

# Optima

A NEW GENERATION OF CNC SYSTEM

**FAGOR**  
AUTOMATION



Open  
to your  
world





# Optima

Leading-edge technology  
at your fingertips.

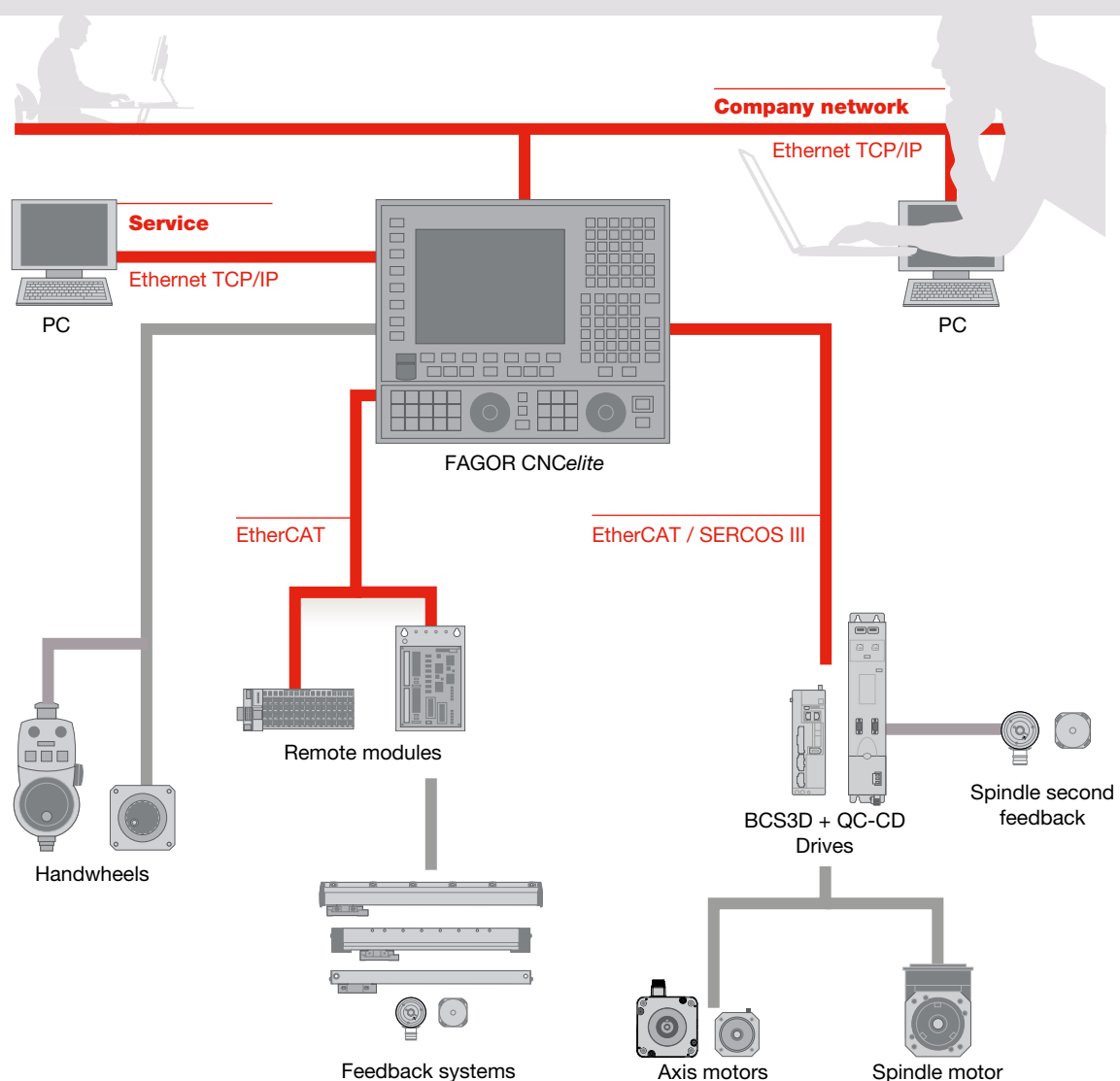
Introducing OPTIMA CNC System, a perfect combination between CNC*elite* and EtherCAT or Sercos III based digital drives and motors- offering the best performance/cost ratio in the industry.

Additionally offering advance technological functions and allowing you to engineer any customizations with ideally sized drives and motors while optimizing power.

# COMPLETELY INTEGRATED SOLUTION

## A SINGLE INTEGRATED PLATFORM FOR ALL YOUR NEEDS

Fagor's uniquely integrated platform brings together every electronic element of your machine- the CNC, digital servo motors and drives, linear and angular feedback and ensures seamless integration, guaranteeing robust machine design and extreme performance to obtain maximum efficiency.



This completely new hardware design is supported by higher processing power, larger solid state memory etc. ensuring the management of most complex algorithms with a flexible & open architecture system.

The Optima CNC platform allows you to communicate with various EtherCAT based devices and peripherals.

The widespread popularity of this platform allows us to communicate and control various high speed communication devices, enhancing performance at every step.



CNC



# WEB TECHNOLOGY-BASED HMIelite

## EASY TO PROGRAM AND EASE OF PORTABILITY TO OTHER PLATFORMS

New revitalized multiplatform HMI, based on HTML5 technology that is modern looking and simplified.

The HTML5 based software allows for the screen contents and the aesthetics to be modified and customized in a simplified manner. The redesigned user windows enhance the appearance and make it more intuitive and user friendly.

Adaptable to all screen formats, wide, panoramic or compact.

