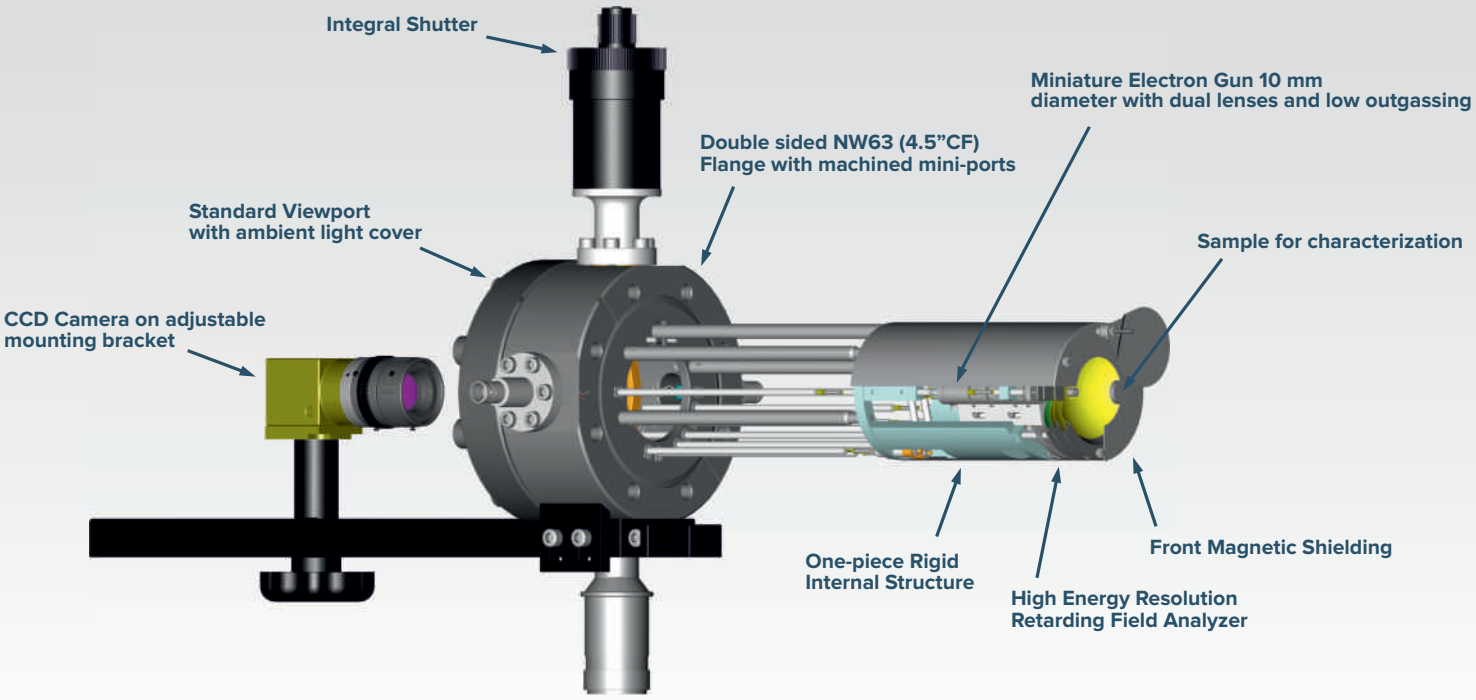
# Surface Crystallography Spectrometer - IntegraLEED

**based on Low Energy Electron Diffraction (LEED) and Auger Electron Spectroscopy (AES)**

## MODEL LEED 450 (BDL450) with Integral Shutter




**Features:**

- High angular & energy resolution LEED & AES
- Miniature Electron Gun with double focusing
- Superior magnetic shielding
- Suitable for "in situ" epitaxial growth monitoring
- Integral Shutter
- External Linear Retraction
- Low Outgassing Rate
- Easy add-on AES

**Applications**

Miniature sized and high performance characterization tool for surface crystallography of single crystals and "in-situ" epitaxy.

The LEED 450 is capable of providing LEED and AES data for a wide range of samples.

The miniature instrument size allows for integration into any UHV system.

Materials suitable for characterization should be single crystals and epitaxial films in categories such as: 2D materials, semiconductors, metals, oxides and magnetic films.

