PRODUCT INFORMATION

SEK/SEL37, SEK/SEL52

FLEXIBLE, ROBUST, SAVES SPACE: SICK CAPACITIVE MOTOR FEEDBACK SYSTEMS

Motor feedback systems rotary HIPERFACE®

SICK
Sensor Intelligence.

FLEXIBLE, ROBUST, SAVES SPACE: SICK CAPACITIVE MOTOR FEEDBACK SYSTEMS

Product description

The SEK/SEL37 capacitive motor feedback systems are from two different automation worlds: On the one hand, the world of resolvers, where users require more power from absolute final encoders, such as with servo motors or feeder axes. On the other, the SEK/SEL37 devices are particularly interesting for servo motor manufacturers due to the flexibility in connection with the automation technology features. With 16 sine/cosine signals per revolution, this family represents the basic solution among the MFB systems with HIPERFACE® interface. The centerpiece of the product family is a bearing-free, capacitive sensor element. The holistic scanning system almost completely compensates for eccentricity errors and is very robust. Dispensing with consumable parts ensures that error sources are ruled out as much as possible. In addition, the motor feedback systems have high temperature resistance, which so far was the case with resolvers only. SEK/SEL37 motor feedback systems feature the globally accepted HIPERFACE® interface which is supported by numerous renowned drive manufacturers.

At a glance

- Motor feedback systems for the basic performance range
- 16 sine/cosine periods per revolution
- Absolute position with a resolution of 512 increments per revolution and 4,096 revolutions with the multiturn system
- Programming of the position value
- Electronic type label
- HIPERFACE® interface
- Installed version with tapered shaft and axial or radial connector outlet
- Conforms to RoHs

Your benefits

- The small dimension allows manufacturers of low-power and minimal-power motors to considerably reduce the size of their motors
- The SEK/SEL37 motor feedback systems are excellently suited for use under rough environmental conditions
- The capacitive principle of measurement with holistic scanning allows for high axial and radial tolerances
- The consistent mechanical components in SKS/SKM36 allow for a high degree of flexibility with various encoder systems

Additional information

→ www.mysick.com/en/SEK_SEL37

For more information, just enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples and much more.

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Detailed technical data

Performance

Number of sine/cosine periods per revolution	16
Total number of steps **Singleturn SEK** **Multiturn SEL**	 512 2,097,152
Measuring step	20 angular seconds at interpolation of the sine/cosine signals with e.g. 12 Bit
Integral non-linearity typ.	± 288 angular seconds (Error limits for evaluating sine/cosine period), typical values at nominal position ± 0.1 mm and + 20 °C
Differential non-linearity	± 144 angular seconds (Non-linearity within a sine/cosine period), typical values at nominal position ± 0.1 mm and + 20 °C
Operating speed	6,000 min^{-1}, up to which the absolute position can be reliably produced

Interfaces

Type of code for the absolute value	Binary
Code sequence	Increasing, for clockwise shaft rotation, looking in direction “A” (see dimensional drawing)
Interface signals	Process data channel SIN, REFSIN, COS, REFCOS: analog, differential Parameter channel RS 485: digital
Available memory area within E^2PROM 2048	1,792 Byte

Electrical data

Operating voltage range/supply Voltage	7 V DC ... 12 V DC
Recommended supply voltage	8 V DC
Operating power consumption (no load)	< 50 mA

Mechanical data

Shaft version	Tapered shaft
Dimensions	See dimensional drawing
Mass **Male connector, radial** **Male connector, axial**	 0.04 kg 0.05 kg
Moment of inertia of the rotor	1 gcm^2
Maximum operating speed	12,000 min^{-1}
Maximum angular acceleration	≤ 500,000 rad/s^2
Permissible shaft movement **radial** **axial**	 ± 0.15 mm ± 0.3 mm
Connection type	Male connector, 8-pin, radial Male connector, 8-pin, axial

Ambient conditions

Working temperature range **Singleturn SEK** **Multiturn SEL**	 –40 °C ... +115 °C –20 °C ... +115 °C
Storage temperature range	–50 °C ... +125 °C, without package
Relative humidity / Condensation	90 %, Condensation not permitted
Resistance to shocks	100 g / 10 ms , according to EN 60068-2-27
Resistance to vibration	50 g / 10 Hz ... 2,000 Hz / according to EN 60068-2-6
EMC	according to EN 61000-6-2 and EN 61000-6-3 [1]
Enclosure rating **Male connector, radial** **Male connectorr, axial**	 IP 20, built-on version, with mating connector inserted and closed cover (according to IEC 60529) IP 40, built-on version, with mating connector inserted and closed cover (according to IEC 60529)

[1] The EMC according to the standards quoted is achieved when the motor feedback system is mounted in an electrically conductive housing, which is connected to the central earthing point of the motor controller via a cable screen. Users must perform their own tests when other screen designs are used.