**This web based technology allows the user interface to be displayed appropriately on any portable device.**



Android



iOS



Windows



Linux

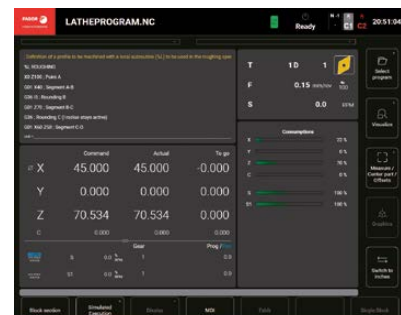
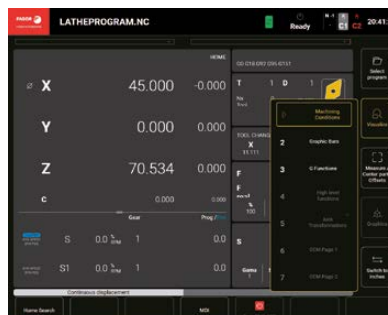
< HTML5 >



### The advantages of utilizing HTML5: seamless multiplatform accessibility

Remote and portable device connections are possible. The remote connection allows immediate and easy access for diagnosis or monitoring of unattended machine, for data collection and analysis purposes including troubleshooting.

The web-based technology HMI multiplatform means easier customizations and a single development can visualize the interface on all types of platforms, such as Windows, Android, iOS, Linux, etc.





# ENHANCED LIBRARY OF TOOLS

## TO FACILITATE EASY SETUP

These all inclusive tools will allow you to set up the machine in a systematic manner and with extraordinary ease.

### PLC

Fagor CNC's built in PLC is easy to program for controlling all types of machine functions and external devices. You can program the PLC using easy statement based (mnemonic) language. In addition, C or ladder programming can be used.

It provides elaborate tools to assist during machine development and operational management.

The messages and errors created in the PLC may also be associated with texts, photos and videos so that the operator can work more autonomously to resolve any incidents at the machine.



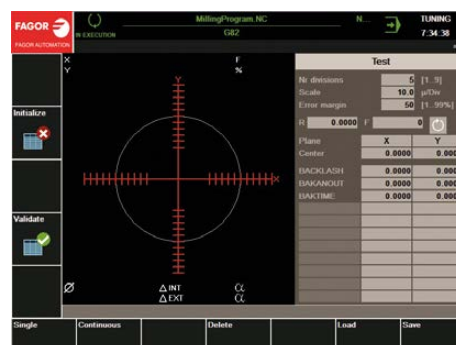
### Built-in Oscilloscope

The Oscilloscope function provides assistance when adjusting the dynamic performance of axes. It gives you the ability to display, analyze and correct the axis's dynamic behavior with the help of 8 separate channels showing both analog and digital variables.



### Circularity (roundness) test

Helps improve the behavior of the axes when reversing their movement. When executing a circle, the feature graphically compares the actual path with the theoretical path and then provides the necessary tools for the correct adjustment.





### Diagnosis

To carry out quick troubleshooting of the system's condition, Fagor provides the Diagnosis mode.

In this mode, you can check the condition of all the hardware modules installed and a history of incidences in the machine. In this way, any issue with the machine on start-up or during use in the workshop can be quickly resolved.

### File encryption

The CNCelite platform offers the manufacturers the possibility to protect their “know-how” using a file encryption system. The manufacturer will only have to select the file to be protected, encrypt it and delete the original file.

The program will keep working exactly the same way as before, but it cannot be displayed, edited or modified.



### Report generation

After machine set up is completed an image can be created including the programs, parameters and PLC etc. This image can be used as a restoration point if needed in the future during machine repair and troubleshooting. For serial production environment these files can also be copied in to a new machine.

# A CUTTING-EDGE

## NAVIGATION AND PROGRAMMING

More intuitive,  
simple and interactive.

## Highly interactive and agile navigation

Utilizing a host of modern tools along with association from various prominent designers, helped us to create our most user friendly, creative and responsive work interface to date.

The HTML5 platform used for the development allows the CNC's interface to be connected to all types of devices such as smartphones, tablets, etc.

## Drop-down menus

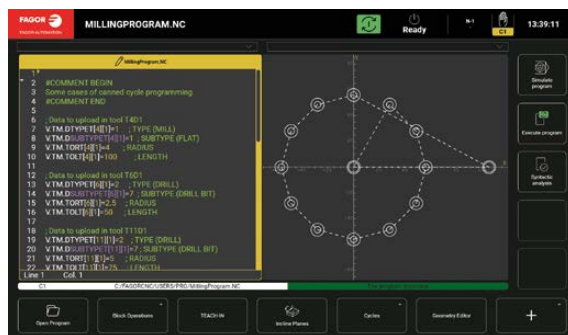
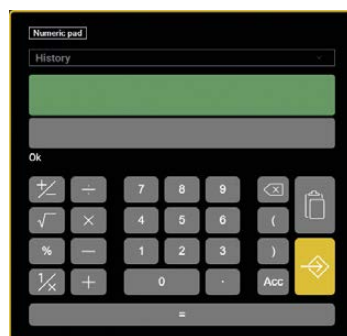
We provide a pop-up menu system that allows for easier navigation and it eliminates cumbersome sub-levels that can be confusing.

### Built-in calculator

In production areas, it is very common to use digital calculators to enter data, calculate new offsets, etc. Fagor CNCs provide you with a built-in calculator as standard so that you can make these calculations directly, avoiding any possible errors. The calculations can be directly inserted into the desired location.

## Graphic assistance for programming

This function allows you to simultaneously check, while editing the part, the result of it's programming in graphic form. Hence allowing you to optimize or fix programming errors even before the simulation.







