



10TF TURNING CNC

The 10TF is a conversational programming CNC unit for turning applications. Using GENERAL NUMERIC's unique Symbolic FAPT TURN, a revolutionary software, it permits immediate preparation of NC programs simply by following the step-by-step instructions as they appear on the graphic display screen. The machining shape is input by pressing the symbolic keys on the operator's panel which describe the raw material shape as it appears on the design drawing. Input of dimensions and other relevant data is performed

by responding to inquiries that appear on the screen. Pertinent data is displayed on the screen for easy reference. As soon as the programming input has been completed, the material or workpiece shape is described graphically, and the proper tools and cutting processes are automatically selected by pressing the "auto" key. The NC program is automatically generated with the tool path displayed on the screen. The 10TF is a high performance CNC and is designed to meet today's demanding requirements in the area of large

scale Flexible Manufacturing Systems (FMS).

SYMBOLIC CONVERSATIONAL PROGRAMMING

Ten arrow keys are provided to directly specify the shape of the workpiece as it appears on the blueprint. When the values of elements are not specified on the blueprint, the programming can proceed without answering all the requests from the NC. The 10TF has powerful, automatic geometry definition software to calculate these values. Simply by de-

GENERAL NUMERIC

FEATURES

scribing the raw material, its size and the finish profile of the workpiece, a program can be generated. Roughing and semi-finishing tool paths are automatically generated. It is not necessary to make a specially formatted blueprint or to calculate redundant dimensions for the intersection of curves. Ordinary blueprints can be used as is.

STEP-BY-STEP CONVERSATIONAL

Symbolic FAPT is a step-by-step input and checking process. The graphic display shows the result of input data as soon as the geometry is defined. When erroneous data is input, it is shown immediately and can be corrected. The entire list of input data can be seen. Therefore, it is easy to find an error block, even if previous input data caused the error. Interference checks between the tool and workpiece as well as the tool shape and work shape are automatically checked for the entire program. The NC automatically generates the tool path so that the interference will not occur. The part can be graphically checked by the programmer. Symbolic FAPT is applicable for both horizontal and vertical lathes. The graphic display shows the workpiece and tool path as it would be seen on the actual machine.

AUTOMATIC CUTTING PROCESS AND TOOL DETERMINATION (OPTIONAL)

Cutting processes, such as rough facing, rough turning and drilling, can be automatically determined. Unnecessary processes for the specific shape are automatically omitted. A suitable tool for each process can be automatically determined. The programmer simply depresses the "Auto" key to obtain all cutting processes and the determination of tools.

14 INCH COLOR GRAPHIC DISPLAY

The clear, wide, color graphic display is a basic feature. Seven different colors result in a graphic display that is easily distinguished for each process. The large screen enables more information to be displayed on screen for the benefit of the operator/programmer. In addition, a scaling function for the graphic display enables visual checking of precise cutting points.

ADVANCED TECHNOLOGIES

The 10TF employs a variety of advanced technologies. They include 8000 gates custom VLSIs, high speed 16/32 bit microprocessors, and high density EPROMs and static RAMs. These features provide outstanding reliability and allow for compact design. In addition, optical fiber connections between the main processor unit and remote units such as the Manual Data Input MDI/CRT unit and the machine interface unit (Data In{DI}/Data Out {DO}), allows high speed transmission of data with high noise immunity. The 10TF is the first CNC in the world employing state-of-the art optical fiber technology.

HIGH PERFORMANCE HIGH PRODUCTIVITY

The 10TF is a high performance CNC capable of controlling axes at a maximum traverse rate of 2400 IPM with a resolution of 0.0001 in. Thanks to a unique acceleration/deceleration control technique (optional), increased servo loop gain is possible, reducing contouring error. Four more axes can be added for auxiliary axes positioning such as a programmable tailstock or cut-off slide.

FOREGROUND AND BACKGROUND OPERATION

The 10TF offers the capability of "background editing" as a basic feature. This function allows the programmer/operator to load, edit and check programs while a machining program is being executed in the "foreground". Therefore, programs may be prepared for the next job without waiting for the completion of the current machining operation. This feature increases machine productivity as well as operator/programmer efficiency.

