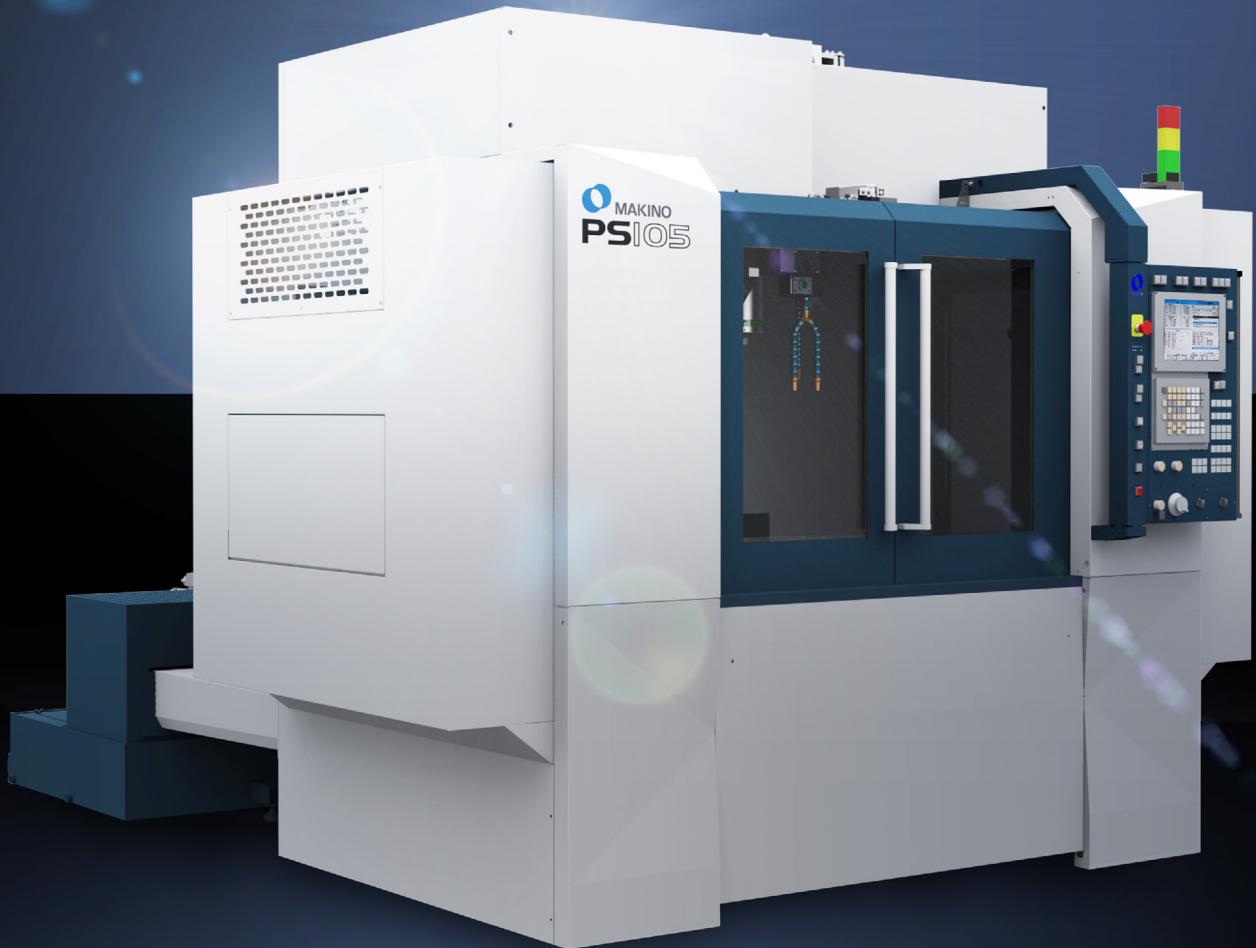


PS65 PS105



Vertical Machining Centre

UNBEATABLE PERFORMANCE

HARMONY WITHIN POWER, ACCURACY AND SPEED WITH SUSTAINED RELIABILITY.

In the competitive environment of the metal working industry, it is important to look at highly flexible and productive processes that provide integrated solutions in order to sustain growth.

Makino is well known for bringing high performance, quality and reliability through its innovative machining centres, technologies and process know-how.

Makino's PS Series Vertical Machining Centre, targeting the high mix and low volume segment of the manufacturing sector, provides users the capability to meet the requirements for precision metal cutting industries like Aerospace, Medical, Automotive, General Engineering and Precision Engineering.

Equipped with Makino's high performance spindle technology, the PS Series guarantees optimal material removal rates with desired surface finish and accuracy. The mechanical structure with linear guideway design ensures swift, stable, rigid and precise motion even with the heaviest of loads installed.