Ordering information

Other models available at www.mysick.com/en/SEK_SEL37

Data acquisition Singleturn

- **Available memory area in E²PROM 2048:** 1,792 byte
- **Electrical interface:** HIPERFACE®
- **Programmable/configurable:** ✔
- **Mechanical interface:** tapered shaft

Connection type	Model name	Part no.
Male connector, radial	SEK37-HFB0-K02	1037378
Male connector, axial	SEK37-HFA0-K02	1037376

Data acquisition Multiturn

- **Available memory area in E²PROM 2048:** 1,792 byte
- **Electrical interface:** HIPERFACE®
- **Programmable/configurable:** ✔
- **Mechanical interface:** tapered shaft

Connetion type	Model name	Part no.
Male connector, radial	SEL37-HFB0-K02	1037379
Male connector, axial	SEL37-HFA0-K02	1037377

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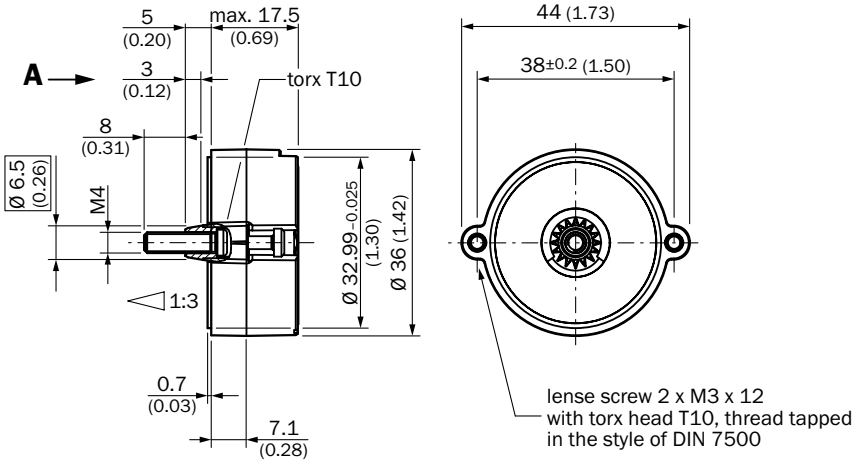
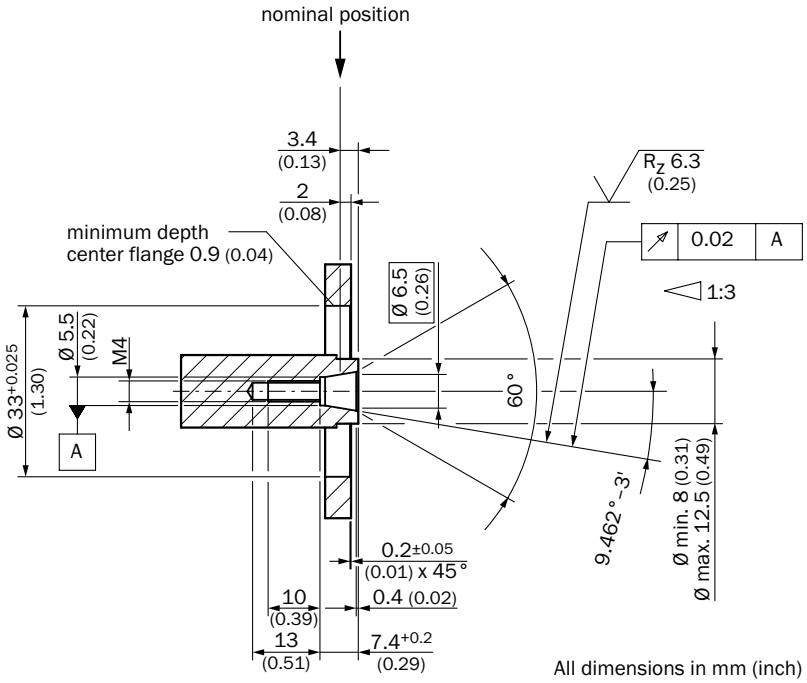
Dimensional drawings (Dimensions in mm (inch))

