

JPCA Standard

**Detail Specification for Optical Board
Connector type MF using glass Fibers**

JPCA-PE03-01-04S-2004

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JPCA Standard

Detail Specification for Optical Board Connector type MF using Glass Fibres

JPCA-PE03-01-04S

1. Scope This standard specifies the detailed specification for the optical board connector type MF to connect a flexible optical board and a ribbon fibre cable by means of buckling in physical contact of the bare optical fibres.

The purpose of this standard is to provide the information of required characteristics of the connector and the methods to evaluate it, and to clarify the conditions in assembling the connector to an optical board.

2. Normative references

IPC-0040 Optoelectronics Assembly and Packaging Technology

IEC 60793-2-10 Optical Fibres - Part 2-10: Product specifications - Sectional specification for category A1 multimode fibres.

IEC 60793-2-50 Optical Fibres - Part 2-50: Product specifications - Sectional specification for class B single-mode fibres

IEC 60874-1 Connectors for optical fibres and cables - Part1:Generic specification

JPCA-PE02S General rules of optical boards

JPCA-PE02-01-01S Detail specification for flexible optical board using glass fibre

IEC 61753-1-1 Fibre optic interconnecting devices and passive components performance standard – Part1-1: General and guidance - Interconnecting devices (connectors)

IEC 61300-X "Fibre optic interconnecting devices and passive components - Basic test and measurement procedures" series

JIS C 5961 Test methods of connectors for optical fiber cables

3. Terms and Definitions Terms not specified in this section shall be referred to IPC-0040, IEC 60874-1, JPCA-PE02S, JPCA-PE02-01-01S and JIS C 5961.

- 1) **MF Optical Connector** (Optical Board Connector Type MF) This is the type of optical connectors using the physical contact of optical fibres in an F plug and a B plug by buckling of a fibre.
- 2) **F Plug** (Fixed end Plug) The plug structure in the MF optical connector in which the optical fibre does not buckle within the plug
- 3) **B Plug** (Buckling end Plug) The plug structure in the MF optical connector in which the optical fibre buckles within the plug.
- 4) **Bare Fibre** An optical fibre whose primary coating is removed
- 5) **Physical Contact** The joining of two optical fibres in contact nearly at the state of optical contact.
- 6) **Buckling** Bending of a fibre at physical contact with a compressive force to the fibre above the elastic limit of the fibre so that the fibre bends in the vertical direction to the fibre. The force to generate this bending, or buckling, is the buckling force.

7) **Clamp Spring** A piece to connect F plug and B plug with an adaptor by means of a pressing force.

4. Classification

4.1 Structure and Components of the MF optical connector The structure of the MF optical connector is illustrated in Figure 4.1.1 and the connection scheme in Figure 4.1.2. The components of the connector are given in Table 4.1.1.

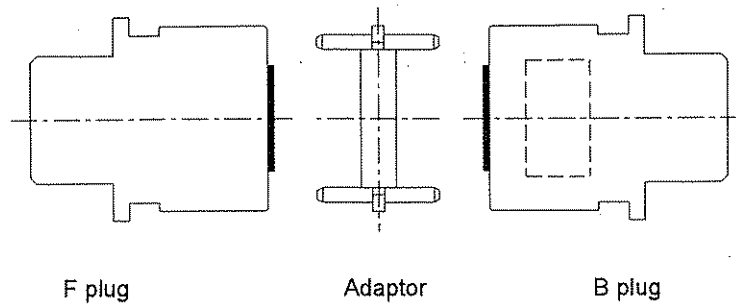


Figure 4.1.1 Structure of the MF optical Connector

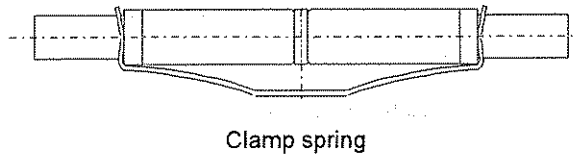


Figure 4.1.2 Connected MF optical connector

Table 4.1.1 Components and their dimensions

Name	Shape and dimension
F plug	Figure 5.1.1, Tables 5.1.1.1, and 5.1.1.2
B plug	Figure 5.1.2, Tables 5.1.2.1, and 5.1.2.2
Adaptor	Figure 5.1.3, Tables 5.1.3.1, and 5.1.3.2
Clamp spring	Figure 5.1.4, Tables 5.1.4

4.2 Optical fibres The optical fibres suitable for the MF optical connector are specified in Table 4.2.

Table 4.2 Optical fibres

Fibre	Specification
Quartz type single mode optical fibre	IEC 60793-2-50
Quartz type multi mode optical fibre	IEC 60793-2-10

5. Requirements

5.1 Structure and dimension

5.1.1 F Plug The structure, shape and dimensions of the connecting section of the F Plug are specified in Figure 5.1.1 and Tables 5.1.1. and 5.1.2.

