Source of **QUALITY**

Source of **POWER**

Source of **the FUTURE**

METAL LASER SINTERING
HYBRID MILLING MACHINE

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

Matsuura Machinery Corporation

LUMEX | Concept

Challenge Conventional Thinking

Freedom of Design

Make the impossible, possible

Create the Future

From Vision to Reality

A revolution in metal processing

Equipment List

LUMEX Avance-25

Oil cooler

Tool magazine operation panel

Fiber laser unit

Tool magazine

Powder overflow tanks
[Inside the guard]

Air unit
[Inside the guard]

Build chamber
Oxygen concentration
& Temperature display

Operation panel

Supply of
powder material
[Inside the guard]

Fume collector [Inside the guard]

Auto grease supply unit
[Inside the guard]

Air dryer [Inside the guard]

Oxygen
concentration
sensor
[Inside the guard]

Reactive Material Specification (Option) (for use with reactive materials)

Powder sieving unit

Auto powder recovery unit

Fume collector

Ancillary Equipment (external to the machine)

Auto powder
recovery unit (Option)

Water chiller

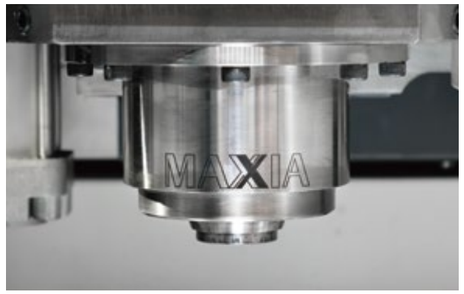
Nitrogen gas
generator

Molding - Cutting Related Equipment

LUMEX Avance-25

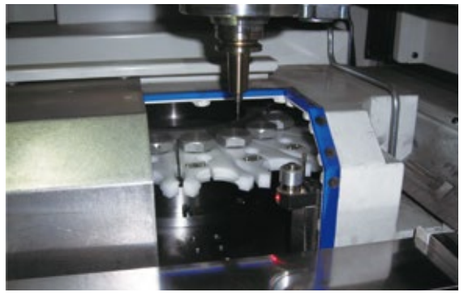
High speed spindle (45,000min-1)

Maintenance free grease lubrication
Use #20 tool with original 1/10 taper.



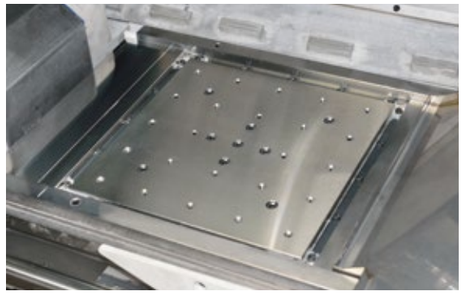
Tool changer

20 tool automatic tool changer.



Build table

During builds the powder temperature can vary due to the heat from laser sintering. The build table has an internal heater to reduce temperature variation.



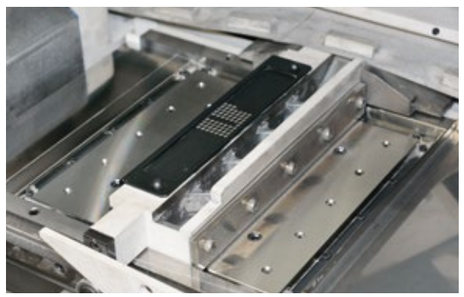
Auto tool length measurement detection

Before each machining operation the tool length is automatically set. After each machining operation each tool is checked for tool breakage.

Powder distribution unit

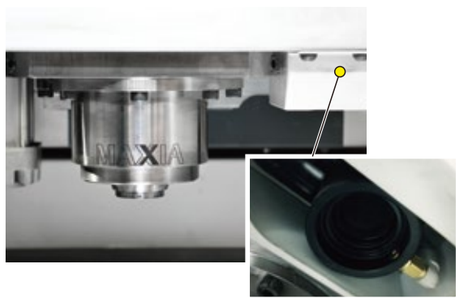
[Japanese patent number : 4351218]

The powder distribution unit is used to supply the powder to the build chamber in both directions. Depending on the part size being built the powder distribution range can be adjusted.



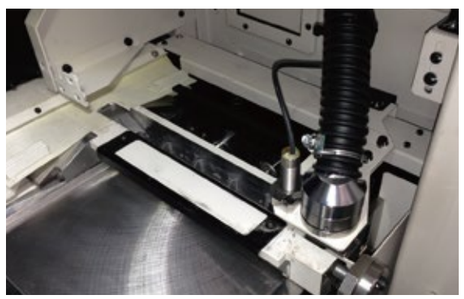
CCD camera

Used for calibration of the laser cordinate system. The CCD camera checks the aligment of a laser test pattern and adjusts the laser co-cordinate system to the machine co-cordinate system during builds.



Supply of powder material

Powder material is supplied automatically into the powder distribution unit.



Automatic Powder recovery system (Option)

Powder material in the build chamber is automatically recovered after builds.

Machine Specification

LUMEX Avance-25

Standard Machine Specification

Traverses

X-axis travel (Table left / right)	[mm]	260
Y-axis travel (Table back / forth)	[mm]	260
Z-axis travel (Table up / down)	[mm]	100
U-axis travel (Build table)	[mm]	185
W-axis travel (Material laser sintering blade)	[mm]	522
Distance from table to spindle end	[mm]	-10 ~ 90

Table

Build tank size	[mm]	270 × 270
Max. Work weight	[kg]	90
Build table size	[mm]	246 × 246
Build table surface configuration		Tap M6 (P1) x Pitch 50mm x 24pcs
Max. Work size	[mm]	250 × 250
Distance from floor to table surface	[mm]	980

Spindle

Spindle speed	[min-1]	450 ~ 45000
Spindle bearing inner diameter	[φmm]	25
Spindle end		1/10 taper #20
Spindle max. torque	[N・m]	1.31
Spindle airblow		Std.
Spindle orientation		Std.

Feedrate

Rapid traverse rate	X / Y / Z	[mm/min]	60000 / 60000 / 30000
Rapid feed acc./dec.	X / Y / Z	[G]	0.98 / 1.28 / 0.95
Feedrate	X / Y	[mm/min]	1 ~ 60000
	Z	[mm/min]	1 ~ 30000
Feedrate acc./dec.		[G]	0.77 / 0.73 / 0.66

Automatic Tool Changer

Tool shank		Matsuura original #20
Pullstud		Matsuura original #20
Tool storage capacity	[pcs]	20
Max. tool diameter	[φmm]	10
Min. tool diameter	[φmm]	0.6
Max. tool length (with condition)		Specified Tool holder : Matsuura special
Tool support length of tool holder : α	[mm]	α≧3×φ (φ=3,4,6,8,10)
Max. tool protrusion length from tool holder : β	[mm]	β≦5×φ (φ=3,4,6,8)
	[mm]	β≦30 (φ=10)
Max. tool weight	[kg]	0.25 (Incl. holder)
	[kg]	0.05 (Tool only)
Tool change time (Tool to Tool)	[sec]	24.4
Tool change time (Chip to Chip)	[sec]	25.4
Tool selection method		Fixed address

Motors

Spindle motor Model βil 40S/70000	[kw]	AC 2.6 / 4.5 (Continuous/50%)
Feed motor		
X-axis: Model Lis4500B2/2	[kw]	AC 3.6 / 4.8
Y-axis: Model Lis3000D1/2	[kw]	AC 2.4 / 3.2
Z-axis: Model Lis600A1/4	[kw]	AC 0.8 / 1.4
U-axis: Model βis4/4000B	[kw]	AC 0.75
W-axis: Model βis2/4000	[kw]	AC 0.5
Tool magazine motor: Model βis1/6000	[kw]	AC 0.5
Material supply motor	[kw]	AC 0.03
Feed axis auto grease supply motor	[kw]	AC 0.025
Oil cooler motor (Spindle, Linear motor)	[kw]	AC 0.75

Laser

Laser type		Yb Fiber laser
Oscillator output range	[W]	40 ~ 400
Beam mode quality value (M2)		< 1.1
Beam spread angle (Full width)	[mrad]	0.5
Wavelength	[nm]	1070 ± 5

Laser Scanning Module

Scanning module X / Y		Galvano scanner system
Z		Linear translator
laser wavelength	[nm]	1070±5
Max. laser power	[W]	400
Drive power supply	[V]	DC 24

Power Supply

Electrical power supply	[KVA]	28 (Varies with option configuration)
Power supply voltage		AC 200/220V ± 10% Transformer is required in case voltage is other than above
Power supply frequency	[Hz]	50/60 ± 1
Compressed air supply	[MPa]	0.6 ~ 0.93
Volume of compressed air to be supplied	[NL/min]	500 (atmospheric pressure)

Tank Capacity

Oil cooler tank capacity (Spindle, Linear motor)	[L]	7

Machine Size

Machine height (From floor)	[mm]	2050
Floor space (Incl. maintenance area)	[mm]	3200W×4650D (Varies with option configuration)
Machine weight	[kg]	4500

Accuracy

Positioning accuracy	X / Y / Z	[mm]	±0.0025
Repeatability	X / Y / Z	[mm]	±0.001

Machine Capability

Axial thrust (Continuous/ Max.)	X	[kN]	1.8/4.5
	Y	[kN]	1.2/3.0
	Z	[kN]	0.2/0.6

Standard Accessories

Total safety guard with ceiling cover	Door interlock
Oil temperature controller	Air dryer
Linear motor cooler	Z-axis balance cylinder
Nitrogen gas generator	Interior temperature sensor
Oxygen concentration sensor	Fume collector
Chiller unit	CCD camera & Image processing apparatus
Galvano scanner & Laser controller	Leveling bolts & Plates
Work light	Spindle integrated run meter
Laser integrated run meter	Guide light function
IPC function	15 inch LCD with touch panel
Qwerty key-arrangement keyboard	USB interface 2ports
High table temperature alarm	AC100V Outlet 3A
Tools & Tool box	Machine color paint
Auto tool length measurement detection sensor (Touch type)	
Scale feedback X / Y / Z Heidenhain (Absolute)	
Feed axis auto grease supply unit X / Y / Z guide only	
Preheating heater & Controller for build table	
3 color signal light (red, yellow, green from top) Position from top, red / alarm, yellow / work completion, green / auto run All light are lighted while laser is oscillating	

Machine Optional Specifications

Input command	inch
Frequency	50Hz
Plate display	English overseas standard
	German
Safety standard	CE mark specification
Special machine color	Special machine color (NC box : Std)
	Special machine color (NC box : Same)
	Special machine color (NC box : Specified separately)
Spare spindle	
Weekly timer	
Power supply voltage	380V Machine & NC are 200V. Exterior transformer is required
	415V Machine & NC are 200V. Exterior transformer is required
Powder sieving machine	Non reactive material specification
Laser power meter	Power meter head
	Power meter display
Powder vacuum unit	Powder vacuum unit (External vacuum)
	Automatic powder recovery system
De-magnetiser	De-magnetising unit
Technical support	1st year maintenance A: laser inspection Laser inspection & adjustment (twice/year)
	1st year maintenance B: Machine software version upgrades Machine software version upgrades
	1st year maintenance C: Laser inspection + Machine software version upgrades Laser inspection & adjustment (twice/year) + Machine software version upgrades
CAM	Laser & machining program CAM software
	Laser & machining program Operation instruction
Tool	Matsuura original #20 tool holder
	Matsuura Original endmill for finishing
Start up parts	Tools for work preparation, Safety mask, Gloves, etc.

Equipment for Reactive Powder

- Std. equipment for reactive powder (Japan 50/60Hz area)
- Fume collector for reactive powder (USA, China, Taiwan)
- Powder vacuum unit for reactive powder (Japan 50/60Hz area)
- Powder vacuum unit for reactive powder (USA, China, Taiwan)
- Auto powder recovery unit for reactive powder (Japan 50/60Hz area)
- Auto powder recovery unit for reactive powder (USA, China, Taiwan)
- Auto powder sieving unit for reactive powder (Japan 50/60Hz area)
- Auto powder sieving unit for reactive powder (USA, China, Taiwan)

Metal Powder Materials

Materials (Work)

Matsuura Maraging II	Maraging material powder (Order unit / 10Kg)
Matsuura Titanium 6Al4V	Ti-6Al-4V material powder (Order unit / 10Kg)
Matsuura Stainless 630	SUS630 material powder (Order unit / 10Kg)
Matsuura Stainless 316L	SUS316L material powder (Order unit / 10Kg)
Matsuura Cobalt Crom	Co-Cr material powder (Order unit / 10Kg)
Matsuura Nickel Alloy 718 (Inconel 718)	Nickel alloy material powder (Order unit / 10Kg)

※Machine specification is subject to change without notice.
※Only specified materials can be used. Order the materials from Matsuura Machinery Corporation.
※Specified materials are subject to change and update without notice. Ask Matsuura Machinery Corporation about updates.

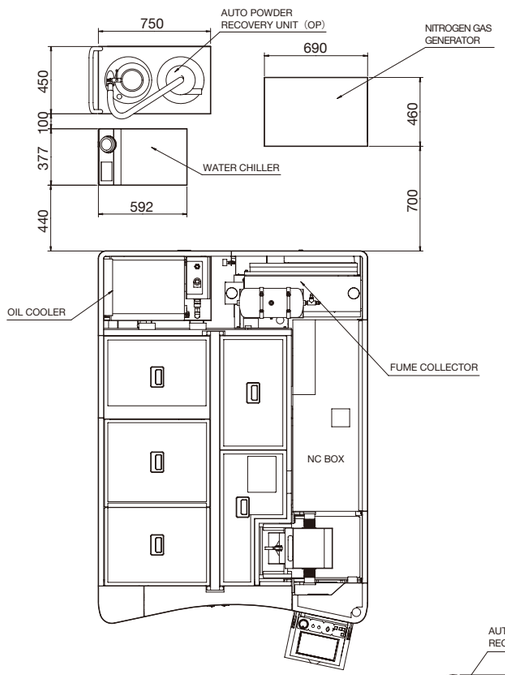
Related Diagram

LUMEX Avance-25

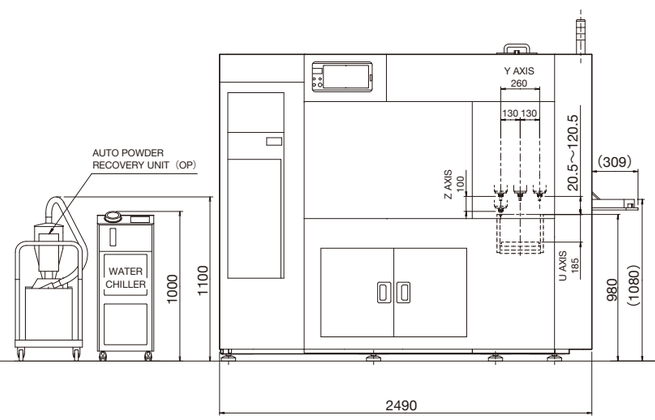
Standard Machine Specification

Machine Length | 2,490mm
Machine Width | 1,800mm
Machine Height | 2,282mm

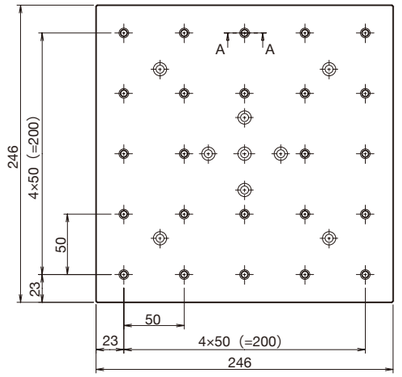
Machine Weight | 4,730kg
Max. Work Weight | 90kg



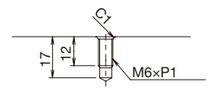
[Top View]



