OptiSplice™ CDS and OptiSplice LID

Field Fusion Splice Systems and Accessories

EMEA, APAC & China Edition

Issue 2

CORNING

Requirements for Field Fusion Splice Systems

Depending on the application required, splice systems for use in the field must satisfy differently weighted standards. These requirements may be a combination of the following criterias:

- Universal fiber suitability
- High quality of the splicing results
- Reliable splice analysis
- Reproducibility
- Highest possible efficiency
- Maximum of user friendliness (ergonomics)
- Convenient user interface
  (display, software structure, user languages)
- Low susceptibility
- Easy to maintain
- Minimum size and weight of equipment
- Additional functions
- Large variety of accessories
- Flexible capability for different applications

OptiSplice CDS and OptiSplice LID Field Fusion Splice Systems

The OptiSplice CDS and OptiSplice LID splice systems were developed in order to provide the ideal solution for all conceivable applications in the field.
Both fusion splice systems have a rugged design to ensure high reliability even for the future. This focus on a stable value in operation for years stands for maximum protection of investment.

The units may be combined with either the high-speed heat-shrink oven RapidoShrink or the RapidoCrimp crimping device. The high-speed heat-shrink oven RapidoShrink allows for shrink times of less than 20 seconds with standard heat-shrink splice protectors and can be controlled by the fusion splicer.

The OptiSplice CDS is equipped with CDS (Core Detection System) as well as with L-PAS™ (Lens-Profile Alignment System).

The CDS splice process control system is primarily used in applications where speed is given top priority. This system achieves outstanding splice results. Due to this system, the speed of the splice process including core-to-core alignment is optimized to a few seconds.

The video image evaluation system L-PAS is used for fast pre-alignment, end-face evaluation and contamination detection (dirt and dust) as well as for fiber position analysis. According to the applied process, it is also used for splice loss estimation. Furthermore, the L-PAS is applied for process control of very fast splice processes in video mode or for multimode fiber splicing.

In addition to CDS and L-PAS, the OptiSplice LID is working with the LID-System™ (Local light Injection and Detection). The LID-System enables high-precision core-to-core alignment, optimization of each splice process by AFC™ (Automatic Fusion-time Control), and real splice loss measurement with extremely high correlation between displayed and real splice loss. Consequently, excellent splicing results even for non-identical fibers with high core eccentricities are achieved and displayed with highest accuracy.

The OptiSplice LID offers as well the function of automatic fiber type detection (to be enabled or disabled by the user).

By means of the LID measurement, high precision attenuation splices with an accuracy of 0.1 dB can be generated. Using suitable splice protectors, they can be applied as attenuators.

In accordance with the respective requirement, the focus can be put on either speed or precision by selecting CDS or LID mode. Due to the high precision in LID mode, the accuracy of the fiber end analysis and the measurement of the splice loss are improved significantly compared to CDS.

Both OptiSplice fusion splicers may be run independently from the mains by a 7.2 Ah lithium ion battery. The typical operating period with one battery charge is seven hours.

One battery is included in the respective kit; additional batteries may be ordered separately. Charging the battery is carried out in an independent charger consisting of a power supply unit and a charging tray. By using a second battery, the fusion splicer may be run mains-independently during the charging time of the first.

The dimensions of the fusion splicers are very compact: 240 mm x 200 mm x 110 mm (L x W x H); the weight is only about 2.0 kg / 2.5 kg without / with battery.

The integrated Global Positioning System (GPS) allows for automatic altitude adjustment above sea level as well as for storing the local coordinates of the splice point with all splice data.

The case included in the kit may be used for transport only or even as a working station which provides for even more protection of the fusion splicer in use.

The OptiSplice LID and OptiSplice CDS fusion splice systems are fully compliant with the requirements of the European Union according to 2002/95/EC (RoHS compatibility) and to 2002/96/EC (WEEE). The units are as well CE compliant according to 89/336/EWG (electro magnetic compatibility) and 73/23/EWG (low voltage directive).

Splice Process Control Systems of OptiSplice CDS and OptiSplice LID

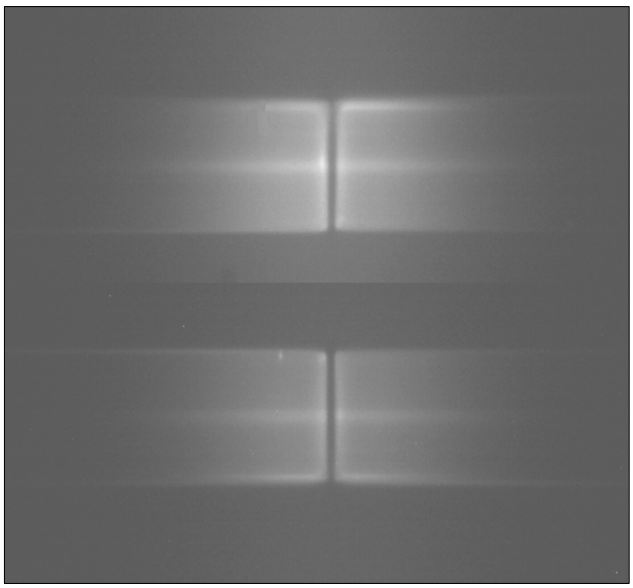
CDS Core Detection System

The CDS is a very fast system for the core-to-core alignment in three axes and guarantees minimal splice loss. With this system, the splice cycle period including the core-to-core alignment is reduced to a few seconds, the splice results being of excellent quality.

The position and size of the fiber cores are analyzed in the digital picture of the splice area during the CDS core detection process. A brief arc causes the fiber to light up. Due to the different doping of the fiber core, its brightness is higher than the cladding.
For an accurate three-dimensional evaluation, the core is examined from x- and y-directions separately.

The microcontroller of the fusion splicer analyzes the digital picture of both views and verifies the fiber geometry. This determines the three-dimensional position of the core in both fiber ends and is used for the core-to-core alignment.

To counteract the self-centering effect at high core cladding eccentricity, the splice process control automatically optimizes the anticipated misalignment by setting up a corresponding reverse misalignment.
To optimize the splice loss estimation, the fiber offset, after the core-to-core alignment, is taken into account for a better correlation between the displayed and the real value.

