PRODUCT INFORMATION

SES/SEM70, SES/SEM90

MOTOR FEEDBACK SOLUTION FOR HOLLOW SHAFT MOTORS AND DIRECT DRIVES

Motor feedback system rotary HIPERFACE®

SICK
Sensor Intelligence.

THE MOTOR FEEDBACK SOLUTION FOR COMPACT HOLLOW SHAFT MOTORS AND DIRECT DRIVES

Product description

The trend toward compact and rugged direct drives in factory automation has clearly strengthened in recent years. With the SES/SEM70 rotative motor feedback system with industrial HIPERFACE® standard interface, SICK is providing new options for hollow shaft types and direct drives. The motor feedback system, which works with holistic sensing, is mounted directly on the drive shaft without addition mounting tools and renders transmission components such as timing belts or couplings unnecessary. A mechanical multiturn function is also integrated into the device, which eliminates the need for additional components such as external buffer batteries. The small design saves space and weight and is rugged, wear-free and reliable thanks to the bearing-free technology.

At a glance

- Singleturn and multiturn variants with 25 mm hollow shaft
- 32 sine-cosine periods per revolution, 4,096 revolutions with the multiturn variants
- HIPERFACE® interface with extended type label
- Maximum speed: 8,500 rpm
- Easy mounting without special mounting tools
- High shock and vibration resistance

Your benefits

- Integrated mechanical multiturn function for additional measuring of revolutions without external battery
- Direct mounting on the drive shaft renders transmission components such as timing belts or couplings unnecessary
- Simple, compact design, wear-free, low maintenance costs
- Quick installation without special mounting tools: easy to put on, turn, and go
- Rugged and reliable thanks to high shock and vibration resistance
- Reliable establishment of the absolute position at high speeds
- Mounting check for reading out the axial position of the rotor

Additional information

→ www.sick.com/SES_SEM70

For more information, simply 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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Fields of application

- Hollow shafts and torque motors
- Applications with axial movements, e.g. extrusion machines, injection molding machines
- Revolving machines and woodworking machines
- Rotary table applications
- Robot applications

Detailed technical data

Performance

	Singleturn	Multiturn
Sine/cosine periods per revolution	32	
Number of the absolute ascertainable revolutions	1	4,096
Total number of steps	1,024	4,194,304
Measuring step	10 ″ For interpolation of the sine/cosine signals with, e. g., 12 bits	
Integral non-linearity	± 100 ″ [1]	
Differential non-linearity	± 55 ″ [1]	
Latency period	25 µs	

[1] Typical values at nominal position ± 0.1 mm und +20 °C.

Interfaces

Type of code for the absolute value	Binary
Code sequence	Rising, For clockwise shaft rotation, looking in direction “A” (see dimensional drawing)
Communication interface	HIPERFACE® [1]
Available memory area	2,048 Byte

[1] Information on the start-up time can be found in the white paper (DE: 8021543/EN: 8021544).

Electrical data

Supply voltage range	7 V DC ... 12 V DC
Warm-up time voltage ramp	Max. 180 ms [1]
Recommended supply voltage	11 V DC
Operating current	150 mA [2]

[1] Duration of voltage ramp between 0 and 7.0 V.

[2] At 7 V DC and without load.

Mechanical data

Shaft version	Through hollow shaft
Dimensions	See dimensional drawing
Weight	0.13 kg
Moment of inertia of the rotor	60 gcm²
Operating speed	8,500 min^{-1}, up to which the absolute position can be reliably produced
Angular acceleration	≤ 50,000 rad/s²
Permissible radial shaft movement	± 0.15 mm
Permissible axial shaft movement	± 0.4 mm
Connection type	Male connector, 8-pin

Ambient data

Operating temperature range	–30 °C ... +115 °C
Storage temperature range	–40 °C ... +125 °C, without package
Relative humidity/condensation	85 %, Condensation not permitted [1]
Resistance to shocks	100 g, 6 ms (according to EN 60068-2-27) [2]
Frequency range of resistance to vibrations	50 g, 10 Hz ... 2,000 Hz (according to EN 60068-2-6) [1]
EMC	According to EN 61000-6-2 and EN 61000-6-4 (Class A) [3]
Enclosure rating	IP40, with mating connector inserted and closed cover (according to IEC 60529)

[1] Further information can be found in the white paper (DE: 8021543/EN: 8021544).

