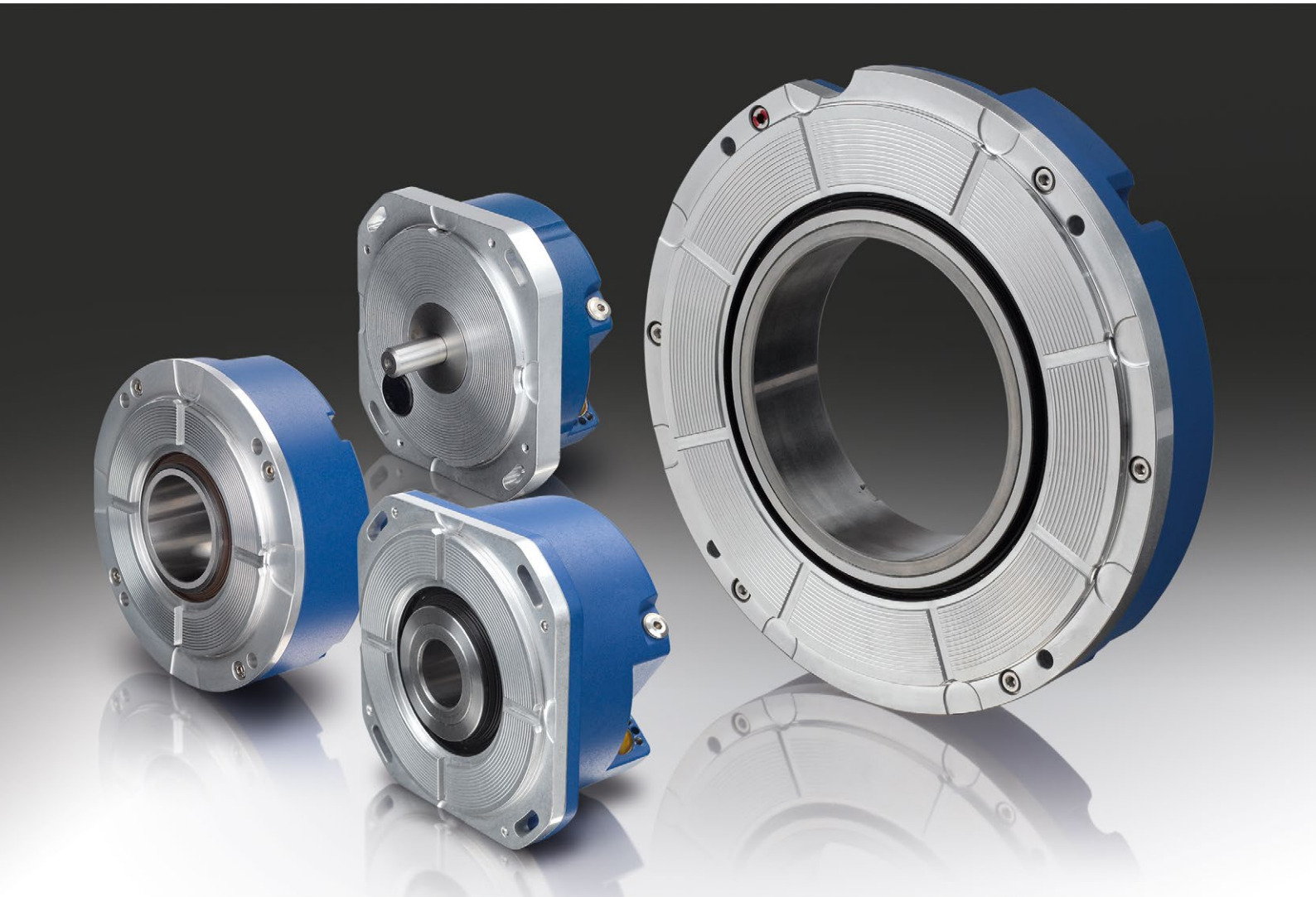
Series 3

ANGULAR ENCODER

FAGOR AUTOMATION

Open to your world



H3B-D200i100 series

Model description:

H3B: Absolute angular encoders with SSI protocol for FAGOR and others.

H3BS: Absolute angular encoders with SSI protocol for SIEMENS® (Solution Line).

H3BF: Absolute angular encoders with FANUC® (α and αi) protocol.

H3BM: Absolute angular encoders with MITSUBISHI® CNC protocol.

H3BP: Absolute angular encoders with PANASONIC® (Matsushita) protocol.

H3BD: Absolute angular encoders with FeeDat® protocol for FAGOR and others.

H3BD + EC-PA-DQ1-M: Absolute angular encoders with DRIVE-CLiQ® protocol, for SIEMENS® (Solution Line and Sinumerik One) (*).

H3BBC: Absolute angular encoders with BiSS® C protocol.

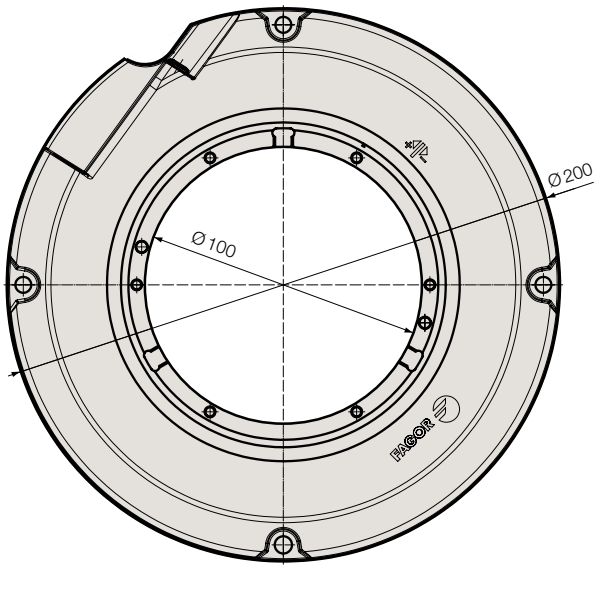
(*) Pending approval.

