

**Manual of Earthquake Monitoring
Instrument for Elevators
(V1.1)**

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Preface

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This manual can help you to learn functions of this earthquake monitoring instrument; its composition, configuration and specifications. It introduced installation procedure of its hardware and how to use it correctly. It also introduced the way of getting rid of the breakdown. Before using this instrument, please read this manual carefully, this can help you to use it perfectly. Please keep this manual in a suitable place so that you can read it in time.

When we made up this manual, we tried to make it completely, correctly and liability. But it is also possible to exit some careless mistakes. If you have any advice, suggestion or if you don't understand any point in it, contact us please. Thank you for your support and cooperation.

In order to satisfy demand of the product market, we may upgrade the product in the future. In this way, this manual will not meet with the upgrading product and we will modify the manual according to the upgrading product. Prospect Company has the right of modifying the manual without notice.

Thank you for using earthquake monitoring instrument for elevators.

1. General Introduction

Earthquake monitoring instrument for elevators will be applied with elevator controlling system together to make the elevator be governed effectively before earthquake coming or during earthquake striking. Before earthquake coming, earthquake monitoring instrument for elevators can detect earthquake wave in advance, then it will output alarm contactor that will be adopted by elevator controlling system. According to the contactor information, elevator control system makes the elevator stop and open the door at the nearest floor and release the passengers. In this way, maximum passengers will be survived and elevator can be protected from damage.

2. Principle of the Operation

When earthquake strikes, it will cause earthquake waves. Earthquake waves compose of primary wave and secondary wave according to their travelling way. Primary wave is translatory wave, the travelling speed in earth's crust of it is 5.5-7 kilometers/second and it will reach epicenter firstly. It is also called wave P, it makes ground shake up and down and its destructive effect is weak. Secondary wave is shear wave, the travelling speed in the earth's crust of it is 3.2-4.0 kilometers/second, it will reach epicenter secondly. It is also called wave S, it makes ground shake left and right. Its destructive effect is strong. For these reasons, wave P and wave S during earthquake striking is detected according to travelling way of primary wave and secondary wave separately. Shock degree (or degree affected by earthquake) at a certain place on the ground within the seismic wave scope is called seismic intensity. Shock strength of the ground will affect the feeling of human beings, degree of things change, degree of house damage and change of ground view etc directly. Generally, it is considered that earthquake is caused by inertial force and inertial force is decided by ground acceleration speed. Ground acceleration speed is regarded as the basis of earthquake intensity internationally. Several different intensity scales are used in the countries in the world. In western countries, Modified Mercalli Intensity Scale is used popularly, shortly called M.M.Intensity Scale, composed of 12 intensity scales from scale I to VII. In Japan, no feeling seismic is called scale 0, and feeling seismic is divided from scale I to VII, altogether 8 scales (see attached table 2). Former Soviet Union and China divide it into 12 scales. In 1980, China modified Earthquake Intensity Scale (see attached table 1).

According to the above basis, this instrument collects action acceleration speed on the ground from three directions of X/Y/Z during earthquake striking for detecting the coming seismic

accurately. When wave P is coming, acceleration sensor can feel the shock from the vertical direction in seismic early time, and signal will be output, then it will be amplified by filtration and then to be sent to microprocessor control by analog digital converter for being treated correspondingly. The same ,when wave S is coming, acceleration sensor can feel the shock from the horizontal direction in seismic early time, and signal will be output, then it will be amplified by filtration and then to be sent to microprocessor control by analog digital converter for being treated correspondingly.

This instrument has two ways relay output, they are alarm level one output and alarm level two output separately and they are connected into operation control system of elevator separately for being collected by elevator control system. Alarm level one will be output when the instrument detects wave P in seismic early time or lower seismic acceleration speed. It is primary output for alarming the possible coming seismic. If there is no alarm level two output 10 seconds after alarm level one action, it will reset automatically and contactor signal will disappear. Alarm level two output is for higher action acceleration speed on the ground, it can't be reset automatically. Only after elevator engineer check the elevator and ensure that the elevator works normally, it will be reset manually.

Acceleration speed threshold value of alarm output above mentioned is set before the product is delivered to the market. It can be adjusted according to the customer's requirement.

3. Technique Data

- Input Voltage: AC220V+10% 50Hz ~ 60Hz;
- Output Mode: by two-way relay
- Contactor Capacity: 1.0A 30V DC, 0.5A 125V AC;
- Frequency Response: 0.1Hz~30Hz;
- Setting Scope of Acceleration Speed Threshold Value for Alarm Level I:
0.2 m/s² ~ 1m/s² ;
- Setting Scope of Acceleration Speed Threshold Value for Alarm Level II:
0.4 m/s² ~ 3 m/s²;
- Collection Accuracy: 0.01m/s²;
- Reset Mode: Manually
- Total Power Consumption: <2W;
- Weight: 1kg.

4. Structure and Connection Instruction

4.1 Outside Structure:



4.2 Connection:

The connection way of this product is outgoing line. Power supply line and signal line comes out from water proof terminals separately, as per above drawings. Power supply is connected with 220V AC voltage. Different color signal lines represent the following meanings:

| Color | Red | Black | Green | White | Grey | Brown |
|-------------|-----------------------------------------------|------------------------------------------|------------------------------------------------|----------------------------------------------|-----------------------------------------|-----------------------------------------------|
| Signal Name | Normal Open Relay Contactor of Alarm Level II | Common Relay Contactor of Alarm Level II | Normal Close Relay Contactor of Alarm Level II | Normal Open Relay Contactor of Alarm Level I | Common Relay Contactor of Alarm Level I | Normal Close Relay Contactor of Alarm Level I |
| Color | Yellow | Pink | Purple | Blue | Orange | Dark |
| Signal Name | Reset 1 | Reset 2 | Reserved | Reserved | Reserved | Reserved |

Contactor output can choice normal open or normal close according to the requirement. They are dry contactors at the reset and detecting interface. Button can be set outside, when button is used, corresponding operation will be done.