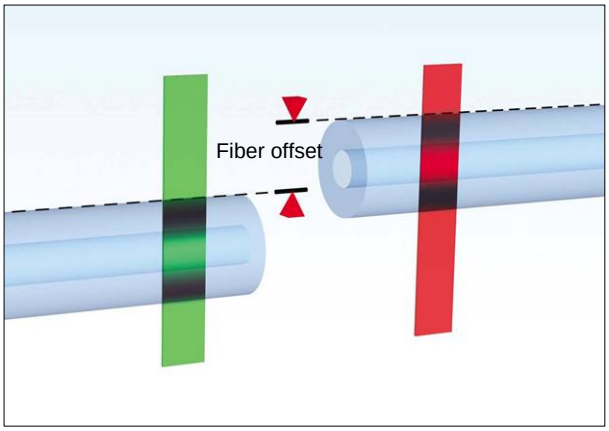


Picture of Fibers of the Core Detection System in x- and y-view

L-PAS™ Video Image Evaluation

The picture of the fiber ends is evaluated by the L-PAS (Lens Profile Alignment System) video image evaluation system. The image of the fiber ends is detected by using two optical systems as well as two cameras in two views (x- and y-axis). For further analysis, the video image is digitized and afterwards used for fiber position detection, end-face quality assessment and detection of contamination (dirt and dust).

To control the fiber alignment, L-PAS uses the luminance profile of the relevant video image columns and rows. These profiles comprise all visible fiber details, including potential shadows along the fiber center, possible damages, fiber offsets as well as particles of dust and dirt.

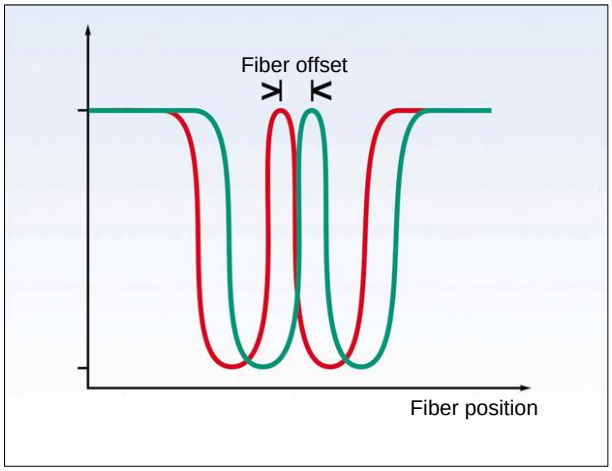


Two Video Columns to be Measured in one View of a Fiber Pair with Offset
(Luminance Profile: see page 5)

A cross correlation method facilitates the exact calculation of the fiber position by the luminance profiles of both fiber views.
As an example, the illustration above shows two video columns and the typical course of the luminance profiles of an opposite fiber pair with fiber offset in one view. Any deviations (offsets) are determined using the cross correlation function of all relevant brightness profiles along the entire fiber.

Subject to the process applied, the splice loss estimation is done on the basis of the offset data taken before and after the fusion process.
The L-PAS is also used as process control for very fast splice processes in video mode or, on principle, for splicing multimode fibers.

Splice Process Control Systems of OptiSplice CDS and OptiSplice LID



Common Luminance Profiles of each Column of two opposite Fiber Ends

The L-PAS™ enables in all fusion splicers the fast pre-alignment, the patented automatic compensation for bad cleave angles up to 2.5 ° between both fiber ends as well as the detection of intolerable fiber axis angles (poor fiber position in the v-groove). To repeat the fiber preparation is therefore very rarely necessary.

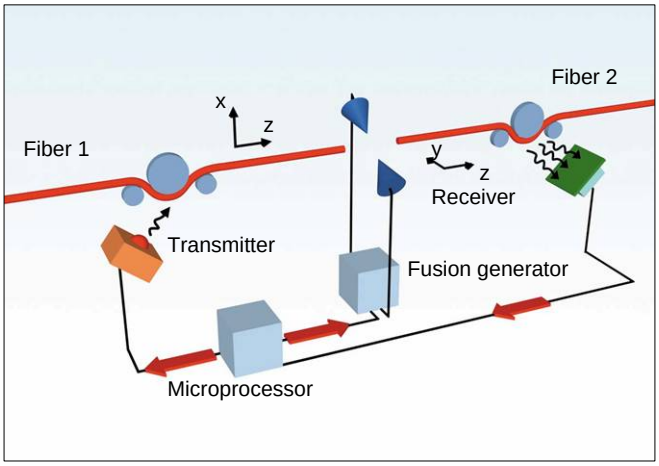
LID-System™ (OptiSplice LID only)

The well-known and proven LID-System (Local light Injection and Detection) enables power-through measurement, thus allowing:

- High-precision core-to-core alignment
- Automatic fusion-time control AFC™
- Splice loss measurement
- Automatic fiber type detection by means of mode-field scanning
- High precision attenuation splices

Light in the single-mode range with a measuring wavelength of 1,300 nm is injected into the core of the fiber by the left bend coupler (transmitter) and is decoupled from the other fiber by the right bend coupler (receiver). The received light level is then measured and used for the control of the different processes.

The LID-System is suitable for all commercially available fibers with a primary coating of 250 µm in diameter.

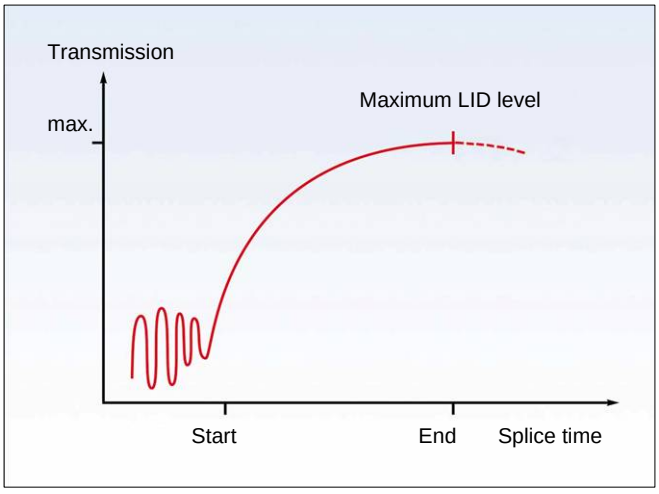


Schematic diagram of the LID system

Automatic Fusion-time Control AFC

With AFC the light power transmitted through the splice is evaluated during the fusion process. The operation is terminated with attaining the best possible transmission.

Fiber characteristics, the condition of the electrode and changing environmental conditions (humidity, barometric pressure, temperature, etc.) are thus compensated; the lowest possible splice loss is guaranteed for each individual splice by the optimum core-to-core alignment.



Schematic diagram: Automatic Fusion-time Control AFC

OptiSplice CDS Fusion Splicer

The OptiSplice CDS fusion splicer is the optimal solution for the fast high-quality splicing of single fibers. The OptiSplice CDS satisfies all demands on a high-speed, reliable, compact, rugged, long-lifespan and precise field fusion splicer.

- For splicing all common single- and multimode fibers as well as special fiber types (titanium coated, LS, DS and NZDS fibers such as TrueWave™ and LEAF™)
- For Telco, CATV, Long-Haul, Enterprise und FTTx networks in which low splice loss is required
- Wherever reliable and reproducible splice results are required, regardless of fiber type, fiber manufacturer, fiber preparation quality and operator capabilities

The OptiSplice CDS splice system is equipped with the core detection system CDS™ for core-to-core alignment as well as the high-resolution video image evaluation system L-PAS™.

