



YASKAWA
CONTROL



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SAFETY PRECAUTION

Although the product(s) are produced under strict quality control and should not malfunction, if there is any chance for bodily harm or property damage while in use you must apply a safety device or other necessary measure to prevent this from happening.

YASKAWA CONTROLS CO., LTD.

2-13-1 Nishimiyaichi Yukuhashi-City, Fukuoka, 824-8511 Japan
Phone: +81-930-24-4601 Fax: +81-930-24-7131

TOKYO OFFICE 1-3-2 Iidabashi, Chiyoda-Ku, Tokyo, 102-0072 Japan
Syosankan Bldg. 6F
Phone: +81-3-3263-5611 Fax: +81-3-3263-5625

WEST TOKYO OFFICE 480 Kamifujisawa, Iruma-City, Saitama-Pref., 358-8555 Japan
Yaskawa Electric Solution Center 3F
Phone: +81-4-2964-8043 Fax: +81-4-2965-2722

NAGOYA OFFICE Hanaguruma Bldg., Minami-Kan 8F, 5-16-17 Meieki
Nakamura-ku, Nagoya-City, Aichi, 450-0002, Japan
Phone: +81-52-562-4721 Fax: +81-52-562-4720

OSAKA OFFICE 12-24 Toyotsumachi, Suita-City, Osaka, 564-0051 Japan
Nakamura Bldg. 2F
Phone: +81-6-6337-8102 Fax: +81-6-6337-4513

KYUSHU OFFICE 2-13-1 Nishimiyaichi Yukuhashi-City, Fukuoka, 824-8511 Japan
Phone: +81-930-24-8630 Fax: +81-930-24-8637

YASKAWA CONTROLS CO., LTD.
REPRESENTATIVE OFFICE EUROPE
Hauptstraße 185, 65760 Eschborn, Germany
Phone: +49-6196-569-322 Fax: +49-6196-569-398
URL: <http://www.yaskawa.eu>

YASKAWA ELECTRIC AMERICA, INC.
Switch Business Group 2121 Norman Drive South Waukegan, IL 60085 U.S.A.
Phone: +1-847-887-7206 Fax: +1-847-887-7030
URL: <http://www.yaskawa.com/site/Home.nsf/home/home.html>

Elevators and Parking Machines With Bestact

Bestact for Elevators and Parking Machines

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The sales department is not included in the environmental management system.



ISO9001 ISO14001
JQA-0792 JQA-EM0498

Bestact's high reliability provides stability for high-speed elevator operation.

Since Bestact, a hermetically sealed glass contact power reed switch; was placed in service over 30 years ago; over 18 million have been used worldwide in applications such as transit train control, elevators and electric power facilities. Along with the construction of more high-rise buildings, the elevators that service them require more stable, reliable operation with ease of maintenance. Automatic monitoring of elevators now occur in hotels, apartment houses, department stores and railway yards around the clock by host computers. Safety and amenity demands computer control automation for high-speed elevator operation and with a high frequency of floor calls. For the sensors which detect stop position of elevator car and parking pallet,

maintenance-free proximity switches with high reliability and long-life are the sensor of choice. Good elevator control requires reliable notification of "stop position of the car", "stop operation when the door opens" and "absolute position of the car" to the controller. In addition to this, high contact opening capacity is needed for switching magnetic switches (solenoids) in motor break circuits to assure passengers' safety. Bestact is often used in the above-mentioned applications as power interface devices for elevators with high reliability. The following showcases some examples of actual use.

Safety devices for elevators

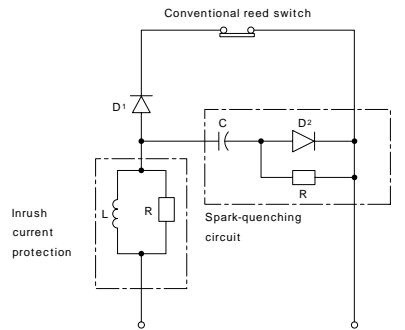
Safety devices for elevators utilizing computer control circuit are often used in conjunction with landing-zone detector and door-zone detector switches.

