HSTC-2001 and HSAFC-2008

User Manual

Issue 2.8

Contents

Issue 2
Scope 2
Unpacking Instructions 3
Introduction 4
Introduction 4
Specifications 6
HSAFC-2008/125 6
Contents of Cleaving Kits 7
Description of HSTC-2001 & HSAFC-2008 8
Cleaving Problems 14
(i) Will not cleave Offcut fiber still in tool. Remove 14
Cleaver Maintenance 16
Cleaning the clamping surfaces 17
Blade Advance Adjustment 19
Changing Diamond Blade 20
Cleaving Principles 21
HSAFC-2008 angled cleaver 23

Warranty 24
Service 24
Address for UK Factory: 24

Illustrations courtesy of Lucid Optical Services Ltd.
Printed in the U.K. by *Lucid Optical Services Ltd.*

Issue

This user manual will be updated from time-to-time to reflect technical changes to the product.

Scope

This user manual covers operation of the **HSTC-2001 and HSAFC-2008** precision optical fiber cleaving tools.

Special variants of these cleavers may be supplied with additional user instructions for operation & maintenance.

Unpacking Instructions

- Open packing box
- Take cleaver and base out of box
- Remove plastic packing protecting upper and lower sections of cleaver
- Check all fiber channels are free from fiber in both clamps and offcut side
- Remove rubber tube protecting diamond blade (HSTC)
- Wipe diamond blade clean with alcohol wipe

The cleaver is now ready to start cleaving.

Introduction

This booklet describes the:

HSTC-2001 High Strength Fiber Cleaver

HSAFC-2008 High Strength Angled Fiber Cleaver

Perpendicular Cleavers

The **HSTC-2001 High Strength Fiber Cleaver** is designed to cleave a single 125 µm diameter singlemode or multimode optical fiber cladding with a mirror-smooth, damage-free perpendicular end. The cleaves produced are perpendicular to within 0.5°. The cleaver avoids direct contact when clamping the fiber and so the resultant cleaved fiber is strong enough to be used in a high-strength fusion splice.

The standard **HSTC-2001 is designed to cleave** 125µm diameter fiber. Other fiber diameters are cleaved by variants which operate in the same way as the standard cleaver but have certain parts replaced to allow cleaving of the different fiber diameters. Cleavers can be produced for fiber diameters in the range of 50-400µm; any one cleaver will produce good cleaves within a range of approximately +/-15% of the specified diameter.

Angled Cleavers

The **HSAFC-2008 High Strength Angled Fiber Cleaver** is designed to cleave a single mode 125μm diameter optical fiber with the core angled at 8º(±0.5º) from the perpendicular, for reduced back-reflection, where the working end of the optical fiber is clamped through its coating by an external clip. Cleave lengths as short as 2mm are possible.

Cleaving a singlemode fiber at around 8º from the perpendicular ensures the back-reflection will not be guided down the fiber, and hence the return loss will be around 60 dB (reflectance of -60 dB or 0.0001%).

The cleaver avoids direct contact when clamping the fiber and so the resultant cleaved fiber has enough strength to be used in a high-strength fusion splice.

Variants of this cleaver are able to angle cleave fiber of different diameters (50,80, 200μm, etc)

High strength angle cleaved fibers are typically used to pigtail optical fiber to opto-electronic components such as lasers and detectors.

Specifications

HSTC-2001/125

Fiber diameter:	125 µm
Coating diameter:	250 - 900µm
Cleave length:	> 2mm for 250µm coating > 12mm for 900µm coating
Blade life:	12 positions x 2,000 cleaves/position
Dimensions:	77 mm x 70 mm x 90 mm (3” x 2.5” x 3.5”)
Weight:	500 g (1.1 lbs)
Typical end angle:	<0.5°

