

MACHINEMATE Products

MACHINEMATE INC supplies a family of premier PC-based CNC products. The **MACHINEMATE**® CNC family is the recognized leader in PC-based CNC technology. The use of Windows NT, a standard Pentium motherboard, standard PC components, an IEC-1131-3 conformant integrated soft PLC and the capability of Ethernet and standard field bus systems give this system the utmost flexibility and openness available today.

MachineMate CNC

CNC Package

The **MACHINEMATE** CNC package is a complete control solution. There are four product models: MM1, MM3, MM5, MM7. The MM1 is the lowest cost model. Each later model has a Pentium processor with a higher performance. The MM5 and MM7 models have a larger color display and an additional I/O module.



The package hardware includes:

- Industrial control in CE stainless steel shell with IP65 front panel, 19" rack-mount
- Flat TFT screen: 10.4" color display in MM1/MM3 models; 12.1" in MM5/MM7 models
- Operator key pad
- Floppy disk drive (3.5" HDD)
- Interface to either analog or SERCOS drives (4 servos for analog; 8 for SERCOS)
- Enough DC input and output points for many applications (for MM1/MM3: 24i/16o – analog model; 48i/32o – SERCOS model; for MM5/MM7: additional 24i/16o)
- 2-meter cable to the I/O module box
- Power cord
- Standard PC peripheral connections (keyboard, PS/2 mouse, COM1, COM2, LPT1, external VGA)

The package software includes:

- Windows NT preinstalled on the PC
- **MACHINEMATE** software preinstalled (that includes several utilities)
- Integrated soft PLC preinstalled (with both Structured Text and Ladder Diagram IEC-1131 languages)
- Documentation on CD

The four different models of the CNC offer increasing CNC performance (doubling the blocks/second performance capacity with each model). As mentioned above, the higher models also offer the larger display and an additional IO module as part of the package price.



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The package hardware options include:

- Pentium processor upgrade
- Motherboard memory capacity upgrade
- Larger displays
- Touch screen overlay
- Operator push buttons and rotary switches mounted on the IP65 front panel (cycle start/stop, jog plus/minus, feed override and spindle speed override)
- Special teach panel (with its own small display and full keyboard) (this panel is shown below in the Accessories section)
- Ethernet network card
- Fieldbus I/O interface card (either Interbus-S or Profibus-DP)
- Longer I/O interface cable (up to 35 meters)
- Additional I/O modules
 - 24VDC discrete I/O modules available in 24i/16o increments up to 792i/528o
 - Analog I/O available in module with 4 A/D and 4 D/A channels
 - Additional interface connections to more drives (up to 16 analog or 32 SERCOS)
 - Each analog axis interface module has 4 encoder inputs, 4 D/A and 4 A/D



The package software options include:

- Other IEC-1131 languages for the integrated soft PLC (Function Block Diagram, Instruction List, or Sequential Flow Chart)
- CNC options for such special features like 5-axis transformations, an electronic gear box (for applications like gear hobbing), laser power control or additional CNC stations (for other independent part program paths, up to 8). Note that most of the common CNC features are included in the CNC package.
- Visualizer product (custom screen package using bit-map pictures and icons; screens are configured using menus and drag-drop; no software programming is required for the screen layout or development)
- Compile cycles (the customer can write dll(s) to interface with the CNC software at a very low level, enabling the customer to add/change features and/or internal CNC operations)

Accessories

MACHINEMATE INC has several accessories to provide a complete control solution.

MTBP

The MACHINEMATE MTBP (machine tool builder's panel) can make the operator's panel design and implementation easier. The MTBP is pictured below.



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The width of the MTBP is identical to that of the MACHINEMATE control for a simple layout of an operator's station. This panel includes:

- the e-stop pushbutton (push in to lock, twist out to release),
- feed and speed override switches,
- cycle start and stop pushbuttons,
- the machine start pushbutton,
- the jog + and – pushbuttons,
- six general-purpose pushbuttons (clear buttons are also available separately for the customer to provide different button labels),
- a molded 2-meter cable (with a 50-pin D-shell on both ends).

