

**Compact CO₂ Laser with High Reliability, High Performance
and High Functionality**

FANUC LASER C series

C1000*i*-MODEL C
C2000*i*-MODEL C
C4000*i*-MODEL C
C5000*i*-MODEL C
C6000*i*-MODEL C



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C1000i-C/C2000i-C/C4000i-C/C5000i-C/C6000i-C

FANUC LASER C series i-MODEL C is designed for **Series 30i/31i-L**, which is compact, high-performance and highly-reliability carbon-dioxide laser applicable to cut metallic and non-metallic materials.

Superior Control Functions

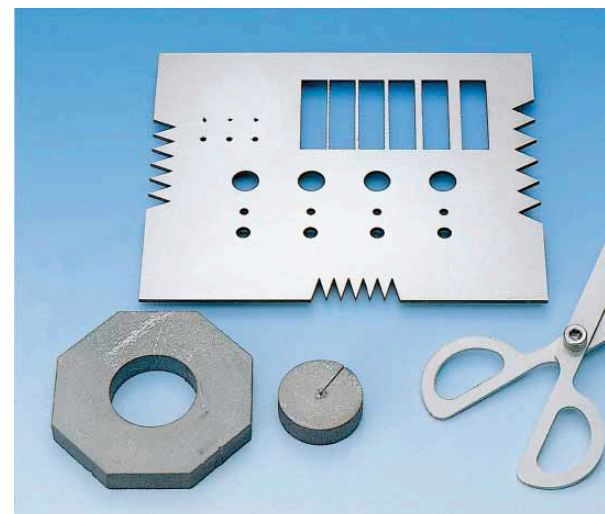
- Oscillator Control
 - Direct oscillator control by CNC
 - Laser power feedback control
 - Laser cutting condition control
- Power Saving Functions
 - Quick power saving function
 - Eco power saving function

High-Speed High-Precision Cutting

- High-Performance Cutting Functions
 - High-speed high-precision cutting function
 - Edge cutting function
 - Nano smoothing function
 - Minute laser output control function
 - Enhancement of pulse frequency command range
- Easy Cutting Condition Settings
 - Cutting condition setting function
 - Gap control function

Superior Oscillator Efficiency

- Superior RF Discharge Excitation
 - High conversion efficiency
 - Stable laser output
- High-Efficiency Turbo Blower
 - Compact with large blowing capacity by high speed rotation
 - Employment of FANUC Built-in Spindle Motor





Tuning for Dedicated System

- Tools for Dedicated Functions
 - Nano CNC system
 - C language executor
 - Real-time custom macro
 - Personal computer function with Windows® OS
- Customization
 - Cutting condition data settings

Highly Reliable Design

- RF Discharge Excitation with High Reliability and High Safety
 - All-solid-state RF power supply unit
 - Compact and high efficiency by latest MOSFETs
- Easy Maintenance
 - Screen of maintenance information history power compensation coefficient, run hour/maintenance time of parts etc.
 - Automatic leakage check function
 - Automatic power supply adjustment function
 - Support function for start-up after turbo oil exchange
- Conformity to Safety Standards
 - EC directive (CE Marking)
 - FDA (U.S.)



