MACHINEMATE®

SERIES CNC

STANDARD FEATURES

INCLUDED IN THE BASIC OEM PACKAGE

MACHINEMATE BASIC CONFIGURATION

1. OPERATION

The **MACHINEMATE CNC** has six different operating modes that are selected by means of soft keys. Alternatively they may be selected through a pointing device, i.e., a cursor, a mouse, or alternative means.

MANUAL

- Move Continuously
- Traverse to Reference Point
- Auxiliary Functions
- Move Incrementally
- Retreat
- Hand Wheel Function
- Playback

AUTOMATIC

- Program Selection
- Program Test
- Path Graphics
- Backward
- Program Process 1 (Continuous, Single Block, Manual NC)
- Program Process 2 (Block Read Over, Optional Halt, Parallel Edit, Initial State)

DATA

- Selection
- Load
- Save
- Edit
- Modify
- Manage

INFORMATION

- Interface Display
- Version
- Status Treatment

SYSTEM

- Display Functions
- Station (Channel) Selection
- Exit
- Operation
- Settings
- Minimize

SETUP

- PLC
- Machine Parameters
- SERCOS Monitor
- I/O Configuration
- Drive Configuration
- Pitch Error Comp
- Gantry Initialize
- Logic Analyzer

2. DISPLAY/DIAGNOSTICS

Display Languages

Two display languages are selectable:

- English
- German
- Other Languages on Request

NC Axis Information

- Position
- Direction
- Output Voltage
- Distance To Go
- Active Offsets
- Velocity
- Lag (Following Error)
- Position Loop Gain
- End Position
- Offset Values

Stored Data Information

- NC Programs
- NT/DOS Programs
- Radius Compensation
- File Attributes
- PLC Programs
- Tool Length Offsets
- Zero Offsets

Status Information

- Auxiliary Functions
- Active Block
- Active G Codes
- PLC Interface
- Active NC Program Status
- Active Subprogram
- Program Repetition

System Memory

- Memory Size for Both CNC and Windows NT System
- Memory Space Available
- Number of Part Programs
- Program Size

Interfaces/Data Ports

- CNC ←→PLC Interface
- Serial Interfaces*
- External Device Definition
- PLC ←→ Machine Interface
- Serial Interface Setup*

*May require additional software.

User Information Box

- Error Messages in Legible Text
- Time and Date Display
- Help Messages in Legible Text

Machine Parameters

- Legible Machine Parameters
- Edit Machine Parameters
- Input/Output of Machine Parameters

3. AXES/AXIS FUNCTIONS

4 Axes Simultaneous

Choice of Analog Interface or Digital Interface (SERCOS)

	Analog 4x	SERCOS 8x
Measurement Input frequency	1 MHz (Internal 4 MHz)	Depends on Drive
Measurement Resolution	Freely Selectable	Freely Selectable
Maximum Feedrate		Depends on Drive
Resolution of 10 µm : 2,400 m/min		
Resolution of 1 µm : 240 m/min		
Resolution of 0.1 µm : 24 m/min		
Output Signal	±10V DC, 5 mA	Digital via Optical Fiber Cable

4. COMPENSATIONS

Tool Compensation

- 128 Radius Compensations
- 128 Length Compensations

Backlash Compensation

Zero Offsets

External Compensation via PLC

Access to Compensations via Cycle Programming

5. SPINDLE CONTROL

Through SERCOS or Analog CNC engine
Analog Spindle Control via PLC is also possible (option - analog module)

6. COMMUNICATION

Interfaces	COM 1 Port COM 2 Port LPT 1 Port VGA/SVGA external Display Port Keyboard Port CD ROM (IDE) Connector Mouse Port
Data Transfer Monitoring	RTS/CTS hardware handshake, XON, XOFF, PA checksum
NC Format	ISO (DIN 66025)

Data I/O Simultaneously with Program Execution

Continuous Download (Drip-Feed)

File Load

Main- and Subprograms Executable From Hard Disk

7. MEMORY

Hard Disk
- Number of NC Programs — unlimited (to disk capacity)
- Program Number — 6 digits

NC Program Memory — 128 KB CMOS RAM
- Number of NC Programs — 200
- Program Number — 6 digits

