

GP2Y0A Series / GP2Y0D Series Application Note

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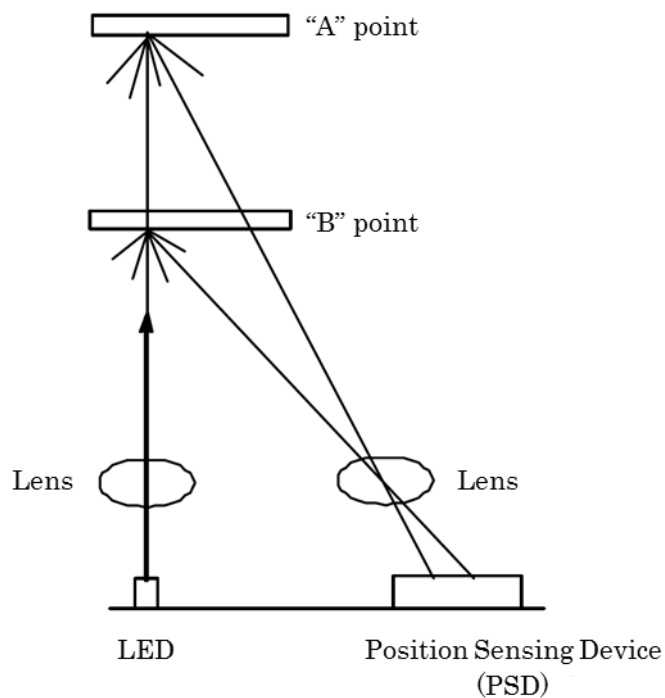
1. General Description

This GP2Y0A Series / GP2Y0D Series application note has been completed by preparing several characteristic data for customers' convenient reference when the GP2Y0A Series / GP2Y0D Series are used. Please utilize this application note for customers' design. This application note should be for reference, however please make sure them in actual mounted condition before using.

2. Measuring principle and features of this sensor

2-1. Principle of triangulation

Optical spot position on PSD shall be changed when reflective object is at "A" point and a "B" point. By processing this optical spot position electrically, the position (distance) of the reflective object on straight line can be detected.



2-2. Features of this GP2Y0A Series / GP2Y0D Series

- 1) Compact high performance distance measuring sensor with built-in PSD, Infrared LED and signal Processing circuit.
- 2) No need to input signal, it can be handled easily.
- 3) Little influence by color and reflective ratio of the reflective object.
- 4) High accuracy measuring by sequential position detection and mean processing data output.

GP2Y0A Series

- Output voltage depending on the reflective object distance can be got by analog voltage output.
- Shipping after correcting the output deviation of the distance by SHARP.

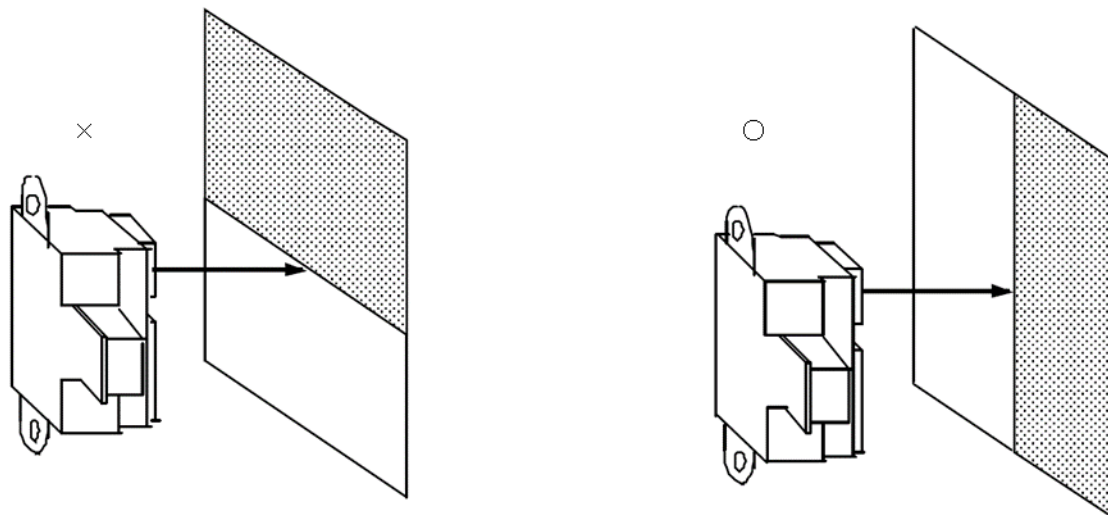
GP2Y0D Series

- 1 bit(H/L) output type.
- Shipping after adjusting the detecting threshold distance by SHARP.
- Adjusting the detecting threshold distance by customer's demand is also possible.

