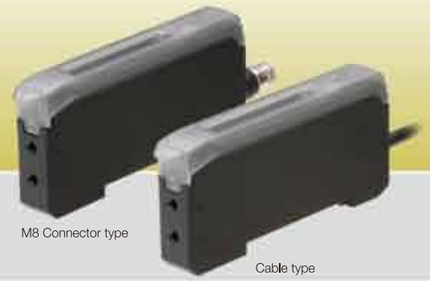
Fiber Sensors

All Optex-FA fiber optic sensors are designed for high performance and ease of use.
From models with digital display and pushbutton teach to manual adjust there is an amplifier to solve your application.
All amplifiers are available in Cabled or M8 QD versions and are offered with a choice of NPN or PNP outputs.



Digital Fiber Sensor

D2RF series

Standard Type : Stand-alone use

(IP50 protection)
・D2RF-TN / TP / TCN4 / TCP4

(IP66 protection)
・D2RF-2TN / 2TP / 2TCN3 / 2TCP3 / 2TCN4 / 2TCP4

Standard Type : Interconnection use

(IP50 protection)
・D2RF-TMN / TMP / TMCN4 / TMCP4 / TSN / TSP / TSCN4 / TSCP4

Mark Sensor Type : Stand-alone use

(IP50 protection)
・D2GF-TN / TP / TCN4 / TCP4

(IP66 protection)
・D2GF-2TN / 2TP / 2TCN3 / 2TCP3 / 2TCN4 / 2TCP4

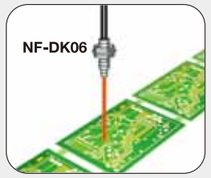
Next page

- ***Digital Fiber Amplifier with Two Independent Outputs.***
- ***High speed 60 micro second response.***
- ***SAM Circuit - The ASC function (Auto Sensitivity Control)***

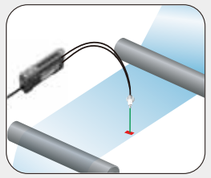
Applications

Bottle sensing in chemical environment (Full power teaching)

Counting electric components (One point teaching)



Sensing PC Board (Two point teaching)



Detection of mark on sheet

Product Types

Standard Type : Stand-alone use		
IP50 protection	**D2RF-TN/TP**	2 meter cable
	D2RF-TCN4/TCP4	M8 QD, 4 pin
IP66 protection	**D2RF-2TN/2TP**	2 meter cable
	D2RF-2TCN3/2TCP3	M8 QD, 3 pin
	D2RF-2TCN4/2TCP4	M8 QD, 4 pin

Standard Type : Interconnection use		
IP50 protection	**D2RF-TMN/TMP**	Master Unit
	D2RF-TSN/TSP	Slave Unit
	D2RF-TMCN4/TMCP4	Master Unit, M8 QD
	D2RF-TSCN4/TSCP4	Slave Unit, M8 QD

Mark Sensor Type : Stand-alone use		
IP50 protection	**D2GF-TN/TP**	2 meter cable
	D2GF-TCN4/TCP4	M8 QD, 4 pin
IP66 protection	**D2GF-2TN/2TP**	2 meter cable
	D2GF-2TCN3/2TCP3	M8 QD, 3 pin
	D2GF-2TCN4/2TCP4	M8 QD, 4 pin

Analogue Type : Stand-alone use		
IP50 protection	**D2RF-TAN/TAP**	4-20mA Analog Transistor output
IP66 protection	**D2RF-2TAN/2TAP**	4-20mA Analog Transistor output

Features

Two four digit display's.

Received Light Level and Threshold Setting

6 teach method for individual applications.

Full Power Teaching
Standard detection mode for Thru-beam type sensing but applicable for retro-reflective sensing also.

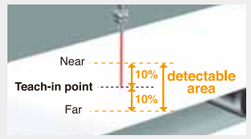
Full automatic Teaching
Set while the equipment is operating.

Single point Teaching
Set without a target present.

Transparent / Glass Teaching
Ideal for the detection of glass, film, plastic or any transparent material.

Two points Teaching
Standard detection mode for Diffuse type sensing.
It is possible to make fine adjustments.

Zone Teaching
Similar to Area Teach Mode.
This is useful if the conveyor moves closer to and farther from the sensor. An area +/- 10% of the teach point can be detected.



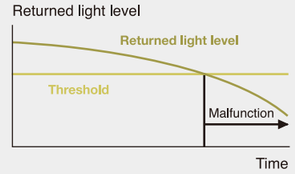
SAM Circuit - The ASC function (Auto Sensitivity Control)

Our engineer "SAM" designed this function. The lens and/or reflector may be contaminated over time. The D2RF amplifier monitors the change in light level and automatically resets the threshold value.

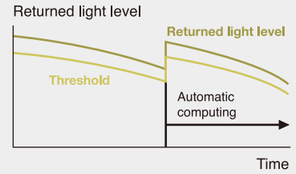
After cleaning off the lens / reflector it used to be necessary to reset the threshold setting. The D2RF does not require this step. Simply clean off the lens and wait three seconds without a target present. The sensor will automatically reset the threshold level for the change. This is how the SAM circuit works.

After cleaning the incoming light level will increase suddenly. The SAM circuit computes the preset threshold based on the increase in light intensity.
This function is available only in Transparent Detection Mode.

Conventional Sensor
Contamination on the lens will eventually cause the sensor to malfunction.

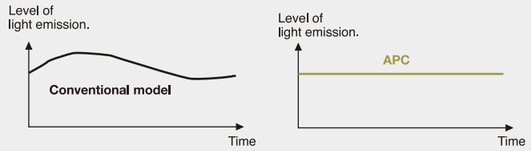


D2RF series SAM Circuit
The threshold will auto-matically return to the preset level after the lens is cleaned off.



APC Function (Auto Power Control)

The APC function ensures precise sensing even when there are changes in the temperature or environmental conditions.
APC maintains a constant power level of light emission by regulating the current flow into the light emission element. The APC function can be turned On and Off.



Mark Sensor Type : Interconnection use

(IP50 protection)
・D2GF-TMN / TMP / TMCN4 / TMCP4 / TSN / TSP / TSCN4 / TSCP4

Analogue Type : Stand-alone use

(IP50 protection)
・D2RF-TAN / TAP

(IP66 protection)
・D2RF-2TAN / 2TAP

IP66 and IP50, two types.

If your application is around water or high humidity.
There is a model of the D2RF-T series with an IP66 rating.

60 micro second high speed response.

Both outputs can be set to operate at this speed.
This response time is available in 5 of the teach modes

Long Term Stable Detection.

A conventional 3 element LED will lose brightness over time. This results in a decrease in sensitivity in the sensor. Optex FA's new D2RF uses a 4 element LED to provide long service life. The Green LED type D2GF uses a "Glan N2" LED, which offers the best performance for Mark Detection with a Green LED light source.

Cross Talk Prevention

The amplifier frequencies are automatically set between the Master and Slave units. Cross talk prevention is possible for up to 4 amplifiers.

LED Power adjustment - 3 step adjustment of LED emitting power.

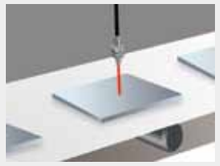
A highly reflective target will cause the amplifier to saturate making adjustment difficult. This can also happen if the fiber cable is mounted too close to the target.
In situations where the amplifier is saturated due to excessive reflected light, the power level of the emitting LED can be decreased to 50 or 25 percent.

Power setting

100%

50%

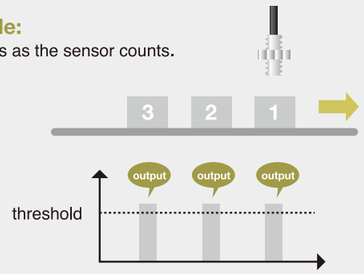
25%



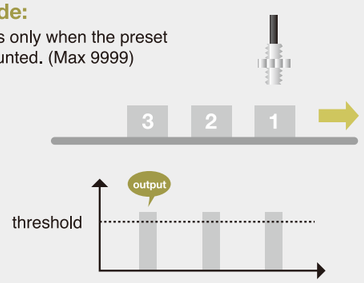
Counter Mode

The D2RF amplifier features a built-in counter. This makes it convenient to count parts, for example 10 pcs. in a bag. The output turns on once the sensor has counted the desired quantity. Simply program in the number of parts to count.

Normal Mode:
An output comes as the sensor counts.



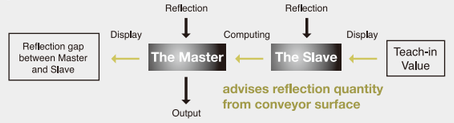
Counter Mode:
An output comes only when the preset numbers are counted. (Max 9999)



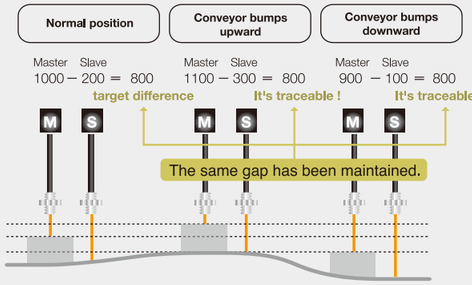
Differential Sensing Mode

A bumpy conveyor always makes stable detection difficult. The D2RF-T solves this problem with the Differential Sensing Mode. The Master and Slave amplifiers will calculate the difference between the reflection from the background and the target (see picture below). No matter how much the surface of the conveyor moves up and down the D2RF-T can follow the change and reliably detect the target.

Operation Flow:



How to follow the changing condition!



Automatic Tuning

This provides a way to boost or dampen the excess gain level of the amplifier in poor sensing conditions (low light level, low sensitivity or saturating condition).
Automatic Tuning is ideal when you need a little bit better excess gain level, or when detecting a dark object with diffuse reflective fiber cables.

Edge Sensing

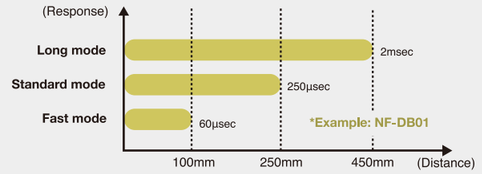
The sensor output triggers when there is a sudden increase or decrease in the light level. This is ideal for sensing objects without being influenced by a dusty environment.

Rising Edge Sensing Mode

Falling Edge Sensing Mode

Selectable Response Time

The Response time will affect the sensing distance.
The D2RF-T has three choices (Long, Standard, and Fast), select the response time based on the required sensing distance.
Long Mode boosts the power for the maximum sensing distance with a 2 msec. response time.
The Fast Mode has a reduced sensing distance but provides high speed 60μsec. response.



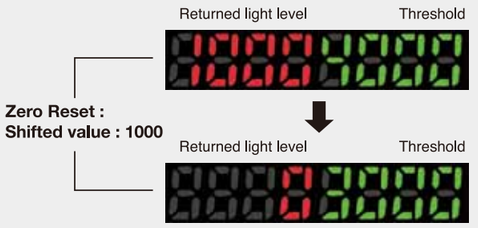
Long mode

Standard mode

Fast mode

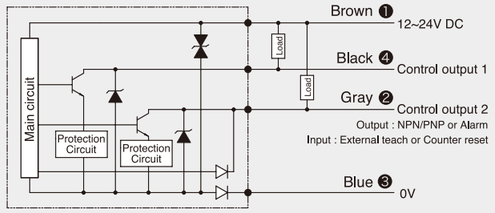
Zero Reset

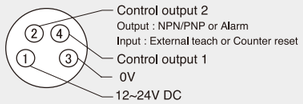
The sensor display can be reset to zero. This is useful for adjusting the display's of the Master and Slave units to read the same. It is also good to set the value to zero when the light is interrupted.



Two Independent Outputs. Each output can be set separately.

The 2nd output can be configured as an external Teach input.





The operation of each output can be set to Light-On / Dark-On. Also, the Threshold level, Timer settings, etc. of each output can be set independently. The Analog output type (D2RF-TAN/P) provides a 4 ~ 20 mA (gray wire) analog output and a NPN (or PNP) digital output (black wire).

The second output can be configured as an Alarm output (self-diagnostic). It can also be set to operate as an External Teach Input or Counter Reset Input if the Counter function is being used.

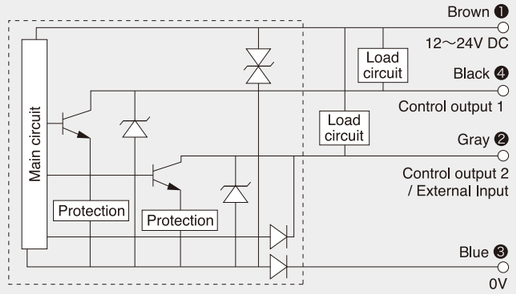
External Teach Input (CH2)

It is possible to have a Remote Teach Input if the CH2 output is re-assigned as an input.
When using the Remote Teach with Interconnected amplifiers all units will perform the Teach function simultaneously.
(This function is not available for Analogue Type)

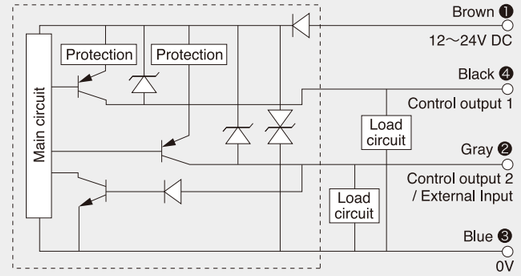
Circuit diagram

Stand-alone model

NPN output

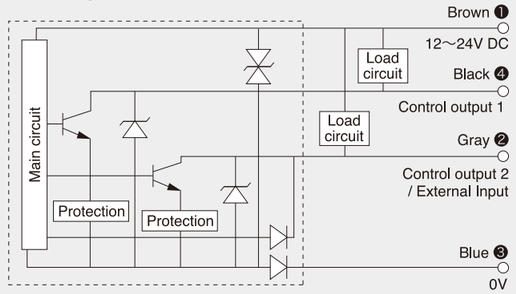


PNP output

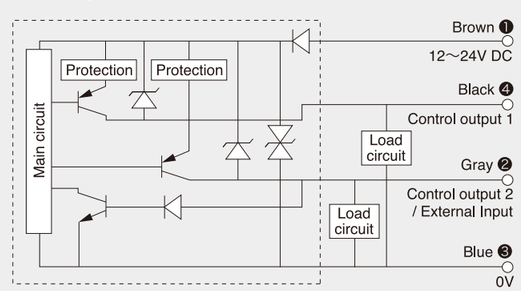


Interconnection model

NPN output



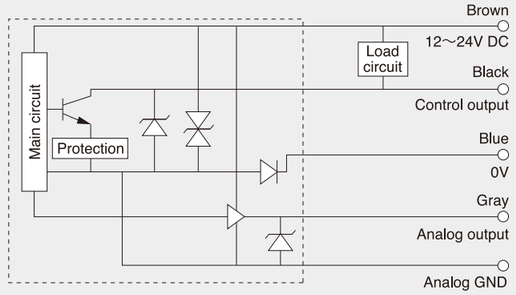
PNP output



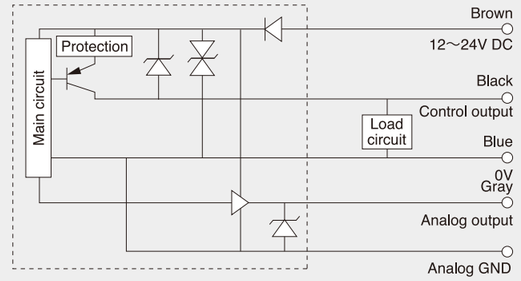
· Power wires (Brown ❶. Blue ❸) are not attached to Handset unit, both on cable and connector type.

