

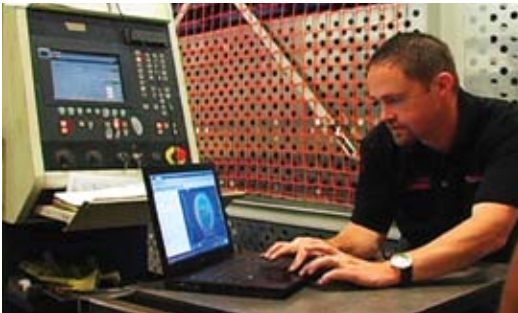
3.9 A New Method to Assure the Performance of High Power CO₂ Lasers

3.9.1 ModeCheck®

- Beam Profiler for collimated CO₂, 10.6µm wavelength, beam width up to 30mm
- Quality Cutting, Marking, Drilling & Ablating Require More Than Consistent Laser Power
- Instantaneously “see” and measure the beam - reduce set-up time between jobs
- Real-time “mode burns” - eliminate hazardous acrylic vapors
- Optimize laser efficiency - reduce cost per part
- Predict laser preventative maintenance - increase manufacturing efficiency

ModeCheck is designed for the industrial parts manufacturer to reduce the time it takes to change over between different jobs. The user can quickly place the ModeCheck in front of the laser and see and measure, in real-time, the laser beam profile to confirm optimal laser performance. In addition, and when used periodically, the user can compare measurement changes from the same set-up and make necessary laser adjustments, keeping the laser output constant for the same job from day-to-day. Over time the user will be able to see and measure laser degradation to predict and advance schedule down-time needed for periodic maintenance.

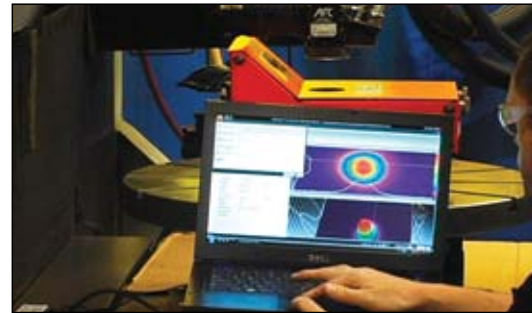
ModeCheck eliminates operator exposure to acrylic mode burn hazards while improving product quality and manufacturing efficiency.



Measurements:

In addition to both 2D and 3D graphical image display and save, the following measurements are made from each image:

- Beam Widths and Diameters
- Beam Position Stability
- Power Density Peak
- Beam Centroid Location
- Elliptical Analysis with Major Axis Orientation



It's just this easy.

1. Remove Focusing optic or attach the optional MLA
2. Locate the beam center with pointing beam or similar device
3. Place ModeCheck in beam center
4. Turn on Laser
5. Instantly see, measure and electronically store the beam characteristics

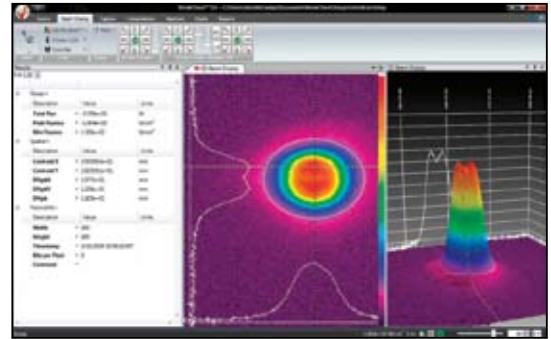
Optional Accessories

One must manage the pass-through laser beam by collecting the beam using either a power meter or beam dump. We recommend using a power meter as the additional measurement information will assist in managing laser optimization. Note that any beam dump or power meter large enough to handle 5-10kW will require water cooling. There are holes on the bottom of ModeCheck for mounting the Power Meter Head or Beam Dump.

A ruggedized storage/carrying case is highly recommended for safe and efficient handling.

The ModeCheck Lens Adapter (MLA) is an option that will enable a ModeCheck to recollimate a focused CO₂ laser beam. The advantage of using this adapter is that the focusing head of the machine does not have to be removed, which is the normal case for a ModeCheck without this adapter. The disadvantage is that the ModeCheck must be positioned further from the output head in order to properly recreate the collimated beam profile. The recollimating lens must be supplied by the user and must be the same lens that is used on the lasers cutting head. (See application note: SP90329).

A PC is required to run the ModeCheck imaging software. The camera is powered over the USB cable that connects the computer to ModeCheck.