AEROSPACE



AUTOMOTIVE



GENERAL ENGINEERING



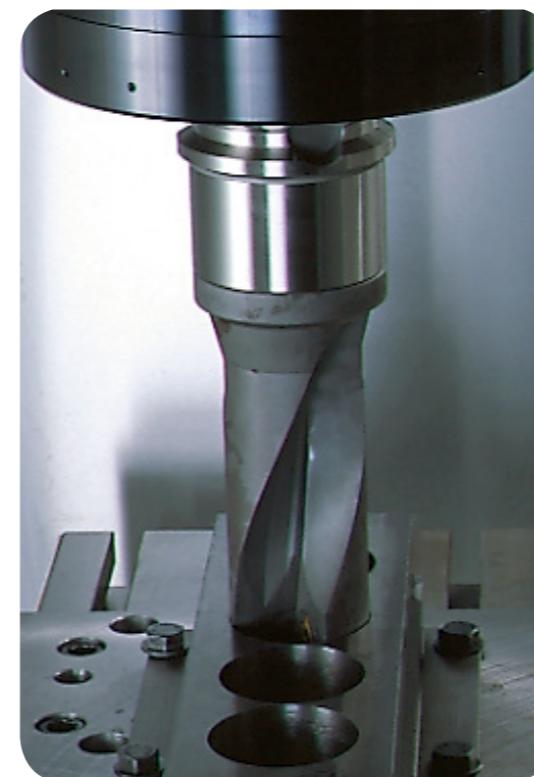
OIL & GAS



PRECISION ENGINEERING

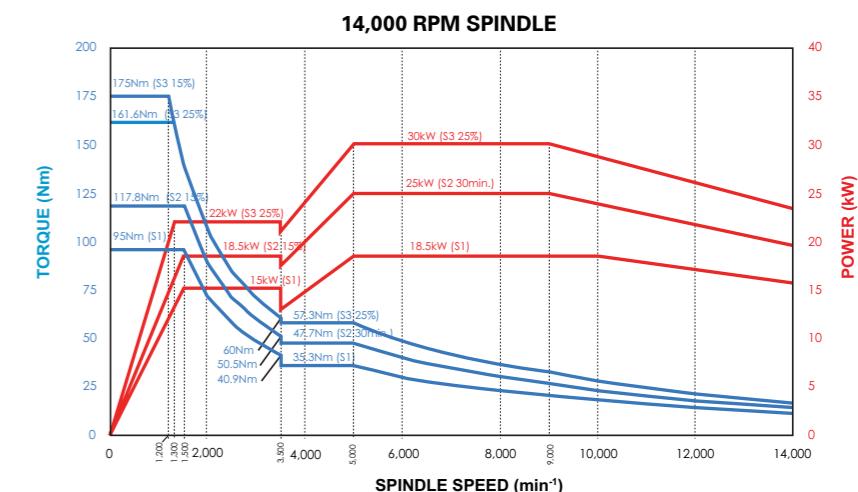


| | | |
|-----------------------|--------------------------|----------------------------|
| Face mill | $\varnothing 80$ | $\varnothing 63$ |
| Material Removal Rate | 800 cm ³ /min | 3,750 cm ³ /min |
| Depth/Width of Cut | 5.7 / 60mm | 7.5 / 50mm |
| Material | S53C | A5052 |
| Spindle Speed | 1,300 rpm | 10,000 rpm |
| Feedrate | 2,340 mm/min | 10,000 mm/min |



63 mm dia. Drill

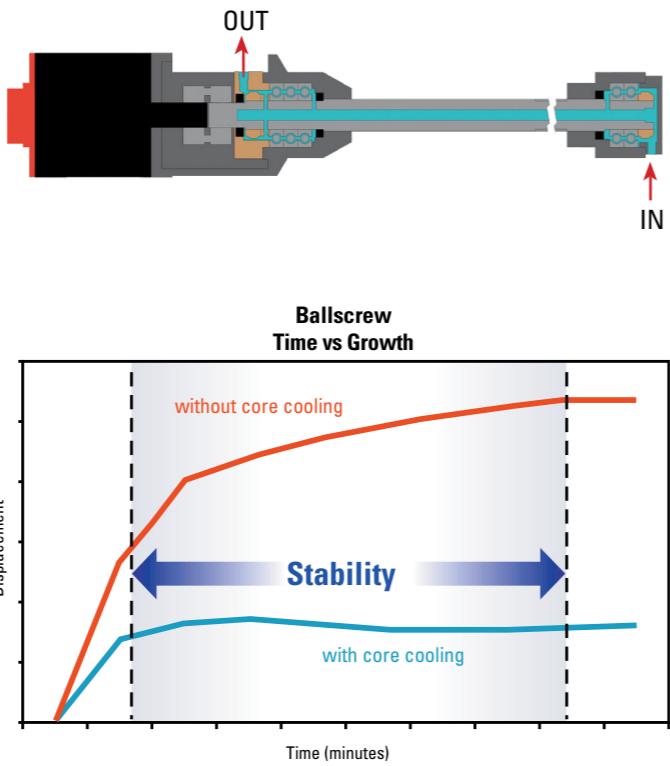
| | |
|-----------------------|--------------------------|
| Material Removal Rate | 467 cm ³ /min |
| Spindle Speed | 1,200 rpm |
| Feedrate | 150 mm/min |
| Depth of Cut | 40 mm |
| Material | S45C |