Male connector, radial

General tolerances as per ISO 2768-mk



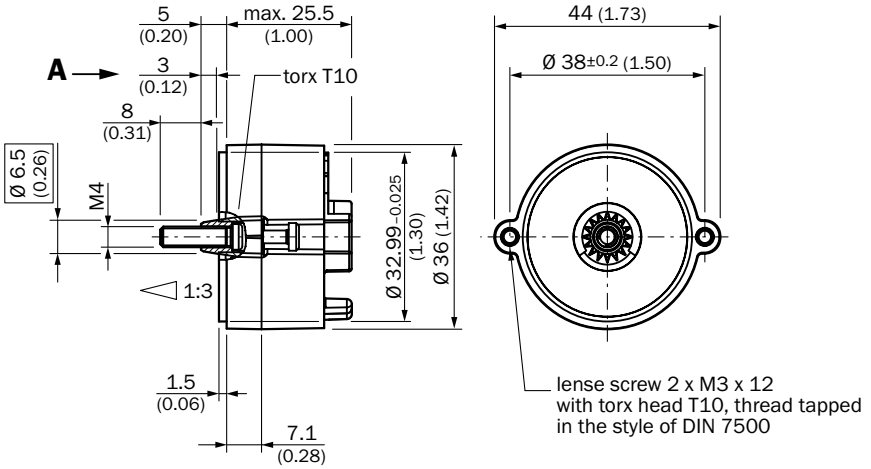
Mounting suggestion



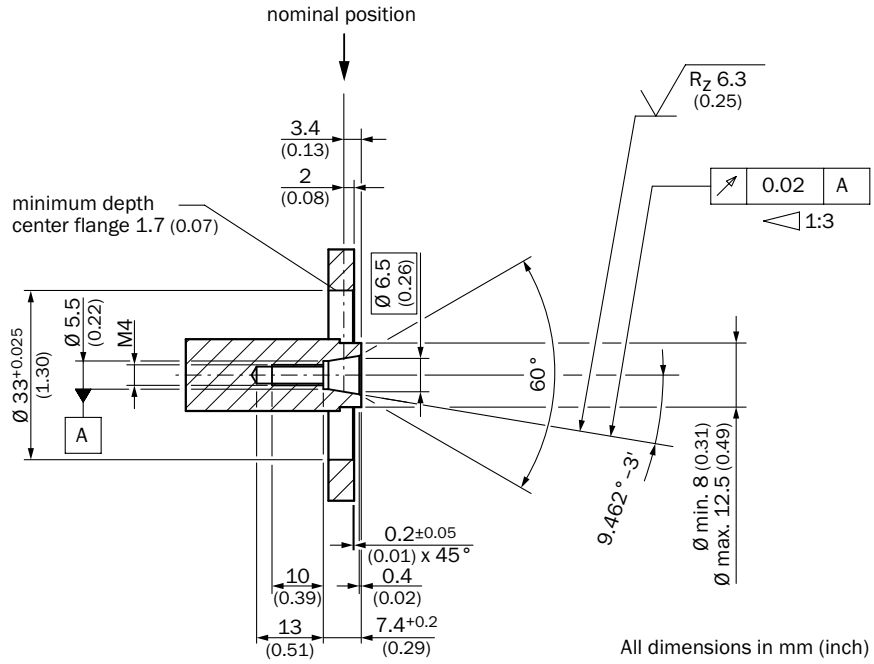
All dimensions in mm (inch)

Male connector, axial

General tolerances as per ISO 2768-mk



Mounting suggestion



All dimensions in mm (inch)

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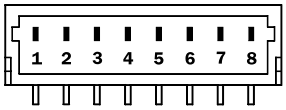
Connection type

View of the plug-in face



Pin	Signal	Farbe der Adern	Erklärung
1	U_S	red	7 ... 12 V Supply voltage
2	+ SIN	white	Process data channel
3	REFSIN	brown	Process data channel
4	+ COS	pink	Process data channel
5	REFCOS	black	Process data channel
6	GND	blue	Ground connection
7	Daten +	grey or yellow	RS-485-parameter channel
8	Daten -	green or purple	RS-485-parameter channel

The GND-(0V) connection of the supply voltage has no connection to the housing.

Accessories

Programming and configuration tools

Brief description	Type	Part no.
sVip® LAN programming tool for all motor feedback systems	PGT-11-S	1057324
sVip® WLAN programming tool for all motor feedback systems	PGT-11-S	1067474

Plug connectors and cables

Connecting cable (female connector-open)

Brief description	Type	Part no.
Female connector, JST, 8-pin, straight, cable, HIPERFACE®, unshielded, 0.2 m	DOL-0J08-G0M2XB6	2031086

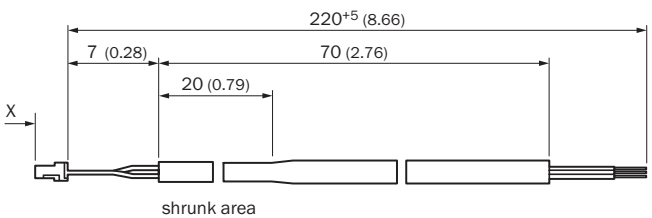
Cable (open-open)

Brief description	Type	Part no.
Cable, HIPERFACE®, drag chain use, PUR halogen-free, shielded,	LTG-2708-MW	6028361

Dimensional drawings, accessories (dimensions in mm (inch))

Plug connectors and cables connecting cable (female connector-open)

DOL-0J08-G0M2XB6



FLEXIBLE, ROBUST, SAVES SPACE: SICK CAPACITIVE MOTOR FEEDBACK SYSTEMS

HIPERFACE® by SICK

Additional information

Product description

The SEK/SEL52 capacitive motor feedback systems are from two different automation worlds: On the one hand, the world of resolvers, where users require more power from absolute position encoders, such as with servo motors or feeder axes. On the other, the SEK/SEL52 devices are particularly interesting for servo motor manufacturers due to the flexibility in connection with the automation technology features. With 16 sine/cosine signals per revolution, this family represents the basic solution among the motor feedback systems with HIPERFACE® interface. The centerpiece of the product family is a bearing-free, capacitive sensor element. The holistic scanning system almost completely compensates for eccentricity errors and is very robust. Dispensing with consumable parts ensures that error sources are ruled out as much as possible. In addition, the motor feedback systems have high temperature resistance, which so far was the case with resolvers only. SEK/SEL52 motor feedback systems feature the globally accepted HIPERFACE® interface which is supported by numerous renowned drive manufacturers.

At a glance

- Motor feedback systems for the basic performance range
- 16 sine/cosine periods per revolution
- Absolute position with a resolution of 512 increments per revolution and 4,096 revolutions with the multiturn system
- Programming of the position value
- Electronic type label
- HIPERFACE® interface
- Various shaft variants: Hollow and tapered shaft and as shoulder clamping
- Conforms to RoHs

Your benefits

- The small dimension allows manufacturers of low-power and minimal-power motors to considerably reduce the size of their motors
- The SEK/SEL52 motor feedback systems are excellently suited for use under rough environmental conditions
- The capacitive principle of measurement with holistic scanning allows for high axial and radial tolerances
- Due to the resolver-compatible mechanical components of the SEK/SEL52 motor feedback systems the encoders can be mounted immediately

→ www.mysick.com/en/SEK_SEL52

For more information, just enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples and much more.

