

Mazak

FG-220

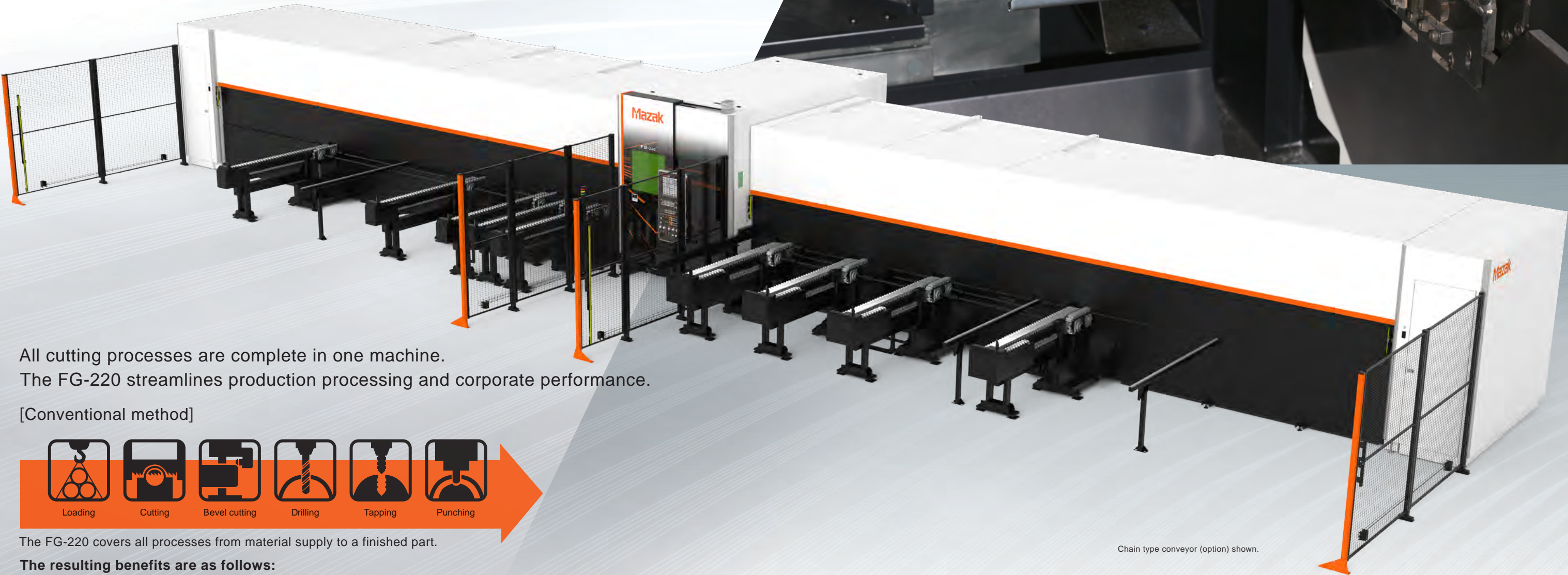
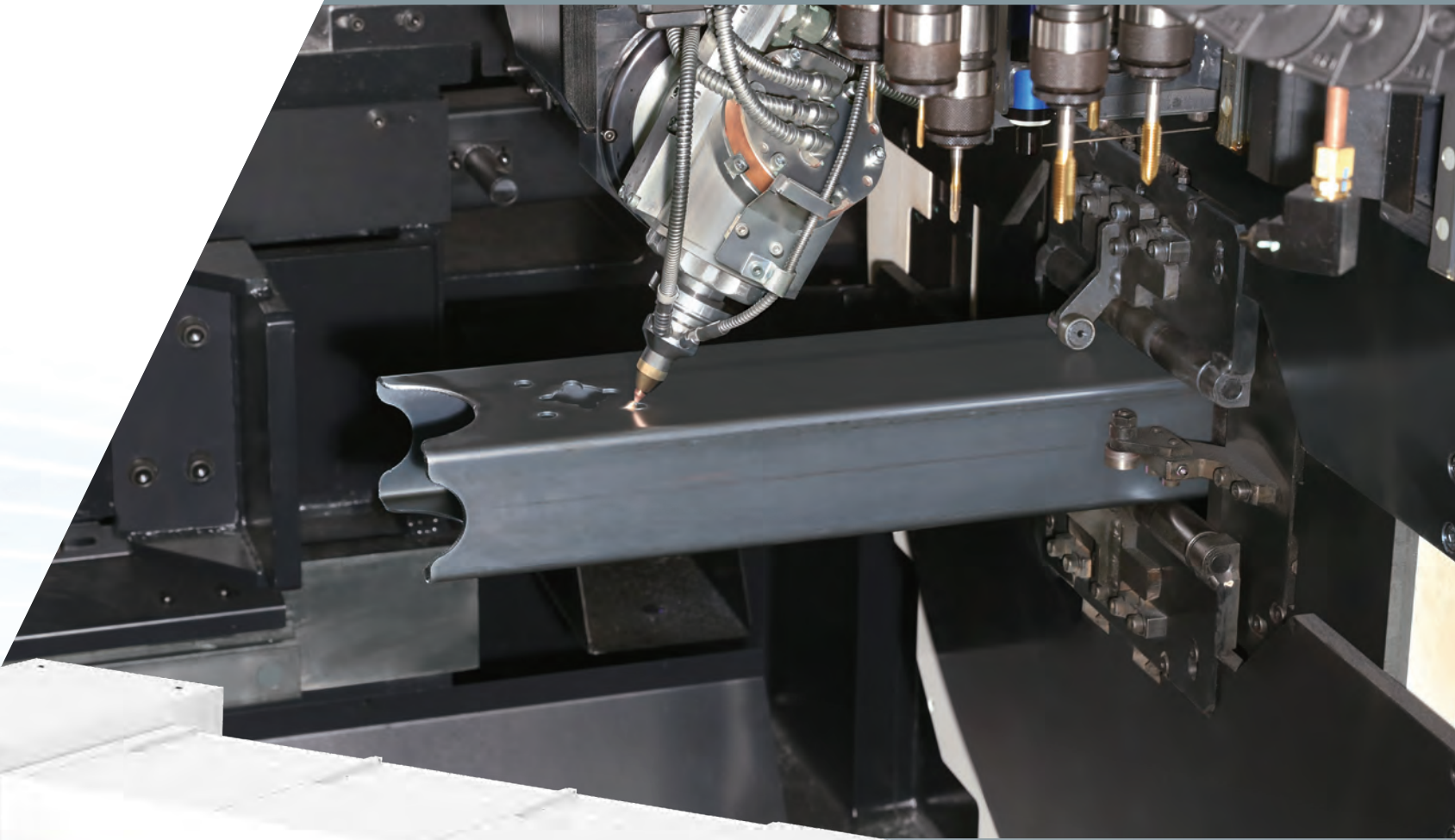
[3D Fiber Laser Processing Machine]



3D Fiber Laser Processing Machine for Long Pipes and Structural Material

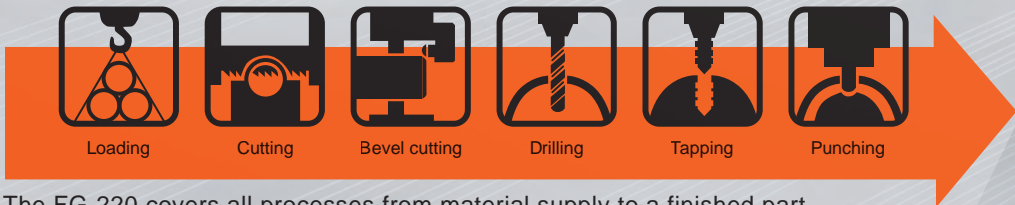
FG-220

Automatic and continuous 3D laser cutting of long structural material
High-precision cutting of complex features



All cutting processes are complete in one machine.
The FG-220 streamlines production processing and corporate performance.

