High-Efficiency CO_2 LASER with Wide Usage

FANUC

LASER C series

Compact CO_2 LASER with High Reliability, High Performance and High Functionality

FANUC LASER C series

C1000*i*-C/C2000*i*-C/C3000*i*-C/C4000*i*-C/C6000*i*-C

FANUC LASER C series *i*-MODEL C is designed for CNC Series 30*i*/31*i*-LB Plus, 0*i*-LF Plus, which is compact, high-performance and highly-reliability carbon-dioxide LASER oscillator applicable to cut metallic and non-metallic materials.
Newly, 3kW C3000*i*-C optimized for sheet metal and resin cutting was added to the line-up.

Mach
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High Efficiency and Economy

Maximizing Uptime

- 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
- Power Saving Functions
  - –Quick Power Saving state
  - –Eco Power Saving state
- LASER Gas Saving Function

Maximizing Uptime

Highly Reliable Design

Maximizing Uptime

- RF Discharge Excitation with High Reliability and High Safety
  - –All-solid-state LASER power supply
  - –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.)

Tuning for Dedicated

- Tools for Dedicated Functi
  - –Nano CNC system
  - –C Language Executor
  - –Real-Time Custom Ma
  - –Personal Computer Fu
- Customization
  - –Cutting condition data

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mance

C3000*i*-C

C6000*i*-C

High-Speed High-Precision Cutting

Cutting Performance

- High-Speed Cutting Functions
  - –High-Speed High-Precision Cutting Function
- High-Precision Cutting Functions
  - –Edge Cutting Function
  - –LASER Power Control Function
  - –Enhancement of pulse frequency command range
- High-Efficient Cutting Functions
  - –Cutting Condition Setting Function
  - –Gap Control Function

Ease of Use

Superior Control Functions

Ease of Use

- Oscillator Control
  - –Direct Oscillator Control by CNC
  - –LASER Power Feedback Control
  - –Minute LASER Output Control and Calibration Function
  - –LASER Cutting Condition Control
  - –Power Failure Restart Function
- Control functions with controllers not made by FANUC
- Combined processing made easy
  - –Allows combining the processes for both FANUC LASER and non-FANUC LASER as well as ink markers
  - –LASER functions such as power control can be applied to other machines and not only FANUC LASER

