No. SPC3-10706(4)

Messrs. Fujikura Fiber Optics Vietnam Ltd.

Purchase specification

Product Name	: Cezanne Reflection Monitor
Maker Model	: FLU-2200-W-01-RM
FA Number	: FA004917

Signature on the receipt

TungDD-10745
6th-Sep-2024

Development Department		
Approved by	Reviewed by	Prepared by
堀本	三室	毛利

Revision History

Rev.	Clause	Revised Contents	Reasons	Date(y/m/d)	Prepared by
1	-	Original	Initial Input	2023/9/19	S. Namiki
2	5	Removed signal loss specification	By review. This is difficult to measure and Because the design can be guaranteed based on the materials alone.	2023/10/4	S. Namiki
2	12, 13	Removed signal loss specification	Same as above	2023/10/4	S. Namiki
2	13	FBG transmission loss fixed at C=20.9 dB	By review. FBG specifications	2023/10/4	S. Namiki
2	2	Fixed serial number requirements	By review. To clarify the requirements for SN format	2023/10/4	S. Namiki
2	8	Added explanation of storage period	for clarification	2023/10/4	S. Namiki
2	9	Replacing the diagram Number of coupler resin fixing points: 2->3 Fixed fiber measurement start point	Mistake in description	2023/12/21	S. Namiki
2	9	Change in fiber length specifications. Lg2: “<400” -> “<370”	Specification revision	2023/12/21	S. Namiki
3	Cover Sec.2	FA004947 was deleted and unified to FA004917.	Change management with FA number revision	2024/04/26	S.Namiki
3	Sec.2	Define the configuration of FA004917-002	For version control	2024/04/26	S.Namiki
3	Sec4	Delete unnecessary FA numbers (CMS6:FA004954)	To be discontinued	2024/04/26	S.Namiki
4	Sec.2	Define the configuration of Rev 003	For version control. FA004924 rev change due to rev change	2024/08/01	T.Mouri

1. Scope of application

This specification describes the required specifications for purchased products, and applies to the products shown in Section 2 "Components".

2. Components

The components to which this specification applies are shown in Table 2-1.

Table 2-1. Product code and Optical Components type

Product name	Cezanne Reflection Monitor
Maker Model	FLU-2200-W-01-RM
FA Number	FA004917
FA Rev.	3
BOM	DSN2-11585
Description	Designated material supplier - PLT: FUJIIMPULSE

3. Reference

Reference documents list is shown in Table 3-1.

Table. 3-1.Reference document list

No.	Number	Document	Description.
1	SPC3-10711	Requirement for quality assurance for fiber laser products	・Quality assurance ・Monitoring competence and performance ・Precautions for special process work ・Precautions for manufacturing
2	SPC3-10712	Requirement for consignment manufacturing	・Scope of contract ・Supply period ・Defect warranty liability ・Safety requirements ・Observance of delivery date ・Process change (4M change) ・Restrictions on sales of similar products
3	SPC3-10715	Packing specification of Reflection Monitor	・Packing
4	SPC3-10718	Visual inspection Spec of Fiber Components	・Visual inspection Specification (detail)
5	SPC3-10719	Visual inspection Spec of	・Visual inspection Specification (detail)

		Mechanical Components	
6	SPC3-10720	Requirement for Deliverable data	・Test report format ・Means of sharing deliverable data
7	SPC3-10740	Guidelines for the Management of Chemical Substances Contained in Products	・RoHS Directive Conformity Report ・Compliance Agreement for Management of Chemical Substances Contained in Products

4. Material

Material are specified in Table 4-1.

Table 4-1. Material

Material	Item Code	Qty.	Description
WDM-A Coupler	FN004230	1	630~670/1065~1075&1120~1130nm HPWDM 2*2
TAP Coupler	FN004232	1	1065~1075/1120~1130nm HPWBC 2*2 0.03/99.97
630-HP fiber	FN001222	3.0m	630-HP
Coreless fiber	FN001578	0.7m	RF0.25-S
Sleeve	FN000043	3	FPS01-400-25-01
AlN fiber trace	FN001213	2	DRW3-10298
RTV Resin	FN000051	1.1g	SE-9186 Clear
Silicone resin A	FN000047	0.1g	OE-6520A
Silicone resin B	FN000048	0.1g	OE-6520B
PLT	FN005393	1	DRW3-12622
FBG	FA003692	1	SPC2-10263
CMS	FA004924	1	FLU-CMS6 Assy(ForC05)
TAG-TAPE	***	**	SPK18W-50

Note: The Quantity of resin/fiber is a reference value.

