Autonics



Single / Dual Display Fiber Optic Amplifiers

BF5 Series

PRODUCT MANUAL

For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.
The specifications, dimensions, etc. are subject to change without notice for product improvement. Some models may be discontinued without notice.

CE UKCA EAC

Safety Considerations

- Observe all 'Safety Considerations' for safe and proper operation to avoid hazards.
- ⚠ symbol indicates caution due to special circumstances in which hazards may occur.

⚠ Warning Failure to follow instructions may result in serious injury or death.

01. Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss.(e.g., nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)
Failure to follow this instruction may result in personal injury, economic loss or fire.

02. Do not use or store the unit in the place where flammable/explosive/ corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact or salinity may be present.
Failure to follow this instruction may result in explosion or fire.

03. Install the unit on DIN rail to use.
Failure to follow this instruction may result in fire.

04. Do not disassemble or modify the unit.
Failure to follow this instruction may result in fire.

05. Do not connect, repair, or inspect the unit while connected to a power source.
Failure to follow this instruction may result in fire.

06. Check 'Connections' before wiring.
Failure to follow this instruction may result in fire.

⚠ Caution Failure to follow instructions may result in injury or product damage.

01. Use the unit within the rated specifications.
Failure to follow this instruction may result in fire or product damage.

02. Use a dry cloth to clean the unit, and do not use water or organic solvent.
Failure to follow this instruction may result in fire.

Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- When connecting an inductive load such as a DC relay, remove surge by using a diode or varistor.
- Use the product after 3 sec of the power input.
- The power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Wire as short as possible and keep it away from high voltage lines or power lines to prevent surge and inductive noise.
- When using switching mode power supply (SMPS), ground F.G. terminal and connect a condenser between 0V and F.G. terminal to remove noise.
- Since external disturbance light (sunlight, fluorescent lighting, etc.) can cause product malfunction, use the product with a light shield or slit.
- When sensing an object with the maximum sensitivity, an error of sensing distance can occur due to the deviation of each feature.
- Turn off the power of the fiber optic amplifier before installation or removal.
- When installing the fiber optic unit, check the bend radius of each unit written on the product manual. If the installed unit that has the bend radius under the rated range, causing optical loss so the sensing distance is shortened.
- Be sure not to scratch the surface of the fiber optic unit.
- Do not pull the cable of the fiber optic unit that is connected to the amplifier.
- This unit may be used in the following environments.
  - Indoors (in the environment condition rated in 'Specifications')
  - Altitude max. 2,000 m
  - Pollution degree 2
  - Installation category III

Ordering Information

This is only for reference, the actual product does not support all combinations.
For selecting the specified model, follow the Autonics website.

BF5 ❶ - ❷ ❸ - ❹

❶ Light source
R: Red LED
G: Green LED
B: Blue LED

❷ Display part
D: Dual display
S: Single display

❸ Function
1: General type

❹ Control output
N: NPN open collector output
P: PNP open collector output

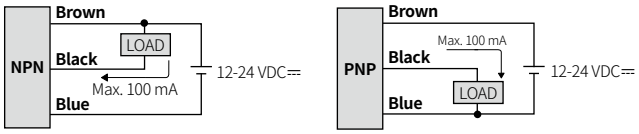
Product Components

- Product
- Connector cable
- Instruction manual
- Side connector

Sold Separately

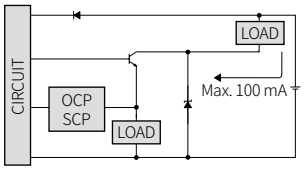
- Fiber optic units
- Communication converter: BFC Series

Connections

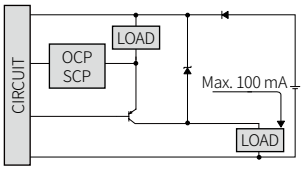


Circuit

■ **NPN open collector output**



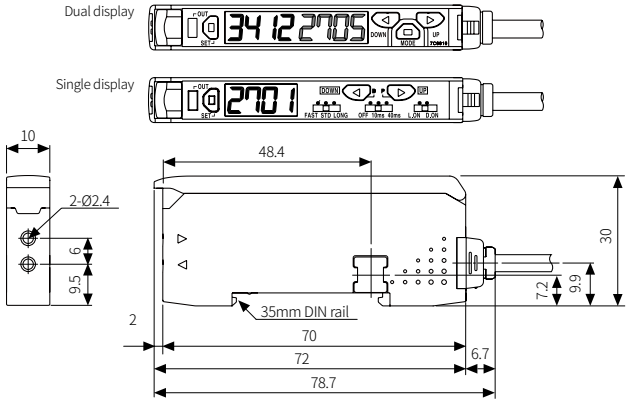
■ **PNP open collector output**



• OCP (over current protection), SCP (short circuit protection)

Dimensions

• Unit: mm, For the detailed drawings, follow the Autonics website.



Error

Error	Cause	Troubleshooting
Err	In RUN mode, the overcurrent has been detected from the output circuit.	Remove the overcurrent due to the overload.
Erb	- Slave fails to execute the Master's instructions such as 1:M copy, load all, save all, and group teaching due to unstable communication lines. - Another communication error occurs.	- Check the cascaded amplifiers. - Check the circuitry around the side connector and hardware condition.

Specifications

Model	BF5R-D1-□	BF5G-D1-□	BF5B-D1-□
Light source	Red LED	Green LED	Blue LED
Peak emission wavelength	660 nm, modulated	530 nm, modulated	470 nm, modulated
Response time	Standard (500 µs), Long distance (4 ms), Ultra long distance (10 ms), Ultra fast (50 µs), Fast (150 µs) mode		
Sensitivity setting	Manual, Teaching (Auto-tuning, 1-point, 2-point, positioning)		
Operation mode	Light ON, Dark ON		
Measured value display	7-segment LCD, 4-digit (decimal, percentage)		
Operation mode of the timer	OFF, OFF Delay, ON Delay, One-shot		
Max. cascading units	≤ 31 units		
Mutual interference prevention	≤ 8 units		
Indicator	Operation indicator (red), display screen (PV display part: red LED, SV display part: green LED)		
Approval	CE UK EAC	CE UK EAC	CE UK EAC
Unit weight (packaged)	≈ 20 g (≈ 138 g)	≈ 20 g (≈ 138 g)	≈ 20 g (≈ 138 g)

Model	BF5R-S1-□
Light source	Red LED
Peak emission wavelength	660 nm, modulated
Response time	Standard (500 µs), Long distance (4 ms), Fast (150 µs) mode
Sensitivity setting	Manual, Teaching (Auto-tuning)
Operation mode	Light ON, Dark ON
Measured value display	7-segment LCD, 4-digit (decimal, percentage)
Operation mode of the timer	OFF Delay (time range: OFF, 10 ms, 40 ms)
Mutual interference prevention	≤ 8 units
Indicator	Operation indicator (red), display screen (PV / SV display part: red LED)
Approval	CE UK EAC
Unit weight (packaged)	≈ 20 g (≈ 138 g)

Power supply	12-24 VDC⎓ ±10% (ripple P-P: ≤ 10%)
Current consumption	≤ 50 mA
Control output	NPN open collector output / PNP open collector output model
Load voltage	≤ 24 VDC⎓
Load current	≤ 100 mA
Residual voltage	NPN: ≤ 1 VDC⎓, PNP: ≤ 3 VDC⎓
Protection circuit	Reverse power protection circuit, output short over current protection circuit, surge protection circuit
Insulation resistance	≥ 20 MΩ (500 VDC⎓ megger)
Dielectric strength	Between the charging part and the case: 1,000 VAC~ 50 / 60 Hz for 1 min
Vibration	1 mm double amplitude at frequency 10 to 55 Hz in each X, Y, Z direction for 2 hours
Shock	500 m/s² (≈ 50 G) in each X, Y, Z direction for 3 times
Ambient illuminance (receiver)	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx
Ambient temperature	-10 to 50 °C, storage: -20 to 70 °C (no freezing or condensation)
Ambient humidity	35 to 85%RH, storage: 35 to 85%RH (no freezing or condensation)
Protection rating	IP40 (IEC standard)
Connection	Connector cable
Cable spec.	Ø 4 mm, 3-wire, 2 m
Wire spec.	AWG22 (0.08 mm, 60-core), insulator outer diameter: Ø 1.25 mm
Tightening torque for fiber optic unit	≥ 2kgf
Material	Case: PBT, cover: PC

Supporting Functions & Mode Settings

• For more detailed information on functions and settings, refer to the manual.

■ **Dual display model**

RUN	[MODE] 3 sec	→	**Program mode**	[MODE] 3 sec	→	RUN
	[SET]	→	**Teaching sensitivity setting**	Auto	→	
	[SET] 3 sec	→	**Group teaching**	Auto	→	
	[◀] or [▶]	→	**Manual sensitivity setting**	Auto after 3 sec	→	
	[MODE] 5 sec	→	**Data bank mode**	[MODE] 3 sec	→	
	[SET] + [▶]	→	**Anti-saturation function**	Auto	→	
	[MODE]	→	**Incident light level monitoring**	[MODE] or auto after 1 min	→	
	[MODE] 7 sec	→	**Initialization**	Auto	→	

■ **Single display model**

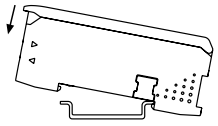
RUN	[SET]	→	**Teaching sensitivity setting**	Auto	→	RUN
	[SET] 3 sec	→	**Group teaching**	Auto	→	
	[◀] or [▶]	→	**Manual sensitivity setting**	Auto after 3 sec	→	
	[SET] + [▶]	→	**Anti-saturation function**	Auto	→	
	[▶] 3 sec	→	**Incident light level monitoring**	[▶] or auto after 1 min	→	
	[◀] 3 sec	→	**Measured value display**	Auto	→	

Mode	Switch settings	Setting range
Response time	FAST STD LONG	FST: fast mode (150 µs) STD: standard mode (500 µs) LONG: long distance mode (4 ms)
Time of the timer	OFF 10ms 40ms	Timer operation mode: OFF Delay Time: OFF, 10 ms, 40 ms • Refer to the 'Timing Chart of the Timer.'
Operation mode	L.ON D.ON	L.ON (Light ON): when the light is received state, operation indicator turns ON. D.ON (Dark ON): when the light is interrupted state, operation indicator turns ON.

DIN Rail Mount and Removal

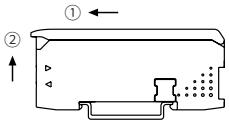
■ Mount

01. Hang up the holder on the backside of the amplifier to the DIN rail (35 mm).
02. Press the front side of the amplifier toward the DIN rail.



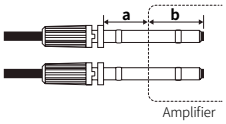
■ Removal

01. Slide the amplifier to direction ①.
02. Lift the front side of the amplifier to direction ②.



Insert Fiber Optic Unit

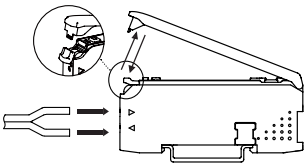
01. Lift the protective cover and lower down the lever lock.
02. Insert the cable of the fiber optic unit to the slot completely.
(▷ : receiver part, ◁ : emitter part)



Length (mm)	Receiver part	Emitter part
a 01)	8	
b	13	

01) With the adaptor attached

03. Lift the lever lock to fix the fiber optic unit and close the protective cover.



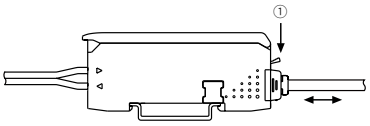
Connect and Remove Connector Cable

■ Connection

Insert the connector into the amplifier mounted to the DIN rail with a click.

■ Removal

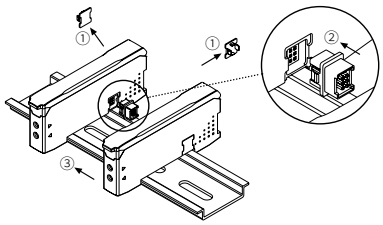
Press the connector part to direction ① and pull it.



Cascade the Amplifiers

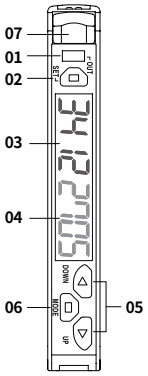
- Cascading multiple amplifiers is available via the side connector. (max. 31 units)
- Make sure that if you connect the side connector with excessive force, it may cause extruded pins.
- Be sure to mount the side connector to fit tightly. Otherwise, the communication connection and the function of mutual interference prevention may not normally work.
- All amplifies share the supply power from the one.
- When power is supplied, assigning channels of the cascaded amplifiers automatically (direction: →, channel number: +1). Be aware that the channel number cannot be changed, and it is not saved when turning off the power.
  - Dual display model: it is available to check P-9. Channel in the program mode.
  - Single display model: it is only available when the power is supplied for the first time.
- The function of mutual interference prevention activates after cascading amplifiers with supplying power. (max. 8 units)

01. Turn OFF the power of all amplifiers.
02. Remove the side cover (①) on the amplifier and mount the side connector (②) to the socket.
03. Hang up the amplifier to the DIN rail and push it to direction ③.
04. Be sure to check the connection of the amplifiers and side connector.



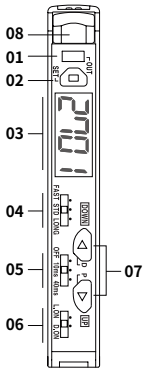
Unit Descriptions

■ Dual display model



01. Operation indicator (red)
02. [SET] key
Teaching sensitivity setting, group teaching, data back setting, incident light level monitoring, initialization
03. PV display part (red 4-digit LED)
RUN mode: it shows PV (present value).
Setting mode: it shows the parameter.
04. SV display part (green 4-digit LED)
RUN mode: it shows SV (setting value).
Setting mode: it shows the setting value, parameter value.
05. [◀] [▶] key
Manual sensitivity setting, select the setting value
06. [MODE] key
Enter mode, return to RUN mode, move parameter, save the setting value
07. Lever lock
It is used to fix the fiber optic unit.

■ Single display model



01. Operation indicator (red)
02. [SET] key
Teaching sensitivity setting, group teaching, incident light level monitoring
03. PV / SV display part (red 4-digit LED)
04. Setting switch for the response time
05. Setting switch for the time of the timer
06. Setting switch for the operation mode
07. [◀] [▶] key
Enter mode, manual sensitivity setting, select the setting value
08. Lever lock
It is used to fix the fiber optic unit.

Program Mode

■ Dual display model

- Activate or deactivate some of the parameters depending on other parameter settings. Refer to the detailed explanation of each mode.
- Return to the RUN mode for applying the setting.
- [MODE] key: saves the setting value and move to the next parameter
  [◀], [▶] key: selects the setting value and time of the timer

Mode		Display	Factory defaults	Setting range
		PV	SV	
P	Program mode	ProG	nodE	• Entering method: in RUN mode, [MODE] key 3 sec
P-1	Response time	rSPd	Std	STD: standard mode (500 µs) LONG: long distance mode (4 ms) ULOG: ultra long distance mode (10 ms) UFST: ultra fast mode (50 µs) FST: fast mode (150 µs)
P-2	Measured value display [01]	dSPF	4000	4000: decimal 999P: percentage
P-3	Display direction	dIr	1234	1234: normal ɥƐZ⊥: upside down
P-4	Operation mode of the timer	tmod	oFF	OFF OND: delays OFF → ON timing of the control output (ON delay) OFD: delays ON → OFF timing of the control output (OFF delay) SHOT: maintains ON state of the control output during the setting time (One-shot) • Refer to the 'Timing Chart of the Timer.'
P-5	Time of the timer [02]	tIME	2000	1 to 5,000 ms
P-6	Teaching mode	SEnS	AUto	AUTO: auto-tuning 1PNT: 1-point teaching 2PNT: 2-point teaching PSTN: positioning teaching • Refer to the 'Teaching sensitivity setting.'
P-7	Energy saving mode	ESAu	nor	NOR: not used 1SAV: OFF the SV display part without pressing the key over 1 min 2SAV: OFF the display screen without pressing the key over 1 min
P-8	Operation mode	Ldon	L-on	L-ON (Light ON): when the light is received state, operation indicator turns ON. D-ON (Dark ON): when the light is interrupted state, operation indicator turns ON.
P-9	Channel	CH	-	When the power is supplied, automatically set : 1 to 32 channels
P-10	Communication	Comm	EnA	ENA: enable DISA: disable • Refer to the 'Group Teaching, Data Bank Mode.'
P-11	Lock mode	LoCK	oFF	OFF LOC1 LOC2 • Refer to the [Table 1] below.

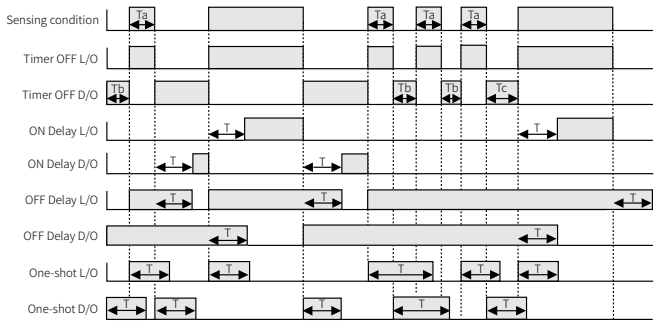
01) Decimal range: 0 to 4000 (in case of the long-distance mode in the response time : 0 to 9999)
Percentage range: 0 to 999P (no decimal points)

02) Setting condition: all but OFF of P-4. Operation mode of the timer

• [Table 1]

Parameter	LOC 1		LOC 2	
	Check	Setting	Check	Setting
Sensitivity setting	○	X	○	X
Program mode	○	X	X	X
Data bank mode	X	X	X	X
Anti-saturation function	X	X	X	X
Initialization	X	X	X	X

Timing Chart of the Timer



• T: setting time (T>Ta , T>Tb , T>Tc>Tb)

Teaching Selection

■ **Auto-tuning**
It is suitable for the sensing environment in which fast-moving objects make unstable incident light levels. Also, it is convenient because the object maintains its movement continuously during the teaching mode. It uses the average value of the incident light level estimated a certain period of time.

■ **1-point teaching**
It is suitable for the sensing environment where much dust or pollutant makes the lower incident level. The teaching proceeds; through-beam type: with sensing target, reflective type: without sensing target

■ **2-point teaching**
It is suitable for the sensing environment in which the object moves slowly or stops with stable incident light level. After the teaching 2 points (with/without sensing target), set the average value as a teaching value.

