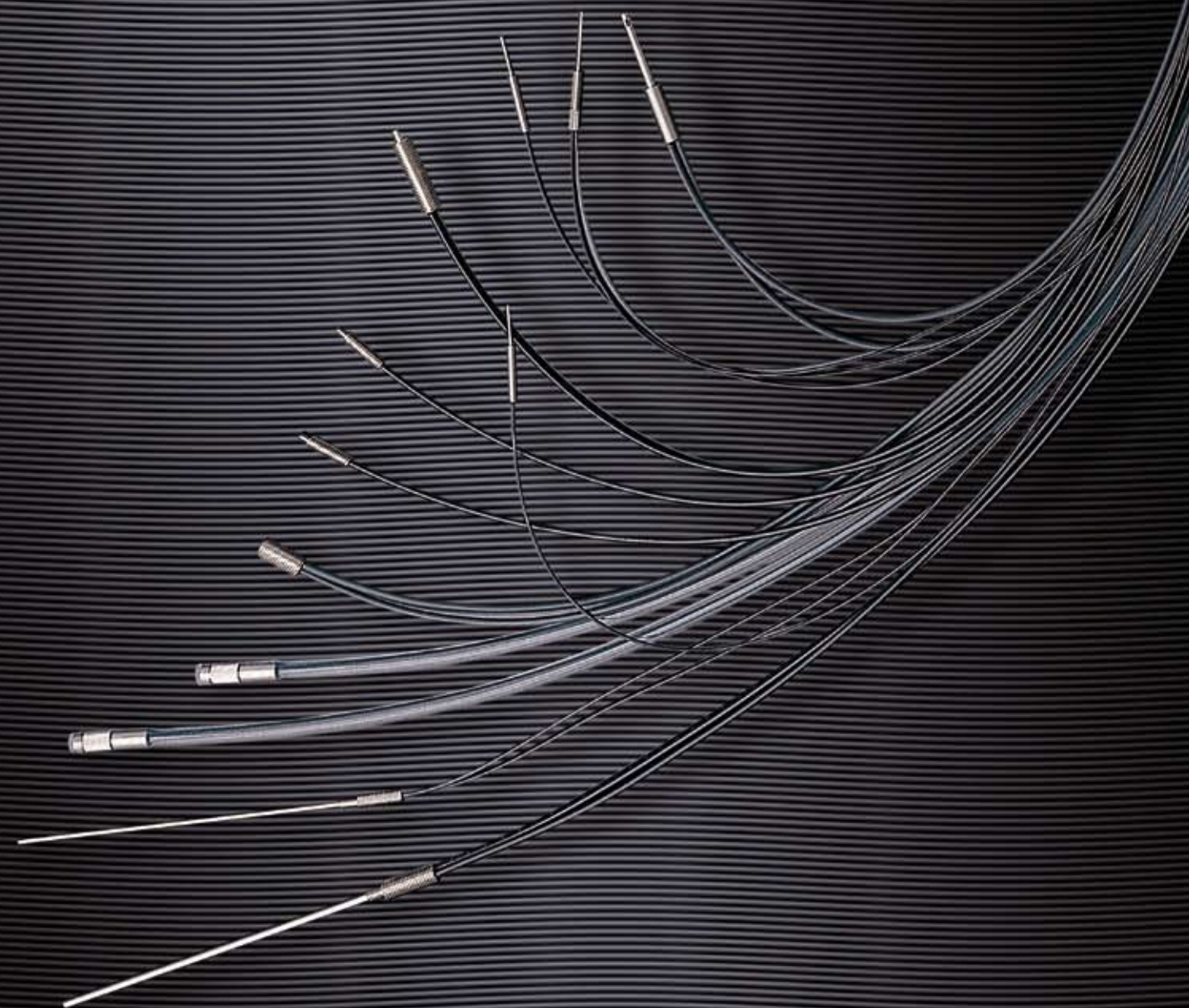


Technical data are available at ;
<http://www.optex-fa.com>



Fiber optic cables for the most demanding applications.
Special requests for custom made fiber cables are welcome.

- Specifications are subject to change without prior notice.
- Specifications and technical information not mentioned here are written in Operation Manual. Or visit our website for details.
- All the warnings and cautions to know prior to use are given in Operation Manual.

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.
- **Noisy environments**
Fibers are non-electronic mechanical components, and are completely immune to electrical noise.
- **High temperature applications**
Fiber optic assemblies can tolerate elevated temperatures in some cases as high as 300°F.
- **Corrosive and wet environments**
Special purpose fibers withstand corrosive materials, moisture and even repeated washdown.
- **High vibration and shock**
The low mass of fibers enables them to withstand extreme vibration and mechanical shock.
- **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.

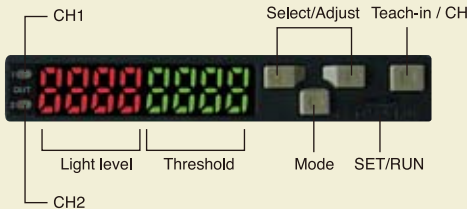
OPTEX FA Amplifiers for NF series Fibers

(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

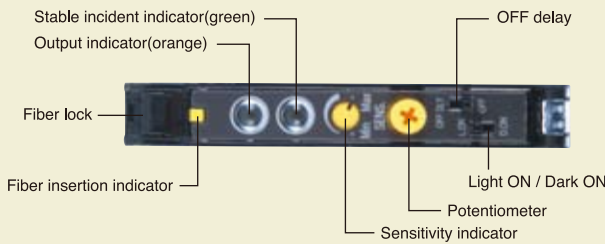
(Infrared LED) Moisture Sensing Amplifier
BIF series

(Red LED) High Speed Type
BRF-H series

(Green LED) Mark Sensor
BGF 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

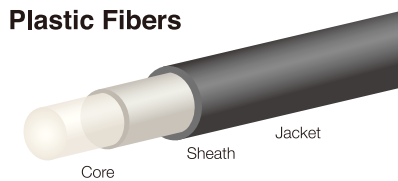
Glass fibers are the best choice for challenging environments such as high temperatures, corrosive materials and moisture.

Features:

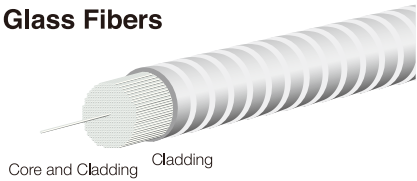
- Solve numerous challenging sensing requirements.
- For hostile environments such as high temperatures up to 300°C (572°F), corrosive materials, and extreme moisture.
- Withstand high levels of shock and vibration.
- Inherently immune to extreme electrical noise.
- Sheathing is typically stainless steel 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.



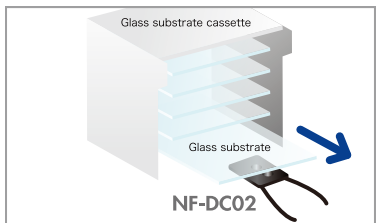
Water

Water/Moisture sensing type with 1.45 μm IR element.

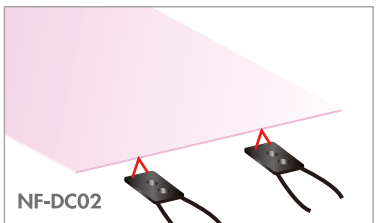
NF series Plastic Fiber Optics

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

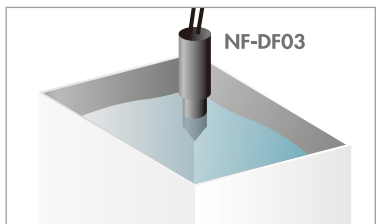
Applications



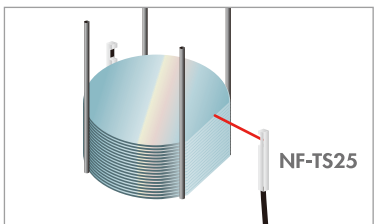
Detecting glass substrate



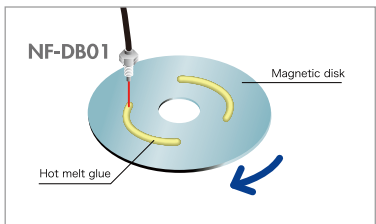
Detecting glass substrate



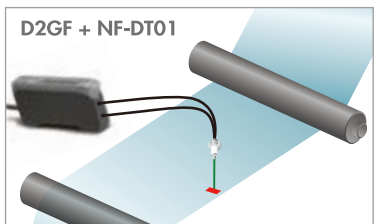
Detecting liquid level



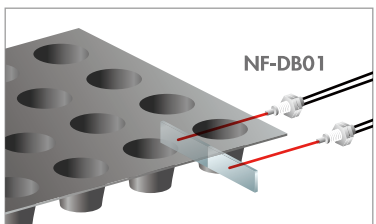
Detecting wafer position



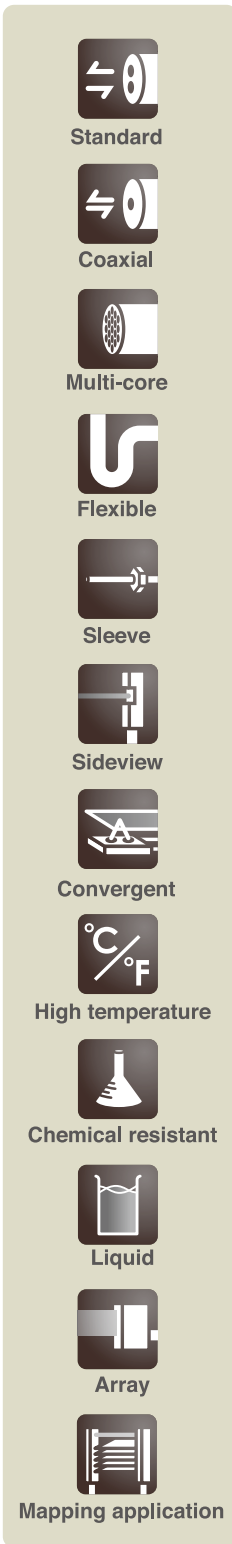
Detection of hot melt glue on magnetic disk