5. Optical specification

Requirement of optical test conditions & specifications are specified in Table 5-1.

Table 5-1. Requirement of Optical specification

Item	Port	unit	Specification			Comment
			Min		Max	
Insertion Loss @ Red WL	LD->IN	dB			3.2	λ:650±20nm, [1]
Insertion Loss @ Signal WL	IN->PD	dB	52.4			λ:1065-1080nm[2]
Insertion Loss @ Raman WL	IN->PD	dB	31.5		36.7	λ:1120-1135 nm
Return Loss	IN	dB	50.0			λ:1065-1080nm, [4]

[1] Transcribe the values from the coupler's inspection report.

[2] Calculated from the sum of the values in the coupler and FBG inspection report.

[4] Design guarantee

6. General specification

Requirement of General specification are specified in Table 6-1 and Table 6-2.

Table 6-1. Tensile strength & Reinforcement tension

Item	unit	Specification			Conditions
		Min	typ.	Max	
Tensile strength of fusion splicing point G1	gf	400			Guaranteed by proofing before reinforcement
Tensile strength of fusion splicing point G2	gf	400			Guaranteed by proofing before reinforcement
Reinforcement tension of fusion splicing point G1	gf	36	40	44	
Reinforcement tension of fusion splicing point G2	gf	36	40	44	

Table 6-2. Minimum fiber bending radius

Fiber	unit	Specification			Conditions
		Min	typ.	Max	
630-HP fiber	mm	20	25		
Coreless fiber	mm	15			
Other fiber	mm	30			

7. Visual specifications

Requirement of Visual specification are specified in Table 7-1.

See SPC3-10718 and SPC3-10719 for detailed specifications.

Table 7-1. Visual specification

Item	unit	Specification	Comment
Appearance of fiber coating	-	No scratches or peeling	[2]
Housing Appearance	-	No dents, scratches or chips	
Fixing direction of individual optical components	-	Conform to structural specifications	
Reinforced structural resin appearance	-	No cracks, wrinkles or debris adherence.	

[2] Stipulated in separate appearance inspection standards

8. Environmental specifications

Requirement of Environmental specification are specified in Table 8-1 and Table 8-2. Absolute humidity depends on temperature and relative humidity RH as shown in Fig.8.

Table 8-1. Optical inspection condition

Item	unit	Specification			Comment
		Min	typ.	Max	
Room temperature	℃	20.0		30.0	
Humidity	%	10		90	
Humidity	%	No condensation			

Table 8-2. Storage conditions

Item	unit	Specification			Comment
		Min	typ.	Max	
Room temperature	℃	5.0		55.0	
Absolute humidity	g/m^3			29.0	
Humidity	%			90	
Humidity	%	No condensation			
Storage period	Month			12	Period from inspection date to shipping date. [1]

[1] If the deadline has passed, the test results will be invalidated. Re-examination is required.

Absolute humidity Simplified chart

[RedCells: > 29g/m^3]

