

GENERAL CATALOGUE

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ISAC

All that technology can do.

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INTRODUCTION

ISAC, thanks to the experience achieved in industrial automation field and especially in working machines, is able to offer a wide range of solutions for **CNC** (Computer Numeric Control) machines, for **automatic plants** and for **supervising systems**. These solutions are realized by using base products so **modular** and **flexible** to allow the customization and the use in many **application fields**.

ISAC OFFERS PRODUCTS FOR

 **NUMERIC CONTROL MACHINE OF HIGH PERFORMANCES.** Solutions of big versatility, equipped with dedicated interface and able to host third-path CAD/CAM. The versatility ranges from the normal adapting of the CNC to machines defined as standard up to advanced customization for machines dedicated to specific workings.


Employment sector	Machining Technology
Metal working	Milling Machines, Machining centres, Slotting Machines, Lathes
Plate cutting	Thermal Cutting Routers
Stone working	Polishing Machines (for marble and granite), Cutting lines, Multidisc Block Cutter, Cutting Centres, Bridge Milling and banner Milling, Contouring-machines (with different cutting technologies: diamond cutter, diamond wire, water jet).
Wood, Plastics, Leather, Hides and Textile working	Routers, Tenoning-Machines, Special Machines.

 **AUTOMATIC PLANTS.** These solutions:

- make easier the integration of PLC Software project with the one for axes management or the one for local operator interface or supervising (for example via Web),
- allow to construct distributed plants with the consequent reduction of costs and increase of reliability, also assuring the scalability of configuration.

MACHINES FOR WORKING OF DIFFERENT MATERIALS:

Sector	Solution
Stone Working	Multidisc block cutters, bridge milling machine, Grinders, Polishing machines, Cutting lines, Wire cutting (single wire with coordinates and for quarry cutting; multi wire) ...
Wood processing	Tenoning machines, Trimming machines, Bordering machines, Polishing machines, Panel saws ...
Glass processing	Cutting benches ...
Metal processing	Sawing machines, Drilling machines ...
Paper processing	Rewinding machines, Tube plates, Cut-off machines, Packing machines ...
Clothing processing	Warping machines ...
Accessories for machine tools	Tool-changing systems, Backing plates, Value displays, Loading and unloading systems ...
Logistics and Packaging	Automatic storage systems, Packaging lines, Cartesian robots for loading and unloading operations, Fleet control systems ...
Domotics	Lifts, Access control systems, Remote control for domotics devices...

 **SUPERVISING SYSTEMS.** The **Industrial PC** for **supervising systems** are characterized by:

- the software that collects data from the production environment, based on wired or wireless network;
- a specific design that make them perfect to work also in hostile environments;

a wide range of connectable devices that will consent a precise and non-invasive data collection.

PRODUCTS

ISAC designs and realizes **PAC**, **CNC** and **Industrial PC**, besides several pre-configured solutions for the automation of machines and plants that require standard performances.



ULISSE

PAC - To manage the automation

The ISAC PACs are configurable and implement the following features:

- PLC
- Operator interface (MMI)
- Axes control (MC)
- Connectivity



AIACE



ACHILLE



SPARTACO

CNC - for numeric control machines

The ISAC CNC Spartaco extends the PAC and implements several features:

- Axes interpolation with ISO code
- Standard auxiliary functions
- Handling of all machines with Cartesian coordinates
- Control of machines with rotating tool or workpiece that require high speed and precision

Industrial PC - for supervising systems

ISAC industrial Personal Computers represent the ultimate solution for those needs of reliability, flexibility and modularity.

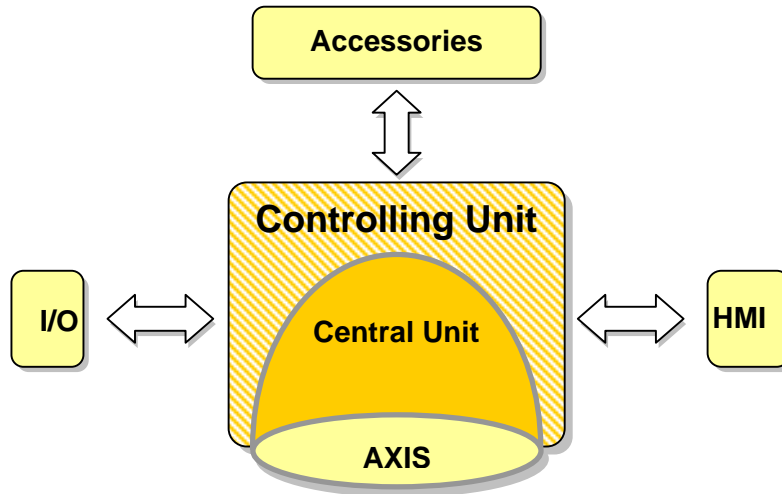
ISAC products, thanks to their modularity and openness, allow to reduce initial designing costs and to save resources for eventual updates.

- **One hardware** - the **hardware is common** with all products (PAC, CNC and industrial PC): this consents to uniform the implant designing, to reduce the number of spare parts, and to improve the system efficiency.
- **One software** - The **base software is unique** for PAC and CNC. This allows you to develop and update applications on one platform (instead of doing it for each machine) and distribute them to all machine that will work on the same automation.
- **Near and far** - the standard **human-machine interface (HMI)** consents to visualize all data both on **local** and from **remote**, via LAN.
- **Tools and support** - ISAC provides the **human-machine interface customized for the application** and offers all the resources and tools to ease the developing and customization of the application interface.
- **Use your software** – the ISAC central units can host **third-part applications** such as CAD-CAM (on CNC), operator interfaces or other utilities.
- **D.I.Y.** – ISAC put at your disposal all the libraries and utilities for **application development and debugging**, also from remote through standard software tools.

DESCRIPTION OF HARDWARE ARCHITECTURE

The ISAC products are characterized by **modularity** and **freedom of configuration**; this allows the realization of solutions that are heterogeneous and perfectly adequate to the machine performances.

Here below there is a diagram summarizing the main parts of configuration:



The hardware of controlling units is the same for all ISAC products: **PAC**, **CNC Spartaco** and **Industrial PC**.

ISAC control units for **PAC** and **CNC Spartaco** are formed by:

- ✓ Central unit
- ✓ Operative system Microsoft Windows XP or Windows CE
- ✓ PAC software
- ✓ CNC Spartaco software module(OMCNC), if you need to create a CNC;
- ✓ Optional applicative software;
- ✓ Size, which includes the real-time operative system and determines the max number of managed axes
- ✓ PLC peripherals (I/O)
- ✓ The Motion Control function is required, the axes interface will be added

The *controlling unit* hosts the **axis interface** for the piloting of servomotors, inverter and step motors. The *axis interfaces* can be of several types: standard (CANopen, EtherCAT, Analogical, Pulse/Direction) and custom, that can implement the communication protocol required by a specific motor manufacturer.

The *field bus interface*, **I/O**, is available on CANopen protocol and it can be connected through terminal boards in Open Frame and IP67 protection degree.

There are different kind of *operator interfaces*, **HMI**: they are equipped with TFT colour display of various dimensions and resolutions, some of them have Touch Screen function and they connect to the central unit through standard interfaces (usually LVDS, VGA and USB). They are all designed to work in industrial environments

The **Industrial PC** is formed by:

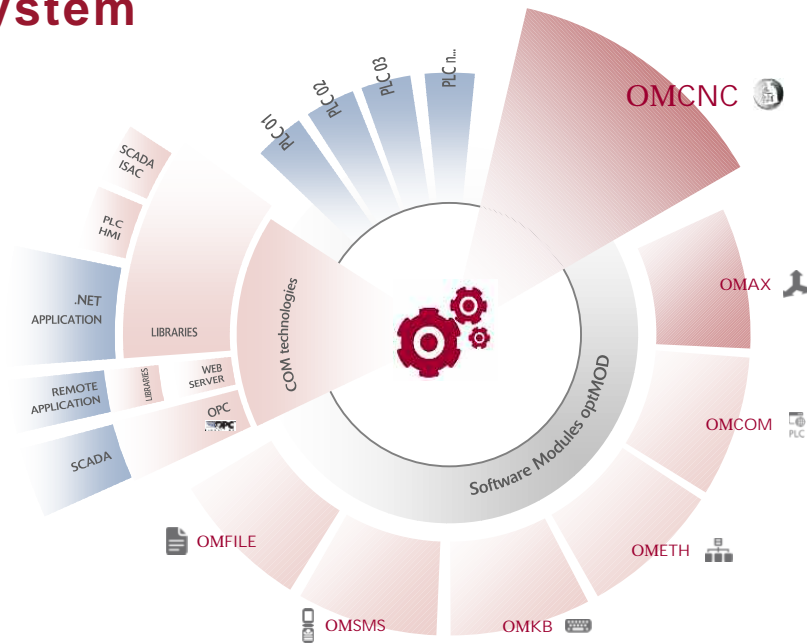
- ✓ Central unit
- ✓ Operator interface integrated or remote
- ✓ Operative system
- ✓ Possible accessories

➡ Reading notes:

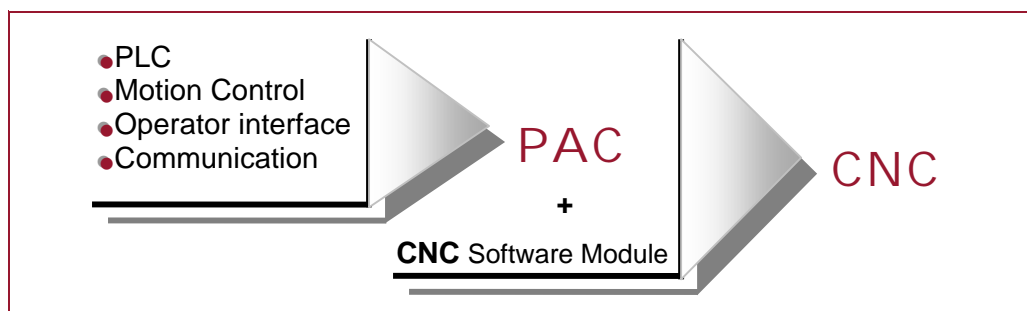
In this catalogue is described the available hardware for controlling units, the software for automation (PAC and CNC) and the preconfigured products.

The I/O and HMI peripherals, together with the accessories, are described in the Peripheral and Accessories Catalogue

ISAC system



ISAC system allows to feature, through several software, the following functionalities:



The **PAC** is a *Programmable Automation Controller* based on a microprocessor architecture that carries out the functions of:





- **PLC**: executes the control law in real-time and multithread environment; it is programmable with standard languages; the provided development tools ease the debugging;
- **Motion control (Axes management)**: it renders the *motion* development independent from the hardware configurations; it consents a high control flexibility;
- **Operator interface**: it can be executed on the central unit and it is realized with well-known tools, such as SCADA and systems for rapid application development (RAD);
- **Communication**: it grants the transparency of the control law with the supervising and control system and with other PAC devices.

The **CNC** is an extension of the PAC and implements all those functionalities requested by rotating tool machines, such as *routers, slotting machines, etc...* and with rotating workpiece, such as *lathes*.

PLC, motion control, operator interface and CNC share the same development environment and are programmed with well-known standard languages (C, IEC61131 and languages compliant with .NET standard).

ISAC system characteristics

Summarizing of codes for versions

<i>Sw. Version</i>	<i>Code</i>	<i>Compatible central units</i>	<i>Operating System</i>	<i>Programm. Interpreter IEC61131 code</i>
 ULISSE	OPULISSE	Central Unit U	Windows CE	OPPROCONU0
 AIACE	OPAIAACE	Central unit Q	Windows CE	OPPROCONA0
 ACHILLE	OPACHILLE	Central Unit M Central Unit H Central Unit K	Windows XP Embedded	OPPROCONK0
 SPARTACO	OPSPARTACO	Central Unit M Central Unit H Central Unit K	Windows XP Embedded	OPPROCONK0

Operative system

On ISAC controllers are available Microsoft Windows XP embedded, with Real-time extension, or Windows CE operative systems. The first provides a programming interface (API) similar to the Win32 one, typical of NT/2000/XP operative systems. Windows XP embedded is compatible with those system at binary level, so the same application can be executed on all environments.

The Windows CE OS is specifically designed for embedded application; it offers real-time features, together with functions typical of office systems; it is provided with powerful development tools.

The supported technologies are:

- MFC: library similar to MFC for desktop applications
- ATL: library for developing of COM components
- COM: Microsoft technology to create reusable components
- .NET compact framework: collection of functionalities that allow to execute interpreted code (metacode) widely independent from the beneath hardware and software platform
- Script with support of Automation
- Web server: it allows to publish information with HTTP protocol
- FTP server: it allows to transfer file from and to unit in an efficient way

PLC environment

The PLC is implemented through an execution environment (framework) and by the control law, which is realized by one or several software modules. The framework deals with the protocol handling, the execution of PLC modules functions and with the interfacing with other applications; the PLC modules implements the control laws.

All the operations are done with given execution times (real-time management).

PLC logic programming

The PLC modules can be written in languages that comply with IEC61131 standard. This has been promoted by PLCopen consortium (www.plcopen.org) of which ISAC is member.

In the standard are defined the following languages, all supported by ISAC PACs:

- IL (Instruction List)
- ST (Structured Text, similar to PASCAL)
- LD (Ladder Diagram)
- FBD (Functional Block Diagram)
- SFC (Sequential Functional Chart)

The components of the control law can be written with each of these languages; all of them can be used in the same application code. For further information about this, refer to [IEC 61131 programming](#) paragraph.