### FGE (Fagor Geometry Editor)

This functionality inspired by CAD CAM software allows you to program complex shapes very intuitively at the machine, without the need for additional software.

It also includes a comprehensive DXF file import tool.

### IIP (Interactive Icon-based Pages) interactive language

Our programming language (IIP), based on one operation one screen concept, is the best conversational cycle-based programming in the CNC machining world today.

All you have to do is define the geometry of the part to be made, the tool and the machining conditions and the CNC will do the rest.



### HD graphics

The HD graphics are primarily useful in the following situations:

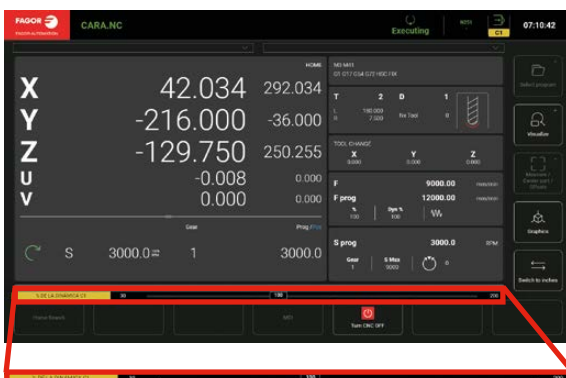
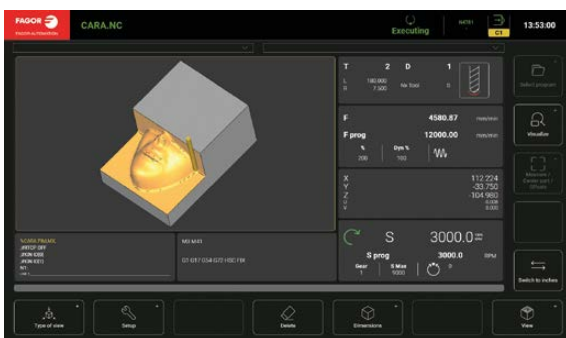
- Before machining: To check that the program is correct and prevent interference or collision with the finished part or the fixture.
- While machining: When the visibility is low (e.g. due to coolant or chips) and it is difficult to view the actual machining status at any time.

### Dynamic override

Using the cursor on the screen you can quickly alter the machining behavior to suit your needs.

You can choose from various options depending on the prevailing conditions:

- If you observe vibrations or jerky movements they can be eliminated by adjusting the cursor (which in turn applies the algorithm to adjust feeds and speed) to obtain desired surface qualities.
- If the machine movement is very sluggish, it can be improved by adjusting the cursor to improve the machining time.



# TOOLS

## FOR PRODUCTIVITY AND MAINTENANCE

By offering most advanced tools for production control and maintenance we can ensure your machine performance is always maximized.

### Predictive maintenance

Using our free auto-tuning tool, FINETUNE you can evaluate and modify the current performance of your machine. This information can be easily compared to previously stored machine data and corrective measures can be performed, including detection of future mechanical failures.

### Remote machining control

Certain operations do not require constant operator presence either because the process is highly automated or because the operation takes a long time.

During such processes Fagor's "Process Informer" feature can notify you via e-message if the process is interrupted or requires attention due to any possible errors allowing you to act immediately.

### Telediagnosis (Remote Troubleshooting)

From a remote location a technician can securely connect to your CNC to diagnose and solve issues you may have with your machine.

This powerful tool not only allows the technician to optimize axis and spindle tuning but also modify PLC, parameters, programs etc.

### Integrated manuals

Following on our commitment towards environment protection and sustainability Fagor has adopted digital documentation for all technical products.

Every CNC has a built in library of all documents, which is only a "HELP" key away.

### Maintenance modes

The new **elite** series CNC also offers a maintenance mode for your CNC. Utilizing an interactive and powerful HMI you can monitor the machine status and the history of incidents.





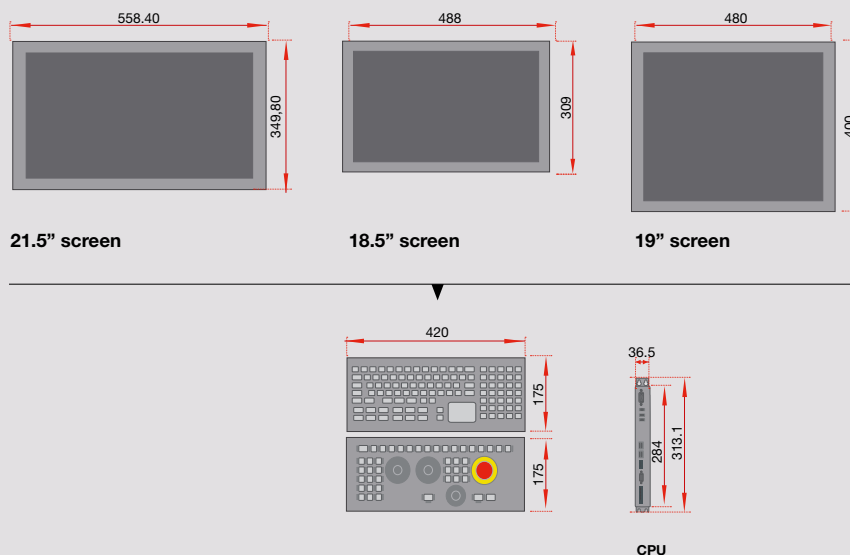
# CONFIGURATION

## MODULAR CONFIGURATION

### CUSTOMIZED SOLUTIONS.

Fagor allows users to configure an open and flexible solution that best suits their needs: there is a choice of three screen sizes.