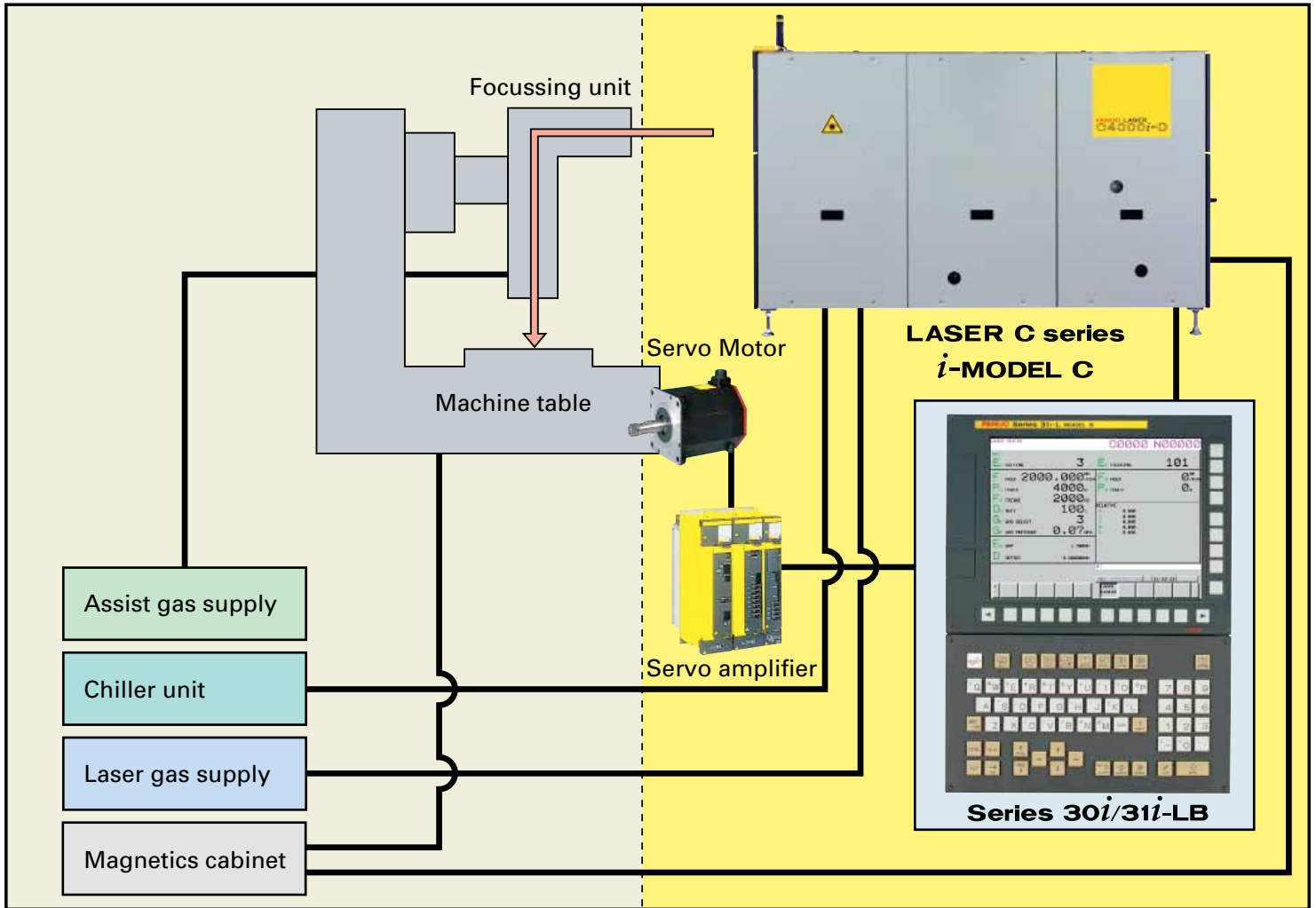
System Configuration

FANUC LASER C series is supplied together with FANUC CNC and servo motors, which makes it easy for customers to construct high-performance laser cutting machines. **FANUC LASER C series** is compact, high-performance and high-reliability carbon-dioxide laser. Five models – **C1000i-C**, **C2000i-C**, **C4000i-C**, **C5000i-C** and **C6000i-C** – are available to tailor output to your processing needs. They are specifically developed to cut metallic and non-metallic materials. Pumped at 2MHz with RF discharge using all-solid-state RF power supply unit, the laser oscillator became compact, efficient, and stable. Moreover, the fast axial gas flow produces the optimum beam quality for the cutting process.

FANUC Series 30i/31i-LB realizes high-speed, high-precision laser cutting with **FANUC LASER C series**.

FANUC AC SERVO MOTOR α i series, which is the most widely used in the world, also improves stable process together with the most advanced digital servo controlling technology.