Analogue model

NPN output



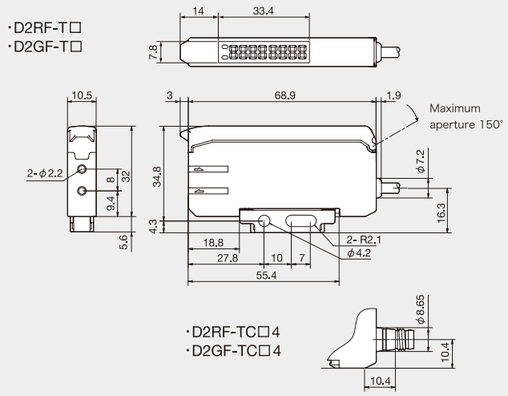
PNP output



Dimensions

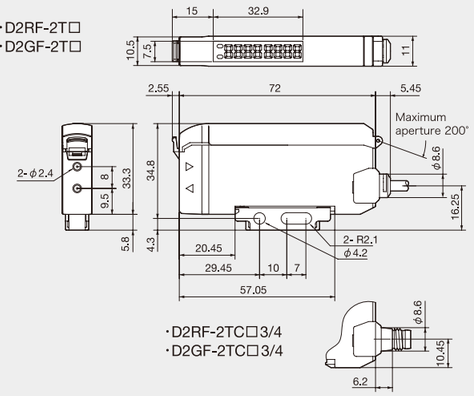
Stand-alone model

・D2RF-T□
・D2GF-T□



・D2RF-TC□4
・D2GF-TC□4

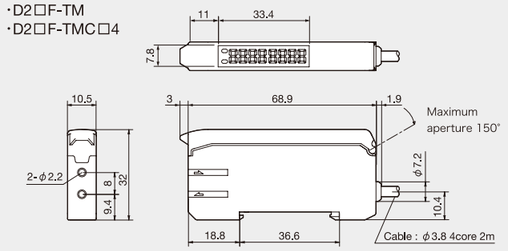
・D2RF-2T□
・D2GF-2T□



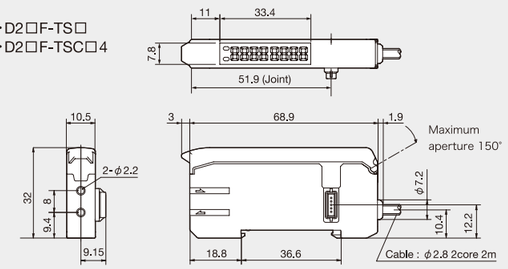
・D2RF-2TC□3/4
・D2GF-2TC□3/4

Interconnection model

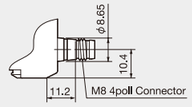
・D2□F-TM
・D2□F-TMC□4



・D2□F-TS□
・D2□F-TSC□4

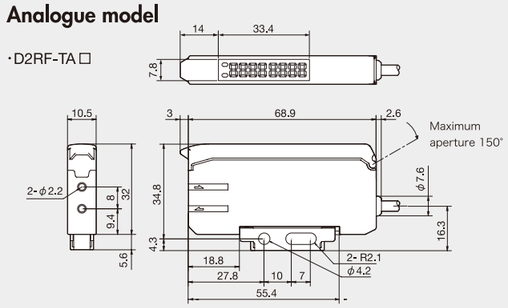


・M8 Connector type

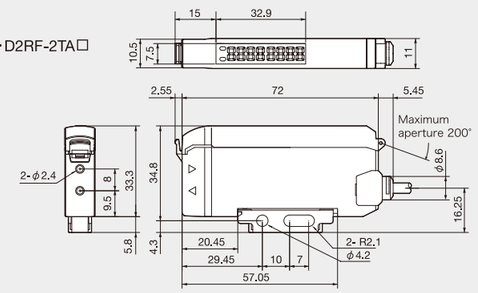


Analogue model

・D2RF-TA□



・D2RF-2TA□



Specifications

Model		Standard	Mark sensor	Analogue
Stand-alone Type				
IP50 type	**Cable type NPN / PNP**	D2RF-TN / TP	D2GF-TN / TP	D2RF-TAN / TAP
	M8 QD 4pin, NPN / PNP	D2RF-TCN4 / TCP4	D2GF-TCN4 / TCP4	NA
IP66 type	**Cable type NPN / PNP**	D2RF-2TN / 2TP	D2GF-2TN / 2TP	D2RF-2TAN / 2TAP
	M8 QD 4pin, NPN / PNP	D2RF-2TCN4 / 2TCP4	D2GF-2TCN4 / 2TCP4	NA
	M8 QD 3pin, NPN / PNP	D2RF-2TCN3 / 2TCP3	D2GF-2TCN3 / 2TCP3	NA
Interconnection Type				
Master unit	**Cable type NPN / PNP**	D2RF-TMN / TMP	D2GF-TMN / TMP	NA
	M8 QD 4pin, NPN / PNP	D2RF-TMCN4 / TMCP4	D2GF-TMCN4 / TMCP4	NA
Slave unit	**Cable type NPN / PNP**	D2RF-TSN / TSP	D2GF-TSN / TSP	NA
	M8 QD 4pin, NPN / PNP	D2RF-TSCN4 / TSCP4	D2GF-TSCN4 / TSCP4	NA
Light source		Red LED	Green LED	Red LED
Response time		60 micro sec (Fast mode), 250 micro sec (standard), 2.0 ms (Long distance)		
Auto control system		APC / ASC		
LED Power control		3 steps ; 100%, 50% and 25%		
Timer functions		On delay/Off delay /One shot, 1-9,999msec (1msec increment)		
Sensitivity adjustment		Teach-in + fine adjustment		
Output indicator		Output (orange) : 1CH / 2CH common		Output (orange)
Digital indicator		7 segment LED, 4 digits in Red, 4 digits in Green		
Teach-in mode		Full Power / One point / Two points / Full Automatic / Differential / Zone / Transparent		
Control output		2CH, NPN or PNP open collector, DC30V, 100mA Max		1CH, NPN or PNP
Analogue output		NA		4-20mA, Resolution 0.1%FS
Parallel installation		Up to 16 sets		
Crosstalk prevention		Up to 4 sets		
Operating mode		Light on / Dark on selectable		
Sensing mode		Long Distance Mode, Standard, Fast mode,		
Display		Regular dislay plus ; bar, %, eco (off, run mode only)		
External input		Teaching / Counter Reset		
Supply voltage		DC 10-24V +/- 10% ripple		
Power consumption		45mA Max (24V)		
Circuit protection		Reverse Polarity, Overcurrent, Short circuit		
Warm-up time		100m sec		
Operating temp / humidity		–25 to 55°C, 35 to 85% RH		
Storage temp / humidity		–40 to 70°C, 35 to 85% RH		
Environmental illuminance		Sunlight 10,000 lux, High Frequency Lamp 3,000 lux		
Protection category		IEC, IP50 (except Stand-alone IP66 types)		
Comformity		IEC, CE		
Shock resistance		IEC 68, 50G		
Weight		Cable type 21g, M8 connector type 23g		
Factory default settings		Response time (Standard), Output (Light On), Timer (OFF), APC (OFF),		

・Independent settings between CH1 and CH2 are possible at Threshold setting. Timer setting and Light/Dark setting.
・Ambient Temperature is limited up to 50℃ when amplifires are connected in parallel over 4 pcs.

Options

JCN-S : M8 Straight type

JCN-S : 2 meter
JCN-5S : 5 meter
JCN-10S : 10 meter

JCN-L : M8 L-shape type

JCN-L : 2 meter
JCN-5L : 5 meter
JCN-10L : 10 meter

BEF EB01-W190

Fiber Sensor

BRF series

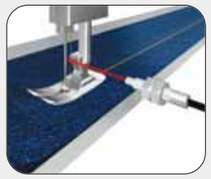
Standard type
Stand alone ·BRF-N / P / CN / CP

High speed type
Stand alone ·BRF-HN / HP / CHN / CHP

Mark detection type
Stand alone ·BGF-N / P / CN / CP

- ***3 models: Standard, High Speed, Mark Detection.***
- ***High Speed type (50 micro sec) and Green LED type for Mark Sensing.***
- ***Crosstalk prevention. IP66 protection.***
- ***10 turn adjustment potentiometer for fine tuning.***

Applications

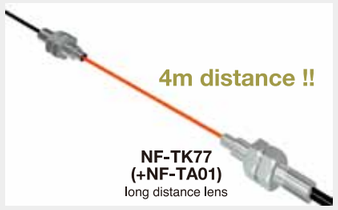


Standard type (BRF-N)

High speed type (BRF-HN)

Mark detection type (BGF-N)

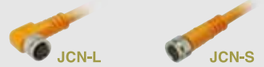
Long distance sensing



Min object ϕ0.015mm

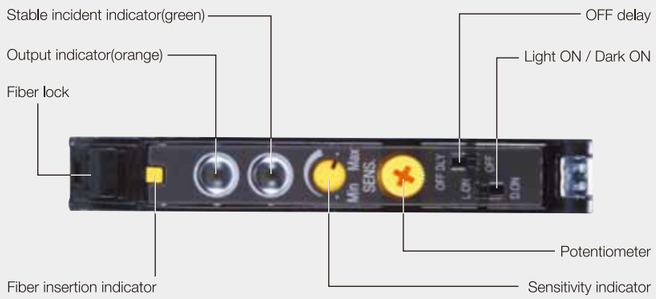
High Speed response 50μsec

System requirements

Stand-alone type		
with cable	BRF-N / BRF-P 	No additional cables are required
M8 connector	BRF-CN / BRF-CP 	M8 connector cable  JCN-L JCN-S

Features

Part Identification



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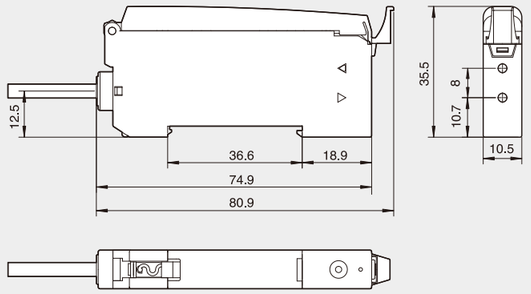
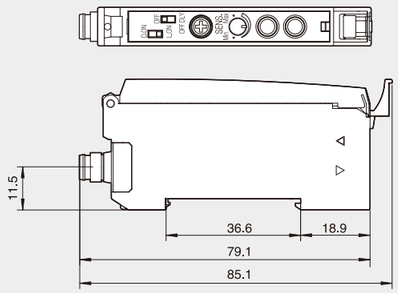
Dimensions

Cable Type Stand-alone



M8 Connector Stand-alone

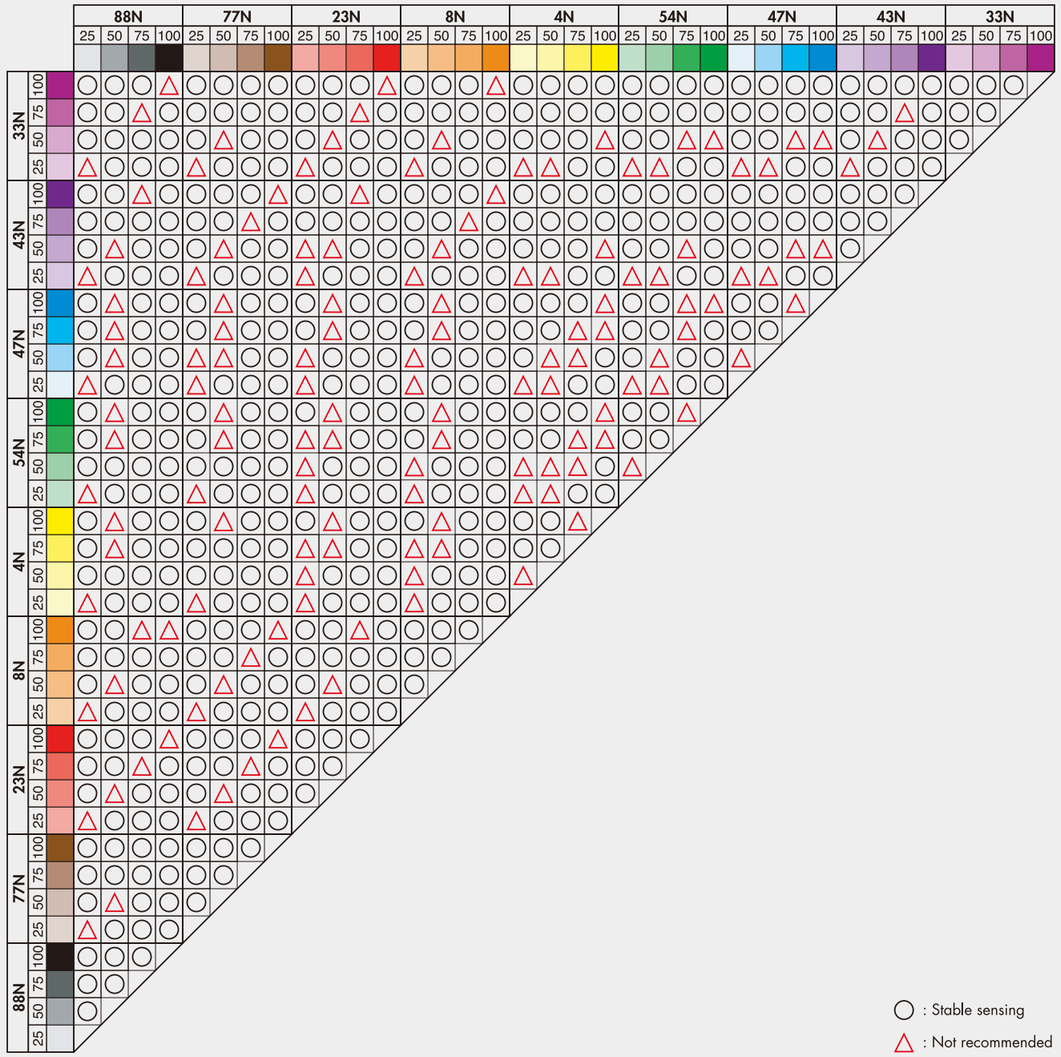


<4 Pin configuration>

① DC10~30V
② –
③ 0V
④ Control Output

(Unit : mm)

Sensing Chart by colours (BGF series Mark Sensor)



Specifications

Model		Standard type	High speed type	Mark type
Stand-alone	Cable type	BRF-N / P	BRF-HN / HP	BGF-N / P
	M8 QD type	BRF-CN / CP	BRF-CHN / CHP	BGF-CN / CP
Sensing distance (*1)	90% 250mm×200mm DK-06 Diffuse Fiber	150mm	50mm	40mm
Response time		250 μsec	50 μsec	250 μsec
Control output		NPN or PNP Open Collector 100mA/DC30V max. 1.8V/100mA max.		
Light source		Red LED		Green LED
LED Indicator	Stable output	Green		
	Output	Orange		
Potentiometer		10 turn		
Operating mode		Dark On/Light On selectable		
Timer		Off Delay 40msec fixed		
Supply voltage		DC10 ~ 30V Inc. 10% ripple		
Power consumption		25mA/30V (30mA/30V Interconnection type)		
Environmental illuminance	Sunlight	10,000 lx min.		
	Incandescent lamp	3,000 lx min.		
Operating temp		−25 ~ +55°C		
Operating humidity		35 ~ 85%		
Storage temp / humidity		−40 ~ +70°C/35 ~ 95%		
Insulation resistance		Min. 20MΩ/DC500V		
Conformity	EMC Test	CE regulation		
	Failen Test (house test)	Level 3		
Temperature drift		±5% max.		
LED Compensation ratio		−10% max./1000 h		
Vibration resisitance	IEC68	10 ~ 55Hz, 1.5mm		
Shock resistance	IEC68	500m/s²		
Protection category	Stand-alone	IP66		
	Interconnection	IP50		
Warm-up time		100ms max.		
Circuit protection		Overcurrent (output), Reverse Polarity, Short Circuit		
VED classification		Class 3		
Material	Housing	PBT G10		
	Cover	PC		
Dimensions		W10.5 x D80 x H35.5mm		
Regulation	UL	cRU recognition		
	CE	CE sign		

* 1 See NF series Fiber optics.