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# IntegraLEED - MODEL LEED 450

## Specifications

**LEED-AUGER OPTICS (Model BDL450)**

| | |
|---|---|
| **Retarding Field Analyzer** | Concentric assembly of hemispherical grids<br>Working distance from sample 10 mm |
| **Grid Material** | Gold coated tungsten wire mesh<br>(100 mesh, 81% transparency) |
| **Energy Resolution** | 0.2% - 0.5% at low modulation volt. |
| **Glass-Display** | Fused silica glass coated with indium-tin oxide conductive layer and P31 phosphor (ZnS:Ag:Cu-green, 525 nm wavelength)<br>90° angle of acceptance from sample at a distance of 32 mm |
| **Monitoring** | Standard viewport on NW63 (4.5" CF) Flange |
| **Linear Motion** | External nipple with bellow up to 150mm retraction |
| **Integral Shutter** | Open and close at any position of the linear motion |
| **Magnetic Shielding** | Mu-metal cylinder with front cover for maximum magnetic field attenuation |
| **Assembly** | Extreme-high-vacuum compatibility with stainless steel, high alumina and gold-plated copper alloy materials |
| **Mounting** | 4.5”(DN63CF) double sided conflat flange with port length range 145 mm - 580 mm |
| **Bakeability** | Under vacuum, 250°C maximum |

**Integral Miniature Electron Gun**

| | |
|---|---|
| **Beam Energy** | LEED 5 eV to 750 eV<br>AES 5 eV to 3000 eV |
| **Beam Current** | LEED 2 µA at 100 eV and 0.5 mm beam size<br>AES up to 100 µA at 3 keV |
| **Beam Size** | from 1 mm to 250 µm - adjusted by wehnelt voltage |
| **Electron Source** | Tungsten-2%Thoriated filament standard,<br>single crystal LaB6 filament optional |
| **Energy Spread** | 0.45 eV (thoriated-tungsten filament) |
| **Overall Size** | 10 mm lens diameter and 80 mm length |

## Ordering Guide

**LEED Application:**

| | |
|---|---|
| **BDL450** | LEED optics with integral electron gun on 4.5” flange - 3 Grids |
| **LMX-EXT** | External linear motion (nipple-bellow) (X=retraction distance) |
| **ISH** | Integral shutter |
| **LPS075-D** | Digital power supply with voltage range 0 - 750 V |
| **LIM12** | LEED imaging software with CCD camera, full version (optional) |
| **LIM12B** | LEED imaging software with CCD camera, basic version (optional) |

**LEED and AES Application:**

| | |
|---|---|
| **BDL450** | LEED optics with integral electron gun on 4.5” flange - 4 Grids |
| **LMX-EXT** | External linear motion (nipple-bellow) (X=retraction distance) |
| **ISH** | Integral shutter |
| **LPS300-D** | Digital power supply with voltage range 0 - 3 kV |
| **LOA10-AES** | Digital AES controller with ramp voltage, sinewave oscillator, lock-in and AES software |
| **LIM12** | LEED imaging software with CCD camera, full version (optional) |
| **LIM12B** | LEED imaging software with CCD camera, basic version (optional) |

## Control Electronics

**LPS075-D Digital LEED**
Power supply (0-750 V) with USB interface and PC control software for Windows 10. True primary beam current and total emission measurements. Automatic start-up and shut down, 10 memory settings including standby and outgassing mode with timer, constant beam current mode.

**LPS300-D Digital LEED-AES**
Power supply (0-3.2 kV) with USB interface and PC control software for Windows 10. True primary beam current and total emission measurements. Automatic start-up and shut down, 10 memory settings including outgassing with timer, automatic switch from LEED to AES, constant beam current mode.

**LOA10-AES**
Digital AES controller with lock-in amplifier, AES high voltage ramp board 0-2.0 kV with precision sinewave oscillator (0.5-20 Vpk-pk) and AES software for Windows 10. USB communication to PC.