Features of magnetic proximity switches incorporating Bestact

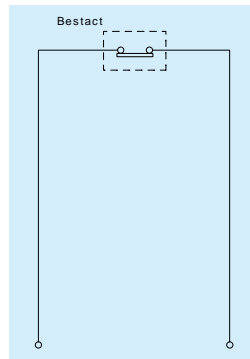
- 1) No power supply needed.
- 2) Quick operating time: 10m/sec response for high-speed applications.
- 3) Suitable for frequent use: mechanical life is 100 million times or more.
- 4) Large contact opening capacity: 1 million times or more, energizing the load of 240VAC, 5A making and 0.5A breaking. Ideal for magnetic contactor coils which control motor circuit operation.
- 5) High contact reliability: failure rate is 5×10^{-9} (1 / time) or less for logic input circuits.

Conventional reed switches have very small contact closing current capability and they often exhibit contact welding when used in long wiring cables because the cables themselves act as capacitors over long distances. When the switch operates, high inrush current is often seen leading to contact sticking (micro-welds) or even welding. A protective circuit is often used that can lessen this

inrush but also a spark quenching devices, thereby creating a more complicated circuit (see below diagram). Bestact has large contact closing current of 15A and large contact switching capacity, so it needs no protective circuit. Therefore, circuitry is simplified and reduces the total cost while improving reliability dramatically.

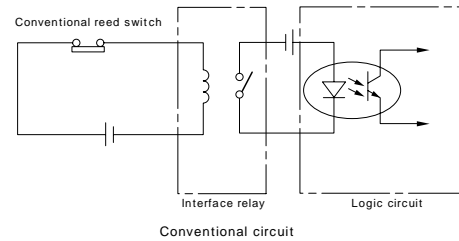


Circuit incorporating conventional reed switches

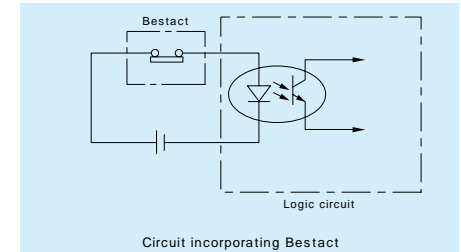


Circuit incorporating Bestact

Conventional reed switches are often used as an input device in conjunction with interface relay because contact reliability will go down in an adverse environment or when neglected for a long time. Bestact is a hermetically sealed contact, which exhibits



no environmental or deterioration over time. This leads to long-term stable contact reliability. Therefore, no interface relay is needed and direct input is achievable while reducing control circuitry costs.



Comparison of various switches used for elevators

	High frequency oscillation type proximity switch	Light activated switch	Vane-type switch (Conventional reed switch)	Vane-type switch (Bestact)
Detection accuracy				
DC power source	Necessary	Necessary	Not necessary	Not necessary
Application for control system				
Reliability				
Facilities for use				
Circuits and wiring				
Environmental condition				
	Excellent	Good	Normal	

Japanese Ministry of Land, Infrastructure and Transport mandates the use of safety devices that cannot allow car movement until all exit doors of elevator are closed. However, there is an exception to this rule in the immediate door zone area, so door zone detection is required. Moreover, when moving away from the

door zone area, safety devices are required to make an emergency stop independently from controlling devices. Similarly, European standard EN81 and North American standard ASME stipulate landing-zone and door-zone control in this fashion.

Figure 1 shows the mounting concept chart of the landing floor switch. 4 to 6 pieces of the Vane type magnetic proximity switches are mounted on the elevator car. In addition to this, we mount ferrous Vane (strong magnetic conductors) on each floor for position

detection. When the car moves in either and up or down direction, the stop target Vane enhances the magnetism of magnetic proximity switch on the elevator car turning it on (or off) and sending a signal to the elevator control system.