Relative humidity [%] \ Temperature (°C)	0	5	10	15	20	22	24	26	28	30	32	34	36	38	40	45	50	55
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.2	0.3	0.5	0.6	0.9	1.0	1.1	1.2	1.4	1.5	1.7	1.9	2.1	2.3	2.6	3.3	4.1	5.2
10	0.5	0.7	0.9	1.3	1.7	1.9	2.2	2.4	2.7	3.0	3.4	3.8	4.2	4.6	5.1	6.5	8.3	10.4
15	0.7	1.0	1.4	1.9	2.6	2.9	3.3	3.7	4.1	4.5	5.1	5.6	6.2	6.9	7.7	9.8	12.4	15.6
20	1.0	1.4	1.9	2.6	3.5	3.9	4.4	4.9	5.4	6.1	6.8	7.5	8.3	9.2	10.2	13.0	16.5	20.8
25	1.2	1.7	2.3	3.2	4.3	4.9	5.4	6.1	6.8	7.6	8.4	9.4	10.4	11.5	12.8	16.3	20.7	26.0
30	1.5	2.0	2.8	3.8	5.2	5.8	6.5	7.3	8.2	9.1	10.1	11.3	12.5	13.8	15.3	19.6	24.8	31.2
35	1.7	2.4	3.3	4.5	6.0	6.8	7.6	8.5	9.5	10.6	11.8	13.1	14.6	16.1	17.9	22.8	28.9	36.4
40	1.9	2.7	3.8	5.1	6.9	7.8	8.7	9.7	10.9	12.1	13.5	15.0	16.7	18.4	20.4	26.1	33.1	41.6
45	2.2	3.1	4.2	5.8	7.8	8.7	9.8	11.0	12.2	13.6	15.2	16.9	18.7	20.8	23.0	29.4	37.2	46.8
50	2.4	3.4	4.7	6.4	8.6	9.7	10.9	12.2	13.6	15.2	16.9	18.8	20.8	23.1	25.5	32.6	41.3	52.0
55	2.7	3.7	5.2	7.1	9.5	10.7	12.0	13.4	15.0	16.7	18.6	20.6	22.9	25.4	28.1	35.9	45.5	57.2
60	2.9	4.1	5.6	7.7	10.4	11.6	13.1	14.6	16.3	18.2	20.3	22.5	25.0	27.7	30.6	39.1	49.6	62.4
65	3.1	4.4	6.1	8.3	11.2	12.6	14.1	15.8	17.7	19.7	21.9	24.4	27.1	30.0	33.2	42.4	53.7	67.6
70	3.4	4.8	6.6	9.0	12.1	13.6	15.2	17.0	19.0	21.2	23.6	26.3	29.1	32.3	35.7	45.7	57.9	72.8
75	3.6	5.1	7.0	9.6	13.0	14.6	16.3	18.3	20.4	22.7	25.3	28.1	31.2	34.6	38.3	48.9	62.0	78.0
80	3.9	5.4	7.5	10.3	13.8	15.5	17.4	19.5	21.8	24.3	27.0	30.0	33.3	36.9	40.8	52.2	66.2	83.1
85	4.1	5.8	8.0	10.9	14.7	16.5	18.5	20.7	23.1	25.8	28.7	31.9	35.4	39.2	43.4	55.5	70.3	88.3
90	4.4	6.1	8.5	11.5	15.5	17.5	19.6	21.9	24.5	27.3	30.4	33.8	37.5	41.5	45.9	58.7	74.4	93.5
95	4.6	6.5	8.9	12.2	16.4	18.4	20.7	23.1	25.8	28.8	32.1	35.6	39.5	43.8	48.5	62.0	78.6	98.7
100	4.8	6.8	9.4	12.8	17.3	19.4	21.8	24.3	27.2	30.3	33.8	37.5	41.6	46.1	51.0	65.2	82.7	####

Fig 8. Absolute humidity Simple chart

9. Dimensional and structural specifications

9-1. Parts layout and Parts dimensions.

Parts layout is shown in Fig 9-1 and Table 9-1.

