



Big Sky Laser Series Ultra & CFR

Compact Nd:YAG Q-Switched Lasers



CFR and Ultra Series Compact, Rugged Pulsed Nd:YAG Lasers with Compact Folded Resonator Design.

When we tell you about compact, rugged lasers for “real-world” applications, we are talking about key features and superior performance found in our Big Sky Lasers line of products.

The CFR Series of lasers were designed at the outset for the user needing a rugged, reliable source for real-world applications. The acronym CFR stands for Compact Folded Resonator.

While the CFR Series will function in a laboratory, a laboratory laser will not function in the kind of environment frequently encountered elsewhere. Extreme temperatures, humidity, dust and other pollution, as well as vibration and shock are all factors taken into account in the fundamental design of the CFR.

More and more manufacturers are claiming to offer compact and rugged lasers. We decided to look at the facts and explain why Quantel is unique among laser manufacturers in offering a commercial product, coming from a military heritage, at an affordable price.

Rugged by Design

The design of the CFR closely follows that of a military laser. That means it can operate in temperatures from below the freezing to those typical of a hot desert, not just a few degrees either side of room temperature. An optional ethylene glycol/water coolant mixture enables operation below the freezing point.

The CFR can be transported in a land, sea or air vehicle without needing realignment afterwards. CFR Series of lasers are extensively tested on our in-house vibration rig and every one is temperature cycled from 5°C to 60°C before it is shipped.

This ruggedness is a direct result of the combination of our unique CFR optical design and the stiff I-beam mechanical design, optimized by finite element analysis.

Compact

A smaller, lighter laser is easier to transport and takes up less valuable equipment space. Our CFR (Compact Folded Resonator) design halves the length of the laser for a given resonator length without significantly affecting other dimensions.

The Ultra head is small enough to mount directly to a microscope while its power supply and cooling system, at 30lb, is an easy lift under a table or behind a car seat. OEM systems integrators take advantage of the small size of our lasers by offering smaller systems or using the space saved to offer other features.

User-Friendly

Most users are not laser technicians and they want to spend their time on their application, not on the laser. The CFR Series is naturally easy to use.

Operation is turn-key. Control is via intuitive push button controls, external TTL triggers or by computer, via the standard built-in RS232 interface.

The CFR Series lasers rarely, if ever, need alignment because of the ruggedized CFR design. In our view, the frequent “tweaking”, typical of laboratory lasers, is an unnecessary nuisance.

Electrical and coolant lines are all fitted with quick release connectors for ease of packing, transportation and subsequent set up. No external water is necessary.

The lamp change is the easiest in the industry, taking the user a few minutes, with no realignment necessary.



The Key Features of the CFR Laser Technology

Pumping Chamber

We use diffuse ceramic reflectors that are virtually indestructible in normal use and give high efficiency and excellent pump uniformity. Other reflectors can tarnish and erode or fail completely.

Resonator

The CFR laser mirrors are hard-mounted side by side in the same plane, with a folding prism at the other end. The mirrors remain co-aligned while the folding prism gives additional compensation. Placing the resonator mirrors at opposite ends of a longer, unfolded resonator makes alignment much more sensitive to temperature and vibration effects.

Pockels Cell

Our CFR lasers contain lithium niobate based Pockels cells, which are non-hygroscopic and work properly over a wide temperature range. A cube polarizer is used, which is stable over a wide temperature range. Other manufacturers use KD*P, which must be kept temperature stabilized and is susceptible to moisture. Film polarizers lose contrast outside a limited range of temperature. Most military lasers use a Pockels cell design similar to those used in our Big Sky Laser products, such as the CFR series of lasers.

Mechanical Construction

The stiff I-beam mechanical housing is machined from a single block of stress-relieved aircraft grade alumi-