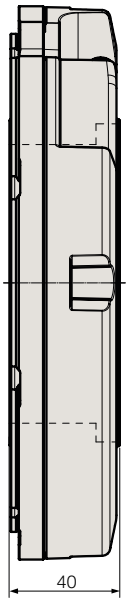
Characteristics

	H3B	H3BS	H3BF
Measurement	By means of graduated glass disk		
Accuracy	±1 arc-second ±2 arc-seconds		
Output signals	∿ 1 Vpp		–
Resolution / Maximum number of positions per turn	27 bits (134 217 728 positions) 1 Vpp: 32 768 pulses/turn	27 bits (134 217 728 positions) 1 Vpp: 32 768 pulses/turn	αi: 29 bits (536 870 912 positions) α: 27 bits (134 217 728 positions)
Maximum frequency	180 kHz for 1 Vpp signal	180 kHz for 1 Vpp signal	–
Maximum electrical speed	< 300 min^{-1}	< 300 min^{-1}	< 750 min^{-1}
Natural frequency	> 1000 Hz		
Supply	3.8 to 14 V DC; < 250 mA (at 5V without load)		
Maximum cable length	75 m (1)	100 m	50 m
Maximum mechanical speed	1000 min^{-1} non-mechanical fault exclusion		
Inertia	Rotor: $2.5 \cdot 10^{-3}$ kgm^2		
Starting torque	< 0.5 Nm		
Vibration	100 m/s^2 (55...2000 Hz) IEC 60068-2-6		
Shock	200 m/s^2 (6 ms) IEC 60068-2-27		
Operating temperature	0 °C...50 °C		
Storage temperature (in its packaging)	-20 °C...60 °C		
Weight	2.6 kg		
Protection	IP 64 DIN 40050 (standard) > IP 64 (DIN 40050) using pressurized air at 0.8 ±0.2 bar in angular encoders (3)		
Connection	With built-in connector		

ABSOLUTE ANGULAR ENCODER

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 Angular Encoder: H3BF-29-D200i100-1

H3	B	F	29	D200	i100	1
Type of shaft: • **H3: Hollow shaft**	***Letter identifying the absolute encoder***	***Type of communications protocol:*** • Blank space: SSI protocol (FAGOR) • D: FeeDat® protocol (FAGOR) (1) • S: SSI SIEMENS® (SL) protocol • **F: FANUC® (α and αi) protocol** • M: MITSUBISHI® CNC protocol • P: PANASONIC® (Matsushita) protocol • BC: BiSS® C protocol	***Absolute positions per turn:*** • **29 bits (536 870 912 positions) (2)** • 27 bits (134 217 728 positions)	***Outside diameter:*** • **D200: 200 mm**	***Inside diameter:*** • **i100: 100 mm**	***Accuracy:*** • 2: ± 2 arc-seconds • **1: ± 1 arc-second**

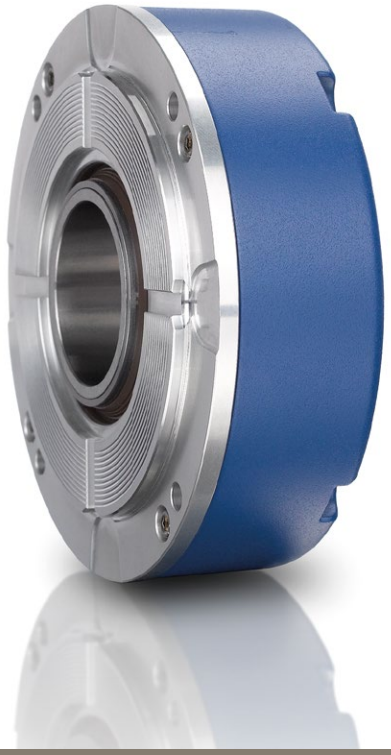
(1) Plus EC-PA-DQ1-M with DRIVE-CLiQ® protocol for SIEMENS® (Solution Line and Sinumerik One).
(2) Only for purely digital models, not available for SSI models.

Notes: Not all protocol, positions per turn and accuracy combinations are possible.

H3BM / H3BP	H3BD	H3BD + EC-PA-DQ1-M	H3BBC
By means of graduated glass disk			
± 1 arc-second ± 2 arc-seconds			
–			(2)
29 bits (536 870 912 positions)			
–			
< 750 min^{-1}			
> 1000 Hz			
3.8 to 14 V DC; < 250 mA (at 5V without load)			
30 m	100 m	Up to 100 m (4)	50 m
1000 min^{-1} non-mechanical fault exclusion			
Rotor: $2.5 \cdot 10^{-3}$ kgm^2			
< 0.5 Nm			
100 m/s^2 (55...2000 Hz) IEC 60068-2-6			
200 m/s^2 (6 ms) IEC 60068-2-27			
0 °C...50 °C			
-20 °C...60 °C			
2.6 kg			
IP 64 DIN 40050 (standard) > IP 64 (DIN 40050) using pressurized air at 0.8 ±0.2 bar in angular encoders (3)			
With built-in connector			

(1) Contact Fagor Automation for maximum cable length.
(2) Consult Fagor Automation for analog output signals.
(3) For more information consult the AI-1000 Filter Unit catalog.
(4) Depending on CNC model. Consult SIEMENS® documentation.

H3B-D110 series



Model description:

H3B: Absolute angular encoders with SSI protocol for FAGOR and others.

H3BS: Absolute angular encoders with SSI protocol for SIEMENS® (Solution Line).

H3BF: Absolute angular encoders with FANUC® (α and αi) protocol.

H3BM: Absolute angular encoders with MITSUBISHI® CNC protocol.

H3BP: Absolute angular encoders with PANASONIC® (Matsushita) protocol.

