



Delivering solutions

Since 1985 **Eltra** is present in the market of encoders and industrial automation both nationally and in foreign Countries.

During these years the company constantly grew extending its product range (currently more than 15000 articles and 3000 customers) maintaining flexibility and capability to manufacture products designed according to Customer specifications. This is possible thanks to continuous investments designated to Research and Development and to the high knowhow of our employees.

Eltra manufactures a wide range of products (incremental, absolute, explosion-proof, rope and magnetic encoders, linear and optical incremental systems operating through field buses, photoelectric and inductive proximity sensors, magnetostrictive transducers, linear potentiometers, several accessories, etc.) and makes the ability to manufacture custom products one of its main strengths.

Thanks to our extended Sales Network and the establishment of new branch offices (China, Slovak Republic and USA) we are able to quickly satisfy different Customer needs maintaining the highest level of reliability and a prompt after-sales service.

All our products are tested according to the severe ISO 9001:2000 quality standards. We also have UL/CSA certification and many of our products satisfy ATEX standards.

By presenting this catalogue the company would like to thank customers, suppliers and stakeholders who contributed to make **Eltra** a leader on this field and will contribute to develop Italian technology all over the world.

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 Hollow shaft
incremental encoders

Please note: models marked with * are available with Hall phases

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Magnetic incremental encoders

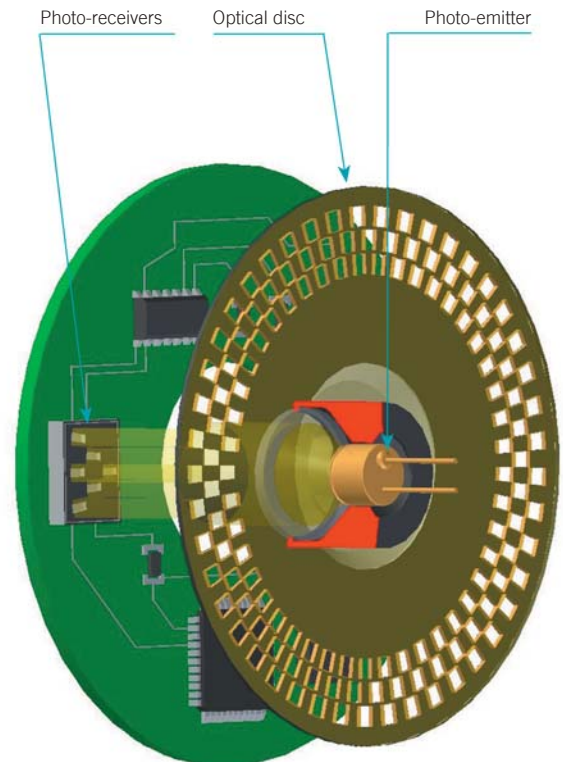
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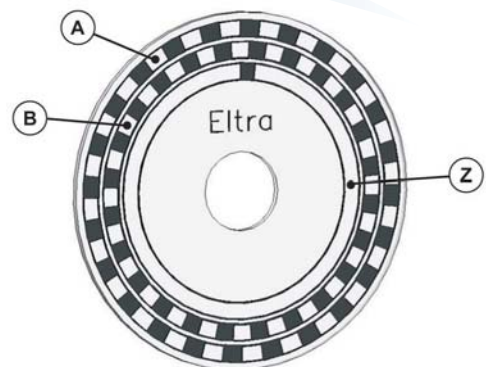
Working principle

An encoder is a rotary transducer that converts an angular movement into a series of electrical digital pulses. If associated to racks or endless screws, these generated pulses can be used to control angular or linear movements. During rotation, electrical signals can be elaborated by numerical controls (CNC), programmable logic controls (PLC), control systems, etc. Main applications of these transducers are: machinery, robots, motor feedback, measure and control devices. In Eltra encoders the angular movement transduction is based on the photoelectric scanning principle. The reading system is based on the rotation of a radial graduated disk formed by opaque windows and transparent ones alternated. The system is perpendicularly illuminated by an infrared light source. The light projects the disk image on the receivers surface which are covered by a grating called collimator having the same disk steps. The receivers trasduce the occurring light variations caused by the disk shifting and convert them into their corresponding electrical variations. Electrical signals, raised to generate squared pulses without any interference, must be electronically processed. The reading system is always carried out in differential modality, that is comparing different signals nearly identical but out of phase of 180 electrical degrees. That in order to increase quality and stability of output signals. The reading is performed comparing the difference between the two channels, to remove the noise known as "common mode", because signals are overlapped in equal way on each wave.



Incremental encoders

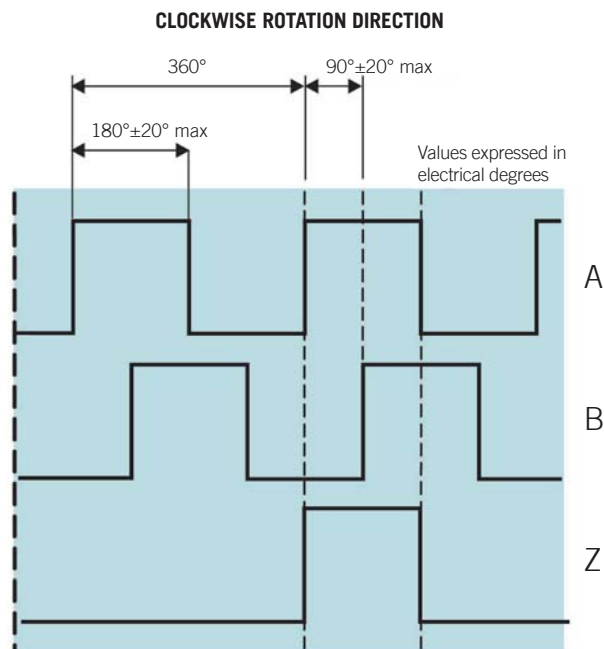
The incremental encoder usually gives two types of squared waves out of phase of 90 electrical degrees. They are usually called channel A and B. The first channel gives information about the rotation speed while the second, basing on the state sequence produced by the two signals, provides the direction of rotation. A further signal, called Z or zero channel, is also available. It gives the absolute zero position of the encoder shaft. This signal is a squared pulse with phase and width centered on A channel.



The incremental encoder precision depends on mechanical and electrical factors. These errors could be: grating division, disk eccentricity, bearings eccentricity, electronic reading and optical inaccuracy. The measurement unit to define encoder precision is the electrical degree. It determines the division of the impulse generated by the encoder: 360 electrical degrees correspond to the mechanical rotation of the shaft which is necessary to carry out a complete cycle. To know how many mechanical degrees correspond to 360 electrical degrees the following formula has to be applied:

$$\text{electrical } 360^\circ = \frac{\text{mechanical } 360^\circ}{\text{nr. pulses / turn}}$$

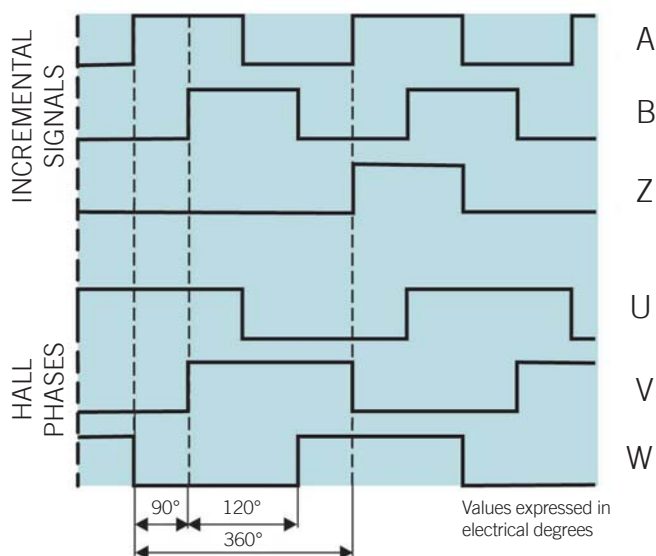
The encoder division error is given from the maximum shifting shown in the electrical degrees of two consecutive edges. This error exists in any encoder and is due to the above mentioned factors. For Eltra encoders this error is included in ± 25 electrical degrees max. in whatever allowed condition, which corresponds to a shifting of $\pm 7\%$ from the nominal value. Regarding the 90 electrical degrees shifting between the two channels, it differs in ± 35 electrical degrees max. It corresponds to $\pm 10\%$.



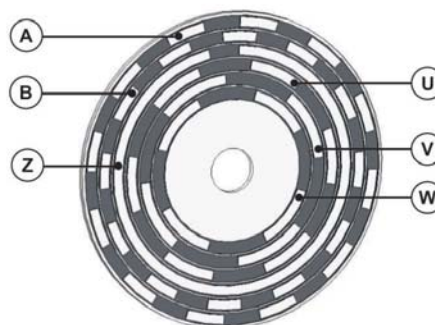
Graphic representation of A, B and Z incremental signals.

Incremental encoder with integrated commutation phases (Hall phases)

In addition to the above mentioned encoders, there are other encoders that integrate additional electrical output signals. These are incremental encoders with integrated commutation signals, used as motor feedback. These additional signals simulate the Hall phases that are usually present in brushless motors and are generally realized by magnetic sensors. In Eltra encoders these commutation signals are optically generated and presented as three squared waves, shifted by 120 electrical degrees. These signals will be used by the driver that controls the motor in order to generate correct voltage phases to determine right rotation. These commutation pulses can be repeated many times within one mechanical turn because they directly depend on the pole number in the related motor. So we have commutation phases for motors of 4, 6 or more poles.



Graphic representation of A, B and Z incremental signals with U, V and W Hall phases.



Main features

Miniaturized \varnothing 30 encoder series. Recommended when a minimal size is required even providing excellent performances.

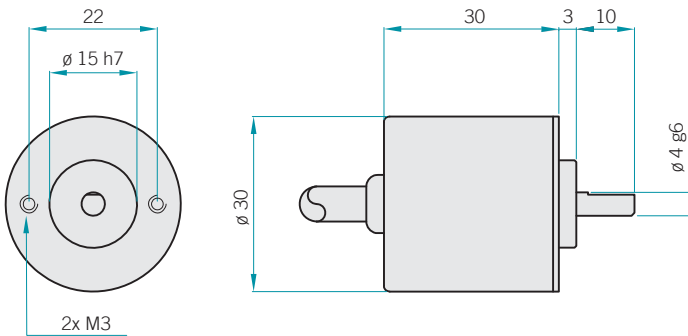
- Up to 1024 ppr with zero signal
- Several output types available
- Up to 24 V DC power supply
- Up to 100 kHz output frequency
- Cable output. Cable with connector at the end available on demand
- Several flanges available
- Up to 3000 RPM rotation speed
- Up to IP54 sealing



Ordering code

EL 30 E 50 Z 5 N 4 X 3 P A . XXX		full stop to separate special version
incremental encoder series	EL	
size	30	
Type of flange	E H I	
EL 30 E model	E	
EL 30 H model	H	
EL 30 I model	I	
Resolution	1 to 1024	
ppr from 1 to 1024		
please directly contact our offices for pulses availability		
Zero pulse	S Z	
without zero pulse	S	
with zero pulse	Z	
Power supply	5 8/24	
5 V DC	5	
8÷24 V DC	8/24	
Max. rotation speed	3	3000 RPM
Enclosure rating	X	IP54
Shaft diameter	4 6	\varnothing 4 mm (EL 30 E) \varnothing 6 mm (EL 30 E / H / I)
Output type	N C P L	NPN NPN open collector push-pull line driver
please refer to page 92 for optionals about output types		
	A	axial
	P	cable output (standard length 0.5 m)
	XXX	special version code numbered from 001 to 999

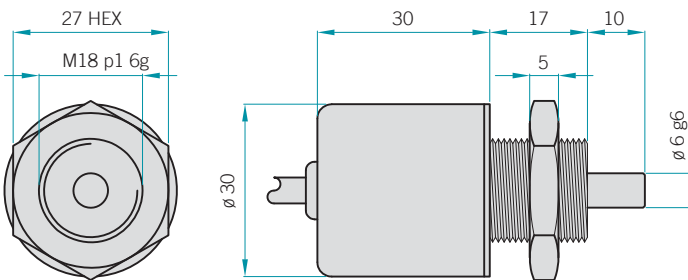
EL 30 E



Electrical specifications

Resolution	from 1 to 1024 ppr
Power supply	5 V DC 8÷24 V DC
Current consumption without load	100 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output type	NPN / NPN open collector push-pull / line driver
Max. output frequency	100 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

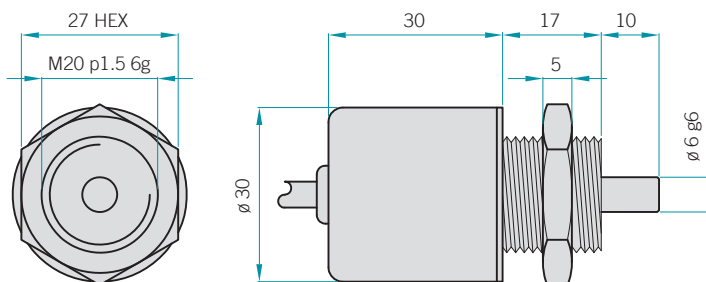
EL 30 H



Mechanical specifications

Shaft diameter	∅ 4 mm (EL 30 E) ∅ 6 mm (EL 30 E / H / I)
Enclosure rating	IP54
Max. rotation speed	3000 RPM
Max. shaft load	5 N (0.5 kgf) axial 5 N (0.5 kgf) radial
Shock	50 G, 11 ms
Vibration	10 G, 10÷2000 Hz
Bearing life	10 ⁹ revolutions
Bearings	2 ball bearings
Shaft material	stainless steel UNI X10CrNiS1809
Body material	aluminium UNI 9002/5
Housing material	PA66 glass fiber reinforced
Operating temperature	0÷60 °C
Storage temperature	-25÷70 °C
Weight	50 g

EL 30 I



Main features

Miniaturized \varnothing 38 encoder series. Recommended when a minimal size is required even providing excellent performances.

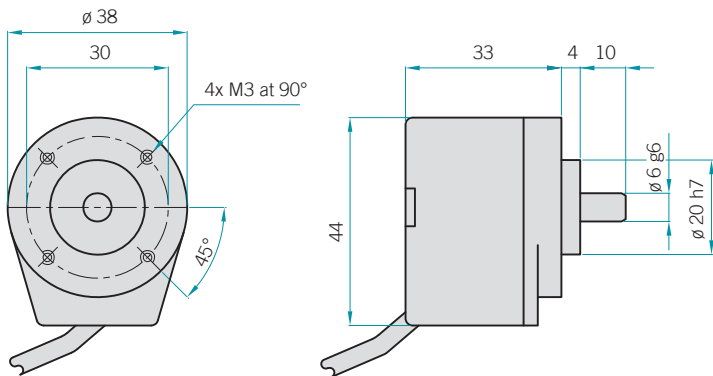
- Up to 1024 ppr with zero signal
- Several output types available
- Up to 24 V DC power supply
- Up to 100 kHz output frequency
- Cable output. Cable with connector at the end available on demand
- Several flanges available
- Up to 3000 RPM rotation speed
- Up to IP54 sealing



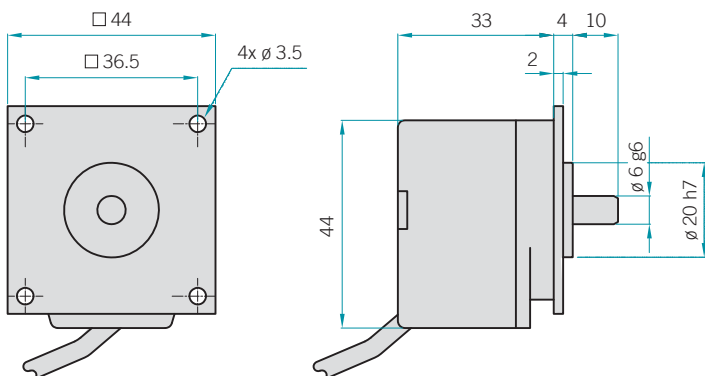
Ordering code

EH 38 A 500 Z 5 N 6 X 3 P R . XXX											
incremental encoder series EH		size 38		Type of flange		Resolution		Zero pulse		Power supply	
				EH 38 A model A EH 38 B model B EH 38 D model D		ppr from 40 to 1024 <i>please directly contact our offices for pulses availability</i>		without zero pulse S with zero pulse Z		5 V DC 5 8÷24 V DC 8/24	
										Enclosure rating	
										X IP54	
										Shaft diameter	
										6 \varnothing 6 mm	
										Output type	
										N NPN C NPN open collector P push-pull L line driver <i>please refer to page 92 for options about output types</i>	
										Max. rotation speed	
										3 3000 RPM	
										Enclosure rating	
										X IP54	
										Enclosure rating	
										X IP54	
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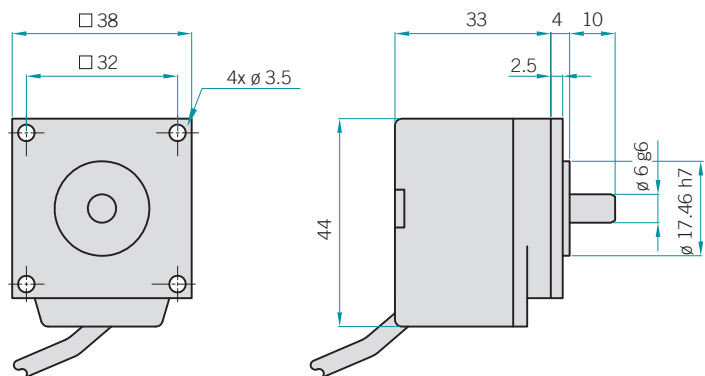
EH 38 A



EH 38 B



EH 38 D



Electrical specifications

Resolution	from 40 to 1024 ppr
Power supply	5 V DC 8÷24 V DC
Current consumption without load	100 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output type	NPN / NPN open collector push-pull / line driver
Max. output frequency	100 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Mechanical specifications

Shaft diameter	ø 6 mm
Enclosure rating	IP54
Max. rotation speed	3000 RPM
Max. shaft load	5 N (0.5 kgf) axial 5 N (0.5 kgf) radial
Shock	50 G, 11 ms
Vibration	10 G, 10÷2000 Hz
Bearing life	10 ⁹ revolutions
Bearings	2 ball bearings
Shaft material	stainless steel UNI X10CrNiS1809
Body material	aluminium UNI 5076
Housing material	PA66 glass fiber reinforced
Operating temperature	0÷60 °C
Storage temperature	-25÷70 °C
Weight	100 g

Main features

Miniaturized $\varnothing 42$ encoder series for general applications.

- Up to 2500 ppr with zero signal
- Several output types available
- Up to 28 V DC power supply
- Up to 100 kHz output frequency
- Cable output. Cable with connector at the end available on demand
- Several flanges available
- Up to 6000 RPM rotation speed
- Up to IP65 sealing



Ordering code

full stop to separate special versions

EL 40 A 500 Z 5/28 N 6 X 3 P R . XXX

incremental encoder series **EL**

size **40**

Type of flange

EL 40 A model **A**
 EL 40 B model **B**
 EL 40 C model **C**
 EL 40 E model **E**
 EL 40 H model **H**
 EL 40 I model **I**

Resolution

ppr from **1** to **2500**

please directly contact our offices for pulses availability

Zero pulse

without zero pulse **S**
 with zero pulse **Z**

Power supply

5÷28 V DC **5/28**

line driver available only with 5 V DC or 8÷24 V DC power supply

special version code numbered from 001 to 999

R radial
A axial

P cable output (standard length 0.5 m)

PS axial cable output with SKINTOP® and IP66 protection rating (EL 40 A / B)

Max. rotation speed

3 3000 RPM
6 6000 RPM

Enclosure rating

X IP54 standard
S IP65 optional (EL 40 A / B)

Shaft diameter

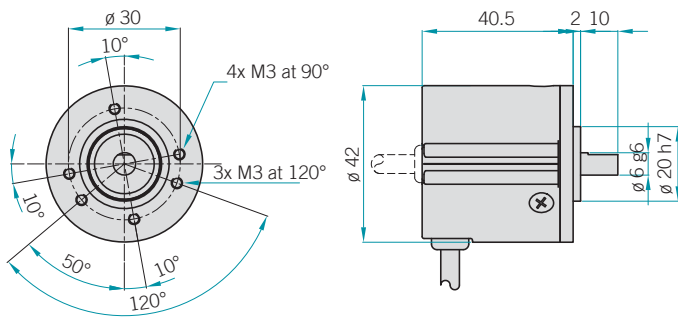
4 $\varnothing 4$ mm (EL 40 E)
6 $\varnothing 6$ mm (EL 40 A / B / C / H / I)

Output type

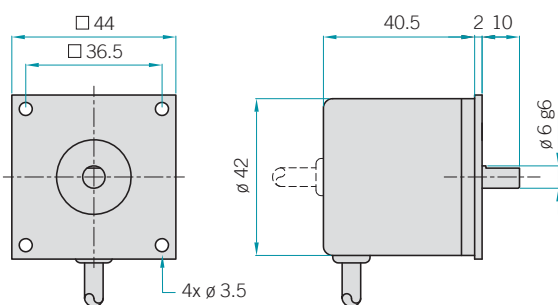
N NPN
C NPN open collector
P push-pull
L line driver

please refer to page 92 for optionals about output types

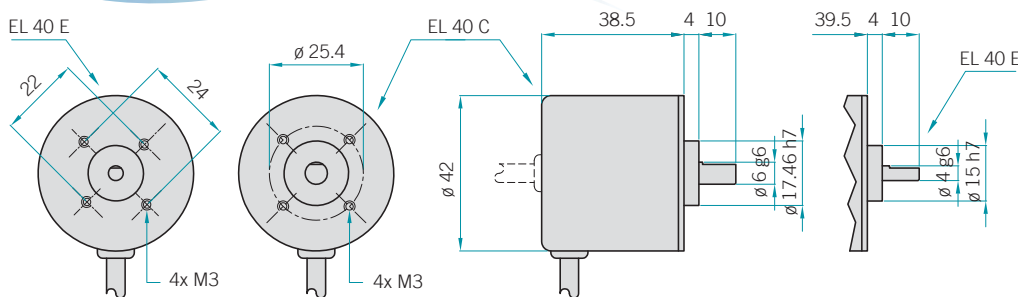
EL 40 A



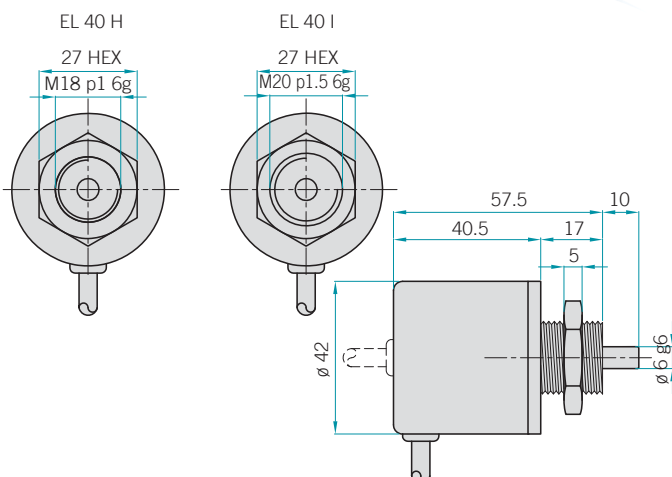
EL 40 B



EL 40 C / E



EL 40 H / I



Mechanical specifications

Shaft diameter	∅ 4 mm (EL 40 E) ∅ 6 mm (EL 40 A / B / C / H / I)
Enclosure rating	IP54 standard (EL 40 C / E / H / I) IP65 optional (EL 40 A / B) IP66 (EL 40 A / B only axial output with SKINTOP®)
Max. rotation speed	3000 RPM 6000 RPM
Max. shaft load	5 N (0.5 kgf) axial 5 N (0.5 kgf) radial
Shock	50 G, 11 ms
Vibration	10 G, 10÷2000 Hz
Bearing life	10 ⁹ revolutions
Bearings	2 ball bearings
Shaft material	stainless steel UNI X10CrNiS1809
Body material	aluminium UNI 9002/5
Housing material	PA66 glass fiber reinforced
Operating temperature	0÷60 °C
Storage temperature	-25÷70 °C
Weight	100 g

Electrical specifications

Resolution	from 1 to 2500 ppr
Power supply	5÷28 V DC line driver available only with 5 V DC or 8÷24 V DC power supply
Current consumption without load	100 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output type	NPN / NPN open collector push-pull / line driver
Max. output frequency	100 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Main features

Standard \varnothing 58 encoder series for industrial applications with high mechanical resistance requirements. These encoders are designed to support high radial and axial shaft load and they can be mounted by means of flanges or servo-fasteners.

- Up to 10000 ppr with zero signal for EL series, up to 1024 ppr for EH series
- Several output types available
- Up to 28 V DC power supply for EL series and up to 24 V DC for EH series
- Up to 300 kHz output frequency for EL series and up to 100 kHz for EH series
- Cable or connector output
- Several flanges available
- Up to 6000 RPM rotation speed
- Up to IP66 sealing


Ordering code

full stop to separate
special versions

EL 58 B 1000 Z 5/28 P 6 X 6 P R . XXX

incremental encoder series **EL**
incremental encoder series **EH**

size **58**

Type of flange

EH - EL 58 B model **B**
EH - EL 58 C model **C**
EH - EL 58 H model **H**
EH - EL 58 T model **T**

Resolution

(EL series) ppr from **1** to **10000**
(EH series) ppr from **40** to **1024**
please directly contact our offices for pulses availability

Zero pulse

without zero pulse **S**
with zero pulse **Z**

Power supply

(EH series) 5 V DC **5**
(EH series) 8÷24 V DC **8/24**
(EL series) 5÷28 V DC **5/28**
line driver available only with 5 V DC or 8÷24 V DC power supply

R radial
A axial

P cable output (standard length 1.5 m)

M M connector output

J J connector output

Max. rotation speed

3 3000 RPM
6 6000 RPM
3000 RPM max. with "S" enclosure rating

Enclosure rating

X IP54 standard
S IP66 optional

Shaft diameter

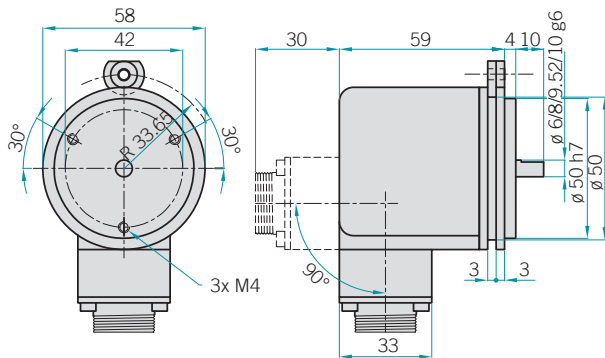
6 \varnothing 6 mm (EH - EL 58 B / C / H)
8 \varnothing 8 mm (EH - EL 58 B / C / H / T)
9 \varnothing 9,52 mm (3/8") (EH - EL 58 B / C / H)
10 \varnothing 10 mm (EH - EL 58 B / C / H / T)
12 \varnothing 12 mm (EH - EL 58 T)

Output type

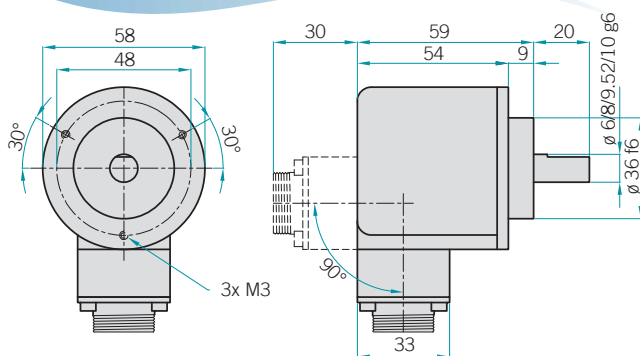
N NPN
C NPN open collector
P push-pull
L line driver (EL series)
please refer to page 92 for optionals about output types

special version
code numbered
from 001 to 999

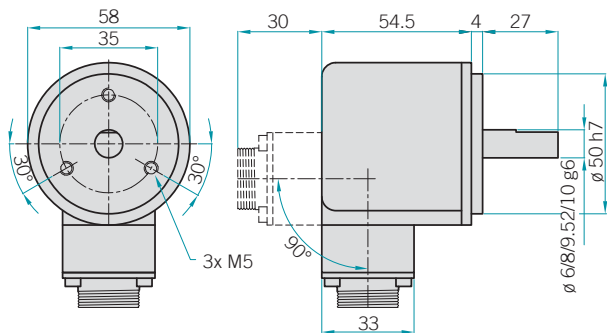
EH - EL 58 B



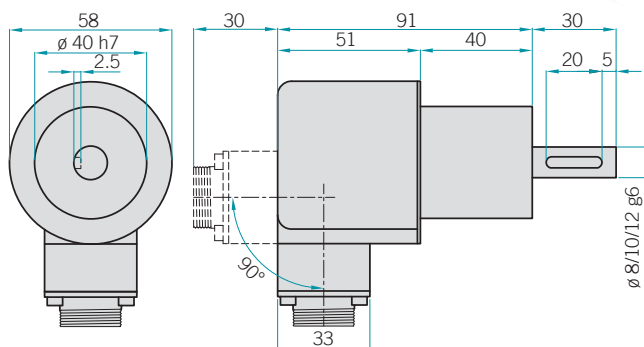
EH - EL 58 C



EH - EL 58 H



EH - EL 58 T



Electrical specifications (EL series)

Resolution	from 1 to 10000 ppr
Power supply	5÷28 V DC line driver available only with 5 V DC or 8÷24 V DC power supply
Current consumption without load	100 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output type	NPN / NPN open collector push-pull / line driver
Max. output frequency	300 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Electrical specifications (EH series)

Resolution	from 40 to 1024 ppr
Power supply	5 V DC 8÷24 V DC
Current consumption without load	100 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output type	NPN / NPN open collector push-pull / line driver
Max. output frequency	100 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Mechanical specifications

Shaft diameter	ø 6 / 8 / 9.52 / 10 mm (EH - EL 58 B / C / H)
Enclosure rating	IP54 standard IP66 optional
Max. rotation speed	3000 RPM 6000 RPM 3000 RPM max. with "S" enclosure rating
Max. shaft load	10 N (1 kgf) axial with ø 6 mm shaft 20 N (2 kgf) radial with ø 6 mm shaft 200 N (20 kgf) axial 200 N (20 kgf) radial
Shock	50 G, 11 ms (plastic disc) 20 G, 11 ms (glass disc)
Vibration	10 G, 10÷2000 Hz
Bearing life	10 ⁹ revolutions
Bearings	2 ball bearings
Shaft material	stainless steel UNI X10CrNiS1809
Body material	aluminium UNI 9002/5
Housing material	PA66 glass fiber reinforced
Operating temperature	0÷60 °C
Storage temperature	-25÷70 °C
Weight	300 g

Main features

Standard \varnothing 63 encoder series for industrial applications with high mechanical resistance requirements. These encoders are designed to support high radial and axial shaft load and they can be mounted by means of flanges or servo-fasteners.

