NAiS

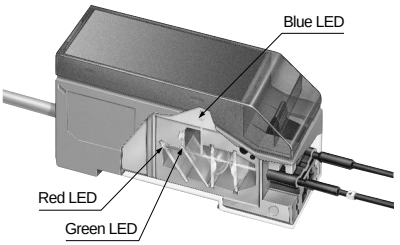
COLOR DETECTION OPTICAL FIBER PHOTOELECTRIC SENSORS

UZF6 Series

PRECISE COLOR RESOLUTION TO COLOR DISCRIMINATION

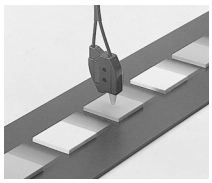
Red, Green, and Blue LEDs

The **UZF6** series are incorporated with the red, green, and blue LEDs as its beam sources that promise longer lifetime and greater immunity against ambient lights than any fluorescent lamp sensor.

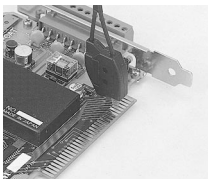


Excellent Color Detectability

Each of red, green, and blue components is digitally processed so precisely that the identical color can be only detected. The **UZF6** series can discriminate between white and yellow or distinguish if a surface is plated or not that have never been solved by conventional fiber sensors.



Yellow article is securely identified.



Dully gold-plated surface is reliably find out.

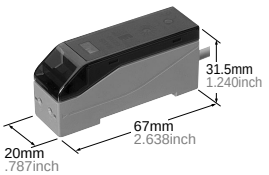
Easy Set Up

Just pressing the button recognizes the target color you want to detect as the criterion. There are two approaches to set the criterion, the manual teaching and the auto-teaching. The tolerance adjuster also allows you to condition how much equivalent colors are identified in 16 grades. (Refer to P7 for easy setting.)

Miniature • Space-effective

The amplifier is only W 20×H 31.5×D 67mm W .787×H 1.240×D 2.638inch in size and fibers head are 7mm .276inch, 8mm .315inch and 12mm .472inch thick, that is mountable in a tight space.

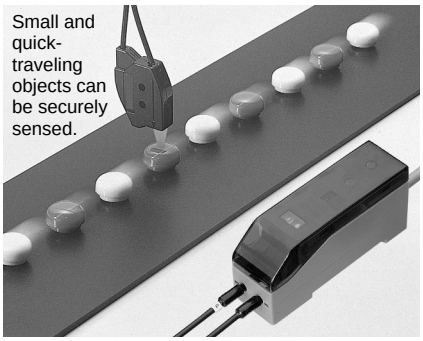
Amplifier



Fiber

High-speed Response Time : 1ms

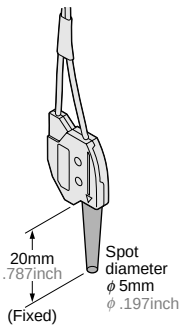
Because of the response time of 1ms, small traveling objects can be sensed even on a high-speed production line.



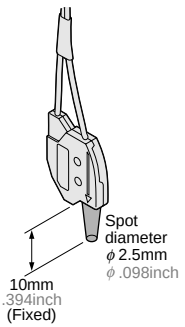
Four Types of Fibers are Available

Select the fiber to meet the size and application of the work that you want to differentiate by color. This allows the certain color differentiation of even small work pieces.

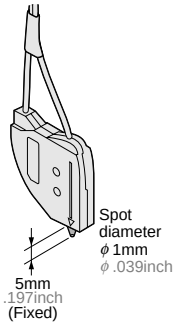
UZFRL51 (Standard type)



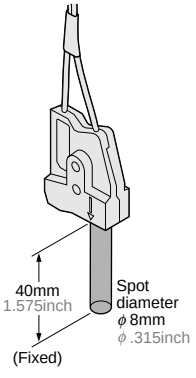
UZFRL52 (High precision type)



UZFRL53 (Extremely small spot type)



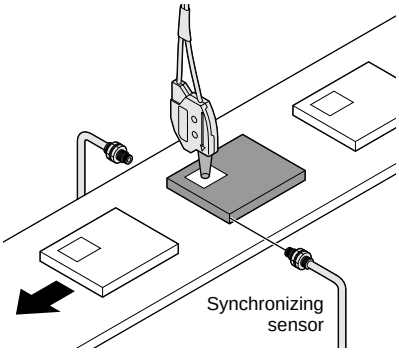
UZFRL54 (Long sensing range type)



APPLICATIONS

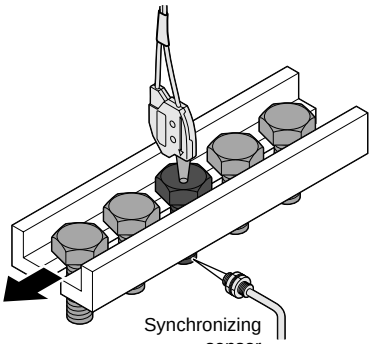
Discriminating labels on various colored objects

Even if objects are colored diversely, the **UZF6** finds out labels.



