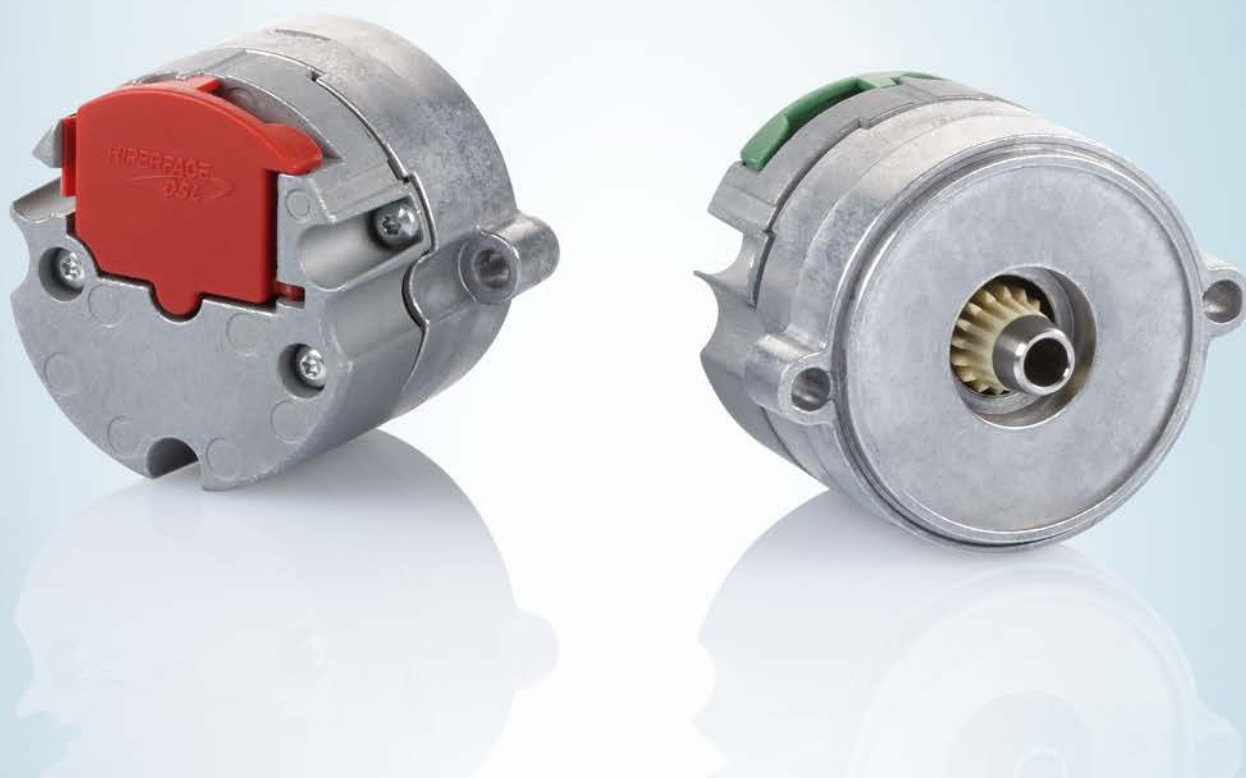




EES/EEM37

DRIVE TECHNOLOGY STAR:
MOTOR FEEDBACK SYSTEM WITH HIPERFACE DSL®

Motor feedback systems rotary HIPERFACE DSL®

SICK
Sensor Intelligence.

DRIVE TECHNOLOGY STAR: THE MOTOR FEEDBACK SYSTEM WITH HIPERFACE DSL®



**HIPERFACE®
DSL** **CE**



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Product description

The digital HIPERFACE DSL® interface has played a significant role in shaping drive technology over recent years. The EES/EEM37 motor feedback systems featuring HIPERFACE DSL® will play an important role in drive technology and complete the lower power range within the SICK product portfolio. Fitted with a standardized mechanical interface, they offer the utmost flexibility when used in

conjunction with the EKS/EKM36 and EFS/EFM50 motor feedback systems. EES/EEM37 feature a bearing-free structure and outstanding resistance to shock and vibrations. Additional features, such as secure singleturn absolute position or an electronic type label, make them the ideal solution for a wide range of applications, e.g., in the packaging industry or robotics.