**LEED Software**

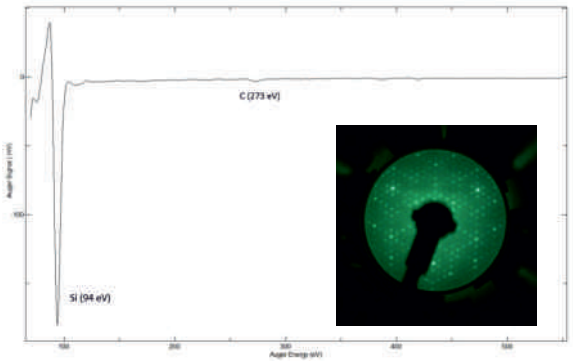
**LIM12B**
Basic LEED pattern measurements and analysis software and hardware for Windows 10 including:
- Automatic LEED pattern acquisition
- CCD camera
- Flange Mounting kit with ambient light cover and cables

**LIM12**
Full version LEED pattern measurements and analysis software and hardware for Windows 10 including:
- CCD camera
- Flange mounting kit with ambient light cover and cables
- Software features:
  - o Automatic LEED pattern acquisition
  - o Automatic I-V analysis with spot tracking
  - o Automatic I-T analysis
  - o Automatic spot profile analysis

**CCD Camera Specifications**
- 12-bit colour high performance video CCD camera with sensitivity control and USB3.1 interface
- 1/3” CCD sensor size, image size: 1.3 MP (1288x964), 3.75 um pixel size, CS-mount lenses
- Linear Full Well: 9000e-, Dynamic Range: 59 dB

## Data

**LEED pattern and AES spectrum**
**Si (111) - single crystal wafer at 80 eV beam energy after thermal annealing in UHV**

