

EKS36-2KF0B0S01

EKM36-2KF0B0S01

EKS36-2KF0B0S03

EKM36-2KF0B0S03

Safe motor feedback systems

EN

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1 About this document

Please read these operating instructions carefully before using the EKS36-2/EKM36-2 safe motor feedback system or mounting it, putting it into operation or servicing it.

This document is an original document.

1.1 Purpose of this document

These operating instructions are for giving technical personnel of the machine manufacturer or operator instructions on the safe assembly, electrical installation, commissioning, operation and maintenance of the EKS36-/EKM36-2 safe motor feedback system.

In addition, for planning and using protective equipment such as the EKS36-2/EKM36-2 safe motor feedback system, technical skills are required that are not covered by this document.

The official and legal regulations for operating the EKS36-2/EKM36-2 safe motor feedback system must always be complied with.

1.2 Symbols used



Safety instruction!

A warning indicates a specific or potential hazard. It is for protecting you from accidents.

Read the safety instructions carefully and follow them.

2 On safety



Attention!

In addition, observe the safety instructions and warnings in the documentation of the drive system connected.

2.1 Skilled persons

The EKS36-2/ EKM36-2 safe motor feedback system may be mounted, put into operation, checked, serviced and used by skilled persons only. A skilled person

- has taken part in adequate technical training and
- has been instructed by the machine operator in machine operation and the applicable safety guidelines
- and
- can access these operating instructions.

2.2 Field of use for the device

The safety-related use of the EKS36-2/EKM36-2 safe motor feedback system with a HIPERFACE DSL® interface applies to its use in combination with servo systems with three-phase AC synchronous motors. Their commutating information and (rotational) speed information is derived from the digital position signals of the encoder connected directly to the motor shaft. Alternatively it is possible to use the system on asynchronous motors, the speed or speed information of which is derived directly from the digital position signals of the encoder which is coupled directly to the motor shaft.

The EKS36-2/EKM36-2 safe motor feedback system can be used in combination with a drive system as per IEC 61800-5-2, for safety applications up to control category 3 as per EN ISO 13849, SILCL2 as per EN 62061 or up to PL d as per EN ISO 13849.

It meets the requirements of machinery directive 2006/42/EC and is for supporting the drive system in ensuring

- the safety functions, based on the reliable position or speed information of the motor feedback system
- The motor feedback system has only one channel for safety-oriented diagnosis for safety functions that are based on the absolute position. A second channel must be established by the user with the help of other measures. Without a second channel, every time the motor feedback system is activated a reference traverse must be done in order to confirm the absolute position.

2.3 Intended use

The safe motor feedback system may be used only in terms of the "Scopes of application of the device" chapter and within the limits of the prescribed and specified technical data, dimensions and tolerances of the dimensional drawings and operating conditions, and the specified tightening torques must be complied with. It is especially important that the motor feedback system not be used for safety applications beyond its mission time and bearing service life (see technical data). After its bearing service life is exceeded, bearing wear or fatigue could lead to bearing failure.

To prevent this, the motor feedback system must be taken out of operation no later than when the bearing service life has been reached. The bearing service life is also influenced by the specific application, in particular due to operating modes with low speeds, reversing operation and mechanical vibrations. Current should be prevented from passing through the ball bearing (e.g. due to injected currents).

If used in any other way or if alterations are made to the device – including in the context of assembly and installation – this will render warranty claims void directed to SICK AG.

2.4 General safety instructions and protective measures



Safety instructions!

Observe the following to ensure the safe use of the EKS36-2/EKM36-2 safe motor feedback system as intended.

- The national and international legal specifications apply to the installation and use of the EKS36-2/EKM36-2 safe motor feedback system, to its commissioning and to technical inspections repeated at regular intervals, in particular:
 - the machinery directive 2006/42/EC
 - the use of work equipment directive 2009/104/EC
 - the accident prevention regulations and safety regulations
 - and any other relevant safety regulations.
- The manufacturer and operator of the machine on which the EKS36-2/EKM36-2 safe motor feedback system is used are responsible for coordinating and complying with all applicable safety specifications and regulations, in cooperation with the relevant authorities.
- The manufacturer of the drive system connected must have complied with the safety requirements for the drive system design described in the implementation manual, "HIPERFACE DSL® Safety".