3. Attended issues in use

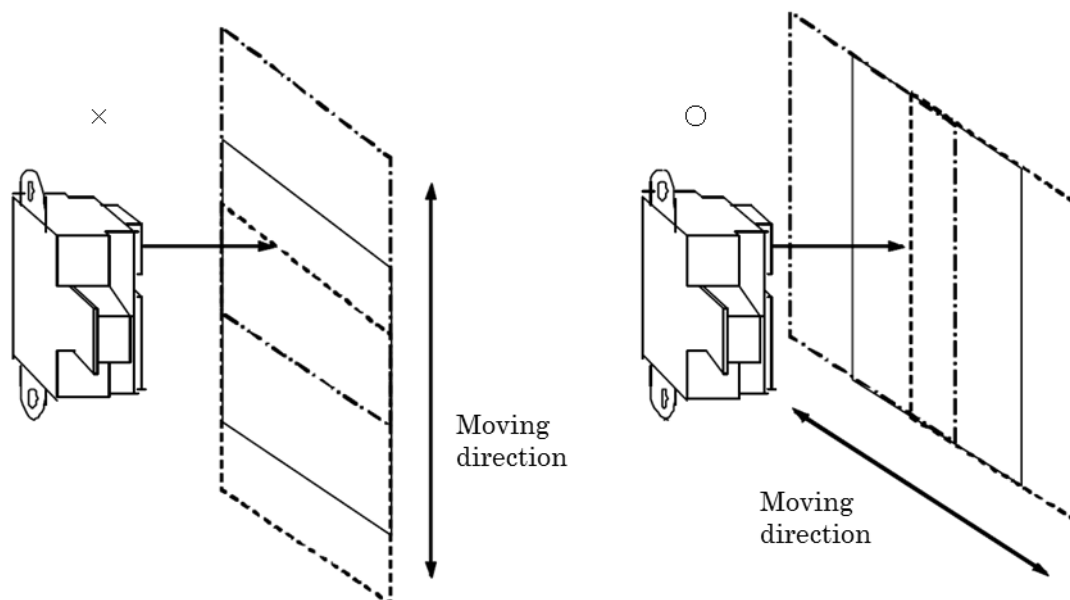
3-1. Direction of the reflective object

In case that reflective object has boundary line which material or etc. are excessively different, in order to decrease deviation of measuring distance, it shall be recommended to set the sensor that the direction of boundary line and the line between emitter center and detector center are in parallel.



3-2. Moving direction of moving reflective object

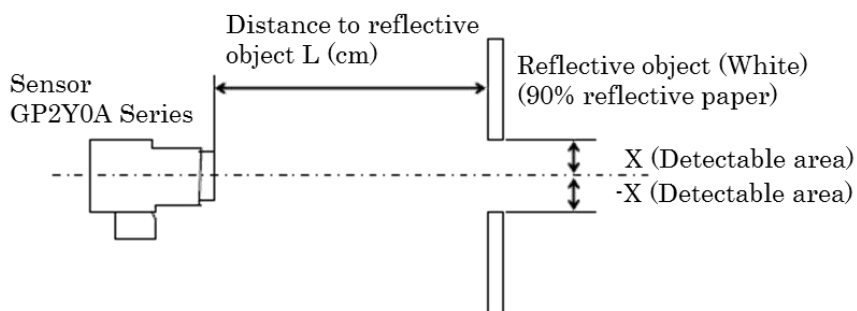
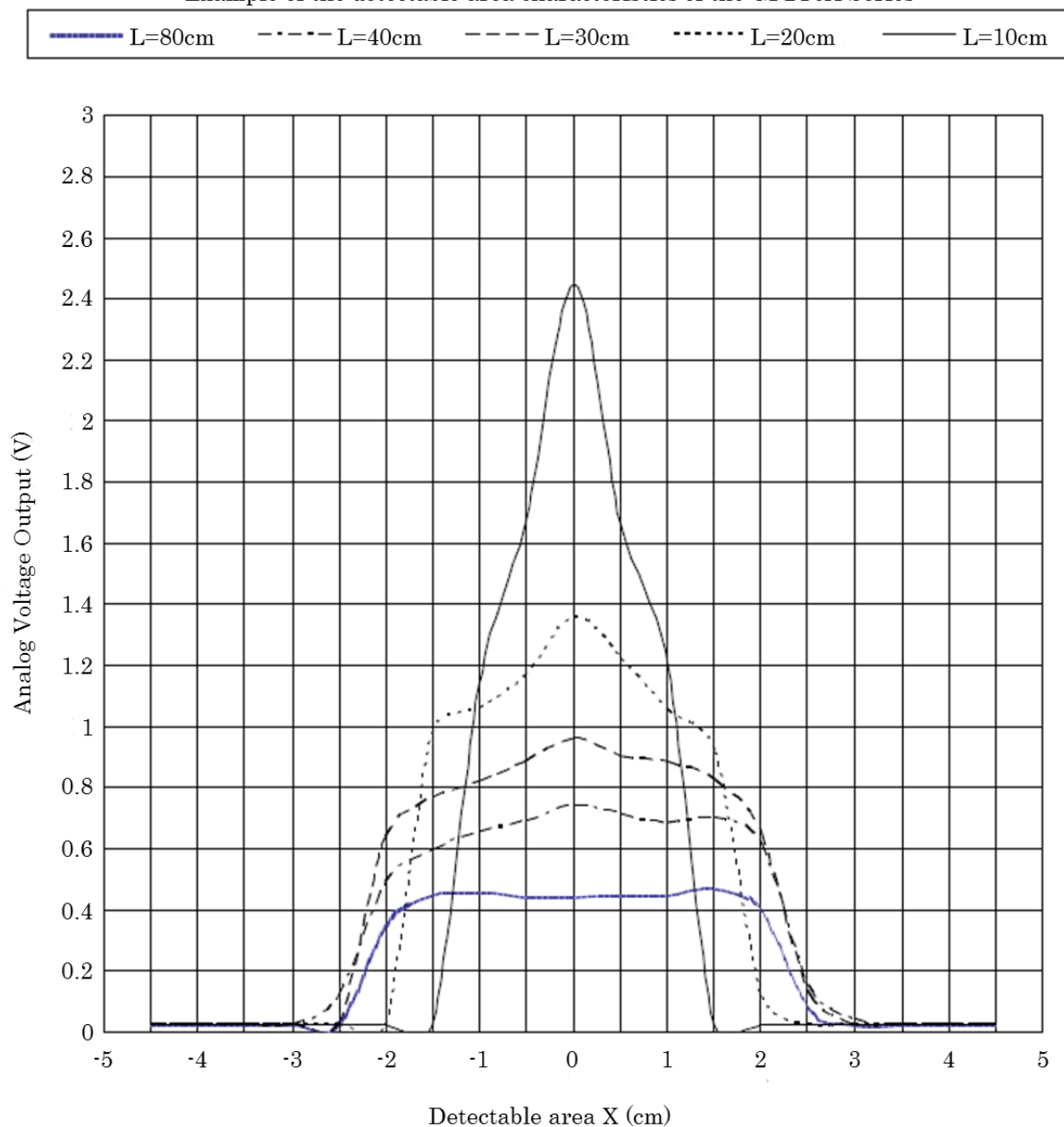
In order to decrease deviation of measuring distance by moving direction of the reflective object, it shall be recommended to set the sensor that the moving direction of the object and the line between emitter center and detector center are vertical.



