OKUMA

5-Axis Bed Type Profiler

MILLAC 853PF-5X

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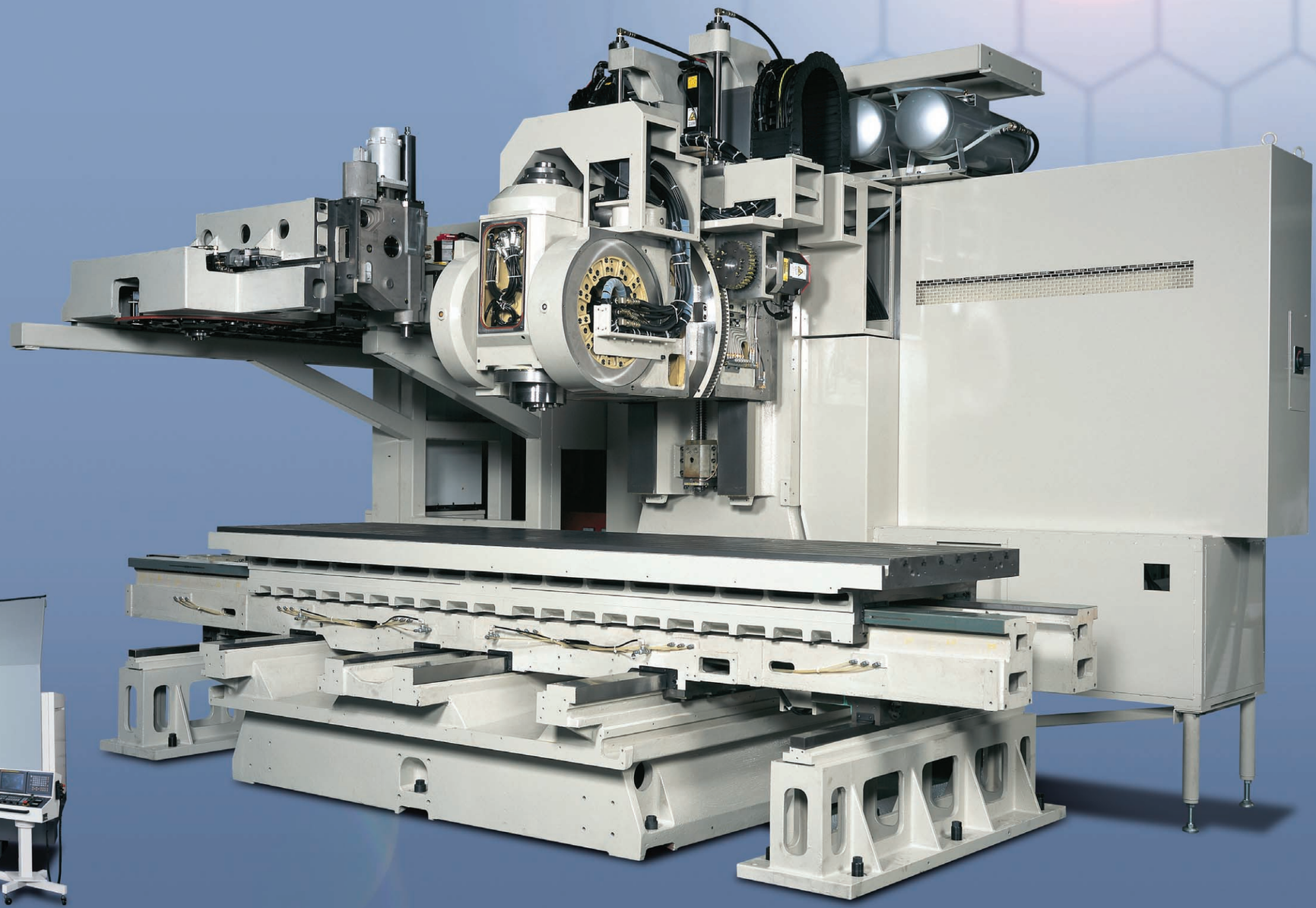
From the beginning of this century, the highly competitive aerospace manufacturers especially have been further reducing costs by minimizing the number of assembly and fuel system components with simpler and lighter monolithic structures—which on the other hand require more cutting operations of more complex shapes.

