

## QUALITY CONTROL FLOW CHART OF EXPANDABLE BREAKOUT MODULE PRODUCT

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**I. Purpose:**

- To set up the manufacturing processes which are implemented in Fujikura Fiber Optics Vietnam
- To determine Quality control items of each process

**II. Application:**

- This guideline is applied for Expandable breakout Module products.
- This document concerns to Production function, Production engineering function, Quality Assurance function and Planning function.

**III. Reference document:**

- Customer specification:

No.	Specification	No.	Specification
1	HS-B-2301-0494-09	5	HS-B-2301-0532-11
2	HS-B-2301-0495-13	6	HS-B-2301-0533-11
3	HS-B-2301-0503-11	7	HS-B-2301-0534-11
4	HS-B-2301-0531-11	8	HS-B-2301-0535-11



- FMEA: 0-PR-012-0-FO-001-4-RC-0141 version 12

**IV. Term and definition:**

FOV: Fujikura Fiber Optics Viet Nam Ltd.

OCAP: Out of Control Action Plan

Samp.: Size of sample

P.I.C: Person in charge

IL: Insertion Loss

RL: Return Loss

QAE: Quality Assurance section

PRE: Production Engineering section

PRD: Production section

PLN: Planning section

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Date: 05-Aug-2024

Originator: Ngo Dinh Duy Tan  
Date: 03-Mar-2023

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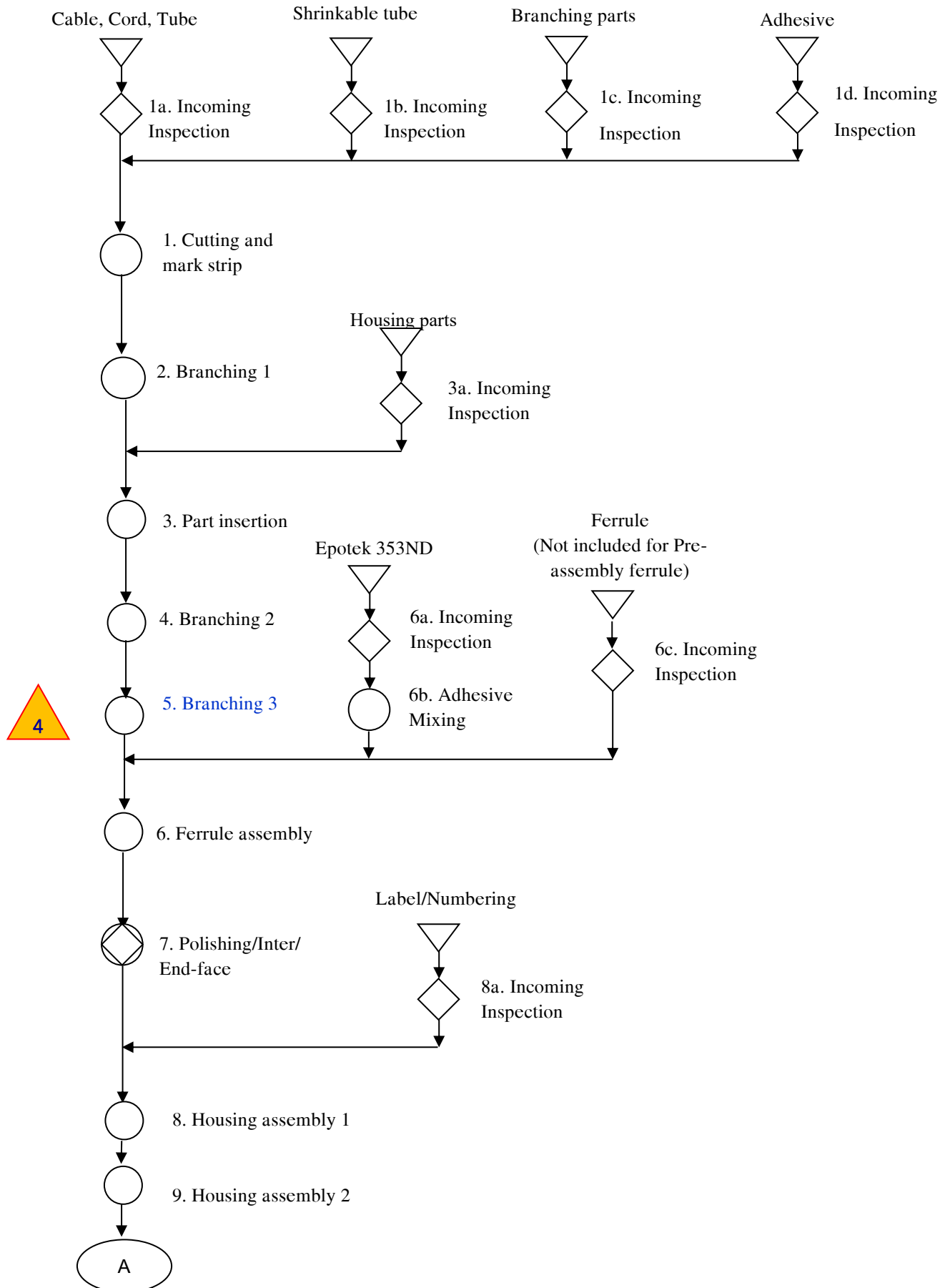
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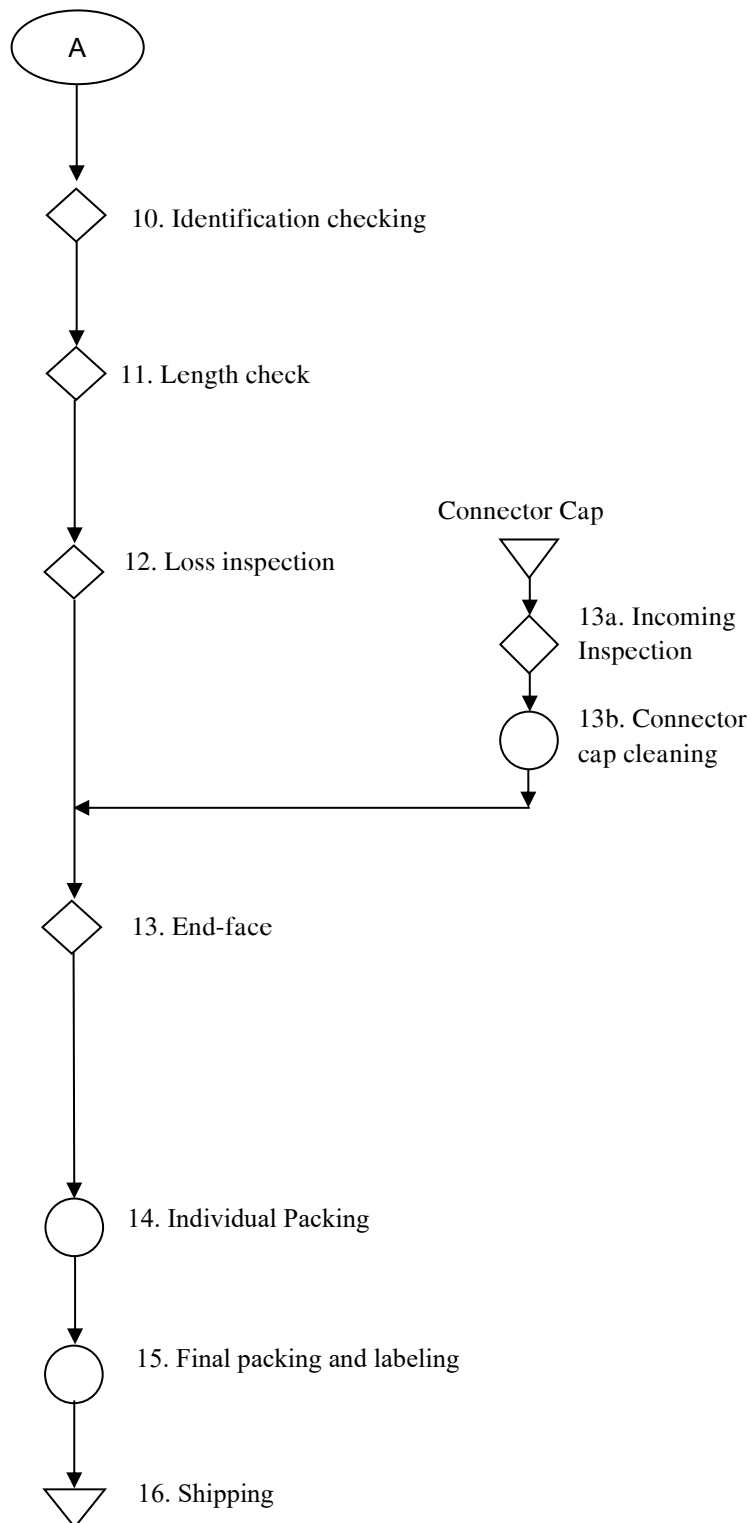
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## V. Content:

## V.1. QC Flow Chart for all processes





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## V.2. Quality control items for each process






