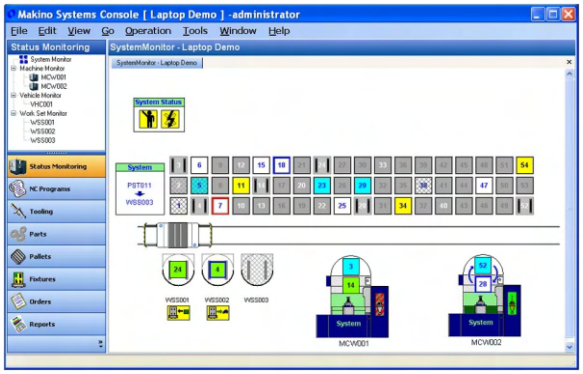
MAS-A5

Makino Advanced System Cell Controller

MAKINO

Promise of Performance®

MAS-A5 Cell Controller



Monitor and control the production requirements of your Makino MMC equipment with the Makino Advanced System – A5 Cell Control software. This PC-based software solution will maximize your production output while effectively monitoring your multi-machine MMC of standalone production requirements.

MAS-A5 is a state-of-the-art cell controller designed to handle a wide variety of parts and production requirements. It will provide you with flexible production management while it monitors and schedules production resources within the MMC cell or standalone machines.

MAS-A5 is the standard Makino global cell controller for all new installations of Makino MMC2, MMC-R and MAG MMC systems as well as select standalone machine installations. MAS-A5 can also be installed as an upgrade to existing Makino Model A2, Model B2, Model A3 and Model C systems, either on its own, or in conjunction with the installation of new equipment into existing systems.*

MAS-A5 Features

Graphical User Interface

- Provides intuitive, user-friendly operation from the Microsoft Windows based interface
- Interactive status of equipment, processes, and tools are indicated by the interface and available at a glance
- Point and click operation provides immediate access to system data and equipment status
- Supports remote connectivity with multiple full access user interfaces (limited to 10)

NC Program Management

- All NC programs are stored on the MAS-A5 main PC hard drive
- NC programs are downloaded using high-speed Ethernet (TCP/IP, 100Mbs standard) or HSSB (optional) to the machining center per the current processing requirement. This ensures the current released revision of the NC program is always used
- Machining center NC Program memory is managed for optimum utilization
- By supporting the FANUC Data Server Buffer Mode option, the MAS-A5 software can manage execution of large (exceeding CNC memory) NC programs
- By supporting the Makino PRO5 & PRO6 machine Data Center, the Data Center and PRO_MEM Storage mode manage execution of large (exceeding CNC memory) NC programs

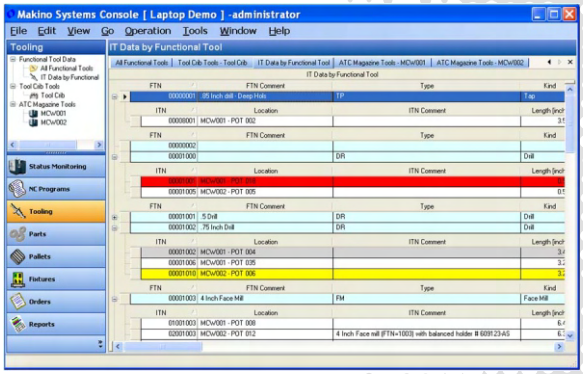
MAS-A5 Cell Controller

Tool Resource Management

- Notifies operator when required tools are not present or have exceeded their estimated life
- Informs the operator when the Automatic Tool Changer capacity is reached
- Work is only scheduled for machines which meet the tooling requirement for the process sequence
- Tool Data can be accessed and modified from the MAS-A5 User Interface
- Tooling and Part Information Files are supported
  - Using a wide variety of available formats, including images, video, or text, the system can display information files to assist with part loading/unloading and tool setting operations
  - The Work Setting Station Operation interface allows the operator to view the information file for each part process quickly and easily for assistance with more complex operations
  - From the Tool Data interface, the associated information file for each tool type can be viewed to assist with tool setting operations. is valuable in verifying that Tools will not expire during unattended operation times
- Tool Life learning can be accomplished per NC Program per tool execution and this feedback is displayed on the MAS-A5 interface for review. This feature allows the user to see how long a tool is used in each NC program execution
- Tool Life Predict function allows the MAS-A5 software to use the Tool Life used per NC program execution information to inform the operator of how many spare tools will be required in order to finish the current production for selected NC Programs. This is valuable in verifying that Tools will not expire during unattended operation times
- MAS-A5 can also be configured to support multiple methods of Tool Chip type Tool ID Systems

