

## OPERATION PROCEDURE OF T-CONNECTOR GUMI PRODUCT

Document No.: 4-OP-0081

Version: 12

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**I. Purpose**

- To instruct operation method which implemented in Fujikura Fiber Optics Vietnam

**II. Application**

- This guideline is applied for T-Connector Gumi as processes following

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No	Product name	Remark
<a href="#">S-GAISHI-71-2186-3</a>	KY-T-Connector S-LG	Use 20dB FBG
<a href="#">S-GAISHI-71-2186-3</a>	KY-T-connector S-LM-R	Use 40dB FBG

- This document concerns to Production function, Production engineering function, Quality Assurance function and Planning function.

**III. References**

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**Customer specification**

Reference document	Product name	Remark
<a href="#">S-GAISHI-71-2186-3</a>	KY-T-Connector S-LG	Use 20dB FBG
<a href="#">S-GAISHI-71-2186-3</a>	KY-T-connector S-LM-R	Use 40dB FBG

**IV. Term and Definition**

FOV: Fujikura Fiber Optics Viet Nam

SIC: Section In Charge

T-Connector GUMI: one kind of products which are manufacture in FOV

**V. Traceability control:**

The requirement of traceability record for each products shall follow the 9-PR-013 Data traceability procedure.

Type of record	Items	Record
Quality control items	Refer to: QC Flow chart 4-QC-0081	Related Check sheet
Identification & trace ability record	4M information (if any): - Material Lot# - Machine/Tool-jig control number - Operator code - Manufacturing/ inspecting date	

## VI. Content

### 1. *Epotek mixing & injection*

#### 1.1 Process specification

Item	Specification
Final mixture	<ul style="list-style-type: none"> <li>- Enough part</li> <li>- Mixing ratio, time</li> <li>- Pot time</li> <li>- Expire date of each part</li> </ul>

#### 1.2 Process condition

Item	Condition
Amount of part A and B	Scale, software
Mixing in 5 minutes	Timer
Remove air bubble	Centrifugal

Step 1: Put the cup on to the scale and fill Epotek part A with amount in Table 1

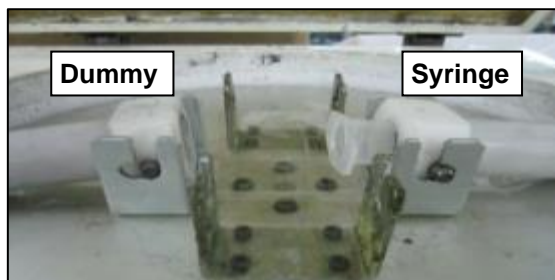
Step 2: Fill Epotek part B into the cup with amount in Table 1

Phần A (2)	Phần B (01)
2g (1.8g ~ 2.2g)	0.2g (0.18g ~ 0.22g)

Step 3: Mix by manual in 5 minutes.



Step 4: Fill into the syringe and put it into centrifugal to remove air bubble at least 10 minutes.



Step 5: Check air bubble inside syringe

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## 2. GUMI mixing

### 2.1 Process specification

Item	Specification
Final mixture	<ul style="list-style-type: none"> <li>- Enough part (FW-L + FW-H+ MEK if any)</li> <li>- Mixing ratio (27%,4%), time</li> <li>- Pot time (≤15h)</li> <li>- Expire date of each part</li> </ul>

### 2.2 Process condition

Item	Condition
Amount of FW-L, MEK, FW-H	Scale
Tolerance	0.01 gram
Remove air bubble	Centrifugal
Mixing adhesive	By mixer

Apply Gumi mixing program:

Step 1: Measure the weight of FW-H.

Step 2: Add amount of MEK need input to balance into FW-H.

Step 3: Measure the weight of FW-L and add FW-H into FW-L (following to instruction of program).

Step 4: Input solvent MEK into FW-L.



Step 5: Shake by manual in about 2 minutes to mix 2 parts



Step 6: Mixing by mixer in 10 minutes



Step 7: Fill into the syringe and put it into centrifugal to remove air bubble in 5 minutes.



Step 8: Check air bubble inside syringe

### 3. GUMI process

#### 3.1 Process specification

Item	Specification
Fiber	<ul style="list-style-type: none"> <li>- Enough length</li> <li>- Correct direction</li> <li>- No contamination</li> <li>- Blow by ion fan</li> <li>- End-face no chip.</li> </ul>
Film attached on fiber	<ul style="list-style-type: none"> <li>- No tail</li> <li>- Adhesive attach on surround of fiber less than haft of fiber</li> </ul>
Branching fiber	- No broken
Measure GUMI thickness	<ul style="list-style-type: none"> <li>- Nikon microscope (Sample 3pcs/machine/day)</li> <li>- Thickness 25~35um</li> </ul>

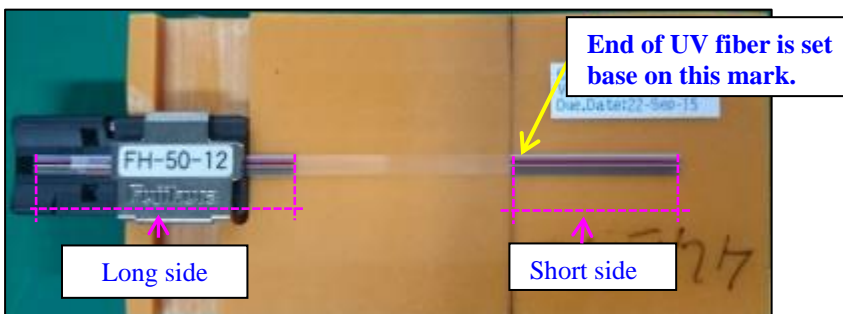
#### 3.2 Process condition

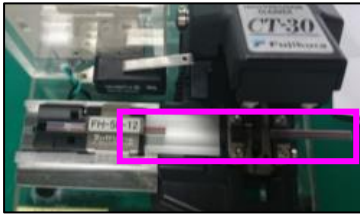
This process should be carried out in cleanroom and without wind.

