

CLWS-300/C

Circular laser writing system CLWS-300/C

Laser pattern generator CLWS-300/C is used for manufacturing of binary amplitude masks of computer-synthesized holograms with arbitrary topology, multi-level axial-symmetric diffractive optical elements, precision circular scales for angular encoders and limbs. Laser writing system CLWS-300/C is intended for direct laser writing of diffractive structures on chromium and photoresist films. Writing process is carried out in polar coordinates system. The radial displacement unit with optical writing head, angular coordinate unit and laser beam power control unit are fixed on granite plate placed on antivibration table. Laser beam power control unit stabilizes and modulates laser power in a range of 1:10000 by means of two acousto-optic modulators. There is a mechanical shutter, which helps to avoid exposure of the photoresist during break in writing. The optical writing head mounted on the radial displacement unit includes autofocus subsystem with focusing objective (N.A.= 0.65), CCD camera, illuminator, photodetectors for control of writing beam power and light reflected by recording layer. The objective forms a light spot with diameter about 0.65 μm (FWHM at 488nm) on a substrate covered by recording material. The optical substrate is fixed on spindle by vacuum holder. Angular position of the substrate is measured by angular optical encoder, which is used for rotation speed stabilization as well. The linear air-bearing stage is moved by means of a computer-controlled linear motor. The stage displacement is measured by the precision laser interferometer. The system is computer controlled with a set of special PCI cards and Windows-based software.



Basic laser writing system CLWS-300/C includes:

- ♦ **Optomechanical unit** (radial displacement unit with optical writing head, angular coordinate unit, laser beam power control unit) on granite table;
- ♦ **Computer and control software,**
- ♦ **Antivibration table;**
- ♦ **Air and vacuum preparation unit;**
- ♦ **Rack with electronic control units;**
- ♦ **User documentation.**
- ♦ **Argon ion laser Innova 300-5 (Coherent, USA)**

Main specifications

Writing spot diameter, μm (at FWHM)	0.65
Writing laser wavelength, nm	458-514
Writing field diameter, mm	285
Spindle rotation speed, rpm	300-900
Accuracy of radial coordinate (rms) , μm	Better then 0.1 *
Accuracy of angular coordinate, (rms) ang. sec	2
Writing pitch, mm	0.1 -1
Writing time for arbitrary binary pattern per 100 cm^2 at <ul style="list-style-type: none"> • Addressable grid: 0.5 μm • Radial range of writing: 0-56.5 mm • Rotation speed: 900 rpm 	Approx. 4.2 hours
Minimal time for substrate mounting and adjustment, min	1-10
Allowable substrate unflatness, mm per inch of diagonal	1.3
Substrate thickness, mm	1.5-25
Substrate loading	Handle
Recording material: - for binary structures - multi-level structures	Cr-films, Photoresist films
Operation temperature range	21 \pm 1 $^{\circ}\text{C}$
Temperature tolerance during writing process for obtaining guaranteed accuracy	\pm 0.1 $^{\circ}\text{C}$
Dimensions of optomechanical unit (LxHxW) without writing laser/ weight	1.5x1.2x1 m3/1500kg

Optional Upgrades:

- ♦ **Software for direct laser writing of phase multi-level diffractive optical elements with arbitrary topology on photoresist films.**
- ♦ **UV laser beam power control unit (with 532nm and 365-375 nm lasers) and NA=0.85-0.9 focusing objective.**

* - base version.

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