ModeCheck makes instantaneous beam measurements along with graphically displaying both the 2D and 3D power density distribution



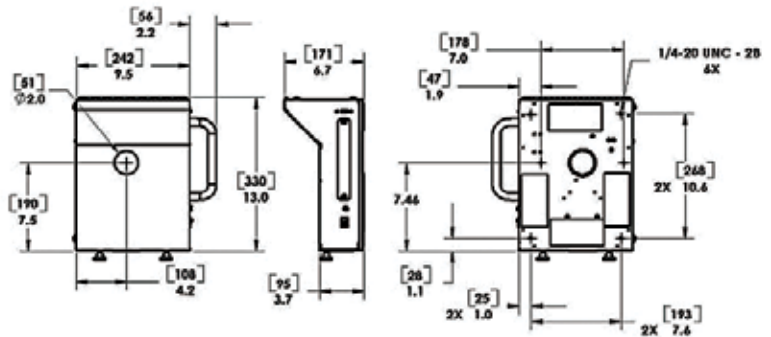
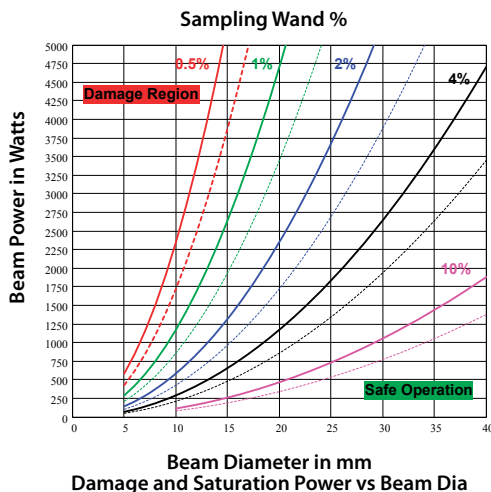
ModeCheck with optional MLA, profiling a CO₂ cutting laser with its processing head installed

3.9.1.1 Specifications Model

Specifications	
Model	ModeCheck
Laser Input Power	100-5000 Watts (or more depending on Beam size)
Input Clear Aperture	50mm (~2")
Laser Type	CW, Pulsed >100 KHz
Beam Width	5mm - 30mm
Pick-off Percent	0.5%, 1%, 2%, 4%, 10% sampling wands; user replaceable
Damage Threshold	27 - 36 W/cm ² ; See graph
Camera	1/3" format CMOS, 480x480, 6µm pixel, 8bit, CS-mount, USB2
Lens	12mm C-mount
Cooling	Built in Fan (water required for the optional beam dump or optional power meter sensor)
UV Light Source	LED array
Software	ModeCheck
Power Requirements	Input: 100-240 Vac, 50-60Hz, 1.5A Output: 12Vdc, 5.0A, w/power jack, UL listed and CE compliant universal power supply included Camera is powered over the USB port
Dimensions	9.5" x 13" x 6.7" 242mm x 330mm x 171mm Not including handle and cabling or any options
Weight	~8 lbs 3.6kg
Beam Dump (optional)	Water cooled and rated for 5kW total power
Power Meter (optional)	5000W-SH; up to 5kW total power 10kW-SH-V2; up to 10kW total power
Laptop Computer	Provided by user; Windows 7 (32/64)
Compliance	Unit meets CE and RoHS requirements



The optional rugged case is recommended for safe storage in an industrial facility



MODECHECK DIMENSIONS W/O BEAM DUMP

Damage and Saturation Power vs Beam Dia

Safe Operation is to the Right of the Solid line. Image Saturation is approximately the Dashed line. Chose a sampling Wand that contains your beams maximum power and minimum diameter to be near but below the dashed line for safe and best beam viewing.

3.9.1.2 Ordering Information

Item	Description	P/N
MODECHECK CO ₂ -5kW	ModeCheck, CO ₂ sampler for 10.6µm beams up to 5kW, beam width up to 30mm; includes 2 user selectable wands from selection below	SP90211
0.5% wand	0.5% beam wand sampler, see damage and saturation chart	SP90324
1% wand	1% beam wand sampler, see damage and saturation chart	SP90325
2% wand	2% beam wand sampler, see damage and saturation chart	SP90326
4% wand	4% beam wand sampler, see damage and saturation chart	SP90327
10% wand	10% beam wand sampler, see damage and saturation chart	SP90283
Beam Dump; 5kW	Beam dump for up to 5kW continuous, includes mounting bracket, requires continuous water flow.	SP90224
5W-BB-50	Power sensor, measure CO ₂ power up to 5000W; water cooling needed	7Z02754
Mounting Hardware, 5000W detector	Mounting hardware for 5kW power sensor. Required when ordering the 5000W-SH sensor	SP90212
10kW-BB-45	Power sensor, measure CO ₂ power up to 10,000W; water cooling needed	7Z02756
Mounting Hardware, 10,000W detector	Mounting hardware for 10KW power sensor. Required when ordering the 10kW-SH-V2 sensor	SP90213
ModeCheck storage/carrying case	Ruggedized ModeCheck storage/carrying case	SP90227
Collimating 2" Lens Adapter	ModeCheck Lens Adapter (MLA) enables a ModeCheck to recollimate a focused CO ₂ laser beam. MLA should be ordered with the ModeCheck so that it can be factory installed.	SP90329