

DynaPath 

HIGH SPEED MILLS

3-Axis CNC Milling for Contouring and High Surface Finish Operations

Featuring High Speed Spindle + Standard G-Code + Advanced Path Planning



DynaPath 

The HSM-Series are production level machines specialized in the high-speed machining of electrodes, molds, and high-precision parts.

DESIGNED FOR PRECISION, FINISHING AND EFFICIENCY

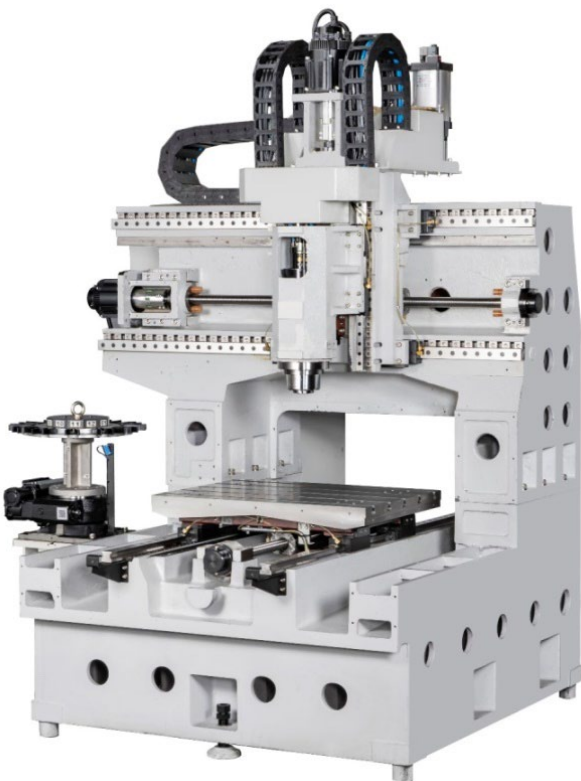
Featuring a rigid fixed double column frame, Roller type linear rails, and a high-speed spindle, the HSM-Series machines can produce parts with excellent precision and surface finishing at faster cycle times, while simultaneously reducing or eliminating subsequent secondary detailing, grinding, or polishing work.

HIGH PRECISION RIGID FRAME

The base, column, and beam are composed of precision-machined Meehanite cast iron heat treated to eliminate internal stress and ensure long term stability. The stationary column and moving head design provides the best structural rigidity and spindle stability while performing high speed machining. Each axis is driven by precision ball screws with careful pre-tensioning to effectively suppress thermal deformation, thereby ensuring high positioning accuracy and repeatability.

KEY FEATURES

- The column and beam are cast in unison to achieve symmetry and uniform thermal characteristics.
- The base and its geometry are designed to provide triangular support with focus on high-speed accuracy and dynamics.
- The integrated bearing housing is designed to improve mechanical precision.
- Each axis incorporates high precision linear V-type roller rails.
- Servo driven tool magazine allows faster tool change.
- Linear ways, precision ball screws, and high-resolution encoders offer sub-micron precision while retaining machining speeds of up to 15m/min rapid and 10m/min feed rates.
- The custom fitted, built-in 10HP high-speed spindle decreases pitch and yaw motion to improve tool tip accuracy, surface roughness, and high-RPM operation.
- Carefully tuned oil-air type spindle cooling system extends spindle life and minimizes z-axis deviation.
- DynaPath advanced motion control can perform up to 10,000-blocks look-ahead and apply dynamic path smoothing to achieve ultra-high quality surface finish.
- Optional Optical scale feedback enables ultra-high machining accuracy across the working envelope.

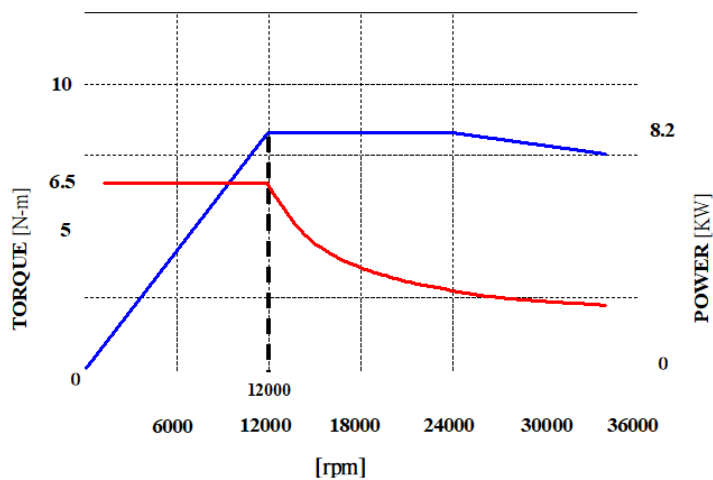


BUILT-IN HIGH-SPEED SPINDLE

Designed for high-speed, high-quality operation, the built-in spindle is ideal for precision die, electrode, and mold machining. The standard HSK 40E type spindle enables precision tool holding up to a max of 24,000 RPMs, with a 30,000 RPM upgrade option available.



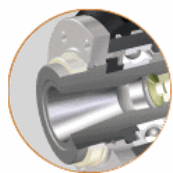
Torque and Power vs. RPM Curve



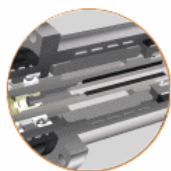
SPINDLE FEATURES



Water-Repellant Ring effectively repels cutting fluid from entering the spindle.



Labyrinth Design with Air Seal utilizes positive air pressure and special geometry to further isolate internal parts.



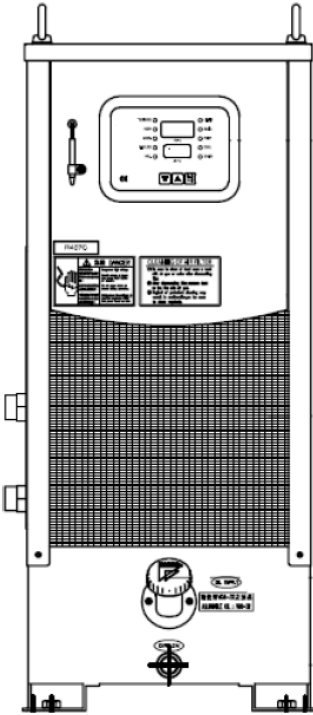
High Efficiency Helical Cooling Channel effectively dissipate heat from the stator coil and bearings to reduce thermal deformation.



