

9 – OsiSense® XCC Opto-electronic rotary encoders

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Encoder type		Incremental encoders				
Applications		Counting indication				
Diameter of housing		Ø 40 mm	Ø 58 mm	Ø 58 mm parameterable (multi-resolution) (1)	Ø 90 mm	
Shaft	Solid	Ø 6 mm	Ø 6 mm and Ø 10 mm	Ø 10 mm	Ø 12 mm	
	Through	Ø 6 mm	Ø 14 mm Ø 6, 8, 10 and 12 mm (with reduction collar)	Ø 14 mm Ø 6, 8, 10 and 12 mm (with reduction collar)	Ø 30 mm Ø 12, 20 and 25 mm (with reduction collar)	
Resolution	Incremental encoders	100 points	100 points	–	100 points	
		256 points	–	256 to 4096 points	–	
		360 points	360 points	360 to 5760 points	360 points	
		500 points	500 points	500 to 8000 points	500 points	
		1000 points	1000 points	–	1000 points	
		1024 points	1024 points	1024 to 16,384 points	1024 points	
		2500 points	–	–	2500 points	
		3600 points	–	–	3600 points	
		4096 points	–	–	–	
		5000 points	–	5000 points	5000 to 80,000 points	5000 points
10,000 points	–	–	–	10,000 points		
Absolute encoders	4096 points/8192 turns (12-bit/13-bit)	–	–	–	–	
	8192 points	–	–	–	–	
	8192 points/4096 turns (13-bit/12-bit)	–	–	–	–	
Output stage/supply (2)	Incremental encoders	Type R (N)	5 V, RS 422, 4.5 to 5.5 V	–	–	5 V, RS 422, 4.5 to 5.5 V
		Type K (N)	Push-pull, 11 to 30 V	–	–	Push-pull, 11 to 30 V
		Type X	–	5 V, RS 422, 4.75 to 30 V	5 V, RS 422, 4.75 to 30 V	–
		Type Y	–	Push-pull, 5 to 30 V	Push-pull, 5 to 30 V	–
	Absolute encoders	Type KB (N) or KG (N)	–	–	–	–
		Type SB (N) or SG (N)	–	–	–	–
		Type C	–	–	–	–
Type F	–	–	–	–		
Connection	Pre-cabled, radial	•	–	–	–	
	Connector, radial, M23	–	•	•	•	
	Terminal block, radial	–	–	–	–	
Catalog Numbers		XCC14●●●●	XCC15●●●●	XCC15●●●●M●●	XCC19●●●●	
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(1) Parameterable version: multiplication of the basic resolution of the disc using dip switches, the factory setting being that of the lowest value.

(2) Characteristics of the output stage/supply types:
 - Type R (N): 5 V output driver, RS 422, 4.5 to 5.5 V.
 - Type K (N): push-pull output driver, 11 to 30 V.
 - Type X: 5 V output driver, RS 422, 4.75 to 30 V.
 - Type Y: push-pull output driver, 5 to 30 V.
 - KB (N) or KG (N) output: push-pull output driver, 11 to 30 V, binary code KB (N) or Gray code KG (N).

Single turn absolute encoders	Multi-turn absolute encoders	Accessories for encoders
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Absolute position indication within a revolution	Absolute position indication within a revolution and indication of the number of revolutions	
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Ø 58 mm	Ø 90 mm	Ø 58 mm	Ø 90 mm	<ul style="list-style-type: none"> - Shaft couplings with spring - Anti-rotation devices - Reduction collars - Pre-wired connectors
Ø 6 mm and Ø 10 mm Ø 14 mm Ø 6, 8, 10 and 12 mm (with reduction collar)	Ø 12 mm Ø 30 mm Ø 12, 20 and 25 mm (with reduction collar)	Ø 6 mm and Ø 10 mm Ø 14 mm Ø 6, 8, 10 and 12 mm (with reduction collar)	Ø 12 mm Ø 30 mm Ø 16, 20 and 25 mm (with reduction collar)	
-	-	-	-	
-	-	-	-	
-	-	-	-	
-	-	-	-	
-	-	-	-	
-	-	-	-	
-	-	-	-	
-	-	-	-	
-	-	-	-	
-	-	-	-	
-	-	-	-	
-	-	-	-	
-	-	4096 points/8192 turns	-	
8192 points	8192 points	-	-	
-	-	8192 points/4096 turns	8192 points/4096 turns	
-	-	-	-	
-	-	-	-	
-	-	-	-	
-	-	-	-	
Push-pull, 11 to 30 V, binary or Gray	Push-pull, 11 to 30 V, binary or Gray	-	-	
SSI, 13-bit, 11 to 30 V, binary or Gray	SSI, 13-bit, 11 to 30 V, binary or Gray	SSI, 25-bit, 11 to 30 V, binary or Gray	SSI, 25-bit, 11 to 30 V, binary or Gray	
-	-	-	-	
-	-	-	-	
-	-	-	-	
•	•	•	•	
-	-	-	-	
XCC25●●●●●	XCC29●●●●●	XCC35●●●●●	XCC39●●●●●	XCCR, XCCP, XZC

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(2) Characteristics of the output stage/supply types (continued):

- Type SB (N) or SG (N): SSI output without parity, 13-bit or 25-bit, 11 to 30 V, binary code SB (N) or Gray code SG (N).
- Type KB (N) or KG (N): push-pull output driver, 11 to 30 V, binary code KB (N) or Gray code KG (N) with multi-turn connecting cable.
- Type C: binary CANopen serial link.
- Type F: binary PROFIBUS serial link, RS 485.

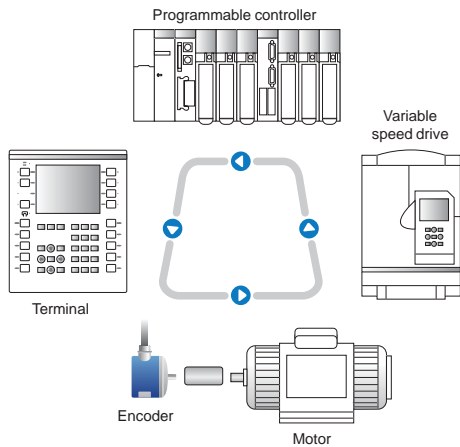
Applications

The increase in the power of processing systems, coupled with the requirements for high productivity, has created the need for continuous information in all areas of production regarding:

- Counting, positioning by counting,
- Absolute positioning,
- Speed control.

Example

The positioning of a moving part is fully controlled by the processing system via the encoder.



- Processing units:
please refer to our “Premium automation platform” catalog.
- Variable speed drives:
please refer to our “Variable speed drives and starters” catalog.

Principle of the opto-electronic rotary encoder

The opto-electronic rotary encoder is an angular position sensor.

Mechanically coupled to a driving spindle of a machine, the shaft of the encoder rotates a disc that comprises a succession of opaque and transparent sectors.

Light from light emitting diodes (LEDs) passes through the transparent sectors of the disc as they appear and is detected by photosensitive diodes.

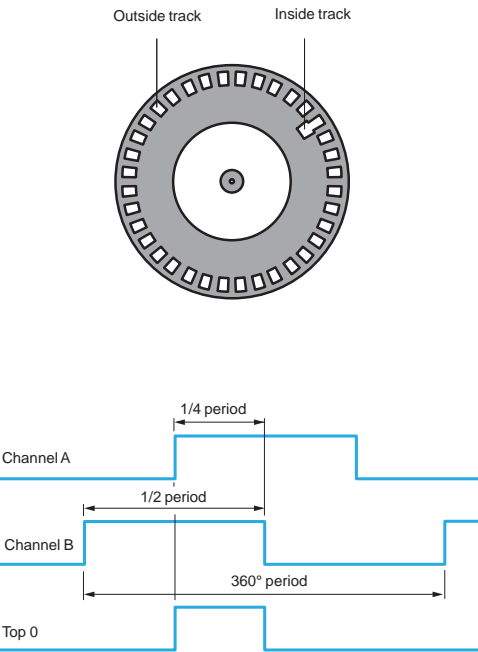
The photosensitive diodes, in turn, generate an electrical signal which is amplified and converted into a digital signal before being transmitted to a processing system or an electronic variable speed drive.

The electrical output of the encoder therefore represents, in digital form, the angular position of the input shaft.

Types of opto-electronic rotary encoder

- Incremental encoders:
 - Counting, positioning by counting, speed.
- Parameterable incremental encoders:
 - Multiplication of the basic resolution of the disc using dip switches (the factory setting being that of the lowest value).
- Single turn and multi-turn absolute encoders:
 - Absolute positioning.
- Fieldbus multi-turn absolute encoders:
 - CANopen and PROFIBUS-DP.

Incremental encoder



Principle

The disc of an incremental encoder comprises two types of track:

- one or several outside tracks (channels A and B), comprising “n” equal angular steps that are alternately opaque and transparent, with “n” being the resolution or number of periods of the encoder,
- an inside track comprising a single window, which serves as the catalog number point and enables reinitialization at each revolution (top 0).

Wiring diagrams and settings

The operation of the photosensitive elements (LEDs + photosensitive diodes) is based on the real-time differential optical reading principle:

- The photosensitive elements of tracks A and B are offset so that each will simultaneously read only its respective slot (channels A and B are 90° electrically offset),
- The electronics operate following the principle of real-time differential measurement.

Channel B (rising edge) arriving before A in the clockwise direction viewed from base side.

Period: 360° electrical.
Cyclic ratio: 180° electrical ± 10%.
Phase displacement: 90° electrical ± 25%.

Advantages of real-time differential optical reading

Reading by offset photosensitive elements

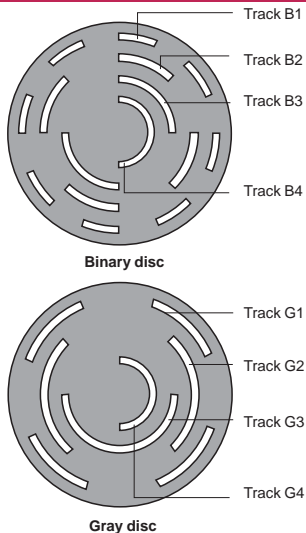
- Radial play of encoder shaft greater than 30%, which is higher than traditional optical reading encoders.
- Maintains a phase displacement of channels A and B within the tolerance limits of the unit.

Triple light source emission

- Maintains cyclic ratio, even in the event of:
 - Failure of one of the three light sources,
 - Diminishing efficiency of the light sources (up to 30%),
 - Fine dust deposit on the optical components, reducing signal strength of the photosensitive elements (up to 30%).

These advantages are the reliability factors of the XCC encoders.

Absolute encoder



Principle

The disc of an absolute encoder comprises “n” concentric tracks, equally divided into alternate opaque and transparent segments, and each track has its own transmitter and receiver.

The inside track is half opaque and half transparent. Reading of this MSB (Most Significant Bit) track determines in which half-turn the encoder is situated.

The next track is divided into four quarters, alternately opaque and transparent. The reading of this track, in conjunction with the previous track, determines in which quarter-turn the encoder is situated.

The following tracks enable successive determination of which eighth-turn, sixteenth-turn, etc. the encoder is situated.

The outside track corresponds to the LSB (Least Significant Bit) and provides the final accuracy. It has 2ⁿ points corresponding to the resolution of the encoder. Therefore, for each angular position of the shaft, the disc provides a code. This code can either be binary or Gray.

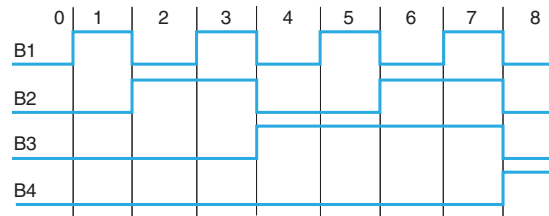
Following one complete revolution of the encoder, the same coded values are repeated.

The multi-turn absolute encoder, in addition to providing the digital position within the revolution, also provides the total number of revolutions.

Absolute encoder (continued)

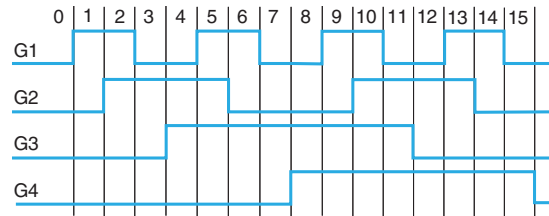
Binary coding

The binary code is directly usable by processing systems (programmable controllers for example) in order to execute calculations or comparisons, but has the disadvantage of having several bits which change state between two positions.



Gray coding

The Gray code offers the advantage of only changing one bit between two consecutive numbers.



Example of Gray code disc

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
2^0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0
2^2	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0
2^4	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1
2^8	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
2^{16}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1

Reintroduction of the first twenty-four decimal values corresponding to the reading of the first five tracks.

Advantages of position detection by an absolute encoder

An absolute encoder continuously provides a code that is an image of the actual position of the moving object being monitored.

On power-up, or restart following a loss of power^o, the encoder provides data that is directly exploitable by the processing system.

7 specifications to be established

1 Function

- Incremental encoder
Provides counting indication.
- Single turn absolute encoder
Provides absolute position within each revolution.
- Multi-turn absolute encoder
Provides absolute position within each revolution and indicates total number of revolutions.

2 Diameter of housing

- Incremental encoders
Ø 40, 58 and 90
- Single turn and multi-turn absolute encoders
Ø 58 and 90

3 Diameter of shaft

- Ø 6 mm to 30 mm, depending on model
- Reduction collars
For Ø 58 and 90 mm encoders, with Ø 14, 15 and 30 mm through shaft, reduction collars are available to reduce the diameters:
 - from 14 to 6, 8, 10 and 12
 - from 15 to 6, 8, 10, 12 and 14
 - from 30 to 12, 16, 20 and 25.

4 Type of shaft

- Solid shaft
The shaft of the encoder is mechanically linked to a drive shaft using a flexible coupling, which eliminates alignment inaccuracies.
- Through shaft/Hollow shaft
The encoder is mounted directly on the drive shaft. A flexible mounting kit prevents encoder rotation and compensates for alignment inaccuracies.

5 Connection method

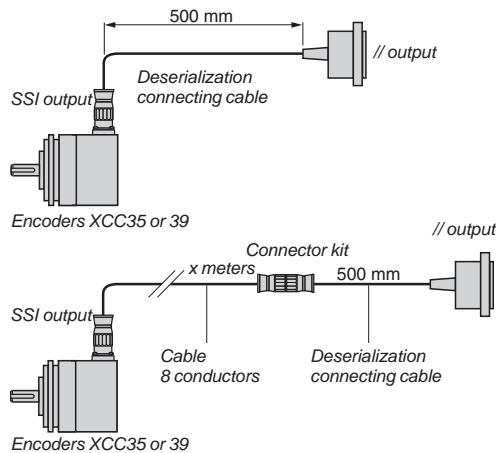
- Pre-cabled with 2 m long shielded cable or M23/M12 connector.
- Radial type connection.

6 Resolution

- Number of points per revolution.
- Number of revolutions (for multi-turn absolute encoders).
- On Ø 58 parameterable incremental encoders, this resolution can be adjusted using dip switches (multiplication factor up to 16 times on 9 basic resolutions).

