

SPEEDIO

R450Xd1

R650Xd1

R650Xd1^{40Tools}

Compact Machining Center
Equipped with Pallet Changer



Machine Tools Sales Department,
Machinery Business Division,
Brother Industries, Ltd.

SPEEDIO R-Series Introducing the **R450Xd1 / R650Xd1**

- 1.** Description of ***SPEEDIO***
- 2.** Advantages of Pallet Changing
- 3.** **R450Xd1 / R650Xd1** Features

Cutting Out the Waste

Times are changing. Are you ready?
You need a machine that's fast and compact.
With the ability to make any cut.
In this world, only the strong survive.
Make it better with SPEEDIO.

SPEEDIO



SPEEDIO

SPEEDIO is a brand of No. 30 machine for customers who demand high productivity, which has high machining ability while having compactness and speed not found in No. 40, and is eco-friendly

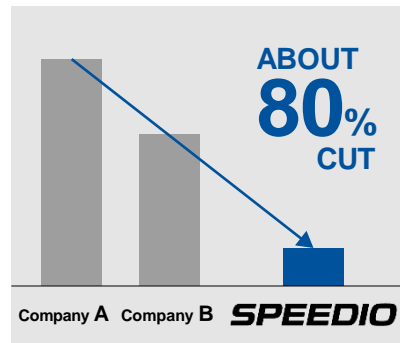




SPEEDIO for the Environment Looking to Achieve Carbon Neutrality

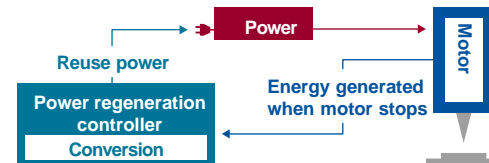
While retaining the #30 spindle, and based on Brother's original technology, the **SPEEDIO** strives for industry-leading environmental performance, in addition to overwhelming high productivity, machining capabilities, and usability.

When machining is performed by replacing a general #40 machining center with the **SPEEDIO**



Power-Saving Functions

Power Regeneration system



Power consumption application



- LED work light
- Coolant automatically turns OFF
- Standby mode
- Machine light automatically turns OFF
- Display automatically turns OFF
- High efficiency pump, etc.

R

SPEEDIO

R450Xd1
R650Xd1
R650Xd1 40Tools

Compact Machining Center
Equipped with Pallet Changer



S Compact Machining Center

S300Xd1 S500Xd1 S700Xd1



W Wide Stroke
Compact Machining Center

W1000Xd1



M Compact Multitask Machine

M200X3 M300X3



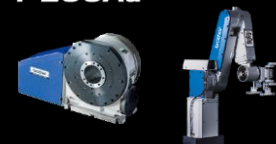
F High Rigidity
Compact Machining Center

F600X1



Special Options

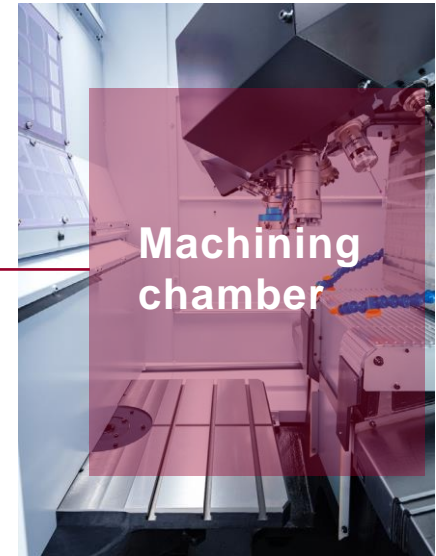
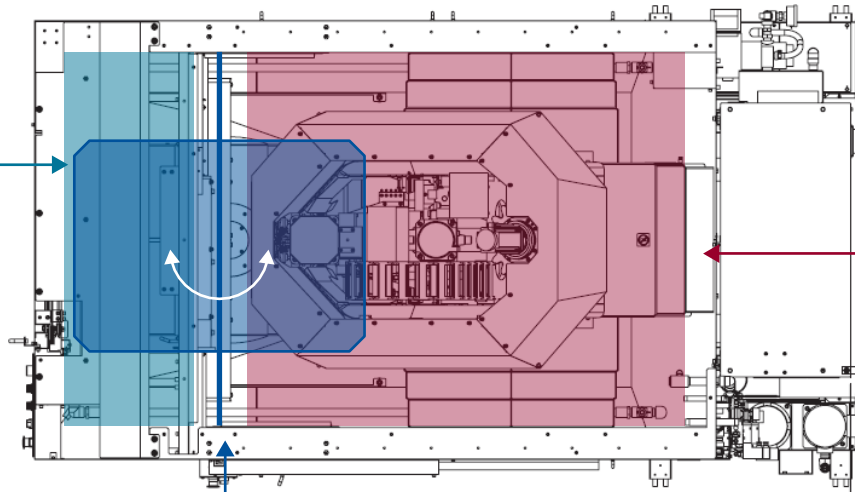
T-200A/ BV7-870
T-200Ad



2. Advantages of Pallet Changing

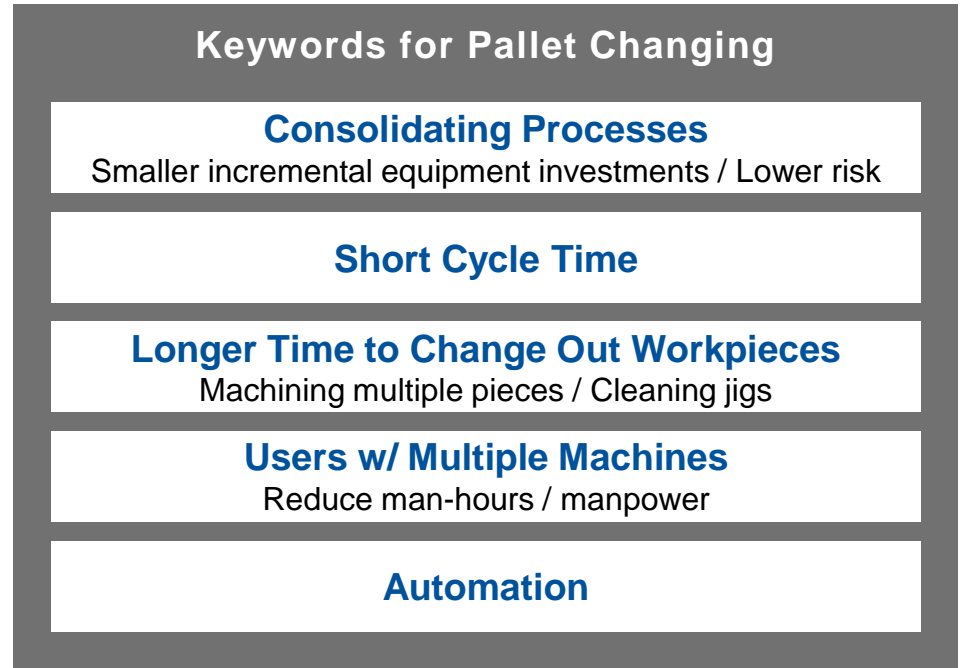
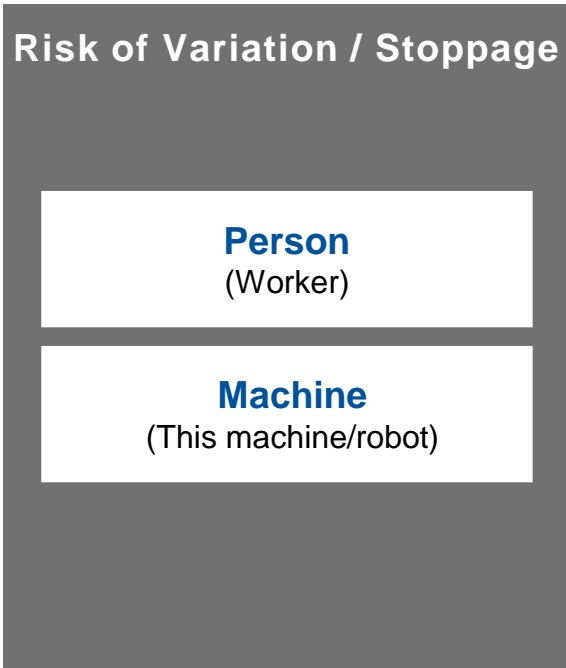
Pallet changer provides high and consistent productivity, eliminating loss when changing workpieces