HSAFC-2008/125

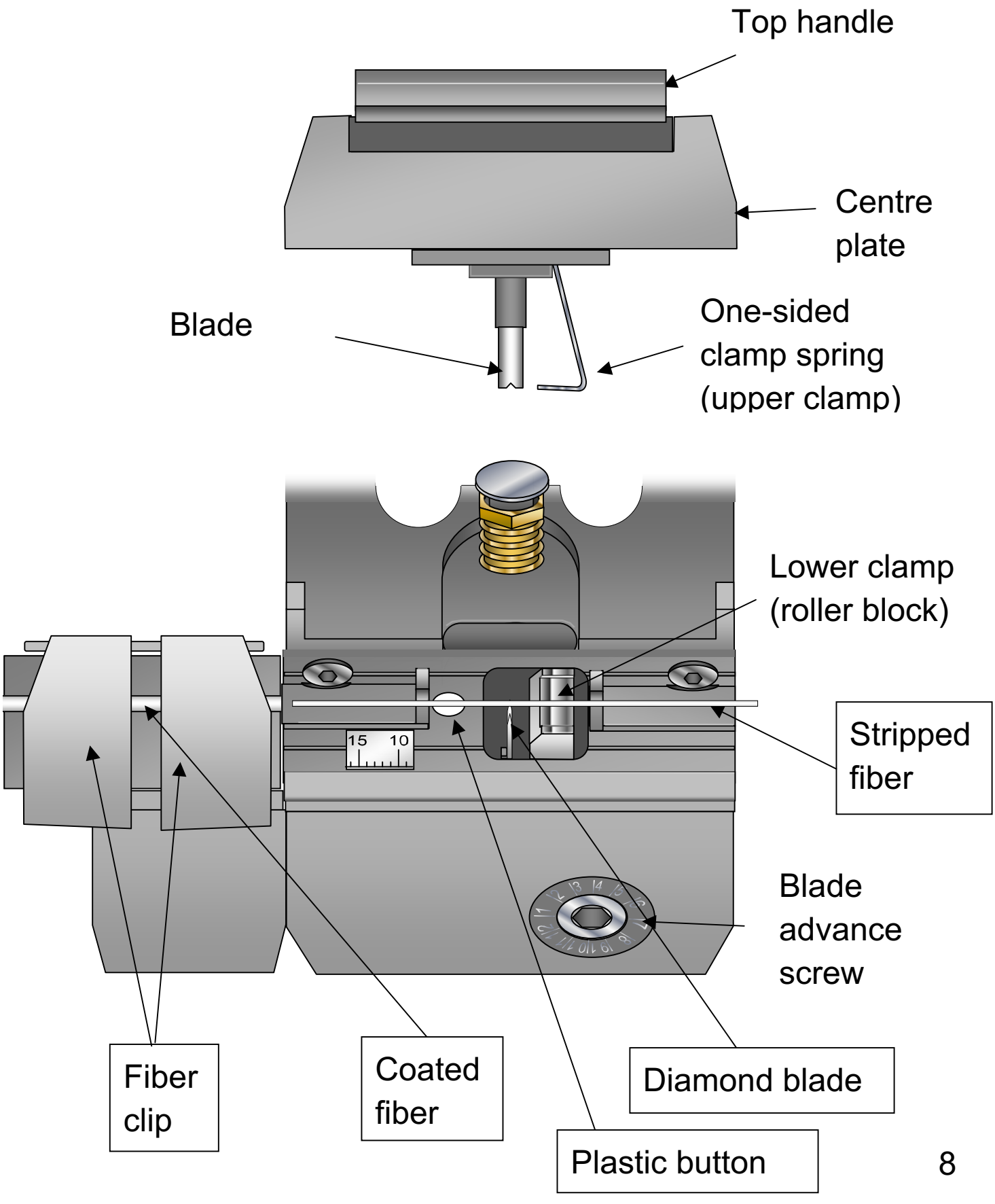
Fiber diameter:	125 µm
Coating diameter:	250, 400 or 900 µm
Ferrule dimensions:	As specified
Cleave length:	> 2mm for 250µm coating, > 10mm for 900µm coating
Blade life:	12 positions x 2,000 cleaves/position
Dimensions:	77 mm x 70 mm x 90 mm (3” x 2.5” x 3.5”)
Weight:	500 g (1.1 lbs)
Typical end angle :	8.0°
Standard deviation:	0.5°

Contents of Cleaving Kits

The cleaver is supplied along with the following items:

1. HSTC-2001 and HSAFC-2008 with external clip screwed to cleaver to hold coated fiber; possible to use coating diameters in range of 250-900μm
2. User Manual
3. Carry Case
4. Performance certificate for your cleaver (end angle measured for cleaves from this cleaver)

Description of HSTC-2001 & HSAFC-2008



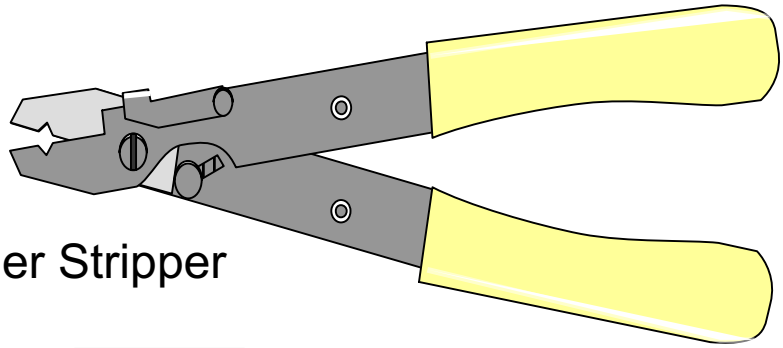
Using the Cleavers

1. Fiber Preparation

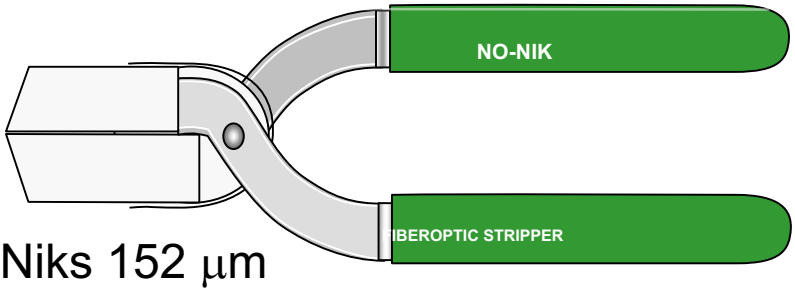
Strip primary coating (and secondary coating if applicable).

The stripped fiber should be at least 25 mm long to ensure that the glass cladding passes over both the left and right fiber clamps, through left and right fiber guides.

Commonly used stripping tools:



Miller Stripper



No-Niks 152 μm

(gold handles)

Clean fiber thoroughly using a lint-free wipe wetted with alcohol (IPA)

2. Fiber insertion (HSTC-2001 & HSAFC-2008)

Load the stripped fiber into the fiber clip.

A single fiber clip is able to clamp coating diameters in the range of 250-900μm.

The clip is made up of two rubber-coated clamps holding the coated fiber in to a common groove. The coated fiber should lie in the groove so that it can be clamped on its coating by both clamps.

The fiber is tensioned by pulling the stripped fiber using the one-sided clamping spring whilst the fiber clip anchors the coating of the fiber, so stopping any movement and so tensioning the fiber.

Note: When inserting a stripped fiber into the cleaver take care to avoid unnecessary physical contact with the fiber cladding as this will weaken the fiber, and may result in the cladding becoming dirty. The fiber should not be 'threaded', but should be lowered into position.

