I. Purpose

This operation procedure is used for setting up the manufacturing processes for Cavity-FG product

II. Application

Table II.1 Products general information 67

FOV code	QC flow chart	Type name	Specification No.	RV	RLS (mm)	MCS	D.S	FV	PT	IP	OP	Spectrum type	Thermal aging (heating after exposing)	Apply hot air at stripping process
CFS0002	4-QC-378	DXV	AOP82-4001-27-04	RV1	30~55	Red	D01	FV1	B	Patt 2	Patt A	Uniform	Cartridge	Yes
CFS0006	4-QC-378	DUV	AOP82-4001-27-04	RV1	30~55	Red	D01	FV1	B	Patt 2	Patt A	Uniform	Cartridge	Yes
CFS0054	4-QC-378	HCV	AOP82-4001-27-11	RV3	>25	No	D06	FV2	G	Patt 7	Patt C	Chirped	Hot air	No
CFS0059	4-QC-378	YUV	AOP82-4001-27-04	RV1	30~55	Red	D01	FV1	E	Patt 5	Patt B	Uniform	Cartridge	Yes
CFS0063	4-QC-378	WAV	AOP82-4001-27-10	RV2	<50	No	D03	FV2	C	Patt 3	Patt B	Uniform	No	No
CFS0064	4-QC-378	YXV	AOP82-4001-27-04	RV1	30~55	Red	D01	FV1	E	Patt 5	Patt B	Uniform	Cartridge	Yes
CFS0066	4-QC-0154	NAV	AOP81-2122-27-01	RV1	30~55	Black	D02	FV1	A	Patt 1	Patt A	Uniform	Cartridge	No
CFS0067	4-QC-0154	NBV	AOP81-2122-27-01	RV1	30~55	Black	D02	FV1	A	Patt 1	Patt A	Uniform	Cartridge	No
CFS0068	4-QC-0154	NCV	AOP81-2122-27-01	RV1	30~55	Black	D02	FV1	A	Patt 1	Patt A	Uniform	Cartridge	No
CFS0069	4-QC-0154	NWV	AOP81-2122-27-01	RV1	30~55	Red	D07	FV1	F	Patt 6	Patt C	Uniform	Cartridge	No
CFS0070	4-QC-0154	NUV	AOP81-2122-27-01	RV1	30~55	Red	D07	FV1	F	Patt 6	Patt C	Uniform	Cartridge	No
CFS0071	4-QC-378	KEV	AOP82-4001-27-09	RV2	<50	Red	D05	FV2	D	Patt 4	Patt B	Chirped	No	Yes
CFS0073	4-QC-378	KDV	AOP82-4001-27-09	RV2	<50	Red	D05	FV2	D	Patt 4	Patt B	Chirped	No	Yes
CFS0074	4-QC-378	HDV	AOP82-4001-27-11	RV3	>5	No	D06	FV2	G	Patt 7	Patt C	Chirped	Hot air	No
CFS0075	4-QC-378	KCV	AOP82-4001-27-09	RV2	<50	Red	D05	FV2	D	Patt 4	Patt B	Chirped	No	Yes
CFS0077	4-QC-378	WBV	AOP82-4001-27-10	RV2	<50	No	D03	FV2	C	Patt 3	Patt B	Uniform	No	No
CFS0078	4-QC-378	YAV	AOP82-4001-27-04	RV1	30~55	Red	D01	FV1	E	Patt 5	Patt B	Uniform	Cartridge	Yes
CFS0079	4-QC-378	YEV	AOP82-4001-27-04	RV1	30~55	Red	D01	FV1	E	Patt 5	Patt B	Uniform	Cartridge	Yes
CFS0080	4-QC-378	YDV	AOP82-4001-27-04	RV1	30~55	Red	D01	FV1	E	Patt 5	Patt B	Uniform	Cartridge	Yes
CFS0081	4-QC-0154	NXV	AOP81-2122-27-01	RV1	30~55	Red	D07	FV1	F	Patt 6	Patt C	Uniform	Cartridge	No
CFS0082	4-QC-0154	NYV	AOP81-2122-27-01	RV1	30~55	Red	D07	FV1	F	Patt 6	Patt C	Uniform	Cartridge	No
CFS0087	4-QC-0154	NDV	AOP81-2122-27-01	RV1	30~55	Black	D02	FV1	A	Patt 1	Patt A	Uniform	Cartridge	No
CFS0089	4-QC-378	HEV	AOP82-4001-27-11	RV3	>5	No	D06	FV2	G	Patt 7	Patt C	Uniform	Hot air	No
CFS0090	4-QC-378	KBV	AOP82-4001-27-09	RV2	<50	Red	D05	FV2	D	Patt 4	Patt B	Chirped	No	Yes
CFS0091	4-QC-378	SAV	AOP82-4001-27-14	RV1	30~55	Red	D01	FV1	B	Patt 2	Patt A	Uniform	Cartridge	No
CFS0092	4-QC-378	SCV	AOP82-4001-27-14	RV1	30~55	Red	D08	FV1	B	Patt 2	Patt A	Uniform	Cartridge	No
CFS0093	4-QC-378	CAV	AOP82-4001-27-13	RV1	<50	No	D09	FV1	H	Patt 8	Patt B	Uniform	No	Yes
CFS0097	4-QC-378	XCV	AOP82-4001-27-10	RV2	<50	No	D03	FV2	C	Patt 3	Patt B	Uniform	Cartridge	No
CFS0098	4-QC-378	XDV	AOP82-4001-27-10	RV2	<50	No	D03	FV2	C	Patt 3	Patt B	Uniform	Cartridge	No
CFS0099	4-QC-378	PAV	AOP82-4001-27-10	RV2	<50	Red	D05	FV2	D	Patt.4	Patt B	Chirped	No	No
CFS0100	4-QC-378	HHV	AOP82-4001-27-11	RV3	>5	No	D06	FV2	G	Patt 7	Patt C	Uniform	Hot air	No
CFS0103	4-QC-378	TAV	AOP82-4001-27-15	RV1	40~50	Red Black	D10	FV1	J	Patt 9	Patt B	Uniform	Cartridge	Yes
CFS0104	4-QC-378	TBV	AOP82-4001-27-15	RV1	40~50	Red Black	D10	FV1	J	Patt 9	Patt B	Uniform	Cartridge	Yes
CFS0105	4-QC-378	UAV	AOP82-4001-27-16	RV1	<55	Red Black	D11	FV1	J	Patt 9	Patt B	Chirped	Cartridge	No

CFS0106	4-QC-378	UBV	AOP82-4001-27-16	RV1	<55	Red Black	D11	FV1	J	Patt 9	Patt B	Chirped	Cartridge	No
CFS0115	4-QC-378	XFV	AOP82-4001-27-10	RV2	<50	No	D03	FV2	C	Patt 3	Patt B	Uniform	Cartridge	No
CFS0116	4-QC-378	XEV	AOP82-4001-27-10	RV2	<50	No	D03	FV2	C	Patt 3	Patt B	Uniform	Cartridge	No
#NA	4-QC-378	HKV	AOP82-4001-27-11	RV3	>5	No	D06	FV2	G	Patt 7	Patt C	N/A	Hot air	No
#NA	4-QC-378	HJV	AOP82-4001-27-11	RV3	>5	No	D06	FV2	G	Patt 7	Patt C	N/A	Hot air	No
#NA	4-QC-378	HFV	AOP82-4001-27-11	RV3	>5	No	D06	FV2	G	Patt 7	Patt C	N/A	Hot air	No
#NA	4-QC-378	HGV	AOP82-4001-27-11	RV3	>5	No	D06	FV2	G	Patt 7	Patt C	N/A	Hot air	No
#NA	4-QC-378	SBV	AOP82-4001-27-14	RV1	30~55	Red	D08	FV1	B	Patt 2	Patt A	N/A	Cartridge	No

Noted:

D.S: Dimension specification
FV: Visual inspection criteria of Fiber section.
RV: Visual inspection criteria of Recoat section.
IP: Inner Packing.
OP: Outer Packing.
RLS: Recoating length specification.
MCS: Marking color specification.
PT: Packing type
#NA: Will be define when PLN require

The content of operation procedure is applied to Cavity-FG products manufactured in Fujikura Fiber Optics Vietnam Ltd

Including following processes:

Table II.2 Processes for Cavity-FG 67

No.	Process
1	Material preparation
2	Fiber Rewinding
3	Hydrogen Loading
4	Fiber Cutting
5	Fiber Stripping
6	Exposing & Thermal Aging
7	Thermal Aging (hot air)
8	Recoating
9	Marking and Proof test
10	Hydrogen Unloading
11	Visual Inspection (Recoat)
12	Optical measurement
13	Visual Inspection and Packing
14	Final Packing
15	Test report & Shipping

This procedure directly to Production (PRD), Production Engineering (PRE), Quality Assurance Engineering (QAE) and Planning (PLN).

III. Reference Documents:

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1. Specification No.:

No	Specification	Name
1	AOP82-4001-27-04(18)	Cavity-FG (SM980 for Lumentum)
2	AOP82-4001-27-09(21)	Cavity-FG (SM980 for Coherent)
3	AOP82-4001-27-11(17)	Cavity-FG (80µm PM980 for Coherent)
4	AOP82-4001-27-10(17)	Cavity-FG (PM980 for Coherent)
5	AOP81-2122-27-01(19)	Cavity-FG (PM980 for Submarine)
6	AOP82-4001-27-13(05)	Cavity-FG (SM980 for Dogain Tech)
7	AOP82-4001-27-14(05)	Cavity-FG (PM980 for Lumentum)
8	AOP82-4001-27-06(14)	Manufacturing condition of Cavity-FG
9	AOP82-4001-27-07(9)	Requirement for quality assurance of Cavity-FG
10	AOP82-4001-27-08(24)	Packing requirement of Cavity-FG
11	AOP82-4001-27-05(26)	Visual inspection of Cavity-FG
12	AOP81-2122-27-02(02)	Requirement for Submarine Cavity-FG manufacturing
13	AOP82-4001-27-12(04)	Requirement for Deliverable data and Environmental information of Cavity-FG
14	AOP82-4001-27-15(03)	Cavity-FG (SM980 for 3SP)
15	AOP82-4001-27-16(03)	Cavity-FG (PM980 for 3SP)

2. Working Direction No.:

No	Working direction	Name	Application process
1	PTE82-59-21-2010	Working direction about visual inspection for Submarine products	Recoat Inspection & Fiber Inspection

IV. Term definition:

- FG: Fiber Grating
- Recoat: a layer of acrylate material

V. ROHS material requirement & Traceability control:

1. ROHS material requirement

Table V.1 List of material required RoHS compliance.

Item	Material name	Description
1	Optical Fiber	Corning-HI1060, Fujikura-SM98PSU25DH, Fujikura-RCSM98PSU17C, Fujikura-RCSM98PSU17D, Fujikura-HASM1060
2	Recoat resin	950-200 (Desolite) or 950Y200(JFC)
3	Marking pen	Artline K-50 Red (Shachihata), Artline K-50 Black (Shachihata) Artline EK-50 Red (Shachihata), Artline EK-50 Black (Shachihata)
4	Packing case	Packing Case for Cavity FG ver.2*, Antistatic Packing Case (60pcs Cavity-FG)
5	Reel Lite	SPOOL-1-ST (OPTO QUEST)*
6	Individual label	TZe-221 (Brother)
7	Packing label	TZe-251 (Brother)
8	Individual label	TZe-231 (Brother)
9	Zipper bag	GP-F-4-YOKONAGA (SEISANNIPPONSHA) or equivalent material (i)
10	Silicone spiral tube	KEPSi-2-3 (HAGITEC) or equivalent material (i)
11	Fushigi tape (white)	Fushigi tape (Nirei industory)
12	Mending tape	Magic Tape (Scotch)

(i) Need to use material approved by FJK.

2. Traceability control:

Type of Record	Items	Record
Quality control items	Refer to 4-QC-378 or 4-QC-0154	Manufacturing program /Checksheet
Identification and traceability record	- Material Lot#	
	- Operation date	
	- Machine/Tool-jig control number	
	- Operator code	
	- Manufacturing/ inspecting date	

VI. Content:

1. Incoming Inspection

1.1 Process specification

Item	Specification
Length of spiral tube	5 ~ 10mm
Length of scotch tape	~ 90mm
Length of the fold	~ 5mm
Length and quantity of air bubble sheet for an inner carton box	+ ~ 550 x 160mm, 1 sheet + ~ 450 x 200mm, 1 sheet + ~190 x 130mm , 9 sheets
Appearance	+ Aluminum board and silicon gum's groove must be not dirty, damaged… + Spiral tube & Scotch tape: Not dirty (contamination), both of end must be straight, not deviated + Air bubble: Edges must be straight, not deviated + Packing case/bag must not be dirty, damaged…

1.2 Process condition

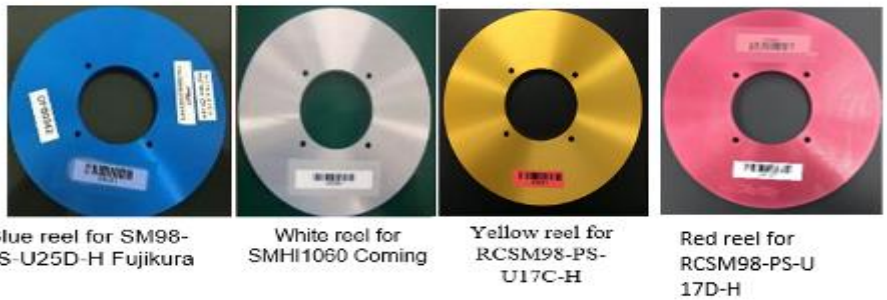
Item	Condition
Appearance	Visual
Length of spiral tube	Jig/Ruler
Length of scotch tape	Machine
Length of the fold	Visual
Quantity of air bubble	Counting and visual

2. Fiber Rewinding

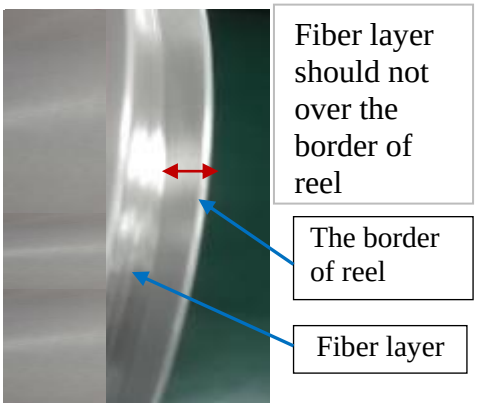
2.1 Process specification

Item	Specification
Fiber rewinding length	- Rewinding length of fiber is 250 m/reel - In case of end of bobbin, the rewinding length can be over 250m but less than 300m.
Appearance	- Fiber layer should not over the border of reel (See Fg 2.1.2). - There is no damage or deformation of fiber and reel.

Fg 2.1.1: Optical Fiber Rewinding Machine



Fg 2.1.2: Optical Fiber Reel (aluminum)



2.2 Process condition

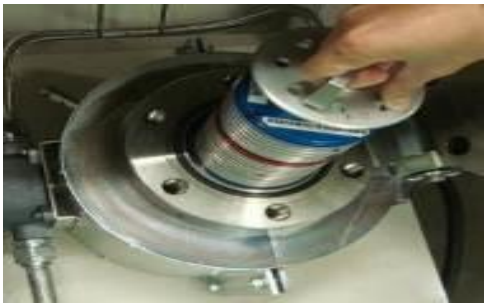
Item	Condition
Fiber rewinding length	Machine setting (See Fg 2.1.1).
Appearance	Visual

3. Hydrogen Loading

3.1 Process specification

Item	Specification
Loading pressure	Pressure is 9.0 ~ 11.0 Mpa
Loading temperature	Temperature is less than 70ºC (Optimal condition: 55 ~ 65ºC)
Loading time	Loading time is equal or greater than 24hrs.
Pot life of fiber (or Storage time)	* Storage at room temperature (Storage time @RT): - Pot life should: ≤ 8hr * Storage time at low temperature: - Fiber must be used less than 24 hours (Optimal condition: 22hours) - Storage temperature: -40℃ < T < -20℃ (Setting value) - Reel package: should be packaged individually in a zipper bag

Fg 3.1.1: Hydrogen Loading Chamber



Fg 3.1.2: Putting Optical Fiber Reel (aluminum) into Chamber

Fg 3.1.3: Pressure of Hydrogen Loading

Fg 3.1.4: Temperature of Hydrogen Loading

Fg 3.1.5: Packing reel before put into low-temperature storage

3.2 Process condition

Item	**Condition**
Pot life of fiber	Visual (expiration date on reel)
Pressure	Hydrogen loading machine
Temperature	
Loading time	Clock, Checksheet
Storage time	- Clock, Checksheet - Visual (expiration date on reel)
Storage at low temperature	Freezer or equivalent equipment

4. Fiber cutting

4.1 Process specification

Item	**Specification**
Pot life of fiber	Fiber must be used less than 24 hours after taking out Hydrogen loading chamber. (Optimal condition: 22hours)
Cutting length	Prefer to table 4.1.1
Yellow port position (yellow tape)	Prefer to table 4.1.1 and Figure 4.1.1
Red port position (red plastic tape)	Prefer to table 4.1.1 and Figure 4.1.1

Table 4.1.1 Cutting length of Cavity-FG. 67

Group	**Type name**	**L1**	**L2**	**L3**	**Total length of cutting (mm)**
1	DUV, DXV, DYV, YDV, YEV, YUV, YXV	830 ± 50	820 ± 50	1100 ± 50	~ 2750
2	NAV, NBV	860 ± 50	820 ± 50	2530 ± 50	~ 4210
3	WAV	660 ± 50	820 ± 50	2010 ± 50	~ 3490
4	XAV	660 ± 50	820 ± 50	1260 ± 50	~ 2740
5	XBV, WBV	660 ± 50	820 ± 50	510 ± 50	~ 1990
6	KBV, KCV, KYV, KXV	1505 ± 50	820 ± 50	665 ± 50	~ 2990
7	HCV, HDV, HEV, HFV, HGV, HHV,HJV,HKV	N/A	640 ± 20	945 ± 20	~ 1735
8	KDV, KEV	460 ± 50	820 ± 50	760 ± 50	~ 2040
9	YAV	1580 ± 50	820 ± 50	1100 ± 50	~ 3500
10	NCV, NDV	1480 ± 50	820 ± 50	2550 ± 50	~ 4850
11	NYV, NXV	1425 ± 50	820 ± 50	2745 ± 50	~ 4990
12	XCV, XDV	1950 ± 50	820 ± 50	1270 ± 50	~ 4040
13	NWV, NUV	765 ± 50	820 ± 50	2745 ± 50	~ 4330
14	SAV	835 ± 50	820 ± 50	1375 ± 50	~3030
15	SBV, SCV	1615 ± 50	820 ± 50	1095 ± 50	~3530
16	CAV	865 ± 50	820 ± 50	1095 ± 50	~2780
17	PAV	455 ± 50	820 ± 50	725± 50	~2000
18	UAV, UBV	1085 ± 50	820 ± 50	615± 50	~2520
19	TAV, TBV	1845 ± 50	820 ± 50	1075± 50	~3740
20	XEV, XFV	2755 ± 50	820 ± 50	2815± 50	~6390

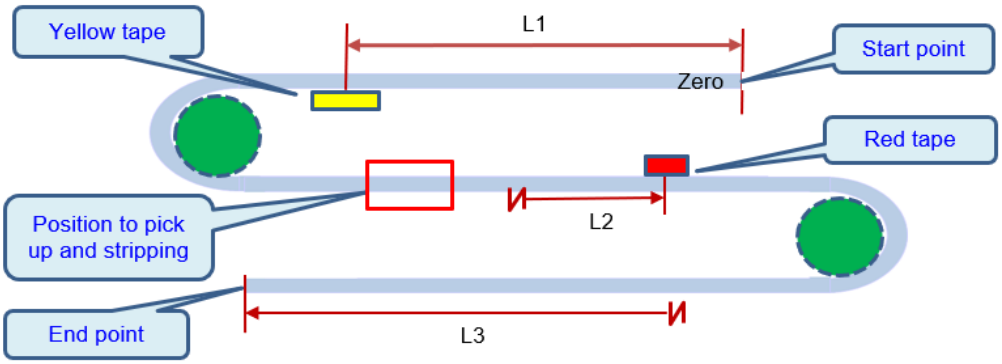


Figure 4.1.1 Diagram of cutting length - Cavity-FG

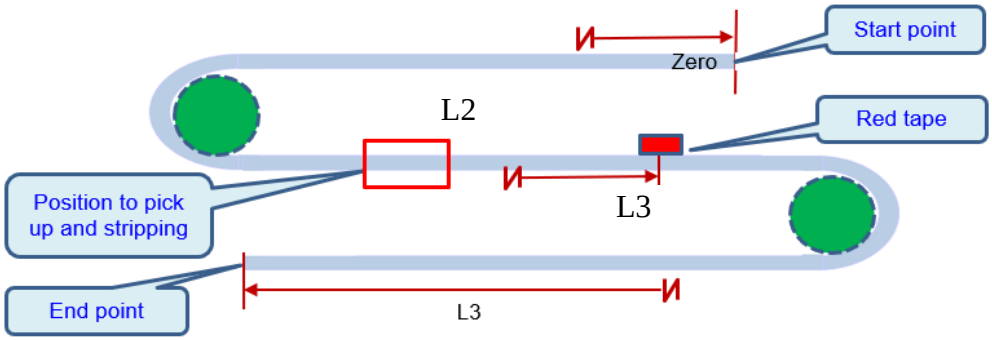


Figure 4.1.2 Diagram of cutting length - Cavity-FG (PM80um group)

4.2 Process condition

Item	**Condition**
Pot life of fiber	Program
Length of cutting	Jig
Position of starting winding fiber: Yellow port	Visual, Jig
Position of starting winding fiber: Red port	Visual, Jig
Fiber Type	Visual reel color

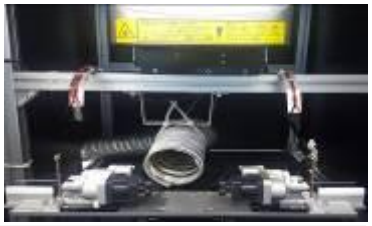
5. Fiber stripping

5.1 Process specification

Item	**Specification**
Appearance checking microscope	- Checking bare fiber appearance by microscope. (Fg 5.1.8) - There are not: contamination on the glass at the middle area, contamination burned changing brown or black, peeling off the edge of primary coat, stripping sharp. - Stripping shape for Corning fiber and 80 um fiber as the Fg 5.1.3 - Stripping shape for Fujikura fiber as the Fg 5.1.4.
Position of stripping	At the middle of INPUT PORT (Yellow port) and OUTPUT PORT (Red port). Note: For PM80um group, position of stripping at the middle of the end fiber left port and the end of the red tape port's fiber wrap (Fg 5.1.2)
Cleaning bare fiber	- Cleaning bare fiber by acetone right after stripping. (Fg 5.1.7) - Not touched bare fiber by anything.
Stripping length	Daily check, 1 sample. - Fiber 80um: < 4.5 mm - Other fiber: 20 ~ 30mm - Dogain Tech (CAV type): 8 ~ 12mm
Apply hot air (*)	- Hot air temperature < 650°C

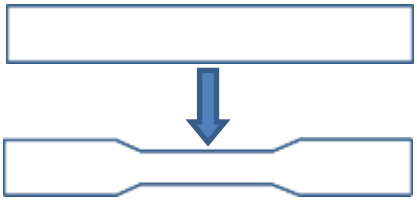
	- Hot air strip movement: 18mm (other SM types), 7mm (CAV type) - UV remain: < 2mm from stripping end (Fg 5.1.6)

(*) Refer to table II.1, "Apply hot air at stripping process" column

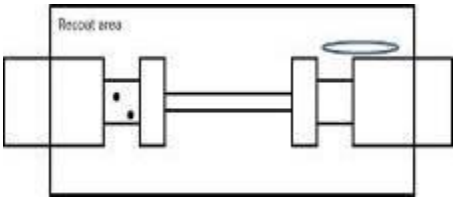


Fg 5.1.1: Stripping by CO2 Laser machine

Fg 5.1.2: Check balance of fiber before setting to machine (apply for PM80um group)

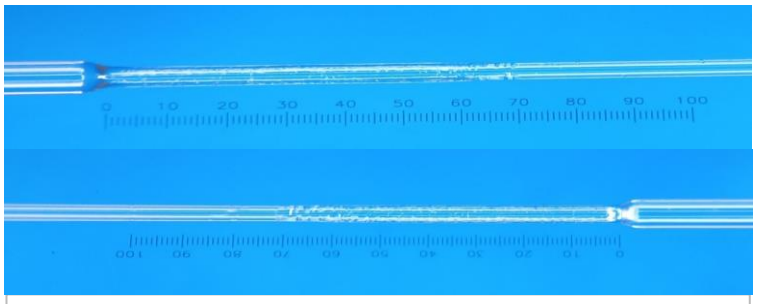


Fg 5.1.3: Stripping shape for Corning fiber and 80um fiber



Fg 5.1.4: Stripping shape for Fujikura fiber

Fg 5.1.5: Stripping by hot air machine (SM980)



Fg 5.1.6: UV remain < 2mm from stripping end → OK

Fg 5.1.7: Cleaning bare fiber by acetone and ultrasonic machine

Fg 5.1.8: Checking bare fiber by microscope.