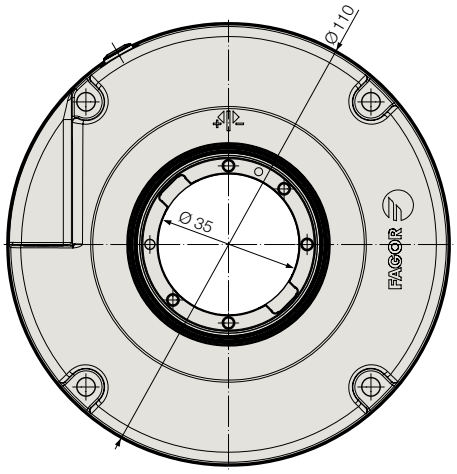
H3BD: Absolute angular encoders with FeeDat® protocol for FAGOR and others.

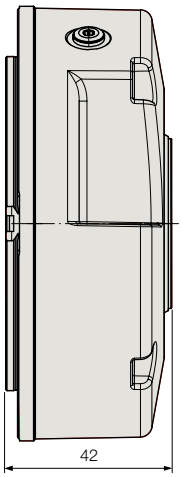
H3BD + EC-PA-DQ1-M: Absolute angular encoders with DRIVE-CLiQ® protocol, for SIEMENS® (Solution Line and Sinumerik One).

H3BBC: Absolute angular encoders with BiSS® C protocol.

Characteristics

	H3B	H3BS	H3BF
Measurement	By means of graduated glass disk		
Accuracy	±2.5 arc-seconds ±5 arc-seconds		±2 arc-seconds ±4 arc-seconds
Output signals	∿ 1 Vpp		–
Maximum resolution / Maximum number of positions per turn	23 bits (8 388 608 positions) 1 Vpp: 16 384 pulses/turn		αi: 28 bits (268 435 456 positions) α: 27 bits (134 217 728 positions)
Maximum frequency	400 kHz for 1 Vpp signal		–
Maximum electrical speed	< 1500 min^{-1}		< 3000 min^{-1}
Natural frequency	> 1200 Hz		
Supply	3.8 to 14 V DC; < 250 mA (at 5V without load)		
Maximum cable length	75 m (1)	100 m	50 m
Maximum mechanical speed	1500 min^{-1} / 3000 min^{-1} (for a limited time)		
Inertia	Rotor (hollow shaft) $93 \cdot 10^{-6}$ kgm^2 Stator (housing/flange) $780 \cdot 10^{-6}$ kgm^2		
Starting torque (at 20 °C)	< 0.2 Nm		
Vibration	200 m/s^2 (55...2000 Hz) IEC 60068-2-6		
Shock	200 m/s^2 (6 ms) IEC 60068-2-27		
Operating temperature	0 °C...60 °C		
Storage temperature (in its packaging)	-20 °C...60 °C		
Weight	0.65 kg		
Protection	IP 64 DIN 40050 (standard) > IP 64 (DIN 40050) using pressurized air at 0.8 ±0.2 bar in angular encoders (3)		
Connection	With built-in connector		





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 Angular Encoder: H3BF-28-D110-2

H3	B	F	28	D110	2
Type of shaft: • **H3: Hollow shaft**	***Letter identifying the absolute encoder***	***Type of communications protocol:*** • Blank space: SSI protocol (FAGOR) • D: FeeDat® protocol (FAGOR) (1) • S: SSI SIEMENS® (SL) protocol • **F: FANUC® (α and αi) protocol** • M: MITSUBISHI® CNC protocol • P: PANASONIC® (Matsushita) protocol • BC: BiSS® C protocol	***Absolute positions per turn:*** • 23 bits (8 388 608 positions) • 26 bits (67 108 864 positions) (2) • **28 bits (268 435 456 positions (3)**	***Outside diameter:*** • **D110: 110 mm**	***Accuracy:*** • Blank space: ± 4 arc-seconds (± 5 arc-seconds for SSI models) • **2: ± 2 arc-seconds (± 2.5 arc-seconds for SSI models)**

(1) Plus EC-PA-DQ1-M with DRIVE-CLiQ® protocol for SIEMENS® (Solution Line and Sinumerik One).
(2) Only for purely digital models, not available for SSI models.
(3) Not available for SSI or BiSS® C models.

Notes: Not all protocol, positions per turn and accuracy combinations are possible. Please consult with Fagor Automation for a list models.

H3BM / H3BP	H3BD	H3BD + EC-PA-DQ1-M	H3BBC
By means of graduated glass disk			
± 2 arc-seconds ± 4 arc-seconds			
–			(2)
28 bits (268 435 456 positions)			26 bits (67 108 864 positions)
–			
< 3000 min^{-1}			
> 1200 Hz			
3.8 to 14 V DC; < 250 mA (at 5V without load)			
30 m	100 m	Up to 100 m (4)	50 m
1500 min^{-1} / 3000 min^{-1} (for a limited time)			
Rotor (hollow shaft) $93 \cdot 10^{-6}$ kgm^2 Stator (housing/flange) $780 \cdot 10^{-6}$ kgm^2			
< 0.2 Nm			
200 m/s^2 (55...2000 Hz) IEC 60068-2-6			
200 m/s^2 (6 ms) IEC 60068-2-27			
0 °C...60 °C			
-20 °C...60 °C			
0.65 kg			
IP 64 DIN 40050 (standard) > IP 64 (DIN 40050) using pressurized air at 0.8 ±0.2 bar in angular encoders (3)			
With built-in connector			

(1) Contact Fagor Automation for maximum cable length.
(2) Consult Fagor Automation for analog output signals.
(3) For more information consult the AI-1000 Filter Unit catalog.
(4) Depending on CNC model. Consult SIEMENS® documentation.

H3B-D90 series

Model description:

H3B: Absolute angular encoders with SSI protocol for FAGOR and others.

H3BS: Absolute angular encoders with SSI protocol for SIEMENS® (Solution Line).

H3BF: Absolute angular encoders with FANUC® (α and αi) protocol.

H3BM: Absolute angular encoders with MITSUBISHI® CNC protocol.

H3BP: Absolute angular encoders with PANASONIC® (Matsushita) protocol.

