Nd:Glass High Energy Nanosecond Systems

ANL Nd:Glass SERIES

Typical external view of ANL80KSS-AWG laser system

Ekspla offers wide range of high energy Nd:Glass laser systems. Typically Nd:Glass lasers comprise of diode pumped master oscillator, pre-amplifier, pulse shaper and main lamp pumped amplifiers.

Different types of front end options are available – a diode pumped SLM or MM master oscillator featuring excellent stability, long lifetime and maintenance-free operation based on Nd:glass or Nd:YLF. Also, Temporally shaped seeder / regenerative amplifier configuration allowing application of smoothing technics. Wave front correction system based on DFM is possible to implement as well.

Power amplifiers are a chain of low-maintenance flash lamp pumped single and double pass amplifiers where pulses are amplified up to the required energy. During amplification, spatial beam shaping is employed in order to get a Super-Gaussian spatial shape at the output.

APPLICATIONS

- *OPCPA pumping*
- *Thomson Scattering*
- *Multi-stage OPCPA pumping*
- *Non-linear optics*
- *Ti:S pumping*
- *Plasma and shock physics*

Angle-tuned non-linear crystals harmonic generators mounted in temperature stabilized heaters are used for second and third harmonic generation. Harmonic separation system is designed to ensure high spectral purity of radiation and direct it to the output ports.

System control is available through control pad, USB and LAN interfaces (RS232 as optional). The system can be controlled from personal computer with supplied software for Windows operating system.

FEATURES

- *Up to **80 J** from a single channel*
- *Pulse durations **from 100 ps to 20 ns***
- *Spatial Super-Gaussian beam profile*
- *Front-end options:*
  - *Diode pumped **single-mode** (SLM) or **multi-mode** (MM) master oscillator featuring excellent stability, long lifetime and maintenance-free operation based on Nd:Glass or Nd:YLF*
  - ***Temporally shaped seeder** / regenerative amplifier configuration allowing application of smoothing technics*
  - ***Wave front correction** system based on deformable mirror **(DFM)***
- *Flash lamp / LD pumped pre-amplifier*
- *Up to Ø60 mm aperture Nd:Glass power amplifiers*
- *Laser protection by Faraday isolators preventing damage of laser rods by back-reflected light*
- *Optimized design for maximum pulse energy extraction*
- *Separately controlled PFN circuits for each flash lamp*
- *Diagnostics and monitoring of system status based on microprocessor controller*
- *Software guide for step-by-step performance check at designated control points*
- *Optional second and third harmonics generators*

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SPECIFICATIONS

Model	ANL25kSS-AWG	ANL80kSS-AWG	ANL160kSS-AWG
MAIN SPECIFICATIONS [1]			
Center wavelength	1053 nm	1053 nm	1053 nm
Output energy [2]			
at 1053 nm	25 J	80 J	160 J (2 × 80 J) [3]
at 527 nm [4]	15 J	50 J	100 J
at 351 nm [4]	7 J	25 J	50 J
Pulse repetition rate [5]	1 shot every 5 min	1 shot every 20 min	1 shot every 20 min
Pulse duration [6]	0.15 – 20 ns	0.15 – 20 ns	0.15 – 20 ns
Pulse energy stability [7]	≤ 5.0 %	≤ 5.0 %	≤ 5.0 %
Beam spatial profile [8]	Super-Gaussian	Super-Gaussian	Super-Gaussian
Beam diameter [9]	40 mm	60 mm	60 mm
Beam pointing stability [10]	≤ 30 µrad	≤ 30 µrad	≤ 30 µrad
Beam divergence			
Optical pulse jitter [11]	≤ 50 ps	≤ 50 ps	≤ 50 ps
Output isolation from Back-reflected light [12]	> 500 : 1	> 500 : 1	> 500 : 1
Pre-pulse contrast [13]	> 1000 : 1	> 1000 : 1	> 1000 : 1
Polarization contrast	> 100 : 1	> 100 : 1	> 100 : 1
Polarization	Linear	Linear	Linear
PHYSICAL CHARACTERISTICS [14]			
Laser head size (W×L×H mm)	1500 × 2000 × 560	1200 × 3600 × 560	2 × (1200 × 2400 × 560)
Power supply size (W×L×H mm)	553 × 600 × 653 553 × 800 × 1745	2 × (550 × 800 × 1940) 2 × (550 × 800 × 670)	2 × (550 × 800 × 1940) 2 × (550 × 800 × 670)
Umbilical length	10 m	10 m	10 m
OPERATING REQUIREMENTS [15]			
Power requirements [16]	208, 380 or 400 V AC, three phases, 50/60 Hz	208, 380 or 400 V AC, three phases, 50/60 Hz	208, 380 or 400 V AC, three phases, 50/60 Hz
Power consumption [17]	1 kW	1 kW	2 kW
Water supply [17]	5 l/min, 2 Bar, max 15 °C	10 l/min, 2 Bar, max 15 °C	10 l/min, 2 Bar, max 15 °C
Operating ambient temperature	22 ± 2 °C	22 ± 2 °C	22 ± 2 °C
Storage ambient temperature	15 – 35 °C	15 – 35 °C	15 – 35 °C
Relative humidity (non-condensing)	≤ 80 %	≤ 80 %	≤ 80 %
Cleanness of the room	ISO Class 7	ISO Class 7	ISO Class 7