After cleaving, the cleaved fiber should be lifted out vertically to prevent contamination of the cleaved end with dirt.

3 Setting Cleave Length (HSTC-2001 & HSAFC-2008))

The cleave length is set by adjusting the position of the coated fiber in the fiber clip.

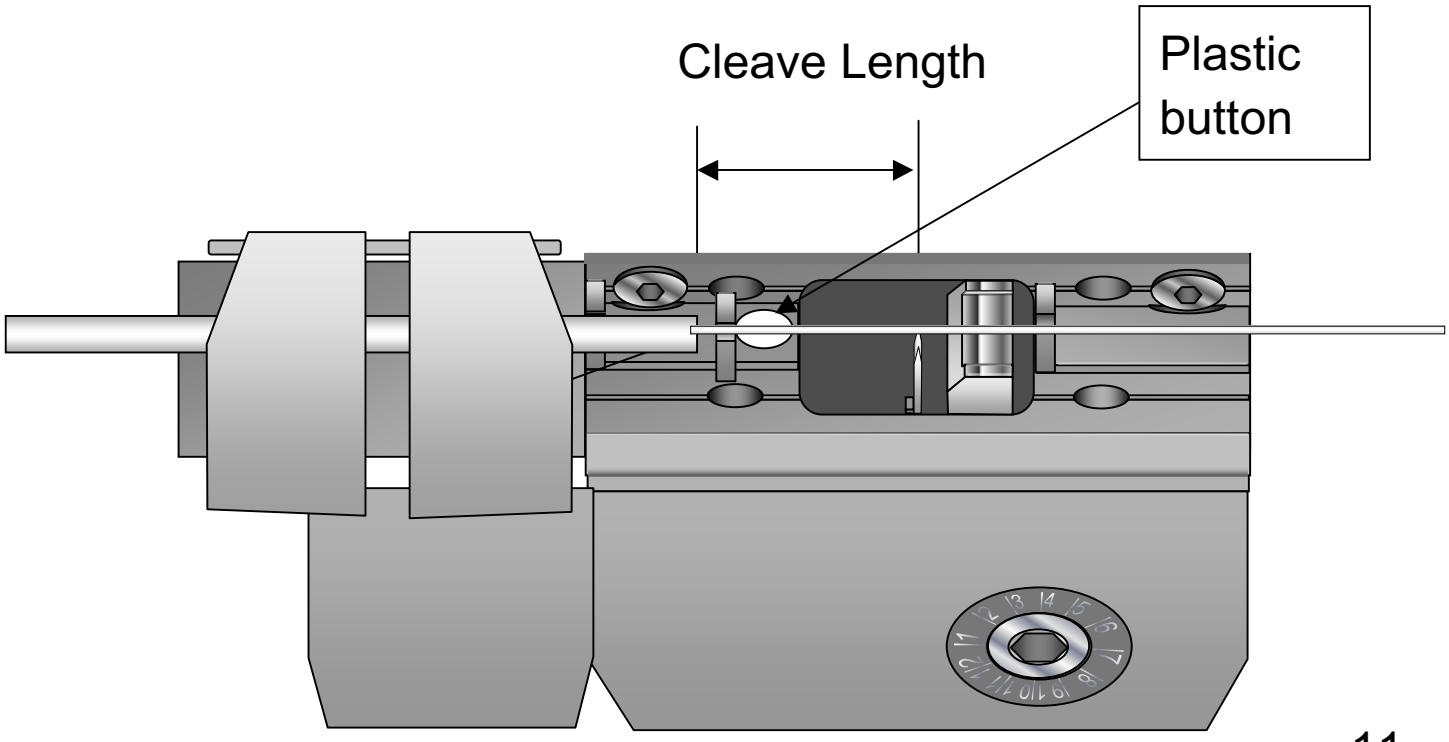
The maximum recommended cleave length is 25mm so that the coated fiber can be held by the fiber clip.

The minimum recommended cleave length is 7mm is set because bare fiber and not the plastic coating should be in contact with the plastic button for low end angles to be achieved. Shorter cleave lengths can be achieved by passing the coating over the plastic button.

Fiber with a coating > 300μm has a minimum cleave length of about 12mm because the coating will not go through the 300μm-wide slot in the fiber guide.

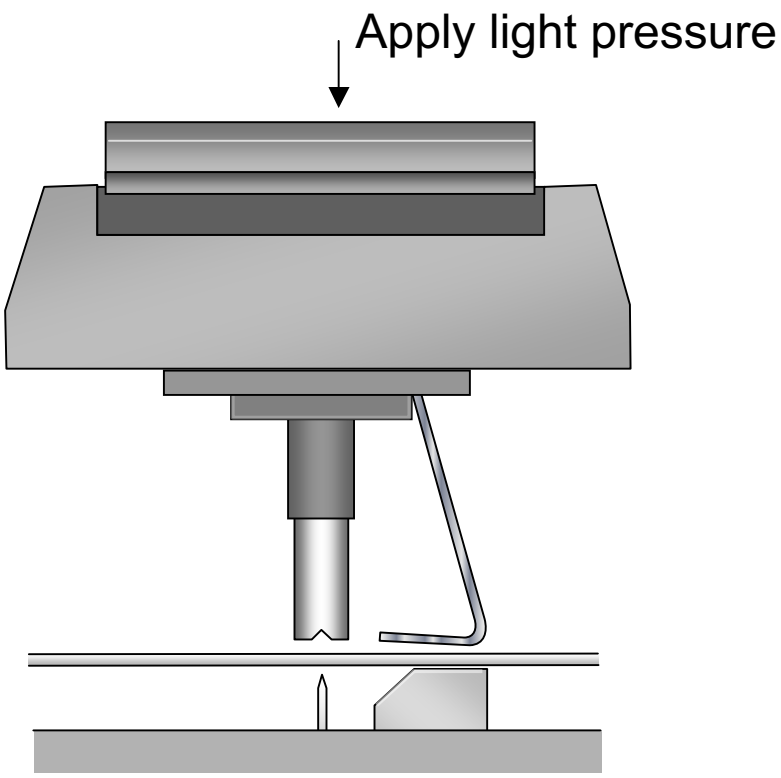
WARNING

DO NOT CLEAVE THE FIBER THROUGH THE COATING …. THIS WILL DAMAGE THE BLADE.