[Conventional method]



The FG-220 covers all processes from material supply to a finished part.

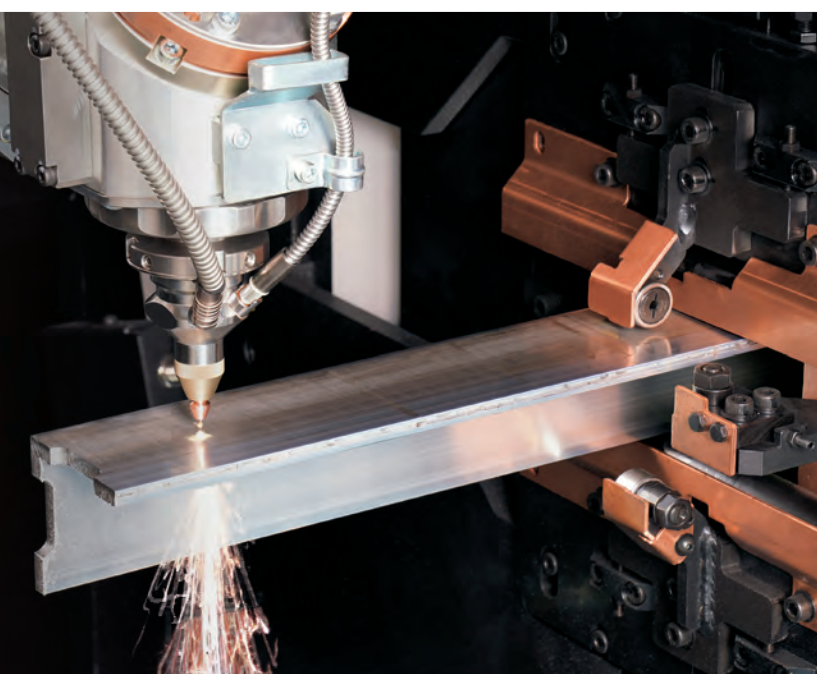
The resulting benefits are as follows:

- | | |
|----------------------------------------------|-----------------------------------------|
| Reduction of time required for machine setup | Reduction of production lead time |
| Smaller in-process inventory | Reduced number of machines and fixtures |
| Fewer operators required | Reduced floor space requirements |

Chain type conveyor (option) shown.

Fiber Laser

The advanced technology of the fiber laser provides higher productivity and higher efficiency than other systems



Applications

L beam
Material : Aluminum
Size : 60 mm (2.36") × 60 mm (2.36") × t 6.0 mm (0.24")
Assist gas : Nitrogen

Round pipe
Material : Brass
Size : Φ50.8 mm (2.00") × t 1.0 mm (0.04")
Assist gas : Nitrogen

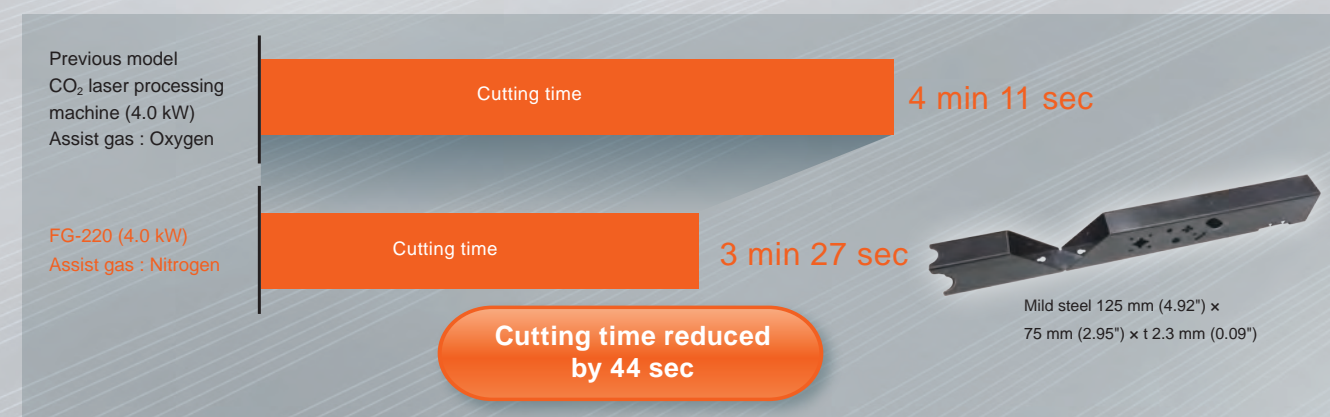
Round pipe
Material : Copper
Size : Φ50.8 mm (2.00") × t 1.5 mm (0.06")
Assist gas : Oxygen

Energy saving

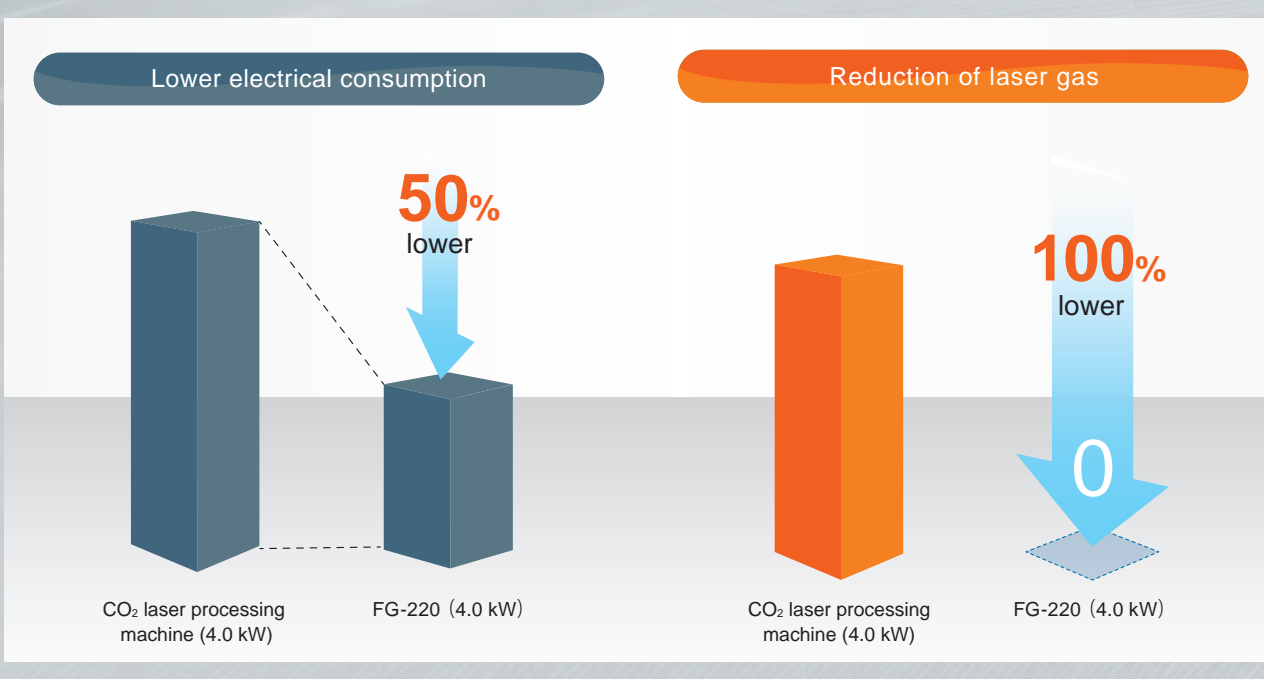
The FG-220 eliminates the amount of laser gas used by conventional laser processing machines, and the gas used for purging optical components. Electrical power consumption is reduced as well.