Fg 5.1.9: Fiber stripping, setting and winding fiber on metal board.
Yellow port is left and red port is right.

5.2 Process condition

Item	Condition	Remark
WIP control	Visual (Optimum condition: 5pcs)	For good yield% at Exposing, - The WIP should be controlled not over 5pcs normally to keep input to Exposing within 2 hours after cutting. - If process stopped for any reason, Leader up

		must re-confirm WIP before input as following: + If don't use refrigerator: Don't excessed 8hours after taking out from Hydro Loading chamber. + If use refrigerator: Don't excessed 8 hours after taking out from refrigerator and don't excessed 24h after taking out from Hydro Loading chamber.
Appearance of bare fiber	Visual by microscope	
Position of stripping	Visual	
Equipment control: + Stripping length + Proof test	Ruler (Daily checking) Proof tester (Daily checking)	
Stripping condition control	Daily Pull test (Breaking test)	Check the breaking strength before mass production usage: - Frequency: 3pcs/condition/ machine/shift - Breaking force: + ≥ 5 kg.f, 1 sec for 125um fiber + ≥ 2 kg.f, 1 sec for 80um fiber
	Reliability test or verification	Refer to 4-PR-006 for detail requirement
Operator skill control	Pull test (Breaking test)	Refer to 4-PR-006 for detail requirement
Hot air temperature	Visual (Machine setting)	Refer to table II.1, "Apply hot air at stripping process" column.
Hot air strip movement	Machine setting	Refer to table II.1, "Apply hot air at stripping process" column.

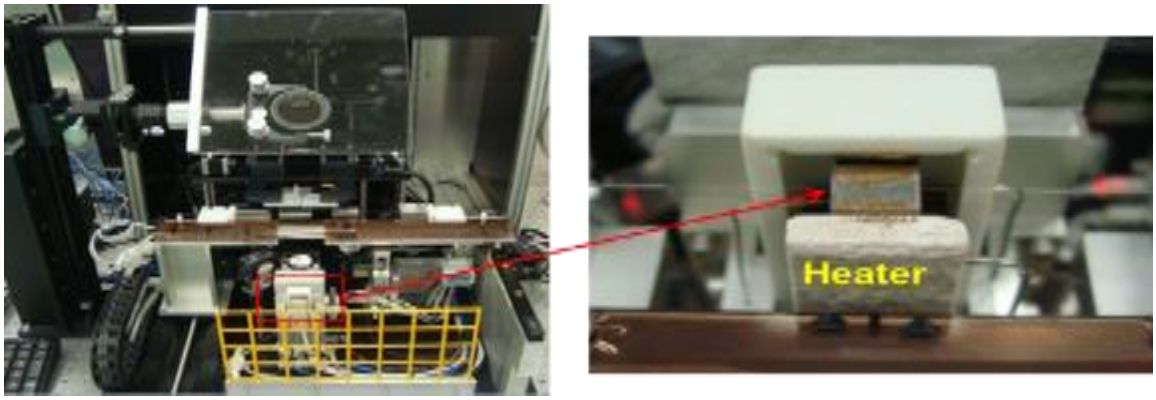
6. Exposing and Thermal aging

Noted: Thermal aging has been applies base on requirement of product code (see the Table II. 1 Products general information).

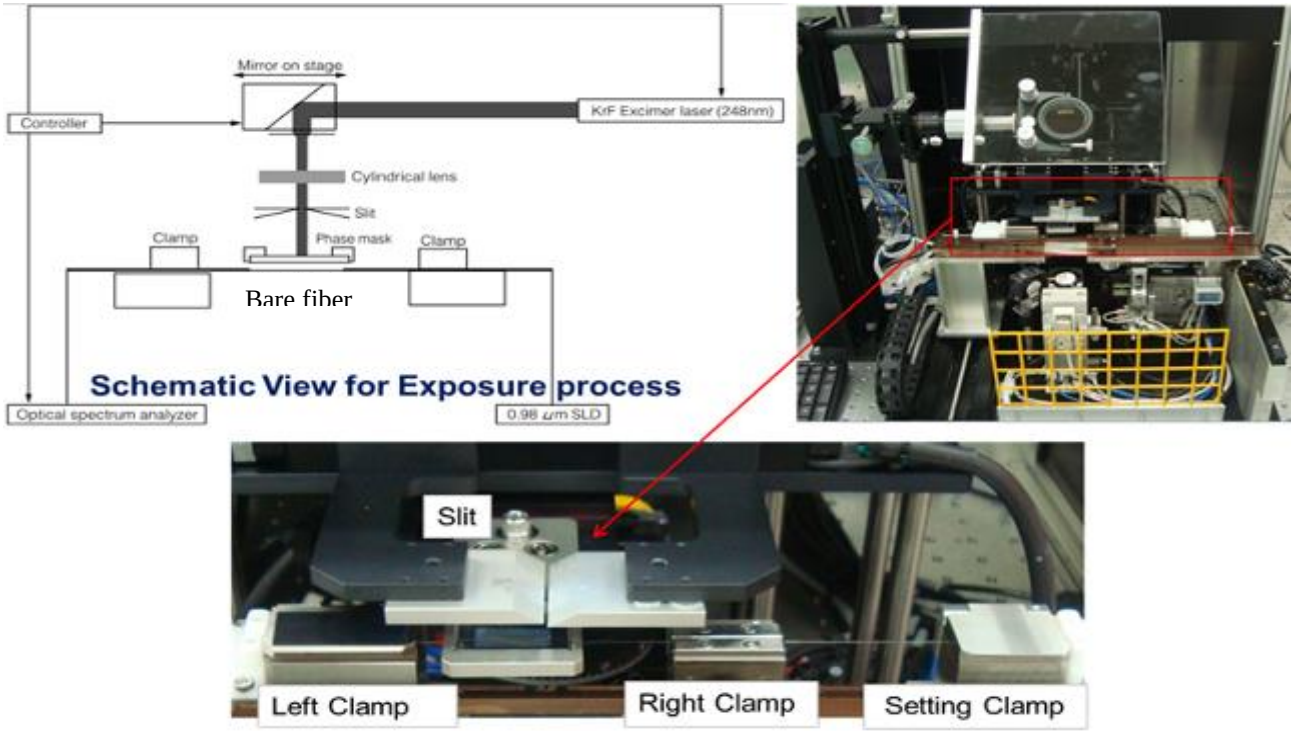
6.1 Process specification 67

Item	Specification
Exposing result Center wavelength Reflectivity Full Width Half Max Side Lobe Suppression Ratio Spectrum type	Control criteria by optical measurement result
Excimer Laser Energy Excimer Laser Density Heater Temperature Aging Time	Manufacturing: 120mJ, mode EGY-N or EGY-P, 40Hz < 3 mJ/mm^2 (weekly checking) > 380°C 15 ± 2 seconds (Setting time on program)

Fg 6.1.1: Excimer Laser and Exposing



Fg 6.1.2: Thermal Aging



Fg 6.1.3: Exposing system of Cavity FG

Fg 6.1.4: Exposing program(80um)

Fg 6.1.4: Exposing program

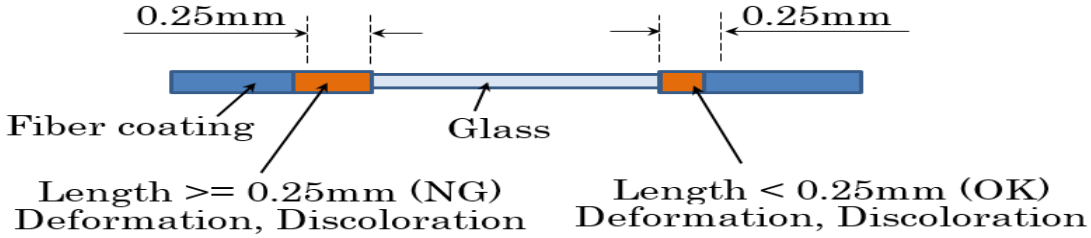
6.2 Process condition

Item	Condition	Remark
WIP control	Visual (Optimum condition: 10pcs)	For good yield% at Exposing, - The WIP should be controlled not over 10pcs normally to keep input to Exposing within 2 hours after cutting. - If process stopped for any reason, Leader up must re-confirm WIP was not excessed 24hours after Hydrogen loading before input.
Position of bare fiber FBG (80um)	Template	
Equipment control: + Excimer Laser Energy + Excimer Laser Density + Heater Temperature + Heating Time	 + Excimer laser machine (Daily checking) + Laser power meter, ruler, calculation (Weekly checking) + Exposing system (and program) (Daily checking) + Exposing system (and program) (Daily checking)	
Exposing result: + Center wavelength + Reflectivity + Full Width Half Max + Side Lobe Suppression Ratio + Spectrum type	 Manufacturing program, measuring system Visual by checking OSA	

7.**Thermal Aging (hot air) process**

7.1 Process specification

Item	Specification
Hot air temperature	> 500^{o}C
Stripping movement	2.5 mm
Pre-Heating	10 sec
Velocity	3.0mm/sec
Appearance	Check length of deformation or discoloration of fiber coating is less than 0.25mm (Fg 7.1.1) - Frequency: 3pcs/OP/day
Magnification	40X



Fg. 7.1.1: Heating Area criteria at hot air

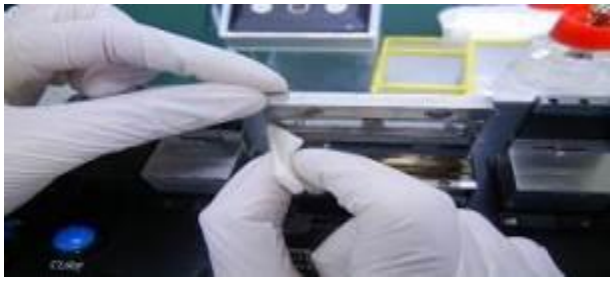
7.2 Process condition

Item	**Condition**
Hot Air Temperature	Machine Setting
Appearance	Microscope

8. Recoating process

8.1 Process specification

Item	**Specification**
Appearance	Coating zone must not be over heat (change color), white, dried. Peel off: prefer to section 11. Visual inspection (recoating zone). Dent: prefer to section 11. Visual inspection (recoating zone). Dirty (contamination): prefer to section 11. Visual inspection (recoating zone).
Shape of UV resin on mold after recoating	After recoating, shape of UV resin on mold must be rhombus (see 8.1.5) but not apply for D06.
Recoating mold diameter sample.	D01, D02,D07, D08,D09,D10,D11: 300 ± 30 µm. Refer to table II.1, DS column. D03, D05: ≤ 320 µm. Refer to table II.1, DS column. D06: < 260µm. Refer to table II.1, DS column.
Cleaning's recoating	- Cleaning's liquid: clean alcohol (F.g 8.1.4) - Cleaning in 3~5 second.

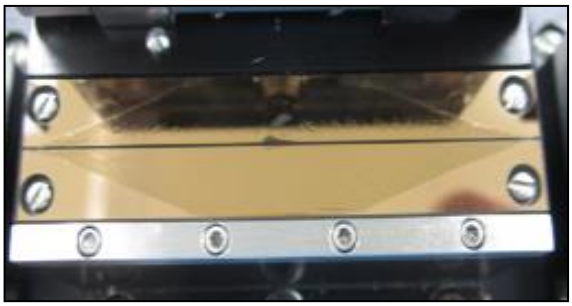


Fg 8.1.1: Mold cleaning

Fg 8.1.2: Adhesive injection and curing

Fg 8.1.3: Remove from mold

Fg 8.1.4: Cleaning by Alcohol



Fg 8.1.5: The shape of UV resin on mold must be rhombus after recoating

8.2 Process condition

Item	**Condition**
Appearance	Visual by microscope
Equipment control: + Recoating diameter + Appearance + Recoating length	 Microscope (Daily checking) Microscope (Checking sample) By template (Daily checking)
Shape of UV resin on mold after recoating	Visual
Recoat and UV curing	Recoater
Remove burr/cleaning	Ultrasonic machine

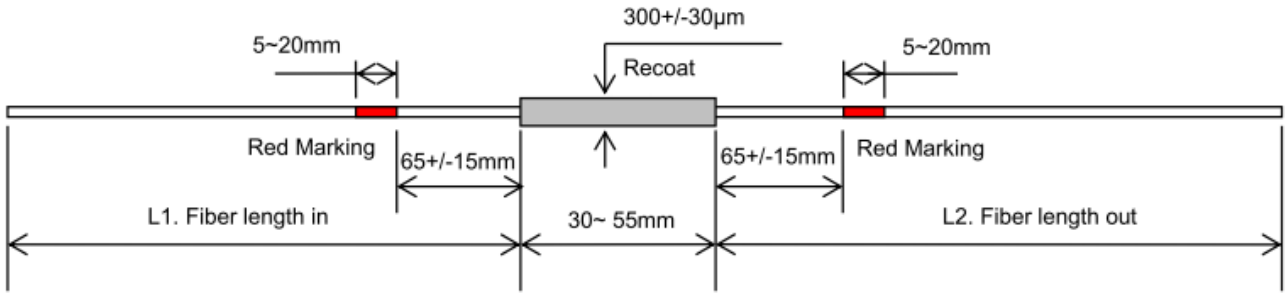
9. Marking and proof test:

9.1 Process specification

Note: The marking process will be apply for product, which defined detail in table

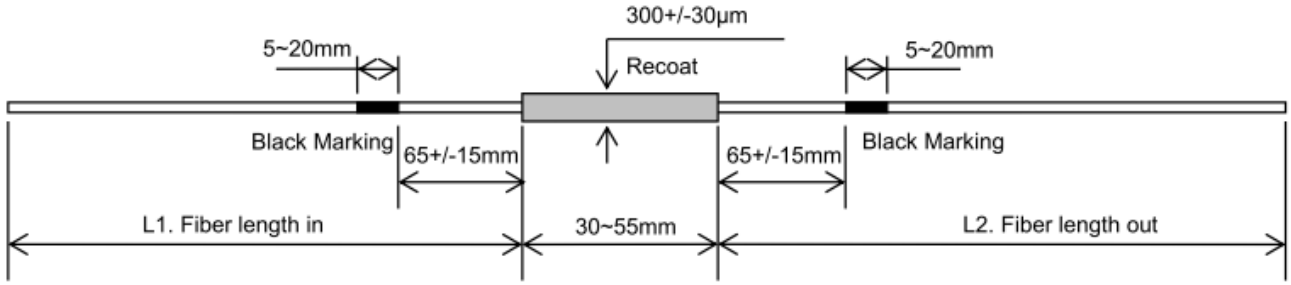
Item	**Specification**
Proof test level	+ ≥ 1.8 kgf, 1sec (NAV,NBV,NCV,NDV,NYV,NXV,NWV,NUV type) + ≥ 1.5 kgf, 1sec (others product) + ≥ 0.6 kgf, 1sec (80um 980PM)
Fiber pull strain rate	< 0.4mm/sec
Marking position	Mark must be located in marking area (Refer to F.g 9.1.1, 9.1.2 and 9.1.4)
Marking length	+ 5~10mm (D05, D07: Refer to table II. 1, column D.S) + 5~20mm (D01, D02, D08: Refer to table II. 1, column D.S) + 3~7mm (D10, D11: Refer to table II. 1, column D.S)
Recoating length	+ > 5mm (D06: Refer to table II. 1, column RLS) + 30mm~55mm (D01, D02, D07, D08, D11: Refer to table II. 1, column RLS) + 40~50mm (D10: Refer to table II. 1, column RLS) + < 50mm (others product)
Color of marking	Refer to table II.1, MCS column.

(D01)



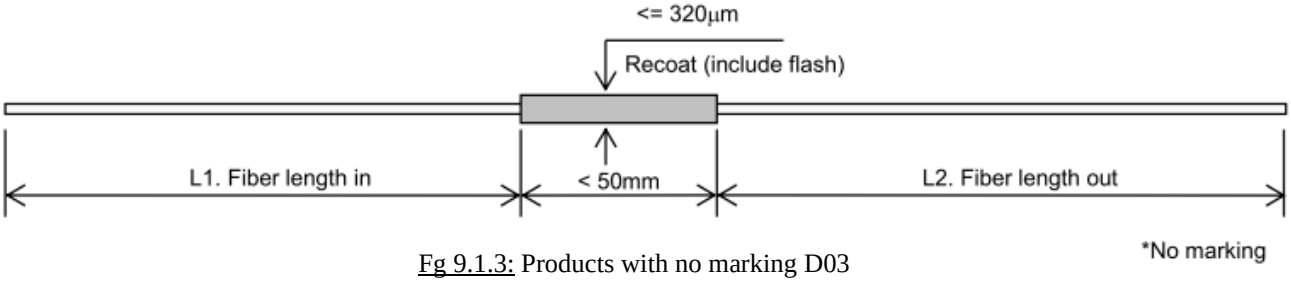
Fg 9.1.1: Product with red marking

(D02)



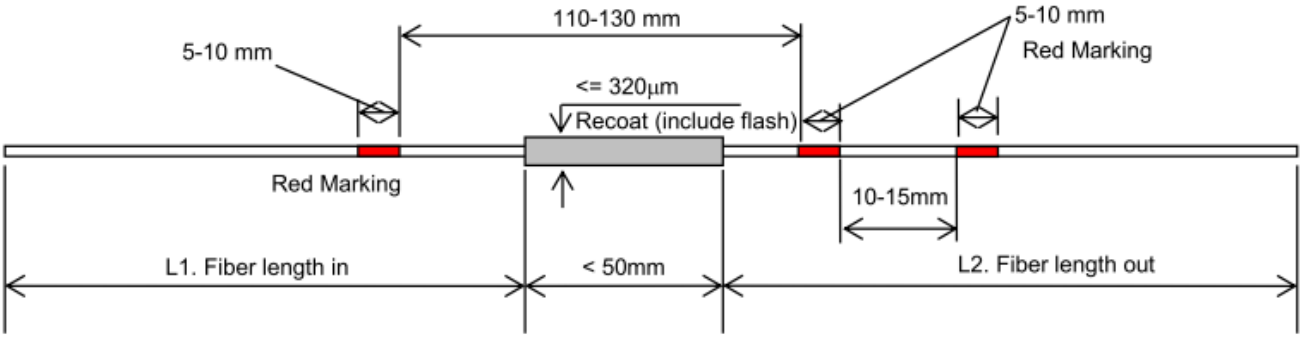
Fg 9.1.2: Products with black marking

(D03)



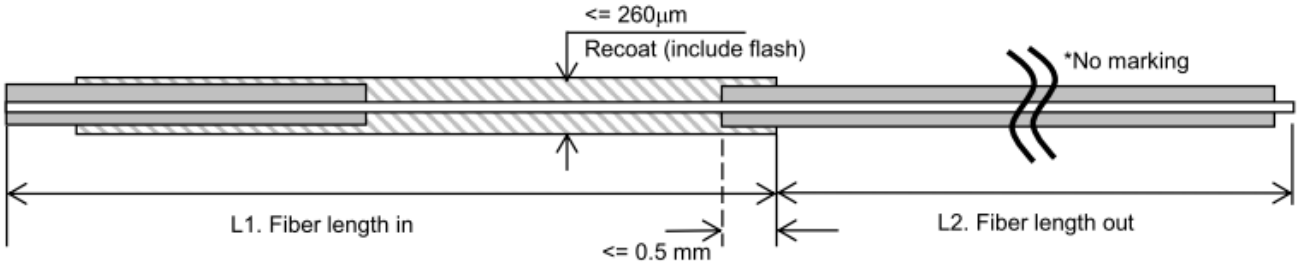
Fg 9.1.3: Products with no marking D03

(D05)



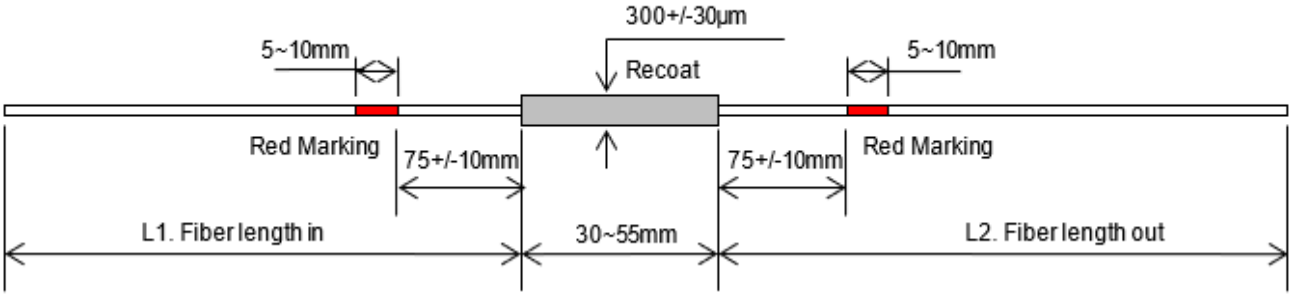
Fg 9.1.4: Products with two red marking on the right

(D06)



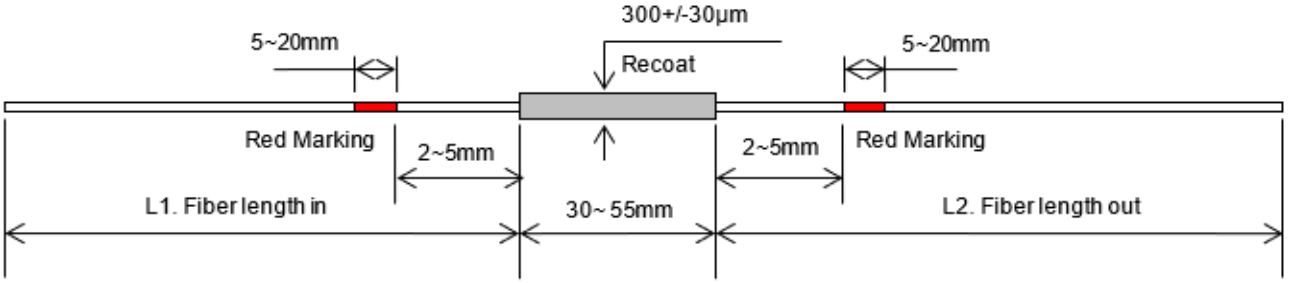
Fg 9.1.5: Products with no marking (fiber 80µm)