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Detailed technical data

Performance

Number of sine/cosine periods per revolution	16
Total number of steps	
Singleturn SEK	512
Multiturn SEL	2,097,152
Measuring step	20 angular seconds at interpolation of the sine/cosine signals with e.g. 12 Bit
Integral non-linearity typ.	± 288 angular seconds (Error limits for evaluating sine/cosine period), typical values at nominal position ± 0.1 mm and + 20 °C
Differential non-linearity	± 72 angular seconds (Non-linearity within a sine/cosine period), typical values at nominal position ± 0.1 mm and + 20 °C
Operating speed	6,000 min^{-1}, up to which the absolute position can be reliably produced

Interfaces

Type of code for the absolute value	Binary
Code sequence	Increasing, for clockwise shaft rotation, looking in direction “A” (see dimensional drawing)
Interface signals	Process data channel SIN, REFSIN, COS, REFCOS: analog, differential Parameter channel RS 485: digital
Available memory area	
within E²PROM 2048	1,792 Byte

Electrical data

Operating voltage range/supply Voltage	7 V DC ... 12 V DC
Recommended supply voltage	8 V DC
Operating power consumption (no load)	< 50 mA

Mechanical data

Shaft version	Tapered shaft Hollow shaft Hollow shaft with shoulder clamping
Dimensions	See dimensional drawing
Mass	
Tapered shaft	0.04 kg (without cover)
Hollow shaft with shoulder clamping	0.07 kg (with cover part no. 2048234)
Hollow shaft	0.06 kg (with cover part no. 2048232)
Moment of inertia of the rotor	
Tapered shaft	7 gcm^2
Hollow shaft with shoulder clamping	6 gcm^2
Hollow shaft	6 gcm^2
Maximum operating speed	
Singleturn SEK	12,000 min^{-1}
Multiturn SEL	10,000 min^{-1}
Maximum angular acceleration	≤ 500,000 rad/s^2
Permissible shaft movement	
radial	± 0.15 mm
axial	± 0.5 mm
Connection type	Connector, 8-pin, axial

Ambient conditions

Working temperature range	
Singleturn SEK	–40 °C ... +115 °C
Multiturn SEL	–20 °C ... +115 °C
Storage temperature range	–50 °C ... +125 °C, without package
Relative humidity / Condensation	90 %, Condensation not permitted
Resistance to shocks	100 g / 10 ms , according to EN 60068-2-27
Resistance to vibration	50 g / 10 Hz ... 2,000 Hz / according to EN 60068-2-6
EMC	
Tapered shaft	according to EN 61000-6-2 and EN 61000-6-3 [1]
Hollow shaft with shoulder clamping	according to EN 61000-6-2 and EN 61000-6-3 [1]
Hollow shaft	according to EN 61000-6-2 and EN 61000-6-3 [2]
Enclosure rating	IP 40, built-on version, with mating connector inserted and closed cover 2048234 (according to IEC 60529)[3]

[1] The EMC according to the standards quoted is achieved when the motor feedback system is mounted in an electrically conductive housing, which is connected to the central earthing point of the motor controller via a cable screen and by using the cover (part no. 2048234). Users must perform their own tests when other screen designs are used.

[2] The EMC according to the standards quoted is achieved when the motor feedback system is mounted in an electrically conductive housing, which is connected to the central earthing point of the motor controller via a cable screen and by using the cover (part no. 2048232). Users must perform their own tests when other screen designs are used.

[3] IP 20, in hollow shaft, built-on version, with mating connector inserted and opened cover 2048232 (according to IEC 60529)

Ordering information

Other models available at www.mysick.com/en/SEK_SEL52

Data acquisition Singleturn

- **Available memory area in E²PROM 2048:** 1,792 byte
- **Connection type:** male connector
- **Electrical interface:** HIPERFACE®
- **Programmable/configurable:** ✔

Mechanical interface	Model name	Part no.
Tapered shaft	SEK52-HFA0-K02	1037368
Hollow shaft	SEK52-HNA0-K02	1037370
Hollow shaft with shoulder clamping	SEK52-H1A0-K02	1037369

Data acquisition Multiturn

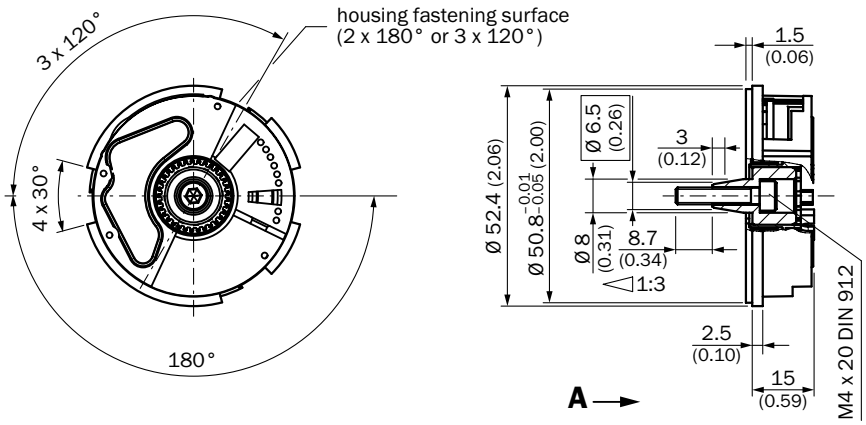
- **Available memory area in E²PROM 2048:** 1,792 byte
- **Connection type:** male connector
- **Electrical interface:** HIPERFACE®
- **Programmable/configurable:** ✔