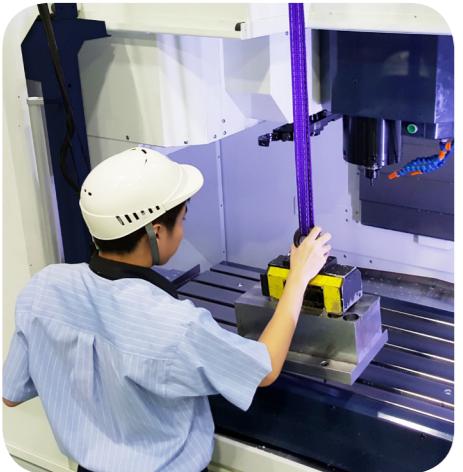
THERMAL STABILITY

Thermal Balance

Apart from the spindle technology which accounts for the High Material Removal Rate (MRR), Makino also adopted the core cooling of ball screw to achieve thermal balance which is an important factor to deliver accuracy. There are 15 axis bearings which support the axis which are traditionally grease packed bearings. During the axis motion, the ball screw rotates in both forward and reverse direction. Quick change of rotation of the ball screw generates heat and knocking effect, thereby leading to poor axis control. The PS Series delivers thermal controlled lubrication oil through the ball screw and support bearing to enhance the life and sustains accuracy.



Accessibility



The machine ceiling opens, to facilitate easy handling of large, heavy workpieces and fixtures that require an overhead crane



Easy Spindle accessibility for tool loading at spindle side



Easy ATC magazine accessibility for tool loading at magazine side

ATC FLEXIBILITY

Dual speed during ATC arm swing ensures smooth tool change and optimum time.

The system ensures proper tool clamping during tool change that increases tool life and proper seating in both the spindle and the ATC pots.

Each tool configuration can be customized as to the type of arm speed used during ATC. High speed for tools with less than 6kg weight and low speed for tools with more than 6kg weight. This increases the productivity of the machine by decreasing non cutting time that is consumed during tool change.

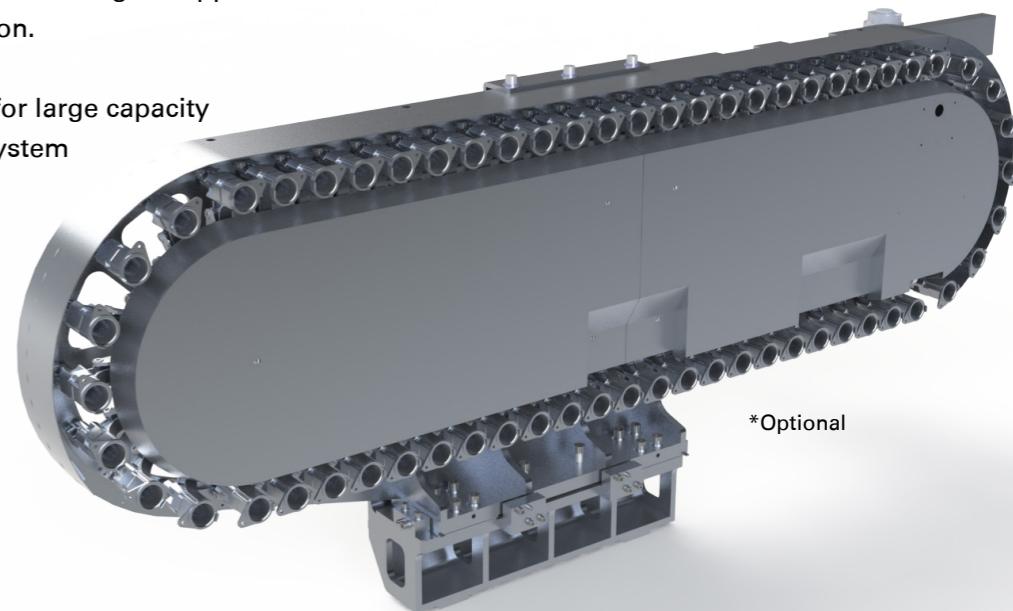
| ATC Configuration | |
|-------------------------------|-----------------------------------------------------|
| Fixed pot configuration | Pot can be assigned as fixed pot |
| Heavy Tool configuration tool | > 6kg to be assigned as heavy |
| Tool Change prohibition | Tool change can be prohibited for a particular tool |



Tool Management

With the standard 30 tool ATC magazine, the PS Series provides smooth and fast indexing to support high speed machining application.

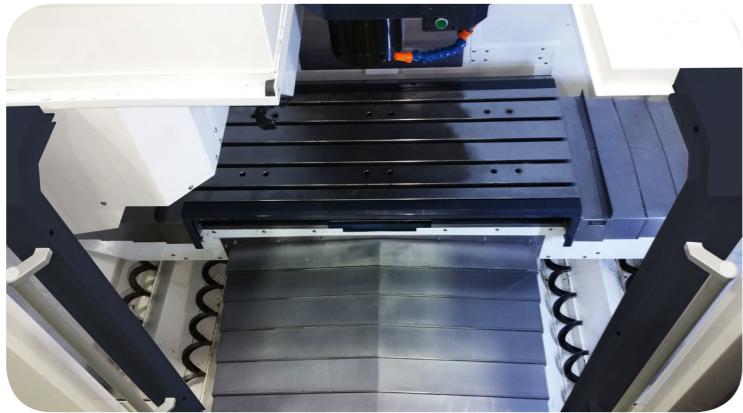
An optional ATC60 is available for large capacity which implements a compact system without additional floor space.



*Optional

PRODUCTION READY

Created with the production environment in mind, the PS Series chip and coolant management systems enhance the productivity of the machine. Configured with nozzle and flush coolant as standard features – chips are efficiently and effectively removed from the cutting zone. Spiral chip conveyors located on the left and right side of the work table quickly and efficiently evacuate chips and coolant from the machining zone. With LUCC option integrated, the machine is tailored for efficient chip handling to the specific need of the application.