(D07)



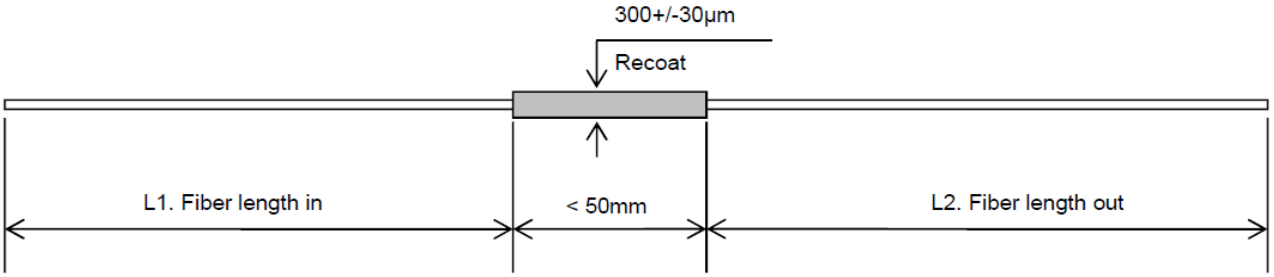
Fg 9.1.6: Products with red marking (NWV, NUV, NXV, NYV)

(D08)



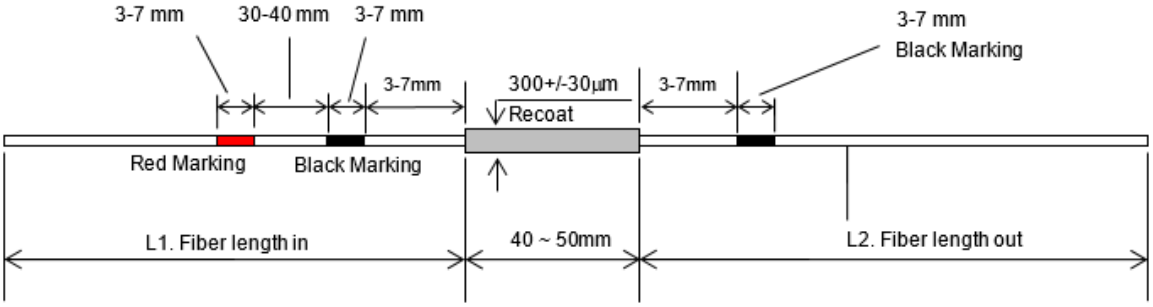
Fg 9.1.7: Products with red marking (SBV, SCV)

(D09)



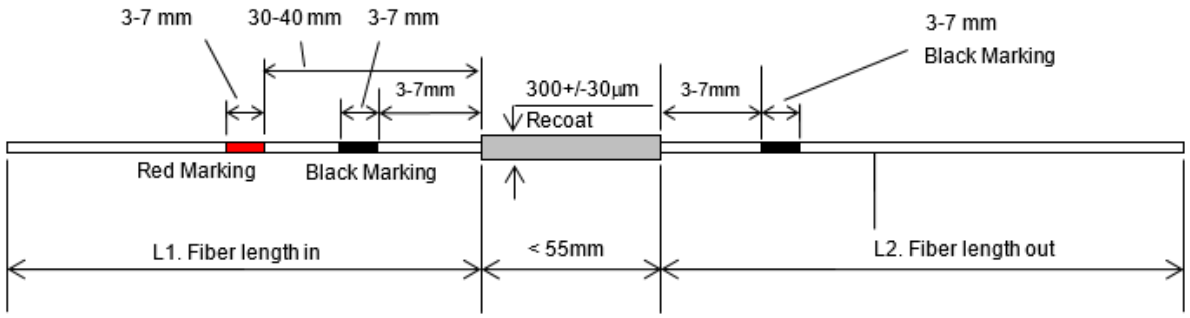
Fg 9.1.8 Products with no marking (CAV)

(D10)



Fg 9.1.9 Products with Red & Black marking (TAV & TBV)

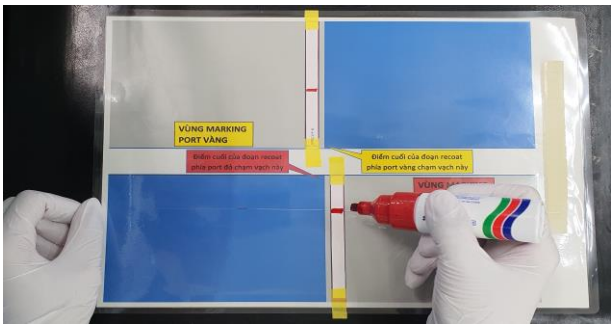
(D11)



Fg 9.1.10 Products with Red & Black marking (UAV & UBV)

Fg 9.1.11: Proof test by machine

Fg 9.1.12: Marking by template



Fg 9.1.13: Marking by template for SBV, SCV

9.2 Process condition

Item	**Condition**
Appearance	Visual
Proof test level	Proof tester (see Fg 9.1.11)
Marking position	Template
Marking length	
Recoating length	
Color of marking	Art-line pen

10. **Hydrogen Unloading**

10.1 Process specification

Item	**Specification**
Temperature	+ 120ºC ± 5ºC *Noted: Allowed temperature over 125ºC but less than 130ºC within first hour from when temperature goes up 115ºC.*
Unloading Time	+11.5~13 hours (690~ 780 min)

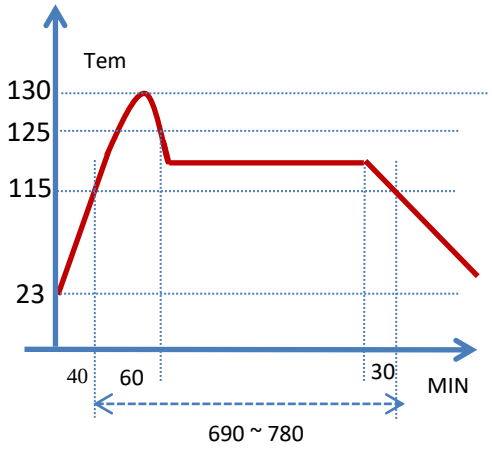


Fig 10.1: Unloading diagram

10.2 Process condition

Item	**Condition**
Unloading Temperature	Oven & Thermal recorder
Unloading Time	

.

11. Visual inspection (Recoating zone)

11.1 Process specification (Refer to table II.1, column RV)

+ Recoat region should be continuous

+ The recoat region must be fully cured and not tacky to the touch.

+ Within the critical recoat zone, recoat must be continuous around the fiber circumference with no exposed glass or original acrylate coating

11.1.1 Apply for all products belong RV1

Item	Specification
Appearance	- Table 11.1.1.1: Defect Size and Frequency Criteria within Critical Recoat Zone - Table 11.1.1.2: Defect Size and Frequency Criteria within Outside Critical Recoat Zone

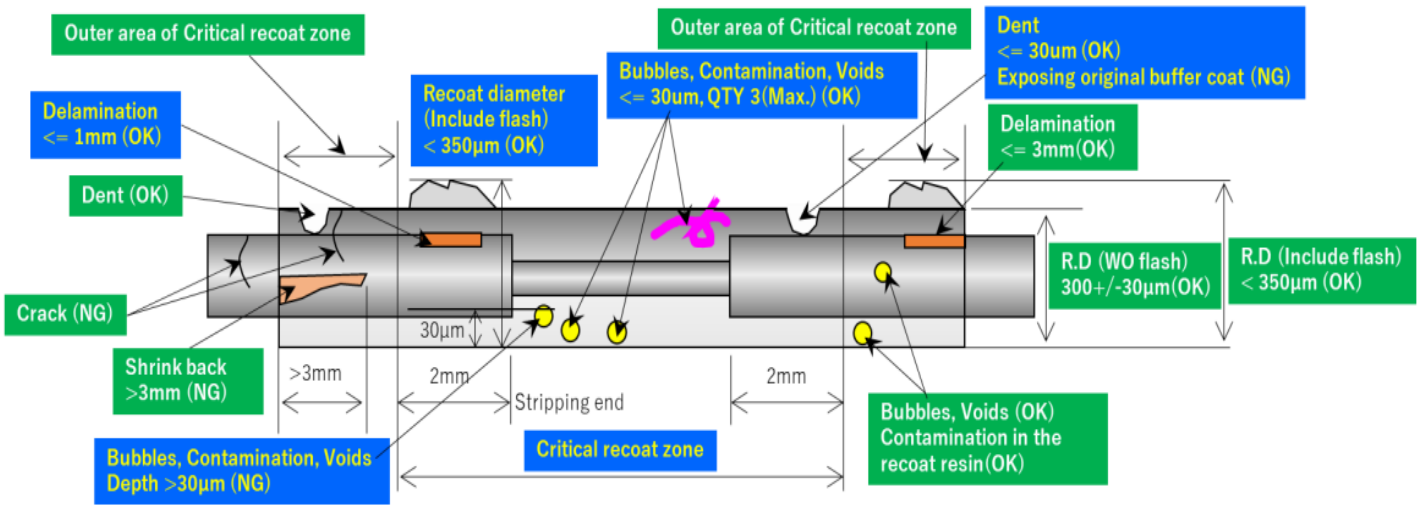


Table 11.1.1.1: Defect Size and Frequency Criteria within Critical Recoat Zone (RV1)

Defect Type	Defect Size/Condition	Acceptance level	Instrument and Method
Crack	Any	Not accept	Microscope: Magnification x40
Voids, Bubbles, contamination, Dent	Maximum depth ≤ 30µm	Accept	Microscope: inspect by Magnification x40 and measure by Magnification x40
	Max. dimension ≤ 30µm	Accept	
Surface irregularities (not overlapped)	Maximum dimension or depth or height ≤ 30µm, Max: 3 pcs	Accept	
	Maximum dimension or depth or height > 30µm	Not accept	
	Exposing original buffer coating	Not accept	
Recoat diameter (wo flash)	D01, D02, D07, D08, D09, D10, D11 < =270um or >= 330um	Not accept	
Recoat diameter (including flash)	D01, D02, D07, D08, D09, ≥ 350um D10, D11 >= 330um	Not accept	
Discoloration (From marking ink)	Easy to find by naked eyes	Not accept	
Brown ring	At buffer/glass interface	Not accept	
Discoloration (yellowing)	Dark yellow	Not accept	
Delamination	A bright reflection between the glass and the recoating layer >1mm	Not accept	

Table 11.1.1.2: Defect Size and Frequency Criteria within Outside Critical Recoat Zone RV1

Defect Type	**Defect Size/Condition**	**Acceptance level**	**Instrument and Method**
Crack	Any	Not accept	Microscope: inspect by Magnification x40 and measure by Magnification x40
Contaminations	Sticking out from recoat surface	Not accept	
Voids, Bubbles, Dent	Any	Accept	
Surface irregularities (not overlapped)	Not expose original buffer coating over 3mm	Not accept	
Recoat diameter (wo flash)	D01, D02, D07, D08, D09 <= 270um or >= 330um	Not accept	
Recoat diameter (including flash)	D01, D02, D07, D08, D09 ≥ 350um D10, D11 >= 330um	Not accept	
Discoloration (From marking ink)	Easy to find by naked eyes	Not accept	
Brown ring	At buffer/glass interface	Not accept	
Discoloration (yellowing)	Dark yellow	Not accept	
Delamination	A bright reflection between the buffer coating (original) and the recoating layer is more than 3 mm from the end of recoating (both side)	Not accept	Microscope: inspect by Magnification x40 and measure by Magnification x20

11.1.2 Apply for all products belong RV2

Item	**Specification**
Appearance	- Table 11.1.2.1: Defect Size and Frequency Criteria within Critical Recoat Zone - Table 11.1.2.2: Defect Size and Frequency Criteria within Outside Critical Recoat Zone

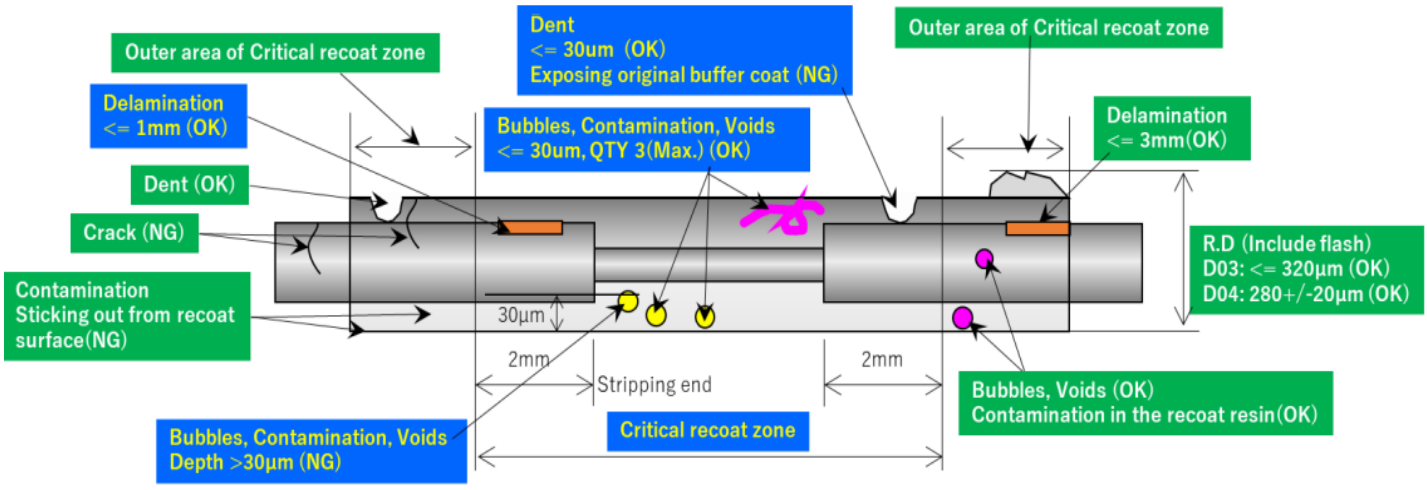


Table 11.1.2.1 Defect Size and Frequency Criteria within Critical Recoat Zone (RV2)

Defect Type	**Defect Size/Condition**	**Acceptance level**	**Instrument and Method**
Crack	Any	Not accept	Microscope: inspect by Magnification x40 and measure by Magnification x40
Contamination	Maximum depth > 30µm Max. dimension > 30µm	Not accept	
	Max. dimension ≤ 30µm Max: 3 pcs	Accept	
Voids, Bubbles	Maximum depth > 30µm Max. dimension > 30µm	Not accept	
	Max. dimension ≤ 30µm Max: 3 pcs	Accept	
Dent	Maximum depth > 30µm	Not accept	
	Exposing original buffer coating		
Recoat diameter	(D03, D05) > 320um	Not accept	
Brown ring	At buffer/glass interface	Not accept	
Discoloration (yellowing)	Dark yellow	Not accept	
Delamination	A bright reflection between the glass and the recoating layer>1mm	Not accept	
Surface irregularities (not overlapped)	Maximum dimension or depth or height ≤ 30µm, Max: 3 pcs	Accept	
	Maximum dimension or depth or height > 30µm	Not accept	
	Exposing original buffer coating	Not accept	

Table 11.1.2.2 Defect Size and Frequency Criteria within Outside Critical Recoat Zone (RV2)

Defect Type	**Defect Size/Condition**	**Acceptance level**	**Instrument and Method**
Crack	Any	Not accept	Microscope: inspect by Magnification x40 and measure by Magnification x40
Contamination	Sticking out from recoat surface	Not accept	
Bubbles, Voids	Any Void, Bubble	Accept	
Recoat diameter	(D03, D05) > 320um	Not accept	
Surface irregularities (not overlapped)	Not expose original buffer coating over 3mm.	Not accept	
Discoloration (yellowing)	Dark yellow	Not accept	
Delamination	A bright reflection between the glass and the recoating layer >3mm	Not accept	Microscope: inspect by Magnification x40 and measure by Magnification x20

Note: D03, D04, D05: Refer to table II.1, column D.S

11.1.3. Apply for all products belong RV3:

Item	Specification
Appearance	- Table 11.1.3.1: Defect Size and Frequency Criteria within Recoat Zone

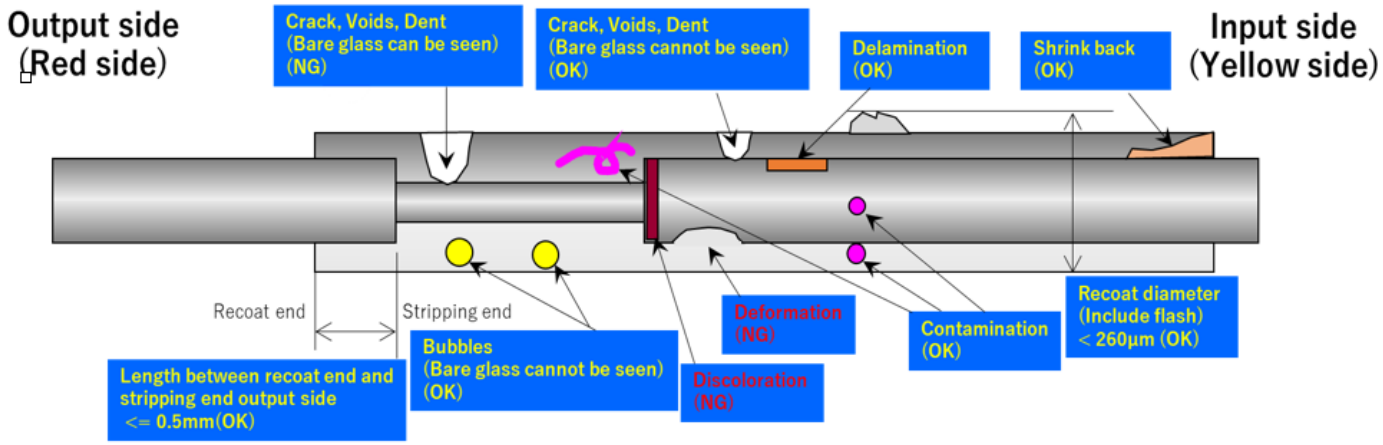
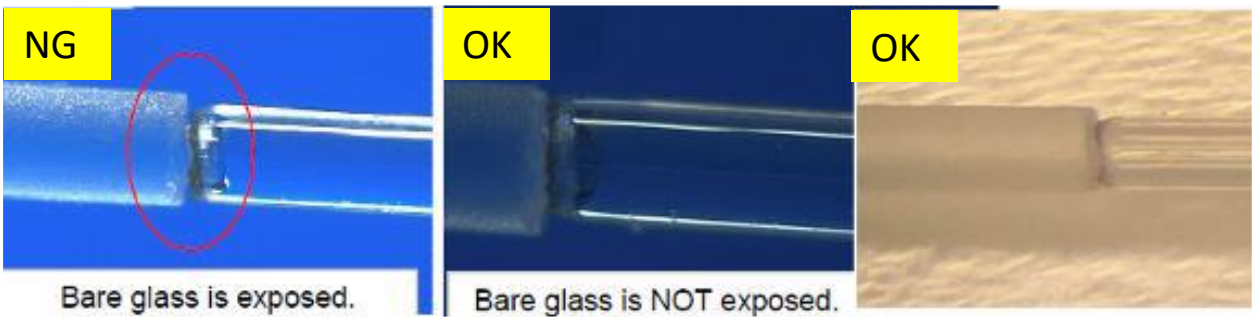
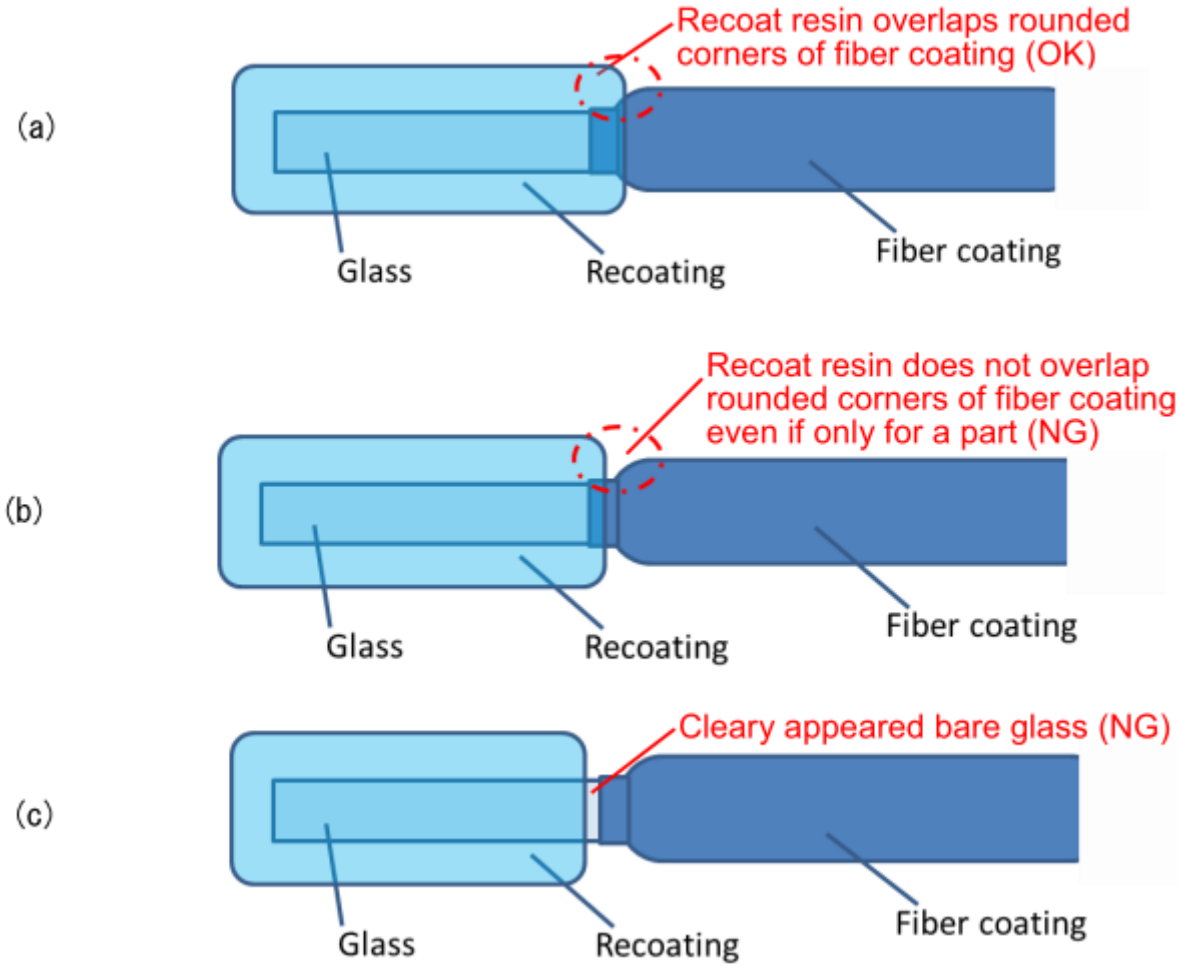


Table 11.1.3.1 Defect Size and Frequency Criteria within Recoat Zone (RV3)

Defect Type	Defect Size/ Condition	Acceptance level	Instrument and Method
Dent, air bubble, delamination, shrink back	- Can be seen bare glass - Recoat resin does not overlap rounded corners of fiber coating even if only for a part	Not accept	Microscope: inspect by Magnification x40 and measure by Magnification x40
Recoating diameter (include flash)	> 260μm	Not accept	Microscope: inspect by Magnification x40 and measure by Magnification x40
Length between recoat edge and stripping end at the output (red port)	> 0.5 mm	Not accept	Ruler in microscope with Magnification x40
Glass exposure at the recoat overlap	Bare glass can be seen	Not accept	Microscope: inspect by Magnification x40
Deformation, discoloration	At buffer/glass interface	Not accept	Microscope: inspect by Magnification x40



Fg 11.1.3.1: Glass exposure at the recoat overlap samples



Fg 11.1.3.2: Schematics of Glass exposure at the recoat overlap

Defect example of RV3
Discoloration
Criteria: At buffer/glass interface is NG

Fig. 11.1.3.3. Discoloration sample

Deformation
Criteria: At buffer/glass interface is NG

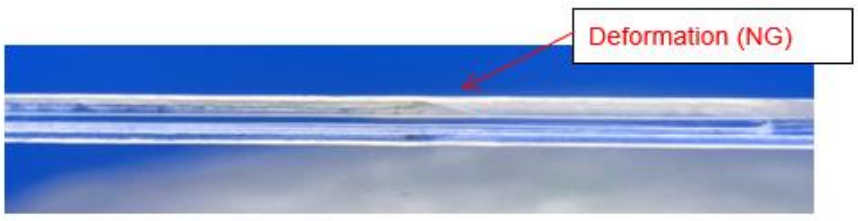


Fig. 11.1.3.4. Deformation sample

11.2 Process condition

Item	**Condition**
Appearance	Microscope
Inspection method (procedure)	- Step 1: set and adjust product in horizontal direction to see burr line (molding line) clearly. - Step 2: do burr removing along the recoating zone - Step 3: measure & check recoating diameter - Step 4: check the appearance of recoat area (contamination, void, air bubble,…) - Step 5: rotate product (recoat area) next 180 degree and repeat step 4. - Step 6. rotate product (recoat area) next 90 degree and repeat step 4. - Step 7: rotate product (recoat area) next 180 degree and repeat step 4. * Note: keep one direction of rotation under checking to complete all sides of recoating surface.

