

## Digital Fiber Sensor

FX-100<sup>SERIES</sup>

Sensing Range



\* The **FX-100** series has been changed to Panasonic brand from production in and after July 2011.  
\* Cover opened state is shown.

## LIST OF FIBERS

### Thru-beam type (one pair set)



Fibers are listed in alphabetic order. Refer to "Fiber Selection" for details of each fiber.

Model No.	Sensing range (mm in) (Note 1)		Type / Ambient temperature	Fiber cable length ✂: Free-cut	Dimensions
	Standard type <b>FX-101</b> □	Long sensing range type <b>FX-102</b> □			
<b>FT-140</b>	14,000 <b>551.180</b>	19,600 <b>771.652</b> (Note 2)	Threaded, M14, Long sensing range, -40 to +70 °C <b>-40 to 158 °F</b>	✂ 10 m <b>32.808 ft</b>	P.51
<b>FT-30</b>	135 <b>5.315</b>	400 <b>15.748</b>	Super quality, Threaded, M3, -55 to +80 °C <b>-67 to 176 °F</b>	2 m <b>6.562 ft</b>	P.51
<b>FT-31</b>	130 <b>5.118</b>	340 <b>13.386</b>	Threaded, M3, -55 to +80 °C <b>-67 to 176 °F</b>	✂ 2 m <b>6.562 ft</b>	P.51
<b>FT-31S</b>	130 <b>5.118</b>	340 <b>13.386</b>	Sleeve, Threaded, M3, -55 to +80 °C <b>-67 to 176 °F</b>		P.51
<b>FT-31W</b>	80 <b>3.150</b>	240 <b>9.449</b>	Threaded, M3, -40 to +60 °C <b>-40 to 140 °F</b>		P.51
<b>FT-40</b>	320 <b>12.598</b>	870 <b>34.252</b>	Super quality, Threaded, M4, -55 to +80 °C <b>-67 to 176 °F</b>	2 m <b>6.562 ft</b>	P.51
<b>FT-42</b>	300 <b>11.811</b>	800 <b>31.496</b>	Threaded, M4, -55 to +80 °C <b>-67 to 176 °F</b>	✂ 2 m <b>6.562 ft</b>	P.51
<b>FT-42S</b>	300 <b>11.811</b>	800 <b>31.496</b>	Sleeve, Threaded, M4, -55 to +80 °C <b>-67 to 176 °F</b>		P.51
<b>FT-42W</b>	260 <b>10.236</b>	720 <b>28.346</b>	Threaded, M4, -40 to +60 °C <b>-40 to 140 °F</b>		P.51
<b>FT-43</b>	350 <b>13.780</b>	970 <b>38.189</b>	Threaded, M4, -55 to +80 °C <b>-67 to 176 °F</b>		P.51
<b>FT-45X</b>	340 <b>13.386</b>	920 <b>36.220</b>	Threaded, M4, -55 to +80 °C <b>-67 to 176 °F</b>	1 m <b>3.281 ft</b>	P.52
<b>FT-A11</b>	1,900 <b>74.803</b>	3,600 <b>141.732</b> (Note 2)	Wide beam, -40 to +70 °C <b>-40 to 158 °F</b>	✂ 2 m <b>6.562 ft</b>	P.52
<b>FT-A11W</b>	1,700 <b>66.929</b>	3,400 <b>133.858</b>	Wide beam, -40 to +55 °C <b>-40 to 131 °F</b>		P.52
<b>FT-A32</b>	3,600 <b>141.732</b> (Note 2)	3,600 <b>141.732</b> (Note 2)	Wide beam, -40 to +60 °C <b>-40 to 140 °F</b>		P.52
<b>FT-A32W</b>	3,600 <b>141.732</b> (Note 2)	3,600 <b>141.732</b> (Note 2)	Wide beam, -40 to +55 °C <b>-40 to 131 °F</b>		P.52
<b>FT-AL05</b>	250 <b>9.843</b>	660 <b>25.984</b>	Wide beam, -55 to +80 °C <b>-67 to 176 °F</b>		P.52
<b>FT-E13</b>	6 <b>0.236</b>	19 <b>0.748</b>	Cylindrical, Ultra-small dia., ø3 0.118, -40 to +70 °C <b>-40 to 158 °F</b>	✂ 1 m <b>3.281 ft</b>	P.52
<b>FT-E23</b>	22 <b>0.866</b>	80 <b>3.150</b>	Cylindrical, Ultra-small dia., ø3 0.118, -40 to +70 °C <b>-40 to 158 °F</b>		P.52
<b>FT-H13-FM2</b>	250 <b>9.843</b>	700 <b>27.559</b>	Heat-resistant, -60 to +130 °C <b>-76 to 266 °F</b>	✂ 2 m <b>6.562 ft</b>	P.52
<b>FT-H20-J20-S</b> (Note 3)	135 <b>5.315</b>	420 <b>16.535</b>	Heat-resistant (joint), -60 to +200 °C <b>-76 to 392 °F</b>	✂ 200 mm <b>7.874 in</b> (Note 4)	P.53
<b>FT-H20-J30-S</b> (Note 3)	135 <b>5.315</b>	420 <b>16.535</b>	Heat-resistant (joint), -60 to +200 °C <b>-76 to 392 °F</b>	✂ 300 mm <b>11.811 in</b> (Note 4)	P.53
<b>FT-H20-J50-S</b> (Note 3)	135 <b>5.315</b>	420 <b>16.535</b>	Heat-resistant (joint), -60 to +200 °C <b>-76 to 392 °F</b>	✂ 500 mm <b>19.685 in</b> (Note 4)	P.53
<b>FT-H20-M1</b>	210 <b>8.268</b>	540 <b>21.260</b>	Heat-resistant, -60 to +200 °C <b>-76 to 392 °F</b>	1 m <b>3.281 ft</b>	P.53
<b>FT-H20-VJ50-S</b> (Note 3)	150 <b>5.906</b>	500 <b>19.685</b>	Heat-resistant (joint), -60 to +200 °C <b>-76 to 392 °F</b>	✂ 500 mm <b>19.685 in</b> (Note 4)	P.53
<b>FT-H20-VJ80-S</b> (Note 3)	150 <b>5.906</b>	500 <b>19.685</b>	Heat-resistant (joint), -60 to +200 °C <b>-76 to 392 °F</b>	✂ 800 mm <b>31.496 in</b> (Note 4)	P.53
<b>FT-H20W-M1</b>	100 <b>3.937</b>	300 <b>11.811</b>	Heat-resistant, -60 to +200 °C <b>-76 to 392 °F</b>	1 m <b>3.281 ft</b>	P.53
<b>FT-H30-M1V-S</b> (Note 5)	110 <b>4.331</b>	280 <b>11.024</b>	Vacuum-resistant, -30 to +300 °C <b>-22 to 572 °F</b>		P.53
<b>FT-H35-M2</b>	170 <b>6.693</b>	490 <b>19.291</b>	Heat-resistant, -60 to +350 °C <b>-76 to 572 °F</b>	2 m <b>6.562 ft</b>	P.53
<b>FT-H35-M2S6</b>	170 <b>6.693</b>	490 <b>19.291</b>	Heat-resistant, -60 to +350 °C <b>-76 to 572 °F</b>		P.53
<b>FT-HL80Y</b>	990 <b>38.976</b>	2,340 <b>92.126</b>	Chemical-resistant, Metal-free, -40 to +115 °C <b>-76 to 239 °F</b>	✂ 2 m <b>6.562 ft</b> (Note 6)	P.53

Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.

2) The fiber cable length practically limits the sensing range.

3) Heat-resistant joint fibers and ordinary-temperature fibers (**FT-42**) are sold as a set.

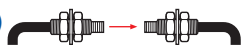
4) This is the fiber length (fixed length) for heat-resistant fibers. The ordinary-temperature fibers are free-cut to 2 m **6.562 ft**.

5) Sold as a set comprising vacuum type fiber + photo-terminal (**FV-BR1**) + fiber at atmospheric side (**FT-J8**).

6) The allowable cutting range is 500 mm **19.685 in** from the end that the amplifier inserted.

## LIST OF FIBERS

### Thru-beam type (one pair set)



Fibers are listed in alphabetic order. Refer to "Fiber Selection" for details of each fiber.

Model No.	Sensing range (mm in) (Note 1)		Type / Ambient temperature	Fiber cable length ✂: Free-cut	Dimensions
	Standard type <b>FX-101</b>	Long sensing range type <b>FX-102</b>			
<b>FT-KS40</b>	2,200 86.614	3,600 141.732 (Note 2)	Narrow Beam, -40 to +60 °C -40 to 140 °F	✂ 2 m 6.562 ft	P.54
<b>FT-KV26</b>	135 5.315	560 22.047	Narrow Beam, Side-view, -40 to +60 °C -40 to 140 °F		P.54
<b>FT-KV40</b>	2,200 86.614	3,600 141.732 (Note 2)	Narrow Beam, Side-view, -40 to +60 °C -40 to 140 °F		P.54
<b>FT-KV40W</b>	2,200 86.614	3,600 141.732 (Note 2)	Narrow Beam, Side-view, -40 to +60 °C -40 to 140 °F	✂ 2 m 6.562 ft	P.54
<b>FT-L80Y</b>	1,100 43.307	2,600 102.362	Chemical-resistant, Metal-free, -40 to +70 °C -40 to 158 °F	✂ 2 m 6.562 ft (Note 3)	P.54
<b>FT-R31</b>	100 3.937	340 13.386	Square head, M3, -55 to +80 °C -67 to 176 °F	✂ 2 m 6.562 ft	P.54
<b>FT-R40</b>	270 10.630	740 29.134	Threaded, M4, Elbow, -55 to +80 °C -67 to 176 °F		P.54
<b>FT-R41W</b>	250 9.843	710 27.953	Square head, M4, -40 to +60 °C -40 to 140 °F		P.54
<b>FT-R42W</b>	510 20.079	2,000 78.740	Square head, M4, -40 to +60 °C -40 to 140 °F		P.54
<b>FT-R43</b>	210 8.268	640 25.197	Square head, M4, -55 to +80 °C -67 to 176 °F		P.54
<b>FT-R44Y</b>	210 8.268	640 25.197	Oil-resistant, Square head, M4, Cable-protection type, -55 to +80 °C -67 to 176 °F		P.55
<b>FT-R60Y</b>	690 27.165	1,890 74.409	Oil-resistant, Square head, M6, Full-protection type, -55 to +80 °C -67 to 176 °F		P.55
<b>FT-S11</b>	40 1.575	90 3.543	Cylindrical, $\phi 1$ 0.039, -55 to +80 °C -67 to 176 °F	500 mm 19.685 in	P.55
<b>FT-S20</b>	135 5.315	400 15.748	Super quality, Cylindrical, $\phi 1.5$ 0.059, -55 to +80 °C -67 to 176 °F	2 m 6.562 ft	P.55
<b>FT-S21</b>	130 5.118	340 13.386	Cylindrical, $\phi 1.5$ 0.059, -55 to +80 °C -67 to 176 °F	✂ 2 m 6.562 ft	P.55
<b>FT-S21W</b>	80 3.150	240 9.449	Cylindrical, $\phi 1.5$ 0.059, -40 to +60 °C -40 to 140 °F		P.55
<b>FT-S30</b>	320 12.598	870 34.252	Super quality, Cylindrical, $\phi 3$ 0.118, -55 to +80 °C -67 to 176 °F	2 m 6.562 ft	P.55
<b>FT-S31W</b>	260 10.236	720 28.346	Cylindrical, $\phi 3$ 0.118, -40 to +60 °C -40 to 140 °F	✂ 2 m 6.562 ft	P.55
<b>FT-S32</b>	1,100 43.307	3,000 118.110	Cylindrical, $\phi 2.5$ 0.098, -40 to +70 °C -40 to 158 °F		P.55
<b>FT-V23</b>	160 6.299	400 15.748	Sleeve, Cylindrical, Side-view, $\phi 2$ 0.079, -55 to +80 °C -67 to 176 °F		P.55
<b>FT-V24W</b>	35 1.378	90 3.543	Sleeve, Cylindrical, Side-view, $\phi 2$ 0.079, -40 to +60 °C -40 to 140 °F		P.56
<b>FT-V25</b>	95 3.740	260 10.236	Sleeve, Cylindrical, Side-view, $\phi 2$ 0.079, -55 to +80 °C -67 to 176 °F		P.56
<b>FT-V30</b>	180 7.087	480 18.898	Sleeve, Cylindrical, Side-view, $\phi 2.5$ 0.098, -55 to +80 °C -67 to 176 °F		P.56
<b>FT-V40</b>	1,000 39.370	3,100 122.047	Cylindrical, Side-view, $\phi 4$ 0.157, -40 to +60 °C -40 to 140 °F		P.56
<b>FT-V80Y</b>	340 13.386	800 31.496	Chemical-resistant, Metal-free -40 to +70 °C -40 to 158 °F	✂ 2 m 6.562 ft (Note 3)	P.56
<b>FT-Z20HBW</b>	100 3.937	320 12.598	Flat with boss, -40 to +60 °C -40 to 140 °F	✂ 1 m 3.281 ft	P.56
<b>FT-Z20W</b>	280 11.024	730 28.740	Flat with boss, -40 to +60 °C -40 to 140 °F		P.56
<b>FT-Z30</b>	710 27.953	2,300 90.551	Flat, -40 to +60 °C -40 to 140 °F	✂ 2 m 6.562 ft	P.56
<b>FT-Z30E</b>	1,200 47.244	3,200 125.984	Flat, -40 to +60 °C -40 to 140 °F		P.56
<b>FT-Z30EW</b>	1,400 55.118	2,600 102.362	Flat, -40 to +60 °C -40 to 140 °F		P.57
<b>FT-Z30H</b>	1,400 55.118	3,200 125.984	Flat, -40 to +60 °C -40 to 140 °F		P.57
<b>FT-Z30HW</b>	1,400 55.118	3,200 125.984	Flat, -40 to +60 °C -40 to 140 °F		P.57
<b>FT-Z30W</b>	540 21.260	1,800 70.866	Flat, -40 to +60 °C -40 to 140 °F		P.57
<b>FT-Z40HBW</b>	260 10.236	720 28.346	Flat with boss, -40 to +60 °C -40 to 140 °F		P.57
<b>FT-Z40W</b>	410 16.142	1,200 47.244	Flat with boss, -40 to +60 °C -40 to 140 °F		P.57
<b>FT-Z802Y</b>	520 20.472	3,100 122.047	Chemical-resistant, 0 to +60 °C 32 to 140 °F		P.57

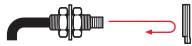
Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.

2) The fiber cable length practically limits the sensing range.

3) The allowable cutting range is 500 mm 19.685 in from the end that the amplifier inserted.

## LIST OF FIBERS

### Retroreflective type



Fibers are listed in alphabetic order. Refer to “Fiber Selection” for details of each fiber.

