

CUTTING, AGING & MARK STRIP

Operation Procedure : 4-OP-0483

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I. Purpose:

Purpose of this procedure is guidance for set up cutting length, aging and mark strip for Connector, MPO product

II. Application:

This operation procedure is applied for:

No.	Group
1	Cutting & Branching for Twin cord product
2	Cutting & Branching for Twin pigtail product
3	Cutting for Jumper Patch cord product
4	Cutting for Pigtail product
5	Cutting & mark strip for Cable product
6	Cutting & mark strip for Fanout product
7	Cutting & mark strip for MPO product
8	Tube cutting
9	Aging cord/tube, abrasion tube
10	Winding cable/cord into bobbin
11	Expando Assembly
12	Cutting of packing materials

This procedure concerns to PRD, PRE, and QAE section

III. Reference Document:

Reference documents are listed in FOV's Quality and Environment Manual

Checked by: Nguyen Thanh Ban

Date : Follow DMS

Prepared by: Chau Thi Cam Tien Cross check by: Vo Duc Thang

Date : 22-Aug-2024

Approved by: Nguyen Trung Kien

Date : Follow DMS

Originator: Vo Duc Thang

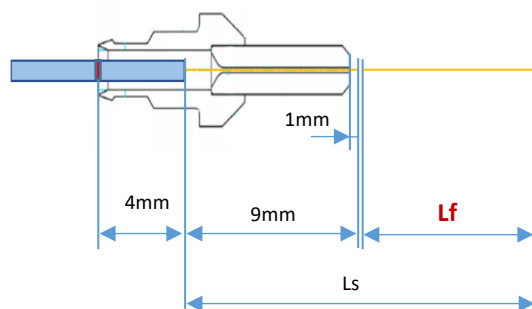
Date : 2-Jun-22

IV. Term definition:

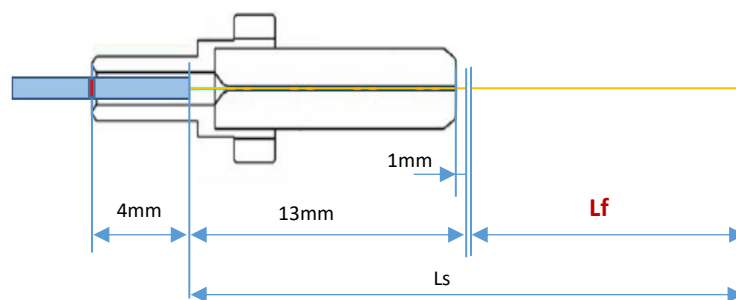
FOV: Fujikura Fiber Optics Vietnam Ltd.,

A/ Extra Length for Ferrule assembly (Lf):

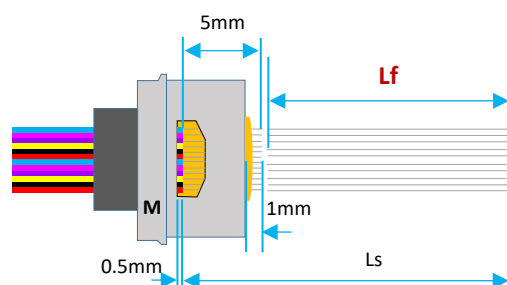
For LC, MU, CS ferrule:



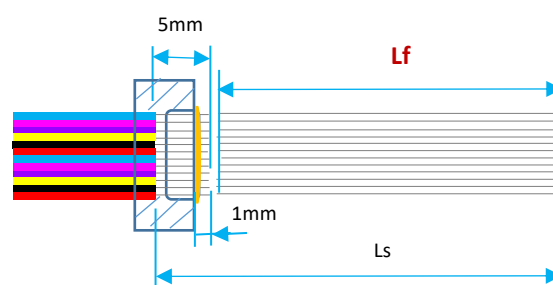
For SC, DP, ST ferrule:



For MT ferrule:



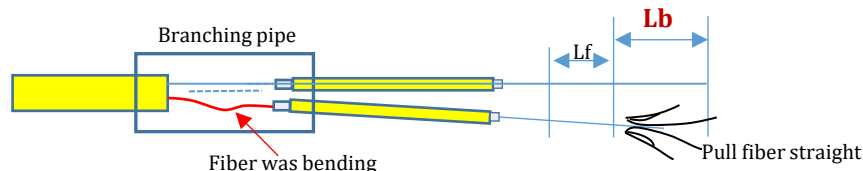
For MMC ferrule:



No.	Ferrule type	Fiber stripping length Ls (mm)	Extra length for ferrule assembly Lf (mm)	Note
1	LC, MU, CS	30	21	
2	LC, MU (AFL)	9	0	No cut fiber before insertion
3	SC, DP, ST	30	17	
4	MT	30	25	
5	MMC	30	25	

B/ Extra Length for Branching (Lb):

Extra Length for branching (Lb) is the fiber length using to pull fiber straight inside branching pipe and furcation tube
This fiber will be cut after adhesive harden inside branching pipe. Lb = 30mm



C/ Extra Length for Gathering (Lg):

For ribbon fiber or cable xxxx that we can identify the fiber order by the fiber length for ferrule assembly.

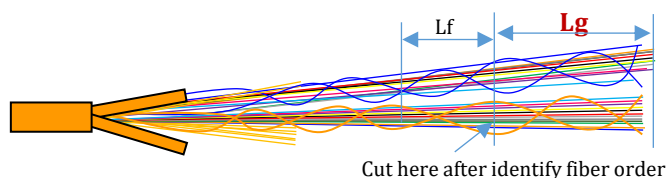
The extra length for gathering (Lg) is 0 mm.

For cable > 2 layer:

For round cable more than 12 fibers that we cannot identify the fiber order by the fiber length for ferrule assembly.

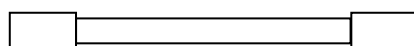
We need more fiber to check and identify the fiber order.

The extra length for gathering (Lg) for this case = 60mm for each side. For MMC product, Lg = 150mm



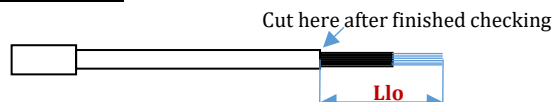
D/ Extra Length for Ident. Loss (Llo):

For product 2 side:



Both side is connector, so we can connect direct into machine to check Ident and Loss => Llo = 0 mm

For product 1 side:



The pigtail side need to strip bare fiber to connect with Ident or Loss machine => Llo = 100 mm

E/ Extra Length for rework (Lr):

$$Lr = n * R_w$$

n is the qty of rework (engineer design by tolerance of product)

Rw: min length for 1 time rework for each kind of connector

Connector type	LC, MU	SC	MT			
Rw (mm)	16	20	12			

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V. Content:**1. Process specifications****1.1 For Twin cord product:****1.1.1 Cutting****a) Cutting items**

Cutting items for Twin cord product:

No.	Items	Cutting requirement	Remark
1	Cable/Cord/Fiber	Yes	Refer below items for detail cutting length & qty
2	Tube	No	
3	Heat shrink tube	Base on product spec	
4	Mesh	No	

b) Cord cutting length

Product specification				Design cutting length				
Cord type	Product picture	Range of Length L	Spec Tolerance of L (m)	Tolerance design Lt (m)	Extra length for ferrule ass Lf 2*Lf (m)	Cutting length (m) L + T1+ T2+ Lt + 2*Lf	Cutting qty / product	Tolerance of cutting (m)
Zipcord		L ≤ 10m	a/b	(a+b)/2	0.04	L + T1 + T2 + (a+b)/2 + 0.04	1	±(a+b)/6
		10m < L ≤ 100m	+10%L/-0	0.56	0.04	L + T1 + T2 + 0.6	1	±0.2%L
			a/b	(a+b)/2	0.04	L + T1 + T2 + (a+b)/2 + 0.04	1	±(a+b)/6
		100m < L	+2%L/-0	1%L - 0.04	0.04	L + T1 + T2 + 1%L	1	±0.2%L
			+10%L/-0					
a/b	(a+b)/2	0.04	L + T1 + T2 + (a+b)/2 + 0.04	1	±(a+b)/6			
Single cord		L ≤ 10m	a/b	(a+b)/2	0.04	L + T1+ T2+ (a+b)/2 + 0.04	2	±(a+b)/6
			+10%L/-0	5%L	0.04	L + T1+ T2+ 5%L + 0.04	2	±1%L
		10m < L ≤ 50m	+1m/-0	0.56	0.04	L + T1+ T2+ 0.6	2	±0.2%L
			+10%L/-0					
		50m < L	+2%L/-0	1%L - 0.04	0.04	L + T1 + T2 + 1%L	2	±0.2%L
			+10%L/-0					

c) Heat shrinkable tube cutting length

Length and qty of heat shrinkable tube was cut base on spec require. Tolerance of heat tube cutting: +/-2mm