7 Type of output

- Incremental encoders
5 V output driver, RS-422, 4.75 to 30 V.
Push-pull output driver, 5 to 30 V, 11...30 V.
- Single turn absolute encoders (depending on model)
Push-pull output driver, 11 to 30 V, binary code or Gray code.
SSI output without parity, 13-bit clock, 11 to 30 V, binary code or Gray code.
- Multi-turn absolute encoders (depending on model)
SSI output without parity, 25-bit clock, 11 to 30 V, binary code or Gray code.
- Parallel outputs obtainable using converter connecting cables
The SSI versions can be converted to a parallel version by using the deserialization connecting cable (see page 9/32).



OsiSense® XCC

Opto-electronic rotary encoders

Specifications required to define an encoder

Installation precautions

Type of cables

In an environment subject to considerable electrical interference, it is recommended that cables with several twisted pairs, reinforced by general shielding, be used.

For the signals, it is recommended that standard 0.14 mm²/0.22 mm² (26/24 AWG) conductors be used.

For 5 V supply encoders.

Due to line voltage drops, it is recommended that the 0 V and + V supply cables have the following minimum cross-sectional areas:

- 0.14 mm² (26 AWG) if the encoder-supply distance is less than 30 m,
- 0.22 mm² (24 AWG) if the encoder-supply distance is greater than 30 m.

Cabling

Separate, by as much as possible, the connecting cables to encoders and power cables. Also, avoid parallel cable runs. Maintain a distance of at least 20 cm and, in the event of cables crossing, ensure that the crossovers are at right-angles.

When using cables with twisted pairs (shielded or non-shielded), group signal cables in common pairs.

In environments subject to electrical interference, we recommend grounding the encoder base using one of the mounting screws.

Connect the control inputs to a potential (absolute encoder).

Connect all 0 V connections back to a star point, i.e. only one and same referential.

Ground the shielding throughout 360° using tap-off braids. This is to be done at both ends of each cable. To ground the shielding use at least 4 mm² cable.

As much as possible, ground the 0 V of the supply to the encoders on the supply side.

Maximum frequency of signals for SSI depending on distance:

Indicative values that can vary depending on the cable specifications.

Distance (m)	Frequency (kHz)
50	400
100	300
200	200
400	100

Supply

It is imperative that regulated and smoothed power supplies, with a ripple factor on 24 V of 500 mV and on 5 V of 200 mV, are used that are specifically for the encoder.

Schneider Electric ABL7 range power supplies are available. Please refer to our "Power supplies, splitter boxes and interfaces" catalog.

For 5 to 30 V encoders, the supply via a transformer with a 24 V rms rectified and smoothed secondary is prohibited, since the DC voltage obtained is higher than the supply voltage limits of the encoder.

Prior to power-up for the first time, ensure that the rated supply voltage of the encoder is suitable for the supply.

OsiSense® XCC Opto-electronic rotary encoders

Specifications required to define an encoder,
installation, power-up

Connection and power-up precautions

Connection

The plugging-in or unplugging of a connector version encoder must only be done while the supply is disconnected.

Encoder supplied by central unit:

- Disconnect supply to central unit,
- Proceed with connection or disconnection,
- Re-establish supply to central unit.

Encoder supplied by source external to central unit:

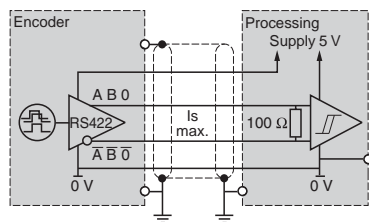
- Disconnect supply to central unit, then disconnect supply to encoder,
- Proceed with connection or disconnection,
- Re-establish supply to encoder, then re-establish supply to central unit.

Power-up

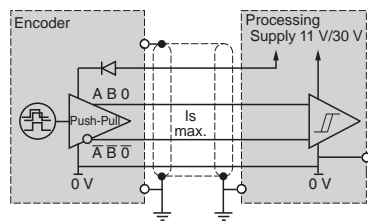
For synchronization reasons, the power-up or switching-off of the encoder must coincide with that of its associated electronics.

Environment			
Encoder type		XCC1406P●●●●	XCC1406T●●●●
Conformity		CE	
Temperature	Operation (housing)	°C (°F)	- 20 to + 80 (- 4 to + 176)
	Storage	°C (°F)	- 30 to + 85 (- 22 to + 185)
Degree of protection	Conforming to IEC 60529	IP 54	IP 52
Vibration resistance	Conforming to IEC 60068-2-6	10 gn (f = 10 to 500 Hz)	
Shock resistance	Conforming to IEC 60068-2-27	30 gn, duration 11 ms	
Resistance to electromagnetic interference	Electrostatic discharges	Conforming to IEC 61000-4-2: level 3, 8 kV air; 4 kV contact	
	Radiated electromagnetic fields (electromagnetic waves)	Conforming to IEC 61000-4-3: level 3, 10 V/m	
	Fast transients (Start/Stop interference)	Conforming to IEC 61000-4-4: level 3, 2 kV (1 kV for inputs/outputs)	
	Surge withstand	Conforming to IEC 61000-4-5: level 2, 1 kV	
Materials	Base	Aluminium or Zamak	
	Housing	Aluminium or Zamak	
	Shaft	Stainless steel or Aluminium	
	Ball bearings	688AZZ1	
Mechanical specifications			
Shaft type		mm	Ø 6, solid shaft (g7) Ø 6, through shaft (H7)
Maximum rotational speed	Continuous		9000 rpm
Shaft moment of inertia		g.cm ²	10 (0.14 oz.in.) 5 (0.07 oz.in.)
Torque		N.cm	0.2 (0.28 oz.in.) 0.25 (0.35 oz.in.)
Maximum load	Radial	N	20
	Axial	N	10
Electrical specifications			
Connection		Radial: pre-cabled, 8 x 0.14 mm ² shielded, Ø ext = 6 mm, length = 2 m Crimped metal cable entry	Pre-cabled 8 x 0.14 mm ² shielded, Ø ext = 6 mm, length = 2 m Crimped metal cable entry
Frequency		kHz	100
Number of channels			3 channels: A, B, top 0 and complements \bar{A} , \bar{B} , $\bar{0}$
Encoders with Type R output stage: 5 V output driver, RS-422, 4.5 to 5.5 V supply			
Supply voltage			--- 5 V ± 10% Max. ripple: 200 mV
Current consumption, no-load		mA	100 max.
Output current		mA	40 max.
Output levels	Low level		(I _s = 20 mA) 0.5 V max.
	High level		(I _s = 20 mA) 2.5 V min.
Encoders with Type K output stage: push-pull output driver, 11 to 30 V supply			
Supply voltage			--- 11 V to 30 V. Max. ripple: 500 mV
Current consumption, no-load		mA	75 max.
Protection			Against short-circuits and reverse polarity
Output current		mA	40 max.
Output levels	Low level		(I _s = 20 mA) 1.5 V max.
	High level		(I _s = 20 mA) V supply - 3 V min.

Wiring diagrams
Type R output stage



Type K output stage



OsiSense® XCC Incremental encoders Ø 40 mm encoders



XCC1406PR●●●

Solid shaft, Ø 6 mm

Resolution	Connection method	Output stage type (1)	Supply voltage	Catalog number	Weight kg (lbs)
100 points	Pre-cabled, radial 2 m	5 V, RS-422	4.5 to 5.5 V	XCC1406PR01R	0.355 (0.787)
		Push-pull	11 to 30 V	XCC1406PR01K	0.355 (0.787)
360 points	Pre-cabled, radial 2 m	5 V, RS-422	4.5 to 5.5 V	XCC1406PR03R	0.355 (0.787)
		Push-pull	11 to 30 V	XCC1406PR03K	0.355 (0.787)
500 points	Pre-cabled, radial 2 m	5 V, RS-422	4.5 to 5.5 V	XCC1406PR05R	0.355 (0.787)
		Push-pull	11 to 30 V	XCC1406PR05K	0.355 (0.787)
1000 points	Pre-cabled, radial 2 m	5 V, RS-422	4.5 to 5.5 V	XCC1406PR10R	0.355 (0.787)
		Push-pull	11 to 30 V	XCC1406PR10K	0.355 (0.787)
1024 points	Pre-cabled, radial 2 m	5 V, RS-422	4.5 to 5.5 V	XCC1406PR11R	0.355 (0.787)
		Push-pull	11 to 30 V	XCC1406PR11K	0.355 (0.787)



XCC1406TR●●●

Through shaft, Ø 6 mm (2)

Resolution	Connection method	Output stage type (1)	Supply voltage	Catalog number	Weight kg (lbs)
100 points	Pre-cabled, radial 2 m	5 V, RS-422	4.5 to 5.5 V	XCC1406TR01R	0.405 (0.893)
		Push-pull	11 to 30 V	XCC1406TR01K	0.405 (0.893)
360 points	Pre-cabled, radial 2 m	5 V, RS-422	4.5 to 5.5 V	XCC1406TR03R	0.405 (0.893)
		Push-pull	11 to 30 V	XCC1406TR03K	0.405 (0.893)
500 points	Pre-cabled, radial 2 m	5 V, RS-422	4.5 to 5.5 V	XCC1406TR05R	0.405 (0.893)
		Push-pull	11 to 30 V	XCC1406TR05K	0.405 (0.893)
1000 points	Pre-cabled, radial 2 m	5 V, RS-422	4.5 to 5.5 V	XCC1406TR10R	0.405 (0.893)
		Push-pull	11 to 30 V	XCC1406TR10K	0.405 (0.893)
1024 points	Pre-cabled, radial 2 m	5 V, RS-422	4.5 to 5.5 V	XCC1406TR11R	0.405 (0.893)
		Push-pull	11 to 30 V	XCC1406TR11K	0.405 (0.893)

(1) For specifications of the output stage type (indicated by last letter of the catalog number), see page 9/10.

(2) Anti-rotation device included with encoder.

Environment			XCC1506P●●●●	XCC1510P●●●●	XCC1514T●●●●
Encoder type					
Conformity			CE		
Temperature	Operation (housing)	°C (°F)	- 30 to + 100 (- 22 to + 212) [except XCCTSM●●X and XCCTSM●●Y: - 30 to + 70 (- 22 to + 158)]		
	Storage	°C (°F)	- 30 to + 85 (- 22 to + 185)		
Degree of protection	Conforming to IEC 60529		IP 65	IP 65 (IP 67 with collar option XCCRB3)	IP 65
Vibration resistance	Conforming to IEC 60068-2-6		10 gn (f = 55 to 2000 Hz)		
Shock resistance	Conforming to IEC 60068-2-27		30 gn, duration 11 ms		
Resistance to electromagnetic interference	Electrostatic discharges		Conforming to IEC 61000-4-2: level 3, 8 kV air, 4 kV contact		
	Radiated electromagnetic fields (electromagnetic waves)		Conforming to IEC 61000-4-3: level 3, 10 V/m		
	Fast transients (Start/Stop interference)		Conforming to IEC 61000-4-4: level 3, 2 kV (1 kV for inputs/outputs)		
	Surge withstand		Conforming to IEC 61000-4-5: level 2, 1 kV		
Materials	Base		Aluminium		
	Housing		Zamak		
	Shaft		Stainless steel		
	Ball bearings		6000ZZ1		6803ZZ

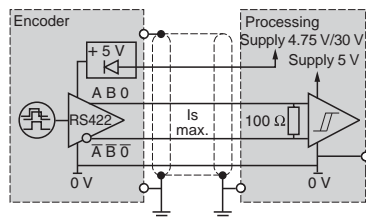
Mechanical specifications			Ø 6, solid shaft (g7)	Ø 10 mm, solid shaft	Ø 14, through shaft (H7)
Shaft type					
Maximum rotational speed	Continuous		9000 rpm	9000 rpm	6000 rpm
Shaft moment of inertia		g.cm ²	10 (0.14 oz.in.)	10 (0.14 oz.in.)	22 (0.31 oz.in.)
Torque		N.cm	0.4 (0.57 oz.in.)	0.4 (0.57 oz.in.)	0.6 (0.85 oz.in.)
Maximum load	Radial	N	100	100	50
	Axial	N	50	50	20

Electrical specifications					
Connection	Connector		M23, 12-pin male connector		
Frequency		kHz	300		
Number of channels			3 channels: A, B, top 0 and complements \bar{A} , \bar{B} , $\bar{0}$		

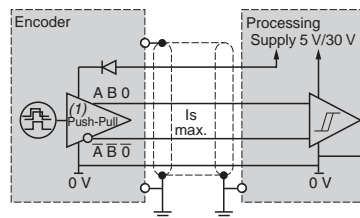
Encoders with Type X output stage: 5 V output driver, RS-422, 4.75 to 30 V supply			
Supply voltage			--- 4.75 to 30 V Max. ripple: 500 mV
Current consumption, no-load		mA	75 max.
Protection			Against short-circuits and reverse polarity
Output current		mA	40 max.
Output levels	Low level		(I _s = 20 mA) 0.5 V max.
	High level		(I _s = 20 mA) 4.5 V min.

Encoders with Type Y output stage: push-pull output driver, 5 to 30 V supply			
Supply voltage			--- 5 to 30 V Max. ripple: 500 mV
Current consumption, no-load		mA	75 max.
Protection			Against short-circuits and reverse polarity
Output current		mA	40 max.
Output levels (for U supply = 30 V) (1)	Low level		(I _s = 20 mA) 0.5 V max.
	High level		(I _s = 20 mA) V supply - 2.5 V min.

Wiring diagrams
Type X output stage



Type Y output stage



(1) RS-422 compatible on 5 V supply.

OsiSense® XCC Incremental encoders Ø 58 mm encoders



XCC1506PS●●●

Solid shaft, Ø 6 mm

Resolution	Connection method (1)	Output stage type (2)	Supply voltage	Catalog number	Weight kg (lbs)
100 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1506PS01X	0.495 (1.091)
		Push-pull	5 to 30 V	XCC1506PS01Y	0.495 (1.091)
360 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1506PS03X	0.495 (1.091)
		Push-pull	5 to 30 V	XCC1506PS03Y	0.495 (1.091)
500 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1506PS05X	0.495 (1.091)
		Push-pull	5 to 30 V	XCC1506PS05Y	0.495 (1.091)
1000 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1506PS10X	0.495 (1.091)
		Push-pull	5 to 30 V	XCC1506PS10Y	0.495 (1.091)
1024 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1506PS11X	0.495 (1.091)
		Push-pull	5 to 30 V	XCC1506PS11Y	0.495 (1.091)
2500 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1506PS25X	0.495 (1.091)
		Push-pull	5 to 30 V	XCC1506PS25Y	0.495 (1.091)
5000 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1506PS50X	0.495 (1.091)
		Push-pull	5 to 30 V	XCC1506PS50Y	0.495 (1.091)



XCC1510PS●●●

Solid shaft, Ø 10 mm

Resolution	Connection method (1)	Output stage type (2)	Supply voltage	Catalog number	Weight kg (lbs)
100 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1510PS01X	0.465 (1.025)
		Push-pull	5 to 30 V	XCC1510PS01Y	0.465 (1.025)
360 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1510PS03X	0.465 (1.025)
		Push-pull	5 to 30 V	XCC1510PS03Y	0.465 (1.025)
500 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1510PS05X	0.465 (1.025)
		Push-pull	5 to 30 V	XCC1510PS05Y	0.465 (1.025)
1000 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1510PS10X	0.465 (1.025)
		Push-pull	5 to 30 V	XCC1510PS10Y	0.465 (1.025)
1024 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1510PS11X	0.465 (1.025)
		Push-pull	5 to 30 V	XCC1510PS11Y	0.465 (1.025)
2500 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1510PS25X	0.465 (1.025)
		Push-pull	5 to 30 V	XCC1510PS25Y	0.465 (1.025)
5000 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1510PS50X	0.465 (1.025)
		Push-pull	5 to 30 V	XCC1510PS50Y	0.465 (1.025)

(1) For female connector use XZC C23FDP120S or pre-wired connectors (2, 5 or 10 m), see page 9/33.