Model No.	Sensing range (mm in) (Note 1) (Note 2)		Type / Ambient temperature	Fiber cable length ✂: Free-cut	Dimensions
	Standard type <b>FX-101</b> □	Long sensing range type <b>FX-102</b> □			
<b>FR-KZ22E</b>	15 to 200 <b>0.591 to 7.874</b>	15 to 360 <b>0.591 to 14.173</b>	Wafer mapping, -40 to +60 °C <b>-40 to 140 °F</b>	✂ 2 m <b>6.562 ft</b>	P.58
<b>FR-KZ50E</b>	20 to 200 <b>0.787 to 7.874</b>	20 to 350 <b>0.787 to 13.780</b>	Narrow Beam, Side sensing, -40 to +60 °C <b>-40 to 140 °F</b>		P.58
<b>FR-KZ50H</b>	20 to 200 <b>0.787 to 7.874</b>	20 to 350 <b>0.787 to 13.780</b>	Narrow Beam, Top sensing, -40 to +60 °C <b>-40 to 140 °F</b>		P.58
<b>FR-Z50HW</b>	100 to 550 <b>3.937 to 21.654</b>	100 to 830 <b>3.937 to 32.677</b>	With polarizing filter, -25 to +55 °C <b>-13 to 131 °F</b>		P.58

Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.

The sensing range of **FR-KZ22E** is specified for the attached reflector. The sensing range of **FR-KZ50E** and **FR-KZ50H** is specified for the attached reflector **RF-003**. The sensing range of **FR-Z50HW** is specified for the **RF-13**.

2) The sensing range is the possible setting range for the attached reflector. The fiber can detect an object less than setting range for the reflector. However, note that if there are any white or highly-reflective surfaces near the fiber head, reflected incident light may affect the fiber head. If this occurs, adjust the threshold value of the amplifier unit before use.

### Reflective type



Fibers are listed in alphabetic order. Refer to “Fiber Selection” for details of each fiber.

