



Hybrid Metal 3D Printer

LUMEX Avance-60

Development Concept, Spec., and Features

June 14th, 2016

Matsuura Machinery Corporation
Engineering Division

<http://www.matsuura.co.jp>



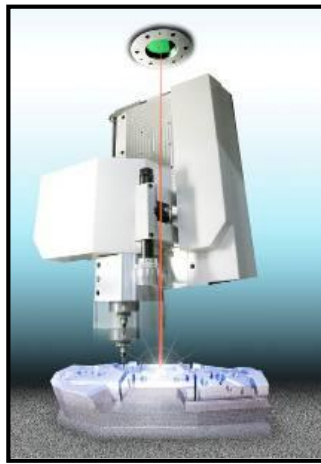


Matsuura Original Technology

**High Accuracy
& High Speed
Milling**



**Laser
Sintering**



The World's First Machine

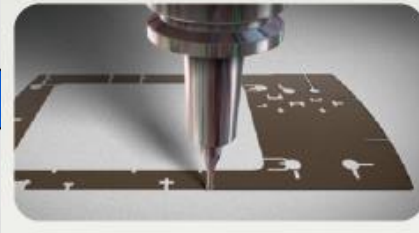


A World First, Release LUMEX Avance-25



LUMEX Sintering & Milling Process

High-Speed Milling



Milling

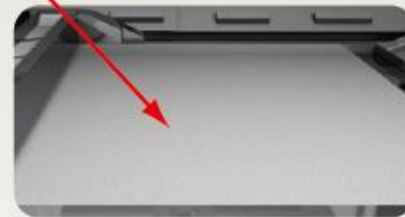
✱ Surface finish by high-speed milling during laser sintering

