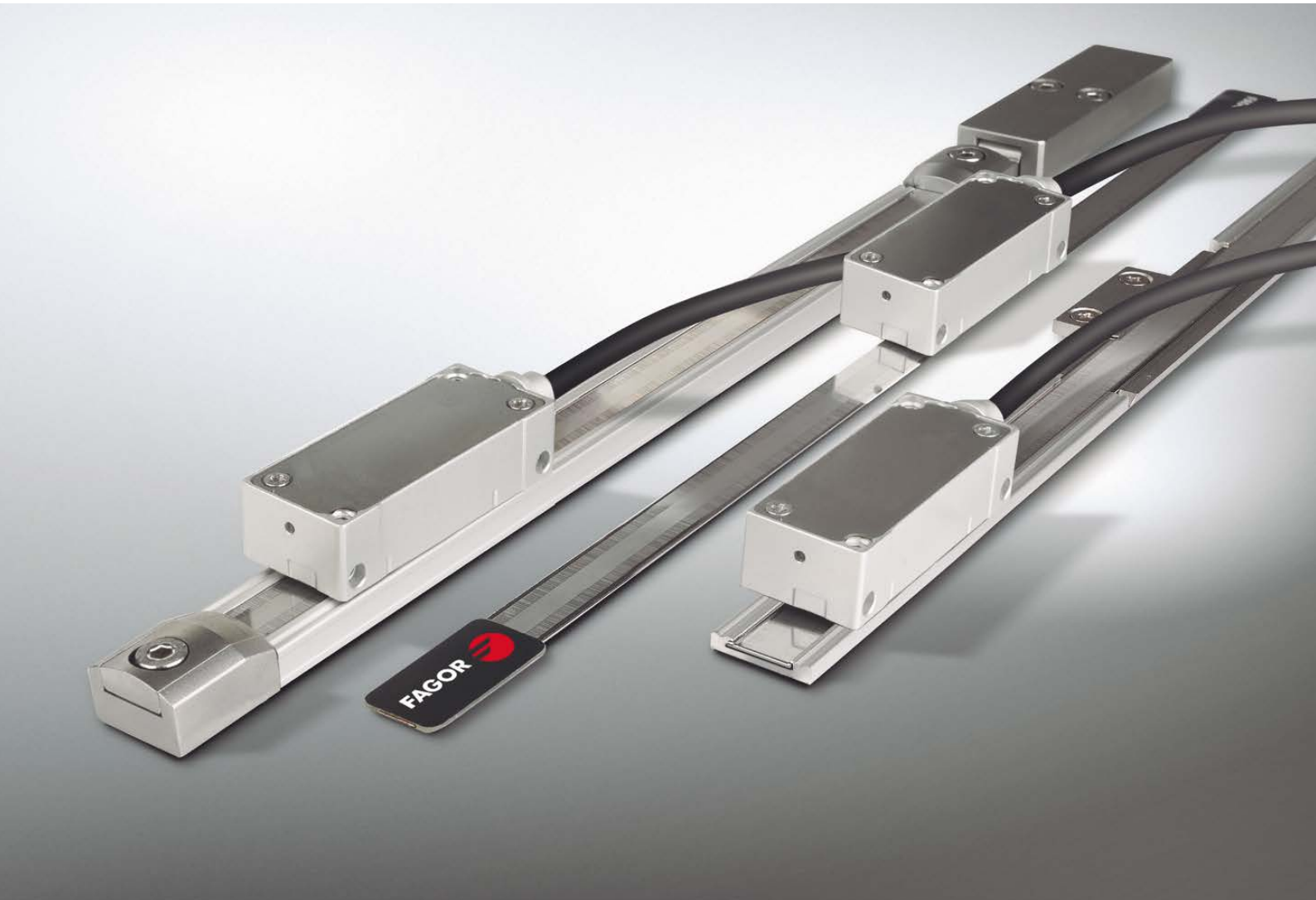
Non-contact absolute

LINEAR ENCODERS

FAGOR AUTOMATION

Open to your world



NON-CONTACT ABSOLUTE

LINEAR ENCODERS

OVER 45 YEARS OF
CONTINUOUS EVOLUTION

Fagor Automation has been manufacturing high quality angular and rotary encoders using precision optical technology for more than 45 years.

Over the years Fagor has created, developed and patented systems, components and technologies that allow us to offer best quality and features over the complete range of product utilizing innovative production methods.

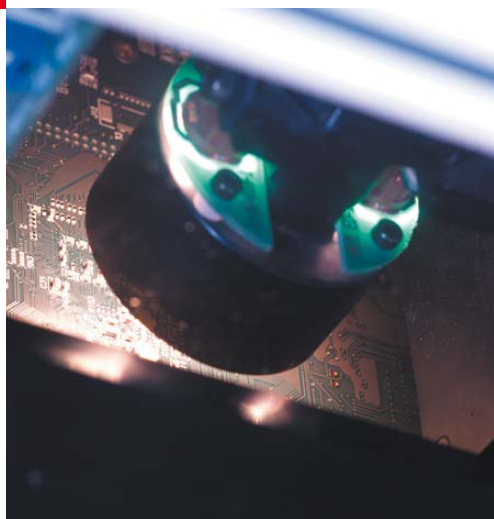
Hence making Fagor Automation the most efficient alternative in the world of feedback systems.

MODERN FACILITIES AND INNOVATIVE PROCESSES

In order to ensure quality and reliability in all its products Fagor Automation utilizes the most advanced technology and testing and manufacturing facilities. From centralized computer control temperature monitoring, cleanliness and relative humidity control, a must for the feedback system manufacturing process, to laboratories for climate, vibration and EMC testing to certify the designs.

WITH STATE-OF-THE-ART TECHNOLOGY

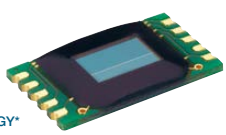
Fagor Automation's commitment to this technology and quality is evident by creation of **Aotek** in 2002, a dedicated research center providing various technological breakthroughs. This investment has resulted in large number of patents and customized solutions in electrical, optical and mechanical fields.



FAGOR TECHNOLOGY*

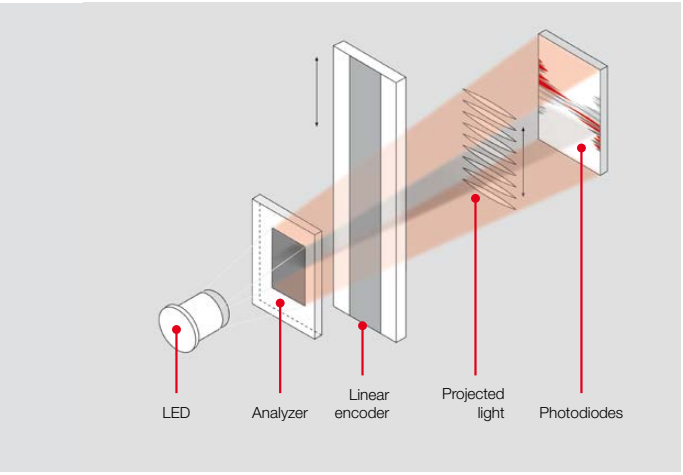
SIR reference marks

FAGOR TECHNOLOGY*



Single-window scanning

(*) Over its history, Fagor Automation has developed its own technology, which has been registered in a large number of patents.



SUPERIOR TECHNOLOGY AND INNOVATIVE DESIGN

Fagor Automation develops with maximum professionalism the three cornerstones in encoder design: optical design, electronic design and mechanical design that result in a state-of-the-art product.