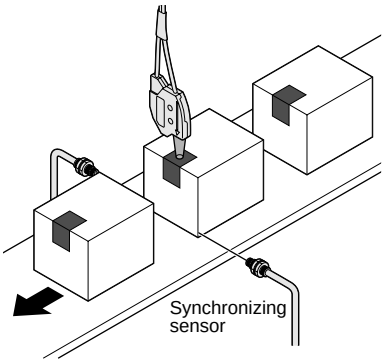
Evaluating if objects are plated or not (*1)

Its precise color resolution discriminates between a bare metal surface and a plated metal surface.



Detecting seals on boxes

Even attractive patterned seals are identified. The **UZF6** inspects the presence of a seal on every package for pharmaceutical, cosmetic, food, tobacco, and software industries.

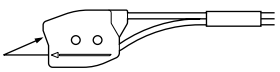


(*1) : The **UZFRL52** or **UZFRL53** fibers head (high precision type and extremely small spot type) are recommended for the applications the **UZF6** has to see specular objects, bearing high reflective indexes, such as evaluating if metal objects are plated or not.

(*2) : The **UZF6** may not identify color in accordance with changes in shape, color, glossiness, size, angle, pattern, or so. Please try to test before actual use and contact us if you have questions.

ORDER GUIDE

Fibers

Type	Appearance	Setting distance	Spot diameter	Fiber cable length	Model No.
Standard type		20mm .787inch (Fixed)	ϕ5mm ϕ.197inch (at the setting distance)	1m 3.281ft	**UZFRL51**
High precision type		10mm .394inch (Fixed)	ϕ2.5mm ϕ.098inch (at the setting distance)		**UZFRL52**
Extremely small spot type		5mm .197inch (Fixed)	ϕ1mm ϕ.039inch (at the setting distance)		**UZFRL53**
Long sensing range type		40mm 1.575inch (Fixed)	ϕ8mm ϕ.315inch (at the setting distance)		**UZFRL54**

Amplifiers

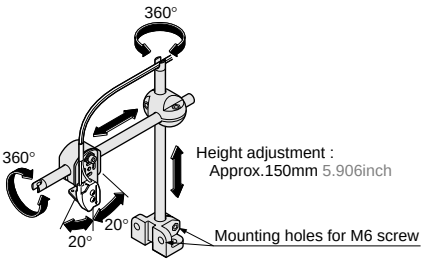
Type	Appearance	Model No.	Emitting element	Output
NPN output type		**UZF60**	Red LED Green LED Blue LED	NPN open-collector transistor
PNP output type		**UZF605**		PNP open-collector transistor

OPTION

Designation	Model No.	Discription
Universal sensor mounting stand	**UZZ24**	Fiber assemblies

Universal sensor mounting stand
• UZZ24

With the lateral arm, the sensor can look down an object.