- Up to 10000 ppr with zero signal for EL series, up to 1024 ppr for EH series
- Several output types available
- Up to 28 V DC power supply for EL series and up to 24 V DC for EH series
- Up to 300 kHz output frequency for EL series and up to 100 kHz for EH series
- Cable or connector output
- Several flanges available
- Up to 6000 RPM rotation speed
- Up to IP66 sealing



Ordering code

full stop to separate special versions

EL 63 A 1000 Z 5/28 P 6 X 6 M R . XXX

incremental encoder series **EL**
incremental encoder series **EH**

size **63**

Type of flange

EH - EL 63 A model **A**
EH - EL 63 D model **D**
EH - EL 63 E model **E**

Resolution

(EL series) ppr from **1** to **10000**
(EH series) ppr from **40** to **1024**
please directly contact our offices for pulses availability

Zero pulse

without zero pulse **S**
with zero pulse **Z**

Power supply

(EH series) 5 V DC **5**
(EH series) 8÷24 V DC **8/24**
(EL series) 5÷28 V DC **5/28**
line driver available only with 5 V DC or 8÷24 V DC power supply

special version code numbered from 001 to 999

R radial
A axial

P cable output (standard length 1.5 m)

M M connector output

J J connector output

Max. rotation speed

3 3000 RPM
6 6000 RPM *3000 RPM max. with "S" enclosure rating*

Enclosure rating

X IP54 standard
S IP66 optional

Shaft diameter

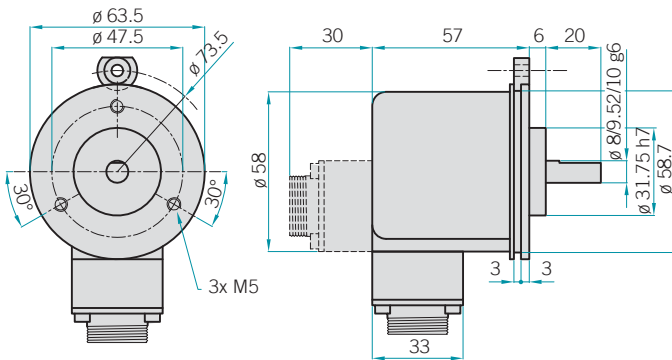
8 \varnothing 8 mm
9 \varnothing 9.52 mm (3/8")
10 \varnothing 10 mm

Output type

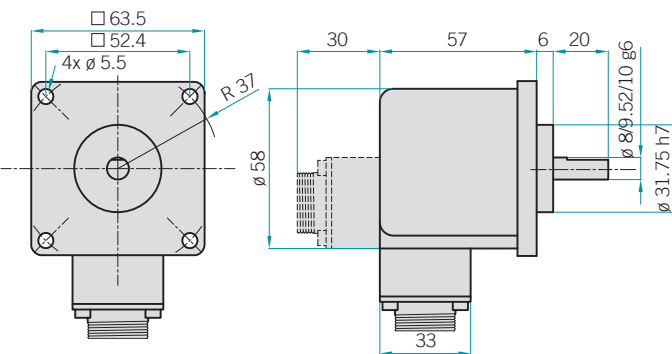
N NPN
C NPN open collector
P push-pull
L line driver

please refer to page 92 for optionals about output types

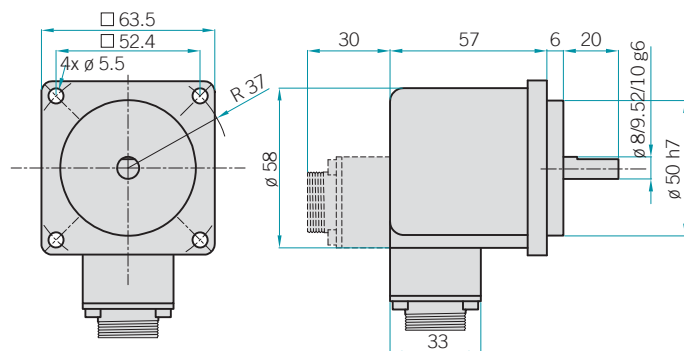
EH - EL 63 A



EH - EL 63 D



EH - EL 63 E



Electrical specifications (EL series)

Resolution	from 1 to 10000 ppr
Power supply	5÷28 V DC line driver available only with 5 V DC or 8÷24 V DC power supply
Current consumption without load	100 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output type	NPN / NPN open collector push-pull / line driver
Max. output frequency	300 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Electrical specifications (EH series)

Resolution	from 40 to 1024 ppr
Power supply	5 V DC 8÷24 V DC
Current consumption without load	100 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output type	NPN / NPN open collector push-pull / line driver
Max. output frequency	100 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Mechanical specifications

Shaft diameter	ø 8 / 9.52 / 10 mm
Enclosure rating	IP54 standard IP66 optional
Max. rotation speed	3000 RPM 6000 RPM 3000 RPM max. with "S" enclosure rating
Shock	50 G, 11 ms (plastic disc) 20 G, 11 ms (glass disc)
Vibration	10 G, 10÷2000 Hz
Bearing life	10 ⁹ revolutions
Bearings	2 ball bearings
Shaft material	stainless steel UNI X10CrNiS1809
Body material	aluminium UNI 5076
Housing material	PA66 glass fiber reinforced
Operating temperature	0÷60 °C
Storage temperature	-25÷70 °C
Weight	350 g



EH - EL 90 A EH - EL 115 A / R

INCREMENTAL ENCODERS



ISO 9001:2000



Main features

Encoder series for critical environments with high mechanical resistance requirements. The 90 model can be mounted by means of flanges or servo-fasteners; the 115 model has a tachometer generator REO-444 type compatible plug.

- Up to 10000 ppr with zero signal for EL series, up to 1024 ppr for EH series
- Several output types available
- Up to 28 V DC power supply for EL series and up to 24 V DC for EH series
- Up to 300 kHz output frequency for EL series and up to 100 kHz for EH series
- Cable or connector output
- Several flanges available
- Up to 6000 RPM rotation speed
- Up to IP66 sealing for model 90 A



Ordering code

EL 90 A 1000 Z 5/28 N 1000 Z 5/28 N 8 X 6 M R . XXX

full stop to separate special versions

incremental encoder series **EL**
incremental encoder series **EH**
size **90**
size **115**

Type of flange

EH - EL 90 A, EH - EL 115 A model **A**
EH - EL 115 R model with centrifugal relay **R**

Resolution

(EL series) ppr from **1** to **10000**
(EH series) ppr from **40** to **1024**
please directly contact our offices for pulses availability

Zero pulse

without zero pulse **S**
with zero pulse **Z**

Power supply

(EH series) 5 V DC **5**
(EH series) 8÷24 V DC **8/24**
(EL series) 5÷28 V DC **5/28**
line driver available only with 5 V DC or 8÷24 V DC power supply

Output type

NPN **N**
NPN open collector **C**
push-pull **P**
line driver **L**

please refer to page 92 for optionals about output types

special version code numbered from 001 to 999

R radial
A axial

P cable output (standard length 1.5 m)

M M connector output

J J connector output

Max. rotation speed

3 3000 RPM
6 6000 RPM *3000 RPM max. with "S" enclosure rating*

Enclosure rating

X IP54 standard
S IP66 optional (EH - EL 90 A)

Shaft diameter

8 ø 8 mm (EH - EL 90)
9 ø 9.52 mm (3/8") (EH - EL 90)
10 ø 10 mm (EH - EL 90, EH - EL 115)
11 ø 11 mm (EH - EL 115)

Output type

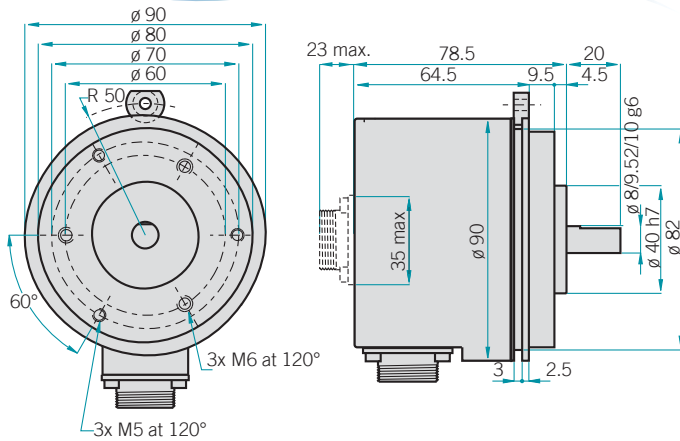
Power supply

Zero pulse

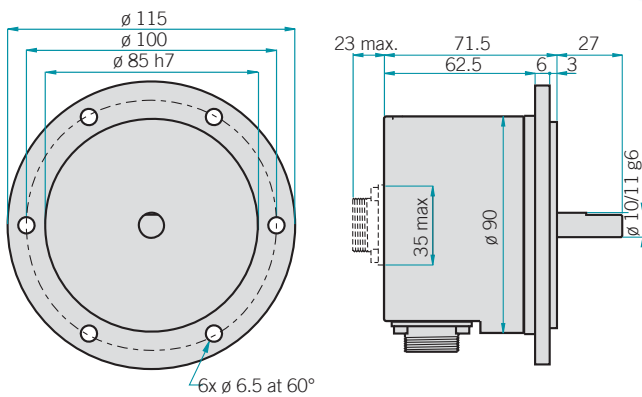
Resolution

to be indicated only on models with double electronic output (for more informations please contact our offices)

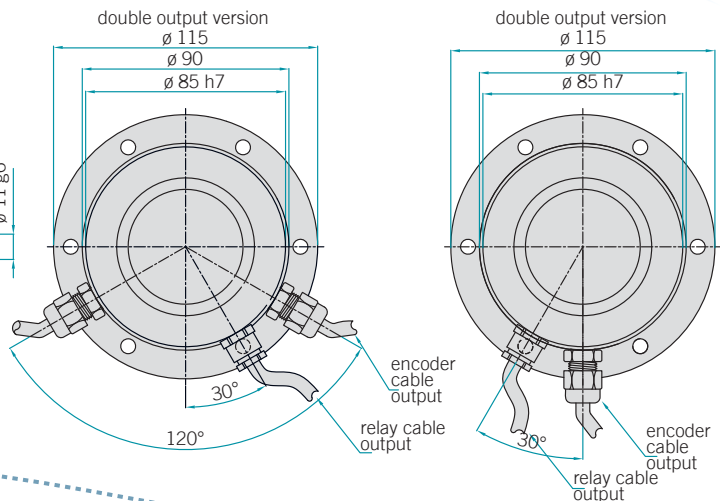
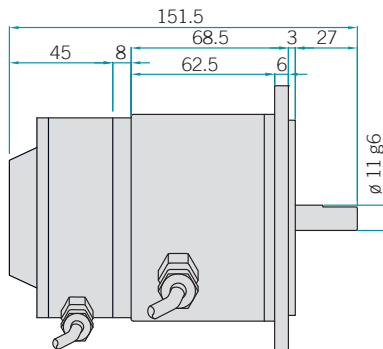
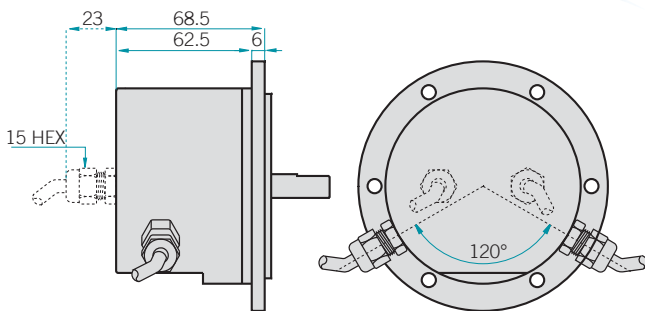
EH - EL 90 A



EH - EL 115 A



EH - EL 90 A / 115 A with double electronics



Electrical specifications

Resolution	from 1 to 10000 ppr (EL series) from 40 to 1024 ppr (EH series)
Power supply	5±28 V DC (EL series) 5 V DC / 8±24 V DC (EH series)
Current consumption without load	100 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output types	NPN / NPN open collector push-pull / line driver
Max. output frequency	300 kHz (EL series) 100 kHz (EH series)
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Mechanical specifications

Shaft diameter	ø 8 / 9.52 / 10 mm (EH - EL 90 A) ø 10 / 11 mm (EH - EL 115 A / R)
Enclosure rating	IP54 standard IP66 optional (EH - EL 90 A)
Max. rotation speed	3000 RPM 6000 RPM 3000 RPM max. with "S" enclosure rating
Shock	50 G, 11 ms (plastic disc) 20 G, 11 ms (glass disc)
Vibration	10 G, 10÷2000 Hz
Bearing life	10 ⁹ revolutions
Bearings	2 ball bearings
Shaft material	stainless steel UNI X10CrNiS1809
Body material	aluminium UNI 9002/5
Housing material	painted aluminium
Operating temperature	0÷60 °C
Storage temperature	-25÷70 °C
Weight	750 g

EH - EL 115 R with centrifugal relay

Main features

ø 36 encoder series recommended in feedback control systems on AC servomotors. It includes a traditional incremental encoder and the Hall effect phases.

- Interchangeable with size 15 Resolver; it allows easy and cost effective mounting
- Easy mechanical mounting
- Small dimensions
- Wide range of resolutions available



Ordering code

full stop to separate special versions

EF 36 K 4 L 512 Z 5 L 8 X 3 PR . XXX

incremental encoder with Hall phases

EF

size 36

Type of flange

blind hollow shaft with rear fixing K

Poles of the motor

4 poles 4

6 poles 6

8 poles 8

Output type for Hall phases

NPN open collector C

line driver L

Resolution

ppr from 1 to 2048

please directly contact our offices for pulses availability

Zero pulse

without zero pulse S

with zero pulse Z

Power supply

5 V DC 5

special version code numbered from 001 to 999

PR radial cable output (standard length 0.3 m)

Max. rotation speed

3 3000 RPM

6 6000 RPM

Enclosure rating

X IP40

Bore diameter

8 ø 8 mm

9 ø 9.52 mm (3/8")

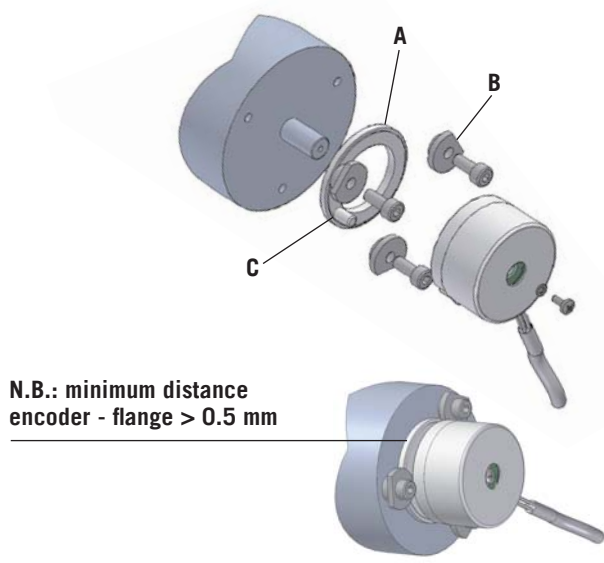
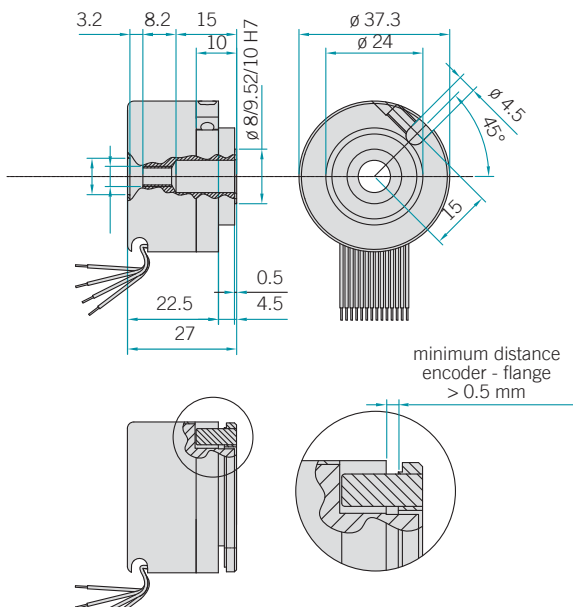
10 ø 10 mm

Output type for incremental signals

L line driver

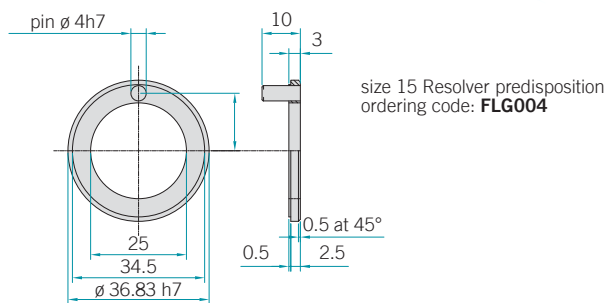
please refer to page 92 for optionals about output types

EF 36 K



N.B.: minimum distance encoder - flange > 0.5 mm

ACCESSORIES Flanges for motor fixing



HOW TO MOUNT IT

- 1) Insert the flange (A) on the motor.
- 2) Tighten the appropriate servo-fasteners (B) without blocking them.
- 3) Insert the encoder on the motor shaft (misalignment recovery system must correspond to the peg (C)).
- 4) Block the encoder on the motor axle by the proper screw.
- 5) Turn for phasing.
- 6) Finally, fix the servo-fasteners (B).
- 7) Verify the right working of the misalignment recovery system.

Electrical specifications

Resolution	from 1 to 2048 ppr
Current consumption without load	15 mA for channel (line driver) 30 mA for channel
Max. output frequency	150 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$
Power supply	5 V DC $\pm 5\%$
Output type for incremental signals	line driver
Output type for Hall phases	line driver NPN open collector
Current consumption without load	150 mA max.

Mechanical specifications

Bore diameter	$\varnothing 8 / 9.52 / 10 \text{ mm}$
Enclosure rating	IP40
Max. rotation speed	6000 RPM
Shock	50 G, 11 ms
Vibration	5 G, 10 \div 500 Hz
Bearings	2 ball bearings
Shaft material	stainless steel UNI X10CrNiS1809
Body material	aluminium UNI 9002/5
Housing material	aluminium UNI 9002/5
Operating temperature	-10 \div 85 °C
Storage temperature	-25 \div 85 °C
Weight	50 g
Accessories	flange for mounting on motors (size 15 Resolver type)



Main features

Miniaturized \varnothing 38 encoder series for general applications.

- Resolution up to 3600 ppr with zero signal
- Several electronic output configurations available
- Up to 28 V DC power supply
- Up to 100 kHz output frequency
- Several flanges available
- Up to 3000 RPM rotation speed
- Up to IP54 sealing



Ordering code

full stop to separate special versions

EL 38 F 500 Z 5/28 N 6 X 3 P R . XXX

incremental encoder series **EL**

size **38**

Type of flange

EL 38 F model **F**

EL 38 G model **G**

Resolution

ppr from **1** to **3600**

please directly contact our offices for pulses availability

Zero pulse

without zero pulse **S**

with zero pulse **Z**

Power supply

5 ÷ 28 V DC **5/28**

line driver available only with 5 V DC or 8-24 V DC power supply

R radial

P cable output with SKINTOP[®] (standard length 0.5 m)

special version code numbered from 001 to 999

Max. rotation speed

3 3000 RPM

Enclosure rating

X IP54

Bore diameter

6 \varnothing 6 mm

8 \varnothing 8 mm

9 \varnothing 9.52 mm (3/8")

10 \varnothing 10 mm

Output type

N NPN

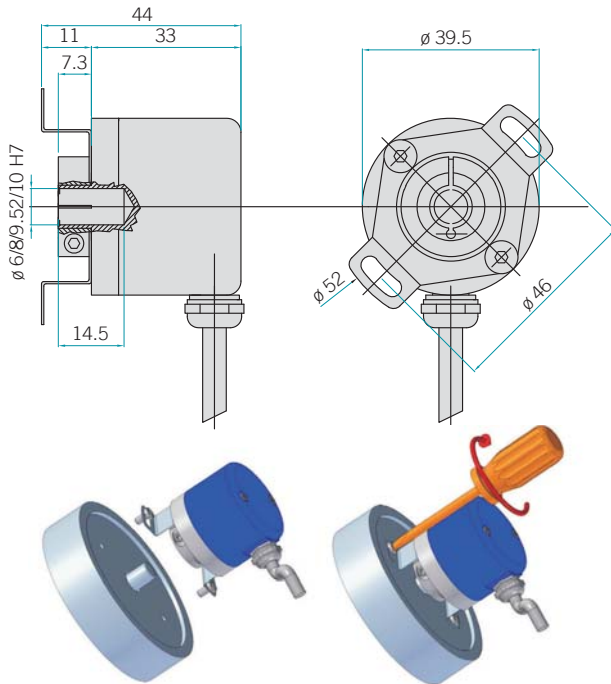
C NPN open collector

P push-pull

L line driver

please refer to page 92 for optionals about output types

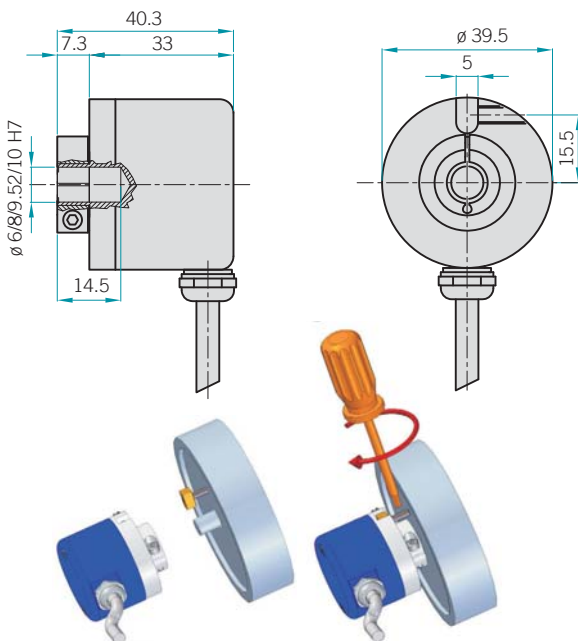
EL 38 F



HOW TO MOUNT IT

- 1) Couple the encoder shaft with the motor shaft.
- 2) Fix the spring to the motor flange without tightening it.
- 3) Fix the encoder shaft by the metal ring.
- 4) Turn for phasing.
- 5) Block the spring.

EL 38 G



HOW TO MOUNT IT

- 1) Mount the anti-rotation pin on the motor flange.
- 2) Couple the encoder shaft with the motor shaft, making sure the pin is inserted in the hole on the front part of the encoder (maintaining a minimum distance of 0.5 mm).
- 3) Fix the encoder shaft by the metal ring.

Electrical specifications

Resolution	from 1 to 3600 ppr
Power supply	5÷28 V DC line driver available only with 5 V DC or 8÷24 V DC power supply
Current consumption without load	80 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output type	NPN / NPN open collector push-pull / line driver
Max. output frequency	100 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Mechanical specifications

Bore diameter	$\varnothing 6 / 8 / 9.52 / 10$ mm
Enclosure rating	IP54
Max. rotation speed	3000 RPM
Max. shaft load	5 N (0.5 kgf) axial 5 N (0.5 kgf) radial
Shock	50 G, 11 ms
Vibration	10 G, 10÷2000 Hz
Bearing life	10 ⁹ revolutions
Bearings	2 ball bearings
Shaft material	stainless steel UNI X10CrNiS1809
Body material	aluminium UNI 9002/5
Housing material	aluminium
Operating temperature	0÷60 °C
Storage temperature	-25÷70 °C
Weight	150 g

Main features

ø 40 encoder series recommended in feedback control systems on AC servomotors. It includes a traditional incremental encoder and the Hall effect phases.

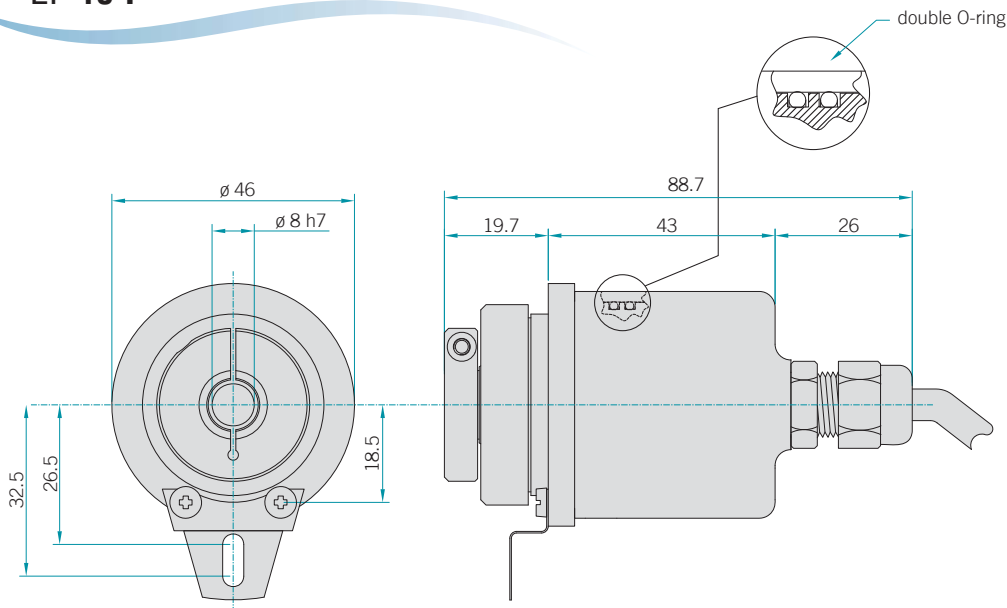
- Easy mechanical mounting
- Small dimensions
- Wide resolution range available



Ordering code

EF 40 F 4 L 1024 Z 5 L 6 S 3 PSA . XXX																										
incremental encoder with Hall phases	EF	size 40	Type of flange	F	blind hollow shaft with front fixing by spring	Poles of the motor	4 poles 4 6 poles 6 8 poles 8	Output type for Hall phases	NPN open collector C line driver L	Resolution	ppr from 1 to 1024 <i>please directly contact our offices for pulses availability</i>	Zero pulse	without zero pulse S with zero pulse Z	Power supply	5 V DC 5	full stop to separate special versions	special version code numbered from 001 to 999	PSA axial cable output with SKINTOP® (standard length 0.5 m)	Max. rotation speed	3 3000 RPM	Enclosure rating	S IP66	Bore diameter	6 ø 6 mm 8 ø 8 mm 9 ø 9.52 mm (3/8") 10 ø 10 mm 12.7 ø 12.7 mm (1/2")	Output type for incremental signals	L line driver <i>please directly contact our offices for optionals about output types</i>

EF 40 F



Electrical specifications

Resolution	from 1 to 1024 ppr
Power supply	5 V DC \pm 5%
Current consumption without load	150 mA max.
Max. load current	15 mA for channel (line driver) 30 mA for channel
Output type for incremental signals	line driver
Output type for Hall phases	line driver NPN open collector
Max. output frequency	150 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Mechanical specifications

Bore diameter	\varnothing 6 / 8 / 9.52 / 10 / 12.7 mm
Enclosure rating	IP66
Max. rotation speed	3000 RPM
Shock	50 G, 11 ms
Vibration	5 G, 10÷500 Hz
Max. shaft load	5 N (0.5 kgf) axial 5 N (0.5 kgf) radial
Bearings	2 ball bearings
Shaft material	stainless steel UNI X10CrNiS1809
Body material	aluminium UNI 9002/5
Housing material	PA66 glass fiber reinforced
Operating temperature	-10÷85 °C
Storage temperature	-25÷85 °C
Weight	70 g

Main features

Miniaturized $\varnothing 42$ encoder series for general applications.