3-Plane Dynamic Balancing with High Precision Assembly Criteria ensures minimal vibration and runout at high speeds.

COOLING SYSTEM DESIGNED FOR HIGH-SPEED MACHINING

The spindle chiller system is designed and tuned for high-speed machining to improve machining quality. By utilizing differential temperature control, the chiller system effectively regulates internal spindle temperatures by monitoring the inlet oil temperature and outputs coolant around the spindle motor in a circulating manner. This greatly minimizes temperature deformation while promoting spindle life.



SPECIFICATION

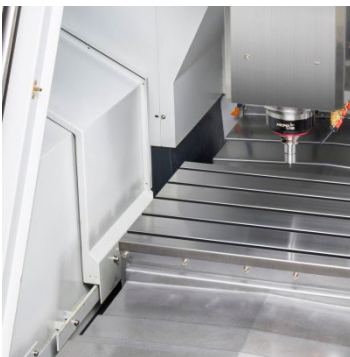
- Cooling Capacity: 840/1000 Kcal/H 50/60Hz, Room temp. 35°C, Liquid temp. 35°C
- **Standard ON-OFF Control Mode** regulates the coolant temp. within $\pm 1^{\circ}\text{C}$.
- **Optional high precision PID Control Mode** regulates the coolant temp. within $\pm 0.2^{\circ}\text{C}$ by PID controlled proportional valve.

FEATURES

- Stabilizes thermal growth of the spindle during high-speed operation thereby improving the working precision of the machine.
- Prevents deviation of spindle center line due to thermal deformation of the machine.
- Extends the lifetime of the spindle and machine.
- Stabilizes oil pressure, preventing uneven lubrication and vibration.
- Easy to operate with low noise.

SERVO DRIVEN TOOL MAGAZINE

The tool magazine is driven by a servo drive and motor, greatly reducing tool change time while improving machining efficiency.



ISOLATED TOOL COMPARTMENT

The tool magazine and all its tools are housed in a sealed compartment with sliding doors that offer full isolation and protection against chips and coolant.



ROLLER TYPE LINEAR GUIDE WAYS

These high-speed machines incorporate V-type roller bearings on linear guide ways for all three axes, providing enhanced rigidity and load characteristics versus normal ball type linear ways. The ball screws incorporate high precision recirculating nut type assemblies with extra low friction. Together, the ball screws and linear guides offer higher accuracy, higher speeds, and excellent rigidity.

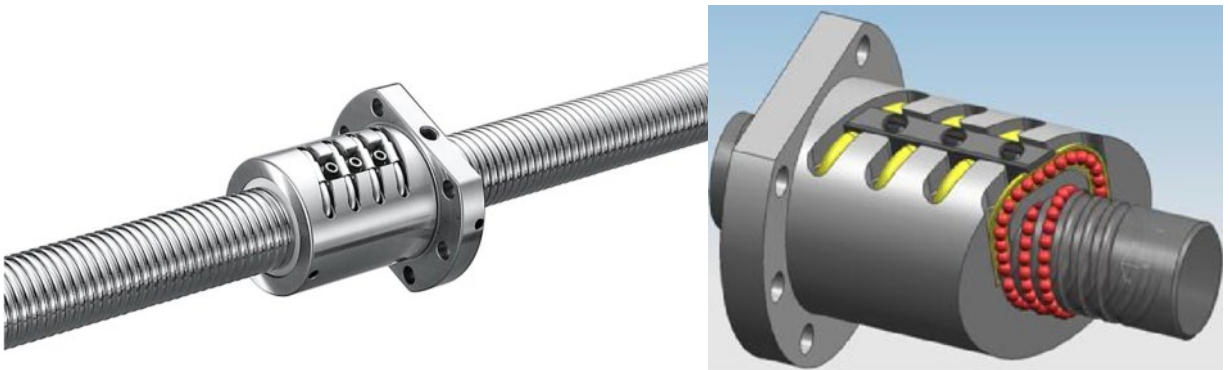
FEATURES

- Able to withstand heavy loads
- Able to achieve high rigidity
- Smooth movement
- Low noise
- Low friction

Roller Guide Ways for Enhanced Rigidity and Accuracy.



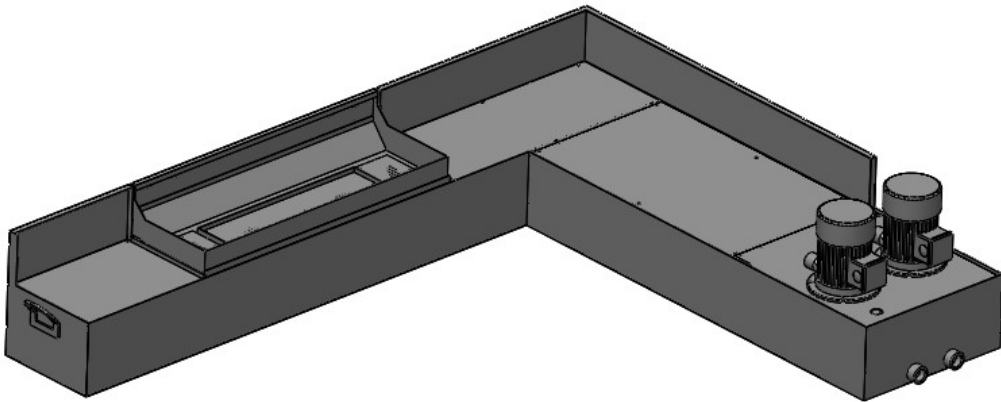
Recirculating Type Ball Screw Offer Lower Friction and Higher Speeds.