[2] Every encoder has been tested with a half-sine-shaped shock.

[3] 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 shield. Users must perform their own tests when other shield designs are used.

Ordering information

Singleturn for integration

- **Available memory area:** E²PROM 2048
- **Electrical interface:** HIPERFACE®

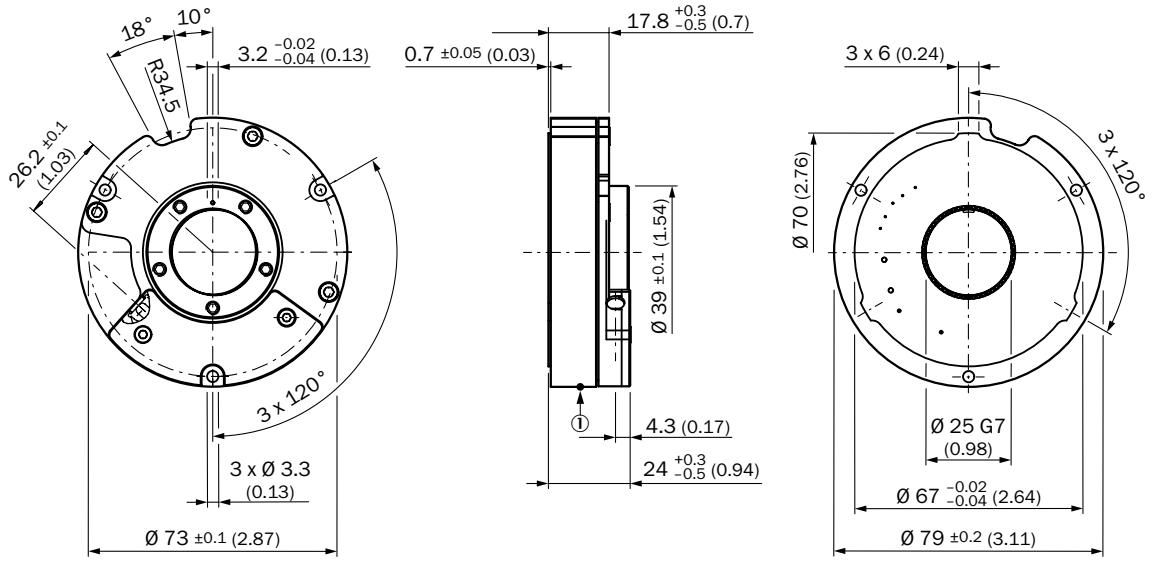
Shaft version	Shaft diameter	Connection type	Type	Part no.
Through hollow shaft	25 mm	Male connector, 8-pin	SES70-HN025AK22	1074671

Multiturn for integration

- **Available memory area:** E²PROM 2048
- **Electrical interface:** HIPERFACE®

Shaft version	Shaft diameter	Connection type	Type	Part no.
Through hollow shaft	25 mm	Male connector, 8-pin	SEM70-HN025AK22	1074669

Dimensional drawings (Dimensions in mm (inch))



① Measuring point for operating temperature

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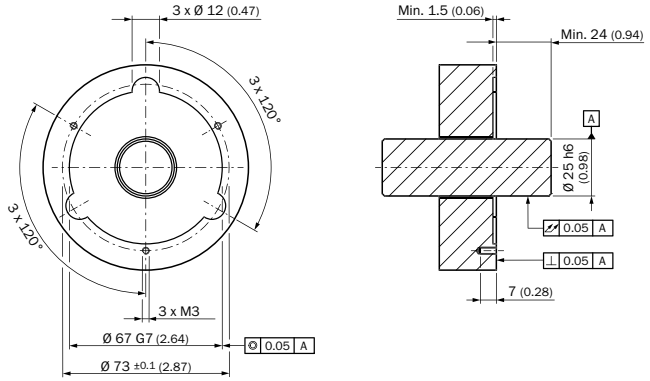
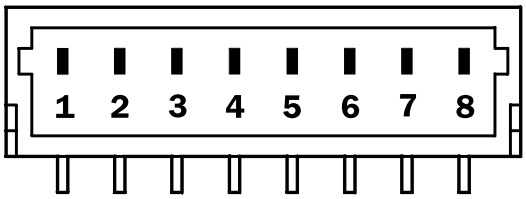
Proposed fitting