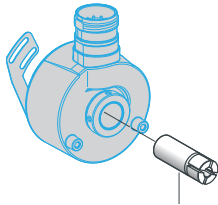
(2) For specifications of the output stage type (indicated by last letter of the catalog number), see page 9/12.

OsiSense® XCC Incremental encoders Ø 58 mm encoders



XCC1514TS●●●

Through shaft, Ø 14 mm (1)					
Resolution	Connection method (2)	Output stage type (3)	Supply voltage	Catalog number	Weight kg (lbs)
100 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1514TS01X	0.435 (0.959)
		Push-pull	5 to 30 V	XCC1514TS01Y	0.435 (0.959)
360 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1514TS03X	0.435 (0.959)
		Push-pull	5 to 30 V	XCC1514TS03Y	0.435 (0.959)
500 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1514TS05X	0.435 (0.959)
		Push-pull	5 to 30 V	XCC1514TS05Y	0.435 (0.959)
1000 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1514TS10X	0.435 (0.959)
		Push-pull	5 to 30 V	XCC1514TS10Y	0.435 (0.959)
1024 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1514TS11X	0.435 (0.959)
		Push-pull	5 to 30 V	XCC1514TS11Y	0.435 (0.959)
2500 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1514TS25X	0.435 (0.959)
		Push-pull	5 to 30 V	XCC1514TS25Y	0.435 (0.959)
5000 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1514TS50X	0.435 (0.959)
		Push-pull	5 to 30 V	XCC1514TS50Y	0.435 (0.959)



XCCR158RDA●●

Through shaft, Ø 6, 8, 10 and 12 mm (1)		
Encoder type	Diameter mm	Reduction collar to be ordered (see page 9/35)
Encoders with through shaft XCC1514TS●●●	Ø 6	XCCR158RDA06
	Ø 8	XCCR158RDA08
	Ø 10	XCCR158RDA10
	Ø 12	XCCR158RDA12

(1) Anti-rotation device included with encoder.

(2) For female connector use XZC C23FDP120S or pre-wired connectors (2, 5 or 10 m), see page 9/33.

(3) For specifications of the output stage type (indicated by last letter of the catalog number), see page 9/12.

OsiSense® XCC Incremental encoders

Ø 58 mm encoders

Parameterable versions (1)



XCC1510PSM02X

Parameterable with solid shaft, Ø 10 mm

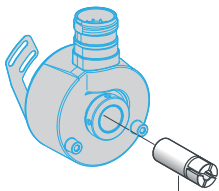
Resolution	Connection method (2)	Output stage type (3)	Supply voltage	Catalog number	Weight kg (lbs)
256 to 4096 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1510PSM02X	0.465 (1.025)
		Push-pull	5 to 30 V	XCC1510PSM02Y	0.465 (1.025)
360 to 5760 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1510PSM03X	0.465 (1.025)
		Push-pull	5 to 30 V	XCC1510PSM03Y	0.465 (1.025)
500 to 8000 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1510PSM05X	0.465 (1.025)
		Push-pull	5 to 30 V	XCC1510PSM05Y	0.465 (1.025)
1024 to 16,384 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1510PSM11X	0.465 (1.025)
		Push-pull	5 to 30 V	XCC1510PSM11Y	0.465 (1.025)
5000 to 80,000 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1510PSM50X	0.465 (1.025)
		Push-pull	5 to 30 V	XCC1510PSM50Y	0.465 (1.025)

Parameterable with through shaft, Ø 14 mm (4)

Resolution	Connection method (2)	Output stage type (3)	Supply voltage	Catalog number	Weight kg (lbs)
256 to 4096 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1514TSM02X	0.435 (0.959)
		Push-pull	5 to 30 V	XCC1514TSM02Y	0.435 (0.959)
360 to 5760 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1514TSM03X	0.435 (0.959)
		Push-pull	5 to 30 V	XCC1514TSM03Y	0.435 (0.959)
500 to 8000 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1514TSM05X	0.435 (0.959)
		Push-pull	5 to 30 V	XCC1514TSM05Y	0.435 (0.959)
1024 to 16,384 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1514TSM11X	0.435 (0.959)
		Push-pull	5 to 30 V	XCC1514TSM11Y	0.435 (0.959)
5000 to 80,000 points	Connector, radial M23 male	5 V, RS-422	4.75 to 30 V	XCC1514TSM50X	0.435 (0.959)
		Push-pull	5 to 30 V	XCC1514TSM50Y	0.435 (0.959)

Parameterable with through shaft, Ø 6, 8, 10 and 12 mm (4)

Encoder type	Diameter mm	Reduction collar to be ordered (see page 9/35)
Encoders with through shaft XCC1514TSM●●●	Ø 6	XCCR158RDA06
	Ø 8	XCCR158RDA08
	Ø 10	XCCR158RDA10
	Ø 12	XCCR158RDA12



XCCR158RDA●●

(1) Parameter configuration: refer to table indicating position of dip switches on page 9/19.

(2) For female connector use XZC C23FDP120S or pre-wired connectors (2, 5 or 10 m), see page 9/33.

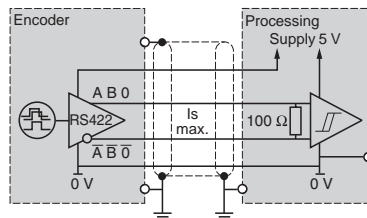
(3) For specifications of the output stage type (indicated by last letter of the catalog number), see page 9/12.

(4) Anti-rotation device included with encoder.

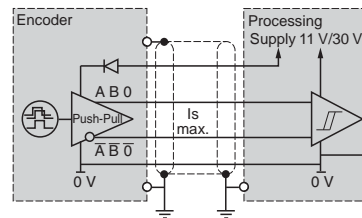
Environment			
Encoder type		XCC1912P●●●●	XCC1930T●●●●
Conformity		CE	
Temperature	Operation (housing)	°C (°F)	- 20 to + 80 (- 4 to + 176)
	Storage	°C (°F)	- 30 to + 85 (- 22 to +185)
Degree of protection	Conforming to IEC 60529	IP 66	IP 65
Vibration resistance	Conforming to IEC 60068-2-6	10 gn (f = 10 to 1 kHz)	
Shock resistance	Conforming to IEC 60068-2-27	30 gn, duration 11 ms	
Resistance to electromagnetic interference	Electrostatic discharges	Conforming to IEC 61000-4-2: level 3, 8 kV air; 4 kV contact	
	Radiated electromagnetic fields (electromagnetic waves)	Conforming to IEC 61000-4-3: level 3, 10 V/m	
	Fast transients (Start/Stop interference)	Conforming to IEC 61000-4-4: level 3, 2 kV (1 kV for inputs/outputs)	
	Surge withstand	Conforming to IEC 61000-4-5: level 2, 1 kV	
Materials	Base	Aluminium	
	Housing	Zamak	
	Shaft	Stainless steel	
	Ball bearings	6001ZZ	6807
Mechanical specifications			
Shaft type		Ø 12, solid shaft (g6)	Ø 30, through shaft (H7)
Maximum rotational speed	Continuous	6000 rpm	3600 rpm
Shaft moment of inertia		g.cm ²	500 (6.94 oz.in.)
Torque		N.cm	1 (1.42 oz.in.)
Maximum load	Radial	N	200
	Axial	N	100
Electrical specifications			
Connection	Connector	M23, 12-pin male connector	
Frequency		kHz	100
Number of channels		3 channels: A, B, top 0 and complements \bar{A} , \bar{B} , $\bar{0}$	
Encoders with Type R (N) output stage: 5 V output driver, RS-422, 4.5 to 5.5 V supply			
Supply voltage		\pm 5 V \pm 10% Max. ripple: 200 mV	
Current consumption, no-load		mA	100 max.
Output current		mA	40 max.
Output levels	Low level	(I _s = 20 mA) 0.5 V max.	
	High level	(I _s = 20 mA) V supply - 2.5 V min.	
Encoders with Type K (N) output stage: push-pull output driver, 11 to 30 V supply			
Supply voltage		\pm 11 V to 30 V Max. ripple: 500 mV	
Current consumption, no-load		mA	75 max.
Protection		Against short-circuits and reverse polarity	
Output current		mA	40 max.
Output levels	Low level	(I _s = 20 mA) 1.5 V max.	
	High level	(I _s = 20 mA) V supply - 3 V min.	

Wiring diagrams

Type R (N) output stage



Type K (N) output stage



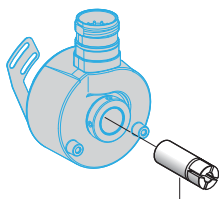
OsiSense® XCC Incremental encoders Ø 90 mm encoders



XCC1912PS●●●N



XCC1930TS●●●N



XCCR290RDP●●N

Solid shaft, Ø 12 mm

Resolution	Connection method (1)	Output stage type (2)	Supply voltage	Catalog number	Weight kg (lbs)
100 points	Connector, radial M23 male	5 V, RS-422	4.5 to 5.5 V	XCC1912PS01RN	1.360 (3.000)
		Push-pull	11 to 30 V	XCC1912PS01KN	1.360 (3.000)
360 points	Connector, radial M23 male	5 V, RS-422	4.5 to 5.5 V	XCC1912PS03RN	1.360 (3.000)
		Push-pull	11 to 30 V	XCC1912PS03KN	1.360 (3.000)
500 points	Connector, radial M23 male	5 V, RS-422	4.5 to 5.5 V	XCC1912PS05RN	1.360 (3.000)
		Push-pull	11 to 30 V	XCC1912PS05KN	1.360 (3.000)
1000 points	Connector, radial M23 male	5 V, RS-422	4.5 to 5.5 V	XCC1912PS10RN	1.360 (3.000)
		Push-pull	11 to 30 V	XCC1912PS10KN	1.360 (3.000)
1024 points	Connector, radial M23 male	5 V, RS-422	4.5 to 5.5 V	XCC1912PS11RN	1.360 (3.000)
		Push-pull	11 to 30 V	XCC1912PS11KN	1.360 (3.000)
2500 points	Connector, radial M23 male	5 V, RS-422	4.5 to 5.5 V	XCC1912PS25RN	1.360 (3.000)
		Push-pull	11 to 30 V	XCC1912PS25KN	1.360 (3.000)
3600 points	Connector, radial M23 male	5 V, RS-422	4.5 to 5.5 V	XCC1912PS36RN	1.360 (3.000)
		Push-pull	11 to 30 V	XCC1912PS36KN	1.360 (3.000)
5000 points	Connector, radial M23 male	5 V, RS-422	4.5 to 5.5 V	XCC1912PS50RN	1.360 (3.000)
		Push-pull	11 to 30 V	XCC1912PS50KN	1.360 (3.000)
10,000 points	Connector, radial M23 male	5 V, RS-422	4.5 to 5.5 V	XCC1912PS00RN	1.360 (3.000)
		Push-pull	11 to 30 V	XCC1912PS00KN	1.360 (3.000)

Through shaft, Ø 30 mm (3)

Resolution	Connection method (1)	Output stage type (2)	Supply voltage	Catalog number	Weight kg (lbs)
100 points	Connector, radial M23 male	5 V, RS-422	4.5 to 5.5 V	XCC1930TS01RN	0.960 (2.116)
		Push-pull	11 to 30 V	XCC1930TS01KN	0.960 (2.116)
360 points	Connector, radial M23 male	5 V, RS-422	4.5 to 5.5 V	XCC1930TS03RN	0.960 (2.116)
		Push-pull	11 to 30 V	XCC1930TS03KN	0.960 (2.116)
500 points	Connector, radial M23 male	5 V, RS-422	4.5 to 5.5 V	XCC1930TS05RN	0.960 (2.116)
		Push-pull	11 to 30 V	XCC1930TS05KN	0.960 (2.116)
1000 points	Connector, radial M23 male	5 V, RS-422	4.5 to 5.5 V	XCC1930TS10RN	0.960 (2.116)
		Push-pull	11 to 30 V	XCC1930TS10KN	0.960 (2.116)
1024 points	Connector, radial M23 male	5 V, RS-422	4.5 to 5.5 V	XCC1930TS11RN	0.960 (2.116)
		Push-pull	11 to 30 V	XCC1930TS11KN	0.960 (2.116)
2500 points	Connector, radial M23 male	5 V, RS-422	4.5 to 5.5 V	XCC1930TS25RN	0.960 (2.116)
		Push-pull	11 to 30 V	XCC1930TS25KN	0.960 (2.116)
3600 points	Connector, radial M23 male	5 V, RS-422	4.5 to 5.5 V	XCC1930TS36RN	0.960 (2.116)
		Push-pull	11 to 30 V	XCC1930TS36KN	0.960 (2.116)
5000 points	Connector, radial M23 male	5 V, RS-422	4.5 to 5.5 V	XCC1930TS50RN	0.960 (2.116)
		Push-pull	11 to 30 V	XCC1930TS50KN	0.960 (2.116)
10,000 points	Connector, radial M23 male	5 V, RS-422	4.5 to 5.5 V	XCC1930TS00RN	0.960 (2.116)
		Push-pull	11 to 30 V	XCC1930TS00KN	0.960 (2.116)

Through shaft, Ø 12, 20 and 25 mm (3)

Encoder type	Diameter mm	Reduction collar to be ordered (see page 9/35)
Encoders with through shaft XCC1930TS●●●●N	Ø 12	XCCR290RDP12
	Ø 20	XCCR290RDP20
	Ø 25	XCCR290RDP25

(1) For female connector use XZC C23FDP120S or pre-wired connectors (2, 5 or 10 m), see page 9/33.

(2) For specifications of the output stage type (indicated by last letter of the catalog number), see page 9/16.

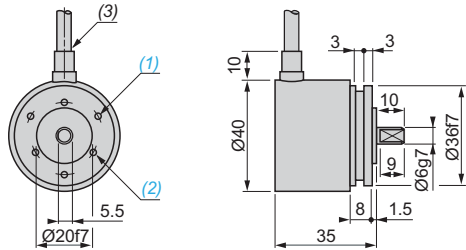
(3) Anti-rotation device included with encoder.