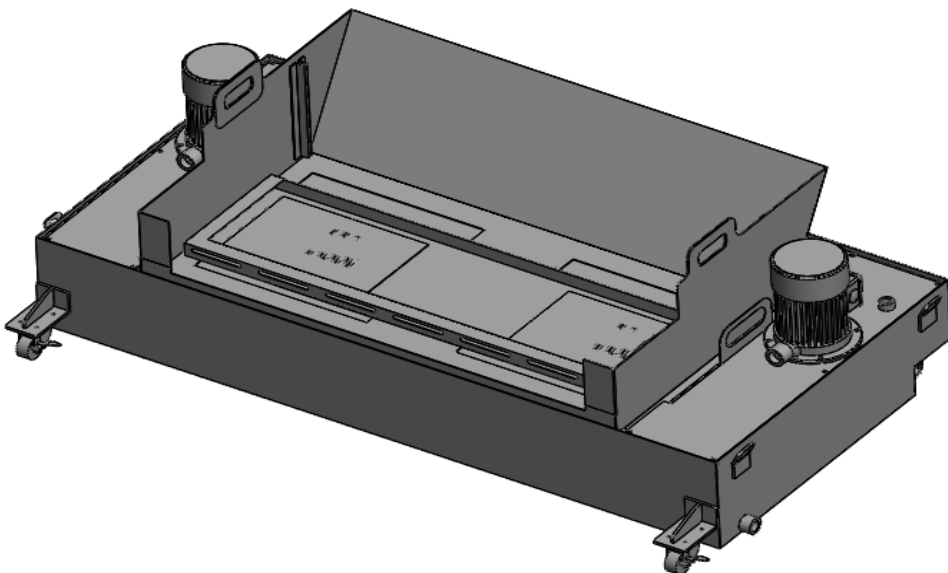
LARGE CAPACITY COOLANT TANK

The large capacity coolant tank reservoir incorporates dual pumps for consistent delivery of flood coolant towards the tool and workpiece. This ensures a sufficient flow rate necessary to cool the cutter while bringing away debris from the work area. The volume capacity is 180 L and includes a metal grate chip filter. The pull-out design from the rear of the machine allows easy access while saving floor-space.

HSM-650



HSM-650S



AVAILABLE OPTIONS

AUTOMATIC TOOL LENGTH MEASUREMENT SYSTEM

Tool length measurement systems offer automatic acquisition of tool compensation data as well as detect tool breakage, either during set up or actual machining, potentially decreasing setup times while avoiding potential mishaps.



AUTOMATIC SPINDLE PROBE SYSTEM

Spindle probing systems offer automatic acquisition of workpiece offsets or finished dimensions with a high degree of accuracy.



OPTIONAL EXTERNAL LINEAR GLASS SCALE ENCODER

External linear glass encoders offer absolute machining accuracy while simultaneously eliminating errors associated with mechanical, thermal, and ball screw deformations.

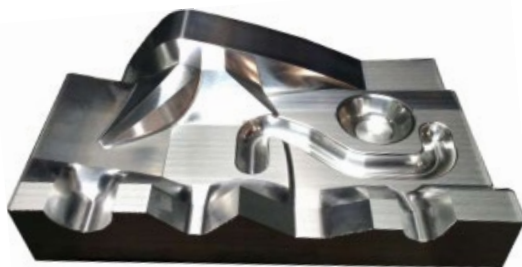


High Precision Parts with Smooth Finishing

The HSM-Series machines are ideal for manufacturing 3D parts, EDM electrodes, injection molds, optical molds, dies, and any other high-precision parts. It is equally capable of machining fine details with small tools or creating ultra-smooth surface finishes.

Lamp mold (Al-7075)

R1 F1200 S18000 4.5h

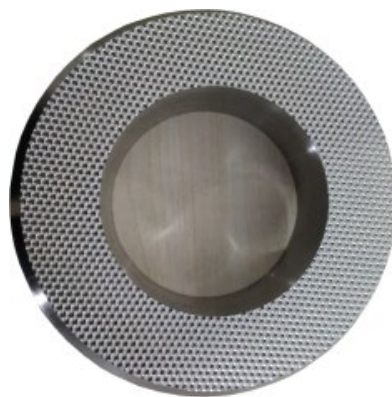


Standard test mold (Al-7075)

R2 F1000 S18000 1h

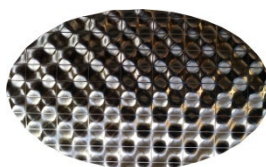
Optical mold (P20)

R0.25 F600 S24000 11h



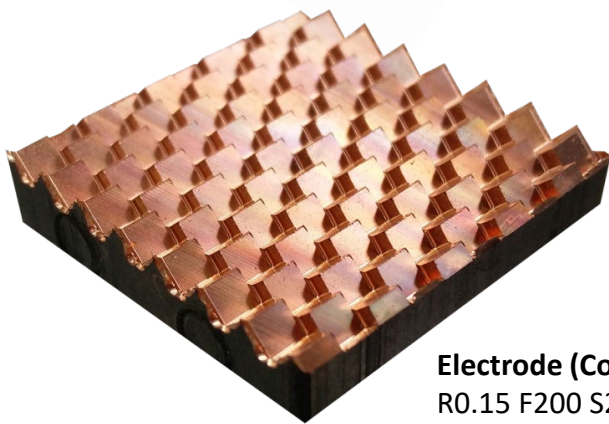
Car lamp mold (Al-7075)

R0.5 F1000 S22000 6h



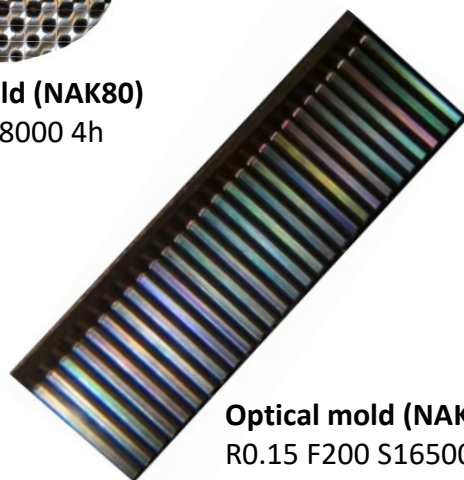
Optical mold (NAK80)

R1 F600 S18000 4h



Electrode (Copper)

R0.15 F200 S22000 6h



Optical mold (NAK80)

R0.15 F200 S16500 6h



Optical mold (P20)

R1 F300 S12000 14h



Optical mold (NAK80)

R0.75 F400 S22000 2h



Taper needle mold

D6 F800 S22000

Single needle 33 min.

Thinnest diameter 0.11 mm

*Figures provided for finish pass only.

