Linear and Angular encoders

FAGOR

FAGOR AUTOMATION

THE BEST ALTERNATIVE FOR

Linear and Angular

Over 30 years guaranteeing measurement and control solutions

Fagor Automation has been manufacturing linear and rotary encoders with high quality and highly reliable optic technology since 1975.

Nowadays, Fagor Automation's feedback systems are the most efficient and profitable alternative to be integrated into Machine-Tools.

System test

FAGOR encoders are integrated as components of a full system; this type of applications requires a thorough test on the whole system regardless of the specifications of the encoder.

The specifications shown in this catalog only apply to the specific encoder, not to the whole system.

Encoders

Optical design

Fagor uses transmission and reflective optics in its range of encoders besides patented techniques and components. Scanning techniques such as the single field and the three-phase scanning provide high-quality signals that minimize interpolation errors down to an insignificant level.

Mechanical design

FAGOR's mechanical developments have produced some of the most innovative and efficient methods for minimizing the effects of especially harsh environments often found in machine-tool applications.

Electronic design

The electronic state of the art provides a perfect relationship between the reader head and the linear encoder. High resolution is achieved at high speed thanks to their great signal stability.

All the models meet the industrial standards. Their signals, protocols and hardware are compatible with most controllers on the market.

Accuracy certificate

Every single FAGOR linear encoder is subjected a final accuracy test carried out on a computerized measuring bench equipped with a LASER interferometer located inside a climate-controlled chamber at a temperature of 20 ºC (68 ºF).

Enclosed linear encoders

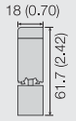
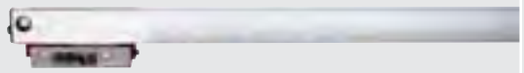
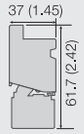
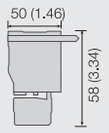
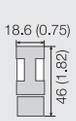
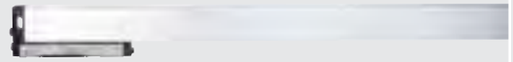
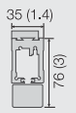
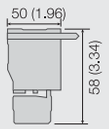
Fagor sealed linear encoders provide a robust and reliable solution for applications requiring high levels of positional control in demanding operating conditions and environments. The mechanical, electronic and optical designs of the linear encoders ensure consistency in technical specification and functional characteristics and minimise the effect of errors.

Incremental linear encoders

Fagor's range of incremental encoder products optimises the balance between commercial and technical constraints. As such they provide solutions for a great variety of applications ranging from manually operated machinery to high speed automatic control systems. Signal (TTL and 1Vpp) and connection options provide compatibility with all leading DRO and CNC applications while other operational features and options ensure reliable and consistent performance.

Absolute linear encoders

The absolute linear encoders from Fagor encompass all the benefits of the incremental encoders with the added feature of absolute position values. These absolute values are generated using optical recognition technology and data is transmitted via a variety of protocols to provide compatibility with all leading drive and CNC systems. The scales can provide sub micron resolution (up to 0,05µm) and can operate in purely digital or in digital and analogue modes. Fagor is a pioneer in the development of optical linear encoder technology and is the first company to provide a reflective, absolute steel tape encoder with measuring lengths of up to 20 metres.

	Series	Cross section	Model	Description	Measuring lengths	Accuracy
Linear encoders for CNC machines	S			Small section for installation in limited space	Without guide bar: 70 mm to 1240 mm With guide bar: 70 mm to 2040 mm	± 5 µm & ± 3 µm
	G			Wide section	140 mm to 3040 mm	± 5 µm & ± 3 µm
	L			For great measuring lengths	440 mm to 30 m Up to 4040 mm in a single module; with successive modules from this length on	± 5 µm
Linear encoders for conventional machines	M			Small section for installation in limited space	140 mm to 1540 mm	± 10 µm
					140 mm to 1240 mm	± 5 µm
	C			Wide section	220 mm to 3040 mm	± 10 µm & ± 5 µm
	F			For great measuring lengths	440 mm to 30 m Up to 4040 mm in a single module; with successive modules from this length on	± 10 µm

Three-phase scanning

PATENTED by FAGOR

An optical incremental scanning system with integrated signal gain control which provides a robust feedback signal and permits high interpolation factors with minimal interpolation error.

Zig Zag technology

PATENTED by FAGOR

This innovative method reduces the effects of unwanted harmonics in the feedback signal thus providing a purer interpretation of the displacement.

FL Reflective scanning method

PATENTED by FAGOR

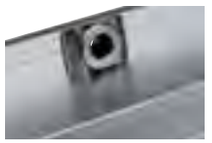
An optical single scanning method which tolerates and compensates for irregularities which may occur as a result of contamination or installation irregularities.

Fringe scanning

PATENTED by FAGOR

A purpose built optical array designed to optimise optical scanning and increase signal reliability.