"How can we get shorter set-up times with process-intensive machining of solid aluminum billets to produce high-quality, complex components with thinner walls?" That cry from machine shops led Okuma designers to develop the MILLAC 853PF-5X 5-axis machining center, a state-of-the-art profiler that will drastically improve productivity to levels unheard of before.

Spindle speed	**12,000** min^{-1}
Travels	
X/Y/Z axes	**3,050/850/700** mm (120/33/28 in.)
A/B axes	**±35** deg
Rapid Traverse	
X/Y axes	**30** m/min (1,181 ipm)
Z axis	**24** m/min (945 ipm)
A/B axes	**3,600** deg/min

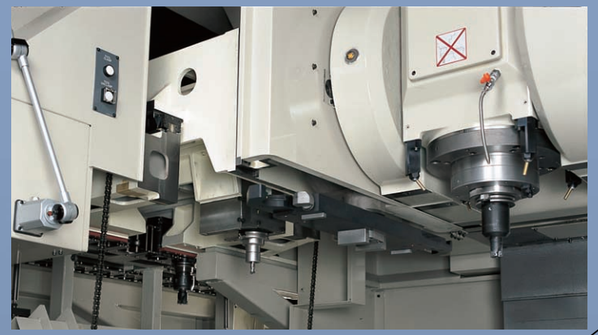


Fast & Rigid profiler provides class-best in productivity

ATC and magazine

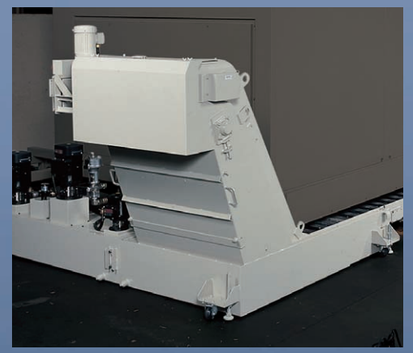
The standard 30-tool ATC handles max ø200-mm (ø7.87-in.) (w/o adjacent tools) diameter and 350-mm (13.78-in.) length tools with quick tool changes for long, continuous operations.

Tool to Tool . . . 9 sec
Chip to Chip . . . 16 sec



Chip conveyor (Optional)

A hinge type chip conveyor with a drum filter and a large coolant tank is available as an optional feature.



Superb machine rigidity, featuring X-, Y-, and Z-axis box ways

Based on a powerfully built machine structure, all three axes (X-Y-Z) use the rugged cast-iron box ways to deliver the best combination of high rigidity, heavy-load carrying capacity, and low friction. The 853PF-5X boxways with wider surface contact area are better able to dampen vibration—resulting in higher part accuracies and longer tool life.

Advanced Okuma designing also provides:

- X-Y rapids: 30 min/min (1,181 ipm)
  - X axis with large-diameter [ø63 mm (2.48 in.)] triple-thread screw
  - Y axis features lube oil air levitation
- Z rapid: 24 min/min (945 ipm)
  - Compressed circulating air counterbalance facilitates smooth movements and saves energy

Full enclosure shielding

This standard feature effectively shields the operator from splashing coolant and flying chips. The doors open to a wide 3,100 mm (122 in.), 50 mm greater than max X-axis travel, for excellent access to the machining area and easy workpiece load/unload.

Pedestal operator's panel

The pedestal-mounted operator's panel can be rolled to any exact position required. That mean's superb ease of use, especially during workpiece setups.

Superb chip discharge

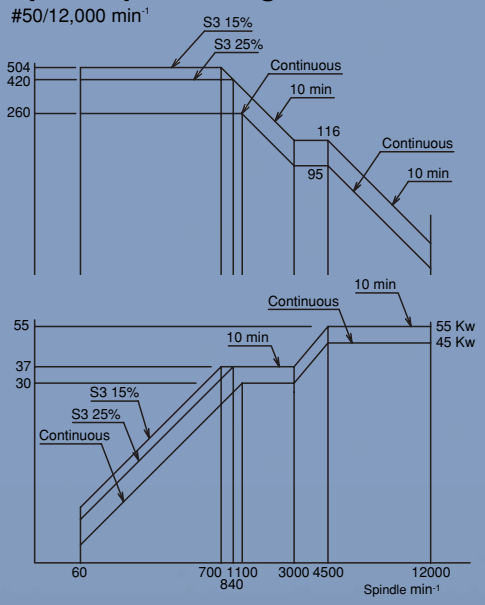
A chip flushing system mounted in the rear and on the sides of the machining area flush out large chip volumes to the chip conveyor in front of the work table.