Read out axial position: negative value shows movement of rotor away from the motor flange; positive value shows movement of rotor towards the motor flange

PIN assignment

View of the plug-in face



1	U_S	Red	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	Data +	Gray or yellow	Parameter channel RS 485
8	Data -	Green or purple	Parameter channel RS 485
The GND (0 V) connection of the supply voltage has no connection to the housing			

Supported resources for HIPERFACE®

Command byte	Function	Comments
42h	Read position	
43h	Set position	
44h	Read analog value	
		48h - Temperature in °C
		F0h - Temperature compatible to product families SCx °C * 2,048 - 40
46h	Read counter	
47h	Increment Counter	
49h	Delete counter	
4Ah	Read data	
4Bh	Store data	
4Ch	Determine status of a data field	
4Dh	Create data field	

Command byte	Function	Comments
4Eh	Determine available memory area	
4Fh	Change access code	
50h	Read encoder status	
52h	Read out type label	
53h	Encoder reset	
55h	Allocate encoder address	
56h	Read serial number and program version	
6Ch	Read Synchronization Offset	
6Dh	Axial Position	
Default interface settings can not be changed (e.g. baudrate, timeout or parity bit)		

Overview of warnings and fault indications

	Status code	Description
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 I2C 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	01h	Analog signals outside specification
	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)
	1Dh	Transmitter current critical or P2RAM-Error
	1Eh	Encoder temperature critical
	08h	Counter overflow
For more information on the interface see HIPERFACE® - description, part no. 8010701		

Accessories

Connection systems

Plug connectors and cables

Cables (ready to assemble)

Brief description	Type	Part no.
Head A: cable Head B: open cable ends Cable: HIPERFACE®, HIPERFACE®, PUR, halogen-free, shielded	LTG-2708-MW	6028361

Connecting cables with female connector

Figure	Brief description	Type	Part no.
	Head A: female connector, JST, 8-pin, straight Head B: open cable ends Cable: HIPERFACE®, unshielded, 0.2 m	DOL-0J08-G0M2XB6	2031086
	Head A: female connector, JST, 8-pin, straight Cable: HIPERFACE®, shielded, 0.5 m	DOL-0J08-G0M5XC3	2089521

Dimensional drawings ➜ page 7

Connection cables with female connector and male connector

Figure	Brief description	Type	Part no.
	Head A: female connector, JST, 8-pin, straight Head B: male connector, M23, 17-pin, straight Cable: HIPERFACE®, unshielded, 1 m	DSL-2317-G01MJB6	2071327

Dimensional drawings ➜ page 7

Further accessories

Programming and configuration tools

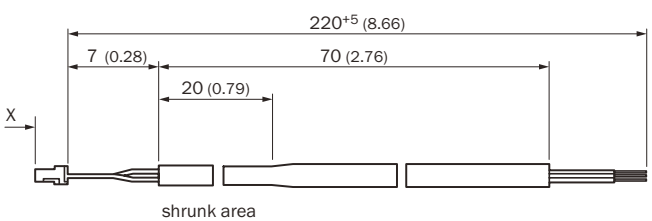
Figure	Brief description	Type	Part no.
	SVip® LAN programming tool for all motor feedback systems	PGT-11-S LAN	1057324
	SVip® WLAN programming tool for all motor feedback systems	PGT-11-S WLAN	1067474

Dimensional drawings ➜ page 9

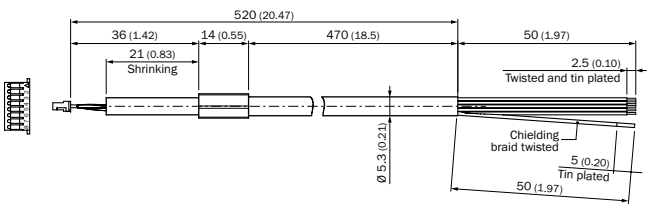
Dimensional drawings for accessories (Dimensions in mm (inch))