■ **Positioning teaching**
After placing the sensing target to the desired position, set 90% of the incident light level as a teaching value. Typically, it is available for detecting a small hole on the surface (through-beam type) or detecting moving object having a curve (reflective type).

Teaching Sensitivity Setting

■ Dual display model

- Before setting the sensitivity, select P-6. Teaching in the program mode suitable for the sensing environment.
- Refer to the detailed explanation of teaching mode.

Mode	PV	SV	Descriptions	
Auto-tuning	AUto	1-5	Press [SET] key to proceed the teaching: 2 sec	
		2-5		
		oK	Flash twice (save a teaching value) and return to RUN mode	
1-point teaching [01]	1Pnt	1-5	Press [SET] key to proceed the teaching: 2 sec	
		2-5		
		oK	Flash twice (save the teaching value) and return to RUN mode	
2-point teaching [02]	2Pnt	1P	1-point teaching : without sensing target	Press [SET] key to enter 1-point teaching mode
		1-5		Press [SET] key to proceed the teaching : 2 sec
		2-5		
		1PoK		Cross-flashing twice (e.g., 1-point teaching value (P_{Min}) = 250)
		250		
		2P	2-point teaching : with sensing target	Standby 2-point the teaching
		1-5		Press [SET] key to proceed the teaching : 2 sec (without pressing key over 1 min: end teaching and return to RUN mode)
		2-5		
		2PoK		Cross-flashing twice (e.g., 2-point teaching value (P_{Max}) = 3400)
		3400		
		1825	Completion	Cross-flashing twice (save the teaching value) and return to RUN mode (e.g., teaching value ($\frac{P_{Min}+P_{Max}}{2}$) = 1825)
Positioning teaching	PStn	1-5	Press [SET] key to proceed the teaching: 2 sec	
		2-5		
		oK	Flash twice (save the teaching value) and return to RUN mode	

01) Adjust incident light level depending on the response time. Refer to the table below.

Response time	Incident light level	
	0	Saturation
Ultra fast mode	10	3980
Fast mode		
Standard (STD) mode		
Long distance mode	5	9980
Ultra long distance mode		

02) Based on the reflective type.

■ Single display model

Mode	PV / SV	Descriptions
RUN mode	3000	It shows the present incident light level, press [SET] key to proceed the teaching
Auto-tuning	1-5	Proceeding the teaching: 2 sec
	2-5	
	oK	Cross-flashing twice (save the teaching value) and return to RUN mode
	1800	

Group Teaching

- The command of Master sets the sensitivity settings of cascaded amplifiers at once.
- Channel range: ≤ 32 channels
- [◀], [▶] key: select the setting value

■ Dual display model

- Supporting teaching mode: auto-tuning, 1-point teaching, positioning teaching
- In the program mode, set P-10. Communication as ENA (enable).

Amplifier	PV	SV	Descriptions
Master	tCH1	ALL	• Entering method: in RUN mode, press [SET] key for 3 sec Press [SET] key to proceed
		no	Press [SET] or [MODE] key to return to RUN mode
		YES	Press [SET] key to proceed Group teaching
	CH□	oK	Transmit the teaching command to each slave PV: channel number, SV: OK
Slave	tCH1	----	Proceeding the teaching (0.5 sec per each progress bar)
		End	Flash twice (teaching complete) and return to RUN mode
Master	tCH1	----	Proceeding the teaching
		End	Flash twice (teaching complete) and return to RUN mode

■ Single display model

Amplifier	PV / SV		Descriptions
Master	tCH1	Cross-flashing	• Entering method: in RUN mode, press [SET] key for 3 sec Press [SET] key to proceed
	ALL		
	tCH1	Cross-flashing	Press [SET] or [MODE] key to return to RUN mode
	no		
	tCH1	Cross-flashing	Press [SET] key to proceed Group teaching
	YES		
	CH□	Channel number/ OK	Transmit the teaching command to each slave
	oK	Cross-flashing	
Slave	tCH1	Cross-flashing twice	Proceeding the teaching
	ALL		

	End	Flash twice	Teaching complete
	2000	Flash twice	Displaying the teaching value and return to RUN mode
Master	----		Proceeding the teaching
	End	Flash twice	Teaching complete
	2000	Flash twice	Displaying the teaching value
	tCH1	Cross-flashing twice	Return to RUN mode
	End		

Manual Sensitivity Setting

- You can set the sensitivity as the desired value. (factory defaults: 2000)
- You can adjust the teaching value from the teaching sensitivity setting.
- PV display part shows the present incident light level during the manual sensitivity setting.

■ Dual display model

Mode	PV	SV	Descriptions
RUN mode	3210	3000	Change the setting value using [◀], [▶] key (e.g., 3000 → 2500)
Sensitivity setting	3210	2500	Press [MODE] key or without pressing a key over 3 sec, flashing the setting value twice (save the setting value) and return to RUN mode

■ Single display model

Mode	PV / SV	Descriptions
RUN mode	3210	Press [◀] or [▶] key once
	2000	Flash the previous setting value twice, Change the setting value using [◀], [▶] key (e.g., 2000 → 2500)
Sensitivity setting	2500	Without pressing the key for 3 sec: flash the setting value twice (save the setting value) and return to RUN mode

Data Bank Function

Change the settings of amplifiers using the Master's command or adjust one amplifier, managing all the banks of cascaded amplifiers at once.

■ **Data load**
Loads one of the preset data banks (BAK 0, 1, 2) and applies it to the amplifier. The bank parameters can be read and changed.

■ **Data save**
Saves settings of the amplifier to one of the data banks.

■ **Data copy**
Selects one of the data banks currently saved in the amplifier, and copies it to the other amplifier (1:1) or all cascaded amplifiers (1:M).

■ **Load all**
Selects one of the data banks currently saved in the amplifier, and loads it to all cascaded amplifiers.

■ **Save all**
Batch saves the data banks selected from master to cascaded amplifiers.

Data Bank Mode

■ Dual display model

- In the program mode, set the P-10. Communication as ENA (enable) of all cascaded amplifiers.
- In the program mode, release P-11. Lock mode of all cascaded amplifiers.
- All cascaded amplifiers should be in RUN mode.
- Be sure to check whether the side connector is mounted correctly.
- [MODE] key: saves the setting value and move to the next parameter, returns to RUN mode after applying the input for 3 sec
  [SET] key: proceeds the mode, returns to the upper mode
  [◀], [▶] key: selects the setting value or the channel of the cascaded amplifier
- Return to the upper mode when pressing [SET] or [MODE] key after selecting NO.

Mode		Amplifier	PV	SV	Descriptions
0	Data bank	Master	dAtA	bAnK	• Entering method: in RUN mode, [MODE] key 5 sec
1	Data load	Master	LoAd	bAK0	BAK0, BAK1, BAK2
1-1	Setting mode	Master	rSPd	Std	Press [SET] key for the load / read / change the BAK data[01]
2	Data save	Master	SAvE	bAK0	Data: BAK0, BAK1, BAK2 Press [SET] key to proceed
2-1	Setting mode	Master	SAvE	YES	Press [SET] key to proceed
				End	After the completion, press [SET] key to return 2. Data save mode
3	Data copy	Master	CoPY	S--S	S--S: 1:1 copy S--M: 1:M copy
3-1	1:1 copy	Master	CoPY	S--S	Press [SET] key to proceed
				CH32	Select the channel of the cascaded amplifier and press [SET] key to proceed
				YES	• Press [SET] key to proceed After that, the flow is the same as 3-2. 1:M copy
3-2	1:M copy	Master	CoPY	S--M	Press [SET] key to proceed
				ALL	Press [SET] key to proceed
				YES	Press [SET] key to proceed
			CH□	oK	Send the command of Master to Slave PV display part: channel number, SV display part: OK
		Slave	rN	oK	After the completion, return to RUN mode
		Master	CoPY	End	After the completion, press [SET] key to return 3. Data copy mode
4	Group load	Master	LdAL	bAK0	Data: BAK0, BAK1, BAK2 Press [SET] key to proceed
4-1	Setting mode	Master	LdAL	YES	Press [SET] key to proceed
			CH□	oK	Send the command of Master to Slave PV display part: channel number, SV display part: OK
		Slave	LdAL	End	After the completion, return to RUN mode
		Master	LdAL	End	After the completion, press [SET] key to return 4. Group load mode
5	Group save	Master	SvAL	bAK0	Data: BAK0, BAK1, BAK2 Press [SET] key to proceed
5-1	Setting mode	Master	SvAL	YES	Press [SET] key to proceed
			CH□	oK	Send the command of Master to Slave PV display part: channel number, SV display part: OK
		Slave	SvAL	End	After the completion, return to RUN mode
		Master	SvAL	End	After the completion, press [SET] key to return 5. Group save mode

01) It is the same as the setting values of program mode.
The factory defaults of SET parameter: 2000

Anti-saturation Function

- When the incident light level is saturated, optimize this value automatically (max. 10 levels).
- The anti-saturation function may change the operation of control output.

■ Dual display model

Mode	PV	SV	Descriptions
RUN mode	4000	2000	Press [SET] + [▶] key to activate the function
ON	3500	---1	Adjust the incident light level (e.g., 3 levels)
	3000	---2	
	2000	---3	
	2000	--oE	Flash twice and complete the setting [01], return to RUN mode
OFF	2000	1500	Press [SET] + [▶] key to deactivate the function
	4000	S-oF	Flash twice and release the function, return to RUN mode

■ Single display model

Mode	PV / SV	Descriptions
RUN mode	4000	Press [SET] + [▶] key to activate the function
ON	---1	Adjust the incident light level (e.g., 3 levels)
	---2	
	---3	
	--oE	Flash twice
	2000	Complete the setting [01], return to RUN mode
OFF	2100	Press [SET] + [▶] key to deactivate the function
	S-oF	Flash twice and release the function, return to RUN mode

01) The condition for setting completion differs depending on the response time.
If the value of saturation is too high so that the adjusted value does not reach the condition for the completion, it stops at level 10 and returns to RUN mode.

Response time	Condition for the setting completion
Ultra fast mode	Incident light level ≤ 2,200
Fast mode	
Standard (STD) mode	
Long distance mode	Incident light level ≤ 5,500
Ultra long distance mode	

Incident Light Level Monitoring

- You can check the high peak / low peak value of incident light level and change it to the currently measured value.
- Return to RUN mode without pressing key for 1 min.

■ Dual display model

Mode	PV	SV	Descriptions
Incident light level monitoring	• Entering method: in RUN mode, press [MODE] key once		
Max. value (High peak)	HPEE	4000	Check max. incident light level and press [SET] key to change (e.g., 4000 → 3000)
	HPEE	3000	Press [MODE] key to move the parameter
Min. value (Low peak)	LPEE	1000	Check min. incident light level and press [SET] key to change (e.g., 1000 → 950)
	LPEE	950	Press [MODE] key and return to RUN mode

■ Single display model

Mode	PV / SV		Descriptions
Incident light level monitoring	• Entering method: in RUN mode, press [▶] key for 3 sec		
Max. value (High peak)	HPEE	Cross-flashing	Check max. incident light level and press [SET] key to change (e.g., 4000 → 3000)
	4000		
	HPEE	Cross-flashing	Press [▶] key to move the parameter
	3000		
Min. value (Low peak)	LPEE	Cross-flashing	Check min. incident light level and press [SET] key to change (e.g., 1000 → 950)
	1000		
	LPEE	Cross-flashing	Press [▶] key to return to RUN mode
	950		

Reset to Factory Settings

■ Dual display model

- Restore the setting value to the factory default settings. (except the incident light level monitoring)
- [◀], [▶] key: select the setting value

Mode	PV	SV	Descriptions
Initialization	• Entering method: in RUN mode, press [MODE] key for 7 sec		
	InIt	no	Press [MODE] key and return to RUN mode
		YES	Press [SET] key to proceed
		InIt	Flash twice (initialization) and return to RUN mode

Measured Value Display

■ Dual display model

- Refer to P-2. Measured value display in the program mode.

■ Single display model

- You can set the display mode of the screen for current incident light level.
  - Decimal (display range: 0 to 4000, display range of the long distance mode: 0 to 9000)
  - Percentage (display range: 0 to 999P, no decimal points)

Mode	PV / SV	Descriptions
RUN mode	• Entering method: in RUN modem press [◀] key for 3 sec	
Decimal	4000	Flash twice and return to RUN mode
Percentage	999P	Flash twice and return to RUN mode

Segment Table

The segments displayed on the product indicate the following meanings.
It may differ depending on the product.

7 segment			
0	0	I	I
1	1	J	J
2	2	K	K
3	3	L	L
4	4	M	M
5	5	N	N
6	6	O	O
7	7	P	P
8	8	Q	Q
9	9	R	R
A	A	S	S
b	B	T	T
C	C	U	U
d	D	V	V
E	E	W	W
F	F	X	X
G	G	Y	Y
H	H	Z	Z

11 segment			
0	0	I	I
1	1	J	J
2	2	K	K
3	3	L	L
4	4	M	M
5	5	N	N
6	6	O	O
7	7	P	P
8	8	Q	Q
9	9	R	R
A	A	S	S
b	B	T	T
C	C	U	U
d	D	V	V
E	E	W	W
F	F	X	X
G	G	Y	Y
H	H	Z	Z

12 segment			
0	0	I	I
1	1	J	J
2	2	K	K
3	3	L	L
4	4	M	M
5	5	N	N
6	6	O	O
7	7	P	P
8	8	Q	Q
9	9	R	R
A	A	S	S
b	B	T	T
C	C	U	U
d	D	V	V
E	E	W	W
F	F	X	X
G	G	Y	Y
H	H	Z	Z

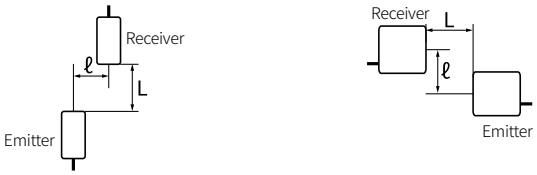
16 segment			
0	0	I	I
1	1	J	J
2	2	K	K
3	3	L	L
4	4	M	M
5	5	N	N
6	6	O	O
7	7	P	P
8	8	Q	Q
9	9	R	R
A	A	S	S
b	B	T	T
C	C	U	U
d	D	V	V
E	E	W	W
F	F	X	X
G	G	Y	Y
H	H	Z	Z

Product Characteristic Data

This data is based on internal testing and for reference only. The measurements are based on non-glossy white paper. Performance may vary by installation and usage environment. Product testing prior to use is recommended. The sensing distance of each product varies depending on the fiber optic unit used. Please refer to the fiber optic unit product manual.

Detection Area Characteristics: Through-Beam Type (TYPICAL)

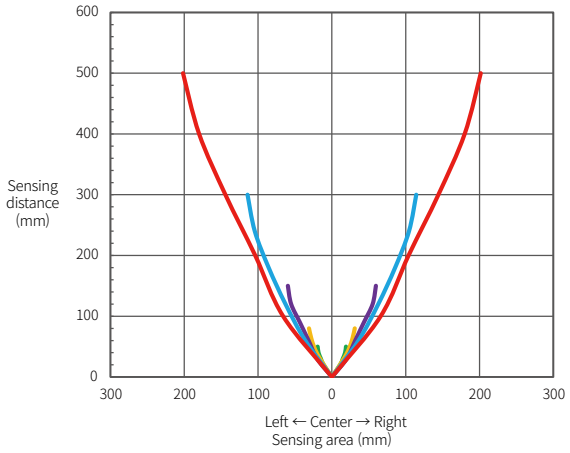
• Horizontal shift (Left ← Center → Right) • Vertical shift (Down ← Center → Up)



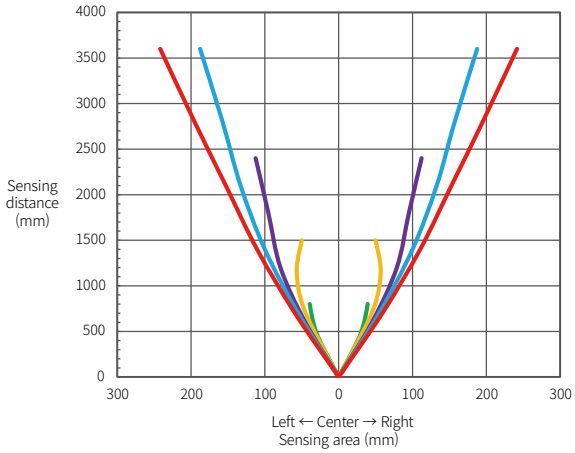
• Legend

UFST (50 µs)	FST (150 µs)	STD (500 µs)	LOG (4 ms)	ULOG (10 ms)

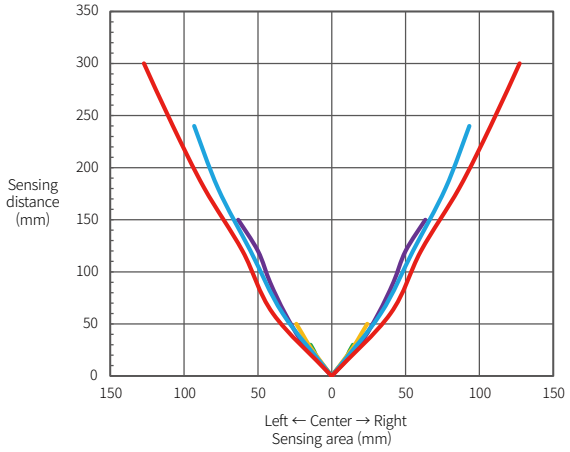
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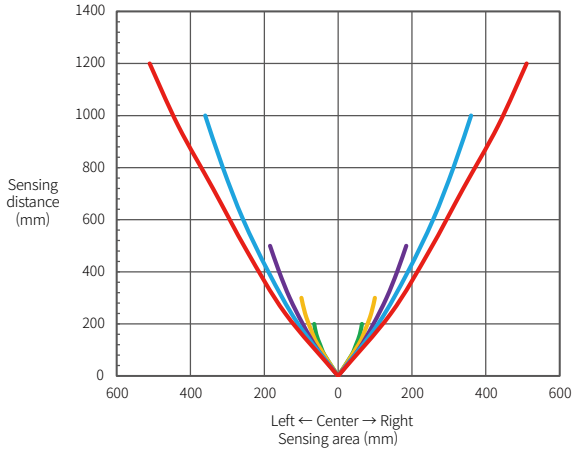
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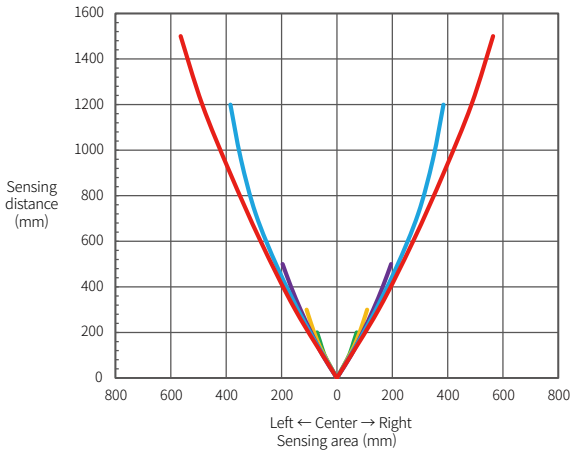
■ FT-320-05