Item	Condition
Check the film shape.	Visual
Cleaning adhesive base	After clean no adhesive attach on base, no alcohol remain
Curing	Hotplate at 130°C $\pm$ 5 at least 60 minutes
Branching fiber	By manual

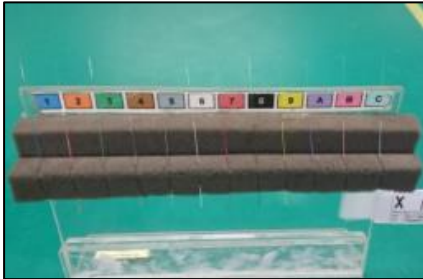
#### \*\*\* 20dB FBG

Step 1: Set ribbon fiber on the checking length jig.

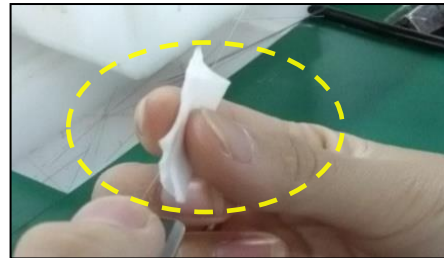




Step 3: Separate ribbon fiber into individual fiber and set fibers into jig.

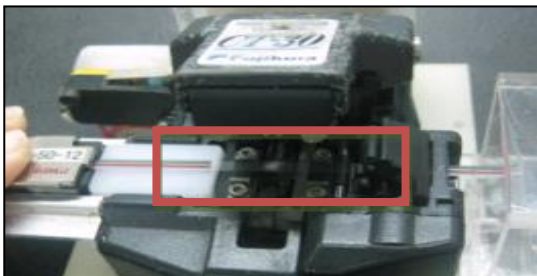


Step 4: Set fiber into UV holder, fiber and UV holder will be dip in Acetone and dried in front of ion fan about 20s. Clean by duster with alcohol (if detect contamination on fiber) and flow it by ion fan.

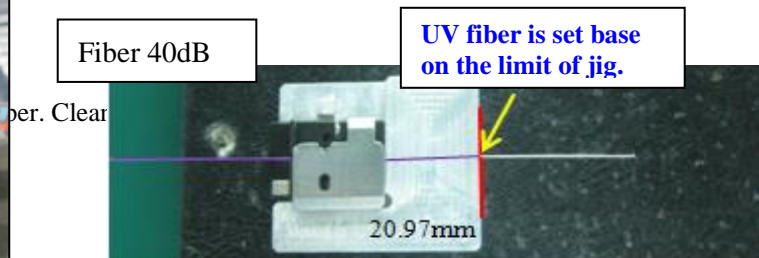


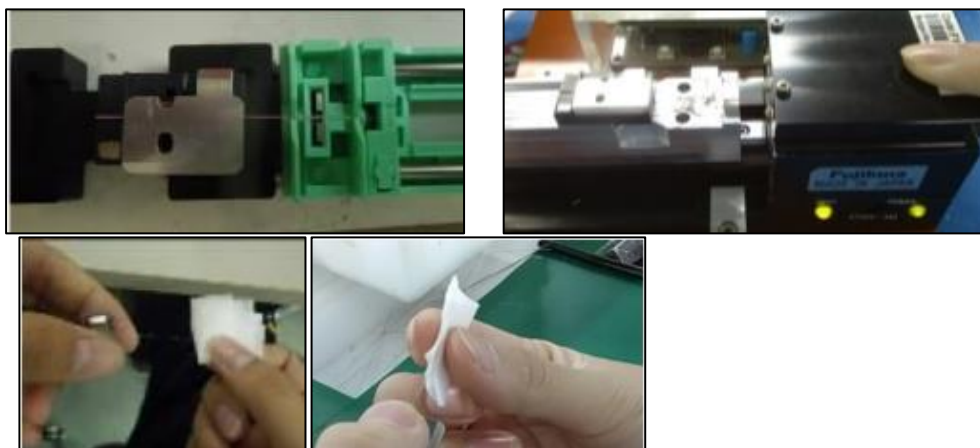
### \*\*\* 40dB FBG

Step 1: Use CT-30 cut the short side of ribbon fiber.



