

C20

» Numerical Control »



FIDIA 

Innovative milling solutions

The C Class numerical control line can be installed on a wide range of machine tools: from traditional milling and boring machines to machining centres, including the most complex high speed milling systems.

The C Class products offers advanced features of functionality and flexibility to manage high levels of automation, from the simple pallet changer to the more complex FMS systems.

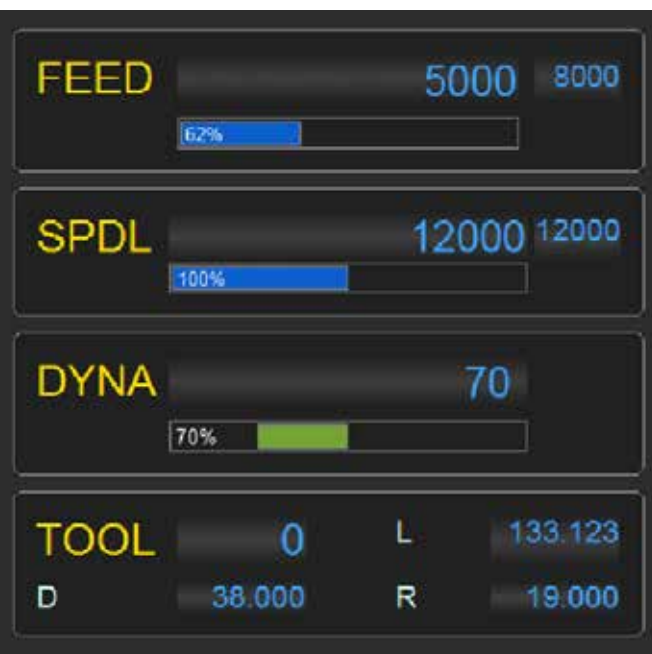
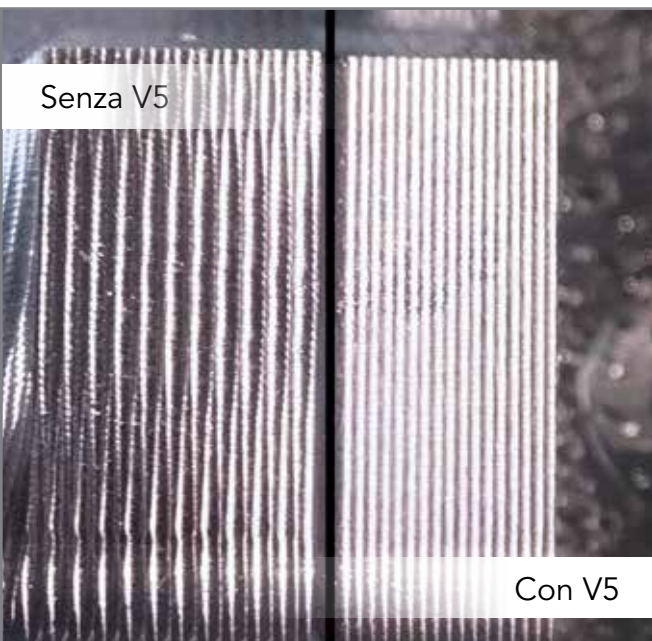
A wide range of hardware and software solutions, combined with a linear and compact design, ensure a high level performances for the milling of moulds and dies, models, aeronautical and general mechanical components.

The architecture with two separate processors, one for the operator interface and one for the real time, enables high milling performance in terms of quality and speed to be achieved. Moreover, thanks to Windows® 10 and the hardware solutions integrated on the C20, it is possible to install other applications for programming, measuring, monitoring etc.

To use at their best the NC features, Fidia also provides its XPOWER digital drives. A wide range of power modules can drive all the most common motors installed on machines tools: brushless, linear and torque motors, synchronous and asynchronous spindles. This means that Fidia provides all the electronic parts of the machine and guarantees its performances, functionalities and service in every part of the world. The expertise and professional competence of Fidia Service Dept. integrated in the supply ensure the investment's validity in time.



Velocity Five™



Acronym V5 has been created to represent the Velocity Five multi axis trajectory control technology. It is today's most accurate and fastest technique for high dynamic simultaneous axes moving.

The mathematical algorithms of Velocity Five allow the computation of the optimal feed rate according to the given Part Program trajectories at any given instant time allowing for:

- Significant reduction of machining time in both 3 and 5 axes.
- Faster and smoother machining of close points areas.
- Better surface quality due to the higher trajectory precision achieved.
- Uniform behavior of the machine tool in contiguous areas machined in opposite directions.
- Smoother changes in axis accelerations to increase critical mechanical component life.
- The Operator has the choice of using the milling strategy override provided by the DYNA parameter. The regulation range of such parameter between 50% and 150% allows a variation of machining dynamics conditions, balancing speed and accelerations with the aim of minimizing machining time and maximizing surface quality within the required tolerances.



advanced technology and features

Fidia controls have always been appreciated for their high level performance and for the comprehensive range of features supplied as standard. The architecture of Fidra NCs, with two separate processors, takes full advantage of the power of the dedicated CPU for axis and PLC management, based on a RISC Power PC. The PC section manages the operator interface: in this way, any programming or display task, even an onerous one, can be performed without interfering with the machining in progress.