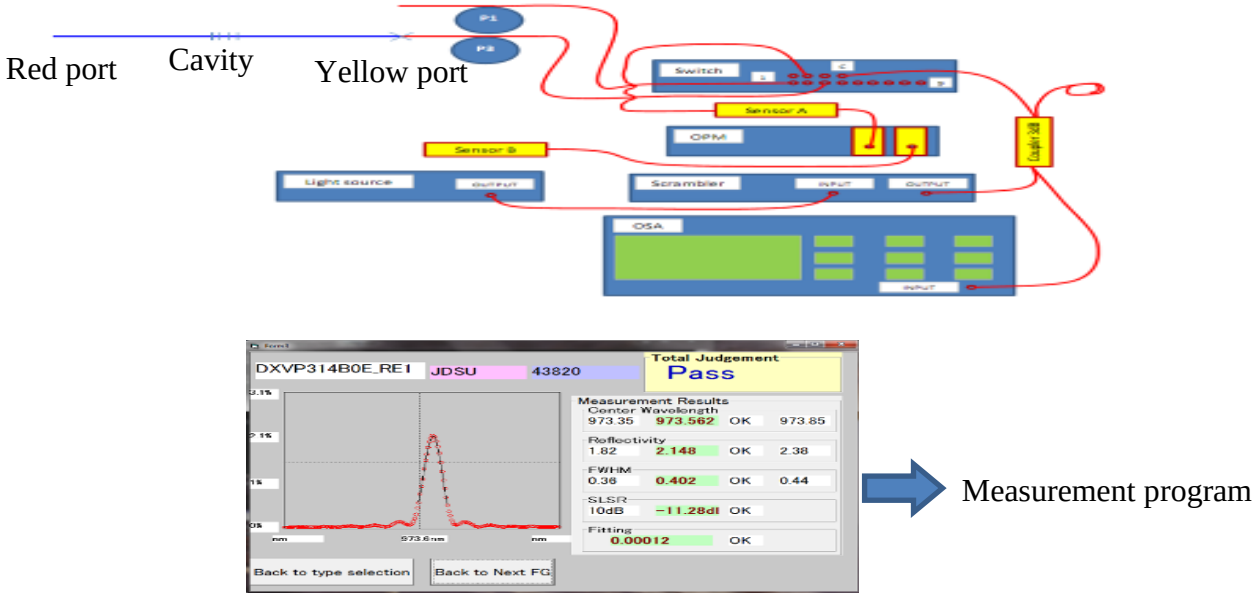
12. Optical Measurement 67

12.1 Process specification

Table 12.1.1: Optical parameter for each product

		Type	**Specification**
	Splice Loss	All product types	-0.1dB ~ 0.3 dB
Optical measurement configuration	Center wavelength	YDV, NDV, NXV, SCV	975.7 ~ 976.3 nm
		YEV	976.7 ~ 977.3 nm
		DUV, YUV	973.9 ~ 974.5 nm
		DXV, DYV, YXV, YAV, SAV, SBV	973.3 ~ 973.9 nm
		NAV, NWV	973.5 ~ 974.5 nm
		NBV, NUV	975.5 ~ 976.5 nm
		WAV, XAV, XBV, WBV	973.75 ~ 974.25 nm
		XCV, TAV, XEV	973.45 ~ 973.95 nm
		XDV, TBV, XFV	975.45 ~ 975.95 nm
		KBV, KYV, KDV, PAV	973.25 ~ 973.75 nm
		KCV, KXV, KEV	975.25 ~ 975.75 nm
		HCV, HEV, HGV, HHV, HJV, HKV	973.7 ~ 974.6 nm
		HDV, HFV	975.7 ~ 976.6 nm
		NCV, NYV	973.2 ~ 973.8 nm
		CAV	973.7 ~ 974.3 nm
		UAV	974.05 ~ 974.55 nm
		UBV	975.55 ~ 976.05 nm
	Reflectivity	DUV, DFV, DXV, YDV, YEV, YUV, YXV, YAV, CAV, SBV, SCV	1.8 ~ 2.4%
		DYV, NAV, NBV, NWV, NUV	3.5 ~ 4.5%
		NCV, NXV, NYV, NDV	1.7 ~ 2.3%
		HCV, HDV	3.5 ~ 5.2%
		WAV	1.5 ~ 2.5%
		XAV, XBV	4.0 ~ 5.0%

		XCV, XDV, XEV,XFV	2.5 ~ 3.5%
		KBV, KCV, KYV, KXV, KDV, KEV, PAV, TAV, TBV	1.75 ~ 2.25%
		WBV	5.0 ~ 6.0%
		HEV, HFV, HGV, HHV,HJV,HKV	5.4 ~ 7.2%
		SAV	1.8 ~ 2.2%
		UAV, UBV	7.5 ~ 8.5%
	Full Width Half Max	DUV, DFV, DXV, DYV, YDV, YEV, YUV, YXV, NAV, NBV, NWV, NUV, CAV, SAV	0.35 nm ~ 0.45 nm
		WAV, WBV	0.4 nm ~ 0.6 nm
		XAV, XBV	1.2 nm ~ 1.4 nm
		KBV, KCV, KYV, KXV, KDV, KEV	1.1 nm ~ 1.4 nm
		HAV, HBV, HCV, HDV, HGV, HKV	1.1 nm ~ 1.5 nm
		YAV, SBV, SCV	0.8 nm ~ 1.2 nm
		NCV, NDV, NYV, NXV	0.9 nm ~ 1.1 nm
		HEV, HFV, HHV, HJV	0.5 nm ~ 1.0 nm
		XCV, XDV, XEV, XFV	0.7 nm ~ 0.9 nm
		PAV	1.1nm ~ 1.4 nm
		TAV, TBV, UAV, UBV	0.55nm ~ 0.75 nm
	Side Lobe Suppression Ratio	DUV, DFV, DXV, DYV, NAV, NBV, WAV, YDV, YEV, YUV, YXV, YAV, NCV, NDV, NYV, NXV, NWV, NUV, WBV, CAV, SAV, SBV, SCV, TAV, TBV, UAV, UBV	≤ -10dB
		XAV, XBV, HEV, HFV, HGV, HHV, HJV, HKV	≤ -15dB
		KBV, KCV, KYV, KXV, KDV, HCV, HDV, KEV, XCV, XDV ,PAV, XEV, XFV	≤ -20dB



Fg 12.1.1: Optical measurement configuration

12.2 Process condition

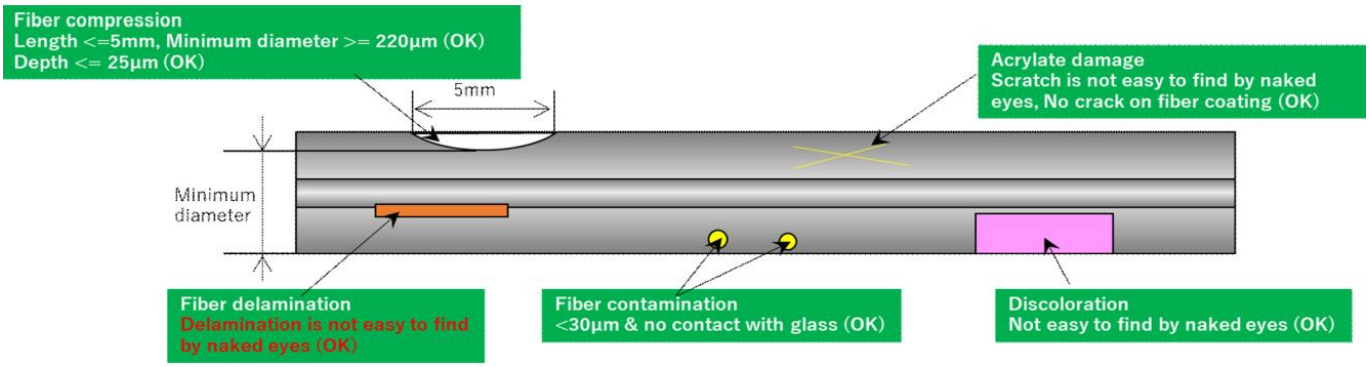
Item	Condition
Environment temperature	Thermometer (Monitoring system)
Thermometer position	Fixed position and near to the product are measuring
Splice Loss	Manufacturing program, measuring system

Optical Measurement result: + Center wavelength + Reflectivity + Full Width Half Max + Side Lobe Suppression Ratio	

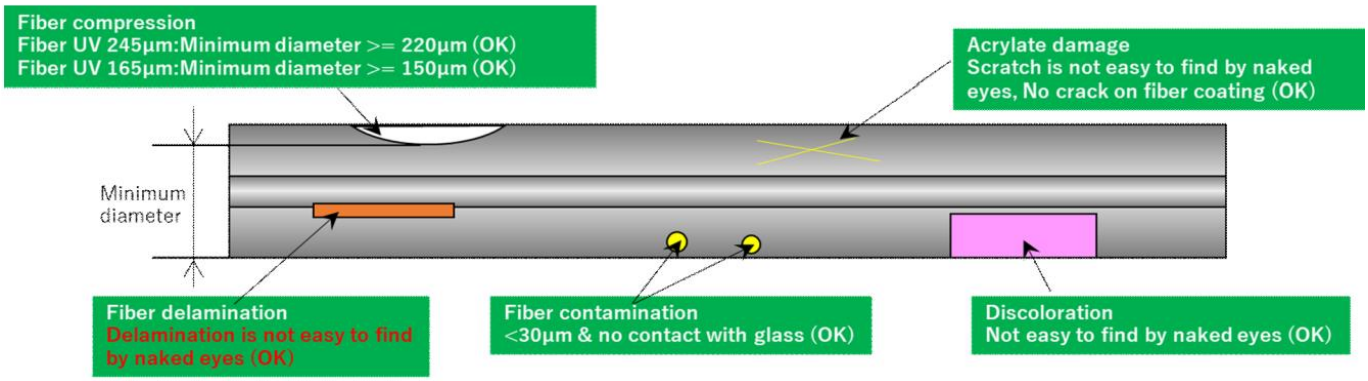
13. Visual Inspection and Packing

a. Process specification (Refer to table II.1, column FV1, FV2)

13.1.1 Visual Inspection



Fg 13.1.1.1: Defect mode on fiber (FV1)



Fg 13.1.1.2: Defect mode on fiber (FV2)

Table 13.1.1.1 Fiber Defect Size and Frequency Criteria

Defect Type	Defect Size/Condition	Acceptance level
Discoloration	Easy to find by naked eyes	Not accept
Contamination	> 30µm	Not accept
	Contacting the glass	
Delamination	Easy to find by naked eyes	Not accept
Fiber compression (criteria of FV1)	Minimum diameter < 220µm OR Depth >25µm	Not accept
	Length in longitudinal direction > 5mm	Not accept
Fiber compression (criteria of FV2)	Fiber UV 245µm: minimum diameter < 220µm	Not accept
	Fiber UV 165µm: minimum diameter < 150µm	Not accept
Acrylate damage without exposed glass	Crack on fiber coating Scratch (easy to find by naked eyes)	Not accept
Acrylate damage with exposed glass	Exposed glass	Not accept

Figure 13.1.1.3: Fiber delamination with crack sample ➔**NG**

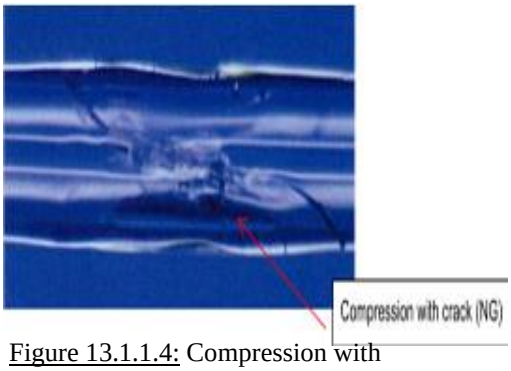


Figure 13.1.1.4: Compression with crack

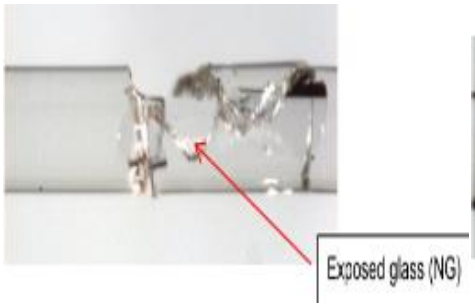


Figure 13.1.1.5: Exposed glass sample

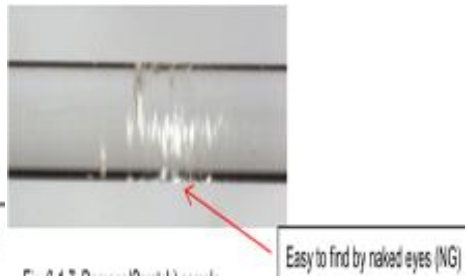


Figure 13.1.1.6: Damage (Scratch) sample

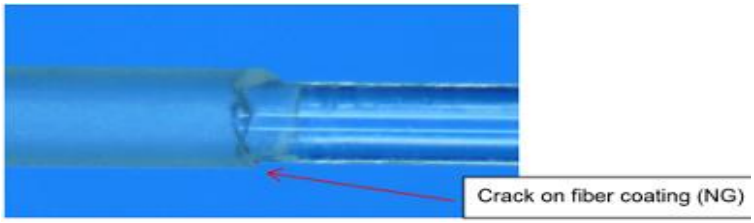


Figure 13.1.1.7: Compression with crack

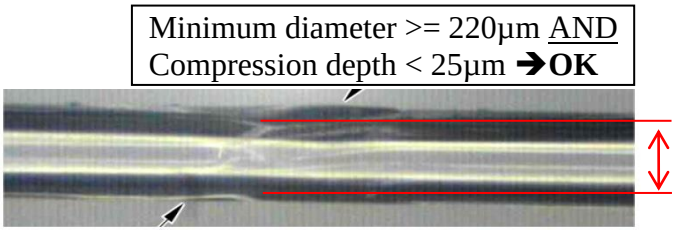


Figure 13.1.1.8: Fiber compression with diameter (FV1)

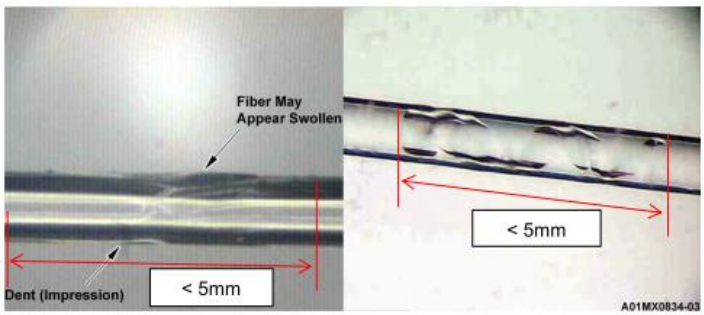


Figure 13.1.1.9: Fiber compression with length in longitudinal direction < 5mm, diameter >=220um → OK (FV1)

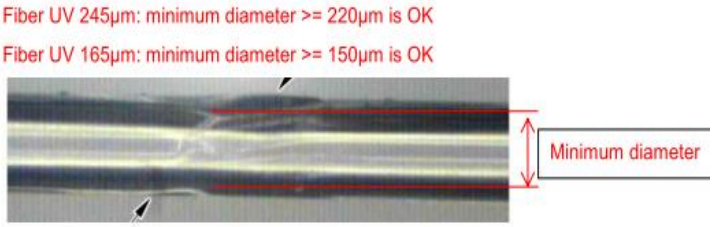
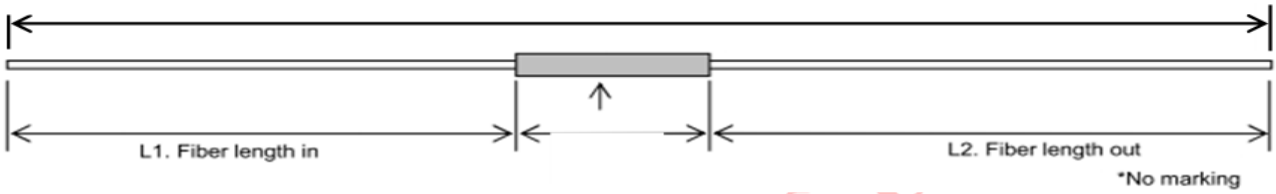


Figure 13.1.1.10: Fiber compression with diameter (FV2)

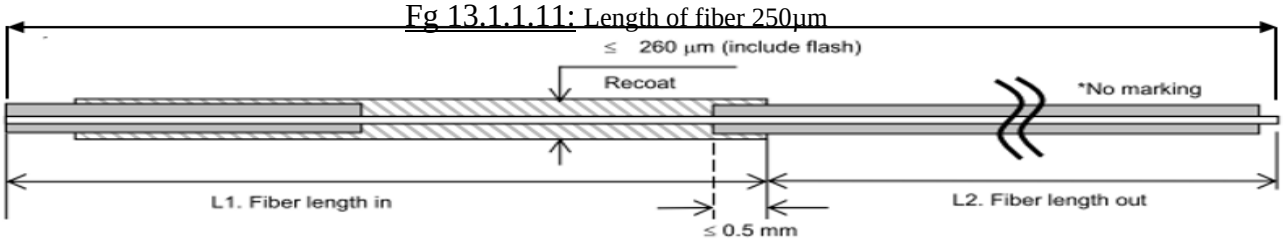
Table 13.1.1.2 Length of Cavity product 67

Group	Type name	L1(mm)	L2(mm)	Remark
1	DDV, DEV, DFV, DUV, DXV, DYV, YDV, YEV, YUV, YXV	1075 ± 25	1275 ± 25	Refer to figure 13.1.1.11
2	NAV, NBV	1105 ± 25	2705 ± 25	
3	WAV	895 ± 25	2195 ± 25	
4	XAV	895 ± 25	1445 ± 25	
5	JAV, JBV, JYV, JXV, XBV, WBV	895 ± 25	695 ± 25	
6	KBV, KCV, KYV, KXV	1745 ± 25	845 ± 25	

7	HAV, HBV, HCV, HDV, HEV, HFV, HGV, HHV, HJV, HKV	30 ± 10	>1050	Refer to figure 13.1.1.12
8	KDV, KEV	695 ± 25	945 ± 25	Refer to figure 13.1.1.11
9	YAV	1825 ± 25	1275 ± 25	
10	NCV, NDV	1725 ± 25	2725 ± 25	
11	NYV, NXV	1670 ± 20	2925 ± 25	
12	XCV, XDV	2195 ± 25	1445 ± 25	
13	NWV, NUV	1005 ± 25	2925 ± 25	
14	SAV	1075 ± 25	1555 ± 25	
15	SBV, SCV	1855 ± 25	1275 ± 25	
16	CAV	1105 ± 25	1275 ± 25	
17	PAV	695± 25	905± 25	
18	TAV, TBV	2085 ± 25	1255 ± 25	
19	UAV, UBV	1325 ± 25	800 ± 20	
20	XEV, XFV	2995 ± 25	2995 ± 25	



Fg 13.1.1.11: Length of fiber 250µm



Fg 13.1.1.12: Length of fiber 80µm

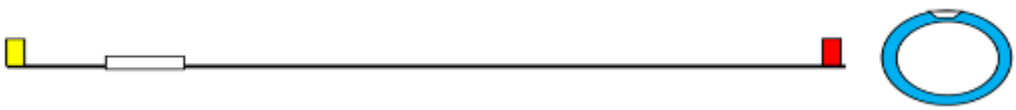
Table 13.1.1.3 Marking specification of Cavity product

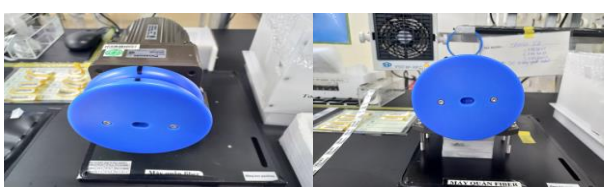
Note: The marking process will be applied for product, which defined detail in table II.1

Item	**Specification**
Marking position	Mark must be located in marking area (following F.g 9.1.1, 9.1.2 and 9.1.4)
Marking length	+ 5~10mm (D05, D07: Refer to table II. 1, column D.S) + 5~20mm (D01, D02, D08: Refer to table II. 1, column D.S) + 3~7mm (D10, D11: Refer to table II. 1, column D.S)
Color of marking	Refer to table II.1, MCS column.