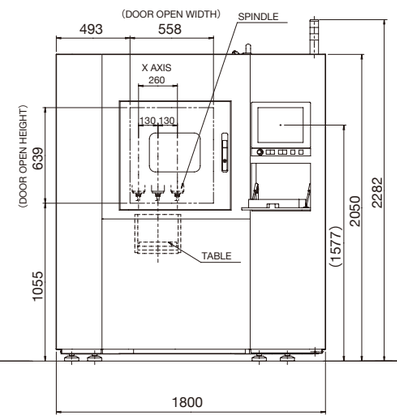
[Left Side View]



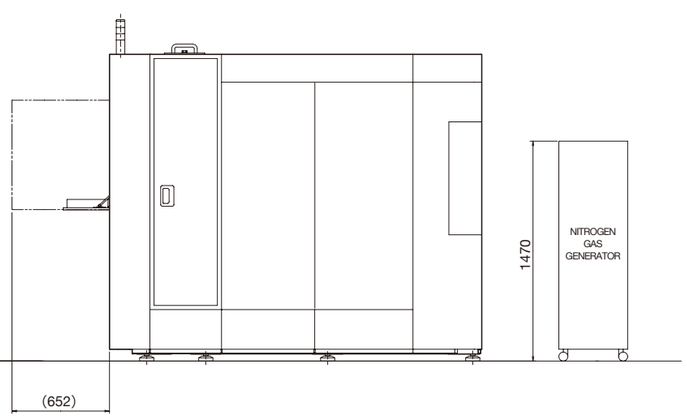
[Table Surface]



[A-A Cross Section View]



[Front Side View]

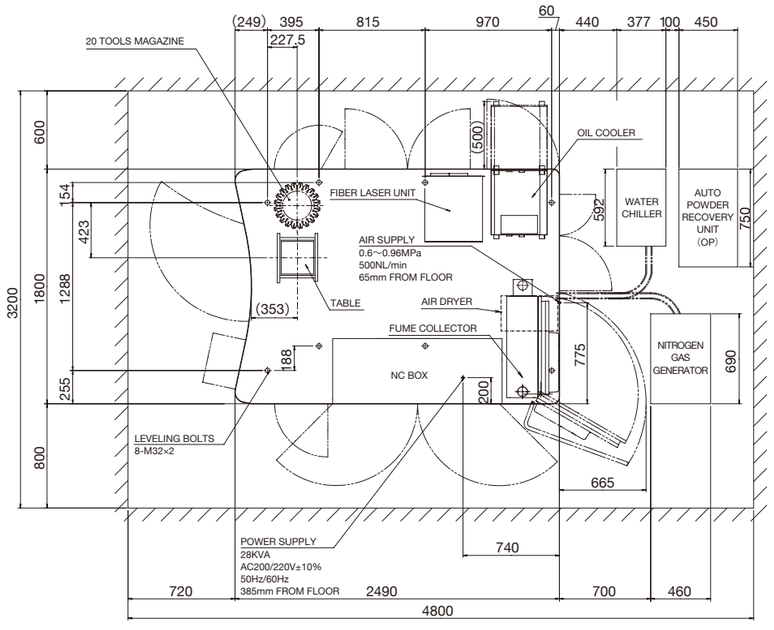


[Right Side View]

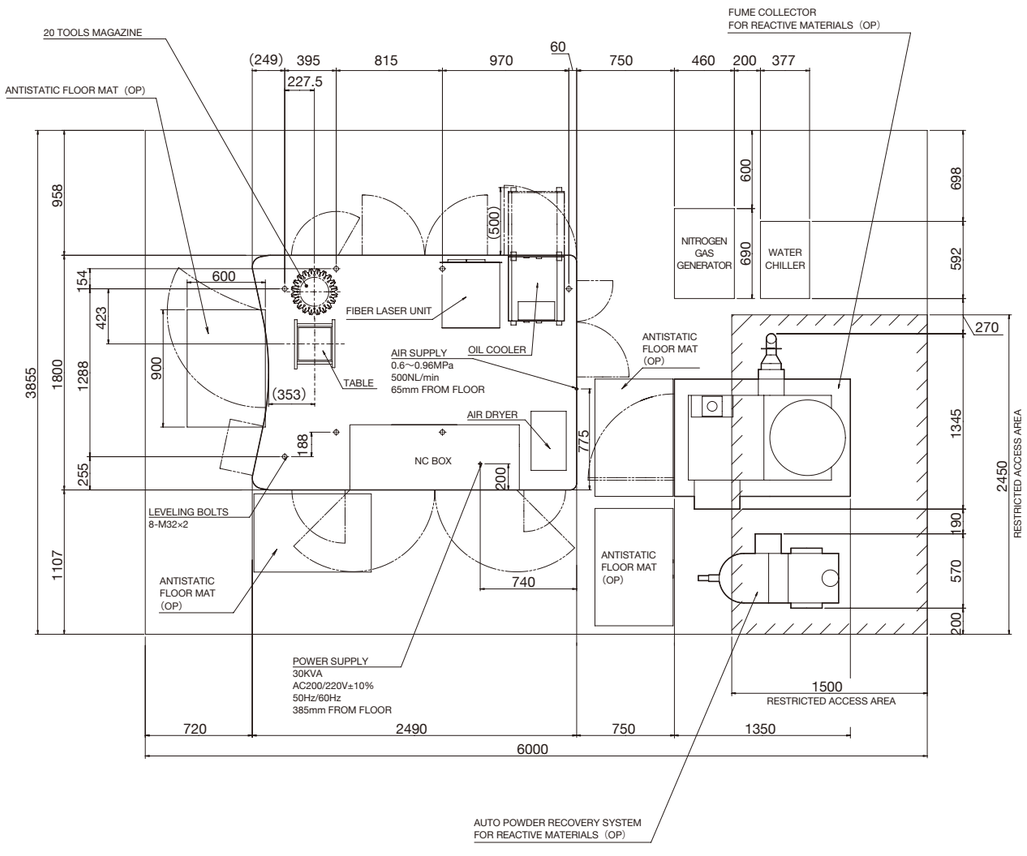
Related Diagram

LUMEX Avance-25

Floorplan



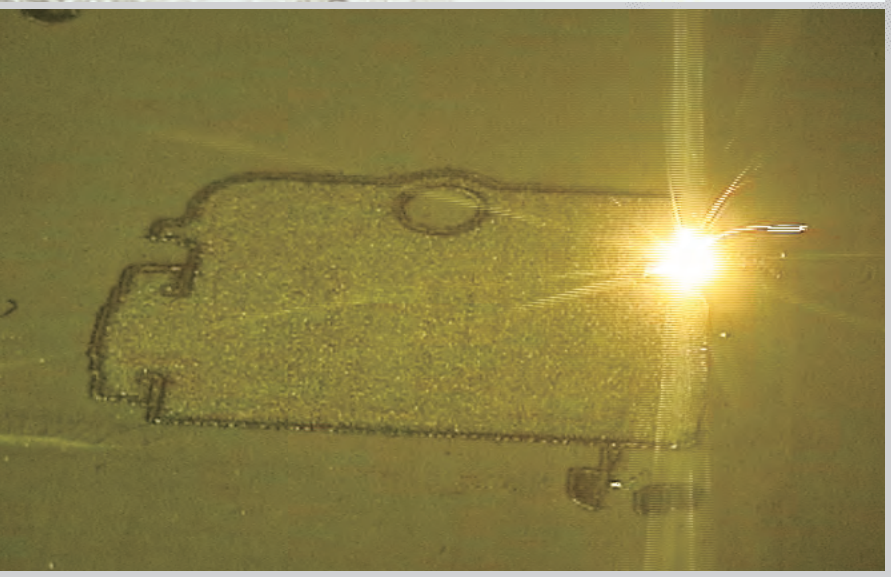
[Standard Machine Specification]



[Reactive Material Machine Specification]

Powder Material

Metal powder material for the ***LUMEX***
The metal powders have been developed and tested, together with optimal sintering and machining conditions, to achieve high quality and consistent part manufacture. Various powder materials are available depending on the required propaties of the manufactured part.

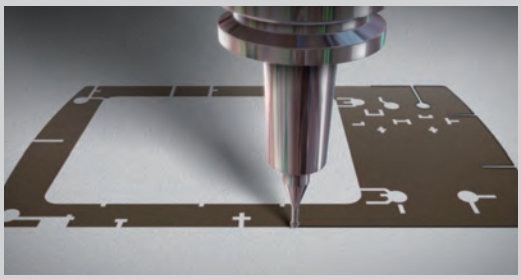


Applicable metal material powder

To respond the requirement of various metal material powder, component and molding methods have been verified.
Matsuura specify them as exclusive materials and offer to users.

Utilize the material powder properties

The material is melted only parts which is eradiate with laser during laser sintering molding.
And rest of material is not changed. Thus, product can be created without regard to any material loss and enable material re-use.



Q [Material powder]

How to obtain the materials

Order the materials from Matsuura . If damage is caused to the machine or operator through the use of non-specified materials, Matsuura is not liable for any loss.

Q [Material powder]

Availability of material powder re-use

Material powder re-use is possible. To re-use the materials, large particles must be removed. Use the sieving machine to eliminate out of spec. Particles from the previous build cycle molding.

Powder Material

Powder material mechanical properties & Chemical composition

	Powder material mechanical properties					
	Hardness	Tensile Strength (MPa)	Proof Stress (MPa)*	Elongation(%)	Relative Density of Work(%)	Sintering Speed (cc/h)
Matsuura Maraging Ⅱ	HRC36±1 [HRC53±1]	1,150-1,200 [1,900-1,970]	1,000-1,100 [1,850-1,900]	11±1 [2.5±1.5]	≧99.5	7-11
Matsuura Titanium 6Al4V	HRC48	460-530	420	1	≧99.5	4-8
Matsuura Stainless 630	HRC32±1 [HRC42±1]	1,070-1,080 [1,240-1,250]	830-850 [1,050-1,150]	17±1 [19±1]	≧99.5	7-11
Matsuura Stainless 316L	HV200±10	570-580	420-460	32±2	≧99.5	7-11
Matsuura Cobalt Chrome	HRC36±1	1,170-1,200	870-900	15±2	≧99.5	6-10
Matsuura Nickel Alloy 718 (Inconel 718)	HRC27±1 [HRC44±1]	930-980 [1,300-1,310]	650-690 [1,070-1,080]	22±5 [15±2]	≧99.5	7-11

Just after Molding
[After aging treatment]

*: Value is from stress-strain diagram of intensity testing

	Powder material chemical composition													
	JIS symbol (Equivalent)	C	O	Al	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Mo	Nb
Matsuura Maraging Ⅱ	—	—	—	0-0.1	—	—	—	—	60-70	1-10	15-25	—	1-10	—
Matsuura Titanium 6Al4V	TAB6400	0-0.08	0-0.25	5.5-6.75	Bal.	3.5-4.5	—	—	0-0.4	—	—	—	—	—
Matsuura Stainless 630	SUS630	—	—	—	—	—	16.3	—	Bal.	—	4	4	—	—
Matsuura Stainless 316L	SUS316L	—	—	—	—	—	17	—	Bal.	—	13.5	—	2.5	—
Matsuura Cobalt Chrome	T7402	—	—	—	—	—	25-30	—	—	60-70	0.1-1	—	1-10	—
Matsuura Nickel Alloy 718 (Inconel 718)	H4553	—	—	0.2-0.8	0.65-1.15	—	17-21	—	Bal.	—	50-55	0-0.3	2.8-3.3	4.75-5.5

Aging treatment

Aging treatment is the method of heating at comparatively low temperature for several hours. By this method. Mechanical properties such as hardness, strength etc. can be enhanced.

[Applicable materials]

Matsuura Maraging Ⅱ
Matsuura Stainless 630
Matsuura Nickel Alloy 718

In case of Matsuura Maraging Ⅱ, heating temperature for aging treatment is 485deg. for 3hours and the part deformation amount is less than 0.1%.

Material storage container

Material supply container

Source of **QUALITY**

Source of **POWER**

Source of **the FUTURE**

METAL LASER SINTERING
HYBRID MILLING MACHINE

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

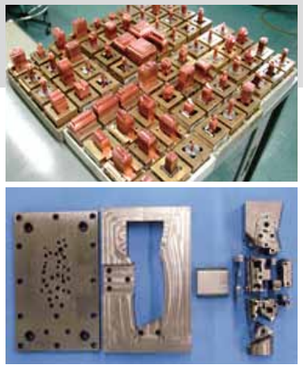
MATSUURA ONLY ONE
TECHNOLOGY

One Machine - One Process

One-process manufacturing of highly functional dies & molds.
Flexible additive manufacturing of parts having complicated geometries, such as three-dimensional cooling water channels, porous structures, or hollow forms.

Shorter Manufacturing Lead Time

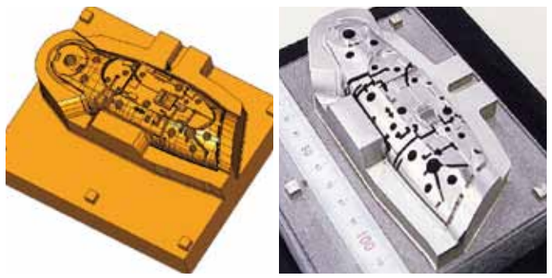
[Conventional manufacturing]
Electrodes and split molds



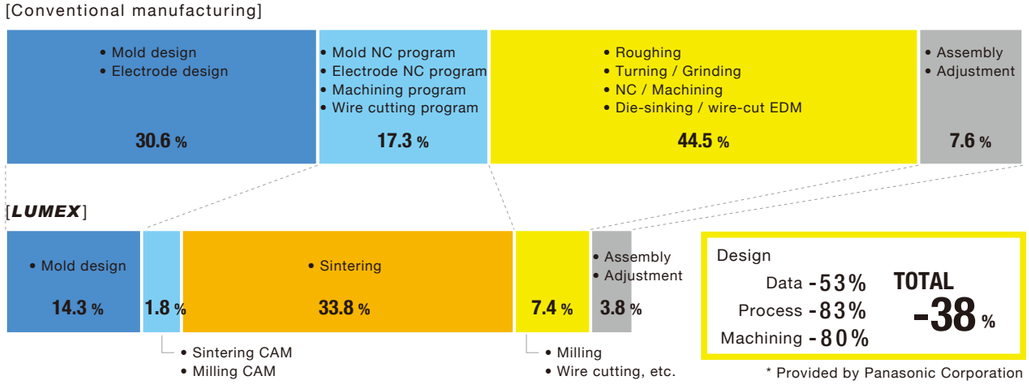
[Advantages of All-in-one Production]

All-in-one production without splitting molds eliminates the need for electric discharge machining and assembly / adjustment work. The design and CAM processing time can be shortened drastically. The design time is reduced approximately by 53%, CAM processing time by 83%, and manufacturing time by 80%. Compared with the conventional method, the total die manufacturing time can be reduced by 38.9%.

[***LUMEX***] Mono-block structure



[Conventional manufacturing]



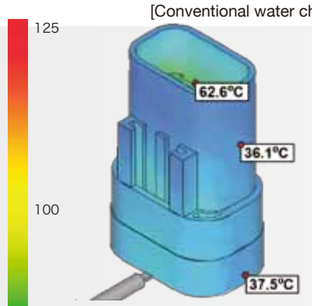
* Provided by Panasonic Corporation

3D Water Channels

By designing 3D cooling channels within the mold, the mold temperature can be uniformly-controlled lycontrolled for high cooling effciency. This enables high-cycle injection molding with greatly reduced molding cycle time.