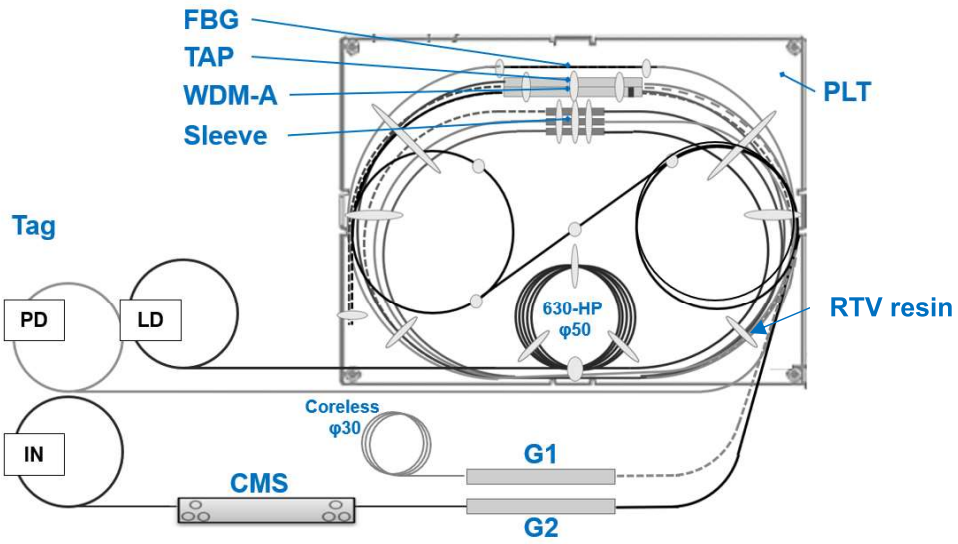


Fig 9-1. Parts layout

Table 9-1. Parts dimensions.

Item	unit	Dimension	Description
PLT	mm	200.0 * 150.0 * 3	Plate size
G1	mm	67.0 * 3.0 * 2.0	AlN fiber trace size
G2	mm	67.0 * 3.0 * 2.0	AlN fiber trace size
CMS	mm	82.0 * 11.7 * 7.0	CMS Enclosure size
630-HP fiber Mode filter	mm	Φ45-55, 5turn	Mode filter Diameter & number of Turns
Coreless fiber Mode filter	mm	Φ30-35, 3turn	Mode filter Diameter & number of Turns

9-2. Input/output fiber length

Fiber length of each port is shown in Fig 9-2 and Table 9-2.

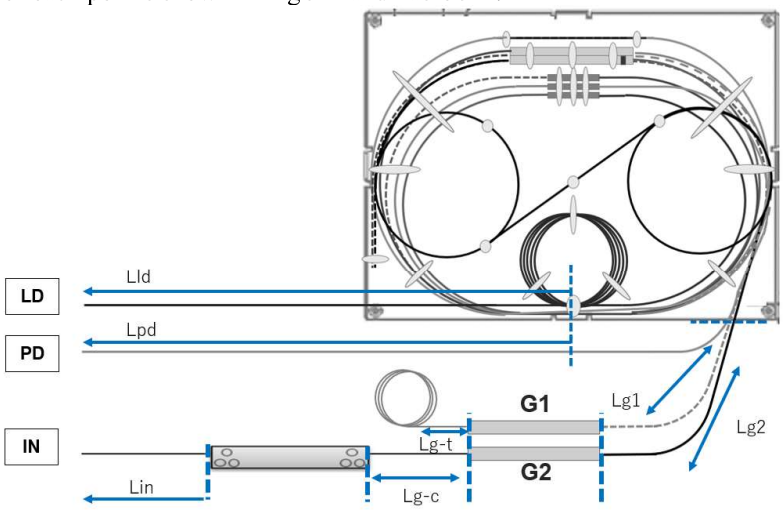


Fig 9-2. Dimension of Fiber Ports

Table 9-2. Dimension of Fiber Ports

Item	unit	Dimension	Port	Description
Lpd	mm	>750	PD	PD port fiber length
Lld	mm	>750	LD	LD port fiber length
Lin	mm	>1000	IN	IN port fiber length
Lg1	mm	>400	-	Fiber length between G1 and PLT
Lg2	mm	>370	-	Fiber length between G2 and PLT
Lg-t	mm	typ.200	-	Fiber length between G1 and Turn
Lg-c	mm	1900+100/-100	-	Fiber length between G2 and CMS

10. Optical circuit diagram

Optical circuit diagram is shown in Fig 10-1.

