



Doosan Machine Tools

Doosan Electric Vehicle Solution Reference



ver. EN 210422 SU

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Doosan Application Business

INTRO

Battery

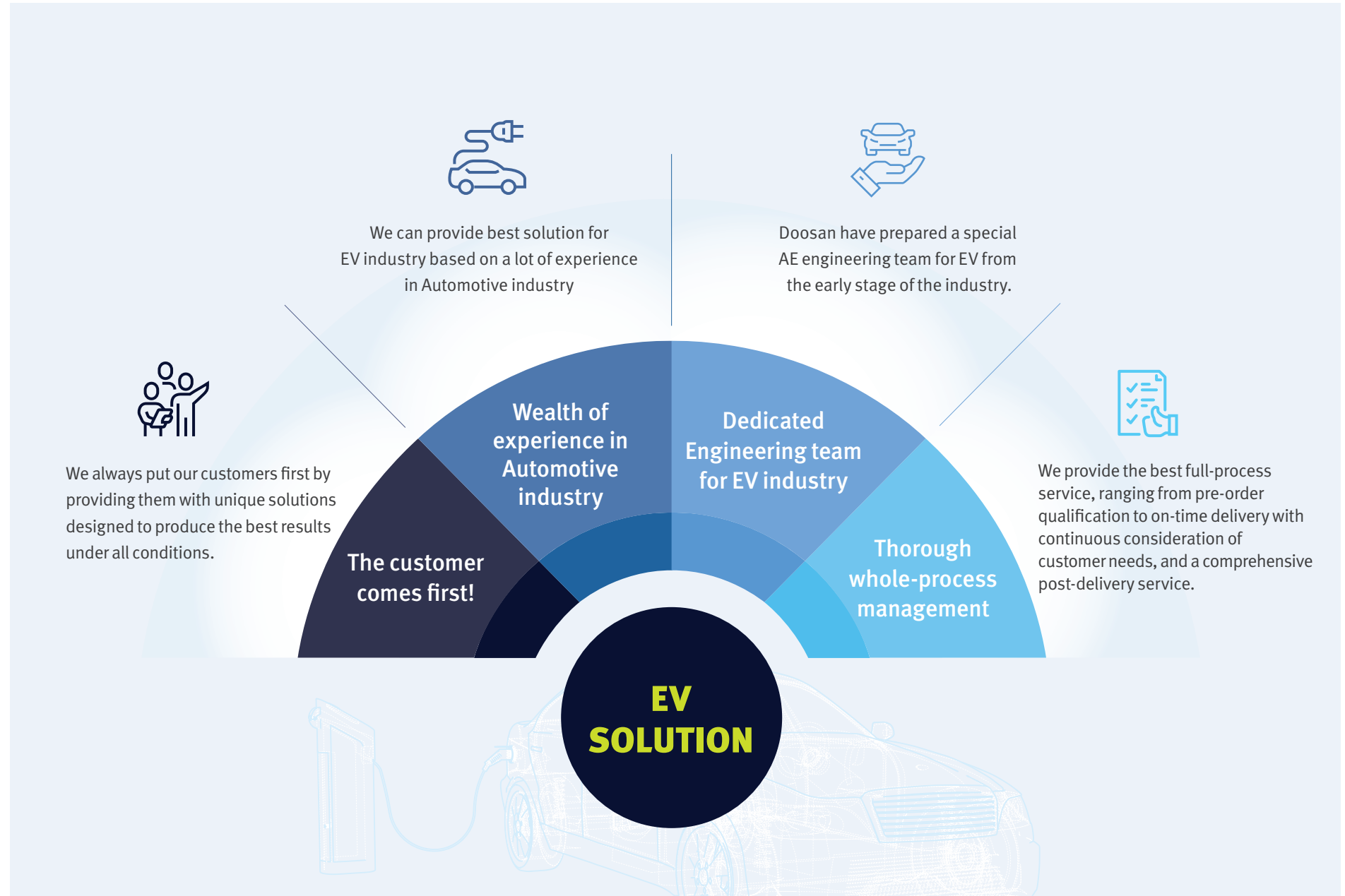
Module
Pack case
Pack Tray
Electronics
Extra items