Optical design

In the vanguard of measuring technology, Fagor Automation uses transmission and reflective optics in its range of encoders.
With new scanning techniques, such as the new single-window scanning technology , more immune to contamination, which is critical for operations in extreme conditions, and contributes to attaining high quality signals that minimize interpolation errors, resulting in improved accuracy of the measurement system.

Electronic design

Fagor Automation uses latest generation integrated electronic components in their design. Owing to that, the optimization of the signals at high traversing speeds is achieved, with micrometric accuracy and nanometric resolution.

Mechanical design

Fagor Automation designs and manufactures the most innovative and reliable measuring systems using its advanced mechanical designs. These designs, together with the materials used contribute to the required product robustness to ensure the best performance in their different applications.

Technology

The absolute measurement system is a direct digital measure of machine position. It is fast, accurate and does not require homing of the machine. The position value is available from the moment the machine is turned on and may be requested by the connected device (CNC) at any time.

The absolute encoders provide direct measure of machine position without using any intermediate device.
The positioning errors originating from machine mechanics are minimized as the encoder is directly mounted to the machine surface and the guide ways. Some of the potential sources of such errors in a machine tool such as lead screw pitch, certain amount of backlash and thermal behavior can be minimized using these encoders.

The open design allows transmitting the machine movement and reading its position accurately and without contact; therefore without friction between the reader head and the graduated scale. All the electronics, including interpolation, is integrated into the reader head. The technology used provides a robust and compact solution with high accuracy and resolution at high speed.

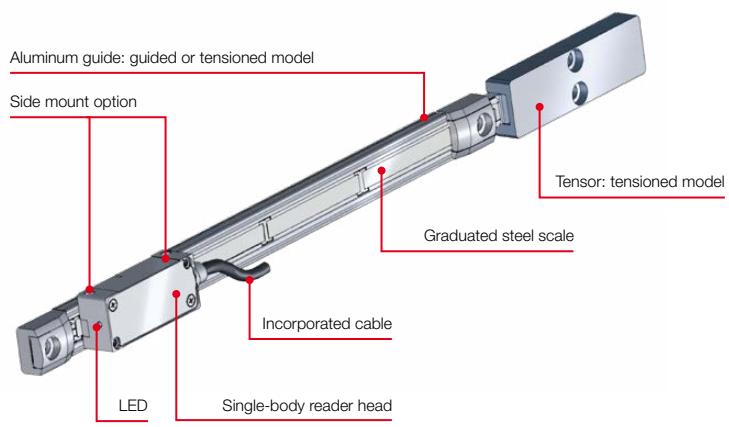
Linear Encoders

Fagor's non-contact open absolute linear encoders use the auto imaging principle which uses diffuse light reflected from the graduated steel tape. The reading system consists of an LED, as the light source of the linear encoder; a reticule that makes the image and a monolithic photo detector element in the plane of the image especially designed and patented by Fagor Automation.

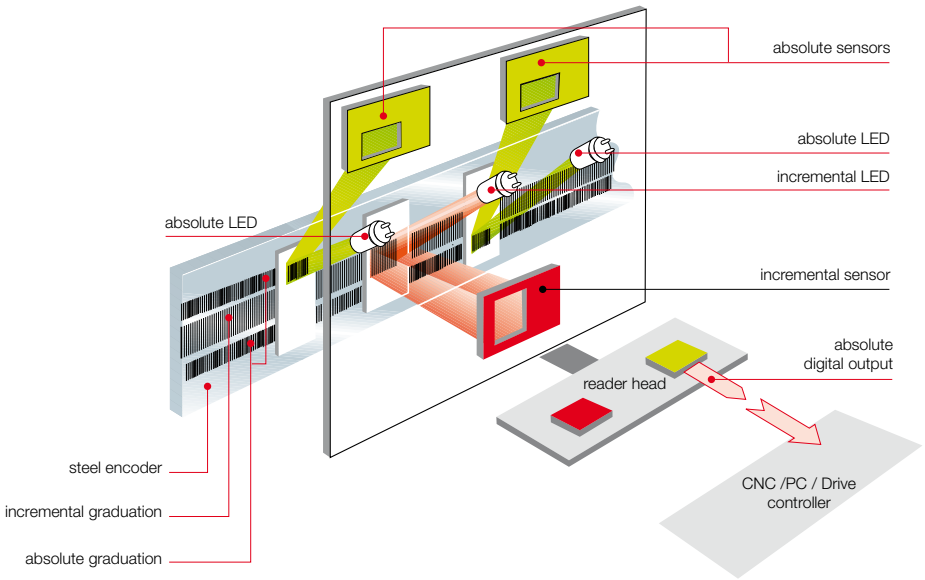
The measuring method has two different etchings:

- **Incremental graduation:** Used to generate incremental signals that are counted inside the reader head.
- **Absolute graduation:** It is a binary code with a special sequence that avoids repetition all along the measuring length of the encoder.

On Fagor absolute encoders, the absolute position is calculated using the data of that code read by means of a high precision optical sensor.



Graduated steel encoder



ELECTRICAL OUTPUT

SIGNALS

They are defined according to the communication protocol. Protocols are specific communication languages used by linear or angular encoders to communicate with the machine controller (CNC, drive, PLC, etc.).

There are different communication protocols depending on the CNC manufacturer: FAGOR, FANUC®, MITSUBISHI®, SIEMENS®, PANASONIC® and others.

PANASONIC® systems

Serial Communication

These systems only use digital signals. The absolute encoder is connected through the MINAS series drive.

- The systems can be connected to linear motors, rotary motors and DD motors.
- Automatic drive/motor matching software available.
- Vibration, resonance suppression filters available with setting done automatically / manually.
- Drive range from 50 W to 15 kW at AC 100 V / 200 V / 400 V.
- Safety Torque Off feature available.

MITSUBISHI® systems

High Speed Serial Interface - HSSI

These systems only use digital signals. The absolute encoder is connected through the MDS or MR-J4 Series drives and it is valid for MITSUBISHI® communication protocol versions Mit 03-2/4.

YASKAWA® Systems

Linear Encoder Serial Communication Interface

These systems only use digital signals. The absolute encoder is connected through the Sigma 5 and Sigma 7 series drive.

FAGOR systems

Fagor FeeDat® Serial Interface

These systems only use digital signals.
The absolute encoder is connected through QUERCUS drive system.

A high communication speed of 10 MHz provides a loop time of 10 microseconds. Communication also includes alarms, analog signal values and other encoder parameters.

Fagor FeeDat® is an open communication protocol that is also used to communicate with other CNC system manufacturers.

Systems with BiSS® C interface

Fast Serial Interface for sensors

These systems only use digital signals. The absolute encoder with BiSS® C BP3 protocol is compatible with BiSS® C Unidirectional.

The absolute encoder is connected to the drive or system with BiSS® C BP3 or BiSS® C unidirectional interface. Please contact FAGOR for information on compatibility of the encoders with these systems.

Other systems

Please contact FAGOR for information on compatibility of the encoders with other systems.

SIEMENS® systems

DRIVE-CLiQ® Interface

These systems only use digital signals.
The absolute encoder is connected through a cable having the electronics integrated into the connector and it is connected to the Solution Line and Sinumerik One families without the need for intermediate modules.

Systems with Serial Synchronous Interface - SSI

These systems only use digital signals. The absolute encoder is connected through the drive or system with SSI interface, only for digital signals.

Please contact FAGOR for information on compatibility of the encoders with these systems.

Range

Analyze the application to make sure that the proper encoder will be selected for the machine.

To do this, bear in mind the following considerations:

Installation

Consider the physical length of the installation and the space available for it.

These aspects are crucial to determine the type of linear encoder to use.