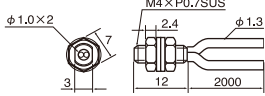
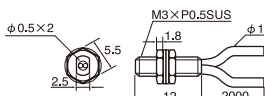
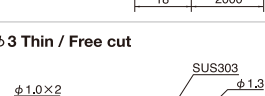
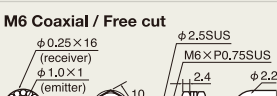
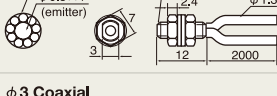
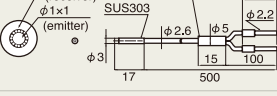
Detection of mark on sheet



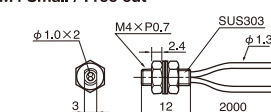
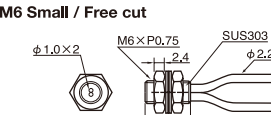
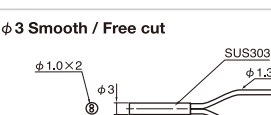
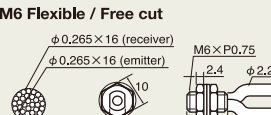
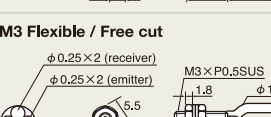
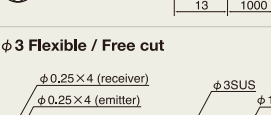
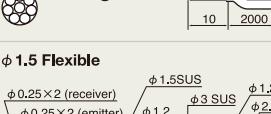
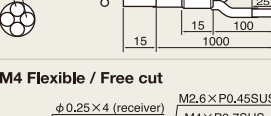
Positioning tray

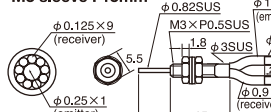
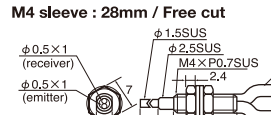
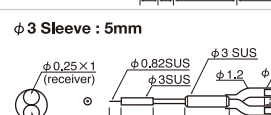
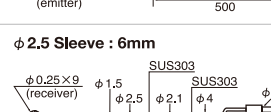
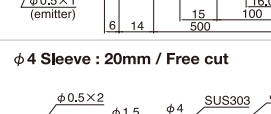
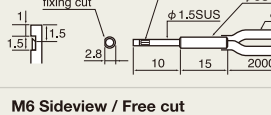
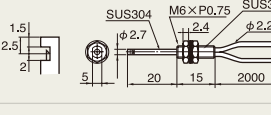
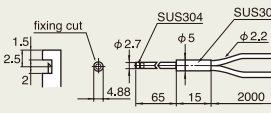
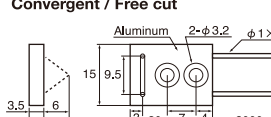
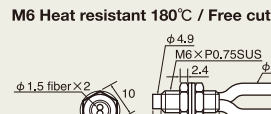


Specifications (Diffuse Type Fibers)

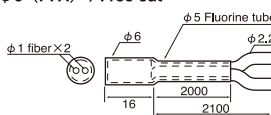
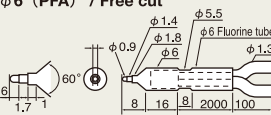
	Sensing head	Sensing distance (unit:mm) Value in parenthesis is the Minimum detectable Gold wire diameter.					Operation temperature (℃ ~℃)	Radius (mm)	Part Number
		Red LED for general purpose			Green LED for Mark Sensing				
		D2RF	BRF/BRF-H	VRF-T/JRF	D2GF	BGF			
Standard	M4 Long Distance / Free cut 	Long mode 400 Standard mode 250 Highspeed mode 100 (0.015)	BRF 160 BRF-H 60 (0.015)	VRF-T 100 (0.015) JRF 70 (0.02)	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)	VRF-T 25 (0.015) JRF 20 (0.02)	Long mode 30 Standard mode 15 Highspeed mode 6 (0.015)	BGF 5 (0.015)	—40~70	R=15	NF-DS06
	φ 2.5 Thin / Free cut 	Long mode 100 Standard mode 60 Highspeed mode 30 (0.015)	BRF 45 BRF-H 15 (0.015)	VRF-T 25 (0.015) JRF 20 (0.02)	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)	VRF-T 100 (0.015) JRF 65 (0.02)	Long mode 160 Standard mode 80 Highspeed mode 40 (0.015)	BGF 45 (0.015)	—40~70	R=25	NF-DK06
	φ 3 Thin / Free cut 	Long mode 450 Standard mode 250 Highspeed mode 100 (0.015)	BRF 160 BRF-H 60 (0.015)	VRF-T 100 (0.015) JRF 65 (0.02)	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)	VRF-T 100 (0.015) JRF 70 (0.02)	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)	VRF-T 100 (0.015) JRF 70 (0.02)	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)	VRF-T 35 (0.015) JRF 25 (0.02)	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)	VRF-T 35 (0.015) JRF 25 (0.02)	Long mode 40 Standard mode 20 Highspeed mode 6 (0.015)	BGF 10 (0.015)	—40~70	R=15	NF-DM02
	φ 3 Coaxial 	Long mode 400 Standard mode 250 Highspeed mode 100 (0.015)	BRF 150 BRF-H 65 (0.015)	VRF-T 100 (0.015) JRF 70 (0.02)	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)	VRF-T 14 (0.015) JRF 8 (0.02)	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 Gold wire diameter.					Operation temperature (°C ~°C)	Radius (mm)	Part Number
		Red LED for general purpose			Green LED for Mark Sensing				
		D2RF	BRF/BRF-H	VRF-T/JRF	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)	VRF-T 80 (0.015) JRF 50 (0.02)	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)	VRF-T 80 (0.015) JRF 50 (0.02)	Long mode 80 Standard mode 45 Highspeed mode 20 (0.015)	BGF 25 (0.015)	—40~70	R=2	NF-DK67
	φ 3 Smooth / Free cut 	Long mode 300 Standard mode 180 Highspeed mode 80 (0.015)	BRF 110 BRF-H 45 (0.015)	VRF-T 80 (0.015) JRF 50 (0.02)	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)	VRF-T 80 (0.015) JRF 50 (0.02)	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)	VRF-T 85 (0.015) JRF 70 (0.02)	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)	VRF-T 14 (0.015) JRF 8 (0.02)	Long mode 15 Standard mode 7 Highspeed mode 3 (0.015)	BGF 2 (0.015)	—40~70	R=4	NF-DR02
	φ 3 Flexible / Free cut 	Long mode 120 Standard mode 50 Highspeed mode 25 (0.015)	BRF 35 BRF-H 10 (0.015)	VRF-T 25 (0.015) JRF 20 (0.02)	Long mode 25 Standard mode 12 Highspeed mode 5 (0.015)	BGF 5 (0.015)	—40~70	R=4	NF-DR03
	φ 1.5 Flexible 	Long mode 70 Standard mode 30 Highspeed mode 15 (0.015)	BRF 20 BRF-H 8 (0.015)	VRF-T 14 (0.015) JRF 8 (0.02)	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)	VRF-T 25 (0.015) JRF 20 (0.02)	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)	VRF-T 100 (0.015) JRF 70 (0.02)	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)	VRF-T 25 (0.015) JRF 70 (0.02)	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)	VRF-T 6 (0.015) JRF 5 (0.02)	Long mode 6 Standard mode 3 Highspeed mode 1.5 (0.015)	BGF 2 (0.015)	—40~70	R=4	NF-DT02