PE System

Motor
Inverter
Reducer

Retained Parts

Body
Suspension



Mobility Innovation : Electric car

INTRO

Battery

Module
Pack case
Pack Tray
Electronics
Extra items

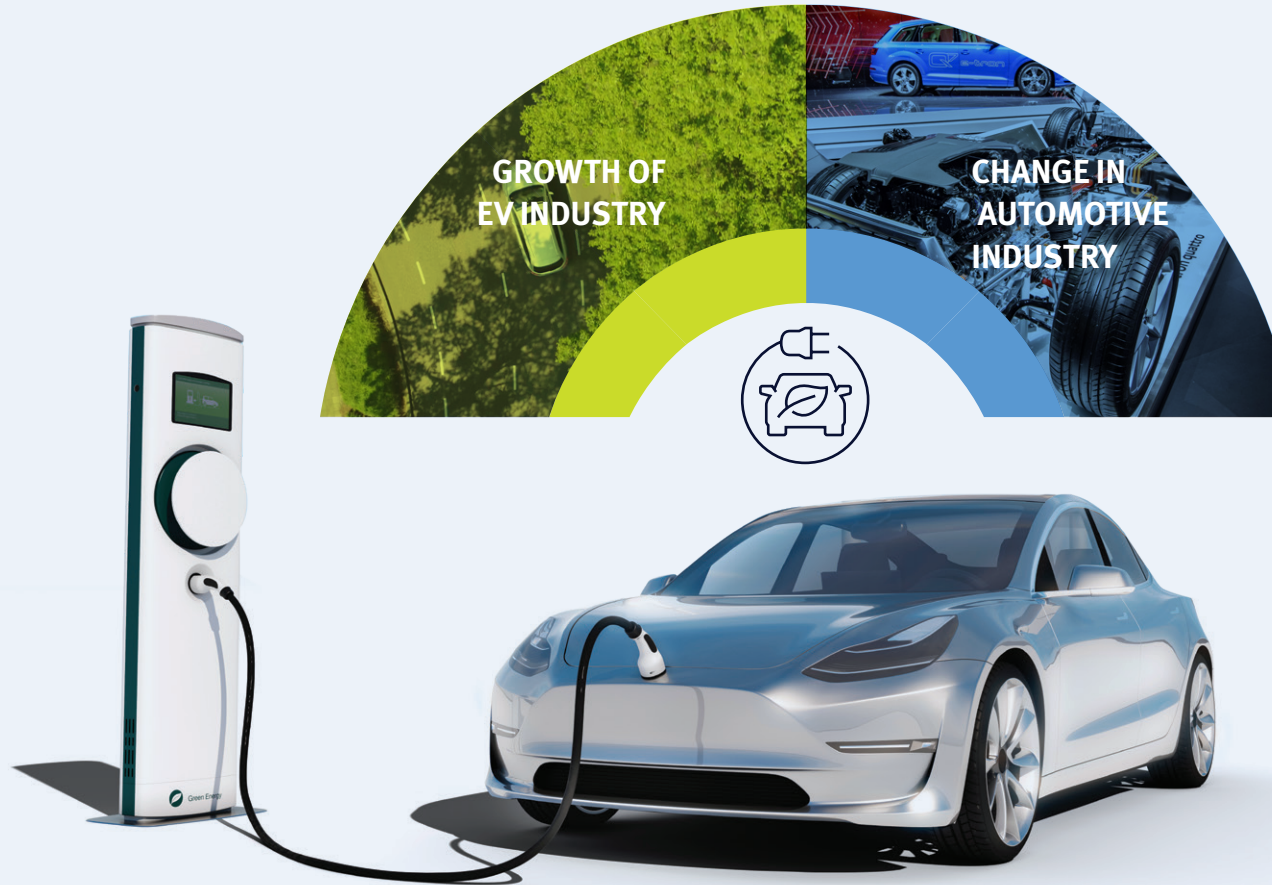
PE System

Motor
Inverter
Reducer

Retained Parts

Body
Suspension

- As combustion engine vehicles reduce in number, many parts will disappear. However, as EV's increase, new parts will emerge
- There is a high risk that the overall number of parts required will reduce, but nevertheless there will be many new parts required for EV's
- Many new solutions will have to be developed for the new parts required for EV's.
- It is estimated that EV's will take 31% of total global sales in 2030
- Conversion to EV's is inevitable due to global environmental regulation
- Efficiency of EV's will continuously increase due to high R&D investment



EV Parts Analysis

INTRO

Battery

Module
Pack case
Pack Tray
Electronics
Extra items

PE System

Motor
Inverter
Reducer

Retained Parts

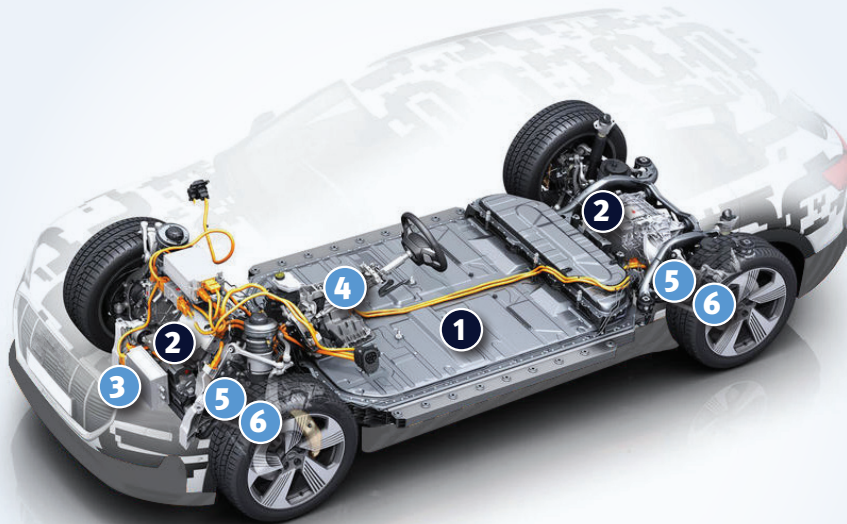
Body
Suspension

New

- 1 Battery
- 2 PE System

Retained

- 3 Thermal System
- 4 Steering
- 5 Axle & Drive
- 6 Suspension/Brake



Retained Equipment

Co-existence equipments in gasoline&diesel car and EV

3 Thermal System

5 Steering

4 Axle & Drive

6 Suspension/Brake

New Equipment

New equipment not in combustion engine car

1 Battery

- New power system that replaces fuel tank
- Machining requirements: various design and production processes from manufacturers



2 PE System(Power Electric System)

- New power system that replaces combustion engine
- Machining requirements : design variations by manufacturers/mainly machining of die castings



Module

INTRO

Battery

- Module
- Pack case
- Pack Tray
- Electronics
- Extra items

PE System

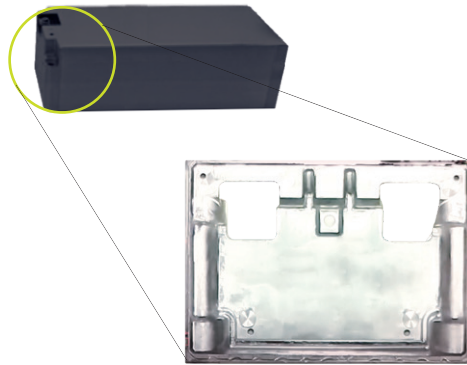
- Motor
- Inverter
- Reducer

Retained Parts

- Body
- Suspension

Workpiece

END PLATE



Material
Aluminum

Manufacturing Specialty

Small size part

Light cutting

Mass production : Robot automation

Special demand : 4-axis machining

Solution

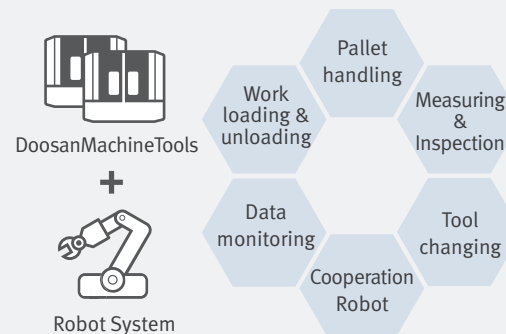
T series

High-Speed, High-Productivity
Tapping Center

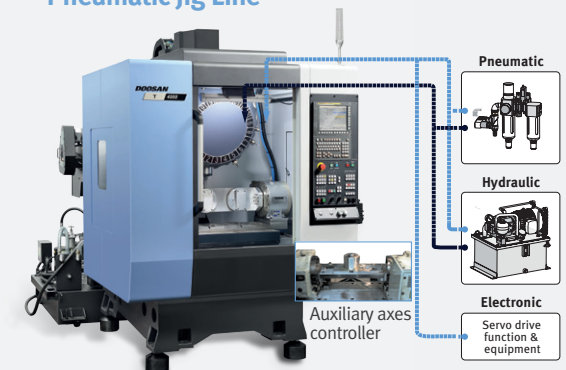


Operation

- OP#10 Face milling, Drilling
- OP#20 Chamfering, Face milling, Drilling



4-axis Auxiliary device Interface/ Hydraulic & Pneumatic Jig Line



• T 4000L recommendation Rotary Table : Ø200(7.9inch)