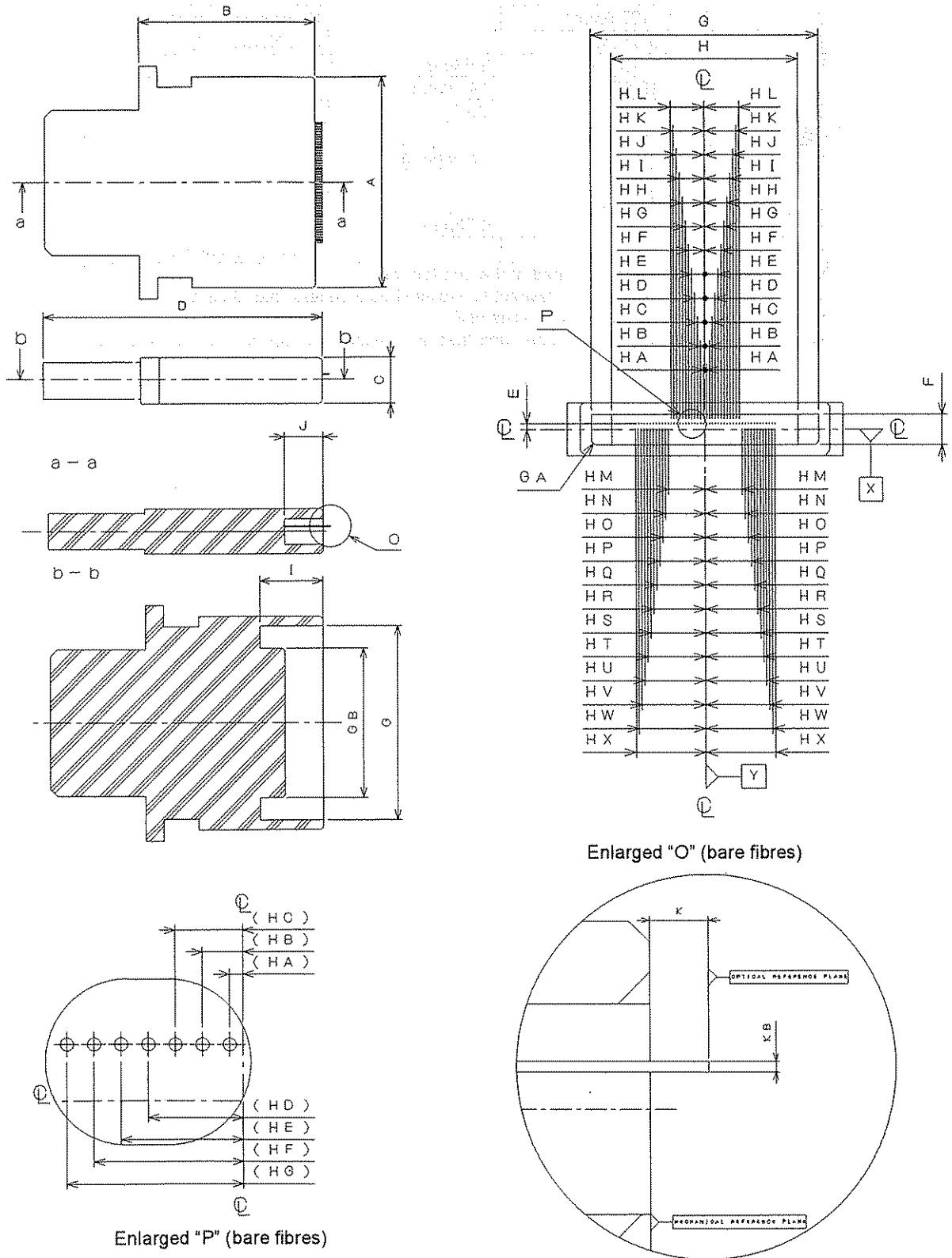


Figure 5.1.1 F plug

Table 5.1.1.1 Dimensions of F plug

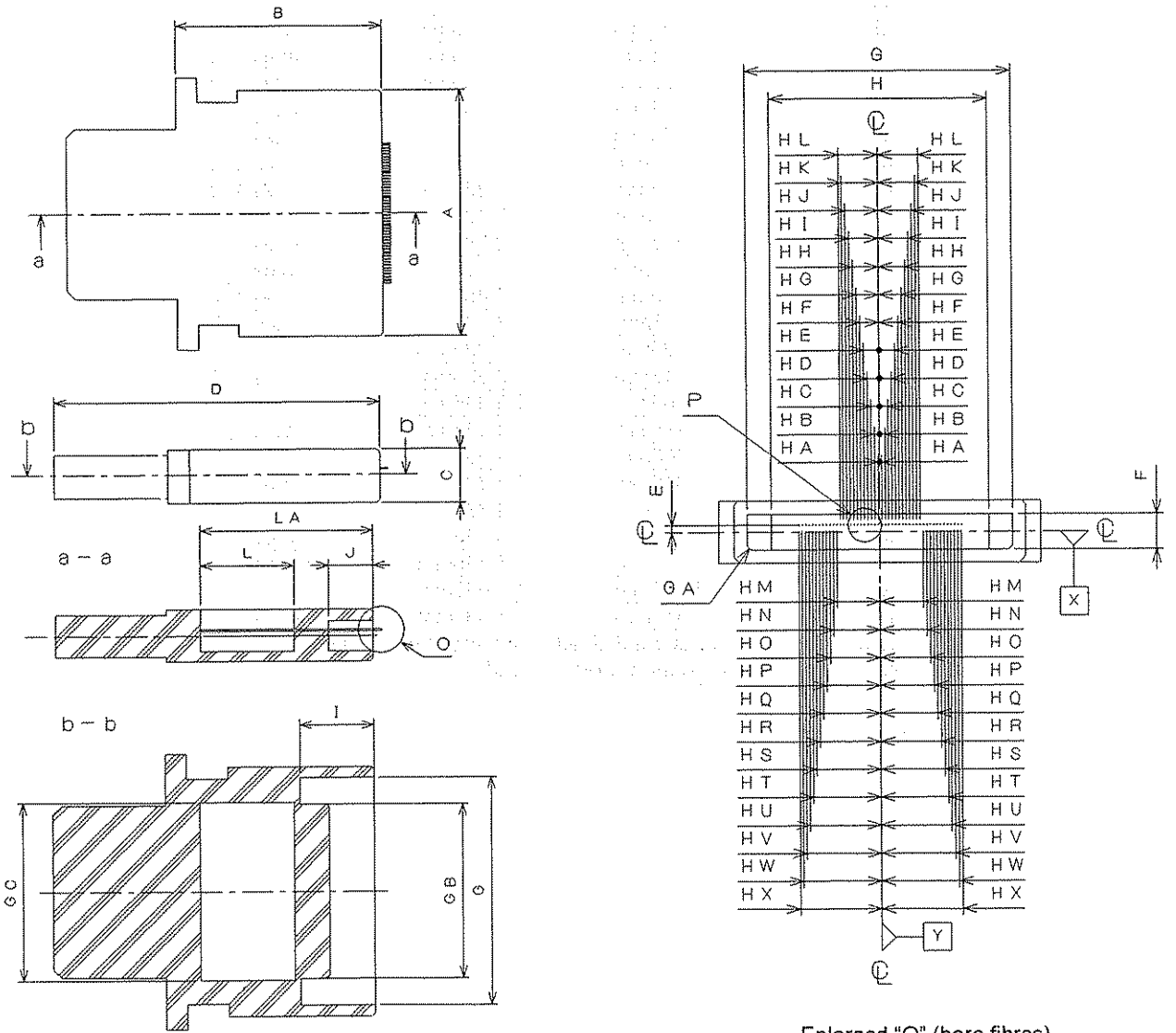
Item	Dimension		Remarks
	MIN	MAX	
A	(21mm)		Reference dimension
B	17.7mm	-	Reference dimension
C	(4.55mm)	-	Reference dimension
D	(27.5mm)	-	Reference dimension
E	0.512mm		See Notes 1, 2, 3
F	2.55mm	2.58mm	
G	19.15mm	19.18mm	
GA	-	C0.3	
GB	14.7mm	-	
H	-	15.695mm	
I	6.3mm	-	
L	3.8mm	-	
K	-	0.75mm	
KB	ϕ 0.125mm	-	Note 4, optical fibre
<p>Note 1: The dimensions are defined at the end (tip) of a fibre. Note 2: The position accuracy in respect to X-axis should be less than 0.02 mm. Note 3: The datum X is the center X-axis of F. Note 4: The dimension KB shall be such that an optical fibre can be inserted into the adaptor.</p>			

Table 5.1.1.2: Dimensions of fibres