Tool Crib Management

- MAS-A5 manages tooling both in and out of the machines
- Tooling for multiple machines is managed from a single location
- Adding a MAS-A5 user interface to your tool room allows tooling to be monitored and maintained offline
- Interfacing with a tool pre-setter, reduces errors by automatically capturing tool offset data. Tool data is transferred from the pre-setter to MAS-A5 for the tool currently being set



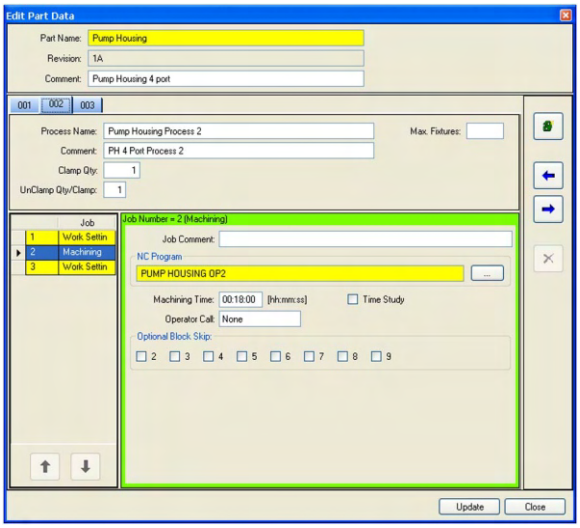
MAS-A5 Cell Controller

Part Data Management

- All processing steps required to complete the part are maintained by MAS-A5
- Work is tracked per process sequence, accurately monitoring the actual production

Multiple Process Sequences per Part

- Part definitions can have an unlimited number of process sequence steps
- The system automatically schedules work setting and machining operations according to the defined part process sequences, recognizing material and machine availability



Multiple Jobs per Process Sequence

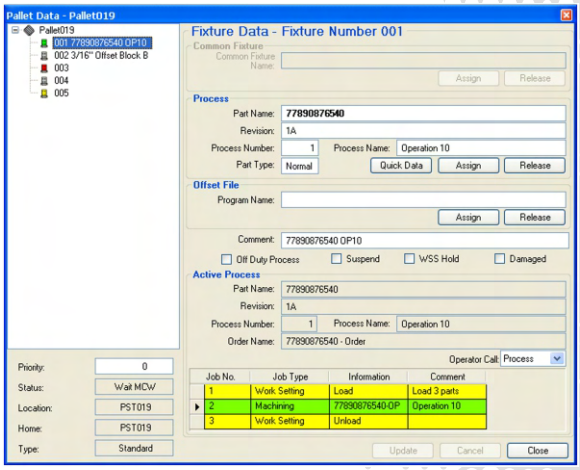
- For more complex processing requirements, MAS-A5 allows multiple jobs to be assigned for each machining process
- Allows for Machine to Machine processing of a process sequence
- Intermediate Work Setting operations can be included in a process sequence to allow for setup changes or gauging requirements of the work on the fixture

Multiple Fixtures per Pallet

- There is an expansive limit of 99 fixtures that can be logically assigned to an individual pallet
- Individual Fixture Offsets can be assigned to each fixture
- Quick Data Entry is available at the fixture level which allows for Part, Process, Order, Material, NC Program and Machine assignment to be made on a single Quick data entry screen
- Fixtures can be designated to automatically run only during unattended times

Common Fixture Management

- Allows multiple process sequences to be assigned to the same fixture
- Using material availability and user-assigned priorities, MAS-A5 will automatically allocate work to the fixture



