MC20III

MultiStationMachiningCell

CITIZEN

MultiStationMachiningCell
Achieves mass customization

By combining three machining modules in a multi-station configuration, the MC20 will support a variety of machining layouts to enable ultra-high productivity levels. Machining processes can also be optimised through the Cincom dynamic control software that supports highly flexible operations thus making 'Ko No Ryosan' (mass customization) a reality. Expanded clearance between two modules helps improve working efficiency during tooling.

Modular Concept

The Citizen MC20 comprises three similar modules able to provide a turnkey solution in a single dedicated machine with a high degree of flexibility to blend the customer's requirements with Citizen's technology.

Each module comprises a headstock that can be equipped with a variety of chucking systems and a gang tool post that can accommodate up to 6 tools. "Optimization of the machining processes" is achieved by selecting the right combination of modules to shorten machining times and create ultra-high levels of productivity.

Using modules of the same type also lessens the burden on users by reducing any stocks of spares, shortening the time needed to learn and train machine setters and support staff.

Basic construction and axis configuration

Conventional machining line

Gantry Loader
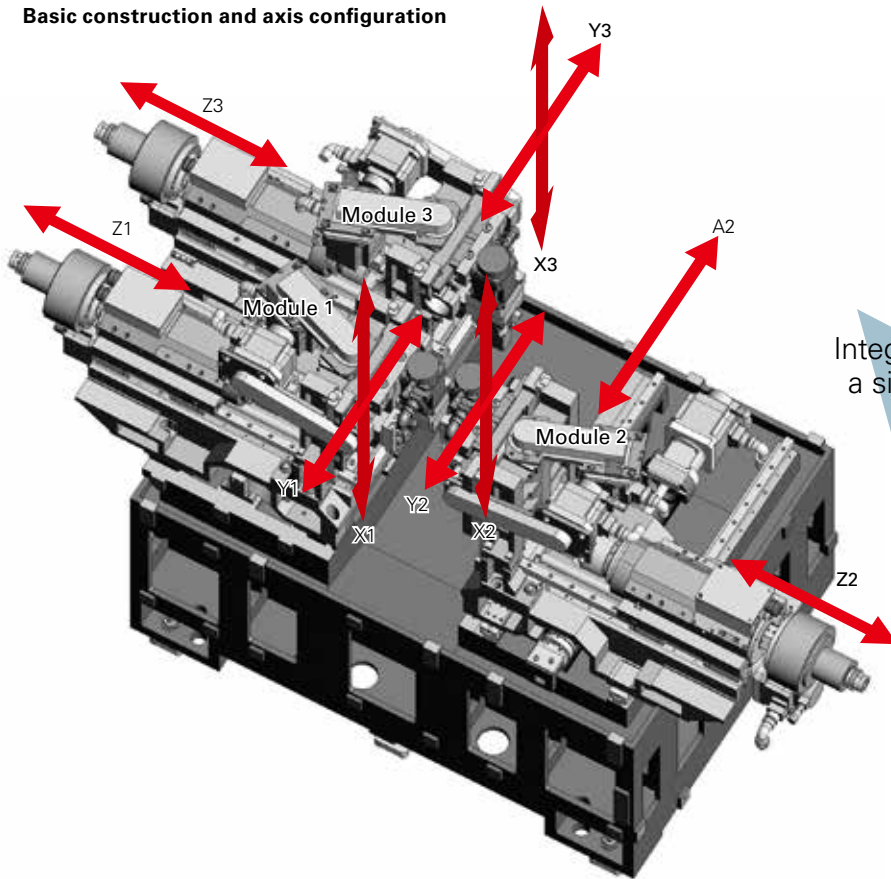
Integrated into a single unit
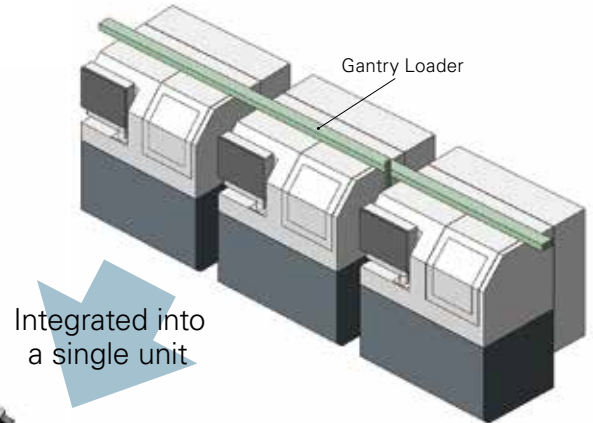
Tremendously Improved Productivity per Unit Area

With the MC20, a production line consisting of three single-spindle CNC automatic lathes can be integrated into a single machine unit, making it possible to maintain the same production capacity but drastically improve the productivity per unit area.

