

QUALITY CABLE & ELECTRONICS, INC.

VFS-D7 Fusion Splicer



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1. General information

This manual contains complete performance and operation for THE VFS-D7 FUSION SPLICER. VFS-D7 uses the high-speed image process technology and special exact orientation technology, so that the whole process of fiber's fusion can be finished in 25 seconds automatically. LCD colour monitor makes each process of fiber fusion clear and multi-languages make users operate easily. Because of small bulk, light weight and AC、DC power supply, it is the same with the project and maintenance of telecommunications, cable TV, railway, petrochemistry, electric power, army, police and scientific research organizations.

1.1 Applicable Fiber

Single mode and Multi mode silica based optical fiber

Cladding diameter 100 to125μm

Coating diameter 0.1 to 1.0mm

Fiber cleaved length: 16mm(standard)

1.2 Specifications:

- **Dimension:** 172mm(length) x186mm (width) x220mm (height)
- **Weight:** Only 4.1 Kg
- Screen: 5.0 inch LCD colour Monitor
Display double light route picture
- Environment: Temperature: -10~50℃
Storage: -40~60℃
Humidity: <95%RH (without dew)
Storage humidity: no dew
- Average fusion loss: 0.01dB (MMF), 0.02dB(SMF), 0.04dB(NZDSF)
- **Average fusion time: 10sec. (Standard)**
- Average heat time: 40sec. (Standard)
- Fusion program: SM,MM,DS,NZDS,EDF,EXF(Changable)
- Languages selectable: Chinese, English
- Work style: Auto,Manual
- Power supply: Alternating Current:176~264V, 50Hz ±15%
Direct current:10.5~15V
- Storage of splice result: 4000(selectable)

2. Terms about VFS-D7

During operating the fusion splicer VFS-D7 by menu, you will find some terms; the meanings are as follows:

Heat time: VFS-D7 sets up heat time. (Unit: 1Seconds)

Surface angle: Allowed maximum cleaved slope angle when VFS-D7 checking the end-face.

Push speed: The electromotor controls delay of unit during arc splicing, while push speed slower, the moving speed of fiber becomes faster.

Pre-fusion: Process that VFS-D7 arcs little current while doesn't push fiber during splicing.

Fusion: Process that VFS-D7 arcs proper current and pushes fiber during splicing.

Test: VFS-D7 arcs to revise arc position and arc current automatically.

Cleaning electrode: Part high temperature gasifies the impurity on electrode's surface during arc.

3 .Main body and accessories

Following are main body and accessories: Fittings No.1~7 are admeasured to users with main body; Options No.8~13 are sell to users base requirement.

Table 1

Serial No	Description	Model No.	Qty.	Remark
1	Fusion splicer	VFS-D7	1	Main body
2	Battery/Battery charger	VFS-D7-01	1	Fittings
3	DC Power Cord	VFS-D7-02	1	Fittings
4	AC Power Cord	VFS-D7-03	1	Fittings
5	Spare Electrodes	VFS-D7-04	2	Fittings
6	Operating manual	VFS-D7-05	1	Fittings
7	Carry box	VFS-D7-06	1	Fittings
8	Splice protection sleeve	VFS-D7-07		Options
9	Fiber coat stripper	VFCFS-02		Options
10	Fiber cleaver	VFCI-01		Options
11	Linking tool box	VFD-100		Options

4.Panel and side elevation



Figure 1

5. Operating keyboard

The keyboard's multi-functions are manual /Auto /parameter menu.
Explanations as below:

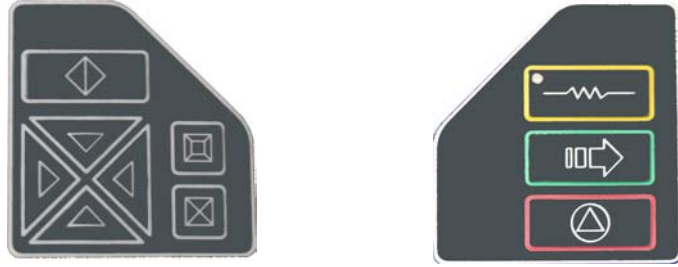












Figure 2

Table 2

Key	Name	Function
	HEAT	Starts tube heater temperature cycle
	AUTO	Auto:Starts splicing operation. Manual:Re-ARC
	RESET	Returns system to Ready state from any state.
	L/R alternate	Manual: left/right alternate
	MENU	1. Enter Menu 2. Confirm efficient selection
	EXIT	Exit Menu
	Scroll down	1. Menu: move cursor 2. Manual:move fiber down
	Scroll up	1. Menu: move cursor 2. Manual:move fiber up
	Scroll right	1. Menu: increase parameter 2. Manual:move fiber right
	Scroll left	1. Menu: decrease parameter 2. Manual:move fiber left