Module

INTRO

Battery

- Module
- Pack case
- Pack Tray
- Electronics
- Extra items

PE System

- Motor
- Inverter
- Reducer

Retained Parts

- Body
- Suspension

Workpiece

MODULE CASE



Material
Aluminum

Manufacturing Specialty

Small size part

Light cutting

Mass production

Solution

T series

High-Speed, High-Productivity
Tapping Center



New, High-Precision Spindle

The spindle length has been minimized to reduce the time required for acceleration/ deceleration and idle time, resulting in greater productivity and reduced vibration and noise.



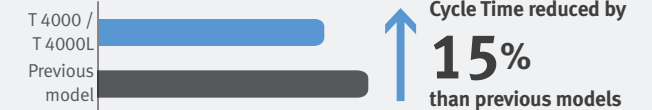
FANUC 31i

The FANUC 31i is designed to satisfy users' demands for higher machining accuracy and ultra-fine cutting.

Maximize productivity

Description	Unit	FANUC 31i
Rapid traverse	m/min	48

Cycle Time



Pack case

INTRO

Battery

- Module
- Pack case
- Pack Tray
- Electronics
- Extra items

PE System

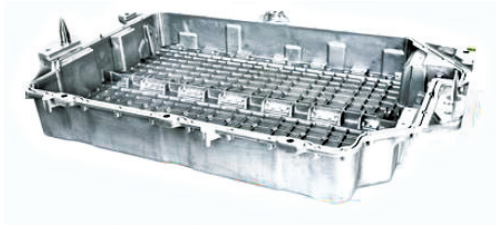
- Motor
- Inverter
- Reducer

Retained Parts

- Body
- Suspension

Workpiece

BATTERY PACK CASE



Material

Aluminum

Manufacturing Specialty

Light cutting

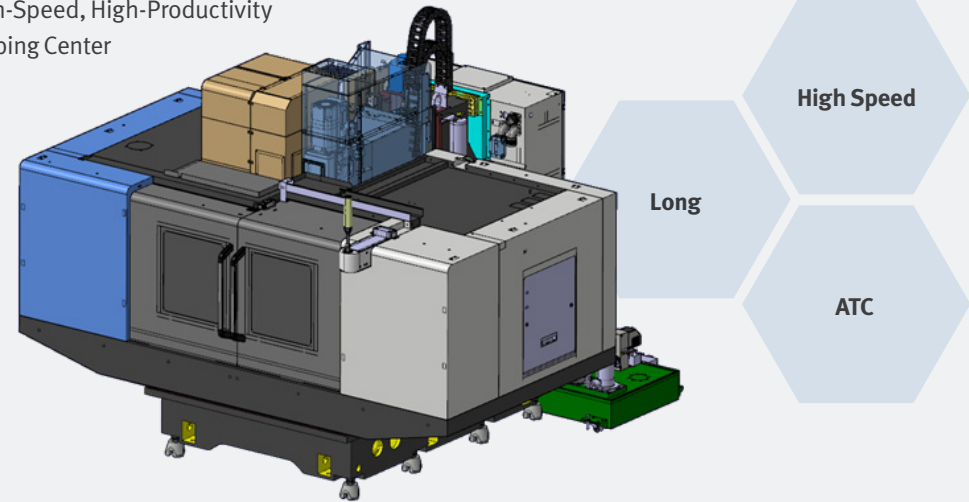
Large size parts

Various type of machining

Solution

T7500

High-Speed, High-Productivity
Tapping Center



30 Tool
Cam type ATC
(BT30)

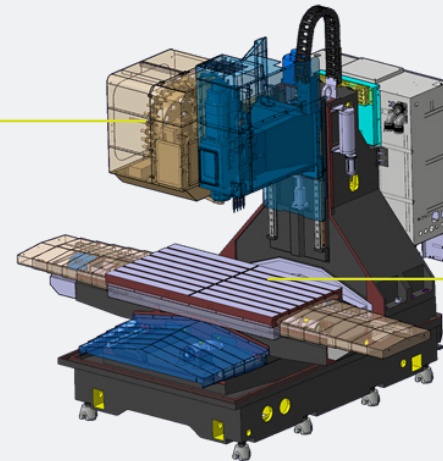


Table size

T7500

1600 x 800 mm
(51.2 X 23.6 inch)

200 kg (440.9 lb)

Pack case

INTRO

Battery

- Module
- Pack case
- Pack Tray
- Electronics
- Extra items

PE System

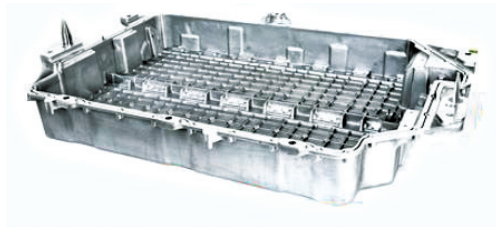
- Motor
- Inverter
- Reducer

Retained Parts

- Body
- Suspension

Workpiece

BATTERY PACK CASE



Material
Aluminum

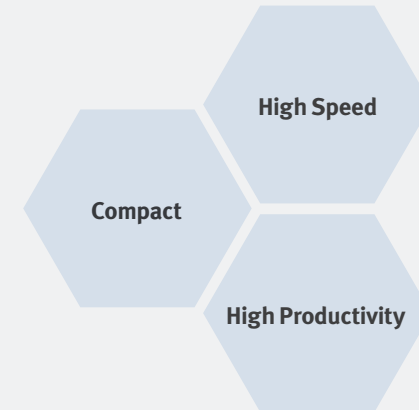
Manufacturing Specialty

- Large size part
- Various type of machining
- Side machining : Rotary table+Rasing block
- compensation for high precision

Solution

DNM series

Global Standard Vertical Machining Center



High precision through S/W



Tool load monitoring

During cutting operation, abnormal load caused by wear and tear of the tool is detected and an alarm is triggered to prevent further damage.



Thermal compensation function

A thermal error compensation function is provided as a standard feature to secure stable cutting safe from potentially harmful environmental factors..