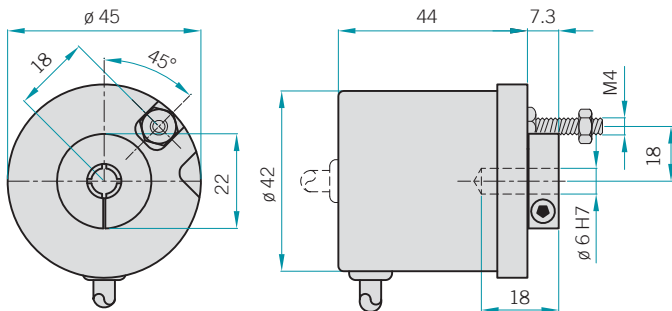
- Up to 2500 ppr with zero signal for EL series
- Different output types available
- Up to 28 V DC power supply
- Up to 100 kHz output frequency
- Cable output. Cable with connector at the end available on demand
- Several flanges available
- Up to 3000 RPM rotation speed
- IP54 sealing



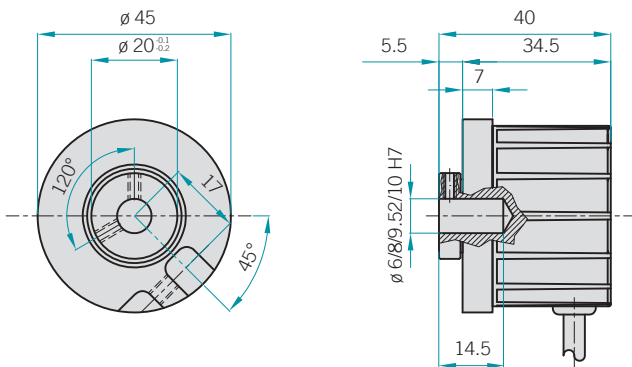
Ordering code

EL 40 G 1000 Z 5/28 P 6 X 3 P R . XXX													
incremental encoder series EL		size 40		Type of flange EL 40 G model G EL 40 GR model GR		Resolution ppr from 1 to 2500 <i>please directly contact our offices for pulses availability</i>		Zero pulse without zero pulse S with zero pulse Z		Power supply 5÷28 V DC 5/28 <i>line driver available only with 5 V DC or 8÷24 V DC power supply</i>		full stop to separate special versions	
										Max. rotation speed 3 3000 RPM		Enclosure rating X IP54	
										Bore diameter 6 \varnothing 6 mm 8 \varnothing 8 mm (EL 40 GR) 9 \varnothing 9.52 mm (3/8") (EL 40 GR) 10 \varnothing 10 mm (EL 40 GR)		Output type N NPN C NPN open collector P push-pull L line driver <i>please refer to page 92 for optionals about output types</i>	
										P cable output (standard length 0.5 m)		R radial A axial XXX special version code numbered from 001 to 999	

EL 40 G



EL 40 GR



HOW TO MOUNT IT

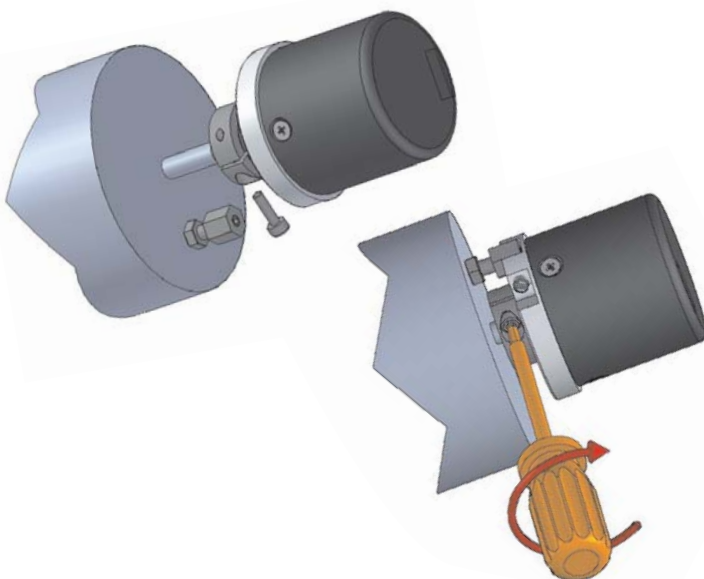
- 1) Fix the anti-rotation pin on the motor flange.
- 2) Couple the encoder shaft with the motor shaft, making sure the pin is inserted on the cave on the frontal part of the encoder (maintaining a minimum distance of 0.5 mm)
- 3) Fix the encoder shaft by the metal ring.

Electrical specifications

Resolution	from 1 to 2500 ppr
Power supply	5÷28 V DC line driver available only with 5 V DC or 8÷24 V DC power supply
Current consumption without load	100 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output type	NPN / NPN open collector push-pull / line driver
Max. output frequency	100 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Mechanical specifications

Bore diameter	6 mm 8 / 9.52 / 10 mm (EL 40 GR)
Enclosure rating	IP54
Max. rotation speed	3000 RPM
Max. shaft load	5 N (0.5 kgf) axial 5 N (0.5 kgf) radial
Shock	50 G, 11 ms
Vibration	10 G, 10÷2000 Hz
Bearing life	10 ⁹ revolutions
Bearings	2 ball bearings
Shaft material	stainless steel UNI X10CrNiS1809
Body material	aluminium UNI 9002/5
Housing material	PA66 glass fiber reinforced
Operating temperature	0÷60 °C
Storage temperature	-25÷70 °C
Weight	150 g



Main features

∅ 48 encoder series recommended in feedback control systems on AC servomotors. They include a traditional incremental encoder and the Hall effect phases.

- Easy mechanical mounting
- Small dimensions
- Wide range of resolutions available
- High temperature resistance

EL series

Basic version with incremental outputs.
Several output types available.

EF series

Optic generation of "Hall effect phases" integrated to the basic version.
Signal transmission by parallel bus.



Ordering code

EF 48 C 6 L 2000 Z 5 L 6 X 6 PR . XXX

full stop to separate
special versions

incremental encoder EL
incremental encoder with Hall phases EH

size 48

special version
code numbered
from 001 to 999

PR radial cable output (standard length 0.3 m)

Type of flange

blind hollow shaft C
through hollow shaft with front fixing P

Max. rotation speed

6 6000 RPM

Enclosure rating

X IP40

Poles of the motor (EF series)

4 poles 4
6 poles 6
8 poles 8

Bore diameter

6 ∅ 6 mm
8 ∅ 8 mm

Output type for Hall phases (EF series)

NPN open collector C
line driver L

Output type for incremental signals

N NPN (EL series)
C NPN open collector (EL series)
P push-pull (EL series)
L line driver

please refer to page 92 for optionals about output types

Resolution

ppr from 1 to 4096

please directly contact our offices for pulses availability

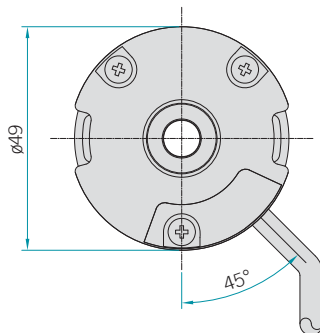
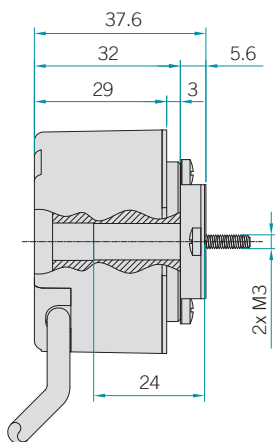
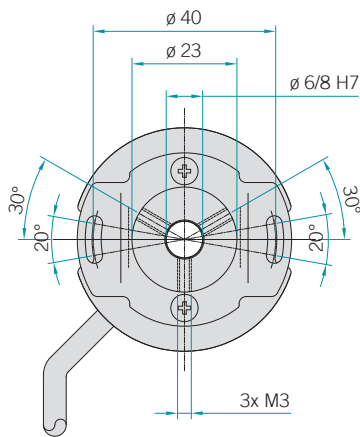
Power supply

5 5 V DC
8/24 8÷24 V DC (EL series)

Zero pulse

without zero pulse S
with zero pulse Z

EL - EF 48 C / P



HOW TO MOUNT IT

- 1) Couple the encoder shaft with the motor shaft.
- 2) Fix the spring to the motor flange without tightening it.
- 3) Fix the encoder shaft with the two grub screws.
- 4) Turn for phasing.
- 5) Block the spring.

Mechanical specifications

Bore diameter	∅ 6 / 8 mm
Enclosure rating	IP40
Max. rotation speed	6000 RPM
Shock	50 G, 11 ms
Vibration	10 G, 10÷500 Hz
Bearing life	10 ⁹ revolutions
Bearings	2 ball bearings
Shaft material	stainless steel UNI X10CrNiS1809
Body material	aluminium UNI 9002/5
Housing material	PA66 glass fiber reinforced
Operating temperature	-20÷85 °C
Storage temperature	-25÷85 °C
Weight	100 g

Electrical specifications

Resolution	from 1 to 4096 ppr
Max. load current	15 mA for channel (line driver) 30 mA for channel
Max. output frequency	150 kHz
Frequency response	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Electrical specifications (EL series)

Power supply	5 V DC 8÷24 V DC
Output type	NPN / NPN open collector push-pull / line driver
Current consumption without load	100 mA max.

Electrical specifications (EF series)

Power supply	5 V DC ±5%
Output type for incremental signals	line driver
Output type for Hall phases	line driver NPN open collector
Current consumption without load	150 mA max.

Main features

ø 49 encoder series recommended in feedback control systems on AC servomotors. They include a traditional incremental encoder and the Hall effect phases.

- Interchangeable with size 19 Resolver; it allows easy and cost effective mounting for the back of the motor
- Easy mechanical mounting
- Small dimensions
- Wide range of resolutions available
- High temperature resistance

EL series

Basic version with incremental outputs. Several output types available.

EF series

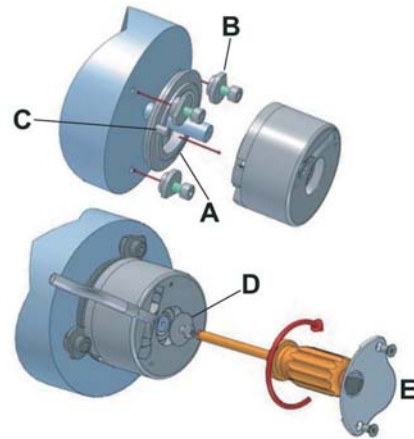
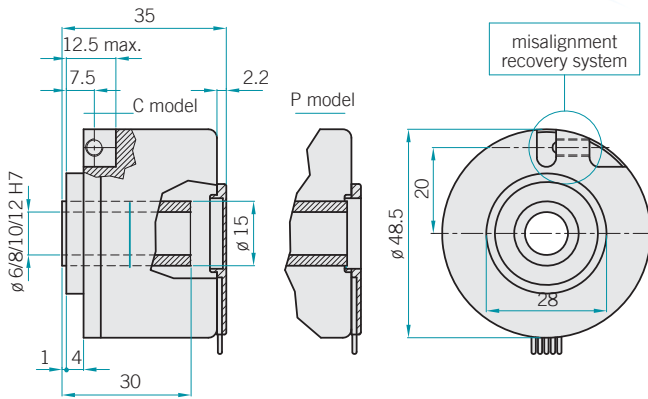
Optic generation of "Hall effect phases" integrated to the basic version. Signal transmission by parallel bus.



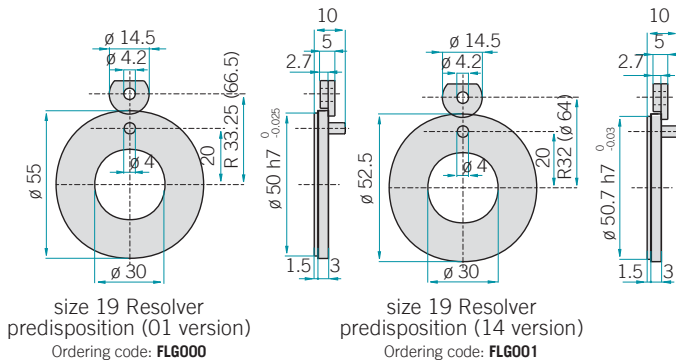
Ordering code

<p>EF 49 C 6 L 2000 Z 5 L 8 X 3 MA . XXX</p> <p>incremental encoder EL incremental encoder with Hall phases EF</p> <p>size 49</p> <p>Type of flange blind hollow shaft C through hollow shaft P</p> <p>Poles of the motor (EF series) 4 poles 4 6 poles 6 8 poles 8</p> <p>Output type for Hall phases (EF series) NPN open collector C line driver L</p> <p>Resolution ppr from 1 to 5000 <i>please directly contact our offices for pulses availability</i></p> <p>Zero pulse without zero pulse S with zero pulse Z</p> <p>Power supply 5 V DC 5 (EL series) 8÷24 V DC 8/24</p>		<p>full stop to separate special versions</p> <p>special version code numbered from 001 to 999</p> <p>PR radial cable output (standard length 0.3 m)</p> <p>MA radial cable output (standard length 0.2 m) with MA connector)</p> <p>Max. rotation speed 6 6000 RPM</p> <p>Enclosure rating X IP40</p> <p>Bore diameter 6 ø 6 mm 8 ø 8 mm 9 ø 9.52 mm (3/8") 10 ø 10 mm 12 ø 12 mm 12.7 ø 12.7 mm (1/2")</p> <p>Output type for incremental signals N NPN (EL series) C NPN open collector (EL series) P push-pull (EL series) L line driver <i>please refer to page 92 for optionals about output types</i></p>
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EL - EF 49 C / P



ACCESSORIES Flanges for fixing on motors



HOW TO MOUNT IT

- 1) Insert the flange (A) on the motor.
 - 2) Tighten the proper servo-fasteners (B), without blocking them.
 - 3) Insert the encoder on the motor shaft with the misalignment recovery system just next to the peg (C).
 - 4) Place the washer on the back of the encoder and block it on the motor axle using the screw.
 - 5) Turn for phasing.
 - 6) Fix the servo-fasteners (B).
 - 7) Verify the right working of the misalignment recovery system.
- Check the connector is fully plugged in.**
- 8) Place the plastic lid (E); then screw.

Electrical specifications

Resolution	from 1 to 5000 ppr
Max. load current	15 mA for channel (line driver) 30 mA for channel
Max. output frequency	150 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Mechanical specifications

Bore diameter	$\varnothing 6 / 8 / 9.52 / 10 / 12 / 12.7 \text{ mm}$
Max. rotation speed	6000 RPM
Shock	50 G, 11 ms
Vibration	5 G, 10÷500 Hz
Bearing life	10 ⁹ revolutions
Bearings	2 ball bearings
Shaft material	stainless steel UNI X10CrNiS1809
Body material	aluminium UNI 9002/5
Housing material	steel
Enclosure rating	IP40
Operating temperature	-10÷85 °C -10÷100 °C on demand
Storage temperature	-25÷85 °C
Weight	100 g
Accessories	1) 3 servo-fasteners (ordering code: 94080001) 2) flanges for fixing on motors with size 19 Resolver predisposition (01 and 14 versions)

Electrical specifications (EL series)

Power supply	5 V DC 8÷24 V DC
Output type	NPN / NPN open collector push-pull / line driver
Current consumption without load	100 mA max.

Electrical specifications (EF series)

Power supply	5 V DC ±5%
Output type for incremental signals	line driver
Output type for Hall phases	line driver NPN open collector
Current consumption without load	150 mA max.

Main features

∅ 50 encoder series recommended as motor feedback.

- Several ways to fix it
- Easy mechanical mounting
- Small dimensions
- Up to 5000 ppr with zero signal
- Several output types available
- Up to 150 kHz output frequency
- Up to 6000 RPM rotation speed
- IP55 sealing



Ordering code

EL 50 G 1000 Z 5/28 P 8 X 3 P R . XXX

incremental encoder series **EL**

size **50**

Type of flange

- blind hollow shaft (front fixing with spring) **F**
- blind hollow shaft (front fixing with pin) **G**
- blind hollow shaft (rear fixing with screw) **K**

Resolution

ppr from **1** to **5000**

please directly contact our offices for pulses availability

Zero pulse

- without zero pulse **S**
- with zero pulse **Z**

Power supply

5÷28 V DC **5/28**

line driver available only with 5 V DC or 8÷24 V DC power supply

full stop to separate
special versions

special version
code numbered
from 001 to 999

R radial

P cable output with SKINTOP® (standard length 0.5 m)

Max. rotation speed

- 3** 3000 RPM
- 6** 6000 RPM

3000 RPM max. with "S" enclosure rating

Enclosure rating

- X** IP40 standard
- S** IP55 optional

Bore diameter

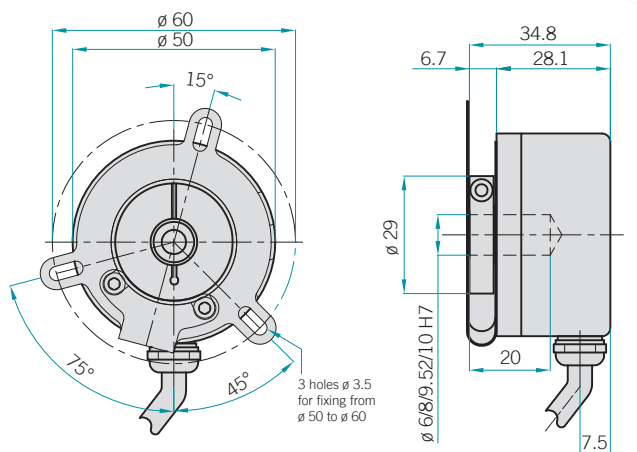
- 6** ∅ 6 mm
- 8** ∅ 8 mm
- 9** ∅ 9.52 mm (3/8")
- 10** ∅ 10 mm

Output type

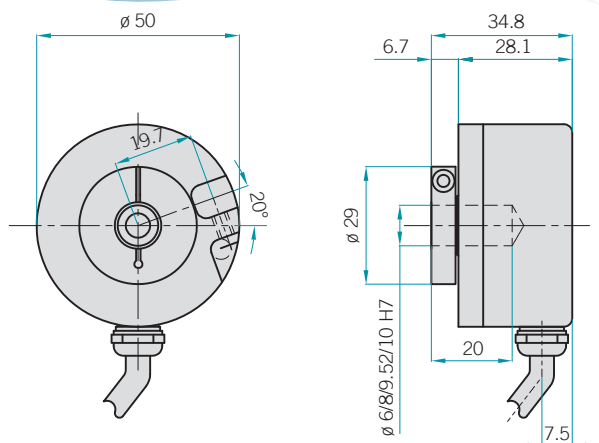
- N** NPN
- C** NPN open collector
- P** push-pull
- L** line driver

please refer to page 92 for optionals about output types

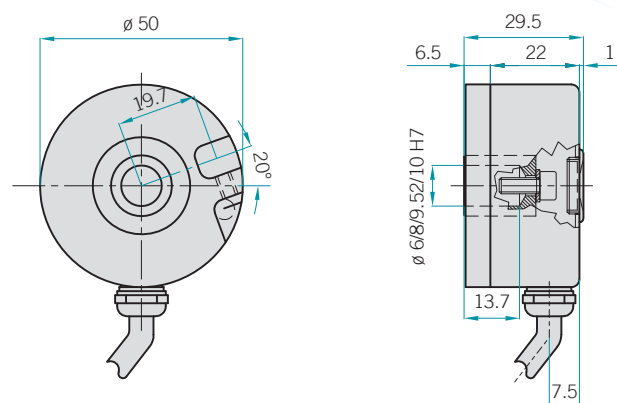
EL 50 F



EL 50 G



EL 50 K



HOW TO MOUNT IT

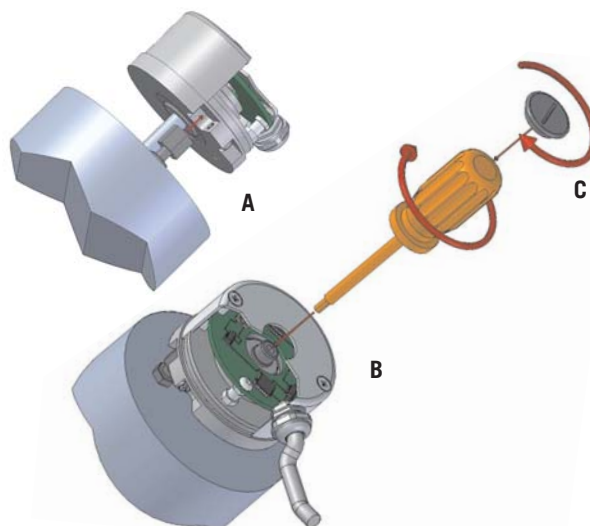
- 1) Fix the anti-rotation pin (A).
- 2) Insert the encoder on the motor shaft with misalignment recovery system just next to the pin (A).
- 3) Insert the washer (B) on the back and block it using the encoder screw on the motor axle.
- 4) Turn for phasing.
- 5) Fix the encoder shaft by metal ring.
- 6) Close the encoder with the plug (C).

Electrical specifications

Resolution	from 1 to 5000 ppr
Power supply	5÷28 V DC line driver available only with 5 V DC or 8÷24 V DC power supply
Current consumption without load	150 mA max.
Max. load current	30 mA for channel 15 mA for channel (line driver)
Output type	NPN / NPN open collector push-pull / line driver
Max. output frequency	150 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Mechanical specifications

Bore diameter	ø 6 / 8 / 9.52 / 10 mm
Enclosure rating	IP40 standard IP55 optional
Max. rotation speed	3000 RPM 6000 RPM 3000 RPM max. with "S" enclosure rating
Shock	50 G, 11 ms
Vibration	5 G, 10÷500 Hz
Bearing life	10 ⁹ revolutions
Bearings	2 ball bearings
Shaft material	stainless steel UNI X10CrNiS1809
Body material	aluminium UNI 9002/5
Housing material	aluminium UNI 9002/5
Operating temperature	0÷60 °C
Storage temperature	-25÷70 °C
Weight	150 g



Main features

∅ 50 encoder series recommended as motor feedback.

- Several ways to fix it
- Easy mechanical mounting
- Small dimensions
- Up to 5000 ppr with zero signal
- Several output types available
- Up to 150 kHz output frequency
- Up to 6000 RPM rotation speed
- IP55 sealing



Ordering code

EL 50 G P 1000 Z 5/28 P 8 X 3 P R . XXX

incremental encoder series **EL**

size **50**

Type of flange

fixing with spring **F**
fixing with pin **G**

through hollow shaft with front fixing **A**
through hollow shaft with rear fixing **P**

Resolution

ppr from **1** to **5000**

please directly contact our offices for pulses availability

Zero pulse

without zero pulse **S**
with zero pulse **Z**

Power supply

5÷28 V DC **5/28**

line driver available only with 5 V DC or 8÷24 V DC power supply

full stop to separate
special versions

special version
code numbered
from 001 to 999

R radial

P cable output with SKINTOP® (standard length 0.5 m)

Max. rotation speed

3 3000 RPM
6 6000 RPM

3000 RPM max. with "S" enclosure rating

Enclosure rating

X IP40 standard
S IP55 optional

Bore diameter

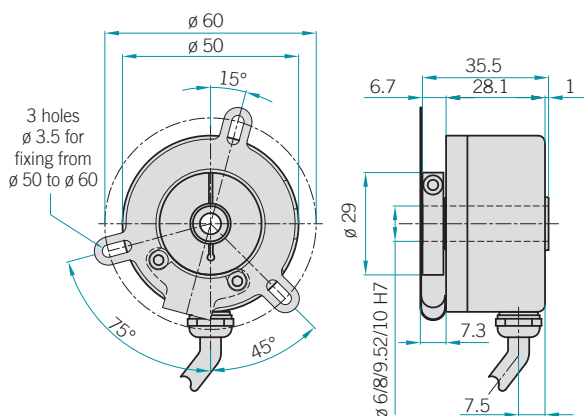
6 ∅ 6 mm
8 ∅ 8 mm
9 ∅ 9.52 mm (3/8")
10 ∅ 10 mm

Output type

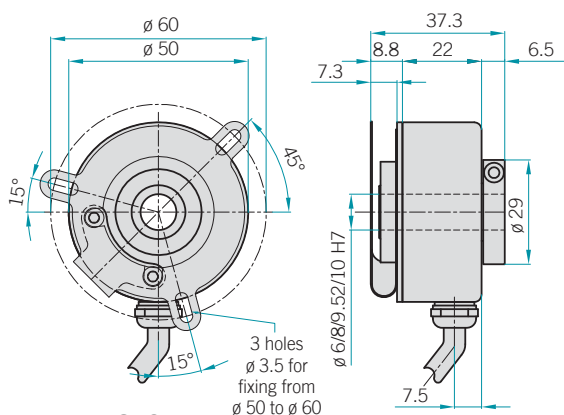
N NPN
C NPN open collector
P push-pull
L line driver

please refer to page 92 for optionals about output types

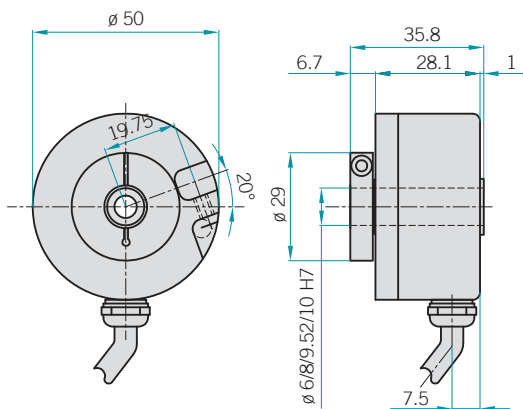
EL 50 FA



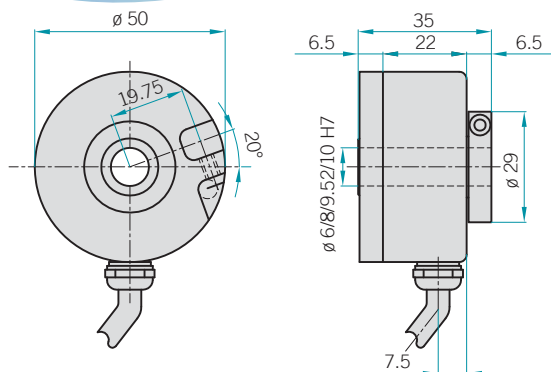
EL 50 FP



EL 50 GA



EL 50 GP

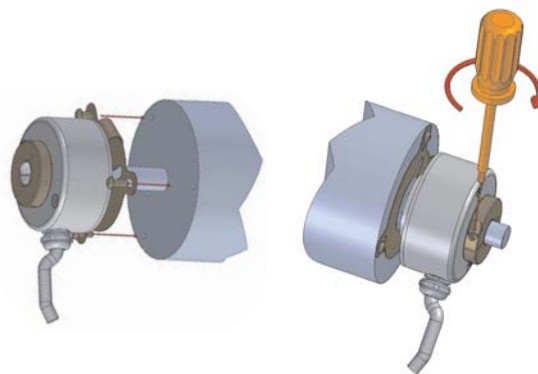


Electrical specifications

Resolution	from 1 to 5000 ppr
Power supply	5÷28 V DC line driver available only with 5 V DC or 8÷24 V DC power supply
Current consumption without load	150 mA max.
Max. load current	30 mA for channel 15 mA for channel (line driver)
Output type	NPN / NPN open collector push-pull / line driver
Max. output frequency	150 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Mechanical specifications

Bore diameter	6 / 8 / 9.52 / 10 mm
Enclosure rating	IP40 standard IP55 optional
Max. rotation speed	3000 RPM 6000 RPM 3000 RPM max. with "S" enclosure rating
Shock	50 G, 11 ms
Vibration	5 G, 10÷500 Hz
Bearing life	10 ⁹ revolutions
Bearings	2 ball bearings
Shaft material	stainless steel UNI X10CrNiS1809
Body material	aluminium UNI 9002/5
Housing material	aluminium UNI 9002/5
Operating temperature	0÷60 °C
Storage temperature	-25÷70 °C
Weight	150 g



HOW TO MOUNT IT

- 1) Couple the encoder shaft with the motor shaft.
- 2) Fix the spring to the motor flange without tightening it.
- 3) Fix the encoder shaft by the metal ring.
- 4) Turn for phasing.
- 5) Block the spring.

Main features

Encoder series designed to be mounted directly on motors. Our integrated elastic coupling allows radial and axial slack compensation.

- Resolution up to 10000 ppr with zero signal for EL series, up to 1024 ppr for EH series
- Different output types available
- Up to 28 V DC power supply for EL series and up to 24 V DC for EH series
- Up to 300 kHz output frequency for EL series and up to 100 kHz for EH series
- Cable or connector output
- Several flanges available
- Up to 6000 RPM rotation speed
- Up to IP64 sealing



Ordering code

EL 53 A 1000 Z 5/28 N 6 X 6 M R . XXX

incremental encoder series **EL**
incremental encoder series **EH**

size **53**

Type of flange

EH - EL 53 A model **A**
EH - EL 53 B model **B**

Resolution

(EL series) ppr from 1 to 10000
(EH series) ppr from 40 to 1024
please directly contact our offices for pulses availability

Zero pulse

without zero pulse **S**
with zero pulse **Z**

Power supply

(EL series) 5÷28 V DC **5/28**
(EH series) 5 V DC **5**
(EH series) 8÷24 V DC **8/24**

line driver available only with 5 V DC or 8÷24 V DC power supply

full stop to separate
special versions

special version
code numbered
from 001 to 999

R radial
A axial (EL series)

P cable output (standard length 1.5 m) (EL series)
cable output (standard length 0.5 m) (EH series)

M M connector output
J J connector output

Max. rotation speed

3 3000 RPM
6 6000 RPM

Enclosure rating

X IP54 (EH series)
IP64 (EL series)

Bore diameter

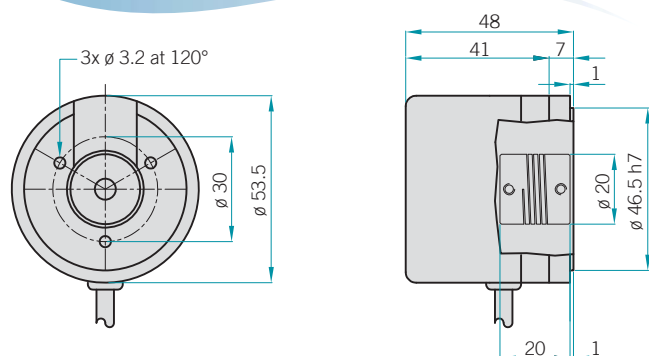
6 ø 6 mm
8 ø 8 mm
10 ø 10 mm

Output type

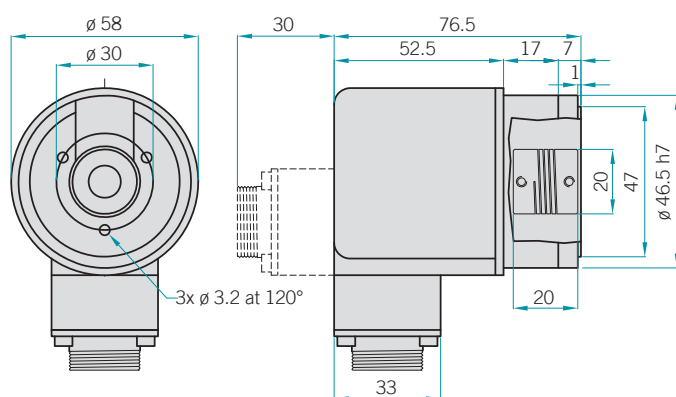
N NPN
C NPN open collector
P push-pull
L line driver

please refer to page 92 for optionals about output types

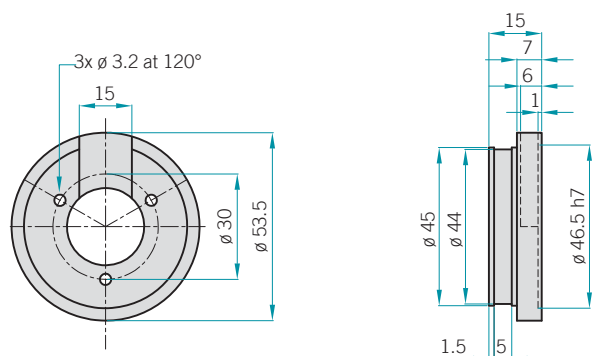
EH 53 A



EL 53 A



Flange version EH - EL 53 B



Electrical specifications (EL series)

Resolution	from 1 to 10000 ppr
Power supply	5÷28 V DC line driver available only with 5 V DC or 8÷24 V DC power supply
Current consumption without load	100 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output type	NPN / NPN open collector push-pull / line driver
Max. output frequency	100 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Electrical specifications (EH series)

Resolution	from 40 a 1024 ppr
Power supply	5÷28 V DC
Current consumption without load	100 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output type	NPN / NPN open collector push-pull / line driver
Max. output frequency	100 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Mechanical specifications

Bore diameter	∅ 6 / 8 / 10 mm
Enclosure rating	IP54 (EH series) IP64 (EL series)
Max. rotation speed	3000 RPM 6000 RPM
Shock	50 G, 11 ms (plastic disc) 20 G, 11 ms (glass disc)
Vibration	10 G, 10÷2000 Hz
Bearing life	10 ⁹ revolutions
Bearings	2 ball bearings
Shaft material	stainless steel UNI X10CrNiS1809
Body material	aluminium UNI 9002/5
Housing material	PA66 glass fiber reinforced
Operating temperature	0÷60 °C
Storage temperature	-25÷70 °C
Weight	150 g (EH series) 350 g (EL series)

Main features

Hollow shaft encoder series for industrial applications with high mechanical resistance requirements. These encoders are designed to withstand high radial and axial shaft loads.