4. Cleaving the Fiber

Apply light pressure to the top handle of the cleaver to close the fiber clamps. Slightly increased pressure will cleave the fiber. When the fiber cleaves, there is a slight click heard as the tensioned roller blocks relax against their stops as the two parts of the fiber separate.



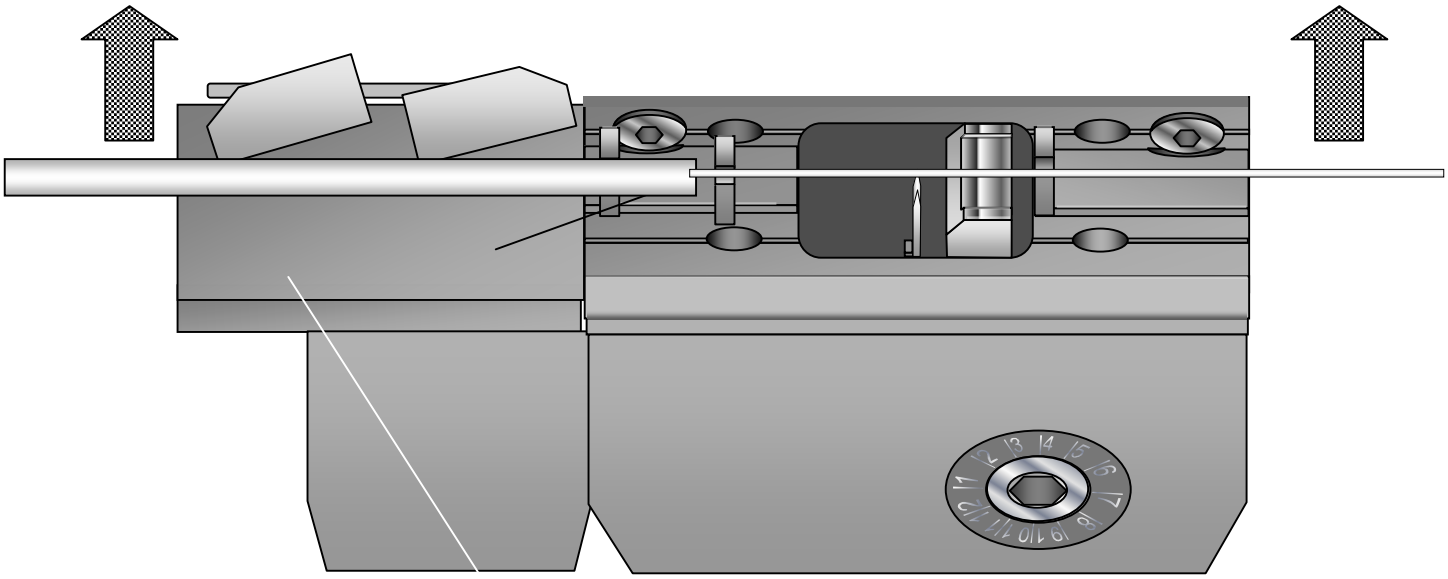
Release the pressure on the cleaver top handle as soon as the fiber cleaves.

A threaded brass stop is set to limit the pressure applied to the fiber and limits the movement of the blade . The fiber will normally cleave before the top handle is fully depressed.

5. Remove Cleaved Fiber

Raise two clips to release fiber from clamp

Carefully lift the cleaved fiber from the fiber guide, as shown below, so that it does not touch any surfaces that could scratch or contaminate the fiber cladding.



6. Remove Fiber Off-Cut

The fiber off-cut is a sharp hazard which should be removed by pulling through the slot on the right-hand side of the cleaver using the rubber tool provided or by hand and placed in a container or ‘cin-bin’.