All of the pushbuttons except the e-stop can be illuminated. The MTBP is available at the list price of \$695.

When using the MACHINEMATE SERCOS interface, the included 2-meter cable is pin-compatible for an easy installation. By connecting the cable from the MTBP to the SERCOS control's IO connector and loading the PLC application template for the MTBP I/O, it takes just a few moments to be running with the MTBP.

MACHINEMATE INC has prepared a PLC application template that includes the processing of all the MTBP inputs and outputs. It is also available for download from our web site.

For analog systems, a breakout card can be obtained from MACHINEMATE to convert the 50-pin connector to terminal strip connections (this card is shown below). Several vendors offer this card.

Handheld Operator Station

The handheld operator station provides a simple solution to the requirement for remote operator activities. This rugged pendant includes the 100 count/rev handwheel, a six-position axis select switch, a three-position feed multiplier switch, two white pushbuttons (that illuminate) and the emergency stop pushbutton (push in to lock, twist out to release). The white pushbuttons are not labeled so they could be used for axis jogging or another machine function.

The dust and waterproof pendant (weighing 650g or less than 1.5 pounds) comes with its 3-meter flexible cord that is terminated with a 26-pin round connector (the mating connector is also included). The MPG is pictured below. The MPG is available at the list price of \$695.



This cost effective handheld operator station comes in 2 models. The IO model uses a MPG that is 25 PPR and requires 2 @ 24V digital inputs to create a pulse counter. The MPG in the Encoder model is a 100 PPR differential encoder and requires 5 Volts for its power.

MACHINEMATE INC has prepared a PLC application template that includes the processing of all the MPG inputs and outputs. It is also available for download from our web site.

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Teach Panel

To complement the MTBP and the operator handheld station products, MACHINEMATE INC also offers a more sophisticated Teach Panel. The Teach Panel connects to the control over the MACHINEMATE's second serial port (COM2). The Teach Panel offers the convenience of most of the CNC functionality in a hand held unit that can be carried to the work piece. The Teach Panel Included is the LCD display (almost 3" x 5"), the five CNC operation mode keys, the F1-F8 soft keys and a complete alphanumeric keypad, as well as the emergency stop push button, a feedrate override potentiometer and the teach panel enable buttons.



Since this panel is often used to teach and edit part programs directly on the machine, a number of other buttons are provided to facilitate the teaching process, including several for axis movements and part program edits. The 3.3lb panel (9.45" x 12.65" x 3.54") comes with a mounting bracket and a 15m cable to assist its operation far from the control.

The Teach Panel option includes both the hardware and software. The option includes a version of the CNC software that supports the capabilities and features of this panel. The complete price for this option for the MACHINEMATE CNC is \$2330.

Connectors and Adapters

Several connectors and adapters are available from MACHINEMATE INC.

A DIN-rail mounted interface card is available to connect a 50-pin D-shell connector via terminal strips. 50-pin cables are used for several connections in a MACHINEMATE system. One of these cards is shown at the right; it is available at the list price of \$150. The interface card is available with either male or female connector.



Drives and Motors

A wide variety of drives and AC motors are available from MACHINEMATE INC.

The CNC will work with the drives and motors from a variety of vendors. Neither the analog nor the SERCOS interface has special requirements for the drive. For a complete automation solution, the drives and motors can also be purchased with the control.

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The AC motors include (motor type and feedback type):

- MKD (servos, resolver feedback),
- MHD (servos, encoder),
- MKE (servos in potentially explosive area, resolver),
- 1MB (frameless spindle, encoder)
- 2AD (spindle, encoder),
- ADF (spindle, encoder),
- MBS (kit motor, encoder).