Plug connectors and cables

DOL-0J08-G0M2XB6

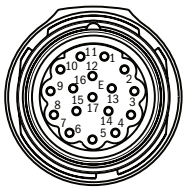


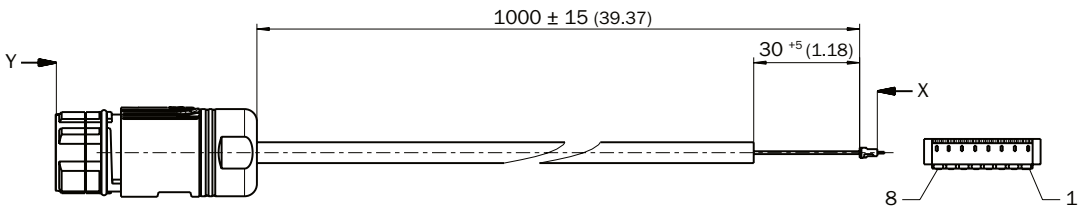
DOL-0J08-G0M5XC3



① red
② wht
③ brn
④ pnk
⑤ blk
⑥ blu
⑦ gra
⑧ grn

DSL-2317-G01MJB6

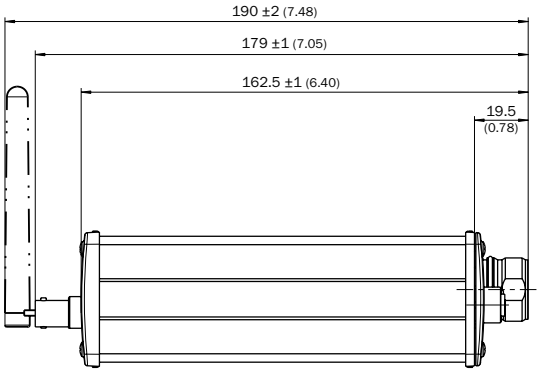


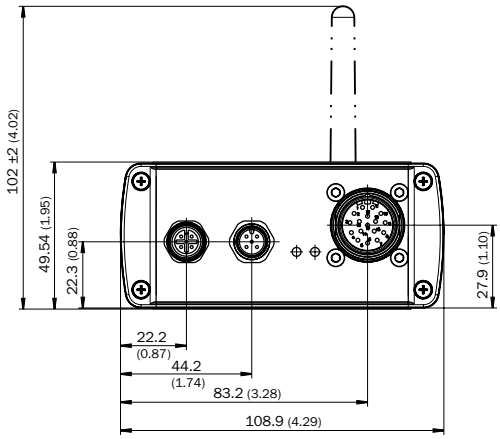


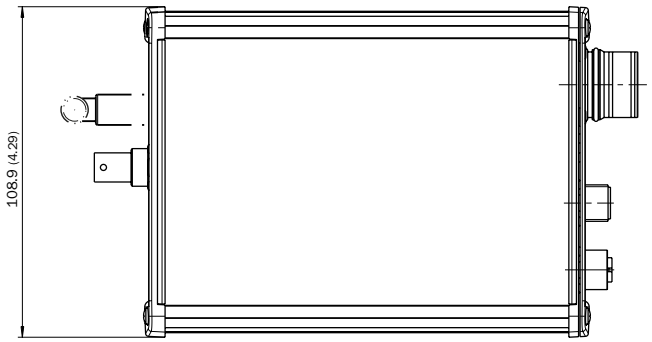
② blu
③ red
⑦ blk
⑪ pnk
⑫ vi
⑭ yel
⑮ brn
⑯ wht

Programming and configuration tools

PGT-11-S LAN
PGT-11-S WLAN







THE MOTOR FEEDBACK SOLUTION FOR LARGE HOLLOW SHAFT MOTORS AND DIRECT DRIVES

Product description

The trend toward compact and rugged direct drives in factory automation has clearly strengthened in recent years. With the SES/SEM90 rotative motor feedback system with industrial HIPERFACE® standard interface, SICK is providing new options for hollow shaft types and direct drives. The motor feedback system, which works with holistic sensing, is mounted directly on the drive shaft without addition mounting tools and renders transmission components such as timing belts or couplings unnecessary. A mechanical multiturn function is also integrated into the device, which eliminates the need for additional components such as external buffer batteries. The small design saves space and weight and is rugged, wear-free and reliable thanks to the bearing-free technology.