Mechanical interface	Model name	Part no.
Tapered shaft	SEL52-HFA0-K02	1037371
Hollow shaft	SEL52-HNA0-K02	1037373
Hollow shaft with shoulder clamping	SEL52-H1A0-K02	1037372

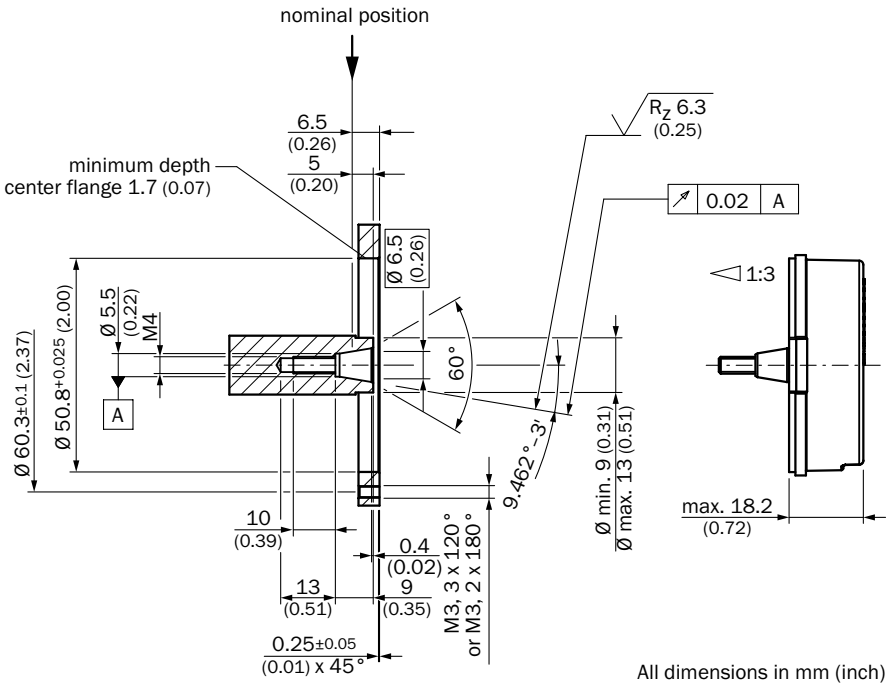
Dimensional drawings (Dimensions in mm (inch))

Tapered shaft

General tolerances as per ISO 2768-mk



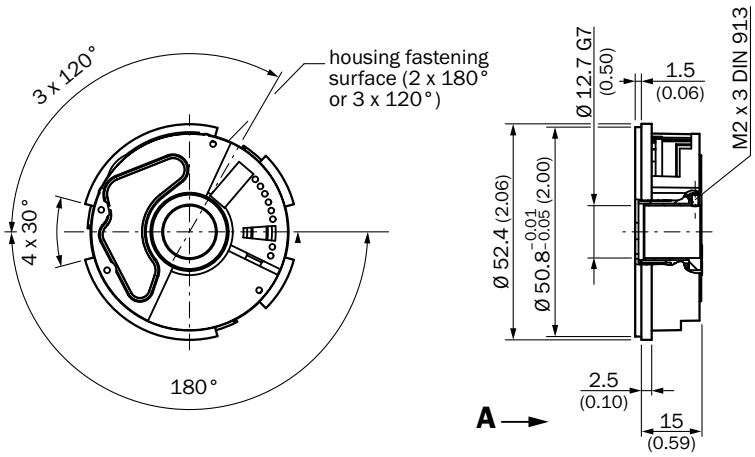
Mounting suggestion



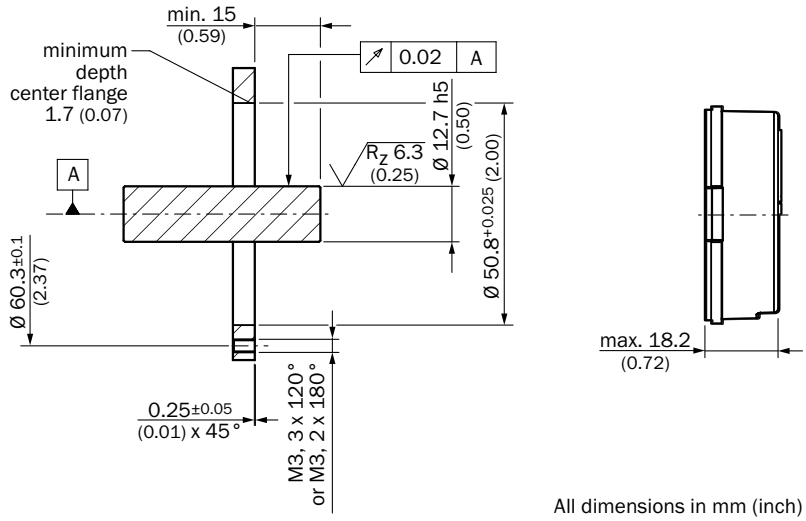
All dimensions in mm (inch)