*Picture of PS105n with two spiral conveyors on each side

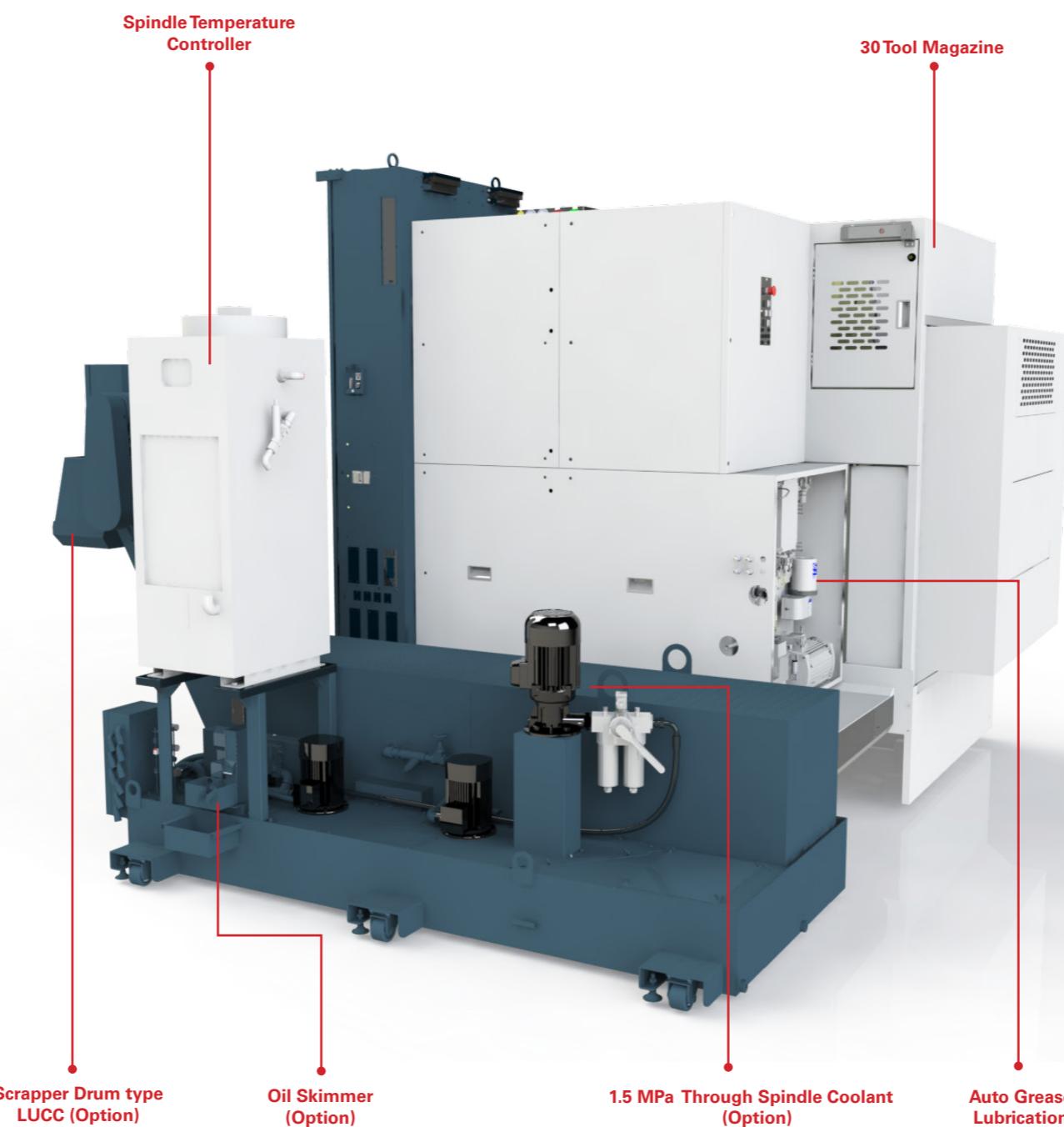
*PS65n comes with one spiral conveyor on each side

Coolant Management System

- Large area of opening for chip flow into screw conveyor
- Minimum casting area to avoid chip accumulation
- Coolant flush for y-axis telescopic covers and shower coolant for better evacuation of chips

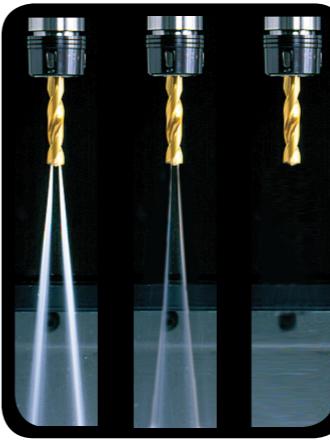
Lift Up Chip Conveyor (option)

To compliment and increase the productivity further in evacuating chips effectively, lift up chip conveyors are available with PS series as optional equipment



Through Spindle Coolant (option)