The middle partition separates the **“machining chamber”** from the **“work setup area”**. The turn table allows the workpieces to be changed out quickly by **positioning the work setup area on the outside**. High productivity is possible because the pallet is changed only while machining is stopped.



When is the pallet changed out?

“Keywords” that demonstrate the efficiency of pallet changing



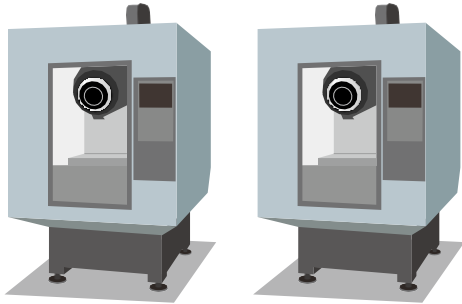
① Consolidating Processes

Consolidating 2 Job Production with 1 Machine

Jobs done on two separate machines ⇒ Consolidate jobs on one machine.

The R-Series models equipped with a pallet changer can help improve productivity further.

No pallet changer



1 piece completed in
115 sec.

Dependent on slowest
cycle time

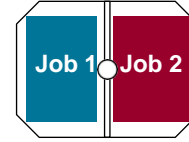
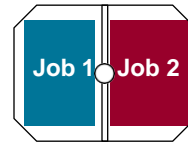
Job 1
90 sec. cycle time

Job 2
100 sec. cycle time

(15 sec. to change out workpieces)



R450Xd1



(3 sec. to change out pallets) (3 sec. to change out pallets)

1 piece completed in
98 sec.

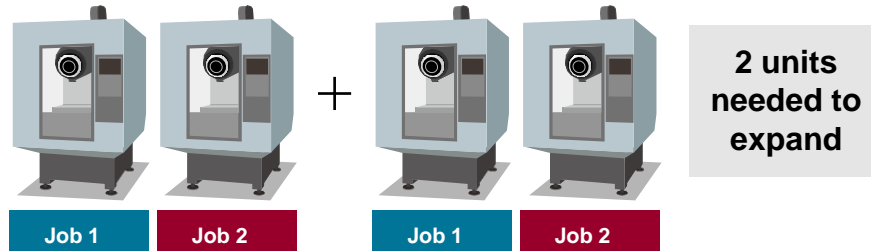
Better line
efficiency and
balance increases
productivity

① Consolidating Processes – Additional Benefits

The Right Capital Investment

Smaller equipment investments to incrementally expand and add equipment is possible based on customer's production volume.

No pallet changer



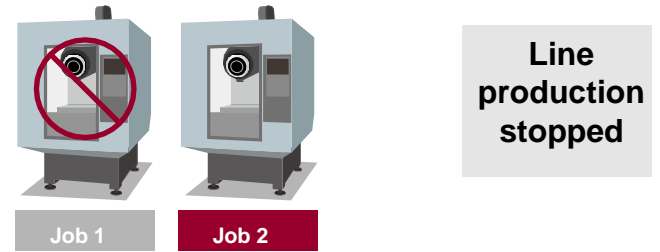
R450Xd1



Lower Risk

Even in the event that a problem occurs, its impact can be minimized.

No pallet changer



R450Xd1



② Short Cycle Time

For Machining Time Target of Under 90 sec.

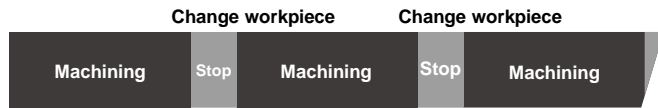
When the machining time is a short cycle, changing out the workpieces ends up taking more time on a single table machine and productivity decreases.

The R-Series models equipped with a pallet changer **eliminates wasted time while changing out the workpieces, providing higher productivity.**

Breakdown of Cycle Time

Ex: Machining time: 60 sec. + Changing out workpieces: 15 sec.

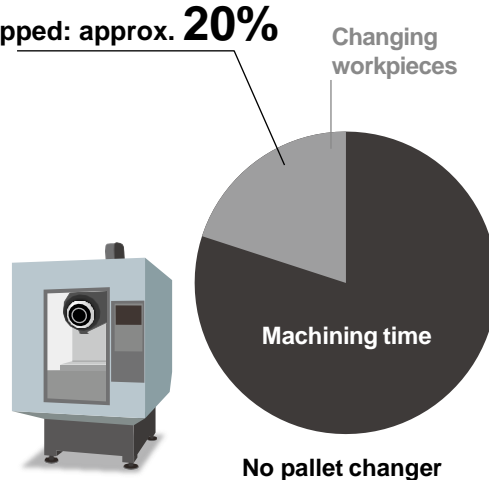
No pallet changer



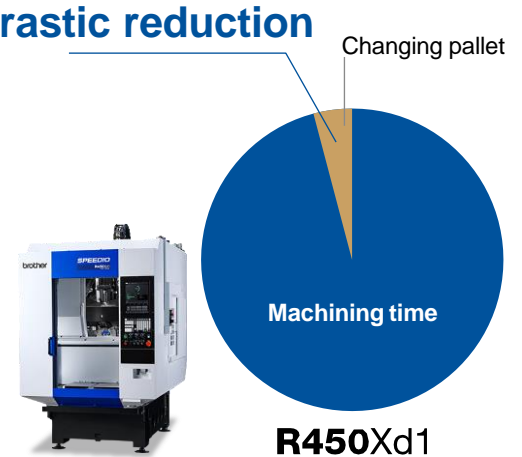
R450Xd1



Machining stopped: approx. **20%**



Drastic reduction



③ Longer Time to Change Out Workpieces

Machining Multiple Workpieces

All workpieces need to be removed and attached together at once.

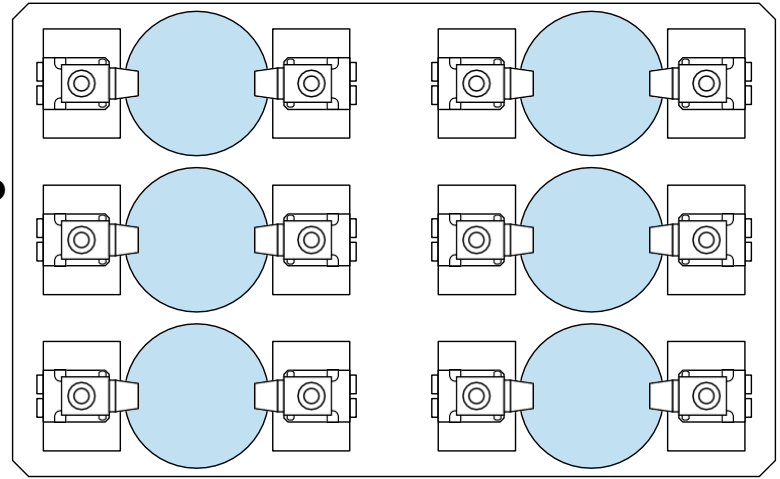
Jig Cleaning

When chips or shavings stick to the jig, it can lead to poor machining accuracy. Cleaning the jigs sufficiently takes time.