OsiSense® XCC Incremental encoders

Ø 40 mm, Ø 58 mm and Ø 90 mm encoders

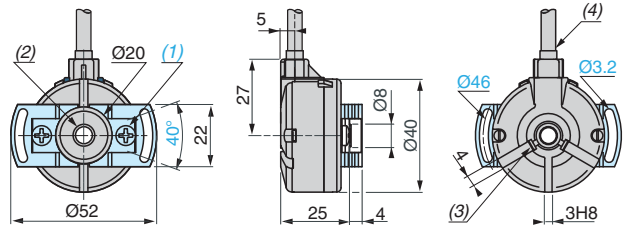
Ø 40 mm encoders

XCC1406PR●●●N



- (1) 3 holes M3 x 0.45 at 120° on 28 PCD, depth: 6 mm.
- (2) 3 holes M3 x 0.45 at 120° on 24 PCD, depth: 6 mm.
- (3) Ø 6 cable, length 2 m, minimum bend radius: 30 mm.

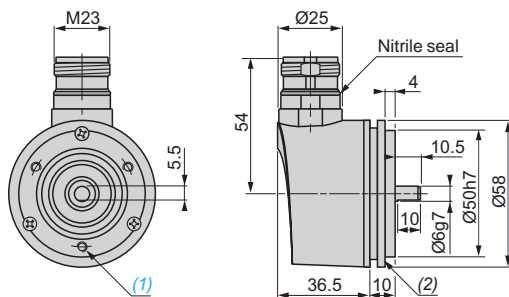
XCC1406TR●●●N



- (1) 2 M4 holes at 120° for cross-headed screws on 30 PCD, depth: 6 mm.
- (2) Through shaft, Ø 6 (H7).
- (3) 2 M2 x 3 flat cross-headed locking screws.
- (4) Ø 6 cable, length 2 m, minimum bend radius: 30 mm.

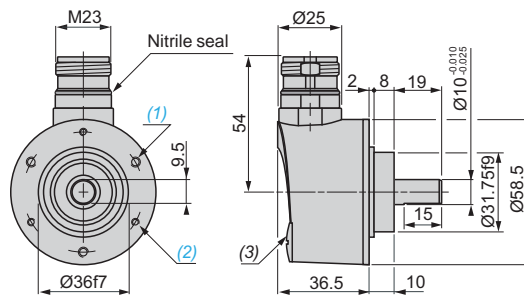
Ø 58 mm encoders

XCC1506PS●●●X, XCC1506PS●●●Y



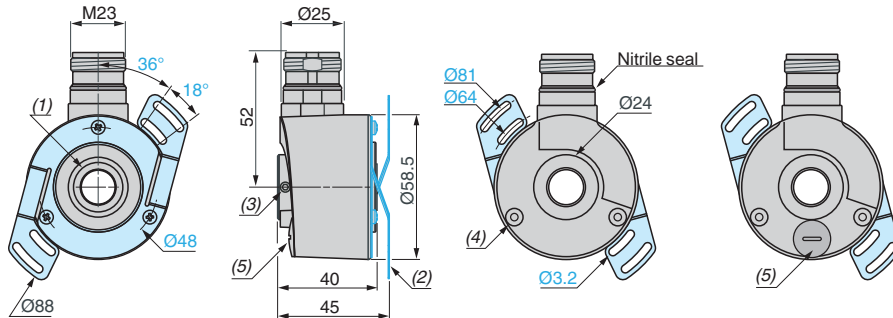
- (1) 3 holes M3 x 4 at 120° on 42 PCD, depth: 10 mm.
- (2) Collar XCCRB1 mounted.

XCC1510PS●●●X, 1510PS●●●Y / XCC1510PSM●●●X, 1510PSM●●●Y



- (1) 3 M4 holes at 120° on 48 PCD, depth: 8 mm.
- (2) 3 M3 holes at 120° on 48 PCD, depth: 8 mm.
- (3) Blanking plug, for encoders XCC1510PSM●●●X and 1510PSM●●●Y only.

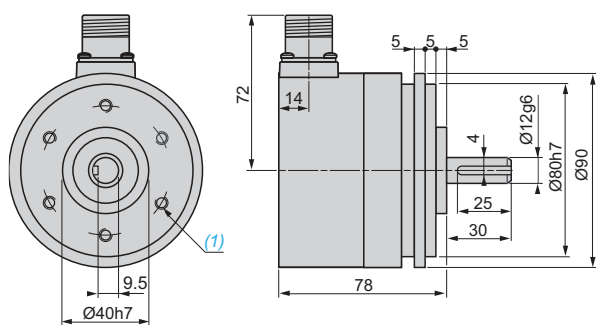
XCC1514TS●●●X, 1514TS●●●Y / XCC1514TSM●●●X, 1514TSM●●●Y



- (1) Through shaft, Ø 14 (H7).
- (2) Flexible mounting kit, 1 x XCCRF5N mounted.
- (3) 2 HC M4 x 4 locking screws.
- (4) Hole for M3 x 6 self-threading screw.
- (5) Blanking plug, for encoders XCC1514TSM●●●X and 1514TSM●●●Y only.

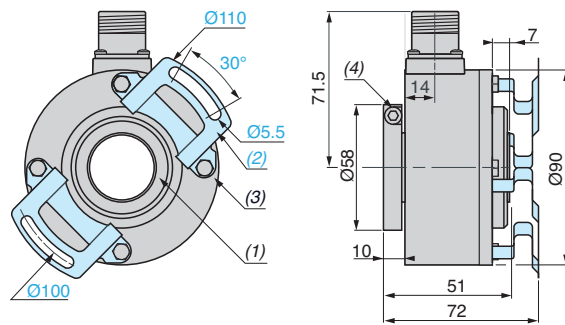
Ø 90 mm encoders

XCC1912PS●●●N



- (1) 6 holes M6 x 1 at 120° on 60 PCD, max. depth: 12 mm.

XCC1930TS●●●N



- (1) Through shaft, Ø 30 (H7).
- (2) Anti-rotation device, 1 x XCCRF9N, mounted.
- (3) 4 M5 x 6 on 78 PCD.
- (4) 1 CHC M5 x 12 stainless steel A2 locking screw.

OsiSense® XCC Incremental encoders

Ø 40 mm, Ø 58 mm and Ø 90 mm encoders

Pre-cabled version encoders (1)

8 x 0.14 mm² shielded cable connections for Ø 40 encoders

Wire color	BN	RD	VT	BU	YE	OG	GN	BK
Signal	\bar{A}	+V	0	$\bar{0}$	B	\bar{B}	A	0V

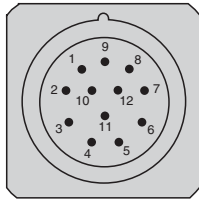
BN = Brown
RD = Red
VT = Violet
BU = Blue
YE = Yellow
OG = Orange
GN = Green
BK = Black

Note: In environments subject to electrical interference, we recommend grounding the encoder base using one of the mounting screws.

Connector version encoders (1)

M23, 12-pin connector connections

Male connector on encoder (pin view)



Pin number	1	2	3	4	5	6	7	8	9	10	11	12
Signal	\bar{A}	+V	0	$\bar{0}$	B	\bar{B}	R	A	R	0V	0V	+V

Note: In environments subject to electrical interference, we recommend grounding the encoder base using one of the mounting screws.

R = reserved; do not connect.

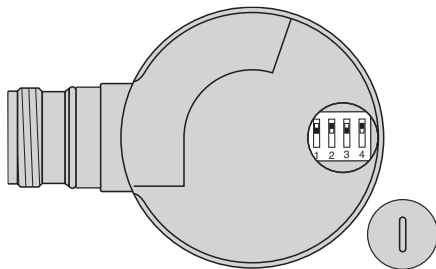
(1) Connect each unused channel to 0 V in series with a 10 kΩ resistor.

Resolutions

Resolutions for parameterable Ø 58 mm encoders XCC1510PSM●●● and XCC1514TSM●●●

Simple multiplication of the basic resolution of the disc using dip switches (1)
(Plastic Ø 2.5 screwdriver recommended).

The factory setting is for factor X1.



Interpolation factor	Basic resolution	Position of dip switches			
		1	2	3	4
Counting Speed	256 360 500 1024 5000				
x 1 x 1	256 360 500 1024 5000	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
x 2 x 2	512 720 1000 2048 10,000	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
x 3 x 3	768 1080 1500 3072 15,000	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
x 4 x 4	1024 1440 2000 4096 20,000	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
x 5 -	1280 1800 2500 5120 25,000	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
x 8 -	2048 2880 4000 8192 40,000	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
x 10 -	2560 3600 5000 10,240 50,000	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
x 12 -	3072 4320 6000 12,288 60,000	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
x 16 -	4096 5760 8000 16,384 80,000	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

(1) Setting the switches to other configurations will result in the encoder providing an unpredictable resolution.

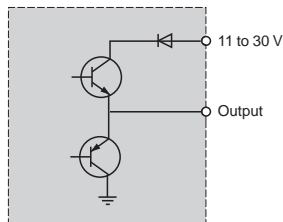
Environment			XCC2506P●●●●●	XCC2510P●●●●●	XCC2514T●●●●●
Encoder type					
Conformity			CE		
Temperature	Operation (housing)	°C (°F)	- 20 to + 90 (- 4 to + 194)		
	Storage	°C (°F)	- 30 to + 95 (- 22 to + 203)		
Degree of protection	Conforming to IEC 60529		IP 65	IP 65 (IP 67 with collar option XCCRB3)	IP 65
Vibration resistance	Conforming to IEC 60068-2-6		10 gn (f = 10 to 2 kHz)		
Shock resistance	Conforming to IEC 60068-2-27		30 gn, duration 11 ms		
Resistance to electromagnetic interference	Electrostatic discharges		Conforming to IEC 61000-4-2: level 3, 8 kV air; 4 kV contact		
	Radiated electromagnetic fields (electromagnetic waves)		Conforming to IEC 61000-4-3: level 3, 10 V/m		
	Fast transients (Start/Stop interference)		Conforming to IEC 61000-4-4: level 3, 2 kV (1 kV for inputs/outputs)		
	Surge withstand		Conforming to IEC 61000-4-5: level 2, 1 kV		
Materials	Base		Aluminium		
	Housing		Zamak		
	Shaft		Stainless steel		
	Ball bearings		6000ZZ1		6803ZZ

Mechanical specifications			Ø 6, solid shaft (g7)	Ø 10 mm, solid shaft	Ø 14, through shaft (H7)
Shaft type					
Maximum rotational speed	Continuous		9000 rpm	9000 rpm	6000 rpm
Shaft moment of inertia		g.cm ²	10 (0.14 oz.in.)	10 (0.14 oz.in.)	22 (0.31 oz.in.)
Torque		N.cm	0.4 (0.57 oz.in.)	0.4 (0.57 oz.in.)	0.6 (0.85 oz.in.)
Maximum load	Radial	N	100	100	50
	Axial	N	50	50	20

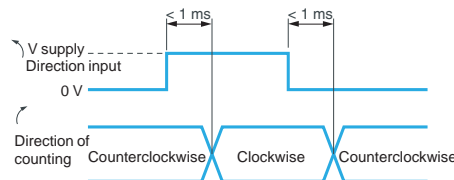
Electrical specifications			
Connection	Connector		Encoders with parallel output stage types KG (N), KB: M23, 16-pin male connector. Encoders with SSI output stage types SB (N), SG (N): M23, 12-pin male connector
Frequency		kHz	Encoders with parallel output stage types KG (N), KB: 100 kHz on LSB (Least Significant Bit) Encoders with SSI output stage types SB (N), SG (N): 100 kHz to 1 MHz clock
Encoders with Type KB and KG (N) output stage: push-pull output driver, 11 to 30 V supply, Gray code			
Supply voltage			--- 11 to 30 V Max. ripple: 500 mV
Current consumption, no-load		mA	100 max.
Protection			Against short-circuits and reverse polarity
Output current		mA	20 max.
Output levels (for U supply = 30 V)	Low level		(I _s = 20 mA) 0.5 V max.
	High level		(I _s = 20 mA) V supply - 2.5 V min.

Wiring diagrams

Type KB and KG (N) output stage



KB and KG (N) Direction input



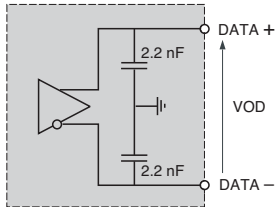
Electrical specifications (continued)

Encoders with Type SB (N) or SG (N) output stage: SSI output without parity, 13-bit clock, 11 to 30 V supply, binary code (SB) or Gray code (SG)

Supply voltage		11 to 30 V. Max. ripple: 500 mV
Current consumption, no-load	mA	100
Protection		Against short-circuits and reverse polarity
Output level		$I_{data} = 20 \text{ mA}$ $ VOD > 2 \text{ V}$

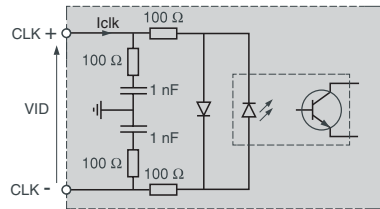
Wiring diagrams

RS-422 data output



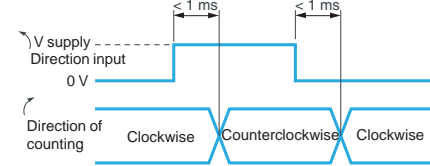
$I_{data} = 20 \text{ mA}$ $|VOD| > 2 \text{ V}$

Isolated clock input



$|VID| \text{ max.: } 5 \text{ V}$
 $|I_{clk}| \text{ max.: } 15 \text{ mA}$

Direction input

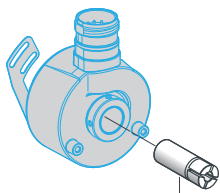


Catalog numbers



XCC2506PS81●●●

Resolution	Connection method (1)	Output stage type (2)	Supply voltage	Catalog number	Weight kg (lbs)
Solid shaft, Ø 6 mm					
8192 points	Connector, radial M23 male	Push-pull, binary	11 to 30 V	XCC2506PS81KB	0.495 (1.091)
		Push-pull, Gray	11 to 30 V	XCC2506PS81KGN	0.495 (1.091)
		SSI, 13-bit, binary	11 to 30 V	XCC2506PS81SBN	0.490 (1.080)
		SSI, 13-bit, Gray	11 to 30 V	XCC2506PS81SGN	0.490 (1.080)
Solid shaft, Ø 10 mm					
8192 points	Connector, radial M23 male	Push-pull, binary	11 to 30 V	XCC2510PS81KB	0.465 (1.025)
		Push-pull, Gray	11 to 30 V	XCC2510PS81KGN	0.465 (1.025)
		SSI, 13-bit, binary	11 to 30 V	XCC2510PS81SBN	0.460 (1.014)
		SSI, 13-bit, Gray	11 to 30 V	XCC2510PS81SGN	0.460 (1.014)
Through shaft, Ø 14 mm (3)					
8192 points	Connector, radial M23 male	Push-pull, binary	11 to 30 V	XCC2514TS81KB	0.435 (0.959)
		Push-pull, Gray	11 to 30 V	XCC2514TS81KG	0.435 (0.959)
		SSI, 13-bit, binary	11 to 30 V	XCC2514TS81SB	0.430 (0.948)
		SSI, 13-bit, Gray	11 to 30 V	XCC2514TS81SG	0.430 (0.948)
Through shaft, Ø 6, 8, 10 and 12 mm (3)					
Encoder type	Diameter mm	Reduction collar to be ordered (see page 9/35)			
Encoders with through shaft XCC2514TS81●●	Ø 6	XCCR158RDA06			
	Ø 8	XCCR158RDA08			
	Ø 10	XCCR158RDA10			
	Ø 12	XCCR158RDA12			



XCCR158RDA●●

(1) For female connector use:

- XZC C23FDP120S for encoders Type SBN and SGN
- XZC C23FDP160S for encoders Type KB and KGN, or pre-wired connectors (2, 5 and 10 m), see page 9/33.

