

SRS50S/SRM50S

Safe motor feedback systems

EN

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8014121/2011-01-18 • KE
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1 About this document

Please read these operating instructions carefully before using the SRS50S/SRM50S safe motor feedback system or mounting it, putting it into operation or servicing it.

This document is a translation of the 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 SRS50S/SRM50S safe motor feedback system.

In addition, for planning and using protective equipment such as the SRS50S/SRM50S safe motor feedback system, technical skills are required that are not covered by this document.

The official and legal regulations for operating the SRS50S/SRM50S 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 SRS50S/SRM50S 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 SRS50S/SRM50S safe motor feedback system with sine/cosine output applies to its use in combination with servo systems with three-phase AC synchronous motors. Their commuting information and (rotational) speed information is also derived from the sine/cosine signals of the encoder connected directly to the motor shaft. These can also be used with servo systems working with asynchronous motors, where the speed control is derived from the sine/cosine signals from the encoder directly connected to the motor shaft. The SRS50S/SRM50S 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 speed information of the motor feedback system

2.3 Intended use

The SRS50S/SRM50S safe motor feedback system may only be used as described in Chapter 2.2 "Field of use for the device".

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 STEGMANN GmbH.

2.4 General safety instructions and protective measures



Safety instructions!

Observe the following to ensure the safe use of the SRS50S/SRM50S safe motor feedback system as intended.

- The national and international legal specifications apply to the installation and use of the SRS50S/SRM50S 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 89/655/EEC
 - the accident prevention regulations and safety regulations
 - and any other relevant safety regulations
- The manufacturer and operator of the machine on which the SRS50S/SRM50S 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 Safety".
- These operating instructions must be made available to the operator of the machine on which the SRS50S/SRM50S 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"® interface manual, order number 8010701, as of 04.2008 (or newer)
- "Hiperface Safety" implementation manual, order number 8014120, as of 2010-12 (or newer)

2.6 Repair

- The SRS50S/SRM50S safe motor feedback system is not designed to be repaired by you in the event of a defect. 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

SRS/SRM-type 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 SRS/SRM series are suitable for use in function chains of safety-related machine functions.

The sensor signals are transferred to the evaluation system via HIPERFACE® 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. If only the analog incremental signal outputs (sine/cosine) are used for speed-based safety functions of the drive, the motor feedback system meets the requirements in EN 61800-5-2.

The safe motor feedback system does not support any safety-related operating modes in the context of an absolute position.

4 Assembly



Safety instructions!

Observe the following for assembly of the SRS50S/SRM50S 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.
- Never pull or push the motor feedback system.
- Never bring the rubber parts into contact with adhesive, e.g. Loctite 241, 243, since the dimethacrylate ester contained therein bites into the surface.

4.1 Preparation for mounting

- Remove any protective film from the back of the motor feedback system (with built-in versions).
- Degrease the drive shaft and the shaft of the motor feedback system when dirty.
- Pay attention to any damage!

4.1.1 Tools/Parts Required

Fixing the torque support requires screws and washers depending on design 2.3 or 4. Fixing via the servo groove also requires servo clamps.

Screw size M3/8.8 select the screw length and screw head type according to the mounting conditions.

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 device housing and the cable screen, resp., to ground. The device is grounded using a blade connector which, depending on the design, is attached to the flange or to the housing, or directly above the spring plate torque support. The braided screen should be connected over a large area.



Shielding connection

To ensure trouble-free operation, it is imperative to ensure a clean shield connection on both sides.



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.

4.2 Assembling the motor feedback system with tapered shaft and spring plate support (Fig. 5)

- Block customer's drive shaft to prevent rotation.
- Carefully push the encoder (1) onto the motor shaft. Make sure that the torque support (2) is not bent in the process. Tighten the screw (3). **Tightening torque: 3.1 Nm.**
- If a screw other than the TufLok-coated screw supplied is used, apply liquid thread lock to the start of the screw thread. E.g. Loctite 243
- Fasten the torque support (2) with washers (4) and M3 (8.8) screws (5) to the motor flange.
- **Tightening torque: 0.8 - 1 Nm**
- Fully tighten to prevent screws (5) from working loose. Make sure that the torque support is not tensioned when the screws (5) are tightened. It is also the shielding connection of the motor feedback system.

