

## Fiber Optic Sensors: FD Specifications

Automation Control Products

- PLC Controls
- HMI Panels
- Industrial Sensors
  - Area Sensors
  - Color Mark Sensors
  - Fiber Optic Sensors
    - FX-100
    - FX-300
    - FX-400
    - FX-500
    - FT Fibers
    - FD Fibers**
    - FR Fibers
  - Laser Sensors
  - Measurement Sensors
  - Optical Touch Switches
  - Photoelectric Sensors
  - Pressure/Flow Sensors
  - Proximity Sensors
  - Safety Light Curtains
  - Semiconductor Sensors
  - Sensor Controllers
  - Special Usage Sensors
  - Static Ionizers
  - Video Borescopes
- Laser Markers
- Servos & Drives
- UV Curing Systems
- Machine Vision/ID Products
- Timers
- Limit Switches
- Temperature Controllers
- Counters
- Hour Meters
- Power Meters



- DOWNLOADS
- TRIAL UNIT
- CATALOG PDF
- SUPPORT

- Overview
- Part Numbers
- Specifications**
- Dimensions

Specifications for this product appear below.

[Download FD product catalog in PDF format for more in-depth part number information](#)

Type	Standard	Flexible	
Model No.	<b>FT/FDB8, FT/FDFM?, FT/FDN?, FT/FDR80, FT/FDS?, FT/FD-T?, FT/FDV?</b>	<b>FT/FDP?, FT-Z?</b> (excluding tough flexible fiber and chemical resistant fiber)	
Allowable bending radius	R25 mm R0.984 in or more [Sleeve of a head with sleeve: R10 mm R0.394 in or more (Note 2)]	R4 mm R0.157 in or more	
Bending durability	-	1 million times or more (at R10 mm R0.394 in, FT-P40/P2 and FD-P40/P2: at R4 mm R0.157 in)	
Ambient temperature	-40 to +70 °C -40 to +158 °F (FT-SFM2SV2: -20 to +70 °C -4 to +158 °F FT-V22, FD-SFM2SV2: -20 to +60 °C -4 to +140 °F FT-V41, FD-V41, FT-V10: -40 to +60 °C -40 to +140 °F)	-40 to +70 °C -40 to +158 °F (FT-Z8?, FT-P60, FT-PS1, FD-P60, FD-P50: -40 to +60 °C -40 to +140 °F)	
Ambient humidity	35 to 85 % RH (No dew condensation or icing allowed)		
Material	Fiber core	Acrylic	
	Sheath	Polyethylene (FT-V22: Polyolefin)	Vinyl chloride (FT-PS1: Polyethylene, FD-P2: Vinyl chloride and polyurethane)
	Fiber head	Brass (Nickel plated) (FT-SFM2L/T80/SFM2/SNFM2/ SFM2SV2/V22/V41, FD-T80/T40/S80/SNFM2/ SFM2SV2/V41 and sleeve: Stainless steel (SUS) FT-FM10L: ABS Lens of FT-FM10L/ SFM2L/V10: Acrylic FT-V10: Stainless steel (SUS) and Polycarbonate)	Stainless steel (SUS) (FT/FD-P80, FT-P60: Brass (Nickel plated) Case of FT-Z8?: Polycarbonate Lens of FT-Z8H/Z8E, Front film of FT-Z8: Polyester)
Accessories (Note 3)	All fibers: 1 fiber attachment set Free-cut type fibers: FX-CT2 (fiber cutter) 1 pc. Threaded head fibers: Nuts 2 pcs. (thru-beam type: 4 pcs.) and toothed lock washer 1 pc. (thru-beam type: 2 pcs.)	All fibers: 1 fiber attachment set. (excluding FT-P80 and FD-P80) Free-cut type fibers: FX-CT2 (fiber cutter) 1 pc. (FT/FD-P80: FX-CT1 1 pc.) Threaded head fibers: Nuts 2 pcs. (thru-beam type: 4 pcs.) and toothed lock washer 1 pc. (thru-beam type: 2 pcs.) FT-Z8?: 1set of mounting screw	

- Notes:
- Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C +73.4 °F.
  - Sleeve part of side-view fiber cannot be bent.
  - The five types of attached fiber attachments (FX-AT2/AT3/AT4/AT5/AT6) described in this catalog are for use only with the FX-100/300/311/410 series. Only one of these five fiber attachments is provided with each fiber.