System Configuration

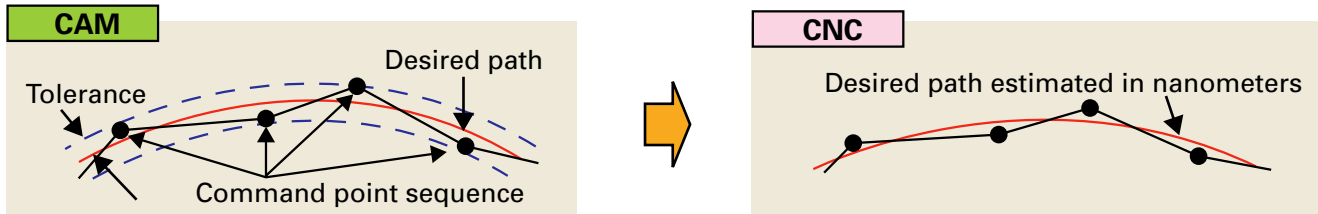


High-Speed High-Precision Cutting

Nano Smoothing [Japanese patent No.3904993]

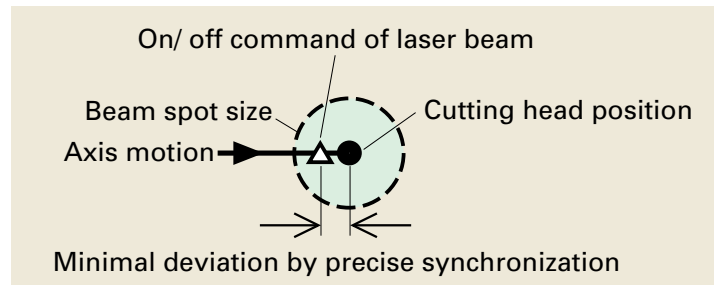
For laser cutting with a free-form curve, since a curve becomes a polygon when a machining program is specified with linear interpolation, an unnatural winding point could be made on the finished cut edge.

“Nano Smoothing” estimates a desired path within the tolerance with NURBS curves using a minute line segment command point sequence created by a CAD/CAM system and interpolates the generated NURBS curves in nanometers. This technology gives a smooth machined surface approximate to the designed figure and reduces manual finishing processes.



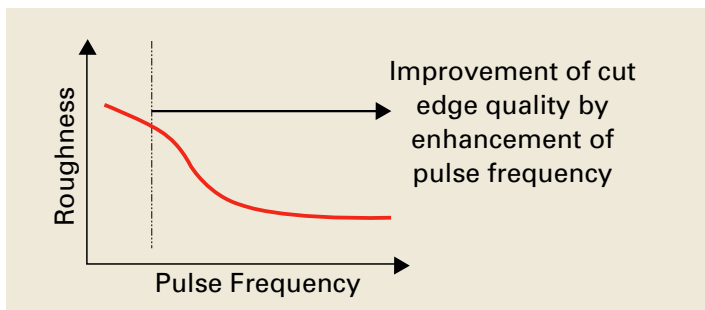
High-Speed High-Precision Cutting Function [Japanese Patent No.3795854, 4436809]

Extreme high-precision synchronization between axis command and beam on/off command is realized. In high speed cutting, deviation between cutting head position and beam on/off command increases. The function minimizes the deviation sufficiently smaller than the beam spot size.



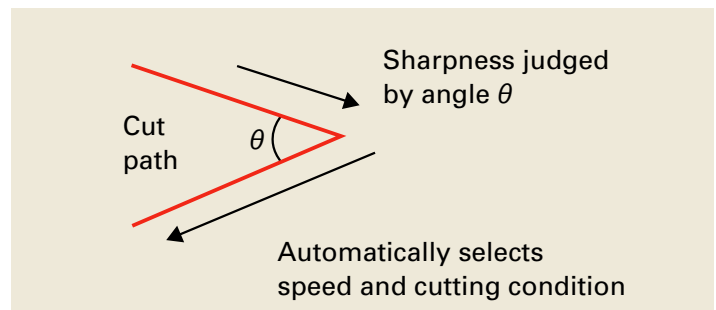
Enhancement of Pulse Frequency

The maximum command frequency of laser power has been enhanced from 2,000Hz to 32,767Hz. Enhancement of Pulse Frequency is effective in the improvement of the cut edge quality and decreasing dross.