13.1.2. Inner Packing

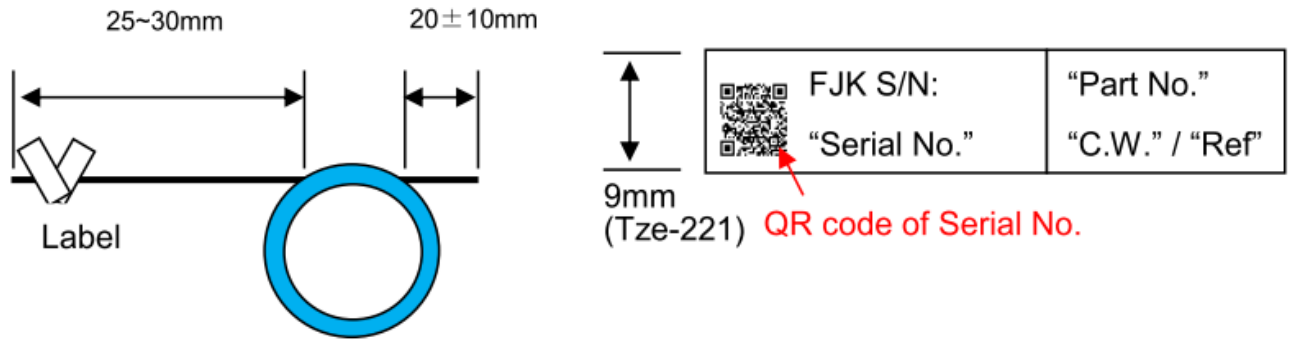
13.1.2.1 Inner Packing for patt 1





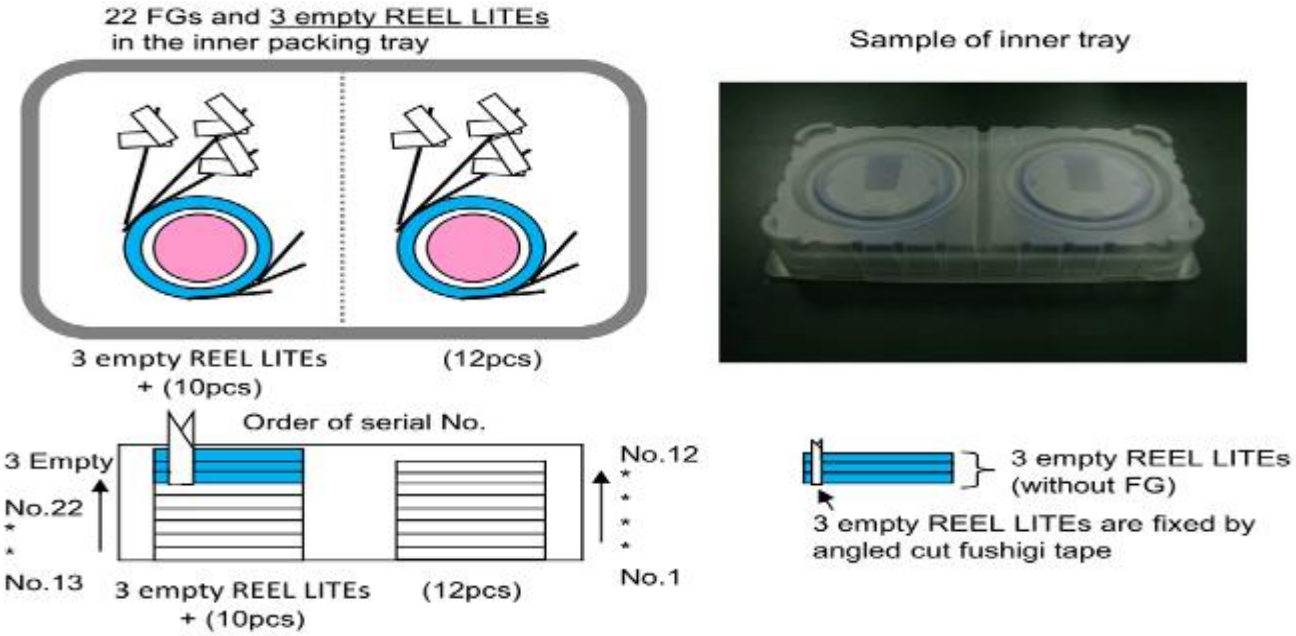
Winding jig

Step 1: Winding fiber to reel by machine from red side



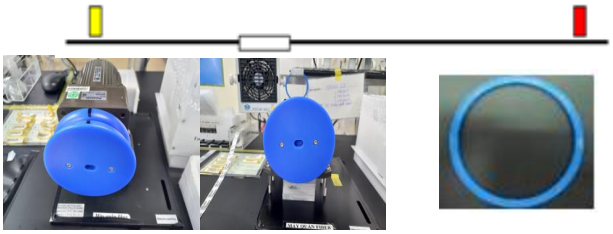
Step 2: The serial label is taped at the end of fiber

Step 3: After rewinding and labeling, there is no protrusion of fiber from REEL LITE

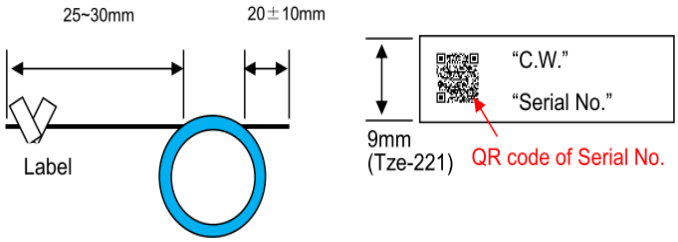


Step 4: Put 22 products in packing tray and cover 3 empty reels lite fixed by fushigi tape

13.1.2.2 Inner Packing for patt 2

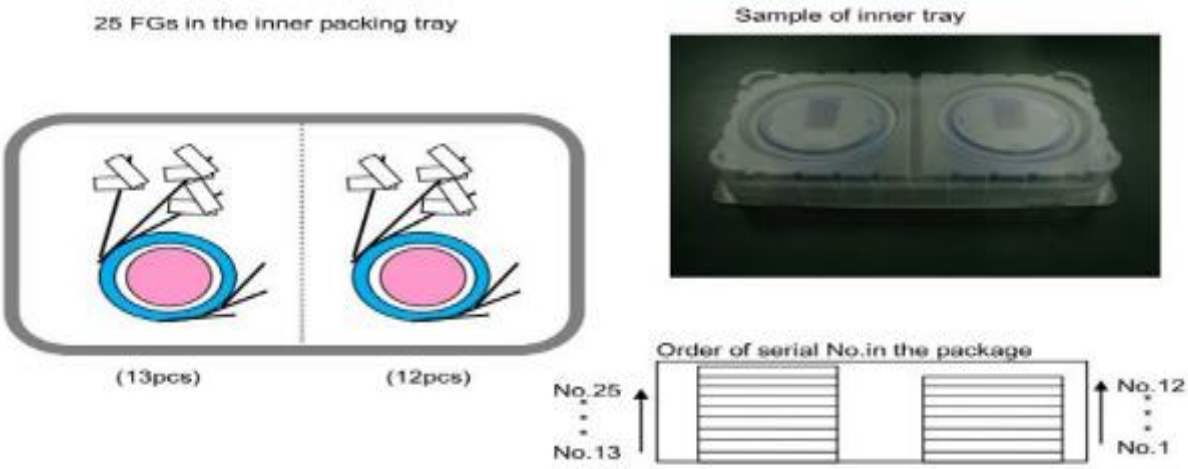


Step 1: Winding fiber to reel by machine from red side



Step 2: The serial label is taped at the end of fiber

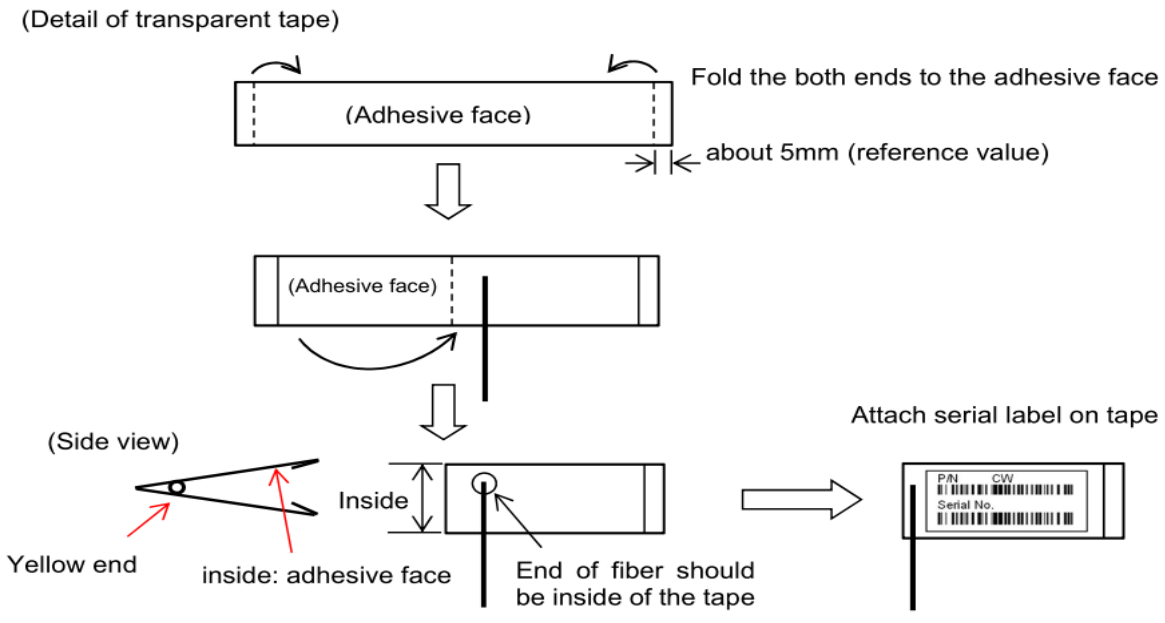
Step 3: After rewinding and labeling, there must be no protrusion of fiber out of REEL LITE

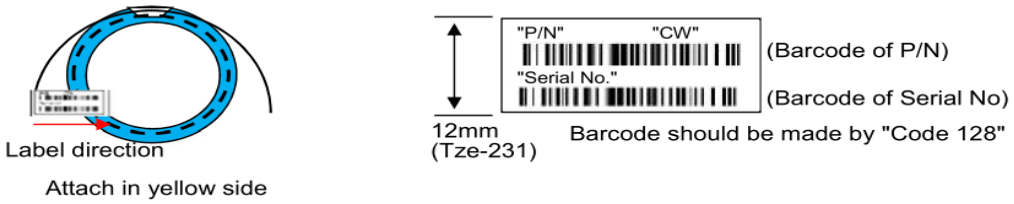


Step 4: Plastic tray packing

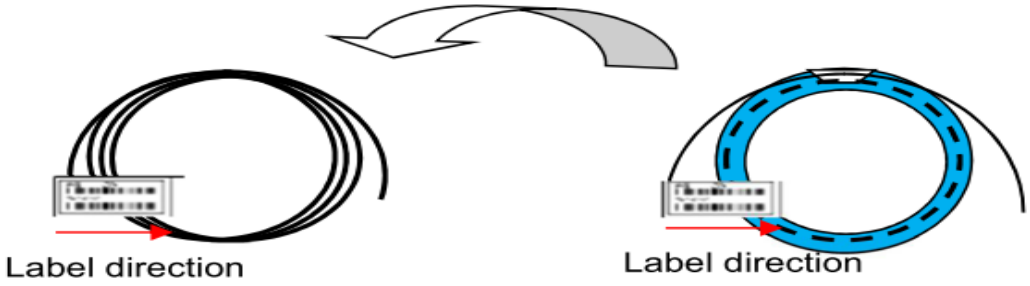
13.1.2.3 Inner Packing for patt 3

Step 1: Winding fiber to reel by machine from red side.

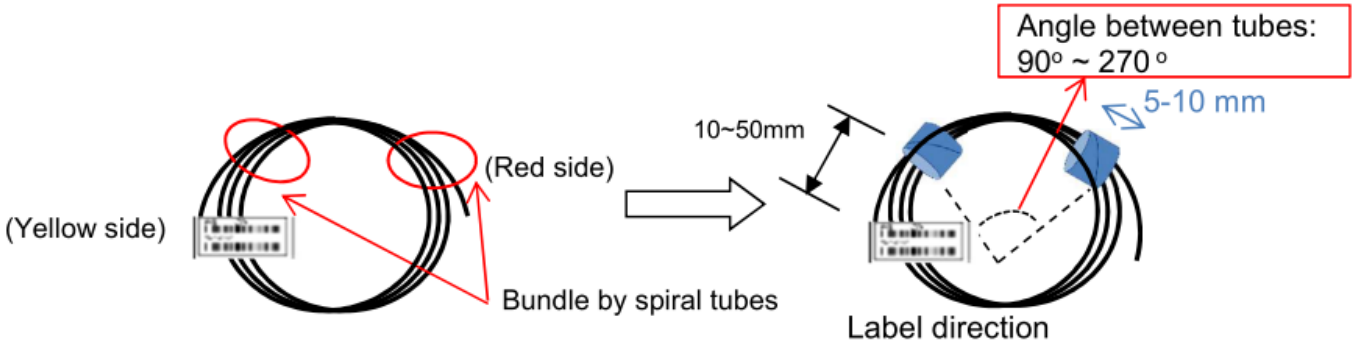




Step 2: Attach transparent tape to fiber end and attach serial label on it



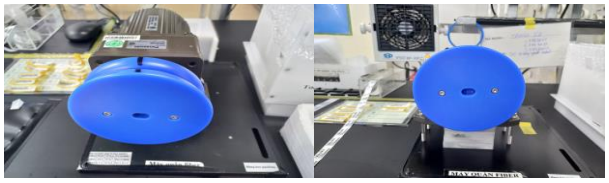
Step 3: Remove bundled fiber from winding jig



Step 4: Bundle each fiber end keeping off recoating area by spiral tubes

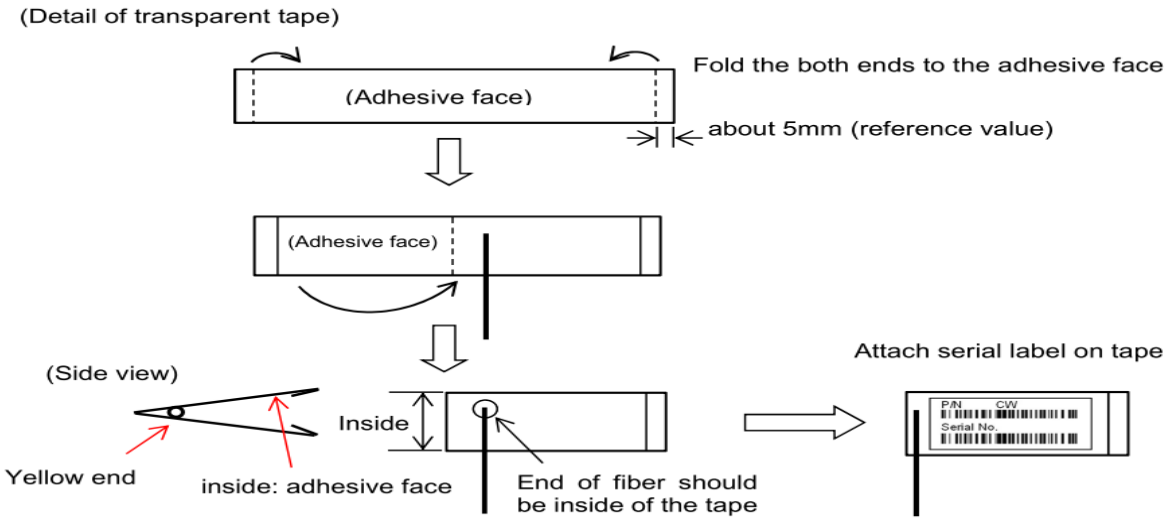
Step 5: Put the individual fiber bundle into zipper bag and close the zipper.

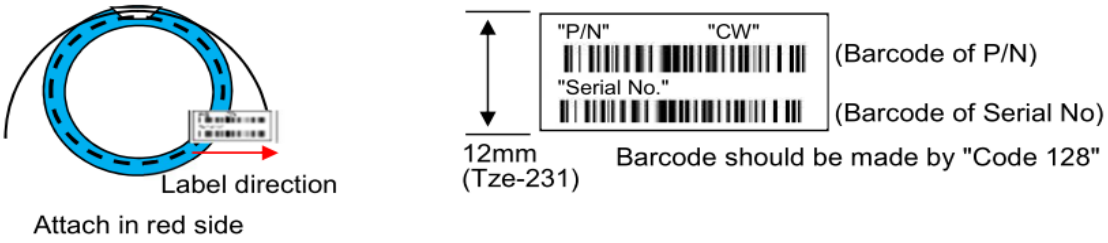
13.1.2.4 Inner packing for patt 4



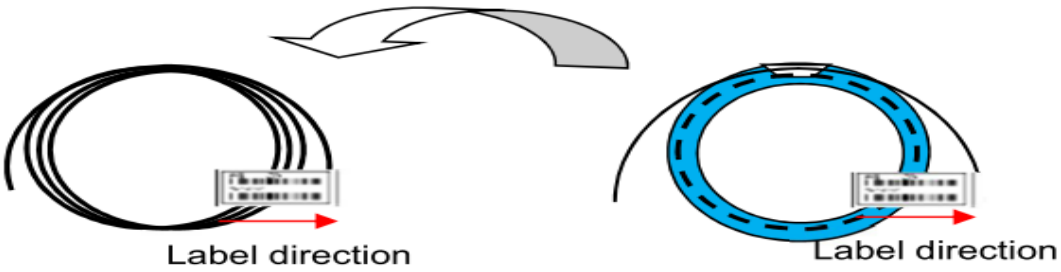
Winding jig

Step 1: Rewind to the winding jig from red side

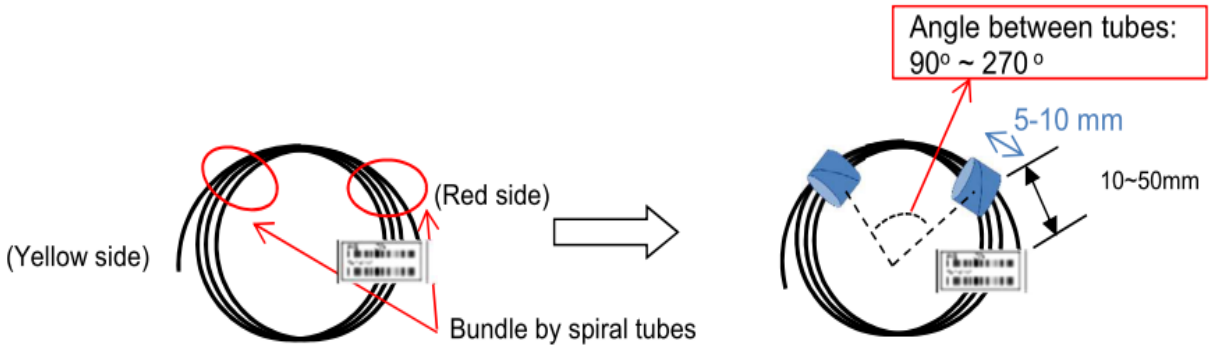




Step 2: Attach transparent tape to fiber end and attach serial label on it label on it



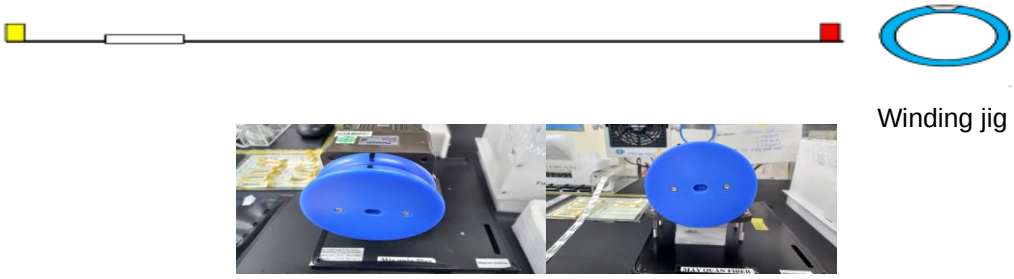
Step 3: Remove bundled fiber from winding jig



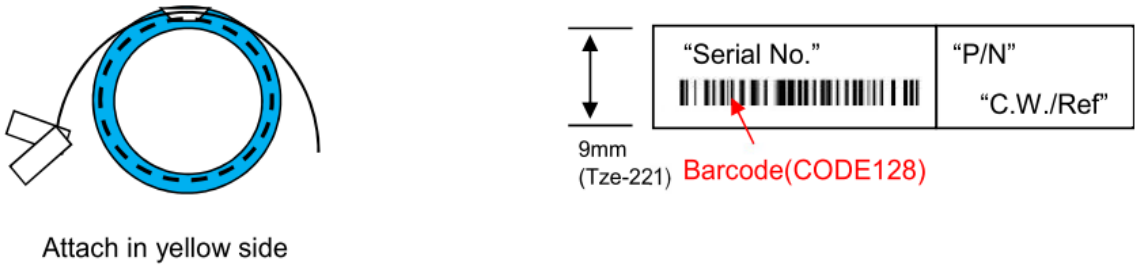
Step 4: Bundle each fiber end keeping off recoating area by spiral tubes

Step 5: Put the individual fiber bundle into zipper bag and close the zipper

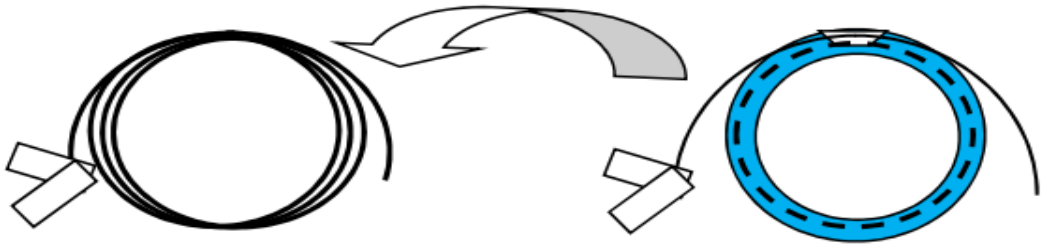
13.1.2.5. Inner packing for patt 5



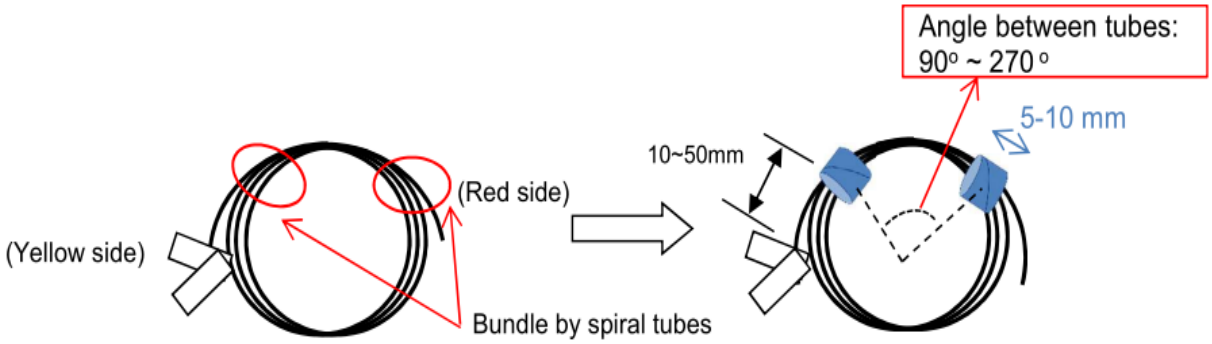
Step 1: Rewind to the winding jig from red side



Step 2: Attach serial label to yellow end



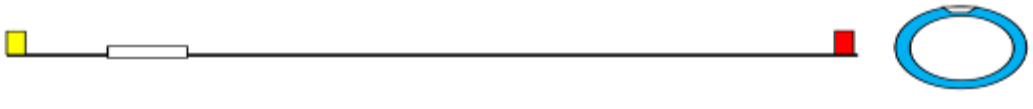
Step 3: Remove bundled fiber from winding jig



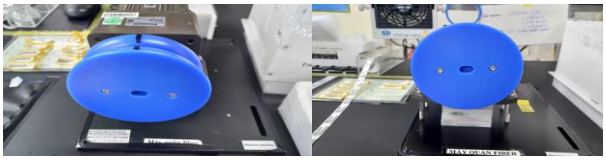
Step 4: Bundle each fiber end keeping off recoating area by spiral tubes