Model No.	Sensing range (mm in) (Note 1) (Note 2) / Description		Type / Ambient temperature	Fiber cable length ✂: Free-cut	Dimensions
	Standard type <b>FX-101</b> □	Long sensing range type <b>FX-102</b> □			
<b>FD-30</b>	45 <b>1.772</b>	155 <b>6.102</b>	Super quality, Threaded, M3, -55 to +80 °C <b>-67 to 176 °F</b>	2 m <b>6.562 ft</b>	P.59
<b>FD-31</b>	35 <b>1.378</b>	140 <b>5.512</b>	Threaded, M3, -55 to +80 °C <b>-67 to 176 °F</b>	✂ 2 m <b>6.562 ft</b>	P.59
<b>FD-31W</b>	15 <b>0.591</b>	60 <b>2.362</b>	Threaded, M3, -40 to +60 °C <b>-40 to 140 °F</b>		P.59
<b>FD-32G</b>	70 <b>2.756</b>	190 <b>7.480</b>	Threaded, M3, -55 to +80 °C <b>-67 to 176 °F</b>		P.59
<b>FD-32GX</b>	75 <b>2.953</b>	210 <b>8.268</b>	Threaded, M3, -55 to +80 °C <b>-67 to 176 °F</b>	✂ 1 m <b>3.281 ft</b> (Note 3)	P.59
<b>FD-40</b>	45 <b>1.772</b>	155 <b>6.102</b>	Super quality, Threaded, M4, -55 to +80 °C <b>-67 to 176 °F</b>	2 m <b>6.562 ft</b>	P.59
<b>FD-41</b>	35 <b>1.378</b>	140 <b>5.512</b>	Threaded, M4, -55 to +80 °C <b>-67 to 176 °F</b>	✂ 2 m <b>6.562 ft</b>	P.59
<b>FD-41S</b>	35 <b>1.378</b>	140 <b>5.512</b>	Sleeve, Threaded, M4, -55 to +80 °C <b>-67 to 176 °F</b>		P.59
<b>FD-41SW</b>	15 <b>0.591</b>	60 <b>2.362</b>	Sleeve, Threaded, M4, -40 to +60 °C <b>-40 to 140 °F</b>		P.59
<b>FD-41W</b>	80 <b>3.150</b>	230 <b>9.055</b>	Threaded, M4, -40 to +60 °C <b>-40 to 140 °F</b>		P.59
<b>FD-42G</b>	70 <b>2.756</b>	190 <b>7.480</b>	Threaded, M4, -55 to +80 °C <b>-67 to 176 °F</b>	✂ 2 m <b>6.562 ft</b>	P.60
<b>FD-42GW</b>	45 <b>1.772</b>	140 <b>5.512</b>	Threaded, M4, -40 to +60 °C <b>-40 to 140 °F</b>		P.60
<b>FD-60</b>	140 <b>5.512</b>	420 <b>16.535</b>	Super quality, Threaded, M6, -55 to +80 °C <b>-67 to 176 °F</b>	2 m <b>6.562 ft</b>	P.60
<b>FD-61</b>	120 <b>4.724</b>	410 <b>16.142</b>	Threaded, M6, -55 to +80 °C <b>-67 to 176 °F</b>	✂ 2 m <b>6.562 ft</b>	P.60
<b>FD-61G</b>	120 <b>4.724</b>	350 <b>13.780</b>	Threaded, M6, -55 to +80 °C <b>-67 to 176 °F</b>		P.60
<b>FD-61S</b>	130 <b>5.118</b>	360 <b>14.173</b>	Sleeve, Threaded, M6, -55 to +80 °C <b>-67 to 176 °F</b>		P.60
<b>FD-61W</b>	80 <b>3.150</b>	230 <b>9.055</b>	Threaded, M6, -40 to +60 °C <b>-40 to 140 °F</b>		P.60
<b>FD-62</b>	170 <b>6.693</b>	450 <b>17.717</b>	Threaded, M6, -55 to +80 °C <b>-67 to 176 °F</b>	✂ 2 m <b>6.562 ft</b>	P.60
<b>FD-64X</b>	75 <b>2.953</b>	220 <b>8.661</b>	Threaded, M6, -55 to +80 °C <b>-67 to 176 °F</b>		P.61
<b>FD-A16</b>	120 <b>4.724</b>	240 <b>9.449</b>	Wide beam, -40 to +60 °C <b>-40 to 140 °F</b>		P.61
<b>FD-AL11</b>	100 <b>3.937</b>	285 <b>11.220</b>	Array, -55 to +80 °C <b>-67 to 176 °F</b>	✂ 2 m <b>6.562 ft</b>	P.61
<b>FD-E13</b>	5 <b>0.197</b>	15 <b>0.591</b>	Cylindrical, Ultra-small dia., ø1.5 <b>0.059</b> , -40 to +60 °C <b>-40 to 140 °F</b>	1 m <b>3.281 ft</b>	P.61
<b>FD-E23</b>	20 <b>0.787</b>	70 <b>2.756</b>	Cylindrical, Ultra-small dia., ø3 <b>0.118</b> , -40 to +70 °C <b>-40 to 158 °F</b>		P.61
<b>FD-EG30</b>	20 <b>0.787</b>	70 <b>2.756</b>	Threaded, M3, Ultra-small dia., -40 to +70 °C <b>-40 to 158 °F</b>	500 mm <b>19.685 in</b>	P.61
<b>FD-EG30S</b>	20 <b>0.787</b>	70 <b>2.756</b>	Sleeve, Threaded, Ultra-small dia., M3, -40 to +70 °C <b>-40 to 158 °F</b>	1 m <b>3.281 ft</b>	P.62
<b>FD-EG31</b>	7 <b>0.276</b>	25 <b>0.984</b>	Threaded, M3, Ultra-small dia., -20 to +60 °C <b>-4 to 140 °F</b>	500 mm <b>19.685 in</b>	P.62
<b>FD-F4</b>	Applicable pipe diameter: Outer dia. ø6 to ø26 mm <b>ø0.236 to ø1.024 in</b> transparent pipe [PFA (fluorine resin) or equivalently transparent pipe, wall thickness 1 mm <b>0.039 in</b> ] Liquid absent: Beam received, Liquid present: Beam interrupted		Pipe-mountable type, Liquid level sensing, -40 to +100 °C <b>-40 to 212 °F</b>	✂ 2 m <b>6.562 ft</b>	P.62
<b>FD-F41</b>	Applicable pipe diameter: Outer dia. ø6 to ø26 mm <b>ø0.236 to ø1.024 in</b> transparent pipe [PVC (vinyl chloride), fluorine resin, polycarbonate, acrylic, glass, wall thickness 1 to 3 mm <b>0.039 to 0.118 in</b> ] Liquid absent: Beam received, Liquid present: Beam interrupted		Pipe-mountable type, Liquid level sensing, -40 to +100 °C <b>-40 to 212 °F</b>		P.62

Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.

2) The sensing range is specified for white non-glossy paper.

3) The allowable cutting range is 500 mm **19.685 in** from the end that the amplifier inserted.

## LIST OF FIBERS

### Reflective type



Fibers are listed in alphabetic order. Refer to "Fiber Selection" for details of each fiber.