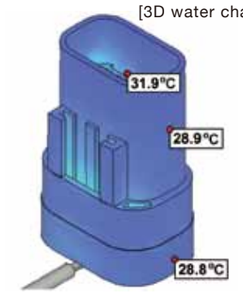
Thermal analysis of the mold
Thermal analysis can be used to predict the cooling effciency of the mold.
- Optimal cooling channel design
- Prediction of molding cycle (cooling time)

[Conventional water channels]

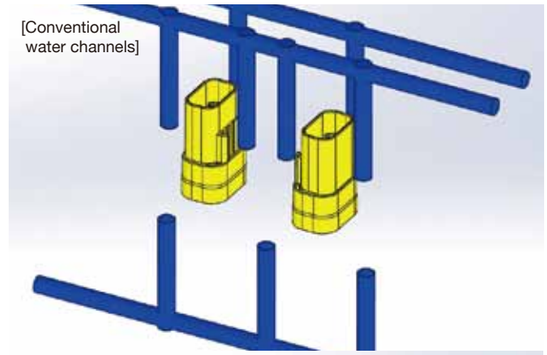


Creature solidification of the molded partfor the same cooling time.

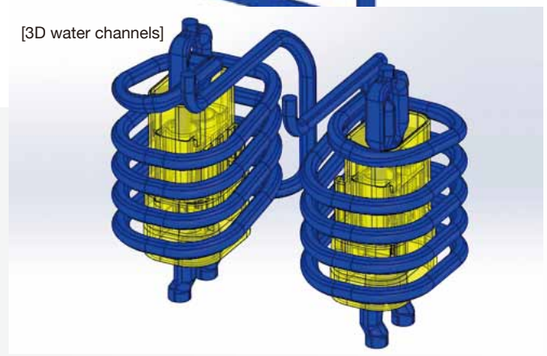
[3D water channels]



[Conventional water channels]

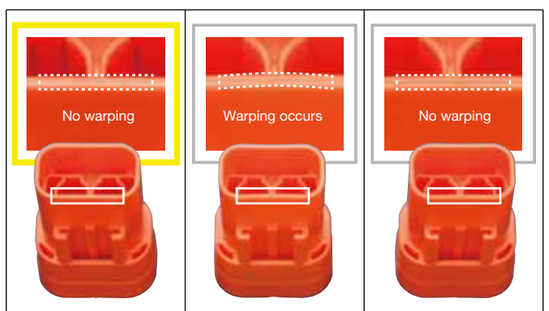


[3D water channels]



[Comparison of cooling effect]

Because of increased cooling effciency, even with a shorter cooling time warping can be reduced.



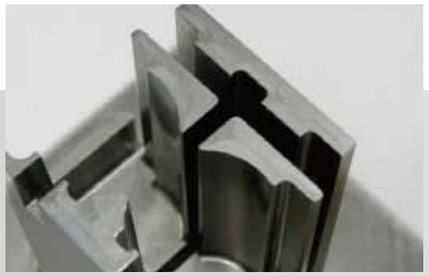
	Sample A	Sample B	Sample C
Water channels	3D cooling water channels	Conventional water channels	Conventional water channels
Cooling time	8 sec	8 sec	18 sec
Quality	○	×	○

One Machine - One Process

High Aspect Features

High aspect Features with large length(L) to depth(D) ratios can be manufactured with precision. Dies & molds can be manufactured without the need for EDM machining.

[Deep rib shape (L/D > 17)]



[Thin rib shape (L/D > 24)]

[Connector cavity mold with high aspect features]

Tooling cost reduction

Tooling costs can also be cut by reducing the number of split molds and eliminating the need for electric discharge machining.

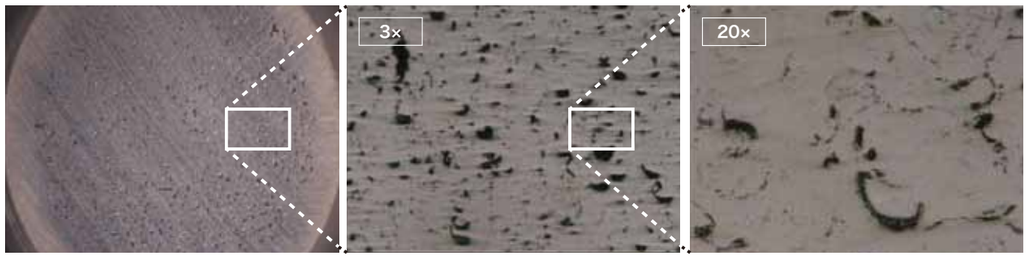
CAD	Cavity machining, Core machining, Electric discharge machining, Assembly, Injection molding	
[Material]	[Tooling costs]	
Metal powders	Cavity/Core machining, Injection molding	**Tooling costs 50% reduction**

Porous Structures

Use of porous Structures

The following effects can be obtained by employing porous structures within appropriate positions of dies & molds. Higher molded part quality by releasing mold gases trapped within the mold. Lower injection pressure by venting mold gases.

Porous Structures (coarse sintering) for gas release and ventilation control can be made by changing the sintering density. This reduces weld lines & burn marks. The following benefits can be expected: shortened filling time, reduction of filling irregularities and weld lines, and prevention of burn marks.



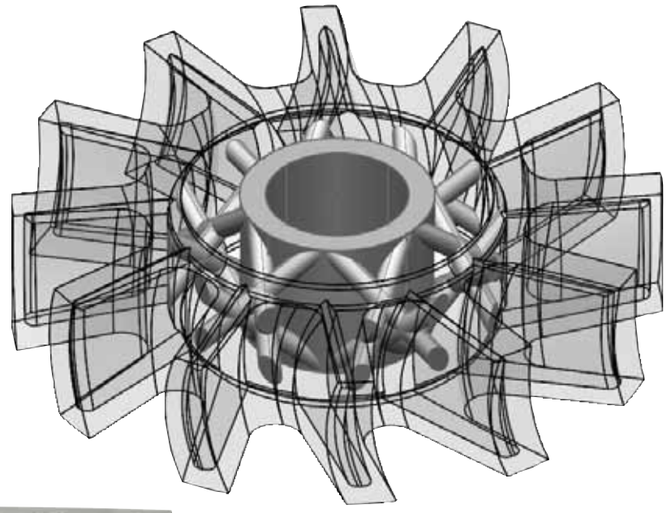
Porous structure ··· A structure containing pores and voids. By changing laser sintering conditions, the porousity of the sintered metal can be controlled. This allows gas to pass through the structure.

Weld line ··· Marks produced where molten resin flows merge.

One Machine - One Process

Weight Reduction

Weight can be reduced by using hollow parts & mesh structures. Maintaining structural strength is essential when designing.

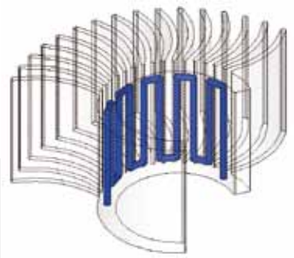


[Solid model]

[Spoke model]

High Functionality

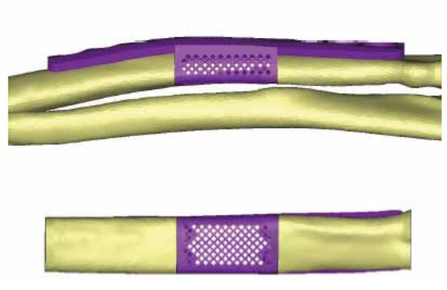
High value can be added to existing products, such as by incorporating hollow structures and 3D cooling water channels.

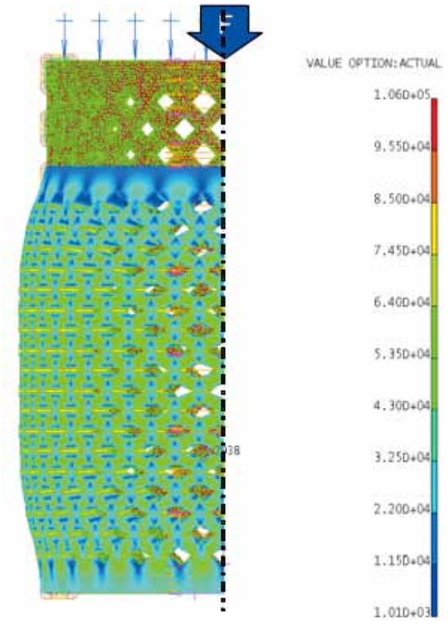


Custom Made

[Mesh Structure]

Mesh structures can be used and designed with flexibility to match that of the surrounding bone.



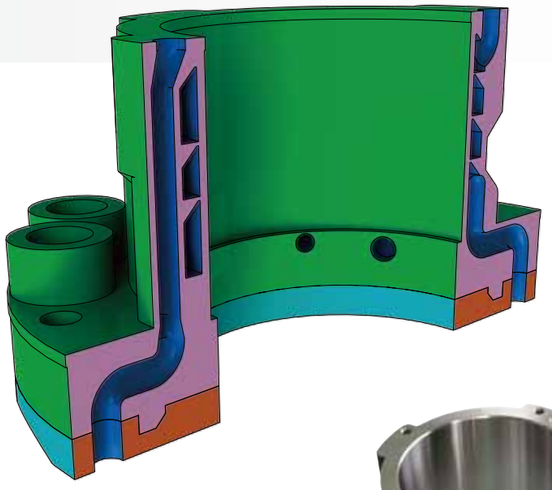


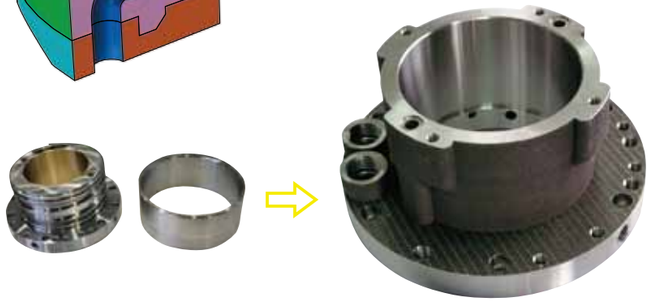
Use of FEM analysis for mesh structure design.

Near-net Shape

Parts that conventionally needed to be split into multiple pieces can be manufactured in one piece on the ***LUMEX***, achieving a considerable reduction in weight.
The amount of waste produced can also be reduced, which reduces environmental impact.

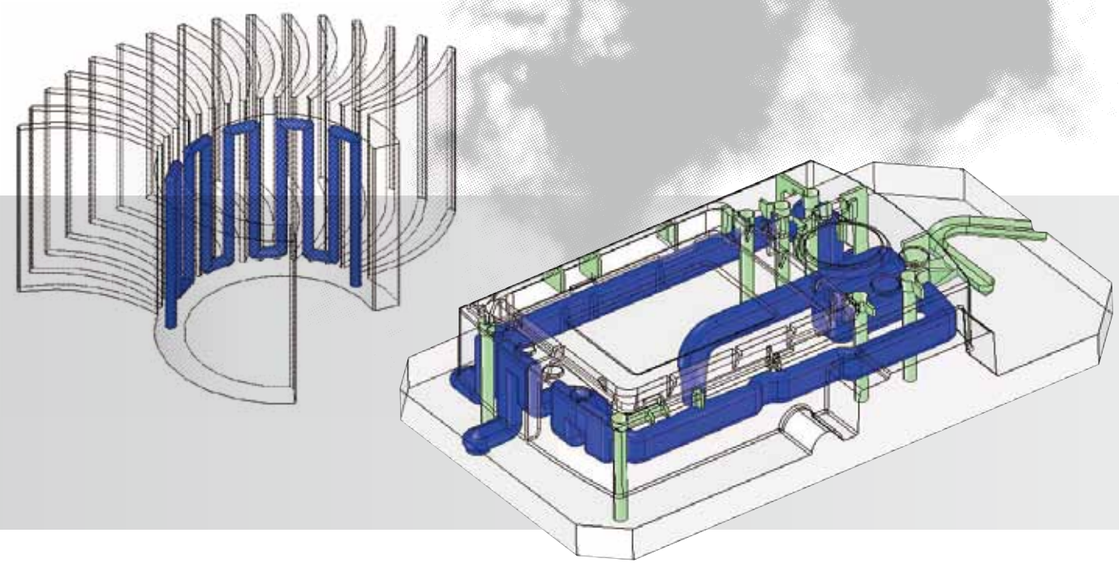
	[Splitting]	[Weight]	[Waste produced]
Conventional manufacturing	**11pieces**	**6.9kg**	**3142cc**
LUMEX **Monoblock**		**4.2kg**	**195cc**





Design Guidelines

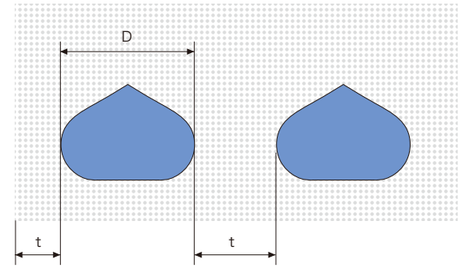
Maximum potential of the ***LUMEX*** can be demonstrated.



[Placement]

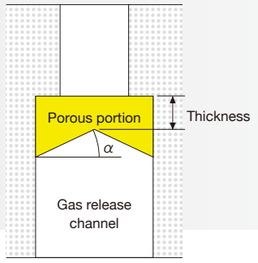
The following restrictions apply to water channel shapes to prevent channel clogging or leaking from channels.

Water channel diameter: D ≧ 3 mm
Wall thickness: t ≧ 3 mm



[Porous Area Design]

The thickness of the porous area must not be greater than 3 mm to ensure good gas release.



Q [Porous Configuration]

Is the porous area (coarsely sintered portion) likely to be clogged with resin?

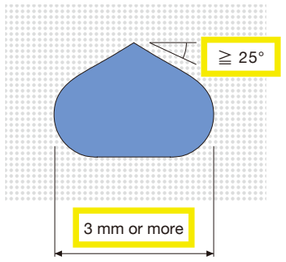
The porous area may become clogged with resin during molding. The following measures are recommended.

1. Manufacture porous pin-shaped insert parts (gas pins), that can be easily replaced if necessary.
2. Remove trapped molten resin by back-flushing with pressurised air.

1. Restrictions on Modeling

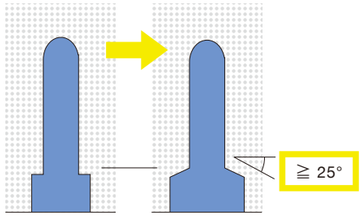
[Water Channels]

A slope of 25 degrees or more must be added to the top of each water channel. The water channel diameter (width) must be 3 mm or more. Since the internal surface of water channels are left as sintered, the channel may be clogged with powder if the diameter is small.



[Counterbore]

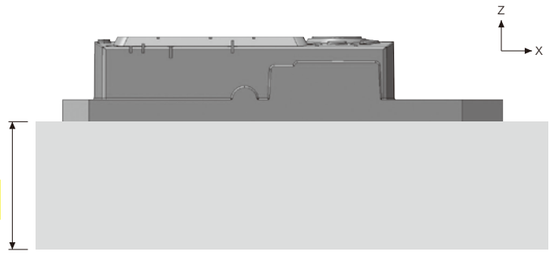
The sintered surface of the counterbore may collapse. A slope of 25 degrees or more must be added.



[Plate]

Sintering must be performed on a plate having a thickness of 10 mm or more.(The thickness will vary depending on the size of the part to be sintered.)

10 mm or more



Q [3D Water Channels]

Do 3D water channels have water leaks, rust formation, or clogging?

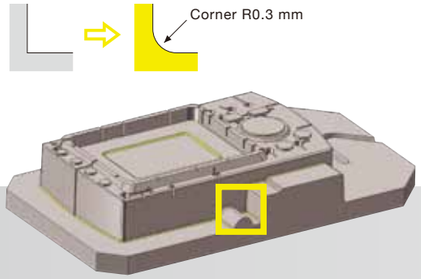
Water leaks do not occur when water channels are sintered with surrounding full melt areas (density 99.5% or higher). Rust formation or clogging largely depends on water quality and constituents. Rust inhibitor should be added if necessary.

