

## SEK90, SEK160, SEK260

# THE ROBUST TURN & PLAY SOLUTION FOR DIRECT DRIVES WITH HIPERFACE® INTERFACE

SICK Sensor Intelligence.

Motor feedback system rotary HIPERFACE®

## THE ROBUST TURN & PLAY SOLUTION FOR DIRECT DRIVES WITH HIPERFACE® INTERFACE



HIPERFACE®

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#### Product description

The trend is clear: the future belongs to compact and robust direct drives. With the SEK90 hollow-shaft motor feedback systems SICK has perfected the concept of the direct drive. The SEK90 with holistic scanning can be mounted directly onto the drive shaft without any mounting tools. A toothed belt and transmission elements such as gearbox or coupling are no longer necessary. The simplified, compact design is wear-free

#### At a glance

- HIPERFACE<sup>®</sup> motor feedback systems for large hollow shaft and torque motors
- 64 sine/cosine periods per revolution
- Absolute position with a resolution of 2,048 increments per revolution
- Programming of the position value and electronic type label

#### Your benefits

- Direct seat on the drive shaft renders transmission elements such as toothed belt or coupling superfluous
- The simplified, compact design is wear-free, thus helping to reduce maintenance costs
- Measuring accuracy is no longer affected by magnetic fields thanks to the capacitive measuring principle

and hence helps to reduce maintenance costs. Since no ball bearings are used either, heat generation is drastically reduced. The minimal dimensions allow for reduced space requirements and also make the device lighter, thus allowing for efficient space utilization. The SEK90 motor feedback systems were developed specifically for direct drives and support the advantages of direct drives all along the line.

- HIPERFACE® interface
- Turn & play for simple assembly without tools
- High resistance to shock and vibration due to holistic scanning
- · Bearingless motor feedback system
- Time-saving mounting, since no mounting tools are required: simply fit it on, turn it and start
- The minimal dimensions enable you to save space and weight, allowing for a more efficient use of space

#### → www.mysick.com/en/SEK90

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.



#### Detailed technical data

#### Performance

Number of sine/cosine periods per revolution	64
Total number of steps	2,048 via RS485
Measuring step	5 angular seconds at interpolation of the sine/cosine signals with e.g. 12 Bit
Integral non-linearity typ.	$\pm$ 72 angular seconds (Error limits for evaluating sine/cosine period), typical values at nominal position $\pm$ 0,1 mm and + 20 $^{\circ}\text{C}$
Differential non-linearity	$\pm$ 45 angular seconds (Non-linearity within a sine/cosine period), typical values at nominal position $\pm$ 0,1 mm and + 20 $^{\circ}\text{C}$
Working speed	3,000 min <sup>-1</sup> , 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 <sup>2</sup> PROM 2048	1,792 Byte
Latency	100 µs

#### Electrical data

Operating voltage range/supply voltage	7 V DC 12 V DC
Recommended supply voltage	8 V DC
Operating power consumption (no load)	150 mA

#### Mechanical data

Shaft version	Through hollow shaft			
Dimensions	ee dimensional drawing			
Mass	0.13 kg			
Moment of inertia of the rotor	3,4 x 10 <sup>-5</sup> kgm <sup>2</sup>			
Maximum operating speed	3,000 min <sup>1</sup>			
Maximum angular acceleration	≤ 50,000 rad/s²			
Permissible shaft movement, radial, static	± 0.2 mm <sup>1)</sup>			
Permissible shaft movement, radial, dynamic	± 0.05 mm <sup>1)</sup>			
Permissible axial shaft movement	± 0.5 mm <sup>1)</sup>			
Connection type	Connector, 8-pin			

<sup>1)</sup> Relative to the installation position, as described in the assembly instructions (order nr. 8013609) and in the proposed customer fitting.