High Productivity

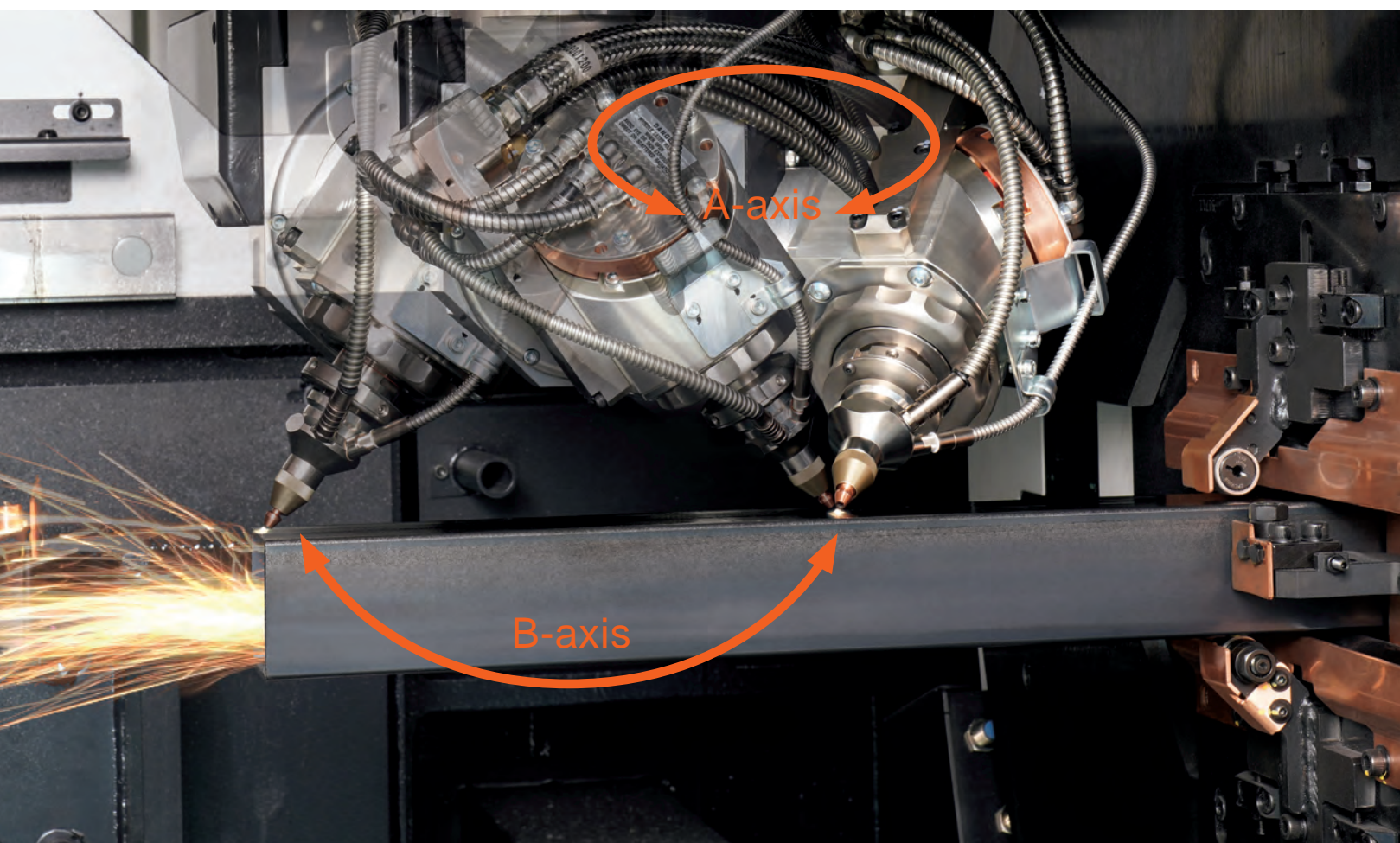
The fiber laser has a shorter wavelength than a CO₂ laser for high speed cutting of medium steel with nitrogen assist gas. The FG-220 improves the productivity of cutting thin to medium thickness pipe and other structural material.



Comparison of previous model: CO₂ laser processing machine (4.0 kW) and FG-220 (4.0 kW)



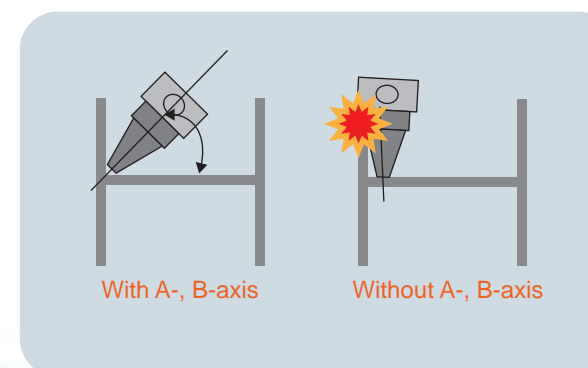
The 3D laser head with A-axis and B-axis can process materials at desired angles



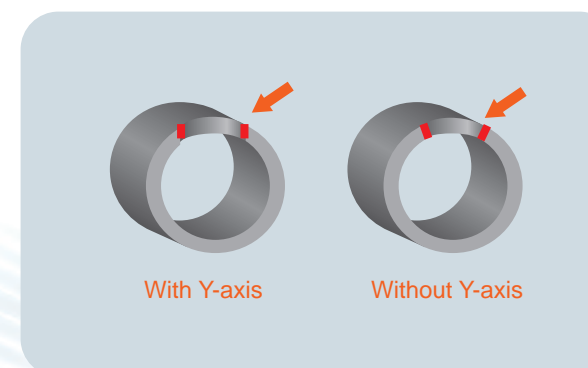
A wide range of workpieces created with highly reflective materials can be processed

Combining the 3D laser head and the fiber laser ensures stable cutting of complex features even on highly reflective materials, such as copper and brass.

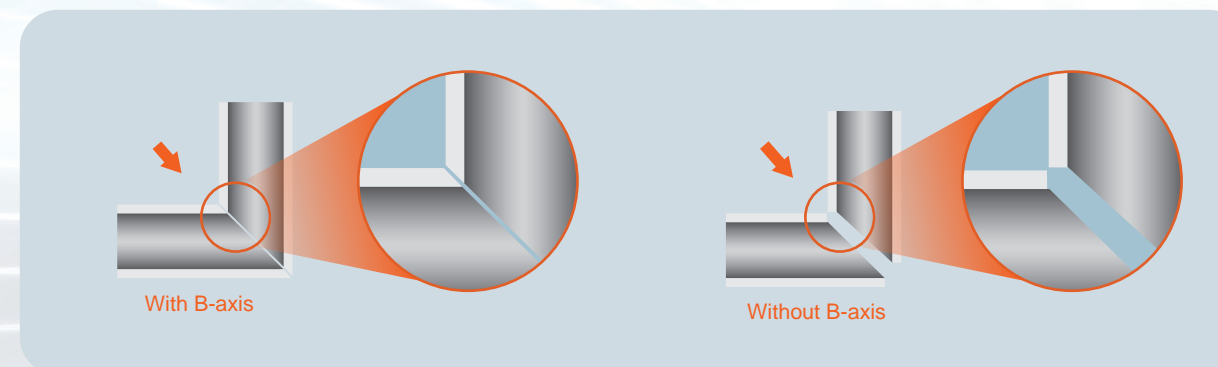
● Cutting off the H beam with the A-axis and B-axis



● Y-axis vertical cutting



● Bevel cutting with the B-axis provides tight-joint pipes



3D laser head enables tight joint fittings

The 3D laser head enables cutting from various angles and directions, and it improves accuracy for joining pipes and structural materials.