In addition, it is possible to connect other brand monitors to the CNC equipment.

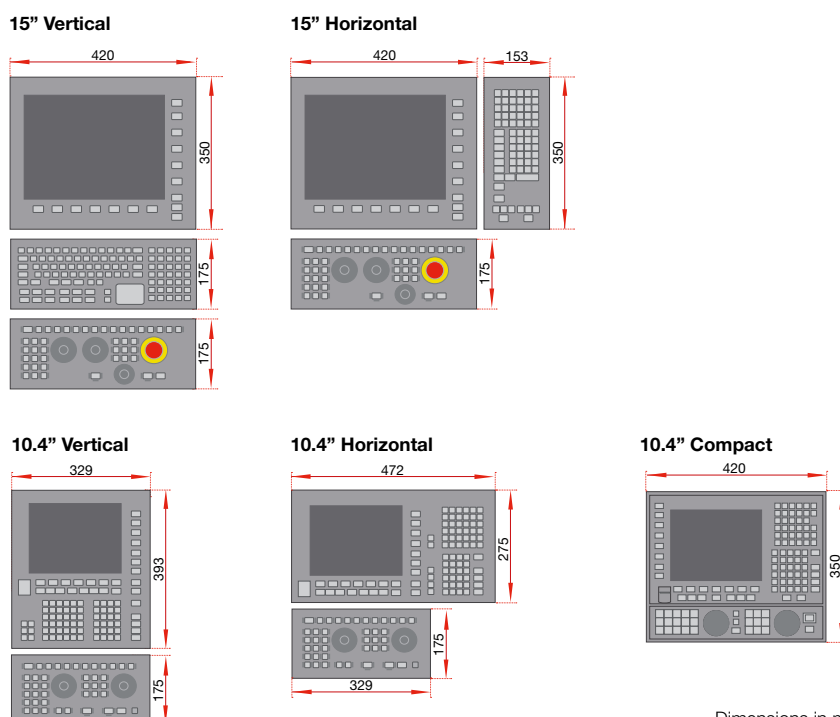


Dimensions in mm

## INTEGRATED CONFIGURATION

### INTEGRATED SOLUTIONS.

All models have a central unit integrated into the monitor. Optionally, 15" or 10.4" screens are available (the 8058 CNC is only available with the 10.4" compact model).



Dimensions in mm

# TECHNICAL CHARACTERISTICS

	CNC 8058elite	CNC 8060elite
<b>Main characteristics</b>		
Monitor	10.4", 18.5" and 21.5"	10.4", 15", 18.5", 19" and 21.5"
Touch Screen	Δ (*)	Δ
Ethernet	•	•
USB connections (integrated/modular)	2/4	2/4
Hard disk memory (Total memory / Free user memory)	15 GB / 3.5 GB free	15 GB / 3.5 GB free
Connector for CFast memory expansion	•	•
Maximum axis configuration	5	9
Maximum configuration of interpolated axes	4	4
Maximum configuration of spindles	2	3
Maximum configuration of execution channels	1	2
Maximum configuration of nodes (axes + spindles)	6	10
Sercos III / Fagor EtherCAT digital drive system	•	•
Analog / Third party EtherCAT servo system	Δ	Δ
<b>Setup and maintenance tools</b>		
Finetune (Auto servo adjustment & Predictive maintenance)	•	•
Process Informer (Incident messages)	•	•
Tele-diagnosis (remote troubleshooting)	•	•
Fagor I4.0 Connectivity Pack	Δ	Δ
<b>Standard features</b>		
Available languages	16 (**)	16 (**)
Integrated manuals	•	•
Pop-up navigation (drop-down menus)	•	•
Built-in calculator	•	•
FMC (Fagor Machining Calculator)	Δ	Δ
HD Graphic simulation	Δ	Δ
<b>Programming / Machining</b>		
IIP (Interactive Icon-based Pages) programming language	Δ	Δ
Graphic assistance for programming	•	•
FGE (Fagor Geometry Editor)	•	•
Block processing time	2 ms	1 ms
Look-ahead blocks	150	300
Nanometric accuracy	•	•
Basic machining algorithms (HSSA I)	Δ	–
Advanced machining algorithms (HSSA II)	–	Δ
Dynamic Override	•	•
Recovery & continuation of machining	•	•
Cancel Continue	•	•
Tool inspection	•	•
Tool life monitoring	•	•
<b>Milling focused features</b>		
Multiple pocket cycles	•	•
Milling cycles for 4th axis (C axis)	Δ	Δ
Work in inclined planes (3+2, 4+1, etc. )	–	Δ
<b>Turning focused features</b>		
Multiple cycles for turning	•	•
Pocket cycles in the XC, ZC planes	•	•
Pocket cycles in the XY, YZ planes	–	•
FFC (Fagor Feed Control)	Δ	Δ