Mechanical Design:

EXA: adhesive model with the smallest cross section for constraint spaces, it consists of an engraved steel tape glued directly onto the machine surface, recommended if the tape is under thermally stable conditions.

EXG: guided model for long measuring lengths it comprises an aluminium extrusion glued to the surface and an engraved steel tape. The steel tape is guided in the extrusion and secured in the mid point to the machine surface that allows the tape to expand/contract freely at its ends and ensures a defined thermal behaviour.

EXT: tensioned model for very long measuring lengths and high accuracy it comprises an aluminium extrusion glued or screwed to the surface, an engraved steel tape and tensioning system. The steel tape is guided in the extrusion and tensioned between its ends. The tensioned steel tape is fixed on the machine base so it replicates the thermal behaviour of the surface.

Accuracy

Each linear encoder is subjected to quality control showing its accuracy along its measuring length.

Signal

The signal selection considers the communication protocols compatible with the main CNC and drives manufacturers.

Resolution

The resolution of the control of machine depends on the linear encoder.

Cable length

The length of the cable depends on the type of signal.

Compatibility

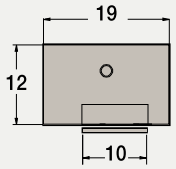
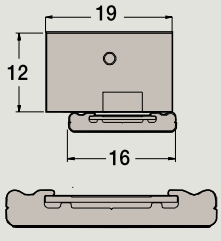
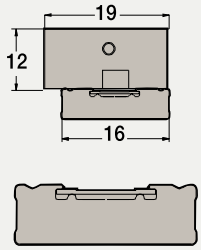
The signal must be compatible with the control system.

Speed

The speed requirements for the application must be analyzed before choosing the linear encoder.

Shock and Vibration

Fagor linear encoders withstand vibrations of up to 200 m/s^2 and shocks of up to 1000 m/s^2.

Series	Section
Absolute **EXA** Adhesive	
Absolute **EXG** Guided	
Absolute **EXT** Tensioned	

	Measuring lengths	Accuracy	Signals	Pitch Resolution up to	Model
	70 mm up to 16 020 mm	± 10 µm/m	SSI	0.01 µm	TAA + L2A
			PANASONIC®	0.01 µm	TAA + L2AP
			MITSUBISHI®	0.01 µm	TAA + L2AM / L2AMH
			BiSS® C	0.01 µm	TAA + L2ABC
			FAGOR	0.01 µm	TAA+L2AD
			SIEMENS® (*)	0.01 µm	TAA+L2AD + XC-C8-PA-DQ-M
			YASKAWA®	0.009765625 µm	TAA + L2AK
	240 mm up to 6 040 mm	± 10 µm/m	SSI	0.01 µm	PG+TGA + L2A
			PANASONIC®	0.01 µm	PG+TGA + L2AP
			MITSUBISHI®	0.01 µm	PG+TGA + L2AM / L2AMH
			FAGOR	0.01 µm	PG+TGA+L2AD
			SIEMENS® (*)	0.01 µm	PG+TGA+L2AD + XC-C8-PA-DQ-M
			BiSS® C	0.01 µm	PG+TGA + L2ABC
			YASKAWA®	0.009765625 µm	PG+TGA + L2AK
	140 mm up to 30 040 mm	± 5 µm/m	SSI	0.01 µm	PT + TTA + L2A
			PANASONIC®	0.01 µm	PT + TTA + L2AP
			MITSUBISHI®	0.01 µm	PT + TTA + L2AM / L2AMH
			FAGOR	0.01 µm	PT+TTA+L2AD
			SIEMENS® (*)	0.01 µm	PT+TTA+L2AD + XC-C8-PA-DQ-M
			BiSS® C	0.01 µm	PT + TTA + L2ABC
			YASKAWA®	0.009765625 µm	PT + TTA + L2AK

EXA series ADHESIVE

Non-contact open linear encoder for high accuracy, high speed applications.

It consists of a compact reader head with all the electronics and optics integrated into a single body that may be mounted from the side or from the top.

It has an LED to help mounting it and includes a 1 or 3 meter cable with a connector, a 10 mm wide adhesive reflective stainless steel tape that is highly resistant to solvents.

Measuring lengths in millimeters:

Available from 70 mm to 16,020 mm in 50 mm increments.

Model description:

TAA + L2A: non-contact open linear encoder with a reader head that uses SSI protocol and an adhesive absolute tape.

TAA + L2AM: non-contact open linear encoder with a reader head that uses MITSUBISHI® CNC full duplex protocol and an adhesive absolute tape.

TAA + L2AMH: non-contact open linear encoder with a reader head that uses MITSUBISHI® CNC half duplex protocol and an adhesive absolute tape.

TAA + L2AP: non-contact open linear encoder with a reader head that uses PANASONIC® (Matsushita) protocol and an adhesive absolute tape.

TAA + L2ABC: non-contact open linear encoder with a reader head that uses BiSS® C protocol and an adhesive absolute tape.

TAA+L2AD: non-contact open linear encoder with a reader head that uses FeeDat® protocol for FAGOR and others and an adhesive absolute tape.

TAA+L2AD + XC-C8-PA-DQ-M: non-contact open linear encoder with a reader head that uses DRIVE-CLiQ® protocol for SIEMENS® (Solution Line and Sinumerik One) and an adhesive absolute tape.

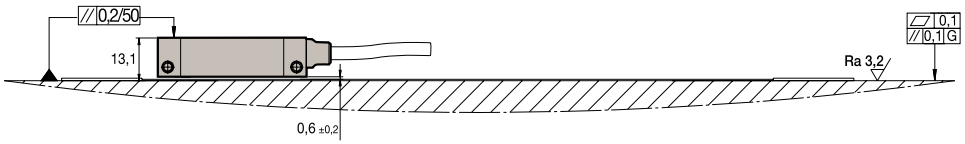
TAA + L2AK: non-contact open linear encoder with a reader head that uses YASKAWA® protocol and an adhesive absolute tape.

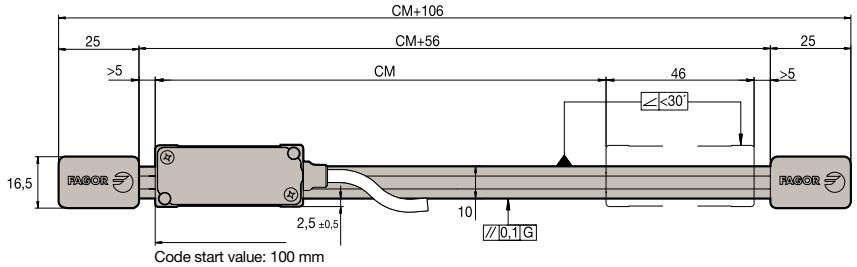
Characteristics

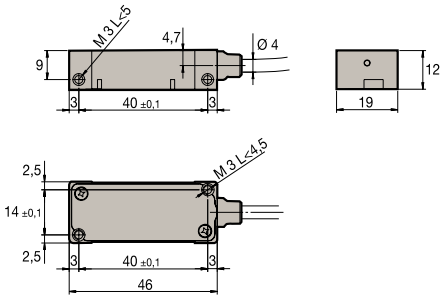
	TAA + L2A	TAA + L2AM / TAA + L2AMH	TAAA + L2AP	TAA + L2ABC	TAA + L2AD	TAA+L2AD + XC-C8-PA-DQ-M	TAA + L2AK
Measurement	**Incremental:** By means of a 20 µm-pitch stainless steel tape **Absolute:** Optical reading of sequential binary code						
Steel tape thermal expansion coefficient	α_{therm}: ≈ 11 ppm/K.						
Measuring resolution	0.01 µm / 0.05 µm						0.009765625 µm / 0.078125 µm
Maximum speed	480 m/min						
Maximum cable length	75 m (1)	30 m		50 m	100 m	Up to 100 m (2)	30 m
Supply voltage	5V ± 10 %, < 250 mA (without load)						
Reader head	1 or 3 meter cable with a connector						
Reader head protection	IP 40						
Accuracy	± 10 µm/m						
Maximum vibration	200 m/s² (55 … 2000 Hz) IEC 60068-2-6						
Maximum shock	1000 m/s² (11 ms) IEC 60068-2-27						
Operating temperature	0 °C … 50 °C						
Storage temperature	-20 °C ... 70 °C						
Weight	0.17 kg + 0.025 kg/m						
Relative humidity	20 … 80 %						

(1) Contact Fagor Automation for maximum cable length.
(2) Depending on CNC model. Consult SIEMENS® documentation.

