Fujikura

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No.B-19DA001B

Messrs.

STANDARD SPECIFICATIONS

FOR

IMAGEFIBERS

(For all sales offices)

Prepared by K. Yoshimaru
Manager

Optical Fiber Development Department
Optical Fiber Division

Approved by M. Miyachi
Senior Manager

Optical Fiber Development Department
Optical Fiber Division

Fujikura Ltd.

STANDARD SPECIFICATIONS FOR IMAGEFIBERS

1. General

These specifications cover Fujikura's standard imagefibers (FIGH series S-type, N-type, G-type and PI-type) for all sales offices and markets.

2. Material

- Material of imagefiber shall be Silica based glass.
- Material of coating shall be as shown on Tables 1~7.
- Fujikura imagefibers met the requirements of a USP biocompatibility Class VI.

3. Specification

- The specifications shall be as shown on Tables 1 to 7.
- The number of picture elements, the dimensions (image circle diameter, fiber diameter, coating diameter), and uncircularity are measured in sampling, and these values are described on the test report.
- The sample of test report is attached at bottom of this document.
- End surface of imagefiber shall be polished for Fujikura's factory inspection purpose only as long as there is no specific requirement from buyer. The end surface condition is "Cut only".
- Fine polished imagefiber at end surface is also available. Buyer, who is need of fine polish, shall specify so in his inquiry.
- If buyer and Fujikura agree with any special polish specification, Fujikura shall issue an individual specification and such specification number shall be clearly mentioned in buyer's purchase order.

4. Packing

- Packing shall be as per Fujikura standard.

5. Permissible Temperature (short term: guaranteed by design)

- PI-type: Max.300 ºC
- All types except PI-type: Max.150 ºC

6. Length

Standard maximum length per piece shall be as follows.

Number of picture elements	up to 20,000:	5,000 mm (16.4feet)
	30,000 ~50,000:	3,000 mm (9.8feet)
	60,000~100,000:	1,000 mm (3.3feet)

In case of longer length per piece: To be discussed.

Length per piece agreed by buyer and Fujikura shall be clearly mentioned in buyer's purchase order.

Length tolerance is defined as below,

$L \leq 0.5m$	+5mm / -0mm
$0.5m < L \leq 5m$	+1% / -0%
$L > 5m$	+2% / -0%

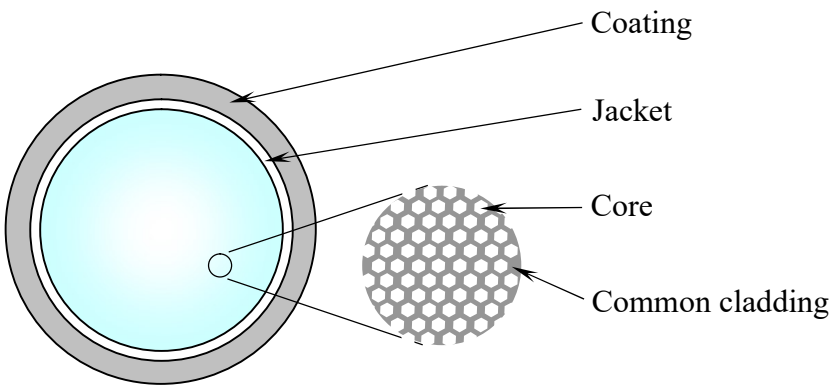
7. Definition of the uncircularity of imagecircle

The Definition of image circle uncircularity is as follows.
The uncircularity is defined from difference between the lengths of long and short sides of respectively. The largest diameter of the image circle is "A" and the image circle diameter perpendicular to it is "B".
The uncircularity is calculated by the following formula.

$$\text{Uncircularity (\%)} = |A-B| / \{(A+B)/2\} \times 100$$

A : Maximum image circle diameter
B : Image circle diameter perpendicular to "A".

8. Cross section of structure



9. Instruction for use of Fujikura's imagefibers

a) The products should not be bent under the minimum bending radius recommended by Fujikura.
b) The products should not be hit by hard objects, especially the end surface of fiber which is so delicate, it might be broken off on impact.
c) Coating surface should not be wiped or scraped off by a cloth containing alcohol or other acid/alkaline solvent.
d) Heat treatment at higher permissible temperature should not be applied for our products.