Dismantling:

- Block customer's drive shaft to prevent rotation.
- Disconnect the electrical connection (6) from the mains.
- Undo the screws (5) on the torque support (2) and remove them. Undo the screw (3) and remove it.

4.3 Assembling the motor feedback system with conical shaft and resolver support (fig. 6)

- Block customer's drive shaft to prevent rotation.
- Carefully push the encoder (1) onto the drive shaft. Tighten the screw (3). **Tightening torque: 3.1 Nm.**
- If a screw other than the TufLok-coated screw supplied is used, apply liquid thread lock to the start of the screw thread. E.g. Loctite 243
- Fasten the torque support (2) on the motor at no less than three points. It can be fastened, for example, using servo clamps (4) and screws M3 (8.8)(5) or with a clamping ring and screws.

Tightening torque: 0.8 - 1 Nm



Friction-lock connection for the torque support

The friction-lock coupling of the resolver support to the housing of the motor must be oversized in accordance with IEC 61800-5-2 to justify a fault exclusion in regard of a "break in the motor/encoder shaft connection". Proof of this must be provided by the motor manufacturer.

- Fully tighten to prevent screws (5) from working loose.
- Connect the plug (6) or braid set with the power supply disconnected.
- Connect up the shielding connection (7).

Dismantling:

- Block customer's drive shaft to prevent rotation.
- Disconnect the electrical connection (6+7) from the mains.
- Undo the fastening screws (5) on the torque support (2) and remove them. Undo the screw (3) and remove it.

4.4 Assembling the motor feedback system with conical shaft and rubber support (fig. 7)

- Block customer's drive shaft to prevent rotation.
- Carefully push the encoder (1) onto the drive shaft. Tighten the screw (2). **Tightening torque: 3.1 Nm.**
- Press the housing rim (3) into the housing groove (4) provided by the customer.
- If a screw other than the TufLok-coated screw supplied is used, apply liquid thread lock to the start of the screw thread. E.g. Loctite 243
- Press the housing cover (5) into the rubber housing and fasten it using screws (6). Should the cover (5) be difficult to press in, then the housing rim (3) can be slightly lubricated (use 160° high-temperature grease).



Safety instruction!

The coupling of the rubber housing to the rear wall of the motor must be positive locking. If this is not possible for friction-lock coupling, proof from the motor manufacturer of sufficient oversizing in regard of fault exclusion as per IEC 61800-5-2 must be provided.

Dismantling:

- Block customer's drive shaft to prevent rotation.
- Disconnect the electrical connection (7+8) from the mains.
- Undo the torque support (3). Undo the screw (2) and remove it.

5 Electrical installation



Safety instructions!

Observe the following for the electrical installation of the SRS50S/SRM50S 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.
- Never establish or remove electrical connections to the motor feedback system with the power connected, since that could result in a faulty device.
- Observe the specifications in EN 60204-1 for installation.

5.1 Connection

- Connect the plug or braid set with the power supply disconnected.
- Connect the shielding's connection leads to the encoder housing.