Numerical controls C20 include an industrial PC, complete with:

- Intel Core i3 + Power Pc 64 bit
- 8 GB RAM memory
- SSD 500 GB min. Hard Disk
- 2x Gigabit Lan Interface - 4x USB 3.0 ports
- Integrated high performance graphic interface
- Windows® 10 IOT Enterprise 64 bits
- Flash drive 32 GB for back-up
- RS232 serial interface
- Audio inputs/outputs

The operator panel comprises:

- Touch Screen 19" TFT monitor
- extended 101 key keyboard
- integrated industrial mouse (an external mouse can be applied)
- pushbutton panel for machine functions with handwheel, 2 potentiometers, 2 pushbutton keys, emergency pushbutton and various custom buttons



the open NC

External Applications

From its first installation on a PC base in 1995, the Fidia NC has been open to all applications in the Windows® environment. Over the years, software for all types of requirements has been installed on Fidia NCs:

- CAD/CAM
- measurement and testing
- monitoring and display

Applications integrated with the numerical control can also be developed owing to the standard CORBA interface that makes the Fidia NC open to the most widely used operating systems and programming languages.

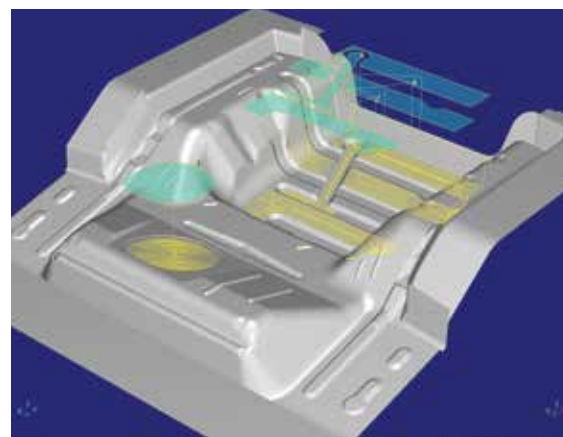
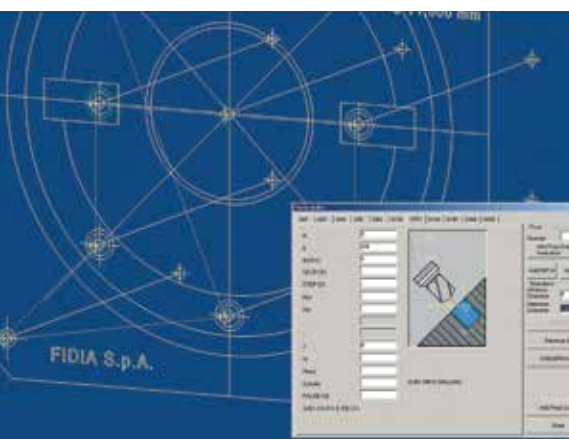
Through the CORBA developing kit and its interface licence is possible to read, by TCP-IP, NC parameters and PLC registers.

Software and hardware updates

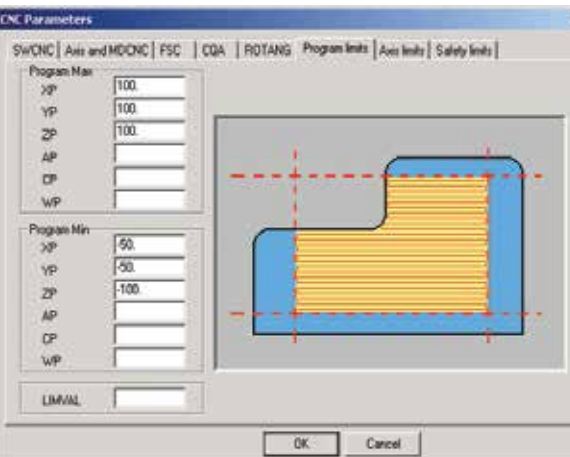
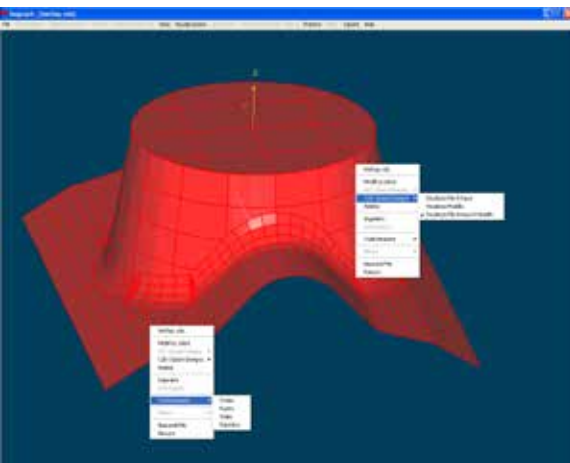
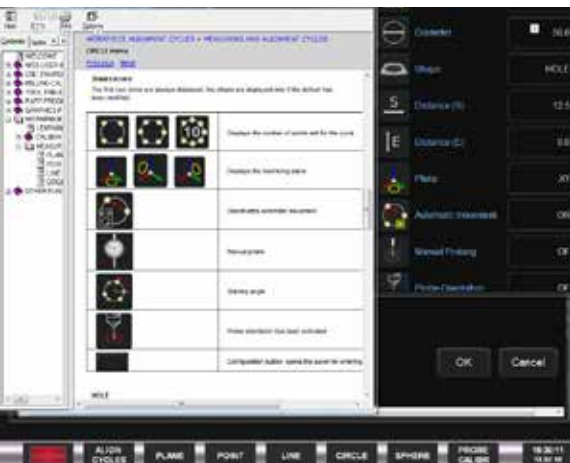
The numerical control structure allows for simple and fast updating of NC software as well as ISOGRAPH and HI-MILL applications.

