

CNC

8060

Hardware configuration.

(Ref: 1709)



FAGOR AUTOMATION

TRANSLATION OF THE ORIGINAL MANUAL

This manual is a translation of the original manual. This manual, as well as the documents derived from it, have been drafted in Spanish. In the event of any contradictions between the document in Spanish and its translations, the wording in the Spanish version shall prevail. The original manual will be labeled with the text "ORIGINAL MANUAL".

MACHINE SAFETY

It is up to the machine manufacturer to make sure that the safety of the machine is enabled in order to prevent personal injury and damage to the CNC or to the products connected to it. On start-up and while validating CNC parameters, it checks the status of the following safety elements. If any of them is disabled, the CNC shows the following warning message.

- Feedback alarm for analog axes.
- Software limits for analog and sercos linear axes.
- Following error monitoring for analog and sercos axes (except the spindle) both at the CNC and at the drives.
- Tendency test on analog axes.

FAGOR AUTOMATION shall not be held responsible for any personal injuries or physical damage caused or suffered by the CNC resulting from any of the safety elements being disabled.

HARDWARE EXPANSIONS

FAGOR AUTOMATION shall not be held responsible for any personal injuries or physical damage caused or suffered by the CNC resulting from any hardware manipulation by personnel unauthorized by Fagor Automation.

If the CNC hardware is modified by personnel unauthorized by Fagor Automation, it will no longer be under warranty.

COMPUTER VIRUSES

FAGOR AUTOMATION guarantees that the software installed contains no computer viruses. It is up to the user to keep the unit virus free in order to guarantee its proper operation. Computer viruses at the CNC may cause it to malfunction.

FAGOR AUTOMATION shall not be held responsible for any personal injuries or physical damage caused or suffered by the CNC due a computer virus in the system.

If a computer virus is found in the system, the unit will no longer be under warranty.

DUAL-USE PRODUCTS

Products manufactured by FAGOR AUTOMATION since April 1st 2014 will include "-MDU" in their identification if they are included on the list of dual-use products according to regulation UE 428/2009 and require an export license depending on destination.



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All rights reserved. No part of this documentation may be transmitted, transcribed, stored in a backup device or translated into another language without Fagor Automation's consent. Unauthorized copying or distributing of this software is prohibited.

The information described in this manual may be subject to changes due to technical modifications. Fagor Automation reserves the right to change the contents of this manual without prior notice.

All the trade marks appearing in the manual belong to the corresponding owners. The use of these marks by third parties for their own purpose could violate the rights of the owners.

It is possible that CNC can execute more functions than those described in its associated documentation; however, Fagor Automation does not guarantee the validity of those applications. Therefore, except under the express permission from Fagor Automation, any CNC application that is not described in the documentation must be considered as "impossible". In any case, Fagor Automation shall not be held responsible for any personal injuries or physical damage caused or suffered by the CNC if it is used in any way other than as explained in the related documentation.

The content of this manual and its validity for the product described here has been verified. Even so, involuntary errors are possible, hence no absolute match is guaranteed. However, the contents of this document are regularly checked and updated implementing the necessary corrections in a later edition. We appreciate your suggestions for improvement.

The examples described in this manual are for learning purposes. Before using them in industrial applications, they must be properly adapted making sure that the safety regulations are fully met.

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ABOUT THE PRODUCT - CNC 8060

BASIC CHARACTERISTICS.

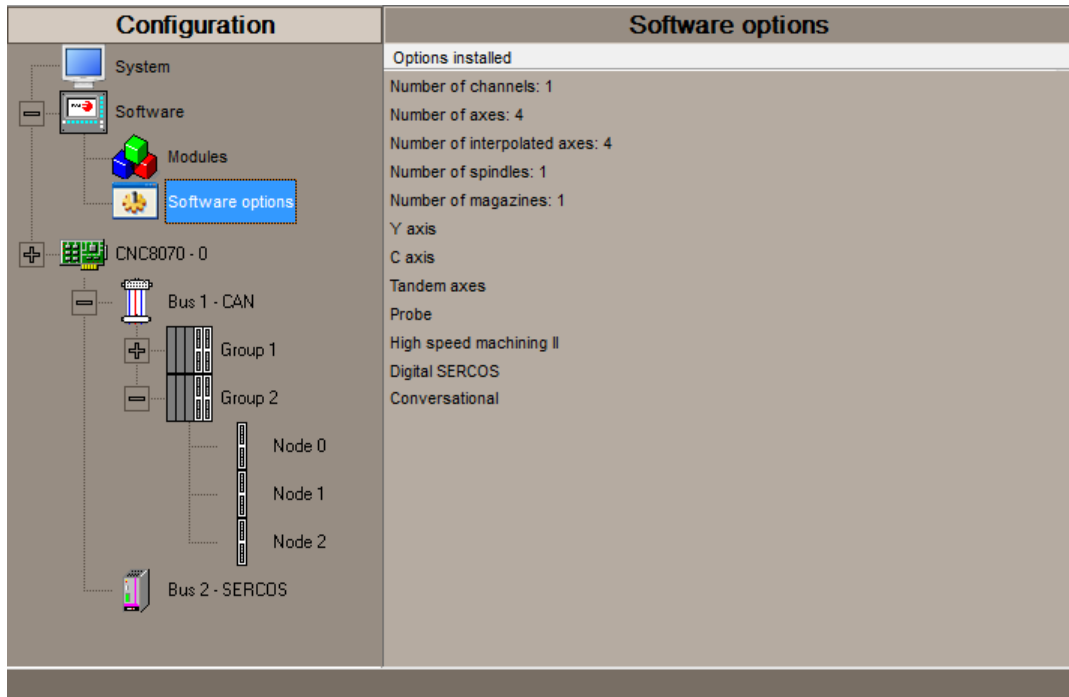
Basic characteristics.	8060 M FL	8060 M Power	8060 T FL	8060 T Power	8060 L
Number of axes.	3 to 4	3 to 6	3 to 4	3 to 6	3 to 6
Number of spindles.	1	1 to 2	1 to 2	1 to 3	1
Maximum number of axes and spindles.	5	7	5	7	7
Interpolated axes.	4	4	4	4	4
Number of tool magazines.	1	1	1	1 to 2	1
Number of execution channels.	1	1	1	1 to 2	1
Number of handwheels.	1 to 3				
Type of servo system.	Analog / Sercos Digital				
Communications.	RS485 / RS422 / RS232 Ethernet				
Integrated PLC. PLC execution time. Digital inputs / Digital outputs. Marks / Registers. Timers / Counters. Symbols.	< 1ms/K 1024 / 1024 8192 / 1024 512 / 256 Unlimited				
Block processing time.	< 2.0 ms	< 1.5 ms	< 2.0 ms	< 1.5 ms	< 1 ms

Remote modules.	RIOW	RIO5	RIO70	RIOR	RCS-S
Valid for CNC.	8070 8065 8060	8070 8065 8060	8070 8065 ---	8070 8065 8060	8070 8065 8060
Communication with the remote modules.	CANopen	CANopen	CANfagor	CANopen	Sercos
Digital inputs per module.	8	24 / 48	16	48	---
Digital outputs per module.	8	16 / 32	16	32	---
Analog inputs per module.	4	4	8	---	---
Analog outputs per module.	4	4	4	---	4
Inputs for PT100 temperature sensors.	2	2	---	---	---
Feedback inputs.	---	---	4 (*)	---	4 (**)

(*) Differential TTL / Sinusoidal 1 Vpp (**) TTL / Differential TTL / Sinusoidal 1 Vpp / SSI protocol / FeeDat / EnDat

SOFTWARE OPTIONS.

Some of the features described in this manual are dependent on the acquired software options. The active software options for the CNC can be consulted in the diagnostics mode (accessible from the task window by pressing [CTRL] [A]), under software options.



Consult the ordering handbook for information on the software options available for your model.

SOFT 8060 ADDIT AXES

Additional shaft.

Add axes to the default configuration.

SOFT 8060 ADDIT SPINDLES

Additional spindle.

Add spindles to the default configuration.

SOFT 8060 ADDIT TOOL MAGAZ

Additional tool magazine.

Add tool magazines to the default configuration.

SOFT 8060 ADDIT CHANNELS

Additional channel.

Add channels to the default configuration.

SOFT DIGITAL SERCOS

Sercos digital bus.

Sercos digital bus.

SOFT EDIT/SIMUL

EDISIMU mode (editing and simulation).

It allows for the editing, modification and simulation of a part-program.

SOFT TOOL RADIUS COMP

Compensación de radio.

Tool compensation allows programming the contour to be machined based on part dimensions of the and without taking into account the dimensions of the tool that will be used later on. This avoids having to calculate and define the tool path based on the tool radius.

SOFT PROFILE EDITOR

Profile editor.

Allows for the part profiles to be edited graphically and to import dxf files.

SOFT 60 F3D GRAPHICS

F3D graphics.

High definition solid 3D graphics for the execution and simulation of part-programs and canned cycles of the editor.

During machining, the F3D graphics display the tool removing the material from the part in real time, allowing for the condition of the part to be seen at all times. F3D graphics can display up to 4 views of the part, where each can be rotated, zoomed in or zoomed out. Measurements can also be made on the part and even sections on the piece from any angle.

SOFT 60 IIP CONVERSATIONAL

Interactive Icon-based Pages (conversational mode).

IIP or conversational mode is specifically designed for people without any prior programming knowledge or for those that are not familiarized with Fagor CNC's.

Working in conversational mode is easier than in ISO mode, as it ensures proper data entry and minimizes the number of operations to be defined. There is no need to work with part-programs.

SOFT 60 RTCP

Dynamic RTCP (Rotating Tool Center Point).

The dynamic RTCP option is required for interpolation machining with 4, 5 or 6 axis.



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SOFT 60 C AXIS

C axis.

It activates the kinematics for working with the C axis and the associated canned cycles. The CNC can control several C axes. The parameters of each axis indicate if it will function as a C axis or not, where it will not be necessary to activate another axis for the machine parameters.

SOFT 60 Y AXIS

Y axis for lathe.

It activates the kinematics for working with the Y axis and the associated canned cycles.

SOFT 60 TANDEM AXES

Tandem axes.

A tandem axis consists in two motors mechanically coupled (slaved) and making up a single transmission system (axis or spindle). A tandem axis helps provide the necessary torque to move an axis when a single motor is not capable of supplying enough torque to do it.

When activating this feature, it should be kept in mind that for each tandem axis of the machine, another axis must be added to the entire configuration. For example, on a large 3-axis lathe (X Z and tailstock), if the tailstock is a tandem axis, the final purchase order for the machine must indicate 4 axes.

SOFT 60 SYNCHRONISM

Synchronization of axes and spindles.

The axes and ballscrews may be synchronized in two ways: in terms of speed or position. The CNC configuration takes into consideration the synchronization of 2 axes or 2 spindles. Once synchronized, only the master displays and programs the element.

SOFT 60 HSSA I MACHINING SYSTEM

High Speed Surface Accuracy.

This is the new version of algorithms for high speed machining (HSC). This new HSSA algorithm allows for high speed machining optimization, where higher cutting speeds, smoother contours, a better surface finishing and greater precision are achieved.

SOFT 60 HSSA II MACHINING SYSTEM

HSSA-II machining system.

This is the new version of algorithms for high speed machining (HSC). This new HSSA algorithm allows for high speed machining optimization, where higher cutting speeds, smoother contours, a better surface finishing and greater precision are achieved.

SOFT 60 PROBE

Probing canned cycles.

The CNC may have two probes; usually a tabletop probe to calibrate tools and a measuring probe to measure the part.

This option activates the functions G100, G103 and G104 (for probe movements) and probe canned cycles (which help to measure part surfaces and to calibrate tools).

For the laser model, it only activates the non-cycle function G100.

SOFT 60 CONV USER CYCLES

Conversational user cycles.

Incorporation of user cycles in conversational mode.

SOFT 60 PROGTL3

ProGTL3 programming language

Another language apart from ISO for the programming of profiles using a geometric language without the need to use external CAD systems. This language allows for program functions to define lines and circles which define the points of intersection on a profile, in addition to macros for the creation of solids defined by a flat profile and one or more section profiles.

SOFT 60 PPTRANS

Part-program translator.

The program translator may be used to convert programs written in other languages into Fagor ISO codes.

SOFT THIRD PARTY CANOPEN

Third-party CANopen.

Enables the use of non-Fagor CANopen modules.

SOFT MAB SYSTEM.

MAB drives.

Sercos connection with MAB drives.

SOFT 60 PWM CONTROL

Pulse-Width Modulation.

This function is only available for Sercos bus controlled systems. It is mostly oriented toward laser machines for the cutting of very thick sheets, where the CNC generates a series of PWM pulses to control the power of the laser when drilling the starting point.

This feature is essential for cutting very thick sheets and it requires two quick digital outputs located on the central unit. With this new feature, the OEM does not need to install or program any external device, which reduces machine costs and installation times. The end user also benefits, since the "Cutting with PWM" feature is much easier to use and program.

SOFT 60 GAP CONTROL

Gap control.

This is mostly oriented toward laser machines. Gap control makes it possible to maintain a set distance between the laser nozzle and the surface of the sheet. This distance is calculated by a sensor connected to the CNC, so that the CNC offsets the sensor variations on the distance programmed with additional movements in the axis programmed for the gap.

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DECLARATION OF CE CONFORMITY AND WARRANTY CONDITIONS

DECLARATION OF CONFORMITY

The declaration of conformity for the CNC is available in the downloads section of FAGOR'S corporate website. <http://www.fagorautomation.com>. (Type of file: Declaration of conformity).

WARRANTY TERMS

The warranty conditions for the CNC are available in the downloads section of FAGOR's corporate website. <http://www.fagorautomation.com>. (Type of file: General sales-warranty conditions).



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VERSION HISTORY - CNC 8060

Here is a list of the features added to each manual reference.

Ref. 1402

First version.

Ref. 1409

The name of the E21 connector (K21 before) of the central unit has been corrected.
New ambient characteristics of the enclosure.

Ref. 1412

New ambient characteristics of the enclosure.

Ref. 1505

Detailed description of the connectors of the central unit.

Ref. 1512

CN60-10K configuration (available for 8060M-FL, 8060T-FL and 8060EN models).
Módulo OP-PANEL. Handwheel cable connection to the ground plate.

Ref. 1703

Laser model.
<ul style="list-style-type: none"> Installing a sensor for gap control (laser model). X24 connector. Minimum cycle on (pins LO1 LO2); 25 μs.

Ref. 1709

New. HORIZONTAL KEYB 2.0 + TOUCHPAD.
New. OP-PANEL / OP-PANEL+SPDL RATE.

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SAFETY CONDITIONS

Read the following safety measures in order to prevent harming people or damage to this product and those products connected to it. Fagor Automation shall not be held responsible of any physical or material damage originated from not complying with these basic safety rules.



Before start-up, verify that the machine that integrates this CNC meets the 2006/42/EC Directive.

PRECAUTIONS BEFORE CLEANING THE UNIT

- Do not get into the inside of the unit.** Only personnel authorized by Fagor Automation may access the interior of this unit.
- Do not handle the connectors with the unit connected to AC power.** Before handling these connectors (I/O, feedback, etc.), make sure that the unit is not powered.

PRECAUTIONS DURING REPAIRS

In case of a malfunction or failure, disconnect it and call the technical service.

- Do not get into the inside of the unit.** Only personnel authorized by Fagor Automation may access the interior of this unit.
- Do not handle the connectors with the unit connected to AC power.** Before handling these connectors (I/O, feedback, etc.), make sure that the unit is not powered.

PRECAUTIONS AGAINST PERSONAL HARM

- Interconnection of modules.** Use the connection cables provided with the unit.
- Use proper cables.** To prevent risks, only use cables and Sercos fiber recommended for this unit.
To prevent a risk of electrical shock at the central unit, use the proper connector (supplied by Fagor); use a three-prong power cable (one of them being ground).
- Avoid electric shocks.** To prevent electrical shock and fire risk, do not apply electrical voltage out of the indicated range.
- Ground connection.** In order to avoid electrical discharges, connect the ground terminals of all the modules to the main ground terminal. Also, before connecting the inputs and outputs of this product, make sure that the ground connection has been done.
In order to avoid electrical shock, before turning the unit on verify that the ground connection is properly made.
- Do not work in humid environments.** In order to avoid electrical discharges, always work with a relative humidity (non-condensing).
- Do not work in explosive environments.** In order to avoid risks, harm or damages, do not work in explosive environments.

PRECAUTIONS AGAINST DAMAGE TO THE PRODUCT

Work environment.	This unit is ready to be used in industrial environments complying with the directives and regulations effective in the European Community. Fagor Automation shall not be held responsible for any damage suffered or caused by the CNC when installed in other environments (residential, homes, etc.).
Install this unit in the proper place.	It is recommended, whenever possible, to install the CNC away from coolants, chemical product, blows, etc. that could damage it. This unit meets the European directives on electromagnetic compatibility. Nevertheless, it is recommended to keep it away from sources of electromagnetic disturbance such as: <ul style="list-style-type: none"> Powerful loads connected to the same mains as the unit. Nearby portable transmitters (radio-telephones, Ham radio transmitters). Nearby radio / TC transmitters. Nearby arc welding machines. Nearby high voltage lines.
Enclosures.	It is up to the manufacturer to guarantee that the enclosure where the unit has been installed meets all the relevant directives of the European Union.
Avoid disturbances coming from the machine.	The machine must have all the interference generating elements (relay coils, contactors, motors, etc.) uncoupled.
Use the proper power supply.	Use an external regulated 24 Vdc power supply for the keyboard, operator panel and the remote modules.
Connecting the power supply to ground.	The zero Volt point of the external power supply must be connected to the main ground point of the machine.
Analog inputs and outputs connection.	Use shielded cables connecting all their meshes to the corresponding pin.
Ambient conditions.	Maintain the CNC within the recommended temperature range, both when running and not running. See the corresponding chapter in the hardware manual.
Central unit enclosure.	To maintain the right ambient conditions in the enclosure of the central unit, it must meet the requirements indicated by Fagor. See the corresponding chapter in the hardware manual.
Power switch.	This switch must be easy to access and at a distance between 0.7 and 1.7 m (2.3 and 5.6 ft) off the floor.

SAFETY SYMBOLS

Symbols that may appear in the manual.



Danger or prohibition symbol.
This symbol indicates actions or operations that may hurt people or damage products.



Warning or caution symbol.
This symbol indicates situations that certain operations could cause and the suggested actions to prevent them.



Obligation symbol.
This symbol indicates actions and operations that must be carried out.



Information symbol.
This symbol indicates notes, warnings and advises.



Symbol for additional documentation.
This symbol indicates that there is another document with more detailed and specific information.

Hardware configuration.

Symbols that the product may carry.



*Ground symbol.
This symbol indicates that that point must be under voltage.*



*ESD components.
This symbol identifies the cards as ESD components (sensitive to electrostatic discharges).*



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RETURNING CONDITIONS

Pack it in its original package along with its original packaging material. If you do not have the original packaging material, pack it as follows:

- 1 Get a cardboard box whose 3 inside dimensions are at least 15 cm (6 inches) larger than those of the unit itself. The cardboard being used to make the box must have a resistance of 170 Kg (375 lb.).
- 2 Attach a label to the device indicating the owner of the device along with contact information (address, telephone number, email, name of the person to contact, type of device, serial number, etc.). In case of malfunction also indicate symptom and a brief description of the problem.
- 3 Protect the unit wrapping it up with a roll of polyethylene or with similar material. When sending a central unit with monitor, protect especially the screen.
- 4 Pad the unit inside the cardboard box with polyurethane foam on all sides.
- 5 Seal the cardboard box with packaging tape or with industrial staples.



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CNC MAINTENANCE

CLEANING

The accumulated dirt inside the unit may act as a screen preventing the proper dissipation of the heat generated by the internal circuitry which could result in a harmful overheating of the unit and, consequently, possible malfunctions. Accumulated dirt can sometimes act as an electrical conductor and short-circuit the internal circuitry, especially under high humidity conditions.

To clean the operator panel and the monitor, a smooth cloth should be used which has been dipped into de-ionized water and /or non abrasive dish-washer soap (liquid, never powder) or 75° alcohol. Never use air compressed at high pressure to clean the unit because it could cause the accumulation of electrostatic charges that could result in electrostatic shocks.

The plastics used on the front panel are resistant to grease and mineral oils, bases and bleach, dissolved detergents and alcohol. Avoid the action of solvents such as chlorine hydrocarbons, benzole, esters and ether which can damage the plastics used to make the unit's front panel.

PRECAUTIONS BEFORE CLEANING THE UNIT

Fagor Automation shall not be held responsible for any material or physical damage derived from the violation of these basic safety requirements.

- Do not handle the connectors with the unit supplied with power. Before handling these connectors (I/O, feedback, etc.), make sure that the unit is not powered.
- Do not get into the inside of the unit. Only personnel authorized by Fagor Automation may access the interior of this unit.

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1 PREVIOUS INFORMATION.

About this manual.

This manual describes the characteristics, technical data and connections of the hardware associated with the CNC. The installation manual describes the CNC configuration, machine adaptation and start-up.

Installation and startup.

The hardware described in this manual is ready to be used in industrial environments complying with the directives and regulations effective in the European Community. Before start-up, verify that the machine that integrates this CNC meets the 89/392/CEE directive.

Safety conditions.

In order to avoid personal injuries and damage to this product or to those connected to it, read carefully the section on safety conditions in the introduction to this manual. Fagor Automation shall not be held responsible of any physical damage or defective unit resulting from not complying with these basic safety regulations.



Do not handle the connectors with the unit connected to AC power. Before doing it, make sure that the unit is unplugged from the power outlet.



Do not get into the inside of the unit. This unit MUST NOT be opened by unauthorized personnel. Only personnel authorized by Fagor Automation may manipulate the inside of this unit.

1.

PREVIOUS INFORMATION.

FAGOR 

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1.

PREVIOUS INFORMATION.



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2 CONFIGURATION.


2.1 Central unit + Monitor + Keyboard.

The central unit is located on the rear of the monitor.

Identification.	Description.
 <p>MONITOR-LCD-10 HORIZONTAL MONITOR-LCD-10 TOUCH HORIZONTAL</p>	<p>Available for 8060M-Power and 8060T-Power models.</p> <ul style="list-style-type: none"> • Central unit. • 10.4" LCD monitor (800x600) 18-bit color. • Built-in keyboard. • USB 2.0 port, at the front, protected by a cover. • Touch-screen optional.
 <p>MONITOR-LCD-10 VERTICAL MONITOR-LCD-10 TOUCH VERTICAL</p>	<p>Available for 8060M and 8060T models.</p> <ul style="list-style-type: none"> • Central unit. • 10.4" LCD monitor (800x600) 18-bit color. • Built-in keyboard. • USB 2.0 port, at the front, protected by a cover. • Touch-screen optional.

2.2 Central unit + Monitor + Keyboard and Operator panel.

The central unit is located on the rear of the monitor.

Identification.	Description.
 <p>MONITOR-LCD-10K-001</p>	<p>Available for 8060M-FL, 8060T-FL and 8060L models.</p> <ul style="list-style-type: none"> • Central unit. • 10.4" LCD monitor (800x600) 18-bit color. • Built-in keyboard. • Built-in operator panel. • USB 2.0 port, at the front, protected by a cover.

2.

CONFIGURATION.




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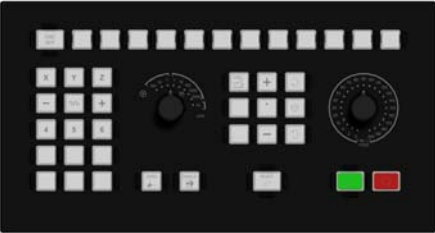
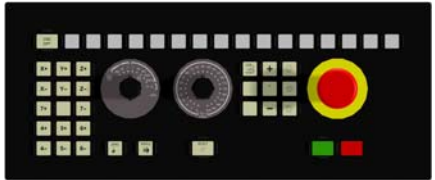
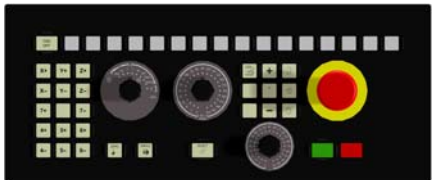
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2.3 Keyboard.


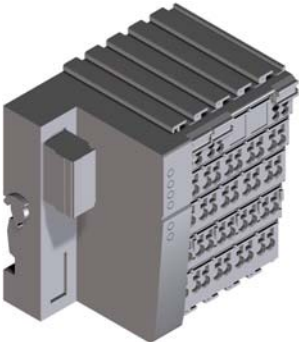


Identification.	Description.
 <p>HORIZONTAL KEYB 2.0 + TOUCHPAD.</p>	<p>Available for all models.</p> <ul style="list-style-type: none"> • USB horizontal, alphanumeric QWERTY keyboard. • Multi-touch touchpad (touch panel). • Numeric keypad optimized to operate with the CNC (keys for axes, feedrate, speed, etc). • Special functions with the Fagor key.

2.4 Operator panels.

Identification.	Description.
 <p>OP-PANEL-329</p>	<p>Available for all models.</p> <ul style="list-style-type: none"> • Length 329 mm (12.95"). • 12 configurable user keys. • Jog switch (0 - 200 %). • 15 configurable jog keys. • CNC power-down key. • CAN communication (CANopen protocol). • Spindle override key. • Possibility to connect up to three handwheels.
 <p>OP-PANEL</p>	<p>Available for all models.</p> <ul style="list-style-type: none"> • Length 420 mm (16.54") • 16 configurable user keys. • Jog switch (0 - 200 %). • 15 configurable jog keys. • CNC power-down key. • CAN communication (CANopen protocol). • Spindle override key. • Possibility to connect up to three handwheels.
 <p>OP-PANEL+SPDL RATE</p>	<p>Available for all models.</p> <ul style="list-style-type: none"> • Length 420 mm (16.54") • 16 configurable user keys. • Jog switch (0 - 200 %). • 15 configurable jog keys. • CNC power-down key. • CAN communication (CANopen protocol). • Spindle override switch. • Possibility to connect up to three handwheels.

2.5 Remote modules.

Remote modules may be used to have extra resources (see table below) distributed at different locations of the machine or installed in the electrical cabinet.

Identification.	Description.
 <p>RIO5 series</p>	<ul style="list-style-type: none"> • CAN communication (CANopen protocol). • Digital inputs and outputs. • Analog inputs and outputs. • Analog inputs for PT100 temperature sensors.
 <p>RIOW series</p>	<ul style="list-style-type: none"> • CAN communication (CANopen protocol). • Digital inputs and outputs. • Analog inputs and outputs. • Analog inputs for PT100 temperature sensors.
 <p>RIOR series</p>	<ul style="list-style-type: none"> • CAN communication (CANopen protocol). • Digital inputs and outputs. • Analog inputs and outputs (configurable to voltage or current). • Analog inputs for PT100 temperature sensors.
 <p>RCS-S Series</p>	<ul style="list-style-type: none"> • Sercos II communication. • Feedback inputs. • Analog outputs.

2.

CONFIGURATION.



