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ADM No. VN-23-016

Messrs. Fujikura Fiber Optics Vietnam Ltd.

Purchase specification

Product Name : 1085 nm 45dB Tap coupler

Product Type : CPL-TAP-1085-45dB-FL-1



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Revision History					
Rev.	Clause	Revised Contents	Reasons	Date (y/m/d)	Prepared by
1	--	--	-Original issue	2009/04/23	H. Fujimoto
2		Change measurement format	-program is changed	2009/8/20	K.Ohara
3	5-3 7-1. 7-2. Table. 3-5-1 Table. 3-5- 2 Table3-5-3 Table. 5-2-1 Pr-2-2. & Fig Pr2-2-1 Fig. Pr-3-2-1 Fig4-1-1 Fig. 4-1-1 Table Pr-8-2-1. TablePr-10-1-1. Fig. Pr-10-1-1 Pr-11-3-1	Term of reliability Assurance is changed Term of traceability is changed Change sampling inspection of return loss Add to sheet of sampling inspection of return loss Data format changes Fiber length changes Fiber length changes Add to sampling inspection of return loss Data format changes Flow change Fiber length changes Fiber length changes Fiber length changes Fiber length changes	Error correct Error correct Result of initial production control Result of initial production control FJK request Lsp isn't need. Lsp isn't need. FJK request Lsp isn't need. Lsp isn't need. Lsp isn't need. Lsp isn't need.	2009/10/20	K.Ohara
4	3-4. Pr-5-3.	Material change 1222B into KE-4896-T Width of stage changed 50.0 +/- 0.2 mm --> 50+/- 0.5mm	1222B is discontinued product. Refer to AOR81-59-09-0003 Specification relaxed	2010/1/11	K.Ohara
5	5-2 5-3. Fig. 4-1-1	Deliverable data format add E-mail address correct FJK inspection deletes	Change direct shipping Change direct shipping Change direct shipping	2010/03/12	K.Ohara H. Fujimoto
6	Table3-4-1 Pr-2-1 Table3-4-1 Pr-6-1,8-1 5-3. 7-3. Pr-6-1 Fig. Pr-7-3-3 Fig. Pr-7-3-4 Fig. Pr-12-1 Fig. Pr-12-3-2 Fig. Pr-12-3-6 Fig. Pr-12-3-7	Add Air-bubble bag 8700-7->8700-7W Change Documentnumber of marking pen KSP->AOP Modify E-mail address list Add details 1221B-->KE-4896-T Cancel KE-4896-T Change box size Add Air-bubble bag Add Air-bubble bag Delete box size Delete box size	FOV request Error correct Numbering system was changed. Contents were not changed. change PIC Error correct Error correct Unify to same structure(on FLC) FOV request FOV request FOV request FOV can know it from Pr-12-1. FOV can know it from Pr-12-1.	2013/2/28	K.Kuniyasu

Revision History					
Rev.	Clause	Revised Contents	Resons	Date (y/m/d)	Prepared by
7	Table3-4-1 Pr-2, Pr-3 5.2, 5.3 Table. 5-2-1, 4 Fig. Pr-7-2-3 Fig. Pr-7-3-1 Fig. Pr-11-2-2 Pr-10 Fig. Pr-7-3-4 Fig. Pr-8-2-1 Fig. Pr-10-1-1	Add D resin LMF Add Purple marking pen Shipping data Serial number Modify of resin flow length	Change of UV coat resin of LMF Change of fiber mark from Green to Purple Change of sending method of deliverable data Unification of deliverable data format Application to D resin LMF To make clear	2015/4/3	T. Arai
8	Fig. Pr-12-3-6	Change the number of Max Blocks	FJK request	2016/7/25	M.Kayahara
9	Fig.Pr-7-3-1 Fig.Pr-7-2-3 Fig.Pr-7-3-4 Fig.Pr-8-2-1 Fig.Pr-10-1-1 Pr-10-1 table Fig.Pr-11-2-2 Fig.Pr-11-3-1	Change SUS Pipe Marking Contents	FJK request	2016/8/11	M.Kayahara
10	Table. 3-5-2 Table. 3-5-2 Pr-2-2 Pr-3-3 Pr-9-1 Pr-9-2 Table. Pr-6-2-1 4-2 Fig. 4-1-1 Pr-13 Fig. Pr-9-2-1 Table 3-4-1 Fig. 4-1-1 Pr-2-1 Pr-2-2 Pr-4-2 Table. Pr-5-2 Table. Pr-5-3 Pr-5-3-2 Pr-5-3-3 Pr-5-3-4 Fig. Pr-7-2-1 Table Pr-10-1-1, Table/Fig Pr-8-2-1 Fig. Pr-11-2-2 Fig. Pr-12-3-6 Fig. Pr-2-2-1 Pr-12-1 Fig. Pr-12-3-7	Change RL specification, add new *5) about sampling frequency Remove *5), *6) Change Fiber Length Specification Change Swelling time for UV coat removal Specification Change Recorded Temperature @85+/-2 deg C => @85+/-4 deg C @-40+/-2 deg C => @-40+/-4 deg C Remove below contents - Max input quantity of CPL per one time - Max quantity per 1 shelf board Change structure Add Heat treatment Change lowest temperature Add Marking pen Change process flow Add EK-50 Add comment "~ reference only" Change tension to 1.8 ~ 2.2kg Change Frequency Change specification of Width of Stage as 55+/-0.5mm Change specification of Gap between Torch and Fiber as 6.5+/-0.5mm Change Frequency, Control Method Add comment "~ reference only" Add comment "~ reference only" Change specifcaiton of Lc Change barcode format Add inner carton box label Add comment Add Impact Label (75G) Change description	PTE81-59-20-0031, PTE81-59-21-0002 PTE82-59-21-0001 PTE82-59-21-0002 PTE82-59-21-0003 AOR81-59-16-0015 PTE81-59-21-0012 4-Pr-007-4-FO-001-4-RC-0732 PTE81-59-21-0012 To make clear 4-PR-007-4-FO-001-4-RC-0972 Relaxation by FJK 9-PR-008-9-FO-002-4-RC-0104 Relaxation by FJK To make clear To make clear To unify with other Coupler product Error correction PTE81-59-22-0001 To make clear 4-Pr-007-4-Fo-0007-9-RC-0058	2023/9/4	T.Yokoo

1. Introduction

This specification covers the requirements for manufacturing couplers for fiber laser module.
This specification is for 1085nm 45dB Tap coupler and applied to the manufacturing process in Fujikura Fiber Optics Vietnam Ltd.

2. Product Outline

Table. 2-1

Product name	1085nm 45dB Tap coupler
Product code (Product type)	CPL-Tap-1085-45dB-FL-1
Application	Fiber laser

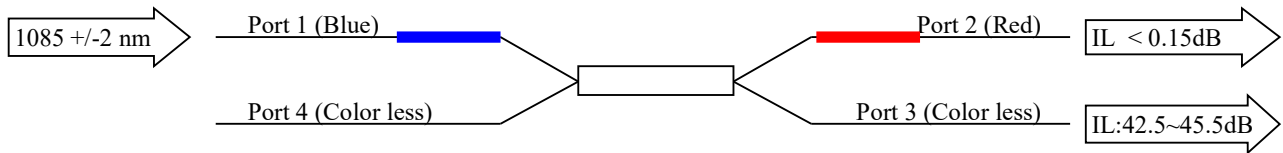



Fig. 2-1

3. Specifications

3-1. Environmental specification

Table. 3-1-1. Environmental Specifications

Parameter	Unit	min	Max	Remarks
Operating Temperature	degC	0	65	
Operating Humidity	%RH	0	85	
Storage Temperature	degC	-20	65	
Storage Humidity	%RH	0	85	
Vibration	G		20	
	Hz	10	2000	
Bump	G		500	
	Times		5	
	Direction		3	
Drop	cm	4.8	5.2	 Fixed direction is different from submerged coupler's.
	times	50		

3-2. Appearance

There should be no damage, scratch, inky, grime and dirt on the finished products when visually checked.

3-3. Dimensions

The dimensions are specified in "Pr-10. Final Appearance".

3-4. Materials

The materials are specified in Table. 3-4-1.

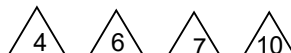


Table 3-4-1. Material list

Name	Description	Remarks
Fiber	SM fiber for 0.98/1.55 WDM coupler(LMF)	AOP86-0002-25-01
Neoceram	2.0-435(8-6)/*	AOP82-5021-26-01
UV resin	8700-7W	
Elastic resin D	KE-4896-T	AOP81-6001-31-18
UV elastic resin	Loctite 5091	
FEP ultra thin tube	NFL021	
SUS pipe	SUS pipe CPL-Tap-1085-45dB-FL-1	AOP82-2017-40-03 Type-30-500 Laser printed
Marking Pen	K-50 or EK-50 Blue K-50 or EK-50 Black K-50 or EK-50 Yellow K-50 or EK-50 Red K-50 or EK-50 Purple	AOP81-5013-31-01
Inner package	Naname Pack	
Sponge for inner package		for Inner package
Shock Watch	L-35	For Outer Carton Box
Cushioning material	Air-Bubble sheet/Air-Bubble bag	
	Packing foam chip	

3-5. Optical specification

The optical specifications customer required are specified in Table. 3-5-1.

The deliverable data & measurement conditions are specified in Table.3-5-2.

3-6. Measurement uncertainty

The measurement uncertainty is shown in Table. 3-6-1. [TBD]

You are responsible to demonstrate these values and maintain the calibration of its measurement instrumentation.

The limits in the present specification are absolute and do not take account of measurement uncertainty.

The limits will be indented by this uncertainty to ensure that product meets specification.

4. Process

4-1. General

The process flow outline is shown in Fig. 4-1-1.

The operators in charge of special process have to pass the qualification test.

The minimum requirements of each process are shown below.

These requirements are not sufficient condition, just minimum condition.

4-2. Requirement of Each Process

- | | | | |
|----------------|-------------------------|--|---------------------|
| Pr- 1. | Materials | | |
| Pr- 2. | Fiber cutting & Marking | | |
| Pr- 13. | Heat treatment | | |
| Pr- 3. | UV removal | | [Special Process] |
| Pr- 4. | Proof Test | | [Special Process] |
| Pr- 5. | Fusion & Elongation | | [Special Process] |
| Pr- 6. | Neoceram Packing | | [Special Process] |
| Pr- 7. | SUS Packing | | |
| Pr- 8. | Fiber coloring | | |
| Pr- 9. | Temperature Cycling 24H | | |
| Pr-10. | Final appearance | | |
| Pr-11. | Casing | | |
| Pr-12. | Packing | | |

5. Shipping requirement

5-1. Packing

The minimum requirements of packing are shown in "Pr-12. Packing".

