create your future

Sodick

Linear Motor Drive / High-speed Milling Machine

UX450L

UX450L

XYZ Axis Linear Motor Drive Machining Machine

The Dominance of Linear Motor Technology

- The simple configuration of the magnet plate and the coil unit maintains high repeatability accuracy with no backlash or friction caused by contact.
- Due to extreme stabilty of the linear drive stable positioning accuracy of the machining axes can be maintained over a long period.
- Even during high speed feeds for long NC programs, this machine demonstrates the best drive performance for high-speed milling machining without positioning deviation or speed errors.
- A unique cooling method is adopted to directly cool the coil unit using temperature-controlled coolant, effectively removing generated heat and minimising thermal displacement.

2015

Linear Motor Drive
Ultra High-Speed
Milling Machine
UH430L / UH650L

2011

Linear Motor Drive
Ultra High-Speed Machining Machine
TT1-400A

2007

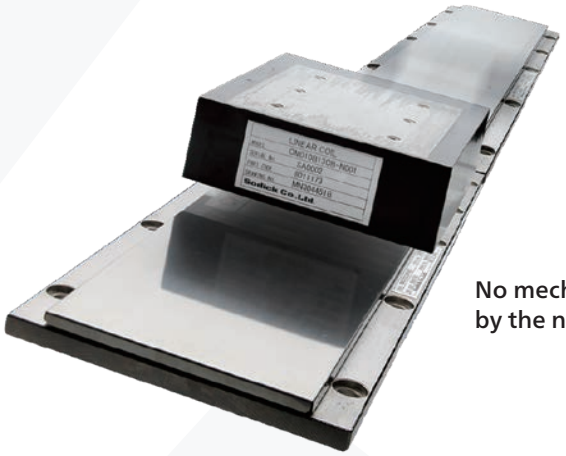
Linear Motor Drive
High-Speed Milling Machine
HS series

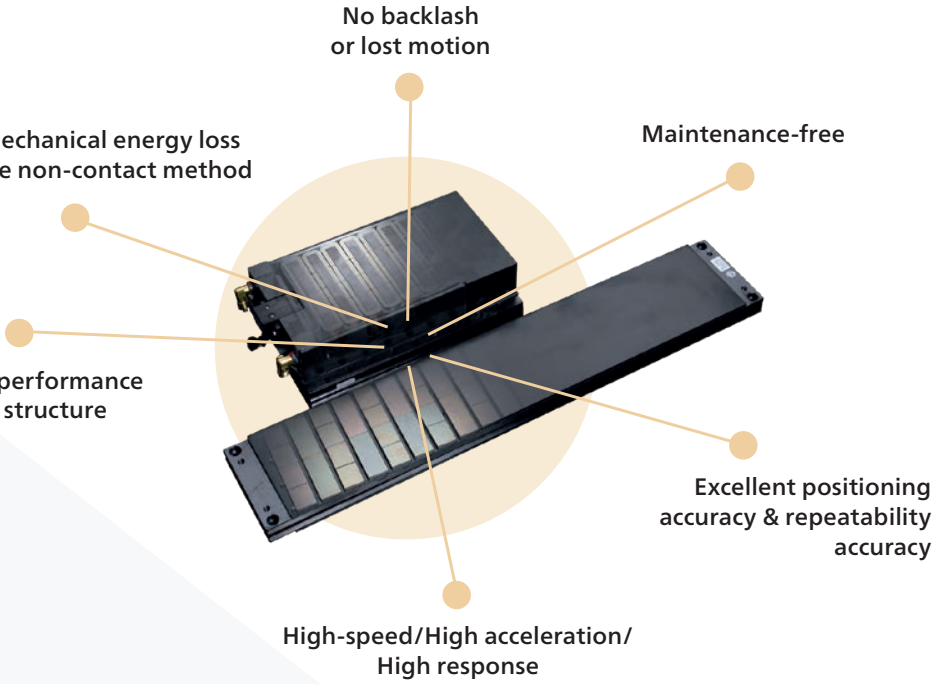
Sodick: Pioneers in Linear Motor Drive

In 1998, we independently developed a linear motor and incorporated it into a mass-production machine tool for the first time in the world.