It is also possible to develop the PLC modules with C language, in an environment that is compatible with IEC 61131. For further details, refer to [C programming](#) paragraph.

Native operator interface

The native PLC Interface (PLCI) is an application running in the .NET framework that is able to display all the information about the PLC and its modules. PLCI can run on PAC or on an external PC connected through Ethernet to the unit to control.

I-O configuration

Through the relative interface is described the configuration of the connected I-O devices (*physical* nodes) and the information are organized in *logical* nodes; those information are available for the PLC modules; so they become independent from the I-O devices technology and their physical organization. The attribution of the values of associated global and local variables is done when the module is loaded according to the current configuration. Physical signals can be forwarded, duplicated or masked. If a variable of a PLC module is associated to a resource that is not available, the framework spot out and reports the error and it disables the variable. Therefore, the module logic still has available the area dedicated to the variable, even if it is not updated with real values.

Memory areas

The PLC software modules can have a memory area for their own variables (*volatile area*) within 128KB and 8MB. They can also record data in retentive way (between 32KB to 128KB).

Performances summary table

	ULISSE	AIACE	ACHILLE and SPARTACO
Min. sampling time	10msec	5msec	1msec
CANopen nodes	16	32	64
Total number of I-O*	1024	2048	4096

* the values are theoretical. They have been estimated for digital interface on a single bus (such as CANopen) and with max computing power consented for each referring model.

COM interface

All the framework functionalities are exposed through a COM interface that consents the other applications to gather and check the information.

The functions exposed by PLC modules (local and global variables, events routines, structure definitions, etc...) are published so that the external application can directly interact with the implemented logic. In this way, for example, a script is able to interact and control the execution flow of a series of axes movement or of a control law, without compromise the framework real-time execution.

The interaction modalities with other application are:

- Bi-directional sending of messages;
- Access to synonym data;
- Activation/Deactivation of event handler;
- Centralized management of alarms, attentions and information messages.

The external applications are also able to load and upload PLC modules.

It is available a library that consents the .NET application to interact with the PLC; those applications can connect run on the same PAC unit or connect to it from another PAC unit connected on the network. In this case, the information are published trough a “web service”.

Software Modules (OPTMOD)

The base features of the framework can be expanded with several optional *software modules* (OPTMOD); these are software and hardware components that exposes to the PLC modules and to the other external applications the hardware or software functionalities, so that they can be used in homogeneous way.

Here is the list of available software modules and their codes, together with a brief description.

OMCNC - SPARTACO

[Cod. OPOMCNC] = CNC Spartaco module. It brings the CNC features on ISAC PACs. Refer below for the *characteristics*.

OMAX

[Code OPOMAX] = Module for axis management. It is indispensable for the Motion management¹. Refer below for the *characteristics*.

OMCAN

[Code OPOMCAN] = Module for management of non-standard devices on bus CAN and CANopen. It is indispensable for handling of OPPILOTxx option.

OMCOM

[Cod. OPOMCOM] = Module for handling the communication with the serial port by PLC. It is useful to manage devices on serial lines with MODBUS protocol, as inverter, PLC and operator interface, or devices with free protocol (as RFID and BARCODE). The MODBUS server is already included into PAC base software.

OMETH

[Cod. OPOMETH]= Module for communication of PLC via Ethernet (in example to synchronize the PLC in Real-Time via Ethernet (TCP/IP)). It does not include the TCP Modbus server and the web server that are standard. OMETH is not compatible with EtherCAT interface. For Achille model it requires the second LAN port.

OMKB

[Cod. OPOMKB]= Module for keyboard management (management of keyboard by means of PLC).

OMFILE

[Cod. OPOMFILE]= Module accessing file (management of file and database). It is necessary for application where the PLC must memorize information, or receive a beginning configuration.

OMSMS

[Cod. OPOMSMS]= It allows the communication by SMS, e-mail and it is necessary for remote diagnostic communication. (It shares a serial resource with OMCOM). It requires an hardware device GPRS to be connected to serial port:

OPGSMGPRS0 (Module GSM dual band GPRS via serial RS232) with local antenna (OPGSMANT01) or remote antenna (OPGSMANT00) up to 4 mt.

OPOMKW

[Cod. OPOMKW]= Integrative module for IEC applications programmed in IEC61131..

¹ except when only inverters are present and they are handled by I/O cards or by OMCAN commands



Axes handling module for PLC - OMAX

OMAX axes handling module deal with the direct control of drives, through communication protocols, and offers an homogeneous interface, independently from the technology and from the peculiarity of each single axis.

OMAX includes several utilities for axes control, that consents to perform the movements, and for initial calibration check (independently from the PLC development):

- Homing cycle:
 - completely programmable and configurable according to the application needs
 - recording of the position upon switch off, this consent to restart the movement without perform the homing
 - any position can be set on 'zero' position of the transducer
- velocity feed forward (VFF) and torque feed forward (TFF) for those servos that support them
- acceleration and deceleration ramps with linear, "cubic" and "sinusoidal" ("S" curves)
- P.I.D. for velocity and space control, integrated in the control regulation or piloted in the servo regulating loop
- digital servos on field buses and proprietary protocols, such as SLM² and Mechatrolink².
- standard digital drives, such as EtherCAT and CANopen (DSP402)
- step motor drives, inverters and servos, both with analog and pulse-direction interface
- absolute encoders with EnDat 2.x and SSI protocol
- incremental encoders with TTL LineDriver and Push-pull interface
- electronic hand-wheels.
- The resolution is of 48Bit so it is possible assuring that the least command increment is 0,01 μm and the least control increment is 0,01 nm.

Upon configuration are defined the functional parameters for each axis and they are assigned to PLC channels. The axes belonging to a channel can receive commands independently or by groups (for certain type of them). Those commands can be set through PLC modules or from external applications. Each channel provides a list of commands interpreted in sequential way, an interpolator and a command distributor for independent axes. There can be up to 8 independent channels and there can be up to 16 associated axes per channel.

The axes operative modes can be:

- Servo free: the axis does not receive commands and only displays the current position;
- Positioning: the axis receive positioning commands independently from the others;
- Channel interpolation: the axis is associated to the channel interpolator and moves in synchrony with the others in the same modality.

Types of interpolation: *linear*, *circular*, *external* (through cam) or *free* (through PLC). In this last case, the PLC module can host a custom interpolation that is designed in function of application needs.

The possible command to the axes are the same that are disposed in the command lists and in the global channel commands:

- Linear axis homing with parameters of micro, mark, entrance and exit velocity, position setting;
- Circular axis homing;
- Movements that ends on input commutation;
- Movements with programmable velocity speed profile;
- Movement in interpolation;
- Change of operative mode;
- Change of position value;
- Change of the value of the position on 'zero' position;
- Axes synchronization (GANTRY);
- Axes synchronization with several slaves (GEAR);
- Positioning movements in space and velocity, with incremental or absolute positions;

² SLM and Mechatrolink field buses cannot be implemented simultaneously on the same controller.

- Movement speed can be controlled through a value in percentage (OVERRIDE).

Application development

IEC 61131 programming

The development of the code compliant with IEC61131 standard languages is done with KW Software environments (www.kw-software.com): Multiprog PRO and Multiprog Express (free light version).

These are powerful development tools that provide a visual interface; they easily consent to connect the software information to the system resources.

Moreover, ISAC provides an *addin* that adds several functionalities, consents to use the features of optional software modules and implements the resources of ISAC framework.

C programming

Moreover, the PLC modules can be also written in C language using the Microsoft Visual Studio .NET 2003, 2005 and 2008 environment with the *addin for PLC module development* for Visual studio. The programming can be done also with Visual C++ Express environment, together with a powerful development tool (RTPLC IDE) provided by ISAC.

The PLC logic can use a selection of the function of the standard C library, the standard framework functions, the PLCopen MC standard library, beside the other available with the optional modules.

SIMU

ISAC offers a software package that makes a simulation of the PLC framework on PC. This package includes the simulator of framework and the simulators of all optional modules OPTMOD. It allows you to realize and to make and test the PLC logic, to simulate the I/O devices and axes, and to perform external application of auxiliary task or human interface [Cod. OPPCSIMU].

PLC Remote Debugger (PRD)

PRD is a powerful verification tool for the PLC code, useful in particular during initial programming phases. It is provided directly with the Visual Studio environment.

With PRD is possible to set

With PRD it is possible to set up breakpoints on code or on global or local variable values.

During the execution of routine inside of PRD, the others are executed inside of the framework with real-time performances, so it is possible to make a test keeping a part or all logic of safety management fully responsible.

Utility libraries

There are several libraries available as PLC modules; they provide function blocks to ease the axes handle and other useful features to realize applications. For example, they implement the handling of CANopen devices and the management of real-time framework event log and alarm and warning messages.

In particular, the introduction of the certified PLCopenMC1.1 library (www.plcopen.org), consent to manage:

- axes enabling/disabling;
- axes in gantry, electronic cams, etc...;
- axes software limits;
- the homing procedure;
- incremental, absolute and jog movements;
- the overrides;
- the operative modes: Home, Manual, Jok, Manual Positioning, Automatic for motion cycle execution, Hold (halt on trajectory), hold Release, Reset of the cycle or of the movement.

Cam editor

[Optional Module **OPCAMMEDT0**]

The cam editor allows you to define a generic position constraint between a master axis and slave axis

(CAM). This constraint is formed from portions of polynomials up to 5 ° degree connected among themselves on reference points, defined by the user. The editor allows you to define points and the polynomial relation between them, and then allows you to move the points directly on the chart displayed in real time. At the same time also displays charts of speed, acceleration, and jerk results. The format of file is in agreement with the most common third-part cam editors.

Panel editor

The paged operator panel has been designed inside of the specific editor. By this you define the pages, where you insert the controls for exchanging the information; for each control you can select connecting properties and graphical appearance. You can program in entirely assisted and visual manner without writing a line of code. There are many controls able to meet various needs of representation data and interaction with the user, and are all independent of the PAC model; other specific controls can be added or even created by expert users.

By means of the same editor it is possible to run the simulator panel, and so distribute it on target PAC.

Control panel simulator

The Panel programmed with editor may be put into execution in a simulator of the Panel for purposes of verification and remote control of the PAC: data exchanged in fact can be produced within the Simulator or directly from the PAC under control.

Oscilloscope

In PLCI it is possible to set up a series of synonyms (not necessary physical signals) and to show the trend during the time. The acquisition can be continuous or triggered by a trigger logic. The data are acquired contemporaneously and in a synchronous mode with respect to the execution of PLC events. The data are showed on video as on last generation digital oscilloscope, they can be saved on a file in order to be analysed by external application and they can be reloaded at every time.

All oscilloscope functionalities are accessible also by other applications through the COM interface of the framework.

Execution trace

It is possible to insert a series of strings and binary data into the PLC logic in order to be used as execution markers, recorders of values of variables, executing flow tracks etc... These strings are recorded by the 'PLC trace data Logger' (FWLOG). The use of the trace does not significantly modify the execution times of PLC logic.

Crash analysis

When the PLC logic raises up a unmanaged exception the framework collects all the necessary information in order to execute the logic in the same conditions. The information are saved in a file that can be read by a dedicated application. In this way it is possible to execute the frozen cycle inside of Visual Studio debugger and analyse the causes of the exception. This tool is very powerful in order to understand the faulty causes, that are hard to be identified otherwise.

Usage statistics

By means of PLCI or dedicated scripts it is possible to acquire information about the execution count of each event routine, main function, and the statistics of execution time.



CNC Spartaco module – OMCNC

Axes management

- Up to 100 axes managed and handled with acceleration, velocity, space and torque control
- Up to 8 independent channels; each of them can handle 12 interloped axes
- NURBS (Non Uniform Rational B-Spline) available on some hardware versions
- Better machining finishing with less machine stress thanks to trapezoidal acceleration profile with Jerk control and to the continuous acceleration modulation with a sine function
- Linear, circular and helical interpolation
- Electronic cams with polynomial interpolation up to 5th degree; the interpolation can be associated to each of the 8 channels
- Movement can be superimposed to the interpolator one.
- The inner resolution for positioning is of 48Bit, thank to this it is possible to control an incremental displacement of 0,01 μm along distance of 1 km at origin.