System

Ease of Use

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settings

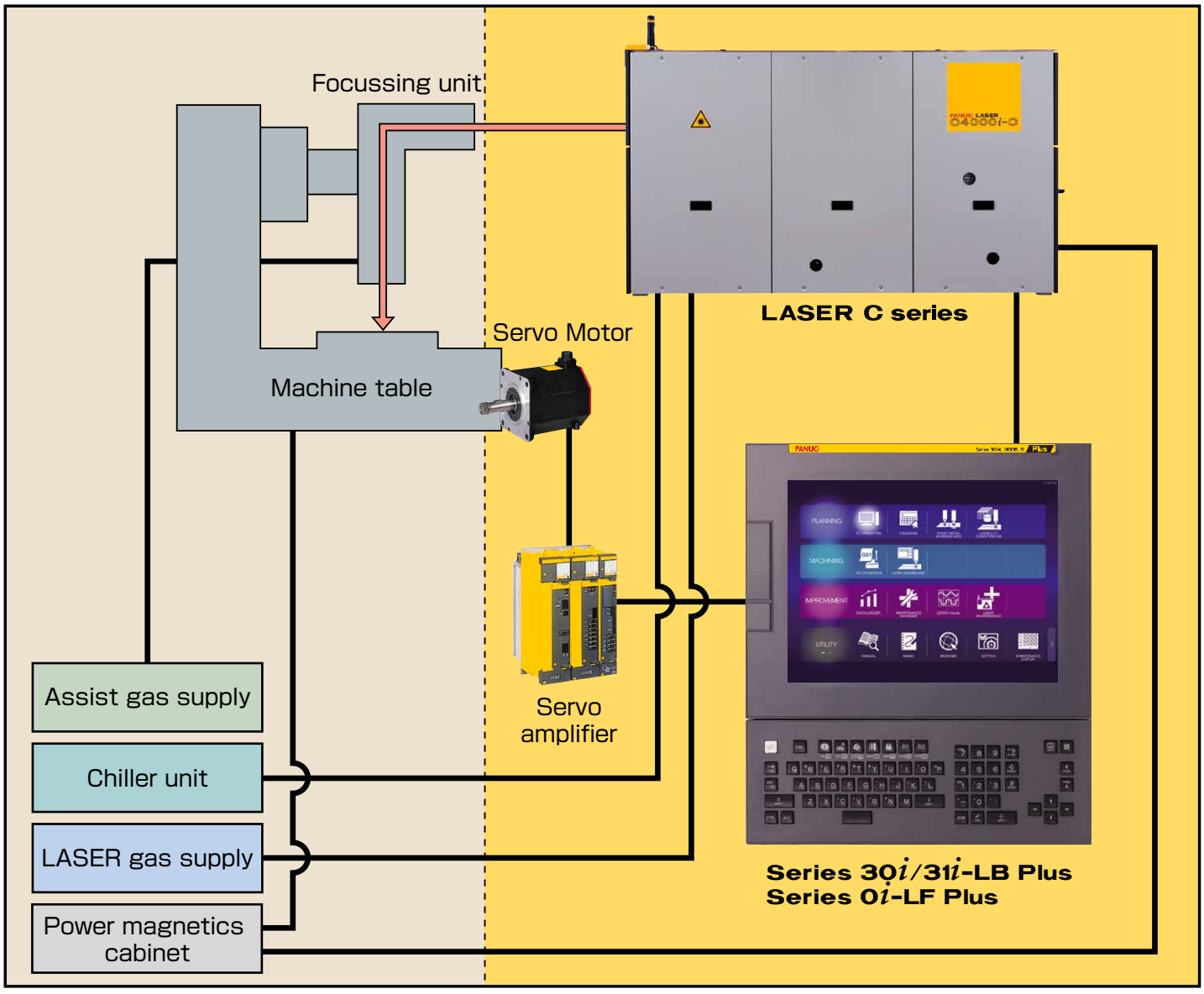
System Configuration

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 gas LASER developed for metal and non-metal materials cutting. Five models −C1000*i*-C, C2000*i*-C, C3000*i*-C, C4000*i*-C, and C6000*i*-C − are available to tailor output to your processing needs. RF discharge excitation, driven by all-solid-state LASER power supply using MOSFETs, has been achieved to reduce LASER size, improve LASER oscillation efficiency and output power stability. In addition, by the high-speed axial flow gas LASER, the optimal beam quality for cutting process can be obtained.

Combination with FANUC CNC for laser processing, Series 30*i*/31*i*-LB Plus and Series 0*i*-LF Plus, enable high-speed, high-precision material cutting.

