Fiber optic sensor

PG series

INSTRUCTION MANUAL

Thank you for purchasing HANYOUNG product.
Please check whether the product is the exactly same as you ordered.
Before using the product, please read this instruction manual carefully.
Please keep this manual where you can view at any time

HANYOUNG NUX

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Safety information

Alerts declared in the manual are classified to Danger, Warning and Caution by their criticality

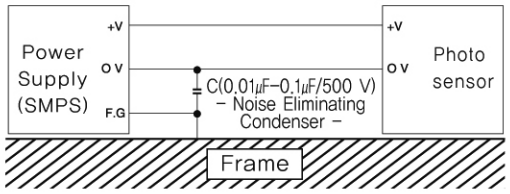
⚠ DANGER	DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury
⚠ WARNING	WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury
⚠ CAUTION	CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury

⚠ Warning

- Since this product is not designed as a safely used device the user must install double safety equipment when this product is used for equipment with possible fatal accident or large property damage.

⚠ Caution

- The contents of this manual may be changed without prior notice.
- If you use the product with methods other than specified by the manufacturer, there may be bodily injuries or property damages.
- Avoid continuously switching the power source On and Off.
- Use a dry cloth to wipe off the substance when cleaning the lens or cases. Never use thinner or organic solvents.
- Do not use this product at any place with much dust, vibration or impact.
- Before inserting power source, make sure that the circuit wiring is properly connected.
- In the case of wiring loaded inductors such as DC Relay and others to output, use diode, varistor and others to prevent surge.
- To avoid malfunction caused by noise, do not put high voltage or power line with sensor wire in a same conduit
- Make its wiring be as short as possible and wire extension shall be within 100 m.
- Consider the fact that the sensing distance may be varied in accordance with the size, color, surface condition, material, glossy, non-glossy or others of a sensing object.
- Prevent strong disturbance light such as sunlight and others which directly enter into the directional angle of the sensor by putting a glare shield.
- In the case of using multiple sensors (more than 2 sensors), there is a possibility of malfunction caused by mutual interference so, for Through-Beam type, sensors shall be installed in a divergent way or there shall be proper distance between them.
- When using the Switching Power Supply as the power source, earth the Frame Ground (F.G) terminal and be sure to connect the noise-eliminating condenser between 0 V and F.G.



※ If you do not follow the contents described in the safety information then it is possible to be a cause of the product's malfunction so please follow them.

Suffix code

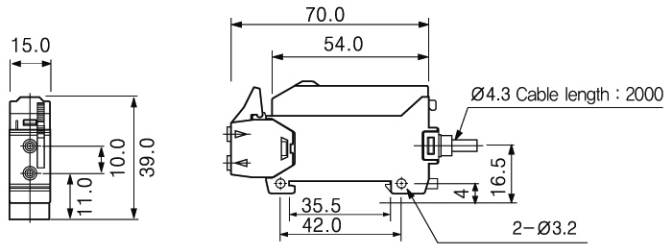
Model	Code		Information
PG-	□	□	Optical fiber sensor
Function	TR		Universal type
	TAR		Multi-function type (Timer and stability output)
Output		N	NPN open collector output
		P	PNP open collector output