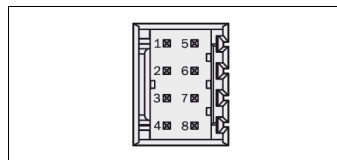


Fig. 1: 8-pin connection

PIN assignment and wiring, SRS50S/SRM50S		
PIN	Signal	Cable color (cable outlet)
1	U _S	Red
2	GND	Blue
3	REFSIN	Brown
4	REFCOS	Black
5	Data +	Gray or yellow
6	Data -	Green or violet
7	+ SIN	White
8	+ COS	Pink
		Shielding connection

Table 1. PIN assignment

5.2 Signals of the encoder system

The SRS50S/SRM50S safe motor feedback system provides the following signals via HIPERFACE® interface:

- V_S – Supply voltage to the encoder. The operating voltage range of the encoder is between +7 V and +12 V. The recommended supply voltage is +8 V.
- GND - Encoder ground connection; electrically isolated from the housing. The voltage relating to GND is +U_S.
- +SIN process data channel; +SIN is a sine signal of 1 Vpp with a static offset of REFSIN.
- REFSIN process data channel; a +2.5 V static voltage which serves as the reference voltage for +SIN.
- +COS process data channel; +COS is a cosine signal of 1 Vpp with a static offset of REFCOS.
- REFCOS process data channel; a +2.5 V static voltage which serves as the reference voltage for +COS.
- Parameter channel; positive data signal. The parameter channel is an asynchronous, half-duplex interface, which physically conforms to the EIA RS485 specification. For this, data can be requested from the encoder through different commands; this also makes it possible to write user-specific data such as position offset to the EEPROM of the encoder
- Parameter channel; negative data signal. The parameter channel is an asynchronous, half-duplex interface, which physically conforms to the EIA RS485 specification. For this, data can be requested from the encoder through different commands; this also makes it possible to write user-specific data such as position offset to the EEPROM of the encoder

6 Commissioning

To commission the SRS50S/SRM50S safe motor feedback system, 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 Safety".

Further measures are not required for commissioning.

6.1 Inspection instructions

When commissioning, it must be ensured by means of random testing that the friction lock for the encoder housing/motor housing connection is adequate for versions with rubber support. To do this, the torque for the fastening screws must be checked, for example.

Further inspection measures are not required during operation.



Observe the service life!

The SRS50S/SRM50S safe motor feedback systems have a maximum service life, after which they must always be put out of service (see Technical data).

6.2 Declaration of conformity

The SRS50S/SRM50S safe motor feedback system family was manufactured in accordance with the following directives:

- the machinery directive 2006/42/EC
- the EMC directive 2004/108/EC

The complete EU declaration of conformity is available at the SICK homepage on the Internet: www.sick.com

7 Order data

Type	Item no.	EEPROM 512 Byte	EEPROM 2048 Byte	Connector outlet	Lead outlet
SRS50S/SRM50S conical shaft, spring plate					
SRS50S-HFA0-K21	1051789	x		x	
SRS50S-HFA0-K22	1051790		x	x	
SRS50S-HFV0-K21	1051791	x			x
SRS50S-HFV0-K22	1051792		x	x	
SRM50S-HFA0-K21	1051793	x		x	
SRM50S-HFA0-K22	1051794		x	x	
SRM50S-HFV0-K21	1051795	x			x
SRM50S-HFV0-K22	1051796		x	x	
SRS50S-HFV0-S22	1053706		x	x	
SRM50S-HFV0-S22	1053707		x	x	
SRS50S/SRM50S conical shaft, resolver support					
SRS50S-HGA0-K21	1051797	x		x	
SRS50S-HGA0-K22	1051798		x	x	
SRS50S-HGV0-K21	1051799	x			x
SRM50S-HGV0-K22	1051800		x	x	
SRM50S-HGA0-K21	1051801	x		x	
SRM50S-HGV0-K21	1051803	x			x
SRM50S-HGV0-K22	1051804		x	x	
SRS50S/SRM50S conical shaft, rubber support					
SRS50S-HEA0-K21	1051805	x		x	
SRS50S-HEA0-K22	1051806		x	x	
SRS50S-HEV0-K21	1051807	x			x
SRS50S-HEV0-K22	1051808		x	x	
SRM50S-HEA0-K21	1051809	x		x	
SRM50S-HEA0-K22	1051810		x	x	
SRM50S-HEV0-K21	1051811	x			x
SRM50S-HEV0-K22	1051812		x		x