Model No.	Sensing range (mm in) (Note 1) (Note 2) / Description		Type / Ambient temperature	Fiber cable length Free-cut	Dimensions
	Standard type <b>FX-101</b>	Long sensing range type <b>FX-102</b>			
<b>FD-F41Y</b> (Note 3)	ø4 mm <b>ø0.157 in</b> Protective tube: Fluorine resin, length 500 mm <b>19.685 in</b> (cuttable) Liquid surface not contacted: Beam received, Liquid surface contacted: Beam interrupted		Contact type, Liquid level sensing, Metal-free, -40 to +70 °C <b>-40 to 158 °F</b>	2 m <b>6.562 ft</b>	P.62
<b>FD-F8Y</b>	ø6 mm <b>ø0.236 in</b> Protective tube: Fluorine resin, length 1,000 mm <b>39.370 in</b> (not cuttable) Liquid surface not contacted: Beam received, Liquid surface contacted: Beam interrupted		Contact type, Liquid level sensing, -40 to +125 °C <b>-40 to 257 °F</b>	2 m <b>6.562 ft</b> (Note 6)	P.62
<b>FD-FA93</b>	Applicable pipe diameter: Outer dia. ø8 mm <b>ø0.315 in</b> or more transparent pipe (When used with the tying bands: ø8 to ø80 mm <b>ø0.315 to ø3.150 in</b> ) [PFA (fluorine resin), including translucent] Liquid absent: Beam received, Liquid present: Beam interrupted		Pipe-mountable type, Liquid sensing, -40 to +70 °C <b>-40 to 158 °F</b>	2 m <b>6.562 ft</b>	P.62
<b>FD-H13-FM2</b>	100 <b>3.937</b>	280 <b>11.024</b>	Heat-resistant, Threaded, -60 to +130 °C <b>-76 to 266 °F</b>		P.63
<b>FD-H18-L31</b>	0 to 10 <b>0 to 0.394</b>	0 to 25 <b>0 to 0.984</b>	Heat-resistant, Glass substrate detection convergent reflective, -60 to +180 °C <b>-76 to 356 °F</b>		P.63
<b>FD-H20-21</b>	90 <b>3.543</b>	280 <b>11.024</b>	Heat-resistant, Threaded, -60 to +200 °C <b>-76 to 392 °F</b>	1 m <b>3.281 ft</b>	P.63
<b>FD-H20-M1</b>	120 <b>4.724</b>	300 <b>11.811</b>	Heat-resistant, Threaded, -60 to +200 °C <b>-76 to 392 °F</b>		P.63
<b>FD-H25-L43</b> (Note 4)	4 to 16 <b>0.157 to 0.630</b>	4 to 23 <b>0.157 to 0.906</b>	Heat-resistant, Glass substrate detection convergent reflective, -20 to +250 °C <b>-4 to 482 °F</b> (Ordinary temp. side: -20 to +70 °C <b>-4 to 158 °F</b> )	3 m <b>9.843 ft</b>	P.63
<b>FD-H25-L45</b> (Note 4)	7 to 35 <b>0.276 to 1.378</b>	7 to 38 <b>0.276 to 1.496</b>	Heat-resistant, Glass substrate detection convergent reflective, -20 to +250 °C <b>-4 to 482 °F</b> (Ordinary temp. side: -20 to +70 °C <b>-4 to 158 °F</b> )		P.63
<b>FD-H30-KZ1V-S</b> (Note 4, 5)	25 to 80 <b>0.984 to 3.150</b>	10 to 220 <b>0.394 to 8.661</b>	Vacuum-resistant, Reflective, -30 to +300 °C <b>-22 to 572 °F</b>	1 m <b>3.281 ft</b>	P.64
<b>FD-H30-L32</b>	2 to 9 <b>0.079 to 0.354</b>	0 to 17 <b>0 to 0.669</b>	Heat-resistant, Glass substrate detection convergent reflective, -60 to +300 °C <b>-76 to 572 °F</b>	2 m <b>6.562 ft</b>	P.64