FANUC AC SERVO MOTOR αi 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

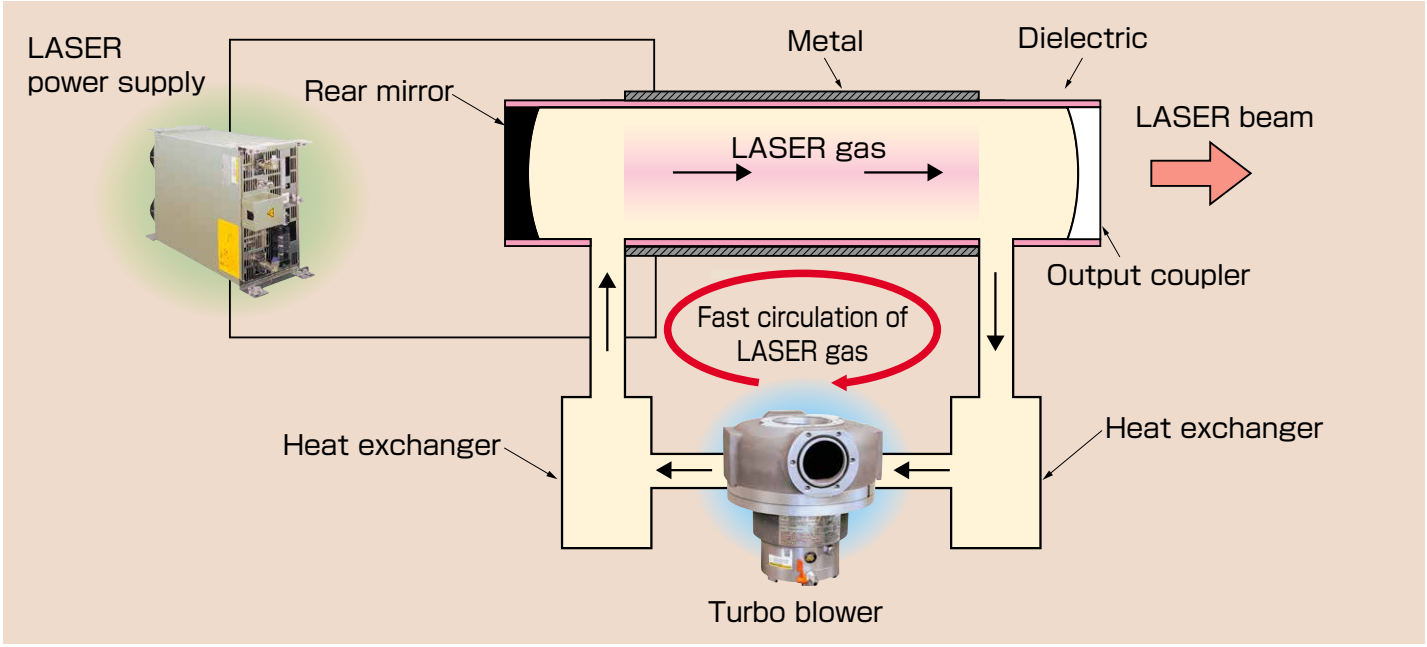


High Efficiency and Economy

Maximizing Uptime

Superior RF Discharge Excitation and High-Efficiency Turbo Blower

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.

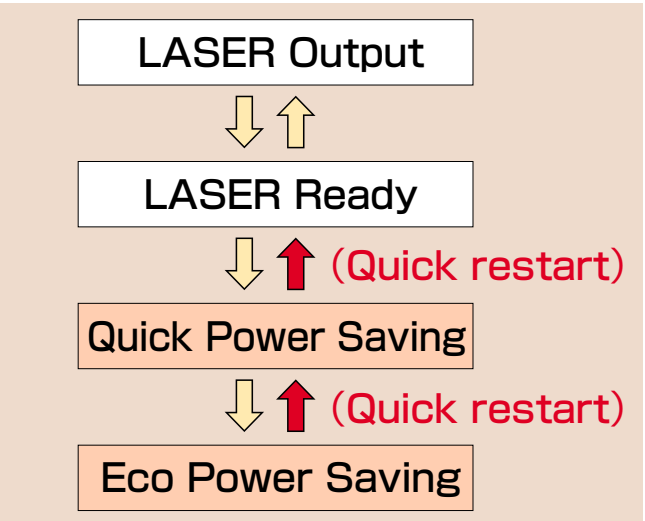


FANUC LASER C series are equipped with high speed rotation Turbo Blower to achieve fast LASER gas circulation. Turbo blower design is optimized by use of FANUC Built-in Spindle Motor. Precise tuning of rotator and strict inspections enabled high speed rotation, and thus realizing the light weight, compact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

Power Saving Functions

During LASER idle time, such as exchanging works, designing layout, and press processing on turret punch press machine, electric power consumption becomes lower by moving into the power saving states, in which LASER power supplies and turbo blowers of LASER oscillator are controlled in power saving conditions.

Two power saving states are available. One is Eco Power Saving state, in which electric power consumption is dramatically saved and the other is Quick Power Saving state, in which LASER cutting can be restarted quickly. Therefore, according to the customers' choices, electric power consumption will be saved with these power saving functions. Assuming a cutting ratio of 50%, the effect of the power saving is about 20% with Power Saving Functions.