Distance area vs. moving object example of characteristics are the next page.

The GP2Y0A Series in the flowing figure, it in dictates analog output voltage for each reflective object distance at the detectable area at $X=0\text{cm}$. The reflective object edge shows the change of analog output voltage when it moves from the lens center. For example, the detecting H/L threshold voltage at $X=0\text{cm}$ shall be about 0.95V , if the detecting threshold distance shall be adjusted at $L=30\text{cm}$, then, the detectable area at the reflective object distance $L=10\text{cm}$ has the range (about -1.1cm to $+1.1\text{cm}$) where the characteristics at $L=10\text{cm}$ cross at the threshold voltage (about 0.95V).

Example of the detectable area characteristics of the GP2Y0A Series



3-3. External disturbing light resistance characteristics

If the direct light from light source such as the sun, Tungsten lamp etc. comes into the detector surface, there are cases that it can not measure exactly.
Please consider the design that the direct light from such light source does not come into the detector surface.

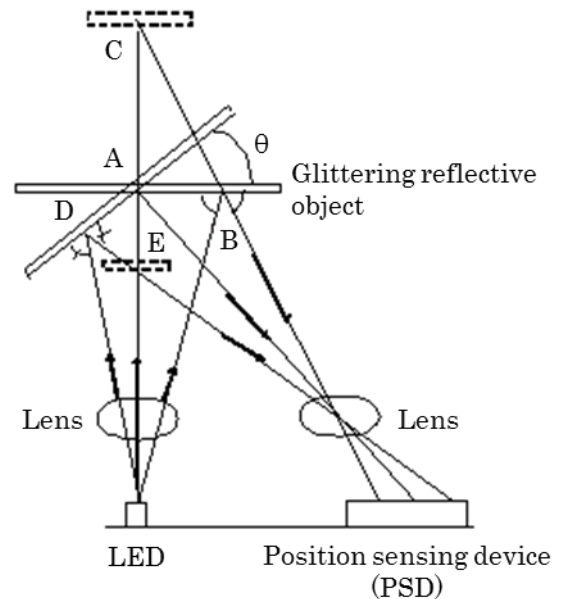
External disturbing light resistance characteristics of the GP2Y0A Series as example is shown in the following page.

3-4. Output at glittering reflective object

3-4-1. Incase of glittering reflective object with no diffused reflective light ingredient (Mirror, Glass etc.)
LED light beam has an expanse.