Step 2: Separate ribbon fiber into individual fiber and set fibers into jig. Set fiber on the checking length jig, use the jig 20.97mm for 40dB FBG



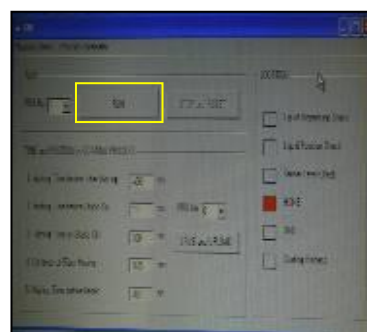
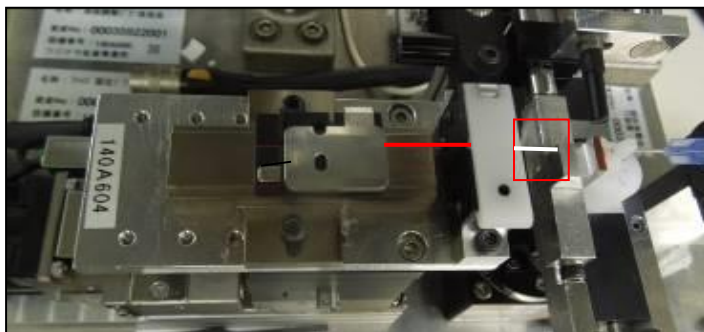


Step 4: Cut fiber by CT-30.

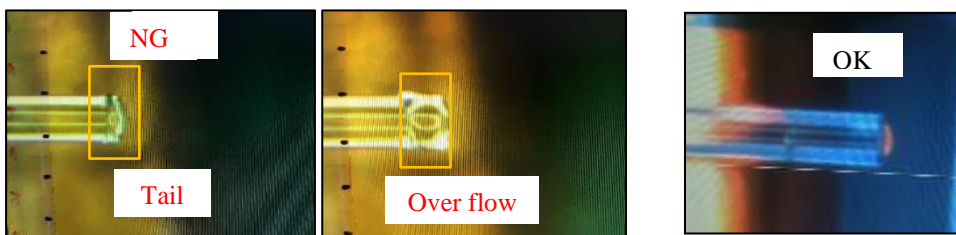


**\*\*\* The next steps are the same for 20dB FBG and 40dB FBG**

Step 5: Put holder into base of machine. Fiber end above static base. Close the clamp to fix fiber. Press the button “Run”



Step 6: Check film is attached by static electric or not (check voltage change or not when running every first time use index machining film machine) ? Check film shape

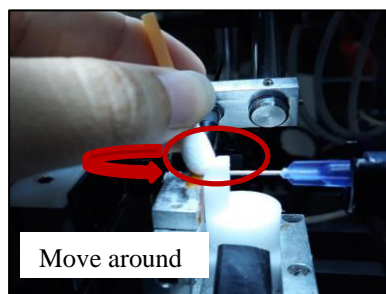


In case film NG, we can use acetone to clean film. After than blow it by ion fan in 1 min





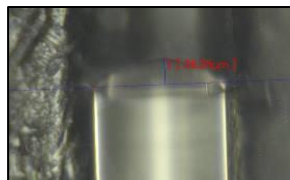
Step 7: Take out holder and clean adhesive base.



Step 8: Put fiber with holder into curing jig and cur it in 1 hour and set hotplate 130°C (Temperature specification: 85°C - 115°C)



Step 9: Checking GUMI thickness (sample)



#### 4. Ferrule assembly

##### 4.1 Process specification

Item	Specification
Fiber	No broken. Fiber end stay between 4 marks
Film	No damage, contamination
Ferrule	Enough epotek in cone No crack, damage

##### 4.2 Process condition

Item	Condition
Curing	Hotplate at 130°C ±5 at least 10mins
Check epotek	Visual
Adjust fiber in 4 marks	Pull protrusion fiber from the top of ferrule. Don't touch film

### \*\*\* 20dB FBG

Step 1: Set ferrule (insert mold) into jig and put the jig into auto suction machine:



Step 2: Adjust suitable program for sucking epotek into ferrule and use auto suction machine to suck epotek.

Step 3: Check amount of epotek in cone of ferrule and on the top of ferrule.



Epotek on the top of ferrule

### \*\*\* 40dB FBG

Step 1: Set ferrule into jig and put the jig into auto suction machine.



Step 2: Adjust suitable program for sucking epotek into ferrule and use auto suction machine to suck epotek.

Check amount of epotek in cone of ferrule and on the top of ferrule.



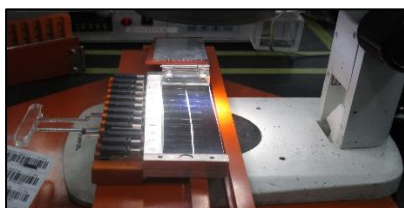
Step 3: Put epotek into groove of ferrule body => assembly to lower body by assembly tool, clean ferrule and check length of ferrule after assembly.



\*\*\* The next steps are applied for both 2 kinds of products: 20dB and 40dB.

Step 4: Take out curing jig after curing and set on jig under microscope for checking.



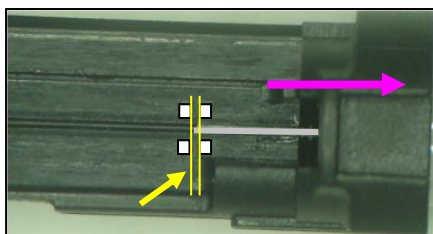


Step 5: Cut fiber by CT-30 and keep fiber by bare fiber holder.