Process		Quality control items	Instrument	Sampling size	Related Document	Function
No	Name					
1a	Incoming inspection [Cable, Cord, Tube]	9-Pr-012				PLN, QAE
1b	Incoming inspection [Shrinkable tube]	9-Pr-012				PLN, QAE
1c	Incoming inspection [Branching parts]	9-Pr-012				PLN, QAE
1d	Incoming inspection [Adhesive]	9-Pr-012				PLN, QAE
1	Cutting and mark strip	- Quantity, Type & Color	Manual Visual	All	4-OP-0495	PRD, PRE
		- Cutting length (cable, cord tube, shrinkable tube)	Machine	- When start machine: + Measure 3 pcs if change roller status + Measure 1 pc if not change roller status. - When stop machine: measure 1 latest pc		
				Ruler		
			- Identify the polarity of cable before inserting Expandable tube	Manual Visual		
		- Expandable tube is tight with cable after insertion	Manual Visual			
		- Expandable tube appearance and position after insertion	Manual Visual			
		- Winding diameter (cable, cord) for packing Coil type	Winding tool			
		- Cable appearance after winding into Reel for packing Reel type	Manual Visual			
		- Position and direction of Part	Manual Visual			
		- Marking length (cable)	Ruler/Jig			
		- Stripping lengths	Ruler/Jig			
		- Tension member cutting length	Ruler/Jig			
		- Tube Aging condition: Time, temperature, Cycle	Chamber & Recorder			
2a	Incoming inspection [Housing parts]	9-Pr-012				PLN, QAE
2	Branching 1	- Quantity, Type & Color	Manual Visual	All	4-OP-0471	PRD, PRE
		- Appearance of Furcation tube after stripping (no deformity)	Visual			
		- Furcation tube after being bundled to every layer (no rotate)	Visual			
		- Colors of tube are in sequence of yellow-white-yellow-white	Visual			
		- Pot life of adhesive (start at mixing time)	Clock			
		- The amount of adhesive	Visual			
		- Temperature of heating Epoxy	Heater			
		- The length of finished tail	Ruler/Jig			
		- Appearance of finished tail (Enough adhesive, no deformity)	Visual. SST housing			
		- The length of SST sub which go inside the SST tube when branching	Template/Jig			
		- The holes at the end of tubes have clearly defined row	Visual, Jig			

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		- The end of tube: flat with epoxy and tube flush	Visual			
3a	Incoming inspection [Housing parts]	9-Pr-012				PLN, QAE
3	Part insertion 	- Quantity & Type	Manual, Visual	All	4-OP-0392	PRD, PRE
		- Direction, order of part	Manual/Jig			
		- Color of Boot (only apply for D8062)	Manual/Jig			
4	Branching 2 	- Furcation tube and kevlar cutting length	Cutter	All	4-OP-0471	PRD, PRE
		- Direction, order of SST branching part	Visual			
		- Arrangement of fiber in furcation tube	Visual, Jig			
5	Branching 3 	<div> <div>Crimping type</div> <div> - Expandable tube and kevlar cover the SST backpost completely before crimping  - Marking length for Crimping SST  - Crimp ring direction, position  - Crimp ring appearance and after clamping  - Position of Crimp ring after crimped </div> </div> <div> <div>Heat shrink tube type</div> <div> - Inner heating tube position  - Heating inner Shrinkable tube  - Marking length for outer tube  - SST position after insetion  - Outer tube position before heating  - Heating outer Shrinkable tube  - Position of outer tube after heated  - Appearance of heat tube and expando tube after heated  - Position of fiber (no swap, no bend)  - Fiber was pull straight before and during injecting adhesive  - Adhesive in SST housing  - The order of single cord  - Appearance of SST transition after branching </div> </div>	Manual Visual Ruler Crimp tool Visual Visual Visual Heater Ruler/ template Visual Visual Heater Visual Visual Jig, Clamp Visual	All	4-OP-0471	PRD, PRE
6a	Incoming Inspection [Epotek-353ND, Part A & B]	9-Pr-012				PLN, QAE
6b	Adhesive Mixing [Expotek-353ND, Part A & B]	- Mixing Ratio - Mixing Time - Degas time - Air bubble checking - Pot life (start at mixing time)	Balancer Mixer Centrifugal Visual Clock	All	4-OP-500	PRD, PRE
6c	Incoming Inspection [Ferrule (Not included for Pre-assembly ferrule)]	9-Pr-012				PLN, QAE
6	Ferrule Assembly	- Fiber re-cutting length - Kevlar cutting length - Epotek injection into ferrule - Direction of stop ring key - Fiber stripping length	Template Template Vacuum Machine/ Dispenser Visual Stripping machine	All	4-OP-0392 9-PR-008- 4-WI-0001 000-5- WI-037	PRD, PRE