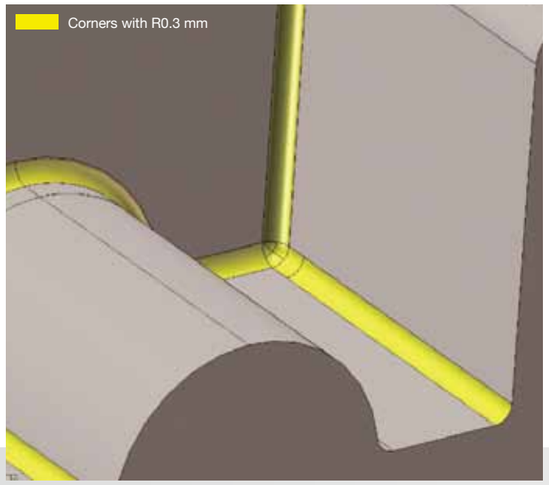
Design Guidelines

2. Milling Guidelines

[Groove/Edge Milling]

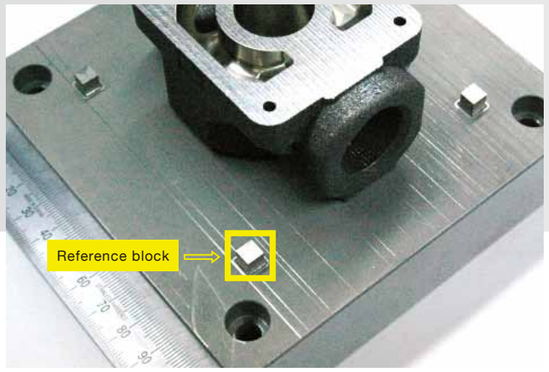
The smallest available tool is a φ0.6 mm ball endmill. The corner radius will be R0.3 mm.





[After Milling]

Reference blocks should be used for alignment of subsequent processing.

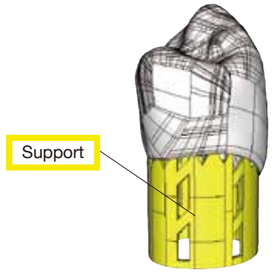


[Flexible Multi-part Setting]

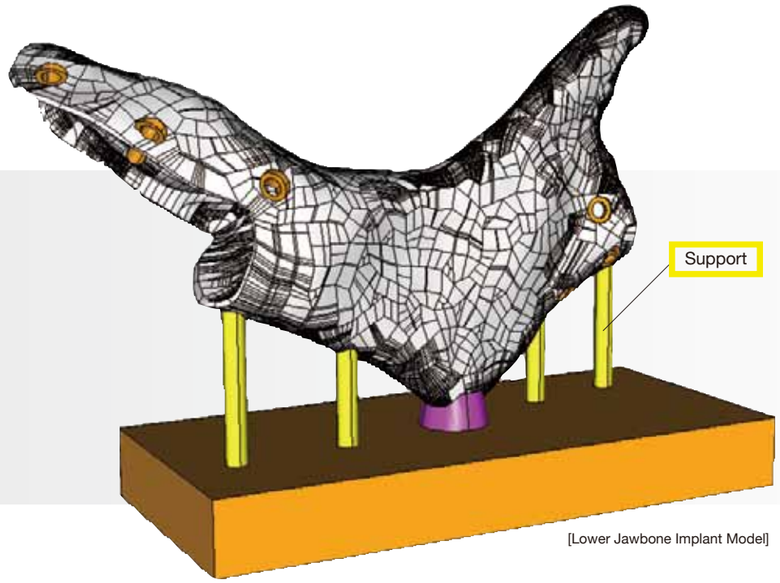
Sintering and milling can be performed with several different models or a single can be arrayed on the build plate.

[Addition of Support Structure]

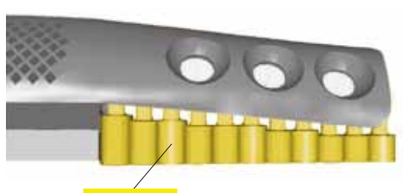
Supports are used to allow the manufacture of free-form parts. Support design is optimized to allow for easy removal while having sufficient strength to resist thermal stresses during builds. Easy removal ensures minimal secondary processing time.



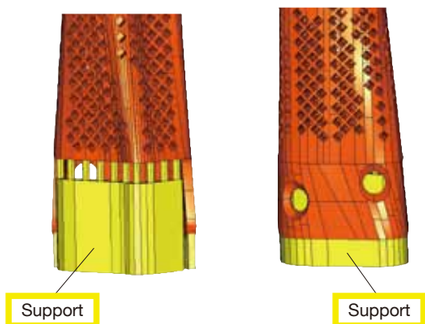
[Tooth Model]



[Lower Jawbone Implant Model]



[Thighbone (dog) Implant Model]



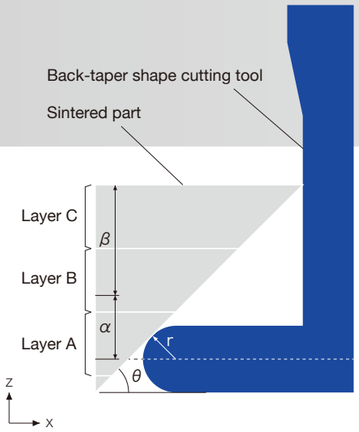
[Ulna (dog) Implant Model]

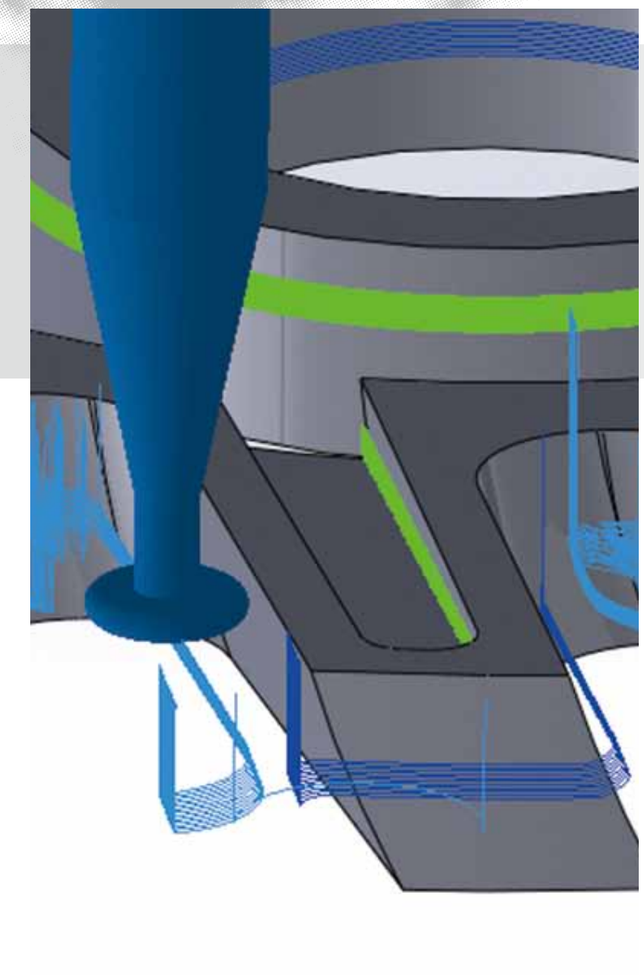
Machining Technology

Conventionally impossible machining has become possible.

Back-taper

Back-taper shapes can be machined. When sintering is finished up to layer C, finish machining of area α, at distance β, will be performed.

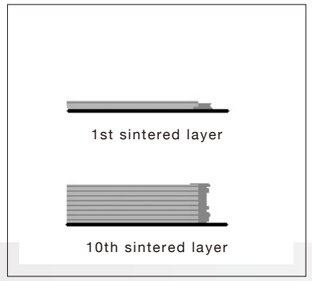




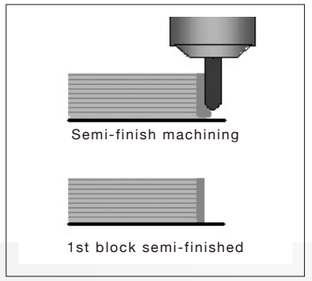
Step Machining Process

(Japanese Patent No.445692)

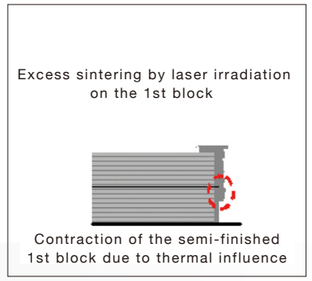
Path Shift Dedicated Cutting Tool
Path shift milling requires special dedicated cutting tools. Contact Matsuura Machinery Corporation for more information.



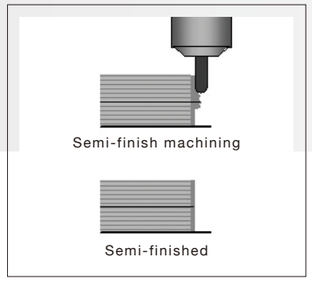
① The first 10 layers are sintered.



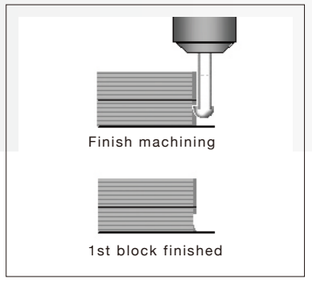
② The first 10 layers are semi-finished.



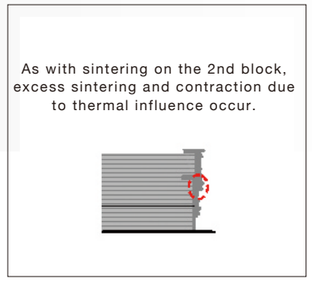
③ The second 10 layers are sintered.



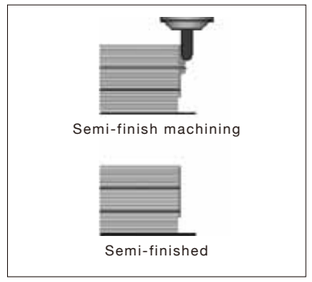
④ Semi-finish machining of the 2nd block and excess sintering of the 1st block



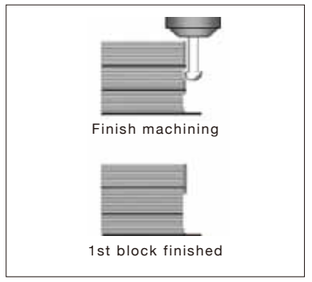
⑤ Finish machining is performed on the portion of the 1st block which is free from thermal contraction. To perform machining leaving a stock allowance on top, a special finishing tool must be used.



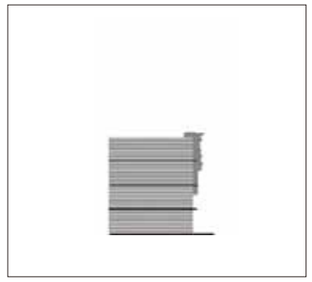
⑥ The third 10 layers are sintered.



⑦ Semi-finish machining of the 3rd block and excess sintering of the 2nd block



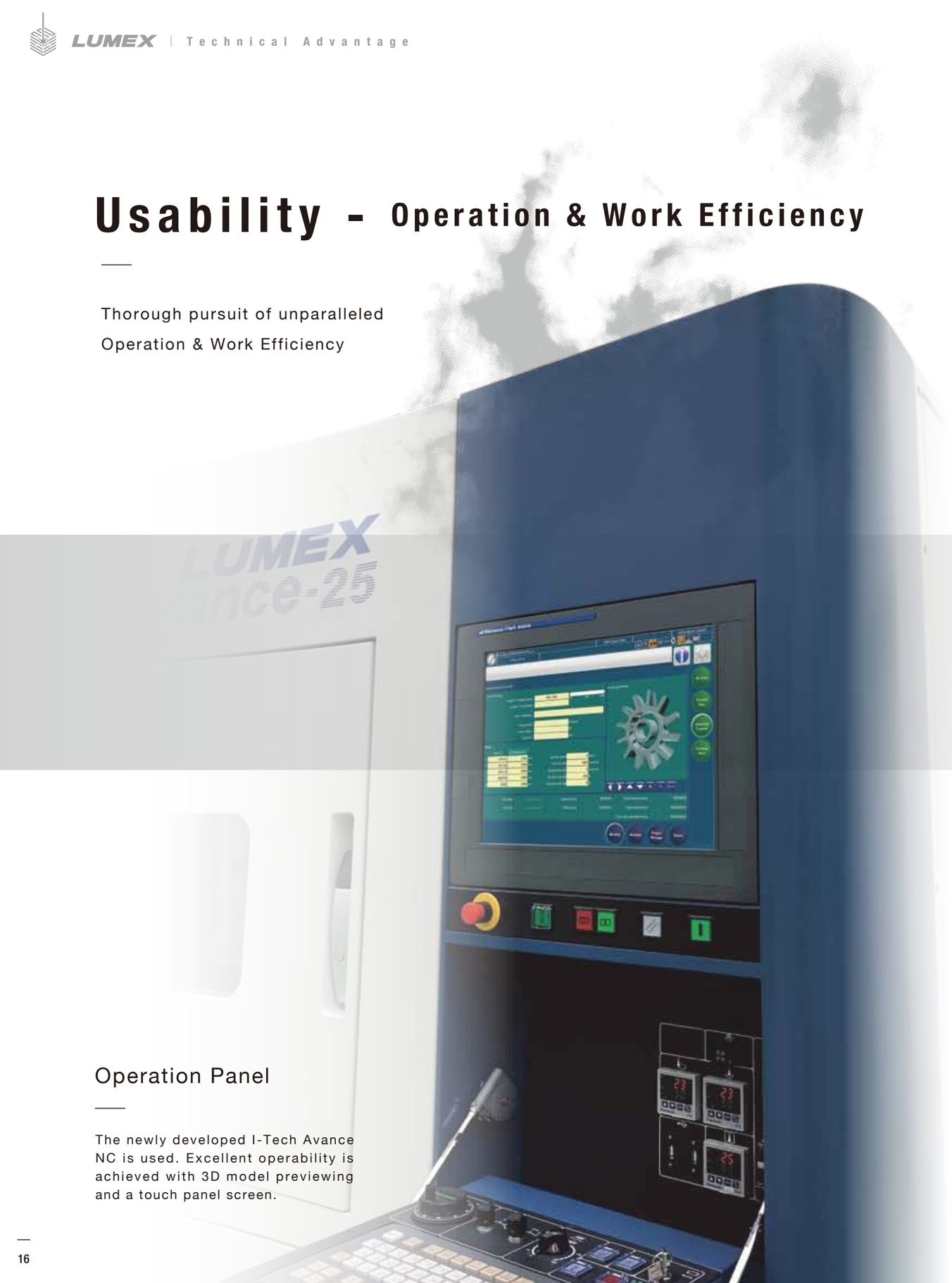
⑧ Finish machining is performed on the portion of the 2nd block which is free from thermal contraction.



⑨ The fourth 10 layers are sintered. These processes are repeated.

Usability - Operation & Work Efficiency

Thorough pursuit of unparalleled
Operation & Work Efficiency

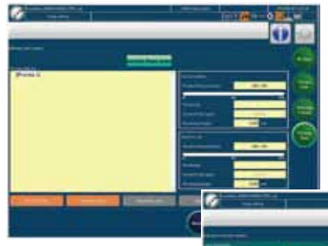


Operation Panel

The newly developed I-Tech Avance NC is used. Excellent operability is achieved with 3D model previewing and a touch panel screen.