Step 5: Put the individual fiber bundle into zipper bag and close the zipper

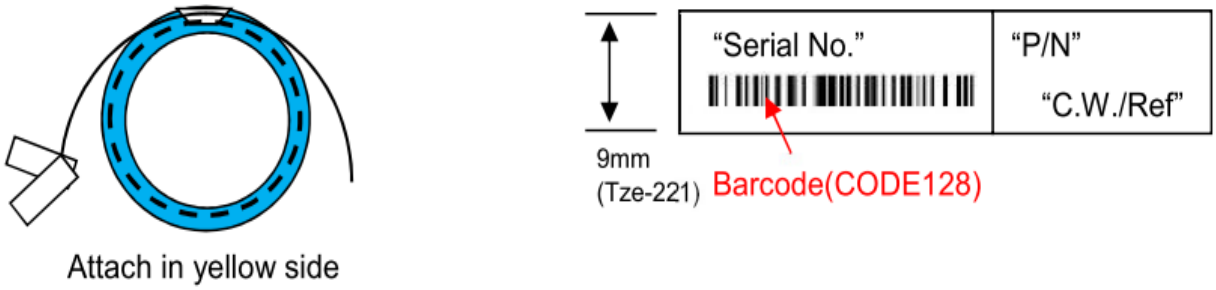
13.1.2.6 Inner packing for patt 6



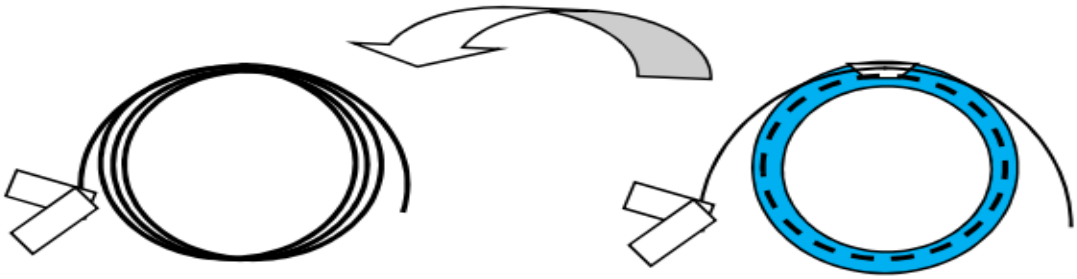
Winding jig



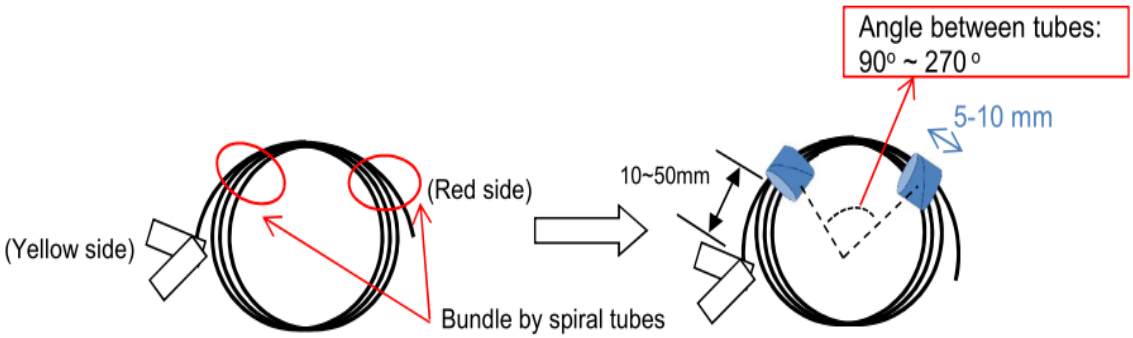
Step 1: Rewind to the winding jig from red side



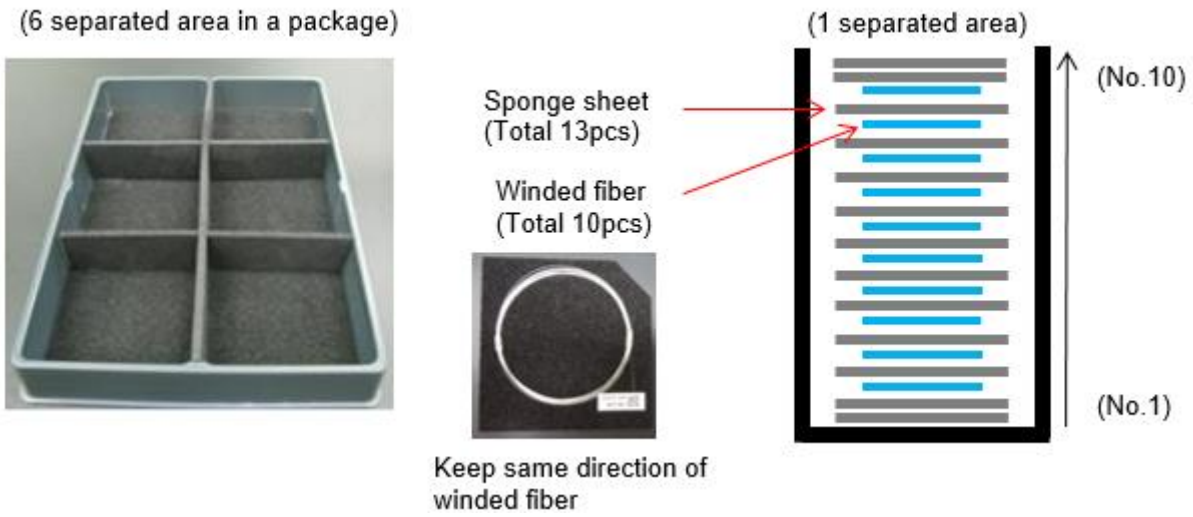
Step 2: Attach serial label to yellow end



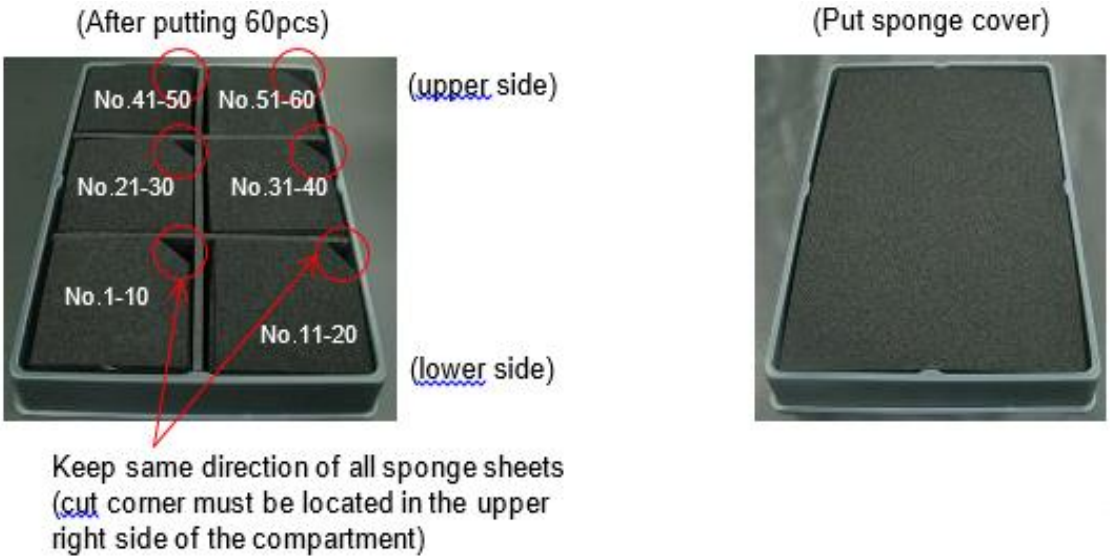
Step 3: Remove bundled fiber from winding jig



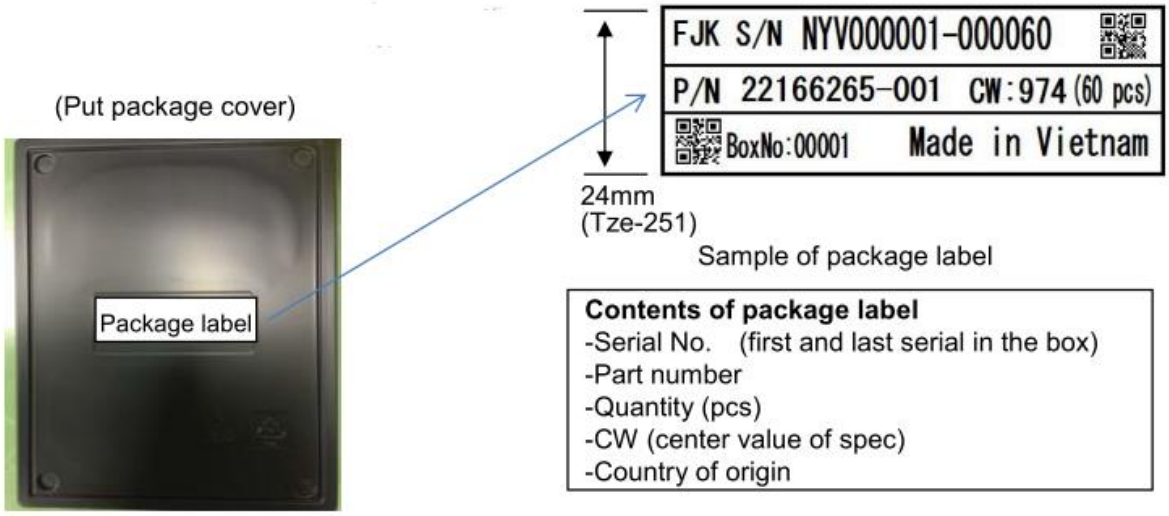
Step 4: Bundle each fiber end keeping off recoating area by spiral tubes



Step 5: Prepare separated area and put products into case

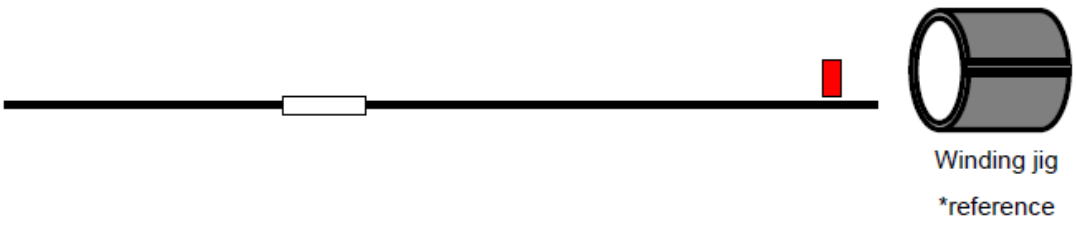


Step 6: Put 60 products in case and cover by sponge.

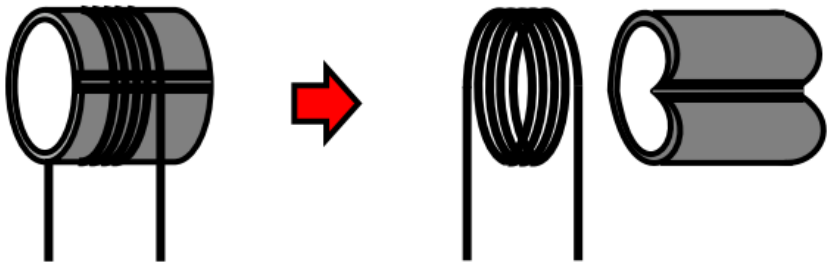


Step 7: Cover tray and paste label

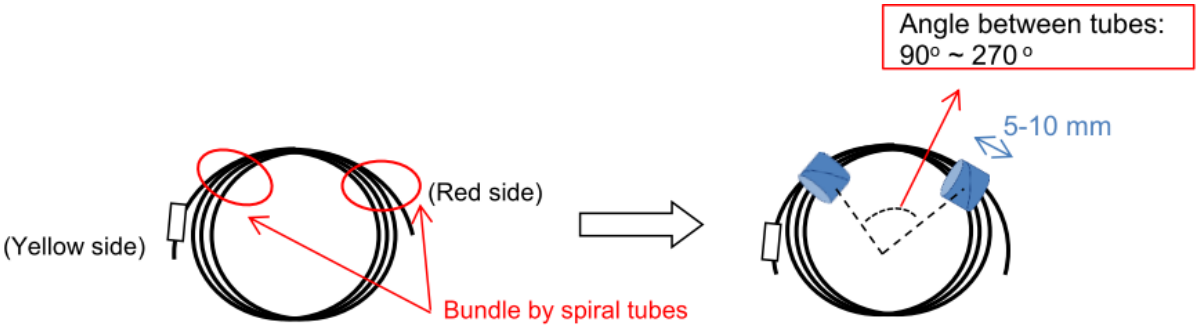
13.1.2.7 Inner packing for patt 7



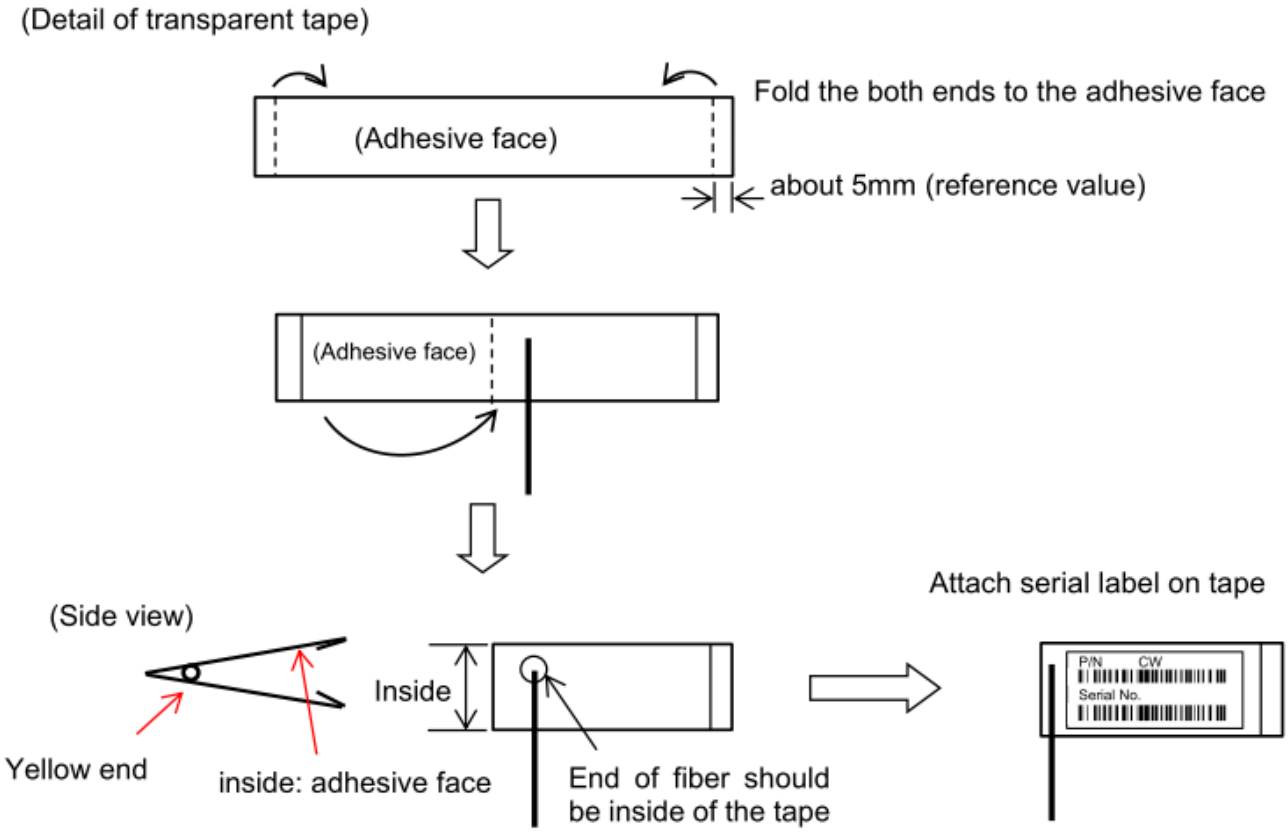
Step 1: Rewind to the winding jig from red side

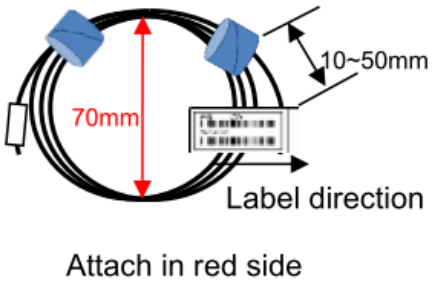


Step 2: Remove bundled fiber from winding jig

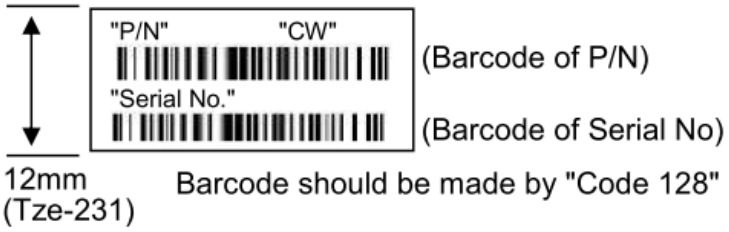


Step 3: Bundle each fiber end keeping off recoating area by spiral tubes



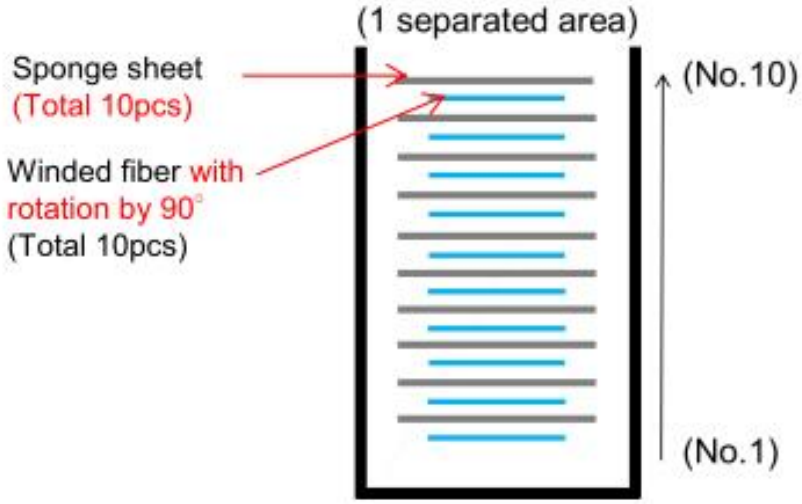


Attach in red side

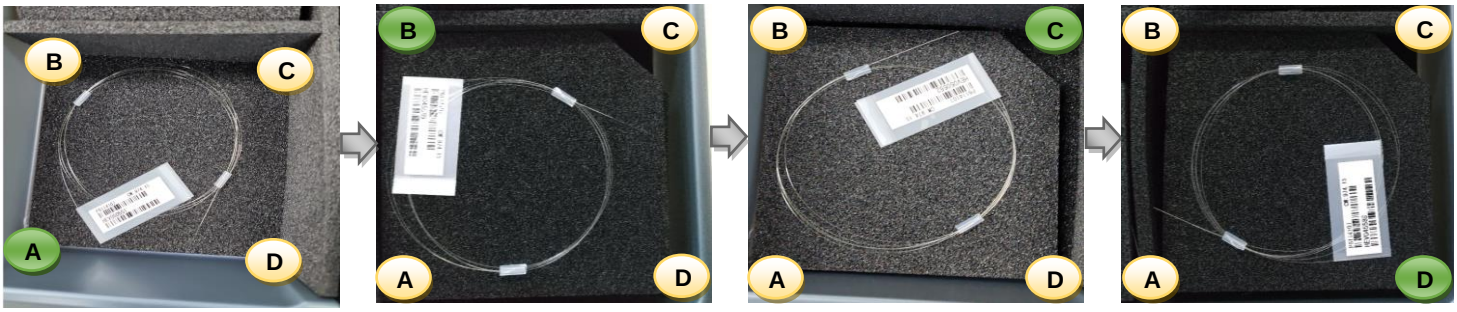


Step 4: Attach transparent tape to fiber end and attach serial label on it.
(Transparent tape and serial label can be attached before bundling each fiber end)

(6 separated area in a package)



Rotation method of winded fiber



Label of 1st product in separated area will direct to corner A

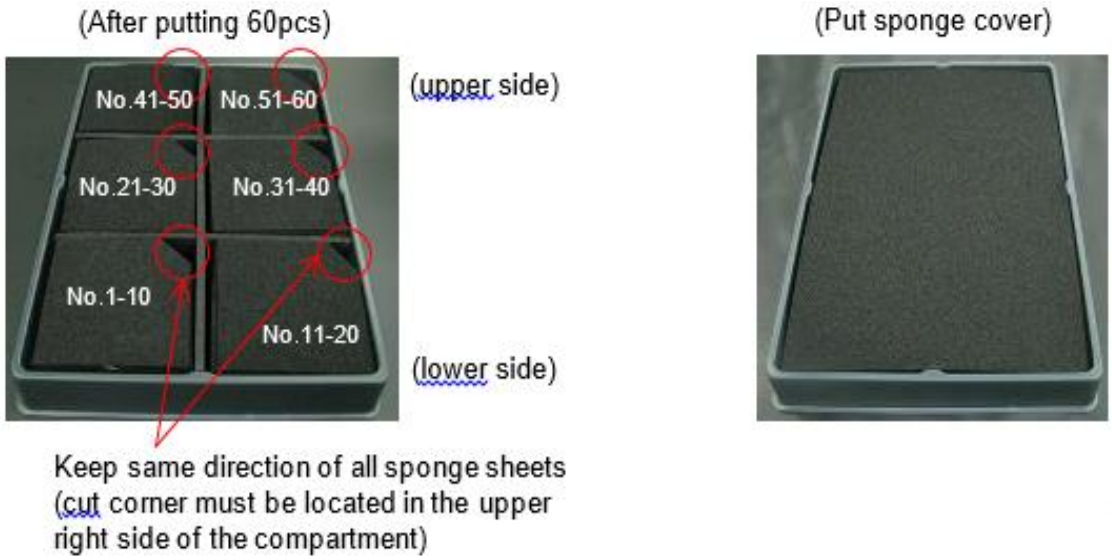
Label of 2nd product will direct to corner B.

Label of 3rd product will direct to corner C.

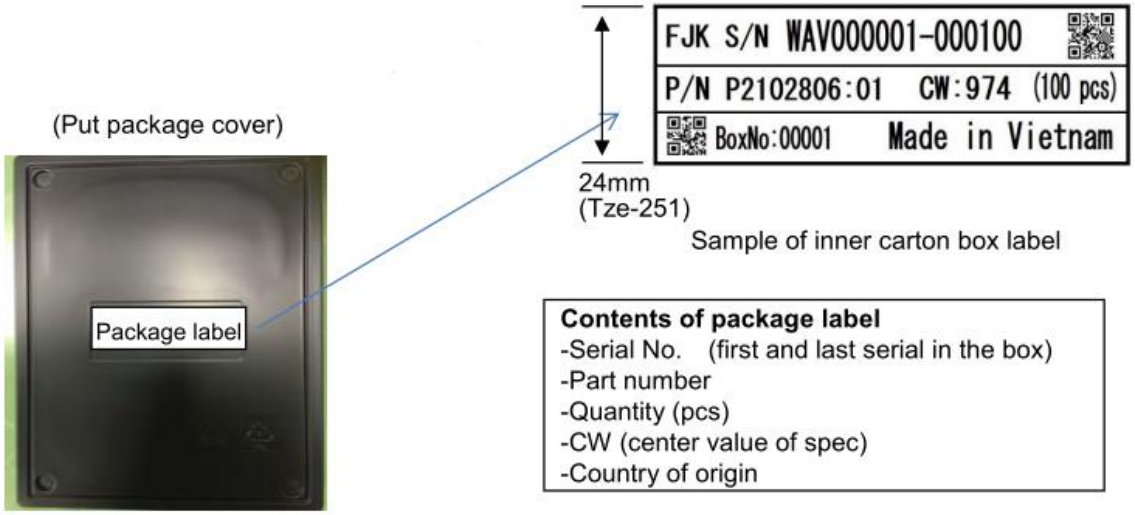
Label of 4th product will direct to corner D.