Fast and rigid high-performance spindle

Years of excellent 5-axis technology has been improved again in speed and stiffness. Okuma's class best cutting capacity spindle really shines from aluminum to titanium applications.

Aluminum . . . . 5,000 cm³/min (305 in.³/min)
Titanium . . . . . 114 cm³/min (7 in.³/min)

Spindle power diagram

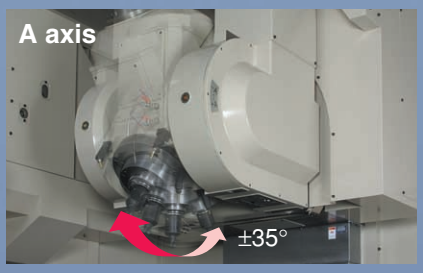


Compact universal head

We made the head even more compact with cross roller bearings [ø400 mm (ø15.75 in.), handle higher loads; 4 times stiffer than angular-contact ball bearings, far greater rotational accuracy].

A/B axes

Either axis can swivel/swing ±35 degrees at up to 3600 degrees/min (60 rpm). And two L/R motors for the B axis operate "in tandem" (synchronized) for extra smooth swing motions. Also equipped with linear scale feedback, this type of double axis spindle head can accommodate long and large workpieces; 3000 x 850 mm (118.11 x 33.47 in.)



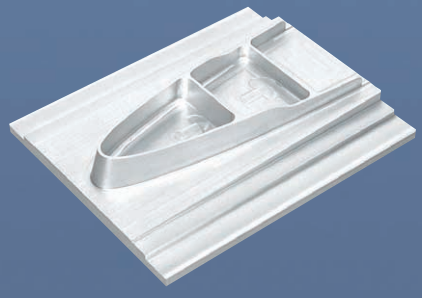
Spindle—Powerful

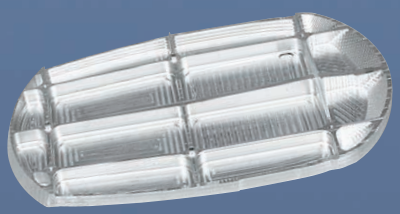
The No. 50 taper spindle rotates up to 12,000 min -1, driven by a high-performance 45/55-kW (60/75-hp) motor, to provide high cutting capacity.

Cutting capacity

	Material	Tool (mm × flutes)	Spindle speed (min-1)	Surface speed (m/min)	Feed (mm/min)	Width (mm)	Depth (mm)	Capacity (cm³/min)
Face milling	S45C	ø5 in × 6	320	102	500	90	5	225
End milling	Al (A7075)	ø50 × 3	6,350	997	12,500	40	10	5,000
	Titanium	ø38 × 6	200	24	120	19	50	114
Drill	S45C	ø50 × 2	200	31	50	—	—	98