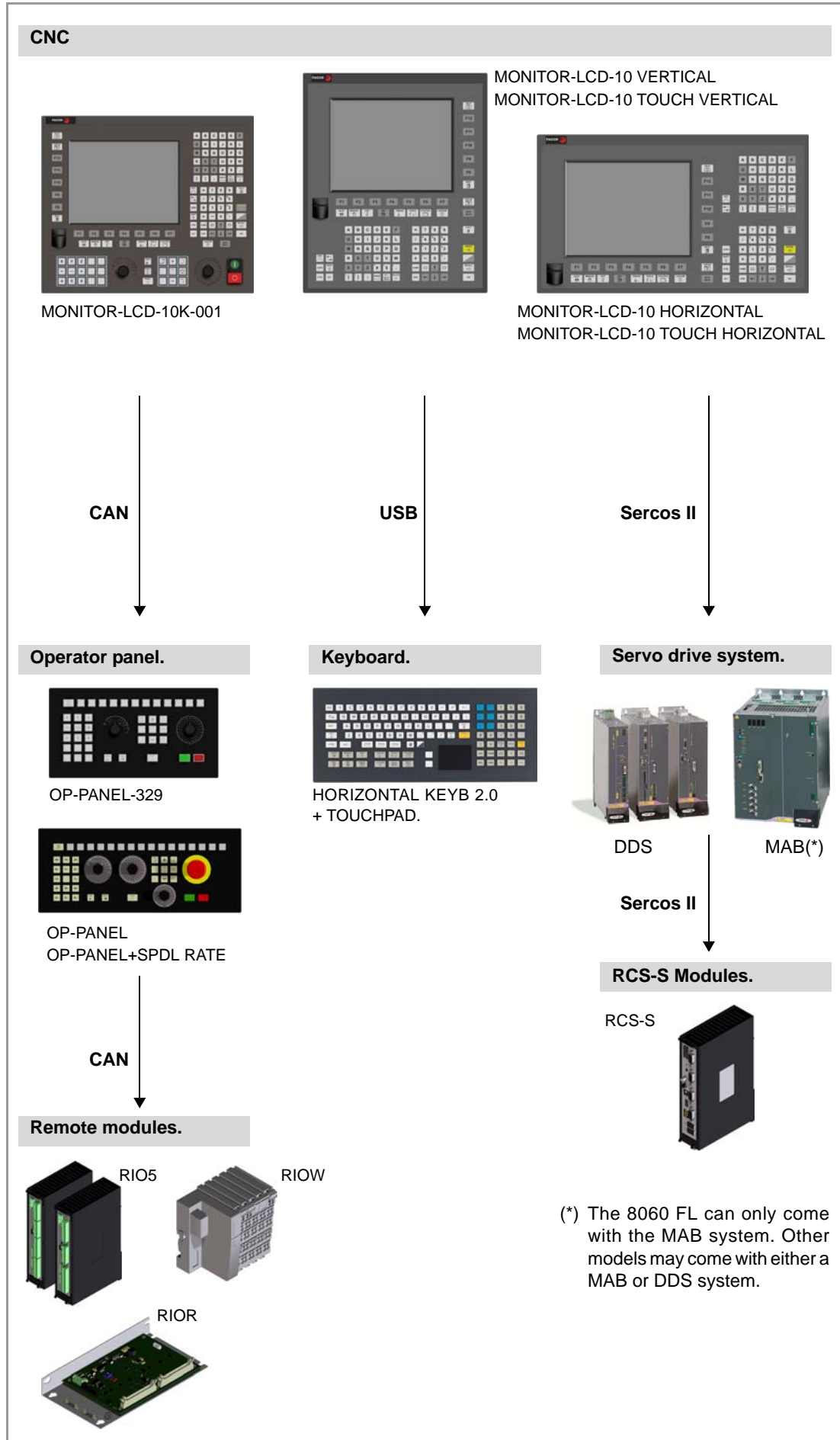
FAGOR AUTOMATION

CNC 8060

(REF: 1709)

2.6 General diagram.

See the schematic description of all the elements that make up the CNC system:



(*) The 8060 FL can only come with the MAB system. Other models may come with either a MAB or DDS system.

2.

CONFIGURATION.

3 CENTRAL UNIT (CPU) ENCLOSURE.

The enclosure must be designed to ensure an ambient temperature of 45 °C (113 °F) and while the unit is running, the inside temperature of the CNC must not exceed 60 °C (140 °F). The inside temperature of the CNC may be monitored from the diagnosis mode (see the operating manual).

Enclosure requirements.

The enclosure must meet the following requirements.

- The protection degree of the enclosure must be IP54.
- The dissipation surface of the enclosure must be enough to evacuate (by convection) the heat generated inside. Dissipation surfaces are all the surfaces of the enclosure except the front and bottom.
- The enclosure must respect the minimum distances recommended between the enclosure walls and the central unit to let the air flow and improve heat dissipation.



To meet the previous requirements, Fagor recommends the following.

- The enclosure must not have any ventilation holes, because they could let dust or other substances in.
- To improve heat dissipation, install a fan inside the enclosure for air circulation.



Before building an enclosure with glass fiber u another poor heat dissipating material, contact Fagor Automation.

Minimum enclosure dimensions.

If necessary, increase the dimensions of the enclosure; NEVER use smaller dimensions than the recommended minimum values.

CN60-10V.

The diagram shows a 3D perspective view of the CN60-10V CNC unit. Dimension A is the width of the unit, B is the height, and C is the depth. Dimensions D, E, and F represent the required clearances between the unit and the enclosure walls: D is the gap between the top and bottom of the unit and the enclosure walls, E is the gap between the top of the unit and the top of the enclosure, and F is the gap between the bottom of the unit and the bottom of the enclosure.

Required minimum dimensions:

CN60-10V		
A	394 mm	15.51 inch
B	423 mm	16.65 inch
C	125 mm	4.92 inch
D*	15 mm	0.59 inch
E*	15 mm	0.59 inch
F*	50 mm	1.97 inch

(*) The minimum gap between the CNC and the side walls of the enclosure.

Dissipating surface:

0.32 m ²	3.44 ft ²
---------------------	----------------------

3.

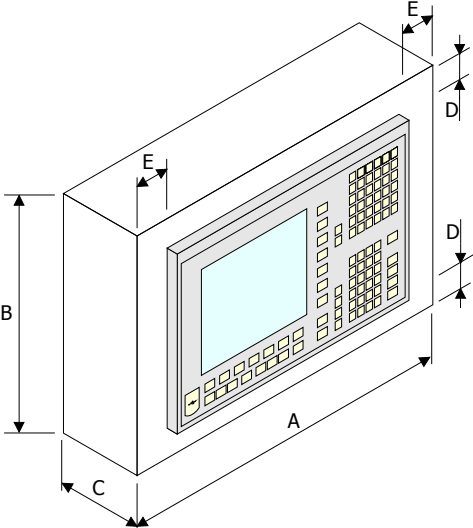
CENTRAL UNIT (CPU) ENCLOSURE.

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CN60-10H.


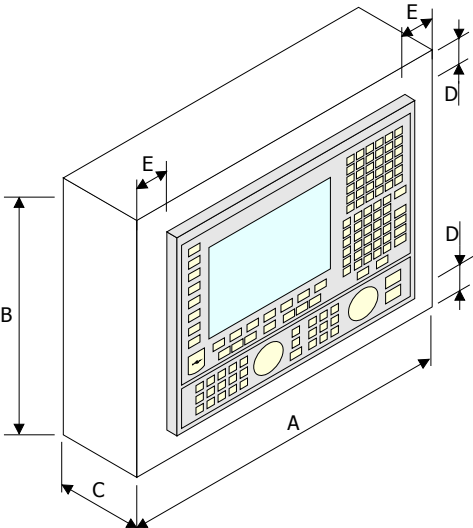
Required minimum dimensions:

CN60-10H		
A	502 mm	19.76 inch
B	305 mm	12.00 inch
C	125 mm	4.92 inch
D*	15 mm	0.59 inch
E*	15 mm	0.59 inch

(*) The minimum gap between the CNC and the side walls of the enclosure.

Dissipating surface:

0.29 m ²	3,12 ft ²
---------------------	----------------------

CN60-10K.


Required minimum dimensions:

CN60-10K		
A	450 mm	17,72 inch
B	380 mm	14,96 inch
C	135 mm	5.31 inch
D*	15 mm	0.59 inch
E*	15 mm	0.59 inch

(*) The minimum gap between the CNC and the side walls of the enclosure.

Dissipating surface:

0.33 m ²	3.55 ft ²
---------------------	----------------------

Power dissipated by the CNC.

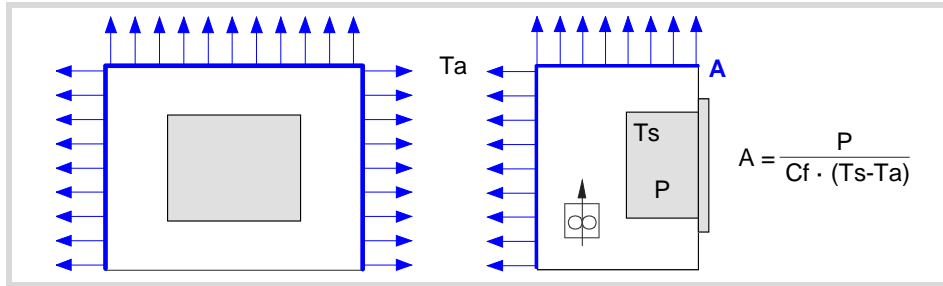
To calculate the dissipated power, all the elements that are inside the enclosure must be taken into account. The central unit dissipates 24 W.

Characteristics of the inside fan of the enclosure.

- Type of fan; ball bearings.
- Work temperature, between -10 °C (14 °F) and +60 °C (140 °F).
- Air flow greater than 13.6 m³/h
- Life expectancy L10 >= 100.000 hours (taken at 25 °C (77 °F))

3.1 Calculation of the surface needed for heat dissipation.

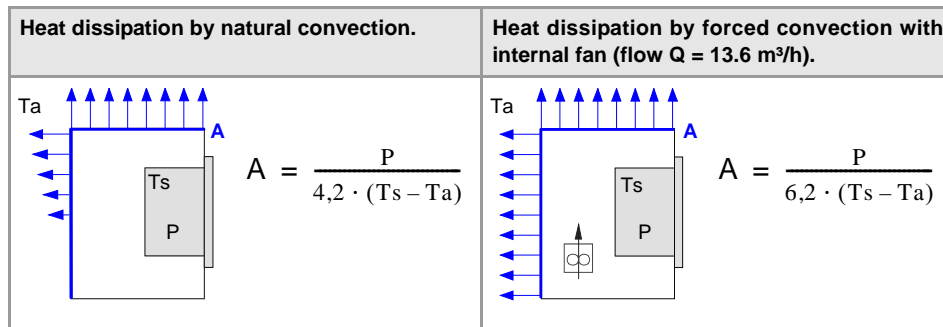
To calculate the total surface required for the enclosure, in order to dissipate the heat generated in it, the following data must be considered.



Data	Units	Meaning
TO	(m ²)	Total required surface (The entire surface of the enclosure except the bottom one is considered useful).
P	(W)	Total power dissipated by all the elements that generate heat inside the enclosure, including the power supply and the fan, if there is one.
Ta	(°C)	Ambient temperature (outside the enclosure).
Ts	(°C)	Internal CNC temperature.
Cf	(m ²)	Dissipation coefficient of the material used for the enclosure.

Heat dissipation example for an enclosure with the recommended minimum surface.

The dissipation coefficient corresponds to an enclosure made of painted sheet metal.



	CN60-10H		CN60-10V		CN60-10K	
Ambient (room) temperature (Ta).	45 °C (113 °F)		45 °C (113 °F)		45 °C (113 °F)	
Dissipated power.	24 W		24 W		24 W	
Dissipating surface.	029 m ² (3.12 ft ²)		0.32 m ² (3.34 ft ²)		0.33 m ² (3.55 ft ²)	
Fan.	Yes	No	Yes	No	Yes	No
Air flow of the fan.	13.6 m ³ /h	---	13.6 m ³ /h	---	13.6 m ³ /h	---
Dissipation coefficient.	6.2	4.2	6.2	4.2	6.2	4.2
Internal CNC temperature.	58.3 °C 136.9 °F	64.6 °C 148.3 °F	57 °C 134.6 °F	62.8 °C 145 °F	56.5 °C 133.7 °F	62.1 °C 143.8 °F

In this case, for an inside temperature of 45 °C (113 °F), the enclosure must be larger or an inside fan must be installed to improve heat dissipation by making the air flow inside.

3.

CENTRAL UNIT (CPU) ENCLOSURE.



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3.

CENTRAL UNIT (CPU) ENCLOSURE.



CNC 8060

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4 CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.

Module.	Differences.
CN60-10H CN60-10HT(*) CN60-10V CN60-10VT(*) (*) Touch-screen.	Available for 8060M Power and 8060T Power models. <ul style="list-style-type: none"> • The central unit is located on the rear of the monitor. • 10.4" (800 × 600 pixels) LCD monitor, aspect ratio 4:3, 18-bit color. • Keyboard. • USB 2.0 port, at the front, protected by a cover. • Touch screen (only CN60-10HT / CN60-10VT).
CN60-10K	Available for 8060M-FL, 8060T-FL and 8060L models. <ul style="list-style-type: none"> • The central unit is located on the rear of the monitor. • 10.4" (800 × 600 pixels) LCD monitor, aspect ratio 4:3, 18-bit color. • Keyboard and operator panel. • USB 2.0 port, at the front, protected by a cover.

The front USB port allows for a pendrive, mouse or keyboard to be connected; no type of hub or hard drive should be connected to the USB port.

CN60-10H / CN60-10HT



CN60-10V / CN60-10VT



CN60-10K



4.

CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.



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CNC 8060

(REF: 1709)

4.1 Specifications.

Type.	Description.
General.	<ul style="list-style-type: none"> • Monitor and keyboard set with the central unit attached on the rear. The CN60-10K also comes with an operator panel. • Touch screen monitors (models CN60-10HT / CN60-10VT). • USB 2.0 port, at the front, protected by a cover. • Dimensions of CN60-10H / CN60-10HT (width x height x depth). <ul style="list-style-type: none"> - 472 x 275 x 58.5 mm. - 18.58" x 10.83" x 2.30". • Dimensions of CN60-10V / CN60-10VT (width x height x depth). <ul style="list-style-type: none"> - 329 x 393 x 58.5 mm. - 12.95" x 15.47" x 2.30". • Dimensions of CN60-10K (width x height x depth) <ul style="list-style-type: none"> - 420 x 350 x 68 mm. - 16.54" x 13.78" x 2.68".
System.	<ul style="list-style-type: none"> • Processor: Atom Z510 1.1 GHz. • Memory: 1 GB. • Storage: Internal 2 GB CompactFlash. • Storage expansion (optional): 2 GB Compact flash. (additional storage space for user programs). • RAM memory with battery.
LCD.	<ul style="list-style-type: none"> • Type: TFT LCD. • Size: 10.4" (aspect ratio 4:3). • Resolution: 800 x 600 pixels.
Regulation.	<ul style="list-style-type: none"> • CE.
Packaging.	<ul style="list-style-type: none"> • The package meets the regulation EN 60068-2-32 procedure 1 with a random fall from a height not greater than 1 m.
	<ul style="list-style-type: none"> • Work temperature: The unit must not be running out of temperature range between a maximum of 55 °C (131 °F) and a minimum 5 °C (41 °F). • The temperature outside the enclosure where the unit is mounted must be within the temperature range, between the maximum of 40 °C (104 °F) and the minimum of 5 °C (41 °F). • Ambient temperature: between -40 °C (-40 °F) and +70 °C (158 °F). • Relative humidity: 20 ~ 85% RH without condensation. • Pollution degree: 2 • Maximum work altitude: The unit must work properly at 2000 m according to IEC 61131-2. • Vibration test according to IEC 60068-2-6 with a frequency step of 1 octave/minute ($\pm 10\%$) and 10 sweeps long. <ul style="list-style-type: none"> - 8.4 Hz $\geq f \geq 5$ Hz; Constant movement with an amplitude peak of 3.5 mm. - 150 Hz $\geq f \geq 8.4$ Hz; Constant peak acceleration of 1g. • Degree of protection: IP65 (front), IP20 (rear).
Power supply.	<ul style="list-style-type: none"> • Universal DC power supply. Use a regulated 24 V DC power supply (between -15% and +20%) and 2 A (including voltage ripple and noise). The power supply must meet the UL1950 standard.
Connectivity.	<p>Monitor.</p> <ul style="list-style-type: none"> • 1 USB 2.0 port, accessible at the front, protected by a cover. <p>Central unit.</p> <ul style="list-style-type: none"> • 1 USB 2.0 ports • 1 RS-232/422/485 (115 kbps) serial port (optional). • 1 LAN RJ45 port for Ethernet 10/100/100 BaseT network. • CAN Bus (CANfagor/CANopen). • Sercos II bus.

4.

CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.



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CNC 8060

(REF: 1709)

Type.	Description.
Inputs/outputs.	<ul style="list-style-type: none"> • 16 opto-coupled digital inputs (24 V DC). <ul style="list-style-type: none"> - IEC61131-2 type 1 and type 3 compliant. • 8 opto-coupled digital outputs (24 V DC, 500 mA). <ul style="list-style-type: none"> - ON cycle: minimum 75 μs (25 μs, optional in two of them). • 1 analog outputs (±10 V, 16-bit resolution). • 1 feedback inputs (5 V 250 mA). <ul style="list-style-type: none"> - Incremental TTL signal, differential TTL or 1 Vpp. - SSI or EnDat communication protocols. - Frequency : 100 kHz (TTL), 1000 kHz (TTL differential) / 500 kHz (1 Vpp). • 1 relay with one normally open contact (1A at 24V). • 2 probe inputs (5 V or 24 V) • 1 input for three handwheels with A and B signals (5 V DC TTL) (only CN60-10K).

The machine manufacturer must comply with the EN 60204-1 (IEC-204-1) regulation regarding electrical shocks in case of defective input/output pins with external power supply when not plugging the connector before turning the power supply on.



Do not get into the inside of the unit. This unit MUST NOT be opened by unauthorized personnel. Only personnel authorized by Fagor Automation may access the interior of this unit.



Fagor Automation offers several flash compact in its catalog to increase storage space; if you are going to use other compact flashes, always use industrial grade compact flash SLC; they support temperatures between -40°C and +80°C (-40 °F and 176 °F) and last 27 years with 1000 writes per day. Fagor Automation shall not be held responsible for any problems caused by using other lower-quality compact flash.



No USB devices must be used nor connected while executing a part program. Using USB devices may slow down the execution or cause some "RT-IT overflow" type error.



DO NOT connect any kind of hub to the USB port.

4.

CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.



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CNC 8060

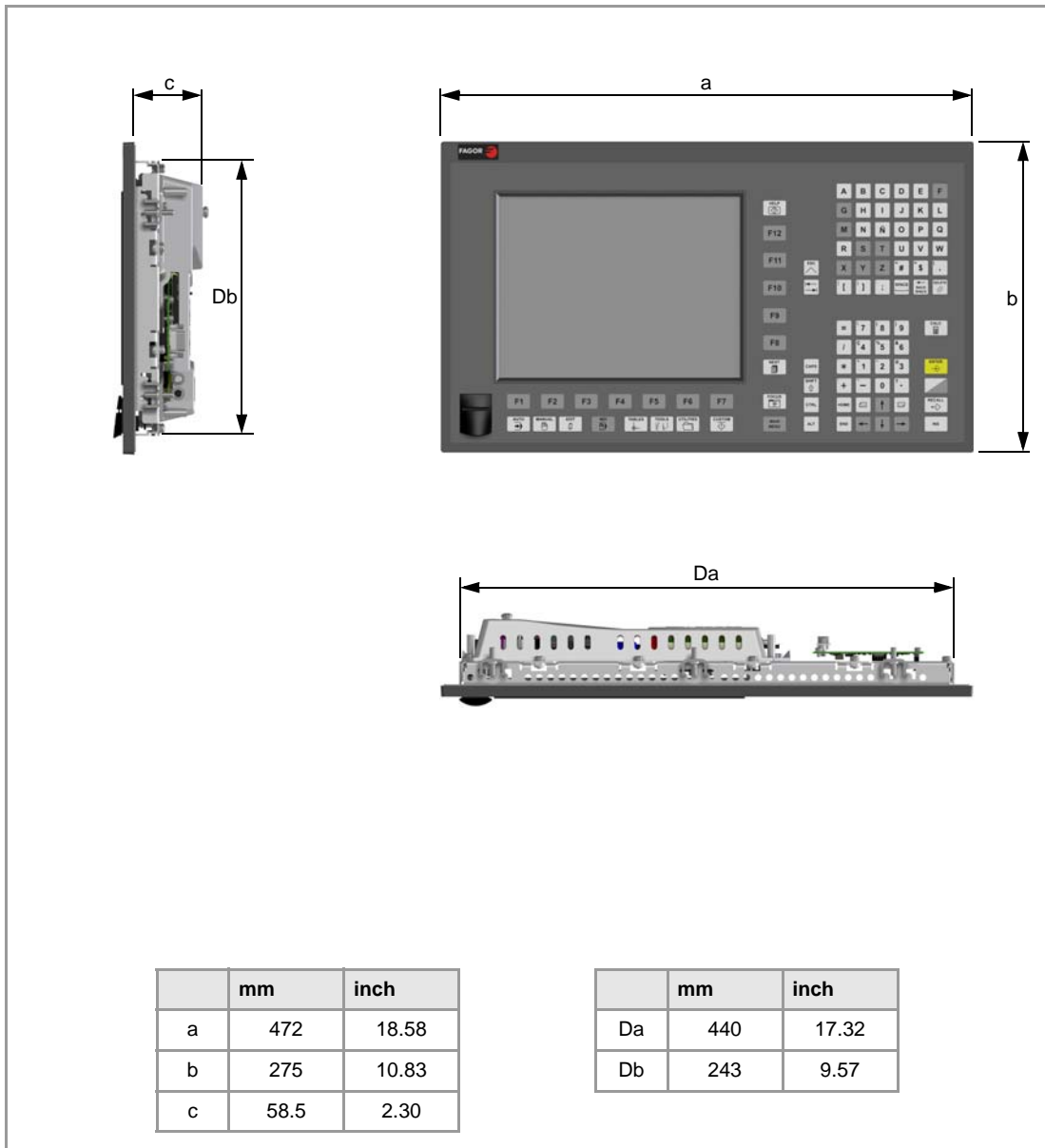
(REF: 1709)

4.2 Dimensions.

4.2.1 CN60-10V / CN60-10VT (8060M-Power and 8060T-Power models).

4.

CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.

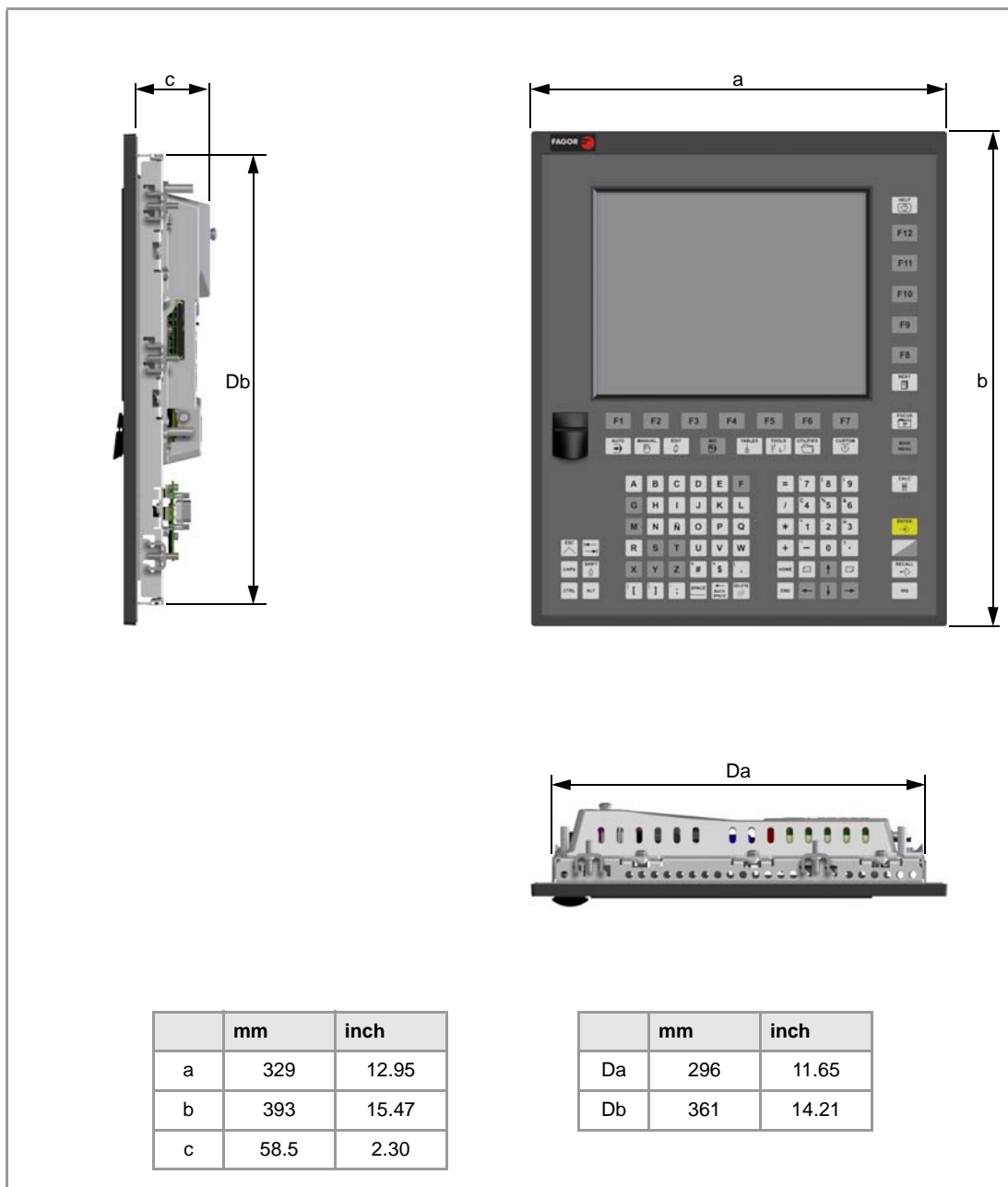


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CNC 8060

(REF: 1709)

4.2.2 CN60-10V / CN60-10VT (8060M-Power and 8060T-Power models).



4.

CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.



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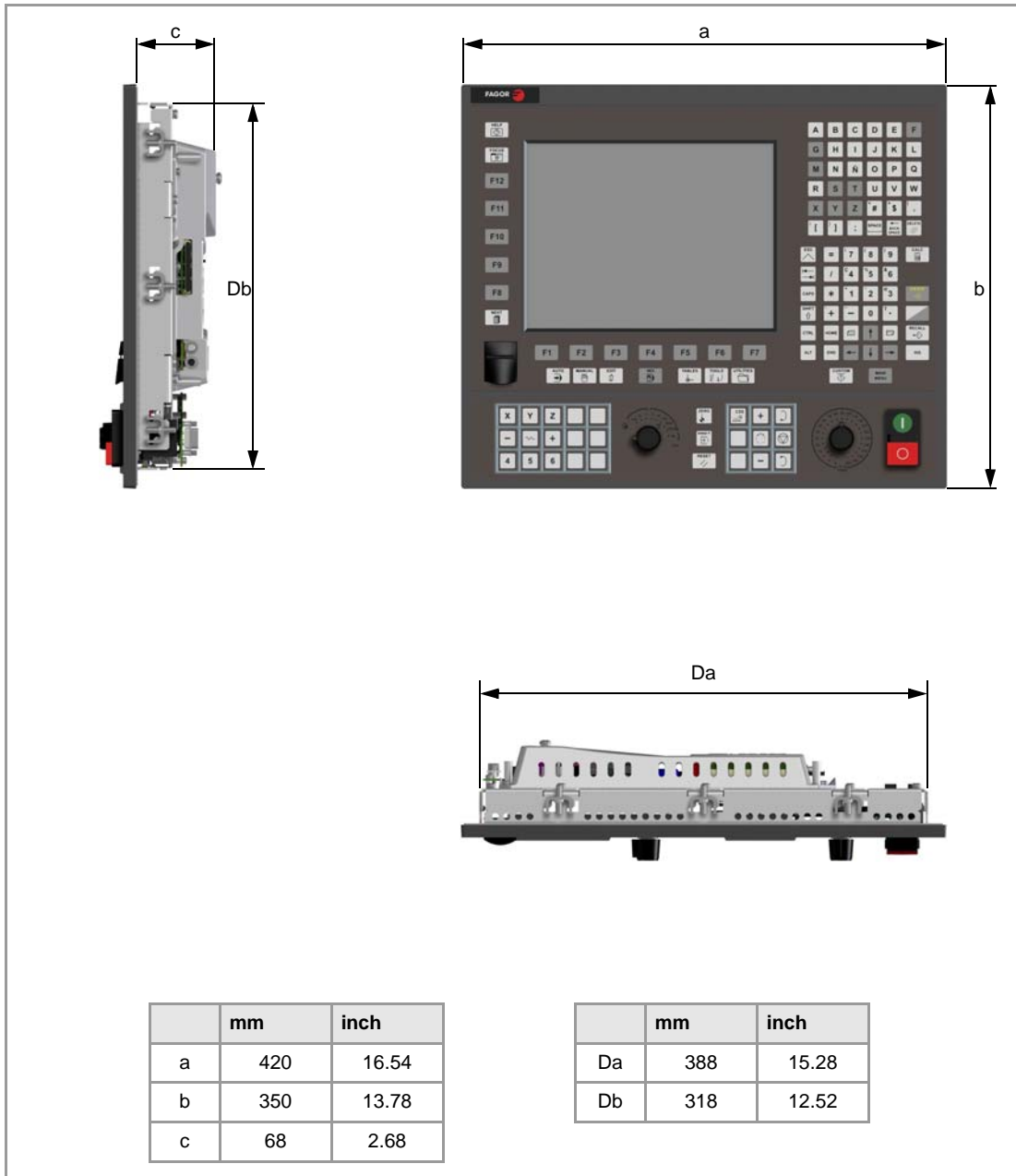
CNC 8060

(REF: 1709)

4.2.3 CN60-10K (8060M-FL, 8060T-FL and 8060L models).

4.

CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.



4.3 Enclosure and securing of the modules.

4.3.1 Ambient characteristics of the enclosure.

To ensure the ambient conditions inside the enclosure, it must meet the requirements mentioned earlier. See chapter "3 Central unit (cpu) enclosure."

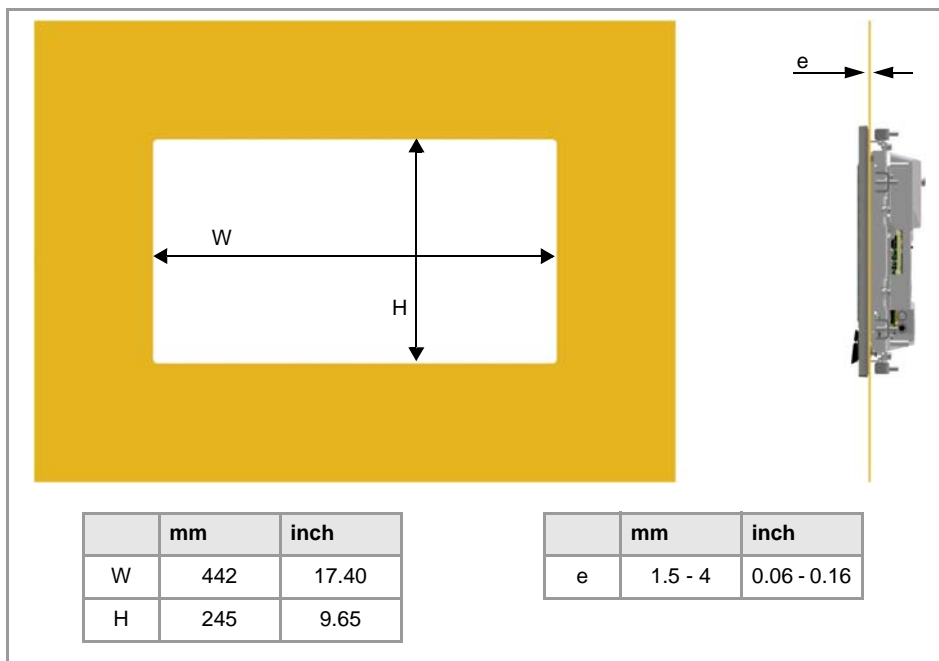
4.3.2 Enclosure design.

Room reserved for cables.

Reserve some room for the cables in the connector area. This space makes it possible to bend the cables for the CPU connection with the recommended bending radius. Special care must be taken with the Sercos connection because bending the optic fiber too much could break it.

Dimensions of the cut off part and the enclosure.

CN60-10H / CN60-10HT.



CN60-10V / CN60-10VT.

Technical drawing of the CN60-10V / CN60-10VT component. The top view shows a square component with a central white square. The width of the central square is labeled 'W' and the height is labeled 'H'. The side view shows the component's profile with a dimension 'e' indicating the thickness of the component.

	mm	inch
W	299	11.77
H	363	14.29

	mm	inch
e	1.5 - 4	0.06 - 0.16

CN60-10K.

Technical drawing of the CN60-10K component. The top view shows a square component with a central white square. The width of the central square is labeled 'W' and the height is labeled 'H'. The side view shows the component's profile with a dimension 'e' indicating the thickness of the component.

	mm	inch
W	391	15.40
H	321	12.63

	mm	inch
e	1.5 - 4	0.06 - 0.16

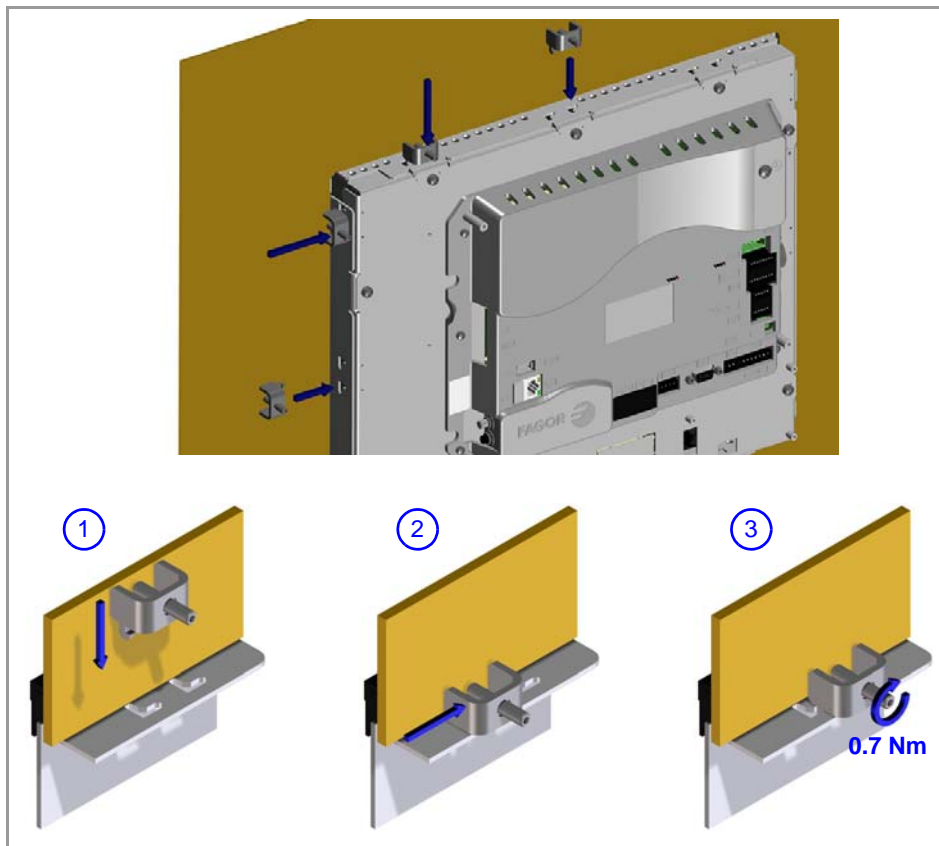
CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.

4.

4.3.3 Securing the module.

The module must be installed in a proper enclosure that may be located on the machine or on an external support. To insert the unit into the enclosure, it must have a big enough hole to allow to insert it easily, without obstacles and without forcing the unit.

The module is secured from the inside of the enclosure; therefore, there is no need to drill any holes on the front. Once the unit has been inserted into the enclosure, secure it from the inside with the tension jacks. To properly secure it, use all the tension jacks on the back of the unit. Apply a tightening torque of 0.7 Nm.



4.

CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.

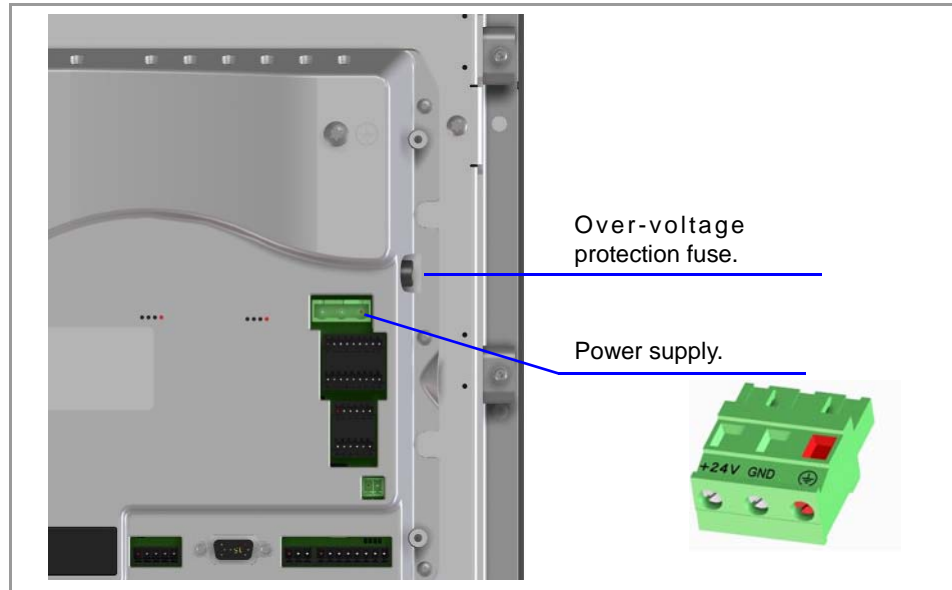
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CNC 8060

(REF: 1709)

4.4 Power supply for the module.



4.4.1 Electrical characteristics.

- The unit is electrical safety class III.
- The nature of the installation where it is connected must not exceed OVC II.
- The unit must be powered with class DVC A power supply with a PELV protection output voltage.

4.4.2 Voltage supply at 24 V DC.

Universal DC power supply. Use a regulated 24 V DC power supply (between -15% and +20%) and 2 A (including voltage ripple and noise). See "4.4.5 Specs of the power supply." on page 41.

Connector pinout.



Plug-in part 3-pole Phoenix-contact combicon connector (7.62 mm pitch). Rated current; 12 A.

Pin	Signal.	Function.
1		---
2	11	0 V reference signal.
3	+24 V	Power supply.

4.4.3 Protection against over-voltage and reverse voltage.

Protection against over-voltage and reverse voltage. The central unit has a F2A fuse that may be accessed from the outside to protect against over-voltage (greater than 36 V DC or 25 V AC). The central unit is also protected against reverse connection of the power supply.

(REF: 1709)

4.

CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.



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CNC 8060

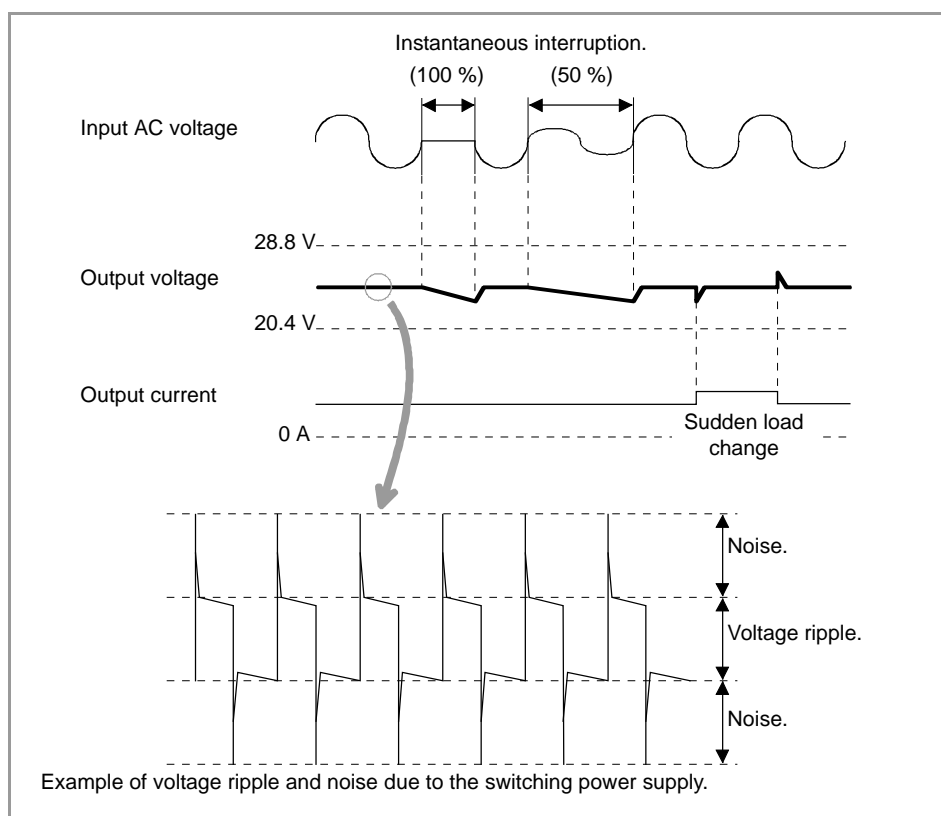
4.4.4 Non-volatile RAM (FRAM).

The CNC has non-volatile RAM (FRAM) that keeps the information saved in it even when a power failure occurs. The non-volatile RAM (FRAM) always saves the position of the axes, the rest of the data that it saves is determined by machine parameters, like for example, PLC registers (parameter BKUPREG), common arithmetic parameters (parameter BKUPCUP), etc.

4.4.5 Specs of the power supply.

Power the central unit with an external regulated 24V power supply with the following characteristics. The power supply must meet the UL1950 standard.

- Output voltage.
24 V DC (between -15% and +20%) and 2 A (including voltage ripple and noise).
- Output current.
The continuous load current must be greater than the current consumed by the CNC (2 A) (at the maximum temperature inside the electrical cabinet - enclosure - where the power supply is).
- Load fluctuations (including the current peak due to the load).
The output voltage must not exceed the previous limits (20.4 V ÷ 28.8 V), due to load fluctuations.
- Output voltage holding time after an instantaneous power interruption.
10 ms (for an interruption of 100%) / 20 ms (for an interruption of 50%).

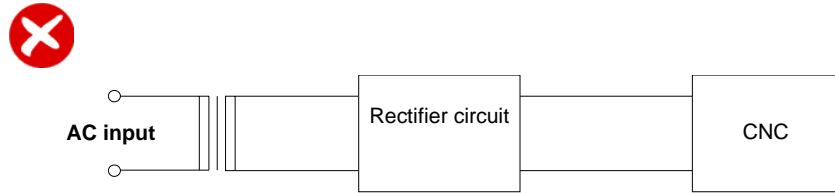


4.4.6 NOT recommended circuits.

The following types of circuits should NOT be used.

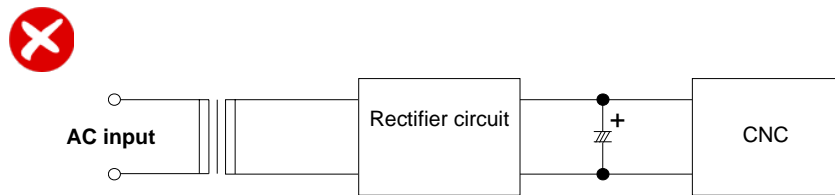
- 1 Examples of circuits that cannot maintain the output voltage in an instantaneous interruption (the output voltage drops under 20.4 V).

Example 1. Not recommended diagram.



A rectifier circuit is a circuit that uses diodes for full wave rectification.

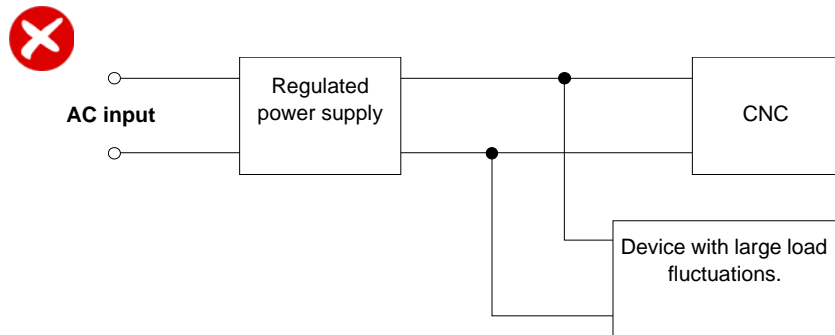
Example 2. Not recommended diagram.



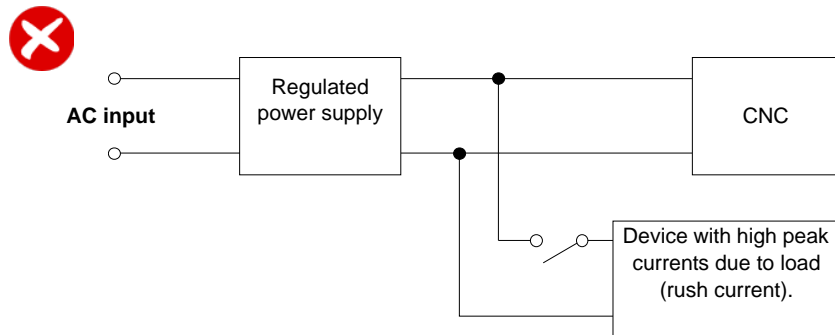
A rectifier circuit is a circuit that uses diodes for full wave rectification.

- 2 Examples of circuits that exceed the output voltage range (20.4 V to 28.8 V) due to load fluctuations. For these circuits, use a regulated second phase to power devices with large load fluctuations so as not to affect the CNC and other units.

Example 1. Not recommended diagram.



Example 2. Not recommended diagram.



CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.

4.



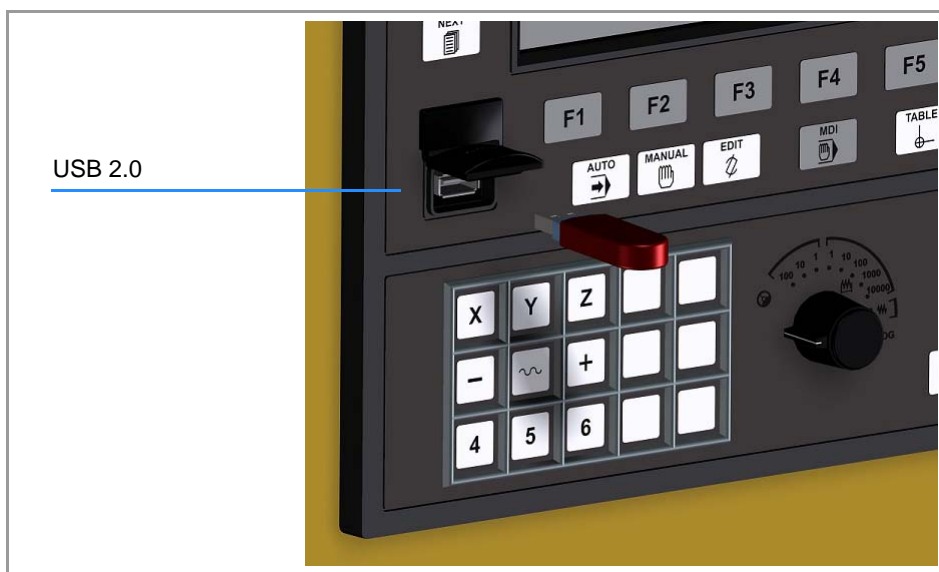
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CNC 8060

(REF: 1709)

4.5 Hardware functionality. Connectors.

4.5.1 Front of the monitor. USB connector.



USB 2.0 port accessible from the front and protected by a cover, for the connection of a pendrive, mouse or keyboard. The cover must be tightly closed for the keyboard to comply with standard IP65.

4.

CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.

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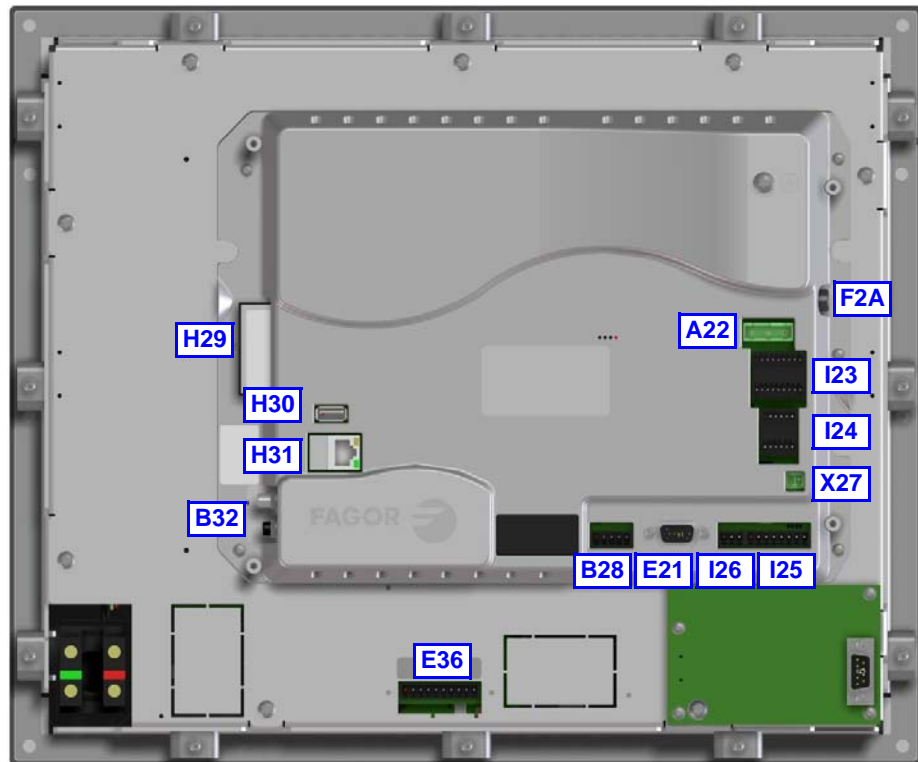
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4.5.2 Rear. Central unit and handwheel connectors.

CN60-10H
 CN60-10HT
 CN60-10V
 CN60-10VT
 CN60-10K



Connector identification.

Connector.		
·A22·	24 V supply input.	See Page 45 .
·B28·	CAN bus.	See Page 45 .
·B32·	Sercos II bus.	See Page 45 .
·E21·	Local feedback input.	See Page 46 .
·E36·	Handwheel input (only CN60-10K model).	See Page 46 .
·F2A·	Protection fuse.	See Page 47 .
·H29·	Compact flash.	See Page 47 .
·H30·	Type A USB port.	See Page 47 .
·H31·	Ethernet.	See Page 47 .
·I23·	Local digital inputs.	See Page 48 .
·I24·	Local digital outputs.	See Page 48 .
·I25·	Probe input.	See Page 49 .
·I26·	General purpose ± 10 V analog output (16 bits).	See Page 49 .
·X27·	Relay for the emergency chain.	See Page 50 .

CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.

-A22- 24 V DC supply input.



Plug-in part 3-pole Phoenix-contact combicon connector (7.62 mm pitch). Rated current; 12 A.

Pin	Signal.	Function.
1		---
2	11	0 V reference signal.
3	+24 V	Power supply.

Connector data.	
Number of poles.	3.
Pitch.	7.62 mm.
Connection technique.	Screw connection.
Minimum/maximum tightening torque.	0.5 / 0.6 Nm.
Minimum/maximum section.	0.2 / 2.5 mm ² .
Minimum/maximum AWG section.	24 / 12.
Rated current In.	12 A.

Cable data.	
Length to be stripped.	7 mm.

See "4.4 Power supply for the module." on page 40.

-B28- CAN bus.



Plug-in part 5-pole Phoenix-contact miniconbicon connector (3.5 mm pitch). Rated current; 8 A.

Pin.	Signal.	Function.
1	11	Ground / 0 V.
2	CL	(LOW) bus signal.
3	SH	CAN shield.
4	CH	(HIGH) bus signal.
5	SH	CAN shield.

Connector data.	
Number of poles.	5.
Pitch.	3.5 mm.
Connection technique.	Screw connection.
Minimum/maximum tightening torque.	0.22 / 0.25 Nm.
Minimum/maximum section.	0.14 / 1.5 mm ² .
Minimum/maximum AWG section.	28 / 16.
Rated current In.	8 A.

Cable data.	
Length to be stripped.	7 mm.

See "8 CAN Bus (CANopen protocol)." on page 99.

-B32- Sercos II bus.



Honeywell emitter and receiver.

Signal.	Function.
IN	Sercos signal receiver.
OUT	Sercos signal emitter.

See "9 Sercos-II Bus." on page 105.

4.

CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.



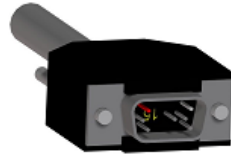
FAGOR AUTOMATION

CNC 8060

(REF: 1709)

-E21- Local feedback input.

The feedback signals may be incremental (TTL, differential TTL, Vpp) or communication protocols (SSI, EnDat).



1 ... 5
11 ... 15

Plug-in part 15-pin female SUB-D HD connector.

- Feedback signals (TTL, differential TTL, Vpp).

Pin.	Signal.	Function.
1	A	Feedback signals.
2	/A	
3	B	
4	/B	
5	I0	Reference signals.
6	/I0	
7	AL	Feedback alarm.
8	/AL	
9	+5 V DC	Voltage supply for the feedback system.
10	+5 V DC	
11	11	0 V reference signal.
12	11	
13/15	- - -	- - -

Connect the cable shield to the connector housing at both ends.

- Communication protocols (SSI, EnDat).

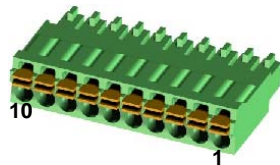
Pin.	Signal.	Function.
1	A	Feedback signals.
2	/A	
3	B	
4	/B	
5	DATA	Data line.
6	/DATA	
7	CLOCK	Clock line.
8	/CLOCK	
9	+5 V	Voltage supply for the feedback system.
10	+5_SENSE	
11	11	Reference signal.
12	GND_SENSE	
13/15	- - -	- - -

Connect the cable shield to the connector housing at both ends.

See "[4.6.4 Feedback inputs.](#)" on page 53. See "[4.7.2 Feedback connection.](#)" on page 56.

-E36- Handwheel input (only CN60-10K model).

The LCD-10K model admits the connection of up to 3 handwheels (MPG1, MPG2 and MPG3) with A and B signals (5 V DC TTL). If the handwheel has an axis selector button, the button signal may be connected to a digital input and may be managed from the PLC using the -NEXTMPGAXIS-mark.



Plug-in part 10-pole Phoenix-contact minicombicon connector (3.5 mm pitch).

Pin	Signal	Function
1	+5 V	Power supply.
2	- - -	- - -
3	- - -	- - -
4	MPG3-B	B signal of the third handwheel.
5	MPG3-A	A signal of the third handwheel.
6	MPG2-B	B signal of the second handwheel.
7	MPG2-A	A signal of the second handwheel.
8	MPG1-B	B signal of the first handwheel.
9	MPG1-A	A signal of the first handwheel.
10	11	Power supply.



Always connect the shield of the cable to the ground plate using a metallic clamp. See "[4.7.3 Handwheel connection \(only CN60-10K\).](#)" on page 57.

-F2A- Protection fuse.



The module has a F2A (fast 2A) fuse that may be accessed from the outside to protect against over-voltage (greater than 36 V DC or 25 V AC).

-H29- Compact flash



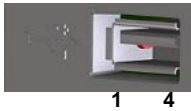
Additional storage space for user programs.



Fagor Automation offers several flash compact in its catalog to increase storage space; if you are going to use other compact flashes, always use industrial grade compact flash SLC; they support temperatures between -40°C and +80°C (-40 °F and 176 °F) and last 27 years with 1000 writes per day.

Fagor Automation shall not be held responsible for any problems caused by using other lower-quality compact flash.

-H30- USB port.



Type A USB connector.

Pin.	Signal.
1	+ 5 V
2	DT -
3	DT +
4	11

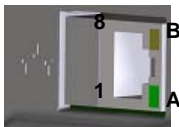


No USB devices must be used nor connected while executing a part program. Using USB devices may slow down the execution or cause some "RT-IT overflow" type error.



DO NOT connect any kind of hub to the USB port.

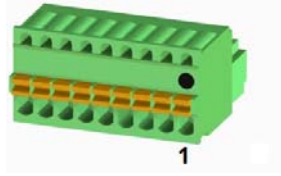
-H31- Ethernet.



8-pin RJ45 connector and 2 status LED's.

Pin.	10Base-T (10/100 Mhz).	1000Base-T (1000 Mhz).
1	TX+ (transmit data).	BI_DA+
2	TX- (transmit data).	BI_DA-
3	RX+ (receive data).	BI_DB+
4	---	BI_DC+
5	---	BI_DC-
6	RX- (receive data).	BI_DB-
7	---	BI_DD+
8	---	BI_DD-
A	Connection LED. The LED turns on when the central unit is connected to network.	
B	Activity LED. The LED blinks when data is being transferred.	

See "4.7.5 Connection to an Ethernet network." on page 61.

-I23- Local digital inputs (16 inputs).

Plug-in part 2 identical connectors 9-pole Phoenix-contact minicombicon connector (2.5 mm pitch). Rated current; 4 A.

- Top connector.

Pin.	Signal.	Function.
1 ●	24 V	24 V DC voltage supply.
2 - 9	LI1 - LI8	Local digital inputs.