At a glance

- Capacitive motor feedback system with HIPERFACE DSL®
- Up to 17-bit resolution per revolution and 4,096 revolutions with the multi-turn system
- Certified according to SIL2 and PL d
- Status monitoring and mission time histogram; temperature, speed, and supply voltage are stored throughout the service life

Your benefits

- The compact design allows manufacturers of small and very small motors to reduce the lengths of their motors significantly
- The EES/EEM37 motor feedback systems are extremely well suited to use in harsh environments where resolvers were previously the only option
- The capacitive measurement principle with holistic sensing enables high axial and radial tolerances, simplifying the motor design
- Certification allows for easy integration into a safe drive system

→ www.sick.com/EES_EEM37

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.



Fields of application

- Packaging industry
- Robotics

Detailed technical data

Performance

	Absolute Sin- gleturn 15 bit	Absolute Sin- gleturn 17 bit	Absolute Multiturn 15 bit	Absolute Multiturn 17 bit
Resolution per revolution	15 bit	17 bit	15 bit	17 bit
Number of the absolute ascertainable revolutions	1		4,096	
Signal noise (σ)	± 20 " (nominal position, 25 °C, filter setting 21 kHz)			
System accuracy	± 280 "± 190 " ¹⁾ 1)	± 240 "± 160 " ¹⁾ 1)	± 280 "± 190 " ¹⁾ 1)	± 240 "± 160 " ¹⁾ 1)
Speed when switching on/resetting the motor feedback system	≤ 6,000 min ⁻¹			
Available memory area	8,192 Byte			
Measurement step per revolution	32,768	131,072	32,768	131,072

¹⁾ See diagram for error limits (default filter setting: 21 kHz).

Interfaces

Code sequence	Increasing, when turning the shaft For clockwise rotation, looking in direction "A" (see dimensional drawing)
Communication interface	HIPERFACE DSL®
Initialization time	Max. 500 ms ¹⁾
Measurement external temperature resistance	32-bit value, without prefix (1 Ω) 0 ... 209.600 Ω ²⁾

¹⁾ From reaching a permitted operating voltage.

²⁾ Without sensor tolerance; at $-17^\circ\text{C} \dots +167^\circ\text{C}$: NTC $+2\text{K}$ (103 GT); PTC $+3\text{K}$ (KTY84/130/PT1000).

Electrical data

Connection type	Male connector, 4-pin
Supply voltage	7 V ... 12 V
Warm-up time voltage ramp	Max. 180 ms ¹⁾
Power consumption	$\leq 150 \text{ mA}$ ²⁾

¹⁾ Duration of the voltage ramp between 0 and 7.0 V, see diagram "Current consumption" in the diagram section.

²⁾ Current rating applies when using interface circuit suggestions as shown in HIPERFACE DSL® manual (8017595).

Mechanical data

Shaft version	Tapered shaft
Dimensions	See dimensional drawing
Centering collar	Standard 1.5 mm Reduced 0.7 mm
Weight	$\leq 0.1 \text{ kg}$
Moment of inertia of the rotor	1 gcm^2
Operating speed	$\leq 12,000 \text{ min}^{-1}$
Angular acceleration	$\leq 500,000 \text{ rad/s}^2$
Permissible radial shaft movement	$\pm 0.15 \text{ mm}$
Permissible axial shaft movement	$\pm 0.5 \text{ mm}$

Ambient data

Operating temperature range	-40 °C ... +115 °C ¹⁾
Storage temperature range	-40 °C ... +120 °C, without package
Relative humidity/condensation	85 %, Condensation not permitted
Resistance to shocks	100 g, 6 ms (according to EN 60068-2-27)
Frequency range of resistance to vibrations	50 g, 10 Hz ... 2,000 Hz (according to EN 60068-2-6)
EMC	According to EN 61000-6-2: 2016, EN 61000-6-4: 2006, IEC 6100-6-7: 2014 ²⁾
Enclosure rating	IP30, When cover is closed and mating connector is attached (acc. to EN 60529-1) ³⁾

¹⁾ For typical values for self-heating, see diagram "Electrical self-heating" in the diagram section. see section "Mounting" in the operating instructions (8021414/8021265).

²⁾ According to the listed standards, EMC is guaranteed if the motor feedback system with mating connector inserted is connected to the central grounding point of the motor controller via a cable shield. If other shielding concepts are used, users must perform their own tests. Class A device.

³⁾ When using the strands (2079920).