Fiber Sensor

BIF series

Moisture detection type
(Sensing distance : 50mm)
Stand alone ·BIF-WN / WP / CWN / CWP

- ***Unique "Moisture Sensing Type" BIF-W series senses the presence of moisture in a product.***

Applications

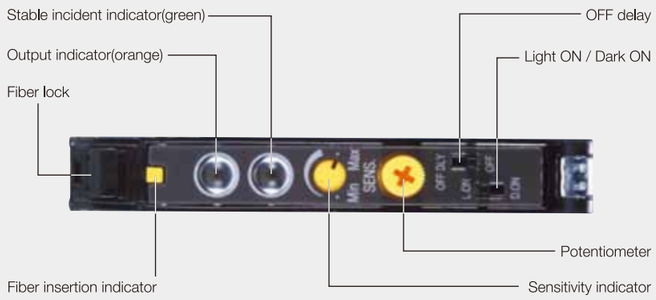
Moisture detection type (BIF-WN)

System requirements

Stand-alone type		
with cable	**BIF-WN / BIF-WP** 	**No additional cables are required**
M8 connector	**BIF-CWN / BIF-CWP** 	**M8 connector cable**  **JCN-L** **JCN-S**

Features

Part Identification

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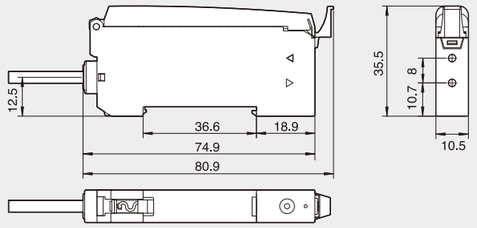
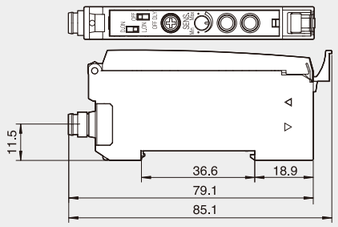
Dimensions

Cable Type Stand-alone



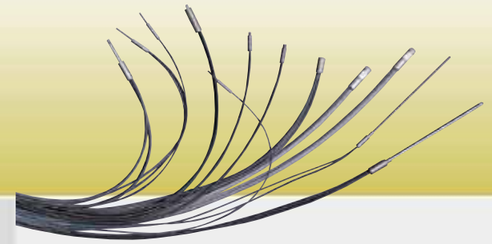
M8 Connector Stand-alone



(Unit : mm)

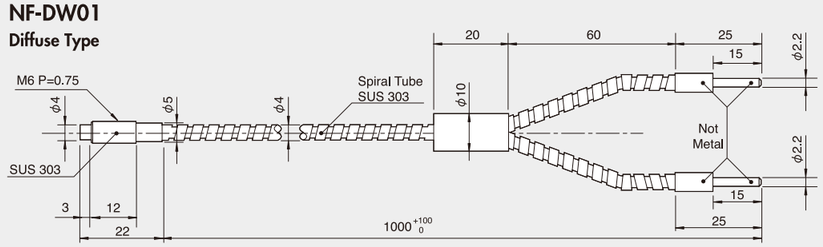
Specifications

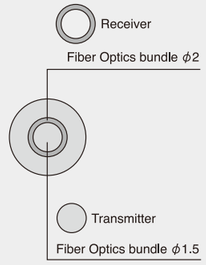
Model		Moisture type
Stand-alone	**Cable type**	BIF-WN / WP
	Connector type	BIF-CWN / CWP
Sensing distance	**90% 250mm×200mm**	30mm Diffuse
	DK-06 Diffuse Fiber	100mm Thru-beam
Response time		1msec
Control output		NPN or PNP Open Collector 100mA/DC30V max. 1.8V/100mA max.
Light source		Infrared LED
LED Indicator	**Stable output**	Green
	Output	Orange
Potentiometer		10 turn
Operating mode		Dark On/Light On selectable
Timer		Off Delay 40msec fixed
Supply voltage		DC10 ~ 30V Inc. 10% ripple
Power consumption		25mA/30V (30mA/30V Interconnection type)
Environmental illuminance	**Sunlight**	10,000 lx min.
	Incandescent lamp	3,000 lx min.
Operating temp		–25 ~ +55°C
Operating humidity		35 ~ 85%
Storage temp / humidity		–40 ~ +70°C/35 ~ 95%
Insulation resistance		Min. 20MΩ/DC500V
Conformity	**EMC Test**	CE regulation
	Failen Test (house test)	Level 3
Temp drift		±5% max.
LED Compensation ratio		–10% max./1000 h
Vibration resisitance	**IEC68**	10 ~ 55Hz, 1.5mm
Shock resistance	**IEC68**	500m/s²
Protection category	**Stand-alone**	IP66
	Interconnection	IP50
Warm-up time		100ms max.
Circuit protection		Overcurrent (output), Reverse Polarity, Short Circuit
VED classification		Class 3
Material	**Housing**	PBT G10
	Cover	PC
Dimensions		W10.5 x D80 x H35.5mm
Regulation	**UL**	cRU recognition
	CE	CE sign



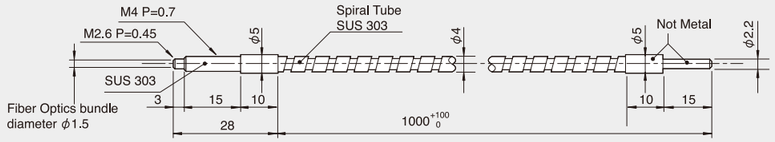
Special fiber unit for BIF-W Moisture Type

NF-DW01
Diffuse Type





NF-TW01
Thru-beam Type



Fiber Sensors Overview

A complete fiber optic sensor consists of the amplifier and a fiber optic cable. The fiber optic cable is chosen based upon the specific application. Optex offers more than 80 different cables in both Thru-beam and Diffuse sensing modes.

When to use Fiber optics

- **Confined areas**
  The small size and flexibility of fibers allows precise positioning where space is limited.
- **High temperature applications**
  Fiber optic assemblies can tolerate elevated temperatures in some cases as high as 300°F.
- **High vibration and shock**
  The low mass of fibers enables them to withstand extreme vibration and mechanical shock.
- **Noisy environments**
  Fibers are non-electronic mechanical components, and are completely immune to electrical noise.
- **Corrosive and wet environments**
  Special purpose fibers withstand corrosive materials, moisture and even repeated washdown.
- **Unique target shapes and requirements**
  Fiber optic sensing heads can be custom-designed and optimally "shaped" to the physical and optical requirements of a specific application.

1. Amplifiers

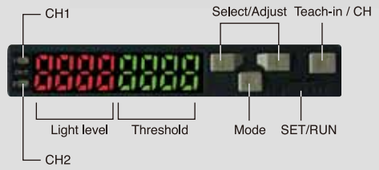
The amplifier contains the electronics, transmitting / receiving LED's and is the mechanical interface for the fiber. The D2RF series amplifiers are sealed and have an IP67 rating. They can easily be DIN-rail mounted directly on the machine or in a centralized control enclosure.

OPTEX FA Amplifiers for NF series Fibers

(Red LED) Digital Amplifier
D2RF series

(Green LED) Digital Mark Sensor
D2GF series

Amplifier Features



- Digital Fiber Amplifier with Two Independent Outputs.
- High speed 60 micro second response.
- SAM Circuit gives automatic sensitivity control.
- 6 different teach functions

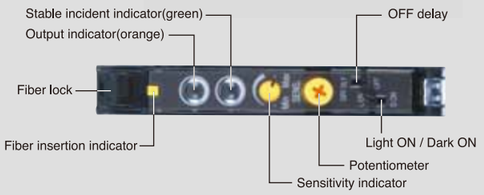
(Red LED) Fiber Amplifier
BRF series

(Red LED) High Speed Type
BRF-H series

(Green LED) Mark Sensor
BGF series

(Infrared LED) Moisture Sensing Amplifier
BIF series

Amplifier Features



- 4 models: Standard, High Speed, Mark Detection and Moisture Detection.
- Unique " Moisture Sensing Type" BIF-W series senses the presence of moisture in a product.
- Interconnection of up to 100 amplifiers is possible (ambient temp. approx 45°C, @ 12VDC)

2. Fibers

Fiber optic cables are non-electronic, light-transmitting, optical quality glass or plastic strands with cladding. The fibers serve as a light guide, they are used to transmit the light from and return the light to the amplifier. Glass fibers are arranged in bundles, while plastic fibers are typically packaged as monofilaments with a protective jacket of polyethylene, PVC, stainless steel braid or other material. Fiber cable sensing tips can have a wide variety of shapes and configurations.

Plastic Fibers

Plastic fibers are best for general purpose use, and where severe flexing like R=2 is required; they can be cut-to-length in the field, and are less expensive than glass fibers.

Features:

- Inexpensive and easily cut to length during installation.
- Bend very easily to fit precisely where you want them.
- Special high-flex models withstand flexing.
- Special jackets withstand corrosion, impact and abrasion.
- Quickly custom-designed and built for your unique applications.

Glass Fibers

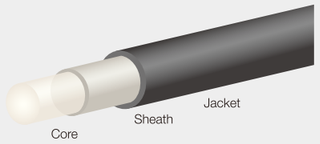
Glass fibers are the best choice for challenging environments such as high temperatures, corrosive materials and moisture.

Features:

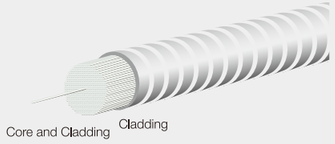
- Solve numerous challenging sensing requirements.
- For hostile environments such as high temperatures up to 300°C (572°F), corrosive materials, and extreme moisture.
- Withstand high levels of shock and vibration.
- Inherently immune to extreme electrical noise.
- Sheathing is typically stainless steel flexible conduit, but can be PVC or other flexible tubing.
- Quickly custom-designed and built for your unique applications.

Plastic vs Glass Fiber Construction

Plastic Fibers



Glass Fibers



Notes on fibers:

Core
Thin glass or plastic center of the fiber through which light travels.

Cladding
Outer optical material surrounding the core that reflects light back into the core.

Jacket
Protective layer to protect plastic fiber from damage and moisture.

Fiber Unit Selection Guide

Standard
Acrylic monofilament fiber of Bend Radius between R = 15mm and 25mm.

Coaxial
For tight alignment to the target.

Multi-core
Multi-cored under cladding and jacket.

Flexible
Repeat bending type of between R = 2mm and 4mm.

Sleeve
A long tip that can be bent to focus on the target.

Sideview
Fiber Optic with 90 degree angled end tip.

Convergent
Specular reflective optics with convergent beam spot.

High temperature
Durable to high temp not having transmission loss and fiber shrinkage.

Chemical resistant
Unlike acrylic fibers the jacket protects the fiber from chemical environments.

Liquid
For liquid level sensing.

Array
For applications of area sensing

Mapping application
For Mapping applications.

Water
Water/Moisture sensing type with 1.45 µm IR element.

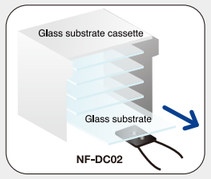
NF series Plastic Fiber Optics

- ***Optex FA plastic fiber optic cables are easy to use and are more economical than glass fiber optic cables. Plastic cables can be used in confined area as where the mounting space is limited and the use of a self-contained photoelectric sensor is not practical.***
  Plastic fiber optic cables are ideally suited for applications involving small-sized objects or for repeated bending.

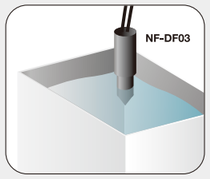
- ***Plastic fiber optic cables are designed in the following configurations Regular, Coaxial, Multi-core, Side-view, Convergent, Chemical resistant, Liquid level detection, High temperature and with bendable metal sleeve.***
  A minimum bend radius of R=2 mm is avaliable for some fibers.