Repeat 10 times & make 0.5mm layer

Powder distribution unit Metal Powder



Build table



Powder Supply

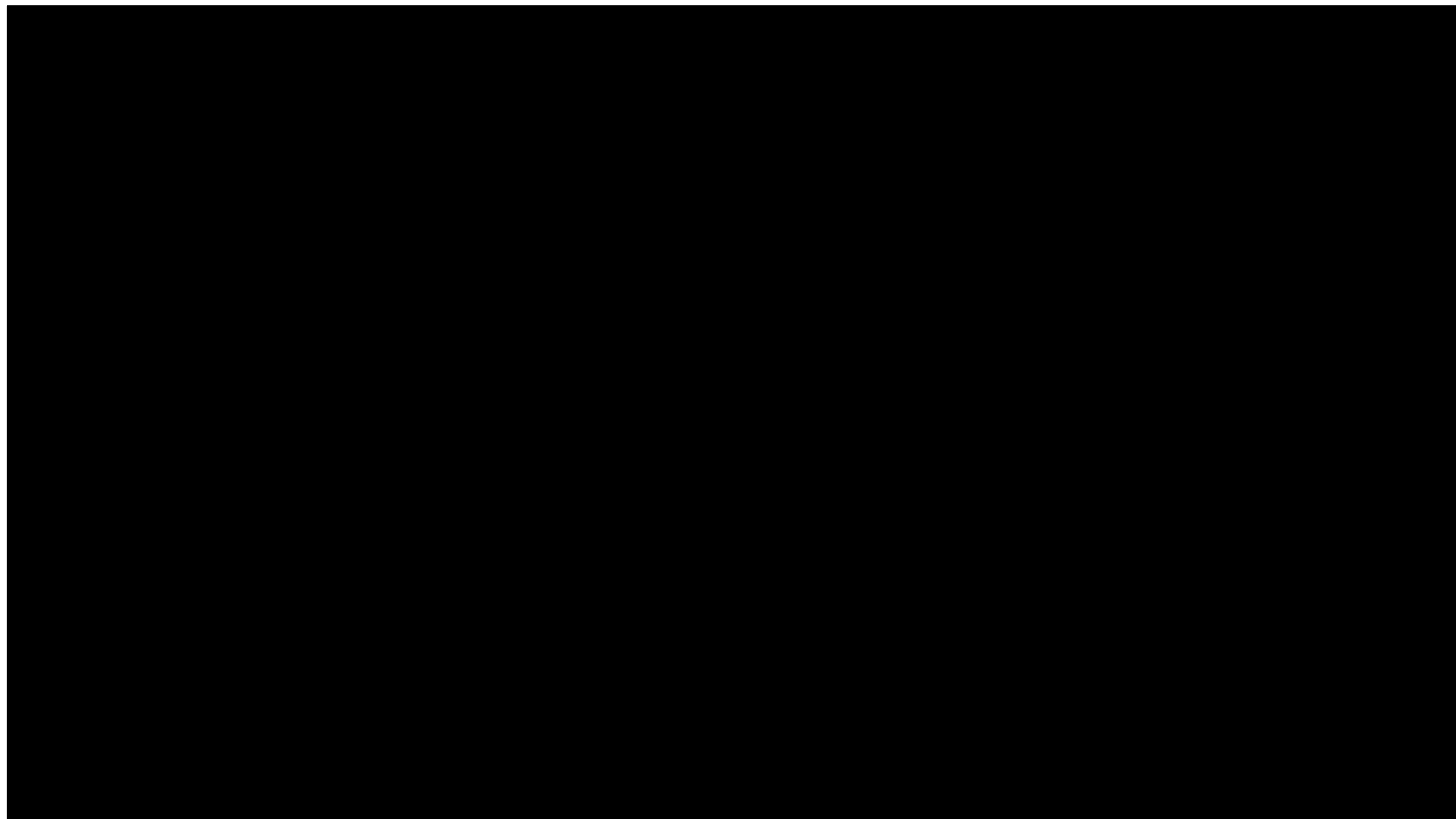
Laser Sintering

Laser Sintering

Repeat Laser Sintering & High-Speed Milling



LUMEX Motion





Laser Sintering & High Accuracy/ Speed Milling

Laser Sintering only



Hybrid Metal 3D Printer
LUMEX





Advantage of *LUMEX* Technologies

- Creation of Reference Surfaces for After Milling
- Sintering Position Control by Machine Coordinate
- Compensation of Laser Sintering Coordinate System