Shrinkable tube heating 120+/-5 degrees, 50 seconds

1.1.2 Branching

Product specification	Branching picture	Branching Length				
		Tolerance of T1, T2	Tolerance design Lt(mm)	Tolerance for ferrule assy Lf(mm)	Branching length Li $Li = Ti + Xi + Lt + Lf$	Tolerance of Li
		a/b	$(a+b)/2$	20	$Li = Ti + Xi + (a+b)/2 + 20mm$	$\pm 2mm$
		Heat shrinkable tube was heat at the middle of 2 single cord				

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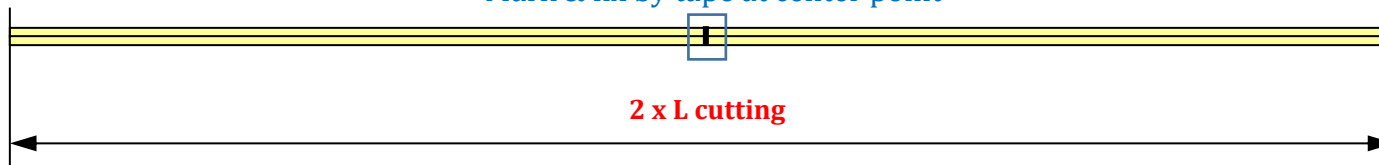
1.2 For Twin Pigtail product:**1.2.1 Cutting****a) Cutting items**

Cutting items for Twin Pigtail product:

No.	Items	Cutting requirement	Remark
1	Cable/Cord/Fiber	Yes	Refer below items for detail cutting length & qty
2	Tube	No	
3	Heat shrink tube	Base on product spec	
4	Mesh	No	

b) Cord cutting lengthNote: In case run 2set at the same time, center mark is applied if cutting by manual and product length over 2m

Mark & fix by tape at center point



Product specification			Tolerance design Lt (m)	Extra length for ferrule ass Lf (m)	Length for measure loss Llo (m)	Design length of L cutting 1 set		Design length of L cutting 2 set	
Product picture	Range of Length L	Spec Tolerance of L (m)				Cutting length (m) $L+T+Lt+Lf+Llo$	Tolerance of cutting (m)	Cutting length (m) $2*(L+T+Lt+Lf)$	Tolerance of cutting (m)
	$L \leq 10m$	a/b	$(a+b)/2$	0.02	0.1	$L + (a+b)/2 + 0.12$	$\pm(a+b)/6$	$2*(L + (a+b)/2 + 0.02)$	$\pm(a+b)/6$
	$10m < L \leq 100m$	+10%L/-0	0.58	0.02	0.1	$L + 0.7$	$\pm 0.2\%L$	$2*(L + 0.6)$	$\pm 0.2\%L$
		a/b	$(a+b)/2$	0.02	0.1	$L + (a+b)/2 + 0.12$	$\pm(a+b)/6$	$2*(L + (a+b)/2 + 0.02)$	$\pm(a+b)/6$
	$100m < L$	+2%L/-0	$1\%L-0.02$	0.02	0.1	$L + 1\%L + 0.1$	$\pm 0.2\%L$	$2*(L + 1\%L)$	$\pm 0.2\%L$
		+10%L/-0				$L + (a+b)/2 + 0.12$	$\pm(a+b)/6$	$2*(L + (a+b)/2 + 0.02)$	$\pm(a+b)/6$
	$L \leq 10m$	a/b	$(a+b)/2$	0.02	0.1	$L + T + (a+b)/2 + 0.12$	$\pm(a+b)/6$	$2*(L + T + (a+b)/2 + 0.02)$	$\pm(a+b)/6$
	$10m < L \leq 100m$	+10%L/-0	0.58	0.02	0.1	$L + T + 0.7$	$\pm 0.2\%L$	$2*(L + T + 0.6)$	$\pm 0.2\%L$
		a/b	$(a+b)/2$	0.02	0.1	$L + T + (a+b)/2 + 0.12$	$\pm(a+b)/6$	$2*(L + T + (a+b)/2 + 0.02)$	$\pm(a+b)/6$
	$100m < L$	+2%L/-0	$1\%L-0.02$	0.02	0.1	$L + T + 1\%L + 0.1$	$\pm 0.2\%L$	$2*(L + T + 1\%L)$	$\pm 0.2\%L$
		+10%L/-0				$L + T + (a+b)/2 + 0.12$	$\pm(a+b)/6$	$2*(L + T + (a+b)/2 + 0.02)$	$\pm(a+b)/6$
		a/b	$(a+b)/2$	0.02	0.1	$L + T + (a+b)/2 + 0.12$	$\pm(a+b)/6$	$2*(L + T + (a+b)/2 + 0.02)$	$\pm(a+b)/6$

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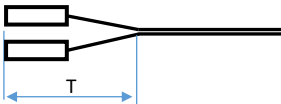
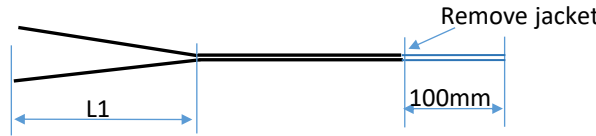

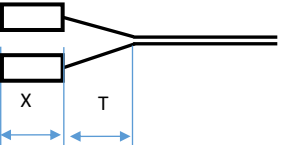
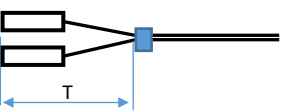
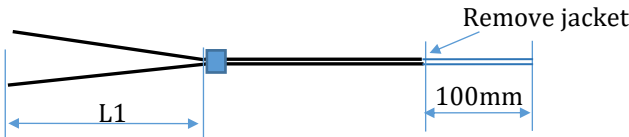
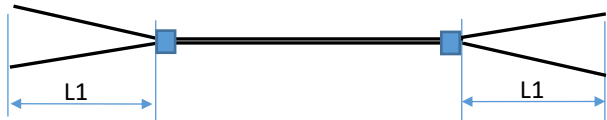
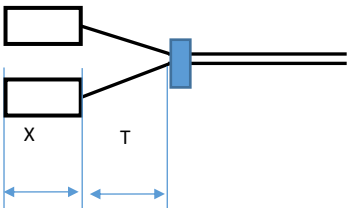
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c) Heat shrinkable tube cutting length

Length and qty of heat shrinkable tube was cut base on spec require. Tolerance of heat tube cutting: +/-2mm

Shrinkable tube heating 120+/-5 degrees, 50 seconds

1.2.2 Branching

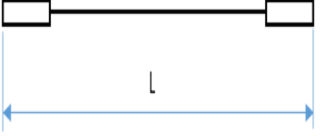
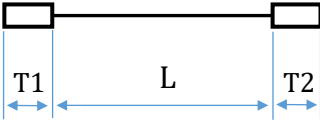
Product specification	Branching in case run 1 set/time					Branching in case run 2 set/time				
										
	Tolerance of T (mm)	Tolerance design Lt (mm)	Tolerance for ferrule assy Lf (mm)	Branching length L1 $L1=T+X+Lt+Lf$	Tolerance of L1 (mm)	Tolerance of T (mm)	Tolerance of design Lt (mm)	Tolerance for ferrule assy Lf (mm)	Branching length L1 $L1=T+X+Lt+Lf$	Tolerance of L1 (mm)
	+50/-0mm	30	20	$L1=T+X+50\text{mm}$	+/-5mm	+50/-0mm	30	20	$L1=T+X+50\text{mm}$	+/-5mm
	a/b	$(a+b)/2$	20	$L1=T+X+(a+b)/2+20\text{mm}$	+/-2mm	a/b	$(a+b)/2$	20	$L1=T+X+(a+b)/2+20\text{mm}$	+/-2mm
										
	Tolerance of T (mm)	Tolerance design Lt (mm)	Tolerance for ferrule assy Lf (mm)	Branching length L1 $L1=T+X+Lt+Lf$	Tolerance of L1 (mm)	Tolerance of T (mm)	Tolerance of design Lt (mm)	Tolerance for ferrule assy Lf (mm)	Branching length L1 $L1=T+X+Lt+Lf$	Tolerance of L1 (mm)
	+50/-0mm	30	20	$L1=T+X+50\text{mm}$	+/-5mm	+50/-0mm	30	20	$L1=T+X+50\text{mm}$	+/-5mm
	a/b	$(a+b)/2$	20	$L1=T+X+(a+b)/2+20\text{mm}$	+/-2mm	a/b	$(a+b)/2$	20	$L1=T+X+(a+b)/2+20\text{mm}$	+/-2mm

1.3 For Jumper product:**a) Cutting items**

Cutting items for Jumper product:

No.	Items	Cutting requirement	Remark
1	Cable/Cord/Fiber	Yes	Refer below items for detail cutting length & qty
2	Tube	Base on product spec & cord/fiber size	
3	Heat shrink tube	No	
4	Mesh	No	

b) Cord/Fiber cutting length

Product specification			Design cutting length			
Product picture	Range of Length L	Tolerance of L (m)	Tolerance design Lt (m)	Extra length for ferrule ass 2*Lf (m)	Cutting length (m) $L + Lt + 2Lf + T1 + T2$	Tolerance of cutting (m)
	$L \leq 10m$	a/b	$(a+b)/2$	0.04	$L + (a+b)/2 + 0.04$	$\pm(a+b)/6$
	$10m < L \leq 100m$	$+10\%L/-0$	0.56	0.04	$L + 0.6$	$\pm 0.2\%L$
		a/b	$(a+b)/2$	0.04	$L + (a+b)/2 + 0.04$	$\pm(a+b)/6$
	$100m < L$	$+2\%L/-0$	$1\%L - 0.04$	0.04	$L + 1\%L$	$\pm 0.2\%L$
		$+10\%L/-0$				
	$L \leq 10m$	a/b	$(a+b)/2$	0.04	$L + (a+b)/2 + 0.04 + T1 + T2$	$\pm(a+b)/6$
	$10m < L \leq 100m$	$+10\%L/-0$	0.56	0.04	$L + 0.6 + T1 + T2$	$\pm 0.2\%L$
		a/b	$(a+b)/2$	0.04	$L + (a+b)/2 + 0.04 + T1 + T2$	$\pm(a+b)/6$
	$100m < L$	$+2\%L/-0$	$1\%L - 0.04$	0.04	$L + 1\%L + T1 + T2$	$\pm 0.2\%L$
		$+10\%L/-0$				
		a/b	$(a+b)/2$	0.04	$L + (a+b)/2 + 0.04 + T1 + T2$	$\pm(a+b)/6$

c) Tube cutting length

Tube was cut to make product as below table:

Cord/fiber type		Cutting requirement	Remark
Cord	1.5mm Cord	Yes	Refer below items for detail cutting length
	Cord with fiber 0.2 or 0.25mm inside	Yes	
	Cord with fiber 0.5 or 0.9mm inside	No	
Fiber	Fiber 0.2 or 0.25mm	Yes	
	Fiber 0.5 or 0.9mm	No	

***) Cutting nylon tube for 1.5mm cord product**

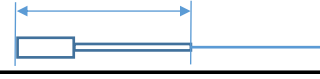
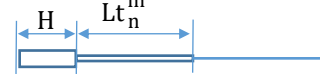
Nylon tube size D0.4x0.7mm. The cutting length base on connector type as below:

Connector type	Tube cutting length	Tolerance of cutting
SC	25mm	$\pm 2mm$
LC	29mm	$\pm 2mm$
MU	23mm	$\pm 2mm$

***) Cutting tube for cord product with fiber 0.2 or 0.25mm**

Connector type	Tube cutting length	Tolerance of cutting
SC	25mm	$\pm 2mm$
SC shutter	35mm	$\pm 2mm$
LC duplex Uniboot	31mm	$\pm 2mm$
LC	29mm	$\pm 2mm$
MU	23mm	$\pm 2mm$

***) Cutting tube for 0.2 or 0.25mm fiber product**

Product specification	Connector type	Tolerance design Lt (mm)	Length from endface to tube	Tube cutting length (mm)	Tolerance of cutting
	For LC, MU connector	$(m+n)/2$	8	$Lt - 8 + (m+n)/2$	$\pm 2mm$
	Other connector	$(m+n)/2$	12	$Lt - 12 + (m+n)/2$	$\pm 2mm$
	For LC, MU connector	$(m+n)/2$	8	$Lt + H - 8 + (m+n)/2$	$\pm 2mm$
	Other connector	$(m+n)/2$	12	$Lt + H - 12 + (m+n)/2$	$\pm 2mm$

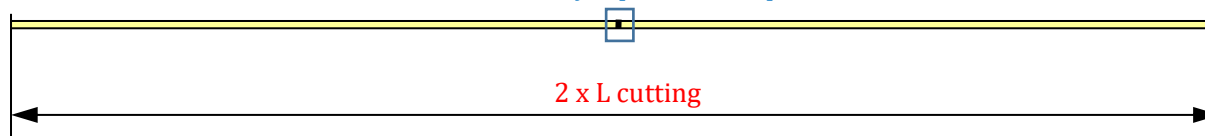
1.4 For Pigtail product:**a) Cutting items**

Cutting items for Pigtail product:

No.	Items	Cutting requirement	Remark
1	Cable/Cord/Fiber	Yes	Refer below items for detail cutting length & qty
2	Tube	Base on product spec & cord/fiber size	
3	Heat shrink tube	No	
4	Mesh	No	

b) Cord/Fiber cutting lengthNote: In case run 2set at the same time, center mark is applied if cutting by manual and product length over 2m

Mark & fix by tape at center point



Product specification			Tolerance design Lt (m)	Extra length for ferrule ass Lf (m)	Length for measure loss Llo (m)	Design length of L cutting 1 set		Design length of L cutting 2 set	
Product picture	Range of Length L	Spec Tolerance of L (m)				Cutting length (m) L+T+Lt+Lf+Llo	Tolerance of cutting (m)	Cutting length (m) 2*(L+T+Lt+Lf)	Tolerance of cutting (m)
	$L \leq 10m$	a/b	$(a+b)/2$	0.02	0.1	$L + (a+b)/2 + 0.12$	$\pm(a+b)/6$	$2*(L + (a+b)/2 + 0.02)$	$\pm(a+b)/6$
	$10m < L \leq 100m$	+10%L/-0	0.58	0.02	0.1	$L + 0.7$	$\pm 0.2\%L$	$2*(L + 0.6)$	$\pm 0.2\%L$
		a/b	$(a+b)/2$	0.02	0.1	$L + (a+b)/2 + 0.12$	$\pm(a+b)/6$	$2*(L + (a+b)/2 + 0.02)$	$\pm(a+b)/6$
	$100m < L$	+2%L/-0	1%L-0.02	0.02	0.1	$L + 1\%L + 0.1$	$\pm 0.2\%L$	$2*(L + 1\%L)$	$\pm 0.2\%L$
		+10%L/-0							
	$L \leq 10m$	a/b	$(a+b)/2$	0.02	0.1	$L + T + (a+b)/2 + 0.12$	$\pm(a+b)/6$	$2*(L + T + (a+b)/2 + 0.02)$	$\pm(a+b)/6$
	$10m < L \leq 100m$	+10%L/-0	0.58	0.02	0.1	$L + T + 0.7$	$\pm 0.2\%L$	$2*(L + T + 0.6)$	$\pm 0.2\%L$
		a/b	$(a+b)/2$	0.02	0.1	$L + T + (a+b)/2 + 0.12$	$\pm(a+b)/6$	$2*(L + T + (a+b)/2 + 0.02)$	$\pm(a+b)/6$
	$100m < L$	+2%L/-0	1%L-0.02	0.02	0.1	$L + T + 1\%L + 0.1$	$\pm 0.2\%L$	$2*(L + T + 1\%L)$	$\pm 0.2\%L$
		+10%L/-0							
		a/b	$(a+b)/2$	0.02	0.1	$L + T + (a+b)/2 + 0.12$	$\pm(a+b)/6$	$2*(L + T + (a+b)/2 + 0.02)$	$\pm(a+b)/6$

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c) Tube cutting length

Tube was cut to make product as below table:

Cord/fiber type		Cutting requirement	Remark
Cord	1.5mm Cord	Yes	Refer below items for detail cutting length
	Cord with fiber 0.2 or 0.25mm inside	Yes	
	Cord with fiber 0.5 or 0.9mm inside	No	
	Fiber 0.5 or 0.9mm	No	

***) Cutting nylon tube for 1.5mm cord product**

Nylon tube size D0.4x0.7mm. The cutting length base on connector type as below:


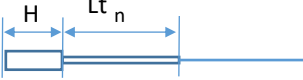
Connector type	Tube cutting length	Tolerance of cutting
SC	25mm	+/-2mm
LC	29mm	+/-2mm
MU	23mm	+/-2mm

***) Cutting tube for cord product with fiber 0.2 or 0.25mm**

Nylon tube size D0.4x0.7mm. The cutting length base on connector type as below:

Connector type	Tube cutting length	Tolerance of cutting
SC	25mm	+/-2mm
SC	13mm	+/-2mm
SC shutter	35mm	+/-2mm
LC duplex Uniboot	31mm	+/-2mm
LC	29mm	+/-2mm
MU	23mm	+/-2mm