5-2. Deliverable Data



The deliverable data format for FJK and Customer is specified in Table. 5-2-1 ~ 3.

The deliverable data has to be uploaded to FTP server (IP: 10.16.248.4) on the same day of shipping.

6. Build standard control & Key documents

6-1. Build Standard control

Any part of the device, fabrication and testing procedure, either listed in the Key Document List, cannot be changed without prior written consent from Fujikura.

Any major change in the build standard must be discussed at least six months prior to its intended implementation. If the changes will involve changes in external parts, such as fiber pigtail, package dimensions, etc., the FOV will supply samples of the new part at least 6 months in advance.

The FOV is responsible to fulfill orders (at the current shipping rate) without any changes for six months following the notification of the intended change in the build standard.

6-2. Key Document List

The FOV shall list, in the Quality Plan, all specifications used during the manufacture and inspection of couplers for Fujikura showing quality control points during the total manufacturing process.

These shall include as a minimum: manufacturing/assembly operations; inspections; component testing; device ageing and screening.

The FOV shall generate, with Fujikura, a list of documents that are mutually agreed to be key document list .

These documents may not be changed or deviated from without the written consent of Fujikura, with the exception of editorial changes, which may be performed at the manufacturer's discretion.

The issue level of all key documents shall be reviewed during bill of document reviews.

7. QUALITY ASSURANCE REQUIREMENTS

7-1. Reliability Assurance

Systems installed by our customer are required to operate for periods of ten years with the absolute minimum of repair or maintenance.

A failure is a device whose Insertion Loss shift outside the limits given in the optical specification section, at any time during its 15 years life.



7-2. Traceability

Fujikura shall have access to all piece parts and process control records, individual measurements, failure rate predictions, failure analysis reports and other documentation relevant to the Qualification Approval and Acceptance of all products used in, or considered for use in, Fiber Laser Systems.

All the measurements data, screening, and predictions relevant to the parameters listed in this specification must be archived by the FOV and available for inspections for 15 years from the date of shipment.



The following table defines a minimum set of records:

Manufacturing records and Process control data
Traceability of raw materials and parts
History of 4M changes
Software/Program revision history
All audits carried out by the FOV on their own processes and those of their sub-contractors, plus records of all corrective actions resulting from audits, whether carried out internally or by external parties.
Test and measurements results
Failure analysis reports
Life test and qualification data
Screening results and predictions

7-3. Drop Test

Frequency: 1 product/week • machine

Number of drop: 50 times/test

Dropping height: 5.0+/-0.2cm



7-4. Case of passed troubles

FOV has to prepare the cases of passed troubles about coupler production.

And when FOV accepts new persons (engineers, operators, staffs), they have to be educated with the cases of passed troubles.

△
3

Table. 3-5-1 Customer required Optical specification

Item	Port	Specification (dB)		Wavelength (nm)	
		(min)	(Max)		
Insertion loss (IL)	Port 1 -> 2	< 0.15		1083 ~ 1087	
	Port 1 -> 3	42.50	< 45.50	1083 ~ 1087	
Return Loss	Port 1	48.0	<	980	*1)

*1) ; Sampling inspection

△ 3 △ 10

Table. 3-5-2 Deliverable data for Customer & specification

Item	Port	Specification (dB)		Wavelength (nm)	Remark
		(min)	(Max)		
Insertion loss (IL)	Port 1 -> 2	< 0.15		1080	*1, 2)
	Port 1 -> 3	43.50	< 45.50	1080	*1, 2)
Return Loss (RL)	Port 1	50.0	<	980	*1, 4)

*1) : Measurement temperature ; room temperature(20-30℃)

*2) : Measurement with 1080nmSMLD & Optical power meter

*3) : Sampling inspection ; Refer to Table.3-5-3 Sampling condition of Return loss

*4) : Sampling frequency : 1pc/shipping day

△
3

Table.3-5-3 Sampling condition of Return loss

Condition	Sampling number	Remark
Elongation condition change (H2 flow ,O2 flow , Velocity of clamp ,Velocity of torch)	3	
Lot of fiber changes	3	When lot of fiber changes,you measure related type which uses new lot fiber
Elongation system change (Torch , clamp change)	3	When elongation system changes, you measure related type which uses new system

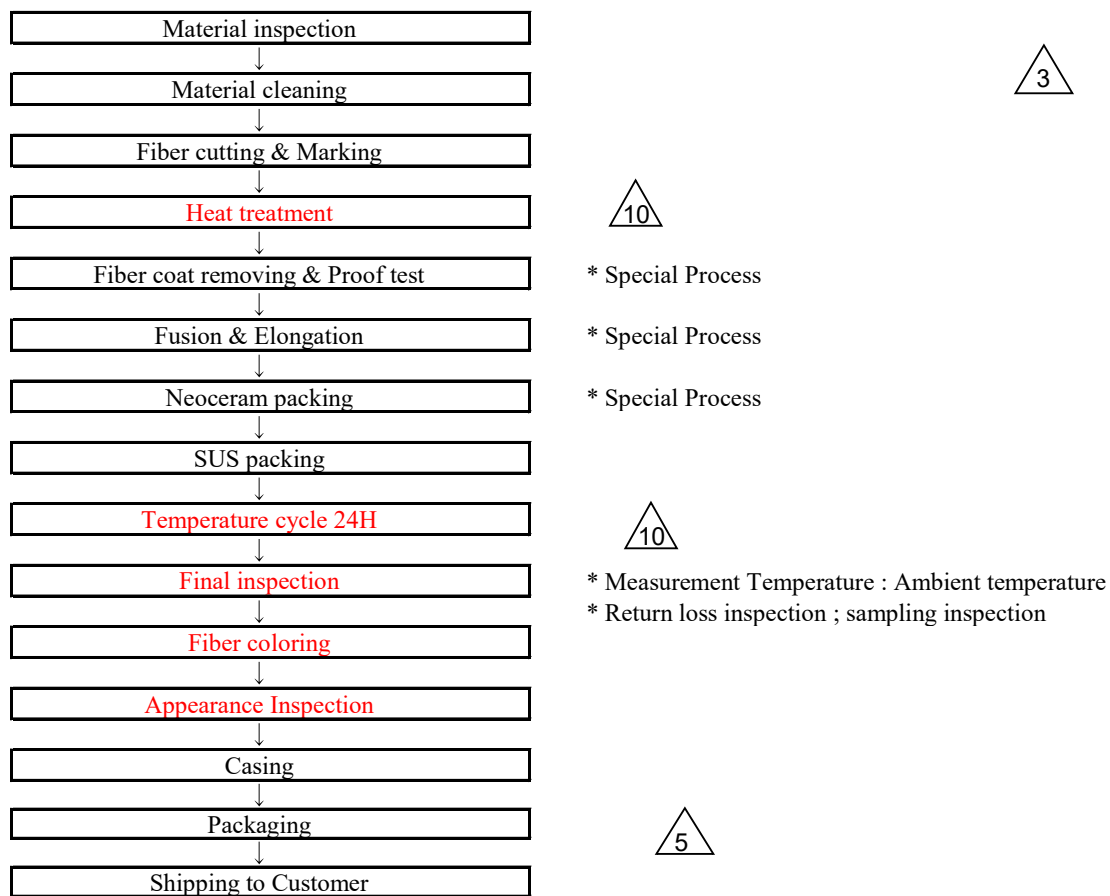


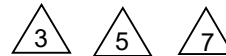
Fig. 4-1-1 Process Flow Outline



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AOP82-2017-27-03 (10)

Deliverable data file format Type 1



File format : Microsoft Excel (Excel 2000 Book : ".xls")

*Remarks ; If you found defect (UV coat deforming ,cracks etc), you judge it as OK.
You write content of judge in Remarks of test data.

Table. 5-2-1 Deliverable data

	A	B	C	D	E	F	G	H	I	J	K
1	No	CPL Name	SUS pipe No	Fiber Lot No	PO	Spec	Shipping date	Remarks			
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											

Shipping Date Format : yyyy/mm/dd

Fujikura



Deliverable data file format Type 2

File format : Microsoft Excel (Excel 2000 Book : ".xls")

File Name : [CPL No]+".xls"

Table. 5-2-2 Measurement Data 2

	A	B	C	D	E	F	G	H	I	J	K
1	CPL No	[CPL No]						Program Version	[Program Ver]		
2			first	second	third	forth					
3		P2	[P2 1st]	[P2 2nd]	[P2 3rd]	[P2 4th]		IL12[dB]	[IL12]	Judgement	
4		P3	[P3 1st]	[P3 2nd]	[P3 3rd]	[P3 4th]		IL13[dB]	[IL13]	Judgement	
5		P0	[P0 1st]	[P0 2nd]	[P0 3rd]	[P0 4th]		EcLoss[dB]	[Excess loss]		
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											



Deliverable data file format Type 3

File format : Microsoft Excel (Excel 2000 Book : ".xls")
File Name : [CPL No]+".xls"

Table. 5-2-3 Measurement Data 3

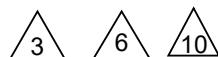
	A	B	C	D	E	F	G	H	I	J	K	L	M
1	CPL No	[CPL No]						Program Version	[Program Ver]				
2			first	second	third	forth							
3		P2	[P2 1st]	[P2 2nd]	[P2 3rd]	[P2 4th]		IL12[dB]	[IL12]	Judgement	WDM+TAP ref	[Ref]	
4		P3	[P3 1st]	[P3 2nd]	[P3 3rd]	[P3 4th]		IL13[dB]	[IL13]	Judgement	TAP ref	[Ref]	
5		P0	[P0 1st]	[P0 2nd]	[P0 3rd]	[P0 4th]		EcLoss[dB]	[Excess loss]		WDM ref	[Ref]	Judgement
6		Ref	[Ref 1st]	[Ref 2st]	[Ref 3st]	[Ref 4st]							
7													
8													
9													
10													
11													
12													
13													
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15													
16													
17													
18													
19													
20													
21													
22													