- These operating instructions must be made available to the operator of the machine on which the EKS36-2/EKM36-2 safe motor feedback system is used. The machine operator must be instructed by skilled personnel and read the operating instructions.

2.5 Associated documents

- "HIPERFACE DSL®" interface manual, order number 8013607, as of 02.2011 (or newer)
- "Hipreface DSL® safety" implementation manual, order number 8013664, as of 02.2011 (or newer)

2.6 Maintenance and repair

The EKS36-2/EKM36-2 safe motor feedback system is maintenance-free. It is not designed to be repaired if defective. Please contact us if you have any complaints.

2.7 Disposal

- Always dispose of unusable or irreparable devices in accordance with the applicable specific national waste disposal regulations.

Note

We will be glad to assist you in the disposal of these devices. Please contact us.

3 Product description

Type EKS36-2/EKM36-2 encoders are motor feedback systems predestined for the dynamic and precise operation of servo-control circuits, due to their equipment.

The overall system, consisting of encoder, evaluation system, servo inverter and motor, forms a control circuit. Actual values for commutation, rotational speed, direction of rotation and position are derived from the encoder signals.

Encoder systems of the EKS36-2/EKM36-2 series are suitable for use in function chains of safety-related machine functions.

The sensor signals are transferred to the evaluation system via HIPERFACE DSL® interface. In combination with a drive system of category 3 (EN ISO 13849), SILCL2 (EN 62061) or PL d (EN ISO 13849), the motor feedback system is suitable for safety applications. For position and speed-based safety functions of the drive, the motor feedback system meets the requirements in EN 61800-5-2.

4 Assembly



Safety instructions!

Observe the following for assembly of the EKS36-2/EKM36-2 safe motor feedback system.

- Switch off the power of all affected machines/units during the assembly process.
- Make sure to avoid any blows or impact to the shaft under all circumstances, to prevent damage to the ball bearings.
- For EKS36-2/ EKM36-2 encoders with tapered shaft the shaft end of the motor may only have a diameter of max. 12 mm.

4.1 Preparation for mounting

Degrease the drive shaft and the shaft of the motor feedback system.

4.1.1 Tools/parts required

The assembly tool BEF-MW-EKX36 (part no. 2060224) is required for mounting or removing all variants. Two DIN cheese-head/ oval-head screws M3 are required for assembly.

4.1.2 Generally applicable notes

Using the torque support for the motor feedback system, the housing must be correctly seated in the customer's flange arrangement. The more precise the centering for the motor feedback system, the less the angle and shaft offset during assembly and the less load on the bearings of the motor feedback system.

EMC considerations make it mandatory to connect the housing and/or the encoder to earth. For the EKS36-2/EKM36-2 with tapered shaft, this is provided by the torque support.



Shielding connection

To ensure trouble-free operation, it is imperative to ensure suitable shield connection of the motor.

4.2 Assembling the motor feedback system with tapered shaft and spring plate support (Fig. 4)

- Block customer's drive shaft to prevent rotation.
- The hexagonal part (1) of the encoder shaft (2) must be engaged in the recess of the fixing plate (3) of the torque support (4). Place the assembly tool (5) on the back of the encoder and engage in the recesses of the encoder housing (6). Using the hexagonal part (7) of the assembly tool (5), screw the encoder into the drive shaft. Screws (8) must not hook into the fixing holes of the motor.

Tightening torque: 4 Nm ± 0.8 Nm.



Observe the tightening torque!

Compliance with the tightening torque attains an oversizing of the friction-lock shaft connection that justifies the supposition of fault exclusion in regard of a "break in the motor/encoder shaft connection".



Safety instruction!

Make sure that assembly work is only performed and documented by appropriately instructed and trained personnel.

- Release the drive shaft and rotate the encoder until the holes in the fixing plate (3) are positioned over the fixing holes of the motor flange. Alternately tighten the fixing plate (3) with 2 M3 screws (8) on the motor flange. This releases the encoder shaft.
- Fastening torque: 0.8 Nm ± 0.08 Nm.**

Attention!

- The internal thread in the motor shaft must be free of burrs and dirt.
- The taper must be free of dirt and grease.
- Max. torque for the tapered shaft thread, before the taper is seated: 0.8 Nm.