1) Due to continuous improvement, all specifications are subject to change without notice. The parameters marked 'typical' are indications of typical performance and will vary with each unit we manufacture. Presented parameters can be customized to meet customer's requirements. All parameters measured at 1064 nm if not stated otherwise.

2) The output energies are measured at 5 ns, rectangular pulse at time domain, FWHM.

3) The 160 J energy output is combined of two 80 J channels with vertical and horizontal polarizations.

4) Harmonic outputs are optional. Specifications valid with respective harmonic module purchased. Outputs are not simultaneous.

5) In service or low energy modes the time between shots can be reduced by half or more.

6) Variable pulse duration in steps of 125 ps. Pulse shaping is possible in the range of 1 – 20 ns.

7) Under stable environmental conditions, normalized to average pulse energy (RMS, averaged from 10 shots).

8) Super-Gaussian spatial mode of 6-11th order in near field.

9) Beam diameter is measured at signal output at $1/e^2$ level for Gaussian beams and FWHM level for Super-Gaussian beams.

10) Beam pointing stability is evaluated as movement of the beam centroid in the focal plane of a focusing element (RMS, averaged from 10 shots).

11) Optical pulse jitter with respect to electrical outputs. ≤ 50 ps - with AWG oscillator. ≤ 0.2 ns – with SLM oscillator. ≤ 10 ps – optional

12) Faraday isolator contrast.

13) Contrast up to 10^4 : 1 available upon request.

14) System sizes are preliminary and depend on customer lab layout and additional options purchased.

15) The laser and auxiliary units must be settled in such a place void of dust and aerosols. It is advisable to operate the laser in air conditioned room, provided that the laser is placed at a distance from air conditioning outlets. The laser should be positioned on a solid worktable. Access from one side should be ensured.

16) Voltage fluctuations allowed are +10 % / -15 % from nominal value.

17) Power consumption and water supply requirements deviate depending on system configuration.

OPTIONS

Option	Description	Comment
- AWG	Arbitrary waveform generator	Temporal pulse shape control in 1 – 10 ns range by 125 ps step
- Back reflection protection	Protects the system's optical elements from an accidental back reflection	Ø45 mm Faraday isolator with additional optics

PERFORMANCE

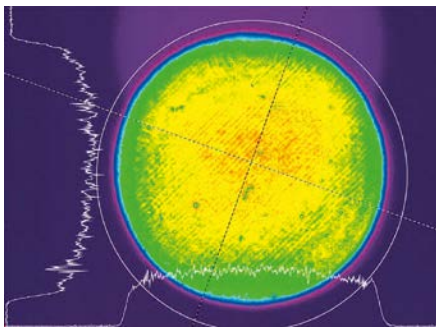

Fig 1. Typical beam profile of Nd:Glass laser system at 1053 nm (imaged from amplifier exit)

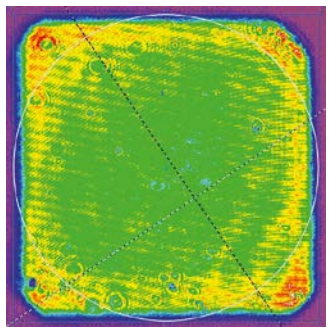

Fig 2. Spatially shaped beam profile of Nd:Glass laser system at 1053 nm (imaged from amplifier exit)

