

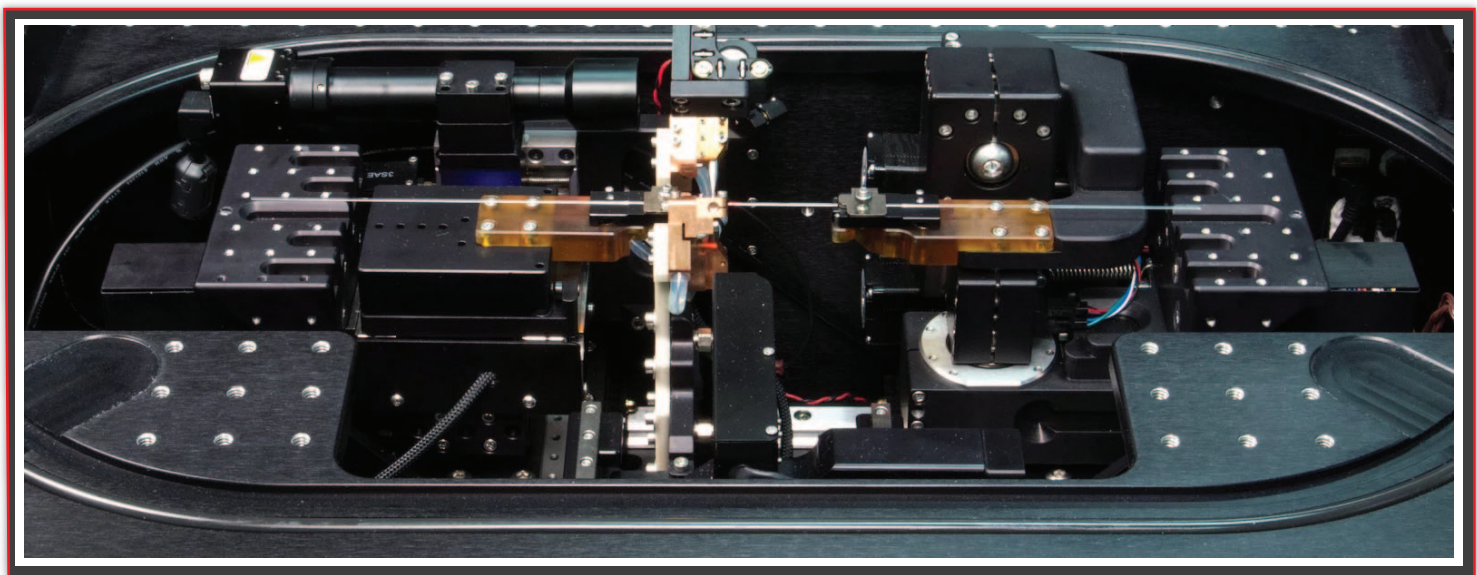
### 3SAE COMBINER MANUFACTURING SYSTEM (CMS)

#### What is it?

The Combiner Manufacturing System (CMS) is an optical glass processing system designed to maintain production level repeatability for combiners and other fused optical components. The CMS includes tapering, cleaving, bundling, and splicing utilizing 3SAE's patented Thermally Stabilized Plasma™ technology and achieves the industry's best optical performance, process cycle times, and component cleanliness.

#### Why is it better?

In standard plasma based glass processing, the plasma temperature scales as input power is increased but the temperature can fluctuate due to changes in the dielectric between the electrodes caused by electrode wear, contamination, atmospheric pressure, and several other variables. If the input power level were increased enough, all of the available air molecules between the electrodes would reach saturation and additional power scaling would not further increase the plasma temperature but instead would increase its size proportionally. This is "Thermally Stabilized Plasma™" and it occurs at >3000 degrees C at atmospheric pressure. By reducing the density of air molecules between the electrodes with vacuum, the saturation point can be adjusted down to the ideal glass processing window (~1600 degrees C). Since the Plasma is thermally stabilized, any other process variation such as electrode wear, will adjust the plasma volume rather than altering its temperature. For this reason, "Thermally Stabilized Plasma™" is more than ten times more thermally repeatable as compared to any preexisting arc technology and is also programmatically adjustable in size.