(2) For specifications of the output stage type (indicated by last letter of the catalog number), see pages 9/20 and 9/21.

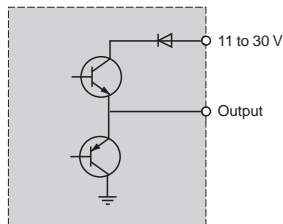
(3) Anti-rotation device included with encoder.

Environment			
Encoder type		XCC2912P●●●●●	XCC2930T●●●●●
Conformity		CE	
Temperature	Operation (housing)	°C (°F)	- 20 to + 85 (- 4 to + 185)
	Storage	°C (°F)	- 40 to + 85 (- 40 to + 185)
Degree of protection	Conforming to IEC 60529	IP 66	IP 65
Vibration resistance	Conforming to IEC 60068-2-6	10 gn (f = 10 to 2 kHz)	
Shock resistance	Conforming to IEC 60068-2-27	30 gn, duration 11 ms	
Resistance to electromagnetic interference	Electrostatic discharges	Conforming to IEC 61000-4-2: level 3, 8 kV air; 4 kV contact	
	Radiated electromagnetic fields (electromagnetic waves)	Conforming to IEC 61000-4-3: level 3, 10 V/m	
	Fast transients (Start/Stop interference)	Conforming to IEC 61000-4-4: level 3, 2 kV (1 kV for inputs/outputs)	
	Surge withstand	Conforming to IEC 61000-4-5: level 2, 1 kV	
Materials	Base	Aluminium	
	Housing	Zamak	
	Shaft	Stainless steel	
	Ball bearings	6001ZZ	6807

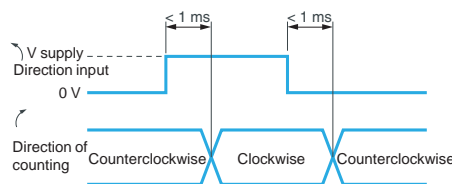
Mechanical specifications			
Shaft type		Ø 12, solid shaft (g6)	Ø 30, through shaft (H7)
Maximum rotational speed	Continuous	6000 rpm	3600 rpm
Shaft moment of inertia		g.cm ²	500 (6.94 oz.in.)
Torque		N•cm	2.5 (3.54 oz.in.)
Maximum load	Radial	N	200
	Axial	N	100

Electrical specifications			
Connection	Connector	Encoders with parallel output stage types KB (N), KG (N): M23, 16-pin male connector. Encoders with SSI output stage types SB (N), SG (N): M23, 12-pin male connector	
Frequency		Encoders with parallel output stage types KB (N), KG (N): 100 kHz on LSB (Least Significant Bit) Encoders with SSI output stage types SB (N), SG (N): 100 kHz to 1 MHz clock	
Encoders with Type KB (N) or KG (N) output stage: push-pull output driver, 11 to 30 V supply, binary code KB (N) or Gray code KG (N)			
Supply voltage		--- 11 to 30 V. Max. ripple: 500 mV	
Current consumption, no-load		mA	100 max.
Protection		Against short-circuits and reverse polarity	
Output current		mA	20 max.
Output levels (for U supply = 30 V)	Low level	(I _s = 20 mA) 0.5 V max.	
	High level	(I _s = 20 mA) V supply - 3 V min.	

Wiring diagrams
Type KB (N) and KG (N) output stage



KB (N) and KG (N) Direction input



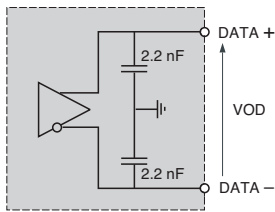
Electrical specifications (continued)

Encoders with Type SB (N) or SG (N) output stage: SSI output without parity, 13-bit clock, 11 to 30 V supply, binary code SB (N) or Gray code SG (N)

Supply voltage		11 to 30 V Max. ripple: 500 mV
Current consumption, no-load	mA	100
Protection		Against short-circuits and reverse polarity
Output level		I _{data} = 20 mA VOD > 2 V

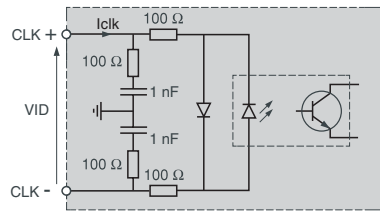
Wiring diagrams

RS-422 data output



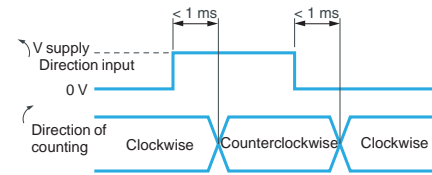
I_{data} = 20 mA |VOD| > 2 V

Isolated clock input



|VID| max.: 5 V
|I_{clk}| max.: 15 mA

Direction input



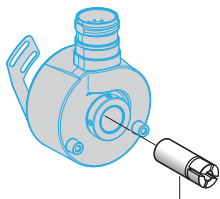
Catalog numbers



XCC2912PS●●●●



XCC2930TS●●●●



XCCR290RDP●●

Resolution	Connection method (1)	Output stage type (2)	Supply voltage	Catalog number	Weight kg (lbs)
Solid shaft, Ø 12 mm					
8192 points	Connector, radial M23 male	Push-pull, binary	11 to 30 V	XCC2912PS81KBN	1.365 (3.001)
		Push-pull, Gray	11 to 30 V	XCC2912PS81KGN	1.365 (3.001)
		SSI, 13-bit, binary	11 to 30 V	XCC2912PS81SBN	1.370 (3.020)
		SSI, 13-bit, Gray	11 to 30 V	XCC2912PS81SGN	1.370 (3.020)
Through shaft, Ø 30 mm (3)					
8192 points	Connector, radial M23 male	Push-pull, binary	11 to 30 V	XCC2930TS81KBN	0.975 (2.150)
		Push-pull, Gray	11 to 30 V	XCC2930TS81KGN	0.975 (2.150)
		SSI, 13-bit, binary	11 to 30 V	XCC2930TS81SBN	0.980 (2.161)
		SSI, 13-bit, Gray	11 to 30 V	XCC2930TS81SGN	0.980 (2.161)
Through shaft, Ø 12, 20 and 25 mm (3)					
Encoder type	Diameter mm	Reduction collar to be ordered (see page 9/35)			
Encoders with through shaft XCC2930TS81●●●	Ø 12	XCCR290RDP12			
	Ø 20	XCCR290RDP20			
	Ø 25	XCCR290RDP25			

(1) For female connector use:

- XZC C23FDP120S for encoders Type SB (N) and SG (N)
- XZC C23FDP160S for encoders Type KB (N) and KG (N), or pre-wired connectors (2, 5 and 10 m), see page 9/33.

(2) For specifications of the output stage type (indicated by last letter of the catalog number), see pages 9/22 and 9/23.

(3) Anti-rotation device included with encoder.

OsiSense® XCC

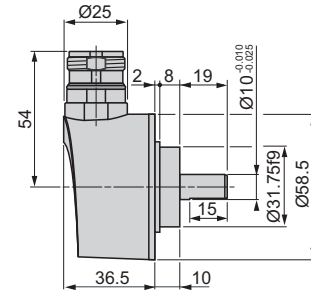
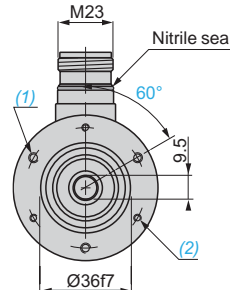
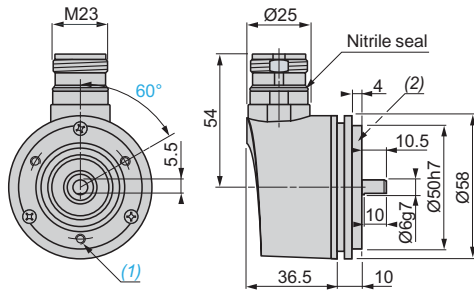
Single turn absolute encoders

Ø 58 mm and Ø 90 mm encoders

Ø 58 mm encoders

XCC2506PS81KB, XCC2506PS81KGN, XCC2506PS81SBN, XCC2506PS81SGN

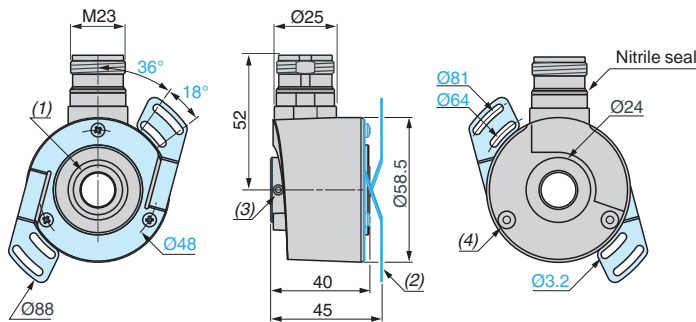
XCC2510PS81KB, XCC2510PS81KGN, XCC2510PS81SBN, XCC2510PS81SGN



(1) 3 M4 holes at 120° on 42 PCD, depth: 10 mm.
(2) Collar XCCRB1 mounted.

(1) 3 M4 holes at 120° on 48 PCD, depth: 8 mm.
(2) 3 M3 holes at 120° on 48 PCD, depth: 8 mm.

XCC2514TS81KB, XCC2514TS81KGN, XCC2514TS81SB, XCC2514TS81SG

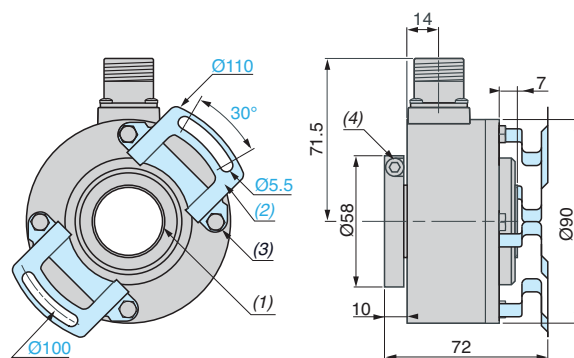
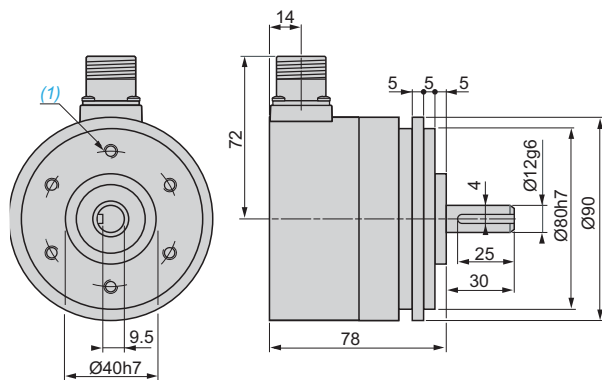


(1) Through shaft, Ø 14 (H7).
(2) Flexible mounting kit, 1 x XCCRF5N mounted.
(3) 2 HC M4 x 4 locking screws.
(4) Hole for M3 x 6 self-threading screw.

Ø 90 mm encoders

XCC2912PS81KBN, XCC2912PS81KGN

XCC2930TS81SBN, XCC2930TS81SGN



(1) 6 holes M6 x 1 at 120° on 60 PCD, depth: 12 mm max.

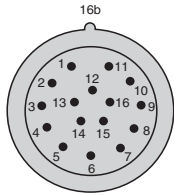
(1) Through shaft, Ø 30 (H7).
(2) Anti-rotation device, 1 x XCCRF9N, mounted.
(3) 4 M5 x 6 on 78 PCD.
(4) 1 CHC M5 x 12 stainless steel A2 locking screw.

Connector version encoders

Encoders Type KB (N) and KG (N)

M23, 16-pin connector, counterclockwise connections

Male connector on encoder (pin view)



Pin number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
------------	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----

Signal/Supply 0 V +V d0 d1 d2 d3 d4 d5 d6 d7 d8 d9 d10 d11 d12 Direction (1)

If a resolution less than 13 bits (8192 points) is required, only the corresponding number of bits need to be connected:

Example:

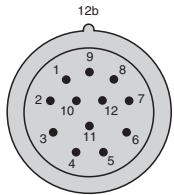
- D5 to D12 for 8 bits (256 points)
- D3 to D12 for 10 bits (1024 points)
- D2 to D12 for 11 bits (2048 points)

(1) : Clockwise direction, 16 to +V.
 : Counterclockwise direction, 16 to 0 V.

Encoders Type SB (N) and SG (N)

M23, 12-pin connector, counterclockwise connections

Male connector on encoder (pin view)



Pin number	1	2	3	4	5	6	7	8	9	10	11	12
------------	---	---	---	---	---	---	---	---	---	----	----	----

Signal/Supply 0 V Data + Clk + R Direction R R +V R Data - Clk - R (1)

R = Reserved (do not connect).

(1) : Clockwise direction, 5 to 0 V.
 : Counterclockwise direction, 5 to +V.

