Benchtop Type D Goniospectrometer

Used to measure lamp and luminaire output, efficiency/efficacy, intensity distribution, and zonal lumen density

Complete turnkey solution
Everything your business needs in one system: hardware, software, computer, and NIST-traceable spectral intensity lamp standard.

Save money, save space
The Labsphere Type D Goniospectrometer fits on a benchtop. No need for costly lab expansions or large capital investment projects.

Get your products to market faster
Testing in-house protects your IP and saves the time and hassle associated with third-party lab testing.

IES files made easy
Create IES and EULUMDAT data files compatible with your existing design and data analysis tools for producing reports in industry standard formats.
Over 35 years of leadership in light metrology enables Labsphere to offer the Benchtop Type D Goniospectrometer as the standard of the lighting industry. The Benchtop Type D Goniospectrometer delivers easy operation with accurate results in the space of a benchtop. State-of-the-art hardware and control, coupled with sophisticated data collection provides an easy and practical fully-automated test system for generating IES files for lamps and luminaires.

The high value, high performance of the Benchtop Type D Goniospectrometer can cut your development time by a third while saving time and cost by not having to send your light products out for third party testing. Managing test and characterization in house protects your IP throughout development. Save time and money creating IES files in the space of a benchtop with this accurate and easy to operate instrument.

**Labsphere Goniospectrometer Benefits Summary**

- Space saving goniospectrometer fits on a benchtop eliminating the need for a large dedicated room or costly expansion.
- Create the IES and EULUMDAT data formatted files compatible with leading design and data analysis software tools for creating detailed reports in industry standard and flood formats.
- Complete turnkey solution including goniometer, CCD spectrometer, control rack and electronics, temperature sensors, lamp standard, computer and preprogrammed control software, display, and wireless keyboard and mouse.
- The detector remains at a fixed height in reference to the lateral axis of the lamp. During the test; the lamp or luminaire rotates about the lateral and vertical axis on a C Ordinate system for replication of Type C Data Formats.
- The sensor can slide along a lateral axis to optimize sensitivity for a variety of light sources.
- Limited field of view spectral sensor optimizing reduction of stray light.
- Includes interchangeable optical density filters that allow tests over a high dynamic range of lamp intensities.
- Fixed and auto ranging CCD spectrometer for high speed spectral intensity and color uniformity.
- Automatic dark current compensation reduces errors, boosts accuracy.
- Includes NIST traceable spectral intensity standard for user calibration at any time.
- Four pole power connector box plus easy wire feedthroughs for simple lamp interchange and with no light interference from cabling.
- Edison Base plus multiple interchangeable versatile lamp and lamp holding adaptors.
- Precision drives providing unrivaled accuracy.
- High-speed data collection and point-to-point choices for accurate data collection.
- Temporal stability data for measured thermal, photometric and electrical data.
- High-quality construction delivers years of trouble-free performance.
- An extremely strong steel framework allows the safe attachment of heavy luminaires.
- Backed by Labsphere, the foremost producer of light metrology systems.
Goniospectrometer Components

The Benchtop Type D Goniospectrometer consists of the following basic components:

**Spectrometer Sensor**
A shielded unit houses the optical fiber that feeds back to a high-dynamic range spectrometer that is used to obtain the spectral intensity data. The shielding housing also serves as an adaptor for the series of optical density filters and is mounted at the same height as the lamp’s lateral axis on vertical arm. The vertical arm is mounted on a sliding rail to slide and fix the measurement distance. The spectrometer is calibrated over the visible spectrum. The data is relayed to the computer interface via USB.

**Goniospectrometer Integrated Console**
This unit contains all of the system’s electric and electronic equipment including main power switches, power supplies, power analyzer, motor controllers and computer and computer interfaces.

**Computer Station**
This includes a mini computer with goniospectrometer control software to control the operation and data collection functions of the Benchtop Type D Goniospectrometer during testing. All information controlled and collected is displayed on the computer monitor. Additional automated software produces IES, EULUMDAT and Excel files for full data analysis.

**Lamp Swing-Arm and Support Structure**
The height of the test luminaire or lamp is fixed on a 360 degree rotating lateral axis at the same height as the sensor. The arm rotates in circles around the vertical axis, eliminating constant repositioning of the test item to different heights.