OMCNC implements the feature to control and handle:

- axes synchronized, or “gantry”, up to 4 masters and n slaves per process or channel. The rapport between “gantry” axes can be freely set, both with direct and with inverted function
- positioning and interpolation of axes with telescopic movement (for example raft and support)
- axes positioned in optimal way without servo-motor
- linear and rotating axes
- axes with blocks and brakes
- limit switches of axes; before beginning the movements, the software checks that all the points in the linear or circular trajectories are within the limits
- movement limits to avoid collisions
- auxiliary axes for complementary machining such as pallet movement or tool storage

ISAC CNC Spartaco implements the management of the following settings:

- interpolator and regulating loop sampling time
minimum sampling time: 500 μs
- regulating parameters, some of them can be changed also from PLC software or from part-program
- velocity override on trajectory during machining or rapid movement
- tool rotating speed override

The functionalities introduced with OMCNC include also the following compensations:

- axes movement aberrations through errors mapping; the compensation can be against a single axis or a couple of axes
- thread pitch error
- structural setting for arm-type axes
- thermal
- motion loss due to movement inversion (backlash)

Spindle handling

- spindle speed programmable with standard ‘S’ and ‘M’ codes
- Speed override
- Handling of 6 speed transmission gears
- Automatic adjustment of the acceleration and of the setting parameters of the space loop according to the inserted transmission gear
- Automatic control of transmission gear insertion
- Range automatic selection according to the programmed speed
- Halt with oriented spindle (space control)
- Tapping with compensated tool

- Rigid tapping

CNC functionalities

- Look ahead of the blocks to interpolate to get the optimal speed on the profile
- Look ahead up to 256 blocks
- The speed change, set with the override, is extended to those blocks that has been already elaborated
- Throughput of 20.000 instructions/second, and 128.000 on peak, depending of the CPU and of the type of the ISO program
- Accelerations can be changed “on flight”, also block-by-block
- Speed control on corners of the trajectory according to the axes acceleration parameters
- Choice, through a G function, of the max speed on the profile instead of the max precision (G64, G66)
- Peripheral velocity control on the circle arches in function of the max acceleration consented to the interpolating axes
- Specularity function applied axis by axis
- Part program interpreting with direct or inverted execution sequence
- Scaling rapport function programmable with different parameters for each axis
- Machining of linear or circular geometrical elements on planes that are rotated to the machine coordinates
- Movements in manual mode (JOG) of depth axis according to the spindle orientation
- RTCP (Rotation Tool Center Point) interpolation for machining in space with rotating axes. The function consent to program the trajectory on the tool tip independently by its orienting
- Interpolation with following axis: the third axis (defined as follower) follow the tangent to the trajectory of the first two (axes on the plane)
- Smoothing of the trajectory and automatic joint

Tools management

The CNC Spartaco module introduces specific functions for the management of the tools. Between the many ones available we highlight these that are designed for the control of:

- tool storages with or without assigned slots (Planar or Rotative)
- tool slot assigned in function of the dimension (Small, Medium and Large size)
- tool wear and time usage
- replacement tools

The module, further, consents to apply several corrections, some of them compensate:

- tool length for machine with rotating tool or workpiece
- vectorial of the radius on the working plane
- tool radius and length in the space

Finally, CNC Spartaco consents to define the tool length through self-sampling.

It also manages a database for up to 300 tools.

Auxiliary functions

- Miscellaneous ‘M’ and ‘H’ functions with up 65.000 possibilities of definitions
- Management of the priorities of execution of the auxiliary functions compared to the axes movement. This consents to write on the same program block the auxiliary functions (M codes) that must be active before, during and after the axes movement.

CNC programming

- Programming language ISO 6983
- The advanced Interactive Graphic Editor GIE consents:
 - to program the machining in ISO code with the aid of macroinstructions (conversational programming)
 - the graphic visualization of the programmed machining with the rendering of the programmed

and compensated trajectories

- Recall of sub-programs up to 7 levels
- Selection of the contouring plane
- Implicit 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
- Excludable program blocks
- Programmed stop with and without possibility of exclusion
- Synchronizing function between processes
- Synchronizing function on events
- Association function between axis and process
- The quotas can be defined:
 - with cartesian and polar coordinates
 - with absolute or incremental values
 - in millimeters or inches
- The origins can be rotated and translated with the following features:
 - definition of up to 20 origin points, plus 1 absolute and 1 incremental shift
 - translation and roto-translation of a profile on its contouring plane
 - forming of workpiece origin through self-sampling

Drilling cycles

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

CAD-CAM interface

- 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.
- CA- CAM designed for the machining of stones with diamond wire.
- CAD-CAM oriented to the machining of stones with diamond disc.
- Importation of profiles from external CAD through DXF format.
- Orders control and optimization for cutting.

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

Oscilloscope and measures

- Analysis of the cinematic chain through oscilloscope function integrated in the *measure* feature. This is to control:
 - regulating loop stability
 - “overshoot” entity
 - following error
 - interpolation precision
- visualizing as trace or numerical value of all the registries and variables content in the numeric controller
- archiving of the measures on exportable files
- easy insertion of the calibration parameters of the CNC and of the servos if provided with digital

interface

Operative modes

- **Set**

To find the 'zero' position of each axis (homing)

- **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.

Visualizations

- Graphic display of the machine profile at the same time of the machining.
- Displays in the selected language.

Program archiving

The programs can be archived in different working folders and sub-folders with all the features provided by the operative system.

Data exchange

- Programs load and upload through Ethernet network
- RS232 serial line managed by the PLC
- USB

Maintenance

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

PLC software

To ease PLC code drafting, ISAC provides several function blocks and libraries to implement the functionalities typical of the numeric control machines

Base function blocks

These function blocks implement the handling of:

- servos and auxiliaries (i.e. brake)
- axes positioning
- axes movement in jog mode
- *home* operative mode
- axes end-stroke exit

-
- commands of operator interface
 - spindle and speed variation (gams)
 - auxiliary functions selector
 - standard auxiliary functions (anticipate, posticipate and simultaneous as for axes movement)
 - handled dashboards

Function blocks for Milling Bridge machine

ISAC has programmed several function blocks specific for Milling Bridges machines. These are designed for the management of:

- basic functionalities (through the main function block):
 - X, Y and Z axes and end-stroke control specific for the application
 - tilting axis
 - commands from operator interface
 - axes override commands specific for the application
 - laser, vacuum, lubrication, etc...
- semi-automatic operative mode (for manual cuts)
- table (controlled or displayed) + tilting(controlled or displayed)
- mono-rotating head (with non-controlled tilting)
- bi-rotating head (rotation and tilting)
- disc and tip and the relative override
- lathe
- auxiliary axes

Function blocks for Thermal Cut

- Torch management
 - ignition/extinction
 - height control
- *retrace* management for cut resuming

Function blocks for Laser Cut

- Laser power control

CNC lathe

As regards the application for CNC lathes, ISAC integrates the CNC functions with the ones described below:

Spindle handling

- Automatic rotating speed adjustment in function of the type of programming: cut with constant speed (mt/min), with programmed speed (rev./min) or in function of the tool machining progress (advancing mm/rev.)
- Automatic speed adjustment according to the previously selected type of control and to the axis X
- Control of a secondary spindle for drilling cycles
- Tapping

Tools handling

- Vectorial radius compensation for lathe tools in 1 of 9 possible planes or quadrants
- Handling of 2 turrets

Lathing 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.

CONFIGURATOR

Hardware choice

To help you to choose the central unit that fits your needs, we suggest the main selection criteria.

- First of all, you need to know the number and the type of axes you need to use; this will make you to find the **size** - which is the number of axes that can be controlled - and the **axis interface**.
- Then you have to find how many **board slots** you need to host the axis interface controllers.
- After this, you can choose the **video resolution**.
- It is important to choose a configuration that complies with the minimum requirements for third party applications and to check their compatibility with the operative system provided with the ISAC central unit.

At the end of this process, you should spot out one (or more) central unit that suites your need.

For further help, don't hesitate to contact ISAC support.

Central Unit	Video Resol.	Min sampling time	Software									
			Size	Axes processes	Axis interface: number of axes that can be connected for each type. The size defines the max number of axes that can be handled						SW type	
					Analogic	Pulse/Dir	SLM ³	Mechatrolink I ³	Mechatrolink II ³	EtherCAT	CANopen	
U ¹	320x240 ÷ 640x480	10ms	/	1	3 (1 slot)	3 (1 slot)	3 (1 slot)	3 (1 slot)	3 (1 slot)	/	8 (0 Slot)	ULISSE
			/									
			/									
			/									
			/									
Q	640x480 ÷ 1024x768	5ms	T	2	6 (2 slot)	6 (2 slot)	8 (2 slot)	8 (1 slot)	8 (1 slot)	/	16 (0 Slot)	AIACE
			S									
			/									
			/									
			/									
M	640x480 ÷ 1024x768	1ms	T	8	9 (3 slot)	9 (3 slot)	12 (3 slot)	12 (1 slot)	15 (1 slot)	/	128 (0 Slot)	ACHILLE / SPARTACO
			S									
			M									
			L									
			E									
M 2Lan	640x480 ÷ 1024x768	1ms	T	8	9 (3 slot)	9 (3 slot)	12 (3 slot)	15 (1 slot)	32 (1 slot)	128 (2a LAN)	128 (0 Slot)	ACHILLE / SPARTACO
			S									
			M									
			L									
			E									
H	640x480 ÷ 1024x768	1ms	T	8	12 (4 slot)	12 (4 slot)	12 (3 slot)	15 (1 slot)	32 (1 slot)	128 (2a LAN)	128 (0 Slot)	ACHILLE / SPARTACO
			S									
			M									
			L									
			E									
K	640x480 ÷ 1024x768	1ms	T	8	12 (4 slot)	12 (4 slot)	12 (3 slot)	15 (1 slot)	32 (1 slot)	128 (2a LAN)	128	ACHILLE / SPARTACO
			S									
			M									
			L									
			E									

SIZE legend - NOTE: The size limits the number of handled axes.

T = Tiny: 3 ax. ; S = Small : 4 ax.; M = Medium: 6 ax.; L = Large: 12 ax. ; E = Extra: 128 ax.

1 With U central unit is not possible to realize a CNC Spartaco

2 SLM and MECHATROLINK interfaces cannot be hosted simultaneously on the same controller.

Software choice

Software modules

After you choose the central unit, you can proceed with the **software modules** (OPTMOD) to integrate the desired functions. For further information and OPTMOD description, refer to **Software Modules (OPTMOD)** paragraph.

At this moment it is possible to choose if to realize a PAC or a CNC.

If you want to realize a CNC, you have to apply the **CNC Spartaco** OPTMOD (refer to **CNC Spartaco module – OMCNC** paragraph). So the code is OPSPARTACO (it includes all functionalities of PAC ACHILLE, besides to the modules OPOMCNC, OPOMAX, OMFIL, OMKW; in case of programming in IEC61131 languages, you have to include the programming interpreter OPPROC0).

Applicative software

ISAC provides a wide choice of applicative software for PAC and CNC Spartaco.

The tables below reports the description and the codes of the most meaningful of them.

For further information contact ISAC.

Applications for PAC

Main software	<input type="checkbox"/> Milling Bridge for PAC (OPCAMFPSWP) <input type="checkbox"/> Remote Diagnostic (OPMERCUSWP)
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Applications for CNC Spartaco

Main Software	Software for milling machine (Routers): <ul style="list-style-type: none"> <input type="checkbox"/> OPSWCNCCP0 (Software CNC SPARTACO provided of closed PLC designed to manage the basic functionalities). <ul style="list-style-type: none"> <input type="checkbox"/> OPFBGR0004: software options of group 1 (import. file dxf from external CAD/CAM, Gantry, diagnostic for each single axis, etc..). <input type="checkbox"/> OPSWCNCOP0 (Software CNC SPARTACO provided of opened PLC to allow further implementations) [You have to add the OPPROC0 for programming in IEC61131 environment]
	CNC Milling machine base software (OPSPARTACO). To this software are added the following applications: <ul style="list-style-type: none"> <input type="checkbox"/> Milling bridge (OPCAMFPSP0) <input type="checkbox"/> Thermal Cut (OPCAMOSSP0) <ul style="list-style-type: none"> <input type="checkbox"/> OPFBGR0001: see description here below. <input type="checkbox"/> Thermal Cut with Advanced Graphical Interface (OPCAMOSSP1) <ul style="list-style-type: none"> <input type="checkbox"/> OPFBGR0001: software options of group 1 (interact. Program. program. with DXF MACRO, importing of DXF file from external CAD, retrace, restarting from an hole, Gantry, diagnostic for each single axis, etc. ...) <input type="checkbox"/> OPFBGR0002: opzioni software gruppo 2 (Self-acquisition dimensions, change the position of entry hole, ect.) <input type="checkbox"/> OPFBGR0003: opzioni software gruppo 3 (Direct interfacing with source, Management of more torches, titling axes) <input type="checkbox"/> Wire Cutting (OPCAMTFIL0)
Complementary Software	<input type="checkbox"/> CAM for trajectory smoothing (OPCAMSMOOTH) <input type="checkbox"/> CAM Pedoca for cut optimization (OPCAMPEDOC)

Development and diagnostic tools

Software for simulation and developing	<input type="checkbox"/> SIMU (OPPCSIMU00): ISAC framework simulator + development software + Multiprog express + WebServer libraries (no protection key)
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Demo and simulators

The simulations of ISAC applications for PAC and CNC Spartaco are also available in DEMO versions for PC. These demos are installed on Microsoft Windows XP virtual machines, so to guarantee the best ease to use and compatibility with standard PC.

Some examples are:

- ❑ Milling Bridge for Spartaco DEMO (SWVMFREPO1)
- ❑ Milling Bridge for PAC DEMO (SWVMFREPO2)

Guide lines for choosing

Here below we list a collection of questions/answer: the question points out the needs and answer suggests the best solution that fits the needs.

