



Worldwide reliability

- ▶ New feedback Manufacturing Plant
- ▶ 8070 CNC. Integral solution for mold and die manufacturing
- ▶ New High Resolution Angular Encoder
- ▶ Customer feedback



Three manufacturing plants



CNC (Computerized Numerical Control).

Servo drive systems (Drives and motors). Linear and rotary feedback systems.

Digital Readouts.

FAGOR AUTOMATION especially emphasizes R&D investment by allocating it over 12% of its sales thus gaining the trust of OEM's and users worldwide. It exports over 67% of its total production to the industrialized world through a significant distribution network throughout Europe, America and Asia.

INDEX

- New Feedback Manufacturing Plant. [Pág. 4](#)
- 8070 CNC. Integral solution for mold and die manufacturing. [Pág. 6](#)
- Fagor 8055i CNC helps to reduce small shop costs. [Pág. 8](#)
- FAGOR 8055i CNC: easy to customize for special applications. [Pág. 8](#)
- FAGOR Integral Solutions for machine tool Automation. [Pág. 9](#)
- New range of high accuracy, high-resolution angular encoders. [Pág. 9](#)
- Customer feedback. [Pág. 10](#)

THREE MANUFACTURING PLANTS

Throughout the years, FAGOR AUTOMATION has been upgrading its production facilities to meet market demands. Today, FAGOR AUTOMATION has 3 production plants dedicated to offer products that meet all the requirements of the automation industry.



An ample commercial network



Fagor Automation excels especially with its vast commercial network worldwide. Fagor Automation is aware of the importance of being able to offer an immediate response to any problem that their customers may run into. This is why Fagor Automation today has 20 branch offices and over 40 exclusive distributors worldwide offering unparalleled service.

BACKED BY GREAT CORPORATION



MONDRAGON COOPERATIVE CORPORATION (MCC) is a business group integrated by over 150 companies that are also grouped in three sectors. Financial, industrial and distribution together with the Research and Training areas.

MCC is one of the 7 most important Spanish corporations, with over 60,000 employees and whose industrial groups had a turnover increase of 16.5% in the year 2002 thanks to new personnel hiring and outside vitality that resulted in international sales of 51%.

The enterprises making up the industrial group have to do with the manufacturing of semiconductors, home appliances, industrial equipment, communications systems, automotive components, machine tools, construction equipment and engineering goods.

SOME MCC FIGURES:

- Invoicing of over 9,390 million Euros.
- Over 67,000 employees comprised by the Industrial Group (30,830), Distribution Group (32,848), Financial Group (2,374) and Corporate Activity Group (982).

Corporate info



New Feedback Manufacturing Plant

Fagor Automation has always believed that our business is based on offering high quality, robust and reliable products. Together with a nearby and efficient service, this policy represents the technical core of our daily activity and effort.

Near our 25th anniversary as an independent cooperative and thanks to the daily confidence shown by our customers worldwide, we have been able to make the necessary investment on the new manufacturing plant for linear and rotary encoders. Equipped with the latest means and technologies in order to guarantee, even more if possible, the technical quality and reliability of our products.

The new plant, has three levels and it integrates the new automated logistic center that provides service to all business of Fagor Automation. With a total built surface of 10,000 m², the productive surface for encoders occupies more than 2,000m².

Its internal layout minimizes all material movements. Both within the manufacturing process and between it and the automated warehouse. The manufacturing surface is divided into two large areas: Shops for mechanical components and rooms for electronic assembly, adjustments and tests.

All the sections of the building are equipped with state-of-the-art equipment and the temperature in the entire building is computer controlled. All this to guarantee that it meets the strict conditions required by the manufacturing of high quality, high precision opto-electronic products.

Designed as a involving set of white rooms, with a greater or lesser degree of cleanliness, a system of interlocking doors and rooms with positive pressure that makes it possible to reach a temperature control of up to $\pm 0.1^{\circ}\text{C}$ in the most critical areas. This ensures that the individual calibration charts supplied to our customers are obtained under the most demanding metrology standards.