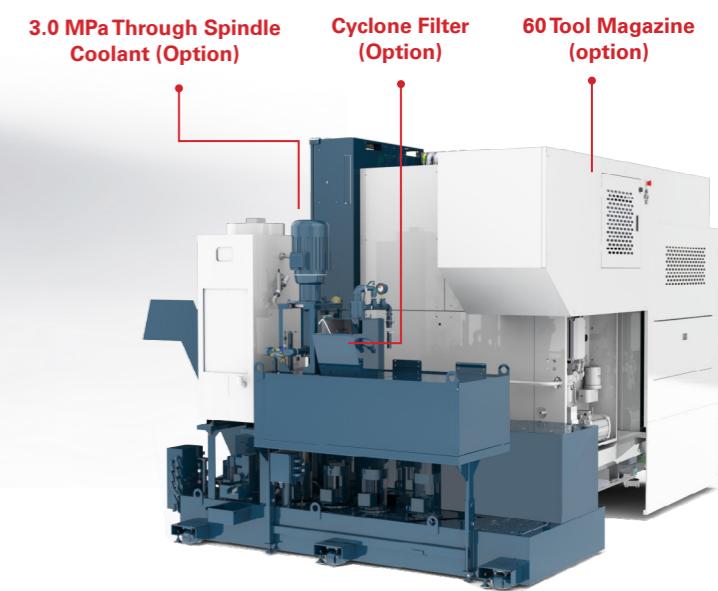
This feature improves the machining process during deep hole drilling operations and at the same time, increases the tool life.



FAST SUCTION

Coolant Nozzles (standard)

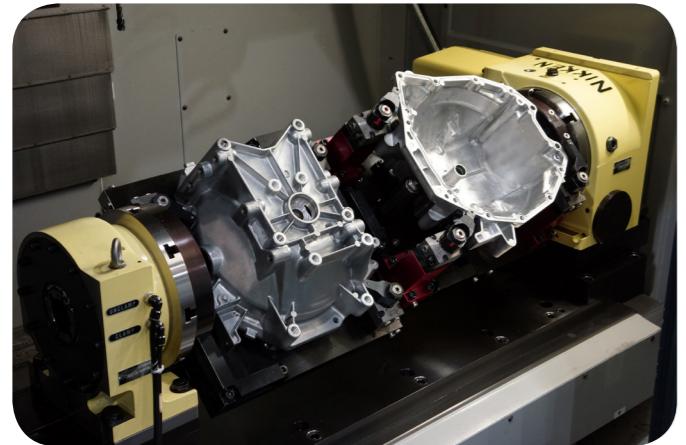
PS Series has 8 built-in nozzle outlets and 2 flexible nozzle hoses which results in increased tool life and improved machining performance.



AUTOMATION READY

Interface for Hydraulic Fixture / Rotary Work Head

Interface for hydraulic fixtures (option) can be done from the ports on table casting. The maximum number of ports available are 6 hydraulic, 8 pneumatic and 1 coolant.



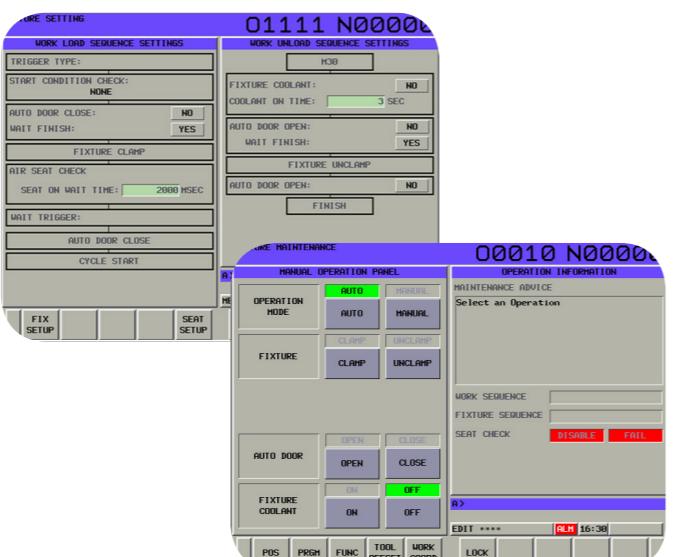
Robot Interface

With the increase in demand for automation in the global market, automating production processes to optimise the use of time, materials, human resources, maintain the highest possible quality standards and reduction of costs is needed. The PS series is equipped with optional interfaces for it to be ready for automation systems available in the market. These may include 4th axis tables, tool length measurement, spindle probe, light curtain, auto doors, and a variety of other features.



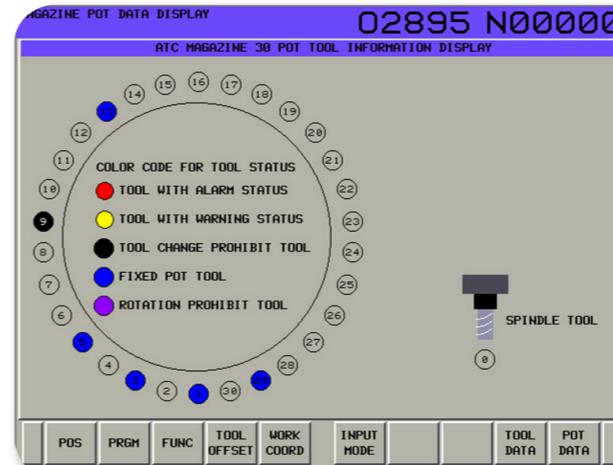
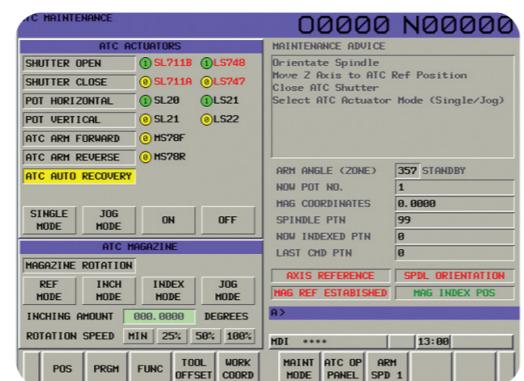
Hydraulic Fixture Control