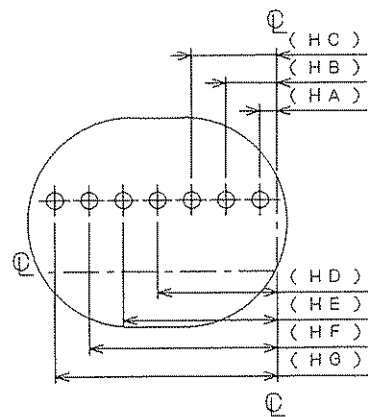
Item	Dimension		Remarks
	MIN	MAX	
HA	0.115mm	0.135mm	Notes 1, 2
HB	0.365mm	0.385mm	Notes 1, 2
HC	0.615mm	0.635mm	Notes 1, 2
HD	0.865mm	0.885mm	Notes 1, 2
HE	1.115mm	1.135mm	Notes 1, 2
HF	1.365mm	1.385mm	Notes 1, 2
HG	1.615mm	1.635mm	Notes 1, 2
HH	1.865mm	1.885mm	Notes 1, 2
HI	2.115mm	2.135mm	Notes 1, 2
HJ	2.365mm	2.385mm	Notes 1, 2
HK	2.615mm	2.635mm	Notes 1, 2
HL	2.865mm	2.885mm	Notes 1, 2
HM	3.115mm	3.135mm	Notes 1, 2
HN	3.365mm	3.385mm	Notes 1, 2
HO	3.615mm	3.635mm	Notes 1, 2
HP	3.865mm	3.885mm	Notes 1, 2
HQ	4.115mm	4.135mm	Notes 1, 2
HR	4.365mm	4.385mm	Notes 1, 2
HS	4.615mm	4.635mm	Notes 1, 2
HT	4.865mm	4.885mm	Notes 1, 2
HU	5.115mm	5.135mm	Notes 1, 2
HV	5.365mm	5.385mm	Notes 1, 2
HW	5.615mm	5.635mm	Notes 1, 2
HX	5.865mm	5.885mm	Notes 1, 2