SPECIFICATIONS

Amplifiers

Type		NPN output type	PNP output type
Model No.		**UZF60**	**UZF605**
Applicable fibers		**UZFRL51, UZFRL52, UZFRL53, UZFRL54**	
Supply voltage		12 to 24V DC±10% Ripple P-P 10% or less	
Current consumption		45mA or less	
Sensing object		Translucent or opaque objects larger than the spot diameter of the applicable fiber	
Sensing output		NPN open-collector transistor • Maximum sink current : 100mA • Applied voltage : 30V DC or less • Residual voltage : 1V or less (at 100mA sink current) 0.4V or less (at 16mA sink current)	PNP open-collector transistor • Maximum source current : 100mA • Applied voltage : 30V DC or less • Residual voltage : 1V or less (at 100mA source current) 0.4V or less (at 16mA source current)
	Utilization category	DC-12 or DC-13	
	Output operation	Switchable either Coincident-ON or Incoincident-ON	
	Short-circuit protection	Incorporated	
Response time		1ms or less (3ms or less when the auto-teaching has been engaged)	
Indicator		Power indicator : Green LED (lights up while the power is supplied, blinks during the auto-teaching) Operation indicator : Red LED (lights up when the output is activated) ❋Both blink alternately when the manual teaching error occurs Both blink simultaneously when the output is short-circuited	
Timer function		Fixed OFF-delay timer approx. 40ms (switchable either effective or ineffective)	
Teaching		Button operation Switchable either the manual-teaching or the auto-teaching	
Tolerance		Adjustable in 16 grades with the tolerance adjuster	
Environmental resistance	Pollution degree	3 (Industrial environment)	
	Ambient temperature	–10 to +55°C +14 to +131°F (No dew condensation nor icing allowed) (*1), Storage : –20 to +70°C –4 to +158°F	
	Ambient humidity	35 to 85%RH, Storage : 35 to 85%RH	
	Ambient illuminance (Extraneous light immunity)	Sun light : 10,000lux at the light-receiving face, Incandescent light : 3,000lux at the light-receiving face	
	EMC	Emission : EN50081-2, Immunity : EN50082-2	
	Voltage withstandability	1,000V AC for one min. between all terminals connected and enclosure (*2)	
	Insulation resistivity	20MΩ or more at 250V DC Megger between all terminals connected and enclosure (*2)	
	Vibration-proof	10 to 150 Hz frequency, 0.75mm .030inch amplitude, and X, Y, and Z directions each for two hours (unenergized)	
	Shock-proof	100m/s^{2}acceleration {approx. 10G}, and X, Y, and Z directions each for five times (unenergized)	
Emitting element		Red LED • Green LED • Blue LED (modulated)	
Material		Enclosure : ABS, Case cover : Polycarbonate, Fiber lock lever : PPS	
Cable		Cabtyre cable 2m 6.562ft long with three 0.2mm^2 conductors	
Cable extension		Maximum extension is 100m 328.084ft overall with an equivalent cable with conductors 0.3mm^{2}or more	
Weight		Approx. 85g 3.00oz	
Accessories		**UZF861** (Mounting bracket) 1pc., Adjusting screw-driver : 1 pc.	

(*1) : The sensor should be used under the ambient temperature from +15°C to +35°C +59°F to +95°F when the tolerance adjuster is set from the 1st grade to the 4th grade, which provide fine color resolutions.
(*2) : The voltage withstandability and the insulation resistivity described in the above table are inherent in the amplifier only.

SPECIFICATIONS

Fibers

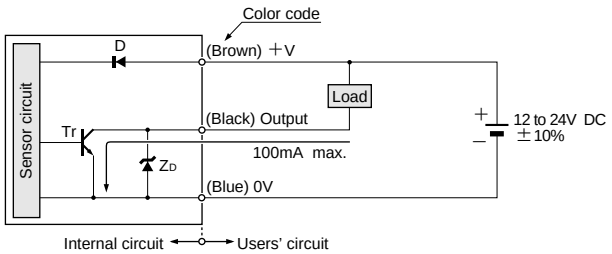
Type	Standard type	High precision type	Extremely small spot type	Long sensing range type
Model No.	**UZFRL51**	**UZFRL52**	**UZFRL53**	**UZFRL54**
Applicable amplifiers	UZF60 and UZF605			
Sensing range (*1)	14 to 24mm .551 to .945inch	8 to 11mm .315 to .433inch	4 to 6mm .157 to .236inch	30 to 50mm 1.181 to 1.969inch
Setting distance	20mm .787inch (Fixed)	10mm .394inch (Fixed)	5mm .197inch (Fixed)	40mm 1.575inch (Fixed)
Spot diameter (at setting distance)	ϕ5mm ϕ.197inch	ϕ2.5mm ϕ.098inch	ϕ1mm ϕ.039inch	ϕ8mm ϕ.315inch
Allowable bending radius	R25mm or more (*2)			
Fiber cable length	1m 3.281ft			
Ambient temperature	–20 to +70°C –4 to +158°F (No dew condensation nor icing allowed), Storage : –20 to +70°C –4 to +158°F			
Ambient humidity	35 to 85%RH, Storage : 35 to 85%RH			
Material	Fiber core : Acrylic, Sheath : Polyethylene, Fiber head : Polycarbonate, Lens : Polyarilate (*4)			

(*1) : The sensing range stands for the detectable range with white paper that the sensor has been taught with white non-glossy paper 50×50mm 1.969×1.969inch at the rated setting distance with the 16th grade of tolerance.
(*2) : If the fiber cable is bent at R25mm .984inch or less, the detectability may deteriorate.
(*3) : With the specular objects bearing high reflective indexes, such as mirrors, plated metals, or metal foils, the **UZFRL51** and **UZFRL54** fibers may not be taught properly or sense stably. Use the **UZFRL52** and **UZFRL53** fibers to adapt the **UZF6** for such applications, and position the fiber head perpendicular to the object surface.
(*4) : Lens material of **UZFRL54** is Acrylic.