- Bottom connector.

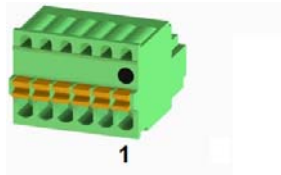
Pin.	Signal.	Function.
1 ●	11	0 V reference signal.
2 - 9	LI9 - LI16	Local digital inputs.

- Both connectors.

Connector data.	
Number of poles.	9.
Pitch.	2.5 mm.
Connection technique.	Spring connection.
Minimum/maximum section.	0.14 / 0.5 mm ² .
Minimum/maximum AWG section.	26 / 20.
Rated current In.	4 A.

Cable data.	
Length to be stripped.	8 mm.

See "4.6.1 Digital inputs." on page 52.

-I24- Local digital outputs (8 outputs).

Plug-in part 2 identical connectors 6-pole Phoenix-contact minicombicon connector (2.5 mm pitch). Rated current; 4 A.

- Top connector.

Pin.	Signal.	Function.
1 ●	24 V	24 V DC voltage supply.
2-3	LO1 - LO2	Local digital outputs. In the laser model, use these pins for PWM and synchronous switching.
4-5	LO3 - LO4	Local digital outputs.
6	11	0 V reference signal.

- Bottom connector.

Pin.	Signal.	Function.
1 ●	24 V	24 V DC voltage supply.
2 - 5	LO5 - LO8	Local digital outputs.
6	11	0 V reference signal.

- Both connectors.

Connector data.	
Number of poles.	6.
Pitch.	2.5 mm.
Connection technique.	Spring connection.
Minimum/maximum section.	0.14 / 0.5 mm ² .
Minimum/maximum AWG section.	26 / 20.
Rated current In.	4 A.

Cable data.	
Length to be stripped.	8 mm.

See "4.6.2 Digital outputs." on page 52.

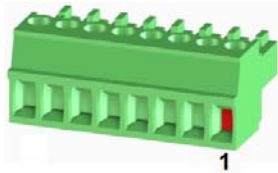


In the laser model, PWM and synchronous switching options can only use pins 2 (LO1) and 3 (LO2).

CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.

4.

-I25- Probe input.



Plug-in part 8-pole Phoenix-contact minicombicon connector (3.5 mm pitch). Rated current; 8 A.

Pin.	Signal.	Description.
1	GND_5V	0 V reference signal for 5V.
2	+5 V	5 V output.
3	PRB1_IN5V	5 V input of probe 1.
4	PRB2_IN5V	5 V input of probe 2.
5	PRB1_IN24V	24 V input of probe 1.
6	PRB2_IN24V	24 V input of probe 2.
7	GND_24V	0 V reference signal for 24 V.
8	Chassis	Shield.

Connect GND of 5V power supply to pin 1.
Connect GND of 24 V power supply to pin 7.

Connector data.	
Number of poles.	5.
Pitch.	3.5 mm.
Connection technique.	Screw connection.
Minimum/maximum tightening torque.	0.22 / 0.25 Nm.
Minimum/maximum section.	0.14 / 1.5 mm ² .
Minimum/maximum AWG section.	28 / 16.
Rated current In.	8 A.

Cable data.	
Length to be stripped.	7 mm.

See "4.7.4 Probe connection." on page 58.

-I26- General purpose ±10 V analog output (16 bits).



Plug-in part 3-pole Phoenix-contact minicombicon connector (3.5 mm pitch). Rated current; 8 A.

Pin	Signal.	Function.
1	11	0 V reference signal.
2	AO	Analog output.
3	CH	Shield.

Connector data.	
Number of poles.	3.
Pitch.	3.5 mm.
Connection technique.	Screw connection.
Minimum/maximum tightening torque.	0.22 / 0.25 Nm.
Minimum/maximum section.	0.14 / 1.5 mm ² .
Minimum/maximum AWG section.	28 / 16.
Rated current In.	8 A.

Cable data.	
Length to be stripped.	7 mm.

4.

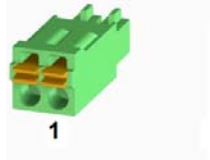
CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.



FAGOR AUTOMATION

CNC 8060

(REF: 1709)

·X27· Relay for the emergency chain.

Plug-in part 2-pole Phoenix-contact minicombicon connector (3.5 mm pitch). Rated current; 8A.

Pin.	Signal.	Function.
1	RELAY	Relay for the emergency chain.
2	RELAY	Relay for the emergency chain.

Connector data.	
Number of poles.	2.
Pitch.	3.5 mm.
Connection technique.	Spring connection.
Minimum/maximum section.	0.2 / 1.5 mm ² .
Minimum/maximum AWG section.	24 / 16.
Rated current In.	8 A.

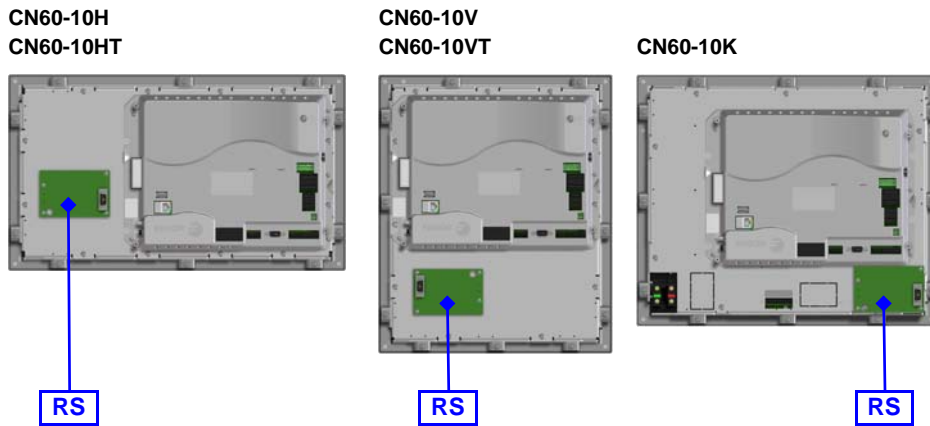
Cable data.	
Length to be stripped.	10 mm.

See ["4.7.1 Connecting the relay for the emergency chain."](#) on page 55.

4.

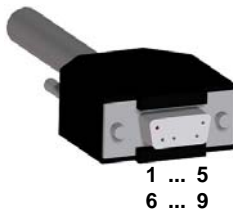
CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.

4.5.3 RS expansion board (available soon).



·RS· RS232 / RS422 / RS485 serial line.

Plug-in part 9-pin male SUB-D connector.



Pin.	RS232 signal.	RS422 signal.	RS485 signal.
1	DCD	---	---
2	RxD	LineTerm 120 Ω.	LineTerm 120 Ω.
3	TxD	/LineTerm 120 Ω.	/LineTerm 120 Ω.
4	DTR	---	---
5	11	11	11
6	DSR	TxD	---
7	RTS	/TxD	---
8	CTS	RxD	TxD RxD
9	RI	/RxD	/TxD /RxD

At the CNC, the type of serial line is selected by means of the machine parameters (parameter RSTYPE).

4.

CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.

4.6 Technical/electrical characteristics of the inputs and outputs.

4.6.1 Digital inputs.

All digital inputs are galvanically isolated up to 500 V through opto-couplers. All digital inputs meet the standard IEC61131-2 type 1 and type 3.

Characteristic.	Value.
Nominal voltage.	+24 V DC (between +18 V DC and +30 V DC).
Activation level.	From +11 V DC on and between 2.1 mA and 2.6 mA.
Deactivation level.	Under +10 V DC or 1.5 mA.

4.6.2 Digital outputs.

All digital outputs are galvanically isolated up to 500 V through opto-couplers. All the digital outputs have the following characteristics:

Characteristic.	Value.
Nominal voltage.	+24 V DC (between +18 V DC and +30 V DC).
Output voltage.	2 V less than the supply voltage.
Maximum output current.	500 mA per output.
Minimum cycle on.	Pins LO1 LO2: 25 μ s. Rest of pins: 75 μ s.



For the PWM and synchronized switching, only pins LO1 or LO2 may be used. Depending on the input receiving the PWM pulse and the cable, an external load resistor (at least 10% of rated current; if 24 V, 470 Ω / 2 W) improves signal quality and noise immunity.

4.6.3 Analog outputs.

Use shielded cables connecting their meshes to the corresponding shield pin. All the analog outputs have the following characteristics:

Characteristic.	Value.
Command voltage within range.	± 10 V.
Resolution.	16 bits.
Minimum impedance of the connected device.	10 k Ω .
Maximum cable length (unshielded).	75 mm.

CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.

4.



FAGOR AUTOMATION

CNC 8060

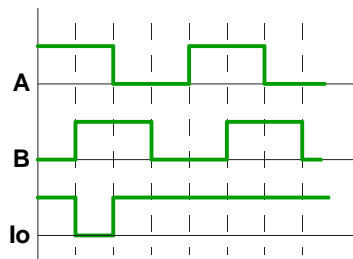
(REF: 1709)

4.6.4 Feedback inputs.

The central unit has one feedback input. The feedback signals may be incremental (TTL, differential TTL, Vpp) or communication protocols (SSI, EnDat).

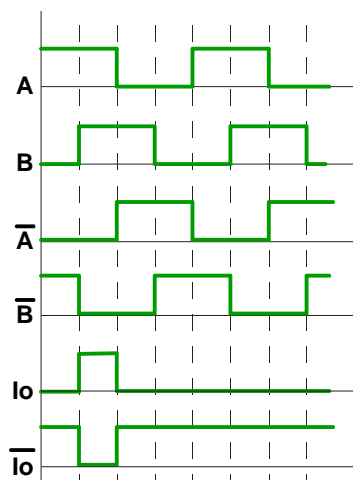
Characteristic.	Value.
+5 V power consumption.	250 mA.

Work levels for TTL signal.



Characteristic.	Value.
Maximum frequency:	100 kHz.
Phase difference:	$90^\circ \pm 20^\circ$.
High threshold (logic level "1") VIH:	$2,2 \text{ V} < \text{VIH} < 5 \text{ V}$.
Low threshold (logic level "0") VIL:	$-1 \text{ V} < \text{VIL} < 0,6 \text{ V}$.
Maximum voltage:	$-1 \text{ V} \div 7 \text{ V}$
Hysteresis:	1.2 V.

Work levels for differential TTL signal.



Characteristic.	Value.
Maximum frequency:	1000 kHz.
Phase difference:	$90^\circ \pm 20^\circ$.
Maximum voltage in common mode:	$-1 \text{ V} \div 7 \text{ V}$
Maximum voltage in differential mode:	$\pm 6 \text{ V}$.
Hysteresis:	0.2 V.
Maximum differential input current:	50 mA.

4.

CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.

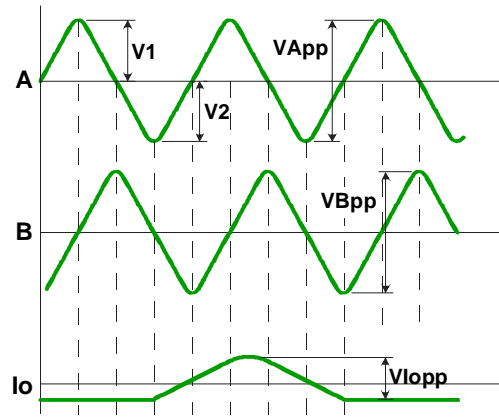


FAGOR AUTOMATION

CNC 8060

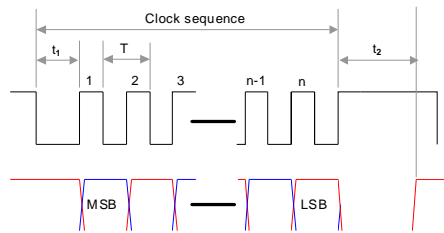
(REF: 1709)

Work levels for sinusoidal 1 Vpp signal.



Characteristic.	Value.
Maximum frequency:	500 kHz.
A and B signals. Amplitude:	$0.6 \div 1.2 V_{pp}$
A and B signals. Centered:	$ V1 - V2 / 2 V_{pp} \leq 6,5\%$
A and B signals. Ratio:	$V_{App} / V_{Bpp} = 0.8 \div 1.25$
A and B signals. Phase shift:	$90^\circ \pm 10^\circ$
I0 signal. Amplitude:	$0.2 \div 0.85 V$
I0 signal. Width:	$T - 90^\circ \leq I0 \leq T + 180^\circ$

Work levels for SSI signal.



Characteristic.	Value.
Transmission:	SSI synchronous serial transfer via RS 485.
Levels:	EIA RS 485
Clock frequency:	100 kHz - 500 kHz
Maximum number of bits (n):	32 (configurable).
T:	1 μ s to 10 μ s
t1:	> 1 μ s
t2:	20 μ s to 35 μ s
SSI:	Gray or binary (configurable).
Parity:	Fully configurable.

4.

CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.



FAGOR AUTOMATION

CNC 8060

(REF: 1709)

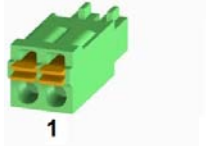
4.7 Connections.

4.7.1 Connecting the relay for the emergency chain.

Single-contact relay, normally open contact that closes when the CNC is powered up and running properly; it opens again when the CNC is turned off or when an internal failure occurs. The relay withstands up to 1 A at 24 V.

Connector pinout.

Plug-in part 2-pole Phoenix-contact minicombicon connector (3.5 mm pitch).



Pin.	Signal.	Function.
1	RELAY	Relay for the emergency chain.
2	RELAY	Relay for the emergency chain.

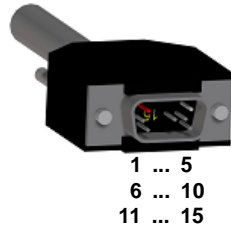
4.

CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.

4.7.2 Feedback connection.

The central unit has one feedback input. The feedback signals may be incremental (TTL, differential TTL, Vpp) or communication protocols (SSI, EnDat).

Connector pinout.



Plug-in part 15-pin male SUB-D HD type connector.

Pin.	Incremental signal. TTL. Differential TTL. 1 Vpp sinusoidal.	Protocol. SSI EnDat.
1	A	A
2	/A	/A
3	B	B
4	/B	/B
5	I0	DATA
6	/I0	/DATA
7	AL	CLOCK
8	/AL	/CLOCK
9	+5 V DC	+5 V
10	+5 V DC	+5_SENSE
11	11	11
12	11	GND_SENSE
13	---	---
14	---	---
15	---	---

Connect the cable shield to the connector housing at both ends.

Cable characteristics.



Fagor Automation offers a wide range of cables and extension cables to connect the feedback systems to the CNC. The cable characteristics, as well as its length, depend on the type of feedback being used. Refer to our catalog for further information.

We recommend to run the feedback cables as far away as possible from the power cables of the machine.

The cable being used must have overall shield. The cable shield must be connected to the metallic hood at each end. The unshielded portion of the wires of an unshielded cable cannot be longer than 75 mm.

CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.

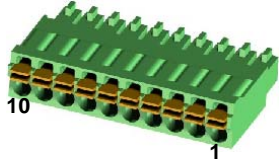
4.7.3 Handwheel connection (only CN60-10K).

The LCD-10K model admits the connection of up to 3 handwheels (MPG1, MPG2 and MPG3) with A and B signals (5 V DC TTL). If the handwheel has an axis selector button, the button signal may be connected to a digital input and may be managed from the PLC using the -NEXTMPGAXIS-mark.

We recommend to run the handwheel cable as far away as possible from the power cables of the machine.

Connector pinout.

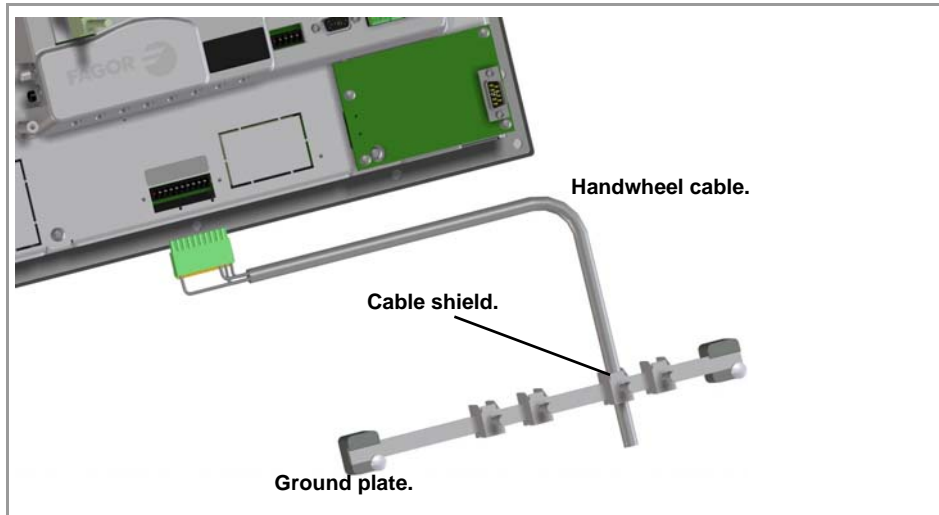
10-pin male Phoenix-contact miniconbicon connector (3.5 mm pitch).



Pin	Signal	Function
1	+5 V	Power supply.
2	---	---
3	---	---
4	MPG3-B	B signal of the third handwheel.
5	MPG3-A	A signal of the third handwheel.
6	MPG2-B	B signal of the second handwheel.
7	MPG2-A	A signal of the second handwheel.
8	MPG1-B	B signal of the first handwheel.
9	MPG1-A	A signal of the first handwheel.
10	11	Power supply.



Always connect the shield of the cable to the ground plate using a metallic clamp.



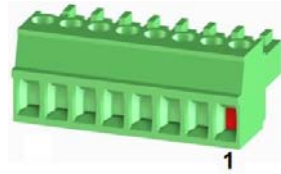
Cable characteristics.

The cable being used must have overall shield. The unshielded portion of the wires of an unshielded cable cannot be longer than 75 mm.

4.7.4 Probe connection.

Connector pinout.

Plug-in part 8-pole Phoenix-contact minicombicon connector (3.5 mm pitch).



Pin.	Signal.	Description.
1	GND_5V	0 V reference signal for 5V.
2	+5 V	5 V output.
3	PRB1_IN5V	5 V input of probe 1.
4	PRB2_IN5V	5 V input of probe 2.
5	PRB1_IN24V	24 V input of probe 1.
6	PRB2_IN24V	24 V input of probe 2.
7	GND_24V	0 V reference signal for 24 V.
8	Chassis	Shield.

Connect GND of 5V power supply to pin 1.

Connect GND of 24 V power supply to pin 7.

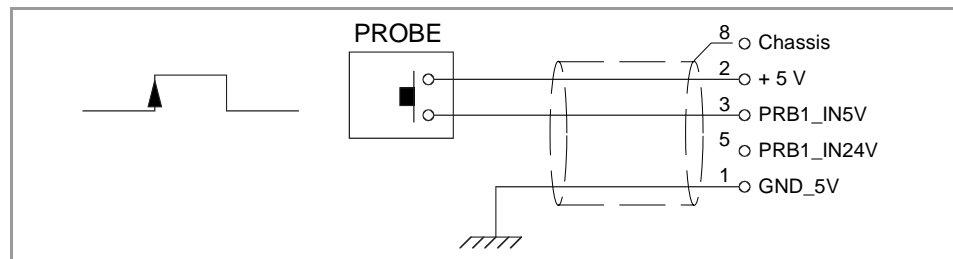
The CNC offers two 5 V probe inputs and two 24 V probe inputs. The following diagram uses the first probe input (pins 1/3 for 5 V or pins 5/7 for 24 V); For the second input, use pins 1/4 for 5 V or pins 6/7 for 24 V. Pins 2 and 8 are common.

All the shields of the cables must be connected to ground only at the CNC through pin -8- of the connector, leaving the other one free. The wires of the shielded cable must not be longer than 75 mm without the protection shield.

Probe connection.

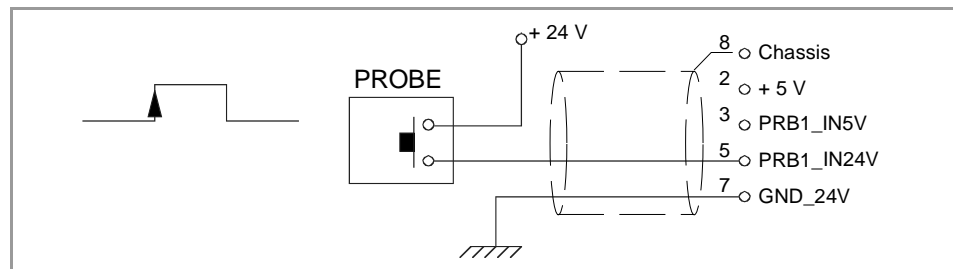
Probe whose output has a normally open contact. Connection to +5 V.

The connection acts upon the up flank (positive pulse) of the probe signal.



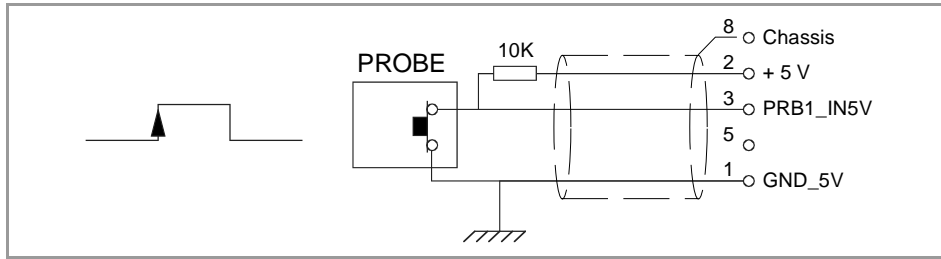
Probe whose output has a normally open contact. Connection to +24 V.

The connection acts upon the up flank (positive pulse) of the probe signal.



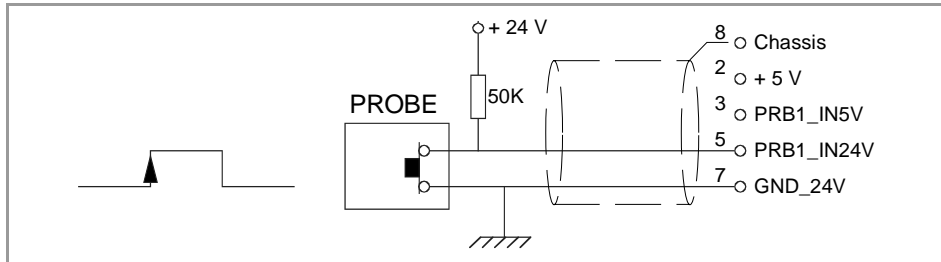
Probe whose output has a normally closed contact. Connection to +5 V.

The connection acts upon the up flank (positive pulse) of the probe signal.



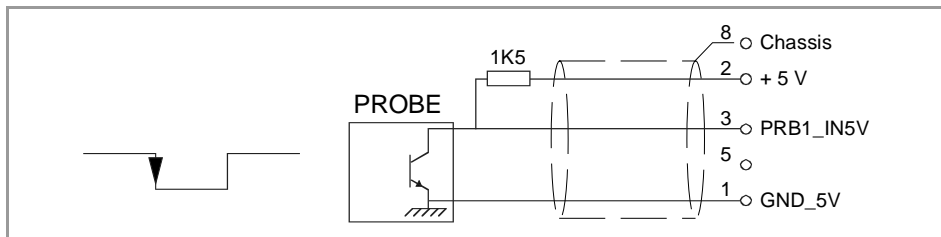
Probe whose output has a normally closed contact. Connection to +24 V.

The connection acts upon the up flank (positive pulse) of the probe signal.



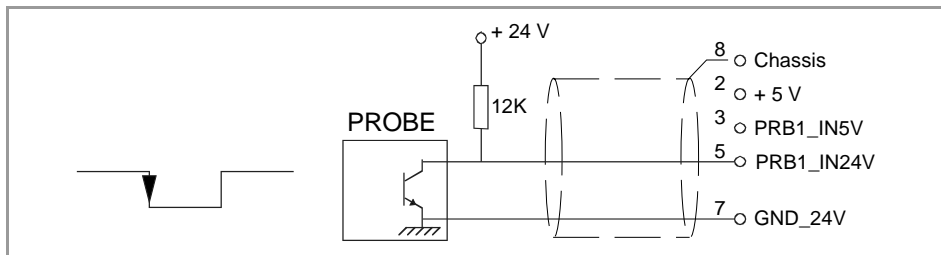
Interface with an open-collector output. Connection to +5 V.

The connection acts upon the down flank (negative pulse) of the probe signal.



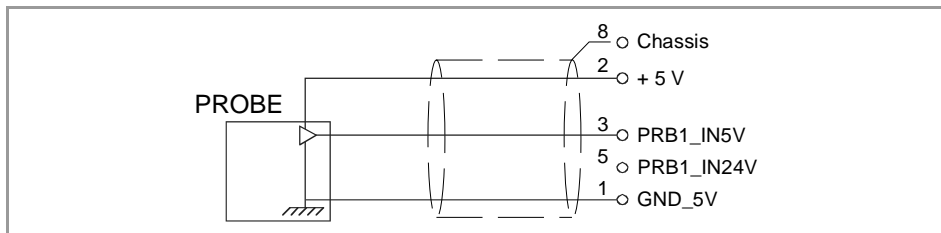
Interface with an open-collector output. Connection to +24 V.

The connection acts upon the down flank (negative pulse) of the probe signal.



Interface with a PUSH-PULL output. Connection to +5 V.

Depending on the interface being used, the connection acts upon the up flank or down flank of the probe signal.



4.

CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.



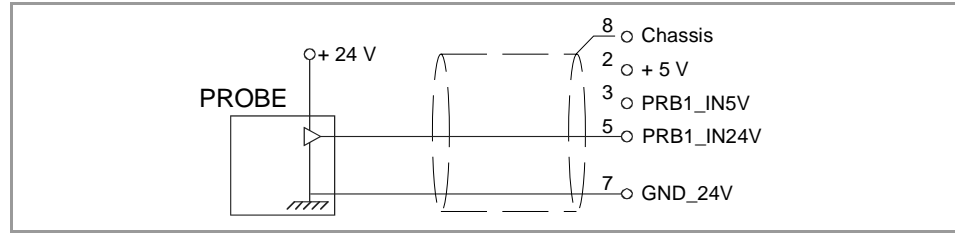
FAGOR AUTOMATION

CNC 8060

(REF: 1709)

Interface with a PUSH-PULL output. Connection to +24 V.

Depending on the interface being used, the connection acts upon the up flank or down flank of the probe signal.



4.

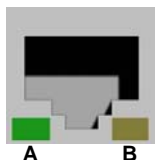
CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.

4.7.5 Connection to an Ethernet network.

The Ethernet connection enables the CNC to be configured as another node in the local network, thus being able to communicate with other CNCs or PCs to transfer files, run telediagnoses, etc. The Ethernet connection also enables direct connection (point to point connection) to another CNC or PC.

Connector.

The RJ45 port has two LEDs to indicate whether the CNC is connected to the network (green LED) and if data are being transmitted (yellow LED).



LED.	Meaning.
A (green)	Connection LED. The LED turns on when the CNC is connected to the data network.
B (yellow)	Activity LED. The LED blinks when data is being received/transferred.

Cable characteristics.

Use a specific Ethernet cable with the following characteristics.

Characteristic.	Description.
Type.	10/100 MHz connection Cat.5 (100 Ω - 120 Ω) or greater. 1000 MHz connection Cat.5e (100 Ω - 120 Ω) or greater. Use a crossed cable to connect for the point to point connection to the CNC.
Maximum length.	100 meters (328 ft).

Transmission speed.

The CNC permits a connection at 10, 100 or 1000 MHz; by default, it is configured for a connection at 10 MHz. Use a cable having the recommended characteristics to ensure a transmission at 100 MHz or 1000 MHz. Even so, since the transmission speed depends on the configuration of the network (number of nodes, their configuration, etc.) a 100 MHz or 1000 MHz transmission might not be stable. In these cases, we recommend to lower the transmission speed,

Element connection.

In order to ensure proper performance, the connection cable must be inserted all the way into the connectors so they're latched. This ensures that the cable is properly latched and does not come off due to vibration.

4.

CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.



FAGOR AUTOMATION

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4.7.6 RS232 serial line connection.

Connector pinout.

Plug-in part 9-pin male SUB-D connector.



Pin.	Signal.	Description.
1	DCD	Carrier detect.
2	RxD	Receive data.
3	TxD	Send data.
4	DTR	Data terminal ready.
5	11	Reference signal.
6	DSR	Data set ready.
7	RTS	Request to send.
8	CTS	Clear to send.
9	RI	Ring indicator.