Build Monitor Screens

Build preview, NC data, process data, etc. can be monitored.



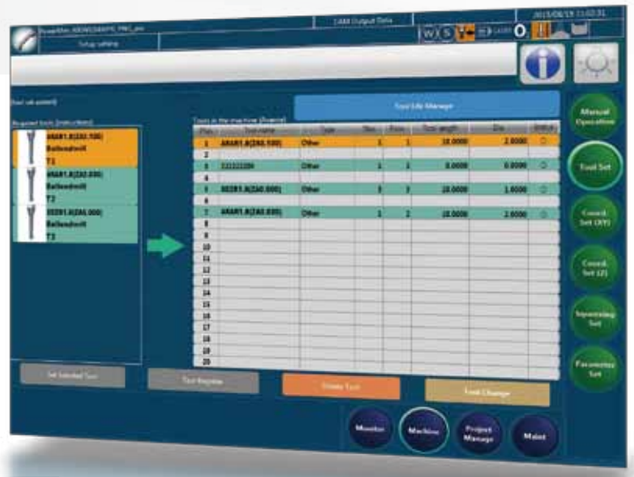
[Partway start screen]

[Execution monitor screen]

[Execution monitor screen]

Machine Operation Screens

These screens are used for setup including tool data settings. In addition, tool life management, coordinate system setting, powder squeezing range and speed settings can be made.



[Tool setting screen]

[Offset Z screen]

[Powder distribution setting screen]

Usability - Operation & Work Efficiency

Project Management Screens

Projects can be managed on these screens. Project data can be transferred from external devices and via LAN.

[Environment setting screen]

[Project transfer screen]

[Project selection screen]

Maintenance Screens

Check points for routine inspection, scheduled inspection, ATC monitor, and pincushion offset can be viewed.

[Check report screen]

[ATC monitor screen]

[Laser offset setting screen]

Major Icons

[Machine status]	EDIT mode ON	EDIT mode OFF
	Milling mode ON	Milling mode OFF
	Memory mode ON	Memory mode OFF
	Handle mode ON	Handle mode OFF
	MDI mode ON	MDI mode OFF
[Oxygen concentration]	Oxygen concentration Less than 3%	Oxygen concentration 3% or more
[Table heater status]	Heater ON	Heater OFF
[Powder supply status]	Being supplied	Not being supplied
[Powder amount]	Sufficient powder	Short powder
[W-axis position]	Home	Other than home
[S-axis position]	Home	Other than home
[Spindle standby position]	Standby position	Other than standby position
[Single block]	Single block ON	Single block OFF
[Guide beam mode]	Guide beam mode ON	Guide beam mode OFF

LUMEX CAM

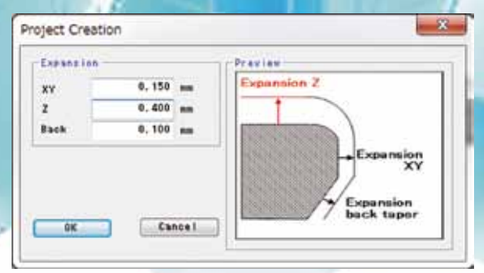
Original ***LUMEX CAM*** system with
high functionality and optimal usability

Simple Operation

Sintering/Milling
Program Creation for
Complex Parts

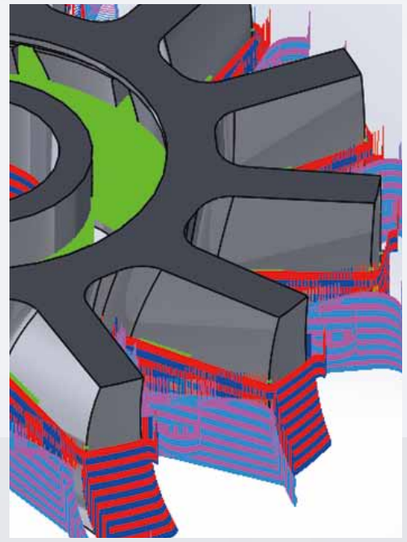
Machining compensation
for part shrinkage:

Automatic 3D Model Surface Offset



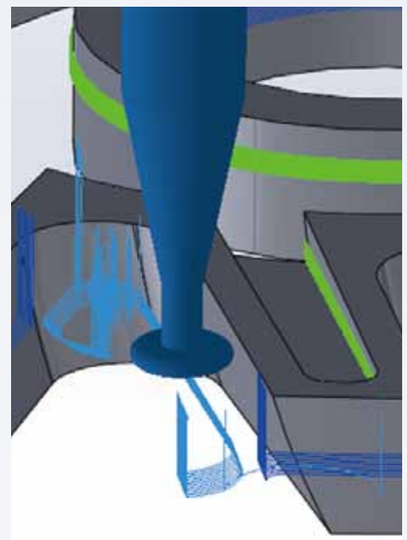
[Project Generation Screen]

Optimal Path Creation with Simple Operation

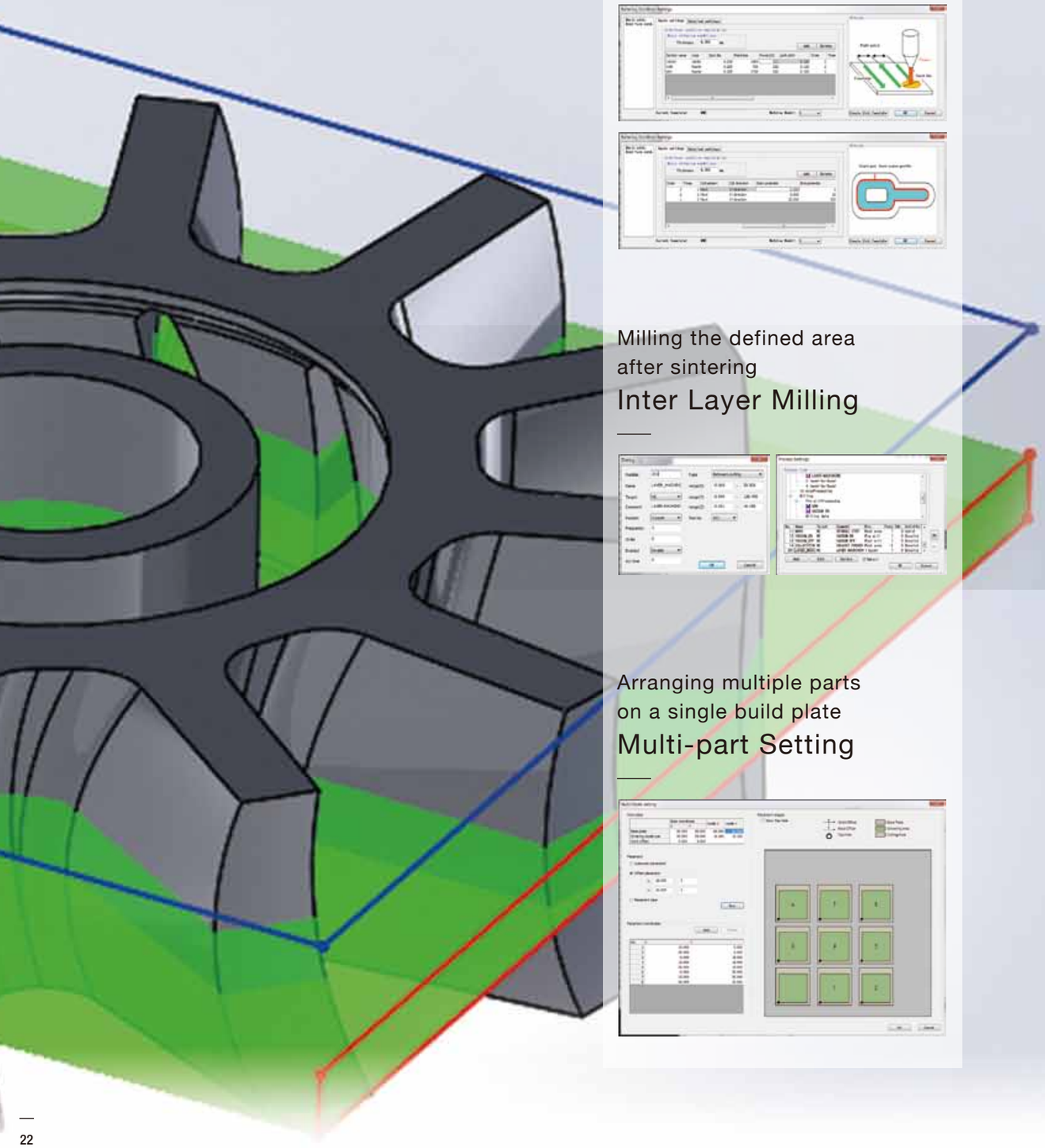


Complicated geometries
beyond the capability of
conventional manufacturing

Back-taper



LUMEX CAM



Setting of sintering conditions for each model

Sintering Condition Setting

Milling the defined area after sintering

Inter Layer Milling

Arranging multiple parts on a single build plate

Multi-part Setting

Various File Formats Supported

[Data Input/Output]

Formats Supported

- Parasolid
- IGES
- STL
- STEP
- PROE
- NX
- CATIA
- VDAFS
- Inventor R
- Invalid surface check
- Gap check
- Surface correction, surface creation
- Solid exchange
- Data exchange, output (Parasolid)

[Sintering CAM Function]

Basic Sintering Condition Setting

- Layer thickness editing
- Sintering section (2 kinds)
- Sintering section (random registration)
- Template

Advanced Sintering Condition Setting

- Layer thickness
- Raster
- Vector
- Sintering order
- Laser output
- Feedrate
- Spot diameter
- Multi-part

[Milling CAM Function]

Basic Milling Condition Setting

- Ball endmill
- Special stepped tool
- Back-taper (T-slot)
- Back-taper (lollipop)
- Tool shape setting
- Layers per process
- Stock allowance (rough, finish)
- Shape feature extraction
- Shape feature definition
- Shape feature milling conditions
- Milling area registration

Geometry Processing

- Expansion setting

Advanced Milling Conditions

- Safety net creation
- Milling between layers
- Milling order
- Automatic recognition of optimal tool
- Approach, retract, pick
- Tool contact point Z-level path
- Low slope interpolation path
- Undercut machining
- Step machining
- Overlap
- Top path deceleration
- Tool collision check
- Variable Z pitch
- Shape feature path
- Filleting
- NURBS
- G code

[Simulation]

Path Display

- Sintering path / milling path display
- Model display
- Remaining stock display
- Estimated processing time

[Processing File Creation]

Processing File Creation (project creation)

- Process editing (macro editing)

Processing File Transfer (project transfer)

- Project transfer

[Support Functions]

Machining Support

- Process editing before automatic operation

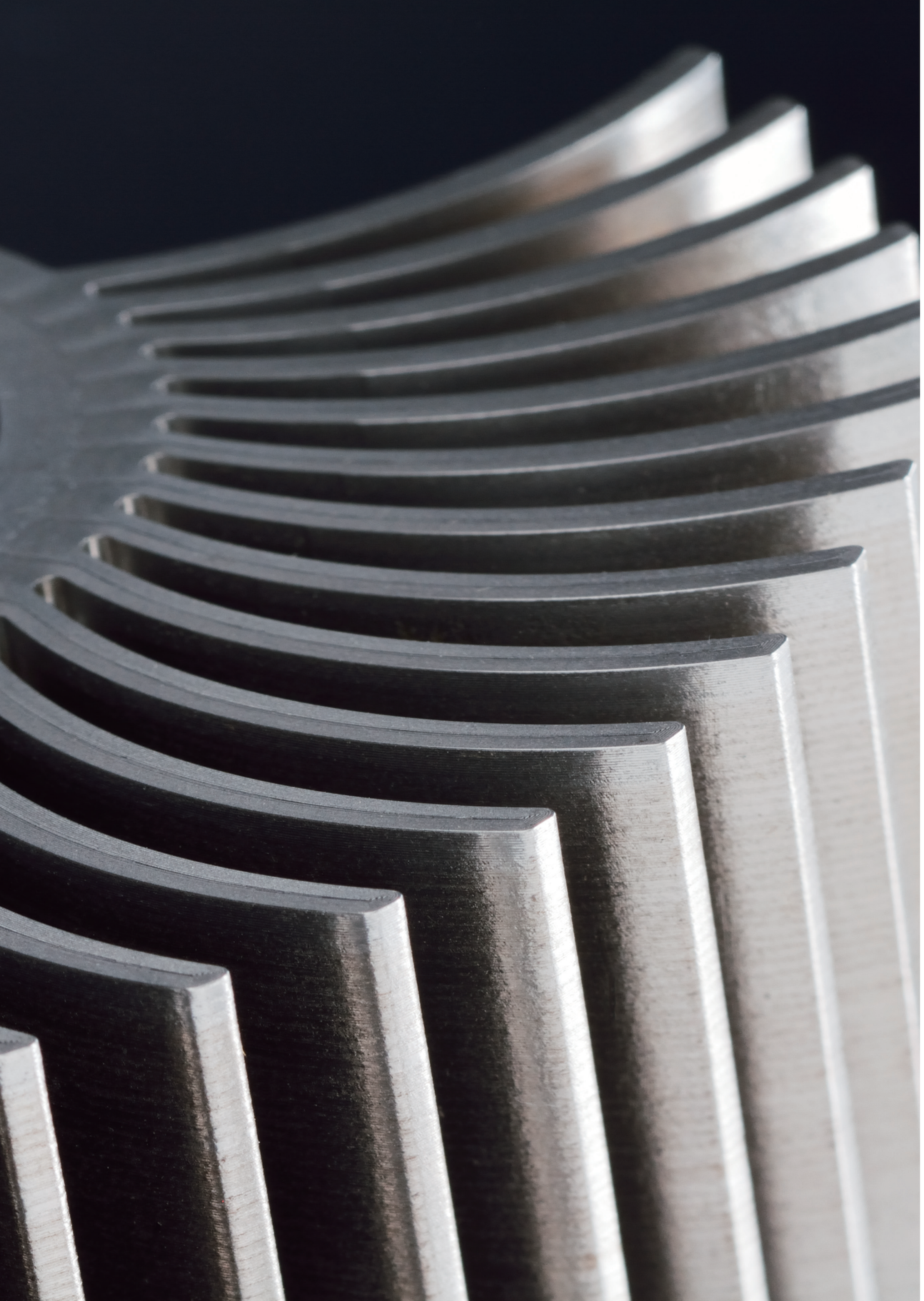
Quality Control Support

- Form sheet data

Q [LUMEX CAM]

How to create programs?
Can existing CAM software be used?

> ***LUMEX*** dedicated CAM software "***LUMEX CAM***" is required.