Label of 5th product will direct to corner A same with 1st product.

Step 5: Prepare separated area and put products into case with right direction.

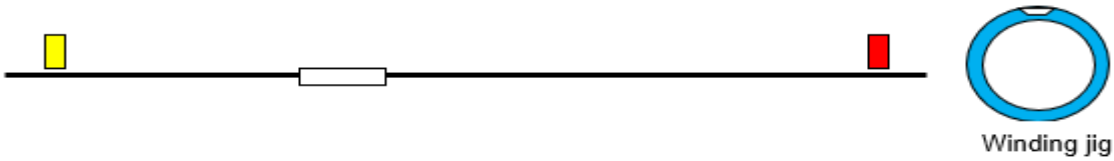


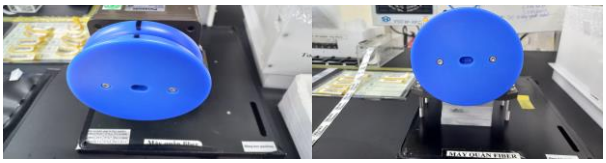
Step 6: Put 60 products in case and cover by sponge.



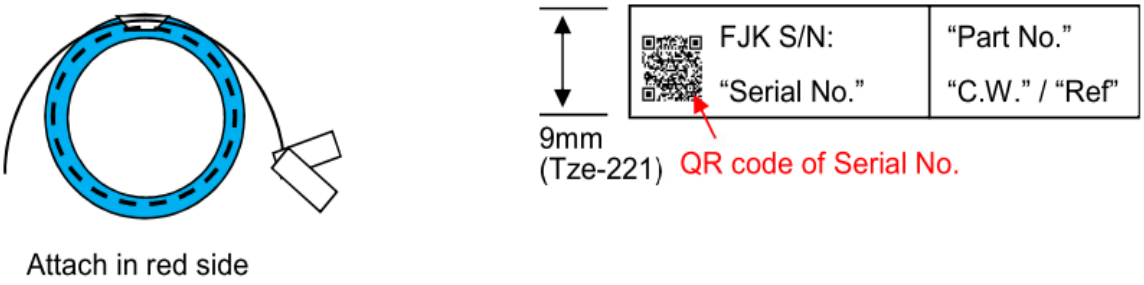
Step 7: Cover tray and paste label

13.1.2.8 Inner packing for patt 8



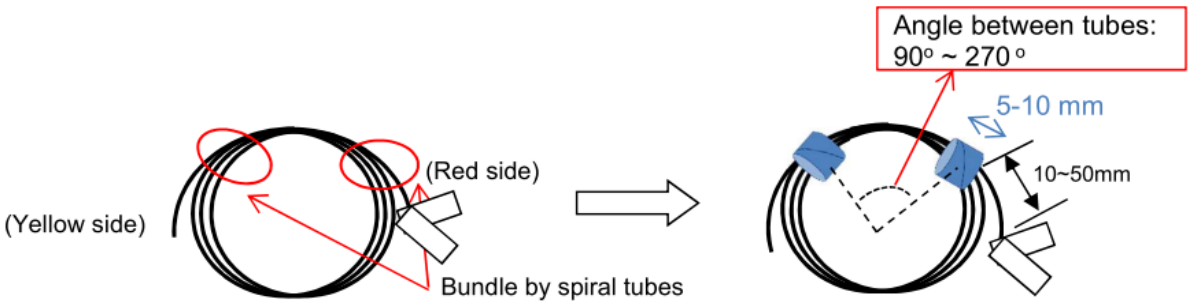


Step 1: Rewind to the winding jig from red side

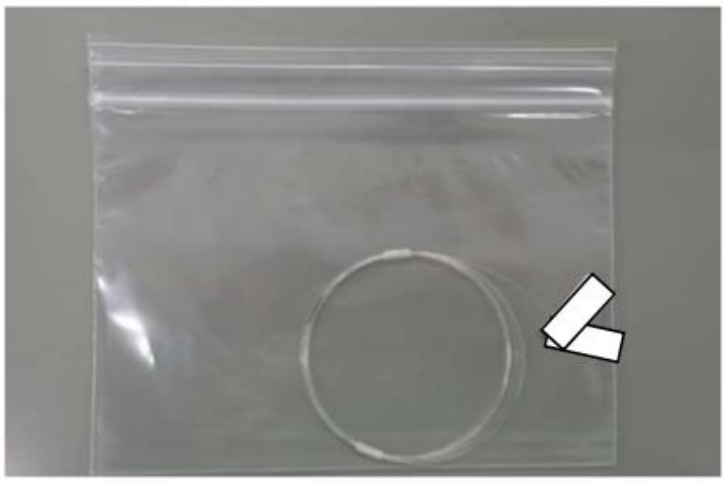


Step 2: Attach serial label to red end

Step 3: Remove bundled fiber from winding jig

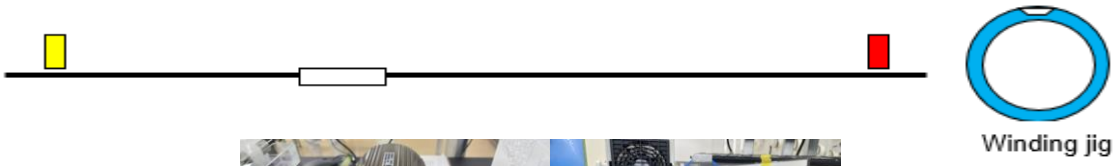


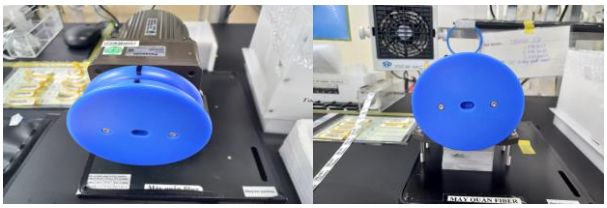
Step 4: Bundle each fiber end keeping off recoating area by spiral tubes



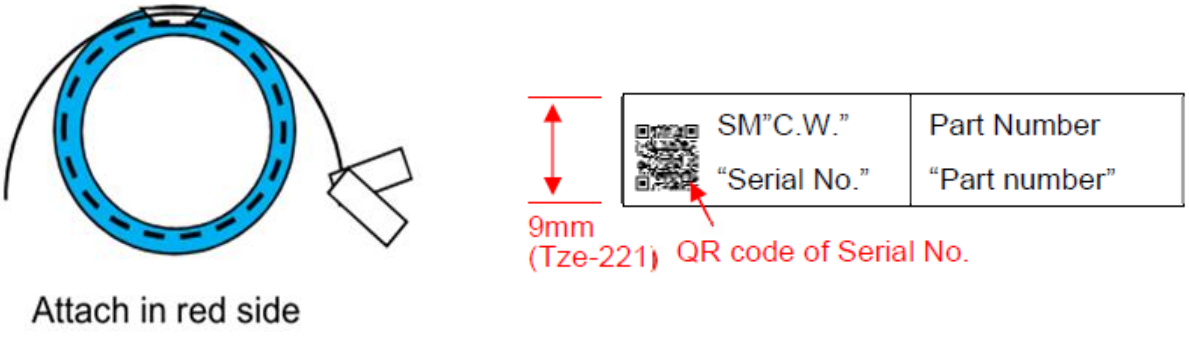
Step 5: Put the individual fiber bundle into zipper bag and close the zipper.

13.1.2.9 Inner packing for patt 9



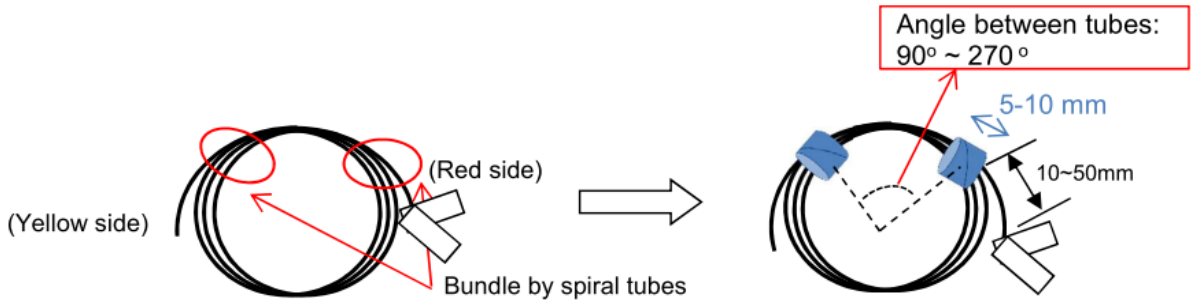


Step 1: Rewind to the winding jig from red side



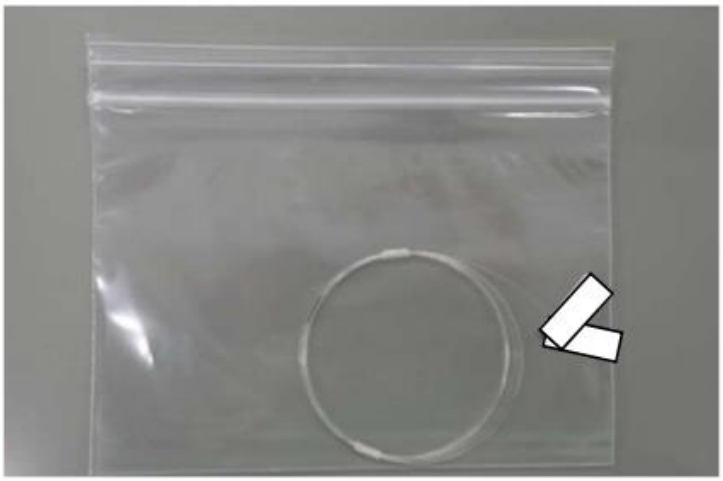
Step 2: Attach serial label to red end

Step 3:



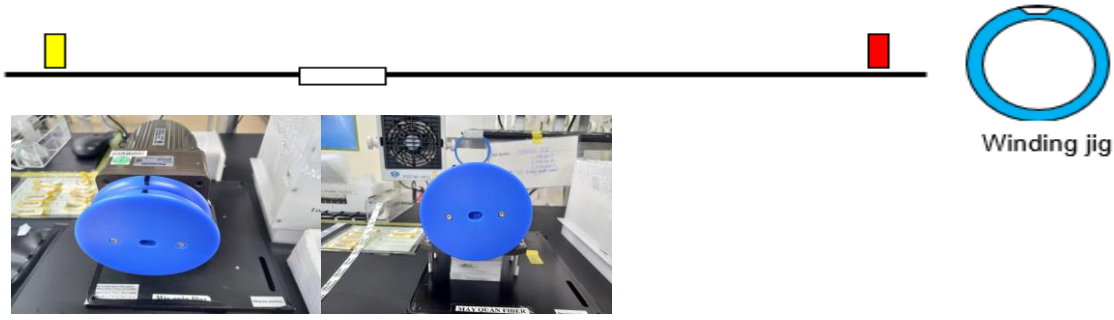
Remove bundled fiber from winding jig

Step 4: Bundle each fiber end keeping off recoating area by spiral tubes

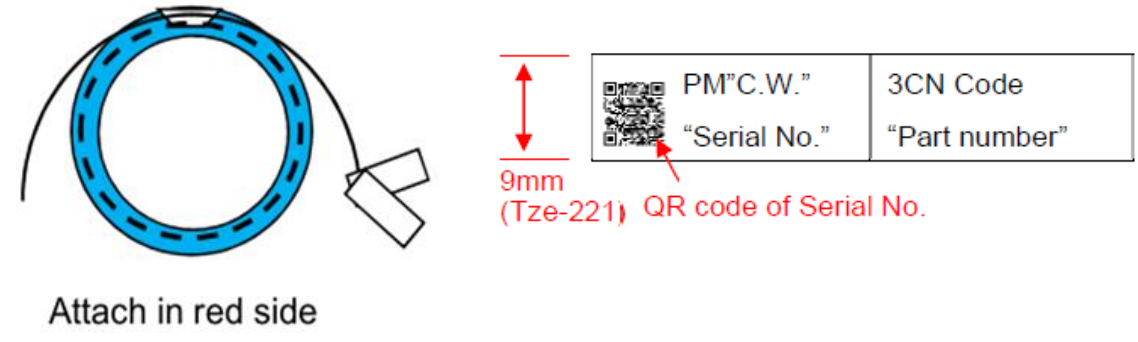


Step 5: Put the individual fiber bundle into zipper bag and close the zipper

13.1.2.10 Inner packing for patt 10

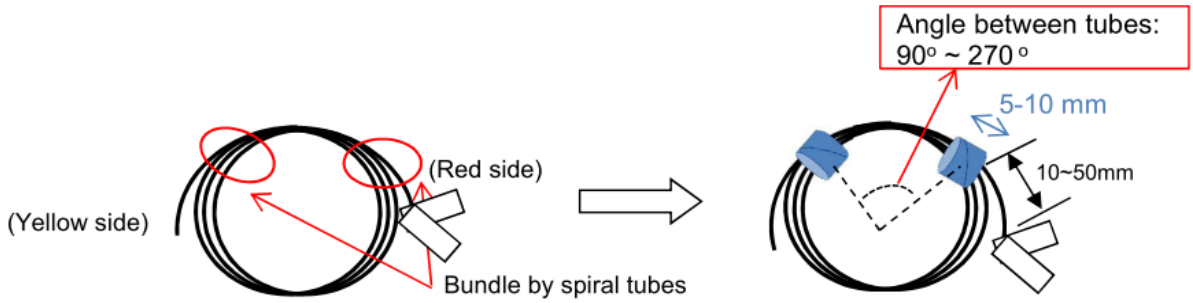


Step 1: Rewind to the winding jig from red side

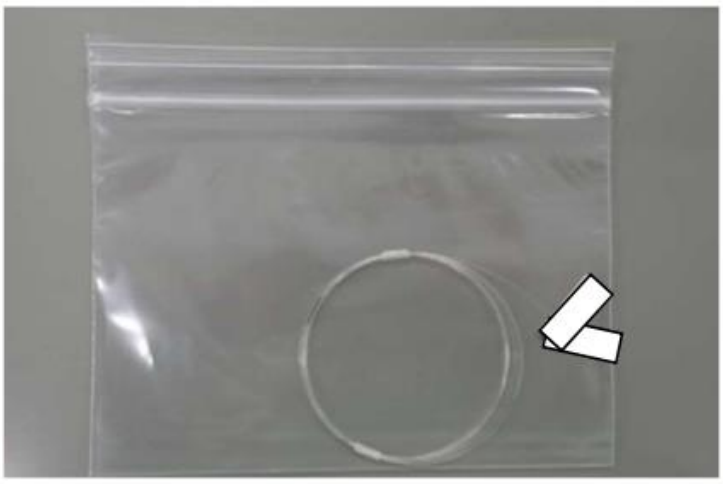


Step 2: Attach serial label to red end

Step 3: Remove bundled fiber from winding jig



Step 4: Bundle each fiber end keeping off recoating area by spiral tubes



Step 5: Put the individual fiber bundle into zipper bag and close the zipper

13.2. Process condition

Item	**Condition**
Appearance	Visual Microscope (To confirm NC)
Length	Template Ruler (To confirm NC)
Marking	Template Ruler (To confirm NC)
Packing quantity and serial No. order	Program and Jig
Fiber protrusion length (if required)	Template/Ruler
Contamination/hair	Ionizer Fan

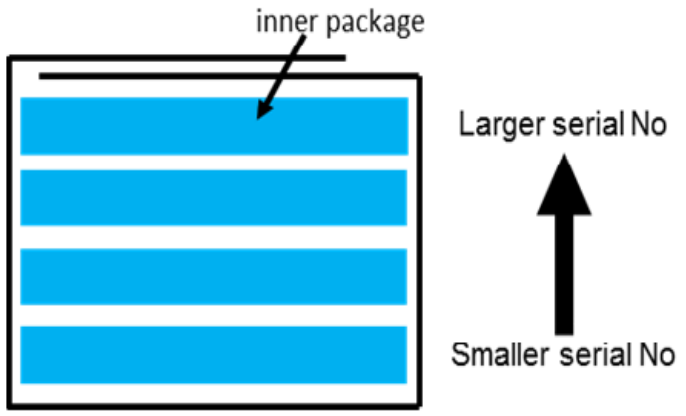
14 Final Packing

14.1. Process specification

Item	Specification
Appearance	No damage for inner package, inner carton box, outer carton box
Quantity of block in the inner carton box	Max 1 blocks
Quantity of the inner carton box in an outer carton box	Refer to relative product structure
Storage condition	Thermal (0 – 30°C) (Refer 4-PR-014 Table 1 (Final Packing area & Storage area of Product which required storage conditions))

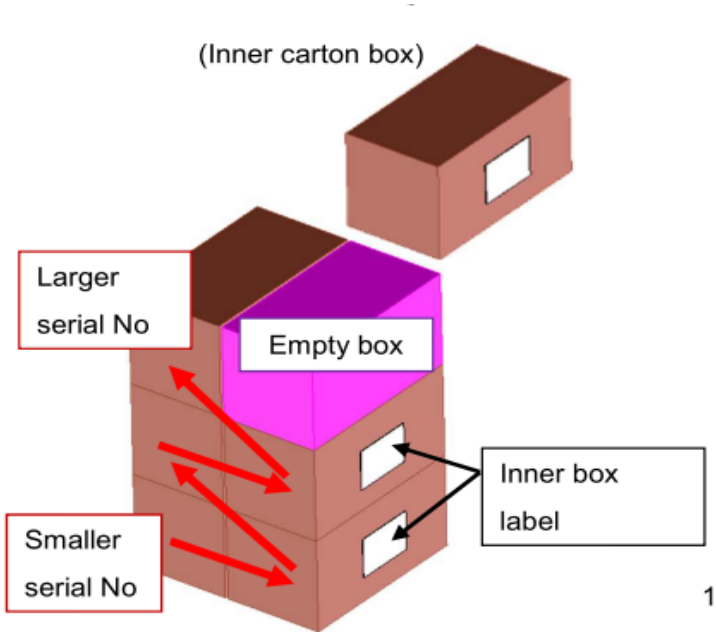
14.1.1 Outer packing specification patt A

<Packing image> <Order of serial No> <Note>



Wrap the inner package in the bubble sheet
(Max 4 packages)

Step 1: Put product case with small serial No. at bottom and latest serial No at top. Max 4 cases

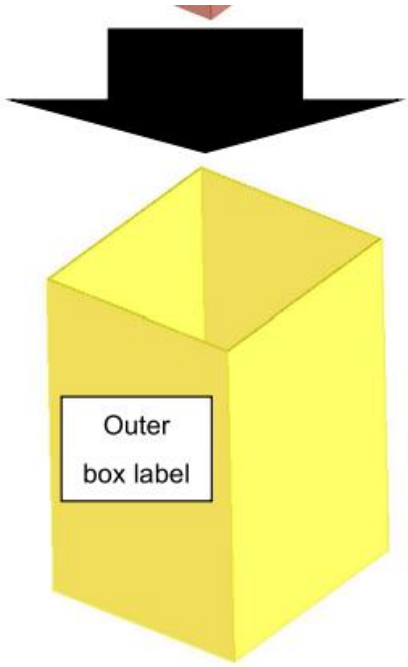


Put 1 block into an inner carton box

Fill up an interspace with cushioning material.
For example (Packing form chip, Bubble wrap)
Almost center of inner carton box
No move the block in an inner carton box

Put 6 inner carton boxes into an outer carton box
6 inner carton boxes are arranged in 2 rows.

1. Fill up an interspace with cushioning material.



For example (Packing form chip, Bubble wrap, Trikon, empty inner carton box)

No move the block in an outer carton box.

Can use Empty Box to fill up the outer carton box when there is not enough products to pack fill up for 6 inner carton boxes

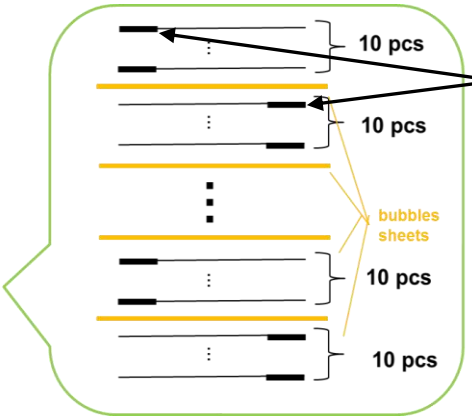
2. Attach outer box label

Label example

Contents of box label
*P/O No
*Product name
*Quantity
*Shipping date
*Box number
(current and total number)
*Order number
(informed by ODD's planner)

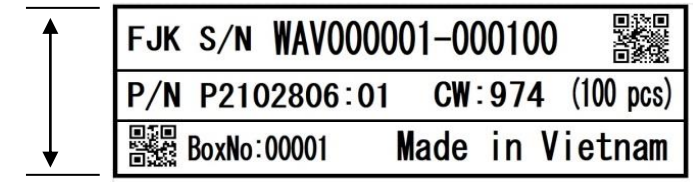
Step 2: Put inner boxes and empty box into outer box

14.1.2 Outer packing specification patt B



Reverse the direction of zipper of plastic bags after per 10 pcs

Step 1: Put the individual zipper bags into inner carton box and insert bubble sheet after per 10 pcs



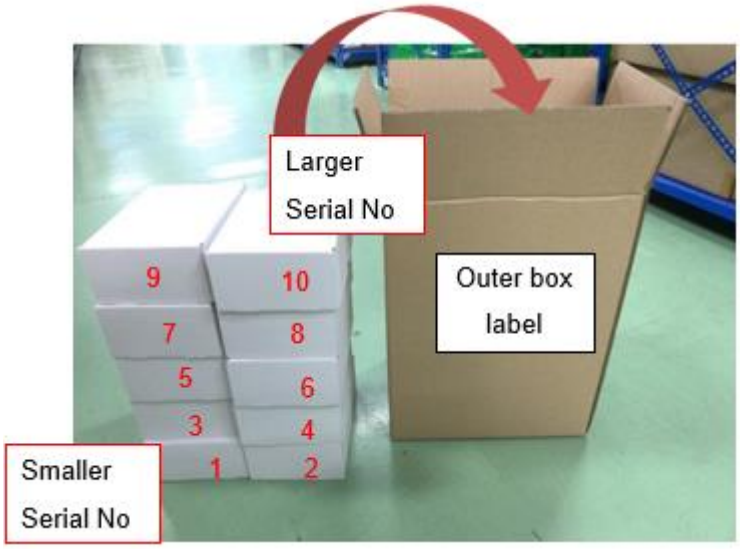
24mm
(Tze-251)

Sample of package label

Step 2: Attach the label to the inner carton box.

Contents of inner carton box label
-Serial No. (first and last serial in the case)
-Part number and Version
-Quantity (pcs)
-CW (center value of spec)
-Country of origin
-Box No.
*Refer to outer box label

Note: Fill up an interspace with cushioning material.
For example:
+ Packing form chip, Bubble wrap, Trikon, empty inner carton box.
+ No move the block in an outer carton box.
+ Can use Empty Box to fill up the outer carton box when there is not nough product to pack fill up for 6 inner carton boxes. In that case, please indicate "**Empty**" on the box.