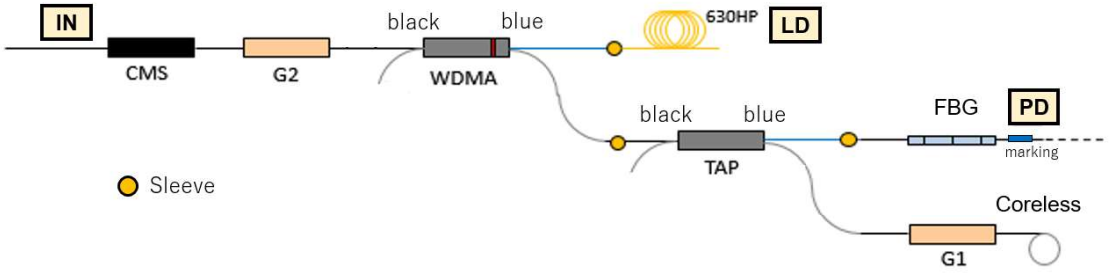


Fig 10-1. Optical circuit diagram

11. Dimensional and structure of individual components

11-1. Reinforcement structure

Optical circuit diagram is shown in Fig 11-1, Fig 11-2 and Fig 11-3.

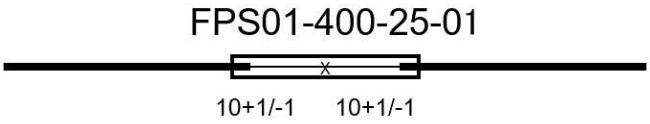


Fig 11-1. Reinforcement structure of Sleeve

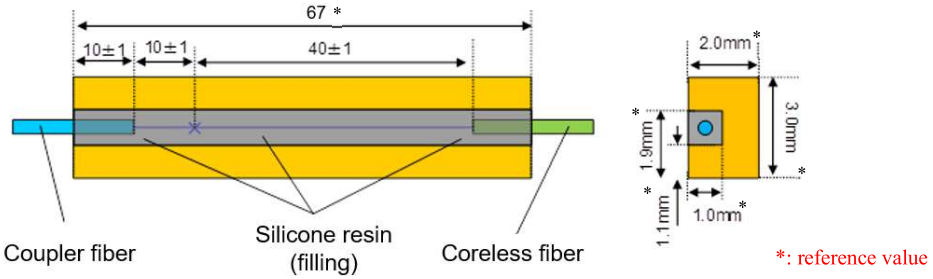


Fig 11-2. Reinforcement structure of G1

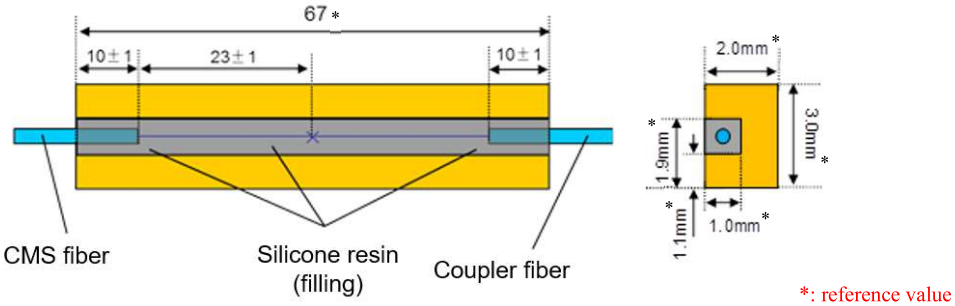


Fig 11-3. Reinforcement structure of G2

11-2. Unnecessary port termination

Unused ports of the coupler are terminated with scissor cuts. It is illustrated graphically in Fig 11-4.

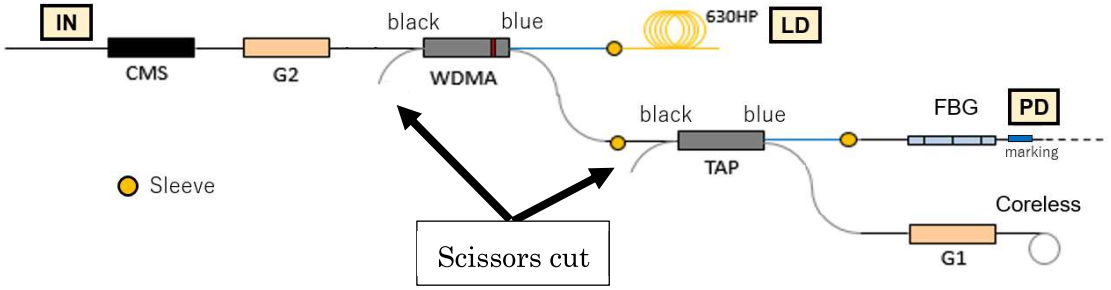


Fig 11-4. Scissors cut point

12. Inspection

Inspection items and inspection methods are shown in Table 12-1.