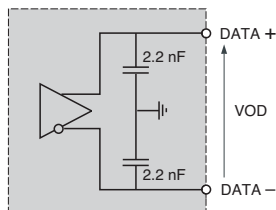
Environment					
Encoder type	Multi-turn absolute		XCC3506P●●●●●	XCC3510P●●●●●	XCC3514T●●●●●
Conformity			CE		
Temperature	Operation (housing)	°C (°F)	- 20 to + 85 (- 4 to + 185)		
	Storage	°C (°F)	- 20 to + 85 (- 4 to + 185)		
Degree of protection	Conforming to IEC 60529		IP 65	IP 65 (IP 67 with collar option XCCRB3)	IP 65
Vibration resistance	Conforming to IEC 60068-2-6		10 gn (f = 10 to 2 kHz)		
Shock resistance	Conforming to IEC 60068-2-27		30 gn, duration 11 ms		
Resistance to electromagnetic interference	Electrostatic discharges		Conforming to IEC 61000-4-2: level 3, 8 kV air; 4 kV contact		
	Radiated electromagnetic fields (electromagnetic waves)		Conforming to IEC 61000-4-3: level 3, 10 V/m		
	Fast transients (Start/Stop interference)		Conforming to IEC 61000-4-4: level 3, 2 kV (1 kV for inputs/outputs)		
	Surge withstand		Conforming to IEC 61000-4-5: level 2, 1 kV		
Materials	Base		Aluminium		
	Housing		Steel		
	Shaft		Stainless steel		
	Ball bearings		6900ZZ1		6803ZZ

Mechanical specifications					
Shaft type			Ø 6, solid shaft (g7)	Ø 10 mm, solid shaft	Ø 14, through shaft (H7)
Maximum rotational speed	Continuous		6000 rpm		
Shaft moment of inertia		g·cm ²	10 (0.14 oz.in.)		22 (0.31 oz.in.)
Torque		N·cm	0.4 (0.57 oz.in.)		0.6 (0.85 oz.in.)
Maximum load	Radial	N	100		50
	Axial	N	50		20

Electrical specifications				
Connection	Connector		Encoders with SSI output stage types SB (N), SG (N): M23, 12-pin male connector	
Frequency			Encoders with SSI output stage types SB (N), SG (N): 100 to 500 kHz clock	
Supply voltage			--- 11 to 30 V. Max. ripple: 500 mV	
Current consumption, no-load		mA	100 max.	
Protection			Against short-circuits and reverse polarity	
Output level			I _{data} = 20 mA VOD > 2 V	

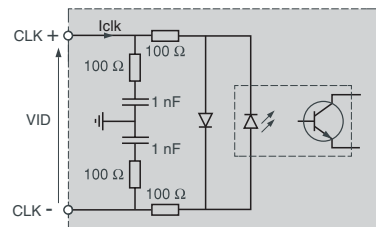
Wiring diagrams

RS-422 data output



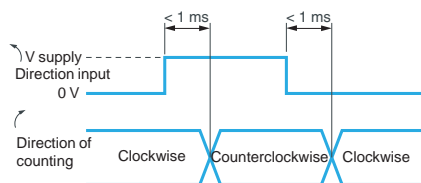
I_{data} = 20 mA |VOD| > 2 V

Isolated clock input

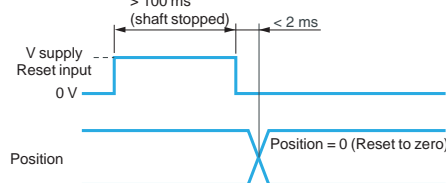


|VID| max.: 5 V
|I_{clk}| max.: 15 mA

Direction input



Input stage - Reset to zero



OsiSense® XCC

Multi-turn absolute encoders

Ø 58 mm encoders

Ø 58 mm multi-turn absolute encoders with SSI output convertible to parallel output

The SSI versions can be converted to a parallel version using the deserialization connecting cable XCCRM23SUB37●●, see pages 9/32 and 9/33.



XCC3506PS84SBN

Solid shaft, Ø 6 mm

Resolution	Connection method (1)	Output stage type (2)	Supply voltage	Catalog number	Weight kg (lbs)
4096 points 8192 turns	Connector, radial M23 male	SSI, 25-bit, Gray	11 to 30 V	XCC3506PS48SGN	0.725 (1.598)
		SSI, 25-bit, binary	11 to 30 V	XCC3506PS48SBN	0.725 (1.598)
8192 points 4096 turns	Connector, radial M23 male	SSI, 25-bit, binary	11 to 30 V	XCC3506PS84SBN	0.725 (1.598)
		SSI, 25-bit, Gray	11 to 30 V	XCC3506PS84SGN	0.725 (1.598)

Solid shaft, Ø 10 mm

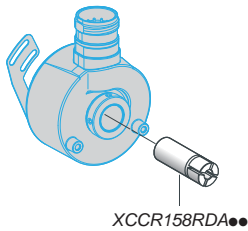
Resolution	Connection method (1)	Output stage type (2)	Supply voltage	Catalog number	Weight kg (lbs)
4096 points 8192 turns	Connector, radial M23 male	SSI, 25-bit, Gray	11 to 30 V	XCC3510PS48SGN	0.685 (1.510)
		SSI, 25-bit, binary	11 to 30 V	XCC3510PS48SBN	0.685 (1.510)
8192 points 4096 turns	Connector, radial M23 male	SSI, 25-bit, binary	11 to 30 V	XCC3510PS84SBN	0.685 (1.510)
		SSI, 25-bit, Gray	11 to 30 V	XCC3510PS84SGN	0.685 (1.510)

Through shaft, Ø 14 mm (3)

Resolution	Connection method (1)	Output stage type (2)	Supply voltage	Catalog number	Weight kg (lbs)
8192 points 4096 turns	Connector, radial M23 male	SSI, 25-bit, binary	11 to 30 V	XCC3514TS84SB	0.655 (1.444)
		SSI, 25-bit, Gray	11 to 30 V	XCC3514TS84SG	0.655 (1.444)

Through shaft, Ø 6, 8, 10 and 12 mm (3)

Encoder type	Diameter mm	Reduction collar to be ordered (see page 9/35)
Encoders with through shaft XCC3514TS84●●●	Ø 6	XCCR158RDA06
	Ø 8	XCCR158RDA08
	Ø 10	XCCR158RDA10
	Ø 12	XCCR158RDA12



XCCR158RDA●●

(1) For female connector use XZC C23FDP120S or pre-wired connectors (2, 5 or 10 m), see page 9/33.

(2) For specifications of the output stage type (indicated by last letter of the catalog number), see page 9/26.

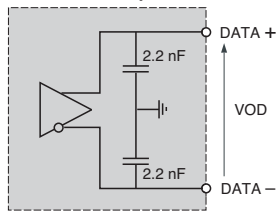
(3) Anti-rotation device included with encoder.

Environment			
Encoder type		XCC3912P●●●●●	XCC3930T●●●●●
Conformity		CE	
Temperature	Operation (housing)	°C (°F) - 20 to + 85 (- 4 to + 185)	- 10 to + 75 (+ 14 to +167)
	Storage	°C (°F) - 30 to + 85 (- 22 to + 185)	- 20 to + 85 (- 4 to + 185)
Degree of protection	Conforming to IEC 60529	IP 66	IP 65
Vibration resistance	Conforming to IEC 60068-2-6	10 gn (f = 10 to 2 kHz)	
Shock resistance	Conforming to IEC 60068-2-27	30 gn, duration 11 ms	
Resistance to electromagnetic interference	Electrostatic discharges	Conforming to IEC 61000-4-2: level 3, 8 kV air; 4 kV contact	
	Radiated electromagnetic fields (electromagnetic waves)	Conforming to IEC 61000-4-3: level 3, 10 V/m	
	Fast transients (Start/Stop interference)	Conforming to IEC 61000-4-4: level 3, 2 kV (1 kV for inputs/outputs)	
	Surge withstand	Conforming to IEC 61000-4-5: level 2, 1 kV	
Materials	Base	Aluminium	
	Housing	Zamak	
	Shaft	Stainless steel	
	Ball bearings	6001ZZ	6807ZZ

Mechanical specifications			
Shaft type		Ø 12, solid shaft (g6)	
Maximum rotational speed		Continuous	6000 rpm
Shaft moment of inertia		g.cm ²	150 (2.08 oz.in.)
Torque		N.cm	1 (1.42 oz.in.)
Maximum load	Radial	N	200
	Axial	N	100

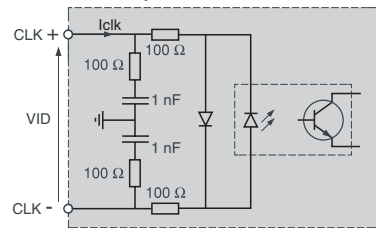
Electrical specifications			
Connection		Connector	
Frequency		Encoders with SSI output stage types SB (N), SG (N): M23, 12-pin male connector	
Supply voltage		Encoders with SSI output stage types SB (N), SG (N): 100 to 500 kHz clock	
Encoders with Type SBN or SGN (Gray) output stage: SSI output without parity, 25-bit clock, 11 to 30 V supply, binary code (SB) or Gray code (SG)			
Supply voltage		--- 11 to 30 V Max. ripple: 500 mV	
Current consumption, no-load		mA 100 max.	
Protection		Against short-circuits and reverse polarity	
Output level		I _{data} = 20 mA V _{OD} > 2 V	

Wiring diagrams
RS-422 data output



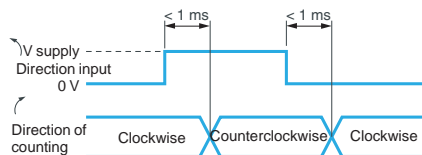
I_{data} = 20 mA |V_{OD}| > 2 V

Isolated clock input



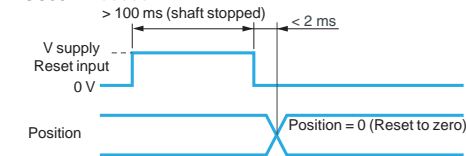
|VID| max.: 5 V
|I_{clk}| max.: 15 mA

Direction input

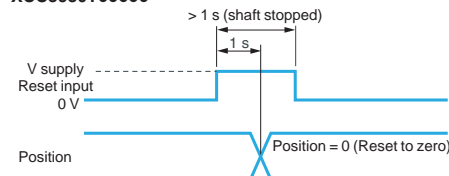


Input stage - Reset to zero

XCC3912P●●●●●



XCC3930T●●●●●



OsiSense® XCC

Multi-turn absolute encoders

Ø 90 mm encoders

Ø 90 mm multi-turn absolute encoders with SSI output convertible to parallel output

The SSI versions can be converted to a parallel version using the deserialization connecting cable XCCRM23SUB37●●, see pages 9/32 and 9/33.



XCC3912PS●●●●

Solid shaft, Ø 12 mm

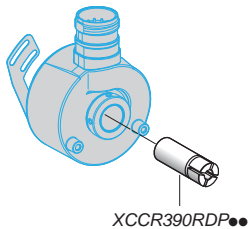
Resolution	Connection method (1)	Output stage type (2)	Supply voltage	Catalog number	Weight kg (lbs)
8192 points 4096 turns	Connector, radial M23 male	SSI, 25-bit, binary	11 to 30 V	XCC3912PS84SBN	1.840 (4.057)
		SSI, 25-bit, Gray	11 to 30 V	XCC3912PS84SGN	1.840 (4.057)



XCC3930TS●●●●

Through shaft, Ø 30 mm (3)

Resolution	Connection method (1)	Output stage type (2)	Supply voltage	Catalog number	Weight kg (lbs)
8192 points 4096 turns	Connector, radial M23 male	SSI, 25-bit, binary	11 to 30 V	XCC3930TS84SBN	1.060 (2.337)
		SSI, 25-bit, Gray	11 to 30 V	XCC3930TS84SGN	1.060 (2.337)



XCCR390RDP●●

Through shaft, Ø 16, 20 and 25 mm (3)

Encoder type	Diameter mm	Reduction collar to be ordered (see page 9/35)
Encoders with through shaft XCC3930TS84●●●	Ø 16	XCCR390RDP16
	Ø 20	XCCR390RDP20
	Ø 25	XCCR390RDP25

(1) For female connector use XZC C23FDP120S or pre-wired connectors (2, 5 or 10 m), see page 9/33.

(2) For specifications of the output stage type (indicated by last letter of the catalog number), see page 9/28.

(3) Anti-rotation device included with encoder.

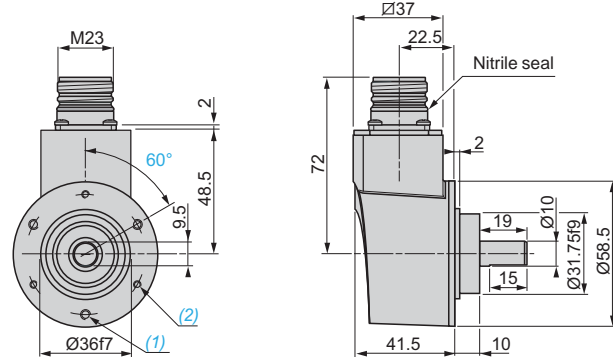
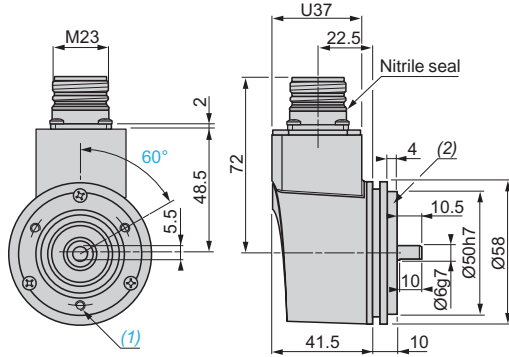
OsiSense® XCC Multi-turn absolute encoders

Ø 58 mm and Ø 90 mm encoders

Ø 58 mm encoders

XCC3506PS84SBN, XCC3506PS84SGN

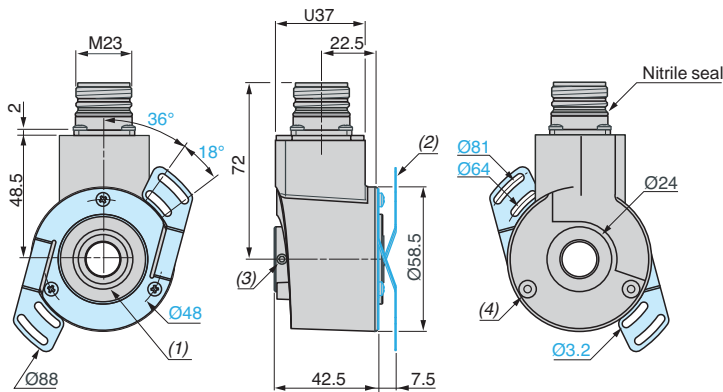
XCC3510PS84SBN, XCC3510PS84SGN



(1) 3 M4 holes at 120° on 42 PCD, depth: 10 mm.
(2) Collar XCCRB1 mounted.

(1) 3 M4 holes at 120° on 48 PCD, depth: 8 mm.
(2) 3 M3 holes at 120° on 48 PCD, depth: 8 mm.

XCC3514TS84SB, XCC3514TS84SG

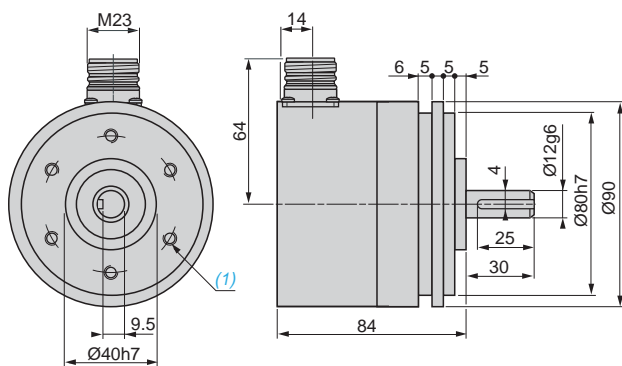


(1) Through shaft, Ø 14 (H7).
(2) Flexible mounting kit, 1 x XCCRF5N mounted.
(3) 2 HC M4 x 4 locking screws.
(4) Hole for M3 x 6 self-threading screw.

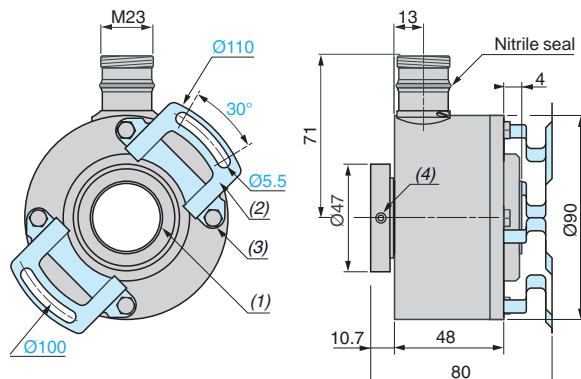
Ø 90 mm encoders

XCC3912PS84S●N

XCC3930TS84S●N



(1) 6 holes M6 x 1 at 120° on 60 PCD, depth: 12 mm max.

