Incremental encoders

GI357

Solid shaft with clamping or synchro flange

SIL2 approval

Overview

- Encoder with solid shaft ø10 mm or ø6 mm
- Max. 5000 pulses per revolution
- Optical sensing method
- Clamping or synchro flange
- High rotation speed up to 10000 rpm
- Compact design
- For safety-relevant applications in compliance with SIL2 (Safety Integrity Level 2)

Technical data

Technical data - electrical ratings

Voltage supply	24 VDC +20/-50 %
Reverse polarity protection	Yes
Consumption w/o load	≤30 mA
Pulses per revolution	5 … 5000
Reference signal	Zero pulse 70...720° electr. (Option)
Sensing method	Optical
Output frequency	≤150 kHz
Output signals	A 90° B + inverted
Output stages	Linedriver/RS422 Push-pull short-circuit proof
Safety operating figures	Encoder operating life: 20 years PFH: 1.16E-08 1/h SFF: >90 %
Interference immunity	EN 61000-6-2 IEC 61326-3-1
Emitted interference	EN 61000-6-4
Approval	UL approval / E63076 SIL2 approval according to DIN EN 61508

Technical data - mechanical design

Size (flange)	ø58 mm
Shaft type	ø6 mm solid shaft (synchro flange) ø10 mm solid shaft (clamping flange)

Technical data - mechanical design

Admitted shaft load	≤20 N axial ≤40 N radial
Flange	Clamping or synchro flange
Protection EN 60529	IP 54 (without shaft seal) IP 65 (with shaft seal)
Operating speed	≤10000 rpm
Starting torque	≤0.015 Nm (+25 °C, IP 54) ≤0.03 Nm (+25 °C, IP 65)
Rotor moment of inertia	14.5 gcm²
Material	Housing: aluminium Flange: aluminium
Operating temperature	-25...+85 °C
Relative humidity	95 % non-condensing
Resistance	EN 60068-2-6 Vibration 10 g, 16-2000 Hz EN 60068-2-27 Shock 100 g, 6 ms
Connection	Connector M12, 8-pin Connector M23, 12-pin
Weight approx.	250 g

Optional

- Additional zero pulse (not safety related)

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Functional safety remarks

The safety function in the master PLC must detect the following events in order to uncover dangerous errors and, in case of error, actuate appropriate safety precautions:

Non-equivalence Monitoring
The non-inverted and inverted signal lines of each safety track (A vs. A inv. and B vs. B inv.) must have non-equivalent signal levels at all times. In state transition, very short periods of time (some microseconds) are permissible in which both lines have same logical signal level. A dangerous error occurs when this short period of time is exceeded.

Line break detection
Make sure none of the signal cables (A, A inv, B, B inv.) is high-impedant. The encoder will utilize the high-impedant status of the safety tracks (A, A inv., B, B inv.) to output an error message.

Safe rotational speed
In the event of a predefined speed limit, the master control will require identical speed frequencies on both safety tracks. If not, it is a fatal error.

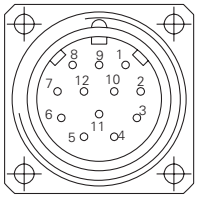
Safe rotational direction
The phase shift of the safety relevant incremental signals (A vs. B and A inv. vs. B inv.) has to be monitored. A dangerous error occurs when exceeding the given tolerances. Compliance to the defined rotational direction has to be monitored as well.

Safe stop
In case of missing state changes in at least one of the signals (A, A inv., B, B inv.), the customer has to ensure shaft standstill by means of a second, independent safety precaution within an acceptable amount of time depending on the facility.
Zero pulse as well as the test output are not part of the SIL2 approval and must not be used to fulfill safety functions.

Terminal assignment

Flange connector M23

Pin	Assignment without zero pulse	Assignment with zero pulse
1	Track B inv.	Track B inv.
2	–	–
3	Test Out	Test Out
4	–	Zero pulse
5	Track A	Track A
6	Track A inv.	Track A inv.
7	–	–
8	Track B	Track B
9	–	–
10	GNDB	GNDB
11	–	n.c.[1)]
12	UB	UB

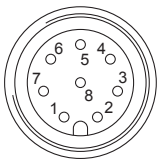


Please use cores twisted in pairs (for example track A / track A inv.) for extension cables of more than 10 m length.