- ***Special fibers ideal for various applications are available upon request.***

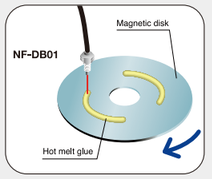
Applications



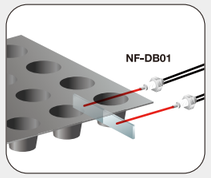
Detecting glass substrate



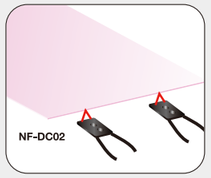
Detecting liquid level



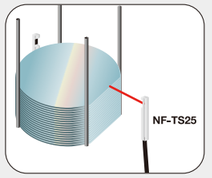
Detection of hot melt glue on magnetic disk



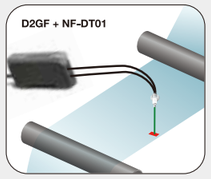
Positioning tray



Detecting glass substrate



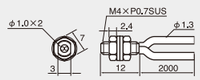
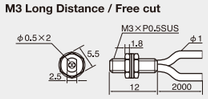
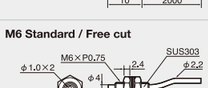
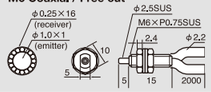
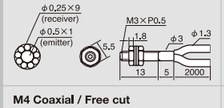
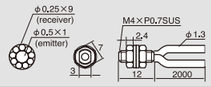
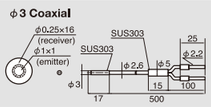
Detecting wafer position



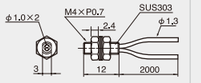
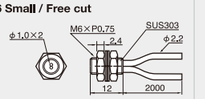
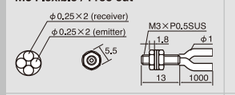
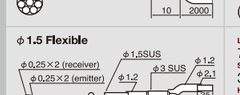
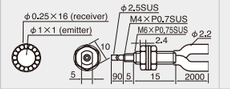
Detection of mark on sheet

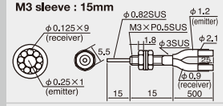
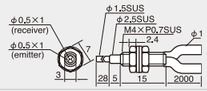
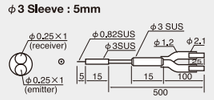
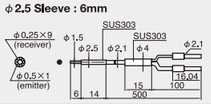
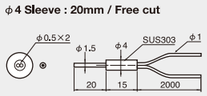
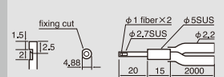
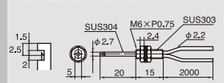
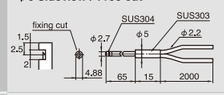
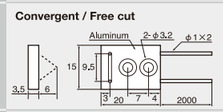
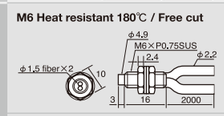
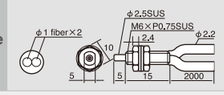
Standard
Coaxial
Multi-core
Flexible
Sleeve
Sideview
Convergent
High temperature
Chemical resistant
Liquid
Array
Mapping application

Specifications (Diffuse Type Fibers)

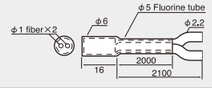
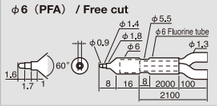
	Sensing head	Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire)				Operation temperature (℃～℃)	Radius (mm)	Part Number
		Red LED for general purpose		Green LED for Mark Sensing				
		D2RF	BRF/BRF-H	D2GF	BGF			
Standard	**M4 Long Distance / Free cut** 	Long mode 400 Standard mode 250 Highspeed mode 100 (0.015)	BRF 160 BRF-H 60 (0.015)	Long mode 160 Standard mode 80 Highspeed mode 40 (0.015)	BGF 45 (0.015)	−40～70	R=25	NF-DM01
	M3 Long Distance / Free cut 	Long mode 100 Standard mode 60 Highspeed mode 30 (0.015)	BRF 45 BRF-H 15 (0.015)	Long mode 30 Standard mode 15 Highspeed mode 6 (0.015)	BGF 5 (0.015)	−40～70	R=15	NF-DS06
	ϕ2.5 Thin / Free cut 	Long mode 100 Standard mode 60 Highspeed mode 30 (0.015)	BRF 45 BRF-H 15 (0.015)	Long mode 30 Standard mode 15 Highspeed mode 6 (0.015)	BGF 5 (0.015)	−40～70	R=15	NF-DT03
	M6 Standard / Free cut 	Long mode 400 Standard mode 250 Highspeed mode 100 (0.015)	BRF 160 BRF-H 60 (0.015)	Long mode 160 Standard mode 80 Highspeed mode 40 (0.015)	BGF 45 (0.015)	−40～70	R=25	NF-DK06
	ϕ3 Thin / Free cut 	Long mode 450 Standard mode 250 Highspeed mode 100 (0.015)	BRF 160 BRF-H 60 (0.015)	Long mode 160 Standard mode 80 Highspeed mode 40 (0.015)	BGF 45 (0.015)	−40～70	R=25	NF-DK04
Coaxial	**M6 Coaxial / Free cut** 	Long mode 450 Standard mode 250 Highspeed mode 100 (0.015)	BRF 150 BRF-H 65 (0.015)	Long mode 100 Standard mode 70 Highspeed mode 30 (0.015)	BGF 45 (0.015)	−40～70	R=25	NF-DB01
	M6 Coaxial / Free cut 	—	—	—	—	−40～70	R=25	NF-DB01-10
	M6 Coaxial / Free cut 	Long mode 450 Standard mode 250 Highspeed mode 100 (0.015)	BRF 150 BRF-H 65 (0.015)	Long mode 100 Standard mode 60 Highspeed mode 25 (0.015)	BGF 45 (0.015)	−40～70	R=25	NF-DB03
	M3 Coaxial / Free cut 	Long mode 250 Standard mode 120 Highspeed mode 50 (0.015)	BRF 70 BRF-H 20 (0.015)	Long mode 40 Standard mode 20 Highspeed mode 6 (0.015)	BGF 10 (0.015)	−40～70	R=15	NF-DT01
	M4 Coaxial / Free cut 	Long mode 250 Standard mode 120 Highspeed mode 50 (0.015)	BRF 70 BRF-H 20 (0.015)	Long mode 40 Standard mode 20 Highspeed mode 6 (0.015)	BGF 10 (0.015)	−40～70	R=15	NF-DM02
	ϕ3 Coaxial 	Long mode 400 Standard mode 250 Highspeed mode 100 (0.015)	BRF 150 BRF-H 65 (0.015)	Long mode 100 Standard mode 70 Highspeed mode 30 (0.015)	BGF 45 (0.015)	−40～70	R=25	NF-DK23
	M3 Coaxial 	Long mode 70 Standard mode 40 Highspeed mode 15 (0.015)	BRF 20 BRF-H 5 (0.015)	Long mode 15 Standard mode 7 Highspeed mode 4 (0.015)	BGF 4 (0.015)	−40～70	R=15	NF-DK21

Specifications (Diffuse Type Fibers)

	Sensing head	Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire)				Operation temperature (℃～℃)	Radius (mm)	Part Number
		Red LED for general purpose		Green LED for Mark Sensing				
		D2RF	BRF/BRF-H	D2GF	BGF			
Multi-core	**M4 Small / Free cut** 	Long mode 300 Standard mode 180 Highspeed mode 80 (0.015)	BRF 110 BRF-H 45 (0.015)	Long mode 80 Standard mode 45 Highspeed mode 20 (0.015)	BGF 25 (0.015)	−40～70	R=2	NF-DK66
	M6 Small / Free cut 	Long mode 300 Standard mode 180 Highspeed mode 80 (0.015)	BRF 110 BRF-H 45 (0.015)	Long mode 80 Standard mode 45 Highspeed mode 20 (0.015)	BGF 25 (0.015)	−40～70	R=2	NF-DK67
	ϕ3 Smooth / Free cut 	Long mode 300 Standard mode 180 Highspeed mode 80 (0.015)	BRF 110 BRF-H 45 (0.015)	Long mode 80 Standard mode 45 Highspeed mode 20 (0.015)	BGF 25 (0.015)	−40～70	R=2	NF-DK04Z
	M4 Sleeve / Free cut 	Long mode 300 Standard mode 180 Highspeed mode 80 (0.015)	BRF 110 BRF-H 45 (0.015)	Long mode 80 Standard mode 45 Highspeed mode 20 (0.015)	BGF 25 (0.015)	−40～70	R=2	NF-DK63Z
Flexible	**M6 Flexible / Free cut** 	Long mode 350 Standard mode 200 Highspeed mode 80 (0.015)	BRF 130 BRF-H 45 (0.015)	Long mode 100 Standard mode 50 Highspeed mode 30 (0.015)	BGF 15 (0.015)	−40～70	R=4	NF-DR01
	M3 Flexible / Free cut 	Long mode 70 Standard mode 30 Highspeed mode 15 (0.015)	BRF 20 BRF-H 8 (0.015)	Long mode 15 Standard mode 7 Highspeed mode 3 (0.015)	BGF 2 (0.015)	−40～70	R=4	NF-DR02
	ϕ3 Flexible / Free cut 	Long mode 120 Standard mode 50 Highspeed mode 25 (0.015)	BRF 35 BRF-H 10 (0.015)	Long mode 25 Standard mode 12 Highspeed mode 5 (0.015)	BGF 5 (0.015)	−40～70	R=4	NF-DR03
	ϕ1.5 Flexible 	Long mode 70 Standard mode 30 Highspeed mode 15 (0.015)	BRF 20 BRF-H 8 (0.015)	Long mode 15 Standard mode 7 Highspeed mode 3 (0.015)	BGF 2 (0.015)	−40～70	R=4	NF-DR04
	M4 Flexible / Free cut 	Long mode 120 Standard mode 50 Highspeed mode 25 (0.015)	BRF 35 BRF-H 10 (0.015)	Long mode 25 Standard mode 12 Highspeed mode 5 (0.015)	BGF 5 (0.015)	−40～70	R=4	NF-DR06
Sleeve	**M6 Sleeve : 90mm / Free cut** 	Long mode 450 Standard mode 250 Highspeed mode 100 (0.015)	BRF 150 BRF-H 65 (0.015)	Long mode 100 Standard mode 70 Highspeed mode 30 (0.015)	BGF 45 (0.015)	−40～70	R=25	NF-DB02
	M4 Sleeve : 90mm / Free cut 	Long mode 120 Standard mode 50 Highspeed mode 30 (0.015)	BRF 45 BRF-H 15 (0.015)	Long mode 30 Standard mode 15 Highspeed mode 6 (0.015)	BGF 5 (0.015)	−40～70	R=15	NF-DM03
	M3 sleeve : 15mm / Free cut 	Long mode 40 Standard mode 15 Highspeed mode 5 (0.015)	BRF 10 BRF-H 3 (0.015)	Long mode 6 Standard mode 3 Highspeed mode 1.5 (0.015)	BGF 2 (0.015)	−40～70	R=4	NF-DT02

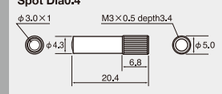
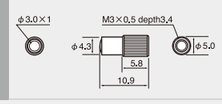
	Sensing head	Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) Red LED for general purpose D2RF	Red LED for general purpose BRF/BRF-H	Green LED for Mark Sensing D2GF	Green LED for Mark Sensing BGF	Operation temperature (℃～℃)	Radius (mm)	Part Number
Sleeve	**M3 sleeve : 15mm** 	Long mode 70 Standard mode 40 Highspeed mode 15 (0.015)	BRF 15 BRF-H 8 (0.015)	Long mode 12 Standard mode 6 Highspeed mode 3 (0.015)	BGF 2 (0.015)	−40～70	R=4	NF-DT04
	M4 sleeve : 28mm / Free cut 	Long mode 100 Standard mode 60 Highspeed mode 30 (0.015)	BRF 45 BRF-H 15 (0.015)	Long mode 30 Standard mode 15 Highspeed mode 6 (0.015)	BGF 5 (0.015)	−40～70	R=15	NF-DT05
	ϕ3 Sleeve : 5mm 	Long mode 40 Standard mode 15 Highspeed mode 5 (0.015)	BRF 10 BRF-H 3 (0.015)	Long mode 6 Standard mode 3 Highspeed mode 1.5 (0.015)	BGF 2 (0.015)	−40～70	R=4	NF-DR05
	ϕ2.5 Sleeve : 6mm 	Long mode 250 Standard mode 120 Highspeed mode 50 (0.015)	BRF 70 BRF-H 20 (0.015)	Long mode 40 Standard mode 20 Highspeed mode 6 (0.015)	BGF 10 (0.015)	−40～70	R=15	NF-DK22
	ϕ4 Sleeve : 20mm / Free cut 	Long mode 100 Standard mode 60 Highspeed mode 12 (0.015)	BRF 45 BRF-H 15 (0.015)	Long mode 30 Standard mode 15 Highspeed mode 6 (0.015)	BGF 5 (0.015)	−40～70	R=15	NF-DK43
Sideview	**ϕ5 Sideview / Free cut** 	Long mode 200 Standard mode 120 Highspeed mode 50 (0.025)	BRF 90 BRF-H 40 (0.025)	Long mode 80 Standard mode 35 Highspeed mode 15 (0.025)	BGF 25 (0.025)	−40～70	R=25	NF-DV01
	ϕ3 Sideview / Free cut 	Long mode 80 Standard mode 30 Highspeed mode 7 (0.015)	BRF 15 BRF-H 5 (0.015)	Long mode 15 Standard mode 8 Highspeed mode 3 (0.015)	BGF 3 (0.015)	−40～70	R=15	NF-DV02
	M6 Sideview / Free cut 	Long mode 200 Standard mode 120 Highspeed mode 50 (0.025)	BRF 90 BRF-H 40 (0.025)	Long mode 80 Standard mode 35 Highspeed mode 15 (0.025)	BGF 25 (0.025)	−40～70	R=25	NF-DV03
	ϕ5 Sideview / Free cut 	Long mode 200 Standard mode 120 Highspeed mode 50 (0.025)	BRF 90 BRF-H 40 (0.025)	Long mode 80 Standard mode 35 Highspeed mode 15 (0.025)	BGF 25 (0.025)	−40～70	R=25	NF-DK33
Convergent	**Convergent / Free cut** 	Long mode 6 Standard mode 6 Highspeed mode 6 (0.05)	BRF 6 BRF-H 4 (0.015)	Long mode 6 Standard mode 6 Highspeed mode 6 (0.05)	BGF 3 (0.015)	−40～70	R=25	NF-DC02
High temperature	**M6 Heat resistant 180℃ / Free cut** 	Long mode 450 Standard mode 250 Highspeed mode 150 (0.015)	BRF 210 BRF-H 90 (0.015)	Long mode 100 Standard mode 60 Highspeed mode 25 (0.015)	BGF 40 (0.015)	−40～180 ※1	R=35	NF-DH01
	M6 Heat resistant 100℃ / Free cut 	Long mode 250 Standard mode 150 Highspeed mode 50 (0.015)	BRF 110 BRF-H 40 (0.015)	Long mode 20 Standard mode 10 Highspeed mode 5 (0.015)	BGF 7 (0.015)	−40～100 ※1	R=25	NF-DH02

Specifications (Diffuse Type Fibers)

	Sensing head	Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) Red LED for general purpose D2RF	Red LED for general purpose BRF/BRF-H	Green LED for Mark Sensing D2GF	Green LED for Mark Sensing BGF	Operation temperature (℃～℃)	Radius (mm)	Part Number
Chemical resistant	**ϕ6（PFA） / Free cut** 	Long mode 100 Standard mode 70 Highspeed mode 50 (0.02)	BRF 45 BRF-H 25 (0.015)	Long mode 50 Standard mode 20 Highspeed mode 10 (0.02)	BGF 10 (0.015)	−40～100	R=60	NF-DY01
Liquid	**ϕ6（PFA） / Free cut** 	For transparent / opaque liquids				−40～70	R=60	NF-DF03

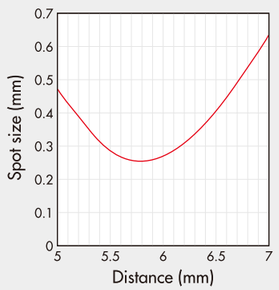
※1 Continuous use over 1,000 hours. Optical power 85% or more.