Wire-cut EDM, Die-sinker EDM, then the Machining Machine.

Sodick's technology has advanced alongside our customers, building upon a proven track record.



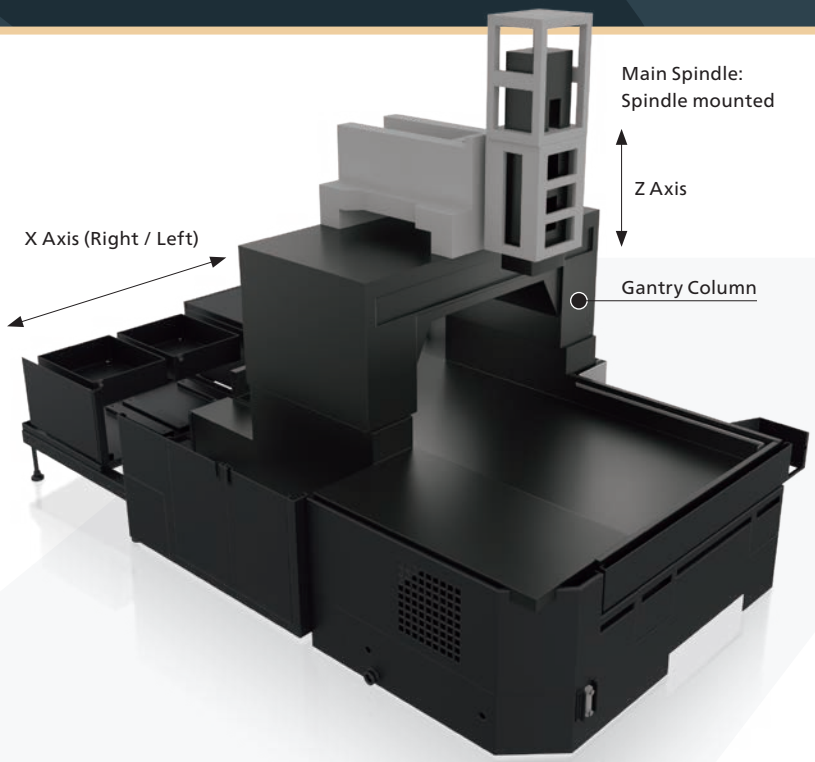


2005	*1999*	*1997*	*1986*
Linear Motor Drive Nano Machining Center AZ150	Linear Motor Drive Machining Center MC180L	Machining Center MC series	NC Electrode Milling Machine APM series

Superiority

Highly Rigid Machine Structure

- High-precision gantry structure & ultra-high rigidity guide
- Z-axis casting cooling mechanism
- High rigidity, low center of gravity machine structure
- Spindle index function (E32FPE)



User-Centric Table Design for Improved Ease of Use

Calibration function for touch sensor

The calibration function before measurement minimises errors, while placing it outside the table expands the machining area throughout the entire table.

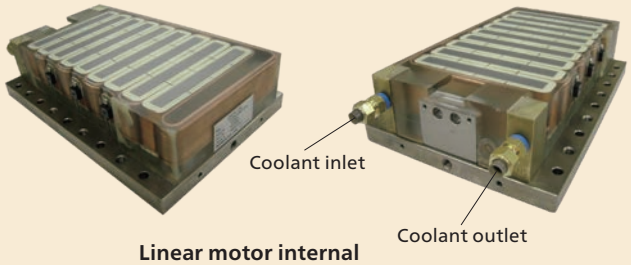
Two-sided door structure

Compared to conventional machines, accessibility has been improved by incorporating doors on both the front and right sides.

Enhanced Thermal Displacement Control for Unmatched Precision and Superior Quality.

Linear motor cooling system

Sodick's proprietary cooling system directly cools the linear motor through water pipes, enabling stable machining even at high speeds.