APPLICATION FLEXIBILITY

The 10TF offers a wide range of applications from a simple two axes lathe to a FMS cell. The powerful built-in Programmable Controller (PC), with wide communication channels, along with the NC control software offers access to all necessary data for construction of a FMS. The combination of a high level language (PASCAL) and conventional ladder type program provides for an optimum PC system. Along with a large memory (80K) and the large number of I/O (848 inputs/560 outputs), the

SPECIFICATIONS

Specifications	With PC			Without PC		Note
	BM	3	6	3	6	
Multiple Repetitive Cycles (G70-G76)	○	○	○	○	○	
Canned cycle : G90, G92, G94	○	○	○	○	○	
Reference point return A : Manual, Automatic G27-G29	○	○	○	○	○	
Diameter and radius programming for X axis	○	○	○	○	○	
Self diagnosis functions	○	○	○	○	○	
Backlash compensation : Max. 9999 pulses	○	○	○	○	○	
Single block	○	○	○	○	○	
Optional block skip	○	○	○	○	○	
Manual absolute on/off	○	○	○	×	○	
External mirror image : For all axes	○	○	○	△	△	△ : X axis only
Dry run	○	○	○	○	○	
Interlock	○	○	○	○	○	
Every axis interlock	○	×	○	×	○	
Machine lock	○	○	○	○	○	
Every axis machine lock	○	○	○	×	×	
Miscellaneous functions lock	○	○	○	×	○	
Feed hold	○	○	○	○	○	
Manual jogging	○	○	○	○	○	
Manual incremental feed : ×1, ×10, ×100, ×1000, ×10000, ×100000	○	△	○	△	○	Up to ×10 for 3 without PC. Up to ×1000 for 3 with PC.
Overtravel	○	△	○	△	○	No hard OT for 3
Stored stroke check	○	○	○	○	○	
Emergency stop	○	○	○	○	○	
Servo off signal input	○	○	○	×	○	
Follow up : Emergency stop, signal input	○	○	○	○	○	
Sequence number : 5 digits	○	○	○	○	○	
Sequence number search	○	○	○	○	○	
Program number : 4 digits	○	○	○	○	○	
Program number search	○	○	○	○	○	
Exact stop	○	○	○	○	○	
External power on/off	○	○	○	○	○	
Connectable servo motors : AC/DC SERVO MOTOR	○	○	○	○	○	
Connectable servo units : AC/DC drive	○	○	○	○	○	
Connectable position detectors : Pulse coder/Optical scale	○	○	○	○	○	
Connectable spindle motor : AC/DC SPINDLE MOTOR	○	○	○	○	○	
Connectable spindle servo units : AC/DC drive	○	○	○	○	○	
Power supply : 200/220VAC, +10%, -15% 1 phase, 50/60Hz ±1Hz	○	○	○	○	○	

○ = Available △ = Restricted × = Not Available

SPECIFICATIONS

2) OPTIONAL FUNCTIONS

Specifications	With PC			Without PC		Note
	NM	3	6	3	6	
Tape reader without reels	○	○	○	○	○	Built-in or external
Tape reader with reels	○	○	○	○	○	External only
Skip functions	○	○	○	○	○	
Tool nose radius compensation	○	○	○	○	○	
Addition in registered programs : 100/200	○	○	○	○	○	
2nd reference point return : Automatic (G30)	○	○	○	○	○	
Cutting feed automatic acc. dec. : Linear before interpolation	○	○	○	○	○	
External deceleration	○	×	○	×	×	
Manual pulse generator : Max. 3	○	○	○	○	○	
Variable lead thread cutting	○	○	○	○	○	
Spindle speed binary/analog output	○	○	○	△	○	△ : Analog only
Constant surface speed control	○	○	○	○	○	
2nd miscellaneous functions : 8 digits (binary), select address from A, B, C so that it does not duplicate with control axes' address	○	×	×	×	×	
Inch/metric conversion	○	○	○	○	○	
Programmable data input (G10)	○	○	○	○	○	
Stored stroke check 2, 3	○	○	○	○	○	
Stroke check before move	○	○	○	○	○	
Stored pitch error compensation	○	○	○	○	○	
Program restart	○	×	○	×	○	
Block restart	○	×	○	×	×	
Sequence number comparison and stop	○	○	○	○	○	
Optional block skip addition 2-9	○	×	○	×	○	
External work number search : 31 points	○	△	○	△	○	△ : Up to 15 points for 3
External data input	○	○	○	×	○	
Input/output interface : RS232C × 2, RS422 × 1, 20mA current loop × 1	○	○	○	○	○	
Custom macro	○	△ ↑	△ ↑	△ ↑	△ ↑	DI/DO = 16/16 DI/DO : None
Programmable mirror image	○	○	○	○	○	
Mirror image for double turrets	○	○	○	○	○	
Chamfering, Corner R	○	○	○	○	○	

○ = Available △ = Restricted × = Not Available

SPECIFICATIONS

system is more than adequate for construction of complex FMS cells. The wide communication channels will accommodate the following items:

- Control of program loading/unloading through serial port

TECHNICAL SPECIFICATIONS

BM BASIC MACHINE INTERFACE: System with BM interface (the only interface with which all functions of SYSTEM 10 can be used). PC is required.