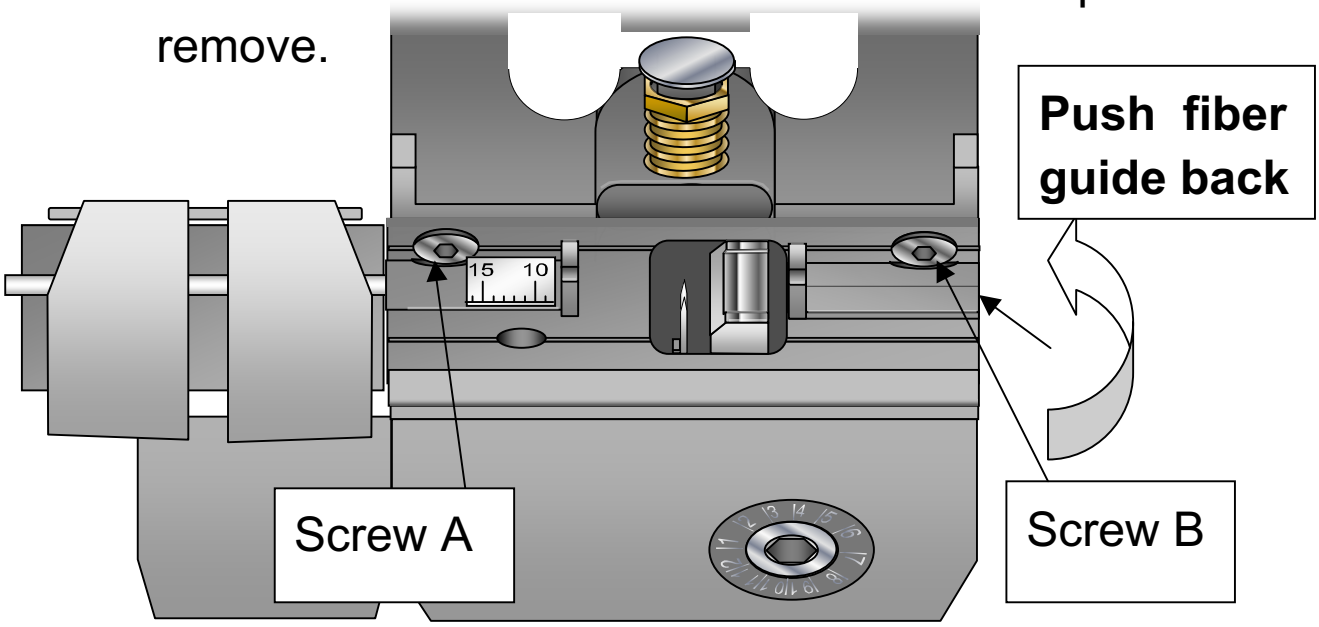
Any fiber off-cuts left in the cleaver may cause problems for subsequent cleaves because the fiber will not be clamped.

Cleaving Problems

(i) Will not cleave Offcut fiber still in tool. Remove

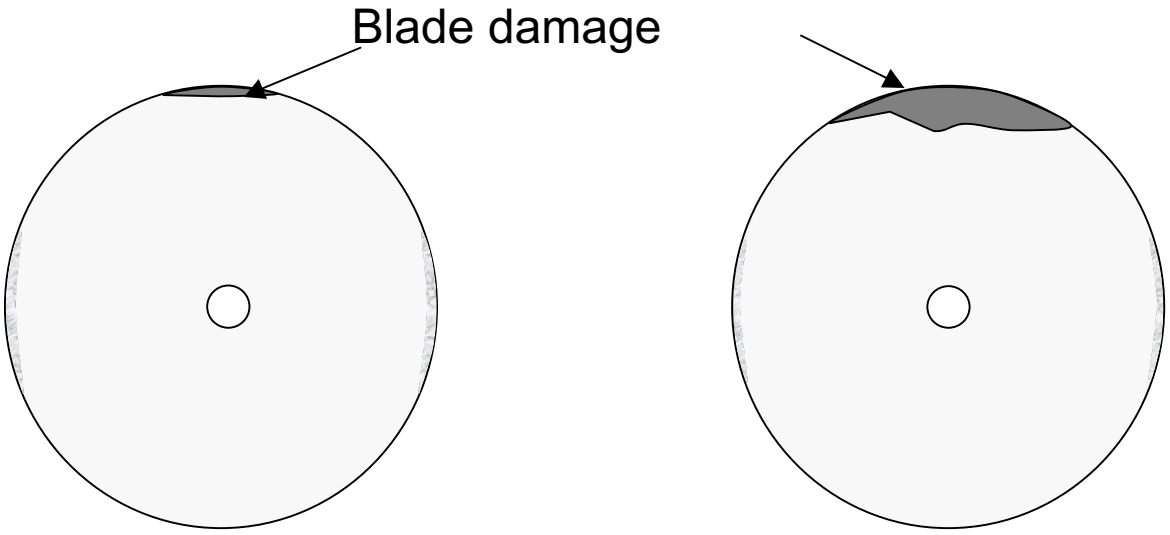
(ii) Damaged clamping surface

- The fiber may break at right-hand clamping surfaces because the clamping surfaces have become damaged by the glass fiber.
- Release 2 screws which hold fiber guide in place. Do not remove.



- Push right-hand side of fiber guide backwards by 0.5mm. The left-hand screw **A** is countersunk and so acts as a pivot for the fiber guide, the right-hand screw **B** is flat bottomed under head and can slide in the slotted hole.
- Retighten 2 screws.
- The fiber is now clamped by a new part of the clamping surface which is not damaged.
- The clamping surface can be changed 3 times.

(iii)Excess blade damage:



Good cleave *Excess blade damage*

1. Blade dirty: Clean blade with alcohol wetted cotton bud or lint-free tissue.
2. Blade chipped: Advance blade by turning screw 30^{o} clockwise, to line up with the next position on the front dial. (With proper use each blade position should achieve around 2,000 cleaves before needing to be advanced.)

(iv) Incorrect fiber end angles:

1. Not enough tension: Clean top of lower clamp & bottom of top clamp spring. If the problem persists the cleaver will need servicing.