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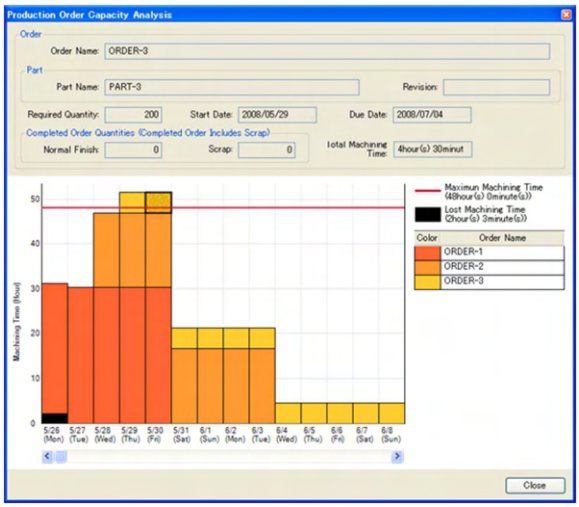
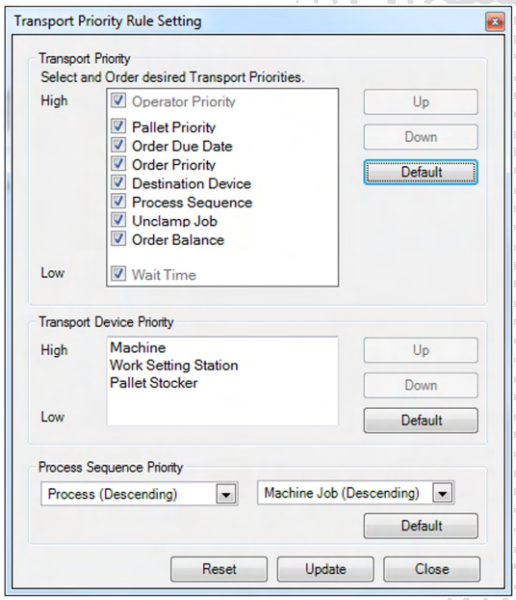
Production Order Management

- Multiple Production Orders can be created for each Part defined in the system
- Order production is scheduled by date, allowing the user to set a production start date and due date
- Material and completed work is accurately tracked for each production order
- MAS-A5 includes a Production Order Capacity Check which will evaluate all the orders with future due dates in the system and part quantities required and necessary cycle times and provide a chart that will show system capacity on a daily basis based on currently running orders



Dynamic System Scheduling

- The system schedules work dynamically using priorities set for Pallets, Process Sequences, and Production Orders as well as multiple other methods
- System Priorities can be easily reassigned to meet changes in schedule or demand
- Dynamic scheduling maximizes the utilization of your investment.
- Operator can change the method of scheduling daily if desired
- Pallet delivery to multiple capable machines will be decided based on the least amount of remaining machining time



Pallet Input & Output

- The MAS-A5 system can manage offline pallets or more pallets than the MMC system can store within the MMC system
- MAS-A5 is equipped with a Pallet Input & Output capability to assist with the removal of pallets from the MMC system and input of offline pallets into the system
- The data & setup for offline pallets are stored in the MAS-A5 database so when these pallets are returned to the system the associated data is attached and does not have to be entered again.

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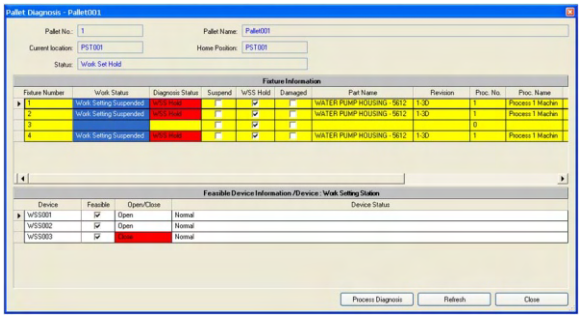
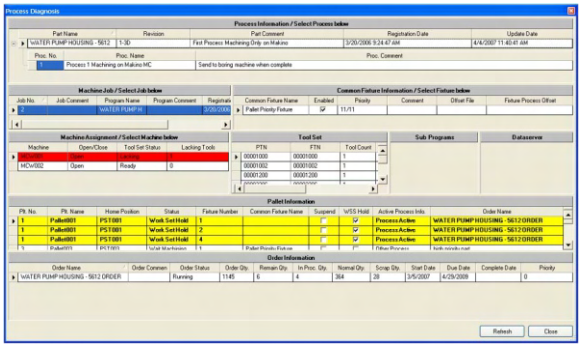
Pallet & Process Diagnosis