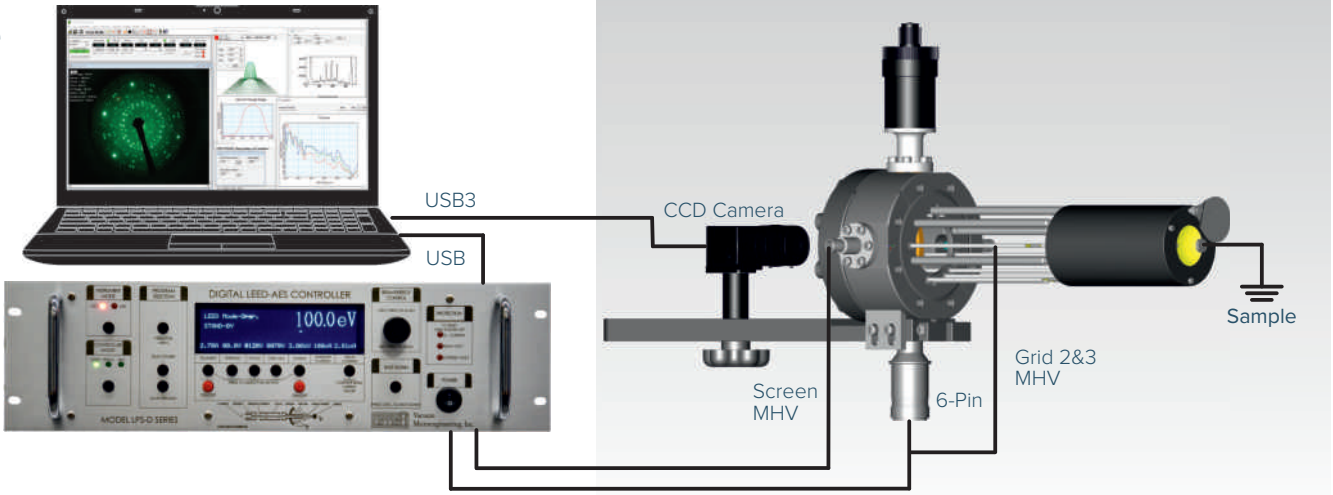



**Link for more data:**
http://www.ocivm.com/leed-aes-data.html

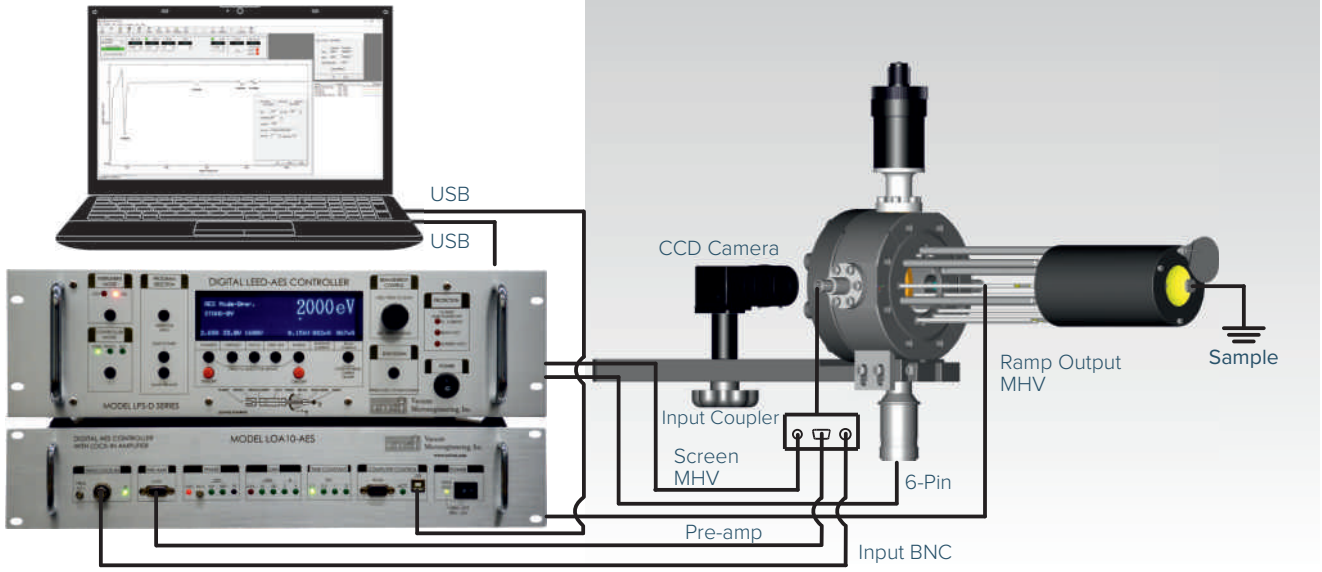
# IntegraLEED - MODEL LEED 450

## Connection Diagrams

### LEED Mode



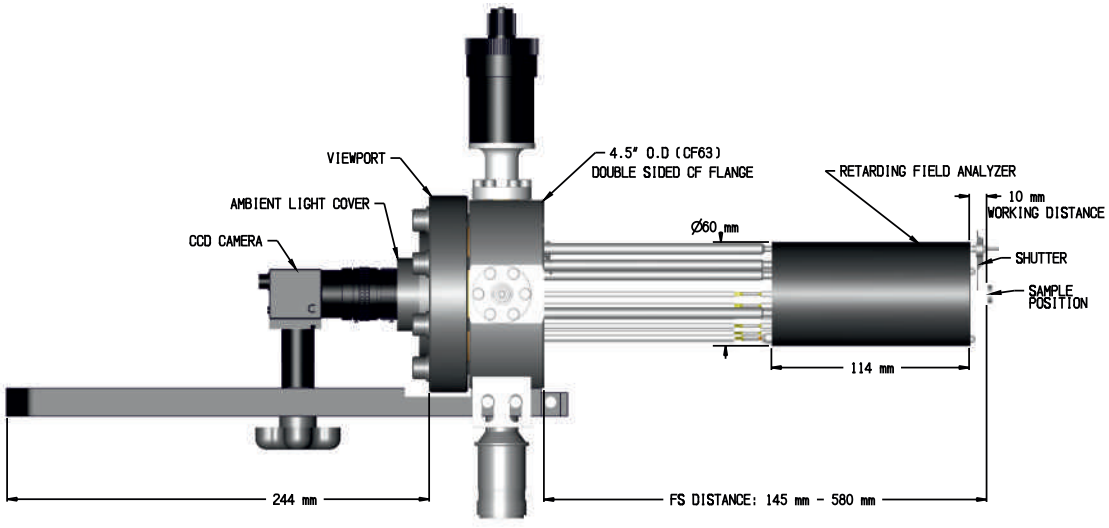

### AES Mode




## Schematic Drawings

### BDL450-ISH

**SIDE VIEW**
**WITH 100mm RETRACTION**



# IntegraLEED - MODEL LEED 450

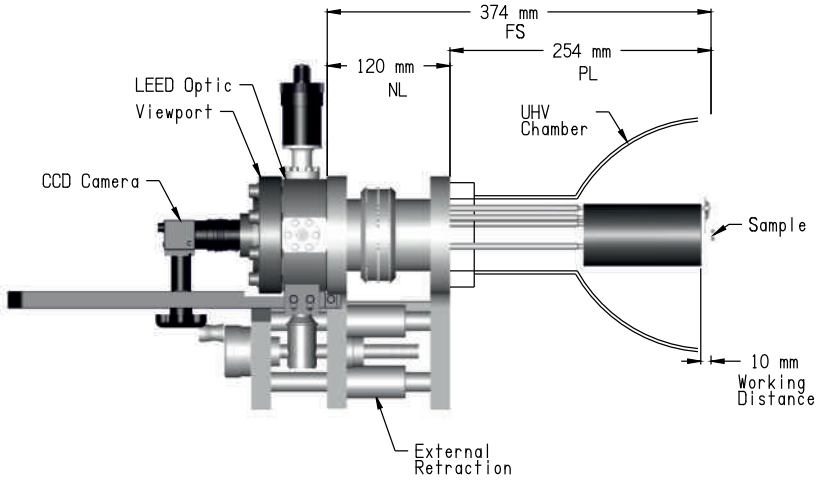
## LEED Optics and UHV Chamber Configuration

## Calculation formula for Flange-Sample distance and Retraction length:

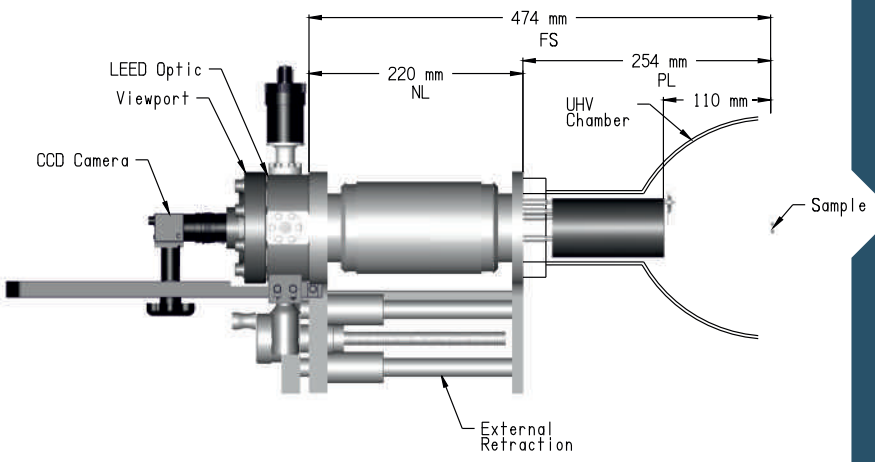
$FS_w = OL + WD = PL + B + OV$
$FS_p = FS_w + LMX$