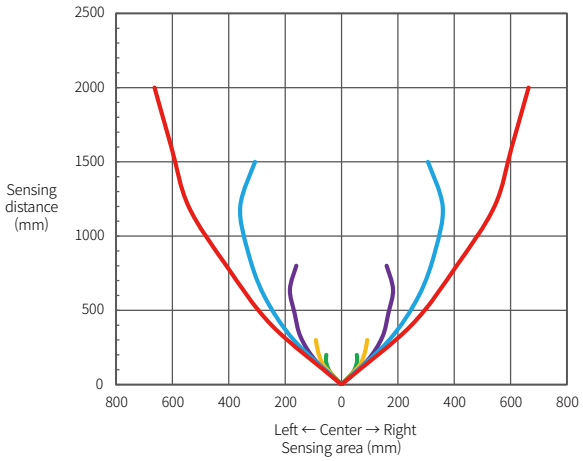
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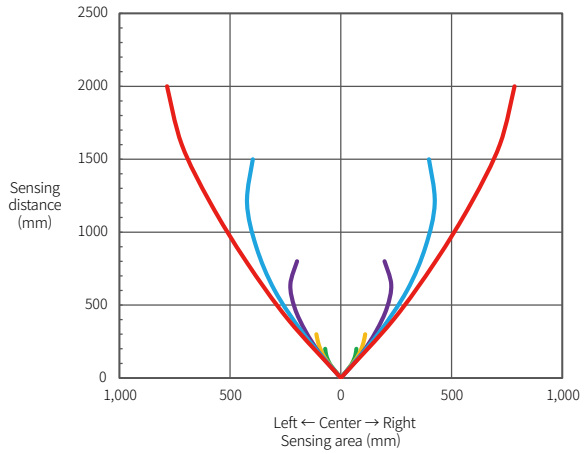
■ FT-420-10



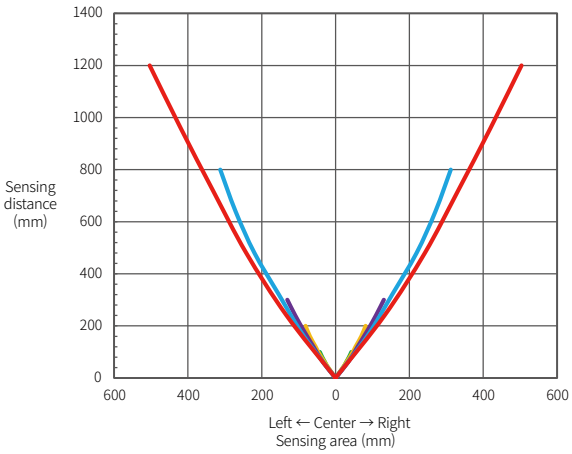
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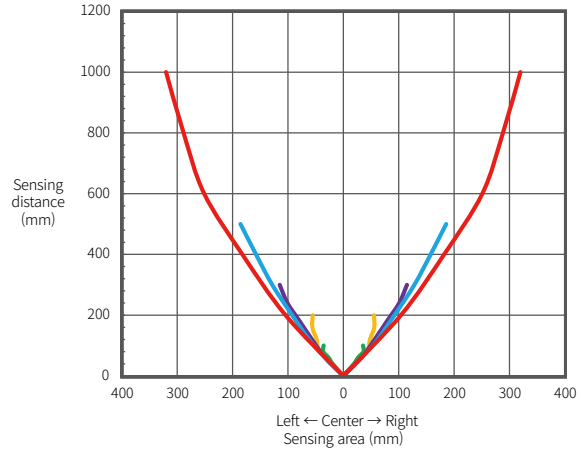
■ GT-420-13H2



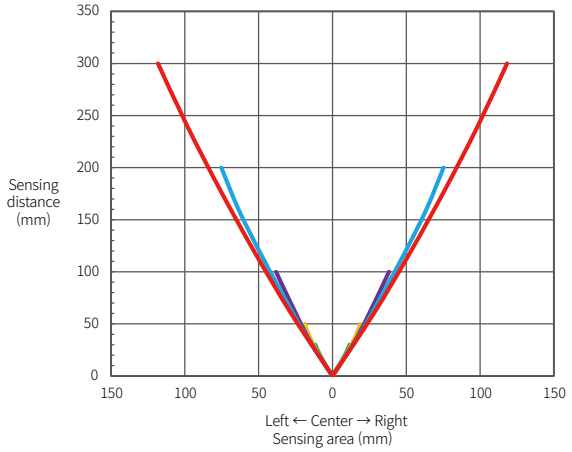
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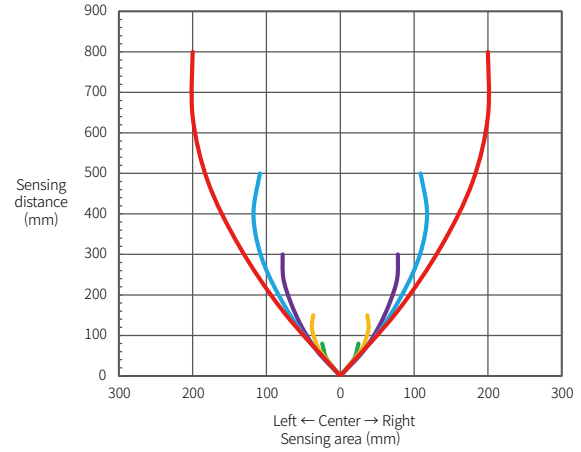
■ GT-410-12V2 (VA01)



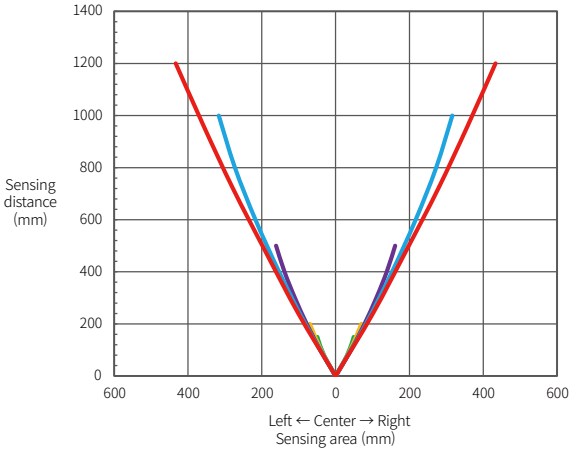
■ FT-320-05R



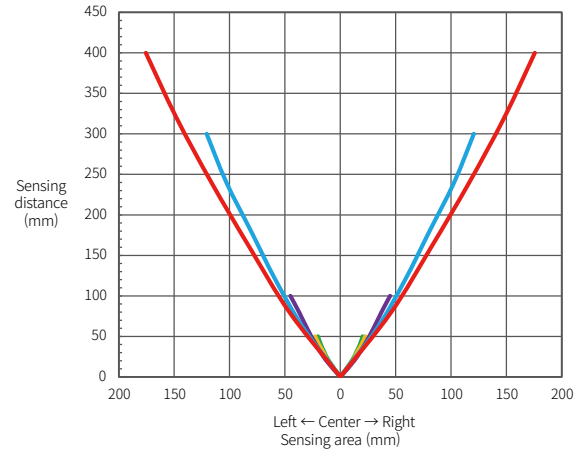
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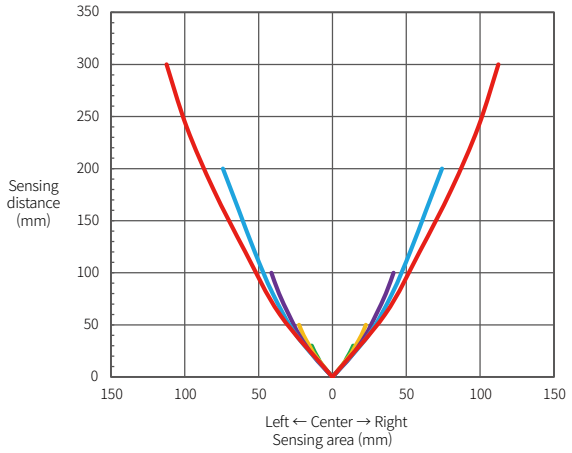
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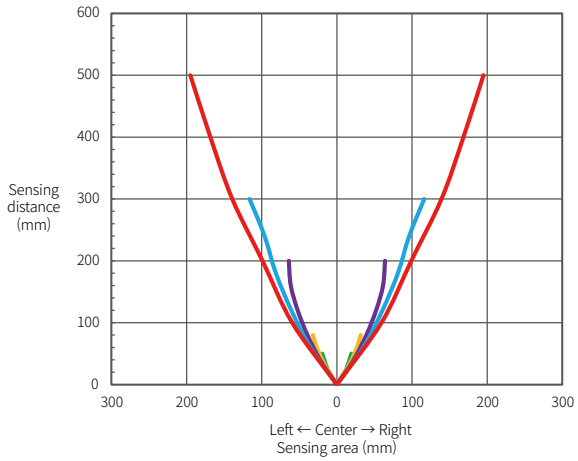
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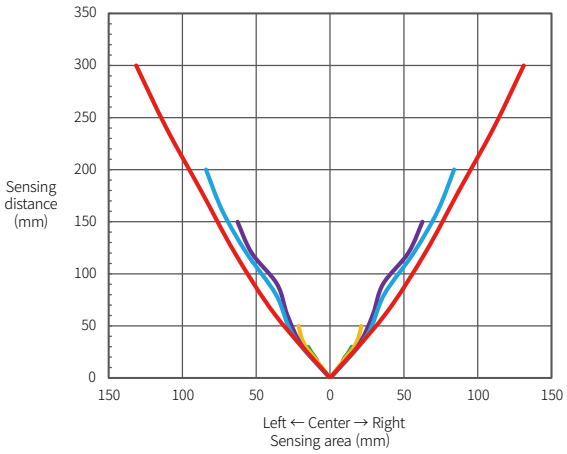
■ FTC-1520-05



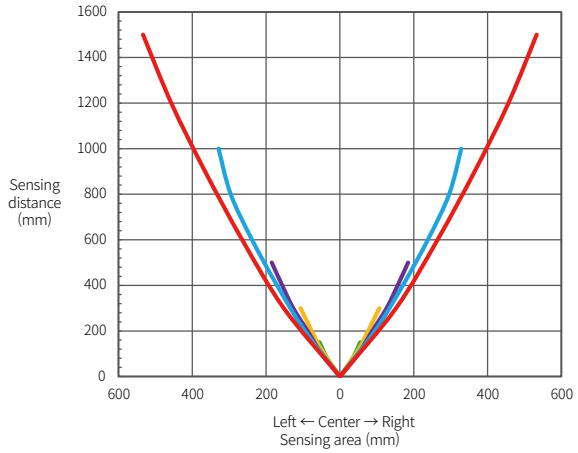
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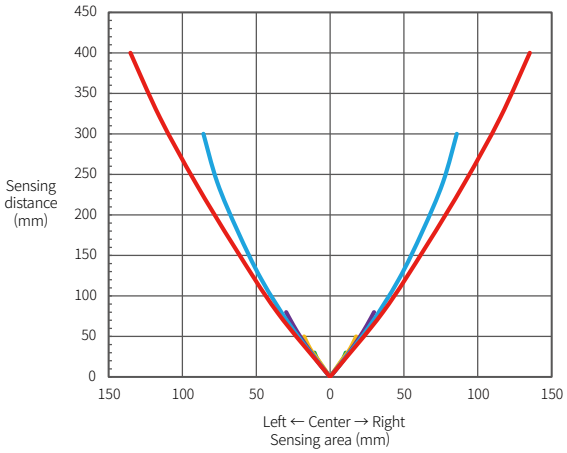
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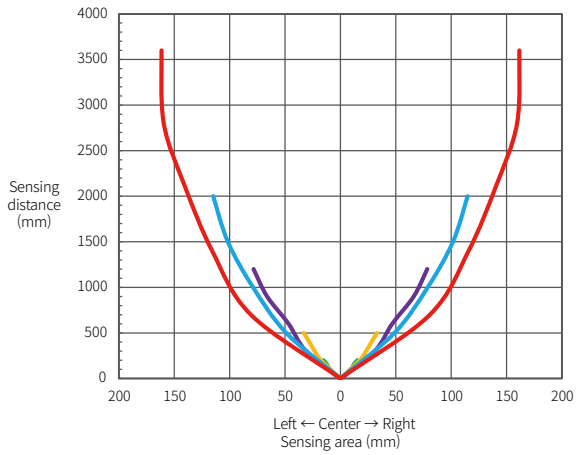
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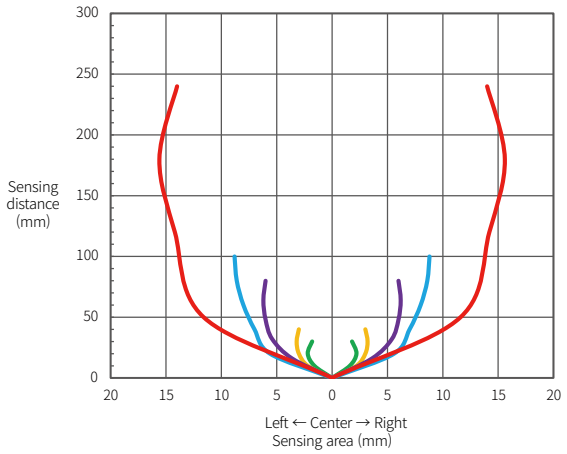
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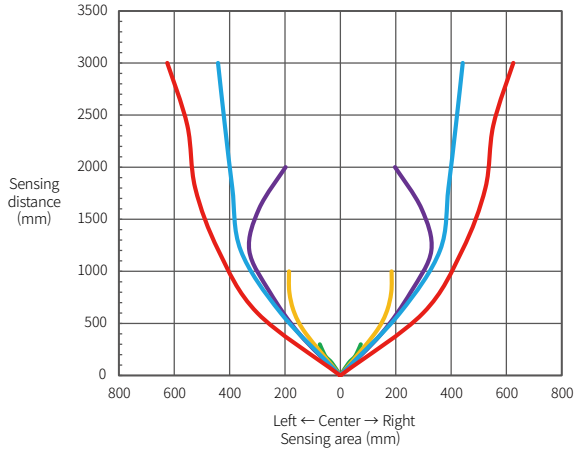
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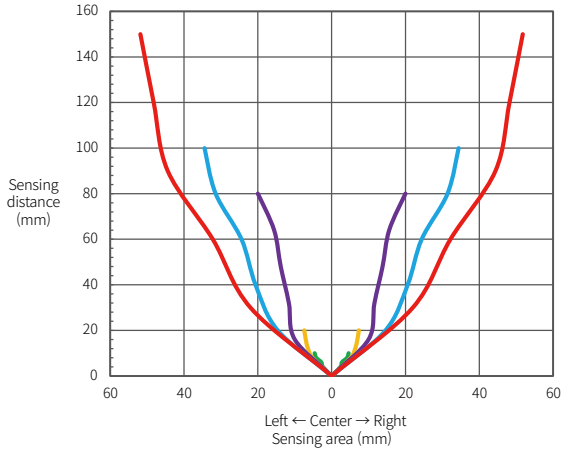
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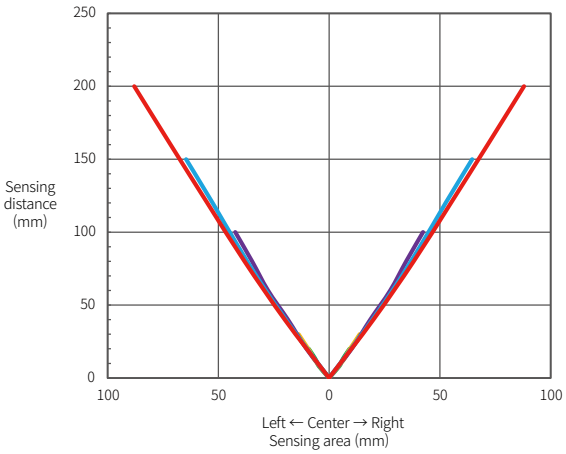
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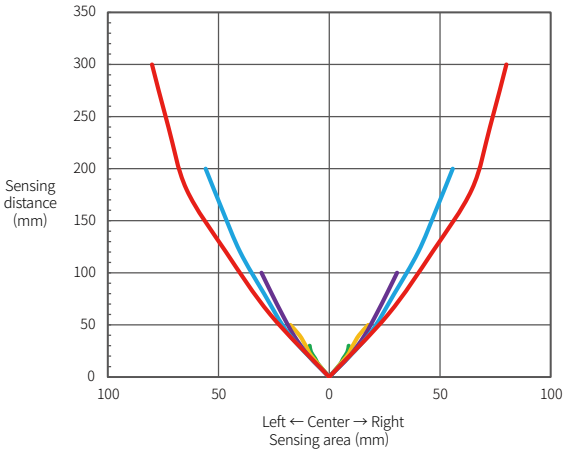
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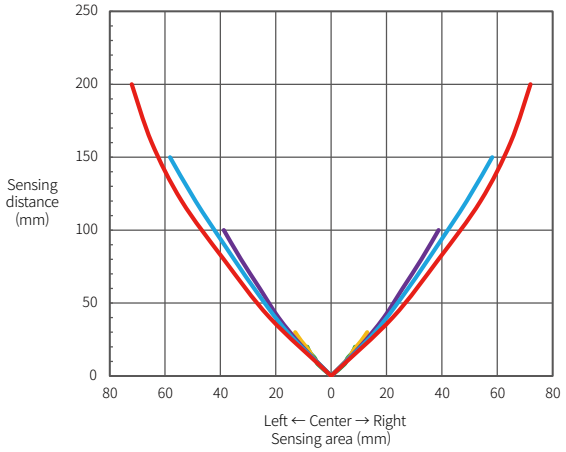
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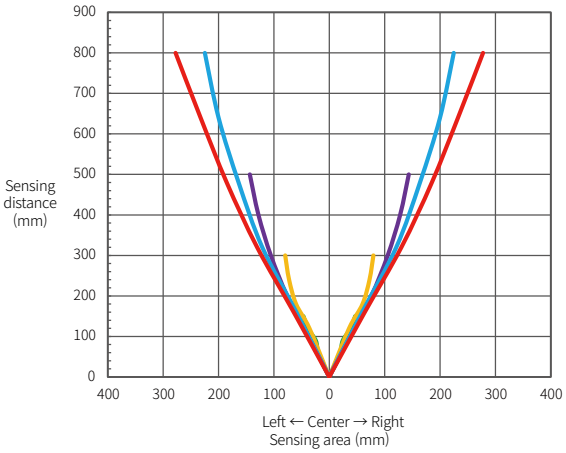
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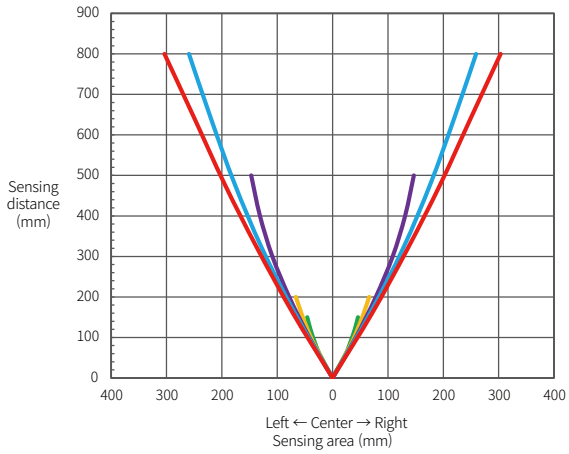
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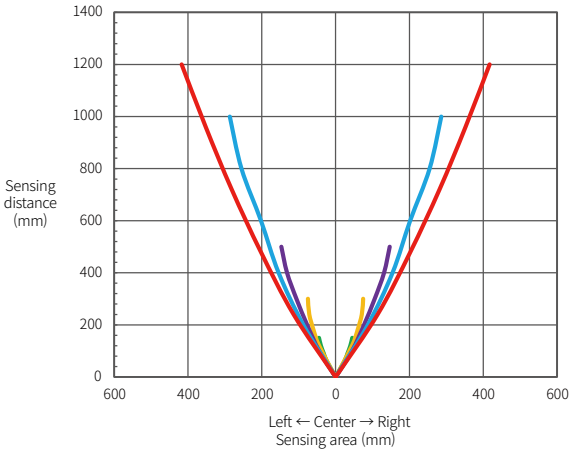
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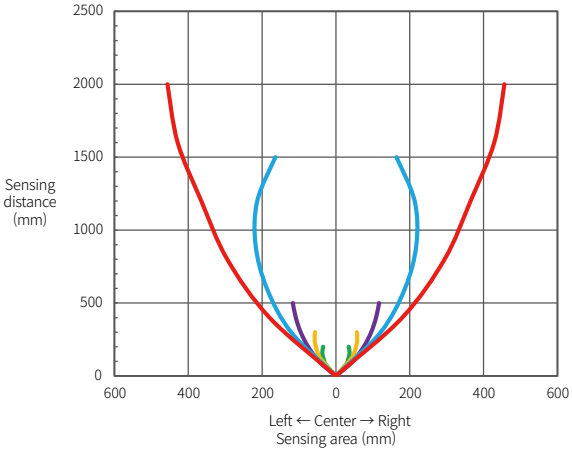
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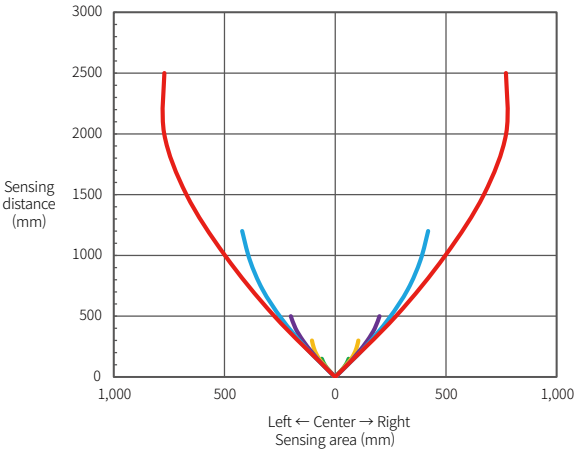
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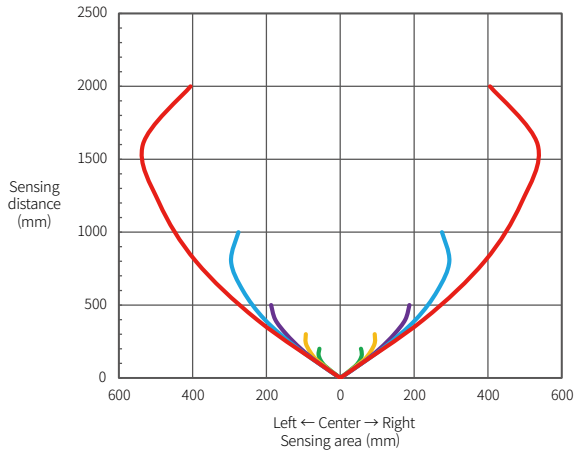
■ FTL-420-10