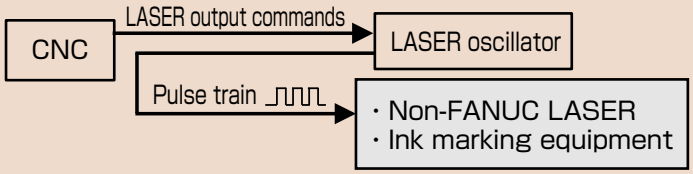


Superior Control Functions

Ease of Use

Direct Oscillator Control by CNC

A CNC unit can be connected directly to control the LASER oscillator. The CNC unit constantly checks the status of the LASER oscillator during operation from startup to termination and automatically keeps the oscillator ready with the optimum operating conditions. The CNC unit also automatically controls other parameters that affect beam output, such as LASER gas pressure.
In FANUC LASER C series *i*-model C, the enhancement of oscillator control sequence enabled to reduce the start-up time and shut down time of oscillator by half to the conventional model.
LASER oscillator is capable of outputting pulse signals at a frequency that is proportional with the axis speed. This eases the task of creating a simple multitasking machine by combining with non-FANUC manufactured LASER or ink marking machines.



The machine easily combines processes using the CNC LASER output control function

Power Failure Restart Function

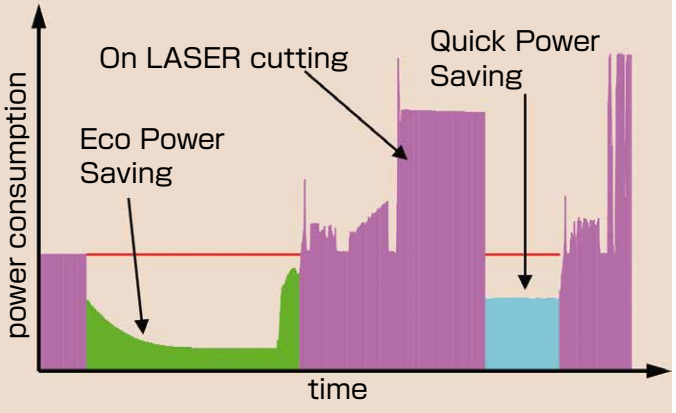
In case that power failure is detected, CNC stores the operating status of the LASER oscillator. After power recovers, CNC analyses the optimal restart sequence for the LASER oscillator to realize the minimum time restart, according to the operating status just before the power failure occurs.
In addition, by using this funciton together with UPS and retry processing function, it is possible to minimize the downtime caused by power failure, realizing high utilization ratio of LASER machine.

Minute LASER Output Control and Calibration Function

Consistent output minute the LASER beams required for marking (scribing) workpiece surfaces and fine processing is made possible thanks to improved LASER power supply control and fine tuning the output.
In addition, Calibration Function for minute LASER output realizes stable LASER marking process over long periods, not to be affected by change of oscillator condition or exchange of mirrors.

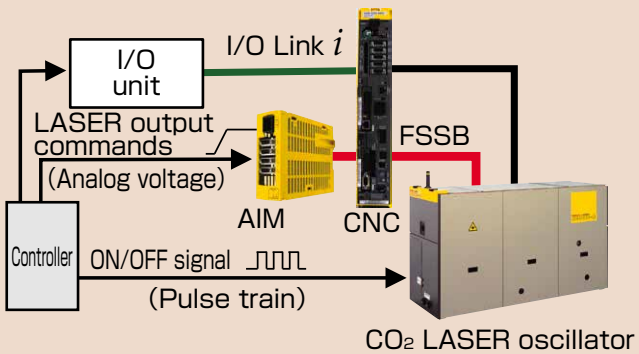
Power Consumption Monitor

CNC always monitors the condition of the LASER oscillator, and outputs estimated power consumption value. Using this power consumption value, the LASER machine can display the total power consumption and the utilization rate of the LASER machine, which will support the users to reduce the power consumption by their programming.



LASER Command External Input Function

FANUC CO_2 LASER oscillators can be installed in existing laser processing machines. FANUC CO_2 LASERs can be controlled at high speed using controllers from other suppliers by using CNC for oscillator control. LASER output commands can be made by using analog voltage (0-10V) and ON/OFF signals using the pulse train.