6.Fiber's fusion flow

6.1 Start and stop

6.1.1 Connect with power supply

VFS-D7 fusion splicer supplies power by AC power or DC power (battery).

- 1) Before using the AC power converter, you should connect AC power cord with power socket of VFS-D7, then connect its input with AC: 176~264V, 50Hz $\pm 15\%$.
- 2) During using the storage battery, you can connect its output with the power socket of VFS-D7, and it must be charged fully before use.

Notice:

- 1> The power socket of VFS-D7 is of direction; you should use the plug provided by factory. To avoid damage of instrument, do not insert the plug forcibly.
- 2> To avoid exhausted battery, please make sure that the battery has been charged fully before use.

6.1.2 Start and stop









Connect with power supply; turn on the switch to start the fusion splicer.

Turn off the switch to make the fusion splicer stop working.

- Notice:
- 1> To avoid damage of instrument, please make sure that two electrodes are loaded well in proper position before starting.
 - 2> Please select power supply on the LCD monitor base needs during splicing.

6.2 Preparation before fusion

6.2.1 Checking the electrode

- 1> Make sure no fiber; electrodes are loaded well.
- 2> Connect with the power then start machine, initialize the fusion splicer.
- 3> Observe arc electrodes; make sure that no obvious damage on electrode's top.
- 4> Arc to check state of electrode's top, as following measures:
 - a> Press " to enter the first class menu.
 - b> Press " or " move cursor move to "Other".
 - c> Press " to enter the menu of other.
 - d> Press " or " move cursor to "Clean Electrode", then press " to Clean Electrode.
 - e> press " to exit menu.

Notice:

- 1> Hear little "Hiss" in the whole arc process.
- 2> Make sure that arc is stable.

Otherwise please consult "Maintenance" to clean or replace electrode.

6.2.2 Fixing splice protection sleeve

To protect joint after fusion, you should enclose the fiber into the splice protection sleeve. Please consult figures 4 (a).

Notice:

- 1> Make sure that there's no dirt in the splice protection sleeve and the surface of fiber has been cleaned before fixing.
- 2> Make sure that fiber is in the splice protection sleeve.
- 3> To avoid influencing fusion's target, please cut the otiose part if the inside core's length is longer than the sleeve's coat.

6.2.3 Making fiber's end-surface

- 1> Strips cover about 40mm~100mm with fiber coat stripper and clean the dirt of bare fiber with alcohol tampons. Please consult figure4 (b).

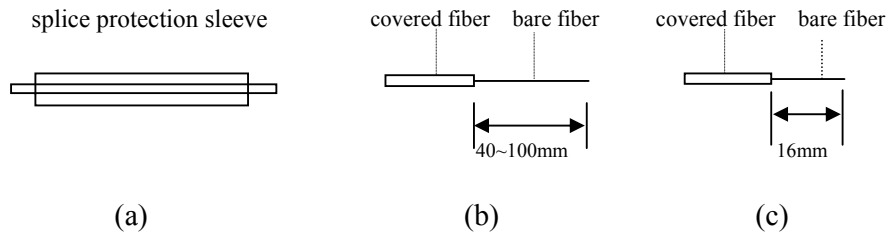


Figure 3

- 2> Cut the bare fiber with fiber cleaver and hold it about 16mm (Standard) as figure4 (c) shows.

6.2.4 Side elevation of cleaved fiber's end-face

The quality of fiber's end-surface is of influence to fusion loss; you should try to make end-surface flatly, and the inclination between end-surface and section should be less than 1° . The figure4(a) is finer end-surface for fusion while (b) ~ (f) are unqualified and need to remade.