H3BD: Absolute angular encoders with FeeDat® protocol for FAGOR and others.

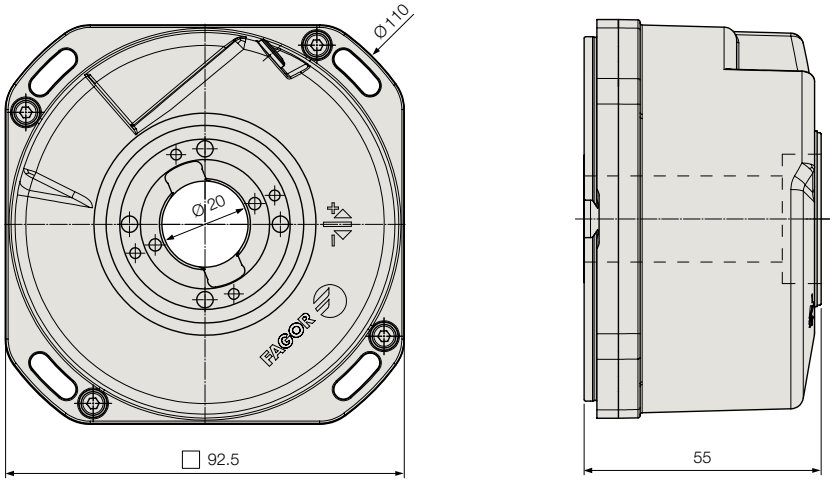
H3BD + EC-PA-DQ1-M: Absolute angular encoders with DRIVE-CLiQ® protocol, for SIEMENS® (Solution Line and Sinumerik One).

H3BD-FS + EC-PA-DQS-M: Absolute angular encoders with DRIVE-CLiQ® protocol, for SIEMENS® (Solution Line and Sinumerik One) with Functional Safety

H3BBC: Absolute angular encoders with BiSS® C protocol.

Characteristics

	H3B	H3BS	H3BF
Measurement	By means of graduated glass disk		
Accuracy	±2.5 arc-seconds ±5 arc-seconds		±2 arc-seconds ±4 arc-seconds
Output signals	∿ 1 Vpp		–
Maximum resolution / Maximum number of positions per turn	23 bits (8 388 608 positions) 1 Vpp: 16 384 pulses/turn		αi: 28 bits (268 435 456 positions) α: 27 bits (134 217 728 positions)
Maximum frequency	400 kHz for 1 Vpp signal		–
Maximum electrical speed	< 1500 min^{-1}		< 3000 min^{-1}
Natural frequency	> 1500 Hz		
Supply	3.8 to 14 V DC; < 250 mA (at 5V without load)		
Maximum cable length	75 m (1)	100 m	50 m
Maximum mechanical speed	3000 min^{-1}		
Inertia	Rotor (hollow shaft) $82 \cdot 10^{-6}$ kgm^2 Stator (housing/flange) $480 \cdot 10^{-6}$ kgm^2		
Starting torque (at 20 °C)	< 0.08 Nm		
Vibration	200 m/s^2 (55...2000 Hz) IEC 60068-2-6		
Shock	200 m/s^2 (6 ms) IEC 60068-2-27		
Operating temperature	0 °C...60 °C		
Storage temperature (in its packaging)	-20 °C...60 °C		
Weight	0,75 kg		
Protection	IP 64 DIN 40050 (standard) > IP 64 (DIN 40050) using pressurized air at 0.8 ±0.2 bar in angular encoders (3)		
Connection	With built-in connector		



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 Angular Encoder: H3BF-28-D90-2

H3	B	F	28	D90	2	
Type of shaft: • **H3: Hollow shaft**	***Letter identifying the absolute encoder***	***Type of communications protocol:*** • Blank space: SSI protocol (FAGOR) • D: FeeDat® protocol (FAGOR) (1) • S: SSI SIEMENS® (SL) protocol • **F: FANUC® (α and αi) protocol** • M: MITSUBISHI® CNC protocol • P: PANASONIC® (Matsushita) protocol • BC: BiSS® C protocol	***Absolute positions per turn:*** • 23 bits (8 388 608 positions) • 26 bits (67 108 864 positions) (2) • 27 bits (134 217 728 positions) (3) • **28 bits (268 435 456 positions) (4)**	***Outside diameter:*** • **D90: 90 mm**	***Accuracy:*** • Blank space: ± 4 arc-seconds (± 5 arc-seconds for SSI models) • **2: ± 2 arc-seconds (± 2.5 arc-seconds for SSI models)**	***Safety:*** • **Blank space: No** • FS: Functional Safety (5)

(1) Plus EC-PA-DQ1-M with DRIVE-CLiQ® protocol for SIEMENS® (Solution Line and Sinumerik One).
(2) Only for purely digital models, not available for SSI models.
(3) Only for compatibility with legacy products.
(4) Not available for SSI or BiSS® C models.
(5) Only for H3BD-FS + EC-PA-DQS-M with DRIVE-CLiQ® protocol for SIEMENS® (Solution Line and Sinumerik One) with Functional Safety.

Notes: Not all protocol, positions per turn and accuracy combinations are possible. Please consult with Fagor Automation for a list models.

H3BM / H3BP	H3BD	H3BD + EC-PA-DQ1-M	H3BD-FS + EC-PA-DQS-M	H3BBC
By means of graduated glass disk				
± 2 arc-seconds ± 4 arc-seconds				
–				(2)
28 bits (268 435 456 positions)				26 bits (67 108 864 positions)
–				
< 3000 min^{-1}			< 1500 min^{-1}	< 3000 min^{-1}
> 1500 Hz				
3.8 to 14 V DC; < 250 mA (at 5V without load)			5±10 % V DC; <300 mA	3.8 to 14 V DC; < 250 mA (at 5V without load)
30 m	100 m	Up to 100 m (4)		50 m
3000 min^{-1}			1500 min^{-1}	3000 min^{-1}
Rotor (hollow shaft) $82 \cdot 10^{-6}$ kgm^2 Stator (housing/flange) $480 \cdot 10^{-6}$ kgm^2				
< 0,08 Nm				
200 m/s^2 (55...2000 Hz) IEC 60068-2-6				
200 m/s^2 (6 ms) IEC 60068-2-27				
0 °C...60 °C				
-20 °C...60 °C				
0,75 kg				
IP 64 DIN 40050 (standard) > IP 64 (DIN 40050) using pressurized air at 0.8 ±0.2 bar in angular encoders (3)				
With built-in connector				

(1) Contact Fagor Automation for maximum cable length.
(2) Consult Fagor Automation for analog output signals.
(3) For more information consult the AI-1000 Filter Unit catalog.
(4) Depending on CNC model. Consult SIEMENS® documentation.