Edge Cutting Function

On detection of sharp angles in the cut path, automatic acceleration/deceleration is performed with appropriate cutting condition, thus enabling sharp-edge cutting.



Minute Laser Output Control Function [patent pending]

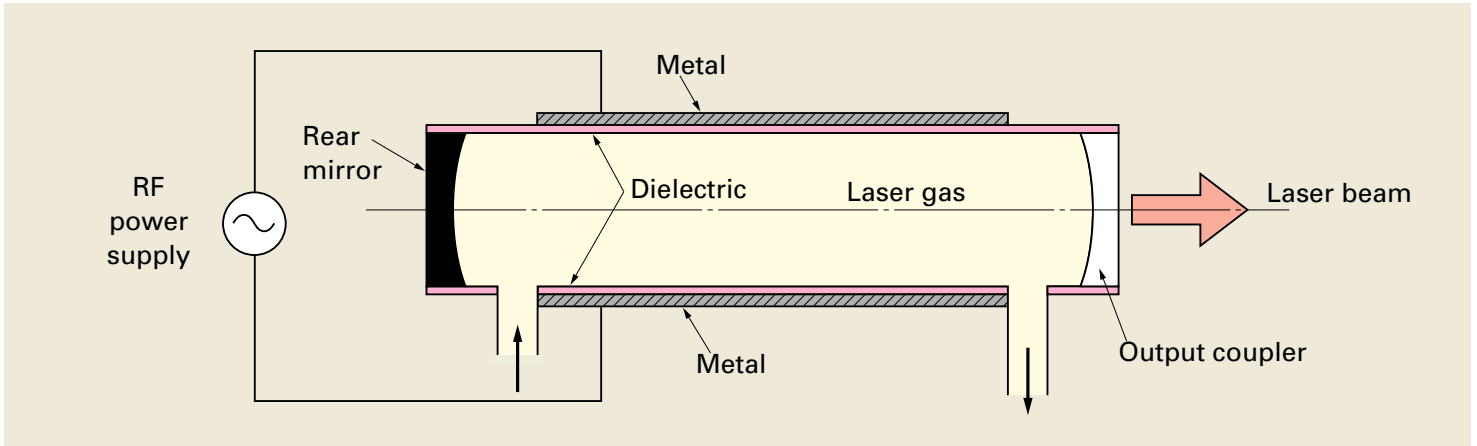
Stable minute laser output, which is needed for laser marking, is achieved with enhanced control of power supply units. The stability of laser marking process is further enhanced by the calibration function of Minute Laser Output Control.