Note 1: The dimensions are defined at the end (tip) of a fibre.
Note 2: The datum Y is the center Y-axis of H.

5.1.2 Plug B The structure, shape and dimensions of the connecting section of the Plug B are specified in Figure 5.1.2 and Tables 5.1.2.1 and 5.1.2.2.



Enlarged "O" (bare fibres)



Enlarged "P" (bare fibres)

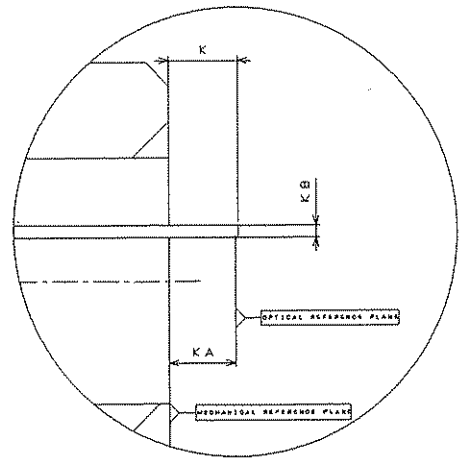


Figure 5.1.2 B plug

Table 5.1.2.1 Dimensions of B plug

Item	Dimension		Remarks
	MIN	MAX	
A	(21mm)		Reference dimension
B	17.7mm	-	Reference dimension
C	(4.55mm)		Reference dimension
D	(27.5mm)		Reference dimension
E	0.512mm		Notes 1, 2 and 3
F	2.55mm	2.58mm	
G	19.15mm	19.18mm	
GA	-	C0.3	
GB	14.7mm	-	
GC	14.98mm	-	
H	-	15.695mm	
I	6.3mm	-	
J	3.8mm	-	
K	-	0.75mm	
KA	0.65mm	-	
KB	ϕ 0.125mm	-	Note 4: optical fibre
L	-	10mm	
LA	(14.8mm)		Reference dimension
<p>Note 1: The dimensions are defined at the end (tip) of a fibre. Note 2: The position accuracy in respect to X-axis should be less than 0.02 mm. Note 3: The datum X is the center X-axis of F. Note 4: The dimension KB shall be such that an optical fibre can be inserted into the adaptor.</p>			

Table 5.1.2.2 Dimensions of fibres

Item	Dimension		Remarks
	MIN	MAX	
HA	0.115mm	0.135mm	Notes 1, 2
HB	0.365mm	0.385mm	Notes 1, 2
HC	0.615mm	0.635mm	Notes 1, 2
HD	0.865mm	0.885mm	Notes 1, 2
HE	1.115mm	1.135mm	Notes 1, 2
HF	1.365mm	1.385mm	Notes 1, 2
HG	1.615mm	1.635mm	Notes 1, 2
HH	1.865mm	1.885mm	Notes 1, 2
HI	2.115mm	2.135mm	Notes 1, 2
HJ	2.365mm	2.385mm	Notes 1, 2
HK	2.615mm	2.635mm	Notes 1, 2
HL	2.865mm	2.885mm	Notes 1, 2
HM	3.115mm	3.135mm	Notes 1, 2
HN	3.365mm	3.385mm	Notes 1, 2
HO	3.615mm	3.635mm	Notes 1, 2
HP	3.865mm	3.885mm	Notes 1, 2
HQ	4.115mm	4.135mm	Notes 1, 2
HR	4.365mm	4.385mm	Notes 1, 2
HS	4.615mm	4.635mm	Notes 1, 2
HT	4.865mm	4.885mm	Notes 1, 2
HU	5.115mm	5.135mm	Notes 1, 2
HV	5.365mm	5.385mm	Notes 1, 2
HW	5.615mm	5.635mm	Notes 1, 2
HX	5.865mm	5.885mm	Notes 1, 2

Note 1: The dimensions are defined at the end (tip) of a fibre.
Note 2: The datum Y is the center Y-axis of H.

5.1.3 Adaptor The structure, shape and dimensions of the connecting section of the Adaptor are specified in Figure 5.1.3 and Tables 5.1.3.1 and 5.1.3.2.