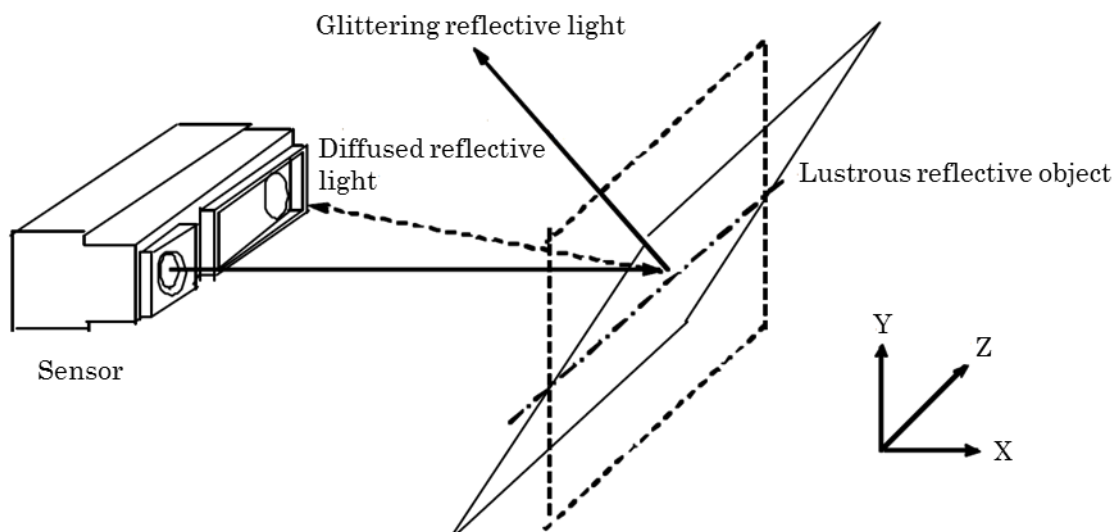
Therefore, incase that there is glittering reflective object at “A” point in the right drawing, the glittering reflected light comes into the detecting device from “B” point and it shall be the same output when there is the diffused lustrous reflective object at “C” point, so that accurate measuring is not possible.

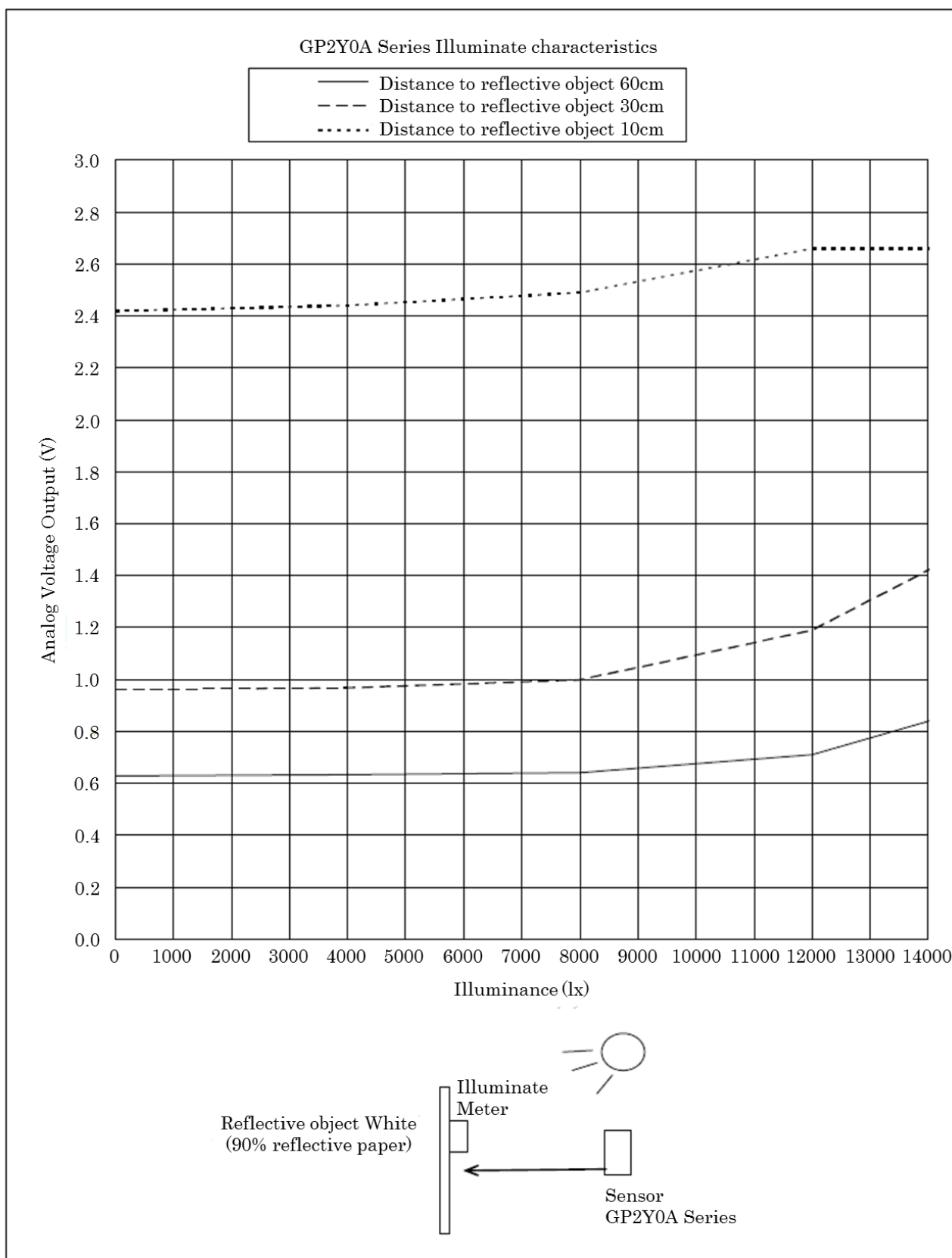
In addition, in case that a glittering reflective object inclines at “A” point as the center by θ , the glittering reflected light comes into the detecting device from “D” point and it shall be the same output when there is the diffused lustrous reflective object at “E” point, so that accurate measuring is not possible.