Fine Spot Lens for Diffuse Type Fibers

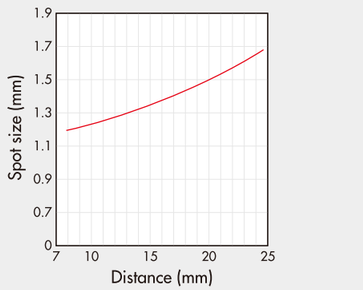
	Lens detail	Applicable fiber	Minimum detectable object (mm)	Focus distance (Minimum object) DRF-T	Focus distance (Minimum object) BRF	Part Number
Fine spot lens	**Spot Dia0.4** 	NF-DT01	DRF-T 0.01 BRF 0.01 VRF-T / JRF 0.01	6±1		NF-DA01 
		NF-DT01	DRF-T 0.02 BRF 0.02 VRF-T / JRF 0.02	15±1		NF-DA02 

Sensing Distance with Fine Spot Lens

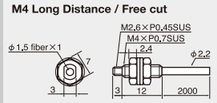
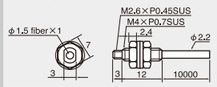
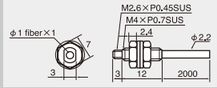
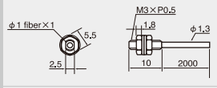
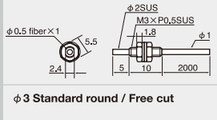
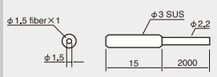
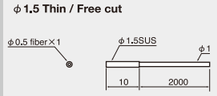
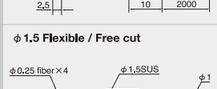
NF-DA01 + NF-DT01



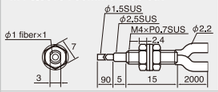
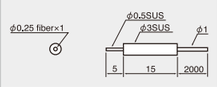
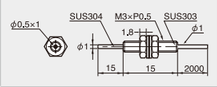
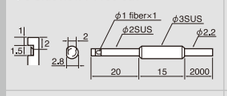
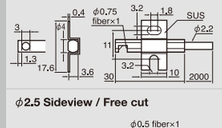
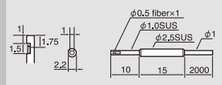
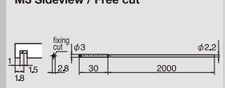
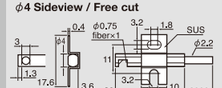
NF-DA02 + NF-DT01



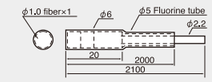
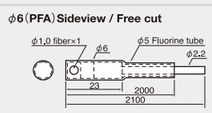
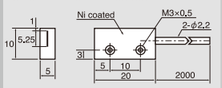
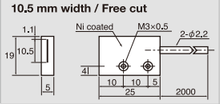
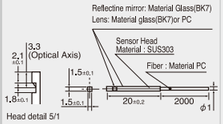
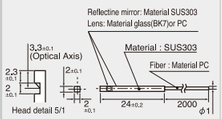
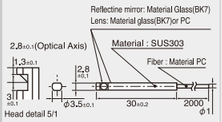
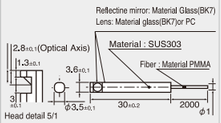
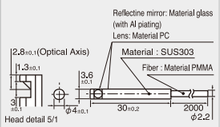
Specifications (Thru-beam Type Fibers)

	Sensing head	Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) Red LED for general purpose D2RF	BRF/BRF-H	Green LED for Mark Sensing D2GF	BGF	Operation temperature (℃～℃)	Radius (mm)	Part Number
Standard	**M4 Long Distance / Free cut** 	Long mode 1800 Standard mode 800 Highspeed mode 450 (0.5)	BRF 700 BRF-H 350 (0.5)	Long mode 800 Standard mode 400 Highspeed mode 200 (0.5)	BGF 350 (0.5)	−40～70	R=30	NF-TB01
	M4 Long Distance / Free cut 	—	—	—	—	−40～70	R=30	NF-TB01-10
	M4 Standard / Free cut 	Long mode 1000 Standard mode 500 Highspeed mode 250 (0.2)	BRF 450 BRF-H 160 (0.2)	Long mode 450 Standard mode 250 Highspeed mode 100 (0.2)	BGF 130 (0.2)	−40～70	R=25	NF-TB02
	M3 Long Distance / Free cut 	Long mode 1000 Standard mode 500 Highspeed mode 250 (0.2)	BRF 450 BRF-H 160 (0.2)	Long mode 500 Standard mode 250 Highspeed mode 120 (0.2)	BGF 130 (0.2)	−40～70	R=25	NF-TM01
	M3 Standard / Free cut 	Long mode 350 Standard mode 200 Highspeed mode 90 (0.1)	BRF 120 BRF-H 40 (0.1)	Long mode 120 Standard mode 60 Highspeed mode 30 (0.1)	BGF 25 (0.1)	−40～70	R=15	NF-TM02
	ϕ3 Standard round / Free cut 	Long mode 1800 Standard mode 800 Highspeed mode 450 (0.5)	BRF 700 BRF-H 350 (0.5)	Long mode 800 Standard mode 400 Highspeed mode 200 (0.5)	BGF 350 (0.5)	−40～70	R=30	NF-TS07
	ϕ1.5 Thin / Free cut 	Long mode 350 Standard mode 200 Highspeed mode 90 (0.1)	BRF 120 BRF-H 40 (0.1)	Long mode 120 Standard mode 60 Highspeed mode 30 (0.1)	BGF 25 (0.1)	−40～70	R=15	NF-TM03
Multi-core	**ϕ3 Smooth / Free cut** 	Long mode 800 Standard mode 400 Highspeed mode 200 (0.2)	BRF 360 BRF-H 120 (0.2)	Long mode 350 Standard mode 200 Highspeed mode 90 (0.2)	BGF 110 (0.2)	−40～70	R=2	NF-TK05
	M4 Coaxial / Free cut 	Long mode 800 Standard mode 400 Highspeed mode 200 (0.2)	BRF 360 BRF-H 120 (0.2)	Long mode 350 Standard mode 200 Highspeed mode 90 (0.2)	BGF 110 (0.2)	−40～70	R=2	NF-TK77
Flexible	**M4 Flexible / Free cut** 	Long mode 800 Standard mode 400 Highspeed mode 250 (0.3)	BRF 330 BRF-H 120 (0.2)	Long mode 500 Standard mode 250 Highspeed mode 120 (0.3)	BGF 120 (0.2)	−40～70	R=4	NF-TR01
	M3 Flexible / Free cut 	Long mode 350 Standard mode 200 Highspeed mode 90 (0.1)	BRF 110 BRF-H 35 (0.1)	Long mode 70 Standard mode 40 Highspeed mode 20 (0.1)	BGF 20 (0.1)	−40～70	R=4	NF-TR02
	ϕ1.5 Flexible / Free cut 	Long mode 350 Standard mode 200 Highspeed mode 90 (0.1)	BRF 110 BRF-H 35 (0.1)	Long mode 70 Standard mode 40 Highspeed mode 20 (0.1)	BGF 20 (0.1)	−40～70	R=4	NF-TR03

Specifications (Diffuse Type Fibers)

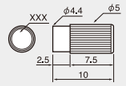
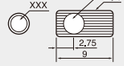
	Sensing head	Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) Red LED for general purpose D2RF	BRF/BRF-H	Green LED for Mark Sensing D2GF	BGF	Operation temperature (℃～℃)	Radius (mm)	Part Number
Sleeve	**M4 sleeve : 90mm / Free cut** 	Long mode 1000 Standard mode 600 Highspeed mode 250 (0.2)	BRF 450 BRF-H 160 (0.2)	Long mode 500 Standard mode 250 Highspeed mode 120 (0.2)	BGF 130 (0.2)	−40～70	R=25	NF-TB03
	ϕ3 sleeve : 5mm / Free cut 	Long mode 80 Standard mode 40 Highspeed mode 20 (0.1)	BRF 30 BRF-H 12 (0.1)	Long mode 25 Standard mode 10 Highspeed mode 5 (0.1)	BGF 4 (0.1)	−40～70	R=15	NF-TT01
	M3 sleeve : 15mm / Free cut 	Long mode 300 Standard mode 150 Highspeed mode 70 (0.1)	BRF 120 BRF-H 40 (0.1)	Long mode 100 Standard mode 55 Highspeed mode 30 (0.1)	BGF 25 (0.1)	−40～70	R=15	NF-TK75
Sideview	**ϕ3 Sideview / Free cut** 	Long mode 800 Standard mode 400 Highspeed mode 200 (0.2)	BRF 320 BRF-H 110 (0.2)	Long mode 300 Standard mode 150 Highspeed mode 80 (0.2)	BGF 85 (0.2)	−40～70	R=25	NF-TV01
	ϕ4 Sideview / Free cut 	Long mode 900 Standard mode 500 Highspeed mode 250 (0.2)	BRF 320 BRF-H 110 (0.2)	Long mode 400 Standard mode 200 Highspeed mode 100 (0.2)	BGF 110 (0.2)	−40～70	R=25	NF-TS08
	ϕ2.5 Sideview / Free cut 	Long mode 200 Standard mode 150 Highspeed mode 60 (0.1)	BRF 75 BRF-H 25 (0.1)	Long mode 80 Standard mode 45 Highspeed mode 15 (0.1)	BGF 15 (0.1)	−40～70	R=15	NF-TV02
	M3 Sideview / Free cut 	Long mode 200 Standard mode 150 Highspeed mode 60 (0.1)	BRF 75 BRF-H 25 (0.1)	Long mode 80 Standard mode 45 Highspeed mode 15 (0.1)	BGF 15 (0.1)	−40～70	R=15	NF-TV04
	ϕ4 Sideview / Free cut 	Long mode 4000 Standard mode 3000 Highspeed mode 2000 (0.5)	BRF 1700 BRF-H 830 (0.5)	Long mode 1600 Standard mode 900 Highspeed mode 400 (0.5)	BGF 750 (0.5)	−40～70	R=25	NF-TS12
	ϕ3 Sideview / Free cut 	Long mode 800 Standard mode 400 Highspeed mode 200 (0.2)	BRF 320 BRF-H 110 (0.2)	Long mode 300 Standard mode 150 Highspeed mode 70 (0.2)	BGF 85 (0.2)	−40～70	R=25	NF-TK34
	ϕ4 Sideview / Free cut 	Long mode 4000 Standard mode 3000 Highspeed mode 2000 (0.2)	BRF 2000 BRF-H 900 (0.2)	Long mode 1800 Standard mode 1000 Highspeed mode 450 (0.2)	BGF 800 (0.2)	−40～70	R=25	NF-TK16
High temperature	**M4 Heat resistant 100℃ / Free cut** 	Long mode 700 Standard mode 400 Highspeed mode 200 (0.2)	BRF 300 BRF-H 120 (0.2)	Long mode 150 Standard mode 80 Highspeed mode 40 (0.2)	BGF 45 (0.2)	−40～100 ※2	R=25	NF-TH01
	M4 Heat resistant 180℃ / Free cut 	Long mode 1000 Standard mode 700 Highspeed mode 350 (0.5)	BRF 600 BRF-H 250 (0.5)	Long mode 350 Standard mode 180 Highspeed mode 80 (0.5)	BGF 120 (0.5)	−40～180 ※1	R=35	NF-TH02

※1 Continuous use over 1,000 hours. Optical power 85% or more. ※2 Continuous use over 2,000 hours. Optical power 90% or more.

	Sensing head	Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) Red LED for general purpose D2RF	Red LED for general purpose BRF/BRF-H	Green LED for Mark Sensing D2GF	Green LED for Mark Sensing BGF	Operation temperature (℃～℃)	Radius (mm)	Part Number
Chemical resistant	**ϕ6(PFA)Straight / Free cut** 	Long mode 3500 Standard mode 2500 Highspeed mode 1200 (0.3)	BRF 2000 BRF-H 400 (0.3)	Long mode 1800 Standard mode 1000 Highspeed mode 300 (0.3)	BGF 380 (0.3)	−40～70	R=60	NF-TY01
	ϕ6(PFA)Sideview / Free cut 	Long mode 1500 Standard mode 800 Highspeed mode 400 (0.3)	BRF 550 BRF-H 220 (0.3)	Long mode 400 Standard mode 300 Highspeed mode 130 (0.3)	BGF 210 (0.3)	−40～70	R=60	NF-TY02
Array	**5.25 mm width / Free cut** 	Long mode 800 Standard mode 500 Highspeed mode 250 (1.0)	BRF 330 BRF-H 120 (1.0)	Long mode 300 Standard mode 200 Highspeed mode 80 (1.0)	BGF 85 (1.0)	−40～70	R=25	NF-TS10
	10.5 mm width / Free cut 	Long mode 800 Standard mode 500 Highspeed mode 250 (0.5)	BRF 330 BRF-H 120 (0.5)	Long mode 300 Standard mode 200 Highspeed mode 80 (0.5)	BGF 85 (0.5)	−40～70	R=25	NF-TS14
	Super Slim Shape 	Long mode 500 Standard mode 280 Highspeed mode 220 (0.06)	—	—	—	−40～105	R=10	NF-TS25
	Narrow Aperture 2.5° 	Long mode 800 Standard mode 500 Highspeed mode 400 (0.06)	—	—	—	−40～105	R=10	NF-TS23
Mapping application (Polyethylene)	**Long distance 1,700mm** 	Long mode 1700 Standard mode 700 Highspeed mode 600 (0.06)	—	—	—	−40～105	R=10	NF-TS22H
	Long distance 1,800mm 	Long mode 1800 Standard mode 800 Highspeed mode 700 (0.06)	—	—	—	−40～105	R=10	NF-TS22M
	R=1mm flexible, 1,700mm 	Long mode 1700 Standard mode 700 Highspeed mode 600 (0.06)	—	—	—	−40～70	R=1	NF-TS22V

※ Mapping Application Fibers are applicable only with D2RF series amplifiers.