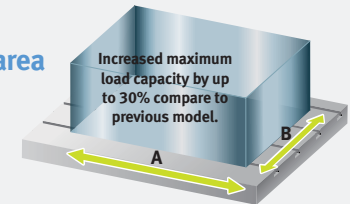
Wide machining area

Table size (A x B)

DNM 4500/L
1000{1050} **x450**mm
(39.4{41.3} x 17.7 inch)

DNM 5700/L
1300{1050} **x570**mm
(51.2{59.1} x 21.3 inch)

DNM 6700/L/XL
1500{1600/2200} **x670**mm
(59.1{63.0/86.6} x 26.4 inch)



Max weight on Table
DNM 4500/4500L
600kg (1322.8 lb)

DNM 5700/5700L
1000kg (2204.6 lb)

DNM 6700/6700L/6700XL
1300kg (2866.0 lb)

Pack tray

INTRO

Battery

- Module
- Pack case
- Pack Tray
- Electronics
- Extra items

PE System

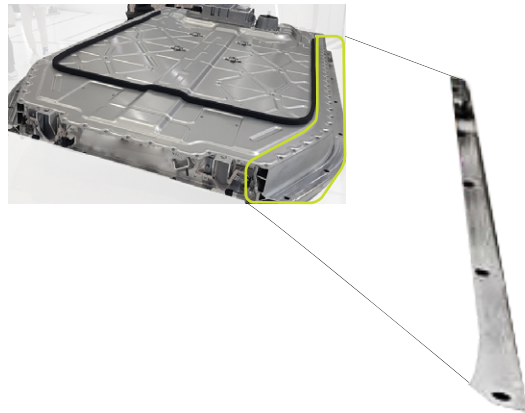
- Motor
- Inverter
- Reducer

Retained Parts

- Body
- Suspension

Workpiece

PROFILE_1



Material
Aluminum

Manufacturing Specialty

Long parts

Twin spindle rotary table needed

Machining a single side of extruded profile

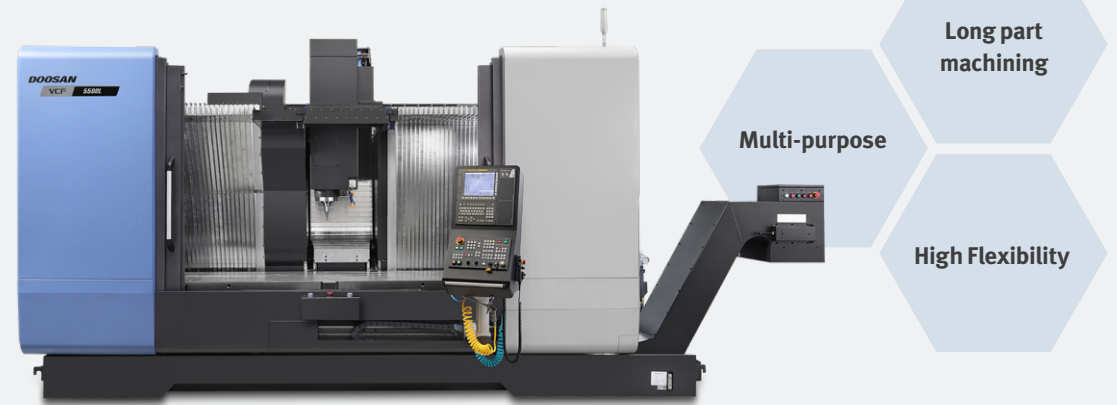
Light cutting

Special demand: optimal solution for easy chip disposal

Solution

VCF 5500L

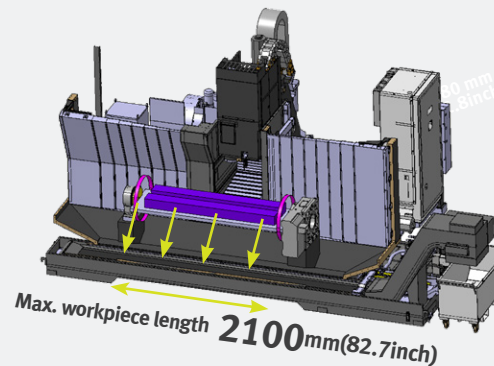
Multi-purpose Vertical Machining Center



Long parts solution

Speical bed for easy chip disposal
Workpiece to chip conveyor directly

Twin spindle Rotary table
Productivity : Set up two workpieces at the same ime



Rotary table

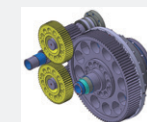
Equipped with dual driving rotary table for powerful cutting and improved accuracy.



Left/ Right A axis

- Synchro mode On : Simultaneous operation of left and right A-axis
- Synchro mode Off : Separated operation of left and right A-axis

Rapid traverse **Travel distance**
A-axis **60 r/min** **360 deg**



Dual pinion

There is no backlash by applying dual pinion structure to increase rigidity.

Pack tray

INTRO

Battery

- Module
- Pack case
- Pack Tray
- Electronics
- Extra items

PE System

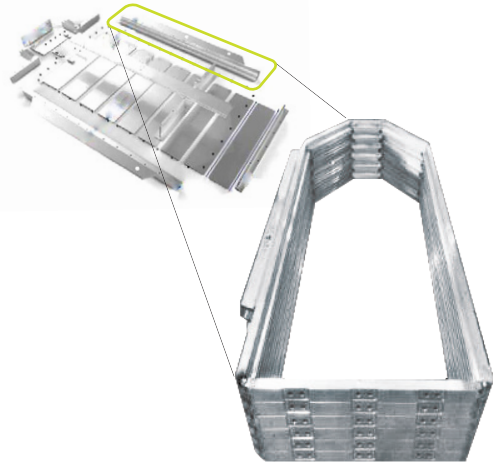
- Motor
- Inverter
- Reducer

Retained Parts

- Body
- Suspension

Workpiece

PROFILE_2



Material
Aluminum

Manufacturing Specialty

Assembling machined parts of various lengths

Mass production

Maintain high and stable production

Solution

T series

High-Speed, High-Productivity
Tapping Center



DNM series

Global Standard Vertical
Machining Center



Optimal Design for the User Environment

The machine's compact design delivers greater user convenience and requires minimal floor space.