At a glance

- Singleturn and multiturn variants with 50 mm hollow shaft
- 64 sine-cosine periods per revolution, additionally 4,096 revolutions with the multiturn variants
- HIPERFACE® interface with extended type label
- Maximum speed: 6,000 rpm
- Easy mounting without special mounting tools
- High shock and vibration resistance

Your benefits

- Integrated mechanical multiturn function for additional measuring of revolutions without external battery
- Direct mounting on the drive shaft renders transmission components such as timing belts or couplings unnecessary
- Simple, compact design, wear-free, low maintenance costs
- Quick installation without special mounting tools: easy to put on, turn, and go
- Rugged and reliable thanks to high shock and vibration resistance
- Reliable establishment of the absolute position at high speeds
- Mounting check for reading out the axial position of the rotor

Additional information

→ www.sick.com/SES_SEM90

For more information, simply 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.

8021252/2018-05-23
Subject to change without notice

Fields of application

- Hollow shafts and torque motors
- Applications with axial movements, e.g. extrusion machines, injection molding machines
- Revolving machines and woodworking machines
- Rotary table applications
- Robot applications

Detailed technical data

Performance

	Singleturn	Multiturn
Sine/cosine periods per revolution	64	
Number of the absolute ascertainable revolutions	1	4,096
Total number of steps	2,048	8,388,608
Measuring step	5 ″ For interpolation of the sine/cosine signals with, e. g., 12 bits	
Integral non-linearity	± 72 ″ [1]	
Differential non-linearity	± 45 ″ [1]	
Latency period	25 µs	

[1] Typical values at nominal position ± 0.1 mm und +20 °C.

Interfaces

Type of code for the absolute value	Binary
Code sequence	Rising, For clockwise shaft rotation, looking in direction “A” (see dimensional drawing)
Communication interface	HIPERFACE® [1]
Available memory area	2,048 Byte

[1] Information on the start-up time can be found in the white paper (DE: 8021543/EN: 8021544).

Electrical data

Supply voltage range	7 V DC ... 12 V DC
Warm-up time voltage ramp	Max. 180 ms [1]
Recommended supply voltage	11 V DC
Operating current	150 mA [2]

[1] Duration of voltage ramp between 0 and 7.0 V.

[2] At 7 V DC and without load.

Mechanical data

Shaft version	Through hollow shaft
Dimensions	See dimensional drawing
Weight	0.21 kg
Moment of inertia of the rotor	280 gcm²
Operating speed	6,000 min^{-1}, up to which the absolute position can be reliably produced
Angular acceleration	≤ 50,000 rad/s²
Permissible radial shaft movement	± 0.15 mm
Permissible axial shaft movement	± 0.4 mm
Connection type	Male connector, 8-pin

Ambient data

Operating temperature range	–30 °C ... +115 °C
Storage temperature range	–40 °C ... +125 °C, without package
Relative humidity/condensation	85 %, Condensation not permitted [1]
Resistance to shocks	100 g, 6 ms (according to EN 60068-2-27) [2]
Frequency range of resistance to vibrations	30 g, 10 Hz ... 2,000 Hz (according to EN 60068-2-6) [1]
EMC	According to EN 61000-6-2 and EN 61000-6-4 (Class A) [3]
Enclosure rating	IP40, with mating connector inserted and closed cover (according to IEC 60529)

[1] Further information can be found in the white paper (DE: 8021543/EN: 8021544).

[2] Every encoder has been tested with a half-sine-shaped shock.

[3] 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 shield. Users must perform their own tests when other shield designs are used.