OptiSplice CDS Fusion Splicer with Mounted Shrink Oven RapidoShrink

Features

- Fully automatic splice process
- Fast and precise core-to-core alignment by CDS core detection system
- 6.4 inch color TFT display (VGA resolution) with simultaneous digital display of both fiber views in 140x magnification
- High-resolution video image evaluation system L-PAS for fast pre-alignment, evaluation of fiber end-face, contamination and fiber axis angle detection
- Selectable auto-start function (Start by closing the electrode flap)
- Integrated Global Positioning System (GPS)
- Altitude compensation from -2,000 m up to 4,500 m above sea level, manually adjusted or automatically by GPS
- Tensile test capability with adjustable force between 0.1 N and 4.5 N
- Four preset programs for all standard fiber types (two for each single mode and multi mode fiber)
- 19 preset programs for special fiber types (programs for titanium-coated, LS-, DS- and NZDS-fibers as for example TrueWave and LEAF, program for dissimilar fibers as well as erbium doped fibers)
- Long-lifespan, maintenance-free P&D electrodes
- Memory space for up to 200 user-defined programs
- Splice data memory for up to 6,000 data sets including splice number, program in use, splice loss, position coordinates (GPS) and date
- Serial RS232 / V.24 interface to download splice data and parameter sets plus software update
- TV-output port (PAL)
- Tilt base to work ergonomically
- USB port to connect USB work lamp (USB work lamp optional)
- Plug-in slot for 7.2 Ah lithium ion battery and capacity control
- Separate 80 W desktop power supply unit
- Separate battery charger consisting of a power supply unit and a charging tray
- 12 V DC port to connect additional accessories

Technical Data of the OptiSplice CDS

Procedure	Three-axis core-to-core alignment with CDS and three-axis positioning according to outer cladding contour with video image evaluation system L-PAS™
Suitable fibers	Single- and multimode optical fibers with cladding diameter 125 µm and coating diameters of 250 µm to 900 µm
Fiber clamping	On 125 µm cladding
Splice loss (for identical fibers)	• Multimode fibers, typically < 0.01 dB • Standard single-mode fibers, typically < 0.02 dB • Dispersion-shifted fibers typically < 0.05 dB • NZDS fibers, typically < 0.04 dB
Accuracy of splice loss estimation	Typical deviations in CDS mode < 0.03 dB
Splice operation	Fully automatic or by hand step-by-step
Splice process control system	• CDS with precise core-to-core alignment • Video mode (L-PAS) for cladding alignment, pre-alignment and fiber evaluation
Fiber alignment	Pre-alignment in z-direction with stepper motors, three-axis precision alignment with piezo-ceramic actuators
Splice analysis	Splice loss estimation (CDS / Video); tensile test with adjustable force between 0.1 N and 4.5 N
End-face evaluation	Cleave angle detection, end-face quality evaluation, fiber position evaluation, core evaluation (CDS), contamination detection
Fiber display	High-contrast 6.4 inch color TFT monitor (VGA resolution), 140 x magnification
Splice cycle time	CDS: 15 s to 25 s Video (L-PAS): 10 s to 15 s
Splice protection	Heat-shrink splice protector or crimp splice protector (selectable)
Additional software features	• 23 fixed programs for different fiber types • Up to 200 user-defined programs • Splice data memory for 6,000 datasets incl. GPS data • Selectable auto-start function • Selectable splice process mode either CDS or Video (L-PAS) • Automatic altitude compensation with GPS • Automatic compensation for poor fiber axes alignment • Automatic compensation for poor cleave angle up to 2,5 ° • Compensation of altitude from - 2,000 m up to 4,500 m above sea level by hand or automatically by GPS • Selectable energy-saving function in battery mode • Automatic initial self-test • Operating hours and total splice counters • Electrode replacement and cleaning display in programmable intervals • Time and date display • Service support by special analysis programs
Interfaces	• RS232 / V.24 • GPS antenna socket • Video signal Cinch PAL 75 Ohm (TV-output port)

Technical Data of OptiSplice CDS

Environmental data	• Operating temperature: - 15 °C to + 50 °C • Storage temperature: - 40 °C to + 80 °C • Relative humidity < 93 % non-condensing
Dimensions of basic unit	240 mm x 200 mm x 110 mm (L x W x H)
Weight of basic unit	Without battery: 2.0 kg or with battery: 2.5 kg
Power supply	• External 12 V DC / 80 W desktop power supply; input voltage 100 V AC to 240 V AC / 47 Hz to 63 Hz • Internal 7.2 Ah lithium ion battery, exchangeable without tools, for about 7 h continuous working time (if fully charged) with typically 200 splice operations without shrink oven and typically 130 splice operations with fast heat-shrink oven RapidoShrink working

Order numbers of the OptiSplice CDS Fusion Splicer Kits

OS2-CDSKST-1	OS2-CDSKCT-1	Description	Order number
		OptiSplice CDS fusion splicer kit, RapidoShrink version with accessories	OS2-CDSKST-1
		OptiSplice CDS Spleißgeräte-Kit, RapidoCrimp version with accessories	OS2-CDSKCT-1
1	1	OptiSplice CDS basic unit	OS2-CDSUNIT-1
1	1	FBC-006 cleaver	CLV-FBC006-1
1		RapidoShrink heat-shrink oven with connecting cable	OS-RPDSHRINK-1
	1	RapidoCrimp crimp device	OS-RPDCRIMP-1
	1	Mounting bracket for RapidoCrimp crimp device	OS-CRMPMOUNT-1
1	1	7.2 Ah lithium ion battery	OS-LIIONBATT-1
1	1	Charger with charging tray, power supply unit and power cable with EU connector	OS2-CHARGESET-1
1	1	Deluxe case for transport and as working station	OS2-DLXCASE-1
1	1	Power supply unit with cable (EU connector)	OS2-PWRSUPL-EU
1	1	Maintenance tool set	OS2-TOOLKIT-1
1	1	GPS antenna	GPS-ANTENNA
1	1	Operating Instructions on CD plus short guide in German and English	OS2-MANDGB-1
1	1	USB work lamp	U-USBLAMP-1
1	1	Protective glasses for v-groove area, replacement set (10 pcs.)	OS2-PRTSETV-1
1	1	Protective glasses for electrode flap, replacement set (10 pcs.)	OS2-PRTSETE-1
1	1	Spare P&D electrodes (1 pair)	OS-PDELECTRO-1

Scope of delivery

Upon delivery, the OptiSplice CDS fusion splicer is equipped with a pair of P&D electrodes. The OptiSplice CDS fusion splicer kit is accompanied by diverse accessories such as case, battery, cleaver and a pre-mounted splice protection device. The unit with accessories and replacement sets is assembled in the case. The basic unit as well as all accessory components may be ordered separately.

