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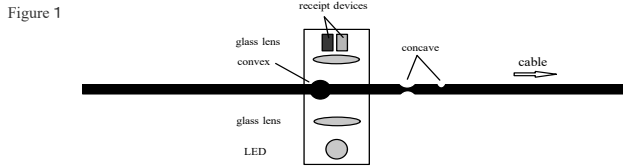
diameter concave-convex detector

Instruction manual

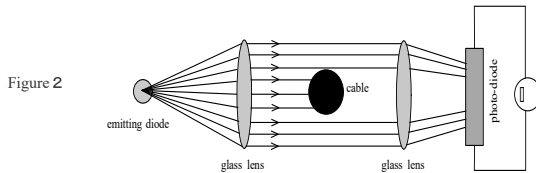
· *FUKOU Measurement Ltd.* ·

1. diameter concave-convex detector operation principle

a. The following explanation chart is 1 axis. The number of receipt devices is 2, and this structure can guarantee the accuracy of the measurement result.



When the cable passes in the inspection machine, the quantities of light of the receiver are fixed values. The change occurs, and if it appears on the surface of the cable there is a concave-convex, the quantities of light of the receiver can do the defective concave-convex it detection.



The signal of the pulse appears when the defect appears

2. Specification

- Direction of detection : 1 direction (FK-0501A)、3 direction (FK-0503B、FK-2003B、FK-3003B、FK-5003B)
- Range of measurement diameter : ① : $\Phi 0.02\text{mm} \sim \Phi 1.0\text{mm}$ (FK-0501A、FK-0503B)、② : $\Phi 0.02\text{mm} \sim \Phi 2.0\text{mm}$ (FK-2003B)、③ : $\Phi 0.05\text{mm} \sim \Phi 3.0\text{mm}$ (FK-3003B)、④ : $\Phi 0.1\text{mm} \sim 5.0\text{mm}$ (FK-5003B)
- Detection slit : Double slit type
- Source of light : Near-infrared radiation light emitting diode (LED)
- Range of detection sensitivity : $0.02\text{mm} \sim 0.99\text{mm}$ ①② / $0.05\text{mm} \sim 9.99\text{mm}$ ③④ (range of set level)
- Detection accuracy : Within $\pm 1\%$ of the maximum set value
- Line swinging tolerance : Horizontal direction $\pm 0.01\text{mm}$
Vertical direction $\pm 0.01\text{mm}$
- Line speed : $5\text{m/min} \sim 1500\text{m/min}$
- Response : $15\text{Hz} \sim 30\text{kHz}$
- Alarm output : Concave-convex output, Red lamp lighting and relay point of contact output, Output time about 0.1sec.
AC 250V 2A Resistance load
- Operating temperature : $-5^{\circ}\text{C} \sim 50^{\circ}\text{C}$ (However, there must not be dewy.)
- Power : $\pm 15\text{V}$ (Within $\pm 5\%$)

3. Function of each part

① Power input connector

Please input $\pm 15\text{V}$ by using the drop type direct current stabilizing supply.

Figure 3



② Alarm output connector

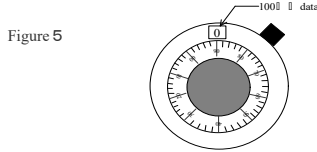
when the change of the concave-convex is more than the level setting value and it is output to the point of contact of the relay between 0.1sec.

Figure 4



③Concave-convex detection level setting machine

The detection level setting machine's data is showing of a concave-convex size (Figure5) by the unit of μm . A concave-convex level can be set between $020 \mu m \sim 999 \mu m$. It is set to the same value for a concave level and a convexity level.



※When the value at a set level is lowered while inspecting the measurement thing, a normal measurement thing has the level to which the alarm lamp lights. It is said a concave-convex Inherent level where a normal measurement thing has this level. If the detection level is set to the vicinity of a concave-convex Inherent level, it becomes easy to pull the misoperation. Please set it to about 2~3 time at concave-convex Inherent level value when you set the detection level. When high sensitivity beginning to be set, it is necessary to make an enough environment (The measurement thing's vibration, The outside vibration, the turbulence light, and drops of water etc.removed as much as possible) is right.

④Concave-convex detection alarm lamp

When the change of the concave-convex becomes more than the level setting value, it lights between 0.1sec.