3-4-2. In case of lustrous reflective object with diffused reflective light ingredient
(painted metal, Colored vinyl etc.)

In case that lustrous reflective object with diffused reflective light ingredient shall be measured, accurate measuring for the distance between the sensor and the object is possible by tilting the lustrous reflective object like the following drawing since the glittering reflective light ingredient runs away to "Y" direction and the diffused reflective ingredient comes into the detecting device (PSD).



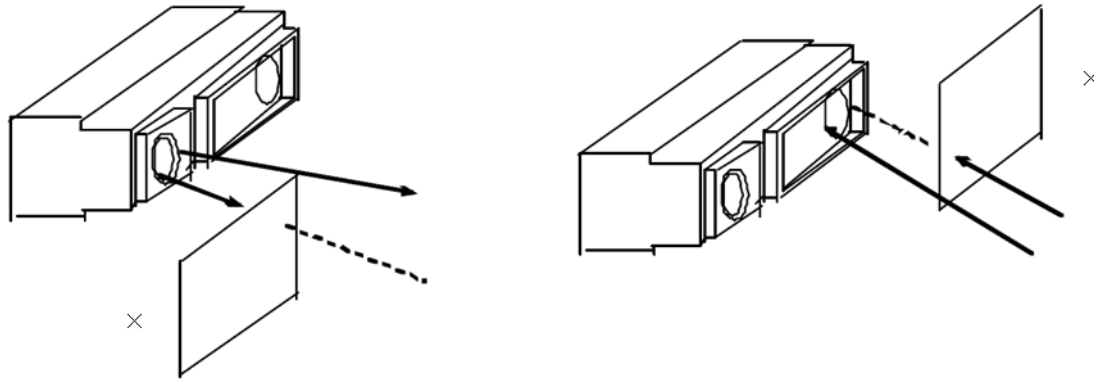


3-5. Ambient temperature

Example of ambient temperature characteristics if the GP2Y0A Series as example is shown in the following page.

3-6. Optical conditions in front of the sensor

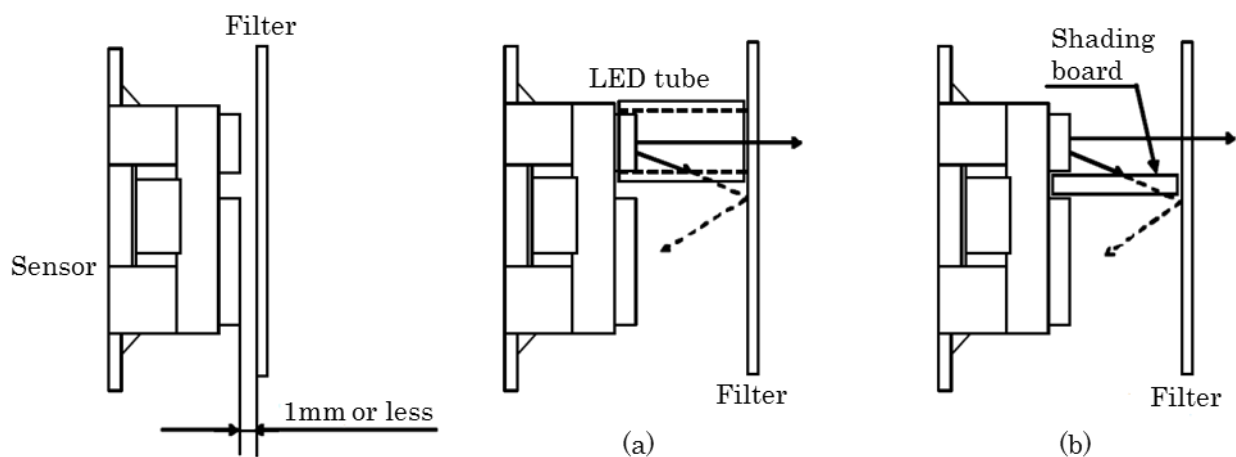
- 1) Please consider that there is no object which interrupt the LED beam from sensor or no object which interrupt the reflective light from the reflective object to the detector portion.



- 2) In case that an optical filter is set in front of the sensor, the filter must have high transmittance with emitted spectrum wavelength of LED ($\lambda=850\text{nm} \pm 70\text{nm}$) which is used in the sensor, please use the filter whose surface is face and back mirror. (When there's like sand brushing on the surface, there is a case that the light is diffused inside of the filter, so the filter is sometimes detected.)