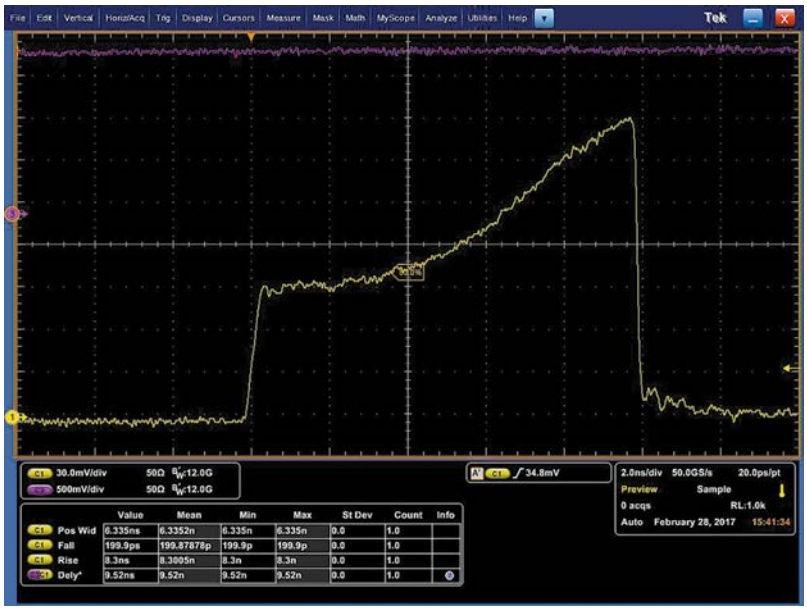

Fig 3. Temporally shaped rising pulse at 33 J (yelow line)

OUTLINE DRAWINGS

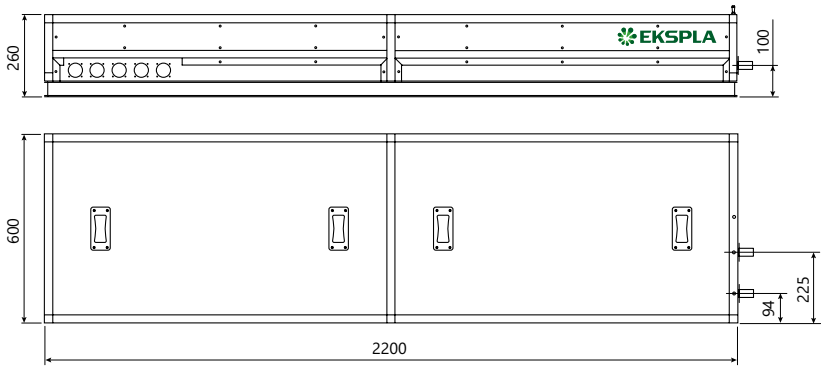

Fig 4. ANL25kSS-AWG laser head outline drawing (actual dimensions might vary)

POWER SUPPLY

Cabinet	Usable height	Height H, mm	Width W, mm	Depth D, mm
MR-9	9 U	455.5 (519 [1])	553	600
MR-12	12 U	589 (653 [1])	553	600
MR-16	16 U	768 (832 [1])	553	600
MR-20	20 U	889 (952 [1])	553	600
MR-25	25 U	1167 (1231 [1])	553	600
MR-34	34 U	1640 (1709 [1])	553	600
MR-38	38 U	1745 (1810 [1])	553	800

[1] Full height with wheels.

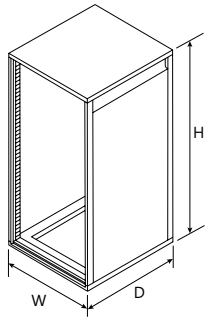

Fig 5. Typical Nd:Glass laser system power supply dimensions (MR rack used depends on the laser model)

ORDERING INFORMATION

Note: Laser must be connected to the mains electricity all the time. If there will be no mains electricity for longer that 1 hour then laser (system) needs warm up for a few hours before switching on.

ANL(1)(2)-(3)

Energy level:
25k → 25 J
80k → 80 J
160k → 160 J

Pulse repetition rate:
SS → Single shot

Any additional options:
See 'Options' table

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