


CNC : BASE SOFTWARE CHARACTERISTICS

Axes Control

- **Control up to 36 axes with 3 processor.**
Control of acceleration, feed and space
- **Concurrent management among more interpolators or multi-process.**
- **Control of linear axes and rotating axes**
For the rotating axes, functions are available which allow: the choice of the shortest path and the set-up within 360 degrees also with commands of angles bigger than a circle angle.
- **Interpolation: Linear, circular, helical and tabular (electronic cam).**
- Set-up and interpolation between axes with **telescopic movement**. For example slide and support.
- Possibility of **changing**, by means of the **Override, the speeds on the trajectory during the machining or the rapid displacement.**
- **“Zero” research cycle**
 - **completely programmable** and configurable according to the needs of the application,
 - **memorizing of the measure** when the machine is switched off, which allows the next handling to be executed without having to carry out the “zero” research cycle,
 - setup of no matter which measure on the ‘zero’ point of the transducer.
- **Control of servo-motor drives, Step motor drives, Inverters, AC motors with encoder, servo-motors by proprietary protocol (SLM, Mechatrolink) and standard protocol CANopen.**
- **Control of the acceleration ramps by means of ‘S’ type curves.**
- **Set-up parameters adjustable** also from the **PLC software** and **Part-Program**.
- **Interaction on the axis measures directly from the PLC software.**
- **Compensation of the measures inaccuracy by means of 1024 points to be distributed on any axis or on several axes.**
- **Compensation of the screw pitch error.**
- **Compensation of the structural setting** for arm-type axes.
- **Thermal compensation.**
- **Compensation of the movement decrease during the inversion of the axes movement.**
- **Compensation of the dead zone of the speed/time characteristic.**
- **Control of axes with Clamps and Brakes.**
- **Axes Stroke-End control by checking all the points of the linear and circular trajectory before the movements start.**
- **Control of the movement limits in order to avoid collisions.**
- **Control of auxiliary axes for complementary working** such as movement of pallets or tool stores.
- **Control of 3 electronic handwheel**
- **Refreshing time for Axis Controlling from 0,5 to 8 ms.** (in function of the elaboration capacity)
- **Synchronized axes control** or **Gantry:** with relationship between the movements to be set up according to the user’s choice and as direct or inversed function (milling machine).

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- **Control of auxiliary axes** for movement of the piece supports: **“Rest”** (“Lunetta”) and **“lathe centres”** (“contropunta”) (Lathe).

Spindle control

- **Spindle speed programmable with standard ‘S’ and ‘M’ codes.**
- **Speed variation by means of override.**
- **Automatic variation of the velocity of spindle rotation in function of the type of programming:** cutting with constant velocity (revolution per minute), programmed velocity (in meters per minute), or in function of the tool removing (millimetres of advance per revolution).
- **Control of 6 speed ranges.**
- Automatic variation of acceleration and of the space ring setting parameters according to a given range.
- **Automatic control to insert the range gear.**
- **Range automatic selection according to the setup speed.**
- **Spindle oriented stop** (Space controlling)
- **Tapping with compensated tool**
- **Rigid tapping**
- **Threading control**
- **Automatic speed adjustment** according to the **previously selected** type of **control** and to the **axis X** (lathe).
- **Control of a secondary spindle for drilling cycles** (Lathe).

CNC functionalities

- **Forward reading of the blocks to be interpolated in order to obtain the optimum speed on the profile.**
 - The number of blocks can be programmed.
 - The speed variation given by means of the override is also extended to the blocks already processed.
- **Speed control on the angles of the trajectory** according to the axis acceleration parameters. Selection by means of the function G of the maximum

speed on the profile, in alternative to the highest accuracy (G64, G66).

- **Control of the peripheral speed on the circle arcs** according to the maximum acceleration allowed by the interpolating axes.
- **Mirror** function axis by axis.
- **Interpretation of the part program** with **direct** and **inverse** execution
- Function **Relation of programmable scale** with different parameters for each axis.
- Machining of **linear and circular geometric elements on rotated plans** as to the machine co-ordinates
- **Manual movement (JOG) of depth axis according to the spindle orientation**
- S-shape acceleration profile
- Trajectory smoothing and automatic connection (chamfering)

Tool control

- **Tool length compensation for machines with rotating tool or piece** (milling machine-lathe).
- **Length** definition also by means of **self-learning**.
- **Radius vectorial compensation in the machining plane which has been defined.**
- **Compensation of tool radius and length in the space.**
- **Control of the tool magazines both with or without dedicated sites (planar and rotating).**
- **Control of the tool place according to the dimensions** (small, medium and big size).
- **Control of consumption because of waste and time of use.**
- **Control of alternative tools.**
- **Data Base for 300 tools.**
- **Radius vectorial compensation for lathe tools in one of the 9 planes or quadrants available.**
- **Control of two turrets** (Lathe).

Auxiliary functions

- **Miscellaneous functions type M and H with nr. 2 definition decades**
- **Control of the execution priority for**

the auxiliary functions with reference to the axes movement

This allows to write auxiliary functions (with M codes) in the same program block which must be enabled before the axes start, during their movement and after the stop.

- Association function between axis and process.