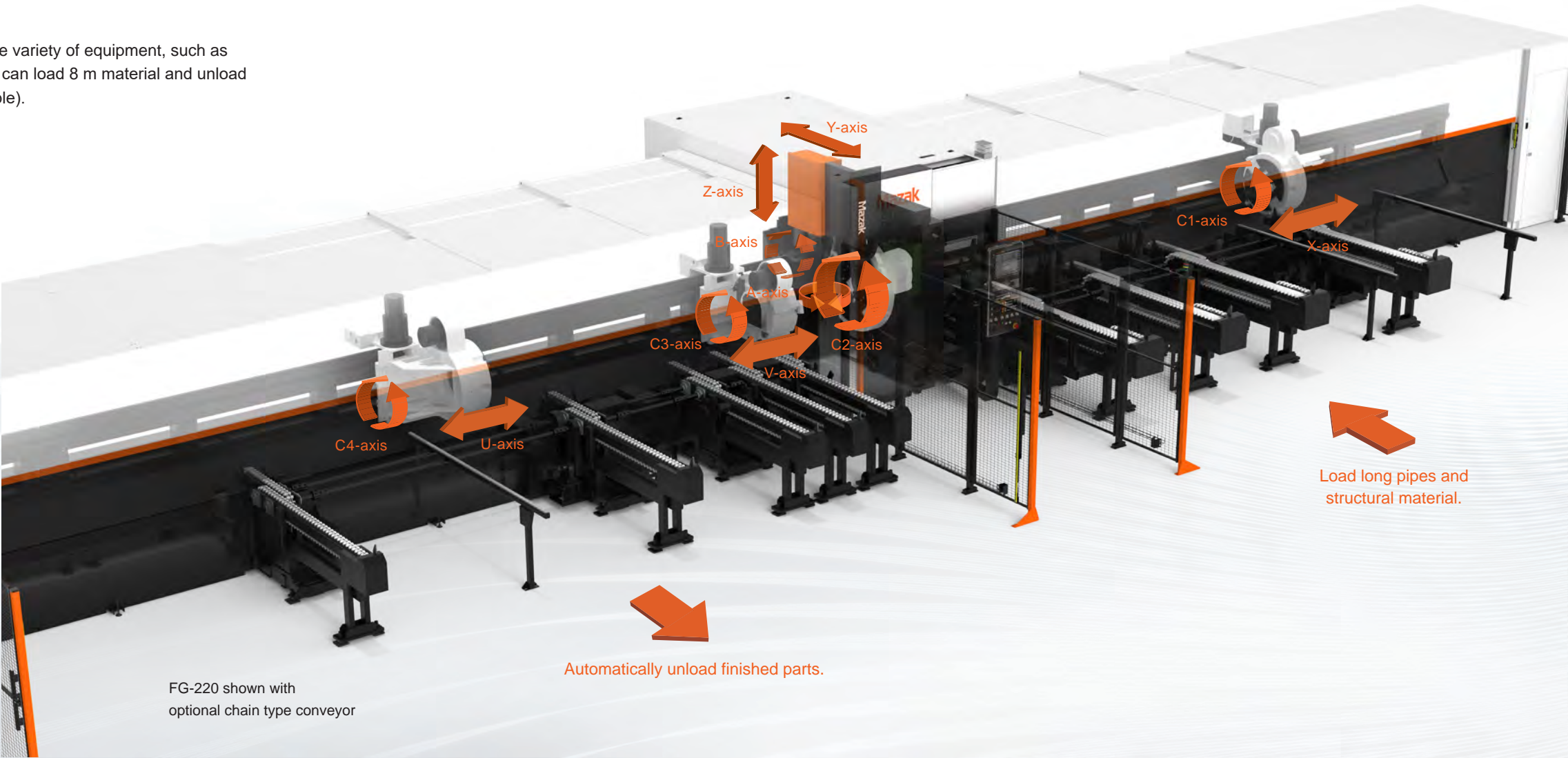
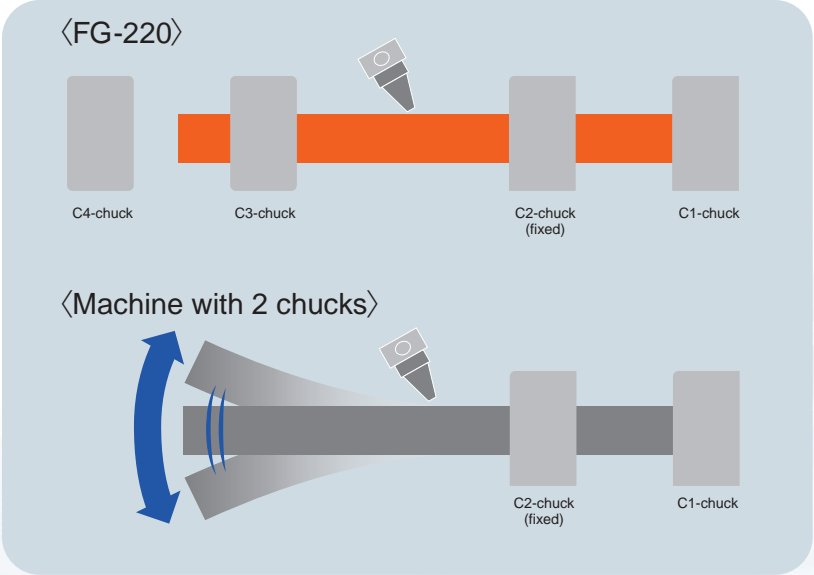
Protection torch

Damage is minimized by torch tilting if it collides with the workpiece.

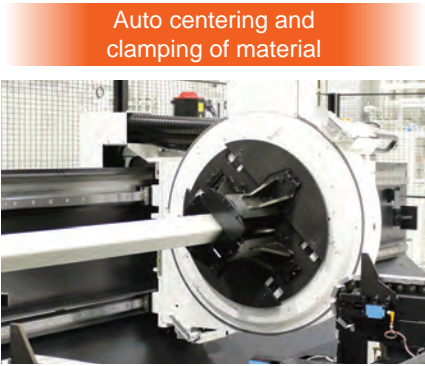


Higher Accuracy

To prevent material distortion, 4 chucks simultaneously travel and rotate. A wide variety of equipment, such as supporters, enable high-accuracy cutting of long material. The standard model can load 8 m material and unload 8 m finished parts (Optional 6 m and 12 m loading / unloading units are available).



er



Auto centering and clamping of material

Automatically centers and clamps different shapes such as: round, square and rectangular.



Horizontal workpiece centering

Horizontal workpiece centering for long beams and small pipes by roller to prevent material displacement.



Flat support

A flat roller follows the shape of material so that the material will not sag from its own weight.



Fixed support

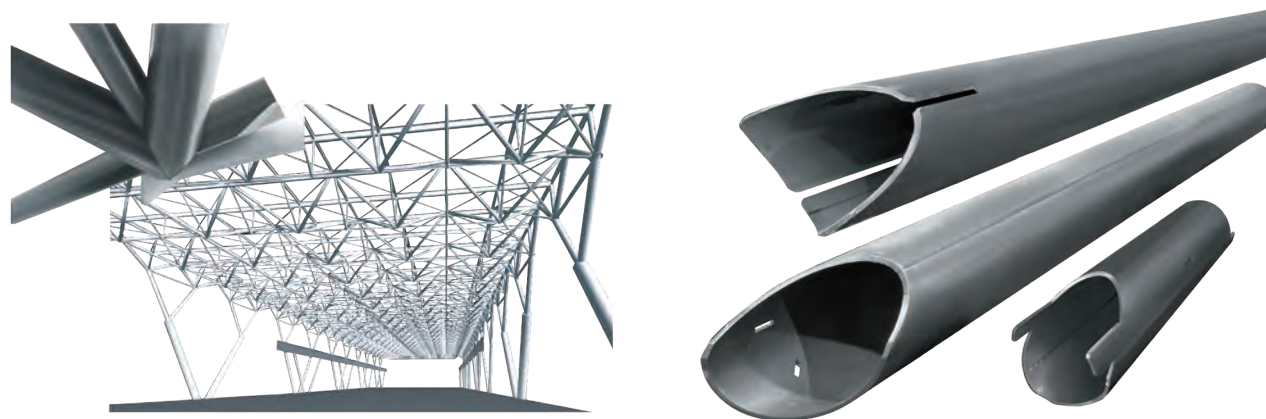
Longer, small diameter material is supported by fixed supports located just beside V-shaped supports. This prevents the material from sagging from its own weight.