Manual Jig

Universal jigs require tightening screws like in manual clamps

⇒ Despite a lower cost, **changing out workpieces takes time.**



R-Series models equipped with a pallet changer **change out workpieces more efficiently, and allow workers to clean jigs or change workpieces outside the machining chamber.**

Better Quality & Productivity

④ Users w/ Multiple Machines

Helping Reduce Man-Hours / Manpower

Workpieces can be changed out during machining cycles on R-Series models equipped with a pallet changer
⇒ **This helps reduce man-hours by minimizing stoppage while changing workpieces.**

No pallet changer



R450Xd1



Workpieces cannot be changed until machining is finished

Must wait by machine until machining is finished
⇒ Time of workers is wasted and there is loss in productivity

Setup outside of chamber allows workpieces to be changed during machining cycle

Pallet change allows machining on next workpiece to be started immediately after previous machining is finished.
⇒ **1 worker can manage multiple machines** at the same time, **reducing manpower** and providing **consistent production output.**

Automation

Changing workpieces with a robot

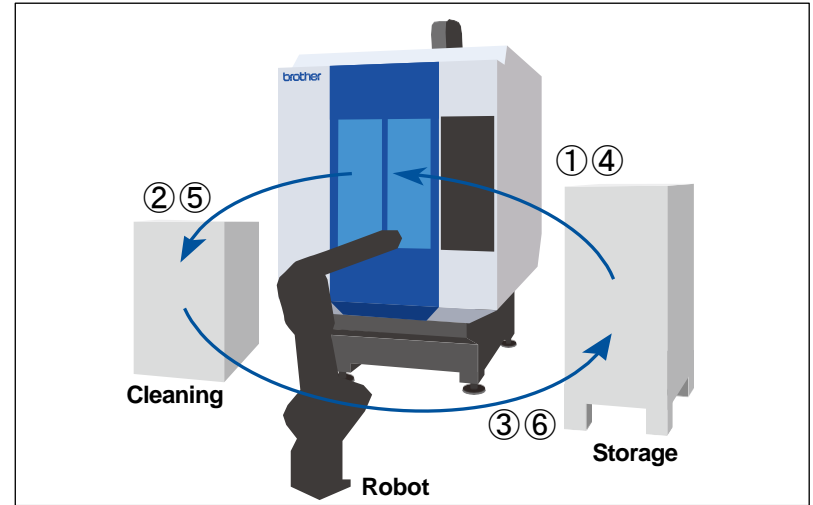
→ **Consistent production output** is possible but **less speedy**

Setting up workpieces outside the chamber is perfect for creating a flexible robot cycle that includes peripheral equipment

R-Series models equipped with a pallet changer

When combined with a multi-joint robot:

Provides consistent and high productivity and automation



Automation example:

Machining 2 workpieces on system with cleaning device

1st workpiece flow ① Machining ② Cleaning ③ Storage

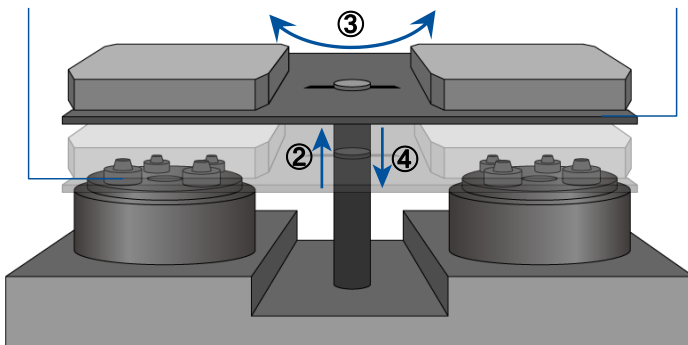
2nd workpiece flow ④ Machining ⑤ Cleaning ⑥ Storage

Quick Pallet Change and High Reliability

Standard Pallet Changer

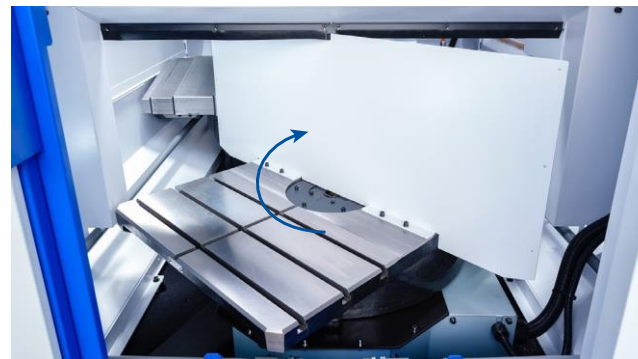
Chips or shavings on tapered cone
→ Accuracy adversely affected

Chips or carbon sticks to fork
→ Pallet drops down



① Unlocks ② Lift goes up ③ Rotates 180° ④ Lift goes down ⑤ Locks

Brother's Quick Table (QT)



① Unlocks ② Rotates 180° ③ Locks

Models equipped with QT: More than 22,000 units shipped since 1992

Non-lift type:




No risk of chips or shavings on tapered cone or coolant entering inside

Stable positioning:

Unique stopping system without backlash

3. R450Xd1 / R650Xd1 Features

3 Types w/ Pallet Changer Available Depending on Application

Compact Machining Center SPEEDIO	R450Xd1 	R650Xd1 	R650Xd1 40Tools 
Travel range for X- / Y- / Z-axes	450 mm / 320 mm / 305 mm	650 mm / 400 mm / 305 mm	650 mm / 400 mm / 435 mm
Maximum spindle speed	10,000 min ⁻¹ (Option) 16,000 min ⁻¹ , 10,000 min ⁻¹ high-torque spec.		
Tool quantity	14 tools (Option) 22 tools / 28 tools		40 tools
Spindle option	BT dual contact system, Coolant-through-spindle (CTS) withstand pressure 3.0 MPa / 7.0 MPa		

*CTS air pressure refers to the piping specification.

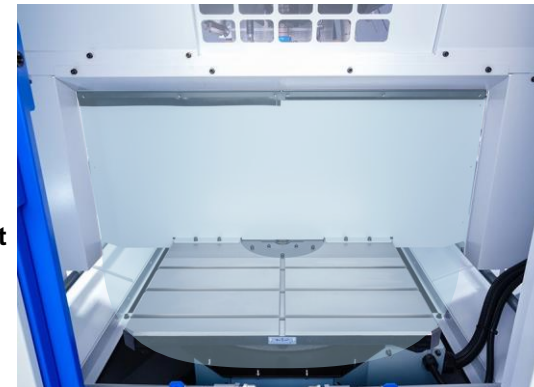
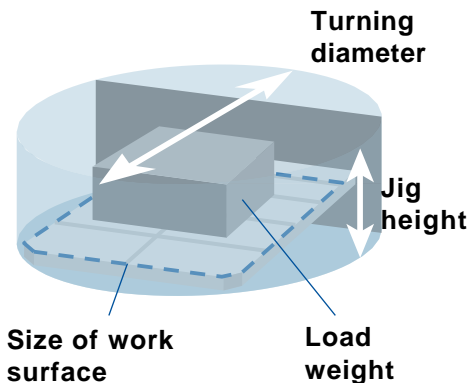
R450Xd1 / R650Xd1 Load Specifications

R450Xd1

Small Footprint with High Productivity Using Pallet Change

R650Xd1

Consolidates Processes Even More When Processing Multiple Workpieces and Using Rotary Table



	R450Xd1	R650Xd1
Size of work surface (mm/side)	600 × 300	800 × 400
Max. turning diameter (mm) *1	1100 (1020)	1300 (1250)
Max. jig height (mm) *2	380 (300)	450 (350)
Max. load weight (kg/side) *3	200 (120)	300 (200)

*1 When the option to extend the turning diameter is selected.