[1)] Do not use. Pin is internally assigned and must not be connected externally.

Flange connector M12

Pin	Assignment without zero pulse
1	Track A
2	Track B
3	Track A inv.
4	Track B inv.
5	–
6	Test Out
7	GNDB
8	UB



Please use cores twisted in pairs (for example track A / track A inv.) for extension cables of more than 10 m length.

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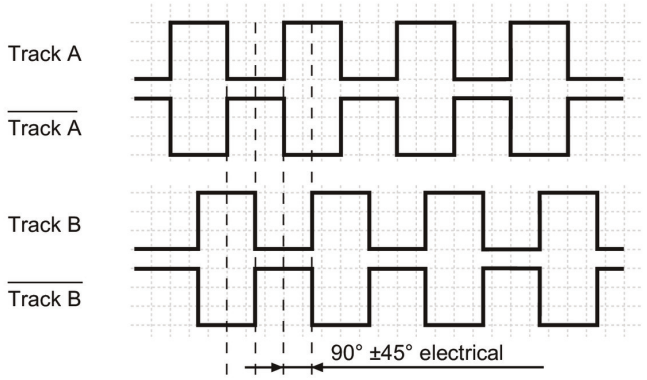
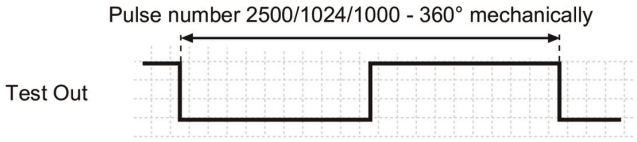
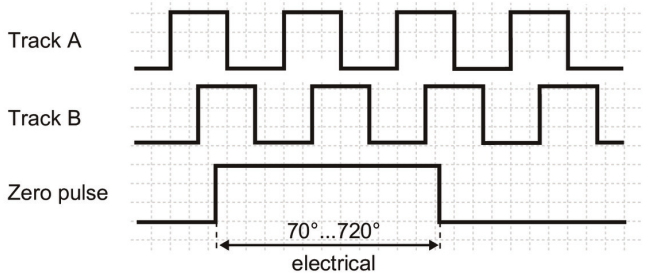
Output signals

Clockwise rotating direction when looking at flange.





Zero pulse 70°...720° (Option)



Trigger level

Outputs	**Linedriver RS422**
Output level High	>2.5 V (I = -20 mA)
Output level Low	<0.5 V (I = 20 mA)
Load High	<20 mA
Load Low	<20 mA

Outputs	**Push-pull** short-circuit proof
Output level High	>UB -3 V (I = -20 mA)
Output level Low	<0.5 V (I = 20 mA)
Load High	<20 mA
Load Low	<20 mA