#### Ambient conditions

Working temperature range	-30 °C +115 °C
Storage temperature range	-50 °C +125 °C, without package
Relative humidity / Condensation	90 %, Condensation not permitted
Resistance to shocks	100 g / 6 ms / according to EN 60068-2-27
Resistance to vibration	30 g / 10 Hz 2,000 Hz / according to EN 60068-2-6
EMC	(according to EN 61000-6-2 and EN 61000-6-3) $^{\mbox{\tiny 1}\mbox{\tiny }}$
Enclosure rating	IP 40, with mating connector inserted and closed cover (according to IEC 60529)

<sup>1)</sup> 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/SEK90

#### Data acquisition Singleturn

Connection type	Model name	Part no.
Male connector	SEK90-HN050AK02	1038271

#### Dimensional drawings (Dimensions in mm (inch))



#### Assembly note



#### Connection type

View of the plug-in face

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Pin	Signal	Colour of wires	Explanation
1	U <sub>s</sub>	red	Supply voltage 7 12 V
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	Data +	grey or yellow	RS485 parameter channel
8	Data -	green or purple	RS485 parameter channel

#### Accessories

#### Programming and configuration tools

Accessory category	Brief description	Туре	Part no.
Other accessories	Programming tool for HIPERFACE® motor feedback systems	PGT-03-S	1034252

#### Plug connectors and cables

Connecting cable (female connector-open)

Accessory category	Brief description	Туре	Part no.
Connection systems	Female connector, JST, 8-pin, straight, cable, HIPERFACE <sup>®</sup> , unshielded, 0.2 m	DOL-0J08-G0M2XB6	2031086
	Female connector, JST, 8-pin, straight, cable, HIPERFACE®, shielded, 0.5 m	DOL-0J08-G0M5XB6	2056250

#### Cable (open-open)

Accessory category	Brief description	Туре	Part no.
Connection systems	Cable, cable, HIPERFACE®, HIPERFACE®, drag chain use, PUR halogen-free, shielded	LTG-2708-MW	6028361

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

DOL-0J08-G0M2XB6



#### DOL-0J08-G0M5XB6



## THE ROBUST TURN & PLAY SOLUTION FOR DI-RECT DRIVES WITH HIPERFACE<sup>®</sup> INTERFACE



## 

#### Product description

The trend is clear: the future belongs to compact and robust direct drives. With the SEK160 hollow-shaft motor feedback systems SICK has perfected the concept of the direct drive. The SEK160 with holistic scanning can be mounted directly onto the drive shaft without any mounting tools. A toothed belt and transmission elements such as gearbox or coupling are no longer necessary. The simplified, compact

#### At a glance

- HIPERFACE<sup>®</sup> motor feedback systems for large hollow shaft and torque motors
- 128 sine/cosine periods per revolution
- Absolute position with a resolution of 4,096 increments per revolution

#### Your benefits

- Direct seat on the drive shaft renders transmission elements such as toothed belt or coupling superfluous
- The simplified, compact design is wear-free, thus helping to reduce maintenance costs
- Measuring accuracy is no longer affected by magnetic fields thanks to the capacitive measuring principle

design is wear-free and hence helps to reduce maintenance costs. Since no ball bearings are used either, heat generation is drastically reduced. The minimal dimensions allow for reduced space requirements and also make the device lighter, thus allowing for efficient space utilization. The SEK160 motor feedback systems were developed specifically for direct drives and support the advantages of direct drives all along the line.

- Programming of the position value and electronic type label
- HIPERFACE® interface
- Turn & play for simple assembly without tools
- High resistance to shock and vibration due to holistic scanning
- Bearingless motor feedback system
- Time-saving mounting, since no mounting tools are required: simply fit it on, turn it and start
- The minimal dimensions enable you to save space and weight, allowing for a more efficient use of space.