Pr-2. Fiber cutting & Marking
Pr-2-1. Material



Material	Remark
Fiber (LMF)	SM fiber for 0.98/1.55 WDM coupler(LMF) AOP86-0002-25-01 acceptance material
Marking Pen	K-50 or EK-50 : Color : Blue, Red, Yellow, Pui AOP81-5013-31-01 acceptance material

Pr-2-2. Quality & Control Item



Item	Specification	Control Method	Frequency	Record	Case of defect
Fiber Lot No	-----	by Test report	ALL	Check Sheet	readjust or scrap readjust the counter number
Fiber Length	Should meet final product requirement	by Counter of fiber length measurement machine			
Coloring	see drawing below Red mark for UV removal point Purple mark for FOV's production Yellow mark for port identification Fig. Pr-2-2-1, -2 <i>*This specification is for reference only</i>	by Counter of fiber length measurement machine			
Appearance	No Damage, No inky	by Visual			readjust or scrap

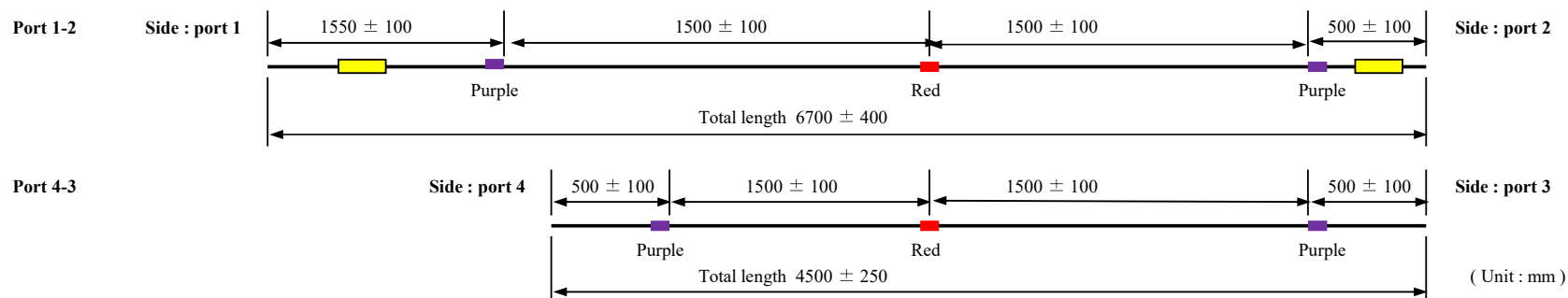


Fig. Pr-2-2-1 Fiber cutting length & Marking position

FOV can adjust fiber cutting length, however Finished Goods must be met the specification of final appearance.

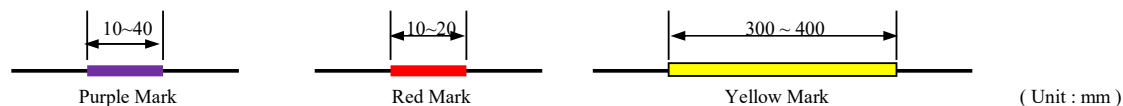


Fig. Pr-2-2-2 Size of Color Marking



Pr-3. UV removal [Special Process]
Pr-3-1. Material

Material	Q'ty	Remark
Fiber (LMF)	1 pair	pass the "Pr-2. Fiber cuttingt & Marking" Cutted & Marked Fibers No Damage
Dusper	Optimum dose	
Alcohol		

Pr-3-2. Quality & Control Item

Item	Specification	Control Method	Frequency	Record	Case of defect
Length of UV coat removal	24 +/- 1 mm	by Ruler	ALL	Check sheet	Scrap Readjust the removal length
Position of UV coat removal	see drawing below Fig. Pr-3-2-1	by Fiber length measurement machine		-----	Scrap
Appearance	No damage	by Visual inspection		Check sheet	Scrap

Pr-3-3. Process specifications



Item	Specification	Control Method	Frequency	Record	Case of defect
The number of using of stripper	< 1000 times	by Check sheet	ALL	Check sheet	Fiber : Scrap Stripper : Change blade
Swelling time for UV coat removal	Around 120s	by Timmer		-----	Fiber : Scrap

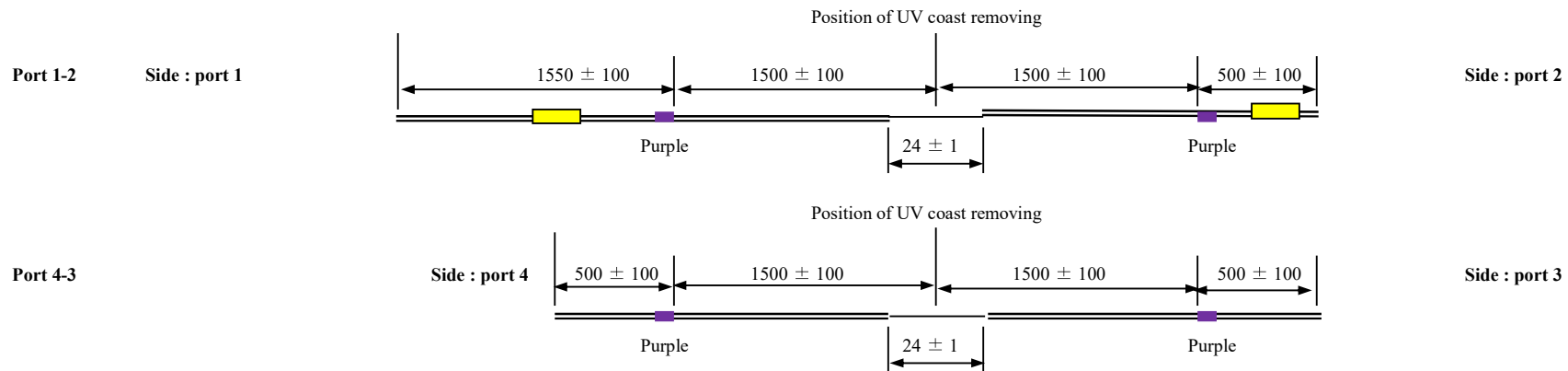


Fig. Pr-3-2-1 UV coat removal position



Pr-4. Proof Test [Special Process]
Pr-4-1. Quality & Control Item

Item	Specification	Control Method	Frequency	Record	Case of defect
Proof Test	No fiber broken	by Visual using Proof tester	ALL	Check sheet	Scrap
Appearance	No damage	by Visual inspection			

Pr-4-2. Process specifications



Item	Specification	Control Method	Frequency	Record	Case of defect
Tension	1.8 ~ 2.2 kg	by Proof Tester under daily checking control	ALL	Check sheet	Scrap
Applied time	1 sec				



Pr-5. Fusion & Elongation [Special Process]
Pr-5-1. Material

Table. Pr-5-1 Material

Material	Q'ty	Remark
Fiber	1 pair	pass the "Pr-4. Proof Test"
UV resin	Optimum dose	pass the "Pr-1. Material Inspection" (UV-7)

Pr-5-2. Quality & Control Item



Table. Pr-5-2 Quality & Condition Item

Item	Specification	Control Method	Frequency	Record	Case of defect
Haba Yose	Width of Haba Yose tool 21.0 +/- 0.2 mm Fig. Pr-5-3-1-c	by ruler	1 time / day	Check sheet	equip : readjust, scrap
Fiber tension	Before parallel contact 30 +/- 1 g	by visual, by elongation program	ALL	-----	elong. Condition : readjust product : scrap
	After parallel contact 15 +/- 1 g			Check sheet	
	While Fusion & Elongation < 10 g			e-data	
	Step 1 typ. < 3 ~ 4 g Step 2 typ. < 2 g Step 3 typ. ~ 0 g Step 4 typ. < 8 ~ 9 g				
Elongation Condition	Restrictive condition	by visual			
Elongation Length	5.8 +/- 0.75 mm	by elongation program			
Optical characteristics	see Table. Pr-5-3-1 below	by elongation program			
UV irradiation	UV intensity 14.0 ~ 18.5 mW/cm ² with IR cut filter	by daily check result with UV-M03A & UV-SN35-M10	1 time / day	Check sheet	equip : readjust
	time 30 sec / point or time	by daily check result (internal timer)			product : scrap
UV resin : Expire Date	Unexpired Check the label on the syringe	by visual inspection	ALL	Check sheet	material : csrap product : scrap
Structure	UV resin : Length UV resin : Position see drawing below Fiber position	by visual, microscope			product : scrap

Pr-5-3. Process Condition



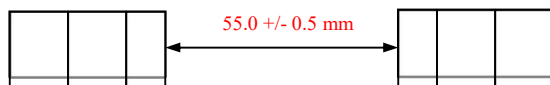
Table. Pr-5-3 Process Condition

Item	Specification	Control Method	Frequency	Record	Case of defect
Geometry	Width of Stage 55.0 +/- 0.5 mm Fig. Pr-5-3-1-a	by ruler & elongation program	1 times / week	Daily Check sheet	Readjust Scrap
	Gap between Torch and Fiber 6.5 +/- 0.5 mm Fig. Pr-5-3-1-b				
	Haba Yose tool 21.0 +/- 0.2 mm Fig. Pr-5-3-1-c	by ruler	1 time / day	Daily Check sheet	
Haba Yose	Position of UV resin see drawing below Size of UV resin Fig. Pr-5-3-3-a ~ -c	by Visual, Haba Yose tool	ALL	-----	Scrap
UV irradiation	see drawing below Fig. Pr-5-3-4-a ~ -c	by Visual			
Fiber setting	Length of UV coat see drawing below Fig. Pr-5-3-2	by Visual, Haba Yose tool			Readjust
	sticking out of stage Target : A(L) - A(R) < 0.5 mm				
	On the stage Far side Port 1-2 Near side Port 4-3	by visual, dot mark			
	Connect to Light Source Port 1 Connect to Optical Power Meter Port 2 --> OPM : Ch B Port 3 --> OPM : Ch A				
	see drawing below : Fig. Pr-5-3-5				
Optical characteristics	see Table. 5-3-1 below	by elongation program			

Table. Pr-5-3-1 Optical characteristics

Parameter	Specification
Before Elongation	Initial Value port1-2 no spec (Just record)
After Elongation	Insertion Loss IL1-2 typ. : < 0.15 dB @1080nm
	IL1-3 typ. : 43.5 ~ 45.5 dB @1080nm
	Excess Loss < 0.14 dB

Pr-5-3-1. Geometry



After initializing process (Before fiber setting)