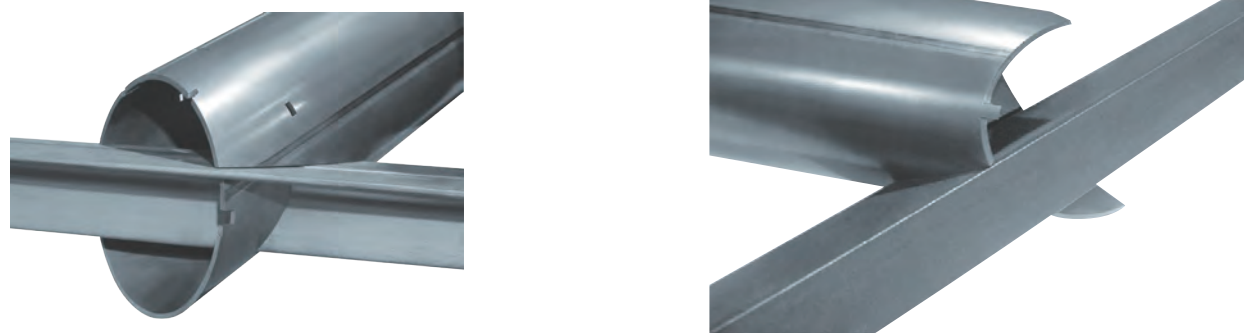
Round pipe support

Round material is supported by V-shaped supports. This prevents the material from sagging due to its own weight.

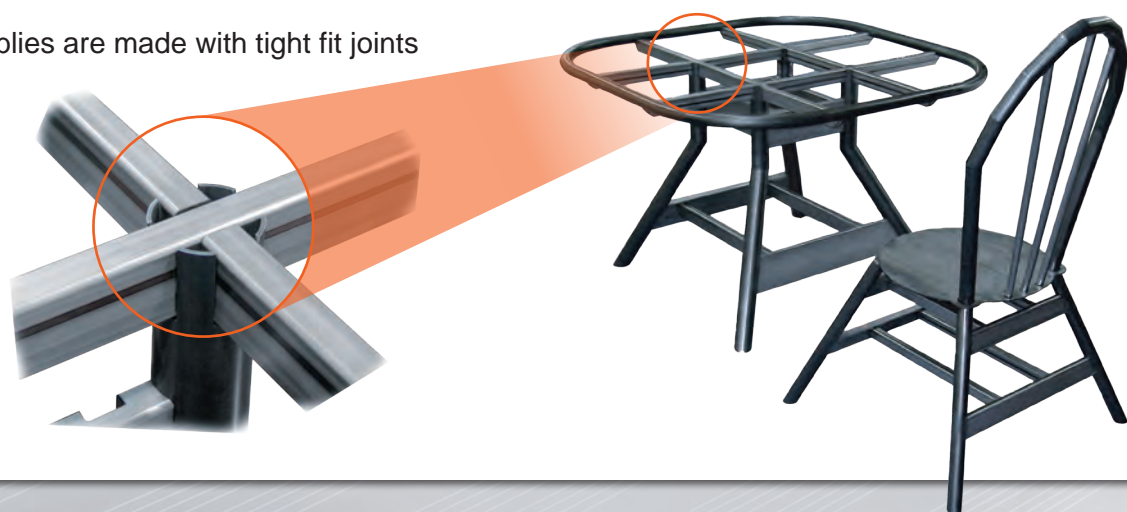
The FG-220 can cut complex contours with higher productivity



Complex joints of pipes



Assemblies are made with tight fit joints



Steel Space Frames

Tight pipe joints can be produced by laser cutting pipes and structural material with high precision. As a result, rigid-spaced frames can quickly be constructed with reduced welding compared to conventional construction processes.

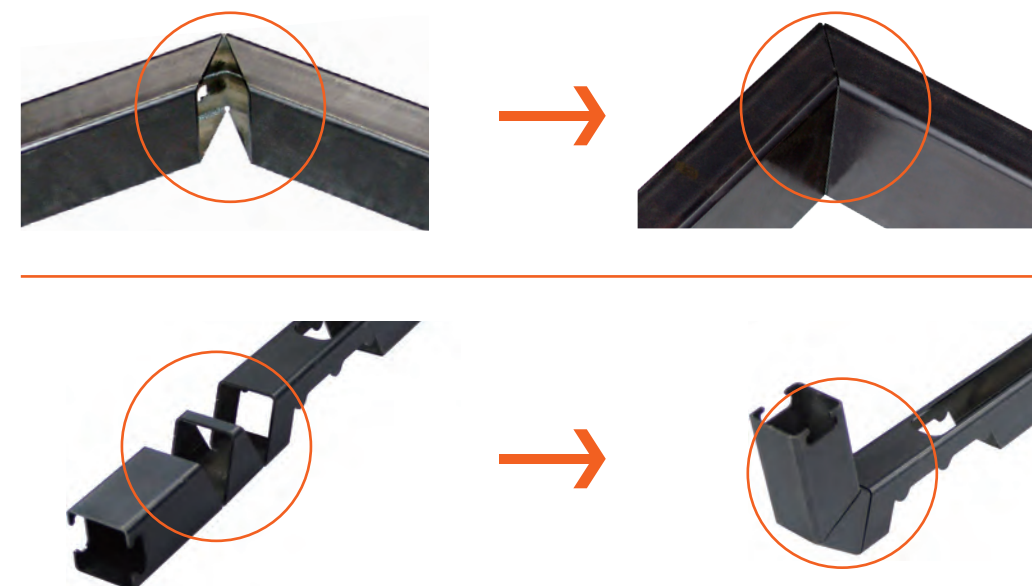
Laser cut complex contours with tabs and slots shortens positioning time for welding

Laser cut tabs and slots on pipe components allow for tighter fitting joints, resulting in reduced positioning time for welding.



Bending and folding method reduces processing time

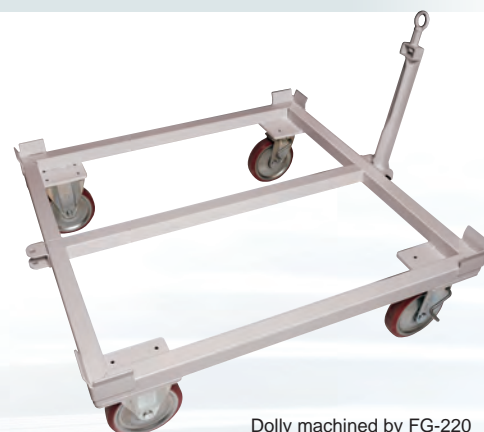
The utilization of bending and folding methods results in improved assembly accuracy and significantly reduces processing times.