Linear motor internal cooling system

Main shaft thermal displacement correction function

This standard function is provided to minimise thermal displacement elongation based on the spindle speed, significantly reducing warm-up operation time.*

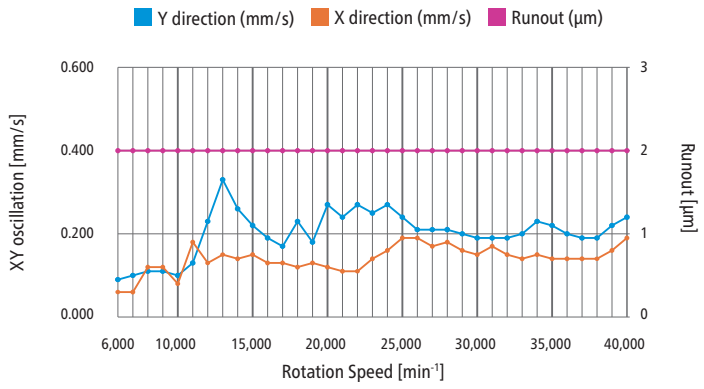
* According to Sodick's survey

Adopting a structure that directly cools the inside of the Z-axis casting

Reduces heat generation in the spindle and minimises thermal displacement in the Z direction caused by the surrounding environment.

High-rigidity and Stable Torque Output

Dynamic runout accuracy

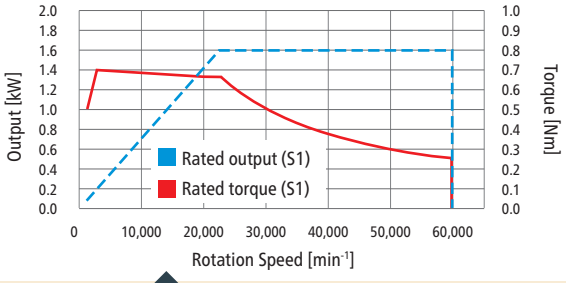


Spindle: HSK-E32 (40,000 min-1 model)

Remarkable improvement has been achieved in dynamic runout accuracy through the re-assessment of bearing arrangement and other structural factors. The runout at high rotation speed is effectively reduced to within 2 μm across the entire area.

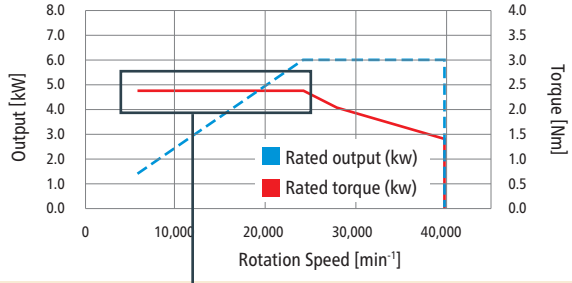
Spindle Torque curve

HSK-E25IK (60,000 min-1)



Corresponds to an extensive range of rotation speeds from 1,500 to 60,000 min-1

HSK-E32 (6,000~40,000min-1)



Stable torque at low rotation

LN4X

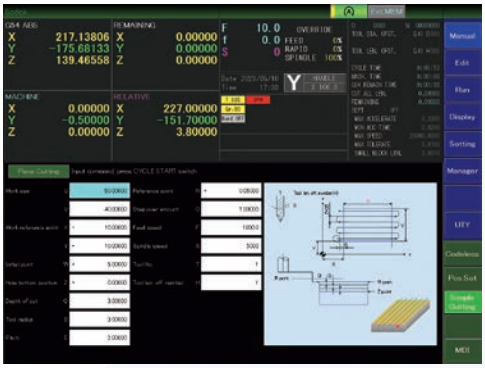
Developed and manufactured by Sodick

NC Unit

LN4X operation screen

This is a 19-inch horizontal touch panel designed for optimised workability and ease of operation. Its clear operability enables intuitive direct interaction.

Simple program creation function *(software)*



This function facilitates the generation of machining programs for drilling, workpiece top-up drilling, and more. It involves inputting the necessary data into the parameters on the screen, allowing for immediate machining.

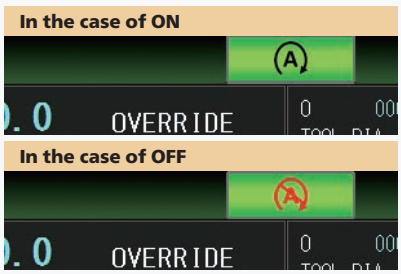
Sleep mode function

This function minimises power consumption by automatically switching off the power when it determines that the machine has been inactive for a specific period of time.