Drilling Cycles

- Drilling cycles.
- Cycles of “pockets” milling.
- Tapping cycles
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Height

- **Polar** and **Cartesian** coordinates.
- **Absolute** and **incremental**.
- Values in **millimetres** and **inches**.

Origins displacement (Translation/Rotation)

- **Possibility to define 20 origin points** plus an absolute and an incremental displacement.
- **Possibility to translate and roto-translate a profile in its contouring plane**
- **Creation of the piece origin by self learning**

Turning cycles

- Thread with fixed and variable (increasing/decreasing) pitch.
- Cylindrical, conic and frontal thread.
- Thread macro to execute all types of standard and customized threads with one or more starting point (beginning).
- Roughing macro for square profiles.
- Roughing macro “with following to profile” (for complex profiles)
- Macro for the machining of grooves.

CNC programming

- Programming language **ISO** (G code).
- **The graphical interactive editor GIE allow the programming by “working blocks” and the graphic preview of the result of programmed working.**
- Recall of **sub-programs** up to 7 levels.
- Selection of the contouring plane.
- Chamfering and angle connection.
- Machining starting point with a tangent arc to the profile.
- Machining starting point with tangent helicoids to the profile.
- Over-Metal programming.
- Arithmetic, trigonometric and Boolean functions.
- Functions for the program flow control.
- Function for interruption control in order to allow the running of high priority programs.
- Blocks which can be excluded.
- Programmed stop with and without possibility of exclusion.
- Synchronizing function between processes.
- Synchronizing function on events.

CAD-CAM

- CAD CAM oriented to the machining on the plan (2D and half) for milling-drilling and slotting machines for the machining of metals.
Milling of pockets and slots, levelling, milling and internal and external milling-slotting of cylinders.
Drilling, Compensated tapping, rigid tapping and its respective Macro.
- CAD CAM oriented to the machining of stones by means of diamond wire.
- CAD CAM oriented to the machining of stones by means of diamond disc.
- Importation of profiles from external CAD to DXF format.
- Orders control and optimisation for cutting.

Notice: The software packages of above are optional and they are available both in the version for CNC and for PC external (Programming work-station).

Operating modes

- **Set**
To find the ‘zero’ of each axis

- **Manual**
Movement of one or more axes at the same time in continuous Jog mode, by impulses and by means of electronic hand-wheel.
Emulation of the instrument board of the machine
- **Automatic**
Automatic execution of part programs
- **Restart functioning for the interrupted machining** (on the point of the interrupted trajectory).
It allows the interruption of the tool feed, its detachment from the piece in manual functioning mode and to restart from the position of the interruption moment repositioning control of the auxiliary functions such as spindle rotation, cooler, tool change etc.
- **Retrace**
It enables to come back along the trajectory, to put in an accurate way onto the requested point by forward and backwards displacements and to restart the machining (this basic function must be developed for dedicated application).
- **Test**
Testing of coherence and syntax of program.
- **Single block**
Program executing step by step.

Displays

- *Display of the CNC data in **local** or **remote**.*
- Display the following data:
 - Display of the CNC state.
 - Display of the present position, of the distance to be reached and of the pursuit error.
 - Display of the running program.
 - Display of the enabled cycle.
 - Display of the enabled origin.
 - Display of the enabled tool.
 - Display of the piece measures and of the machine coordinates.
 - Display of warning and alarms.
 - Display of parameters.
 - Display of the axes state.
 - Display of the PLC inputs and outputs.
- Graphic display of the machine profile at

- the same time of the machining.
- Displays in the selected language.

Filing of programs

- Filing of programs in different working directories and with all the simplifications available for the operating system.

Data exchange

- Loading and unloading of programmes from Floppy Disk.
- Loading and unloading of programmes from the network (LAN).
- Serial lines RS232 (Controlled by PLC or by operating system)
- USB

Installation

- Analysis of the kinematics chains by means of the integrated oscilloscope function
Stability control of the adjustment rings, 'overshoot' control, pursuit error control, interpolation accuracy control. Filing of measures on a file which can be exported.
- Friendly-use input of parameters, mainly for the configuration of the CNC equipped with digital control

Maintenance

- Saving on a file of all the machine stops, together with all the alarms displayed.
- Software of application for this diagnosis.

PLC

- Programming language: ANSI C.
- 32K bytes data volatile storage and 32Kbytes buffer.
- 64 precisely timed (resolution 3 or 10 milliseconds) with possibility of extension up to 90.
- 256 timed with large tolerance.
- Execution time can be selected (in function of CNC size).
- The PLCs can be synchronized among them via Ethernet.
- Hardware resources control up to a maximum of: 4000 between digital inputs

and outputs, 256 analog inputs, 4 serial lines.

- Libraries for the control of: axes, spindle, instrument boards, electronic hand-wheels, self-learning of heights, serial line, man-machine interface of the CNC, lubrication, change of tools, Digitalization, File Management, Multi-process.
- Verification of the machine logic through:
 - Software for simulation of the machine,
 - Complete debugger from remote development unit.

Operating System

- Windows 2000 and XPembedded
- Real Time Extension.

Customising of the man-machine interface

The local and remote operator's interface can be customised. The customising is allowed by means of visual languages and of the OCX components properly developed.