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		- Fiber cleaning & screening	Manual			
		- Fiber length before insert to ferrule	Template			
		- Marking length	Template			
		-	Heater			
		- Ferrule moving in housing	Spring push test			
7	Polishing/Inter/End-face	- Ferrule, fiber surface checking	Microscope	All		4-OP-526 9-PR-008-4-WI-0001 PRD, PRE
		- Ferrule length before/after re-polishing	Micrometer/Template			
		- Interferometer checking (APC)	Interferometer			
8a	Incoming Inspection [Label, number ring]	9-Pr-012				PLN, QAE
8	Housing assembly 1	- Quantity & Type	Manual, Visual	All		4-OP-523 9-PR-008-4-WI-0001 PRD, PRE
		- Cord direction	Visual			
		- Ferrule direction, position in bottom housing	Visual			
		- Fiber status inside bottom housing	Visual			
		- Back post direction, position in bottom housing	Visual			
		- Cable end position	Visual			
		- Shrinkable ring crimping direction, position	LC Clamping tool Visual			
		- Shrinkable ring appearance and Kevlar protrusion after clamping	Visual			
		- Top housing fix completely with bottom housing	Visual			
		- Shrinkable heating: temperature, time	Heater			
		- Shrinkable appearance after heating	Visual			
		- Cable rotation checking	Manual			
		- Boot fix completely with housing	Visual			
		- Ferrule, Housing, Boot, appearance checking	Visual			
9	Housing assembly 2	- Label sticking direction, position	Jig	All		4-OP-0495 PRD, PRE
		- Label order, content, color	Visual			
		- Label appearance checking	Visual			
10	Identification checking	- Fiber arrangement (no swap)	Ident system	All	4-OP-510	PRD, PRE
		- Brand label content, color	Visual	All	4-OP-0495 PRD, PRE	
		- Brand label order and scanning function	Visual, Template			
11	Length checking	- Branching Length	Ruler/Template	All	4-OP-0495 9-PR-008-4-WI-0001	PRD, PRE
		- Total product length L	OTDR machine			
12	Loss inspection 	- Connection diagram	Loss system, Master cord	All	4-OP-506 4-OP-507	PRD, PRE
		- P <sub>0</sub> value & IL, RL value (connector loss)	Loss system	All	9-PR-008-4-WI-0001 000-5-WI-037	
		- Master cord end face checking	Microscope, Loss program	Sampling		
13a	Incoming Inspection [Connector Cap]	9-Pr-012				PLN, QAE

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13b	Connector cap cleaning	- Quantity	Visual	All	000-4-WI-013	PLN, PRE
13	Final End-face	- Ferrule and fiber surface check	Microscope	All	4-OP-0495	PRD, PRE
		- Control cap quantity	Visual		9-PR-008-4-WI-0001	
14	Individual Packing	Appearance of branch label after travelling	Visual	All	4-OP-0495 9-PR-008-4-WI-0001	PRD, QAE
		Label is tightly affixed, no peel off more than criteria.	Visual	All		
		Enough cap to cover all connector	Visual	All		
		SN, PN label content	Visual	1pc/PO		
		Kind and quantity of packing materials.	Visual	All		
		Packing Label content	Visual	1pc/PO		
		Packing pulling eye method	Visual, ruler, heating machine	All		
15	Final packing and labeling	Pack product securely inside the carton box	Visual	All	4-OP-0495	PRD, QAE
		- Correct mesh color of two sides, color of pulling rope - Correct content of end label for each side.	Visual	All	4-OP-0495	PRD, QAE
		- Product name - PO No. - Serial No. of product - Quantity	Program			
		- First Article report	Manual/Program	Every PN/ 1PO	4-OP-0495	PRD, QAE
		- P/O number - Product quantity - Test report	Manual Visual	All	4-OP-0495	PLN
16	Shipping	- P/O number - Product quantity - Test report	Manual Visual	All	4-OP-0495	PLN

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**VI. Review:**

Regularly, this document will be reviewed yearly by engineering function or when anybody found unsuitable points of this QC flow chart and would like to suggest revising it. (Refer to 0-Pr-001: Control of documents).

**VII. Record:**

<b>No.</b>	<b>Record</b>	<b>Retention time</b>	<b>Responsibility for keeping</b>
1	Relative check sheet created by Production Section	11 years	Production
2	Relative check sheet created by Quality Assurance Section (QAE)	11 years	Production/ Logistic
3	Test Report	11 years	Quality Assurance Engineering (QAE)

- Identification, storage, protection, retrieval & disposition of these records refer to 0-PR-004 Control of record.