- **Q:** Do you need to program in ISO6983 (G-codes)? **A:** You need of Spartacus;
- **Q:** Do you need execute part program in ISO or DXF code imported from CAD-CAM ? **A:** They need of Spartacus
- **Q:** Do you need to rotate, translate, mirror, scale, a program? **A:** You need of Spartacus;
- **Q:** Do you need tool compensation ? **A:** You need of Spartacus
- **Q:** Do you need 5 axis-interpolation? **A:** You need of Spartacus;
- **Q:** Do you need high feed interpolated with precision in geometry control ? **A:** You they need of Spartacus
- **Q:** Do you need to run fixed, 2D figures with a well defined geometry consisting in a low number of segments and arcs? **A:** You can use Aiace;
- **Q:** Do you need to run a third-part HMI? **A:** You need of Achille;
- **Q:** Do you need to make a two-channel interpolation? **A:** You need of Achille;
- **Q:** Do you need to run a Panel developed with Panel Developer (formerly called "SCADA Developer")? **A:** You can use Aiace;
- **Q:** Do you need to interpolate more than 3 axes with CAMs, Gears or similar? **A:** You need of Aiace;
- **Q:** Do you need to receive instructions via Ethernet, RS232, or a simple text file that a PC program can generate, and run 1, 2, or 3 axes, with a very simple HMI on board (say 2-3 pages with only parameters and status report)? **A:** You can use Ulisse;

HARDWARE

CENTRAL UNITS

The configurable central unit are: **U, Q, M, H, K**; they differ for some connections, for the supported options and so for the computing capacities (both for functionalities of CNC and PAC software and for third-part hosted application, such as CAD-CAM, SCADA and other management software).

They differ also for the maximum number of axis interface slots:

- up to 2 axes slots on U and Q central units
 - up to 3 axes slots on M central unit
 - up to 6 axes slots on H central unit
 - up to 10 axes slots on K central unit
- For all configurable models, through specific options, it is possible to choose the elaboration capability of PC processor and the amount of the RAM.
 - All available processors have a 32Bit architecture.
 - The memory mass is of static type (Flash or Compact Flash) (except for model with inner memory) and the operating system in Windows XP embedded.
 - The can be powered at 220Vac or directly in continuous at +24 Vdc (in function of model and/or available options).
 - Here below there is a list of available standard communication interfaces (in function of model and/or option):
 - Serial RS-232(RS-485 e RS-422)
 - Parallel LPT
 - USB V2.0
 - PS/2 Keyboard and Mouse
 - Video:
 - o Digital LVDS (for display with digital interface)
 - o Analogical VGA (for monitor and display TFT with analogical interface). In case of failure, for example, this port can connect a monitor of office while you are waiting for spare parts, without stopping the working machine)
 - LAN Ethernet 10-100 Mb/sec (for connection via Web with the firm network in order to transfer programs and data)
 - LAN Ethernet 10-100 Mb/sec in Real-Time (deterministic) (for connection among them controllers and servodrives and I/O devices through the EthrCAT protocol)
 - CANopen port (Except for Industrial PC)
 - Services (0...5 volt) (Except for Industrial PC)

On central unit you can add some options that implement functionalities and performances. See *Peripheral and Accessories Catalogue* for further details.

General technical characteristics:

- The degree of protection IP20.
- The working temperature is 0 +45 centigrade degree.
- The storage temperature is -20 +70 centigrade degree
- The maximum degree of damp is 90% with no condensation.
- Every central unit are prepared for the fixing to the panel (The drilling template in available on documentation)

Central Unit U

The central unit **U** is available in base model UN07UR0000 and it can be configured according to the table below.

Central Unit U		Dimensions: <table border="1" data-bbox="1038 786 1353 891"><tr><td>HEIGHT</td><td>140,0 mm</td></tr><tr><td>WIDTH</td><td>166,0 mm</td></tr><tr><td>DEPTH</td><td>122,0 mm</td></tr></table>	HEIGHT	140,0 mm	WIDTH	166,0 mm	DEPTH	122,0 mm
HEIGHT	140,0 mm							
WIDTH	166,0 mm							
DEPTH	122,0 mm							

		Unità centrale U	Note
		Description Central unit code: UN07UR0000	Options available to configure the C.U. (for a full configuration you need to choose one of the following option for each category)
Power	Power supply +24Vdc		
CPU / RAM / Mass storage memory		Processor ARM9, CPU a 520 MHz, RAM 64 MB, internal memory mass (OPCPUARM01)	(About 10MB are available for applications storage)
		Processor ARM9, CPU at 520 MHz, RAM 128 MB, internal memory mass (OPCPUARM04)	(About 10MB are available for applications storage)
		Processor ARM9, CPU at 520 MHz, RAM 64 MB, Compact Flash 128MB (OPCPUARM02)	
		Processor ARM9, CPU at 520 MHz, RAM 128 MB, Compact Flash 128MB (OPCPUARM03)	
Operative system		Windows CE (OPOSWINCE)	
Connections	Serials: 2 ports RS-232		One of the two ports can be choose as type RS- 485.
	USB (V1.1) : 2 ports The U Central Unit supports a maximum number of peripherals of 11. You can connect all ISAC keyboards, besides to the office type.		For USB options, see catalogue Peripherals and Accessories. Opt.: 2 ports USB (in developing).
	LAN Ethernet a 10 Mb/sec: 1 port		Opt: second LAN port 10Mb/sec (in developing).
	Video : 1 port LVDS 1 port VGA You can connect all ISAC operator panel, besides to the office monitors.		See Catalogue Peripherals and Accessories for units and connecting cables.
	1 Safety relay and services port (0÷5 volt)		Safety port.
	CANopen : 1 port		I/O peripheral displaceable and expandible.
Axes slot	2 Axes slot (short type) [The axes slots host connectors and axis interface cards.]		For the supported axes interface refer to <u>CONFIGURATOR</u> .
Software		Base software PAC ULISSE (OPULISSE)	Refer to <u>CONFIGURATOR</u> .

Central unit Q



The central unit **Q** is available in base model UN07QR0000 and it can be configured according to the table in the next page.

Central Unit Q		Dimensions: <table border="1"><tr><td>HEIGHT</td><td>140,0 mm</td></tr><tr><td>WIDTH</td><td>166,0 mm</td></tr><tr><td>DEPTH</td><td>145,0 mm</td></tr></table>	HEIGHT	140,0 mm	WIDTH	166,0 mm	DEPTH	145,0 mm
HEIGHT	140,0 mm							
WIDTH	166,0 mm							
DEPTH	145,0 mm							

		Central Unit Q		
		Description Central unit code: UN07QR0000	Options available to configure the C.U. <i>(for a full configuration you need to choose one of the following option for each category)</i>	Central Unit Q
Power	Power supply +24Vdc			
CPU / RAM		Processor x86, CPU at 500 MHz and 256MB RAM (OPCPUETX05)		
		CPU ETX Atom N270, 800MHz, RAM 1GB (OPCPUETX08)		
Mass storage memory		Compact Flash 4 GB (OPFLASH04G)		
Operative system		Windows CE (OPOSWINCE)		
		Windows XP Embedded (OPOSWINXP)		
		Windows XP (OPOSWINXPC)		For industrial PC
Connections	Serials: 2 ports RS-232			
	USB (V2.0): 2 ports You can connect all ISAC keyboards, besides to the office type.			For USB options, see catalogue Peripherals and Accessories.
	LAN Ethernet 10-100 Mb/sec : 1 port It can be chosen Web or deterministic.			Opt.: second LAN port. It can be chosen Web or deterministic.
	Video : 1 port LVDS 1 port VGA You can connect all ISAC operator panel, besides to the office monitors.			See Catalogue Peripherals and Accessories for units and connecting cables.
	1 Safety relay and services port (0÷5 volt)			Safety port
	CANopen: 1 port			I/O peripheral displaceable and expansible. (not available on Ind. PC)
Axes slot	2 Axes slot (short type) [The axes slots host connectors and axis interface cards.]			For the supported axes interface refer to <u>CONFIGURATOR</u> .
Software				Refer to <u>CONFIGURATOR</u> .

Central Unit M

The central unit **M** is available in two base model: *M* model and *M 2LAN*.
The can be configured according to the table below.

Central unit M model		Central unit M 2LAN model						
	<p>Dimensions:</p> <table border="1"> <tr> <td>HEIGHT</td> <td>391,0</td> </tr> <tr> <td>WIDTH</td> <td>87,0</td> </tr> <tr> <td>DEPTH</td> <td>178,0</td> </tr> </table>	HEIGHT	391,0	WIDTH	87,0	DEPTH	178,0	
HEIGHT	391,0							
WIDTH	87,0							
DEPTH	178,0							
The picture shows the central unit with one axis slot that hosts the analogical interface.		The figure shows the M2LAN central unit configured as Industrial PC.						


Central Unit M		Note
	<p>Description Central units codes: UN2011LM30 } M UN2011LM40 } M UN2012LM30 } M 2LAN UN2012LM40 }</p>	<p>Options available to configure the C.U. (for a full configuration you need to choose one of the following option for each category)</p>
Power	<p>220 Vac power supply (Code OPALI220V0)</p> <p>+24Vdc power supply (Code OPALI024V0)</p>	
CPU / RAM	<p>CPU ETX Celeron M 800MHz + RAM 1GB (OPCPCETX00)</p> <p>CPU ETX 1.6 GHz Intel Atom N270 + RAM 1,0 GB + Intel 945GME graphic chipset (OPCPUETX07)</p>	<p>Only for versions: UN2011LM30 and UN2012LM30</p> <p>Only for versions: UN2011LM30 and UN2012LM30</p>

GENERAL CATALOGUE

		CPU Intel ATOM N270 1.6GHz + Chipset nVidia MMP9 embedded ION + RAM DDR3 1 GB (OPCPUCEX01)	Only for versions: UN2011LM40 and UN2012LM40
		CPU Intel ATOM N270 1.6GHz + Chipset Intel 945GME + RAM DDR3 1 GB (OPCPUCEX03)	Only for versions: UN2011LM40 and UN2012LM40
Mass storage memory		Compact Flash 4 GB (OPFLASH04G)	
Operative system		Windows XP Embedded (OPOSWINXP)	
		Windows XP (OPOSWINXPC)	Opz. per PC industriale
Connections	Serials: 2 ports RS-232		
	USB V2.0 : ▪ 2 ports on UN2011LM30 UN2011LM40 ▪ 4 ports on UN2012LM30 UN2012LM40.		For USB options, see catalogue Peripherals and Accessories.
	Parallel: n.1 LPT		
	LAN Ethernet a 10- 100 Mb/sec : ▪ 1 port on UN2011LM30 UN2011LM40 ▪ 2 ports on UN2012LM30 UN2012LM40.		The second port LAN can be of deterministic type for EtherCAT axis interface.
	PS/2 : 2 ports (mouse and keyboard)		
	Video : 1 port LVDS 1 port VGA You can connect all ISAC operator panel, besides to the office monitors.		See Catalogue Peripherals and Accessories for units and connecting cables.
	1 Safety relay and services port (0÷5 volt)		Safety port. Not on Industrial PC.
	1 port CANopen		I/O peripheral expansible. (It is not present on Ind. PC)
Axes slot	3 Axes slots (short type) [The axes slots host connectors and axis interface cards].		For the supported axes interface refer to <u>CONFIGURATOR</u> .
Software			Refer to <u>CONFIGURATOR</u> .

Central Unit H

The central unit **H** can be configured according to the table below.

Model H (Central unit) ETX H							
	<p>Dimensions</p> <table border="1"> <tr> <td>HEIGHT</td> <td>391,0</td> </tr> <tr> <td>WIDTH</td> <td>141,0</td> </tr> <tr> <td>DEPTH</td> <td>178,0</td> </tr> </table> <p>The picture shows the central unit with 3 occupied axis slots.</p>	HEIGHT	391,0	WIDTH	141,0	DEPTH	178,0
HEIGHT	391,0						
WIDTH	141,0						
DEPTH	178,0						

Unità centrale H		Note
Description: Central unit codes UN2012LH30 UN2012LH40	Options available to configure the C.U. (for a full configuration you need to choose one of the following option for each category)	
Power	220 Vac power supply (Code OPALI220V0)	
	+24Vdc power supply (Code OPALI024V0)	
CPU / RAM	CPU ETX 1,5 GHz + RAM 1,0 GB (OPCPUETX03)	Only for version: UN2012LH30
	CPU ETX 1.6 GHz Intel Atom N270 + RAM 1,0 GB + Intel 945GME graphic chipset (OPCPUETX07)	Only for version: UN2012LH30
	CPU Intel Core2 Duo T7500 2.2GHz + Intel 945GME graphic chipset + RAM DDR2 1GB (OPCPUCEX02)	Only for version: UN2012LH40


GENERAL CATALOGUE

		CPU Intel Core2 Duo T7500 1.6GHz + ATI Mobility Radeon E2400 Graphic chipset + RAM DDR2 1GB (OPCPUCEX04)	<i>Only for version: UN2012LH40</i>
Mass storage memory		Compact Flash 4 GB (OPFLASH04G)	
Operative system		Windows XP Embedded (OPOSWINXP)	
Connections	Serials : 2 ports RS-232		Opzioni per compatibilità RS-422 e RS-485
	USB : 4 ports V2.0		For USB options, see catalogue Peripherals and Accessories.
	Parallela : 1 port LPT		
	LAN Ethernet 10-100 Mb/sec : 2 ports		The second port LAN can be of deterministic type for EtherCAT axis interface.
	PS/2 : 2 ports (mouse and keyboard)		
	Video : 1 port LVDS 1 port VGA You can connect all ISAC operator panel, besides to the office monitors.		See Catalogue Peripherals and Accessories for units and connecting cables.
	1 Safety relay and services port (0÷5 volt)		Safety port.
	CANopen : 1 port		I/O peripheral expandible.
Axes slot	6 Axes slot (short type) [The axes slots host connectors and axis interface cards].		For the supported axes interface refer to <u>CONFIGURATOR</u> .
Software			Refer to <u>CONFIGURATOR</u> .