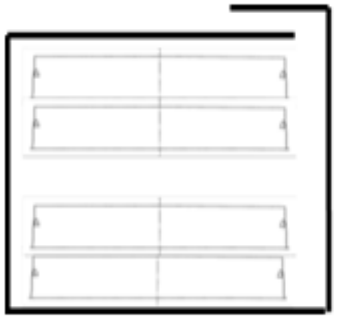


10 inner carton boxes are arranged in 2 rows.
Fill up an interspace with cushioning material.

Step 3: Put 10 inner carton boxes into an outer carton box and attach outer box label

14.1.3. Outer packing specification patt C

<Packing image> <Order of serial No> <Note>

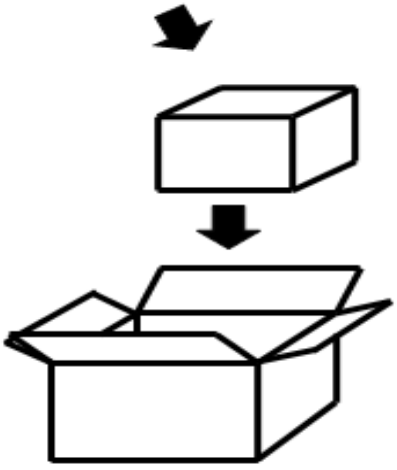


Larger serial No

Smaller serial No

Wrap the inner package in the bubble sheet
(Max 5 packages)

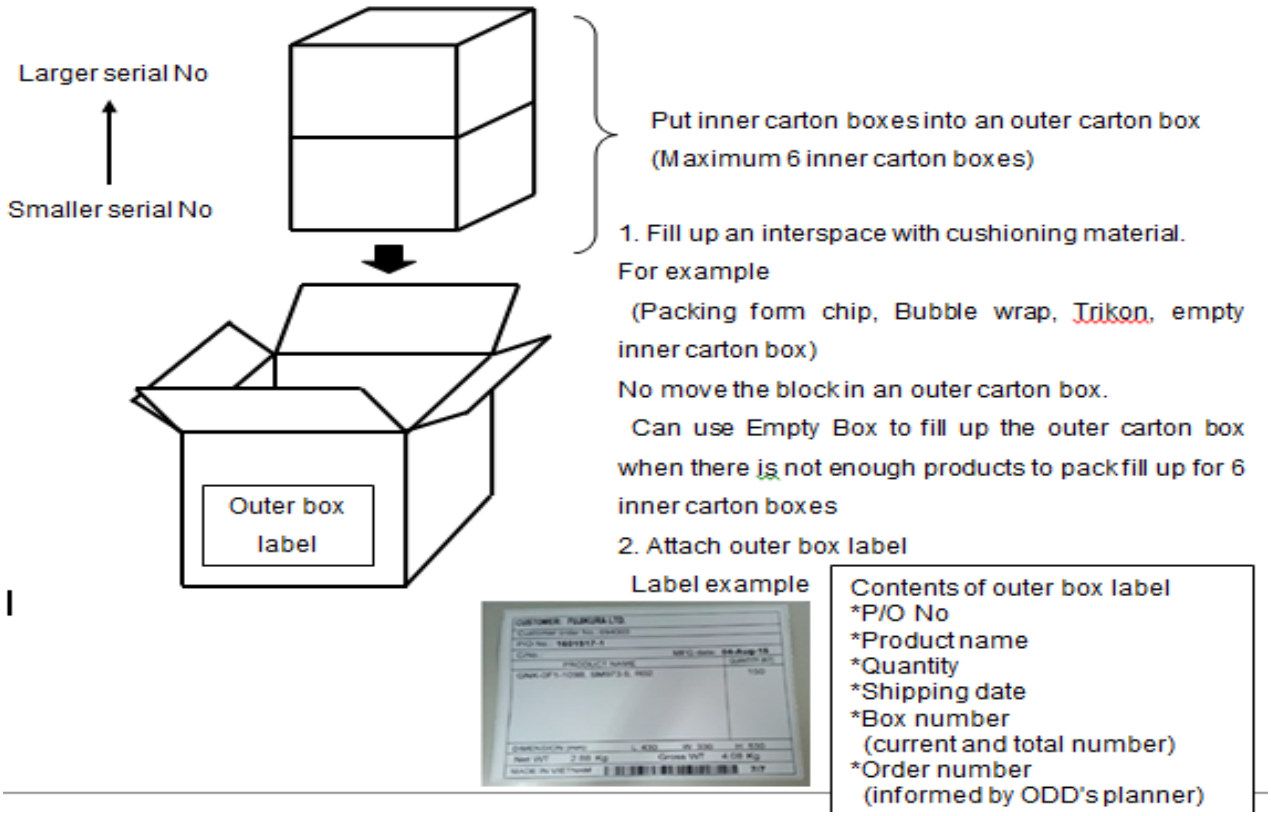
Step 1: Wrap the inner package in the bubble sheet (maximum 5 packages).



Put 1 block into an inner carton box

Fill up an interspace with cushioning material.
For example (Packing form chip, Bubble wrap)
Almost center of inner carton box
No move the block in an inner carton box

Step 2: Put 1 block into an inner carton box



Step 3: Put inner carton boxes into an outer carton box (maximum 6 inner carton boxes) and attach outer box label

Note: *Need ODD's approval before changing carton box size or maximum capacity per box even if it meets specification.*

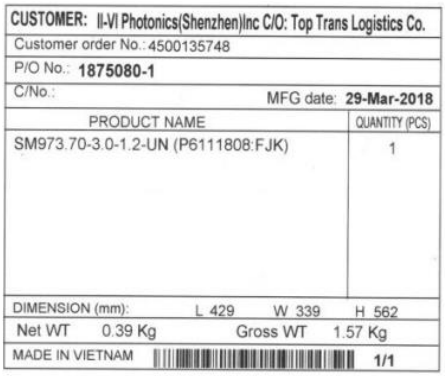
Noted for Box label format

The formats are separated depending on packing type and the order types VMI P/O or Other. VMI P/O is indicated on PURCHASE ORDER SHEET. The contents are shown in Table 14-3. Box label formats and PURCHASE ORDER SHEET example are shown in Fig.1, Fig.2.

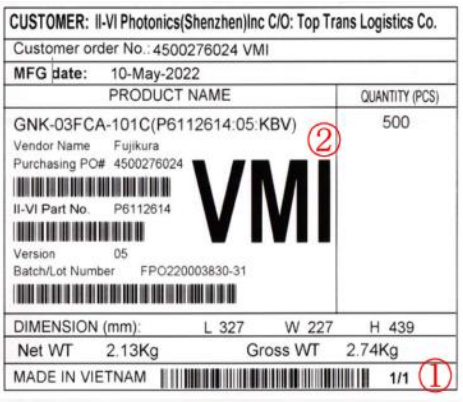
Table 14-3: Box label contents

Packing type	A, B, E, F, H, J, K	C, D, G	
Label format	Standard	VMI P/O	Other
Customer order No.	o	o	o
P/O No./Lot.No.	o	x	x
Product name	o	o	o
Quantity	o	o	o
Shipping date	o	o	o
Box number	*1	o	*1
VMI P/O identification	x	o	x
Vendor Name	x	o	o
Purchasing PO#	x	o *2	o *2
II-VI Part No.	x	o *2	o *2
Version	x	o	o
Batch/Lot Number	x	o *2	o *2

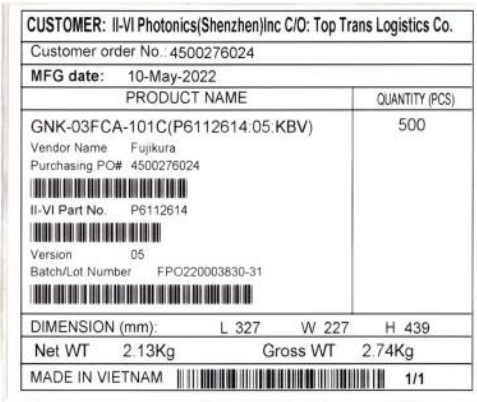
o: to be displayed, x: not to be displayed, *1 may be displayed,
*2 to be displayed with Code 39 barcode



(a) Format for Standard



(b) Format for VMI P/O



(c) Format for Other

Fig.1 Box label formats

	VMI P/O	Other
①Box number (current number / total quantity)	Current number should be consecutive number within each P/O. Total quantity should be counted as each P/O.	Current number may be consecutive number and Total quantity may be counted in particular shipping date.
②VMI P/O identification	The words “VMI” should be displayed.	The words “VMI” must not be displayed.

PURCHASE ORDER SHEET

Order No *4	Product name/Type *5	Remarks *6
1234567-1	GNK-03FUN-001F(P6111808:01:JYV)	27/Apr 1p II-VI PO#:1234567890 VMI
9876543-1	GNK-03FUN-001F(P6111808:01:JYV)	27/Apr 1p II-VI PO#:9876543210

Fig.2 PURCHASE ORDER SHEET example with VMI P/O

*3 FOV should not change label format without ODD's approval.
*4 Order No is Batch/Lot Number.
*5 Product name/Type contains customer information.

GNK-03FUN-001F(P6111808:01:JYV)
II-VI Part No. Version

*6 There are the words "VMI" at the end of Remarks column only VMI P/O.

II-VI PO#:1234567890 VMI
Purchasing PO# space
"VMI" with capital letter

14.2 Process condition

Item	Condition
Packing quantity	Program
Appearance	Visual
Storge condition	Thermal recorder

15. Test report & Shipping 67

- Shipping quantity and product name must be confirmed correct with P/O from Customer
- Attach label outside carton box to indicate: Specification of product type, Specification Number and serial No.
- Update Data (test report and E-data) to FTP server IP: 10.16.248.14
- Shipping date of deliverable data:

  + Uploading deliverable data by 11AM of 2 days before shipping day in Vietnam time.

  + If you cannot upload TR in time, inform QA in ODD by 11AM of 2 days before shipping day.

  + Counting number of days is working day in Vietnam except for Saturday and Sunday.

  + After 11AM of 2days before shipping day, DON'T replace TR on your server before informing ODD.

- In case storage period after the last measurement date over 1 year, the product has to be re-measured before shipping.
- FOV must inform to Fujikura before re-measure the stock products.
- After measurement Fujikura will review the results and judge they can be shipped or not.
- The measurement value in the test report should be the result of re-measurement.

Note for test report:

1. Optical measurement data should be described to two decimal places
2. For the items as shown below, the specified value needs to be written in Spec column
   - Center Wavelength
   - Reflectivity
   - FWHM
   - SLSR
   - Fiber length in / Fiber (pigtail A)
   - Recoat length
   - Fiber length out / Fiber (pigtail B)
3. Detailed requirements for each type, refer to Spec No. AOP82-4001-27-12

REVISION HISTORY

Date	PIC	Ver	Description		Reason of change	Change requester
			Old contents	**New contents**		
09-Sep-2024	VietTA	67	II. Application Table II.1 Products general information N/A	II. Application Table II.1 Products general information Add new products XEV, XFV		
			III. Reference Documents: 1 AOP82-4001-27-04(17) 2 AOP82-4001-27-09(20) 3 AOP82-4001-27-11(16) 4 AOP82-4001-27-10(16) 5 AOP81-2122-27-01(18) 6 AOP82-4001-27-13(04) 7 AOP82-4001-27-14(04) 11 AOP82-4001-27-05(25) 14 AOP82-4001-27-15(02) 15 AOP82-4001-27-16(02)	III. Reference Documents: 1 AOP82-4001-27-04(18) 2 AOP82-4001-27-09(21) 3 AOP82-4001-27-11(17) 4 AOP82-4001-27-10(17) 5 AOP81-2122-27-01(19) 6 AOP82-4001-27-13(05) 7 AOP82-4001-27-14(05) 11 AOP82-4001-27-05(26) 14 AOP82-4001-27-15(03) 15 AOP82-4001-27-16(03)	Customer update Specifications Version	TrungDN
			Table 4.1.1 Cutting length of Cavity-FG N/A	Table 4.1.1 Cutting length of Cavity-FG Add new products XEV, XFV		
			12. Optical Measurement N/A	12. Optical Measurement Add new products XEV, XFV		
	ThuyNTD		II. Application Table II.2 Processes for Cavity-FG Item 15. Shipping	II. Application Table II.2 Processes for Cavity-FG Item 15. Test report & Shipping	Correction (as internal review from audit no QLA2404)	DucNTM
			Table 13.1.1.2 Length of Cavity product - Type name: HAV, HBV, HCV, HDV, HEV, HFV, HGV, HHV, HJV, HKV: Refer to figure 13.1.1.10 - Remain of type name: Refer to figure 13.1.1.9 - N/A	Table 13.1.1.2 Length of Cavity product - Type name: HAV, HBV, HCV, HDV, HEV, HFV, HGV, HHV, HJV, HKV: Refer to figure 13.1.1.12 - Remain of type name: Refer to figure 13.1.1.11 - Add new products XEV, XFV	- Correction - Correction - Customer update Specifications Version add new product code.	
			VI. Content: 15. Shipping	VI. Content: 15. Test report & Shipping	Correction (as internal review from audit no QLA2404)	
14-Aug-2024	VietTA	66	1. Material preparation 2. Fiber Optical Rewinding	1.Incoming Inspection 2. Fiber Rewinding	Action for finding internal audit 8-Aug-2024	TrungDN
1-Aug-2024	VietTA ThuyNTD	65	III. Reference Documents: 1 AOP82-4001-27-04(16) 2 AOP82-4001-27-09(19) 3 AOP82-4001-27-11(15) 4 AOP82-4001-27-10(15) 5 AOP81-2122-27-01(17) 6 AOP82-4001-27-13(03) 7 AOP82-4001-27-14(03) 8 AOP82-4001-27-06(13) 9 AOP82-4001-27-07(08) 10 AOP82-4001-27-08(23) 11 AOP82-4001-27-05(24) 13 AOP82-4001-27-12(03) 14 AOP82-4001-27-15(01) 15 AOP82-4001-27-16(01)	III. Reference Documents: 1 AOP82-4001-27-04(17) 2 AOP82-4001-27-09(20) 3 AOP82-4001-27-11(16) 4 AOP82-4001-27-10(16) 5 AOP81-2122-27-01(18) 6 AOP82-4001-27-13(04) 7 AOP82-4001-27-14(04) 8 AOP82-4001-27-06(14) 9 AOP82-4001-27-07(09) 10 AOP82-4001-27-08(24) 11 AOP82-4001-27-05(25) 13 AOP82-4001-27-12(04) 14 AOP82-4001-27-15(02) 15 AOP82-4001-27-16(02)	Customer update Specifications Version	TrungDN
			III. Reference document. 2. Working direction PTE82-59-24-2003(01) PTE82-59-24-2007 PTE82-59-23-2010 PTE82-59-23-2023	III. Reference document 2. Working direction Remove	The content of WD was updated in new specifications version	
			Table 4.1.1 Cutting length of Cavity-FG. Fiber length of KBV, KCV, KXV, KYV	Table 4.1.1 Cutting length of Cavity-FG. Change Fiber length of KBV, KCV, KXV, KYV	Update follow new specifications version	
			5.1 Process specification Stripping length: - Fiber 80um: ≤ 5mm	5.1 Process specification Stripping length: - Fiber 80um: < 4.5mm		

			6. Exposing and Thermal aging *Excimer Laser Energy* *Manufacturing: 120mJ, mode EGY-N*	6. Exposing and Thermal aging *Excimer Laser Energy* *Manufacturing: 120mJ, mode EGY-N or EGY-P*	Update follow CO :9-PR-0014-9-FO-0001-4-RC-0127	
			7.Thermal Aging (hot air) process N/A	7.Thermal Aging (hot air) process Stripping movement Pre-Heating Velocity	Update to match with control process	
			11.1.3. Apply for all products belong RV3 Deformation and discoloration + Defect Size/ Condition Length of deformation or discoloration of fiber coating is greater than 0.25mm + N/A	11.1.3. Apply for all products belong RV3 Deformation and discoloration + Defect Size/ Condition At buffer/glass interface + Add Fig. 11.1.3.3&11.1.3.4	Update follow new specifications version.	
			Table 13.1.1.2 Length of Cavity product Fiber length of KBV, KCV, KXV, KYV + L2: 1245 ± 25 mm	Table 13.1.1.2 Length of Cavity product Fiber length of KBV, KCV, KXV, KYV + L2: 845 ± 25 mm		
			13.1.2.7 Inner packing for patt 7: Products have scotch tape at yellow port and red port.	13.1.2.7 Inner packing for patt 7: Delete scotch tape at yellow port.	Follow AOP82-4001-27-08(24)	
			13.1.2.9 Inner packing for patt 9: Have 2 format label: a. For UAV, UBV; TAV, TBV products b. For other products	13.1.2.9 Inner packing for patt 9: Update format label for patt 9, delete format label for: + UAV, UBV products + Other product		
			13.1.2.10 Inner packing for patt 10: N/A	13.1.2.10 Inner packing for patt 10: Add method packing for patt 10.		
			14.1. Process specification: N/A	14.1. Process specification: Add storage condition Thermal (0 – 30°C)	-Add storage conditional from specification	
			14.2 Process condition: N/A	14.2 Process condition: Add storage condition: thermal recorder.		
			15 Shipping + N/A + Update Data (test report and Shipping data) to FTP server	15 Shipping + Add Re-measurement for stock products. + Update Data (test report and E-data) to FTP server (Change "Shipping data" to "E-data")	Follow AOP82-4001-27-07(09)	
4-Jun-2024	NguyenVT	64	III.Reference document. 2. Working direction - PTE82-59-21-2005	III.Reference document. 2. Working direction - Remove	FOV didn't use resin 950Y200	ChienPH
			IV. Content 4. Fiber cutting Table 4.1.1 Cutting length of Cavity-FG. L1 = 120 ± 50 5. Fiber Stripping 5.1 Process specification - Stripping position:N/A	IV. Content 4. Fiber cutting Table 4.1.1 Cutting length of Cavity-FG. Remove L1 5. Fiber Stripping 5.1 Process specification - Stripping position: Add note	Following 9-PR-0014-9-FO-0001-4-RC-0105	
26-Mar-2024	VietTA	63	III. Reference Documents: 2.Working Direction No.: N/A	III. Reference Documents: 2.Working Direction No.: Add WD : PTE82-59-24-2007	Add WD: PTE82-59-24-2007	TrungDN
			7.Thermal Aging (hot air) process N/A	7.Thermal Aging (hot air) process - Frequency: 3pcs/OP/day		
			Table 11.1.3.1 Defect Size and Frequency Criteria within Recoat Zone (RV3) N/A	Table 11.1.3.1 Defect Size and Frequency Criteria within Recoat Zone (RV3) + Defect Type: Deformation and discoloration		
8-Mar-2024	VietTA	62	II. Application Type name RLS (mm) HCV > 21 HDV > 21 HEV > 21 HFV > 21 HHV > 21 HJV > 21 HKV > 21	II. Application Type name RLS (mm) HCV > 5 HDV > 5 HEV > 5 HFV > 5 HHV > 5 HJV > 5 HKV > 5	Removed WD: PTE82-59-23-2029	TrungDN
			III. Reference Documents: 2.Working Direction No.: PTE82-59-23-2029	III. Reference Documents: 2.Working Direction No.: Remove PTE82-59-23-2029		
			5. Fiber stripping Stripping length: - Fiber 80um: 20~ 24 mm 6. Exposing and Thermal aging	5. Fiber stripping Stripping length: - Fiber 80um: ≤ 5mm 6. Exposing and Thermal aging		

			- Item Specification FBG position FBG position is <4.5mm (80um 980PM from red port side stripping edge. -Add Fg 6.1.4: FBG position(80um)	N/A		
			9. Marking and proof test Recoating length: + > 21mm (D06: Refer to table II. 1, column RLS	9. Marking and proof test Recoating length: + > 5mm (D06: Refer to table II. 1, column RLS)		
			III. Reference Documents: 2.Working Direction No.: N/A	III. Reference Documents: 2.Working Direction No.: PTE82-59-24-2003(01)	Add new WD: PTE82-59-24-2003(01)	
			15 Shipping N/A	15 Shipping Add content of PTE82-59-24-2003(01)		
			12. Optical Measurement 12.2 Process condition N/A	12. Optical Measurement 12.2 Process condition + Add thermometer position	Update to match with control process	
16-Jan-2024	QAE VanPNT (10896)	61	III.2. Working Direction No. Not have item 4, 5	III.2. Working Direction No. Add item 4, 5	Customer issue WD for Fiber Inspection and Packing process	DucTNM
			VI.13. Visual Inspection and Packing NA	VI.13. Visual Inspection and Packing Revise Fig 13.1.1.1 and 13.1.1.2		
			VI.13. Visual Inspection and Packing Table 13.1.1.1 Delamination with Length in longitudinal direction >1mm or with damage – Not accepted	VI.13. Visual Inspection and Packing Table 13.1.1.1 Delamination not easy to find by naked eyes – Not accepted	Follow PTE82-59-23-2023	
			VI.13. Visual Inspection and Packing 13.1.2.9. Step 2 NA	VI.13. Visual Inspection and Packing 13.1.2.9. Step 2 Add illustration of new label format for 3SP products	Follow PTE82-59-23-2010	
20-Dec-2023	VietTA 10811	60	II. Application Type name RLS (mm) HCV > 5 HDV > 5 HEV > 5 HFV > 5 HHV > 5 HJV > 5 HKV > 5	II. Application Type name RLS (mm) HCV > 21 HDV > 21 HEV > 21 HFV > 21 HHV > 21 HJV > 21 HKV > 21	Follow PTE82-59-23-2029	TrungDN
			III. Reference Documents: 2.Working Direction No.: N/A	III. Reference Documents: 2.Working Direction No.: + Add PTE82-59-23-2029		
			V. ROHS requirement: 1. Material list	V. ROHS material requirement & Traceability control1. 1.ROHS material requirement 2.Traceability control1.	Follow new concept 0-Pr-001-5-WI-0749	
			VI. Content: 1.3. Material list 1.4. Checking items.	VI. Content: - Cancel 1.3 Material list. - Cancel 1.4 Checking items.		
			5. Fiber stripping Stripping length: - Fiber 80um: ≤ 5mm 6. Exposing and Thermal aging N/A	5. Fiber stripping Stripping length: - Fiber 80um: 20~ 24 mm 6. Exposing and Thermal aging - Item Specification FBG position FBG position is <4.5mm (80um 980PM from red port side stripping edge. -Add Fg 6.1.4: : FBG position(80um	Follow PTE82-59-23-2029	
			8. Recoating process - (D04) <= 260um or >= 300um	8. Recoating process - (D04) <= 260um or >= 300um - Cancel picture D04	Products have diameter D04 is no longer available	
			9. Marking and proof test Recoating length:	9. Marking and proof test Recoating length:	Follow PTE82-59-23-2029	

			+ > 5mm (D06: Refer to table II. 1, column RLS)	+ > 21mm (D06: Refer to table II. 1, column RLS)		
27-July-2023	PRE3 HuyDM 10893	59	General Information table: - N/A Exposing process condition - N/A	General Information table: - Spectrum type Exposing process condition - Spectrum type	Correction (as internal review for RCV issue)	TrungDN
	VietTA 10811		III. Reference Documents No Specification 1 AOP82-4001-27-04(15) 2 AOP82-4001-27-09(18) 5 AOP81-2122-27-01(16) 6 AOP82-4001-27-13(02) 7 AOP82-4001-27-14(02)	III. Reference Documents No Specification 1 AOP82-4001-27-04(16) 2 AOP82-4001-27-09(19) 5 AOP81-2122-27-01(17) 6 AOP82-4001-27-13(03) 7 AOP82-4001-27-14(03)	Customer update Specifications Version	