Workpiece Transfer Between Spindles and In-machine Loader

Workpieces are transferred between modules with spindles that are accurately aligned making gantry loaders of the type used in conventional machining lines unnecessary. Thus the problems of machining accuracy that can occur when transferring workpieces, and realising high-speed transfers are avoided.

Workpieces are supplied and unloaded with the in-machine loader in an area protected from chips and coolant. This minimizes the risk of misloading and deterioration of chucking accuracy.

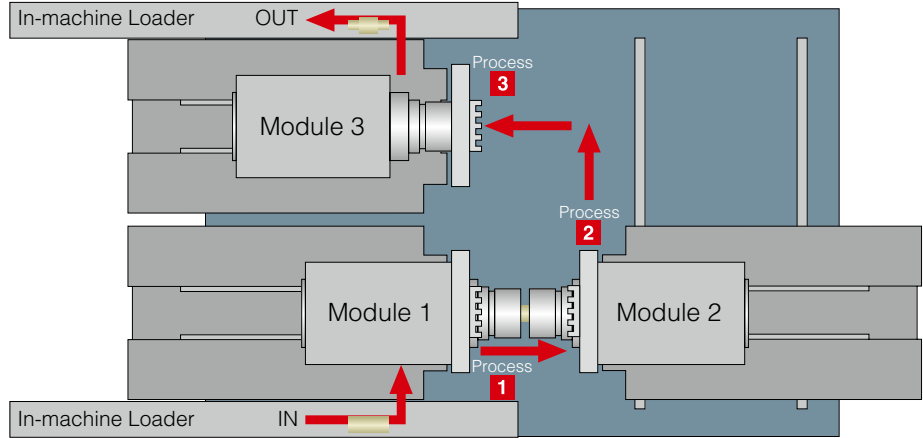Transfer between spindles (SP1 and SP2)

In-machine Loader

Optimization of Machining Processes

The entrance and exit for workpieces and the route between them can be set as required. Processes can be allocated to each module in the most appropriate way for specific workpieces, enabling the most efficient machining process flow to be selected.

Variable process flows are also supported, including mixed machining with separate collection of similar and/or different workpieces. Parallel machining of paired components, and even in-cycle processes such as press fitting and fastening of parts can be achieved.
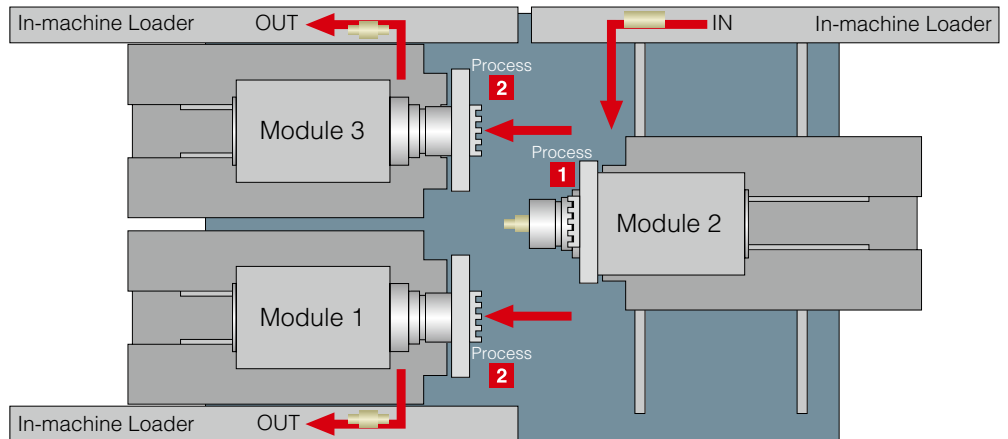
Sharing among 3 processes (1->2->3)
Simultaneous machining on 3 axis control groups where the machining processes are shared among 3 modules substantially increases productivity. The flow can also be reversed 3->2->1
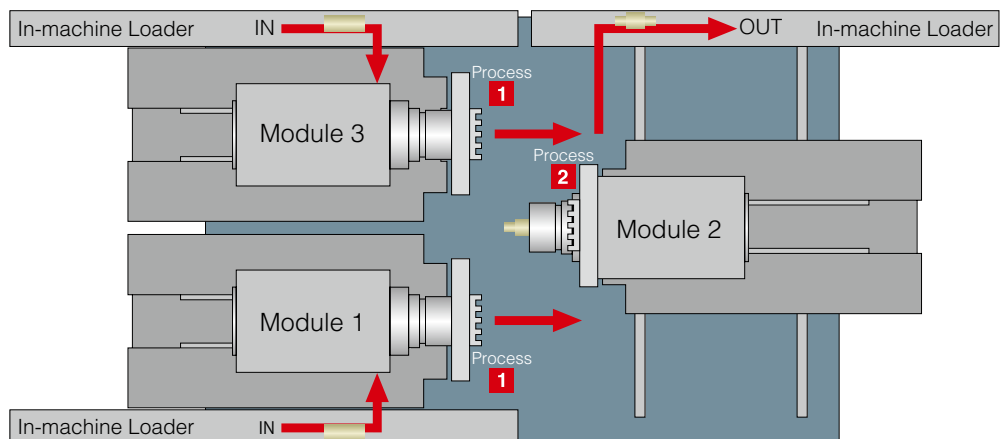
In-machine Loader   OUT