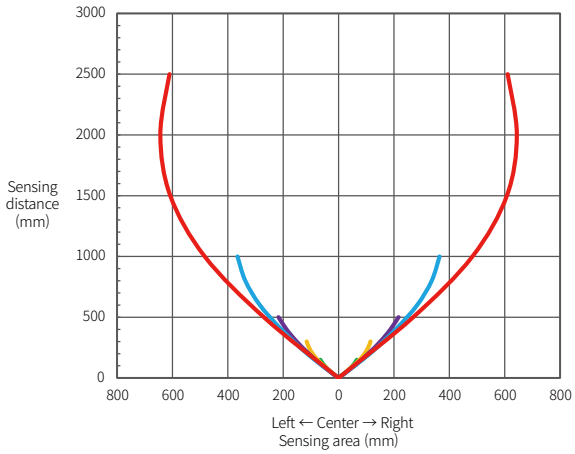
■ GTL-420-12H2



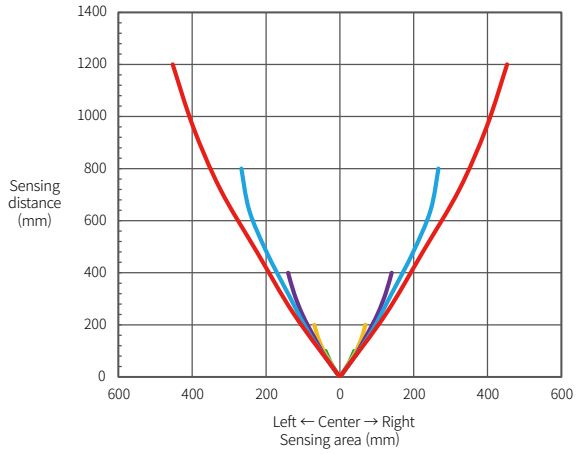
■ GTL-420-12H3



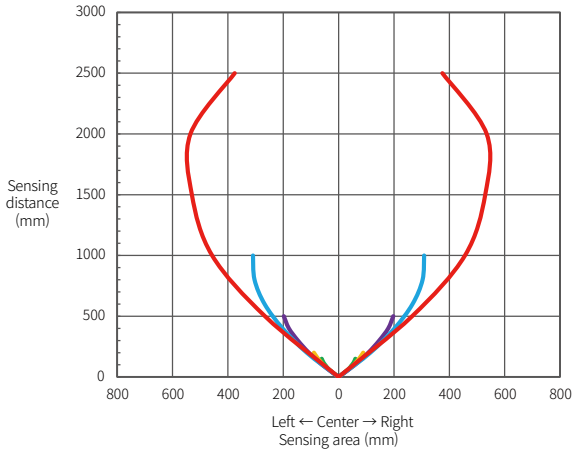
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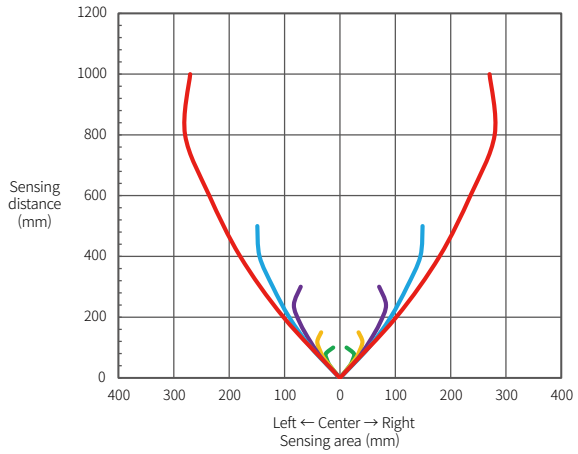
■ GTL-410-12V2 (VA01)



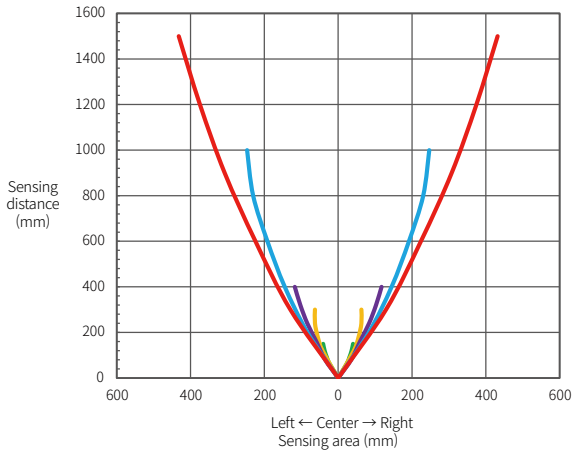
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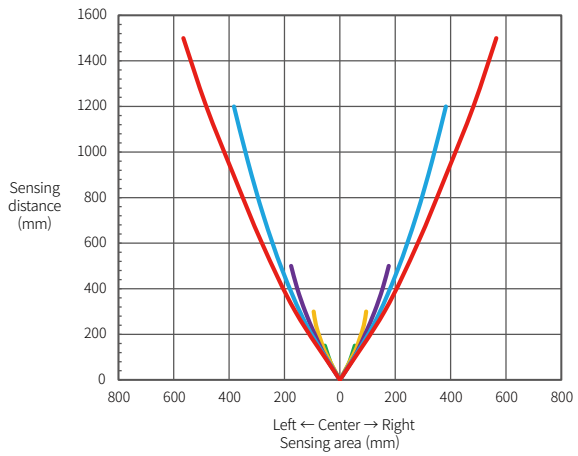
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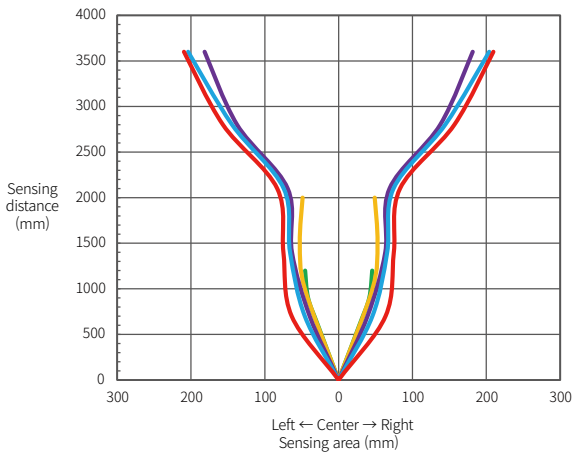
■ FTR-410-10R



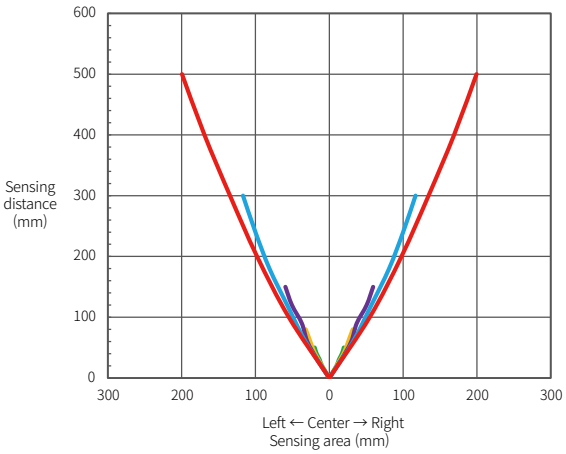
■ FTP-320-10



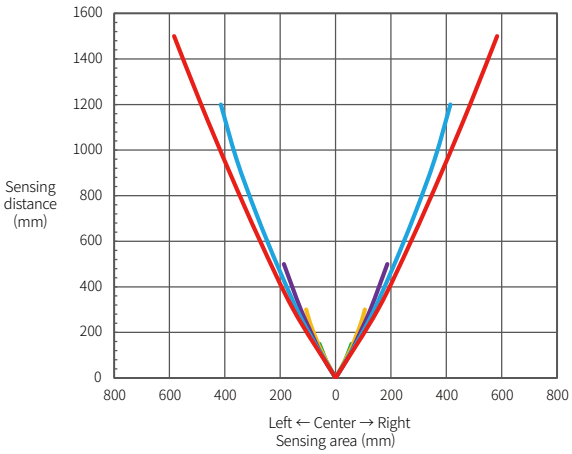
■ FTR-420-10RLN



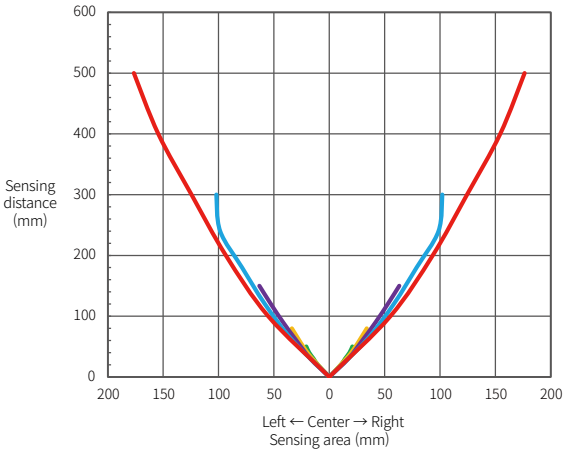
■ FTS-320-05



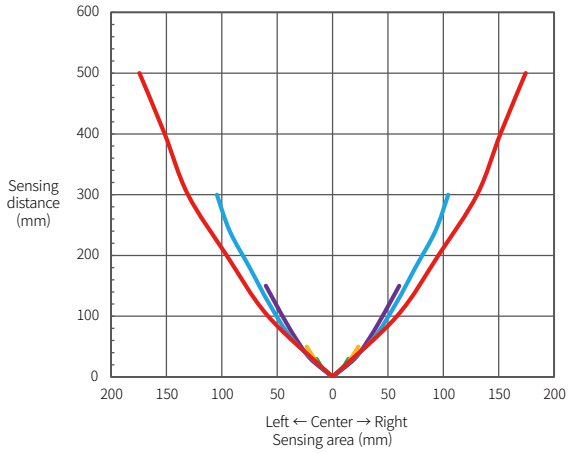
■ FTS2-420-10



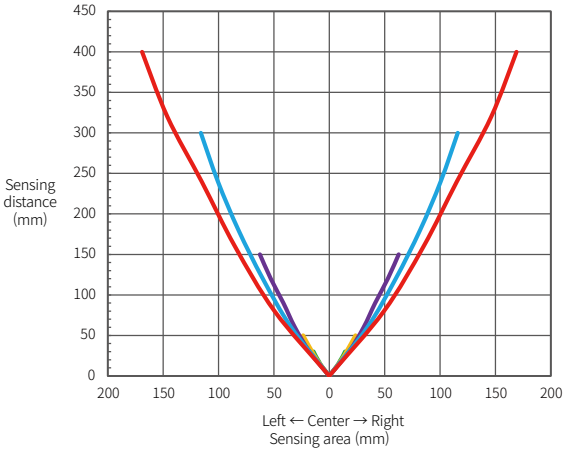
■ FTS1-320-05



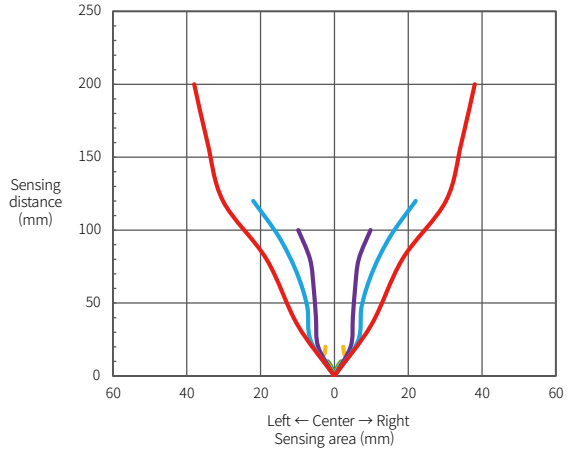
■ FTCS-220-05



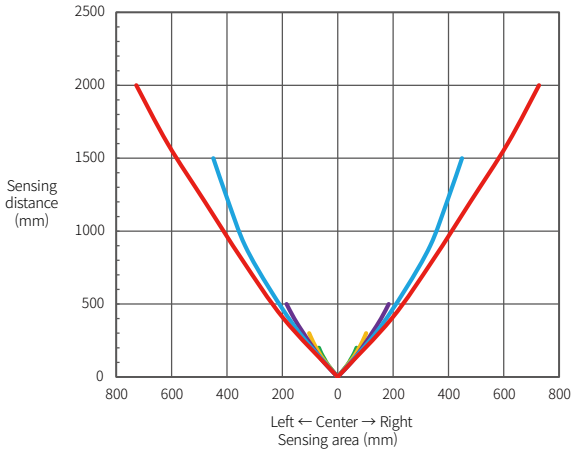
■ FTS2-320-05



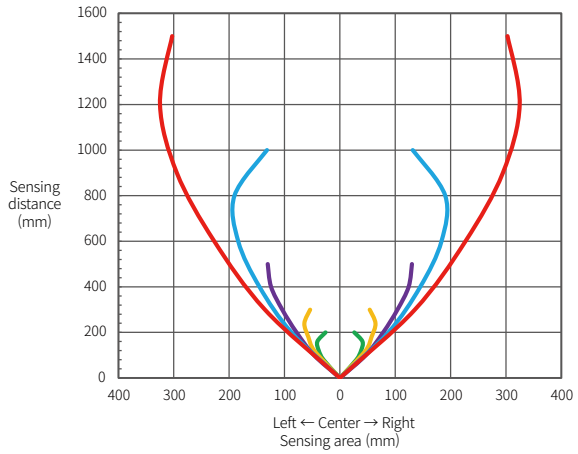
■ FTCSN-2520-05



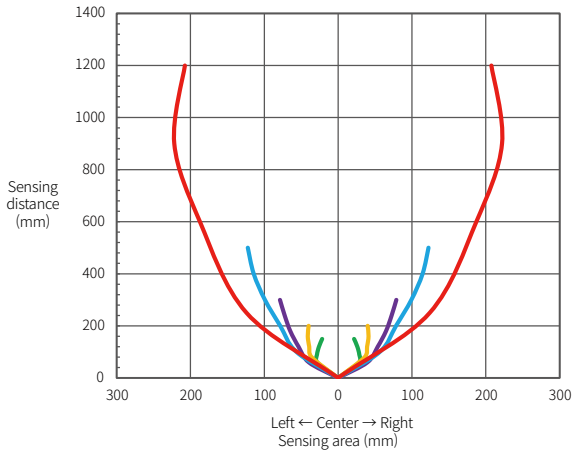
■ FTS-420-10



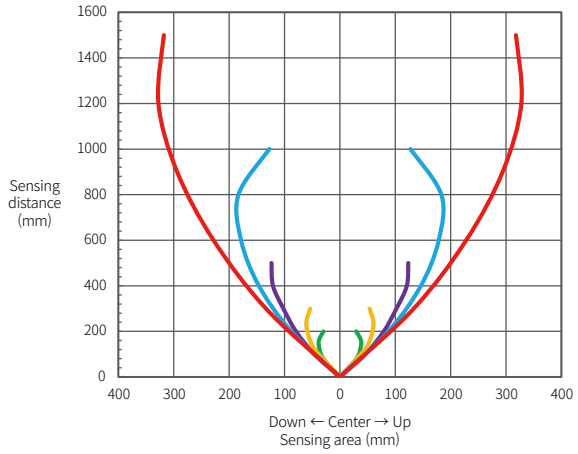
■ FTW5-320-02B (horizontal)