#### → www.mvsick.com/en/SEK160





#### Detailed technical data

#### Performance

Number of sine/cosine periods per revolution	128
Total number of steps	4,096 via RS485
Measuring step	$2.5$ angular seconds at interpolation of the sine/cosine signals with e.g. 12 Bit $% 10^{-1}$
Integral non-linearity typ.	$\pm$ 36 angular seconds (Error limits for evaluating sine/cosine period), typical values at nominal position $\pm$ 0,1 mm and + 20 $^{\circ}\text{C}$
Differential non-linearity	$\pm$ 21 angular seconds (Non-linearity within a sine/cosine period), typical values at nominal position $\pm$ 0,1 mm and + 20 °C
Working speed	1,500 min <sup>-1</sup> , 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 <sup>2</sup> PROM 2048	1,792 Byte
Latency	100 µs

#### Electrical data

Operating voltage range/supply voltage	7 V DC 12 V DC
Recommended supply voltage	8 V DC
Operating power consumption (no load)	150 mA

#### Mechanical data

Shaft version	Through hollow shaft
Dimensions	See dimensional drawing
Mass	0.27 kg
Moment of inertia of the rotor	28,6 x 10 <sup>-5</sup> kgm <sup>2</sup>
Maximum operating speed	1,500 min <sup>-1</sup>
Maximum angular acceleration	≤ 28,000 rad/s <sup>2</sup>
Permissible shaft movement, radial, static	± 0.2 mm <sup>1)</sup>
Permissible shaft movement, radial, dynamic	± 0.05 mm <sup>1)</sup>
Permissible axial shaft movement	± 0.5 mm <sup>1)</sup>
Connection type	Connector, 8-pin

<sup>1)</sup> Relative to the installation position, as described in the assembly instructions (order nr. 8013609) and in the proposed customer fitting.

#### Ambient conditions

Working temperature range	-30 °C +115 °C
Storage temperature range	-50 °C +125 °C, without package
Relative humidity / Condensation	90 %, Condensation not permitted
Resistance to shocks	100 g / 6 ms / according to EN 60068-2-27
Resistance to vibration	30 g / 10 Hz 2,000 Hz / according to EN 60068-2-6
EMC	(according to EN 61000-6-2 and EN 61000-6-3) <sup>1)</sup>
Enclosure rating	IP 40, with mating connector inserted and closed cover (according to IEC 60529)

<sup>1)</sup> 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/SEK160

#### Data acquisition Singleturn

Connection type	Model name	Part no.
Male connector	SEK160-HN110AK02	1038272

#### Dimensional drawings (Dimensions in mm (inch))







#### Connection type

#### View of the plug-in face

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Pin	Signal	Colour of wires	Explanation
1	U <sub>s</sub>	red	Supply voltage 7 12 V
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	Data +	grey or yellow	RS485 parameter channel
8	Data -	green or purple	RS485 parameter channel

#### Accessories

#### Programming and configuration tools

Accessory category	Brief description	Туре	Part no.
Other accessories	Programming tool for HIPERFACE® motor feedback systems	PGT-03-S	1034252

#### Plug connectors and cables

Connecting cable (female connector-open)

Accessory category	Brief description	Туре	Part no.
	Female connector, JST, 8-pin, straight, cable, HIPERFACE®, unshielded, 0.2 m	DOL-0J08-G0M2XB6	2031086
Connection systems	Female connector, JST, 8-pin, straight, cable, HIPERFACE®, shielded, 0.5 m	DOL-0J08-G0M5XB6	2056250

Cable (open-open)

Accessory category	Brief description	Туре	Part no.
Connection systems	Cable, cable, HIPERFACE®, HIPERFACE®, drag chain use, PUR halogen-free, shielded	LTG-2708-MW	6028361

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

DOL-0J08-G0M2XB6



#### DOL-0J08-G0M5XB6



## THE ROBUST TURN & PLAY SOLUTION FOR DI-RECT DRIVES WITH HIPERFACE<sup>®</sup> INTERFACE



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#### Product description

The trend is clear: the future belongs to compact and robust direct drives. With the SEK260 hollow-shaft motor feedback systems SICK has perfected the concept of the direct drive. The SEK260 with holistic scanning can be mounted directly onto the drive shaft without any mounting tools. A toothed belt and transmission elements such as gearbox or coupling are no longer necessary. The simplified, compact

#### At a glance

- HIPERFACE<sup>®</sup> motor feedback systems for large hollow shaft and torque motors
- 256 sine/cosine periods per revolution
- Absolute position with a resolution of 8,192 increments per revolution

#### Your benefits

- Direct seat on the drive shaft renders transmission elements such as toothed belt or coupling superfluous
- The simplified, compact design is wear-free, thus helping to reduce maintenance costs
- Measuring accuracy is no longer affected by magnetic fields thanks to the capacitive measuring principle

design is wear-free and hence helps to reduce maintenance costs. Since no ball bearings are used either, heat generation is drastically reduced. The minimal dimensions allow for reduced space requirements and also make the device lighter, thus allowing for efficient space utilization. The SEK260 motor feedback systems were developed specifically for direct drives and support the advantages of direct drives all along the line.