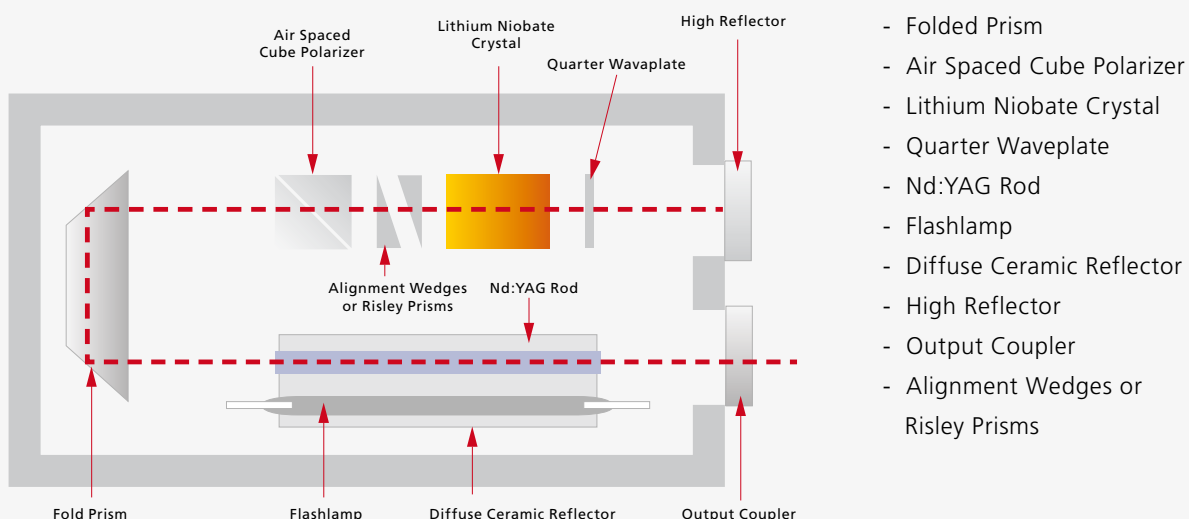
num. Use of finite element analysis in its design ensures that its rigidity and stability to environmental factors is unparalleled. Other types of construction are simply not as stable and will go out of alignment. The high rigidity and short physical length of the laser body makes the acoustic resonance frequencies of the unit higher. The higher the frequency, the lower the amplitude is for a given initial disturbance. This, along with fixed and pinned optical mounts imparts a high degree of vibration resistance.

Sealed and Purged

Our design approach is to make the laser completely impervious to dust and moisture by using hermetic o-ring sealing. For utmost protection, the CFR optical head is o-ring sealed and purged with dry nitrogen upon completion. The lasers of some other manufacturers typically are not hermetically sealed and will fail under dusty or humid conditions.

User-Friendly

The quick lamp change of our lasers is the easiest in the industry and can be accomplished in minutes. Other lasers often require extensive disassembly and even realignment. Sometimes the laser needs to be returned to the manufacturer. All the laser systems of our Big Sky Laser family of products have convenient quick disconnect coolant and power lines for ease of transportation. Other lasers are hard-wired together making transport less convenient.



CFR Options and Accessories

"Eye Safe" Optical Parametric Oscillators

For applications such as ranging and designation, it is often desirable to use a wavelength that is not transmitted by the eye and focused on the retina. To minimize the risk of eye damage a wavelength that is absorbed before it reaches the retina is used. In order to be truly eye safe, the laser beam must be expanded. We offer a range of compact, ruggedized, fixed wavelength Optical Parametric Oscillator (OPO) devices that integrate directly with the Ultra and CFR lasers. Like all our Big Sky Laser products, the OPO modules are compact, sealed, and purged for field use. They are factory pre-aligned for true plug and run capability.

The OPO modules can be supplied with the laser during the original manufacturing, or they can be factory retrofitted at a later date.

Ultra Fiber Optic Delivery

A fiber delivery system is available for the Ultra series of lasers. The fiber is rigidly integrated to the Ultra laser and it is fully prealigned, with no user alignment required. A 1 mm diameter fiber is used to transmit the laser energy reliably. The fiber is factory integrated and purged.

Variable Attenuator

An adjustable attenuator is available for the CFR series, which enables the user to adjust the 1064nm output energy across a wide range with no effect on beam quality, energy stability or pulse duration.