Cleaver Maintenance

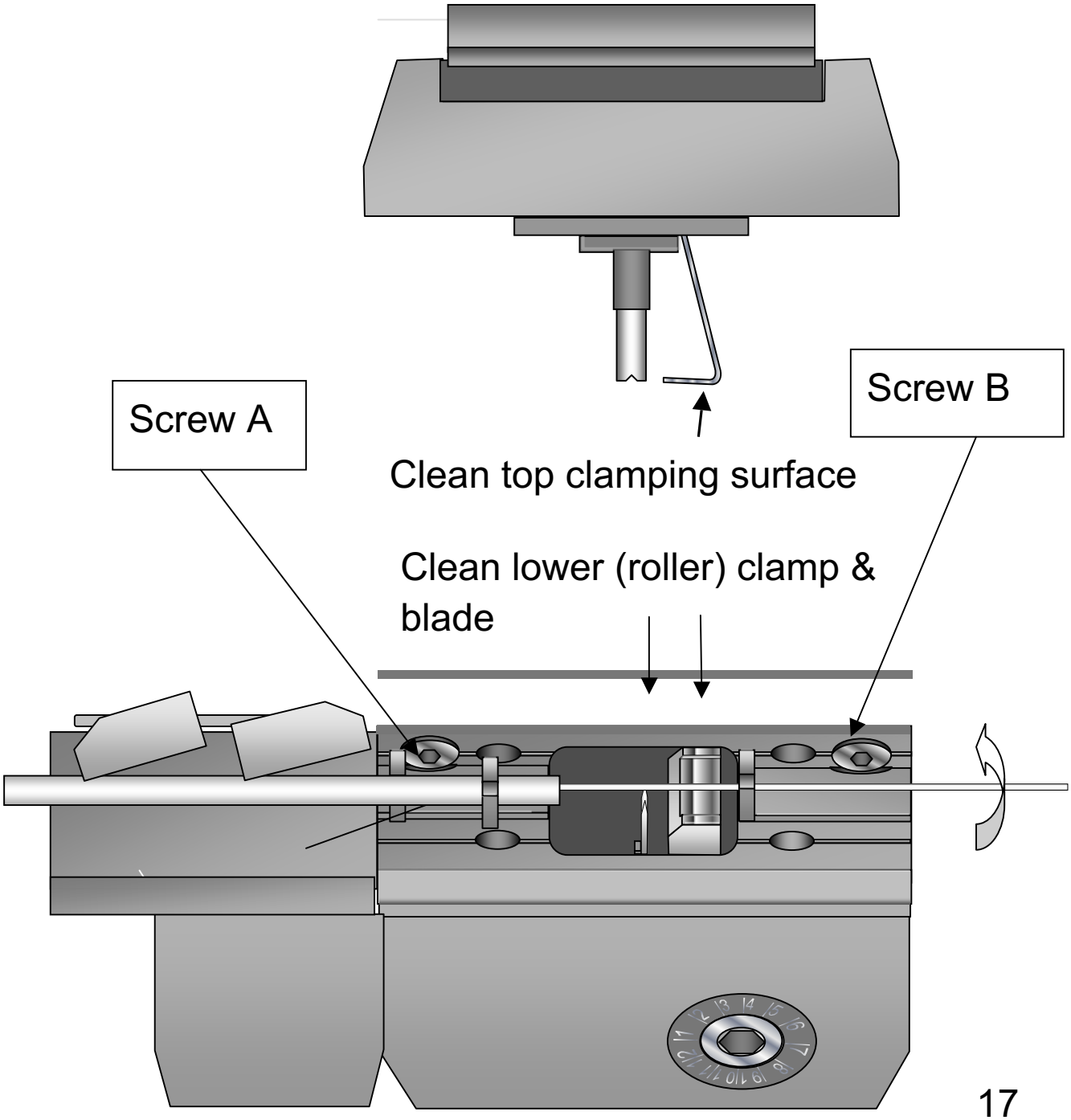
The cleavers should be kept clean and free of dust and fiber off-cuts at all times. The cleaver should be transported in its carrying case.

All stripped fibers should be cleaned with an alcohol wipe prior to insertion into the cleaver to prevent dirt accumulating under the clamping surfaces which may break fibers.

The diamond blade wears with time. A maintenance schedule should be agreed with the operators in advance and the diamond blade should be advanced after a certain number of cleaves have been carried out or a certain amount of time has elapsed. (See Blade Advance Adjustment below.)

Cleaning the clamping surfaces

The top faces of the lower clamp(s) (roller blocks) and the bottom of the top clamping spring should be wiped regularly with an alcohol-wetted tissue or the rubber tool provided. This will remove dust particles and fiber debris, which might otherwise prevent proper clamping of the fiber and so give poor cleaving.



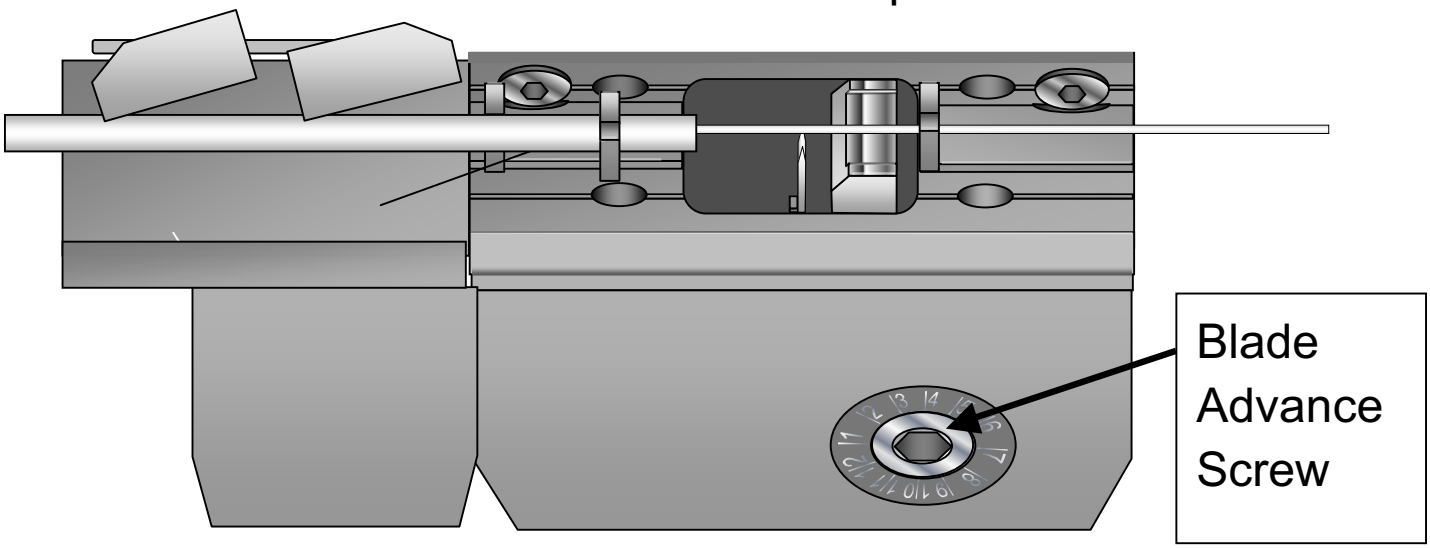
The lower clamps should be cleaned with an alcohol wipe, rubber, wood or other non-hard material. Do not touch the diamond blade.