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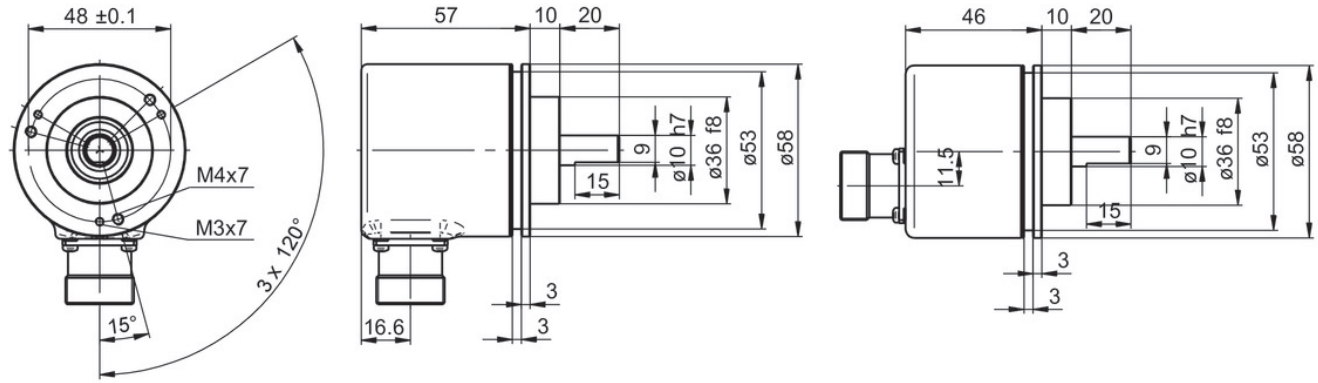
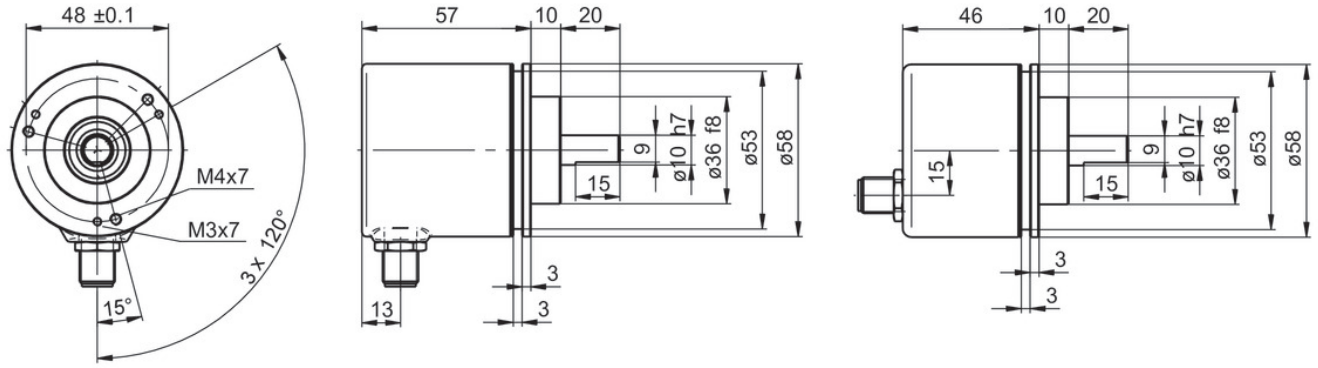
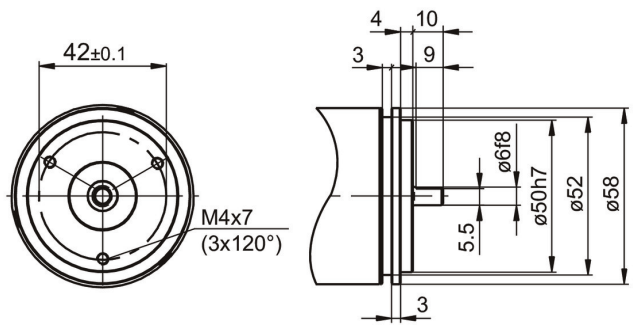
Dimensions



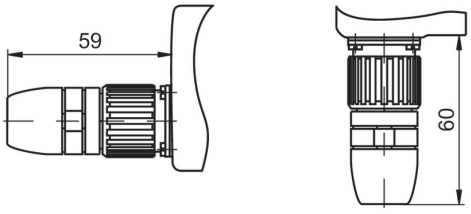
Clamping flange / connector M23



Clamping flange / connector M12



Synchro flange



Connector dimensions M23

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Ordering reference

	GI357	.	#	##	#	#####
Product						
	GI357					
Flange / Solid shaft						
Clamping flange / ø10 mm, IP 54			0			
Clamping flange / ø10 mm, IP 65			A			
Synchro flange / ø6 mm, IP 54			1			
Synchro flange / ø6 mm, IP 65			B			
Voltage supply / signals						
24 VDC / push-pull				70		
24 VDC / linedriver RS422				72		
Connection						
Connector M23, 12-pin, axial					C2	
Connector M23, 12-pin, radial					C3	
Connector 2 x M12, 5-pin axial					M2	
Connector 2 x M12, 5-pin radial					M3	
Pulse number						
1000						22
1024						23
1024(1)						23N
2500						30

(1) Version with zero pulse: Only with connector M23, 24 VDC / push-pull and 1024 pulses (zero pulse not safety related).
Other pulse numbers on request.

Accessories

Mounting accessories	
10117669	Eccentric fixing, single (Z 119.006)
10141255	Adaptor plate for clamping flange for modification into synchro flange (Z 119.013)
10117667	Mounting adaptor for encoders with synchro flange
10125051	Mounting adaptor for encoders with clamping flange
11034088	Adaptor plate for clamping flange, mounting by eccentric fixings (order separately) (Z 119.025)
10158124	Bearing flange for encoders with synchro flange (Z 119.035)