- Dimensional Accuracy
- Surface Roughness
- Sintering Quality

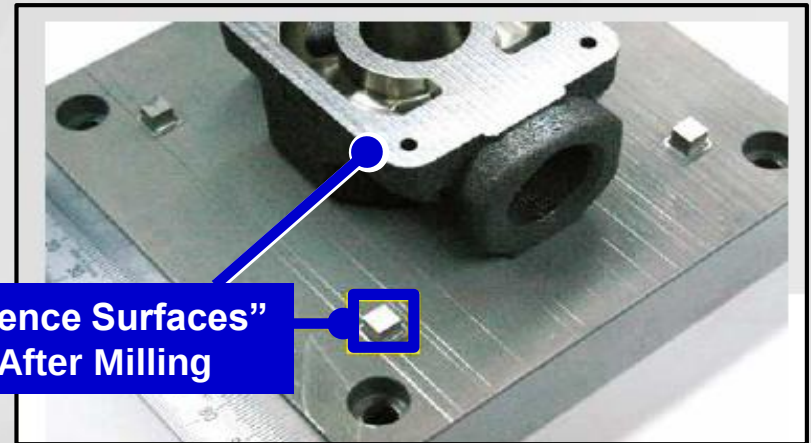
Spindle



Feedrate

- X & Y AX
60m/min
- Z AX
30m/min

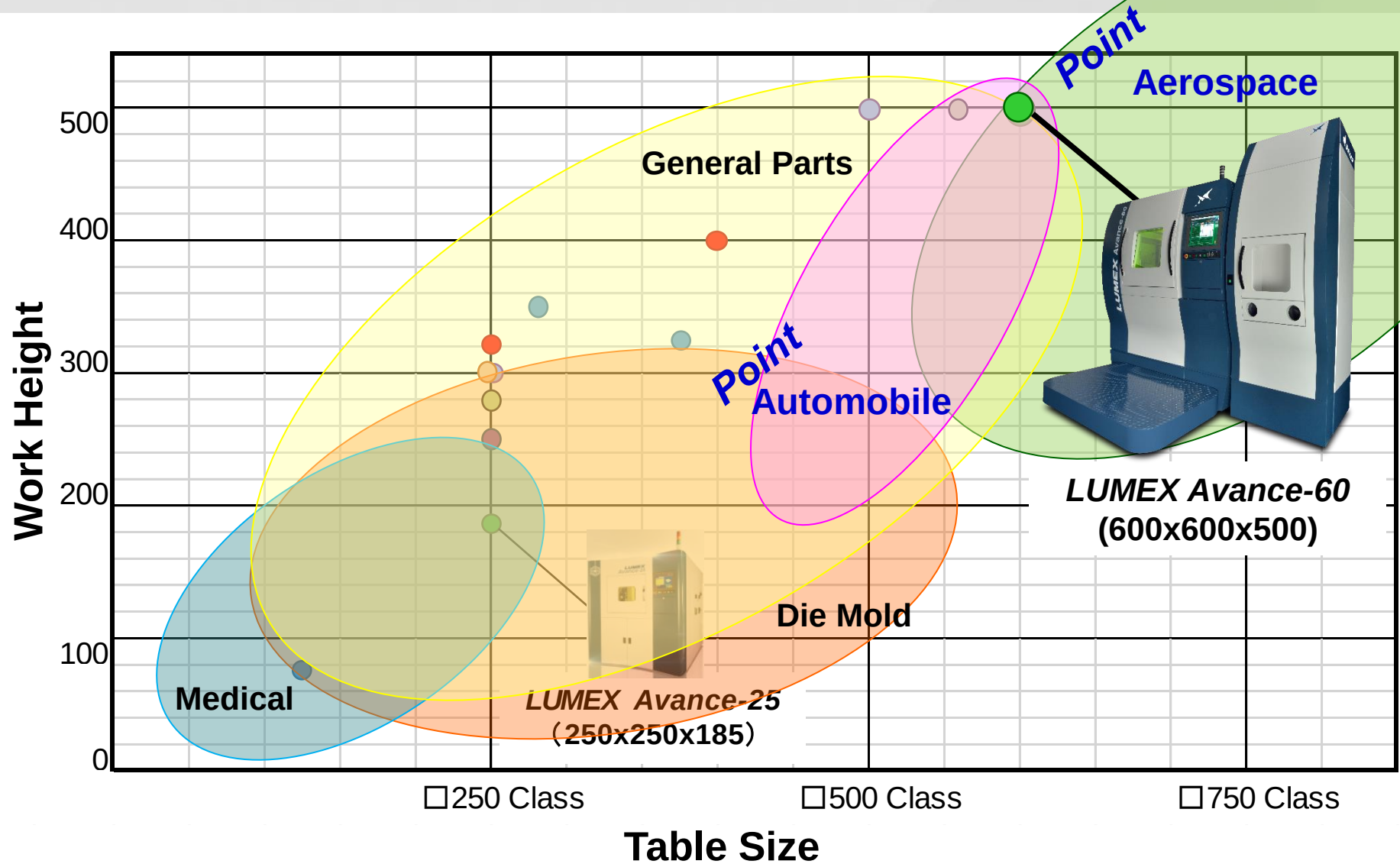
Linear Motor Drive



"Reference Surfaces"
for After Milling



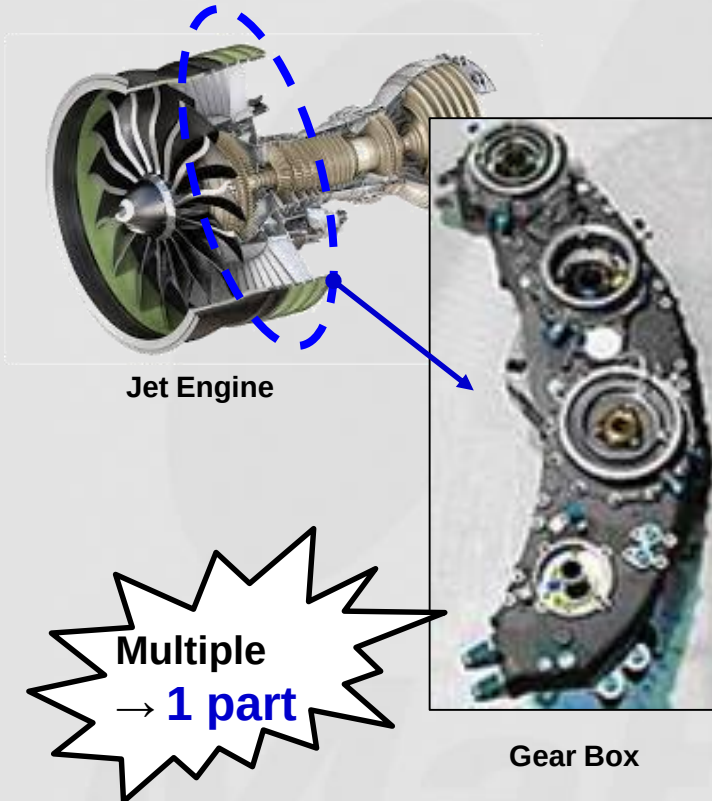
Target of Development





Target Market_Aerospace

- New Design Possibilities
- Weight Saving



* Above effects are researched by Matsuura



Target Market_Automobile

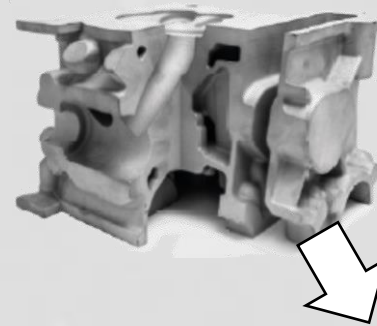
➤ Shorter Lead Time



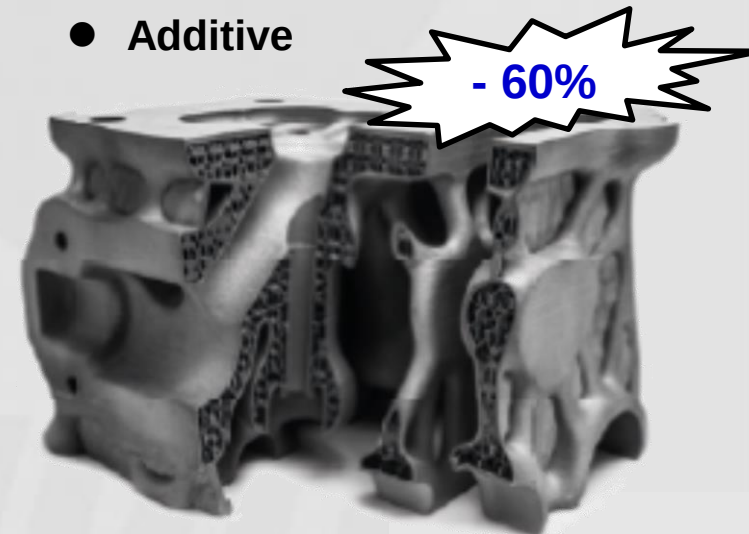
V8 Engine
Material: Aluminum

➤ Weight Saving

● Conventional



● Additive



Cylinder Case