OptiSplice LID Fusion Splicer

The OptiSplice LID is the perfect solution for all single-fiber applications in the field.

It meets highest demands for splice quality and reliability and satisfies all requirements for a fast, compact, rugged, long-lifespan and high-precision field fusion splicer.

- For splicing all common single- and multimode fibers as well as special fiber types (titanium coated, LS, DS and NZDS fibers such as TrueWave™ and LEAF™)
- For Telco, CATV, Long-Haul, Enterprise und FTTx networks in which low splice loss is required
- Wherever reliable and reproducible splice results are required, regardless of fiber type, fiber manufacturer, fiber preparation quality and operator capabilities

In addition to CDS and L-PAS™, the OptiSplice LID uses the proven LID-System™ (Local light Injection and Detection). Thanks to these three splice process control systems of the OptiSplice LID, the priority can be either set upon speed or precision in accordance with the requirement at hand. By choosing the LID system for splice process control, considerably more flexibility and performance will be available for a small extra charge compared to OptiSplice CDS.

The LID-System offers amongst others the automatic fusion-time control AFC™. With the automatic fusion-time control in operation, the light power transmitted through the splice is evaluated during the fusion process. The fusion operation is terminated at the time with attaining the best possible transmission. This automatically compensates for different fiber characteristics, electrode condition and changing environmental conditions (humidity, barometric pressure, temperature, etc.) so that the lowest possible splice loss is achieved for each individual splice.

OptiSplice LID Fusion Splicer with Optional Accessories (included in the kit´s scope of delivery)

Even while operating in the CDS mode, the unit checks in the background if the AFC can be used. If yes, each individual splice is optimized for best transmission without any loss of time in CDS mode.

Furthermore, with the LID-System in operation, the fiber position analysis is very precise and the correlation of the results of the splice loss measurement compared to reality is excellent.

The LID-System additionally allows for generating high precision attenuators.

The video image evaluation system L-PAS is basically utilized for fast pre-alignment, end-face evaluation and contamination (dirt and dust) detection as well as for fiber position analysis and splice loss estimation.

Features of the OptiSplice LID

- Fully automatic splice process
- High-precision core-to-core alignment with LID-System™ or fast and precise core-to-core alignment with CDS
- Best possible splice loss by optimizing each individual splice with automatic fusion-time control AFC™ even in CDS mode operation (if possible)
- Real splice loss measurement with LID-System or splice loss estimation with CDS
- Automatic fiber type detection with LID-System
- 6.4 inch colour TFT display (VGA resolution) with simultaneous digital display of both fiber views in 140x magnification
- High-resolution video image evaluation system L-PAS™ for fast pre-alignment, evaluation of fiber end-face, contamination, fiber position and fiber axis angle
- Selectable auto-start function (Start by closing the electrode flap)
- Integrated Global Positioning System (GPS)
- Altitude compensation from -2,000 m up to 4,500 m above sea level, manually adjusted or automatically by GPS
- Tensile test capability with adjustable force between 0.1 N and 4.5 N
- Five preset programs for all common standard fiber types (3 single-mode-, 2 multimode fiber programs)
- 30 preset programs for special fiber types (Programs for titanium-coated, LS-, DS- and NZDS-fibers as for example TrueWave™ and LEAF™, variable fusion curve program and programs for critical dissimilar fibers as well as erbium doped fibers)
- Two programs for attenuation splices to create high-accuracy attenuators in the range of 0.1 dB to 10 dB in 0.1 dB increments for 1,310 nm and 1,550 nm wavelength
- Long-lifespan, maintenance-free P&D electrodes
- Memory space for up to 200 user-defined programs
- Splice data memory for up to 6,000 data sets including splice number, program in use, splice loss, position coordinates (GPS) and date
- Serial RS232 / V.24 interface to download splice data and parameter sets plus software update
- TV-output port (PAL)
- Tilt base to work ergonomically
- USB port to connect USB work lamp (USB work lamp optional)
- Plug-in slot for 7.2 Ah lithium ion battery and capacity control
- Separate 80 W desktop power supply unit
- Separate battery charger consisting of a power supply unit and a charging tray
- 12 V DC port to connect additional accessories

OptiSplice LID Fusion Splicer with mounted heat-shrink oven RapidoShrink

Technical Data of OptiSplice LID Fusion Splicer

Procedure	Three-axis, core-to-core alignment with LID-System™ or CDS and three-axis positioning according to outer cladding contour with video image evaluation system L-PAS™
Suitable fibers	Single and multimode optical fibers with cladding diameter of 125 µm and coating diameters of 250 µm to 900 µm
Fiber clamping	On 125 µm cladding
Splice loss (for identical fibers)	• Multimode fibers, typically < 0.01 dB • Standard single-mode fibers, typically < 0.02 dB • Dispersion-shifted fibers, typically < 0.04 dB • NZDS fiber, typically < 0.03 dB
Accuracy of splice loss measurement	Typical deviations in LID mode < 0.02 dB
Splicing operation	Fully automatic or by hand step-by-step
Splice process control system	• LID-System with core-to-core alignment and automatic fusion-time control AFC™ • CDS with precise core-to-core alignment • Video mode (L-PAS) for cladding alignment, pre-alignment and fiber evaluation
Fiber alignment	Pre-alignment in z-direction with stepper motors, three-axis precision alignment with piezo-ceramic actuators
Splice analysis	Splice loss measurement (LID-System), splice loss estimation (CDS / Video); tensile test with adjustable force between 0.1 N and 4.5 N
End-face evaluation	Cleave angle detection, end-face quality evaluation, fiber position evaluation, core evaluation (CDS), contamination detection
Fiber display	High-contrast 6.4 inch TFT monitor (VGA resolution); 140 x magnification
Splice cycle time	LID system: 35 s to 45 s CDS: 15 s to 25 s Video (L-PAS): 10 s to 20 s
Splice protection	Heat-shrink splice protector or crimp splice protector (selectable)
Additional software features	• 35 fixed programs for different fiber types and two attenuation splice programs • Up to 200 user-defined programs • Splice data memory for 6,000 data sets incl. GPS data • Selectable auto-start function • Selectable splice process mode (LID, CDS or Video) • Automatic selection of the suitable splice process control system • Automatic altitude compensation with GPS • Automatic compensation for poor fiber axes alignment • Automatic compensation for poor cleave angle up to 2.5 ° • Attenuation splice function for wavelengths 1,310 nm and 1,550 nm in 0.1 dB increments from 0.1 dB to 10 dB • Selectable automatic fiber type detection • Compensation of altitude from -2,000 m up to 4,500 m above sea level by hand or automatically by GPS • Selectable energy-saving function in battery mode • Automatic initial self-test • Operating hours and total splice counters • Electrode replacement and cleaning display in programmable intervals • Time and date display • Service support by special analysis programs