S3B-D90 series

Model description:

S3B: Absolute angular encoders with SSI protocol for FAGOR and others.

S3BS: Absolute angular encoders with SSI protocol for SIEMENS® (Solution Line).

S3BF: Absolute angular encoders with FANUC® (α and αi) protocol.

S3BM: Absolute angular encoders with MITSUBISHI® CNC.

S3BP: Absolute angular encoders with PANASONIC® (Matsushita) protocol.

S3BD: Absolute angular encoders with FeeDat® protocol for FAGOR and others.

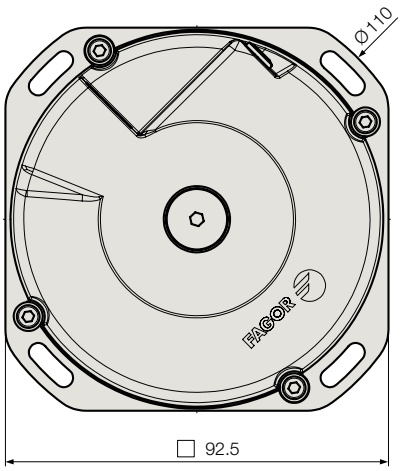
S3BD + EC-PA-DQ1-M: Absolute angular encoders with DRIVE-CLiQ® protocol, for SIEMENS® (Solution Line and Sinumerik One) (*).

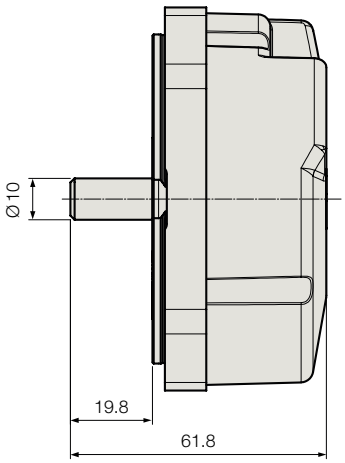
S3BBC: Absolute angular encoders with BiSS® C protocol.

(*) Pending approval.

Characteristics

	S3B	S3BS	S3BF
Measurement	By means of graduated glass disk		
Accuracy	±2.5 arc-seconds ±5 arc-seconds		±2 arc-seconds ±4 arc-seconds
Output signals	~ 1 Vpp		–
Resolution / Maximum number of positions per turn	23 bits (8 388 608 positions) 1 Vpp: 16 384 pulses/turn	23 bits (8 388 608 positions) 1 Vpp: 16 384 pulses/turn	αi: 28 bits (268 435 456 positions) α: 27 bits (134 217 728 positions)
Maximum frequency	400 kHz for 1 Vpp signal	400 kHz for 1 Vpp signal	–
Maximum electrical speed	< 1500 min^{-1}		< 3000 min^{-1}
Supply	3.8 to 14 V DC; < 250 mA (at 5V without load)		
Maximum cable length	75 m (1)	100 m	50 m
Maximum mechanical speed	10000 min^{-1}		
Inertia	Rotor: $25 \cdot 10^{-6}$ kgm^2		
Starting torque	< 0.01 Nm		
Load on the shaft	Axial: 10 N Radial: 10 N		
Vibration	100 m/s^2 (55...2000 Hz) IEC 60068-2-6		
Shock	200 m/s^2 (6 ms) IEC 60068-2-27		
Operating temperature	0 °C ... 60 °C		
Storage temperature (in its packaging)	-20 °C ... 60 °C		
Weight	0.57 kg		
Protection	IP 64 DIN 40050 (standard) > IP 64 (DIN 40050) using pressurized air at 0.8 ±0.2 bar in angular encoders (3)		
Connection	With built-in connector		





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 Angular Encoder: S3BF-28-D90-2

S3	B	F	28	D90	2
Type of shaft: • **S3: Solid shaft**	***Letter identifying the absolute encoder***	***Type of communications protocol:*** • Blank space: SSI protocol (FAGOR) • D: FeeDat® protocol (FAGOR) (1) • S: SSI SIEMENS® (SL) protocol • **F: FANUC® (α and αi) protocol** • M: MITSUBISHI® CNC protocol • P: PANASONIC® (Matsushita) protocol • BC: BiSS® C protocol	***Absolute positions per turn:*** • 23 bits (8 388 608 positions) • 26 bits (67 108 864 positions) (2) • 27 bits (134 217 728 positions) (3) • **28 bits (268 435 456 positions) (4)**	***Outside diameter:*** • **D90: 90 mm**	***Accuracy:*** • Blank space: ± 4 arc-seconds (± 5 arc-seconds for SSI models) • **2: ± 2 arc-seconds (± 2.5 arc-seconds for SSI models)**

(1) Plus EC-PA-DQ1-M with DRIVE-CLiQ® protocol for SIEMENS® (Solution Line and Sinumerik One).
(2) Only for purely digital models, not available for SSI models.
(3) Only for compatibility with legacy products.
(4) Not available for SSI or BiSS® C models.

Notes: Not all protocol, positions per turn and accuracy combinations are possible.