Dimensions in mm







Additional information can be found in the technical documentation and installation manual available on the website ***www.fagorautomation.com***

Order identification

Example of Non-contact linear Encoder: TAA-62 + L2AP10-3C9D

Tape

TAA	62
Absolute graduated tape for the adhesive model	***Measuring lengths in centimeters:*** In the example 62 = 620 mm

Reader head

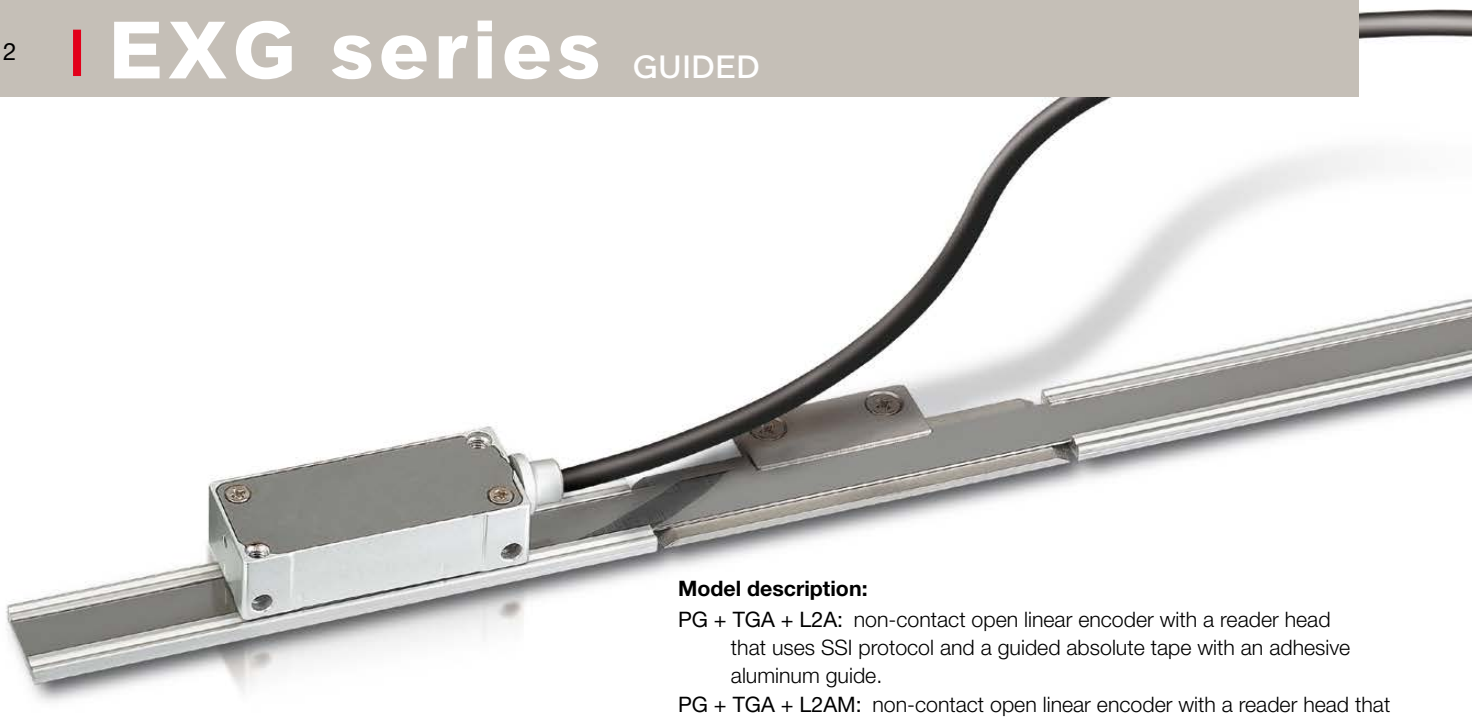
L2	A	P	10	3	C9D
Single-body reader head with LED	***Letter identifying the absolute encoder***	***Type of communications protocol:*** • Blank space: SSI protocol (FAGOR) • M: MITSUBISHI® CNC protocol full duplex • MH: MITSUBISHI® CNC protocol half duplex • **P: PANASONIC® (Matsushita) protocol** • B: BiSS® C protocol • D: FeeDat® protocol (FAGOR) (1) • K: YASKAWA® protocol	***Resolution:*** 50: 0.05 µm **10: 0.01 µm** 211: 0.009765625 µm (2) 208: 0.078125 µm (2)	**Cable length:** 1: 1 meter **3: 3 meters**	***Connector:*** • DA: Sub D HD 15 M • MB: MITSUBISHI® • PN5: PANASONIC® • PN: YASKAWA® • **C9D: 17-pin round connector** (3)

(1) Plus XC-C8-PA-DQ-M with DRIVE-CLiQ® protocol for SIEMENS® (Solution Line and Sinumerik One).

(2) Only for YASKAWA® model.

(3) MITSUBISHI® models with ferrite. Description C9D-F.

EXG series GUIDED



Non-contact open linear encoder for high accuracy, high speed applications.

It consists of a compact reader head with all the electronics and optics integrated into a single body that may be mounted from the side or from the top.

It has an LED to help mounting it and includes a 1 or 3 meter cable with a connector, a 10 mm wide reflective stainless steel tape that is highly resistant to solvents on an adhesive aluminum guide.

Measuring lengths in millimeters:

Available from 240 mm to 6,040 mm in 100 mm increments.

Model description:

PG + TGA + L2A: non-contact open linear encoder with a reader head that uses SSI protocol and a guided absolute tape with an adhesive aluminum guide.

PG + TGA + L2AM: non-contact open linear encoder with a reader head that uses MITSUBISHI® CNC full dupllex protocol and a guided absolute tape with an adhesive aluminum guide.

PG + TGA + L2AMH: non-contact open linear encoder with a reader head that uses MITSUBISHI® CNC half duplex protocol and a guided absolute tape with an adhesive aluminum guide.

PG + TGA + L2AP: non-contact open linear encoder with a reader head that uses PANASONIC® (Matsushita) protocol and a guided absolute tape with an adhesive aluminum guide.

PG +TGA + L2ABC: non-contact open linear encoder with a reader head that uses BiSS® C protocol and a guided absolute tape with an adhesive aluminum guide.

PG +TGA + L2AD: non-contact open linear encoder with a reader head that uses FeeDat® protocol for FAGOR and others and a guided absolute tape with an adhesive aluminum guide.

PG +TGA + L2AD + XC-C8-PA-DQ-M: non-contact open linear encoder with a reader head that uses DRIVE-CLiQ® protocol for SIEMENS® (Solution Line and Sinumerik One) and a guided absolute tape with an adhesive aluminum guide.