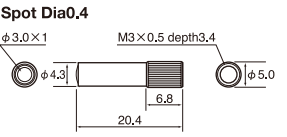
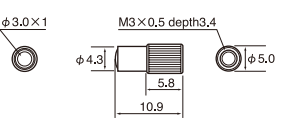
	Sensing head	Sensing distance (unit:mm) Value in parenthesis is the Minimum detectable Gold wire diameter.					Operation temperature (°C ~ °C)	Radius (mm)	Part Number
		Red LED for general purpose			Green LED for Mark Sensing				
		D2RF	BRF/BRF-H	VRF-T/JRF	D2GF	BGF			
 Sleeve	M3 sleeve : 15mm 	Long mode 70 Standard mode 40 Highspeed mode 15 (0.015)	BRF 15 BRF-H 8 (0.015)	VRF-T 13 (0.015) JRF 9 (0.02)	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)	VRF-T 25 (0.015) JRF 20 (0.02)	Long mode 30 Standard mode 15 Highspeed mode 6 (0.015)	BGF 5 (0.015)	—40~70	R=15	NF-DT05
	φ 3 Sleeve : 5mm 	Long mode 40 Standard mode 15 Highspeed mode 5 (0.015)	BRF 10 BRF-H 3 (0.015)	VRF-T 8 (0.015) JRF 5 (0.02)	Long mode 6 Standard mode 3 Highspeed mode 1.5 (0.015)	BGF 2 (0.015)	—40~70	R=4	NF-DR05
	φ 2.5 Sleeve : 6mm 	Long mode 250 Standard mode 120 Highspeed mode 50 (0.015)	BRF 70 BRF-H 20 (0.015)	VRF-T 35 (0.015) JRF 25 (0.02)	Long mode 40 Standard mode 20 Highspeed mode 6 (0.015)	BGF 10 (0.015)	—40~70	R=15	NF-DK22
	φ 4 Sleeve : 20mm / Free cut 	Long mode 100 Standard mode 60 Highspeed mode 12 (0.015)	BRF 45 BRF-H 15 (0.015)	VRF-T 25 (0.015) JRF 20 (0.02)	Long mode 30 Standard mode 15 Highspeed mode 6 (0.015)	BGF 5 (0.015)	—40~70	R=15	NF-DK43
 Sideview	φ 5 Sideview / Free cut 	Long mode 200 Standard mode 120 Highspeed mode 50 (0.025)	BRF 90 BRF-H 40 (0.025)	VRF-T 50 (0.025) JRF 40 (0.03)	Long mode 80 Standard mode 35 Highspeed mode 15 (0.025)	BGF 25 (0.025)	—40~70	R=25	NF-DV01
	φ 3 Sideview / Free cut 	Long mode 80 Standard mode 30 Highspeed mode 7 (0.015)	BRF 15 BRF-H 5 (0.015)	VRF-T 12 (0.015) JRF 8 (0.02)	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)	VRF-T 50 (0.015) JRF 40 (0.02)	Long mode 80 Standard mode 35 Highspeed mode 15 (0.025)	BGF 25 (0.025)	—40~70	R=25	NF-DV03
	φ 5 Sideview / Free cut 	Long mode 200 Standard mode 120 Highspeed mode 50 (0.025)	BRF 90 BRF-H 40 (0.025)	VRF-T 50 (0.015) JRF 40 (0.02)	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)	VRF-T 6 (0.015) JRF 6 (0.02)	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°C / Free cut 	Long mode 450 Standard mode 250 Highspeed mode 150 (0.015)	BRF 210 BRF-H 90 (0.015)	VRF-T 135 (0.015) JRF 100 (0.02)	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°C / Free cut 	Long mode 250 Standard mode 150 Highspeed mode 50 (0.015)	BRF 110 BRF-H 40 (0.015)	VRF-T 75 (0.015) JRF 55 (0.02)	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)

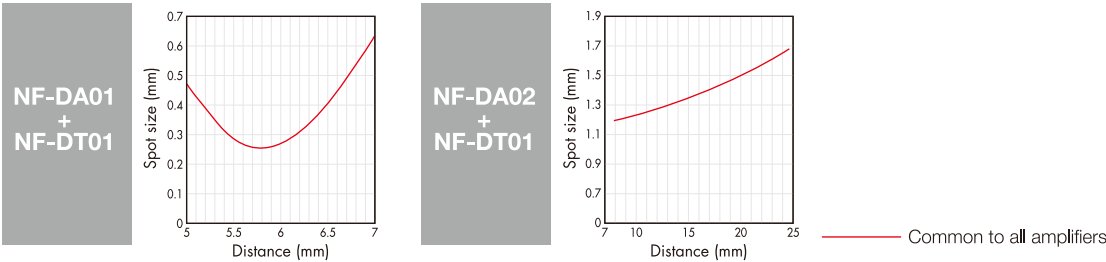
	Sensing head	Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable Gold wire diameter.					Operation temperature (℃ ~℃)	Radius (mm)	Part Number
		Red LED for general purpose			Green LED for Mark Sensing				
		D2RF	BRF/BRF-H	VRF-T/JRF	D2GF	BGF			
 Chemical resistant	φ 6 (PFA) / Free cut 	Long mode 100 Standard mode 70 Highspeed mode 50 (0.02)	BRF 45 BRF-H 25 (0.015)	VRF-T 60 (0.015) JRF 45 (0.03)	Long mode 50 Standard mode 20 Highspeed mode 10 (0.02)	BGF 10 (0.015)	—40~100	R=60	NF-DY01
 Liquid	φ 6 (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.

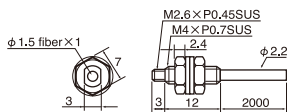
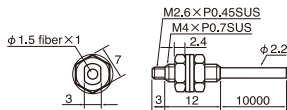
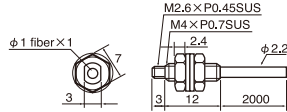
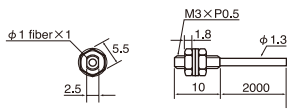
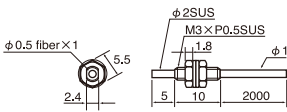
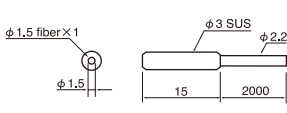
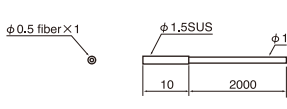
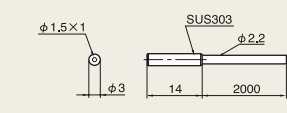
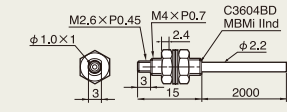
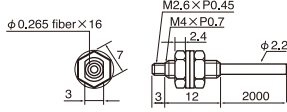
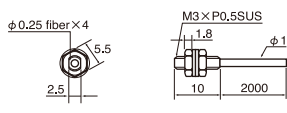
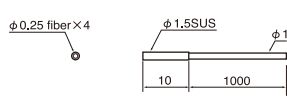
Fine Spot Lens for Diffuse Type Fibers

	Lens detail	Applicable fiber	Minimum detectable Gold wire diameter (mm).	Focus distance (Minimum object)			Part Number
				DRF-T	BRF	VRF-T / JRF	
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

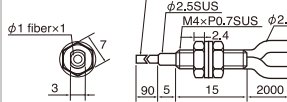
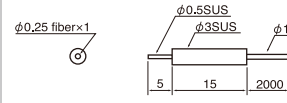
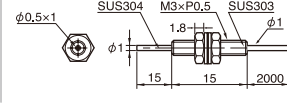
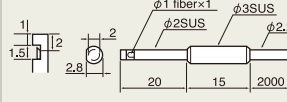
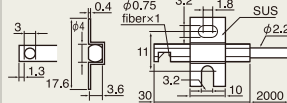
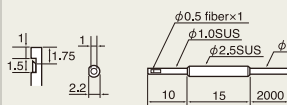
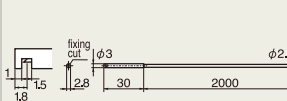
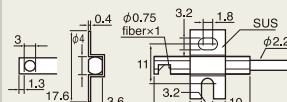
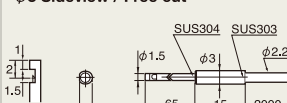
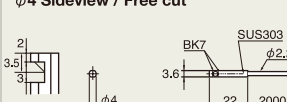
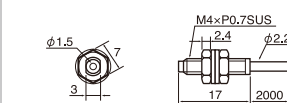
Sensing Distance with Fine Spot Lens