Sample workpieces





Machine Major Specifications

Table dimensions			mm (in)	3,200 × 850 (125.99 × 33.47)
Max load on table			kg (lbs)	3,000 (6,600)
Travels		X axis	mm (in)	3,050 (120.08)
		Y axis	mm (in)	850 (33.46)
		Z axis	mm (in)	700 (27.56)
		A axis	deg	±35
		B axis	deg	±35
Spindle nose to table top			mm (in)	150 - 850 (5.91 - 33.46)
Spindle center to column slideway			mm (in)	930 (36.61)
Table top from floor			mm (in)	1,080 (42.52)
Rapid traverse		X/Y axes	mm/min (ipm)	30,000 (1,181)
		Z axis	mm/min (ipm)	24,000 (945)
		A/B axes	deg/min	3,600
Cutting feedrate		X/Y/Z axes	mm/min (ipm)	1 - 24,000 (0.039 - 945)
		A/B axes	deg/min	1 - 2,400
Spindle bore taper				NST No. 50
Spindle speed range			min^{-1}	60 - 12,000
Spindle speed change				double wound motor
Spindle bearing ID			mm (in)	ϕ90 (ϕ3.54)
Motors	Spindle drive motor		KW (hp)	45/55 (60/75)
	Feed motor X/Y/Z/A axes		KW (hp)	7 (9.3)
	B-axis		KW (hp)	3 (4) x 2 pcs
	Hydraulic unit motor		KW (hp)	2.8 (3.7)
	Lubrication pump motor		W	17
	Coolant pump motor		KW (hp)	2.2 (2.9)
Tanks	Hydraulic unit		L (gal)	10 (2.64)
	Slideway lube tank		L (gal)	12 (3.17)
	Coolant tank		L (gal)	1,500 (396)
Overall machine height			mm (in)	3,300 (130)
Floor space required (W x L)			mm (in)	8,600 × 4,550 (339 × 179)
Machine weight			kg (lbs)	20,000 (44,000)
Total power required			KVA	116
Voltage required			V	AC400/480
ATC	Applicable tool shank			MAS403-BT50 / Caterpillar No. 50
	Pull stud			MAS407-P50T-Ⅱ / Caterpillar special
	Tool selection			fixed address
	Max tool	with adjacent	mm (in)	ϕ125 (ϕ4.92)
		without adjacent	mm (in)	ϕ200 (ϕ7.87)
	Max tool length		mm (in)	350 (13.78)
	Max tool weight		kg (lbs)	20 (44)
	Magazine capacity		tools	30
	Tool change time (T-T/C-C)		sec	9 / 16

Standard Accessories

- Mounting plates and leveling screws
- Service tool and tool box
- Spindle nose air curtain
- Oil chiller for spindle
- Coolant equipment
- Slideway lubricating unit
- Work light
- Operation manuals
- Maintenance manuals
- Pedestal type operator's panel
- Spare fuses
- Full enclosure shielding without ceiling cover
- Cutting chip flushing system by coolant
- Scale feed back for A/B axes (AbsoScale)

Optional Accessories

- 3-color signal tower (indicator lamps)
- AbsoScale for X/Y/Z axes
- Automatic power shut-off system
- Chip air blow system
- Thru-the-spindle coolant system (1.5 Mpa , 7.0 Mpa)
- Hinge type lift-up chip conveyor with coolant tank and drum filter
- Chip bucket for lift-up chip conveyor
- Oil skimmer
- Full enclosure shielding (with ceiling cover)
- Automatic centering device

FANUC-31i Specifications

Basic Control Functions

Controlled axes	5 axes（simultaneously）
Least input increment	0.001 mm
Max programmable dimension	±99999.999 mm
Dimensioning system	Absolute/incremental programming
Auxiliary functions	S5-digit（direct command of spindle speed）
	M3-digit
	T2-digit

Standard Control Features

- Feed drive AC digital servomotor
- Ambient conditions
  Temperature: 0 - 45ºC
  Humidity: below 75% (relative)
- 10.4-in. color LCD (color)
- Tape memory, editing
- Part program storage length: 2MB
- Manual handle 1 pc
- Feedrate command Direct F5-digit
- Rapid traverse override
- Feedrate override
- Dwell G04
- Coordinate system setting: G92
- Auto coordinate system setting
- Plane selection G17, G18, G19
- Absolute/incremental programming: G90/G91
- Decimal point programming / pocket calculator type decimal point programming
- Reference point return: G27 – G30
- Stored travel limits: end travel limits
- Linear / circular interpolation: G01 / G02, G03
- Coordinate system rotation
- Workpiece coordinate systems: G52 (Local), G53 (machine), G54 – G59 (work 1 – 6)
- Optional block skip
- Stored pitch error compensation
- Optional stop
- Single block
- Z-axis command cancel
- Tool nose radius compensation: G40, G41, G42
- Tool length compensation: G43, G44, G49
- Tool offset pairs: 99
- Tool length measurement
- Canned cycles: G73, G74, G76, G80 – G89, G98, G99
- Registerable programs 1000
- Machine lock
- Dry run
- RS-232-C interface
- Mirror image: M codes (XY only)
- Single direction positioning
- Skip function G31
- Jog override
- Exact stop
- Self diagnosis function
- Clock function
- Manual absolute
- Sub program call; 4 folds nested
- External message
- Help function
- Alarm history
- Program number search
- Sequence number search
- Graphic function
- Macro executor; main CPU custom: 2MB
- AI contour Ⅱ
- Rapid traverse bell-shaped acc/dec
- Bell-type acc/dec after cutting feed interpolation
- Custom macro B
- Jerk control
- Nano smoothing
- High speed processing
- Programmable data input: G10
- 3-D coordinate conversion
- Tool length compensation in tool axis direction
- 3-D handle feed
- 3-D cutter compensation
- Tool center point control