Specification

Model	NPN	PG-TRN	PG-TARN
	PNP	PG-TRP	PG-TARP
Function		Selectable by dip switch (Normal/ON-Delay/OFF-Delay) 40ms (fixed)	selectable by dip switch (Normal/ON-Delay/OFF-Delay/One-Shot) 1 ㎳ ~ 5000 ㎳ (adjustable)
Sensing method		Through beam type, Diffuse reflection type(depending on optical fiber cable type)	
Power supply voltage		12 - 24 V d.c ±10 %	
Current consumption		35 ㎃ max	
Output	Control	NPN/PNP Voltage output , Load current : 200 ㎃ (30 V d.c) max, Residual voltage : 1 V d.c max	
	Stability	-	NPN/PNP Voltage output Load current : 50 ㎃(30 V d.c) max Residual voltage : 1 V d.c max
Operation mode		Light ON / Dark ON switch selection operating Normal or ON/OFF delay Switch selection operating	
Response time		Max. 1 ㎳	
Hysteresis		10 % max of sensing distance (Reflection)	
Light source		Red LED(630 ㎚)	
Indicators		Operation indicator : Red LED, Stability indicator : Green LED	
Sensitivity adjustment		Coarse Adjuster, Fine Adjuster	
Protection circuit		Reverse polarity protection, overcurrent protection (except for stable output of multi-function type)	
Ambient illumination		Sunlight : 11,000 lx max, Incandescent lamp : 3,000 lx max	
Ambient temperature		Operating : -20 ~ 60 ℃, Storage : -25 ~ 70 ℃(Without condensation)	
Ambient humidity		35 ~ 85 % RH(Without condensation)	
Protective structure		IP40	
Insulating resistance		20 ㏁ min (500 V d.c Mega standard)	
Dielectric strength		1000 V a.c 50/60 Hz for 1 min	
Vibration resistance		10-55 Hz double amplitude 1.5mm, X,Y,Z each direction for 2 hours	
Shock resistance		500 ㎨ X,Y,Z each direction for 3 times	
Connection method		Cable extended type (3P, 2 m)	Cable extended type (4P, 2 m)
Weight		Approx. 120 g	
Accessories		Sensitivity adjust driver	

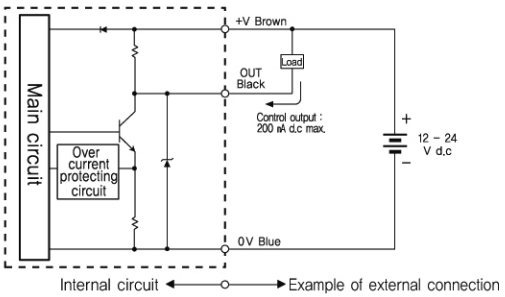
Dimension

[Unit : mm]