Specifications (Thru-beam Type Fibers)

	Lens detail	Applicable fiber	Minimum detectable object (mm)	Sensing distance D2RF	Sensing distance BRF	Part Number
Extension lens NF-TA01	Extended sensing distance 	NF-TB01	D2RF: 3 BRF: 4 VRF-T/JRF: 4	Long mode 4000 Standard mode 3500 Highspeed mode 1500	Standard type 3000 High speed type 1200 Mark sensor type 1200	 NF-TA01
		NF-TB02	D2RF: 3 BRF: 4 VRF-T/JRF: 4	Long mode 4000 Standard mode 4000 Highspeed mode 3000	Standard type 4000 High speed type 1600 Mark sensor type 1700	
		NF-TR01	D2RF: 3 BRF: 4 VRF-T/JRF: 4	Long mode 4000 Standard mode 4000 Highspeed mode 3000	Standard type 3000 High speed type 1500 Mark sensor type 1100	
		NF-TH01	D2RF: 3 BRF: 4 VRF-T/JRF: 4	Long mode 4000 Standard mode 3500 Highspeed mode 2500	Standard type 4000 High speed type 1500 Mark sensor type 800	
		NF-TK77	D2RF: 3 BRF: 4 VRF-T/JRF: 4	Long mode 4000 Standard mode 4000 Highspeed mode 3000	Standard type 4000 High speed type 1400 Mark sensor type 1500	
Sideview lens NF-TA02	Right Angle Sensing 	NF-TB01	D2RF: 3 BRF: 3 VRF-T/JRF: 3	Long mode 1500 Standard mode 800 Highspeed mode 400	Standard type 600 High speed type 200 Mark sensor type 200	 NF-TA02
		NF-TB02	D2RF: 3 BRF: 3 VRF-T/JRF: 3	Long mode 1500 Standard mode 1000 Highspeed mode 450	Standard type 600 High speed type 250 Mark sensor type 250	
		NF-TR01	D2RF: 3 BRF: 3 VRF-T/JRF: 3	Long mode 1000 Standard mode 700 Highspeed mode 450	Standard type 500 High speed type 200 Mark sensor type 150	
		NF-TH01	D2RF: 3 BRF: 3 VRF-T/JRF: 3	Long mode 1000 Standard mode 800 Highspeed mode 450	Standard type 500 High speed type 200 Mark sensor type 90	
		NF-TK77	D2RF: 3 BRF: 3 VRF-T/JRF: 3	Long mode 1500 Standard mode 800 Highspeed mode 450	Standard type 600 High speed type 200 Mark sensor type 200	

Plastic Fiber Optics - Additional Models Available

In addition to the configurations shown, custom designed fiber optics are available on request:

- Reduce or increase plastic fiber optic bundle diameters.
- Change and tip material from brass to stainless steel.
- Modify straight or angled probe tip dimensions.
- Modify overall fiber length.
- Modify high temperature rating.
- Chemical resistance modifications.

Application notes and Warnings

- Terminated plastic fiber assemblies are optically ground and polished, and cannot be shortened, spliced, or otherwise modified.
- Do not subject the plastic fibers to sharp bends, pinching, high tensile loads, or high levels of radiation.
- When ordering fiber lengths in excess of 2m, take into account light signal attenuation due to the additional length.
- Due to the light transmission properties of plastic fiber optic cables it is recommended that they are only used with amplifiers that have a visible light source. If used with an Infrared LED light source the sensing distance cannot be guaranteed.
- Use cation when applying fiber optics in hazardous locations. Although fiber optics assemblies are, by themselves, intrinsically safe, the sensor and associated electronics must be LOCATED IN A SAFE ENVIRONMENT.

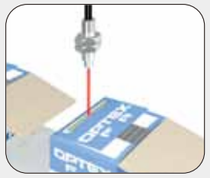
NF series Water (Moisture) Sensing Type (Unique!!)

- ***Optex FA Water (moisture) sensing type fiber optic cables are designed for use with the "BIF series" amplifiers. A special Infrared LED in the 1.45 micron spectral response range is used as the light source. Water and Humidity will absorb optical energy at this spectral range. The sensor is able to detect the presence of moisture in the target due to the absorption of this energy.***
- ***Thru-Beam and Diffuse types are available.***

Water

BIF series

Applications



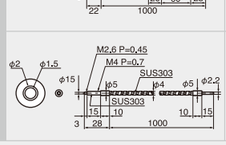
Presence of cold or hot glue in packaging

IV solution bag

Water in the dark colored bottle

Level check of water

Specifications

Sensing head	Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire)				Operation temperature (℃～℃)	Radius (mm)	Part Number
	Red LED for general purpose		Green LED for Mark Sensing				
	D2RF	BRF/BRF-H	D2GF	BGF			
Water 	—	Applicable with "BIF" series amplifier only. (30)※1	—	—	−40～200	R=25	NF-DW01
Water	—	Applicable with "BIF" series amplifier only. (100)	—	—	−40～200	R=25	NF-TW01

※ 1 Amplifier BIF-W

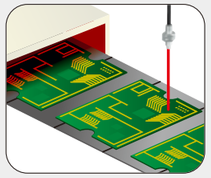
NF series Glass Fiber Optics

- ***Optex FA glass fiber optic cables are excellent for use in harsh sensing environments such as high temperatures up to 300˚C (572˚F), around corrosive materials, extreme moisture, etc.***
- ***Glass fiber optic cables are constructed of a combination of optical glass fibers, stainless steel, PVC and optical grade epoxy, they are able to withstand high levels of mechanical shock and vibration. They are also immune to electrical noise.***
- ***Special fibers ideal for various applications are available upon request.***

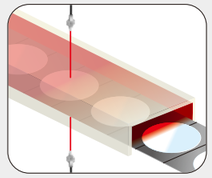
High temperature

Mapping application

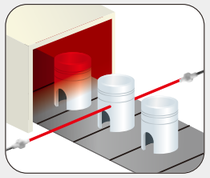
Applications



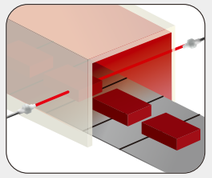
Post heated board



Disks in the furnace

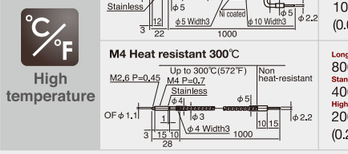


Post heat metals



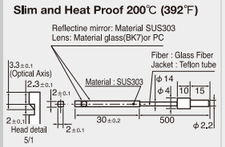
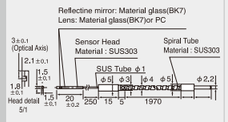
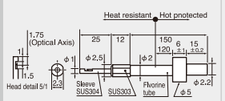
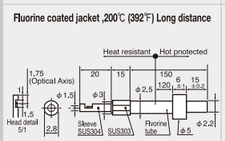
Bricks in the furnace

Specifications (Diffuse & Thru-beam Type Fibers)

Sensing head	Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire)				Operation temperature (℃～℃)	Radius (mm)	Part Number
	Red LED for general purpose		Green LED for Mark Sensing				
	D2RF	BRF/BRF-H	D2GF	BGF			
High temperature 	Long mode 300 Standard mode 200 Highspeed mode 100 (0.015)	BRF 140 BRF-H 55 (0.015)	Long mode 30 Standard mode 15 Highspeed mode 5 (0.015)	BGF 25 (0.015)	−40～300	R=25	NF-DH83
High temperature	Long mode 800 Standard mode 400 Highspeed mode 200 (0.2)	BRF 350 BRF-H 150 (0.2)	Long mode 350 Standard mode 180 Highspeed mode 80 (0.2)	BGF 130 (0.2)	−40～300	R=25	NF-TH84

※ Non-catalogue products are available upon request.

Specifications (Thru-beam Type Fibers)

	Sensing head	Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable object size. (copper wire) Red LED for general purpose D2RF	Red LED for general purpose BRF/BRF-H	Green LED for Mark Sensing D2GF	Green LED for Mark Sensing BGF	Operation temperature (℃～℃)	Radius (mm)	Part Number
Mapping application (Glass)	**Slim and Heat Proof 200℃ (392℉)** 	Long mode 500 Standard mode 400 Highspeed mode 300 (0.06)	—	—	—	−40～200	R=30	NF-TS27
	Heat Proof 300℃ (572℉), SUS303 armed 	Long mode 650 Standard mode 380 Highspeed mode 330 (0.06)	—	—	—	−40～300	R=25	NF-TS24
	Fluorine coated jacket. 200℃ (392℉) 	Long mode 100 Standard mode 80 Highspeed mode 60 (0.06)	—	—	—	−40～200	R=30	NF-TH04S
	Fluorine coated jacket ,200℃ (392℉) Long distance 	Long mode 350 Standard mode 250 Highspeed mode 200 (0.06)	—	—	—	−40～200	R=30	NF-TH05S

Glass Fiber Optics - Additional Models Available

In addition to the configurations shown, custom designed fiber optics are available on request:

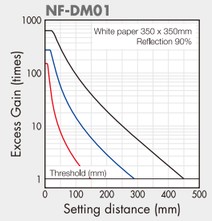
- Substitute PVC over monocoil sheathing for stainless steel.
- Reduce or increase plastic fiber optic bundle diameters.
- Substitute a rectangular-shaped fiber bundle (0.5mm x 2.5mm) for a circular bundle, or vice versa.
- Change sensing tip material from brass to stainless steel.
- Modify straight or angled probe tip dimensions.
- Modify overall fiber length.

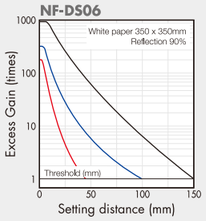
Application notes and Warnings

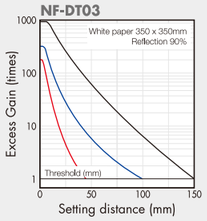
- The ends of glass fiber optic assemblies are optically ground and polished. Care taken in this manufacturing process accounts for the light coupling efficiency of the fiber optic assembly. As a result, glass fiber assemblies cannot be shortened, spliced, or otherwise modified.
  Terminated plastic fiber assemblies are optically ground and polished, and cannot be shortened, spliced, or otherwise modified.
- Use cation when applying fiber optics in hazardous locations. Although fiber optics assemblies are, by themselves, intrinsically safe, the sensor and associated electronics must be LOCATED IN A SAFE ENVIRONMENT.
- In applications where glass fibers are being used to insulate the control from high voltage, specify silicone rubber, teflon, or high-density polyethylene sheathing with no reinforcing wire in the cable. It is the responsibility of the user to test each fiber optic assembly for insulation capacity.
- Do not subject the fibers to sharp bends, repeated flexing, or high levels of radiation.
- When ordering fiber lengths in excess of 1m, take into account light signal reduction of 5percent per 300mm of additional length.

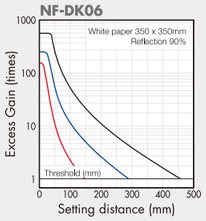
Diffuse Type Fibers + D2RF amplifier Excess Gain Curves (Typical Value)

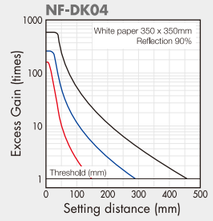
Long mode
Standard mode
Fast mode

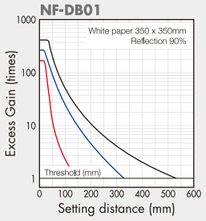
NF-DM01


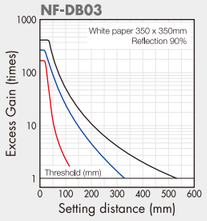
NF-DS06


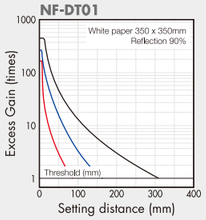
NF-DT03


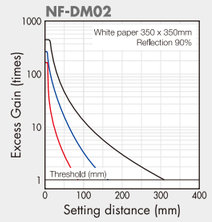
NF-DK06


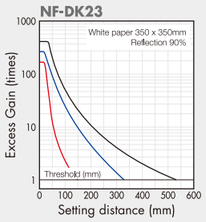
NF-DK04


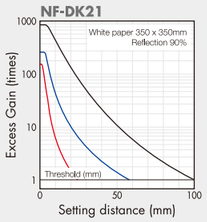
NF-DB01


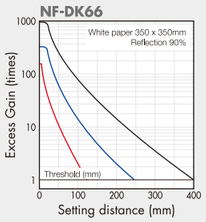
NF-DB03


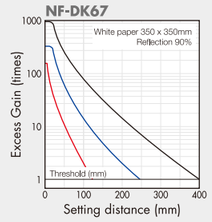
NF-DT01


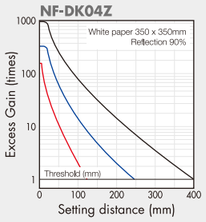
NF-DM02


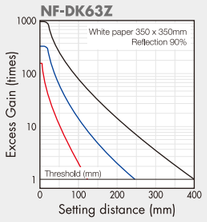
NF-DK23


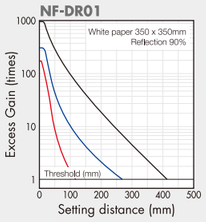
NF-DK21


NF-DK66


NF-DK67


NF-DK04Z


NF-DK63Z


NF-DR01


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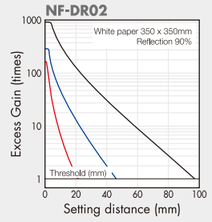

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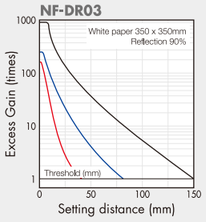
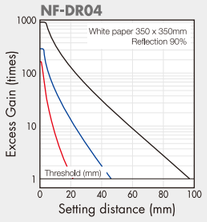
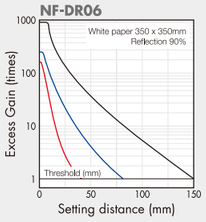
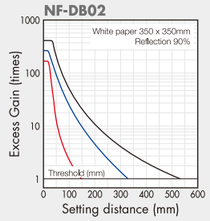


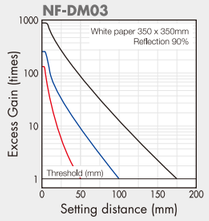
NF-DR04


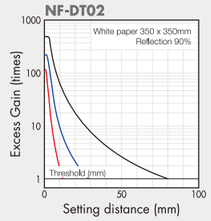
NF-DR06


Diffuse Type Fibers + D2RF amplifier Excess Gain Curves (Typical Value)

Long mode
Standard mode
Fast mode

NF-DB02


NF-DM03


NF-DT02


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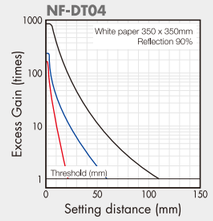
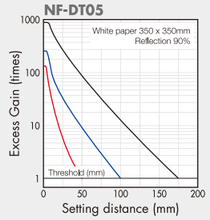


NF-DT05


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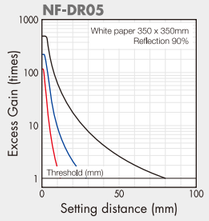
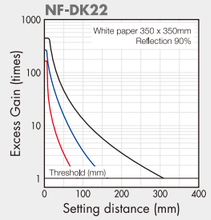
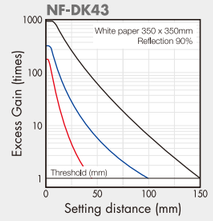
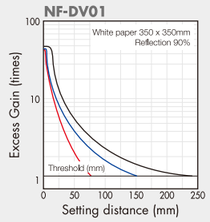
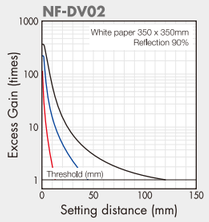
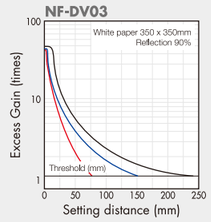