Software interface for Hydraulic Fixture Control through touch screen operations, sequences like work load/ unload and fixture clamp / unclamp can be easily customized. The sequence logic for work loading and work unloading can be modified easily in Professional P (only by supervisor user).



ATC Recovery

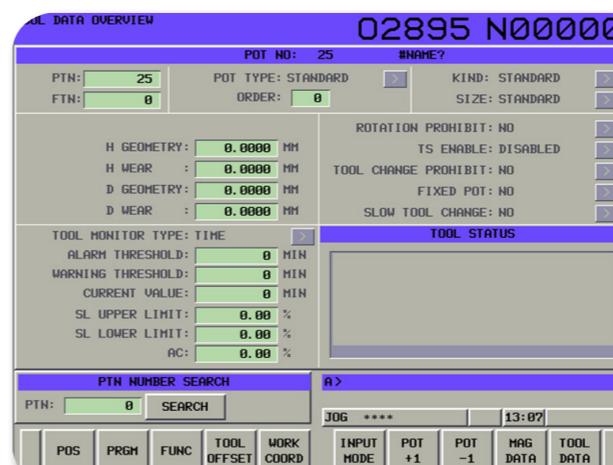
In one step, recovery is possible without remembering the sequence.



Tool Monitoring

Spindle Load (SL) monitoring

Monitors the spindle load current for each tool. If the spindle current exceeds a preset load value, it issues an alarm and shuts down the machine.



Tool Life (TL) monitoring

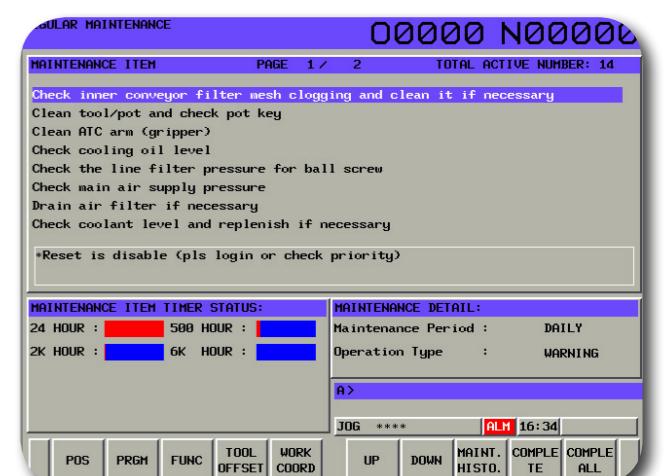
Monitors tool life according to preset tool lifetime or cutting length. If the end of tool life is reached during operation, it issues an alarm while allowing machining to continue.

Spare Tool Changing

This function allows a spare tool to be predesignated for every tool used. If a tool causes an alarm, it is automatically replaced with its spare to allow machining to proceed without interruption.

Screen Display for monitoring

The spindle load current and load current of each servo axis (XYZ) are shown on the screen in easy-to-read data during machining. Operators can easily determine the best machining conditions by checking the displayed current loads.



Maintenance and Inspection functions

Regular maintenance display

The items to be checked during regular maintenance are automatically displayed on the inspection day after 24, 500, 2K and 6K machine hours. This prevents items from being neglected during inspection.

INTELLIGENT TECHNOLOGY

Vision Broken Tool Sensor (Vision BTS)*

The Vision BTS System is located within the tool magazine outside the machining chamber and checks for tool breakage.



Tool breakage illustration

| OFFSET | | | | | | 00011 N00000 | |
|--------|-------------|--------|---------|--------|---------------------------------------------------|--------------|--|
| NO. | GEOM LENGTH | WEAR | GEOM | WEAR | RELATIVE | | |
| 001 | 200.0000 | 0.1000 | 40.0000 | 0.1000 | I X 329.6416 | | |
| 002 | 220.0000 | 0.2000 | 50.0000 | 0.1200 | I Y 255.6141 | | |
| 003 | 240.0000 | 0.3000 | 60.0000 | 0.1000 | I Z 590.4023 | | |
| 004 | 320.0000 | 0.1300 | 40.0000 | 0.2000 | IATC 0.0000 | | |
| 005 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | ABSOLUTE | | |
| 006 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | I X 329.6416 | | |
| 007 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | I Y 255.6141 | | |
| 008 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | I Z 590.4023 | | |
| 009 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | IATC 0.0000 | | |
| 010 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | MACHINE | | |
| 011 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | I X 0.0000 | | |
| 012 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | I Y 0.0000 | | |
| 013 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | I Z 0.0000 | | |
| 014 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | IATC 0.0000 | | |
| 015 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | B2> | | |
| 016 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | NO. SRH INP. C. +INP INPUT ERASE F INPUT F OUTPUT | | |