8 Technical data in accordance with DIN 32878

	SRS50S Spring plate	SRM50S Spring plate	SRS50S Resolver	SRM50S Resolver	SRS50S Rubber support	SRM50S Rubber support
Number of sine/cosine periods per revolution	1024					
Number of absolutely encodable revolutions	1	4096	1	4096	1	4096
Dimensions	see dimensional drawings					
Weight	0.20 kg					
Rotor moment of inertia	10 gcm ²					
Code type for the absolute value	binary					
Code sequence when rotating the shaft clockwise while looking towards "A" (see fig. 3)	increasing					
Measuring step for interpolation of the sine/cosine signals with e.g. 12 bit	0.3 angular seconds					
Error limits for evaluation of the sine/cosine signals, integral non-linearity ¹	± 45 angular seconds					
Non-linearity of a sine/cosine period, differential non-linearity	± 7 angular seconds					
Output frequency for sine/cosine signals	0 ... 200 kHz					
Working speed up to which the absolute position can be reliably determined	6000 rpm					
Max. operating speed	12000 rpm					
Max. angular acceleration	0.2 x 10 ⁶ rad/s ²					
Operating torque	0.2 Ncm					
Start-up torque	0.4 Ncm					
Permissible shaft movement	-					
Static (radial/axial)	± 0.5 mm/± 0.75 mm		± 0.25 mm/± 0.75 mm -		± 0.5 mm/± 0.75 mm	
Dynamic (radial/axial)	± 0.1 mm/± 0.2 mm		± 0.1 mm/± 0.2 mm		± 0.1 mm/± 0.2 mm	
Angle movement vertical to axis of rotation						
Static	± 0.005 mm/mm					
Dynamic	± 0.0025 mm/mm					
Service life of ball bearings	3.6 x 10 ⁹ revolutions					
Working temperature range	-20 ... + 115 °C					
Storage temperature range (without packaging)	-40 ... + 125 °C					
Permissible relative humidity (without condensation)	90%					
Resistance to shocks ²	100 g/10 ms					
Resistance to vibrations ³	20 g/10 ... 2000 Hz					
Protection class ⁴	IP 40					
EMC ⁵						
Operating voltage	7 ... 12 V					
Recommended operating voltage	8 V					
Max. operating current w/o load	80 mA					
Available memory in EEPROM 512 ⁶	128 byte					
Available memory in EEPROM 2048 ⁶	1792 byte					
Interface signals, process data channel	analog, differential					
Interface signals, parameter channel (RS 485)	digital					
Type identifier (HIPERFACE [®] command 52h)	22h	27h	22h	27h	22h	27h
Safety characteristics						
Safety integrity level ⁷	SIL2 (IEC 61508), SILCL2 (EN 62061)					
Category	3 (EN ISO 13849)					
Test rate	Not required					
Maximum demand rate	continuous (analog signals)					
Performance level ⁷	PL d (EN ISO 13849)					
PFH ₀ : probability of dangerous failure per hour ⁸	1.0 x 10 ⁻⁸					
T _M (service life)	20 years (EN ISO 13849)					
MTTF ₀ : mean time to (dangerous) failure	1073 years (EN ISO 13849)					

¹ With released torque support

² In accordance with EN 60068-2-27

³ In accordance with EN 60068-2-6

⁴ In accordance with IEC 60529, with mating plug inserted and cover closed

⁵ In accordance with EN 61000-6-2, EN 61000-6-3 and EN 61326-1. EMC 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-(0V) connection of the supply voltage is also grounded. If other shielding concepts are used, the user must perform his own tests.

⁶ If the electronic type label is used in effective combination with numeric controls, patent EP 425 912 B 2 must be observed; that does not apply if the effective connection is established using speed controllers.

⁷ For more detailed information on the exact configuration of your machine/unit, please consult your relevant SICK branch office.