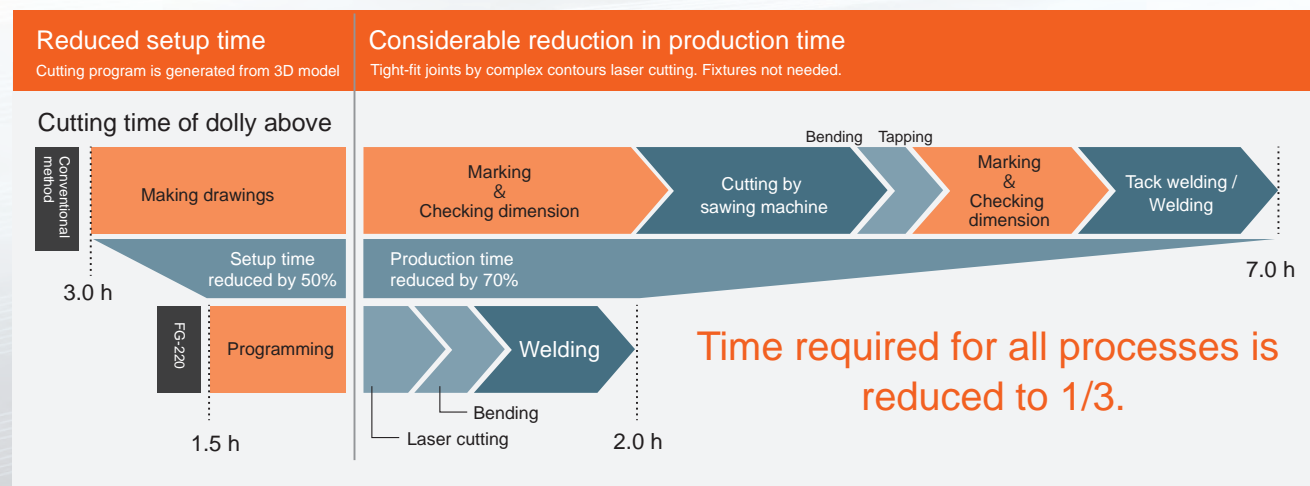
Higher Productivity

Productivity comparison with conventional method

Cutting complex contours with the FG-220 provides extreme tight joints. This reduces some required processes in marking and welding. Productivity is considerably improved compared to the conventional method. Additionally, fixtures are not required, so production costs are reduced.



Dolly machined by FG-220



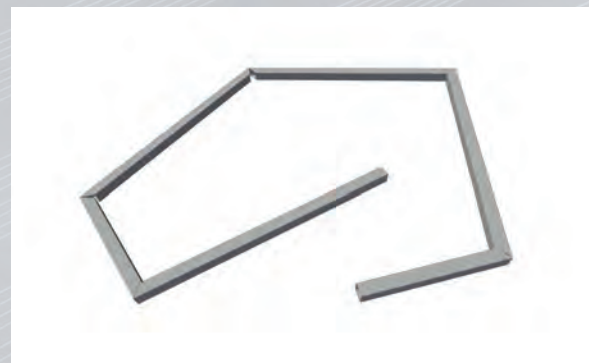
Conventional method

- Marking and cutting with a sawing machine
- Checking right angles between parts; positioning and welding with fixtures



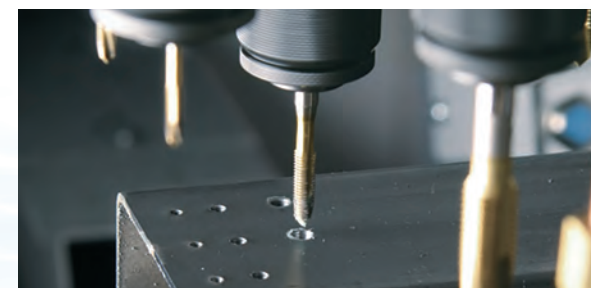
FG-220

- Bending manually for shortened processing times
- Right angles automatically determined and welding without fixtures



Optional equipment available for high-accuracy and high-value cutting

Tapping unit



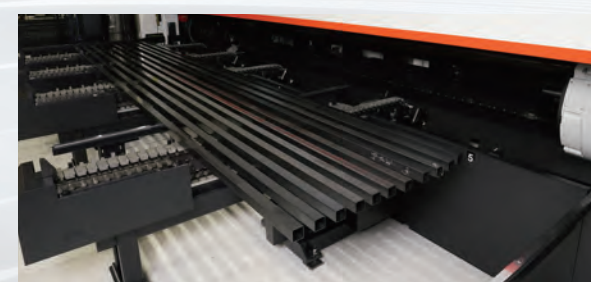
From 3D cutting to tapping, all processes are finished with one machine. The hole to be tapped is cut by the laser and tapped for shorter production lead time and higher productivity.
[Max. M12 (1/2 UNC and UNF)]

Workpiece measurement



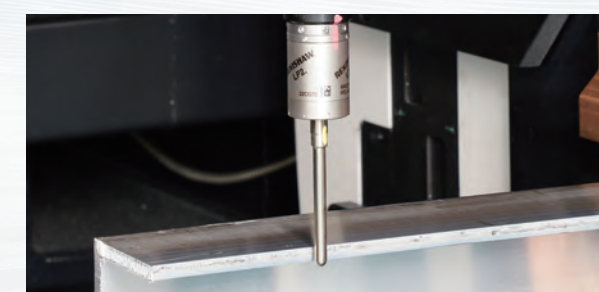
Automatically measures the material's length after loading onto the machine. This eliminates manual measuring for each piece of material.

Chain type conveyor



Easily load larger quantities of material (depending on diameter) for continuous operation.
(V support type conveyor is standard equipment)

Touch sensor



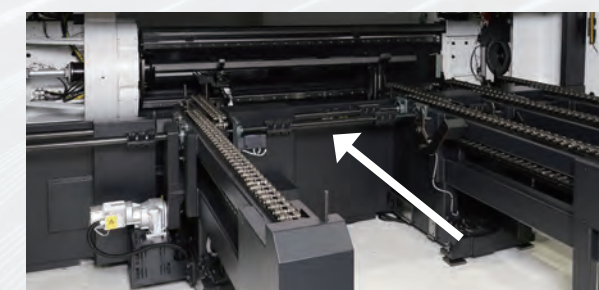
Measures the O.D. of pipe and structural material. Automatically compensates for material distortion to ensure high precision positioning.

Flat bar handling



By attaching a jaw dedicated for flat bar cutting, flat bars can be processed.