- Each pallet and part process entered into the MAS-A5 system can be 'diagnosed' at the request of the user to determine if some data or resource availability is missing which is causing the pallet or process to not be produced
- This will aid the user in determining why certain jobs have not been released for production





Inspection Frequency

- MAS-A5 comes standard with the ability to set various inspection frequencies which will alert the operator during work piece unloading that is time to inspect the part or fixture. MAS-A5 supports the following Inspection frequencies:
  - Part Process Level
  - Machine Use
  - Fixture Use
  - First Time Tool Is Used
  - Tool Use by Frequency
  - Operator Request

On/Off Duty Mode

- MAS-A5 can be configured to set a schedule as to when Operators are On Duty, or attending the system or when they are Off Duty, or unattended operation. By allowing the MAS-A5 to automatically set this status by a schedule the MAS-A5 system will allow the machines to run unattended and therefore make automated decisions based on tool alarms to accomplish unattended continuous operations even in the event of some tool alarm conditions
- Fixtures can be configured to automatically begin running when Off Duty time arrives and automatically stop running when On Duty time arrives

Auto Power Off

- MAS-A5 can be configured to set a schedule as to when machine and vehicle system is to be automatically powered off. By allowing the MAS-A5 to automatically set this status by a schedule the MAS-A5 system will allow the machines to run production until no more work is available. At the scheduled time the MAS-A5 software will shut down power to both the machines and vehicle system controllers, as well as the main MAS-A5 PC, if desired.

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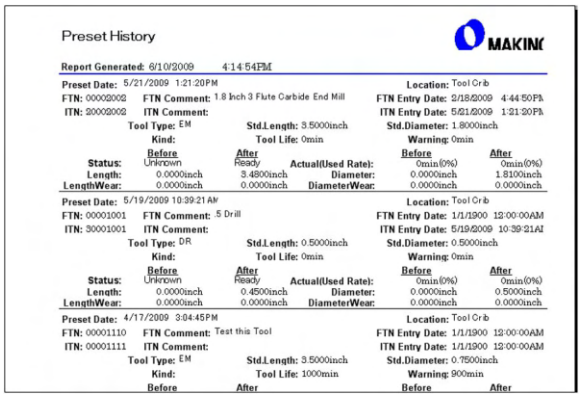
Makino Advanced System - A5 Reporting

- A number of built-in reports are included, such as; production data, tool data, production results, alarm history, and utilization
- Reports are generated and displayed using industry standard Crystal Reports Viewer
- Reporting data can be exported and stored offline as needed in multiple file formats


Preset History

MAKINO

Report Generated: 6/10/2009 4:14:54PM

Preset Date: 5/21/2009 1:21:20PM — Location: Tool Crib
FTN: 00002002 — FTN Comment: 1.8 Inch 3 Flute Carbide End Mill — FTN Entry Date: 2/18/2009 4:44:50PM
ITN: 20002002 — ITN Comment: — ITN Entry Date: 5/21/2009 1:21:20PM
Tool Type: EM — Std.Length: 3.5000inch — Std.Diameter: 1.8000inch
Kind: — Tool Life: 0min — Warning: 0min

	Before	After		Before	After
Status:	Unknown	Ready	Actual(Used Rate):	0min(0%)	0min(0%)
Length:	0.0000inch	3.4800inch	Diameter:	0.0000inch	1.8100inch
LengthWear:	0.0000inch	0.0000inch	DiameterWear:	0.0000inch	0.0000inch

Preset Date: 5/19/2009 10:39:21AM — Location: Tool Crib
FTN: 00001001 — FTN Comment: .5 Drill — FTN Entry Date: 1/1/1900 12:00:00AM
ITN: 30001001 — ITN Comment: — ITN Entry Date: 5/19/2009 10:39:21AM
Tool Type: DR — Std.Length: 0.5000inch — Std.Diameter: 0.5000inch
Kind: — Tool Life: 0min — Warning: 0min

