

Sensors and Switches in Commercial Traction Elevators

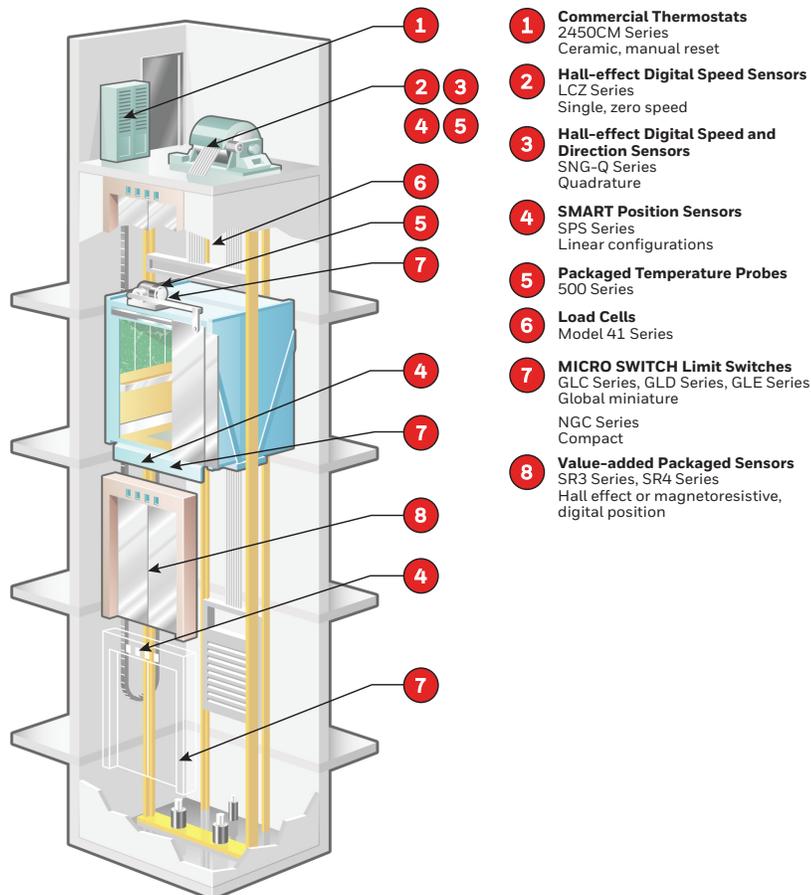
An Application Note

Background

People-moving, cable-pull elevators are classified as commercial (see Figure 1) or residential, and have different codes and safety requirements. Generally powered by electric motors, elevators are vertical transport vehicles that move people or goods between floors of a building. The four primary types of elevator movement mechanisms are: traction (geared or gearless), hydraulic, pneumatic/vacuum and climbing:

- Geared traction elevators use worm gears to control the mechanical movement of the elevator cars by “rolling” steel hoist cables over a drive shaft which is attached to a gearbox drive by a high speed motor. Gearless traction elevators are low speed, high torque electric where the drive shaft is directly attached to the end of the motor.
- Hydraulic elevators use hydraulic systems rather than direct traction.

Figure 1. Potential Honeywell Sensors and Switches Used in Commercial Traction Elevators



- 1 Commercial Thermostats**
2450CM Series
Ceramic, manual reset
- 2 Hall-effect Digital Speed Sensors**
LCZ Series
Single, zero speed
- 3 Hall-effect Digital Speed and Direction Sensors**
SNG-Q Series
Quadrature
- 4 SMART Position Sensors**
SPS Series
Linear configurations
- 5 Packaged Temperature Probes**
500 Series
- 6 Load Cells**
Model 41 Series
- 7 MICRO SWITCH Limit Switches**
GLC Series, GLD Series, GLE Series
Global miniature
NGC Series
Compact
- 8 Value-added Packaged Sensors**
SR3 Series, SR4 Series
Hall effect or magnetoresistive,
digital position



- Pneumatic/vacuum elevators do not have cables and are often installed in spaces that are narrower than traditional elevator shafts.
- Climbing elevators are self-ascending, through the use of a combustion or electric engine.

This application note refers primarily to commercial traction elevators.

Solutions

Honeywell manufactures many products that may be used in commercial traction elevator applications. (See Figure 1.)

1. Commercial Thermostats

Thermostats are used in the elevator system control box as an over-temperature switch to help prevent the system from overheating. Honeywell’s commercial and precision snap-action thermostats include automatic and manual reset options, phenolic or ceramic housings, and a variety of mounting brackets and terminal options. Each thermostat’s design is configured from a base unit, and may be customized for temperature tolerance and mechanical configurations. (See Table 1).