10. Warranty

a) Warranty period in respect of the conformity to this specification shall be 12 months from the date described in AIR WAY BILL.
b) In case any non-conformity found during above mentioned warranty period and the cause having been clearly proven to be attributable to Fujikura, Fujikura shall deliver the defective section within reasonable time without any cost to buyer.
c) In case buyer finds non-conformity during the above mentioned warranty period, buyer shall promptly deliver a non-conformity notice to Fujikura along with the product.
d) It is guaranteed that the total number of lattice defects is less than 0.1% of the number of pixels. Lattice defect is defined as black area larger than one pixel in the image circle except edge area.
e) Please do not be used to cut the product. If the product is cut in the process, we cannot guarantee the optical fiber.
f) This imagefiber is designed for industrial purposes. For any application, all necessary test and evaluation for its application shall be done at customer's responsibility. The products are not certified as medical device or any other special usage.

11. Natural Twisting Angle

- Natural twisting angle of imagefiber cannot be specified and guaranteed in case there is no specific requirement at the time of inquiry and the value agreed by buyer and Fujikura is not clearly mentioned in buyer's purchase order.

12. Remarks

- All specifications are subject to change without notice.
- Customized products are also available.
- All products shall not be stored in humid and high temperature conditions.
- For special applications, Fujikura accept consultation on the image fiber separately.
- If buyer have any doubts about the contents of this specification and any matter not stated in this specification, Fujikura will consult with you separately.

Reference document: B-07D9045K

----------End of Specification----------

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Table 1

IMAGEFIBER SPECIFICATIONS

(FIGH series N-type 6K-15K and G-type 6K)

Item	FIGH-06-350G	FIGH-06-400N	FIGH-10-500N	FIGH-15-600N
Number of picture elements	6000 ± 600	6000 ± 600	10000 ± 1000	15000 ± 1500
Imagecircle diameter (μm)	325 ± 20	370 ± 25	460 ± 25	550 ± 30
Fiber diameter (μm)	350 ± 20	400 ± 25	500 ± 25	600 ± 30
Coating diameter (μm)	420 ± 30	500 ± 30	600 ± 35	700 ± 35
Minimum bending radius (mm)	35*1 (20*2)	40*1 (20*2)	50*1 (25*2)	60*1 (30*2)
Coating material	Silicone resin (Black)			
Lattice defect (%)	< 0.1			
Uncircularity of imagecircle (%)	< 5			

*1:Minimum bending radius in storage
*2:Recommended bending radius in use for short period of time.
(For your reference only, possible breakages due to static fatigue)

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Table 2

IMAGEFIBER SPECIFICATIONS

(FIGH series N-type 30K and G-type17K, 30K, 40K)

Item	FIGH-17-600G	FIGH-30-800G	FIGH-30-850N	FIGH-40-920G
Number of picture elements	17000 ± 1700	30000 ± 3000	30000 ± 3000	40000 ± 4000
Imagecircle diameter (μm)	560 ± 30	750 ± 40	790 ± 50	854 ± 30
Fiber diameter (μm)	600 ± 30	800 ± 40	850 ± 50	920 ± 30
Coating diameter (μm)	680 ± 35	950 ± 50	950 ± 50	1,030 ± 40
Minimum bending radius (mm)	60*1 (30*2)	80*1 (40*2)	90*1 (50*2)	100*1 (70*2)
Coating material	Silicone resin (Black)			
Lattice defect (%)	< 0.1			
Uncircularity of imagecircle (%)	< 5			

*1:Minimum bending radius in storage
*2:Recommended bending radius in use for short period of time.
(For your reference only, possible breakages due to static fatigue)

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Table 3

IMAGEFIBER SPECIFICATIONS

(FIGH series N-type 50K-100K)

Item	FIGH-50-1100N	FIGH-60-1200N	FIGH-100-1500N
Number of picture elements	50000 ± 5000	60000 ± 6000	100000 ± 10000
Imagecircle diameter (μm)	1,025 ± 80	1,116 ± 50	1,400 ± 120
Fiber diameter (μm)	1,100 ± 80	1,200 ± 50	1,500 ± 120
Coating diameter (μm)	1,200 ± 100	1,275 ± 80	1,700 ± 150
Minimum bending radius (mm)	110*1 (80*2)	150*1 (100*2)	200*1 (130*2)
Coating material	Silicone resin (Black)		
Lattice defect (%)	< 0.1		
Uncircularity of imagecircle (%)	< 5		

*1:Minimum bending radius in storage
*2:Recommended bending radius in use for short period of time.
(For your reference only, possible breakages due to static fatigue)

