

# Trek Model 640

## Electrostatic Chuck Optimizer



Trek's Model 640 Electrostatic Chuck Optimizer system is a diagnostic tool which enables evaluation and optimization of waveforms and voltages for electrostatic chucks/clamps in order to minimize de-clamp time, maximize clamp force, and achieve optimum wafer processing for ESC systems.

Model 640 combines two amplifiers (for two-phase voltage combinations) and a waveform generator, which can be independently programmed and configured to investigate, research, and discover the perfect power supply and waveform recipe to efficiently drive an ESC application. An electrostatic voltmeter (ESVM) is included to monitor residual voltage from the clamping/de-clamping process.

### Key Specifications

- Output Phasing:
  - Voltage A (Reference Phase) 0 to  $\pm 2$  kV
  - Voltage B (Phase B =  $[-1] \times$  Phase A) 0 to  $\pm 2$  kV
- Output Voltage Range: 0 to  $\pm 2$  kV
- Output Current Range: 0 to  $\pm 6.5$  mADC with a peak capability of 10 mA

### Typical Applications Include

- Electrostatic-driven handling of materials
- Semiconductor wafer processing
- Non-mechanical transfer of flat panels or other processing materials sensitive to mechanical clipping

### Features and Benefits

- Enables the creation of customized waveforms to be simple yet powerful, to generate the most complex waveforms that can be envisioned by the user
- The product's software accepts parameters via arbitrary data input, pre-programmed waveforms, or company-specific CSV files
- Utility is enhanced via three individually programmed stages to build the waveform: (1) Clamp Signal Stage, (2) Processing Signal Stage (with options to "loop" the process cycle), and (3) De-clamp Stage
- Test data is recorded and presented in numerical and graphical format with a color coded display
- The graphs can also be used to troubleshoot mechanical and electrical problems within an ESC operation
- NIST-traceable Certificate of Calibration provided with each unit
- **CE** Compliant



## Model 640 Specifications

### Outputs

#### Output Phasing

Phase A Output Voltage Range	0 to $\pm 2$ kV DC or peak AC (4 kV p-p)
Phase A Output Current Range	0 to $\pm 5$ mA DC or peak AC (10 mA p-p)
Phase B Output Voltage Range	0 to $\pm 2$ kV DC or peak AC (4 kV p-p)
Phase A Output Current Range	0 to $\pm 5$ mA DC or peak AC (10 mA p-p)

### Amplifier Performance [each phase]

Large Signal Bandwidth (1% distortion)	DC to greater than 1.2 kHz
Small Signal Bandwidth (-3 dB)	DC to greater than 5 kHz
Slew Rate	Greater than 15 V/ $\mu$ s
Settling Time	less than 300 $\mu$ s for 0 to 2 kV step
DC Accuracy	Better than 0.1% of full scale
Offset Voltage	Less than 500 mV
Output Noise	Less than 100 mV rms*
Drift with time	Less than 100 ppm/hour, noncumulative
Drift with Temperature	Less than 350 ppm/ $^{\circ}$ C

### Output Voltage Monitor (Back Panel Connector)

Drift with Temperature	Less than 350 ppm/ $^{\circ}$ C
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### Steady State Voltage Leakage Current Monitor

### Features

Clamped Wafer Detection Feature (Thresholds are set by the program)	To indicate wafer clamping events, the capacitive currents generated by a low voltage sine wave, super-imposed on the Phase A and Phase B outputs, are monitored but can be disabled through the program. The super-imposed waveform is used to indicate a no wafer, wafer present or wafer clamped status
Capacitive Load Select	Clamped capacitance status range can be selected by the program for 0 to 10, 20 or 30nF (phase to phase) depending on the system and electrostatic clamp physical configurations

### Mechanical

Dimensions	43.7 mm H x 421.6 mm W x 457.3 mm D (1.72" H x 16.6" W x 18" D) 1U rack enclosure
Panel Width	482.6 mm (19")
Weight	8.5 lbs (3.86 kg)
Connectors	15-pin "D" ITT Canon used by remote device to control/monitor the unit, 9-pin "D" ITT Canon RS-232, 3-Pin FCT "D" High-Voltage, standard type-A USB, Ethernet (optional) and Front Panel
Power ON/OFF	2-position rocker switch

### Operating Conditions

Temperature	0 $^{\circ}$ C to 35 $^{\circ}$ C (32 $^{\circ}$ F to 104 $^{\circ}$ F)
Relative Humidity	To 85%, noncondensing
Altitude	To 2000 meters (6561.68 ft.)

### Electrical

DC Input Receptacle	2.0 mm locking DC jack; center contact is positive and shell is negative (receptacle mates with Switchcraft S761K plug)
Ground Receptacle	Ground stud
Power Requirements	24 V DC, 1.7 A

### Supplied Accessories

Operator Manual, SW	PN: 24010
USB Cable	PN: BA103
HV Connectors	PN: B8084R, B8085R, B8088R, B8089R
DC Plug (Switchcraft S761K)	PN: BA119R
Line Cord, Fuses	Selected per geographic destination

### Optional Accessories

90-264 V AC to 24 V DC Power Adapter	PN: IK045
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### Note

Trek Model 646, a  $\pm 3$  kV version of this instrument, is also available. Please contact the factory for more information

Features Measured using



Model 34401A digital multimeter

Measurement and Power Solutions™



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