- Resolution up to 10000 ppr with zero signal for EL series, up to 1024 ppr for EH series
- Several output types available
- Up to 28 V DC power supply for EL series and up to 24 V DC for EH series
- Up to 300 kHz output frequency for EL series and up to 100 kHz for EH series
- Cable or connector output



Ordering code

full stop to separate special versions

EL 63 G 1000 Z 5/28 N 8 X 3 M R . XXX

incremental encoder series EL
incremental encoder series EH
size 58
size 63

Type of flange

EH - EL 58 F, EH - EL 63 F model F
EH - EL 58 G, EH - EL 63 G model G
EH - EL 63 P model P
EH - EL 63 PB model PB
EH - EL 63 GB model GB
EH - EL 63 FB model FB
EH - EL 63 PC model PC
EH - EL 63 PBF model PBF
EH - EL 63 PCF model PCF

Resolution

(EL 58 F / G, EL 63 F / G) ppr from 1 to 10000
(EH - EL 63 FB / GB / P / PB / PBF / PC / PCF) ppr from 1 to 2048
(EH 58 F / G, EH 63 F / G) ppr from 40 to 1024
please directly contact our offices for pulses availability

Zero pulse

without zero pulse S
with zero pulse Z

Power supply

(EL series) 5÷28 V DC 5/28
(EH series) 5 V DC 5
(EH series) 8÷24 V DC 8/24

line driver available only with power supply 5 V DC or 8÷24 V DC power supply

R radial
A axial (EH - EL 58 F / G, EH - EL 63 F / G)

P cable output (standard length 0.3 m)
M M connector output (EH - EL 58 F / G, EH - EL 63 F / G)
J J connector output (EH - EL 58 F / G, EH - EL 63 F / G)

Max. rotation speed

3 3000 RPM

Enclosure rating

X IP54 standard
S IP66 optional (EH - EL 58 F / G, EH - EL 63 F / G)

Bore diameter

8 ø 8 mm
9 ø 9.52 mm (3/8") (EH - EL 58)
10 ø 10 mm
12 ø 12 mm
14 ø 14 mm
15 ø 15 mm

Output type

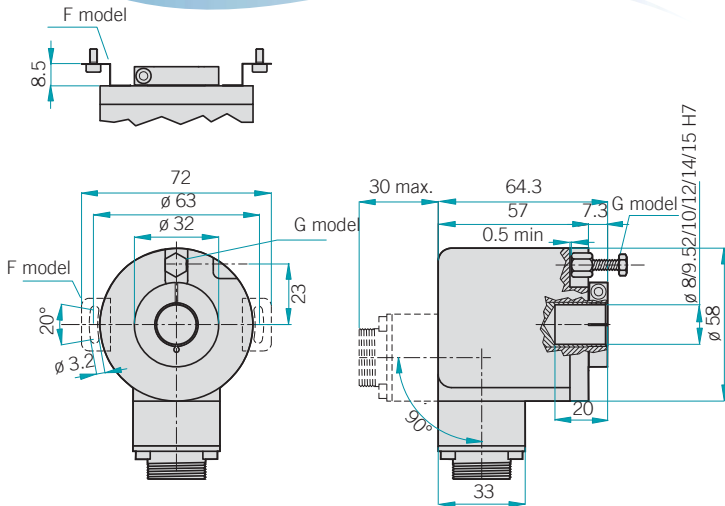
N NPN
C NPN open collector
P push-pull
L line driver

please refer to page 92 for optionals about output types

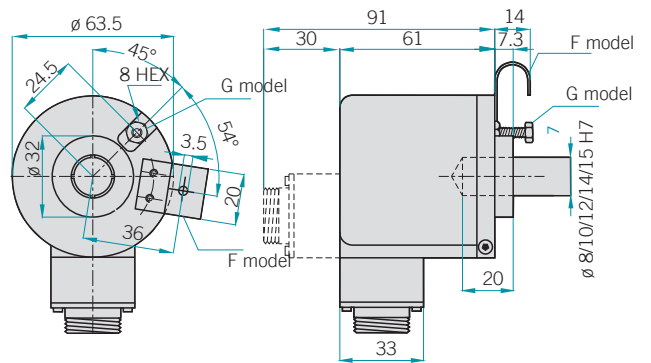
EH - EL 58 F / G EH - EL 63 F / G / FB / GB

BLIND HOLLOW SHAFT ENCODER

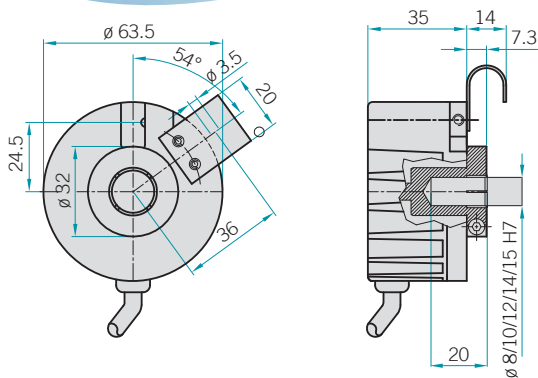
EH - EL 58 F / G



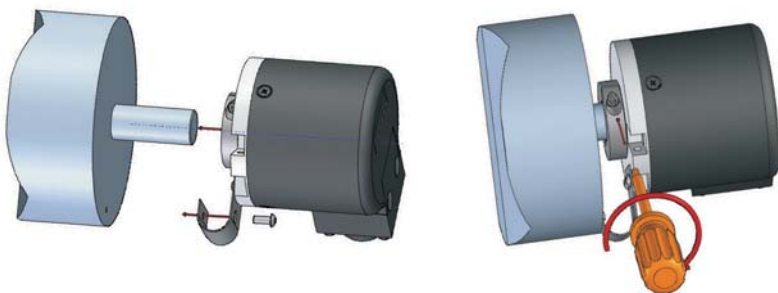
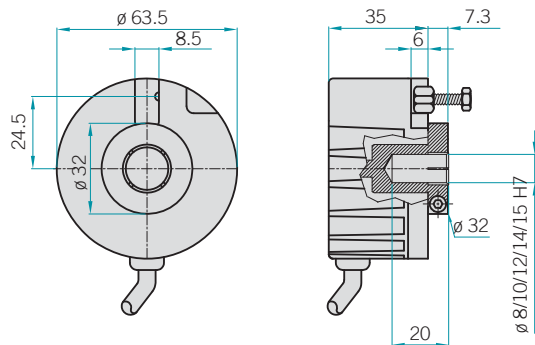
EH - EL 63 F / G



EH - EL 63 FB



EH - EL 63 GB

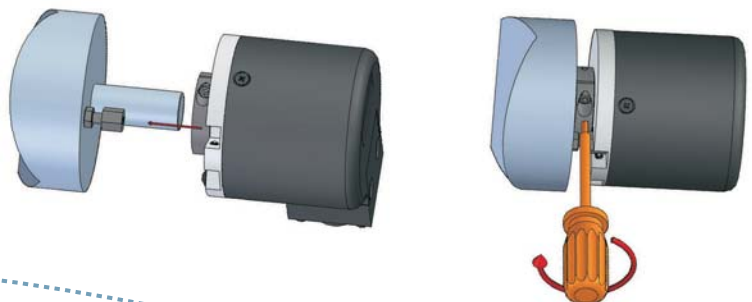


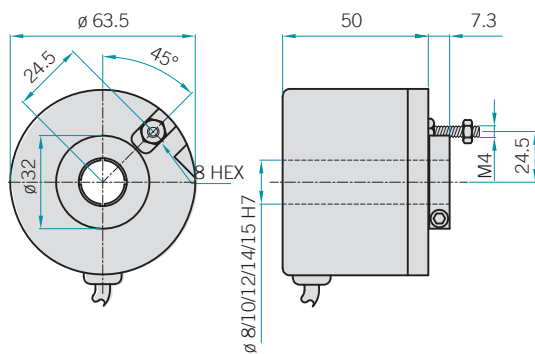
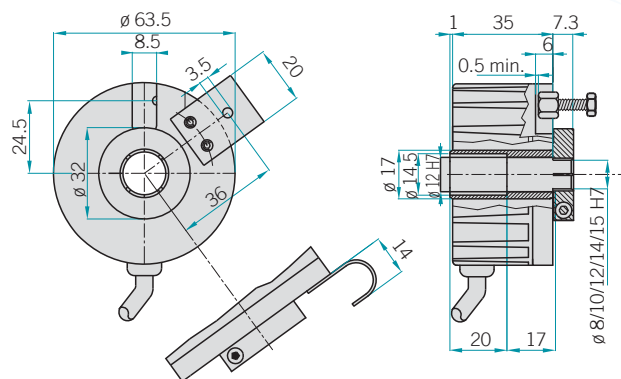
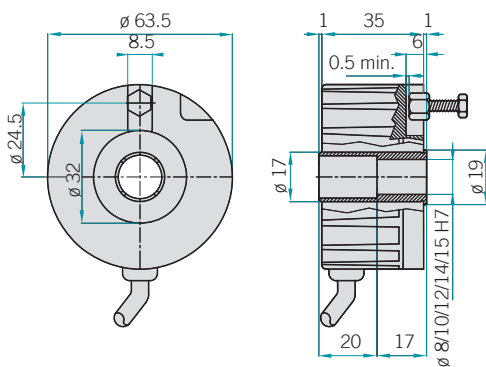
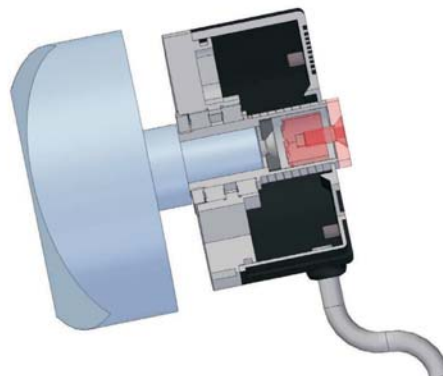
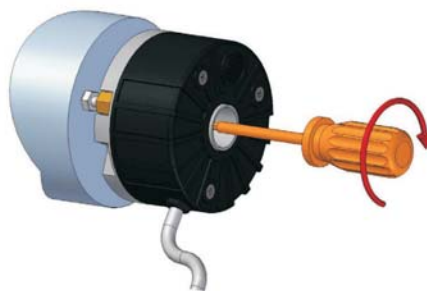
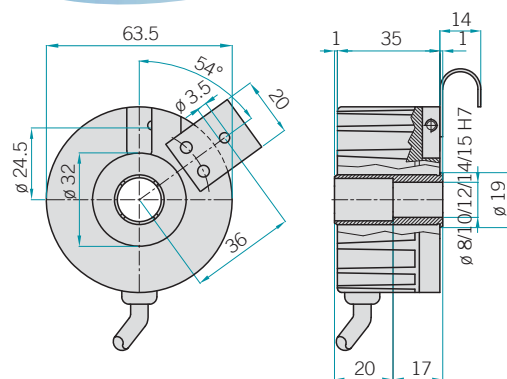
HOW TO MOUNT THE EH - EL 63 F

- 1) Couple the encoder shaft with the motor shaft.
- 2) Fix the spring to the motor flange without tightening it.
- 3) Fix the encoder shaft by the metal ring.
- 4) Block the spring.

HOW TO MOUNT THE EH - EL 63 G

- 1) Mount the anti-rotation pin on the motor flange.
- 2) Couple the encoder shaft with the motor shaft, making sure the pin is inserted in the front hole (maintaining a minimum distance of 0.5 mm)
- 3) Fix the encoder shaft by the metal ring.



EH - EL 63 P

EH - EL 63 PB / PBF

EH - EL 63 PC

EH - EL 63 PCF

HOW TO MOUNT THE EH - EL 63 P

- 1) Mount the anti-rotation pin on the motor flange.
- 2) Couple the encoder shaft with the motor shaft, making sure the pin is inserted in the front hole (maintaining a minimum distance of 0.5 mm).
- 3) Fix encoder shaft packed with the motor shaft. Place a washer at the end of the encoder shaft, under the screw that blocks the whole pack.

Electrical specifications (EL series)

Resolution	from 1 to 10000 ppr (EL 58 F / G, EL 63 F / G) from 1 to 2048 ppr (EL 63 FB / GB / P / PB / PBF / PC / PCF)
Power supply	5÷28 V DC line driver available only with 5 V DC or 8÷24 V DC power supply
Current consumption without load	100 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output type	NPN / NPN open collector push-pull / line driver
Max. output frequency	300 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Electrical specifications (EH series)

Resolution	from 40 to 1024 ppr (EL 58 F / G, EL 63 F / G)
Power supply	5 V DC 8÷24 V DC line driver available only with 5 V DC or 8÷24 V DC power supply
Current consumption without load	100 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output types	NPN / NPN open collector push-pull / line driver
Max. output frequency	100 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Mechanical specifications

Bore diameter	∅ 9.52 mm (EH - EL 58) ∅ 8 / 10 / 12 / 14 / 15 mm
Enclosure rating	IP54 standard IP66 optional (EL 58 F / G, EL 63 F / G)
Max. rotation speed	3000 RPM
Shock	50 G, 11 ms (plastic disc) 20 G, 11 ms (glass disc)
Vibration	10 G, 10÷2000 Hz
Bearing life	10 ⁹ revolutions
Bearings	2 ball bearings
Shaft material	stainless steel UNI X10CrNiS1809
Body material	aluminium UNI 5076
Housing material	PA66 glass fiber reinforced
Operating temperature	0÷60 °C
Storage temperature	-25÷70 °C
Weight	350 g

Main features

Standard encoder series for industrial environments with high mechanical resistance requirements. These encoders are designed to withstand high radial and axial shaft loads and they can be mounted by means of flanges or servo-fasteners. Specifically designed for direct mounting on motors or speedometer dynamos. Our integrated elastic coupling allows radial and axial slack compensation.

- Up to 10000 ppr with zero signal for EL series, up to 1024 ppr for EH series
- Several output types available
- Up to 28 V DC power supply for EL series and up to 24 V DC for EH series
- Up to 300 kHz output frequency for EL series and up to 100 kHz for EH series
- Cable or connector output
- Several flanges available
- Up to 6000 RPM rotation speed
- Up to IP66 sealing



Ordering code

full stop to separate special versions

EL 72 1 A 1000 Z 5/28 N 10 X 6 M R . XXX

incremental encoder series **EL**
incremental encoder series **EH**

size **72**

Distance between holes on flange

- ∅ 63.5 mm **1**
- ∅ 65 mm **2**
- ∅ 57 mm **3**
- ∅ 60 mm **4**

Type of flange

- EH - EL 72 A model **A**
- EH - EL 72 B model **B**

Resolution

(EL series) ppr from **1** to **10000**
(EH series) ppr from **40** to **1024**
please directly contact our offices for pulses availability

Zero pulse

- without zero pulse **S**
- with zero pulse **Z**

Power supply

(EL series) 5÷28 V DC **5/28**
(EH series) 5 V DC **5**
(EH series) 8÷24 V DC **8/24**
line driver available only with 5 V DC or 8÷24 V DC power supply

special version code numbered from 001 to 999

- R** radial
- A** axial

- P** cable output (standard length 1.5 m)
- M** M connector output
- J** J connector output

Max. rotation speed

- 3** 3000 RPM
- 6** 6000 RPM
3000 RPM max. with "S" enclosure rating

Enclosure rating

- X** IP54 standard
- S** IP66 optional

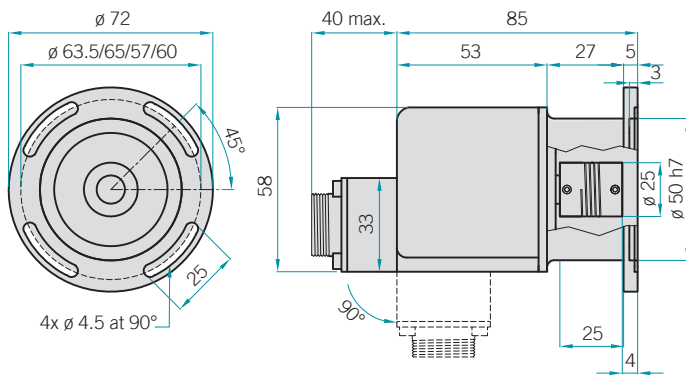
Bore diameter

- 6** ∅ 6 mm
- 8** ∅ 8 mm
- 10** ∅ 10 mm

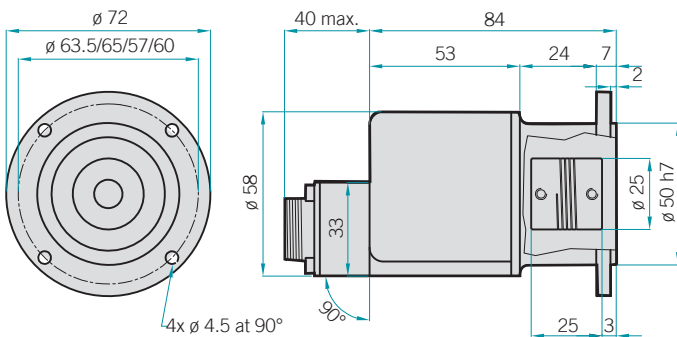
Output type

- N** NPN
- C** NPN open collector
- P** push-pull
- L** line driver
please refer to page 92 for optionals about output types

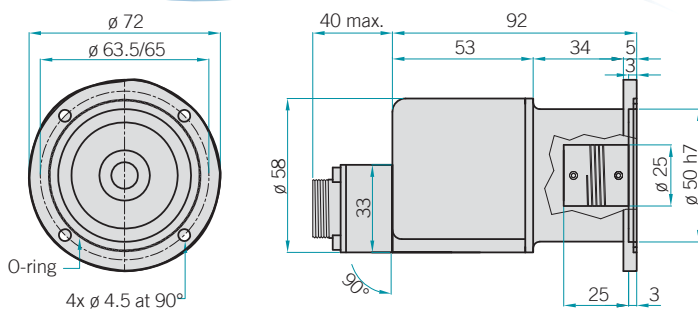
EH - EL 72 A



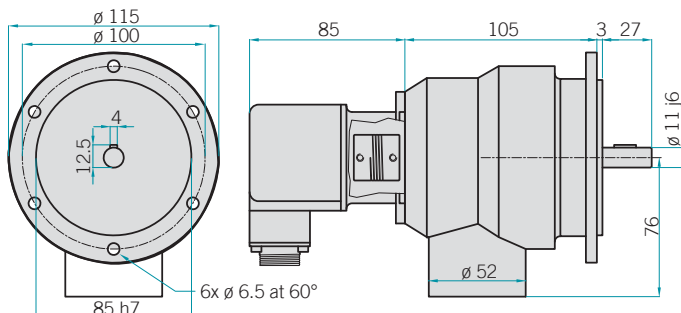
EH - EL 72 B



EH - EL 72 A IP66 version



Use on speedometer dynamo
Available dynamos: A) 20 V - 1000 RPM
B) 60 V - 1000 RPM



Electrical specifications (EL series)

Resolution	from 1 to 10000 ppr
Power supply	5÷28 V DC line driver available only with 5 V DC or 8÷24 V DC power supply
Current consumption without load	100 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output type	NPN / NPN open collector push-pull / line driver
Max. output frequency	300 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Electrical specifications (EH series)

Resolution	from 40 to 1024 ppr
Power supply	5 V DC 8÷24 V DC
Current consumption without load	100 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output type	NPN / NPN open collector push-pull / line driver
Max. output frequency	100 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Mechanical specifications

Bore diameter	ø 6 / 8 / 10 mm
Enclosure rating	IP54 standard IP66 optional
Max. rotation speed	3000 RPM 6000 RPM 3000 RPM max. with "S" enclosure rating
Shock	50 G, 11 ms (plastic disc) 20 G, 11 ms (glass disc)
Vibration	10 G, 10÷2000 Hz
Bearing life	10 ⁹ revolutions
Bearings	2 ball bearings
Shaft material	stainless steel UNI X10CrNiS1809
Body material	aluminium UNI 5076
Housing material	PA66 glass fiber reinforced
Operating temperature	0÷60 °C
Storage temperature	-25÷70 °C
Weight	400 g
Accessories	Precision elastic couplings G25A6/10 G25A8/10 G25A/10

Main features

ø 80 encoder series recommended in feedback control systems on AC servomotors. They include a traditional incremental encoder and the Hall effect phases.

- Small dimensions
- Wide resolution range available
- High temperature resistant
- Easy mounting

EH series

Basic version with incremental outputs.
Several output types available.

EF series

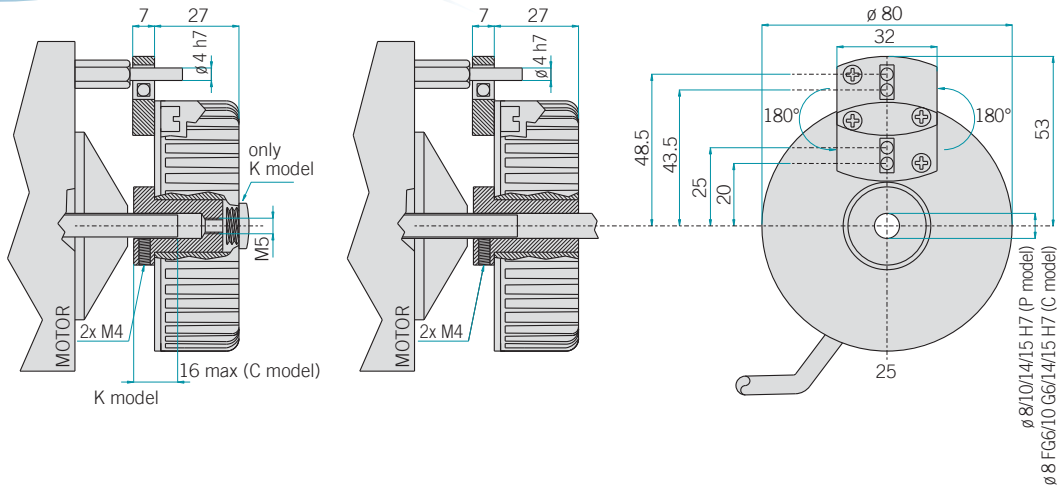
Optic generation of "Hall effect phases" added to the basic version.
Signal transmission by parallel bus.



Ordering code

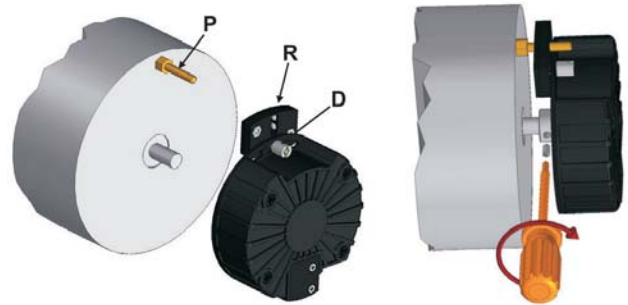
incremental encoder series EH	incremental encoder series EF	size 80	6	L	2000	Z	5	L	8	X	3	P	R	XXX
Type of flange		Poles of the motor (EF series)		Output type for Hall phases (EF series)		Resolution		Zero pulse		Power supply		Max. rotation speed		
blind hollow shaft C through hollow shaft P blind hollow shaft with rear fixing K		4 poles 4 6 poles 6 8 poles 8		NPN open collector C line driver L		ppr from 200 to 2048 <i>please directly contact our offices for pulses availability</i>		without zero pulse S with zero pulse Z		5 V DC 5 8÷24 V DC 8/24 <i>line driver available only with 5 V DC or 8÷24 V DC power supply</i>		3 3000 RPM		
Type of flange		Bore diameter		Output type for incremental signals		Enclosure rating		Resolution		Max. rotation speed		Enclosure rating		
blind hollow shaft C through hollow shaft P blind hollow shaft with rear fixing K		8 ø 8 mm 10 ø 10 mm 14 ø 14 mm 15 ø 15 mm		N N NPN C C NPN open collector P P push-pull L L line driver <i>please refer to page 92 for optionals about output types</i>		X X IP54		ppr from 200 to 2048 <i>please directly contact our offices for pulses availability</i>		3 3000 RPM		R R radial P P cable output (standard length 0.3 m)		
Type of flange		Bore diameter		Output type for incremental signals		Enclosure rating		Resolution		Max. rotation speed		Enclosure rating		
blind hollow shaft C through hollow shaft P blind hollow shaft with rear fixing K		8 ø 8 mm 10 ø 10 mm 14 ø 14 mm 15 ø 15 mm		N N NPN C C NPN open collector P P push-pull L L line driver <i>please refer to page 92 for optionals about output types</i>		X X IP54		ppr from 200 to 2048 <i>please directly contact our offices for pulses availability</i>		3 3000 RPM		R R radial P P cable output (standard length 0.3 m)		

EH - EF 80 C / P / K



HOW TO MOUNT IT

- 1) Fix the anti-rotation pin (P).
- 2) Insert the encoder on the motor shaft with misalignment recovery system corresponding to the pin (P).
- 3) Screw the nut (D) (don't tighten it if you need to phase zero signal).
- 4) Couple the encoder shaft with the motor shaft, making sure the pin (P) is inserted in the hole of the misalignment recovery system (R).
- 5) Fix the encoder shaft with the two M4 grub screws.
- 6) For zero phasing turn the encoder (22° max.), then screw the nut (D).



Mechanical specifications

Bore diameter	∅ 8 / 10 / 14 / 15 mm
Enclosure rating	IP54
Max. rotation speed	3000 RPM
Vibration	10 G, 10÷2000 Hz
Bearing life	10 ⁹ revolutions
Bearings	2 ball bearings
Shaft material	aluminium UNI 9002/5
Housing material	PA66 glass fiber reinforced
Operating temperature	-10÷85 °C -10÷100 °C on demand
Storage temperature	-25÷85 °C
Weight	250 g

Electrical specifications

Resolution	from 200 to 2048 ppr
Max. load current	15 mA for channel (line driver) 15 mA for channel
Max. output frequency	300 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Electrical specifications (EH series)

Power supply	5 V DC 8÷24 V DC
Output type	NPN / NPN open collector push-pull / line driver
Current consumption without load	100 mA max.

Electrical specifications (EF series)

Power supply	5 V DC ±5%
Output type for incremental signals	line driver
Output type for Hall phases	NPN open collector line driver
Current consumption without load	200 mA max.

Main features

∅ 88 through hollow shaft encoder series designed for motors with big shaft.

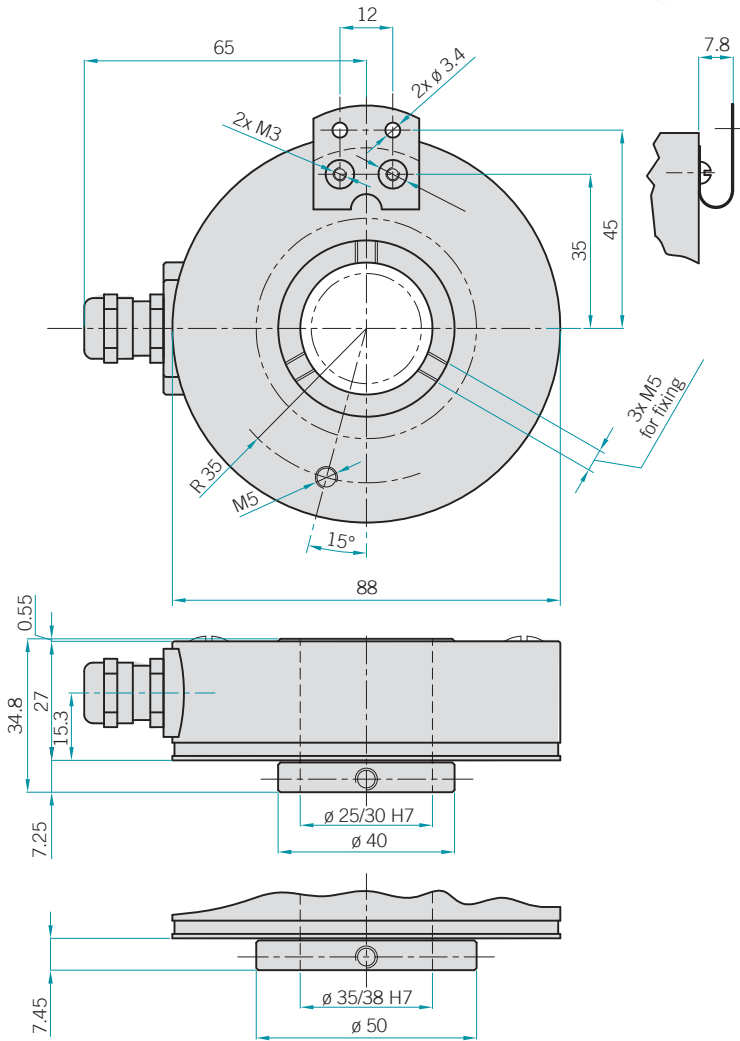
- Up to 38 mm bore diameter
- Easy and steady fixing
- Sturdy mechanics
- Up to 2048 ppr with zero signal
- Several output types available
- Up to 28 V DC power supply
- Up to 100 kHz output frequency
- Up to 3000 RPM rotation speed
- Up to IP54 sealing



Ordering code

EL 88 P 500 Z 5 L 38 X 3 P R . XXX													
incremental encoder series EL		size 88		Type of flange through hollow shaft P		Resolution ppr from 1 to 2048 <small>please directly contact our offices for pulses availability</small>		Zero pulse without zero pulse S with zero pulse Z		Power supply 5÷28 V DC 5/28 <small>line driver available only with 5 V DC or 8÷24 V DC power supply</small>		full stop to separate special versions	
												special version code numbered from 001 to 999	
												R radial	
												P cable output with SKINTOP® (standard length 0.5 m)	
												Max. rotation speed 3 3000 RPM	
												Enclosure rating X IP54	
												Bore diameter 25 ∅ 25 mm 30 ∅ 30 mm 35 ∅ 35 mm 38 ∅ 38 mm	
												Output type N NPN C NPN open collector P push-pull L line driver <small>please refer to page 92 for optionals about output types</small>	

EL 88 P



Electrical specifications

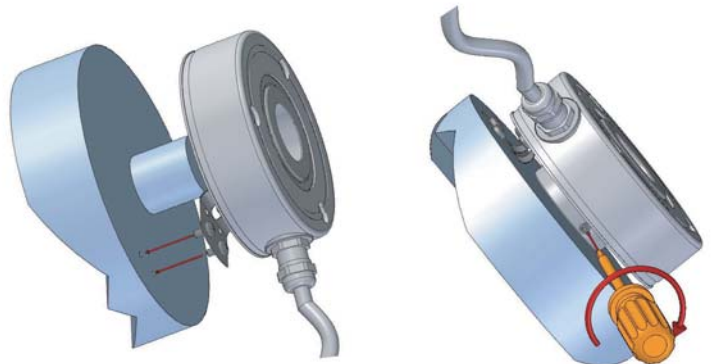
Resolution	from 1 to 2048 ppr
Power supply	5÷28 V DC line driver available only with 5 V DC or 8÷24 V DC power supply
Current consumption without load	100 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output type	NPN / NPN open collector push-pull / line driver
Max. output frequency	100 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Mechanical specifications

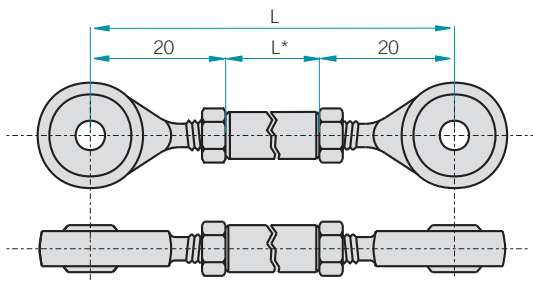
Bore diameter	∅ 25 / 30 / 35 / 38 mm
Enclosure rating	IP54
Max. rotation speed	3000 RPM
Bearings	2 ball bearings
Shaft material	stainless steel UNI X10CrNiS1809 (∅ 35, ∅ 38) aluminium UNI 9002/5 (∅ 25, ∅ 30)
Housing material	aluminium UNI 9002/5
Operating temperature	0÷60 °C
Storage temperature	-25÷70 °C
Weight	350 g

HOW TO MOUNT IT

- 1) Couple the encoder shaft with the motor shaft.
- 2) Fix the spring to the motor flange without tightening it.
- 3) Fix the encoder shaft by the metal ring.
- 4) Block the spring.