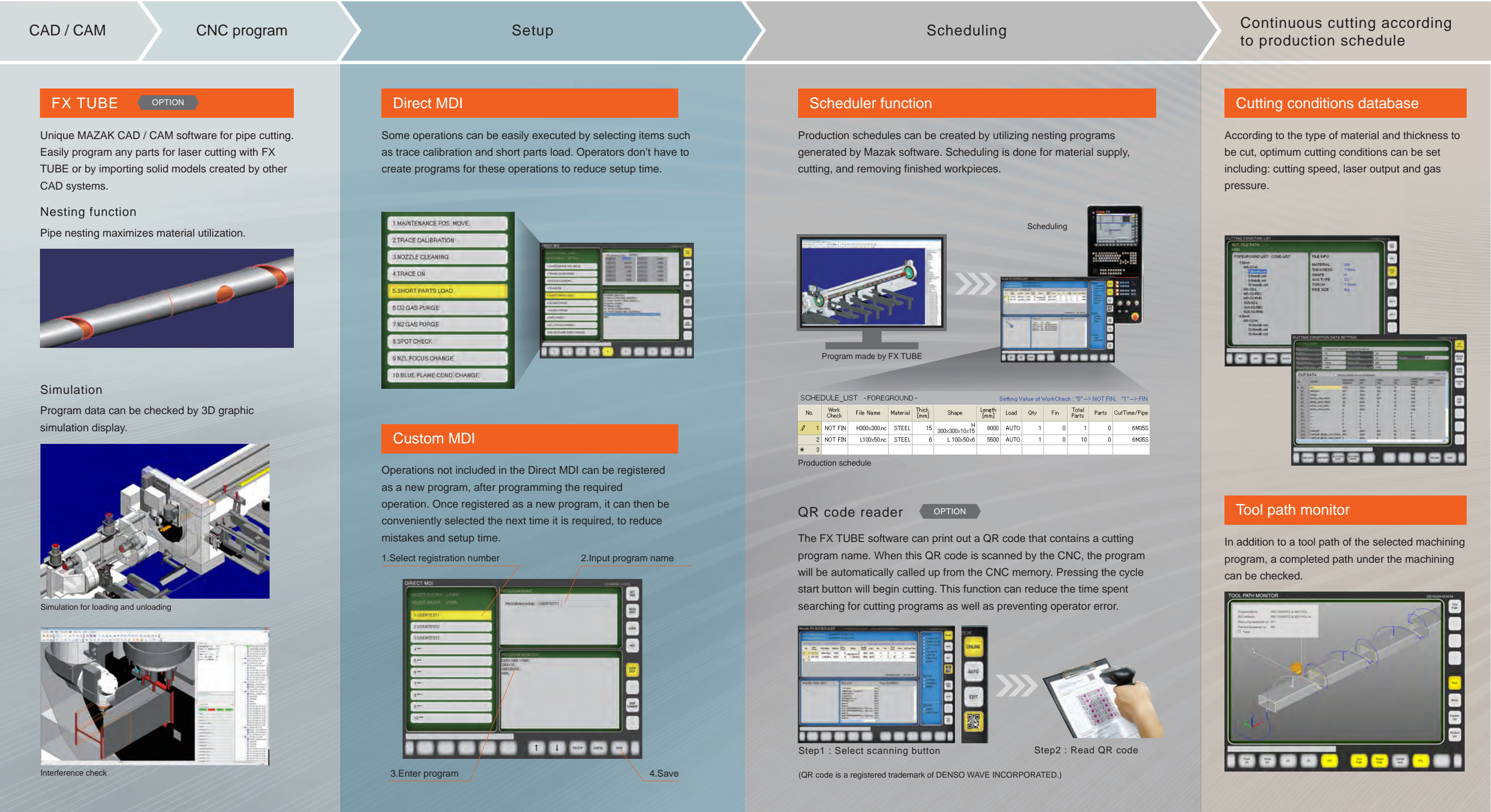
Short material carrying function



Short materials, which cannot be loaded from the loader side, can be loaded from the unloader side, maximizing material usage.

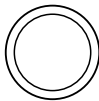
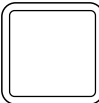
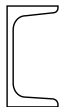
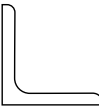

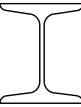
Ease of Programming

Convenient operation of FG-220 from CNC programming to cutting



Specification in Materials

The list below shows the JIS steel reference masses for each material shape.

Matarial shape	Minimum to maximum	JIS steel reference masses
	Φ20 mm to Φ220 mm (Φ0.79" to Φ8.66")	Φ152.4 mm × t 12 mm (Φ6.00" × t 0.47") : 41.5 kg/m (300.17 ft /lbs) Φ216.3 mm × t 8.2 mm (Φ8.52" × t 0.32") : 42.1 kg/m (304.50 ft /lbs)
	20 mm × 20 mm to 152.4 mm × 152.4 mm (0.79" × 0.79" to 6.00" × 6.00") Or a long side of 203.2 mm (8.00") and a diameter of the circumscribed circle on the cross section: max. 227 mm (8.94")	150 mm × 150 mm × t 9 mm (5.91" × 5.91" × t 0.35") : 38.2 kg/m (276.30 ft /lbs) 200 mm × 100 mm × t 12 mm (7.87" × 3.94" × t 0.47") : 49.1 kg/m (355.14 ft /lbs)
	20 mm × 20 mm to 152.4 mm × 152.4 mm (0.79" × 0.79" to 6.00" × 6.00") Or a long side of 203.2 mm (8.00") and a diameter of the circumscribed circle on the cross section: max. 227 mm (8.94")	150 mm × 75 mm × t 9 mm × t 12.5 mm (5.91" × 2.95" × t 0.35" × t 0.49") : 24.0 kg/m (173.59 ft /lbs) 200 mm × 90 mm × t 8 mm × t 13.5 mm (7.87" × 3.54" × t 0.31" × t 0.53") : 30.3 kg/m (219.16 ft /lbs)
	20 mm × 20 mm to 152.4 mm × 152.4 mm (0.79" × 0.79" to 6.00" × 6.00") Or a long side of 203.2 mm (8.00") and a diameter of the circumscribed circle on the cross section: max. 227 mm (8.94")	150 mm × 150 mm × t 12 mm (5.91" × 5.91" × t 0.47") : 27.3 kg/m (ft /lbs)
	20 mm × 20 mm to 152.4 mm × 152.4 mm (0.79" × 0.79" to 6.00" × 6.00") Or a long side of 203.2 mm (8.00") and a diameter of the circumscribed circle on the cross section: max. 227 mm (8.94")	150 mm × 150 mm × t 7 mm × t 10 mm (5.91" × 5.91" × t 0.28" × t 0.39") : 31.1 kg/m (224.95 ft /lbs) 200 mm × 100 mm × t 5.5 mm × t 8 mm (7.87" × 3.94" × t 0.22" × t 0.31") : 20.9 kg/m (151.17 ft /lbs)
	20 mm × 20 mm to 152.4 mm × 152.4 mm (0.79" × 0.79" to 6.00" × 6.00") Or a long side of 203.2 mm (8.00") and a diameter of the circumscribed circle on the cross section: max. 227 mm (8.94")	150 mm × 125 mm × t 8.5 mm × t 14 mm (5.91" × 4.92" × t 0.33" × t 0.55") : 36.2 kg/m (261.84 ft /lbs) 200 mm × 100 mm × t 7 mm × t 10 mm (7.87" × 3.94" × t 0.28" × t 0.39") : 26.0 kg/m (188.06 ft /lbs)
Others	In the range of 20 mm × 20 mm to 152.4 mm × 152.4 mm (0.79" × 0.79" to 6.00" × 6.00") or a long side of 203.2 mm (8.00") and a diameter of the circumscribed circle on the cross section: max. 227mm (8.94") This applies to workpices that can be transferred in the correct posture without interfering with any device.	

- Note 1:** Even though the material brand used is the same, the maximum processable material thickness, the machining speed, and the surface roughness vary depending on the dispersion and surface condition of materials.
The actual material thickness depends on the pipe shape and the maximum loading mass.
- Note 2:** The above table shows material shapes that can be clamped and transferred by a standard chuck. However, they may not be machined due to bends, warps, machining shapes, etc. in actual machining.
- Note 3:** The permissible range of cross-sectional dimensions is as shown above for each shape. Do not fail to consider the length and thickness in order that the maximum allowable deadmass should not be exceeded.
- Note 4:** For the 12 m (39.4') model, materials with a diameter of less than 40 mm (1.57"), or materials with a short side of less than 40 mm (1.57") and a length larger than the regular length material may not be able to be loaded because of deflection.

Machine Specifications

Model* ¹		3 m (9.8') (option, unloader only)	6 m (19.6') (option)	8 m (26.2')	12 m (39.4') (option)
Workpiece shape		Round, square, L / H / I beam and channel			
Workpiece material		Mild steel / stainless steel / copper / brass / aluminum			
Workpiece diameter* ²	Round pipe	Φ20 mm ~ Φ220 mm (Φ0.79" ~ Φ8.66")			
	Square pipe	20 mm × 20 mm ~ 152.4 mm × 152.4 mm (0.79" × 0.79" ~ 6.0" × 6.0") * ³			
	L beam				
	H / I beam				
	Channel				
Max. material length for loading		–	6250 mm (246.06")	8150 mm (320.87")	12350 mm (486.22")
Min. material length for loading		–	2500 mm (98.43")	3450 mm (135.83")	3650 mm (143.7")
Min. material length for loading (option)		–	1700 mm (66.93")	2200 mm (86.61")	2200 mm (86.61")
Max. material length for unloading		3000 mm (118.11")	6100 mm (240.16")	8000 mm (314.96")	12200 mm (480.31")
Max. workpiece weight* ⁴		135 kg (298 lbs)	270 kg (595 lbs)	360 kg (794 lbs)	510 kg (1124 lbs)
		45 kg/m (30 lbs/ft)			
Stroke	X Chuck left / right	–	7155 mm (281.69")	9055 mm (356.50")	13255 mm (521.85")
	U Chuck left / right	3989 mm (157.05")	7089 mm (279.09")	8989 mm (353.90")	13189 mm (519.25")
	V Chuck left / right	1915 mm (75.39")	2315 mm (91.14")		
	Y Head back / forth	985 mm (38.78")			
	Z Head up / down	400 mm (15.75")			
	A Head rotation	±99999.999 deg			
	B Head swing	±135 deg			
	Max. traverse rate	X, U, V	100 m/min (3937 IPM)		
Y		36 m/min (1417 IPM)			
Z		30 m/min (1181 IPM)			
A, B		9600 deg/min			
C (Chuck rotation)		20000 deg/min			
Machine weight* ⁵		–	31200 kg (68783 lbs)	33200 kg (73192 lbs)	40400 kg (89065 lbs)
Electrical requirement		49 kVA* ⁶			
Sound* ⁷		Less than 80 dB (A)			