*Units are Ball Nose Radius R (mm), Feed F (mm/min), and Spindle Speed S (RPM)

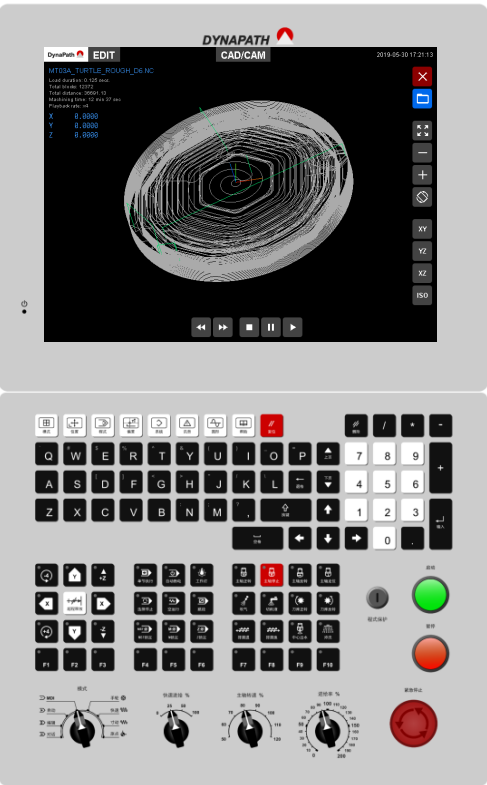
DynaPath WinDelta Control System

POWERFUL, FRIENDLY CONTROL

The DynaPath WinDelta Control offers high speed contouring features, such as **program look-ahead**, **path smoothing (NURBs)**, and **vibration control**, all designed specifically for a **high-quality surface finish**.

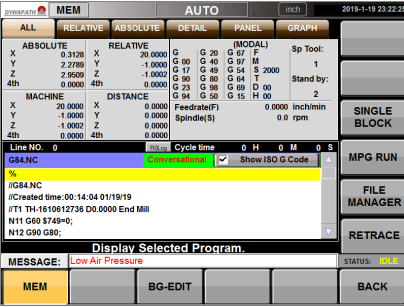
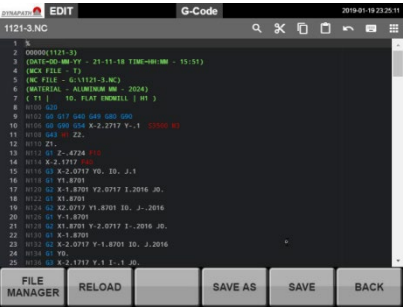
A choice of operating panel style featuring either a **mode switch dial** or a **mode select button** provides a friendly operating experience.

DynaPath D8 Console with 15" Touchscreen LCD



Control Features

- **AI-based adaptive motion control**, dynamically adjusts machining processes based on accuracy or surface finish requirements.
- **Advanced path planning with look-ahead and path smoothing.**
- Runs **Standard ISO/EIA G-Code**.
- **Workpiece Align Functions** for finding Edge, Circle, or Rectangular centers.
- **Auto Tool Measurement** cycles.

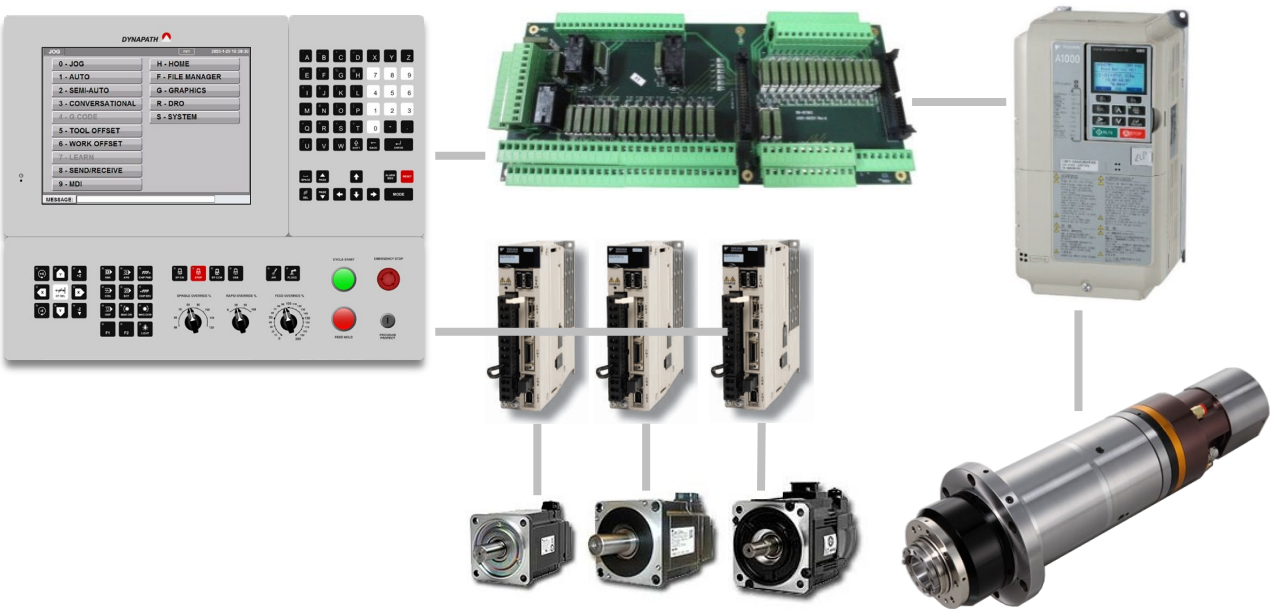


The WinDelta CNC runs standard ISO/EIA G-Code programs of unlimited size, while supporting the standard 3/4-Axis mill post from most CAD/CAMs.

Auto Mode offers a MPG run feature to feed through the program by electronic handwheel, and a Retrace feature to restart from anywhere within a program.

Networked program management capabilities include send/receive from USB, a built-in FTP server, or link to remote servers for centralized file management.