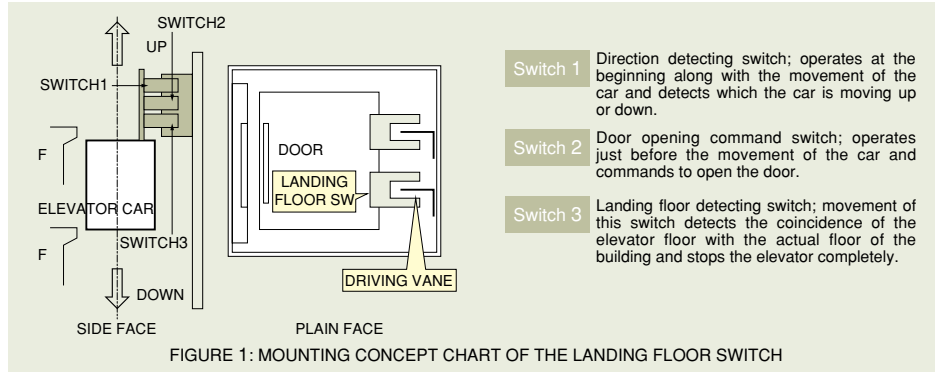


FIGURE 1: MOUNTING CONCEPT CHART OF THE LANDING FLOOR SWITCH

Moreover, they are often used as switches detecting absolute position of the car to prevent collision between objects in the elevator hoist way and the elevator car itself. This concept is shown in figure 2 and depicts the absolute position of the elevator car. This is done through the means of mounting a PSMM (memory type) magnetic proximity switch between each floor and mounting the magnet unit itself on the car. The memory

type magnetic proximity switch operates and maintains its operating state (effectively latching itself closed) as the elevator car rises from floor to floor. The controller now "knows" which switch are closed, thus which floor the car is on. This is done through the use of a bias magnet whereby the state of the switch is maintained (even through a power loss), and this state is then transmitted to the memory in CPU after the power failure is recovered.

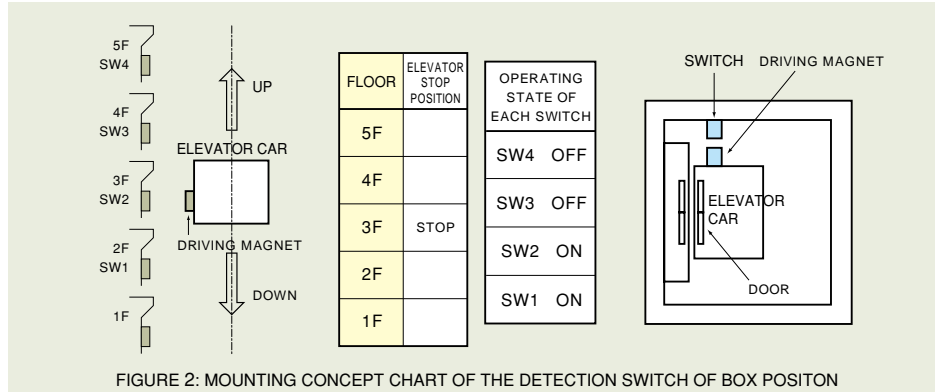


FIGURE 2: MOUNTING CONCEPT CHART OF THE DETECTION SWITCH OF BOX POSITION

Safety devices in parking structures

Machine type parking devices comprise over 2 million units installed from 1960 to 2002 with the multi-step and 2-step systems making up over 60% of all the systems

and are often used as stop position detectors of pallets for cars.

Features of Bestact

Highly Reliable Contact Employing New Materials and Innovative Designs such as Wiping and Hammering Action, Bifurcated Contact and Back-Stop Mechanism.

Features

1. Sealed with an inert gas, ensuring freedom from aging and influences exerted by an adverse environment.
2. The twin contact and wiping effect assures outstanding contact reliability.
3. Hammering action and back-stop mechanism permits a larger make and break capacity and longer service life.

Bestact elements are manufactured according to IEC, EN, UL and CSA certification.

IEC 62246-2: Reed contact units – Part 2:

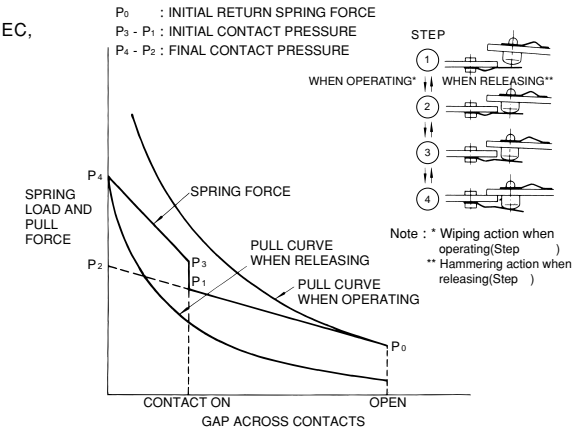
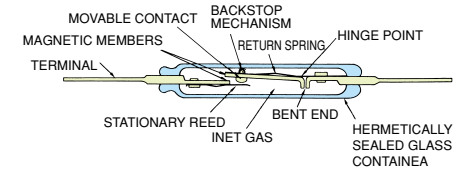
Heavy-duty reed switches (issued in Oct 2007)