***) Cutting tube for 0.2 or 0.25mm fiber product**

Product specification	Connector type	Tolerance design Lt (mm)	Length from endface to tube (mm)	Tube cutting length (mm)	Tolerance of cutting
	For LC, MU connector	$(m+n)/2$	8	$Lt - 8 + (m+n)/2$	+/-2mm
	Other connector	$(m+n)/2$	12	$Lt - 12 + (m+n)/2$	+/-2mm
	For LC, MU connector	$(m+n)/2$	8	$Lt + H - 8 + (m+n)/2$	+/-2mm
	Other connector	$(m+n)/2$	12	$Lt + H - 12 + (m+n)/2$	+/-2mm

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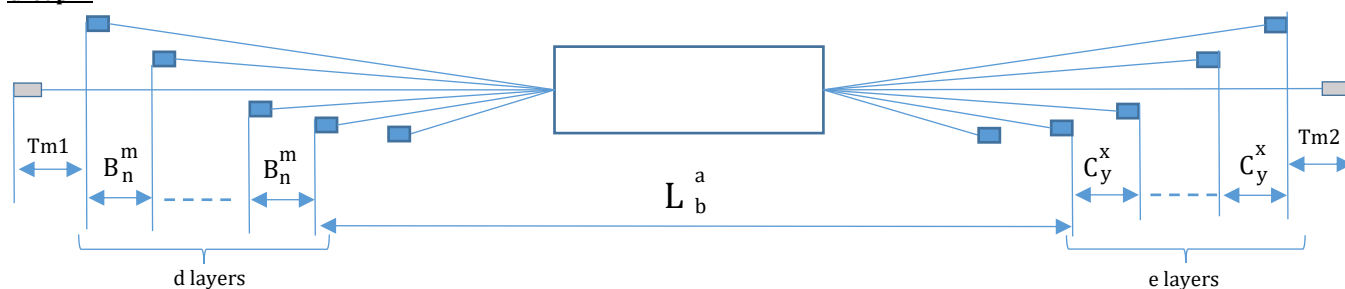
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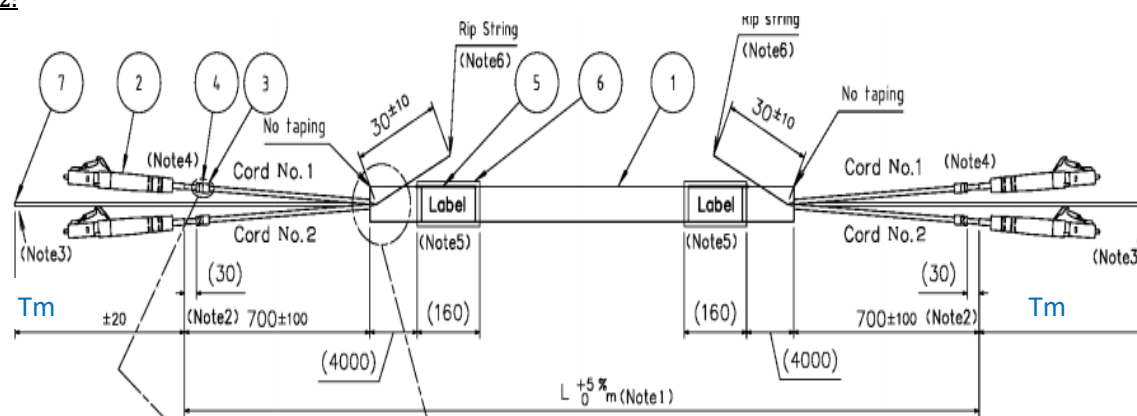
b) Cutting length for cable 2 side:

Group 1:



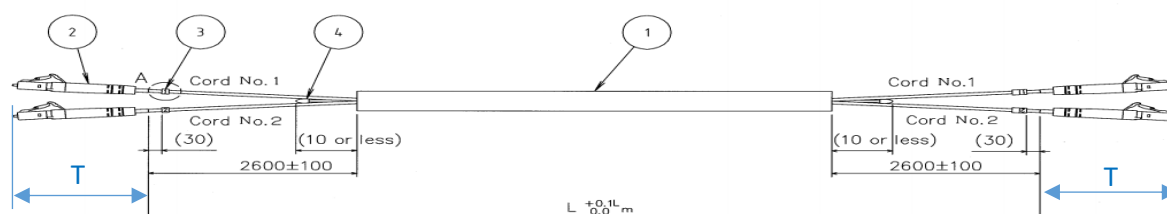
Product specification		Design length of L cutting		
Range of Length L	Tolerance of L (m)	Tolerance design for L (Lt)	Cutting length (m)	Tolerance of cutting (m)
$L \leq 1m$	$10\%L/-0$	$8\%L$	$L + Lt + [B + (m+n)/2] * d + [C + (x+y)/2] * e + Tm1 + Tm2$ <u>Note:</u> If $Tmi < 20mm$, L cutting will be calculated with $Tmi = 20mm$	$\pm 0.2\%L$
	a/b	$(a+b)/2$		$\pm (a+b)/6$
$1m < L \leq 10m$	a/b	$(a+b)/2$		$\pm (a+b)/6$
$10m < L \leq 50m$	$+1m/-0$	0.5m		$\pm 0.2m$
	a/b	$(a+b)/2$		$\pm (a+b)/6$
$L > 50m$	$2\%L/-0$	$1\%L$		$\pm 0.2\%L$
	a/b	$(a+b)/2$		$\pm (a+b)/6$

Group 2:



Product specification		Design cutting length	
Range of Length L	Tolerance of L (m)	Cutting length (m)	Tolerance of cutting (m)
$L \leq 50m$	$+5\%L / -0$	$L + 300mm + 2Tm$	$\pm 200mm$
$L > 50m$		$L + 1\%L + 2Tm$	$\pm 0.2\%L$

Group 3:



Product specification		Design cutting length	
Range of Length L	Tolerance of L (m)	Cutting length (m)	Tolerance of cutting (m)
$L \leq 10m$	$+10\%L / -0$	$L + 300mm + 2T + 40mm$	$\pm 200mm$
$10m < L \leq 50m$		$L + 500mm + 2T + 40mm$	$\pm 500mm$
$L > 50m$		$L + 1\%L + 2T + 40mm$	$\pm 0.2\%L$

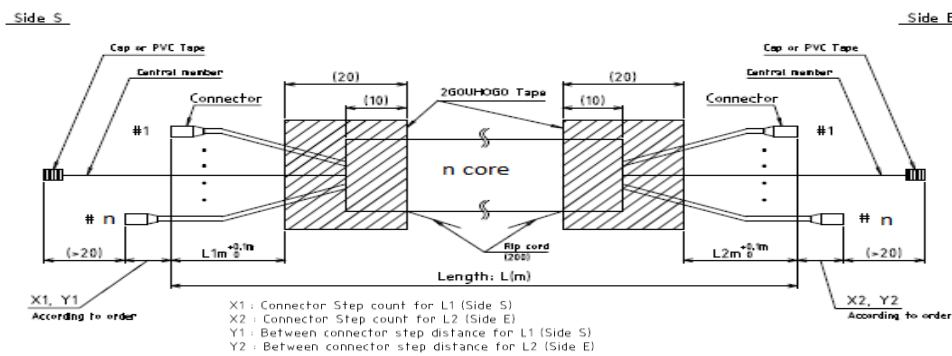
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Group 4:



Product specification		Design length of L cutting		
Range of Length L	Tolerance of L (m)	Tolerance design for L (Lt)	Cutting length (m)	Tolerance of cutting (m)
$L \leq 1m$	$10\%L/-0$	$8\%L$	$L + Lt + (X1-1)*Y1 - 0.5Y1 + (X2-1)*Y2 - 0.5Y2$	$\pm 0.2\%L$
	a/b	$(a+b)/2$		$\pm(a+b)/6$
$1m < L \leq 10m$	a/b	$(a+b)/2$		$\pm(a+b)/6$
	$+1m/-0$	0.5m		$\pm 0.2m$
$10m < L \leq 50m$	a/b	$(a+b)/2$		$\pm(a+b)/6$
	$2\%L/-0$	$1\%L$		$\pm 0.2\%L$
$L > 50m$	a/b	$(a+b)/2$		$\pm(a+b)/6$

1.5.1.3 Cutting nylon tube for cord 1.5mm

Nylon tube size D0.4x0.7mm. The cutting length base on connector type as below:

Connector type	Tube cutting length	Tolerance of cutting
SC	25mm	$\pm 2mm$
LC	29mm	$\pm 2mm$
MU	23mm	$\pm 2mm$