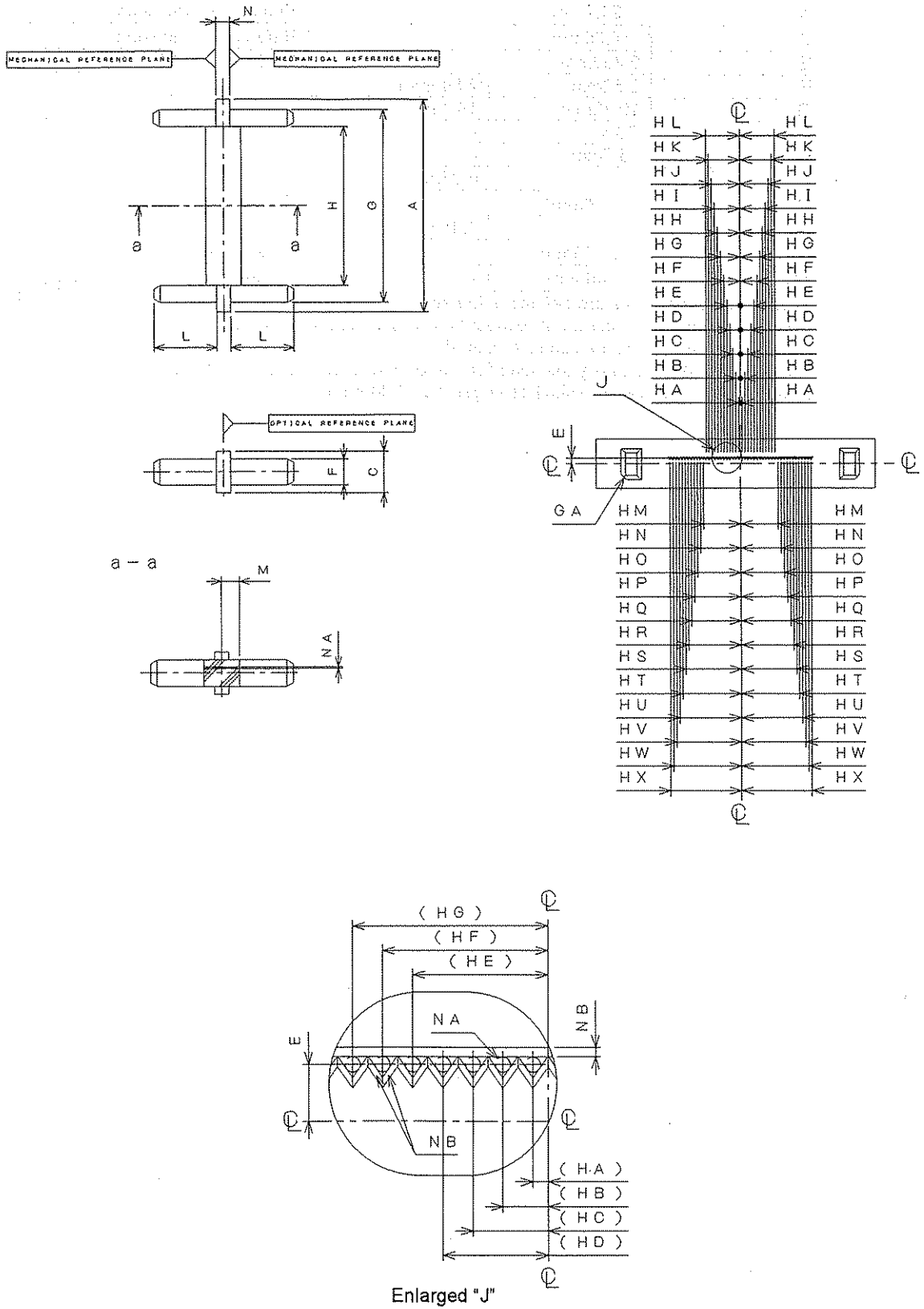


Figure 5.1.3 Adaptor

Table 5.1.3.1 Dimension of the adaptor

Item	Dimension		Remarks
	MIN	MAX	
A	(21.7mm)		Reference dimension
C	(4.05mm)		Reference dimension
E	0.462mm		Notes 1, 2 and 3
F	2.52mm	2.545mm	
G	19.12mm	19.145mm	
GA	C0.4	-	
H	15.7mm	-	
L	-	6.25mm	
M	(1.76mm)		Reference dimension
N	-	1.4mm	
NA	ϕ 0.125mm		Note 4
NB	(0.045mm)	-	Referencedimension、 Note 5
<p>Note 1: The dimensions are defined at the end (tip) of a fibre. Note 2: The position accuracy in respect to X-axis should be less than 0.02 mm. Note 3: The datum X is the center X-axis of F. Note 4: The NA shall satisfy the specified performance for a 0.125 mm optical fibre. Note 5: The guide of a fibre shall be larger then 0.045mm.</p>			