*2 When the low table specification option is selected.

*3 Parameter settings must be adjusted.

*4 Values in parentheses are for the standard specification.

40-Tool Magazine × Pallet Change

Most Versatile *SPEEDIO*

ATC equipped with double-arm.

Using a separate magazine structure allows for a longer 250 mm tool length.

When combined with a Z-stroke extension of +130 mm, the long drill can exceed 200 mm reach for machining.

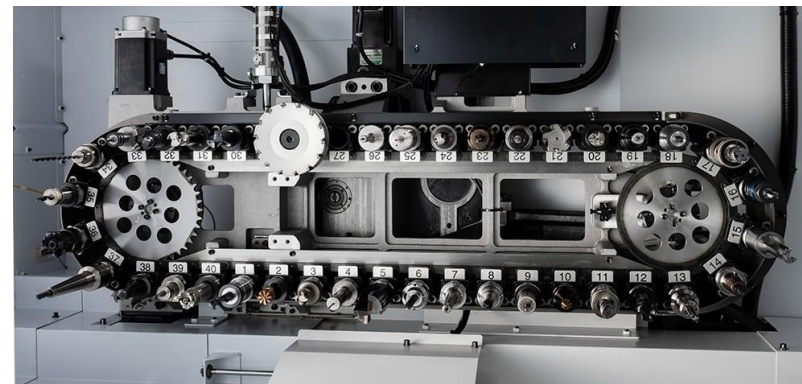
Tool storage capacity	40 tools
Maximum tool weight	4 kg
Maximum tool length	250 mm
Maximum tool radius*1	125 (55)

*1 No adjacent tool. Value in parentheses is with adjacent tool.

Separate machining and magazine chambers



When changing tools



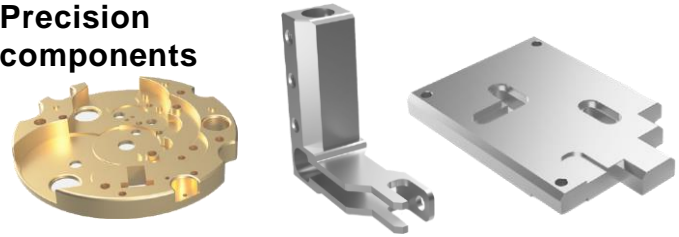
Sample of Workpieces Machined

Supporting a broad range, from mass production of automotive parts like valves, to production of different types and various quantities like precision components

Automotive



Precision components



Valves



New Design and New User Interface in R-Series



R450Xd1



R650Xd1



14/22/28Tools



40Tools



CNC-D00

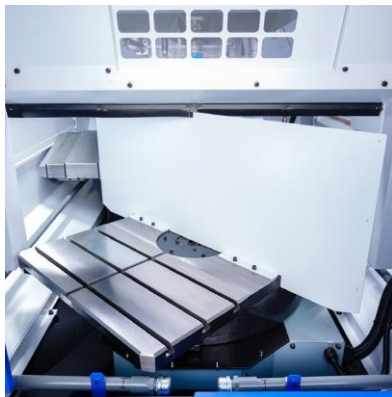


Quick Table and optimal tool magazine selection provides high production machining without waste



① Tool magazines

Various magazine setups available: 14, 22 and 28 tool capacities (Turret type) as well as a 40 tool capacity (Double arm type).



② Quick Table

Faster pallet change time.

③ Jig support

Extended jig area with low table, additional quantity option.



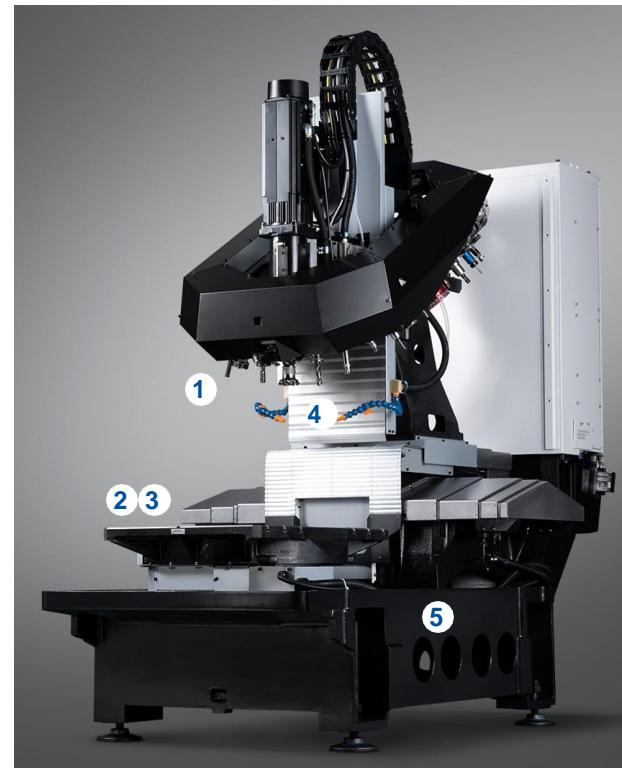
④ Spindle

Coolant Through Spindle (CTS) Max. 7.0 Mpa (Option)



⑤ Chip Discharge

Improved slope on center trough base



Advancements in R-Series



**Pursuing High
Productivity**

**Expanding
Functionality**

**Advanced,
New D00 Control**

**Constantly
Improving Reliability**

Advancements in R-Series



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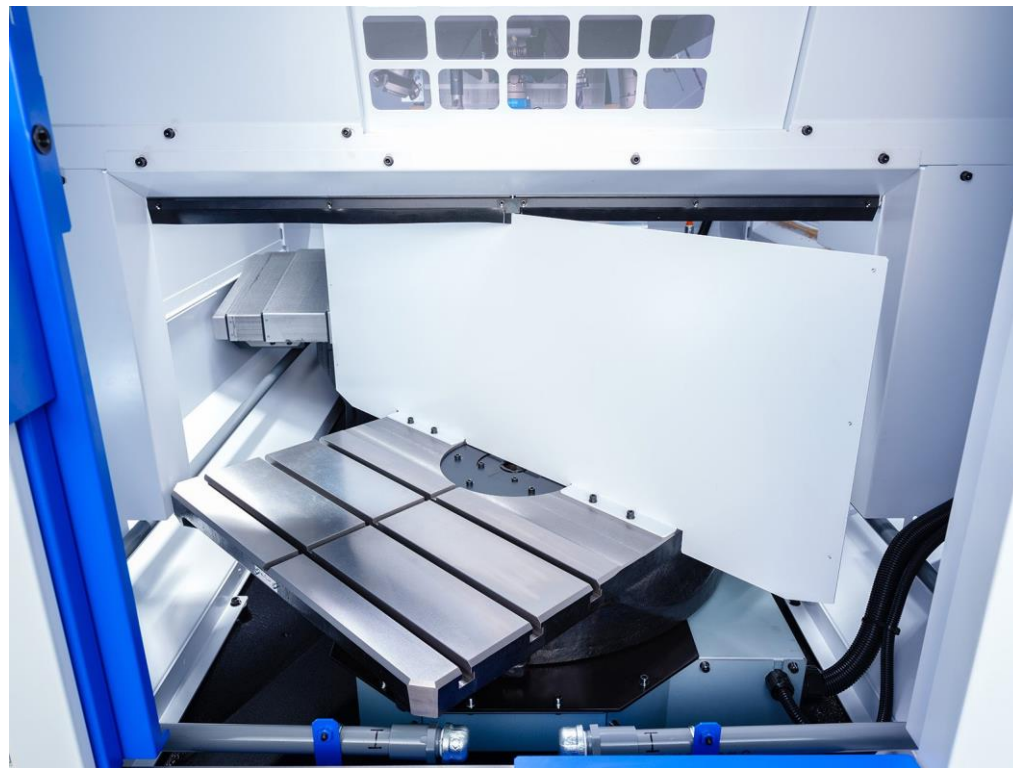
Pursuing High Productivity