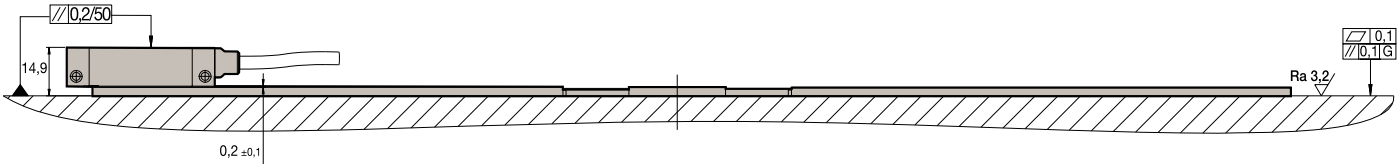
PG + TGA + L2AK: non-contact open linear encoder with a reader head that uses YASKAWA® protocol and a guided absolute tape with an adhesive aluminum guide.

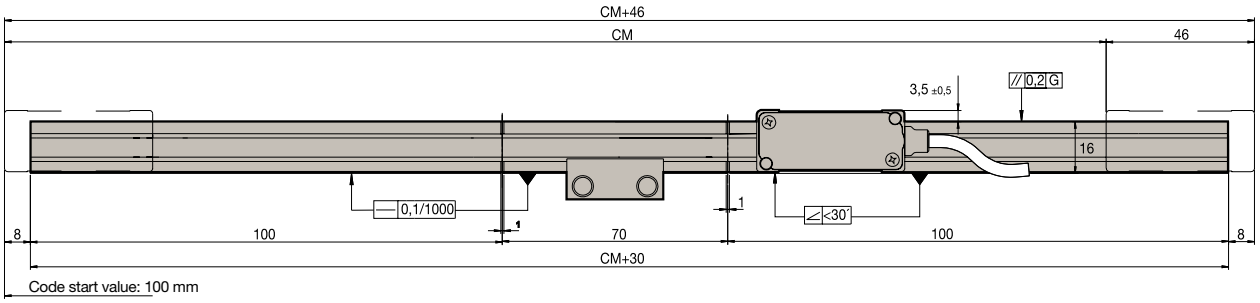
Characteristics

	PG + TGA + L2A	PG + TGA + L2AM / PG + TGA + L2AMH	PG + TGA + L2AP	PG + TGA + L2ABC	PG +TGA + L2AD	PG +TGA + L2AD + XC-C8-PA-DQ-M	PG + TGA + L2AK
Measurement	**Incremental:** By means of a 20 µm-pitch stainless steel tape **Absolute:** Optical reading of sequential binary code						
Steel tape thermal expansion coefficient	α_{therm}: ≈ 11 ppm/K.						
Measuring resolution	0.01 µm / 0.05 µm						0.009765625 µm / 0.078125 µm
Maximum speed	480 m/min						
Maximum cable length	75 m (1)	30 m		50 m	100 m	Up to 100 m (2)	30 m
Supply voltage	5V ± 10 %, < 250 mA (without load)						
Reader head	1 or 3 meter cable with a connector						
Reader head protection	IP 40						
Accuracy	± 10 µm/m						
Maximum vibration	200 m/s² (55 … 2000 Hz) IEC 60068-2-6						
Maximum shock	1000 m/s² (11 ms) IEC 60068-2-27						
Operating temperature	0 °C … 50 °C						
Storage temperature	-20 °C ... 70 °C						
Weight	0.27 kg + 0.05 kg/m						
Relative humidity	20 … 80 %						

(1) Contact Fagor Automation for maximum cable length.
(2) Depending on CNC model. Consult SIEMENS® documentation.

Dimensions in mm





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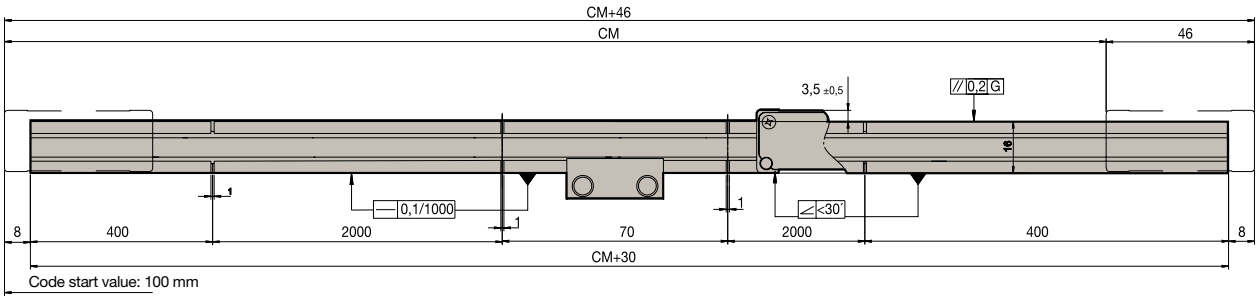

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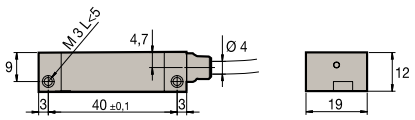

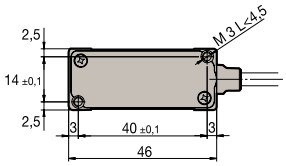

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Order identification

Example of Non-contact linear Encoder: PG-30 + TGA-64 + L2AP10-3C9D

Guide		Tape	
PG	**30**	**TGA**	**64**
Adhesive guide for guided tape	***Lengths in centimeters:*** In the example 30 = 300 mm	Absolute graduated tape for the guided model	***Measuring lengths in centimeters:*** In the example 64 = 640 mm

Cabeza lectora

L2	A	P	10	3	C9D
Single-body reader head with LED	***Letter identifying the absolute encoder***	***Type of communications protocol:*** • Blank space: SSI protocol (FAGOR) • M: MITSUBISHI® CNC protocol full duplex • MH: MITSUBISHI® CNC protocol half duplex • **P: PANASONIC® (Matsushita) protocol** • B: BiSS® C protocol • D: FeeDat® protocol (FAGOR) (1) • K: YASKAWA® protocol	***Resolution:*** 50: 0.05 µm **10: 0.01 µm** 211: 0.009765625 µm (2) 208: 0.078125 µm (2)	***Cable length:*** 1: 1 meter **3: 3 meters**	***Connector:*** • DA: Sub D HD 15 M • MB: MITSUBISHI® • PN5: PANASONIC® • PN: YASKAWA® • **C9D: 17-pin round connector** (3)

(1) Plus XC-C8-PA-DQ-M with DRIVE-CLiQ® protocol for SIEMENS® (Solution Line and Sinumerik One).

(2) Only for YASKAWA® model.

(3) MITSUBISHI® models with ferrite. Description C9D-F.

EXT series TENSIONED

Non-contact open linear encoder for high accuracy, high speed applications.

It consists of a compact reader head with all the electronics and optics integrated into a single body that may be mounted from the side or from the top.

It has an LED to help mounting it and includes a 1 or 3 meter cable with a connector, a 10 mm wide reflective stainless steel tape that is highly resistant to solvents on an adhesive or bolted aluminum guide.

Measuring lengths in millimeters:

Available from 140 mm to 30,040 mm in 100 mm increments.

Model description:

PT + TTA + L2A: non-contact open linear encoder with a reader head that uses SSI protocol and a tensioned absolute tape with an adhesive aluminum guide. Indicate PTS for bolted guided.

PT + TTA + L2AM: non-contact open linear encoder with a reader head that uses MITSUBISHI® CNC full duplex protocol and a tensioned absolute tape with an adhesive aluminum guide. Indicate PTS for bolted guided.