Fig. Pr-5-3-1-a Width of stage

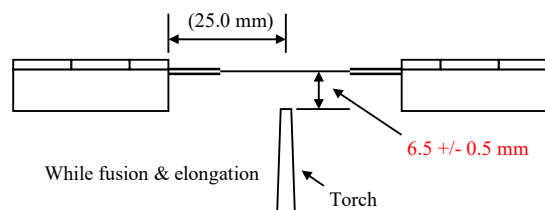


Fig. Pr-5-3-1-b Gap between Torch and Torch position

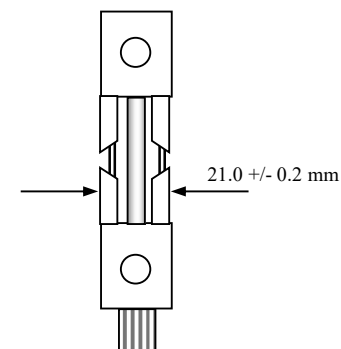


Fig. Pr-5-3-1-c Haba Yose tool

Pr-5-3-2. Fiber setting

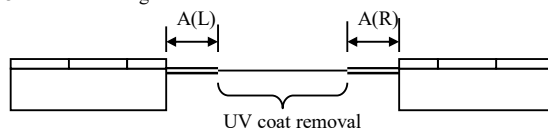


Fig. Pr-5-3-2 Fiber setting : Length of UV coat

Target : $|A(L) - A(R)| < 0.5 \text{ mm}$
*This specification is for reference only

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Pr-5-3-3. Haba Yose

*This specification is for reference only

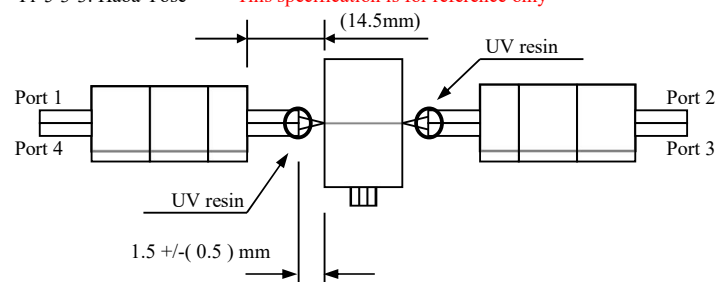


Fig. Pr-5-3-3-a Position of Haba Yose tool & UV resin

*This specification is for reference only

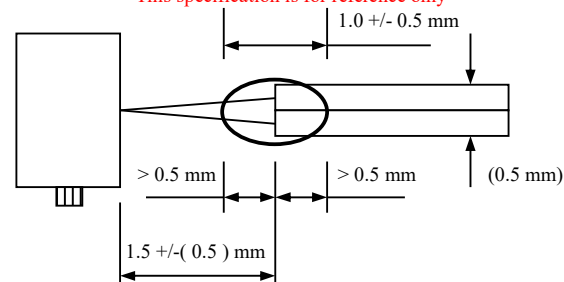


Fig. Pr-5-3-3-b UV resin : Position & Size

*This specification is for reference only

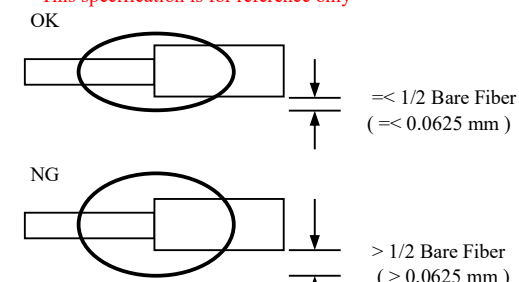


Fig. Pr-5-3-3-c Size of UV resin after curing

Pr-5-3-4. UV irradiation

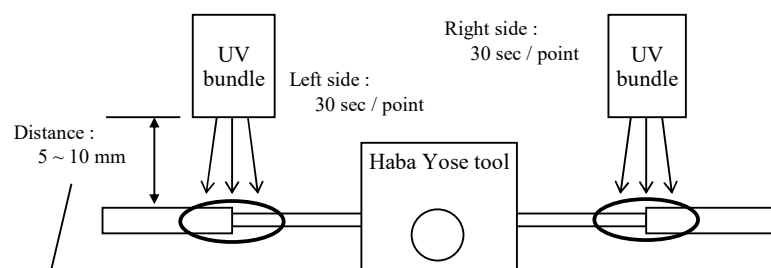


Fig. Pr-5-3-4-a UV irradiation condition (part 1)

*This specification is for reference only

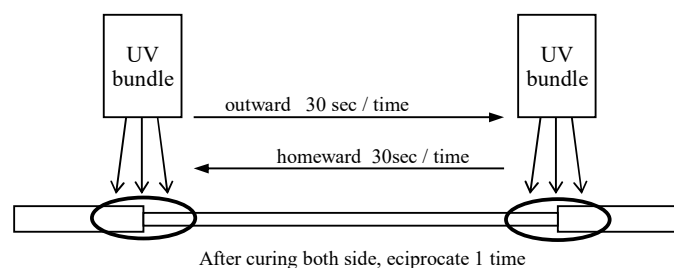


Fig. Pr-5-3-4-b UV irradiation condition (part 2)

Note:

If UV irradiation is not enough,
the uncured UV resin will be posed the serious trouble after shipping.

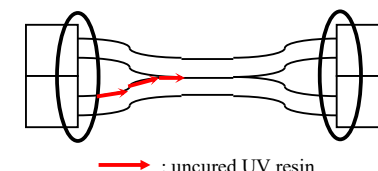


Fig. Pr-5-3-4-c Mechanism of serious trouble
Caused by Capillarity

Pr-5-3-5. Fiber connection

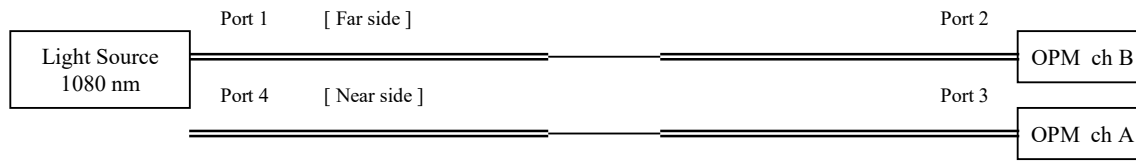


Fig. Pr-5-3-5 Fiber connection



Pr-6. Neoceram Packing [Special Process]
Pr-6-1. Material



Material	Q'ty	Remark
Neoceram	1 pc	pass the "Pr-1. Material Cleaning"
UV resin	Optimum dose	pass the "Pr-1. Material Inspection" (UV-7)
FEP tube	1 pc	pass the "Pr-1. Material Cleaning"
UV elastic resin	Optimum dose	pass the "Pr-1. Material Inspection" (KE-4896-T for Medome)
Marking Pen	Optimum dose	acceptance material K-50 : Color : Black AOP81-5013-31-01

Pr-6-2. Quality & Control Item

Item	Specification	Control Method	Frequency	Record	Case of defect
Proof Test	No fiber broken Pull 250g for 1 sec	by Visual & Elongation Program	ALL	Check sheet	Check Proof test again
Fiber tension	Before packing While packing After packing } 20.0 +/- 1.0 g	by Visual & Elongation Program using load cell on elongation machine			Scrap Readjust a movement of stage
Structure	UV resin : Expire Date unexpired : check the label on the syringe	by Visual			Scrap
	UV resin : Length see table and drawing below	by Visual & Microscope & ruler			Scrap
	UV resin : Position Table. Pr-6-2-1 Fig. Pr-6-2-1-a, -b				
UV irradiation	UV intensity 14.0 ~ 18.5 mW/cm ² with IR cut filter UV light Irradiation time 30sec / point or time	by daily check with UV-M03A & UV-SN35-M10 by internal timer	1 times / shift		Scrap Readjust
Optical characteristics	After Packing Insertion Loss IL1-2 typ. : < 0.15 dB @1080nm IL1-3 typ. : 43.5 ~ 45.5 dB @1080nm Excess Loss < 0.14 dB	by elongation program	ALL		Scrap Readjust the elongation condition
Appearance	Shape of FEP To shrink uniformly	by Visual			Scrap
	Overlapping Length of FEP tube 1.0 ~ 5.0 mm [typ. 2~3 mm] Fig. Pr-6-2-2	by Ruler			
	Gap between Fiber & top of shell 0.16 ~ 0.25 mm Gap between Fiber & bottom of shell 0.11 ~ 0.17 mm see drawing below Fig. Pr-6-2-3	by Microscope			
	Bubble size in UV resin see drawing below see drawing below Fig. Pr-6-2-5-a, -b	by Microscope			
	Gap between fibers No gap see drawing below Fig. Pr-6-2-1-a Fig. Pr-6-2-4	by Microscope			
Medome	No Gap between FEP tube & shell & UV resin see drawing below Fig. Pr-6-2-7	by visual, microscope			Scrap Readjust

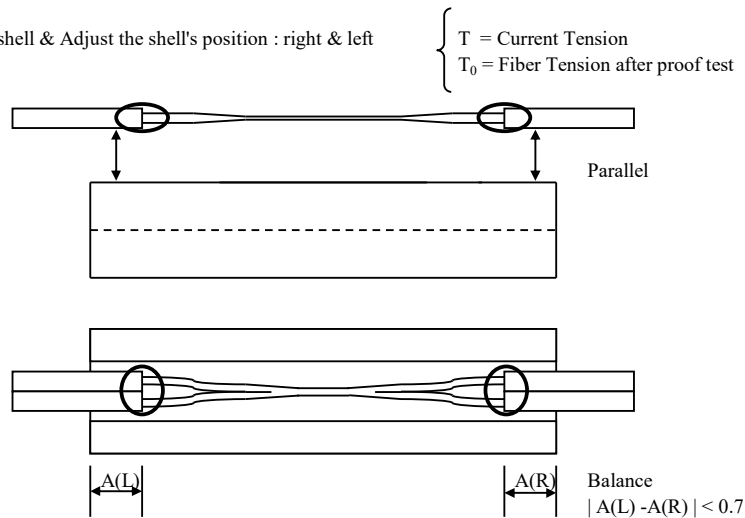


Pr-6-3. Process Condition

Item	Specification	Control Method	Frequency	Record	Case of defect
Adjust a shell position	To be parallel between Fiber & upper edge of shell To be balance the UV coat length of both sides on the shell see the "Pr-6-3-1. Shell packing flow" below	by Visual & elongation program see drawing below	ALL	Check sheet	Scrap Readjust the alignment
Application sequence	inside right -> outside right -> inside left -> outside left see drawing below Fig. Pr-6-3-1	by Visual			Scrap
UV irradiation	Distance between fiber & UV bundle 5 ~ 10 mm Procedure see drawing below Fig. Pr-6-3-2-a, -b	by Visual, Hand by internal timer			Scrap or Again Readjust
Temperature of Tube Heater (SH-7)	Max Temp < 170 deg C Target Temp < 160 deg C	by Measurement with noncontact thermo meter	1 time / Month		Readjust
Optical characteristics	After Proof Test Insertion Loss IL1-2 typ. : < 0.15 dB @1080nm IL1-3 typ. : 43.5 ~ 45.5 dB @1080nm Excess Loss < 0.14 dB	by elongation program	ALL		Scrap
Medome	Application Position see drawing below Fig. Pr-6-2-7 Waiting Time after Medome > 1 hour	by Visual, Microscope by timer	ALL		Scrap Readjust

