BOURNS®
Reliable Electronic Solutions

APPLICATION NOTE

Model EN

Industry:

Passenger Elevator Industry

Application Requirement:

Compliance with EN81 Elevator Safety Regulations

Directive 95/16/EC established European legal requirements for the design, installation and placing on the market of new elevators. The Directive makes provisions for a number of standards, the first of which was EN81 introduced in July 1999 and defined the development and type approval of new passenger and goods elevators. Extensions of the original standard have been implemented to deal with new requirements as they have arisen. Examples include EN81-70 for disabled access to elevators or EN81-21 for new elevators in existing buildings. In the United States ASME A17.1 defines a similar safety code for elevators and escalators.

EN81-1 defines safety rules for the construction and installation of electric elevators while EN81-2 establishes safety rules for the construction and installation of hydraulic lifts. In both of these cases the standards apply to new elevators. In 2003 it was determined that there were three million elevators in use in Europe, 50% of these lifts were installed more than 20 years ago. As a result it was necessary to introduce EN81-80 to cover requirements for the improvement of existing passenger and goods passenger elevator safety. EN81-80 categorizes various hazards and hazardous situations, analyzed by a risk assessment, covering 74 scenarios.

Solution:

The EN Series Bourns® Rotary Optical Encoders has been successfully retrofitted to existing elevators in order to comply with functional safety requirements established in EN81-80. The EN encoder offers a two-channel quadrature output necessary for detecting both the speed and direction of either a hydraulic or traction elevator. The encoder output may also be used to determine the position of the elevator, if necessary. The EN encoder is capable of 10 million to 200 million revolutions while maintaining a high level of reliability and good resolution. For harsh environments, such as in an elevator shaft, the EN encoder is available as an IP65 sealed unit. The standard model's terminal pins can also be retrofitted with a locking connector. The optional index channel provides a zero-position signal allowing the device to be used for tracking absolute position of the elevator. The following are elevator application examples for the Bourns® EN Encoder based on requirements from EU95/16/EC.

1. The EN encoder can be used to provide feedback on the speed and direction of the elevator. The encoder works to measure direction in an elevator via a signal response to the elevator controller. The controller monitors the A and B channel output of the encoder to determine which channel arrives first. The controller then verifies whether the encoder is turning clockwise or counter-clockwise. Speed is determined by the rate at which the A and B channels are switched. An electronic controller will have been pre-programmed with parameters determining safe elevator operation during the design and installation phase. If the encoder output produces a signal that defines a speed higher than the safety limit prescribed for a specific load, in either direction, then the controller will apply the brakes to the elevator car and either bring the car to a full stop or slow the elevator as necessary. The high resolution of the encoder helps ensure that the application of

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brakes by the electronic controller is smooth, preventing discomfort to passengers that could result from a sudden or rapid deceleration. Encoders can be mounted using several different methods. Examples include connection directly to the electric motor of the elevator, attachment to a pulley on which the traction rope runs (the encoder rotates as the rope moves), or may be used in draw-wire configuration. Bourns® EN Encoder can be used, for example, as part of a system for compliance with Section 3.2 of Annex I of the Lift Directive. This section requires that a device be fitted to the elevator to prevent the car from falling, or uncontrolled upward movements, in the event of a power failure, or failure of other components.

2. The EN Encoder can also be used to ensure accurate lands of the elevator car at each floor. Distance is measured by assigning each pulse interval a distance value, which is memorized by the elevator controller based on the exact output of the encoder at a specific position. During the service life of the elevator this initial set-up ensures that the car will be directed to stop within a few millimeters of each floor, independent of the actual load. As an additional feature, the output can be monitored continuously by the controller for improper counting sequences. This input may be used to determine scheduling of maintenance. This use of the EN encoder also eliminates the need for a set of reed switches for each floor, improving the reliability and reducing the maintenance costs of the elevator.

3. Bourns offers customers the option of supplying the EN Encoder with a servo mount that facilitates the direct coupling of the encoder to the motor. This feature creates the possibility of using the encoder for determination of the elevator door position. Typically the encoder is mounted in a motor shaft. Based on the quadrature output, a signal is generated that provides information on the position of the door, stall protection and confirms the direction in which the door is travelling. The rotational life characteristics of an EN encoder with ball bearings and a servo mount bushing (200 million revolutions) helps ensure that the service life of the door position detection mechanism lasts longer than many of the mechanical components used in an elevator door assembly.

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