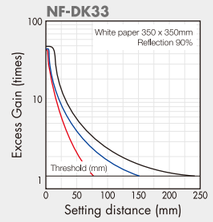
NF-DK22


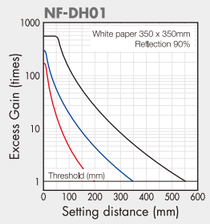
NF-DK43


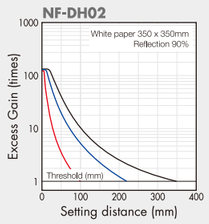
NF-DV01


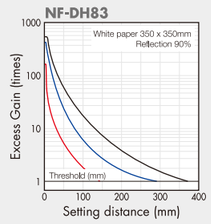
NF-DV02


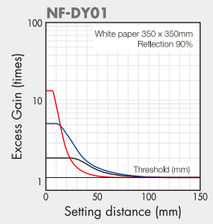
NF-DV03


NF-DK33


NF-DH01


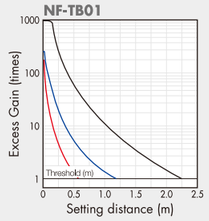
NF-DH02


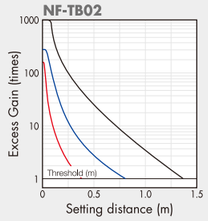
NF-DH83


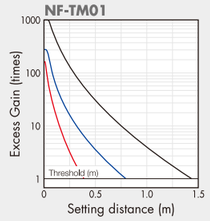
NF-DY01


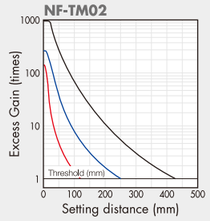
Thru-beam Type Fibers + D2RF amplifier Excess Gain Curves (Typical Value)

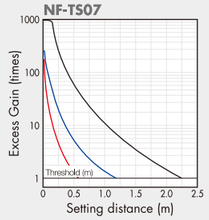
Long mode
Standard mode
Fast mode

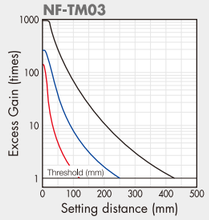
NF-TB01


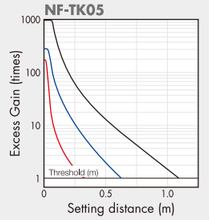
NF-TB02


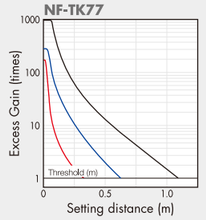
NF-TM01


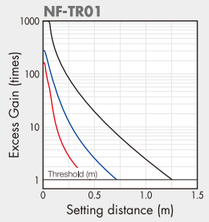
NF-TM02


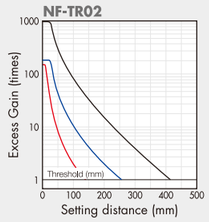
NF-TS07


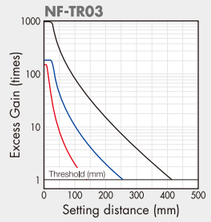
NF-TM03


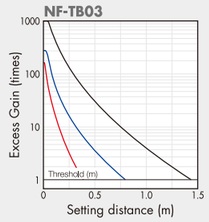
NF-TK05


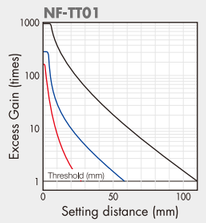
NF-TK77


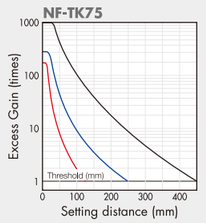
NF-TR01


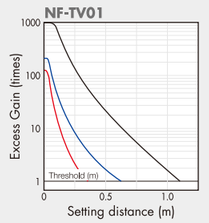
NF-TR02


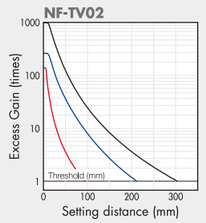
NF-TR03


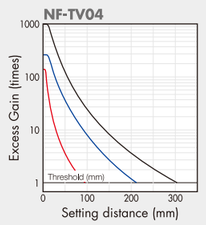
NF-TB03


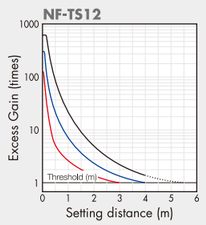
NF-TT01


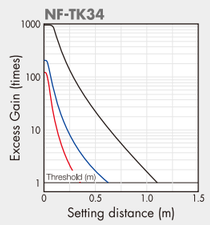
NF-TK75


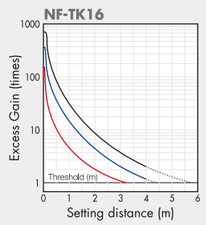
NF-TV01


NF-TV02


NF-TV04


NF-TS12


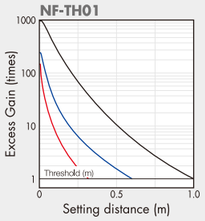
NF-TK34


NF-TK16


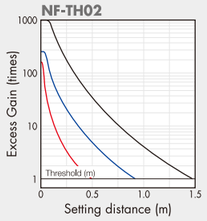
Thru-beam Type Fibers + D2RF amplifier
Excess Gain Curves (Typical Value)

Long mode
Standard mode
Fast mode

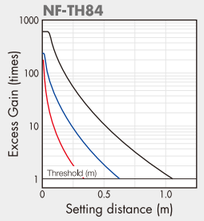
NF-TH01



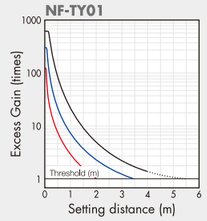
NF-TH02



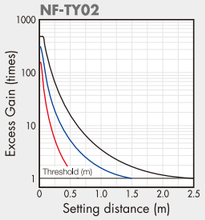
NF-TH84



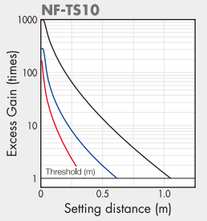
NF-TY01



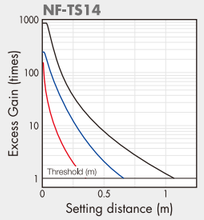
NF-TY02



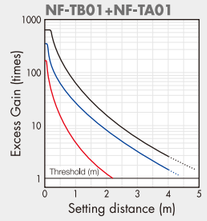
NF-TS10



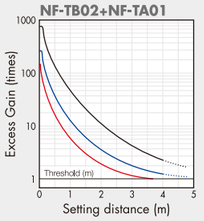
NF-TS14



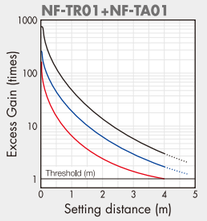
NF-TB01+NF-TA01



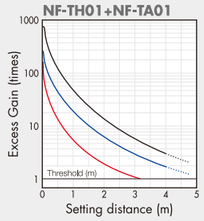
NF-TB02+NF-TA01



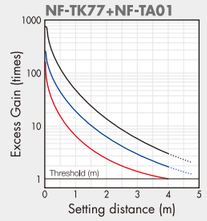
NF-TR01+NF-TA01



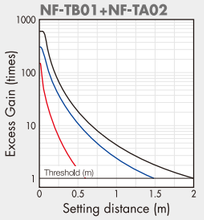
NF-TH01+NF-TA01



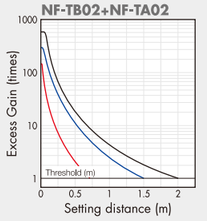
NF-TK77+NF-TA01



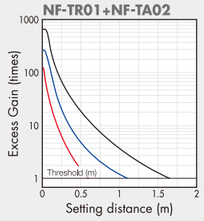
NF-TB01+NF-TA02



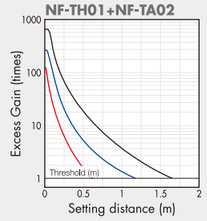
NF-TB02+NF-TA02



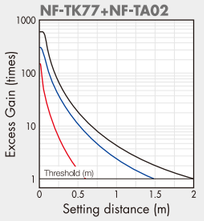
NF-TR01+NF-TA02



NF-TH01+NF-TA02

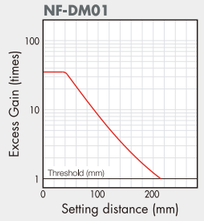


NF-TK77+NF-TA02

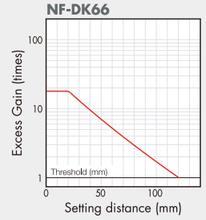


Diffuse Type Fibers + BRF amplifier
Excess Gain Curves (Typical Value)

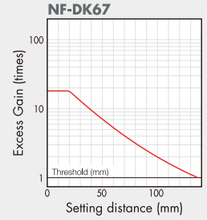
NF-DM01



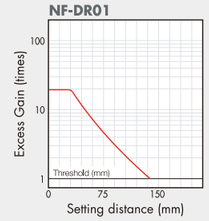
NF-DK66



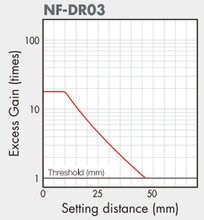
NF-DK67



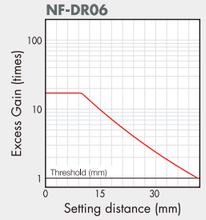
NF-DR01



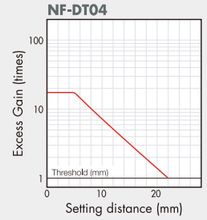
NF-DR03



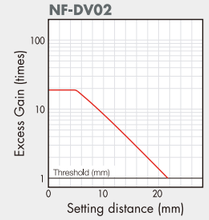
NF-DR06



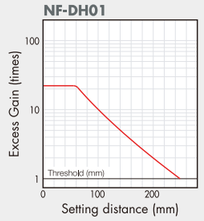
NF-DT04



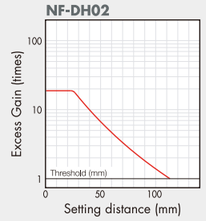
NF-DV02



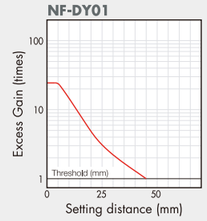
NF-DH01



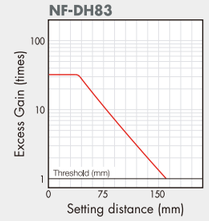
NF-DH02



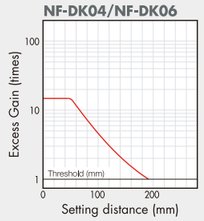
NF-DY01



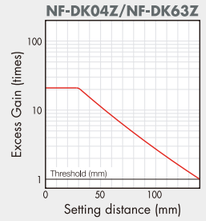
NF-DH83



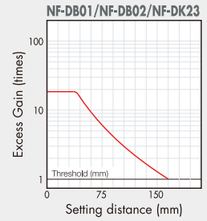
NF-DK04/NF-DK06



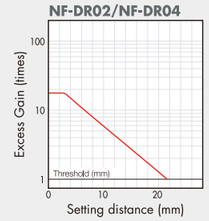
NF-DK04Z/NF-DK63Z



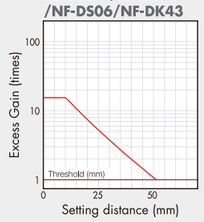
NF-DB01/NF-DB02/NF-DK23



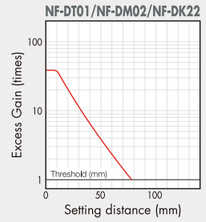
NF-DR02/NF-DR04



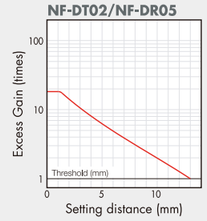
NF-DM03/NF-DT03 /NF-DS06/NF-DK43



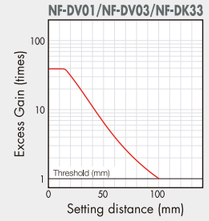
NF-DT01/NF-DM02/NF-DK22



NF-DT02/NF-DR05

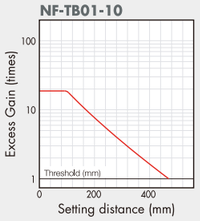


NF-DV01/NF-DV03/NF-DK33

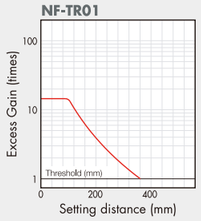


Thru-beam Type Fibers + BRF amplifier
Excess Gain Curves (Typical Value)