Ordering information

Singleturn for integration

- **Available memory area:** E²PROM 2048
- **Electrical interface:** HIPERFACE®

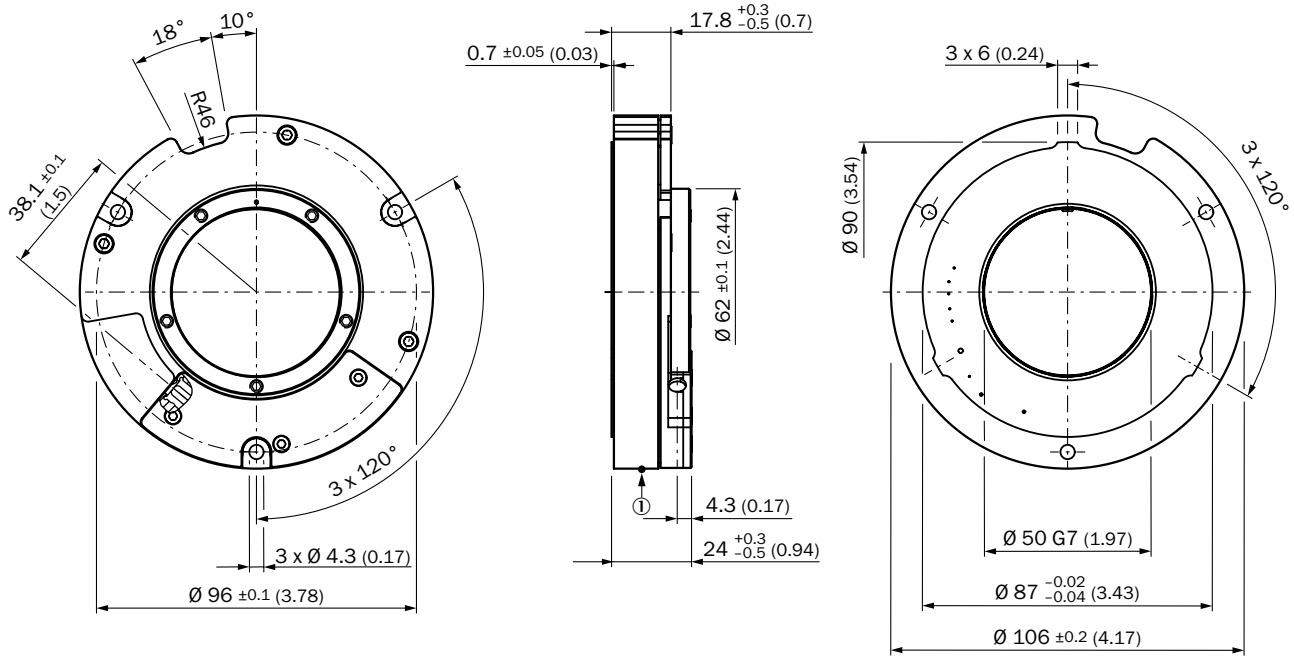
Shaft version	Shaft diameter	Connection type	Type	Part no.
Through hollow shaft	50 mm	Male connector, 8-pin	SES90-HN050AK22	1075350

Multiturn for integration

- **Available memory area:** E²PROM 2048
- **Electrical interface:** HIPERFACE®

Shaft version	Shaft diameter	Connection type	Type	Part no.
Through hollow shaft	50 mm	Male connector, 8-pin	SEM90-HN050AK22	1705348

Dimensional drawings (Dimensions in mm (inch))



① Measuring point for operating temperature

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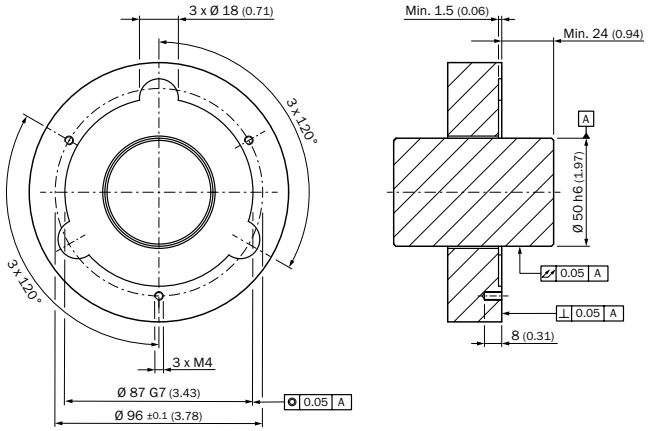
Subject to change without notice