*1 Workpiece length for loading and unloading can be different length
*2 Jaws are changed according to material diameter
*3 Workpiece can be cut under the following condition : long side under 203.2 mm (8"), and diameter of the circumscribed circle on the cross section under Φ227 mm (Φ8.94") ex : 200 mm × 100 mm (7.87"×3.94")
*4 Requires to meet maximum workpiece weight and maximum workpiece weight per 1 meter
*5 When workpiece length for loading and unloading is the same length
*6 Varies depending on region
*7 Equivalent continuous sound pressure level at operator position (dependent on equipment options)

Loader / Unloader Specifications

		V support	Chain (option)
Max. quantity of material loaded	Φ220 mm (Φ8.66")	5	7
	Φ150 mm (Φ5.91")		9
	Φ50 mm (Φ1.97")		18
	Φ20 mm (Φ0.79")		37
Max. total weight capacity of loader / unloader		2550 kg (5622 lbs)	3600 kg (7937 lbs)
Transfer speed		5.3 m/min*8 (209 IPM)	2.5 m/min (98 IPM)

*8 Transfer speed may vary depending on region

CNC Standard Specifications

Model	MAZAK FX
CPU	64 bit
Controlled axes	Max. 32
Minimum program increment	0.001 mm (0.0001")
Programming method	EIA / ISO
Monitor	15" color LCD

Specification of Laser Resonator

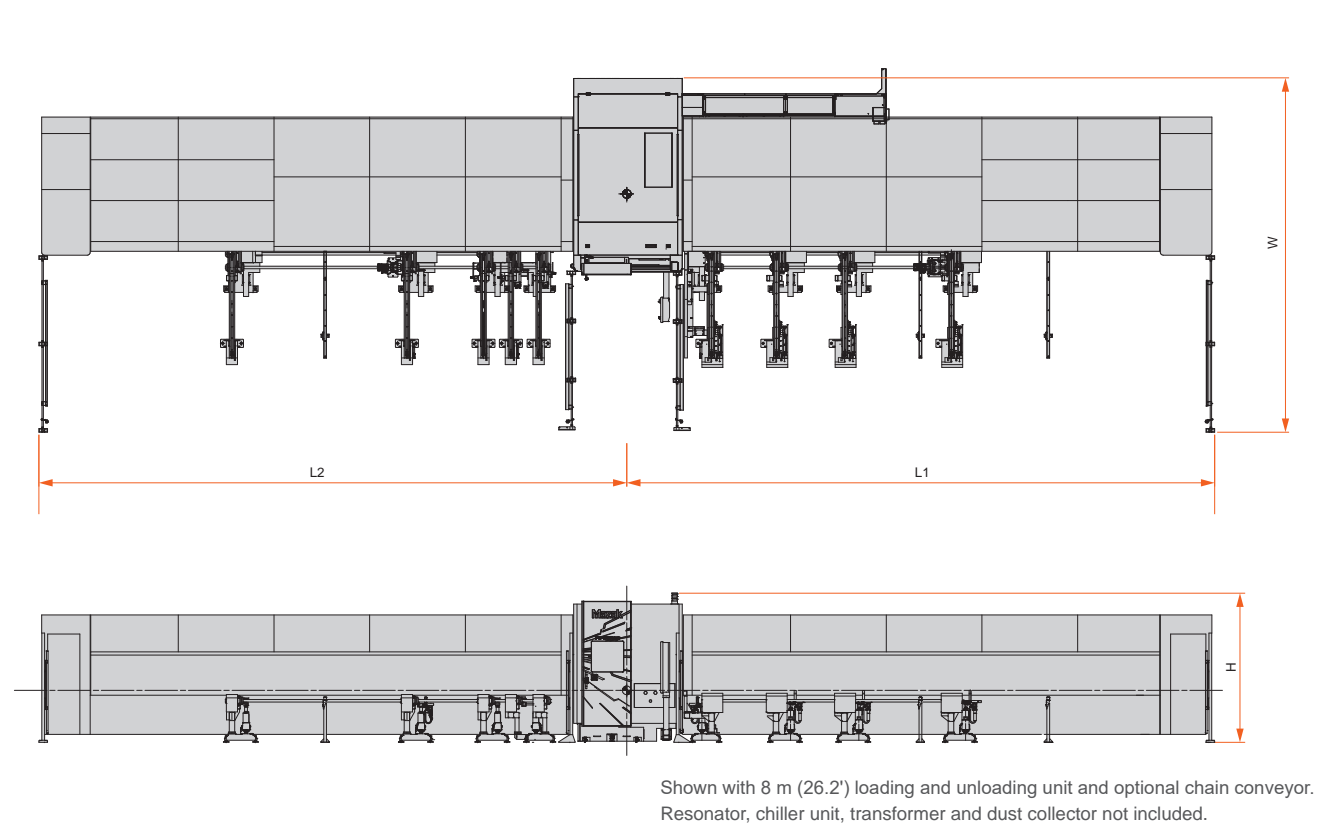
Resonator	4.0 kW
Wave length	1060 ~ 1080 nm* ⁹ (Center wave)

*⁹ Varies depending on region

Standard and Optional Equipment

● : Standard ○ : Option		
Machine	Work light	●
	Resonator status indicator light	●
	Chiller unit	●
	8 m (26.2') loading equipment	●
	8 m (26.2') unloading equipment	●
	6 m (19.6') / 12 m (39.4') loading equipment	○
	3 m (9.8') / 6 m (19.6') / 12 m (39.4') unloading equipment	○
	Additional loader	○
	V support type conveyor	●
	Chain type conveyor	○
	Safety fence, light curtain	●
	Material support function (flat support, fixed support and round pipe support)	●
	Workpiece mesurement function	○
	Short material carrying function	○
	Horizontal workpiece centering	○
	Support for small diameter work (C2 chuck)	○
	Flat bar handling	○
	Parts catcher	●
	Auto power off	●
Cutting head	Additional protection window	○
	Nozzle pointer	●
	Profiling retry function	●
	Auto profiler calibration	●
	Auto nozzle cleaning	●
	Auto focus positioning	●
	Beam diameter change function	●
	Touch sensor (X-axis end measurement, rechucking and twist compensation)	○
	Seam detector	○
	Tapping unit	○
Assist gas	3rd assist gas piping (supply : 3.0 MPa (435 PSI))	●
	4th assist gas piping (supply : 3.0 MPa (435 PSI))	○
	Assist gas changer (O ₂ , air and 3rd gas)	●
	Assist gas pressure NC control	●
Environment	Scrap bucket	●
CNC	Scheduler function	●
	MTConnect adapter	○
	QR code reader	○
Other	Manual	●

Floor Space



Model		3 m (9.8') (option, unloader only)	6 m (19.6') (option)	8 m (26.2')	12 m (39.4') (option)
Dimensions	L1	–	8850 mm (348.43")	10750 mm (423.23")	14950 mm (588.58")
	L2	5750 mm (226.38")	8850 mm (348.43")	10750 mm (423.23")	14950 mm (588.58")
	W (V support)	5758 mm (226.69")			
	W (chain) (option)	6468 mm (254.65")			
	H	2733 mm (107.60")			



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