The NC architecture with its double processor also allows for hardware upgrades by replacing all or part of the PC (memory, hard disk, network boards) without modifying the other components.

In this way, the control can always be kept up to date by implementing both hardware and software innovations as they become available.



simple and reliable
to use



Menu and softkeys

The graphics environment is intuitive and easy to use, while the set up of operations on the numerical control is further facilitated by the use of softkeys.

Switching between different operating environments (CNC, ISOGRAPH, HI-MILL) allows the user to perform simultaneous tasks with complete safety.

On line Help / Log file

All functions available on the numerical control, whether standard or optional, can be rapidly consulted by means of the on line Help. The log file records all events (messages, commands, etc.) sequentially to facilitate diagnostics, including remote diagnostics via Teleservice.

Graphics – 3D files visualization

Simulation of machining programs and graphic visualization of tool path both before and during the machining.

An optimized and even simultaneous visualisation for displaying large and different format files enables a quick check of the milling path.

Its main features as follows:

- visualization of the mathematical model laid upon the tool path;
- display of multiple paths marked with different colours;
- vertex coordinates measurements, distance between two points and angle formed by two segments for each loaded tool path;
- management of ISO-DXF/DWG-IGES-STL-VDA-FS-PRJ (HI-MILL project) formats

Parameters and procedures

Although the technical department usually checks all CAM programs, for several reasons (machine change, unexpected overall dimensions, change of the origins) the milling path could not be suitable for the machining.

In such cases the tool path should be newly calculated, partially or in full, or the file should be modified (movement release clearance, shift of origins, axis switch, etc.).

On Fidia controls instead, the operator can directly activate all these variations (roto-translation, scale factors, axis change, etc.) to the aid of suitable parameters but with no need to perform corrective actions on the part program.

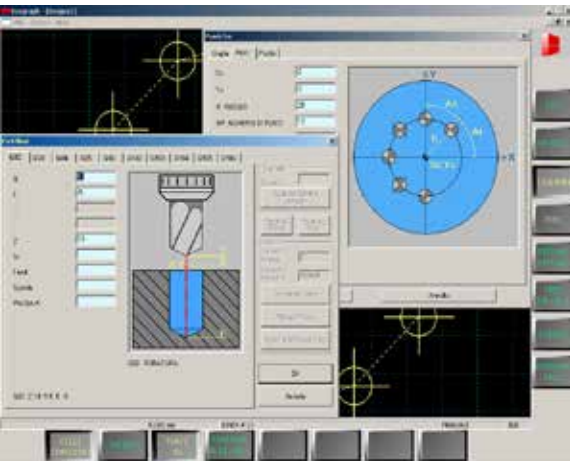
In addition to this, where changes are to be applied with a specific sequence on file parts or on several files, the programming through Procedures is provided allowing for an easy and maximum automation of part program sequences thus resulting in maximum efficiency.

simple and reliable
to use

Operator Functions

In any kind of 3 or 5 axis machining, with continuous or indexed heads, when there is an unexpected breakdown there must be a quick and simple intervention. Included in the Fidia NC are special functions that make easier for the operator doing the following procedures:

- automatic re-positioning of the tool on the part, with 3 and 5 axes, following manual retraction using the "Retract" function
- translation of the tool along its axis during machining by means of the electronic handwheel (virtual quill)
- fast and flexible cycle resume with optional re-execution of graphics and the ability to re-position one axis at a time