Central Unit K

The central unit **K** can be configured according to the table below.

Model **K** (Central unit) ETX K



Dimensions:

HEIGHT	391,0
WIDTH	220,0
DEPTH	178,0

The picture shows the central unit with 4 axis slots occupied with analogical interface and one slot with supplementary CANopen port.

Central unit K		Note
Description Central unit code UN2012LK30 UN2012LK40	Options available to configure the C.U. (for a full configuration you need to choose one of the following option for each category)	
Power	220 Vac power supply (Code OPALI220V0) +24Vdc power supply (Code OPALI024V0)	
CPU/RAM	CPU ETX 1,5 GHz + RAM 1,0 GB (OPCPUETX03)	Only on version: UN2012LK30
	CPU Intel Core2 Duo T7500 2.2GHz + Intel 945GME graphic chipset + RAM DDR2 1GB (OPCPUCEX02)	Only on version: UN2012LK40
	CPU Intel Core2 Duo T7500 1.6GHz + ATI Mobility Radeon E2400 Graphic chipset + RAM DDR2 1GB (OPCPUCEX04)	Only on version: UN2012LK40
Mass storage memory	Compact Flash 4 GB (OPFLASH04G)	
Operative system	Windows XP Embedded (OPOSWINXP)	
Connections	Serials : 2 ports RS-232	
	USB : 4 ports V2.0	For USB options, see catalogue Peripherals and Accessories.
	Parallela : 1 port LPT	
	LAN Ethernet 10-100 Mb/sec : 2 ports	The second port LAN can be of deterministic type for EtherCAT axis interface.
	PS/2 : 2 ports (mouse and keyboard)	
	Video : 1 port LVDS 1 port VGA You can connect all ISAC operator panel, besides to the office monitors.	See Catalogue Peripherals and Accessories for units and connecting cables.
	1 Safety relay and services port (0÷5 volt)	Safety port.
	CANopen : 1 port	I/O peripheral expansible.
Axes slot	9 Axes slot (high type)+ 1 Axes slot (short type) [The axes slots host connectors and axis interface cards].	For the supported axes interface refer to <u>CONFIGURATOR</u> .
Software		Refer to <u>CONFIGURATOR</u> .

AXES INTERFACE

The control of the axes and spindle (in space) involves that every axis, or spindle, must be associated to one of the channel of CNC. However the spindle can be also controlled in an independent way by PLC without the CNC controlling. This alternative is not available you have to use performances such as Rigid Tapping, Spindle orientation and controlling of speed range changing with spindle movement to the inserting.

The control movement accuracy depends on the sampling time (TAU is expressed in milliseconds) and on the elaboration velocity that has repercussion also on the execution velocity of the blocks of program for axis movements (part program). For every model it is indicated the minimum time permitted: this value is also influenced by the kind of interface with servomotors.

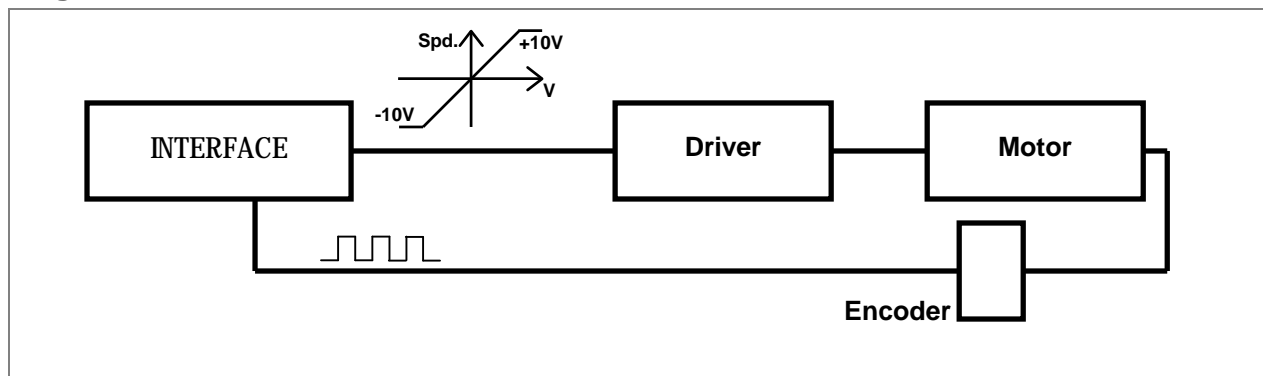
The **interface** with **servomotors** can be also **mixed**. The mixed interface is used for controlling axes by digital interface together with a spindle controlled by inverter and equipped with position transducer (encoder type). This need comes from the necessity to use a servocontrolled spindles for applications with the necessity of Tapping / Orientating.

The main rules are the following:

- The digital interfaces with proprietary protocol SLM and Mechatrolink can not be present together.
- The CANopen interface is always available (DSP-402 positioning profile)
- These interfaces can be present together: 'Analogical' + 'Pulse/Direction' + 'EtherCAT' + 'one digital interface with proprietary protocol'

► *Notes for reading: there is brief theoretical description of several typology of the supported axes interfaces. Then the technical details and the corresponding codes are listed.*

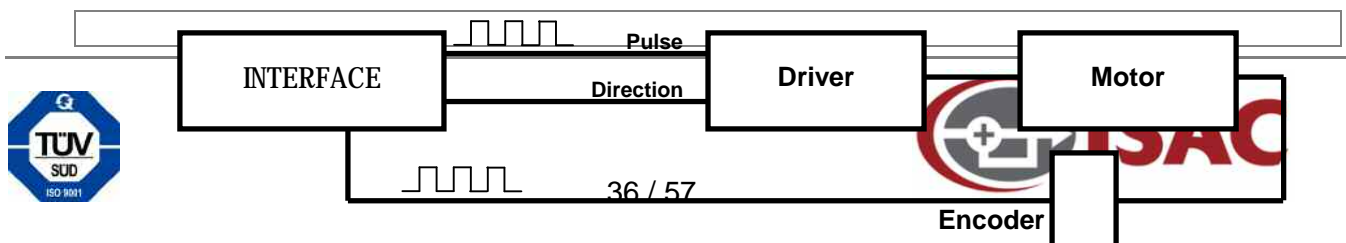
Analogic

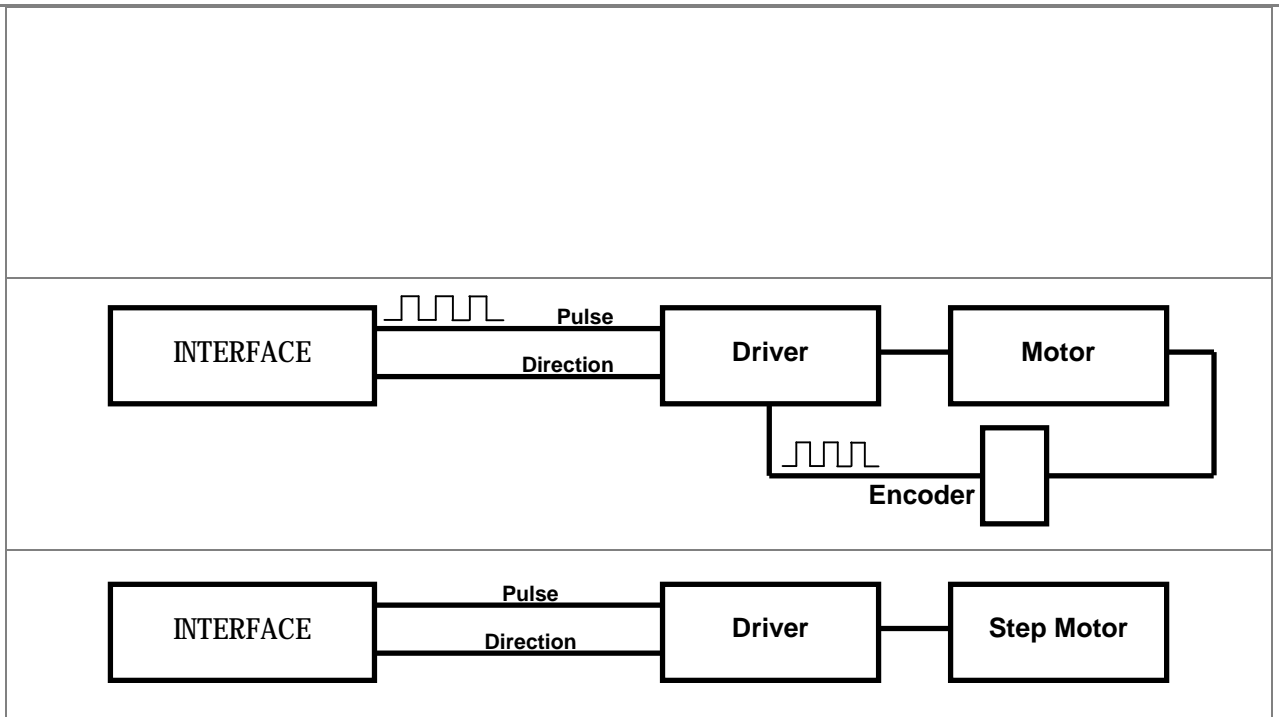


Analogic interface is piloted with signal of level +/- 10V and with 16 bit resolution. The reaction of space loop through is performed by connecting a transducer of encoder type, optic or magnetic line, to an input of fast counting, foreseen by interface, with maximum input frequency of 1 MHz (and max. counting freq. 4 MHz). The measure inputs are in agreement with transducers of type TTL Line-Driver or Push-Pull, with voltage level of 5 Volt, and they give auxiliary power supply at 5 Volt – 500 mA. The analogical option is indicated for applications that ask rigid tapping.

Modularity: 1 slot controls 3 axes. In accord to the option code there are already foreseen the height reading (number 3 of module) and the hybrid handling Analog and Pulse/Direction, singularly configurable for each channels (number 3 for module).

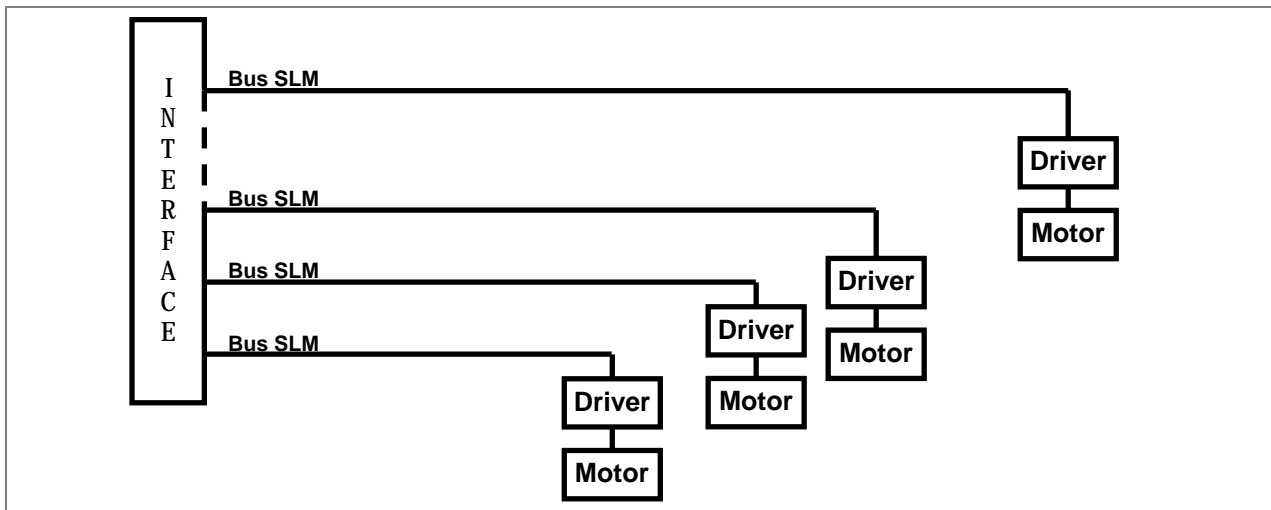
Pulse/Direction





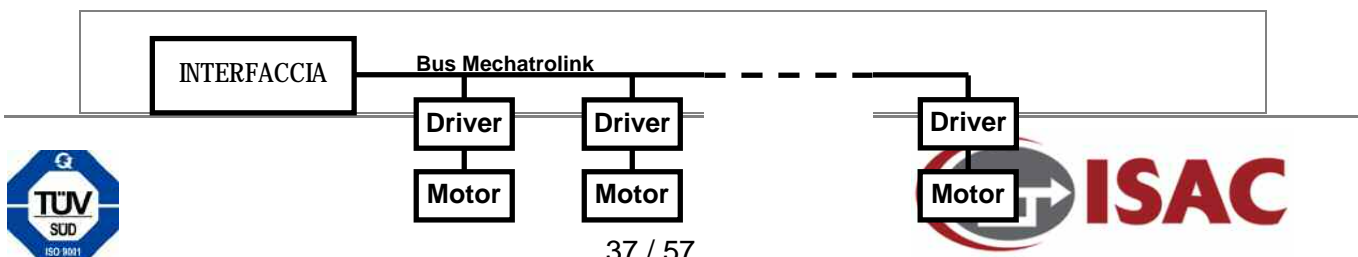
Interface with Pulse/Direction output for controlling of servomotors or step-by-step motors. The maximum frequency of pulses is 500 KHz (symmetrical signal) and it can be set up by parameter. The output signal is of type Line Driver (Differential) 0-5Volt: the used component is a Driver for serial line 485. For servomotors or Inverter the reaction of space loop is made by connecting a transducer (encoder or optical or magnetic line) to a counter input that is foreseen in the interface itself and with maximum frequency of 1 MHz. As alternative, it is possible to close the space loop onto the driver.
Modularity: 1 slot for controlling 3 axes.