Source of **QUALITY**
Source of **POWER**
Source of **the FUTURE**
METAL LASER SINTERING
HYBRID MILLING MACHINE

LUMEX

Process Reduction

Electric Driver

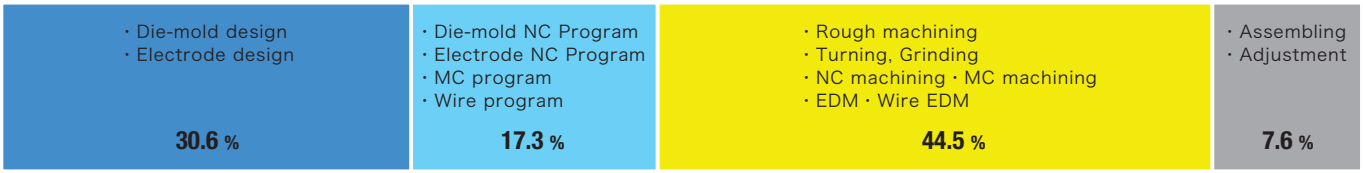
Matsuura Machinery Corporation

CATEGORY
Industry

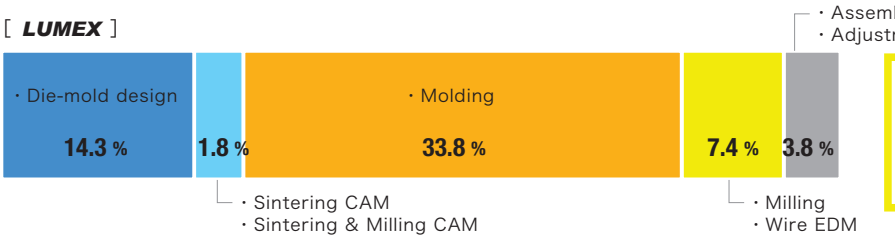
Electric Driver

High cycle molding achieved by reducing cycle time while maintaining product quality

[Conventional manufacturing]

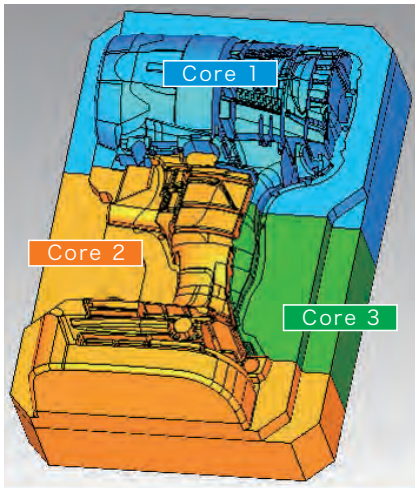


[LUMEX]



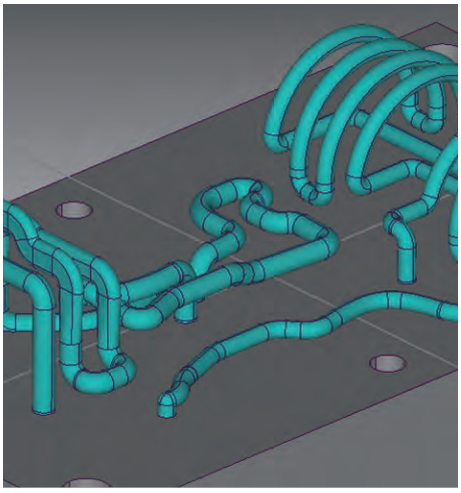
Design	-53%
Data production	-83%
Machining	-80%
TOTAL	-38 %

38% process reduction from design to finish



Reduced number of core parts (Here 3 core parts are used to allow design changes)

High aspect features without EDM



3D water cooling channels

Machine

LUMEX Avance-25

— Spindle speed : 45,000min^{-1}
— Laser output : 400W

Check Sintering & Machining video from here

D A T A

Model	Core 1	Core 2	Core 3
Material powder	Matsuura Maraging Ⅱ		
Machining time	Sintering : 19h36m Cutting : 79h42m Total : 108h18m	Sintering : 33h36m Cutting : 50h24m Total : 84h00m	Sintering : 02h30m Cutting : 04h00m Total : 06h30m
Hardness	HRC 36±1 (After Aging Treatment HRC 53±1)		
Aging Treatment	Heating at 485deg. For 3hours		

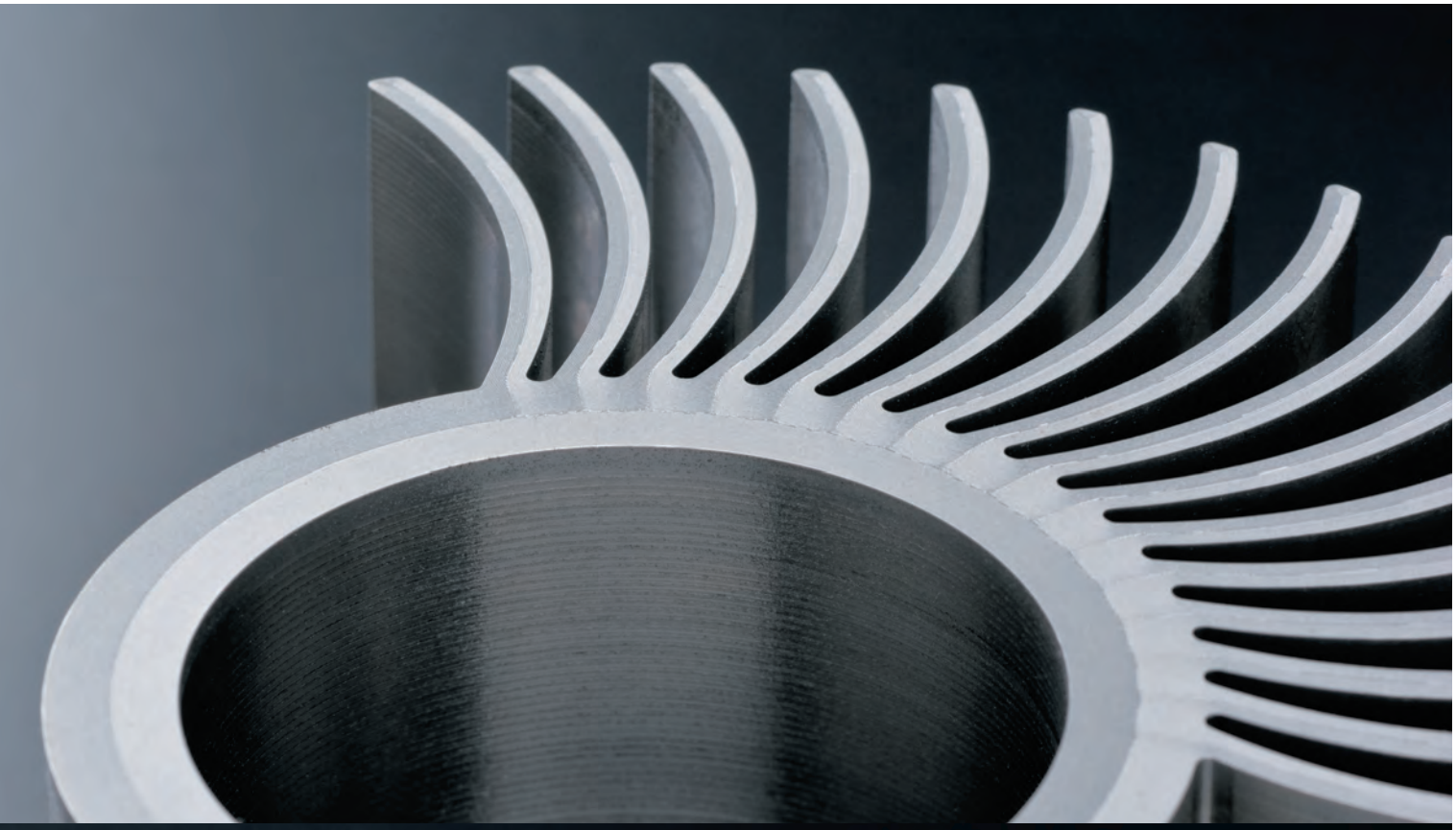
Source of **QUALITY**
Source of **POWER**
Source of **the FUTURE**

METAL LASER SINTERING
HYBRID MILLING MACHINE

LUMEX

No EDM & High Functionality

Cooling Fin

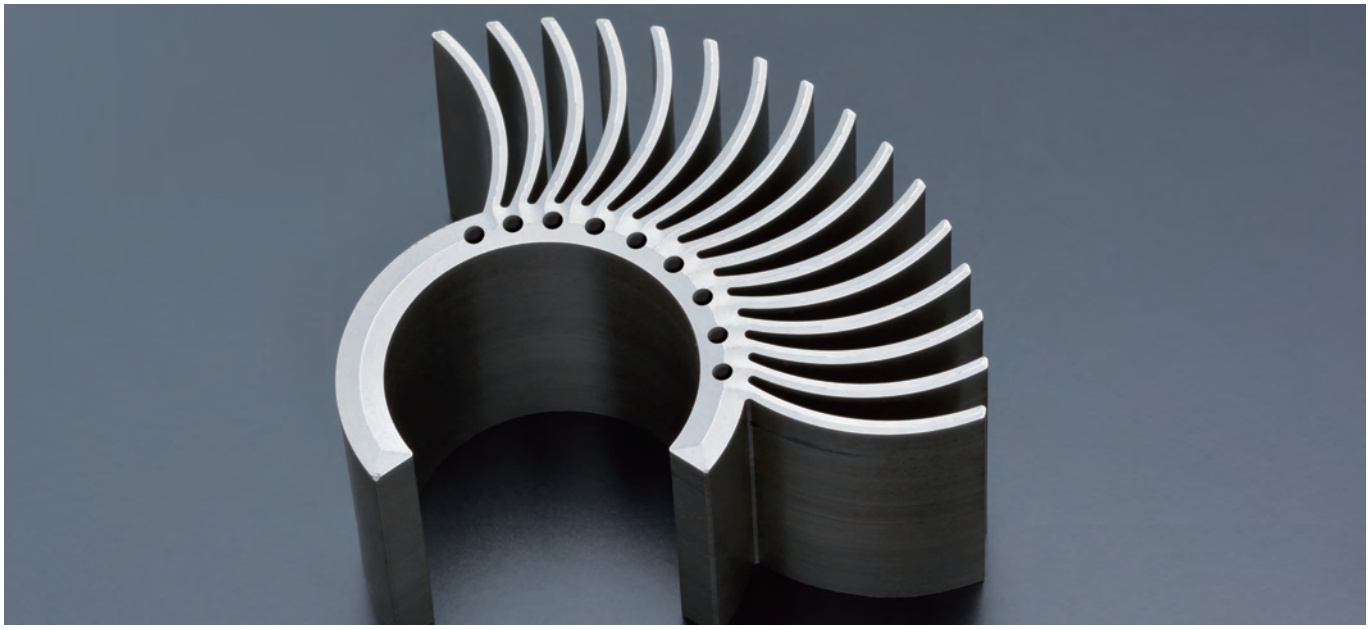


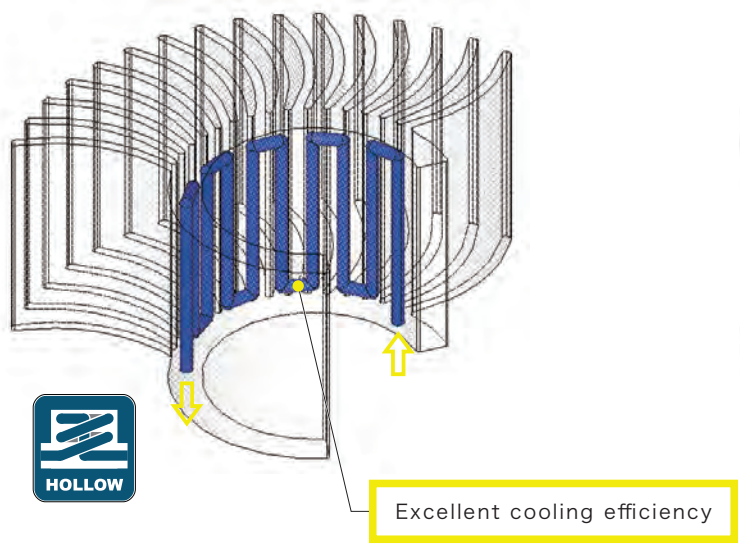
Matsuura Machinery Corporation

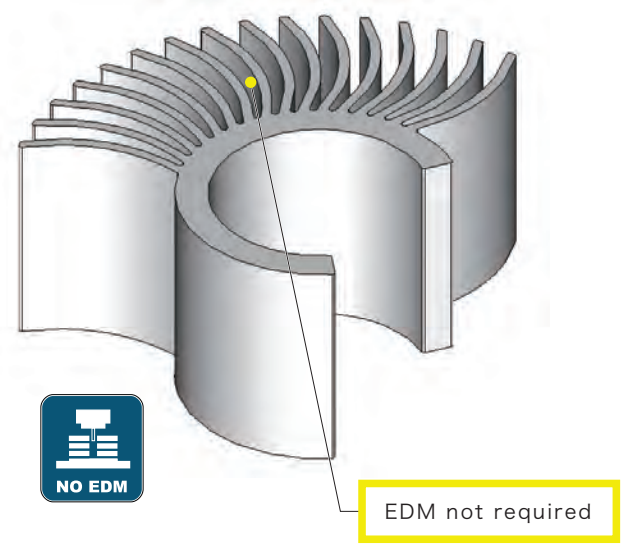
CATEGORY
Industry

Cooling Fin

Corner R0.5mm x height 40mm Connected wall







Machine

LUMEX Avance-25

— Spindle speed : 45,000min^{-1}
— Laser output : 400W

Check Sintering & Machining video from here

D A T A

Material powder	Matsuura Maraging Ⅱ
Weight	500g
Machining time	Sintering : 19h00m Cutting : 42h00m Total : 61h00m
Hardness	HRC 36±1 (After Aging Treatment HRC 53±1)
Surface roughness	Rz 7.36μm (outer periphery)

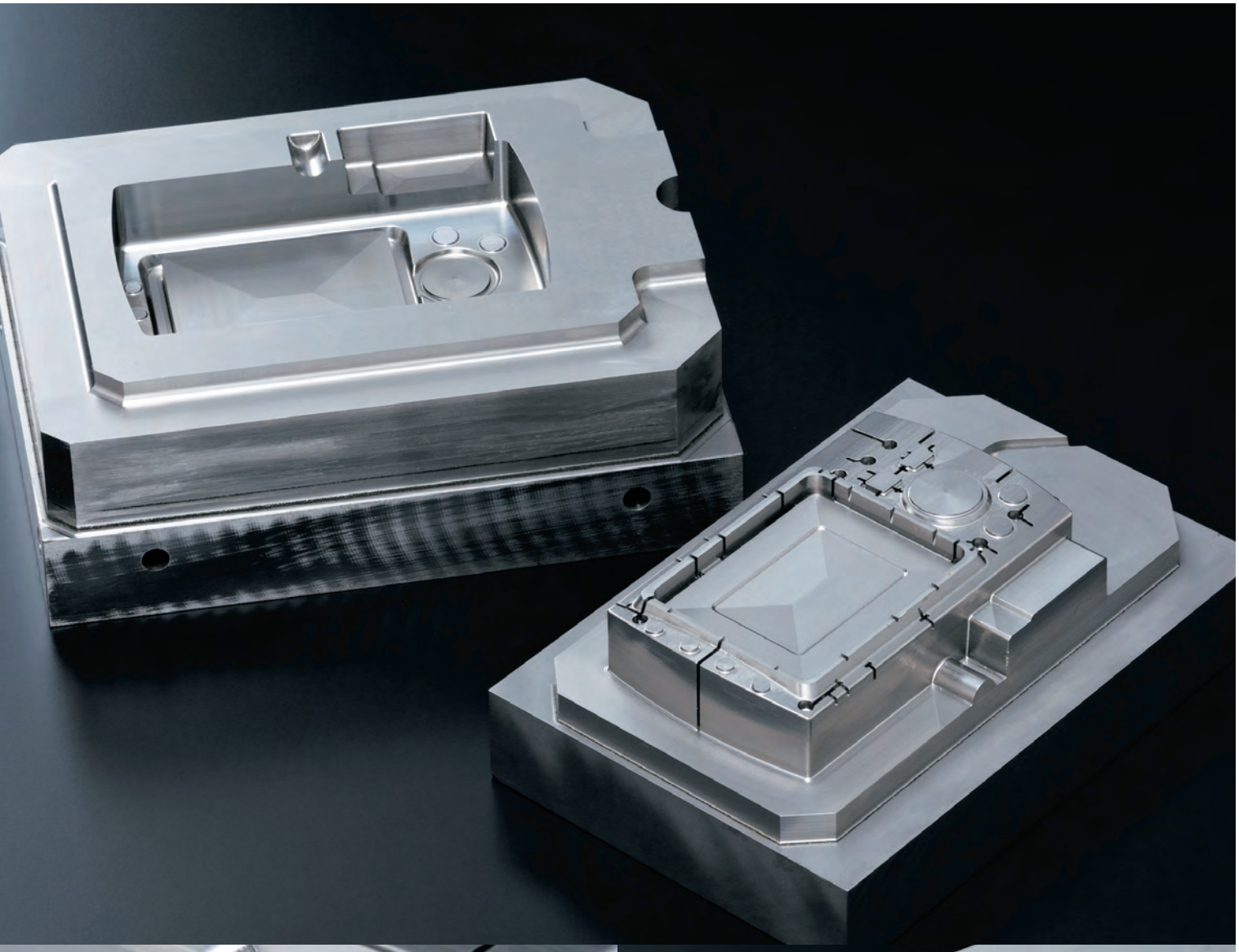
Source of **QUALITY**
Source of **POWER**
Source of **the FUTURE**