	Before	After		Before	After
Status:	Unknown	Ready	Actual(Used Rate):	0min(0%)	0min(0%)
Length:	0.0000inch	0.4500inch	Diameter:	0.0000inch	0.5000inch
LengthWear:	0.0000inch	0.0000inch	DiameterWear:	0.0000inch	0.0000inch

Preset Date: 4/17/2009 3:04:45PM — Location: Tool Crib
FTN: 00001110 — FTN Comment: Test this Tool — FTN Entry Date: 1/1/1900 12:00:00AM
ITN: 00001111 — ITN Comment: — ITN Entry Date: 1/1/1900 12:00:00AM
Tool Type: EM — Std.Length: 3.5000inch — Std.Diameter: 0.7500inch
Kind: — Tool Life: 1000min — Warning: 900min

Before — After — Before — After

Microsoft SQL Server 2014 Express Edition Relational Database

- All data required to operate the cell is stored in a Microsoft SQL database in either 32 or 64 bit architectures

Alarm Notification

- An alarm notification system can be configured to automatically generate and send emails

Online Help

- Assistance with the MAS-A5 is available locally on the MAS-A5 Main & Client PC's in the form of a Windows Help File automatically launched from the keyboard F1 key

Makino Maintenance and Support

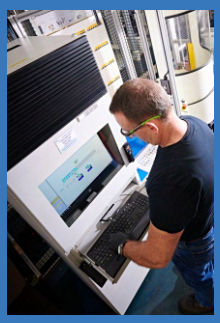
- Technical assistance and troubleshooting includes remote diagnostic support via Internet connection
- Makino maintains a global development staff to ensure that we meet the needs of our customers today and in the future
- Software enhancements and upgrades are provided

Customer Choice of User Interface Styles

Hoffman Nema-12 Enclosure

Included as standard for Main MAS-A5 Workstation type PC. Available at additional cost for other PC's if required.

- Provides environmental protection for the main computer and/or work setting station and tool pre-setter client PCs.
- Air conditioner provided as standard for harsh temperatures.
- Completely sealed and rated NEMA12.
- Includes Standard Workstation type tower PC solution.
- 20" Monitor within enclosure
- Multiple 120VAC Power requirements



or

Makino Industrial Pedestal Design

Included as standard for main industrial 24VDC PC. Ideal in less harsh environments or in confined space situations. Available at an additional cost for other pedestal station locations.

- Smaller footprint
- Large 27" monitor
- Built in industrial PC, network switch and battery backup with high heat (60C) rated 24VDC components.
- Solid state hard drive
- Single 120VAC power requirement with included 24VDC power supply

Standard Hardware Configuration

- Makino Advanced System-A5 Software
- 2 Day Pre-Installation Meeting at Makino
  - Travel to Makino & expenses not included
- MAS-A5 2.5 Day Operations Training:
  - 3 credits for MAS-A5 training class at Makino in Mason, OH
  - Travel to Makino & expenses are not included
  - Quotation for onsite training site available upon request
- 1 week onsite startup assistance during system installation
- PC Vendor contracted 24 hour response, 3 year hardware maintenance support (workstation only)
- 1 year Makino Maintenance and Support
- Remote Technical Assistance and troubleshooting
- MAS-A5 system software enhancements and upgrades

- Pedestal Style User Interface for industrial 24VDC PC
  - Intel Core i7 – 4650 1.70Ghz 2.3Ghz
  - 8 GB Ram Memory
  - Microsoft Windows 10 Professional (64 bit)
  - High Resolution 27" LCD Color Monitor
  - 256GB Solid State HD
  - 256GB Solid State HD for Backup
  - PC-101 Style Keyboard and Optical Mouse
  - (4) RJ45 10/100/1000 Mbps Fast Ethernet ports
  - (2) RS232C & (2) RS422 ports
  - 1 VGA & 1 HDMI/Display Port