Dismantling:

- Block customer's drive shaft to prevent rotation.
- Open the cover (12) using a screwdriver if necessary (Fig. 4). Remove the connector fitted with the set of strands (9+10) volt-free.
- Remove the 2 M3 screws (8). The fixing plate (3) is to be positioned in such a way that the screw holes are aligned with the torque support (4). Turn the encoder by hand until fixing plate (3) engages. Place the assembly tool (5) on the back of the encoder and engage in the recesses of the encoder housing (6). Using the hexagonal part (7) of the assembly tool (5), detach and remove the encoder from drive shaft.

5 Electrical installation



Safety instructions!

Observe the following for electrical installation of the EKS36-2/EKM36-2 safe motor feedback system.

- To connect the sensors, refer to the corresponding operating instructions for the external drive system or for the higher-order control system. The supply voltage has to be generated by PELV systems (EN 50178). The motor feedback system corresponds to protection class III according to DIN EN 61140. If the supply voltage is not generated by the PELV systems, other measures must be found that will guarantee that mains supply voltage parts are safely separated
- Never establish or remove electrical connections to the motor feedback system with the power connected, since that could result in a faulty device.

5.1 Interface connection

- Open the cover (12) using a screwdriver if necessary (Fig. 4). Engage the connector (9) fitted with the set of strands (10), volt-free, in the connector socket (11) of the encoder.
- Close the cover (engage in the recess of the encoder housing (6)).
- The engagement by clicking must be clearly felt or heard. May be difficult to close with your bare hands. Use tools if necessary.

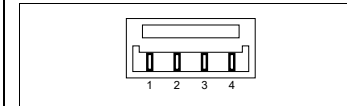


Fig. 1: In-line plug connection, 4-pin

PIN and conductor assignment		
PIN	Signal	Cable color (cable outlet)
1	n.c.	-
2	+ Us / DSL +	Gray
3	GND / DSL -	Green
4	Housing	Cable shield

Table 1: 2-pin interface PIN assignment

5.2 Temperature sensor connection

Plug the temperature sensor (13) into the connector socket (14) volt-free.



Safety instructions!

Since there is no electrical isolation of the temperature sensor in the motor feedback system, only temperature sensors with double or reinforced isolation may be used.

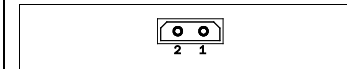


Fig. 2: 2-pin sensor plug pin assignment

PIN and conductor assignment	
PIN	Signal
1	T+
2	T- / GND

Table 2: 2-pin sensor plug PIN assignment

5.3 Signals of the encoder system

The EKS36-2/ EKM36-2 safe motor feedback system provides the following signals via HIPERFACE DSL® interface:

- + Us/DSL+: Supply voltage to the encoder with modulated positive data signal. The operating voltage range of the encoder is between +7 V and +12 V.
- GND/DSL-: Encoder ground connection with modulated negative data signal. The operating voltage range of the encoder is between +7 V and +12 V.
- Housing: to connect cable shield to housing potential
- T+; Sensor signal for passive temperature sensor/ temperature resistance.
- T-/GND: Ground reference for passive temperature sensor/temperature resistance sensor signal.

6 Commissioning

To commission the safe motor feedback system, EKS36-2/EKM36-2, it is assumed that the manufacturer of the connected drive system has complied with the safety requirements for the drive system design, as described in the implementation manual, "HIPERFACE DSL® Safety".

6.1 Inspection instructions

- When commissioning, ensure that a safe EKS36-2/EKM36-2 motor feedback system is used and not an EKS36-0/EKM36-0 standard motor feedback system. This must be verified by reading out the type name (resource 083h). In addition this must be verified by sending off at least one test message (see "HIPERFACE DSL® Safety" implementation manual).
- When changing the position offset of the motor feedback system via the resource 101h ("Set position") or 108h ("Factory settings"), you must subsequently verify that the sensor is delivering the desired positional value.

Further inspection measures are not required during operation.



Warning!

Observe the service life!

The EKS36-2/EKM36-2 safe motor feedback systems have a specified maximum service life, after which they must always be taken out of service.

The bearing service life must be taken into account in addition to the mission time. The parameter which is first reached depending on the application determines the time when the system must be taken out of operation.

The year of manufacture of the motor feedback system is specified on the device label and/or packaging label using a four digit code (yyww). The first two digits yy specify the year (without the century), the last two digits ww specify the calendar week of the last manufacturing process. The EKS36-2/EKM36-2 safe motor feedback systems issue a warning message when their service life has expired.