Safety-related parameters

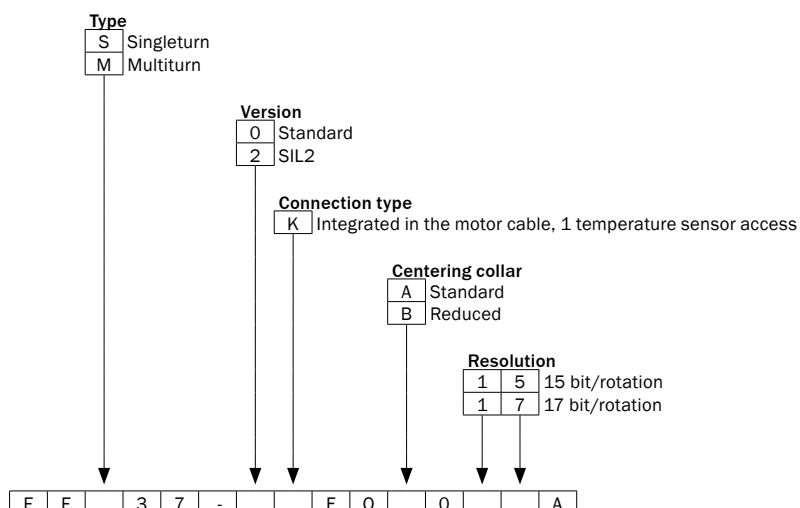
Note	The following parameters are only valid for SIL2 certified versions
Safety integrity level	SIL2 (IEC 61508), SILCL3 (EN 62061) ¹⁾
Category	3 (EN ISO 13849)
Systematic suitability	SC 3 (IEC61508)
Test rate	24 h
Maximum demand rate	216 µs
Performance level	PL d (EN ISO 13849)
Basis for safety function	Safe singleturn absolute position
Safety-related resolution	Channel 1 = 15 or 17 bit, channel 2 = 15 or 17 bit
PFH _D : Probability of dangerous failure per hour	26×10^{-9} ²⁾
T _M (mission time)	20 years
Safety-related accuracy	1° ³⁾

¹⁾ For more detailed information on the exact configuration of your machine/unit, please consult your relevant SICK branch office.

²⁾ The values displayed apply to a diagnostic degree of coverage of 90%, which must be achieved by the external drive system.

³⁾ The safety-related accuracy indicates the maximum positioning error limit with which the safety functions can be supported.

Type code



Ordering information

Absolute Singleturn for integration

- **Shaft version:** tapered shaft
- **Communication interface:** HIPERFACE DSL®
- **Connection type:** male connector, 4-pin

Type	Part no.
EES37-OKFOA015A	1068810
EES37-OKFOA017A	1068811
EES37-OKFOA0S02	1101196
EES37-OKFOA0S03	1101200
EES37-OKFOB015A	1086281
EES37-OKFOB017A	1086282

- **Shaft version:** tapered shaft
- **Safety system:** ✓
- **Communication interface:** HIPERFACE DSL®
- **Connection type:** male connector, 4-pin

Type	Part no.
EES37-2KFOA015A	1067126
EES37-2KFOA017A	1067127
EES37-2KFOB015A	1086283
EES37-2KFOB017A	1086284

Absolute Multiturn for integration

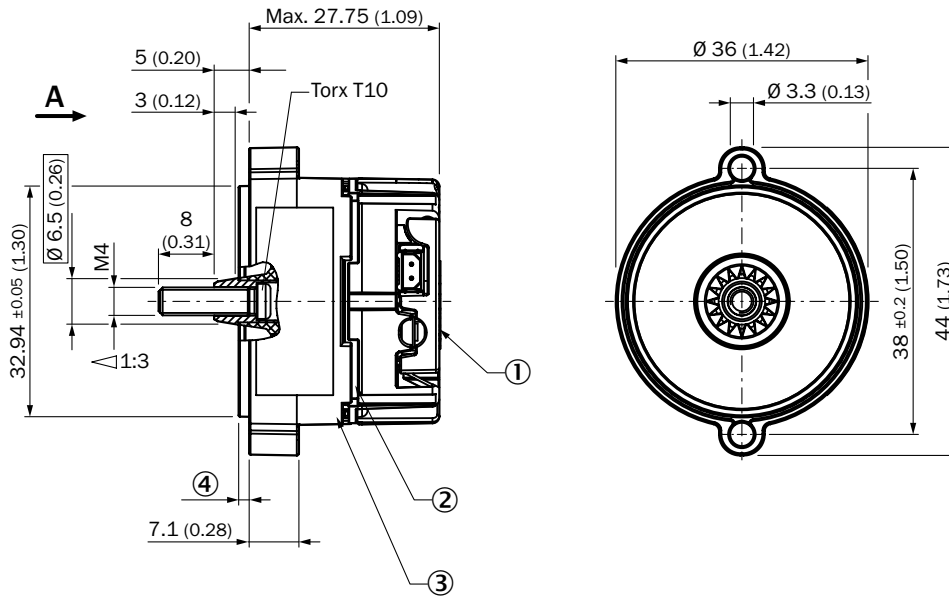
- **Shaft version:** tapered shaft
- **Communication interface:** HIPERFACE DSL®
- **Connection type:** male connector, 4-pin