- Terminal emulation by MDI/CRT
- Reporting NC and machine status
- Supervising machining by a host computer
- NC command format conversion

3System with which interface is compatible with the current system 3.

6System with which interface is compatible with the current SYSTEM 6.

1) BASIC FUNCTIONS

Specifications	With PC			Without PC		Note
	BM	3	6	3	6	
Controlled axes : 2 axes	○	○	○	○	○	
Name of axes : Optional from X, Z	○	○	○	○	○	
Simultaneously controllable axes : 2 axes	○	○	○	○	○	
Tape code : EIA RS244A, ISO840 Automatic recognition	○	○	○	○	○	
Decimal point programming	○	○	○	○	○	Pocket calculator type available
Max. command value : +8 digits	○	○	○	○	○	
Rapid traverse override : F0, 25, 50, 100%	○	○	○	○	○	
Feed rate command : mm/min or inch/min, mm/rev or inch/rev E6 digits specify	○	○	○	○	○	
Feed rate override : 0-254% per every 1%	○	△	△	△	△	Up to 150% in 3 Up to 200% in 6 (per 10%)
Tangential speed constant control	○	○	○	○	○	
Automatic acceleration/deceleration : Rapid traverse; linear, cutting feed, exponential	○	○	○	○	○	Acceleration/deceleration after interpolation
Positioning	○	○	○	○	○	Linear interpolation type available
Linear interpolation	○	○	○	○	○	
Multi-quadrant circular interpolation	○	○	○	○	○	
Radius designation on arc	○	○	○	○	○	
Thread cutting, continuous thread cutting, synchronous feed	○	○	○	○	○	
Combined use of absolute/incremental command : possible in the same block	○	○	○	○	○	
Coordinate system setting	○	○	○	○	○	
Local coordinate system setting	○	○	○	○	○	
Work coordinate system selection	○	○	○	○	○	
Machine coordinate system selection	○	○	○	○	○	
Buffer register	○	○	○	○	○	
Dwell	○	○	○	○	○	
Auxiliary functions : M 8-digit (Binary output)	○	△	△	△	△	△ : BCD 2-digits output.
Spindle functions : S 8-digit (Binary output)	○	△	△	△	△	
Tool functions : T 8-digit (Binary output)	○	△	△	△	△	
Tool offset : T code command	○	○	○	○	○	
Tool offset amount memory 6 : +6 digits, 32 pairs	○	○	○	○	○	
Keyboard type manual data input (MDI)	○	○	○	○	○	
Incremental offset	○	○	○	○	○	
Offset counter input	○	○	○	○	○	
CRT character display : 14" color	○	○	○	○	○	
Symbolic FAPT TURN	○	○	○	○	○	Includes 16KB file
Part program storage, editing	○	○	○	○	○	
Background editing functions : Editing during automatic operation	○	○	○	○	○	
Tape storage length : CMOS memory 20m	○	○	○	○	○	
Registerable program : 50	○	○	○	○	○	Program name display also possible

○ = Available △ = Restricted × = Not Available

SPECIFICATIONS

Specifications	With PC			Without PC		Note
	BM	3	6	3	6	
Handle interruption	○	×	○	×	○	
Play back	○	○	×	○	×	
Tool life management	○	×	○	×	○	
Menu switch	○	○	○	○	○	
Manual numerical command under JOG mode	○	○	○	○	○	
G code system C	○	○	○	○	○	
Direct input of offset value measured	○	○	○	△	○	△ : No position records
Automatic tool compensation	○	×	×	×	×	
Run hour display	○	○	○	○	○	
Bubble cassette & adaptor	○	○	○	○	○	
LSI cassette & adaptor	○	○	○	○	○	
Portable tape reader	○	○	○	○	○	
Printer punch reader	○	○	○	○	○	
Programmable controller	○	○	○	×	×	PC-MODEL I
PC window	○	×	×	×	×	
Thread cutting feed hold	○	○	○	○	○	
Tape storage length : CMOS memory max. 80m	○	○	○	○	○	Additional memory required. Limits in max. storage may occur according to offset memories, etc.

○ = Available △ = Restricted × = Not Available

GENERAL NUMERIC

(312)640-1595 390 Kent Ave. Elk Grove Village, IL 60007