I/O CIRCUIT AND WIRING DIAGRAMS

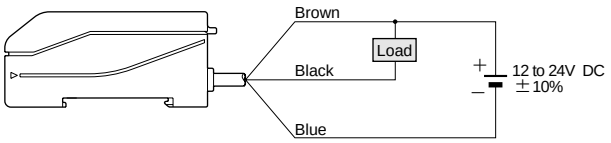
UZF60 NPN output type

I/O circuit diagram



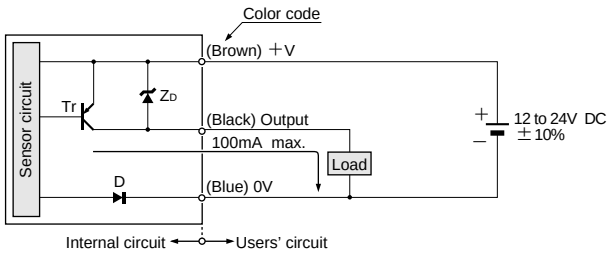
Symbol . . . D : Reverse polarity protection diode
Z_D: Surge absorption zener diode
Tr : NPN output transistor

Wiring diagram



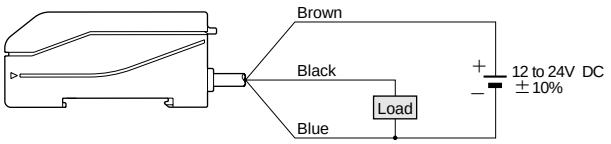
UZF605 PNP output type

I/O circuit diagram



Symbol . . . D : Reverse polarity protection diode
Z_D: Surge absorption zener diode
Tr : PNP output transistor

Wiring diagram



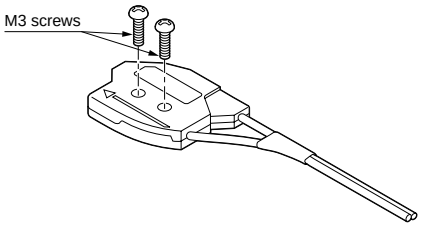
PRECAUTIONS FOR PROPER USE

These products are **not** safety sensors and are **not** designed or intended to be used to protect life and prevent bodily injury or property damage.

Fiber

Mounting

• Use two M3 screws at the tightening torque of 0.5N•m {5.1kgf•cm} or less.



• The fiber heads (**UZFRL51**, **UZFRL52**, **UZFRL53** and **UZFRL54**) can be closely mounted together as their spots do not overlap each other.

Others

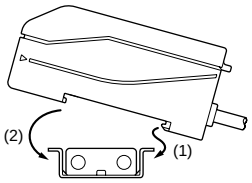
• The detectability may deteriorate if the fiber cable is bent at the allowable bending radius or less.
• If the fiber head is spoilt, wipe it lightly with a soft cloth without any chemical agent.
• After teaching, do not move or bent the fiber cable. If so, the operation may become unstable.
• Keep the fiber hend surface intact. If it is scratched or spoiled, the detectability may deteriorate.
• Keep the fiber head not to be exposed to water splash or mist. A water drop on the fiber head annihilates the sensing.
• Do not expose the fiber cable to any organic solvent.
• Keep the receiving face of the fiber head not to be exposed to any ambient light source.
• Do not apply excessive tensile force to fiber cable.

Amplifier

Mounting

How to mount the amplifier

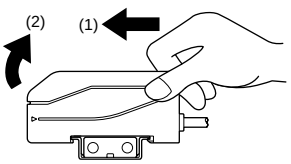
(1) Hook the rear part to the attached mounting bracket (**UZF861**) or DIN rail.
(2) Press the amplifier down on the bracket or DIN rail.