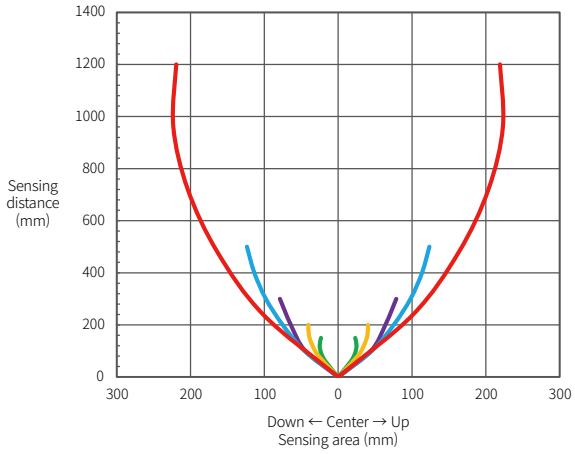
■ FTW40-320-02B (horizontal)



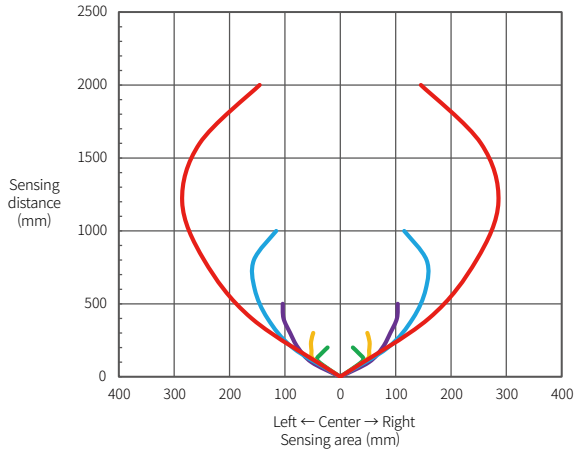
■ FTW5-320-02B (vertical)



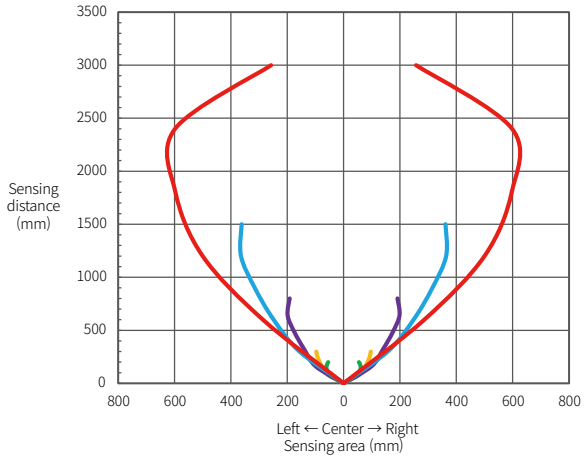
■ FTW40-320-02B (vertical)



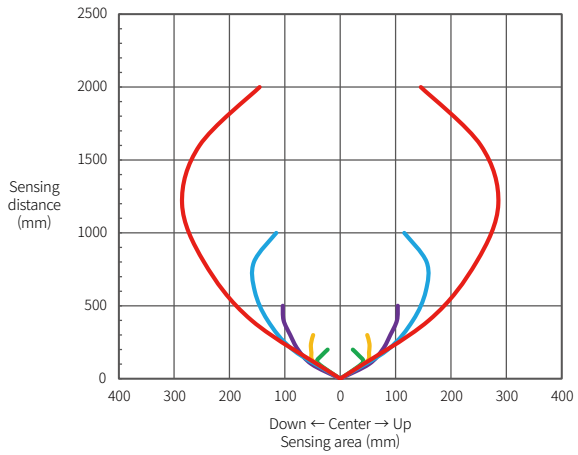
■ FTW20-320-02B (horizontal)



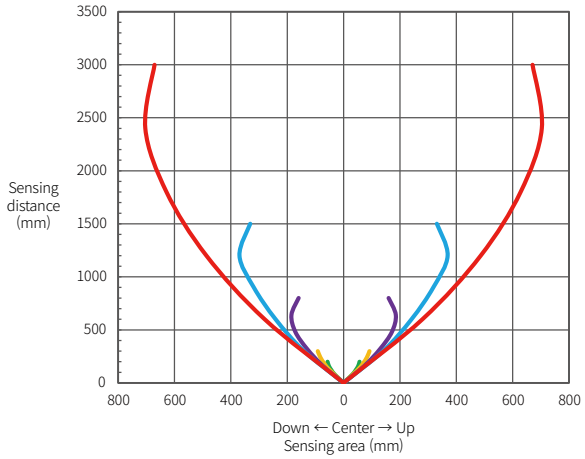
■ FTW60-320-02B (horizontal)



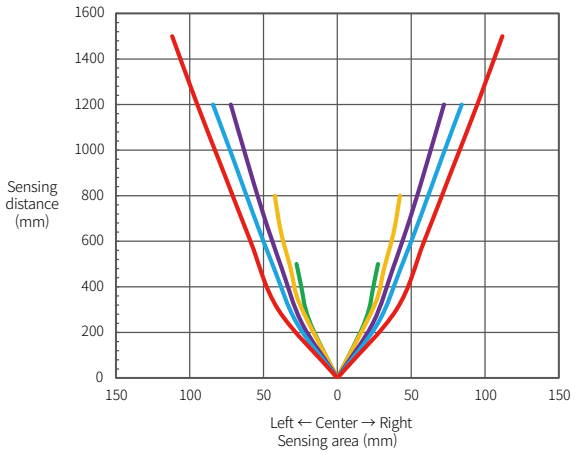
■ FTW20-320-02B (vertical)



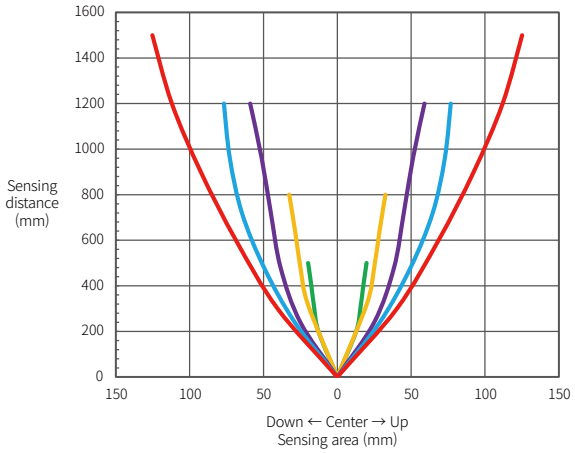
■ FTW60-320-02B (vertical)



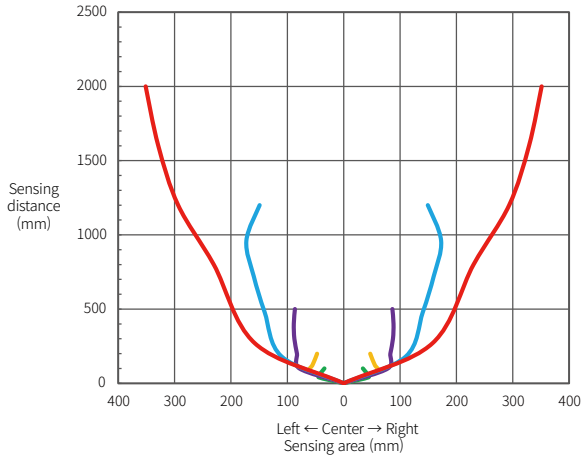
■ FTW11-210-10R (horizontal)



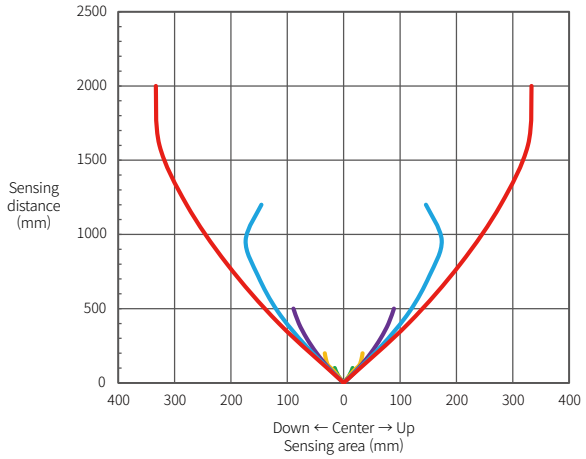
■ FTW11-210-10R (vertical)



■ FTW100-420-02R (horizontal)

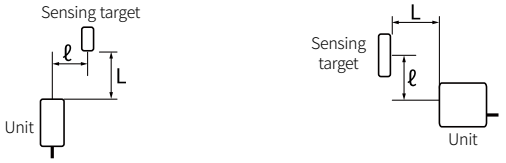


■ FTW100-420-02R (vertical)



Detection Area Characteristics: Diffuse Reflective Type (TYPICAL)

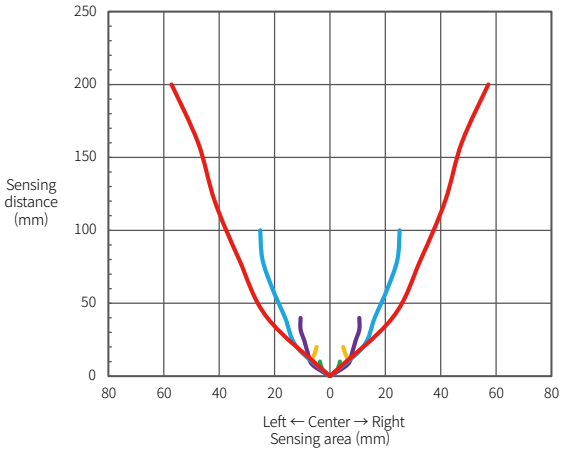
• Horizontal shift (Left ← Center → Right) • Vertical shift (Down ← Center → Up)



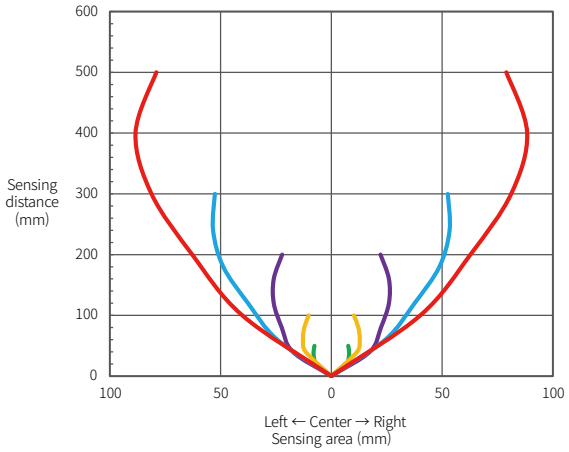
• Legend

UFST (50 µs)	FST (150 µs)	STD (500 µs)	LOG (4 ms)	ULOG (10 ms)