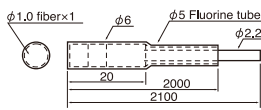
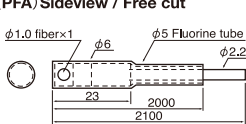
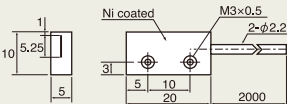
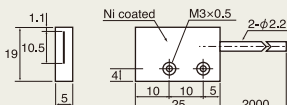
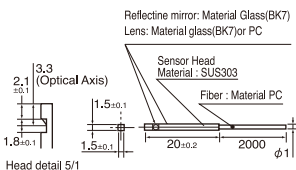
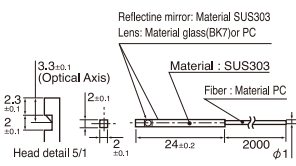
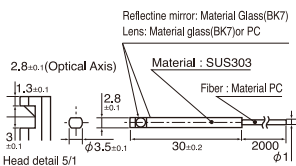
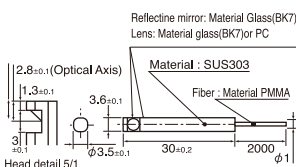
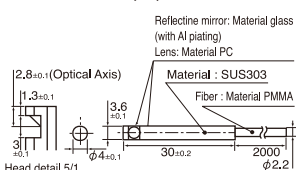
Specifications (Thru-beam Type Fibers)

	Sensing head	Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable Gold wire diameter.					Operation temperature (℃~℃)	Radius (mm)	Part Number
		Red LED for general purpose			Green LED for Mark Sensing				
		D2RF	BRF/BRF-H	VRF-T/JRF	D2GF	BGF			
 Standard	M4 Long Distance / Free cut 	Long mode 1800 Standard mode 800 Highspeed mode 450 (0,5)	BRF 700 BRF-H 350 (0,5)	VRF-T 580 (0,5) JRF 400 (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) JRF 200 (0,2)	VRF-T 350 (0,2) JRF 200 (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) JRF 200 (0,2)	VRF-T 350 (0,2) JRF 200 (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) JRF 70 (0,2)	VRF-T 100 (0,1) JRF 70 (0,2)	Long mode 120 Standard mode 60 Highspeed mode 30 (0,1)	BGF 25 (0,1)	-40~70	R=15	NF-TM02
	φ 3 Standard round / Free cut 	Long mode 1800 Standard mode 800 Highspeed mode 450 (0,5)	BRF 700 BRF-H 350 (0,5) JRF 400 (0,5)	VRF-T 580 (0,5) JRF 400 (0,5)	Long mode 800 Standard mode 400 Highspeed mode 200 (0,5)	BGF 350 (0,5)	-40~70	R=30	NF-TS07
	φ 1.5 Thin / Free cut 	Long mode 350 Standard mode 200 Highspeed mode 90 (0,1)	BRF 120 BRF-H 40 (0,1) JRF 70 (0,2)	VRF-T 100 (0,1) JRF 70 (0,2)	Long mode 120 Standard mode 60 Highspeed mode 30 (0,1)	BGF 25 (0,1)	-40~70	R=15	NF-TM03
 Multi-core	φ 3 Smooth / Free cut 	Long mode 800 Standard mode 400 Highspeed mode 200 (0,2)	BRF 360 BRF-H 120 (0,2) JRF 230 (0,3)	VRF-T 350 (0,2) JRF 230 (0,3)	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) JRF 230 (0,3)	VRF-T 350 (0,2) JRF 230 (0,3)	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) JRF 180 (0,2)	VRF-T 270 (0,3) JRF 180 (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) JRF 50 (0,2)	VRF-T 80 (0,1) JRF 50 (0,2)	Long mode 70 Standard mode 40 Highspeed mode 20 (0,1)	BGF 20 (0,1)	-40~70	R=4	NF-TR02
	φ 1.5 Flexible / Free cut 	Long mode 350 Standard mode 200 Highspeed mode 90 (0,1)	BRF 110 BRF-H 35 (0,1) JRF 50 (0,2)	VRF-T 80 (0,1) JRF 50 (0,2)	Long mode 70 Standard mode 40 Highspeed mode 20 (0,1)	BGF 20 (0,1)	-40~70	R=4	NF-TR03

Specifications (Thru-beam Type Fibers)

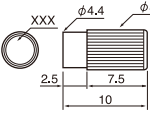
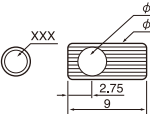
Sensing head		Sensing distance (unit:mm) Value in parenthesis is the Minimum detectable Gold wire diameter.					Operation temperature (℃ ~℃)	Radius (mm)	Part Number	
		Red LED for general purpose			Green LED for Mark Sensing					
		D2RF	BRF/BRF-H	VRF-T/JRF	D2GF	BGF				
 Sleeve	M4 sleeve : 90mm / Free cut 	Long mode 1000 Standard mode 600 Highspeed mode 250 (0.2)	BRF 450 BRF-H 160 (0.2)	VRF-T 330 (0.2) JRF 200 (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)	VRF-T 23 (0.1) JRF 18 (0.2)	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)	VRF-T 70 (0.1) JRF 50 (0.3)	Long mode 100 Standard mode 55 Highspeed mode 30 (0.1)	BGF 25 (0.1)	—40～70	R=15	NF-TK75	
	φ3 Sideview / Free cut 	Long mode 800 Standard mode 400 Highspeed mode 200 (0.2)	BRF 320 BRF-H 110 (0.2)	VRF-T 230 (0.2) JRF 150 (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)	VRF-T 250 (0.2) JRF 200 (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)	VRF-T 60 (0.1) JRF 40 (0.2)	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)	VRF-T 60 (0.1) JRF 40 (0.3)	Long mode 80 Standard mode 45 Highspeed mode 15 (0.1)	BGF 15 (0.1)	—40～70	R=15	NF-TV04	
 Sideview	φ4 Sideview / Free cut 	Long mode 4000 Standard mode 3000 Highspeed mode 2000 (0.5)	BRF 1700 BRF-H 830 (0.5)	VRF-T 1000 (0.5) JRF 700 (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)	VRF-T 230 (0.2) JRF 150 (0.3)	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)	VRF-T 1000 (0.2) JRF 700 (0.3)	Long mode 1800 Standard mode 1000 Highspeed mode 450 (0.2)	BGF 800 (0.2)	—40～70	R=25	NF-TK16	
	M4 Heat resistant 100℃ / Free cut 	Long mode 700 Standard mode 400 Highspeed mode 200 (0.2)	BRF 300 BRF-H 120 (0.2)	VRF-T 250 (0.2) JRF 180 (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)	VRF-T 500 (0.5) JRF 350 (0.5)	Long mode 350 Standard mode 180 Highspeed mode 80 (0.5)	BGF 120 (0.5)	—40～180 ^{※1}	R=35	NF-TH02	
	 High temperature									

※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 Gold wire diameter.					Operation temperature (℃~℃)	Radius (mm)	Part Number
		Red LED for general purpose			Green LED for Mark Sensing				
		D2RF	BRF/BRF-H	VRF-T/JRF	D2GF	BGF			
 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)	VRF-T 1800 (0.3) JRF 1000 (0.8)	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)	VRF-T 380 (0.3) JRF 250 (0.5)	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)	VRF-T 330 (1.0) JRF 200 (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)	VRF-T 330 (0.5) JRF 150 (0.5)	Long mode 300 Standard mode 200 Highspeed mode 80 (0.5)	BGF 85 (0.5)	—40~70	R=25	NF-TS14
 Mapping application (Polyethylene)	Super Slim Shape  Reflective mirror: Material Glass(BK7) Lens: Material glass(BK7)or PC Sensor Head Material: SUS303 Fiber: Material PC Head detail 5/1	Long mode 500 Standard mode 280 Highspeed mode 220 (0.06)	—	—	—	—	—40~105	R=10	NF-TS25
	Narrow Aperture 2.5°  Reflective mirror: Material SUS303 Lens: Material glass(BK7)or PC Material: SUS303 Fiber: Material PC Head detail 5/1	Long mode 800 Standard mode 500 Highspeed mode 400 (0.06)	—	—	—	—	—40~105	R=10	NF-TS23
	Long distance 1,700mm  Reflective mirror: Material Glass(BK7) Lens: Material glass(BK7)or PC Material: SUS303 Fiber: Material PC Head detail 5/1	Long mode 1700 Standard mode 700 Highspeed mode 600 (0.06)	—	—	—	—	—40~105	R=10	NF-TS22H
	Long distance 1,800mm  Reflective mirror: Material Glass(BK7) Lens: Material glass(BK7)or PC Material: SUS303 Fiber: Material PMMA Head detail 5/1	Long mode 1800 Standard mode 800 Highspeed mode 700 (0.06)	—	—	—	—	—40~105	R=10	NF-TS22M
	R=1mm flexible, 1,700mm  Reflective mirror: Material glass (with Al plating) Lens: Material PC Material: SUS303 Fiber: Material PMMA Head detail 5/1	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.

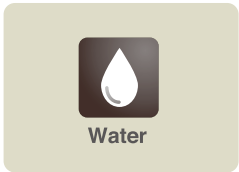
Specifications (Thru-beam Type Fibers)

	Lens detail	Applicable fiber	Minimum detectable Gold wire diameter (mm).	Sensing distance			Part Number
				D2RF	BRF	VRF-T / JRF	
Extension lens NF-TA01		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	VRF-T 2500 JRF 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	VRF-T 3200 JRF 1500	
		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	VRF-T 2500 JRF 1000	
		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	VRF-T 2500 JRF 1500	
		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	VRF-T 3200 JRF 1500	
Sideview lens NF-TA02		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	VRF-T 550 JRF 400	 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	VRF-T 500 JRF 300	
		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	VRF-T 320 JRF 240	
		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	VRF-T 320 JRF 240	
		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	VRF-T 500 JRF 200	

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.