The drives range in size and motor from (with the nominal/maximum ratings for smallest & largest motors)

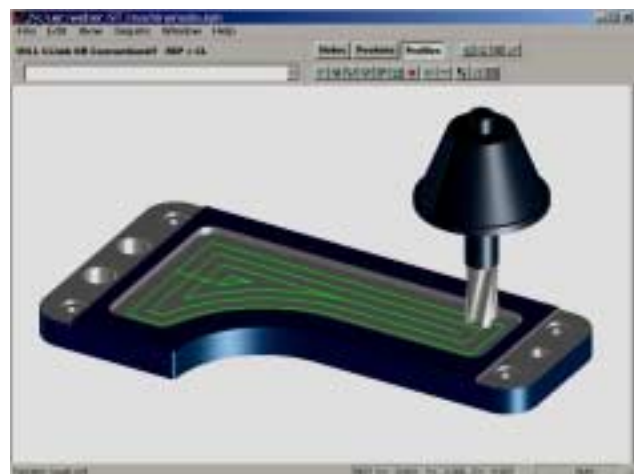
- EcoDrive, with many combinations available:

	smallest nom/max Nm		largest non/max Nm	smallest non/max lb-in		largest non/max lb-in	nom/max lb-ft
MKD:	0.8 / 3.4	to	49.0 / 81.0	7.1 / 30.1	to	434 / 717	36.1 / 59.7
MHD:	1.3 / 5.6	to	95.0 / 160.0	11.5 / 49.6	to	840 / 1416	70.1 / 118
MKE:	0.9 / 4.0	to	12.0 / 43.5	8.0 / 35.4	to	106 / 385	8.9 / 32.1
1MB:	7.0 / 17.6	to	514.2 / 1448	62.0 / 155.8	to	4551 / 12819	379 / 1068
2AD:	23.2 / 66.3	to	223.0 / 546.8	205.3 / 587	to	1974 / 4839	16 / 403
ADF:	48.0 / 99.1	to	102.0 / 252.9	424.8 / 877	to	903 / 2238	75.2 / 187
MBS:	65.0 / 180.0	to	120.0 / 180.0	575.3 / 1593	to	1062 / 1593	88.5 / 133

- Minidrive (this small drive is the only one that uses the small MMD motor; the motor model range is either nom 0.32 / 0.95Nm to max 2.4 / 6.9Nm or nom 2.8 / 8.4lb-in to max 21.8 / 61.1lb-in),
- Diax1 (2AD spindle; 2AD servo; 1MB spindle),
- and others.

Conversational Synergy

Our partner Weber Systems has jointly developed the Synergy conversational shop floor part programming software (CAM) for **MACHINEMATE**. The specialized interface allows geometry to be described quickly and efficiently (or imported from dxf or iges files), using a combination of icons and a data entry dialog. After describing the geometry, the **MACHINEMATE** part program is easily generated. The software has two versions, either for a mill or a lathe. The price for this software on a new **MACHINEMATE** CNC shipment is \$500.



This software is obtained from **MACHINEMATE** INC.

Documentation

MACHINEMATE INC offers a complete documentation set. The set is provided with each control on a CD, in the pdf format including an index to support a search of all documents on the CD. The documents are also available for purchase as spiral-bound printed manuals.

Our customers are provided access to these documents on-line, via our web site. If any documents are updated, they can download the latest copy, to view and/or print.

Training Classes

MACHINEMATE INC provides training on the control hardware and software. The emphasis is on the configuration of the control parameters for the machine and on the PLC programming for the machine. Several controls with analog and SERCOS drives are available for the important hands on training.

If you are interested in attending one of these regularly scheduled classes at our facility, please contact us.



Web Site

MACHINEMATE INC has a web site that offers a wealth of information, including several slide shows, control application articles, the current class schedule, past newsletters, product details (such as CNC performance data, a list of the standard CNC G-codes, brochures, etc.), a number of PLC application templates and more. Check it out at: <http://www.machinemate.com>.

MACHINEMATE INC
phone: 920-907-0001
fax: 920-907-0181
e-mail: info@machinemate.com



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