1.5.2 Mark strip

Product specification	Length of mark strip
	<p> $Tmi - 20mm$ $Li + r + Br * e + Tmi - 20mm$ if $Tmi > 0mm$ $Li + r + Br * e$ if $Tmi < 0mm$ </p>
	<p> $Tmi - T - 20mm$ $Li + r + T$ </p>
	<p> Tmi $Li + r + T$ </p>
	<p> $L1 * 1000 + 50 + 10 \pm 2mm$ $(L1 + (Xi-1)*Y) * 1000 + 10 \pm 2mm$ if $Y = 100mm$ $(L1 + (Xi-1)*Y) * 1000 + 35 \pm 2mm$ if $Y = 50mm$ </p>

1.5.3 Rip cord treatment for cable product with Rip cord: refer PNJHG-0003-25-01A

- Pulling rip cord over mark point L1/L2 about 5mm as figure C-1
- Cut rip cord length 210mm \pm 5mm as figure C-2

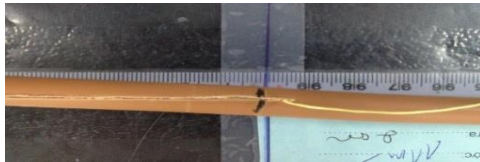


Figure C-1



Figure C-2

- Wind and cover rip cord by wrapping film as figure C-3
- In case product packing with S type, rip cord will keep in nylon bag as figure C-4. Nylon bag will be removed before packing



Figure C-3

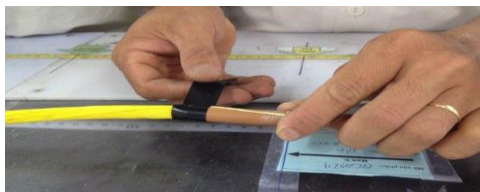


Figure C-4

- Remove cable sheath and cut paper sheath as figure C-5



- Fix 2GOUHOGO tape as figure C-6 if purchase spec require

**Note:**

Don't remove rip cord from the slit 5mm of cable sheath

The purpose of arrange rip cord Figure C-7 and Figure C-8 to prevent a problem like Figure C-9.

Do NOT entangle the rip cord with optical fiber

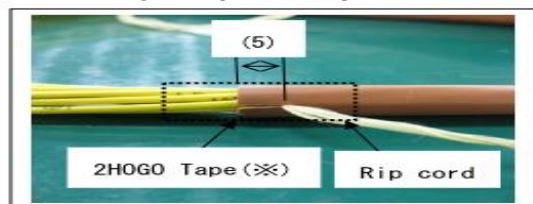


Figure C-7

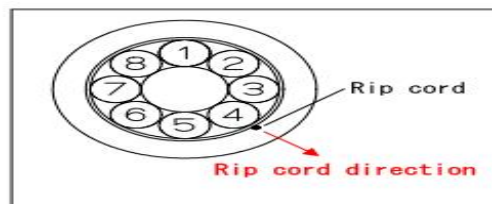
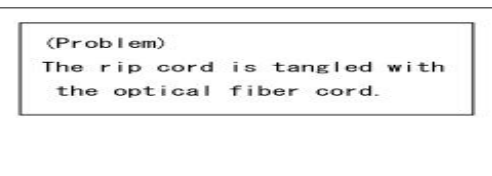


Figure C-8



Figure C-9

**1.5.4 Instructs notch treatment for Connector Optical Fiber Flat Cable Product**

Split the notch at approximately 10mm as Fig-1.

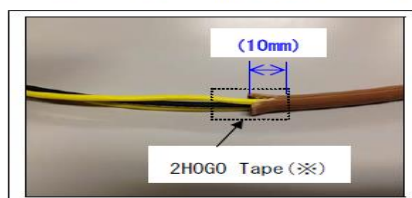


Fig-1

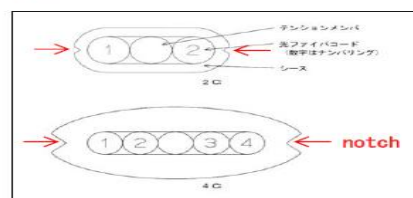


Fig-2

(※)2HOGO Tape is fixed if 2HOGO Tape is required in each purchase spec.
(If a purchase spec says "No taping", 2HOGO Tape is unnecessary.)

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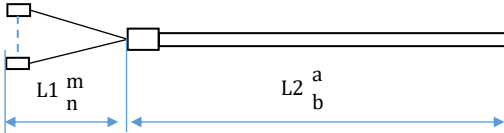
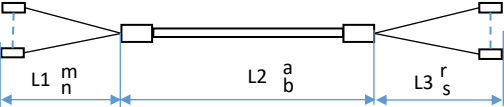
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1.6 For Fanout product:**1.6.1 Cutting****a) Cutting items**

Cutting items for Fanout product:

No.	Items	Cutting requirement	Remark
1	Cable/Cord/Fiber	Yes	Refer below items for detail cutting length & qty
2	Tube	Base on product spec & cord/fiber size	
3	Heat shrink tube	Base on product spec	
4	Mesh	No	

b) Cable/Cord/Fiber cutting length

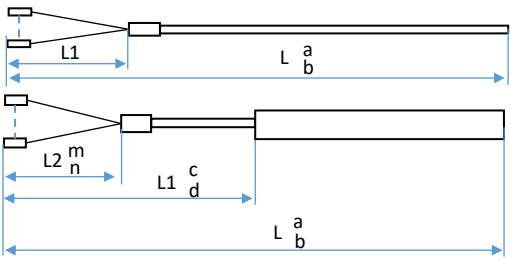
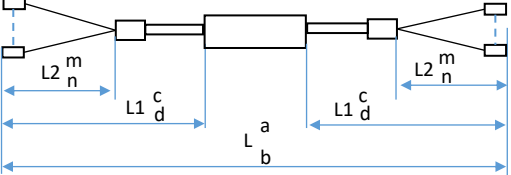
Product specification			Tolerance design Lt (m)	Extra length for ferrule ass Lf (m)	Length for branching Lb (m)	Length for measure loss Llo (m)	Design length of L cutting	
Product picture	Range of Length L2	Spec Tolerance of L2 (m)					Cutting length (m) $L1+L2+L3+(m+n)/2+(r+s)/2+Lt+Lf+Lb+Ll$	
	L2 ≤ 1m	+10%L2/-0	8%L2	0.02	0.03	0.1	$L1+L2+(m+n)/2+8\%L2+0.15$	±0.2%L
		a/b	(a+b)/2	0.02	0.03	0.1	$L1+L2+(m+n)/2+(a+b)/2+0.15$	±(a+b)/6
	1m < L2 ≤ 10m	+10%L2/-0	5%L2	0.02	0.03	0.1	$L1+L2+(m+n)/2+5\%L2+0.15$	±0.2%L
		a/b	(a+b)/2	0.02	0.03	0.1	$L1+L2+(m+n)/2+(a+b)/2+0.15$	±(a+b)/6
	10m < L2 ≤ 50m	+10%L2/-0	0.6	0.02	0.03	0.1	$L1+L2+(m+n)/2+0.75$	±0.2%L
		a/b	(a+b)/2	0.02	0.03	0.1	$L1+L2+(m+n)/2+(a+b)/2+0.15$	±(a+b)/6
	50m < L2	+10%L2/-0	1%L2	0.02	0.03	0.1	$L1+L2+(m+n)/2+1\%L2+0.15$	±0.2%L
		+2%L2/-0						
	L2 ≤ 1m	+10%L2/-0	8%L2	0.04	0.06	0.1	$L1+L2+L3+(m+n)/2+(r+s)/2+8\%L2+0.2$	±0.2%L
		a/b	(a+b)/2	0.04	0.06	0.1	$L1+L2+L3+(m+n)/2+(r+s)/2+(a+b)/2+0.2$	±(a+b)/6
	1m < L2 ≤ 10m	+10%L2/-0	5%L2	0.04	0.06	0.1	$L1+L2+L3+(m+n)/2+(r+s)/2+5\%L2+0.2$	±0.2%L
		a/b	(a+b)/2	0.04	0.06	0.1	$L1+L2+L3+(m+n)/2+(r+s)/2+(a+b)/2+0.2$	±(a+b)/6
	10m < L2 ≤ 50m	+10%L2/-0	0.6	0.04	0.06	0.1	$L1+L2+L3+(m+n)/2+(r+s)/2+0.8$	±0.2%L
		a/b	(a+b)/2	0.04	0.06	0.1	$L1+L2+L3+(m+n)/2+(r+s)/2+(a+b)/2+0.2$	±(a+b)/6
	50m < L2	+10%L2/-0	1%L2	0.04	0.06	0.1	$L1+L2+L3+(m+n)/2+(r+s)/2+1\%L2+0.2$	±0.2%L
		+2%L2/-0						
		a/b	(a+b)/2	0.04	0.06	0.1	$L1+L2+L3+(m+n)/2+(r+s)/2+(a+b)/2+0.2$	±(a+b)/6