Equipment Layout

Specification	Unit	T 4000	T 4000L
Width	mm (inch)	1600	2050
Length	mm (inch)	2560	2574
Height	mm (inch)	2324	2324
Distance to table	mm (inch)	799	799



Wide machining area

Table size (A x B)

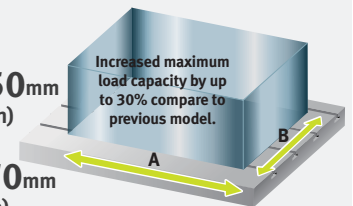
DNM 4500/L
1000{1050} x 450mm
(39.4{41.3} x 17.7 inch)

DNM 5700/L
1300{1050} x 570mm
(51.2{59.1} x 21.3 inch)

DNM 6700/L/XL
1500{1600/2200} x 670mm
(59.1{63.0/86.6} x 26.4 inch)

Rapid traverse rate (X/Y/Z axis)

DNM 4500/5700/6700/6700L	DNM 6700XL
36/36/30m/min	30/30/30m/min
(1417.3/1417.3/1181.1 ipm)	(1181.1/1181.1/1181.1 ipm)
{42/42/36(1653.5 /1653.5/1417.3 ipm)} <small>Option</small>	



INTRO

Battery

- Module
- Pack case
- Pack Tray
- Electronics
- Extra items

PE System

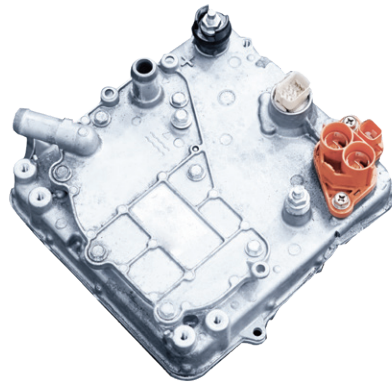
- Motor
- Inverter
- Reducer

Retained Parts

- Body
- Suspension

Workpiece

CONTROL BOX



Material
Steel, Aluminum

Manufacturing Specialty

Light cutting

Mass production

Solution

DNM series

Global Standard Vertical
Machining Center



High Speed

High
Productivity

Easy
Operation

T series

High-Speed, High-Productivity
Tapping Center



Compact

High Speed

High
Productivity

Automatic tool change arm



Tool to Tool time

1.2s

Chip to Chip* time

3.2s

* The Chip-to-Chip time has been tested in accordance with Doosan's strict testing conditions, but may vary depending on the user's operating conditions.

FANUC 31i

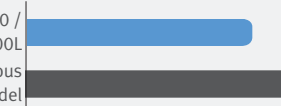
The FANUC 31i is designed to satisfy users' demands for higher machining accuracy and ultra-fine cutting.

Maximize productivity

Description	Unit	FANUC 31i
Rapid traverse	m/min	48

Cycle Time

T 4000 /
T 4000L
Previous
model



Cycle Time reduced by
15%
than previous models

Extra items

INTRO

Battery

- Module
- Pack case
- Pack Tray
- Electronics
- Extra items

PE System

- Motor
- Inverter
- Reducer

Retained Parts

- Body
- Suspension

Workpiece

ACCUMULATOR



Material
Aluminum

Manufacturing Specialty

Mass production

Maintain high and stable production

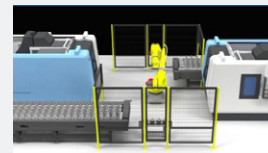
Solution

XC series

High productivity 2spindle column moving VMC



XC Automation Solution



Robot system (1cell)

1Cell configuration
OP#10
XC4000-2SP (1unit)

OP#20
XC4000-2SP (1unit), Robot (1unit)



Gantry loader system (1cell)

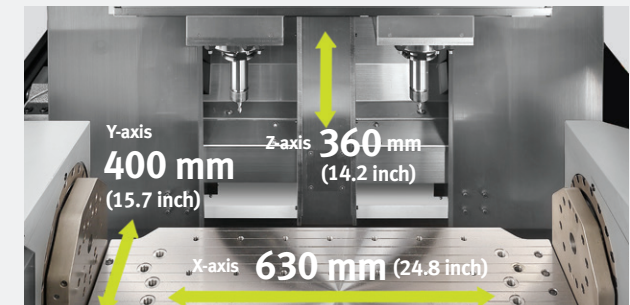
1Line configuration
OP#10
XC4000-2SP (1unit)

OP#20
XC4000-2SP (1unit), Gantry loader (1unit)

Axis System

To optimize durability and stiffness, dual ballscrews are included. Linear scales on XYZ axes are applied as standard. Productivity is maximized by high speed acc/dec rates on all axes.

Axis acceleration **7/10/11 m/s²** (X,Y,Z)



Motor

INTRO

Battery

- Module
- Pack case
- Pack Tray
- Electronics
- Extra items

PE System

- Motor
- Inverter
- Reducer

Retained Parts

- Body
- Suspension

Workpiece

MOTOR HOUSING



Material
Steel, Aluminum

Manufacturing Specialty

High precision

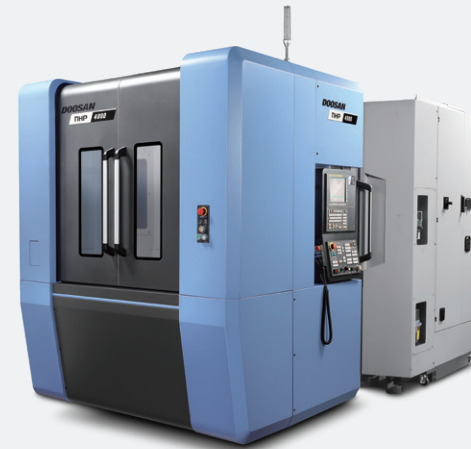
Optimal solution by various size of parts

Cooperation with tooling companies

Solution

NHP 4000/5000 series

High productivity Horizontal Machining Center

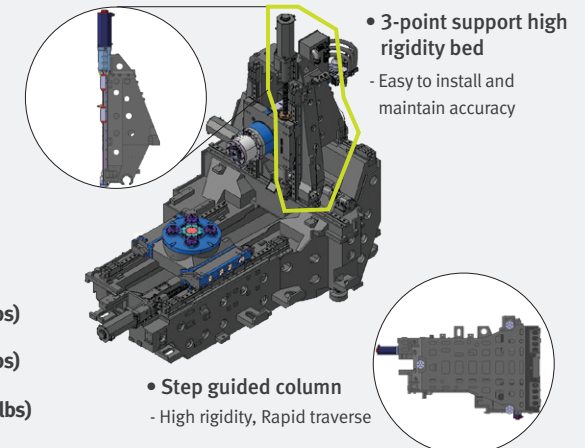


Spindle



Max. spindle speed	Max. spindle motor power	Max. spindle motor torque
15000 r/min	30kW (40.2 Hp)	230 N-m (169.7 ft-lbs)
15000 r/min	37kW (49.6 Hp)	303 N-m (223.6 ft-lbs)
20000 r/min	37kW (49.6 Hp)	221 N-m (1633.1 ft-lbs)