DIN rail or the attached mounting bracket

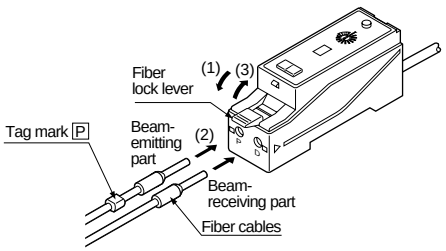
How to remove the amplifier

(1) Push the amplifier forward.
(2) Remove it by lifting the front part.

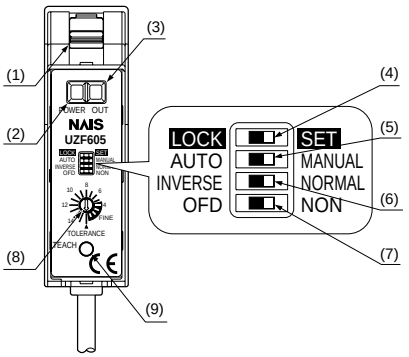


How to connect fiber cables

(1) Unlock the fiber lock lever by lowering it.
(2) Insert the beam-emitting fiber cable tagged with the mark "P" into the beam-emitting part "P", and the beam-receiving fiber cable into the beam-receiving part "D". They should be inserted gradually until the position where they stop. If the emitting fiber cable and the receiving fiber cable are reversely inserted no proper operation is obtained.
(3) Lock the fiber lock lever to the original position.



Designation and function



	Designation	Description	
(1)	Fiber lock lever	Locks or unlocks fiber cables.	
(2)	Power indicator (Green LED)	Lights up while the power is supplied, blinks during auto-teaching.	Both blink alternately when a manual teaching error occurs. Both blink simultaneously when the output is short-circuited.
(3)	Operation indicator (Red LED)	Lights up when the output is activated.	
(4)	Teaching protect switch	The teaching button is ineffective if the switch is set on "LOCK", but is effective if the switch set is on "SET".	
(5)	Setting mode selection switch	Manual teaching is selected if the switch is set on "MANUAL". Auto-teaching is selected if the switch is set on "AUTO".	
(6)	Output operation mode switch	The Coincident-ON is selected if the switch is set on "NORMAL". The Incoincident-ON is selected if the switch is set on "INVERSE".	
(7)	Timer operation mode switch	The OFF-delay timer is ineffective if the switch is set on "NON", but effective if the switch is set on "OFD".	
(8)	Tolerance adjuster	Determines the tolerance of equivalence in the reference color that the sensor has been taught in 16 grades.	
(9)	Teaching button	Teaches the sensor the target color as the criterion (reference color). While the button is held, the sensor emits blue, red, and green beams one after the other.	

Others

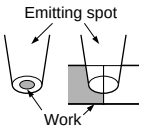
• The transient time duration is 0.5sec. after power-up.
• Periodical teaching should be done to maintain the stable sensing conditions.

PRECAUTIONS FOR PROPER USE

Amplifier

Setting

- During teaching the **UZF6** resolves a color projected by the spot into red, green, and blue components that are processed as numerical values and stored into the EEPROM memory are. If during teaching the spot area is not filled by one flat color, such as when the target objects are smaller than the spot area, or are partly projected then colors other than the one you want to detect may also be sensed. Make sure that objects fulfill the whole spot area during teaching as well as sensing.
- The taught data is saved in the EEPROM even while the sensor is powered off. However, the guaranteed rewrite operations are limited to 100,000 times because of its lifetime.
- To manipulate the DIP switches, use a pair of tweezers, etc, with a tip width of about 0.8mm .031inch.



• Procedure

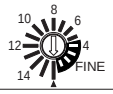
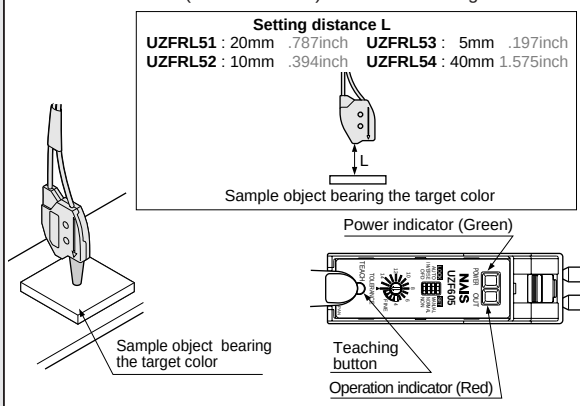
1	2	3	4
Setting reference color	Setting output operation	Setting timer operation	Setting tolerance

1. Setting reference color

• Prepare a sample object bearing the target color you want to detect. Choose manual teaching or auto-teaching.