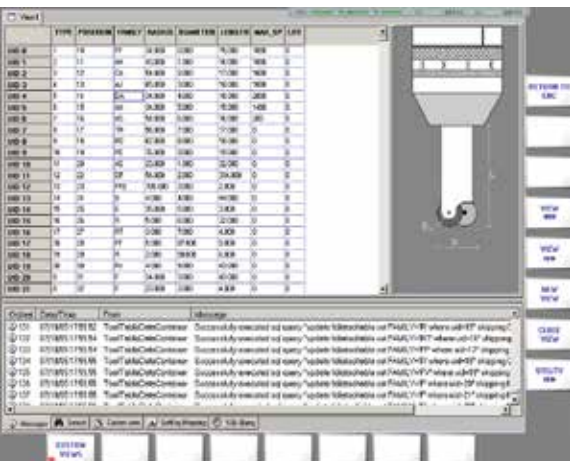
Extended Tool Table

It enables to define up to 10000 tools identifiable with a 16 alpha-numerical name that can be called from the part-program. The table can be customized by inserting fields handled by the PLC and can be exported according to the Windows® standard formats.

Also the visualization can be customized by choosing the columns and by defining the sort order of rows.

The tool table completion can be performed directly on the machine or it can be done externally and then transmitted to the NC via the network or via the USB port.

The combination with the tool identification systems results particularly useful within a tool centralized management.

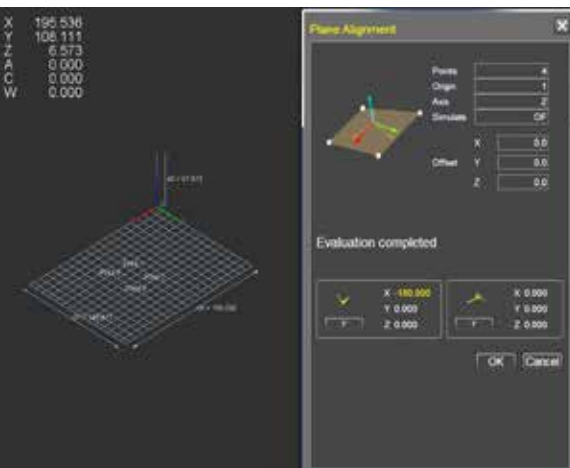


Piece Alignment

To avoid time-wasting operations on the machine it may be useful to use the FIDIA piece alignment features. To this purpose some specific dialog pages with graphic support can guide the operator in calculating and activating the suitable rotations. The alignment cycles can be performed with digital probes or more simply with a tool: in the latter case the points have to be collected manually.

Several cycles are provided referring to the geometrical elements available on the piece: working surface, holes, pins.

On machines with swivelling head, rotation for piece alignment may also be applied to rotary axes, so that even in 5-axis paths the tool will keep the proper orientation in relation to the piece.



5-axis machining



RTCP

Applied to bi-rotary heads and roto-tilting tables, the RTCP function manages tool length compensation in space, directly from the machine tool. A 5-axis tool path can therefore be programmed without having to consider the pivot that will be inserted in the NC tool table before the program is executed.

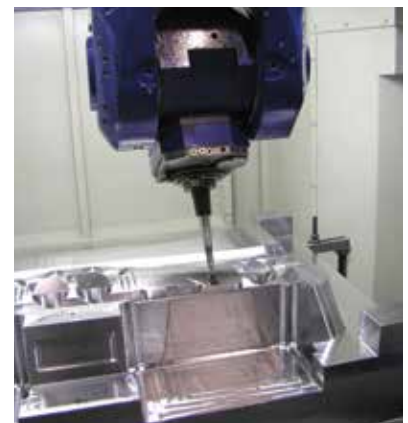
RTCP features:

- controlled feed at the tool tip
- management of orthogonal, angular and eccentric heads
- "virtual quill": manages an axis oriented in the tool direction for executing drillings and release movements.
- rotation and/or translation on 5 axis
- rotation of the reference system (G194): applied to programmed movements and to those executed by jog and handwheel.
- the TCPs function (hyper smooth) allows to reduce the sudden movements introduced from RTCP compensation in specific situations; the resulting machine movements are smoother, for the benefit of the work-piece surface quality and of the machine mechanical parts.

The RTCP function can also be used for 3-axis programs: by orientating the head or table manually, the tool tip is maintained in contact with the part.

RTCP and HMS

Combining the RTCP function with the HMS head calibration system is a winning and unique formula in 5-axis milling technology, with clear benefits for accuracy of movement at the tool tip.



Head Measuring System

HMS

The HMS system is a device designed for measuring and checking continuous and indexed bi-rotary heads and roto-tilting tables. Equipped with 3 sensors connected to the CNC, the HMS system is managed by a specific measurement software. By processing incoming data in real time, the software is able to check and correct geometric error, positioning accuracy and the RTCP parameters for the heads and tables.