3-point support high rigidity bed



INTRO

Battery

- Module
- Pack case
- Pack Tray
- Electronics
- Extra items

PE System

- Motor
- Inverter
- Reducer

Retained Parts

- Body
- Suspension

Workpiece

MOTOR HOUSING



Material
Steel, Aluminum

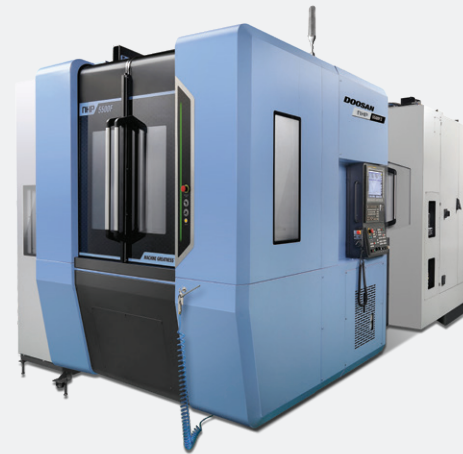
Manufacturing Specialty

- More high Precision
- Optimal solution by various size of parts
- Cooperation with tooling companies

Solution

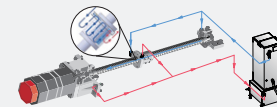
NHP 5500/ NHP 5500F

New Fine version Horizontal Machining Center



NHP series High Precision Option

Cooling system



Linear scale

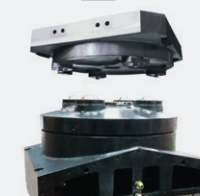
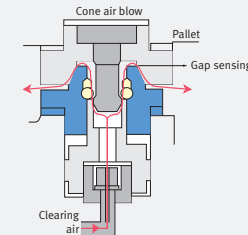


Coolant Chiller



Dust collector

Cone air blow



Basic structure for high precision

- 3-point support high rigidity bed
- Easy to install and maintain accuracy
- Sensor integrated thermal compensation function for structure
- Step guided column
- High rigidity, Rapid traverse

Motor

INTRO

Battery

- Module
- Pack case
- Pack Tray
- Electronics
- Extra items

PE System

- Motor
- Inverter
- Reducer

Retained Parts

- Body
- Suspension

Workpiece

MOTOR HOUSING COVER



Material
Steel, Aluminum

Manufacturing Specialty

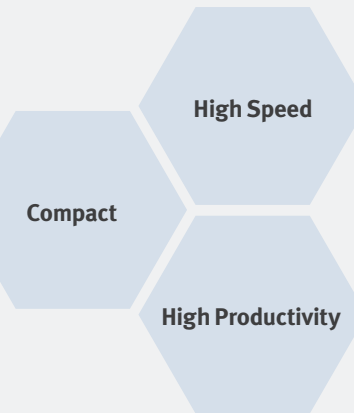
Mass production

Keep the high productivity stably

Solution

T series

High-Speed, High-Productivity
Tapping Center



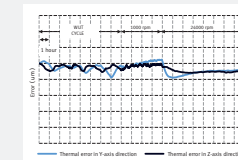
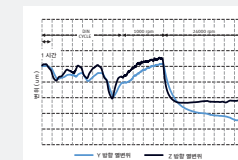
New, High-Precision Spindle

Max. spindle speed **12000/24000 r/min**



Spindle Thermal Error Compensation System (standard)

Thermal error of the spindle is calculated with the spindle temperature feedback and automatically compensated to maintain the highest level of work accuracy.



Before thermal error compensation

* T 4000, 18000 r/min, In-house measurement

After thermal error compensation*

INTRO

Battery

- Module
- Pack case
- Pack Tray
- Electronics
- Extra items

PE System

- Motor
- Inverter
- Reducer

Retained Parts

- Body
- Suspension

Workpiece

SUPPORT RING



Material
Aluminum

Manufacturing Specialty

Light cutting

Mass production

Solution

DNM series

Global Standard Vertical Machining Center



High Speed

High Productivity

Easy Operation

Wide machining area

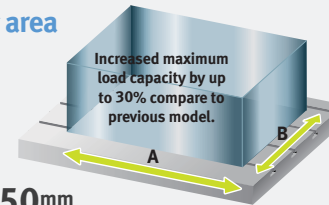


Table size (A x B)

DNM 4500/L
1000{1050} **x450**mm
(39.4{41.3} x 17.7 inch)

DNM 5700/L
1300{1050} **x570**mm
(51.2{59.1} x 21.3 inch)

DNM 6700/L/XL
1500{1600/2200} **x670**mm
(59.1{63.0/86.6} x 26.4 inch)

Max weight on Table

DNM 4500/4500L
600kg (1322.8 lb)

DNM 5700/5700L
1000kg (2204.6 lb)

DNM 6700/6700L/6700XL
1300kg (2866.0 lb)

PUMA V400 series

High Performance Vertical Turning Center



Compact

High Speed

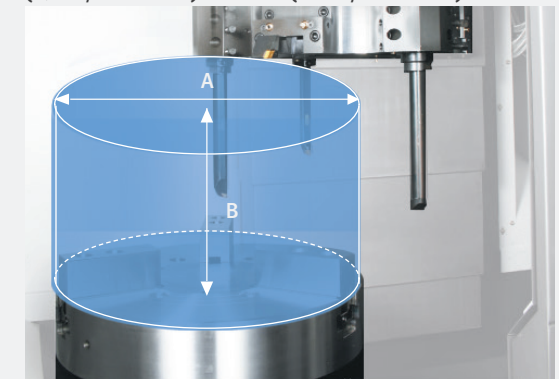
High Productivity

Max. turning diameter (A)

PUMA V400/ V400M
Ø496/420 mm
(19.53/16.54 inch)

Max. turning length (B)

PUMA V400/ V400M
461/400 mm
(18.15/15.75 inch)



Inverter

INTRO

Battery

- Module
- Pack case
- Pack Tray
- Electronics
- Extra items

PE System

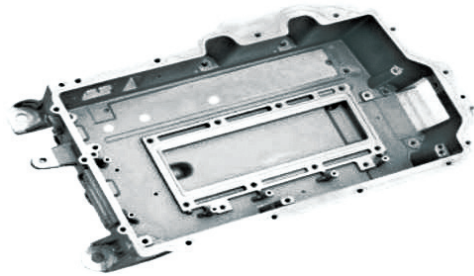
- Motor
- Inverter
- Reducer

Retained Parts

- Body
- Suspension

Workpiece

INVERTER CASE



Material
Steel, Aluminum

Manufacturing Specialty

Small size part

Light cutting

Optimal solution by various size of parts

Solution

T series

High-Speed, High-Productivity
Tapping Center



Optimal Design for the User Environment

The machine's compact design delivers greater user convenience and requires minimal floor space.