* Above effects are researched by Matsuura



Development Concept

1. Enlargement

2. High-Speed

3. Automation





1. Enlargement

Max. Work Capacity: **15 times**

Max. Work Wight : **14 times**

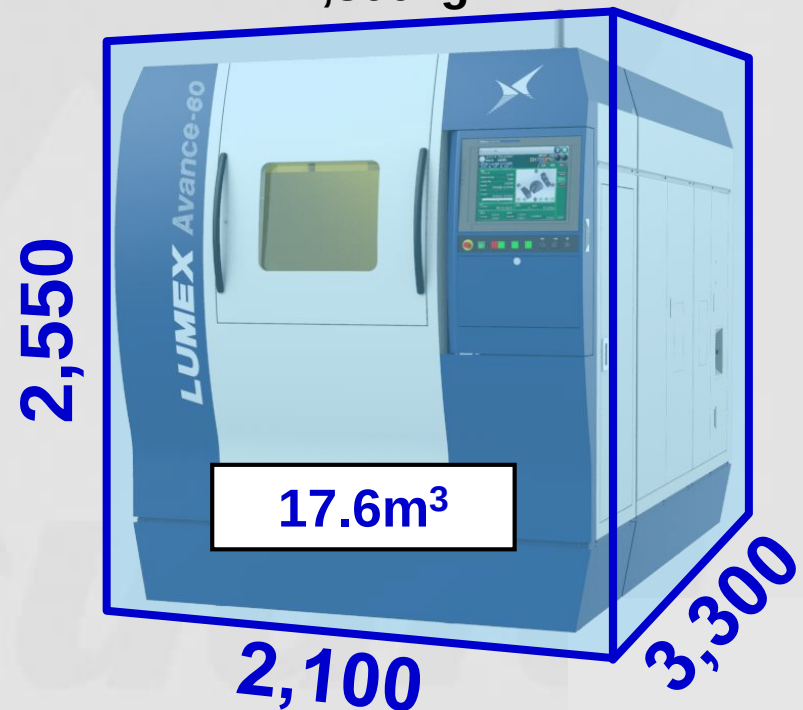
LUMEX Avance-25

□250 x H185
90kg



LUMEX Avance-60

□600 x H500
1,300kg





2. High-Speed: Sintering

Sintering Time **75%** Reduction

- 1kW High Power Fiber Laser STD
- Powder Build Speed-Up
 - 1,000 $\Rightarrow$ 10,000mm/min
- Changeable Layer Thickness
by Sintering Conditions
 - 50 $\Rightarrow$ 100 μ m
- Optimization of Galvano Control

	<i>Avance-60</i>		<i>Avance-25</i>
	STD	OP	STD
Laser Power	1kW	500W	400W
Sintering Volume	35cc/h	16cc/h	7cc/h



2. High-Speed: Milling

Milling Time : **75%** Faster than Current *Avance-25*

- **Milling Time Reduction
by Cutting Path Optimization**
 - Reduce Overlap Amount
& Z-pitch Optimization depend on the Shape
- **Operation Switching Time Reduction**
 - Reduce the Waiting Time at Operation Change



2. High-Speed: Sintering Simulation

V8 Engine Block **73%** Reduction



- Size : 425 x 320 x 340mm
- Material : Aluminum

Conventional

Total : 402h 50m
Sintering : 333h 23m
Squeegeeing : 69h 27m



LUMEX Avance-60

Total : **107h 00m**
Sintering : 97h 46m
Squeegeeing : 9h 14m



1: Above values are calculated and not guaranteed.

2: Reduction rate differ depending on Molding shape & size.