In order to ensure the integrity of the electronic components through the whole manufacturing process, all the opto-electronic sections are equipped with anti-static floor that does not generate any electrostatic discharges. Likewise, the shoes, clothes and job posts used by the operators meet the ESD (ElectroStatic Discharge) control specifications.

Computerized test benches permit individual adjustments of the encoder signal levels to make the product repeatable and homogeneous within the defined tolerances.



All linear encoders are laser calibrated and computerized and carry their own accuracy chart for all their measuring length. Their high speed features are verified and registered in a specific automated test. Likewise, the rotary encoders are subject to the same individual calibration process.

Likewise, the rotary encoders are subject to the same individual calibration process. A computer master is used to obtain its accuracy graph throughout its whole angular travel.



All the information obtained in these stages is saved in our computers and become part of the technical file of the encoder. This makes it possible to diagnose easily, quickly and efficiently any incident reported because the product sent to our customer may be easily traced.

CNC 8070 Integral solution for mold and die manufacturing

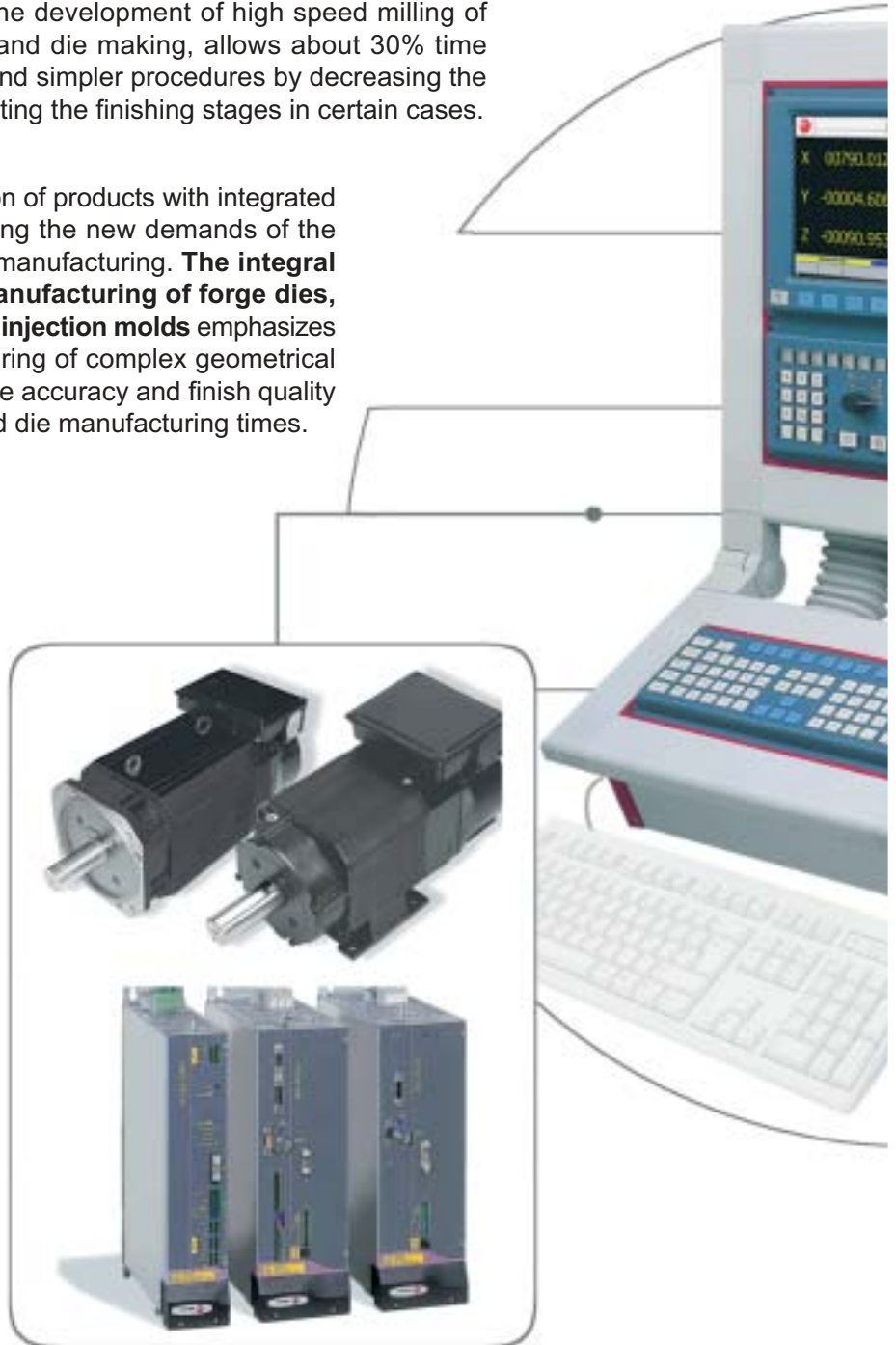
High speed machining is having a great impact in the production processes of the die and mold sector competing or complementing in certain processes with the already consolidated penetration EDM techniques. High speed machining technology offers greater productivity, better quality and lower costs by considerably reducing machining time. The efforts made in the development of high speed milling of hardened steel, widely used in mold and die making, allows about 30% time reduction versus conventional milling and simpler procedures by decreasing the number of operations and even eliminating the finishing stages in certain cases.