Eliminated Unnecessary Non-Machining Time for Much Higher Productivity

Our optimized pallet control shortens the change time even further, leaving our competition far behind.

Pallet change time*	Xd1	Compared to X2
R450Xd1	2.7 sec.	Approx. 0.2 sec. faster
R650Xd1	3.1 sec.	Approx. 0.3 sec. faster

*Load conditions per side R450Xd1: 120 kg, R650Xd1: 200 kg



Eliminated Unnecessary Non-Machining Time for Much Higher Productivity

“Non-stop ATC” **eliminates wasted, unnecessary time** during tool changing, positioning and switching from machining to non-machining operation.

R450Xd1	14MG	22/28MG
Tool-Tool	0.6 sec.	0.7 sec.
Chip-Chip	1.3 sec.	1.5 sec.

R650Xd1	14MG	22/28MG	40MG
Tool-Tool	0.6 sec.	0.8 sec.	0.9 sec.
Chip-Chip	1.4 sec.	1.5 sec.	2.5 sec.

Low inertia motor shortens spindle start / stop times

Optimized operation, **eliminating unnecessary operation in magazine control**

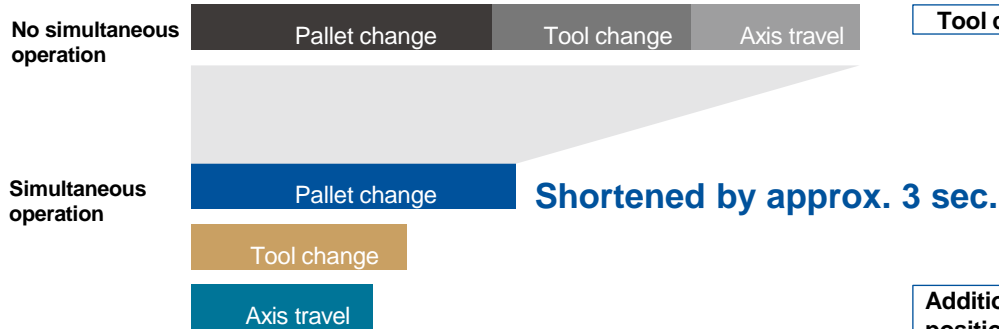
Highly responsive servo
for smooth acceleration / deceleration



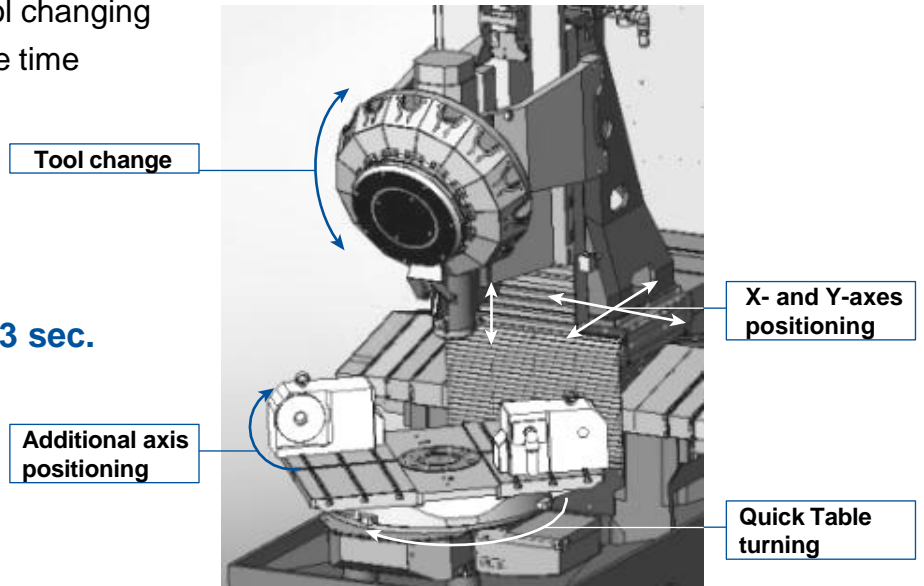
Pursuing High Productivity

Eliminated Unnecessary Non-Machining Time for Much Higher Productivity

Operation control is possible for simultaneous QT turning, tool changing and axis positioning operations.* Shortening the pallet change time provides even better productivity.



*Optional specification to extend the turning diameter may limit operation.



Advancements in R-Series



**Pursuing High
Productivity**

**Expanding
Functionality**

**Advanced,
New D00 Control**

**Constantly
Improving Reliability**

Expanding the Breadth of Machining + α

Turret Type ATC Equipped with 28 Magazines

Heightened demand for part modules and consolidating processes

→ Need for more tools

ATC with 28 magazine capacity available using same amount of floor space

Space-Savings and High Productivity w/ Direct ATC
SPEEDIO Original ATC Magazine

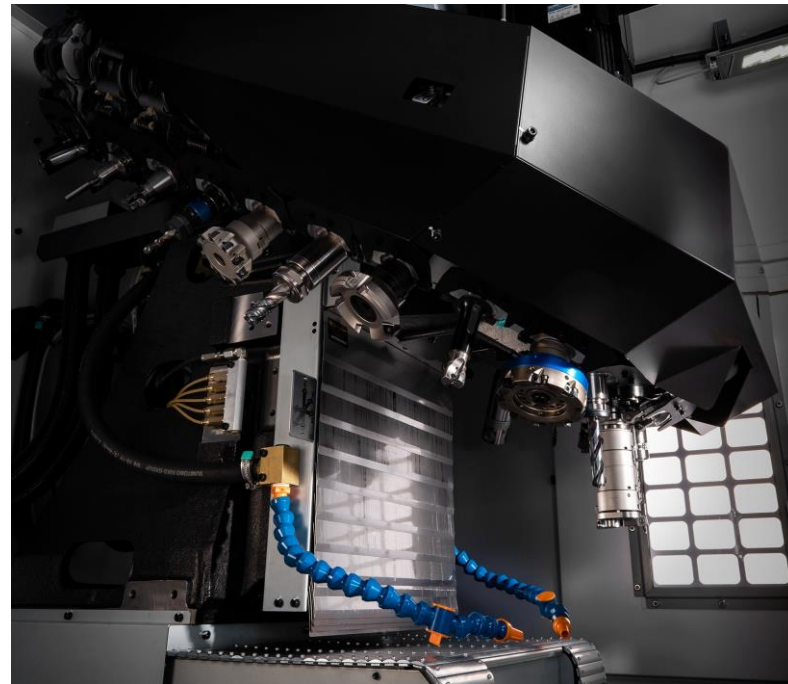
Tool change time	28MG
Tool-Tool	0.7 sec. (0.8 sec.*)
Chip-Chip	1.5 sec.