[Back to top](#)

Type	Sharp bending	
Model No.	<b>FT/FD/FRW?</b>	
Allowable bending radius	R1 mm R0.039 in or more (FD-WG4/WG4: R2 mm R0.079 in or more, Sleeve of FD-W44: R10 mm R0.394 in or more)	
Ambient temperature	-40 to +60 °C -40 to +140 °F (FT-WA30/WA8/WK8: -40 to +55 °C -40 to +131 °F, FD-WL48: -20 to +60 °C -4 to +140 °F, FR-WKZ11: -25 to +55 °C -13 to +131 °F)	
Ambient humidity	35 to 85 % RH (No dew condensation or icing allowed)	
Material	Fiber core	Acrylic
	Sheath	Polyethylene
	Fiber head	Stainless steel (SUS) (including sleeve) [FT-W8/W4, FD-W8/W44/WG4: Brass (Nickel plated), Case of FT-WR80(L): Die-cast zinc alloy, Case of FT-WA30/WA8/WZ?(HB), FD-WZ?(HB), Case of FR-WKZ11, Case and prism of FD-WL48, Lens of FT-WZ8L and Resin part of FT-WK8: Polycarbonate, Lens of FT-WA30/WA8: Norbornene resin, Lens of FT-WZ8H/WZ8E and FT-WR80L, Reflector of FT-WZ8E, Prism of FT-WK8 and FT/FD-WZ4/WZ7: Acrylic, Reflector of FT-WZ8: Polycarbonate, Case of FD-WL41: Heat-resistant ABS, Front film of FD-WL41: Polyester, Lens of FD-WKZ1: Optical glass, Lens of FR-WKZ11: Crown glass (BK7), Inner pipe of FT/FD-WZ?(HB): Stainless steel (SUS304).]
Accessories (Note 2)	All fibers: 1 fiber attachment set and FX-CT2 (fiber cutter) 1 pc. Threaded head fibers: Nuts 2 pcs. (thru-beam type: 4 pcs.) and toothed lock washer 1 pc. (thru-beam type: 2 pcs.) FT-WA30: 0.5 x 32 mm 0.020 x 1.260 in seal type slit mask 2 pcs. FT-WA8: 0.5 x 12 mm 0.020 x 0.472 in seal type slit mask 2 pcs. and 1 x 12 mm 0.039 x 0.472 in seal type slit mask 2 pcs. FT-WZ8?, FT/FD-WZ4?(HB): 1 set of mounting screw FD-WKZ1: MSFD-2 (fiber mounting bracket) 1 pc. FR-WKZ11: MSFD-2 (fiber mounting bracket) 1 pc, RF-13 (reflective tape) 1 pc.	

- Notes:
- Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C +73.4 °F.
  - The five types of attached fiber attachments (FX-AT2/AT3/AT4/AT5/AT6) described in this catalog are for use only with the FX-100/300/311/410 series. Only one of these five fiber attachments is provided with each fiber.

[Back to top](#)