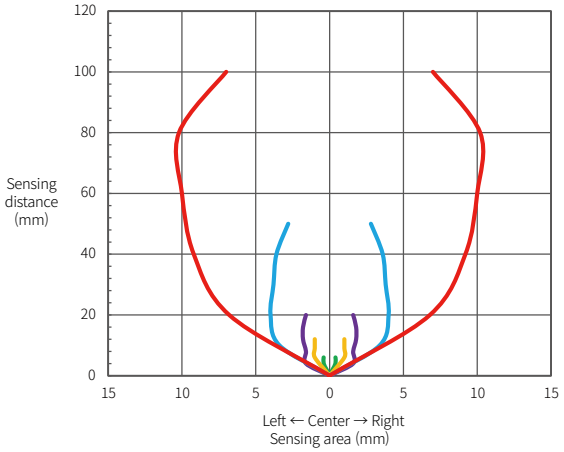
■ FD-310-05



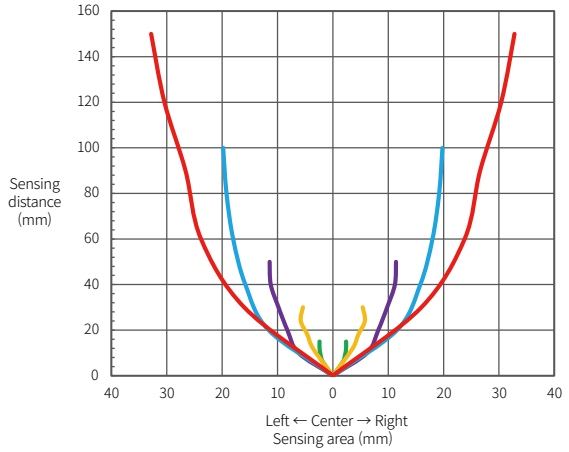
■ FD-620-10



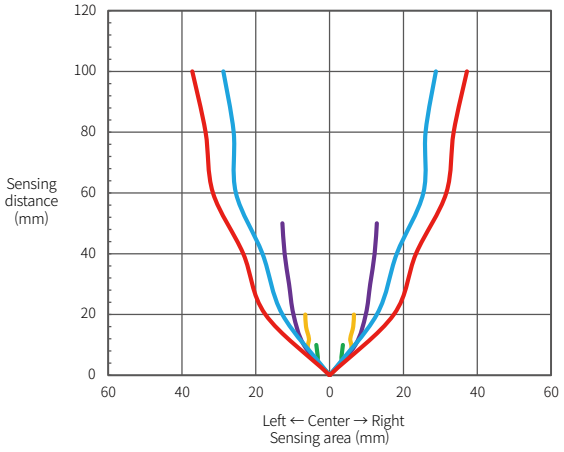
■ FD-320-05



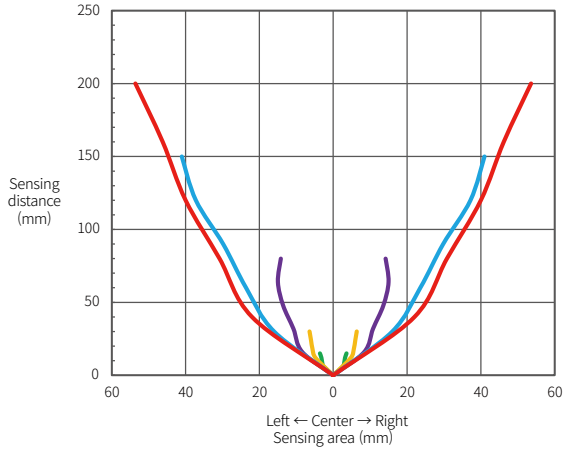
■ FD-320-F



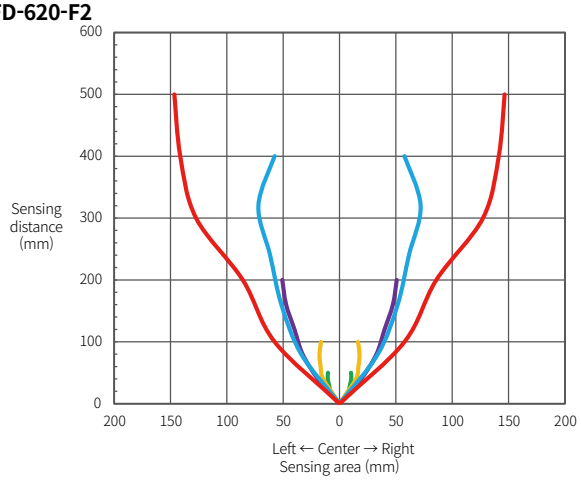
■ FD-420-05



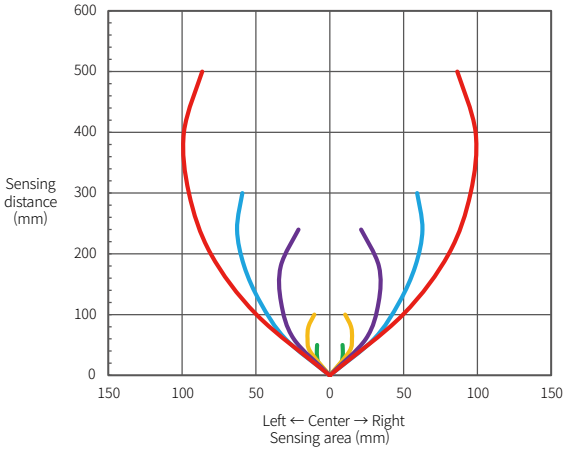
■ FD-320-F1



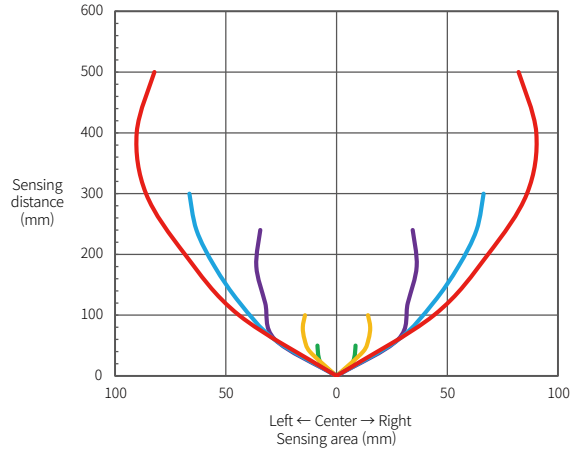
■ FD-620-F2



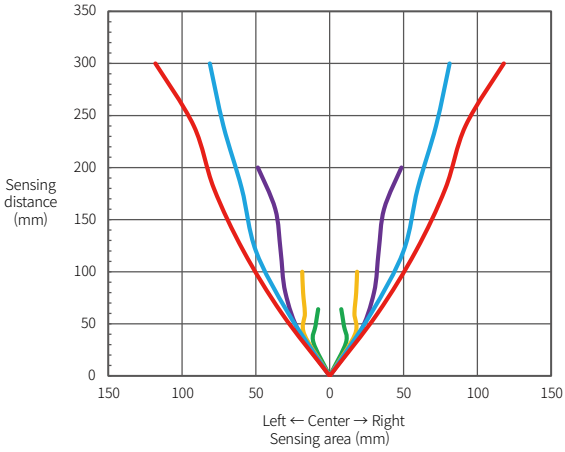
■ GD-620-20H2



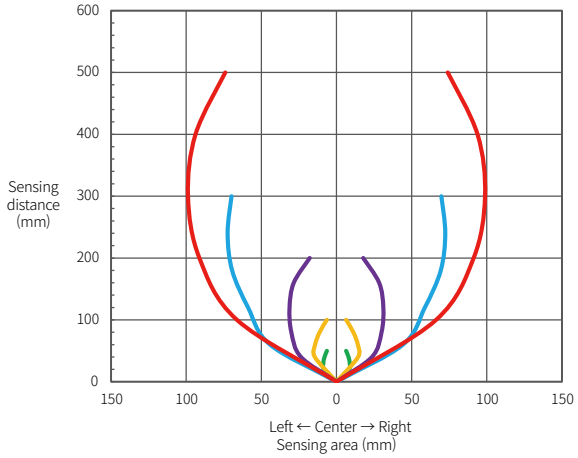
■ FD-620-10H



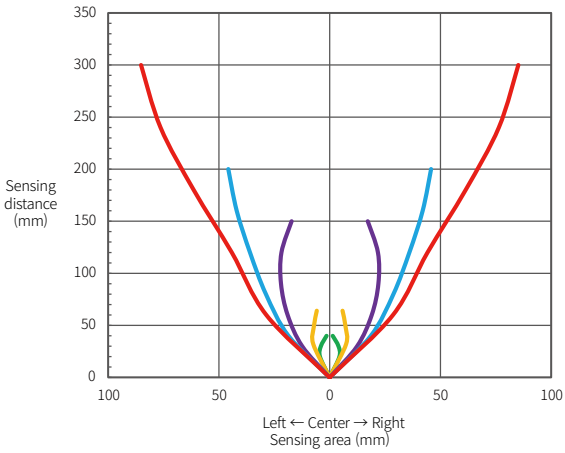
■ GD-620-12H3



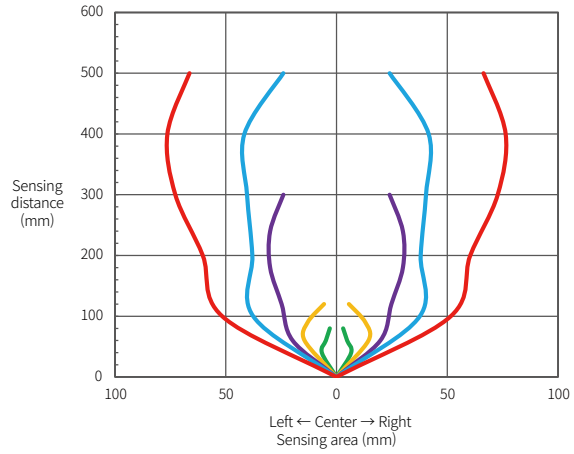
■ FD-620-15H1



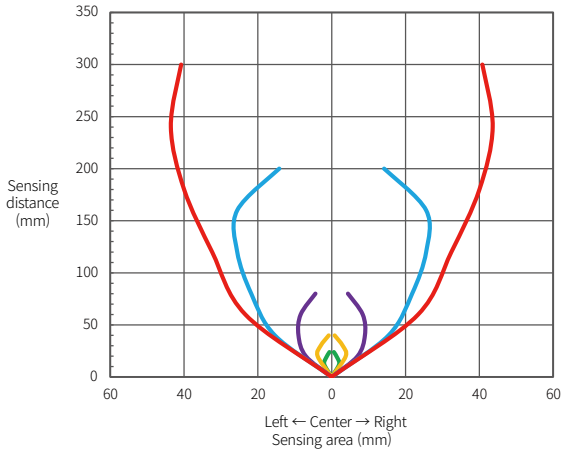
■ GD-610-12V2 (VA01)



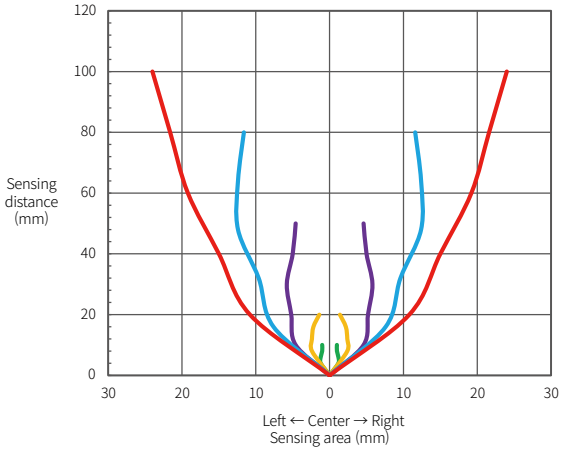
■ GD-420-20H2



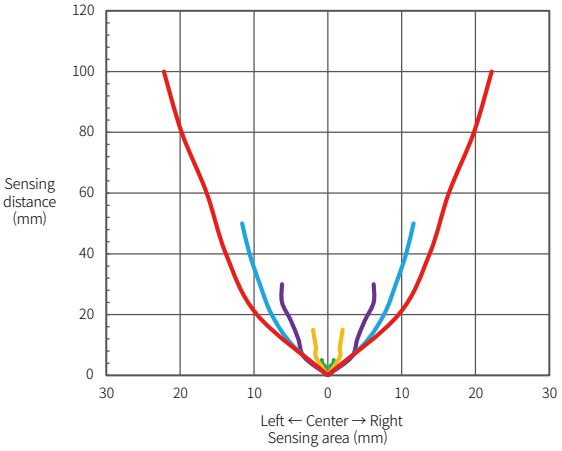
■ GD-610-12V2 (VA02)