This component holds the test luminaire or lamp during testing and includes the sensor support on a rail, swing-arm, rotating luminaire mounting fixtures, and the temperature sensors. The structure may be manufactured in several sizes, depending on the maximum size of item to be tested. Optional rail extensions are available for increasing the measurement path length for larger devices.
Component Features
Lamp Swing-Arm and Support Structure
The main vertical swing-arm and lateral access mounting assembly are all engineered and manufactured to produce the most stable test platform available. Precision assembly ensures that the lamp swing-arm is balanced to provide for continuously accurate alignment throughout all rotational positions.

The test luminaire or lamp is at a fixed height in the center of the lamps lateral axis* and referenced to the detector optical axis throughout the test. The lamp rotates about the vertical axis in reference to the fixed sensor.

The lamp or luminaire is positioned at the goniospectrometer's vertical axis which accommodates for a variety of tall fixtures up to 0.4 meter.

Precision digital motors are coupled to the vertical axis shaft and the luminaire rotation shaft, and are constantly monitored by the system's homing sensor, ensuring that swinging arm position and the luminaire angles are precise throughout the test sequence. Resolution of each motor of the Benchtop Type D Goniospectrometer is an extremely fine 0.1 degrees.

*Options for increasing the height for larger lamps
Spectrometer Sensor

The sensor is Labsphere’s CDS-600 CCD Array Spectrometer. The highly sensitive CDS 600 CCD Array Spectrometer offers low noise and a broad spectral response with sensitivity range from 200 to 850 nm. For use with the Benchtop Type D Goniospectrometer it is used for the visible range of 380 nm to 780 nm. When coupled with a Benchtop Type D Goniospectrometer the spectrometer avoids the inherent photometric errors associated with filter-based photometers. The CDS-600 multi-channel spectral analyzer is designed for real-time spectral analysis. The instantaneous spectral acquisition provides the radiometric, photometric, and color characteristics of the lamp or luminaire. The fast results help to maintain high scan rates, excellent linearity and low drift, and is housed in a shielded chamber. The optical fiber field of view helps to exclude stray light not emitted directly from the luminaire itself. This serves to block stray light from room surfaces by allowing the optical fiber to collect light only from the intended source.

The housing has a thread end compatible with the 2.54 cm optical density filters included with system. The optical filters can be threaded onto the housing in the beam path. Filter correction is applied in software. The optical filters allow for attenuation of high intensity lamps from saturating the sensors, increasing the sensitivity and dynamic range of the system.

The optical fiber sensor can be moved along the optical rail to change the distance between the sensor and the vertical rotation axis of the system. Industry recommendations for keeping in the far field for goniophotometer is 5x the area of illumination. In most cases it is not necessary to move the sensor distance from its fixed position.

The CDS-600 is calibrated for spectral intensity. The spectral intensity is used to determine radiant and luminous intensity distribution and color distribution as well as total lumens. The spectrometer can be calibrated at any time by the user using the spectral intensity lamp standard provided with the system. Dark correction is measured during calibration with the standard lamps and applied with every measurement thereafter.

The CDS-600 spectrometer is housed in the goniospectrometer support structure. It is interfaced to the goniospectrometer console computer via USB.
Goniospectrometer Console
This component contains all of the system's electrical and electronic controls. Main power switches and a test primary lamp voltage input, power analyzer and computer are included in the goniospectrometer console. A single bundled cable is routed between the goniospectrometer and console.

Four Options Are Available:

**No AC Power Supply or Power Analyzer:**
With this option the lamp power can come from the main line or an independent external power supply.

**Power Analyzer, no AC Power Supply:**
With this option the Yokogawa WT 310E Power Analyzer is included and mounted in the console. The lamp power can come from the main line or an independent external power supply. The current can be routed into the console through the power analyzer.

**AC Power Supply, no Power Analyzer:**
With this option the Chroma 61602 AC Power Supply is included and mounted in the console. The lamp power can come from the Chroma 61602 AC Power Supply, main line or an independent external power supply. If from the Chroma 61602, the power to the lamp is controlled via the system control software. The voltage to the lamp is routed directly to the lamp, independent of the console.

**AC Power Supply and Power Analyzer:**
With this option the Chroma 61602 AC Power Supply and the Yokogawa WT 310E Power Analyzer are included and mounted in the console. The lamp power can come from the Chroma 61602 AC Power supply, main line or an independent external power supply. If from the Chroma 61602, the power to the lamp is controlled via the system control software. The current from the power supply is routed through the power analyzer.