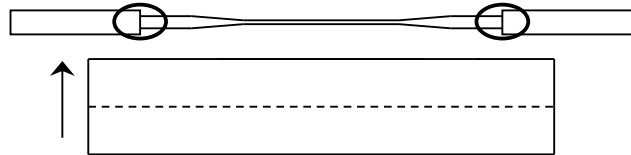
Pr-6-3-1. Shell Packing Flow

- 1) Set the shell & Adjust the shell's position : right & left



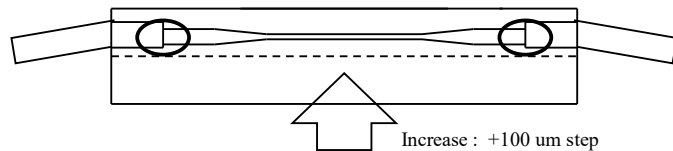
- 2) 250g Proof Test

- 3) Adjust the shell position: vertical direction
 $T_0 = 20.0 \pm 1.0 \text{ g}$ (19.0 ~ 21.0 g)



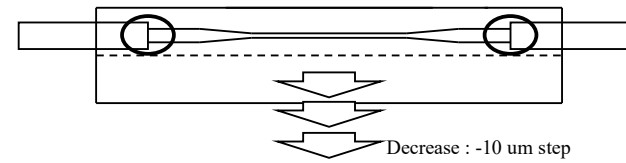
- 4) Lift up the shell

$$T = T_0 + dT; \quad dT = 0.5 \sim 1.0 \text{ g}$$



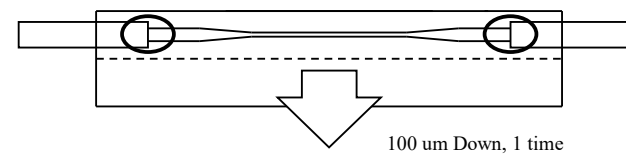
- 5) Lower the shell

$$T = T_0 + dT; \quad dT = 0.0 \sim 0.1 \text{ g}$$



- 6) Lower the shell; just 100 um

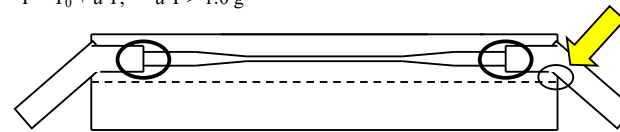
$$T \sim T_0$$



Note :

If lift up the shell too much, shell's edge attacks the Fiber

$$T = T_0 + dT; \quad dT > 1.0 \text{ g}$$



If UV resin size is too big, you must not pack the fiber into the shell.

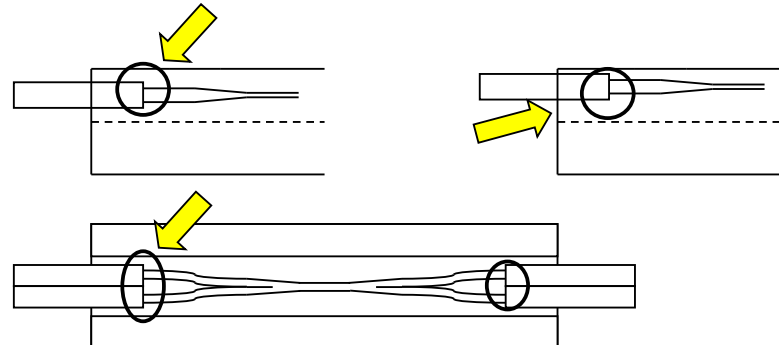


Table. Pr-6-2-1 Structure

	A(L), A(R)	A(L) - A(R)	B	C	D	E	F1, F2, F3	G	Y	L	X	S
Spec	6.0 ~ 8.0	< 0.7	7.0 ~ 9.0	> 0.8	10.0 ~ 11.0	4.5 ~ 5.5	< 0.6	> 0.5	> 0.5	< 9.5	10.5 ~ 14.5	No gap between fibers
Target	7.0	< 0.3	8.0	(>1)	10.5	5.0	< 0.4	> 1.0	> 0.7	(8.8)	12.5	-----

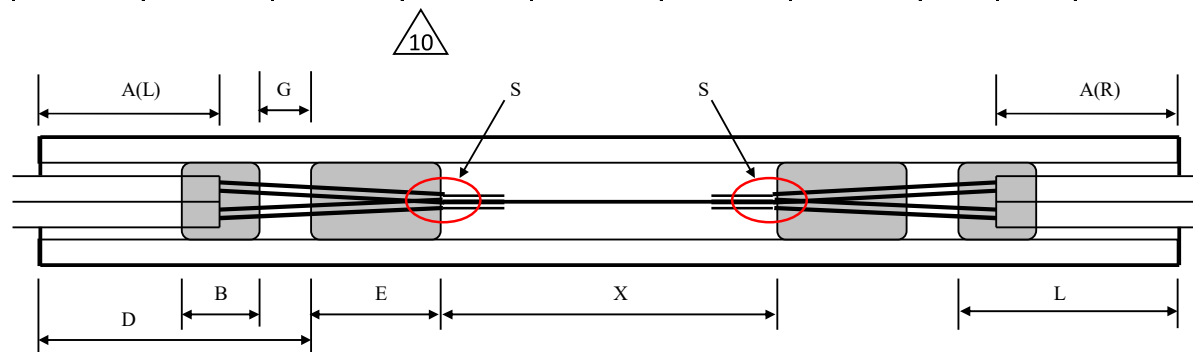


Fig. Pr-6-2-1-a Structure

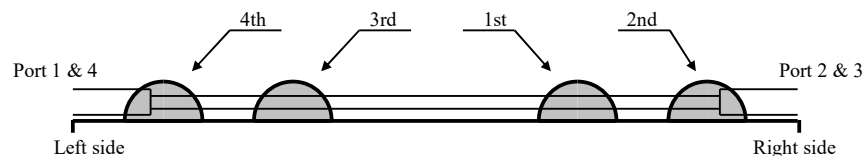


Fig. Pr-6-3-1 Application sequence

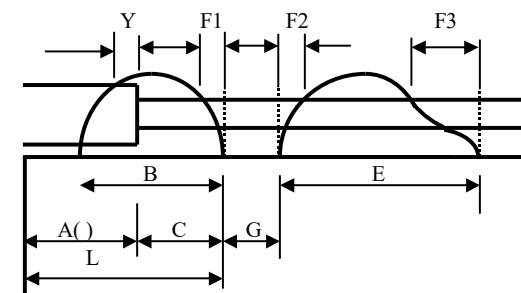


Fig. Pr-6-2-1-b Structure

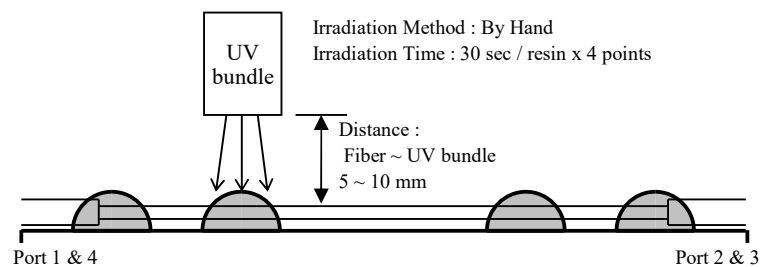


Fig. Pr-6-3-2-a Irradiation Method : part 1

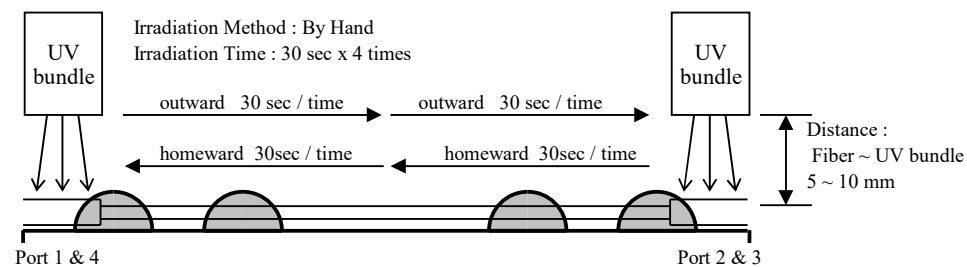


Fig. Pr-6-3-2-b Irradiation Method : part 2

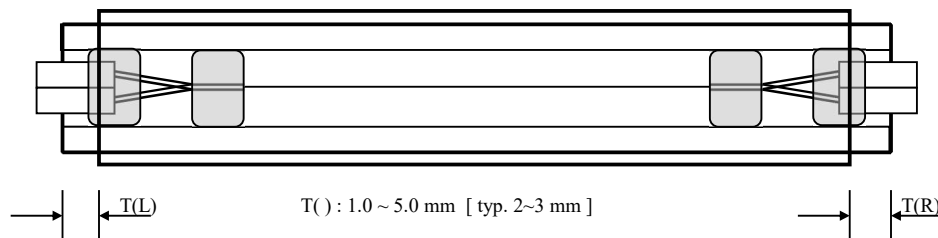


Fig. Pr-6-2-2 Overlapping Length of FEP tube

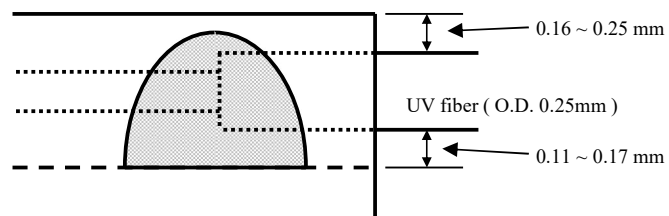


Fig. Pr-6-2-3 Distance between fiber & Neoceram Bottom & Neoceram Top

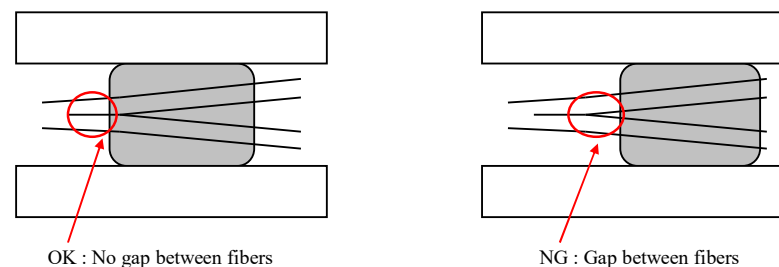


Fig. Pr-6-2-4 Fiber appearance at the inside of inside UV resin (@domain "S")