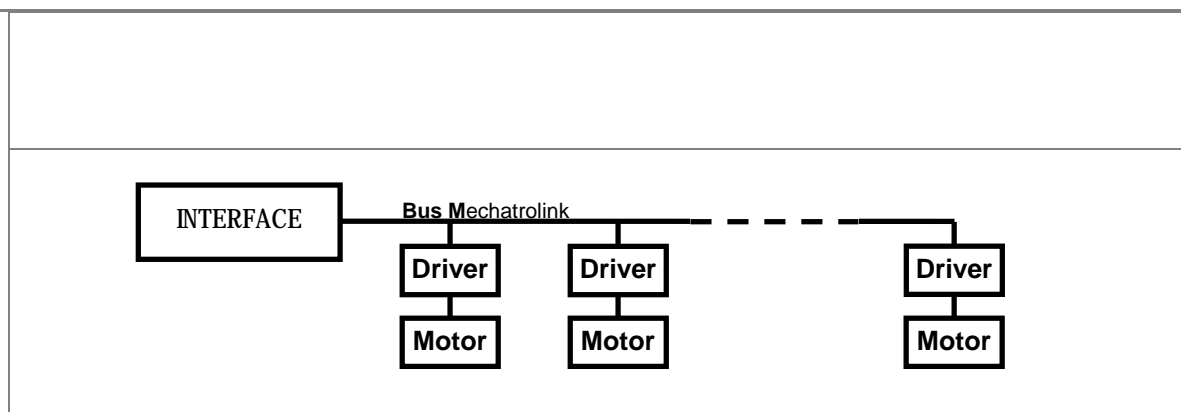
SLM



This Control Techniques proprietary communication protocol enables to exchange on serial bus at high speed all data necessary for controlling and settings of M'AX e MULTIAX servomotors.
Modularity: 1 slot controls 4 axes.

Mechatrolink



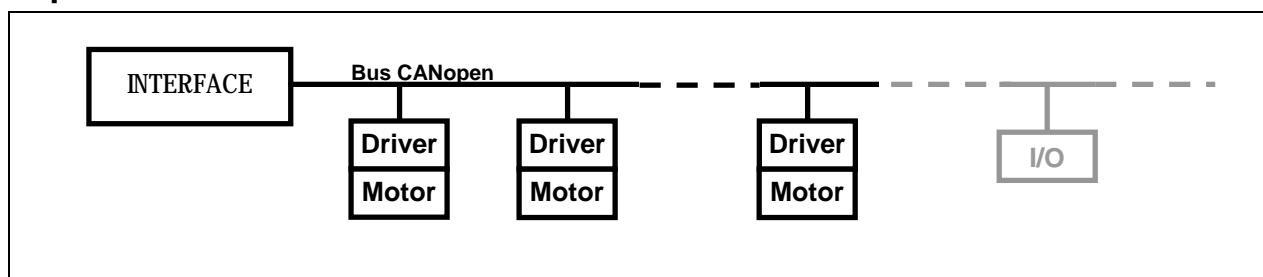


This communication protocol (<http://www.mechatrolink.org/>) consents to exchange on serial bus at high speed all data necessary for controlling of SGDB, SGDH, SGDM and SGDV servomotors. If the Mechatrolink I interface is present the sampling axis time is 2 ms.

The protocol Mechatrolink II is supported.

Modularity: 1 slot controls up to 12 axes on CNC and 15 on PAC (The limit on axis number depends on size).

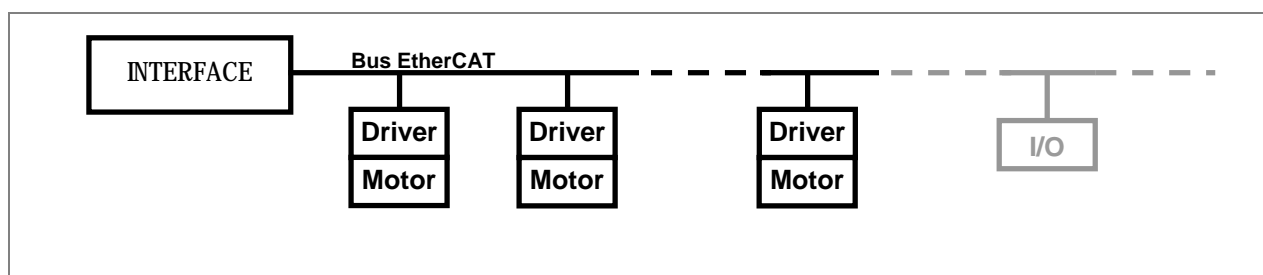
CANopen



Standard protocol of communication (<http://www.can-cia.org>) in accord to the CANopen DSP-402 draft positioning profile and speed profile (interpolation profile is under development). It makes possible that all necessary data to control servomotors with this protocol are exchanged on serial bus at high speed.

Modularity: 1 slot for axes that are controlled in speed or positioned (the maximum number of controlled axes depends on size). None slot is asked for the positioning axes on PLC CANopen line

EtherCAT



The standard EtherCAT (Ethernet Control Automation Technology - <http://www.ethercat.org>) is a communication protocol of high performances for Ethernet deterministic connections, in agreement with the IEEE 802.3 standard, and ensures an high and precise controlling. The distribution of devices is free: can be on line, star, parallel lines.

Modularity : Refer to CONFIGURATOR.

Technical descriptions and codes

Analog and pulse/direction

The option **OPANALOG02** and **OPANALOG05** allow to control up to 3 axes on analogical interface with the following functionalities:

- quick reading of positions, by adding a slot with a connector for fast micro inputs;
- it already foresees the hybrid handling of **analog** and **pulse/direction** interface: in fact you can add a slot in order to supply the pulse/direction output for each of three channels and in this manner for each axis you can choose the type of interface;
- finally, it is possible to add an output for Pulse/Direction axes (option code **OPEXTFD01**) and one for fast micro inputs (**OPEXTMIC01**).

In brief, with only one card you can indifferently manage servomotors and step motor. The driver of servomotors can be piloted through analog or digital (Pulse/Direction) interface. The choice about the type of regulation, with or without space feedback loop, and the type of interface can be performed for each single channel.

OPANALOG02: receives on the MIS connector the signals coming from the measure transducer Incremental TTL type.

OPANALOG05: Receives on the MIS connector the signals coming from the absolute transducers compatible with EnDat2.2, EnDat2.1 and Ssi (Heidenhain standard).

OPEXTCVI01: OPANALOG05 can mount an additional slot (OPEXTCVI01) to receive also the signals from incremental transducers and provide pulse/direction referring signals to realize a mix interface for 3 axes.

“Flying” connectors are available for the wiring of signals (OPKITAS01: Male D-type 9 pins connector ‘RIF’ connection and Male D-type 25pins connector for ‘MIS’ connection).

To manage more than 3 analog axes you need to add other OPANALOG02 or OPANALOG05 options.

To add only 1 analog axes for incremental transducer, use the option **OPANALOG04**.



In order to pilot **drivers for step motors**, with opened space loop, the option

OPFREQESEG2 is available and it allows to manage up to 3 step axis. It is possible to add the fast micro inputs with option (OPEXTMIC01).

In order to control more than 3 step axes you have to add other OPFREQESEG2 options.



OPFREQESEG3 board consents to control **drivers for pulse/direction motors** with closed space loop. This option can control up to **3 axes**.

It is possible to add the fast micro inputs with option (OPEXTMIC01).

To add other 3 pulse/direction axes it is necessary to add another OPFREQESEG3 board.



You can directly pilot step motor. The **OPSLM00002** interface can be completed by a power interface (**OPDS464800**) that is able to pilot step-by-step motors up to 6 Ampere for phase with 20KHz of Frequency. For further information see the section “Special interfaces”.



The **OPANALOG03** option (reserved for the central unit model K) allows you to manage up to 3 axes on analog interface, pulse/direction and step with the following features:

- quick reading of heights by means of fast micro inputs.;
- hybrid management of **analogical** and **pulse/direction** and **step**: for each axis you can choose the type of interface in independent way from the others;
- each channel has a dedicated input and output connector to facilitate operations of cabling and maintenance.

A single card allows you to manage indifferently servomotors and step motors. The servo drives can be piloted by means of analogical interface or digital interface (pulse/direction with open or closed loop). For each channel you can choose the type of regulation, with or without space feedback, moreover the type of interface.

In order to handle more than 3 axes you only have to add other OPANALOG03 options.

SLM

The option code is **OPSLM00002**. Each option allows to control up to 4 axes. In order to control more than 4 axes you have to add other OPSLM00002 options (up to a maximum of 3 cards).

Mechatrolink

The option code for Mechatrolink I and Mechatrolink II interface is **OPMECHATR2**. Each option allows you to manage up to 12 axes on CN and 15 axes on PAC (see limitations related to the size).

The board have two connectors.

Please Note: the second connector is used only to host the Mechatrolink Bus II termination

CANopen

The central unit provided with CANopen interface manages the I/O (profile DS-401) signals and positioning axes (profile DSP-402).

The OPCANOPEN2 option adds a second CANopen port on GIANO model (for handling I-O signals and positioning axes).

EtherCAT

The code for axis EtherCAT is OPECAT0001. The EtherCAT bus is connected to the 10-100 MB/sec Real-Time LAN Ethernet port (deterministic). It requires central unit with second LAN (M 2Lan, H, K).

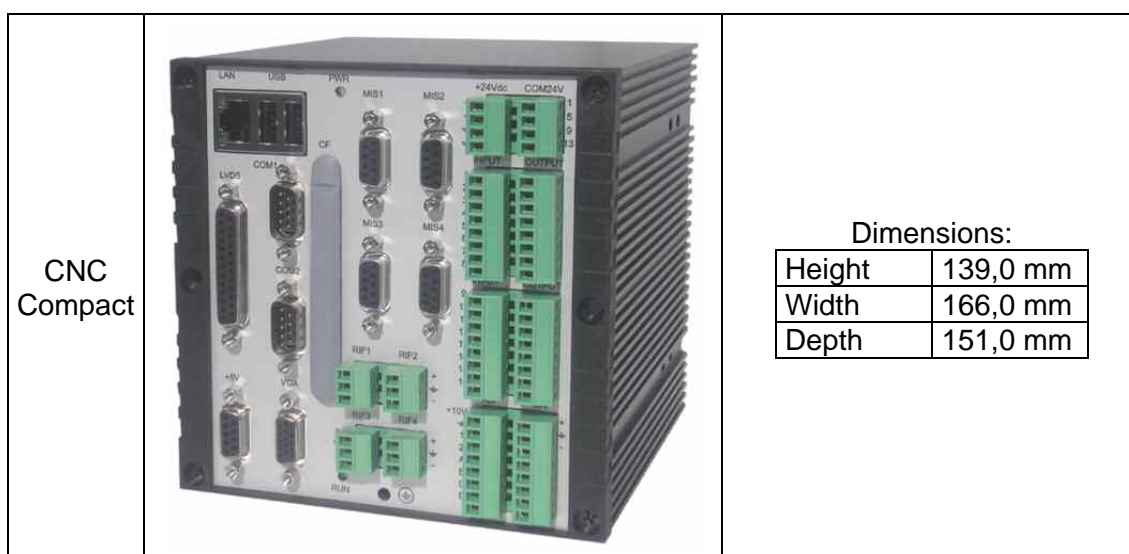
PRE-CONFIGURED CNC

ISAC proposes the pre-configured CNC that is the ideal solution for several automation need of small machines that don't request high level performances.

The CN Compact is available in four arrangements, which differ for CPU/RAM, interface axes and some I/O resources.

Quick Summarizing of Characteristics for different models:

Code	CPU / RAM	Axes	DI	DO	AI	AO
UN07001C00	500 MHz / 256MB	Analog	16	16	2	1
UN07002C00	500 MHz / 256MB	Step	16	16	2	0
UN07004C00	Atom 800 MHz / 1 GB	Analog	16	16	2	1
UN07005C00	Atom 800 MHz / 1 GB	Step	16	16	2	0



	Description CN Compact	Notes / Options
Power Supply	Powered at +24Vdc	
CPU / RAM	(UN07001C00 / UN07002C00) CPU ETX AMD Geode LX800 500 MHz ; RAM soldered, 256 MB	
	(UN07004C00 / UN07005C00) CPU ETX Intel Atom N270 800 MHz; RAM 1,0 GB	
Mass Memory	Compact Flash 4GB (or bigger)	
Operating System	Windows XP Embedded	
Connections	Serials: 2 ports RS-232	Available options for compatibility RS-422 and RS-485
	USB (V2.0): 2 ports	Possibility to connect options on USB interface. See Catalogue Peripherals and accessories.
	LAN Ethernet 10-100 Mb/sec : 1 port	
	Video : 1 port LVDS 1 port VGA You can connect all operator panels and keyboards of ISAC, besides to monitor and keyboards of office type.	See catalogue Peripherals and accessories for units and connection cables.