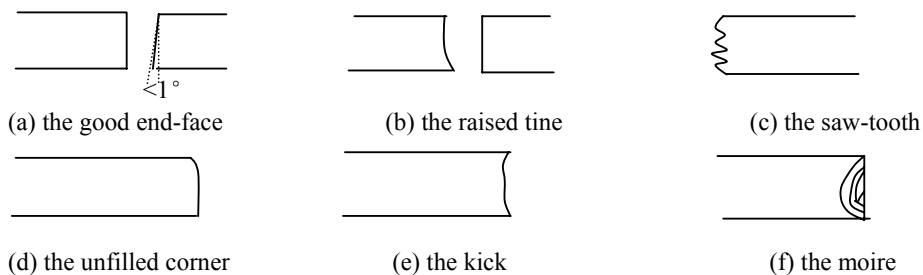



Figure 4 fiber's end-face

6.3 Fusion

6.3.1 Selecting right fusion program

Select right program and parameter to obtain the best fusion result due to different environment and different kinds of fibers (SM, MM, DS, NZDS, EDF, EXF).

6.3.2 Loading the fiber

- 1> Press “” to reposit the fiber holder; “Please place fiber” is displayed on the screen.
- 2> Place cleaved fiber into V-groove, and the end-surface couldn't touch the bottom of V-groove, consult figure 5(a)、(b).

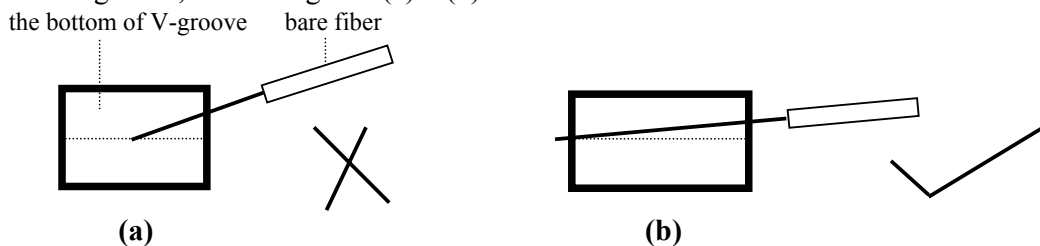



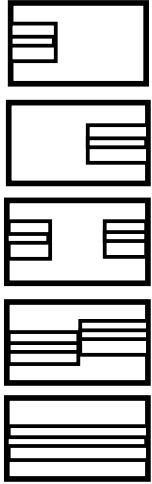


Figure 5

6.3.3 Possible fiber place

Table 2 is the possible phenomena that appeared after pressing “”.


- Notice:
- 1> Make sure that electrode is fixed well before splicing.
 - 2> Make sure that electrode is well and there's no obvious injury on electrode's top.
 - 3> Best to Program test each time before splicing.

Table 3

Graphic	Message	Reason	Measure
	Reload the fiber	<ol style="list-style-type: none"> 1. Don't reposit the fiber holder before loading. 2. The bare fiber is cleaved too long or too short. 	<ol style="list-style-type: none"> 1. Replace fiber. 2. Recut fiber.
	Bad left fiber or bad right fiber	Bad end-surface's quality.	<ol style="list-style-type: none"> 1. Remake the end-surface. 2. Reset end-surface's angle
	The picture is clear in only one direction or picture are unclear in two directions.	<ol style="list-style-type: none"> 1. There is dust in V-groove. 2. There is dust on bare fiber. 	<ol style="list-style-type: none"> 1. Clean V-groove. 2. Clean bare fiber 3. Replace fiber

6.3.4 Auto fusion and estimating loss

The steps of auto-fusion are as follows:

- 1) Check and confirm the right option of “fusion fiber”.
- 2) Consult 6.2.4 and make the end-surface of fiber.
- 3) Raise the windshield and fiber holder to load fiber.
- 4) Close the windshield, then press “”, VFS-D7 will begin to work automatically: clean fibers automatically, check end-surface, setup gap, adjust fiber's core, arc splice, estimate loss and display loss on screen.
- 5) If “bad end-surface” or “Replace fiber” is displayed, VFS-D7 will stop working. Please remake fiber's end-surface or refer table 2. (Consult 6.2.3 and 6.2.4)

- Notice:
- 1> Fusion splicer will estimate loss one time only after splicing automatically.
 - 2> Only the electrode is well, arc parameter is optimized, fiber character is identical, then fusion loss is of reference.
 - 3> Best to program test before splicing.