Equipment Layout

Specification	Unit	T 4000	T 4000L
Width	mm (inch)	1600	2050
Length	mm (inch)	2560	2574
Height	mm (inch)	2324	2324
Distance to table	mm (inch)	799	799



DNM series

Global Standard Vertical
Machining Center



Wide machining area

Increased maximum load capacity by up to 30% compare to previous model.

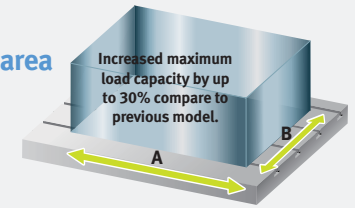


Table size (A x B)

DNM 4500/L

1000{1050} x 450mm
(39.4{41.3} x 17.7 inch)

Max weight on Table
DNM 4500/4500L
600kg (1322.8 lb)

DNM 5700/L

1300{1050} x 570mm
(51.2{59.1} x 21.3 inch)

DNM 5700/5700L
1000kg (2204.6 lb)

DNM 6700/L/XL

1500{1600/2200} x 670mm
(59.1{63.0/86.6} x 26.4 inch)

DNM 6700/6700L/6700XL
1300kg (2866.0 lb)

Reducer

INTRO

Battery

- Module
- Pack case
- Pack Tray
- Electronics
- Extra items

PE System

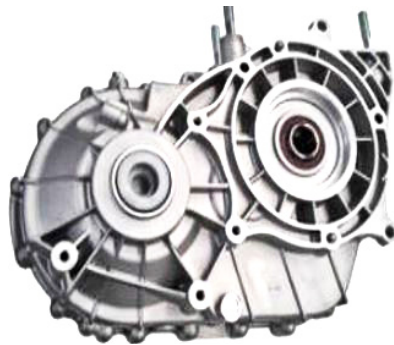
- Motor
- Inverter
- Reducer

Retained Parts

- Body
- Suspension

Workpiece

MOTOR REDUCER HOUSING



Material
Steel, Aluminum

Manufacturing Specialty

HSK recommended

Mass production

High productivity & precision

Solution

DNM series

Global Standard Vertical Machining Center



Wide machining area

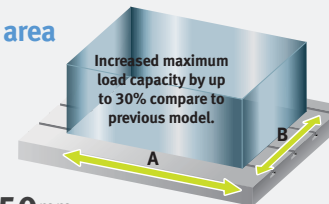


Table size (A x B)

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1300{1050} **x570**mm
(51.2{59.1} x 21.3 inch)

DNM 6700/L/XL
1500{1600/2200} **x670**mm
(59.1{63.0/86.6} x 26.4 inch)

Max weight on Table

DNM 4500/4500L
600kg (1322.8 lb)

DNM 5700/5700L
1000kg (2204.6 lb)

DNM 6700/6700L/6700XL
1300kg (2866.0 lb)

Various Spindle



Max. spindle speed

8000 r/min
12000 r/min Option
15000 r/min Option

Max. spindle motor power

18.5 kW (24.8 Hp)

Max. spindle motor torque

117.8 N·m (86.9 lbf·ft)
(8000 r/min, 12000 r/min,
15000 r/min)
286 N·m (211.1 lbf·ft) Option
(8000 r/min high torque version)

Body

INTRO

Workpiece

MEMBER



Battery

Module
Pack case
Pack Tray
Electronics
Extra items

PE System

Motor
Inverter
Reducer

Retained Parts

Body
Suspension

Material

Aluminum

Manufacturing Specialty

Symmetrical designed parts

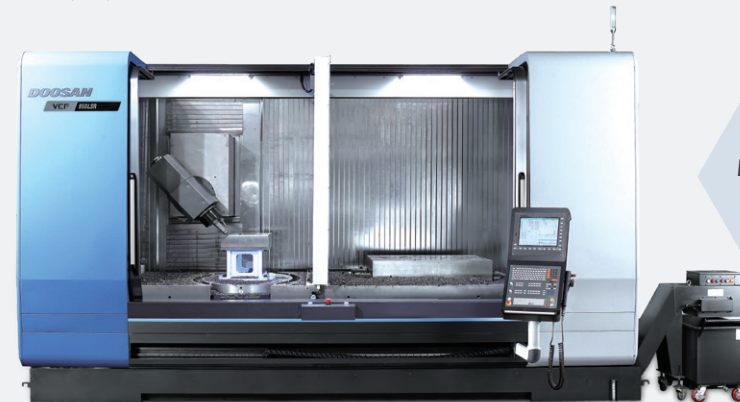
Middle and Large size parts

Light cutting

Solution

VCF 850LSR II

Multi-purpose Vertical Machining Center

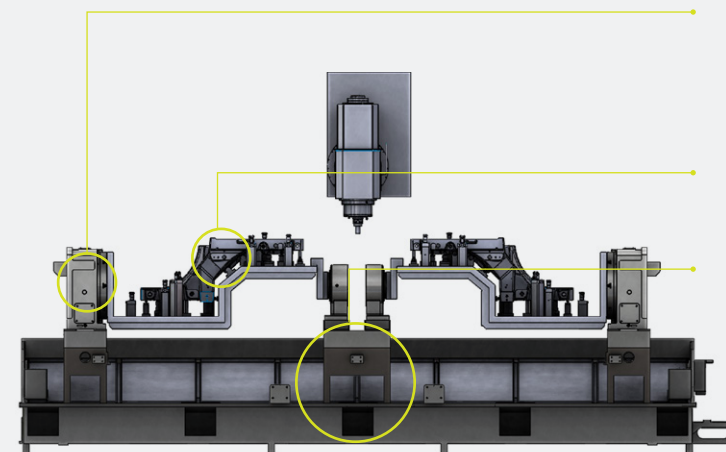


Multi-purpose

Long part
machining

High Flexibility

Dual Rotary Table Solution



Operational flexibility

Capable of controlling the two A axes either simultaneously or individually

Additional 6th Axis (Addition of an additional axis to the 5 axes : Control Otp.)