**Note:** Nonconforming product/material shall be identified & controlled according to relevant procedures: 9-PR-008.



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## REVISION HISTORY

Date	Person in charge	Ver	Content		Reason	Change requester
			Old description	New description		
5-Aug-24	PhungTK	4	-	Item III. No 3 to no 8: Update spec version 09 -> 11	Update spec version	Ban NT
			Item IV. QCS, LOG, PUR	Item IV. QCS => QAS LOG, PUR => PLN	Update new section	
			Item V.2.7 - Label/number ring sticking direction, position - Tail label appearance checking	Item V.2.8 Cancel this checking	Standard document	
			Item V.2.3 Color of Boot	Item V.2.3 Color of Boot (only apply for D8062)	Standard document	
			Item V.2.5 The order of single cord: Jig	Item V.2.5 The order of single cord: Jig, Clamp	Standard document	
			Item V.2.4 Branching2	Item V.2.4, V.2.5 Branching 2, Branching 3	Standard document	
			Item V.2.6 Ferrule, fiber surface checking: The first jig/line/shift	Item V.2.7 Ferrule, fiber surface checking: 100%	Cancel 9-PR-0014-9-FO-0001-4-RC-0017	
			Item V.2.11 Label direction checking	Item V.2.12 Cancle this checking items	Standard document	
5-Apr-24	PhungTK	3	Item V.2.1 Material Lot No. Machinee No.	Remove	Follow to 9-PR-013	Manager TienDT
			Item V.2.2, V.2.3 Material Lot No.	Remove		
			Item V.2.4 Crimping Tool No Heater No	Remove		
			Item V.2.5b Lot No (Part A & B) Expiry date of Adhesive	Remove		
			Item V.2.5 Ferrule Lot No. Stripper No. Heater No.	Remove		
			Item V.2.5 Epotek curing temperature, time		Follow to 5-PR-007	
			Item V.2.6 Polishing Condition			
			Item V.2.6 Polisher No Microscope No Inter machine No	Remove	Follow to 9-PR-013	
			Item V.2.7 Material Lot No. Heater No	Remove		

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			Crimping tool No			
			Item V.2.9, V.2.10 Machine no	Remove		
			Item V.2.11 - Loss Machine No - Master cord No - Microscope No	Remove		
			Item V.2.12b Lot No.	Remove		
			Item V.2.12 Microscope No	Remove		
			Item V.1 2. Branching 3. Part insertion	Item V.1 2. Branching 1 3. Part insertion 4. Branching 2	Follow to 9-PR-0014-9-FO-0001-4-RC-0049	
			Part insertion: - Fiber re-cutting length - Kevlar cutting length	Ferrule assembly: - Fiber re-cutting length - Kevlar cutting length		
			Item V.3. FMEA No: 0-PR-012-0-Fo-001-4-RC-0141 ver08	Item V.3. FMEA No: 0-PR-012-0-Fo-001-4-RC-0141 ver12		
			-	Item VII. Add Required record and Retention time no 1, 2, 3	Follow to 0-PR-004	
			-	Item V.2.5, 11 Add 9-PR-008-4-WI-0001 000-5-WI-037	Update related documents	
			-	Item V.2.6, 7, 10, 12, 13 Add 9-PR-008-4-WI-0001		
	MyNTH ThuTT	Have the appearance checking process	Cancel appearance checking process	Follow 9-PR-0014-9-FO-0001-9-RC-0028 Follow 9-PR-0014-9-FO-0001-9-RC-0028		
		Item 7. Identification checking process: Have no label checking item	Item 7. Identification checking process: Add label checking item			
		-	Add more checking items at Individual packing process			
12-Mar-24	ThuTT MyNTH	2	- Item 5.2.6: Check Ferrule, fiber surface 100%  -Item 14: Appearance checking 2	- Change the QC format - Item III: Add FMEA version 11; Update latest spec version - Item 5.2.6: Check Ferrule, fiber surface sampling  - Cancel Appearance checking 2 -Item 14 Final packing and labeling : add more 2 requirements: + Correct mesh color of two sides, color of pulling rope + Correct content of end label for each side.	Follow 9-PR-0014-9-FO-0001-4-RC-0017  Follow 4-Pr-007-4-Fo-0007-9-RC-0083	TienDT  DucTNM
03-Mar-2023	Ngo Dinh Duy Tan	1	None	Established	-	Manager Dinh Tan Tien