Process
3

Module 3

Process
2

Module 1   Module 2

Process
1

In-machine Loader   IN

Sharing the 2nd process (2->1 / 2->3)
This type of flow is effective for workpieces with a long 2nd process machining time. Wasted time is minimized by performing the 1st process machining at module 2 and sharing the time-consuming 2nd process machining between modules 1 and 3.
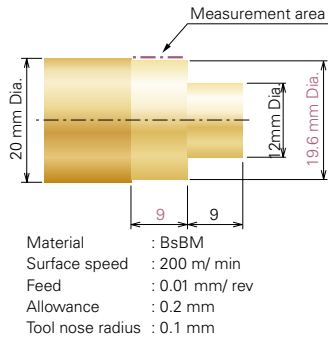
In-machine Loader   OUT   IN   In-machine Loader

Process
2

Module 3

Process
1

Module 2

Module 1

Process
2

In-machine Loader   OUT

Sharing the 1st process (1->2 / 3->2)
This type of flow is effective for workpieces with a long 1st process machining time.
Wasted time is minimized by sharing the 1st process machining between modules 1 and 3.
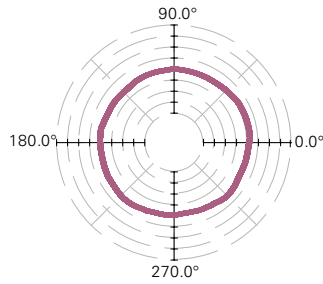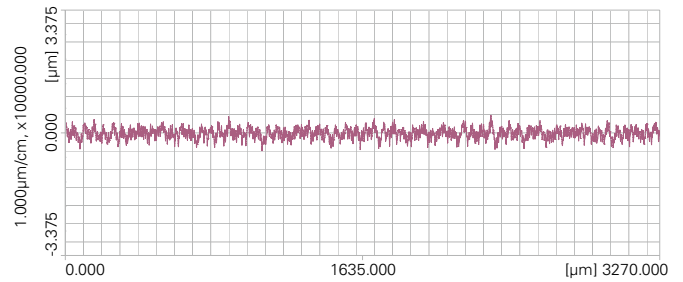
In-machine Loader   IN   OUT   In-machine Loader

Process
1

Module 3

Process
2

Module 2

Module 1

Process
1

In-machine Loader   IN

Accuracy

Test piece

Measurement area

20 mm Dia.

12 mm Dia.

19.6 mm Dia.

9 | 9

Material	: BsBM
Surface speed	: 200 m/ min
Feed	: 0.01 mm/ rev
Allowance	: 0.2 mm
Tool nose radius	: 0.1 mm

Roundness

0.248 µm

90.0°

180.0°   0.0°

270.0°

x 5000 (2.000 um/ cm)

Surface roughness

Ra0.116 µm

[µm] 3.375

0.000

1,000µm/cm, ×10000.000

-3.375

0.000   1635.000   [µm] 3270.000

200.000µm/cm, x50.000

Operability Allowing Intuitive Use of Multiple Functions

The main operation panel is a touch panel that is simply organized in appearance with multiple functions.
A sub-operation panel without a display is provided for operations at the rear of the machine and a detachable tablet PC is available as an optional auxiliary device.

When the tablet is placed in its dedicated holder, the same level of operation as with the front operation panel is possible after the tablet PC is synchronized with the machine control system.
A single tablet PC can be paired with multiple Citizen MC20 machines.

Main operation panel

Sub operation panel

Tablet PC (OP)

Options

No. 2 Loader
Fitting a loader to module 2 enables a variety of workflows.

Coolant Discharge Detector
Prevents damage to tools by checking the status of coolant discharge.

Pendant Operation Panel
Enables adjustment of positions such as for workpiece transfer while checking the location of actual movements.

Bar feeder
Proven technology for protracted unattended bar work operation.

Medium-pressure Coolant (1.5 MPa)
Enables efficient chip removal by discharging coolant directly from the tool post.