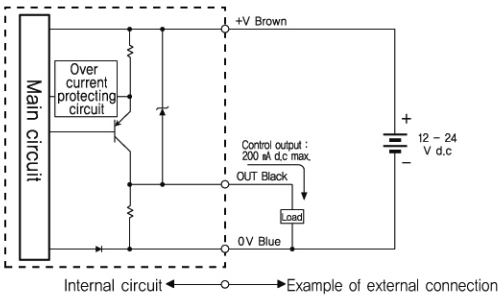


Output circuit diagram

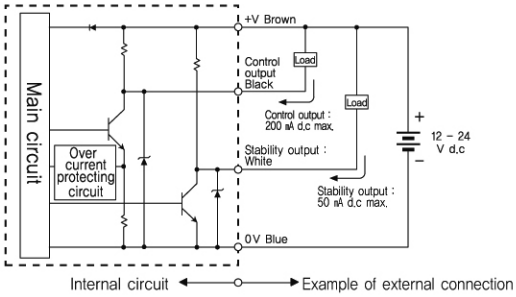
■ PG-TRN



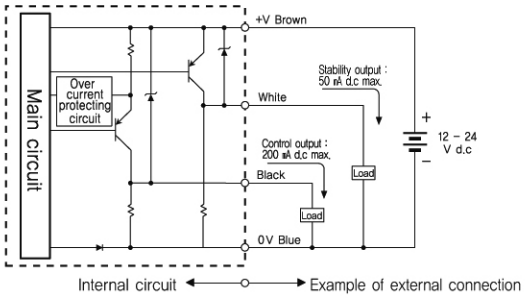
■ PG-TRP



■ PG-TARN

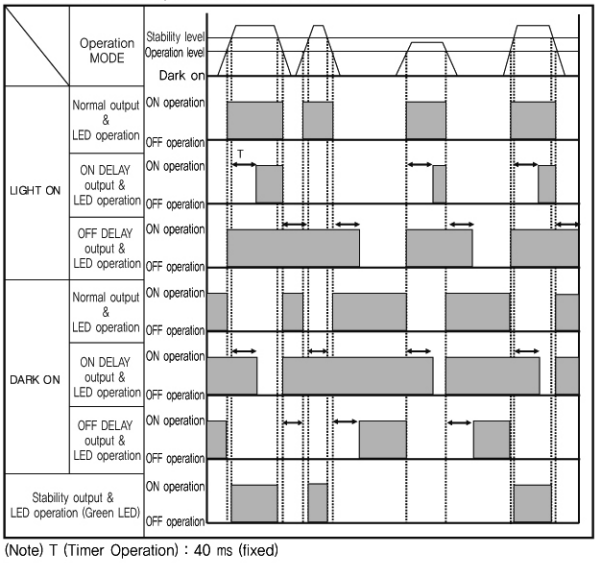


■ PG-TARP



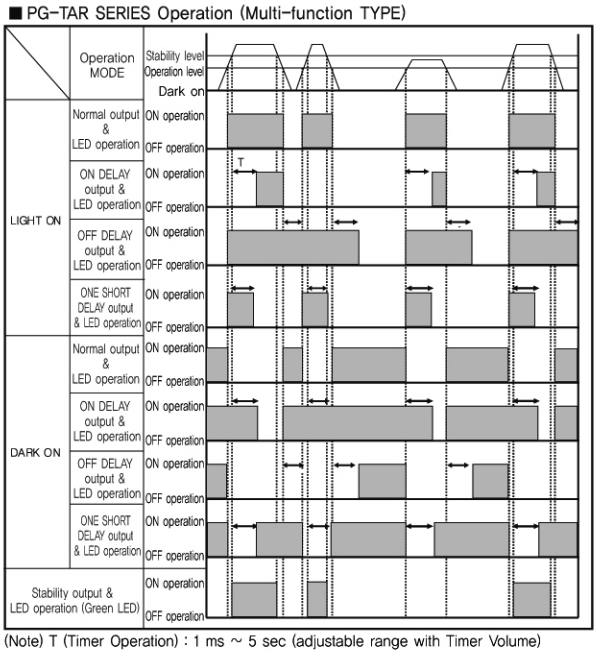
Timer Operation Chart

■ PG-TR SERIES Operation (Universal TYPE)



(Note) T (Timer Operation) : 40 ms (fixed)

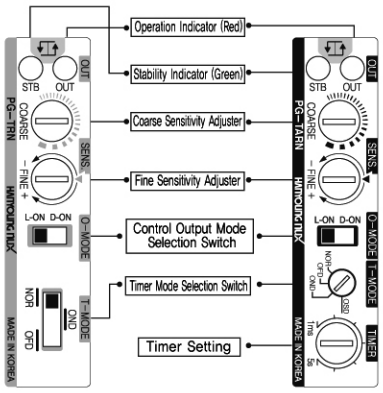
■ PG-TAR SERIES Operation (Multi-function TYPE)



(Note) T (Timer Operation) : 1 ms ~ 5 sec (adjustable range with Timer Volume)

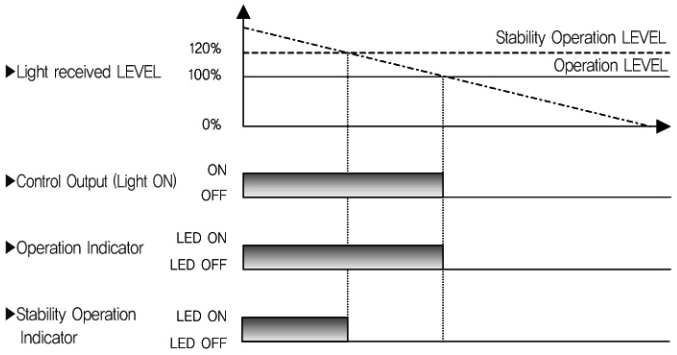
Part Name

■ PG-TR□ ■ PG-TAR□



Mode		Description
STB(Stability)	Stability Operation Indicator	Stability indicator (Green LED) is on when it maintains the stability operation level.
O-MODE (Operating mode)	Operating Mode	L-ON(Light-ON) : this operates when Light-ON D-ON(Dark-ON) : this operates when Dark-ON
T-MODE (Timer mode)	Timer Mode	NOR(Normal mode) OND(ON-Delay mode) OFD(OFF-Delay mode) OSD(One-shot delay mode)
TIMER	Timer Time Setting	40 ms fixed (PG-TR) 1 ms ~ 5000 ms adjustable (PG-TAR)

Description of Operation/Stability Indicator and Output



- Stability indicator is ON when the light received level is more than 20% above the operation level.
- The stability indicator shows the margin of the operation status. If the sensor detects an object when the stability indicator is OFF, there is a possibility of malfunction.
- When the light received level is less than 120% of the operation level due to deviation of the optic axis or a wrong sensitivity adjustment, the stability indicator is OFF.
- Therefore, we recommend both the operation indicator (Red LED) and the stability indicator (Green LED) are ON when adjusting sensitivity.