Fagor Automation offers a wide selection of products with integrated automation solutions capable of meeting the new demands of the production processes in mold and die manufacturing. **The integral solution 8070 CNC for automated manufacturing of forge dies, plastic injection molds and aluminum injection molds** emphasizes on needs resulting from the manufacturing of complex geometrical shapes and deep cavities and meets the accuracy and finish quality requirements while optimizing mold and die manufacturing times.

This configuration based on the 8070 CNC model, with Windows® operative system turns it into an **open architecture** CNC, it uses digital servo systems, high speed motors and linear as well as rotary feedback systems.

The FAGOR 8070 CNC model with a 10" or 12" TFT LCD flat screen offers high resolution images, up to **4 execution channels** and can control up to **16 axes and 4 spindles**.

Large CAD-CAM generated programs with a great deal of highly accurate points are used to design parts for molds and dies and require a specific CNC system treatment in order to obtain the desired precision at maximum speed.



The **8070 CNC integral solution** offers a number of competitive advantages that are mentioned next.

- It is capable of **interpreting 4th degree polynomial paths** and of converting a point-to-point based contour into a **spline** so it follows a path that goes through those points when machining it. All this makes path transition smoother and reduces the stress on the mechanical parts of the machine.
- With the **Look Ahead** and **Jerk** control features, it is possible to analyze the tool path in advance, carry out a predictive control and apply the right acc/dec control. This way, block processing time may be optimized thus increasing productivity while maintaining machining accuracy.
- The **filters for post-interpolations and anti-resonance**, besides providing smoother machining and better part-finish, also expand the life span of the machine components.
- With **Ethernet Connection**, the CNC may be configured as any other node within the computer network to save programs and enjoy faster data transmission speed (CAD-CAM generated programs) between the PC of the drawing (programming) department to the CNC.
- Using **SERCOS** interface between the CNC and the **Fagor servo drives** permits having more information on the status of the servo drives thus improving system response (position and velocity loops), apply digital filters to avoid working at conflicting frequencies, obtain greater precision and apply compensations for static friction and backlash.
- The new **Fagor high speed, hollow shaft spindle motors** of up to 16,000 rpm require very short acc/dec time and are small, with very low noise and vibration levels, ideal for working under the best conditions at high speed.
- The new **Fagor high performance linear encoders** are designed for high speed applications and can reach feedrates of up to 120 meter per minute with high accuracy and withstand vibrations of up to 20g thus achieving a very reliable system.