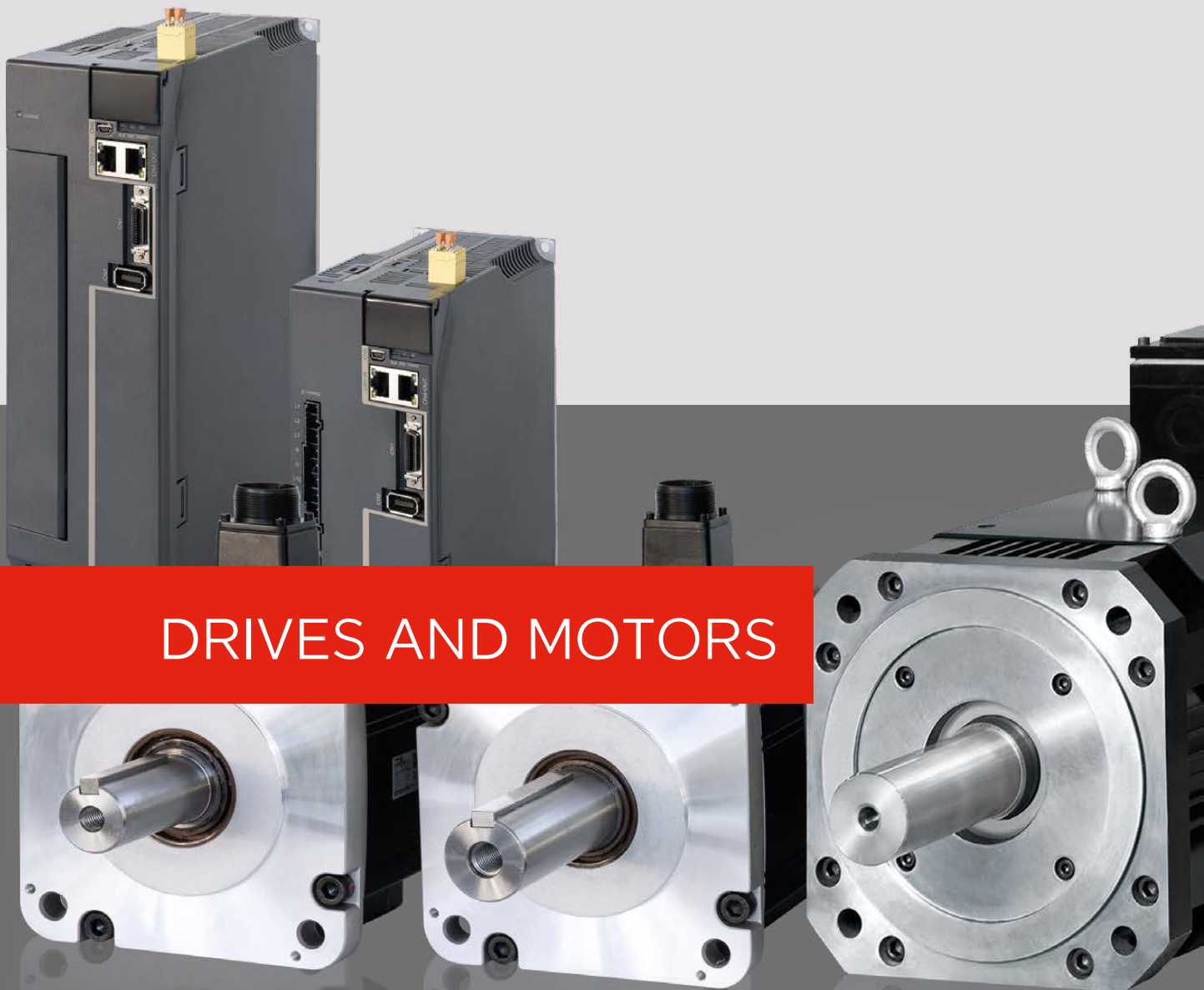
– Not available.

• Standard.

Δ Optional.

(\*) Not available on integrated models.

(\*\*) English, Spanish, Italian, German, French, Basque, Portuguese, simplified Chinese, traditional Chinese, Russian, Czech, Korean, Turkish, Dutch, Polish and Swedish.



## DRIVES AND MOTORS



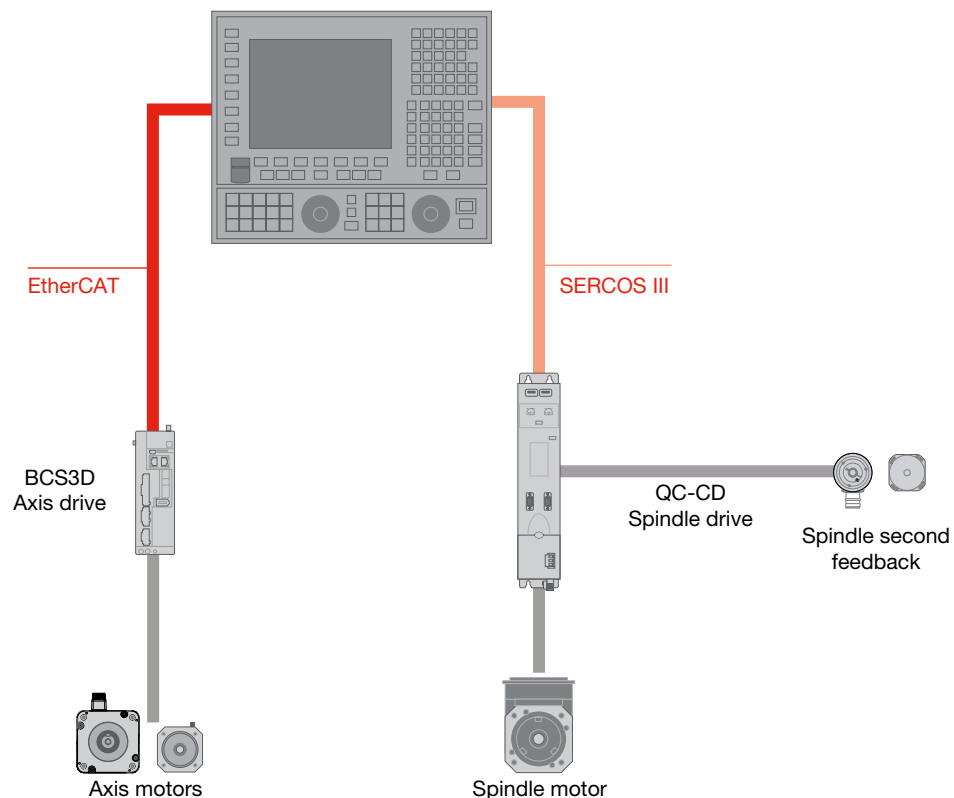
# COMPLETELY INTEGRATED SOLUTION

Optimized solution with reduced sizes, many choices, and a high performance/cost ratio for any application.