Table 1. Commercial Thermostats

2450CM SERIES	FEATURES
	<ul style="list-style-type: none"> • Ceramic, manual reset • Cost effective • Small size allows enhanced response to temperature changes • Wide variety of mounting brackets and terminals allow flexibility of use within the application

2. Hall-effect Digital Speed Sensors

Speed sensors are used to control the elevator motor speed. Honeywell’s speed sensors use multiple technologies to detect a magnetic field change to create an electronic signal for the control system interface. These technologies offer the ability to detect speed, direction, or position

of a moving ferrous metal or magnetic target. Sensing is accomplished without contacting the target, and there are no moving parts, minimizing mechanical wear of the sensor or target. (See Table 2.)

Table 2. Hall-effect Digital Speed Sensors

LCZ SERIES	FEATURES
	<ul style="list-style-type: none"> • Single, zero speed • Available in several diameters and lengths for flexibility of use within the application • Stainless steel package is simple to install and adjust, and does not require rotational orientation • Small size • Cost effective • Low power consumption allows energy efficiency • Durable

3. Hall-effect Digital Speed and Direction Sensors

Speed and direction sensors are used to help control elevator motor speed and position. Speed information is provided by digital square wave outputs; direction information is provided by using a quadrature output with signals 90° phase shifted from each other. With the quadrature output, target direction is determined by output lead/lag phase shifting. This product is designed for applications where dual differential Hall-effect sensor

IC technology allows an enhanced ability to detect small target features. This accuracy is enabled by dual differential Hall-effect sensor IC technology. The SNG-Q Series is designed for a wide operating temperature range, robust electrical noise immunity and industry leading environmental sealing capability. (See Table 3.)

Table 3. Hall-effect Digital Speed and Direction Sensors

SNG-Q SERIES	FEATURES
	<ul style="list-style-type: none"> • Quadrature output provides direction information • Sensing air gap of 0,0 mm to 2,0 mm [0.0 in to 0.08 in] • Wide operating temperature range of -40°C to 150°C [-40°F to 302°F] • Enhanced frequency switching capability of 3 Hz to 20 kHz • Supply voltage range of 4.5 V to 26 V • Electrical noise radiated immunity (EMC) rated to 100 V/m • Moisture ingress protection rated to IP69K • O-ring seal enables environmental sealing to mounting surface • Fixed mounting flange allows for a simpler installation process, using one fastener • Radial or axial mounting, depending on the geometry envelope in which it fits, can simplify design-in

4. SMART Position Sensors

Honeywell’s SMART Position Sensors, Linear Configurations, may be used in elevator applications for more accurate floor position control. When the elevator approaches the floor, it slows and then levels to the floor it has reached. This product uses a combination of ASIC (Application-Specific Integrated Circuit) technology and an array of MR (magnetostrictive) sensors to determine the position of a magnet attached to a moving object. The MR array measures the output of the MR sensors mounted along the magnet’s direction of travel. The output and the MR sensor sequence

determine the nearest pair of MR sensors to the center of the magnet location. The output of these two MR sensors is then used to determine the position of the magnet between them. In this application, the SMART position sensor is attached to the floor, and the magnet is attached to the elevator. When the linear array senses the magnet, the elevator slows down and stops. (See Table 4.)

Table 4. SMART Position Sensors

SPS SERIES, LINEAR CONFIGURATIONS	FEATURES
	<ul style="list-style-type: none"> • 0 mm to 35 mm, 0 mm to 75 mm, 0 mm to 225 mm sensing ranges • Indicates floor location, even without power • Reduces overall system cost • Reliability minimizes downtime • Enhanced durability for 10-25 years • Self-diagnostics feature reduces equipment downtime • Programmability enhances flexibility, allowing the user to adjust the parameters without having to develop new equipment • Small size, which takes up 50% less space than most competitive technologies; for use where space is at a premium

5. Packaged Temperature Probes

Packaged Temperature Probes are used in the motor windings and bearings to help prevent the motor from overheating. Temperature probes are used in both the main drive motor as well as in the elevator door motor. Honeywell’s temperature probes are designed to maximize component and

product performance with enhanced reliability, repeatability, precision, and responsiveness. A wide selection of housing, resistance and termination options allow flexibility of use within the application. (See Table 5.)