Cable characteristics.

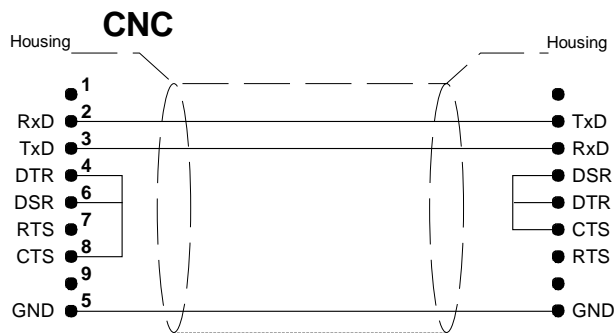
Twisted-pair shielded cable should be used to minimize interference between cables, thus preventing poor communication in long lengths.

Characteristic.	
Type.	Shielded. Twisted-pair, with a minimum wire section of 0.14 mm ² .
Capacitance.	164 pF/m (50 pF/ft).
Maximum length.	At a baudrate of 19200 Bd, 15 m (50 ft) or a length equivalent to a capacitance of 2500 pF.

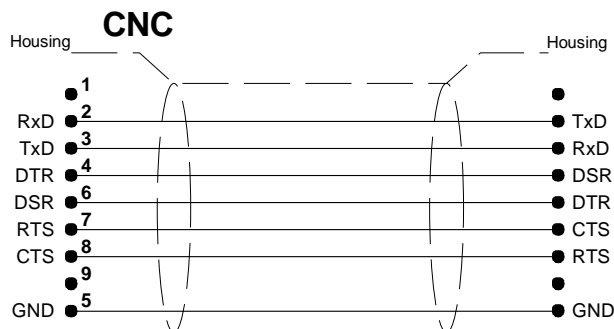
Node connection.

The cable shield must be connected to the connector at both ends. It is recommended to reference all the control and data signals to the same point (pin 5 GND), thus avoiding reference points with different voltages because there could be voltage differences in long lengths between the two ends of the cable.

- Simplified connection



- Full connection



CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.

4.7.7 RS422 serial line connection.

Connector pinout.

Plug-in part 9-pin male SUB-D connector.



Pin.	Signal.	Description.
1	---	---
2	LineTerm	120Ωline terminating resistor.
3	LineTerm	120Ωline terminating resistor.
4	---	---
5	11	Reference signal.
6	TxD	Send data.
7	/TxD	Send data.
8	RxD	Receive data.
9	/RxD	Receive data.

The reserved pins must NOT be used in any case.

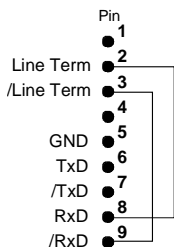
Cable characteristics.

Twisted-pair shielded cable should be used to minimize interference between cables, thus preventing poor communication in long lengths.

Characteristic.	
Type.	Shielded. Twisted-pair, with a minimum wire section of 0.20 mm ² (24 AWG).
Impedance.	120 Ω.
Maximum length.	1200 m (3937 ft).

Node connection.

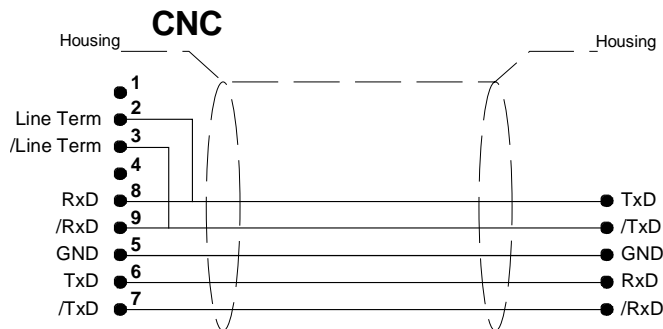
Line terminating resistor.



All the elements of the bus must have the line terminating resistor activated. The central unit has the resistor inside at pins 2 and 3; to activate it, jumper pin 2 with pin 8 and pin 3 with 9.

Interconnection of modules.

The cable shield must be connected to the connector at both ends. It is recommended to reference all the control and data signals to the same point (pin 5 GND), thus avoiding reference points with different voltages because there could be voltage differences in long lengths between the two ends of the cable.



4.

CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.



FAGOR AUTOMATION

CNC 8060

(REF: 1709)

4.7.8 RS485 serial line connection.

Connector pinout.

Plug-in part 9-pin male SUB-D connector.



Pin.	Signal.	Description.
1	---	---
2	LineTerm	120Ωline terminating resistor.
3	LineTerm	120Ωline terminating resistor.
4	---	---
5	11	Reference signal.
6	TxD RxD	Data send/receive.
7	/TxD RxD	Data send/receive.
8	TxD RxD	Data send/receive.
9	/TxD RxD	Data send/receive.

Pins 6-8 and 7-9 are internally jumpered, thus either one can be used in the connection. The reserved pins must NOT be used in any case.

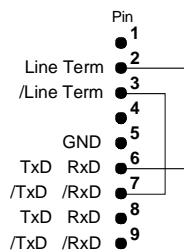
Cable characteristics.

Twisted-pair shielded cable should be used to minimize interference between cables, thus preventing poor communication in long lengths.

Characteristic.	
Type.	Shielded. Twisted-pair, with a minimum wire section of 0.20 mm ² (24 AWG).
Impedance.	120 Ω.
Maximum length.	1200 m (3937 ft).

Node connection.

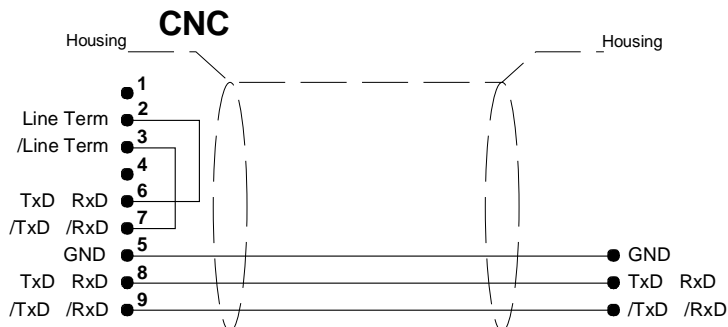
Line terminating resistor.



The elements located at the ends of the bus must have the line terminating resistor activated. The central unit has the resistor inside at pins 2 and 3; to activate it, jumper pin 2 with one of the pins 6/8 and pin 3 with one of the pins 7/9.

Interconnection of modules.

The cable shield must be connected to the connector at both ends. It is recommended to reference all the control and data signals to the same point (pin 5 GND), thus avoiding reference points with different voltages because there could be voltage differences in long lengths between the two ends of the cable.



CN60-10H / CN60-10HT CN60-10V / CN60-10VT CN60-10K.



FAGOR AUTOMATION

CNC 8060

(REF: 1709)

5 HORIZONTAL KEYB 2.0 + TOUCHPAD.

Model.	Description.
HORIZONTAL KEYB 2.0 + TOUCHPAD	<ul style="list-style-type: none"> • USB horizontal, alphanumeric QWERTY keyboard. • Multi-touch touchpad (touch panel). • Numeric keypad optimized to operate with the CNC (keys for axes, feedrate, speed, etc). • Special functions with the Fagor key.



In the operating system, customize the keyboard arrangement as "English (United States)". See "5.7 Selecting the language and the keyboard distribution." on page 71.

HORIZONTAL KEYB 2.0 + TOUCHPAD.

5.

5.1 Specifications.

Type.	Description. HORIZONTAL KEYB 2.0 + TOUCHPAD
General.	<ul style="list-style-type: none"> • USB horizontal, alphanumeric QWERTY keyboard. • Multi-touch touchpad (touch panel). • Numeric keypad optimized to operate with the CNC (keys for axes, feedrate, speed, etc). • Special functions with the Fagor key. • Keyboard distribution; "English (United States)". • Dimensions (width x height x depth) <ul style="list-style-type: none"> - 420 x 175 x 34 mm. - 16.54" x 6.89" x 1.33". • Weight: 3,065 kg (6.75 lb)
Regulation.	<ul style="list-style-type: none"> • CE.
Ambient.	<ul style="list-style-type: none"> • Storage temperature: Between -40 and 70 °C (-40 and 158 °F). • Working temperature: Between 0 and 55 °C (32 and 131 °F). • Relative humidity: 90 % RH (non-condensing). • Vibrations: Vibration test according to IEC 60068-2-6 with a frequency step of 1 octave/minute (±10%) and a duration of 10 sweeps. Frequency of 5 Hz at 8.4 Hz (3.5 mm constant movement) and 8.4 Hz at 150 Hz (1 g of constant acceleration). • Degree of protection: IP65 (front panel).
Power supply.	<ul style="list-style-type: none"> • Power through the USB cable. • Maximum consumption: 0.5 W.
Connectivity.	<ul style="list-style-type: none"> • Connection to the central unit through USB-B 2.0 (rear).

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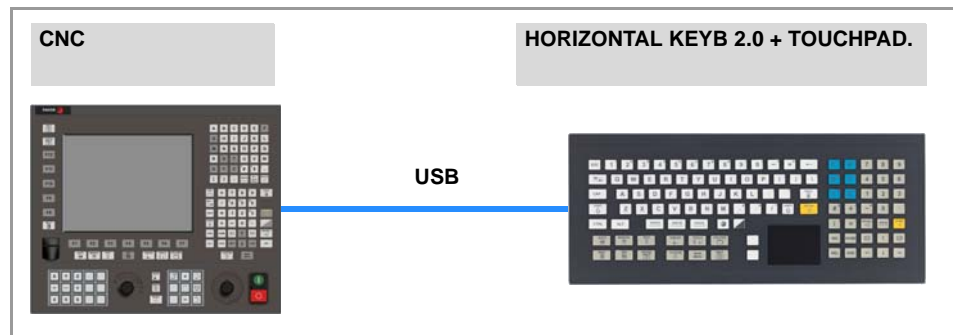
CNC 8060

(REF: 1709)

5.2 General diagram.



- Do not replace the cable supplied by Fagor.
- Do not connect any type of extension cord to the USB power cable.
- Connect the keyboard directly to the central unit; do not connect the keyboard to any type of hub.

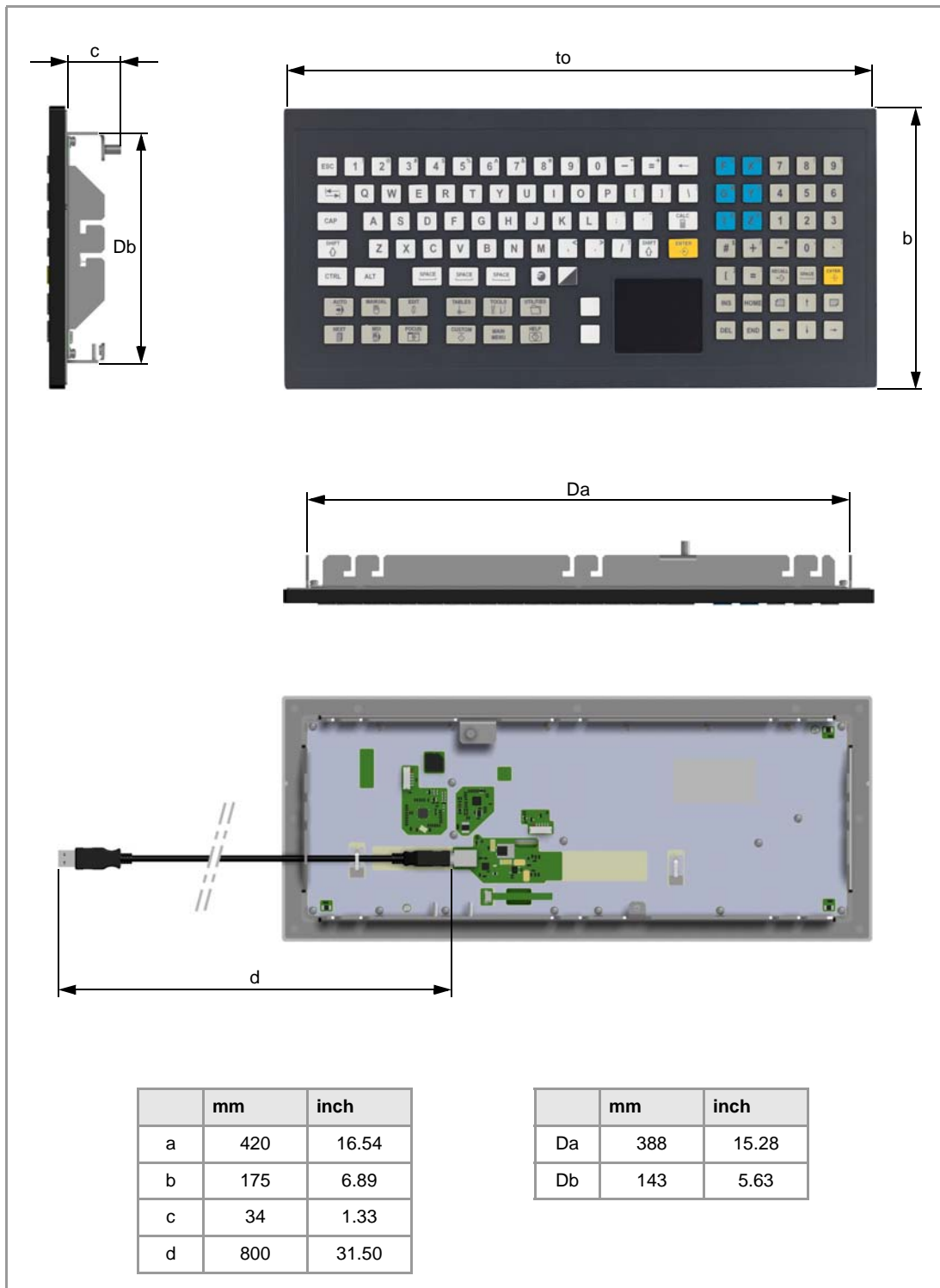


Connection.	Description.
USB	Communication with the CNC and voltage supply. Maximum length; 800 m (32.50 inches).

HORIZONTAL KEYB 2.0 + TOUCHPAD.

5.

5.3 Dimensions.



5.

HORIZONTAL KEYB 2.0 + TOUCHPAD.



FAGOR AUTOMATION

CNC 8060

(REF: 1709)

5.4 Enclosure and mounting of the module.

5.4.1 Enclosure design.

The enclosure must meet the following requirements:

- The degree of protection of the enclosure must be IP54, according to standard IEC 60529.
- Keep the enclosure clean. If the enclosure has ventilation holes, anti-dust filters should be installed in all of them.
- The dissipation surface of the enclosure must be enough to evacuate (by convection) the heat generated inside.
- In the connector area, reserve a space that allows the cables to be connected, respecting their radius of curvature.
- Respect the minimum distances recommended between the enclosure walls and the hardware to let the air flow and improve heat dissipation.



To meet the previous requirements, Fagor recommends the following.

- The enclosure must not have any ventilation holes, because they could let dust or other substances in.
- To improve heat dissipation, install a fan inside the enclosure for air circulation.



Before building an enclosure with glass fiber or another poor heat dissipating material, contact Fagor Automation.

Dimensions of the cut off part and the enclosure.

General tolerance for W and H = ± 0.5 mm (0.02 inches).
Maximum radius of the corners = 5 mm (0.2 inches).

	mm	inch
W	392	15.43
H	147	5.79

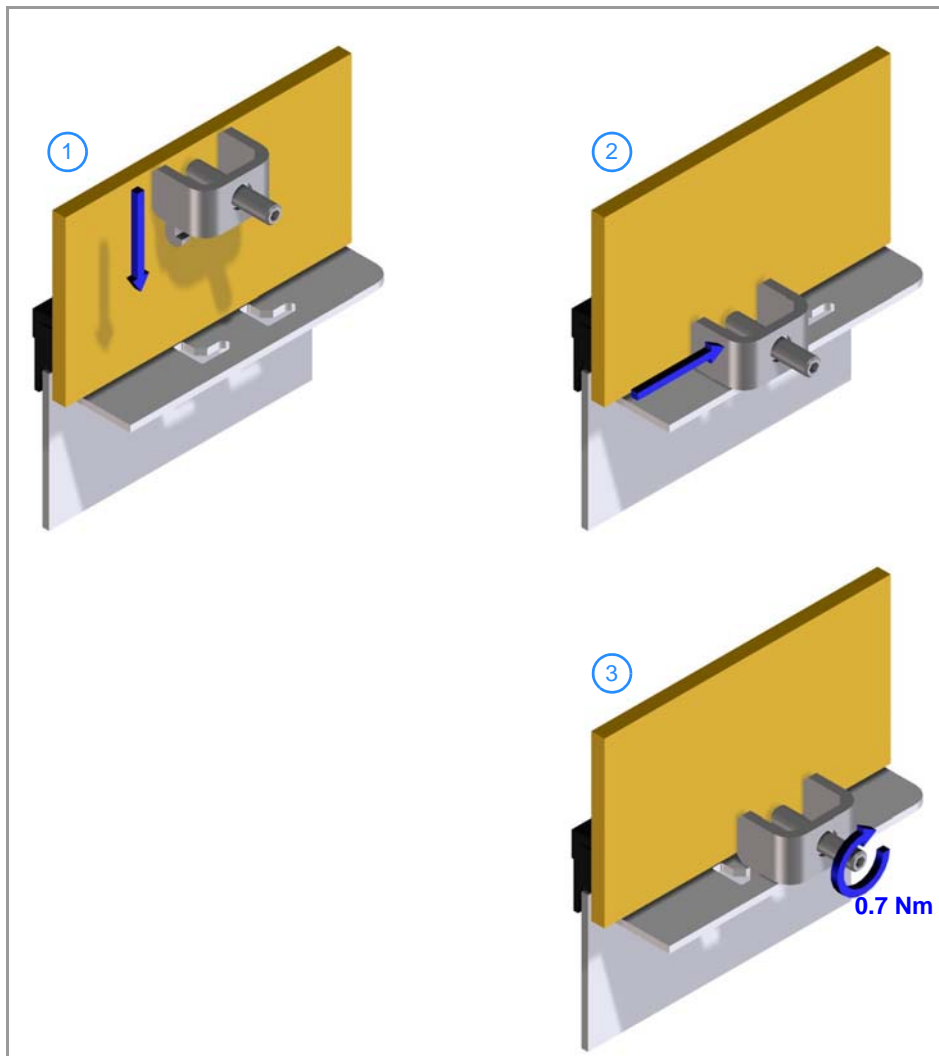
	mm	inch
D (*)	74	2.91
e	1.5 - 4	0.06 - 0.16

(*) Minimum recommended distance.

5.4.2 Securing the module.

The module must be installed in a proper enclosure that may be located on the machine or on an external support. To insert the unit into the enclosure, it must have a big enough hole to allow to insert it easily, without obstacles and without forcing the unit. See "5.4.1 Enclosure design." on page 68.

The module is mounted from inside the enclosure. Once the unit has been inserted into the enclosure, secure it from the inside with the tension jacks. To properly secure it, use all the tension jacks on the back of the unit. Apply a tightening torque of 0.7 Nm.



5.

HORIZONTAL KEYB 2.0 + TOUCHPAD.

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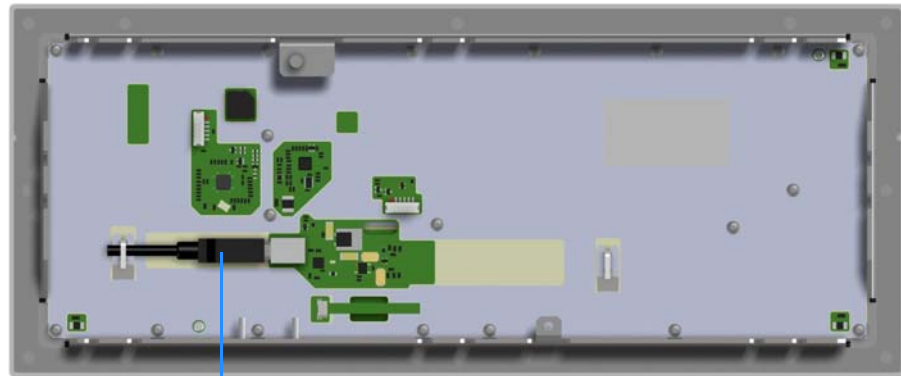
CNC 8060

(REF: 1709)

5.5 Voltage supply for the module.

Power the module through the keyboard's USB cable.

Rear view.



USB power cable.



- Do not replace the cable supplied by Fagor.
- Do not connect any type of extension cord to the USB power cable.
- Connect the keyboard directly to the central unit; do not connect the keyboard to any type of hub.

Cable characteristics.

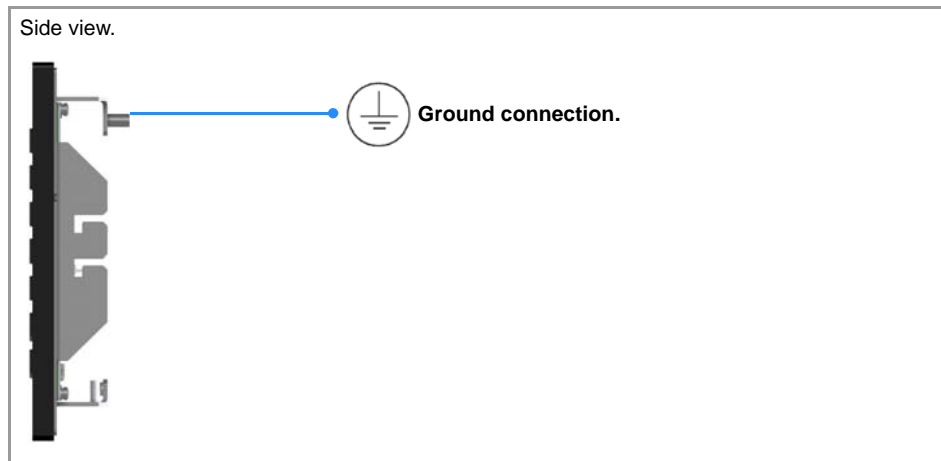
Characteristic.	Description.
Type.	USB cable, type A-B. Shielded cable. 4-Wire cable in twisted pairs.
Characteristic impedance.	90 Ω \pm 15 %.
Length.	0.8 meters (0.03 inches).
Bending radius.	Fixed installation: 5 x d (d=7 mm). Flexible installation: 10 x d (d=7 mm).
Resistance to oils.	Meets the DIN EN 60811-2-1 standard

Consumption.

Maximum consumption: 0.5 W.

5.6 Connectors.

The connectors are in the rear.



5.

HORIZONTAL KEYB 2.0 + TOUCHPAD.

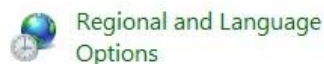
5.7 Selecting the language and the keyboard distribution.

In the operating system, customize the input language and the keyboard distribution as "English (United States)". The keyboard distribution controls the characters that appear on screen when the keys are pressed. If the keyboard distribution is not assigned to this language, it is possible that the characters on screen will not match the characters of the keys.

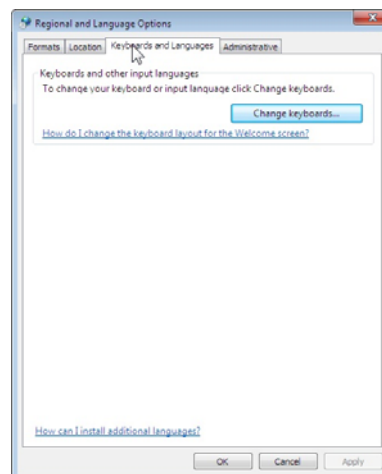
In order to change the keyboard distribution, the desired input language and keyboard distribution must be added to Windows.

Adding an input language and a keyboard distribution.

- 1 Click on the Start menu > Control panel > Regional and language configuration. Depending on how Windows is configured, it may be necessary to first select "Clock, language and region".



- 2 Click on the "Keyboards and languages" tab and then click on "Change keyboards".



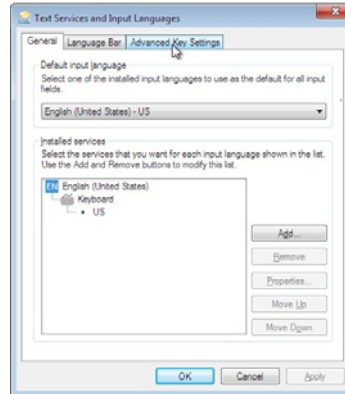
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FAGOR AUTOMATION

CNC 8060

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- In the "Installed services" section, click on the button "Add". Add the desired input language and the keyboard distribution (in this case, English (United States)). Click on "OK" to finish.



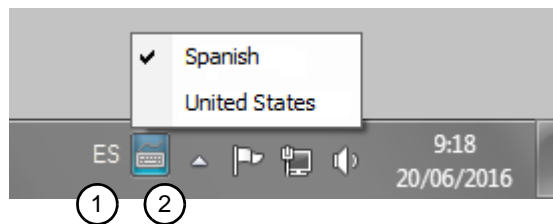
Changing the input language.



On the login screen, click on the language button (top left corner of the screen) and select the language "English (United States)".

Change the input language (only for the active window).










- In the language bar, click on the button "Input language" and select the language "English (United States)".
- Next, click on the button "Keyboard distribution" and select the distribution "United States".



5.

HORIZONTAL KEYB 2.0 + TOUCHPAD.

5.8 Using the Fagor logo key.

Keys.	Meaning.
 + [1] .. [0]	Keys [F1] to [F10].
 + [-]	Key [F11].
 + [=]	Key [F12].
 + [S]	Cancel or activate the keystroke sound.
 + [T]	Cancel or activate the touchpad (touch panel).
 + [C]	Change the function of the axis keys on the numeric keypad; write the name of axis1 to axis6 / always write X, Y, Z, A, B, C.
 + [D]	Minimize everything / Show the last active application.
 + [P]	Print screen; can be combined with [SHIFT] and with [ALT].
 + [E]	Open the Windows Explorer.

5.

HORIZONTAL KEYB 2.0 + TOUCHPAD.

5.9 Numeric keypad.

Numeric keypad optimized to operate with the CNC (keys for axes, feedrate, speed, etc). The second function of the keys is available with a long press of the key; the [SHIFT] key is not necessary.

The behavior of the three axis keys can be modified with the [FAGOR]+[C] keys.

Option 1.

The keys write the name of the first six axes of the channel.

Option 2.

The keys always write the characters X Y Z A B C.



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(REF: 1709)

5.10 Touchpad (touch screen).

5.

HORIZONTAL KEYB 2.0 + TOUCHPAD.

Left button.

Right button,



Primary button.



Tap lightly with one finger to simulate a mouse click.

Double click.



Tap lightly twice with one finger to simulate the double click of a mouse.

Secondary button.



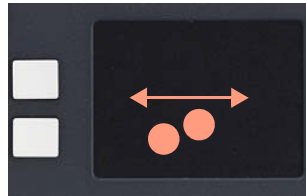
Tap lightly with two fingers to simulate the right click of a mouse.

Move the cursor.



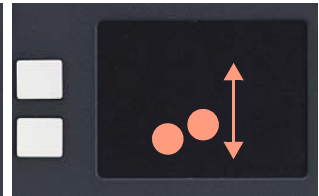
Move a finger to move the cursor.

Move screen (pan).



Move two fingers to the left and right to move horizontally (pan).

Move screen (scroll).



Move two fingers up and down to move vertically (scroll).

Zoom.



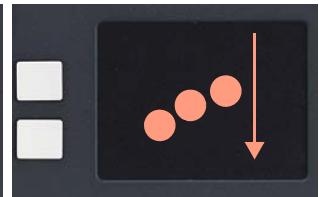
Pinch or separate two fingers to zoom in or out.

Turn the page.



Drag three fingers horizontally to move forward or back a page.

Minimize the window.



Drag three fingers downward to minimize the active window.

Start menu.



Drag three fingers upward to access the start menu.

The actions of touching with one or two fingers work in reverse if the mouse is configured for left-handed people.