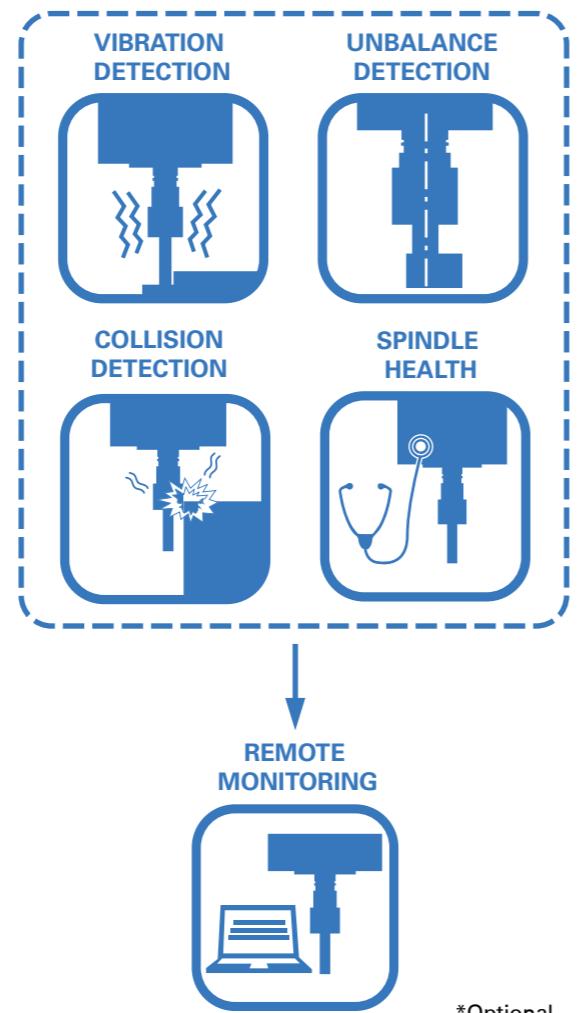
Tool verification against tool length data

Spindle Active-Care (SAC)*

With SAC, unplanned machine downtime can be eliminated by closely monitoring the operational conditions for the spindle and then evolving spindle health status. SAC uses cutting edge signal processing techniques to:

- Detect abnormal spindle impacts / vibration / unbalance and stop the machine to prevent further damages
- Monitor tool unbalance (against maximum value specified by the user) to ensure the required workpiece surface quality
- Analyse the spindle bearing health and eventually warn the operator of any unacceptable health status to allow planned maintenance

In addition, SAC provides software for remote monitoring of machine processes and spindle health status.



10

Machine Specification

| | Unit | PS65 | PS105 |
|------------------------|----------------------------------|--------|---------------------------------|
| Travels | X | mm | 660 |
| | Y | mm | 510 |
| | Z | mm | 460 |
| | Table Top to Spindle End | mm | 150-610 |
| Table | Size | mm | 920 x 510 |
| | Payload | kg | 600 |
| | Work Size (L x W x H) | mm | 920 x 510 x 460 |
| | Loading Height | mm | 950 |
| Spindle | Taper | - | #40, HSK-A63* |
| | Speed | rpm | 50 ~14,000 |
| | Power (25% ED / cont.) | kW | 30 / 18.5 |
| | Torque (15% ED / cont.) | Nm | 175 / 95 |
| Feedrate | Rapid | mm/min | 48,000 (X), 36,000 (Y & Z) |
| | Cutting | mm/min | 30,000 |
| ATC | Tool Capacity | - | 30 / 60* |
| | Tool Diameter / Length | mm/mm | 75, 125** / 300 |
| | Tool Weight | Kg | 8 |
| Power | Electrical Power Supply | V(kVA) | 380 - 415 (38) |
| Accuracy (Full Stroke) | Positioning wo-scale / w-scale | mm | JIS Standards: ±0.0025, ±0.0015 |
| | Repeatability wo-scale / w-scale | mm | JIS Standards: ±0.002, ±0.0014 |
| Machine | Floor Space (L x W) | mm | 2,480 x 3,820 |
| | Height | mm | 2,555 |
| | Weight | kg | 6,800 |