- Programming of the position value and electronic type label
- HIPERFACE® interface
- Turn & play for simple assembly without tools
- High resistance to shock and vibration due to holistic scanning
- Bearingless motor feedback system
- Time-saving mounting, since no mounting tools are required: simply fit it on, turn it and start
- The minimal dimensions enable you to save space and weight, allowing for a more efficient use of space

#### → www.mvsick.com/en/SEK260





#### Detailed technical data

#### Performance

Number of sine/cosine periods per revolution	256
Total number of steps	8,192 via RS485
Measuring step	1.3 angular seconds at interpolation of the sine/cosine signals with e.g. 12 Bit
Integral non-linearity typ.	$\pm$ 27 angular seconds (Error limits for evaluating sine/cosine period), typical values at nominal position $\pm$ 0,1 mm and + 20 $^{\circ}\text{C}$
Differential non-linearity	$\pm$ 10 angular seconds (Non-linearity within a sine/cosine period), typical values at nominal position $\pm$ 0,1 mm and + 20 $^{\circ}\text{C}$
Working speed	750 min <sup>-1</sup> , 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 <sup>2</sup> PROM 2048	1,792 Byte
Latency	100 µs

#### Electrical data

Operating voltage range/supply voltage	7 V DC 12 V DC
Recommended supply voltage	8 V DC
Operating power consumption (no load)	150 mA

#### Mechanical data

Shaft version	Through hollow shaft
Dimensions	See dimensional drawing
Mass	0.6 kg
Moment of inertia of the rotor	3,1 x 10 <sup>-3</sup> kgm <sup>2</sup>
Maximum operating speed	750 min <sup>-1</sup>
Maximum angular acceleration	≤ 23,000 rad/s <sup>2</sup>
Permissible shaft movement, radial, static	± 0.2 mm <sup>1)</sup>
Permissible shaft movement, radial, dynamic	± 0.05 mm <sup>1)</sup>
Permissible axial shaft movement	± 0.5 mm <sup>1)</sup>
Connection type	Connector, 8-pin

<sup>1)</sup> Relative to the installation position, as described in the assembly instructions (order nr. 8013609) and in the proposed customer fitting.

#### Ambient conditions

Working temperature range	-30 °C +115 °C
Storage temperature range	-50 °C +125 °C, without package
Relative humidity / Condensation	90 %, Condensation not permitted
Resistance to shocks	100 g / 6 ms / according to EN 60068-2-27
Resistance to vibration	30 g / 10 Hz 2,000 Hz / according to EN 60068-2-6
EMC	(according to EN 61000-6-2 and EN 61000-6-3) $^{\scriptscriptstyle 1\!\!\!\!\!\!)}$
Enclosure rating	IP 40, with mating connector inserted and closed cover (according to IEC 60529)

<sup>1)</sup> 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/SEK260

#### Data acquisition Singleturn

Connection type	Model name	Part no.
Male connector	SEK260-HN210AK02	1053596

#### Dimensional drawings (Dimensions in mm (inch))



#### Assembly note



#### Connection type

View of the plug-in face

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Pin	Signal	Colour of wires	Explanation
1	U <sub>s</sub>	red	Supply voltage 7 12 V
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	Data +	grey or yellow	RS485 parameter channel
8	Data -	green or purple	RS485 parameter channel

#### Accessories

#### Programming and configuration tools

Accessory category	Brief description	Туре	Part no.
Other accessories	Programming tool for HIPERFACE® motor feedback systems	PGT-03-S	1034252

#### Plug connectors and cables

Connecting cable (female connector-open)