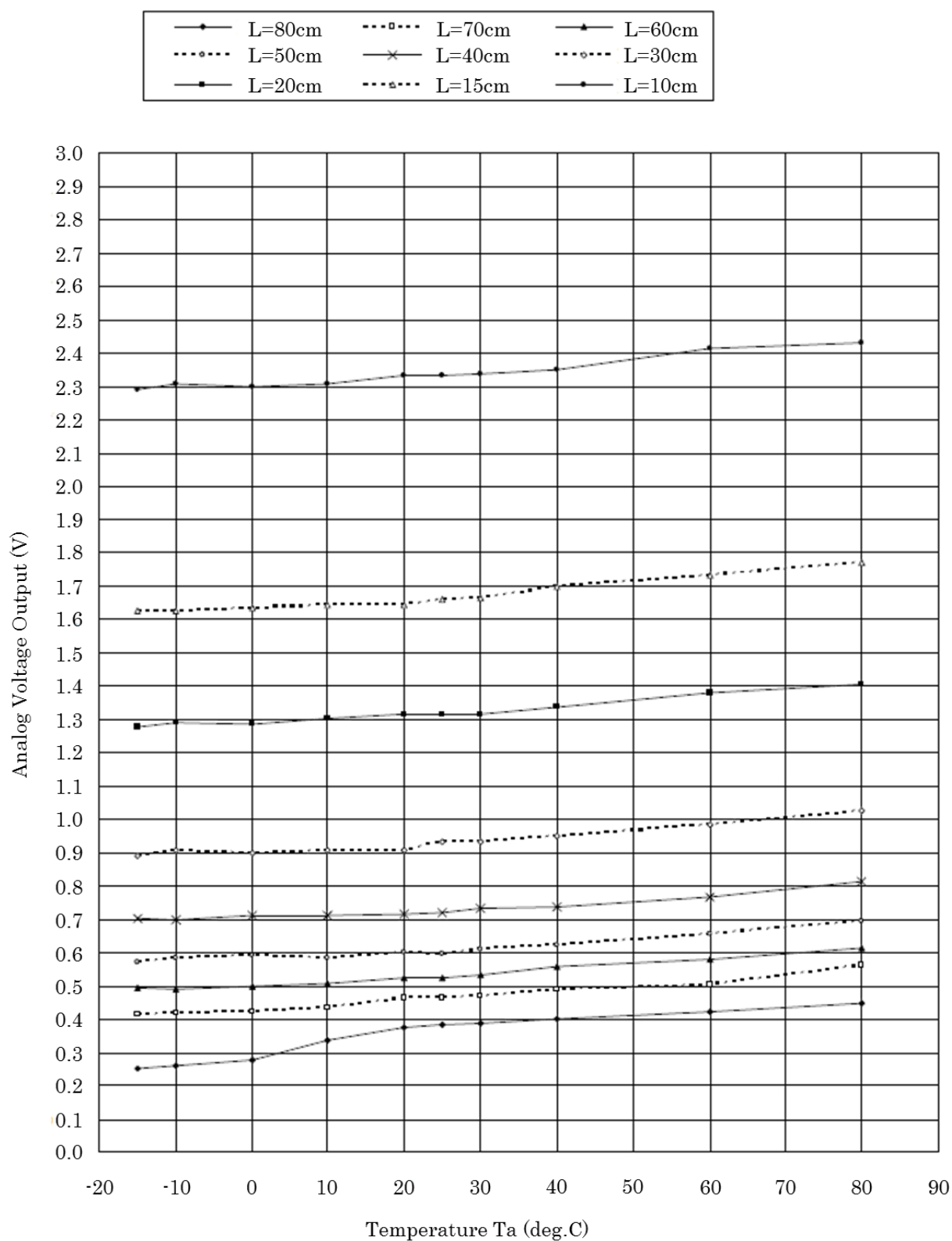
Also, the clearance between the sensor and the optical filter should be set at 1mm or less. In case that the clearance is 1mm or more, in order to avoid the light emitting from the filter to the detector, which is emitted from LED and is glittering reflected by the filter, the following would be recommended.

- a) Set a tube to the filter on emitter side
- b) Set a shading board between emitter lens and detector lens.



When an optical filter is used, please use it after confirming the operation in actual application.