The 8070 CNC offers **background editing and graphic simulation** (while running another program), it also offers the **Fagor Conversational Editor** with graphic assistance to define profiles by means of known coordinates of a blueprint.

With the **Telediagnosis** option, it is possible to remotely diagnose and control all the incidences that may occur at the machine saving travel expenses and reducing machine down time. Just connect the CNC with the PC of the technical service department via modem so the technician can manipulate and observe the status of the system (CNC-drives-motors) remotely from his work table and with his own PC.

The **8070 CNC simulator** software application is also available to simulate at a PC all the functions of the 8070 CNC. Editing, executing, moving the axes, accessing the tables and machine parameters, etc. It is a very handy tool for self-teaching the CNC and at the drawing (programming) departments for preparing part-programs by previously simulating them and optimizing the processing times for the machine.



FAGOR 8055i CNC helps to reduce small shop costs

Cutting production costs appear to be one of the main challenges facing the manufacturing industry today. Whether is metal cutting or metal forming, the suppliers are being asked to cut prices more than ever before. During the '60s and '70s most Computer Numerical Control (CNC) manufacturers produced controls that only understood G-coded programming. You needed skilled people to program and operate these machines. The starts up cost were high.

Availability of skilled personnel the machine trade has always been an issue. With the introduction of many **conversational or Icon-driven** CNC controls, this problem has been resolved to some extent as the skill level required to operate these CNC machines has been reduced considerably. In the beginning such systems were a big success for low and medium-production job shops that didn't have their own CAD-CAM departments.

There are two major types of interactive systems available: Menu-driven programming systems and Icon -based conversational systems. In a menu-driven system the operator sequentially follows the menu instruction, often juggling between various screens to create a part program. The Icon- based programming system is interactive and uses graphic images to create a part program. There are no menus to follow and one machining operation can be done using one screen. The Icon-based programming system is considered to be a faster and more user friendly. It also incorporates an interactive teach-in mode that allows the CNC to operate as a manual machine.

Fagor Automation CNC 8055i TC/MC are highly advanced and offer up to three different types of programming: Icon-based conversational, G-codes both online or off line, and Built CAD/CAM system, which allows the operator to input the part drawing on the control.

These systems are ideal for all types of manufacturing shops doing low-medium or high production runs.

CNC machine tools can offer a shop cost reductions and provide flexibility at the same time. Such flexible CNC systems are the future of general purpose machining.



Note: Article written by Mr. Harsh Bibra (Manager of the Canadian branch of Fagor Automation in Ontario).

FAGOR 8055i CNC: easy to customize for special applications

The great acceptance of Fagor Automation's conversational language among CNC users, thanks to its incredibly friendly operation, has lead to a family of **Open Conversational CNC's** (8055iT/CO/MCO). These models are aimed at special applications where the machine manufacturer can easily customize the CNC to his machine's requirements by designing his own cycles and work interface.



The 8055iT/CO/MCO CNC is being used in very diverse applications including cylindrical and surface grinders, sharpeners, forming machines (pipe bending, hole punching, etc.) woodwork applications, and so on, that require specific cycles for a particular type of application.

The manufacturer can use PC-based tools to create cycles customized to the characteristics of the application. Basic operations are defined associated with each one of the cycles that make up the machining operation of the part. Every operation has its own editing screen that can show graphic help and interactive definition menus that make it easier to create custom cycles. Every operation has an associated parametric subroutine that must be defined in order to carry out the relevant machining operation

The keyboard can also be customized, not only its looks but also its functionality adapting it to the requirements of the application.

functionality of the 8055i T/M CNC since they have the features of a unit with high level programming, with the possibility of controlling up to 7 axes and 2 spindles plus the power provided by the possibility of customizing cycles, the user interface and the keyboard.

On all programming levels, ISO and conversational, it is possible to test the program in simulation mode to ensure that it runs fine before saving it and/or executing it. This feature provides considerable time saving when editing and testing programs.