6.3.5 Splicing partial core fiber

If loss is unsteady during splicing, the measures are as follows:

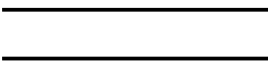



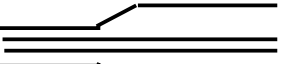
- 1> Check opposite position between fiber and arc.
- 2> If opposite position is steady, maybe fiber's core is partial. The solution is to minimize the value of "fusion time" and "fusion push".
- 3> If method<2> is useless, to obtain best loss, you must mark direction angle on the fiber to test fiber's fusion.

6.3.6 Evaluating fusion quality

Fusion quality is judged by estimating loss, fusion shape and fusion process. Only combine them together, and then the evaluation is external.

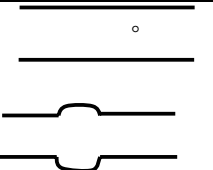
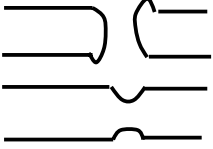


- 1> If fusion process is steady and the spliced fiber's shape as follows as Table 3, then the fusion status is well.

Table 3

	Fiber's cord is accord with shape
	Spot or abrasion, be care of cleaning and cleaving end-surface
 white line	Because of optics, there's no effect to joint
	Different eccentricity between two fibers
	Different external diameter between two fibers

- 2> If the spliced fiber's shapes are as follows as Table 4, you must splice over again even the loss value is very low.

Table4

Shape	Reason	Measure
 bubble	<ol style="list-style-type: none"> 1. There is dust on the end-face 2. Dew 3. Bad fiber's end-surface 4. Too small arc current 	<ol style="list-style-type: none"> 1. Remake end-surface. 2. Adjust program or current.
 broken thin diameter	<ol style="list-style-type: none"> 1. Too large arc current 2. Too small push speed 3. Little fusion push 4. Feed blocked 	<ol style="list-style-type: none"> 1. Adjust program or current parameter. 2. Clean V-groove.
 black line	Notice: Black line will appear on fiber's joint with fluorine, it has no effect to transport characteristic.	Press " 

6.4 Tension test

VFS-D7 fusion splicer supply the function of tension test after splicing.

6.5 Protection of fusion point

6.5.1 Taking out spliced fiber

Raise windshield and fiber-collect in turn, take out spliced fiber, do not touch electrode.

6.5.2 Moving splice protection sleeve

Move splice protection sleeve that covered around fiber to joint, make sure that length of two fiber's coat is equal in splice protection sleeve. Consult figure 6(a).

6.5.3 Heating splice protection sleeve

The heating processes are as follows:


- 1> Make sure that down lead of heater power is inserted well if use outside heater.
- 2> Open heater and put the splice protection sleeve into it.
- 3> Press “” to heat splice protection sleeve when light is on.
- 4> After time is up, the light will stop heating automatically.
- 5> Wait a moment, after splice protection sleeve stiffen, take out it and the joint protection is finished.

Figure 6(a) and 6(b) are the good examples; 6(c) is the bad example. If the phenomenon as 8(c) appears you should remake the joint and check whether there is dust in the splice protection sleeve and on bare fiber, then heat it.

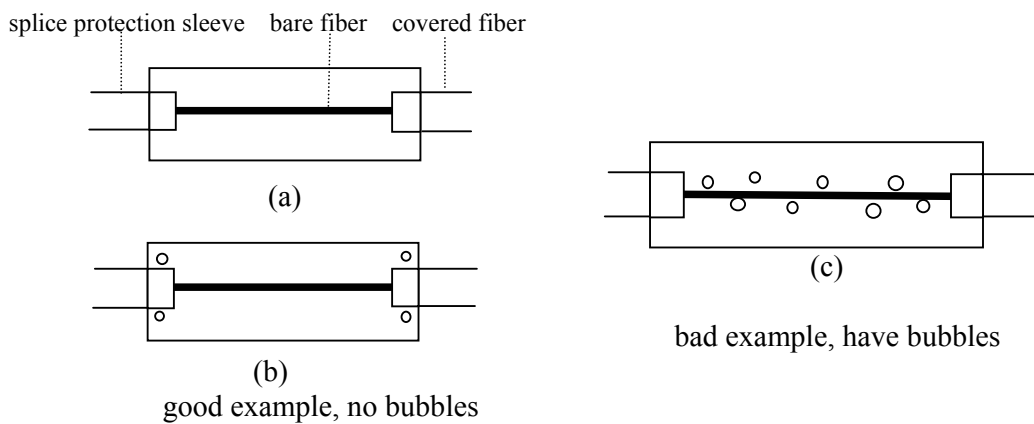



Figure 6




Notice: VFS-D7 will close heater if temperature sensor checks too high temperature when heater works continually, you can wait a moment then heat.