*R650Xd1

Users can select from our various models to find the right capacity to match their workpieces and lots.

ATC Magazine Capacities

14 tools	22 tools	28 tools	40 tools
	R450Xd1		
		R650Xd1	



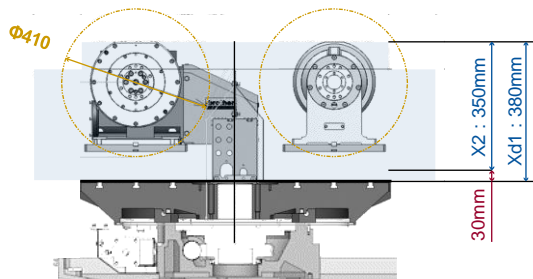
Expanding Functionality

Expanding the Breadth of Machining + α

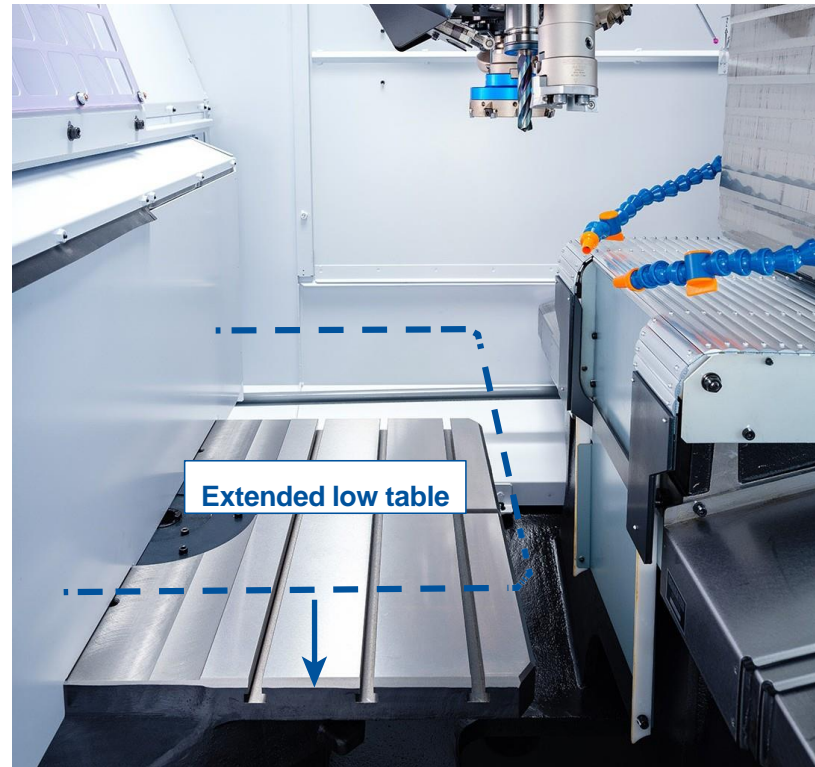
Low Table Option Extends Jig Area

Heightened demand for rotary table to consolidate processes
 → Low table option can support extending the jig height

Ex: **R450Xd1**



*Low table spec.	Jig height	Base comparison	Compared to X2
R450Xd1	380 mm	+80 mm	+30 mm
R650Xd1	450 mm	+100 mm	+30 mm



Expanding the Breadth of Machining + α

Coolant Through Spindle (CTS) Max. 7.0 MPa

Improved chip discharge for deep hole drilling and machining difficult materials.
Machining with better efficiency.



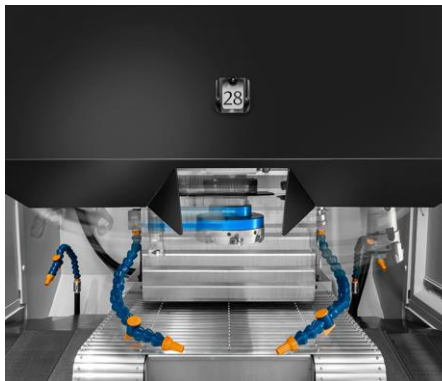
Machining example

Φ6 x 170 non-step
Material: S45C



*Coolant-through-spindle with 7.0 MPa air pressure only applies to the piping.
Customers must make separate arrangements for the pump and tank.

Select Coolant Nozzle Specifications



Fixed to column*

Coolant can be supplied more easily to machining points even if the tool length varies.



Fixed to spindle head (New)

Coolant can be supplied more easily to machining points even if the machining height varies.

Coolant nozzle specification can be selected to match the customer's jigs and machining conditions.

*For R650Xd1 40 tools, available only for Head coolant nozzle.

Advancements in R-Series



Pursuing High
Productivity

Expanding
Functionality

**Advanced,
New D00 Control**

Constantly
Improving Reliability

Global Standard User Interface



Received “iF DESIGN AWARD 2021”
one of the top 3 design awards in the world.

Increased screen size
12.1-inch → 15-inch



Our standardized touch panel is made for onsite work conditions

- User operation like a smartphone
- Safe to use onsite

Consolidated Access on New Home Screen

Home Screen

Cycle time

Remaining time can also be displayed

Workpiece counter

Workpiece counters enabled in program are displayed

Tool life

5-tool display, starting from tool with shortest tool life

Support application keys



Program

Shortcut keys

Previous Screen

Touch panel can be changed to previous screen that user is accustomed to



Advanced User Interface Equipped with new “Support Applications” to help the user with everyday tasks



More Visibility

Production performance



Task support

ATC tools

Tool ID	Tool Name	Status
001	TAP DR. 0 PL. 15	稼働中
002	DRILL DR. 0	稼働中
003	003-TAP DR. 0 PL. 5	稼働中
004	DRILL DR. 0	稼働中
005	TAP DR. 0 PL. 9	稼働中
006	005-DRILL DR. 0	稼働中
007	DRILL DR. 0	稼働中
008	002-DRILL DR. 0	稼働中
009	TAP DR. 0 PL. 9	稼働中
010	DRILL DR. 0	稼働中
011	001-SPRING DR. 0	稼働中
012	011-TAP DR. 0 PL. 25	稼働中
013	011-SPRING DR. 0	稼働中
014	011-SPRING DR. 0	稼働中
015	011-TAP DR. 0 PL. 5	稼働中
016	004-DRILL DR. 0	稼働中
017	004-DRILL DR. 0	稼働中
018	004-DRILL DR. 0	稼働中
019	003-DRILL DR. 0 PL. 0	稼働中

Operational performance



Recovery support / Check

- 1. E1ボタンキーを押してください。プログラムの実行が完了します。
- 2. 手動運転モードにしてください。
- 3. 3番目以降の項目を確認し、問題が解消しない場合は、図説を参照して確認してください。
- 4. 図説の操作を参照し、E1ボタンを押してください。

Power consumption



Shorten cycle time settings

Tool ID	Tool Name	Setting 1	Setting 2	Setting 3
MC70	インボリジョンチェック	0.000	0.000	0.000
MC71	インボリジョンチェック	0.000	0.000	0.000
MC72	インボリジョンチェック	0.000	0.000	0.000
MC73	インボリジョンチェック	0.000	0.000	0.000
MC74	インボリジョンチェック	0.000	0.000	0.000
MC75	インボリジョンチェック	0.000	0.000	0.000
MC76	インボリジョンチェック	0.000	0.000	0.000
MC77	インボリジョンチェック	0.000	0.000	0.000
MC78	インボリジョンチェック	0.000	0.000	0.000
MC79	インボリジョンチェック	0.000	0.000	0.000