Setting by manual-teaching

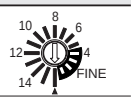
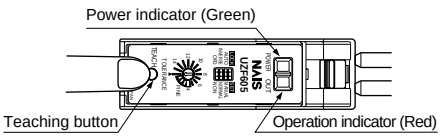
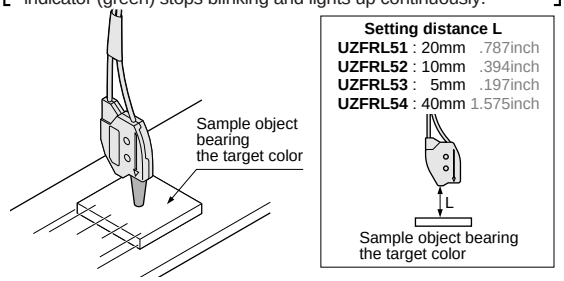
• Teaching the target color on a stationary object.

Procedure	Operation
(1)	Set the tolerance adjuster at the 16th grade (▲ mark) with the adjusting screw-driver. 
(2)	Set the teaching protect switch on “SET”. 
(3)	Set the setting mode selection switch on “MANUAL”. 
(4)	Place the sample object bearing the target color under the fiber head. The surface of the sample object must face the fiber head perpendicularly (at right angle to the beam axis) and the target color must fulfill the whole spot area. Depress the teaching button, then the sensor recognizes the target color as the criterion (reference color) and starts sensing.  *When the teaching fails, the operation indicator (red) and the power indicator (green) blink alternately. Make sure that the sample object is opposed to the fiber head perpendicularly (a right angle to the beam axis) at the proper setting distance, then teach the sensor again.
(5)	Set the teaching protect switch on “LOCK”.  *After the teaching, try to test the sensing. If the sensor identifies other similar colors that you do not want to detect, set the tolerance to be finer. (Refer to “**4. Setting tolerance**” (P.7) for more details.)

Setting along auto-teaching

• Teaching the target color on a moving object.

[If the sample object includes colors other than the target color, perform manual teaching. The sample object must contain only one flat color for correct auto-teaching.]

Procedure	Operation
(1)	Set the tolerance adjuster at the 16th grade (▲ mark) with the adjusting screw-driver. 
(2)	Set the teaching protect switch on “SET”. 
(3)	Set the setting mode selection switch on “AUTO”. 
(4)	Depress the teaching button and release it. Then, the sensor enters into the waiting state. [The sensor recognizes the background color, then enters into the waiting state at the same time as the power indicator (green) starts blinking.] 
(5)	Run the sample object. [・The sensor recognizes the first coming color other than the background color as the criterion. ・The traveling speed must satisfy the following two conditions. (1) More than 300mm 11.811inch/sec. (2) The target color must be exposed to the spot for 3ms or more. ・After the sample object moves away, the sensor takes approx. 50ms to perfect the teaching. The sensor is not operable in this period. ・The sensor automatically starts sensing after recognizing the target color as the criterion (reference color), and the power indicator (green) stops blinking and lights up continuously.]  *If the teaching fails, the power indicator (green) keeps blinking. The sensor still stays in the waiting state. Make sure of the perpendicularity of the sample object to the beam axis, the setting distance between the fiber head and the sample, the time duration the sample passes through the beam, and the consistency of the background color during the teaching. Then, run the sample object again. *If your target color is similar to the background color, the teaching may fail by the tolerance at the 16th grade. Make the tolerance of the background color narrower with the tolerance adjuster from the 1st to the 15th grade according to the contrast between these colors. Then, run the sample object again. (Refer to “**4. Setting tolerance**” (P.7) for more details.)
(6)	Set the teaching protect switch on “LOCK”. 

PRECAUTIONS FOR PROPER USE

Amplifier

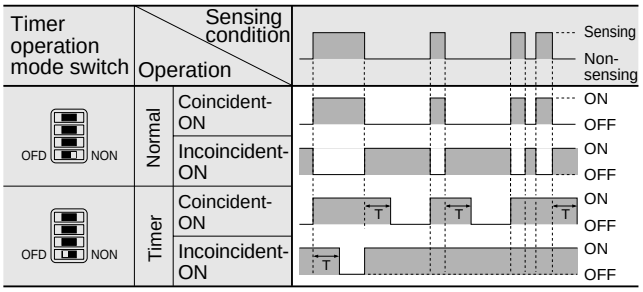
2. Setting output operation

• Either Coincident-ON or Incoincident-ON can be selected.