(option – increases to 224KB, 400KB or 872KB)

Dynamic Block Buffer — 50 blocks

(option – increases to 200 or 1000 blocks)

PLC Program Memory — 64 KB

(option – increases to 128KB or 256KB)

Cycle Parameter Memory — 1000 parameters

(option – increases in increments of 1000)

8. PROGRAMMING

NC Programming as per ISO (DIN 66025)
- G00 Rapid traverse
- G01 Linear interpolation
- G02/G03 Circular interpolation
- G04 Dwell
- G07 Tangential circle interpolation
- G08/G09 Path control mode (ramp at block transitions)
  "Adaptive Look ahead" function
- G10/G11 Block pre-processing control
- G12/G13 Circular interpolation with radius input
- G17-G20 Plane selection
- G33 Thread cutting/rigid tapping
- G38/G39 Mirror image
- G40-G44 Tool radius compensation
- G50 Scaling
- G51/G52 Part rotation
- G53-G59 Zero offsets
- G63/G66 Programmable feed rate/spindle speed override
- G70/G71 Inch/metric switching
- G72/G73 Interpolation with in position stop
- G74 Home position
- G80-G89 Canned cycles
- G86 or G186 Programmable tolerance band

- G90/G91 Absolute/incremental programming
- G92 Position register preset
- G94/G95 Feedrate programming
- M00 Program stop
- M01 Optional stop
- M02/M30 End of program
- M03/M04/M05 Spindle control
- M06 Tool change
- M19 Spindle orientation
- M101-M118 Fast M functions

(programming options: see Product Guide section 2 for complete G-code list)

Cycle Programming

- Programming tool with 1000 parameters
- Use of parameter values within NC addresses
- Execution control of the NC program
- Programmable man-machine interface
- Input/output signal programming
- Monitoring of input signals
- Arithmetic and trigonometric functions
- Boolean operators
- Jump commands
- Repeat commands

Subroutines (4 Levels)

Automatic Syntax Check

Decimal Point Programming

Compensation Programming

Programming Parallel to Program Execution

Probing function - Automatic Position Value Acquisition

9. INTEGRATED SOFT PLC AS PER IEC 1131-3

Languages:	Structured Text (Standard) Ladder Diagram (Standard)
PLC Memory	64 KB (expandable to 256KB, equiv. to 40,000 instr.)
Internal Flags	256 (expandable to 1000) non retentive 256 (expandable to 1000) retentive

Timers	256 (expandable to 1000) non retentive 256 (expandable to 1000) retentive
I/O Definition	bit/byte, word, double word
C Routines	Custom routines written in C can be integrated via an external object library

10. INTEGRATED PERSONAL COMPUTER

Integrated Personal Computer Board

- Intel Pentium processor (varies with CNC model) & motherboard
- 1.44 MB, 3½"-system floppy drive
- TFT display graphics board
- System hard disk
- MS Windows NT operating system
- **MACHINE**MATE real time kernel

11. SAFETY FUNCTIONS

Following checks are integrated:

- CNC voltage monitoring
- Battery voltage monitoring for CMOS backup
- Processor watchdog timer monitoring
- Feedback supervision (incremental encoder)
- RAM memory
- Bus systems
- Processor activity
- Electrical noise monitoring
- CMOS Memory
- Feedback signal (broken wire detection)
- Hard disk / floppy drive
- Temperature monitoring

Operator Guidance Through Soft Keys

Syntax Check During NC Program Input

Checksum Test

Software Limit Switches

CNC Status and Machine Status Display via PLC

Read, Write, Delete and Execution Protection for NC Programs

Protected Programs

Password Protection (up to 10 levels)

The **MACHINE**MATE Milling or Turning application software must be specified at the time of purchase.

Abbreviations in the following list are as follows:

Package:		item:	
M	Milling package	i	included
T	Turning package	o	optional

When an item is indicated as included for a major group, there is usually at least one option for that category.

CNC STANDARD FEATURES

DESCRIPTION	***M***	***T***	***COMMENTS***

1. OPERATION

Handwheel Interface 250 pulses per rev.; maximum of 3 handwheels	i	i	
(options include operator hardware)			

2. DISPLAY / DIAGNOSTICS

The color displays available are selected through the choice of the basic control type. The 10.4“ color flat panel display with VGA (640x480) is standard, whereas the expanded version features a 12.1“ SVGA (800x600) color flat panel display. In either case, an additional VGA and SVGA interface is provided for an external display.