Hollow shaft

General tolerances as per ISO 2768-mk



Mounting suggestion



All dimensions in mm (inch)

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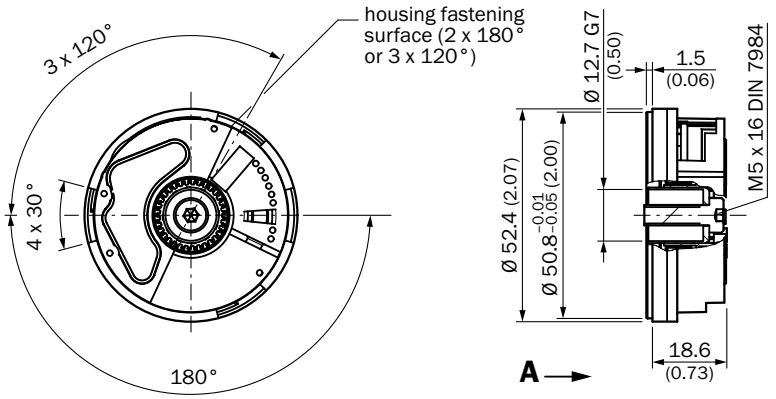
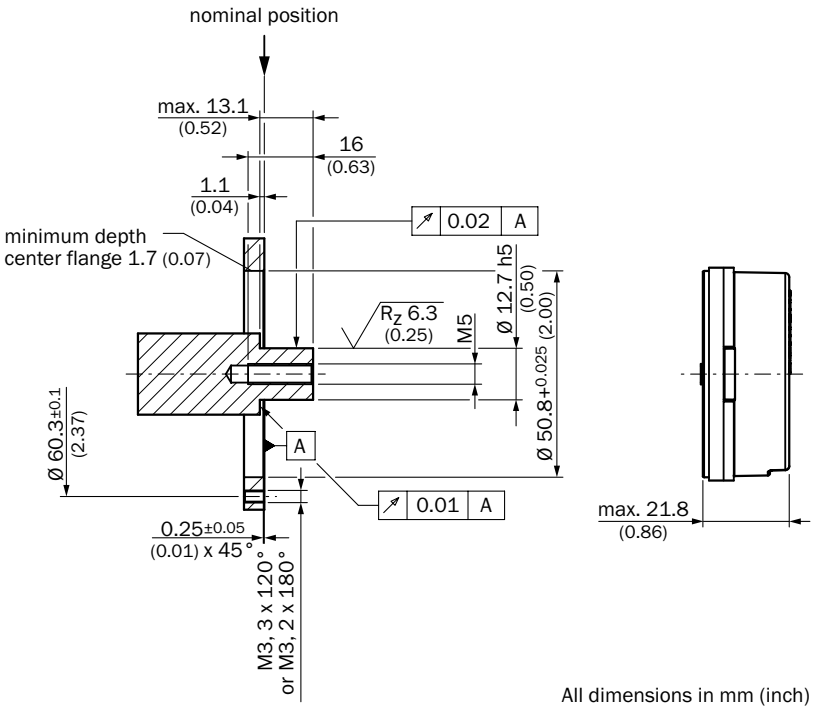
Hollow shaft

General tolerances as per ISO 2768-mk



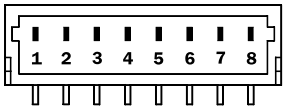
Mounting suggestion



All dimensions in mm (inch)

Connection type

View of the plug-in face



Pin	Signal	Farbe der Adern	Erklärung
1	U_S	red	7 ... 12 V Supply voltage
2	+ SIN	white	Process data channell
3	REFSIN	brown	Process data channe
4	+ COS	pink	Process data channe
5	REFCOS	black	Process data channe
6	GND	blue	Ground connection
7	Daten +	grey or yellow	RS-485-parameter channel
8	Daten -	green or purple	RS-485-parameter channe

The GND-(0V) connection of the supply voltage has no connection to the housing.

Accessories

Programming and configuration tools

Brief description	Type	Part no.
sVip® LAN programming tool for all motor feedback systems	PGT-11-S	1057324
sVip® WLAN programming tool for all motor feedback systems	PGT-11-S	1067474

Device protection (mechanical)

Protective housings/pipes

Brief description	Type	Part no.
Cover, closed for tapered shaft or collar clamping	BEF-GA-SEY52BS1	2048234
Open cover for SEK/SEL52 with hollow shaft	BEF-GA-SEY52TS1	2048232

Other mounting accessories

Mounting tools

Brief description	Type	Part no.
Assembyl tool SEK52/SEL52	BEF-MW-SEY52	2048235

Servo clamps

Figure	Brief description	Type	Part no.
	Servo clamps, small, for servo flange (clamping claws, mounting eccentric), (3 pcs), without mounting hardware	BEF-WK-RESOL	2039082
	Servo clamp for shoulder clamping, without mounting hardware	BEF-WK-RESOL1	2048827

Plug connectors and cables

Connecting cable (female connector-open)

Brief description	Type	Part no.
Female connector, JST, 8-pin, straight, cable, HIPERFACE®, unshielded, 0.2 m	DOL-0J08-G0M2XB6	2031086