Superior Oscillator Efficiency

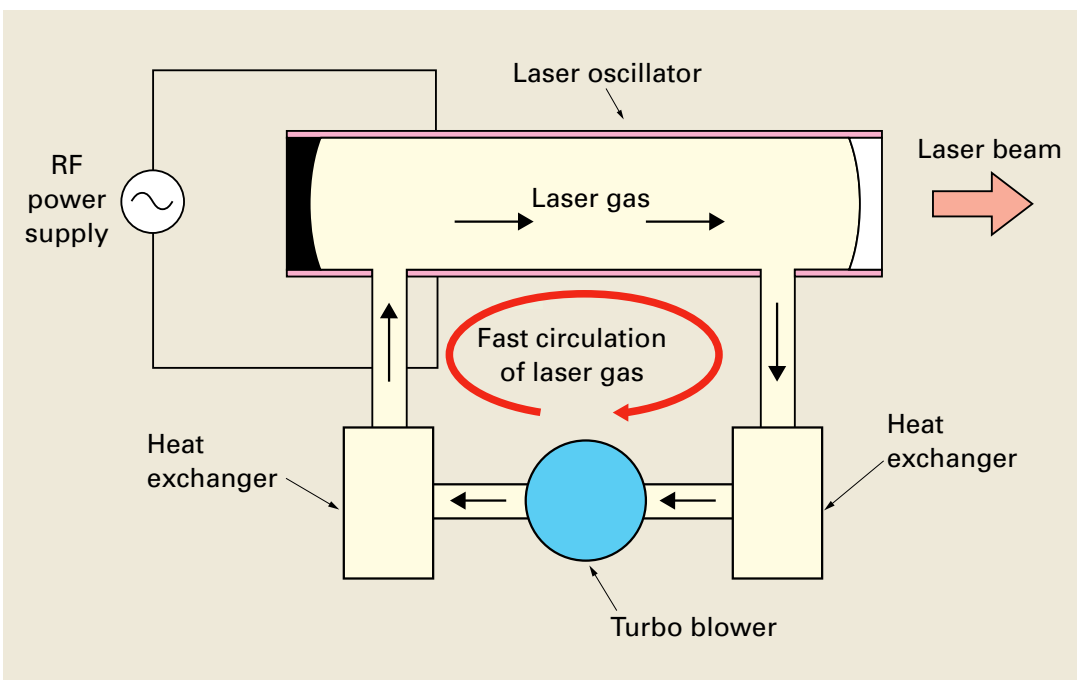
Superior RF Discharge Excitation

Using RF discharge excitation has brought about improved oscillation efficiency as well as output power stability. It also produces safety of operation due to low discharge voltage and high reliability due to non-contamination of laser gas which is possible only by adopting the external electrode structure as in **FANUC LASER C series**. The RF discharge excitation, stable and uniform one by nature, produces excellent pulsing characteristics. The transistorization using high power MOSFET, the first achievement at this power level, has also improved reliability.



High-Efficiency Turbo Blower

FANUC LASER C series are equipped with high speed rotation Turbo Blower to achieve fast laser gas circulation. Turbo blower design is optimized by use of FANUC Built-in Spindle Motor. Precise tuning of rotator and strict inspections enabled high speed rotation, and thus realizing the light weight, compact and large capacity Turbo Blower.



Turbo Blower

Tuning for Dedicated System

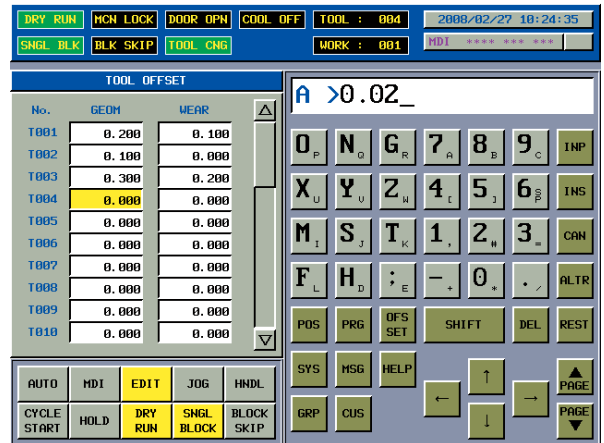
Nano CNC System

High-precision cutting achieved by coordination between “High-Precision Operation in Nanometers” and “State-of-the-Art Servo Technology” Nano interpolation that computes position commands for the digital servo control unit in nanometers, SERVO HRV Control and SPINDLE HRV Control for which the control cycle is made faster, and **FANUC AC SERVO MOTOR α i series** with a high-resolution pulse coder are used as standard and make up “Nano CNC System,” which achieves high-speed, high-precision cutting.

C Language Executor

Machine tool builders can create their own operation screens.