ACCESSORIES Articulated joints



Available articulated joints

L* = 30 mm	Ordering code: SN5A30
L* = 60 mm	Ordering code: SN5A60
L* = 90 mm	Ordering code: SN5A90

Main features

∅ 120 through hollow shaft encoder series designed for motors with big shaft.

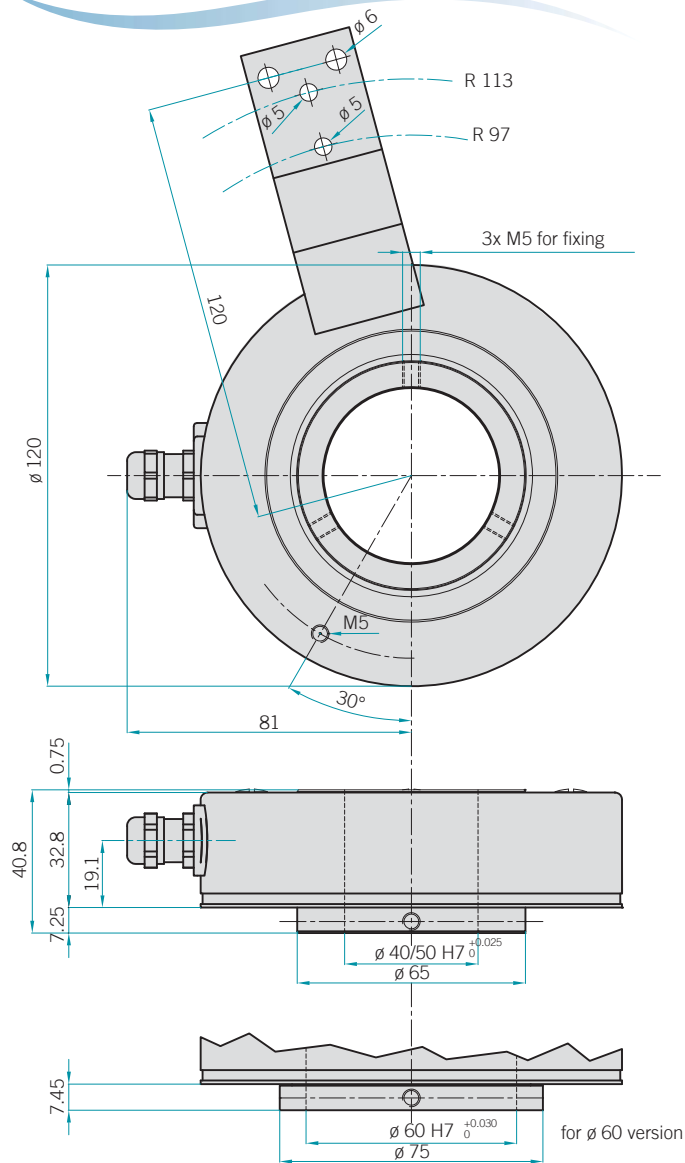
- Up to 60 mm bore diameter
- Easy and steady fixing
- Sturdy mechanics
- Up to 2048 ppr with zero signal
- Several output types available
- Up to 28 V DC power supply
- Up to 100 kHz output frequency
- Up to 3000 RPM rotation speed
- Up to IP54 sealing



Ordering code

EL 120 P 500 Z 5 N 50 X 3 P R . XXX															
incremental encoder series EL		size 120		Type of flange through hollow shaft P		Resolution ppr from 1 to 2048 <i>please directly contact our offices for pulses availability</i>		Zero pulse without zero pulse S with zero pulse Z		Power supply 5÷28 V DC 5/28 <i>line driver available only with 5 V DC or 8÷24 V DC power supply</i>		full stop to separate special versions		special version code numbered from 001 to 999	
												R radial			
												P cable output with SKINTOP [®] (standard length 0.5 m)			
												Max. rotation speed 3 3000 RPM			
												Enclosure rating X IP54			
												Bore diameter 40 ∅ 40 mm 50 ∅ 50 mm 60 ∅ 60 mm			
												Output type N NPN C NPN open collector P push-pull L line driver <i>please refer to page 92 for optionals about output types</i>			

EL 120 P



Electrical specifications

Resolution	from 1 to 2048 ppr
Power supply	5 V DC 8÷24 V DC
Current consumption without load	100 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output type	line driver push-pull
Max. output frequency	100 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

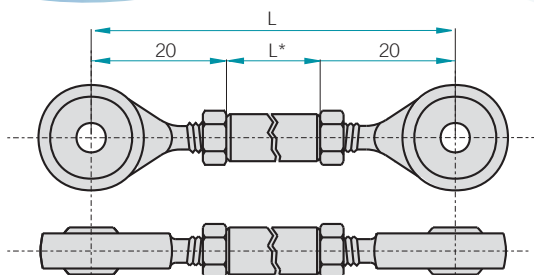
Mechanical specifications

Bore diameter	∅ 40 / 50 / 60 mm
Enclosure rating	IP54
Max. rotation speed	3000 RPM
Bearings	2 ball bearings
Shaft material	aluminium UNI 9002/5
Housing material	aluminium UNI 9002/5
Operating temperature	0÷60 °C
Storage temperature	-25÷70 °C
Weight	750 g

HOW TO MOUNT IT

- 1) Couple the encoder shaft with the motor shaft.
- 2) Fix the spring to the motor flange without tightening it.
- 3) Fix the encoder shaft by the metal ring.
- 4) Block the spring.

ACCESSORIES Articulated joints



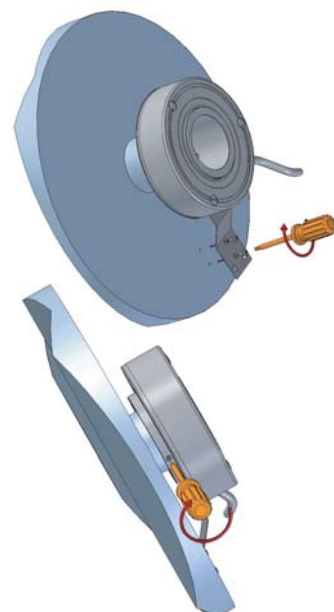
* See below for arm length

Available articulated joints

L* = 30 mm Ordering code: SN5A30

L* = 60 mm Ordering code: SN5A60

L* = 90 mm Ordering code: SN5A90



Main features

∅ 150 through hollow shaft encoder series designed for motors with big shaft.

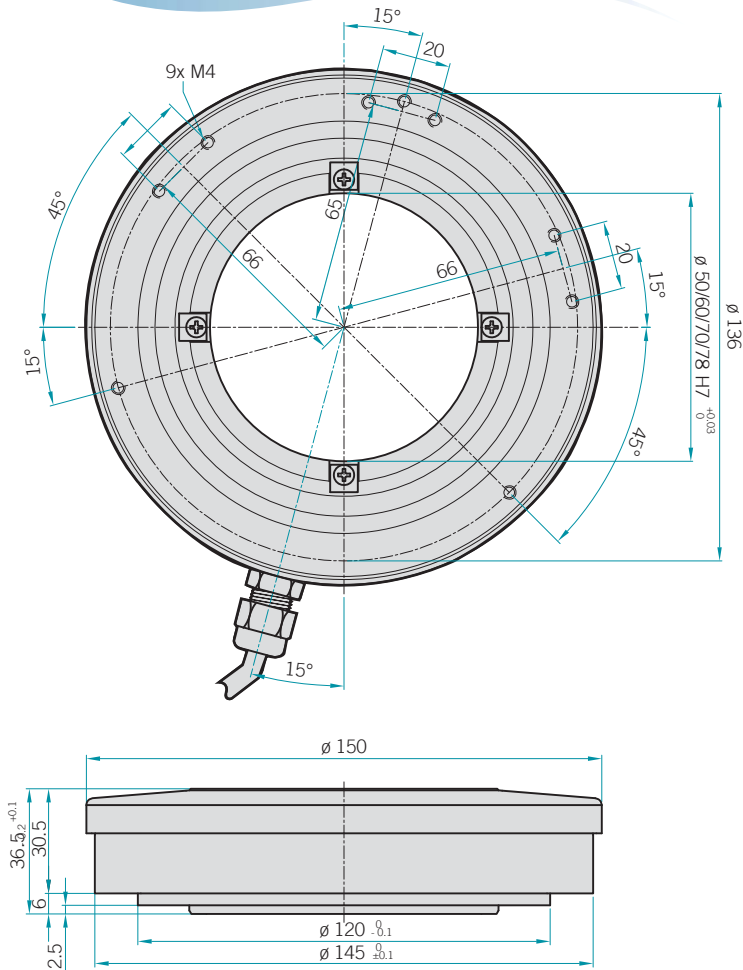
- Up to 78 mm bore diameter
- Easy and steady fixing
- Sturdy mechanics
- Up to 5040 ppr with zero signal
- Several output types available
- Up to 24 V DC power supply
- Up to 100 kHz output frequency
- Up to 1000 RPM rotation speed
- Up to IP65 sealing



Ordering code

EH 150 P 1024 Z 5 N 50 X 1 P R . XXX													
incremental encoder series EH		size 150		Type of flange through hollow shaft P		Resolution ppr from 1024 to 5040 <small>please directly contact our offices for pulses availability</small>		Zero pulse without zero pulse S with zero pulse Z		Power supply 5 V DC 5 8÷24 V DC 8/24		full stop to separate special versions	
												special version code numbered from 001 to 999	
												R radial	
												P cable output with SKINTOP® (standard length 0.5 m)	
												Max. rotation speed 1 1000 RPM	
												Enclosure rating X IP54 standard S IP65 optional (ideal operating conditions)	
												Bore diameter 50 ∅ 50 mm 60 ∅ 60 mm 70 ∅ 70 mm 78 ∅ 78 mm	
												Output type N NPN C NPN open collector P push-pull L line driver <small>please refer to page 92 for optionals about output types</small>	

EH 150 P



Electrical specifications

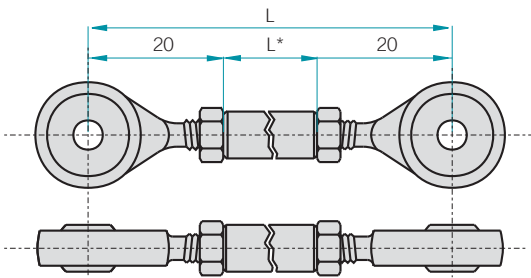
Resolution	from 1024 to 5040 ppr
Power supply	5 V DC 8÷24 V DC
Current consumption without load	100 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output type	NPN / NPN open collector push-pull / line driver
Max. output frequency	100 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Mechanical specifications

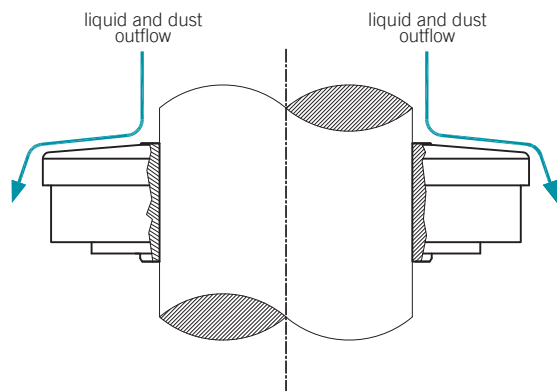
Bore diameter	$\varnothing 50 / 60 / 70 / 78$ mm
Enclosure rating	IP54 standard IP65 optional (ideal operating condition)
Max. rotation speed	1000 RPM
Bearings	1 ball bearing
Shaft material	aluminium UNI 9002/5
Housing material	aluminium UNI 9002/5
Operating temperature	0÷60 °C
Storage temperature	-25÷70 °C
Weight	1000 g

Hollow shaft incremental encoders

ACCESSORIES Articulated joints



Ideal operating condition to obtain IP65 protection rating



Available articulated joints

$L^* = 30$ mm	Ordering code: SN5A30
$L^* = 60$ mm	Ordering code: SN5A60
$L^* = 90$ mm	Ordering code: SN5A90

EH 150 P



Main features

EM series encoders are suitable for several application fields like electric motors, marine industry, iron and steel industry, textile machines, wood-working, paper-working, glass-working, marble-working machinery and, more generally, automation and process control fields.

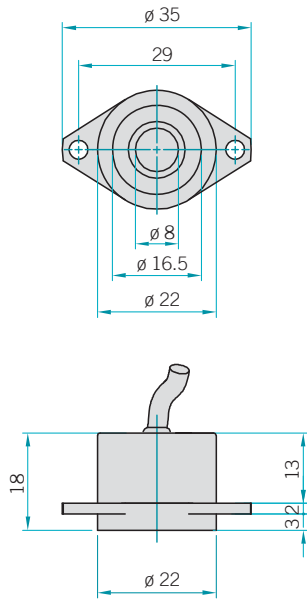
- Compact dimensions
- Absence of physical contact between encoder and motor shaft
- High temperature resistant
- High resolution and precision
- High protection rating
- High operating speed
- Excellent mechanical sturdiness
- Very easy mounting



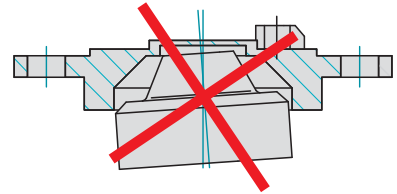
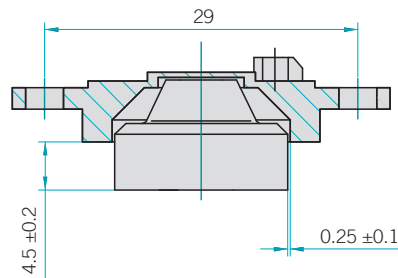
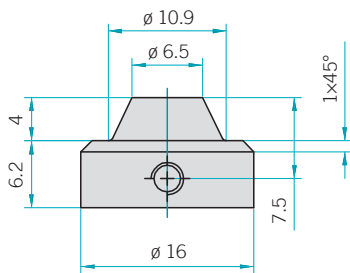
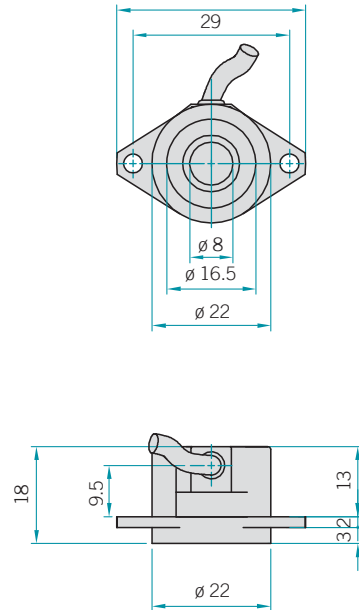
Ordering code

magnetic incremental encoder		EMI 22		A		100		S		5		P		6		S		10		PR		XXX	
		size		standard																		special version code numbered from 001 to 999	
																						PA axial cable output (standard length 0.5 m) PR radial cable output (standard length 0.5 m)	
																						Max. rotation speed	
																						10 10000 RPM	
																						Enclosure rating	
																						S IP68	
																						Bore diameter (magnet-carrier)	
																						6 ø 6 mm 8 ø 8 mm 9 ø 9.52 mm (3/8") 10 ø 10 mm	
																						Output type	
																						P push-pull L line driver <i>please directly contact our offices for further measures</i>	
																						Zero pulse	
																						without zero pulse S with zero pulse Z	
																						Power supply	
																						5 V DC 5	

EMI 22 axial cable output



EMI 22 radial cable output



Electrical specifications

Resolution	up to 2048 ppr
Current consumption without load	100 mA max.
Max. load current	15 mA for channel
Power supply	5 V DC ±5%
Output type	line driver push-pull
Max. output frequency	200 kHz

Mechanical specifications

Bore diameter (magnet-carrier)	up to 10 mm
Enclosure rating	IP68
Max. rotation speed	10000 RPM
Shock	50 G, 11 ms
Vibration	10 G, 10÷2000 Hz
Body material	aluminium UNI 9002/5
Housing material	aluminium UNI 9002/5
Magnet-carrier material	aluminium UNI 9002/5
Operating temperature	-25÷125 °C
Storage temperature	-30÷130 °C
Weight	30 g
Mounting tolerances	axial: ±0.2 mm radial: ±0.1 mm

Main features

EM series encoders are suitable for several application fields like electric motors, marine industry, iron and steel industry, textile machines, wood-working, paper-working, glass-working, marble-working machinery and, more generally, automation and process control fields.

- Compact dimensions
- High temperature resistant
- High resolution and precision
- High protection rating
- High operating speed
- Excellent mechanical sturdiness
- Very easy mounting



Ordering code

full stop to separate special versions

EMI 38 A 100 S 5 P 6 X 6 PR . XXX

magnetic incremental encoder **EMI**

size **38**

Type of flange

standard **A**

Resolution

(only powers of 2) ppr from **2** to **2048**
ppr **10 / 20 / 25 / 40 / 50 / 80 / 100 / 125 / 200 / 250 / 400 / 500**
please directly contact our offices for pulses availability

Zero pulse

without zero pulse **S**
with zero pulse **Z**

Power supply

5 V DC **5**
8÷24 V DC **8/24**

special version code numbered from 001 to 999

PA axial cable output with SKINTOP® (standard length 0.5 m)

PR radial cable output with SKINTOP® (standard length 0.5 m)

Max. rotation speed

6 6000 RPM

Enclosure rating

X IP64

Bore diameter

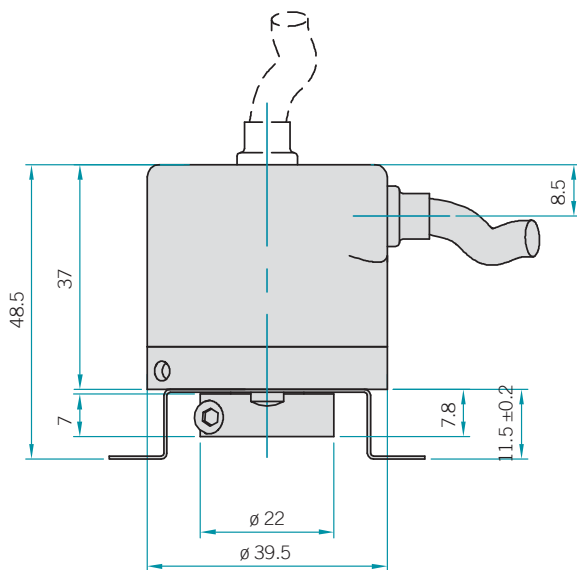
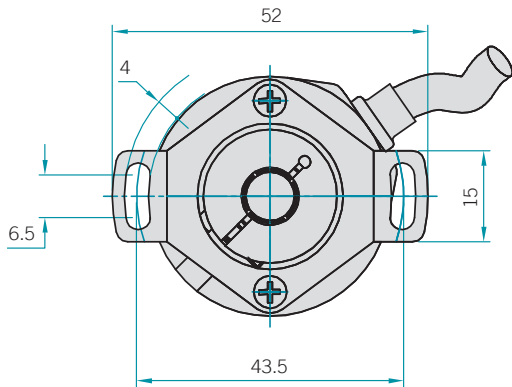
6 ø 6 mm
8 ø 8 mm
9 ø 9.52 mm (3/8")
10 ø 10 mm

Output type

P push-pull
L line driver

please directly contact our offices for further measures

EMI 38



Electrical specifications

Resolution	up to 2048 ppr
Current consumption without load	100 mA max.
Max. load current	15 mA for channel
Power supply	5 V DC $\pm 5\%$ 8 \div 24 V DC
Output type	line driver push-pull
Max. output frequency	200 kHz

Mechanical specifications

Bore diameter	up to 10 mm
Enclosure rating	IP64
Max. rotation speed	6000 RPM
Shock	50 G, 11 ms
Vibration	10 G, 10 \div 2000 Hz
Body material	aluminium UNI 9002/5
Housing material	aluminium UNI 9002/5
Operating temperature	-25 \div 100 °C
Storage temperature	-30 \div 105 °C
Weight	250 g

Main features

EM series encoders are suitable for several application fields like electric motors, marine industry, iron and steel industry, textile machines, wood-working, paper-working, glass-working, marble-working machinery and, more generally, automation and process control fields.

- Compact dimensions
- Absence of physical contact between encoder and motor shaft
- High temperature resistant
- High resolution and precision
- High protection rating
- High operating speed
- Excellent mechanical sturdiness
- Very easy mounting



Ordering code

full stop to separate special versions

EMI 55 A 100 S 5 P 6 S 10 PR . XXX

magnetic incremental encoder **EMI**

size **55**

Type of flange

standard **A**

Resolution

(only powers of 2) ppr from 2 to 2048
ppr **10 / 20 / 25 / 40 / 50 / 80 / 100 / 125 / 200 / 250 / 400 / 500**
please directly contact our offices for pulses availability

Zero pulse

without zero pulse **S**
with zero pulse **Z**
programmable zero pulse **E**

Power supply

5 V DC **5**
8÷24 V DC **8/24**

special version code numbered from 001 to 999

PA axial cable output with SKINTOP® (standard length 0.5 m)

PR radial cable output with SKINTOP® (standard length 0.5 m)

M12 M12 connector output

Max. rotation speed

10 10000 RPM

Enclosure rating

X IP64 standard

S IP68 optional

Bore diameter (magnet-carrier)

6 ø 6 mm

8 ø 8 mm

9 ø 9.52 mm (3/8")

10 ø 10 mm

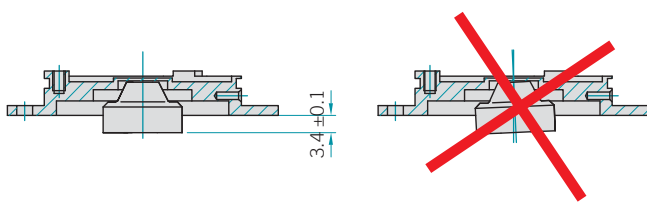
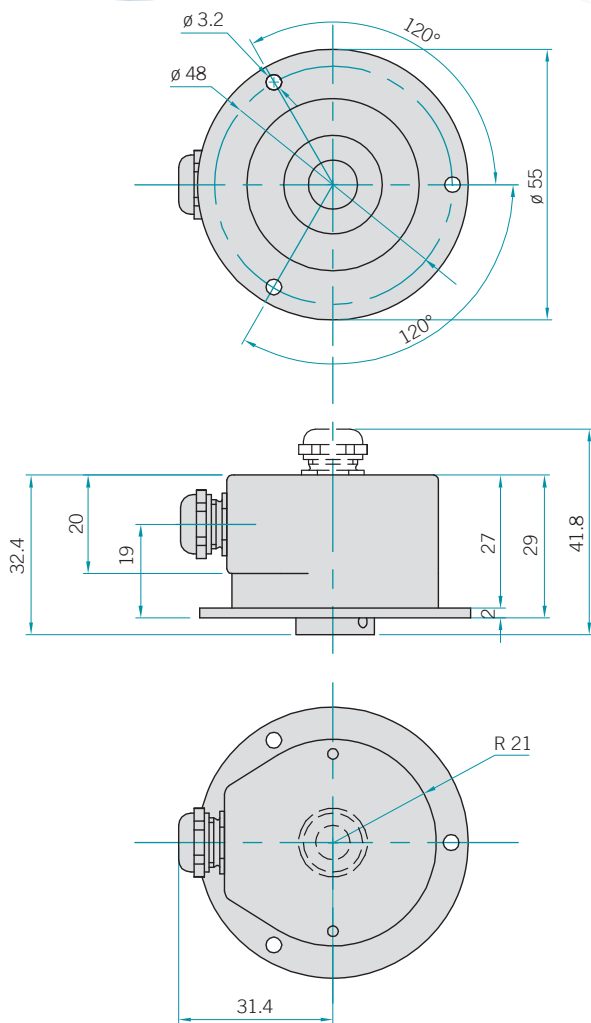
Output type

P push-pull

L line driver

please directly contact our offices for further measures

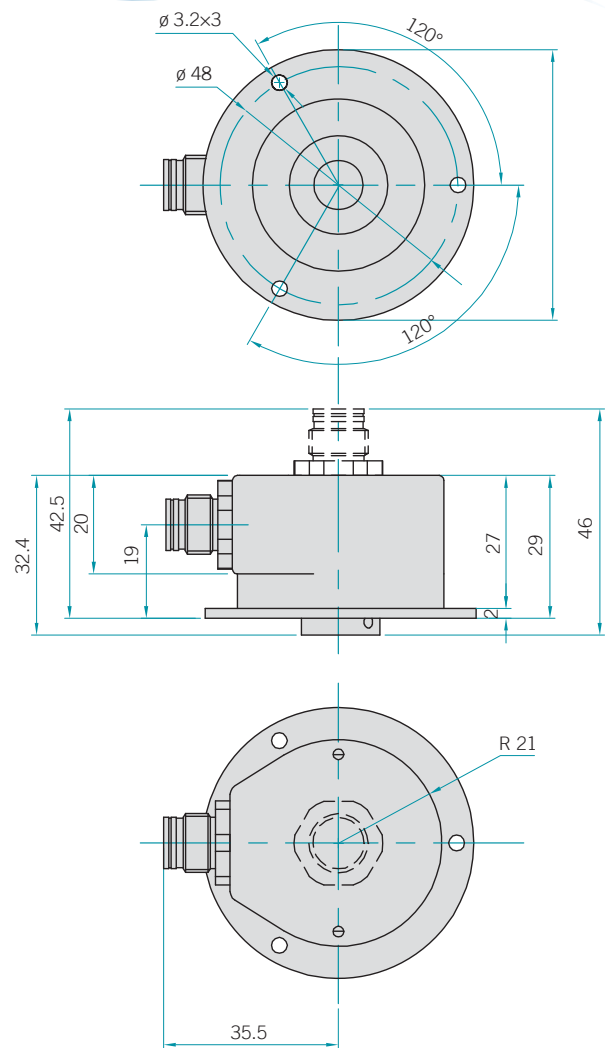
EMI 55 cable output



Electrical specifications

Resolution	up to 2048 ppr
Current consumption without load	100 mA max.
Max. load current	15 mA for channel
Power supply	5 V DC ±5% 8÷24 V DC
Output type	line driver push-pull
Max. output frequency	200 kHz

EMI 55 connector output



Mechanical specifications

Bore diameter (magnet-carrier)	up to 10 mm
Enclosure rating	IP64 standard IP68 optional
Max. rotation speed	10000 RPM
Shock	50 G, 11 ms
Vibration	10 G, 10÷2000 Hz
Body material	aluminium UNI 9002/5
Housing material	aluminium UNI 9002/5
Magnet-carrier material	aluminium UNI 9002/5
Operating temperature	-25÷125 °C
Storage temperature	-30÷130 °C
Weight	150 g
Mounting tolerances	axial: ±0.2 mm radial: ±0.1 mm

Main features

Explosion-proof encoder for explosive and hazardous environments.