**3SAE COMBINER MANUFACTURING SYSTEM (CMS) KEY FEATURES:**

- *Extremely repeatable glass processing heat source ideal for high volume optical component manufacturing with a range of operation from <300°C to >3000°C.*
- *Unsurpassed heat source circumferential thermal uniformity for symmetrical ultra-low loss tapering and reduced thermally induced component stress.*
- *Contamination free heat source capable of producing ultra-high strength multi kilowatt class optical components. .*
- *Fastest cycle times based on standard splice, taper, and cleave cycle times averaged together.*
- *Embedded electrode cooling system included for up to 100% duty cycle operation.*
- *Exclusive automatic alignment of Pitch and Yaw included with <0.01 degree resolution for endcap or tapered glass splicing and pre-taper alignment.*
- *Exclusive two and three electrode operation modes supported to maximize heat zone dimensional flexibility.*
- *Exclusive standard and controlled atmospheric pressure modes supported to provide the best possible application flexibility and repeatability.*
- *Orthogonal view 5mp vision system with telecentric lenses providing 4.2mm wide x 3.5mm tall field of view at up to 75 frames per second.*
- *Live process monitoring via full resolution video imaging of the molten glass without under or overexposure.*
- *Optional 50nm resolution, optical encoder system available on both fiber platforms and the heat zone Z Axis for real world thermally insensitive positional feedback.*
- *In situ cleaver included for <10um-1000um.*
- *Splicing of 125um to 2mm supported.*
- *Exclusive <50nm X and Y fiber positional resolution of over the full stroke of 10mm.*
- *Taper lengths of up to 175mm supported in bidirectional mode.*
- *Exclusive "Table Based Tapering™" software included for easy user level single direction or bidirectional taper program creation and nearly infinite engineer level process control.\**

\*User can adjust both fiber platform locations, the heat zone location, and the arc power setting 25 times per second for the entire process

**3SAE CMS PACKAGES AND COMPONENTS**

**CMS-01-0100 - 3SAE Combiner Manufacturing System (CMS)**

Thermally Stabilized Plasma glass processing system with the following capabilities:

**Splicing:**

- Semi-automatic alignment and splicing including pitch/yaw for 125um to 2mm
- End cap splicing for cylindrical, chamfered, and tapered end caps (additional fixturing may be required)

**Tapering:**

- Automatic taper creation via intuitive software interface or manual table editing
- Integrated load cell system for process development and monitoring

**Cleaving:**

- Semi-automatic in-situ cleaving of fibers up to 1000um
- Adjustable precision cleaving location via image feedback

**Hardware includes:**

- Two orthogonal 5MP cameras with precision double telecentric lenses providing 4.2 x 3.5mm field of view
- PC with all necessary software, 23" monitor, user manual and accessories
- Accessory kit including 250um fiber holders, 700um fiber holders, (2) spare electrode sets, (2) electrode cleaning discs, all necessary PC and LDS interconnect cables. (No substitutions for fiber holder sizes.)

**\*Includes manufacturer's 1-year parts and labor warranty**

**CMS-01-0150 - CMS Work Station Cart**

*Includes:*

- 40" 4K display with mount (replaces standard 23" monitor)
- Ergonomic design with CMS recessed into workstation
- Includes enclosed PC area with locking soft wheels
- Lightweight aluminum design

**CMS-01-0105 - CMS Bundling Convenience Package**

*Includes:*

- Capillary Speed Loader which facilitates rapid loading (less than 1 minute) of seven (7) fibers into pre-tapered capillaries.
- Fixturing for 700um and 870um OD capillaries (other sizes available), power supply, user's manual
- 1000um Fiber Holders (pr) (No substitutions for fiber holder sizes.)

**CMS-01-0110 - CMS Short End Cap Holding Package**

*Includes:*

- Vacuum based short end cap holding system for supporting end caps during splicing
- 2000um fiber holders (pr)

**CMS-01-0200 - CMS Z-Axis Optical Encoder Positional Feedback System**

Optically encoded feedback system on the Z axis of the Ring of Fire (ROF) and both left and right fiber stages

**TRN-01-0012 - Training**

Training-3SAE CMS Multi-day On-site Installation, Operational Training & Travel Expenses

**Optional Components**

CMS Fiber Holders – 250um (pr)	CMS-01-0300
CMS Fiber Holders – 400um (pr)	CMS-01-0303
CMS Fiber Holders – 700um (pr)	CMS-01-0307
CMS Fiber Holders – 1000um (pr)	CMS-01-0309
CMS Fiber Holders – 1500um (pr)	CMS-01-0312
CMS Fiber Holders – 2000um (pr)	CMS-01-0315
CMS Fiber Holders – 2500um (pr)	CMS-01-0320
3SAE CMS End Cap Holder (1.1mm-7mm)	CMS-01-0318
3SAE CMS End Cap Holder (5mm-12mm)	CMS-01-0319
Diamond Tip Replacement Blade	SPT-10-1570
Electrode (CMS)	SPT-10-1819