<b>FD-H30-L32V-S</b> (Note 4, 5)	2.5 to 6.5 <b>0.098 to 0.256</b>	0 to 11 <b>0 to 0.433</b>	Vacuum-resistant, Convergent reflective, -30 to +300 °C <b>-22 to 572 °F</b>	3 m <b>9.843 ft</b>	P.64
<b>FD-H35-20S</b>	85 <b>3.346</b>	200 <b>7.874</b>	Heat-resistant, Threaded, -60 to +350 °C <b>-76 to 662 °F</b>	1 m <b>3.281 ft</b>	P.64
<b>FD-H35-M2</b>	75 <b>2.953</b>	280 <b>11.024</b>	Heat-resistant, Threaded, -60 to +350 °C <b>-76 to 662 °F</b>	2 m <b>6.562 ft</b>	P.64
<b>FD-H35-M2S6</b>	75 <b>2.953</b>	280 <b>11.024</b>	Heat-resistant, Threaded, -60 to +350 °C <b>-76 to 662 °F</b>		P.64
<b>FD-HF40Y</b> (Note 3)	ø4 mm <b>ø0.157 in</b> Protective tube: Fluorine resin, length 500 mm <b>19.685 in</b> (cuttable) Liquid surface not contacted: Beam received, Liquid surface contacted: Beam not received		Contact type, Liquid level sensing, Metal-free, -40 to +105 °C <b>-40 to 221 °F</b>	2 m <b>6.562 ft</b>	P.64
<b>FD-L10</b> (Note 4)	0 to 4.5 <b>0 to 0.177</b>	0 to 5.5 <b>0 to 0.217</b>	Glass substrate detection, -40 to +60 °C <b>-40 to 140 °F</b>		P.65
<b>FD-L11</b> (Note 4)	0 to 8 <b>0 to 0.315</b>	0 to 9 <b>0 to 0.354</b>	Glass substrate detection, -40 to +60 °C <b>-40 to 140 °F</b>		P.65
<b>FD-L12W</b> (Note 4)	1 to 4.5 <b>0.039 to 0.177</b>	0.5 to 7 <b>0.020 to 0.276</b>	Ultra-small, -40 to +60 °C <b>-40 to 140 °F</b>	1 m <b>3.281 ft</b>	P.65
<b>FD-L20H</b>	5 to 15 <b>0.197 to 0.591</b>	1 to 30 <b>0.039 to 1.181</b>	General purpose, -40 to +70 °C <b>-40 to 158 °F</b>		P.65
<b>FD-L21</b> (Note 4)	3 to 15 <b>0.118 to 0.591</b>	1.5 to 16 <b>0.059 to 0.630</b>	Glass substrate detection, -40 to +60 °C <b>-40 to 140 °F</b>	2 m <b>6.562 ft</b>	P.65
<b>FD-L21W</b> (Note 4)	7 to 12 <b>0.276 to 0.472</b>	3 to 14 <b>0.118 to 0.551</b>	Glass substrate detection, -40 to +60 °C <b>-40 to 140 °F</b>		P.65
<b>FD-L22A</b> (Note 4)	0 to 19 <b>0 to 0.748</b>	0 to 25 <b>0 to 0.984</b>	Glass substrate detection, 0 to +70 °C <b>32 to 158 °F</b>		P.65
<b>FD-L23</b> (Note 4)	0 to 28 <b>0 to 1.102</b>	0 to 30 <b>0 to 1.181</b>	Glass substrate detection, -20 to +70 °C <b>-4 to 158 °F</b>		P.65
<b>FD-L30A</b> (Note 4)	0 to 40 <b>0 to 1.575</b>	0 to 50 <b>0 to 1.969</b>	Glass substrate detection, 0 to +70 °C <b>32 to 158 °F</b>	3 m <b>9.843 ft</b>	P.65
<b>FD-L31A</b> (Note 4)	5 to 30 <b>0.197 to 1.181</b>	4 to 33 <b>0.157 to 1.299</b>	Glass substrate detection, 0 to +70 °C <b>32 to 158 °F</b>		P.65
<b>FD-L32H</b> (Note 4)	16 to 30 <b>0.630 to 1.181</b>	0 to 50 <b>0 to 1.969</b>	Glass substrate detection, -40 to +60 °C <b>-40 to 140 °F</b>	4 m <b>13.123 ft</b>	P.66

Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.

2) The sensing range of reflective type is the value for white non-glossy paper (as for **FD-H30-L32** and **FD-H18-L31** 50 × 50 mm **1.969 × 1.969 in** glass substrate).

3) Liquid inflow prevention joint, protective tube extension joint, fiber mounting joint are available.

4) The sensing range is specified for transparent glass 100 × 100 × t0.7 mm **3.937 × 3.937 × t0.028 in** (**FD-L32H**: R edge, **FD-L21** and **FD-L21W**: t2 mm **t0.079 in**) [**FD-L10**: silicon wafers 100 × 100 mm **3.937 × 3.937 in**].

5) Sold as a set comprising vacuum type fiber + photo-terminal (**FV-BR1**) + fiber at atmospheric side (**FT-J8**).

6) The allowable cutting range is 1,000 mm **39.370 in** from the end that is inserted to the amplifier.

## LIST OF FIBERS

### Reflective type



Fibers are listed in alphabetic order. Refer to “Fiber Selection” for details of each fiber.

Model No.	Sensing range (mm in) (Note 1) (Note 2)		Type / Ambient temperature	Fiber cable length ✂: Free-cut	Dimensions
	Standard type <b>FX-101</b> □	Long sensing range type <b>FX-102</b> □			
<b>FD-R31G</b>	45 <b>1.772</b>	150 <b>5.906</b>	Square head, M3, -55 to +80 °C -67 to 176 °F	✂ 2 m <b>6.562 ft</b>	P.66
<b>FD-R32EG</b>	20 <b>0.787</b>	68 <b>2.677</b>	Square head, M3, -40 to +70 °C -40 to 158 °F	500 mm <b>19.685 in</b>	P.66
<b>FD-R33EG</b>	7 <b>0.276</b>	22 <b>0.866</b>	Square head, M3, -20 to +60 °C -4 to 140 °F		P.66
<b>FD-R34EG</b>	17 <b>0.669</b>	60 <b>2.362</b>	Square head, M3, -40 to +70 °C -40 to 158 °F		P.66
<b>FD-R41</b>	60 <b>2.362</b>	170 <b>6.693</b>	Square head, M4, -55 to +80 °C -67 to 176 °F		P.66
<b>FD-R60</b>	110 <b>4.331</b>	240 <b>9.449</b>	Threaded, M6, Elbow, -55 to +80 °C -67 to 176 °F	✂ 2 m <b>6.562 ft</b>	P.66
<b>FD-R61Y</b>	85 <b>3.346</b>	185 <b>7.283</b>	Oil-resistant, Square head, M6, Cable-protection type, -55 to +80 °C -67 to 176 °F		P.66
<b>FD-S21</b>	25 <b>0.984</b>	70 <b>2.756</b>	Cylindrical, ø1.5 <b>0.059</b> , -55 to +80 °C -67 to 176 °F	1 m <b>3.281 ft</b>	P.66
<b>FD-S30</b>	45 <b>1.772</b>	155 <b>6.102</b>	Super quality, Cylindrical, ø3 <b>0.118</b> , -55 to +80 °C -67 to 176 °F	2 m <b>6.562 ft</b>	P.67
<b>FD-S31</b>	35 <b>1.378</b>	140 <b>5.512</b>	Cylindrical, ø3 <b>0.118</b> , -55 to +80 °C -67 to 176 °F	✂ 2 m <b>6.562 ft</b>	P.67
<b>FD-S32</b>	120 <b>4.724</b>	345 <b>13.583</b>	Cylindrical, ø3 <b>0.118</b> , -55 to +80 °C -67 to 176 °F		P.67
<b>FD-S32W</b>	80 <b>3.150</b>	230 <b>9.055</b>	Cylindrical, ø3 <b>0.118</b> , -40 to +60 °C -40 to 140 °F		P.67
<b>FD-S33GW</b>	45 <b>1.772</b>	140 <b>5.512</b>	Cylindrical, ø3 <b>0.118</b> , -40 to +60 °C -40 to 140 °F		P.67
<b>FD-S60Y</b>	140 <b>5.512</b>	300 <b>11.811</b>	Chemical-resistant, Cylindrical, Metal-free, ø5.5 <b>0.217</b> , -40 to +70 °C -40 to 158 °F	✂ 2 m <b>6.562 ft</b> (Note 3)	P.67