Technical Data of OptiSplice LID

Interfaces	• Video signal PAL, cinch socket 75 Ohms (TV-output port) • RS232 / V.24 • GPS antenna port • External LID transmitter (pigtail adapter), 3.5 mm socket
Environmental data	• Operating temperature: - 15 °C to + 50 °C • Storage temperature: - 40 °C to + 80 °C • Relative humidity < 93 % non-condensing
Dimensions of basic unit	240 mm x 200 mm x 110 mm (L x W x H)
Weight of basic unit	Without battery: 2.0 kg or with battery: 2.5 kg
Power supply	• External 12 V DC / 80 W desktop power supply; input voltage 100 V AC to 240 V AC / 47 Hz to 63 Hz • Internal 7.2 Ah lithium ion battery, exchangeable without tools, for about 7 h continuous working time (if fully charged) with typically 200 splice operations without shrink oven and typically 130 splice operations with fast heat-shrink oven RapidoShrink working

Order Numbers of OptiSplice LID Fusion Splicer Kits

OS2-LIDKST-1	OS2-LIDKCT-1	Description	Order number
		OptiSplice LID fusion splicer kit, heat-shrink oven version with accessories	OS2-LIDKST-1
		OptiSplice LID fusion splicer kit, crimp device version with accessories	OS2-LIDKCT-1
1	1	OptiSplice LID basic unit	OS2-LIDUNIT-1
1	1	FBC-006 cleaver	CLV-FBC006-1
1		RapidoShrink heat-shrink oven with connecting cable	OS-RPDSHRINK-1
	1	RapidoCrimp device	OS-RPDCRIMP-1
	1	Mounting bracket for RapidoCrimp device	OS-CRMPMOUNT-1
1	1	7.2 Ah lithium ion battery	OS-LIIONBATT-1
1	1	Charger with charging tray, power supply unit and power cable with EU connector	OS2-CHARGESET-1
1	1	Deluxe case for transport and as working station	OS2-DLXCASE-1
1	1	Power supply unit with cable (EU connector)	OS2-PWRSUPL-EU
1	1	Maintenance tool set	OS2-TOOLKIT-1
1	1	GPS antenna	GPS-ANTENNA
1	1	Operating Instructions on CD plus short guide in German and English	OS2-MANDGB-1
1	1	USB work lamp	U-USBLAMP-1
1	1	LID coupler films, replacement set (two, one each side)	OS2-LIDFILM-1
1	1	Protective glasses for v-groove area, replacement set (10 pcs.)	OS2-PRTSETV-1
1	1	Protective glasses for electrode flap, replacement set (10 pcs.)	OS2-PRTSETE-1
1	1	Spare P&D electrodes (1 pair)	OS-PDELECTRO-1

Scope of Delivery

Upon delivery, the OptiSplice LID fusion splicer is equipped with a pair of P&D electrodes. The OptiSplice LID fusion splicer kit is accompanied by diverse accessories such as case, battery, cleaver and a pre-mounted splice protection device. The unit with accessories and replacement sets is assembled in the case. The basic unit as well as all accessory components may be ordered separately.

FBC-006 Cleaver

The FBC-006 cleaver is suitable for all OptiSplice single fiber fusion splicers, but can also be used for other cleave applications. The simple operation and maintenance of the FBC-006, combined with its excellent cleaving quality and attractive pricing, makes it the perfect choice. The FBC-006 cleaver is fully compliant with the RoHS requirements of the European Union (according to 2002/95/EC).

Applications

- Cleaving of all common single- and multimode fibers plus special fiber types (LS, DS and NZDS fibers such as TrueWave™ and LEAF™) with a cladding diameter of 80 µm to 125 µm
- For single fibers with a coating diameter of 250 µm to 900 µm (cleaver is equipped with universal fiber guide as standard)

FBC-006 Cleaver

Features

- Average cleave angle deviation with standard single-mode fiber: < 0.35 °
- Simple, fast operation: Fiber clamping, bending, scribing and breaking at the push of a finger
- Diamond cleave blade for high cleave quality and long-lifespan
- Diamond cleave blade easily replaceable in the field
- Low susceptibility and sensibility to contaminations as well as simple cleaning

Order Numbers for FBC-006 Cleaver

Description	Order number
FBC-006 cleaver	CLV-FBC006-1
Replacement diamond blade	CLV-FBC6BLADE-1

Scope of Delivery

The FBC-006 cleaver is delivered in a plastic transport case with detailed operating instructions, 25 cleaning strips and an Allen key to change the fiber guide and diamond blade. There is space provided for this case in the deluxe transport and workstation case.

P&D Electrodes

Impact of Condition of Electrodes

A reproducible and stable arc is imperative for high-quality splicing. The condition of the electrode exerts the greatest influence on the quality of the arc. In case of wear or contamination, e.g. by glass particles vaporized during fusion, the condition of the electrodes changes. Consequently, electrode cleaning (by hand or by a cleaning arc) or a complete replacement of the electrodes is necessary from time to time.

P&D Electrodes (Precise & Durable)

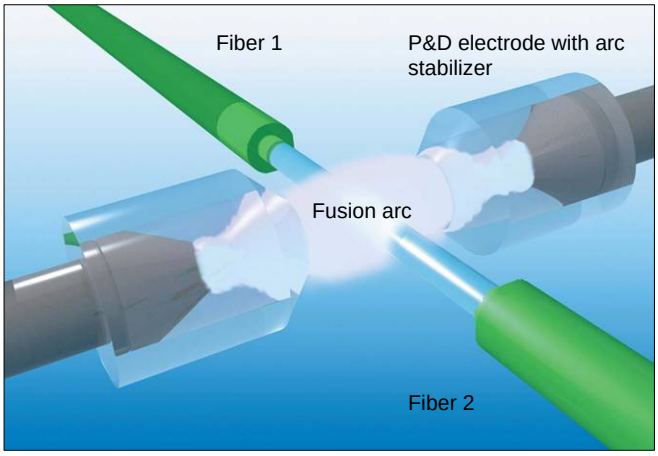
The patented P&D electrodes used in the OptiSplice CDS and OptiSplice LID fusion splicers are maintenance-free and trouble-free. Compared to standard electrodes, they reduce the average splice loss by up to 50 %. The P&D electrodes also reduce the standard deviation of the splice loss values down to 0.02 dB (with high eccentric fibers).

The arc stability ensures a precisely defined, uniform heating of the fibers directly at the splice point. This is a major prerequisite for splices with continuously low splice loss, especially for NZDS fibers (e.g., LEAF™, TrueWave™).