Table 5. Packaged Temperature Probes

500 SERIES	FEATURES
	<ul style="list-style-type: none"> • Wide selection of housing materials ranging from all plastic to all metal, resistance and termination options allow flexibility within the applications • Wide operating temperature range (-40°C to 300°C [-40°F to 572°F]) allow operation under a wide range of environmental conditions • Wide variety of connectors and lead types allow application flexibility

6. Load Cells

Load cells are designed to determine the weight of the load on the elevator so it won’t move if it is overloaded. Low profile “pancake” type, bonded foil, strain gage load cells are engineered to measure loads from 5 lb to 500,000 lb. The tension/compression Model 41 is designed with the threaded hole running completely through the center of the cell. The Model

41 Series utilizes two stabilizing diaphragms, welded to the sensing member, which is fixed as integral part of the load cell and cannot be moved or changed. (See Table 6.)

Table 6. Load Cells

MODEL 41 SERIES	FEATURES
	<ul style="list-style-type: none"> • Low profile “pancake” type • Engineered to measure loads from 5 lb to 500,000 lb • Two stabilizing diaphragms, welded to the sensing member, reduce off-center and side-loading effects • Non-linearity, hysteresis and repeatability specifications provide enhanced performance • Welded construction and ability to be hermetically sealed enhance durability

7. MICRO SWITCH Limit Switches

Commercial elevators employ limit switches to detect the position of the elevator or lift floor, as well as in the buffer system. These durable and reliable limit switches are suitable for many industrial applications, agriculture equipment, transportation equipment, and other applications requiring an environmentally sealed (IP and NEMA) switch. The compact

metal or plastic housings are often ideal for equipment where space is at a premium. The extensive product range is available in a wide range of actuators, contact blocks, and conduit/connectivity options. (See Table 7.)

Table 7. MICRO SWITCH Limit Switches

GLC GLD GLE SERIES, GLOBAL MINIATURE	FEATURES
	<ul style="list-style-type: none"> • Designed to EN50047 • Metal housing or double-insulated plastic housing for indoor and outdoor applications • Wide range of actuator heads and levers • Heads can be positioned at 90° increments for design flexibility; side rotary actuator heads can be factory set for CW, CCW, or CW and CCW actuation • Certified for global applications: CE, UL, CSA, CCC • Conforms to CE, EN50047, IEC/EN 60947-5-1; CSA C22.2 #14; UL 508; CCC GB14048.5, EN45545-2 (GLC GLE) • IP66 and NEMA/UL 1, 4, 12, and 13
NGC SERIES, COMPACT	FEATURES
	<ul style="list-style-type: none"> • Compact size allows ability to be positioned in areas where space is at a premium • Internal workings are sealed from the environment, allowing for potential use in many types of environments • Configurable options (more than 380,000) allow a common switch body and interface for a variety of sensing requirements: <ul style="list-style-type: none"> - Choice of connector or cable options - Compact option for double pole double throw switching needs - Optional cable lengths and switch body exit configurations • Conforms to IEC 60947-5-1, IEC 61373, EN45545-2 (metal variants with M12 connectors only) • IP67 and NEMA 1, 4, 12, 13

8. Value-added Packaged Sensors

Hall-effect (SR3 Series) and magnetoresistive (SR4 Series) Value-added Packaged Sensors are used to monitor elevator door open/closed position. When the doors open completely, the sensor resets the timer that determines when the doors should close. When the doors are closed, the sensor senses when the door is closed, indicating that the elevator can be

moved. The SR3 Series and SR4 Series sensors are constructed from a thin sheet of conductive material with output connections perpendicular to the direction of current flow. The rugged, epoxy-filled plastic housing allows for use in potential corrosive applications. (See Table 8.)

Table 8. Value-added Packaged Sensors

SR3 SERIES, SR4 SERIES	FEATURES
	<ul style="list-style-type: none"> • Digital output • Enables total system cost reduction • Enhances durability and reduces repair and maintenance costs • Stable magnetic solution with 30+ years of functionality • Easily interfaces and wires with many designs

Warranty/Remedy

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship during the applicable warranty period. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items that Honeywell, in its sole discretion, finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While Honeywell may provide application assistance personally, through our literature and the Honeywell web site, it is buyer's sole responsibility to determine the suitability of the product in the application.

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For more information

To learn more about Honeywell's sensing and switching products, call 1.800.537.6945, visit sensing.honeywell.com, or e-mail inquiries to info.sc@honeywell.com

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