HMS is a high-precision instrument and provides an alternative to the traditional checking method using dial gauges. It has many advantages:

- a drastic reduction in checking time (half an hour rather than an entire day)
- measurement of all head and/or table positions (not just orthogonal positions)
- measurement of RTCP parameters
- automatic insertion of correction values in the CNC.

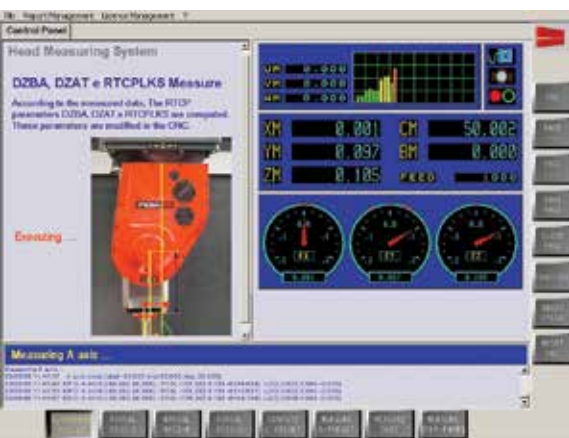
Easy to install and use, HMS can also be used by operators with no particular expertise. This means head geometry checks can be performed whenever necessary, avoiding lengthy and costly service interventions and reducing machine tool downtime.

A full report is available at the end of the calibration cycle detailing the measurements made and the compensation values inserted.

Errors are represented graphically for the best interpretation of head conditions and to assess the suitability of scheduling a service intervention for the mechanical parts.

The HMS device is available in two different versions, standard and compact, to adapt to machine tool axis working travel for executing the cycles.

The equipment and the application have been granted a European patent No. 1549459.



**simple and
comprehensive
programming**

ISOGRAPH, the 2½D CAD/CAM

ISOGRAPH is a 2½D CAD/CAM that is especially suited to workshop use with its highly innovative user interface. The system is ideal for all situations where service machining has to be quickly programmed and executed, such as: pocket milling, flattening, the machining of profiles, drilling, boring and so on.

The use of the softkeys and mouse makes it easily and immediately accessible to all operators, even those with no specific programming knowledge.

With ISOGRAPH, the operator can:

- define geometric elements and profiles thanks to the powerful and intuitive GRAPHICS EDITOR
- use the ISOGRAPH programming language to generate even very complex machining cycles
- manage ISO and ISOGRAPH files
- import geometric elements written in the DWG and DXF formats
- generate tool paths with tool radius compensation on any plane
- generate paths for the automatic re-machining of residual material
- generate fixed drilling, tapping and boring cycles, also when repeated along pre-defined profiles
- generate complex cycles for the milling of pockets with rectangular, circular or generic profiles, and slots
- generate flattening cycles
- use the integrated environment for writing and simulating CNC Procedures

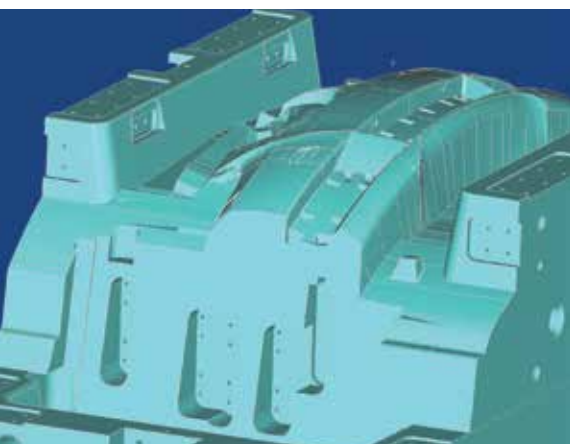
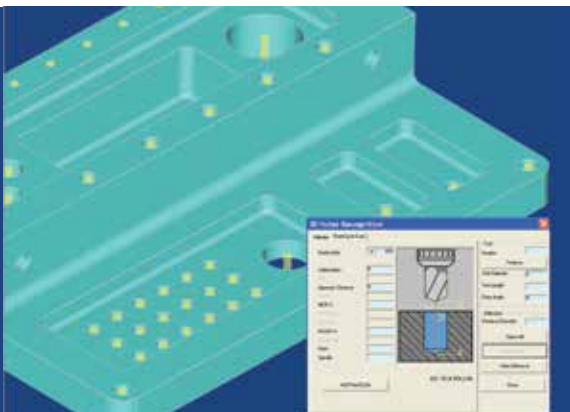
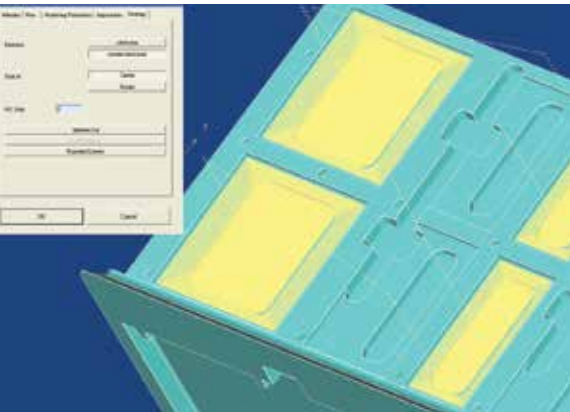
IGES interface

Files can be imported in IGES format from which 2½D tool paths can be generated, for example drilling cycles and pocket milling.