Type	Part no.
EEM37-OKFOA015A	1068808
EEM37-OKFOA017A	1068809
EEM37-OKFOA0S03	1101197
EEM37-OKFOB015A	1086277
EEM37-OKFOB017A	1086278

- **Shaft version:** tapered shaft
- **Safety system:** ✓
- **Communication interface:** HIPERFACE DSL®
- **Connection type:** male connector, 4-pin

Type	Part no.
EEM37-2KFOA015A	1067124
EEM37-2KFOA017A	1067125
EEM37-2KFOB015A	1086279
EEM37-2KFOB017A	1086280

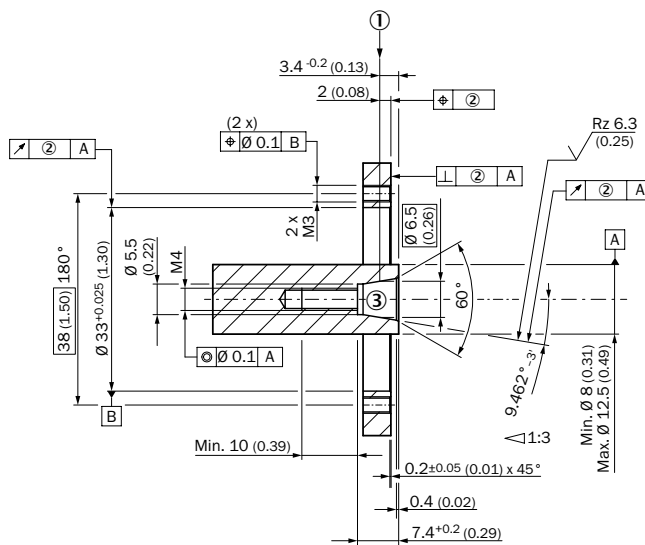
Dimensional drawings (Dimensions in mm (inch))



Screw M4 not included (see under accessories)

- ① Measuring point for vibrations
- ② Design-related gap
- ③ Measuring point for operating temperature
- ④ Centering collar: Standard 1.5 mm; reduced 0.7 mm

Attachment specifications

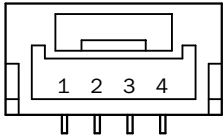


Read out axial position: positive value shows movement of rotor away from the motor flange; negative value shows movement of rotor towards the motor flange

- ① Nominal position
- ② The size of the tolerance reduces the permissible wave movement, see data sheet
- ③ Threaded holes in accordance with DIN 13 with recesses in accordance with DIN 76 min. 1.05 x thread diameter

PIN assignment

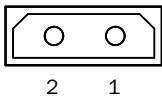
Supply / Communication pin assignment



Integrated in motor cable = J, K

PIN	Signal	Explanation
1		Not connected - no function
2	+U _S /DSL+	Supply 7 V ... 12 V
3	GND/DSL-	Ground connection
4		Not connected - no function
Recommended outer diameter of set of stranded wires: 4 mm +0/-1.5 mm		
Recommended mating connector: JST (GHR-04V-S)		

Temperature sensor pin assignment



PIN	Signal	Explanation
1	T+	Thermistor connection
2	T-	Thermistor connection (to ground)
Recommended outer diameter of set of stranded wires: 2.2 mm ± 0.1 mm		
Recommended mating connector: Harwin M80-8990205		

Technical Description

Notes on the diagrams

Self-heating

The max. internal encoder temperature may not exceed 125 °C. The defined measuring point on the encoder must be used for measuring the operating temperature. See section

Error limits

The EES/EEM37 motor feedback systems do not have bearings. By mounting them to a servomotor, the sensors are positioned finally, which defines the system characteristics of

“Mounting” in the operating instructions (8021414/8021265). For typical values for self-heating, see diagram “Electrical self-heating”. The electrical self-heating is caused by the current consumption of the encoder.