4.3 Indicator Instruction

Normally, indicator is light, when alarm level I contactor is output, indicator will glimmer; when alarm level II contactor is output, indicator will glimmer quickly.

4.4 Test Button Instruction

To be used for testing if the product can operate correctly or not.

5 Installation and Operation

5.1 Installation

This instrument is recommended to be installed in elevator control room. It should be connected with load bearing wall closely and be fixed with 4 screws of M6 and flat washers tightly. Installation procedure is as follow:

5.1.1 To fix instrument on the load bearing wall or fixed on the support in the elevator control room according to the direction instruction marked on the surface outside. To ensure the instrument is connected with the ground tightly. Wall for installation should not incline too much (tilting angle should be less than 30 degree).

5.1.2 To connect signal wire and power supply wire correctly according to wire list of interface.

5.1.3 To switch on the power supply.

5.2. Operation

5.2.1 To set the acceleration speed value

Before product is delivered, acceleration speed value will be set in advance. It also can be set according to the customer’s requirement. We recommend the following value according to the actual situation and Domestic Earthquake Intensity Scale.

| Reference Acceleration Value of Contactor Output | Output Threshold Value of Intensity Scale I (m/s ²) | Output Threshold Value of Intensity Scale II (m/s ²) |
|--------------------------------------------------|-----------------------------------------------------------------|------------------------------------------------------------------|
| Building Height | | |
| Less Than 60m | 0.6 | 1.2 |
| Between 60m and 120m | 0.3-0.4 | 0.60- 1.0 |
| More Than 120m | 0.2-0.3 | 0.4-0.8 |

Values in above table are obtained through analysis to earthquake stroke. When earthquake intensity scale is between level I to Level V, it mainly gives feeling of human beings, but gives small damage to buildings. So, we recommend that the contactor output value of intensity Scale I is set between scale V and scale VI (Domestic Earthquake Intensity Scale) when the building height is less than 60 meters, that is to say, acceleration on ground is 0.6m/s² or so. In this way, it both can ensure accurate forecast to the coming earthquake, and can avoid wrong report due to non seismic shock. Facts have been proved that elevators are seldom damaged under earthquake intensity scale 7, so when the building height is less than 60 meters, threshold value of alarm level II is set as 1.2 mm/s² for enlarging auto reset scope of alarm level I.

For super high rise buildings, even though acceleration speed is small, amplitude is possible to be big. So, lower acceleration speed or shocking speed also can cause elevator to shock obviously. If don’t stop elevator, it is possible to make passengers feel afraid and make elevator be damaged. Just because of these, in principle, acceleration speed value is set as above table. But acceleration speed value can be set according to the characteristics of base and buildings and shock resistant degree of elevator.

Acceleration speed value of the instrument here supplied is set as 0.6 m/s² for threshold acceleration value of alarm level I and 1.2 m/s² for threshold acceleration value of alarm level II.

5.2.2 Operation Flow

When early micro shock or lower intensity scale is detected by earthquake monitoring instrument, alarm level I contactor will be output and indicator will glimmer, if there is no signal of alarm level II is output within 10 seconds, then it will be reset automatically and elevator will operate normally.

If alarm level II contactor is output and indicator glimmers quickly, elevator engineer must check the elevator and reset the instrument manually.

5.2.3 Reset

After the alarm level II contactor is output, elevator engineer will check the elevator. If you want elevator to work normally, the instrument must be reset firstly. Instrument reset is realized by short circuiting two reset lines. Reset lines can be wired into control rooms and product can be reset remotely.

5.2.4 Test the Instrument

After the earthquake monitoring instrument is installed, it should be test once a year for ensuring its normal operation. To switch on the test button, and simulate seismic output, first output alarm level I contactor, 3 seconds later, output alarm level II contactor, then reset it manually. If it is normal, then system operates correctly. Otherwise, deliver it to the factory for repaired.

5.2.5 Recommended Operation Mode of Elevator Control System When Earthquake striking

5.2.5.1 When the elevator control system receives signal of alarm level I, elevator should keep at the floor station if it is not working; if the elevator is operating, it should be governed by elevator control system till it reaches base station. After it reaches base station, open the door and keep the door open till signal of alarm level I output disappeared.

5.2.5.2 When the elevator control system receives signal of alarm level II, elevator should keep at the floor station if it is not working; if the elevator is operating, elevator control system should make it go to the direction far from the counterweight and stop at the nearest floor. Open the door and keep the door open till signal of alarm level II output disappeared.

5.2.5.3 When the power supply of elevator is off, elevator should keep the actual situation as before the power supply off. Output provided by the earthquake monitoring instrument should not be deleted.

5.2.5.4 Contactor should be under alarm situation when the power supply of this instrument is off.

6. Notes

6.1 Please don't install this instrument in the following places for avoiding mistaking action.

- Tilting place(tilting angle< 30 degree)
- Shock place, place where is easy to be shocked by opening the door or closing the door.
- High temperature place
- To be affected by magnetic field.
- Place full of dust and corrosive gas to be produced.
- Place existing inflammable and explosive gas.

6.2 When connecting lines, power supply must be off, otherwise it is easy to cause inflammable, explosive accidents or electric shock.

6.3 When installing the instrument, fix it on the wall or fixed it on the support tightly, installation direction must be accordance with the Manual.

6.4 To reset the instrument according to the operation instruction to the Main Unit for ensuring the fully safety.

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