PT + TTA + L2AMH: non-contact open linear encoder with a reader head that uses MITSUBISHI® CNC hald duplex protocol and a tensioned absolute tape with an adhesive aluminum guide. Indicate PTS for bolted guided.

PT + TTA + L2AP: non-contact open linear encoder with a reader head that uses PANASONIC® (Matsushita) protocol and a tensioned absolute tape with an adhesive aluminum guide. Indicate PTS for bolted guided.

PT + TTA + L2ABC: non-contact open linear encoder with a reader head that uses BiSS® C protocol and a tensioned absolute tape with an adhesive aluminum guide. Indicate PTS for bolted guided.

PT +TTA + L2AD: non-contact open linear encoder with a reader head that uses FeeDat® protocol for FAGOR and others and a tensioned absolute tape with an adhesive aluminum guide. Indicate PTS for bolted guided.

PT +TTA + L2AD + XC-C8-PA-DQ-M: non-contact open linear encoder with a reader head that uses DRIVE-CLiQ® protocol for SIEMENS® (Solution Line and Sinumerik One) and a tensioned absolute tape with an adhesive aluminum guide. Indicate PTS for bolted guided.

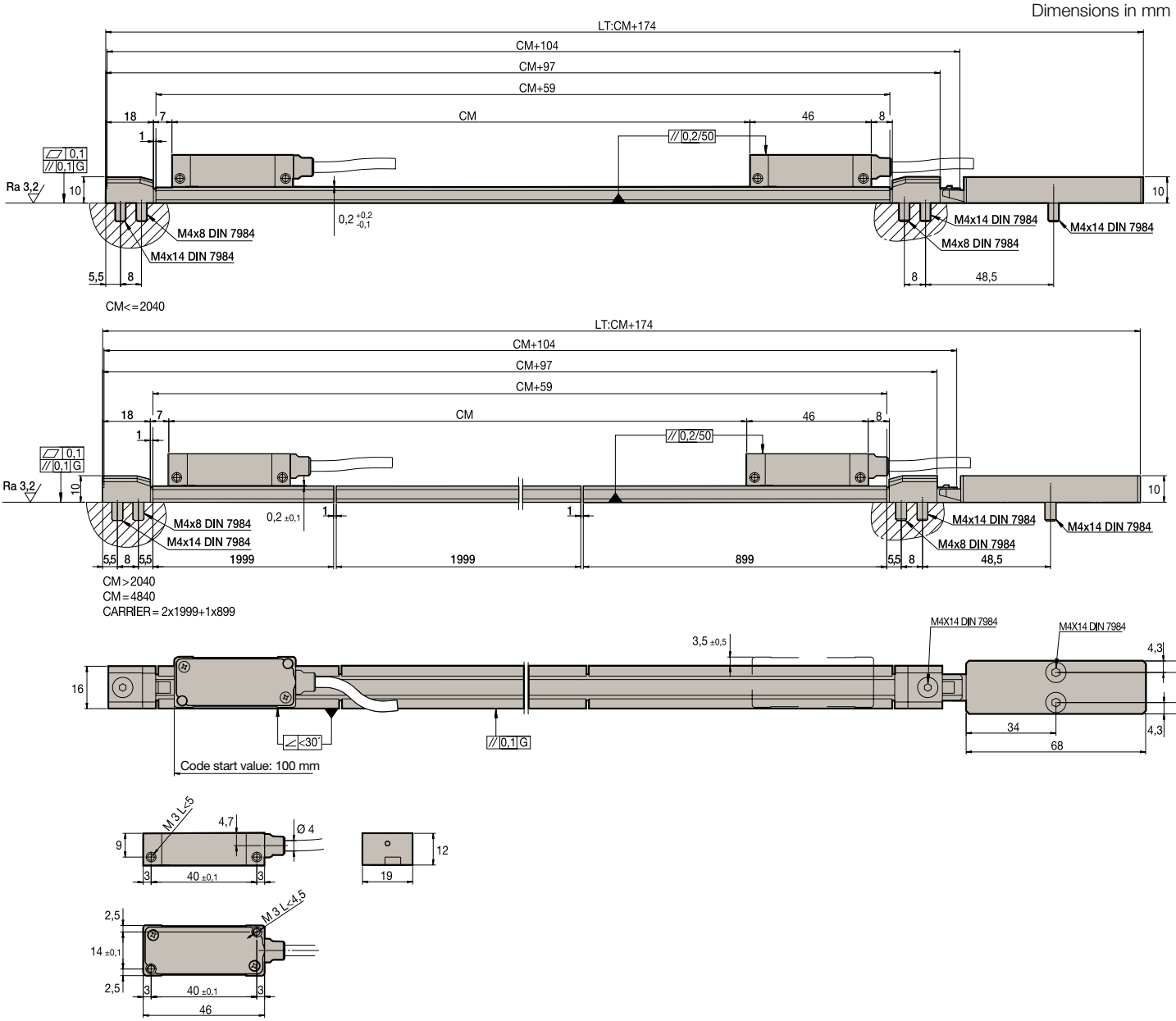
PT + TTA + L2AK: non-contact open linear encoder with a reader head that uses YASKAWA® protocol and a tensioned absolute tape with an adhesive aluminum guide. Indicate PTS for bolted guided.

Characteristics

	PT + TTA + L2A	PT + TTA + L2AM / PT + TTA + L2AMH	PT + TTA + L2AP	PT + TTA + L2ABC	PT + TTA + L2AD	PT +TTA + L2AD + XC-C8-PA-DQ-M	PT + TTA + L2AK
Measurement	**Incremental:** By means of a 20 µm-pitch stainless steel tape **Absolute:** Optical reading of sequential binary code						
Steel tape thermal expansion coefficient	α_{therm}: ≈ 11 ppm/K.						
Measuring resolution	0.01 µm / 0.05 µm						0.009765625 µm / 0.078125 µm
Maximum speed	480 m/min						
Maximum cable length	75 m (1)	30 m		50 m	100 m	Up to 100 m (2)	30 m
Supply voltage	5V ± 10 %, < 250 mA (without load)						
Reader head	1 or 3 meter cable with a connector						
Reader head protection	IP 40						
Accuracy	± 10 µm/m						
Maximum vibration	200 m/s² (55 … 2000 Hz) IEC 60068-2-6						
Maximum shock	1000 m/s² (11 ms) IEC 60068-2-27						
Operating temperature	0 °C … 50 °C						
Storage temperature	-20 °C ... 70 °C						
Weight	0.27 kg + 0.26 kg/m						
Relative humidity	20 … 80 %						

(1) Contact Fagor Automation for maximum cable length.
(2) Depending on CNC model. Consult SIEMENS® documentation.

Dimensions in mm



Additional information can be found in the technical documentation and installation manual available on the website ***www.fagorautomation.com***

Order identification

Example of Non-contact linear Encoder: PTS-70 + TTA-64 + L2AP10-3C9D

Guide		Tape	
PTS	**70**	**TTA**	**64**
PT: adhesive guide for tensioned tape **PTS: bolted guide for tensioned tape**	***Lengths in centimeters -1:*** In the example 70 = 699 mm	Absolute graduated tape for the tensioned model	***Measuring lengths in centimeters:*** In the example 64 = 640 mm

Reader head

L2	A	P	10	3	C9D
Single-body reader head with LED	***Letter identifying the absolute encoder***	***Type of communications protocol:*** • Blank space: SSI protocol (FAGOR) • M: MITSUBISHI® CNC protocol full duplex • MH: MITSUBISHI® CNC protocol half duplex • **P: PANASONIC® (Matsushita) protocol** • B: BiSS® C protocol • D: FeeDat® protocol (FAGOR) (1) • K: YASKAWA® protocol	***Resolution:*** 50: 0.05 µm **10: 0.01 µm** 211: 0.009765625 µm (2) 208: 0.078125 µm (2)	***Cable length:*** 1: 1 meter **3: 3 meters**	***Connector:*** • DA: Sub D HD 15 M • MB: MITSUBISHI® • PN5: PANASONIC® • PN: YASKAWA® • **C9D: 17-pin round connector** (3)

(1) Plus XC-C8-PA-DQ-M with DRIVE-CLiQ® protocol for SIEMENS® (Solution Line and Sinumerik One).