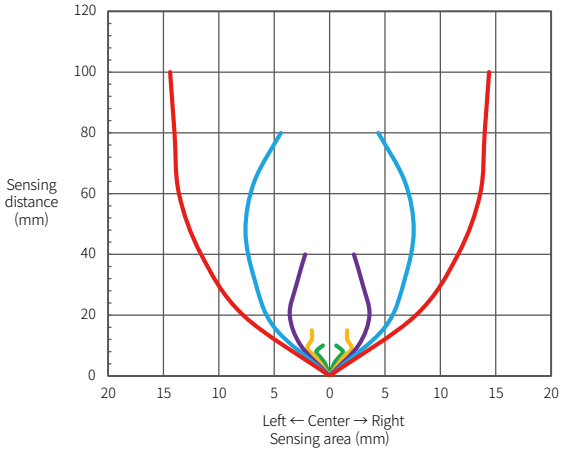
■ FD-320-06B



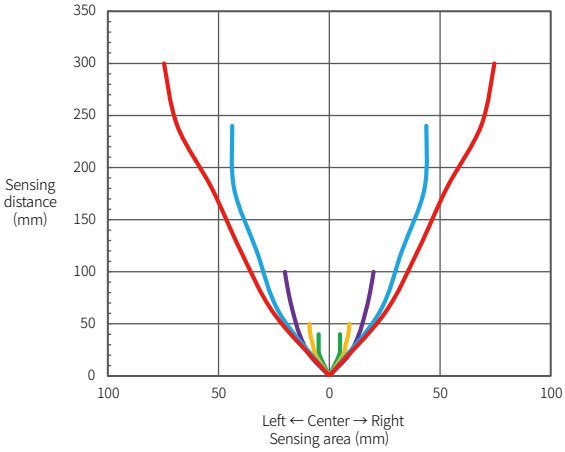
■ FD-420-05R



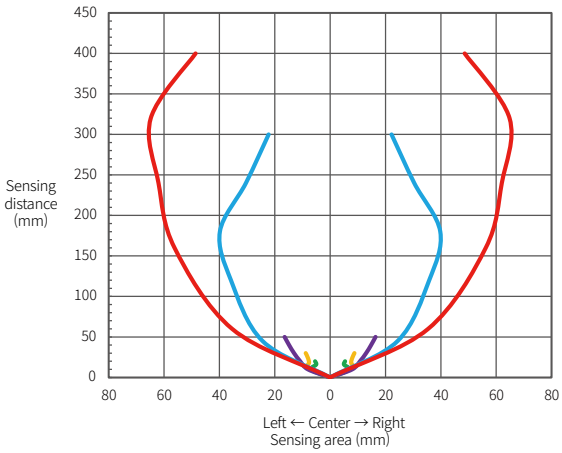
■ FD-420-06B



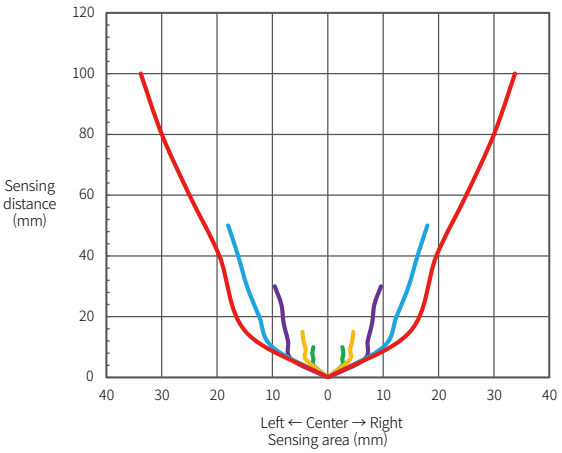
■ FD-620-10R



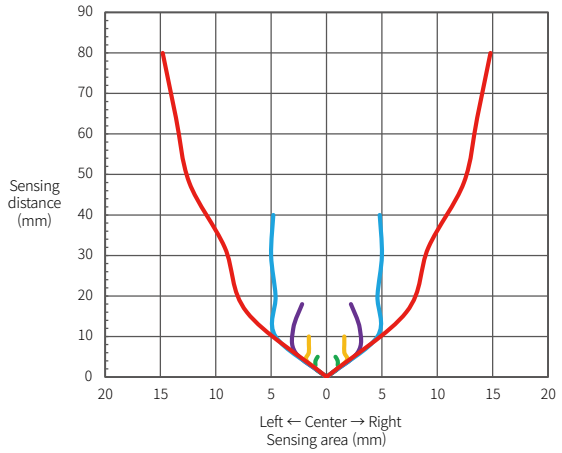
■ FD-620-13B



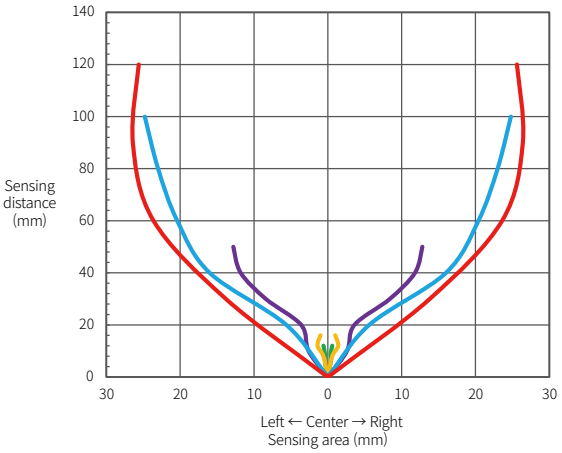
■ FDC-320-05



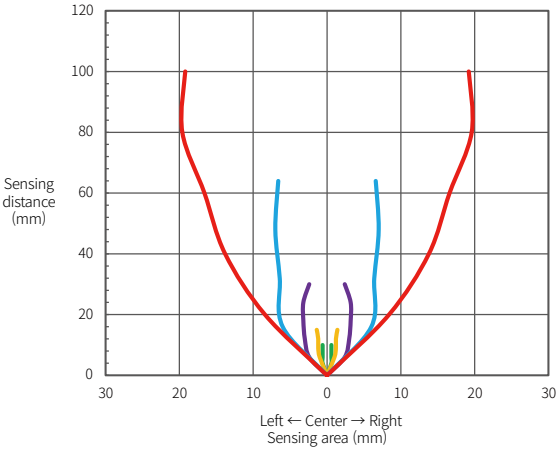
■ FD-320-05R



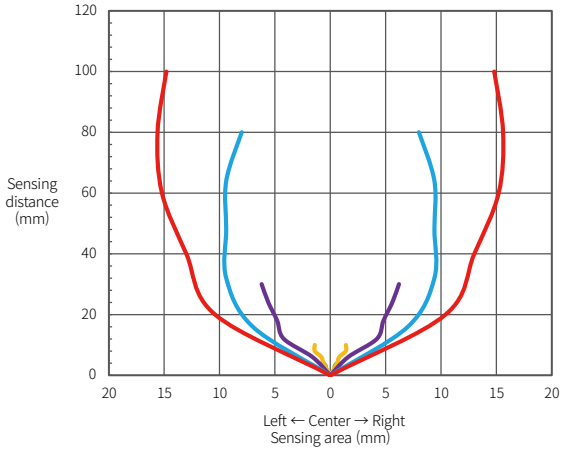
■ FDC-320-F



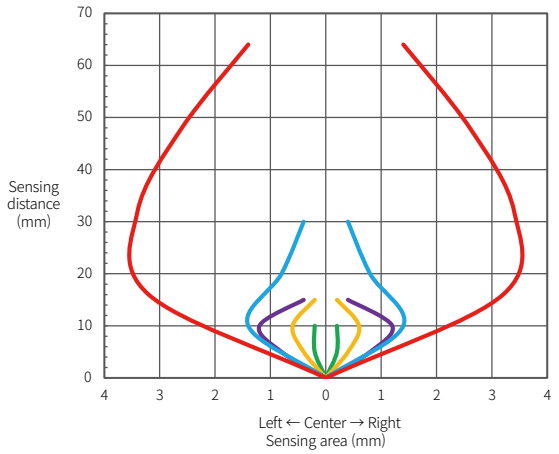
■ FDC-320-06B



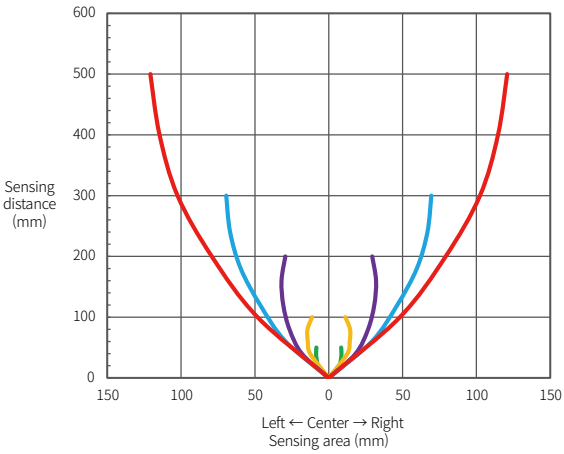
■ FDFU-210-05R



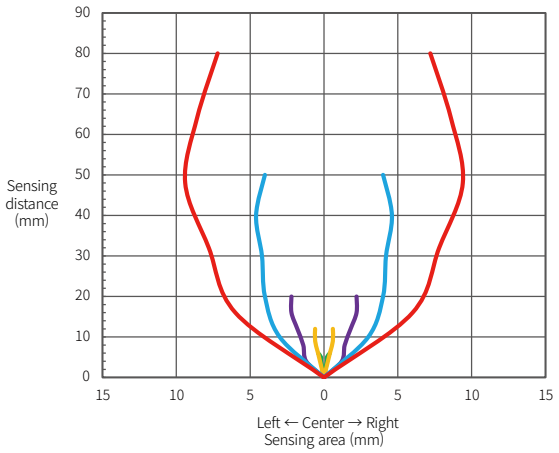
■ FDC-310-10R



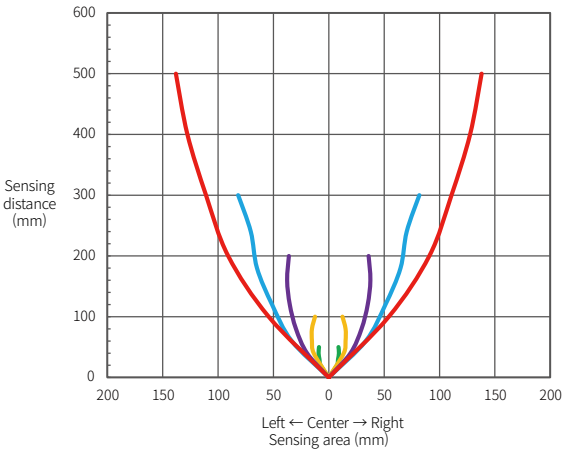
■ GDL-620-12H2



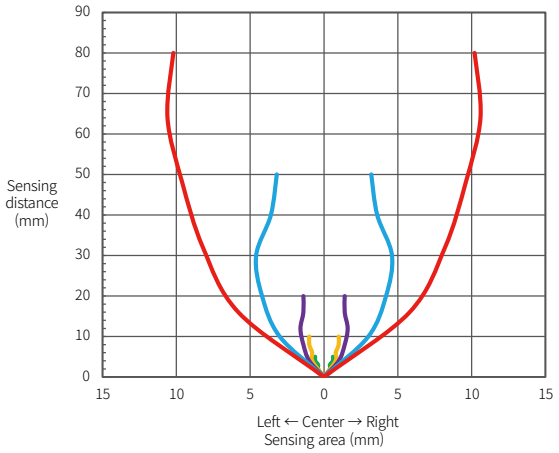
■ FDF-210-05R



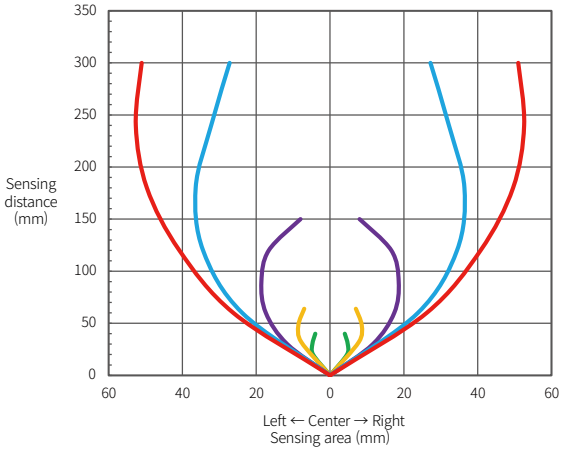
■ GDL-620-12H3



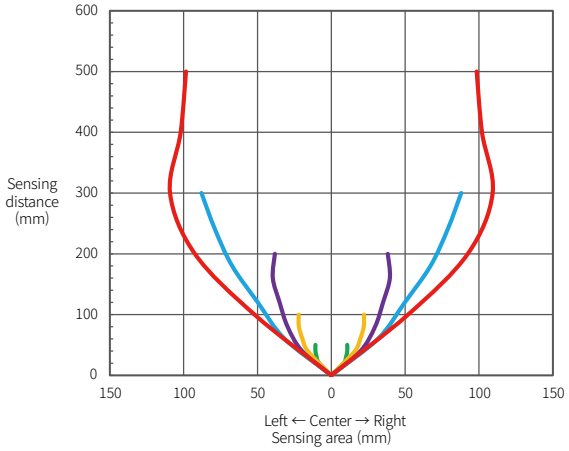
■ FDFN-210-05R



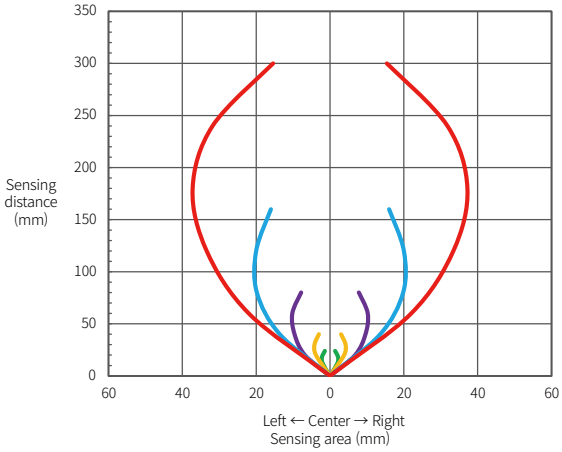
■ GDL-610-12V2 (VA01)



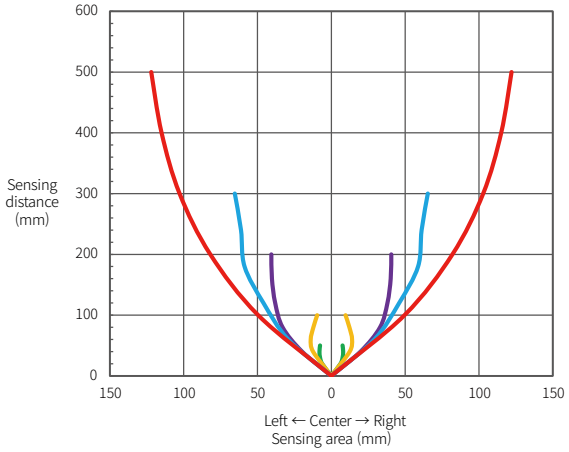
■ GDR-620-17H2



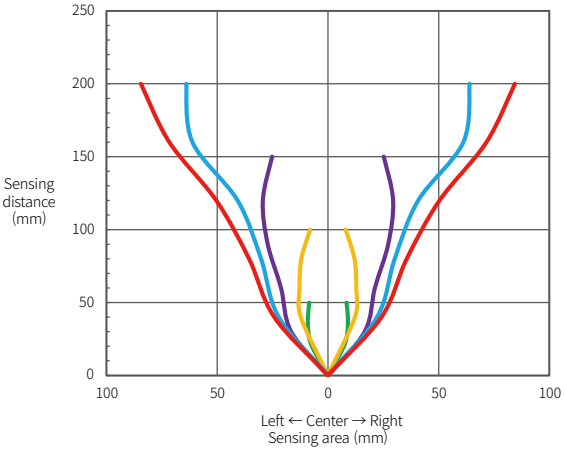
■ GDL-610-12V2 (VA02)



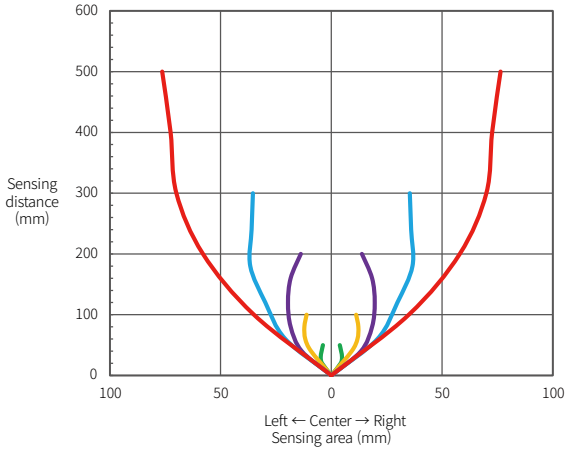
■ GDR-620-17H3



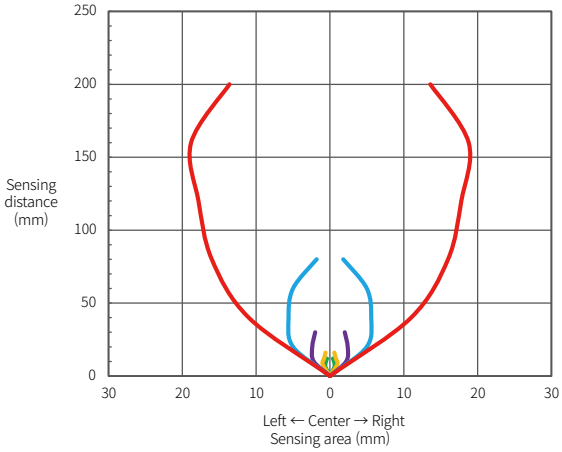
■ FDP-320-10



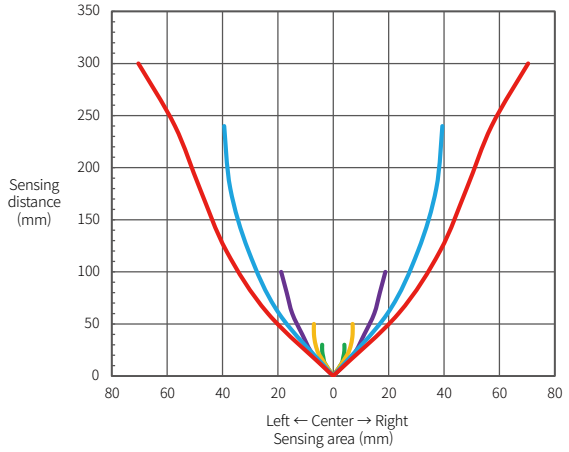
■ FDRT-420-02B



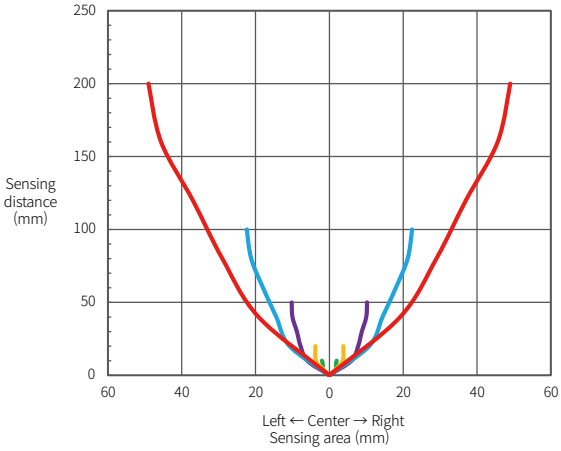
■ FDPF-210-05R



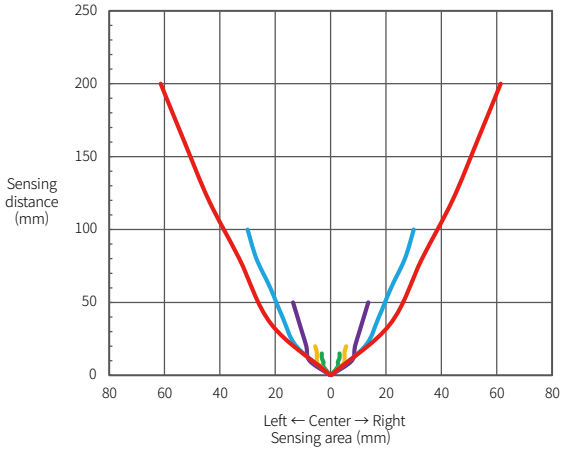
■ FDR-610-10R



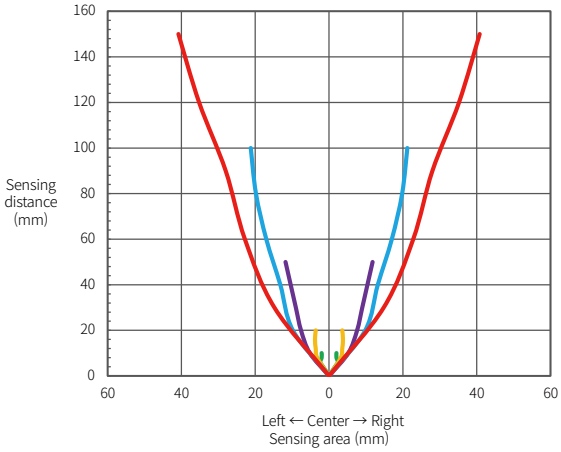
■ FDS-320-05



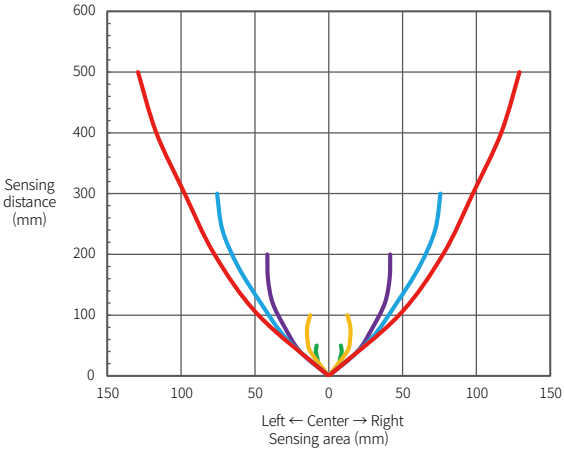
■ FDS2-420-05



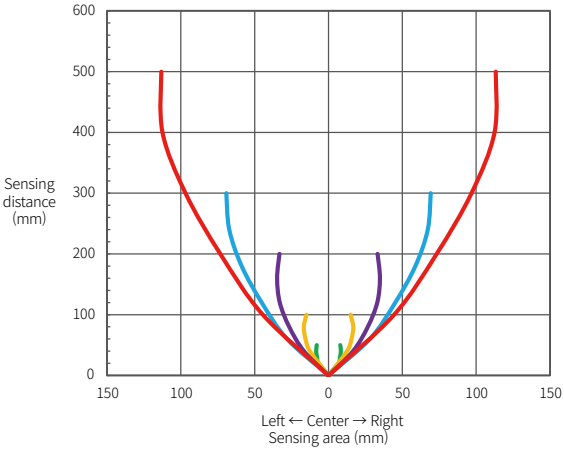
■ FDS-420-05



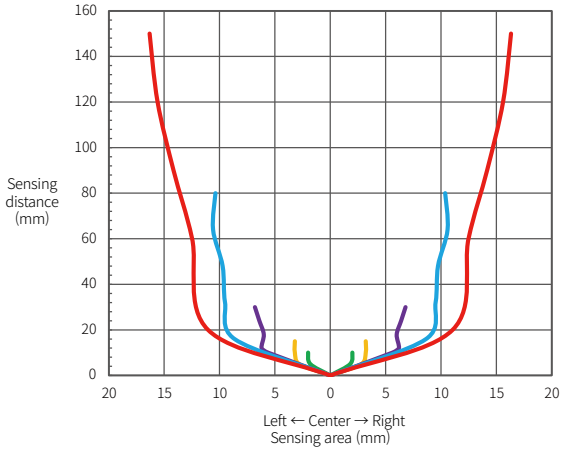
■ FDS2-620-10



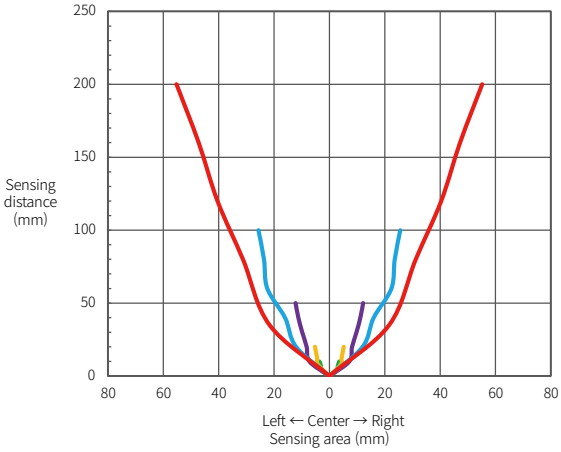
■ FDS-620-10



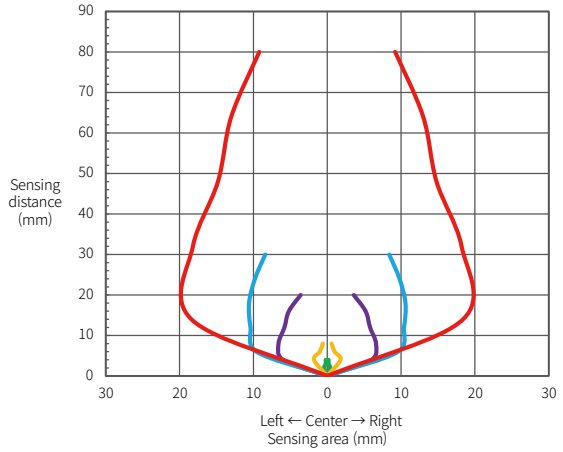
■ FDCS-320-05



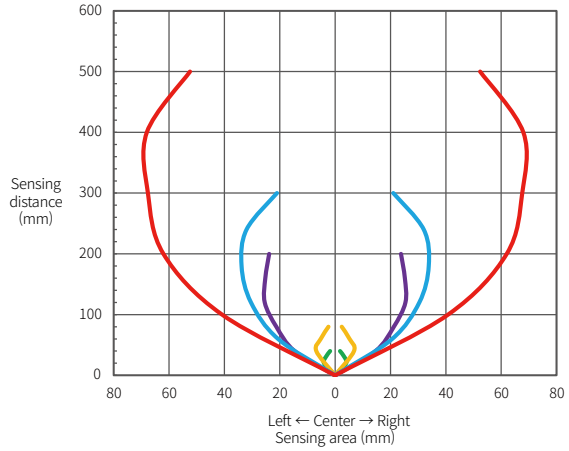
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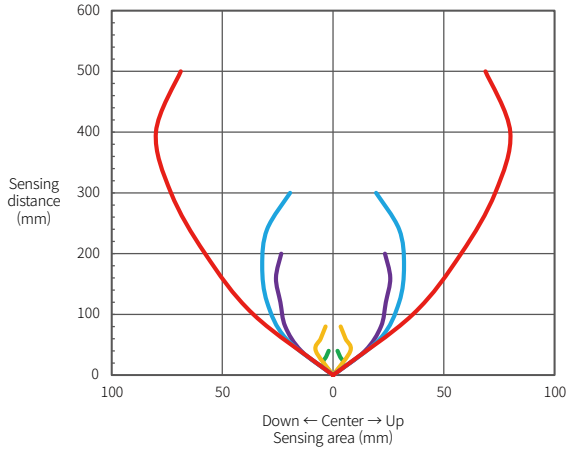
■ FDCSN-320-05



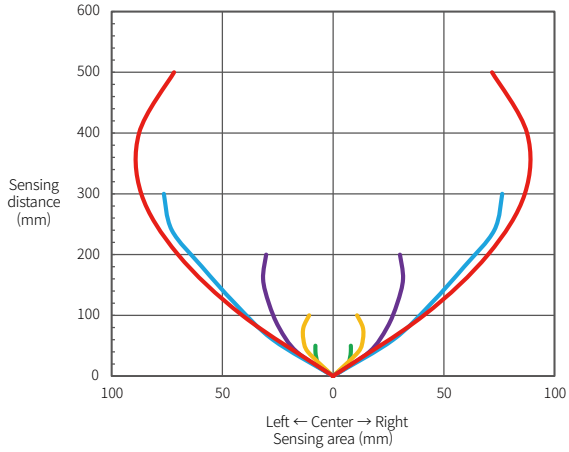
■ FDW10-320-02B (horizontal)



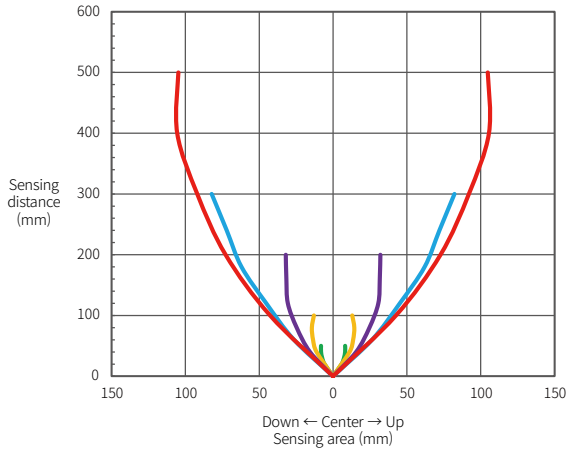
■ FDW10-320-02B (vertical)



■ FDW10T-320-02B (horizontal)

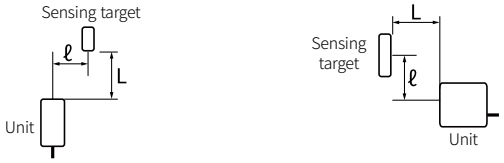


■ FDW10T-320-02B (vertical)