Applications



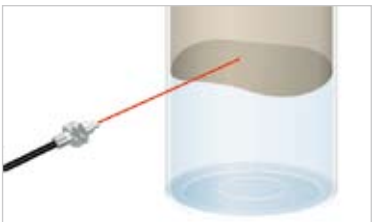
Presence of cold or hot glue in packaging



IV solution bag



Water in the dark colored bottle



Level check of water

Plastic Fiber Optics - Additional Models Available

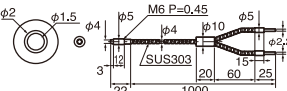
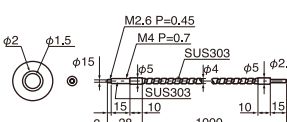
In addition to the configurations shown, custom designed fiber optics are available on request:

- Reduce or increase plastic fiber optic bundle diameters.
- Change sensing 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 caution 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.

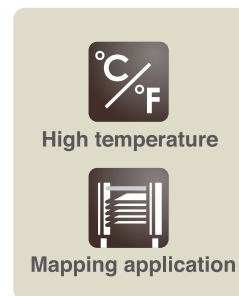
Specifications

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

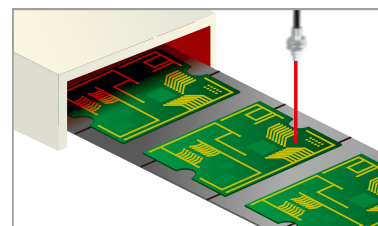
※1 Amplifier BIF-W

NF series Glass Fiber Optics

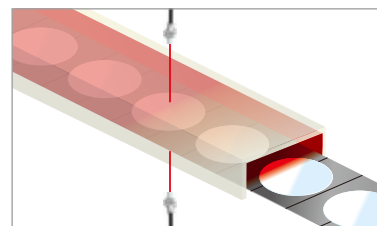
- Optex FA glass fiber optic cables are excellent for use in harsh sensing environments such as high temperatures up to 300°C (572°F), around corrosive materials, extreme moisture, etc.
- Glass fiber optic cables are constructed of a combination of optical glass fibers, stainless steel, PVC and optical 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.



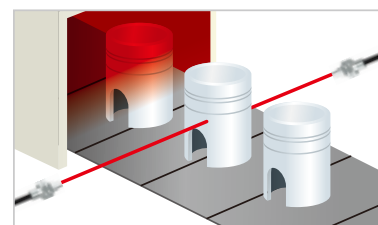
Applications



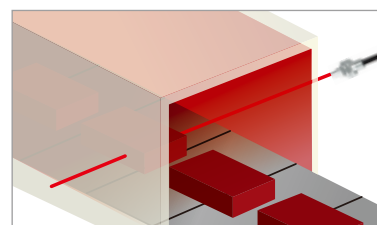
Post heated board



Disks in the furnace



Post heat metals



Bricks in the furnace

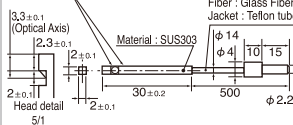
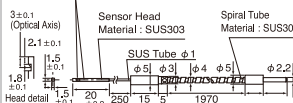
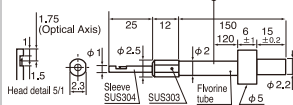
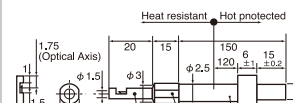
Specifications (Diffuse & Thru-beam Type Fibers)

Sensing head		Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable Gold wire diameter.						Operation temperature (°C ~℃)	Radius (mm)	Part Number
		Red LED for general purpose			Green LED for Mark Sensing					
		D2RF	BRF/BRF-H	VRF-T/JRF	D2GF	BGF				
°C/°F High temperature	M6 Heat resistant 300℃									

※ Non-catalogue products are available upon request.

Specifications (Thru-beam Type Fibers)

Mapping
application
(Glass)

Sensing head	Sensing distance (unit=mm) Value in parenthesis is the Minimum detectable Gold wire diameter.					Operation temperature (°C ~°C)	Radius (mm)	Part Number			
	Red LED for general purpose			Green LED for Mark Sensing							
	D2RF	BRF/BRF-H	VRF-T/JRF	D2GF	BGF						
Slim and Heat Proof 200°C (392°F) Reflective mirror: Material SUS303 Lens: Material glass(BK7)or PC 	Long mode 500 Standard mode 400 Highspeed mode 300 (0.06)	—	—	—	—	—40~200	R=30	NF-TS27			
Heat Proof 300°C (572°F), SUS303 armed Reflective mirror: Material glass(BK7) Lens: Material glass(BK7)or PC 	Long mode 650 Standard mode 380 Highspeed mode 330 (0.06)	—	—	—	—	—40~300	R=25	NF-TS24			
Fluorine coated jacket, 200°C (392°F) 	Long mode 100 Standard mode 80 Highspeed mode 60 (0.06)	—	—	—	—	—40~200	R=30	NF-TH04S			
Fluorine coated jacket, 200°C (392°F) 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