⁸ The values displayed apply to a diagnostic degree of coverage of 90%, which must be achieved by the external drive system.

8.1 Dimensional drawings (all dimensions in mm)

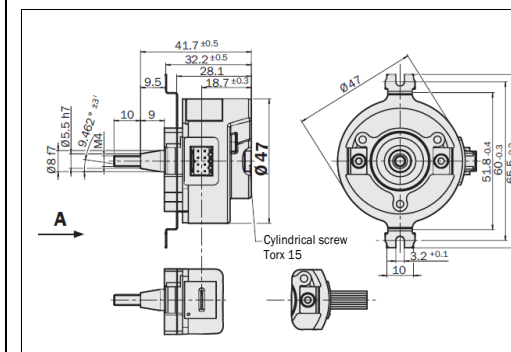


Fig. 2: Dimensional drawing of SRS50S/SRM50S, conical shaft, spring plate

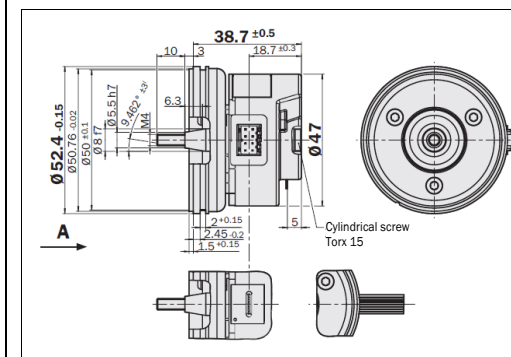


Fig. 3: Dimensional drawing of SRS50S/SRM50S, conical shaft, resolver support

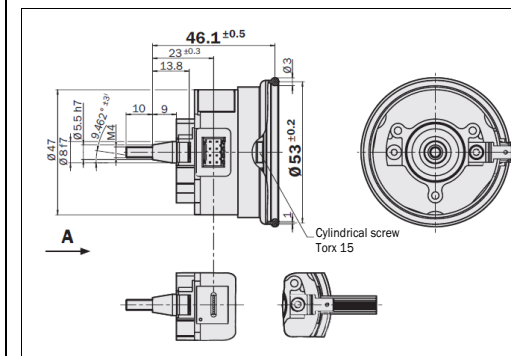


Fig. 4: Dimensional drawing of SRS50S/SRM50S, conical shaft, rubber support

8.2 Assembly figures

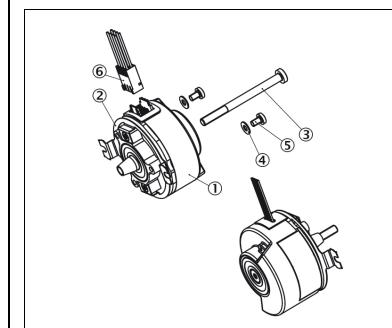


Fig. 5: Assembly figure of SRS50S/SRM50S, conical shaft, spring plate

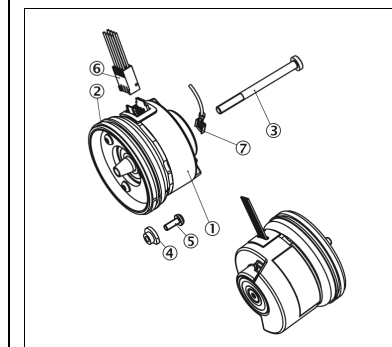


Fig. 6: Assembly figure of SRS50S/SRM50S, conical shaft, resolver support

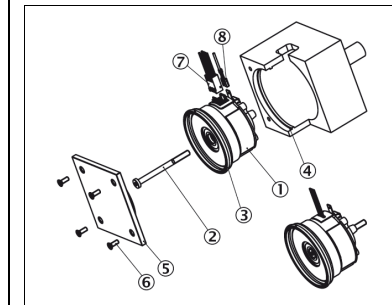


Fig. 7: Assembly figure of SRS50S/SRM50S, conical shaft, rubber support