3. Automation

Easy Powder Handling

- **Auto Powder Supply-Recovery System** STD
 - Automatic Powder Supply System
 - Automatic Powder Recovery System
 - Automatic Powder Sieving Unit

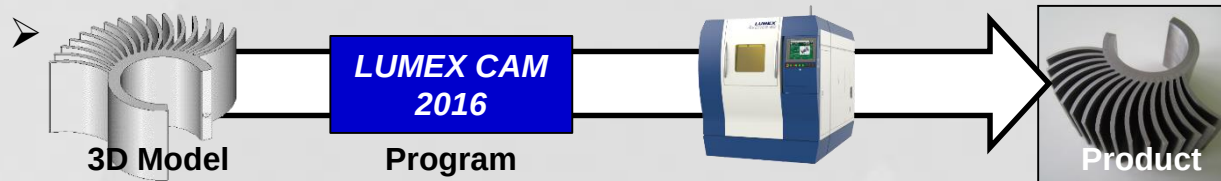




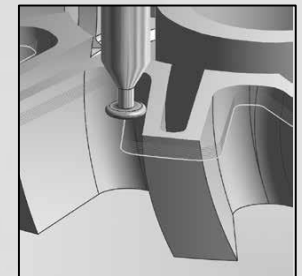
Application (*LUMEX CAM 2016*)

Sintering & Milling Path Calculation **40%** Reduction
(from Marks-Mill)

- Simple Operation



- Back-taper Machining

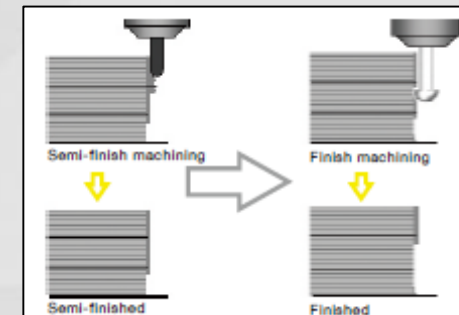


Back-taper Machining

- Path Shift Milling
(Patent in Japan: No.4452692)

- New Function

➤ Tool Load Optimization



Path Shift Milling



Application (Material)

Metal	Materials Name
Steel	Matsuura Maraging II
Stainless	Matsuura Stainless 630 (SUS630) Matsuura Stainless 316L (SUS316L)
Titanium	Matsuura Titanium 6Al4V (Ti-6Al-4V)*
Co-Cr	Matsuura Cobalt Chrome (Co-Cr)
Ni Alloy	Matsuura Nickel Alloy 718 (Inconel718)
Aluminum	Matsuura Aluminum Si10Mg

New!

* Argon Gas is required



- Use only specified sintering materials.
- Order required sintering materials from Matsuura Machinery Corporation.



Spec. Comparison

*) Incl. Base Plate Thickness

			Avance-60	Avance-25
Max. Work	Size (mm)		600 x 600 x 500*	250 x 250 x 185 *
	Weight (kg)		1,300	90
Stroke	X/Y/Z (mm)		610/ 610/ 100	260/ 260/ 100
Spindle	Spindle Speed (min ⁻¹)		450 – 45,000	←
	Spindle End		1/10 Taper #20	←
	Spindle Max. Torque (N·m)		1.31	←
Tool	Capacity (Pcs)		20	←
Laser	Type		Yb Fiber Laser	←
	Laser Power	STD	1kW	400W
		OP	500W	-
CAM			LUMEX CAM 2016	←
NC Control			I-Tech Avance	←



Exhibition Schedule

DMS

Design Engineering &
Manufacturing Solutions
EXPO

- Date : Jun. 22 (Wed) to 24 (Fri)
- Venue : Tokyo, Japan



Open House

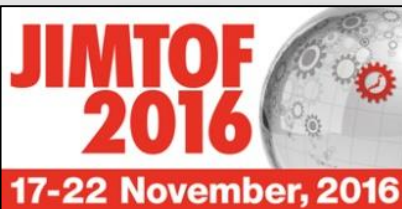
- Date : Jul.6 (Wed) to 7 (Thu)
- Venue : Matsuura Headquarter



- Date : Sep. 12 (Mon) to 17 (Sat)
- Venue : Chicago, USA

formnext

- Date : Nov. 15 (Wed) to 18 (Fri)
- Venue : Frankfurt, Germany



- Date : Nov. 17 (Thu) to 22 (Tue)
- Venue : Tokyo, Japan



Thank You