Type	Special use			
	Wide beam	Array	Narrow beam, Wafer mapping	High precision
Model No.	<b>FT-AB/ A30 FD-A15 (Note 3)</b>	<b>FT-AFM2/ AFM2E FD-AFM2/ AFM2E</b>	<b>FT-K8/ KV8/WK8 FT/FRKV1 FR-KZ21/ KZ21E</b>	<b>FD-EG1/ EG2/EG3 FD-G4/G6</b>
Allowable bending radius	FT-A30/A8: R10 mm R0.394 in or more FD-A15: R25 mm R0.984 in or more	R25 mm R0.984 in or more	R25 mm R0.984 in or more (FT/FR-KV1, FR-KZ21/KZ21E: R10 mm R0.394 in or more)	FD-EG2/EG3: R10 mm R0.394 in or more FD-G4/G6/EG1: R25 mm R0.984 in or more
Ambient temperature	FT-A30, FD-A15: -40 to +60 °C -40 to +140 °F FT-AB: -40 to +70 °C -40 to +158 °F	-40 to +70 °C -40 to +158 °F	-40 to +60 °C -40 to +140 °F	-20 to +60 °C -4 to +140 °F (FD-G4: -40 to +70 °C -40 to +158 °F, FD-G6: -40 to +60 °C -40 to +140 °F)
Ambient humidity	35 to 85 % RH (No dew condensation or icing allowed)			
Material	Fiber core	Acrylic		
	Sheath	Polyethylene		
	Fiber head	Polycarbonate (Lens of FT-AB/A30 and FD-A15: Norbornene resin)	Brass (Nickel plated) Liquid crystal polymer	Stainless steel (SUS), Polycarbonate (Lens: Norbornene resin, Case of FR-KZ21/KZ21E: ABS, Prism of FT-KV8 and FR-KZ21E: Acrylic)
Accessories (Note 2)	All fibers: 1 fiber attachment set and FX-CT2 (fiber cutter) 1 pc. FT-A30: 0.5 x 32 mm 0.020 x 1.260 in seal type slit mask 2 pcs. FT-AB: 0.5 x 12 mm 0.020 x 0.472 in seal type slit mask 2 pcs. and 1 x 12 mm 0.039 x 0.472 in seal type slit mask 2 pcs.	All fibers: 1 fiber attachment set Free-cut type fibers: FX-CT2 (fiber cutter) 1 pc. Threaded head fibers: Nuts 2 pcs. and toothed lock washer 1 pc. FR-KV1: Reflector 1 pc, M1.4 (length: 1.6 mm 0.063 in) stainless steel (SUS) mounting screw 4 pcs. FR-KZ21/KZ21E: RF-003 (reflector) 1 pc, MS-FD-2 (fiber mounting bracket) 1 pc.		

- Notes:
- Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C +73.4 °F.
  - The five types of attached fiber attachments (FX-AT2/AT3/AT4/AT5/AT6) described in this catalog are for use only with the FX-100/300/311/410 series. Only one of these five fiber attachments is provided with each fiber.
  - The FTWA8/WA30 is in the 'Sharp bending type' section of the previous page.

[Back to top](#)

Type	Special use		
	Ultra-small diameter	Convergent reflective	Tough flexible
Model No.	<b>FT/FDE12/E22 FD-EN500S1 FD-ENM1S1</b>	<b>FD-L4?</b>	<b>FT/FDP81X FD-G6X</b>
Allowable bending radius	FT-E12/E22: R5 mm R0.197 in or more (Note 2) FD-E12: R10 mm R0.394 in or more (Note 2) FD-E22/EN500S1/ENM1S1: R25 mm R0.984 in or more (Note 2)	R10 mm R0.394 in or more FD-L43/L45: R4 mm R0.157 in or more, FD-L45A, FD-L46: R25 mm R0.984 in or more	R10 mm R0.394 in or more
Ambient temperature	FT-E12/E22, FD-E22: -40 to +70 °C -40 to +158 °F FD-E12: -40 to +60 °C -40 to +140 °F FD-EN500S1/ENM1S1: -20 to +60 °C -4 to +140 °F	FD-L43/L45/L45A: 0 to +70 °C +32 to +158 °F FD-L41/L44/L44S/L46: -40 to +60 °C -40 to +140 °F FD-L4: -40 to +70 °C -40 to +158 °F	-40 to +60 °C -40 to +140 °F (FD-P81X: -40 to +70 °C -40 to +158 °F)
Ambient humidity	35 to 85 % RH (No dew condensation or icing allowed)		
Material	Fiber core	Acrylic	
	Sheath	Polyolefin	
	Fiber head	Brass (Nickel plated) [Sleeve: Stainless steel (SUS)]	FD-L41/L43/L45/L45A: Heat-resistant ABS Case of FD-L44/L46: ABS [Case of FD-L44/L44S: Polycarbonate, Slit of FD-L44S: Stainless steel (SUS304), Lens of FD-L41/L43/L44/L44S/L45/L45A: Acrylic, Front film of FD-L41: Polyester, Lens of FD-L46: Norbornene resin]
Accessories (Note 3)	All fibers: 1 fiber attachment set Threaded head fibers: Nuts 2 pcs. (FT-E12/E22: 4 pcs.) and toothed lock washer 1 pc. (FT-E12/E22: 2 pcs.)	All fibers: 1 fiber attachment set and FX-CT2 (fiber cutter) 1 pc. FD-L4: M2.6 (length 12 mm 0.472 in) screws with washers 2 pcs. and nuts 2 pcs.	All fibers: 1 fiber attachment set, nuts 2 pcs. (FT-P81X: 4 pcs.) and toothed lock washer 1 pc. (FT-P81X: 2 pcs.) FD-G6X: FX-CT2 (fiber cutter) 1 pc.