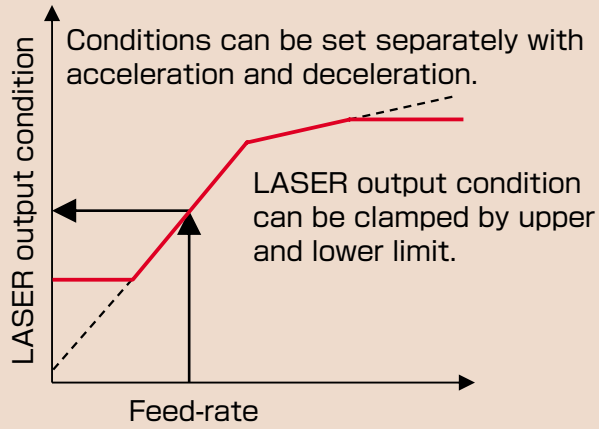
High-speed control of CO_2 LASER oscillator from third-party control equipment

High-Speed High-Precision Cutting

Cutting Performance

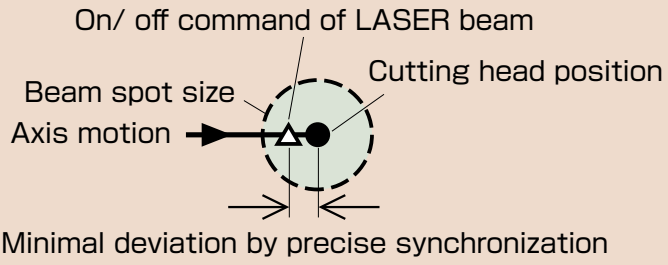
LASER Power Control Function

LASER output conditions (Peak power, Pulse Frequency, Pulse duty) are controled corresponding to feed-rate commanded in a part program. Uniform cutting result can be obtained by controlling power, frequency and duty at acceleration and deceleration caused by machine axes.
Power control conditions can be switched in 2 stages according to feed-rate. LASER output conditions can be clamped by upper and lower limits. Furthermore, power control conditions can be set separately for acceleration and deceleration.



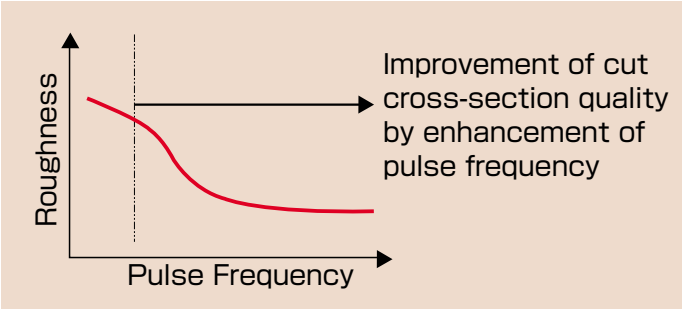
High-Speed High-Precision Cutting Function

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.



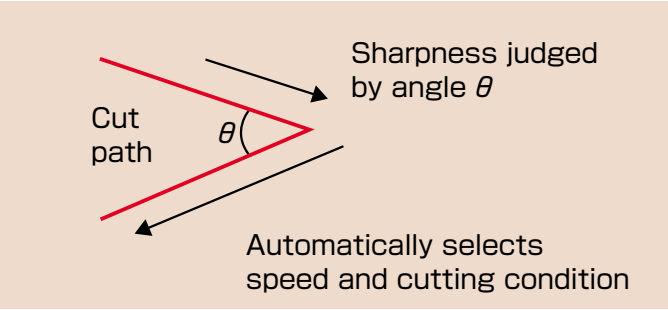
Enhancement of Pulse Frequency

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 cross-section 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.