Many New Convenient Functions Added

■ Tap override

Spindle and cutting **Override Enabled** during tapping operation

***Tap return recovery operation also enabled**

*Excluding end mill tapping (G177/178)

■ Cycle time log

Keeps the most recent **20 records** for cycle time

■ Tool log

After selecting a record from the cycle time log,

the **cutting time of each tool** in that program **can be displayed**

■ Additional functions

- Accessories
- Multi-skip
- Program restart from (automatically) saved position
- Measure time for specified part
- Load monitor and predict overload display
- Multiple block support in MDI operation
- External sub program call
- Added new ST/FBD languages to internal PLC



実行開始日時	プログラム P	番線	サイクルタイム	切削時間	非切削時間	準備時間
2020/06/03 15:51:29	1011	1	NC	0000:00:54.8	0000:00:54.8	---
2020/06/03 15:52:41	1011	1	MC	0000:00:00.2	0000:00:00.2	---
2020/06/03 15:53:29	1010	1	MC	7:0000:00:00.2	0000:00:00.2	---
2020/06/03 15:54:04	1011	1	MC	7:0000:00:00.9	0000:00:00.3	---
2020/06/03 15:55:26	1011	1	MC	7:0000:00:00.2	0000:00:00.2	---
2020/06/03 15:56:09	1010	1	MC	7:0000:00:00.8	0000:00:00.2	---
2020/06/03 15:56:53	1011	1	MC	7:0000:00:00.6	0000:00:00.0	---
2020/06/03 15:58:13	1011	1	MC	7:0000:00:00.6	0000:00:00.0	---
2020/06/03 15:58:43	1011	1	MC	7:0000:00:00.1	0000:00:00.9	---
2020/06/03 15:59:34	1012	1	MC	7:0000:00:00.1	0000:00:00.3	---
2020/06/03 15:59:47	1012	1	MC	7:0000:00:00.9	0000:00:00.0	---
2020/06/03 15:59:52	1010	1	MC	0000:00:32.7	0000:00:19.4	---
2020/06/03 16:01:23	1010	1	MC	0000:00:32.8	0000:00:23.4	---
2020/06/03 16:02:18	1010	1	MC	0000:00:28.7	0000:00:19.3	---
2020/06/03 16:03:01	1010	1	MC	7:0000:00:38.8	0000:00:10.1	---
2020/06/03 16:03:49	1010	1	MC	7:0000:00:38.9	0000:00:10.0	---
2020/06/03 16:04:32	1010	1	MC	7:0000:00:38.9	0000:00:10.0	---
2020/06/03 16:05:23	1010	1	MC	7:0000:00:38.4	0000:00:00.6	---
2020/06/03 16:05:59	1010	1	MC	7:0000:00:38.9	0000:00:00.0	---
2020/06/03 16:06:49	1010	1	MC	7:0000:00:38.1	0000:00:00.1	---

Cycle time log



番号	工具番号	切削時間
1	1	0000:00:02.7
2	2	0000:00:03.3
3	3	0000:00:03.3
4	4	0000:00:03.3
5	5	0000:00:03.3
6	6	0000:00:02.7

Tool log



Accessories



Load monitor

Hardware Specifications Upgrade

■ Faster block processing speed

Block processing is 4 times faster

■ More look ahead blocks in high accuracy mode B

Standard 40 → **160**

Option 200 → **1000**

■ Increased memory capacity, more workpiece zero point settings

◎ Memory capacity

Standard 100 MB → **500 MB**

Option 500 MB → **3 GB**

(Up to 4000 record files for both)

◎ Extended workpiece coordinate zero setting combinations

48 → **300**

■ Doubled tool data capacity (NC only)

99 → **198**

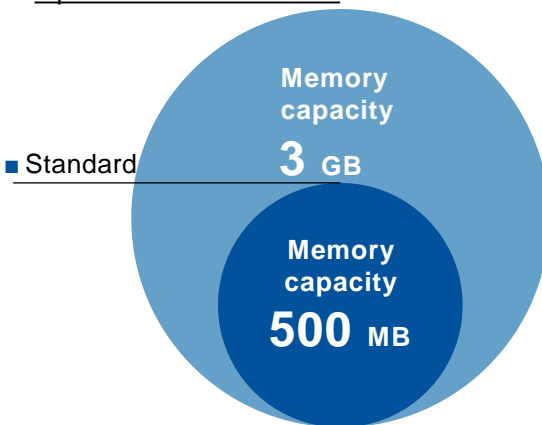
Tool life unit can be set to seconds

3D machining
workpiece example



■ Option

■ Standard



*Data comparison with CNC-C00

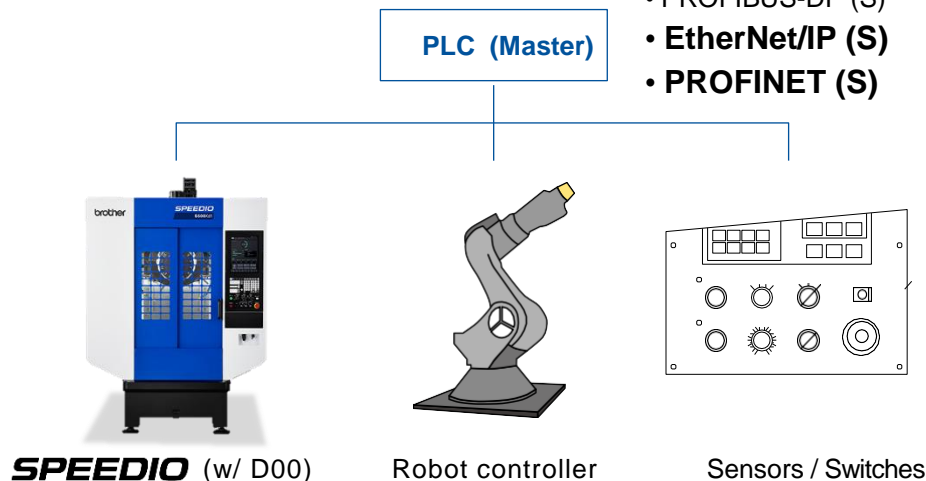
CNC-D00: Strengthened Network Functionality

Added Compatible Standards

Added 2 types of industrial Ethernet:

Ethernet/IP and PROFINET to use on fieldbus networks, making the connection easier for users.

- CC-Link (M/S) *1
- Device Net (S)
- PROFIBUS-DP (S)
- **EtherNet/IP (S)**
- **PROFINET (S)**



Support also for OPC UA

Users can now connect directly to other companies' monitor software that is compatible with OPC UA.



*1 PLC (Master) is not necessary for CC-Link (Master).

*2 Only 1 type can be selected from all the options for the fieldbus network.