FAGOR AUTOMATION

CNC 8060

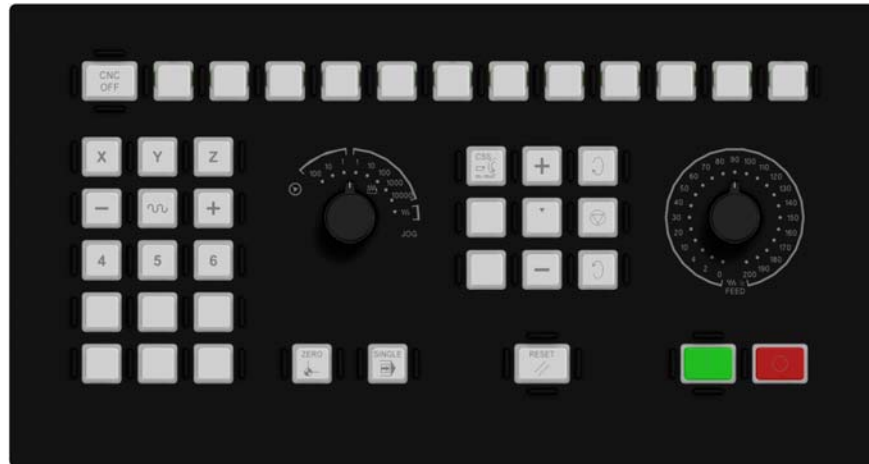
(REF: 1709)

6 OP-PANEL-329.



The machine manufacturer must comply with the EN 60204-1 (IEC-204-1) regulation regarding electrical shocks in case of defective input/output pins with external power supply when not plugging the connector before turning the power supply on.

Module.	Description.
OP PANEL 329	CAN operator panel 329 mm (12.95"), configurable jog key, speed override key, CNC power-down key and 12 configurable user keys. Possibility to connect up to three handwheels.



6.1 Specifications.

Type.	Description.
General.	<ul style="list-style-type: none"> Jog switch (0 - 200 %). 12 configurable user keys. 15 configurable jog keys. Speed override key. CNC power-down key. Dimensions (width x height x depth) <ul style="list-style-type: none"> - 329 x 175 x 20 mm. - 12.95" x 6.89" x 0.78".
Safety.	CE
Ambient.	<ul style="list-style-type: none"> Degree of protection: IP65 (front panel).
Power supply.	<ul style="list-style-type: none"> 24 V DC universal power supply, via Phoenix connector.
Connectivity.	<ul style="list-style-type: none"> Connecting the central unit via CAN (CANopen/CANfagor). Three handwheels with A and B signals (5 V DC TTL).

6.

OP-PANEL-329.

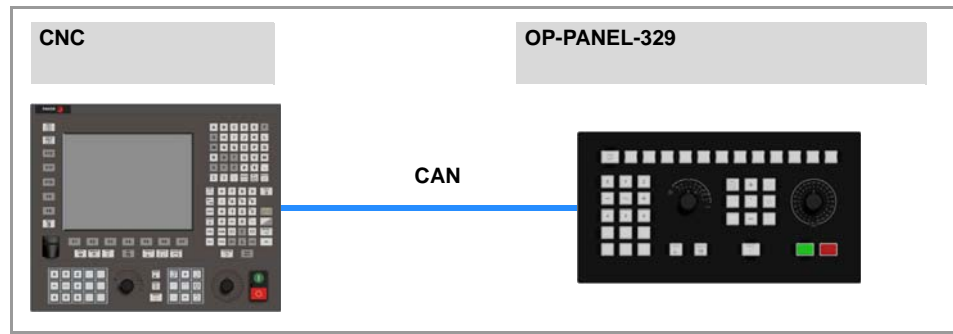
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FAGOR AUTOMATION

CNC 8060

(REF: 1709)

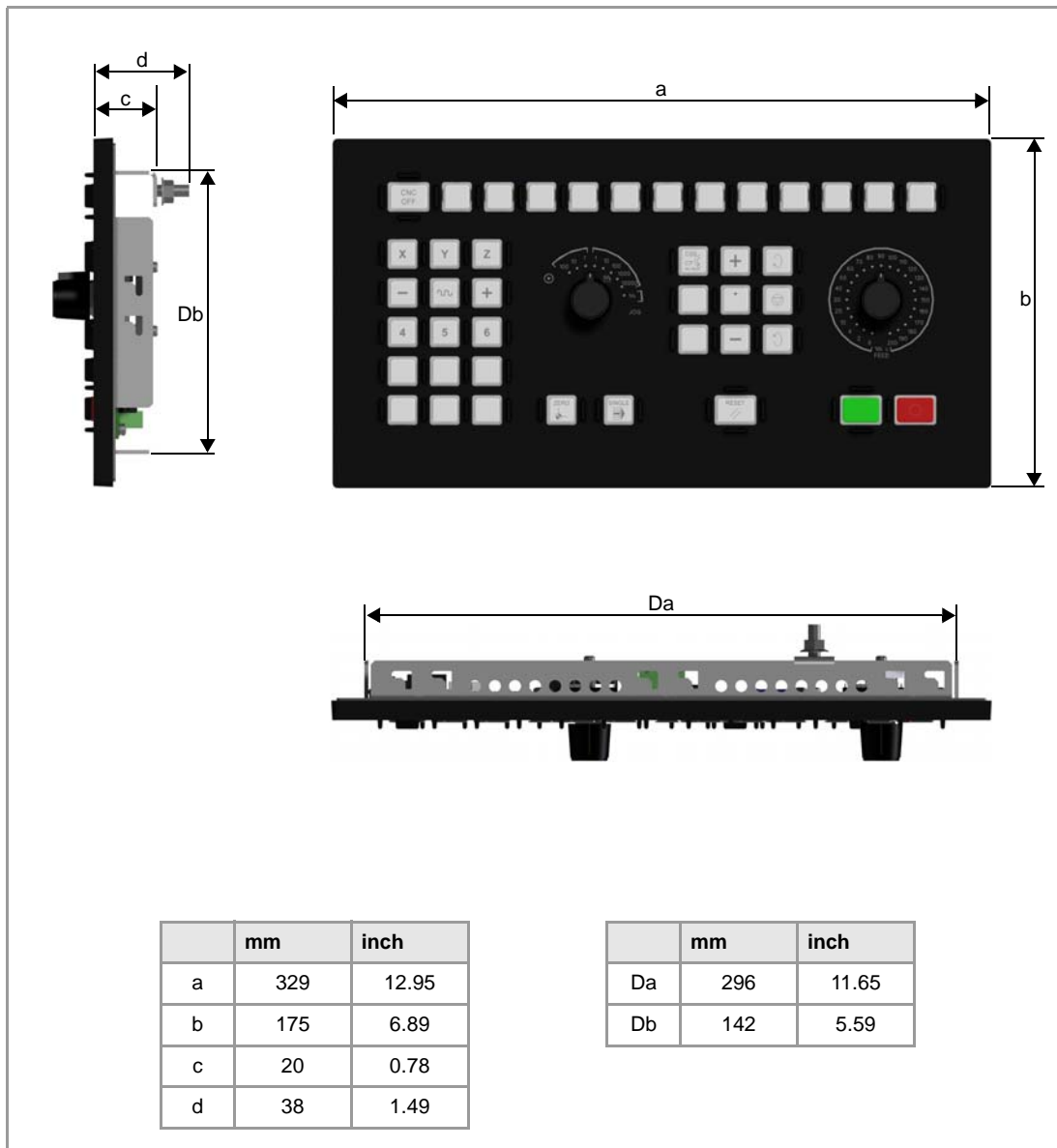
6.2 General diagram.



Connection.	Description.
CAN	Communication with CNC. Maximum length: 500 m (1640 ft) for the CANopen bus.

OP-PANEL-329.

6.3 Dimensions.



6.

OP-PANEL-329.

6.4 Enclosure and mounting of the module.

6.4.1 Enclosure design.

The enclosure must meet the following requirements:

- Keep the enclosure clean. If the enclosure has ventilation holes, anti-dust filters should be installed in all of them.
- Reserve some room for the laying out cables in the connector area. This space must allow for the connection of cables, while accounting for their bending radius.
- The cabinet must consider the minimum recommended distances between the enclosure walls and the hardware to let the air flow and improve heat dissipation.



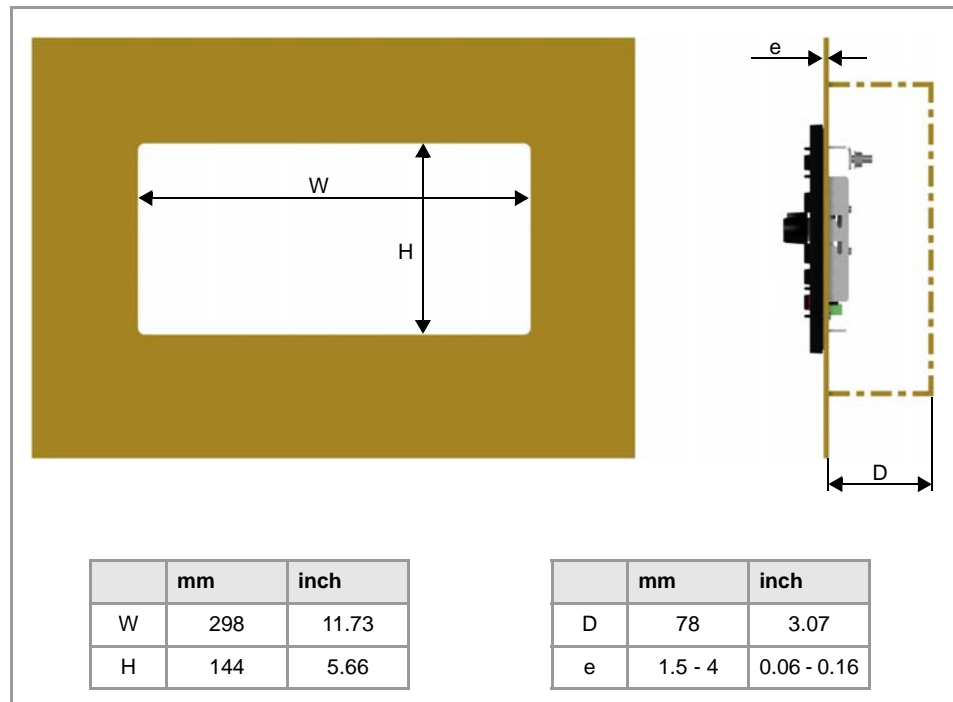
To meet the previous requirements, Fagor recommends the following.

- The enclosure must not have any ventilation holes, because they could let dust or other substances in.
- To improve heat dissipation, install a fan inside the enclosure for air circulation.



Before building an enclosure with glass fiber or another poor heat dissipating material, contact Fagor Automation.

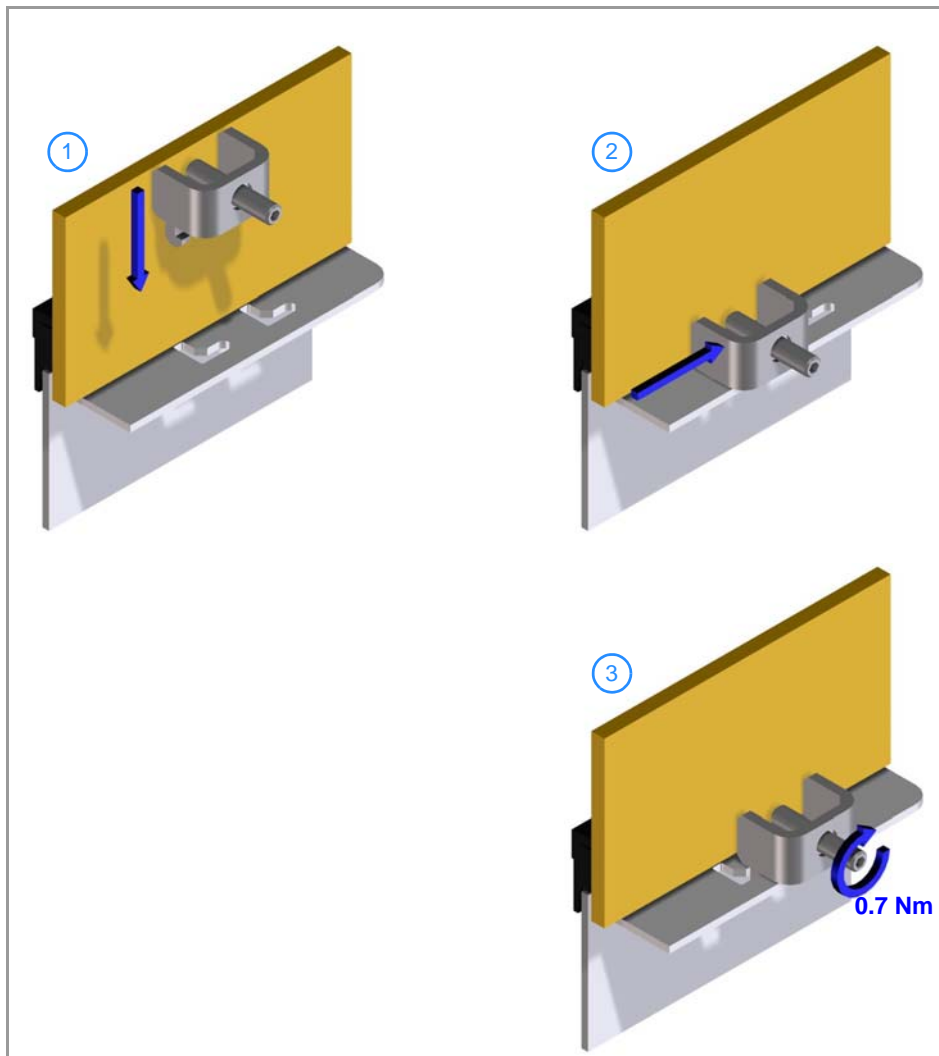
Dimensions of the cut off part and the enclosure.



6.4.2 Securing the module.

The module must be installed in a proper enclosure that may be located on the machine or on an external support. To insert the unit into the enclosure, it must have a big enough hole to allow to insert it easily, without obstacles and without forcing the unit. See "6.4.1 Enclosure design." on page 78.

The module is mounted from inside the enclosure. Once the unit has been inserted into the enclosure, secure it from the inside with the tension jacks. To properly secure it, use all the tension jacks on the back of the unit. Apply a tightening torque of 0.7 Nm.



6.

OP-PANEL-329.

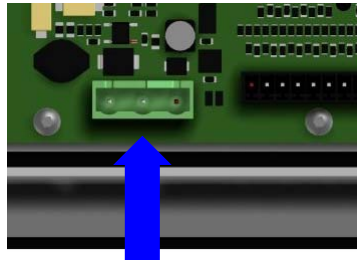
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FAGOR AUTOMATION

CNC 8060

(REF: 1709)

6.5 Power supply for the module.




24 V DC universal power supply, via Phoenix connector. See "[24 V DC voltage supply.](#)" on page 82.

24 V DC

Connector pinout.



Plug-in part 3-pole Phoenix-type combicon connector (7.62 mm pitch).
Rated current; 12 A.

Pin	Signal.	Function.
1		Chassis.
2	11	0 V reference signal.
3	+24 V	Power supply.

6.

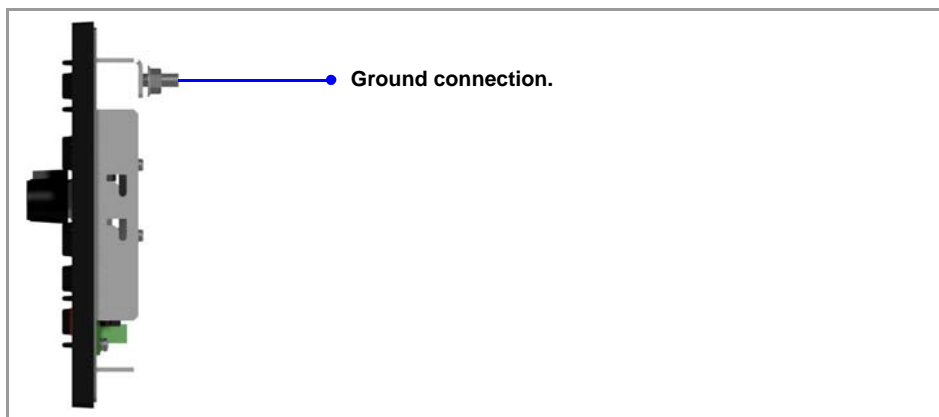
OP-PANEL-329.

6.6 Hardware functionalities.

6.6.1 Ground connection.



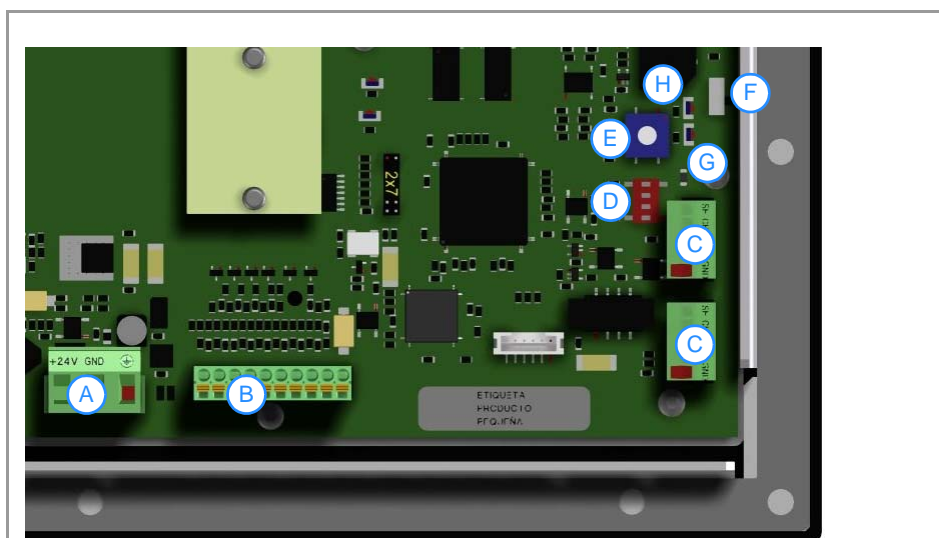
It is up to the system integrator to meet all the requirements of local and national electrical codes as well as all the regulations applicable regarding the grounding of the whole unit.



6.

OP-PANEL-329.

6.6.2 Rear connectors.



- | | |
|-----|---|
| (A) | 24 V DC voltage supply. |
| (B) | Handwheels. |
| (C) | B28A / B28B CAN bus. |
| (D) | S42 Bus switch and transmission frequency (CANfagor). |
| (E) | S41 Address (node) of the element. |
| (F) | S43 Line terminating resistor. |
| (G) | D46 ERR led, transmission status indicator. |
| (H) | D45 RUN led, module status indicator. |

24 V DC voltage supply.

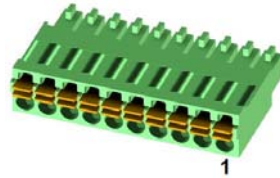
Plug-in part 3-pole Phoenix-type combicon connector (7.62 mm pitch). Rated current; 12 A.

Pin	Signal.	Function.
1		Chassis.
2	11	0 V reference signal.
3	+24 V	Power supply.

Connector data.	
Number of poles.	3.
Pitch.	7.62 mm.
Connection technique.	Screw connection.
Minimum/maximum tightening torque.	0.5 / 0.6 Nm.
Minimum/maximum section.	0.2 / 2.5 mm ² .
Minimum/maximum AWG section.	24 / 12.
Rated current I _n .	12 A.

Cable data.	
Length to be stripped.	7 mm.

See "6.5 Power supply for the module." on page 80.

Handwheel connection.

Plug-in part 10-pole Phoenix-contact minicombicon connector (3.5 mm pitch). Rated current; 8 A.

Pin.	Signal.	Function.
1	+5 V	5 V DC voltage supply.
2	---	---
3	---	---
4	MPG3-B	B signal of the third handwheel.
5	MPG3-A	A signal of the third handwheel.
6	MPG2-B	B signal of the second handwheel.
7	MPG2-A	A signal of the second handwheel.
8	MPG1-B	B signal of the first handwheel.
9	MPG1-A	A signal of the first handwheel.
10	11	Power supply.

Connector data.	
Number of poles.	10.
Pitch.	3.5 mm.
Connection technique.	Spring connection.
Minimum/maximum section.	0.2 / 1.5 mm ² .
Minimum/maximum AWG section.	24 / 16.
Rated current I _n .	8 A.

Cable data.	
Length to be stripped.	7 mm.



Cable shields must be connected to the ground plate. See "6.7 Handwheel connection." on page 85.

6.

OP-PANEL-329.

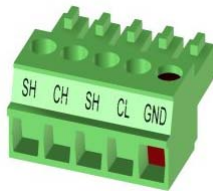


FAGOR AUTOMATION

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(REF: 1709)

-B28A / B28B- CAN bus.



Plug-in part 5-pole Phoenix-contact minicombicon connector (3.5 mm pitch). Rated current; 8 A.

Pin.	Signal.	Function.
1	11	Ground / 0 V.
2	CL	(LOW) bus signal.
3	SH	CAN shield.
4	CH	(HIGH) bus signal.
5	SH	CAN shield.

Connector data.	
Number of poles.	5.
Pitch.	3.5 mm.
Connection technique.	Screw connection.
Minimum/maximum tightening torque.	0.22 / 0.25 Nm.
Minimum/maximum section.	0.14 / 1.5 mm ² .
Minimum/maximum AWG section.	28 / 16.
Rated current I _n .	8 A.

Cable data.	
Length to be stripped.	7 mm.

6.

OP-PANEL-329.

-S42- CAN bus. Bus switch; CANfagor/CANopen.



Switch 1 of the DIP switch selects the type of CAN bus to be used, this being either CANfagor or CANopen.

DS -1-	Type of CAN bus.
off	The CANfagor bus has been selected.
on	The CANopen bus has been selected.

-S42- CAN bus. Transmission frequency (CANopen).



With the protocol CANopen, switches 2 and 3 of the DIP switch allow for the transmission frequency to be selected. All the bus nodes must work under the same frequency. The transmission frequency depends on the total length of the bus. Using the following illustrative values; assigning other values may cause communication errors due to signal distortion.

DS -2-	DS-3-	Frequency.	Length of the CAN bus.
on	on	1000 kHz	Up to 20 meters.
off	on	800 kHz	From 20 to 40 meters.
on	off	500 kHz	From 40 to 100 meters.
off	off	250 kHz	From 100 to 500 meters.

In order for any change of frequency to take place, the corresponding module must be reset; however, we recommend to change the speed while the modules and the CNC are turned off.

-S42- CAN bus. Address (node) of the element.



The 4 switch of the DIP switch allows for up to 32 positions or elements to be integrated in the CAN bus.

DS -4-	Address (node) of the element.
off	Positions 0-15 within the bus.
on	Positions 16-31 within the bus.



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CNC 8060

(REF: 1709)

-S41- CAN bus. Address (node) of the element.



Each one of the elements (nodes) integrated into the CAN bus is identified by the 16-position rotary switch (0-15) "Address" (also referred to as "Node_Select"). With the ADD MSB switch, the positions or elements integrated in the CAN bus may be expanded up to 32. The "Address" switch also sets the priority of the node within the bus; the lower the number the higher the priority.

The CNC must always occupy position "0" and the rest of the elements of the bus will occupy consecutive positions starting with 1. It is recommended to place the remote modules after the CNC and for the keyboard and the jog panel to be the last nodes of the bus.

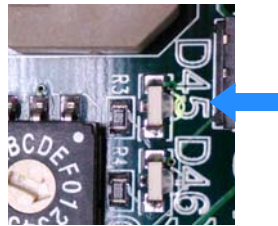
In order for any change at the "Address" switch to be assumed, the CNC must be restarted and the corresponding drive must be reset, however, we recommend to change the address while the modules and the CNC are off.

-S43- CAN bus. Line terminating resistor.



The line terminating resistor identifies which are the elements that occupy the ends of the CAN bus; i.e. the first and last physical element in the connection. The terminating elements must have the resistor activated (position 1) but not the rest of the elements (position 0).

-D45- RUN Led. Module status.



Green LED. The meaning depends on the blinking frequency.

Blinking rate.	Description.
Intermittent.	Module in PRE-OPERATIONAL state.
Single blinking.	Module in STOPPED state.
On.	Module in OPERATIONAL state.

-D46- ERR Led. Transmission status.



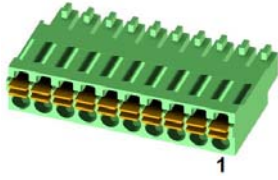
Red LED. The meaning depends on the blinking frequency.

Blinking rate.	Description.
Off.	The module is ready to run.
Intermittent.	Module configuration stage.
Single blinking.	Poor transmission. At least one of the error counters of the CAN controller has reached the alarm level.
Double blinking.	There is no communication with the cpu.
On	Error. The CAN controller is in "Bus Off" state.

6.7 Handwheel connection.

The keyboard admits the connection of up to 3 handwheels (MPG1, MPG2 and MPG3) with A and B signals (5 V DC TTL). If the handwheel has an axis selector button, the button signal may be connected to a digital input and may be managed from the PLC using the NEXTMPGAXIS mark.

Connector pinout.



Plug-in part 10-pole Phoenix-contact minicombicon connector (3.5 mm pitch). Rated current; 8 A.

Pin.	Signal.	Function.
1	+5 V	5 V DC voltage supply.
2	---	---
3	---	---
4	MPG3-B	B signal of the third handwheel.
5	MPG3-A	A signal of the third handwheel.
6	MPG2-B	B signal of the second handwheel.
7	MPG2-A	A signal of the second handwheel.
8	MPG1-B	B signal of the first handwheel.
9	MPG1-A	A signal of the first handwheel.
10	11	Power supply.

Cable characteristics.

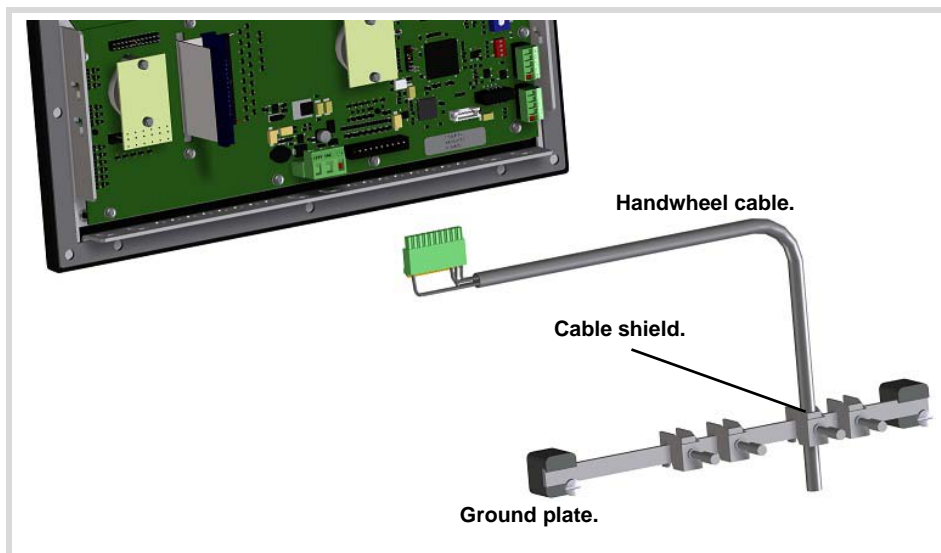
The cable being used must have overall shield. The unshielded portion of the wires of an unshielded cable cannot be longer than 75 mm.

Connection.

We recommend to run the handwheel cable as far away as possible from the power cables of the machine.



Always connect the shield of the cable to the ground plate using a metallic clamp.



6.

OP-PANEL-329.

FAGOR 

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CNC 8060

(REF: 1709)

6.

OP-PANEL-329.



FAGOR AUTOMATION

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(REF: 1709)

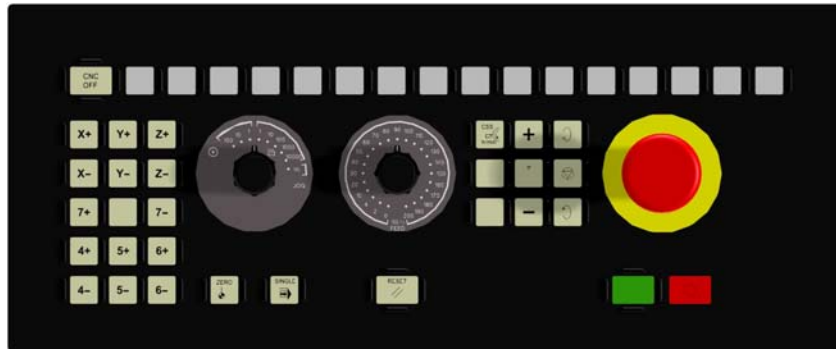
7 OP-PANEL / OP-PANEL+SPDL RATE.