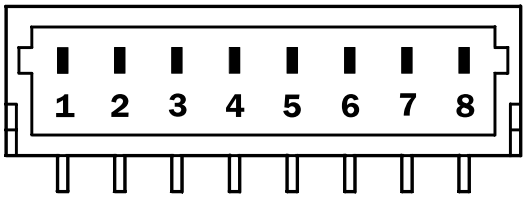
Proposed fitting



Read out axial position: negative value shows movement of rotor away from the motor flange; positive value shows movement of rotor towards the motor flange

PIN assignment

View of the plug-in face



PIN	Signal	Colour of wires (cable outlet)	Explanation
1	U_S	Red	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	Data +	Gray or yellow	Parameter channel RS 485
8	Data -	Green or purple	Parameter channel RS 485
The GND (0 V) connection of the supply voltage has no connection to the housing			

Supported resources for HIPERFACE®

Command byte	Function	Comments
42h	Read position	
43h	Set position	
44h	Read analog value	
		48h - Temperature in °C
		F0h - Temperature compatible to product families SCx °C * 2,048 - 40
46h	Read counter	
47h	Increment Counter	
49h	Delete counter	
4Ah	Read data	
4Bh	Store data	

Command byte	Function	Comments
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	
53h	Encoder reset	
55h	Allocate encoder address	
56h	Read serial number and program version	
6Ch	Read Synchronization Offset	
6Dh	Axial Position	
Default interface settings can not be changed (e.g. baudrate, timeout or parity bit)		

Overview of warnings and fault indications

	Status code	Description
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 I2C 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	01h	Analog signals outside specification
	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)
	1Dh	Transmitter current critical or P2RAM-Error
	1Eh	Encoder temperature critical
	08h	Counter overflow
For more information on the interface see HIPERFACE® - description, part no. 8010701		

8021252/2018-05-23
Subject to change without notice

Accessories

Connection systems

Plug connectors and cables

Cables (ready to assemble)

Brief description	Type	Part no.
Head A: cable Head B: open cable ends Cable: HIPERFACE®, HIPERFACE®, PUR, halogen-free, shielded	LTG-2708-MW	6028361

Connecting cables with female connector

Figure	Brief description	Type	Part no.
	Head A: female connector, JST, 8-pin, straight Head B: open cable ends Cable: HIPERFACE®, unshielded, 0.2 m	DOL-0J08-G0M2XB6	2031086
	Head A: female connector, JST, 8-pin, straight Cable: HIPERFACE®, shielded, 0.5 m	DOL-0J08-G0M5XC3	2089521

Dimensional drawings ➜ page 15

Connection cables with female connector and male connector

Figure	Brief description	Type	Part no.
	Head A: female connector, JST, 8-pin, straight Head B: male connector, M23, 17-pin, straight Cable: HIPERFACE®, unshielded, 1 m	DSL-2317-G01MJB6	2071327

Dimensional drawings ➜ page 15

Further accessories

Programming and configuration tools

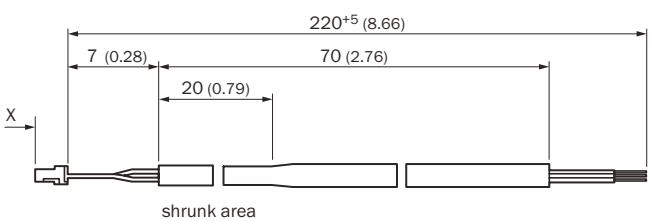
Figure	Brief description	Type	Part no.
	SVip® LAN programming tool for all motor feedback systems	PGT-11-S LAN	1057324
	SVip® WLAN programming tool for all motor feedback systems	PGT-11-S WLAN	1067474