Pr-6-2-5. Specification of Bubble size in UV resin

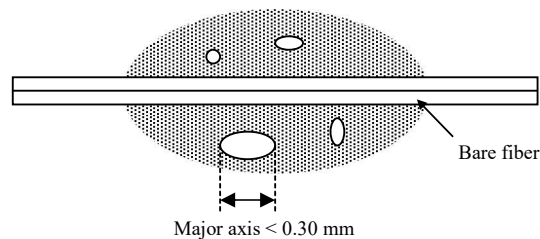


Fig. Pr-6-2-5-a. Example of OK

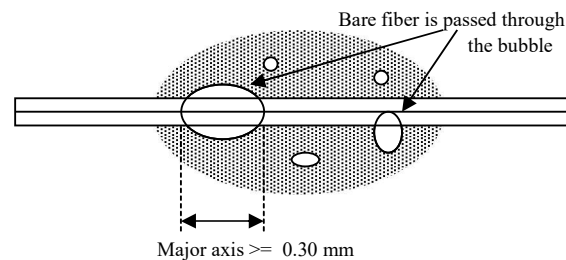


Fig. Pr-6-2-5-b. Example of NG

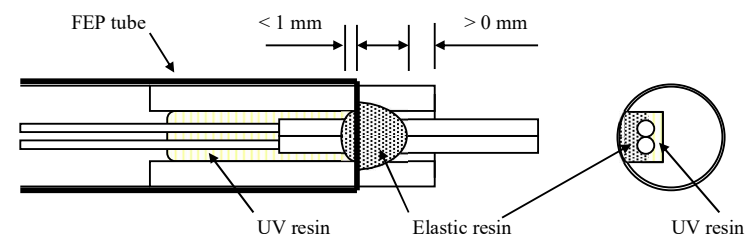


Fig. Pr-6-2-7 Medome



Pr-7. SUS Packing

Pr-7-1. Material

Material	Q'ty	Remark
SUS pipe	1	Type30-500 (O.D. 3.0 x L50.0) Laser printed : AOP82-2017-40-03, Finish the cleaning process
UV elastic resin	Optimum dose	Loctite 5091

Pr-7-2. Quality & Control Item

Item	Specification	Control Method	Frequency	Record	Case of defect
Position	Shell is set in the center of SUS pipe. see drawing below Fig. Pr-7-2-1	by the mark on the SUS packing board by visual	ALL	Check sheet	Scrap or Readjust
Curing condition	UV intensity 14.0 ~ 18.5 mW/cm ² with IR cut filter UV light Irradiation time 30sec x 2 times see drawing below Fig. Pr-7-2-2	by daily check with UV-M03A & UV-SN35-M10 by internal timer	1 time / shift		
Fiber Alignment	Twisted angle Target 0 deg Spec (+/- 10) deg see drawing below Fig. Pr-7-2-3	by visual inspection	ALL		Scrap Re-training
Appearance	Before SUS packing Complete the "MEDOME" at the both ends of shell	by visual & elongation process check sheet			Readjust
	After SUS packing Without the grime of resin on SUS pipe surface Without the grime of resin on fiber surface Without scratch / damage on SUS pipe surface & fiber surface	by visual inspection			Cleaning or scrap Retraining

Pr-7-3. Process Condition

Item	Specification	Control Method	Frequency	Record	Case of defect
Kind of SUS pipe	Type 30-500(O.D. 3.0 -L50.0) & SUS pipe No initial is "C"	by visual inspection	ALL	Check sheet	Replace or Scrap
Direction of SUS pipe	see drawing below Fig. Pr-7-3-1				
UV elastic resin	Expire Date within expire date Control No				Replace or Scrap
Elastic resin	Expire Date within expire date Control No				
Dimension	see drawing below Fig. Pr-7-2-1 Fig. Pr-7-3-3, -4	by ruler, visual			Scrap

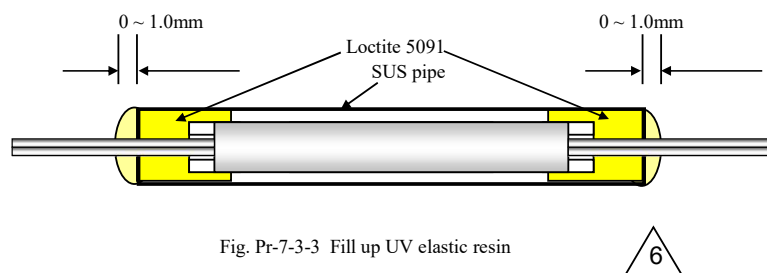
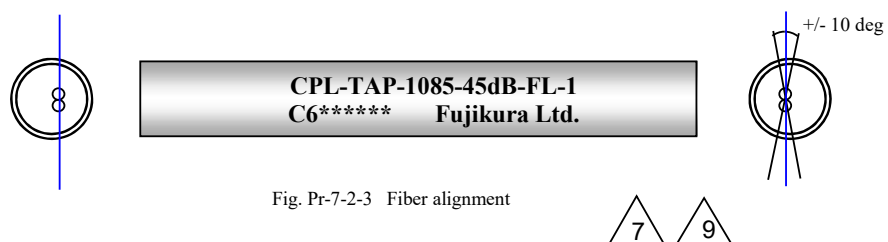
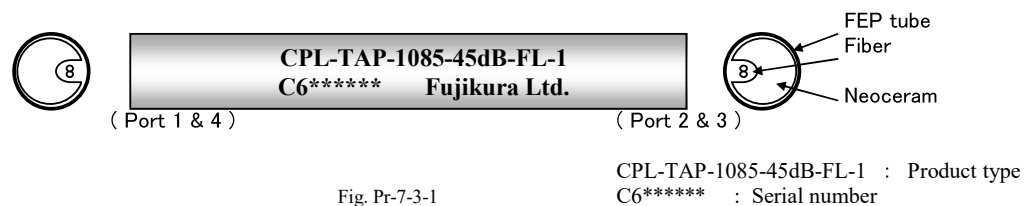
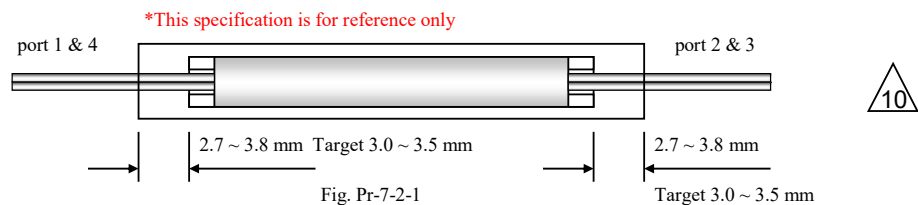


Fig. Pr-7-3-2 Fill UV elastic resin into SUS pipe

Fig. Pr-7-2-2 Curing the UV elastic resin

Pr-8. Fiber coloring
Pr-8-1. Material



Material	Q'ty	Remark
Marking Pen	Optimum dose	Blue : AOP81-5013-31-01 Red : AOP81-5013-31-01

Pr-8-2. Quality & Control Item

Item	Specification	Control Method	Frequency	Record	Case of defect
SUS pipe No	Initial of SUS pipe No is "C"	by Visual inspection	ALL	Check sheet	Scrap
Coloring Color	Port 1: Blue see drawing below	by Visual & Ruler			Readjust or Scrap
Coloring Length	Port 2: Red Fig. Pr-8-2-1				
	Port 3: colorless Port 4: colorless				
Appearance	No damage, No inky	by Visual inspection			Scrap or Cleaning

Pr-8-3. Process Condition

Item	Specification	Control Method	Frequency	Record	Case of defect
Marking Pen	specified Marking pen	by Visual inspection	ALL	Check sheet	Readjust
Direction of character string on SUS pipe	[Left side] SUS No [Right side] port1 & 4 port2 & 3				Scrap

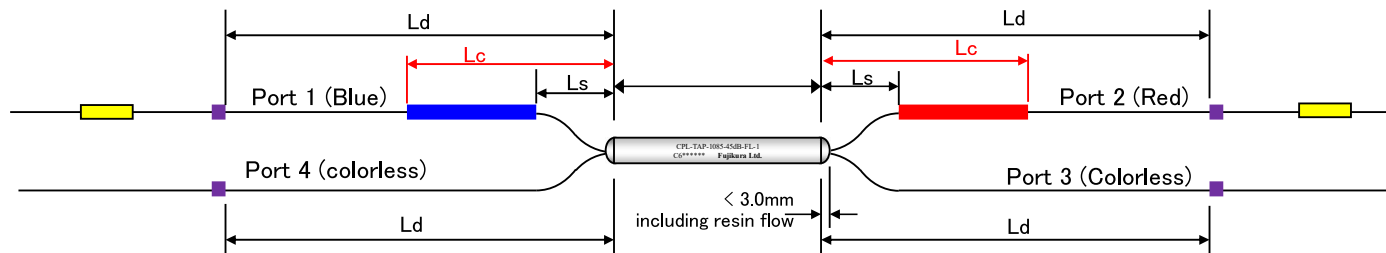
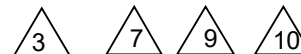