(2) Only for YASKAWA® model.

(3) MITSUBISHI® models with ferrite. Description C9D-F.

CONNECTION TO FAGOR CNC

UP TO 3 METERS

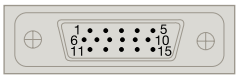
For direct connection to FAGOR

L2A...-DA

Lengths: 1 and 3 meters

Cable included
SUB D 15 HD connector (male Pin ■)

Pin ■	Signal	Color
5	Data	Grey
6	/Data	Pink
7	Clock	Black
8	/Clock	Purple
9	+5 V	Brown
10	+5 V sensor	Blue/Red
11	0 V	White
12	0 V sensor	Grey/Pink
Housing	Ground	Shield



FROM 3 METERS ON

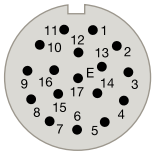
For connection to FAGOR QUERCUS:
L2AD...-C9D Cable + XC-C8-...F-DA extension cable

L2A...-C9D

Lengths: 1 and 3 meters

Cable included
M23 17 connector (male Pin ■)

Pin ■	Signal	Color
14	Data	Grey
17	/Data	Pink
8	Clock (Request)	Black
9	/Clock (Request)	Purple
7	+5 V	Brown
1	+5 V sensor	Blue/Red
10	0 V	White
4	0 V sensor	Grey/Pink
Housing	Ground	Shield

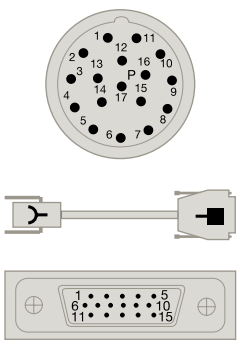


XC-C8-...F-DA extension cable

Lengths: 5, 10, 15, 20 and 25 meters

M23 17 connector (female Pin ⊃)
SUB D 15 HD connector (male Pin ■)

Pin ⊃	Pin ■	Signal	Color
15	1	A	Green/Black
16	2	/A	Yellow/Black
12	3	B	Blue/Black
13	4	/B	Red/Black
14	5	Data	Grey
17	6	/Data	Pink
8	7	Clock	Purple
9	8	/Clock	Yellow
7	9	+5 V	Brown/Green
1	10	+5 V sensor	Blue
10	11	0 V	White/Green
4	12	0 V sensor	White
Housing	Housing	Ground	Shields



CONNECTION TO OTHER CNC'S

UP TO 3 METERS

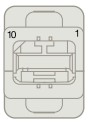
Connector for direct connection to PANASONIC® MINAS

L2AP...-PN5

Lengths: 1 and 3 meters

Cable included
PANASONIC 10 pin connector (female Pin ⊀)

Pin	Signal	Color
3	Data	Grey
4	/Data	Pink
1	+5 V	Brown + Blue/Red
2	0 V	White + Grey/Pink
Housing	Ground	Shield



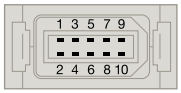
Connector for direct connection to MITSUBISHI®

L2AM...-MB / L2AMH...-MB

Lengths: 1 and 3 meters

Cable included
10-pin MOLEX/3M RECTANGULAR connector (female Pin ⊀)

Pin	Signal	Color
7	SD (MD) (*)	Black
8	/SD (MD) (*)	Purple
3	RQ (MR)	Grey
4	/RQ (MR)	Pink
1	+5 V	Brown + Blue/Red
2	0 V	White + Grey/Pink
Housing	Ground	Shield



(*) : only used in full duplex model L2AM-MB

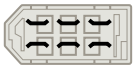
Connector for direct connection to YASKAWA®

L2AK...-PN

Lengths: 1 and 3 meters

Cable included
6-pin MOLEX connector (female Pin ⊀)

Pin	Signal	Color
5	Data	Grey
6	/Data	Pink
1	+5 V	Brown + Blue/Red
2	0 V	White + Grey/Pink
Housing	Ground	Shield



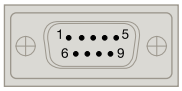
Connector for direct connection to BiSS® C systems

L2ABC...-D9D

Lengths: 1 and 3 meters

Cable included
SUB D 9 HD connector (male Pin ⊢■)

Pin	Signal	Color
6	Data	Grey
7	/Data	Pink
2	Clock	Black
3	/Clock	Purple
4	+5 V	Brown
5	+5 V sensor	Blue/Red
8	0 V	White
9	0 V sensor	Grey/Pink
Housing	Ground	Shield



CONNECTION TO OTHER CNC'S

FROM 3 METERS ON

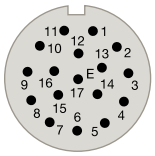
For connection to MITSUBISHI® full duplex: **L2AM...-C9D-F + XC-C8-...-MB extension cable**
For connection to MITSUBISHI® half duplex: **L2AMH...-C9D-F + XC-C8-...-MB extension cable**
For connection to PANASONIC®: **L2AP...-C9D + XC-C8...A-PN5 extension cable**
For connection to YASKAWA®: **L2AK...-C9D + XC-C8-...A-PN extension cable**
For connection to SIEMENS®:
RJ 45 connector with IP 20: L2AD...-C9D + XC-C8-...PA-DQ-M cable + XC- M2-...S-RJ2 extension cable
RJ 45 connector with IP 67: L2AD...-C9D + XC-C8-...PA-DQ-M cable + XC- M2-...S-RJ6 extension cable

L2A...-C9D

Lengths: 1, 3, 6 and 9 meters

M23 17 connector (male Pin ■)

Pin	Signal	Color
14	Data	Grey
17	/Data	Pink
8	Clock (Request)	Black
9	/Clockk (Request)	Purple
7	+5 V	Brown
1	+5 V sensor	Light green
10	0 V	White
4	0 V sensor	Orange
Housing	Ground	Shield

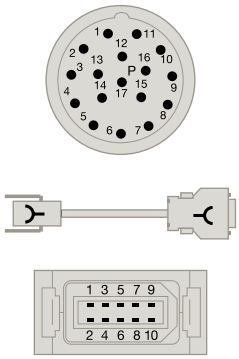


XC-C8-...-MB extension cable

Lengths: 5, 10, 15, 20 and 25 meters

M23 17 connector (female Pin ⊃)
10-pin MOLEX/3M RECTANGULAR connector (female Pin ⊂)

Pin	Pin	Signal	Color
8	7	SD (MD)	Purple
9	8	/SD (MD)	Yellow
14	3	RQ (MR)	Grey
17	4	/RQ (MR)	Pink
7	1	+5 V	Brown/Green
1	1	+5 V sensor	Blue
10	2	GND	White/Green
4	2	0 V sensor	White
12	2	SEL	Black
Housing	Housing	Ground	Shield