The blade should be kept clean and free from dust or grease. This is best achieved by gently wiping the blade with an alcohol soaked tissue or cotton bud. The blade can also be cleaned by gently running the rubber tool (located in the bottom of the carrying case) along the edge of the blade.

Caution: Any hard or contaminated cleaning implement may damage the sharp edge of the diamond blade.

Blade Advance Adjustment

The part of the diamond blade which cuts into the fiber may become worn or chipped, giving poor cleaves. The blade can be advanced so a new portion cleaves the fiber



Using the hexagonal screwdriver supplied, turn the blade adjustment screw clockwise by 30° so the indicator mark is aligned opposite the next mark on the circular scale

The blade has 12 marked positions. When the blade has reached its final position, the cleaver should be returned to the factory, or agent, for replacement of the blade.

The blade adjust screw should only be turned clockwise, advancing the blade to an unused portion. If the screw is turned anti-clockwise, this will expose an used part of the blade which is probably damaged. The blade adjustment screw is deliberately set tight to eliminate any backlash.

CAUTION: Poor cleaving may be caused by dirt. Clean the blade and the fiber thoroughly and re-cleave the fiber. Only advance the blade if cleaving does not improve.

Changing Diamond Blade

When the blade has been fully used (after position 12 on dial) it is necessary to change the diamond blade.

The blade is a single crystal of natural diamond oriented and polished along {111} crystal planes. The diamond blade is glued on to a steel shank. The shank is mounted to a carrying block through a pivot using an eccentric cam

The diamond blade scratches the fiber at a glancing angle to reduce the cutting forces and so improve the lifetime of the blade.

The diamond edge should be horizontal when it scratches the fiber. The height of the diamond edge can be adjusted by adjusting the rotation of the eccentric cam.

The sequence of operation of the cleaver is as follows:

1. Fiber clamped
2. Fiber progressively tensioned and fiber bent to a fixed stop to give a pre-set deflection.
3. Clamped and bent fiber is further tensioned until blade scratches fiber. A M3 grub screw adjusts the delay before blade scratches fiber and so adjusts tension.
4. After cleaving, top handle is released and spring returns diamond to starting position.

To change the blade:

PLEASE CONSULT SERVICE MANUAL

Cleaving Principles

Optical fiber cleavers operate by a combination of scoring and tensioning the cladding surface of the fiber. The quality of a cleaved fiber end will depend on the degree of control provided by the scoring and tensioning mechanisms. The precision fiber cleavers here described have been designed to minimise the damage to the cleaved fiber end-face.

HSTC-2001 and the HSAFC-2008 cleavers

The pressure applied to the top handle causes the top ‘spring’ clamp to splay slightly and the bottom clamp to pivot slightly, so tensioning the fiber

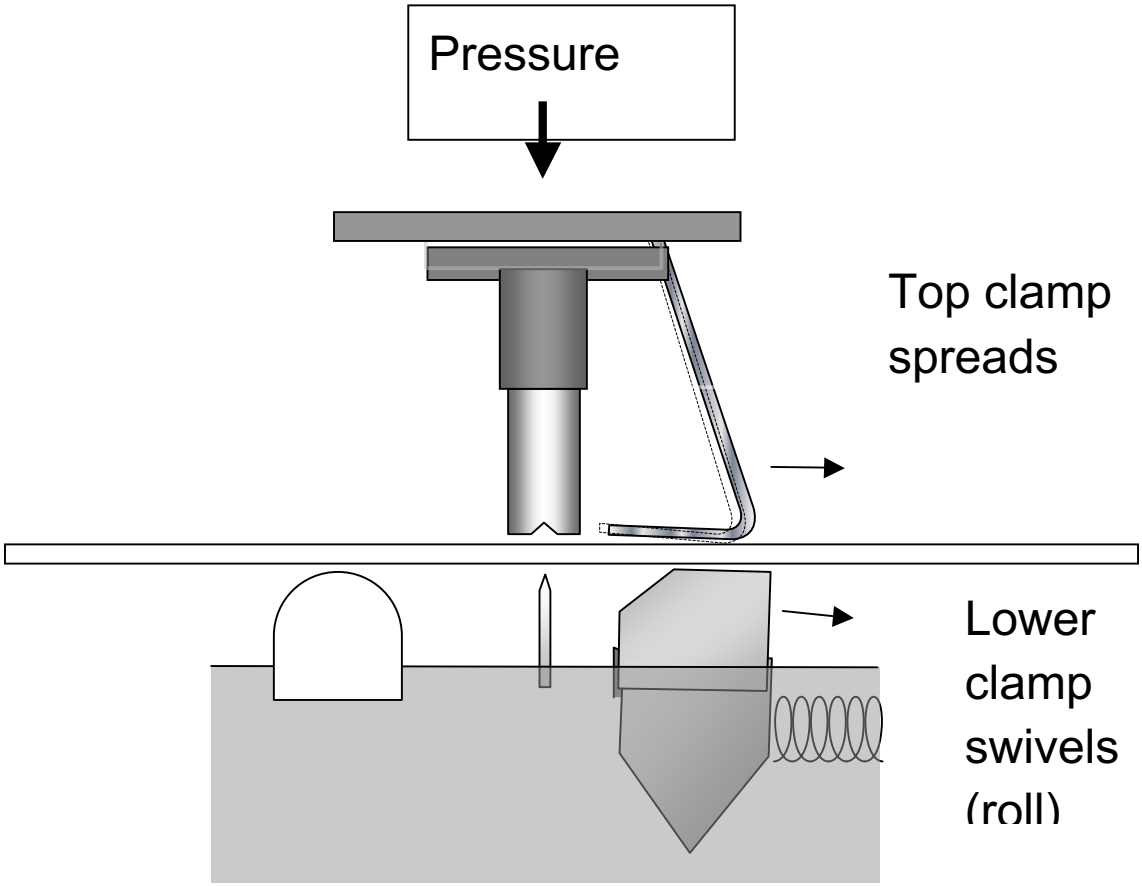
Further pressure on the top handle causes the anvil to be lowered into contact with the fiber whilst the diamond blade swings up and towards the anvil such that it strikes the fiber at a glancing angle.