Step 6: Take out fiber holder and set it in fiber insert tool. Slide fiber holder until we can see fiber protrusion ~2mm at the tip of ferrule. Open the lock and pull back fiber holder.



Step 7: Adjust fiber in 4 marks by pull protrusion fiber on the tip of fiber. (Never push fiber end)



Step 8: Curing body at least 10mins at  $130^{\circ}\text{C} \pm 5$



## 5. Polishing

### 5.1 Process specification

Item	Specification
Ferrule length	7.75mm ~7.95mm
Inter	Radius of curvature(mm) : 10~ 25 Apex offset(um) : < 50 Fiber height(nm) : -100~50
End-face	Follow 4-OP-0397 spec

### 5.2 Process condition

Item	Condition
Polishing ferrule	Polisher
Polishing liquid, cleaning	Water, Kim wipe
Inter	Inter machine
End-face	Microscope at lens 400x

*Details step please refer to:*

**+ 4-OP-528: Polishing condition**

**Note:**

- Apply white tube to protect GUMI from contamination, polishing water
- Sampling Inter 02 Jig/shift.

**6. Film inspection (Appearance 3+ appearance 5)**

**6.1 Process specification**

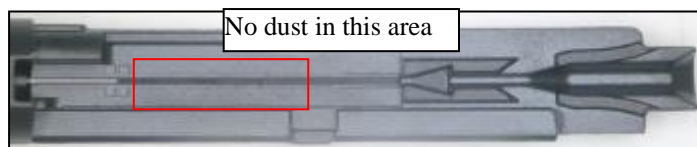
Item	Specification
V-groove area	No contamination
GUMI film	No deform, damage No contamination

**6.2 Process condition**

Item	Condition
Checking GUMI shape	Microscope ME2503 system
V-groove area	Microscope
Air blow	By air gun

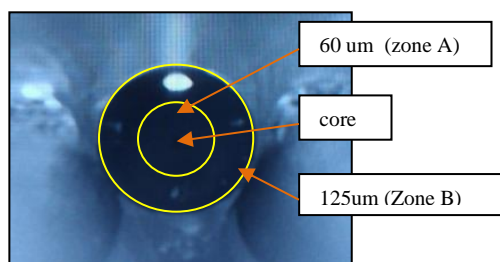
**\*\*\* Appearance 3:**

No dust in V-groove area.



Note: If have contamination, only blow by air. Don't use alcohol to clean contamination.

**\*\*\* Appearance 5: Check GUMI shape**



**7. Body cleaning**

**7.1 Process specification**

Item	Specification
Upper body A, B/ Upper body FAS	- Cleaning condition
Lower body	- No burr, stone, crack

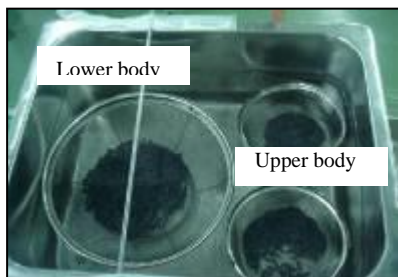
**7.2 Process condition**

Item	Condition
Alcohol for cleaning	Change after cleaning 25,000 pcs

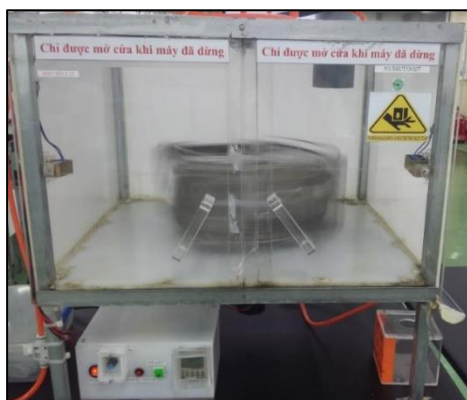
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Tray to storage lower body	No contamination
PE bag to storage upper body	No contamination inside. Don't damage
Cleaning time, dry body	Timer, auto drying machine

Step 1: Check body appearance. Cleaning 1: use alcohol to clean it by ultrasonic machine in 10 minutes



Step 2: Carry out cleaning 2 by ultrasonic with alcohol in 10 minutes. After that, dry body by auto drying machine. The last, upper body were put into plastic box.



## 8. Body assembly

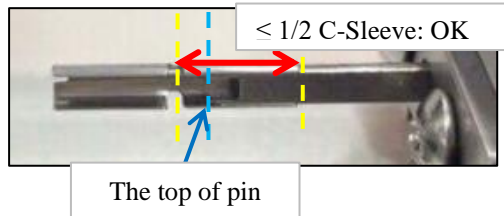
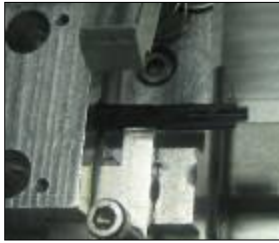
### 8.1 Process specification

Item	Specification
Upper body A,B/ Upper body FAS	- No contamination, dirty stuck on body.
C-sleeve	- Position and direction of key
Appearance	- No contamination, no scratch

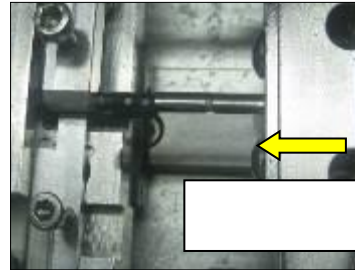
### 8.2 Process condition

Item	Condition
Upper body	- Check contamination by visual.
Body Assembly	- Tool for assembly: Smoothly, no any damaged onto product. - Assembly condition: carried out in the clean bench - Check appearance by visual

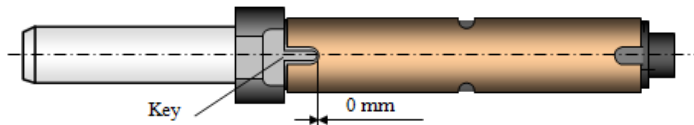
Step 1: Set lower body and upper on body assembly tool. And assembly  $\leq 1/2$  C-Sleeve to the pin of body assembly tool.