Sensitivity Adjusting Method (for Universal Type and Multi-function Type)

· Please use after adjusting the most appropriate sensitivity for your application as following the steps of adjusting sensitivity like the below.
· Please adjust the sensitivity as confirming the output indicator.
· But the output indicators are depending on the condition of sensing and function, please refer to the following steps.

Step	Sensing Method		Adjusting Method	COARSE Sensitivity Adjuster	FINE Sensitivity Adjuster	Output Indicator OUT
	Diffuse Reflection	Through Beam				
1	Initial Setup		Turn the coarse adjuster counterclockwise until it cannot turn anymore and set the fine adjuster in the middle of its range. Set L-ON (Light ON) in the control output mode selection switch and set NOR (Normal) in the timer mode selection switch. No need to adjust for the timer setting at this time.	MIN	(-) (+)	○ OUT ○ STB
2	Light received	Light received	After setting light received condition, turn the coarse adjuster clockwise gradually. Set its position where the operation indicator (Red LED) turns ON. We recommend that the stability indicator is also ON.	MIN	(-) (+)	● OUT ◉ STB
3	Light received	Light received	Leave the coarse adjuster for now and turn the fine adjuster to (-) direction gradually until OUT (Red LED) is OFF. From the OFF position, turn the fine adjuster to (+) direction gradually until OUT (Red LED) is ON. This position is called Ⓐ.	No need to adjust the coarse adjuster.	Ⓐ ON, OFF, (-) (+)	● OUT ○ STB
4	No Light received	No Light received	After setting the sensing condition as no light received condition, turn the fine adjuster to (+) direction until OUT (Red LED) is ON. From the ON position, turn the fine adjuster to (-) direction gradually until OUT (Red LED) is OFF. This position is called Ⓑ.		OFF Ⓑ, ON, (-) (+)	○ OUT ○ STB
5	—	—	Set the fine adjuster at the middle of Ⓐ and Ⓑ.		Ⓐ Ⓑ (-) (+)	● OUT ◉ STB
6	Light received	Light received	If the above adjusting method did not work, set the fine adjuster the max position of (+) direction and then follow step 1 again.	MIN	(-) (+)	○ OUT ◉ STB

(Note) • In step 4, the max position of (+) direction is Ⓑ when OUT (Red LED) is not ON.
• Timer setting is only available in multi-function type (PG-TAR series)
• STB (Green LED) is stability indicator in the output indicators.
(But, only stability "indicator" is available for universal type (PG-TR series) and stability "output" is available for multi-function type (PG-TAR series))

Regarding optical fiber cable

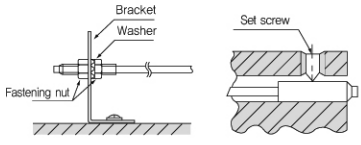
■ Notes for when installing optical fiber cable

① Like [Picture] below, insert an optical fiber's hood (head) into a bracket after adjusting an appropriate height and then fasten it with nuts. The head part should be installed horizontally except when it needs to be installed in a different direction.

② When fastening the fiber unit with an iron pipe, insert the fiber unit into the iron pipe which the inner diameter is about 20% greater than the diameter of the hood and then fasten with a set screw at the hood area.

③ When installing fiber unit, please follow the tightening torque listed in [Table 1] below.

[Bolt installation type] [Cylindrical type]



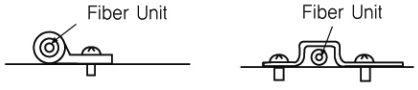
[Picture]

[Table 1]

Fiber Unit	Tightening Torque
M3 bolt type M4 bolt type	0.78 N M(8 kgf cm) max.
M6 bolt type	0.98 N M(10 kgf cm) max.
2 ㎜ cylindrical type 3 ㎜ cylindrical type	0.29 N M(3 kgf cm) max.