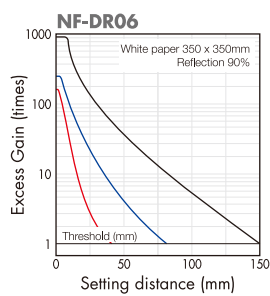
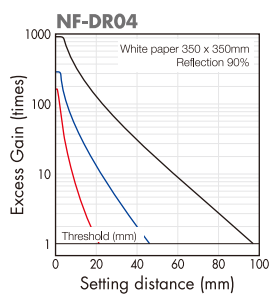
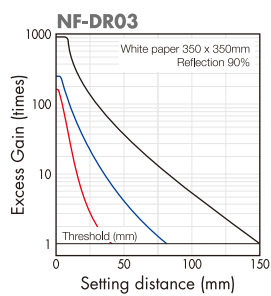
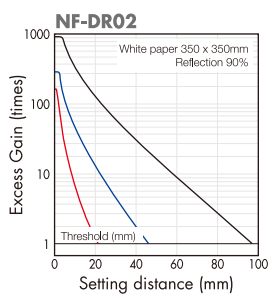
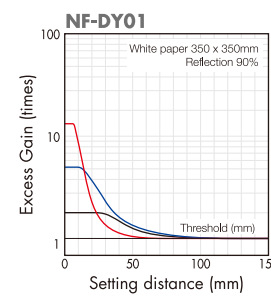
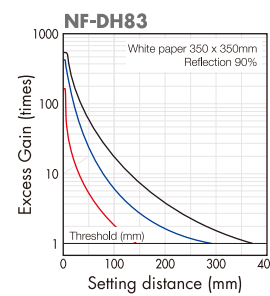
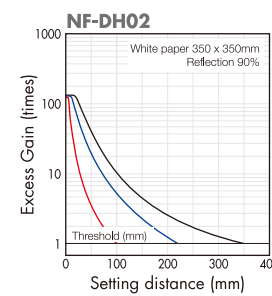
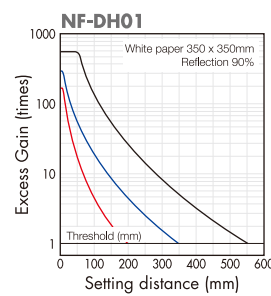
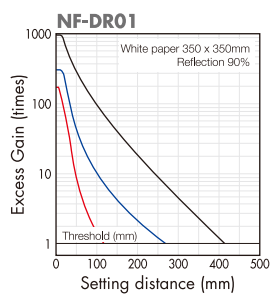
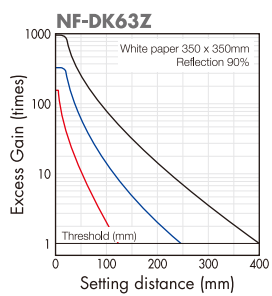
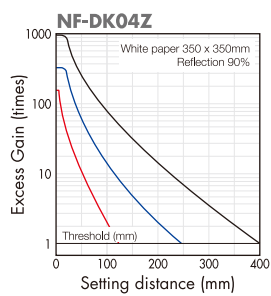
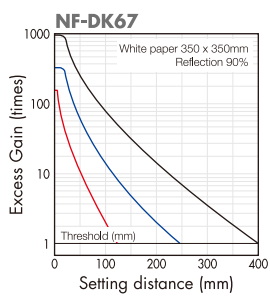
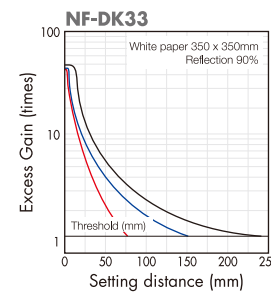
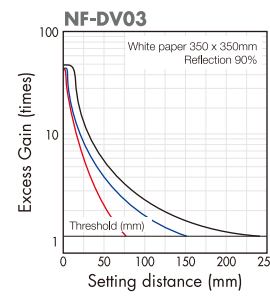
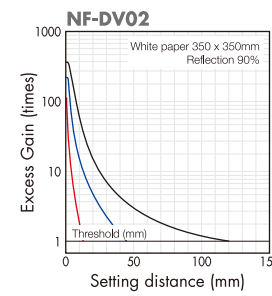
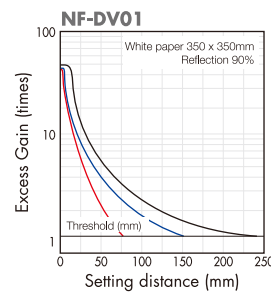
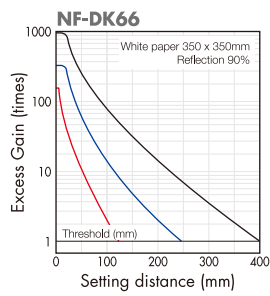
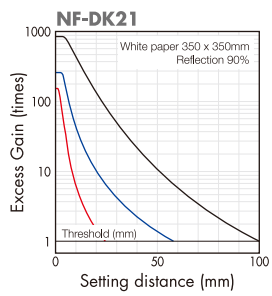
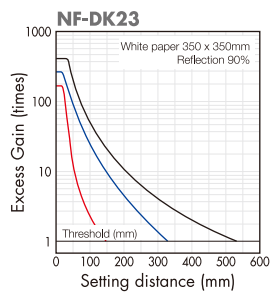
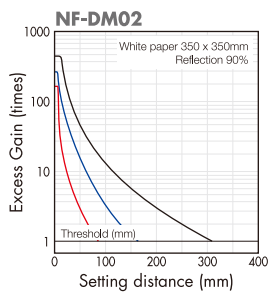
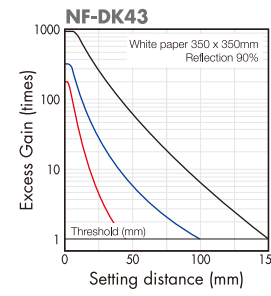
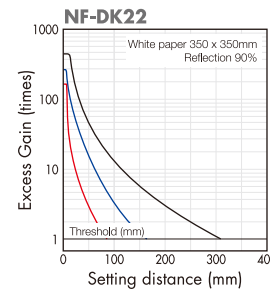
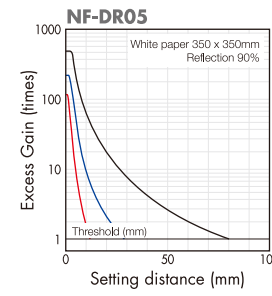
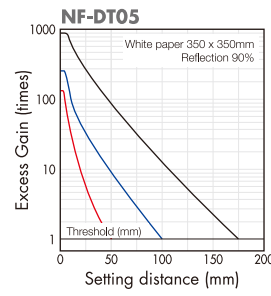
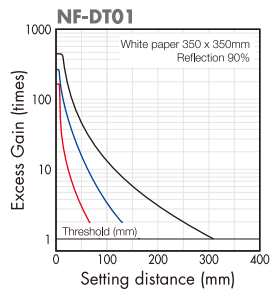
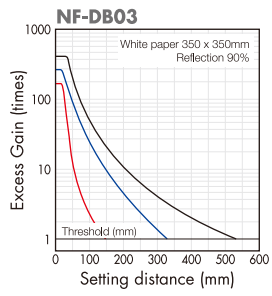
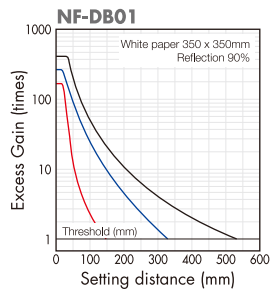
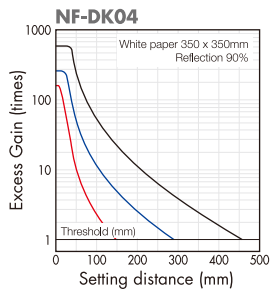
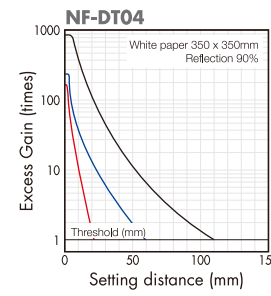
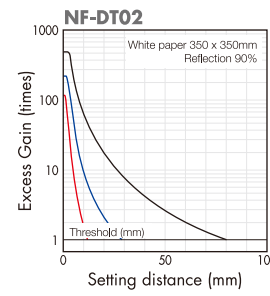
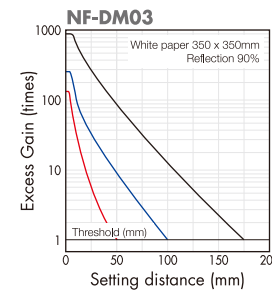
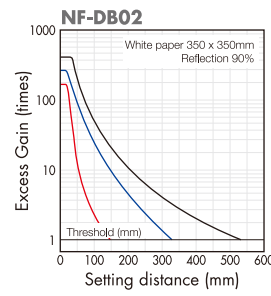
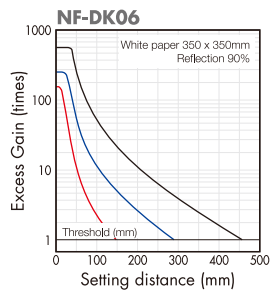
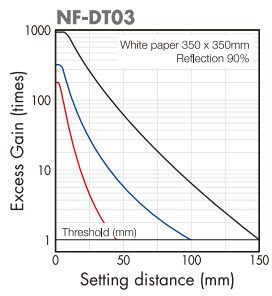
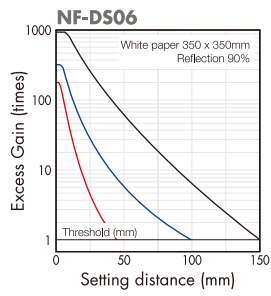
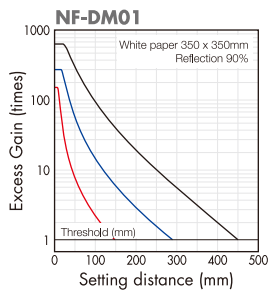
In addition to the configurations shown, custom designed fiber optics are available on request:

- 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

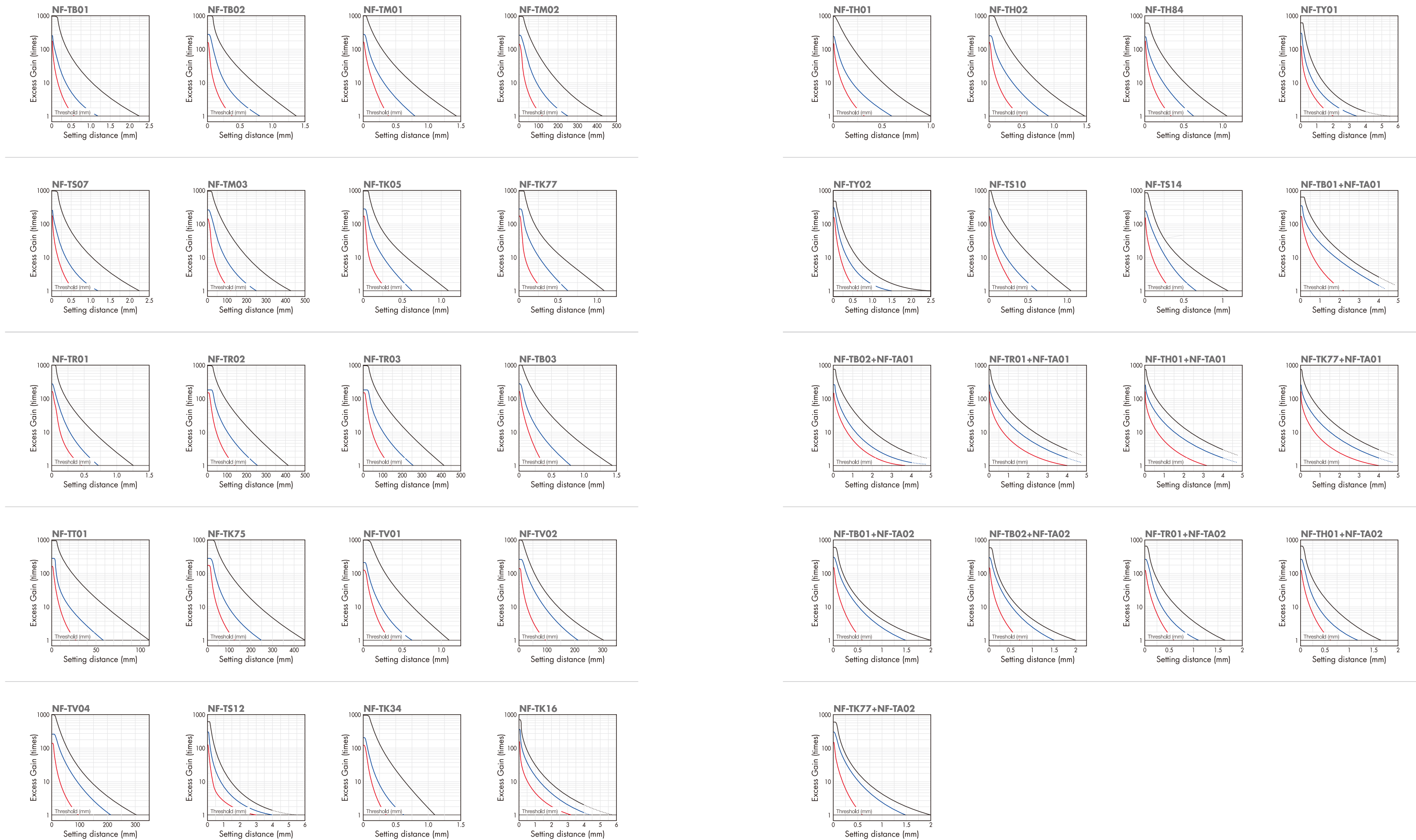
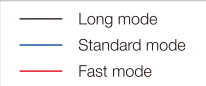
- The ends of glass fiber optic assemblies are optically ground and polished. Care taken in this manufacturing process accounts for the light coupling efficiency of the fiber optic assembly. As a result, glass fiber assemblies cannot be shortened, spliced, or otherwise modified. Terminated plastic fiber assemblies are optically ground and polished, and cannot be shortened, spliced, or otherwise modified.
- Use caution 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)