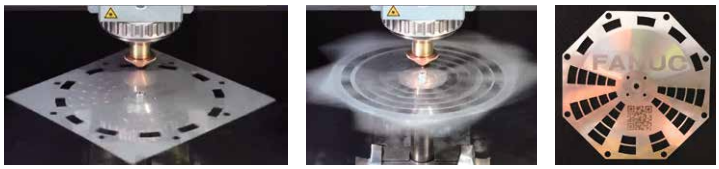


Tuning for individual system

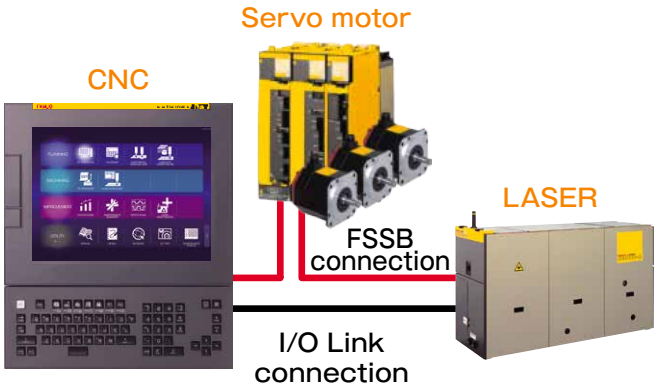
Ease of Use

High synchronization between servos and LASERs

The CNC simultaneously generates the axis command for the servomotor and the output command for the LASER oscillator. Simultaneous transmission over the same FSSB connection offers superior synchronization of axis motion and LASER output.



High-speed, high-precision cutting and marking of rotating workpiece ("FANUC" character marking)



LASER dashboard screen that summarizes the information required for processing

The *i*HMI LASER dashboard screen is primarily for LASER cutting HMI.
The CNC status display, LASER cutting conditions display, shape previews, and other information required for cutting are concentrated in a single screen.
The LASER dashboard screen allows you to see the shape before cutting, progress during cutting, and cutting conditions without requiring any screen transitions.
You can also easily set up your own screen transitions by allocating launcher soft keys to the required screens.

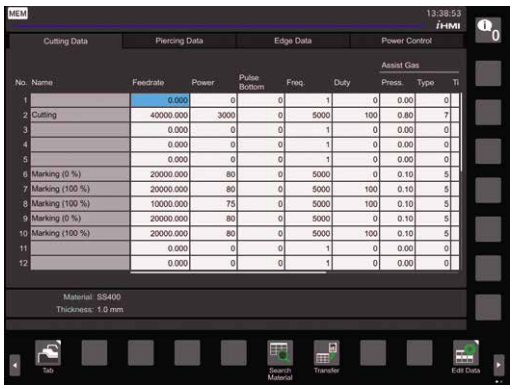
Can allocate desired screens with launcher soft keys

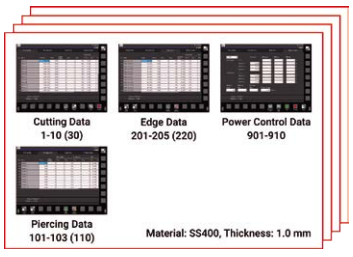
It is possible to select a program on the program management slide while monitoring form processing.

Program management slide

Cutting conditions database can manage multiple cutting conditions

The LASER cutting conditions database is an application that saves cutting condition settings for each material and board thickness for retrieval with *i*HMI.
Cutting condition settings saved on the PANEL *i*H/*i*H Pro database (can be saved for each material and board thickness, maximum 1000 items.) can be retrieved and forwarded to CNC memory cutting condition settings.





Select the cutting condition setting and forward to CNC memory

Highly Reliable Design

Maximizing Uptime

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 LASER power supply is all-sollid-state type using the latest MOSFETs.
All these factors contribute to the high reliability.

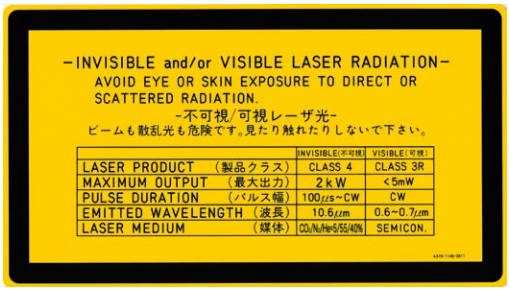
Easy Maintenance

The history of power compensation coefficient, current/ voltage of LASER power supplies, 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 LASER 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.

Automatic leakage check screen

High Safety

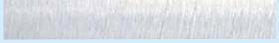
FANUC LASER C series products comply with the EU directive (CE Marking) and U.S. standards (FDA) under the LASER radiation control for health and safety that apply to manufactures of LASER products.
Warning labels and certification label such as the ones shown down side are affixed permanently on each LASER product.
Using RF discharge excitation produces safety of operation due to low discharge voltage and skin effect by RF current.