EN 62246-2: Reed contact units – Part 2:

Heavy-duty reed switches (issued in Dec 2007)

UL & CSA File No. E159361

CONSTRUCTION AND OPERATING MECHANISM



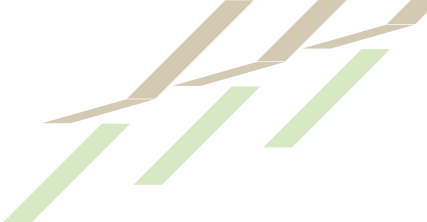
Reliability and main applications

Reliability problems which have eluded even semi-conductor or photo-electric devices can be solved using Bestact.

Field failure rate of magnetic proximity switches incorporated Bestact



We carried out extensive investigation of the field failure rate of the PSMO-25G type switches for nearly 15 years (175 months) from 1987 to 2002. Results indicate 25 defective (failed) switches were found from an accumulated total of 387,595 switches. Of the 25, 1 was a dangerous failure (contact OFF failure) due to a crack in the glass tube. The incidence was 2.0×10^{-19} (1 / h), of the rest (24 pcs.), safety failure (contact ON failure) was the cause, and the incidence was the 4.2×10^{-9} (1 / h).

- Industrial automatic control systems
- Computer and peripheral devices
- Transportation equipment and devices
- Waterworks and sewage equipment
- Electric power equipment, nuclear power facilities, extra-high voltage electric power facilities
- Shinkansen railway application
- Elevators
- Continuous casting machines
- Marine development application
- Various limit switches
- Low-level command and control switches
- Over-current and over-voltage detection switches
- Motor vehicle electrical instruments
- Valve position detection switches for liquid level control
- Explosion-proof equipments
- Machine safety switches



Usage in Elevators and Parking Machines

Over 1.8 million have been used from 1981 to April, 2007.

Application	Product Type	Approx. Accumulated	Main Customer
Door-zone detection Landing-zone detection	Vane type magnetic proximity switches PSMO-15G1,15G2,25G1,25G2; Dust-proof PSMO-15G1T,15G2T,25G1T, PSMO-25G2T; Flood-proof (IP67)	800,000	Mitsubishi Hitachi TOSHIBA ELEVATOR Nippon Otis Elevator FUJITEC Schindler Elevator NIPPON ELEVATOR YOKOHAMA ELEVATOR Daiko MORIYA Kumalift HUASHENG FUJITEC ELEVATOR
	 Detection Gap 15mm  Detection Gap 25mm(CCC Certification)		LG-OTIS Elevator SIGMA Elevator Fujitec America
	Contact unit and driving magnet for OEM	800,000	Hitachi FUJITEC
Cage position detection	Memory type magnetic proximity switch(15mm gap) PSMM-RPE1&-MP15; Dust-proof PSMM-RPE1T&-MP15T; Flood-proof PSMM-RPE1U&-MP15U; Dust-proof with UL certification	120,000	Hitachi FUJITEC HUASHENG FUJITEC ELEVATOR ThyssenKrupp Northern Elevator Fujitec America
Pallet stop position detection	Separate type magnetic proximity switch (10mm gap) PSMS-RV1G1T, MV10T; Flood-proof	100,000	Tokyu Car Corporation



High Reliability, Inherent in Stringent Quality Control

Bestact products are manufactured in the most advanced facilities, utilizing the expertise we have gained from years of ongoing research and development as well as empirical field data under a stringent quality control system. As example of this would be our production equipment, which automatically adjusts the spring load to the optimum value, thereby maximizing contact life and reliability.



Quality management on the Bestact production line