FAGOR INTEGRAL SOLUTIONS

for machine tool automation

The new trends in CNC machine tools are demonstrating further more the need for tighter cooperation between machine-tool manufacturers and their suppliers of automation and control systems

Integrating all the components of an automation system requires a wide range of products and flexible communication between them in order to obtain the best results from the machine tool application to be automated.

The market's ever-increasing demands on features (speed, vibration, communication and compatibility) may be satisfied more effectively with the cooperation of a single source. The foreseeable positive effects for the manufacturer translate into obtaining a more appropriate solution for each type of application, faster product delivery and response from a single technical service for solving any incidents.

Only a few suppliers of automation solutions can offer the full range of components of whole packages. Fagor Automation is one of the manufacturers that offer an ample range of integral solutions covering the current needs of the market for machine tool automation.

- **8070 CNC Automation Solutions** with PC-based open architecture CNC's .
- **8055i CNC Automation Solution**, for high production with the choice of conversational programming.
- **Conversational Open CNC** designed for special applications.
- **Servo drive systems**.
- **Axis and spindle motors**, from simpler motors to high speed, hollow shaft spindle motors of up to 16,000 rpm.
- **Linear encoders** from 120 mm to 30 m with either differential TTL or 1Vpp signals. Designed for High speed, high accuracy applications, the new linear encoders not only offer the reliability demanded by the machine manufacturers, they also offer numerous new features further enhancing the characteristics of the previous encoder models.

Among these new features:

- **Vibration:** Up to 20g.
- **Feedrate:** Up to 120 m/min.
- **Accuracy:** Fagor linear encoders maintain their accuracy constant even at high speed and under high vibration.
- **Immune to Temperature Changes:** Errors suffered by other linear encoders due to temperature changes are drastically reduced on those manufactured by Fagor thanks to our patented new support system TDMS ®.
- **Rotary Encoders**, from general purpose models (between 50 and 5,000 pulses/turn) to high performance models (between 9,000 and 180,000 pulses/turn).

NEW RANGE OF HIGH ACCUARY, high-resolution angular encoders

The new range of encoders complements and improves on the existing range which now offers a very wide variety of angular encoders for various applications. The new models are aimed primarily at machine tool applications requiring high resolutions and high accuracy. They are already being used on rotary tables, swivel heads, C-axes of lathes and for electrode positioning in EDM machines.

The complete range now offers the following features: Accuracy grades of up to 2 arc seconds, Resolutions of up to 1 arc second, Accuracy graph with each product, 1Vpp or differential TTL signal options, Cable connector in encoder casing, Etc.

Highly stable signal: Comparative tests show that Fagor's angular encoders have better signal stability over a wider range of temperatures and speeds. This ensures high performance and reliability.

Resolutions of up to 1 arcsecond: The new range consists of 12 models which are available with a stub shaft or a hollow shaft and with TTL or 1Vpp signals. The signal is generated using Fagor's patented optoelectronic components and techniques which removes the unwanted signal harmonics and allows resolutions of up to 1 arc second to be achieved.

Guaranteed performance in harsh conditions: The product design is of such high quality that Fagor guarantees that the performance characteristics will remain stable even when subjected to vibrations of 10g and shocks of 30g.

have a hard-wired cable. Instead they use the already tried and tested reader head connector of the linear encoders, which has been incorporated into the angular encoder casing. The cable can be connected and routed after the encoder has been mounted and should the encoder need to be upgraded or replaced it would not be necessary to change the cable.



Capital goods

DURO FELGUERA HAS TRUSTED CNC FAGOR SOLUTIONS SINCE 1973

Duro Felguera is a Spanish leading group of enterprises of Engineering and building Capital Equipment and Industrial Plants with a strong international presence. Founded over 150 years ago, they recently celebrated the centennial of the consolidation of the industrial group as members company (1902). "Felguera Construcciones Mecánicas S.A", one of the most relevant in the group, actively cooperates with Fagor Automation since 1973 when they began installing Fagor dro and feedback systems on their machines.