Detection Area Characteristics: Convergent Reflective Type (TYPICAL)

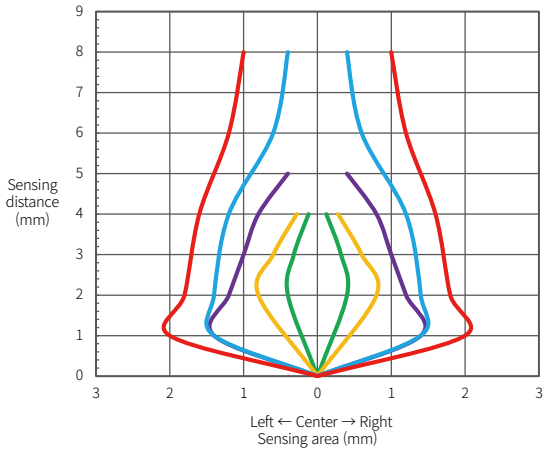
• Horizontal shift (Left ← Center → Right) • Vertical shift (Down ← Center → Up)



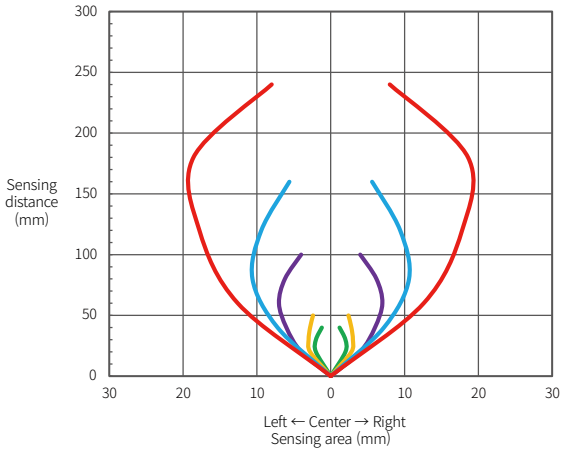
• Legend

UFST (50 µs)	FST (150 µs)	STD (500 µs)	LOG (4 ms)	ULOG (10 ms)

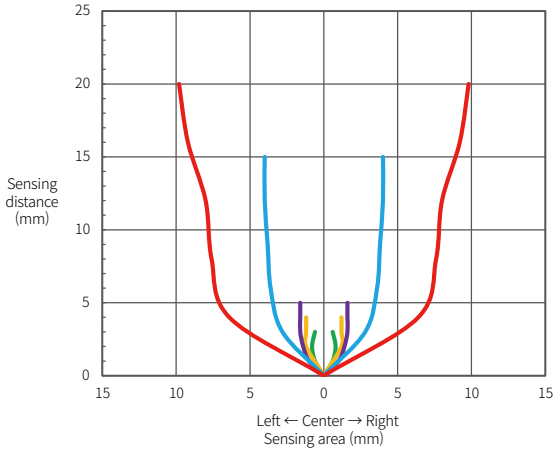
■ FLF-320-05



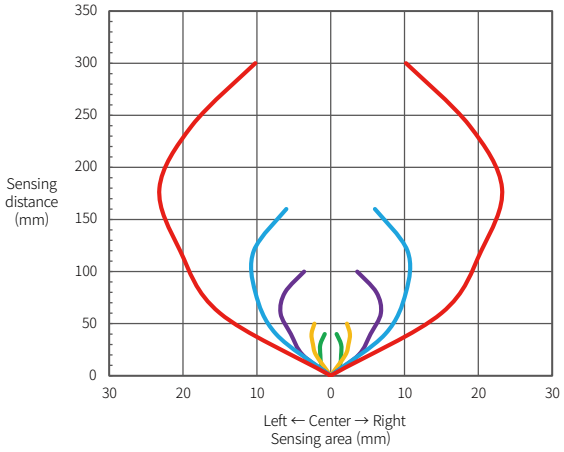
■ FLF-320-10H



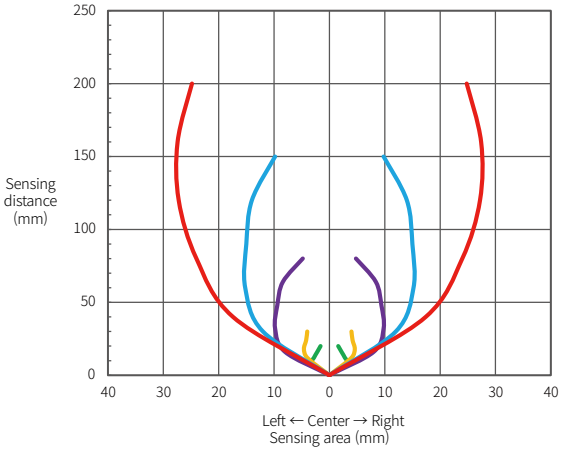
■ FLF-320-10



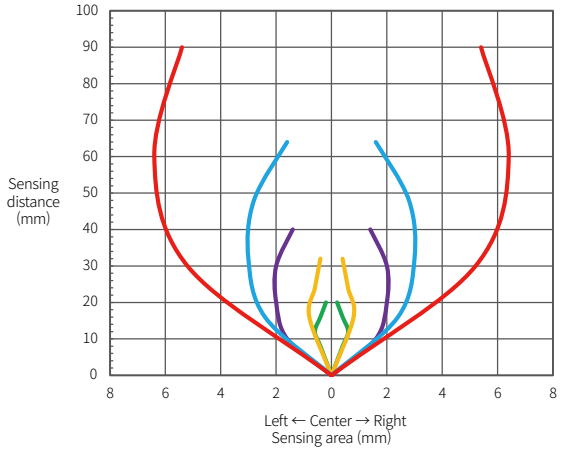
■ GLF-320-12H2L



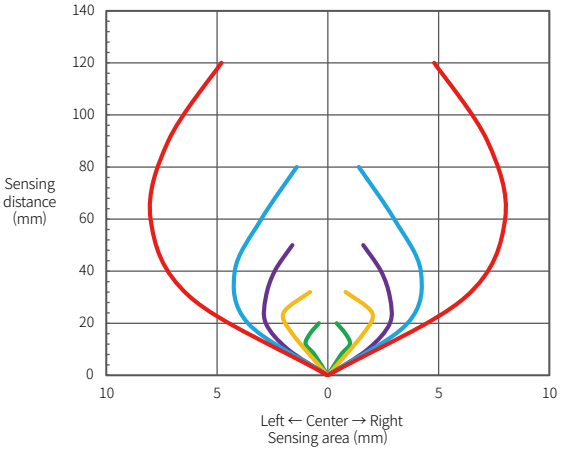
■ FLF-320-10A



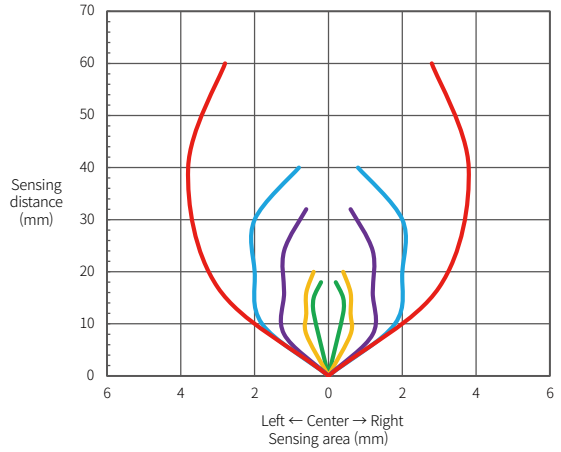
■ FLF-310-10V (VA01)



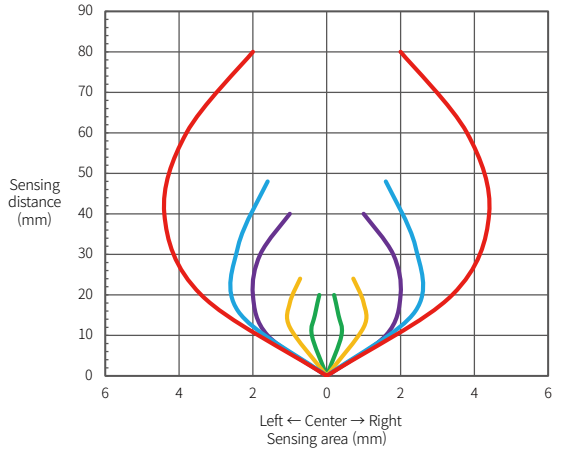
■ GLF-310-12V2L (VA01)



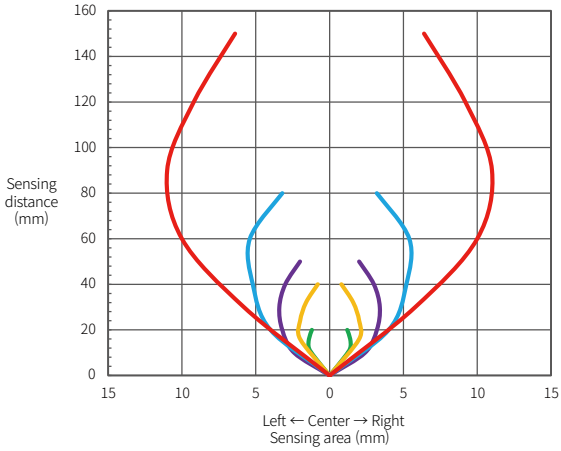
■ FLF-310-10V (VA02)



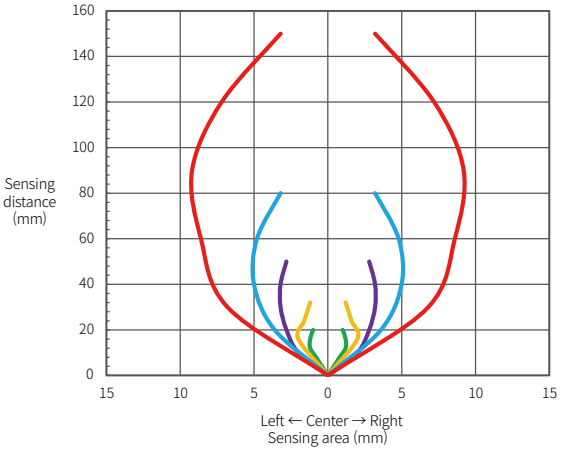
■ GLF-310-12V2L (VA02)



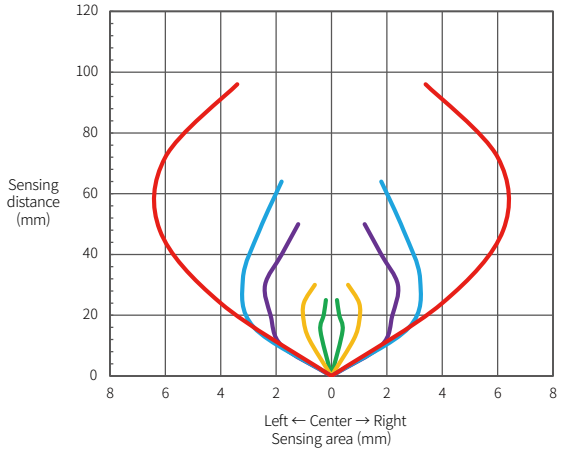
■ GLF-310-12V2 (VA01)



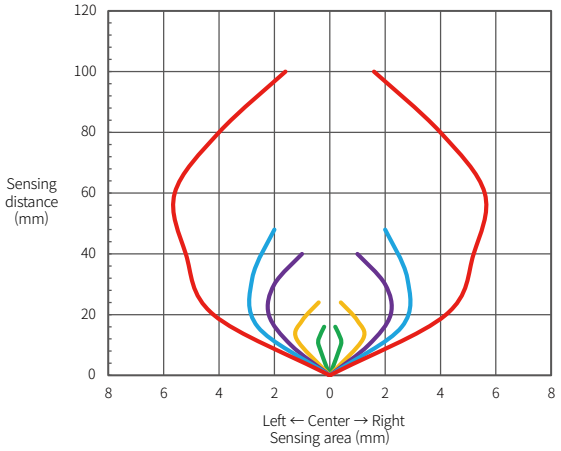
■ GLF-310-12V3L (VA01)



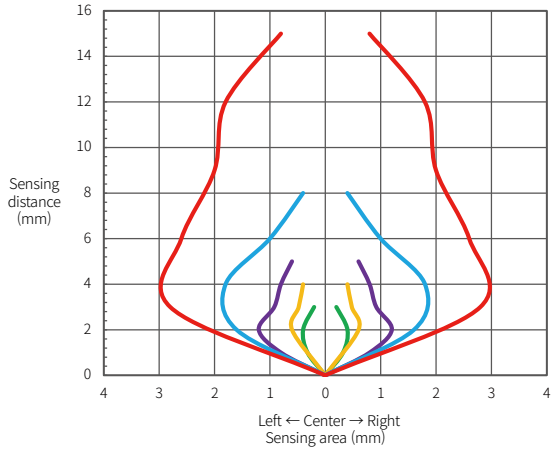
■ GLF-310-12V2 (VA02)



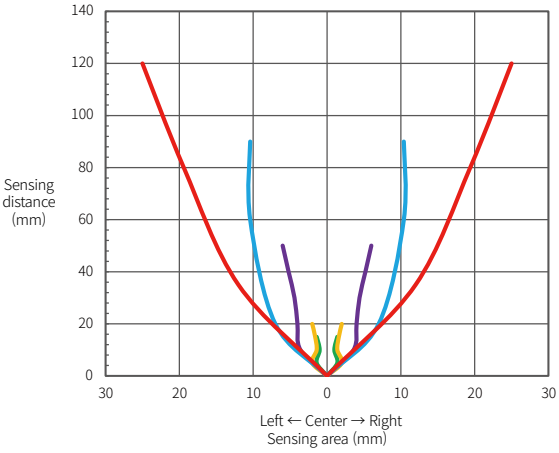
■ GLF-310-12V3L (VA02)



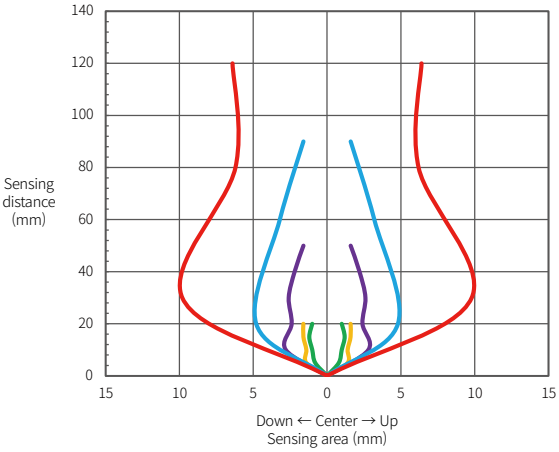
■ FLF-320-05R



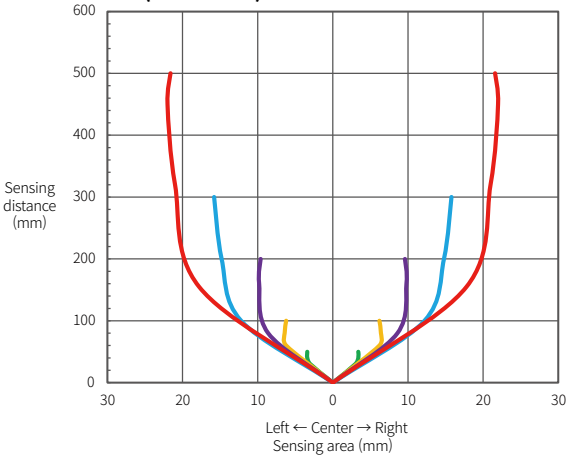
■ FLFU-320-10WP (horizontal)



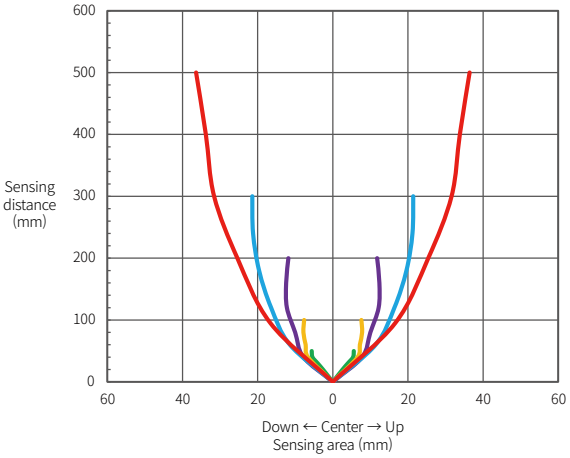
■ FLFU-320-10WP (vertical)



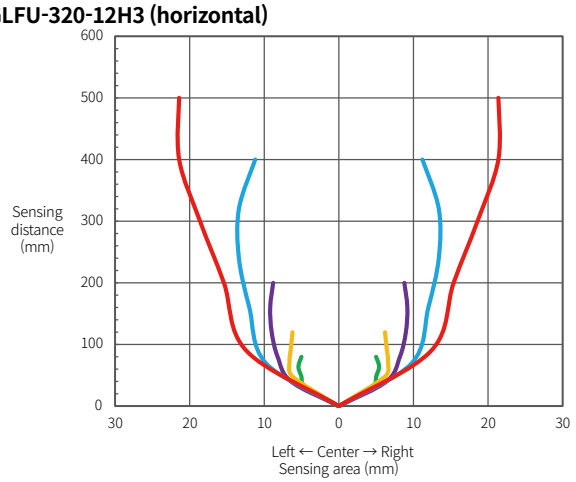
■ GLFU-320-12H2 (horizontal)



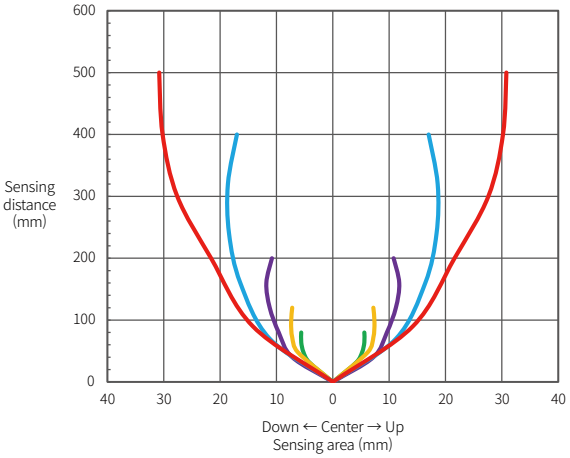
■ GLFU-320-12H2 (vertical)



■ GLFU-320-12H3 (horizontal)



■ GLFU-320-12H3 (vertical)



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