All items shall be inspected.

See Section 13 ‘Inspection method’ for inspection methods and definitions of specific items.

Table 12-1. Inspection Item

	Item	Port	unit	Note
Optical	Insertion Loss @ Red WL	LD->IN	dB	Posting value
	Insertion Loss @ Signal WL	IN->PD	dB	Calculated value
	Insertion Loss @ Raman WL	IN->PD	dB	Measured value
Dimensions	Fiber length : Lpd		mm	Pass/Fail
	Fiber length : Lld		mm	Pass/Fail
	Fiber length : Lin		mm	Pass/Fail
	Fiber length : Lg1		mm	Pass/Fail
	Fiber length : Lg2		mm	Pass/Fail
	Fiber length : Lg-t		mm	Pass/Fail
	Fiber length : Lg-c		mm	Pass/Fail
Visual	Appearance of fiber coating		-	Pass/Fail
	Tagging			Pass/Fail
	Housing Appearance		-	Pass/Fail
	Fixing direction of individual optical components		-	Pass/Fail
	Reinforced structural resin appearance		-	Pass/Fail

13. Inspection Method

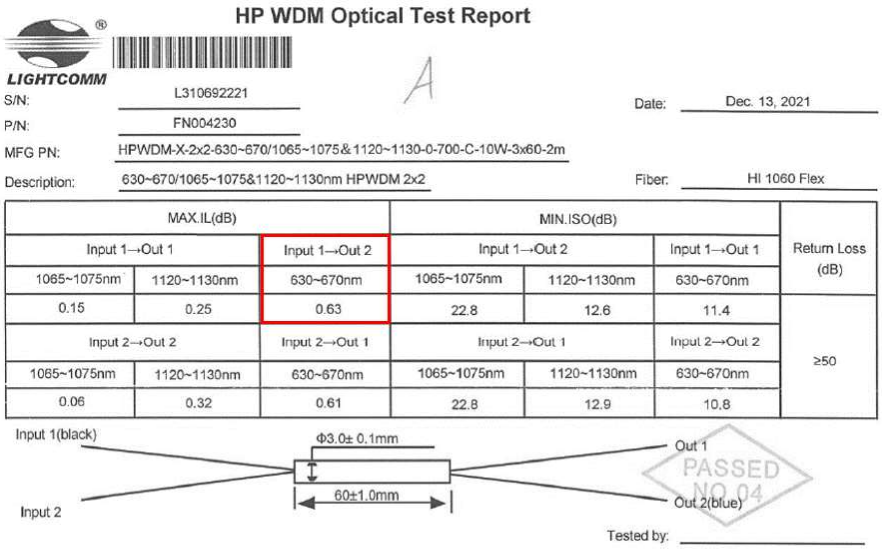
13-1. Insertion Loss @ Red WL (Port: LD->IN)

It is calculated as follows from the inspection data of each part.

Value = A

A: Transcribe the value of Insertion loss at 630-670nm of Input1->Out2 of WDM-A coupler.

A description example is shown in Fig 13-1.