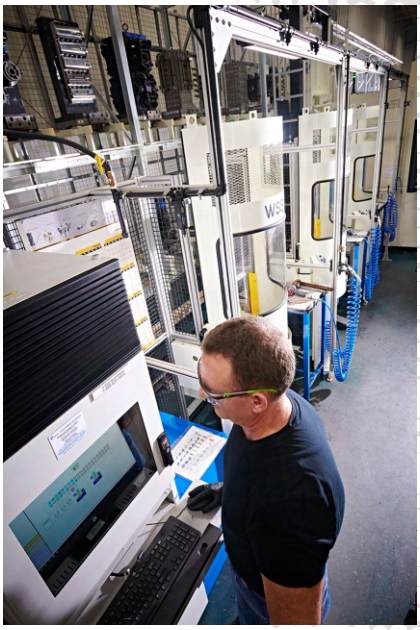
or

- NEMA-12 enclosure w/ AC unit
  - Intel Xeon E-2126G (3.3 GHz up to 4.5 GHz) PC Workstation
  - Microsoft Windows 10 Professional (64 bit)
  - 8 GB RAM Memory
  - High Resolution 20" LCD Color Monitor
  - HD Graphics P4600
  - 256 GB M.2 PCIe NVMe 2280 MLC 3D-Nand SSD Solid State
  - 256 GB M.2 PCIe NVMe 2280 MLC 3D-Nand SSD Solid State Backup
  - PC-101 Style Keyboard and Optical Mouse
  - DVD-R/W Drive
  - Two (2) 10/100 Base T Ethernet I/O cards
  - APC Un-interruptible Power Supply
  - (2) 16 GB USB Removable Thumb Drive

Specification is subject to change without notice at the discretion of Makino.

MAS-A5 Features

- Delivered with a Windows PC Workstation or Windows Industrial 24VDC PC
- Supports Remote cConnectivity with Multiple Full Client Access User Interfaces (10 max).
- Uses Microsoft SQL Server 2014 Express Edition Database for Data Storage
- 12 Connected Machines (MMC), 10 Standalone MCs
- 4 Work Set Stations per Vehicle (Optionally Supports More than 4 per Special Specification)
- 200 Pallets
- Supports MMC2, OPC1, OPC2, MAG & A2 type Vehicles, Robot on a Rail (MMC-R) and Pallet Magazine Configurations, Standalone Machines with or without Robot Load
- Supports Washing Station (Specification Review Required), Debur Station and CMM
- Unlimited Number of Stored Parts
- Unlimited Number of Stored Orders
- Unlimited Orders per Part
- 99 Fixtures per Pallet
- Unlimited Process Sequences per Part
- Unlimited Processes per Fixture when Using Common Fixtures
- Use the Same NC Program for Multiple Process Sequences
- Common Fixtures
- Tool Data and Resource Management
- Allows Connectivity to a Tool Pre-Setter
- 9999 Stored Tools (99999999 with 8 digit Tool Number Option)
- On/Off Duty Modes
- Auto Power Off
- Pallet Input/Output
- Pallet Diagnosis
- Process Diagnosis
- Tool Life Study Mode
- Predict Tool Life Function
- Production Order Capacity Check
- Machine and Part Process Level Machine Feasibility Settings



- NC Program Management
- NC Program Download by High-Speed Ethernet or HSSB. Also Supports RS232C Communications
- Supports the FANUC Dataserver Using Buffer Mode for Large NC Programs
- Supports the PRO5/PRO6 Data Center and Data Server Storage Mode, PRO_MEM and SGI_MEM
- Allows Part Loading/Unloading from Different Work Set Stations
- Serial Number Part Tracking Capability
- Set Inspection Frequencies on a Part, Machine, First Used Tool, or Pallet Fixture Basis or Operator Request
- Display Work and Tool Setting Information Files from Multiple Formats Including Video and Graphics
- Operator Identification for Part Loaded at WSS
- High Level Pallet Maintenance
- Quick Data Entry Feature
- Device Diagnosis
- Generate and Display Detailed Reports from the User Interface
- Equipment Status I Displayed Graphically Using Dynamic Icons and Colors
- Remote Support of the System via Internet Connection
- Kit Management to Generate Kit Orders
- Macro Variable Setting from MAS-A5 for Various Capabilities
- Tool Crib Location Management
- ADE (.XML) Automated Data Entry

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