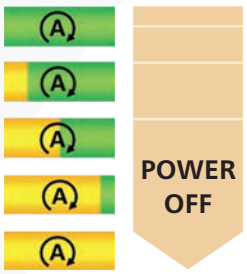
Stop conditions

- Program stops
- Axis stops
- Spindle stops
- Door is closed
- Coolant stops
- No error occurred
- Power is turned ON
- Set time is other than 0

Function ON/OFF can be changed



Visually displaying time passage



Machining recorder (Optional)

This function enables the capturing and display of videos and images on the NC screen during machining or in the event of an error.

In the case of an error, videos/images can be saved approximately 160 times.

During machining, videos/images can be saved for approximately 5 hours.

Image example

Video example

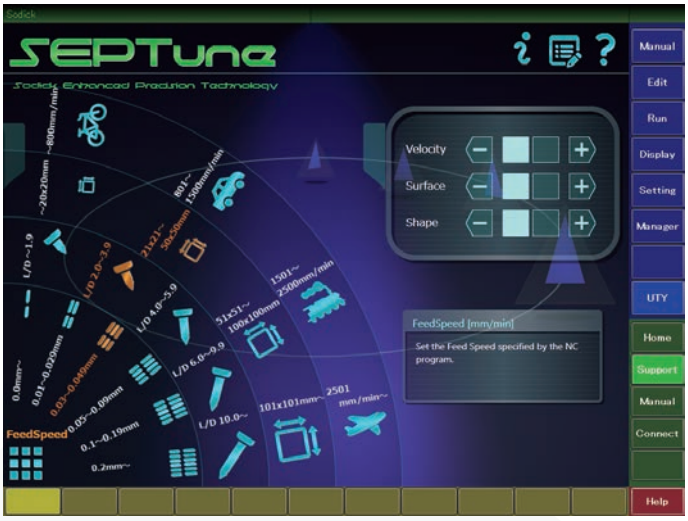
NC Unit Machining Support

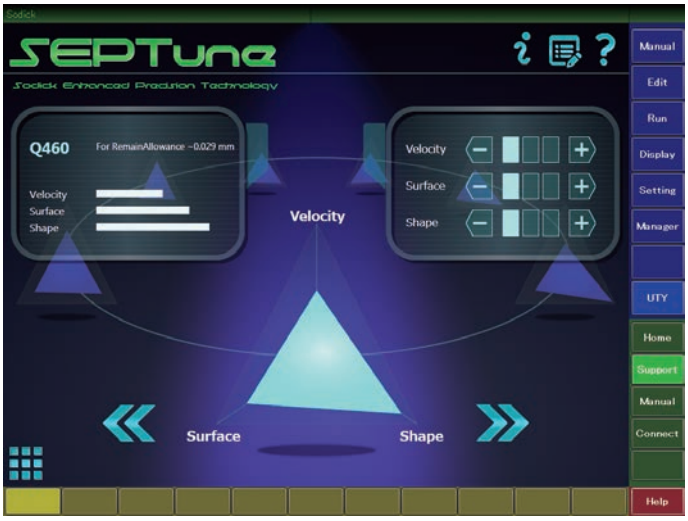
*Machining support system of NC Unit **LN4X***