For drilling and pocket milling, the associated geometric elements are interpreted with automatic recognition of the machining start and end values.

When milling pockets, any internal islands of material are detected and automatically excluded from the machining.

All machining operations can be executed on orthogonal planes as well as on inclined planes.



CAM

directly on the
machine tool

HI-MILL, the 3D CAM

HI-MILL is a 3D CAM that is perfectly integrated in the Fidia numerical controls and therefore a very useful tool for programming in the workshop.

With HI-MILL the operator has a simple and essential interface: any type of operation becomes easy and spontaneous.

HI-MILL allows for the generation of tool paths from roughing out to super-finishing with a complete range of machining strategies. It also manages the bi-tangency and radii re-machining with reference to the previously used tool.

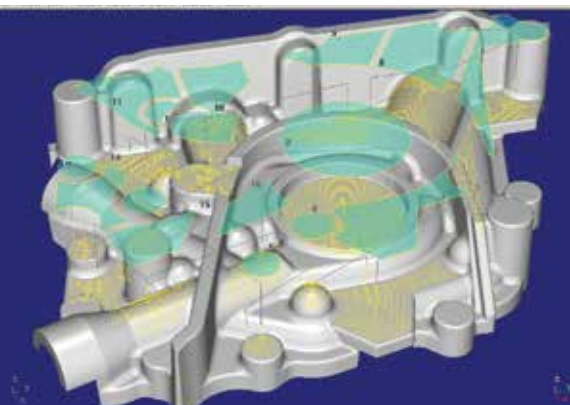
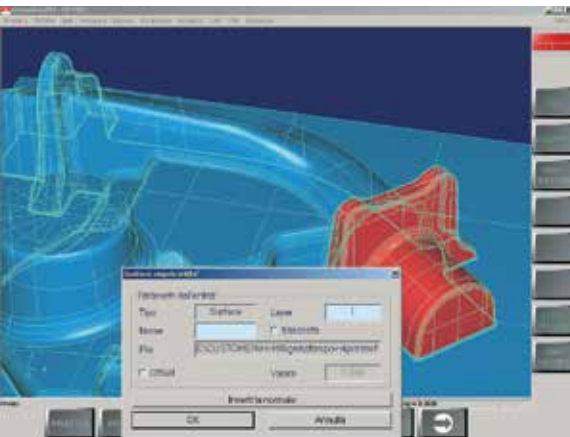
HI-MILL imports mathematical models in IGES, VDA, STL formats as well as physical models obtained by means of mechanical or laser tracers.

Furthermore, with an optional module, it can read the native CATIA language.

There are also CAD features for the generation of elementary surfaces, offset, functions for surface rotation and translation.

An integrated display module for the rough part is the product of the simulation of individual tool paths calculated with any tool inclination. Machining stock is highlighted with varying colours according to the quantity of residual material. The machine operator can define the technological parameters on the basis of actual tooling availability. The system operates in real time: the machining is started in parallel with the tool path calculation.

HI-MILL is suitable for any type of milling machine, either traditional or high speed, with a continuous or indexed bi-rotary head. A complete range of machining strategies, with all related parameters, allows for the efficient machining of any material.



C20

External applications

The Fidia C20 high end control can be equipped with a Touch Screen 19" TFT display. Apart from the Fidia software applications, it also supports other software products, such as Viewer CAM systems or measuring software that may run in parallel.

The IPC – CNC rack comes up with state of the art PC hardware and a Microsoft operating system.

The C20 pushbutton can also have an additional 9 buttons kit for a better customisation of the machine functions.

In order to enable control from two areas for machines with long axis travel, a second operating panel with LCD TFT display and keyboard can be connected.

The C20 fulfills highest demands for complex applications where 5-axis HSC machining with RTCP and a large number of drives (Gantry, Tandem, multiple axes) must be managed simultaneously.

The C20 manages complex upper Gantry machines with 12-14 motors for 5 axes as well as heavy portal-type machines with different exchangeable head systems and spindles. It is possible to manage up to 32 digital drives with linear motors, torque motors or conventional motors. The C20 is therefore the right choice for all complex machines.