The arc stabilizer of the P&D electrodes guarantees maximum splicing precision and an extreme long-lifespan. A cleaning arc, automatically ignited by the fusion splicer on a regular basis (interval adjustable), ensures at least 7,000 splicing operations with minimal splice loss (typically with SMF 28e).

A mechanical cleaning with insertion and removal of the P&D electrodes is not necessary.

The P&D electrodes are fully compliant with the RoHS requirements of the European Union (according to 2002/95/EC).



P&D Electrodes with arc stabilizing Quartz Glass Tubes

Features

- No manual cleaning required
- Less time for maintenance means more time to splice
- Stabilization of the electric arc and thus of the fusion process
- Trouble-free arc for uniform heating of the fibers
- 50 % lower splice loss for higher productivity
- Protection of electrode tips against damage

Order Number for P&D Electrodes

Description	Order number
Spare P&D electrodes (1 pair)	OS-PDELECTRO-1

Splice Protection Process with Heat-shrink Splice Protector

The first step when splicing optical glass fibers is to gain access to the cladding by removing the coating. After splicing, this unprotected area must once again be protected against environmental influences and mechanical damage.

Heat-shrink splice protectors comprise an inner EVA (ethylene vinyl acetate) tube, a reinforcement element and an outer polyolefin heat-shrink splice tube. The splice protector is slipped over the splice area and the heat from the oven then shrinks it over the splice. During this process the EVA tube melts and adheres to the cladding surface and to the coating which is also securely enveloped. The optical fiber is hermetically enveloped and protected against environmental influences and mechanical damage. Heat-shrink ovens are used to feed the heat to the splice protector.

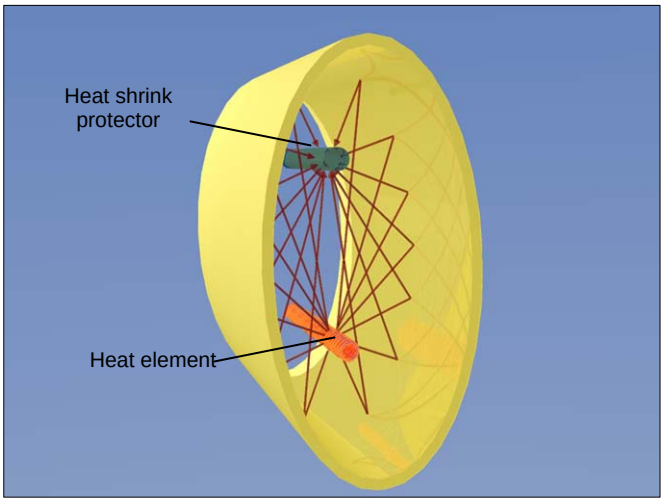
Principle of Conventional Heat-shrink Ovens

Normally the splice protector is inserted in a U-shaped groove which is heated by an electric heating element. The disadvantage of this technology is that both the heating element and the U-groove have to be heated before the U-groove heats the splice protector itself. In actuality, only a small portion of the U-groove touches the surface of the cylindrical splice protector. The majority of the U-groove heats the air in the oven compartment and this heated air in turn heats the splice protector. This approach costs both much time as well as energy.

Principle of the Heat Radiating Heat-shrink Oven

The basic idea of this innovative heat-shrink oven concept is the reduction of the amount of material to be heated combined with direct transportation of heat to the splice protector. One efficient method of importing heat into objects is to utilize heat radiation. To generate heat radiation efficiently, electricity is transported through an appropriately dimensioned wire. At an suitable amperage the wire begins to glow and radiates heat.

A tube-shaped mirror with an elliptical cross section is an obvious choice to direct the heat radiation generated by the wire onto the cylindrical splice protector. When the wire and the splice protector are in the two focal points of the elliptical cross section of the reflector the mirror directs virtually all of the heat radiation generated by the wire.



Distribution of heat radiation in the mirror ellipse

Concept of Heat Radiation Transmission

This design eliminates virtually all parasitic consumption of energy by heating components such as the U-shaped heating element of traditional heat-shrink ovens and the air in the oven chamber, from which nothing is gained. Only the heating wire has to be heated. Compared to the heating element of conventional ovens however, it possesses very little volume and weight, therefore the concept of heat radiation transmission is extremely energy efficient. Consequently, the new heat-shrink oven concept enables more splices with one battery charge. Since only a small wire has to be heated, the heat-up phase with the new design is extremely fast. As a result, the heat-shrink phase begins sooner and total shrink cycle time is significantly reduced. When the splicing process sequence is optimal, significantly more splices can be produced per hour than with a conventional heat-shrink oven.

RapidoShrink Fast Heat-shrink Oven for OptiSplice Fusion Splicers

The RapidoShrink fast heat-shrink oven offers innovative technology in line with the OptiSplice fusion splicers. Its gold coated reflector enables shrink times of less than 20 seconds for 60 mm heat-shrink protectors. There is 50 % less energy consumption with the new concept than with the standard heat-shrink ovens. The heat-shrink oven is one of the significant energy consumers, therefore this new model greatly extends the operating time of the fusion splicers in the battery mode.

The RapidoShrink heat-shrink oven is available with cables for the OptiSplice fusion splicers or as an autonomous device for operation independently from a fusion splicer. The oven is powered by OptiSplice fusion splicers and can be controlled via their software.

As an autonomous device, the oven is mounted on a stand and can be programmed with the aid of two rotary switches. The autonomous solution is shipped with a power supply.

The RapidoShrink heat-shrink oven is fully compliant with the RoHS requirements of the European Union (according to 2002/95/EC).

Features

- For fast, defined shrinking of all common heat-shrink splice protectors on single-fiber or ribbon splices
- Fully automatic control via the software of the OptiSplice fusion splicer systems
- Manual control with 16 heating power stages and 16 selectable heating times from 15 s to 75 s
- Suitable for common heat-shrink splice protectors
- Heat-up time significantly less than 10 s
- Shrink cycle time less than 20 s for common single-fiber heat-shrink splice protectors
- Low energy consumption
- Status displayed by LED (heating, cooling, removing)

RapidoShrink Fast Heat-shrink Oven

Order Numbers for RapidoShrink

Description	Order number
RapidoShrink fast heat-shrink oven with connection cable for OptiSplice fusion splicers	OS-RPDSHRINK-1
RapidoShrink version with stand and desktop power supply	U-RPDSHRINK-3

Scope of Delivery

The RapidoShrink fast heat-shrink oven is alternatively delivered with a 6-pin Mini DIN connection cable for connection to the OptiSplice fusion splicers. The autonomous version is delivered with mounted stand, desktop power supply with integrated connection cable and power cord with EU connector. The RapidoShrink oven comes with a protective shield insert for splice protectors with lengths of 45 mm and less as well as with operating instructions.