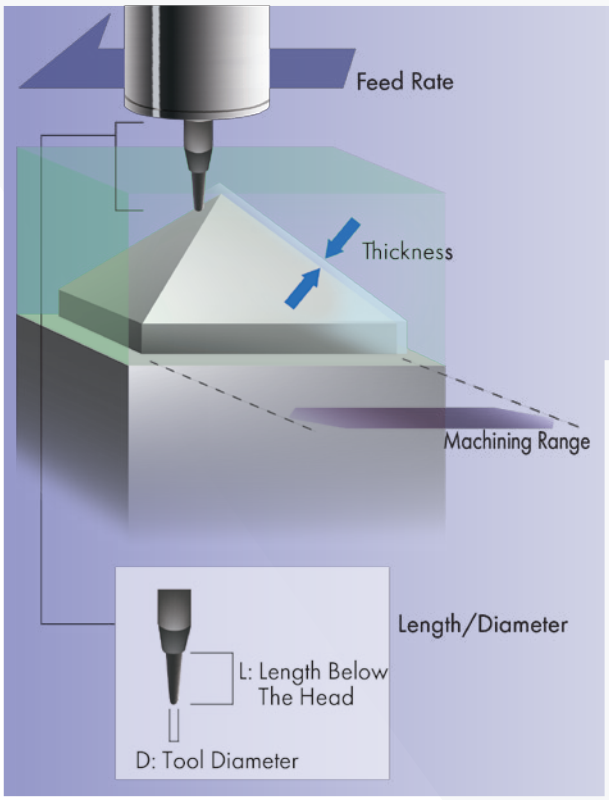
SEPTune

Facilitates straightforward selection of optimal cutting operation conditions and parameter settings.

SEPTune, the processing support system, prioritises user-friendliness through its graphical design. It offers optimal processing parameters for a machining process, achieved through a simple operation that involves just 4 steps of machining information.







▶ *Select Four Steps*

- ▶ STEP1 Material to remove XYZ
- ▶ STEP2 Length / Diameter
- ▶ STEP3 Machining area mm²
- ▶ STEP4 Cutting Feed Rate

Q Number (Machining parameter number suitable for a machining process)

▶ *Fine adjustment of machining parameters*

To enhance the emphasis of items related to Velocity, Surface, and Shape, precise adjustments can be made to the Q number.

Q number reflected in the NC code

Machining is started

Sodick's Precision-Powered Software:

Only possible by Sodick, which uses its in-house NC Unit

Machining Support Software

By utilising the USB drive included with the machine,the below two types of machining software can be installed on a PC for seamless integration.

Machining time and machined shape simulation software
MotionExpert®-S

Machining feed rate software
EF-Tune

Operating Environment

The software installation necessitates the following environment.

OS	Windows 10 *1 (64 bit, Japanese/English/Chinese)	**HDD**	100MB or more free space (required for installation)
CPU	Intel Core i5 *2 or later	**USB**	1 port used for dongle
Memory	4 GB or more is recommended.	**Input Device**	Keyboard, Mouse
Display Resolution	1280 × 1024, 1366 × 768 or more		

Example of software utilization

Function of Each Software Type

Application of MotionExpert®-S

The simulation software examines conditions and performance to prevent collisions.

1. Creating an NC program with a commercial CAM
2. Setting tool/work information Setting parameters for high-speed and high-precision contouring control (NC program reflecting the settings)
3. Axis movement command calculation/generation
4. Machining simulation
5. Re-examination of machining conditions
6. Output

Application of EF-Tune

The EF tuning process will suggest the most suitable feed rate to ensure stable machining.

Machining information
- Residual Margin
- Tool L/D
- Machining size

NC program

→ NC program analysis
→ AI analysis
→ Cutting feed rate
Contouring control parameters

*1.Windows is a trademark of Microsoft Corporation, USA. *2. Intel and Intel Core are trademarks of Intel Corporation.

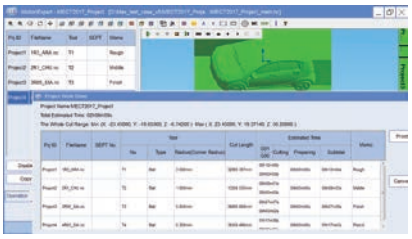
Elevating Speed and Accuracy in Machining

Features of MotionExpert®-S

- Performs simulations using the identical calculation module as the in-house NC Unit (LN4X).
- Minimises defects in real machining by validating machining conditions through simulation.

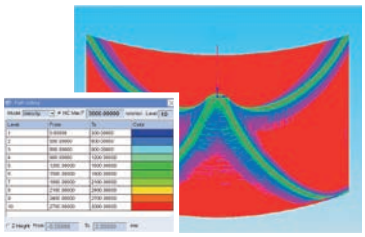
Forecasting machining length and machining time

Estimating the machining length and time by accounting for spindle acceleration/deceleration.