V5: Fastest velocity with best milling results



Accessories



HPX21

Handheld pushbutton panel with handwheel, two potentiometers for feed and spindle rpm, 16 configurable pushbuttons, 2 pushbuttons for handwheel resolution, display for axis position values, feed and spindle rpm. Available with a spiral cable (max. 4.5 meters) or a metal sheath cable with a length of either 8 or 13 meters.



HPJ21

Handheld pushbutton panel with handwheel, feed potentiometer, 3 pushbuttons for axis selection and handwheel resolution, 2 pushbuttons for axis movement in jog, HOLD and RELEASE buttons. Available with a spiral cable (max. 4.5 meters) or a metal sheath cable with a length of either 8 or 13 meters.



HPW

Wireless handheld pushbutton for max. 6 axes, with handwheel, two potentiometers for feed and spindle speed, 15 configurable buttons, display for axis position, feed, spindle speed values and messages.

Range 25 m, running time up to 24 hours.

XPOWER Fidia Digital Drives

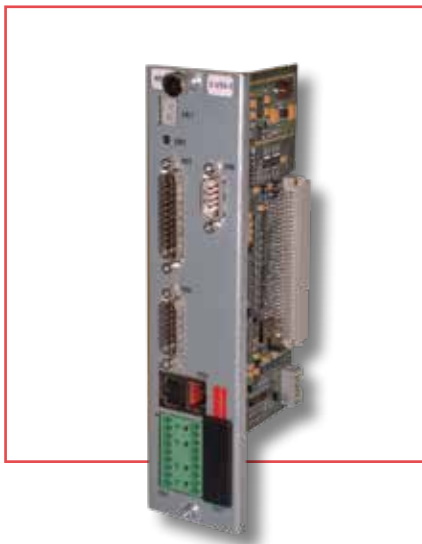
Fidia digital drives

Fidia XPOWER series digital drives have been designed to solve all axis and spindle movement problems. Ideal for mounting on a wide range of machine tools, the drives are particularly suited to milling machines and machining centres.

Main characteristics:

- FULL DIGITAL drives with DSP 32 bit processing
- 90 Mbit/s proprietary FFB bus
- programmable switching frequency to optimize the thermal performance of the motor: up to 8 kHz for the axes, up to 16 kHz for the electrospindle
- encoder interface or ENDAT for motor position feedback
- optical scale axis interface or ENDAT
- PTC input for measuring the motor temperature
- parameter setting software integrated in the NC
- 64 parameter sets per axis
- 9 configurable filters (notch, low-pass or generic).

A wide range of modules with different widths (from 50 mm to 300 mm) can drive motors using 10A up to 200A nominal current power.



Machine tool interface

I/O Line



The I/O Line range is the latest generation of input/output; designed to be installed inside the machine tool electrical cabinet, they are connected to the numerical control through the Fidia FFB bus.

In order to grant the maximum flexibility while minimizing the space required, each rack can host either 4, 8 or 12 I/O Line modules, according to the needs of the application.

With the new architecture, the CNC directly accesses the interface boards; this solution provides a significant improvement in terms of performances and reliability, as well as a more efficient diagnosis of any malfunctions.

Profibus-DP

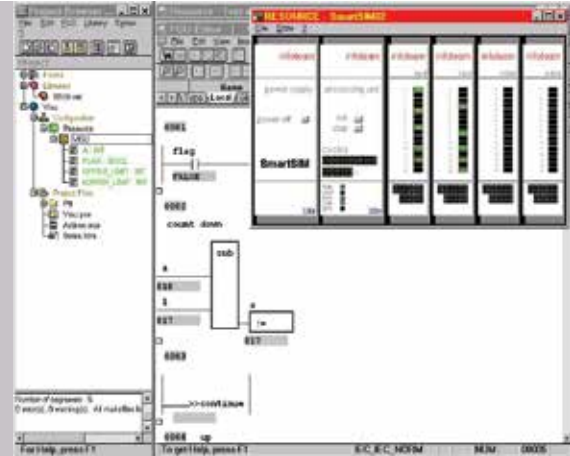
The Profibus-DP interface is one of the most widely used standard systems for managing communication between distributed I/O devices. Together with the IEC1131 PLC, it enables high levels of standardization of automation systems to be achieved.

PLC IEC1131

The development system adopted by Fidia is a worldwide recognized standard for the programming of programmable logic controllers.

Different programming languages can be used:

- IL Instruction List
- FBD Function Block Diagram
- ST Structured Test
- LD Ladder Diagram



The modular design of the IEC1131 makes for powerful and flexible management of machine tool logics, while the relevant debugging can be performed on the NC, on board the machine or on an external PC. Furthermore, the programming and debugging tools can be installed and used on any PC.

Axis management

Interpolation up to 9 axes.

Ability to control analog and digital drives.

Management of Gantry axes, axes moved by more than one motor (tandem or anti-backlash), multiple axes, synchronous axes and PLC axes (index heads, tables, tool changers, etc).