- Notes:
- Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C +73.4 °F.
  - Sleeve part cannot be bent.
  - The five types of attached fiber attachments (FX-AT2/AT3/AT4/AT5/AT6) described in this catalog are for use only with the FX-100/300/311/410 series. Only one of these five fiber attachments is provided with each fiber.

[Back to top](#)

Type	Special use			
	Leak liquid detection	Liquid detection	FD-F8Y	FD-F4?
Model No.	<b>FD-F705</b>	<b>FT-F902</b>	<b>FD-F8Y</b>	<b>FD-F4?</b>
Allowable bending radius	Protective tube: R20 mm R0.787 in or more Fiber cable: R4 mm R0.157 in or more		Protective tube: R40 mm R1.575 in or more Fiber: R15 mm R0.591 in or more	R10 mm R0.394 in or more
Bending durability	Fiber cable: 1 million times or more (at R4 mm R0.157 in)		-	
Ambient temperature	-20 to +50 °C -4 to +122 °F (Note 2)	-20 to +60 °C -4 to +140 °F (Note 2)	-40 to +125 °C -40 to +257 °F (Note 2)	-40 to +100 °C -40 to +212 °F (Note 2)
Ambient humidity	35 to 85%RH (No dew condensation or icing allowed)			
Material	Fiber core	Acrylic		
	Sheath	Vinyl chloride (Protective tube: Fluorine resin)		
	Fiber head	Outer casing: Fluorine resin, Inner: Heat-resistant ABS, Acrylic, Brass (Nickel plated)	Enclosure: Heat-resistant ABS Lens: Acrylic	Polypropylene (Protective tube: Fluorine resin)
Accessories (Note 3)	1 fiber attachment set, FX-CT2 (fiber cutter) 1 pc., MS-FD-F7-1 (SUS mounting bracket) 1pc., MS-FD-F7-2 (PVC mounting bracket) 1pc.	1 fiber attachment set, FX-CT2 (fiber cutter) 1 pc., Tying band 2 pcs., Anti-slip tube 2 pcs.	1 fiber attachment set FX-CT2 (fiber cutter) 1 pc.	1 fiber attachment set, FX-CT2 (fiber cutter) 1 pc. Tying band, 4 pcs., Anti-slip tube 2 pcs.

- Notes:
- Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C +73.4 °F.
  - Liquid being detected should also be kept within the rated ambient temperature range.
  - The five types of attached fiber attachments (FX-AT2/AT3/AT4/AT5/AT6) described in this catalog are for use only with the FX-100/300/311/410 series. Only one of these five fiber attachments is provided with each fiber.