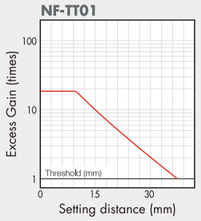
NF-TB01-10



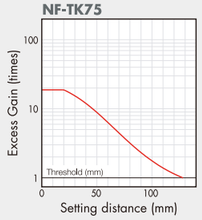
NF-TR01



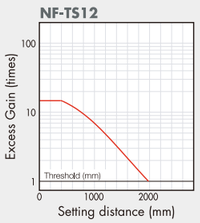
NF-TT01



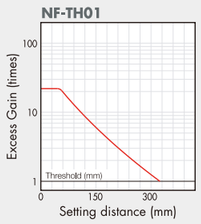
NF-TK75



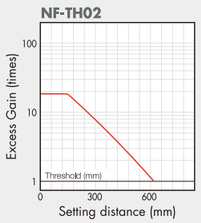
NF-TS12



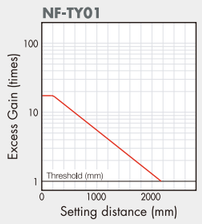
NF-TH01



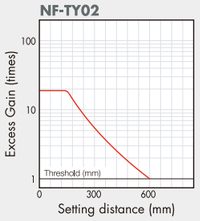
NF-TH02



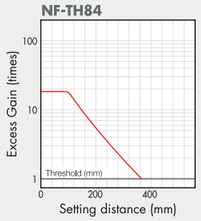
NF-TY01



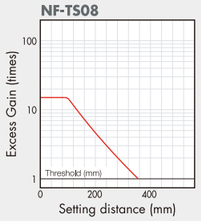
NF-TY02



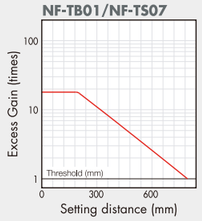
NF-TH84



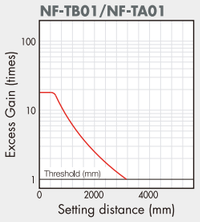
NF-TS08



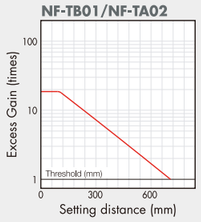
NF-TB01/NF-TS07



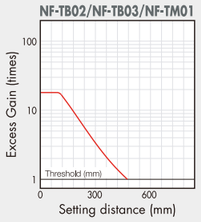
NF-TB01/NF-TA01



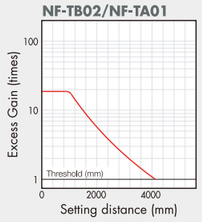
NF-TB01/NF-TA02



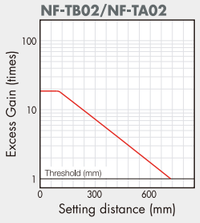
NF-TB02/NF-TB03/NF-TM01



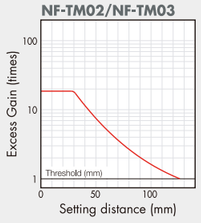
NF-TB02/NF-TA01



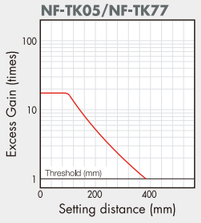
NF-TB02/NF-TA02



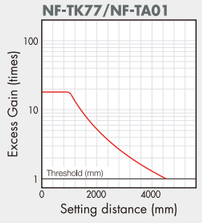
NF-TM02/NF-TM03



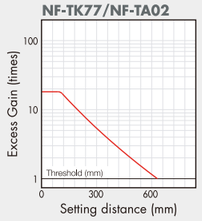
NF-TK05/NF-TK77



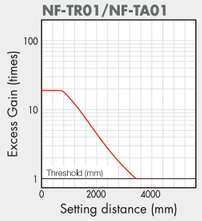
NF-TK77/NF-TA01



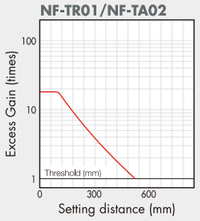
NF-TK77/NF-TA02



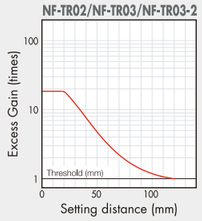
NF-TR01/NF-TA01



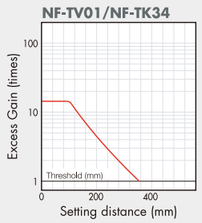
NF-TR01/NF-TA02



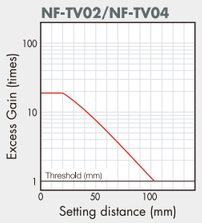
NF-TR02/NF-TR03/NF-TR03-2



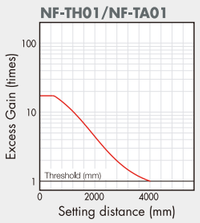
NF-TV01/NF-TK34



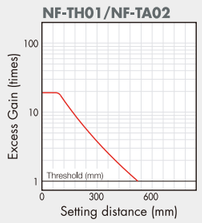
NF-TV02/NF-TV04



NF-TH01/NF-TA01



NF-TH01/NF-TA02

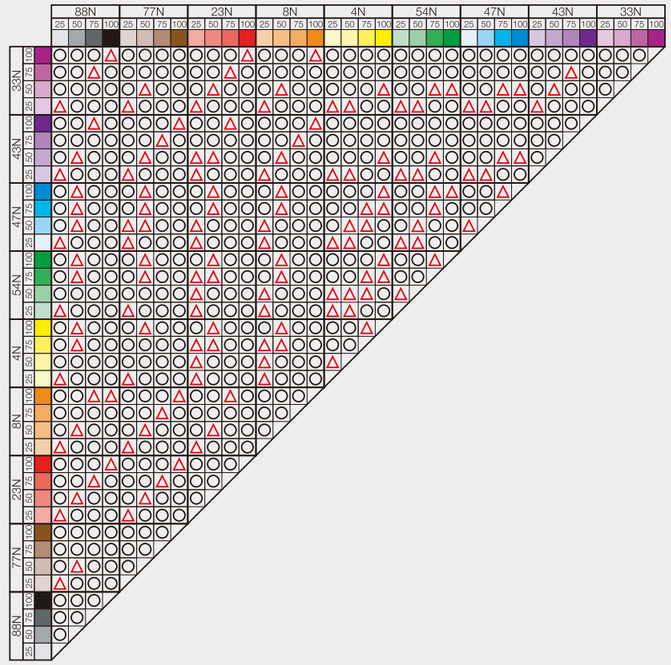


Color combination reference by amplifiers.

BGF series

○ : Stable

△ : Not recommended



Thru-beam type
- NF02-TK
- NF25-T
- NF25-TH

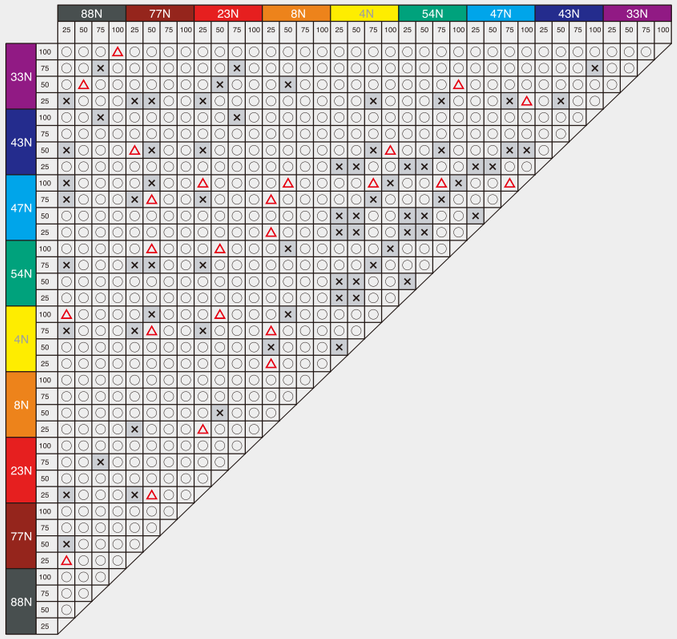
Diffuse reflective type
- NF02-DK
- NF25-D
- NF25-DH

- ***Hex shaped fiber sensing head is ideal for space-savings and easy mounting.***
- ***Available in Standard, Tight Bend and High Temperature models.***

Color combination reference by amplifiers.

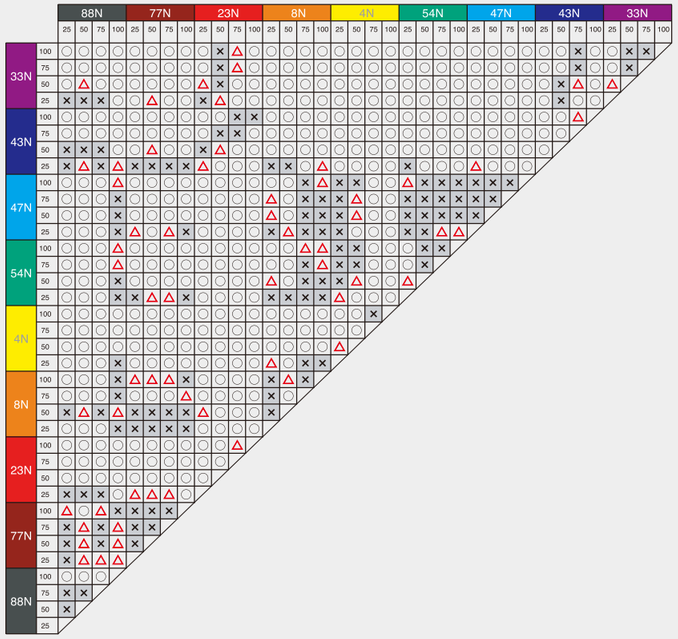
D2GF series (Standard mode)

◯ : Stable
△ : Not recommended
× : Impossible

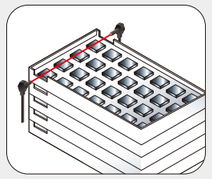


D2GF series (Long mode)

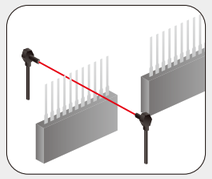
◯ : Stable
△ : Not recommended
× : Impossible



Applications



Detecting IC height

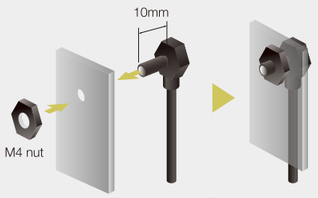


Checking IC pins (using slit masks)

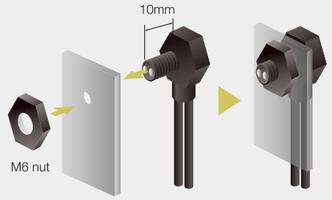
Features

Easy Mounting

The NF25/02 fiber cables (M4 Thru-beam / M6 Diffuse Reflective) are easily mounted using the threaded tip. All that is required for mounting is a single nut.
The threaded tip is sufficient in length to extend through most mounting surfaces.



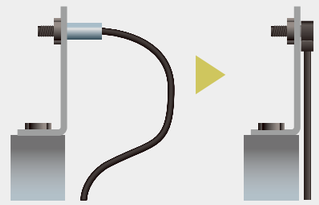
Thru-Beam Type



Diffuse Reflective Type

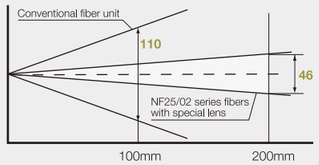
Space-saving installation

The design of the sensing head allows for installation in areas where a standard cable cannot be used.



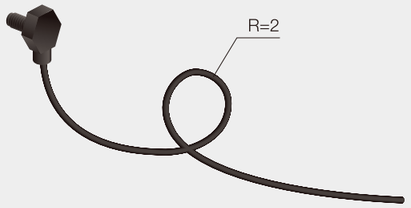
Narrow Beam Angle

The NF25/02 fiber cables have a lens mounted on the tip of the sensing head to project a narrow beam.



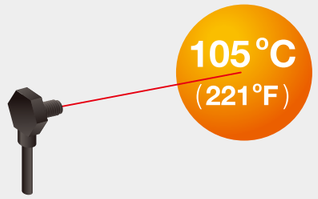
Tight Bend Type NF02 (R=2 mm)

The NF02 series can be bent to a 2 mm radius. This makes it ideal when mounting in areas where space is limited and helps to prevent the cable from becoming entangled with other parts of the equipment.



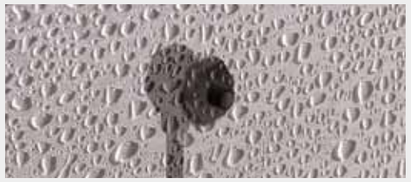
High Temperature Type NF25-H

The NF25-TH (Thru-beam) and NF25-DH type fibers are designed for use in high temperature applications.
The cables are rated up to 105 °C (221 °F).



IP67 Rating

Both the NF25 (Regular and High Temp) and the NF02 (Tight Bend) have a plastic housing, making them resistant to water and corrosion.



New Ergonomic Fiber Cutter

The NF25 and NF02 are free cut type fibers. The cutter that is included with the package has been ergonomically designed to make cutting the cable quick and easy.

The NF25/02 fiber cables can be used with any Optex FA Amplifier.

D2RF series
Digital amplifier

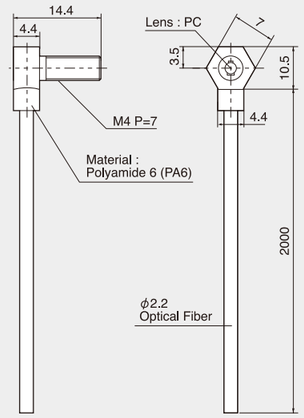
▶P117

BRF series
Pot type economical amplifier

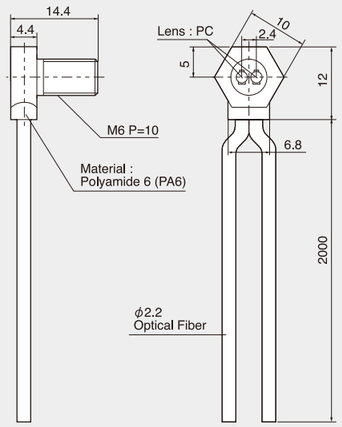
▶P125

Dimensions

Thru-Beam Type



Diffuse Reflective Type



(Unit : mm)

Sensing Distance

Thru-Beam Type

Type		Distance / Response		Radius	Operating Temp.
D2RF					
NF25-T	Standard	60μs	200	R25	–40C°~70C°
		250μs	600		
		2ms	800		
NF25-TH	High temperature	60μs	170	R25	–40C°~105C°
		250μs	500		
		2ms	750		
NF02-TK	Tight bend	60μs	150	R2	–40C°~70C°
		250μs	500		
		2ms	600		
D2GF					
NF25-T	Standard	60μs	100	R25	–40C°~70C°
		250μs	250		
		2ms	400		
NF25-TH	High temperature	60μs	40	R25	–40C°~105C°
		250μs	120		
		2ms	150		
NF02-TK	Tight bend	60μs	70	R2	–40C°~70C°
		250μs	250		
		2ms	300		
BRF					
NF25-T	Standard		350	R25	–40C°~70C°
NF25-TH	High temperature		300	R25	–40C°~105C°
NF02-TK	Tight bend		270	R2	–40C°~70C°
BGF					
NF25-T	Standard		150	R25	–40C°~70C°
NF25-TH	High temperature		100	R25	–40C°~105C°
NF02-TK	Tight bend		130	R2	–40C°~70C°
BRF-H					
NF25-T	Standard		150	R25	–40C°~70C°
NF25-TH	High temperature		130	R25	–40C°~105C°
NF02-TK	Tight bend		130	R2	–40C°~70C°

Diffuse Reflective Type

Type		Distance / Response		Radius	Operating Temp.
D2RF					
NF25-D	Standard	60μs	25	R25	–40C°~70C°
		250μs	80		
		2ms	120		
NF25-DH	High temperature	60μs	25	R25	–40C°~105C°
		250μs	80		
		2ms	120		
NF02-DK	Tight bend	60μs	10	R2	–40C°~70C°
		250μs	45		
		2ms	65		
D2GF					
NF25-D	Standard	60μs	5	R25	–40C°~70C°
		250μs	25		
		2ms	40		
NF25-DH	High temperature	60μs	-	R25	–40C°~105C°
		250μs	9		
		2ms	15		
NF02-DK	Tight bend	60μs	-	R2	–40C°~70C°
		250μs	10		
		2ms	18		
BRF					
NF25-D	Standard		45	R25	–40C°~70C°
NF25-DH	High temperature		45	R25	–40C°~105C°
NF02-DK	Tight bend		15	R2	–40C°~70C°
BGF					
NF25-D	Standard		15	R25	–40C°~70C°
NF25-DH	High temperature		10	R25	–40C°~105C°
NF02-DK	Tight bend		10	R2	–40C°~70C°
BRF-H					
NF25-D	Standard		15	R25	–40C°~70C°
NF25-DH	High temperature		10	R25	–40C°~105C°
NF02-DK	Tight bend		10	R2	–40C°~70C°