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Table 4

IMAGEFIBER SPECIFICATIONS

(FIGH series S-type 1.6K-6K)

Item	FIGH-016-160S	FIGH-03-200S	FIGH-03-215S	FIGH-06-280S
Number of picture elements	1600 ± 160	3000 ± 300	3000 ± 300	6000 ± 600
Imagecircle diameter (μm)	145 ± 15	186 ± 15	190 ± 20	252 ± 20
Fiber diameter (μm)	160 ± 20	200 ± 15	215 ± 25	280 ± 20
Coating diameter (μm)	210 ± 30	250 ± 20	285 ± 30	340 ± 30
Minimum bending radius (mm)	20*1 (10*2)	25*1 (15*2)	25*1 (15*2)	30*1 (15*2)
Coating material	Silicone resin (Black)			
Lattice defect (%)	< 0.1			
Uncircularity of imagecircle (%)	< 5			

*1:Minimum bending radius in storage
*2:Recommended bending radius in use for short period of time.
(For your reference only, possible breakages due to static fatigue)

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Table 5

IMAGEFIBER SPECIFICATIONS

(FIGH series S-type 6K-30K)

Item	FIGH-06-300S	FIGH-10-350S	FIGH-30-650S
Number of picture elements	6000 ± 600	10000 ± 1000	30000 ± 3000
Imagecircle diameter (μm)	270 ± 20	325 ± 20	600 ± 30
Fiber diameter (μm)	300 ± 25	350 ± 25	650 ± 30
Coating diameter (μm)	400 ± 30	450 ± 30	750 ± 50
Minimum bending radius (mm)	30*1 (15*2)	35*1 (20*2)	70*1 (35*2)
Coating material	Silicone resin (Black)		
Lattice defect (%)	< 0.1		
Uncircularity of imagecircle (%)	< 5		

*1:Minimum bending radius in storage
*2:Recommended bending radius in use for short period of time.
(For your reference only, possible breakages due to static fatigue)

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Table 6

IMAGEFIBER SPECIFICATIONS

(FIGH series PI-type 6K-40K)

Item	FIGH-06-300PI	FIGH-10-350PI	FIGH-10-500PI	FIGH-30-850PI	FIGH-35-900PI	FIGH-40-900PI
Number of picture elements	6000 ± 600	10000 ± 1000	10000 ± 1000	30000 ± 3000	35000 ± 3500	40000 ± 4000
Imagecircle diameter (μm)	270 ± 20	325 ± 20	460 ± 25	790 ± 50	830 ± 50	830 ± 50
Fiber diameter (μm)	300 ± 25	355 ± 15	500 ± 25	850 ± 50	900 ± 50	900 ± 50
Coating diameter (μm)	350 ± 30	400 ± 20	550 ± 35	900 ± 50	950 ± 50	950 ± 50
Minimum bending radius (mm)	30*1 (15*2)	35*1 (20*2)	50*1 (25*2)	120*1 (60*2)	120*1 (60*2)	120*1 (60*2)
Coating material	Polyimide (Black)					
Lattice defect (%)	< 0.1					
Uncircularity of imagecircle (%)	< 5					

*1:Minimum bending radius in storage
*2:Recommended bending radius in use for short period of time.
(For your reference only, possible breakages due to static fatigue)

Sample of Test Report (as FIGH-10-500N)

TEST RESULTS

Lot No. :

Product name : Imagefiber (FIGH-10-500N)

Quantity : (total = m)

Test item	Spec. value	Results									
		1	2	3	4	5	6	7	8	9	10
Number of picture elements	10,000 ± 1,000										
Imagecircle diameter (μm)	460 ± 25										
Fiber diameter (μm)	500 ± 25										
Coating diameter (μm)	600 ± 35										
Uncircularity of imagecircle (%)	< 5										
Length(mm)	X +y/-0										

Product Name : IMAGEFIBERS (For all sales offices)

History of Revision

DCR no.	Rev.	Content of Revision		Writer	Approved	Revised date
		Item	Description and Reason for change			
B-19DA001			Initial release	Suzaki	Miyachi	19.01.25
	A	p.9	Added FIGH-10-350PI to Table 6	Takakura	Miyachi	19.05.10
	B	7 (p.2)	Added Definition of the uncircularity of imagecircle	Yoshimaru	Miyachi	22.12.27
		p.11	Clerical error corrections			

END