innovative technologies and materials. The flat belt with its revolutionary traction technology – the core of the system - represents a decisive breakthrough. This innovation, linked to the new technologies of the gearless machine and compact sheaves, make the GeN2 Mod a highly efficient system.

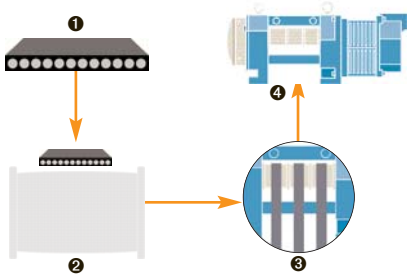


An innovating modernisation concept that can be adapted to a wide range of configurations.

ADVANTAGES

- **Reliability and long life**
- **Passenger safety**
- **Unsurpassed car comfort**
- **Power unit efficiency**
- **Environmental friendliness**
- **Speed of installation**

PRINCIPLE



1 The flat belt houses the steel cords in a polyurethane sheath.
2 The flexibility of the belt enables its bending radius to be reduced and in turn allows the machine to be more compact. The crown surfaced sheaves permit the self-centering of the belt.
3 The sheave diameter has been reduced and the bearings lubricated for life.
4 The gearless machine is 70% more compact than traditional machines.

KEY FIGURES

- Flat belts 20% lighter than traditional cables
- 2 to 3 times longer lifetime
- Tensile strength of 32 kN or 64 kN
- Sheaves less than 10cm diameter

CHARACTERISTICS

An innovative technology

The GeN2 Mod concept marks the arrival of a new technology in lift modernisation: the use of high-strength flat belts.
These belts consist of:
- steel cords that are stronger than traditional cables,
- a polyurethane sheath with exceptional properties that encloses the steel cords.

This technology was developed in 1997 and launched in 2000. Since then, over 50 000 new lifts worldwide have been equipped with the system.

Reliability and durability

Reinforcement with steel cords invests the belts with great dynamic stability and enables a constant tension to be maintained over their entire length.
The polyurethane sheath is robust and abrasion-resistant besides being flexible and resistant to greases, oils and solvents.
Compared with traditional steel cables, the belts have a larger contact surface that reduces the wear of the belts and sheaths. Their lifetime is also increased through the contact of the smooth surface of the belts with the crown-surfaced sheaves. The service life of flat belts is thus 2 to 3 times greater than that of conventional cables.
The belts have undergone exactly the same stressing and bending tests as traditional cables: 20 years of operation and 300 000 lift journeys per year were simulated with the belts under full-load cycles. All these reliability tests were performed under the supervision of the TÜV, an independent international certification organisation.

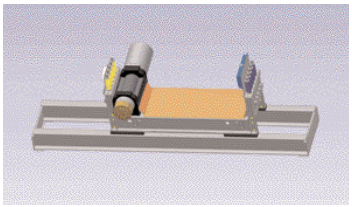
Passenger safety

The belts have undergone operating tests at temperatures ranging from –20°C to +60°C.
They have also been exposed to hazardous materials.
The fire tests demonstrated that the polyurethane resists temperatures up to 200°C. Beyond this, the steel cords continue to maintain adherence.
The lift operates until the car reaches a safe position at a floor level.
The tensile strength of the belts is identical to that of traditional cables: 32kN or 64kN depending on the flat belt model.
The steel cords are fabricated in electrogalvanized steel to prevent corrosion.

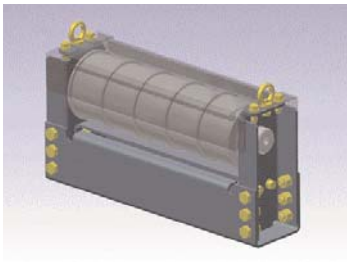
Flat belt

TECHNICAL DATA

Bedplate and pulleys



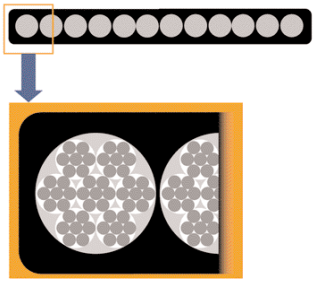
Flexible telescopic bedplate



Car and counterweight sheave

CHARACTERISTICS

Cross-sectional view of a type-1 flat belt with details of one of the steel cables enclosed in the sheath.