Output operation	Operation	Output operation mode switch
Coincident-ON	Set the output operation mode switch on "NORMAL".	
Incoincident-ON	Set the output operation mode switch on "INVERSE".	

3. Setting timer operation

• The **UZF6** amplifier is incorporated with the OFF-delay timer fixed for approx. 40ms. When the timer operation mode switch is set on "OFD", the OFF-delay timer is engaged on the output. It is useful if the output signal responds so quickly, because of sensing small and fast traveling objects or the like that a connected device cannot respond.

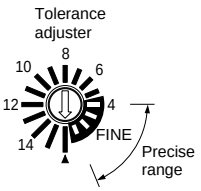


Timer : T=Approx. 40ms

4. Setting tolerance

• The tolerance adjuster determines the tolerance of equivalence with respect to the reference color in 16 grades.

• Set the arrow mark of the adjuster to the desired grade from 1st to 16th.

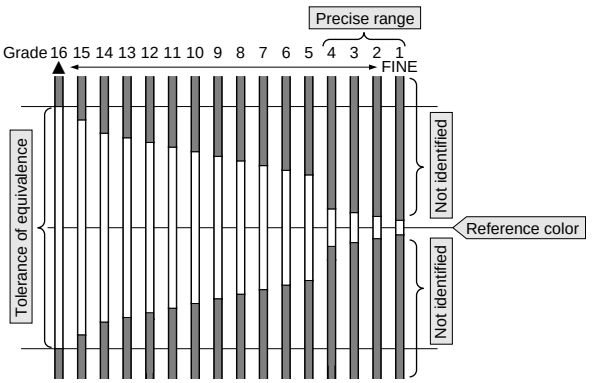


• When the grade is changed, the output is turned ON, once, for resetting.

• Even if the grade is changed, the reference color taught before does not change until the sensor is taught again.

• If the target color is similar to the background color, the auto-teaching may fail. Set the tolerance adjuster at a lesser grade and do manual-teaching.

• The tolerance of equivalence becomes severer from the 16th to the 5th grade in the relative rate among red, green, and blue components, and from the 4th to the 1st grade in the amount of reflected beam as well. Within the precise range from the 4th to the 1st grade, glossiness and lightness of color can be identified.



Tolerance in precise range (4th to 1st grade)

• Within the precise range, color is identified in all dimensions of hue, chroma, and lightness, so the sensor can discriminate the reference color from others even with subtle difference in glossiness or density.

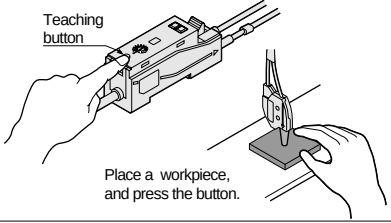
• After the tolerance is set within the precise range, the sensor should be used under the ambient temperature of +15 to +35°C +59 to +95°F. Also, periodical teaching should be done to maintain the stable sensing conditions. Before teaching, wait for the warm-up time of approx. 10min. after power-up.

• Carefully inspect the environment, an intense ambient light or a vibration over the certain degree that may affect the detectability.

5. Easy setting
Criterion

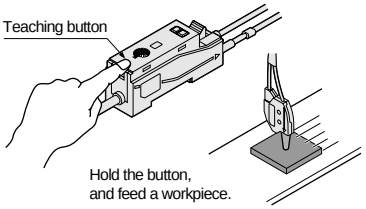
Manual teaching

Place a workpiece bearing the target color under the fiber head and press the teaching button.



Auto-teaching

Keep depressing the teaching button until a workpiece bearing the target color travels beyond the fiber head.



Tolerance adjustment

Severe judgment

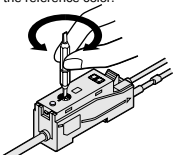
Tolerance adjuster

Turn the adjuster cloc-kwise. The closer to “FINE” it is, the more fine tolerance can be set.

Narrow tolerance

Reference color (Criterion)

The adjuster determines the tolerance of equivalence in the reference color.