Table 5.1.3.2 Dimensions of the adaptor (part B)

Item	Dimension		Remarks
	MIN	MAX	
HA	0.115mm	0.135mm	Notes 1, 2
HB	0.365mm	0.385mm	Notes 1, 2
HC	0.615mm	0.635mm	Notes 1, 2
HD	0.865mm	0.885mm	Notes 1, 2
HE	1.115mm	1.135mm	Notes 1, 2
HF	1.365mm	1.385mm	Notes 1, 2
HG	1.615mm	1.635mm	Notes 1, 2
HH	1.865mm	1.885mm	Notes 1, 2
HI	2.115mm	2.135mm	Notes 1, 2
HJ	2.365mm	2.385mm	Notes 1, 2
HK	2.615mm	2.635mm	Notes 1, 2
HL	2.865mm	2.885mm	Notes 1, 2
HM	3.115mm	3.135mm	Notes 1, 2
HN	3.365mm	3.385mm	Notes 1, 2
HO	3.615mm	3.635mm	Notes 1, 2
HP	3.865mm	3.885mm	Notes 1, 2
HQ	4.115mm	4.135mm	Notes 1, 2
HR	4.365mm	4.385mm	Notes 1, 2
HS	4.615mm	4.635mm	Notes 1, 2
HT	4.865mm	4.885mm	Notes 1, 2
HU	5.115mm	5.135mm	Notes 1, 2
HV	5.365mm	5.385mm	Notes 1, 2
HW	5.615mm	5.635mm	Notes 1, 2
HX	5.865mm	5.885mm	Notes 1, 2
Note 1: The dimensions are defined at the end (tip) of a fibre. 2: The datum Y is the center Y-axis of H.			

5.1.4 Clamp Spring The shape and dimensions of the clam spring are specified in Figure 5.1.4 and Table 5.1.4.

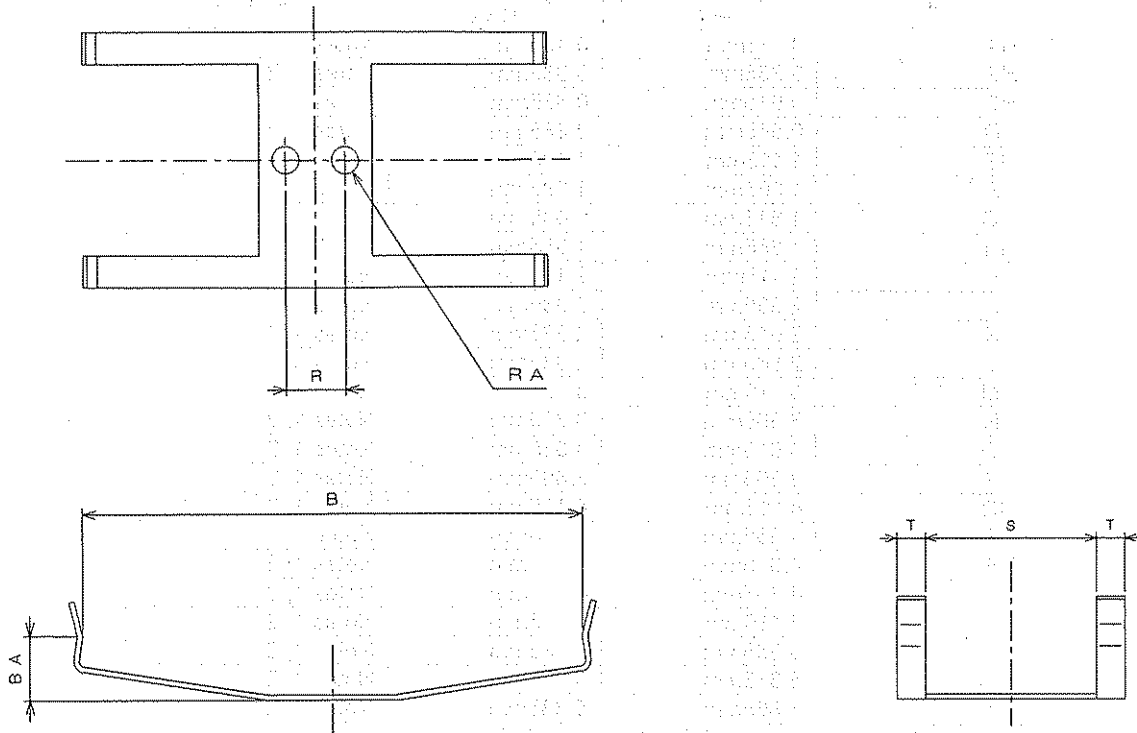


Figure 5.1.4 Shape of the clamp spring

Table 5.1.4 Dimension of clamp spring

Item	Dimension		Remarks
	MIN	MAX	
B	-	34.6mm	
BA	(6mm)		Reference dimension
R	4.7mm	-	Note 1
RA	ϕ 2.2mm	-	Note 1
S	(15mm)		Reference dimension
T	2.4mm	2.6mm	

Note 1: Dimension of the screw to hold the clamp to a substrate is shown for reference. The height of the fixing screw shall be less than 2mm.