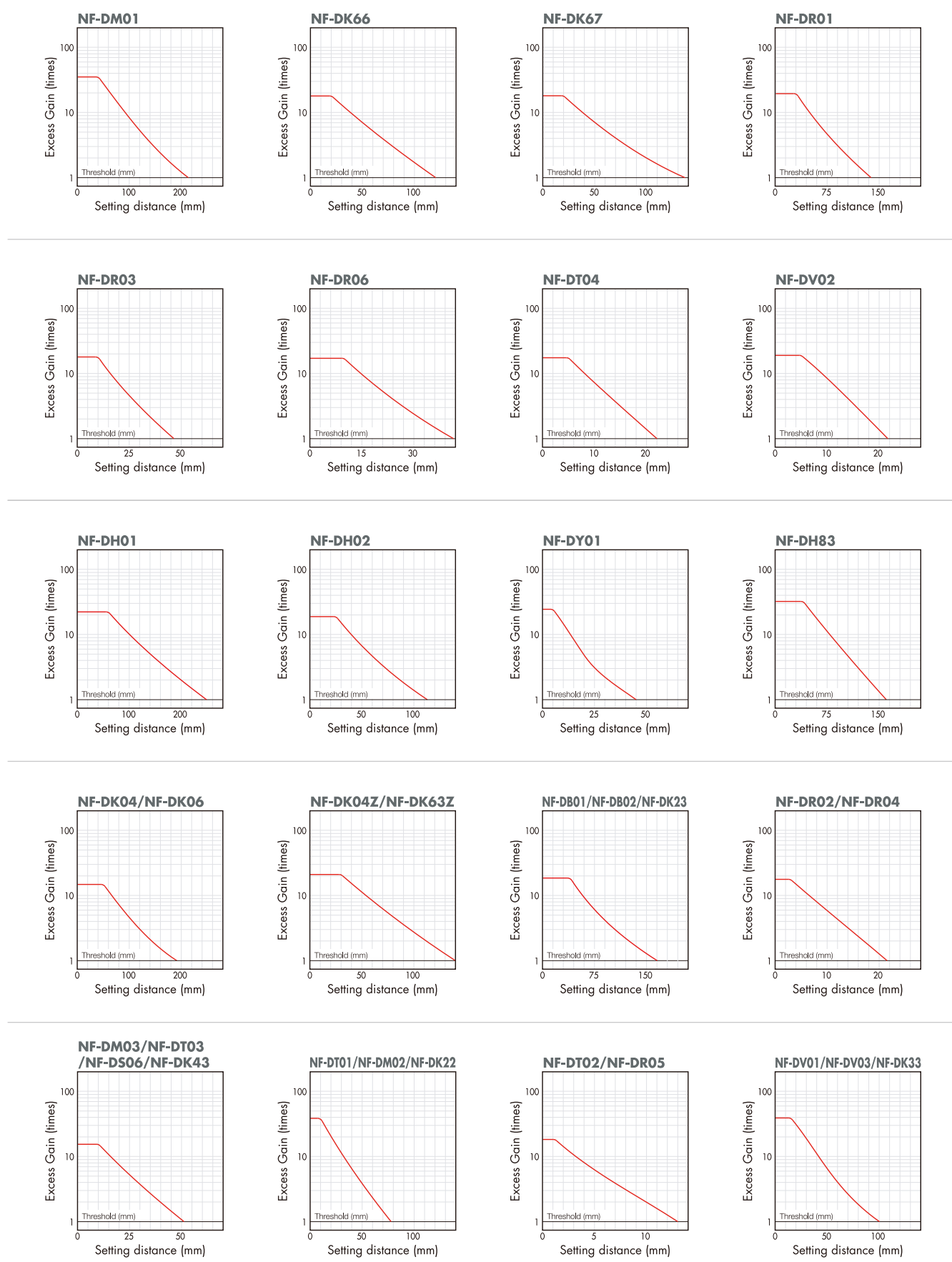


Thru-beam Type Fibers + D2RF amplifier

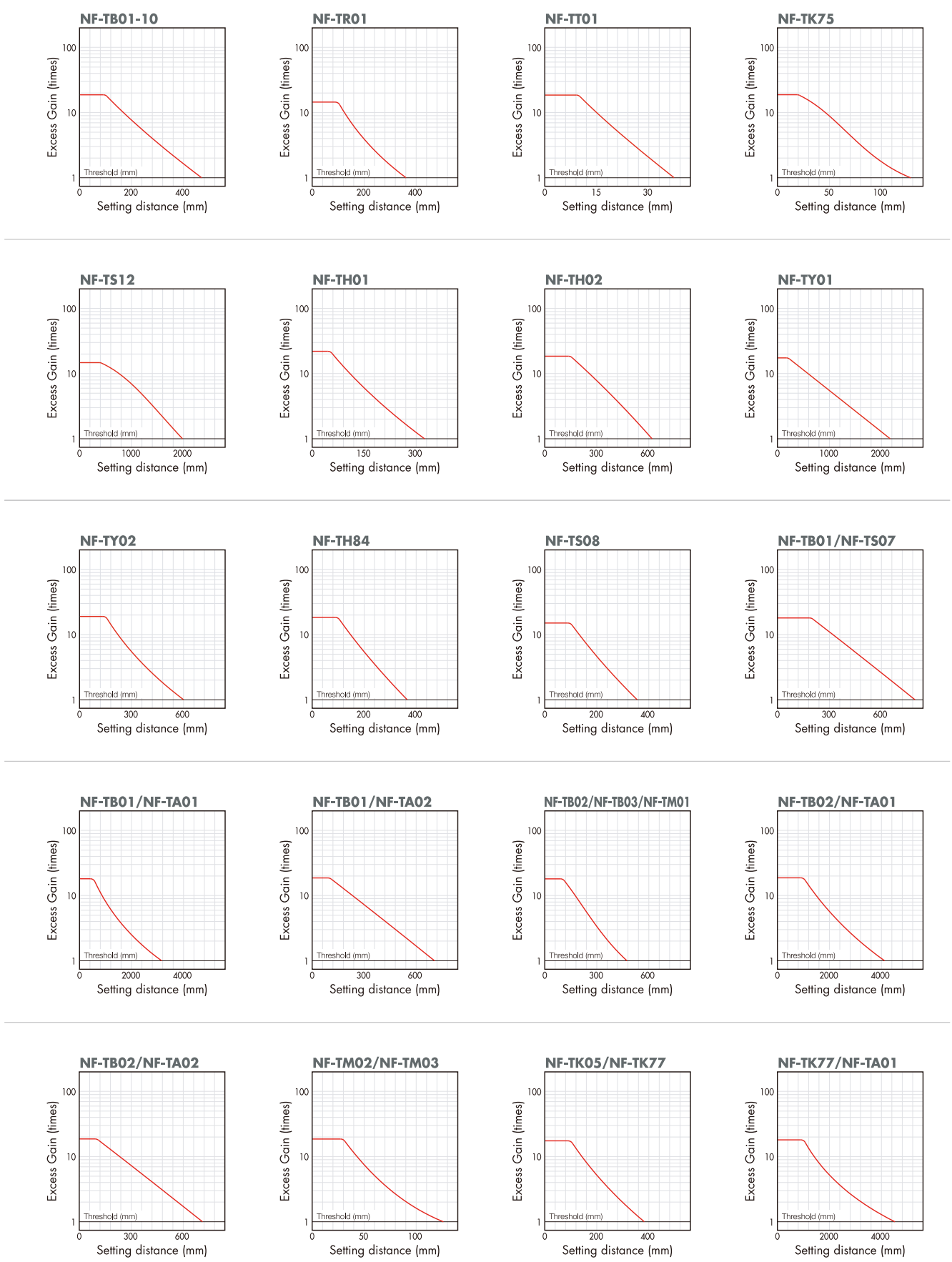
Excess Gain Curves (Typical Value)