Each steel cable features: 7 bundles each comprising 7 steel strands giving a total of 588 strands.

Type of Flat Belt	Type 1	Type 2
Thickness	3 mm	3 mm
Width	30 mm	60 mm
Linear weight	0.205 kg/m	0.410 kg/m
Number of cables	12 cables	24 cables
Min. breaking load	32,000 N	64,000 N
Static friction coefficient	0,176	0,176
Dynamic friction coefficient	0,24	0,24
Friction coefficient with counterweight on buffer	0,48	0,48

CHARACTERISTICS

Unsurpassed ride quality

The polyurethane coating of the flat belts eliminates the metal friction of traditional cables so ensuring a quieter ride. The flat contact surface of the belts reduces vibrations. The pulleys have also been specially adapted so that they minimise vibrations transmitted to the lift car to ensure a more comfortable ride.

Power unit efficiency

The flat belts ensure uniform and precise transfer of the power from the motor to the car as they adhere better than conventional cables while weighing 20% less. Their flexibility allows for a very small bending radius so the sheaves can be as small as 10 cm in diameter. The machine can be up to 70% more compact than a machine with conventional gearing.
The power unit is no less effective since the GeN2 Mod technology uses a 2/1 roping system: the car and counterweight suspension uses belts that allow the installation of lower power, smaller and therefore more efficient machines.

Environmental friendliness

The compact pulleys (machine, bedplate, car and counterweight) are equipped with sealed-for-life bearings which, like the polyurethane flat belts, require neither oil nor grease. The GeN2 Mod technology constitutes an important advance in Otis' corporate responsibilty towards a green programme.

Speed of installation

To adapt the old traction equipment located in the machine room placed above the hoistway, a flexible and modular bedplate is installed on the slab. This makes it extremely easy to adjust the belt with car and counterweight traction points in exactly the same position. The installation method, using a laser guiding process, ensures absolute precision and ease of positioning of all the elements.
The coupling of the pulleys to the car and counterweight is achieved using a modular adaptor assembly that can be fitted onto virtually all existing configurations.
The cable ducts are reused, and enlarged if necessary. The design of the bedplate ensures perfectly uniform and complete distribution of the bearing points.

GeN2 Mod

Modernisation reinvented

Gearless compact machine

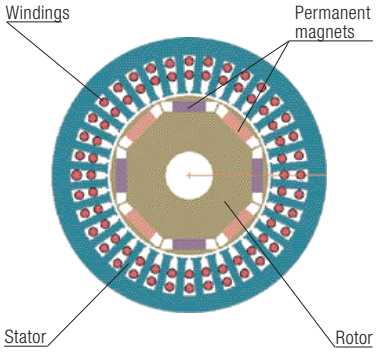
Comfort, smoothness, quietness, efficiency

Otis has adapted its gearless compact machine for your lift modernisation. Clean and quiet, it ensures optimum energy efficiency with smaller overall dimensions than geared machines of the same power rating.

ADVANTAGES

- **Smooth operation and comfort**
- **High efficiency and low electrical power consumption**
- **Increased service life**
- **Low operating noise**
- **Small dimensions and low weight**
- **Environmental friendliness**

PRINCIPLE



1 The current is injected into the windings creating a magnetic field.
2 The windings (of the rotor) and the permanent magnets (of the stator) interact.
3 The motor starts turning.