Fig. Pr-8-2-1

Table Pr-8-2-1. Port configuration

Port	Color	Ls	Lc	Ld
Port 1	Blue	160 ~ 240	760 ~ 840	1400 ~ 1700
Port 2	Red	160 ~ 240	760 ~ 840	1400 ~ 1700
Port 3	Colorless	---	---	1400 ~ 1700
Port 4	Colorless	---	---	1400 ~ 1700

unit : mm



Pr-9. Temperature Cycling 24H
Pr-9-1. Quality & Control Item

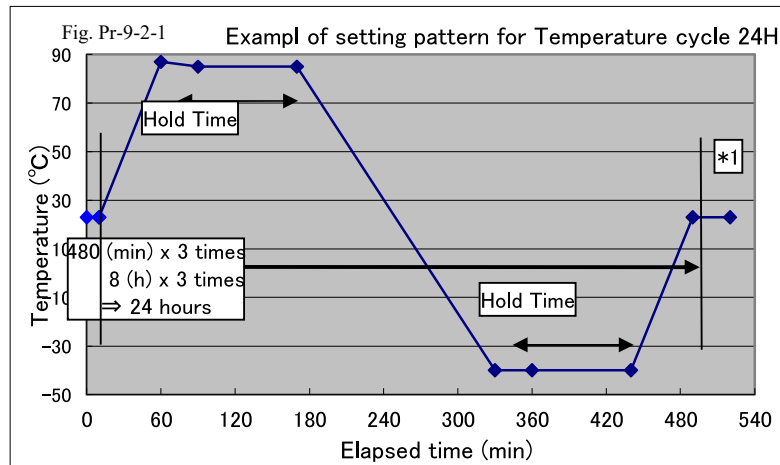
△10

Item	Specification	Control Method	Frequency	Record	Case of defect
Appearance	No condensation on SUS pipe surface when take out from chamber	by visual	ALL	-----	Scrap
Recorded Temperature	Hold time > 1 hour @85+/-4 deg C @-40+/-4 deg C	by thermo recorder	Every time	Check sheet	Readjust the HC program & again Readjust the input quantity

Pr-9-2. Process Condition

△10

Item	Specification	Control Method	Frequency	Record	Case of defect
Chamber unit No	Working Range : -40 ~ +85 degC Recommend model PL or PU or PSL series	by thermo recorder & prog. setting pattern	Every time	Check sheet	Replace chamber
Temperature	-40 / +85 degC Table. Pr-9-2-1	set the temperature cycle pattern			Readjust the cycle pattern
Time & Cycle	8 hours / cycle x 3 cycles	and by Visual			Retry
Temperature pattern	see table & drawing below Fig. Pr-9-2-1	check by thermo recorder			Correction
Hold time	more than 1 hour	by Visual	ALL	-----	Wipe the condensation
Appearance	No sticking out the fiber from CPL plate No condensation inside the chamber before using		Every time		



Temperature (°C)	Time	Elapsed Time
From	To	(min)
23	23	10
23	87	50
87	85	30
85	85	80
85	-40	160
-40	-40	30
-40	-40	80
-40	23	50
23	23	30
23	23	520

△10

Repeat 3 times (480x3)

Hold 30 min at 23°C *1

*1 : To prevent the dew condensation

Table Pr-9-2-1 Condition of Temperature cycle 24H

Temperature Range	-40 / +85 °C
Time	8 hours / cycle
Total time	24 hours (3 cycles)
Holed time	more than 1 hour



Pr-10. Final appearance
Pr-10-1. Quality & Control Item



Item	Specification	Control Method	Frequency	Record	Case of defect
Printed content on SUS	"CPL-TAP-1085-45dB-FL-1 C6*****"	by visual inspection	ALL	Check sheet	Scrap
Port color	Port 1 : Blue Port 2 : Red Port 3 : coloreless Port 4 : coloreless	by visual inspection by ruler			
Coloring position & length	see table & drawing below				
Appearance	for SUS pipe : No scratch, No dirt, No inky, No grime for Fiber : No scratch, No dirt, No inky, No dent	by visual inspection			

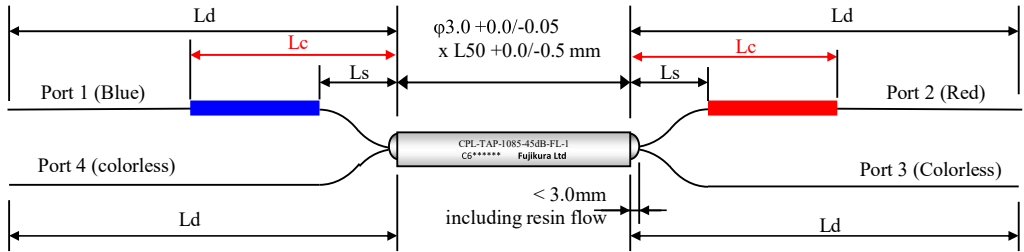


Fig. Pr-10-1-1. Coupler outside drawing

Table Pr-10-1-1. Port configuration

unit : mm				
Port	Color	Ls	Lc	Ld
Port 1	Blue	160 ~ 240	760 ~ 840	1300 ~ 1700
Port 2	Red	160 ~ 240	760 ~ 840	1300 ~ 1700
Port 3	Colorless	---	---	1300 ~ 1700
Port 4	Colorless	---	---	1300 ~ 1700



Pr-11. Casing

Pr-11-1. Material

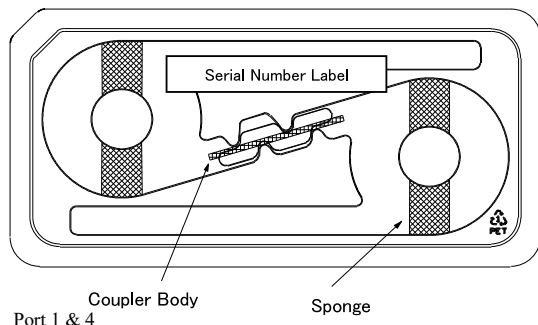
Material	Q'ty	Remark
Inner package	1	Naname Pack
Cushioning sponge	4	To hold the lead fiber in an inner package
Fushigi Tape	Optimum dose	To bind lead fibers

Pr-11-2. Quality & Control Item

Item	Specification	Control Method	Frequency	Record	Case of defect
Appearance	Naname pack	by visual	ALL	Check sheet	Replace
	No scratch, No dirt, No inky, No grime				Scrap or
	No sandwich the fibers between "Naname pack" & cover				Correct after reconfirm an appearance of fiber
	Cover direction Clipping corner is the left. see drawing below Fig. Pr-11-2-1				Correct or scrap
	Serial number label on "Naname pack" cover Content : product type, serial number Pasted position, Pasted direction see drawing below Fig. Pr-11-2-2				

Pr-11-3. Process Condition

Item	Specification	Control Method	Frequency	Record	Case of defect
Fiber bind	Bind lead fibers with Fushigi tape	by hand by visual	ALL	Check sheet	Correction
CPL's Direction	Left side : Input port (port 1 & 4) Right side : Output port (port 2 & 3) see drawing below Fig. Pr-11-3-1	by visual			



Port 2 & 3



Fig. Pr-11-2-2 Example of Serial number label format

Format of Bar code ("Product type" + " " + "Serial number"; Code 128 without check digit)
Product type + " " + "Serial number"

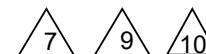
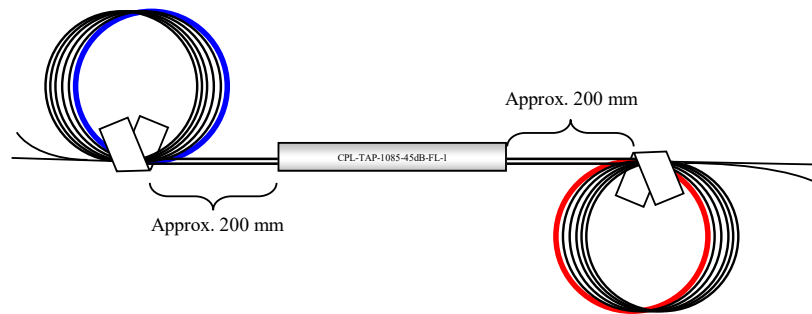
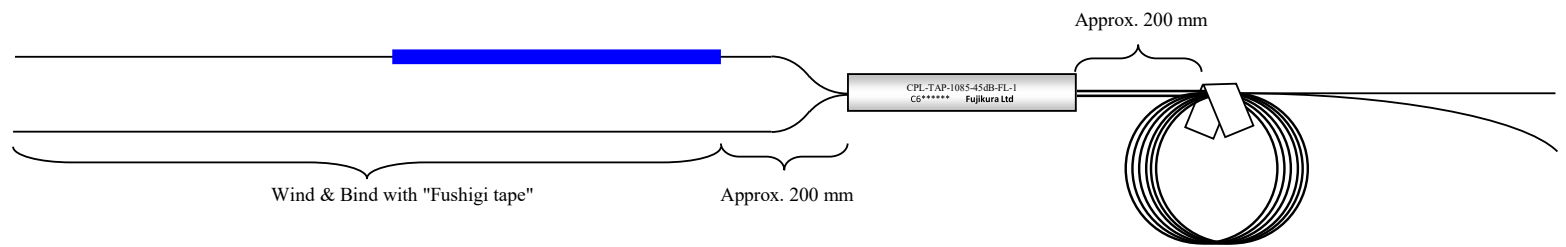
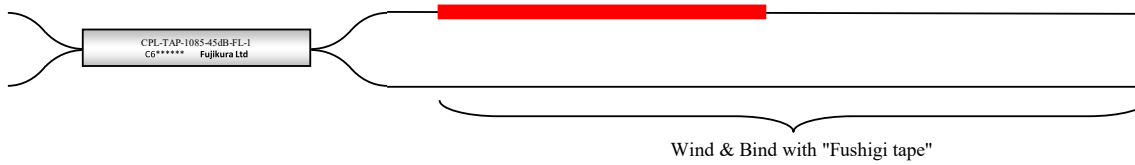


Fig. Pr-11-2-1

Pr-11-3-1. How to wind & bind the fiber with "Fushigi tape" 9





Pr-12. Packing

Pr-12-0. General

The packing shall be sufficient to protect the device against optical and mechanical damage during transit and storage under the conditions stated in this specifications.
FOV shall guarantee that the fiber is stored with bending radius greater than 30mm.