Step 2: Put upper B on lower body. And push C-sleeve to cover body.



Step 3: Take out and check C-Sleeve position. Check body appearance.



## 9. Material preparation

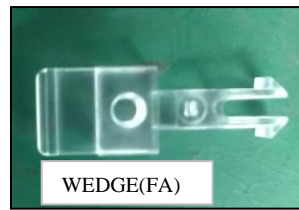
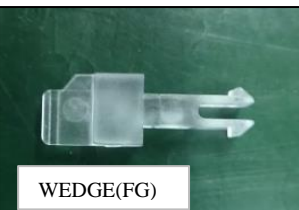
### 9.1 Process specification

Item	Specification
Holder Wedge	- Correct part - Enough quantity - No crack, broken.
Stop-ring/PS Slider Lever	- Correct part - Enough quantity - No crack, broken.
Assembly part	- Correct direction, parts

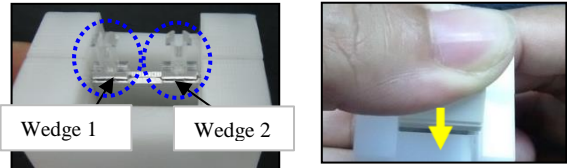
### 9.2 Process condition

Item	Condition
Appearance	Visual
Assembly	Manual

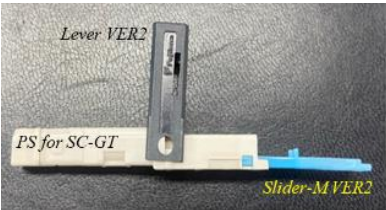
Step 1: Assembly Wedge into Holder (With products that use 40dB FBG)  
 - Use 2 kinds of Wedge: Wedge (FG) => Wedge 1 and Wedge (FA) => Wedge 2.



- Assembly wedge into tool and then press Holder to insert Wedge into Holder.



Step 2: Check appearance of material and assembly PS, Lever and Slider.



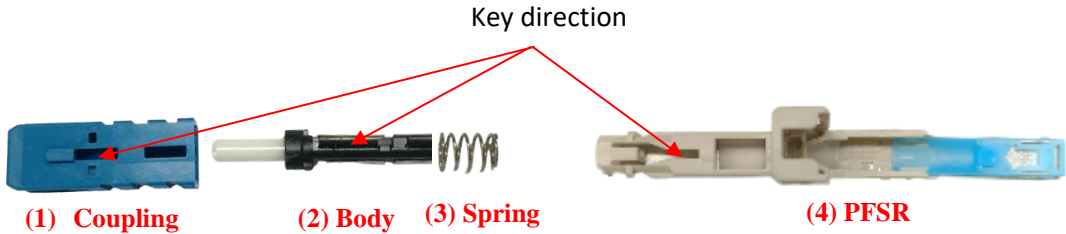
# 10. Housing

## 10.1 Process specification

Item	Specification
Housing part	<ul style="list-style-type: none"> <li>- Correct part</li> <li>- Enough quantity</li> </ul>
Part assembly	<ul style="list-style-type: none"> <li>- Correct direction</li> <li>- Spring can movement smoothly</li> </ul>

## 10.2 Process condition

Item	Condition
Appearance	Visual
Clean	By dusper/ bencot
Housing Assembly	<ul style="list-style-type: none"> <li>- Tool for assembly: Smoothly, no any damaged onto product.</li> <li>- Assembly condition: carried out in the clean bench</li> <li>- Check appearance by visual</li> </ul>



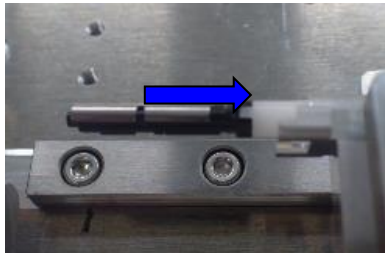
※Operation step:

Step 1: Use vacuum machine to remove contamination on the body.