Chip Conveyor (Hinge Type)
Expels chips automatically and enables unmanned operation over a prolonged time.

Tooling system

Sleeve holder base (3 positions)

Sleeve holder (2 positions) 19.05 mm dia.

Sleeve holder (2 positions) 19.05 mm dia.

Tool post

Revolving tool drive (3 positions)

Cross milling Max 7mm dia.

End-face drilling Max 7mm dia.

Sleeve holder (2 positions) 19.05 mm dia.

Cross milling Max 7mm dia.

Milling Max 7mm dia.

End-face drilling Max 7mm dia.

Sleeve holder (2 positions) 19.05 mm dia.

Turning tool holder (2 positions) 13 mm Sq.

The optimal tooling layout is possible for every process by selection of tool holders for module tool post.

Module 1 | Module 2, 3

Turning tool holder + Cross milling

Turning tool holder + End-face drilling + Cross milling

Turning tool holder + Sleeve holder

Turning tool holder + Cross milling + End-face drilling

Tooling area

Exterminal view

Machine specifications

Item	MC20 (MC20-2M3)
Chuck size	4-inch chuck
Max. through-spindle workpiece diameter	20 mm dia.
Max. workpiece length	70 mm
Max. drilling diameter with the spindle	7 mm dia.
Max. tapping diameter with the spindle (Cutting tap)	M6
Spindle speed	Max 8,000 min^{-1} (differs depending on the chuck type)
Revolving tools on the gang tool post	
Max. drilling diameter	5 mm dia.
Max. tapping diameter (Cutting tap)	M5
Spindle speed	Max 8,000 min^{-1}
Number of tools to be mounted (standard spec.)	5 per module
Turning tools	2
Cross drilling tools	3
Number of tools to be mounted	6 per module
(turning / cross machining / end-face machining spec.)	
Turning tools	2
Cross drilling tools	2
End-face drilling tools	2
Number of tools to be mounted (full tooling capability)	9 per module
End-face sleeve	4
Cross drilling tools	1
End-face drilling tools	4
Tool size	
Turning tools	13 mm sq.
Sleeve	19.05 mm dia. , 20 mm dia.
Rapid feed rate	
X axis	32 m/ min
Y axis	32 m/ min
Z axis	32 m/ min
A axis	40 m/ min
Motor	
Front spindle	2.2/ 3.7 kW
Revolving tools on gang tool post	0.75 kW
Coolant pump	0.18 kW × 3
Lubrication pump	0.003 kW
Loader axis motor	0.2 kW × 2
Center height	1,030 mm
Rated power consumption	16 kVA
Total load current	60 A
Main breaker capacity	80 A
Pneumatic device Required pressure	0.5 MPa
Required flow rate	231 Nl/ min
Machine dimensions	W 3,120×D 1,395×H 1,790 mm
Machine weight	3,600 kg

Standard Accessories

Spindle chucking device, Spindle cooling unit
Emergency stop sub operation switch
Machine transfer detect function
Revolving tool spindle drive device unit (gang tool post)
Workpiece transfer device set (Module 1, Module 3), Door lock

Special Accessories

Work pusher, Work mounting confirmation device
Workpiece transfer device set (Module 2), Chuck air blow
Chip conveyor (Hinge type) with coolant tank unit
Spindle inner air blow,
Air blow for workpiece separator hand
Tool air blow, Coolant tank unit
Coolant flow rate detector, Medium-pressure coolant unit
Pendant Operation Panel, Foot switch, Tablet
3-color signal tower,
Automatic fire extinguishing equipment, Oil mist damper
Bar feeder interface (Cut off confirmation)

Standard NC Function

Preparation functions, Background editing
On machine program check function
High speed program check function
Axis feed motion overlap function
Spindle speed change detection
Corner chamferring/ Radius function
Tool nose R compensation function, Arc radius specification
Thread cutting canned cycle, Multiple canned cycles for turning
Parts counter 8-digit, Interference check function
Program storage capacity 160 m (Approx 64 KB)
Touch panel 10.4" color LCD, Automatic power shut off
I/ O interface (RS232C, Compact flash, USB)

NC Options

Program storage capacity 1200 m (Approx 480 KB)
Custom macro, Sub micron command
Sync tapping function, Canned drilling cycle
Principal-axis constant surface speed control
Differential speed rotary tool function
Tool life management function I
Tool life management function II
Milling interpolation function
External memory program operation, Polygon function
Hobbing function, Helical interpolation function
Slant helical interpolation function
Geometric command function
Variable lead thread cutting function
Circular thread cutting function
2 system simultaneous thread cutting I, II
Coordinate rotation command function
Custom macro G code call
Hi-speed sync tapping function, Optional block skip