S3BM / S3BP	S3BD	S3BD + EC-PA-DQ1-M	S3BBC
By means of graduated glass disk			
± 2 arc-seconds ± 4 arc-seconds			
–			(2)
28 bits (268 435 456 positions)			26 bits (67 108 864 positions)
–			
< 3000 min^{-1}			
3.8 to 14 V DC; < 250 mA (at 5V without load)			
30 m	100 m	Up to 100 m (4)	50 m
10000 min^{-1}			
Rotor: 25 · 10^{-6} kgm^2			
< 0.01 Nm			
Axial: 10 N Radial: 10 N			
100 m/s^2 (55...2000 Hz) IEC 60068-2-6			
200 m/s^2 (6 ms) IEC 60068-2-27			
0 °C ... 60 °C			
-20 °C ... 60 °C			
0.57 kg			
IP 64 DIN 40050 (standard) > IP 64 (DIN 40050) using pressurized air at 0.8 ±0.2 bar in angular encoders (3)			
With built-in connector			

(1) Contact Fagor Automation for maximum cable length.
(2) Consult Fagor Automation for analog output signals.
(3) For more information consult the AI-1000 Filter Unit catalog.
(4) Depending on CNC model. Consult SIEMENS® documentation.

FUNCTIONAL SAFETY

SYMBOLS THAT MAY APPEAR IN THIS CATALOG

WARNING or caution symbol

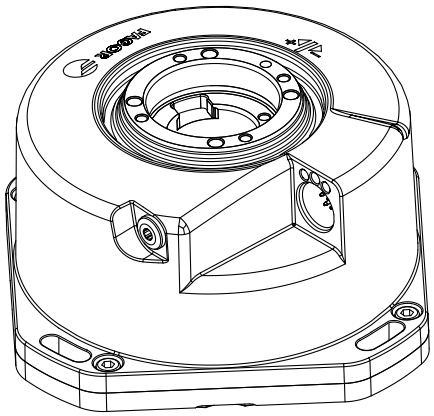
It warns about a potentially dangerous situation. Ignoring this warning may cause serious injuries (even fatal) or damages to the unit.

MANDATORY symbol

It warns about actions and operations that MUST BE carried out. THEY ARE NOT RECOMMENDATIONS. Ignoring this warning may mean non-compliance of some safety regulation.

Mounting

In the application, the encoder must be protected against solids and liquids ingress. Do not orient the sealing rings against pollution sources. See other protection considerations in the Protection section.



Mechanical fault exclusion for the fixation to the machine

In a safety application the fault of loosening or losing of attachment of the encoder to the machine must be eliminated because it cannot be guaranteed that these faults will be detected by the control. For this reason the mounting instructions in the mounting manual must be strictly followed and an adhesive screw lock (medium strength adhesive) must be used for the screws to fix the encoder shaft and the encoder flange to the machine. Also, the specified maximum acceleration and vibration must not be exceeded.

Parts subject to wear

The encoders have a service life of 20 years. Maintenance is not required. However, several components may suffer from wear or degradation.

These include in particular the following parts:
– Cables with frequent flexing

For encoders with an integral bearing, additionally:
– Bearings
– Shaft sealing rings

Installation manual

There is important information in the installation manual to ensure the correct installation of the encoder.
– Installation manual: ANGULAR ENCODER MODEL H3BD-D90-FS: 14460391

Electrical Safety

The power supply must be SELV (Safety Extra Low Voltage) or PELV (Protective Extra Low Voltage).

System Test

The encoder is a component for integration in a larger system. The specifications in this catalog only apply to the specific encoder, not to the whole system. Installation or operation of the encoder outside of the specified conditions is at the user's own risk.
Comprehensive tests of the whole system must be carried out in order to ensure that the encoder works in the range of specified conditions. In particular, **vibration** conditions depend on the whole system, so the whole system must be tested to ensure operation within the limits specified for vibration.

Fault reaction time

The fault reaction time for the encoder system is the time elapsed from the occurrence of a fault in the encoder and the corresponding reaction takes place in the control Unit.

It can be calculated as:
– Time to communicate the fault to the Control Unit + Time needed for the Control Unit to react.
– Time to communicate the fault to the Control Unit ≤ 2 s
  * The DRIVE-CLiQ® cycle time used to operate the encoder.
– Time needed for the Control Unit to react: This is competence of the builder of the Control Unit or the machine.

The overall fault reaction time for the encoder system may be suitable or not depending on the application or safety concept of the overall machine.

Startup time

The encoder is ready to answer to DRIVE-CLiQ® requests 2s after power supply of the encoder.

Site Acceptance Test

The Site Acceptance Test is mandatory in order to guarantee the safety capability of the installed encoder system. The following points must be additionally checked in order to pass the Site Acceptance Test:
– The encoder serial number displayed in the Control Unit matches the serial number printed in the encoder label.
– The encoder resolution parameter shown in the Control Unit matches the values in the encoder label.

Safety functions

The safety functions of the encoder are:

– Safe Absolute Position: The encoder always provides a safe absolute position value. This means that the encoder always provides an absolute value for the position that is correct within the safe position tolerance when the error bits are not activated.

– Safe Communication: The encoder communicates two independently generated position values and error bits.

This allows a wide range of safety functions to be implemented in the control.

Functional Safety

Safety Capability

The encoder system with Functional Safety has the following characteristics related to the safety according to ISO13849-1:2015 and IEC61508:2010 norms.

Safety Capability according ISO 13849-1: 2015 and IEC61508: 2010

	EC-PA-DQS + H3BD-D90-FS
MTTFd (years) (2000 m above sea level)	66.75 years
DC (%)	99
Category	3
Performance level, PL	d
PFH (2000 m above sea level)	$20.15 \cdot 10^{-9}$
Safe Position Tolerance	+0.44º, -0.44º (safety-related measuring step 0.176º)
For applications up to	SIL 2

The encoder system also complies with IEC61800-5-2:2017 and IEC61800-5-3:2021

Protection

Enclosed **angular encoders** meet the protection requirements IP 64 of the **IEC 60529** standard when mounted so water splashes don't hit the sealing lips directly. For further protection, a separate protection guard must be mounted.