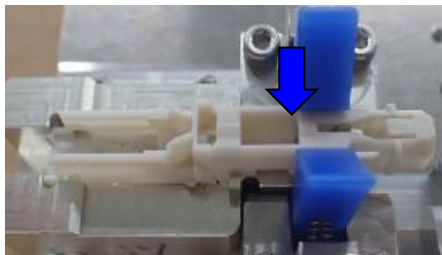




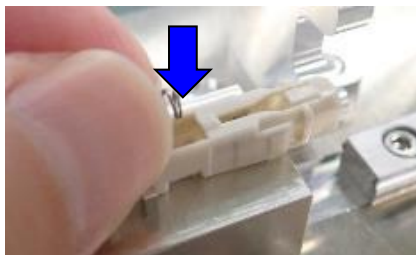
Step 2: Insert body to jig



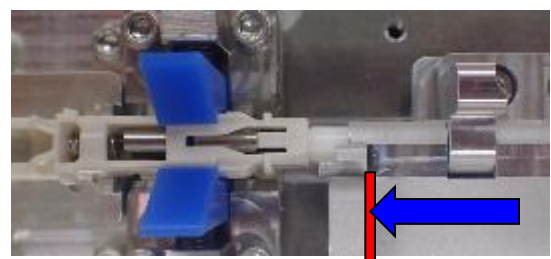
Step 3: Insert PS for SC-GT to jig



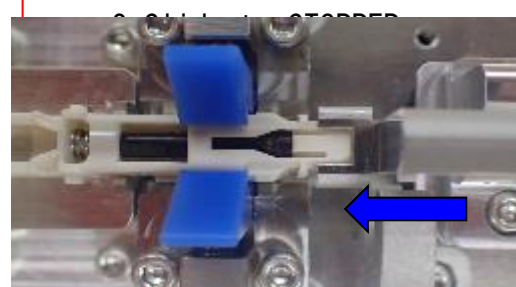
Step 4: Put spring into PS for SC-GT



Step 5: Insert body to PS for SC-GT



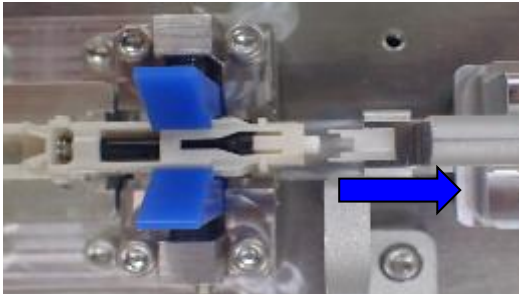
3. Rotate slide 90°



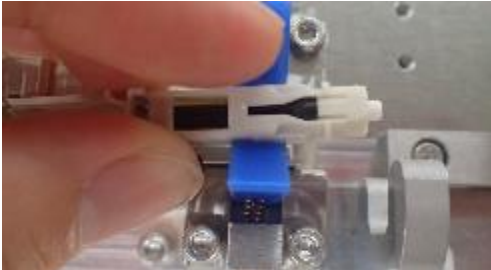
4. insert body into PS for SC-GT.



Step 6: Take out the assembled product



1. Slide out.



2. Take out the assembled product.

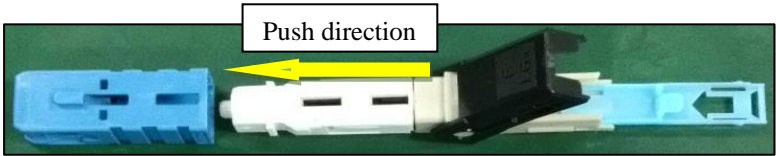
Step 7: Check spring by visual



Step 8: Check body assembly completely in PS for SC-GT

NG(The body is not inserted to the housing completely)	Pass(The body is inserted to the housing completely)

Step 9: Push coupling from the top of plug-frame. Use bemcot for cleaning endface of products.



Step 10: Assembly holder.

\* With products that use 40dB FBG:



\*With products that use 20dB FBG:



## 11. Loss inspection

### 11.1 Process specification

#### \*\*\* 20dB FBG

##### - FBG type G:

Items	RL Value	Wavelength	Equipment & Condition	Sampling
Insertion Loss	< 1.35 dB	1310±20 nm	SLD+OSA (Optical Spectrum Analyzer) (*)	10pcs/PO
	< 1.35 dB	1550±20 nm	SLD+OSA (Optical Spectrum Analyzer) (*)	All
	≥ 21 dB	1650± 6 nm	SLD+OSA (*)	All
Return Loss	≥ 35 dB	1310±20 nm	SLD+OSA (Optical Spectrum Analyzer) (*)	10pcs/PO
	≥ 35 dB	1550±20 nm	SLD+OSA (Optical Spectrum Analyzer) (*)	All
	< 3.95 dB	1650± 5 nm	SLD+OSA (*)	All

##### - FBG type H:

Items	RL Value	Wavelength	Equipment & Condition	Sampling
Insertion Loss	< 1.35 dB	1310±20 nm	SLD+OSA (Optical Spectrum Analyzer) (*)	10pcs/PO
	< 1.35 dB	1550±20 nm	SLD+OSA (Optical Spectrum Analyzer) (*)	All
	≥ 22.5 dB	1650± 6 nm	SLD+OSA (*)	All
Return Loss	≥ 35 dB	1310±20 nm	SLD+OSA (Optical Spectrum Analyzer) (*)	10pcs/PO
	≥ 35 dB	1550±20 nm	SLD+OSA (Optical Spectrum Analyzer) (*)	All
	< 3.95 dB	1650± 5 nm	SLD+OSA (*)	All

#### \*\*\* 40dB FBG

Items	RL Value	Wavelength	Equipment & Condition	Sampling
Insertion Loss	< 1.35 dB	1310±20 nm	SLD+OSA (Optical Spectrum Analyzer) (*)	10pcs/PO
	< 1.35 dB	1550±20 nm	SLD+OSA (Optical Spectrum Analyzer) (*)	All
	≥ 41.5 dB	1650± 5 nm	SLD+OSA (*)	All
Return Loss	≥ 35 dB	1310±20 nm	SLD+OSA (Optical Spectrum Analyzer) (*)	10pcs/PO
	≥ 35 dB	1550±20 nm	SLD+OSA (Optical Spectrum Analyzer) (*)	All
	< 3.95 dB	1650± 5 nm	SLD+OSA (*)	All

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(\*) In case of using TLD, measuring wavelength should be 0.01um step. In case of using SLD, measuring should be continuity

✚ With products that use 40dB FBG: Assembly Holder cover after measuring loss.