METAL LASER SINTERING
HYBRID MILLING MACHINE

LUMEX

High Cycle Molding & Quality Improvement

Digital Camera

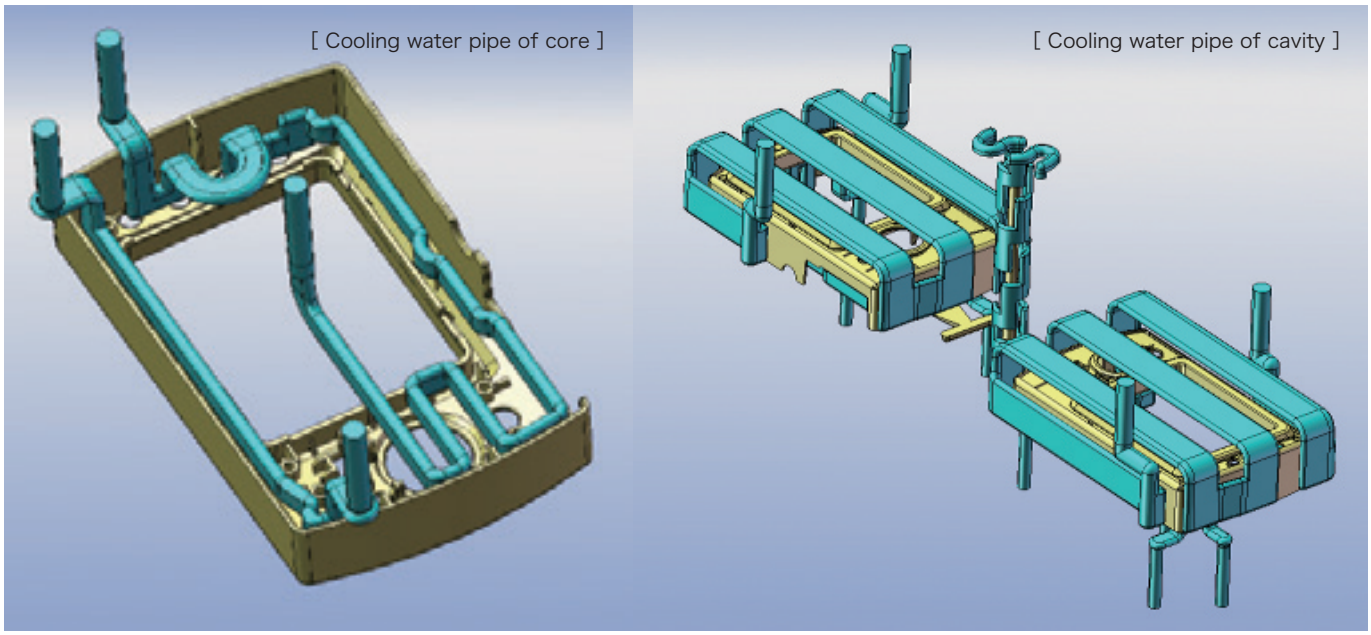


Matsuura Machinery Corporation

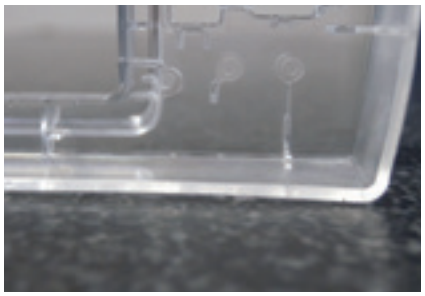
CATEGORY
Industry

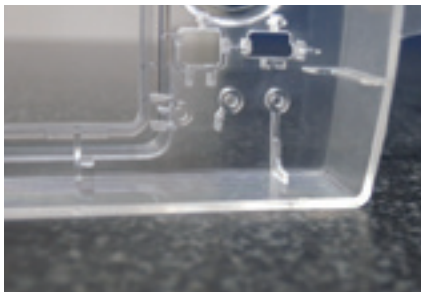
Digital Camera

High cycle molding & Prevention of shrinkage & Warping of thin walled injection molded parts



3D cooling water pipe along with product wall





Conventional water pipe

Cooling time : **13**sec
Molding cycle : **25**sec
Camber : Max. **0.4**mm

3D water pipe

Cooling time : **9**sec
Molding cycle : **21**sec
Camber : Max. **0.03**mm

MULTI FINISH NO EDM HOLLOW POROUS

Machine

LUMEX Avance-25

— Spindle speed : 45,000min^{-1}
— Laser output : 400W

Check Sintering & Machining video from here

D A T A

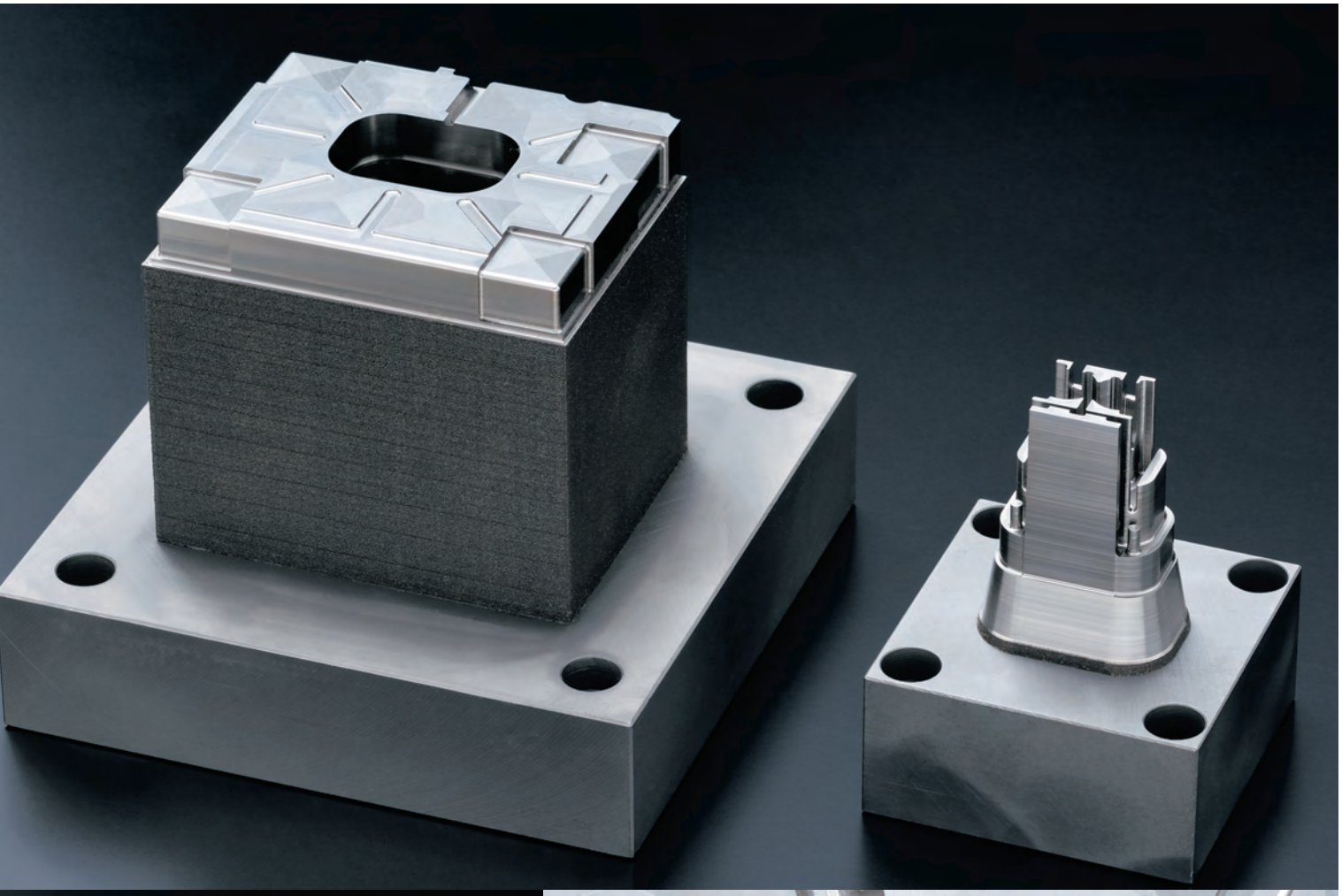
Model	Cavity	Core
Material powder	Matsuura Maraging Ⅱ	
Machining time	Sintering : 68h18m Cutting : 29h06m Total : 97h30m	Sintering : 36h00m Cutting : 53h30m Total : 89h30m
Hardness	HRC 36±1 (After Aging Treatment HRC 53±1)	
Aging Treatment	Heating at 485deg. For 3hours	

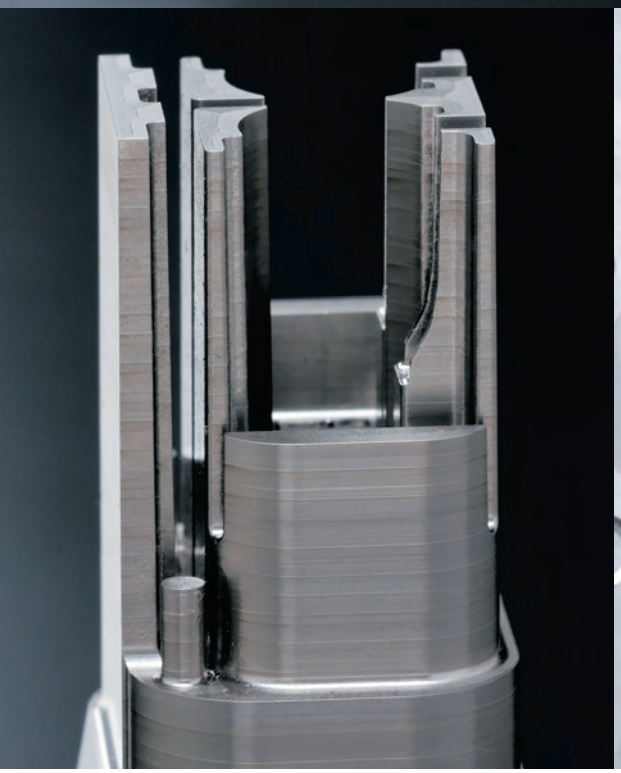
Source of **QUALITY**
Source of **POWER**
Source of **the FUTURE**
METAL LASER SINTERING
HYBRID MILLING MACHINE

LUMEX

High Cycle Molding & High Aspect Features

Waterproof Connector



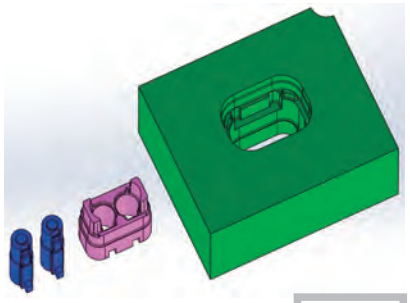


Matsuura Machinery Corporation

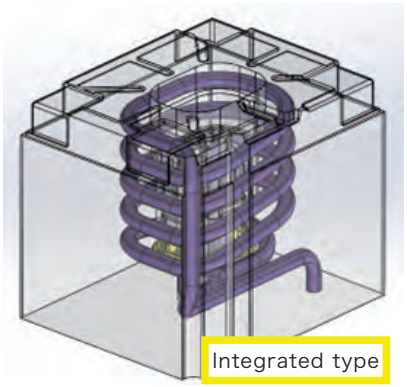
CATEGORY
Industry

Waterproof Connector

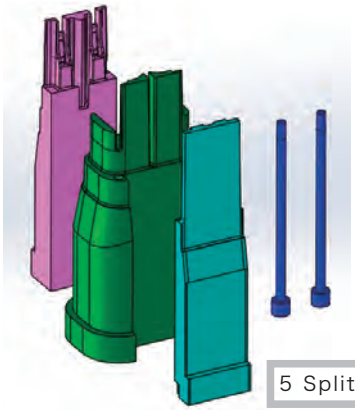
Deep ribs, Porous & 3D water cooling channels created in both core and cavity



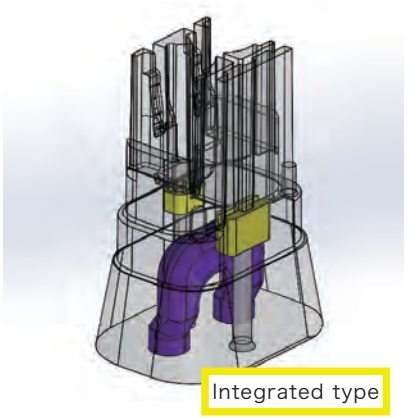
4 Splits



Integrated type



5 Splits



Integrated type

[Conventional water pipe]

21.7%	18.3%	60%
Mold open/ close : 5 sec Ejector pin operation : 1.5sec	Injection : 1.5sec Pressure holding : 4sec	Cooling : 18sec

[3D cooling water pipe]

21.7%	18.3%	27%
Mold open/ close : 5 sec Ejector pin operation : 1.5sec	Injection : 1.5sec Pressure holding : 4sec	Cooling : 8sec