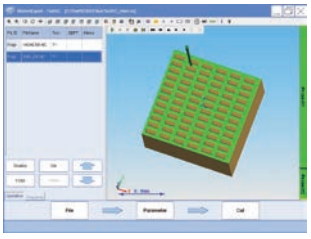
Machined surface quality estimation

Estimating the machined surface quality variations resulting from adjustments in spindle speed, utilising information from the speed distribution display.



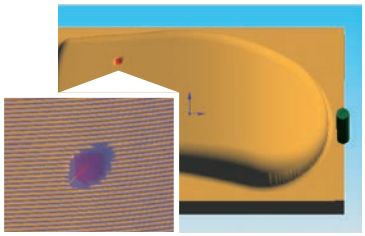
Machining operation simulation

3D modeling allows for the pre-assessment of machining duration and distance before actual machining takes place.



Gouge (Interference) check (Optional)

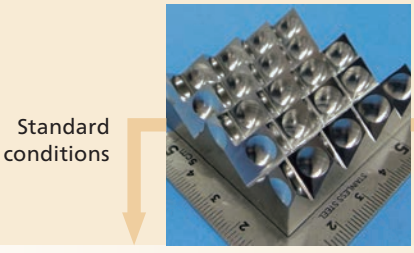
Visuals will reveal any gouges or interference on the surface of the parts model, helping prevent errors prior to commencing the machining process.



Features of EF-Tune

- Has a consistent feed rate with minimal speed fluctuations.
- An AI that has internalized the criteria established by experts forms a model for making judgments.

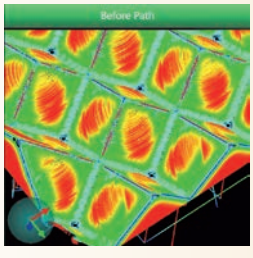
Contrast between machining under standard conditions and Machining using the EF-Tune calculated feed rate



- The closer to red, the closer the command value is to the actual machining speed.
- When machining under the standard conditions, the feed rate on the R plane varies. However, the variation is suppressed by lowering the command feed rate.

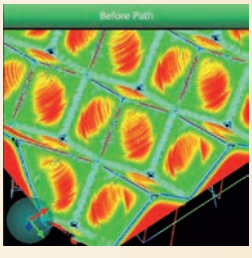
Realisation of more stable feed rate results in improved surface quality and reduced tool wear, contributing to cost reduction.

Before



F-value: 2200

After



F-value: 1540

Specification

Machine Tool

Drive Mechanism (X, Y, Z)	Linear Motor Drive
X, Y, Z Axis Travel	450 × 350 × 200 mm
Distance from Table Surface to Spindle End	100 to 300 mm
Work Table Size	600 × 400 mm
Maximum Workpiece Weight	100 kg
Distance from Floor to Table Work Surface	750 mm
Spindle Speed	E25G 6,000 to 40,000 min-1 (Grease Lubrication)
	E32FPE 6,000 to 40,000 min-1 (Oil Air Lubrication)
Tool Holder Type	HSK-E25/E32 (Dual Face Contact)
Machine Tool Dimensions (W x D x H)	1,975 × 3,386 × 2,172 mm
Required Floor Space	3,400 × 4,500 mm
Machine Weight	7,000 kg (Machine Tool + Power Supply + Cooling Unit)

Power requirements

Power Capacity	25 kVA
Power Voltage and Frequency	AC200V/220V±5% | 50/60Hz±2%
Air Source Pressure/ Air Source Flow Rate	0.65 to 0.7 MPa, 700 NL/min

Automatic tool changer (ATC)

Tool Storage Capacity	20 Tools
Maximum Tool Diameter (Replaceable Size)	ϕ50 mm
Maximum Tool Length (From Reference Surface)	110 mm
Maximum Tool Weight	1 kg