A Yokogawa Power Analyzer Meter is installed which incorporates a large digital display of volts, amps and watts. The meter measures the exact lamp characteristics by use of remote sensing leads to the test luminaire. Measurement of Power Factor and Total Harmonic Distortion is available.

Computer and Software
The functional heart of the Benchtop Type D Goniospectrometer is the computer hardware and software which control the system's entire operation. Virtually all functions of the system are computer automated including the vertical arm rotation, lamp/luminaire rotation, selection of data points and the recording of data.

The computer system provided with the Benchtop Type D Goniospectrometer consists of MS Windows based equipment totally configured and integrated to provide full system operation, data collection, processing and data file outputs.

Control Software
Comprehensive software controls the operation of the Benchtop Type D Goniospectrometer and gathers the appropriate test data for the particular type of lamp or luminaire being tested. Standard test formats for indoor luminaires, floodlights, spotlights and bare lamps may be created and saved by the test operator from easy-to-use menus. The software is MS Windows 7 based. It allows automatic or manual operation of the system, with pre-stored horizontal (lateral) and vertical angle formats for commonly-used test procedures. Test data is automatically collected and stored in IES data formats.

Data Processing Software
Upon completion, spectral intensity spatial scans of the lamp or luminaire are processed to compute luminous intensity, x, y, CRI and CCT and saved in IES data format for further analysis.

Data can be exported to external spreadsheet software where the spectral intensity at every angle as well as intensity and color are reported.

Data Presented During Scans
- Intensity (candlepower)
- CCT
- Chromaticity x and y
- Set and Actual Angles
- Sensor Saturations Levels
- Axial Plot

IES Formats
Labsphere's software supports IES testing formats for analysis and reporting.
Lamp Standards

A lamp standard is included. The lamps are calibrated in Labsphere's industry leading light metrology labs in reference to NIST. Optional additional lamps are available in sets of three.

The lamp standards are calibrated for directional spectral intensity. Software routines are provided for user-selectable goniospectrometer calibration. One lamp is included with an option for an additional set of three.

Lamp and Luminaire Mounts

Standard Edison socket is included plus versatile lamp mounts to handle or mount different luminaire sizes and to fit customer's specific lamps and luminaires. Application-specific designs available upon request.
Included Items

Hardware:
- A goniometer supporting the main vertical swing arm and horizontal shaft
- The vertical swing arm motor, temperature monitor, and spectrometer are enclosed in the base of the black framed goniometer chassis
- A precision rotating vertical axis incorporating 360 degrees’ rotation of the arm around the test luminaire emitting surface
- A precision rotating horizontal (lateral) axis incorporating 360 degrees’ rotation fitted with a low profile lateral (horizontal) axis enclosed with black metal sheathing
- A horizontal framework holding a lateral shaft, onto which plates are attached for mounting of the lamp or luminaire from above or below
- Means for adjusting the depth of the horizontal arm which holds the vertical shaft and luminaire, using locking rail system
- Vertical rotation drive motor, which is a high-precision digital stepping motor operating under computer control, manually or automatically
- Lamp/luminaire rotation drive motor, which is a high precision digital stepping motor operating under computer control, either manually or automatically
- A high dynamic range CDS-600 Spectrometer calibrated for spectral intensity over the visible spectral range
- A housing for the CDS-600 optical fiber and optical density filters
- Ambient and DUT optical thermal sensors
- Optical density filter set
- Spectral intensity lamp standard and mounting fixture
- Edison socket base
- Two (2) versatile lamp adaptors
- A console housing incorporating:
  - A Windows based computer system and display with wireless keyboard and mouse
  - Goniospectrometer electronic interface
  - Optional AC power supply
  - Optional digital analyzer
  - Emergency off "panic" button

Set of 6 OD filters from ND 0.1 to ND 3 included with every purchase.