HSP Heat-Shrink Splice Protectors

After the fusion splicing, it is necessary to restore the protection of the uncoated fiber. The heat-shrink splice protector is the method employed most frequently to ensure dependable protection of a splice. After the protector is aligned over the splice point, it is applied using a heat-shrink oven. The heat-shrink splice protector lends the splice mechanical stability and protects it against environmental influences and possible damage during handling and splice storage.

Heat-Shrink Splice Protectors for Single Fibers

The heat-shrink splice protector for single fibers is used to protect single-fiber splices with coatings from 250 µm to 900 µm in diameter.

Features

- Standard length versions: 40 mm, 45 mm and 60 mm
- Available in other lengths upon request (25 mm to 60 mm in 5 mm increments)
- No additional attenuation
- Protects splices with coatings from 250 µm to 900 µm in diameter
- Protects splices with uncoated fiber length up to 40 mm (60 mm version)
- Fast and reliable heat-shrink process (depending on the heat-shrink oven type and its settings) for air-tight enclosure of the splice point
- Pre-shrunk ends for simple and error-free fiber insertion
- Stainless steel pin with rounded ends to eliminate the risk of fiber damage
- Inner EVA tube made of transparent hot-melt adhesive and with an exceptionally smooth inside wall
- Exterior heat-shrink tube, transparent, for easy alignment over the splice point
- Tested against Telcordia (Bellcore) GR-1380-CORE specification
- Fully compliant with the RoHS requirements of the European Union (according to 2002/95/EC)
- Upon request, also available with colored ID stripes (e.g. in Telecordia color scheme)

60 mm and 45 mm Heat-shrink Splice Protectors

Heat-Shrink Splice Protector for Attenuation Splices

The heat-shrink splice protector for attenuation splices provides mechanical stability and protects them against environmental influences and damage.

Features

- Fast and reliable shrinking process (depending on the type of heat-shrink oven and its settings) for air-tight enclosure of the splice point
- Semi-cylindrical glass element for supporting the fiber offset of a attenuation splice and reinforcing the splice point
- Inner EVA tube made of transparent hot-melt adhesive
- Exterior heat-shrink tube, transparent, for easy alignment over the splice point

Technical Data of the Heat-Shrink Splice Protectors for Single Fibers

	Outer Heat-Shrink tube	Inner EVA tube	Steel Pin
Length (standard)	40 mm, 45 mm or 60 mm ± 2 mm	40 mm, 45 mm or 60 mm ± 2 mm	36 mm, 41 mm or 56 mm ± 0.5 mm
Material	Polyolefin, transparent, shrink operation temperature-activated	Ethylene Vinyl Acetate (EVA) hot-melt adhesive sleeve, transparent, smooth inner wall surface	Stainless VA steel pin, burr-free, polished, rounded ends
Diameter before shrinking	3.0 mm (inside diameter)	1.5 mm – 0.15 mm (inside diameter)	1.0 mm ± 0.1 mm
Diameter after shrinking	2.6 mm ± 0.1 mm (outer diameter)	n/a	1.0 mm ± 0.1 mm
Activation temperature	90 °C to 150 °C (shrinking)	>75 °C (melting)	n/a

Order Numbers of Heat-Shrink Splice Protectors

Description	**Order number**
Heat-Shrink Splice Protector 60 mm, pack with 100 pieces	HSP-60S100-1
Heat-Shrink Splice Protector 45 mm, pack with 100 pieces	HSP-45S100-1
Heat-Shrink Splice Protector 40 mm, pack with 100 pieces	HSP-40S100-1
Heat-Shrink Splice Protector for attenuation splices, pack with 5 pieces	HSP-40R405-1

RapidoCrimp Crimping Device for Crimp Splice Protector

By using a crimp device, the crimp splice protector is precisely closed over the splice point. The RapidoCrimp device is fully compliant with the RoHS requirements of the European Union (according to 2002/95/EC).

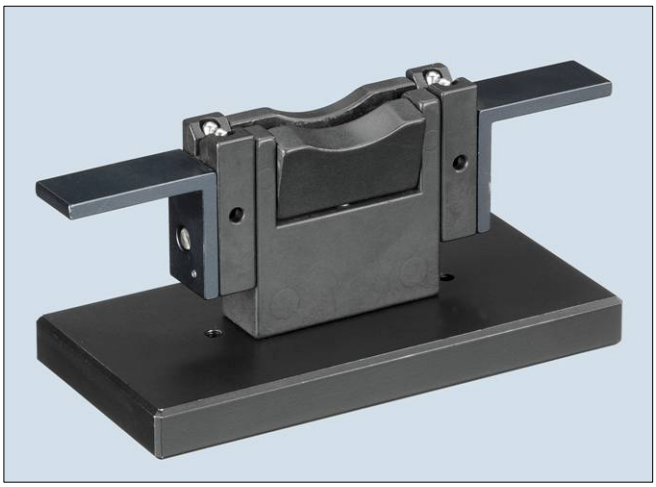
Features

- Easy to operate
- Process with no waiting time
- No electrical power required
- Maintenance-free

The crimp device is available in two versions:

- For installation on the mounting bracket of the OptiSplice fusion splicers
- With stand for use independently of the splicer

The mounting bracket which is necessary to install the crimp device on the respective fusion splicer must be ordered separately. The autonomous version is delivered with the stand installed.



RapidoCrimp Crimping Device on Stand

Order Numbers for RapidoCrimp Crimping Device

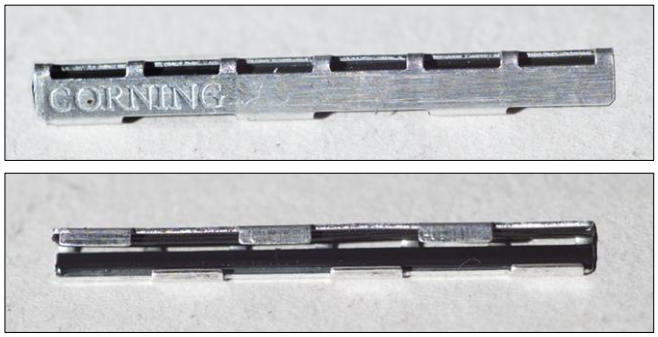
Description	Order number
RapidoCrimp crimping device for crimp splice protector	OS-RPDCRIMP-1
Mounting bracket for RapidoCrimp device	OS-CRMPMOUNT-1
RapidoCrimp crimping device for crimp splice protector on stand	U-RPDCRIMP-2

CSP-1 Crimp Splice Protector

The crimp splice protector is used to protect single-fiber splices with 250µm primary coated fibers. The uncoated fibers are unprotected at splice point and the protection must therefore be restored after the fusion splicing. The crimp splice protection offers the fastest and easiest solution for guaranteeing the required protection. It lends the splice mechanical stability and protects it from environmental influences and from damage during handling and splice tray storage. The CSP-1 crimp splice protector is fully compliant with the RoHS requirements of the European Union (according to 2002/95/EC).