Dimensional drawings ➜ page 17

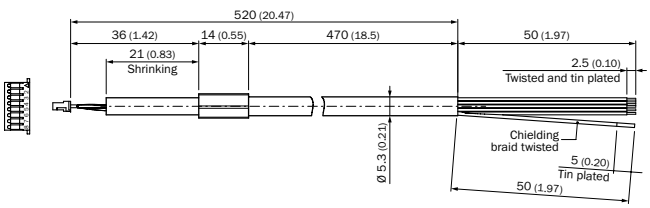
Dimensional drawings for accessories (Dimensions in mm (inch))

Plug connectors and cables

DOL-0J08-G0M2XB6

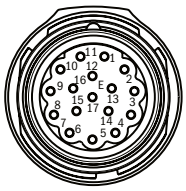


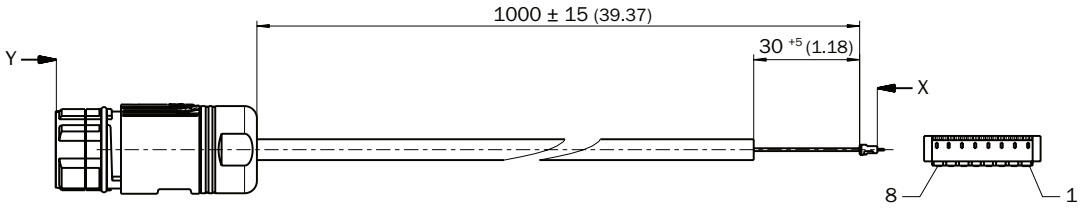
DOL-0J08-G0M5XC3



① red
② wht
③ brn
④ pnk
⑤ blk
⑥ blu
⑦ gra
⑧ grn

DSL-2317-G01MJB6

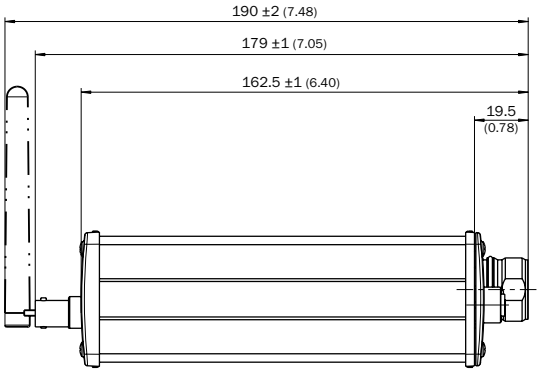


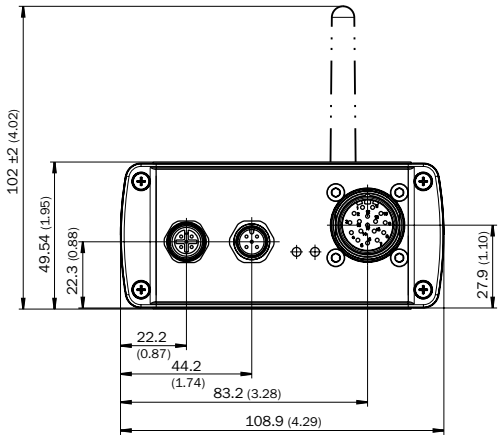


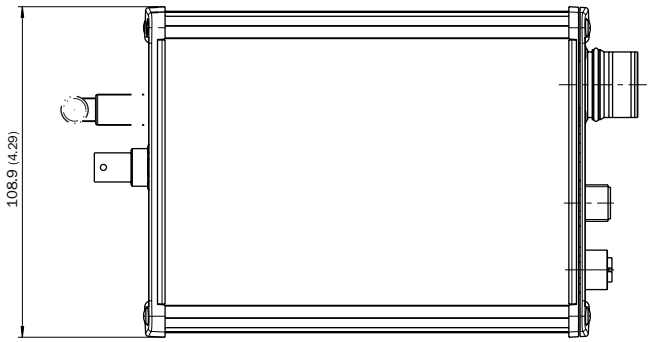
② blu
③ red
⑦ blk
⑪ pnk
⑫ vi
⑭ yel
⑮ brn
⑯ wht

Programming and configuration tools

PGT-11-S LAN
PGT-11-S WLAN







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