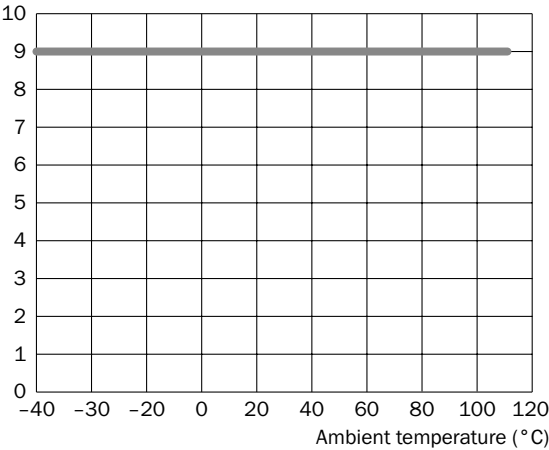
the feedback systems in the application.

The system accuracy specified in the product information relates to the mechanical nominal position and an ambient temperature of 25 °C. The effect of the temperature and axial position is shown in diagrams under “error limits”.

Diagrams

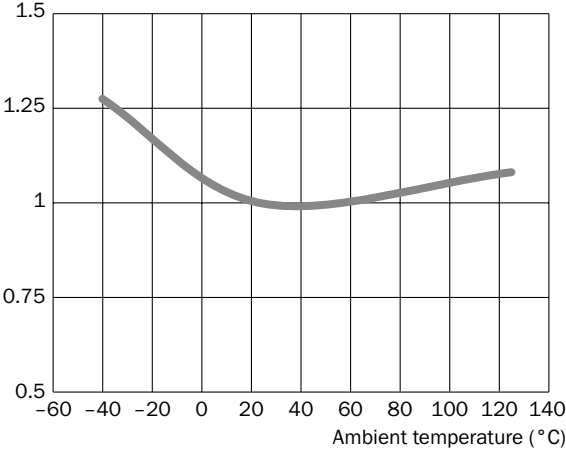
Electrical self-heating

Typ. electrical self-heating, kelvin (K)