Software:
All software is Windows based. Standard data collection software package offering:
- Automatic or manual operation
- Automated and manual control of vertical rotation
- Automated and manual control of lamp/luminaire rotation
- Selectable vertical angle intensity steps
- Selectable lamp/luminaire rotation increments and angles
- Output in industry standard format (IES)
- Single readings mode with the capability to input the desired vertical and lamp/luminaire angular location, with automatic rotation to selected angles
- Calibration software routines using standard lamps calibrated for directional spectral intensity
- LM-79 stabilization routine
- Temporal graphing data
- Operator selectable data collection vertical angles
  - Specify starting and ending angles, and step increment
  - Step increment as small as 2 degrees
- Operator selectable luminaire horizontal angles
  - Specify starting and ending angles, and step increment
  - Step increment as low as 0.1 degrees
- Output in industry standard format, or format compatible with Excel spreadsheet
### Summary of Technical Specifications

<table>
<thead>
<tr>
<th>Measurement Method</th>
<th>Far field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Benchtop Type D</td>
</tr>
<tr>
<td>Axis</td>
<td>V-plane axis automated, H-axis rotation automated</td>
</tr>
<tr>
<td>Operation</td>
<td>Fully automated save loading lamp samples and align process</td>
</tr>
<tr>
<td>Area Occupied by Goniometer</td>
<td>1.7 m x 0.6 m x 0.8 m</td>
</tr>
<tr>
<td>Sensor Distance</td>
<td>0.5 m to 1 m (with option to extend to 2.4 M and 3.6 m, (costed separately)</td>
</tr>
<tr>
<td>Device Limit Size</td>
<td>0.3 m x 0.4 m (ask about options to increase)</td>
</tr>
<tr>
<td>Spectrometer</td>
<td>Labsphere CDS-600</td>
</tr>
<tr>
<td>Max Lamp Weight</td>
<td>~5 kg</td>
</tr>
<tr>
<td>Wire Routing</td>
<td>Axial feedthrough for system cabling and to allow customer to route their own source cables when needed</td>
</tr>
<tr>
<td>Electric Connections</td>
<td>90-240VAC, 15A, 50-60-Hz</td>
</tr>
<tr>
<td>Power Analyzer Voltage Range</td>
<td>12VAC - 240 VAC +/- 0.2V</td>
</tr>
<tr>
<td>Power Analyzer Current Range</td>
<td>0A - 3A (Avg: +/- 0.1mA)</td>
</tr>
<tr>
<td>Power Analyzer Power Range</td>
<td>0W - 200W (Avg: +/- 0.001W)</td>
</tr>
<tr>
<td>Electrical Measurements</td>
<td>Lamp Power factor, voltage, and current</td>
</tr>
<tr>
<td>Lumen</td>
<td>1 - &gt;10000</td>
</tr>
<tr>
<td>Intensity Range (cd)</td>
<td>1 to &gt;5000</td>
</tr>
<tr>
<td>Color Temperature</td>
<td>1000K to 10,000K +/-35K</td>
</tr>
<tr>
<td>CRI</td>
<td>0-100 +/- 0.7</td>
</tr>
<tr>
<td>UI</td>
<td>Interface(s) to entering control and test parameters and display measurement results</td>
</tr>
<tr>
<td>Operating System</td>
<td>Windows 7</td>
</tr>
<tr>
<td>Angular Rotation</td>
<td>Lateral Axis: 0.1 degree / step</td>
</tr>
<tr>
<td></td>
<td>Vertical Axis: 2 degree / step</td>
</tr>
</tbody>
</table>
Report Inputs

Descriptive Information

a) Date and testing agency
b) Manufacturer's name and designation of product under test
c) Lamp category
d) Lamp or luminaire
e) Ambient temperature
f) Power factor
g) THD
h) Current
i) Voltage
j) Warm up
k) Lumen
l) Lamp characteristics based on lamp type
m) Measurement quantities measured (angles, luminous intensity, total luminous flux, luminous efficacy, etc.)
n) Rated electrical values (AC (frequency) or DC) of product tested
o) Number of hours operated prior to measurement
   (0 h for rating new products)
p) Total operating time of the product for measurements including stabilization
q) LM-79 stability procedure using intensity measurement at a fixed point. Ability to save warm up intensity data
r) Ambient temperature
s) Device temperature
t) Orientation (burning position) of product during test
u) Designation and type of reference standard used
v) Photometric measurement conditions: photometric distance
w) Measured total luminous flux (lm) and input voltage (V), current (A), and power (W) of each SSL product
x) Luminous intensity distribution (IES.net)
   i. Peak intensity
   ii. Cone illuminance
   iii. Beam angle
y) Color quantities (chromaticity coordinates, CCT, and CRI)
z) Spectral power distribution
aa) Color uniformity

Data Format

Traceability (where applicable)

*IES IESNA, EULUMDAT file format
NIST
Order Information
Available optional equipment consists of individual accessories or complete systems providing enhanced capabilities.