TDMS® mounting systems



PATENTED by FAGOR

This mounting system allows reduction in the errors which can be induced into linear encoders as a result of thermal changes.

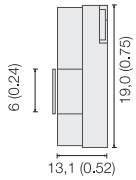
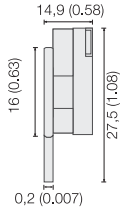
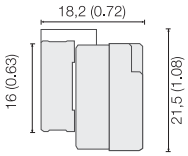
Exposed linear encoders

Fagor's range of exposed linear encoders integrate the experience and technologies of the sealed linear encoders in a reduced size, non-contact linear encoder system. The commercial and technical features respond to the increasingly competitive market demands for optical linear encoders, resulting in a reliable, high performance product with the support and response expected from a worldwide organisation.

Exposed linear encoders

The range of exposed linear encoders consists of three main models; EXA, EXG and EXT. The modular nature of each of these products allows them to be configured, which allows them to be matched to a diverse range of applications such as metrology, semiconductor, linear motors etc...

The technology used results in a robust and resilient solution that answers current market requirements for resolution, speed and accuracy. All interpolation electronics are incorporated into the reader head as are the dual limit detector switches and feedback alarm signal. The reference marks are synchronised and integrated into the incremental track, allowing repeatable reference searches.

	Cross section	Model	Description	Measuring lengths	Accuracy
EXA Exposed linear encoders			Self adhesive 6 mm stainless steel tape for limited space applications	until 16 m	± 10 µm
EXG Exposed linear encoders			Guided, 10 mm stainless steel tape with intermediate fixing point for defined thermal behaviour	until 6 m	± 10 µm
EXT Exposed linear encoders			10 mm stainless steel tape for increased accuracy and linear error compensation	until 30 m	± 5 µm

Reader head

The reader head is available with 1 Vpp & TTL signals, alarm & limit signals and reference mark options, making the complete range of products adaptable to a wide range of applications.

Accessories



The exposed scale comes with various accessories. Magnetic actuators are used for limit switch activation and for selecting reference marks. Reader head alignment is aided by using the transparent installation slips and the signal strength device.

SIR reference marks

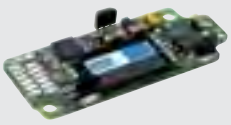
PATENTED by FAGOR

The SIR reference marks are optically synchronised and integrated into the incremental track. This allows even the most restricted installation spaces to benefit from the advantages of optically synchronised reference marks.

Stainless steel measuring standards

Fagor's reflective scales are manufactured from stainless steel to making them robust and resilient to mechanical and chemical damage.

Electronics in reader head



As well as containing the optical scanning system, the reader head also houses the signal conditioning and interpolation electronics, signal alarm circuitry, reference mark selection sensor and limit sensors.

Angular encoders

FAGOR angular encoders provide high resolution and high quality solutions and may be used in applications such as indexers, rotary tables with NC positioning, angular metrology, aerials, telescopes, etc.

Angular encoders

These are some of the main features of FAGOR angular encoders:

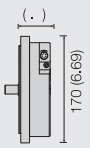
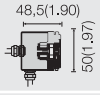
. Number of pulses: between 18000 and 360000
. Accuracy of ±5", ±4", ±2.5 and ± 2"
. Differential TTL square and 1 Vpp sinusoidal signals
. With a solid shaft and 90 /170 mm diameter or an incorporated flexible coupling (hollow shaft) and 90 / 200 mm diameter
. With a connector built-into the encoder housing
. With differential TTL or 1 Vpp sinusoidal output signals

Reference marks (I0)

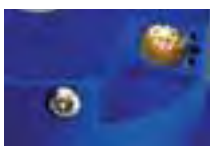
. One reference mark per turn
. Distance-coded reference marks throughout the whole circumference

Alarm signal

All angular encoders with differential TTL signal offer the alarm signal /AL

	Series	Section	Model	Pulses/turn	Type of axis	Accuracy
Angular encoders	S D90			18000, 90000 & 180000	Solid shaft	± 5”, ± 2” (arc-seconds)
				18000	Solid shaft	± 5”, ± 2” (arc-seconds)
	H D90			18000, 90000 & 180000	Hollow shaft	± 5”, ± 2.5” (arc-seconds)
				18000	Hollow shaft	± 5”, ± 2.5” (arc-seconds)
	S1024 D90			90000-1024	Solid shaft	± 5” (arc-seconds)
				18000-1024	Solid shaft	± 5” (arc-seconds)
	S D170			90000, 180000 & 360000	Solid shaft	± 2” (arc-seconds)
				18000	Solid shaft	± 2” (arc-seconds)
	H D200			90000, 180000 & 360000	Hollow shaft	± 2” (arc-seconds)
				From 18000 to 36000	Hollow shaft	± 2” (arc-seconds)
Rotary encoders	S			From 50 to 5000	Solid shaft	± 1/10 of the pitch
	H			From 50 to 3000 (TTL)	Hollow shaft	± 1/10 of the pitch
				From 1000 to 3000 (1 Vpp)	Hollow shaft	± 1/10 of the pitch
	HA			From 1024 to 10000	Hollow shaft	± 1/10 of the pitch

Connector in housing



The angle encoder has a connector in the housing as opposed to a hard wired cable thus easing the installation procedure and providing greater flexibility with applications.