The BCS3D and QC-CD series drives provide superior accuracy, great stability and advance control functionalities utilizing high precision encoders in the servo motors.

The FBM3J and FBM3G series synchronous motors, combined with FM9 asynchronous motors are ideal for a wide range of machine tool application.

A distinctly robust motor design utilizing special high precision bearings and a streamlined manufacturing process ensures superior quality motors which are available in a wide ranging rated power.



# AXIS DRIVES

## BCS3D

Perfect solution with reduced motor and drive sizes and good performance/cost ratio for your automation application.

### General characteristics

Line Voltage/Frequency	BCS3D-02A/15A, Single-phase AC 200 (1 - 15 %) ... 240 (1 + 10 %) Vac, 50/60 Hz BCS3D-08A/20A, Three-phase AC 200 (1 - 15 %) ... 240 (1 + 10 %) Vac, 50/60 Hz BCS3D-10D/75D, Three-phase AC 380 (1 - 15 %) ... 440 (1 + 10 %) Vac, 50/60 Hz
Control circuit	BCS3D-02A/20A, Single-phase AC 200 (1 - 15 %) ... 240 (1 + 10 %) Vac, 50/60 Hz BCS3D-10D/75D, Single-phase AC 380 (1 - 15 %) ... 440 (1 + 10 %) Vac, 50/60 Hz
Control method	SVPWM control
Feedback	23 bit serial absolute encoder, 8388608 pulses per turn
Regenerative power function	200 ... 400 W (without internal braking resistor) Others (with internal braking resistor)
Protective functions	Overcurrent, overvoltage, low voltage, overload, regeneration error, overspeed, STO (Safety Torque Off) Safety Function
Communication protocol	EtherCAT communication module, CiA 402 protocol

### Description

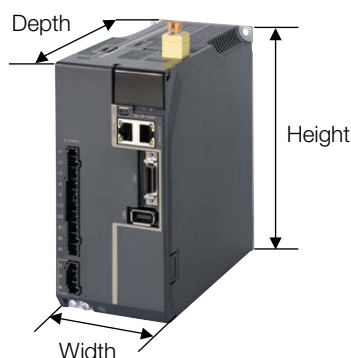
Example: BCS3D-10AEA-FS02

BCS3D	10	A	E	A	FS02
Servo drive model	Rated power	Line Voltage	Communication Interface	Encoder Type	Extended Function
BCS3D	02: 200 W 04: 400 W 08: 750 W <b>10: 1.0 kW</b> 15: 1.5 kW 20: 2.0 kW 30: 3.0 kW 50: 5.0 kW 75: 7.5 kW	A: 200 Vac D: 400 Vac	E: EtherCAT	A: Serial encoder	FS02: Support the STO

### Electrical data

BCS3D servo drive model	200 - 240 Vac						380 - 440 Vac					
	02A	04A	08A	10A	15A	20A	10D	15D	20D	30D	50D	75D
Continuous output current [A]	1.5	2.9	5.1	6.9	9.5	12.6	3.6	5.0	7.1	12.0	17.0	27.3
Maximum output current [A]	5.8	11.5	19.5	21.0	31.6	42.0	10.9	16.3	21.2	36.6	53.0	70.0
Mains power supply capacity [kVA] Single-phase	0.6	1.2	1.9	2.6	4.0	—	—	—	—	—	—	—
Mains power supply capacity [kVA] Three-phase	—	—	1.6	2.0	3.0	3.5	1.8	2.8	3.5	5.0	8.2	12.0
Rated output power [kW]	0.2	0.4	0.75	1	1.5	2	1	1.5	2	3	5	7.5

### Dimensions



BCS3D Model	Width x Height x Depth (mm)
02A - 04A	40x172x180
08A - 10A	55x172x180
15A - 20A	70x172x180
10D - 15D	60x172x180
20D - 30D	85x172x180
50D - 75D	90x260x230

# SPINDLE DRIVES

## QC-CD

Digital compact drives for synchronous and asynchronous motors and together with CNC*elite* they provide both speed and position control for spindles.

### General characteristics

Line voltage	3 AC, 400 (1-10 %) - 480 (1+10 %) Vac
Line frequency	48 ... 62 Hz
Interface	SERCOS III
Velocity feedback	High resolution SinCos encoder
Protections	Overvoltage, overcurrent, overspeed, overtemperature, overload, etc.
Control	High speed spindles and built-in motors
Direct position feedback	Differential TTL, Vpp, distance-coded reference mark, Fagor absolute
Interpolation	Position loop (250 µs) and velocity loop (62.5 µs)

### Description

Example: QC-CD-030-FS1

QC-CD	030	F	S1
Compact drive model	Maximum current	Type of bus	Type of module
QC-CD	021: 21 A 030: 30 A 040: 40 A 055: 55 A	F: Bus Fagor (SERCOS III)	S1: Without second feedback S2: With second feedback

### Electrical data

	QC-CD-021	QC-CD-030	QC-CD-40	QC-CD-055
Rated output current [A]	16	23	30	42
Maximum output current [A]	21	30	40	55
Power S1 for 4 kHz [kW]	11	15	21	29

### Dimensions



	Width (mm)	Height (mm)	Depth (mm)
QC-CD-021	78	388	266
QC-CD-030	78		
QC-CD-040	78		
QC-CD-055	117		

# AXIS MOTORS

The FBM3J/FBM3G series motors are permanent magnet synchronous motors suitable for a wide range of automation applications and high performance machine tools.