Features

- Easy, safe handling
- Installation time < 5 s
- Compact dimensions 30 mm x 1.3 mm x 3.2 mm
- No electrical energy required
- Million-fold proven technology
- No additional attenuation
- Protects 250 µm splices with uncoated fiber length of up to 22 mm



CSP-1 Crimp Splice Protector

The v-shaped design enables application after splicing, eliminating threading before fiber preparation. This saves time and eliminates repeated splices resulting from a failure to apply the protector before splicing.

The compact dimensions permit maximum density storage in splice trays or splice support combs.

The v-shaped aluminum carrier is corrosion resistant, offers the required mechanical protection and, due to the precise open angle with tight tolerances, guarantees the precise compatibility with common crimp devices. Protection against environmental influences is ensured by imbedding the splice in a permanently elastic butyl mass.

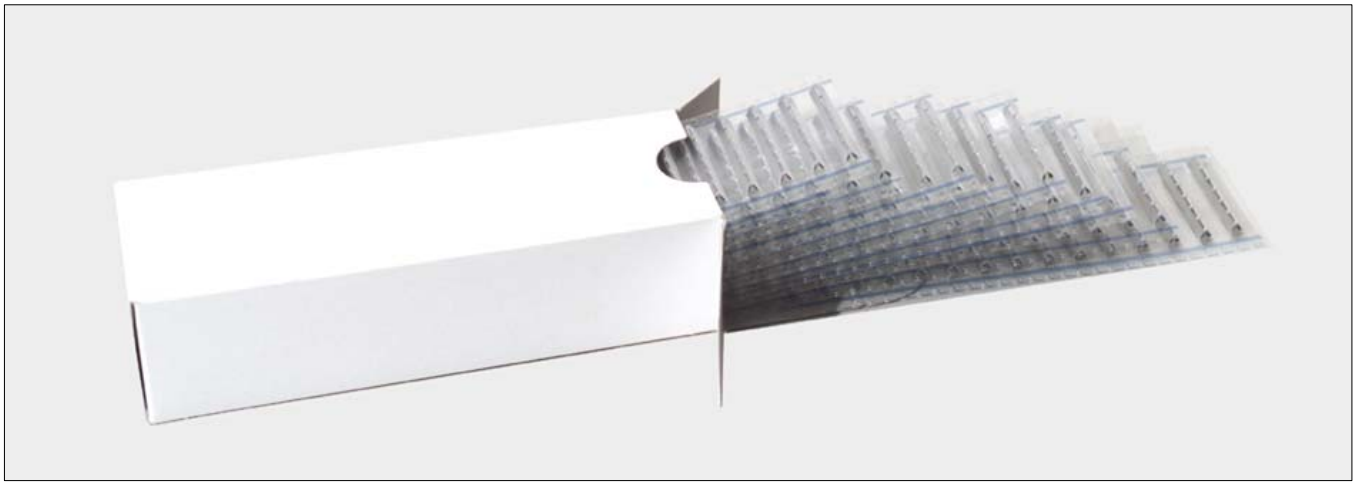
The protector can be closed manually quickly and easily with a crimp device. When the 1.3 mm crimp width (dictated by the crimp device) is observed, no additional losses or other optical influences will impact the splice. Furthermore, no additional electrical power is drawn from the batteries of the fusion splicer.

Technical Data of CSP-1 Crimp Splice Protector

Parameter	Specification
Length	30.0 mm
Width (before closing)	3.2 mm
Width (after closing)	1.3 mm (basic factory setting of Corning crimp devices)
Height	3.2 mm
Opening angle	58 ° +/- 2 °
Aluminum material thickness	0.3 mm
Packaging	10 strips with 15 pieces each (total of 150 pieces) in carton with dimensions 135 mm x 50 mm x 40 mm

Order Number for CSP-1 Crimp Splice Protector

Description	**Order number**
CSP-1 Crimp Splice Protector, 250 µm, pack with 150 pieces	CSP-1



Packaging of CSP-1 Crimp Splice Protector

Deluxe Transport and Workstation Case

The deluxe transport and workstation case is equipped with wheels and designed for OptiSplice CDS and OptiSplice LID fusion splicers. In addition to the fusion splicer, it can hold various accessories such as the FBC-006 cleaver even in separate transport packaging, the desktop power supply, the charger for lithium ion battery, the USB work lamp, a maintenance tool set and operating instructions. Due to its compact size, the case meets the requirements for airline carry-on luggage. The upper shell may be opened in an angle of more than 180 ^{o} so that the work with the fusion splicer, inserted in its working position inside of the case, may be done in the field. The positions of the cleaver and an optional bottle of fiber cleaning liquid are selected in such a way that an ergonomic work sequence is guaranteed.

Features

- Secure protection of the fusion splicer and the accessories during transport and work in the field (if used as working station)
- Pull-out handle and wheels for maximum transport friendliness
- Two handles
- Waterproof and dustproof
- Valve for automatic pressure equalization
- Lockable with two padlocks (locks not included)
- Carry-on luggage dimensions
- Dimensions: 559 mm x 351 mm x 229 mm (L x W x H)

Deluxe Transport and Workstation Case for OptiSplice CDS and OptiSplice LID

Order Number for Deluxe Transport and Workstation Case

Description	Order number
Deluxe transport and workstation case	OS-DLXCASE-1

USB Work Lamp

The USB work lamp has a goose neck for flexible adjustment of its position. Eight ultra-bright LEDs function as the light source. The OptiSplice CDS and OptiSplice LID fusion splicers are equipped with USB sockets to power the USB lamp. The USB work lamp is fully compliant with the RoHS requirements of the European Union (according to 2002/95/EC).

Features

- Very bright
- Long-living
- Little energy required
- Switch for operation with four or eight LEDs and ON/OFF
- Compact

USB Work Lamp

Order Number for USB Work Lamp

Description	Order number
USB work lamp	U-USBLAMP-1

Replacement Parts

Although the fusion splicers are designed for longevity, wear & tear is a natural effect depending on the degree of use. The wear parts on the fusion splicers are reduced to a minimum and can be replaced on site.

Order Numbers of Replacement Parts

Description	Order number
Spare P&D electrodes (1 pair)	OS-PDELECTRO-1
7.2 Ah lithium ion battery	OS-LIIONBATT-1
Protective glasses for v-groove area, replacement set (10 pcs.)	OS2-PRTSETV-1
Protective glasses for electrode flap, replacement set (10 pcs.)	OS2-PRTSETE-1
LID coupler films, replacement set (two, one for each side)	OS2-LIDFILM-1
Replacement diamond blade	CLV-FBC6BLADE-1

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