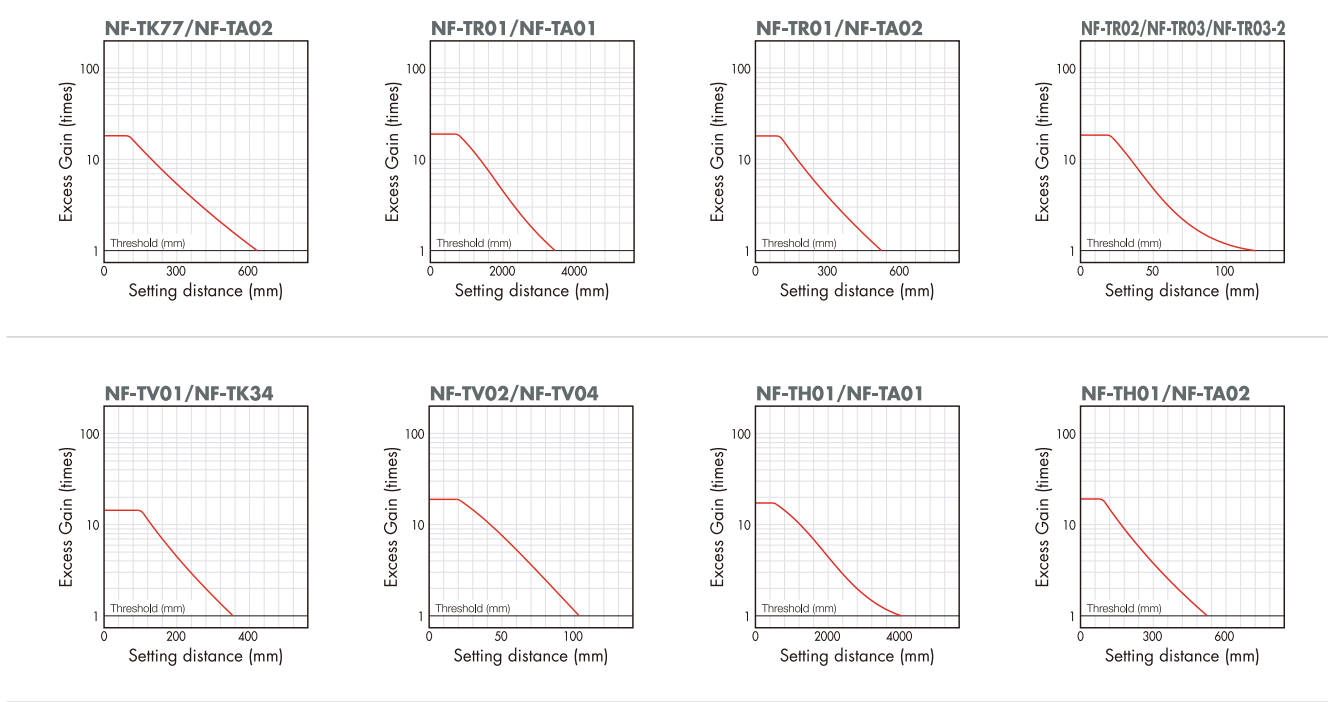
Diffuse Type Fibers + BRF amplifier
Excess Gain Curves (Typical Value)



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

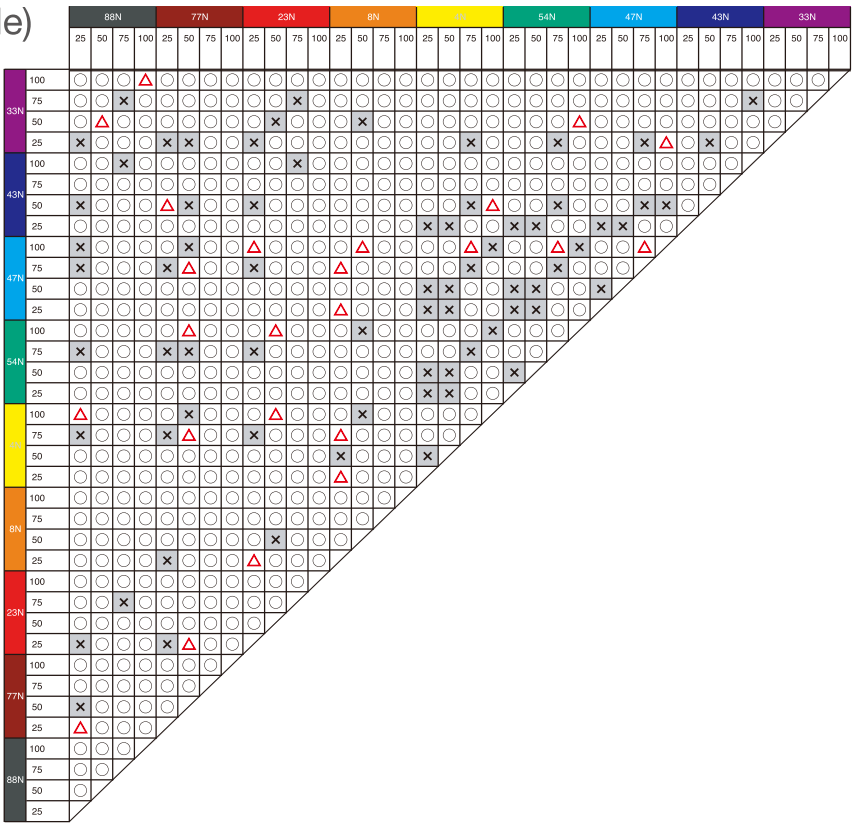


Thru-beam Type Fibers + BRF amplifier
Excess Gain Curves (Typical Value)



D2GF series (Standard mode)

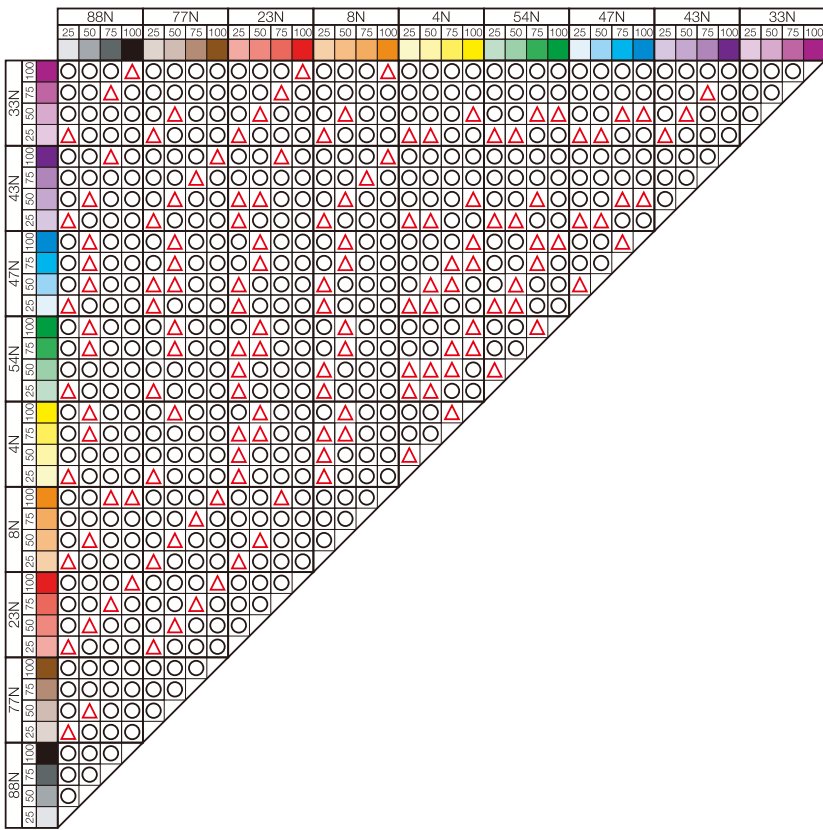
- : Stable
- △ : Not recommended
- × : Impossible



Color combination reference by amplifiers.

BGF series

- : Stable
- △ : Not recommended



D2GF series (Long mode)

- : Stable
- △ : Not recommended
- × : Impossible