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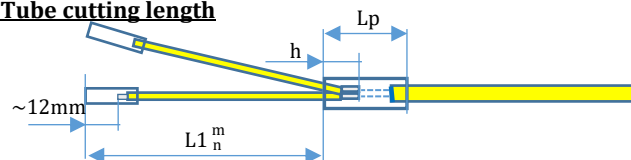
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Product specification			Tolerance design Lt (m)	Length for ferrule assy Lf (m)	Length for branching Lb (m)	Length for measure loss Llo (m)	Design length of L cutting	
Product picture	Range of Length L	Spec Tolerance of L (m)					Cutting length (m) $L+Lt+Lf+Lb+Llo$	Tolerance of cutting (m)
	$L \leq 10m$	$+10\%L/-0$	$5\%L$	0.02	0.03	0.1	$L+5\%L+0.15$	$\pm 0.2\%L$
		a/b	$(a+b)/2$	0.02	0.03	0.1	$L+(a+b)/2+0.15$	$\pm (a+b)/6$
	$50m < L$	a/b	$(a+b)/2$	0.02	0.03	0.1	$L+(a+b)/2+0.15$	$\pm (a+b)/6$
		$+10\%L/-0$	$1\%L$	0.02	0.03	0.1	$L+1\%L+0.15$	$\pm 0.2\%L$
		$+2\%L/-1$						
		a/b						
	$L \leq 10m$	$+10\%L/-0$	$5\%L$	0.04	0.06	0.1	$L+5\%L+0.2$	$\pm 0.2\%L$
		a/b	$(a+b)/2$	0.04	0.06	0.1	$L+(a+b)/2+0.2$	$\pm (a+b)/6$
	$10m < L \leq 50m$	$+10\%L/-0$	0.6	0.04	0.06	0.1	L+0.8	$\pm 0.2\%L$
		a/b	$(a+b)/2$	0.04	0.06	0.1	$L+(a+b)/2+0.2$	$\pm (a+b)/6$
	$50m < L$	$+10\%L/-0$	$1\%L$	0.04	0.06	0.1	$L+1\%L+0.2$	$\pm 0.2\%L$
		$+2\%L/-1$						
		a/b	$(a+b)/2$	0.04	0.06	0.1	$L+(a+b)/2+0.2$	$\pm (a+b)/6$

c) Tube cutting length



Length of furcation tube at cutting:

$$L_{\text{tube}} = L1 + (m+n)/2 + rw - 12\text{mm} + h + k + g$$








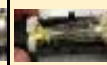
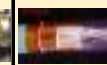
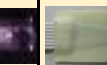
Note:

h is the length of tube inside branching pipe

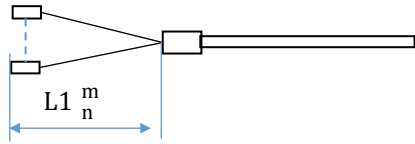
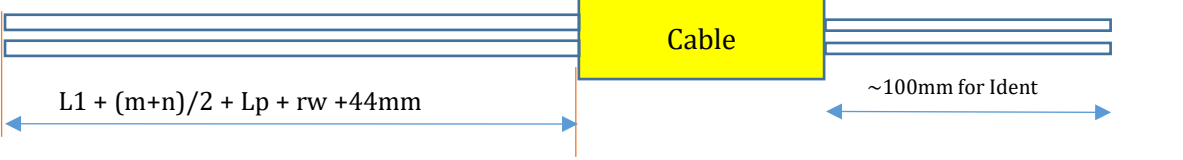

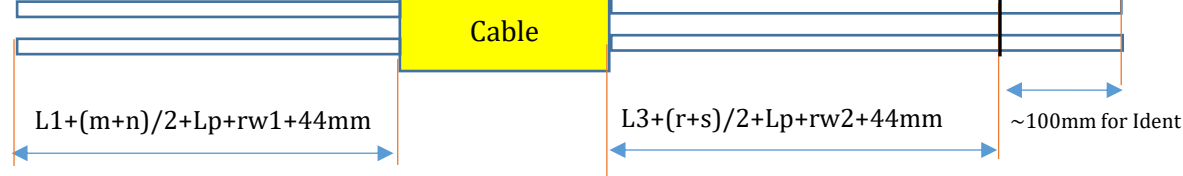
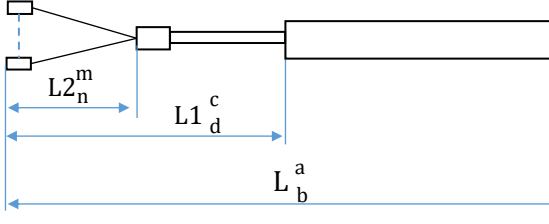

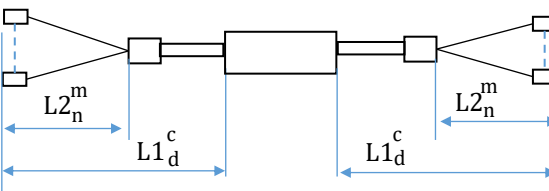
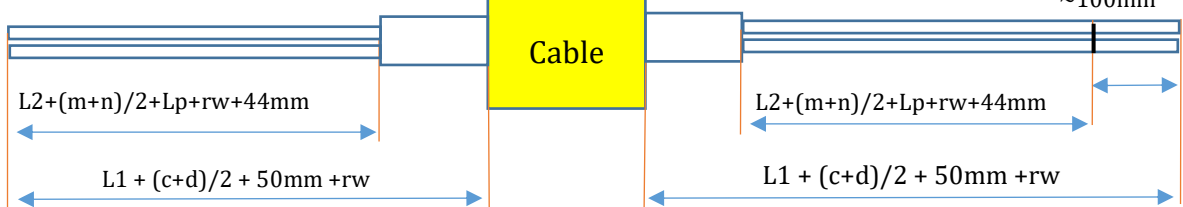
k is the length of tube that shrinks when aging

g is the length of tube that is removed when preparing the tube

rw is the extra length for rework if needed

Branching pipe	2 or 4FO	8FO	12FO		SUS pipe	SST	BO 15	BO 22	Clear tube	Clear tube
										
Lp (mm)	40	48	70	50	30	42	60	65	70	25
h (mm)	20	25	32	22	10	10	10	10	30	6
g (mm)	0	0	0	0	5	25	25	25	0	0

1.6.2 Mark strip**a) Fan out cord**

Spec	Length of mark strip
	
	
	
	

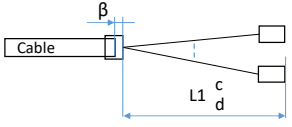
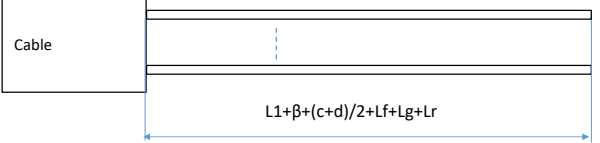
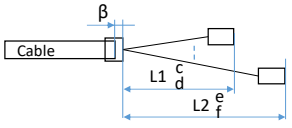
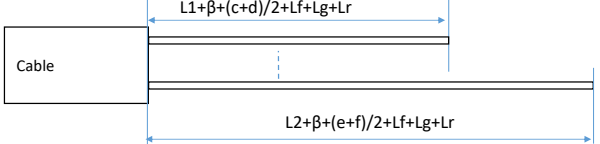
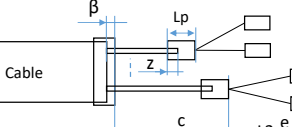
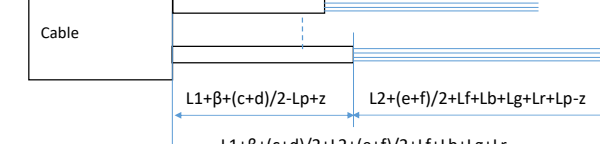
1.7 For MPO product:**1.7.1 Cutting**

Cable/Cord/Fiber cutting length for MPO product:

Product specification**Design cutting length**

				Target of product length (LT) LT=L+L1+L2			Extra length for side start (LEX1) LEX1=Lf+Lb+Lg+Llo+Lr					Extra length for side end (LEX2) LEX2=Lf+Lb+Lg+Llo+Lr					Cutting length (m)		
Group	Product picture	Range of Length L	Tolerance of L (m)	L	L1	L2	Lf	Lb	Lg	Llo	Lr	Lf	Lb	Lg	Llo	Lr	L cutting	Tolerance of cutting	Qty/set
Product has 2 side		L ≤ 10m	a/b	L+(a+b)/2	0	0	Lf1	Lb1	Lg1	0	n*Rw1	Lf2	Lb2	Lg2	0	n*Rw2	LT+LEX1+LEX2	±(a+b)/6	Cutting qty/set base on product spec
		10m < L ≤ 50m	+10%L/-0	L+0.5														±0.2%L	
			a/b	L+(a+b)/2														±(a+b)/6	
		50m < L ≤ 100m	+10%L/-0	L+1														±0.2%L	
			a/b	L+(a+b)/2														±(a+b)/6	
		100m < L	+2%L/-0	L+1%L														±0.2%L	
			+10%L/-0	L+1%L														±0.2%L	
			a/b	L+(a+b)/2														±(a+b)/6	
		L ≤ 10m	a/b	L+(a+b)/2	L1+(c+d)/2	L2+(e+f)/2	Lf1	Lb1	Lg1	0	n*Rw1	Lf2	Lb2	Lg2	0	n*Rw2	LT+LEX1+LEX2	±(a+b)/6	Cutting qty/set base on product spec
		10m < L ≤ 50m	+10%L/-0	L+0.5														±0.2%L	
			a/b	L+(a+b)/2														±(a+b)/6	
		50m < L ≤ 100m	+10%L/-0	L+1														±0.2%L	
			a/b	L+(a+b)/2														±(a+b)/6	
		100m < L	+2%L/-0	L+1%L														±0.2%L	
			+10%L/-0	L+1%L														±0.2%L	
			a/b	L+(a+b)/2														±(a+b)/6	
Product has 1 side		L ≤ 10m	a/b	L+(a+b)/2	0	0	Lf1	Lb1	Lg1	Llo1	n*Rw1	0	0	0	0	0	LT+LEX1+LEX2	±(a+b)/6	Cutting qty/set base on product spec
		10m < L ≤ 50m	+10%L/-0	L+0.5														±0.2%L	
			a/b	L+(a+b)/2														±(a+b)/6	
		50m < L ≤ 100m	+10%L/-0	L+1														±0.2%L	
			a/b	L+(a+b)/2														±(a+b)/6	
		100m < L	+2%L/-0	L+1%L														±0.2%L	
			+10%L/-0	L+1%L														±0.2%L	
			a/b	L+(a+b)/2														±(a+b)/6	
		L ≤ 10m	a/b	L+(a+b)/2	L1+(c+d)/2	0	Lf1	Lb1	Lg1	Llo1	n*Rw1	0	0	0	0	0	LT+LEX1+LEX2	±(a+b)/6	Cutting qty/set base on product spec
		10m < L ≤ 50m	+10%L/-0	L+0.5														±0.2%L	
			a/b	L+(a+b)/2														±(a+b)/6	
		50m < L ≤ 100m	+10%L/-0	L+1														±0.2%L	
			a/b	L+(a+b)/2														±(a+b)/6	
		100m < L	+2%L/-0	L+1%L														±0.2%L	
			+10%L/-0	L+1%L														±0.2%L	
			a/b	L+(a+b)/2														±0.2%L	

1.7.2 Mark strip**a) Mark strip for Trunk cable**

Spec	Length of mark strip
	 $L1 + \beta + (c+d)/2 + Lf + Lg + Lr$
	 $L1 + \beta + (c+d)/2 + Lf + Lg + Lr$
	 $L1 + \beta + (c+d)/2 + Lf + Lg + Lr$

b) Mark strip for Fanout product

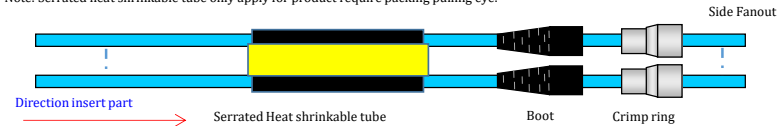
- For Fanout AFL product:

+ Refer letter direction on cable/cord to identify start side S and end side E



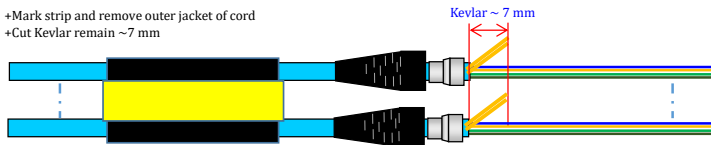
+Insert Boot, crimp ring and Serrated Heat shrinkable tube on cord at Fanout side

Note: Serrated heat shrinkable tube only apply for product require packing pulling eye.



+Mark strip and remove outer jacket of cord

+Cut Kevlar remain ~7 mm

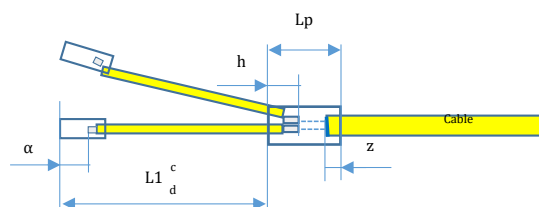


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1.8 Tube cutting:**a) Furcation tube for Fanout product:**

L_p is the length of branching pipe
 h is the length of tube inside branching pipe
 z is the length of cable inside branching pipe

k is the length of tube was shrink when aging

g is the length of tube was remove when branching

Branching pipe	2 or 4FO	8FO	12FO				SUS pipe	SST	BO 15	BO 22	Clear tube	Clear tube
L_p (mm)	40	48	70	90	50	60	30	42	60	65	60	25
h (mm)	20	25	33	43	22	32	10	10	10	10	25	6
z (mm)	4	4	12	22	10	15	5	0	10	10	20	5
g (mm)	0	0	0	0	0	0	5	25	25	25	0	0

Length of furcation tube at cutting: **$L_{\text{tube}} = L_1 + (c+d)/2 + L_r - \alpha + h + k + g$**

Note:

α is the distance from ferrule endface to furcation tube end

Ferrule type	LC,MU	SC	LCR
α (mm)	8	12	38

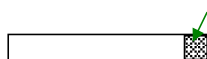
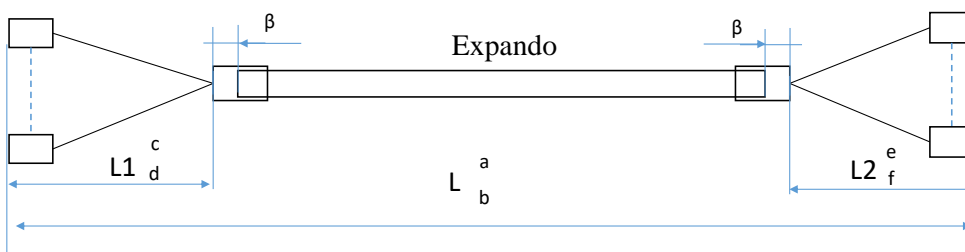
The length of tube was shrink when aging

k (mm)	Length of tube			
	$L_1 \leq 1m$	$1m < L_1 \leq 2m$	$2m < L_1 \leq 3m$	$3m < L_1$
FJK furcation tube	0	5	10	15
Other tube	5	10	20	30

b) Cutting tube for 0.2 or 0.25mm fiber product

Product specification	Tube cutting length (mm)
	$X + (m+n)/2 - \alpha$
	$X + (m+n)/2 + H - \alpha$

Apply abrasion tube 0.9/0.6 mm before Part insertion
 abrasion 3 ~ 5 mm for ferrule assembly

**c) Expando cutting:**

Cutting length of Expando: **$L_{\text{cutting expando}} = (L + (a+b)/2 - L_1 - (c+d)/2 - L_2 - (e+f)/2 - 2\beta) * \lambda$**

Note:

λ is the shrinkable of expando when insert cable inside expando. Normal: $\lambda = 1.06 \sim 1.10$

d) Heat shrinkable tube:

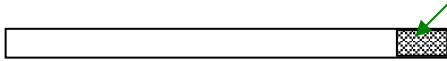
Heat shrinkable tube cutting length = L tube as spec require + Length will shorten after heat

Qty of cutting base on spec require

1.9 Aging cord/tube, abrasion tube:

Apply abrasion tube 0.9/0.6 mm before Part insertion

abrasion 3 ~ 5 mm for ferrule assembly



Aging condition for cord/tube is setting as below:

Spec type	Items	Aging condition	Note
Spec mention aging condition	Cord/tube	Follow spec requirement	Can aging 1m for both end of cord if it's long length
Spec don't mention aging condition	Cord	No aging	
	Tube (hytel/nylon)	Aging 70 degrees, 20hours	

Note: Tube 0.9/0.6 mm has short length $L \leq 30\text{mm}$, no need aging

Before using, cord/tube must be keep at room temp about 30 minutes after get it from chamber

1.10 Winding cable/cord into bobbin:

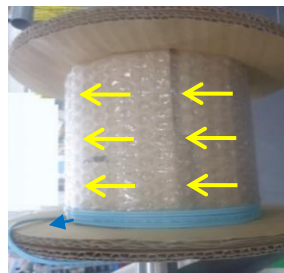
- Direction of winding cable as below picture
- The letter on cord or cable is outward-facing
- Cord or cable was wind layer by layer and no twist, easy to re-winding.