	1 Safety relay and services port (0÷5 volt)	Safety port
Software		See table "Applicative Software" of CNC.
Axes	<ul style="list-style-type: none"> • It is provided of Real-Time operating system in order to assure the controlling. • It can manages au to 4 interpolated axes (Small size) • Interpolation of type linear, circular and Helical; • Management of axis interface: <ul style="list-style-type: none"> ○ Analogical (on arrangement UN07001C00/4C00): gives measure input and reference output for 4 axes. ○ Pulse/Direction (on arrangement UN07002C00/5C00): gives reference output for piloting of maximum 4 axes. The axis interface of Pulse/Direction type can control Step motors and Servo-Driver in open or closed space loop. 	Technical description: <ul style="list-style-type: none"> □ up to 4 Measure Inputs (max freq. input 1 MHz [so max. counting freq. 4 MHz], level TTL); □ up to 4 Reference Outputs Analogical (+/- 10Volt, resol. 16 bit) o Pulse/Direction (0..5V Single-Ended).
Spindle	1 spindle with analog speed reference management.	It can also be controlled in space (rigid tapping spindle orientation) using a count encoder input. [Only on arrangement UN070001C00/4C00 using an axis]
I-O PLC	The CNC Compact includes the PLC local interface: <ul style="list-style-type: none"> ▪ up to 16 digital Inputs (type PNP 24Vdc -Optoisolated) and up to 16 Digital outputs (type Mosfet 24V-2A) available with 8I/O modularity 8 I/O. ▪ 2 Analog inputs (0-10V and resolution 12 bit. As option, the second input can be of type: 4-20mA, PT100, Thermocouple). ▪ 1 Analogical Output (+/- 10V, resolution 16 bit) [Only on arrangement UN070001C00/4C00] 	Expansion port for a separated I/O unit, in order to add: <ul style="list-style-type: none"> ▪ up to 56 digital inputs, ▪ up to 32 digital outputs, ▪ up to 2 analogical inputs ▪ up to 6 Fast Counting Inputs (max freq. input 1 MHz and max. freq. counting 4 MHz, level TTL). Possibility to mange up t o3 electronic handwheels. [In developing]

PRE-CONFIGURED PAC

PAC for milling bridge

This controllers are developed to suites those needs for milling bridges and milling flags. Both software and hardware are already configured. After a simple initial calibration, you can begin to test the cut and the machining.

You just need to plug the wires!

The PAC for Milling Bridge is available in 3 versions, **STANDARD**, **MID** and **TOP**, each of them can have 5,7 or 12 inches touch screen display.

The choice of the model must be done depending of the number of axes and I/O that you need to manage, and in particular, of the type of machining you need to perform.

For this, we suggest to refer to the *comparative table*.

All the versions are provided with a 40cm CAN cable that consents also to supply power to the CANopen terminal board directly from the central unit.



PAC for Milling Bridge. TOP version with 12" touchscreen display



Central Unit

The STANDARD and MID versions are provided with **Central Unit U** (UN07UR0000).

The TOP version is provided with **Central unit Q** (UN07QR0000).



CAN bus cable

CAN bus cable provided:
Desina type, 4 wires, shielded.
Length 40cm
Terminals: 4pins

Display

Display available are:



OPMMILVDS14:

Colour LVDS touchscreen display TFT 5,7"
Resolution: 640x480 pixel.



OPMMIVGA4:

Colour VGA touchscreen display TFT 12".
Resolution: 640x480 pixel.

Refer to *Peripheral and Accessories* catalogue for further descriptions.

COMPARATIVE TABLE			
	STANDARD¹ GRFPBAS570 (5,7") GRFPBAS120 (12")	MID¹ GRFPMED570 (5,7") GRFPMED120 (12")	TOP¹ GRFPFUL570 (5,7") GRFPFUL120 (12")
Central Unit	U UN07UR0000	U UN07UR0000	Q UN07QR0000
CANopen terminal board²	BASIOCAN5 OPBASIOCAN5 ²	BASIOCAN5 OPBASIOCAN5 ² + BASIOCAN6 OPBASIOCAN6 ²	BASIOCAN2 OPBASIOCAN2 ²
I/O			
Digital Inputs	16	32	48
Digital Outputs	16	32	32
Analog Inputs	2	2	5
Analog Outputs	-	-	1
Functionalities			
X – Car (Carriage)	✓	✓	✓
Y – Bridge	✓	✓	✓
Z – Depth (Lowering)	✓	✓	✓
B – Table rotation or head rotation		✓	✓
Table overturn		✓	✓
W – Tilting (Leaner)			✓
Disc management	Low/High speed X,Y,Z axes	Low/High speed X,Y,Z,B axes	✓ (with inverter)
Managed through touch-screen	Machining speed forward/backward machining	Machining speed forward/backward machining	X,Y,Z,B, W axes
Managed through external potentiometers	Disc speed (low/high)	Disc speed (low/high)	Mach. Speed Forward/backward Spindle consumption Disk speed
Machining			
Single cut	✓	✓	✓
Multiple cut	✓	✓	✓
Tiles cut	With manual table rotation	✓	✓
Circle cut		✓	✓
Polygons cut		✓	✓
Slab smoothing	✓	✓	✓
Profiling	✓	✓	✓
Shoulder finishing	✓	✓	✓
Drawings archive	✓	✓	✓
Remote diagnostic	✓	✓	✓

¹ All versions are available with 5,7 and 12 inches touch screen displays.

² Refer to *Peripheral and Accessories* catalogue for the description of CANopen terminal boards

PAC Telemaco

The PAC TELEMACO is available in arrangements with predefined configurations that include only the connections relating to specific performances, allowing to offer economic models foreseen to realize particular typologies of PAC.

	PLC UN07005T00	PLC + LAN UN07004T00	PLC + Axes + LAN UN07000T00 UN07007T00	PLC + Axes+ LAN + Compact Video UN07006T00 UN07008T00
Power Supply	+24Vdc			
CPU/RAM	Architecture ARM9 at 520MHz and RAM at 64MB			
Mass Memory	Inner (available 32 MB for application)			
Operating System	Windows CE			
Connections :				
USB ports (**)	2	2	2	2
Serials ports RS-232(*)	2	2	2	2
LAN port	no	10Mbit/sec	10Mbit/sec	10Mbit/sec
Video port	LVDS	LVDS	LVDS	LVDS
Compact video	no	no	no	yes
Axes and I-O resources				
Max. managed axes – Analogical	0	0	4 (on UN07000T00)	4 (on UN07006T00)
Max. managed axes Pulse/Direction (controlling of opened and closed loop)	0	0	4 (on UN07007T00)	4 (on UN07008T00)
Total digital I-O	16DI + 16DO	16DI + 16DO	16DI + 16DO	16DI + 16DO
Total analogical I-O	2 A/D	2 A/D	2 A/D + 1 D/A	2 A/D + 1 D/A
I-O expansion port	yes	yes	yes	yes

Specifications:

- Measure Channels = max freq. input 1 MHz.
- Analogical reference output = +/- 10Volt, resol. 16 bit.
- Pulse/Direction reference output = 0..5V Single-Ended, freq. max. 500 KHz.
- Digital Input (DI) = type PNP 24Vdc – Optoisolated.
- Digital Output (DO) = type Mosfet 24V-2A.
- Analogical Input (A/D) = 0÷10V, resolution 12 bit. As option, the second input can be of type: 4-20mA, PT100, Thermocouple.
- Analogical Output (D/A) = -10 ÷ +10V, resolution 12 bit.
- Compact Video = TFT 4,3"wide, resol. 478 x 272, provided of Touch Screen function. On front panel there is available an USB port.
- I-O expansion port = Expansion port for a separated I/O unit, in order to add: digital inputs, digital outputs and other resources (Expansion unit in developing)]

Notes

- (*) Serial ports = As option, one of the two serials ports can be of type RS-485 e RS-422.
 (**) USB ports = The maximum number of supported peripherals is 11.

Dimension
(Model TELEMACO
with remote display):

HEIGHT	139,0 mm
WIDTH	166,0 mm
DEPTH	124,mm

The units are provided with rear fixing.

TELEMACO: PLC (UN07005T00)



TELEMACO: PLC + LAN (UN07004T00)



TELEMACO: PLC + Axes + LAN (UN07000T00 and UN07007T00)



TELEMACO : PLC + Axes + LAN + Compact display (UN07006T00 and UN07008T00)

Dimensions:

HEIGHT	146,0 mm
WIDTH	146,0 mm
DEPTH	153,mm

Front view: display side



Rear view



Positioner, Position Displayer, Operator Panel

These are pre-configured PAC products, comprehensive of dedicated software. They belong to the PAC – TELEMACO family with which they share hardware and fittings but, respect them, they already are provided of dedicated software. Here below there are a description of performances and included application.

Hardware description

All these products need power supply at +24Vdc. They are equipped with processor ARM9 at 520MHz and RAM a 64MB, inner memory mass, Windows CE operating system. They offers the following connections: 2 USB ports (The maximum number of supported peripheral is 11), 2 serial ports RS-232. They are equipped with TFT video 4,3wide resol. 478x272, with Touch screen function; the video is directly fixed on central unit. On front side of operator panel there is an USB port.

The Visualizing of Heights offers 4 counting inputs (max. freq. input 1 MHz).

The Positioning

- Allows to control up to 4 axes on analogical interface and pulse/direction interface
Measure input with max. freq. 1 MHz
Reference output Analogical (+/- 10Volt, resol. 16 bit.) and Pulse/Direction (0 ÷ 5V Single-Ended, freq. max. 500 KHz). (N.B.: during order, you have to select the type of interface for each axes).
- Offers I/O resources: 16 Digital Inputs (type PNP 24Vdc –Optoisolated), 16 Digital Outputs (type Mosfet 24V-2A), 2 Analogical Inputs (0 ÷ +10V, resol.12 bit), 1 Analogical output (-10 ÷ +10V, resol.12 bit).

Front view: Display side
Overall dimensions:

HEIGHT	146,0 mm
WIDTH	146,0 mm
DEPTH	153,mm



POSITIONING (UN07001T00)



VISUALIZING of QUOTAS (UN07002T00)



PROGRAMMABLE OPERATOR PANEL (UN07003T00)



PAC NANO(NANO, NANO-M, NANO-L)

ISAC proposes NANO family to realize several PAC configurations with affordable and reliable solutions.

NANO is a pre-configured central unit available in three settings: NANO | NANO-M | NANO-L.

The PAC NANO is programmable, like all other PACs, with IEC 61131 standard language; to ease the programming, we provide a lite version of the development environment.

	NANO (UN07N6A000)	NANO-M (UN07N6M000)	NANO-L (UN07N6L000)
Power supply	+24Vdc		
CPU/RAM	ARM9 a 520MHz e RAM a 64MB		
Storage memory	Internal (32 MB available for the application)		
Operative system	Windows CE		
Connections:			
Serial port RS-232(*)	0	1	1
Serial port RS-485(*)		1	1
LAN port(**)	10Mbit/sec	10Mbit/sec	10Mbit/sec
Wireless	NO	(OPTIONAL)	(OPTIONAL)
Axes and I/O resources			
Controlled step motors	1	1	0
Pulse/direction axes (for open and close space loop control)	0	0	2
Digital Inputs (DI) Digital Outputs (DO)	1 DI	9 DI + 8 DO (1 DI is for MICRO input)	10 DI + 8 DO (2 DI are for MICRO inputs)
Analogic inputs (A/D)	0	2 A/D	2 A/D
CANopen slave port	1	1	1
CANopen master port	0	1*** (OPZ.)	1*** (OPZ.)
Measure channels	1	2	2

Technical specifications:

- Incremental measure channels = max freq. input 1 MHz.
- Absolute measure channels (opt.) = EnDat v.2.2 and SSI protocols
(this opt. excludes the incremental channel).
- Pls/dir reference outputs = 0.5V Single-Ended, freq. max. 500 KHz.
- Digital Inputs (DI) = PNP type, 24Vdc –Optoisolated.
- Digital Outputs (DO) = Mosfet type, 24V-2A.
- Analogic inputs(A/D) = 0÷10V, resolution 12 bits.

Step motor:

- Phase current = up to 6A phase and 20~80Vdc
(opt. with 2A or 4A with 20~40Vdc).
- Resolution = 12.8K microsteps/rev.
(for standard 200 microsteps motors)

Notes

(*) Serial ports Can be handled through the ModBus communication protocol.

(**) LAN port Supports TCP/IP and ModBus TCP/IP protocols.

(***) CANopen Slave port: DSP402 protocol.

CANopen Master port: DS401 protocol. The Master excludes the slave port and vice versa.

NANO and NANO-M positioners

ISAC NANO and NANO-M positioners are pre-configured PAC provided with PLC environment that integrate the driver for step motors.

The NANO-M, further, implements the I/O resources with 8 digital outputs, 8 digital outputs and 1 analog input together with two serial lines that support ModBus protocol.

Hardware description

The units require +24Vdc power supply.

They are provided with ARM9 CPU at 520MHz, 64MB RAM, internal mass memory storage and Windows CE operative system.



NANO Dimensions

HEIGHT	193,0
WIDTH	52,0
DEPTH	103,0

NANO, NANO-M and NANO-L have the following connections:

- ZERO MICRO input;
- CANopen slave input;
- CANopen slave output;
- Motor voltage input (only NANO and NANO-M);
- Step motor power output (only NANO and NANO-M);
- pls/dir output (only NANO-L);
- Incremental encoder input;
- Absolute encoder input (optional)
- LAN port.