These motors, combined with BCS3D axis drives, together form a reliable and compact system with high functionality and versatility.

## General characteristics

Servomotor models	FBM3J	FBM3G
Rated speed	3000 rpm	1500 rpm
Maximum speed	6000 rpm	3000 rpm
Feedback device	23 bit serial absolute encoder 8388608 pulses per turn	
Brake supply voltage	24 Vdc	
Electrical insulation	Class F	
Room (ambient) temperature	0°C ~ 40°C (non freezing)	
Ambient humidity	20 % ... 80 % (non-condensing)	
Vibration immunity	Less than or equal to 24.5 m/s <sup>2</sup> (static)	
Protection degree	self-cooling, IP65/IP67	self-cooling, IP65

## Description

Example: FBM3J-10ALA242

FBM3J	10	A	L	A	2	4	2
Motor model	Rated output power	Line Voltage	Encoder	Design order	Shaft end	Optional	Plug type
FBM3J FBM3G	02: 200 W 04: 400 W 08: 750 W <b>10: 1.0 kW</b> 09: 0.85 kW 13: 1.3 kW 18: 1.8 kW 29: 2.9 kW 44: 4.4 kW 55: 5.5 kW 75: 7.5 kW	A: 200 Vac D: 400 Vac	L: 23-bit absolute 8388608 pulses per turn	A	1: Without keys 2: With keys	2: With oil seal, no brake 4: With oil seal, with brake	2: IP 65 / Waterproof (aerial plug-in) 4: IP 65 / Waterproof (base plug-in)

## Electro-mechanical data

Servomotor model	200 - 240 Vac							380 - 440 Vac						
	FBM3J-02	FBM3J-04	FBM3J-08	FBM3J-10	FBM3G-09	FBM3G-13	FBM3G-18	FBM3G-09	FBM3G-13	FBM3G-18	FBM3G-29	FBM3G-44	FBM3G-55	FBM3G-75
Rated torque [N·m]	0.637	1.27	2.39	3.18	5.41	8.28	11.5	5.41	8.28	11.5	18.6	28.4	35.0	48.0
Instantaneous maximum torque [N·m]	2.23	4.46	8.37	9.54	16.2	24.8	31.0	16.2	24.8	31.0	55.8	80.0	105.0	120.0
Rated current [A]	1.5	2.8	5.1	7.1	6.8	9.7	14.5	3.4	5.0	7.1	11.5	16.8	20.3	26.5
Instantaneous maximum current [A]	5.8	11.2	19.5	22.0	22.6	29.7	42.0	10.9	15.6	21.2	37.0	49.5	64.0	70.0
Moment of inertia (without brake) [10E-04 kg·m <sup>2</sup> ]	0.330	0.640	1.64	2.26	11.9	17.3	22.3	11.9	17.3	22.3	43.4	58.8	85.5	117.0
Moment of inertia (with brake) [10E-04 kg·m <sup>2</sup> ]	0.360	0.680	1.79	2.41	12.5	17.9	22.9	12.5	17.9	22.9	49.2	64.6	91.5	123.0
Brake rated power [W]	7.4	7.4	9.6	11.5	23	23	36	23	23	23	36	36	36	36
Brake hold torque [N·m]	≥1.5	≥1.5	≥3.2	≥3.2	≥20	≥20	≥20	≥20	≥20	≥20	≥44	≥44	≥72	≥72

# SPINDLE MOTORS

The asynchronous FM9 series motors can operate with all types of machine tool spindles, providing great reliability and optimum performance the application requires.

The FM9 series motors cover a vast range of power (kW) spectrum, have a robust design and have extremely low vibration under any conditions. The design uses special high speed bearing ensuring quiet operation at all speeds and spindle loads.

- **E01/E02 series:** Spindle motors with a vast range of power spectrum and up to 10,000 rpm.
- **E03 series:** Spindle motors with a vast range of power spectrum and up to 12,000 rpm.

## General characteristics

	FM9 E01	FM9 E02 / E03
Thermal protection (according to IEC 60034-6 standard)	KTY84-130 thermistor	Pt1000 thermoresistance
Vibration level (according to IEC 60034-14 standard)	V5	
Construction type (according to IEC 60034-7 standard)	Horizontal: IM B3, IM B5, IM B35 Vertical: IM V1, IM V5, IM V15, IM V3, IM V6, IM V36	
Insulation class (according to IEC 60034-1 standard)	Class F (155 °C / 311 °F)	
Degree of Protection (according to IEC 60034-5 standard)	IP 54	
Feedback	1024 ppt sinusoidal 1 Vpp encoder Incremental TTL encoder of 1024 ppt	Incremental TTL encoder of 1024 ppt

## Description

Example: FM9-A008-S5C0-E03

FM9	A	008	S	5	C	0	E03
Motor model	Base speed	Rated power	Feedback	Mounting	Degree of vibration	Shaft	Release
FM9	A: 1500 rpm	A004: 3.7 kW (*) A006: 5.5 kW A008: 7.5 kW A011: 11 kW A015: 15 kW	S: Standard encoder C: C axis encoder	1: Flange 3: Foot 5: Flange + foot	C: V5	0: Keyless 1: With key	E01 E02 E03