Software Kit

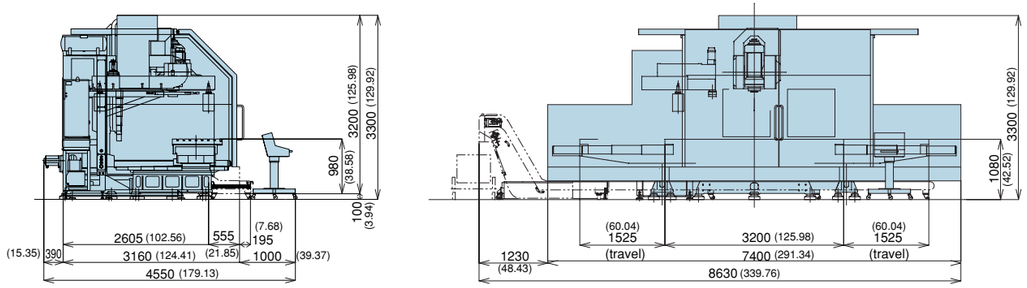
- Rigid tapping
- English display
- Multiple program simultaneous editing
- Tool life management
- Helical interpolation
- Inch/metric conversion
- Run hour and parts count display

Optional Control Features

- Extended part program editing
- Part program storage length expansion: 3MB, 4MB, 5MB, 6MB
- Registerable programs: 2000, 4000
- Tool offset pairs: 200, 400, 499, 999
- Tool offset memory C
- High-speed skip
- Addition of common macro common variables: 600
- Polar coordinate interpolation
- Optional chamfering/corner R
- Programmable mirror image
- Scaling
- Additional workpiece coordinates: 48 pairs
- Optional block skip: 9 pcs
- Program restart
- Data server (recommended) (ATA flash card: 1GB)
- Remote buffer; RS-232-C
- Automatic corner override
- Inverse time feed

mm (in.)

Major Machine Dimensions



Machining Ranges

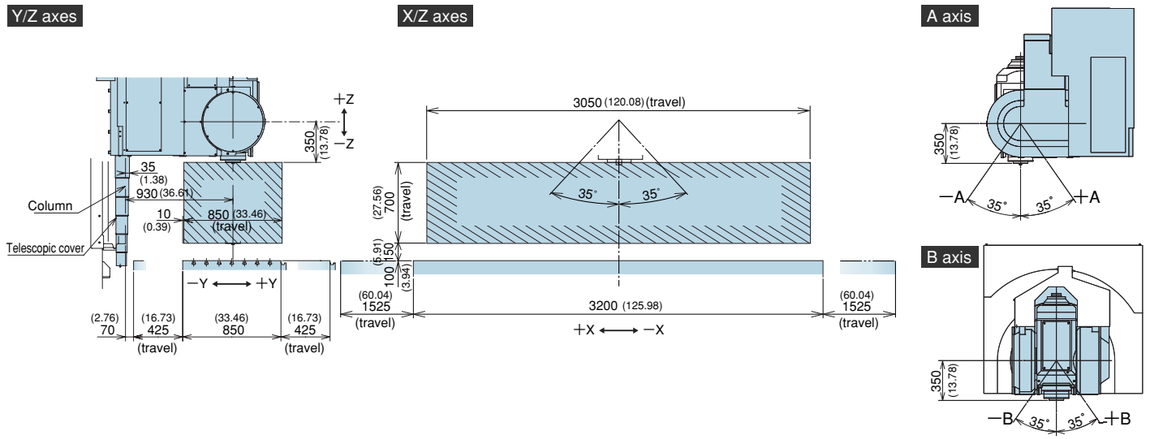
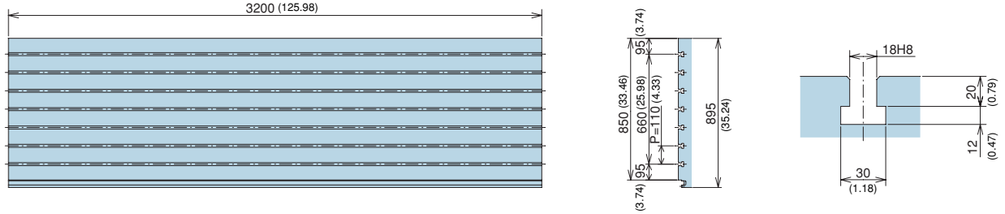
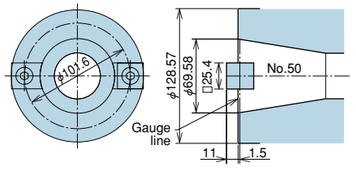