**FIDIA S.p.A.**

Corso Lombardia, 11
10099 San Mauro Torinese - TO - ITALY
Tel. +39 011 2227111
Fax +39 011 2238202
info@fidia.it
www.fidia.com

FIDIA GmbH

Robert-Bosch-Strasse 18
63303 Dreieich-Sprendlingen - GERMANY
Tel. +49 6103 4858700
Fax +49 6103 4858777
info@fidia.de

FIDIA Co.

3098 Research Drive
Rochester Hills MI 48309 - USA
Tel. +1 248 6800700
Fax +1 248 6800135
info@fidia.com

FIDIA Sarl

47 bis, Avenue de l'Europe
B.P. 3 - Emerainville
77313 Marne La Vallée Cedex 2 - FRANCE
Tel. +33 1 64616824
Fax +33 1 64616794
info@fidia.fr

FIDIA Iberica S.A.

Parque Tecnológico
Laida Bidea, Edificio 208
48170 Zamudio - Bizkaia - SPAIN
Tel. +34 94 4209820
Fax +34 94 4209825
info@fidia.es

FIDIA DO BRASIL LTDA

Av. Padre Anchieta, 161 - Jordanopolis
São Bernardo do Campo
09891-420 - SP - BRASIL
Tel. +55 11 3996-2925
info@fidia.com.br

FIDIA JVE

Beijing Fidia Machinery & Electronics Co., Ltd
Room 1509, 15/F Tower A. TYG Center Mansion
C2 North Road East Third Ring Road,
Chaoyang District
100027 BEIJING - P.R. CHINA
Tel. +86 10 64605813/4/5
Fax +86 10 64605812
info@fidia.com.cn

FIDIA JVE

Shanghai Office
28/D, No.1076, Jiangning Road
Putuo District
Shanghai 200060 - CHINA
Tel. +86 21 52521635
Fax +86 21 62760873
shanghai@fidia.com.cn

OOO FIDIA

c/o Promvost
Sushovskiy Val, Dom 5, Str. 2, Office 411
127018 Moscow - RUSSIA
Tel.: +7 499 9730461
Mobile: +7 9035242669
sales.ru@fidia.it
service.ru@fidia.it

Service centres:**FIDIA GmbH - SERVICE CZ**

CZ- 74706 Opava
Tel/Fax +420 553 654 402
sales.cz@fidia.it

FIDIA S.p.A. - SALES & SERVICE UK

32 Riverside, Riverside Place
Cambridge - Cambridgeshire
CB5 8JF - United Kingdom
Mobile: +44 - (0)7425 838162
sales.uk@fidia.it

3H MAKINA

Atasehir Bulvari, Ata 2/3
Plaza, Kat: 9 No: 80
Atasehir - Istanbul - TURKEY
Tel.: +90 216 456 10 43
Fax: +90 216 456 75 23
sales.tr@fidia.it
service.tr@fidia.it

AXIS SYSTEMS

T8 ~ T9 ~ T20, "INSPIRIA"
Old Mumbai - Pune Highway,
Pune - 411044, India
Cell : +91 9881245460
service.in@fidia.it

P.V. ELECTRONIC SERVICES C.C.

P.O. Box 96
Hunters Retreat 6017
Port Elisabeth SOUTH AFRICA
Tel. +27 41 3715143
Fax +27 41 3715143
sales.za@fidia.it

SHIYAN FIDIA SERVICE CENTRE

N.84 Dong Yue Road,
Shiyan, Hubei - CHINA
Tel. +86 719 8225781
Fax +86 719 8228241

CHENGDU FIDIA SERVICE CENTRE

Huang Tian Ba
Chengdu, Sichuan - CHINA
Tel. +86 28 87406091
Fax +86 28 87406091

IE-MAT s.r.l.

Bv. De Los Calabreses 3706
Barrio: Boulevares.
Córdoba - ARGENTINA
CP: X5022EWW
Tel. +54 351 5891717
sales.ar@fidia.it

Manufacturing plants:**FIDIA S.p.A.**

Via Valpellice, 67/A
10060 San Secondo di Pinerolo
TO - ITALY
Tel. +39 0121 500676
Fax +39 0121 501273

FIDIA S.p.A.

Via Balzella, 76
47100 Forlì
ITALY
Tel. +39 0543 770511
Fax +39 0543 795573
info@fidia.it

SHENYANG FIDIA NC & MACHINE CO., LTD.

No. 1 17 Jia Kaifa Rd.
Shenyang Economic & Technological Development Zone
110141 Shenyang - P.R. CHINA
Tel. +86 24 25191218/9
Fax +86 24 25191217
info@fidia.com.cn

Research centres:**FIDIA S.p.A.**

c/o Tecnopolis
Str. Provinciale per Casamassima Km 3,
70010 Valenzano
Bari - ITALY
Tel. +39 080 4673862



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