Select Laser model according to the application

Cutting Performance

Corresponding to the cutting materials and thicknesses, LASER models can be selected to achieve the best cutting performance.
(Cutting performance of the LASER machine might be limited depending on its configuration.)

	Mild steel	Stainless steel	Aluminum
C1000*i*-C	 800mm/min 9mmthk  1600mm/min 4.5mmthk	 1200mm/min 3mmthk 2600mm/min 2mmthk	1600mm/min 2mmthk 4000mm/min 1mmthk
C2000*i*-C	 550mm/min 22mmthk  2400mm/min 6mmthk	 500mm/min 10mmthk  1000mm/min 6mmthk	 600mm/min 6mmthk  2000mm/min 3mmthk
C3000*i*-C	 700mm/min 19mmthk  3000mm/min 6mmthk 10000mm/min 1mmthk	 900mm/min 10mmthk  2000mm/min 6mmthk 9500mm/min 1mmthk	 1800mm/min 4mmthk 12000mm/min 1mmthk
C4000*i*-C	 550mm/min 28mmthk  3000mm/min 6mmthk	 800mm/min 12mmthk  1800mm/min 6mmthk	 2000mm/min 6mmthk  3000mm/min 4mmthk
C6000*i*-C	 550mm/min 32mmthk  2400mm/min 12mmthk	 600mm/min 16mmthk  1200mm/min 12mmthk	 1200mm/min 10mmthk  2600mm/min 6mmthk

Specifications

Standard specification of LASER oscillator

Items		Contents							
Model		C1000*i*-C	C2000*i*-C		C3000*i*-C		C4000*i*-C		C6000*i*-C
Optical path length			Short	Long	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		3000		4000		6000
LASER maximum output (W)		1000	2500		3000		4000		6000
Maximum pulse power command (W)		1000	2700 Note 2)		3200 Note 2)		4000		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)		φ20 or less	φ27 or less	φ24 or less	φ22 or less	φ19 or less	φ27 or less	φ24 or less	φ28 or less
Polarization		45° linear			Circular	90° linear	Circular	90° linear	
Beam divergence angle (full angle)		2mrad or less							
Pulse frequency		5 to 5000Hz	5 to 32767Hz		5 to 10000Hz		5 to 32767Hz		
Pulse duty		0 to 100%							
LASER gas Note4)		Gas A	Gas B						
Gas consumption rate (L/Hr)		Approx. 10							Approx. 20
Cooling water	Water rate (L/min)	40	75		120		160		250
	Circulated water pressure	0.5MPa or less gauge pressure							
	Water temperature/ Water temperature stability	20 to 30℃/±1℃			20 to 30℃/±2℃				
	Recommended cooling capacity (kW)	11	22		33		44		66
Input power supply		200VAC+10%、-15% 50/60Hz±1Hz or 220VAC+10%、-15% 60Hz±1Hz							
Power supply capacity (kVA)		18	33		44		55		75
Mass (kg)		350 30 (pump)	700		750		900		1300

Note 1) In C1000*i*-C, the vacuum pump is placed outside of the main unit.
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 CO_2:N_2:He (volume ratio, N_2 balance) 5:55:40% ±5% or less for each composition
Gas B /Pre-mixed gas of CO_2:N_2:He (volume ratio, He balance) 5:35:60% ±5% or less for each composition

Service & Support

Excellent Maintenance Services

FANUC service team delivers customer trust and confidence based on direction of service “Maximizing Uptime”, “Global Service” and “Lifetime maintenance”.

Service First

Conforming to the spirit of “Service First”, FANUC provides lifetime maintenance to its products for as long as they are used by customers, through more than 260 service locations supporting more than 100 countries and regions throughout the world.

Maximizing Uptime

Global Service

Lifetime Maintenance

FANUC ACADEMY

FANUC ACADEMY operates training courses for daily, periodic, and preventive maintenance including mirror cleaning procedure of CO_2 LASER oscillator.

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Архангельск (8182)63-90-72
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Благовещенск (4162)22-76-07
Брянск (4832)59-03-52
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Орел (4862)44-53-42
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