**a) Paper bobbin**

- Apply air bubble on paper bobbin to protect cord. Air bubble plane facing outwards
- Cord end was fix with bobbin by tape
- Winding direction like picture.



Apply air bubble to protect cord



The starting point is near the operator



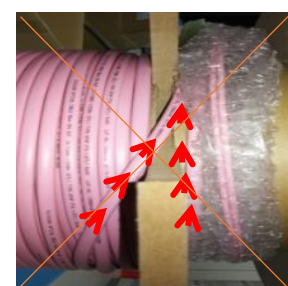
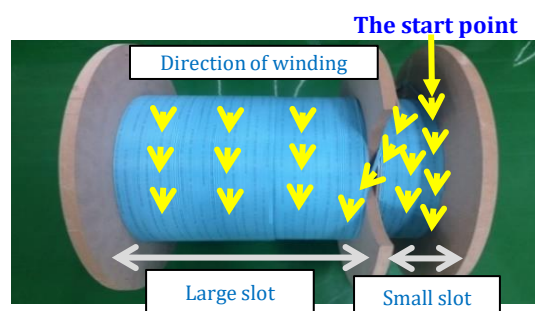
Cord end was fix by tape

b) Wooden bobbin

- The small slot of bobbin is near the operator
- Cable or cord was wind from small slot to large slot
- Small slot must wind cable only 1 layer



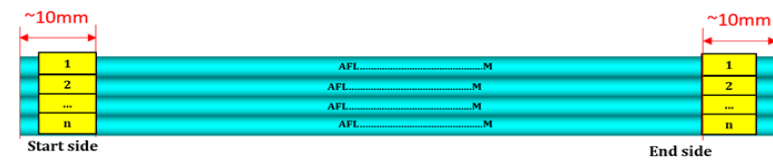
Small slot is near operator



Wrong direction

1.11 Expando Assembly:**For AFL-MPO**

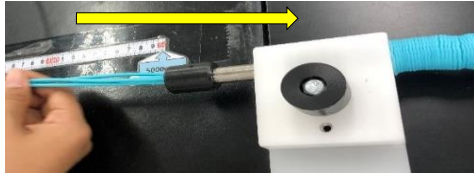
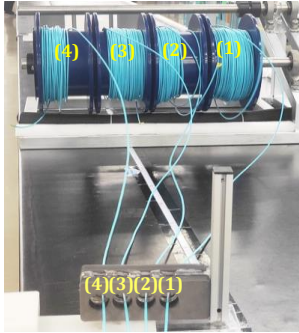
- Use tape with number to identify the cord number.



- Insert expandable tube into metal tube



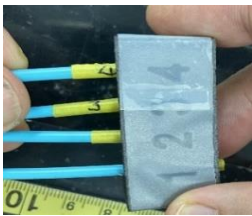
- Insert cord into expandable flexible tube.



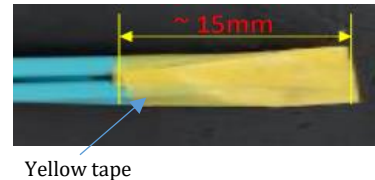
- Insert heat shrinkable tube for each side of cord (1pc for packing & 1pc cover expandable tube). Color of tube follow product spec



- Insert cord into clamp to identify cord number.
The number on tape is same with number on clamp

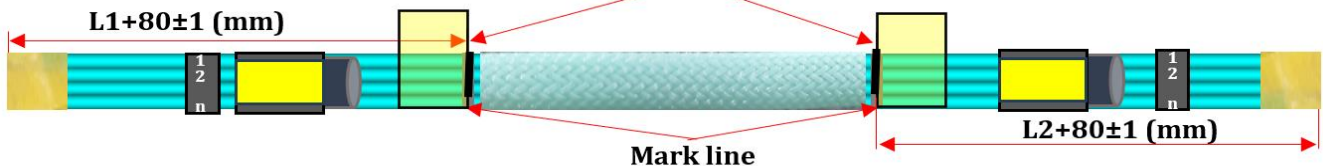


- Stripping the cord ~ 10mm & fix fiber by yellow tape.



- Marking and use tape to fix the Expandable flexible tubing & the cord at Marking point:

Fix the tape on cord



Note: L1 & L2 refer to product specification.

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1.12 Cutting of packing materials:



Packing materials are cutting follow as table below:

Specification (* indicated the latest version)	Material	Length (mm)	Tolerance	Q'ty
HS-B-2304-0028-*	Sholex	380	2	2
HS-B-2304-0029-*	Heatshrink tube ½’’	75	2	2
HS-B-2304-0037-*				
HS-B-2304-0100-*	Heatshrink tube ¾’’	100	10	2
HS-B-2304-0099-*	Mesh tube	Branching length max + 250mm	5	2
HS-B-2304-0035-*	Pull rope	Branching length max + 1050mm	5	2
HS-B-2304-0033-*	Heatshrink tube ½’’	75	2	1
	Heatshrink tube ¾’’	100	10	1
	Sholex	380	2	1
	Mesh tube	Branching len Branching length max + 250mm	5	1
	Pull rope	Branching len Branching length max + 1050mm	5	1
HS-B-2304-0031-*	Heatshrink tube ½’’	75	2	2
	Heatshrink tube ¾’’	100	10	2
	Mesh tube	Branching length max + 250mm	5	2
	Pull rope	Branching length max + 1050mm	5	2


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2. Process condition

Items	Condition
Cutting cable, cord, tube, shrinkable tube, Expando 	Use cutting machine / jig /ruler to cut (prefer cutting by machine) Use jig control qty of scotch tape when cutting by ruler and for long length product
Measure lengths at cutting	Use ruler to measure length: -check 3 pcs when machine stop or re-start -check the first product when cut by jig or manual
Winding jig	Surface of jig must be smooth and clean. Size of jig is suitable with diameter of coil in product spec
Sheath removal method	-Tear the cable sheath with the Kevlar string -Cut at circle of outer sheath at stripping point then Remove it -Rip cord length base on spec
Tension member	-Use nippers for cutting -Cover Tension member by cap or black PVC 20mm tape or silicon tube
Outer jacket removing	Use outer stripping tool
Tube grinding	Use manual grinding tool or grinding machine
Mark pen	Maker pen must be clear for visual and dry quickly Marking size: 0.5 ~ 1 mm.
Cutting Kevlar	Use Kevlar cutter
Appearance	Visual check of the first product after branching
Attach label to indicate product	Contents of label is based on production
Aging cord	By Chamber and use recorder to record aging condition
Heat shrinkable tube	Heater and Jig, heating 120+/-5 degrees, 50 seconds
Position mark strip	Ruler/JIG/template
Direction of part	Identify side S and E by visual

3. Checking items

Type of record	Items	Record
Quality control items	Refer to relating QC Flow Chart	Check sheet: Related check sheet
Identification & trace ability record	Operator name, operation date	
	MO, Product number	
	Lot No.	

VI. Record:

Identification, storage, protection, retrieval and disposition of these records refer to 0-Pr-004

Note: Nonconforming product, material shall be identified & controlled according to relevant procedures: 5-Pr-001 & 9-Pr-008

VII. Review

This document will be reviewed yearly by engineering function or when there is any change concerning to this operation procedure. (Refer to 0-Pr-001: Control of internal origin documents).

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REVISION HISTORY

Date	Person	Ver	Description		Reason	Requester
			Old contents	New contents		
22-Aug-24	Chau Thi Cam Tien	4	item 1.7 For MPO product. 1.7.2 Mark & strip - None	item 1.7 For MPO product. 1.7.2 Mark & strip - Add b) Mark & strip for fanout AFL product:	Combine mark & strip, expando assembly and cutting of packing material from 4-OP-0368 to general OP: 4-OP-0483	Manager. Dinh Tan Tien
			-	Added Item 1.11. Expando Assembly		
			-	Item 1.12: add Cutting of packing materials:		
			item 2.Process condition - None	item 2.Process condition - Add Expando cutting by machine	Follow 4-Pr-007-4-Fo-0007-4-RC-0154	
22-Aug-23	Vo Duc Thang	3	-	IV. Term definition: add define for some extra length	Updated	Manager. Dinh Tan Tien
				Add Item 1.7 MPO product		
				Item 1.8: add Expando cutting		
27-Jun-22	Vo Duc Thang	2	-	Item 1.7 add more requirement: Before using, cord/tube must be keep at room temp about 30 minutes after get it from chamber	Updated requirement for aging cord/tube	Manager. Dinh Tan Tien
02-Jun-22	Vo Duc Thang	1	-	Established	Established	Manager. Dinh Tan Tien