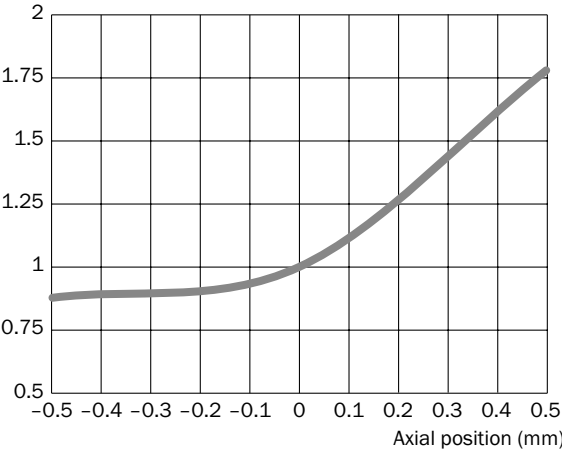
Error limits

Typ. effect of temperature on accuracy, normed



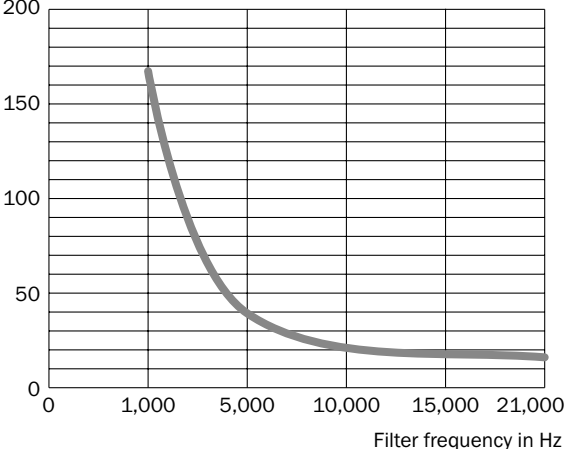
Error limits

Typ. effect of axial position on accuracy, normed



Latency period vs. filter frequency

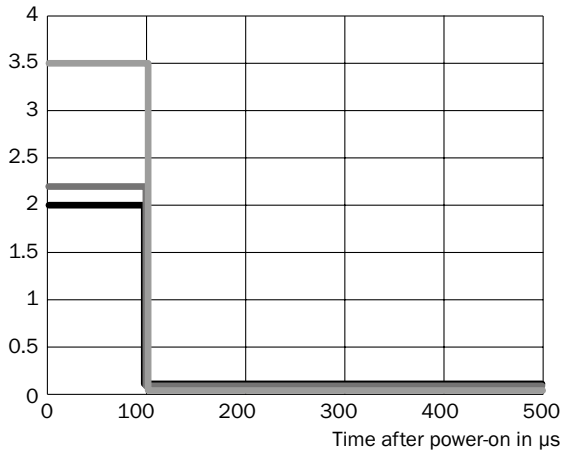
Latency in μ s



Adjustable filter frequencies 21 kHz, 15 kHz, 10 kHz, 5 kHz and 1 kHz - Default setting 21 kHz

Power consumption

Max. current in A



— 7 V
 — 8 V
 — 12 V

This diagram shows the switch-on current

Supported resources for HIPERFACE DSL®

Resource Index	Function	Size (max. Offset)	Read access	Write access	Name
000h	Root node		0	-	ROOT
001h	Designation node		0	-	IDENT
002h	Monitoring node		0	-	MONITOR
003h	Administration node		0	-	ADMIN
004h	Counter node		0	-	COUNTER
005h	Data storage node		0	-	DATA
006h	Sensor hub nodes		0	-	SENSHUB
080h	Type of encoder	2	0	-	ENCTYPE
081h	Solution	4	0	-	RESOLUTN
082h	Range	4	0	-	RANGE
083h	Type code designation	18	0	-	TYPECODE
084h	Serial number	10	0	-	SERIALNO
085h	Firmware version number	20	0	-	FWREVNO
086h	Firmware date	8	0	-	FWDATE
087h	EEPROM size	2	0	-	EESIZE
0C0h	Temperature range	4	0	-	TEMPRNG
0C1h	Temperature	2	0	-	TEMPRTUR
0C4h	Supply voltage range	4	0	-	SUPRANGE
0C5h	Supply voltage	2	0	-	SUPVOLT
0C6h	Rotation speed range	2	0	-	SPEEDRNG
0C7h	Rotation speed	2	0	-	SPEED
0C8h	Acceleration range	2	0	-	ACCRANGE
0CBh	Lifetime	8	0	-	LIFETIME
0CCh	Error protocol	8	0	-	ERRORLOG
0CDh	Usage histogram	4	0	-	HISTOGRM

Resource Index	Function	Size (max. Offset)	Read access	Write access	Name
0D3h	Axial position range	2	0	-	AXPOS RNG
0D4h ¹⁾	Axial position	2	0	-	AXIALPOS
100h	Reset	0	-	0	RESET
101h	Determine position	8	-	4	SETPOS
104h	Determine access level	8	0	0	SETACCES
105h	Change access key	8	-	0	CHNGEKEY
107h	Warning limits	8	0	2	UWARNING
108h	Reset to the factory setting	8	-	2	FACRESET
109h	User-defined encoder index	2	0	3	ENCIDENT
10Ah	Position filter setting	4	0	3	POSFLT
120h	Read counter	4	0	-	READCNT
121h	Increment counter, operational lifetime: max. 300,000 increments	0	-	0	INCCOUNT
122h	Reset the counter	0	-	2	RESETCNT
130h	Load file	8	-	0	LOADFILE
131h	Access file	File size	User-defined	User-defined	RWFILE
132h	File status	4	-	-	FILESTAT
133h	Create/delete/change file	8	-	User-defined	MAKEFILE
134h	Directory	8	0	-	DIR
200h	I/O access	4	0	0	ACCESSIO
201h	Manage I/O	4	0	2	MANAGEIO

¹⁾ Indication for axial position rotor: -2: pos ≤ -0.2 mm, -1: -0.4 mm < pos ≤ -0.2 mm, 0: -0.2 mm < pos < 0.2 mm, 1: 0.2 mm ≤ pos < 0.4 mm, 2: pos ≥ 0.4 mm