Today, they have 15 machines equipped with Fagor CNC's for making large, high precision parts.

They are specialized in manufacturing:

- TUNNEL-DRILLING machines for the railroad industry. Currently, they are manufacturing two tunnel-drilling machines for the new Spanish high speed train AVE.
- AEOLIC energy generating towers, making their sections as well as frames, bushings and axles.
- Turbine components for the HYDRAULICS industry.
- LABORATORIES, manufacturing of components for the LHC project for the largest particle accelerator in the world.
- Manufacturing lines, tests and assembly of OFFSHORE components for OIL platforms.

Mr. Ricardo Suarez, Production manager of "Felguera Constucciones Mecánicas S.A." mentions that **"Fagor CNC systems are involved in the machining of all the components they manufacture"**.



Likewise, Mr. Rafael Blanco, Chief Engineer for the integral maintenance of the plant mentions that **"Their operating and programming ease considerably shortens the learning period for our operators and it represents a key factor of Fagor products". This advantage together with the efficient technical service response, in less than 24 hrs, and the high quality of their products are crucial for a company like ours"**.

Both Mr. Suarez and Mr. Blanco point out that **"the cooperation with Fagor to adapt the Windows-based 8070 CNC to the requirements of our machine has been very interesting and satisfactory"**.

Automation

GKN DRIVELINE VIGO: HIGH PRODUCTION WITH FAGOR CNC SYSTEM

The GKN DRIVELINE VIGO (INDUGASA) is located in Spain and it belongs to the prestigious group of enterprises **GKN Driveline**. This group has production plants in all five continents to supply products to car manufacturers on all markets worldwide.

The Spanish plant, GKN Driveline Vigo (INDUGASA), has 1000 employees and their products have the high quality demanded by the leading auto makers in the world (Peugeot-Citroën, Daimler-Chrysler, GM, Ford, Mazda, etc.).



They work in close cooperation with Fagor Automation with over 100 Fagor CNC systems on their high production machines. **"We have all types of Fagor CNC models"** says Mr. Alberto García who is in charge of maintenance. **"Fagor units are the most educational and the easiest to operate and program"**.

These high production machines are running 24 hrs a day for the full manufacturing of a vital part of the vehicle such as the transmission system, machining from the gear box to the wheel hub. Thus, Mr. García tells us that **"Considering our type of applications, we need a sturdy and reliable CNC to achieve high production within the required tolerances and a fluent technical support"**.

Extrusion Equipment

L. BANDERA: PRECISION AND RELIABILITY WITH FAGOR CNC SYSTEMS

When back in 1940 Mr Luigi Bandera built his first extrusion machine with his own hands in his tiny family company, he probably had no idea that he would become the president of company with 350 employees leader worldwide.

Mr. Mario Crespi is now the person in charge of the machine shop that uses FAGOR CNC's on lathes as well as on milling machines: **"Here we build special devices for extrusion machines, from ballscrews for extrusion to gears and gear boxes. It's company policy to manufacture everything here and we need a CNC capable of doing any type of work with valid canned cycles and a powerful high-level language"**.

The ballscrews for extrusion start with a 300 mm diameter and several meters long and are turned and ground in the shop, they are parts that must be machined with extremely high precision. Because of that and their size, their price is extremely high **"we cannot afford any mistakes; when we start machining, we must be absolutely sure of the result; for that, the graphic support as well as the program testing and the machining repositioning systems offered by FAGOR CNC's perfectly meet our demands"**.



The exclusivity of the production and the great experience accumulated over more than 60 years have taken the company to manufacture gears and motor-gearboxes that are sold in various sectors worldwide. Part precision and repeatability are crucial. The Fagor digital package (CNC plus servo drives) with Fagor feedback systems (reliable in any machining situation), guarantee full satisfaction.

"On-time delivery and quality of the products are improving in our company policy. That requires shorter machine down time". By choosing FAGOR, Mr. Mario Crespi knows that he made the right choice and is aware of the reliability shown over so many years of cooperation, the best inside diagnosis and the ever-present and qualified programming and hardware assistance.