<table>
<thead>
<tr>
<th>MODEL</th>
<th>DESCRIPTION</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benchtop Goniospectrometer w/o AC Power Supply or Power Analyzer</td>
<td>Goniometer stage with E26 and universal adaptor, spectrometer, ND filter kit, temperature monitor control rack and CPU, monitor, keyboard and mouse, lamp standard, and control software</td>
<td>AA-01351-100</td>
</tr>
<tr>
<td>Benchtop Goniospectrometer with AC Power Supply and Power Analyzer</td>
<td>Goniometer stage with E26 and universal adaptor, spectrometer, ND filter kit, temperature monitor control rack with Chroma 61602 and Yokogawa WT310E, and CPU, monitor, keyboard and mouse, lamp standard, control software</td>
<td>AA-01351-000</td>
</tr>
<tr>
<td>Benchtop Goniospectrometer with AC Power Supply</td>
<td>Goniometer stage with E26 and universal adaptor, spectrometer, ND filter kit, temperature monitor, control rack with Chroma 61602, and CPU, monitor, keyboard and mouse, lamp standard, control software</td>
<td>AA-01351-200</td>
</tr>
<tr>
<td>Benchtop Goniospectrometer with Power Analyzer</td>
<td>Goniometer stage with E26 and universal adaptor, spectrometer, ND filter kit, temperature monitor, control rack with Yokogawa WT310E, and CPU, monitor, keyboard and mouse, lamp standard, control software</td>
<td>AA-01351-300</td>
</tr>
<tr>
<td>Benchtop Goniospectrometer with Chroma and Yoko, Photometer</td>
<td></td>
<td>AA-01351-400</td>
</tr>
<tr>
<td>Benchtop Goniospectrometer without Chroma and Yoko, Photometer</td>
<td></td>
<td>AA-01351-500</td>
</tr>
<tr>
<td>Benchtop Goniospectrometer with Chroma, no Yoko, Photometer</td>
<td></td>
<td>AA-01351-600</td>
</tr>
<tr>
<td>Benchtop Goniospectrometer with Yoko, no Chroma, Photometer</td>
<td></td>
<td>AA-01351-700</td>
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<tr>
<td>Benchtop Goniophotometer Options</td>
<td>Description</td>
<td>Part Number</td>
</tr>
<tr>
<td>---------------------------------</td>
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</tr>
<tr>
<td>Intensity Standard Kit</td>
<td>Intensity lamp standard: Set of 3</td>
<td>AA-01309-000</td>
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<tr>
<td>Chroma 61602 AC Power Supply</td>
<td>0 -300V, 1000 VA single phase AC power supply, mounts in rack</td>
<td>AS-03062-006</td>
</tr>
<tr>
<td>Chroma 62000 DC Power Supply</td>
<td>Programmable DC power supply model 620121P-80-60</td>
<td>EX-05140-000</td>
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<tr>
<td>Gonio, CDS-600 Assembly Kit</td>
<td>AS-03062-023</td>
<td></td>
</tr>
<tr>
<td>Gonio, Photometer Assembly Kit</td>
<td>AS-03062-024</td>
<td></td>
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<tr>
<td>Yokogawa WT310E</td>
<td>Power analyzer, mount in rack</td>
<td>PP-04625-011</td>
</tr>
<tr>
<td>E26 Kelvin Socket</td>
<td>4 pole Kelvin socket</td>
<td>AS-03062-005</td>
</tr>
<tr>
<td>2 m Extension Rail</td>
<td>Positions sensor to lamp distance to 2 m</td>
<td>AS-03062-020</td>
</tr>
<tr>
<td>Lamp Mount Accessories</td>
<td>Application specific mounts</td>
<td>Custom</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>EXTENDED WARRANTIES</th>
<th>DESCRIPTION</th>
<th>PART NUMBER</th>
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<tbody>
<tr>
<td>Extended Warranties</td>
<td>Software (12 Months)</td>
<td>AA-01375-000</td>
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<tr>
<td>Extended Warranties</td>
<td>Parts Only (12 Months) (not including lamps)</td>
<td>AA-01375-001</td>
</tr>
<tr>
<td>Extended Warranties</td>
<td>Parts and Labor (12 Months) (not including lamps)</td>
<td>AA-01375-002</td>
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