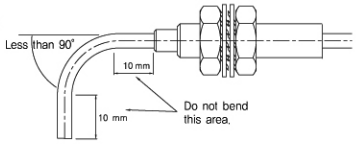
④ Please use a proper tool according to a nut specification.

⑤ Do not apply too much compressive loads.

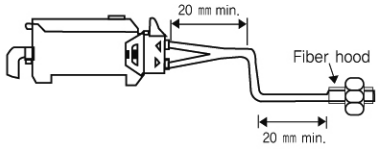


⑥ The bending radius of the fiber unit cable should be as large as possible.

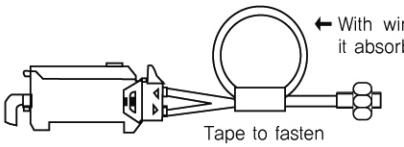
⑦ Please be careful when making the bending radius small that the sensing distance is reduced and this leads a cause of malfunction



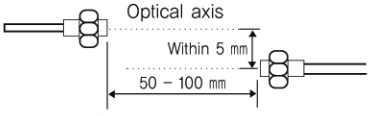
⑧ Do not pull or apply an excessive amount of force to the fiber hood.



⑨ Please follow the picture shown on the right regarding the bending or folding of the fiber unit cable due to the vibration.

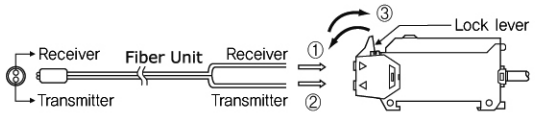


⑩ Align each optical axis of fiber within ±5 ㎜ max.



■ Optical fiber cable connection

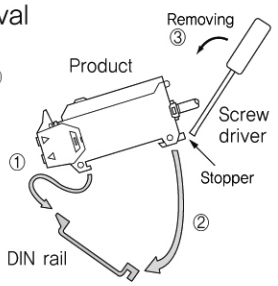
① Push the lock lever downward.
② Insert the optical fiber cable slowly into the inlet. (Insert depth: approx. 21 ㎜)
③ Return the lock lever to the original position.
④ Please be careful that the sensing distance is reduced if the insert depth does not reach an appropriate depth.



■ Product installation and removal

● When installing the product
• Fit the front part of the product into the DIN rail.– ①
• Press the rear part of the product to fit into the DIN rail.– ②

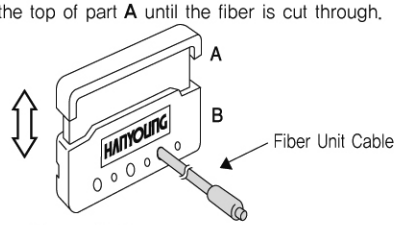
● When removing the product
• Pull the stopper of the rear part backward by using a slotted screwdriver to remove the product.– ③



Regarding accessory

■ Cutting an optical fiber cable

① An optical fiber can be cut in a desired length with a fiber-cutter.
② Cutting procedure
a. Pull up the part **A** of the cutter and then insert the optical fiber cable into the selected hole with a desired length.
b. Press down on the top of part **A** until the fiber is cut through.



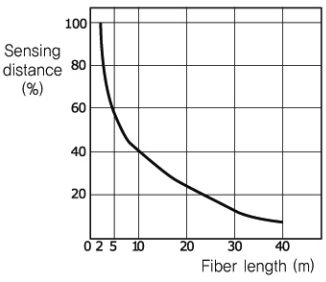
[fiber cutter]

■ Notes

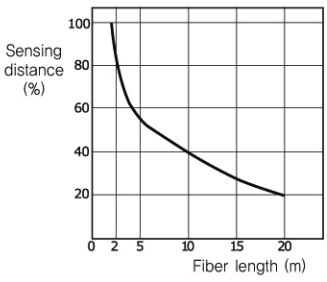
① Even when it is not necessary to cut an optical fiber with a certain length, please cut the end of the optical fiber to get a fine surface end cut.
② Please cut one optical fiber at a time and only one selected hole is used when an optical fiber is needed to be cut.
③ Please be careful that the sensing distance can be reduced as 20% of its specified sensing distance depending on the cutting surface condition of the optical fiber cable.
④ After cutting, please connect it to the amplifier immediately.
⑤ If the optical fiber is bent or wound, there is a case that the sensing distance can be reduced as the optical fiber and sheath are loose.