Accessory category	Brief description	Туре	Part no.
Connection systems	Female connector, JST, 8-pin, straight, cable, HIPERFACE®, unshielded, 0.2 m	DOL-0J08-G0M2XB6	2031086
	Female connector, JST, 8-pin, straight, cable, HIPERFACE <sup>®</sup> , shielded, 0.5 m	DOL-0J08-G0M5XB6	2056250

Cable (open-open)

Accessory category	Brief description	Туре	Part no.
Connection systems	Cable, cable, HIPERFACE®, HIPERFACE®, drag chain use, PUR halogen-free, shielded	LTG-2708-MW	6028361

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

DOL-0J08-G0M2XB6



#### DOL-0J08-G0M5XB6



#### **Electrical interface**

- Secure data transmission
- High information content
- Electronic type label

Signal diagram for clock-

wise rotation of shaft

looking in direction "A"

- Just 8 leads
- Bus-compatible parameter channel
- Process channel in real time



Signal specification of the process channel



1 period = 64/128/256

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  $\pm$  20%.

Characteristics applicable to all stated ambient conditions			
Signal	Values/unit		
Signal peak, peak Vpp of SIN, COS	0.8 1.2 V		
Signal offset REFSIN, REFCOS	2.2 2.8 V		

3 Volt





CAUTION: No **RS485 communication** is possible during the phases highlighted in blue After a software reset, it will take approx. 150 ms until the SIN/COS signals reach an amplitude of 1 Vpp ± 20 %.

## MOTOR FEEDBACK SYSTEMS ROTARY HIPERFACE® SEK90/160/260

Type-specific settings	SEK90/160/260
Type ID (command 52h)	FFh
Free E <sup>2</sup> PROM [bytes]	1,792
Address	40h
Mode_485 <sup>1)2)</sup>	E4h
Codes 0 to 3	55h
Counter	0

Overview of supported commands			SEK90/160/260	
Command byte	Function	Code 0 <sup>3)</sup>	Comment	
42h	Read position (5 bits per sine/cosine period)		11 Bit / 12 Bit / 13 Bit	
43h	Set position	•		
44h	Read analog value		Channel number F0H4 48h	
			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=FFh	
53h	Encoder reset			
55h	Allocate encoder address			
56h	Read serial number and program version			

<sup>1)</sup> Default interface settings can not be changed (e.g. baudrate, timeout or parity bit)

<sup>2)</sup> When using the motor feedback systems SEK90/160/260, 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.

<sup>3)</sup> 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.

 $^{\scriptscriptstyle (4)}$  Temperature compatible with SCx (encoder temperature [°C] \*2.048 – 40)

## SEK90/160/260 MOTOR FEEDBACK SYSTEMS ROTARY HIPERFACE®

Overview of status messages					
	Status code	Description	SEK90/160/260		
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 <sup>2</sup> C bus inoperative	•		
	06h	Internal checksum error	•		
Protocol	07h	Encoder reset occurred as a result of program monitoring	•		
	09h	Parity error	•		
	OAh	Checksum of transmitted data is incorrect	•		
	OBh	Unknown command code	•		
	0Ch	Number of transmitted data is incorrect	•		
	0Dh	Transmitted command argument is not allowed	•		
Data	OEh	The selected data field may not be written to	•		
	OFh	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			
	USN	Counter overnow	-		

For more information on the interface see  ${\sf HIPERFACE}^{\scriptscriptstyle \oplus}$  - description, part no. 8010701

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## SICK AT A GLANCE

SICK is a leading manufacturer of intelligent sensors and sensor solutions for factory, logistics, and process automation. With more than 6,000 employees and over 40 subsidiaries worldwide, we are always close to our customers. A unique range of products and services creates the perfect basis for controlling processes securely and efficiently, protecting individuals from accidents and preventing damage to the environment.

We have extensive experience in various industries and understand their processes and requirements. With intelligent sensors, we can deliver exactly what our customers need. In application centers in Europe, Asia and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes us a reliable supplier and development partner.

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For us, that is "Sensor Intelligence."

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Please find detailed addresses and additional representatives and agencies in all major industrial nations at: www.sick.com