NANO-M Dimensions

HEIGHT	193,0
WIDTH	82,0
DEPTH	103,0

NANO-M and NANO-L also have:

- RS 232 and RS 485 ports;
- I/O port for digital inputs and outputs;
- Wireless connection (optional).

NANO, NANO-M e NANO-L positioners:

- Offer incremental encoder input (with optional absolute encoder with EnDat v. 2.2 and SSI protocols);
- Max. freq. input 1 MHz,
- max. freq. count 4MHz,
- TTL level.
- Can be interfaced as slaves on CANopen DSP402 network.



NANO-L Dimensions

HEIGHT	193,0
WIDTH	82,0
DEPTH	103,0

NANO and NANO-M units:

- Consent to control a step motor up to 6A phase and 20~80Vdc (optionally with 2A or 4A at 20~40Vdc).
- Resolution 12.8K microsteps/rev. (with standard 200 microsteps motors)

NANO-M and NANO-L units:

- Can be connected to other PLC or operator panels through ModBus protocol;
- Integrate the function block for the astronomical revealing of the sun position (ephemeris).

INDUSTRIAL PC

The ISAC industrial Personal Computers represent the answer to requirements of **reliability**, **flexibility**.

The characteristic of **Reliability** distinguishes this series of products. Reliability is guaranteed first of all by the employed components. The particular structure makes PC ideal to be employed in hostile environments characterized by humidity, powder and also by electromagnetic noise that will damage the common devices. In order to avoid these problems it has been foreseen the use of low consumption processors without need of cooling fan and solid-state memories (i.e. Compact Flash). They can house *Windows embedded and standard* operating system.

In order to guarantee the requirements of **flexibility**, several methods of connection with central unit have been foreseen and many type of operator interfaces can be connected in order to satisfy various needs. In fact all kinds of boards and keyboard available in ISAC catalogue can be connected besides to the commercial standard devices.



PC CUBE

The **CUBE** industrial PC is realized with **Central unit Q**, which is properly configured according to the available options. This does not include the CANopen and AUX port.

Dimensions

HEIGHT	140,0
WIDTH	166,0
DEPTH	145,0



PC SLIM

The **SLIM** industrial PC is realized with an M 2LAN central unit configured with the available options. Refer to **Central Unit M** for details. CANopen and AUX ports are not available.

Dimensions

HEIGHT	391,0 mm
WIDTH	87,0 mm
DEPTH	178,0 mm



PANEL PC

The **PANEL PC** industrial PC (UN20000P40) has an integrated 15 inches touch screen monitor. Among the standard PC ports, it offers 2 LAN ports.

This PC can become a PAC by implementing the PLC framework and the EtherCAT field bus.



Dimensions

HEIGHT	316 mm
WIDTH	400 mm
DEPTH	80.0 mm

PANEL PC industrial PC			Note
Description Product code UN20000P40	Options available to configure the C.U. (for a full configuration you need to choose one of the following option for each category)		
Power	+24Vdc power supply		
Video	LCD dimension	15 inches	
	Max resolution	1024 x 768 pixels	
	Brightness	350 cd/m ²	
	Contrast	700:1	
	Touch function	resistive 5 wires	

CPU / RAM		CPU ETX Celeron M 800MHz + 1GB RAM (OPCPETX00)	
		CPU ETX 1.6 GHz Intel Atom N270 + RAM 1GB + Intel 945GME graphic chipset (OPCPUETX07)	
		CPU Intel ATOM N270 1.6GHz + nVidia MMP9 embedded ION graphic chipset + RAM DDR3 1GB (OPCPUCEX01)	
		CPU Intel ATOM N270 1.6GHz + Intel 945GME graphic chipset + RAM DDR3 1GB (OPCPUCEX03)	
Storage		Compact Flash 4 GB (OPFLASH04G)	
		HDD 2.5" SATA 80GByte	
Operative system		Windows XP Embedded (OPOSWINXP)	for PAC
		Windows XP (OPOSWINXPC)	For industrial PC
Connections	Serial: 2 ports RS-232		
	USB V2.0 : 4 ports		For USB options and peripherals refer to Accessories and Peripherals Catalogue
	LAN Ethernet at 10-100 Mb/sec : 2 ports		The second port LAN can be of deterministic type for EtherCAT axis interface.

SUMMARY OF CODES

Code Description	ISAC code
Pre-configured CNC	
CNC Compact (CPU 500MHz) Analogic axes (4) + IO local (16DI + 16DO + 2AD + 1DA)	UN07001C00
CNC Compact (CPU 500MHz) Step axes (4) + IO local (16DI + 16DO + 2AD)	UN07002C00
CNC Compact (CPU Atom) Analogic axes (4) + IO local (16DI + 16DO + 2AD + 1DA)	UN07004C00
CNC Compact (CPU Atom) Step axes (4) + IO local (16DI + 16DO + 2AD)	UN07005C00
PAC - pre-configured	
PAC TELEMACO: PLC (16DI+16DO+2AD)	UN07005T00
PAC TELEMACO: PLC (16DI+16DO+2AD) + LAN	UN07004T00
PAC TELEMACO: PLC (16DI+16DO+2AD+1DA) + 4 Analog. ax+ LAN	UN07000T00
PAC TELEMACO: PLC (16DI+16DO+2AD+1DA) + 4 Pulse/Dir. ax+ LAN	UN07007T00
PAC TELEMACO: PLC(16DI+16DO+2AD+1DA)+ Analog. Axes .+LAN+video 4.3"	UN07006T00
PAC TELEMACO: PLC(16DI+16DO+2AD+1DA)+ 4axes Pulse/Dir. +LAN+video 4.3"	UN07008T00
POSITIONING (Video 4,3"Compact, 4 axes, I/O)	UN07001T00
VISUALIZING of HEIGHTS (Video 4,3"Compact, 4 encoder input.)	UN07002T00
OPERATOR PANEL "Programmable" (Video 4,3" Compact)	UN07003T00
PAC for milling bridge – STANDARD– video 5,7"	GRFPBAS570
PAC for milling bridge – STANDARD– video 12"	GRFPBAS120
PAC for milling bridge – MID – video 5,7"	GRFPMED570
PAC for milling bridge – MID – video 12"	GRFPMED120
PAC for milling bridge – TOP – video 5,7"	GRFPFUL570
PAC for milling bridge – TOP – video 12"	GRFPFUL120
PAC NANO	UN07N6A000
PAC NANO-M	UN07N6M000
PAC NANO-L	UN07N6L000
Central Unit	
U (2 axes slot short type)	UN07UR0000
Q (2 axes slot short type)	UN07QR0000
M (3 axes slot short type) with ETX processor	UN2011LM30
M (3 axes slot short type) with COM EXPRESS processor	UN2011LM40
M 2Lan (3 axes slot short type) with ETX processor	UN2012LM30
M 2Lan (3 axes slot short type) with COM EXPRESS processor	UN2012LM40
H (6 axes slot short type) with ETX processor	UN2012LH30
H (6 axes slot short type) with COM EXPRESS processor	UN2012LH40
K (1 axes slot short type + 9 axes slot high type) with ETX processor	UN2012LK30
K (1 axes slot short type + 9 axes slot high type) with COM EXPRESS proc.	UN2012LK40
Industrial PC	
PC Slim (configurable: see central unit M – 2 Lan)	UN2012LM30+conf.
PC Cube (configurable: see central unit Q)	UN07QR0000+conf.
Panel PC (configurable with 15" integrated display: refer to pg. 51)	UN20000P40
Software CNC Spartaco	
Software CNC SPARTACO for Routers (milling mach.) with closed PLC for manag. of basic functionalities	OPSWCNCCP0
Software CNC SPARTACO for Routers (milling mach.) with opened PLC for implementations	OPSWCNCOP0
Software CNC SPARTACO	OPSPARTACO
Software Basic CNC SPARTACO	OPSPARTACO

Bridge Milling app for Spartaco	OPCAMFSP0
Thermal Cut app for Spartaco	OPCAMOSSP0
Software applicative for Wire Cutting	OPCAMTFILO
CAM Paths optimization	OPCAMSMOOTH
CAM Pedoca optimisation of cuts	OPCAMPEDOC
Software PAC	
Base Software PAC ACHILLE	OPACHILLE
Interpreter for IEC61131 programming for PAC ACHILLE	OPPROCONK0
Base Software PAC AIACE	OPAIAICE
Interpreter for IEC61131 programming for PAC AIACE	OPPROCONA0
Base Software PAC ULISSE	OPULISSE
Interpreter for IEC61131 programming for PAC ULISSE	OPPROCONU0
Optional module OMAX	OPOMAX
Optional module OMCAN	OPOMCAN
Optional module OMCOM	OPOMCOM
Optional module OMETH	OPOMETH
Optional module OMKB	OPOMKB
Optional module OPMFILE	OPOMFILE
Optional module OMSMS	OPOMSMS
Module GSM dual band GPRS via serial RS232 (requested for OPOMSMS)	OPGSMGPRS0
Remote antenna, up to 4 mt., for module OPGSMGPRS0	OPGSMANT00
Local antenna locale for module OPGSMGPRS0	OPGSMANT01
Optional Module for integration of IEC61131 programming	OPOMKW
Develop software + Multiprog Express / Pro (only Trial version) + lib. WebServer	OPPCSIMU00
Module for CAM editor	OPCAMMEDT0
Software for Bridge milling designed for PAC	OPCAMFPSWP
Software for remote diagnostic	OPMERCUSWP
Simulation and demo	
SIMU simulator	OPPCSIMU
Demo Milling bridge for PAC	SWVMFREPO2
Demo Milling bridge for CNC Spartaco	SWVMFREPO1
Opz. Config. central units (see models per compatibility of options)	
CPU ARM9 520 MHz + RAM 64 MB + inner memory mass	OPCPUARM01
CPU ARM9 520 MHz + RAM 128 MB + inner memory mass	OPCPUARM04
CPU ARM9 520 MHz + RAM 64 MB + Compact Flash 128MB	OPCPUARM02
CPU ARM9 520 MHz + RAM 128 MB + Compact Flash 128MB	OPCPUARM03
CPU ETX Atom N270 800MHz + 1GB RAM	OPCPUETX08
CPU ETX 500MHz + RAM 256 MB	OPCPUETX05
CPU ETX 600MHz + RAM 512 MB	OPCPUETX02
CPU ETX 800MHz + RAM 1 GB	OPCPUETX00
CPU ETX 1,5 GHz + RAM 512 MB	OPCPUETX01
CPU ETX 1,5 GHz + RAM 1 GB	OPCPUETX03
CPU ETX 1.6 MHz Intel Atom N270 + RAM 1 GB + chipset Intel	OPCPUETX07
CPU Intel Core2 Duo T7500 1.6GHz, Chipset ATI, RAM DDR2 1 GB	OPCPUCEX04
CPU Intel Core2 Duo T7500 2.2GHz, Chipset Intel, RAM DDR2 1GB	OPCPUCEX02
CPU Intel ATOM N270 1.6GHz, Chipset nVidia, RAM DDR3 1GB	OPCPUCEX01
CPU Intel ATOM N270 1.6GHz, Chipset Intel, RAM DDR3 1GB	OPCPUCEX03
Op. sist. Windows CE (per PAC ULISSE e AIACE)	OPOSWINCE
Op. sist. Windows XPe	OPOSWINXP
Op. sist. Windows XP (per PC)	OPOSWINXPC
Compact Flash 1 GB	OPFLASH1000
Compact Flash 4 GB	OPFLASH04G
Power supply at +24Vdc	OPALI024V0

Power supply at 220 Volt	OPALI220V0
Option for cables bearing	OPFERCAV00
Size and Servomotor interface	
Size Tiny (3 axes) [+ Real-Time operating system]	OPTGTINY01
Size Small (4 axes) [+Real-Time operating system]	OPTGSMALL1
Size Medium (6 axes) [+Real-Time operating system]	OPTGMEDIUM1
Size Large (12 axes) [+Real-Time operating system]	OPTGLARGE1
Size Extra (128 axes) [+Real-Time operating system] (for PAC)	OPTGEXTRA1
Analogic axis card (and arrangement for Pulse/Direction) for Incremental Transducers	OPANALOG02
Expansion for one analogical axes to OPANALOG02	OPANALOG04
Analogic axis card (and arrangement for Pulse/Direction) for Absolute Transducers	OPANALOG05
Kit of connectors for cabling the axes signals MIS and RIF for OPANALOG02/4	OPKITAS01
Expansion for pulse/dir axes [for OPANALOG02]	OPEXTFD01
Axis card Pulse/Direction for Step axes (opened loop)	OPFREQESEG2
Axis card Pulse/Direction (closed loop)	OPFREQESEG3
Expansion for fast micro inputs (for 3 axes) [for OPANALOG02, OPFREQESEG2]	OPEXTMIC01
Card for controlling up to 3 axes on analogic and Pulse/Direction interface + fast micro input	OPANALOG03
Axis card for Mechatrolink digital interface	OPMECHATR2
Axis card for SLM digital interface	OPSLM00002
Axis card for CANopen digital interface (in order to realize CN X GIANO with CANopen axes)	OPCANOPEN2
Axis card for EtherCAT digital interface	OPECAT0001