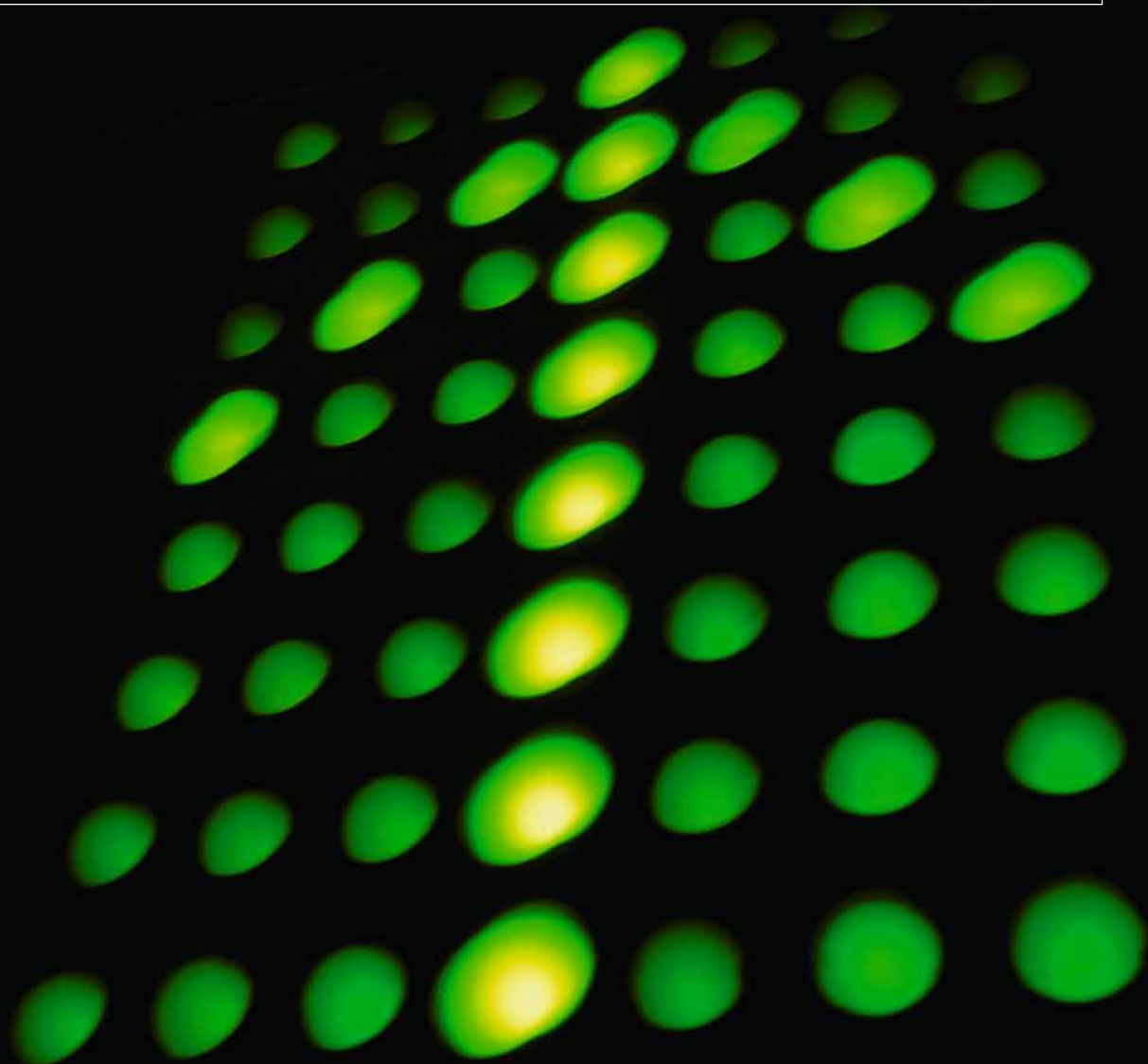


Moving ahead

# Going up!

Elevator manufacturer reaches new heights  
with ABB's high performance machinery drive

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ABB's new high performance machinery drive is making a big impact among end users and system integrators for original equipment manufacturers across a broad range of industries and demanding applications. Motala Hissar, a Swedish-based manufacturer of elevators to markets throughout Europe, is a case in point.

Faced with a technical difficulty that other drives vendors could not solve satisfactorily, Motala Hissar received a timely call from ABB. The result: the problem was solved within hours and Motala Hissar had a product that was "better, simpler and more competitive" than before.

Launched to industry acclaim in late 2006 at one of the key events in the automation calendar – the annual SPS/IPC/Drives trade fair at Nuremberg, Germany – the ABB high performance machinery drive has been quick to make a significant impact in a broad range of machinery applications **1**.