Pr-12-1. Material



Material	Qty	Remark
Inner carton box	Optimum dose	Max 400×300×460 mm ³
Outer carton box	Optimum dose	Max 500×410×570 mm ³
Impact indicator	2	Type : L-35 (Shock watch) or 75G (Impact label) (color : orange)
Air-Bubble sheet/Air-Bubble bag	Optimum dose	Both materials are OK
Cushioning material	Optimum dose	For example, Packing foam chip, Tricon

Pr-12-2. Quality & Control Item

Item	Specification	Control Method	Frequency	Record	Case of defect
ShockWatch	Pasted position see drawing below Fig. Pr-12-3-7 No trip	by visual inspection	Every time	Check sheet	Scrap or Correction
Appearance	Inner / Outer Carton box No dirt, No deformed				Replace a carton box

Pr-12-3. Process Condition

Item	Specification	Control Method	Frequency	Record	Case of defect
Inner package wrapping	Max 5 pcs / block & one kind / block	by visual inspection	each block	Check sheet	Correction
Label of kind	After wrap inner packages, paste a label of kind on a block.				
Packing status of Inner carton box	Position of Block is not leaned to one side. Almost center of inner carton box		Every time		
	After fill up a inter space with packing form chip, No move the blocks in an inner carton box				
Packing status of Outer carton box	Position of Inner carton box is not leaned to one side. Almost center of outer carton box				
	After fill up a inter space with packing material, No move the inner carton box in an outer carton box				

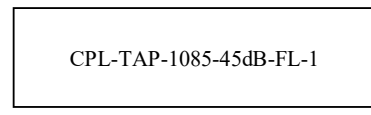
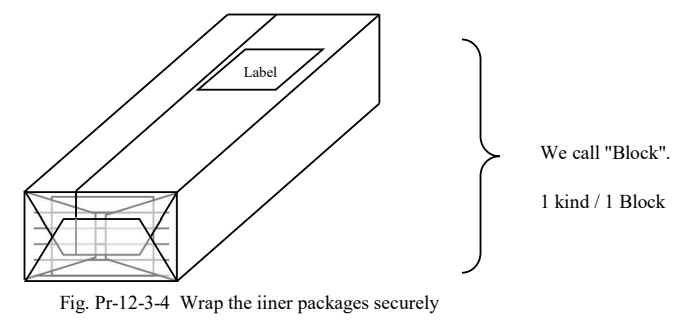
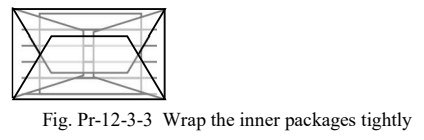
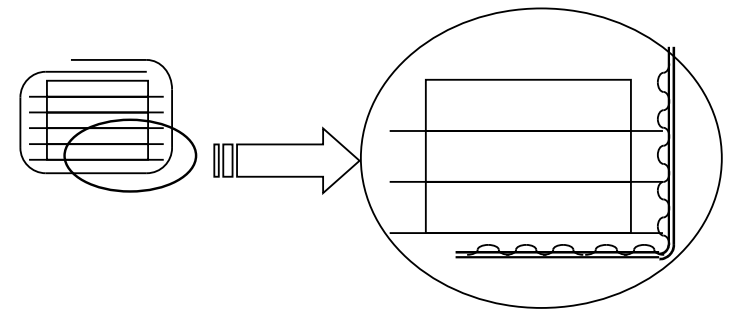
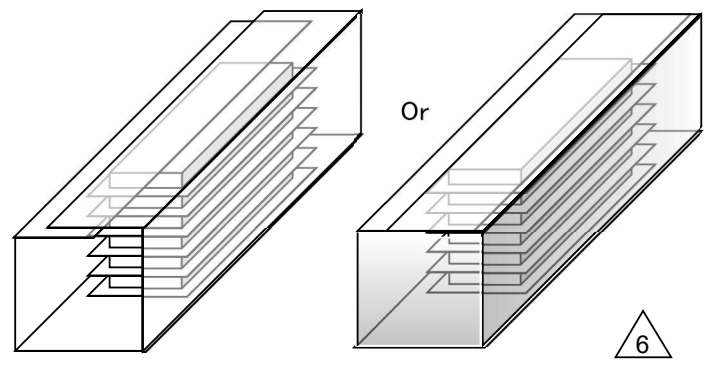
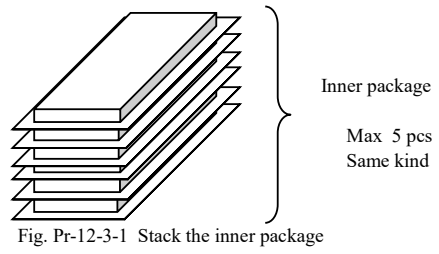


Fig. Pr-12-3-5 Sampl of label of kind
"Product type"

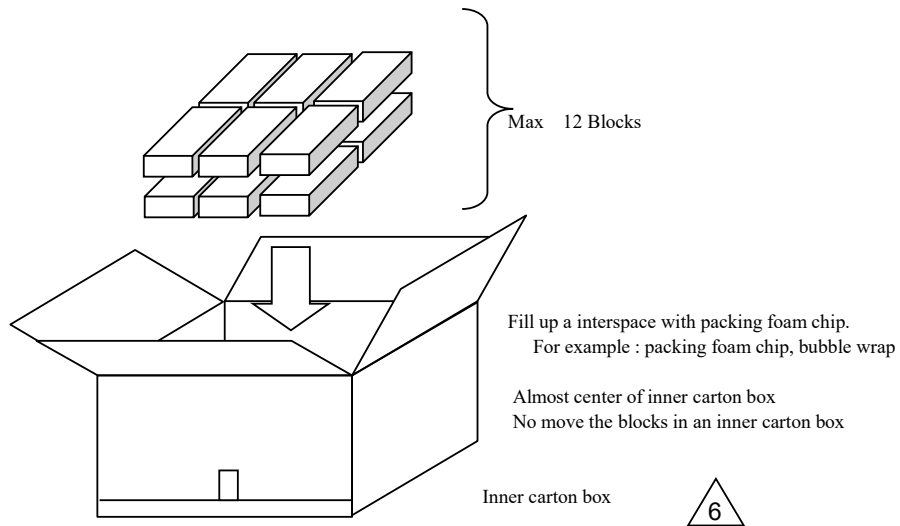



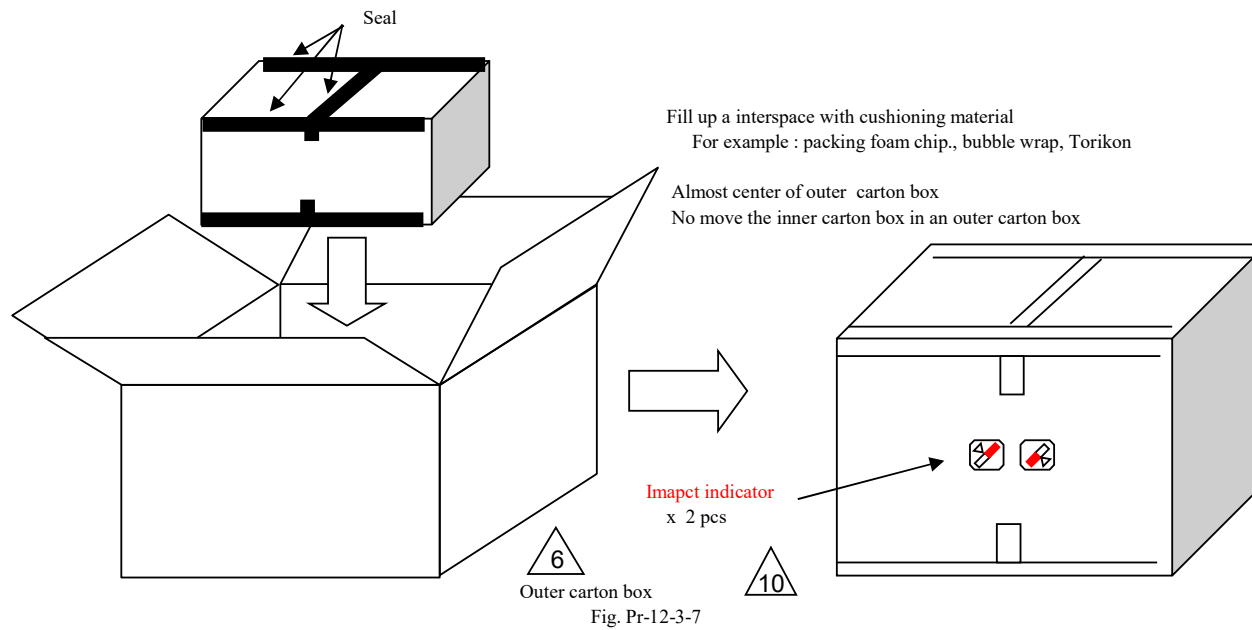
Fig. Pr-12-3-6

10

Attach label on inner carton box

Product Name:	CPL-C-3DB-4P	1
		
P/O No.:	FPO200099123-1	2
Quantity (pcs):	6	3
Carton No.:	1 / 1	4
Date:	15-Mar-2022	5
Made in Vietnam		6
		7

- (1): Product name
- (2) Barcode: "P/O Number" + "-" + "Carton No." + "/" + "Total box" + "Quantities in Box"
- (3): PO Number
- (4): Quantity/box
- (5): MFG date
- (6): Carton no/Total box
- (7): Origin: Made in Vietnam



Pr-13. Heat treatment

Pr-13-1. Material

Material	Qty	Remark
Fiber (LMF)	1 pair	

Pr-13-2. Quality & Control Item

Type of record	Items	Record
Quality control items	Refer to relating QC flow chart	Relative check sheet/database
Identification&Trace-ability record	- Operator	
	- Operation time - Hot Plate machine number	

Pr-13-3. Process Condition

Item	Specification	Frequency
Temperature	Target 120 degree C (110 - 130 degree C)	ALL
Heating time	Target 180 seconds (150 - 600 seconds)	ALL

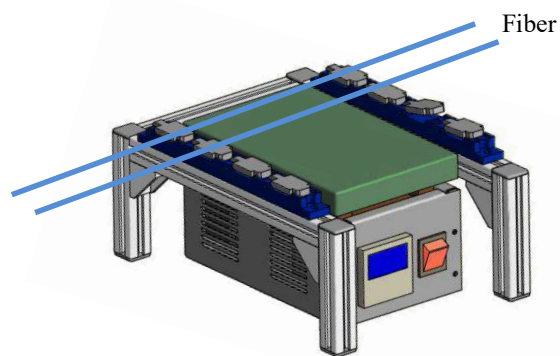


Fig. Pr-13-3-1 Hot plate