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## *The Scepter™ Advantage*

The Scepter is designed using new technologies that dramatically enhance performance yield and unit operation. These features, all of which are unique to Scepter, set this system apart from traditional polishers:

- **High Dynamic Range, Independent Suspension Workholders** – Provides uniform and equalized pressure distribution amongst all connectors for consistent polishes.
- **Optically Aligned Workholders** – Rather than passively assembling a fixture, each connector position is actively aligned to an optical reference for superior interferometric geometries.
- **Universal Workholder Design** – A single polishing fixture supports all connectors and Mil-spec termini having ferrule diameters between 1.25mm and 3.2mm.
- **Maximize Consumable Life** – Polishing film life can be extended by over 50% due to independent suspension and controlled pressure (see attached analysis).
- **Integrated Air Polish Routine** – Unlike standard polishers with which connectors must be prepped off-line with a fiber “denubbing/air polish”, Scepter performs this function as an integrated and automated step.
- **MicroFeed™ Programming** – Scepter™ programming is highly flexible allowing an engineer to control polishing variables such as cycle time, pressure and speed for each process step. Z-axis positioning can be controlled to sub-micron precision with selectable velocities.
- **Teach Mode** – Z axis positioning can be manually manipulated through a PC control window, and values automatically populated into polishing programs for process development.
- **In-line Visual Inspection** – Scepter workholder fixtures are designed to permit interfacing with our unique video inspection probe. With all other polishers, connectors must be removed and transferred to a separate inspection station.
- **External PC Control** – Permits the future upgrade to new operation software, and minimizes the potential of downtime due to failed electronics (i.e. any standard PC can control the system)
- **User Prompted Interface** – Simple, clear and programmable commands prompt technicians through each step of the polishing process.
- **Technical Support** – Krell has vast experience with equipment operation *and* extensive resources regarding polishing procedures and all aspects of connector termination.
- **Upgradeable** – Krell can design and fabricate custom workholders for new applications. Also, being PC-based, new features will be available to meet future application demands.

Krell has designed the Scepter System with the entire connectorization process in mind. Rather than being a machine at a polishing station, the above reference features actually integrate Scepter intimately into production.

Return on investment will be realized very quickly in terms of streamlined workflow, consistent and superior yields, consumables savings, minimization of product rework and immediate quality feedback.

## CONSUMABLES COST ANALYSIS

(singlemode UPC termination)

TRADITIONAL POLISHING			
PROCESS STEP	POLISH FILM	CONNECTORS	PROCESS STEP
	COST	POLISHED PER FILM	COST PER CONNECTOR
Off-line Air Polish	\$ 0.25	24	\$ 0.01
Diamond Polish 1	\$ 4.00	48	\$ 0.08
Diamond Polish 2	\$ 4.00	48	\$ 0.08
Final Polish	\$ 1.50	24	\$ 0.06
<b>Consumables Cost per Connector:</b>			<b>\$ 0.23</b>

## SCEPTER SYSTEM WITH INDEPENDENT SUSPENSION

SCEPTER SYSTEM WITH INDEPENDENT SUSPENSION			
PROCESS STEP	POLISH FILM	CONNECTORS	PROCESS STEP
	COST	POLISHED PER FILM	COST PER CONNECTOR
Air Polish & Epoxy Removal on Scepter	\$ 0.25	48	\$ 0.01
Diamond Polish	\$ 4.00	180	\$ 0.02
Final Polish	\$ 1.50	96	\$ 0.02
<b>Consumables Cost per Connector</b>			<b>\$ 0.05</b>

**SCEPTER PROCESSING THROUGH-PUT EXAMPLE**

2.5mm UPC Singlemode Connectors

**Connector loading (12):** 90 sec. >>>>>>>>>>>>>>>>> 7.5 sec. / connector

**Connector polishing:**

Step 1:	3um silicon carbide	60 sec.
Step 2:	1um diamond	30 sec.
Step 3:	Final polish	30 sec.

120 sec. per set of 12 connectors

>>>>>>>>>>>>>>>>> 10 sec. / connector

**Note:** Step 1 incorporates automated air-polish, eliminating the traditional requirement for off-line epoxy removal/fiber de-nub, and its associated labor time/cost.

**Program activation, film change:** 30 sec. >>>>>>>>>>>>>>>>> 2.5 sec. / connector

**Connector un-loading (12):** 30 sec. >>>>>>>>>>>>>>>>> 2.5 sec. / connector

**Total Connector processing time:** >>>>>>>>>>>>>>>>> **22.5 seconds / connector**

>>>>>>>> 2.5 connectors / min

>>>>>>>> 150 connectors / hour

>>>>>>>> **1,200 connectors / 8 hour shift**

**Overall cable assembly throughput can be further increased through the use of the SpecVision Inspection System. This permits the viewing of connector surface finishes in-line, without removal from the polisher. This eliminates the need for a final quality inspection step. Additionally, if connector "touch-up" polishing is required, cables do not have to be unloaded and reloaded in the polisher.**

Typical yield rate for singlemode UPC connectors using the processes outlined above is >95%. Surface end-face geometric data is Telcordia compliant as illustrated in the test data table below:

## Geometric Repeatability of Twelve Fibers Polished to Completion Using Automatic De-nub

ConnectorID	Test Passed	Linear Offset (um)	Curv Radius (mm)	Fiber Height (nm)
CON1	Yes	8.0623	15.9954	17.8224
CON2	Yes	9.4868	18.0186	27.0003
CON3	Yes	19.2354	21.8554	19.5775
CON4	Yes	9.0000	20.8151	14.7280
CON5	Yes	11.4018	18.4312	11.4455
CON6	Yes	7.8102	16.1149	-4.3207
CON7	Yes	4.0000	15.4073	-1.9763
CON8	Yes	13.9284	14.7800	21.9744
CON9	Yes	7.8102	15.9973	13.3187
CON10	Yes	13.0000	14.7976	17.6057
CON11	Yes	10.6301	17.1617	20.1422
CON12	Yes	8.0623	19.9002	17.7627
<b>SUMMARY</b>				
Minimum	X	4.0	14.78	-4.3207
Maximum	X	19.2354	21.8554	27.0003
Mean	X	10.20229	17.43956	14.59003
Standard Deviation	X	3.88422	2.38267	9.23155
Percentage Passed	100.0%	100.0%	100.0%	100.0%