Tension is applied to the fiber by clamping the fiber with the single-sided polished clamping pad and so pulling the fiber. However, the fiber is stationary because it has been clamped on its coating.

The combination of the tensioning of the fiber in between the clamps and the slight bending/support of the anvil provides unparalleled control of the stresses within the fiber.

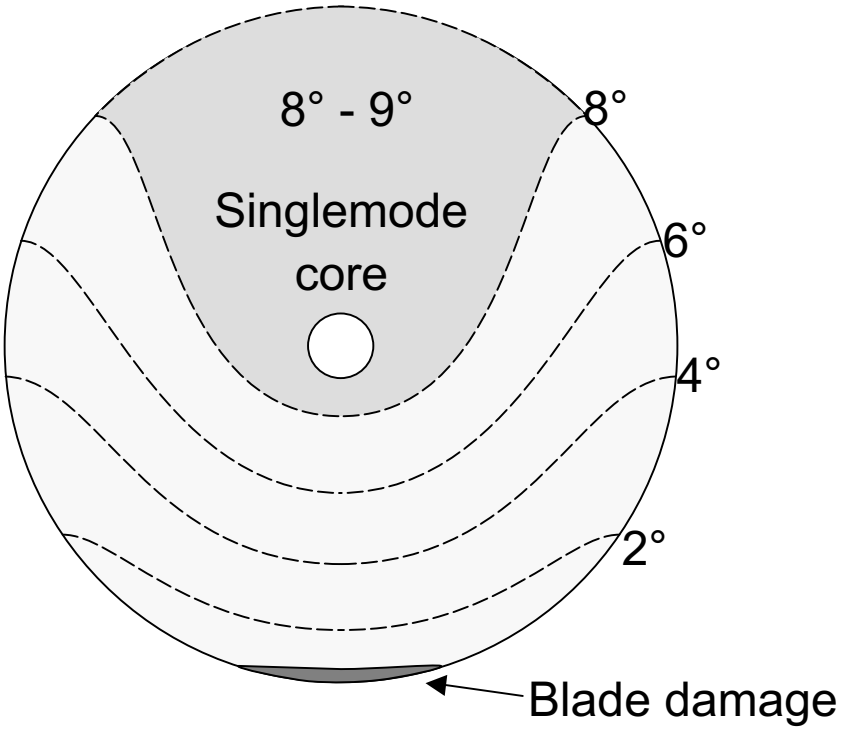
The diamond blade striking the fiber at a glancing angle ensures the cladding is scored precisely without excessive blade ingress or damage.

The small score provides a stress concentration point which starts a crack propagating across the fiber. The resultant cleaved fiber end is mirror-smooth over the core region, with any blade damage penetrating less than 5 µm into the fiber cladding.



HSAFC-2008 angled cleaver

The cleaved end has an average end angle of 8.0° with a standard deviation of less than 0.5° over the region of the core of the optical fiber. The cleaved end is at an angle which is approximately constant over the region of the core of the single mode fiber. However, the region of the cleaved end close to the diamond blade score has a lower end angle.



Warranty

These precision fiber cleavers are fully guaranteed for parts and labour for a 12 month period. However, the diamond blade is not included within this guarantee. Furthermore, the manufacturer accepts no responsibility for damage arising from misuse of the cleaver.

Service

The cleaver may be serviced by your local agent or returned to the factory in the UK, explaining the problems encountered.

Address for UK Factory:

Oxford Fiber Ltd.,
244 Hillmorton Road
Rugby CV22 5BQ
U.K.

TEL: +44 (0)1788 57 67 00
FAX: +44 (0)870 0516 877
e-mail: sales@oxfordfiber.com
www.oxfordfiber.com

Illustrations and printed by Lucid Optical Services Ltd.

Instructions for printing this leaflet:

First print run

2, 23, 4, 21, 6, 19, 8, 17, 10, 15, 12, 13

Second print run

24, 1, 22, 3, 20, 5, 18, 7, 16, 9, 14, 11