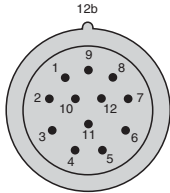


(1) Through shaft, Ø 30 (H7).
(2) Anti-rotation device, 1 x XCCRF9N, mounted.
(3) 4 M5 x 6 on 78 PCD.
(4) 3 HC M5 x 6 stainless steel A2 locking screws.

Connector version encoders

Encoder with SSI output (types SBN and SGN)
M23, 12-pin connector, counterclockwise connections

Male connector on encoder (pin view)



Twisted cable pairs + general shielding must be used.

Pin number	1	2	3	4	5	6	7	8	9	10	11	12
Signal/Supply	0 V	Data +	Clk +	R	Direction	Reset	R	+V	R	Data -	Clk -	R

R = Reserved (do not connect).

(1) ↻ : Clockwise direction, ↺ : Counterclockwise direction.

Selection of code progression direction

The Direction input enables the code progression to match the rotational direction of the encoder shaft (clockwise or counterclockwise).

Clockwise direction: connect pin 5 to 0 V.

Counterclockwise direction: connect pin 5 to + V.

Reset to zero

The Reset input enables the encoder to be set to the zero position.

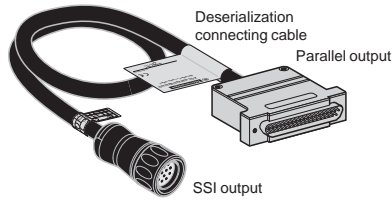
It is actuated by applying an 11 to 30 Vdc supply to pin 6, while the shaft is stopped, for the following times:

- Over 100 ms for XCC3506, XCC3510 and XCC3912,
- Over 1 s for XCC3930T.

Following a reset to zero, the pin 6 connection must be re-established to 0 V.

Note: In environments subject to electrical interference, we recommend grounding the encoder base using one of the mounting screws.

Connector version multi-turn absolute encoders

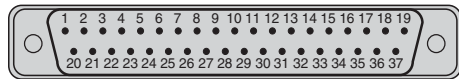


The deserialization connecting cable XCCRM23SUB37●● (see page 9/11) enables conversion, by simple connection, of encoders XCC35●● and XCC39●● with SSI output to parallel output.

Specifications

Supply	11 to 30 V
Encoder input/output	Levels RS-422
Parallel outputs	Push-pull protection against short-circuits
Operating temperature	0 to +50 °C (+32 to +122 °F)

36 x 0.14 mm² shielded cable and SUB-D 37-pin end connector connections



Male connector (pin view)

■ Selection of code progression direction

The Direction input enables the code progression to match the rotational direction of the encoder shaft (clockwise or counterclockwise).

Clockwise direction: connect pin 30 to an 11 to 30 Vdc supply.

Counterclockwise direction: connect pin 30 to 0 V.

■ Reset to zero

The Reset input enables the encoder to be set to the zero position. It is actuated by applying an 11 to 30 Vdc supply to pin 27 for more than 1 second.

■ Encoder selection

The Select input enables encoder selection when several units are connected in parallel on the same data bus.

Encoder selected: apply 0 V potential to pin 28.

Encoder not selected: apply 11 to 30 Vdc to pin 28.

■ Data locking

The Latch input, particularly useful for high speed applications, enables the freezing of the encoder data output while reading the code.

Function not actuated: apply 0 V potential to pin 29.

Function actuated: apply 11 to 30 Vdc to pin 29.

Pin number	Signal
1	2 ⁰ (LSB)
2	2 ¹
3	2 ²
4	2 ³
5	2 ⁴
6	2 ⁵
7	2 ⁶
8	2 ⁷
9	2 ⁸
10	2 ⁹
11	2 ¹⁰
12	2 ¹¹
13	2 ¹²
14	2 ¹³
15	2 ¹⁴
16	2 ¹⁵
17	2 ¹⁶
18	2 ¹⁷
19	2 ¹⁸
20	2 ¹⁹
21	2 ²⁰
22	2 ²¹
23	2 ²²
24	2 ²³
25	2 ²⁴ (MSB)
26	R
27	Reset to zero
28	Select
29	Latch
30	Direction (1) (↻)
31, 32, 33, 34, 35	R
36	+V
37	0 V

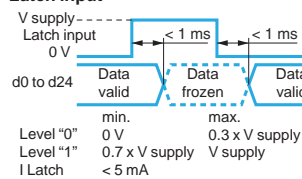
R = Reserved; do not connect

(1) (↻) : clockwise direction, (↺) : counterclockwise direction.

Note: In environments subject to electrical interference, we recommend grounding the encoder base using one of the mounting screws.

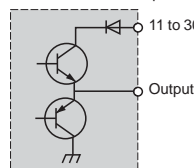
Wiring diagrams

Latch input



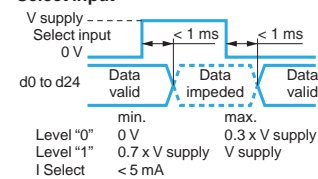
Push-Pull

Supply: 11 to 30 V
Max. ripple: 500 mV
Protection against reverse polarity
Max. no-load consumption: 50 mA (30 mA typical on 24 V)

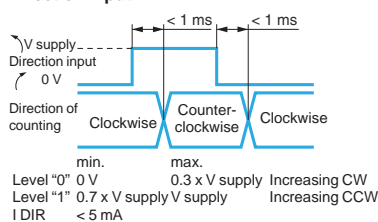


Max. current: 20 mA
Level "0" max.: 1.5 V
Level "1" min.: V supply - 2.5 V
Protection against short-circuits
NPN/PNP compatible

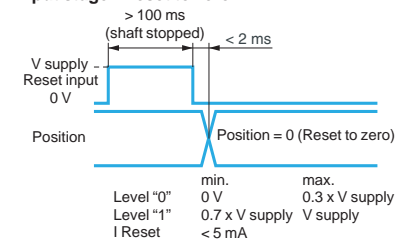
Select input



Direction input



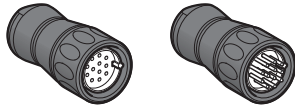
Input stage - Reset to zero



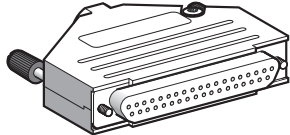
Note: The Latch and Select inputs must be connected to 0 V to become active.

OsiSense® XCC Rotary encoders

Connection accessories



XZCC23FMDP120S



XZCCHFDM370S



XCCRM23SUB37PG



XCCPM23161L2

Cables					
Description	For encoders	Number of wires/c.s.a.	Ø mm	Catalog number	Weight kg (lbs)
Shielded cables with twisted pairs Length: 100 m UL/CSA	Incremental	10 wires/0.14 mm ²	6	XCCRX10	5.000 (11.023)
	Absolute, single turn //	16 wires/0.14 mm ²	6.8	XCCRX16	5.600 (12.346)
	Absolute, single turn and multi-turn SSI, and incremental	1 pair of 0.50 mm ² wires and 3 pairs of 0.14 mm ² wires	8.6	XCCRXS8	11.750 (25.904)

Connectors					
Description	For use with	Number of pins	Type	Catalog number	Weight kg (lbs)
M23 female connectors	Encoders Incremental, absolute SSI	12	Straight	XZCC23FDP120S	0.040 (0.088)
	Absolute encoders, single turn parallel	16	Straight	XZCC23FDP160S	0.040 (0.088)
Connector kit 1 female + 1 male	SSI jumper cable or incremental encoders	–	–	XZCC23FMDP120S	0.090 (0.198)
SUB-D 37-pin female connector	Absolute encoders, multi-turn parallel	37	Straight	XZCCHFDM370S	0.115 (0.254)

Deserialization jumper cables (1)				
Description	Type	Catalog number	Weight kg (lbs)	
M23 F - SUB-D37 M jumper cables, straight M23, cable length 0.5 m	SSI Gray//Gray PNP (PG)	XCCRM23SUB37PG	0.225 (0.496)	
	SSI Gray//Gray NPN (NG)	XCCRM23SUB37NG	0.225 (0.496)	
	SSI Binary//Binary PNP (PB)	XCCRM23SUB37PB	0.225 (0.496)	
	SSI Binary//Binary NPN (NB)	XCCRM23SUB37NB	0.225 (0.496)	

Pre-wired connectors				
Description	Number of wires	Length	Catalog number	Weight kg (lbs)
M23 F straight	8 wires Absolute SSI	2 m	XCCPM23122L2	0.190 (0.419)
		5 m	XCCPM23122L5	0.470 (1.036)
		10 m	XCCPM23122L10	0.900 (1.036)
	10 wires Incremental	2 m	XCCPM23121L2	0.160 (0.353)
		5 m	XCCPM23121L5	0.330 (0.728)
		10 m	XCCPM23121L10	0.620 (1.367)
16 wires Absolute single turn //	2 m	XCCPM23161L2	0.175 (0.386)	
	5 m	XCCPM23161L5	0.415 (0.915)	
	10 m	XCCPM23161L10	0.790 (1.742)	

(1) See Overview, page 9/4 and Connections, page 9/32.

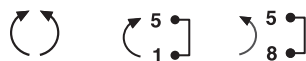
Pre-wired connector connections

XCCPM23122L●		
Pin	Function	Color
1	0V	BK
2	Data (+)	BN
3	Clk (+)	GN
4	R	–
5	()	VT
6	Reset	BU
7	R	–
8	+V	RD
9	R	–
10	Data (-)	OG
11	Clk (-)	YE
12	R	–

XCCPM23121L●		
Pin	Function	Color
1	A/	BN
2	V Supply	RD
3	Top 0	VT
4	Top 0/	BU
5	B	YE
6	B/	OG
7	R	–
8	A	GN
9	R	–
10	Gnd	BK
11	Gnd	WH
12	V Supply	GY

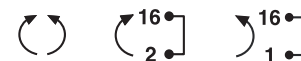
XCCPM23161L●		
Pin	Function	Color
1	Gnd	WH
2	V Supply	BN
3	d0	GN
4	d1	YE
5	d2	GY
6	d3	OG
7	d4	BU
8	d5	RD
9	d6	BK
10	d7	VT
11	d8	WH/BN
12	d9	WH/GN
13	d10	WH/YE
14	d11	WH/BK
15	d12	WH/OG
16	()	WH/RD

Direction of rotation for pin 5



R: reserved; do not connect

Direction of rotation for pin 16



Shaft couplings with spring (1)			
Maximum torque	N•cm	300 (424.83 oz.in.)	
Maximum angular misalignment		5°	
Maximum radial misalignment	mm	± 1.5	
Materials	Collars	Zamak	
	Spring	Nickel plated steel	
Compression/Expansion	mm	± 1 max.	
Homokinetic (flexible) shaft couplings with bellows			
Maximum torque	N•cm	80 (113.29 oz.in.)	
Maximum angular misalignment		4°	
Maximum lateral misalignment	mm	± 0.3	
Maximum axial misalignment	mm	± 0.5	
Materials	Bellows	Stainless steel	
	Mounting collar	Aluminium	
	Screws	Stainless steel	
Elastic monobloc shaft couplings			
Maximum torque	N•cm	20 (28.32 oz.in.)	
Maximum angular misalignment		± 2.5°	
Maximum radial misalignment	mm	± 0.3	
Compression/Expansion	mm	± 2 max.	
Materials		Glass fiber reinforced polyamide	

(1) Not recommended for resolutions higher than 500 points.

Catalog numbers

Shaft couplings (for encoders with solid shaft)						
Type	Bore diameter (encoder side)	Bore diameter (machine side)	Catalog number	Weight kg (lbs)		
With spring (1)	6 mm	6 mm	XCCRAR0606	0.125 (0.276)		
		8 mm	XCCRAR0608	0.125 (0.276)		
		10 mm	XCCRAR0610	0.125 (0.276)		
		12 mm	XCCRAR0612	0.120 (0.265)		
		14 mm	XCCRAR0614	0.120 (0.265)		
		16 mm	XCCRAR0616	0.120 (0.265)		
	10 mm	8 mm	XCCRAR1008	0.120 (0.265)		
		10 mm	XCCRAR1010	0.120 (0.265)		
		12 mm	XCCRAR1012	0.110 (0.243)		
		14 mm	XCCRAR1014	0.110 (0.243)		
		16 mm	XCCRAR1016	0.105 (0.231)		
		12 mm	8 mm	XCCRAR1208	0.110 (0.243)	
	12 mm		XCCRAR1212	0.110 (0.243)		
	14 mm		XCCRAR1214	0.105 (0.231)		
	16 mm		XCCRAR1216	0.100 (0.220)		
Homokinetic (flexible) with bellows	6 mm		6 mm	XCCRAS0606	0.020 (0.044)	
		8 mm	XCCRAS0608	0.020 (0.044)		
		10 mm	XCCRAS0610	0.020 (0.044)		
	10 mm	12 mm	XCCRAS0612	0.015 (0.033)		
		8 mm	XCCRAS1008	0.015 (0.033)		
		10 mm	XCCRAS1010	0.015 (0.033)		
		12 mm	XCCRAS1012	0.015 (0.033)		
		12 mm	8 mm	XCCRAS1208	0.010 (0.022)	
			12 mm	XCCRAS1212	0.010 (0.022)	
	Elastic, monobloc		6 mm	6 mm	XCCRAE0606	0.010 (0.022)

(1) Not recommended for resolutions higher than 500 points.