## 11.2 Process condition

Item	Condition
Measuring cable	UV fiber 0.25
Bare fiber checking	Microscope SZ-61

Prepare fiber with parameter as below:

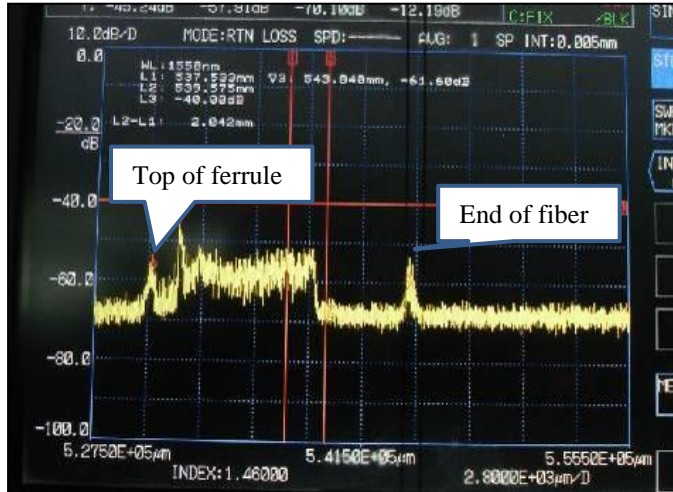
- Strip and cut the fiber with the length: 9.7 => 10.7mm.

- Life time of using: If UV coating becoming peel off of after maximum 6 products measured, the measuring cable should be re-preparing again.
- Time of insertion of measuring fiber into product: 1 product is allowed maximum 2 times.
- Check appearance of measuring fiber after measuring 6 products to ensure appearance of measuring fiber and quality of Gumi.
- Wedge no.1 have to insert and take out before wedge no.2

## 12. Reflection inspection

### 12.1 Process specification

Item	Kind of FBG	Specification
FBG position	20 dB	Distance from the top of ferrule to the end of FBG is 7~9.3 mm
	40dB	Distance from the top of ferrule to the end of FBG is 8.7~11 mm



### 12.2 Process condition

Item	Condition
Reflect inspection	Reflect machine
Judgement	Visual, template

*Note: Sampling Reflect 1pcs/shift.*

## 13. Final End-face

Follow spec [S-GAISHI-01-2000-5](#) and [FOV general 4-OP-0397](#) for more detail

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## 14. QC Appearance

### 14.1 Process specification

Item	Specification
Attached component	- Enough quantity and right parts.
Appearance of main product	- Stain of material not > 5mm - Scratch should not be feeling by finger nail - No any crack, no any bubble, no any contamination. - No any burr.

### 14.2 Process condition

Item	Condition
Appearance	Visual
PE bag	

## 15. QC packing

### 15.1 Process specification

Item	Specification
Process	Carry out in inside (Step 1, 2, 3) and outside (step 4, 5) cleanroom condition

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Packing materials	Correct pack, carton box, labels. Enough quantity
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## 15.2 Process condition

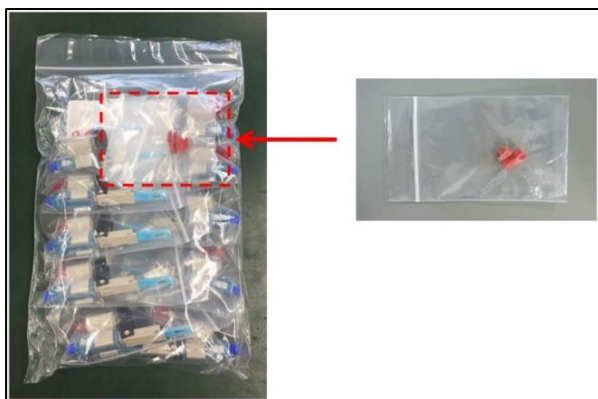
Item	Condition
Packing	Manual

Step 1: Put 1 product + 1 Clamp M ver.2 into each slot into PE bag B-4 (60x85mm)



Step 2: Put 10 packaging of product into the PE bag(G-4).

- Direction is changed one by one. The place of slider M is anywhere OK.
- Put spare of 1 clamp M into a PE bag(B-4) and put into a PE bag(G-4).



Step 3: Paste the label of T-connector packing on PE bag(G-4)





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Where:

F\*\*\*\*\*: PO number

0001: serial

Step 4: Pack 10 PE bag (G-4) into the inner carton [ID] L300mmxW160mmxH150mm.  
And, put in the pad to the bottom and top.