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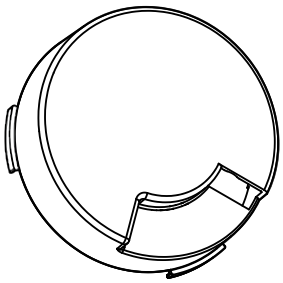
Cable (open-open)

Brief description	Type	Part no.
Cable,HIPERFACE®, drag chain use, PUR halogen-free, shielded	LTG-2708-MW	6028361

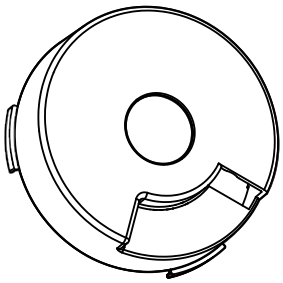
Dimensional drawings, accessories (dimensions im mm (inch))

Device protection (mechanical) Protective housings/pipes

BEF-GA-SEY52BS1

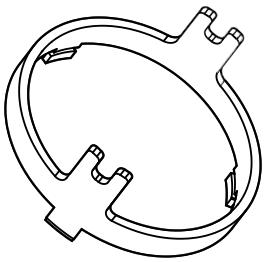


BEF-GA-SEY52TS1



Other mounting accessories Mounting tools

BEF-MW-SEY52



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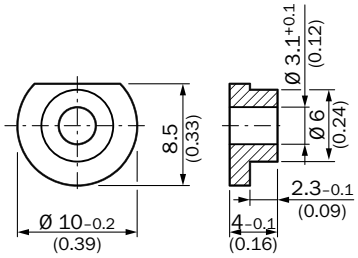
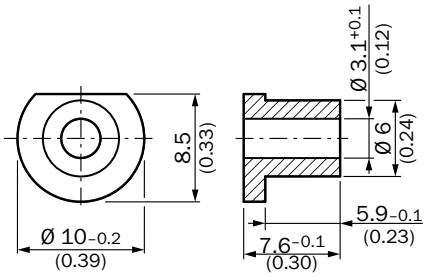
Other mounting accessories servoclamps

BEF-WK-RESOL

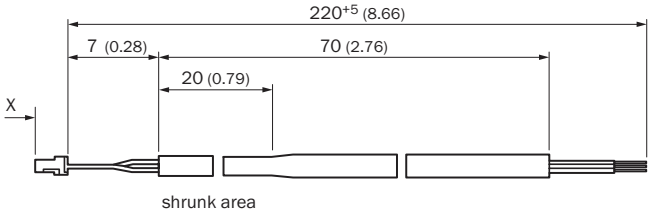


BEF-WK-RESOL1



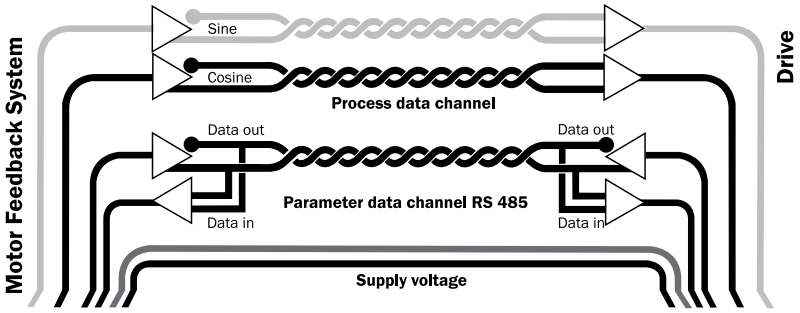
Plug connectors and cables Connecting cable (female connector-open)

DOL-0J08-G0M2XB6

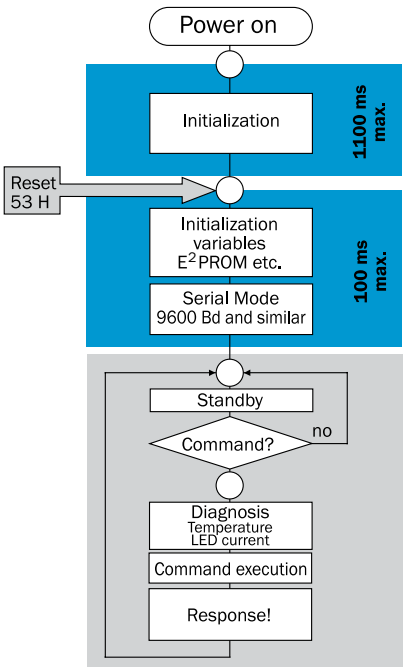


Electrical interface

- Secure data transmission
- High information content
- Electronic type label
- Just 8 leads
- Bus-compatible parameter channel
- Process channel in real time



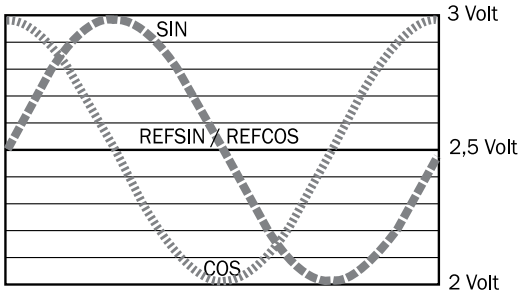
HIPERFACE® Starting time



CAUTION:
No **RS485 communication** is possible during the phases highlighted in blue

Signal specification of the process channel

Signal diagram for clock-wise rotation of shaft looking in direction “A”



1 period = 360° : 16

Access to the process data used for speed control, i.e. to the sine and cosine signals, is practically always “online”. When the supply voltage is applied, the speed controller has access to this information at any time. Sophisticated technology guarantees stable amplitudes of the analogue signals across all specified environmental conditions, with a maximum variation of only ± 20%.