XCCRAR0606



XCCRAS0606



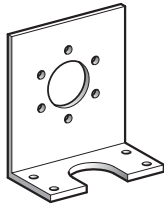
XCCRAE0606

OsiSense® XCC Rotary encoders

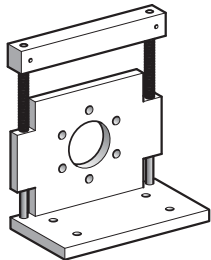
Mounting and installing accessories



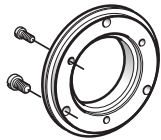
XCCRF



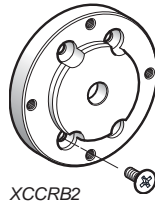
XCCRE9S



XCCRE9R



XCCRB1



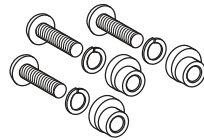
XCCRB2



XCCR158RDA08



XCCR90RDP20



XCCRG

Anti-rotation devices (for encoders with through shaft)				
Description	Features	For encoders	Catalog number	Weight kg (lbs)
Flexible mounting kit	Set of 2 flexible mounts + screws	Ø 40 XCC1406T	XCCRF4	0.010 (0.022)
	1 flexible mount + screws	Ø 58 XCC15●●T, XCC25●●T, XCC3514T	XCCRF5N	0.020 (0.044)
	Set of 2 flexible mounts + screws	Ø 90 XCC19●●T, XCC29●●T, XCC39●●T	XCCRF9	0.030 (0.066)

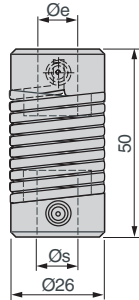
Mounting and installing accessories (for encoders with solid shaft)				
Description	For encoders	Catalog number	Weight kg (lbs)	
Set of 3 eccentric clamps + 3 mounting screws (1) + 3 washers	XCC15●●P, XCC25●●P, XCC35●●P	XCCRG5	0.010 (0.022)	
	XCC1912P, XCC2912P, XCC3912P	XCCRG9	0.030 (0.066)	
Plain brackets for Ø 58 (2)	XCC1506, XCC2506	XCCRE5S	1.300 (2.866)	
	XCC1510P, XCC2510P, XCC3510P	XCCRE5SN	0.130 (0.286)	
Plain brackets for Ø 90 (2)	XCC1912P, XCC2912P, XCC3912P	XCCRE9SN	0.290 (0.639)	
Brackets with play compensator (2)	XCC1510P, XCC2510P, XCC3510PS●●S●●	XCCRE5RN	0.345 (0.761)	
	XCC1912P, XCC2912P, XCC3912P	XCCRE9RN	0.890 (1.962)	
Collar for synchro mounting, for Ø 58 (2)	XCC1510P, XCC2510P, XCC3510P	XCCRB1	0.040 (0.088)	
Substitution interface collar for Ø 90 (2)	XCC1912P, XCC2912P, XCC3912P	XCCRB2	0.175 (0.386)	
IP 67 sealed collar for Ø 58 (2)	XCC1510P, XCC2510P, XCC3510PS●●S●●N	XCCRB3	0.030 (0.066)	

Reduction collars for encoders with through shaft				
Description	For use with	Reduction	Catalog number	Weight kg (lbs)
Reduction collars	Incremental encoders Ø 58 Absolute single turn encoders Ø 58 Absolute multi-turn encoders Ø 58	14 to 6	XCCR158RDA06	0.015 (0.033)
		14 to 8	XCCR158RDA08	0.010 (0.022)
		14 to 10	XCCR158RDA10	0.010 (0.022)
		14 to 12	XCCR158RDA12	0.010 (0.022)
	Incremental encoders Ø 90 Absolute single turn encoders Ø 90	30 to 12	XCCR290RDP12	0.060 (0.132)
		30 to 20	XCCR290RDP20	0.030 (0.066)
		30 to 25	XCCR290RDP25	0.020 (0.044)
	Absolute multi-turn encoders Ø 90	30 to 16	XCCR390RDP16	0.040 (0.088)
		30 to 20	XCCR390RDP20	0.020 (0.044)
		30 to 25	XCCR390RDP25	0.020 (0.044)

(1) 3 M3 x 12 screws for XCCRG5, 3 M4 x 25 screws for XCCRG9.
 (2) Screws included with brackets and collars.

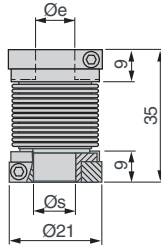
Shaft couplings

XCCRAR●●●●



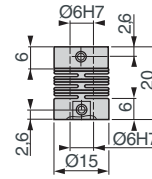
XCC	Ø e	Ø s
RAR0606	6	6
RAR0608	6	8
RAR0610	6	10
RAR0612	6	12
RAR0614	6	14
RAR0616	6	16
RAR1008	10	8
RAR1010	10	10
RAR1012	10	12
RAR1014	10	14
RAR1016	10	16
RAR1208	12	8
RAR1212	12	12
RAR1214	12	14
RAR1216	12	16

XCCRAS●●●●



XCC	Ø e	Ø s
RAS0606	6	6
RAS0608	6	8
RAS0610	6	10
RAS0612	6	12
RAS1008	10	8
RAS1010	10	10
RAS1012	10	12
RAS1208	12	8
RAS1212	12	12

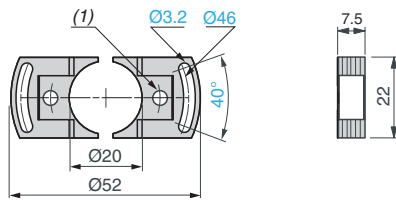
XCCRAE0606



Anti-rotation devices (flexible mounting kit)

XCCRF4

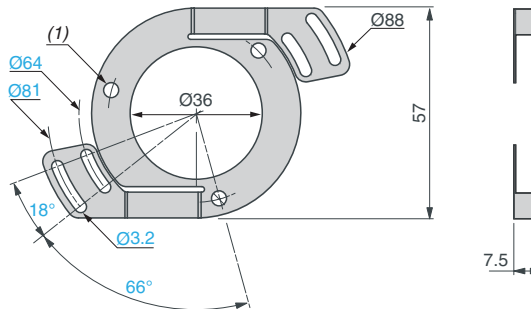
Mounting on Ø 40 mm encoder XCC1406T



(1) 2 holes Ø 4 at 180° on 30 PCD. TC M4 x 5 screw mounts.

XCCRF5N

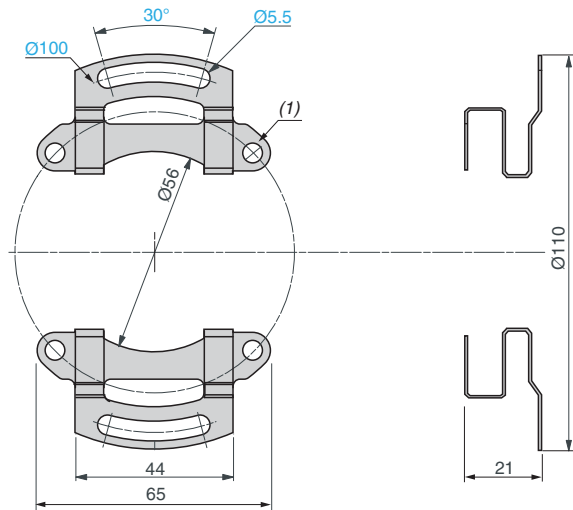
Mounting on Ø 58 mm encoders XCC1514T, XCC2514T and XCC3514T



(1) 3 holes Ø 4.1 at 120° on 48 PCD. TC M3 x 6 screw mounts.

XCCRF9

Mounting on Ø 90 mm encoders XCC1930T, XCC2930T and XCC3930T

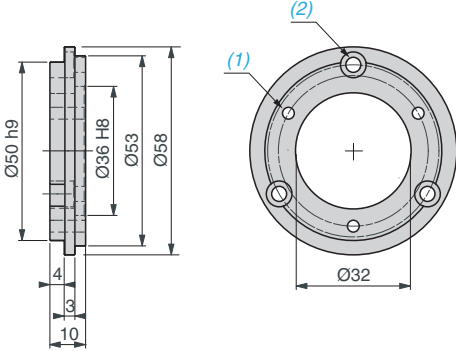


(1) 4 holes Ø 5.2 at 90° on 78 PCD. TH M5 x 6 screw mounts.

Collar kits

XCCRB1

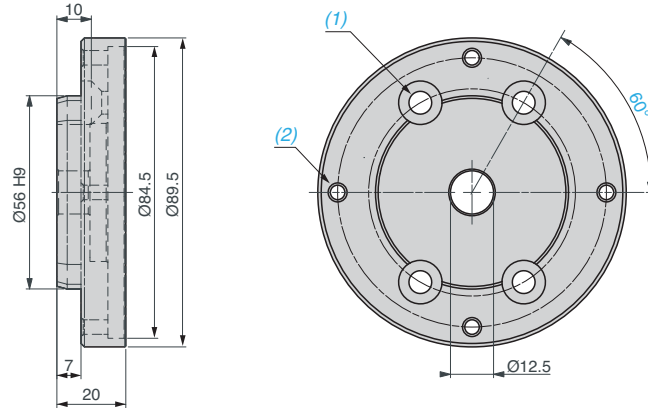
Collar for synchro mounting, for Ø 58 encoders:
XCC15●●P, XCC25●●P and XCC 35●●P



- (1) 3 holes M4 x 0.7 at 120° on 42 PCD. TC M3 x 8 screw mounts.
- (2) 3 counterbored holes for TC M4 x 8 screws at 120° on 48 PCD.

XCCRB2

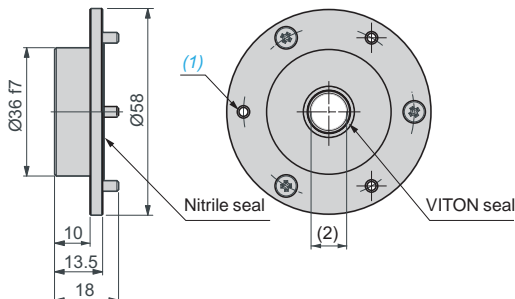
Interface collar for Ø 90 encoders:
XCC1912P, XCC2912P, XCC3912P



- (1) 4 holes Ø 6.6 at 120° on 60 PCD. Countersunk for TZ M6 x 16 screws.
- (2) 4 holes M5 x 0.8 at 90° on 78 PCD.

XCCRB3

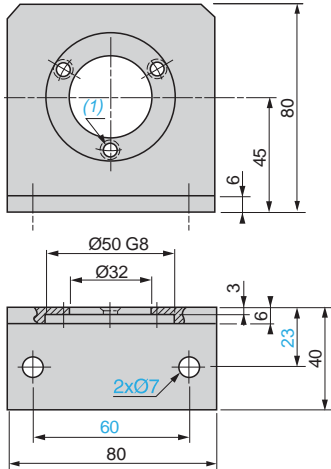
IP 67 sealed collar for Ø 58 encoders:
XCC1510P, XCC2510P and XCC3510PS●●S●N



- (1) 3 holes M3 x 0.5 at 120° on 48 PCD. TZ M3 x 8 screw mounts.
- (2) Shaft Ø 10 mm.

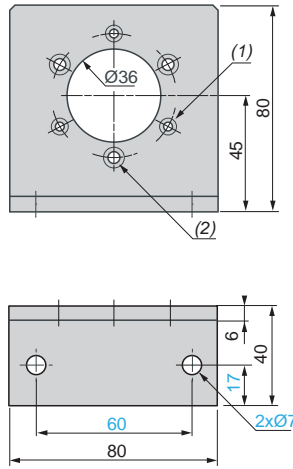
Plain brackets

XCCRE5S



(1) 3 holes $\varnothing 4.5$ at 120° on 42 PCD.

XCCRE5SN

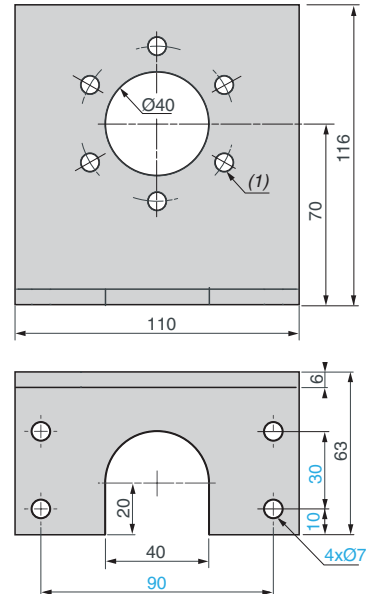


3 CHC M3 x 8 screws included.

(1) 3 counterbored holes for CHC M3 screws at 120° on 48 PCD.

(2) 3 counterbored holes for CHC M4 screws at 120° on 48 PCD.

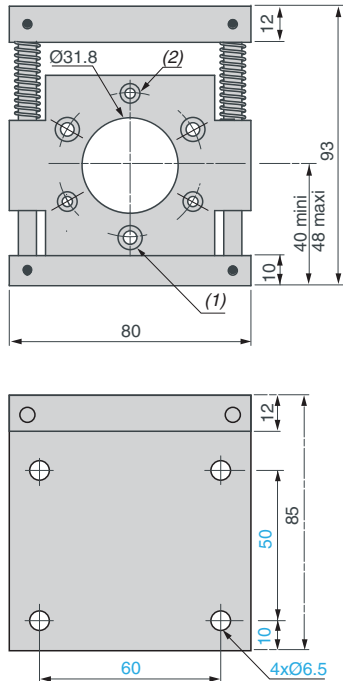
XCCRE9SN



(1) 6 holes $\varnothing 7$ for CHC M6 screws at 60° on 60 PCD.

Brackets with play compensator

XCCRE5RN

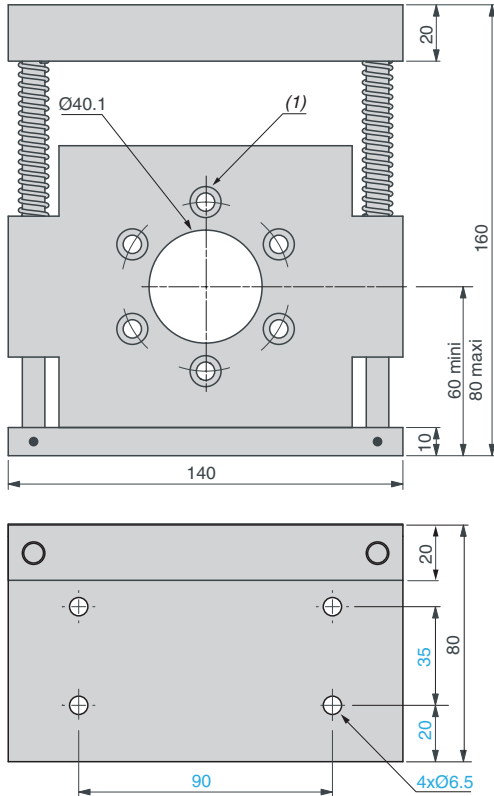


CHC M3 x 12 screws included

(1) 3 counterbored holes for CHC M3 screws at 120° on 48 PCD.

(2) 3 counterbored holes for CHC M4 screws at 120° on 48 PCD.

XCCRE9RN

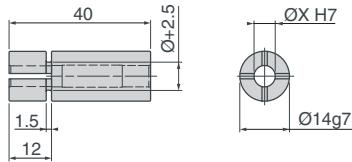


(1) 6 counterbored holes for CHC M6 screws at 120° on 60 PCD.

Reduction collars for through shaft

XCCR158RDA●●

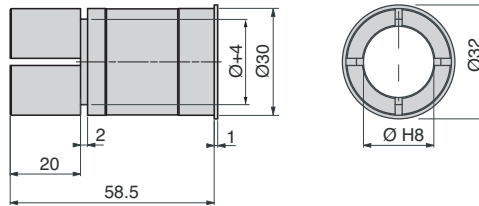
For Ø 58 incremental and absolute single turn and multi-turn encoders



XCC	Ø
R158RDA06	6
R158RDA08	8
R158RDA10	10
R158RDA12	12

XCCR290RDP●●

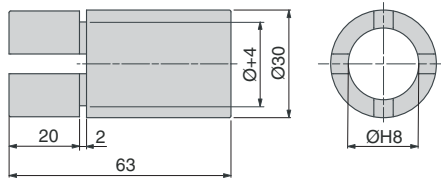
For Ø 90 incremental and absolute single turn encoders



XCC	Ø
R290RDP12	12
R290RDP20	20
R290RDP25	25

XCCR390RDP●●

For Ø 90 absolute multi-turn encoders



XCC	Ø
R390RDP16	16
R390RDP20	20
R390RDP25	25

For Encoders with CANopen and PROFIBUS-DP fieldbus,
contact the Sensor Competency Center at 1-800-435-2121.

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