The result of a three-year research and development program, the drive strengthens ABB's portfolio of state-of-the-art frequency converters for low power ratings, while providing original equipment manufacturers (OEMs), system integrators and end customers alike with a uniquely flexible and powerful product that they can tailor to their precise requirements.

Equipped with ABB's Direct Torque Control technology, the new drive can control any type of motor in open- or closed-loop mode.

The ABB machinery drive provides speed, torque and motion control for an extensive sweep of demanding applications. Industries in which the drive is already making a difference to customers' operations include food and beverage, material handling, textiles, printing, plastics and rubber, and woodworking.

Equipped with ABB's Direct Torque Control technology, the high performance machinery drive can control any type of motor – synchronous or asynchronous, servo or high torque, in the 0.75 to 110kW (1 to 150 hp) range – in open- or closed-loop mode. Designed to meet the high-volume needs of manufacturers and machine builders, as well as the application-specific requirements of individual customers, it combines the following main features into a highly versatile and cost-effective drive:

- Modular design
- Separate memory unit
- Unlimited functionality

#### Modular design

ABB has separated the main hardware and software functionality into three modules – a power electronics unit, a control electronics unit and a software memory unit.

#### Separate memory unit

The pre-programmed memory unit contains all the drive application software and parameter configurations in an easily replaceable, simple-to-install module.

#### Unlimited functionality

Although ready-made plug-and-play solution programs are available for most high performance machinery applications, the unique openness of the drive enables users to adapt and modify these programs to their precise needs.

The combination of these features brings considerable benefits to high volume machine builders in terms of engineering and final assembly, distribution and logistics, intellectual property protection and component replacement **Factbox 1**.

ABB has separated the main hardware and software functionality into three modules – a power electronics unit, a control electronics unit and a software memory unit.

The hardware modules (the power and control electronics units) can be delivered to the end customer as per the usual distribution schedules, while delivery of the memory unit can be delayed until the last moment. There is no need to incur travel costs by sending commissioning engineers – a local technician with basic drives training can simply plug in the memory unit on-site. The number of product components and variants is minimal, and intellectual property rights for OEMs who develop their own control functions are protected by encryption. If the memory unit or one of the hardware modules fails to work, it is simply removed and a replacement plugged in.

**1** ABB high performance machinery drive



**Factbox 1** Drive features

- Compact modular design
  - 3 separate modules for power electronics, control electronics, and memory
- Speed, torque and motion control
- Separate memory unit for easy plug-and-play installation
- Programmable memory with unlimited functionality
- Ready-made programs available for most machinery applications
- Controls any type of motor in 0.75 to 110kW / 1 to 150hp rating
  - Open-loop or closed-loop control
- Several plug-in options for I/O extensions, motor feedback interfaces and communication

## Moving ahead

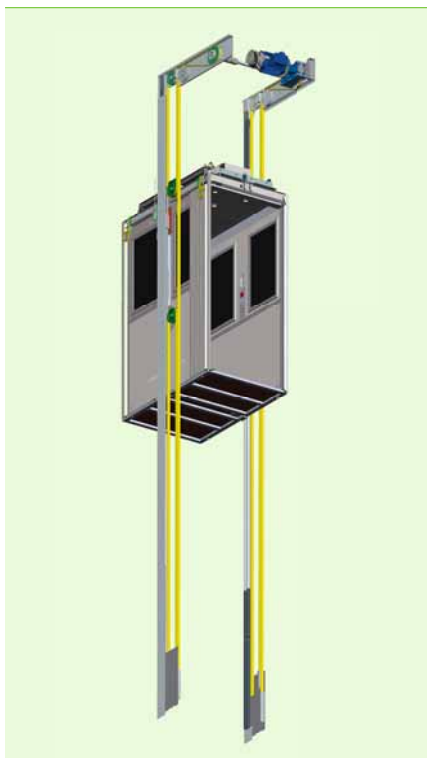
**Exceeding expectations**

One of many machinery applications in which the ABB high-performance machinery drive has made a significant impact is elevators. One company that selected the drive and has

**2** The Motala 6000 is often installed in an existing stairwell, made possible by the exceptional compactness of the design.



**3** Illustration of the Motala 6000 showing the belt drive system in yellow and the motor at the top of the shaft.



obtained more benefits than it anticipated is Swedish elevator manufacturer, Motala Hissar.

Part of the Kone Corporation, one of the world's leading manufacturers of elevators and escalators, Motala Hissar manufactures two specialized products: the Motala 2000 platform elevator for immobilized and physically handicapped people; and the Motala 3000 compact elevator for buildings that were originally designed without an elevator. The company sells about 1,000 elevators a year to markets throughout Europe. It has about 60 employees and annual revenues of some \$ 22 million (SEK 140 million).