Example of the temperature characteristics of the GP2Y0A Series

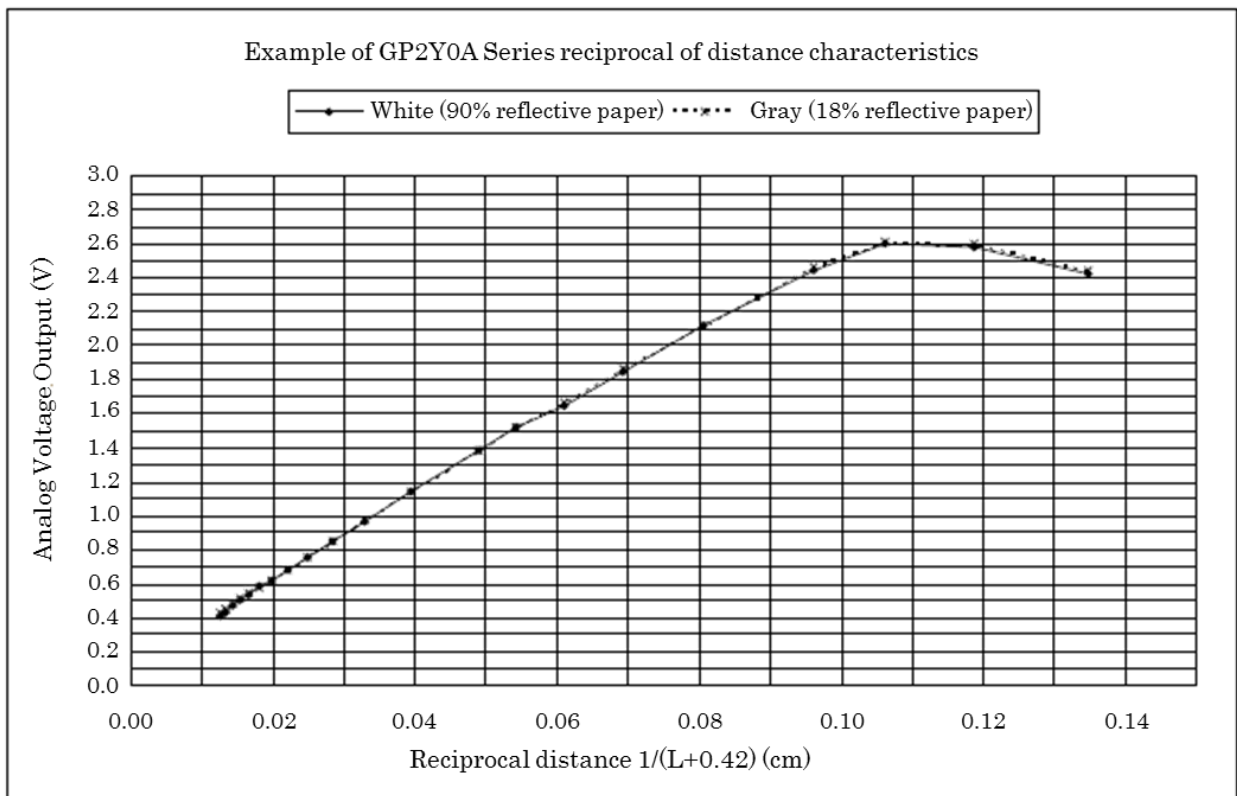
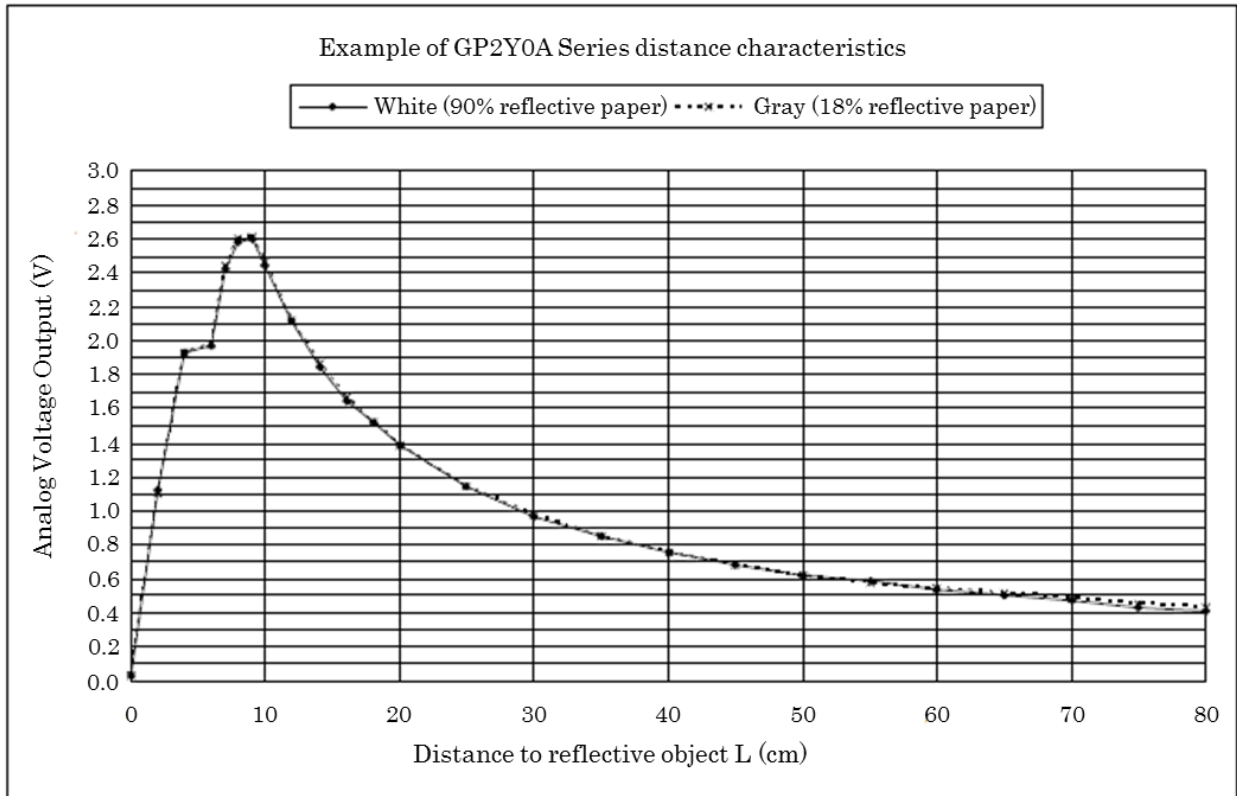


4. Characteristics of GP2Y0A Series / GP2Y0D Series

4-1. Characteristics of GP2Y0A Series

GP2Y0A Series is an analog voltage output type distance measuring sensor and detects the analog voltage depends of the distance from the reflective object.