Characteristics applicable to all stated ambient conditions	
Signal	**Values/unit**
Signal peak, peak V_{pp} of SIN, COS	0.8 ... 1.2 V
Signal offset REFSIN, REFCOS	2.2 ... 2.8 V

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Type-specific settings	SEK37/SEK52	SEL37/SEL52
Type ID (command 52h)	42h	47h
Free E²PROM [bytes]	128/1,792	128/1,792
Address	40h	40h
Mode_485[1)2)]	E4h	E4h
Codes 0 to 3	55h	55h
Counter	0	0

Overview of supported commands			SEK37/SEK52	SEL37/SEL52
Command byte	**Function**	**Code 0 [3)]**	**Comment**	**Comment**
42h	Read position (5 bits per sine/cosine period)		9 bits	21 bits
43h	Set position	■		
44h	Read analog value		Channel number F0H[4)] and 48h	Channel number F0H[4)] and 48h
			Temperature [°C]	Temperature [°C]
46h	Read counter			
47h	Increase counter			
49h	Delete counter	■		
4Ah	Read data			
4Bh	Store data			
4Ch	Determine status of a data field			
4Dh	Create data field			
4Eh	Determine available memory area			
4Fh	Change access code			
50h	Read encoder status			
52h	Read out type label		Encoder type=42h	Encoder type=47h
53h	Encoder reset			
55h	Allocate encoder address	■		
56h	Read serial number and program version			

[1)] Default interface settings can not be changed (e.g. baudrate, timeout or parity bit)

[2)] When using the motor feedback systems SEK|SEL37 and SEK|SEL52, please ensure that the controller's auto-baud function is not enabled, since these motor feedback systems compensate for minor variations when transmitting at a baud rate of 9600.

[3)] The commands thus labelled include the parameter "Code 0". Code 0 is a byte inserted into the protocol, for additional safeguarding of vital system parameters against accidental overwriting. When shipped, "Code 0" = 55h.

[4)] Temperature compatible with SCx (encoder temperature [°C] *2.048 – 40)

Overview of status messages				
	Status code	**Description**	**SEK37/52**	**SEL37/52**
Error type	00h	The encoder has not detected any faults	■	■
Initialization	01h	Incorrect alignment data	■	■
	02h	Incorrect internal angular offset	■	■
	03h	Data field partitioning table destroyed	■	■
	04h	Analog limit values not available	■	■
	05h	Internal I^2C bus inoperative	■	■
	06h	Internal checksum error	■	■
Protocol	07h	Encoder reset occurred as a result of program monitoring	■	■
	09h	Parity error	■	■
	0Ah	Checksum of transmitted data is incorrect	■	■
	0Bh	Unknown command code	■	■
	0Ch	Number of transmitted data is incorrect	■	■
	0Dh	Transmitted command argument is not allowed	■	■
Data	0Eh	The selected data field may not be written to	■	■
	0Fh	Incorrect access code	■	■
	10h	Size of specified data field cannot be changed	■	■
	11h	Specified word address lies outside the data field	■	■
	12h	Access to non-existent data field	■	■
Position	1Fh	Speed too high, no position formation possible	■	■
	20h	Singleturn position unreliable	■	■
	21h	Multiturn position error		■
	22h	Multiturn position error		■
	23h	Multiturn position error		■
Other	1Ch	Value monitoring of the analog signals (process data)	■	■
	1Eh	Encoder temperature critical	■	■
	08h	Counter overflow	■	■

For more information on the interface see HIPERFACE® - description, part no. 8010701

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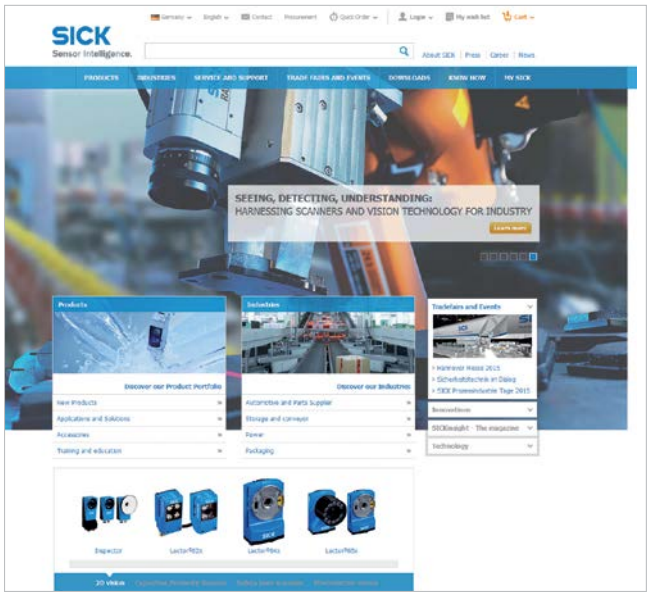

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