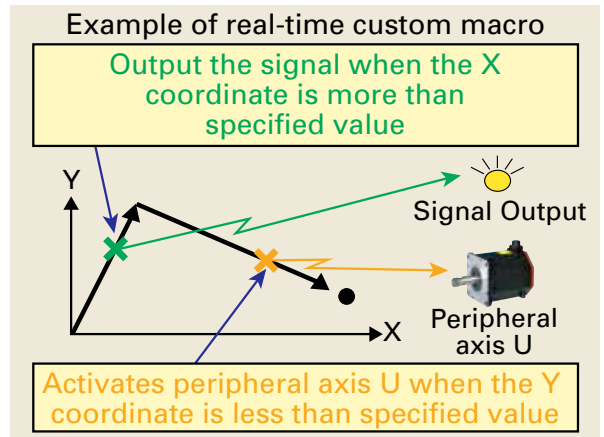
- C language is used ANSI functions and CNC and PMC functions for programming.
- High-level tasks to which high execution priority is assigned can monitor signal.



Real-time Custom Macro

Signals and peripheral axes can be controlled from machining programs.

- A macro statement can be executed in real time in synchronization with a machining program.
- Signals can be input and output by using DI/DO variables.
- Operation that the signal status is used as a trigger can simply be created.
- Macro variables can dynamically be read and written.
- Operation that position information of a system variable is used as a trigger can be created.
- Multiple real-time macro statements can be executed concurrently.
- Peripheral axis control can be written in the same program during machining.



Personal Computer Function

The best combination between a CNC and personal computer is realized by transferring bulk data via an original high-speed interface. Unique dedicated applications can be realized easily by personal computer function, and the machine tools can meet special needs for machine tool customers.

Feature

Various commercially application software and hardware are available

Application

Best fit for flexibility with computer applications, such as tool file management by utilizing database

OS

Windows® XP Embedded



PANEL i

Highly Reliable Design

High Reliability

The thermal deformation of the resonator is suppressed by using low thermal expansion material. The indirect cooling structure exhibits excellent corrosion resistance.

The ceramic coating and external electrode structure are adopted to the discharge tubes, in order to protect them mechanically and to decrease the contamination into the laser gas.

The RF power supply is all-solid-state type using the latest MOSFETs. All these factors contribute to the high reliability.



Easy Maintenance

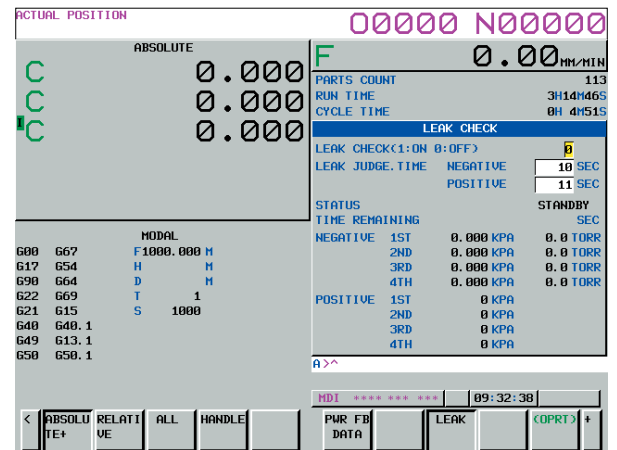
The history of power compensation coefficient, current/ voltage of laser power supply units, status of laser, and run hour/maintenance time of fundamental parts are displayed on the CNC screen.

The automatic leakage check function exhausts the resonator chamber to vacuum and displays the change of inside pressure over time.

The automatic power supply adjustment function automates the adjustment after replacement of power supplies.

After the laser is turned on, decrease of output power is always monitored. When it exceeds a certain preset level, a warning is displayed on the CNC screen to urge mirror cleaning.

In addition, newest techniques such as the oil mist decomposition element, dust collection unit and so on, have reduced the frequency of mirror cleaning interval and the high-precision-machined mirror stage has simplified mirror adjustment.



High Safety

FANUC LASER C series products comply with the EC directive (CE Marking) and U.S. standards (FDA) under the laser radiation control for health and safety that apply to manufactures of laser products.

Warning labels and certification label such as the ones shown down side are affixed permanently on each laser product.