Rough judgment

Tolerance adjuster

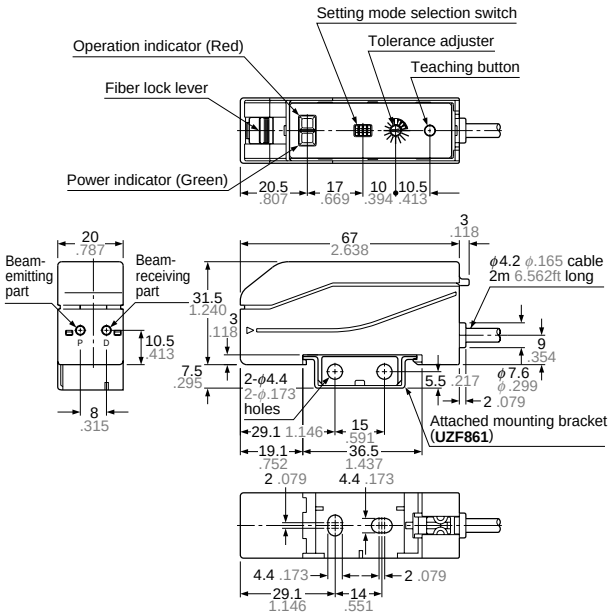
Turn the adjuster counterclock-wise. The clos-er to the “▲” mark it is, the more coarse tolerance can be set.

Wide tolerance

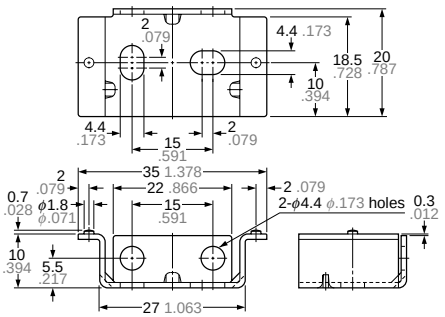
DIMENSIONS (Unit: mm inch)

UZF60 UZF605 Amplifier

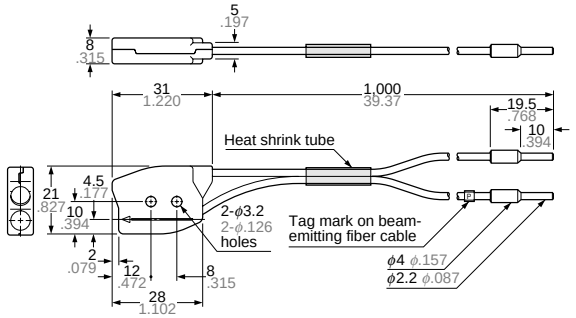
Assembled dimensions with attached mounting bracket



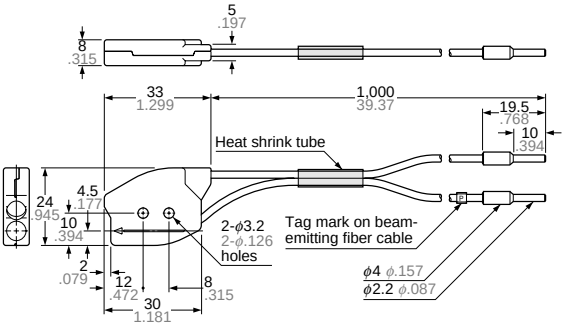
UZF861 Mounting bracket (Accessory for amplifier)



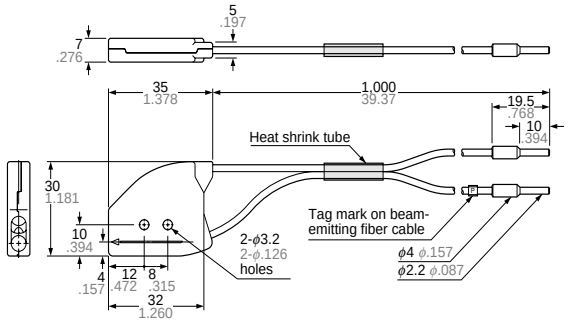
UZFRL51 Fiber



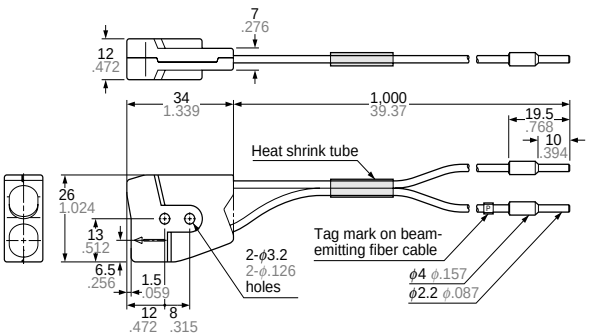
UZFRL52 Fiber



UZFRL53 Fiber



UZFRL54 Fiber



Please contact .....

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