7 Order data

Type	Item no.
EKS36-2KF0B0S01	1085001
EKM36-2KF0B0S01	1085028
EKS36-2KF0B0S03	1088053
EKM36-2KF0B0S03	1088021

8 Technical data

	EKS36-2		EKM36-2	
	S01	S03	S01	S03
Performance				
Resolution per revolution	18 Bit	20 Bit	18 Bit	20 Bit
Number of absolutely encodable revolutions	1		4,096	
Measurement step per revolution	262,144		262,144	
Positional value error limits	±80	±60	±80	±60
Integral non-linearity in angular seconds				
Positional value error limits	±40			
Differential non-linearity in angular seconds				
Working speed up to which the position during switching on can be reliably mapped	6,000/min			
Available memory space	8,192 byte			
Interfaces				
Code type for the absolute value	binary			
Code sequence	Rising, with rotation of the shaft. Clockwise when looking towards "A" (see dimensional drawing).			
HIPERFACE DSL® interface signals	Digital, RS485 ¹⁾			
Measurement of the external temperature resistance	Output format: 32-bit value without algebraic sign Output unit: 1 Ω Measuring range: 0 ... 209,600 Ω			
Mechanics/Electrical system				
Operating voltage range/Supply voltage	7 ... 12 V			
Operating current	Max. 150 mA ²⁾			
Output frequency of digital positional value	0 ... 75 kHz			
Mass	0.10 kg			
Rotor moment of inertia	4.5 gcm ²			
Operating speed	Max. 12,000/min	Max. 9,000/min		
Angular acceleration	Max. 5 x 105 rad/s ²			
Operating torque	0.2 Ncm			
Start-up torque	0.3 Ncm			
Permissible shaft movement (static)	±0.1 mm (radial), ±0.2 mm (axial)			
Permissible shaft movement (dynamic)	±0.05 mm (radial), ±0.1 mm (axial)			
Angle movement vertical to axis of rotation (static)	±0.005 mm/mm			
Angle movement vertical to axis of rotation (dynamic)	±0.0025 mm/mm			
Service life of ball bearings	3.6 x 10 ⁹ revolutions ⁹⁾			
Ambient data				
Working temperature range	-20 ... +115 °C ³⁾			
Storage temperature range	-40 ... +125 °C (without packaging)			
Relative air humidity/condensation	90 % (condensation not permissible)			
Resistance to shocks	100 g/6 ms (as per EN 60068-2-27)			
Resistance to vibrations	50 g/10 ... 2,000 Hz (as per EN 60068-2-6)			
Protection class	IP 40 as per IEC 60529-1 ⁴⁾			
EMC ⁵⁾	As per EN 61000-6-2, EN 61000-6-4 and IEC 61326-3			
Safety characteristics				
Safety integrity level ⁶⁾	SIL2 (IEC 61508), SILCL2 (EN 62061)			
Category	3 (EN ISO 13849)			
Test rate	1 h			
Maximum demand rate	200 μs			
Performance Level ⁶⁾	PL d (EN ISO 13849)			
PfHb: probability of dangerous failure per hour ⁷⁾	4 x 10 ⁻⁸			
T _M (service life)	20 years (EN ISO 13849) ⁹⁾			
MTTFd: Time before a dangerous failure	500 years (EN ISO 13849)			
Resolution channel 1	18 Bit	20 Bit	18 Bit	20 Bit
Resolution channel 2	9 Bit		9 Bit	
Safety-oriented resolution ⁸⁾	0.7°		0.7°	

- For connection with a drive controller, the IP core "DSL Master" must be implemented in the controller, see "Hiperface DSL®" manual (8013607).
- Current specification valid when using an interface electronic system as suggested in the "Hiperface DSL®" manual (8013607).
- With typical thermal connection between motor flange and encoder stator coupling. The limit of the internal encoder temperature must not exceed 125 °C.
- When the mating plug is fitted and the cover is closed.
- EMC as per specified standards is ensured if the motor feedback system is fitted in a conductive housing connected to the central grounding point of the motor controller via cable shielding. The GND(0 V) connection of the supply voltage is also grounded. If other shielding concepts are used, the user must perform his own tests. Class A device.
- For more detailed information on the exact configuration of our machine/unit, please consult your relevant SICK branch office.
- The values displayed apply to a diagnostic degree of coverage of 90 %, which must be achieved by the external drive system.
- The safety-oriented resolution specifies the maximum positioning error limit with which safety components can be supported. It results from the resolution of the lowest-quality channel.
- The mission time can also be limited by the bearing service life specific to the application.