**$FS_w$** - flange to sample distance in working position
**$FS_p$** - flange to sample distance in parking position
**LMX** - retraction length
**B** - minimum bellow length
**OV** - overlapping length
**OL** - fixed optic length
**WD** - working distance
**PL** - port length
**NL** - current bellow length

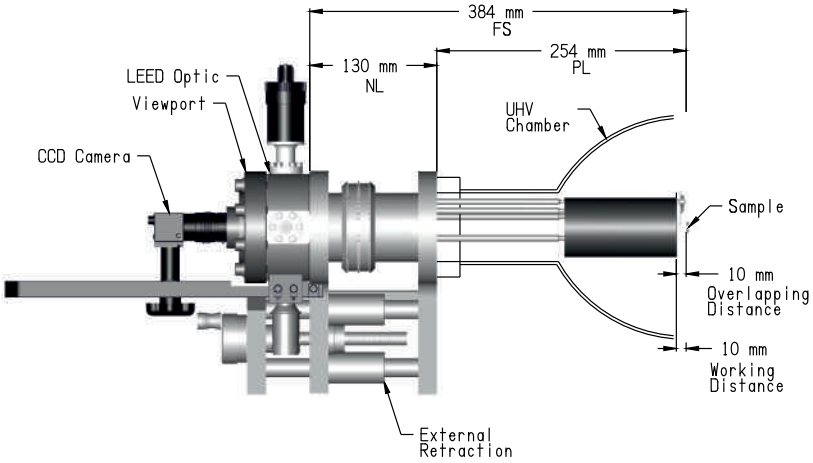
Schematic Diagrams for 100 mm Retraction




**Example:**
**Operating (working) Position**
$FS_w$: 374 mm PL: 254 mm
LMX: 100 mm NL: 120 mm
OV: 0 mm




**Retracted (parking) Position**
$FS_p$: 474 mm PL: 254 mm
LMX: 100 mm NL: 220 mm
OV: 0 mm




**Operating (working) Position with Overlap**
$FS_w$: 384 mm PL: 254 mm
LMX: 100 mm NL: 130 mm
OV: 10 mm