7. Explanation about menu

The most function and parameter are achieved in the menu; the operation methods are as follows:

Press “” to enter the first class menu.

7.1 Program Check

Press “” or “” to move the cursor to “Program Check”; Press “” start Program Check.

7.2 Work Style

Press “▲” or “▼” to move the cursor to “Work Style”; Press “□” select work style : the manual or Auto.

7.3 Select Program

Press “▲” or “▼” to move the cursor to “Select Program”; Press “□” select Select Program : SM, MM, DS, NZDS, EDF, EXF.

7.4 Change Parameter

Press “▲” or “▼” to move the cursor to “Change Parameter”; Press “□” select the program ; Press “◀” or “▶” to change the value of the program.

7.5 Heating time

Press “▲” or “▼” to move the cursor to “Heating time”; Press “□” select the Heating time; Press “◀” or “▶” to change the value of the Heating time.

The setting range of heating time is 0~255 second step-size is 1 second. Press “☹” to turn on the light, then the heater begins to work; heater will stop working if time is up. But if the temperature were the highest value, it would stop also.

Remark: Press “☹” to stop heating. Next heat time counts from zero.

7.6 Other

Cursor move to “Other”, press “□” to enter **Other** menu.

Press “☒” to exit current menu.

8. Maintenance

8.1 Replacing the electrode

Firstly take off protective cover of electrode room, loosen the screw and take out up-electrode. Then take out down-electrode in the same way. The installation's order of new electrode is opposite to strip. Usually, do not adjust electrode, and to avoid damage of electrode do not touch the electrode's top ,in the whole process, prevent electrode dropping into the machine. After replacing electrode, you should adjust arc position, operations are as follows:









- 1> Turn on the power switch.
- 2> Press “□” to enter the first class menu.
- 3> Press “▲” or “▼” move cursor to “Maintenance”.
- 4> Press “□” to enter the maintenance menu.
- 5> Press “▲” or “▼” move cursor to “Clean Electrode”.
- 6> Press “□” to make machine arc automatically, the high temperature will boil away the impurity on the electrode, until current is stable, electrode is clean and new electrode becomes aging.
- 7> Press “☒” to exit submenu in turn.

Notice:

- 1) Shut off the power of machine before replacing electrode.
- 2) Make sure that arc parameter had been setup efficiently in the arc process before adjusting arc position.

8.2 Maintenance of electrode

After extended use, the top of electrode will produce dust; dust will make arc unsmooth. When “hiss” sounds, you should clean electrode. Best to clean electrode timely as following operations:

- 1> Clean electrode’s top tenderly with alcohol tampons;
- 2> Turn on the power switch;
- 3> Press “” to enter the first class menu;
- 4> Press “” or “” move cursor to “Maintenance”;
- 5> Press “” to enter maintenance menu;
- 6> Press “” or “” move cursor to “Clean Electrode”;
- 7> Press “” to make machine arc automatically, do those two or three times. To stabilize arc current and clean electrode, the high temperature will boiloff the impurity on the electrode, until arc is stable and the sound of “hiss” disappear.
- 8> Press “” to exit menu in turn.

Notice:

- 1) Because top of electrode is very weak, to avoid damage of electrode and unstable arc, do not touch it by hard things.
- 2) During the process of maintenance, to avoid damage of instrument, do not arc large current for a long time.

8.3 Cleaning the V-grooves

The driving range of adjusting core’s direction is only a little micron, fiber’s picture will departure normal position and couldn’t level if any things exists. You should clean the V-grooves timely as following operations:

- 1> Raise the windshield;
- 2> Open the fiber holder and fiber clamp;
- 3> Clean the V-groove with a cotton swab soaked with absolute alcohol.

Notice:

To avoid damage of V-groove and instrument, do not clean V-groove with hard thing and energize on it.