Couplings

As well as the angular encoders Fagor provide special purpose couplings. Unlike other couplings, Fagor couplings are designed to ensure maximum transmission of accuracy while exerting minimal force and stress on the encoder axis.

Materials

Titanium and stainless steel result in improved frequency response characteristics and signal stability over the working temperature range.

Fagor Automation S. Coop.

Bº San Andrés, 19 – P.O.Box 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 holds the ISO 9001 Quality System Certificate and the CE Certificate for all its products.

EUROPE

DE - Fagor Automation GmbH (Göppingen)
Tel. 49 7161 15 6850 Fax: 49 7161 15 685 79

ES - Fagor Automation Catalunya (Barcelona)
Tel. 34 934 744 375 Fax: 34 934 744 327

FR - Fagor Automation France S.à.r.l. (Clermont Ferrand)
Tel. 33 473 277 916 Fax: 33 473 150 289

GB - Fagor Automation UK Ltd. (West Midlands)
Tel. 44 1327 300 067 Fax: 44 1327 300 880

IT - Fagor Italia S.R.L. (Milano)
Tel. 39 0295 301 290 Fax: 39 0295 301 298

PO - Fagor Automation Ltda. (Leça da Palmeira)
Tel. 351 229 968 865 Fax: 351 229 960 719

RU - Fagor Automation Russia. (Moscow)
Tel. 7 4966 161 895

AMERICA

BR - Fagor Automation do Brasil Com. Imp. Exp. Ltda. (São Paulo)
Tel. 55 11 56 94 08 22 Fax: 55 11 56 81 62 71

CA - Fagor Automation Ontario (Mississauga)
Tel. 1 905 670 74 48 Fax: 1 905 670 74 49

Fagor Automation Quebec (Montreal)
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

US - Fagor Automation Corp. (Chicago)
Tel. 1 847 98 11 500 Fax: 1 847 98 11 311

Fagor Automation West Coast (California)
Tel. 1 714 957 98 85 Fax: 1 714 957 98 91

Fagor Automation East Coast (New Jersey)
Tel. 1 973 773 35 25 Fax: 1 973 773 35 26

Fagor Automation Texas (Houston)
Tel. 1 281 463 39 15 Fax. 1 281 463 39 19

Fagor Automation South East (Florida)
Tel. 1 813 654 45 99 Fax: 1 813 654 3387

ASIA

CN - Beijing Fagor Automation Equipment Co., Ltd. (Beijing)
Tel. 86 10 84505858 Fax: 86 10 84505860

Beijing Fagor Automation Equipment Ltd. (Nanjing)
Tel. 86 25 83 32 82 59 Fax: 86 25 83 32 82 60

Beijing Fagor Automation Equipment Ltd. (Chengdu)
Tel. 86 28 66 13 20 81 Fax. 86 28 66 13 20 82

Beijing Fagor Automation Equipment Co., Ltd. (Guangzhou)
Tel. 86 20 86 55 31 24 Fax: 86 20 86 55 31 25

Beijing Fagor Automation Equipment Co., Ltd. (Shanghai)
Tel. 86 21 63 53 90 07 Fax: 86 21 63 53 88 40

HK - Fagor Automation (Asia) Ltd., (Hong Kong)
Tel. 852 23 89 16 63 Fax: 852 23 89 50 86

IN - Fagor Control Systems Pvt. Ltd. (Bangalore)
Tel. +91 (0)8042682828 Fax: +91 (0)8042682816

KR - Fagor Automation Korea, Ltd. (Seoul)
Tel. 82 2 21 13 03 41 / 2113 0342 Fax: 82 2 21 13 03 43

MY - Fagor Automation (M) SDN.BHD. (Kuala Lumpur)
Tel. 60 3 8062 2858 Fax: 60 3 8062 3858

SG - Fagor Automation (S) Pte. Ltd. (Singapore)
Tel. 65 68417345 / 68417346 Fax: 65 68417348

TW - Fagor Automation Taiwan Co. Ltd. (Taichung)
Tel. 886 4 2 385 1558 Fax: 886 4 2 385 1598

MONDRAGON
HUMANITY AT WORK
Finance Industry Retail Knowledge

FAGOR
FAGOR AUTOMATION
Worldwide reliability

EUSKOPI CAP - EN 0709