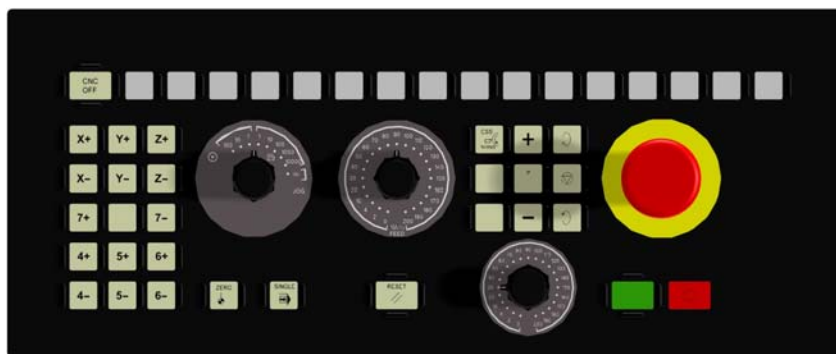
The machine manufacturer must comply with the EN 60204-1 (IEC-204-1) regulation regarding electrical shocks in case of defective input/output pins with external power supply when not plugging the connector before turning the power supply on.

Module.	Description.
OP-PANEL	CAN operator panel 420 mm (16.54") with spindle override. Possibility to connect up to three electronic handwheels.
OP-PANEL+SPDL RATE	CAN Operator panel 420 mm (16.54") with spindle override switch. Possibility to connect up to three electronic handwheels.

OP-PANEL



OP-PANEL+SPDL RATE



7.1 Specifications.

Type.	Description.
General.	<ul style="list-style-type: none"> Jog switch (0 - 200 %). 16 configurable user keys. 15 configurable jog keys. Speed override key (OP-PANEL). Speed override switch (OP-PANEL+SPDL RATE). CNC power-down key. Dimensions (width x height x depth) <ul style="list-style-type: none"> - 420 x 175 x 54.5 mm. - 16.54" x 6.89" x 2.15".
Safety.	<ul style="list-style-type: none"> CE
Ambient.	<ul style="list-style-type: none"> Degree of protection: IP65 (front panel).
Power supply.	<ul style="list-style-type: none"> 24 V DC universal power supply, via Phoenix connector.
Connectivity.	<ul style="list-style-type: none"> Connecting the central unit via CAN (CANopen/CANfagor). Three handwheels with A and B signals (5 V DC TTL).

7.

OP-PANEL / OP-PANEL+SPDL RATE.

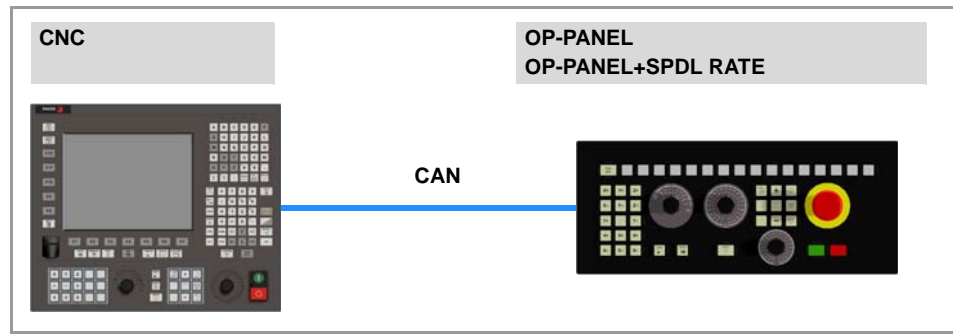
FAGOR

FAGOR AUTOMATION

CNC 8060

(REF: 1709)

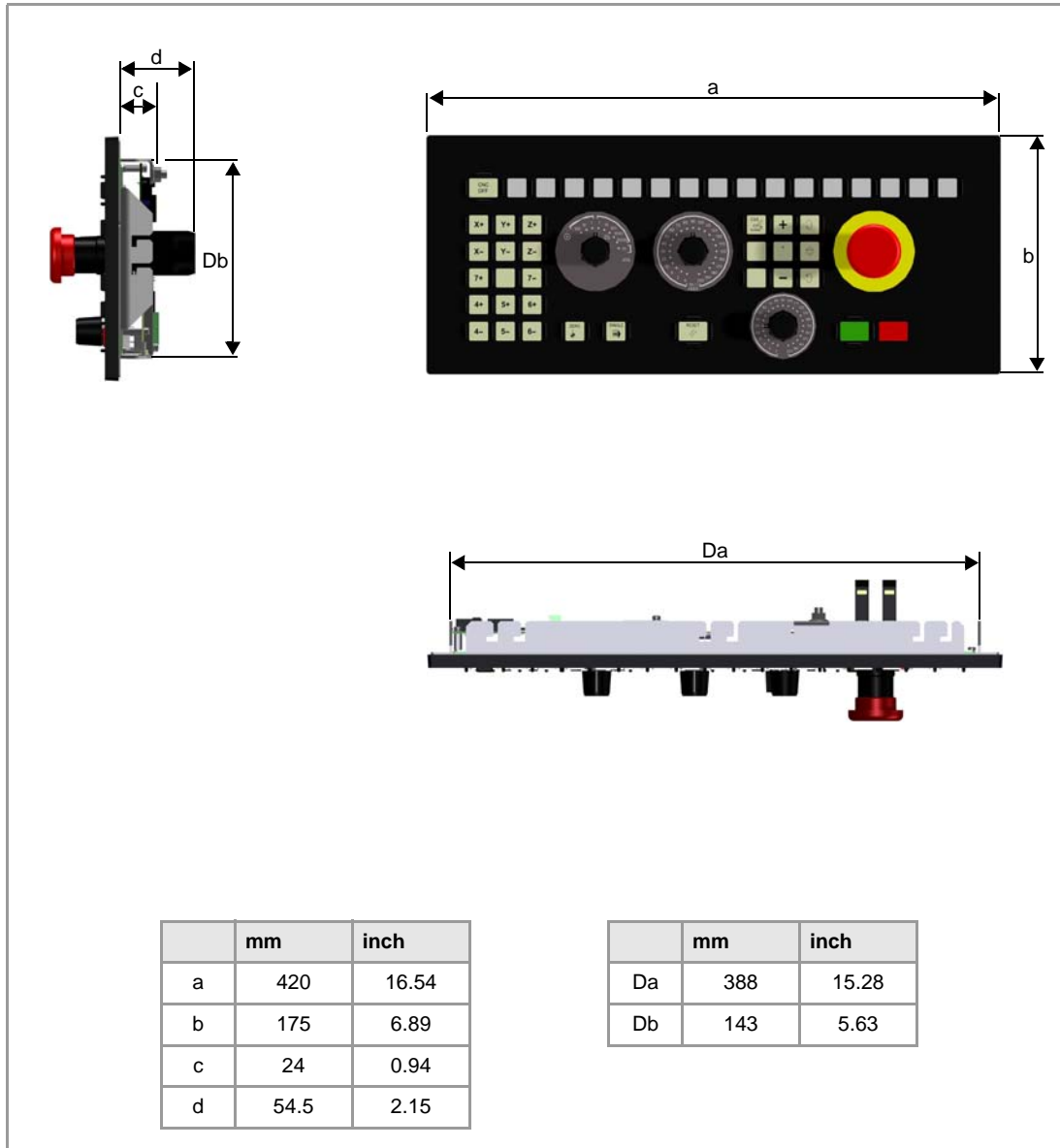
7.2 General diagram.



Connection.	Description.
CAN	Communication with CNC. Maximum length: 500 m (1640 ft) for the CANopen bus.

OP-PANEL / OP-PANEL+SPDL RATE.

7.3 Dimensions.



7.

OP-PANEL / OP-PANEL+SPDL RATE.



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7.4 Enclosure and mounting of the module.

7.4.1 Enclosure design.

The enclosure must meet the following requirements:

- Keep the enclosure clean. If the enclosure has ventilation holes, anti-dust filters should be installed in all of them.
- Reserve some room for the laying out cables in the connector area. This space must allow for the connection of cables, while accounting for their bending radius.
- The cabinet must consider the minimum recommended distances between the enclosure walls and the hardware to let the air flow and improve heat dissipation.



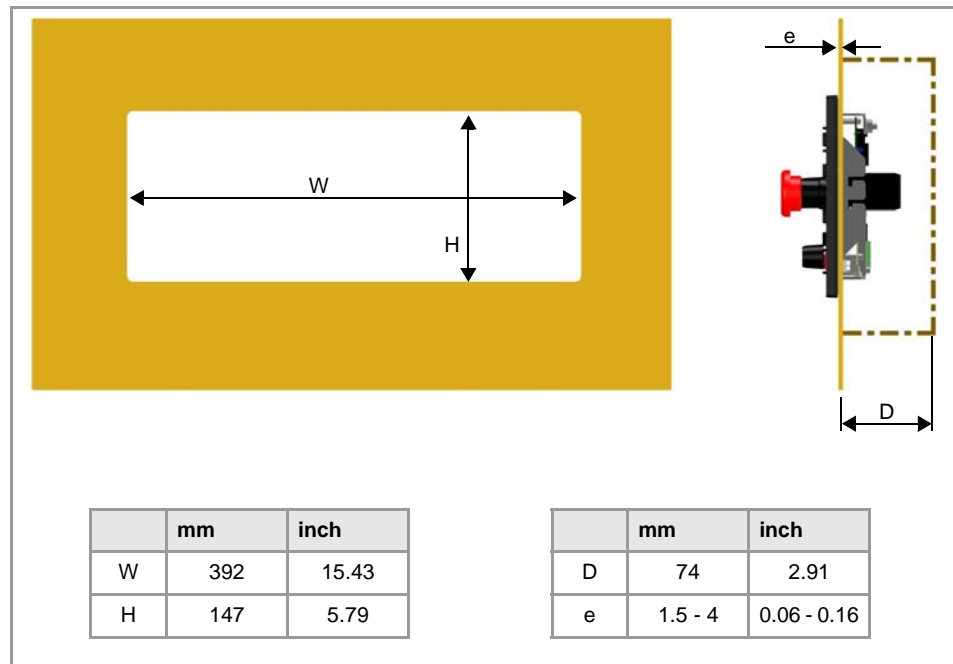
To meet the previous requirements, Fagor recommends the following.

- The enclosure must not have any ventilation holes, because they could let dust or other substances in.
- To improve heat dissipation, install a fan inside the enclosure for air circulation.



Before building an enclosure with glass fiber or another poor heat dissipating material, contact Fagor Automation.

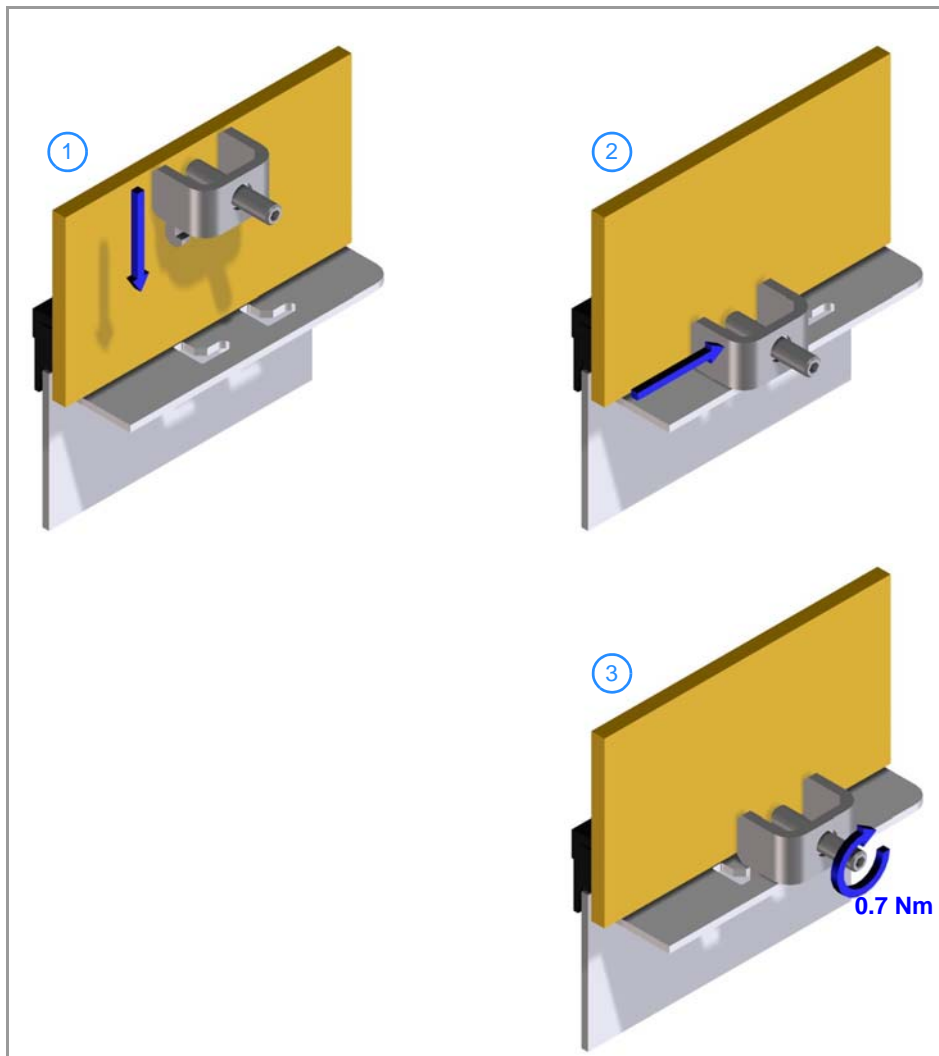
Dimensions of the cut off part and the enclosure.



7.4.2 Securing the module.

The module must be installed in a proper enclosure that may be located on the machine or on an external support. To insert the unit into the enclosure, it must have a big enough hole to allow to insert it easily, without obstacles and without forcing the unit. See "7.4.1 Enclosure design." on page 90.

The module is mounted from inside the enclosure. Once the unit has been inserted into the enclosure, secure it from the inside with the tension jacks. To properly secure it, use all the tension jacks on the back of the unit. Apply a tightening torque of 0.7 Nm.



7.

OP-PANEL / OP-PANEL+SPDL RATE.

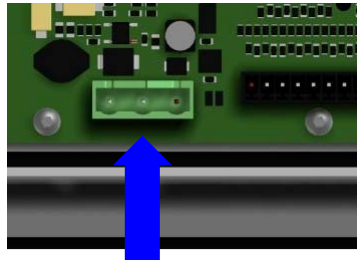
FAGOR 

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CNC 8060

(REF: 1709)

7.5 Power supply for the module.




24 V DC universal power supply, via Phoenix connector. See "[24 V DC voltage supply.](#)" on page 94.

24 V DC

Connector pinout.



Plug-in part 3-pole Phoenix-type combicon connector (7.62 mm pitch).
Rated current; 12 A.

Pin	Signal.	Function.
1		Chassis.
2	11	0 V reference signal.
3	+24 V	Power supply.

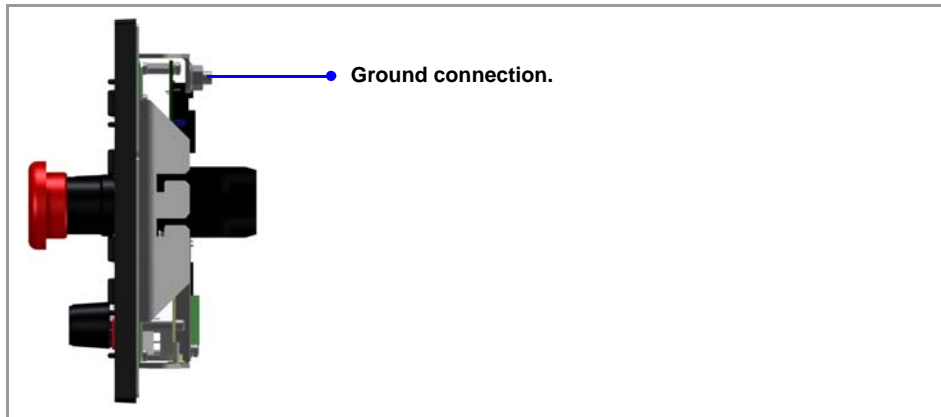
OP-PANEL / OP-PANEL+SPDL RATE.

7.6 Hardware functionalities.

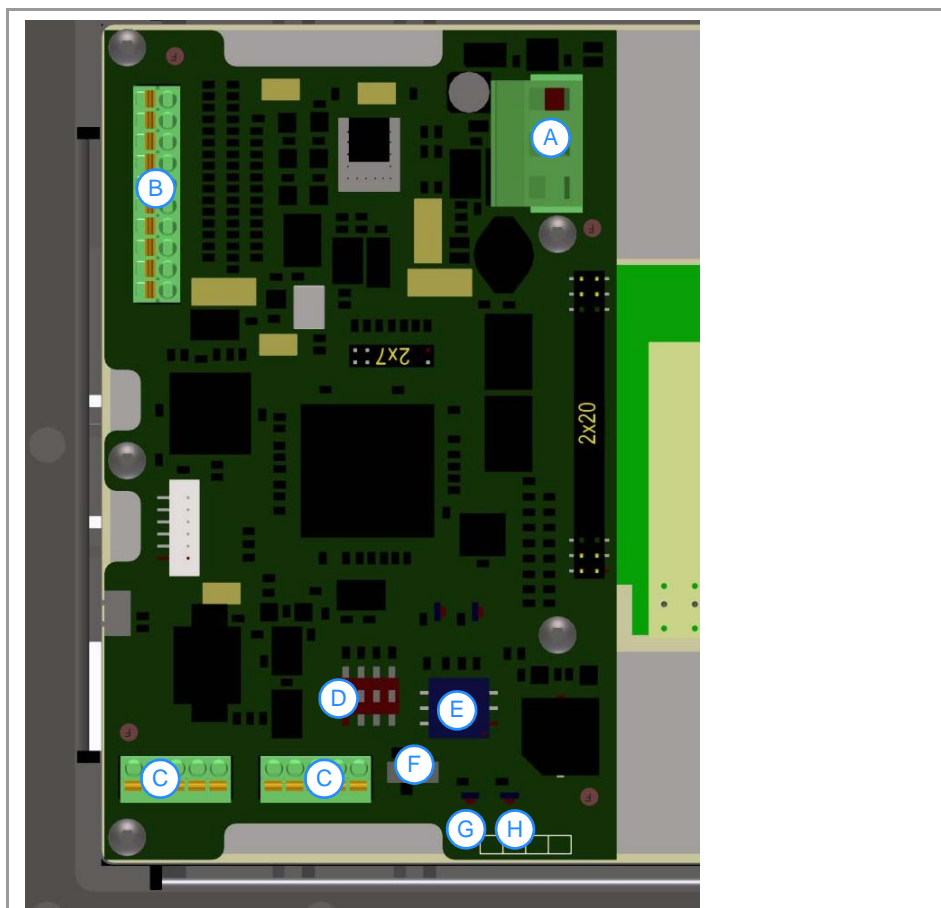
7.6.1 Ground connection.



It is up to the system integrator to meet all the requirements of local and national electrical codes as well as all the regulations applicable regarding the grounding of the whole unit.



7.6.2 Rear connectors.



- (A) 24 V DC voltage supply.
- (B) Handwheels.
- (C) CAN bus.
- (D) Bus switch and transmission frequency (CANfagor).
- (E) Address (node) of the element.
- (F) Line terminating resistor.
- (G) ERR led, transmission status indicator.
- (H) RUN led, module status indicator.

7.

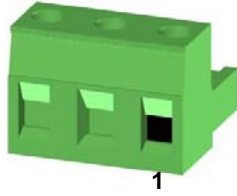
OP-PANEL / OP-PANEL+SPDL RATE.

FAGOR

FAGOR AUTOMATION

CNC 8060

(REF: 1709)

24 V DC voltage supply.

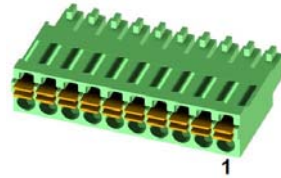
Plug-in part 3-pole Phoenix-type combicon connector (7.62 mm pitch).
Rated current; 12 A.

Pin	Signal.	Function.
1		Chassis.
2	11	0 V reference signal.
3	+24 V	Power supply.

Connector data.	
Number of poles.	3.
Pitch.	7.62 mm.
Connection technique.	Screw connection.
Minimum/maximum tightening torque.	0.5 / 0.6 Nm.
Minimum/maximum section.	0.2 / 2.5 mm ² .
Minimum/maximum AWG section.	24 / 12.
Rated current I _n .	12 A.

Cable data.	
Length to be stripped.	7 mm.

See "[7.5 Power supply for the module.](#)" on page 92.

Handwheel connection.

Plug-in part 10-pole Phoenix-contact miniconbicon connector
(3.5 mm pitch). Rated current; 8 A.

Pin.	Signal.	Function.
1	+5 V	5 V DC voltage supply.
2	---	---
3	---	---
4	MPG3-B	B signal of the third handwheel.
5	MPG3-A	A signal of the third handwheel.
6	MPG2-B	B signal of the second handwheel.
7	MPG2-A	A signal of the second handwheel.
8	MPG1-B	B signal of the first handwheel.
9	MPG1-A	A signal of the first handwheel.
10	11	Power supply.

Connector data.	
Number of poles.	10.
Pitch.	3.5 mm.
Connection technique.	Spring connection.
Minimum/maximum section.	0.2 / 1.5 mm ² .
Minimum/maximum AWG section.	24 / 16.
Rated current I _n .	8 A.

Cable data.	
Length to be stripped.	7 mm.



Cable shields must be connected to the ground plate. See "[7.7 Handwheel connection.](#)" on page 97.

-B28A / B28B- CAN bus.



Plug-in part 5-pole Phoenix-contact minicombicon connector (3.5 mm pitch). Rated current; 8 A.

Pin.	Signal.	Function.
1	11	Ground / 0 V.
2	CL	(LOW) bus signal.
3	SH	CAN shield.
4	CH	(HIGH) bus signal.
5	SH	CAN shield.

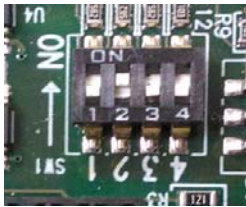
Connector data.	
Number of poles.	5.
Pitch.	3.5 mm.
Connection technique.	Screw connection.
Minimum/maximum tightening torque.	0.22 / 0.25 Nm.
Minimum/maximum section.	0.14 / 1.5 mm ² .
Minimum/maximum AWG section.	28 / 16.
Rated current I _n .	8 A.

Cable data.	
Length to be stripped.	7 mm.

7.

OP-PANEL / OP-PANEL+SPDL RATE.

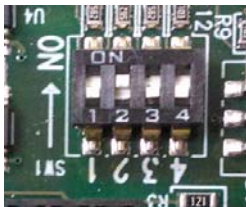
CAN bus. Bus switch; CANfagor/CANopen.



Switch 1 of the DIP switch selects the type of CAN bus to be used, this being either CANfagor or CANOpen.

DS -1-	Type of CAN bus.
off	The CANfagor bus has been selected.
on	The CANopen bus has been selected.

CAN bus. Transmission frequency (CANopen).

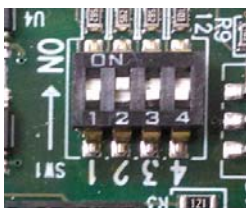


With the protocol CANopen, switches 2 and 3 of the DIP switch allow for the transmission frequency to be selected. All the bus nodes must work under the same frequency. The transmission frequency depends on the total length of the bus. Using the following illustrative values; assigning other values may cause communication errors due to signal distortion.

DS -2-	DS-3-	Frequency.	Length of the CAN bus.
on	on	1000 kHz	Up to 20 meters.
off	on	800 kHz	From 20 to 40 meters.
on	off	500 kHz	From 40 to 100 meters.
off	off	250 kHz	From 100 to 500 meters.

In order for any change of frequency to take place, the corresponding module must be reset; however, we recommend to change the speed while the modules and the CNC are turned off.

CAN bus. Address (node) of the element.



The 4 switch of the DIP switch allows for up to 32 positions or elements to be integrated in the CAN bus.

DS -4-	Address (node) of the element.
off	Positions 0-15 within the bus.
on	Positions 16-31 within the bus.

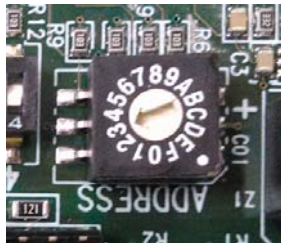


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CAN bus. Address (node) of the element.

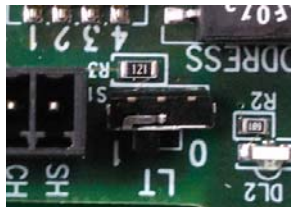


Each one of the elements (nodes) integrated into the CAN bus is identified by the 16-position rotary switch (0-15) "Address" (also referred to as "Node_Select"). With the ADD MSB switch, the positions or elements integrated in the CAN bus may be expanded up to 32. The "Address" switch also sets the priority of the node within the bus; the lower the number the higher the priority.

The CNC must always occupy position "0" and the rest of the elements of the bus will occupy consecutive positions starting with 1. It is recommended to place the remote modules after the CNC and for the keyboard and the jog panel to be the last nodes of the bus.

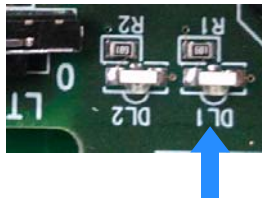
In order for any change at the "Address" switch to be assumed, the CNC must be restarted and the corresponding drive must be reset, however, we recommend to change the address while the modules and the CNC are off.

CAN bus. Line terminating resistor.



The line terminating resistor identifies which are the elements that occupy the ends of the CAN bus; i.e. the first and last physical element in the connection. The terminating elements must have the resistor activated (position 1) but not the rest of the elements (position 0).

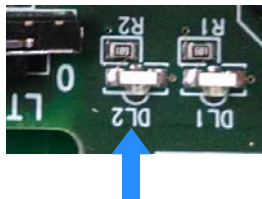
RUN Led. Module status.



Green Led. The meaning depends on the blinking frequency.

Blinking rate.	Description.
Intermittent.	Module in PRE-OPERATIONAL state.
Single blinking.	Module in STOPPED state.
On.	Module in OPERATIONAL state.

Led ERR. Transmission status.



Red LED. The meaning depends on the blinking frequency.

Blinking rate.	Description.
Off.	The module is ready to run.
Intermittent.	Module configuration stage.
Single blinking.	Poor transmission. At least one of the error counters of the CAN controller has reached the alarm level.
Double blinking.	There is no communication with the cpu.
On	Error. The CAN controller is in "Bus Off" state.

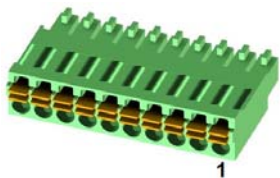
OP-PANEL / OP-PANEL+SPDL RATE.

7.

7.7 Handwheel connection.

The keyboard admits the connection of up to 3 handwheels (MPG1, MPG2 and MPG3) with A and B signals (5 V DC TTL). If the handwheel has an axis selector button, the button signal may be connected to a digital input and may be managed from the PLC using the NEXTMPGAXIS mark.

Connector pinout.



Plug-in part 10-pole Phoenix-contact minicombicon connector (3.5 mm pitch). Rated current; 8 A.

Pin.	Signal.	Function.
1	+5 V	5 V DC voltage supply.
2	---	---
3	---	---
4	MPG3-B	B signal of the third handwheel.
5	MPG3-A	A signal of the third handwheel.
6	MPG2-B	B signal of the second handwheel.
7	MPG2-A	A signal of the second handwheel.
8	MPG1-B	B signal of the first handwheel.
9	MPG1-A	A signal of the first handwheel.
10	11	Power supply.

Cable characteristics.