8.1 Dimensional drawings (all dimensions in mm)

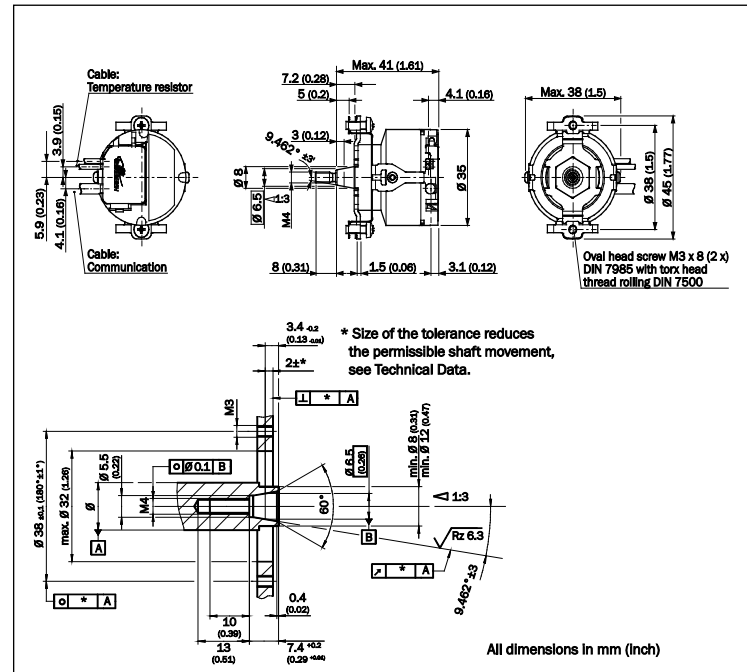


Fig. 3: Dimension illustration and mounting suggestion for EKS36-2/EKM36-2 tapered shaft

8.2 Assembly figure

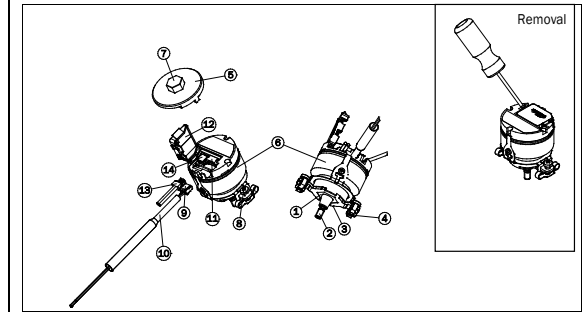


Fig. 4: Assembly drawing for EKS36-2/EKM36-2 tapered shaft

7 Conformities and certificates

You can obtain declarations of conformity, certificates, and the current operating instructions for the product at www.sick.com. To do so, enter the product part number in the search field (part number: see the entry in the "P/N" or "Ident. no." field on the type label).

7.1 EU declaration of conformity

Excerpt

The undersigned, representing the manufacturer, herewith declares that the product is in conformity with the provisions of the following EU directive(s) (including all applicable amendments), and that the standards and/or technical specifications stated in the EU declaration of conformity have been used as a basis for this.

- MACHINERY DIRECTIVE 2006/42/EC
- EMC DIRECTIVE 2014/30/EU
- ROHS DIRECTIVE 2011/65/EU

7.2 UK declaration of conformity

Excerpt

The undersigned, representing the following manufacturer herewith declares that this declaration of conformity is issued under the sole responsibility of the manufacturer. The product of this declaration is in conformity with the provisions of the following relevant UK Statutory Instruments (including all applicable amendments), and the respective standards and/or technical specifications have been used as a basis.

- ELECTROMAGNETIC COMPATIBILITY REGULATIONS 2016
- SUPPLY OF MACHINERY (SAFETY) REGULATIONS 2008
- RESTRICTION OF THE USE OF CERTAIN HAZARDOUS SUBSTANCES IN ELECTRICAL AND ELECTRONIC EQUIPMENT REGULATIONS 2012