Supported access levels

Access level	User	Standard access key
0	Execute (default setting)	0000 (30 30 30 30h)
1	Operator	1111 (31 31 31 31h)
2	Maintenance	2222 (32 32 32 32h)
3	Authorized client	3333 (33 33 33 33h)
4	User service	4444 (34 34 34 34h)

Overview of warnings and fault indications

Error type	Error register	Error bit	Description
Position (incremental)	40h	0	A Protocol reset was executed
	40h	1	Acceleration overflow, invalid position
	40h	3	Drift compensating error
	40h	4	Internal error in plausibility, invalid position
	40h	5	Internal error in vector length, invalid position
	40h	6	Internal error in configuration, invalid position
	40h	7	Cross check error

Error type	Error register	Error bit	Description
Position (absolute)	41h	0	Error in absolute position in rotation
	41h	1	Error 1 in absolute position in several rotations
	41h	2	Error 2 in absolute position in several rotations
	41h	3	Error 3 in absolute position in several rotations
	41h	4	Position cross check error
Initialization	42h	0	Switch-on self-test undertaken (only safety versions)
	42h	1	Warning safety parameter: error could not be rectified (only safety versions)
	42h	2	Warning safety parameter: error could not be rectified (only safety versions)
	42h	3	Error calibration data
	42h	4	Internal communications error 1
	42h	5	Internal communications error 2
	42h	6	Internal general error
Test	43h	0	Critical temperature
	43h	1	Critical rotor position
	43h	2	Critical supply voltage
	43h	3	Critical rotation speed
	43h	5	Critical overflow
	43h	4	Internal test error
Access to resources	44h	0	Invalid argument given during resource access procedure
	44h	1	Resource access refused due to incorrect access level
	44h	2	Internal error during resource access
	44h	3	Error when accessing a user file
User defined Warnings	47h	0	User-defined warning 0
	47h	1	User-defined warning 1
	47h	2	User-defined warning 2
	47h	3	User-defined warning 3

Recommended accessories

Mounting systems

Nuts and screws

Screws

Figure	Brief description	Type	Part no.
	100 pieces, Screws with Precote 85-8 coating; M4*14	BEF-MK-S03	2077358
	10 pieces, Screws with Precote 85-8 coating; M4*14	BEF-MK-S07	2088239
	500 pieces, Screws with Precote 85-8 coating; M4*14	BEF-MK-S08	2088240

Other mounting accessories

Mounting tools

Brief description	Type	Part no.
Test gauge for SEK/SEL34, SEK/SEL37, and EES/EEM37	BEF-MW-PL	2084768

Dimensional drawings → [page 14](#)

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

Dimensional drawings → [page 13](#)

Plug connectors and cables

Plug connectors and cables

Connecting cables

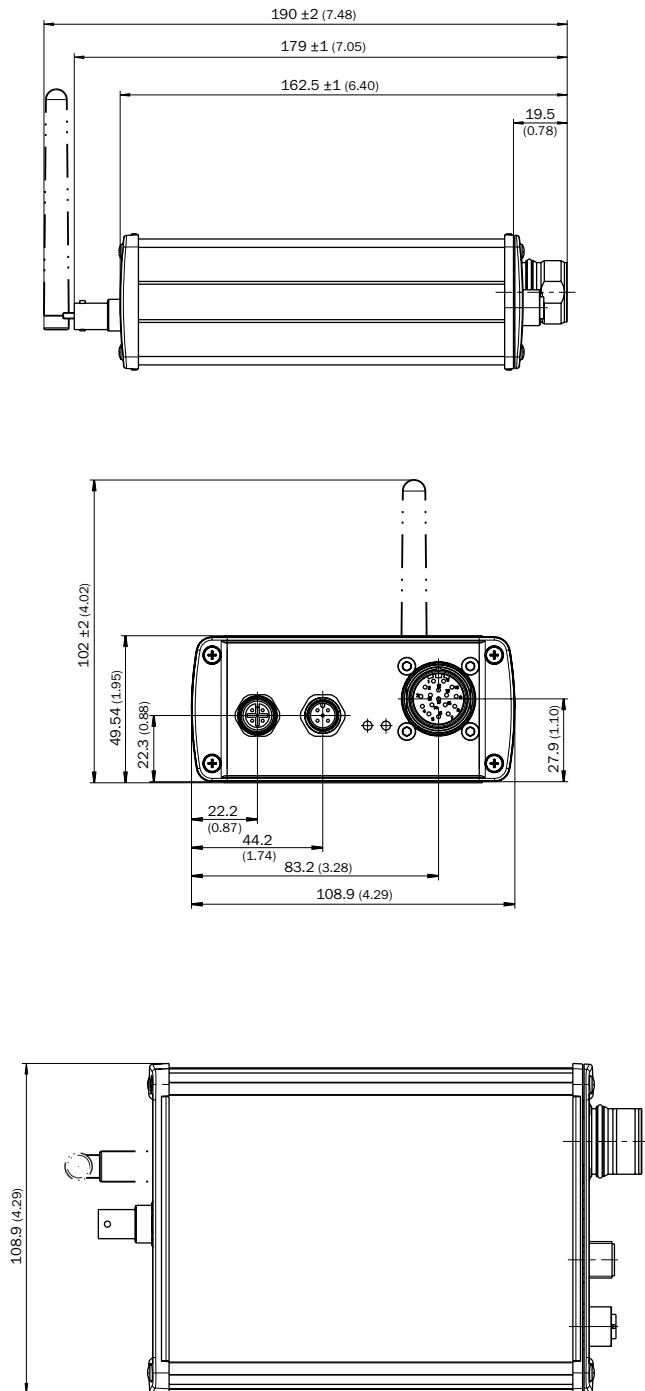
Figure	Brief description	Length of cable	Type	Part no.
	Head A: female connector, stranded wire, 4-pin, straight Head B: Flying leads Cable: HIPERFACE DSL®, unshielded Signalart: HIPERFACE DSL®	0.2 m	DOL-0B02-G0M2XC2	2079920

