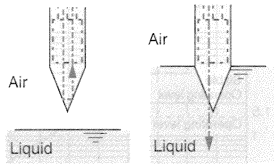
6. Liquid level detection fibre units

Detecting principle of liquid level detection fibre unit

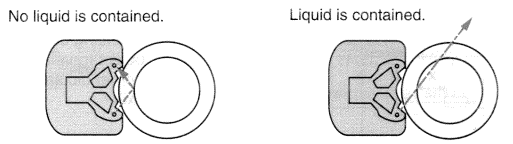
Liquid immersion type (FU-93)

When the fibre unit tip is present in the air, the emitted light is entirely reflected by the fibre unit's PFA sheath and returns back to the receiver because the difference in refraction factor between the PFA sheath and air is large. On the other hand, when the fibre unit tip is immersed in liquid, most of the emitted light is radiated into the liquid and does not return back to the receiver because the difference in refraction factor between the PFA sheath and liquid is small. The FU-93 detects presence or absence of liquid by using the above characteristics.



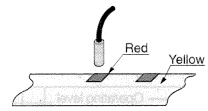
Tube-mountable type (FU-95)

When the tube to which the fibre unit is mounted contains no liquid, the emitted light is reflected by the inside wall of the tube and returns back to the receiver because the difference in refraction factor between the tube and air is large. On the other hand, when the tube contains liquid, most of the emitted light is radiated into the liquid and does not return back to the receiver because the difference in refraction factor between the tube and liquid is small. The FU-95 detects presence or absence of liquid by using the above characteristics.



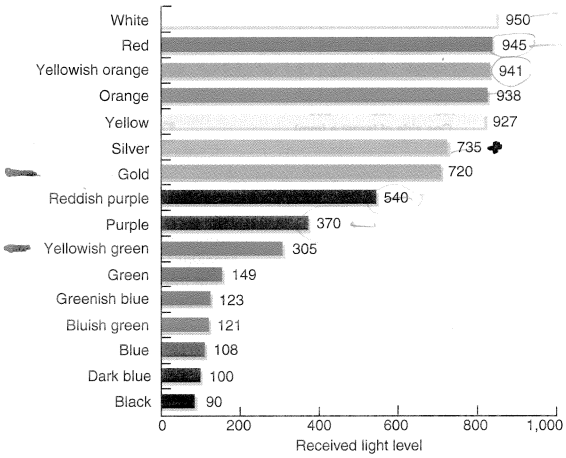
7. Colour differentiation charts

For colour differentiation, choose a light source producing a distinct difference in the reflectance of the 2 colours to be differentiated (i.e. select a light source that allows the sensitivity adjustment trimmer setting positions corresponding to the 2 colours being discriminated to be as far apart as possible).

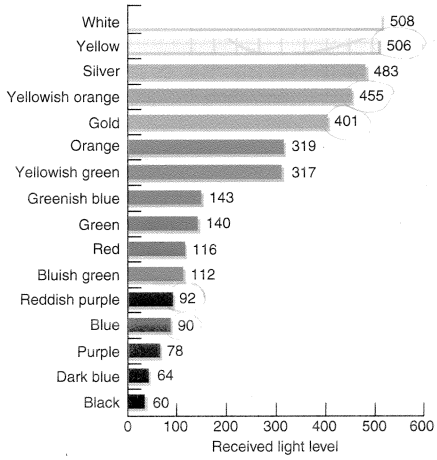


The charts shown here give reference data for colour differentiation. Detection is, however, affected by the surface condition and luminosity of the target. Confirm the sensitivity difference of the colours to be differentiated using the actual target.

Red LED Amplifier: FS-T1, FS-V1
Fibre unit: FU-6F
Setting distance: 15 mm



Green LED Amplifier: FS-T1G
Fibre unit: FU-6F
Setting distance: 5 mm



- The received light level is a value which numerically expresses the light quantity received by the sensor.
- The above are sample colours. Note that they may differ slightly from those used in obtaining the data due to print quality.

How to see the chart

The chart shows the difference in received light quantity between the FS-T1 and FS-V1 (red LED) and the FS-T1G (green LED) manufactured by KEYENCE.

- Guide of colour differentiation

  When the received light level of one colour is 110% or more of the intermediate value of the two colour to be differentiated, the sensor stably detects the light being received. When the received light level is 90% or less, the sensor stably detects the light being interrupted.

Example: To differentiate red and white

From the chart, the FS-T1 (red LED) shows similar received light level of white and red; while the FS-T1G shows some difference. To calculate the excess gain of colour differentiation,

$$\text{Intermediate value} = \frac{\text{Received light quantity with white target} + \text{Received light quantity with red target}}{2}$$

$$= \frac{508 + 116}{2} = 312$$

$$\text{Excess gain of white colour} = \frac{508}{312} \times 100 = 162\%$$

The sensor stably detects the light being received.

$$\text{Excess gain of red colour} = \frac{116}{312} \times 100 = 37\%$$

The sensor stably detects the light being interrupted.
Therefore, the FS-T1G can stably differentiate red and white targets.