If an ingress protection greater than IP 64 is needed compressed air may be used.
For these cases, Fagor Automation recommends their Air Filter unit AI-1000.

The **quality of air** supplied to the encoder must be 1/4/1 according to **ISO 8573-1**:2010.
To achieve this air class, the air supplied to the AI-1000 unit must fulfil class 5/6/4 according to ISO 8573-1:2010.

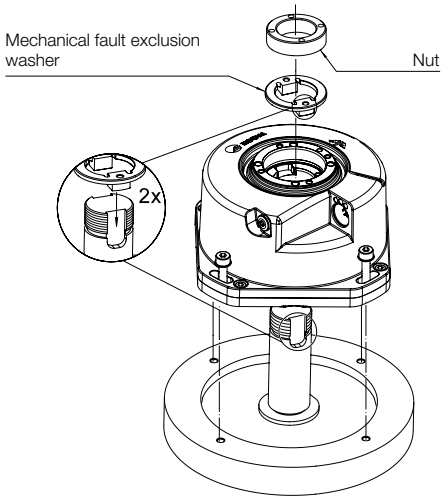
For more information see the AI-1000 catalog and manual.

Safety switch

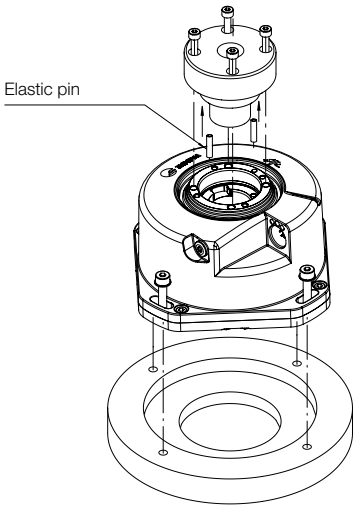
In order to guarantee the air flux it is necessary to install a **safety switch** capable of activating an alarm when the pressure gets below 60 % of the nominal pressure.

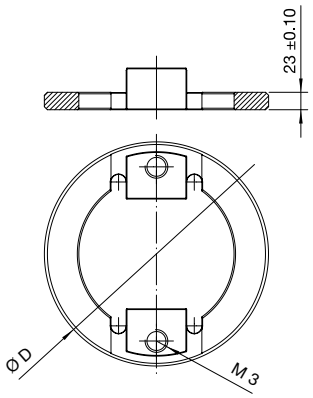
MECHANICAL FAULT EXCLUSION

Shaft coupling with nut and mechanical fault exclusion washer



Front end shaft coupling with pins





Drawings representing the hollow shaft angular encoder of 90 mm diameter (H3-D90).

For the H3-D90 and H3-D110 angular encoders, a mechanical connection between the measuring system and the drive can be made, which excludes failures due to the possibility of loosening and undoing of the connection.
To make a mechanical fault exclusion connection, it is essential that the assembly be made by either using an additional washer (mechanical fault exclusion washer) or alternatively with additional elastic pins.

It must also be taken into account that there are limitations with the following aspects:

- The materials used: it is essential that the shaft of the machine and the fastening components are made of steel
- The maximum turning speed and acceleration
- The operating temperature

Specific information is indicated in the product characteristics tables.

The part numbers and characteristics for the various models of mechanical fault exclusion washer and nut are:

Model	Washer code	Nut code	Moment of Inertia Nut and washer
H3B-D200i100	82620157	82600152	$550 \cdot 10^{-6}$ kgm²
H3-D110	82620158	82620153	$24 \cdot 10^{-6}$ kgm²
H3-D90	82620155	82620150	$4.8 \cdot 10^{-6}$ kgm²

Permissible angular aceleration of the rotor when acceleration is applied via the hollow shaft, and the shaft is coupled with a ring nut and mechanical fault exclusion washer:

– H3-D90 series: 20000 rad/s²

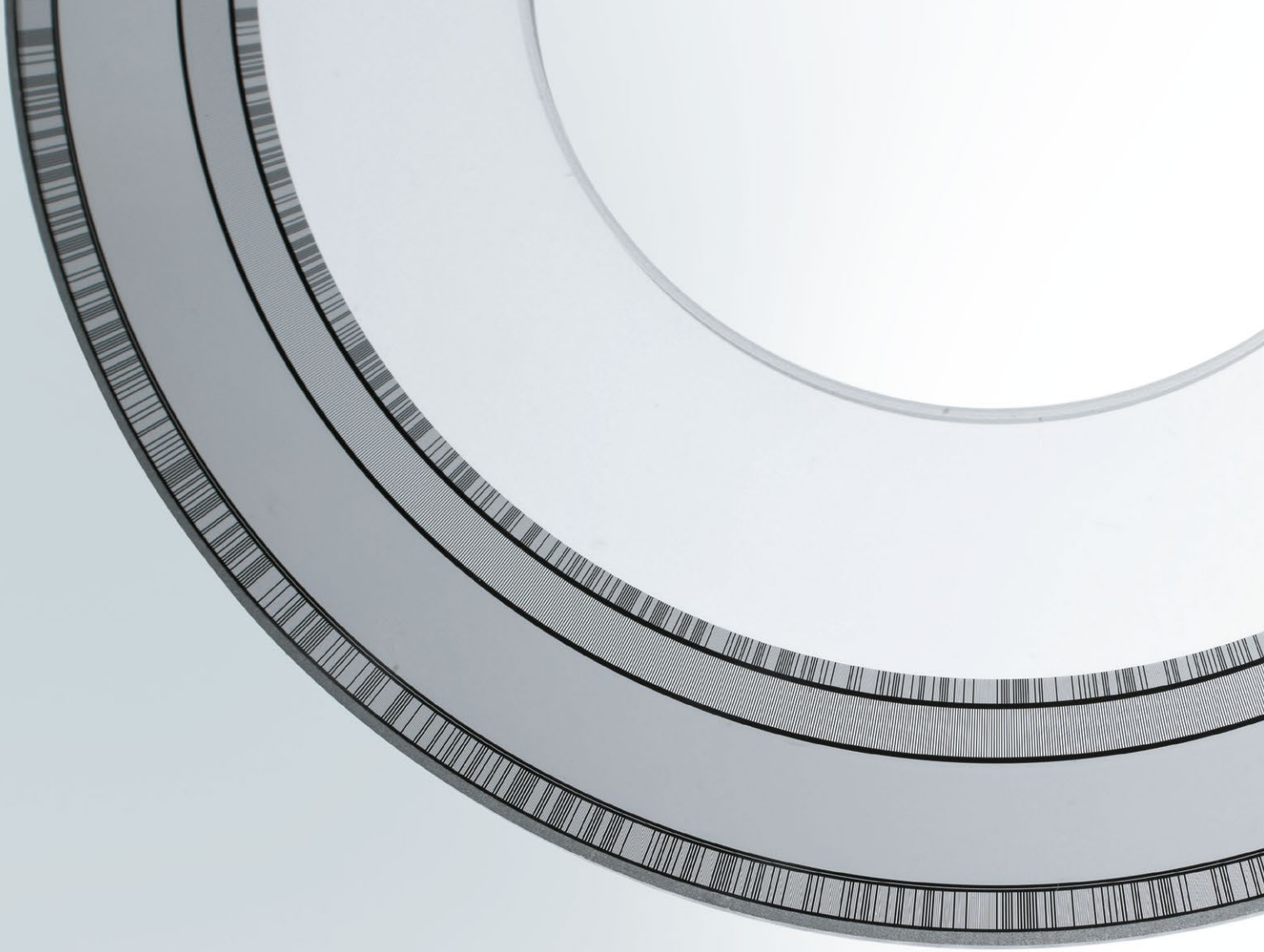
Permissible angular aceleration of the rotor when acceleration is applied via the hollow shaft, and the shaft is front coupled with pins:

– H3-D90 series: 5500 rad/s²

Permissible angular aceleration of the stator when acceleration is applied via the mounting flange:

– H3-D90 series: 4000 rad/s²

Model	Diameter Ø (mm)
H3B-D200i100	114
H3-D110	45.8
H3-D90	29.6



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

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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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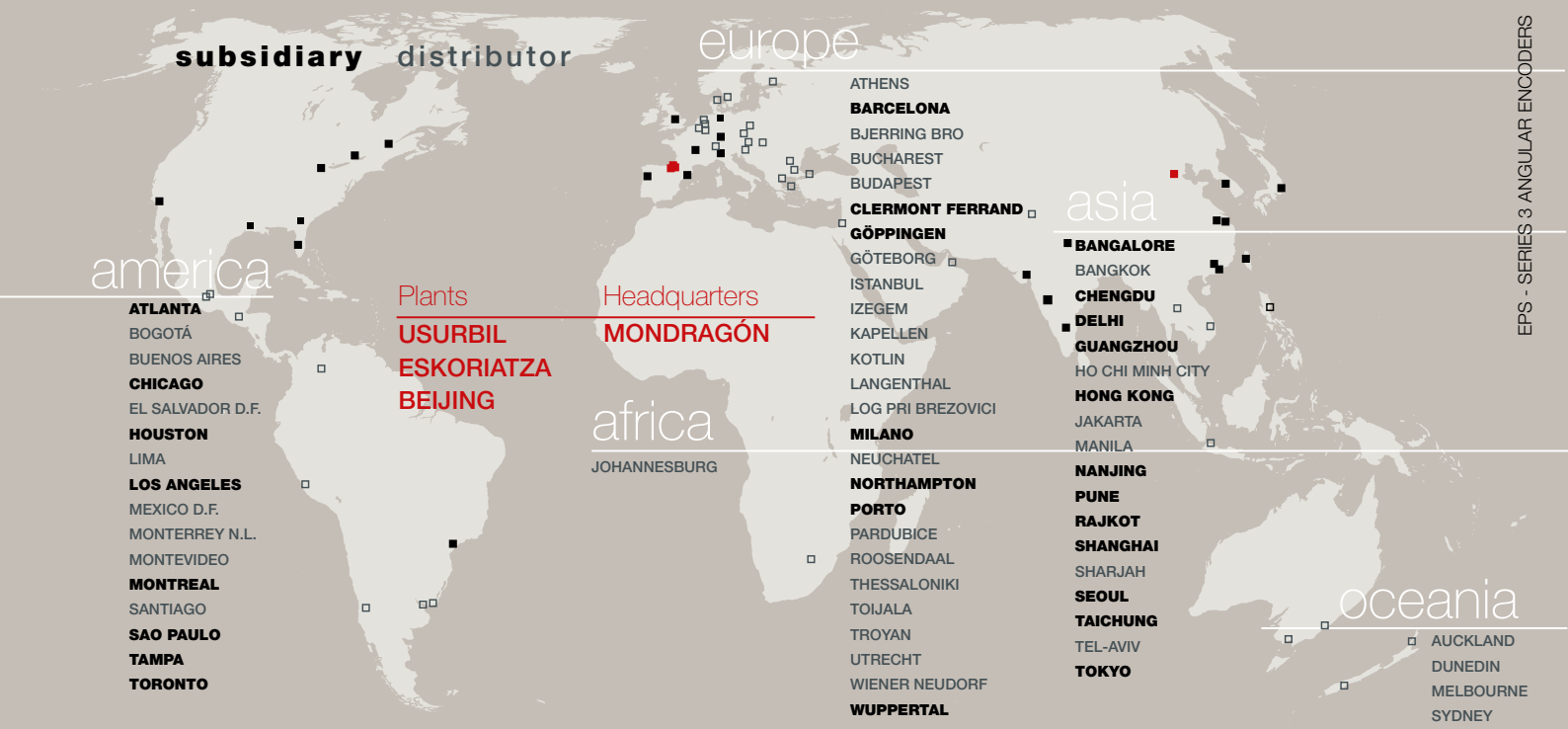

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