Motala Hissar differentiates itself from competitors with the slogan "Largest inside – smallest outside." Its elevator cabins have the largest internal dimensions and the smallest footprint on the market, attributes made possible by the guided chain technology that the company developed and patented in the 1990s and which requires minimal space to raise and lower the elevator **2**.

"The ABB drive has helped us to simplify the product. The Motala 6000 is easier to assemble, easier to service and easier to inspect. It's reduced our operating costs and those of our customers."  
– Ari Nieminen, site manager, Motala Hissar

As part of its product-related research and development program, Motala Hissar recently redesigned this technology for a new elevator, the Motala 6000, by replacing the guided chain with a unique belt drive system that enables the elevator to go twice as fast – and with less noise and more comfort – than its nearest competitor **3**. So great has been customer demand for the new elevator that more than 30 units were sold before the official launch. A major contributor to the success of the elevator and the

technology that lies behind it is the ABB high performance machinery drive. Ari Nieminen, site manager at the Motala Hissar factory in central Sweden, explains why.

"We'd reached a stage where our projected launch date was approaching but we had a technical problem that we couldn't solve," explains Nieminen. "Because the elevator is designed without a counterweight to save space it produced a jerking sensation before starting. We approached several drives vendors to provide a solution that would prevent the jerking and without using an encoder, but none of them could solve the problem satisfactorily. Then ABB came along with their new high performance machinery drive and a team of experts to work on the problem. Within hours we not only had a solution, we had a better, simpler and more competitive product."

At the heart of the ABB high performance drive is the remarkable torque response and speed accuracy of ABB's Direct Torque Control (DTC) technology. This and the ability to program the drive with unlimited functionality result in a powerful capability that remains unmatched by any other make of drive.

DTC has the capacity not only to provide precision open-loop control at low or no speed – thereby providing the required smooth elevator start – but to do so without an encoder or other feedback device. (Competitors' drives required an encoder to achieve a smooth start, but could not do it with open-loop control.)

Secondly, the drive is programmed to calculate the combined weight of the passengers in the cabin so that it knows how much torque to apply to raise the elevator and prevent it from jerking those crucial few millimeters at the start. The more people in the elevator cabin, the more torque is required. This is a major innovation in the elevator industry, one that was made possible by the potential to program the ABB drive with customized functionality. Furthermore, the drive does this without the use and additional cost of a load sensor.

Thirdly, Motala Hissar built on this weight-sensing capability by developing a second feature that differentiates the Motala 6000 from the competition. Elevators are subject to stringent safety regulations. In most countries they are tested by independent inspectors at least once a year; in Spain – one of the customer's main markets – they are inspected once a month. Inspection includes loading the elevator with large weights to ensure that it can safely operate at its maximum load. This is a costly and time-consuming procedure. Motala Hissar has solved this by programming the ABB drive to simulate the test – and without using a load sensor – in a way that is acceptable to regulators. The savings in time and expenditure for Motala Hissar's customers are significant.

"The ABB drive has helped us to simplify the product," says Nieminen. "The Motala 6000 is easier to assemble, easier to service and easier to inspect. It's reduced our operating costs and those of our customers. And we've got an elevator that goes twice as fast as our previous elevator model. These are all important selling points for our customers."

**"We tested the noise levels of different makes of drive and the ABB drive was the quietest."**  
– Ari Nieminen, site manager, Motala Hissar

Noise levels are lower than in the previous elevator, an improvement made possible by a combination of both the belt drive technology and the high performance drive. "We tested the noise levels of different makes of drive and the ABB drive was the quietest," says Nieminen. "Most importantly, our customers are delighted with the new elevator and so too, according to our research, are passengers. The ride is fast, quiet and



smooth. There are no vibrations and no jerking starts and stops. It all adds up to maximum passenger comfort"

#### Factbox 2

To reduce noise levels even more, Motal Hissar is evaluating ABB brake motors and considering using ABB circuit breakers and contactors. ABB supplies a complete range of power and automation products and systems

#### Factbox 2 Benefits for Motal Hissar

- Full torque at zero speed for
  - Smooth elevator start
  - Greater passenger comfort
- Unique weight-sensing function
- Open-loop solution (no encoders)
- Unlimited potential for future functionality
- Annual cost savings due to:
  - No feedback devices
  - No load cells
- Benefits for own customers
  - Twice as fast
  - Easier weight tests
  - Fewer parts, less mechanical wear
  - Less maintenance

to elevator and escalator manufacturers worldwide. The ABB high performance machinery drive adds to this capability by enabling manufacturers to customize their own interface (with or without the help of ABB) and control any type of motor, or connect if needed to any type of feedback device or fieldbus. If the drive fails it can easily be replaced by a building attendant with basic electrical skills – all the application data is in the memory unit.

ABB supports its drives customers with its own dedicated service units and an extensive ABB Drives Alliance global network. Special support arrangements are available for OEM customers, regardless of region.

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