DynaPath WinDelta® Control System



CNC Hardware Specifications

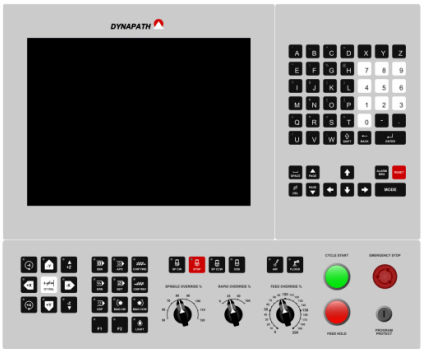
Control	<ul style="list-style-type: none">DynaPath WinDelta CNC	Handwheel	<ul style="list-style-type: none">8-Function Remote Jog Unit (MPG)
Storage	<ul style="list-style-type: none">8 GB SSD	Axis Control	<ul style="list-style-type: none">4-axis simultaneous
Serial Ports	<ul style="list-style-type: none">RS232, RS422/RS485	Standard I/O	<ul style="list-style-type: none">59 DI/33 DO
Networking	<ul style="list-style-type: none">T10/T100 Ethernet Port		<ul style="list-style-type: none">6-channel D/A
Device Inputs	<ul style="list-style-type: none">1x PS/2, 2x USB 2.0		<ul style="list-style-type: none">*5 Channel A/D Optional
Display	<ul style="list-style-type: none">12.1"/15.6" Industrial LCD Touch Display	Expansion I/O	<ul style="list-style-type: none">2x Remote I/O ports (64I/64O each)
	<ul style="list-style-type: none">400 cd/m² Luminance	Power Input	<ul style="list-style-type: none">24 VDC
Operating Panel	<ul style="list-style-type: none">MDI 1st Panel + 2nd Panel		

Operating Console

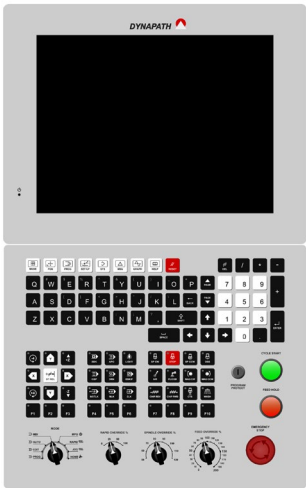
The **DynaPath WinDelta** Control offers high speed contouring features, such as **program look-ahead**, **path smoothing**, and **vibration control**, all designed specifically for a **high quality surface finish**.

A choice of operating panel style featuring a **mode switch dial (D8)** or a **mode select button (D5)** provides a friendly operating experience.

D5 CONSOLE

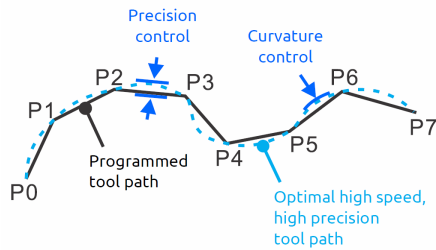


D8 CONSOLE

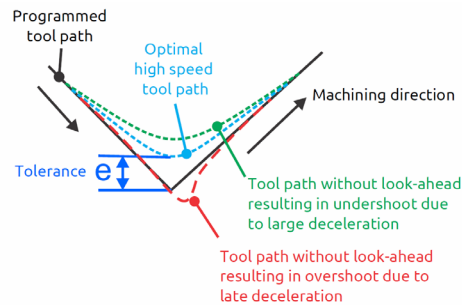


Advanced Path Planning with Look Ahead and Feed Forward

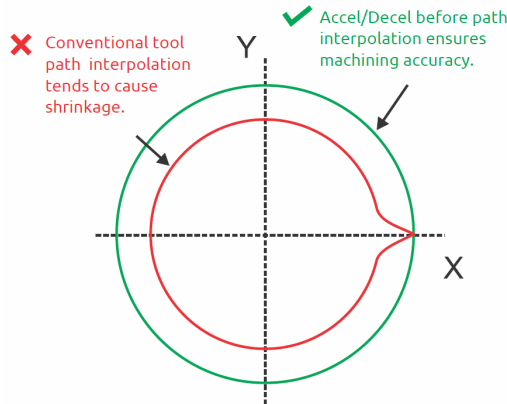
Path Smoothing algorithms provide precision control and curvature control. The result is the optimal tool path for speed and precision.



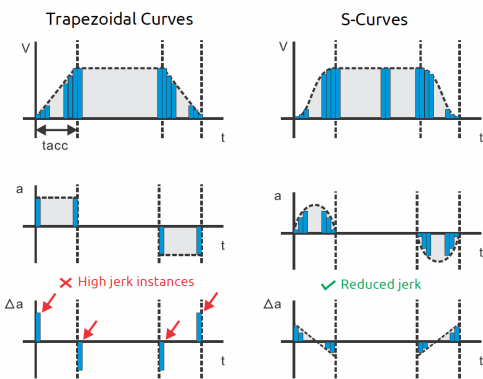
Look Ahead anticipates upcoming programmed motion and plans the optimal trajectory in real time up to 10,000 blocks.



Smart Interpolation ensures machining accuracy by performing acceleration and deceleration before path interpolation.

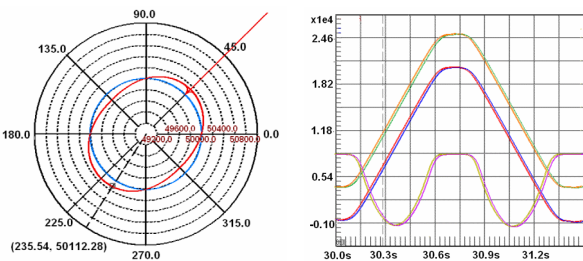


Jerk Reduction is performed by using trapezoidal or S-curve acceleration and deceleration, allowing smoother motion, higher machining speeds, and helps protect against machine wear.



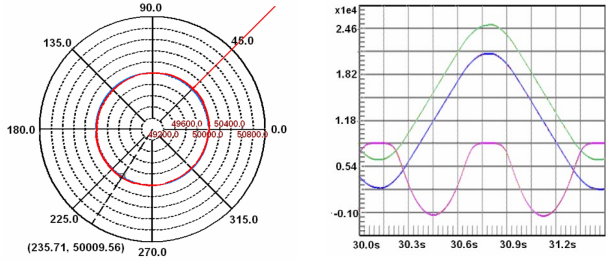
Without Feed Forward and Friction Compensation

XY and Z axes motion accuracy is prone to in-correctable position errors, as demonstrated in the following plots on a circular tool path of 28.3mm diameter, at 8 m/min feed rate. In this case the final trajectory has a maximum position error exceeding 20 μm and more than 6 μm reversal spikes are presented.



With Feed Forward and Friction Compensation

XY and Z axes motion accuracy is greatly increased, as demonstrated in the following plots on a circular tool path of 28.3 mm diameter, at 8 m/min feed rate. The final trajectory has a maximum position error within 5 μm and the reversal spikes are less than 2 μm .