Custom Accessories

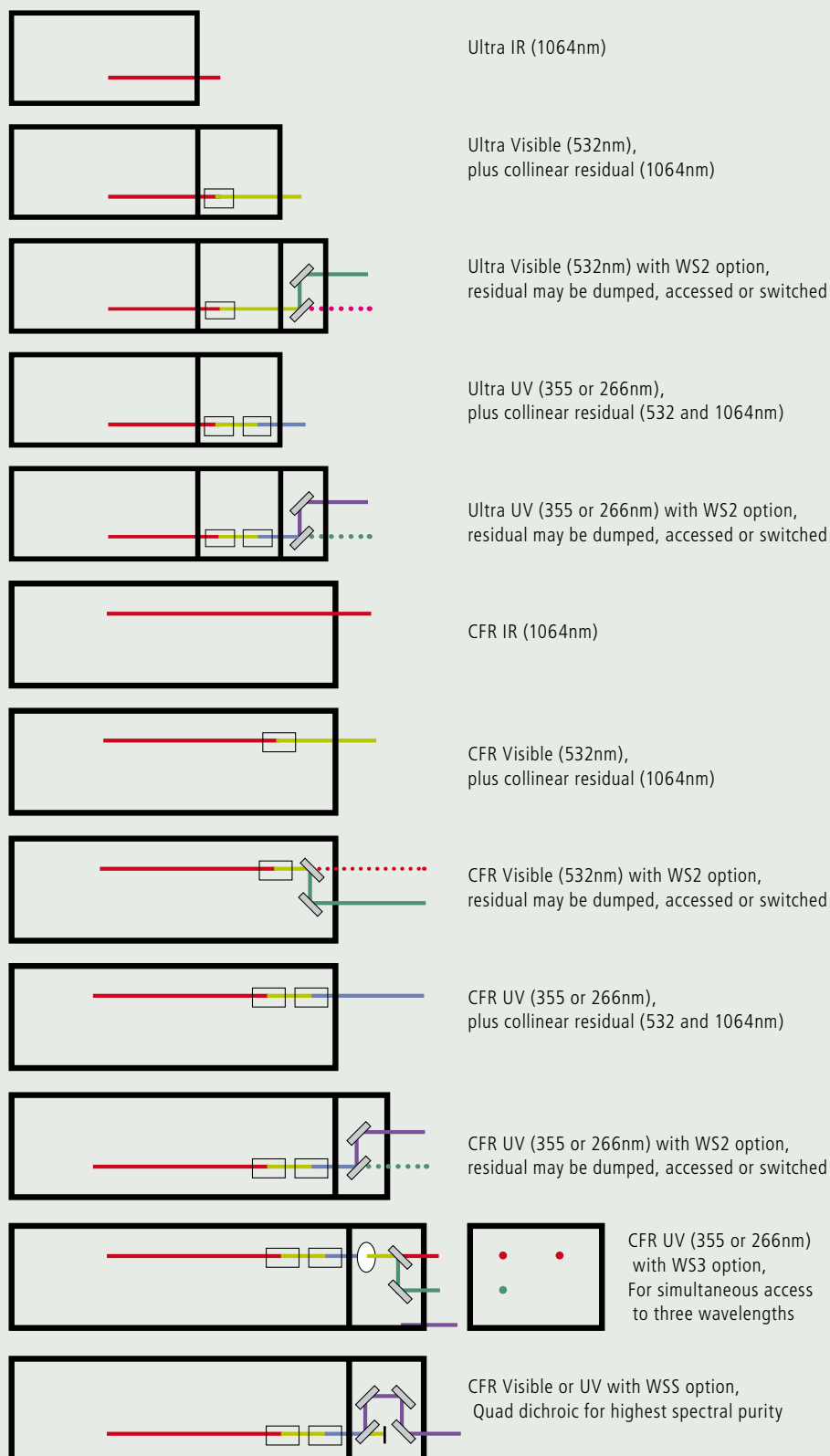
For OEM customers, we are always willing to consider special accessories to match a laser more precisely to an application. Whether this is an articulated delivery arm, a beam expander, or remote wavelength selection, we have the engineering resources to undertake a huge variety of special projects.

**CFR Lasers excel
in Airborne
Applications.**

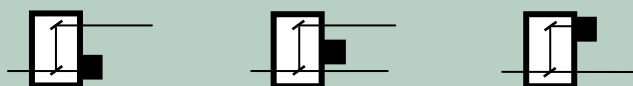


Remote box

Ultra & CFR Harmonics



With the WS2 option, the residual wavelength(s) may be dumped, accessed or switched by rotating a beam block.



Tough, Compact, and Reliable Laser Products Built to **Military Standards**

Features

- Rugged Reliability
- Compact, Portable, User-Friendly
- 20 mJ to 400 mJ at 1064nm
- All Harmonics Available as Standard
- 1.57 μm OPO for "Eyesafe" Operation
- Variable Repetition Rate
- Ideal OEM Laser Source
- Custom Versions Available
- Optical Fiber Delivery

Applications

- Ablation
- LIF (Laser Induced Fluorescence)
- LIBS (Laser Induced Breakdown Spectroscopy)
- PIV (Particle Image Velocimetry)
- Illumination
- Range-finding
- Remote Sensing
- Titanium: Sapphire (Ti:Sa) Laser Pumping
- Flat Panel Display (FPD) Manufacturing
- Solar Cell Manufacturing



*Airborne atmospheric LIDAR
(Leosphere – CEA – Dr Sanak)*

*Ti:Sa amplifier
from Amplitude
pumped by a CFR
(Forschungszentrum
Dresden-Rossendorf)*



*LIBS military system
(Thales)*



*Opolette:
Tunable OPO
pumped by
an Ultra (OPOTEK)*



*Ultra used
in a LA-ICP-MS system
from CETAC*



Visible and invisible laser radiation
avoid eye or skin to direct
or scattered radiation.
Class 4 laser radiation product
Max Average Power : 10 W
Max Energy/pulse : 1J
Pulse duration : <10ns
Emitted Wavelength : 213/1064nm
Class 4 laser product complies with
FDA performance standards for laser products
except for deviations pursuant to laser
notice NO 50 dated June 24, 2007/REC 60825-1

Benefits to OEM User

- Less down time and less expensive servicing
- True turnkey operation with no adjustment
- Genuine install and forget capability

Benefits to Researcher

- Genuine field-portable capability
- User friendly in and out of the laboratory
- No special technical knowledge required



Quantel



Manufacturing Facilities



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