[Back to top](#)

Type	Environment resistant					
	Heat-resistant					
Model No.	<b>FT/FDH?</b>					
Allowable bending radius	R25 mm R0.984 in or more (FT-H20W-M1, FT-H20-J/VJ?: R18 mm R0.709 in or more)					
Ambient temperature	-60 to +350 °C -76 to +662 °F (Note 2, 3)	-60 to +300 °C -76 to +572 °F (Note 2, 3)	-60 to +200 °C -76 to +392 °F (Note 3)	-60 to +180 °C -76 to +356 °F (Note 3, 5)	-60 to +130 °C -76 to +266 °F	
Ambient humidity	35 to 85%RH (No dew condensation or icing allowed)					
Material	Fiber core	Multi-component glass (Note 4)			Silicone	Acrylic
	Sheath				Fluorine resin	
	Fiber head	Stainless steel (SUS)	Silicone [Inside Stainless steel (SUS) spiral tube] [FT-H20W-M1: Fluorine resin FD-H20-21, FT-H20-J/VJ?: Stainless steel (SUS)]	Brass (Nickel plated) [FD-H20-21: Stainless steel (SUS) Prism of FT-H20-VJ?: Glass Lock nut of FT-H20-J/VJ?: Polybutylene terephthalate]	Stainless steel (SUS)	Brass (Nickel plated)
Accessories (Note 6)	FT-H20-J/VJ?, FT-H20W-M1, FD-H18-L31 and FT-H13-FM2: 1 fiber attachment set Free-cut type fibers: FX-CT2 (fiber cutter) 1 pc. Threaded head fibers: Nuts 2 pcs. (thru-beam type: 4 pcs.) and toothed lock washer 1pc. (thru-beam type: 2 pcs.) FT-H20-J/VJ?: M4 x 0.7 nut (Polycarbonate) 2 pcs., M4 spring washer 2 pcs.					

Type	Environment resistant		
	Chemical-resistant	Vacuum-resistant	
Model No.	<b>FT-HL80Y/L80Y/ V80Y/Z80Y</b>	<b>FT/FDH30-?V</b>	
Allowable bending radius	R30 mm R1.181 in or more (FT-Z80Y: R25 mm R0.984 in or more)	R18 mm R0.709 in or more	
Ambient temperature	-40 to +70 °C -40 to +158 °F (FT-Z80Y: 0 to +60 °C +32 to +76 °F FT-HL80Y: -40 to +115 °C -40 to +239 °F)	-30 to +300 °C -22 to +572 °F (Note 3)	
Ambient humidity	35 to 85%RH (No dew condensation or icing allowed)		
Material	Fiber core	Acrylic	
	Sheath	Protective tube: Fluorine resin Sheath: Polypropylene (Sheath of FT-Z80Y: Fluorine resin)	Multi-component glass (Note 4)
	Fiber head		Socket tube: Liner + braid tube [Stainless steel (SUS)] Socket plug: Joint: Stainless steel (SUS), Mounting cap nut: Stainless steel (SUS)  Stainless steel (SUS) (Lens of FD-H30-KZ1V/L32V: BK7 crown glass)
Accessories (Note 6)	1 fiber attachment set FX-CT2 (fiber cutter) 1 pc.		

- Notes:
- Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C +73.4 °F.
  - If the fiber is used below -30 °C -22 °F, its maximum resistable temperature drops to +200 °C +392 °F. If the sleeve lens FX-SV1 is put on the fiber head, the allowable maximum temperature drops to +300 °C +572 °F. (The ambient temperature range of  $\Phi$ W1 is from +60 to +300 °C +76 to +572 °F.)
  - The ambient temperature of heat-resistant 350 °C 662 °F type, 300 °C 572 °F type, 200 °C 392 °F type and 180 °C 356 °F type fibers are the value in dry condition. In humid environment, ambient temperature differs. (For a high humidity of 85 % RH, ambient temperature is 0 to +40 °C +32 to +104 °F.)
  - If the fiber material is quartz glass or multicomponent glass, keep it away from vibration or impact.
  - The normal temperature for continuous usage or storage should be -60 to +150 °C -76 to +302 °F.
  - The five types of attached fiber attachments (FX-AT2/AT3/AT4/AT5/AT6) described in this catalog are for use only with the FX-100/300/311/410 series. Only one of these five fiber attachments is provided with each fiber.

[Back to top](#)