5.2 Interface condition to the flexible optical board The shape and mounting condition of an MF optical connector to a flexible optical board are specified in Figure 5.2.1 and Table 5.2.1. The structure and shape of components whose dimensions are not specified are shown for reference only.

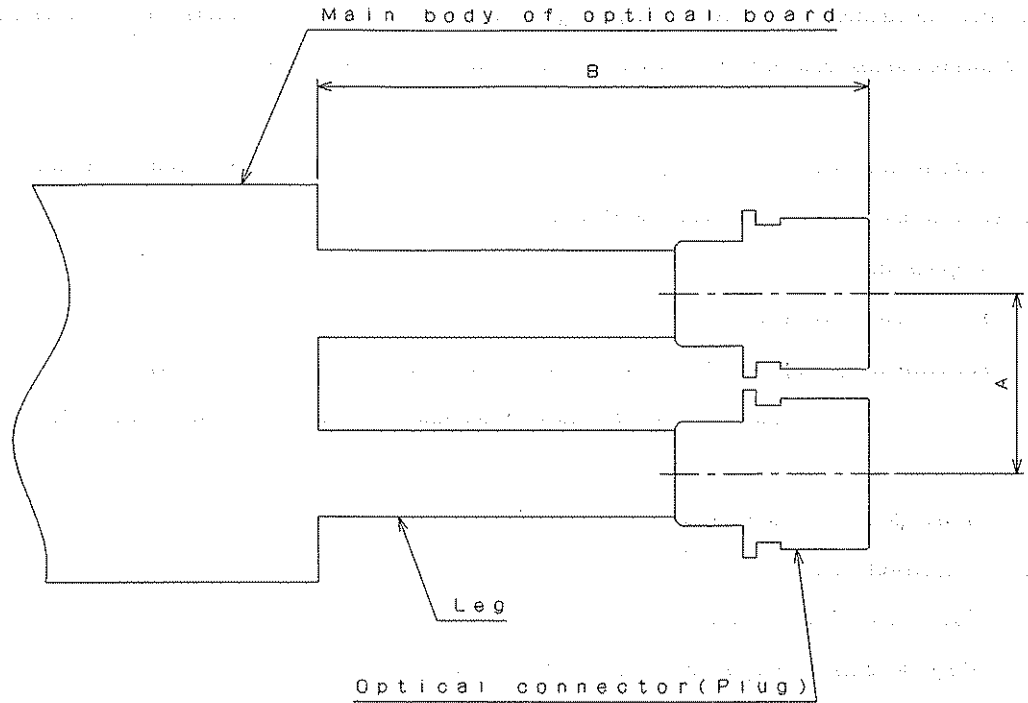


Figure 5.2.1 Flexible optical board with MF optical connector

Table 5.2.1 Fixing dimensions of flexible optical board with optical connector

Item	Dimension		Remarks
	MIN	MAX	
A	25mm	-	
B	100mm	-	Note 1
Note 1: This dimension gives the distance necessary to mount a connector.			

5.3 Environmental conditions The environmental tests for the connectors specified in this specifications shall be made by the test methods specified in IEC 61753-1-1. Connector shall have the required mechanical and optical characteristics after the environmental tests.

Environmental requirement: A connector shall have a long time reliability in an environment of $-10^{\circ}\text{C}\sim+65^{\circ}\text{C}$, and shall have the capability of insertion and pulling out of the connector to the adaptor in an environment of $0^{\circ}\text{C}\sim+50^{\circ}\text{C}$. Other environmental requirements may be agreed between user and supplier.

5.4 Performance Performance requirements are given below. Other requirements not stated here may be agreed between user and supplier as special performance.

5.4.1 Appearance

Test methods: IEC 61300-3-1

Requirement: a) Plugs shall fit to the counter part without any mechanical difficulty

b) No damage that may affect performance such as deformation, crack, or loose fitting.

5.4.2 Initial optical characteristics

5.4.2.1 Insertion loss

Test method: IEC 61300-3-4

Requirements: a) Single mode optical fibre: $< 1\text{dB}$

b) Multi mode optical fibre : $< 1\text{dB}$

5.4.2.2 Reflection loss

Test method: IEC 61300-3-6

Requirements: a) Single mode optical fibre : $> 40\text{dB}$

b) Multi mode optical fibre : $> 25\text{dB}$

5.4.3 Mechanical characteristics

5.4.3.1 Vibration

Test method: IEC 61300-2-1

Test conditions: a) Vibration: $10\text{Hz}\sim 55\text{Hz}$

b) Amplitude (half magnitude): 0.75mm

c) Sweep cycle: 15 (for each direction)

d) Items for initial measurement: Insertion loss and Reflection loss

e) Items for final measurement: Insertion loss, Reflection loss and Mechanical damages

Requirements: a) Insertion loss: Less than 1.2 dB for the final measurement after the test

b) Reflection loss: Reflection loss shall satisfy 5.4.2.2.

c) Mechanical damages: Mechanical damages shall satisfy 5.4.1.