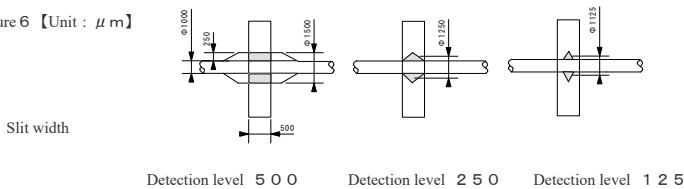
4. Maintenance of the glass lens

It misoperates when the glass filter of the light part of launching and receiving is dirty, and it causes the oversight of the concave-convex due to the sensitivity decrease. Please clean it regularly with the wiper containing the solvent such as the alcohol. Because the lens is installed internally, it is not necessary to clean it.

5. Attention on handling

- ①Please let it pass over the vicinity of the center of the detection range about the measurement thing.
- ②An internal source of light vibrates, too, when the vibration is given to the main body when sensitivity is high and it is likely to misoperation. Please use it as much as possible in the place without the vibration.
- ③Considers it enough, and please reduce the vibration of the measurement thing as much as possible when sensitivity is high (concave-convex detection level setting value $500\mu m$ or less).
- ④Turbulence light's (sun light, fluorescent lamp, and Patorant, etc.) influences are received when sensitivity is high and it is likely to misoperation. Please note that the turbulence light doesn't enter.
- ⑤It is likely to misoperation when the dirt such as drops of water smears to the measurement thing. Please remove dirt enough.
- ⑥When concave-convex shape is narrower than the slit widths, the detection sensitivity might fall. The example of that time is shown (Figure 6).

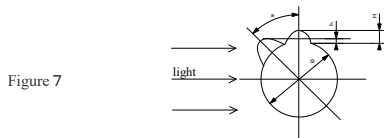
Figure 6 【Unit : μm 】



⑦When the top of the salient inclines at an incidence optical axis, the convexity width is detected actually smaller as shown in Figure 7. This becomes an error of measurement. It is the width h in the following expression by the sign of Figure 7 at this time of detection

The error of measurement can be reduced as much as from the multiway with two or more axes.

$$h = 1 / 2 \Phi \cdot (\cos a - 1) + H \cdot \cos a$$



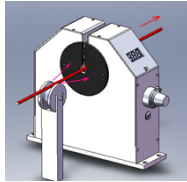
6. Cause and measures of misoperation

① There is a possibility that the drop of water disperses to the detector when a diameter concave-convex detector is set up after the following roller of the guide after the water trough (with air purge) or after the water trough. When the drop of water passes within the range of detection, it is likely to detect it as a concave-convex.

Confirm method : If central guide installed and misoperation decreases, the drop of water's having dispersed can confirm .

Measures : The device that the drop of water doesn't disperse to the detector (The air purge is changed in strengthening and installation features) is given. Or a central guide is obtained. (Figure 8)

Figure 8

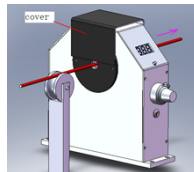


② The detection quantities of light change if the turbulence light (sun light, fluorescent lamp, and Patorant, etc.) invades the range of detection and it is likely to misoperation.

Confirm method : To intercept the turbulence light near the range of detection, whether it detects as a concave-convex when the hand is smelt (The alarm lamp lights) or is no is confirmed.

Measures : Eaves or the cover is obtained for the upper part of the detector. (Figure 9)

Figure 9



③ When there is a vibration in the measurement thing under running, it becomes easy to cause the inconvenience such as being not able to lower the alarm setting level that dashes out from the range of detection to the outside and misoperation.

Confirm method : When a set level is lowered while inspecting the measurement thing, a normal measurement thing has the level to which the alarm lamp lights. It is said a peculiar concave-convex level where a normal measurement thing has this level. The vibration is suppressed to the minimum at this level. (The measurement thing is held by the hand etc. that wore gloves. At this time, the injury is noted because it is easy to be rolled.) And, if it is impossible to lower the alarm setting level more than this level, it will reach truly at the level. If it is more possible to lower the alarm setting label than the level, the inconvenience will be caused in the detector the vibration of the measurement thing under running.

Measures : It passes over the vicinity of the center of the range of detection suppressing the vibration of the measurement thing running by using the guide roller etc.

④ It is likely to misoperation if the alarm setting level is not correctly set

Confirm method : The setting of the detector and the range of sensitivity are reconfirmed.

Measures : It makes it to an appropriate alarm setting level.

⑤ The misoperation and the decrease in the detection sensitivity might occur when the glass filter of the light part of launching and receiving of the detector is dirty.

Confirm method : It is dirty or not is strictly confirmed to the glass filter of the light part of launching and receiving of the detector by watching. The quantities of light is changed when the measurement thing is running with the vibration, and a concave-convex alarm might be output when dirty. Moreover, the quantities of light decrease occurs, and concave-convex might be missed for dirt like dust.

Measures : Wiping dirt falls by the cloth etc.