- Up to 10000 ppr with zero signal
- Several output types available
- Up to 28 V DC power supply
- Up to 300 kHz output frequency
- Cable output
- Several flanges available
- Up to IP65 sealing
- Up to 3000 RPM rotation speed



Ordering code

full stop to separate
special versions

EX 80 A 1000 Z 5/28 P 10 X 3 P R . XXX

explosion-proof encoder **EX**

size **80**

Type of flange

EX 80 A model **A**

EX 80 D model **D**

Resolution

ppr from **1** to **10000**

please directly contact our offices for pulses availability

Zero pulse

without zero pulse **S**

with zero pulse **Z**

Power supply

5÷28 V DC **5/28**

line driver available only with 5 V DC or 8÷24 V DC power supply

special version
code numbered
from 001 to 999

R radial

P cable output with cable gland (standard length 1.5 m)

Max. rotation speed

3 3000 RPM

Enclosure rating

X IP65

Shaft diameter

10 ∅ 10 mm

Output type

N NPN

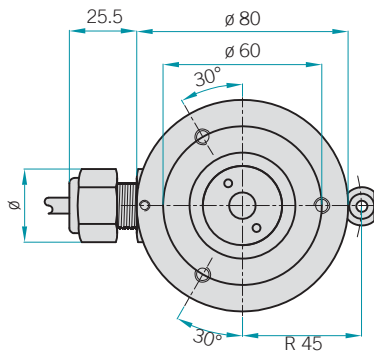
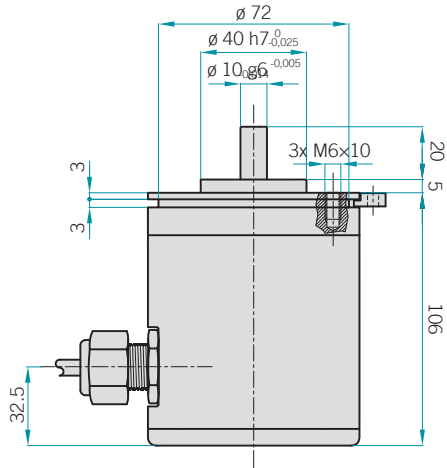
C NPN open collector

P push-pull

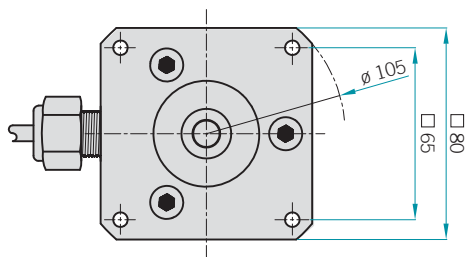
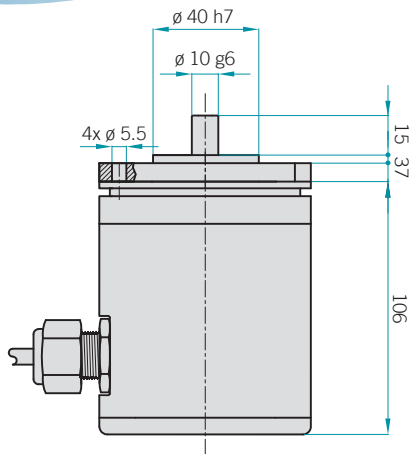
L line driver

please refer to page 92 for options about output types

EH 80 A



EX 80 D



Electrical specifications

Resolution	from 1 to 10000 ppr
Power supply	5÷28 V DC line driver available only with 5 V DC or 8÷24 V DC power supply
Current consumption without load	100 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output type	NPN / NPN open collector push-pull / line driver
Max. output frequency	100 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Mechanical specifications

Shaft diameter	Ø 10 mm
Max. rotation speed	3000 RPM
Shock	50 G, 11 ms (plastic disc) 20 G, 11 ms (glass disc)
Vibration	10 G, 10÷2000 Hz
Max. shaft load	200 N (20 kgf) axial 200 N (20 kgf) radial
Bearing life	10 ⁹ revolutions
Bearings	2 ball bearings
Shaft material	stainless steel UNI X10CrNiS1809
Housing material	aluminium UNI 9002/5
Operating temperature	-20÷50 °C
Storage temperature	-25÷70 °C
Weight	1200 g

Explosion-proof encoder



regulations: IEC 60079-0, IEC 60079-1
CESI certification number: CESI 04 ATEX 082

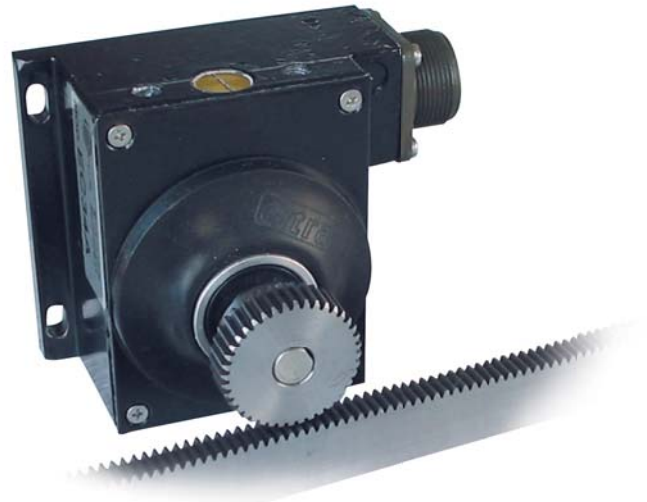
Ex II 2G dIIC T6

- Ex:** in conformity with ATEX regulation
- II:** other potentially explosive atmospheres (gases, dusts, hazes, vapours)
- 2G:** device class (zones 1 and 2)
- d:** explosion-proof case
- IIC:** electrical system which can operate in hazardous areas except for mines where firedamp is present
- C:** type of protection based on the special interstice designed to obtain maximum safety level (MESG) C = strictest MESG
- T6:** maximum case surface temperature 85 °C

Main features

Encoder for rack with automatic slack recovery. If compared to an incremental linear system, this type of encoder extremely simplifies linear measurements and overcomes measurement problems on long distance. Our models are sealed in a solid aluminium body and integrate a preloading system that allows automatic slack recovery between rack and pinion.

- Up to 2000 ppr with zero signal
- Several output types available
- Up to 24 V DC power supply
- Up to 300 kHz output frequency
- Cable or connector output



Ordering code

EC 34 A 100 Z 5 N 10 M . XXX

encoder for rack **EC**

Type of flange

EC 34 A model **A**

Resolution

ppr from **1** to **2000**

please directly contact our offices for pulses availability

Zero pulse

without zero pulse **S**

with zero pulse **Z**

Power supply

5 V DC **5**

8÷24 V DC **8/24**

full stop to separate
special versions

special version
code numbered
from 001 to 999

P cable output (standard length 1.5 m)

M M connector output

J J connector output

Shaft diameter

10 ø 10 mm

Output type

N NPN

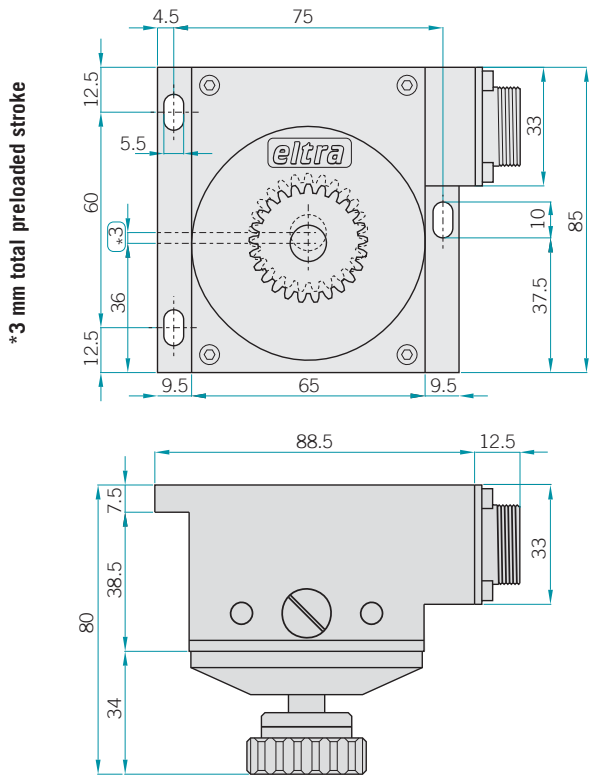
C NPN open collector

P push-pull

L line driver

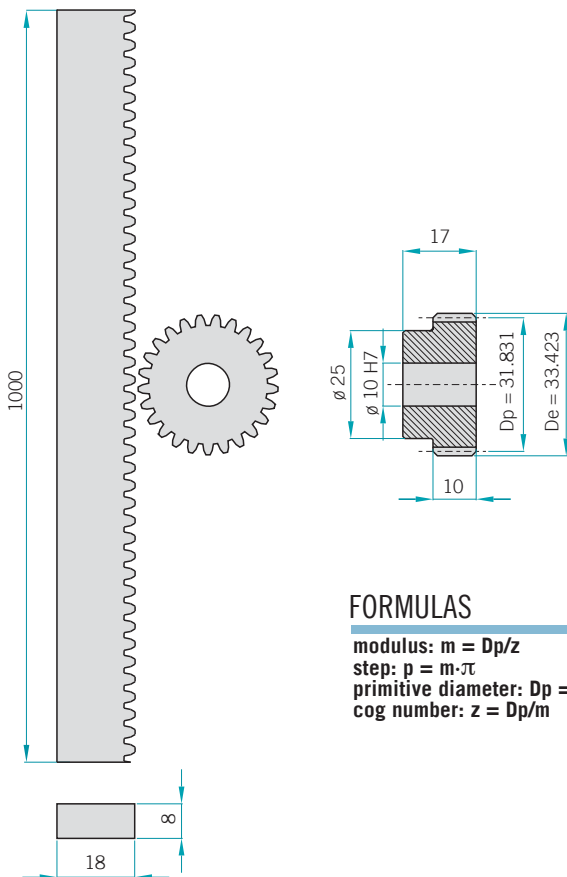
please refer to page 92 for optionals about output types

EC 34



Rack and cogwheel

$p = 2.5$ $z = 40$ $m = 0.796$



FORMULAS

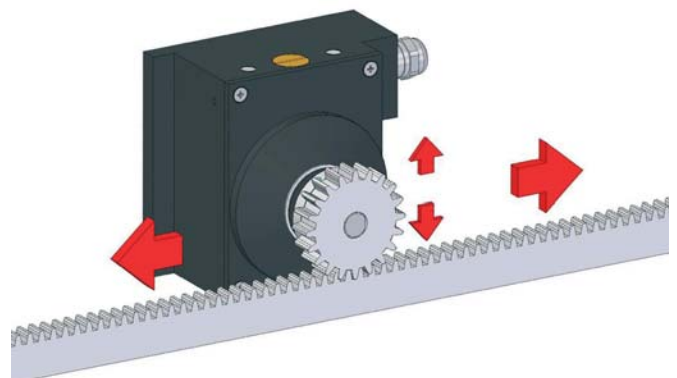
modulus: $m = Dp/z$
 step: $p = m \cdot \pi$
 primitive diameter: $Dp = m \cdot z$
 cog number: $z = Dp/m$

Electrical specifications

Resolution	from 1 to 2000 ppr
Power supply	5 V DC 8÷24 V DC
Current consumption without load	100 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output type	NPN / NPN open collector push-pull / line driver
Max. output frequency	100 kHz
Operating frequency	$F = \frac{RPM \cdot Resolution}{60}$

Mechanical specifications

Shaft diameter	∅ 10 mm
Enclosure rating	IP64
Max. rotation speed	3000 RPM
Max. shaft load	200 N (20 kgf) axial 200 N (20 kgf) radial
Shock	50 G, 11 ms
Vibration	10 G, 10÷2000 Hz
Bearing life	10 ⁹ revolutions
Bearings	2 ball bearings
Shaft material	stainless steel UNI X10CrNiS1809
Housing material	epoxy oven-painted aluminium
Rack and cogwheel material	steel
Operating temperature	0÷60 °C
Storage temperature	-25÷70 °C
Weight	700 g





RH 200 A / B / C RH - RM 500 A / B / C METRIC WHEELS



ISO 9001:2000



Main features

Metric wheel series designed for specific industrial applications where is required to measure a linear movement (i.e. continuous sheet cutting machines of wood, textiles, glass, etc.). Precise reading and high stress resistance are the main features of these encoders. The body is entirely designed of aluminium and mounted using an oscillating arm pivoted on the shaft. It comes with an integrated self-lubricating compact box to assure a long operation period without any maintenance. The weight of the metric wheel keeps a stable contact with the material, allowing an accurate measurement of both length and speed.

The wheel surface can be in crossed-knurl aluminium, special anti-oil or anti-sliding rubber.



Ordering code

full stop to separate special versions

RH 200 A 500 Z 5 N 8 X 3 P R . XXX

RH series **RH**
RM series **RM**

200 mm linear extent **200**
500 mm linear extent **500**

Wheel type

smooth **A**
knurled **B**
rubberized **C**

Resolution

ppr (RM series) from **1** to **10000**
40 1024

please directly contact our offices for pulses availability

Zero pulse

without zero pulse **S**
with zero pulse **Z**

Power supply

(RM series) 5÷28 V DC **5/28**

(RH series) 5 V DC **5**

(RH series) 8÷24 V DC **8/24**

line driver available only with 5 V DC or 8÷24 V DC power supply

R radial
A axial

special version code numbered from 001 to 999

P cable output (standard length 0.5 m) (RH 200)
M cable output (standard length 1.5 m) (RH - RM 500)
J M connector output (RH - RM 500)

Max. rotation speed

3 3000 RPM

Enclosure rating

X IP54 standard (RH 200)
IP64 standard (RH - RM 500)
S IP66 optional (RH - RM 500)

Shaft diameter

8 ø 8 mm (RH 200)

10 ø 10 mm (RH - RM 500)

Output type

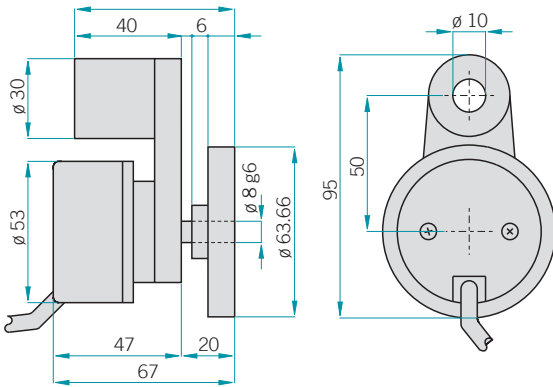
N NPN
C NPN open collector
P push-pull
L line driver

please refer to page 92 for optionals about output types

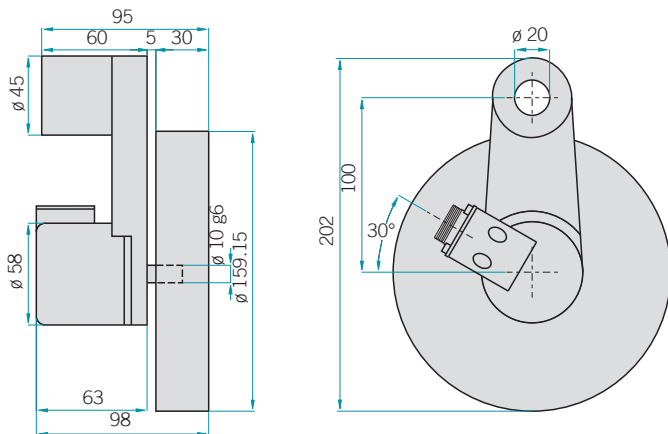
Other products

RH 200 A / B / C
RH - RM 500 A / B / C

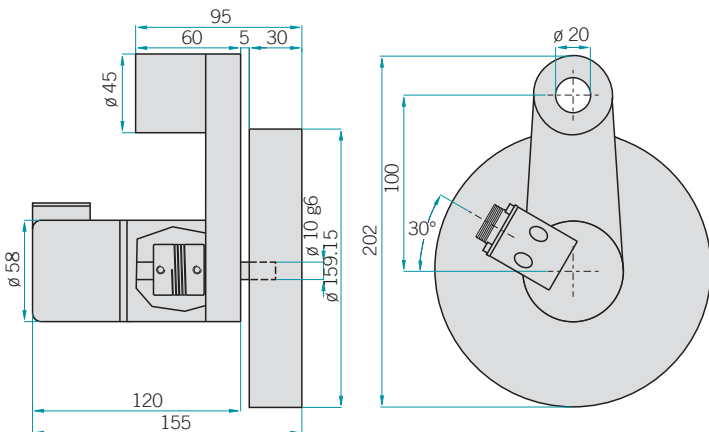
RH 200 A / B / C



RH 500 A / B / C



RM 500 A / B / C



Electrical specifications (RM series)

Resolution	from 1 to 10000 ppr
Power supply	5÷28 V DC line driver available only with 5 V DC or 8÷24 V DC power supply
Current consumption without load	100 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output type	NPN / NPN open collector push-pull / line driver
Max. output frequency	300 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Electrical specifications (RH series)

Resolution	from 40 to 1024 ppr
Power supply	5 V DC 8÷24 V DC
Current consumption without load	100 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output type	NPN / NPN open collector push-pull / line driver
Max. output frequency	100 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Mechanical specifications

Shaft diameter	∅ 8 mm (RH 200) ∅ 10 mm (RH - RM 500)
Enclosure rating	IP54 standard (RH 200) IP64 standard (RH - RM 500) IP66 optional (RH - RM 500)
Max. rotation speed	3000 RPM
Shock	50 G, 11 ms (plastic disc) 20 G, 11 ms (glass disc)
Vibration	10 G, 10÷2000 Hz
Bearing life	10 ⁹ revolutions
Bearings	2 ball bearings 2 ball bearings on support (RM 500)
Shaft material	stainless steel UNI X10CrNiS1809
Housing material	aluminium UNI 5076
Support material	painted aluminium UNI 9002/5
Wheel material	aluminium UNI 9002/5 (RH 200) aluminium UNI 3051 (RH - RM 500)
Operating temperature	0÷60 °C
Storage temperature	-25÷70 °C
Encoder weight + support weight	250 g (RH 200) 1000 g (RH - RM 500)
Wheel weight	100 g (RH 200) 800 g (RH - RM 500)

Main features

Incremental linear system.

- Working stroke up to 500 mm
- Available with or without zero mark on left, right or central position
- Several electronic output configurations available. Up to 24 V DC power supply
- Cable output. Cable with connector at the end available on demand



Ordering code

full stop to separate
special versions

ER A 100 D 5 N 6 P . XXX

incremental linear encoder **ER**

special version
code numbered
from 001 to 999

Resolution

- 0.2 mm (0.05 mm reading all edges) **A**
- 0.1 mm (0.025 mm reading all edges) **B**
- 0.04 mm (0.01 mm reading all edges) **C**

P cable output with cable gland IPON® IP67
(standard length 1.5 m)

Working stroke

working stroke (mm) from **100** to **500**

Fixing hole diameter

6 ø 6 mm

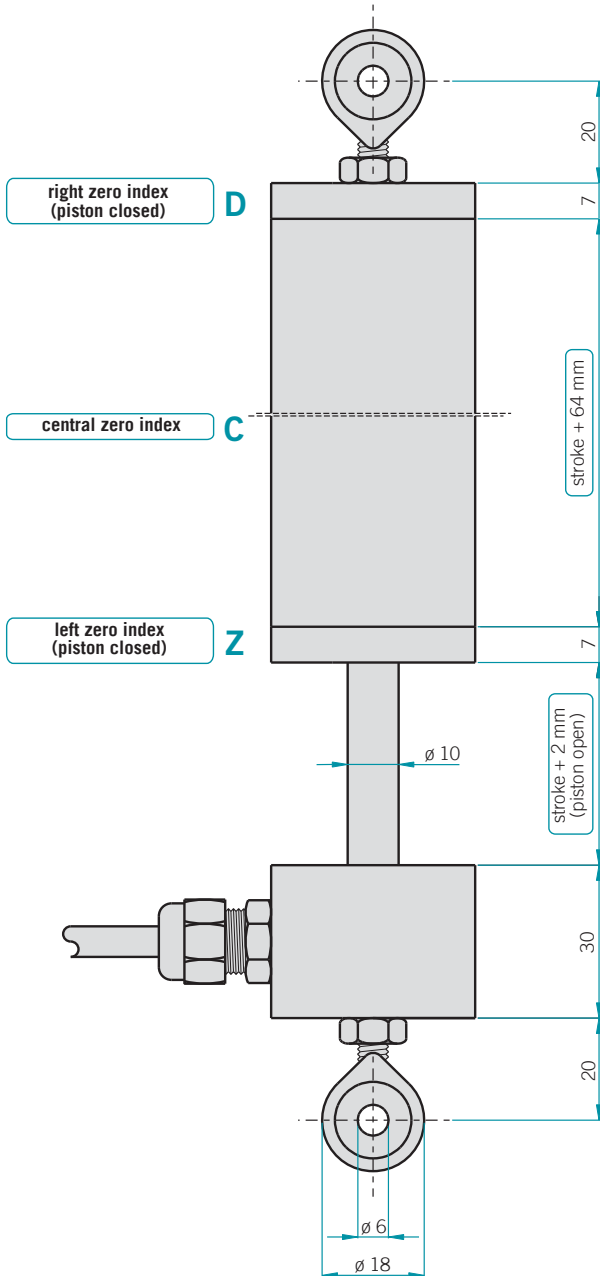
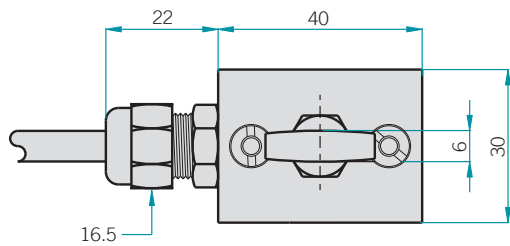
Output type

- N** NPN
 - C** NPN open collector
 - P** push-pull
 - L** line driver
- please refer to page 92 for optional about output types*

Power supply

5 V DC **5**
8÷24 V DC **8/24**

ER A / B / C

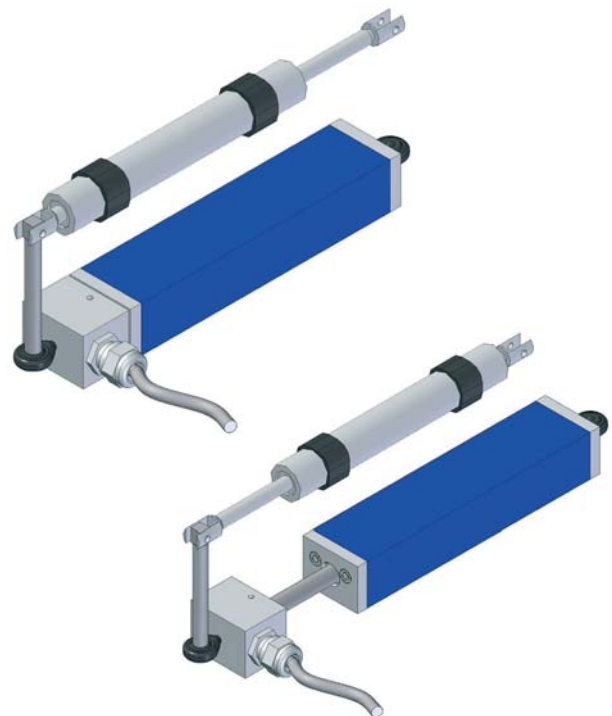


Electrical specifications

Resolution	0.2 mm (0.05 mm reading all edges) 0.1 mm (0.025 mm reading all edges) 0.04 mm (0.01 mm reading all edges)
Linearity error	± 0.05 mm max. (ER A) ± 0.025 mm max. (ER B) ± 0.01 mm max. (ER C)
Power supply	5 V DC 8÷24 V DC
Current consumption without load	50 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output type	NPN / NPN open collector push-pull / line driver

Mechanical specifications

Working stroke	from 100 to 500 mm
Enclosure rating	IP64
Max. movement speed	1 m/s
Shock	50 G, 11 ms
Vibration	10 G, 10÷2000 Hz
Rod material	stainless steel UNI X10CrNiS1809
Housing material	painted aluminium UNI 9002/5
Fixing	2 joint heads with $\varnothing 6$ mm hole
Operating temperature	0÷60 °C
Storage temperature	-25÷70 °C
Weight	from 400 g to 1000 g



Other products

ER A / B / C

Main features

Electronic handwheel series designed for positioning on CNC machines with manual drive.

- Resolution up to 10000 ppr with zero signal
- Several electronic output configurations available
- Up to 28 V DC power supply
- Output frequency up to 100 kHz
- Cable or connector output
- Several flanges available



Ordering code

EV	A	M	100	Z	5	L	10	M	R	.	XXX
electronic handwheel											special version code numbered from 001 to 999
Type of flange											
EV A model	A										
EV B model	B										
EV C model	C										
Knob											
with knob		M									
without knob		S									
Resolution											
(EV A / B) ppr from	1	to	10000								
(EV C) ppr	100										
<i>please directly contact our offices for pulses availability</i>											
Zero pulse											
without zero pulse				S							
with zero pulse				Z							
Power supply											
							5 V DC	5			
							(EV A / B) 5-28 V DC	5/28			
<i>line driver available only with 5 V DC or 8-24 V DC power supply</i>											
Shaft diameter											
							6	∅ 6 mm	(EV C)		
							10	∅ 10 mm	(EV A / B)		
Output type											
							N	NPN			
							C	NPN open collector			
							P	push-pull			
							L	line driver			
<i>please refer to page 92 for optionals about output types</i>											

full stop to separate special versions

A axial (EV A / B)
R radial

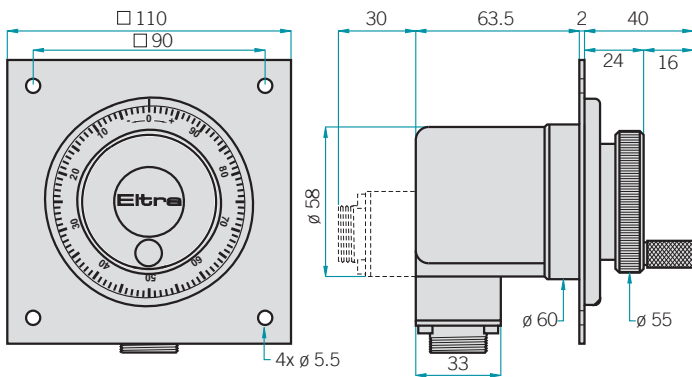
P cable output (standard length 1.5 m) (EV A / B)
cable output (standard length 0.3 m) (EV C)
M M connector output (EV A / B)
J J connector output (EV A / B)

Output type

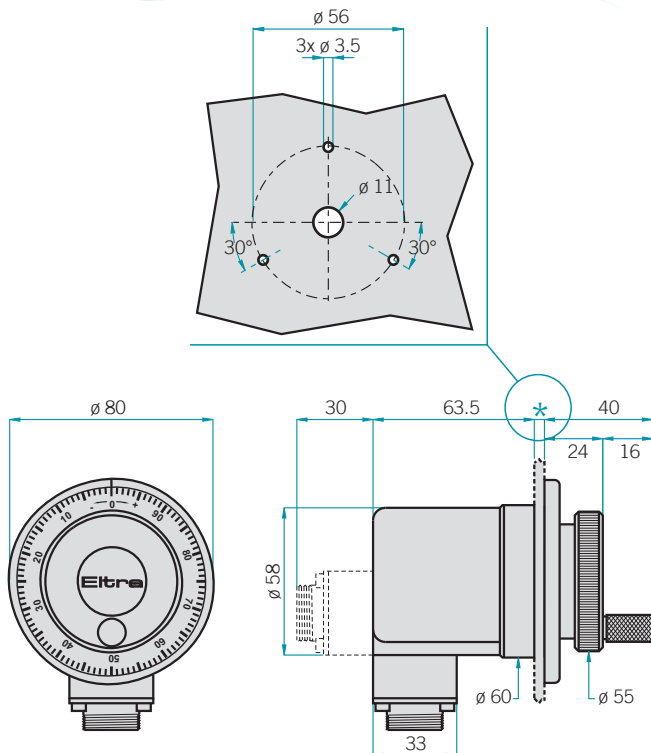
N NPN
C NPN open collector
P push-pull
L line driver

please refer to page 92 for optionals about output types

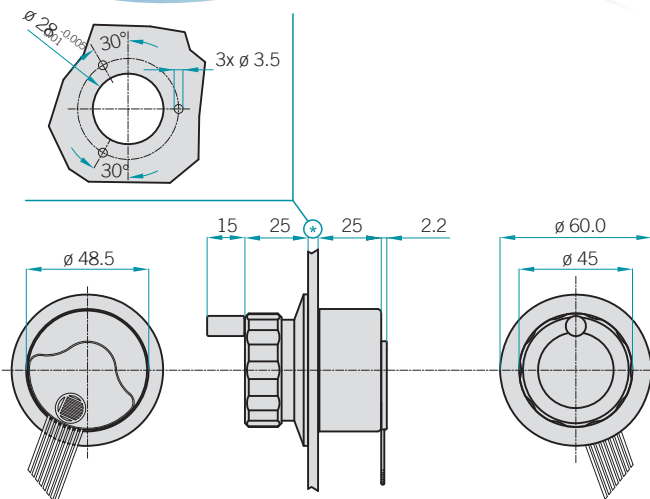
EV A



EV B



EV C



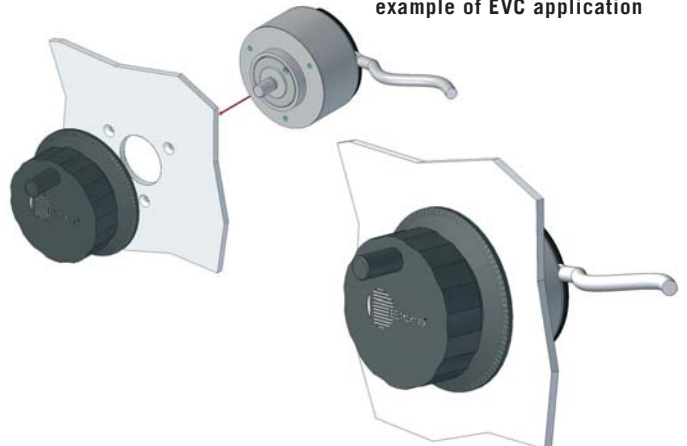
Electrical specifications

Resolution	from 1 to 10000 ppr (EV A / B) 100 ppr (EV C)
Power supply	5 V DC 5÷28 V DC (EV A / B) line driver available only with 5 V DC or 8÷24 V DC power supply
Current consumption without load	100 mA max.
Max. load current	50 mA for channel 20 mA for channel (line driver)
Output type	NPN / NPN open collector push-pull / line driver
Max. output frequency	100 kHz
Operating frequency	$F = \frac{\text{RPM} \cdot \text{Resolution}}{60}$

Mechanical specifications

Shaft diameter	ø 6 mm (EV C) ø 10 mm (EV A / B)
Enclosure rating	IP64 (EV A / B) IP40 (EV C)
Mechanical indexes per turn	100
Shock	50 G, 11 ms
Vibration	10 G, 10÷2000 Hz
Bearing life	10 ⁹ revolutions
Bearings	2 ball bearings
Shaft material	stainless steel UNI X10CrNiS1809
Body material	aluminium UNI 9002/5
Housing material	PA66 glass fiber reinforced (EV A / B) steel (EV C)
Operating temperature	0÷60 °C
Storage temperature	-25÷70 °C
Weight	150 g (EV C) 450 g (EV A / B)

example of EVC application



Main features

Rope encoder series available for lengths up to 6 m.
The applied encoder could be incremental or absolute (both available with SSI or PROFIBUS® interface).
Perfectly suitable also for harsh environments, thanks to its high mechanical strength.