8.4 Cleaning the lens of microscope

VFS-D7 fusion splicer adopts the working mode of disposal pictures. It is necessary to keep the lens of microscope cleaning. The operations are as follows:

- 1> Raise the windshield, you will find aclinic and upright lens.
- 2> If any thing exists on lens, dispose it with proper instrument. To avoid of damage, do not touch lens with hard thing.
- 3> Wipe lens with a cotton swab soaked with absolute alcohol.
- 4> Wipe lens tenderly with dry cotton swab until it is clean.

9. Notice

9.1 Shipping and storing

- 1> VFS-D7 fusion splicer is an exact instrument; it must be transported with special encasement.
- 2> Do not put fusion splicer in too hot environment.
- 3> Do not make it dew when storing.

9.2 Operating instructions

- 1> VFS-D7 fusion splicer can only splice silica fiber.
- 2> To avoid of too high voltage, do not open windshield and touch electrode.
- 3> Do not touch electrode with hard thing when cleaning.
- 4> Do not touch V-groove with hard thing when cleaning.
- 5> Do not use VFS-D7 fusion splicer in flammable and explosive environment.
- 6> Although normal working life of electrode is 1000~3000 times, do not replace electrode easily if arc is stable.
- 7> Best to clean electrode about two or three times before splicing.

10. Addenda A Operating VFS-D7 skillfully

This addendum can help you to resolve some questions by yourself.

- 1> The screen is dark after starting machine and the level lamp on electrodes doesn't work after opening windshield.

Solutions:

- 1) Check whether the electrical outlet is inserted.
- 2) Check whether the fuse is broken, and then replace the broken one.

- 2> "Exhausted Battery" is displayed on the bottom of screen after starting VFS-D7 and buzzer works continually.

Solutions:

If use battery, then replace the power supply.

- 3> The fiber can be reset as normal, but when setting gap, fiber is immovable on the screen and "Replace Fiber" is displayed on the screen.

Solutions:

- 1) Press " " to reset system.
- 2) Raise the windshield, left and right clamps. The checking steps as follows:
- 3) Check whether broken fiber exists.
- 4) Check whether cleaved length is too short.
- 5) Check whether fiber matches with V-groove.




- 4> The fiber can be reset as normal, but when setting gap, fiber moves backwards continually, "Replace fiber" are displayed on screen.

Solutions:

Maybe there is too much dust on the lens of microscope, clean the acclinic and upright lens with cotton swab until dust disappears, then try again.


5> The fiber can be reset as normal, but when setting gap, “Replace fiber” is displayed on screen.

Solutions:

- 1) Press “” to reset system.
- 2) Raise the windshield, left and right clamps. The checking steps as follows:
- 3) Check whether broken fiber exists.
- 4) Check whether cleaved length is too short.
- 5) Check whether fiber matches with V-groove.

6> When calibrating automatically, fiber moves up and down, the screen’s display stops at “Adjust core”.

Solutions:

- 1) Press “” to reset system.
- 2) Check whether bare fiber is clean.
- 3) Clean the dust of V-groove.
- 4) Knock at the holder until fiber is impacted, then try again.

7>The fiber can be reset as normal, but when setting gap, “Bad left fiber’s surface” is displayed.

Solutions:

- 1) Observe fiber picture in screen, if the quality of left fiber’s surface is bad, you can remake surface and try again.
- 2) Observe fiber picture in screen, if the quality of left fiber’s surface is good, maybe the value of “Setting surface” is too small, you can increase it.
- 3) After “Bad left fiber’s surface” is displayed, the screen becomes dark; Make sure that windshield is covered well.

Raise windshield, check whether the reeds are distorting, and then manage it.

8> When splicing the MM fiber, there is bubble in the process of arc.

Solutions: The difference between fiber’s core and envelope’s refractive index is too big. Operations as follows:

- 1)Consult MM fiber’s arc program set by factory and confirm.
- 2)Do arc test until “Moderate current” is displayed three times.
- 3)Splice MM fiber; if there is bubble then modify arc parameter.

Operations are as follows:

- 1) Enter the menu of arc parameter.
- 2) Increase the value of “Pre-fusion time” until no bubble.
- 3) Decrease the value of “Pre-fusion current” if no bubble and fiber thins.