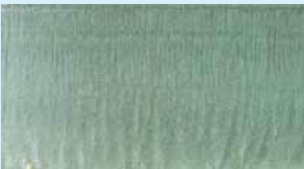
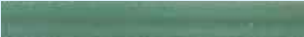














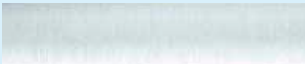
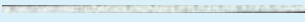






Using RF discharge excitation produces safety of operation due to low discharge voltage and skin effect by RF current.



—CERTIFICATION LABEL—
This laser product complies with 21 CFR 1040.10 and 1040.11.



Utility Plan for the Object

	Mild steel	Stainless steel	Aluminum
C1000i-C	 800mm/min 9mm  1600mm/min 4.5mm	 1200mm/min 3mm  2600mm/min 2mm	 1600mm/min 2mm  4000mm/min 1mm
C2000i-C	 550mm/min 22mm  2400mm/min 6mm	 500mm/min 10mm  1000mm/min 6mm	 600mm/min 6mm  2000mm/min 3mm
C4000i-C	 550mm/min 28mm  3000mm/min 6mm	 800mm/min 12mm  1800mm/min 6mm	 2000mm/min 6mm  3000mm/min 4mm
C5000i-C	 700mm/min 25mm  32000mm/min 1mm	 1000mm/min 12mm  35000mm/min 1mm	 700mm/min 8mm  40000mm/min 1mm
C6000i-C	 550mm/min 32mm  2400mm/min 12mm	 600mm/min 16mm  1200mm/min 12mm	 1200mm/min 10mm  2600mm/min 6mm

Specifications

Standard specification of laser oscillator

Items	Contents							
	C1000i-C	C2000i-C		C4000i-C		C5000i-C	C6000i-C	
Short		Long	Short	Long				
Model								
Optical path length		Short	Long	Short	Long			
System principle	RF discharge excitation fast axial gas flow							
Structure	Integrated type (Note1) (oscillator and power supply)							
Laser rated output (W)	1000	2000		4000		5000	6000	
Laser maximum output (W)	1000	2500		4000		5000	6000	
Pulse peak power (W)	1000	2700 Note 2)		4000		5000	7000 Note 2)	
Output stability	±1% Note 3)			±2% Note 3)				
Laser wavelength	10.6μm							
Beam mode	Low order mode							
Beam diameter at exit (mm)	< φ 20	< φ 27	< φ 24	< φ 27	< φ 24	< φ 20	< φ 27	
Polarization	45° linear			Circular	90° linear			
Beam divergence angle (full angle)	2mrad or less							
Pulse frequency	5 to 32767Hz							
Pulse duty	0 to 100%							
Laser gas Note4)	Gas A	Gas B						
Gas consumption rate (l/h)	Approx. 10				Approx. 20			
Cooling water	Water rate (l/min.)	40	75	160		250		
	Circulated water pressure	0.5MPa or less gauge pressure						
	Water temperature/ Water temperature stability	20 to 30°C/±1°C			20 to 30°C/±2°C			
	Recommended cooling capacity (kW)	11	22	44		55	66	
Input power supply	AC200V+10%、-15% 50/60Hz±1Hz or AC220V+10%、-15% 60Hz±1Hz or AC230V+5%、-10% 60Hz±1Hz							
Power supply capacity (kVA)	18	33	55		60	75		
Mass (kg)	350 30 (pump)	700		900		1100	1300	

Note 1) In **C1000i-C**, the vacuum pump is putting of the outside.

Note 2) Within limited pulse duty

Note 3) At rated power with laser power feedback during 8 hours.