It can be used in wide range of applications such as: vertical storehouses, presses, extruders, etc.



Ordering code

full stop to separate special versions

FE 1500 A . XXX

rope encoder for linear measures FE

special version code numbered from 001 to 999

Working stroke

1,5 m 1500
4 m 4000
6 m 6000

Type of rope end

A rope eyelet

The encoder you wish to apply to the FE model needs to be ordered separately. The **F** letter will be placed before the standard ordering code.

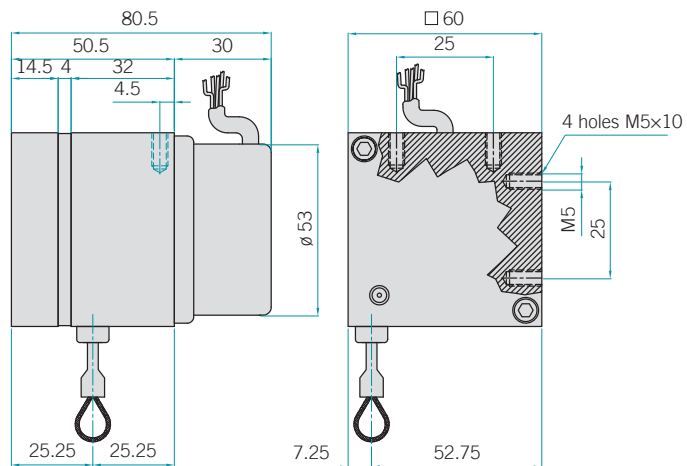
Example:

- 1) encoder model EH 30 M ordering code: FEH30M300S8/24P6X6PR
- 2) encoder model EL 53 B ordering code: FEL53B1100S5/28P6X3MR
- 3) encoder model EAM 53 B ordering code: FEAM53B16/4096G8/28PPX6X3MER

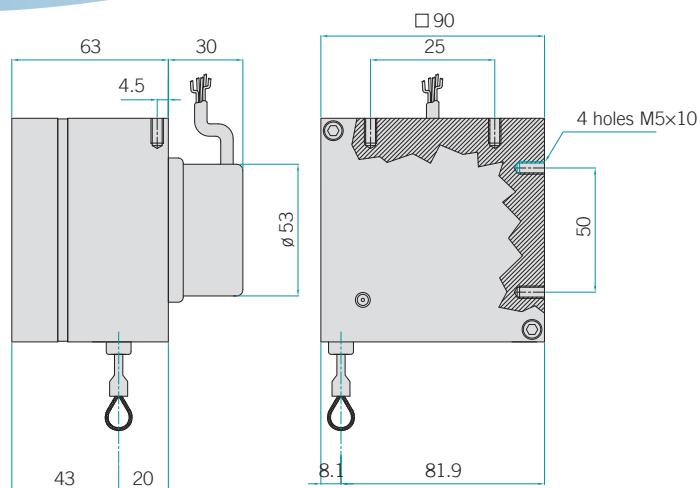
Complete ordering code example:

FE1500A-FEH30M300S8/24P6X6PR

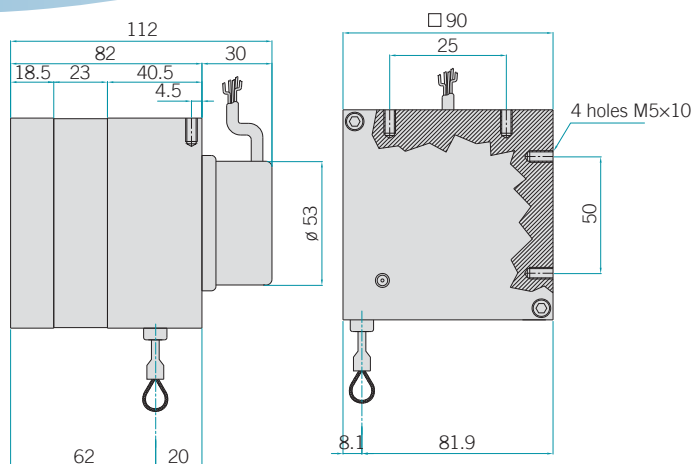
FE 1500



FE 4000

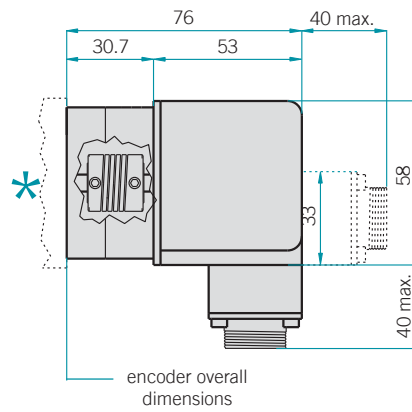


FE 6000



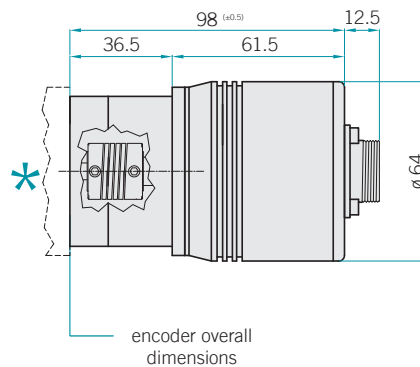
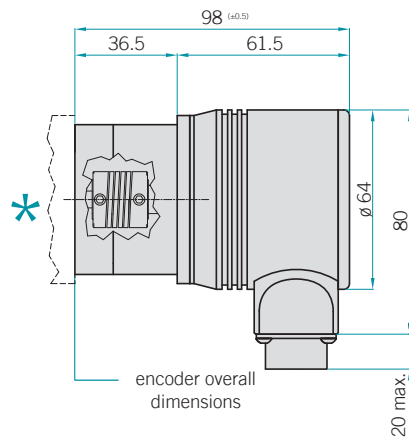
FEL 53 B

Incremental encoder application



FEAM 53 B

Multiturn absolute encoder application



General specifications

Model	FE 1500	FE 4000	FE 6000
Coil extent (1 turn) (mm)	120	220	220

Incremental encoder application

Resolution	Pulses	Pulses	Pulses
1 mm	120	220	220
0.4 mm	300	550	550
0.1 mm	1200	2200	2200

For specific resolutions please contact our offices

Multiturn absolute encoder application

Resolution	Pulses	Pulses	Pulses
1 mm	120	220	220
0.4 mm	300	550	550
0.1 mm	1200	2200	2200

In case of splitted resolutions, output code will be independent of resolution and turn number.

	Turns	Turns	Turns
	12.5	18	27

For specific resolutions please contact our offices

Mechanical specifications

Linearity error	±0.05%
Max. movement speed	0.85 m/s
Enclosure rating	IP54 <small>For encoder IP rating see related datasheet</small>
Shock	50 G, 11 ms
Vibration	10 G, 10÷2000 Hz
Housing material	aluminium UNI 6082
Rope material	Dyneema®
Operating temperature	0÷60 °C
Storage temperature	-25÷70 °C
Weight	500 g (FE 1500) 1100 g (FE 4000) 1300 g (FE 6000)

For encoder specifications, refer to technical sheets of the following models:

- for EH 30 M see EH 38 encoder
- for EL 53 B see EL 53 encoder
- for EAM 53 B see EAM 58 encoder

Main features

ETMA 1

Magnetic incremental linear sensor

- Resolution: 0.025 mm
- Zero pulse every 5 mm

ETMA 2

Magnetic incremental linear sensor

- Resolution: 0.01 mm
- Zero pulse every 2 mm



Ordering code

ETM		A		1		Z		5		L		S		PR3		XXX	
magnetic incremental linear sensor																special version code numbered from 001 to 999	
Head type		horizontal		A													
Resolution		0.1 mm (0.025 mm reading all edges)		1		0.04 mm (0.01 mm reading all edges)		2									
Zero pulse		without zero pulse		S		(ETMA 1) with zero pulse every 5 mm		Z									
		(ETMA 2) with zero pulse every 2 mm															
Power supply		5 V DC		5		8÷24 V DC		8/24									
Output type		push-pull		P		line driver		L									

full stop to separate special versions

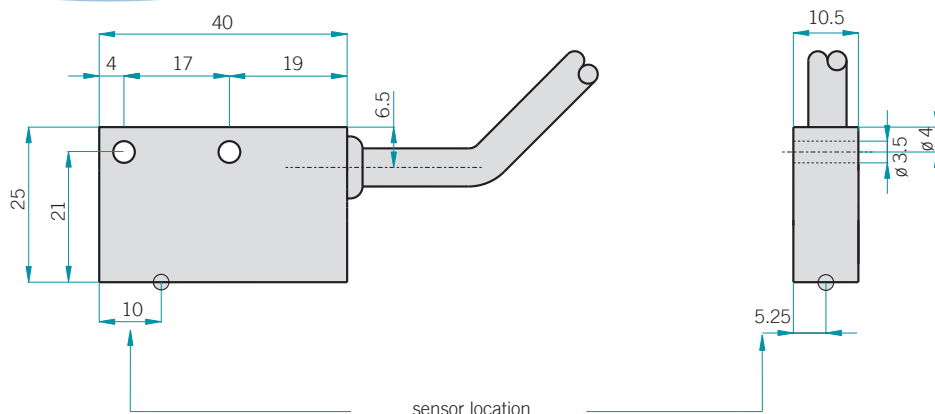
Cable length

- 3 3 m (standard)
- 6 6 m
- 10 10 m
- 20 20 m

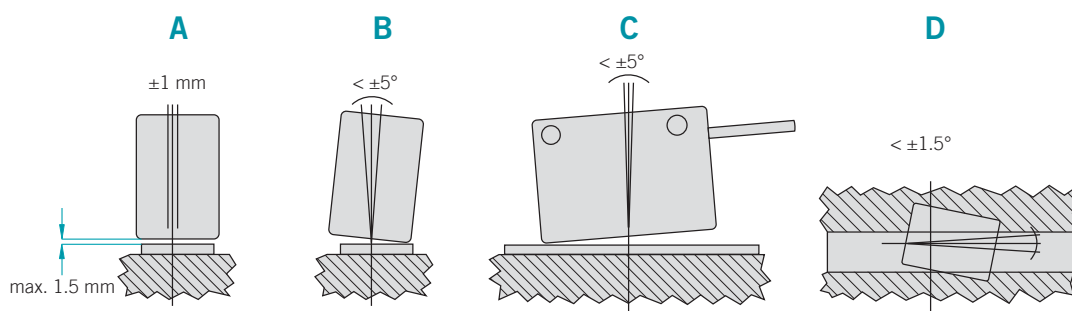
Enclosure rating

S IP68

ETMA 1 / 2

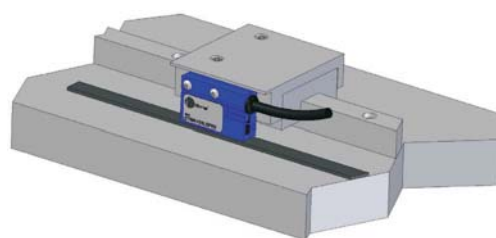


Mechanical tolerances



Electrical specifications

Resolution	0.1 mm (0.025 mm reading all edges) (ETMA 1) 0.04 mm (0.01 mm reading all edges) (ETMA 2)
Linearity error	± 0.025 mm (ETMA 1) ± 0.01 mm (ETMA 2)
Output type	line driver push-pull
Power supply	5 V DC 8÷24 V DC
Current consumption without load	30 mA max.
Max. load current	20 mA for channel
Zero pulse	zero every 5 mm (ETMA 1) zero every 2 mm (ETMA 2)
Max. movement speed	4 m/s

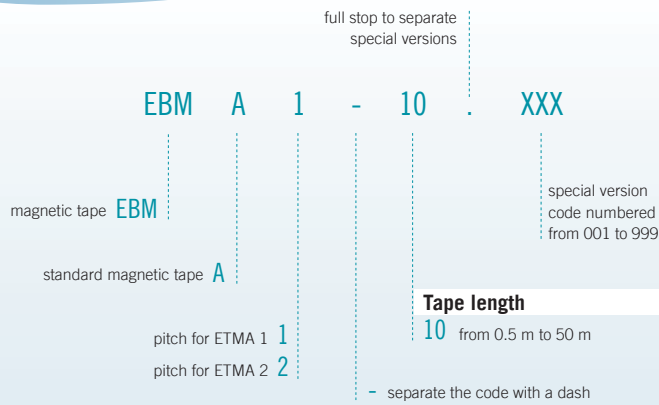


Mechanical specifications

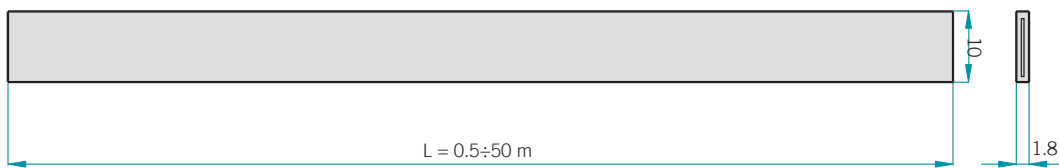
Enclosure rating	IP68
Shock	50 G, 11 ms
Vibration	10 G, 10÷2000 Hz
Housing material	anodized aluminium UNI 6082
Fixing	2 holes \varnothing 3.5 mm
Operating temperature	0÷60 °C
Storage temperature	-25÷70 °C
Working distance from magnetic tape	< 1.5 mm
Weight	150 g



Ordering code



EBM



Different lengths available only on demand.

General specifications

Operating temperature -40 ÷ 120 °C

Accuracy ±0.04 mm/m

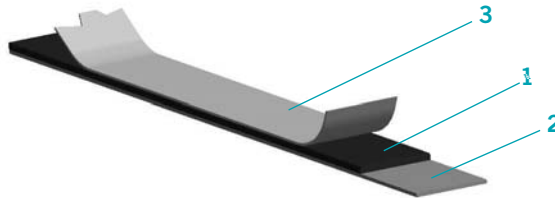
Linear expansion coefficient (11 ± 1) · 10⁻⁶ m/K

Radius of curvature 150 mm min.

General specifications

As shown in the figure below, Eltra magnetic tape is composed by three layers:

- 1 - A flexible magnetic tape made of ferrite bonded into a nitrile rubber matrix.
- 2 - A stainless steel (AISI 301) tape used to create a shield against any external magnetic fluxes and other external agents. Furthermore it's glued to the upper layer in order to give the correct mechanical consistency to the magnetic tape.
- 3 - A steel tape, magnetically transparent and with the function to protect mechanically the magnetic layer; it is the most rigid part and therefore is supplied separately due to transport and application needs. It must be stuck on layer 1 by the user.



To prevent damage from possible internal stresses in the magnetic tape, keep the tape rolled up with magnetic layer facing outwards, with a minimum internal diameter of 300 mm.

Tips to stick on the magnetic tape

Fixing pressure

The magnetic tape is adhesive. Therefore it is important optimum contact between surfaces for right use. A good pressure must be uniformly applied to guarantee a perfect result.

Glueing temperature

In order to guarantee optimal sticking it is recommended a surface temperature between 20 °C and 35 °C. Maximum adhesion is obtained after 72 hours at temperature of 21 °C. We suggest instead to avoid to apply the magnetic tape when surface temperature is lower than 10 °C.

Application materials

Magnetic tape must be placed on dry, smooth and clean surfaces. Surfaces must be cleaned with aqueous solution. Metallic surfaces like brass, copper etc. must be protected to prevent possible oxidation.

Chemical agents and magnetic tape behaviour

Null effect chemicals	Medium effect chemicals	Strong effect chemicals
motor oil	JP-4 fuel	aromatic hydrocarbons (benzene, toluene, xylene, trichloroethylene, freon 10)
transmission oil	gasoline	ketones (acetone)
ATF (automatic transmission fluid)	heptane	mineral acids (hydrochloric, sulphuric, nitric, phosphoric, boric)
hydraulic oil	alcohols	
kerosene		
antifreeze		
detergents, disinfectants (Clorox®)		
turpentine		
water		
salt spray		

Main features

Encoders with potentiometric output signal.
The potentiometer is fitted in a sturdy housing and it is supported by two bearings. It assures excellent lifetime, speed and high accuracy.



Ordering code

EP A 103/10 P R . XXX

full stop to separate special versions

A axial
R radial

P cable output with cable gland (standard length 1.5 m)

special version code numbered from 001 to 999

Resistive value

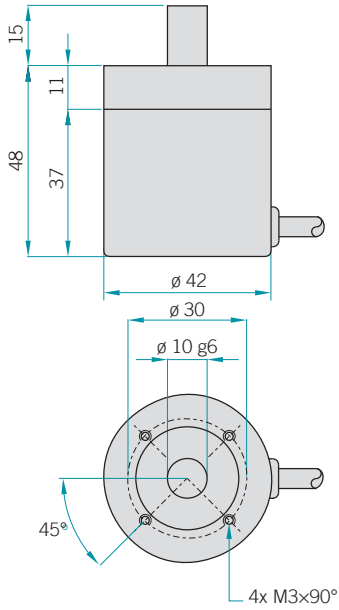
102/1	1 kOhm / 1 turn
102/10	1 kOhm / 10 turns
502/1	5 kOhm / 1 turn
502/3	5 kOhm / 3 turns
502/10	5 kOhm / 10 turns
103/1	10 kOhm / 1 turn
103/3	10 kOhm / 3 turns
103/10	10 kOhm / 10 turns

Shaft type

- A EP A model with \varnothing 10 mm shaft
- B EP B model with cogged shaft

EP rotary potentiometer

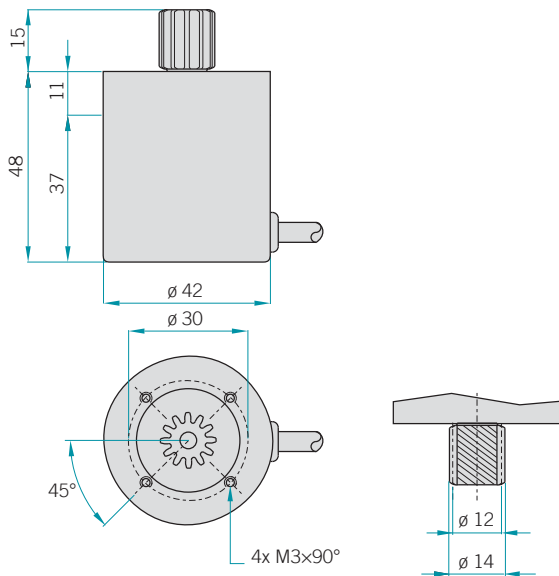
EP A



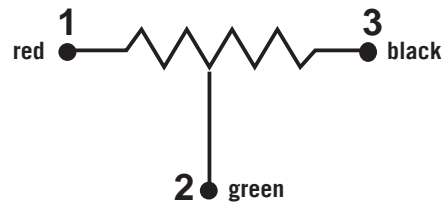
Mechanical specifications

Enclosure rating	IP54
Shaft diameter	ø 10 mm
Shaft material	stainless steel UNI X10CrNiS1809 (EP A) steel UNI C45 (EP B)
Housing material	PA66 glass fiber reinforced
Body material	aluminium UNI 9002/5
Bearings	2 ball bearings
Limit stop	automatic clutch (no stop)
Operating temperature	0÷80 °C
Storage temperature	-25÷85 °C
Weight	150 g

EP B



Electrical connections




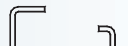
Cogged shaft specifications

z = 12
m = 1
p = 3.1415

General specifications

Model	Resistive value (Ohm)	Mechanical rotation	Electrical rotation	Element technology	Tolerance	Linearity	End resistance (Ohm)	Power rating (70 °C)	Life (shaft revolutions)	Shock	Vibration
102/1	1k	270°	210°	cermet	±10%	±3%	3	2 W	25000	25 G	10 G, 10÷150 Hz
102/10	1k	3600° +10° -0°	3600° +10° -0°	wirewound	±5%	±0,20%	1	2 W	1000000	50 G	15 G, 10÷2000 Hz
502/1	5k	360°	340° ±3°	conductive plastic	±20%	±2%	1	1 W	5000000	50 G	15 G, 10÷2000 Hz
502/3	5k	1080° +10° -0°	1080° +10° -0°	wirewound	±5%	±0,25%	1	1 W	300000	50 G	15 G, 10÷2000 Hz
502/10	5k	3600° +10° -0°	3600° +10° -0°	wirewound	±5%	±0,20%	1	2 W	1000000	50 G	15 G, 10÷2000 Hz
103/1	10k	300° ±5°	270 ±10°	cermet	±10%	±5%	4	1 W	25000	25 G	10 G, 10÷150 Hz
103/3	10k	1080° +10° -0°	1080° +10° -0°	wirewound	±5%	±0,25%	1	1 W	300000	50 G	15 G, 10÷2000 Hz
103/10	10k	3600° +10° -0°	3600° +10° -0°	wirewound	±5%	±0,20%	1	2 W	1000000	50 G	15 G, 10÷2000 Hz

Electrical specifications

INPUT and OUTPUT voltages	5 V DC 8±24 V DC	
Current consumption without load	70 mA max.	
Max. load current	20 mA for channel (line driver) 40 mA for channel (push-pull)	
Max. input current	10 mA for channel	
Max. operating frequency	100 kHz	
Current consumption in maximum operating conditions (A)	$I_{max} = 0.12 \cdot \frac{(VX1+VX2+...+VXn+VX4)}{VX4}$ where: VX1 = input voltage on X1 VX2,...,VXn = output voltage on X2,...,Xn VX4 = board power supply	
Operating temperature	0±50 °C	
Fixing on panel	 DIN 46277-3 rail (Omega)	 DIN 46277-2 rail (Omega)



The EMB board

This board is used when it is necessary to adjust encoder electronic features to control ones.

Main functions of EMB are output signal splitting and adaptation of output stages.

For instance, it happens to have an encoder with 5 V DC output and a control that accepts only 24 V DC data. It may also happen to use an encoder connected with a control with the same power supply, but different electronics.

It can solve a wide range of problems: check the ordering code in the next page to find further informations.

On the board there can be up to 2 different voltages and it must be supplied through the X4 connector with the higher voltage used. Moreover it is possible to obtain up to 8 outputs from the same input by assembling several boards in a single support in order to reduce drastically wiring.

In this case the ordering code will contain information about all outputs. For example, a board with one 5 V DC NPN input and eight 5 V DC line driver outputs has the following ordering code: **EMB5N5L5L5L5L5L5L5L**.

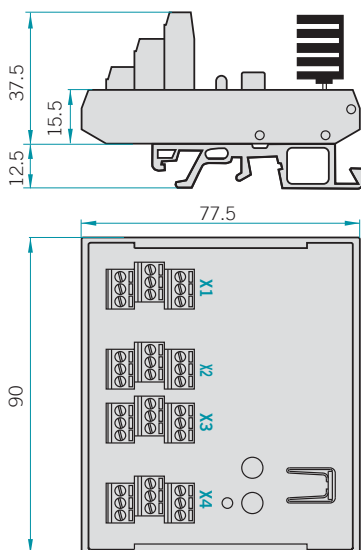
The following example may explain better a typical EMB application: an encoder with 5 V DC line driver output has to be connected to a 24 V DC push-pull input and also to an instrument having 5 V DC line driver input. The board you have to order will have the following code:

EMB5L8/24P5L where **EMB5L** indicates 5 V DC line driver input on X1 connector, **EMB5L8/24P** indicates 24 V DC push-pull output on X2 connector, and the last **EMB5L8/24P5L** indicates 5 V DC line driver output on X3 connector.

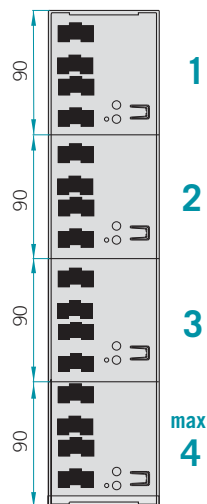
Power supply of this board is 24 V DC, because it is the highest used value, and it will be supplied through X4 connector.

Mechanical dimensions

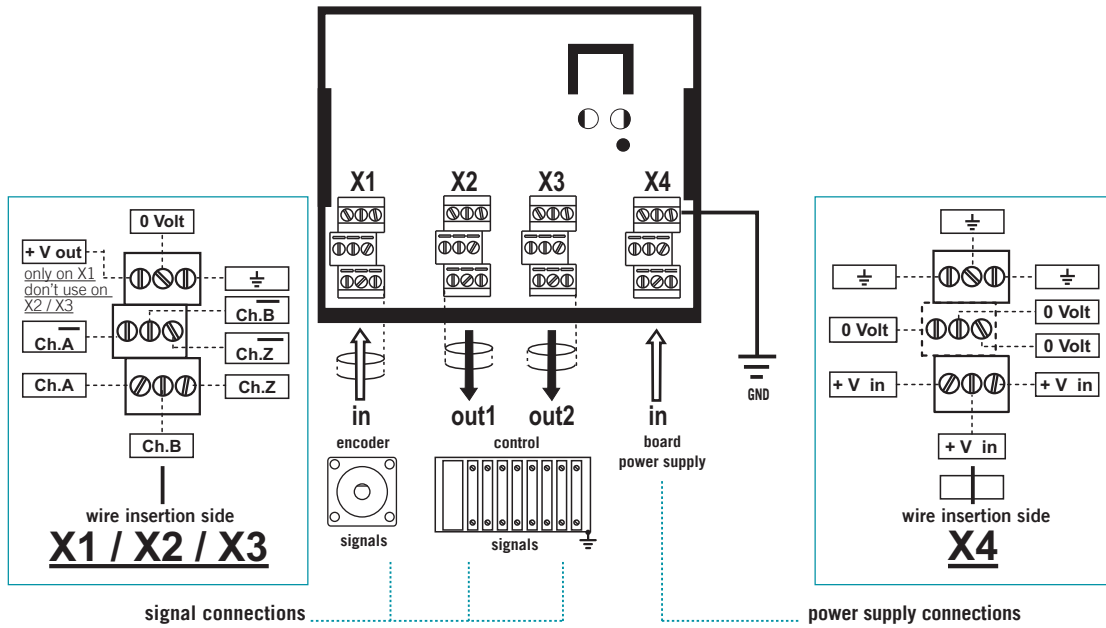
Single implementation



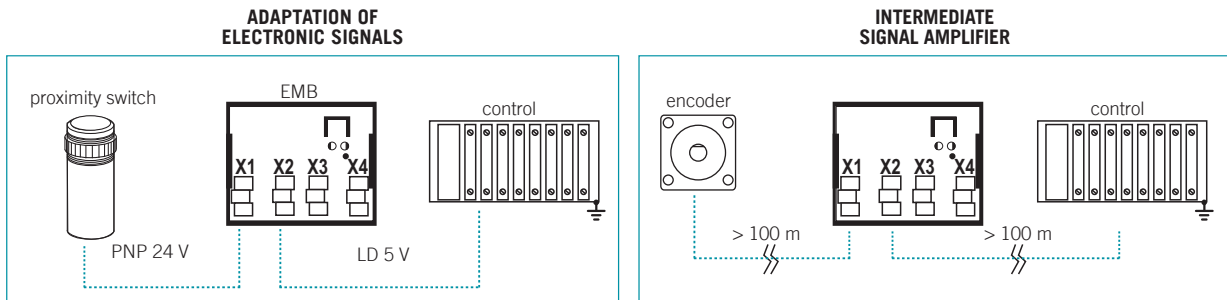
Multiple implementation
(4 modules / 8 outputs max.)



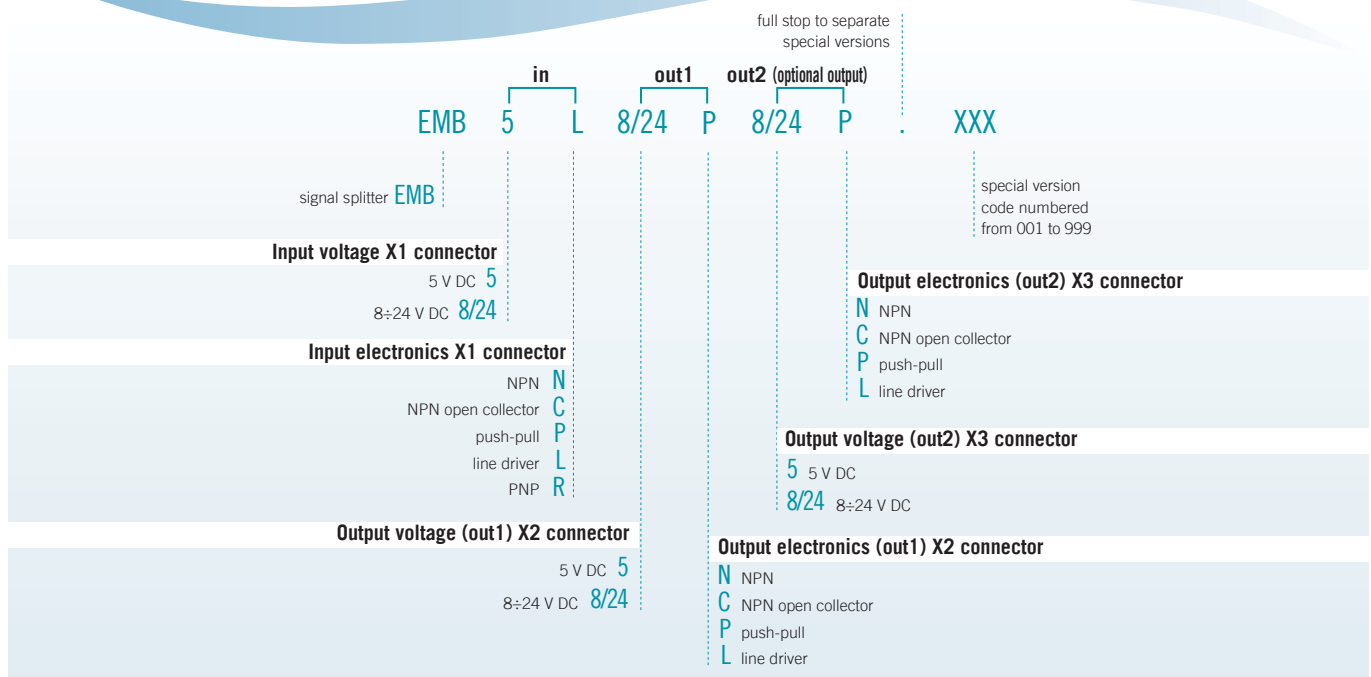
Operating diagram and terminal board connections



Examples

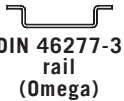



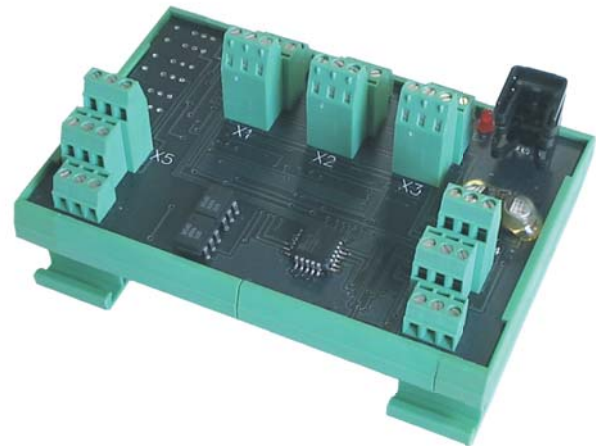
Ordering code



ELECTRONIC INTERFACE SIGNAL SELECTOR

Electrical specifications

Power supply	5 V DC 8÷24 V DC
Current consumption without load	150 mA max.
Max. load current	20 mA for channel (line driver) 40 mA for channel (push-pull)
Max. input current	10 mA for channel
Max. operating frequency	100 kHz
Operating temperature	0÷40 °C
Input logic levels in1 and in2	"1" = 5÷24 V DC "0" = 0÷3 V DC
Contact characteristics	V _{max} = 125 V AC / 60 V DC I _{max} = 0.5 A V _{min} = 5 V DC I _{min} = 1 mA
Fixing on panel	 DIN 46277-3 rail (Omega)  DIN 46277-2 rail (Omega)



The EMD board

This board is used when it is necessary to select a signal among a maximum of 3 inputs.