55% reduction of cooling time

33% reduction of injection molding cycle

FINISH NO EDM MULTI HOLLOW POROUS

Machine

LUMEX Avance-25

— Spindle speed : 45,000min^{-1}
— Laser output : 400W

Check Sintering & Machining video from here

D A T A

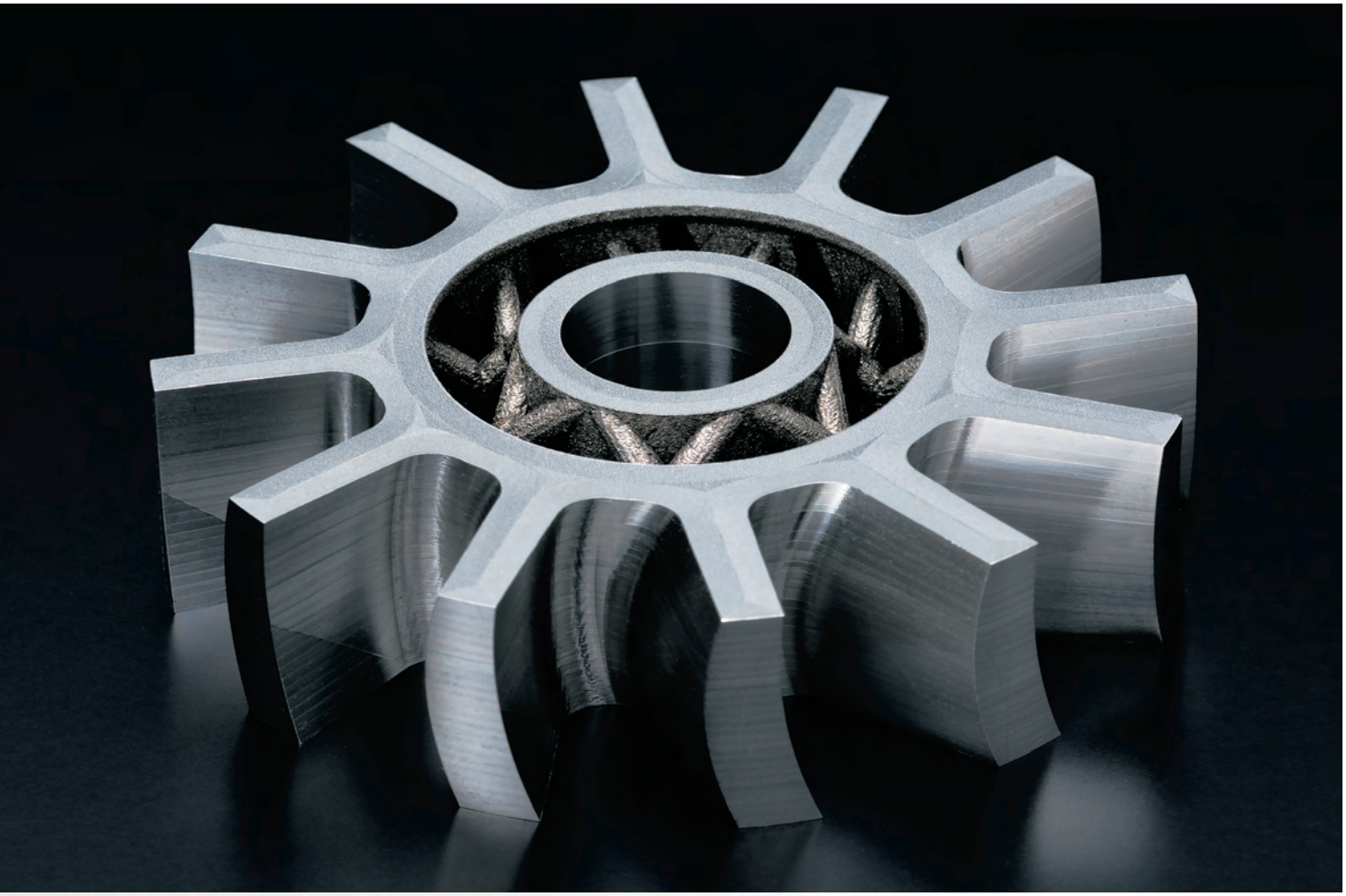
Model	Cavity	Core
Material powder	Matsuura Maraging Ⅱ	
Machining time	Sintering : 65h11m Cutting : 50h53m Total : 116h04m	Sintering : 11h09m Cutting : 34h09m Total : 45h18m
Hardness	HRC 36±1 (After Aging Treatment HRC 53±1)	
Aging Treatment	Heating at 485deg. For 3hours	

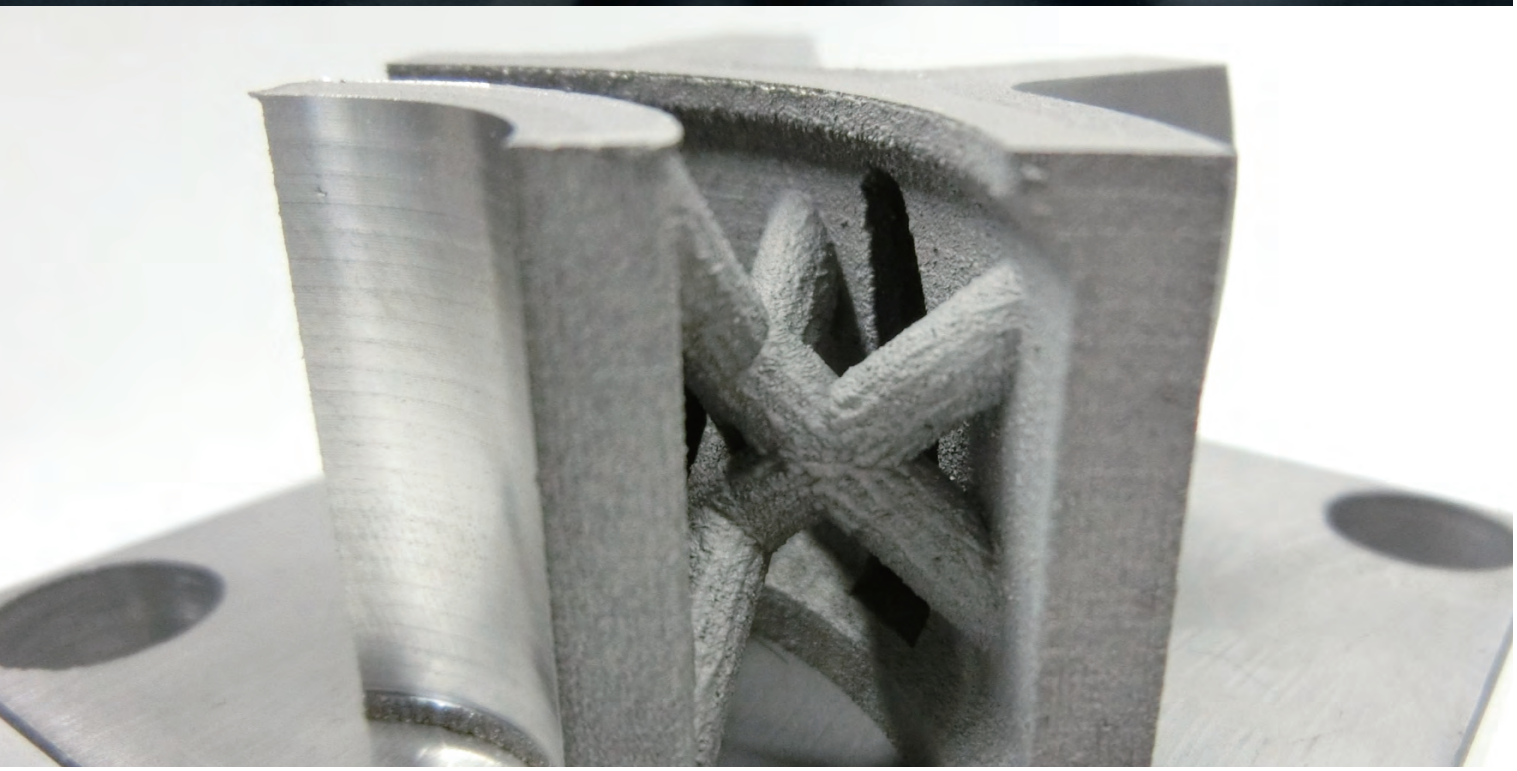
Source of **QUALITY**
Source of **POWER**
Source of **the FUTURE**
METAL LASER SINTERING
HYBRID MILLING MACHINE

LUMEX

Weight Reduction

Blisk



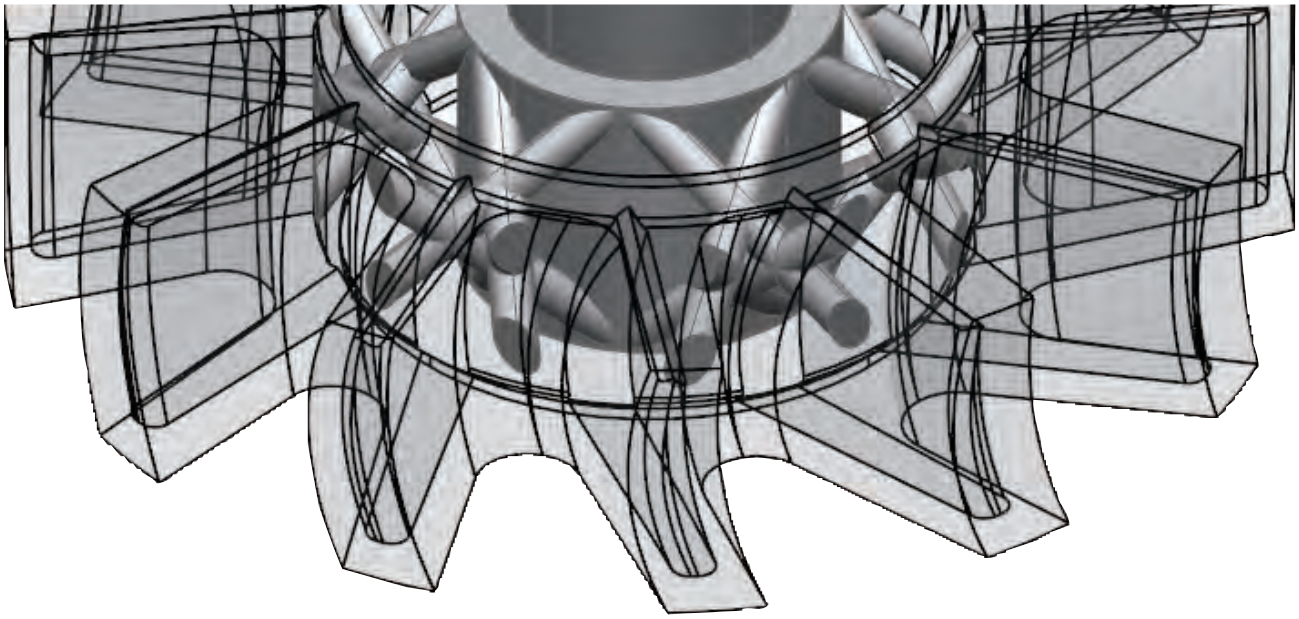


Matsuura Machinery Corporation

CATEGORY
Industry

Blisk

Back taper machining of Blisk
Weight reduction using spoke structure and hollow blade design with required rigidity



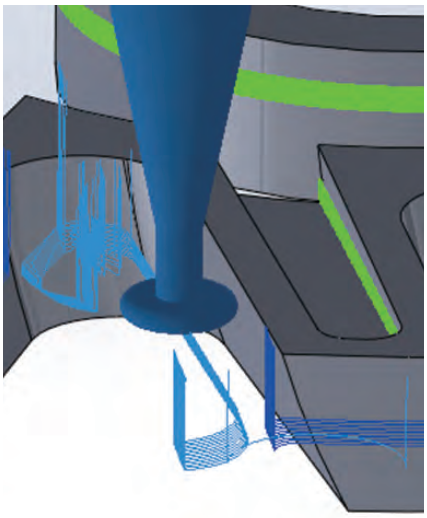
Solid model

775 g

Spork model

437 g

44 % weight reduction



ACCESS 3D MESH HOLLOW

Machine

LUMEX Avance-25

— Spindle speed : 45,000min^{-1}
— Laser output : 400W

Check Sintering & Machining video from here

D A T A

Material powder	Matsuura Stainless 630
Weight	437g
Machining time	Sintering : 11h50m Cutting : 28h30m Total : 40h20m
Hardness	HRC 32±1 (After Aging Treatment HRC 42±1)

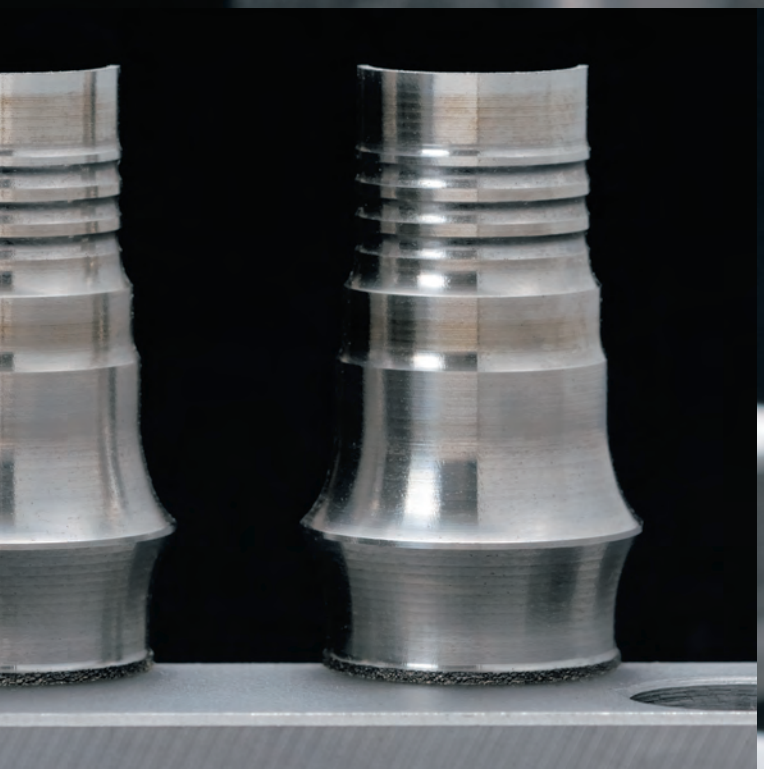
Source of **QUALITY**
Source of **POWER**
Source of **the FUTURE**

METAL LASER SINTERING
HYBRID MILLING MACHINE

LUMEX

Freedom of Design

Jet Engine Nozzle

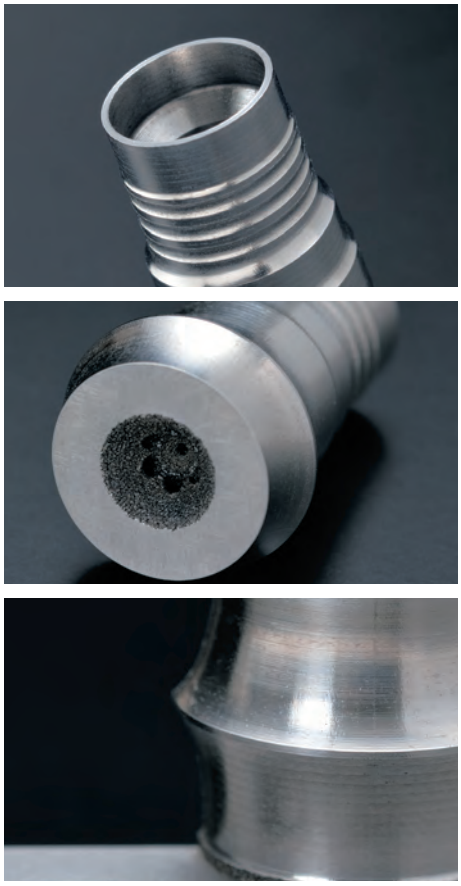


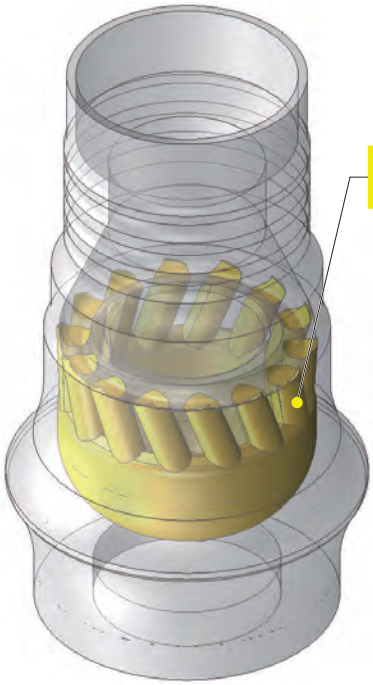
Matsuura Machinery Corporation

CATEGORY
Industry

Jet Engine Nozzle

Offer high value products





Free design of complicated gas channel

Under cut part machining

Machine

LUMEX Avance-25

— Spindle speed : 45,000min^{-1}
— Laser output : 400W

Check Sintering & Machining video from here

D A T A

Material powder	Matsuura Nickel Alloy 718 (Inconel 718)
Machining time	Sintering : 09h00m Cutting : 34h30m Total : 43h30m
Hardness	HRC 27±1 (After Aging Treatment HRC 44±1)