WinDelta[®] CNC is the most versatile control for all your many operations:

Quick Set Up + Standard G-Code Post + Quality Finish

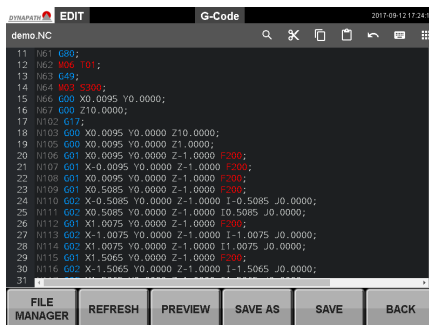
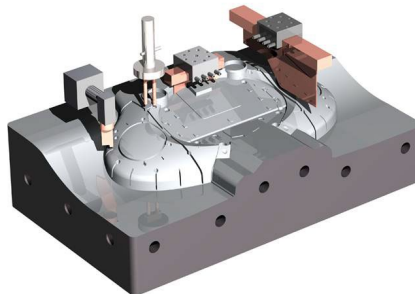
QUICK, EASY, AND ACCURATE SETUP

Automatic tool setter and spindle probe options enable quick and accurate setting up of parts. **Special Center Finding** and **Tool Setting screens** make set up friendly and efficient, so you spend less time setting up and more time cutting.



STANDARD CAD/CAM G-CODE

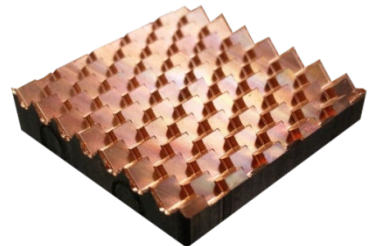
Simply post-process to standard **ISO/EIA G-Code** in the CAD/CAM system of choice, then send the program via **USB, FTP, or networked file sharing** to the control, and fully leverage the power of CNC production.




WORK OFFSET						
	G54 (REF A)	G55 (REF B)	G56 (REF C)	G57 (REF D)	G58 (REF E)	G59 (REF F)
X	266.923	550.000	295.159	295.159	295.159	295.159
Y	-233.813	-320.000	-129.728	-129.728	-129.728	-129.728
Z	-133.120	-500.000	-65.044	-65.044	-65.044	-65.044
4th	0.000	0.000	0.000	0.000	0.000	0.000
EXOS						
	MACHINE	RELATIVE	ABSOLUTE	Manual (RPM)		
X	0.000	358.058	358.058	91.135		
Y	0.000	-191.830	-191.830	41.983		
Z	0.000	-33.451	-33.451	99.669		
4th	0.000	0.00	0.00	0.00		
SPINDLE (S): 0.0 rpm						
FEED RATE: 0.0 mm/min						
SPINDLE LOAD: 0.0 %						
G54 0.000 + Enter						
MESSAGE:						
JOG	MPG	TOOL TABLE	ATC TABLE	ALIGN	BACK	

HIGH SPEED QUALITY FINISH

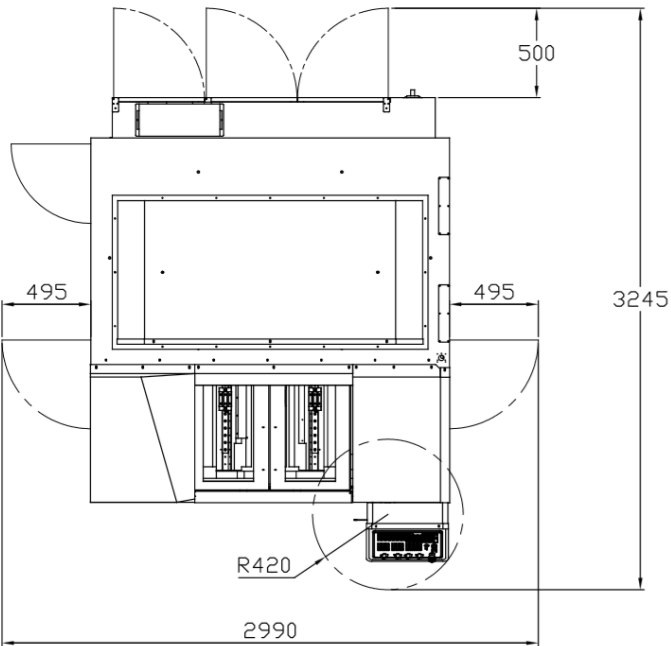
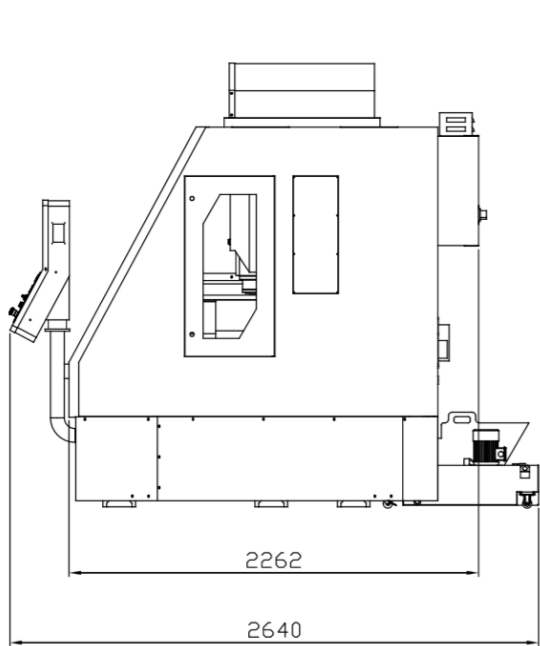
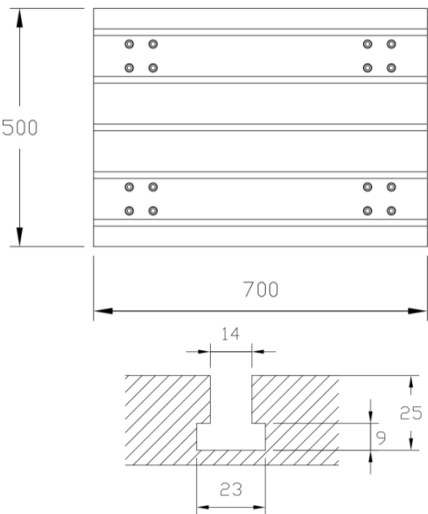
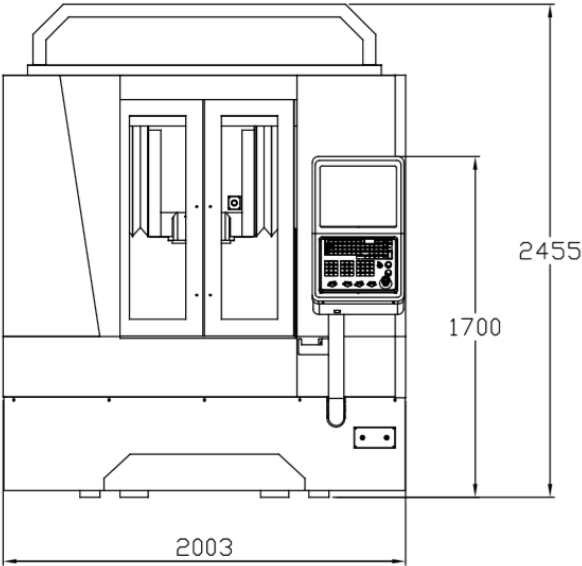
With **advanced path planning** and **vibration control**, programs can be run with higher stable feed rates and thus **produce quality surface finishes at fast cycle times**. Eliminate or alleviate post machining work such as polishing, sanding, and grinding.