■ Characteristic graph of sensing distance regarding optical fiber cable length

• Through-beam cable (consider the optical fiber cable length 2m as 100%)



• Diffuse Reflection cable (consider the optical fiber cable length 2m as 100%)



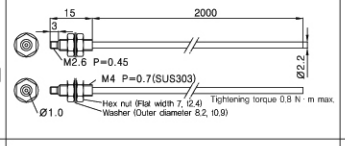
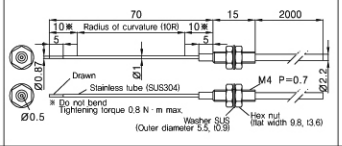
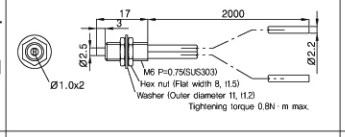
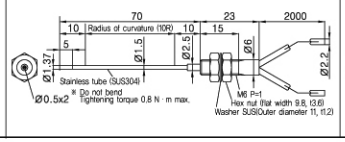
■ Optical fiber cable list

● Through-beam
• GT-4310-2, GTR-2910-2, GT-4M10-2, GT-3005-2, GTR-1505-2 GTS3-4005-2, GT-3075-2

● Diffuse Reflection
• GR-6210-2, GR-6410-2, GR-4205-2, GR-3005-2, GRR-3005-2 GRS3-4005-2, GRS2-6005-2, GR-62X5-2

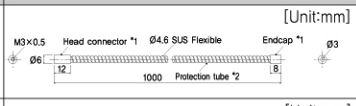
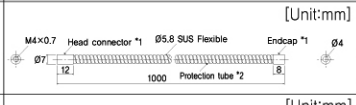
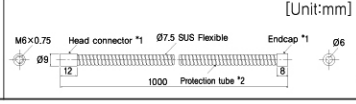
● Diffuse Reflection (liquid surface sensing)
• GL-635-05, GL-635-1

■ Optical fiber cable specification

Sensing Method	Model Name	External Dimension	Radius of Curvature	Sensing Distance
Through-Beam	GT-4M10-2 (Standard TYPE)		30R	150 ㎜
	GTS3-4005-2 (SUS TUBE TYPE)		30R	30 ㎜
Diffuse Reflection	GR-6210-2 (Standard TYPE)		30R	40 ㎜
	GRS3-4005-2 (SUS TUBE TYPE)		Fiber : 10R SUS : 10R	10 ㎜

※ The above list of optical fiber cables is currently available in Hanyoung NUX co., ltd. Please purchase an optical fiber cable separately according to its use.
※ Please refer to the product catalog for the whole list of optical fiber cables specification.

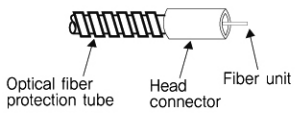
■ Optical Fiber Protection Tube

Model Name	External Dimension	Material	Use	Note
GST-310		* 1. Nickel-plated brass *2. Stainless steel (SUS304)	Optical fiber cable protection (shock, vibration, cutting)	
GST-410		* 1. Nickel-plated brass *2. Stainless steel (SUS304)		
GST-610		* 1. Nickel-plated brass *2. Stainless steel (SUS304)		

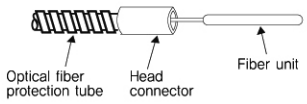
※ The length of the optical fiber protection tube can be extended according to its use. (but, extending multiples of 500mm of cable length available)

■ Installation Method

① Insert the fiber into the head connector of the optical fiber protection tube.
② Make sure that the fiber is not twisted as it goes into the optical fiber protection tube.



③ Make sure that the end of the fiber is also not twisted.



④ Fasten it on the panel with the nuts.