HP WDM Optical Test Report

LIGHTCOMM

S/N: L310692221 A Date: Dec. 13, 2021

P/N: FN004230

MFG PN: HPWDM-X-2x2-630~670/1065~1075&1120~1130-0-700-C-10W-3x60-2m

Description: 630~670/1065~1075&1120~1130nm HPWDM 2x2 Fiber: HI 1060 Flex

MAX.IL(dB)			MIN.ISO(dB)			Return Loss (dB)
Input 1→Out 1		Input 1→Out 2	Input 1→Out 2		Input 1→Out 1	
1065~1075nm	1120~1130nm	630~670nm	1065~1075nm	1120~1130nm	630~670nm	
0.15	0.25	0.63	22.8	12.6	11.4	≥50
Input 2→Out 2		Input 2→Out 1	Input 2→Out 1		Input 2→Out 2	
1065~1075nm	1120~1130nm	630~670nm	1065~1075nm	1120~1130nm	630~670nm	
0.06	0.32	0.61	22.8	12.9	10.8	

Tested by:

Fig 13-1. Example of WDM-A Test Report

13-2. Insertion Loss @ Signal WL (Port: IN->PD)

It is calculated as follows from the inspection data of each part.

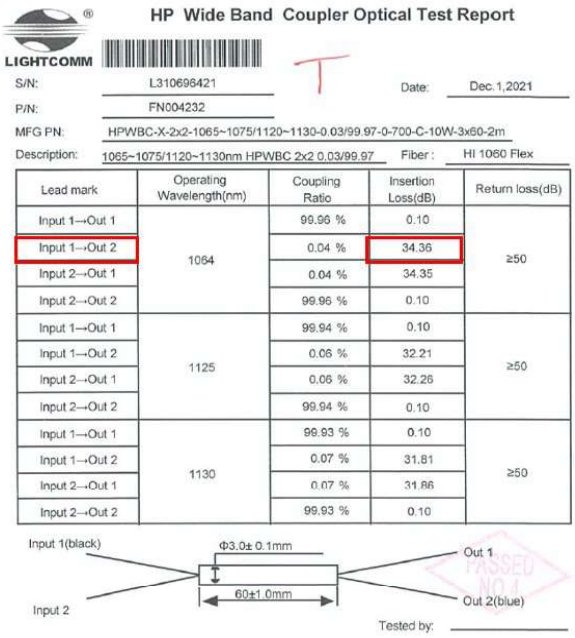
Value = B + C (C=20.9dB)

B: Transcribe the value of Insertion loss at 1064 nm of Input1->Out2 of TAP coupler.

A description example is shown in Fig.13-2.

C: Transcribe the value of Core minimum transmission loss @ FBG.

The value of C is fixed at 20.9dB.



HP Wide Band Coupler Optical Test Report

LIGHTCOMM

S/N: L310698421 Date: Dec.1,2021

P/N: FN004232

MFG PN: HPWBC-X-2x2-1065~1075/1120~1130-0.03/99.97-0-700-C-10W-3x60-2m

Description: 1065~1075/1120~1130nm HPWBC 2x2 0.03/99.97 Fiber: HI 1060 Flex

Lead mark	Operating Wavelength(nm)	Coupling Ratio	Insertion Loss(dB)	Return loss(dB)
Input 1→Out 1	1064	99.96 %	0.10	≥50
Input 1→Out 2		0.04 %	34.36	
Input 2→Out 1		0.04 %	34.35	
Input 2→Out 2		99.96 %	0.10	
Input 1→Out 1	1125	99.94 %	0.10	≥50
Input 1→Out 2		0.06 %	32.21	
Input 2→Out 1		0.06 %	32.26	
Input 2→Out 2		99.94 %	0.10	
Input 1→Out 1	1130	99.93 %	0.10	≥50
Input 1→Out 2		0.07 %	31.81	
Input 2→Out 1		0.07 %	31.86	
Input 2→Out 2		99.93 %	0.10	

Fig 13-2. Example of TAP Coupler Test Report

13-3. Insertion Loss @ Raman WL

Measured by the cutback method.

Value [dB] = - P2_pd + P1

・Definition of P2_pd

Connect a Raman wavelength LD light source to the IN-port and acquire the measured value at the PD-port.

・Definition of P1

Measure the input light intensity of the light source, including the fusion point of the connection point of the light source and IN-port.

・Light source wavelength

1120-1135nm.

14. Electronic test report format

SPC3-10720-*** Requirement for Deliverable data.

15. Packing

SPC3-10715-*** Packing specification of Reflection monitor