(\*) Not available for the E03 series

## FM9 E01/E02 Series

	Rated power	Rated power S6-40 % [kW]	Rated torque S1 [N·m]	Rated current [A]	Base speed [rpm]	Maximum speed [rpm]		Inertia [kg·cm <sup>2</sup> ]
	S1 [kW]	Y	Y	Y	Y	E01	E02	
FM9-A004-xxxx-E01	3.7	5.5	23.3	12.4	1,500	9,000	–	135
FM9-A006-xxxx-E01	5.5	7.5	24.7	15.9	1,500	9,000	–	245
FM9-A008-xxxx-E01/E02	7.5	11	47.3	21.5	1,500	9,000	10,000	353
FM9-A011-xxxx-E01/E02	11	15	69	27.9	1,500	9,000	10,000	580/405
FM9-A015-xxxx-E01	15	22	94.6	39.5	1,500	8,000	–	690

## FM9 E03 Series

	Rated power	Rated power S6-40 % [kW]		Rated torque S1 [N·m]		Rated current [A]		Base speed [rpm]		Maximum speed [rpm]	Inertia [kg·cm <sup>2</sup> ]
	S1 [kW]	Y	D	Y	D	Y	D	Y	D		
FM9-A006-S5C0-E03	5.5	7.5	–	35	–	15.9	–	1,500	–	12,000	245
FM9-A008-S5C0-E03	7.5	11	–	47.8	–	21.5	–	1,500	–	12,000	353
FM9-A011-S5C0-E03	11	15	–	70	–	30	–	1,500	–	12,000	405
FM9-A015-S5C0-E03	15	18.5	–	95.5	–	39.5	–	1,500	–	12,000	650

Other languages are available in the Downloads section from Fagor Automation's website.

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Open  
to your  
world

**Fagor Automation, S. Coop.**

B° San Andrés, 19  
E-20500 Arrasate - Mondragón  
SPAIN

Tel.: +34 943 039 800

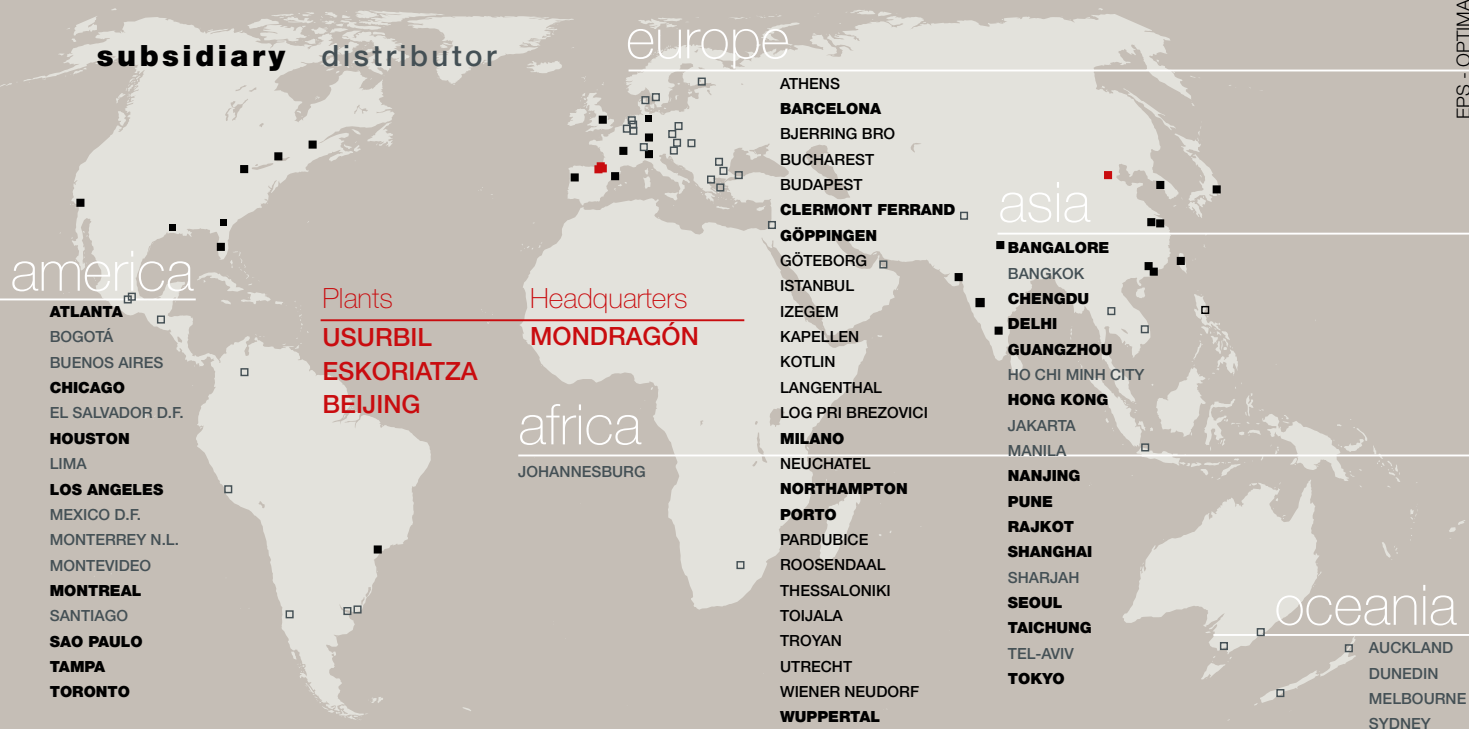
Fax: +34 943 791 712

E-mail: [contact@fagorautomation.es](mailto:contact@fagorautomation.es)

**[www.fagorautomation.com](http://www.fagorautomation.com)**



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