Dimensional drawings → [page 14](#)

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

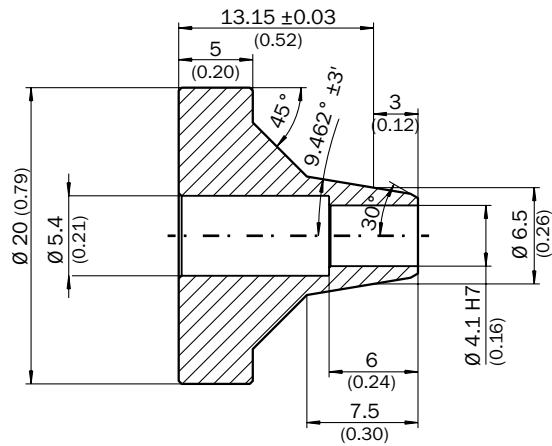
Programming and configuration tools

PGT-11-S LAN



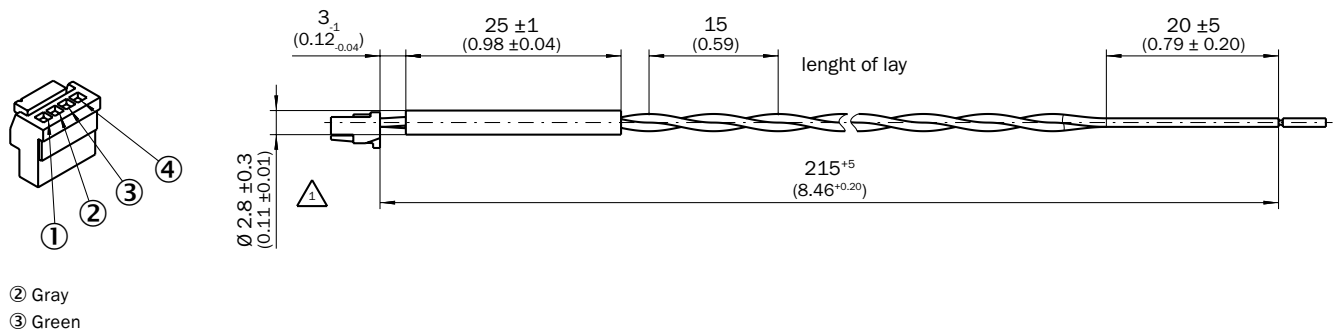
Other mounting accessories

BEF-MW-PL



Plug connectors and cables

DOL-0B02-G0M2XC2



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SICK AT A GLANCE

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SICK has extensive experience in various industries and understands their processes and requirements. With intelligent sensors, SICK delivers exactly what the 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 SICK a reliable supplier and development partner.

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Detailed addresses and further locations → www.sick.com