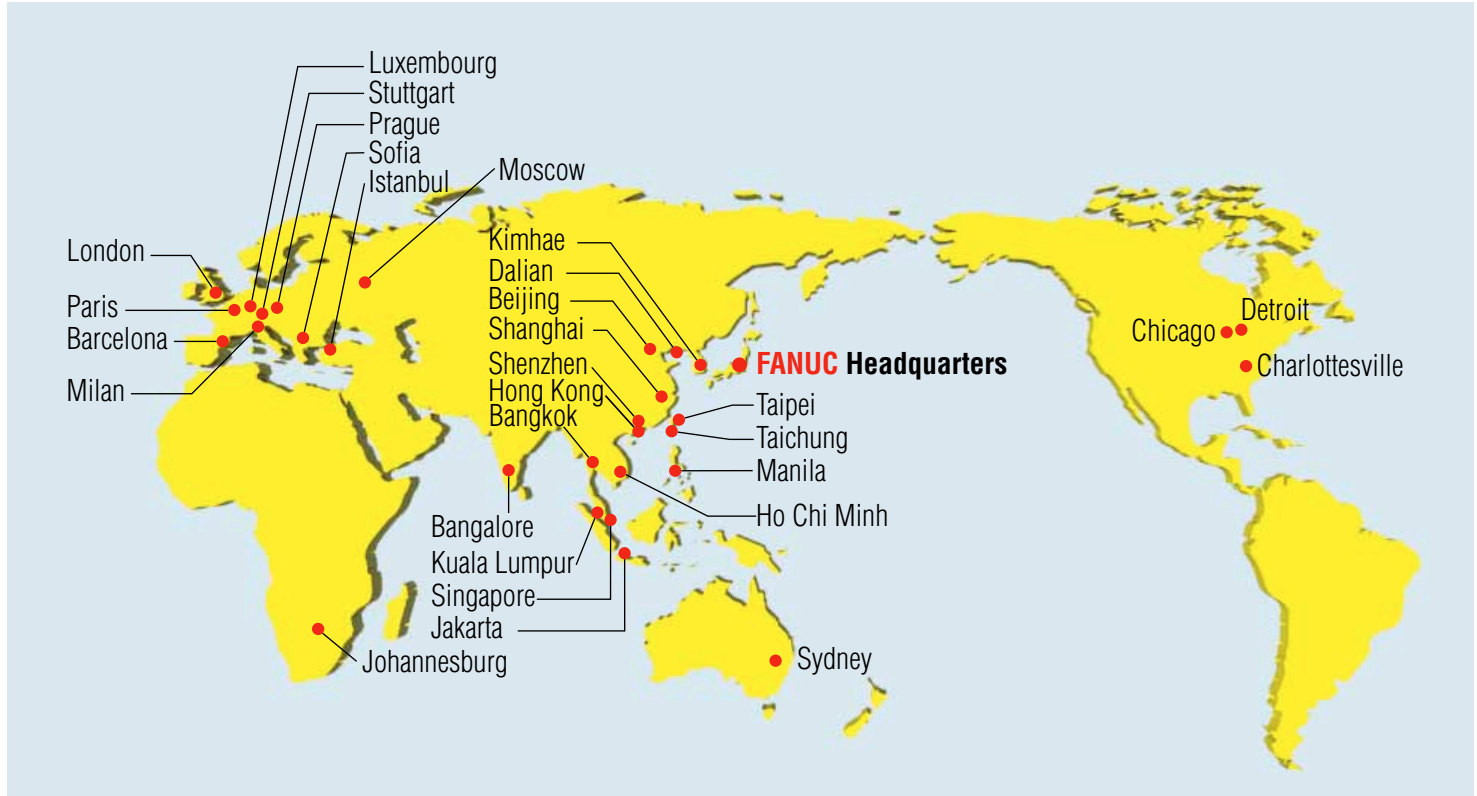
Note 4) Gas A /Pre-mixed gas of CO₂:He:N₂ (volume ratio, N₂ balance) 5:40:55% ±5% or less for each composition

Gas B /Pre-mixed gas of CO₂:He:N₂ (volume ratio, He balance) 5:60:35% ±5% or less for each composition

Maintenance and Customer Support

Worldwide Customer Service and Support

FANUC operates customer service and support system anywhere in the world through subsidiaries and affiliates. FANUC provides the highest quality service with the quickest response at the location nearest you.



FANUC Training Center

FANUC Training Center operates training courses for daily, periodic, and preventive maintenance including mirror cleaning procedure of CO₂ laser oscillator.

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