Output voltage vs. distance and vs. reciprocal of distance examples of characteristics are the following.

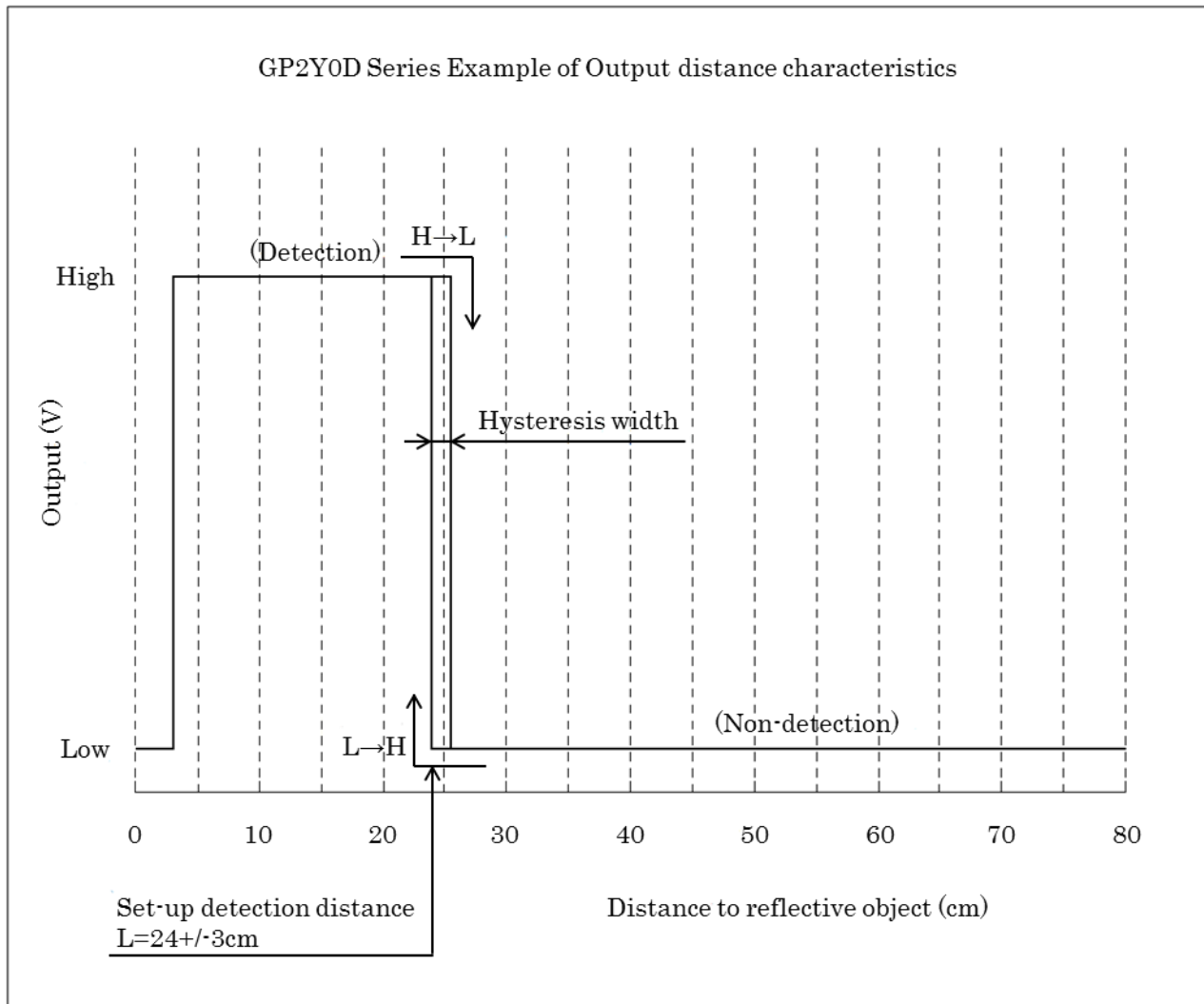


4-1. Characteristics of GP2Y0D Series

GP2Y0D Series is 1 bit (H/L) output performance type distance measuring sensor, and it's able to detect the reflective object at the set-up detection distance ($L=24\pm 3\text{cm}$).

Also, this GP2Y0D Series type has a hysteresis width at the detection distance and has no area, where the output is unstable like the distance measuring sensor currently in use. Therefore, the stable output of H or L is acquired.

Example of output distance characteristics are the following.



5. Supplement

5-1. Modification of the measuring range

The following expression shall be realized by geometrical relation among the distance to the reflective object : "L", Base line length : "A", Focal distance of the lens : "f" and Optical spot position on PSD : "X",

$$X = (A * f) / L$$

For example, when possible measuring range would like to be changed without any change of PSD detector size, it can be realized by changing the base line length : "A" or the focal distance of the lens : "f", Current distance measuring sensors.