KEY FIGURES

- 50% more efficient than a conventional machine
- 10% more efficient than a conventional gearless machine with induction asynchronous motor
- 15% more efficient than other machines with permanent magnet motors of axial construction design
- 70% smaller than a conventional geared machine

CHARACTERISTICS

Smooth operation and comfort

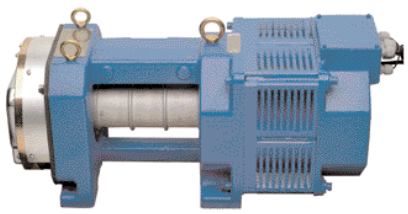
The low speed of the motor and the elimination of the gear mechanism ensure operation without jolts and vibrations.
Driven by a closed-loop variable-frequency drive, the machine ensures a comfortable ride and precise stopping accuracy.

High efficiency and low electrical power consumption

The absence of gearing ensures high efficiency (approaching 1) and a significant reduction in power consumption.
The GeN2™ Mod polyurethane-coated belt is 20% lighter than steel cables and the installation has a 2/1 roping system.
The combination of these two features means that the motor consumes less energy as it requires less power.
Being of low inertia, the motor requires a lower starting current than an asynchronous motor and produces less heat.
The machine and its air-gap are of radial design, meaning that the rotor-stator interaction energy is lower. The motor is 15% more efficient than a synchronous motor with an axial air-gap.
The ability to place the variable frequency speed control in standby mode also helps reduce electrical power consumption.

Increased service life

The robustness of the sheave, combined with the low speed of rotation, ensures a practically unlimited service life and increased safety.
The flat polyurethane-coated belts interact with the smooth and rounded surface of the sheave, eliminating wear and metal-on-metal friction.



TECHNICAL DATA

The gearless compact machine is up to 70% smaller than a conventional machine.

CHARACTERISTICS

Low operating noise

The operating principle of the synchronous motor is based on induction by permanent magnets placed on the rotor.
Consequently there is no moving coil and little slippage.
This brings a significant reduction in vibration levels, even at high speed.
The use of rubber isolating pads minimizes the transmission of vibrations to the structure of the building.

Reduced overall dimensions and low weight

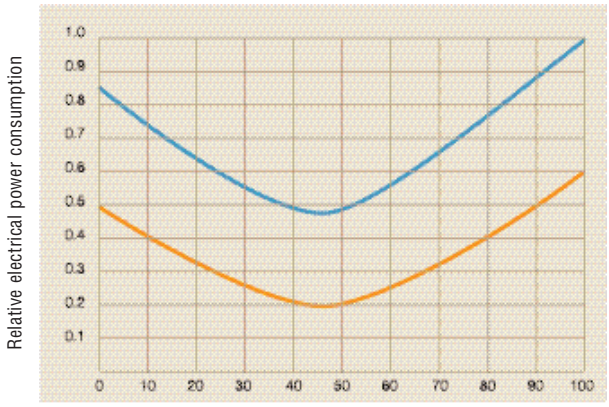
By virtue of its design, the density of the synchronous motor (dead weight and volume) are necessarily reduced which greatly facilitates handling and improves installation programmes.

Environmental friendliness

The bearings of the machine are sealed and lubricated for life.
The flat belts use no polluting lubricants.

ELECTRICITY CONSUMPTION

In addition to the electric current required to produce the rotation force, conventional asynchronous machines (induction motors) require an electrical current to create the magnetic field of the rotor. This current represents 6 to 10% of the total current of the machine and reduces the energy efficiency.



Percentage of car loading. Calculated on the basis of a lift with a load of 630 kg - speed 1.00 m/s with 150 start-ups per hour.

Geared lift system
GeN2 system

The permanent magnets of the synchronous machine provide the rotor with a constant magnetic field, increasing the efficiency of the motor by 10%.

GeN2 Mod

Modernisation reinvented

Variable Frequency Drive

OVF 20

Safety and comfort

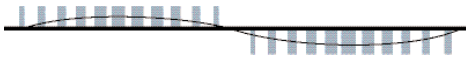
The MCS 222 modular microprocessor-based controller coupled with OVF 20 variable frequency drive guarantees optimum comfort and safety for lifts modernised with the GeN2™ Mod technology.