04

FAGOR AUTOMATION

Worldwide reliability

NEWSLETTER

Fagor Automation S.Coop. (Mondragón)
B° San Andrés, s/n - Apdo. 144
E-20500 Arrasate-Mondragón, Spain
Tel.: 34 943 719 200
34 943 039 800
Fax: 34 943 791 712
E-mail: info@fagorautomation.es
www.fagorautomation.com

Fagor Automation S.Coop. (Usurbil)
B° San Esteban, s/n - Txoko Alde
E-20170 Usurbil, Spain
Tel.: 34 943 000 690
Fax: 34 943 360 527
E-mail: usurbil@fagorautomation.es



ER-073/1994
ER-0968/1/99



Fagor Automation Catalunya (Barcelona-Spain)

Tel.: 34 934 744 375 Fax: 34 934 744 327

Fagor Industriecommerz GmbH (Göppingen-Germany)

Tel.: 49 7161 15 685-0 Fax: 49 7161 15 685 79

Fagor Italia S.R.L. (Milano-Italy)

Tel.: 39 0295 301 290 Fax: 39 0295 301 298

Fagor Automation Ltda. (Leça de Palmeira-Portugal)

Tel.: 351 229 968 865 Fax: 351 229 960 719

Fagor Automation UK Ltd. (West Midlands-United Kingdom)

Tel.: 44 1327 300 067 Fax: 44 1327 300 880

Fagor Automation France S.à.r.l. (Clermont Ferrand-France)

Tel.: 33 473 277 916 Fax: 33 473 150 289

Fagor Automation (Asia) Ltd. Twn Branch (H.K.) (Taichung-Taiwan)

Tel.: 886 4 2327 1282 Fax: 886 4 2327 1283

Fagor Automation (S) Pte. Ltd. (Singapore)

Tel.: 65 684 17 345 Fax: 65 684 17 348

Beijing Fagor Automation Equipment Co., Ltd. (Beijing-China)

Tel.: 86 10 64 64 19 51 Fax: 86 10 64 64 19 54

Beijing Fagor Automation Equipment Ltd. (Nanjing-China)

Tel.: 86 25 332 82 59 Fax: 86 25 332 82 60

Fagor Automation (Asia) Ltd. (Hong Kong)

Tel.: 852 23 89 16 63 Fax: 852 23 89 50 86

Beijing Fagor Automation Equipment Co., Ltd. (Guangzhou China)

Tel.: 86 20 86 55 31 24 Fax: 86 20 86 55 31 24

Beijing Fagor Automation Equipment Co., Ltd. (Shangai-China)

Tel.: 86 21 63 53 90 07 Fax: 86 21 63 53 88 40

Fagor Automation Korea, Ltd. (Seoul-Korea)

Tel.: 82 236 652 923 Fax: 82 236 652 925

Fagor Automation do Brasil Com. Imp. Exp. Ltda. (São Paulo-Brasil)

Tel.: 55 11 56 94 08 22 Fax: 55 11 56 81 62 71

Fagor Automation Corp. (Chicago-USA)

Tel.: 1 847 98 11 500 Fax: 1 847 98 11 311

Fagor Automation West Coast (California-USA)

Tel.: 1 714 957 98 85 Fax: 1 714 957 98 91

Fagor Automation East Coast (New Jersey-USA)

Tel.: 1 973 773 35 25 Fax: 1 973 773 35 26

Fagor Automation South East (Florida-USA)

Tel.: 1 813 654 45 99

Fagor Automation Ontario (Mississauga-Canada)

Tel.: 1 905 670 74 48 Fax: 1 905 670 74 49

Fagor Automation Quebec (Montreal-Canada)

Tel.: 1 450 227 05 88 Fax: 1 450 227 61 32

Fagor Automation Windsor (Canada)

Tel.: 1 519 944 56 74 Fax: 1 519 944 23 69