5.4.3.2 Shock

Test method: IEC 61300-2-12

- Test conditions:
- a) Fall height: 1.5m
 - b) Number of drops: 5
 - c) Initial measurement: Insertion loss and reflection loss
 - d) Final measurement: Insertion loss, reflection loss and mechanical damages

- Requirements:
- a) Insertion loss: Less than 1.2 dB for the final measurement after the test
 - b) Reflection loss: Reflection loss shall satisfy 5.4.2.2.
 - c) Mechanical damages: Mechanical damages shall satisfy 5.4.1.

5.4.3.3 Repeated handling

Test method: IEC 61300-2-2

Test condition: a) Number of repetition: 50

- b) Initial measurement: Insertion loss and reflection loss
- c) Final measurement: Insertion loss, reflection loss and mechanical damages

- Requirements:
- a) Insertion loss: Less than 1.2 dB for the final measurement after the test
 - b) Reflection loss: Reflection loss shall satisfy 5.4.2.2.
 - c) Mechanical damages: Mechanical damages shall satisfy 5.4.1.

5.4.3.4 Pressing force of the clamp spring

Test method: 6.1 of this specification

Requirement: Pressing force of the clamp spring: more than 19N.

5.4.4 Environmental tests

5.4.4.1 High temperature

Test method: IEC 61300-2-18

Test condition: a) Temperature: 65°C

- b) Duration: 96 h
- c) Initial measurement: Insertion loss and reflection loss
- d) Final measurement: Insertion loss, reflection loss and mechanical damages

- Requirements:
- a) Insertion loss: Less than 1.2 dB for the final measurement after the test
 - b) Reflection loss: Reflection loss shall satisfy 5.4.2.2.
 - c) Mechanical damages: Mechanical damages shall satisfy 5.4.1.

5.4.4.2 High humidity

Test method: IEC 61300-2-19

Test condition: a) Temperature: 40°C

- b) Humidity: 93%RH
- c) Duration: 96 h
- d) Initial measurement: Insertion loss and reflection loss

e) Final measurement: Insertion loss, reflection loss and mechanical damages

Requirements: a) Insertion loss: Less than 1.2 dB for the final measurement after the test

b) Reflection loss: Reflection loss shall satisfy 5.4.2.2.

c) Mechanical damages: Mechanical damages shall satisfy 5.4.1.

5.4.4.3 Temperature cycle

Test method: IEC 61300-2-22

Test condition: a) High temperature: 65°C

b) Low temperature: -10°C

c) Maintain at each temperature: 60min

d) Rise and fall of temperature: 1 °C/min

e) Number of temperature cycles: 5

f) Initial measurement: Insertion loss and reflection loss

g) Final measurement: Insertion loss, reflection loss and mechanical damages

Requirements: a) Insertion loss: Less than 1.2 dB for the final measurement after the test

b) Reflection loss: Reflection loss shall satisfy 5.4.2.2.

c) Mechanical damages: Mechanical damages shall satisfy 5.4.1.

5.5 Indication An indication shall be made to identify the polymer material used for the optical connector at the connector or on the optical board near the connector.

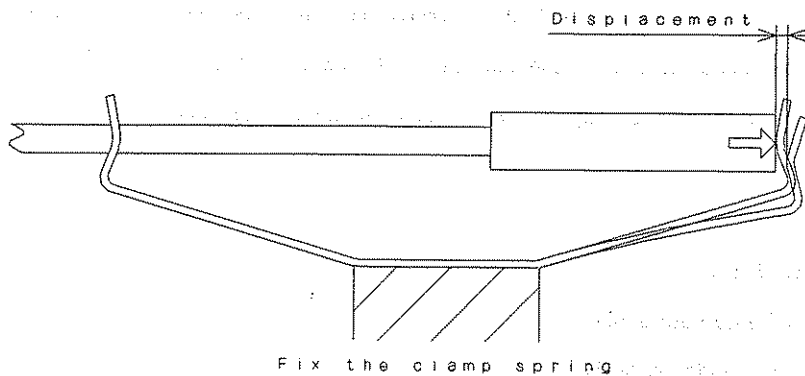
6. Test methods

6.1 Pressing force of the clamp spring

a) **Equipment** The equipment used in this test is a testing machine or a gauge that is capable to perform the test stated in c).

b) **Preparation** Prepare a gauge that can be fitted to the clamp spring under test from the direction of the arrow.

c) **Test** Apply a tensile to the block to push up the clamp spring. The clamping force shall satisfies the specification given in 5.4.3.4 at a displacement of 0,4 mm.



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Date of issue: April 2005

Publishing Office: Japan Printed Circuit Association

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