Advancements in R-Series



Pursuing High
Productivity

Expanding
Functionality

Advanced,
New D00 Control

**Constantly
Improving Reliability**

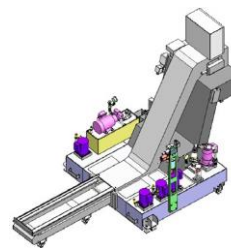
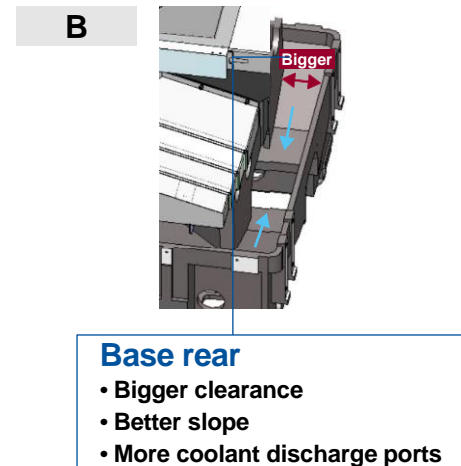
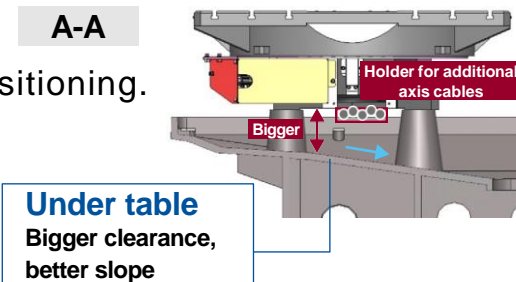
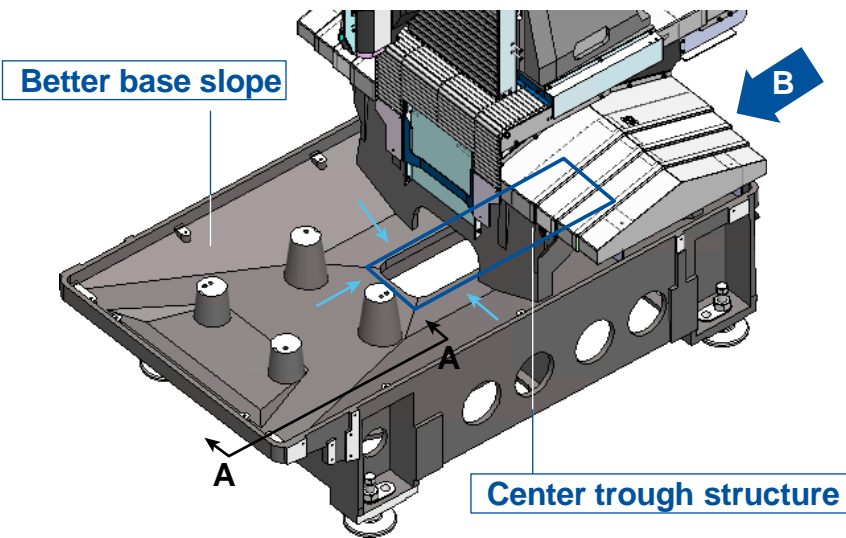
Constantly Improving Reliability

Revised Base Shape for Better Chip Discharge

Adopted center trough structure and improved base slope.

Revised clearances to prevent chip buildup.

Preventing chip buildup with coolant discharge positioning.



Residual chips on base
Residual factor: 0.2% R450Xd1
2.0% R650Xd1

*An example of our evaluation by aluminum work processing

Constantly Improving Reliability

Better Control Unit Reliability

No batteries in servo motor encoder*

No loss of position information in servo motor caused by batteries expiring
→ Less risk of machine stoppage

*Batteries for clock function required

No PCB fuses

Changed from replaceable fuses to semiconductors using thermal detection

- Fuses do not need to be replaced due to self-reset
- Reduces misdetection of overcurrent caused by noise
- Current limit function reduces PCB failure caused by misconnection

Fan speed detection function

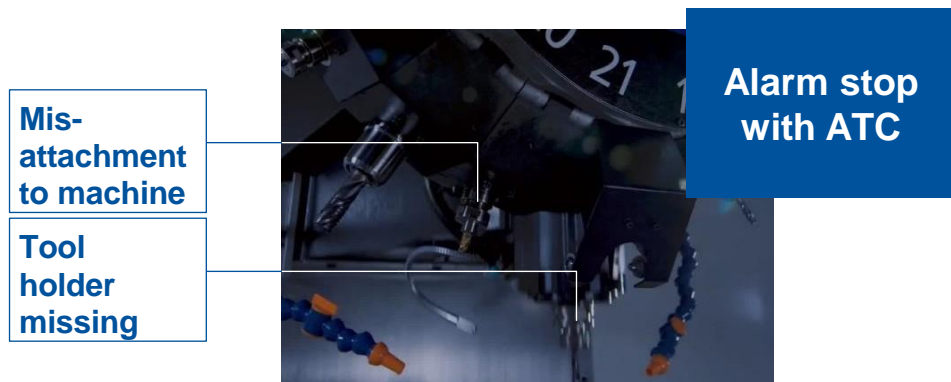
Warning issued when fan stops, preventing equipment failure due to fan defect

Constantly Improving Reliability

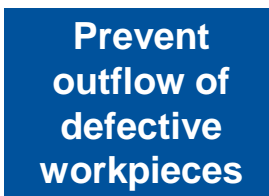
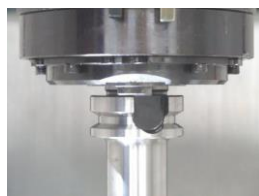
Support for Faulty Workpiece Detection & Machine Collision Avoidance

■ ATC monitoring function

Detects problems due to attachment errors or in the event that a tool is forgotten.

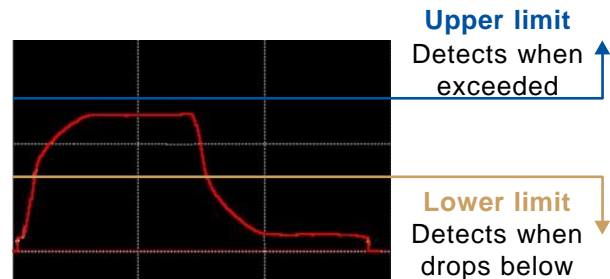


*R650Xd1
40-tool spec. not supported



■ Machining monitoring function

Detects increase in machining load.
Prevents outflow of defective workpiece caused by double machining.



R450Xd1 / R650Xd1 Basic Specifications

Item			R450Xd1	R650Xd1	R650Xd1 40Tools
Spindle	Speed	min ⁻¹	10K / 10KH / 16K		
	Tool	-	BT / BBT		
	Coolant-through-spindle withstand pressure		3.0 MPa / 7.0 MPa*		
Travel range	X-axis	mm	450	650	
	Y-axis	mm	320	400	
	Z-axis	mm	305	305	435
Feed axis	Rapid feedrate X×Y×Z	m/min	50 × 50 × 50		
Table	Size of work surface	mm	600 × 300 Jig height: Std. 300 Low table 380	800 × 400 Jig height: Std. 350 Low table 450	
	Max. load weight	kg	120 (200)	200 (300)	
Tool changer	Method	-	Direct type	Direct type	Double arm type
	Tool storage capacity	Tool qty.	14 / 22 / 28	14 / 22 / 28	40
Chip discharge		-	Center trough system (Compatible with chip conveyor)		
NC control unit		-	CNC-D00 control		

*CTS withstand pressure is a piping specification.

Cutting Down Wasted Time to Zero with Pallet Changer

SPEEDIO productivity coupled with pallet changer **minimizes wasted time when changing workpieces**

Strengthened Functionality, Optimal for Reducing Man-Hours

- Standard equipped **pallet changer** is **faster**
- **Center trough** provides even better **chip discharge**
- **28 tool capacity** available using **same** installation **footprint**
- **Less maintenance** when cleaning chips with **chip conveyor** option setting



brother
at your side