Check the label outside the box:

Product name	品名	KY-ガイハジTS<SC>-<LG>-<F>	合格印
WO number	製番	8603004389	
Box B No	箱番	70	
Box No	外装箱 No.	T140601061	
		T140601062	
		T140601063	
		T140601064	
		T140601065	
		T140601066	
		T140601067	
		T140601068	
		T140601069	
		T140601070	

Step 5: Packing method with pallet (Container 20FT contain maximum 20 pallets (1150\*1150\*1130) ~ 216,000 products)

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Item	Dimension (mm)
Inner carton	300*160*150 (OD)
Pallet	1150*1150*1130



## ***16. Shipping***

Shipping Q'ty and product name must be confirm correct with P/O from Customer  
 Test report of that shipment will be sent to Customer latest one day after product is ex-factory  
 The content of test report included items that are request in Product spec.

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## REVISION HISTORY

Date	Person in charge	Version	Content		Reason	Change Requester
			Old description	New description		
1-Oct-2024	Thu DTM	12	Specification: S-GAISHI-71-2128-2	- Specification: S-GAISHI-71-2186-3	Update Spec changed	Nguyen Ba Phuoc
			*** <b>Appearance 3:</b> Check fiber in 4 marks, no dust in V-groove area	*** <b>Appearance 3:</b> No dust in V-groove area	Follow 9-PR-0014-9-FO-0001-4-RC-0141	
			13. Final End-face Follow spec S-GAISHI-01-2000-4	13. Final End-face Follow spec S-GAISHI-01-2000-5	Document review	
10-Apr-24	Nguyen Ly Thien Ngan	11	- Specification: S-GAISHI-71-2128-6  - Item 1.2: Step 1: With products that use 20dB FBG, use 1 kind of Wedge: Wedge (FA). Step 2: Check appearance of material and assembly Stopping, Lever and Slider. Item 2.1 & 9.1: Upper body A,B  -Item 10: Housing by manual -All Checking items in each process  -Item 7. Checking items: Sampling Inter 2pcs/shift	- Specification: S-GAISHI-71-2186-2  - Correct numerical order of process compliance to QC flow chart - Item 9.1 (change order): Step 1: Cancel  Step 2: Check appearance of material and assembly PS, Lever and Slider.  Item 7.1 & 8.1(change order): Upper body A,B/ FAS -Item 10: Housing by tool -Item V. Traceability control  -Item 5 (change order): Checking items: Sampling Inter 2jig/shift	-Apply new template 0-PR-001-0-TEM-0008  - New product design from customer	Pham Dinh Hieu
04-Sep-18	Nguyen Thi Lan Phuong	10	- Item 8.1: Body: No broken. No contamination. + Item 8.2: Body chip  + Item 8.3: Epotek in cone, body chip...	- Item 8.1: V-groove area: No broken. No contamination. + Item 8.2: V-groove area + Item 8.3: V-groove area	- Improvement with 4M: 4-Pr-007-4-Fo-001-4-RC-0512	Deputy Div. Manager Nguyen Trung Kien
23-Jul-18	Duong Xuan Mai	09	- Item 11.2: Measuring cable: Drop-cable  - Item 4.1: Mixing ratio, Pot time.  - Item 15.1: Carry out outside in cleanroom condition.  - Item 5.2: Step 4:	- Item 11.2: Measuring cable: UV fiber 0.25  - Item 4.1: Mixing ratio (27%4%), Pot time (≤15h). - Item 15.1: Carry out in inside (Step 1, 2, 3) and outside (step 4, 5) cleanroom condition. - Item 5.2: Step 4:	- Improvement with 4M: 4-Pr-007-4-Fo-001-4-RC-0460 - Correction  - Correction	Dept. Manager Nguyen Trung Kien

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			+ Set fiber into UV holder.  - Item 5.2: Step 7: Clean adhesive base.	+ Set fiber into UV holder, fiber and UV holder will be dip in Aceton and dried in front of ion fan about 20 sec. - Item 5.2: Step 7: revise picture for description more: move around cleaning pad for cleaning adhesive base.	- Correction (decrease defect mode “ <i>film no absorb on fiber</i> ” of Gumi machine) - Correction (decrease defect mode “ <i>film over flow</i> ” of Gumi machine)	
01-Sep-2017	Nguyen Thi Lan Phuong	08	- Use Outer carton for packing method  - Clean 1 --> Dry --> Clean 2 --> Put into plastic. - Mix by manual in 1 minute and after that mix by machine in 4 minutes. - Item 14, 15: QAS.  - Mixing Gumi adhesive follow to excel form.	- New packing method. (Don't use Outer carton)  - Clean 1 --> Clean 2 --> Dry --> Put into plastic - Mix by manual in 5 minutes.  - Item 14, 15: QAS -> QCS. - Mixing Gumi adhesive follow to program.	- Improvement with 4M: 4-PR-007-4-FO-001-4-RC-0236 - Correction.  - Correction  - Correction  - Correction.	Dept. Manager Nguyen Trung Kien
22-Dec-16	Nguyen Thi Lan Phuong	07	- Check appearance of measuring fiber 100%	- Check appearance of measuring fiber 1pc/6 products	- Improvement with 4M: 4-PR-007-4-FO-001-4-RC-0097	Dept. Manager Nguyen Trung Kien