<b>FD-V30</b>	25 <b>0.984</b>	75 <b>2.953</b>	Sleeve, Cylindrical, Side-view, ø3 <b>0.118</b> , -55 to +80 °C -67 to 176 °F	✂ 2 m <b>6.562 ft</b>	P.67
<b>FD-V30W</b>	6 <b>0.236</b>	20 <b>0.787</b>	Sleeve, Cylindrical, Side-view, ø3 <b>0.118</b> , -40 to +60 °C -40 to 140 °F		P.67
<b>FD-V50</b>	40 <b>1.575</b>	100 <b>3.937</b>	Sleeve, Cylindrical, Side-view, ø5 <b>0.197</b> , -55 to +80 °C -67 to 176 °F		P.68
<b>FD-Z20HBW</b>	2 to 30 <b>0.079 to 1.181</b>	1 to 90 <b>0.039 to 3.543</b>	Flat with boss, -40 to +60 °C -40 to 140 °F	✂ 1 m <b>3.281 ft</b>	P.68
<b>FD-Z20W</b>	2 to 32 <b>0.079 to 1.260</b>	1 to 80 <b>0.039 to 3.150</b>	Flat with boss, -40 to +60 °C -40 to 140 °F		P.68
<b>FD-Z40HBW</b>	1 to 90 <b>0.039 to 3.543</b>	0.5 to 240 <b>0.020 to 9.449</b>	Flat with boss, -40 to +60 °C -40 to 140 °F	✂ 2 m <b>6.562 ft</b>	P.68
<b>FD-Z40W</b>	1 to 74 <b>0.039 to 2.913</b>	200 <b>7.874</b>	Flat with boss, -40 to +60 °C -40 to 140 °F		P.68
<b>FD-Z50HW</b>	10 to 200 <b>0.394 to 7.874</b>	10 to 530 <b>0.394 to 20.866</b>	Narrow Beam, Long range, -40 to +60 °C -40 to 140 °F		P.68

Notes: 1) Note that the sensing range of the free-cut type fiber may be reduced by 20 % max. depending upon how the fiber is cut.

2) The sensing range is specified for white non-glossy paper.

3) The allowable cutting range is 500 mm **19.685 in** from the end that the amplifier inserted.

## Sensing range when FR-Z50HW is used in combination with a reflector (optional)

Reflector Model No.	Sensing range (mm in)	
	Standard type <b>FX-101</b> □	Long sensing range type <b>FX-102</b> □
<b>RF-230</b>	100 to 2,400 <b>3.937 to 94.488</b>	100 to 5,000 <b>3.937 to 196.850</b>
<b>RF-220</b>	100 to 1,300 <b>3.937 to 51.181</b>	100 to 2,600 <b>3.937 to 102.362</b>
<b>RF-210</b>	100 to 980 <b>3.937 to 38.583</b>	100 to 1,300 <b>3.937 to 51.181</b>

Note: The sensing range is the possible setting range for the reflector.

The fiber can detect an object less than 100 mm **3.937 in**. However, note that if there are any white or highly-reflective surfaces near the fiber head, reflected incident light may affect the fiber head. If this occurs, adjust the threshold value of the amplifier unit before use.

## Disclaimer

The applications described in the catalog are all intended for examples only. The purchase of our products described in the catalog shall not be regarded as granting of a license to use our products in the described applications. We do NOT warrant that we have obtained some intellectual properties, such as patent rights, with respect to such applications, or that the described applications may not infringe any intellectual property rights, such as patent rights, of a third party.

**Panasonic**  
INDUSTRY

**Panasonic Industry Co., Ltd.**

Industrial Device Business Division

7-1-1, Morofuku, Daito-shi, Osaka 574-0044, Japan

[industrial.panasonic.com/ac/e/](http://industrial.panasonic.com/ac/e/)