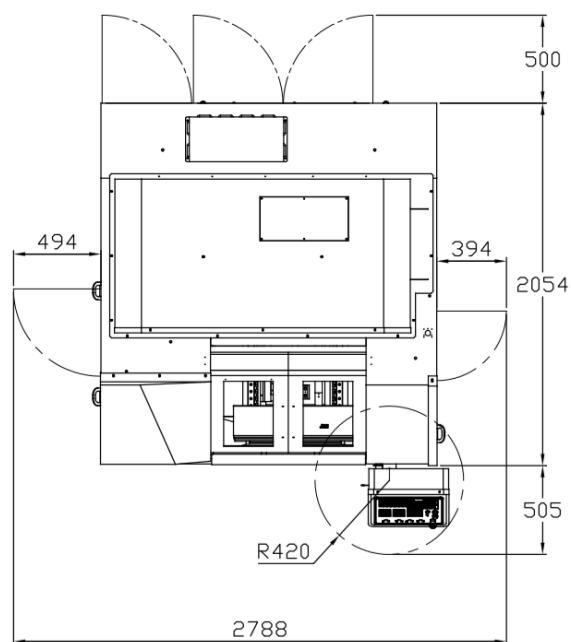
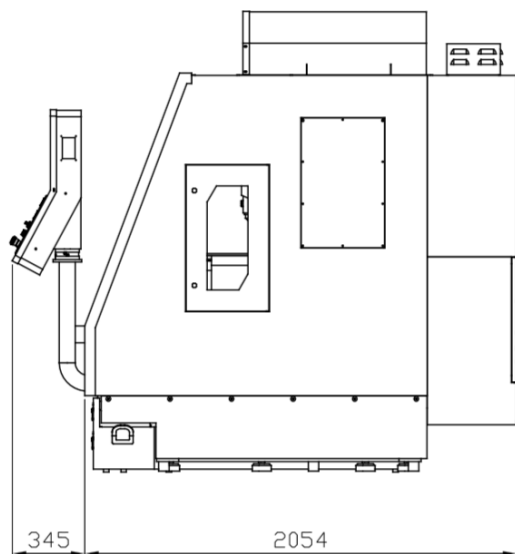
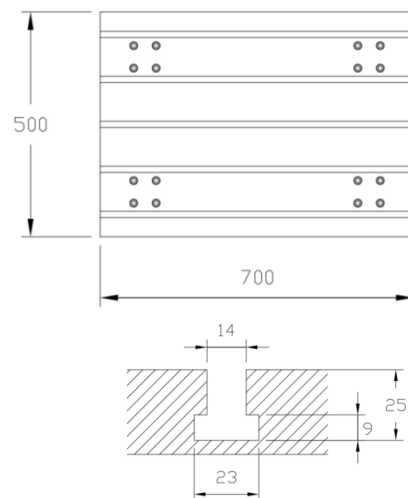
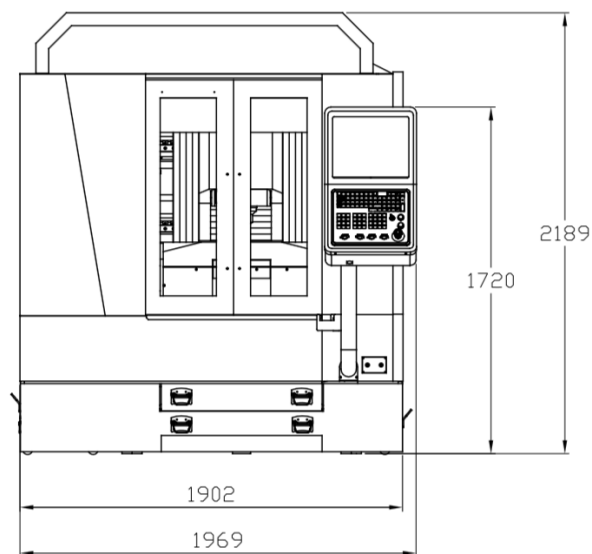
	MODEL	HSM-650	HSM-650S	HSM-650SL
TRAVEL	X-AXIS TRAVEL	600 mm (23.62")	600 mm (23.62")	600 mm (23.62")
	Y-AXIS TRAVEL	500 mm (19.68")	500 mm (19.68")	500 mm (19.68")
	Z-AXIS TRAVEL	300 mm (11.81")	270 mm (10.63")	270 mm (10.63")
	NOSE TO TABLE	150 – 450 mm (5.9"-17.71")	150 - 450 mm (5.9"-17.71")	150 - 420 mm (5.9"-16.5")
	GROUND TO TABLE	700 mm (27.56")	700 mm (27.56")	700 mm (27.56")
SPINDLE	SPINDLE TAPER	HSK40E	HSK40E	HSK40E
	SPINDLE RPM	24000 RPM	24000 RPM	24000 RPM
	SPINDLE POWER	7.5 kW (10 HP)	7.5 kW (10 HP)	7.5 kW (10 HP)
	SPINDLE TORQUE	6.1 Nm	6.1 Nm	6.1 Nm
	COOLING SYSTEM	Oil-Air	Oil-Air	Oil-Air
ATC	ATC TYPE	Carousel	Carousel	Carousel
	MAGAZINE SIZE	12 Tools	12 Tools	12 Tools
	MAX TOOL DIAMETER	50 mm (2")	50 mm (2")	50 mm (2")
	MAX TOOL LENGTH	200 mm (7.87")	200 mm (7.87")	200 mm (7.87")
	MAX TOOL WEIGHT	3 kg (6.6 lbs)	3 kg (6.6 lbs)	3 kg (6.6 lbs)
TABLE	TABLE SIZE (W x H)	700 x 500 mm (27.56" x 19.68")	700 x 500 mm (27.56" x 19.68")	700 x 500 mm (27.56" x 19.68")
	TABLE SLOTS x OFFSET x WIDTH	5 x 100 (3.94") x 14 (0.56")mm	5 x 100 (3.94") x 14 (0.56")mm	5 x 100 (3.94") x 14 (0.56")mm
	MAX TABLE LOAD	300 kg (660 lbs)	350 kg (770 lbs)	350 kg (770 lbs)
MOTION	MOTOR POWER (X/Y/Z)	2.0 / 1.3 / 2.0 Kw (Z-axis with brake)	1.3 / 1.3 / 2.0 Kw (Z-axis with brake)	XY: LINEAR DRIVE, Z: 2.0kW ROTARY
	MAX RAPID SPEED	15 m/min (591 IPM)	15 m/min (591 IPM)	15 m/min (591 IPM)
	MAX CUTTING FEED	10 m/min (394 IPM)	10 m/min (394 IPM)	10 m/min (394 IPM)
	POSITIONING ACCURACY	0.008 mm (0.000315")	0.008 mm (0.00028")	0.0035 mm (0.00015")
	REPEAT ACCURACY	0.004 mm (0.000158")	0.004 mm (0.00016")	0.002 mm (0.00008")
MACHINE	MACHINE WEIGHT	4200 kg (9240 lbs)	3800 kg (8360 lbs)	4000 kg (8800 lbs)
	FLOOR SPACE (L x W x H)	2640 x 3000 x 2460 mm (104" x 119" x 97")	2400 x 2800 x 2200 mm (95" x 111" x 87")	2400 x 2800 x 2200 mm (95" x 111" x 87")
	POWER REQUIREMENTS	13 kVA, 3 Phase, 220 V, 50 A	13 kVA, 3 Phase, 220 V, 50 A	13 kVA, 3 Phase, 220 V, 50 A