*Optional
**Alternate pockets empty

Standard Specifications □

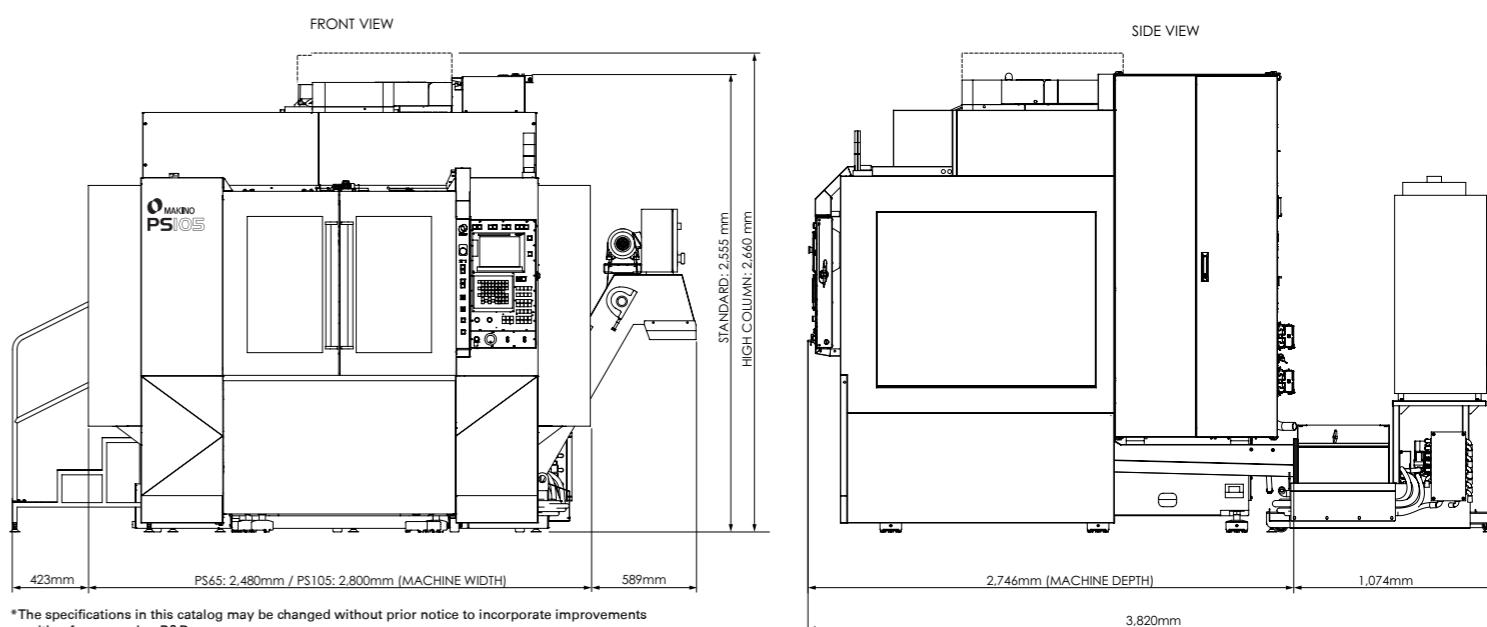
- 30-tool ATC
- Spindle 50 ~ 14,000 rpm
- Air Blow
- Ball Screw Core Cooling
- Centralized Auto Grease
- Coolant System
- Protection of spindle coolant entry for TSC
- Shower coolant
- Cooling of Axis Support Bearings
- Custom Macro Variable
- LED Light
- Fully Enclosed Splashguard
- Makino Professional P Control
- Manuals
- RigidTapping
- Portable Manual Pulse Generator
- Signal Light 3 Layer
- Spindle Temperature Controller
- Splash Guard Door Lock with ATC interlock
- Y Axis Tele-Cover Washing Coolant

Optional Specification* (•)

- High column (+150 mm)
- 60-tool ATC
- HSK-A63
- Scale feedback (X,Y,Z Axis)
- Hydraulic Fixture Control Interface
- 4th Axis NC rotary table Interface
- NC Rotary Table
- Tailstock for NC rotary table
- Splashguard autodoor
- Lift Up Chip Conveyor (Scraper Drum)
- Two-hand push button or striker switch for cycle start
- Coolant temperature control
- Through spindle coolant 1.5 MPa
- Through spindle coolant 1.5 MPa with Cyclone Filter
- Through spindle coolant 3.0 MPa
- Through spindle coolant 3.0 MPa with Cyclone Filter
- ATLM (Automatic tool length measuring device)
- AWM (Automatic workpiece measuring device)
- Power Fail Monitor
- Vision BTS
- Spindle Active-Care
- Data Server (1GB/ 2GB/ 4GB)
- AI Contour Control (AICCII)
- Robot Interface

Machine Drawings

PS65 • PS105



*The specifications in this catalog may be changed without prior notice to incorporate improvements resulting from ongoing R&D programs.
*The machines displayed in this catalog are fitted with optional equipment.
*The accuracy and output of machine may vary according to conditions of working environment.
*This product, including technical data and software, may be subjected to the Singapore Foreign Exchange and Foreign Trade Law.
* Prior to any re-sale or re-export of controlled items, please contact Makino to obtain any required authorization or approval.

**Makino Europe GmbH**

Essener Bogen 5
22419 Hamburg, Germany
+49 (40) 29809-0

4th Dobrininsky Pereulok 8
Office C13-02
119049 Moscow, Russia
+7 (495) 98982-20

www.makino.eu

Makino GmbH

Essener Bogen 5
22419 Hamburg, Germany
+49 (40) 2980 9-0

Kruichling 18
73230 Kirchheim unter Teck, Germany
+49 (7021) 503-0

Makino s.r.o.

Tuhovská 31
83106 Bratislava, Slovakia
+421 (2) 49612-100

Makino Sp. z o.o.

ul. Nowa 10, Stara Iwiczna
05-500 Piaseczno, Poland
+48 (22) 3781 950

Makino France S.A.S.

Bat. Ronsard Hall A Paris Nord 2
22 Avenue des Nations, CS 45045
95912 Roissy Charles De Gaulle Cedex,
France
+33 (1) 787843-20

Makino Italia S.r.l.

Strada Privata delle Orobie 5
20873 Cavenago di Brianza (MB), Italy
+39 (02) 959482-90

Makino Iberia S.L.U.

C/Agricultura, 16–18, 2º 4^a
08320 El Masnou, Barcelona, Spain
+34 (93) 5559515