Synchro control (For sync control : Control Otp.)

Reduced investment cost

2 machines → a single machine

Improved operating stability

Improved jig rigidity and smooth chip discharge by applying a special bed

Suspension

INTRO

Battery

- Module
- Pack case
- Pack Tray
- Electronics
- Extra items

PE System

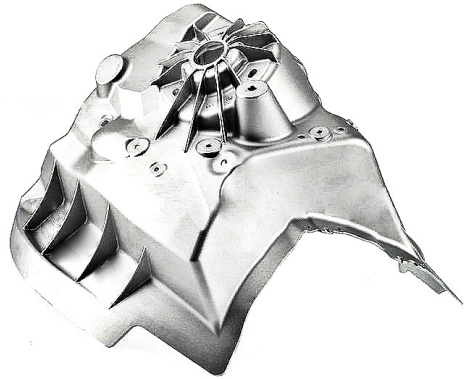
- Motor
- Inverter
- Reducer

Retained Parts

- Body
- Suspension

Workpiece

SHOCK TOWER



Material
Aluminum

Manufacturing Specialty

Complex shaped workpiece

Light cutting

High productivity

Solution

VC 630/5AX

Simultaneous 5-axis Vertical
Machining Center



High
accuracy

Simultaneous
5-axis

High
productivity

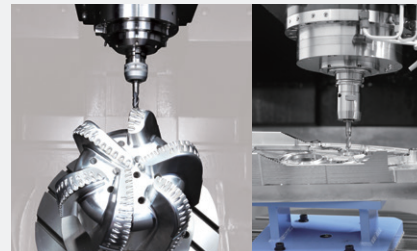
Spindle

Built-in motor minimizes vibration and noise generated.

Max. spindle speed

12000 {20000 Option} r/min

30000 Option r/min



Rotary Table

Large workpiece capacity allows a variety of parts
to be machined in one set up.

Max. Workpiece Size

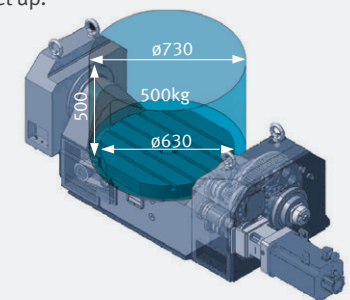
ø730 x 500mm
(ø28.7 x 19.7 inch)

Max. weight

500kg (1102.3 lb)

Wider Machining Area

A wide machining area allows access to machine many
features of large workpieces.



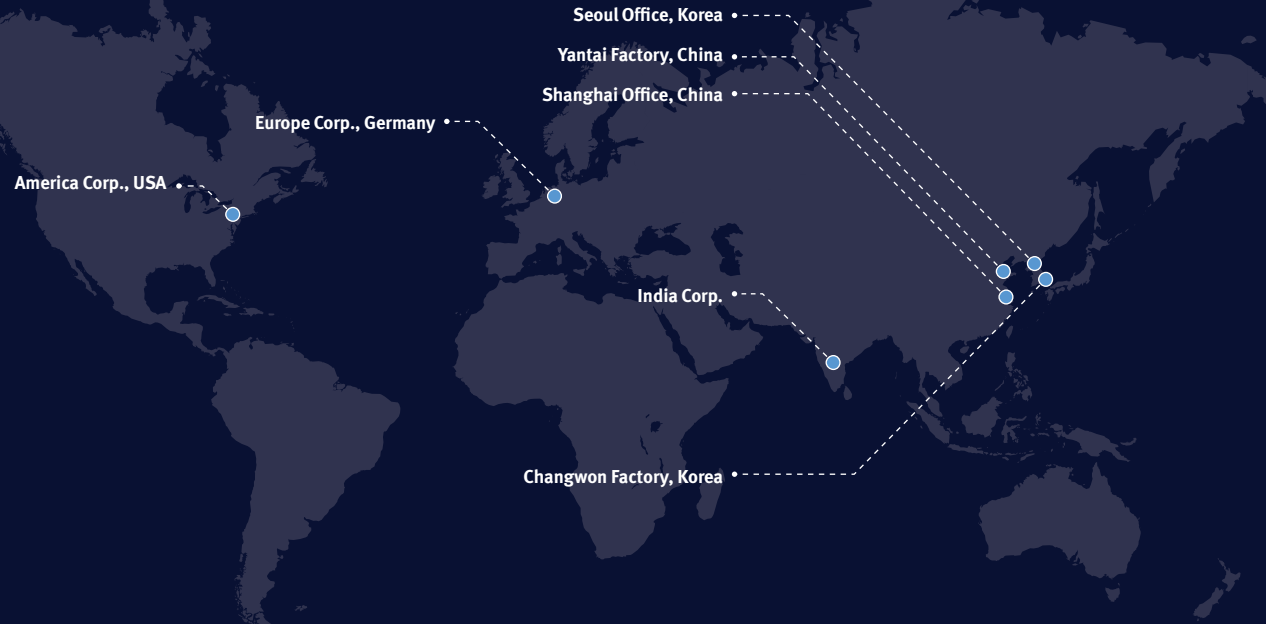
Doosan Machine Tools in the World

In an effort to provide solutions that fit each partners' unique needs, we constantly innovate our thinking, processes, and the way we do business. These optimal solutions lay the foundation for the success of our partners, which adds value to our partners' businesses.

Global Sales and Service Support Network

- 4 Corporations
- 167 Dealer Networks
- 51 Technical Centers
- 200 Service Post
- 3 Factories

Technical Center: Sales Support, Service Support, Parts Support



Supplying Parts

- Supplying parts without charges
- Supplying parts with charges
- Parts repair



Field Services

- On-site services
- Installment and trials
- Scheduled maintenance/ Preventive maintenance
- Repairs with/without charges



Technical Support

- Supporting machining technology
- Responding to technical inquiries
- Providing technical materials



Training

- Programming / Machine operation
- Maintenance
- Application engineering

Doosan Machine Tools

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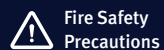
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Fire Safety Precautions

There is a high risk of fire when using non-water-soluble cutting fluids, processing flammable materials, neglecting use coolants and modifying the machine without the consent of the manufacturer. Please check the SAFETY GUIDANCE carefully before using the machine.

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