The EMD board accepts input signals coming from a maximum of 3 encoders and provides as output the signals of one of these encoders.

Output signals are selected connecting properly the two inputs, in1 and in2, according to the operating diagram (see next page).

EMD and encoder electronics must be indicated in the ordering code and the electronic interfaces of the connected encoders must be all identical. Moreover the EMD provides 3 contacts normally open that close when respective input is selected.

The following example is useful to understand better the use of this board.

We would like to read the signals of 3 encoders (or other devices with similar features) in sequential way. Encoders must have same output electronics, for example 5 V DC line driver. The instrument for data acquisition, on the contrary, has a different electronic interface, for example 24 V DC push-pull.

In this case the EMD board will perform the selection function among the connected encoders and the matching of the electronic interfaces.

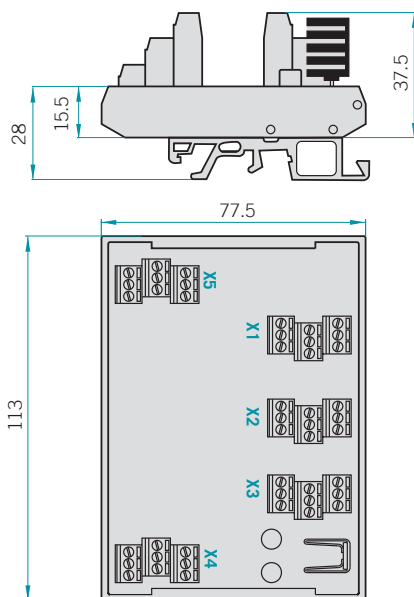
The ordering code will be:

EMD5L8/24P, where EMD5L indicates that inputs are 5 V DC line driver, EMD5L8/24P indicates that output is 8÷24 V DC push-pull. EMD power supply must be the highest value among requested voltages: in this case 8÷24 V DC. The encoder selection is carried out through a logic type signal at in1 and in2 inputs on the terminal board.

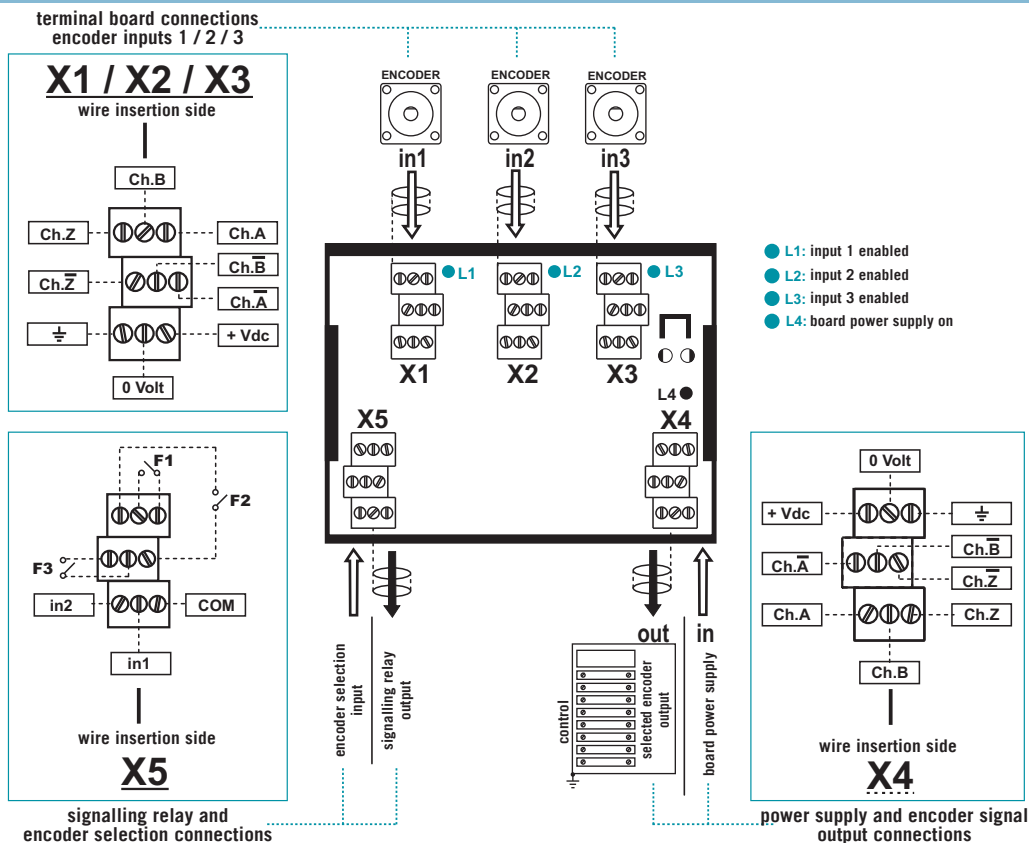
Logic level "1" is obtained connecting a voltage included between 5 and 24 V DC to above mentioned inputs.

Logic level "0", instead, is correctly interpreted if voltage is included between 0 and 3 V DC. The combination of logic levels at in1 and in2 inputs sets outputs to 4 different states, as described in the table in the following page.

Mechanical dimensions



Operating diagram and terminal board connections

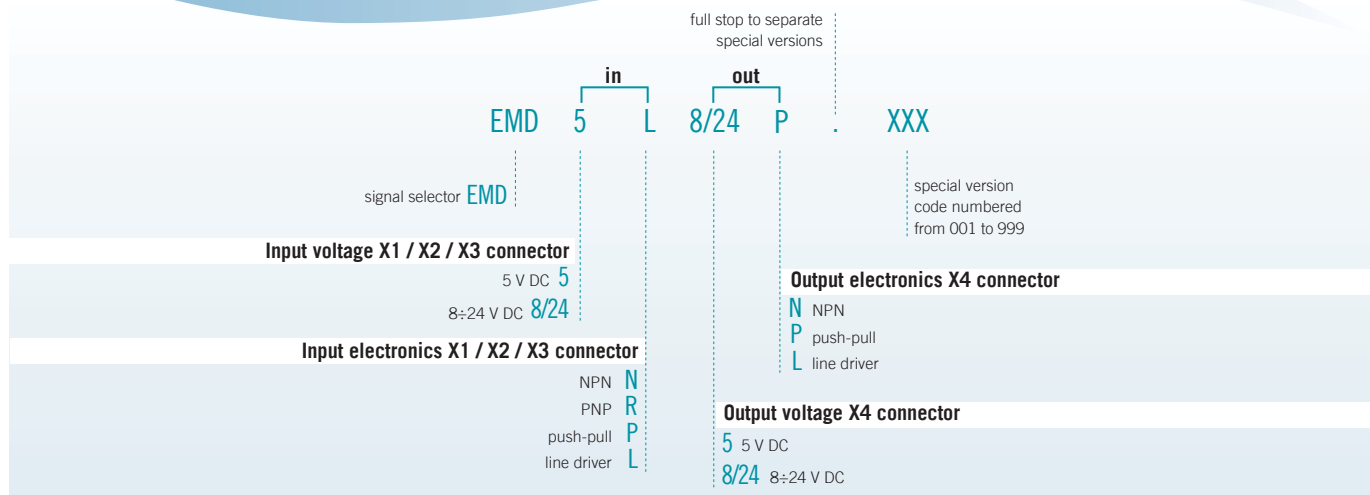


Logic states

The table indicates the output state on X4 connector and on X5 contacts, according to logic states present on in1 and in2 on X5 connector.

Logic state on X5		Selected encoder on X4			Selected contact on X5		
in1	in2	X1	X2	X3	F1	F2	F3
0	0	-	-	-	-	-	-
1	0	•	-	-	•	-	-
0	1	-	•	-	-	•	-
1	1	-	-	•	-	-	•

Ordering code



Main features

Eltra accurate elastic couplings are essential parts for the transmission of rotatory motion to the encoder shaft. Couplings are aluminium alloy made and are composed by a cylindrical body on which there is a helical groove that determines:

- Torsional rigidity
- Ability to compensate for slight shaft misalignments
- Ability to absorb small axial shifts of the shaft

Eltra elastic couplings have also a perfect balancing of the rotating body. They don't have critical points subject to breaking and they are completely frictionless. Moreover they perfectly transmit the rotatory motion, even in case of axial misalignment. Our couplings do not require any type of maintenance.

The internal drain allows the coupling between the shafts with distances from a minimum of 0.5 mm to a maximum of 6.12 mm (see "F" quota).

Elastic coupling can be supplied with different coupling diameters. E.G.: d1 = 8 mm, d2 = 10 mm. In this case the ordering code should be: G25A8/10.

Ordering code

	G	25	A	6 / 8
accurate elastic coupling	G			
Coupling size (see table)		16		
(see table)		20		
(see table)		25		
(see table)		30		
Shaft fixing type shaft fixing with grub screw			A	
Hole diameter "d1"				
ø 6 mm				6
ø 8 mm				8
ø 9.52 mm (3/8")				9
ø 10 mm				10
Hole diameter "d2"				
ø 6 mm				6
ø 8 mm				8
ø 9.52 mm (3/8")				9
ø 10 mm				10
don't indicate if d1 is equal to d2				

Standard couplings

Type of material:
aluminium UNI 9002/5

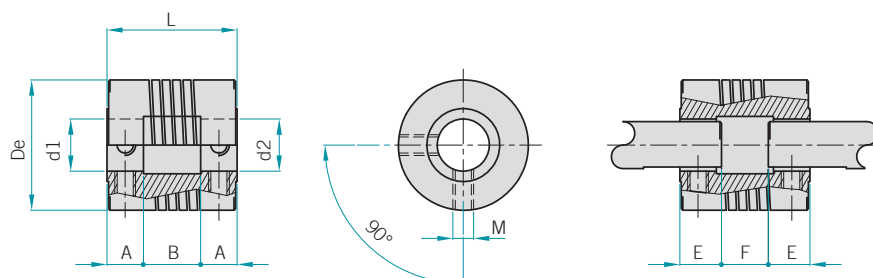
For custom holes (d1-d2)
please contact our offices.



Ordering code	ø De (mm)	L (mm)	ø d1 = d2 (mm)	A (mm)	B (mm)	M (mm)	E (mm)	F (mm)	Torque (Nm)
G 13 A 4	13.7	22 ^{+0.1} _{-0.1}	4 H7 ^{+0.012} ₀	6	8	M3	7	6	0.25
G 20 A 6	20	20 ^{+0.1} _{-0.1}	6 H7 ^{+0.012} ₀	6	8	M3	8	6	0.25
G 25 A 8	25	25 ^{+0.1} _{-0.1}	8 H7 ^{+0.015} ₀	7	11	M4	8	9	0.4
G 25 A 9	25	25 ^{+0.1} _{-0.1}	9.52 H7 ^{+0.015} ₀	7	11	M4	8	9	0.4
G 25 A 10	25	25 ^{+0.1} _{-0.1}	10 H7 ^{+0.015} ₀	7	11	M4	8	9	0.4
G 30 A 10	25	30 ^{+0.1} _{-0.1}	10 H7 ^{+0.015} ₀	8	14	M4	9	12	0.4

For a proper installation it is recommended to insert shafts in the coupling observing "E" quota.

Mechanical dimensions



Special couplings

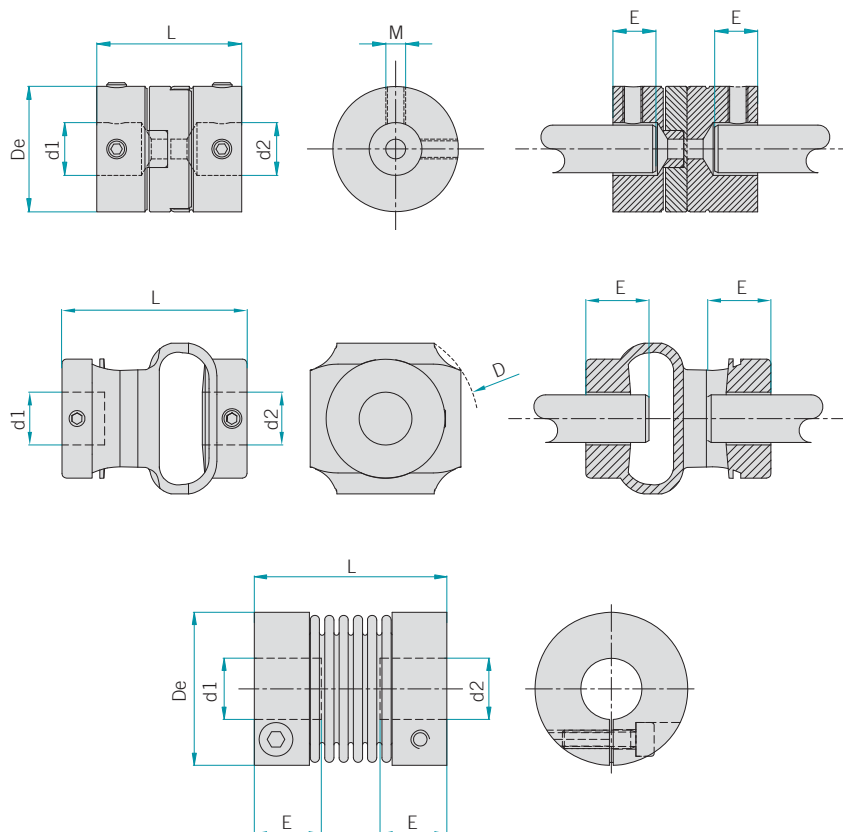


Ordering code	\varnothing De (mm)	L (mm)	\varnothing d1 = d2 (mm)	M	E (mm)	Torque (Nm)
GS 02 A 6	19.1	22 $^{+0.1}_{-0.1}$	6 H7 $^{+0.012}_{-0}$	M3	6.3	0.9
GS 10 A 8	19.1	22 $^{+0.1}_{-0.1}$	8 H7 $^{+0.015}_{-0}$	M3	6.3	0.9
GS 16 A 10	19.1	22 $^{+0.1}_{-0.1}$	10 H7 $^{+0.015}_{-0}$	M3	6.3	0.9
GS 32 A 6	19.1	28 $^{+0.1}_{-0.1}$	6 H7 $^{+0.012}_{-0}$	M3	8	0.35
GS 01 A 8	19.1	28 $^{+0.1}_{-0.1}$	8 H7 $^{+0.015}_{-0}$	M3	8	0.35
GS 11 A 10	19.1	28 $^{+0.1}_{-0.1}$	10 H7 $^{+0.015}_{-0}$	M3	8	0.35
GS 15 A 10	19.1	47 $^{+0.1}_{-0.1}$	10 H7 $^{+0.015}_{-0}$	M4	12.6	1.4
GS 23 A 12	19.1	47 $^{+0.1}_{-0.1}$	12 H7 $^{+0.018}_{-0}$	M4	12.6	1.4
GS 29 A 6	25	32 $^{+0.1}_{-0.1}$	6 H7 $^{+0.012}_{-0}$	M3	10	3
GS 24 A 8	25	32 $^{+0.1}_{-0.1}$	8 H7 $^{+0.015}_{-0}$	M3	10	3
GS 25 A 10	25	32 $^{+0.1}_{-0.1}$	10 H7 $^{+0.015}_{-0}$	M3	10	3

For a proper installation it is recommended to insert shafts in the coupling observing "E" quota.

Eltra also manufactures a special coupling series designed specifically for critical and heavy uses. Some special couplings available on stock are listed in the table above. Different couplings are available on demand.

Mechanical dimensions

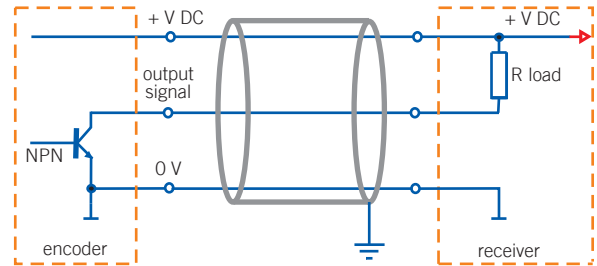


NPN and NPN open collector

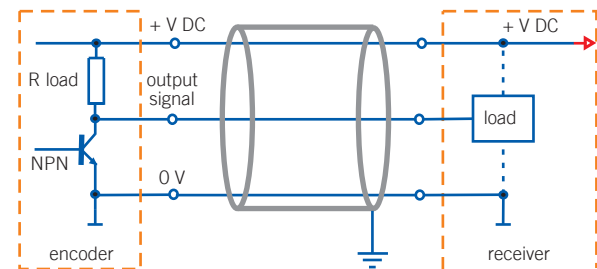
It is composed of a NPN transistor and a pull-up resistor used to match the output voltage to the power supply when transistor is off. From the electrical point of view it is similar to TTL logic and so it is considered compatible. If used properly, it has low saturation levels at 0 V and null at + V DC. It is proportionally influenced by cable length, output frequency and load. So it is necessary to consider these specifications for a proper use.

The open collector variant is different for the absence of the pull-up resistor, which releases the transistor collector from the link to the encoder power supply, and allows to obtain signals with different voltage.

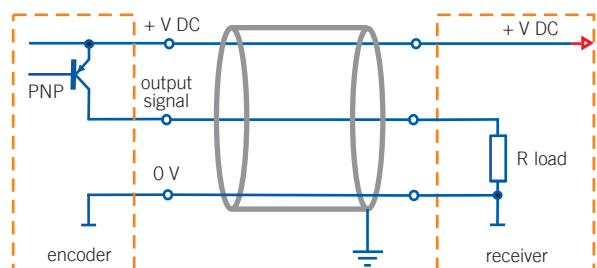
NPN OPEN COLLECTOR



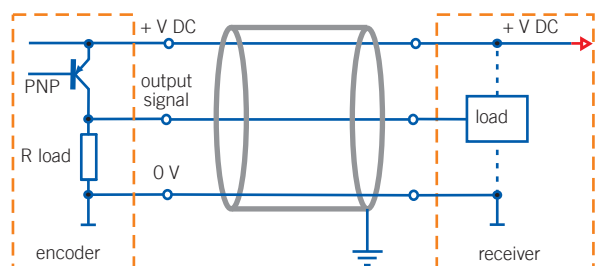
NPN



PNP OPEN COLLECTOR



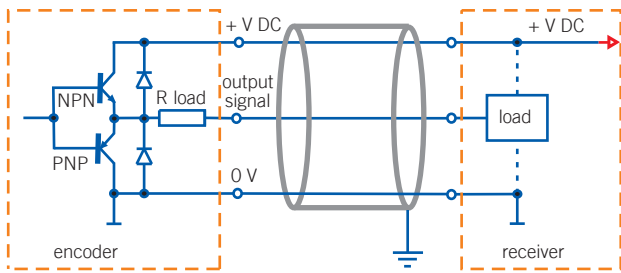
PNP



PNP and PNP open collector

Main features and limitations are the same as NPN electronics. Main difference is the transistor, that is PNP type and is linked to + V DC. The resistor, if present, is pull-down type and is placed between output and 0 V.

PUSH-PULL

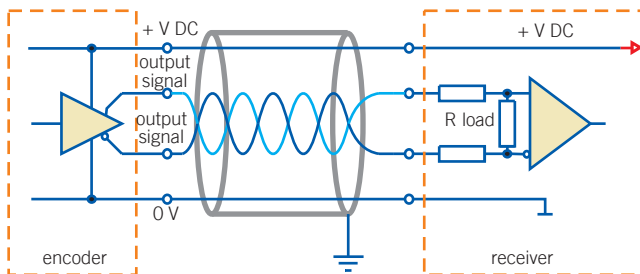


Push-pull

Electronics with high performances. NPN or PNP major limitations are caused by the resistor, that operates with a much higher impedance than a transistor. To overcome this issue, push-pull electronics uses a complementary transistor, so that the impedance is lower for commutations to + V DC and to 0 V.

This solution increases frequency performances, allowing long links and optimal data transmission, even at high speed. Saturation levels are contained, but at times higher than in NPN and PNP electronics. Anyway push-pull electronics is indifferently applicable in place of NPN or PNP.

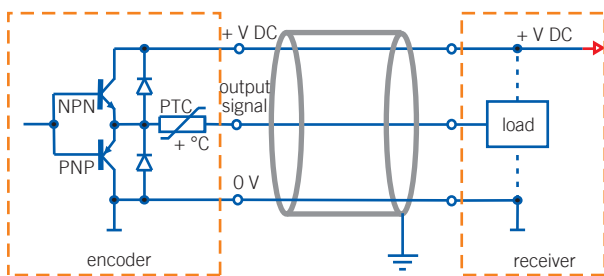
LINE DRIVER



Line driver

Line driver is used when operating environments are particularly exposed to electrical disturbances or when the encoder is far from the receiver. Data transmission and reception uses 2 complementary channels, so disturbances are limited (they usually come from other cables or close machinery). These interferences are known as "common mode" noises because their generation is related to a common point (system ground). In line driver electronics, transmitted and received signals operate in differential mode. In other words, the system works basing the communication on voltage differences between complementary channels. Therefore it is insensitive to "common mode" noises. This type of transmission is used in 5 V DC systems and it is also known as RS422 standard. It is available also with power supply up to 24 V DC on demand.

PROTECTIONS



Protections for outputs

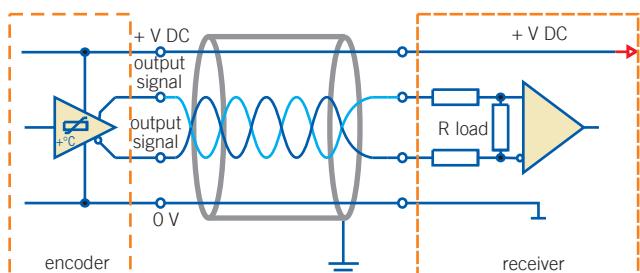
Two different kinds of electronic protection against short circuits may be used: the passive one (using fuses, non-linear resistors, etc.) and the active one (using transistors). Eltra encoders can be equipped with both types of protection.

Passive protection

Passive solution is the cheapest one. It is used to avoid accidental short circuits, that rarely happen. The component which carries out the protection is called PTC. It is a resistor that, if passed through by a current exceeding the definite one, increases its resistance to limit current growing. The limitations of this kind of protection is the low reacting speed, that progressively stresses the components under protection. Therefore this protection is efficacious against a limited number of short circuits and it is available only for NPN, PNP, and push-pull electronics.

Active protection

This solution is based on a integrated circuit in the output stage that constantly controls the temperature reached by the element that must be protected. In this way protection is very effective and reacting speed is very high. Moreover it ensures a constant protection against recurrent and permanent short circuits, which makes it excellent for harsh environments. It is available only for line driver and push-pull electronics.



NPN / NPN open collector (TTL compatible) / push-pull

Function	5 wires	J connector 7 pins	M connector 7 pins	H connector 12 pins	V connector 9 pins	M12 connector 5 pins
+ V DC	red	6	F	12	5	1 (white)
0 V	black	1	A	10	9	3 (black)
signal A	green	3	C	5	1	4 (blue)
signal B	yellow	5	E	8	2	2 (brown)
signal Z	blue	4	D	3	3	5 (grey)
shield	shield	7	G	9	4	-

Line driver (without Z)

Function	8 wires	J connector 7 pins	M connector 7 pins	H connector 12 pins	V connector 9 pins	M12 connector 8 pins
+ V DC	red	4	D	12	5	2 (blue)
0 V	black	6	F	10	9	1 (white)
signal A	green	1	A	5	1	3 (pink)
signal B	yellow	2	B	8	2	5 (yellow)
signal \bar{A}	brown	3	C	6	6	4 (grey)
signal \bar{B}	orange	5	E	1	7	6 (green)
shield	shield	7	G	9	4	-

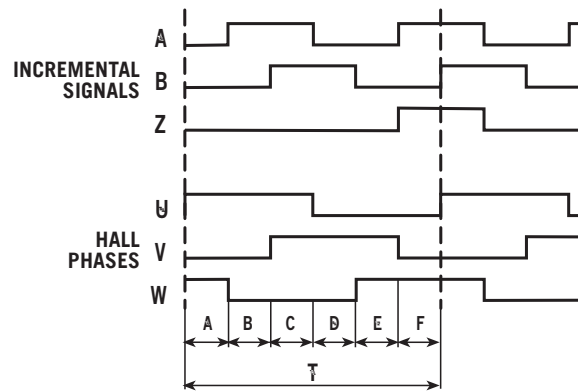
Line driver (with Z)

Function	8 wires	J connector 10 pins	M connector 10 pins	H connector 12 pins	V connector 9 pins	M12 connector 8 pins	MA connector 19 pins
+ V DC	red	4	D	12	5	2 (blue)	A
+ V DC	red	5	E	12	5	2 (blue)	A
0 V	black	6	F	10	9	1 (white)	C
signal A	green	1	A	5	1	3 (pink)	M
signal B	yellow	2	B	8	2	5 (yellow)	P
signal Z	blue	3	C	3	3	7 (brown)	R
signal \bar{A}	brown	7	G	6	6	4 (grey)	N
signal \bar{B}	orange	8	H	1	7	6 (green)	B
signal \bar{Z}	white	9	I	4	8	8 (red)	L
shield	shield	10	J	9	4	-	D

Line driver (with Hall phases)

Function	14 wires	MA connector 19 pins
+ V DC	red	A
0 V	black	C
signal A	green	M
signal B	yellow	P
signal Z	blue	R
signal \bar{A}	brown	N
signal \bar{B}	orange	B
signal \bar{Z}	white	L
signal U	grey	H
signal V	purple	G
signal W	grey-pink	F
signal \bar{U}	red-blue	K
signal \bar{V}	white-green	V
signal \bar{W}	brown-green	U
shield	shield	D

Signal configuration



POLES	A / B / C / D / E / F	T
4	$30^\circ \pm 1,5^\circ$	180°
6	$20^\circ \pm 1,5^\circ$	120°
8	$15^\circ \pm 1,5^\circ$	90°

Connectors

Connector type	Ref. code
J 7 pins cable mount straight plug (female)	PLS-20-7 (PLT® Apex)
J 10 pins cable mount straight plug (female)	SCC6A16-10S (Sam Woo Electronics)
M 7 pins cable mount straight plug (female)	MS3106-16S-1 (Amphenol®)
M 10 pins cable mount straight plug (female)	MS3106-18-1 (Amphenol®)
H 12 pins cable mount straight plug (female)	-
V 9 pins	D-Subminiature DE-9
M12 5 pins	-
M12 8 pins	-
MA 19 pins cable mount straight plug (female)	MS3116-14-19S (Amphenol®)

Proper installation of cables

- Make sure cable shield is connected to the ground and avoid connecting it to the power ground (0 V).
- Keep the encoder cable (signal cable) sufficiently far from power lines.
- Choose the cable according to installation requirements.
- Lay the cable avoiding spirals.

Further informations

- Custom cables, extensions and connectors are available on demand.
- Testing on 100% of the production.
- Anti-vibration wiring system.
- **Contact us for further informations.**

Precautions against electrostatic discharges

Be sure the metallic case of the connector is connected to the ground through a ring fixed to the screw of the connector itself. (Fig. 1)



Connect the cable shield to the ground and to the connector case. (Fig. 2)



Installation and use precautions



The transducer must be used in observance of its specifications. Encoder is a pulse generator; it is not a safety device.



Assembling and installing staff must be qualified and carefully follow instructions of user guide.



Don't expose the device to stresses or impacts in order to ensure right operating and avoid the voidance of warranty.



Make sure that the mechanical coupling of the encoder shaft is carried out with the appropriate elastic couplings, specially in case of accentuated axial or radial movements.



Make sure that operating environment is free from corrosive agents (acids, etc.) or substances that are not compatible with the device.



Check the connection of the device to ground. If it is not possible, provide an additional external connection.



Before switching on, verify the voltage range applicable to the device and protect it from exceeding the stated technical specifications.



Connect power supply and signal cables in order to avoid capacitive or inductive interferences that may cause malfunction of the device.



The user who integrates the transducer in his appliance must observe CE regulations and mark it with CE mark.



Transducer installation and wiring must be carried out in power-off state and only by skilled staff.



It is strongly recommended to avoid any mechanical or electrical modification for safety reasons. In that case it will void the warranty.

Eltra S.p.a. consider itself exempt from any liability for damages or injuries due to non-observation of installation precautions.

Warranty Terms

Replacements or repairs whether under the Warranty or at the Customer's expense must be performed by the Service Department of Eltra S.p.a. or by explicitly authorized staff. Before sending material for repairing, you must obtain a RMA number from our Sales Department. During the repairing process in our Service Department, Eltra S.p.a. will be authorized to remove all parts which Customer added to the device. **Any malfunction due to non-observance of installation and use precautions will cause voidance of warranty.** Repairs will not extend the product Warranty. We also exclude refund for any kind of damage or injury due to use or suspension of use of the transducer.

For additional informations refer to the Sale Terms on our website www.eltra.it or call our Offices.