Flat TFT touch screens are available as an option in 10.4”, 12.1”, 15”, 18” and 20.1” sizes.

3. AXES / AXIS FUNCTIONS

The basic control comes with 8-axes SERCOS or 4-axes analog (not both). Please specify which drive control interface is desired.

Digital SERCOS Drive Interface (8 axes)	i	i	Select SERCOS
			or
Analog Axis Interface (4 axes)	i	i	Analog
(options include more axes and/or more stations – or program paths; also for Analog: axis connection box; for SERCOS: IO expansion box)			

DESCRIPTION		***M***	***T***	***COMMENTS***
	Axis Types			
	Parallel Axes Logic	i	i	
	(options include gantry axes and other axis variations)			
	Adaptive Look Ahead; 2½ D	i	i	
	Adaptive ART II including Command Filter 2½ D	i	i	
	Automatic Drift Compensation (analog)	i	i	
	(options include other transformations, such as full 5-axis, polar or barrel cam)			
4.	COMPENSATIONS			
	Lead Screw Error Compensation 1,000 Internal Points	i	i	
	(options include more points, up to 16000)			
5.	SPINDLE CONTROL			
	Spindle Control	i	i	
	Spindle with Feedback	i	i	
	Automatic Gear Step Selection (analog)	i	i	
	(options include more spindles)			
6.	COMMUNICATION			
	Floppy Disk Drive (A:), Front Access	i	i	
	(options include external floppy drive or network card)			
7.	MEMORY EXTENSION			
	NC Memory Extension (buffered CMOS RAM)	i	i	
	(options include more memory)			

	DESCRIPTION	***M***	***T***	***COMMENTS***
8.	PROGRAMMING			
	Cycle Programming			
	Extension to 1000 Parameters	i	i	
	(options: more available in increments of 1000)			
	NC programming			
	Helical Interpolation	i	o	
	Spline Interpolation	i	o	
	Feedrate Interpolation	i	o	
	Diameter Programming	o	i	
	Thread Cutting G33/G34	o	i	
	Rigid Tapping	i	o	
	Constant Surface Speed	o	i	
	Feed Per Revolution	i	i	
	Polar Coordinate Programming	i	o	
	Programmable Acceleration	i	o	
	Safe Zone Programming	i	i	
	Corner Rounding	i	i	
	Tool Management	i	i	
	Extended PLC Interface	i	i	
	(options in most cases above: the optional item is usually associated with either a Milling or Turning application so it does not apply to the other application – making it optional for that type)			

DESCRIPTION		***M***	***T***	***COMMENTS***
9.	PROBING FUNCTIONS			
	Probing Logic (Probing routine is an option.)	i	i	
10.	**MACHINE**MATE MODULAR I/O*			
	Module Box (for two I/O Modules)	i	i	
	I/O Module 24-Input/16-Output (1A) 24 VDC	i	i	(qty: see below)
	(for the MM1 and MM3 models, only 1 module is provided; for the MM5 and MM7 models, 2 modules are provided; more modules (and boxes) are available for any model)			
	(SERCOS model comes with additional 24i/16o connector)			
	(options: Analog Module: 4 input channels/4 output channels; Axis Encoder Module: 4 analog axis channels)			
	READY-TO-USE CABLES FOR MODULAR I/O			
	Interconnect Cable - 6.6 ft. (2 m)	i	i	
	*Omron I/O can be furnished as an option in place of Modular IO.			
11.	PLC DEVELOPMENT ENVIRONMENT			
	PLC IEC1131 Language (Ladder Diagram and Structured Text)	i	i	
	PLC Development System on CNC	i	i	
	(options: the other IEC-1131 standard languages: Instruction List (IL), Function Block (FB), and Sequential Flow Chart (SFC), individually)			
12.	DOCUMENTATION			
	Installation Kit (includes **MACHINEM**ATE Manuals on CD)	i	i	
	(options: the printed manuals are available individually or as a set)			