ADVANTAGES

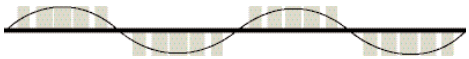
- **Performance and comfort**
- **Passenger safety**
- **Exceptional reliability**
- **Energy savings**
- **Fast installation**
- **Flexibility**

PRINCIPLE

Control of the ideal speed curve independent of lift car load.



Reduced voltage and reduced frequency due to pulse duration modulation.



Optimum voltage and optimum frequency due to pulse duration modulation.

1 The OVF 20 transforms the 3-phase 50 or 60 Hz AC current into direct current.
2 The current is then converted into controlled AC current that drives the GeN2 Mod motor.
3 The speed of the motor is changed by modulating both the voltage and the frequency to speed up or slow down the lift.

KEY FIGURES

Energy savings of between 25 % and 40 % compared with conventional systems

Power factor greater than 0.9

CHARACTERISTICS

Performance and comfort

The MCS 222 controller ensures real-time analysis and management of the landing calls together with dispatching of cars according to passenger traffic. It immediately determines car acceleration, deceleration and stopping accuracy hence providing an optimal flight time.
The OVF 20 variable frequency drive ensures a smooth ride, irrespective of load.
Lift operation is quiet thanks to the use of advanced components and sound-proof isolating units.

Passenger safety

Variable-frequency drive compares, in real-time, the speed of the car and the distance to travel with the theoretical travel profile. In this way it can adjust voltage and frequency to ensure smooth, jolt-free travel with gentle stopping and optimised floor levelling.

Exceptional reliability

Variable frequency means lift travel is smoother and stopping is no longer controlled by a brake but by fine speed adjustments until the car comes to a complete standstill. Consequently, equipment wear on components such as the brake and motor is reduced.
Each electronic component of OVF 20 is tested to Otis' strict quality standards. Microprocessor technology reduces the number of moving parts and minimises the risk of a malfunction.

Energy savings

With OVF 20, the starting current is only 1.8 times the nominal current.
The power factor and efficiency are maintained at the highest level. Little energy is consumed during starting or through heat loss.
The efficiency of OVF 20 control system thus allows significant savings to be made.

Variable Frequency Drive

OVF 20

TECHNICAL DATA

Speed (m/s)	0.63 to 1.75
Max power (kW)	5 to 22
Speed encoder	Yes
Stopping precision	+/-3 mm
Startings per hour	240 max.
Time to travel 3m	5.5 sec
Grouped lifts	1, 2 or 3

CHARACTERISTICS

Fast installation

The MCS 222 controller is pre-assembled in the factory, thereby minimizing lift downtime. Special Gen2 Mod installation procedures further accelerate the onsite installation.

Flexibility

The flexibility of the controller enables the particular demands of users to be met including projects with phased modernisation.

Upgrading products such as door operators, landing fixtures, car operating panel features, entrance protection systems and REM remote monitoring can be easily undertaken at a later date.

COMPONENTS

Modular structure

With a bank of lifts, each lift possesses the hardware and software to accept all the landing call assignment decisions in coordination with the other lifts. This means no group controller is required until the last car becomes unavailable, an arrangement that enables each lift to continue functioning in the group.

Serial link

A bi-directional serial link with high-speed data transmission enables the controllers to communicate constantly and interactively.

Operational monitoring

This system manages the activity of each car in the bank of lifts in coordination with the others to ensure optimum traffic management, whatever the conditions, and more particularly:

- the traffic density on the floors
- the car load
- the status of the cars.

Directing module

This module interfaces with the landing calls and the operational control of each lift.
It enables the bank of lifts to register landing calls.

Motion control

This sub-system controls car travel providing the highest levels of efficiency and safety.

Speed transducer

This is an optical encoder driven directly by the motor and installed in the machine. It acts as an interface that collects the speed information of the car and transforms it into digital information for use by the microprocessors.