The LC 2012 Spatial Light Modulator is based on a transmissive Liquid Crystal (LC) microdisplay with 1024 x 768 pixel resolution. The SLM provides a phase shift of 2 π at 532 nm and around 1 π at 800 nm. The microdisplay and drive electronics are packaged into a compact box for easy integration into optical setups. The device is delivered with a mounting ring which fits for standard laboratory posts / holders. The LC 2012 is addressed using a standard HDMI interface and advanced calibration can be performed using an USB interface.

**Special Optical Features**
- Translucent Liquid Crystal Microdisplay
- Amplitude or Phase Modulation
- 2 π Phase Shift @ 532 nm
- Intensity Ratio of 1000:1 @ 633 nm

**LC 2012 Spatial Light Modulator – Microdisplay Features**
- Display Type: Transmissive LC
- Resolution: 1024 x 768
- Pixel Pitch: 36 µm
- Fill Factor: 58 %
- Active Area 36.9 x 27.6 mm (1.8" Diagonal)
- Addressing 8 Bit (256 Grey Levels)
- Signal Formats HDMI – XGA Resolution
- Frame Rate 60 Hz

**LC 2012 Driver Dimensions (Unit: mm):**

The LC 2012 Spatial Light Modulator can be used for phase and amplitude modulation applications dependent on the configuration. High transmittance and high contrast of the LC panel guarantee an excellent image quality.

**LC 2012 Spatial Light Modulator – Scope of Supply**
- LCD Image Display Device LC 2012 (1024 x 768 Pixel)
- Power Supply
- HDMI Cable + DVI/HDMI Adaptor
- USB/Mini-USB Cable
- Device Mount
- Operating Instruction / Manual
- USB Flash Drive with Manual, User Software and Application Software
The LC-R 720 Spatial Light Modulator is based on a reflective LCOS microdisplay with a resolution of 1280×768 pixel (WXGA). With a pixel pitch of 20µm and a fill factor of 92% the LC-R 720 shows a reflectivity of around 70% in the visible. The very fast response time of < 3ms and the high image frame rate of 180 Hz makes the LC-R 720 Spatial Light Modulator a good choice for high speed applications such as one panel color sequential projection. Besides projection applications the LC-R 720 can also be used for phase modulation. The device provides a phase shift around 1 Pi in the visible (e.g. ~1.2Pi @ 532 nm).

### Special Optical Features
- Reflective (TN) LCOS Microdisplay (180 Hz)
- Amplitude or Phase Modulation
- Above 1 π Phase Shift in the Visible
- Intensity Ratio of 1000:1 Typical
- Fast Response Time < 3 ms
- Trigger Sync
- High Frame Rate (180 Hz) for Color Sequential Operation
- High Light Efficiency / High Fill Factor

The LC-R 720 is delivered as complete developer kit and plug-and-play device. The display settings can be controlled by an user-friendly graphical user interface (GUI) software.

### LC-R 720 Spatial Light Modulator Kit – Contents:
- LC-R 720 SLM Driver Box
- LCOS Imager (1280 x 768 Pixel)
- DVI (Digital Video Interface) Cable
- Serial Port Cable (RS232)
- Power Supply (24V DC, 36VA)
- Operating Instruction / Manual
- Data Medium (CD or USB Flash Drive) with Manual, User Software and Application Software

### Display Dimensions (Unit: mm):

![Display Dimensions](http://www.onset-eo.com)
The LC-R 1080 Spatial Light Modulator system is based on a reflective LCoS™ (Liquid Crystal on Silicon) microdisplay. The LC-R 1080 supports DVI-signals with WUXGA resolution (1920 x 1200 pixel). The device offers very high resolution with a small pixel pitch of only 8.1 µm. Due to the special Brilliant high contrast mode, the display features high intensity ratios even for IR wavelengths.

Long flex extensions and the small display size simplifies integration into optical systems and setups. The LC-R 1080 SLM is also equipped with a VSYNC interface to grasp the vertical synchronous pulse from the DVI signal to trigger the device with external sources (e.g. cameras).

Due to the high resolution (1920 x 1200 – WUXGA-resolution), the small pixel pitch of 8.1 µm and the high contrast microdisplay the LC-R 1080 Spatial Light Modulator is the perfect solution for projection applications (amplitude modulation: Optical metrology / fringe projection; 3D projection / Simulation; Imaging).

**LC-R 1080 Spatial Light Modulator – Microdisplay Features**
- Display Type: Reflective LCoS
- Resolution: 1920 x 1200
- Pixel Pitch: 8.1 µm
- Fill Factor: 90 %
- Active Area: 16.39 x 10.56 mm (0.72” Diagonal)
- Addressing: 8 Bit (256 Grey Levels)
- Signal Formats: DVI – WUXGA Resolution
- Frame Rate: 60 Hz

**LC-R 1080 Spatial Light Modulator – Scope of Supply**
- LC-R 1080 SLM Driver Box
- LCoS Imager (1920 x 1200 Pixel)
- DVI/HDMI Cable
- USB Cable
- Power Supply (24V DC, 12VA)
- Display Mount
- Operating Instruction / Manual
- Data Medium (USB Flash Drive) with Manual, User Software and Application Software

**Special Optical Features**
- Reflective LCoS Microdisplay
- Amplitude or Phase Modulation
- Above 1.2 π Phase Shift in the Visible
- Intensity Ratio of 2000:1 @ 633 nm
- High Contrast
- VSYNC interface