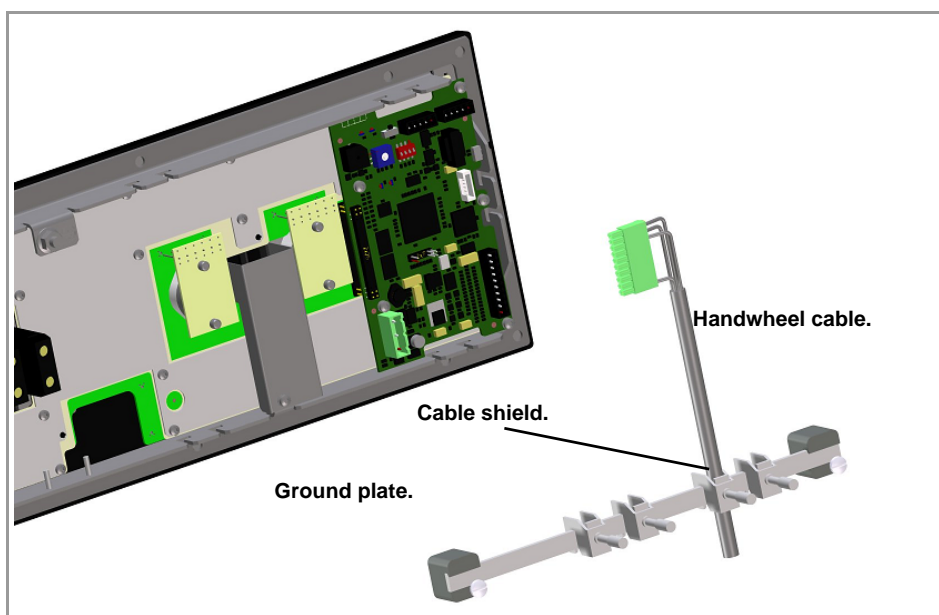
The cable being used must have overall shield. The unshielded portion of the wires of an unshielded cable cannot be longer than 75 mm.

Connection.

We recommend to run the handwheel cable as far away as possible from the power cables of the machine.



Always connect the shield of the cable to the ground plate using a metallic clamp.



7.

OP-PANEL / OP-PANEL+SPDL RATE.

FAGOR 

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7.

OP-PANEL / OP-PANEL+SPDL RATE.

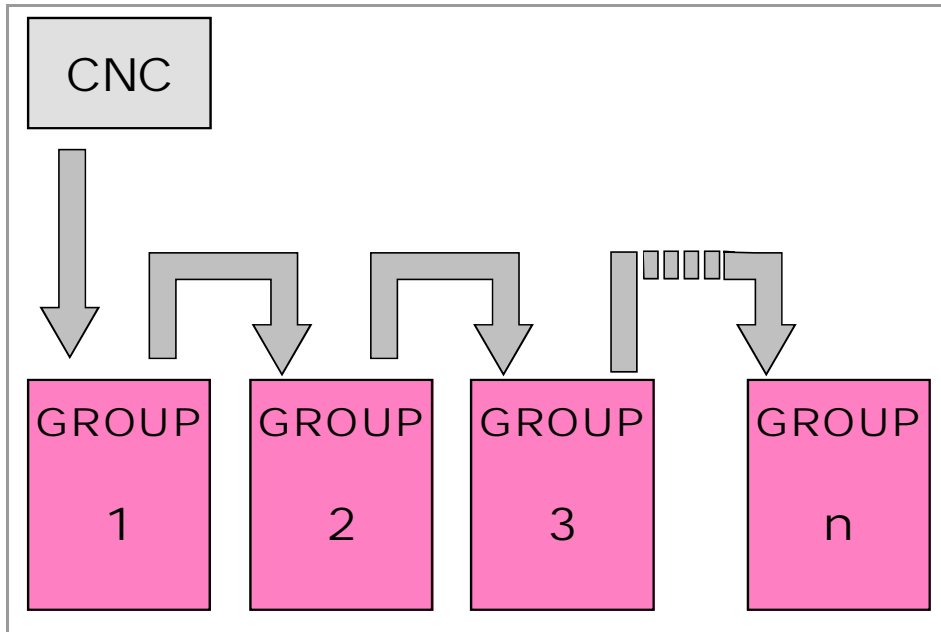


CNC 8060

(REF: 1709)

8 CAN BUS (CANOPEN PROTOCOL).

CANopen is a network communication protocol based on the CAN bus system for connecting the CNC with remote modules and keyboards. The CAN connection supports up to 32 devices (nodes), including the central unit; more one than keyboard and several groups of remote modules are possible.

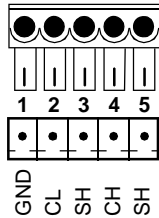


8.

CAN BUS (CANOPEN PROTOCOL).

CAN connector.

5-pin male Phoenix minicombicon contact (3.5 mm pitch).



Pin.	Signal.	Function.
1	GND	Ground / 0 V.
2	CL	(LOW) bus signal.
3	SH	CAN shield.
4	CH	(HIGH) bus signal.
5	SH	CAN shield.

The cable shield must be connected to the connector at both ends. The connector has two shield pins. Both pins are equivalent and the CAN shield may be connected to either one.

CAN cable characteristics.

Use a specific CAN cable. The ends of all the wires and the shield must be protected by the corresponding terminal (pin). Also use the terminals (pins) to secure the cable to the connector.

General characteristics.	
Type.	Shielded. Twisted pair (1 x 2 x 0.22 mm ²).
Flexibility.	Extremely flexible. Minimum bending radius, static = 50 mm and dynamic = 95 mm.
Cover.	PUR
Impedance.	Cat.5 (100 Ω - 120 Ω)

FAGOR 

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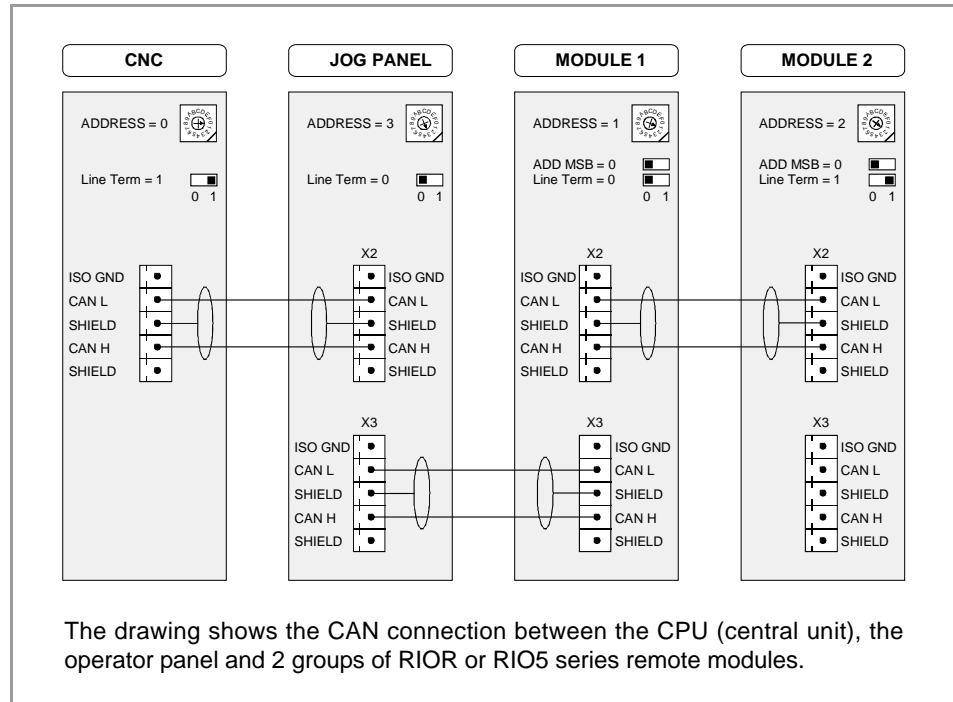
CNC 8060

(REF: 1709)

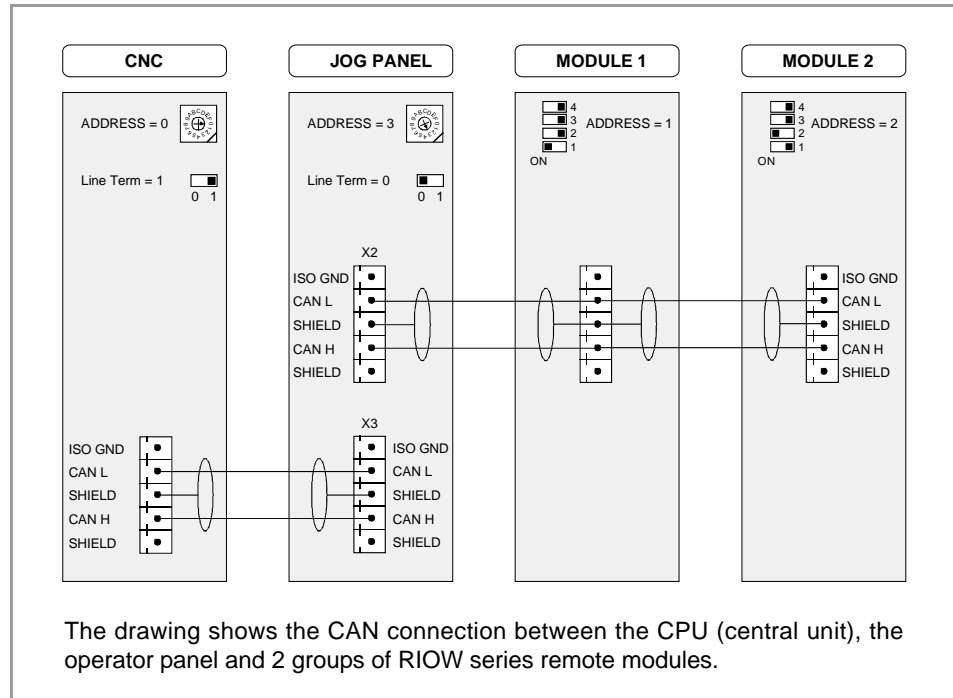
Module interconnection.

Respect the cable's minimum bending radius when connecting it. They must be connected in series; on elements having two CAN connectors, either one may be used. Once the elements have been connected, define their logic order in the bus and the transmission speed.

Remote modules of the RIOR and RIO5 series.



RIOW series remote modules.



CAN BUS (CANOPEN PROTOCOL).

8.

8.1 Identification of the modules at the bus.

Each one of the elements integrated into the CAN bus is identified by its address or node number. The CNC must always occupy position "0" and the rest of the elements of the bus will occupy consecutive positions starting with 1.

The node address or number also sets the priority of the group within the bus; the lower the number the higher the priority. We recommend to set the priority of the groups as follows (from highest to lowest).

- The groups that have the feedback inputs.
- The groups that have analog inputs and outputs.
- The groups that have digital inputs and outputs.
- The keyboard and jog panel

Configuring the address (node number). RIOR and RIO5 series remote modules.

-ADDRESS- selector. Address (node) of the element within the bus.



Each one of the elements integrated into the CAN bus is identified by the 16-position rotary switch (0-15) "Address" (also referred to as "Node_Select"). With the ADD MSB" switch, the positions or elements integrated in the CAN bus may be expanded up to 32.


In order for any change at the "Address" switch to be assumed, the CNC must be restarted and the corresponding drive must be reset, however, we recommend to change the address while the modules and the CNC are off.

The "Address" switch also sets the priority of the group within the bus; the lower the number the higher the priority. We recommend the keyboard and jog panel to be the last node of the bus.

-ADD MSB- selector Address (node) of the element within the bus.

At RIOR serie modules, with the ADD MSB" switch, the positions or elements integrated in the CAN bus may be expanded up to 32. Positions 0-15 are selected with ADD MSB=0 and positions 16-31 with ADD MSB=1.

ADDRESS = 2




ADDRESS = 2

ADD MSB = 0

0 1

ADDRESS = 18



ADDRESS = 2

ADD MSB = 1

0 1

ADDRESS	0	1	2	3	...	13	14	15
ADD MSB =0	0	1	2	3	...	13	14	15
ADD MSB =1	16	17	18	19	...	29	30	31

8.

CAN BUS (CANOPEN PROTOCOL).

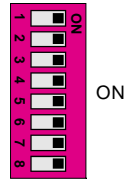


FAGOR AUTOMATION

CNC 8060

(REF: 1709)

Configuring the address (node number). RIOW series remote modules.



The dipswitch may be used to select the address of the node and the transmission speed.

The address (node number) of the group is selected while the module is off. Select the speed by putting the corresponding dipswitches in the ·on· position. The binary meaning of each dipswitch increases according to its number; dipswitch ·1· for address 1, dipswitch ·3· for address 4 and so on.



Identification of the first and last elements of the bus. Line terminating resistor.

In the CAN bus, it is necessary to use a line terminating resistor to identify which are the elements that occupy the ends of the bus; i.e. the first and last physical element in the connection. For the central unit, the terminating resistor is factory installed because the CNC is always at one end of the bus.

Operator panel and RIOR and RIO5 series remote modules. ·LT· selector.



The ·LT· switch identifies which are the elements that occupy the ends of the CAN bus; i.e. the first and last physical element in the connection.

The switch position of the terminating elements must be "1" and that of the rest of the elements "0". The central unit must always be at one end of the line even when not having this switch. The other end of the line will be the last physical device of the bus.

RIOW series remote modules.

The RIOW series modules do not have a factory-installed line terminating resistor. The RIOW module mounted at the end of the bus must have a 120 Ω line terminating resistor between pins CAN_H and CAN_L to avoid signal deflections (rebounds).

8.

CAN BUS (CANOPEN PROTOCOL).

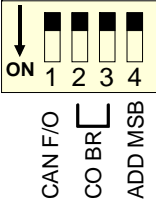
8.2 Type of CAN bus.

Bus type selector: CANfagor / CANopen.

The RIO5 and RIOR modules are always in CANopen mode. The CNC and the operator panel must be configured for the CANopen bus.

Bus type selection at the operator panel.

Switch ·1· (CAN F/O) selects the type of CAN bus to be used, i.e. CANfagor or CANopen.



The diagram shows a switch labeled 'CAN F/O' with positions 1, 2, 3, and 4. Position 1 is marked 'ON'. Below the switch are labels: 'CAN F/O', 'CO BR', and 'ADD MSB'.

·CAN F/O·	Type of CAN bus.
OFF	The CANfagor bus has been selected.
ON	The CANopen bus has been selected.

Bus type selection at the CNC.

At the CNC, the type of CAN bus is selected by means of the machine parameters (parameter CANMODE).

8.3 Selecting the speed for the CANopen bus.

When using the CANopen protocol, the transmission speed at the bus is defined in each node and they all must run at the same speed. The transmission speed depends on the total length of the bus. Using the following illustrative values; assigning other values may cause communication errors due to signal distortion.

Speed	Length of the CAN bus.
1000 kHz	Up to 20 meters.
800 kHz	From 20 to 40 meters.
500 kHz	From 40 to 100 meters.
250 kHz	From 100 to 500 meters. The speed of 250 kHz is only available to communicate with the keyboards and RIO5 series remote modules; this speed is not available at the RIO5 series remote modules.

Selecting the speed at the CNC.

At the CNC, the transmission speed is selected by means of the machine parameters (parameter CANOPENFREQ).

Speed selection at RIO5 remote modules.

SPEED
 1
 0

The speed is selected with the ·SPEED· switches.

In order for any change of speed to be assumed, the corresponding module must be reset; however, we recommend to change the speed while the modules and the CNC are off.

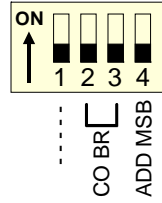
<p>SPEED <input type="checkbox"/> 1 <input type="checkbox"/> 0</p> <p>1000 kHz</p>	<p>SPEED <input type="checkbox"/> 1 <input type="checkbox"/> 0</p> <p>800 kHz</p>	<p>SPEED <input type="checkbox"/> 1 <input type="checkbox"/> 0</p> <p>500 kHz</p>	<p>SPEED <input type="checkbox"/> 1 <input type="checkbox"/> 0</p> <p>500 kHz</p>
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The communication at 250 kHz is not available at the RIO5 series remote modules.

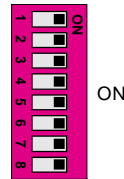
Speed selection at RIOR remote modules.

The speed is selected with switches ·2· and ·3· (CO BR).



DS ·2·	DS·3·	Speed	Length of the CAN bus.
on	on	1000 kHz	Up to 20 meters.
off	on	800 kHz	From 20 to 40 meters.
on	off	500 kHz	From 40 to 100 meters.
off	off	250 kHz	From 100 to 500 meters.

In order for any change of speed to be assumed, the corresponding module must be reset; however, we recommend to change the speed while the modules and the CNC are off.

Speed selection at RIOW remote modules.

The dipswitch may be used to select the address of the node and the transmission speed.

To select the speed of the node, the module must be in configuration mode (all the dipswitches in the ·off· position). After turning the module on in configuration mode, the top 4 LED's of the module blink indicating the speed selected at the module. The STOP LED corresponds to dipswitch ·1·, the RUN to dipswitch ·2·, the TX to dipswitch ·3· and the RX to dipswitch ·4·. The first time the module is configured, the TX LED blinks indicating that no valid speed has been selected.



If when turning the module on, all the dipswitches are not in the ·off· position, the position of the dipswitches will be the new address (node number) of the group.

The first 4 dipswitches are used to select the speed; the rest must be in the ·off· position. To select the speed, put the corresponding dipswitches in the ·on· position.

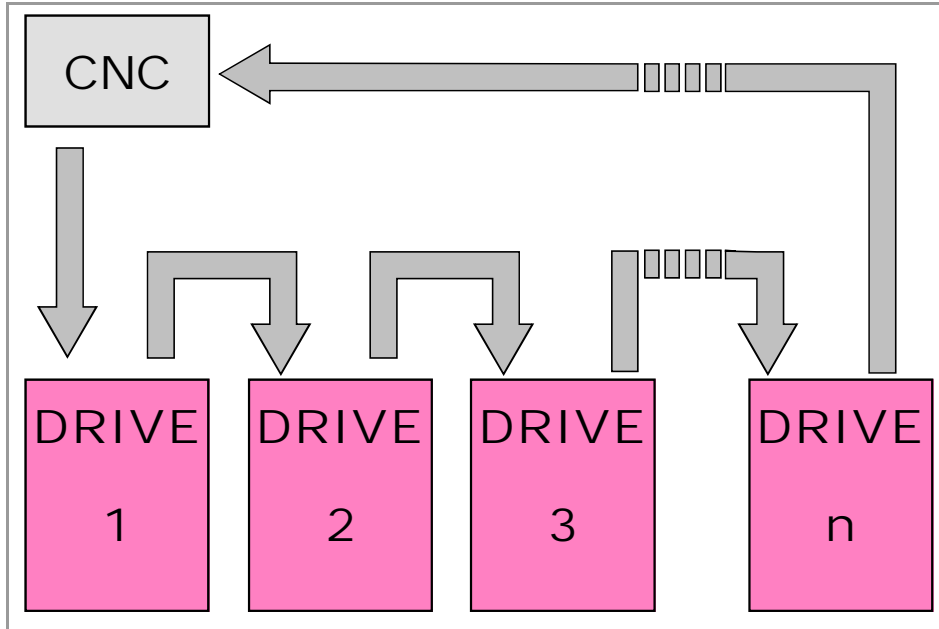
Dipswitch ·1·	Dipswitch ·2·	Dipswitch ·3·	Dipswitch ·4·	Speed
Off	Off	Off	Off	1000 kHz
ON	Off	Off	Off	800 kHz
Off	ON	Off	Off	500 kHz
ON	ON	Off	Off	250 kHz

To save the selected speed, put dipswitch ·8· in the ·on· position. After saving the configuration, the corresponding LED's turn on to indicate the module speed. For 1 MHz, all four LED's turn on.

Once the speed has been selected, turn the module off by removing power and set dip-switch ·8· in the ·off· position. Bear in mind that the next time the module is turned on, the position of the dipswitches will indicate the address (node number) of the group.

9 SERCOS-II BUS.

The Sercos interface is a communications standard especially designed for the machine-tool industry offering a simple interface between the CNC and the drives. All the data and commands are transmitted in digital format through fiber optic lines that make up a ring (the Sercos ring) that connects all the elements of the bus (CNC and drives) to each other. Using the Sercos interface considerably minimizes the necessary hardware, makes cabling simpler and grants greater reliability to the system making it immune to electrical interference (noise).



Sercos cable characteristics.

Fagor Automation supplies the fiber optic cables needed for Sercos communication. There are several types of cable depending on their length and their dynamic and static installation characteristics.

- Fiber optic cable with polymer core (SFO, SFO-FLEX) for up to 40 meters. If the fiber optic cable is going to withstand dynamic conditions (moving), always use the SFO-FLEX cable. If the fiber optic cable is going to withstand static conditions (not moving), always use the SFO cable.
- Fiber optic cable with glass core (SFO-V-FLEX) for over 40 meters.

Mechanical cable characteristics.

SFO cable.	
Flexibility.	Normal. Minimum bending radius of 30 mm. Only to be used in static systems (not moving).
Cover.	PUR. Polyurethane resistant to chemicals used in machines.
Temperature.	Working: -20 °C / 80 °C (-4 °F / 176 °F). Storage: -35 °C / 85 °C (-31 °F / 158 °F).
SFO-FLEX cable.	
Flexibility.	High. Minimum bending radius, static = 50 mm and dynamic = 70 mm. Special cable to be used in cable chains.
Cover.	PUR. Polyurethane resistant to chemicals used in machines.
Temperature.	Working: -20 °C / 70 °C (-4 °F / 158 °F). Storage: -40 °C / 80 °C (-40 °F / 176 °F).

9.

SERCOS-II BUS.

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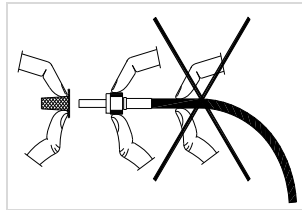
CNC 8060

(REF: 1709)

SFO-V-FLEX cable.	
Flexibility.	Minimum bending radius, static = 45 mm and dynamic = 60 mm.
Cover.	PUR. Polyurethane resistant to chemicals used in machines.
Temperature.	Working: -40 °C / 80 °C (-40 °F / 176 °F). Storage: -40 °C / 80 °C (-40 °F / 176 °F).

Cable handling.

The cable provided by Fagor has its pins protected with a hood. Before connecting the cable, remove the protecting hood.



Both for removing the pins protecting hood for the pins and for plugging and unplugging the cable, hold the cable by its pin, never pull at the cable while holding it by its plastic part because it could make it useless.

9.

SERCOS-II BUS.

9.1 Module identification and connection

Module identification.

The drives are identified with the 16-bit rotary switch "Address" (also called "Node_Select"). This switch selects the address (node) occupied by each of the elements integrated into the Sercos connection. The CNC do not has the switch; it is pre-configured to always occupy position 0 at the bus.

The CNC must always occupy position 0 and the drives will occupy consecutive positions starting with 1. In order for any change at the "Address" switch to be assumed, the corresponding drive must be reset and the CNC powered off and back on.

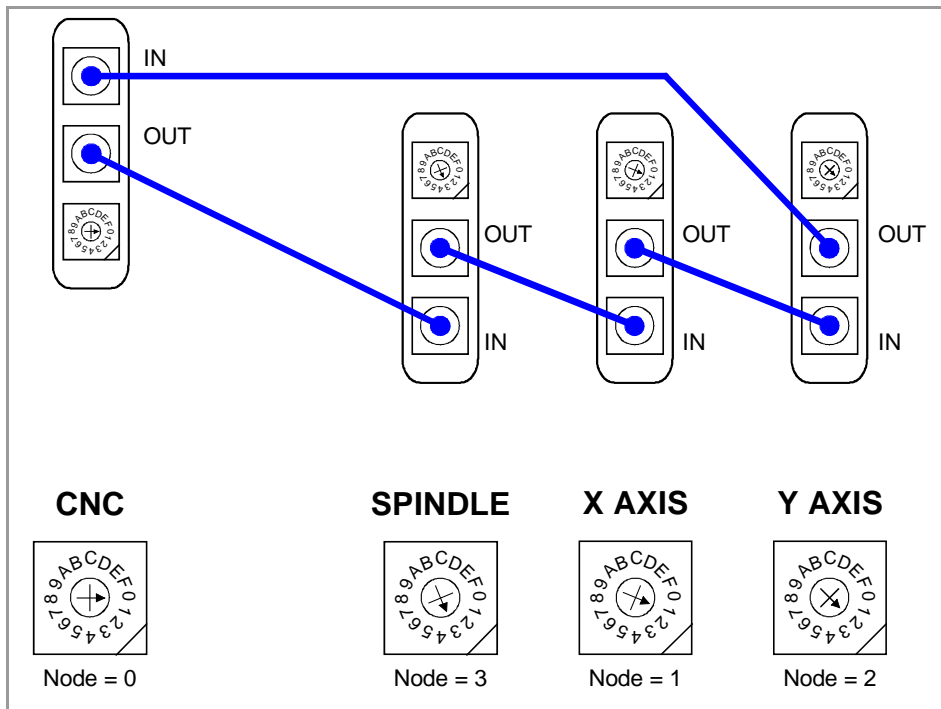
Whether the drive identified with number 1 (for example) corresponds to the X axis, to the Y axis or to another one is irrelevant. However, it is a good idea, for clarity sake, that the machine axes X, Y, Z, U, V, W, A, B and C be assigned consecutive numbers in that order.



Then set certain CNC machine parameters to configure the connection.

Module interconnection.

The Sercos connection is carried out in a ring using fiber optic cable by joining an OUT terminal with an IN terminal. The drawing shows the Sercos connection of the CNC with Fagor spindle drives and the X, Y axes.



9.2 Data exchange via Sercos.

The data exchange between the CNC and the drives takes place in each position loop. The more data is exchanged, the more overloaded the Sercos transmission will be. These registers should be limited leaving only the ones absolutely necessary after the setup.

There is data that must necessarily be transmitted in every position loop (velocity commands, feedback, etc.) and other data that may be transmitted in several loops (monitoring, etc.). Since the CNC must know the priority of those transmissions, there must be two separate transmission channels.

Cyclic channel (fast).

The data is transmitted in every position loop. It contains velocity commands, feedback, etc. Each variable that is read or written at the drive is included in this data pack. In order not to overload the interface, you must limit the number of drive variables involved to the minimum necessary.

Indicate the type of data to be transmitted. The data to be sent to the drives must be placed in certain particular registers of the PLC and the data to be read from the drives is received in other registers of the PLC.

Service channel (slow).

The data is transmitted in several position loops. It contains monitoring data, etc.

This channel can only be accessed through high-level blocks in the part-program or from the PLC channel.

9.

SERCOS-II BUS.



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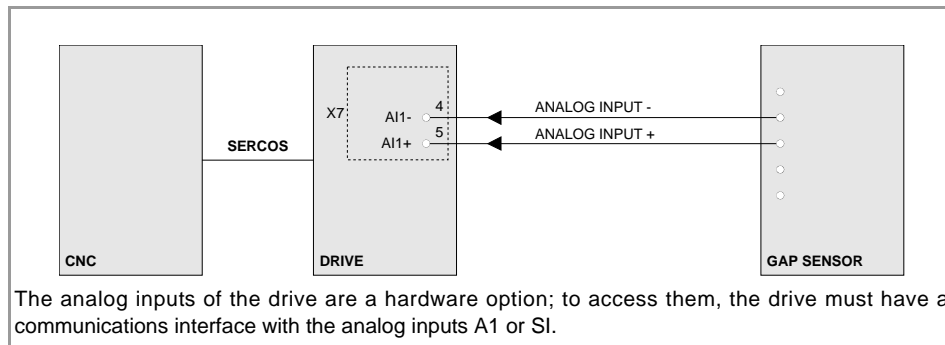
10 INSTALLING A SENSOR FOR GAP CONTROL (LASER MODEL).

The analog input for the sensor can be installed in remote CAN modules or on the Sercos drive of any axis. Fagor Automation recommends using a drive input. Use the machine parameters GAPANAINTYPE and GAPANAINID to define the CNC where the sensor input is located.

Electrical diagram.

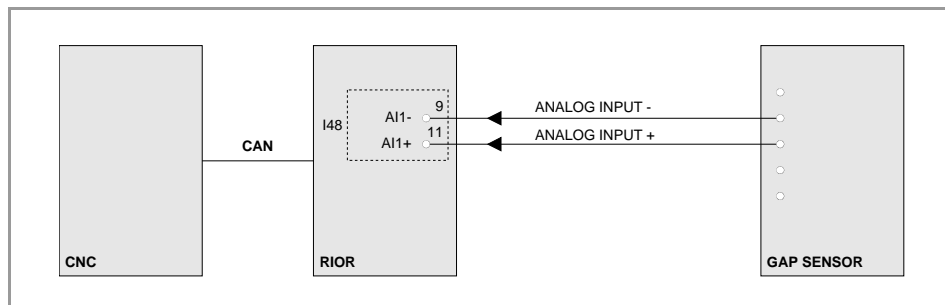
Connecting the sensor to an analog input of the Sercos drive.

The example uses the first analog input of the drive (pins ·4· and ·5·); to use the second input, use pins ·2· and ·3·.



Connecting a sensor to an analog input on remote modules.

The analog inputs are available on modules RIO5 and RIOR.



10.

INSTALLING A SENSOR FOR GAP CONTROL (LASER MODEL).



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