CONTROL SPECIFICATIONS	MACHINE FEATURES	ADDITIONAL OPTIONS
<ul style="list-style-type: none"> 12.1"/15" Touchscreen LCD Display 4 GB Program Storage 2 USB, 1 LAN 3-Axis Synchronous 4th Axis Rotary Table Optional ISO G-Code Motion Interpreter Core Shop Floor Conversational Programming DXF Drawing Import via Touch File Send / Receive thru LAN / USB FTP Networked File Transfer Remote Diagnosis & Support Remote Monitoring and Reporting Up to 10,000 Block Look Ahead Program Retrace, MPG Run MPG Handwheel 	<ul style="list-style-type: none"> Electrical Cabinet Heat Exchanger 24,000 RPM HSK40E Embedded Spindle 12 Tool Carousel Type ATC Spindle Chiller Unit Coolant Pump Work Light Tri-Color Light Post Auto-Lubrication System Coolant and Chip Recovery System One Year Warranty on all Parts <p>HSM-650SL:</p> <ul style="list-style-type: none"> XY-Axis Linear Motors X, Y, Z Linear Scale Encoders <p>DynaPath </p>	<p>General Options:</p> <ul style="list-style-type: none"> Contact Type Tool Length Measurement Non-contact Type Tool Measurement and Breakage detection System Spindle Probe System Spindle Chiller with PID +/- 0.2°C Control <p>HSM-650S Options:</p> <ul style="list-style-type: none"> CE Spec (for CE Regions) 30,000 RPM HSK40E Spindle 24 Tool Carousel Type ATC X, Y, Z Linear Scale Encoders Dual A+C Rotary Table with Glass Scale

JD65 DIMENSIONS



JD65S/L DIMENSIONS



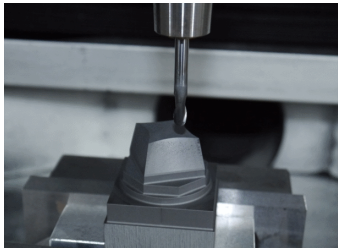
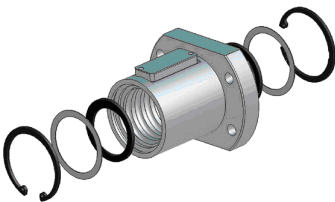
The HSM Graphite Package enables the machining of graphite and metals.

DESIGNED FOR GRAPHITE MACHINING

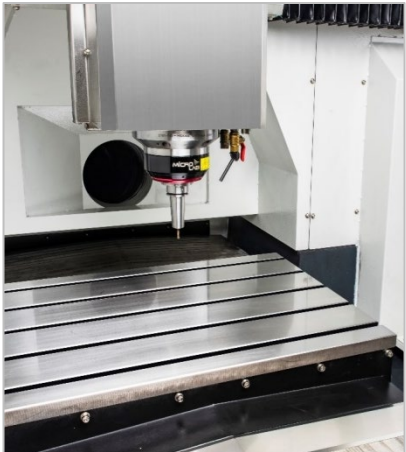
Graphite machining requires special consideration towards the protection of moving parts on the machine and human body from graphite particles. The collection and filtering of airborne graphite dust is also crucial for safe operation. The HSM Graphite Package combines a redesign of critical components with an industrial filtration system specifically for graphite machining.



Redesigned ball screw holding assembly isolates the screws and motors.

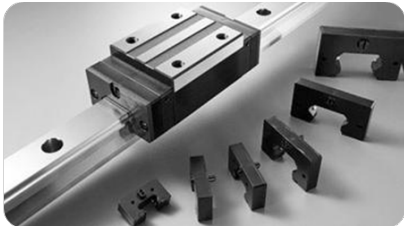


Specially designed way guides consisting of dual wipers and sealed coupling protect against abrasive dust.



An industrial grade submicron level filtration unit removes harmful airborne dust and maintains a clean shop environment.

The low vibration, high speed spindle is protected with a fully isolating air curtain and utilizes grease lubrication.





NORTH AMERICA

<http://www.DynaPath.com>

Tel: 248-488-0440

Fax: 248-488-0430

Email: sales@dynapath.com

ASIA PACIFIC

<http://www.DynaPath.com.cn>

Tel: 886-3-554-5710

Fax: 886-3-554-2241

Email: sales@dynapath.com



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