Tank Capacity

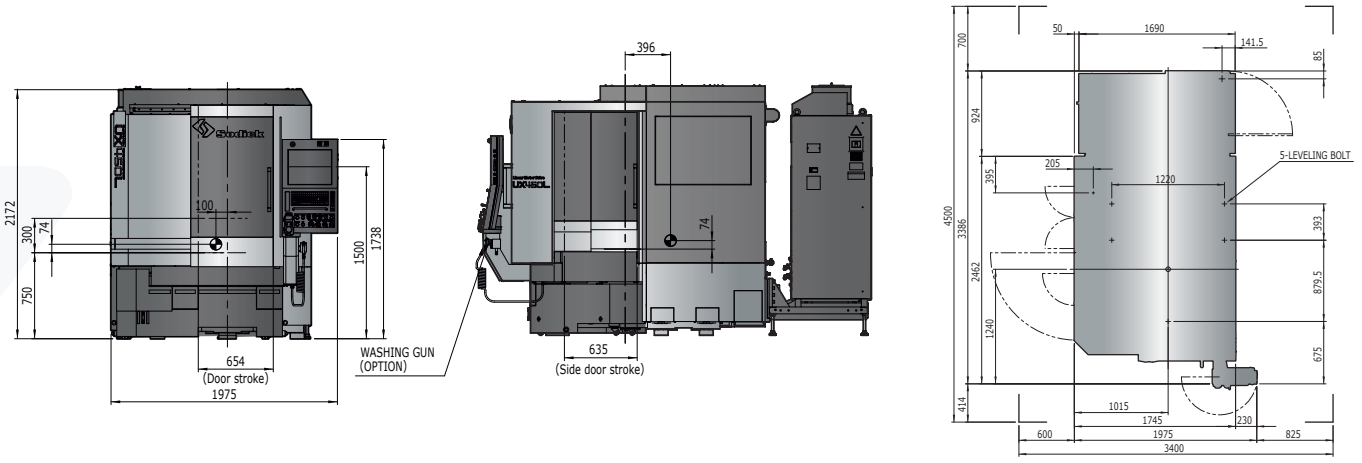
Coolant Tank	130 liter
Coolant Tank Oil Type	Water-soluble Coolant

NC unit (LN4X)

Control axes	4 Axes: X, Y, Z & Main Spindle
Simultaneous control axes	Max. 4 Axes
Min. setting unit	0.00001 mm / 0.000001 inch
Min. travel unit	0.00001 mm / 0.000001 inch
Max. command value	±99999.99999 mm / ±9999.999999 inch
Display	19" LCD Color Display (TFT)

Layout

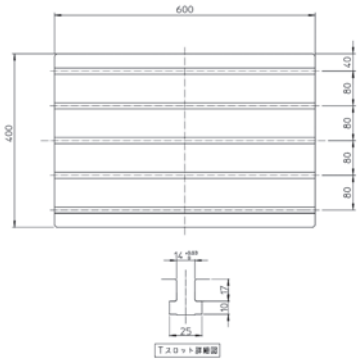
Front View	Side View	Top View



Standard accessories

- Linear motor drive (X/Y/Z)
- 20-station Automatic Tool Changer
- Overall Splash Guard
- ATC Magazine Guard
- ATC Auto Door
- Main Shaft Thermal Displacement Correction Function
- Cooling system for X, Y, Z Axis
- Scale Feedback (X/Y/Z)
- Work-light
- Leveling Bolts, Leveling Pads
- Semi-dry Machining System
- Ethernet Communication (10BASE-T/100BASE-TX)
- Automatic Lubrication Unit
- Manual Pulse Generator
- Chip Tank
- Chip Bucket
- MotionExpert®-S
- EF-Tune
- S-Viewer
- Sleep mode function
- Automatic Tool Length Measuring Device Non-contact laser type (Blum-Novotest K.K.)
- Coolant Oil Specification (including mist collector)

Table Size



Optional equipment

- After Filter (Amano)
- Optical line sensor-type tool measuring instrument “Dyna Line” (BIG DAISHOWA)
- CMOS camera-equipped non-contact tool position measuring instrument “Dyna ZERO Vision” (BIG DAISHOWA)
- Tool Washing Unit
- Renishaw touch sensor" and move it to "standard accessories
- Air Dryer (100 V/200 V)
- Dedicated USB Memory (4GB)
- 3-lamp signal tower
- Washing Gun
- Jet Anchor
- Collision detection function + camera
- 45-station Automatic Tool Changer
- Automatic workpiece changer SR12
- Head Air Blow
- Dry graphite

*Ethernet is a registered trademark of Fujifilm Business Innovation Corporation.

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create your future

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