**LC-R 1080 Driver Dimensions (Unit: mm):**
- 105.0 mm
- 44.0 mm
- DVI Input

**Display Dimensions (Unit: mm):**
- 19.41 mm
- 10.54 mm
- 6.82 mm
- 4.71 mm
- Micro LCD Connector
Phase Only Spatial Light Modulators

The PLUTO phase modulator models are based on reflective LCOS microdisplays with 1920 x 1080 pixel resolution and a small 8.0 µm pixel pitch and are optimized to provide a phase shift above 2 π up to 1550 nm. The devices are packaged in an very small housing to ensure an easy integration into optical setups and applications. The PLUTO phase modulator series comprises 6 versions, optimized for the visible, a broad wavelength band centered at 850 nm, a version specialized for the near infrared around 1064 nm and a version optimized for typical telecommunication wavelength around 1550 nm (C-Band). Furthermore 2 high retardance display panels are available (visible and broadband 400-1100 nm) which enable a modulo 4 Pi or 6 Pi encoding of optical functions depending on the wavelength. Applications range from holography, lithography, optical metrology, interferometry, optical tweezers, wave front corrections to phase shifting applications. The high fill factor of the display also ensures a high light efficiency.

The PLUTO displays show a reflectivity of approx. 60% and diffraction efficiencies of more than 80%. Thereby a total light efficiency of more than 50% per addressable diffractive device is possible. The driving of the PLUTO devices is as easy as with all HOLOEYE Spatial Light Modulators. A HDTV graphics card is sending HDTV resolution images to the device (via DVI) with a frame rate of 60 Hz.

PLUTO – Optimized for different Wavelengths Ranges

PLUTO-VIS:
This version is optimized for the visible because of a broadband AR (anti reflection) coating for this spectral range.

PLUTO-NIR:
This version is optimized for the near infrared around 1064 nm with an AR coating for 1064 nm and a thicker LC layer.

PLUTO-TELCO:
This version is optimized for common telecommunication wavelengths ranges around 1550 nm.
PLUTO-VIS-HR and PLUTO-BB-HR (High Retardance SLM Display Versions):
HOLOEYE developed two new phase only panels (PLUTO-VIS-HR and PLUTO-BB-HR version) which show a considerably higher phase retardation compared to the standard panels which enables mod 4 Pi or even mod 6 Pi phase functions to be addressed. This can be beneficial for wave front functions as this enables higher slopes and can reduce transition points in the addressed function compared to mod 2 Pi encoding.

For some applications a stable phase response is required. This can be accomplished driving the High Retardance panels with adapted settings for 2π phase retardation, however compromising the response time. The driving forces to the LC molecules in such a configuration are reduced and the phase signal typically shows a standard deviation of 0.2-0.7% (wavelength dependent). Due to the high programmability of the drive electronics the same SLM can be adapted for different requirements.

- PLUTO-VIS-HR: High retardance version for the visible (high phase shift, low phase fluctuations)
- PLUTO-BB-HR: High retardance version for a broad wavelength band 400-1100 nm (high phase shift, low phase fluctuations)

PLUTO Spatial Light Modulator Kit – Contents:

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Driver Dimensions (Unit: mm):

Display Dimensions (Unit: mm):
LETO Phase Only Spatial Light Modulator (Reflective)

The LETO phase modulator is based on a reflective LCOS microdisplay with full HD (1920 x 1080 pixel) resolution. With a pixel pitch of only 6.4 µm and a small interpixel gap of 0.2 µm the LETO SLM provides a high fill factor of 93% and thereby a high light efficiency.

The LETO Spatial Light Modulator is usable for the 400-1100 nm range and the modulator provides a phase shift of 2π up to 850 nm. The device is delivered with a linear 256-level phase response for the specified user wavelength. The adaptation of the device settings for different operating wavelengths to a linear 2π phase response can be done by straightforward gamma correction using the supplied calibration software.

The LETO Spatial Light Modulator offers a reflectivity of ~75%. Due to the optimized design of the LCOS microdisplay the LETO SLM shows low cross talk between the pixels resulting in high effective spatial resolution. The device offers diffraction efficiencies of more than 80% (16 level blazed grating) which leads to a total light efficiency of ~60%.

LETO phase only modulator devices can simply be addressed like an external monitor using the standard HDMI interface of the graphics card. No additional software or special hardware is needed to operate the SLM.

**Special Features:**
- Reflective LCOS Microdisplay
- Phase Only Modulation
- Small Interpixel Gaps
- 6.4 µm Small Pixel Pitch

The LETO phase only modulator devices can simply be addressed like an external monitor using the standard HDMI interface of the graphics card. No additional software or special hardware is needed to operate the SLM.

**LETO Spatial Light Modulator – Microdisplay Features**
- Display Type: Reflective LCOS (Phase Only)
- Resolution: 1920 x 1080
- Pixel Pitch: 6.4 µm
- Fill Factor: 93%
- Active Area / Diagonal: 12.5 x 7.1 mm (0.55” Diagonal)
- Addressing: 8 Bit (256 Grey Levels)
- Signal Formats: HDMI – HDTV Resolution
- Frame Rate: 60 Hz

**LETO Spatial Light Modulator – Scope of Supply**
- LETO SLM Driver Box
- Phase Only Display incl. Flex Cable (1920 x 1080 Pixel)
- HDMI-cable & DVI/HDMI-cable
- USB Cable
- Power Supply
- Operating Instruction / Manual
- Data Medium (CD or USB Flash Drive) with Manual, Calibration Software and Application Software

**Display Dimensions (Unit: mm):**
- 31.0 x 162.0 x 44.6

**Driver Dimensions (Unit: mm):**
- 162.0 x 110.6 x 71.0