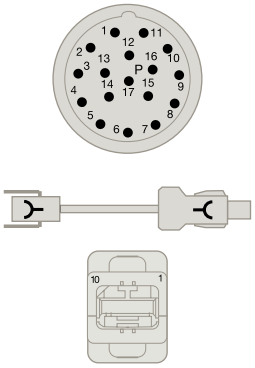


XC-C8-...A-PN5 extension cable

Lengths: 5, 10, 15, 20 and 25 meters

M23 17 connector (female Pin ⊃)
PANASONIC 10 pin connector (female Pin ⊂)

Pin	Pin	Signal	Color
14	3	Data	Grey
17	4	/Data	Pink
7	1	+5 V	Brown+ Black
1	1	+5 V sensor	Green+ Yellow
10	2	GND	White+ Purple
4	2	GND sensor	Blue+ Red
Housing	Housing	Ground	Shield

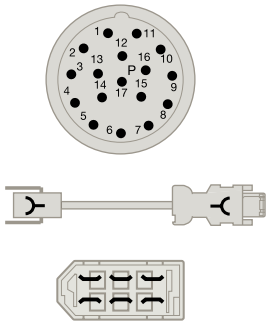


XC-C8-...A-PN extension cable

Lengths: 5, 10, 15, 20 and 25 meters

M23 17 connector (female Pin ⊃)
6-pin MOLEX connector (female Pin ⊂)

Pin	Pin	Signal	Color
14	5	Data	Grey
17	6	/Data	Pink
7		+5 V	Brown+ Black
10	2	GND	White+ Purple
Housing	Housing	Ground	Shield



L2AD-C9D

Lengths: 1 and 3 meters

Cable included

For connection with extension cable (M12 H-RJ45) to SIEMENS® Sinamics/Sinumerik®

XC-C8-...PA-DQ-M

Lengths: 1, 3 and 6 meters

M23 17 connector (female Pin)
M12 8 pin connector (male Pin)

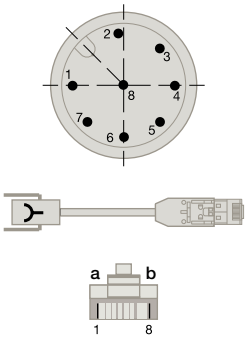
Pin	Signal
3	RXP
4	RXN
6	TXN
7	TXP
1	Vcc (24 V)
5	0 V

XC-M2-...S-RJ2 extension cable

Lengths: 5, 10, 15, 20 and 25 meters

M12 8 pin connector (female Pin)
RJ45 (IP 20) connector

Pin	RJ45 IP 20 Pin	Signal	Color
3	1	RXP	Pink
4	2	RXN	Blue
7	3	TXP	Green
6	6	TXN	Yellow
1	a	Vcc (24V)	Red
5	b	0 V	Black
Housing	Housing	Ground	Shield

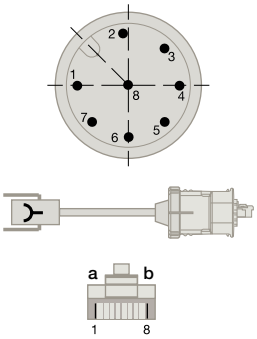


XC-M2-...S-RJ6 extension cable

Lengths: 5, 10, 15, 20 and 25 meters

M12 8 pin connector (female Pin)
RJ45 (IP 67) connector

Pin	RJ45 IP 67 Pin	Signal	Color
3	1	RXP	Pink
4	2	RXN	Blue
7	3	TXP	Green
6	6	TXN	Yellow
1	a	Vcc (24V)	Red
5	b	0 V	Black
Housing	Housing	Ground	Shield



ACCESSORIES

AAA applier

The applier is used to stick the adhesive tape onto the machine surface for proper alignment with the reader head.

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

Fagor Automation shall not be held responsible for any printing or transcribing errors in the catalog.

MONDRAGON
HUMANITY AT WORK
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Fagor Automation holds the ISO 9001 Quality System Certificate and the CE Certificate for all products manufactured.

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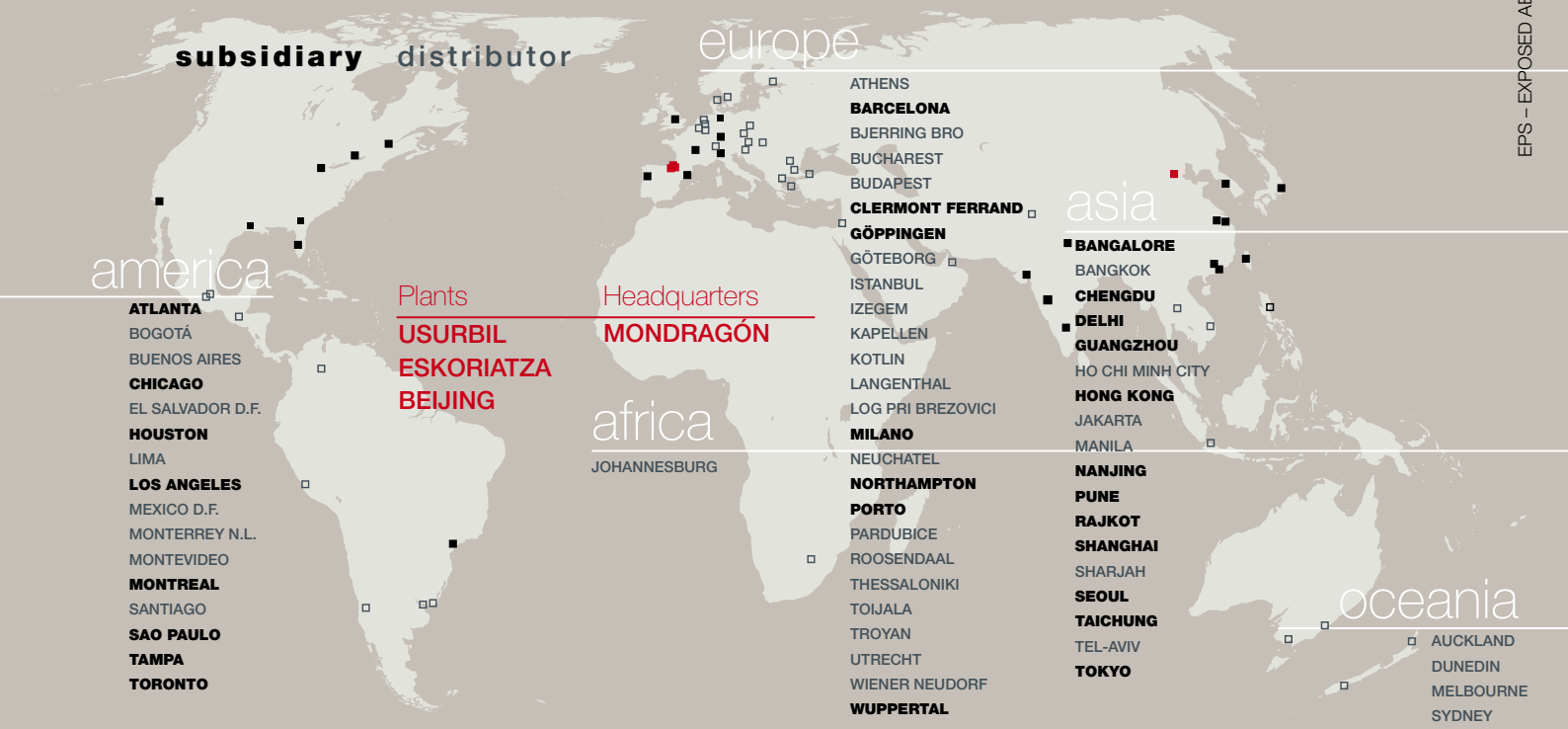

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