Table Dimensions

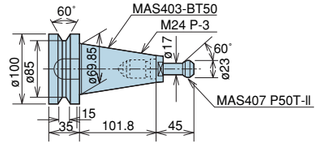


Spindle Nose

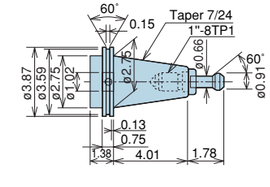


Tool Shank

MAS403 BT50 mm



CAT 50 in.



When using Okuma products, always read the safety precautions mentioned in the instruction manual and attached to the product.

⚠ Fire Safety Precautions

To protect your factory and equipment from fire and assure continued safe operation, observe the following fire safety precautions whenever you operate machinery.
Whenever possible, avoid the use of oil-based coolants for cutting operations.
Sparks caused by hot chips, tool friction, and grinding can cause fires.
Always observe the following safety measures to ensure safe operation when machining flammable materials or when performing dry machining.

1. Oil-based coolant
   (1) Use nonflammable cutting fluid coolant.
   (2) When the use of an oil-based coolant is unavoidable:
   - **Before** you begin machining, check cutting tools to make sure of their service life and the condition of the tool edge, and choose cutting conditions that will not cause a fire.
   - Periodically clean the coolant filter to maintain sufficient coolant discharge, and frequently verify that coolant is discharging normally.
   - Take measures to control the outbreak of fire: Place a fire extinguisher near the machine, have an operator constantly monitor operation, and install an automatic fire extinguishing system.
   - Do not place flammable materials near the machine.
   - Do not allow chips to over accumulate.
   - Periodically clean the inside of the machine and the area surrounding it.
   - Check that the machine is operating normally.
   - Never run the machine unattended.
   - Since an automatic fire extinguishing system and other peripherals are needed for grinding operations, please let us know as soon as possible if you plan to perform such operations.
2. Precautions regarding machining of potentially flammable materials
   Before machining any material designated by law as a flammable substance, e.g., plastic, rubber, wood, acquaint yourself with the special characteristics of the material in terms of fire prevention, and observe the precautions given in (2) above to ensure safe operation.
   Example: When machining magnesium, there is a danger that magnesium chips and water-soluble coolants will react to produce hydrogen gas, resulting in an explosive fire if any chip should ignite.
3. Dry machining
   Dry machining is a fire hazard because workpieces, tools, and chips are not cooled. To ensure safe operation, do not place any flammable objects near the machine and do not allow chips to over accumulate.
   In addition, be sure to check cutting tools to make sure of their service life and the condition of the tool edge, and observe the precautions regarding oil-based coolants given in (2) above.

OKUMA

This product is subject to the Japanese government Foreign Exchange and Foreign Trade Control Act with regard to security controlled items; whereby Okuma Corporation should be notified prior to its shipment to another country.

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